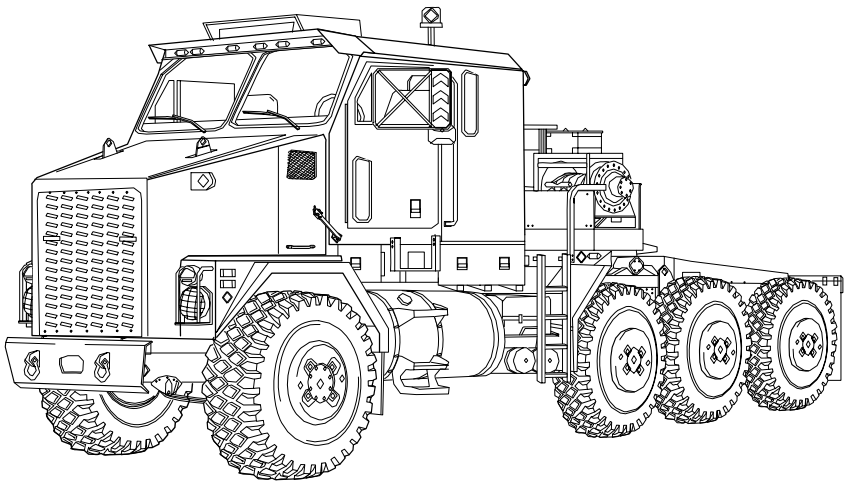
*TM 9-2320-360-34-1

VOLUME NO. 1
DIRECT SUPPORT

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE



TRUCK, TRACTOR, M1070, 8 X 8, HEAVY EQUIPMENT TRANSPORTER (HET)

NSN 2320-01-318-9902

EIC: B5C

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

*Supersedes TM 9-2320-360-34-1 dated 31 March 1994

HEADQUARTERS, DEPARTMENT OF THE ARMY

May 2007

WARNING

Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 dB (A) or greater. Wear approved hearing protection devices when working in high noise level areas. Personnel exposed to high noise levels shall participate in a hearing conservation program in accordance with DA PAM 40-501. Hearing loss occurs gradually but becomes permanent over time.

WARNING

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas and when breathed deprives body of oxygen and causes SUFFOCATION. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Permanent BRAIN DAMAGE or DEATH may result from severe exposure.

The following precautions MUST be followed to ensure personnel are safe whenever personnel heater or main or auxiliary engine is operated for any purpose.

- DO NOT operate personnel heater or engine of vehicle in enclosed area without adequate ventilation.
- DO NOT idle engine for long periods without ventilator blower operation. If tactical situation permits, open hatches.
- DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
- NEVER sleep in a vehicle when the heater is operating or the engine is idling.
- BE ALERT at all times during vehicle operation for exhaust odors or exposure symptoms. If either are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Affected personnel treatment shall be: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 4-25.11 and get medical attention.
- BE AWARE; neither the gas particulate filter unit nor field mask for nuclear, biological, and chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

WARNING

- Wear eye protection and use care when replacing snap rings and retaining rings. Snap/retaining rings are under spring tension and can act as projectiles when released and may cause severe eye injury.
- Protective goggles must be worn when drilling. Failure to comply may result in injury to personnel.
- Always wear eye protection and protective clothing when handling glass. Failure to comply may result in injury.

WARNING

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

WARNING

- **Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.**
- **On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.**

WARNING

SOLVENT CLEANING COMPOUND (DRY CLEANING SOLVENT)

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

- **The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).**
- **Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.**
- **Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.**
- **Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.**
- **Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.**

- **Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).**
- **Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection is required. Failure to comply may result in injury to personnel.**
- **Face shield must be used by personnel operating spray gun. Failure to comply may result in injury to personnel.**

WARNING

- **Floor jack must be positioned on flat surface. Placing jack on uneven or soft surface could result in truck falling, causing serious injury or death to personnel.**
- **Jackstands must be positioned on flat surface, not more than 10 in. (25.4 cm) from wheels. Placing jackstands on uneven or soft surface could result in truck falling, causing serious injury or death to personnel.**
- **Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.**
- **To avoid personal injury, use hoist or get assistance when lifting components that weigh more than 50 lb (23 kg). Ensure all chains, hooks, slings, and lifting devices are in good condition and are of correct capacity.**

WARNING

When servicing this vehicle, performing maintenance, or disposing of materials such as engine coolant, transmission fluid, lubricants, batteries, battery acid or CARC paint, consult your Unit/local hazardous waste disposal center or safety office for local regulatory guidance. If further information is needed, please contact the Army environmental hotline at 1-800-872-3845. Improper disposal of this material may result in damage to environment or injury to personnel.

WARNING

Observe the following precautions when working on or around engine/transmission components.

- **Use guide straps or rope to guide engine/transmission assembly while lifting. Failure to comply may result in injury to personnel.**
- **Grade 8 screws must be used to support engine. Failure to comply may result in engine falling causing injury or death to personnel.**
- **Keep out from under heavy parts. Falling parts may result in serious injury to personnel.**

WARNING

Observe the following precautions when working on or around engine/transmission components (cont)

- **When working on a running engine, use caution around rotating parts. Tools, clothing, and hands may get caught causing serious injury or death to personnel.**
- **Ensure engine is cool before performing maintenance. Failure to comply may result in severe burns.**
- **Engine has may sharp edges. Use caution when using hand tools. Failure to comply may result in injury to personnel.**

WARNING

Observe the following precautions when working on fuel system components.

- **Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET OF VEHICLE.**

WARNING

Observe the following precautions when working on or around exhaust system components.

- **Ensure exhaust manifold and exhaust tube are cool before performing maintenance. Failure to comply may result in serious injury to personnel.**

WARNING

Observe the following precautions when working on or around electrical system components.

- **Remove rings, bracelets, watches, necklaces, and any other jewelry before working around HET Tractor. Jewelry can catch on equipment and cause injury or short across electrical circuit and cause severe burns or electrical shock. Batteries can explode from a spark. Battery acid is harmful to skin and eyes. Always wear eye protection when working with batteries.**
- **Batteries produce explosive gases. Keep sparks and open flame away from batteries. Failure to comply may result in serious injury to personnel.**
- **Use extreme care when measuring voltage while engine is running. Rotating fan blade and hot engine parts may cause injury.**

WARNING

Observe the following precautions when working on or around brake system components.

- **Do not use brake drum that exceeds maximum wear specifications. Failure to comply may result in brake failure and serious injury or death.**
- **Brake shoes/drum may be coated with dust. Breathing dust may be harmful to personnel. Do not use compressed air to clean brake shoes/drum. Wear filter mask approved for use against dust.**
- **Left and right camshafts are different and not interchangeable. Using wrong camshaft may result in inoperative brakes and injury to personnel.**

WARNING

Observe the following precautions when working on or around axle components.

- **Axles are heavy. Keep hands and feet out from under axle. Failure to comply may result in injury or death to personnel.**
- **Differential assemblies are heavy. Stay clear of differential assembly when it is supported by lifting device. If differential falls, serious injury or death may result.**
- **Axle/suspension is heavy. Keep hands and feet out from under axle. Failure to comply may result in injury or death to personnel.**
- **Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.**
- **Keep hands clear of spring and axle housing when lowering axle. Failure to comply may result in serious injury to personnel.**
- **Keep fingers out of pin hole in spring brackets and spring eyes when removing spring pins. Failure to comply may result in injury to personnel.**

WARNING

Observe the following precautions when working on or around cab and frame components.

- **Cab weighs 2600 lb (1179 kg). Stay clear of cab when it is supported by lifting device. If cab falls, serious injury of death may result. Use 10 ft (3 m) guidelines to help guide cab during removal.**
- **Do not work on HET Tractor when supported only by jack or hoist. It may fall and cause severe injury or death.**
- **Ensure personnel are clear of lifting area. All personnel are within visual sight of each other and not within 15 ft (4.6 mm) of cab when lifting is in process. Failure to comply may result in serious injury or death to personnel.**
- **Do not allow personnel to work between jackstands and cab or within designated danger zones while lifting device is supporting cab. Failure to comply may result in serious injury or death to personnel.**
- **Hood is not designed to be a work platform. Using hood as a work platform may result in injury or equipment damage.**

WARNING

Observe the following precautions when working on or around fifth wheel.

- **Rear of fifth wheel plate must be resting on angle stop before performing maintenance. Failure to comply may result in injury.**

WARNING

Observe the following precautions when working on or around suspension system components.

- **Keep hands clear of pin and spring when removing pin. Failure to comply may result in serious injury to personnel.**
- **Air suspension system may still be pressurized even though AIR PRESS gage reads 0 psi. Remove air line slowly to allow air to escape. Failure to comply may result in air line blowing off causing serious injury to personnel.**
- **Air suspension will drop when air line is removed. Stay clear of suspension. Failure to comply may result in serious injury to personnel.**

WARNING

Observe the following precautions when working on or around winch system components.

- **Driver's side and passenger's side winches are not interchangeable. Winch cable slot on drum is on gear end for driver's side winch and on motor end for passenger's side winch. Failure to install correct winch may result in injury to personnel and improper winch operation.**
- **Plug and valve cartridge locations determine if counterbalance valve is for driver or passenger side. Plug and valve cartridge must be in correct locations for driver and passenger side winch. Failure to comply may cause injury to personnel and result in reverse winch operation.**
- **Always wear heavy gloves when handling winch cable. Never let cable run through hands. Frayed cable can cut hands severely.**
- **Use care when removing cable from drum. End of cable can spring up causing injury to personnel.**
- **Output shaft is installed differently in winch drum depending on whether winch is for passenger or driver's side. For driver's side winch, splined end of output shaft must be on cutout end of winch drum. For passenger's winch, splined end of output shaft must be on end opposite cutout end of winch drum. Failure to comply may result in improper winding of cable and injury to personnel.**

WARNING

Polyurethane Coating (CARC)

Eye and hearing protection must be worn at all times when using power tools for grinding, cutting, sawing and drilling. Failure to do so may result in injury to personnel. Chemical Agent Resistant Coating (CARC) paint contains isocyanate which is highly irritating to skin and respiratory system. High concentrations of isocyanate can produce symptoms of itching and reddening of skin, a burning sensation in the throat and nose, and watering of the eyes. In extreme concentrations, isocyanate can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention.

The following precautions must be taken whenever using CARC paint:

•Protective equipment (gloves, goggles, ventilation mask) must be worn when using CARC paint.
•NEVER cut CARC-coated materials without high-efficiency, air-purifying respirators in use.
•DO NOT grind or sand painted equipment without high-efficiency, air-purifying respirators in use.
•BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.
•Use only in well-ventilated areas. Check with local environmental office for methods and locations approved for painting in accordance with local and state environmental regulations.
•ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.

WARNING

After Nuclear, Biological, or Chemical (NBC) exposure of vehicle, all air filters shall be handled with extreme caution. Unprotected personnel may experience injury or death if residual toxic agents or radioactive material are present. If vehicle is exposed to chemical or biological agents, servicing personnel shall wear protective mask, hood, protective overgarments, and chemical protective gloves and boots in accordance with FM 3-11.4. All contaminated air filters shall be placed in double-lined plastic bags and moved swiftly to a segregation area away from the worksite. The same procedure applies for radioactive dust contamination. The Company NBC team should measure radiation prior to filter removal to determine extent of safety procedures required per the NBC Annex to the unit Standard Operating Procedures (SOP). The segregation area in which the contaminated air filters are temporarily stored shall be marked with appropriate NBC placards. Final disposal of contaminated air filters shall be in accordance with local SOP. Decontamination operation shall be in accordance with FM 3-11.5 and local SOP.

See FM 4-25.11 for additional first aid data.

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i thru viii/ (ix blank)	0
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Technical Manual
TM 9-2320-360-34-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 31 MAY 2007

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TRUCK, TRACTOR, M1070, 8 X 8, HEAVY EQUIPMENT TRANSPORTER (HET) (NSN 2320-01-318-9902) EIC: B5C

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications) through the Internet on the Army Electronic Product Support (AEPS) Web site. The Internet address is https://aeps.ria.army.mil. The DA Form 2028 is located under the Public Applications section on the AEPS public home page. Fill out the form and click on SUBMIT. Using this form on the AEPS site will enable us to respond quicker to your comments and to better manage the DA Form 2028 program. You may also mail, fax, or e-mail your letter or DA Form 2028 directly to: TACOM Life Cycle Management Command, ATTN: AMSTA-LC-LPIT / TECH PUBS, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The e-mail address is ROCK-TACOM-TECH-PUBS@conus.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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HOW TO USE THIS MANUAL

OVERVIEW

This technical manual (TM) is provided to help you maintain the HET Tractor at the direct support and general support maintenance levels. Because of its size, it is divided into two volumes. Volume 1 contains the following major sections in order of appearance:

- **WARNING SUMMARY.** Provides a summary of the most important warnings that apply throughout the manual.
- **TABLE OF CONTENTS.** Lists, for both volumes, the chapters, sections, appendixes, and index with page numbers in order of appearance.
- **CHAPTER 1, INTRODUCTION.** Describes the HET Tractor and provides equipment data.
- **CHAPTER 2, VEHICLE MAINTENANCE.** This chapter contains information for finding tools; special tools; test, measurement, and diagnostic equipment (TMDE); and repair parts. It also contains the troubleshooting tables.

The maintenance chapters in volume 1 each contain direct support maintenance instructions for a specific system or group of components.

- **CHAPTER 3, ENGINE MAINTENANCE**
- **CHAPTER 4, FUEL SYSTEM MAINTENANCE**
- **CHAPTER 5, COOLING SYSTEM MAINTENANCE**
- **CHAPTER 6, ELECTRICAL SYSTEM MAINTENANCE**
- **CHAPTER 7, TRANSMISSION MAINTENANCE**
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- **CHAPTER 14, FRAME MAINTENANCE**
- **CHAPTER 15, SUSPENSION SYSTEM MAINTENANCE**
- **CHAPTER 16, CAB AND BODY MAINTENANCE**
- **CHAPTER 17, WINCHES MAINTENANCE**
- **CHAPTER 18, SPECIAL PURPOSE KITS MAINTENANCE**

The last part of volume 1 contains information which will assist you in the performance of direct support and general support maintenance of the HET Tractor.

- **APPENDIX A, REFERENCES.** Lists publications used with the HET Tractor.
- **APPENDIX B, EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST.** Lists expendable and durable items used in the performance of maintenance.

OVERVIEW (CONT)

- **APPENDIX C, ILLUSTRATED LIST OF MANUFACTURED ITEMS.** Illustrates and describes items that must be fabricated from bulk materials for repair of the HET Tractor.
- **APPENDIX D, TORQUE VALUES.** Lists the standard torques values for specific attaching hardware.
- **APPENDIX E, COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST.** This appendix lists equipment used in the performance of maintenance and references publications which contain information regarding the equipment.
- **APPENDIX F, MANDATORY REPLACEMENT ITEMS LIST.** This appendix lists parts required for use in the performance of maintenance procedures, their part numbers, and NSNs.
- **SUBJECT INDEX.** Lists important subjects contained in volume 1 in alphabetical order and gives the paragraph numbers on which they are located.

Volume 2 contains the following major sections in order of appearance:

- **WARNING SUMMARY.** Provides a summary of the most important warnings that apply throughout the manual.
- **TABLE OF CONTENTS.** Lists, for volume 2, the chapters, sections, appendixes, and index with page numbers in order of appearance.

The maintenance chapters in volume 2 each contain general support maintenance instructions for a specific system or group of components.

- **CHAPTER 19, ENGINE MAINTENANCE**
- **CHAPTER 20, FUEL SYSTEM MAINTENANCE**
- **CHAPTER 21, COOLING SYSTEM MAINTENANCE**
- **CHAPTER 22, TRANSMISSION MAINTENANCE**
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- **CHAPTER 26, BRAKE SYSTEM MAINTENANCE**
- **CHAPTER 27, STEERING SYSTEM MAINTENANCE**
- **CHAPTER 28, WINCHES MAINTENANCE**

The last part of volume 2 contains information which will assist you in the performance of direct support and general support maintenance of the HET Tractor.

- **APPENDIX A, REFERENCES.** Lists publications used with the HET Tractor.
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OVER VIEW (CONT)

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- **APPENDIX E, COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST.** This appendix lists equipment used in the performance of maintenance and references publications which contain information regarding the equipment.
- **APPENDIX F, MANDATORY REPLACEMENT ITEMS LIST.** This appendix lists parts required for use in the performance of maintenance procedures, their part numbers, and NSNs.
- **SUBJECT INDEX.** Lists important subjects contained in volume 2 in alphabetical order and gives the paragraph numbers in which they are located.

FINDING INFORMATION

There are several ways to find the information you need in this manual. They are as follows:

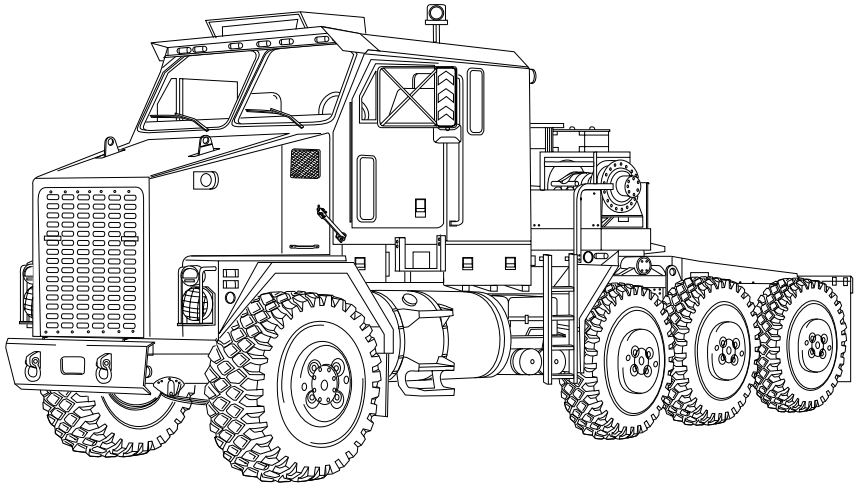
- **FRONT COVER INDEX.** The front cover index contains a list of the most important topics contained in each volume. It features a black box at the right edge of the cover which corresponds with a black box on the page containing the topic. The topics listed on the front cover are highlighted in the table of contents with a box.
- **TABLE OF CONTENTS.** Lists chapters, sections, appendixes, and index with page numbers in order of appearance.
- **CHAPTER INDEXES.** List paragraphs contained in the individual chapters with paragraph and page numbers in order of appearance.
- **SYMPTOM INDEX.** Lists malfunctions contained in the troubleshooting table with page numbers in order of appearance.
- **SUBJECT INDEX.** Lists all important topics with paragraph numbers in alphabetical order.

TROUBLESHOOTING

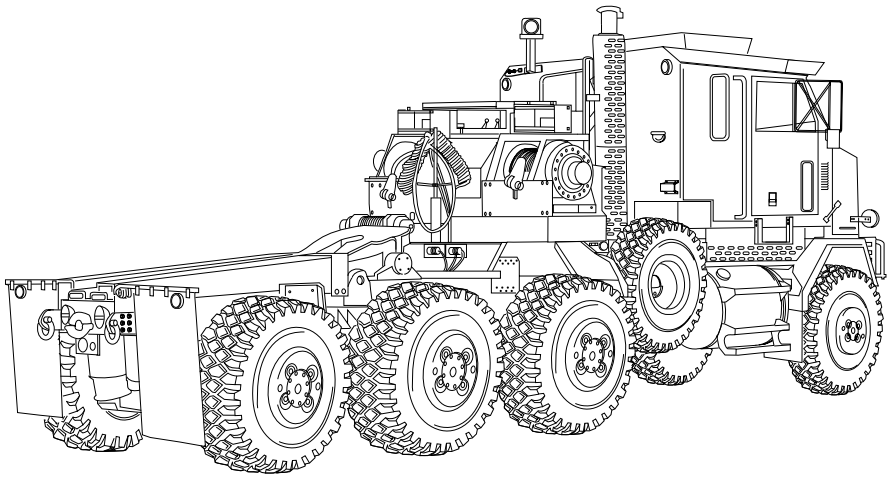
When a malfunction occurs, look at the symptom index for the vehicle troubleshooting table in chapter 2. Find the malfunction in the index. Turn to the page number listed for the malfunction in the troubleshooting table. Perform the steps required to correct the malfunction. If you can't find the malfunction, or the malfunction is not corrected, notify your supervisor. Refer to para 2-4, Introduction to Logic TreeTroubleshooting, for additional troubleshooting instructions.

MAINTENANCE

Maintenance instructions are located in chapters 3 thru 28. The troubleshooting tables often reference you to these procedures. When you perform maintenance, look over the entire procedure before starting. Make sure you have the necessary tools and materials at hand. Always follow the WARNINGS and CAUTIONS.



Left Front View



Right Rear View

TRUCK, TRACTOR, M1070, 8 X 8,
HEAVY EQUIPMENT TRANSPORTER (HET)

CHAPTER 1
INTRODUCTION

Contents

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Equipment Improvement Report and Maintenance Digest (EIR MD) and Equipment Improvement Report and Maintenance Summary (EIR MS)	1-7	1-2
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Section I. GENERAL INFORMATION

1-1. SCOPE

a. Type of Manual. Direct Support and General Support Maintenance Instructions, TM 9-2320-360-34.

b. Model Number and Equipment Name. Truck, Tractor, M1070, 8 X 8, Heavy Equipment Transporter (HET).

c. Purpose of Equipment. The HET Tractor and the M1000 Trailer form the Heavy Equipment Transport System (HETS). HETS will be used to load, unload, and transport the M1 Series Main Battle Tank (MBT) during administrative and tactical operations.

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 750-8. The Army Maintenance Management System (TAMMS).

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

Command decision, according to tactical situation, will determine when the destruction of the HET Tractor will be accomplished. A destruction plan will be prepared by the using organization unless one has been prepared by a higher authority. For general destruction procedures for this equipment, refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (U.S. Army Tank-Automotive Command).

1-4. PREPARATION FOR STORAGE OR SHIPMENT

Instructions for preparation for storage or shipment are provided in paragraph 2-14 of this manual.

1-5. NOMENCLATURE CROSS-REFERENCE

Table 1-1 lists the nomenclature cross-references used in this manual.

Table 1-1. Nomenclature Cross-Reference

Common Name	Official Nomenclature
DDR	CTS J1708 Application
STE/ICE-R	CTS/ICE
Cable	Wire rope
Cold Start System	Ether quick-start system
Engine Coolant	Antifreeze, ehtylene glycol mixture
Gladhand	Quick-disconnect coupling
HET Tractor	Truck, Tractor, M1070, 8 x 8, Heavy Equipment Transporter (HET)
Jacobs Brake	Engine retarder

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your HET Tractor 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 it to us at: Commander, U.S. Army Tank-Automotive and Armaments Command, ATTN: AMSTA-QRT, Warren, MI 48397-5000. We'll send you a reply.

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

The quarterly EIR MD, TB 43-001-39 series, contains valuable field information on the equipment covered in this manual. It is compiled from some of the Quality Deficiency Reports that have been prepared on the vehicles covered in this manual. Many of these articles result from comments, suggestions, and improvement recommendations that were submitted to the EIR program. It also contains information on equipment improvements, minor alterations, proposed Modification Work Orders (MWOs), warranties, actions taken on some of the DA Form 2028's (Recommended Changes to Publications), and advance information on proposed changes that may affect this manual. In addition, the more maintenance significant articles (including minor alterations, field-fixes, etc.) that have a continuing need in the field are republished in the EIR MS for TACOM equipment (TM 43-1043). Refer to both of these publications periodically, especially the TB 43-001-39 series, for the most current and authoritative information on the equipment. The information will help you to do a better job and will advise 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, of this manual.

1-8. WARRANTY INFORMATION

The HET Tractor is warranted by Oshkosh Truck Corporation for 18 months. Warranty starts on the date found in block 23, DA Form 2408-9, in the logbook. Report all defects in material or workmanship to the supervisor, who will take the appropriate action. For complete information covering warranties, refer to Warranty Technical Bulletin for Truck, Tractor, M1070, 8 x 8, Heavy Equipment Transporter (HET), TB 9-2320-360-14.

1-9. METRIC SYSTEM

The equipment described herein contains metric components and requires metric common and special tools, therefore, metric units in addition to English units will be used throughout this manual. An English-to-metric conversion table is included inside the back cover of this manual.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-10. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

Refer to TM 9-2320-360-10 for equipment characteristics, capabilities, and features.

1-11. LOCATION AND DESCRIPTION OF COMPONENTS

Refer to TM 9-2320-360-10 for location and description of components.

1-12. EQUIPMENT DATA

Refer to TM 9-2320-360-10 for equipment data.

1-13. SAFETY, CARE, AND HANDLING

a. Significant Hazards and Safety Recommendations. Significant hazards and safety recommendations are listed in table 1-2.

Table 1-2. Significant Hazards and Safety Recommendations

Operating Hazard	Safety Recommendation or Precaution	Condition*
Low oil pressure/ high coolant temperature	Stop engine operation when CHECK GAUGES and CHECK ENGINE indicators are lit, engine warning alarm sounds, and gages indicate abnormal readings.	Abnormal
Low air pressure	Do not drive HET Tractor while low air pressure alarm is sounding or LOW AIR indicator is lit.	Abnormal
Electric shock	Do not wear watches, rings, or other jewelry while working on or near an electrical circuit.	Abnormal
Refueling vehicle	Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open flame and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post sign that says: NO SMOKING WITHIN 50 FEET OF VEHICLE.	Normal

*Category of hazards as to whether or not they may be expected under normal or abnormal operating conditions.

1-13. SAFETY, CARE, AND HANDLING (CONT)

Table 1-2. Significant Hazards and Safety Recommendations (Cont)

Operating Hazard	Safety Recommendation or Precaution	Condition*
Connecting/Disconnecting trailer.	Make sure that position of assistant is known at all times. Make sure no one is standing directly behind tractor or trailer during connection/ disconnection.	Normal
Vehicle instability on a hill.	Avoid driving diagonally across a hill. HET Tractor may roll, causing equipment damage and injury or death to personnel.	Normal
Winching operations.	Do not use winches for lifting personnel. Always wear heavy gloves when handling winch cable. Never let cable run through hands. Frayed cable can cut severely. Do not operate winch without guard in place. Do not place hands or feet near winch during operation. Ensure that both DRIVER SIDE and PASSENGER SIDE WINCH KICKOUT controls are disengaged prior to paying out winch cables. Failure to disengage KICKOUT controls may result in injury to personnel.	Normal

*Category of hazards as to whether or not they may be expected under normal or abnormal operating conditions.

Section III. PRINCIPLES OF OPERATION

1-14. POWER TRAIN

Power for the HET Tractor is generated by a two-stroke, V-type diesel engine coupled directly to an automatic transmission. The engine is capable of 500 horsepower of braking.

The engine is equipped with an electronic control system that regulates fuel delivery to each injector as well as governing engine speed for power takeoff operation. Engine sensors and engine performance can be checked using a plug-in diagnostic reader.

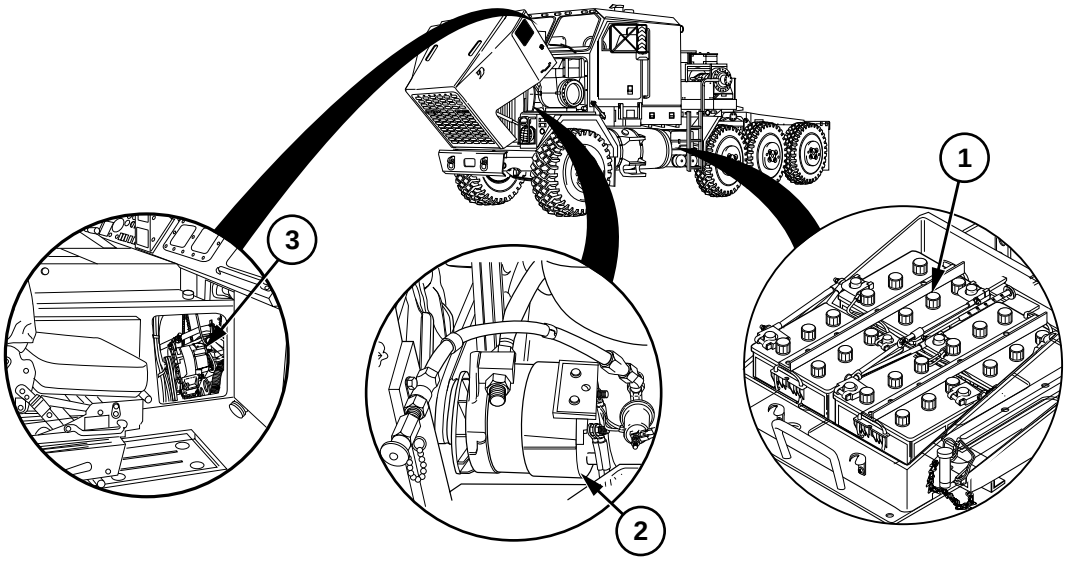
Five forward drive ranges can be manually selected, depending on the terrain and conditions. The transmission will automatically downshift as engine speed and throttle position change.

When the lockup clutch is automatically applied, power is transmitted mechanically through the lockup clutch. A direct drive is engaged from the engine to a converter turbine shaft.

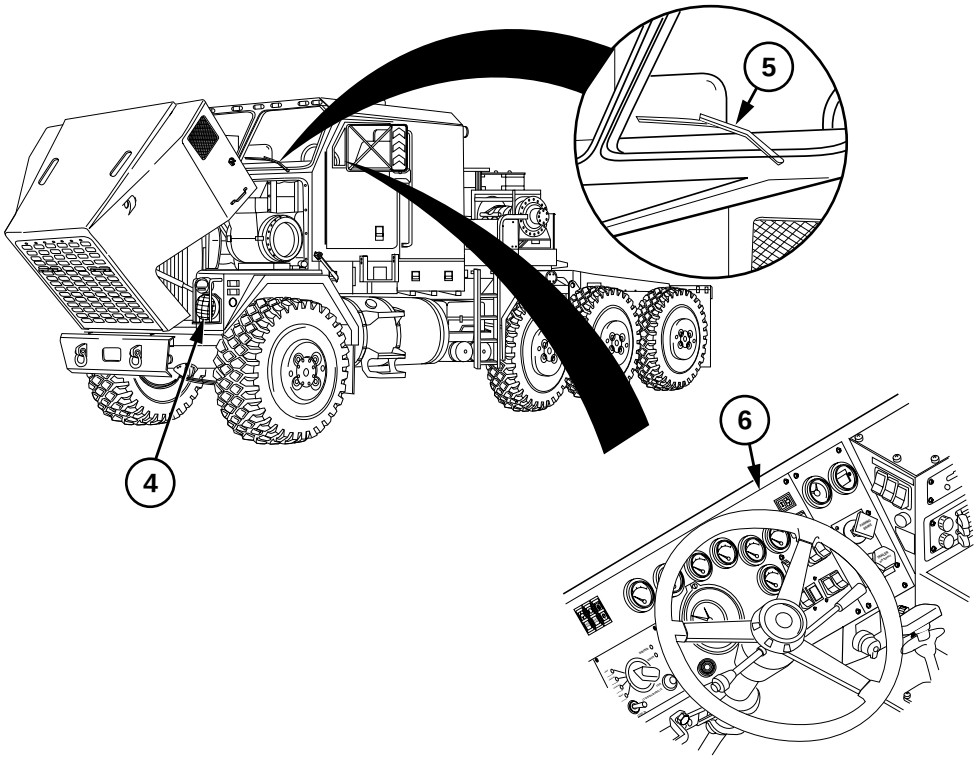
Power from the transmission is directed to the transfer case and propeller shafts forward and rear. The front axle and rear tridem axles are each equipped with planetary wheel ends. In low range, driver-controlled lockouts in the differentials provide positive drive to all four axles.

1-15. ELECTRICAL SYSTEM

The HET Tractor electrical system consists of two different circuits, 12 Vdc and 24 Vdc. Four 12-volt storage batteries (1) connected in series parallel provide current to both circuits. Two belt-driven alternators provide current to the electrical system during normal operation, and recharge the batteries while the engine is operating. The 24 Vdc system utilizes an alternator (2) with 130 amp capacity. The 12 Vdc system utilizes an alternator (3) with 145 amp capacity.

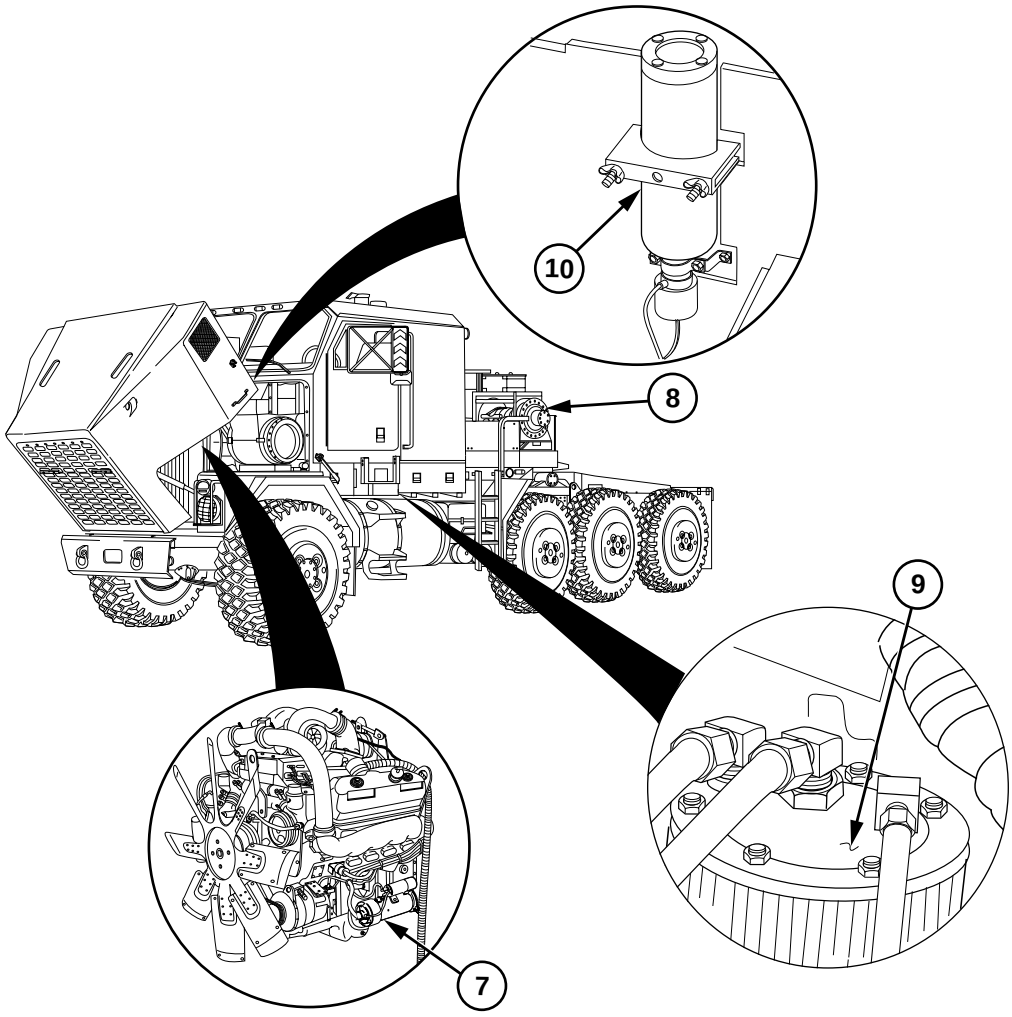


The headlights (4), windshield wipers (5), washer, instrument panel/dash lighting switches (6), warning lights, and gages are supplied with 12 Vdc.



1-15. ELECTRICAL SYSTEM (CONT)

The starter motor (7), winches (8), CTIS, air dryers (9), trailer lights, and ether injection system (10) are operated with 24 Vdc.



The starter motor solenoid receives 24 Vdc from the storage batteries through the engine starter magnetic switch auxiliary contacts and the neutral start relay. If the transmission range selector is not in the N (neutral) position prior to startup, the engine cannot be started.

Warning lights and gages that indicate system malfunctions include: CHECK GAUGES alarm, CHECK ENGINE indicator, and CHECK GAUGES indicator.

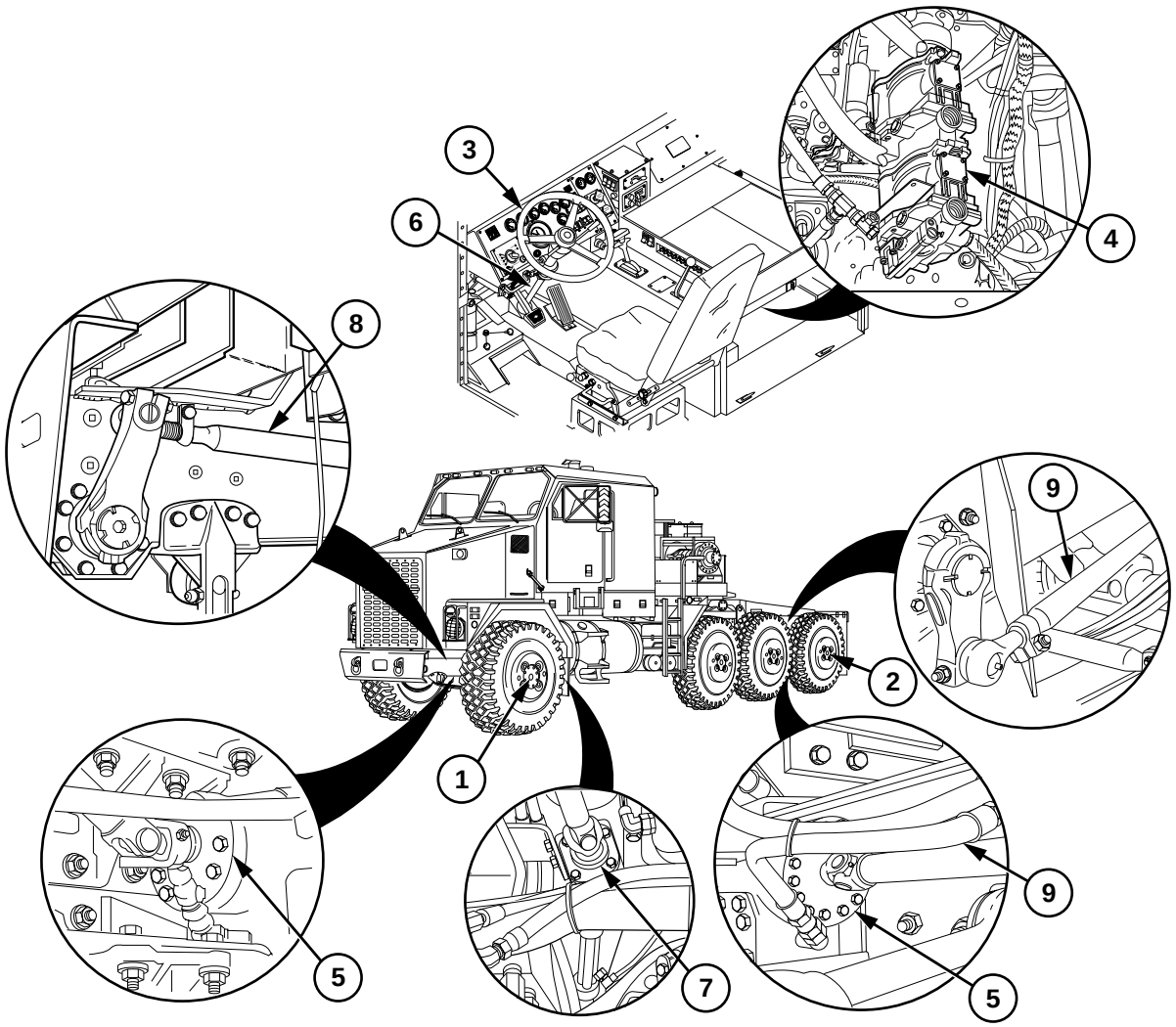
1-16. STEERING SYSTEM

The steering system uses two steering axles, one at the front (1) and one at the rear (2). Each axle turns in response to turning the steering wheel (3) in the cab.

Steering power is generated by a steering pump (4) driven directly at the engine providing pressure to two steering gears (5), one at each steering axle. The pump delivers hydraulic fluid to enable the operator to turn the wheels of a fully-loaded truck. An interconnected series of shaft linkages rotate with hydraulic power assist to turn the two axles.

As the steering wheel is turned, the rotational motion of the upper steering assembly shafts (6) is translated at a tee gear box (7) below the cab to both the front and rear power steering gears (5). The gear boxes multiply the rotational force to a pair of drag links (8) and axle steering arms that apply directional motion to turn the axles.

In the event a steering line (9) to a steering axle is severed or fluid leaks from the system (power steering inoperable), the truck can be steered for short distances in emergency situations.



1-17. AIR SYSTEM

The air system operates the service and parking brakes, rear suspension system, and the Central Tire Inflation System (CTIS). Air also enables operation of the transfer case and interaxle lockups, winch tensioners and kickouts, windshield washer, and horns.

The air system on the HET Tractor consists of an engine-driven air compressor (1), a purge tank (2), and five air reservoirs (3 thru 7). Reservoir (3) supplies air to reservoirs (4 thru 7). Three reservoirs (5 thru 7) are interconnected and separated from reservoir (4) with check valves. Air from reservoir (4) is supplied to service brakes on all four axles and parking brakes on the rear tridem axles, transfer case and interaxle lockups, winch tensioners and kickouts, windshield washer, and horns. The service brakes are actuated by relay valves which are controlled by the operator pressing the brake treadle in the cab. The parking brakes are also actuated by relay valves which are controlled by hand controls. In the event of the loss of system air pressure, the spring brake valve will modulate the parking brakes so the HET Tractor can be stopped safely. Reservoirs (5 thru 7) supply air to operate the CTIS, service and parking brakes on rear tridem axles, and rear suspension system. Air is drawn from the engine air intake and routed to the air compressor (1) where it is pressurized. Pressurized air flows from the air compressor (1) through an aftercooler (7.1), a coalescing filter (7.2), and air dryers (8 and 9) where the air is cooled and moisture/oil is removed. Air from the dryers goes to the purge reservoir (2) and air reservoir (3).

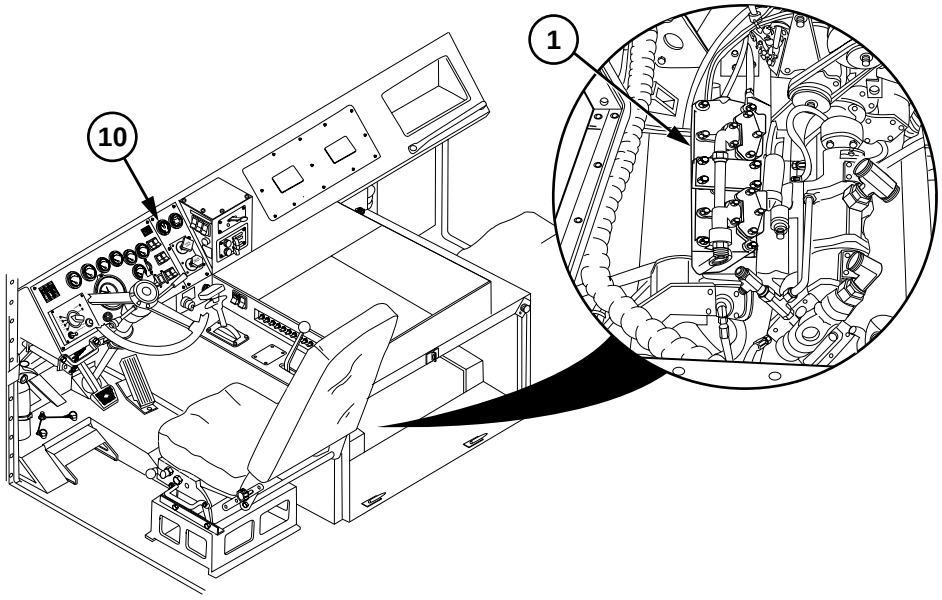
System protection elements include an air cleaner restriction sensor that determines whether air flow through the air cleaner is impeded and also transmits a signal to a dash-mounted gage.

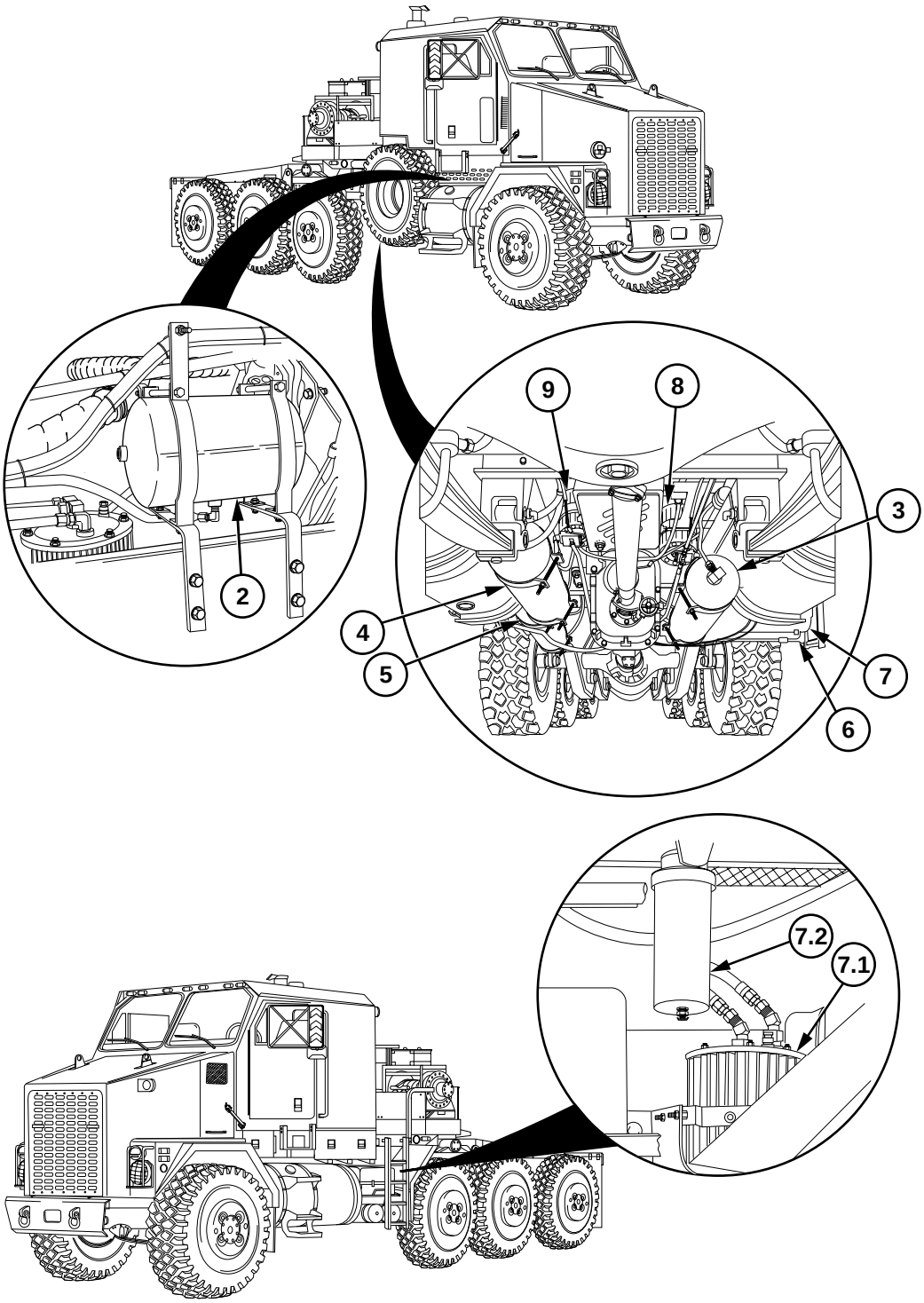
In the cab, air pressure in reservoir (4) is indicated by the green needle on the AIR PRESS gage (10). The red needle on the gage (10) indicates air pressure in reservoirs (5 thru 7). If air pressure falls below 60 psi (414 kPa) in any of the reservoirs, warning alarm will sound and LOW AIR indicator will light.

The rear suspension system contains a pair of suspension air bags on each rear axle that automatically inflates or deflates according to load. Air to the air bags is regulated by a height control valve.

Purging the air in the air dryers and aftercooler is automatically done when 125 psi (862 kPa) system pressure is reached at the compressor. The compressor cycle is stopped and air from purge tank clears accumulated water through a valve on the bottom of the air dryer.

Air to the transfer case enables engagement of four-wheel drive in high or low gear range. An interaxle lockup pilot valve also prevents the axles from locking up in high range.



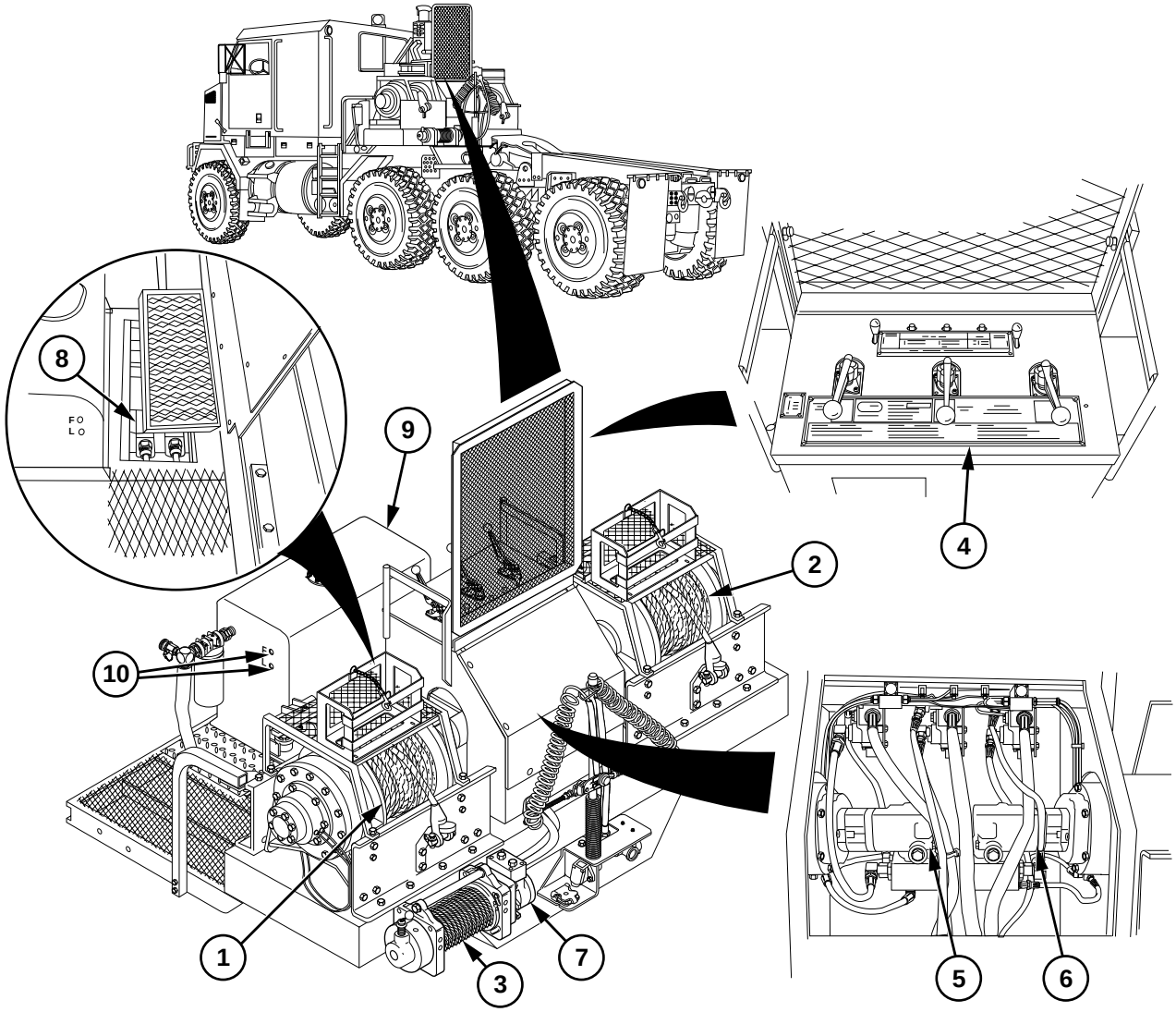

9
8
3
2
4
5
7
6
7.2
7.1

1-18. WINCH SYSTEM

The winch system operates hydraulically and consists of two main winches (1 and 2) and an auxiliary winch (3). The main winches operate independently of each other and are used to recover, load, and unload heavy tracked and wheeled vehicles. The main winches are mounted side-by-side directly to the winch platform. The auxiliary winch is used to pull the main winch cable out to the payload. The auxiliary winch is mounted to the winch platform just below the driver's side main winch.

The winches are controlled from the operator's station (4). The operator is protected by a personnel guard during winch operations. The main winch controls are the winch kickout control, cable hold down lever, engine idle selector switch, engine high idle lock switch, winch speed control switch, and the winch drum control.

Each main winch incorporates a two-speed hydraulic motor (5 and 6). The hydraulic motor is used to provide power. It converts hydraulic horsepower from the pump and control circuitry to rotary mechanical horsepower for driving the gear system. A single-speed motor (7) is used by the auxiliary winch. A Power Takeoff (PTO) driven hydraulic pump (8) supplies the winch system with hydraulic oil from the reservoir (9). A two-piece driveshaft connects the transmission driven PTO to the hydraulic pump (8). A view gage (10) on the reservoir indicates the hydraulic oil level. All winches have a fail-safe brake and winch brake valve for winch load control.



CHAPTER 2
VEHICLE MAINTENANCE

Contents **Para** **Page**

Common Tools and Equipment 2-1 2-1
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Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

For a listing of special tools, TMDE, and support equipment, refer to the Maintenance Allocation Chart (MAC), Appendix B, of TM 9-2320-360-20 and to the Repair Parts and Special Tools List (RPSTL), TM 9-2320-360-34P.

2-3. REPAIR PARTS

Repair parts are listed and illustrated in the repair parts and special tools list, TM 9-2320-360-34P, covering direct support and general support maintenance for this equipment.

Section II. TROUBLESHOOTING

2-4. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING

a. Page Layout The troubleshooting is divided into symptoms peculiar to a vehicle system or component (for example, winch system or engine).

First, determine the symptom or condition that indicates a problem or failure. Refer to page 2-16 to begin Engine Electronic Controls (DDEC) troubleshooting or page 2-64 to begin vehicle troubleshooting

Go to the referenced page to begin troubleshooting. Open the manual flat so that both the right and left hand pages are displayed before you. The information on all facing pages is important.

All diagnostic logic and flowcharts are on the left hand page, with supporting information, warnings, cautions, notes, and test instructions on the right. (See figure on next page.) Pages are set up so you do not need any more than the necessary information, notes, warnings and cautions about a particular question. The experienced technician can generally read just left hand pages and refer to information on the right page when needed. All critical information for decisions is on the left page.

b. How To Begin Troubleshooting

(1) Identify the symptom or fault. Select the applicable symptom (grouped by systems). Follow DDEC Troubleshooting BEFORE going to Engine Troubleshooting.

(2) Follow the diagnostic procedure. Answer question no 1. on the left hand page and follow the YES or NO path to either the remedy or the next question. Helpful information about the problem is also on the left page. Look on the right page for additional specific instructions and help.

(3) Observe warnings, cautions, and notes. **WARNING** is the symbol for a warning statement. If you see this block above a question on the left page, look on the right page for the text of the message. The **WARNING** message on the right page will also have the symbol above it. **CAUTION** is the symbol for a caution statement. If you see this block above a question on the left page, look on the right hand page for the text of the message. The **CAUTION** message on the right hand page will also have the symbol above it. Examples:

WARNING

Do not start engine with air intake duct or exhaust pipe removed from turbocharger. Failure to comply may result in injury.

CAUTION

If OIL PRESS gage does not show engine oil pressure within 10-15 seconds after starting engine, shut down engine immediately. Lack of lubrication may damage engine.

NOTE

Left and right exhaust manifolds are checked in the same manner.

c. Measurements Required for Troubleshooting

(1) Resistance Measurements

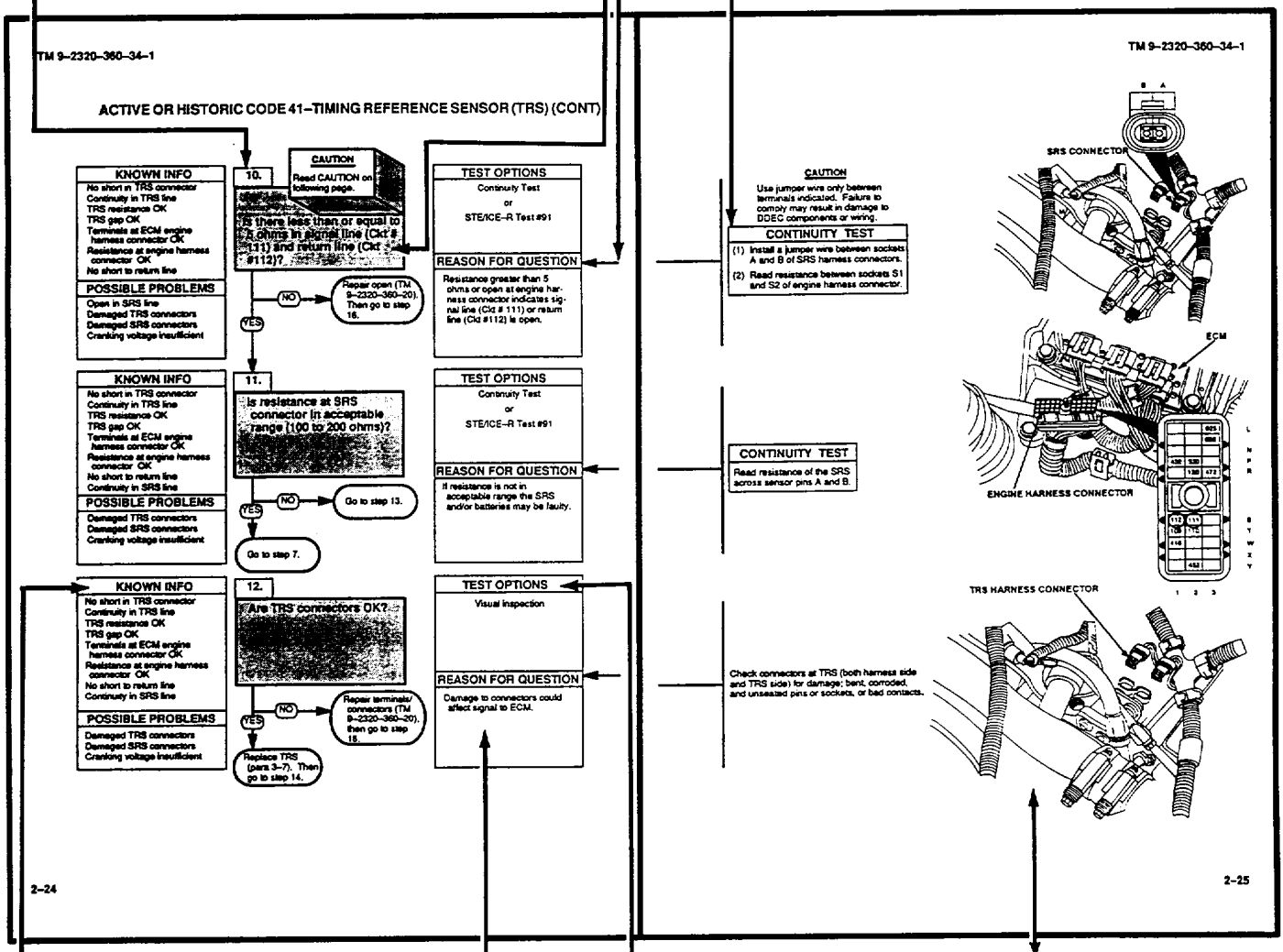
(a) Connect the red test lead to the volt-ohm input connector and black lead to the Common (COM) input connector on the meter.

Question number, so you know where you are in the test chain.

Arrows link reference information with questions.

Question to be answered.

Instructions for how to perform a test or make a measurement, usually numbered steps in a box.



Known information and possible problems with the system.

Line art to assist technician on locating suspect component or test point.

Reasons for question. This tells you why the question is being asked. It contains criteria for a troubleshooting test preformed e. g. resistance range indication, an open circuit.

Test Options: Other methods you can use to obtain the answer to the question.

2-4. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT)

(b) Set the function/range switch to the desired ohm position. If the magnitude of the resistance is not known, set the switch to the highest range, then reduce until a satisfactory reading is obtained.

(c) If the resistance being measured is connected to a circuit, turn ENGINE switch OFF.

(d) Connect test leads to the circuit being measured. When measuring high resistance, be careful not to contact adjacent points, even if they are insulated. Some insulators have a relatively low insulation resistance which can affect the resulting measurement.

(e) Read the resistance value on the digital display.

(2) Continuity Checks

(a) Place the function/range switch in any ohm range.

NOTE

Some meters show '1+m ', or simply '1' when function/range switch in any ohm position.

(b) Connect the red lead to the volt-ohm connector and black lead to COM input connector on the meter. With the test leads separated or measuring an out-of-range resistance, the digital display will indicate 'OL' (overlimit).

(c) Put one test lead probe at one end of the wire or circuit to be tested. Use the other test lead to trace the circuit. When continuity is established, an ohm symbol will appear in the upper left corner of the digital display. If contact in the wire is maintained long enough (about 1/4 of a second), the OL will disappear and the resistance value of the wire or circuit will appear next to the symbol.

(3) Voltage Measurements

(a) Connect the red test lead to the volt-ohm input connector and the black lead to the COM input on the meter. If a DC-AC switch is present, make sure it is switched to the DC position.

(b) Set the function/range switch to the desired volts position. If the magnitude of the voltage is not known, set the switch to highest DC voltage range (50VDC). Then reduce the range until a satisfactory reading is obtained.

(c) Connect the test leads to the circuit being measured. Voltage measurements are always taken at pins, sockets, Battery + or ground. Following the voltage measurement point, the color test lead used is given in parenthesis (red is volt-ohm connection, and black is the COM connection).

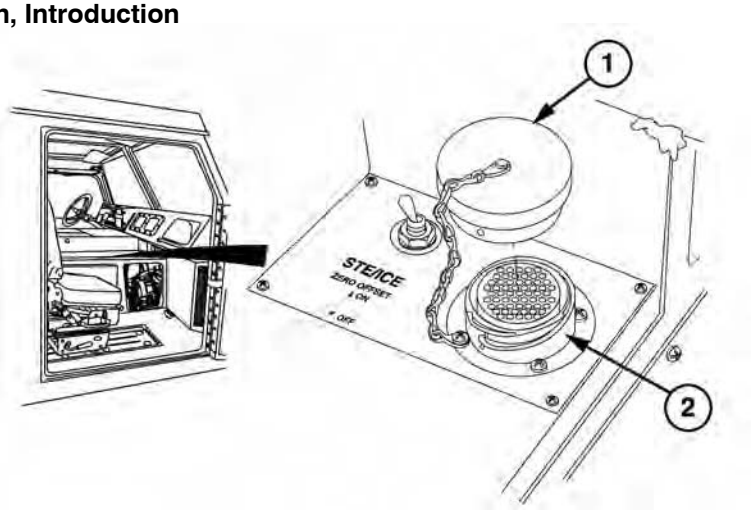
d. Contact Test Set (CTS), J1708 Application, Introduction

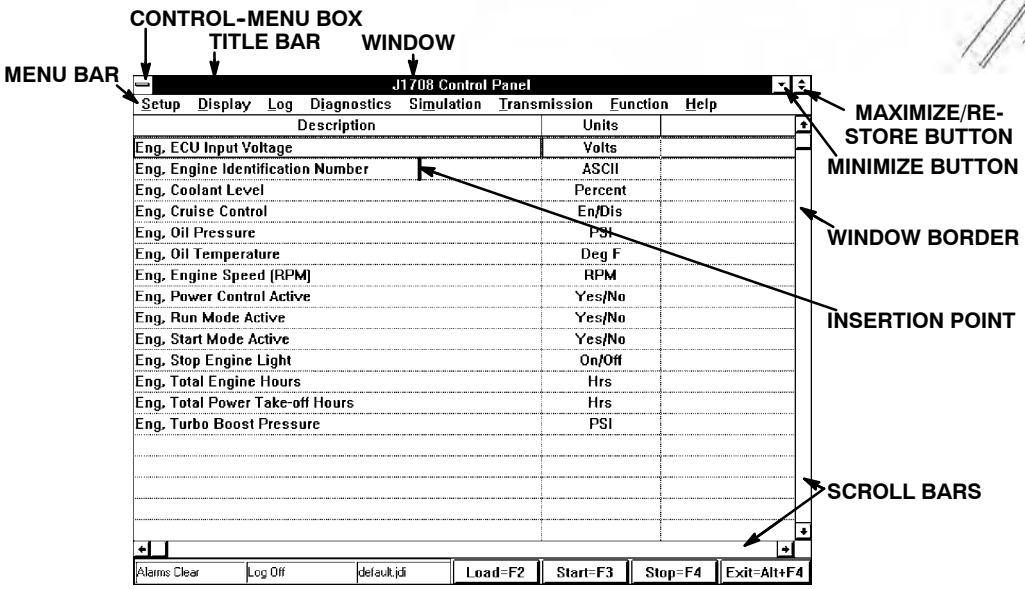
(1) Connecting CTS to HET M1070

(a) Remove cover (1) from diagnostic connector assembly (DCA) (2) by turning counterclockwise.

(b) Install DCA cable on DCA (2).

(c) Prepare CTS for operation (TM - X-XXXX-XXX-XX).





(2) Parts of the Display Window

(a) Control-Menu Box. Located in the upper-left corner of each window. Used to re-size, move, maximize, minimize, and close windows, and to switch to other applications.

(b) Title Bar.

(c) Window Title. The name of the application - J1708 Control Panel.

(d) Menu Bar. Lists the available menus. A menu consists of a list of commands, or actions you can carry out.

(e) Scroll Bars. You can move parts of document into view when the entire document does not fit in the window.

(f) Maximize/Minimize Buttons. Maximize is used to enlarge the window so it fills the entire desktop, Minimize is used to reduce the window to an icon.

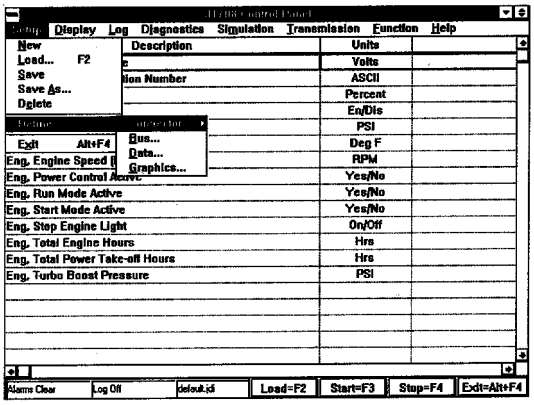
(g) Restore Button. After you enlarge a window, the maximize button is replaced by the restore button. Clicking the restore button will restore the window to its original size.

(h) Window Border. The outside edge of a window. Used to lengthen or shorten the border on each side of the window. The window corner can be used to shorten or lengthen two sides of the border at the same time.

(i) Insertion Point. Where you are at in the document. The mouse pointer changes position on the screen when you move the tracker ball.

2-4. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT)

(3) J1708 Menu Commands



(a) Setup Menu Commands. The commands in this section allow the operator to customize to main display area of the program. The operator has the option of selecting a previously displayed format and save a new display format.

1. New. The New command will delete all items that are on the Data Display Window. This includes all display setups and data. Do not use this command if you wish to delete only data information.

2. Load. The Load command allows the user to select and load a Display Setup File which has been previously saved. These file names will be listed on the display and will be identified by the extension "_____.jdi". Only files with the ".jdi" extension are allowed to load.

3. Save. The Save command allows the user to save a custom display as a new Display Setup File. The new file name must contain no more than eight characters, followed by the ".jdi" extension.

4. Save As. The Save As command allows the user to save a Display Setup File under a different file name. With this command, the operator can copy a frequently used Display Setup so it can be modified for a new need. The new file name must contain no more than eight characters, followed by the ".jdi" extension.

5. Delete. The Delete command allows the user to delete a Display Setup File. Only a file with a ".jdi" extension is allowed to be deleted.

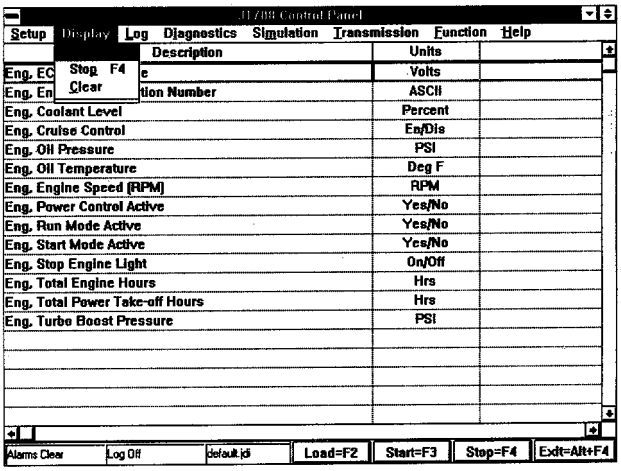
6. Define. The Define command allows define CTS J1708 options. When Define is selected, four choices are given:

   Connector. Allow user to select the DCA connector or the diagnostic data link (DDL) connector located inside the electrical control box (ECB).

   Bus. Not applicable.

   Data. Allows the user to select and deselect the data lines displayed on the main display area of the screen. The information will be displayed in a text format.

   Graphics. The operator can select between three types of graphics readouts: digital readout, bar graph readout, or gage readout.



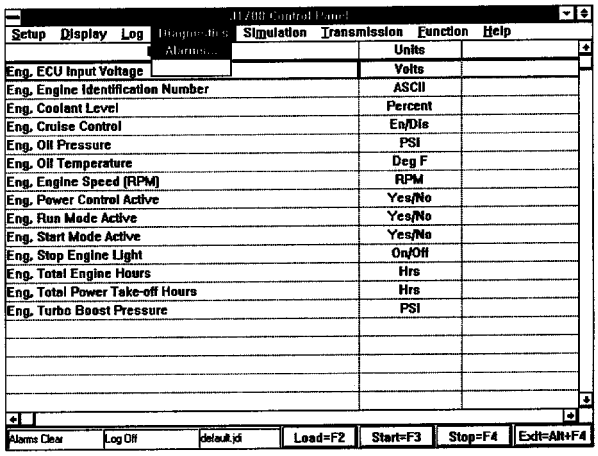
(b) Display Menu Commands. The commands in this section allow the operator to control the data that is being displayed.

1. Start. The start command allows the user to start the display data after it has been stopped for viewing. The command only affects the data which is being displayed.

2. Stop. The Stop command allows the user to stop the constantly changing display data. This allows the operator to freeze the display and study the data.

3. Clear. The Clear command allows the operator to clear the data values from the various readouts. New data will be displayed as it becomes available.

(c) Log Menu Commands. The commands in this section allow the operator to control the various log functions. The operator may play back a previously recorded log, or may create a new log to store incoming data. This function is not used in the HET M1070 troubleshooting.



(d) Diagnostics Menu Commands. The commands in this section allow the operator to view the alarms (active codes) and work the status diagnostics.

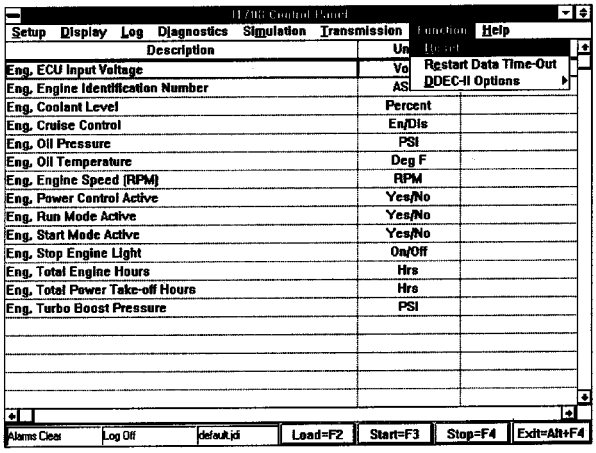
1. Alarms (Active Codes). The Alarms command allows the operator to view all the systems alarms (active codes). When this command is selected, the Current Alarms window is displayed. This window will display all alarms (active codes) that have been detected since system start up or the last time this window was cleared. From this window, the operator can also set the alarm priority for both the Pop-up Window and the Beep Alarm.

2. Status. Not applicable.

2-4. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT)

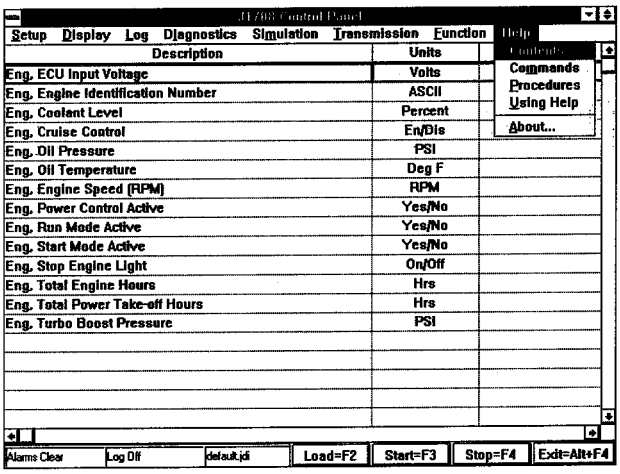
(e) Simulation Menu Commands. The commands in this section allow the J1708 unit to be used as a training simulator. This application is not used during troubleshooting of the HET M1070.

(f) Transmission Menu Commands. The commands in this section allow the operator to select the modes for ATEC Transmission Data. This application is not used on the HET M1070 Tractor.



(g) Function Menu Commands. The commands in this section allow the operator to reset the J1708 computer board and to choose various DDEC options.

1. Reset. The Reset command is used to reset the J1708 board. When this command is used, all board functions will be reset to zero (0) and the Electronic Control Module (ECM) will run through a self test.
2. Restart Data Time-out. This selection is used to re-start the time-out test sequence for the presence of J1708 data when the ”No J1708 Input Data” message is displayed.
3. DDEC-II Option Commands. Refer to paragraph (4) for details.



(h) Help Menu Commands. The commands in this section allow the user to access the on-line help topics.

1. Contents. This section lists the Help items that are available to the operator from this program. These items may be selected directly from this list or from the Help Menu Commands window.

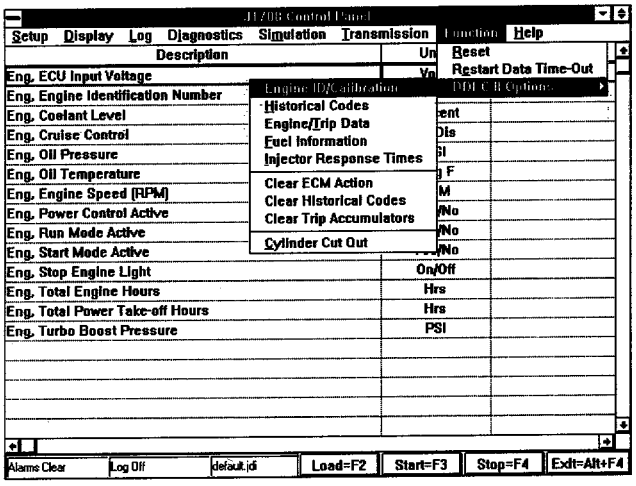
2. Commands. This section allows the operator to access descriptions of the commands found in this program. When the operator selects one of the Menus selections listed below, the screen will display descriptions for the commands found under that menu. For instructions on how to use the commands, the operator should go back to the Main Help Menu and select ”PROCEDURES”.

3. Procedures. This menu allows the user to select the procedures to perform various tasks within the J1708 User Interface program.

4. Using Help. If you are new to Help, choose Help Basics. Use the scroll bar to view information not visible in the Help window. Click on the underlined topic you want to view, or press tab to select a topic, and then press ENTER.

5. About. Information about the J1708 application, such as copyright, version, and application name; the mode Windows is running in; and the amount of memory available on your computer.

2-4. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT)



(4) DDEC-II Option Menu. Click on "OK" to return to the main window from the DDEC-II Options Menu.

(a) Engine ID/Calibration. Click on "Engine ID/Calibration". A pop up window will be displayed with the following information:

1. Engine ID (Identification).
2. ECM S/N (Electronic Control Module Serial Number).
3. No. of Cyl (Number of Cylinders).
4. EPA Cert. No. (EPA Certification Number).
5. SW Level (ECM Software Version).
6. Box Type (indicates whether ECM supports 6 or 8 cylinders.
7. Pk Trq (Peak Torque in lb-ft).
8. Spd Pk Trq (RPM at which peak torque is obtained).
9. Option Word Window (status of options).
10. Shutdown Word Window (status of shutdown words).

(b) View Historical Codes. Click on "Historical Codes". If historical codes are present, they will be displayed in a pop up window. The only codes displayed are those stored by the ECM since the last time the historical codes were cleared. If no codes are stored in the ECM, "No Historical Codes" will be displayed in the pop up window.

(c) Engine/Trip Data. Click on "Engine/Trip Data". A pop up window will be displayed with the following information:

1. Fuel GPH (estimated fuel consumption rate in gallons per hour).
2. Total GAL (estimated total fuel used in gallons).
3. Eng Hours (total hours of engine operation).
4. PTO Hours (total hours of PTO operation).
5. Instant MPG (estimated instantaneous miles per gallon).
6. Ave MPG (estimated average miles per gallon).
7. Trip Miles (total distance since reset).
8. Trip GAL (estimated total fuel used since reset).

(d) Fuel Information. Not applicable.

(e) Injector Response Times. Click on ”Injector Response Times”. The DDEC Injector Response Time Window will be displayed.

(f) Clear ECM Actions. Click on ”Clear ECM Action”. A pop up window will be displayed verifying the step. Click on ”OK” to clear all ECM actions, click on ”CANCEL” to return to the main window.

(g) Clear Historical Codes. Click on ”Clear Historical Codes”. A pop up window will be displayed verifying the step. Click on ”OK” to erase all historical codes, click on ”CANCEL” to return to the main window.

(h) Clear Trip Accumulators. Not applicable.

(i) Cylinder Cutout Function.

1. Click on ”Cylinder Cutout”.
2. Click on ”Auto” or ”1000 RPM”. If ”AUTO” is selected, the ECM will automatically cutout one cylinder at a time and the test results will be displayed as they occur. If ”MANUAL” is selected, the operator must select the individual cylinder to be cutout.
3. Click on ”Idle” or ”1000 RPM”.
4. Click on ”Start”, ”Stop” or ”Cancel”. Selecting ”Start” will change display to ”Re-Start”, and function will run until either ”Stop” or ”Cancel” is selected. If ”Stop” is selected, the function will stop and ”Re-Start” will change back to ”Start”. If ”Cancel” is selected, the function will stop and the operator will be returned to the main menu.

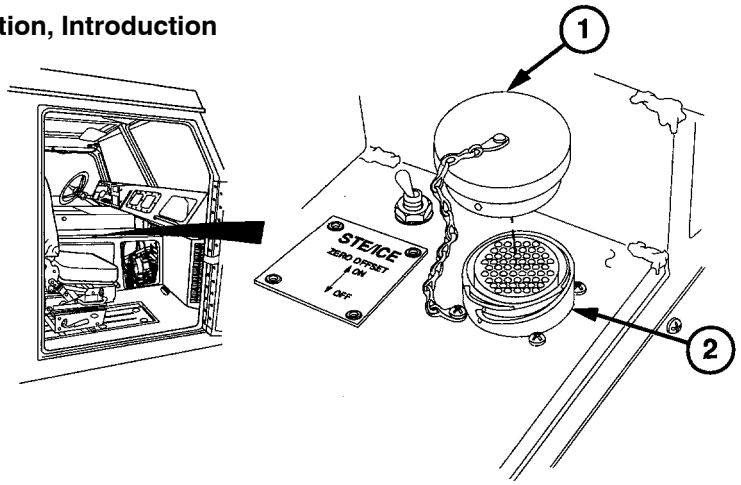
d.1. Contact Test Set (CTS), CTS-ICE Application, Introduction

(1) Connecting CTS to HET M1070

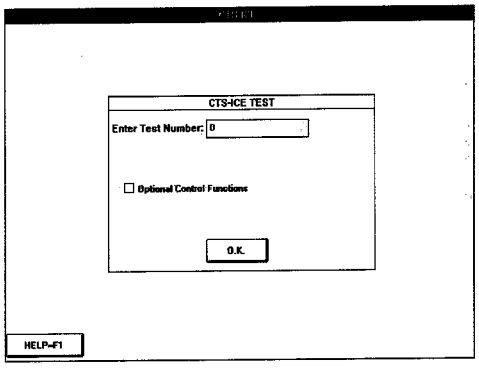
(a) Remove cover (1) from diagnostic connector assembly (DCA) (2) by turning counterclockwise.

(b) Install DCA cable on DCA (2).

(c) Prepare CTS for operation (TM - X-XXXX-XXX-XX).



2-4. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT)



(2) CTS-ICE Menu

(a) Enter Test Number. Allows the user to enter the desired STE/ICE-R test number. CTS-ICE will display a message if any invalid test numbers are selected.

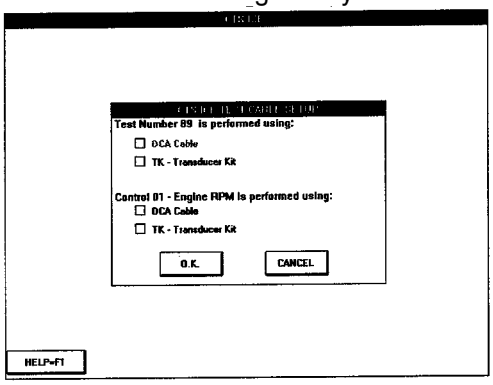
(b) Optional Control Functions. CTS-ICE has the capability to perform two STE/ICE-R tests during a single session. For example, if a voltage reading is desired at a specific engine RPM, both STE/ICE-R test #10 (Engine RPM) and test #89 (voltage) can be conducted at the same time. To activate this function, click on the Optional Control Function Box. A message will be displayed if invalid test combinations are selected.

(c) Click on "O.K." to proceed.

(d) CTS-ICE Test Cable Set-up. Some STE/ICE-R tests can be conducted using either the DCA connector or external leads and transducers. This screen tells the CTS-ICE unit where to look for the test information. Click on "DCA Cable" for all tests except STE/ICE-R tests #45-51, #89 and #91. For these tests, select "TK - Transducer Kit".

(e) Click on "O.K." to proceed with the CTS-ICE test(s).

(f) Diagnostics. The selected CTS-ICE test(s) will be performed with detailed procedures specific to those tests selected. Follow instructions given by the CTS-ICE program.



(3) On-Line Help. Click on "HELP=F1" or press "F1" to access the on-line help portion of the CTS-ICE program. Provides a quick way to find information, such as how to perform a particular task. Highlighted tasks indicate a topic with additional information. This additional information can be viewed by clicking on the highlighted area.

(a) Using Help. Information on how to use CTS-ICE help.

(b) CTS-ICE System Table Of Contents. An alphabetical list of all CTS-ICE help topics available.

(c) Alphabetical List of CTS-ICE Tests.

(d) Numerical List of CTS-ICE Tests.

e. Abbreviations And Commonly Used Terms

(1) A/D – Analog to Digital: The computer inside the ECM uses an A/D converter to convert a sensor voltage into a number with which the computer can work.

(2) Active Codes – These are the codes that currently keep the CHECK ENGINE indicator on. They are read using the Diagnostic Data Reader.

(3) BAT – Battery

(4) CEL – CHECK ENGINE indicator: mounted on the instrument dash and used as panel. It has two functions:

(a) a warning lamp to tell the driver that a problem has occurred, and that the vehicle should be taken in for service as soon as possible.

(b) as a light bulb check and system check the CHECK ENGINE indicator will come on for about five seconds when the ENGINE switch is turned ON. If the CEL remains on, the self–diagnostic system has detected a problem. If the problem goes away, the light will go out, but the (HISTORICAL) trouble code will be stored in the ECM. (See General Diagnostic Information)

(5) CKT – Circuit

(6) CLS – Coolant Level Sensor: Monitors coolant level at the radiator tank top.

(7) COM – Common

(8) CTS – CONTACT TEST SET: Tool used for troubleshooting DDEC and for STE/ICE–R tests.

(9) DCA – Diagnostic Connector Assembly: An electrical harness on the vehicle which allows the STE/ICE–R to be powered and to make measurements of key vehicle signals from a single connection. In addition to many basic electrical signals such as starter voltage and current, it includes engine speed and fuel supply pressure. The STE/ICE–R can make TK measurements at the same time that it is connected to the DCA.

(10) DDEC – Second generation Engine Electronic Controls

(11) DDL – Diagnostic Data Link: The lines (wires) over which the ECM communicates information to be read by a Diagnostic Data Reader.

(12) Diagnostics: Troubleshooting by following an exact procedure.

(13) DL +– Data Link, positive side. Used for communications to the Diagnostic Data Reader, as well as other applications.

(14) DL – Data Link, negative side (See above).

(15) DREQ – Diagnostic Request Terminal: The pin on the DDL connector which must be grounded to obtain diagnostic codes (pin M).

(16) ECM – Electronic Control Module: The brains of DDEC. It reads the DDEC sensors and switches, calculates injector firing times and duration (using a built–in computer), and fires the injectors at the appropriate times.

(17) EEPROM – Electronically Erasable Programmable Read Only Memory. Contains the engine calibration.

(18) EFPA – Electronic Food Pedal Assembly: contains the Throttle Positions Sensor

(19) Erratic: intermittent

(20) EUI – Electronic Unit Injector: replaces the Mechanical Unit Injector (MUI)

(21) Historical Codes – All codes kept in ECM memory (may not turn the CHECK ENGINE indicator). These codes can be cleared by using the Diagnostic Data Reader.

(22) OPS – Oil Pressure Sensor: monitors oil pressure at the main oil gallery.

(23) OTS – Oil Temperature Sensor: monitors oil temperature in the turbo oil supply line.

(24) PCB – Protective Control Box: Located on the firewall above the brake pedal.

(25) PW – Pulsewidth: the amount of time in crank degrees that the ECM is requesting the injectors to be turned on.

2-4. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT)

(26) SEL - CHECK GAUGES Indicator: mounted on the dash, it lights to warn the driver when a potential engine damaging condition has been detected (low oil pressure, low coolant, or engine over-temperature). As a light bulb check and system check, the CHECK GAUGES indicator will come on for about five seconds when ignition takes place.

(27) SRS - Synchronous Reference Sensor: detects when the first cylinder in the firing order is about to be fired.

(28) STE/ICE-R - Simplified Test Equipment for Internal Combustion Engines -Reprogrammable: A testing system used for performing tests and measurements on the vehicle. In addition to acting as a conventional digital multimeter to measure voltage, current and resistance, it is also capable of measuring pressure, speed, compression unbalance, engine power, and some specialized battery and starter evaluations. It is powered from the vehicle batteries. The complete system includes a vehicle test meter (VTM), a transducer kit (TK), cables, transit case, and technical publications. STE/ICE tests are referenced.

(29) System: A collection of devices which are all related to each other because they depend on each other to do some function or job. For example, the function of the fuel system is to inject fuel into the cylinders at the correct time in the correct amount and with the correct quantity. The collection of devices that are required to do this include the fuel pump, fuel lines, lift pump, fuel filter, injection pump, and injectors.

(30) TBS - Turbo Boost Sensor: used to monitor turbo boost pressure. The sensor generates a voltage (from 0 to 5 volts) which is proportional to pressure.

(31) Test Chain: A series of tests to be followed in a particular order or sequence(numbered).

(32) TPS - Throttle Position Sensor: used to detect throttle request.

(33) TPS - Throttle Position Sensor: used to detect throttle request.

(34) Troubleshooting: The process of making measurements and observing the operation of the vehicle to find out if and where any problems exist.

(35) TRS - Timing Reference Sensor: detects whenever any cylinder is about to be fired.

(36) VIN - Vehicle Identification Number

(37) VTM - Vehicle Test Meter: A box which performs the measurement and analysis functions of the STE/ICE-R systems.

f. Contact Test Set (CTS).

The troubleshooting for the HET M1070 Tractor was developed utilizing the Digital Data Reader (DDR) and Simplified Test Equipment for Internal Combustion Engines (STE/ICE-R). Since the initial publication of this manual, the Contact Test Set (CTS) has been developed for use as the primary Test, Measurement, and Diagnostic Equipment (TMDE) for the HET M1070, in place of the DDR and STE/ICE-R.

The CTS J1708 programming performs the same function as the DDR and the CTS/ICE programming performs the same tests as the STE/ICE-R unit. The procedural steps contained within this manual still reflect the original test equipment, however, the CTS can be used to troubleshoot the vehicle. The same test results will be obtained using either piece of test equipment.

Some of the detailed test procedures shown on the right-hand pages of the troubleshooting will deviate slightly from the steps required to operate the CTS. For additional information on CTS operating procedures and individual test instructions, refer to the information provided with the CTS unit.

2-5. TROUBLESHOOTING INSTRUCTIONS

Troubleshooting is divided into two sections: DDEC Troubleshooting and Vehicle Troubleshooting. When a problem with the engine occurs perform Vehicle Troubleshooting before performing DDEC Troubleshooting.

a. This manual cannot list all malfunctions that may occur, not all tests, inspections, or corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify supervisor.

b. Do the tests and inspections in the order listed, and try to return the vehicle or component to operation after each test, inspection, and corrective action has been performed.

DDEC II TROUBLESHOOTING

TRUCK, TRACTOR, M1070
HEAVY EQUIPMENT TRANSPORTER (HET)

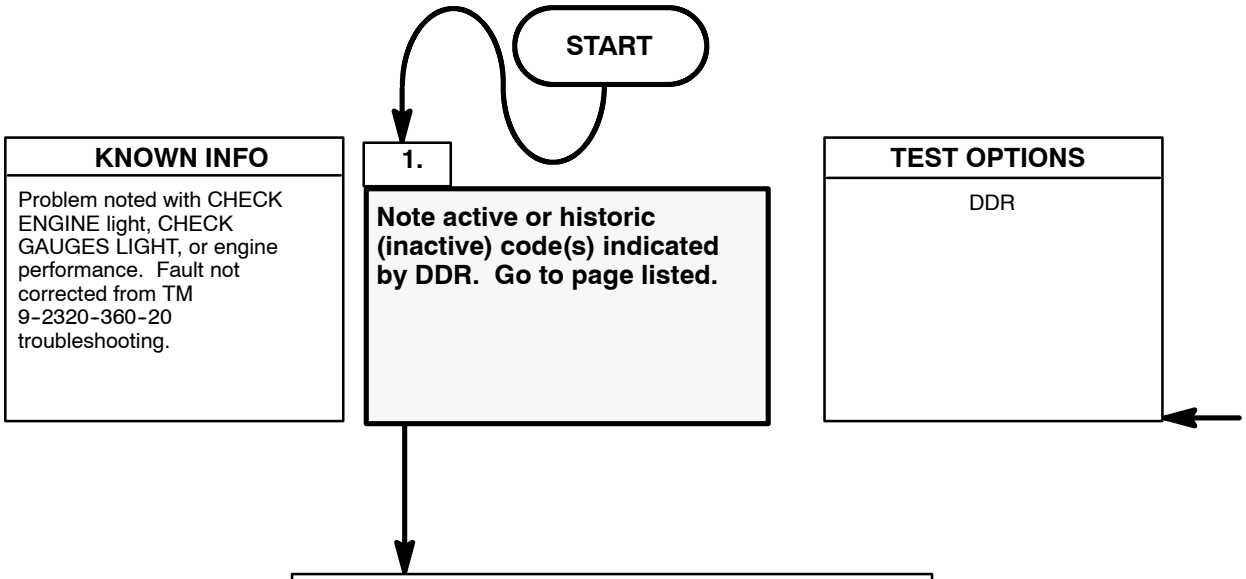
DDEC TROUBLESHOOTING (CODES 41, 42, 61-68, AND 71-78)

INITIAL SETUP

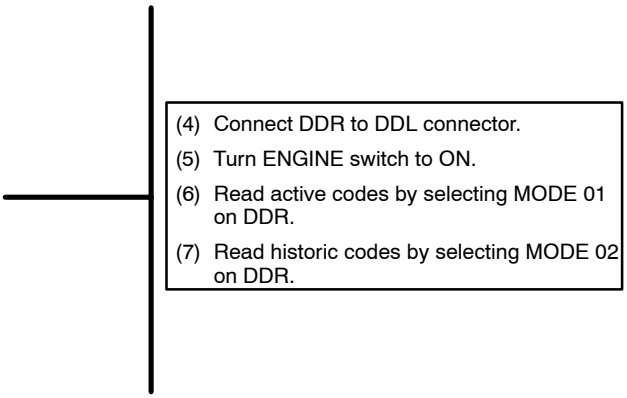
Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Personnel Required
Two

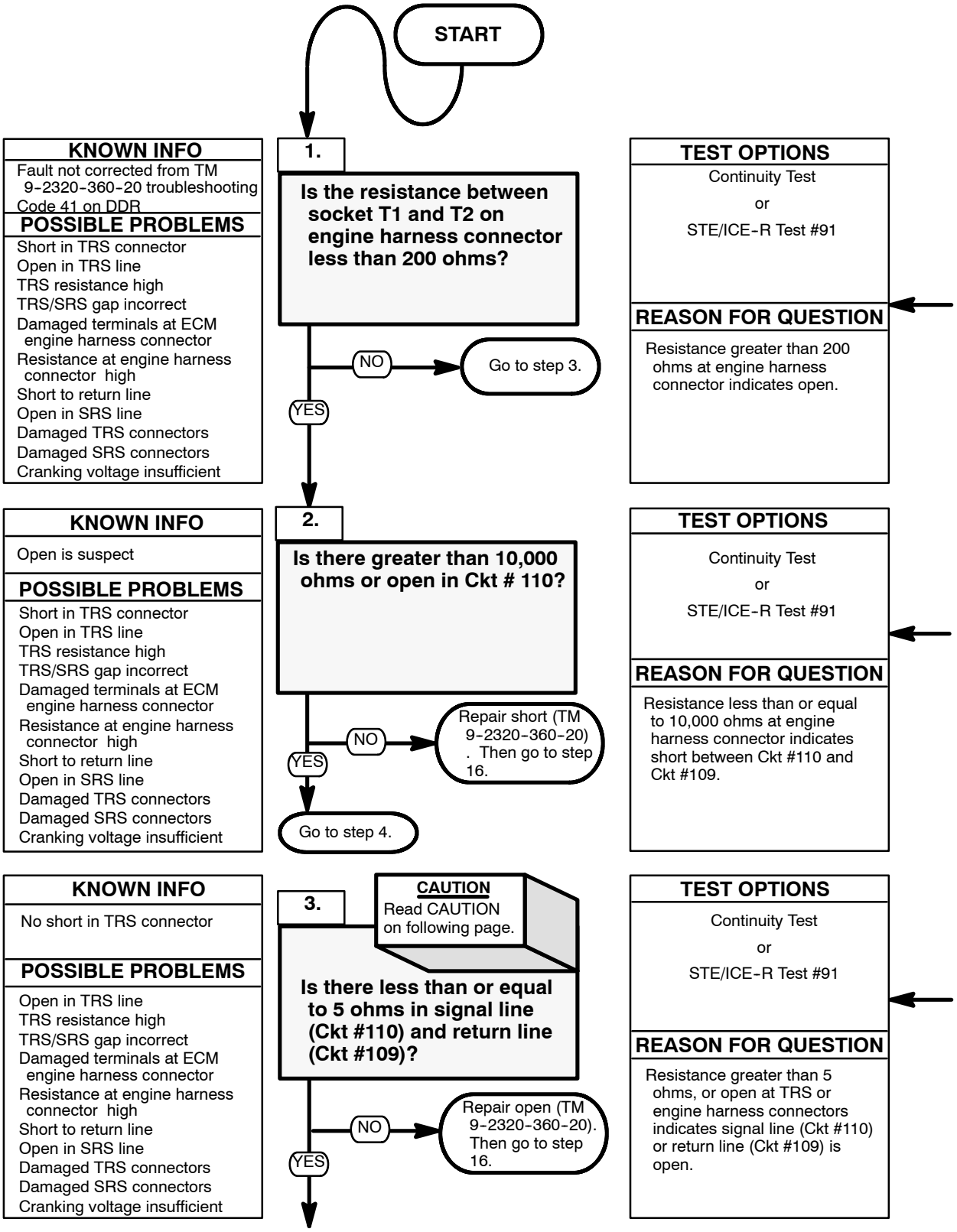
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Contact Test Set (Item 25.1, Appendix E)
Crimper, Terminal (Item 27, Appendix E)
Crimper, Terminal (Item 28, Appendix E)
Crimper, Terminal (Item 29, Appendix E)
Multimeter (Item 98, Appendix E)
Remover, Terminal (Item 140, Appendix E)
Remover, Terminal (Item 141, Appendix E)
STE/ICE-R (Item 184, Appendix E)

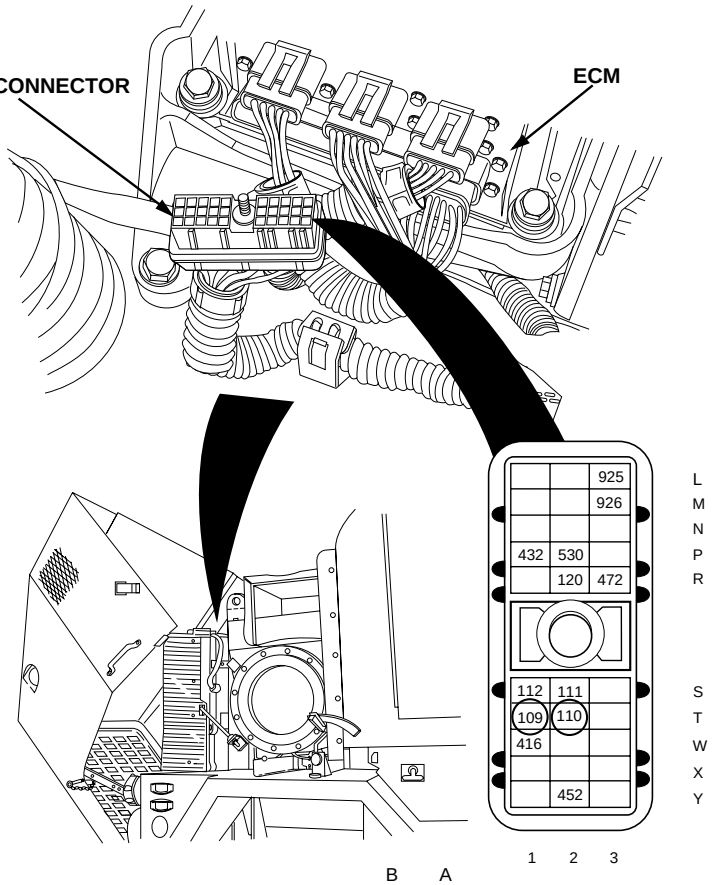


CODE	PAGE
Code 41, DDEC II Only	2-18
Code 42, DDEC II Only	2-30
Code 61-68, DDEC II Only	2-42
Code 71-78, DDEC II Only	2-56
Code 61, DDEC III/IV Only	2-62
Code 71, DDEC III/IV Only	2-62.14


(4) Connect DDR to DDL connector.
(5) Turn ENGINE switch to ON.
(6) Read active codes by selecting MODE 01 on DDR.
(7) Read historic codes by selecting MODE 02 on DDR.

ACTIVE OR HISTORIC CODE 41-TIMING REFERENCE SENSOR (TRS)





CONTINUITY TEST

(1) Turn ENGINE switch OFF.

(2) Disconnect engine harness connector at ECM.

(3) Read resistance between sockets T1 and T2 of engine harness connector.

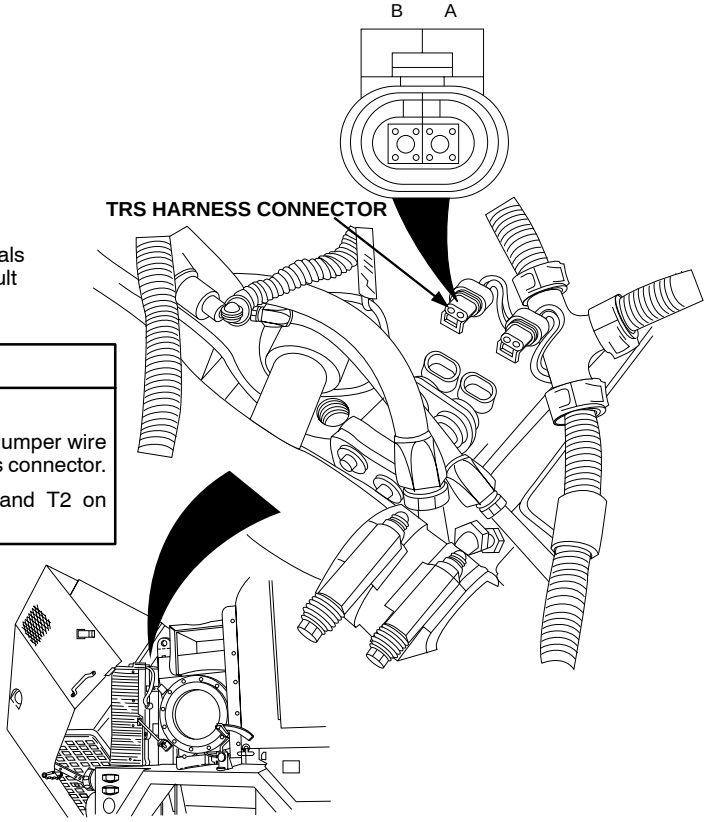
CONTINUITY TEST

(1) Remove ECM (TM 9-2320-360-20).

(2) Disconnect TRS connector.

(3) Read resistance between sockets T1 and T2 on engine harness connector.

(4) Read resistance between sockets T1 and ground, then between socket T2 and ground.



CAUTION

Use jumper wire only between terminals indicated. Failure to comply may result in damage to DDEC components or wiring.

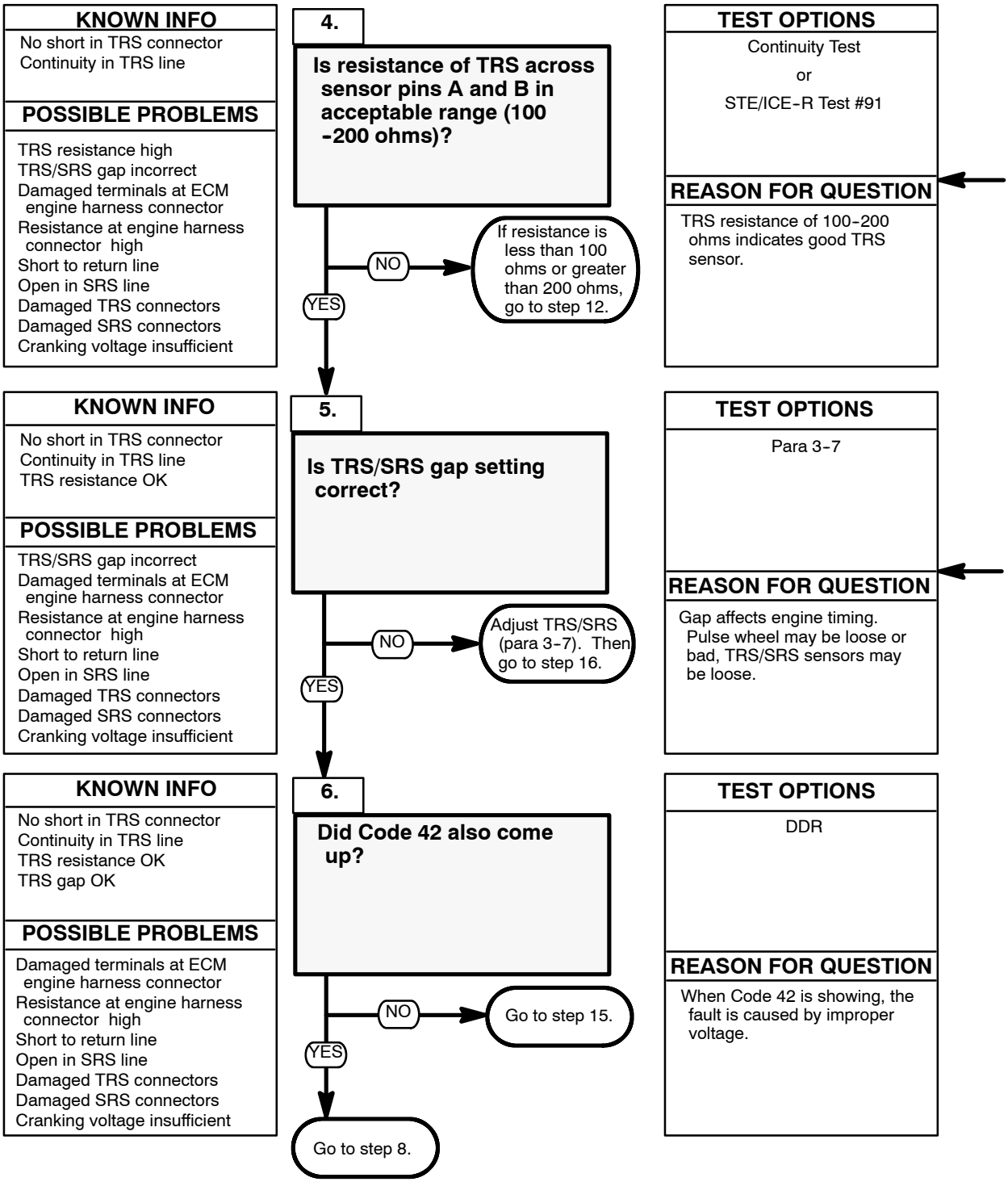
CONTINUITY TEST

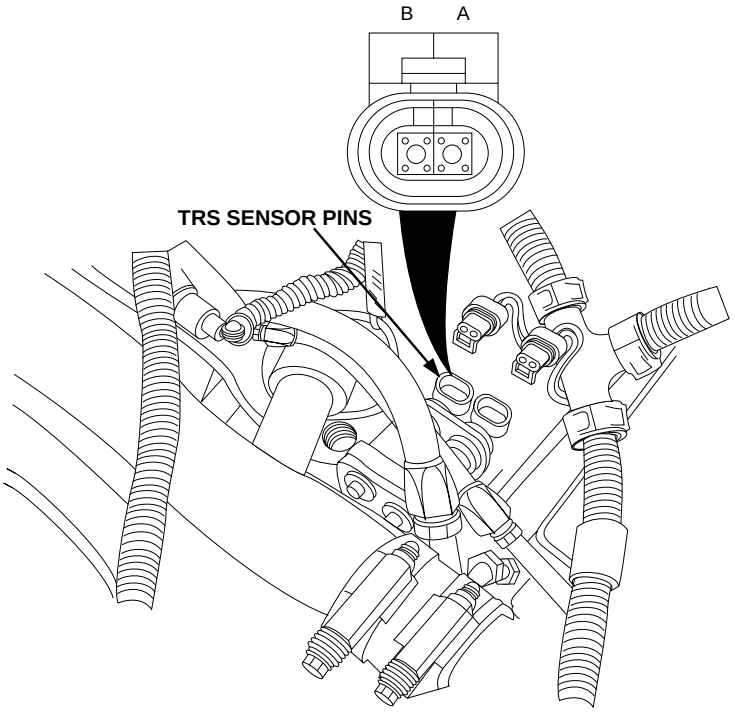
(1) Remove ECM (TM 9-2320-360-20).

(2) Disconnect TRS connector and install a jumper wire between sockets A and B of TRS harness connector.

(3) Read resistance between sockets T1 and T2 on engine harness connector.

ACTIVE OR HISTORIC CODE 41-TIMING REFERENCE SENSOR (TRS) (CONT)



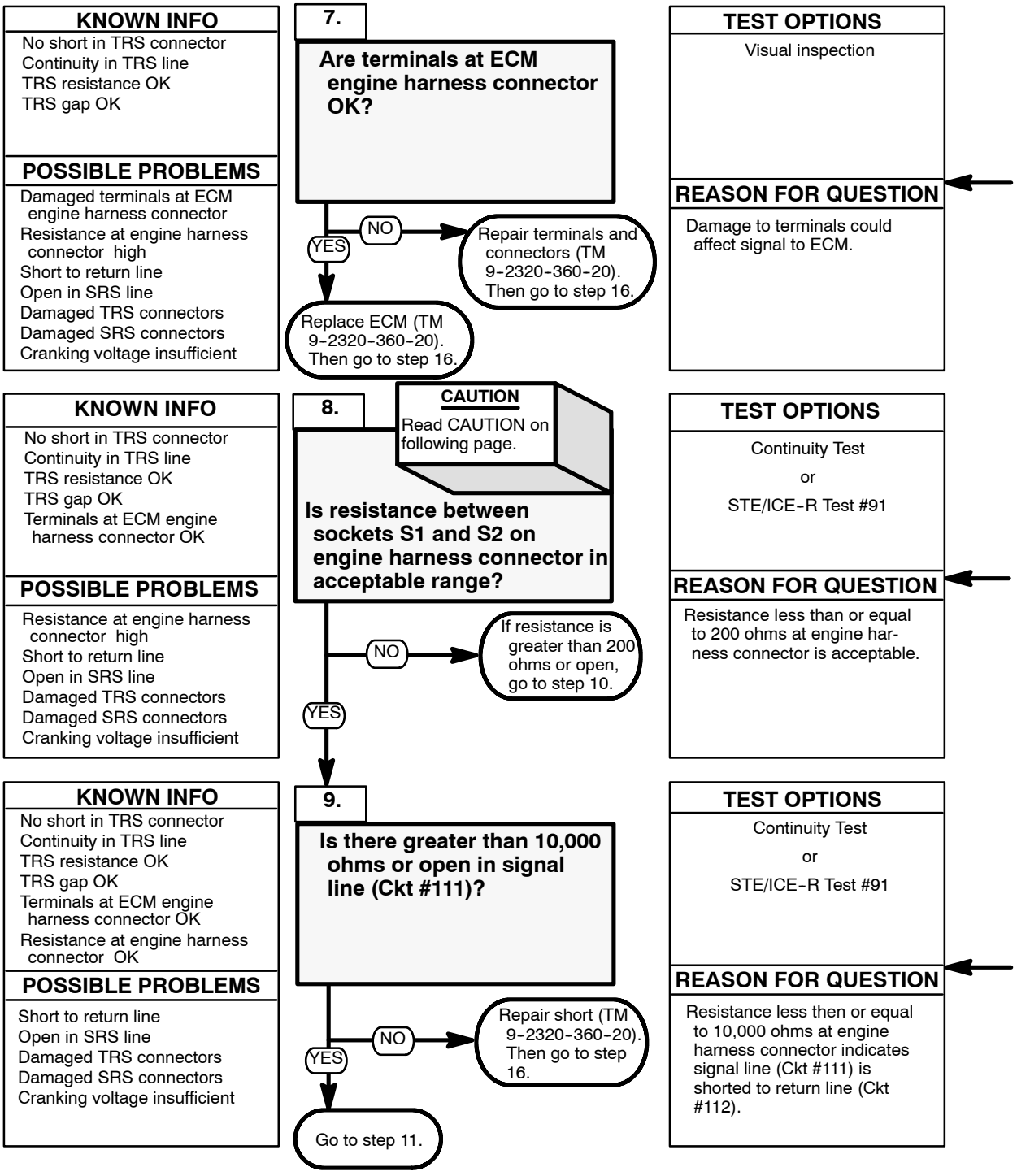


CONTINUITY TEST

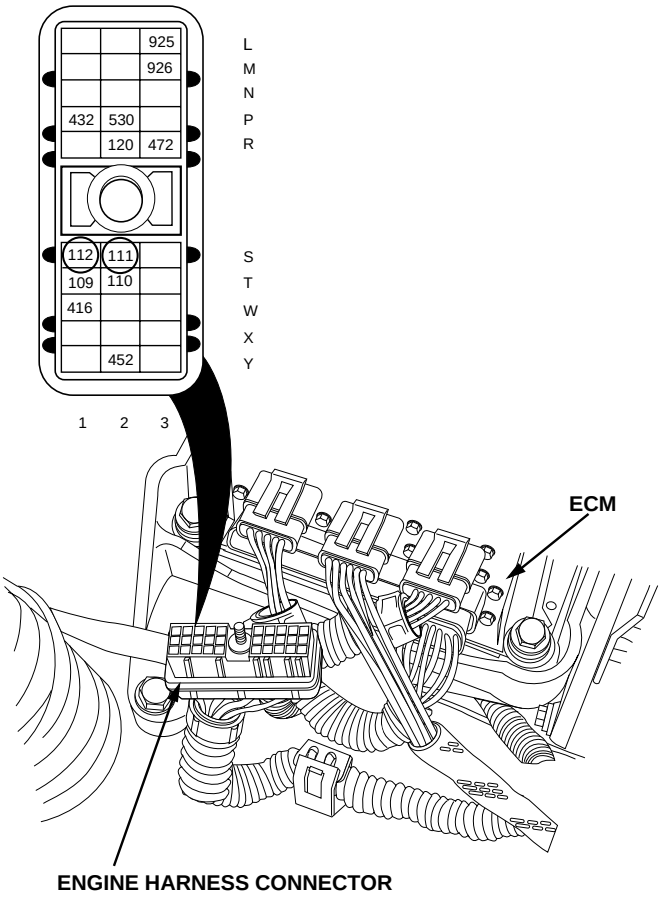
Read resistance of the TRS across sensor pins A and B.

Refer to para 3-7 to check TRS/SRS adjustment.

ACTIVE OR HISTORIC CODE 41-TIMING REFERENCE SENSOR (TRS) (CONT)



Check terminals at ECM engine harness connector (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.



CAUTION

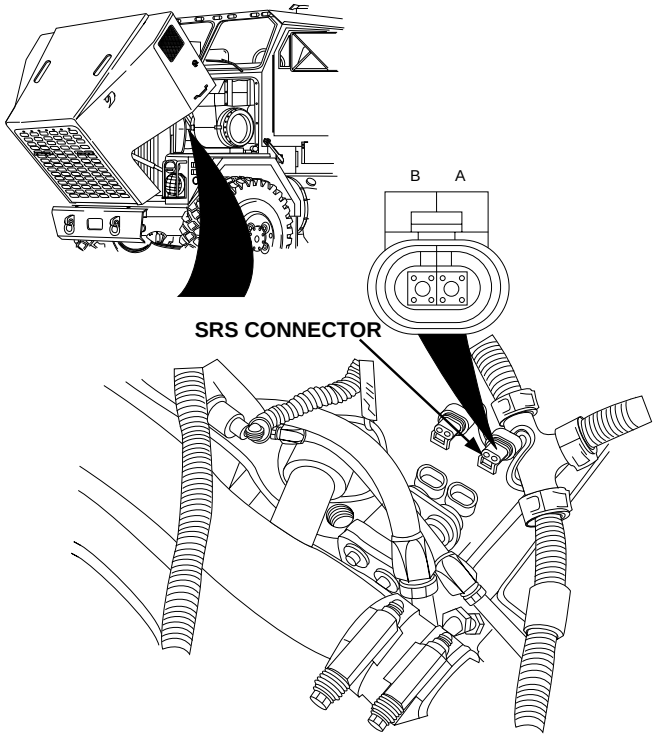
Use jumper wire only between terminals indicated. Failure to comply may result in damage to DDEC components or wiring.

CONTINUITY TEST

(1) Remove ECM (TM 9-2320-360-20).

(2) Disconnect SRS connector.

(3) Read resistance between sockets S1 and S2 on engine harness connector.



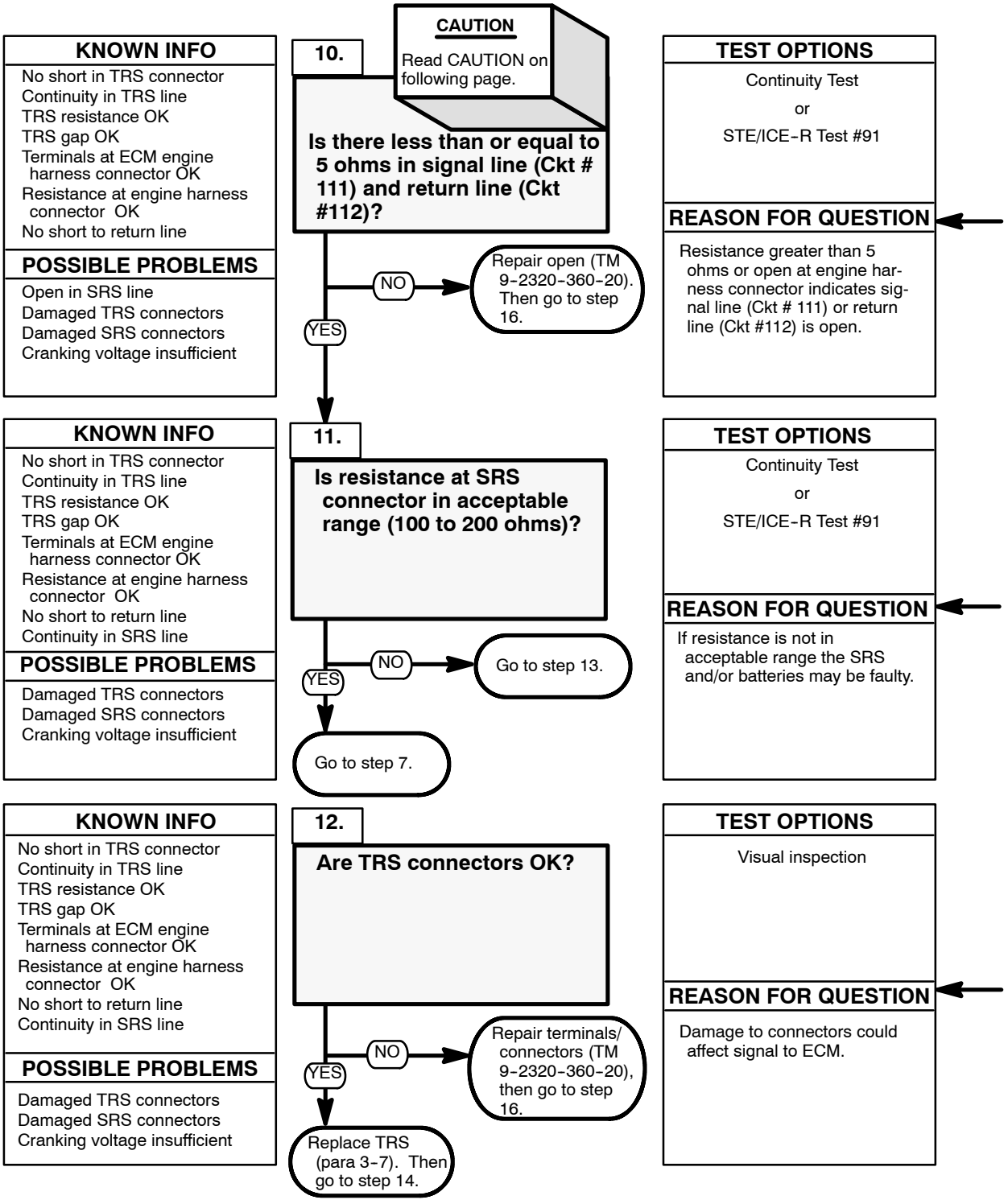
CONTINUITY TEST

(1) Remove ECM (TM 9-2320-360-20).

(2) Disconnect SRS connector.

(3) Read resistance between sockets S1 and S2 on engine harness connector.

ACTIVE OR HISTORIC CODE 41-TIMING REFERENCE SENSOR (TRS) (CONT)



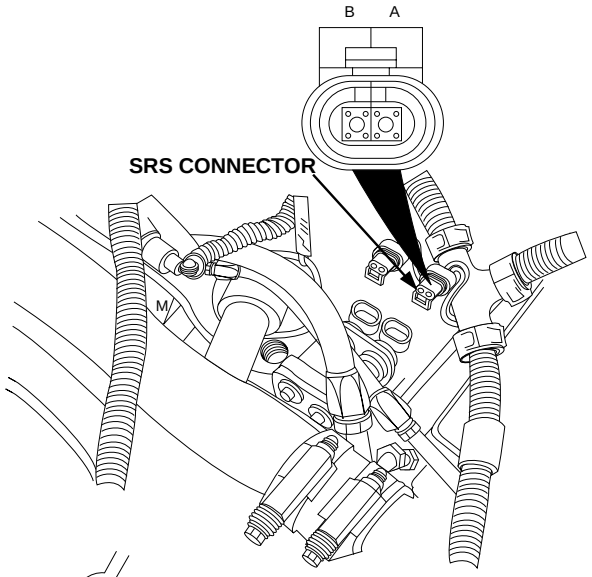
CAUTION

Use jumper wire only between terminals indicated. Failure to comply may result in damage to DDEC components or wiring.

CONTINUITY TEST

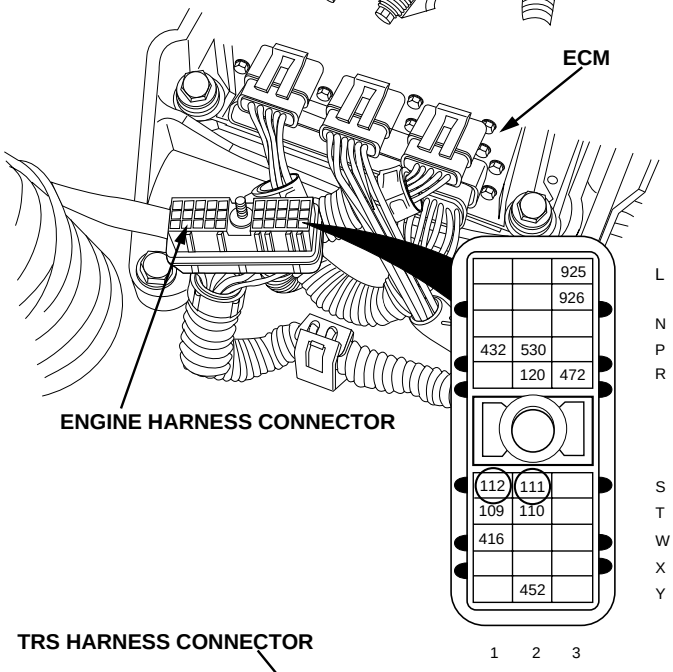
(1) Install a jumper wire between sockets A and B of SRS harness connectors.

(2) Read resistance between sockets S1 and S2 of engine harness connector.

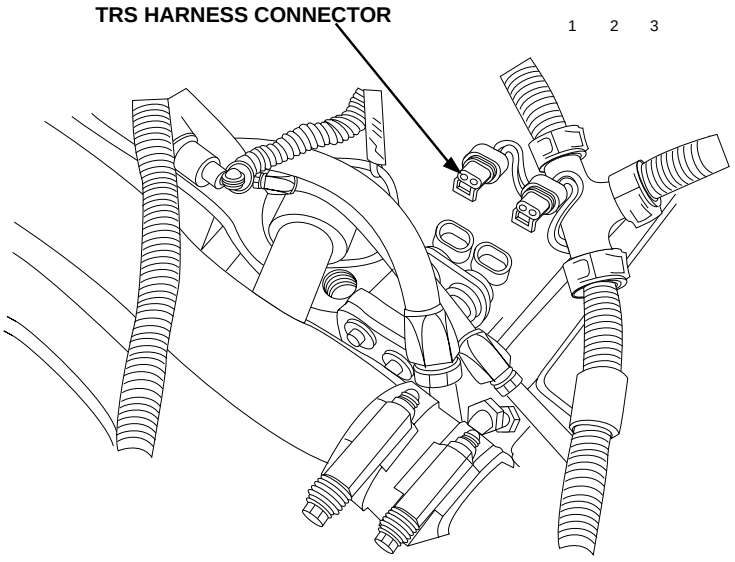


CONTINUITY TEST

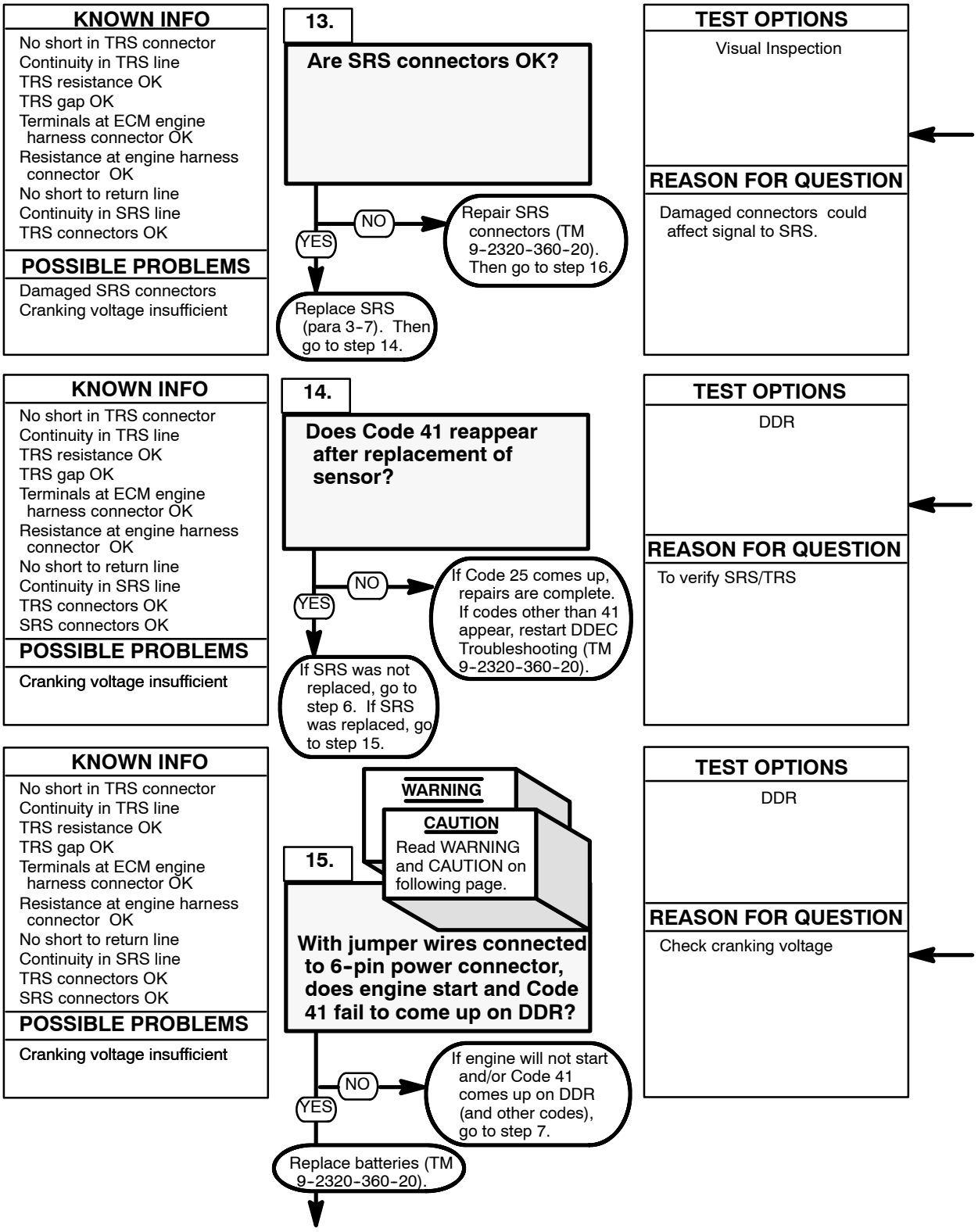
Read resistance of the SRS across sensor pins A and B.

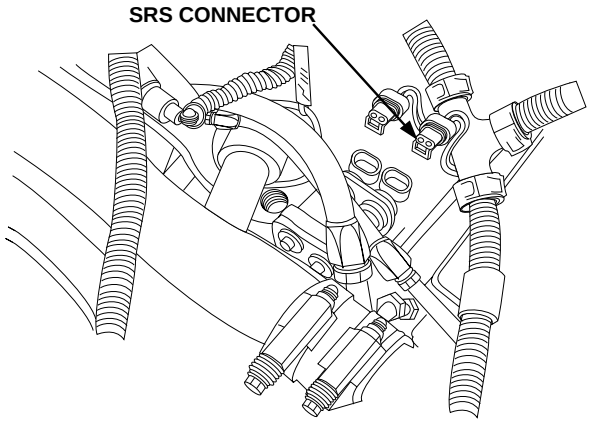


Check connectors at TRS (both harness side and TRS side) for damage; bent, corroded, and unseated pins or sockets, or bad contacts.

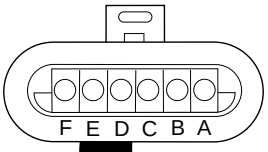


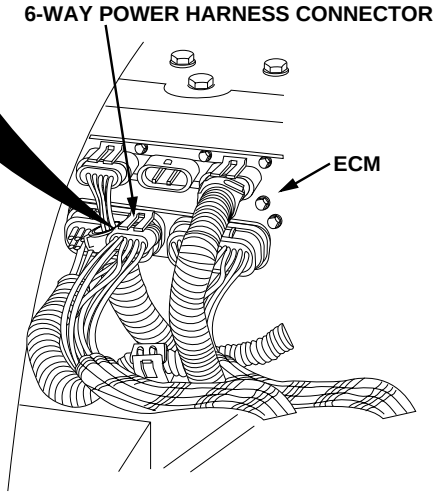
ACTIVE OR HISTORIC CODE 41-TIMING REFERENCE SENSOR (TRS) (CONT)





Check connectors at SRS (both harness side and SRS side) for damage; bent, corroded, and unseated pins or sockets, or bad contacts.





(1) Turn ENGINE switch OFF.
(2) Install ECM (TM 9-2320-360-20).
(3) Reconnect all connectors.
(4) Turn ENGINE switch ON and clear codes.
(5) Start and run engine until, CHECK ENGINE indicator lights for 1 minute.
(6) Stop engine and read historical codes.

WARNING

Jewelry can catch on equipment and cause injury or short across electrical circuit and cause severe burns or electrical shock. Remove rings. bracelets, watches, necklaces, and any other jewelry before working around HET Tractor.

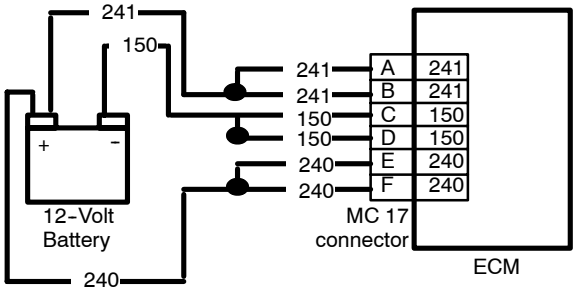
CAUTION

Use jumper wire only between terminals indicated. Failure to comply may result in damage to DDEC components or wiring.

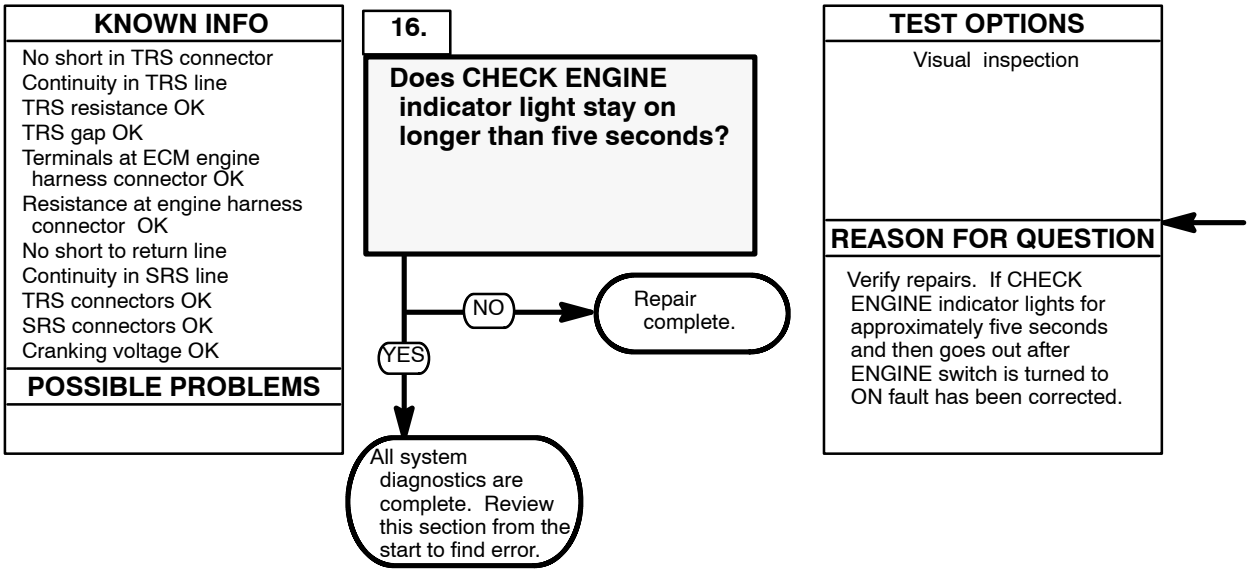
NOTE

Refer to Appendix C, (Illustrated List of Manufactured Items) for fabrication of jumper harness.

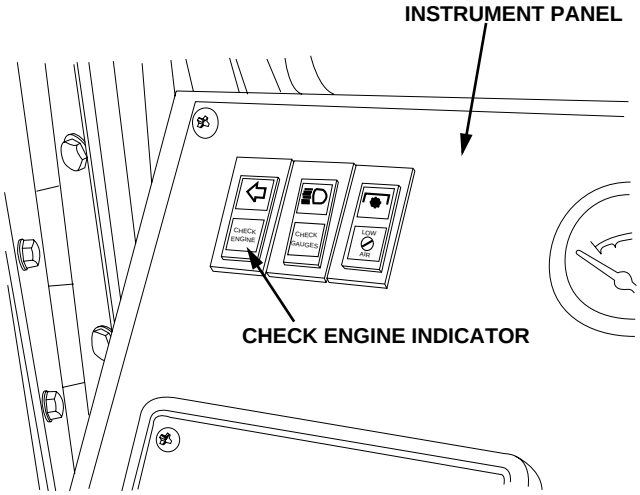
(1) Turn ENGINE switch OFF.
(2) Connect 12 volts from a fully charged battery to 6-pin power connector
(3) Connect other connector.
(4) Turn ENGINE switch ON and clear codes.
(5) Start engine and run for one minute or until CHECK ENGINE indicator lights.
(6) Stop engine and read active codes.



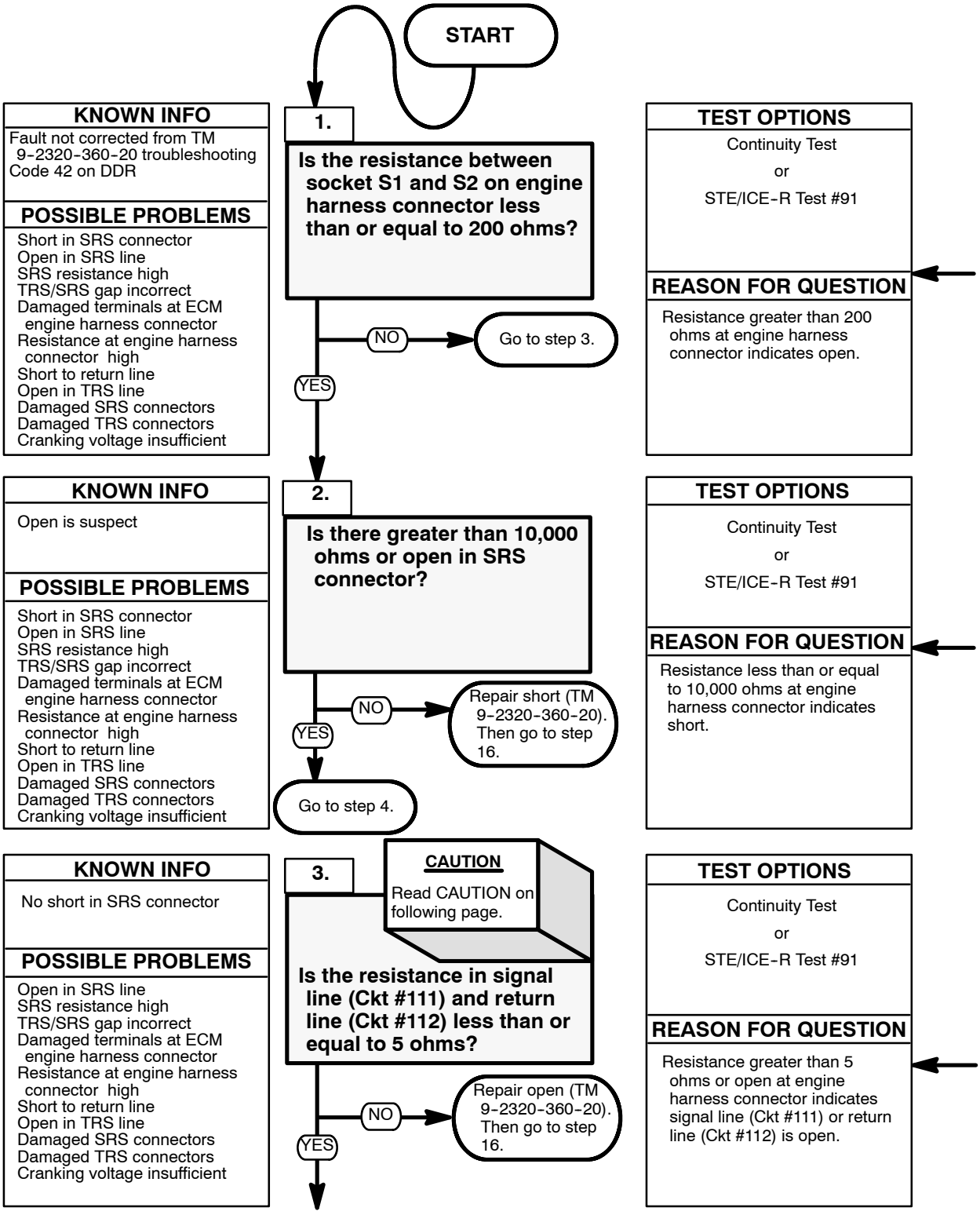
ACTIVE OR HISTORIC CODE 41-TIMING REFERENCE SENSOR (TRS) (CONT)

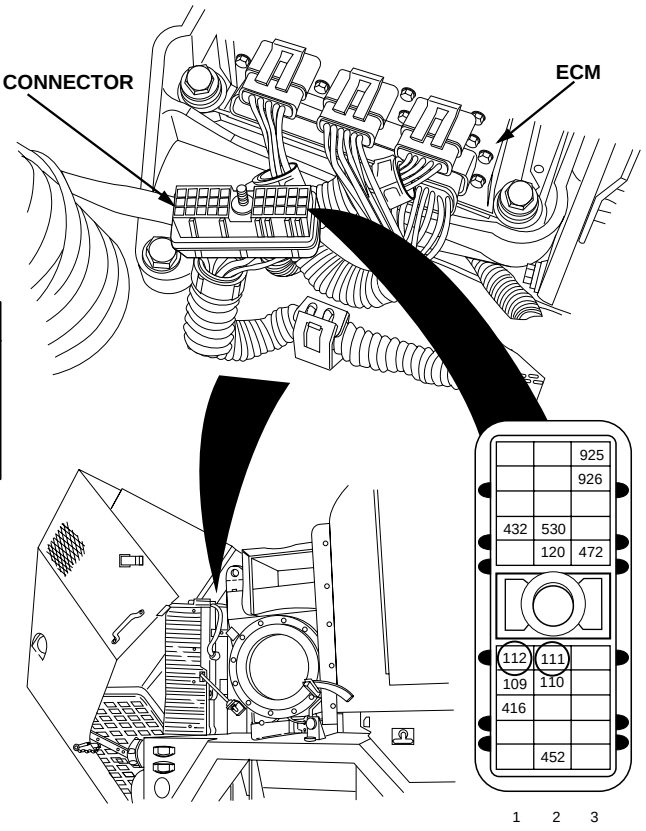


(1) Turn ENGINE switch OFF.
(2) Reconnect all harness connectors.
(3) Install ECM (TM 9-2320-360-20).
(4) Turn ENGINE switch ON and observe CHECK ENGINE indicator.



ACTIVE OR HISTORIC CODE 42-SYNCHRONOUS REFERENCE SENSOR (SRS)



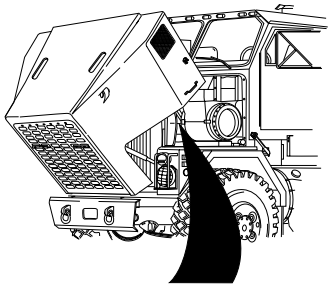


CONTINUITY TEST

(1) Turn ENGINE switch OFF.

(2) Disconnect engine harness connector at ECM.

(3) Read resistance between sockets S1 and S2 of engine harness connector.



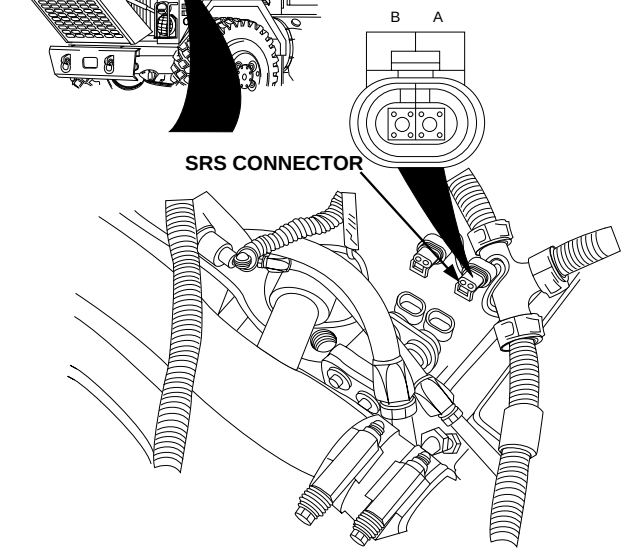
CONTINUITY TEST

(1) Remove ECM (TM 9-2320-360-20).

(2) Disconnect SRS connector.

(3) Read resistance between sockets S1 and S2 on engine harness connector.

(4) Read resistance between sockets S1 and ground, then between S2 and ground.



CAUTION

Use jumper wire only between terminals indicated. Failure to comply may result in damage to DDEC components or wiring.

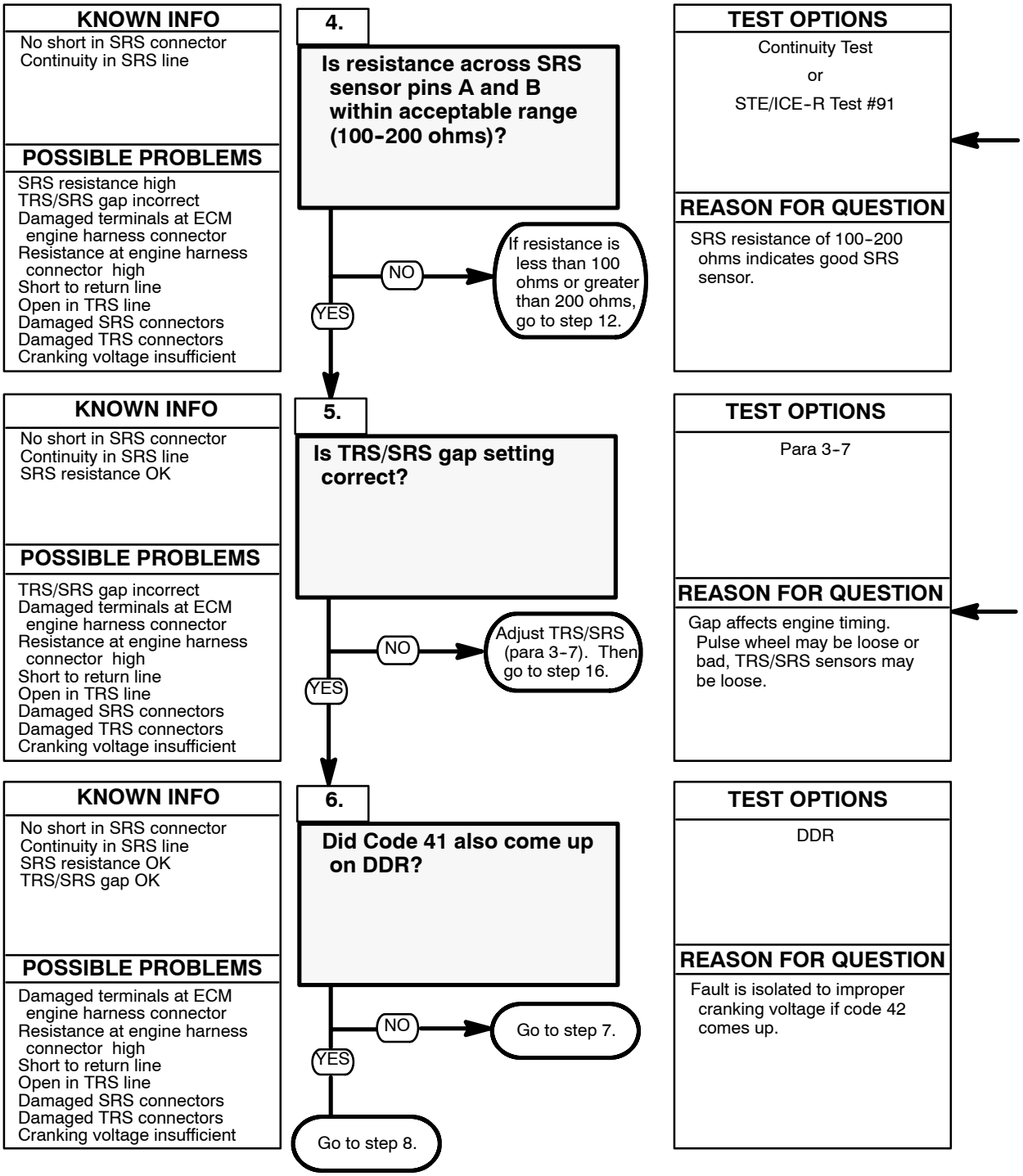
CONTINUITY TEST

(1) Remove ECM (TM9-2320-360-20).

(2) Disconnect SRS connector and install a jumper wire between sockets A and B of SRS harness connector.

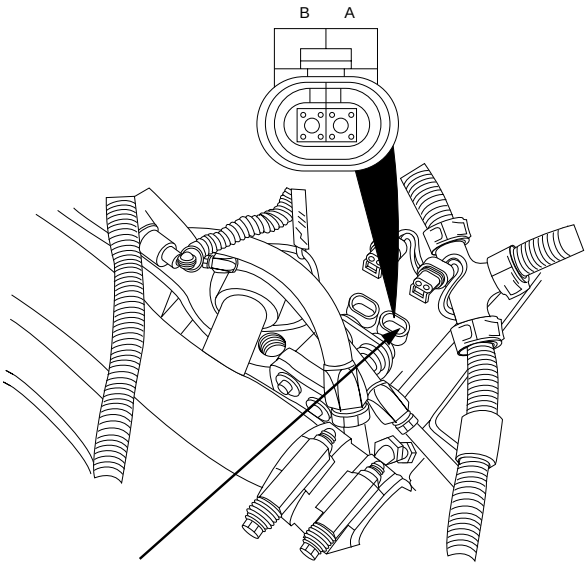
(3) Read resistance between sockets S1 and S2 on engine harness connector.

ACTIVE OR HISTORIC CODE 42-SYNCHRONOUS REFERENCE SENSOR (SRS) (CONT)



CONTINUITY TEST

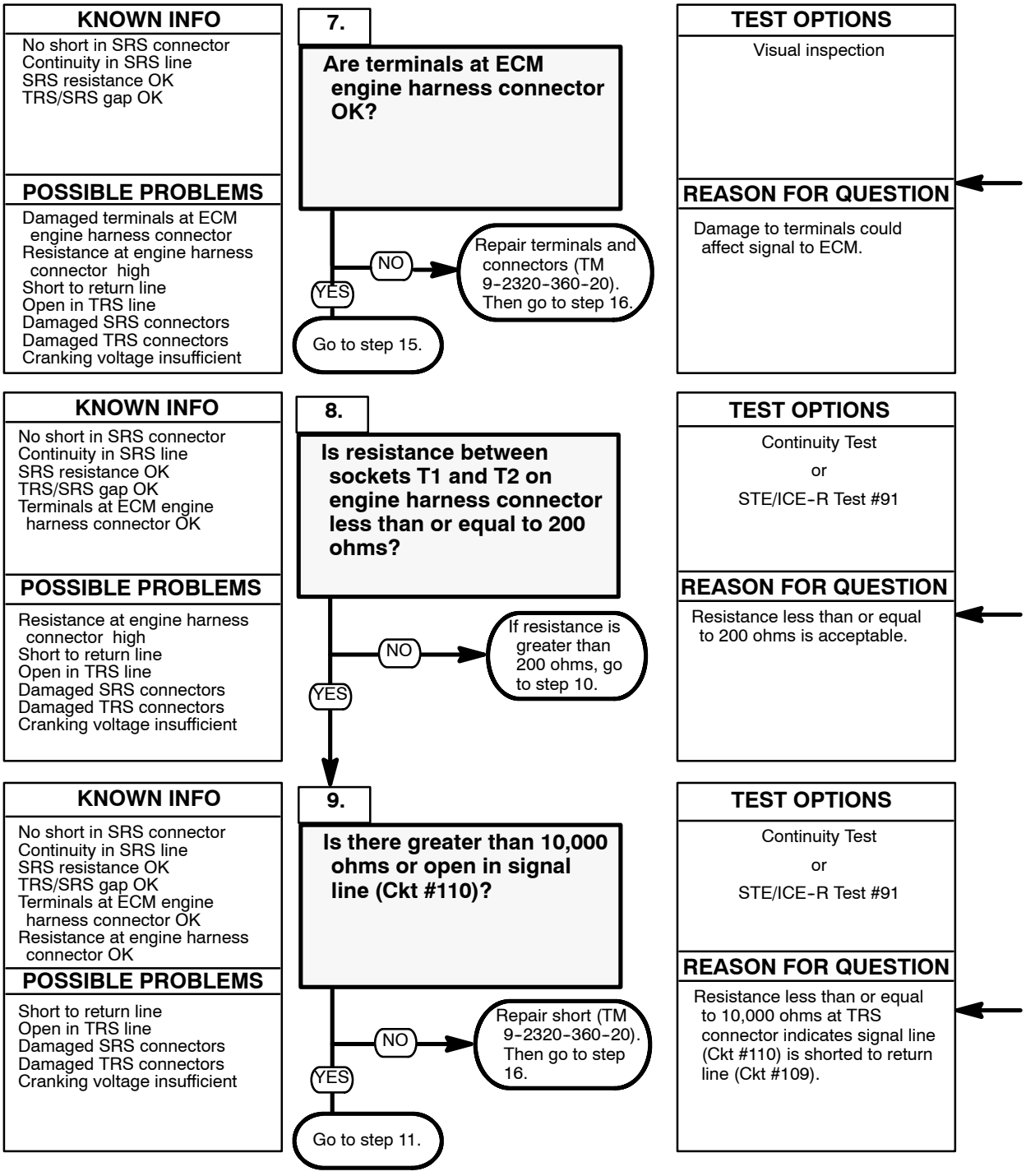
Read resistance of the SRS across sensor pins A and B.



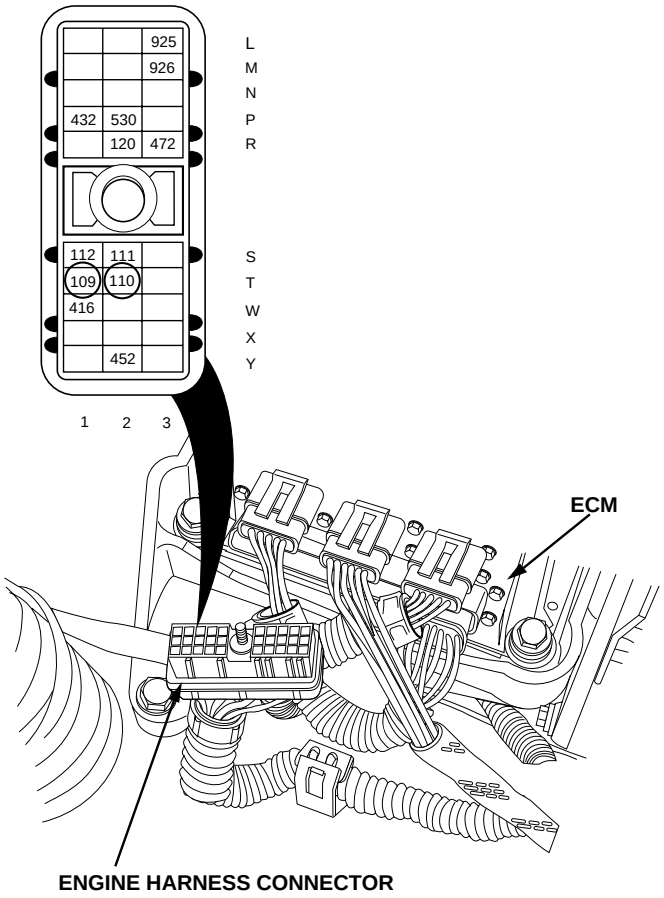
SRS SENSOR PINS

Refer to para 3-7 to check TRS/SRS adjustment.

ACTIVE OR HISTORIC CODE 42-SYNCHRONOUS REFERENCE SENSOR (SRS) (CONT)

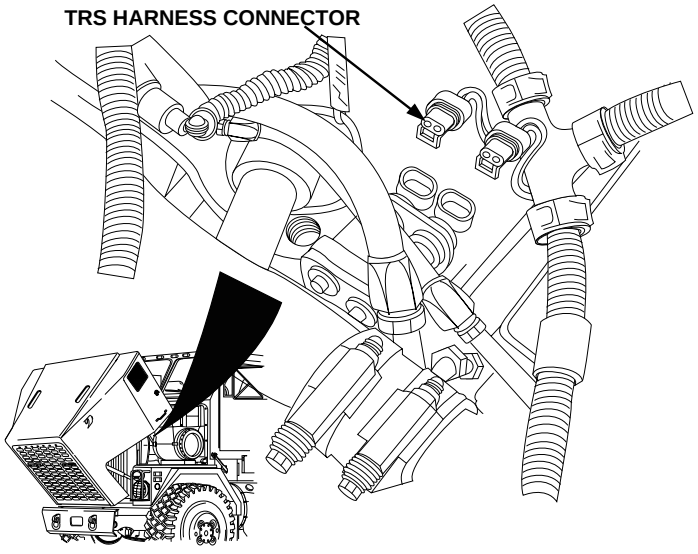


Check terminals at ECM engine harness connector (both ECM and harness side) for damage; bent, corroded, and unseated pins or sockets.



CONTINUITY TEST

Read resistance between sockets T1 and T2 on engine harness connector.

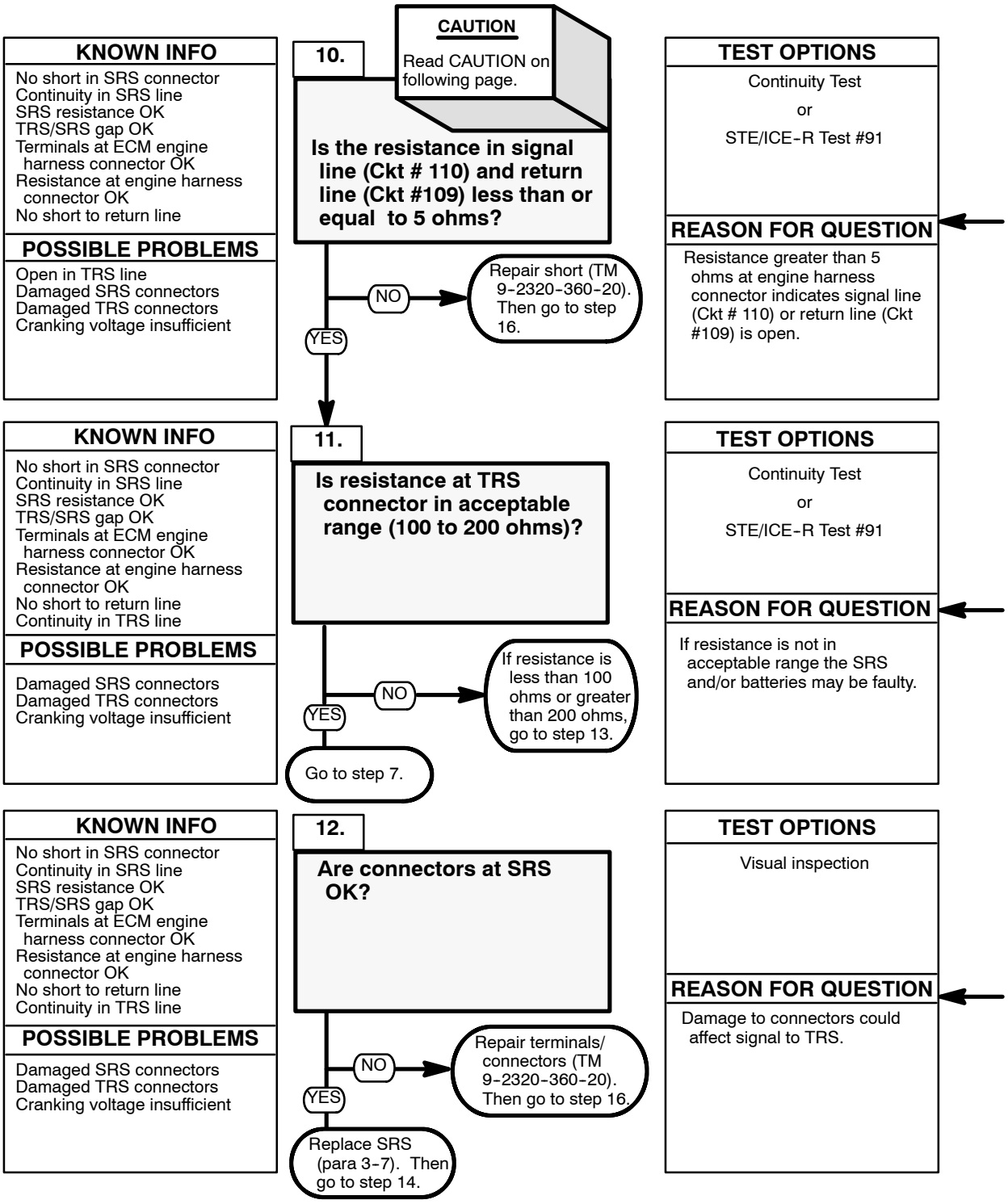


CONTINUITY TEST

(1) Disconnect TRS connector.

(2) Read resistance between sockets T1 and T2 on engine harness connector.

ACTIVE OR HISTORIC CODE 42-SYNCHRONOUS REFERENCE SENSOR (SRS) (CONT)



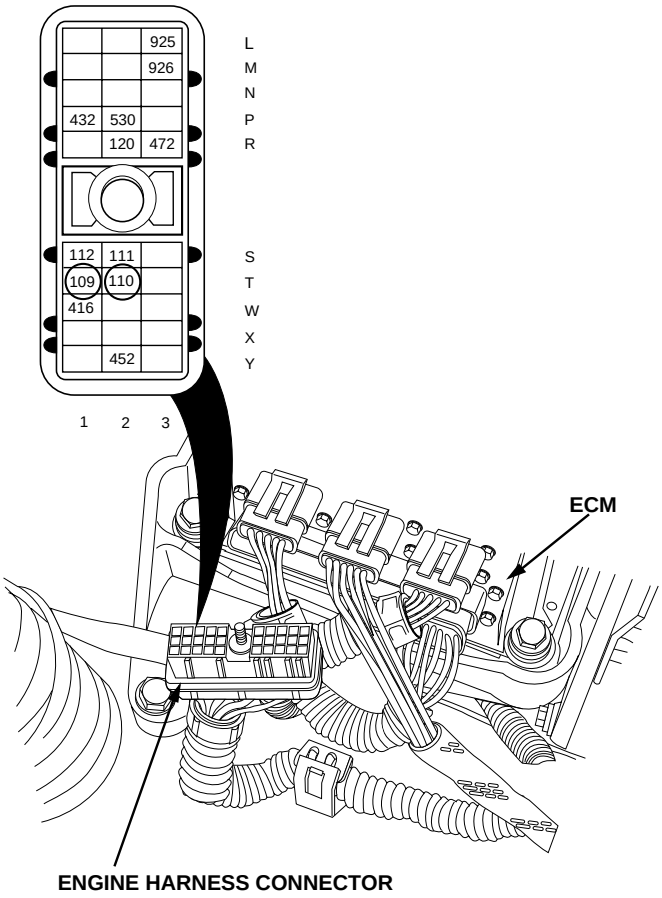
CAUTION

Use jumper wire only between terminals indicated. Failure to comply may result in damage to DDEC components or wiring.

CONTINUITY TEST

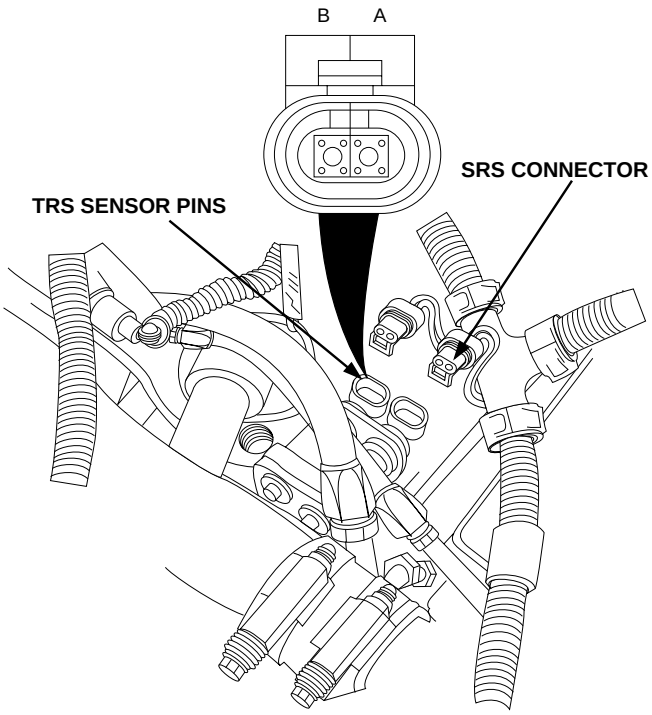
(1) Install a jumper wire between sockets A and B of TRS harness connectors.

(2) Read resistance between sockets T1 and T2 of engine harness connector.



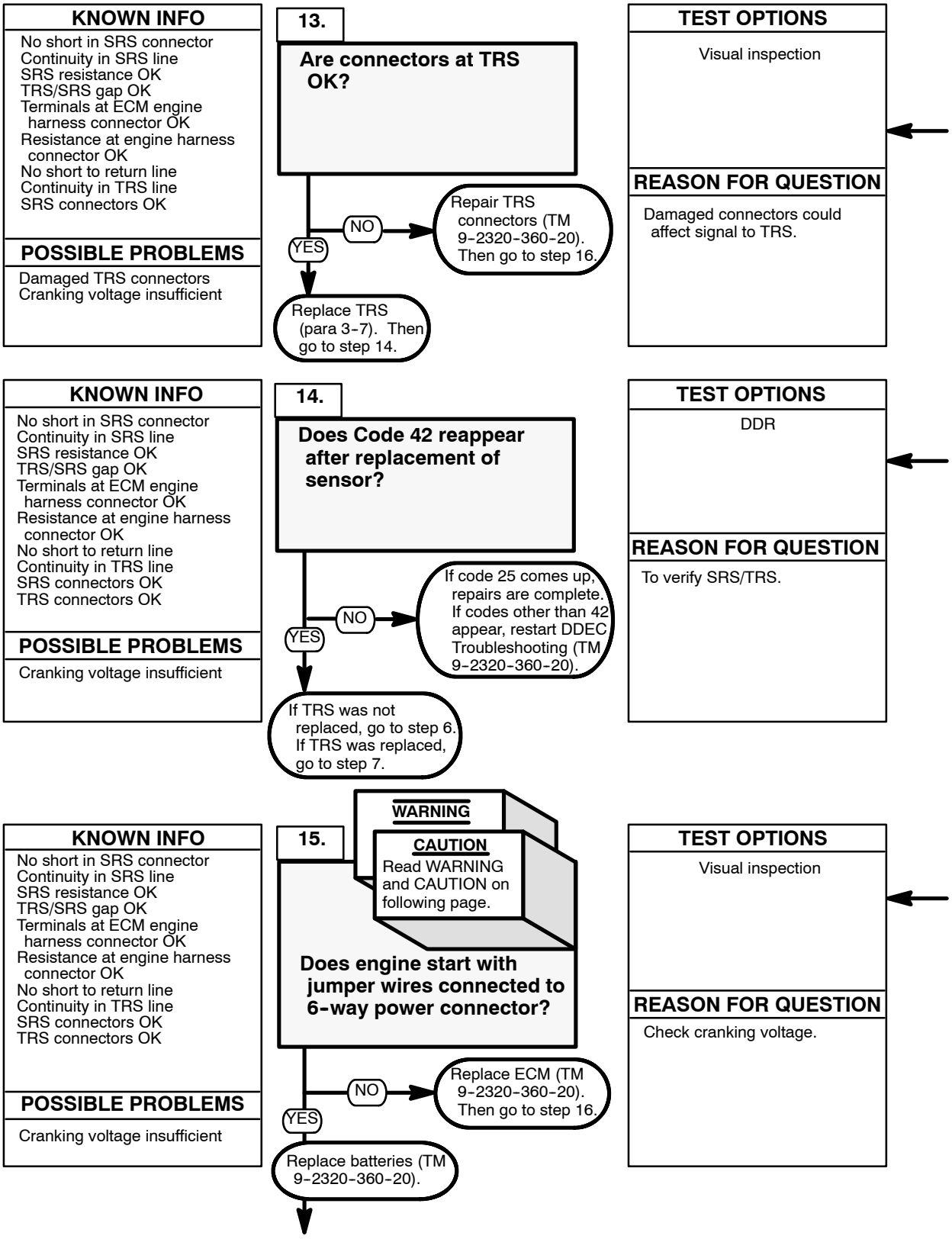
CONTINUITY TEST

Read resistance of TRS across sensor pins A and B.

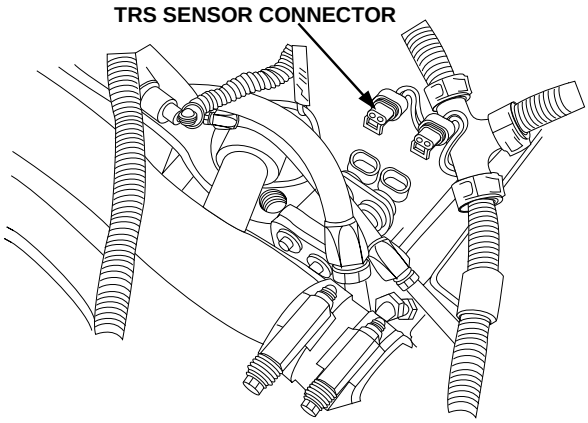


Check connectors at SRS (both harness side and SRS side) for damage; bent, corroded, and unseated pins or sockets, or bad contacts.

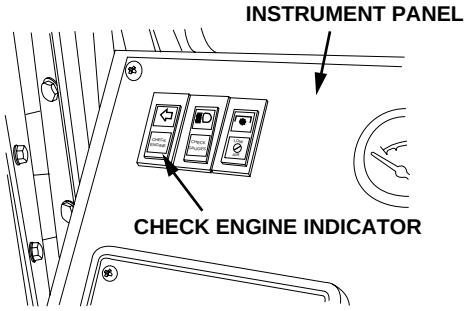
ACTIVE OR HISTORIC CODE 42-SYNCHRONOUS REFERENCE SENSOR (SRS) (CONT)



Check connectors at TRS (both harness side and TRS side) for damage; bent, corroded, and unseated pins or sockets, or bad contacts.



(1) Turn ENGINE switch OFF.
(2) Install ECM (TM 9-2320-360-20).
(3) Reconnect all connectors.
(4) Turn ENGINE switch ON and clear codes.
(5) Start and run engine until, CHECK ENGINE indicator lights for 1 minute
(6) Stop engine and read historical codes.



WARNING

Jewelry can catch on equipment and cause injury or short across electrical circuit and cause severe burns or electrical shock. Remove rings. bracelets, watches, necklaces, and any other jewelry before working around HET Tractor.

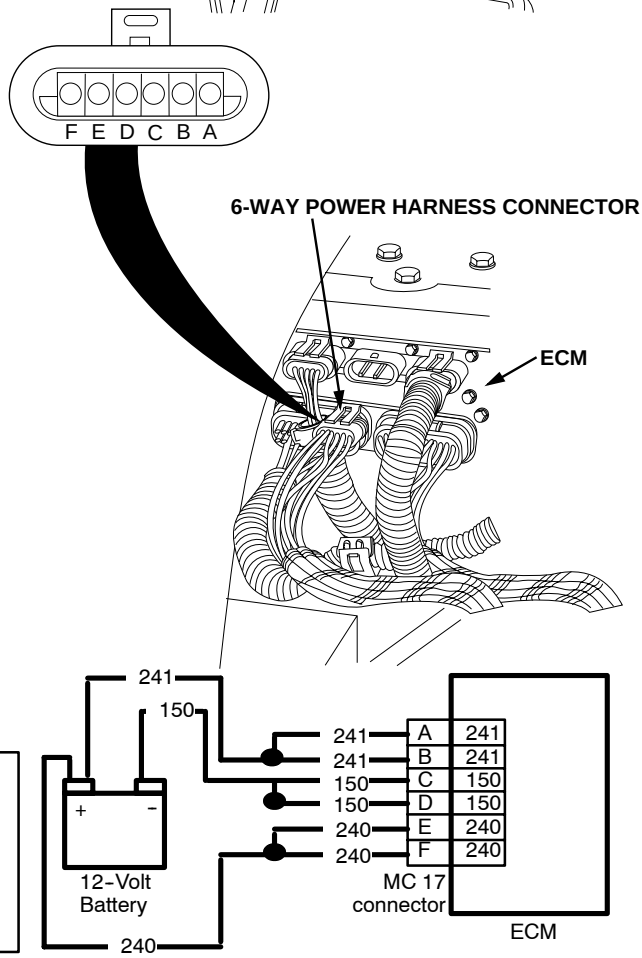
CAUTION

Use jumper wire only between terminals indicated. Failure to comply may result in damage to DDEC components or wiring.

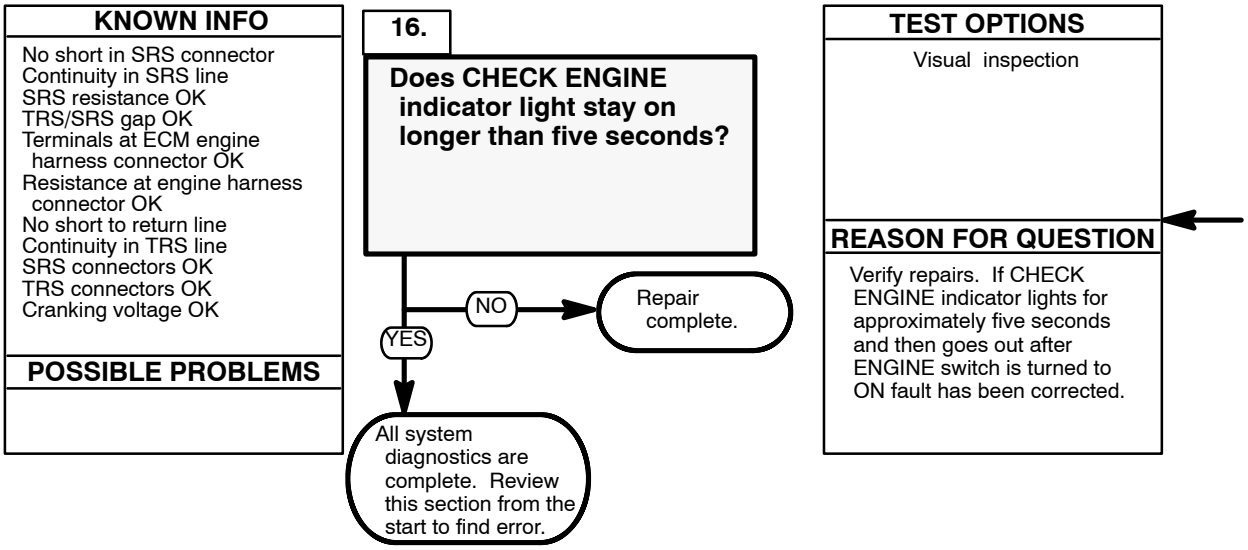
NOTE

Refer to Appendix C, (Illustrated List of Manufactured Items) for fabrication of jumper harness.

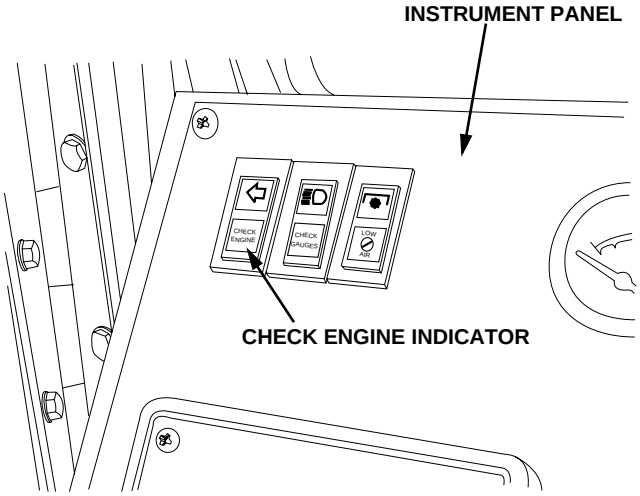
(1) Turn ENGINE switch OFF.
(2) Connect 12 volts from a fully charged battery to 6-pin power connector
(3) Connect other connectors.
(4) Start engine (TM 9-2320-360-10).
(5) Stop engine (TM 9-2320-360-10).



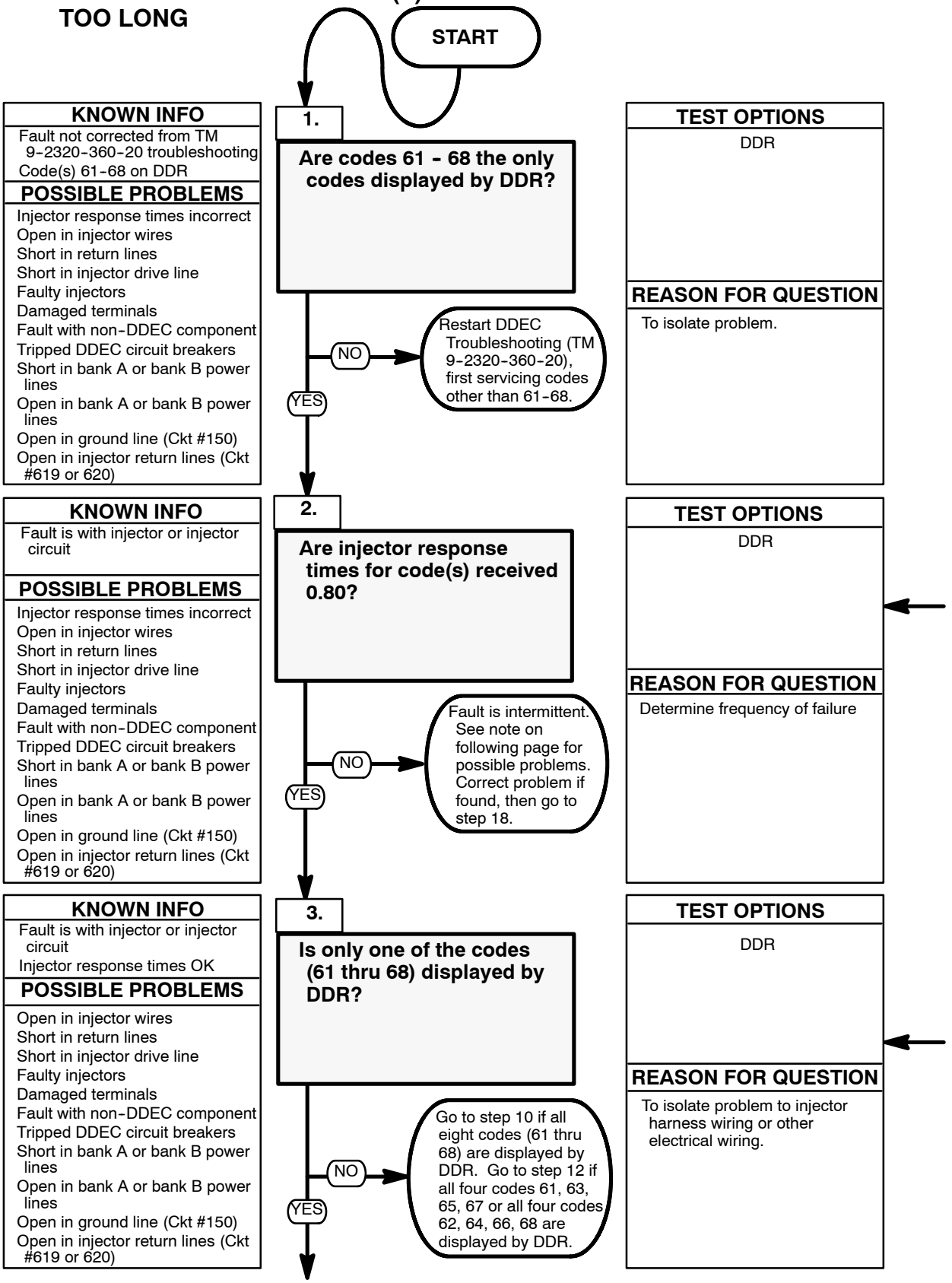
ACTIVE OR HISTORIC CODE 42-SYNCHRONOUS REFERENCE SENSOR (SRS) (CONT)



(1) Turn ENGINE switch OFF.
(2) Reconnect all harness connectors.
(3) Install ECM (TM 9-2320-360-20).
(4) Turn ENGINE switch ON and observe CHECK ENGINE indicator.



ACTIVE OR HISTORIC CODE(S) 61-68 INJECTOR RESPONSE TIME TOO LONG



NOTE

Table 2-5 shows which injector is associated with each of the failure codes.

Table 2-5. Injector Identification

CODE	FIRING ORDER	CYLINDER
61	1	1Left
62	2	3Right
63	3	3Left
64	4	4Right
65	5	4Left
66	6	2Right
67	7	2Left
68	8	1Right

NOTE

If response time(s) is not 0.80 the following may be causing intermittent failures:

a. sticky valve
b. air in fuel
c. low battery charge
d. broken spring or armature on the injector
e. problems in the charging system (loose alternator belt, bad grounds, etc.)
f. signs of insulation wear on injector harness

(1) Start and warm engine to operating temperature (at least 86° F).

(2) Plug in DDR and select INJ RESP TIMES (Mode 10).

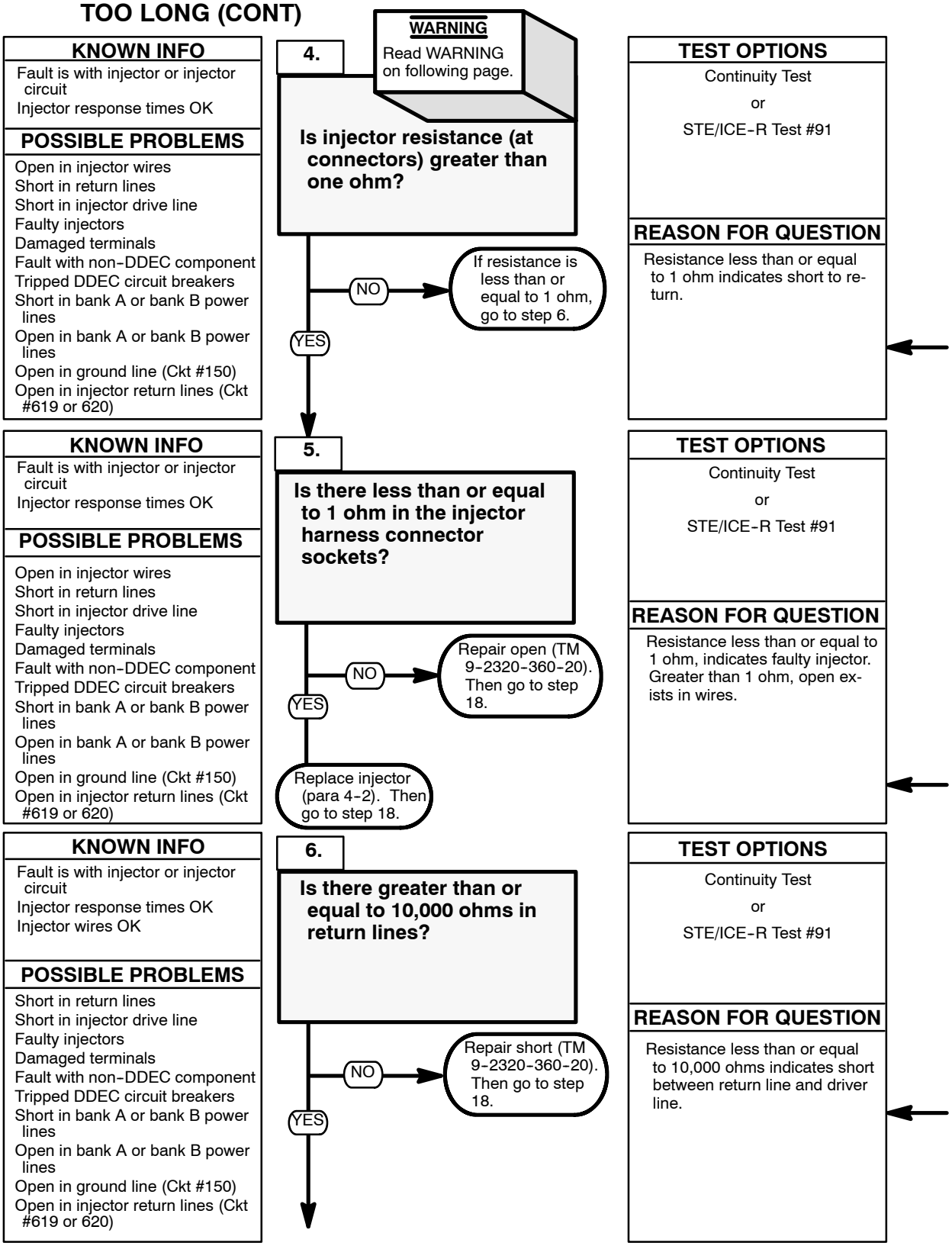
NOTE

Table 2-5 gives the firing sequence in relation to the code received.

(3) Read DDR display of injector response time (in firing order) through several cycles. Note response time(s) of cylinder by number in fault code.

Check which codes (61-68) are displayed by DDR.

ACTIVE OR HISTORIC CODE(S) 61-68 INJECTOR RESPONSE TIME TOO LONG (CONT)



WARNING

Exhaust manifolds and engine parts are hot. Use care to prevent personal injury.

Table 2-6. Injector Harness Connector Identification

CODE	INJECTOR HARNESS CONNECTOR SOCKET	INJECTOR HARNESS CONNECTOR SOCKET
61	L	G
62	A	E
63	K	G
64	B	E
65	H	G
66	D	E
67	J	G
68	C	E

CONTINUITY TEST

(1) Turn ENGINE switch OFF and unplug DDR.

(2) Disconnect both 5-way injector harness connectors at the ECM.

(3) Referring to Table 2-6, read resistance between the 5-way injector harness connector sockets associated with the 61-68 code received. (Example: read resistance between sockets G and L for Code 61.)

CONTINUITY TEST

(1) Remove rocker arm cover (TM 9-2320-360-20) corresponding to injector identified by Table 2-5.

(2) Disconnect the two wires of the injector identified. Short these two wires together.

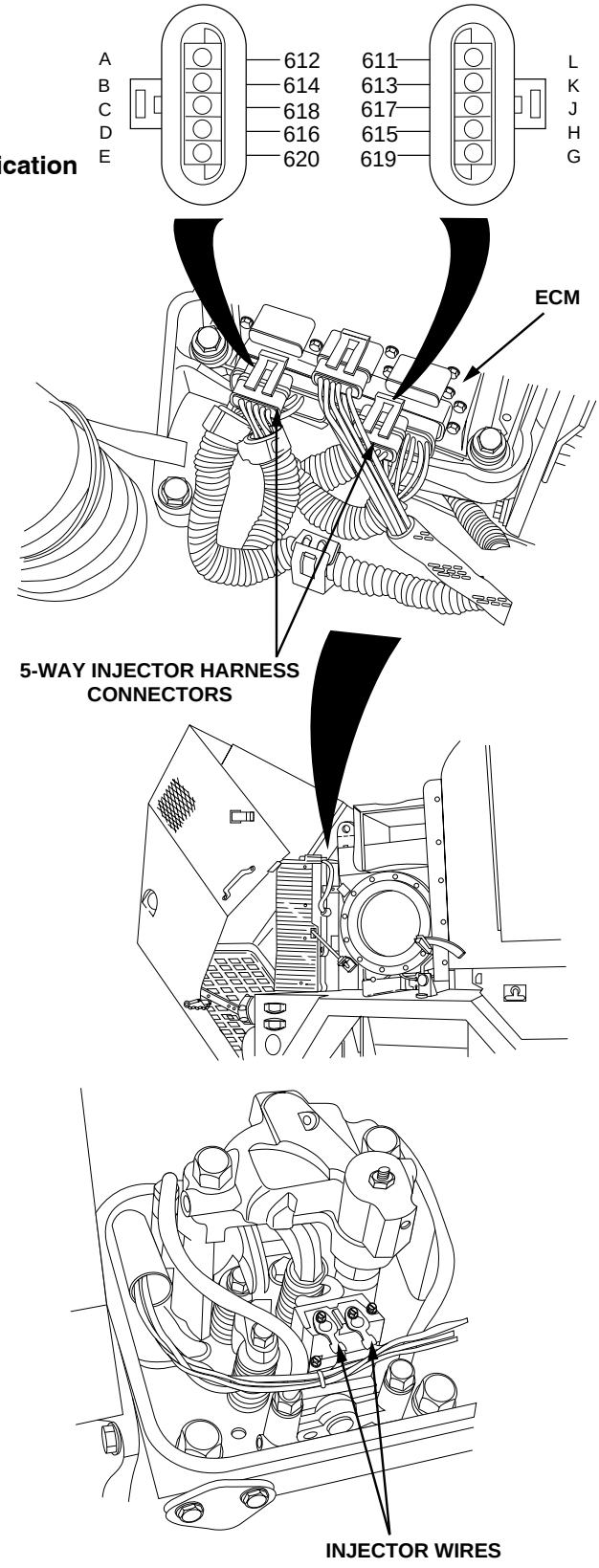
(3) Referring to Table 2-6, read the resistance between the 5-way injector harness connector sockets associated with the faulty injector.

CONTINUITY TEST

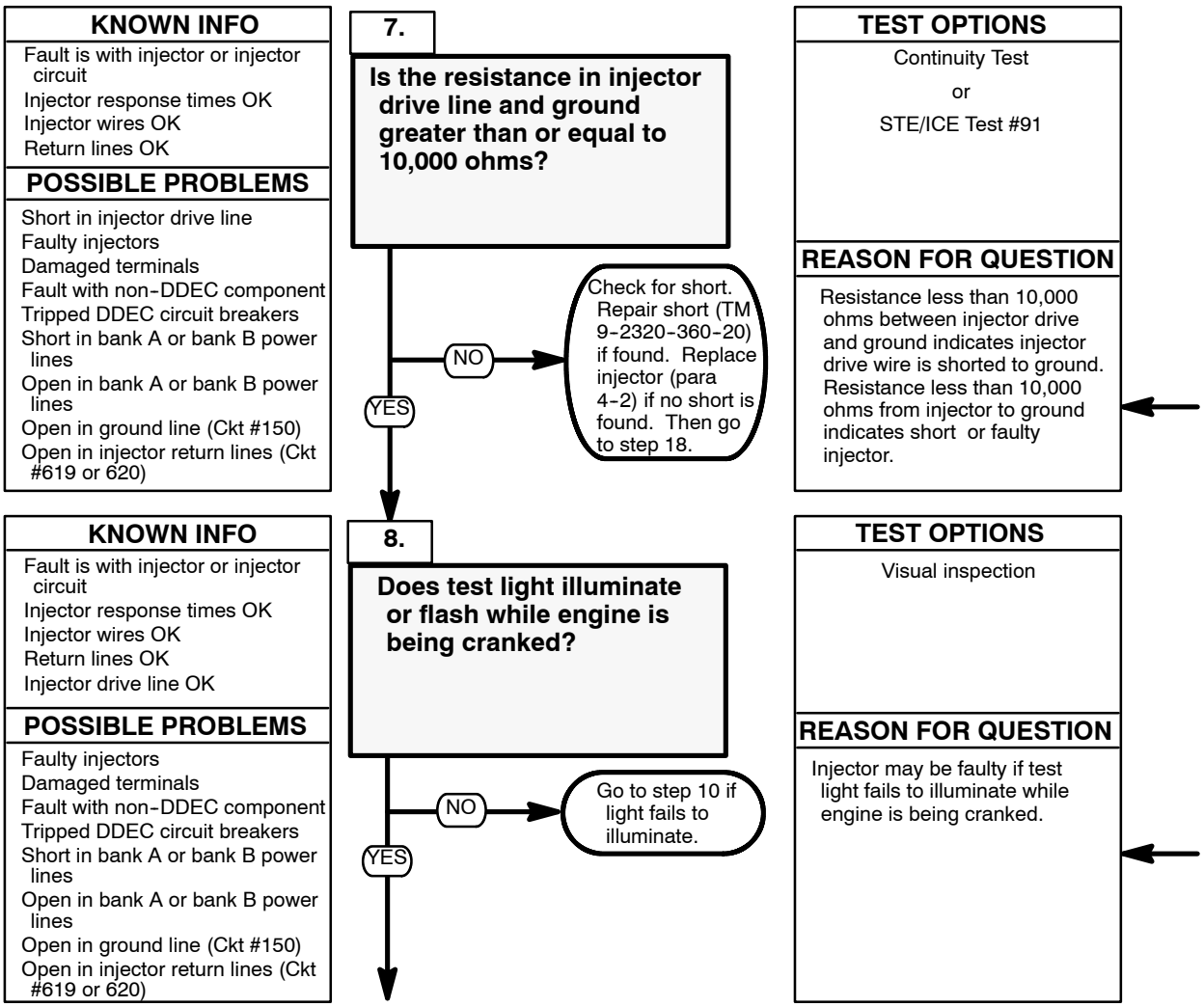
(1) Remove rocker arm cover (TM 9-2320-360-20) corresponding to injector identified by Table 2-5.

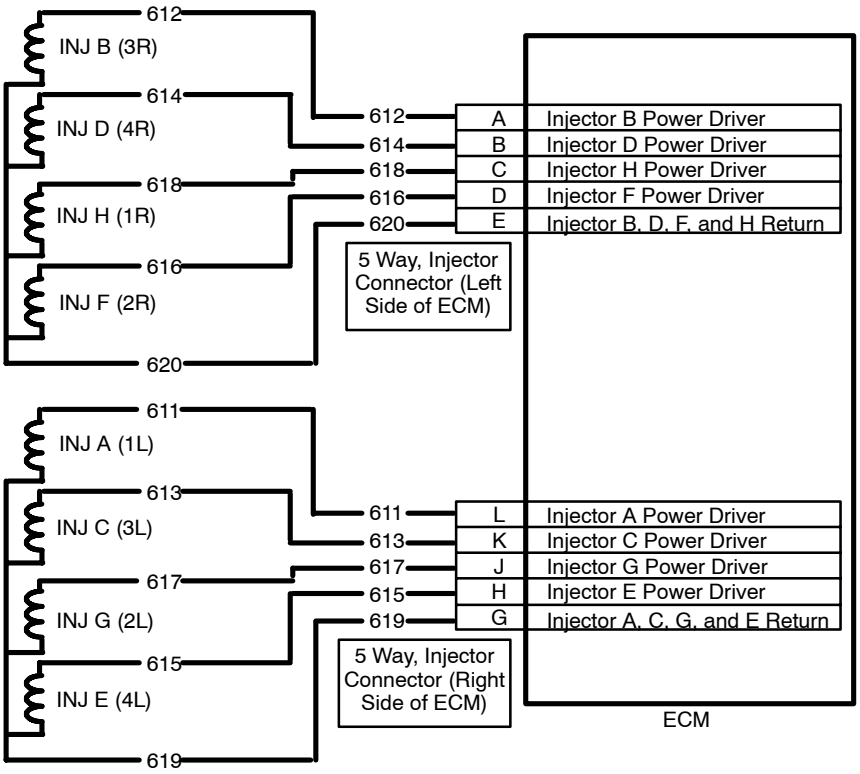
(2) Disconnect two wires of injector indicated.

(3) Referring to Table 2-6, read the resistance between 5-way injector harness connector sockets associated with faulty injector.



ACTIVE OR HISTORIC CODE(S) 61-68 INJECTOR RESPONSE TIME TOO LONG (CONT)

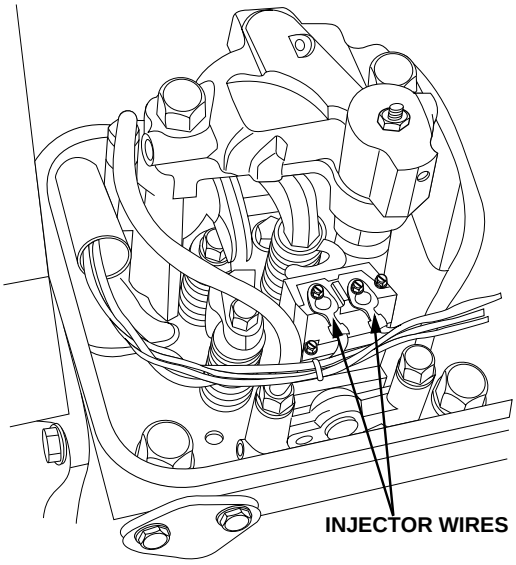




CONTINUITY TEST

(1) Check for short to ground. Working with injector that has its two wires disconnected, measure the resistance between injector drive wire (injector drive wire will have a number from no. 611 to no. 618 depending on cylinder) and a good ground.

(2) Measure resistance between one of terminals of injector (injector with disconnected wires) and a good ground.

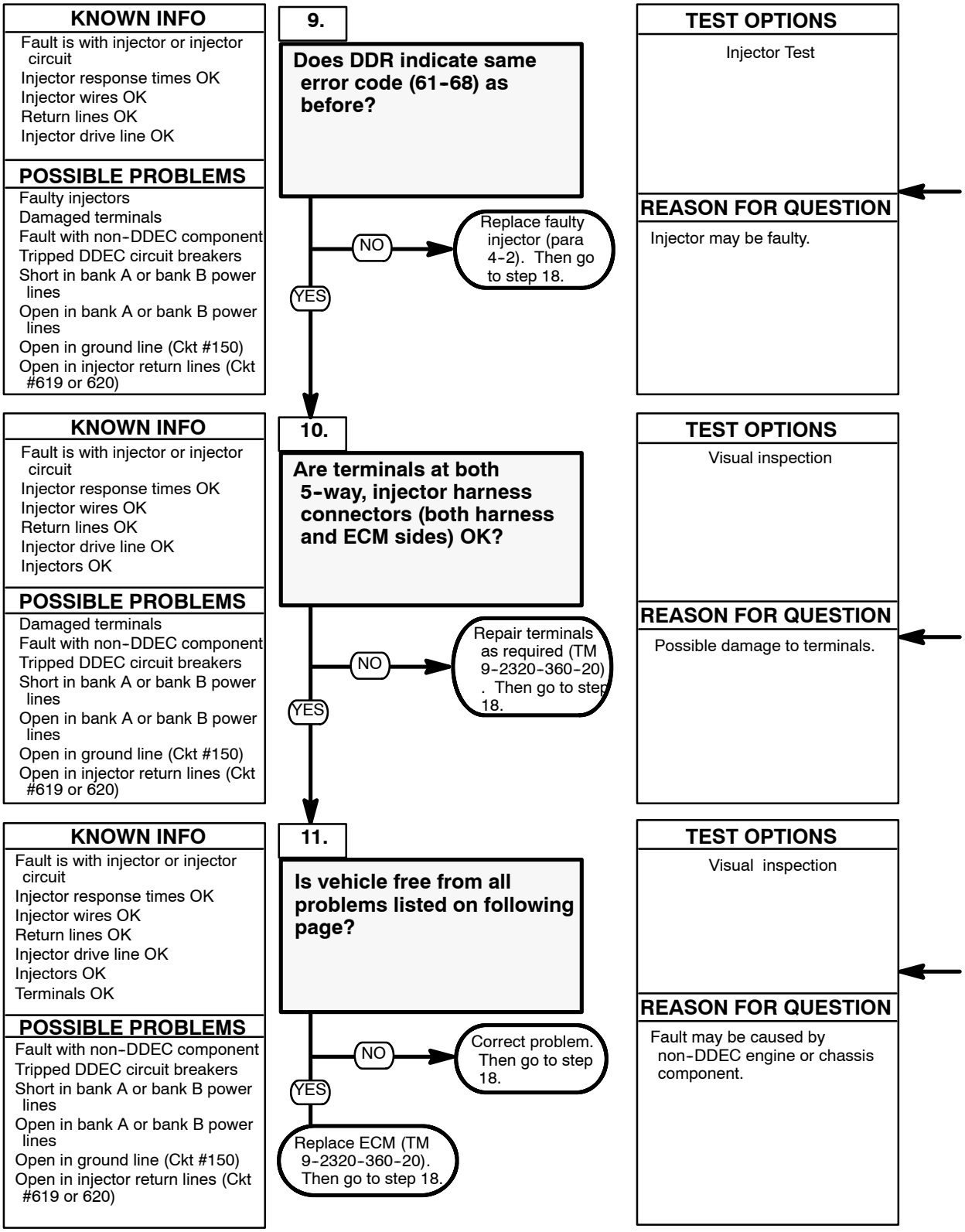


(1) Reconnect both 5-way injector harness connectors at ECM.

(2) Looking at injector with disconnected wires, reattach injector drive wire.

(3) With a 6-volt test light, monitor injector on return side (where no wire is attached) with respect to ground while cranking engine.

ACTIVE OR HISTORIC CODE(S) 61-68 INJECTOR RESPONSE TIME TOO LONG (CONT)



INJECTOR TEST

(1) Turn ENGINE switch to OFF.

(2) Disconnect injector drive line (wire no. 611 thru 618 depending on cylinder) from injector identified by code (61-68).

(3) Disconnect injector drive line and return line from a nearby injector that is operating properly.

(4) Remove injectors (para 4-2) from cylinder identified by code (61-68) and from cylinder in which drive line and return line were disconnected.

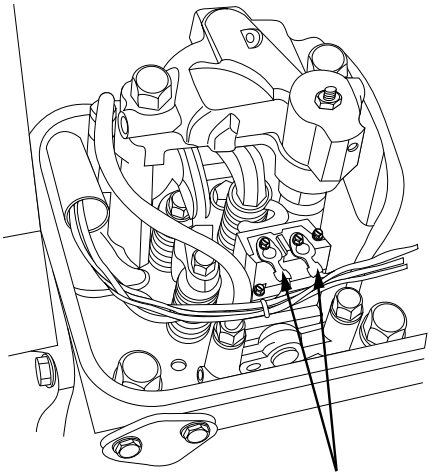
(5) Swap injectors. (Install injector (para 4-2) identified by code (61-68) in cylinder that was firing properly. Install injector that was operating properly in cylinder that was misfiring.)

(6) Clear codes on DDR.

(7) Start engine (TM 9-2320-360-10) and warm to normal operating temperature or until CHECK ENGINE indicator lights.

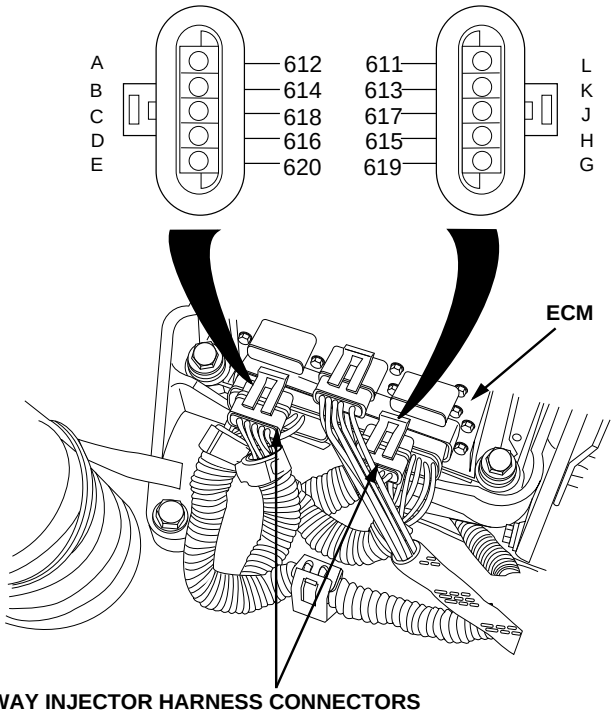
(8) Stop engine (TM 9-2320-360-10).

(9) Read historical codes on DDR.



INJECTOR WIRES

Check terminals at both 5-way, injector harness connectors (both harness and ECM sides) for damage; bent, corroded and unseated pins or sockets.

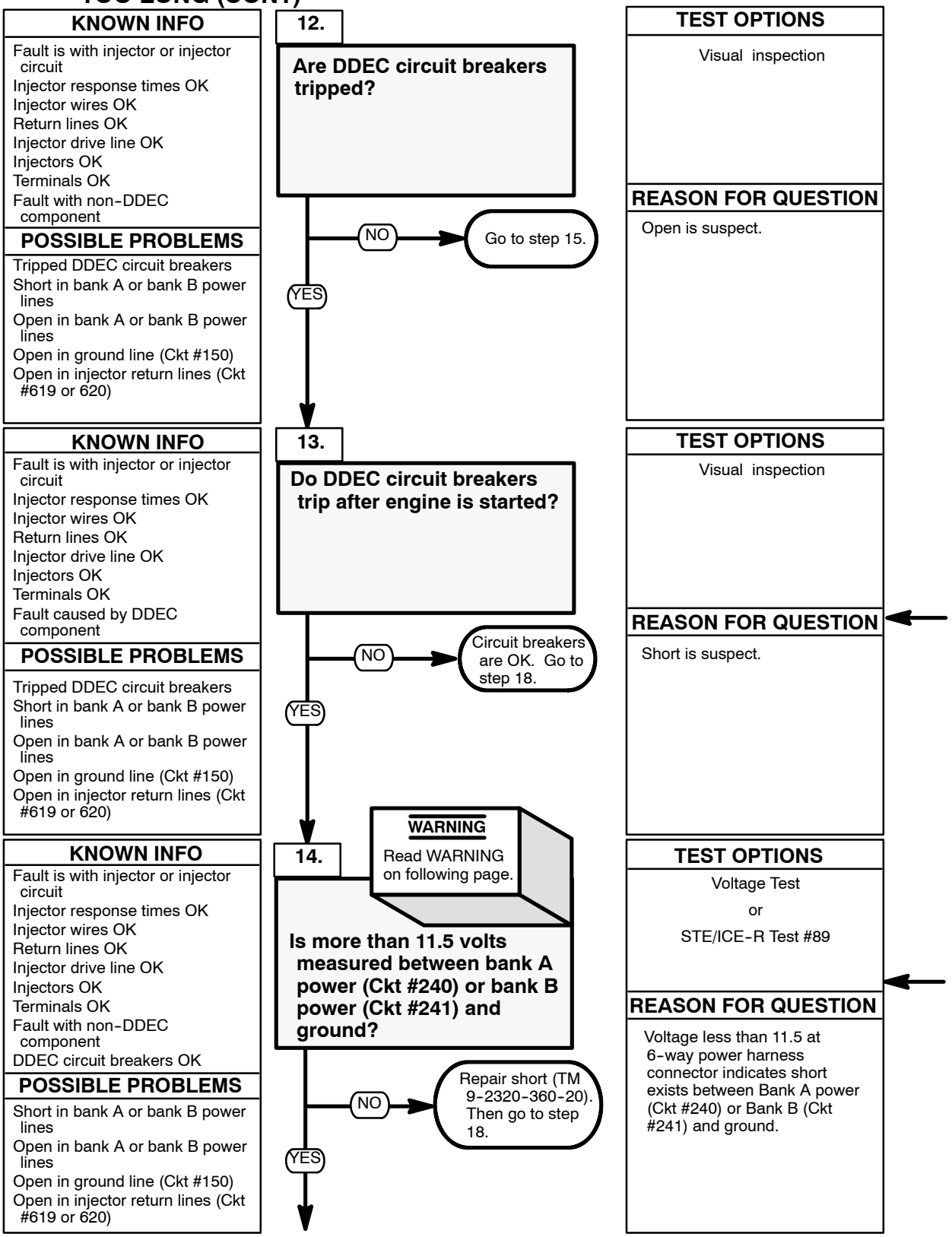


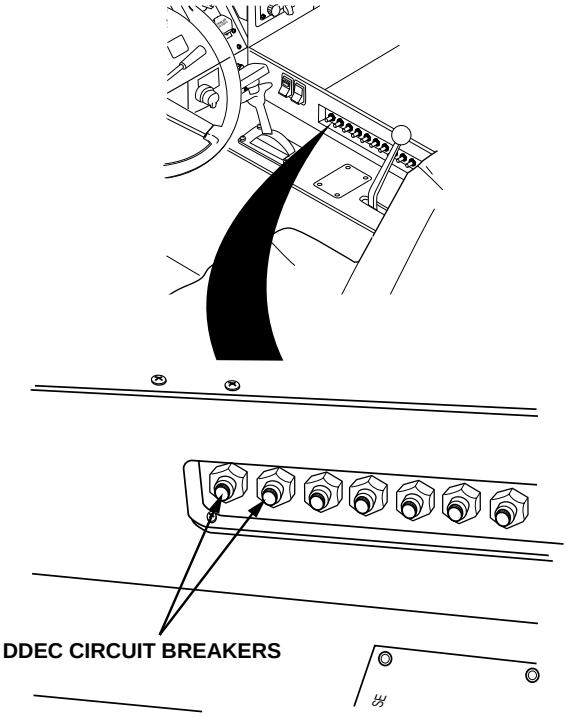
5-WAY INJECTOR HARNESS CONNECTORS

Check for any of the following problems:

- Air in fuel or low fuel pressure
- Sticky valve
- Cold fuel
- Low battery charge
- Broken spring or armature on the injector
- Problems in the charging system (loose alternator belt, etc.) or bad grounds
- Signs of insulation wear on injector harness.

ACTIVE OR HISTORIC CODE(S) 61-68 INJECTOR RESPONSE TIME TOO LONG (CONT)





Reset breaker(s). Start engine (TM 9-2320-360-10) and check to see if circuit breakers trip again.

WARNING

Jewelry can catch on equipment and cause injury or short across electrical circuit and cause severe burns or electrical shock. Remove rings. bracelets, watches, necklaces, and any other jewelry before working around HET Tractor.

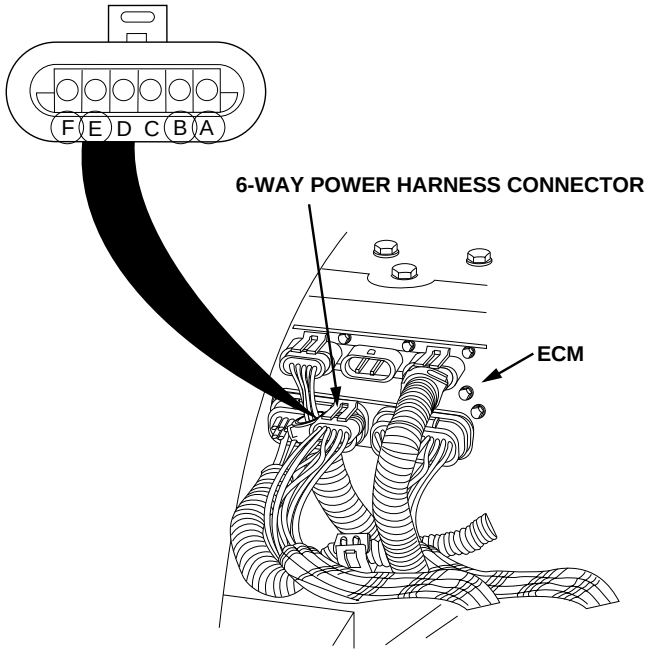
VOLTAGE TEST

(1) Turn ENGINE switch OFF.

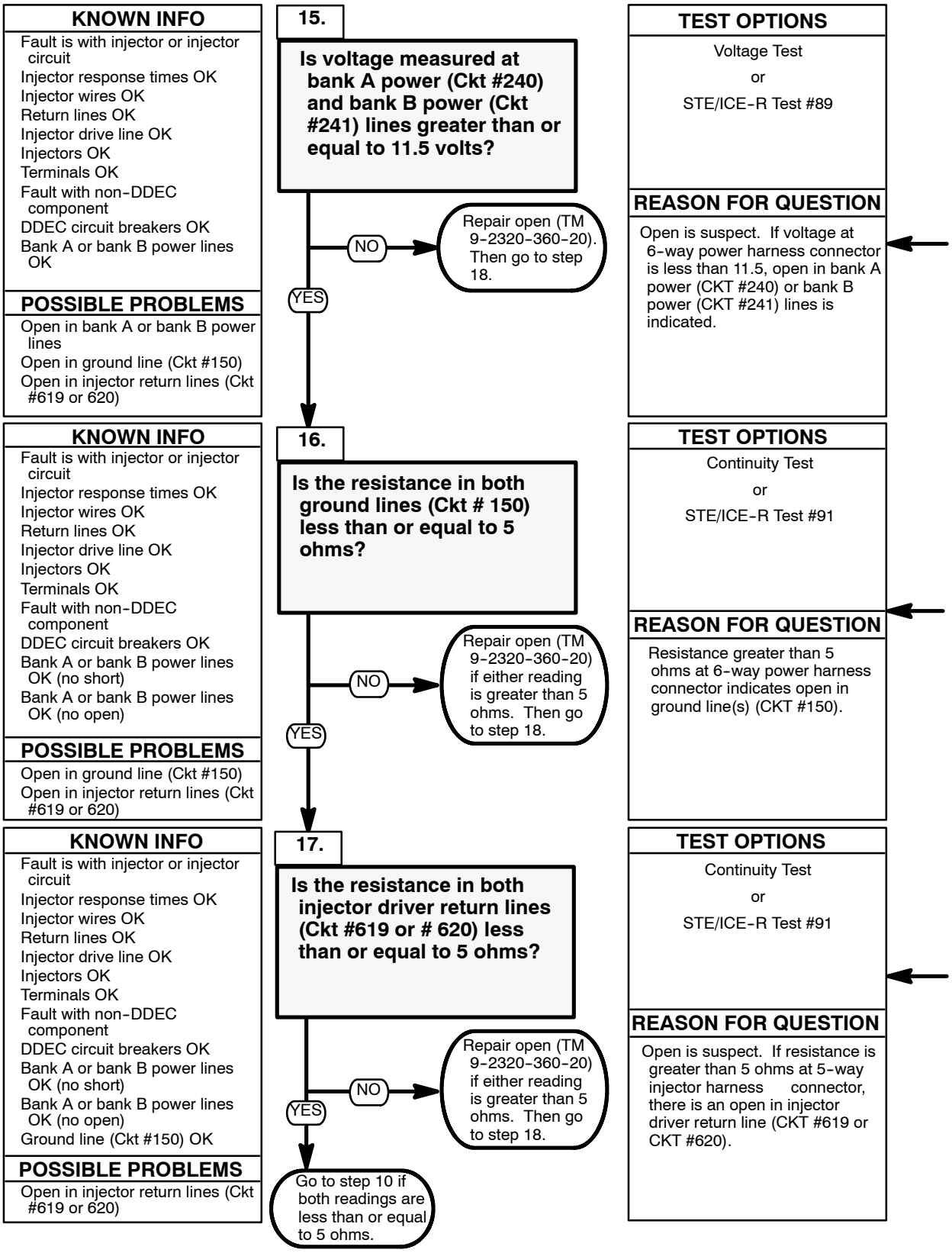
(2) Disconnect 6-way power harness connector.

(3) Read voltage on socket A (red lead) to a good ground (black lead).

(4) Also read voltage on sockets B, E, and F (red lead) to a good ground.



ACTIVE OR HISTORIC CODE(S) 61-68 INJECTOR RESPONSE TIME TOO LONG (CONT)



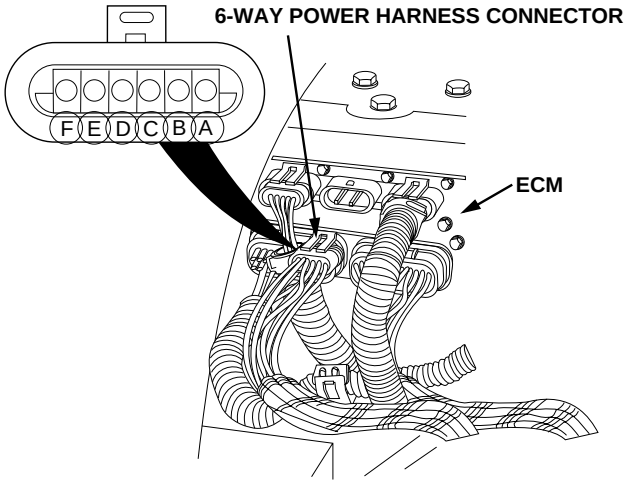
VOLTAGE TEST

(1) Read voltage on socket E and F (red lead) to socket C (black lead) of 6-way power harness connector.

(2) Read voltage on socket E and F (red lead) to socket D (black lead) of 6-way power harness connector.

(3) Read voltage on socket A and B (red lead) to socket C (black lead) of 6-way power harness connector.

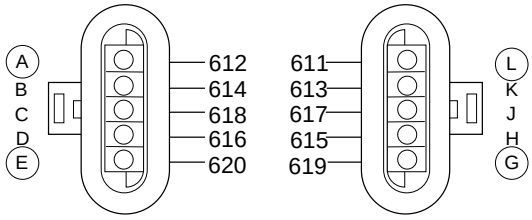
(4) Read voltage on socket A and B (red lead) to socket D (black lead) of 6-way power harness connector.



CONTINUITY TEST

(1) Read resistance between socket C of 6-way power harness connector and a good ground.

(2) Also read resistance between socket D of 6-way power harness connector and a good ground.

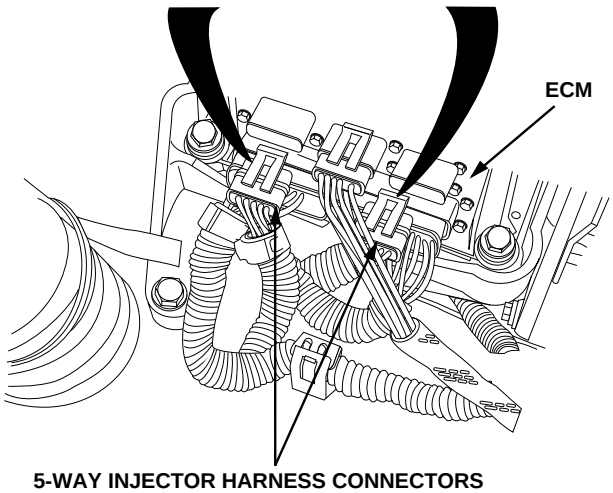


CONTINUITY TEST

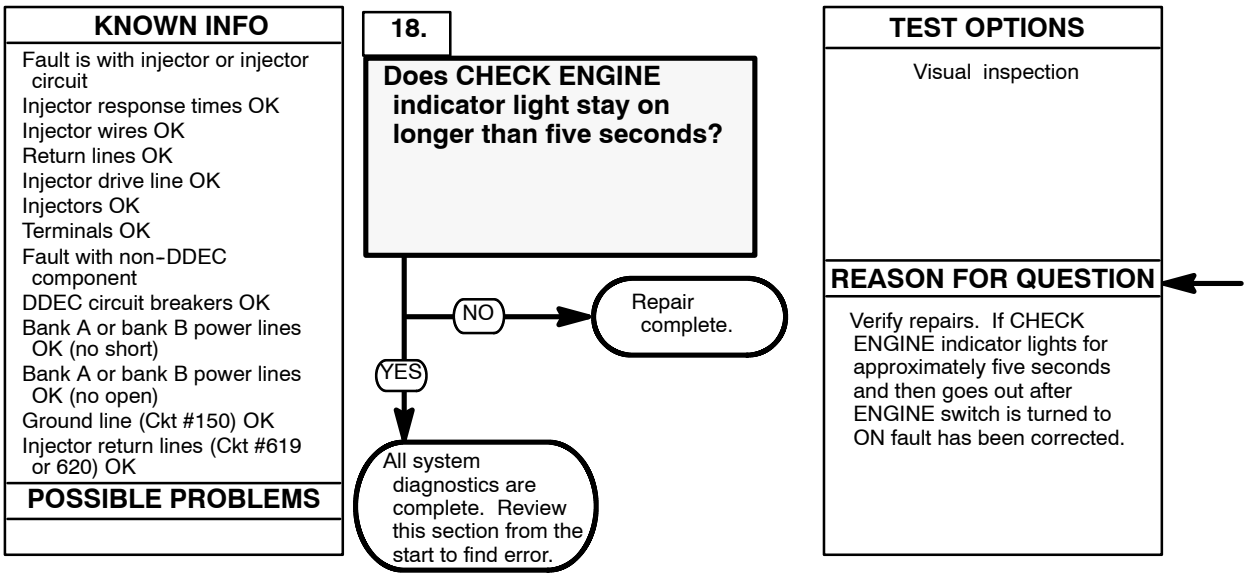
(1) Disconnect both 5-way injector harness connectors at ECM.

(2) Read resistance between sockets G and L on 5-way injector harness connector.

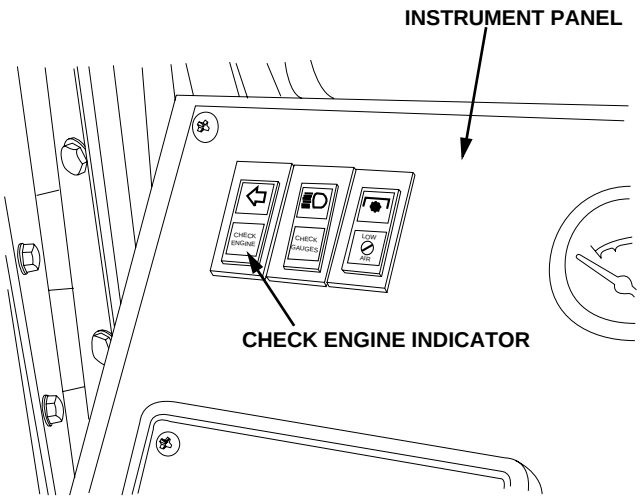
(3) Also read resistance between sockets A and E of other 5-way injector harness connector.



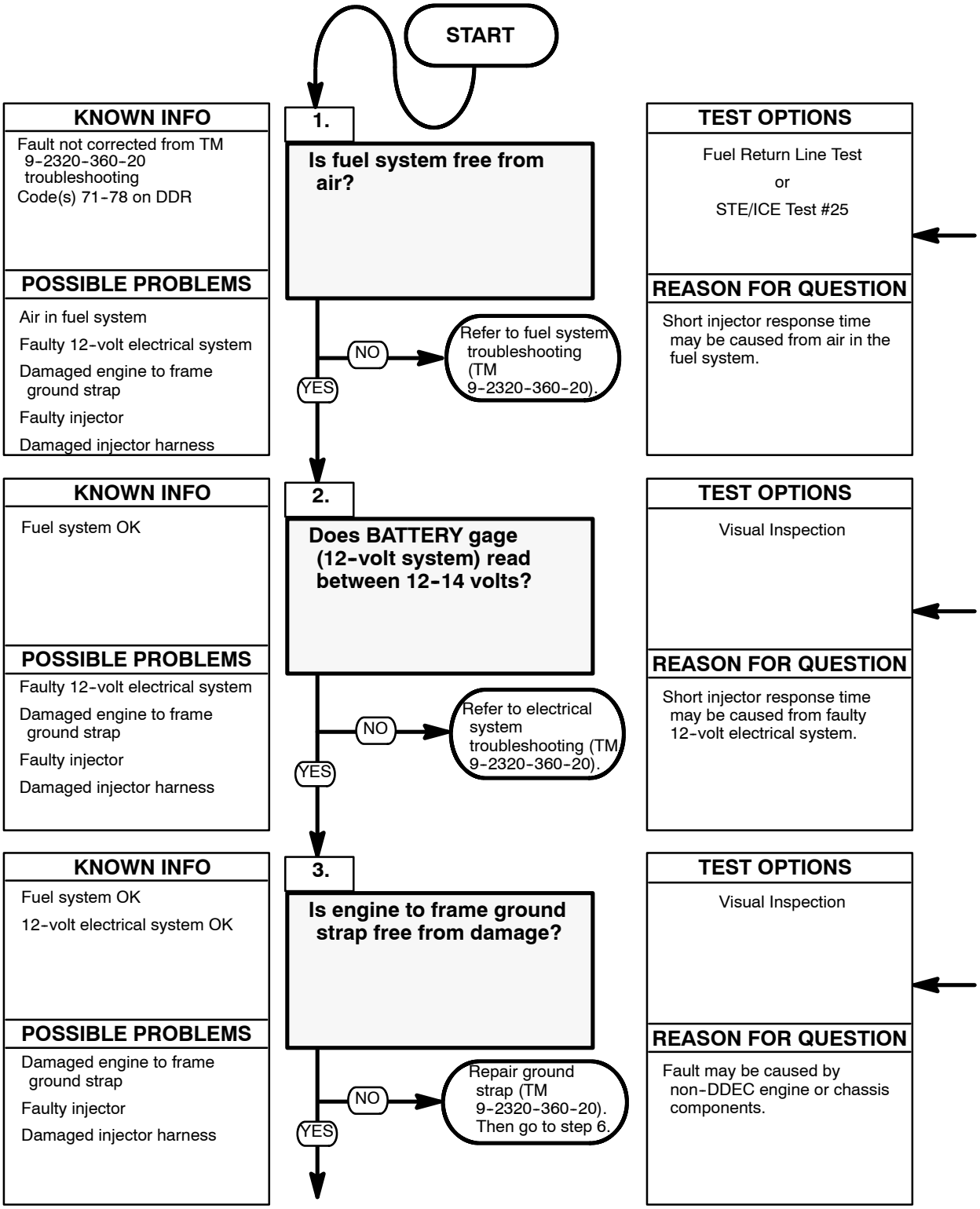
ACTIVE OR HISTORIC CODE(S) 61-68 INJECTOR RESPONSE TIME TOO LONG (CONT)

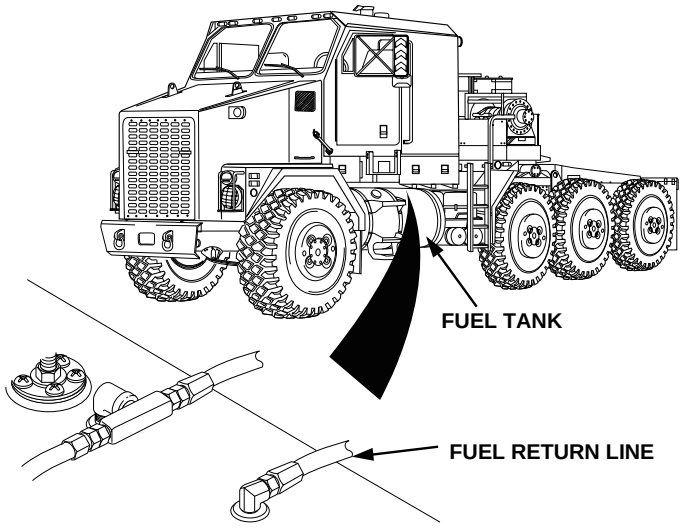


(1) Turn ENGINE switch OFF.
(2) Reconnect all harness connectors.
(3) Turn ENGINE switch ON and observe CHECK ENGINE indicator.



ACTIVE OR HISTORIC CODE(S) 71-78 INJECTOR RESPONSE TIME TOO SHORT





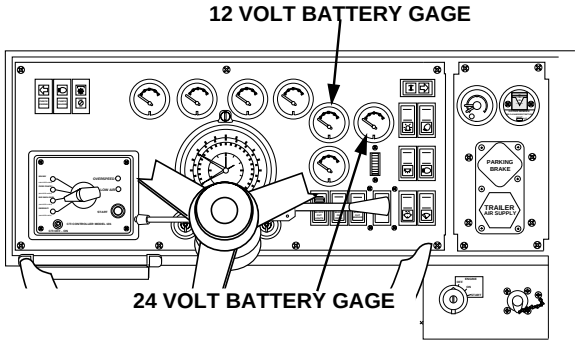
FUEL RETURN LINE TEST

(1) Remove fuel return line from left side fuel tank.

(2) Place fuel line in suitable container.

(3) Start engine (TM 9-2320-360-10) and check for air in fuel return line.

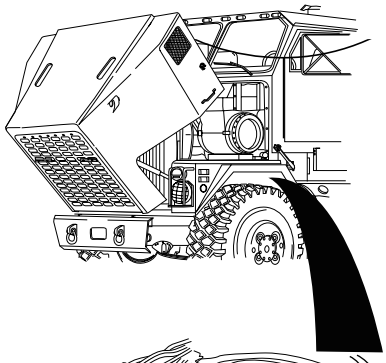
(4) Install fuel return line on left side fuel tank.



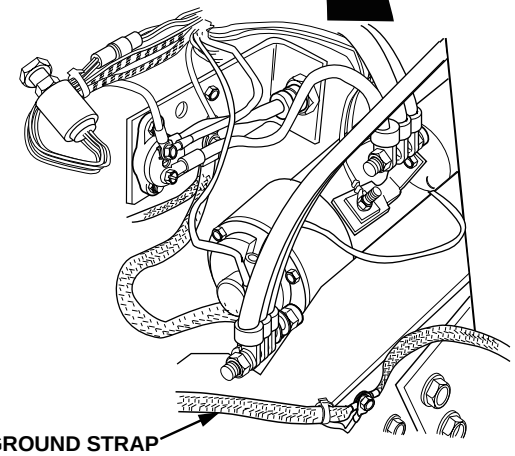
NOTE

ENGINE must be running to perform this test.

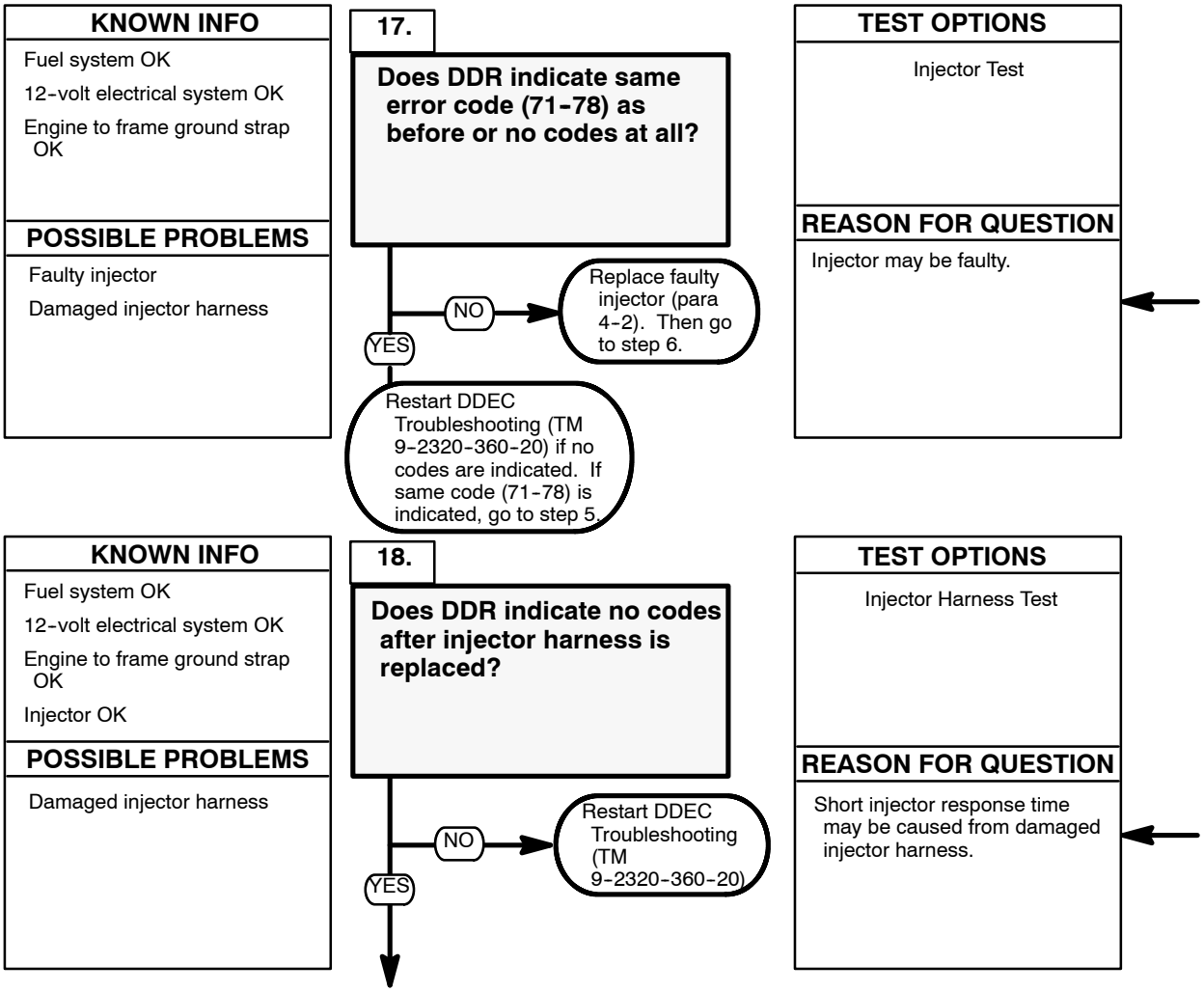
Check BATTERY gage (12-volt system). BATTERY gage should read between 12-14 volts.



Check engine to frame ground strap for loose connections and damage.



ACTIVE OR HISTORIC CODE(S) 71-78 INJECTOR RESPONSE TIME TOO SHORT (CONT)



NOTE

Table 2-7 shows which injector is associated with each of the failure codes.

Table 2-7. Injector Identification

CODE	FIRING ORDER	CYLINDER
71	1	1Left
72	2	3Right
73	3	3Left
74	4	4Right
75	5	4Left
76	6	2Right
77	7	2Left
78	8	1Right

INJECTOR TEST

(1) Turn ENGINE switch to OFF.

(2) Disconnect injector drive line (wire no. 611 thru 618 depending on cylinder) from injector identified by code (71-78).

(3) Disconnect injector drive line and return line from a nearby injector that is operating properly.

(4) Remove injectors (para 4-2) from cylinder identified by code (71-78) and from cylinder in which drive line and return line were disconnected.

(5) Swap injectors. (Install injector (para 4-2) identified by code (71-78) in cylinder that was firing properly. Install injector that was operating properly in cylinder that was misfiring.)

(6) Clear codes on DDR.

(7) Start engine (TM 9-2320-360-10) and warm to normal operating temperature or until CHECK ENGINE indicator lights.

(8) Stop engine (TM 9-2320-360-10).

(9) Read historical codes on DDR.

INJECTOR HARNESS TEST

(1) Turn ENGINE switch OFF.

(2) Replace injector harness (para 4-3).

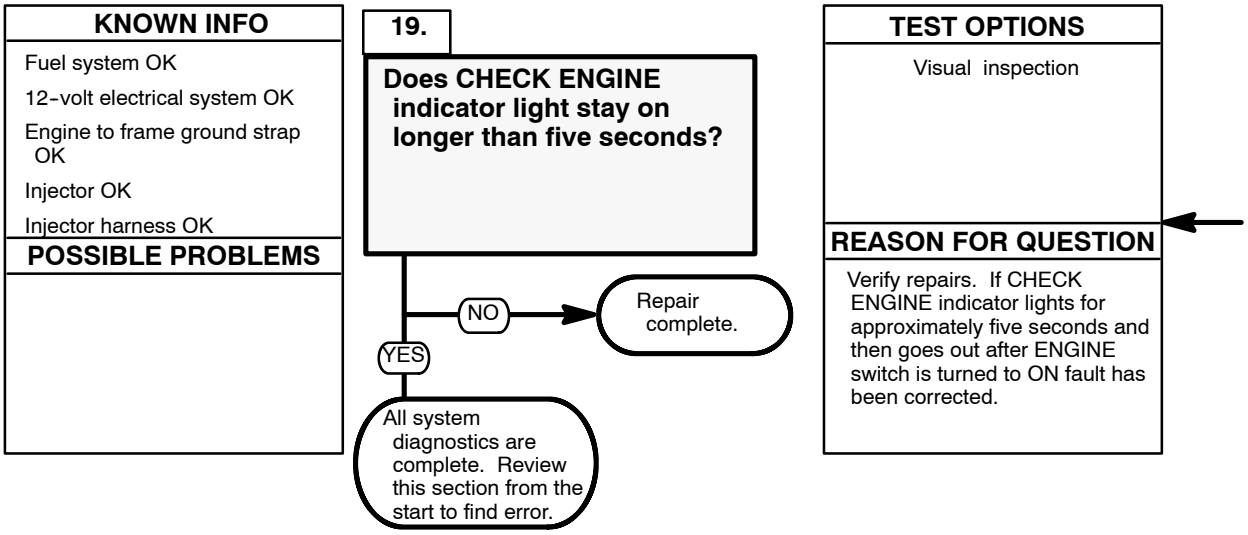
(3) Reconnect all connectors.

(4) Clear codes on DDR.

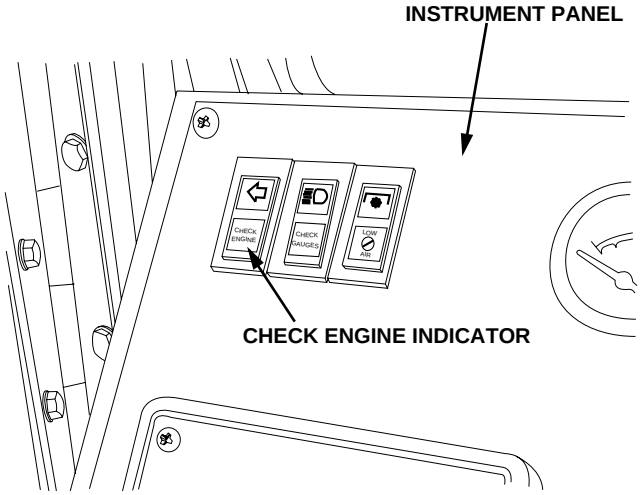
(5) Check mode 10 (INJ RESP TIMES) and MODE 1 (ACTIVE CODES).

(6) Stop engine (TM 9-2320-360-10).

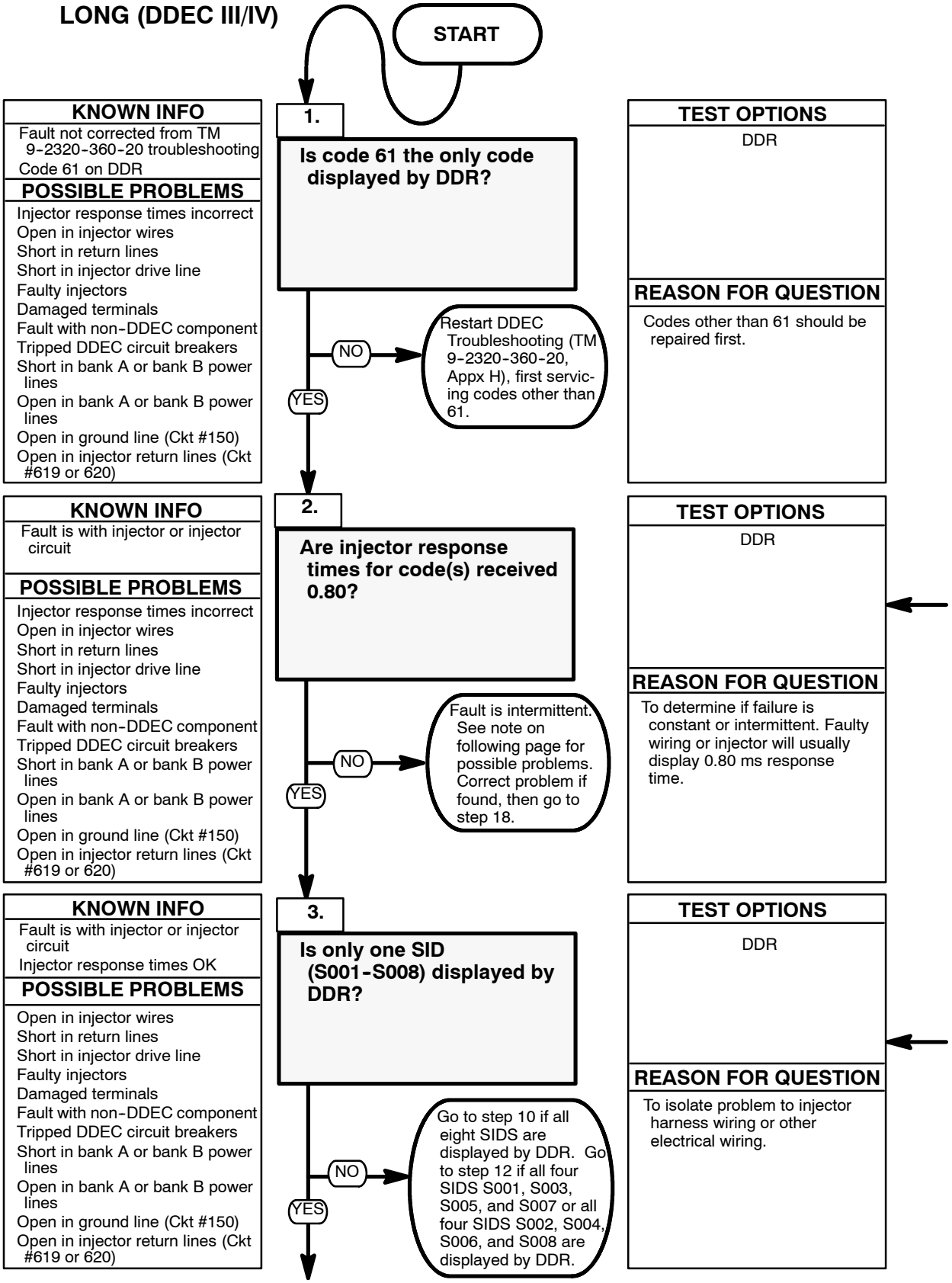
ACTIVE OR HISTORIC CODE(S) 71-78 INJECTOR RESPONSE TIME TOO SHORT (CONT)



(1) Turn ENGINE switch OFF.
(2) Reconnect all harness connectors.
(3) Turn ENGINE switch ON and observe CHECK ENGINE indicator.



ACTIVE OR INACTIVE CODE 61 INJECTOR RESPONSE TIME TOO LONG (DDEC III/IV)



NOTE

Table 2-8 shows which injector is associated with each of the SIDS.

Table 2-8. Injector Identification

SIDS	FIRING ORDER	CYLINDER
S001	1	3Right
S002	2	3Left
S003	3	4Right
S004	4	4Left
S005	5	2Right
S006	6	2Left
S007	7	1Right
S008	8	1Left

NOTE

If response time(s) is not 0.80 the following may be causing intermittent failures:

a. sticky valve
b. air in fuel
c. low battery charge
d. broken spring or armature on the injector
e. problems in the charging system (loose alternator belt, bad grounds, etc.)
f. signs of insulation wear on injector harness

(1) Start and warm engine to operating temperature (at least 86° F).

(2) Plug in DDR and select INJ RESP TIMES.

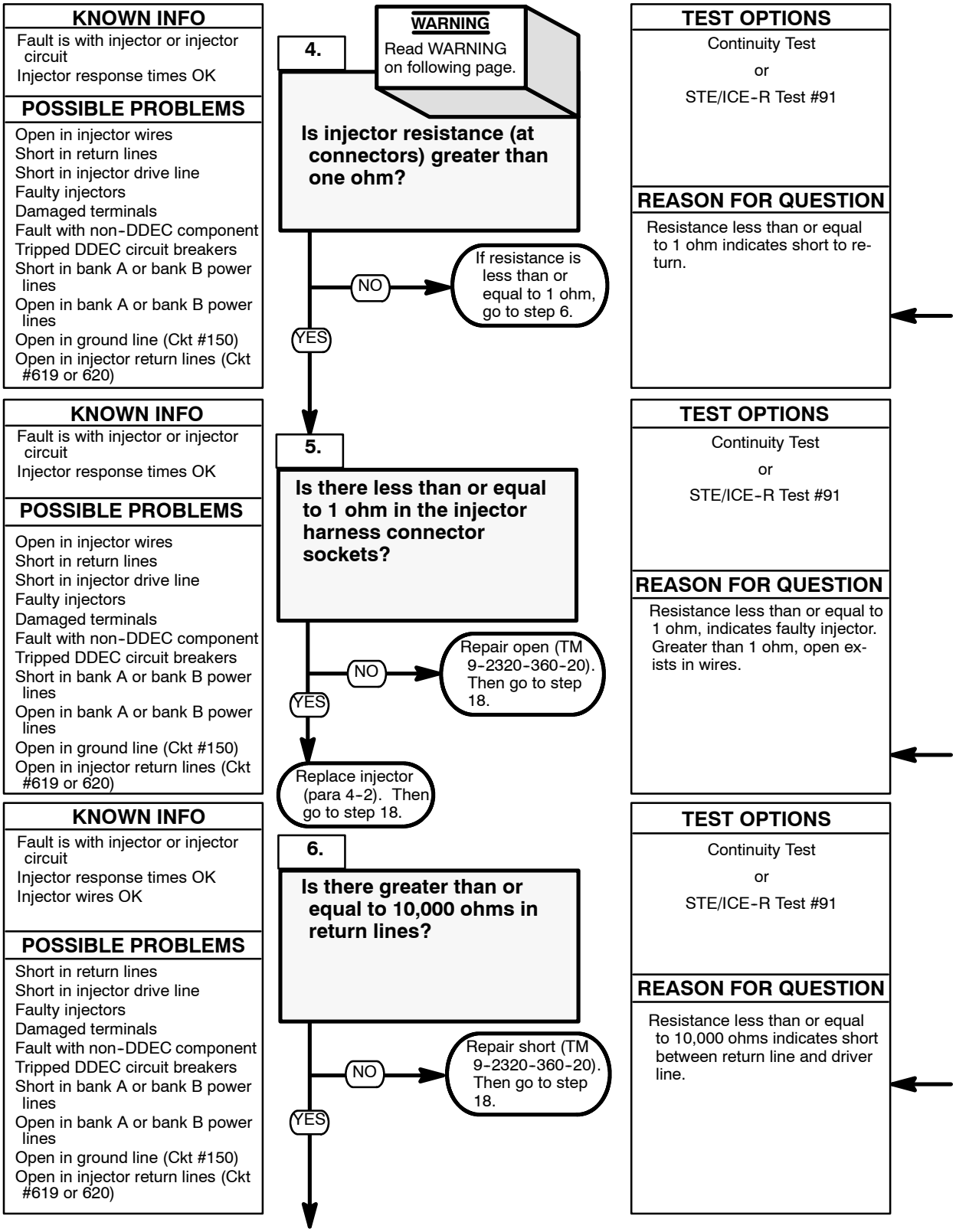
NOTE

Table 2-8 gives the firing sequence in relation to the SID received.

(3) Read DDR display of injector response time (in firing order) through several cycles. Note response time(s) of cylinder by number in fault code.

Check which SIDS are displayed by DDR.

ACTIVE OR INACTIVE CODE 61 INJECTOR RESPONSE TIME TOO LONG (DDEC III/IV) (CONT)



WARNING

Exhaust manifolds and engine parts are hot. Use care to prevent personal injury.

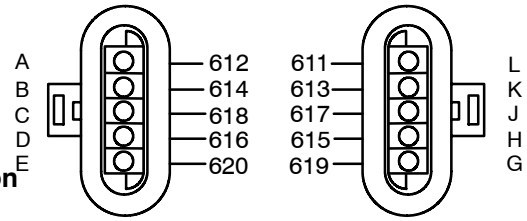


Table 2-9. Injector Harness Connector Identification

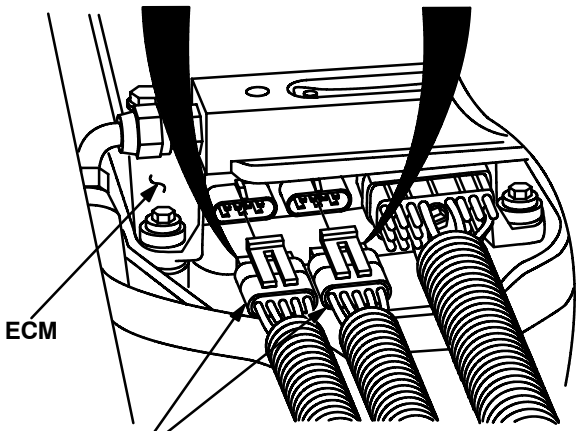
SID	INJECTOR HARNESS CONNECTOR SOCKET	INJECTOR HARNESS CONNECTOR SOCKET
S001	A	E
S002	K	G
S003	B	E
S004	H	G
S005	D	E
S006	J	G
S007	C	E
S008	L	G

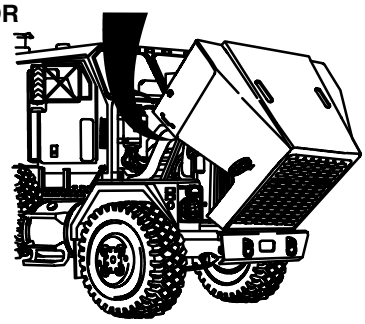
CONTINUITY TEST

(1) Turn ENGINE switch OFF and unplug DDR.

(2) Disconnect both 5-way injector harness connectors at the ECM.

(3) Referring to Table 2-9, read resistance between the 5-way injector harness connector sockets associated with the SID received. (Example: read resistance between sockets G and A for SID S001.)



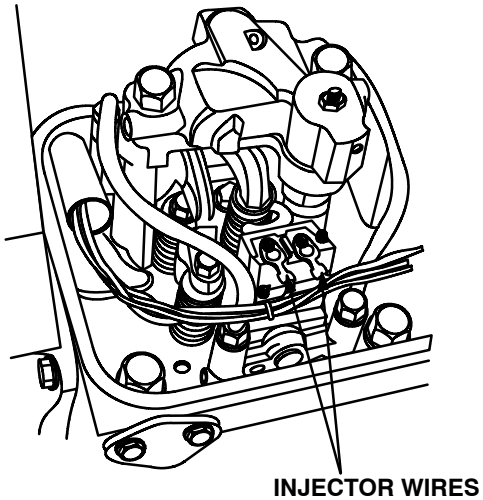


CONTINUITY TEST

(1) Remove rocker arm cover (TM 9-2320-360-20) corresponding to injector identified by Table 2-8.

(2) Disconnect the two wires of the injector identified. Short these two wires together.

(3) Referring to Table 2-9, read the resistance between the 5-way injector harness connector sockets associated with the faulty injector.



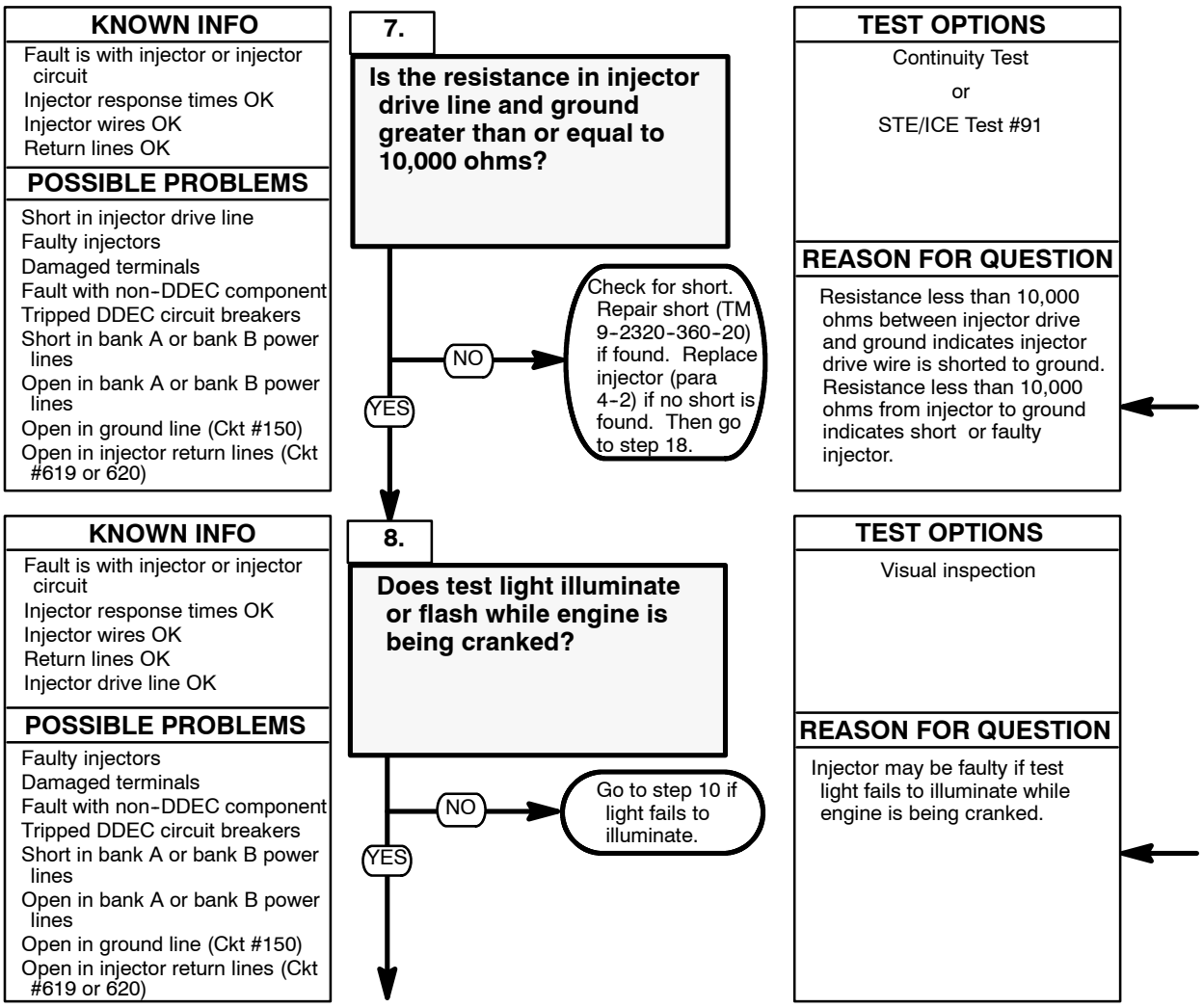
CONTINUITY TEST

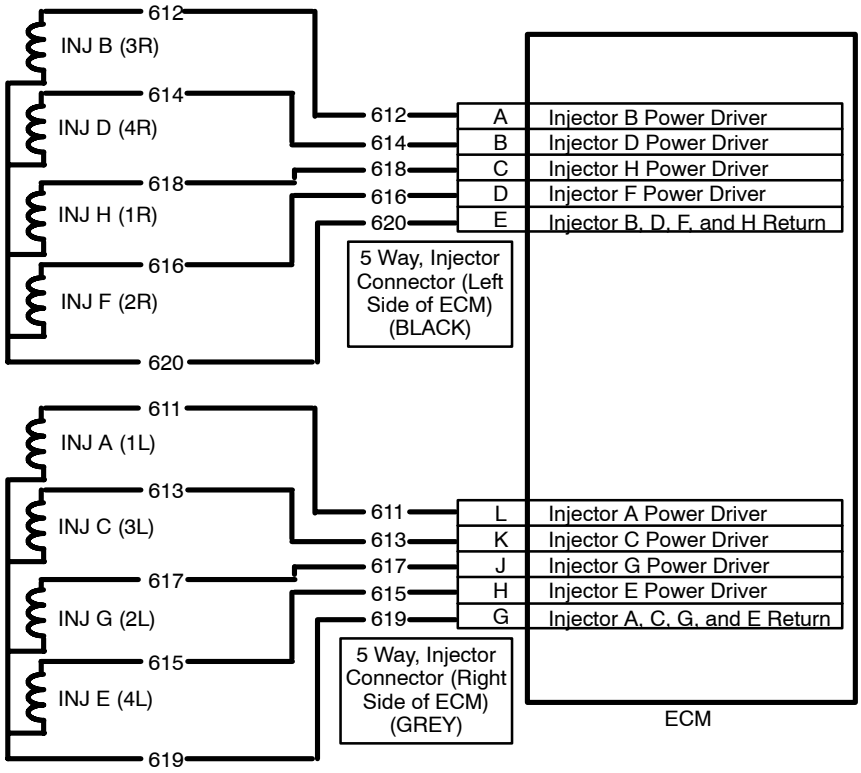
(1) Remove rocker arm cover (TM 9-2320-360-20) corresponding to injector identified by Table 2-8.

(2) Disconnect two wires of injector indicated.

(3) Referring to Table 2-9, read the resistance between 5-way injector harness connector sockets associated with faulty injector.

ACTIVE OR INACTIVE CODE 61 INJECTOR RESPONSE TIME TOO LONG (DDEC III/IV) (CONT)

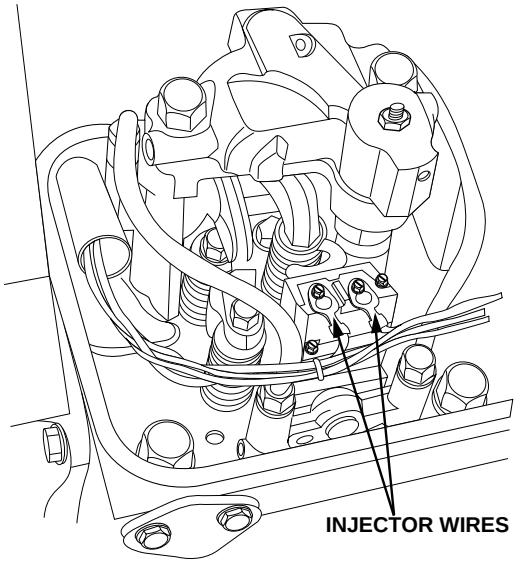




CONTINUITY TEST

(1) Check for short to ground. Working with injector that has its two wires disconnected, measure the resistance between injector drive wire (injector drive wire will have a number from no. 611 to no. 618 depending on cylinder) and a good ground.

(2) Measure resistance between one of terminals of injector (injector with disconnected wires) and a good ground.



WARNING

When working on a running engine, use caution around moving parts. Tools, clothing, and hands may get caught causing serious injury or death to personnel.

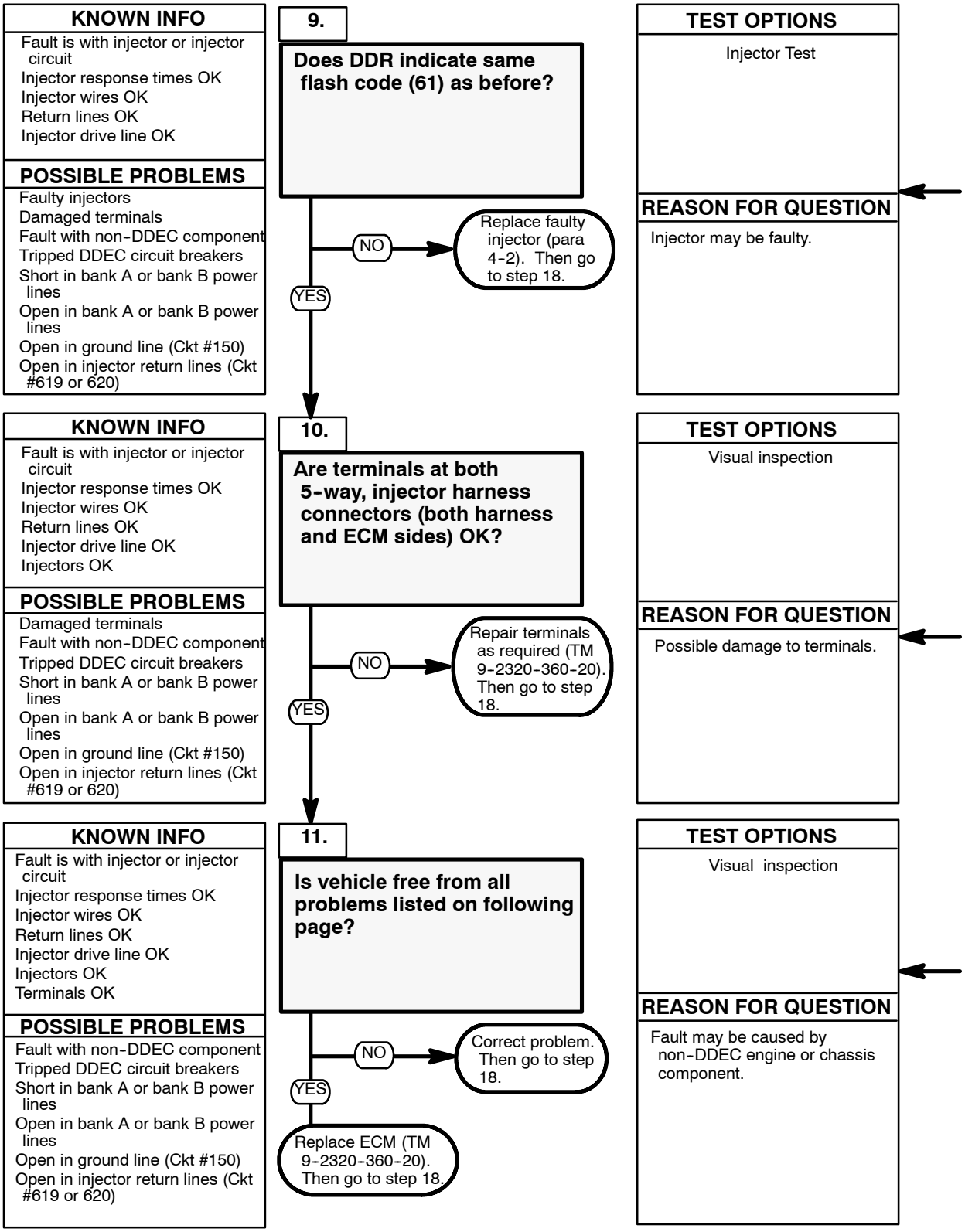
(1) Reconnect both 5-way injector harness connectors at ECM.

(2) Reconnect both injector wires to injector.

(3) Place a 6-volt test light across the injector return side (wire #619 or #620) and good ground.

(4) Crank engine and note if the test light flashes.

ACTIVE OR INACTIVE CODE 61 INJECTOR RESPONSE TIME TOO LONG (DDEC III/IV) (CONT)



INJECTOR TEST

(1) Turn ENGINE switch to OFF.

(2) Disconnect injector drive line (wire no. 611 thru 618 depending on cylinder) from injector identified by SID.

(3) Disconnect injector drive line and return line from a nearby injector that is operating properly.

(4) Remove injectors (para 4-2) from cylinder identified by SID and from cylinder in which drive line and return line were disconnected.

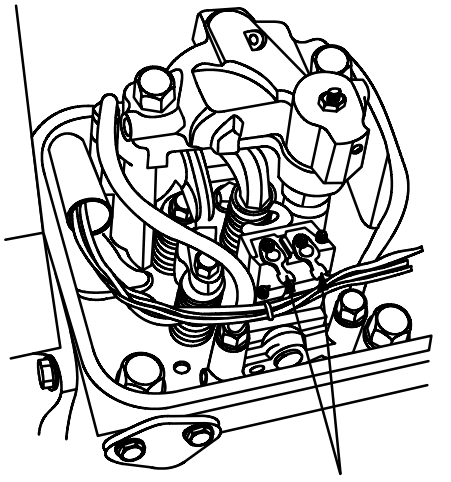
(5) Swap injectors. (Install injector (para 4-2) identified by SID in cylinder that was firing properly. Install injector that was operating properly in cylinder that was misfiring.)

(6) Clear codes on DDR.

(7) Start engine (TM 9-2320-360-10) and warm to normal operating temperature or until CHECK ENGINE indicator lights.

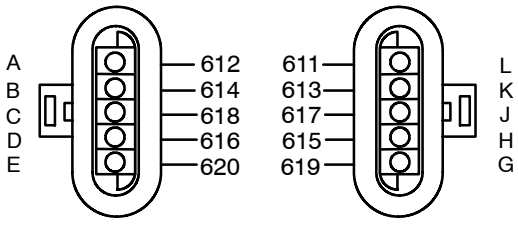
(8) Stop engine (TM 9-2320-360-10).

(9) Read inactive codes on DDR.



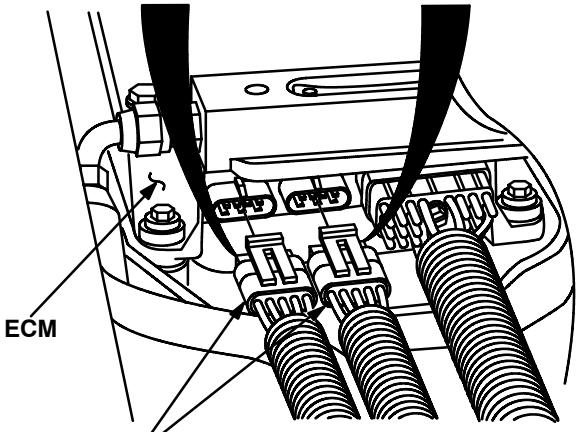
INJECTOR WIRES

Check terminals at both 5-way, injector harness connectors (both harness and ECM sides) for damage; bent, corroded and unseated pins or sockets.



Check for any of the following problems:

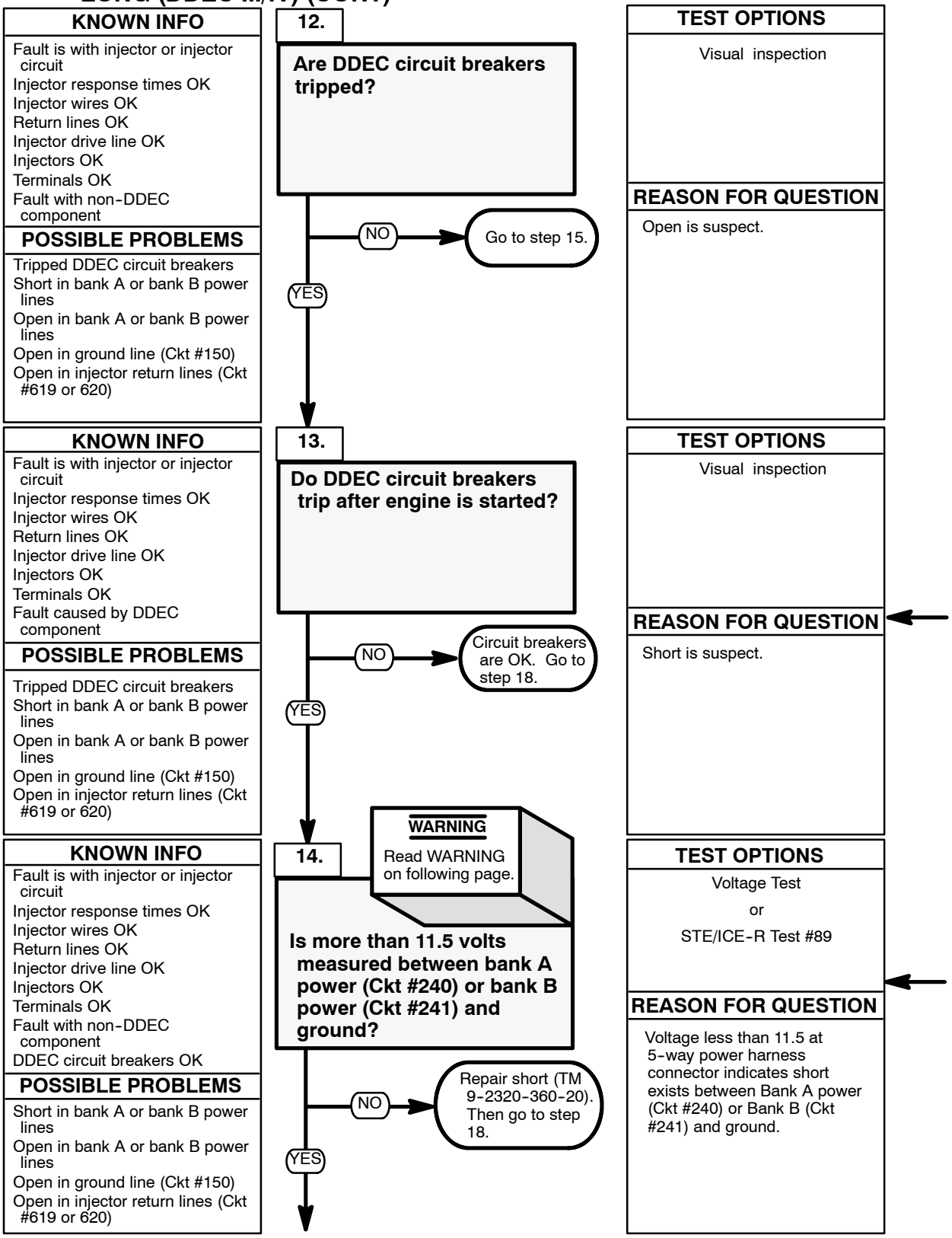
- Air in fuel or low fuel pressure
- Sticky valve
- Cold fuel
- Low battery charge
- Broken spring or armature on the injector
- Problems in the charging system (loose alternator belt, etc.) or bad grounds
- Signs of insulation wear on injector harness.



ECM

5-WAY INJECTOR HARNESS CONNECTORS

ACTIVE OR INACTIVE CODE 61 INJECTOR RESPONSE TIME TOO LONG (DDEC III/IV) (CONT)



Reset breaker(s). Start engine (TM 9-2320-360-10) and check to see if circuit breakers trip again.

WARNING

Jewelry can catch on equipment and cause injury or short across electrical circuit and cause severe burns or electrical shock. Remove rings. bracelets, watches, necklaces, and any other jewelry before working around HET Tractor.

VOLTAGE TEST

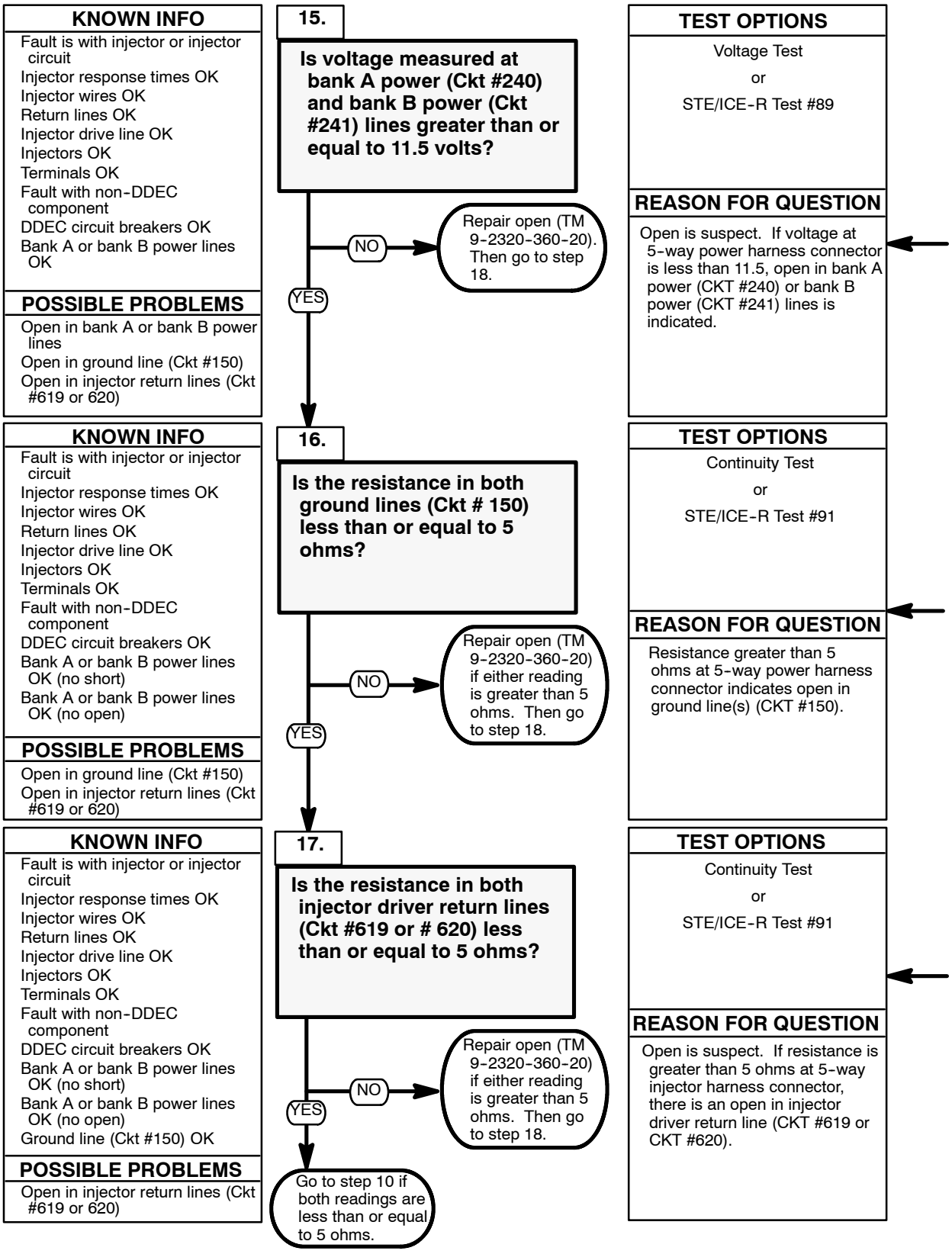
(1) Turn ENGINE switch OFF.

(2) Disconnect 5-way power harness connector.

(3) Read voltage on socket A (red lead) to a good ground (black lead).

(4) Also read voltage on socket C (red lead) to a good ground.

ACTIVE OR INACTIVE CODE 61 INJECTOR RESPONSE TIME TOO LONG (DDEC III/IV) (CONT)



VOLTAGE TEST

(1) Read voltage on socket C (red lead) to socket B, D, and E (black lead) of 5-way power harness connector.

(2) Read voltage on socket A (red lead) to socket B, D, and E (black lead) of 5-way power harness connector.

CONTINUITY TEST

(1) Read resistance between socket B of 5-way power harness connector and a good ground.

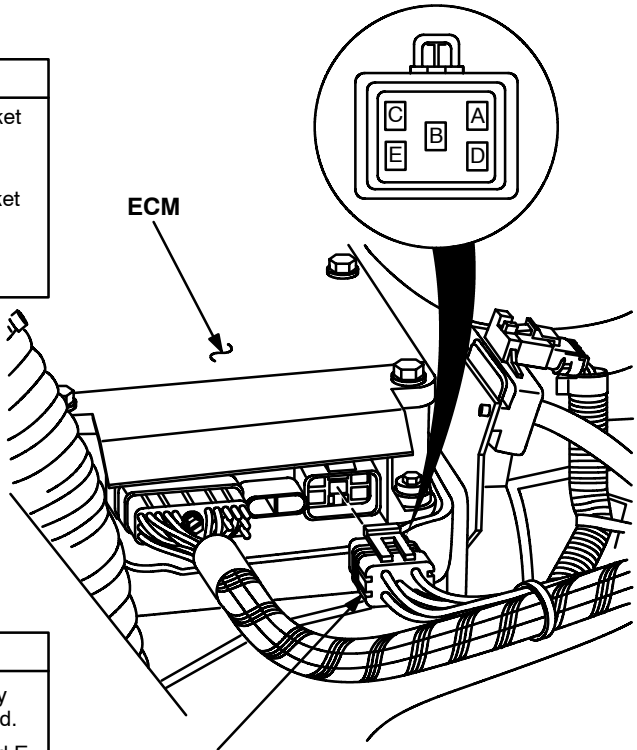
(2) Also read resistance between sockets D and E of 5-way power harness connector and a good ground.

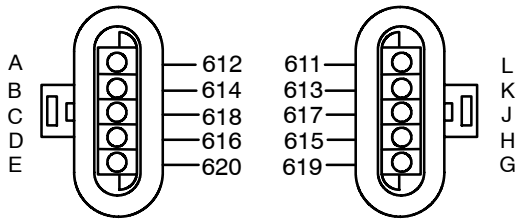
CONTINUITY TEST

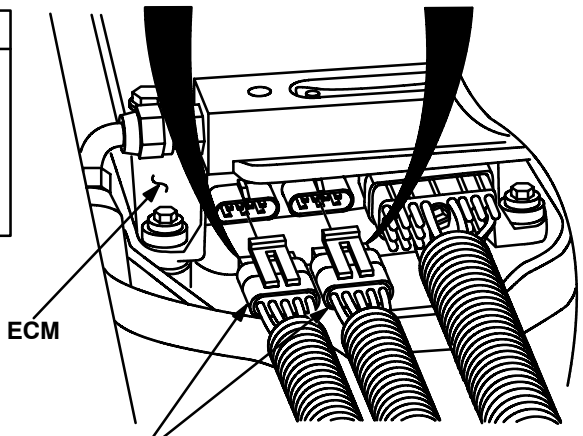
(1) Disconnect both 5-way injector harness connectors at ECM.

(2) Read resistance between sockets G and L on 5-way injector harness connector.

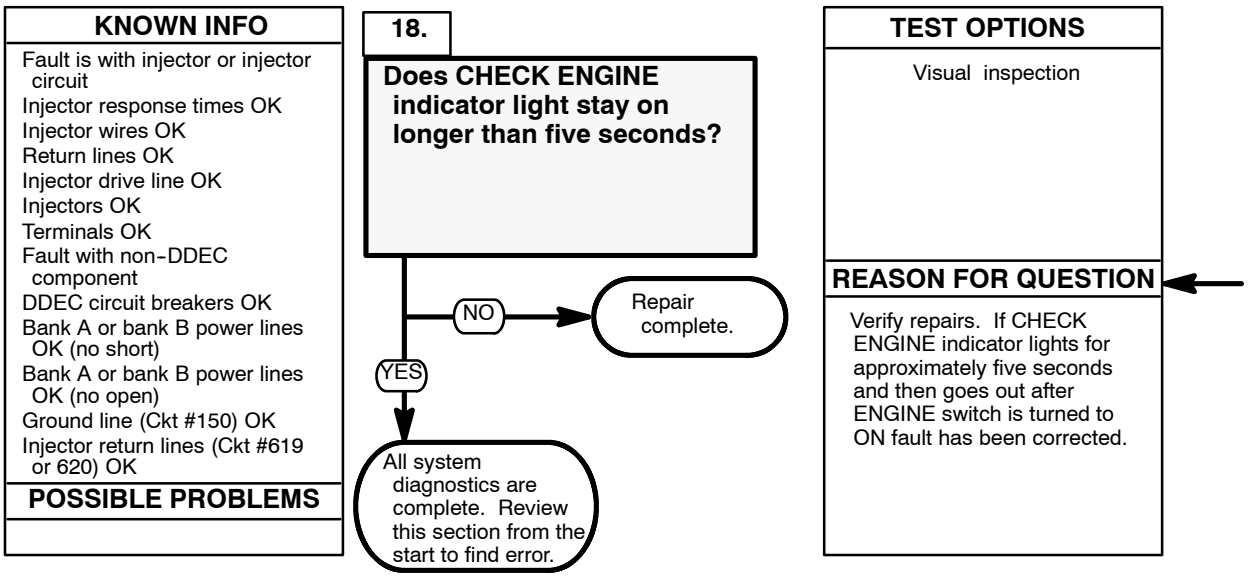
(3) Also read resistance between sockets A and E of other 5-way injector harness connector.



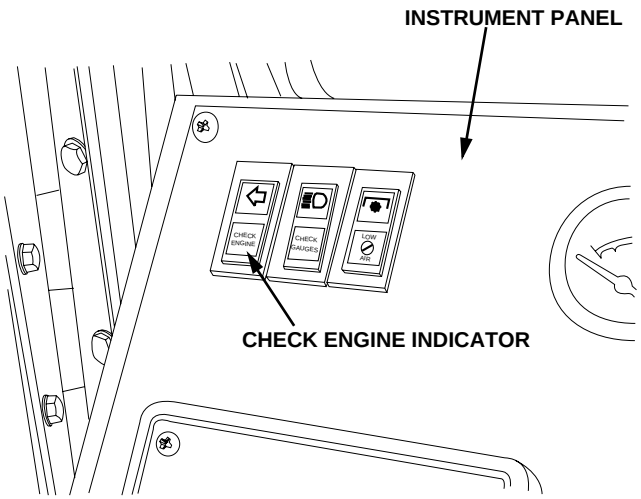




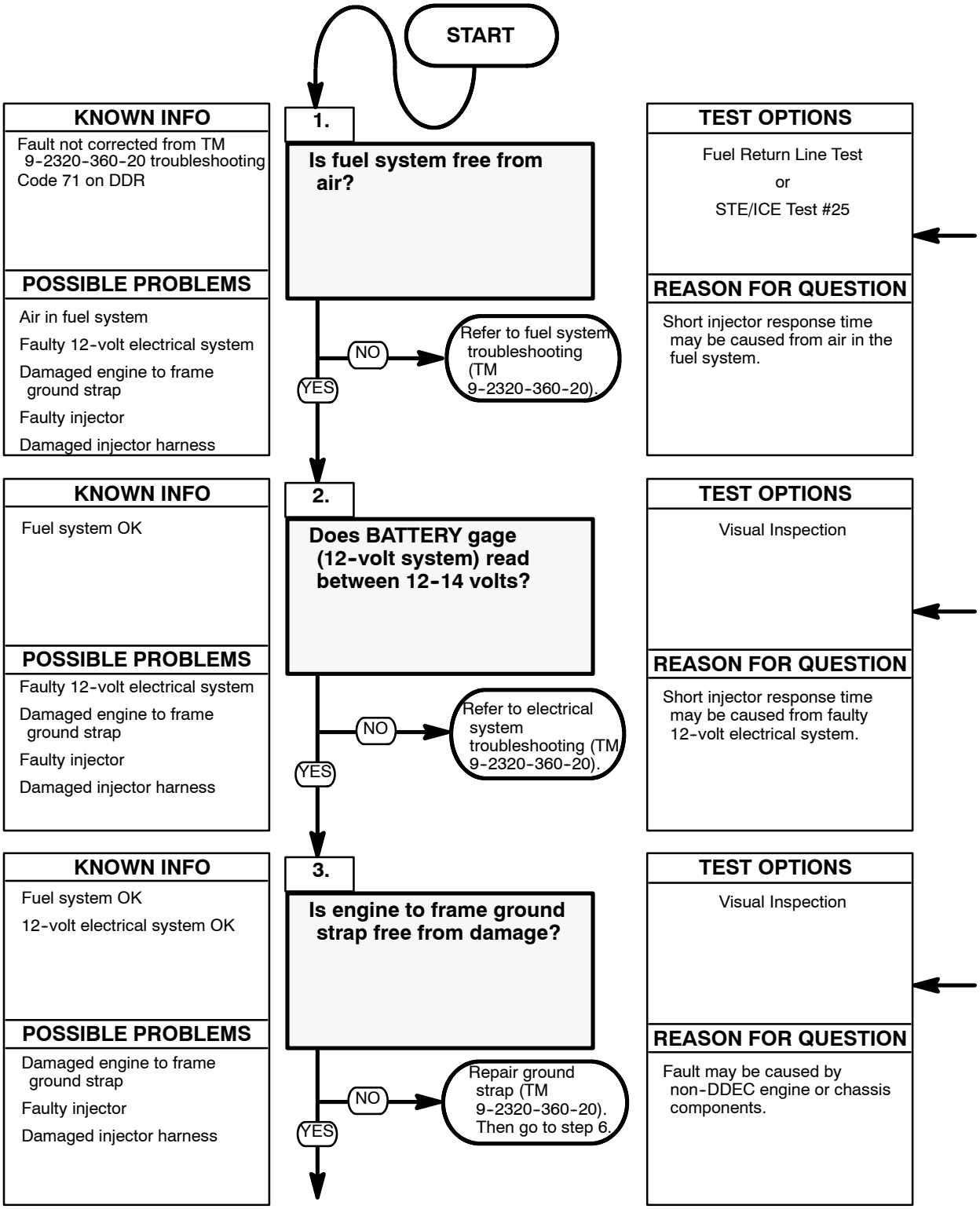
ACTIVE OR INACTIVE CODE 61 INJECTOR RESPONSE TIME TOO LONG (DDEC III/IV) (CONT)

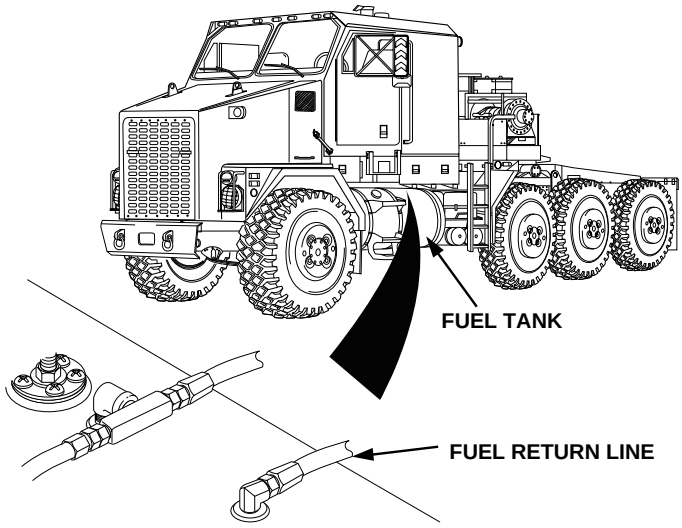


(1) Turn ENGINE switch OFF.
(2) Reconnect all harness connectors.
(3) Turn ENGINE switch ON and observe CHECK ENGINE indicator.



ACTIVE OR INACTIVE CODE 71 INJECTOR RESPONSE TIME TOO SHORT (DDEC III/IV) (CONT)





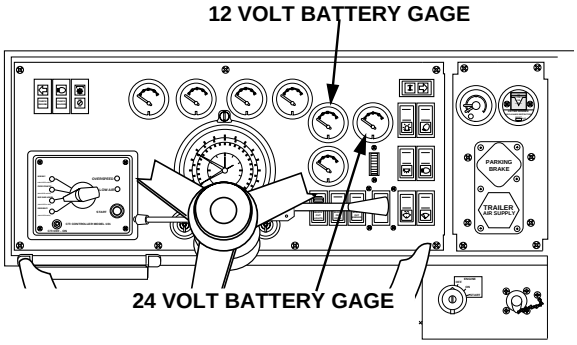
FUEL RETURN LINE TEST

(1) Remove fuel return line from left side fuel tank.

(2) Place fuel line in suitable container.

(3) Start engine (TM 9-2320-360-10) and check for air in fuel return line.

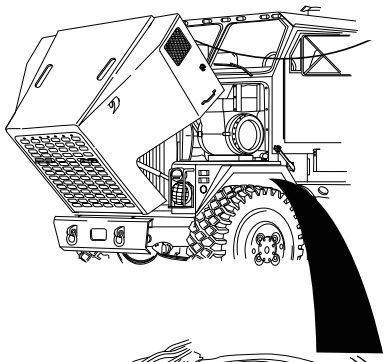
(4) Install fuel return line on left side fuel tank.

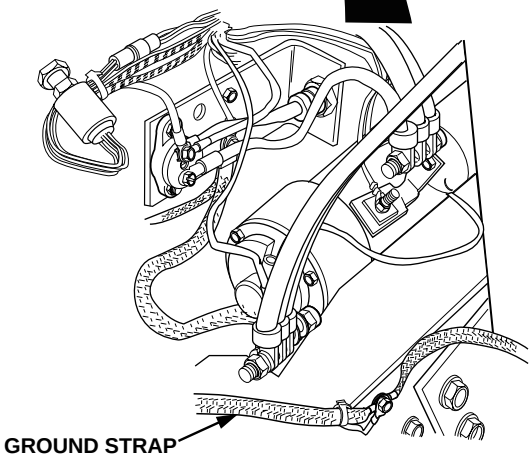


NOTE

ENGINE must be running to perform this test.

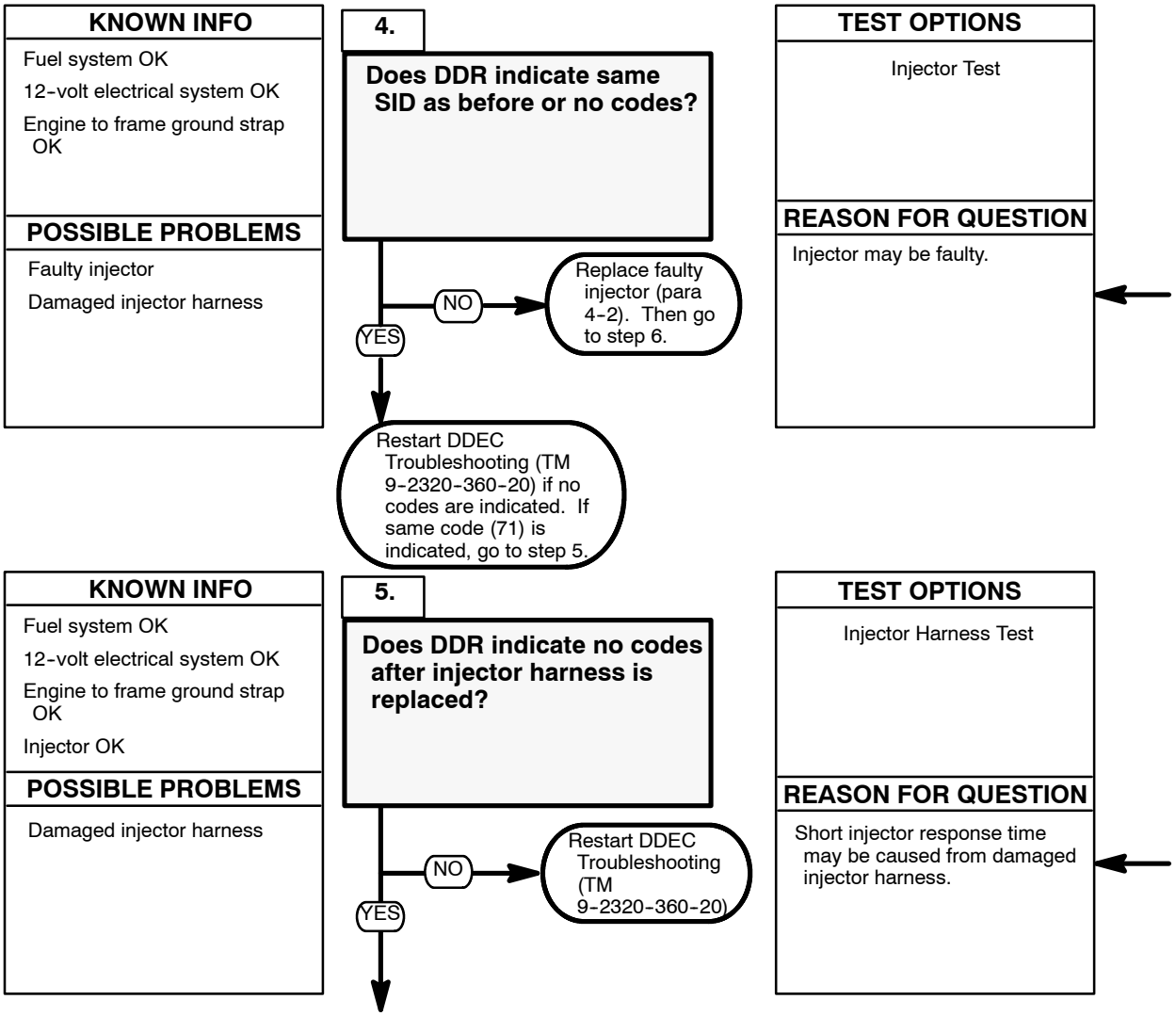
Check BATTERY gage (12-volt system). BATTERY gage should read between 12-14 volts.





Check engine to frame ground strap for loose connections and damage.

ACTIVE OR INACTIVE CODE 71 INJECTOR RESPONSE TIME TOO SHORT (DDEC III/IV) (CONT)



NOTE

Table 2-10 shows which injector is associated with each of the SIDS.

Table 2-10. Injector Identification

SIDS	FIRING ORDER	CYLINDER
S001	1	3Right
S002	2	3Left
S003	3	4Right
S004	4	4Left
S005	5	2Right
S006	6	2Left
S007	7	1Right
S008	8	1Left

INJECTOR TEST

(1) Turn ENGINE switch to OFF.

(2) Disconnect injector drive line (wire no. 611 thru 618 depending on cylinder) from injector identified by SID.

(3) Disconnect injector drive line and return line from a nearby injector that is operating properly.

(4) Remove injectors (para 4-2) from cylinder identified by SID and from cylinder in which drive line and return line were disconnected.

(5) Swap injectors. (Install injector (para 4-2) identified by SID in cylinder that was firing properly. Install injector that was operating properly in cylinder that was misfiring.)

(6) Clear codes on DDR.

(7) Start engine (TM 9-2320-360-10) and warm to normal operating temperature or until CHECK ENGINE indicator lights.

(8) Stop engine (TM 9-2320-360-10).

(9) Read inactive codes on DDR.

INJECTOR HARNESS TEST

(1) Turn ENGINE switch OFF.

(2) Replace injector harness (para 4-3).

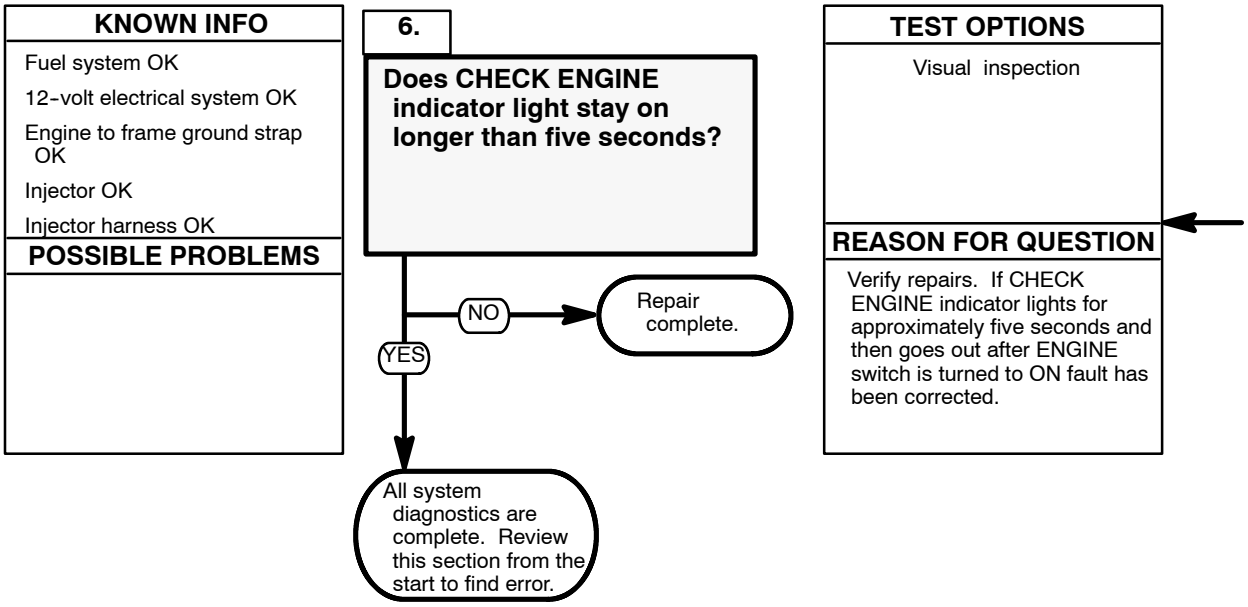
(3) Reconnect all connectors.

(4) Clear codes on DDR.

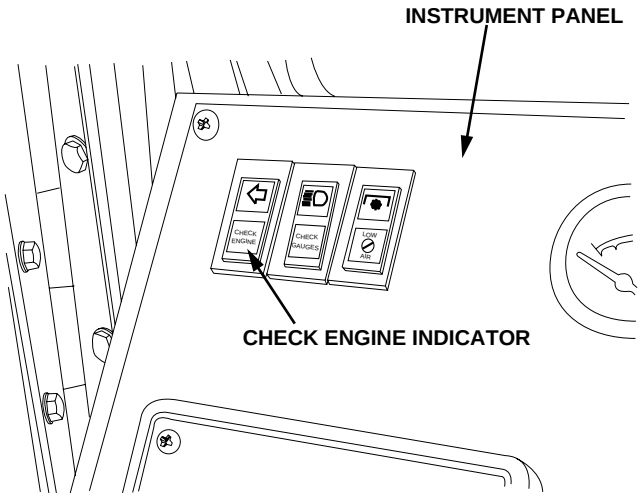
(5) Check INJ RESP TIMES and ACTIVE CODES.

(6) Stop engine (TM 9-2320-360-10).

ACTIVE OR INACTIVE CODE 71 INJECTOR RESPONSE TIME TOO SHORT (DDEC III/IV) (CONT)



(1) Turn ENGINE switch OFF.
(2) Reconnect all harness connectors.
(3) Turn ENGINE switch ON and observe CHECK ENGINE indicator.



VEHICLE TROUBLESHOOTING

TRUCK, TRACTOR, M1070
HEAVY EQUIPMENT TRANSPORTER (HET)

Table 2-7. Vehicle Troubleshooting

Malfunction	Troubleshooting Procedure (Page)
a. ENGINE	
a1 Engine does not develop full power	2-66
a2 Engine overheats (WATER TEMP gage continuously reads over 230 °F (110 °C))	2-72
a3 Low engine oil pressure	2-76
a4 Excessive black or gray exhaust smoke (engine at normal operating temperature)	2-80
a5 Excessive engine oil consumption or blue exhaust smoke (engine at normal operating temperature)	2-84
a6 White exhaust smoke (engine at normal operating temperature)	2-92
b. TRANSMISSION	
b1 Transmission overheats (TRANS TEMP gage continuously reads over 250 °F (121 °C))	2-98
b2 Transmission unusually noisy when operating	2-102
b3 Transmission will not shift into gear, slips out of gear, or operates erratically	2-106
b4 Automatic shifts occur at too high a speed	2-110
b5 Automatic shifts occur at too low a speed	2-112
b6 Deleted	
b7 Engine stalls at idle when in gear	2-116
b8 Vehicle moves in neutral	2-118
b9 Transmission slips in all forward gears	2-120
c. TRANSFER CASE	
c1 Transfer case unusually noisy and/or overheats when operating.	2-124
c2 Transfer case does not shift into HIGH or LOW, or slips out of gear.	2-126
c3 Transfer case does not engage front axle.	2-130
d. AXLES	
d1 Axle unusually noisy when operating	2-134
d2 Interaxle lockup does not engage	2-138
e. STEERING SYSTEM	
e1 Steering binds, does not return to straight ahead after turns	2-142
e2 Excessive play when turning steering wheel, wanders, pulls to one side or shimmies	2-150
e3 Hard to steer in one direction	2-156
e4 Hard to steer in both directions	2-158
f. WINCH SYSTEM	
f1 One main winch will not pull load	2-166
f2 One winch makes excessive or unusual noise, operates slowly, or jerks	2-170
f3 Both main winches and auxiliary winch do not operate	2-172
f4 One main winch will not pay out (using control valve).	2-176
f5 Main winch high speed does not work (one winch only)	2-180
f6 One main winch will not operate in either direction	2-184
f7. Auxiliary winch does not operate	2-185.1
f8. One main winch will not pull at rated line speed	2-185.3

a. ENGINE

Malfunction	Troubleshooting Procedure (Page)
a1 Engine does not develop full power	2-66
a2 Engine overheats (WATER TEMP gage continuously reads over 230 °F (110 °C))	2-72
a3 Low engine oil pressure	2-76
a4 Excessive black or gray exhaust smoke (engine at normal operating temperature)	2-80
a5 Excessive engine oil consumption or blue exhaust smoke (engine at normal operating temperature)	2-84
a6 White exhaust smoke (engine at normal operating temperature)	2-92
a7 Engine brake does not operate properly	2-95.1

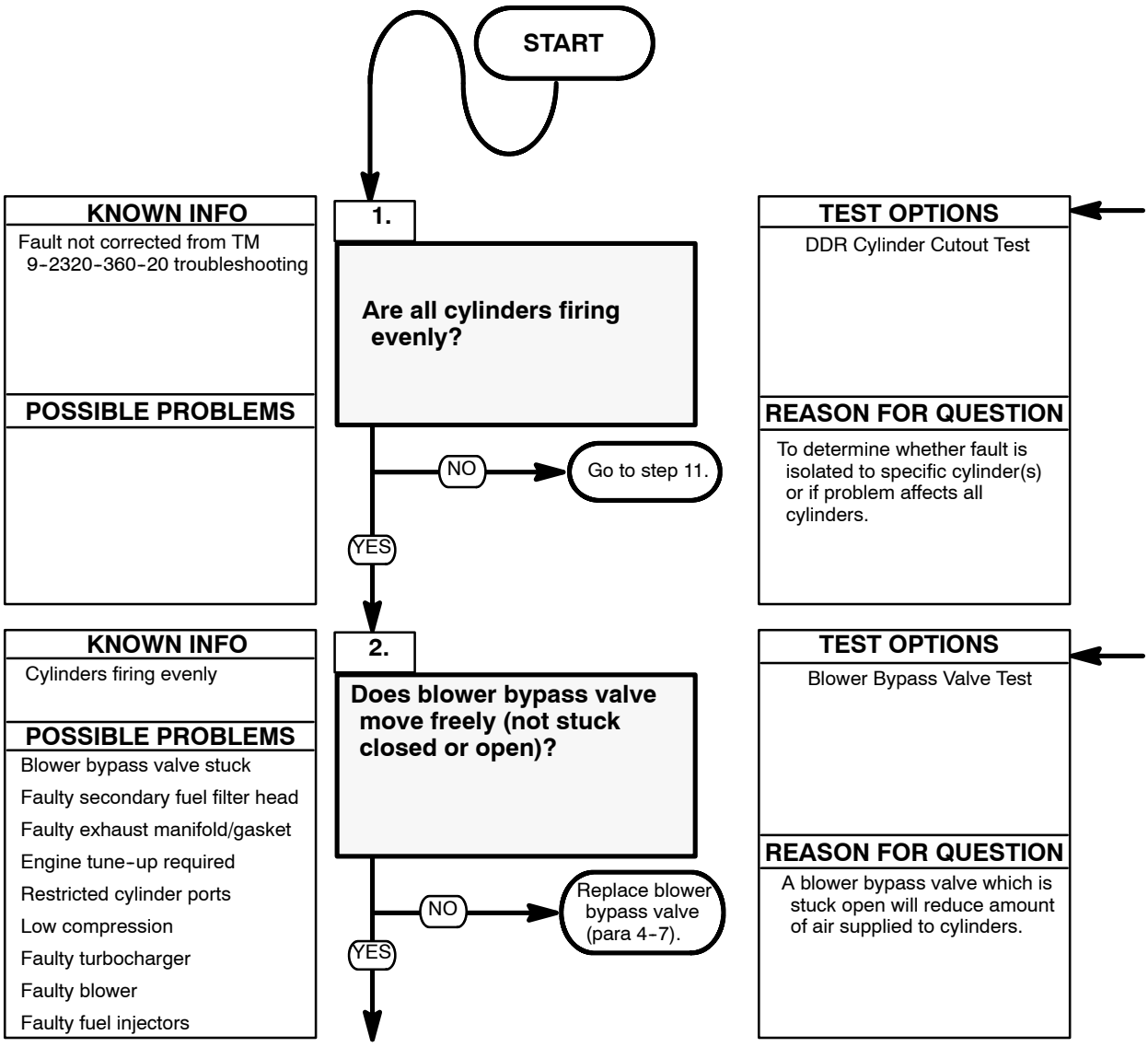
a1. ENGINE DOES NOT DEVELOP FULL POWER

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Personnel Required
Two

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
STE/ICE-R, (Item 184, Appendix E)
Contact Test Set (Item 25.1, Appendix E)



CYLINDER CUTOUT TEST

(1) Connect DDR to DDL connector (page 2-6).

(2) Start engine (TM 9-2320-360-10).

(3) Select Cylinder Cutout on DDR and record displayed pulse widths.

(4) Shut off engine (TM 9-2320-360-10).

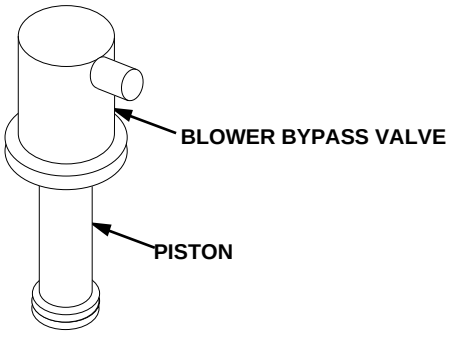
(5) Disconnect DDR from DDL connector.

BLOWER BYPASS VALVE TEST

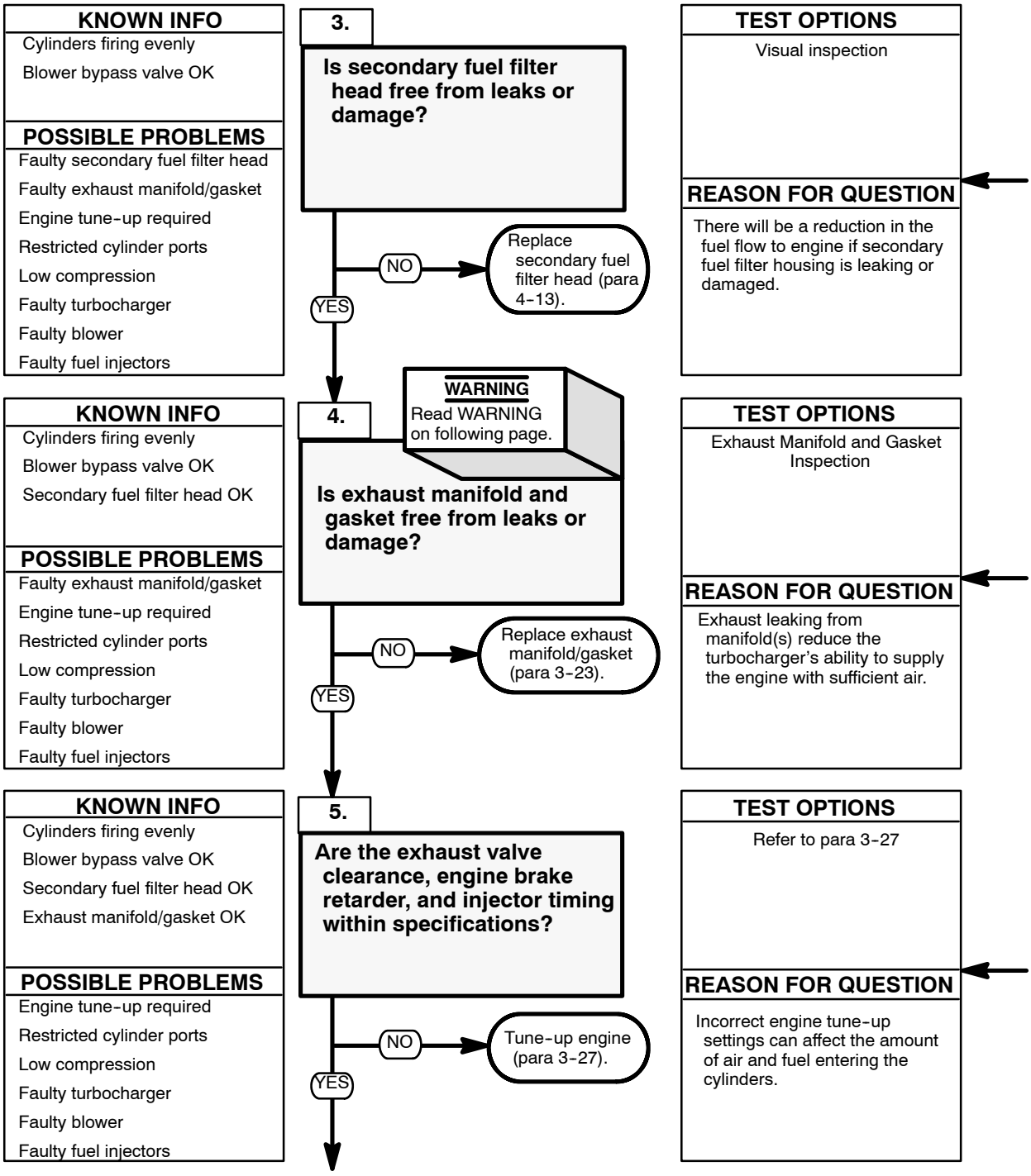
(1) Remove blower bypass valve (para 4-7).

(2) Blower bypass valve piston should move open with hand pressure, and spring should return piston to closed position.

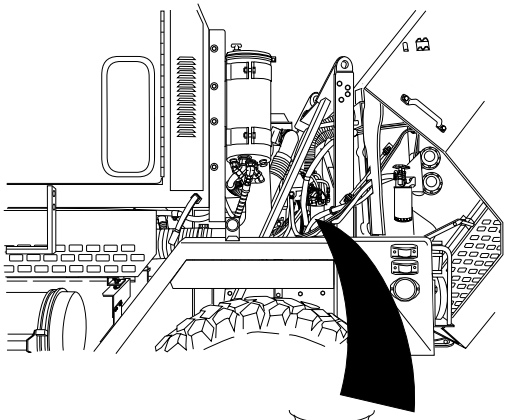
(3) Install blower bypass valve (para 4-7).

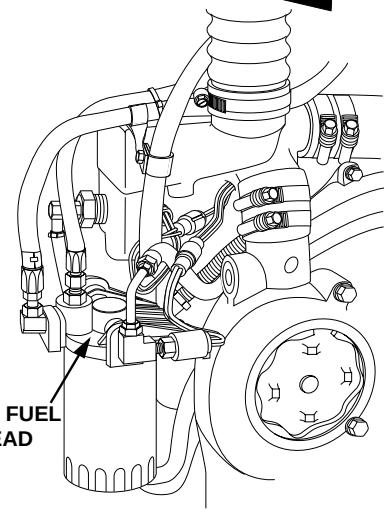


a1. ENGINE DOES NOT DEVELOP FULL POWER (CONT)



Check secondary fuel filter head for leakage or damage.





EXHAUST MANIFOLD AND GASKET INSPECTION

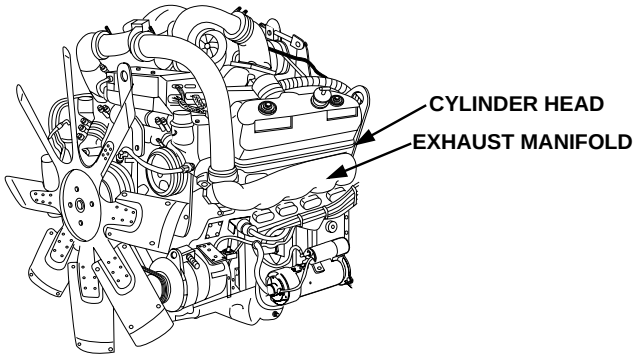
WARNING

Exhaust manifolds and engine parts are hot. Use care to prevent personal injury.

(1) Start engine (TM 9-2320-360-10).

(2) Check exhaust manifold and gasket for leakage and damage.

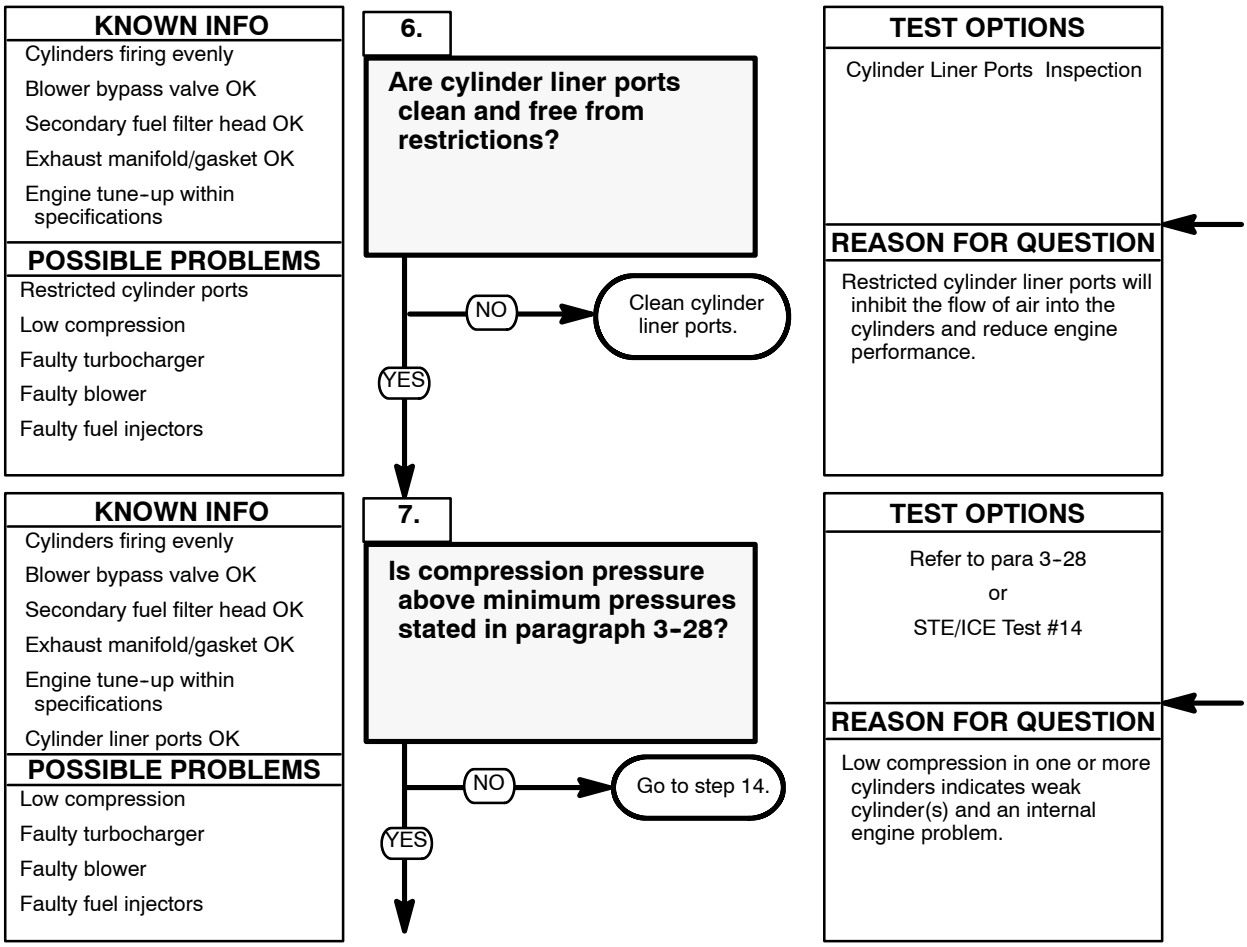
(3) Shut off engine (TM 9-2320-360-10).



ENGINE REMOVED FOR CLARITY

Refer to paragraph 3-27 for specifications and engine tune-up procedure.

a1. ENGINE DOES NOT DEVELOP FULL POWER (CONT)

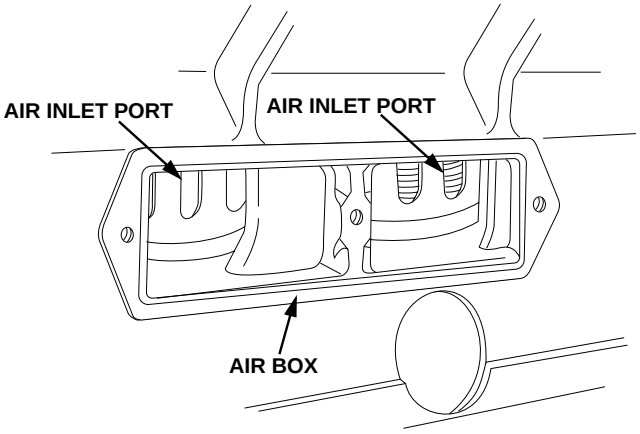


CYLINDER LINER PORTS INSPECTION

(1) Remove engine air box covers (para 3-8).

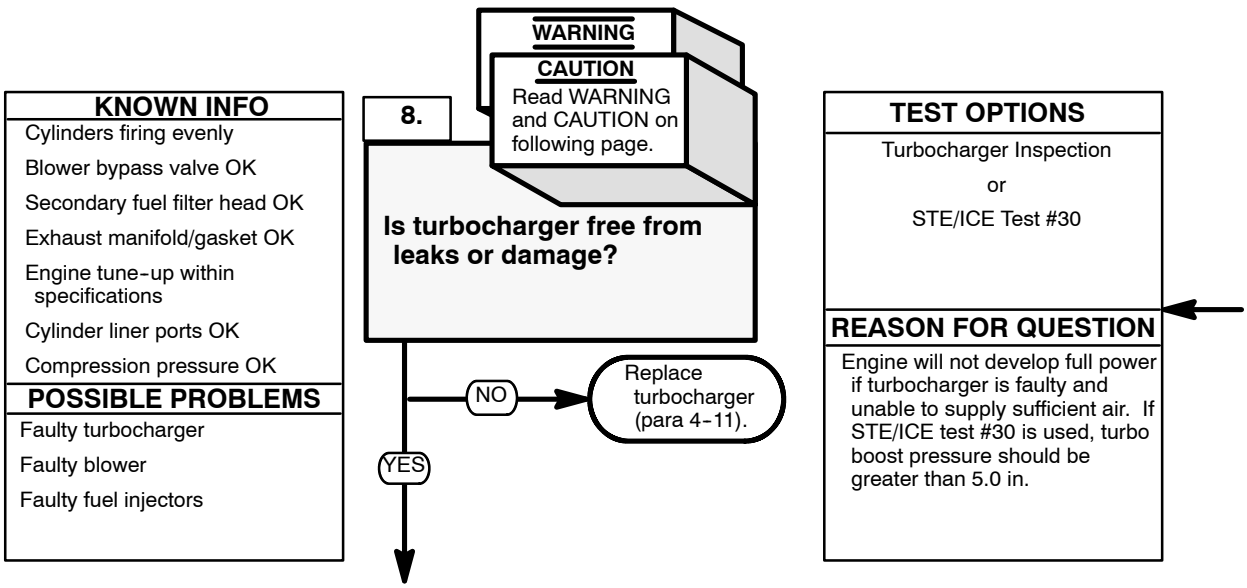
(2) Check for clogged cylinder liner air inlet ports.

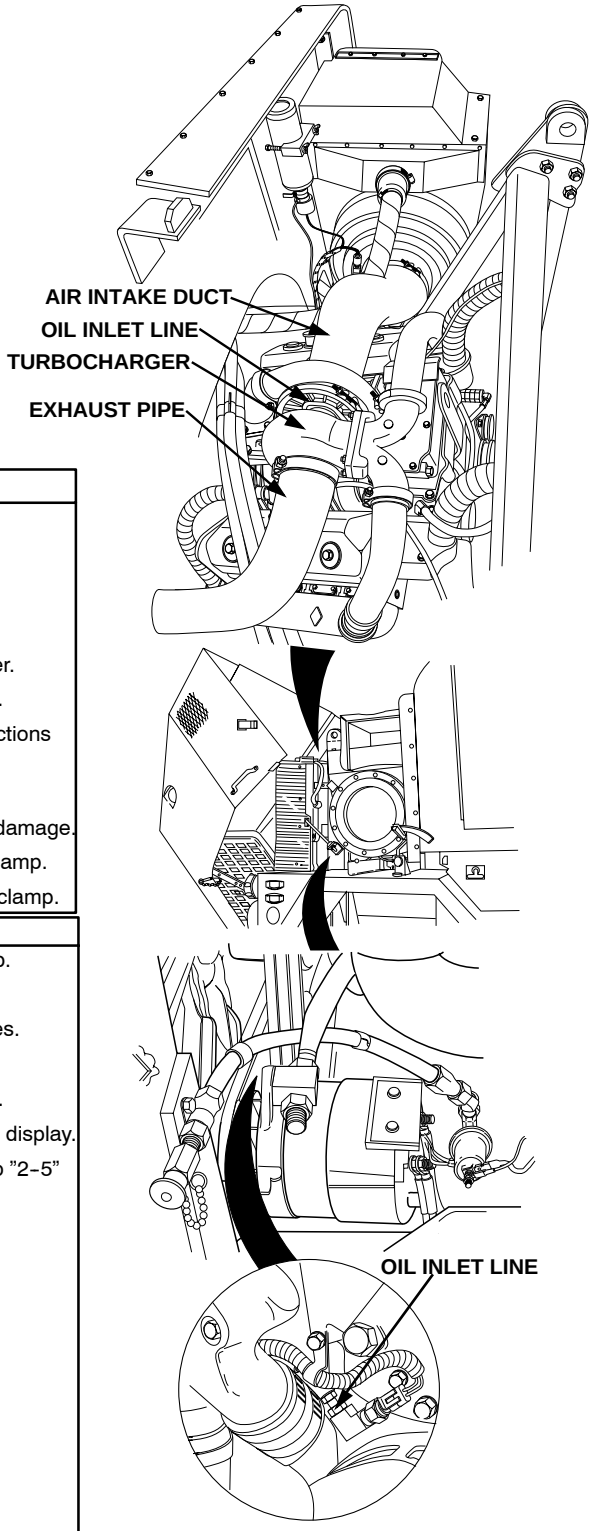
(3) Install engine air box covers (para 3-8).



Refer to para 3-28 for engine compression test procedure.

a1. ENGINE DOES NOT DEVELOP FULL POWER (CONT)





TURBOCHARGER INSPECTION

WARNING

Approved hearing protection and protective goggles must be worn if engine is operated with exhaust pipe removed. Failure to comply may result in injury to personnel.

(1) Loosen clamp and remove air intake duct from turbocharger.

(2) Loosen clamp and remove exhaust pipe from turbocharger.

(3) Inspect mountings, intake and exhaust ducting, and connections for leaks.

(4) Check oil inlet line for leaks.

(5) Check impeller and turbine blades for free movement and damage.

(6) Install exhaust pipe on turbocharger with clamp. Tighten clamp.

(7) Install air intake duct on turbocharger with clamp. Tighten clamp.

STE/ICE TEST #30

(1) Connect STE/ICE test cable to STE/ICE receptacle in cab.

(2) Set STE/ICE test select switch to "30".

(3) Start engine (TM 9-2320-360-10) and warm for 5 minutes.

(3.1) Shift transfer case to high (TM 9-2320-360-10).

(4) Press and hold test button until "CAL" appears on display.

(5) Release test button and wait for offset value to appear on display.

(6) Apply foot brake and move transmission range selector to "2-5" position.

WARNING

Do not stand in front of HET when testing air box pressure. Brakes could release and vehicles could move forward causing injury or death.

CAUTION

Do not operate vehicle with transmission engaged and engine at maximum RPM for more than 15 seconds at a time. Transmission oil heats up quickly and could cause damage to transmission.

(7) Press and hold accelerator pedal to floor.

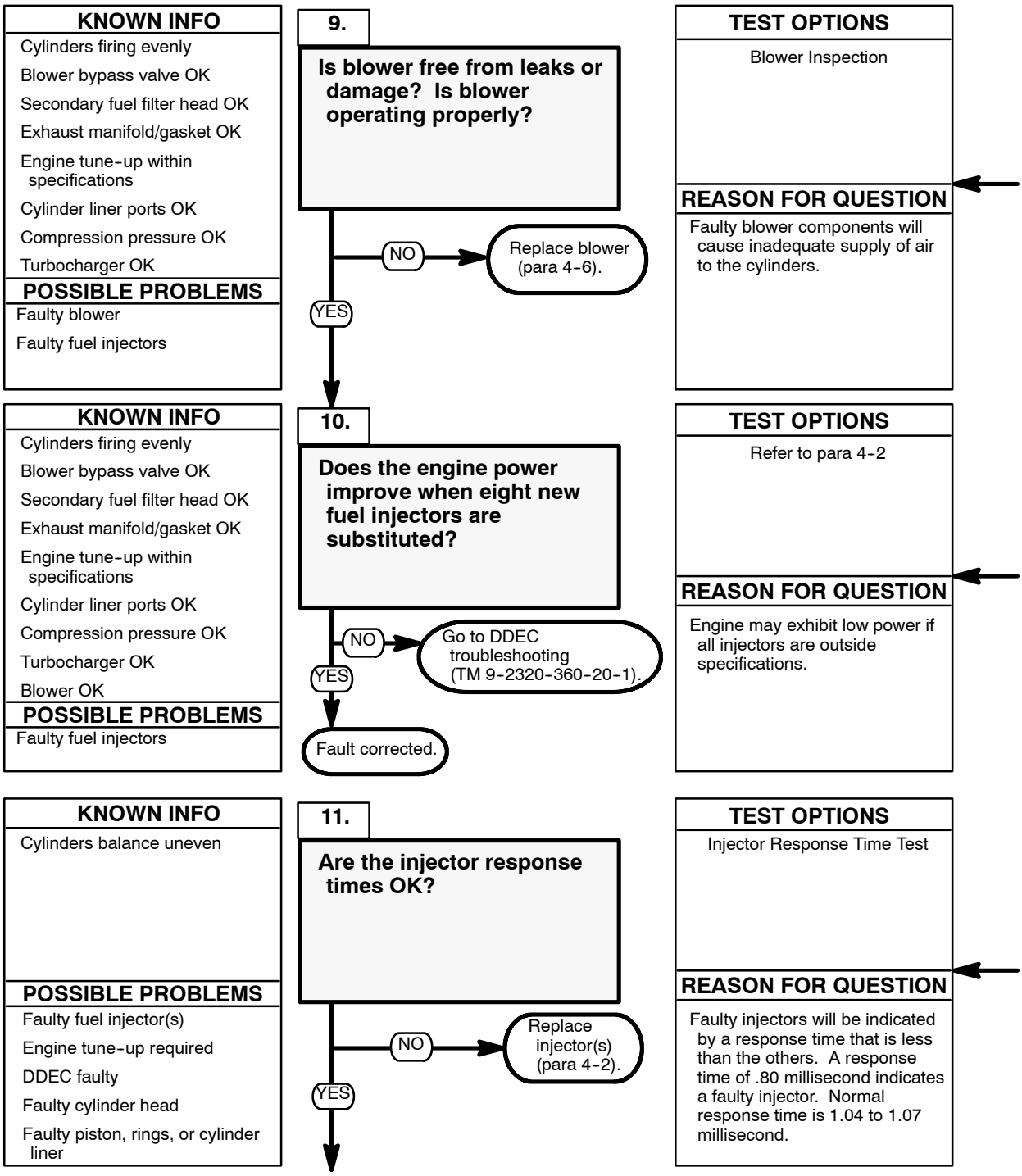
(8) Press and release test button to obtain test results.

(9) Return engine to approximately 600 RPM.

(10) Move transmission range selector to Neutral (N) position.

(11) Shut off engine (TM 9-2320-360-10).

a1. ENGINE DOES NOT DEVELOP FULL POWER (CONT)



BLOWER INSPECTION

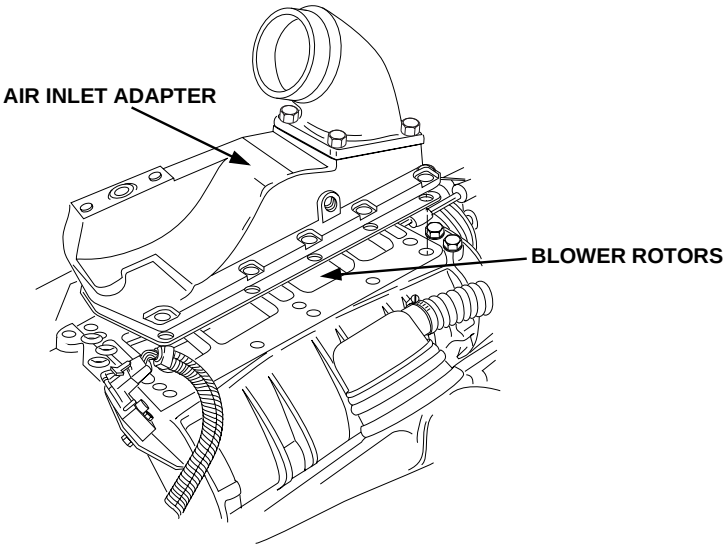
(1) Remove air inlet adapter (para 4-5).

(1.1) Inspect blower to engine block gasket. Check for oil seepage or gasket out of proper position.

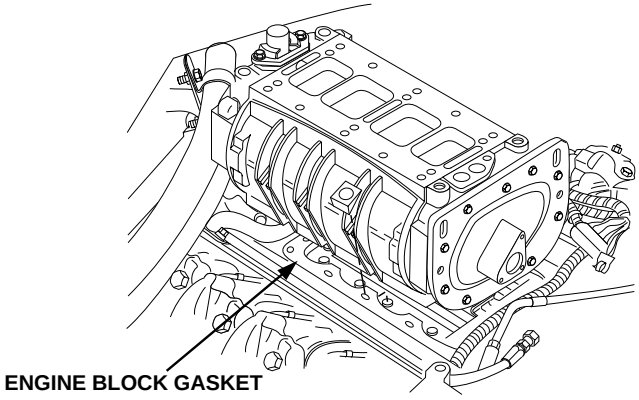
(2) Inspect for oil radiating away from the blower rotor shaft seal area.

(3) Inspect blower rotors and end plates for damage.

(4) Install air inlet adapter (para 4-5).



Refer to para 4-2 for fuel injector replacement procedures.



BLOWER REMOVED FOR CLARITY

INJECTOR RESPONSE TIME TEST

(1) Connect DDR to DDL connector (page 2-6).

(2) Start engine (TM 9-2320-360-10).

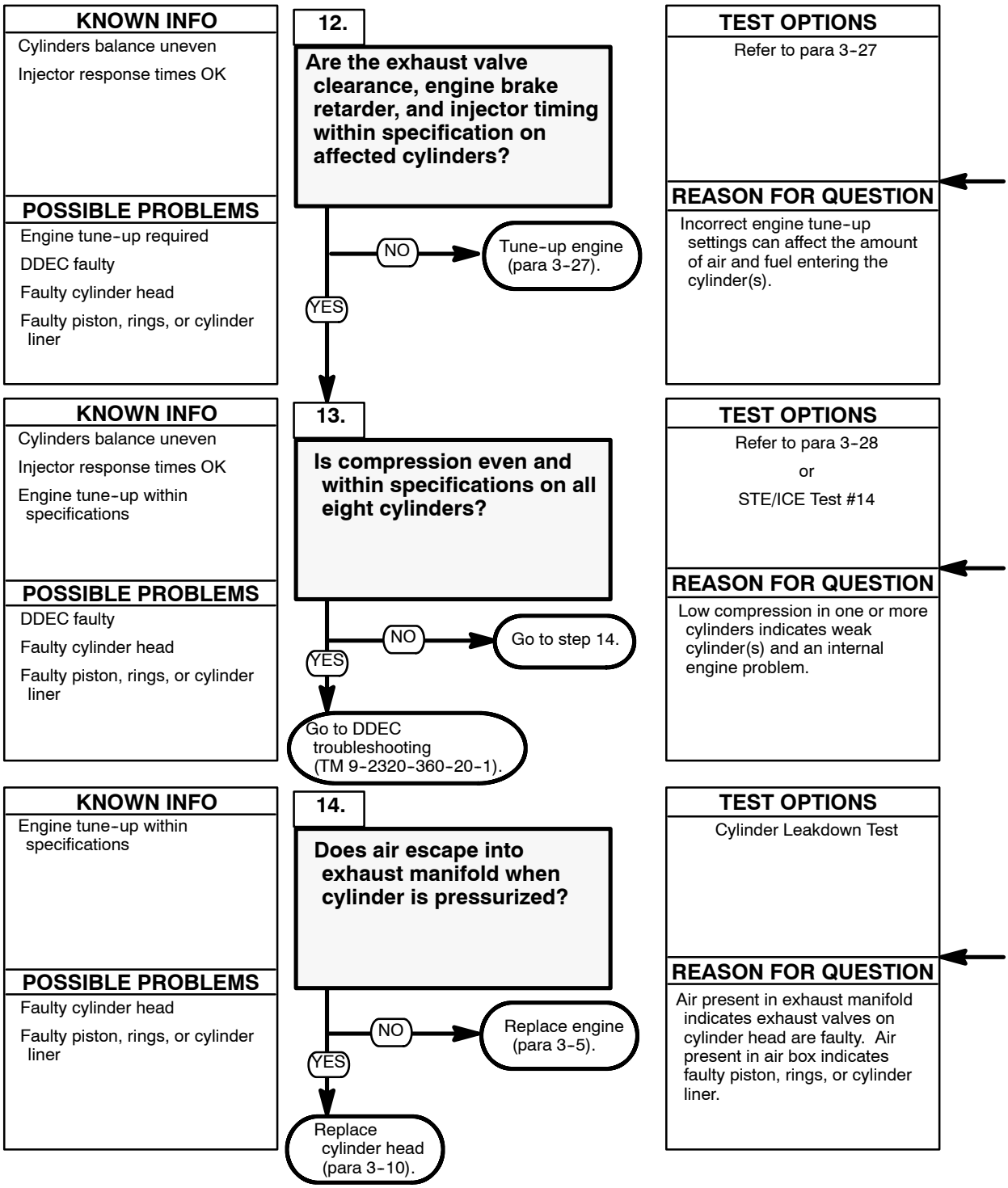
(3) Select Fuel Injector Response Times on DDR.

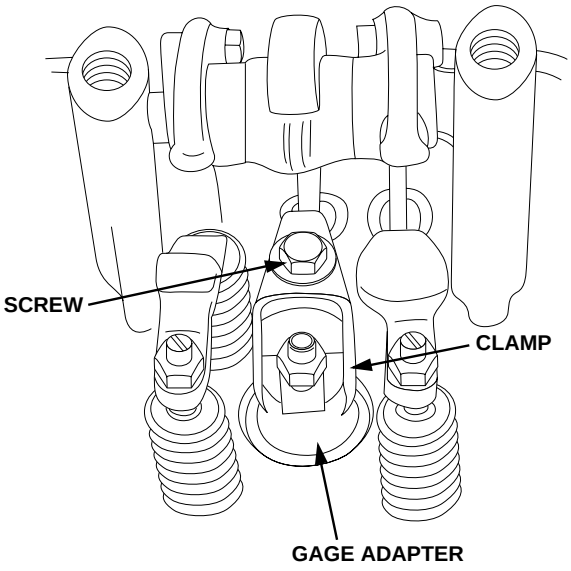
(4) Compare injector response times of all eight injectors.

(5) Shut off engine (TM 9-2320-360-10).

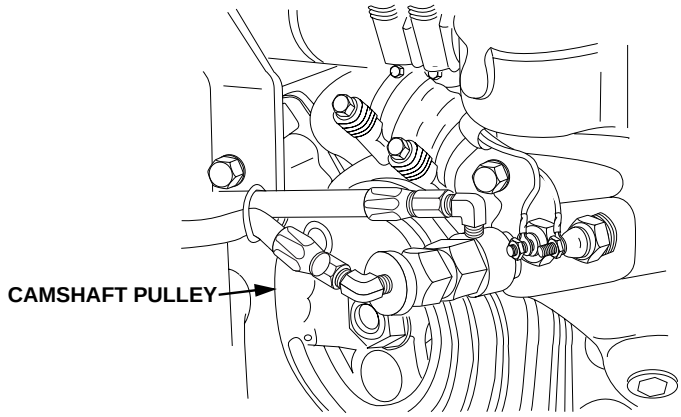
(6) Disconnect DDR from DDL connector.

a1. ENGINE DOES NOT DEVELOP FULL POWER (CONT)





Refer to paragraph 3-27 for specifications and engine tune-up procedure.



Refer to para 3-28 for engine compression test procedure.

CYLINDER LEAKDOWN TEST

(1) Remove engine exhaust tubes (TM 9-2320-360-20).

(2) Remove engine air box cover(s) from cylinder(s) with low compression identified in step 13 (para 3-8).

(3) Remove fuel injector(s) from cylinder(s) with low compression identified in step 13 (para 4-2).

(4) Install gage adapter in injector tube with clamp and screw. Torque screw to 240-300 lb-in. (27-34 N·m).

(5) Rotate crankshaft by turning camshaft pulley clockwise until center injector pushrod is at its highest point.

(6) Apply air pressure source to gage adapter.

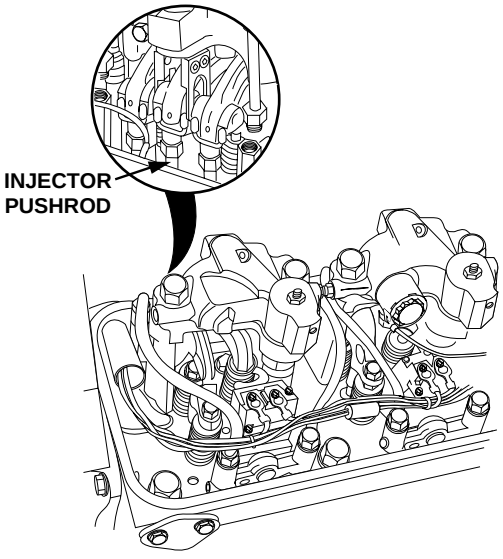
(7) Listen for air leakage from exhaust manifold and air box areas.

(8) Remove screw, clamp and gage adapter from cylinder head.

(9) Install fuel injector(s) (para 4-2).

(10) Install air box cover(s) (para 3-8).

(11) Install engine exhaust tubes (TM 9-2320-360-20).

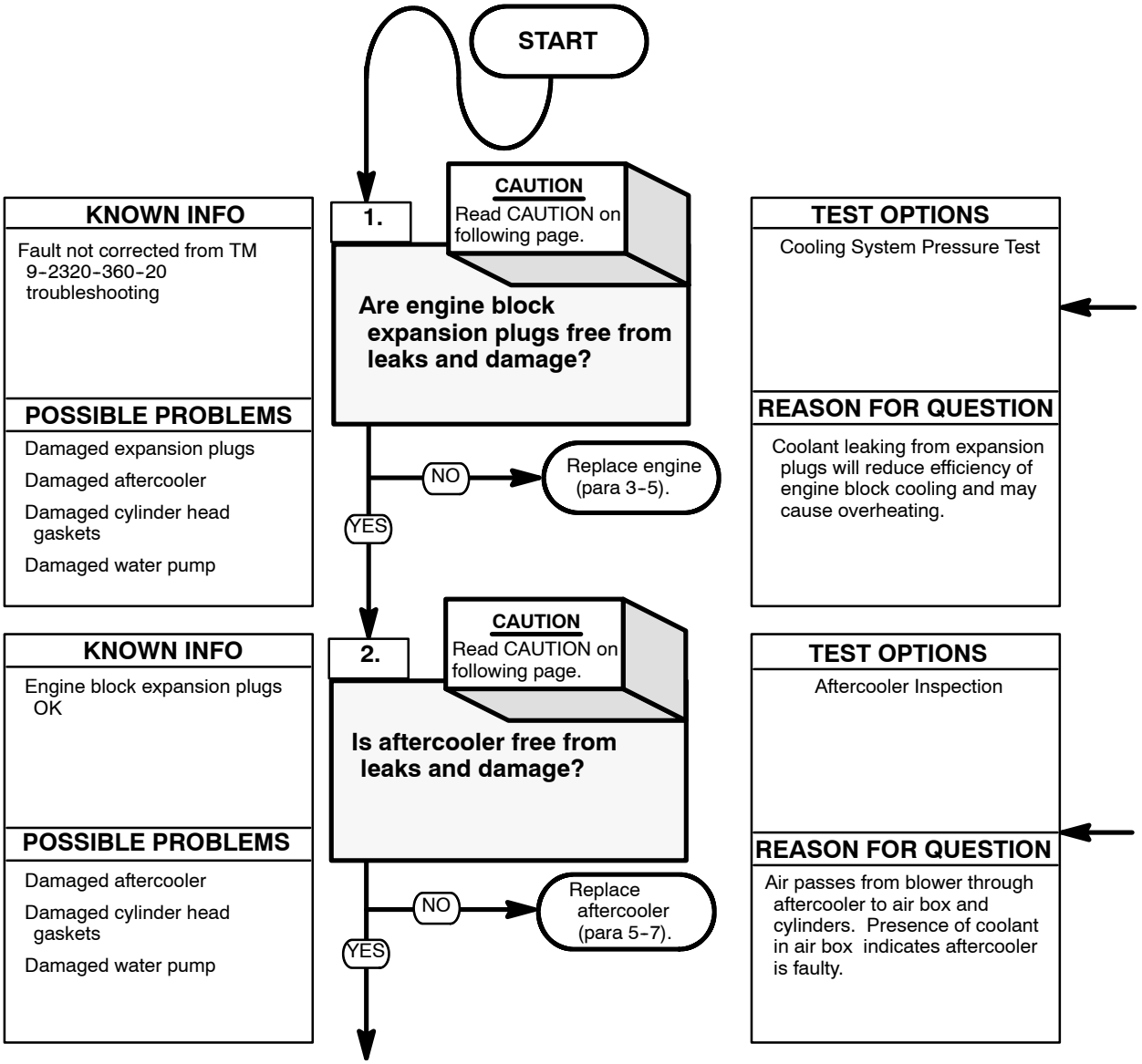


a2. ENGINE OVERHEATS (WATER TEMP GAGE CONTINUOUSLY READS OVER 230 ºF (110 ºC))

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Impeller Slip Test (Item 1, Appendix E)
Adapter, Radiator (Item 2, Appendix E)
Pressure Tester, Radiator (Item 117, Appendix E



COOLING SYSTEM PRESSURE TEST

(1) Open hood (TM 9-2320-360-10).

(2) Remove radiator cap from radiator.

(3) Install adapter on radiator.

(4) Install cooling system pressure tester and adapter.

CAUTION

Do not pressurize over 10 psi (69 kPa). Failure to comply may result ins damage to cooling system.

(5) Pressurize cooling system to 10 psi (69 kPa) and check expansion plugs for leaks.

(6) Release pressure and remove cooling system pressure tester from adapter.

(7) Remove adapter from radiator.

(8) Install radiator cap on radiator.

(9) Close hood (TM 9-2320-360-10).

AFTERCOOLER INSPECTION

(1) Open hood (TM 9-2320-360-10).

(2) Remove engine air box covers (para 3-8).

(3) Remove radiator cap from radiator.

(4) Install adapter on radiator.

CAUTION

Do not pressurize over 10 psi (69 kPa). Failure to comply may result in damage to cooling system.

(5) Install cooling system pressure tester on adapter.

(6) Pressurize cooling system to 10 psi (69 kPa) and check air box for coolant.

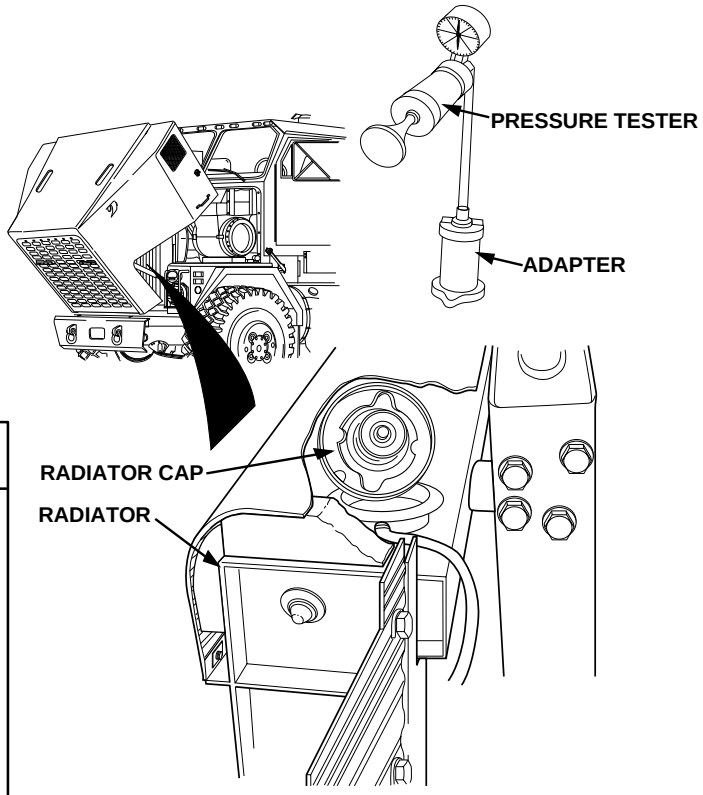
(7) Release pressure and remove cooling system pressure tester from adapter.

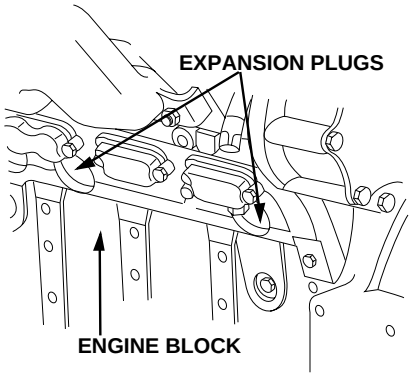
(8) Remove adapter from radiator.

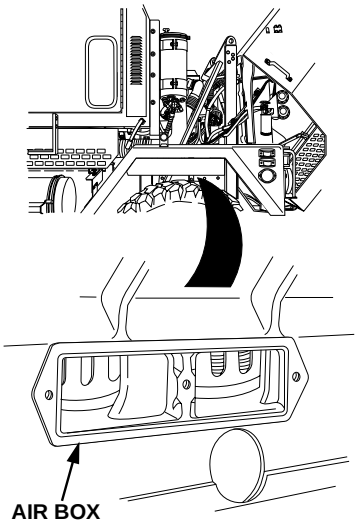
(9) Install radiator cap on radiator.

(10) Install engine air box covers (para 3-8).

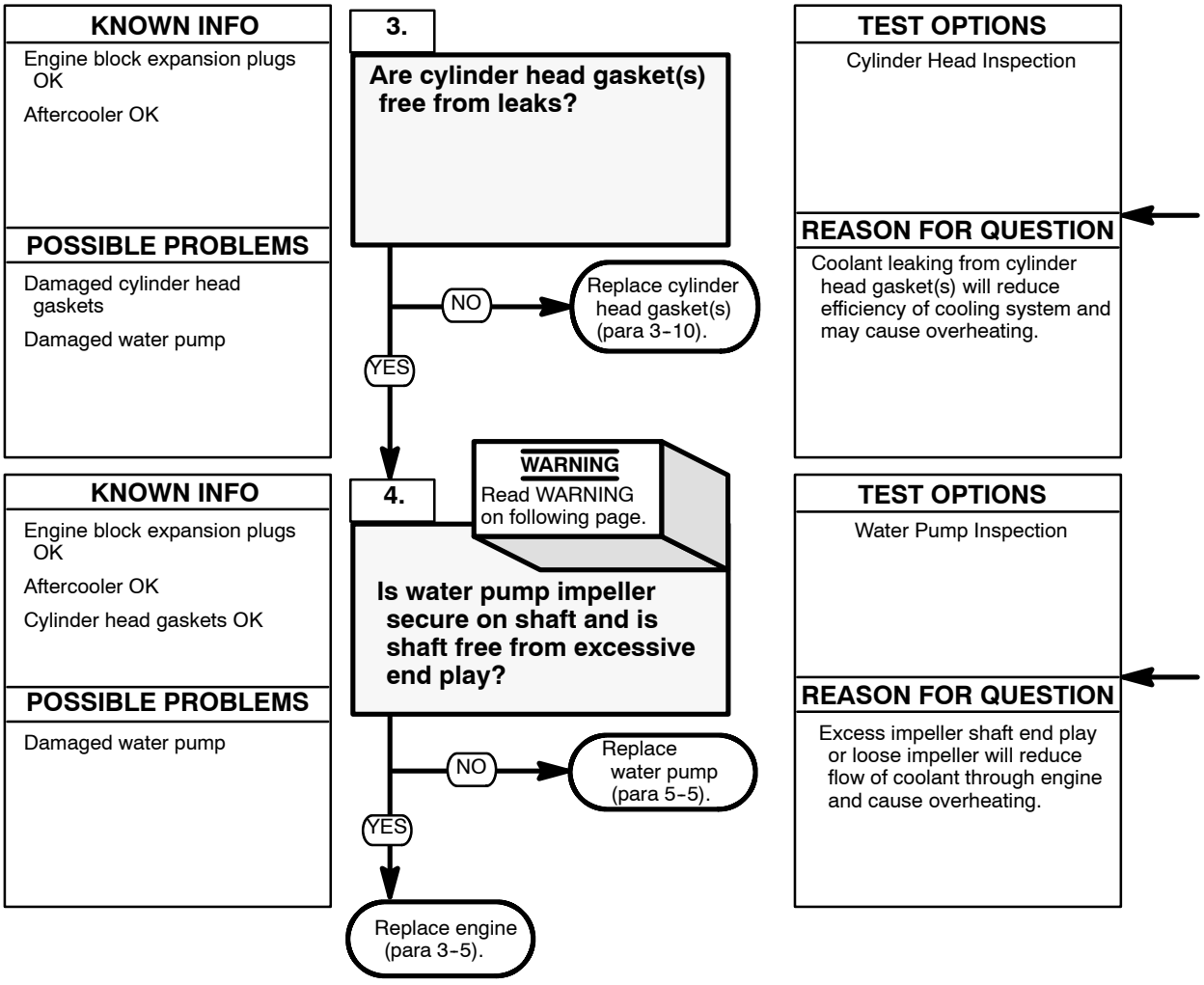
(11) Close hood (TM 9-2320-360-10).





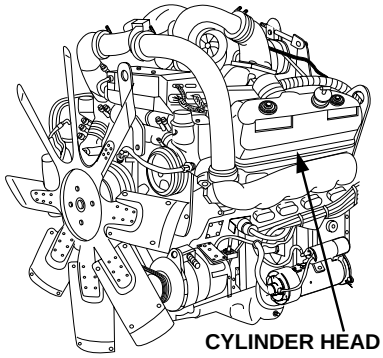


a2. ENGINE OVERHEATS (WATER TEMP GAGE CONTINUOUSLY READS OVER 230 ºF (110 ºC)) (CONT)



CYLINDER HEAD INSPECTION

(1) Open hood (TM 9-2320-360-10).
(2) Remove radiator cap from radiator.
(3) Install adapter on radiator.
(4) Install cooling system pressure tester and adapter.
(5) Pressurize cooling system to 10 psi (69 kPa) and check cylinder heads for leaks.
(6) Release pressure and remove cooling system pressure tester from adapter.
(7) Remove adapter from radiator.
(8) Install radiator cap on radiator.
(9) Install engine air box covers (para 3-8).
(10) Close hood (TM 9-2320-360-10).



ENGINE REMOVED FOR CLARITY

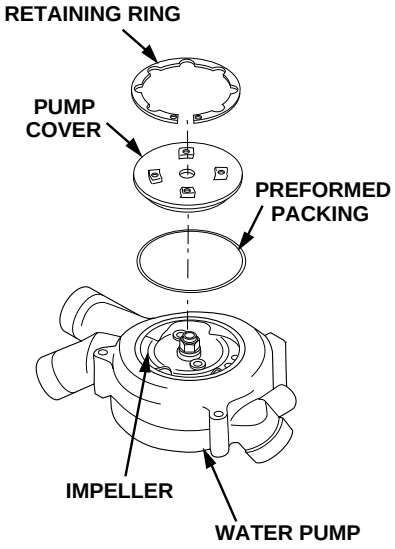
WATER PUMP INSPECTION

(1) Remove water pump (para 5-5).

WARNING

- **Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and may cause severe eye damage.**
- **Due to size and tension of retaining ring in step (2), ensure suitable retaining ring pliers are used for safety. Press a hammer against pump cover to help prevent injury should the retaining ring slip off the pliers.**

(2) Remove retaining ring, pump cover and preformed packing from water pump.
(3) Move impeller in and out on shaft to detect excessive play.
(4) Position water pump drive gear in soft-jaw vise.
(5) Instert impeller slip test adapter dowel pins into impeller.
(6) Attempt to turn impeller with impeller slip test adapter. No slippage should be felt with torque of 80 lb-ft (108 N·m).
(7) Install new preformed packing and pump cover on water pump with new retaining ring.
(8) Install water pump (para 5-5).

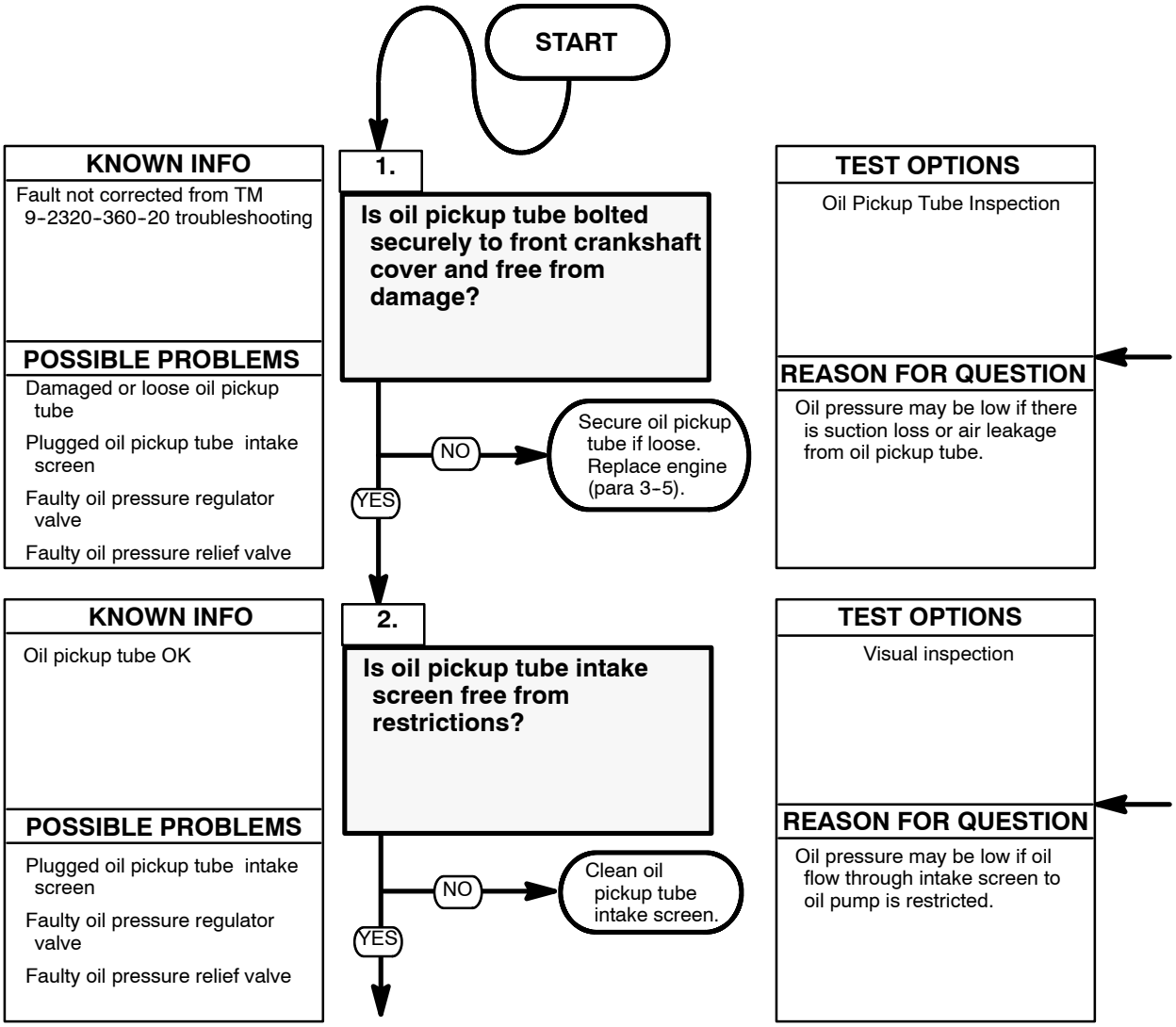


a3. LOW ENGINE OIL PRESSURE

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

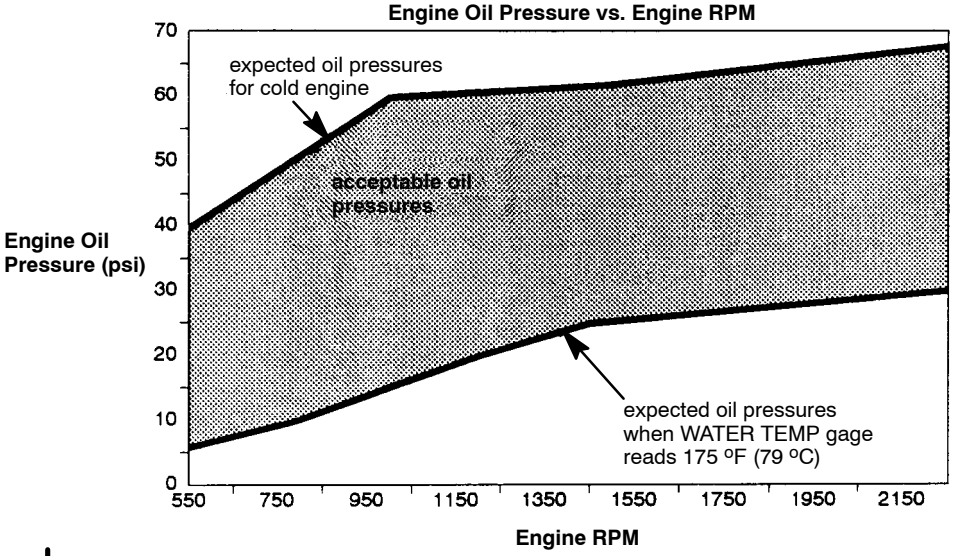
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)



NOTE

Engine oil pressures may be slightly lower when engine is at maximum operating temperature (WATER TEMP gage reads 210 °F (100 °C)).

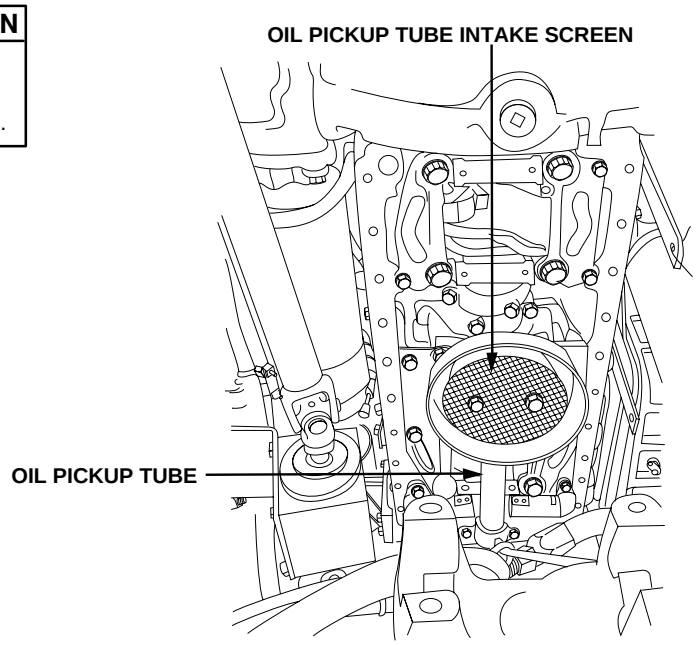
Engine Oil Pressure vs. Engine RPM



OIL PICKUP TUBE INSPECTION

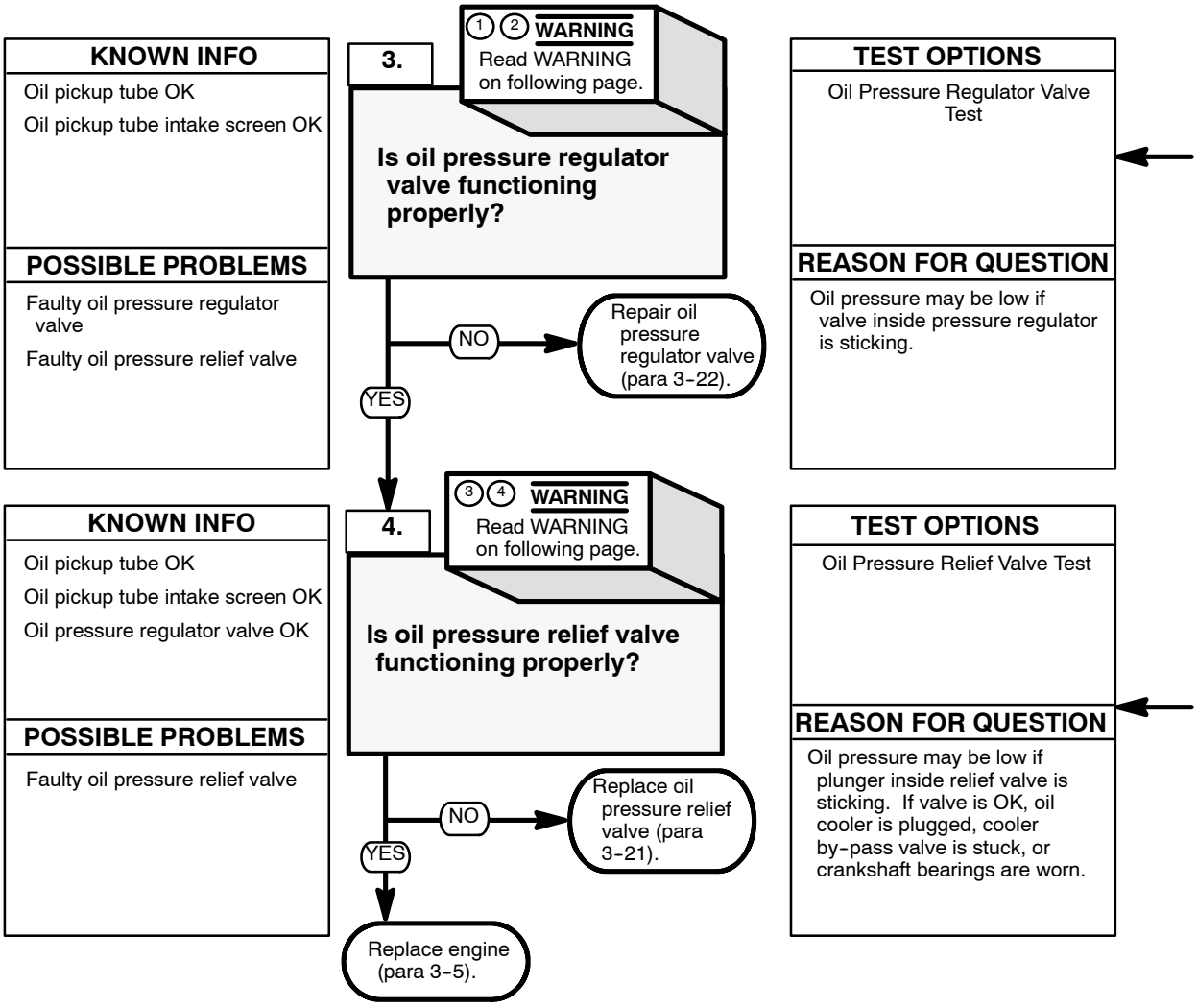
(1) Remove engine oil pan (para 3-20).

(2) Check pickup tube and mounting hardware for looseness and damage.



Inspect oil pickup tube intake screen for restrictions.

a3. LOW ENGINE OIL PRESSURE (CONT)



OIL PRESSURE REGULATOR VALVE TEST

(1) Remove oil pressure regulator valve (para 3-22).

(1) WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean oil pressure regulator valve with solvent cleaning compound.

(2) WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Dry oil pressure regulator valve with compressed air.

(4) Inspect valve inside oil pressure regulator valve for sludge, scoring and not closing completely.

(5) Install oil pressure regulator valve (para 3-22).

OIL PRESSURE REGULATOR VALVE TEST

(1) Remove oil pressure relief valve (para 3-21).

(3) WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean oil pressure relief valve with solvent cleaning compound.

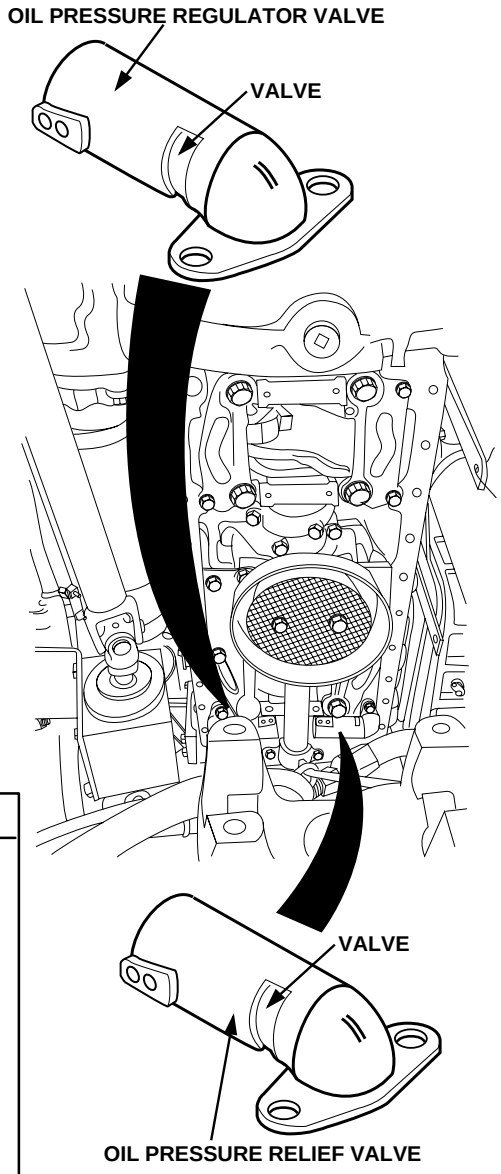
(4) WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Dry oil pressure relief valve with compressed air.

(4) Inspect valve inside oil pressure relief valve for sludge, scoring and not closing completely.

(5) Install oil pressure regulator valve (para 3-21).

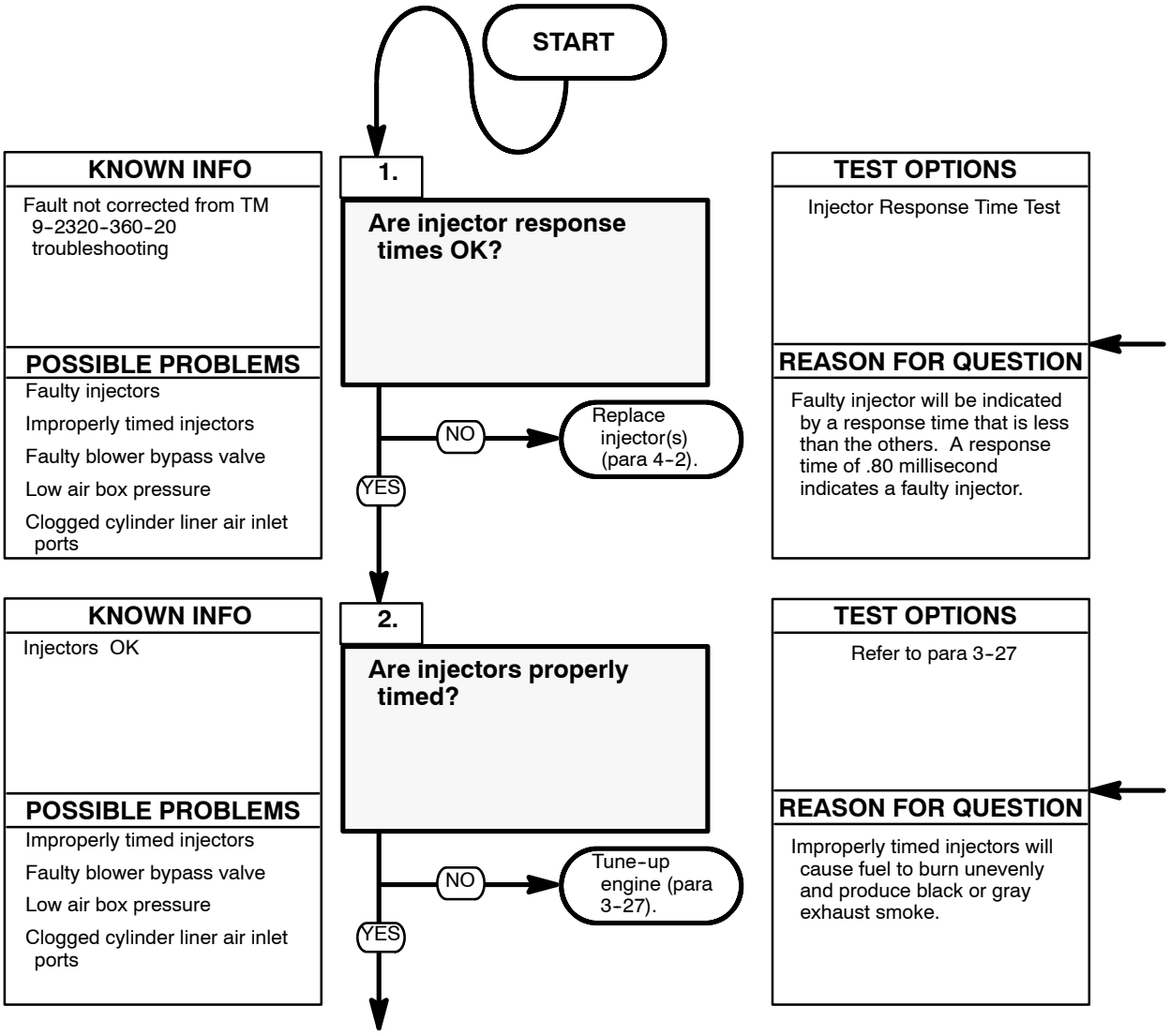


a4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE)

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
STE/ICE-R (Item 184, Appendix E)
Data Reader, Diagnostic (Item 31, Appendix E)



INJECTOR RESPONSE TIME TEST

(1) Connect DDR to DDL connector (page 2-6).

(2) Start engine (TM 9-2320-360-10).

(3) Select Mode 10 (Fuel Injector Response Times) on DDR.

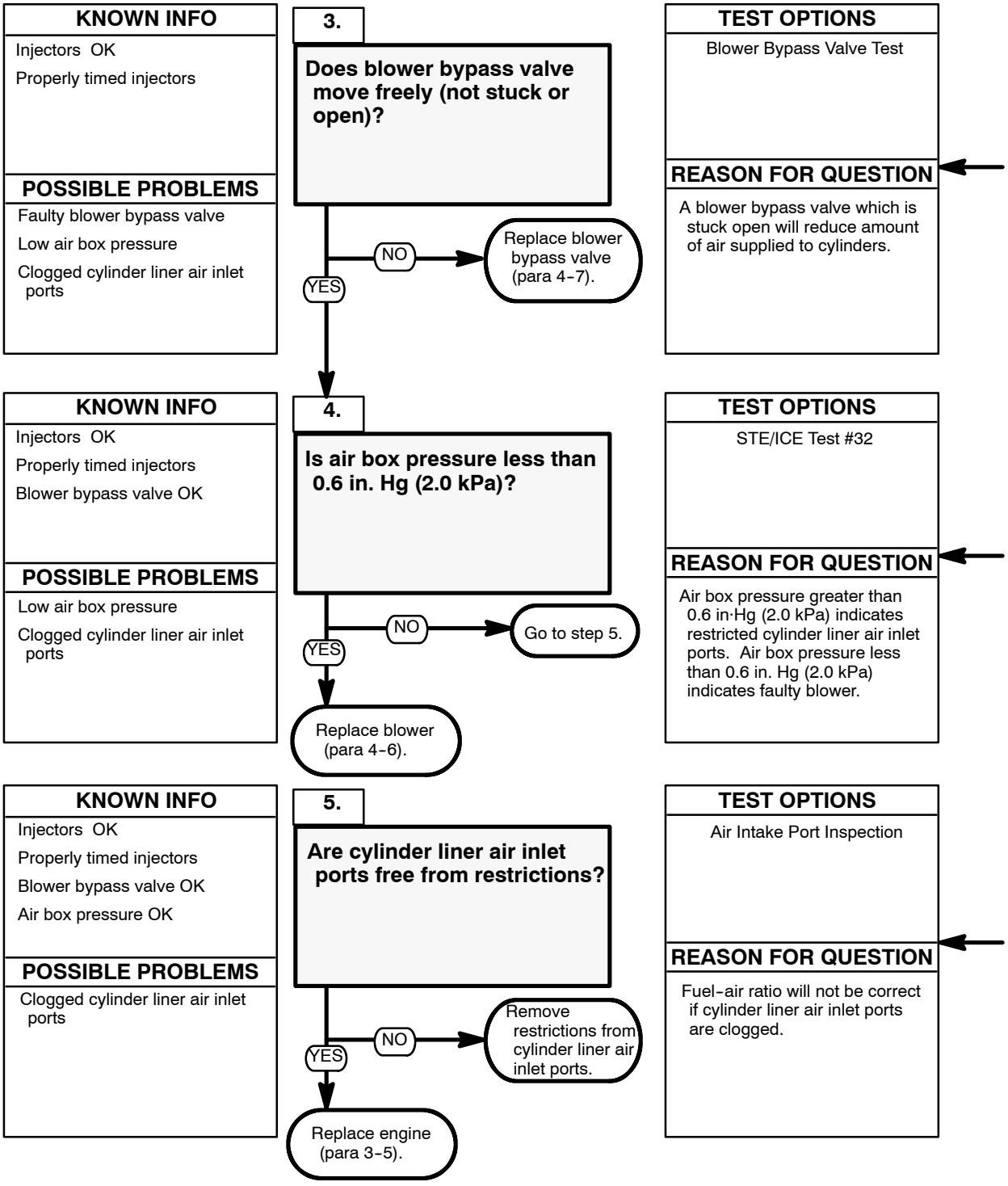
(4) Compare injector response times of all eight injectors.

(5) Shut off engine (TM 9-2320-360-10).

(6) Disconnect DDR from DDL connector.

Refer to paragraph 3-27 for injector timing specifications and procedure.

a4. EXCESSIVE BLACK OR GRAY EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE) (CONT)

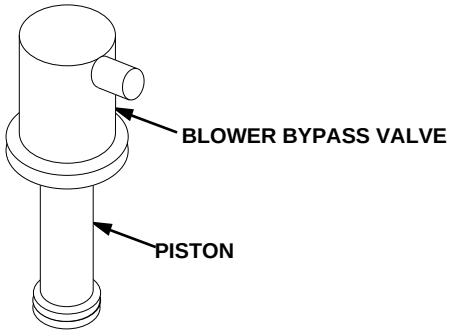


BLOWER BYPASS VALVE TEST

(1) Remove blower bypass valve (para 4-7).

(2) Blower bypass valve piston should move open with hand pressure, and spring should return piston to closed position.

(3) Install blower bypass valve (para 4-7).



STE/ICE TEST #32

(1) Connect STE/ICE test cable to STE/ICE receptacle.

(2) Set test select switch to 32.

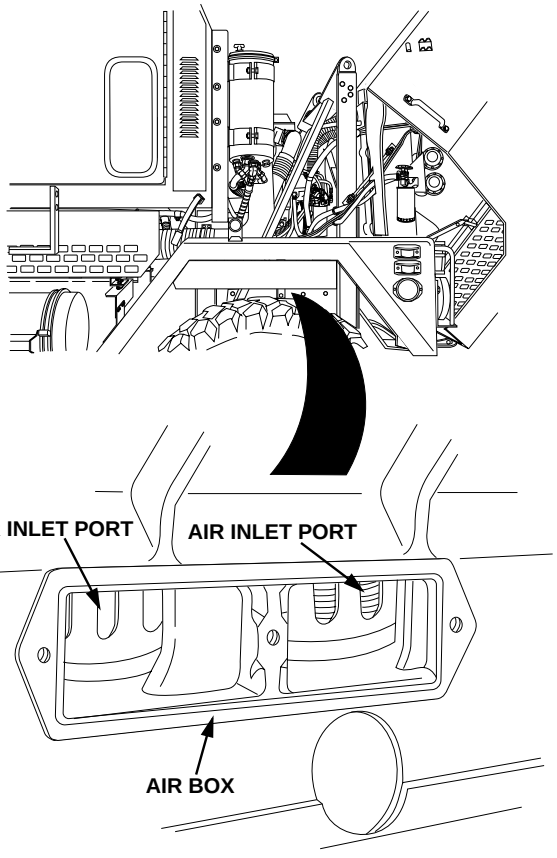
(3) Start engine (TM 9-2320-360-10).

(4) Press and hold test button until CAL appears on display.

(5) Release test button and wait for offset value to appear on display.

(6) Press and release test button to obtain test results.

(7) Shut off engine (TM 9-2320-360-10).



AIR INTAKE PORT INSPECTION

(1) Remove air box covers (para 3-8).

(2) Check cylinder liner air inlet ports for restrictions.

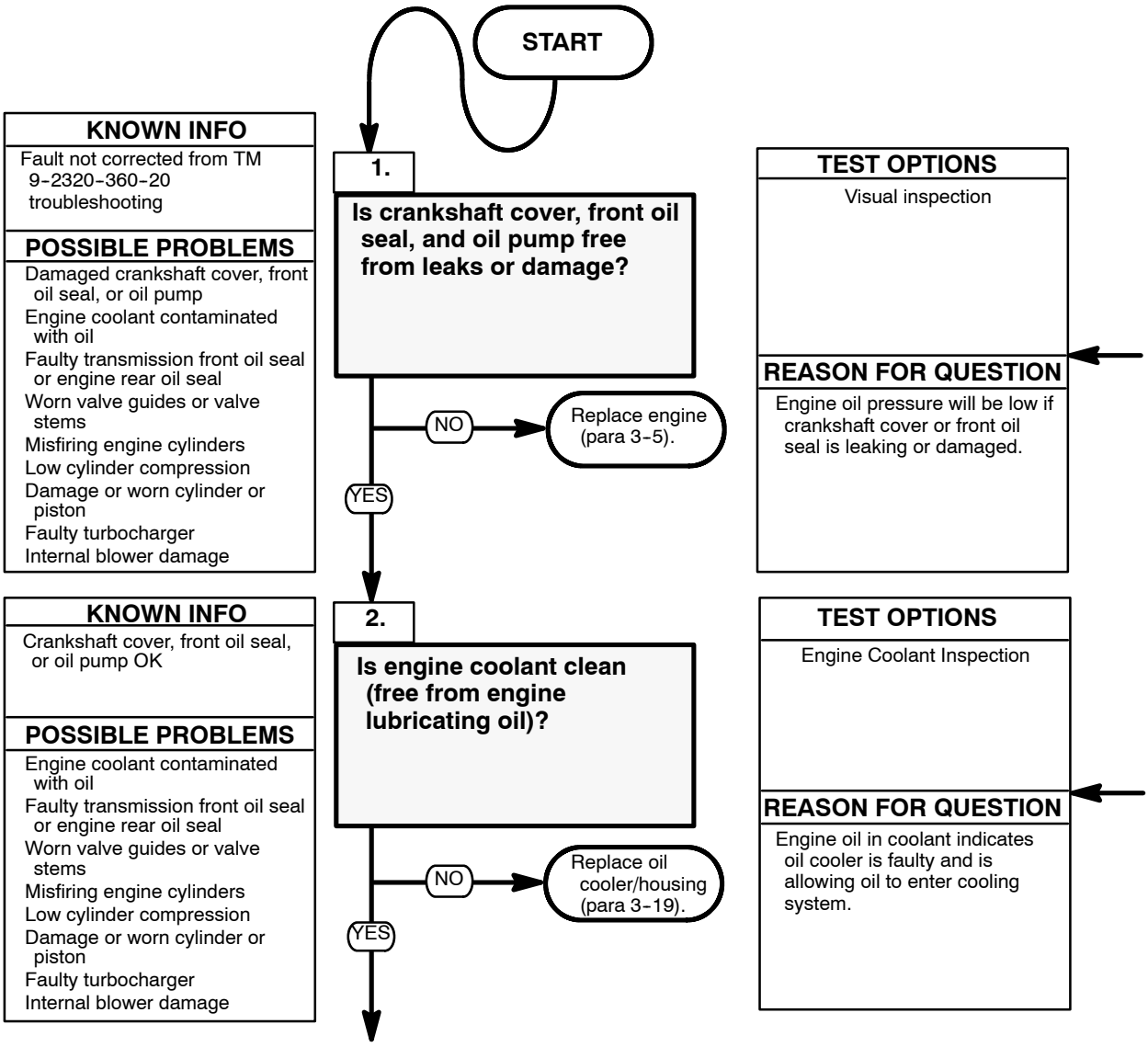
(3) Install air box covers (para 3-8).

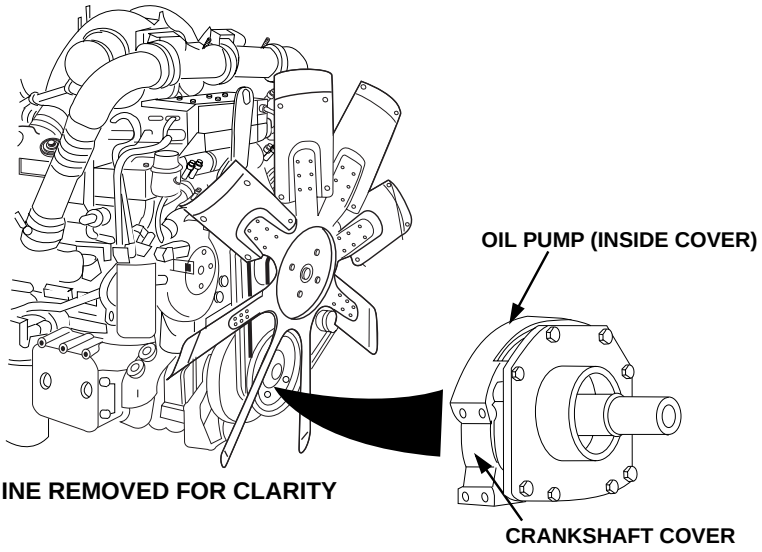
a5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE)

INITIAL SETUP

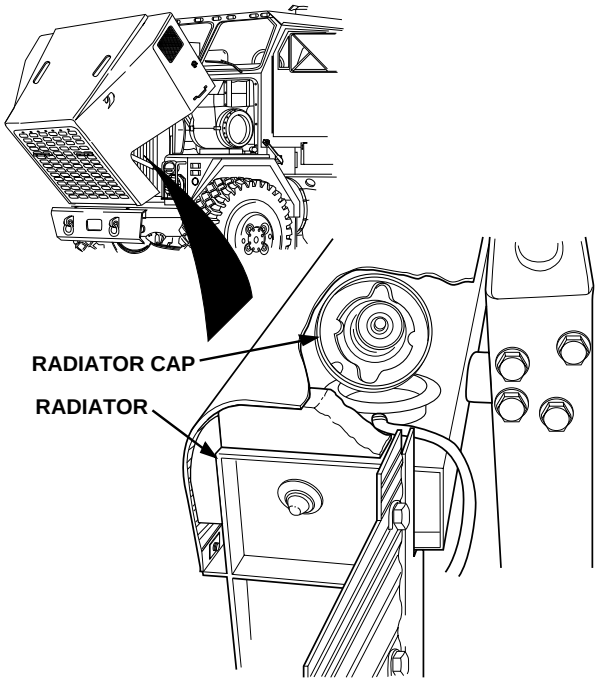
Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Data Reader, Diagnostic (Item 31, Appendix E)
Goggles, Industrial, (Item 57, Appendix E)





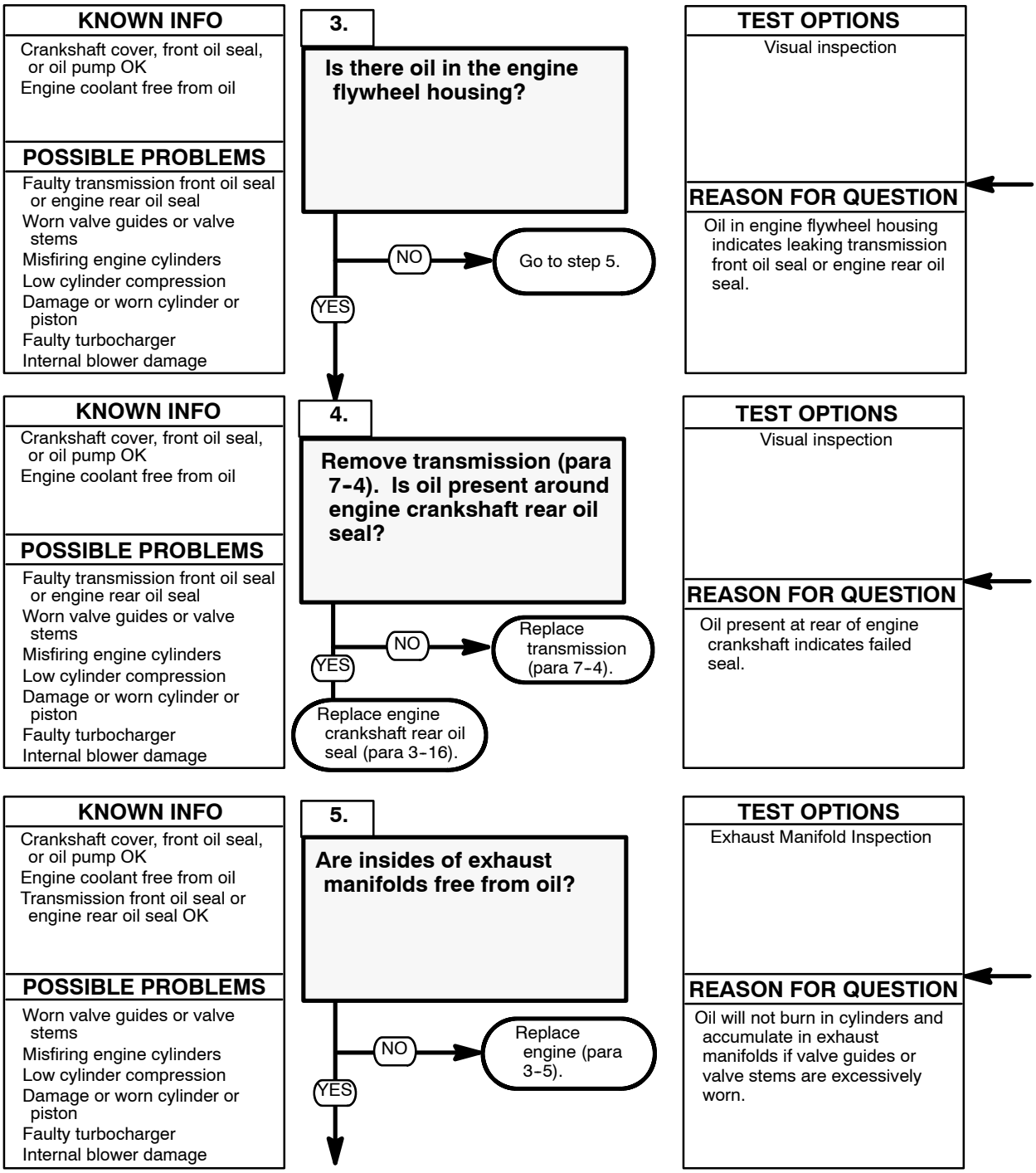
Check crankshaft cover, front oil seal, and oil pump for leakage or damage.

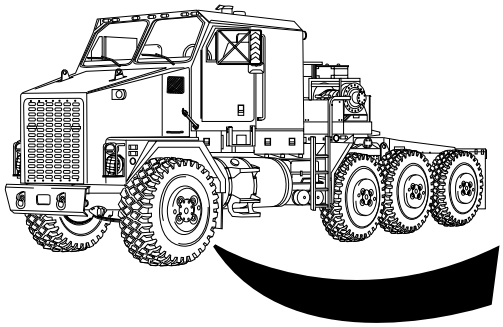


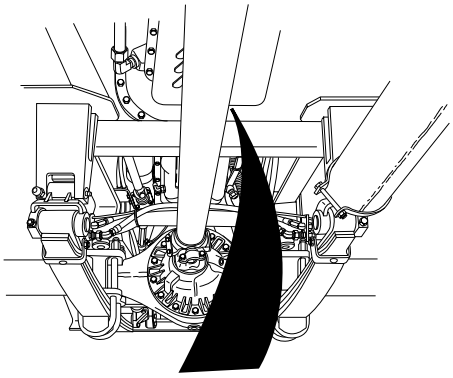
ENGINE COOLANT INSPECTION

(1) Open hood (TM 9-2320-360-10).
(2) Remove radiator cap from radiator.
(3) Inspect coolant for engine lubricating oil.
(4) Install radiator cap on radiator.
(5) Close hood (TM 9-2320-360-10).

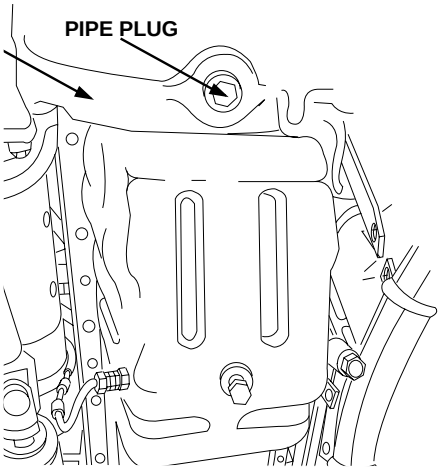
a5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE) (CONT)







Remove pipe plug from bottom of flywheel housing and check for oil in housing.



Inspect engine area behind flexplate.

EXHAUST MANIFOLD INSPECTION

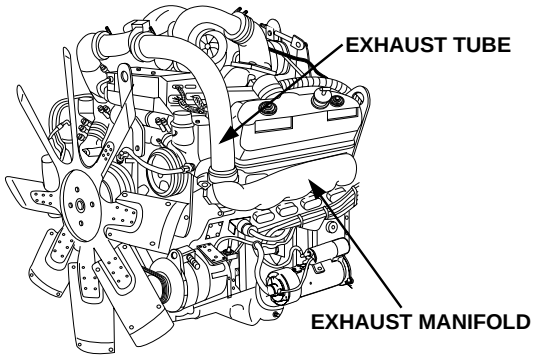
NOTE

Left and right exhaust manifolds are checked in the same manner.

(1) Loosen clamps on exhaust tube and remove exhaust tube from exhaust manifold and turbocharger.

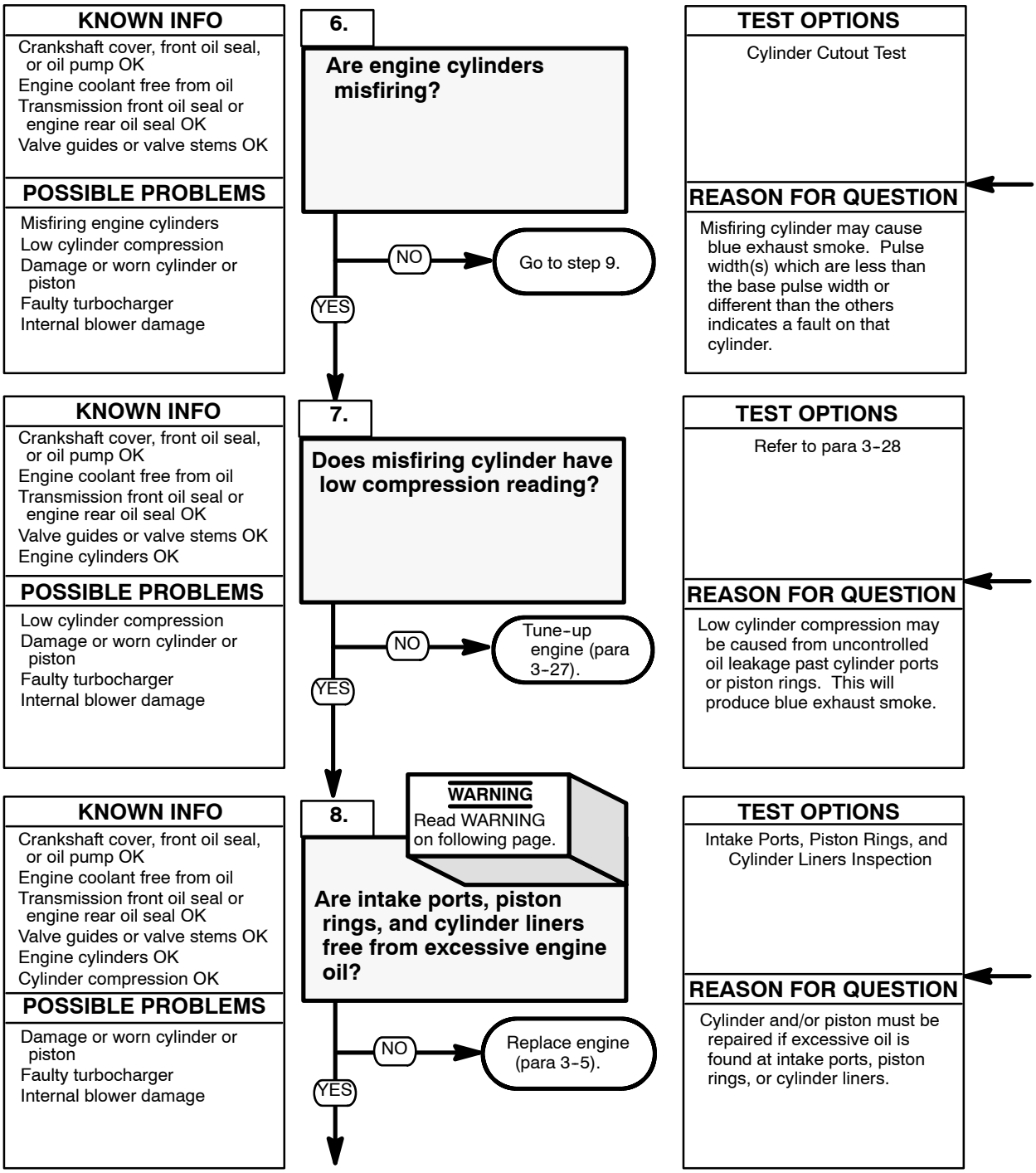
(2) Check inside of exhaust manifold for oil.

(3) Install exhaust tube on exhaust manifold and turbocharger with two clamps. Tighten clamps.



ENGINE REMOVED FOR CLARITY

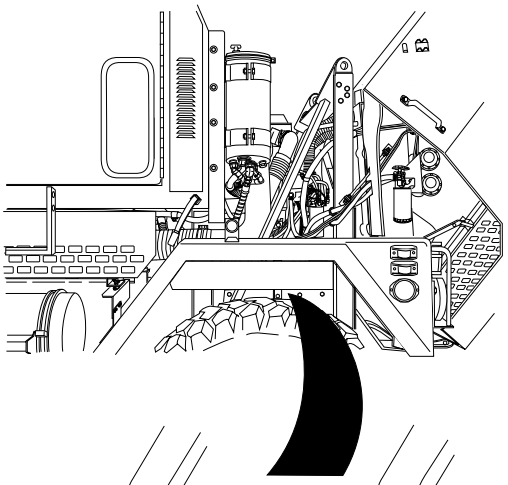
a5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE) (CONT)



CYLINDER CUTOUT TEST

(1) Connect DDR to DDL connector (page 2-6).
(2) Start engine (TM 9-2320-360-10).
(3) Select Mode 11 (Cylinder Cutout) on DDR and record displayed pulse widths.
(4) Shut off engine (TM 9-2320-360-10).
(5) Disconnect DDR from DDL connector.

Refer to para 3-28 to check cylinder compression.

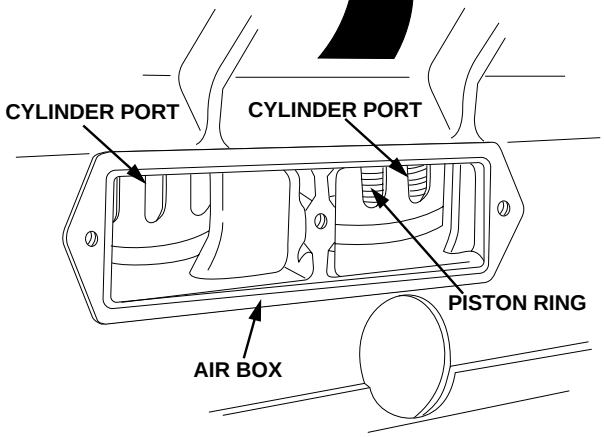


INTAKE PORTS, PISTON RINGS, AND CYLINDER LINERS INSPECTION

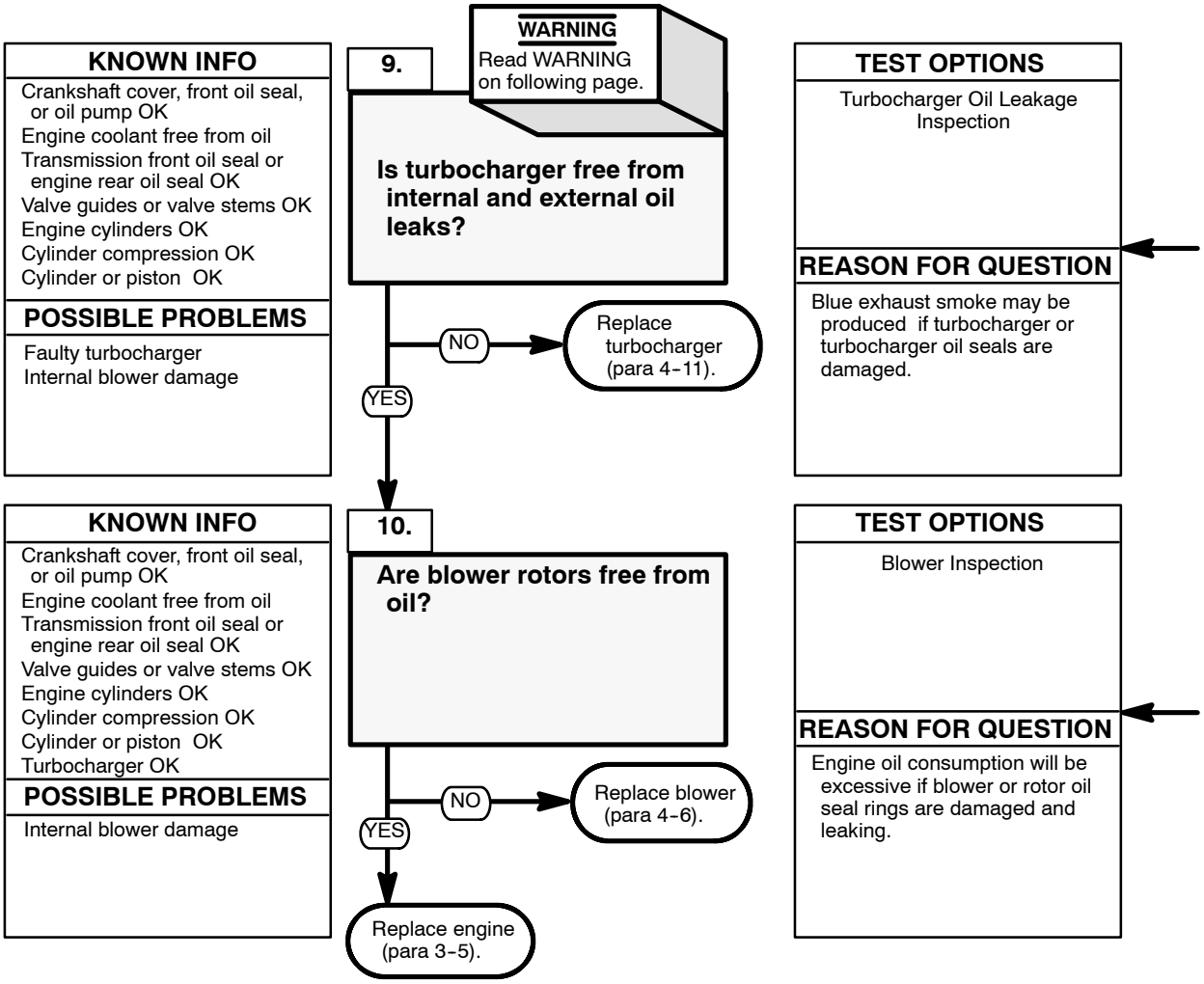
WARNING

Hot lubricating oil could be blown out of air box during this test. Goggles and protective clothing must be worn to prevent personnel injury when air box covers are removed and engine is running.

(1) Remove air box cover (para 3-8) from misfiring cylinder.
(2) Start engine (TM 9-2320-360-10).
(3) Check for uncontrolled oil leakage past cylinder ports or piston rings.
(4) Shut off engine (TM 9-2320-360-10).
(5) Install air box cover on cylinder (para 3-8).



a5. EXCESSIVE OIL CONSUMPTION OR BLUE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE) (CONT)



TURBOCHARGER OIL LEAKAGE INSPECTION

WARNING

Do not start engine with air intake duct or exhaust pipe removed from turbocharger. Personnel injury may result.

(1) Loosen clamp and remove air intake duct from turbocharger.

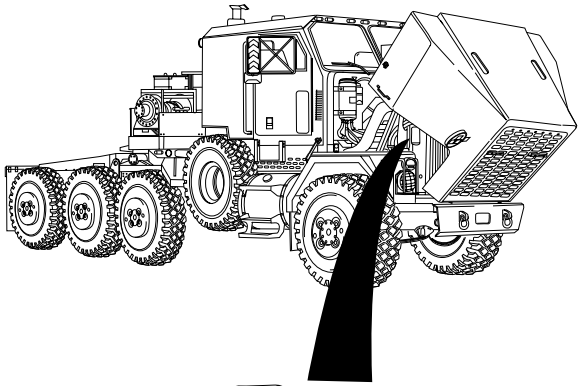
(2) Loosen clamp and remove exhaust pipe from turbocharger.

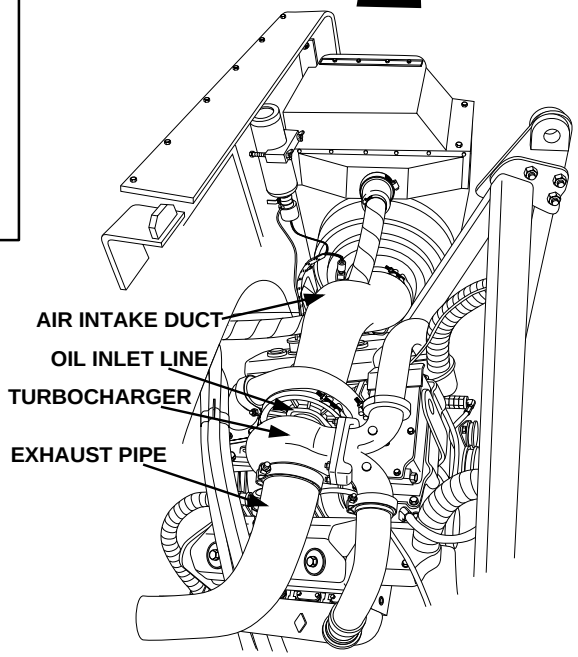
(3) Check oil inlet line for leakage.

(4) Check impeller and turbine blades for oil.

(5) Install exhaust pipe on turbocharger with clamp. Tighten clamp.

(6) Install air intake duct on turbocharger with clamp. Tighten clamp.



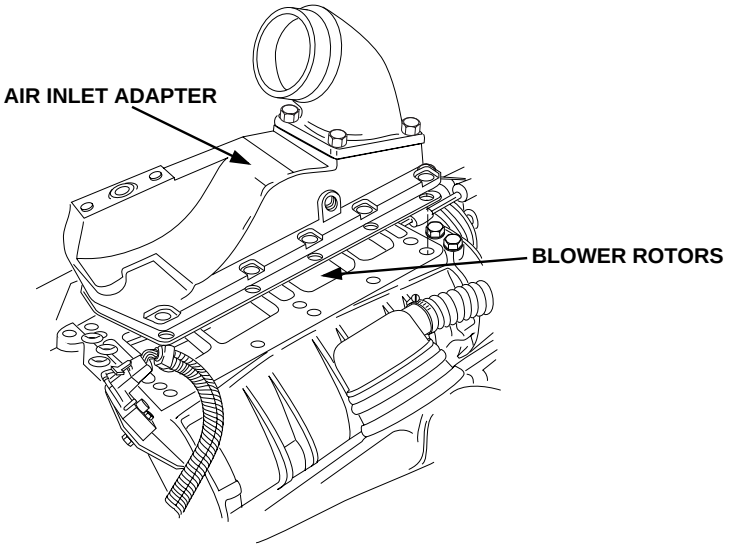


BLOWER INSPECTION

(1) Remove air inlet adapter (para 4-5).

(2) Check blower rotors for signs of oil.

(3) Install air inlet adapter (para 4-5).

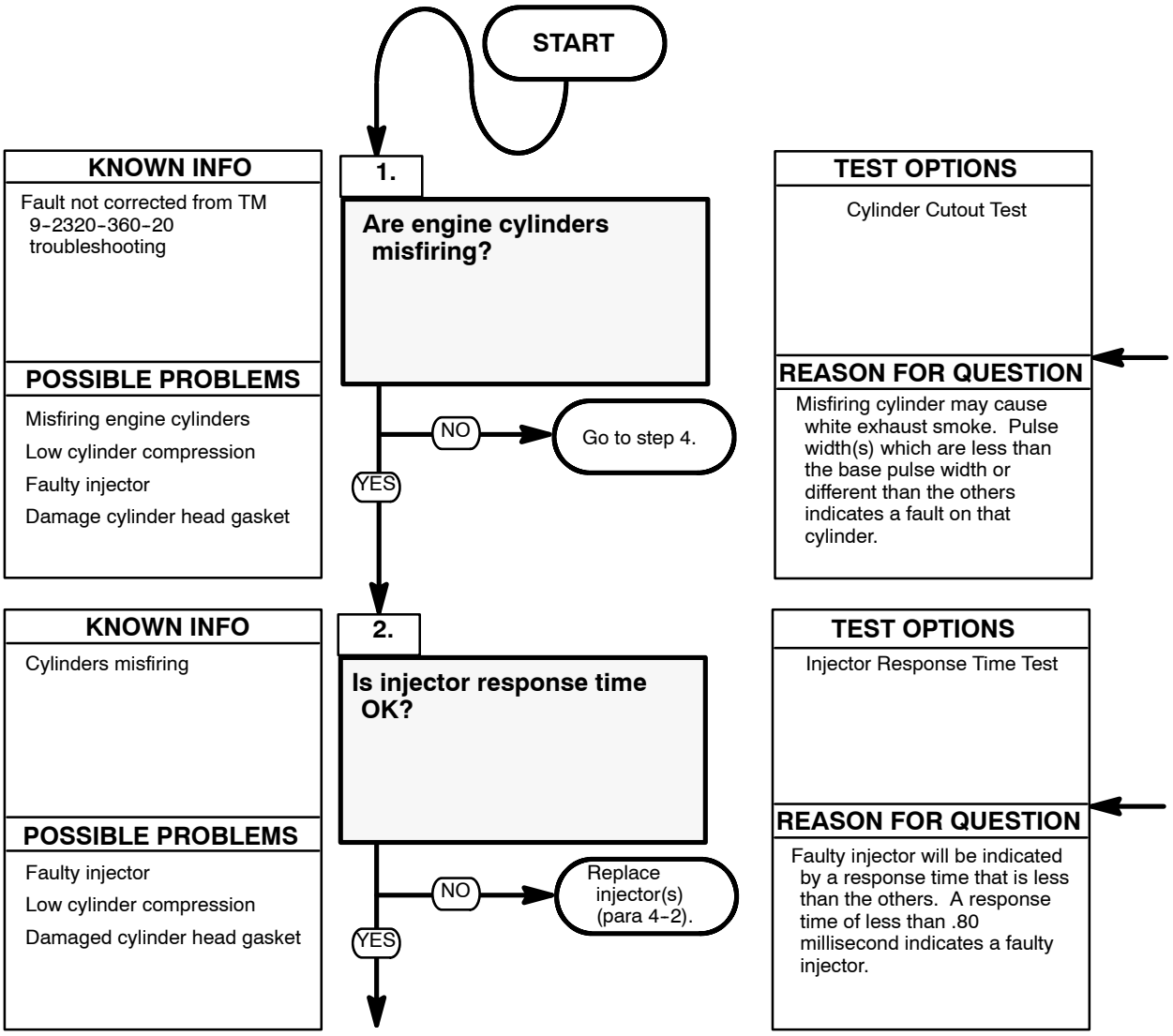


a6. WHITE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE)

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Radiator (Item 2, Appendix E)
Data Reader, Diagnostic (Item 31, Appendix E)
Pressure Tester, Radiator (Item 117, Appendix E)



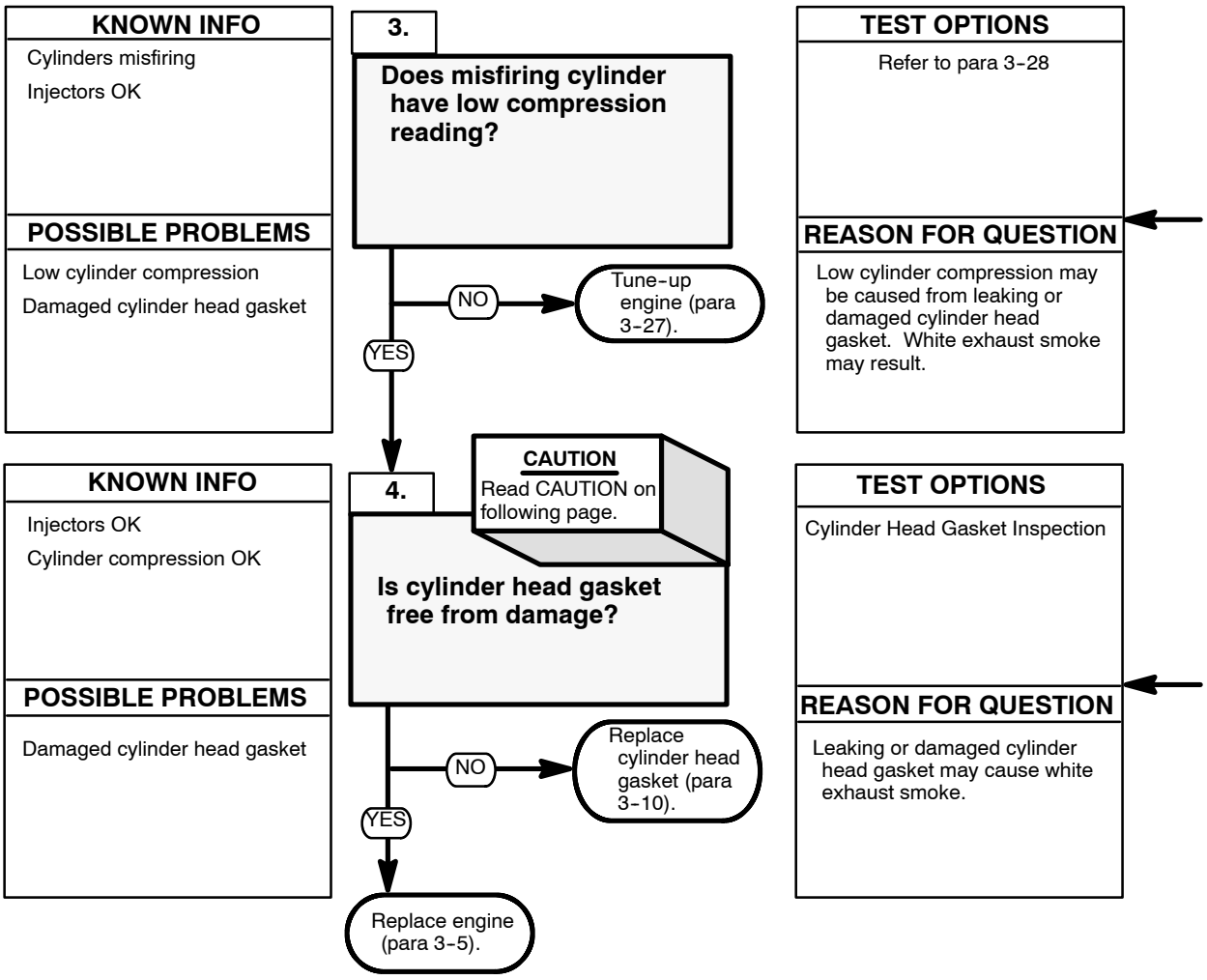
CYLINDER CUTOUT TEST

(1) Connect DDR to DDL connector (page 2-6).
(2) Start engine (TM 9-2320-360-10).
(3) Select Mode 11 (Cylinder Cutout) on DDR and record displayed pulse widths.
(4) Shut off engine (TM 9-2320-360-10).
(5) Disconnect DDR from DDL connector.

INJECTOR RESPONSE TIME TEST

(1) Connect DDR to DDL connector (page 2-6).
(2) Start engine (TM 9-2320-360-10).
(3) Select MODE 10 (Fuel Injector Response Times) on DDR.
(4) Compare injector response times of all eight injectors.
(5) Shut off engine (TM 9-2320-360-10).
(6) Disconnect DDR from DDL connector.

a6. WHITE EXHAUST SMOKE (ENGINE AT NORMAL OPERATING TEMPERATURE) (CONT)



Refer to para 3-28 to check cylinder compression.

CYLINDER HEAD GASKET INSPECTION

(1) Open hood (TM 9-2320-360-10).

(2) Remove radiator cap from radiator.

(3) Install adapter on radiator.

(4) Install cooling system pressure tester on adapter.

CAUTION

Do not pressurize over 10 psi (69 kPa). Failure to comply may result in damage to cooling system.

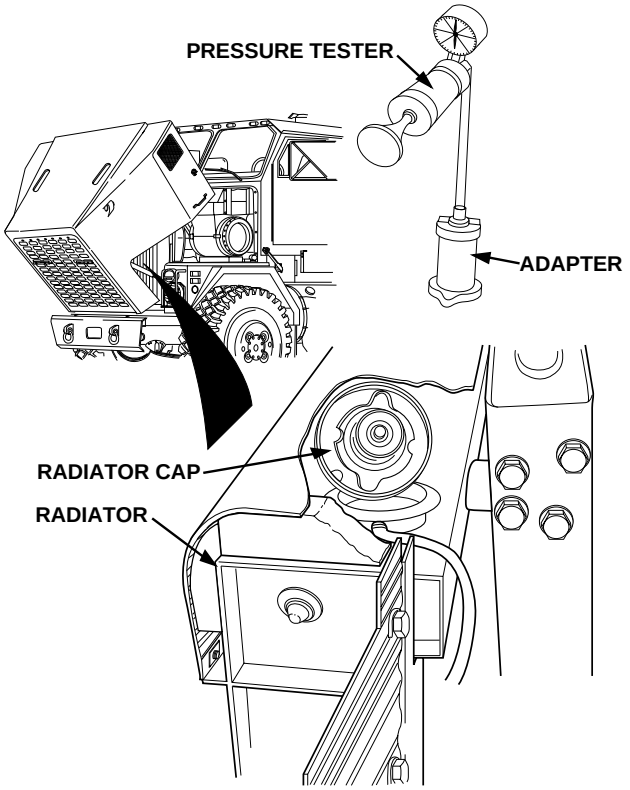
(5) Pressurize cooling system to 10 psi (69 kPa) and check cylinder head for leaks.

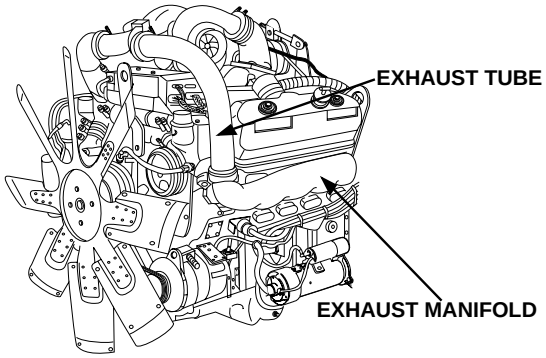
(6) Release pressure and remove cooling system pressure tester from adapter.

(7) Remove adapter from radiator.

(8) Install radiator cap on radiator.

(9) Close hood (TM 9-2320-360-10).





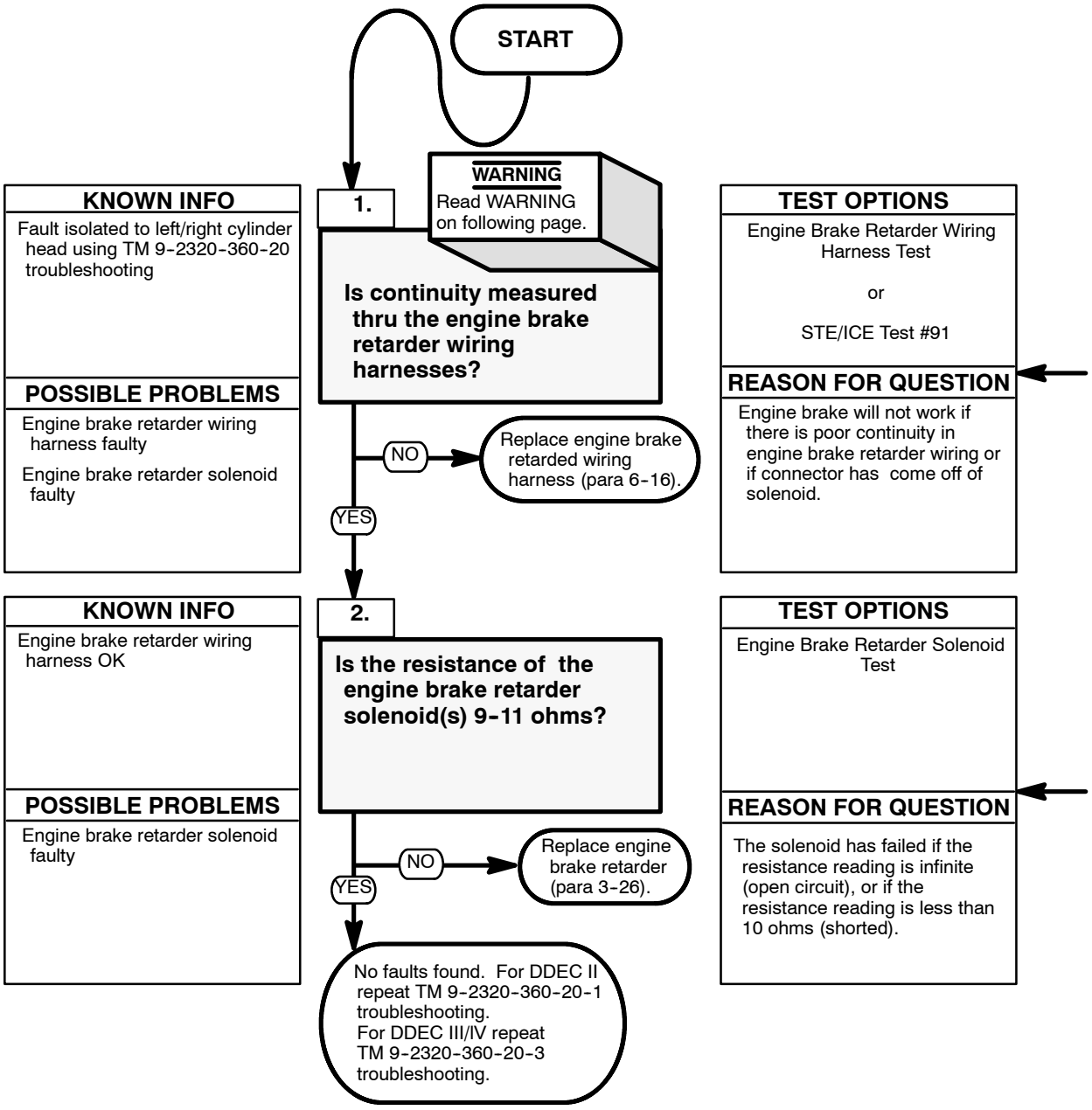
ENGINE REMOVED FOR CLARITY

a7. ENGINE BRAKE DOES NOT OPERATE PROPERLY

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
STE/ICE-R (optional) (Item 184, Appendix E)
Multimeter (Item 98, Appendix E)



WARNING

Ensure engine is cool before performing maintenance. Failure to comply may result in severe burns.

ENGINE BRAKE RETARDER WIRING HARNESS TEST

(1) Remove engine brake retarder wire harness from affected cylinder head (para 6-16).

(2) Set multimeter to ohms position.

(3) Connect multimeter leads to wire harness connectors.

(4) Observe resistance reading displayed on multimeter.

(5) Remove multimeter leads from connectors.

ENGINE BRAKE RETARDER WIRING HARNESS TEST

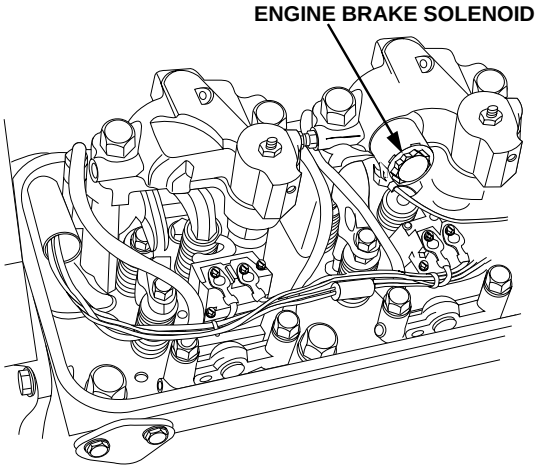
(1) Set multimeter to ohms position.

(2) Connect multimeter leads to solenoid terminal and known good ground.

(3) Observe resistance reading displayed on multimeter.

(4) Remove multimeter leads from terminal and ground.

(5) Install engine brake retarder wire harness (para 6-16).



b. TRANSMISSION

Malfunction	Troubleshooting Procedure (Page)
b1 Transmission overheats (TRANS TEMP gage continuously reads over 250 ºF (121 ºC))	2-98
b2 Transmission unusually noisy when operating	2-102
b3 Transmission will not shift into gear, slips out of gear, or operates erratically	2-106
b4 Automatic shifts occur at too high a speed	2-110
b5 Automatic shifts occur at too low a speed	2-112
b6 Deleted	
b7 Engine stalls at idle when in gear	2-116
b8 Vehicle moves in neutral	2-118
b9 Transmission slips in all forward gears	2-120

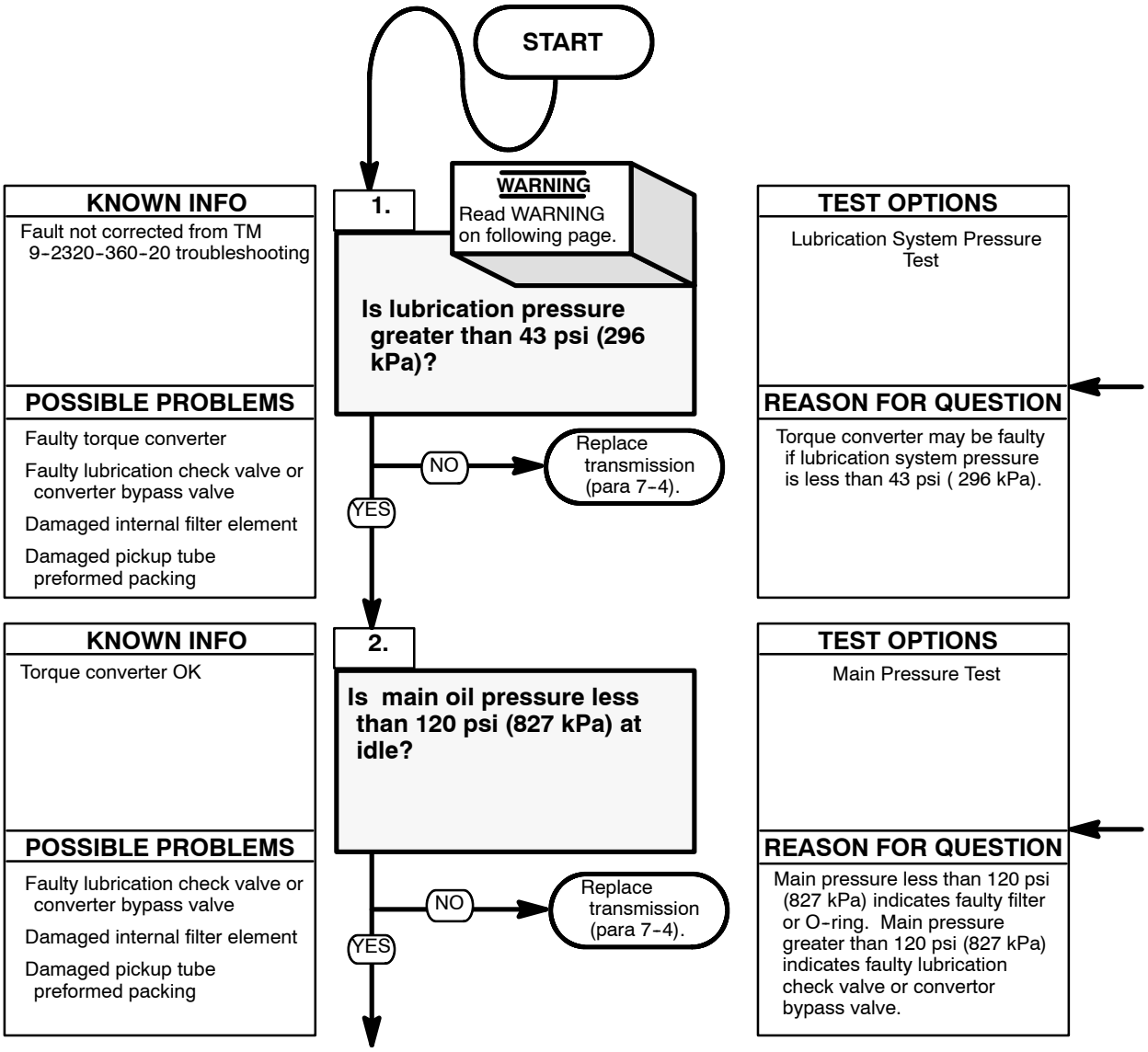
b1. TRANSMISSION OVERHEATS (TRANS TEMP GAGE CONTINUOUSLY READS OVER 250 ºF (121 ºC)

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Goggles, Industrial (Item 57, Appendix E)

Personnel Required
Two



WARNING

Wear approved eye protection when performing transmission pressure checks. Failure to comply may result in oil getting into eyes. If oil contacts eyes, seek medical attention immediately.

LUBRICATION SYSTEM PRESSURE TEST

(1) Remove plug from lubrication port on converter housing.

(2) Install 0-160 psi (0-1103 kPa) pressure gage on bottom of converter housing.

(3) Start engine (TM 9-2320-360-10) and operate at 1900 to 2100 rpm while assistant checks reading on pressure gage.

(4) Shut off engine (TM 9-2320-360-10).

(5) Remove pressure gage from converter housing.

(6) Install plug in transmission lubrication port.

MAIN PRESSURE TEST

(1) Remove main pressure oil line no. 2672 from main pressure port on transmission converter housing.

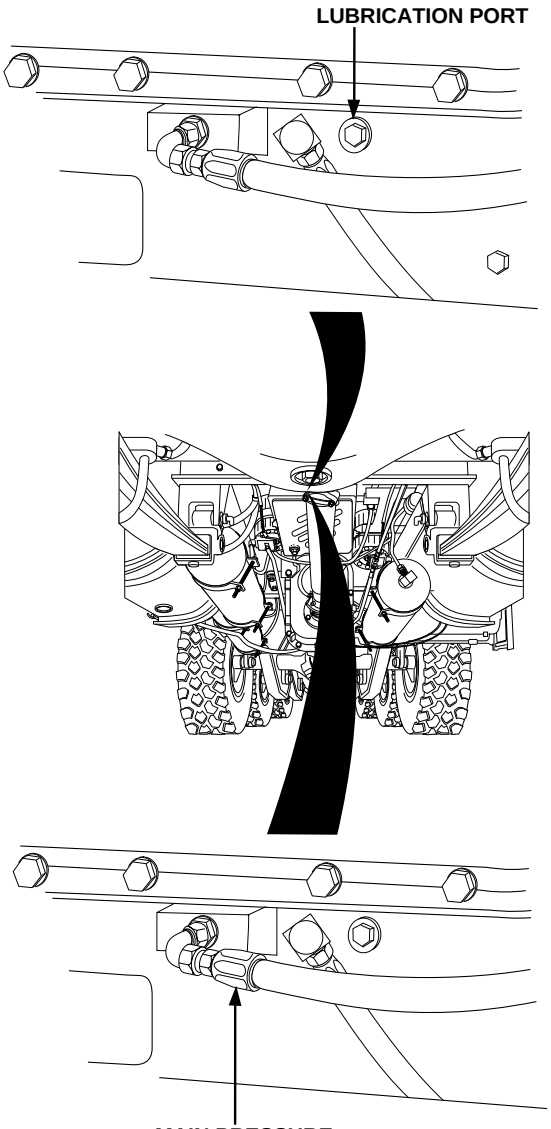
(2) Install tee, 0-2000 psi (0-13,790 kPa) pressure gage, and main pressure oil line no. 2672 in main pressure port on converter housing.

(3) Start engine (TM 9-2320-360-10) and run at idle.

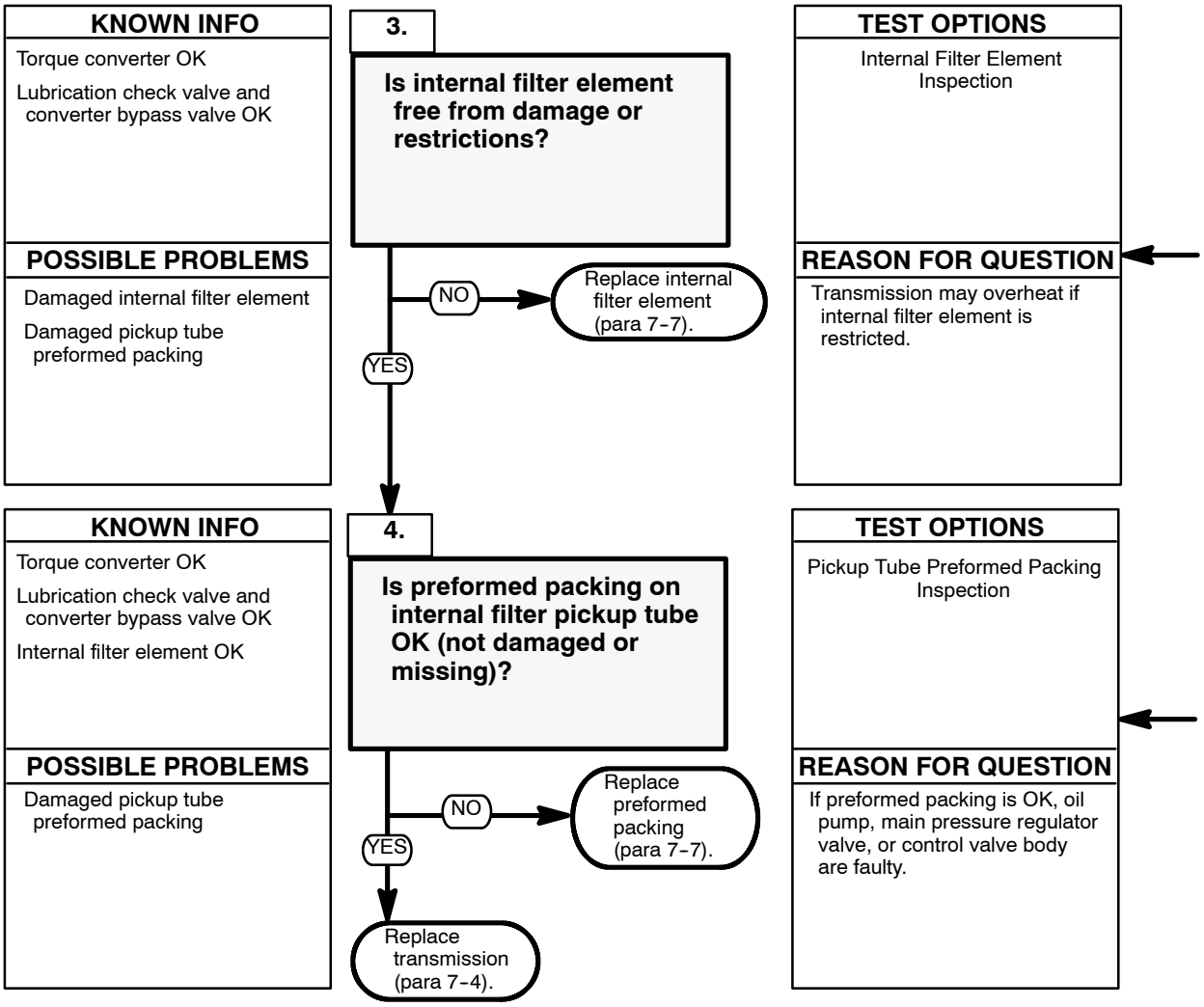
(4) With parking brake applied, position transmission range selector to 2-5 position while assistant checks reading on pressure gage.

(5) Shut off engine (TM 9-2320-360-10).

(6) Remove pressure gage from main pressure oil line and install main pressure oil line on main pressure port.



b1. TRANSMISSION OVERHEATS (TRANS TEMP GAGE CONTINUOUSLY READS OVER 250 ºF (121 ºC)) (CONT)



INTERNAL FILTER ELEMENT INSPECTION

(1) Remove oil pan (para 7-5).

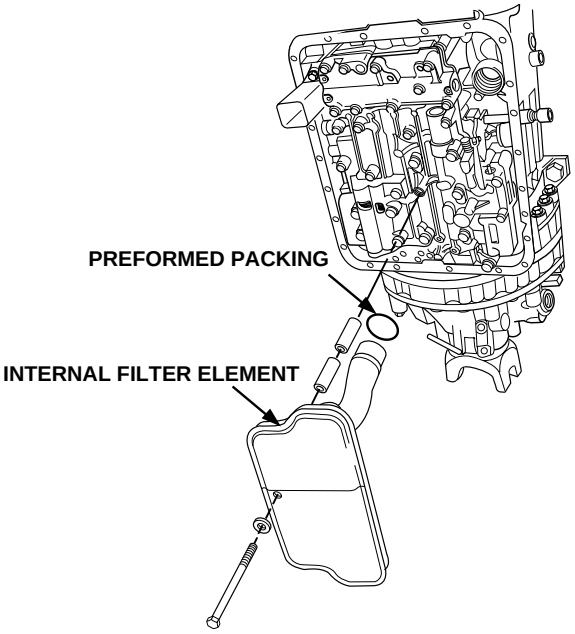
(2) Check internal filter element for damage or restrictions.

PICKUP TUBE PREFORMED PACKING INSPECTION

(1) Remove internal filter element (para 7-7).

(2) Inspect condition of internal filter preformed packing.

(3) Install internal filter element (para 7-7).

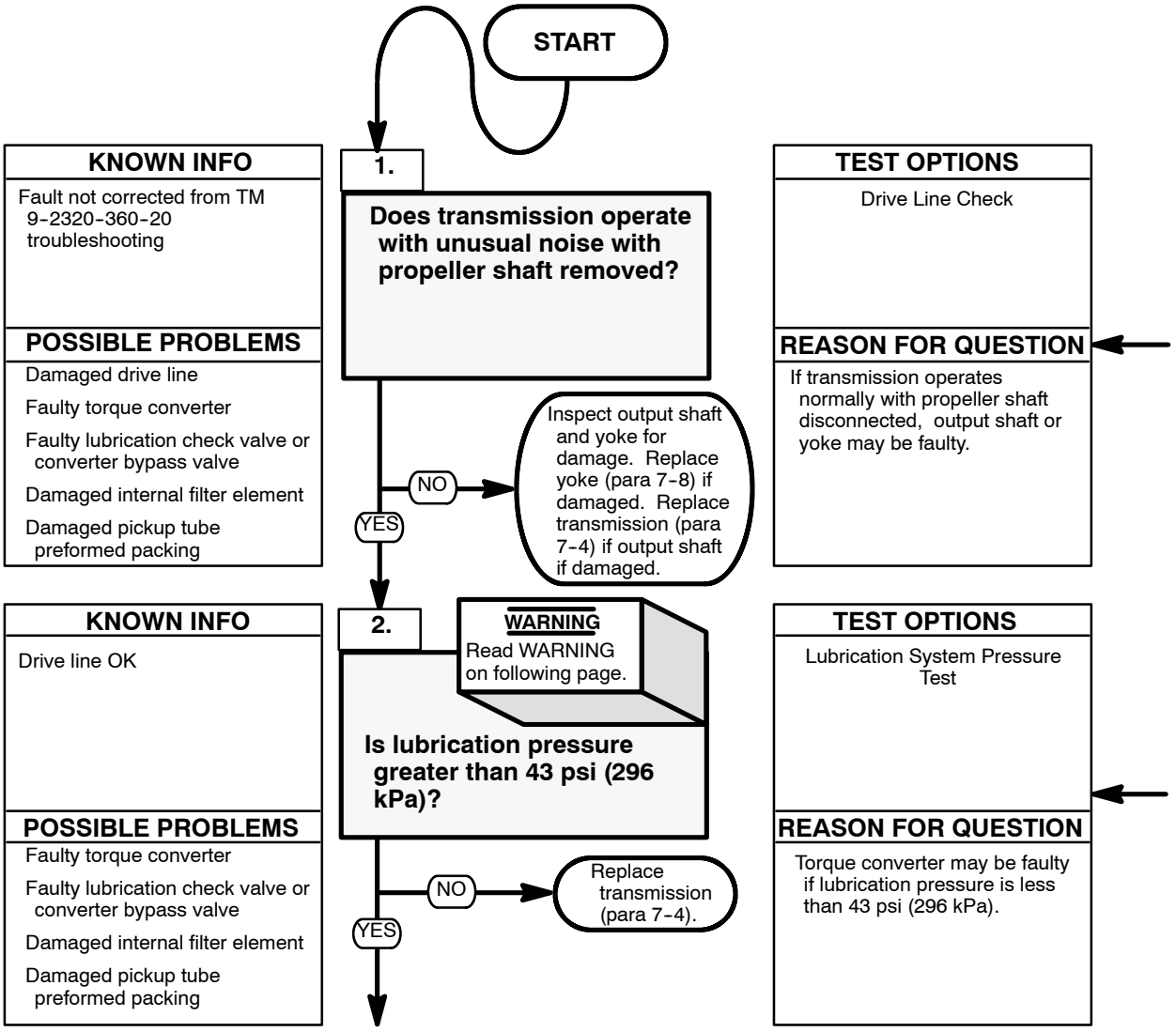


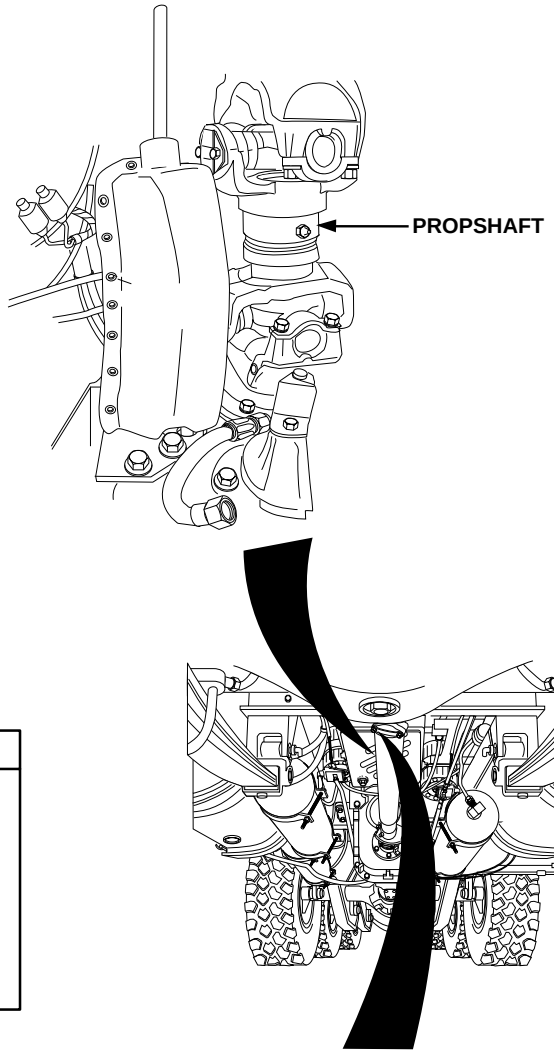
b2. TRANSMISSION UNUSUALLY NOISY WHEN OPERATING

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Goggles, Industrial (Item 57, Appendix E)





DRIVE LINE CHECK

(1) Remove propeller shaft from transmission output shaft (TM 9-2320-360-20).

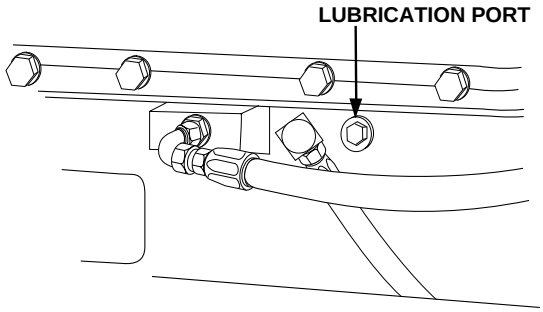
(2) Start engine (TM 9-2320-360-10) and shift transmission range selector through all ranges.

(3) Listen for unusual noises.

(4) Install propeller shaft on transmission output shaft (TM 9-2320-360-20).

WARNING

Wear approved eye protection when performing transmission pressure checks. Failure to comply may result in oil getting into eyes. If oil contacts eyes, seek medical attention immediately.



LUBRICATION SYSTEM PRESSURE TEST

(1) Remove plug from lubrication port on converter housing.

(2) Install 0-160 psi (0-1103 kPa) pressure gage on bottom of converter housing.

(3) Start engine (TM 9-2320-360-10) and operate at 1900 to 2100 rpm.

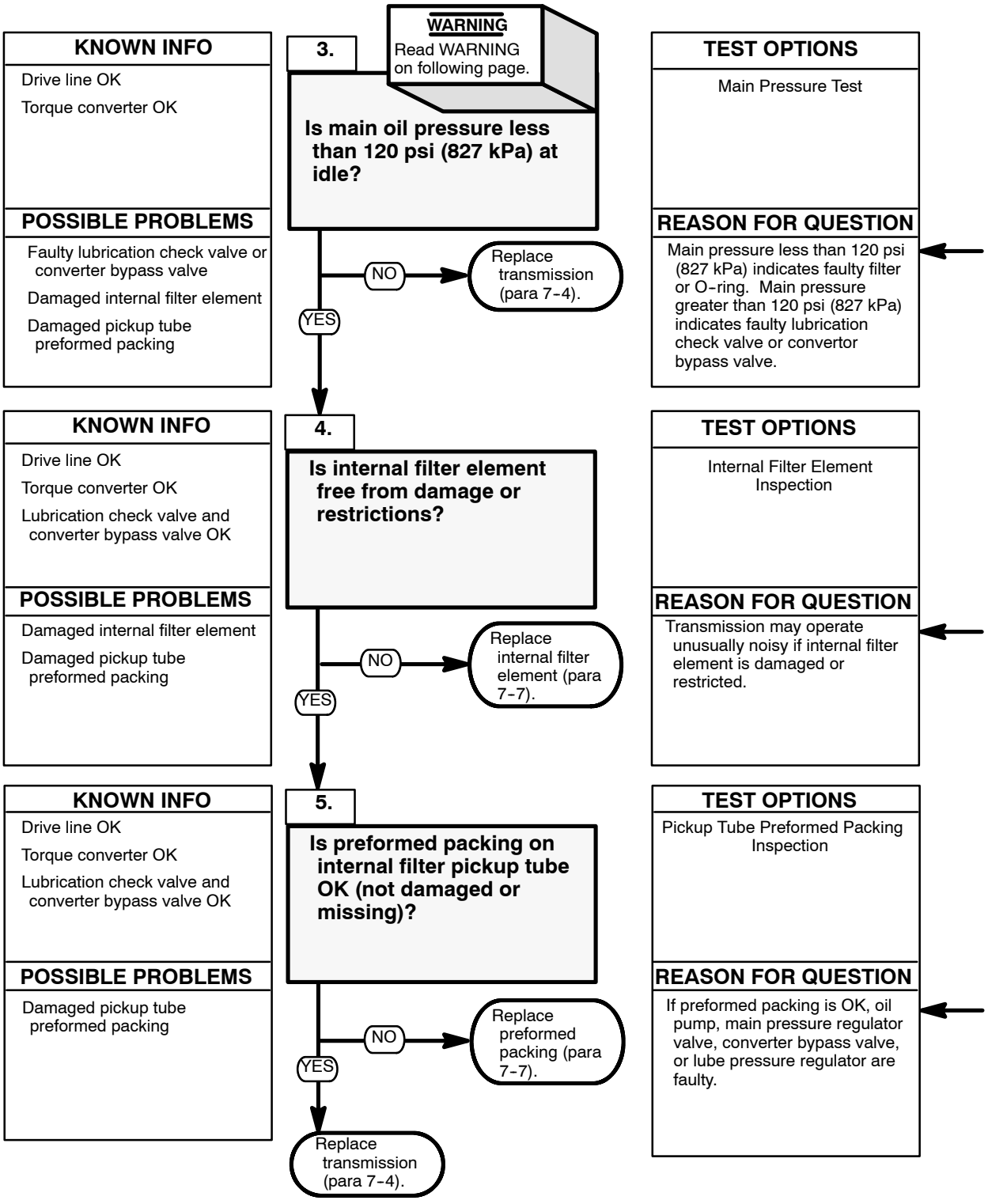
(4) Check reading on pressure gage.

(5) Shut off engine (TM 9-2320-360-10).

(6) Remove pressure gage from converter housing.

(7) Install plug in transmission lubrication port.

b2. TRANSMISSION UNUSUALLY NOISY WHEN OPERATING (CONT)



WARNING

Wear approved eye protection when performing transmission pressure checks. Failure to comply may result in oil getting into eyes. If oil contacts eyes, seek medical attention immediately.

MAIN PRESSURE TEST

(1) Remove main pressure oil line no. 2672 from main pressure port on transmission converter housing.

(2) Install tee, 0-2000 psi (0-13,790 kPa) gage and main pressure oil line no 2672 in main pressure port on converter housing.

(3) Start engine (TM 9-2320-360-10) and run at idle.

(4) With parking brake applied, position transmission range selector to 2-5 position.

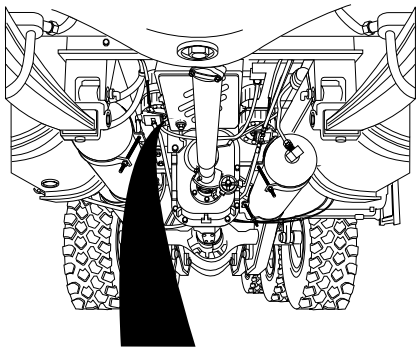
WARNING

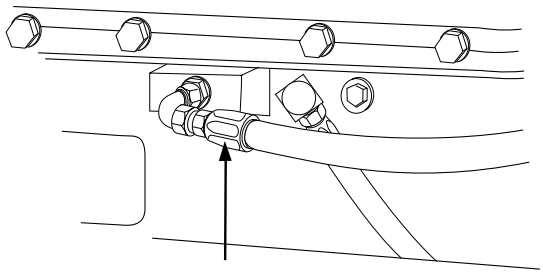
Do not stand in front of HET when testing main pressure. Brakes may release and vehicle could move causing personal injury or death.

(5) Check reading on pressure gage.

(6) Shut off engine (TM 9-2320-360-10).

(7) Remove pressure gage from main pressure oil line and install main pressure oil line on main pressure port.





MAIN PRESSURE OIL LINE NO. 2672

INTERNAL FILTER ELEMENT INSPECTION

(1) Remove oil pan (para 7-5).

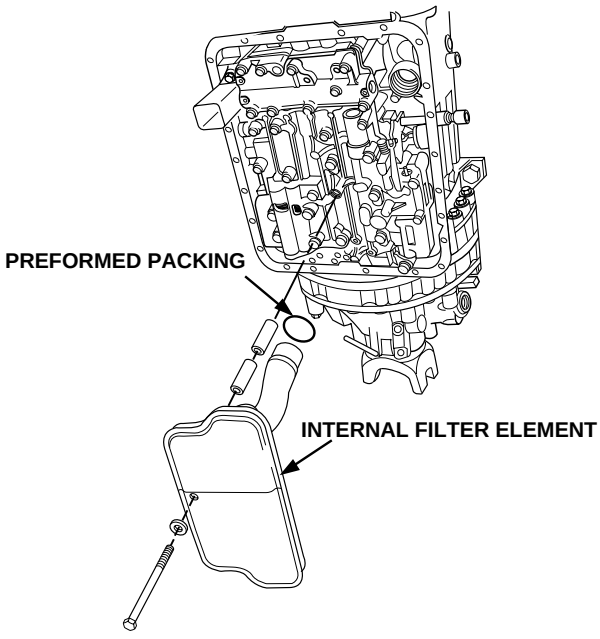
(2) Check internal filter element for damage or restrictions.

PICKUP TUBE PREFORMED PACKING INSPECTION

(1) Remove internal filter element (para 7-7).

(2) Inspect condition of internal filter preformed packing.

(3) Install internal filter element (para 7-7).

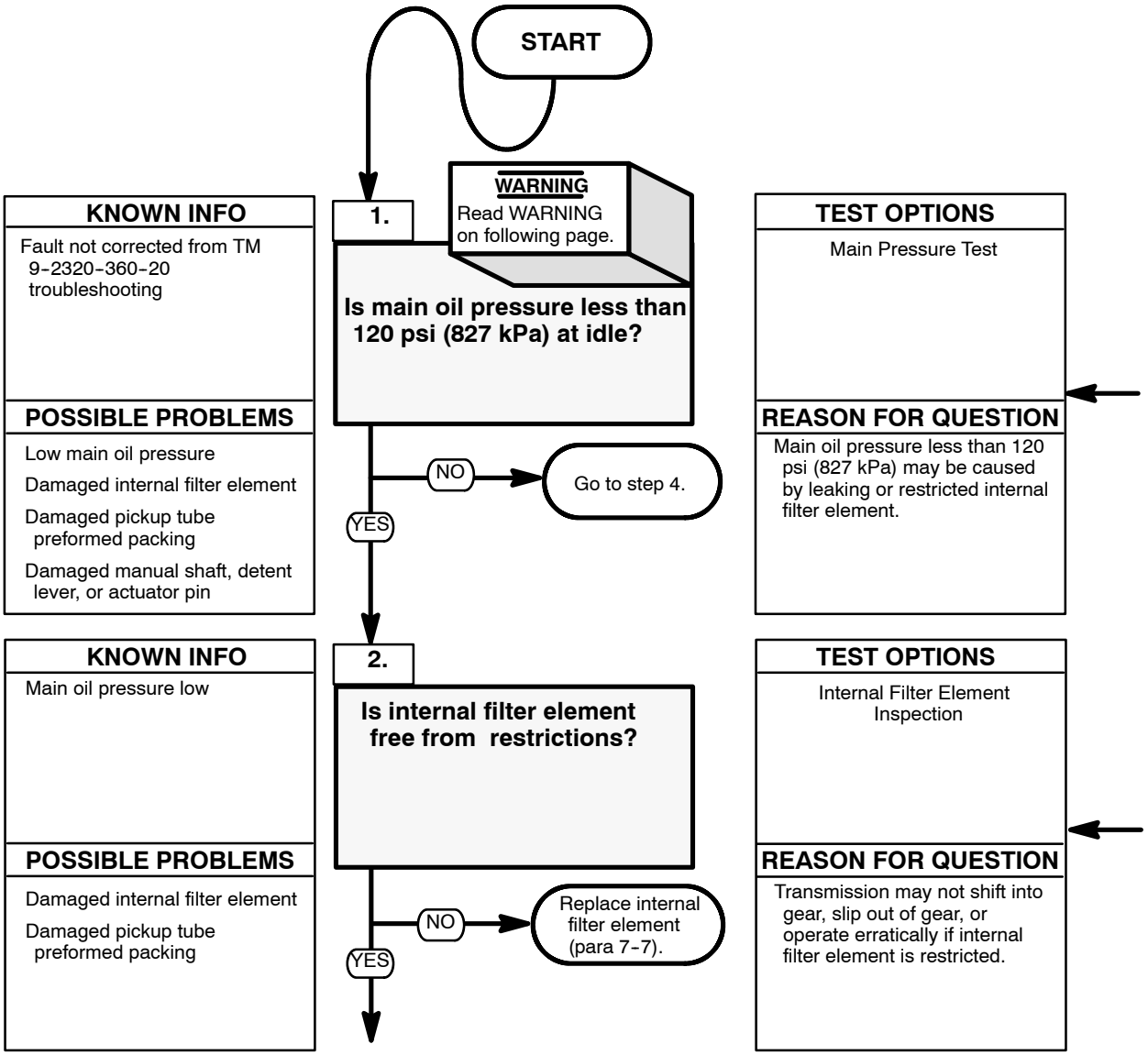


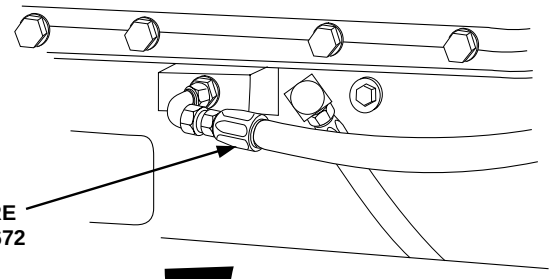
b3. TRANSMISSION WILL NOT SHIFT INTO GEAR, SLIPS OUT OF GEAR, OR OPERATES ERRATICALLY

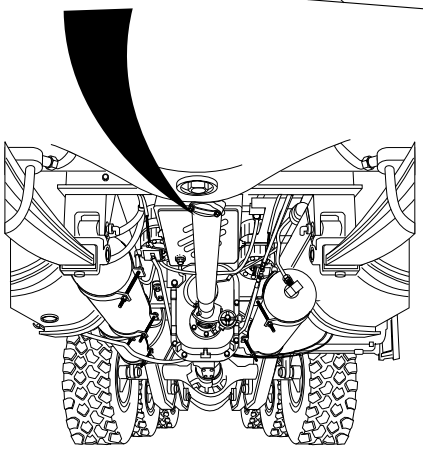
INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Goggles, Industrial (Item 57, Appendix E)







WARNING

Wear approved eye protection when performing transmission pressure checks. Failure to comply may result in oil getting into eyes. If oil contacts eyes, seek medical attention immediately.

MAIN PRESSURE TEST

(1) Remove main pressure oil line no. 2672 from main pressure port on transmission converter housing.

(2) Install tee, 0-2000 psi (0-13,790 kPa) gage and main pressure oil line no. 2672 in main pressure port on converter housing.

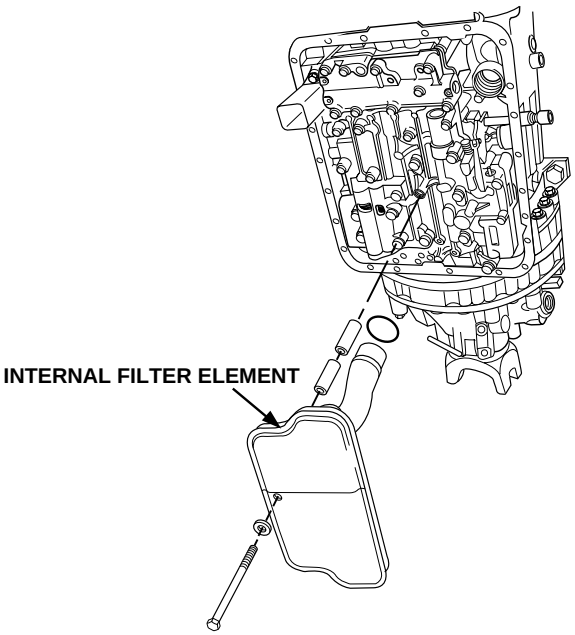
(3) Start engine (TM 9-2320-360-10) and run at idle.

(4) With parking brake applied, position transmission range selector to 2-5 position.

(5) Check reading on pressure gage.

(6) Shut off engine (TM 9-2320-360-10).

(7) Remove pressure gage from main pressure oil line and install main pressure oil line on main pressure port.

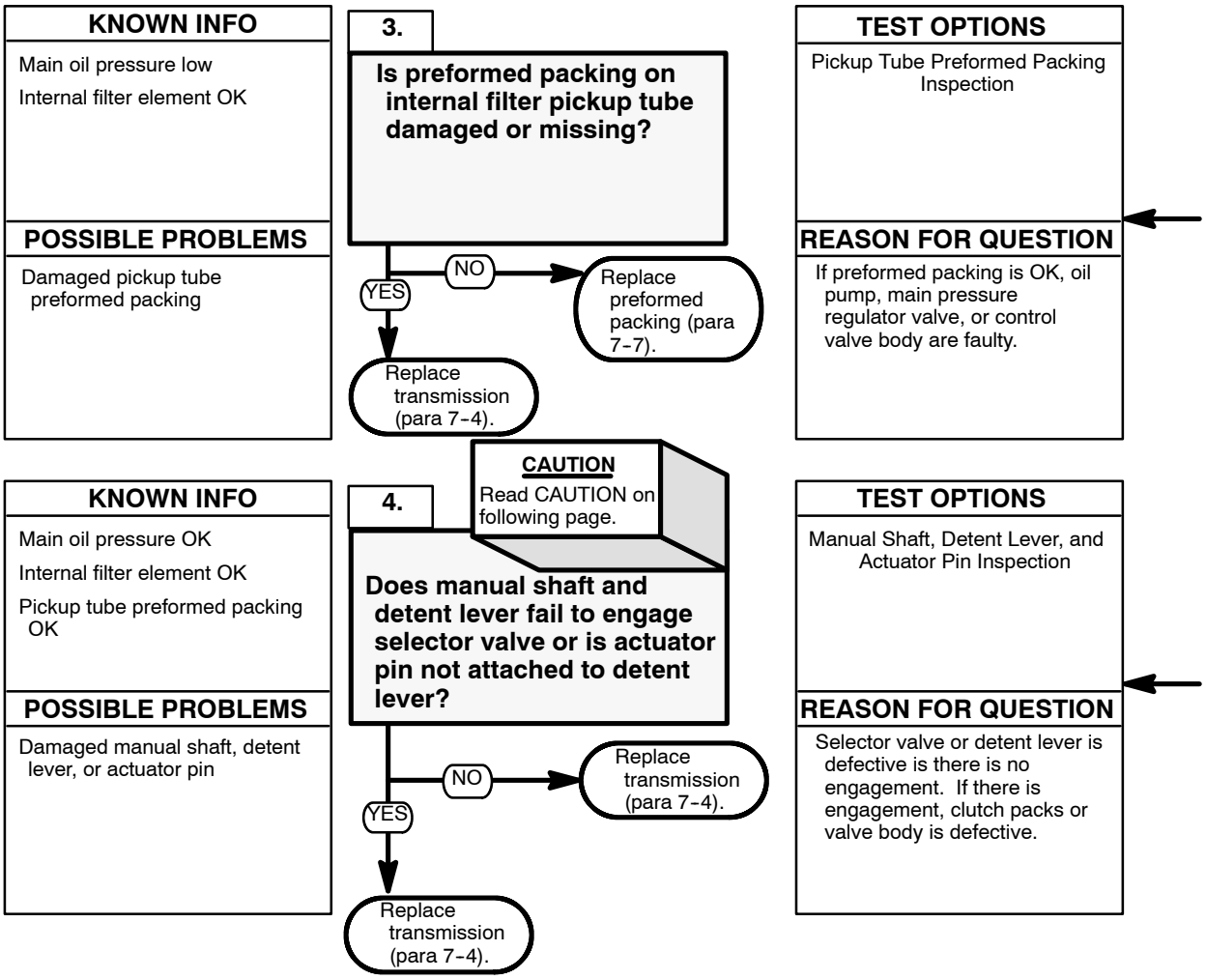


INTERNAL FILTER ELEMENT INSPECTION

(1) Remove oil pan (para 7-5).

(2) Check internal filter element for damage or restrictions.

b3. TRANSMISSION WILL NOT SHIFT INTO GEAR, SLIPS OUT OF GEAR, OR OPERATES ERRATICALLY (CONT)

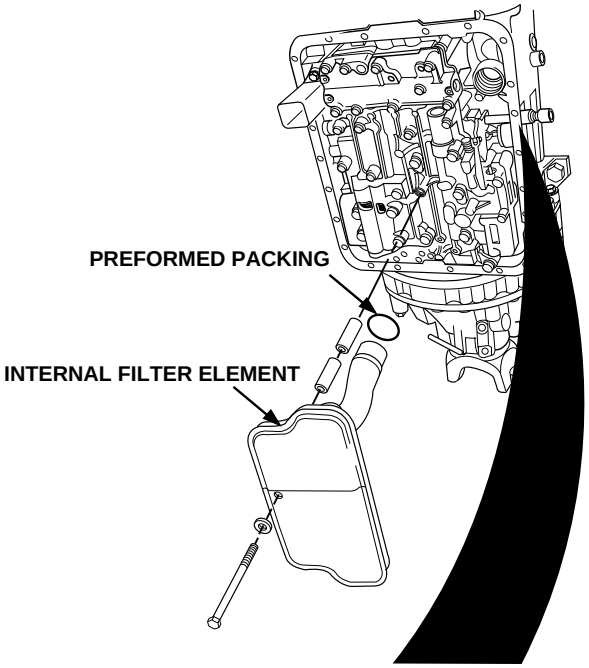


PICKUP TUBE PREFORMED PACKING INSPECTION

(1) Remove internal filter element (para 7-7).

(2) Inspect condition of internal filter preformed packing.

(3) Install internal filter element (para 7-7).



MANUAL SHAFT, DETENT LEVER, AND ACTUATOR PIN INSPECTION

(1) Remove oil pan (para 7-5).

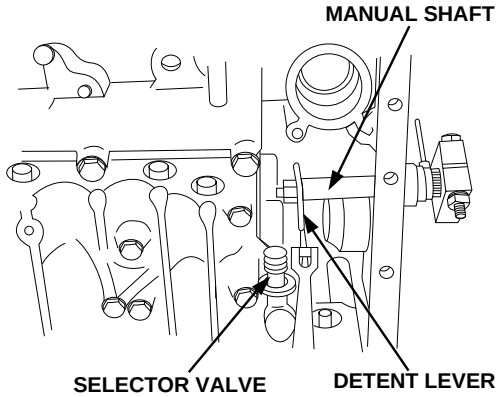
CAUTION

Do not start engine with transmission oil pan removed. Transmission will be damaged.

(2) Without engine running, shift transmission range selector through all gear ranges and check that manual shaft and detent lever engage with selector valve.

(3) Check for missing or damaged actuator pin.

(4) Install oil pan (para 7-5).



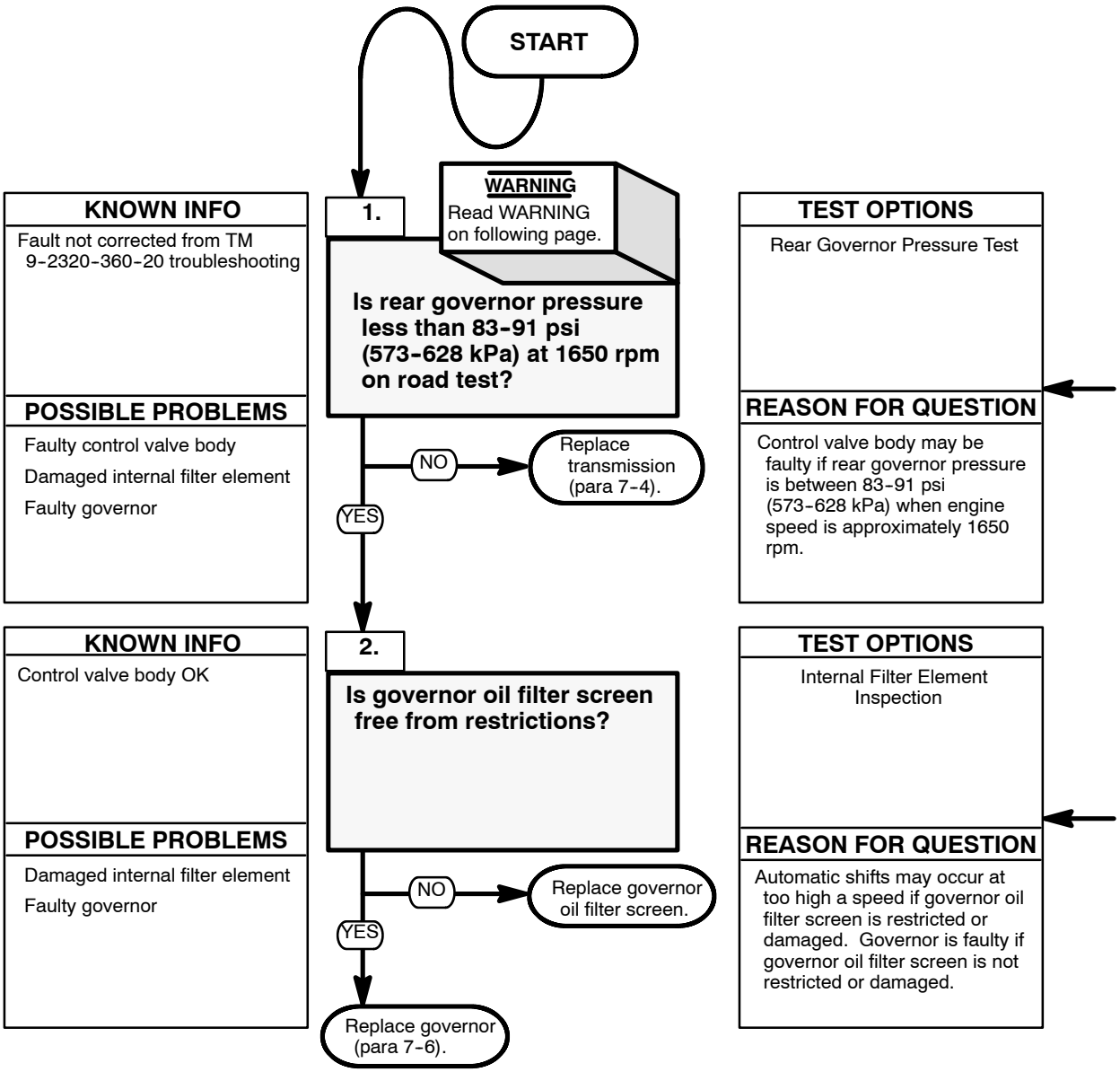
b4. AUTOMATIC SHIFTS OCCUR AT TOO HIGH A SPEED

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.
Lower engine access panel removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Goggles, Industrial (Item 57, Appendix E)

Personnel Required
Two



WARNING

Wear approved eye protection when performing transmission pressure checks. Failure to comply may result in oil getting into eyes. If oil contacts eyes, seek medical attention immediately.

REAR GOVERNOR PRESSURE TEST

(1) Remove plug from rear governor test port.

(2) Install 0-160 psi (0-1103 kPa) pressure gage on rear governor test port.

(3) Remove lower engine access panel (TM 9-2320-360-20).

(4) Route pressure gage and hose thru doghouse.

(5) Start engine (TM 9-2320-360-10).

(6) Position transmission range selector to 2-5 position.

(7) Release parking brake (TM 9-2320-360-10) and drive vehicle.

(8) Check reading on pressure gage when rpm reaches 1650, in 5th gear at approximately 35 mph with aid of assistant

(9) Shut off engine (TM 9-2320-360-10).

(10) Remove pressure gage from rear governor test port.

(11) Install plug on rear governor test port.

(12) Install lower engine access panel (TM 9-2320-360-20)

INTERNAL FILTER ELEMENT INSPECTION

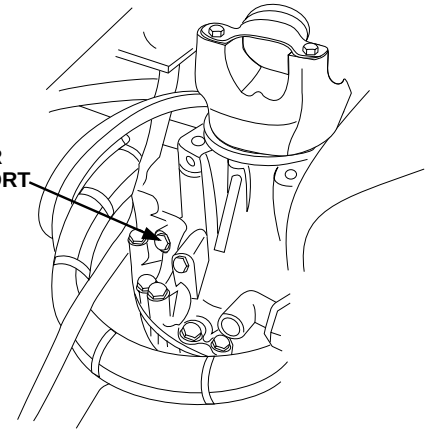
(1) Remove oil pan (para 7-5).

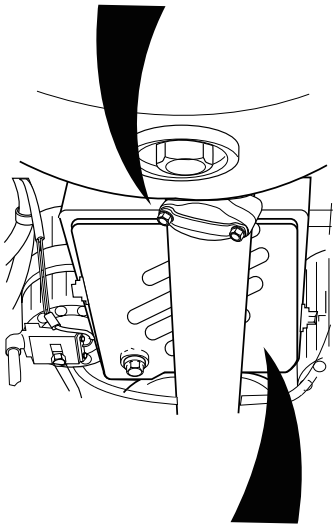
(2) Remove plug and governor oil filter screen.

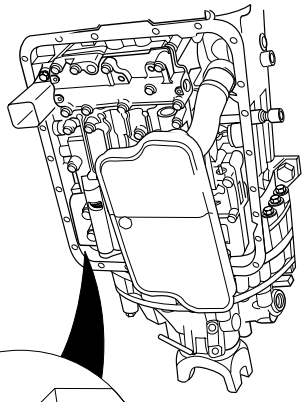
(3) Check internal filter element and oil filter screen for restrictions.

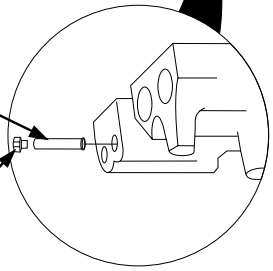
(4) Install governor oil filter screen and plug.

(5) Install oil pan (para 7-5).









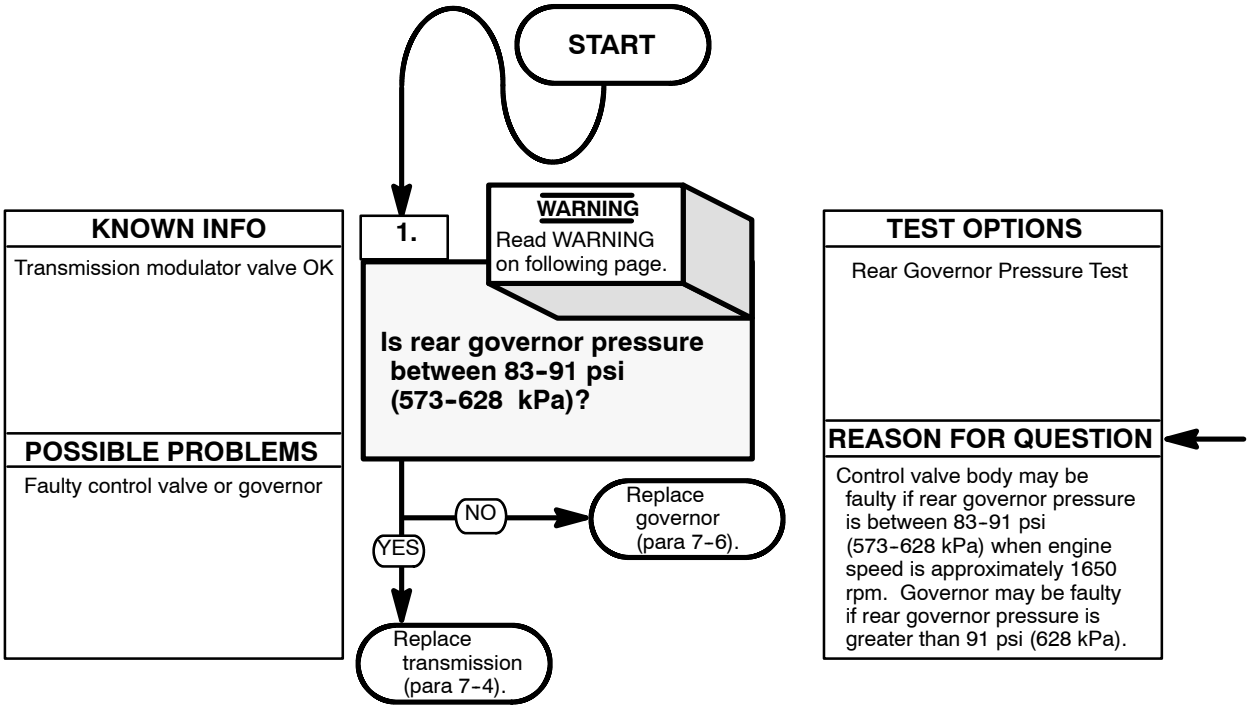
b5. AUTOMATIC SHIFTS OCCUR AT TOO LOW A SPEED

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Personnel Required
Two

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Goggles, Industrial (Item 57, Appendix E)



WARNING

Wear approved eye protection when performing transmission pressure checks. Failure to comply may result in oil getting into eyes. If oil contacts eyes, seek medical attention immediately.

NOTE

This fault will only occur if the control valve is faulty or if the governor pressure is too high. Therefore the governor oil filter screen cannot be at fault in this case.

REAR GOVERNOR PRESSURE TEST

(1) Remove plug from rear governor test port.

(2) Install 0-160 psi (0-1103 kPa) pressure gage on rear governor test port.

(3) Start engine (TM 9-2320-360-10).

(4) Position transmission range selector to 2-5 position.

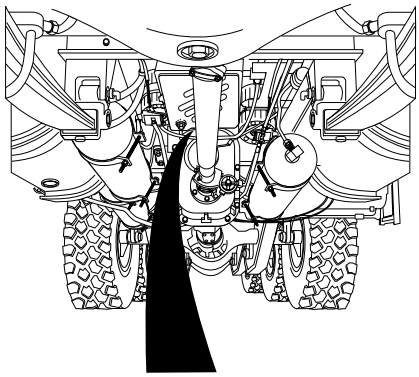
(5) Release parking brake (TM 9-2320-360-10) and drive vehicle.

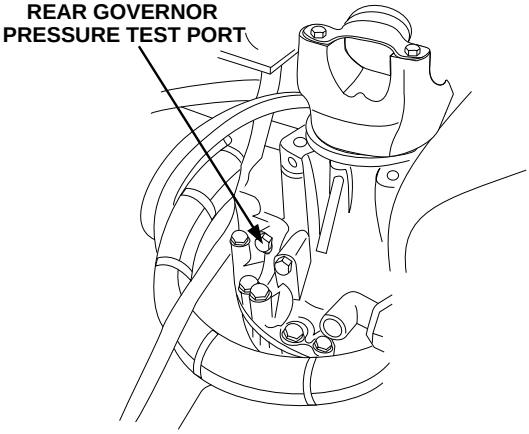
(6) Check reading on pressure gage when rpm reaches 1650, in 5th gear at approximately 35 mph, with aid of assistant.

(7) Shut off engine (TM 9-2320-360-10).

(8) Remove pressure gage from rear governor test port.

(9) Install plug on rear governor test port.



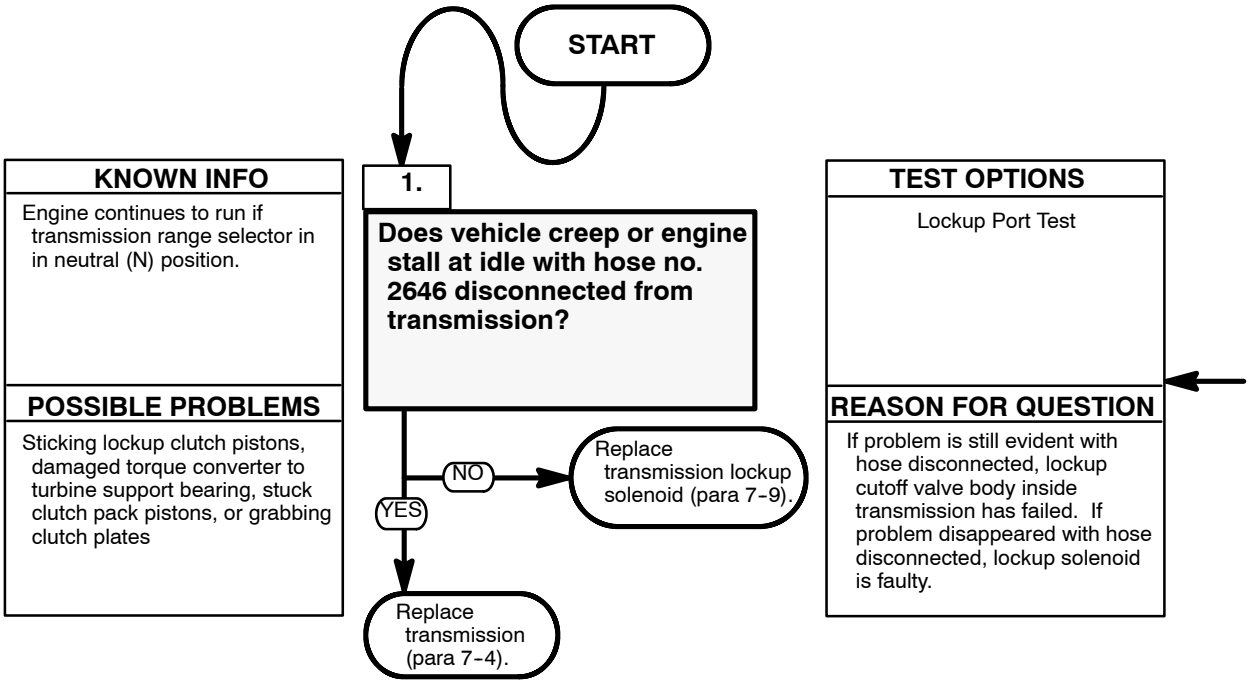


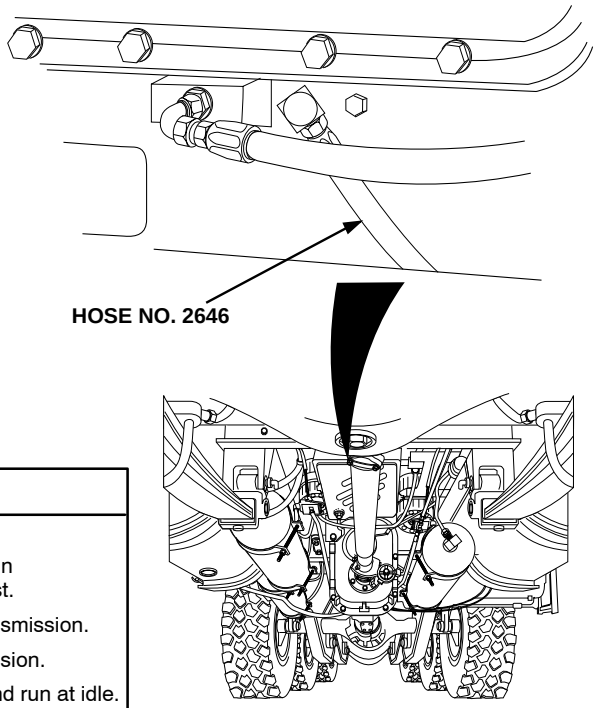
b7. ENGINE STALLS AT IDLE WHEN IN GEAR

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202,Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)





LOCKUP PORT TEST

NOTE

PTO and engine brake switches must be in the OFF position before beginning this test.

(1) Remove hose no. 2646 from lockup port on transmission.

(2) Plug hose no. 2646 and lockup port on transmission.

(3) Attempt to start engine (TM 9-2320-360-10) and run at idle.

(4) Position transmission range selector to 2-5 position.

(5) Position transmission range selector to R (reverse) position.

(6) Position transmission range selector to N (neutral) position.

(7) Shut off engine (TM 9-2320-360-10).

(8) Remove plugs from hose no. 2646 and lockup port on transmission.

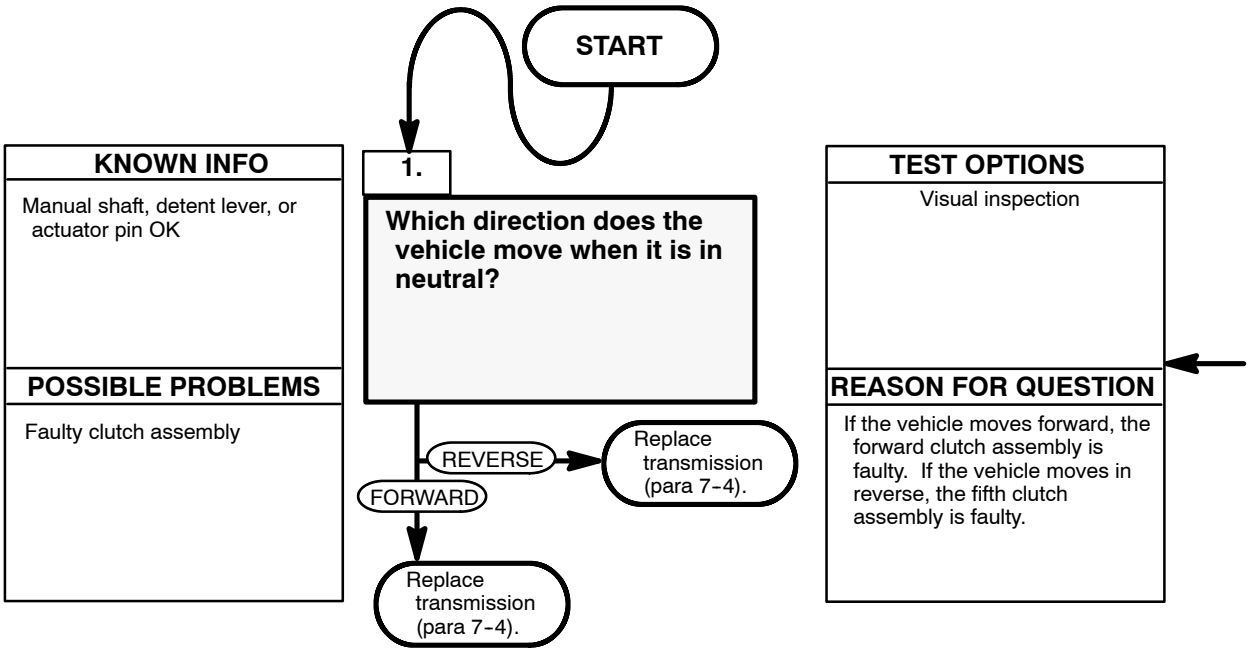
(9) Install hose no. 2646 on transmission lockup port.

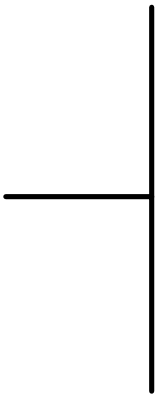
b8. VEHICLE MOVES IN NEUTRAL

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202,Appendix E)





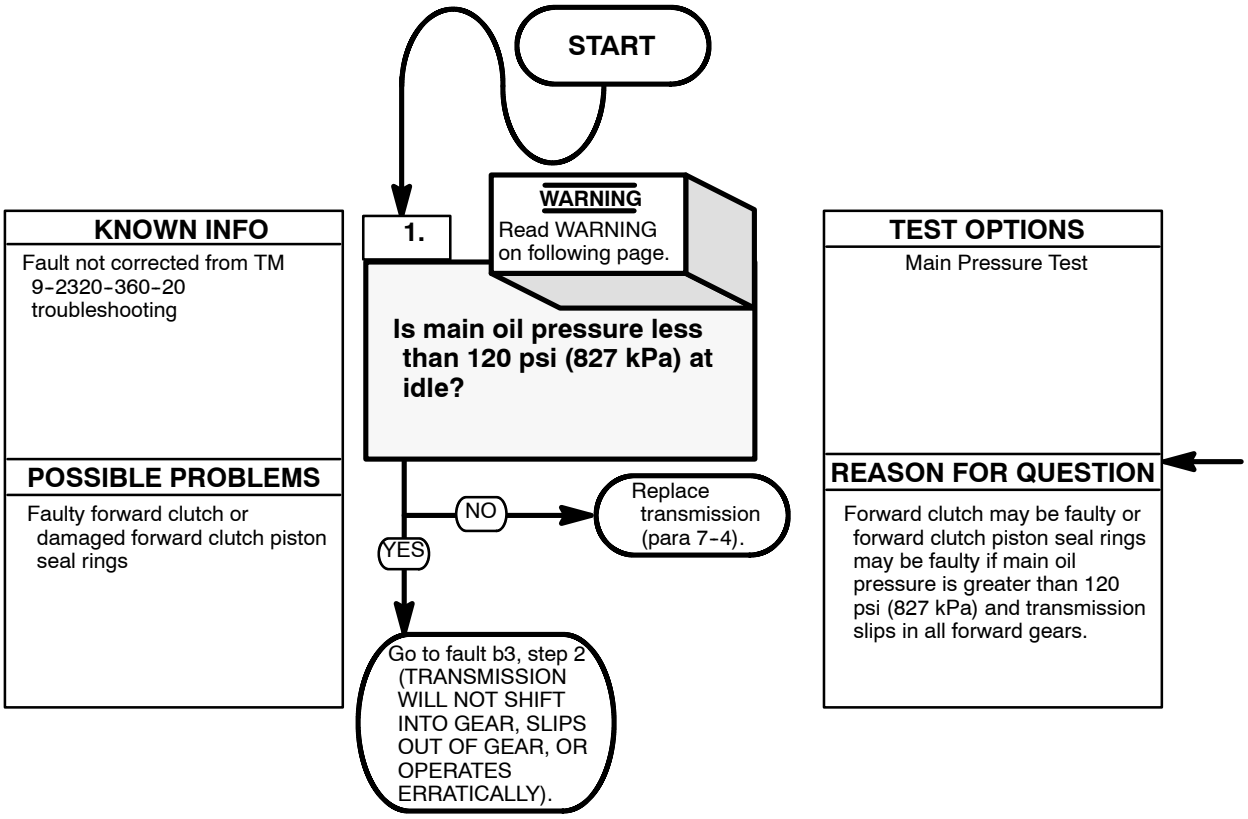
Start engine (TM 9-2320-360-10). With transmission range selector in N (neutral) note which direction vehicle moves.

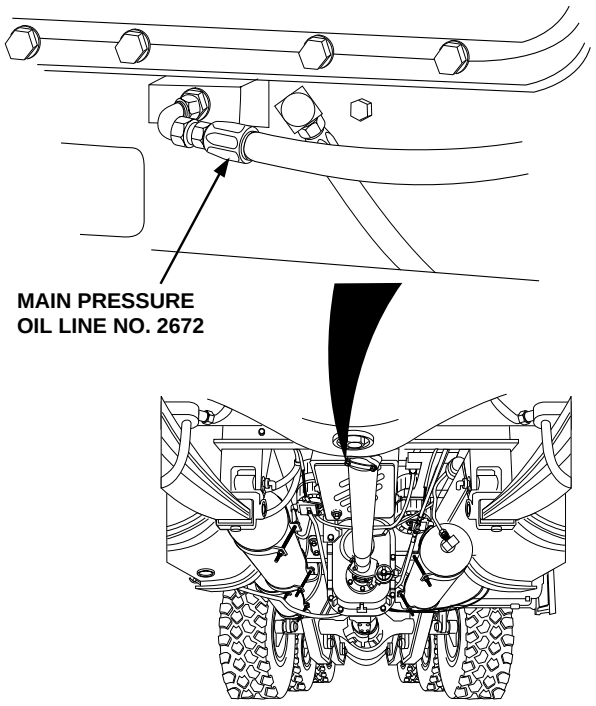
b9. TRANSMISSION SLIPS IN ALL FORWARD GEARS

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Goggles, Industrial (Item 57, Appendix E)





WARNING

Wear approved eye protection when performing transmission pressure checks. Failure to comply may result in oil getting into eyes. If oil contacts eyes, seek medical attention immediately.

MAIN PRESSURE TEST

(1) Remove main pressure oil line no. 2672 from main pressure port on transmission converter housing.

(2) Install tee, 0-2000 psi (0-13,790 kPa) pressure gage, and main pressure oil line no. 2672 in main pressure port on converter housing.

(3) Start engine (TM 9-2320-360-10) and run at idle.

(4) With parking brake applied, position transmission range selector to 2-5 position.

(5) Check reading on pressure gage.

(6) Shut off engine (TM 9-2320-360-10).

(7) Remove pressure gage from main pressure oil line and install main pressure oil line on main pressure port.

c. TRANSFER CASE

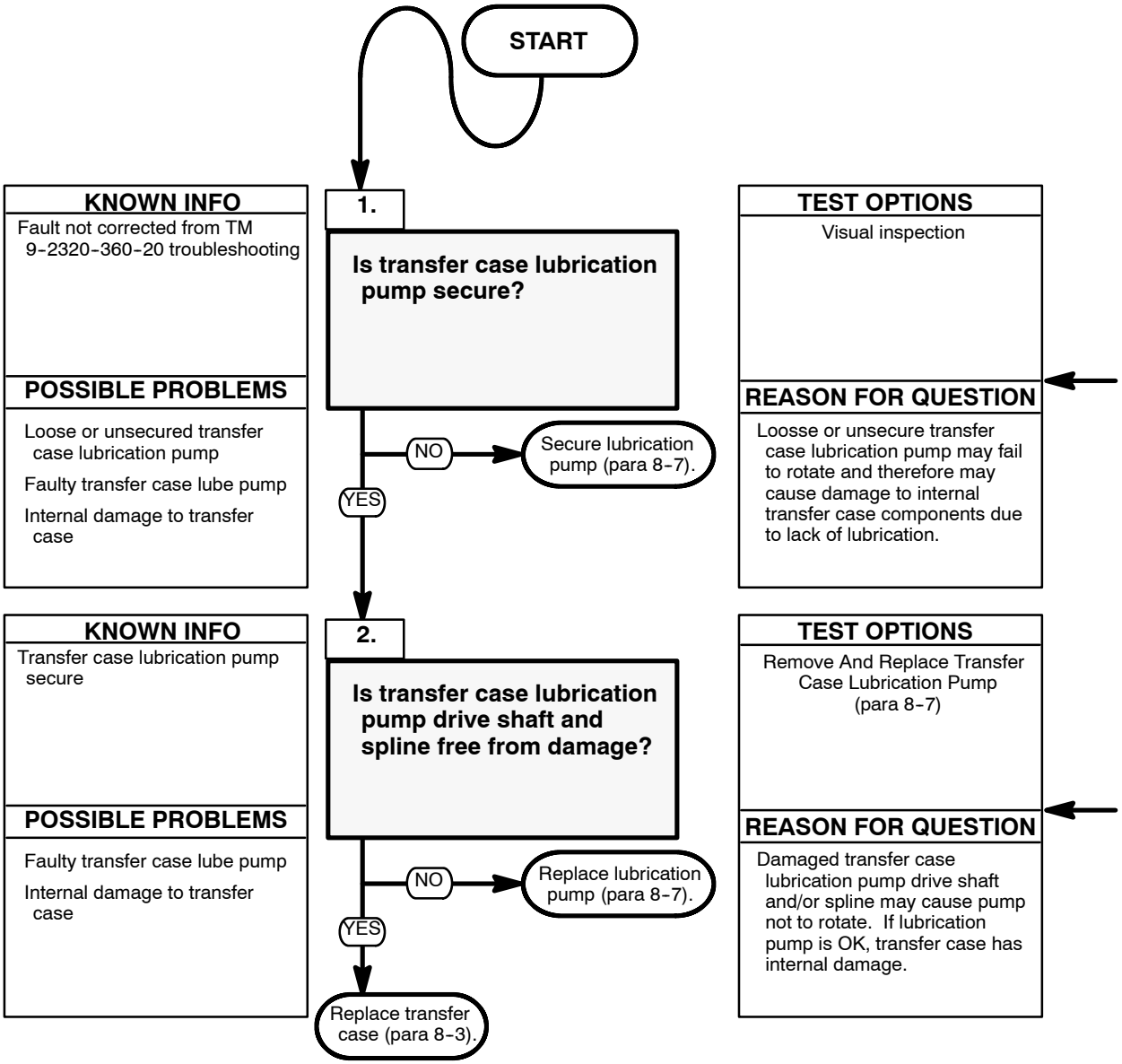
Malfunction	Troubleshooting Procedure (Page)
c1. Transfer case unusually noisy and/or overheats when operating.	2-124
c2. Transfer case does not shift into HIGH or LOW, or slips out of gear.	2-126
c3. Transfer case does not engage front axle.	2-130

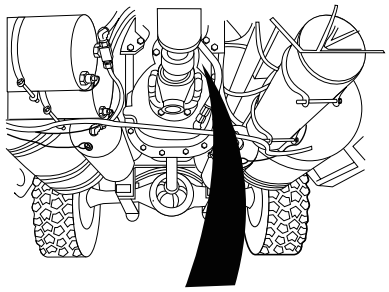
c1. TRANSFER CASE UNUSUALLY NOISY AND/OR OVERHEATS WHEN OPERATING

INITIAL SETUP

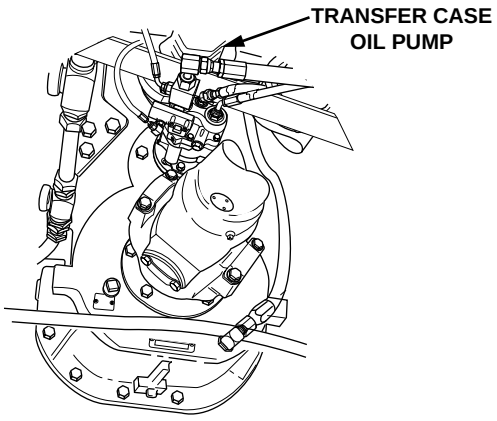
Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)





Check transfer case oil pump for damaged, loose, worn, or missing mounting hardware.



Refer to para 8-7 to remove, inspect, and replace transfer case lubrication pump.

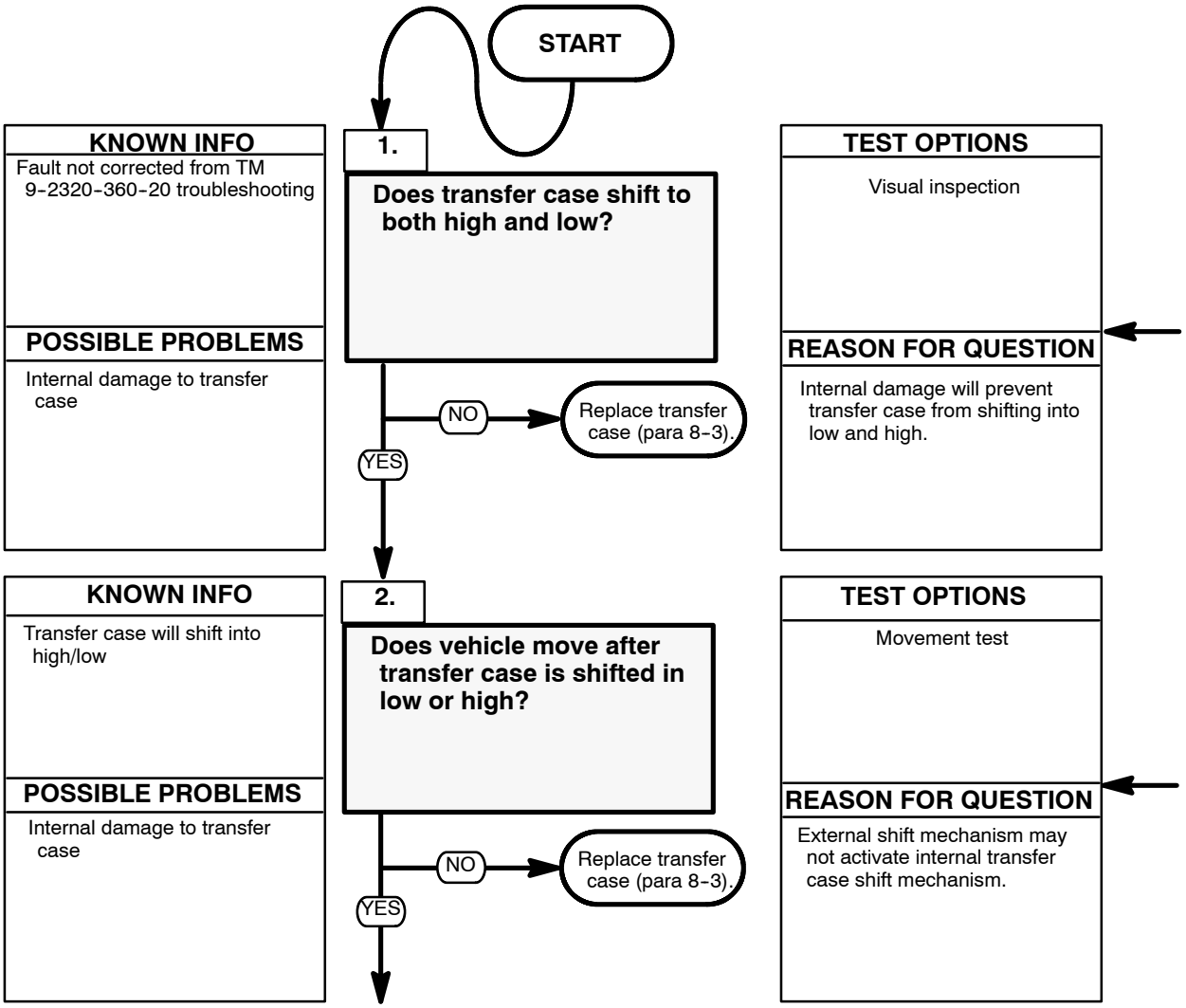
c2. TRANSFER CASE DOES NOT SHIFT INTO HIGH OR LOW, OR SLIPS OUT OF GEAR

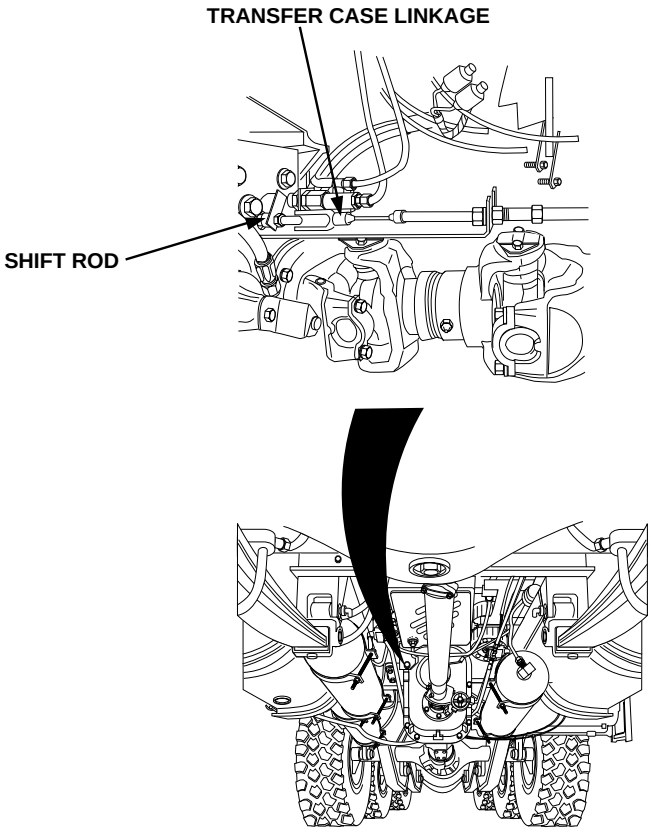
INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Personnel required:
Two



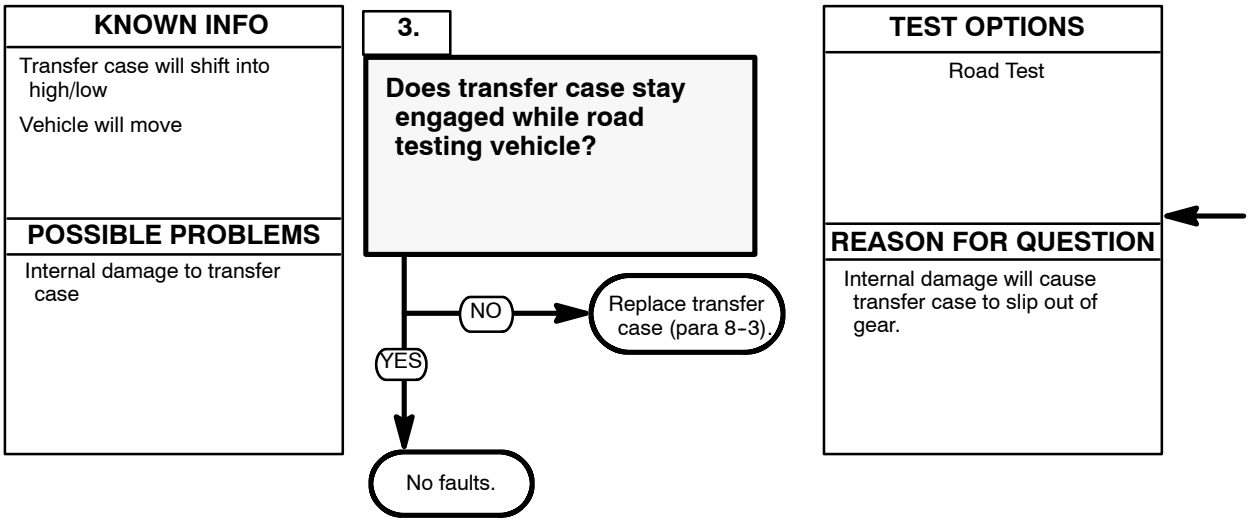


Check transfer case linkage at transfer to see if shift rod attempts to move.

MOVEMENT TEST

(1) Start engine (TM 9-2320-360-10).
(2) Shift transfer case to low (TM 9-2320-360-10).
(3) Shift transmission to D (TM 9-2320-360-10).
(4) Attempt to move vehicle.
(5) Stop vehicle.
(6) Shift transmission to neutral (TM 9-2320-360-10).
(7) Shift transfer case to high (TM 9-2320-360-10).
(8) Shift transmission to D (TM 9-2320-360-10).
(9) Attempt to move vehicle.
(10) Stop vehicle.
(11) Shut off engine (TM 9-2320-360-10).

c2. TRANSFER CASE DOES NOT SHIFT INTO HIGH OR LOW, OR SLIPS OUT OF GEAR (CONT)



(1) Drive HET Tractor (TM 9-2320-360-10).

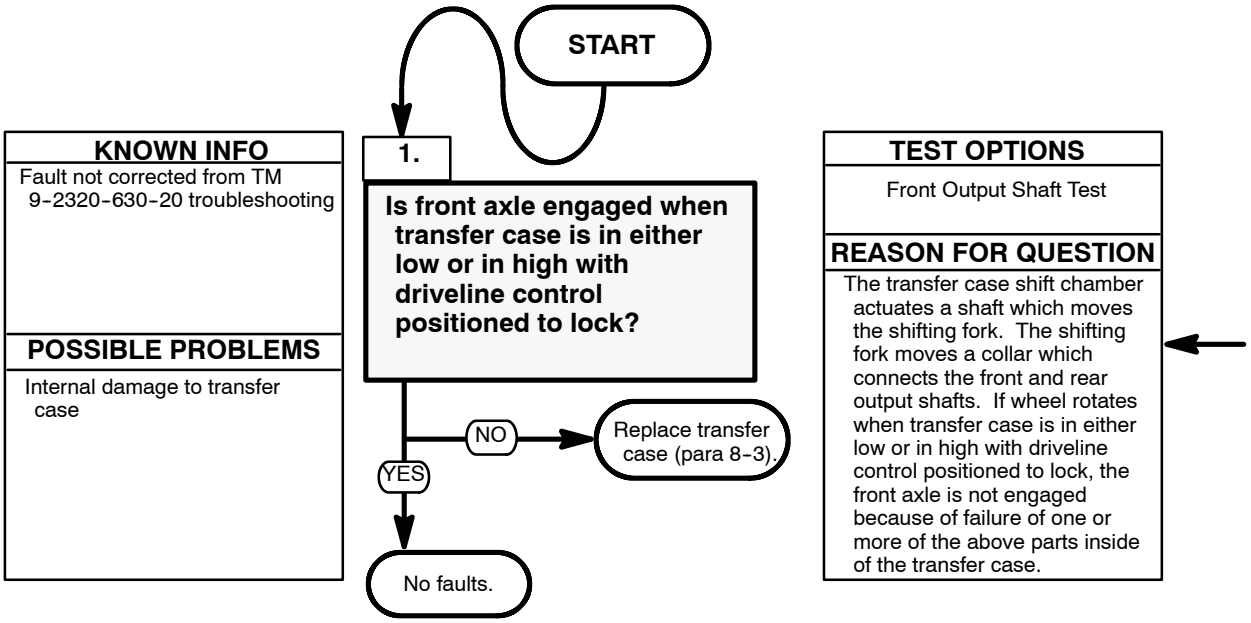
(2) Road test for at least 10 miles (16.1 km) over varying terrain or until transfer case slips out of gear.

c3. TRANSFER CASE DOES NOT ENGAGE FRONT AXLE

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack Hydraulic, 12 Ton (Item 91, Appendix E)
Jackstand, 7 Ton (Item 93, Appendix E)



FRONT OUTPUT SHAFT TEST

(1) Jack one front wheel up so wheel does not touch ground (TM 9-2320-360-20).

(2) Position jackstand under axle.

(3) Shift transfer case to low (TM 9-2320-360-10).

(4) Attempt to rotate front wheel in both directions.

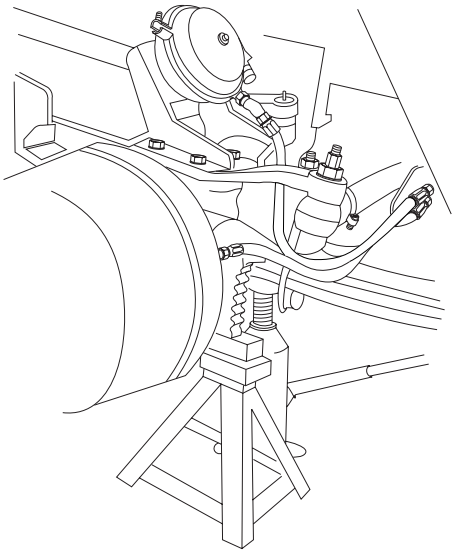
(5) Shift transfer case to high (TM 9-2320-360-10).

(6) Position driveline control valve to lock (TM 9-2320-360-10).

(7) Attempt to rotate front wheel in both directions.

(8) Remove jackstand from under axle.

(9) Lower front wheel and remove jack.



TIRE REMOVED FOR CLARITY

d. AXLES

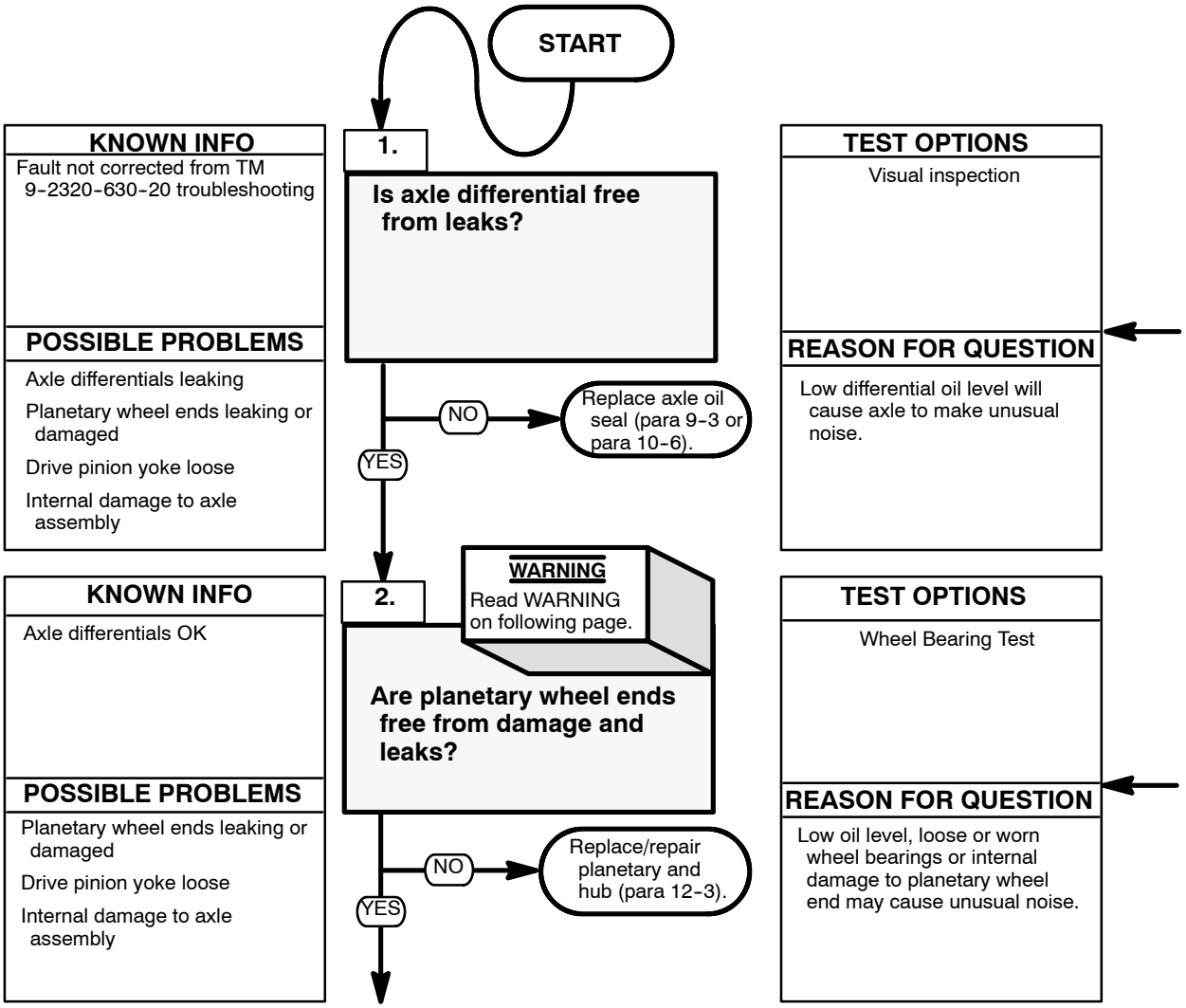
Malfunction	Troubleshooting Procedure (Page)
d1. Axle unusually noisy when operating	2-134
d2. Interaxle lockup does not engage	2-138

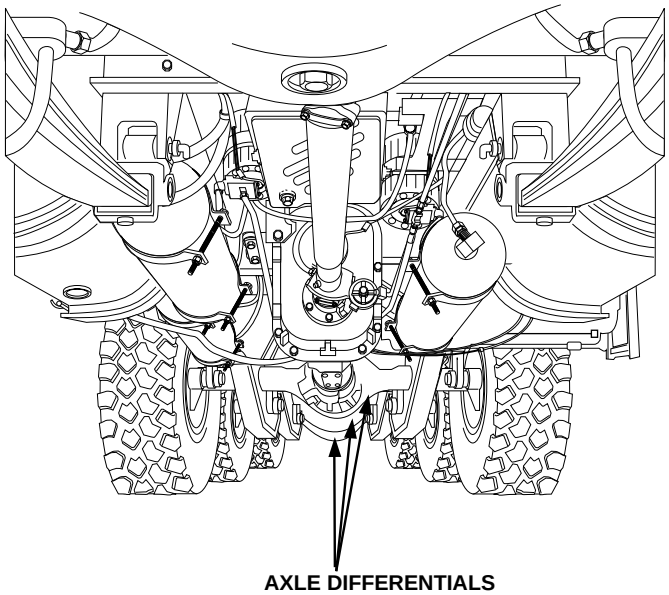
d1. AXLE UNUSUALLY NOISY WHEN OPERATING

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

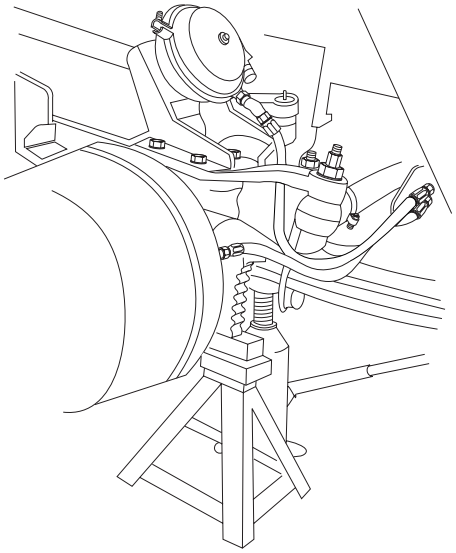
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)





AXLE DIFFERENTIALS

Check differential input and output shafts for leaks and damage.



TIRE REMOVED FOR CLARITY

WHEEL BEARING CHECK

WARNING

HET Tractor must be on level ground and wheels must be chocked before parking brake is released. Otherwise, HET Tractor may roll and cause personnel injury.

(1) Remove tire (TM 9-2320-360-20) from axle that is unusually noisy when operating.

NOTE

- Wheel bearings are loose, worn, or damaged if hub is loose, or rotates roughly.
- Perform step (2) only if working on rear three axles.

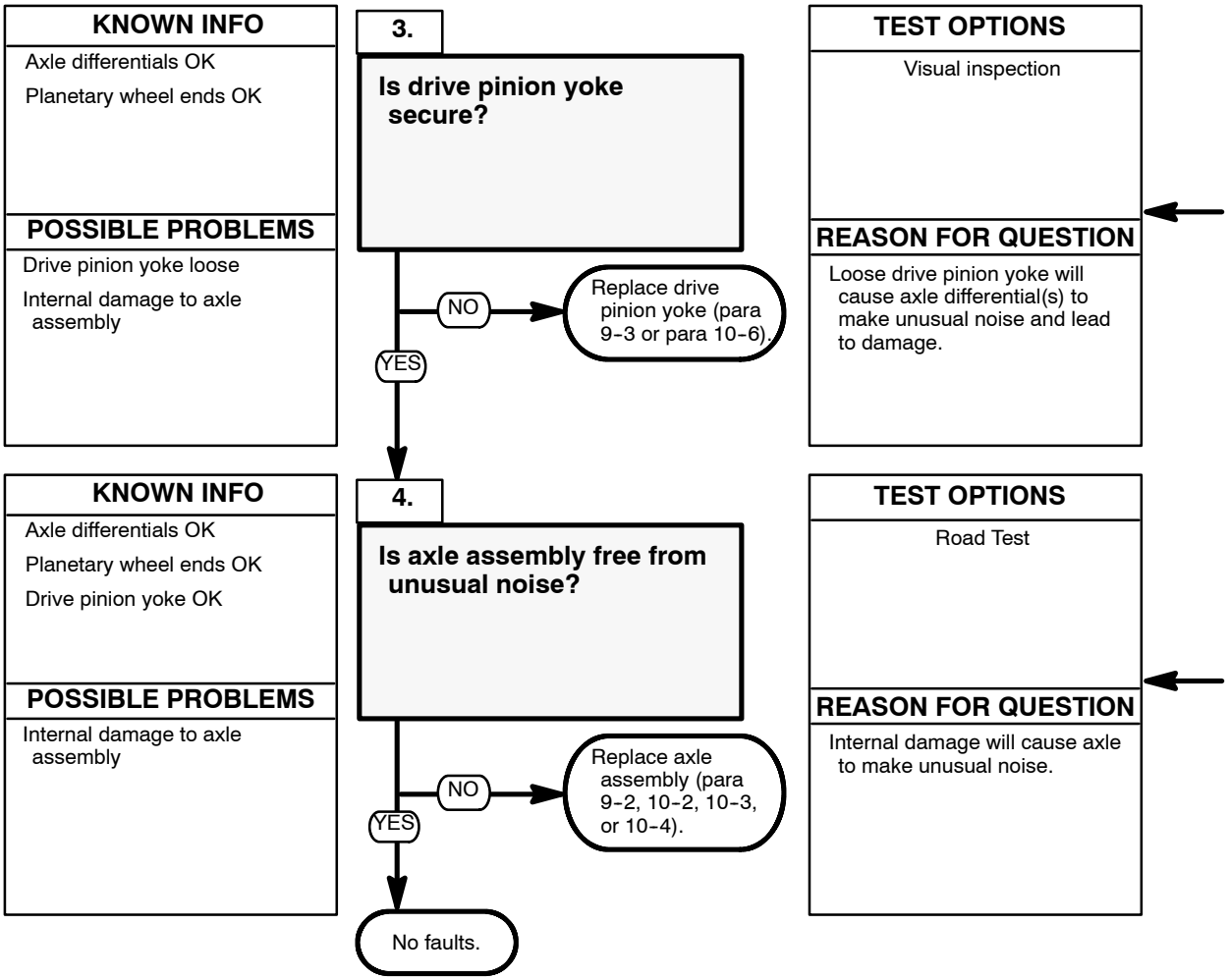
(2) Chock wheels and release parking brake (TM 9-2320-360-10).

(3) Rotate hub and check for looseness, roughness and/or leaks.

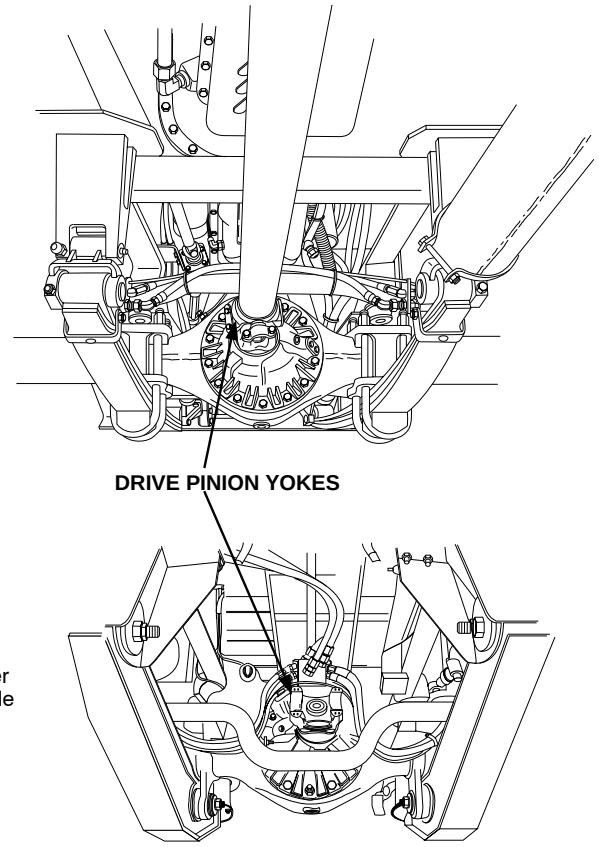
(4) Install tire (TM 9-2320-360-20) on axle.

(5) Repeat steps (1) through (4) for other tire on axle.

d1. AXLE UNUSUALLY NOISY WHEN OPERATING (CONT)



Check drive pinion yoke for looseness and for missing or damaged hardware.



(1) Drive HET Tractor (TM 9-2320-360-10).

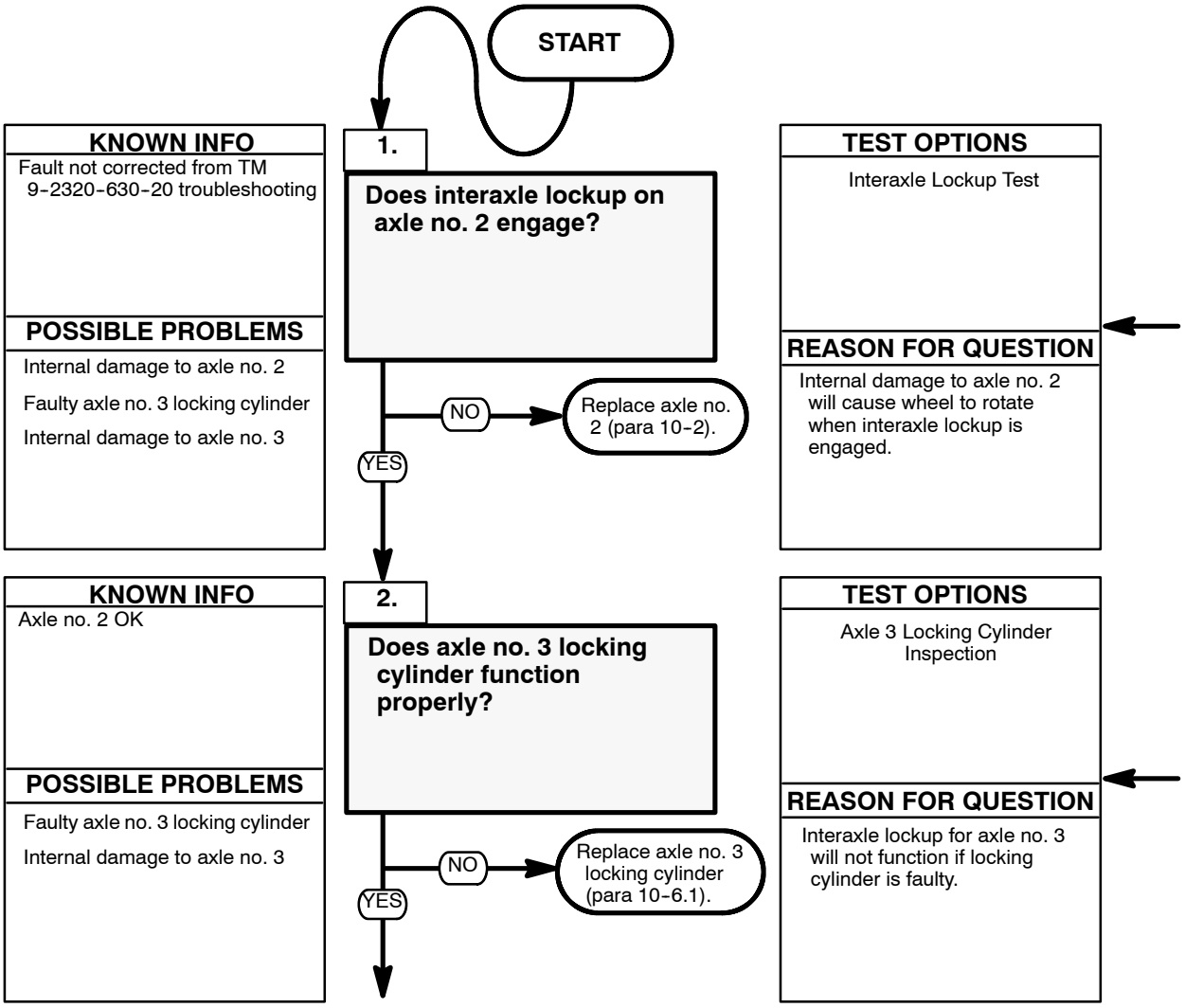
(2) Road test for at least 10 miles (16.1 km) over varying terrain while listening for unusual axle noise.

d2. INTERAXLE LOCKUP DOES NOT ENGAGE

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)



INTERAXLE LOCKUP TEST

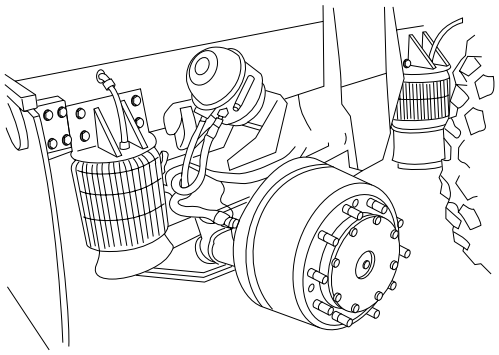
(1) Jack up one wheel on axle no. 2 so wheel does not touch ground (TM 9-2320-360-20).

(2) Shift transfer case to low (TM 9-2320-360-10).

(3) Move driveline control to lock position (TM 9-2320-360-10).

(4) Attempt to rotate wheel in both directions.

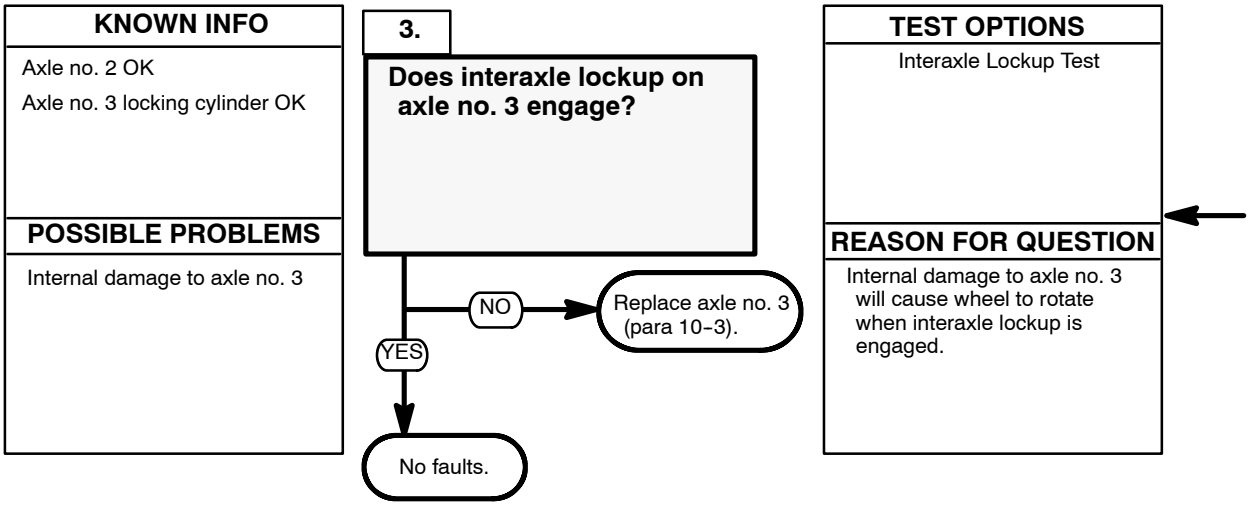
(5) Lower and remove jack (TM 9-2320-360-20).



TIRE REMOVED FOR CLARITY

Refer to para 10-6.1 for inspection/adjustment of axle no. 3 locking cylinder.

d2. INTERAXLE LOCKUP DOES NOT ENGAGE (CONT)

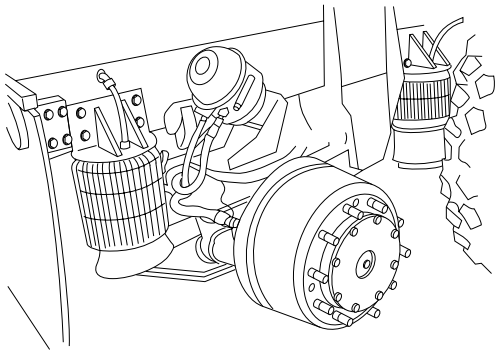


INTERAXLE LOCKUP TEST

(1) Jack up one wheel on axle no. 3 so wheel does not touch ground (TM 9-2320-360-20).

(2) Attempt to rotate wheel in both directions.

(3) Lower and remove jack (TM 9-2320-360-20).



TIRE REMOVED FOR CLARITY

e. STEERING SYSTEM

Malfunction	Troubleshooting Procedure (Page)
e1 Steering binds, does not return to straight ahead after turns	2-142
e2 Excessive play when turning steering wheel, wanders, pulls to one side or shimmies	2-150
e3 Hard to steer in one direction	2-156
e4 Hard to steer in both directions	2-158

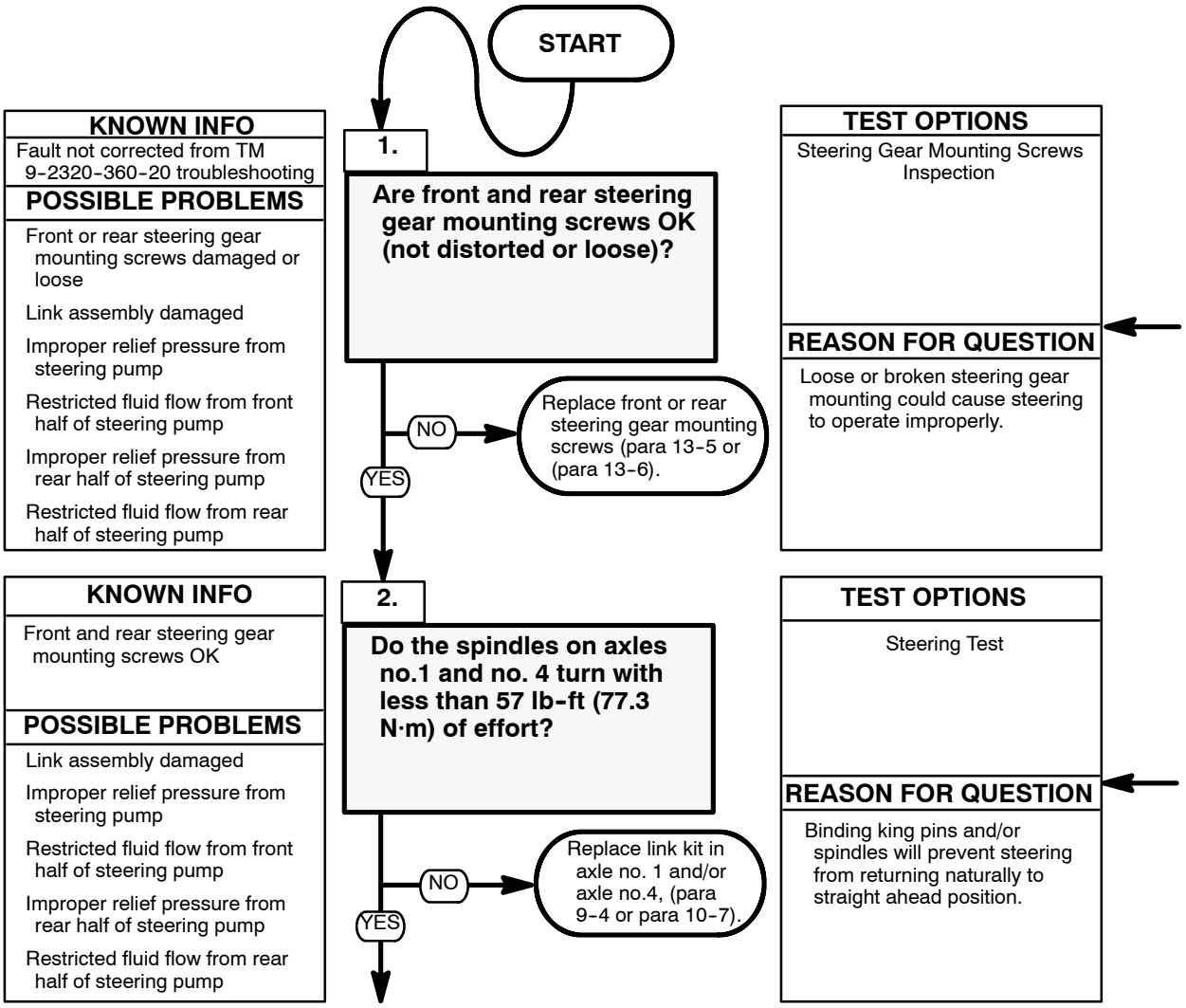
e1. STEERING BINDS, DOES NOT RETURN TO STRAIGHT AHEAD AFTER TURNS

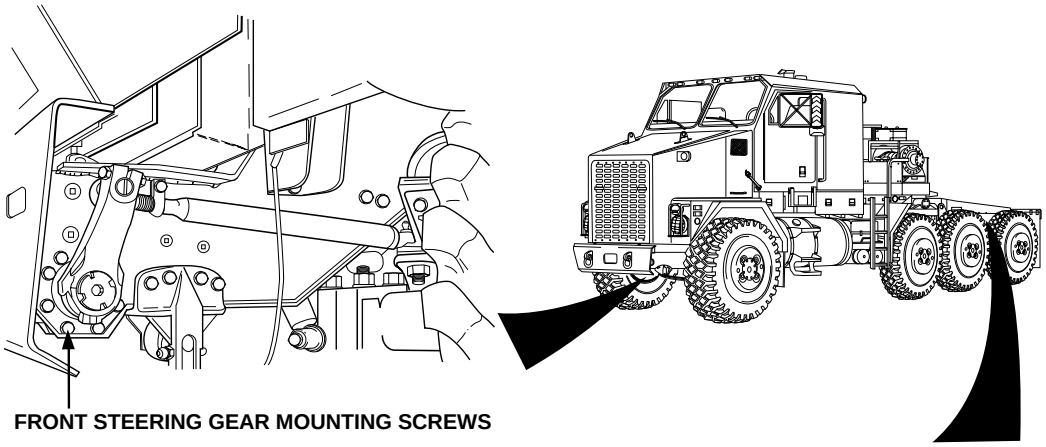
INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10)
Parking brake on (TM 9-2320-360-10)
Wheels chocked

Personnel Required
Two

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Wrench, Torque 0-175 lb-ft (Item 236, Appendix E)





STEERING GEAR MOUNTING SCREWS INSPECTION

(1) Inspect front and rear steering gear for loose mounting screws.

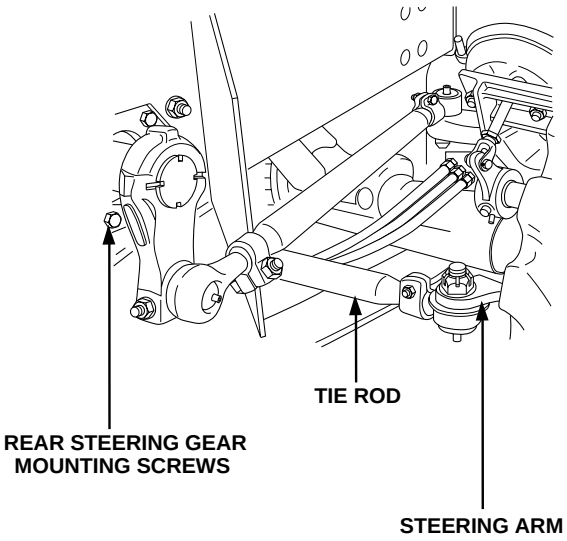
NOTE

If screws are loose, do steps (2) thru (4).

(2) Remove front and/or rear steering gear (para 13-5 and/or 13-6).

(3) Inspect for damage to mounting screw holes or damage to screws from operating while loose.

(4) Install front and/or rear steering gear (para 13-5 and/or 13-6).



STEERING TEST

(1) Remove wheel and tire assemblies from no.1 and no.4 axles (TM 9-2320-360-20).

(2) Remove no.1 and no. 4 axle tie rods (TM 9-2320-360-20).

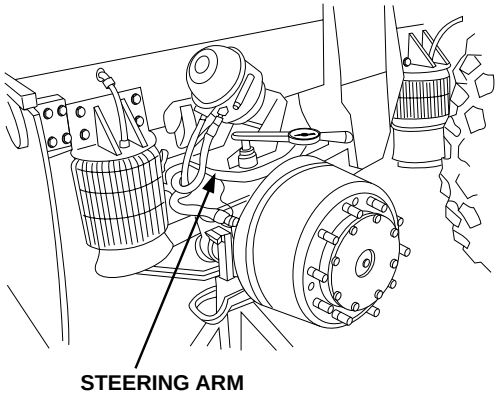
(3) Remove front and rear draglinks (para 13-2 and para 13-3).

(4) Using a torque wrench connected to steering arm, measure the amount of force required to move all spindles through their full range of motion.

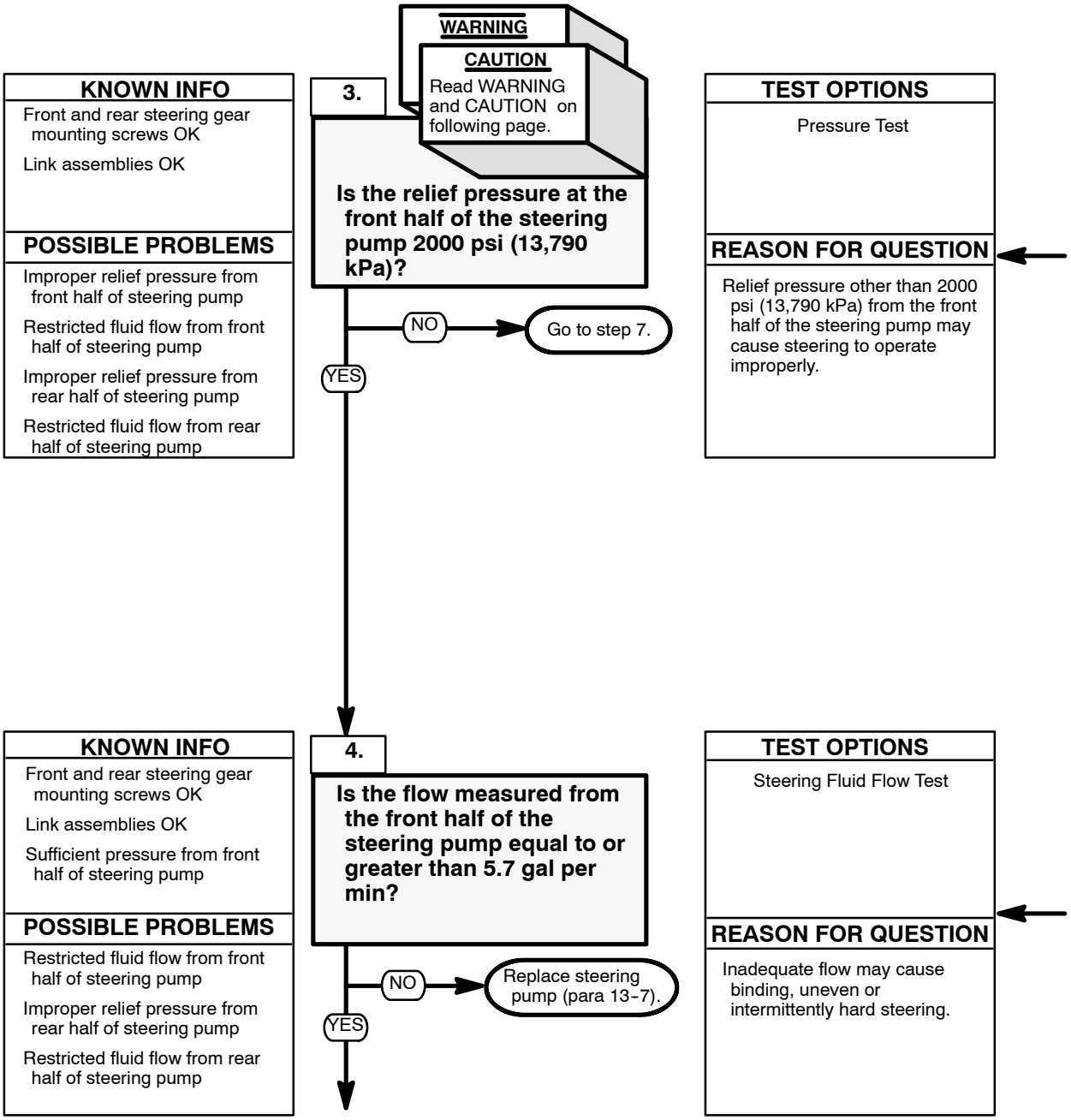
(5) Install no.1 and no. 4 axle tie rods (TM 9-2320-360-20).

(6) Install front and rear draglinks (para 13-2 and para 13-3).

(7) Install no.1 and no. 4 axle wheel and tire assemblies (TM 9-2320-360-20).



e1. STEERING BINDS, DOES NOT RETURN TO STRAIGHT AHEAD AFTER TURNS (CONT)



PRESSURE TEST

WARNING

- **Never disconnect any hydraulic hose while engine is running. Allow several minutes after engine is shut off for pressure to drop.**
- **Before testing hydraulic system with hydraulic systems tester, load valve must be open.**
- **If pressure raises rapidly or appears to be uncontrolled during the test, open load valve immediately.**
- **Failure to comply may result in injury to personnel.**

(1) Remove hose no. 2301 from front steering gear.

(2) Install hose no. 2301 on pressure port fitting of hydraulic systems tester.

(3) Install hose from reservoir port on hydraulic systems tester to front steering gear.

(4) Start engine (TM 9-2320-360-10).

CAUTION

Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

NOTE

Before proceeding with troubleshooting, steering reservoir should feel warm to the touch.

(5) Slowly close the load valve and observe relief pressure. Open the load valve.

(6) Shut off engine (TM 9-2320-360-10).

STEERING FLUID FLOW TEST

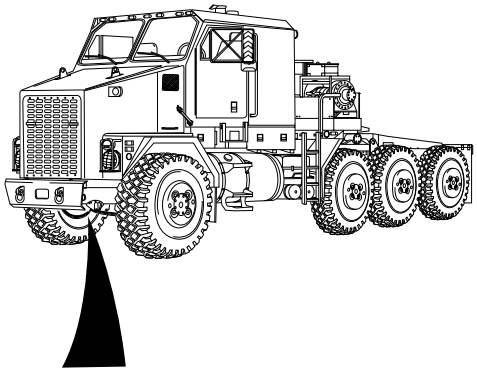
(1) Start engine (TM 9-2320-360-10).

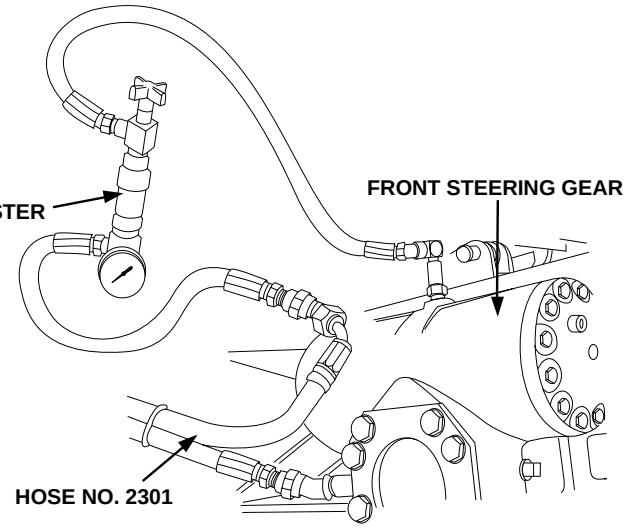
(2) Turn steering wheel from left to full right position, while assistant observes flow reading.

(3) Shut off engine (TM 9-2320-360-10).

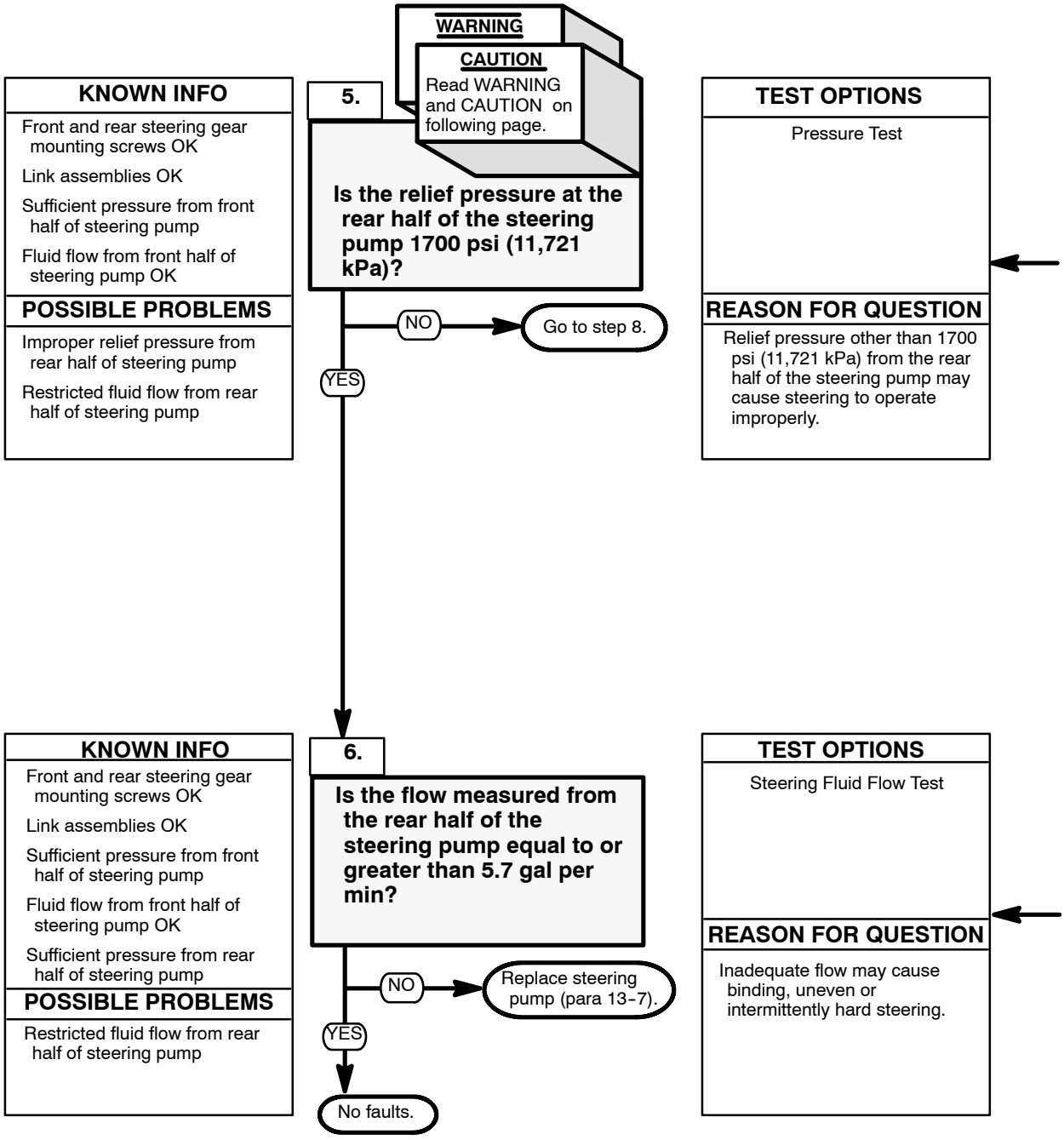
(4) Remove hose from steering gear and hydraulic systems tester.

(5) Remove hose no. 2301 from hydraulic systems tester and install on steering gear.





e1. STEERING BINDS, DOES NOT RETURN TO STRAIGHT AHEAD AFTER TURNS (CONT)



PRESSURE TEST

WARNING

- **Never disconnect any hydraulic hose while engine is running. Allow several minutes after engine is shut off for pressure to drop.**
- **Before testing hydraulic system with hydraulic systems tester, the load valve must be open.**
- **If pressure raises rapidly or appears to be uncontrolled during the test, open load valve immediately.**
- **Failure to comply may result in injury to personnel.**

(1) Remove hose no. 2275 from rear steering gear.

(2) Install hose no. 2275 on pressure port fitting of hydraulic systems tester.

(3) Install hose from reservoir port on hydraulic systems tester to rear steering gear.

(4) Start engine (TM 9-2320-360-10).

CAUTION

Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

NOTE

Before proceeding with troubleshooting, steering reservoir should feel warm to the touch.

(5) Slowly close the load valve and observe relief pressure. Open the load valve .

(6) Shut off engine (TM 9-2320-360-10).

STEERING FLUID FLOW TEST

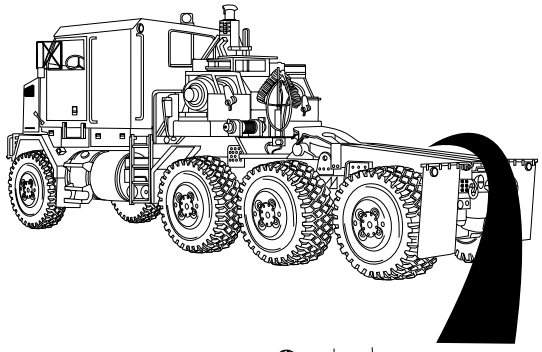
(1) Start engine (TM 9-2320-360-10).

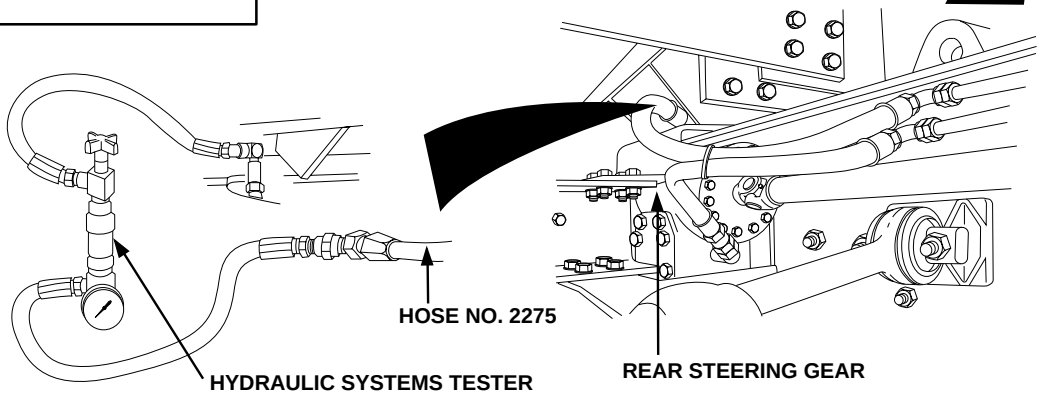
(2) Turn steering wheel from left to full right position,while assistant observes flow reading.

(3) Shut off engine (TM 9-2320-360-10).

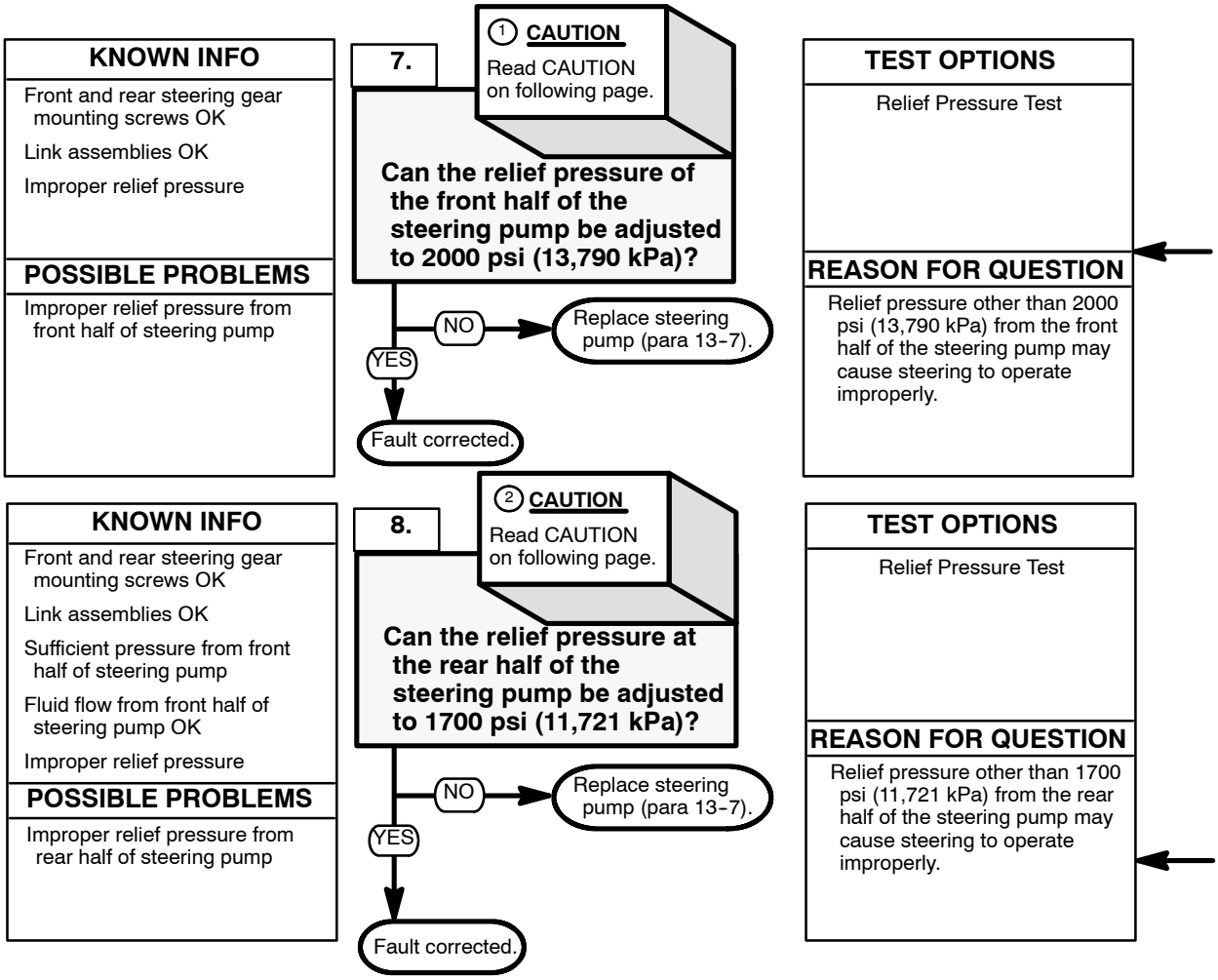
(4) Remove hose from steering gear and hydraulic systems tester.

(5) Remove hose no. 2275 from hydraulic systems tester and install on steering gear.





e1. STEERING BINDS, DOES NOT RETURN TO STRAIGHT AHEAD AFTER TURNS (CONT)



RELIEF PRESSURE TEST

(1) Start engine (TM 9-2320-360-10).

CAUTION

Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

(2) Slowly close the load valve and observe pump relief pressure. Open the load valve.

NOTE

Turning set screw clockwise will increase pressure. Turning set screw counterclockwise will decrease pressure.

(3) Turn slotted set screw plunger on front steering pump compensator to adjust pressure.

(4) Push down the load valve lever.

(5) Shut off engine (TM 9-2320-360-10).

(6) Remove hose from steering gear and hydraulic systems tester.

(7) Remove hose no. 2301 form hydraulic systems tester and install on steering gear.

RELIEF PRESSURE TEST

(1) Start engine (TM 9-2320-360-10).

CAUTION

Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

(2) Slowly close the load valve and observe pump relief pressure. Open the load valve.

NOTE

Turning set screw clockwise will increase pressure. Turning set screw counterclockwise will decrease pressure.

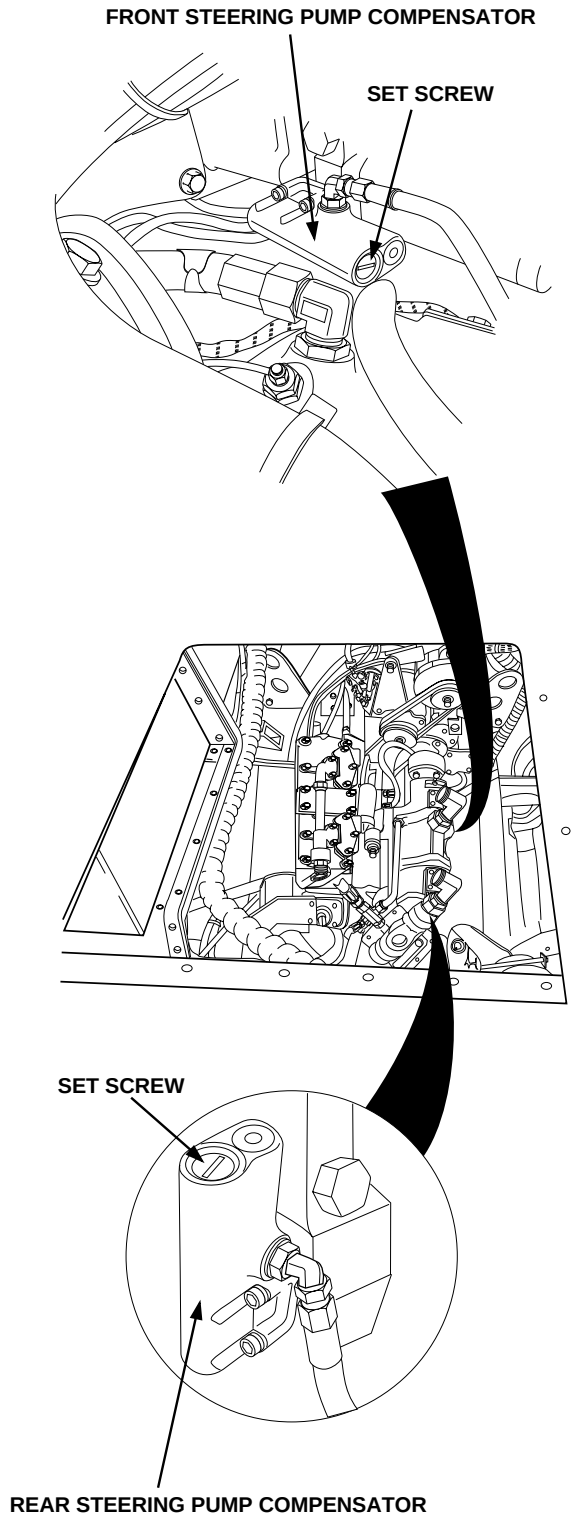
(3) Turn slotted set screw plunger on rear steering pump compensator to adjust pressure.

(4) Push down the load valve lever.

(5) Shut off engine (TM 9-2320-360-10).

(6) Remove hose from steering gear and hydraulic systems tester.

(7) Remove hose no. 2275 form hydraulic systems tester and install on steering gear.



e2. EXCESSIVE PLAY WHEN TURNING STEERING WHEEL, WANDERS, PULLS TO ONE SIDE OR SHIMMIES

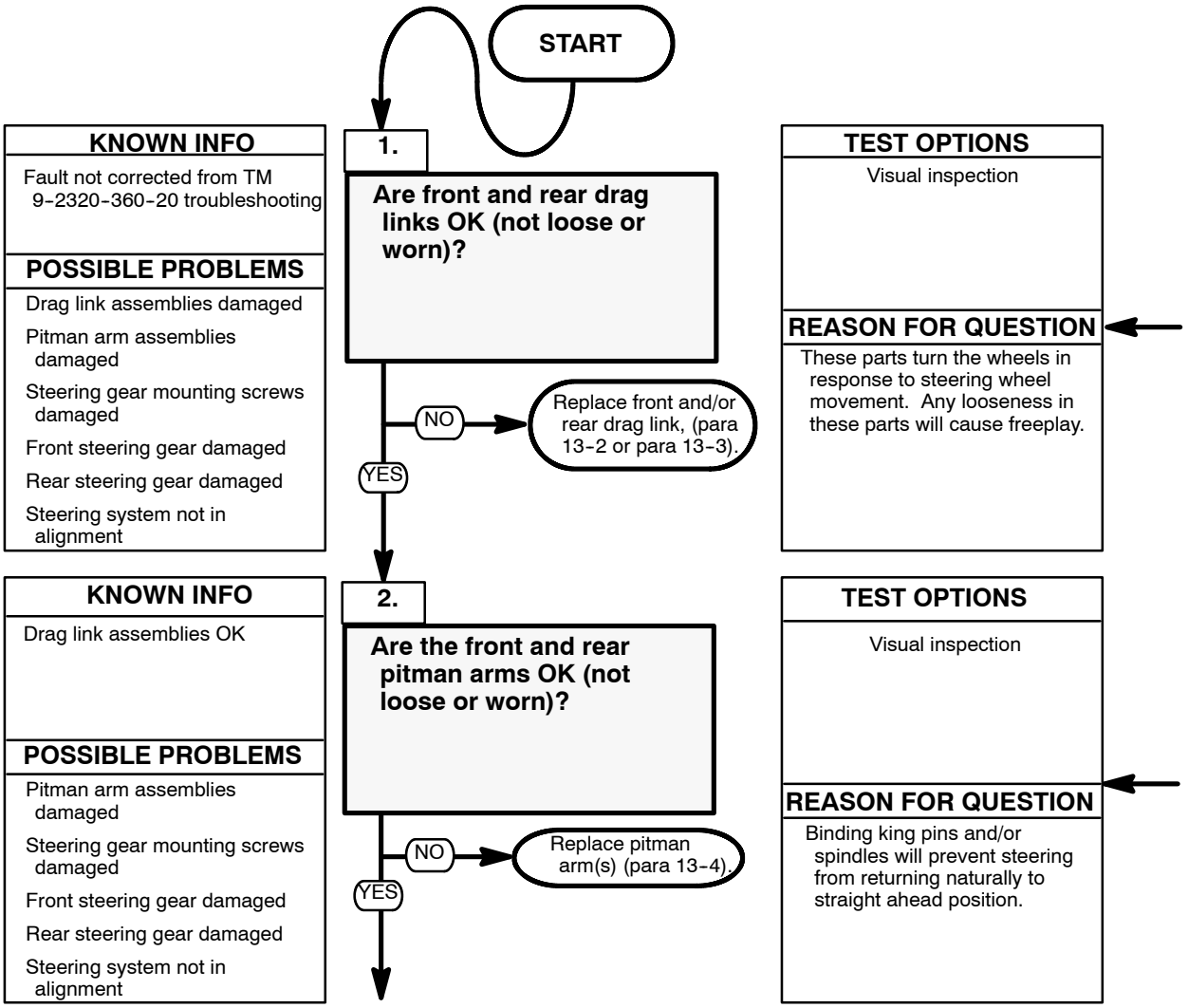
INITIAL SETUP

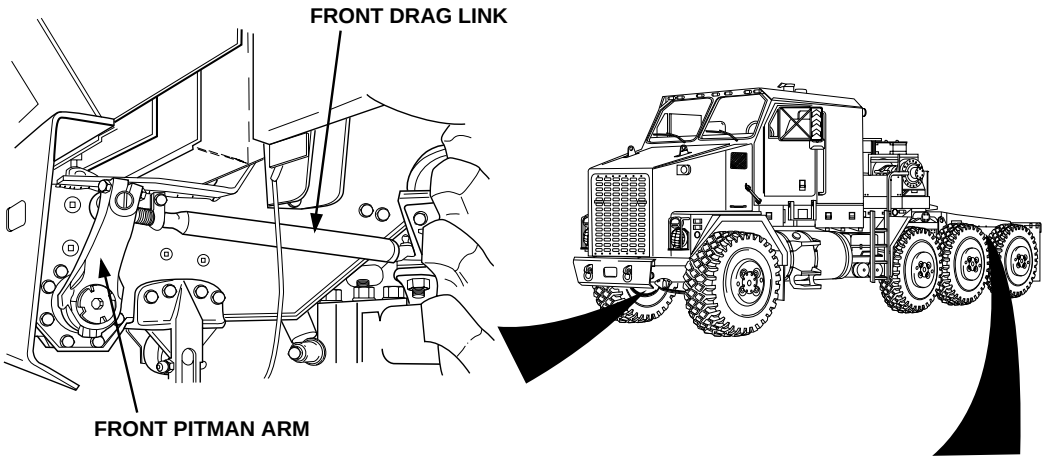
Equipment Conditions
Engine shut off (TM 9-2320-360-10)
Parking brake on (TM 9-2320-360-10)
Wheels chocked

Materials/Parts
Lockwasher (Item 106, Appendix F)

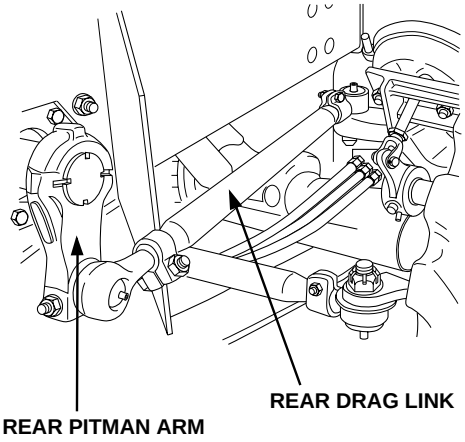
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Personnel Required
Two



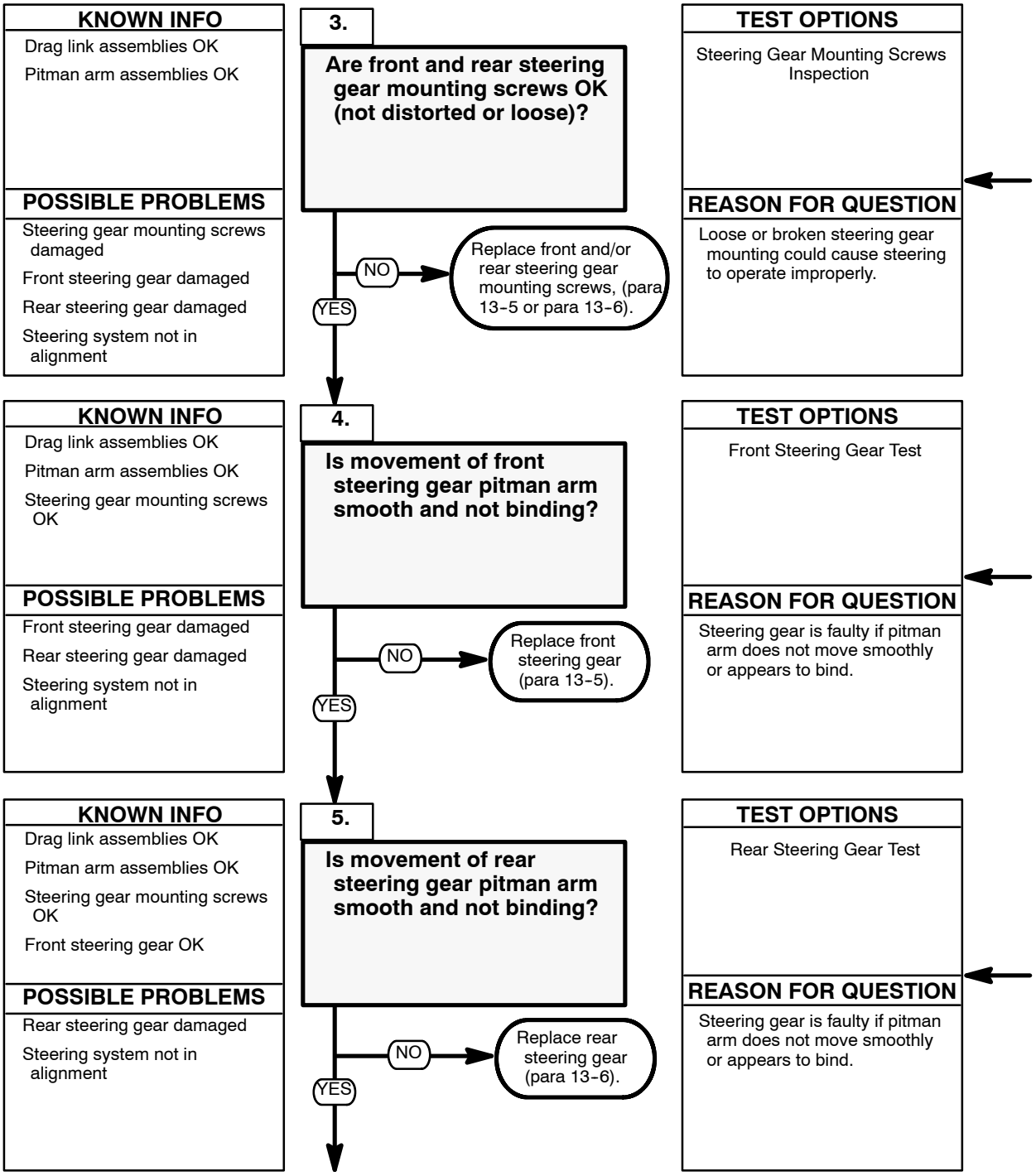


Inspect front and rear drag links for bent or damaged parts, loose mounting or loose drag link sockets.



Inspect for worn pitman arm splines, loose pitman arm socket, bent parts or loose mounting.

e2. EXCESSIVE PLAY WHEN TURNING STEERING WHEEL, WANDERS, PULLS TO ONE SIDE OR SHIMMIES (CONT)



STEERING GEAR MOUNTING SCREWS INSPECTION

(1) Inspect front and rear steering gear for loose mounting screws.

NOTE

If screws are loose, do steps (2) thru (4).

(2) Remove front and/or rear steering gear, (para 13-5 or 13-6).

(3) Inspect for damage to mounting screw holes or damage to screws from operating while loose.

(4) Install and/or rear steering gear, (para 13-5 or 13-6).

FRONT STEERING GEAR TEST

NOTE

Pitman arm must be removed from front steering gear to disconnect drag link.

(1) Remove front pitman arm (para 13-4).

(2) Install pitman arm only on front steering gear.

(3) Start engine (TM 9-2320-360-10).

(4) Slowly turn steering wheel to full left and full right positions, while assistant watches steering gear pitman arm for smooth movement and binding.

(5) Shut off engine (TM 9-2320-360-10).

(6) Remove pitman arm from steering gear.

(7) Install front pitman arm (para 13-4).

REAR STEERING GEAR TEST

(1) Remove nut, lockwasher, and screw from pitman arm. Discard lockwasher.

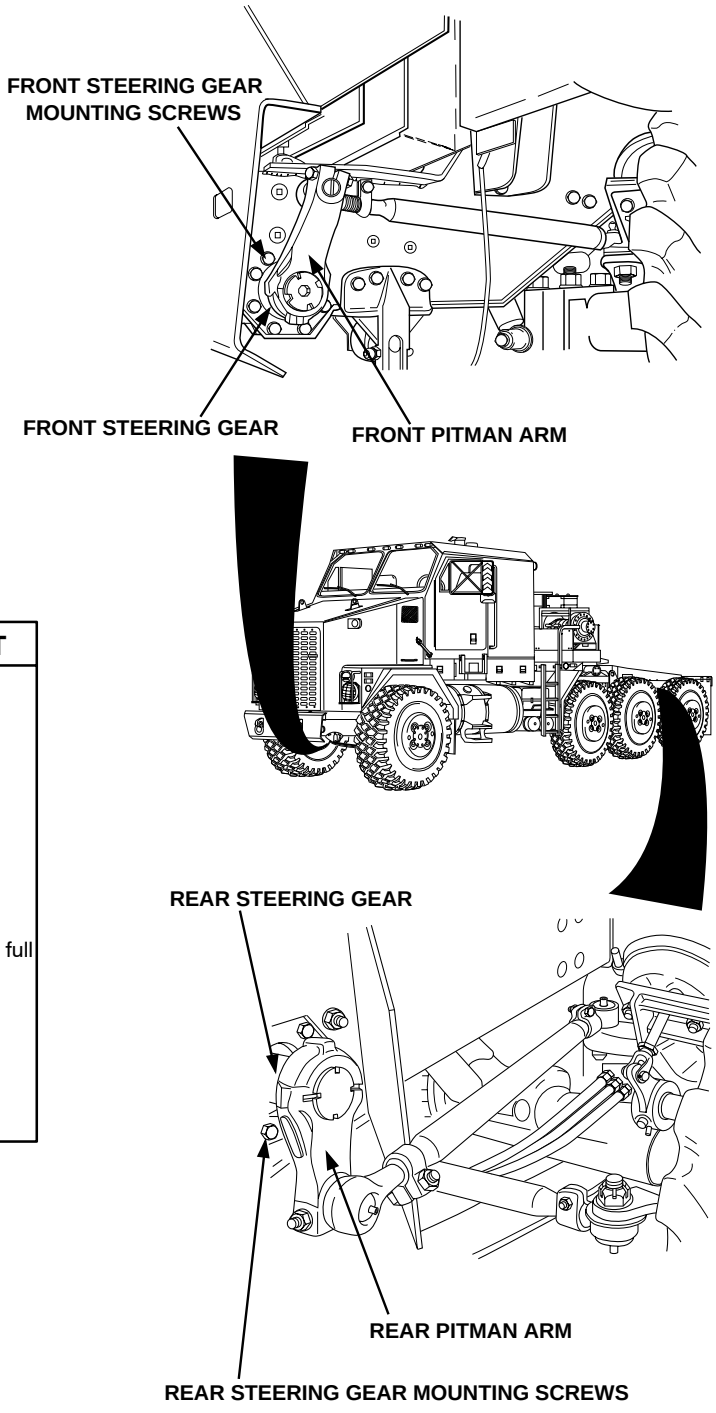
(2) Remove drag link from pitman arm.

(3) Start engine (TM 9-2320-360-10).

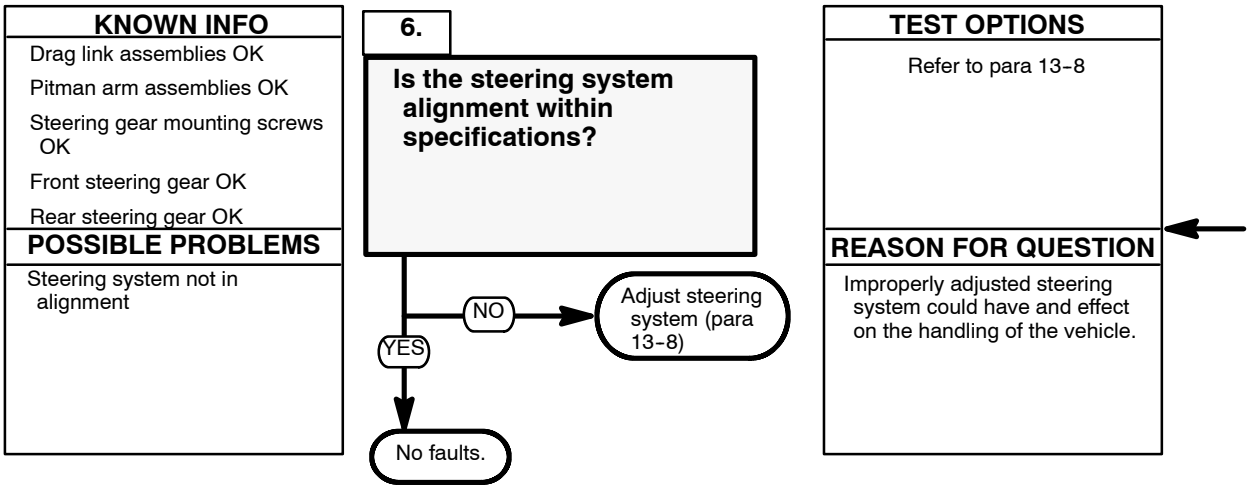
(4) Slowly turn steering wheel to full left and full right positions, while assistant watches steering gear pitman arm for smooth movement and binding.

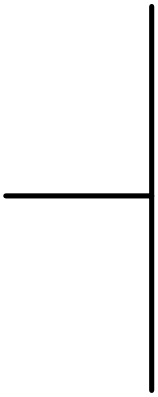
(5) Shut off engine (TM 9-2320-360-10).

(6) Install drag link on pitman arm with screw, new lockwasher, and nut.



e2. EXCESSIVE PLAY WHEN TURNING STEERING WHEEL, WANDERS, PULLS TO ONE SIDE OR SHIMMIES (CONT)





Refer to para 13-8 for instructions on checking and adjusting steering system.

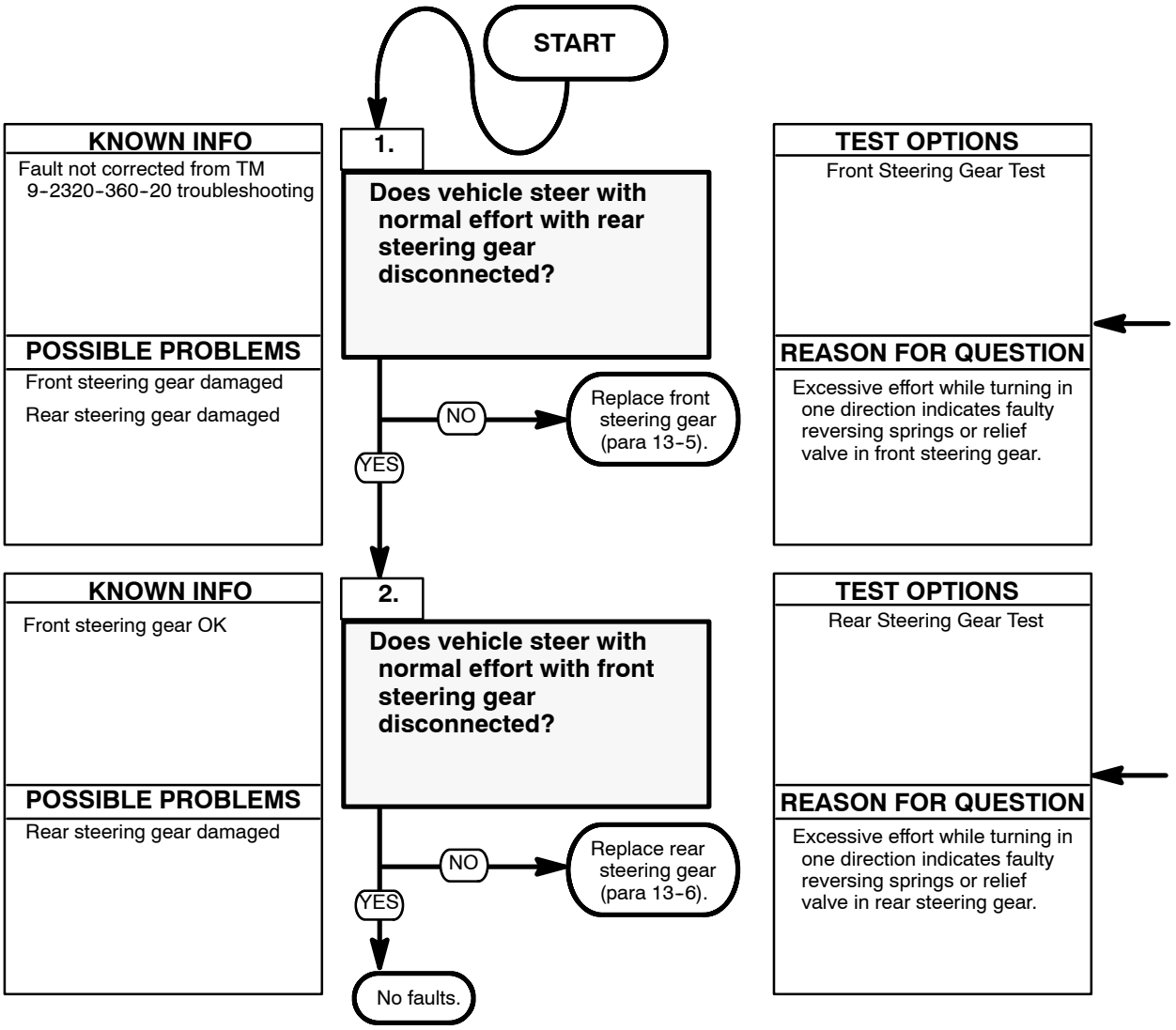
e3. HARD TO STEER IN ONE DIRECTION

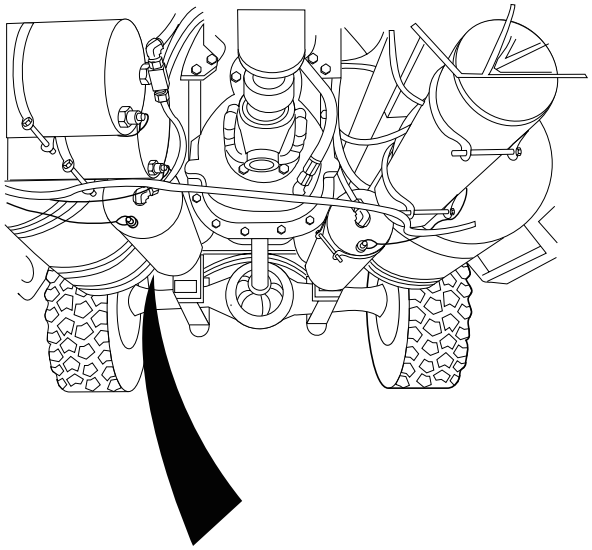
INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10)
Parking brake on (TM 9-2320-360-10)
Wheels chocked

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Locknuts (2), (Item 80, Appendix F)





FRONT STEERING GEAR TEST

(1) Remove locknut, screw and rear steering shaft yoke from tee box. Discard locknut.

(2) Start engine (TM 9-2320-360-10).

(3) Detect steering effort while turning steering wheel from straight ahead to full left and full right positions.

(4) Return steering wheel to straight ahead position.

(5) Shut off engine (TM 9-2320-360-10).

(6) Align slot on yoke with key on tee box shaft.

(7) Install rear steering shaft yoke on tee box with screw and new locknut.

REAR STEERING GEAR TEST

(1) Remove locknut, screw and front steering shaft yoke from tee box. Discard locknut.

(2) Start engine (TM 9-2320-360-10).

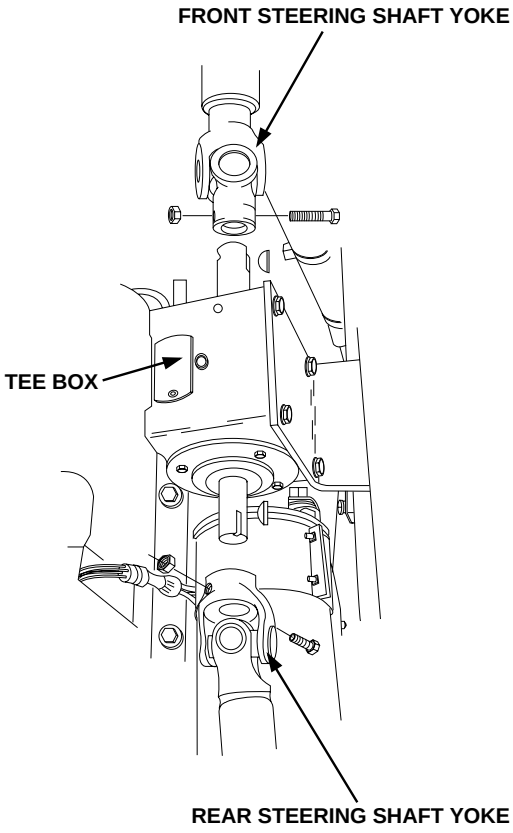
(3) Detect steering effort while turning steering wheel from straight ahead to full left and full right positions.

(4) Return steering wheel to straight ahead position.

(5) Shut off engine (TM 9-2320-360-10).

(6) Align slot on yoke with key on tee box shaft.

(7) Install front steering shaft yoke on tee box with screw and new locknut.



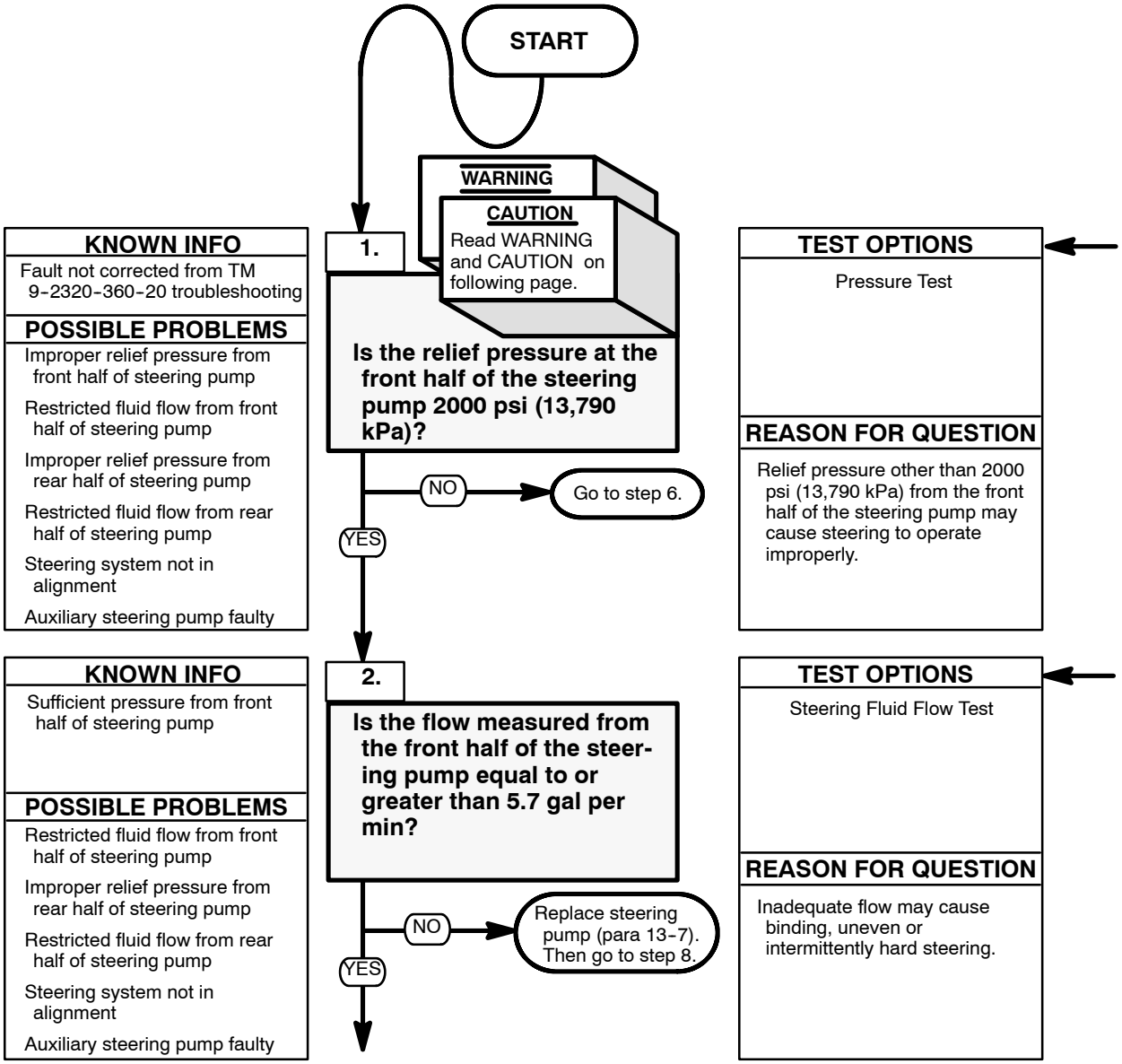
e4. HARD TO STEER IN BOTH DIRECTIONS

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10)
Parking brake on (TM 9-2320-360-10)
Wheels chocked

Personnel Required
Two

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Scale, Spring (Item 145, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Plug (Item 112.1, Appendix E)



PRESSURE TEST

WARNING

- **Never disconnect any hydraulic hose while engine is running. Allow several minutes after engine is shut off for pressure to drop.**
- **Before testing hydraulic system with hydraulic systems tester, load valve must be open.**
- **If pressure raises rapidly or appears to be uncontrolled during the test, open load valve immediately.**
- **Failure to comply may result in injury to personnel.**

(1) Remove hose no. 2301 from front steering gear.

(2) Install hose no. 2301 on pressure port fitting of hydraulic systems tester.

(3) Install hose from reservoir port on hydraulic systems tester to front steering gear.

(4) Start engine (TM 9-2320-360-10).

CAUTION

Closing load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

NOTE

Before proceeding with troubleshooting, steering reservoir should feel warm to the touch.

(5) Close the load valve and observe relief pressure. Open the load valve.

(6) Shut off engine (TM 9-2320-360-10).

STEERING FLUID FLOW TEST

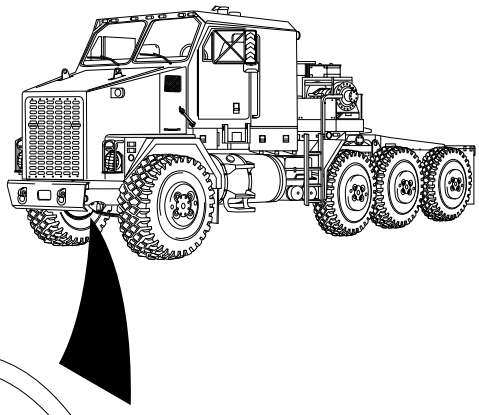
(1) Start engine (TM 9-2320-360-10).

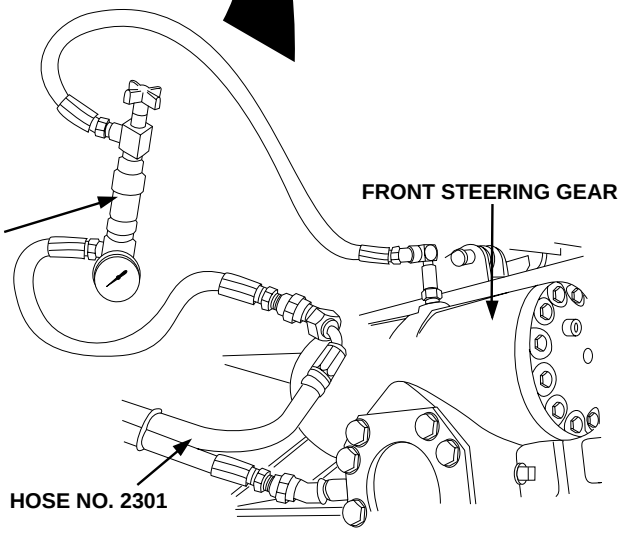
(2) Turn steering wheel from left to full right position,while assistant observes flow reading.

(3) Shut off engine (TM 9-2320-360-10).

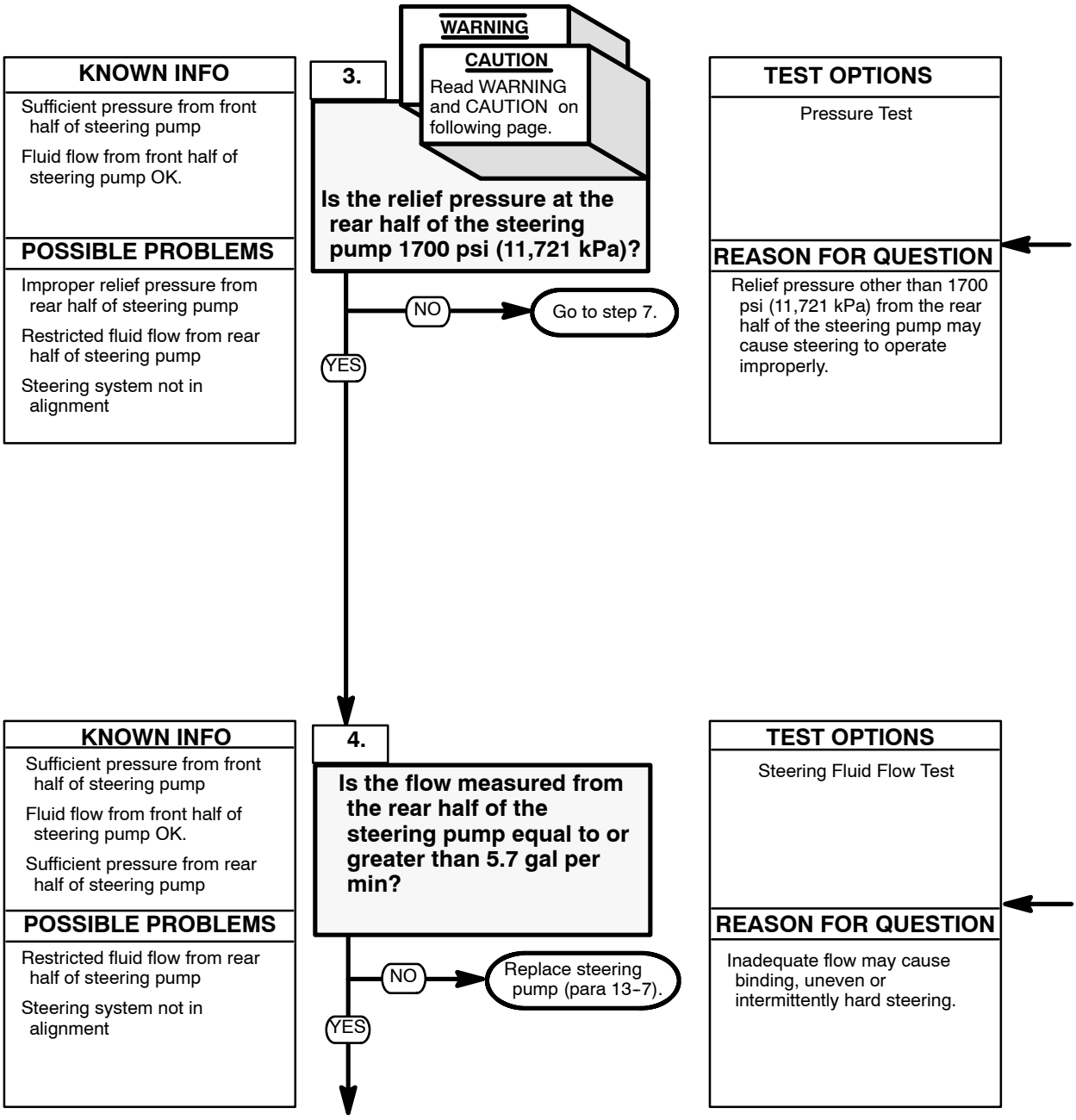
(4) Remove hose from steering gear and hydraulic systems tester.

(5) Remove hose no. 2301 form hydraulic systems tester and install on steering gear.





e4. HARD TO STEER IN BOTH DIRECTIONS (CONT)



PRESSURE TEST

WARNING

- **Never disconnect any hydraulic hose while engine is running. Allow several minutes after engine is shut off for pressure to drop.**
- **Before testing hydraulic system with hydraulic systems tester, load valve must be open.**
- **If pressure raises rapidly or appears to be uncontrolled during the test, open load valve immediately.**
- **Failure to comply may result in injury to personnel.**

(1) Remove hose no. 2275 from rear steering gear.

(2) Install hose no. 2275 on pressure port fitting of hydraulic systems tester.

(3) Install hose from reservoir port on hydraulic systems tester to rear steering gear.

(4) Start engine (TM 9-2320-360-10).

CAUTION

Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

NOTE

Before proceeding with troubleshooting, steering reservoir should feel warm to the touch.

(5) Close the load valve and observe relief pressure. Open the load valve.

(6) Shut off engine (TM 9-2320-360-10).

STEERING FLUID FLOW TEST

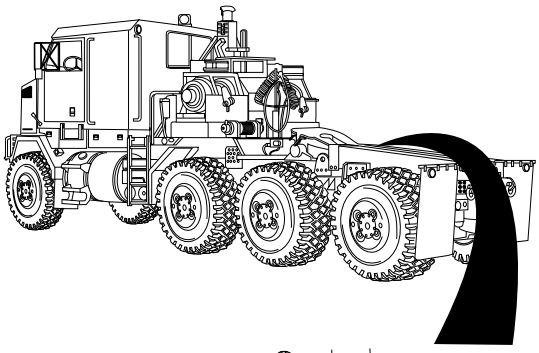
(1) Start engine (TM 9-2320-360-10).

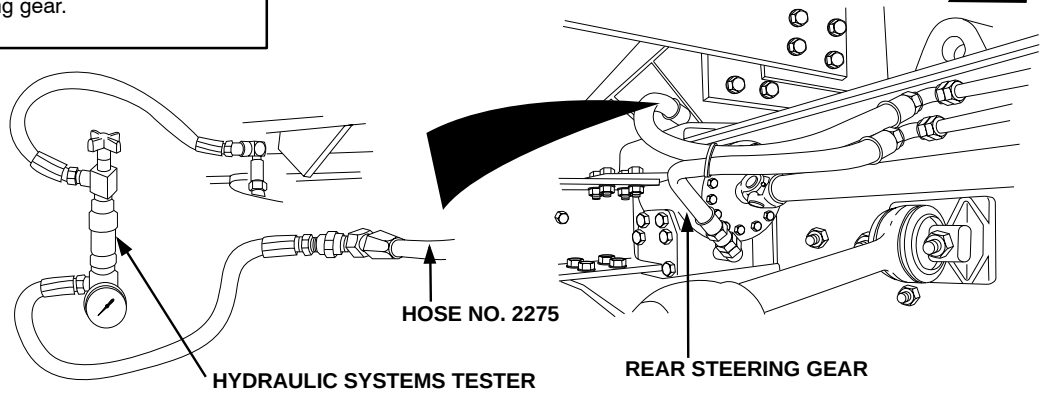
(2) Turn steering wheel from left to full right position,while assistant observes flow reading.

(3) Shut off engine (TM 9-2320-360-10).

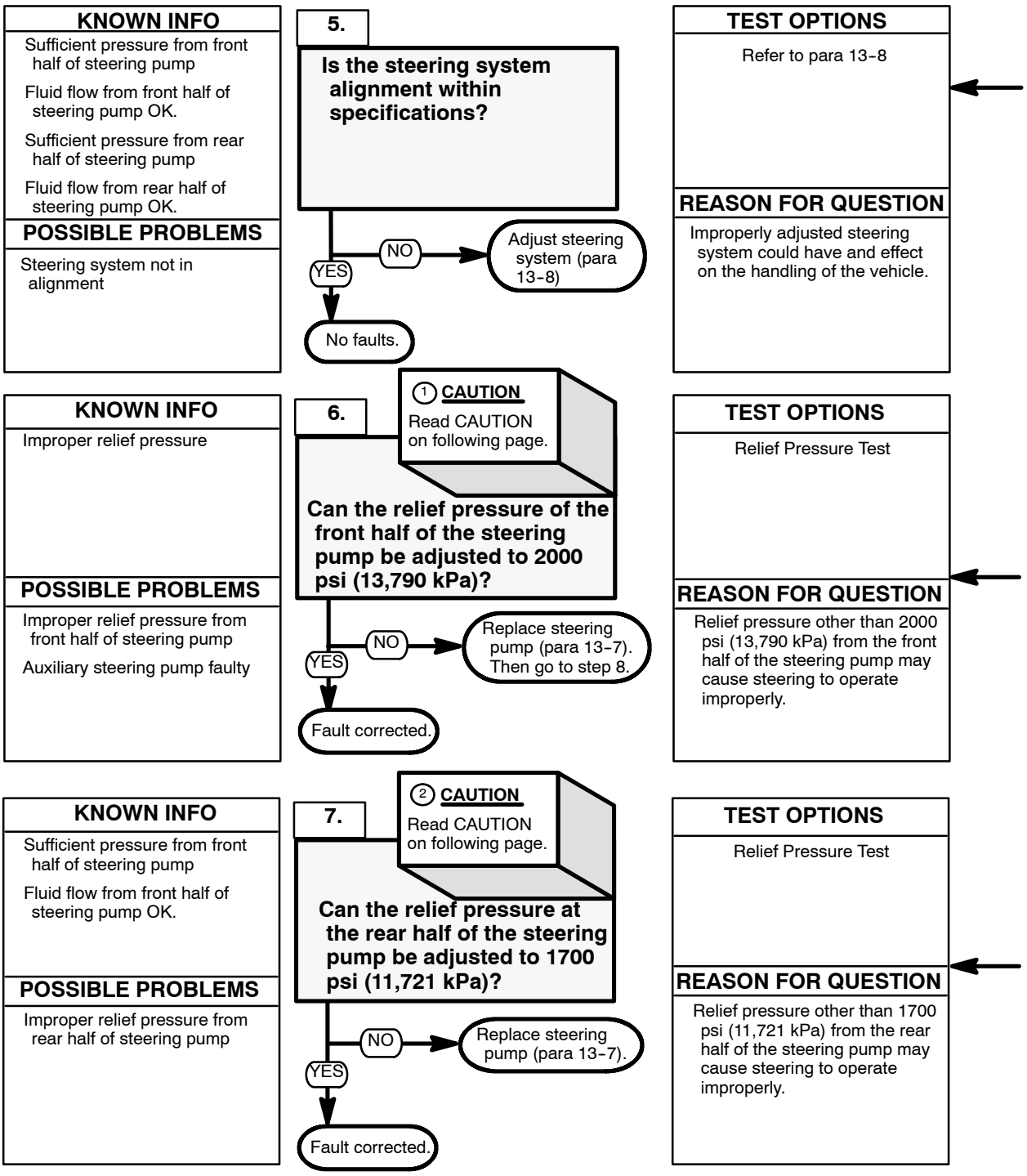
(4) Remove hose from steering gear and hydraulic systems tester.

(5) Remove hose no. 2275 form hydraulic systems tester and install on steering gear.





e4. HARD TO STEER IN BOTH DIRECTIONS (CONT)



Refer to para 13-8 for instructions on checking and adjusting steering system.

RELIEF PRESSURE TEST

(1) Start engine (TM 9-2320-360-10).

① **CAUTION**

Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

(2) Slowly close the load valve and observe pump relief pressure. Open the load valve.

NOTE

Turning set screw clockwise will increase pressure. Turning set screw counterclockwise will decrease pressure.

(3) Turn slotted set screw plunger on front steering pump compensator to adjust pressure.
(4) Push down the load valve lever.
(5) Shut off engine (TM 9-2320-360-10).
(6) Remove hose from steering gear and hydraulic systems tester.
(7) Remove hose no. 2301 form hydraulic systems tester and install on steering gear.

RELIEF PRESSURE TEST

(1) Start engine (TM 9-2320-360-10).

② **CAUTION**

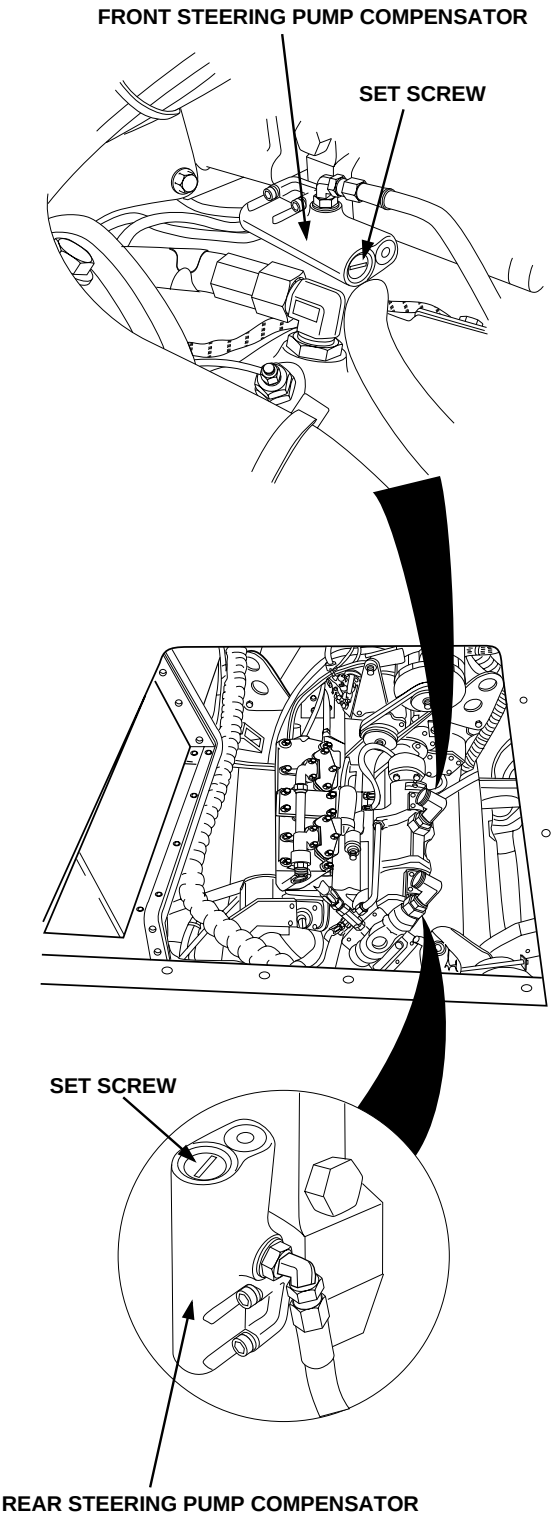
Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may cause equipment damage.

(2) Slowly close the load valve and observe pump relief pressure. Open the load valve.

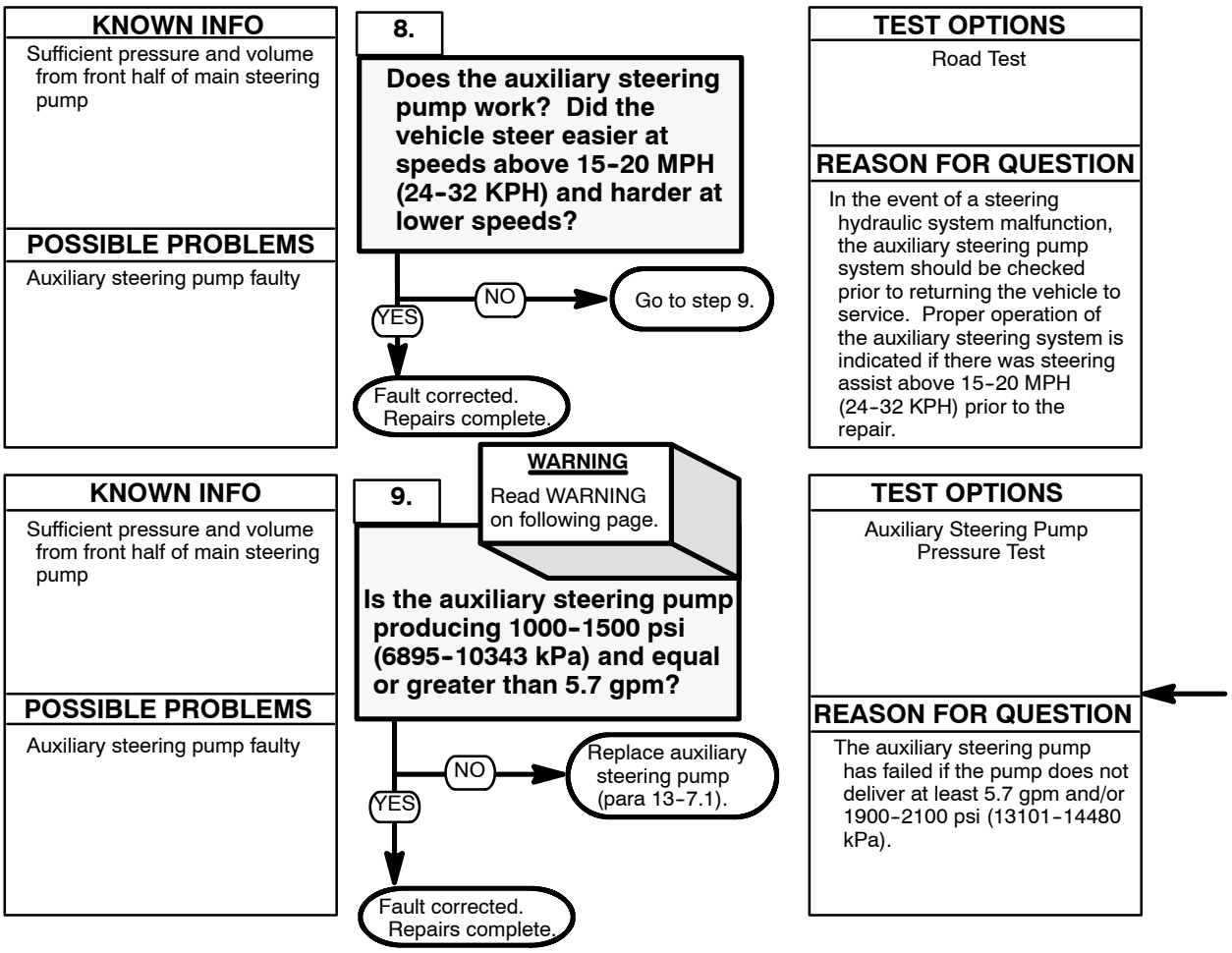
NOTE

Turning set screw clockwise will increase pressure. Turning set screw counterclockwise will decrease pressure.

(3) Turn slotted set screw plunger on rear steering pump compensator to adjust pressure.
(4) Push down the load valve lever.
(5) Shut off engine (TM 9-2320-360-10).
(6) Remove hose from steering gear and hydraulic systems tester.
(7) Remove hose no. 2275 form hydraulic systems tester and install on steering gear.



e4. HARD TO STEER IN BOTH DIRECTIONS (CONT)



WARNING

- **The auxiliary steering pump is driven by the transfer case center shaft. To test the operation of the auxiliary steering pump, the transfer case shafts must be turned by running the engine. The propeller shafts must be disconnected to prevent the movement of the vehicle. Keep out from under the vehicle, as the transfer case output yokes will rotate during the test.**
- **Never disconnect any hydraulic hose while the engine is running. Allow several minutes after the engine is shut off for pressure to drop.**
- **Before testing hydraulic system with hydraulic systems tester, load valve must be open.**
- **Failure to comply may result in injury to personnel.**

NOTE

Propeller shafts only have to be disconnected from transfer case end, leave propeller attached at the axle end.

AUXILIARY STEERING PUMP PRESSURE TEST

(1) Remove transfer case to no. 1 axle propshaft and transfer case to no. 2 axle propshaft from transfer case output yokes (TM 9-2320-360-20).
(2) Remove hose no. 2301 from front steering gear.
(3) Install hose no. 2301 on pressure port on hydraulic systems tester.
(4) Install hose from reservoir port on hydraulic systems tester to front steering gear.
(5) Remove hose no. 2879 from auxiliary steering pump manifold.
(6) Plug hose no. 2879.

NOTE

Fluid will drip from fitting during test. Do not cap manifold fitting. Auxiliary steering pump will act intermittently if fitting is capped.

(7) Place drain pan under auxiliary steering pump manifold.
(8) Place transfer case shift lever in HIGH range.
(9) Start engine (TM 9-2320-360-10).
(10) Place transmission range selector in 2-5 position.

NOTE

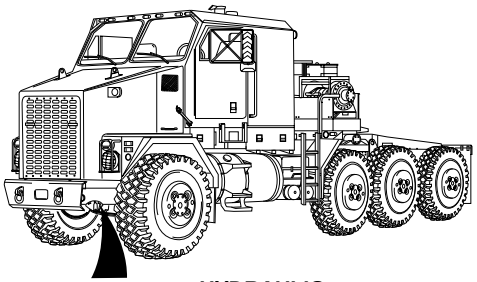
Transmission must shift from 2nd to 3rd gear before accurate test results can be obtained.

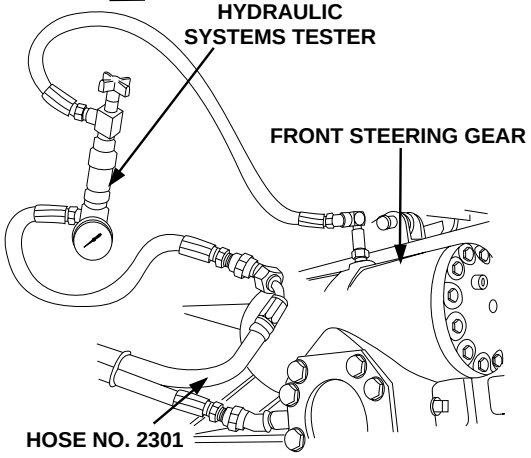
(11) Observe flow reading on hydraulic systems tester while assistant increases engine speed until tachograph indicates approximately 20 MPH (32 KPH).

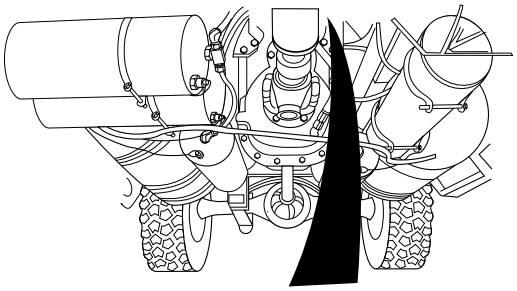
NOTE

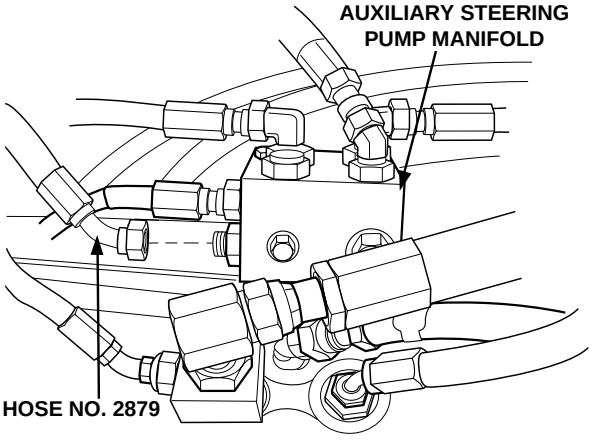
Desired pressures will only be obtained when turning steering wheel.

(12) Observe pressure on hydraulic systems tester while assistant turns steering wheel several times from full right to full left positions.
(13) Shut off engine (TM 9-2320-360-10).
(14) Remove plug from hose no. 2879.
(15) Install hose no. 2879 on auxiliary steering pump manifold.
(16) Remove hose from steering gear and hydraulic systems tester.
(17) Remove hose no. 2301 from hydraulic systems tester and install on front steering gear.
(18) Install transfer case to axle no. 1 propshaft and transfer case to axle no. 2 propshaft (TM 9-2320-360-20).









f. WINCH SYSTEM

Malfunction	Troubleshooting Procedure (Page)
f1. One main winch will not pull load	2-166
f2. One winch makes excessive or unusual noise, operates slowly, or jerks	2-170
f3. Both main winches and auxiliary winch do not operate	2-172
f4. One main winch will not pay out (using control valve).	2-176
f5. Main winch high speed does not work (one winch only)	2-180
f6. One main winch will not operate in either direction	2-184
f7. Auxiliary winch does not operate	2-185.1
f8. One main winch will not pull at rated line speed	2-185.3

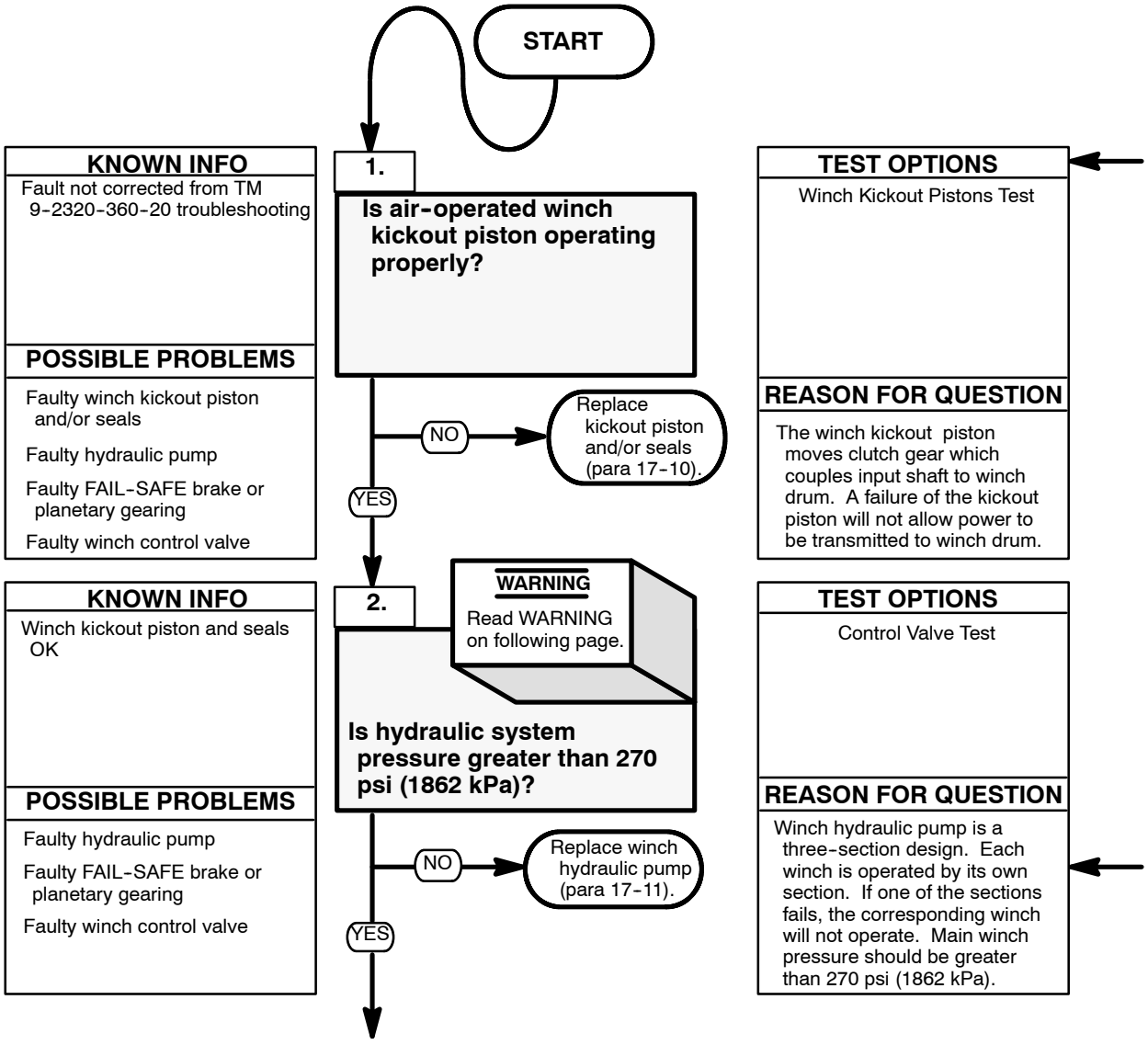
f1. ONE MAIN WINCH WILL NOT PULL LOAD

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Personnel Required:
Two

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Wrench, Combination, 1-1/2 in. (Item 214, Appendix E)
Wrench, Open End, 15/16 in. & 1-1/16 in. (Item 227 Appendix E)
Wrench, Adjustable, Automobile (Item 212.1, Appendix E)



WINCH KICKOUT PISTONS TEST

NOTE

- Winch testing should be done with 10 ft (3 m) of cable payed out and no load on the cable.
- AIR PRESS gage must read at least 65 psi (448 kPa) before winch kickouts will operate.
- Drum should freewheel only when winch kickout control in disengaged.

(1) Start engine (TM 9-2320-360-10) and run until AIR PRESS gage reads at least 65 psi (448 kPa).

(2) Shut off engine (TM 9-2320-360-10).

(3) Disengage winch kickout control on winch that does not operate.

(4) Attempt to manually turn winch drum.

CONTROL VALVE TEST

WARNING

Never disconnect any hydraulic hose while engine is running. Allow several minutes after engine shutdown for pressure to be released.

NOTE

- Winch testing should be done with 10 ft (3 m) of cable payed out and no load on cable.
- Winch hydraulic reservoir filter should be at least warm to the touch and engine on high idle during trouble shooting.

(1) Remove winch control console panels (TM 9-2320-360-20).

(2) Remove pressure hose from winch hydraulic pump.

(3) Install tee, pressure gage and pressure hose on hydraulic pump.

(4) Start engine (TM 9-2320-360-10).

(5) Engage PTO and high idle (TM 9-2320-360-10).

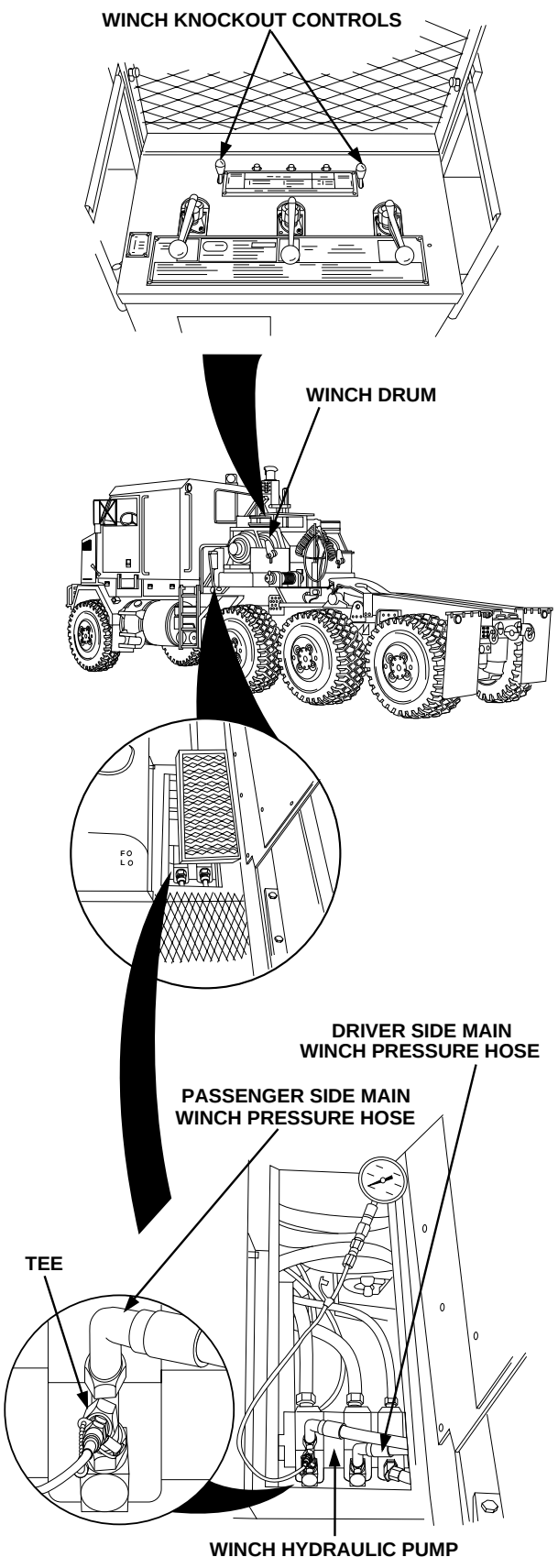
(6) Pull up or push down control valve lever, and observe pressure.

(7) Disengage PTO and high idle (TM 9-2320-360-10).

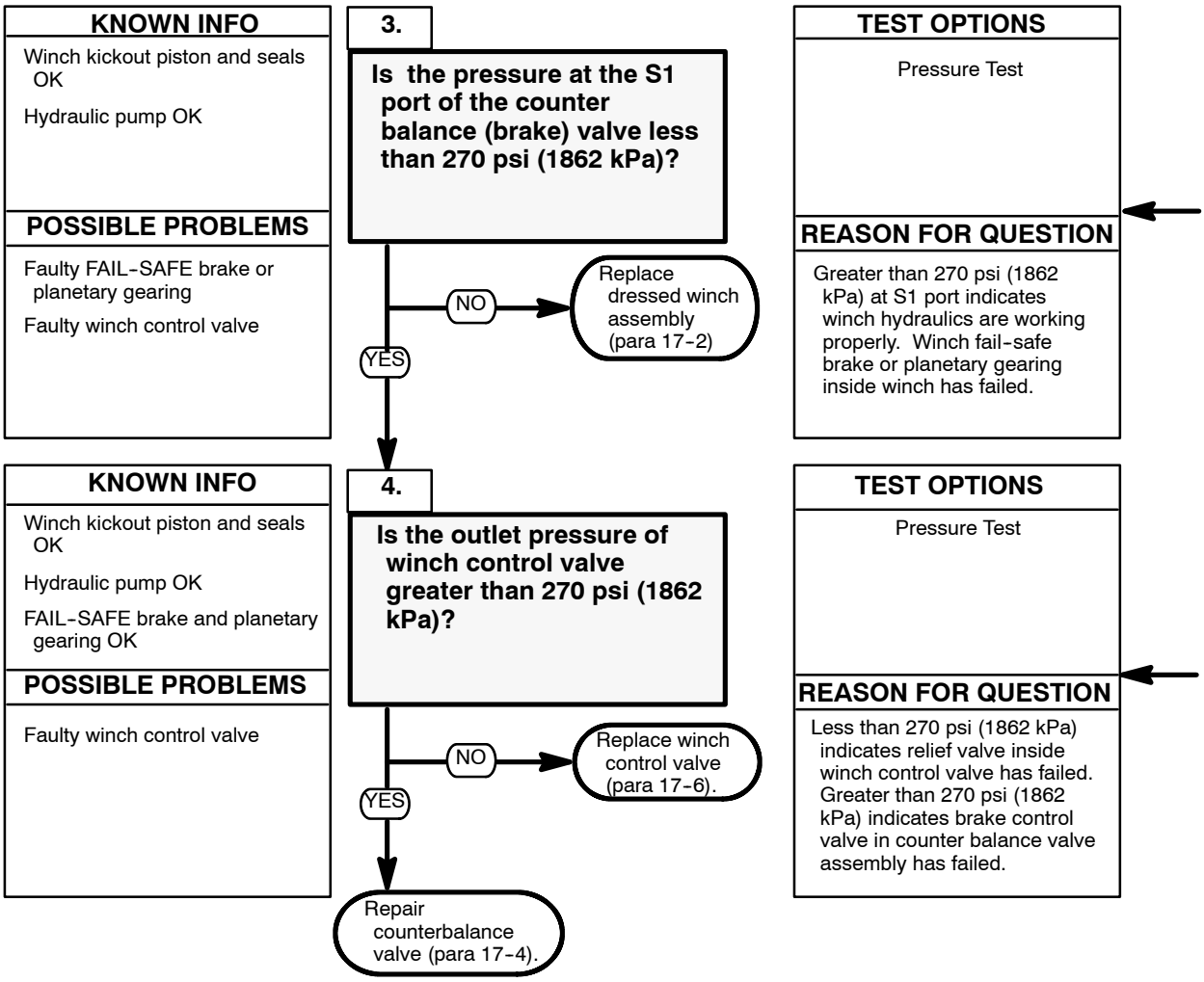
(8) Shut off engine (TM 9-2320-360-10).

(9) Remove pressure hose, pressure gage and tee from hydraulic pump.

(10) Install pressure hose on winch hydraulic pump.



f1. ONE MAIN WINCH WILL NOT PULL LOAD (CONT)



PRESSURE TEST

(1) Remove brake hose from S1 port on counterbalance valve.

(2) Install tee, pressure gage and pressure hose on counterbalance valve.

(3) Start engine and engage PTO and high idle (TM 9-2320-360-10).

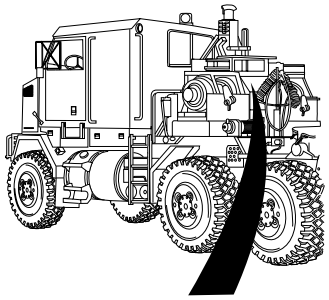
(4) Pull up or push down winch control lever and observe pressure.

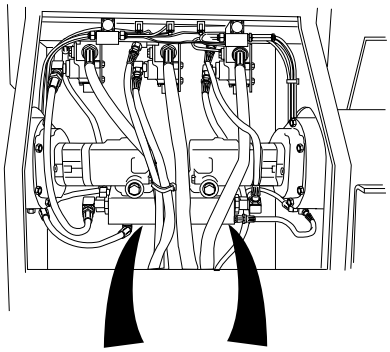
(5) Release winch control lever, disengage high idle and PTO, and shut off engine (TM 9-2320-360-10).

(6) Remove hose from S1 port and hydraulic systems tester.

(7) Remove pressure hose, pressure gage and tee from counterbalance valve.

(8) Install brake hose on S1 port of counterbalance valve.





PRESSURE TEST

(1) Remove outlet hose from control valve.

(2) Install tee, pressure gage and pressure hose on control valve.

(3) Start engine and engage PTO and high idle (TM 9-2320-360-10).

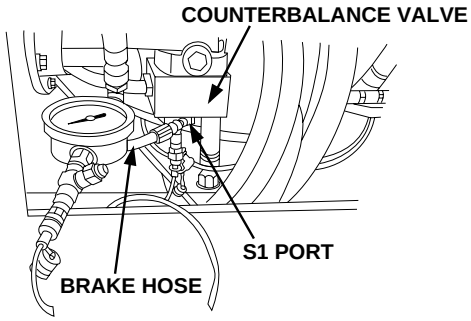
(4) Push down on winch control lever and observe pressure.

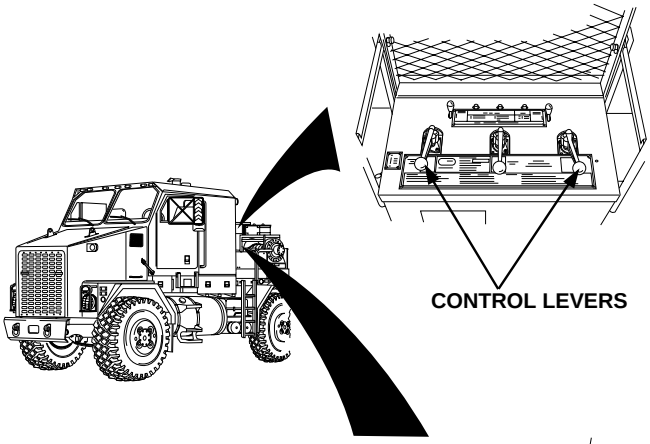
(5) Release winch control lever, disengage high idle and PTO, and shut off engine (TM 9-2320-360-10).

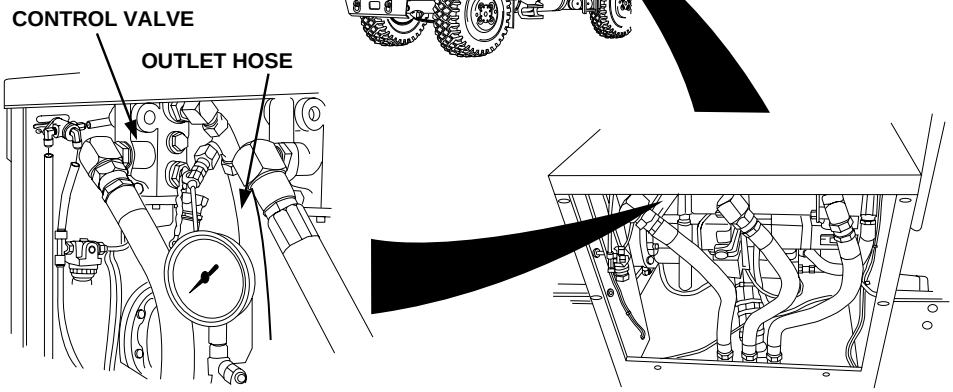
(6) Remove hose from hydraulic systems tester and control valve.

(7) Remove pressure hose, pressure gage and tee from control valve.

(8) Install outlet hose on control valve.







f2. ONE WINCH MAKES EXCESSIVE OR UNUSUAL NOISE, OPERATES SLOWLY, OR JERKS

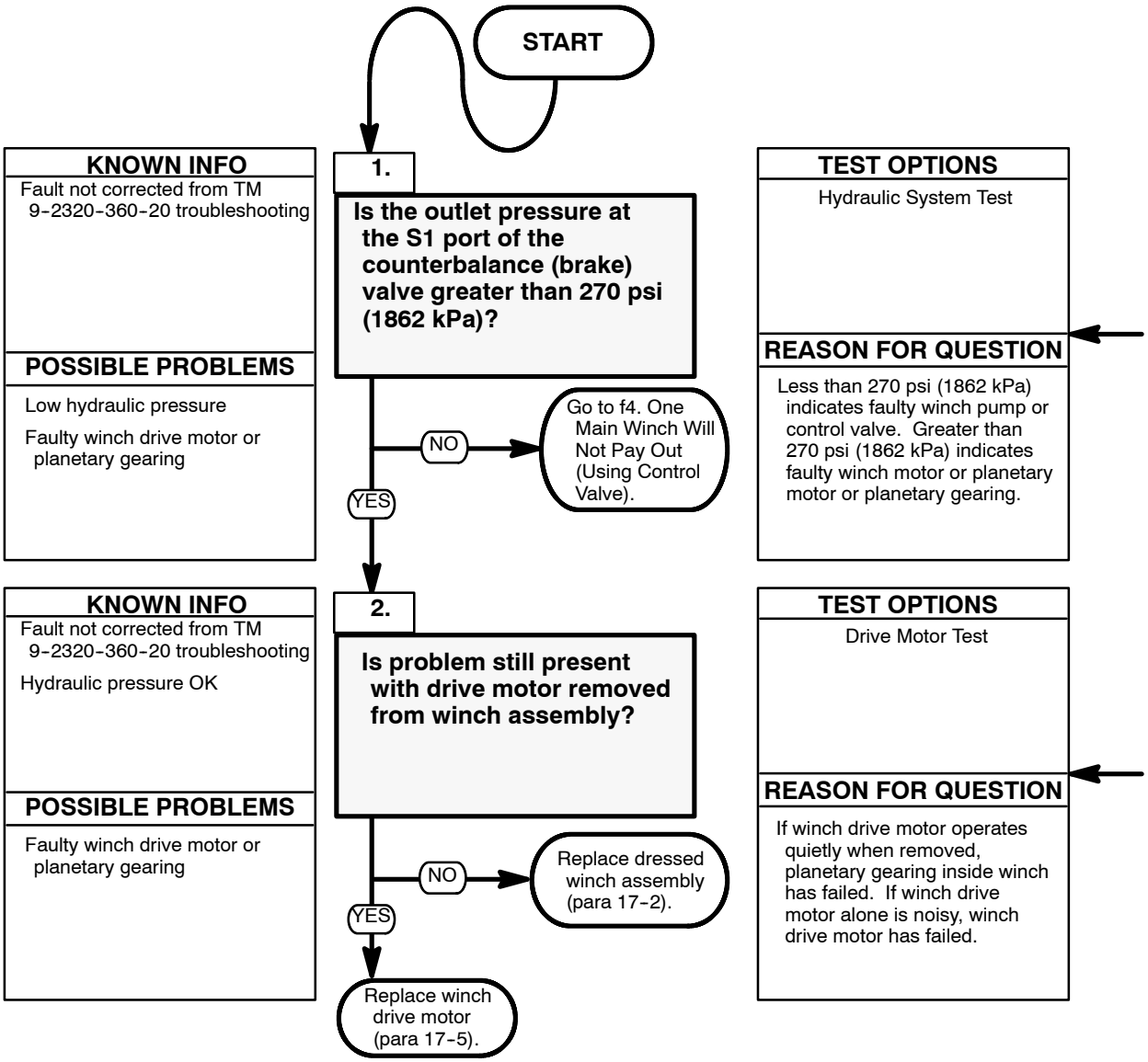
INITIAL SETUP

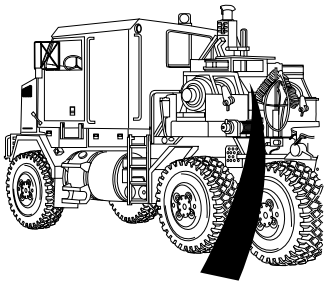
Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

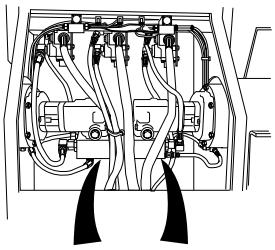
Personnel Required:
Two

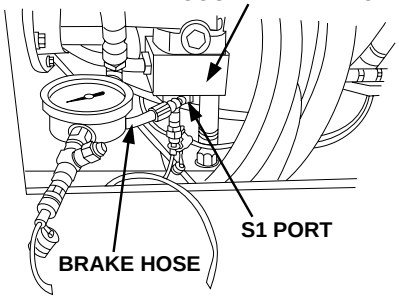
Materials/Parts
Lockwasher (2) (Item 130, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Wrench, Combination, 1-3/8 in. (Item 213, Appendix E)
Wrench, Combination, 1-5/16 in. (Item 216, Appendix E)
Wrench, Open End, 15/16 in. & 1-1/16 in. (Item 227, Appendix E)









HYDRAULIC SYSTEM TEST

(1) Remove brake hose from S1 port on counterbalance valve.

(2) Install tee, pressure gage and pressure hose on counterbalance valve.

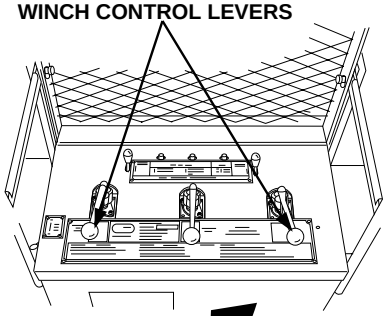
(3) Start engine and engage PTO and high idle (TM 9-2320-360-10).

(4) Pull up or push down control valve lever, and observe pressure.

(5) Release winch control lever, disengage high idle and PTO, and shut engine off (TM 9-2320-360-10).

(6) Remove pressure hose, pressure gage and tee from counterbalance valve.

(7) Install brake hose on S1 port of counterbalance valve.



DRIVE MOTOR TEST

NOTE

- Winch hydraulic reservoir should beat least warm to the touch and engine on high idle during winch troubleshooting
- Winch assembly will leak gear oil when drive motor is removed.

(1) Remove two screws, lockwashers and drive motor from winch assembly with aid of assistant.

(2) Start engine and engage PTO and high idle (TM 9-2320-360-10).

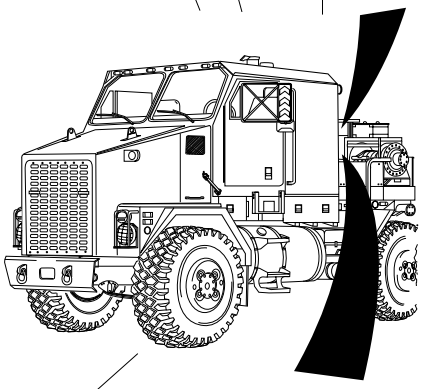
(3) Operate winch drive motor by pulling up and pushing down on control lever while assistant supports motor.

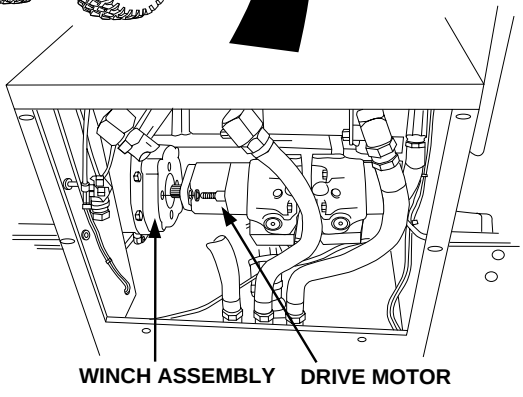
(4) Disengage high idle and PTO and shut off engine (TM 9-2320-360-10).

NOTE

If results of troubleshooting indicate faulty winch drive motor, do not do step (5)

(5) Install drive motor on winch assembly with two new lockwashers and screws with aid of assistant.





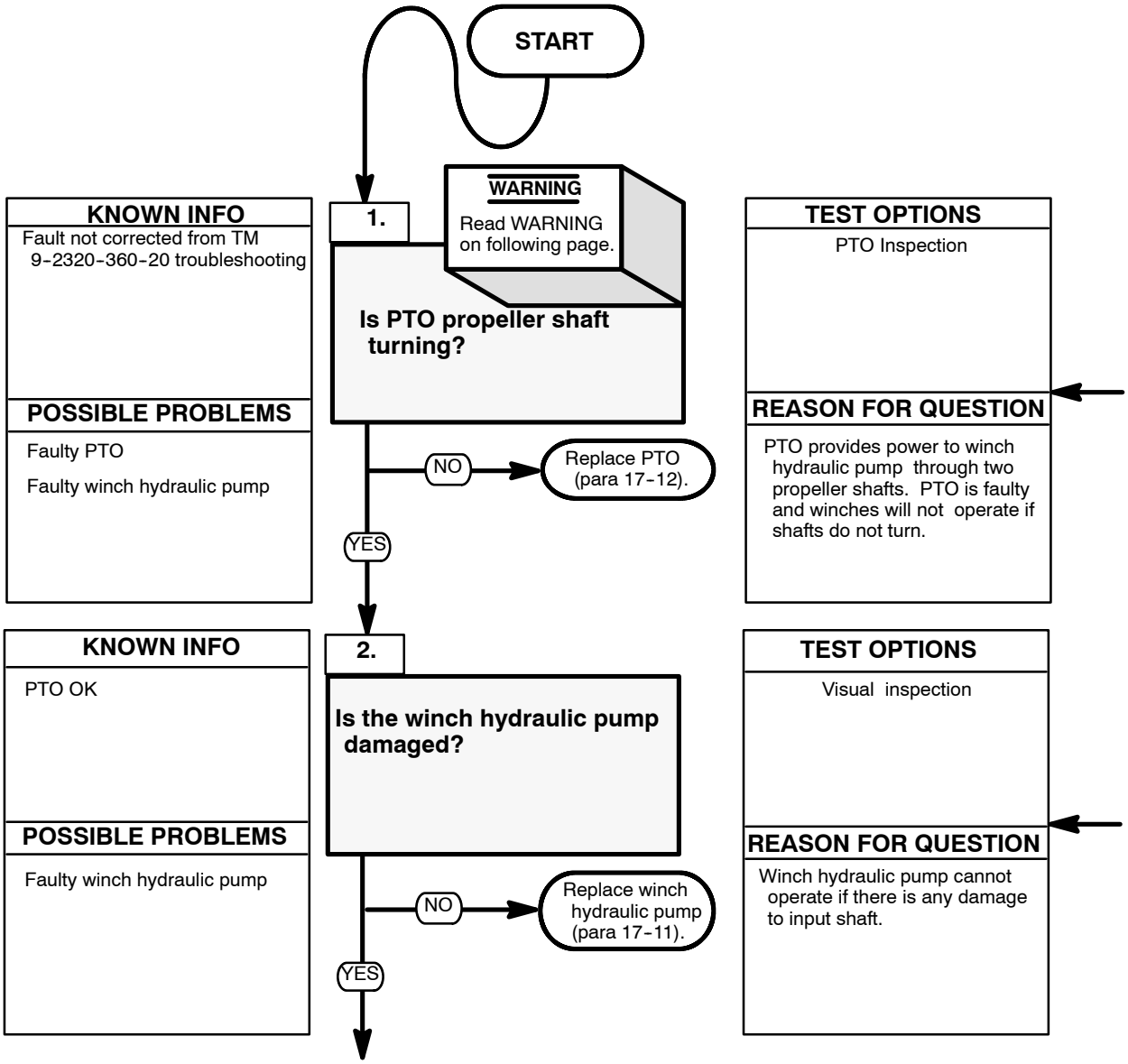
f3. BOTH MAIN WINCHES AND AUXILIARY WINCH DO NOT OPERATE

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Materials/Parts
Ties, Cable, Plastic (Item 60, Appendix B)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Wrench, Combination, 1-1/2 in. (Item 214, Appendix E)
Wrench, Open End, 15/16 in. & 1-1/16 in. (Item 227, Appendix E)
Wrench, Adjustable, Automobile (Item 212.1, Appendix E)



PTO INSPECTION

(1) Start engine (TM 9-2320-360-10).

(2) Press PTO control switch to ON position (TM 9-2320-360-10).

WARNING

Keep clear of rotating parts. Tools, clothing, or hands can get caught and cause serious injury to personnel.

NOTE

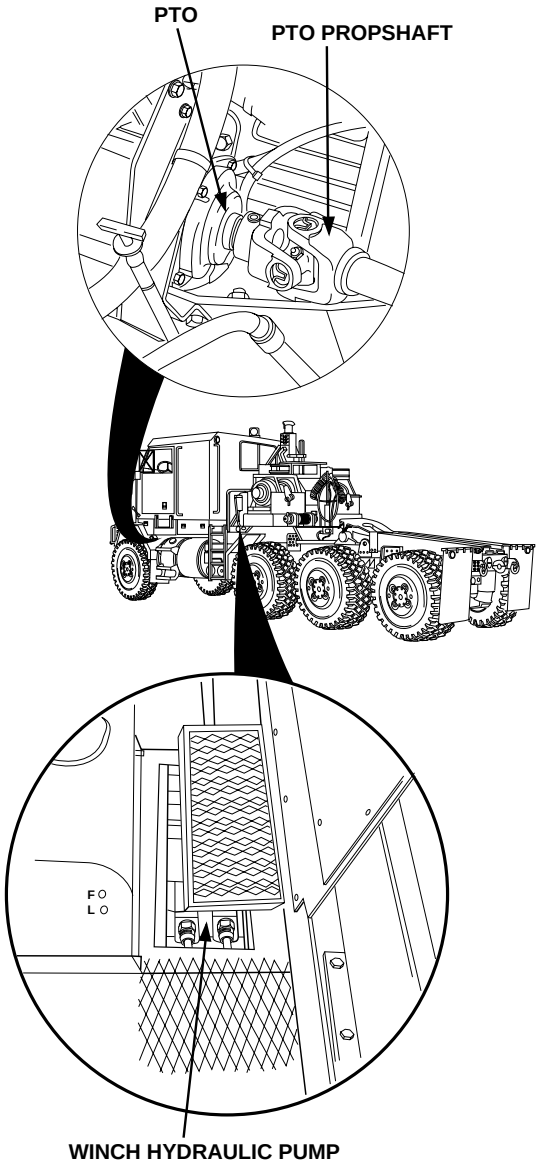
- Parking brake must be applied and transmission range selector in neutral position for PTO to operate.
- To observe PTO propshaft, sound shield flap must be raised.

(3) Observe PTO propshaft to PTO.

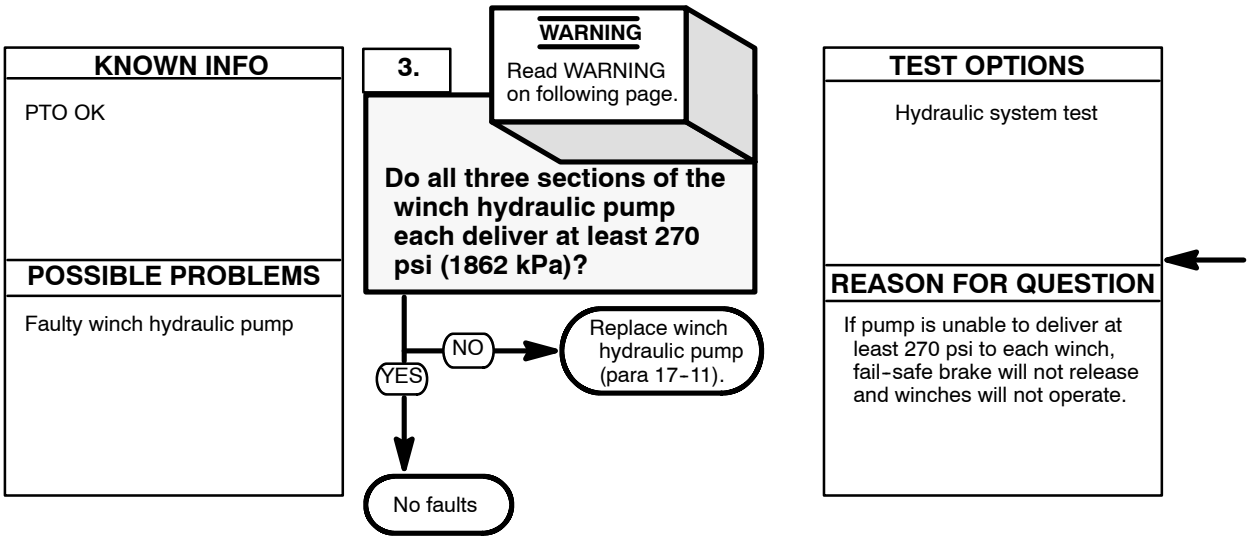
(4) Press PTO control switch to OFF position (TM 9-2320-360-10).

(5) Shut off engine (TM 9-2320-360-10).

Remove access cover from winch deck. Check winch hydraulic pump for broken input shaft, damaged input shaft key or keyway, or other obvious external damage.



f3. BOTH MAIN WINCHES AND AUXILIARY WINCH DO NOT OPERATE (CONT)



HYDRAULIC SYSTEM TEST

WARNING

Never disconnect any hydraulic hose while engine is running. Allow several minutes after engine shutdown for pressure to be released.

NOTE

- Winch testing should be done with 10 ft (3 m) of cable payed out and no load on cable.
- Winch hydraulic reservoir filter should be at least warm to the touch and engine on high idle during trouble shooting.
- Winch hydraulic pump contains three separate sections. Pump test must be performed three times, once on each section.

(1) Remove winch control console panels (TM 9-2320-360-20).

(2) Cut and remove spiral wrap from three pressure hoses.

(3) Remove pressure hose from winch hydraulic pump.

(4) Install tee, pressure gage and pressure hose on hydraulic pump.

(5) Start engine (TM 9-2320-360-10).

(6) Engage PTO and high idle (TM 9-2320-360-10).

(7) Pull up or push down control valve lever, and observe pressure.

(8) Disengage PTO and high idle (TM 9-2320-360-10).

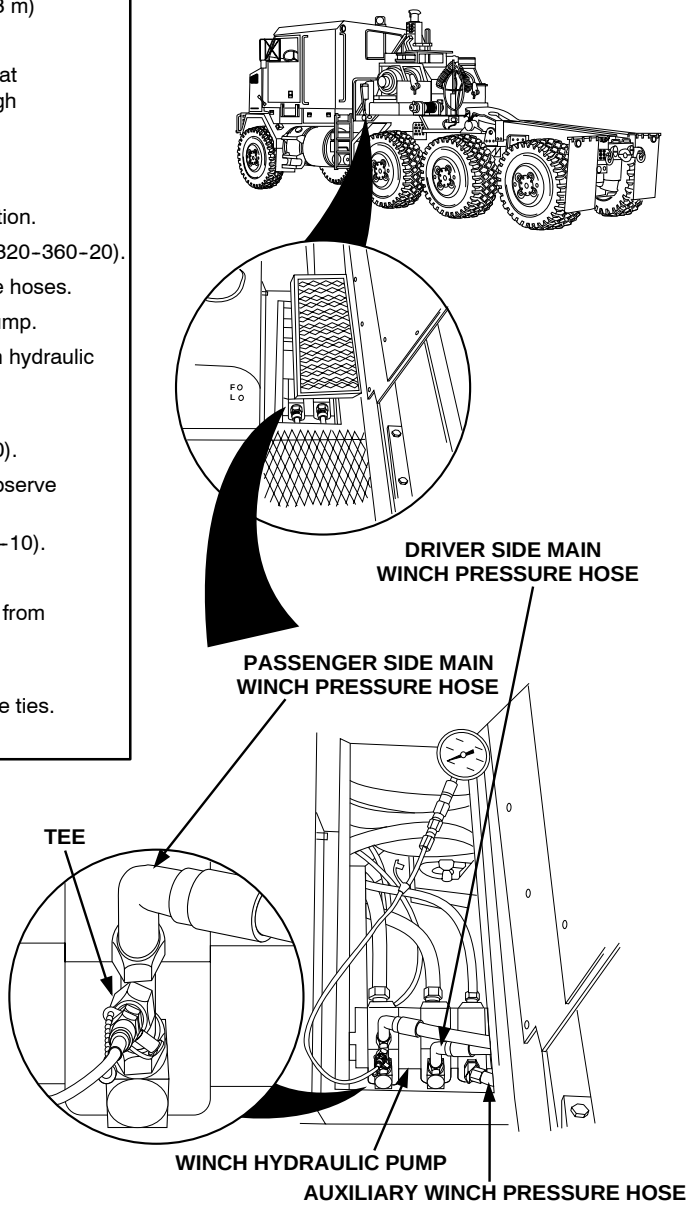
(9) Shut off engine (TM 9-2320-360-10).

(10) Remove pressure hose, pressure gage and tee from hydraulic pump.

(11) Install pressure hose on winch hydraulic pump.

(12) Secure three pressure hoses together with cable ties.

(13) Repeat steps (2) thru (12) on other two pumps.

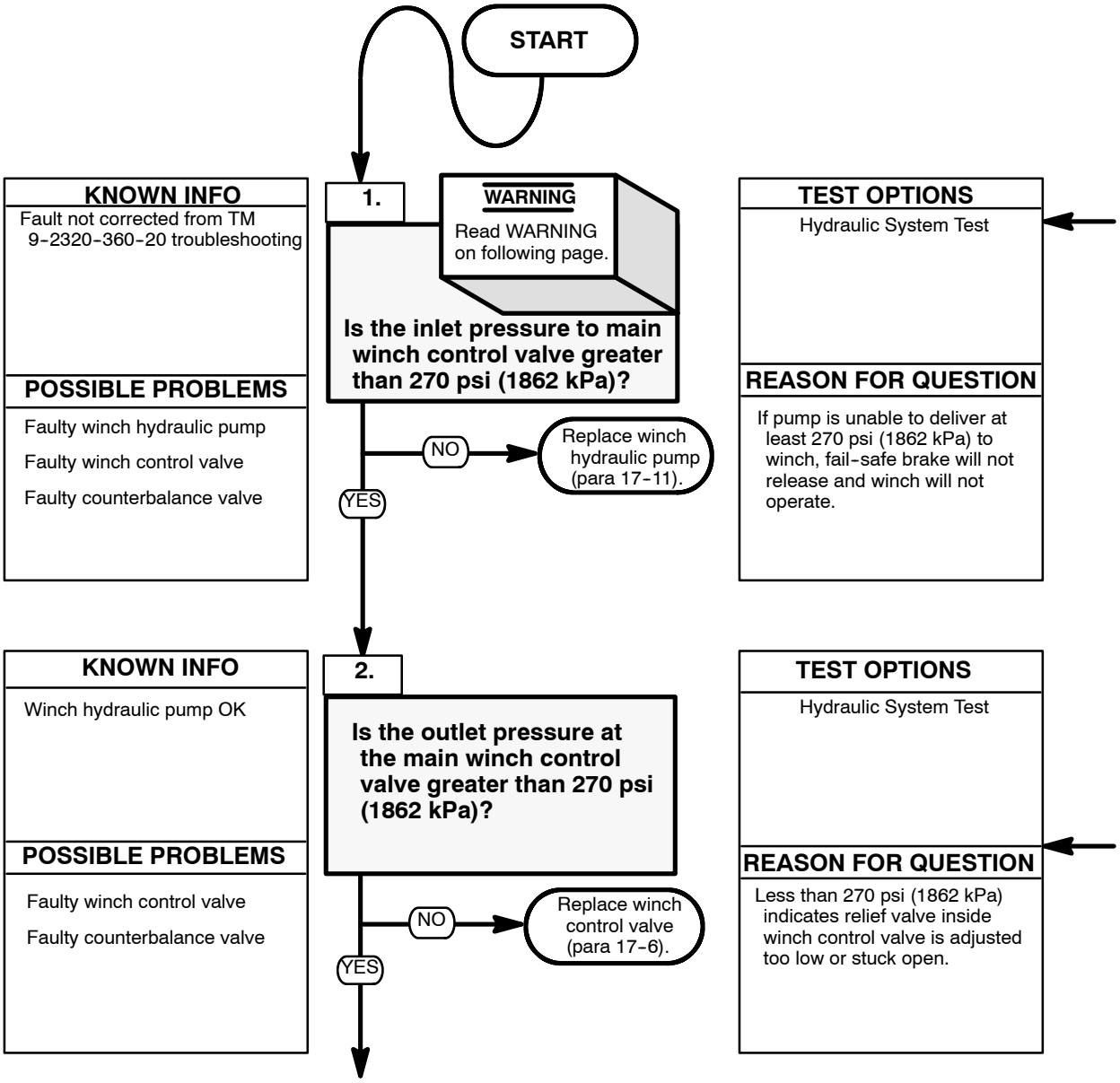


f4. ONE MAIN WINCH WILL NOT PAY OUT (USING CONTROL VALVE)

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Wrench, Combination, 1-3/8 in. (Item 213, Appendix E)
Wrench, Combination, 1-5/16 in. (Item 216, Appendix E)
Wrench, Open End, 15/16 in. & 1-1/16 in. (Item 227, Appendix E)



HYDRAULIC SYSTEM TEST

WARNING

Never disconnect any hydraulic hose while engine is running. Allow several minutes before shutting engine off for pressure to drop.

NOTE

- Winch testing should be done with 10 ft (3 m) of cable payed out.
- Winch hydraulic reservoir filter should be at least warm to the touch and engine on high idle during troubleshooting.
- Winch hydraulic pump contains three separate sections. Pump test must be performed three times, once on each section.

(1) Remove winch console panels (TM 9-2320-360-20).

(2) Remove inlet hose from control valve.

(3) Install tee, pressure gage and pressure hose on control valve.

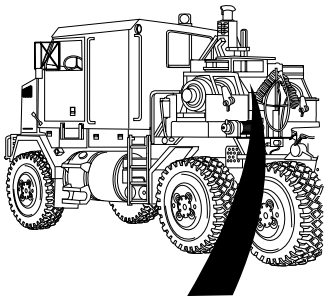
(4) Start engine and engage PTO and high idle (TM 9-2320-360-10).

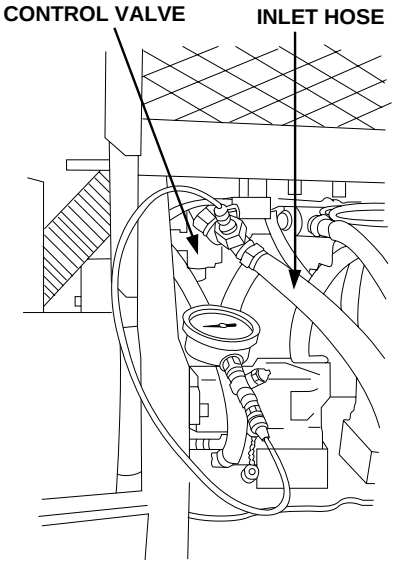
(5) Pull up or push down control valve lever, and observe pressure.

(6) Disengage high idle and PTO and shut engine off (TM 9-2320-360-10).

(7) Remove pressure hose, pressure gage and tee from control valve.

(8) Install inlet hose on control valve.





HYDRAULIC SYSTEM TEST

(1) Remove outlet hose from control valve.

(2) Install tee, pressure gage and pressure hose on control valve.

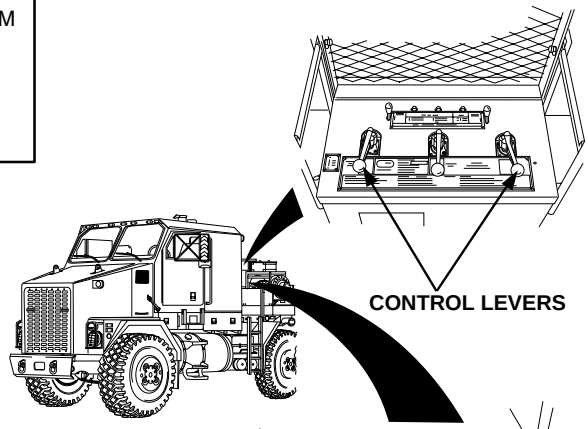
(3) Start engine (TM 9-2320-360-10).

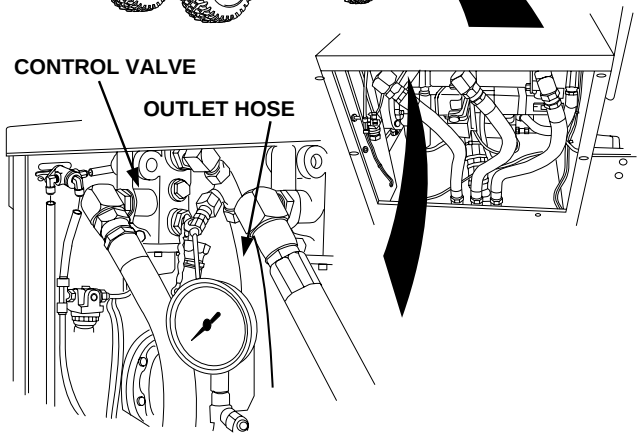
(4) Pull up and hold winch control lever while observing pressure.

(5) Release winch control lever and shut engine off (TM 9-2320-360-10).

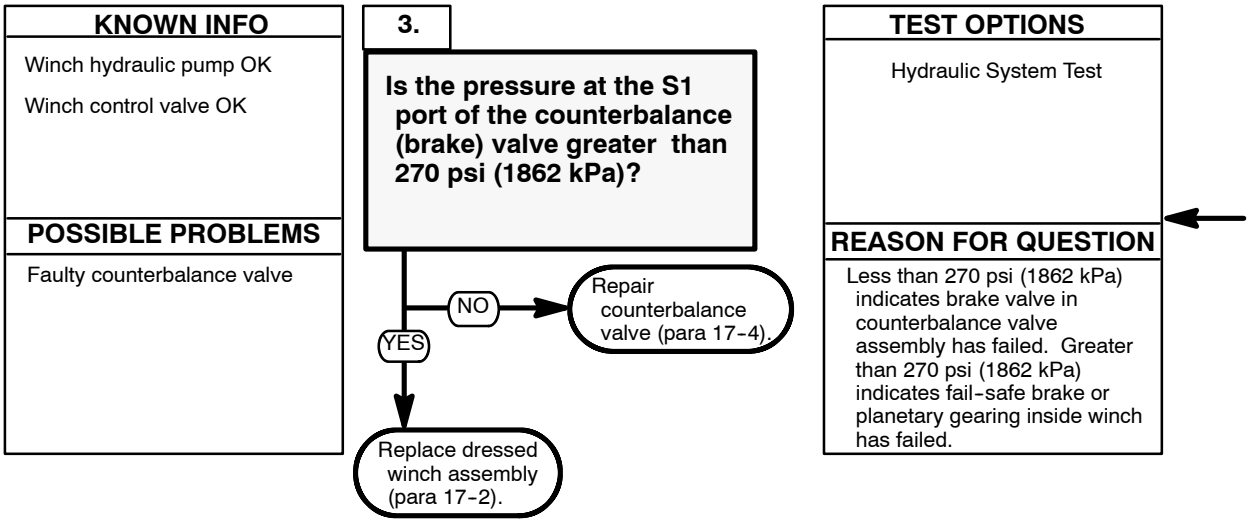
(6) Remove pressure hose, pressure gage and tee from control valve.

(7) Install outlet hose on control valve.





f4. ONE MAIN WINCH WILL NOT PAY OUT (USING CONTROL VALVE) (CONT)



HYDRAULIC SYSTEM TEST

(1) Remove brake hose from S1 port on counterbalance valve.

(2) Install tee, pressure gage and pressure hose on counterbalance valve.

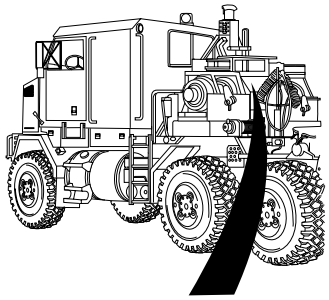
(3) Start engine and engage PTO and high idle (TM 9-2320-360-10).

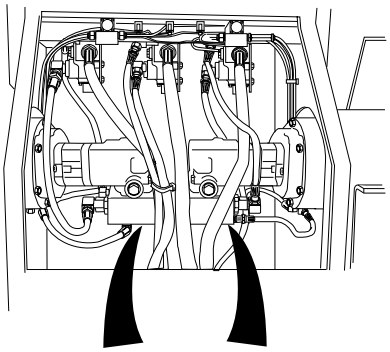
(4) Pull up or push down winch control lever and observe pressure.

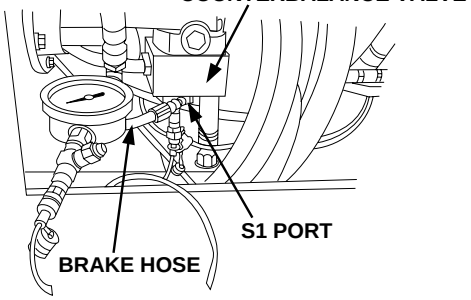
(5) Release winch control lever, disengage high idle and PTO, and shut engine off (TM 9-2320-360-10).

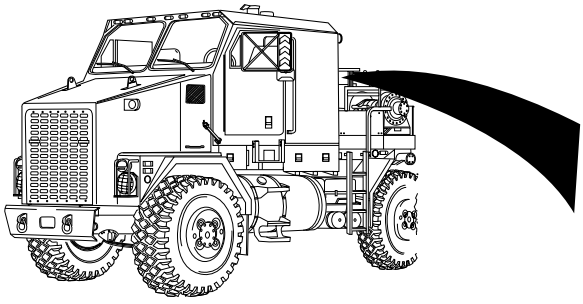
(6) Remove pressure hose, pressure gage and tee from counterbalance valve.

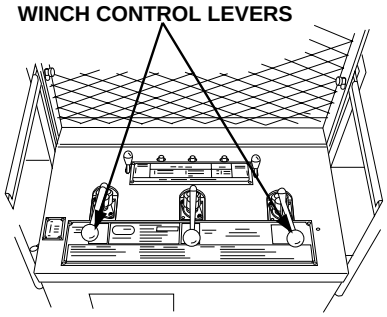
(7) Install brake hose on S1 port of counterbalance valve.









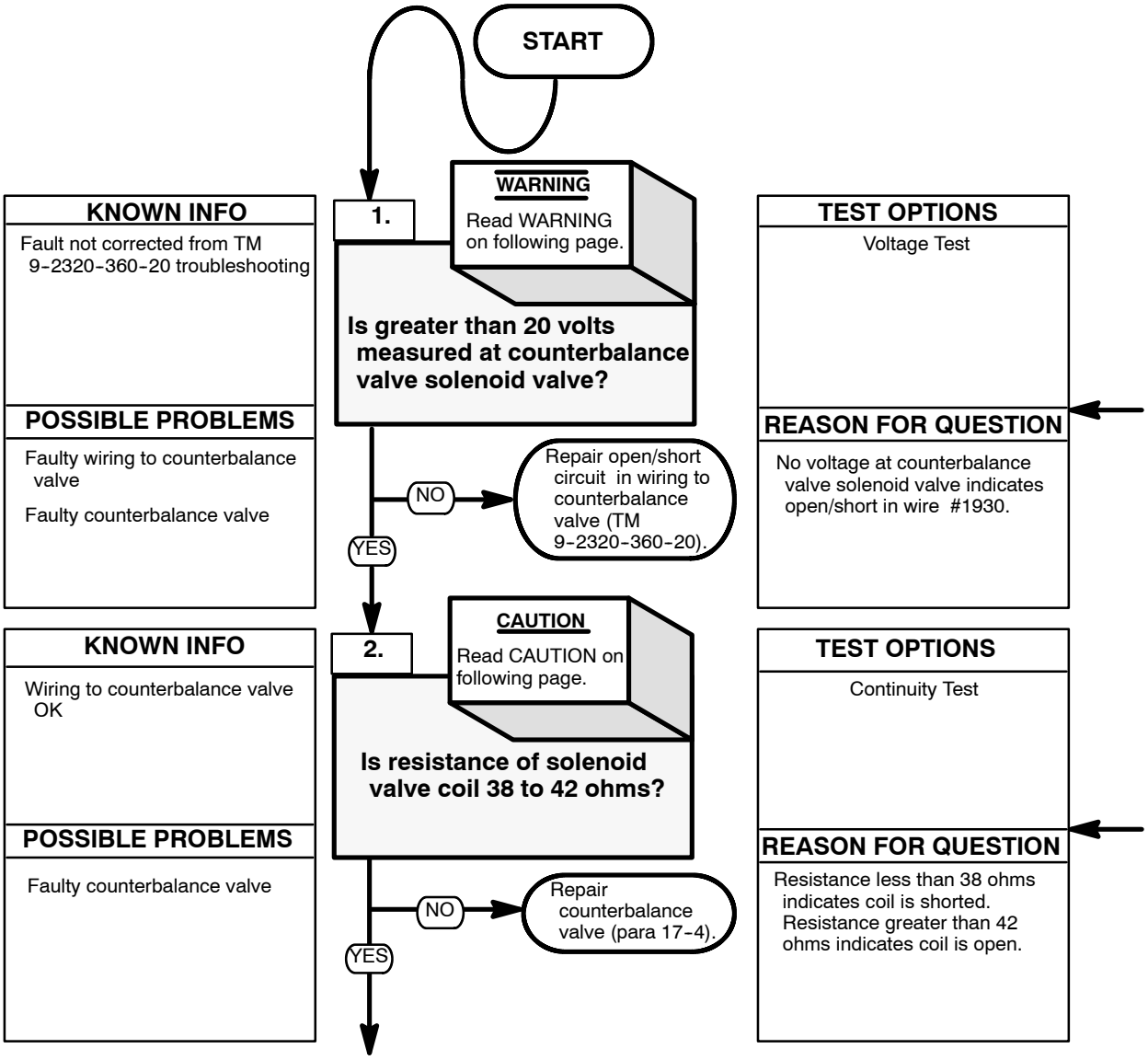


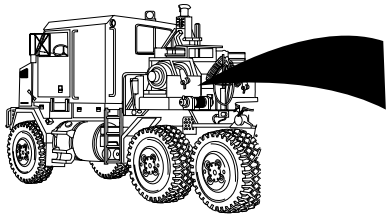
f5. MAIN WINCH HIGH SPEED DOES NOT WORK

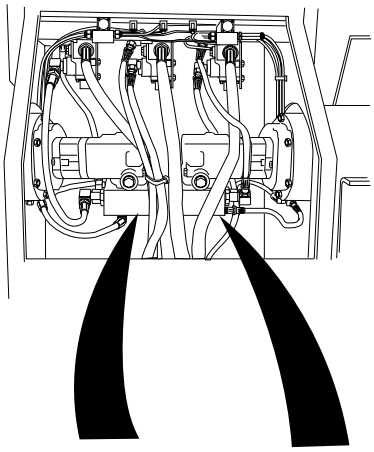
INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Multimeter (Item 98, Appendix E)







VOLTAGE TEST

WARNING

Remove all jewelry such as rings, dog tags, and bracelets. If jewelry contacts electrical terminals a direct short may result in instant heating of tools, damage to equipment, and injury to personnel.

(1) Remove winch control console panels (TM 9-2320-360-20).

(2) Remove two wires from counterbalance valve solenoid.

(3) Turn ENGINE switch to ON (TM 9-2320-360-10).

(4) Push PTO switch to ON position (TM 9-2320-360-10).

(5) Position WINCH SPEED CONTROL switch to HIGH (TM 9-2320-360-10).

(6) Place negative (-) probe of meter on ground.

NOTE

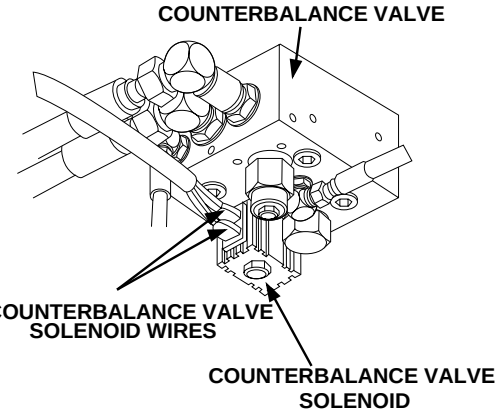
Voltage will only be measured at one wire; the other wire is a ground wire.

(7) Place positive (+) probe of meter on each wire terminal and observe voltage on meter.

(8) Position WINCH SPEED CONTROL switch to LOW (TM 9-2320-360-10).

(9) Push PTO switch to OFF position (TM 9-2320-360-10).

(10) Turn ENGINE switch to OFF (TM 9-2320-360-10).



CONTINUITY TEST

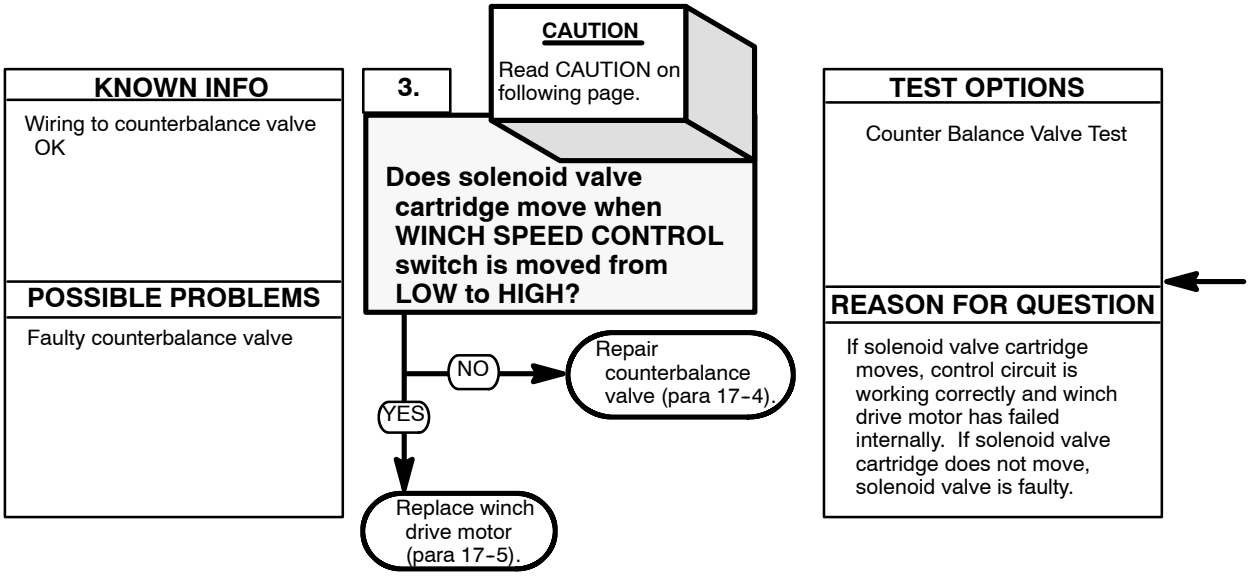
CAUTION

Electrical power must be disconnected from circuit before continuity con be checked. Failure to comply may result in damage to test equipment or electrical system.

(1) Place negative (-) probe of meter on one terminal of solenoid valve coil.

(2) Place positive (+) probe of meter on other terminal of solenoid valve coil and observe ohms reading on meter.

f5. MAIN WINCH HIGH SPEED DOES NOT WORK (CONT)



COUNTERBALANCE VALVE TEST

(1) Remove nut and solenoid from cartridge.

(2) Remove cartridge from counterbalance valve.

(3) install solenoid on cartridge with nut.

(4) Connect two wires to terminals of solenoid valve coil.

CAUTION

Do not start engine during this test. Failure to comply will result in loss of hydraulic oil and possible damage to equipment.

(5) Turn ENGINE switch to ON (TM 9-2320-360-10).

(6) Press PTO switch to ON position (TM 9-2320-360-10).

(7) Press WINCH SPEED CONTROL switch to HIGH (TM 9-2320-360-10) and observe solenoid valve cartridge.

(8) Press WINCH SPEED CONTROL switch to LOW (TM 9-2320-360-10) and observe solenoid valve cartridge.

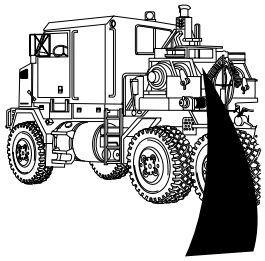
(9) Press PTO switch to OFF position (TM 9-2320-360-10).

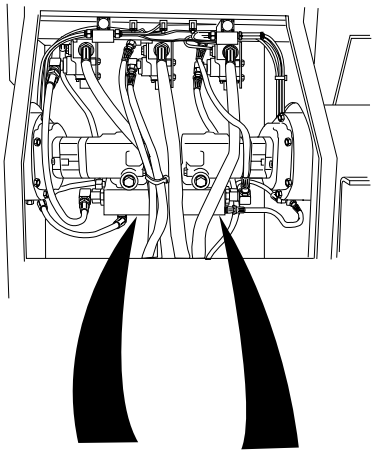
(10) Turn ENGINE switch to OFF (TM 9-2320-360-10).

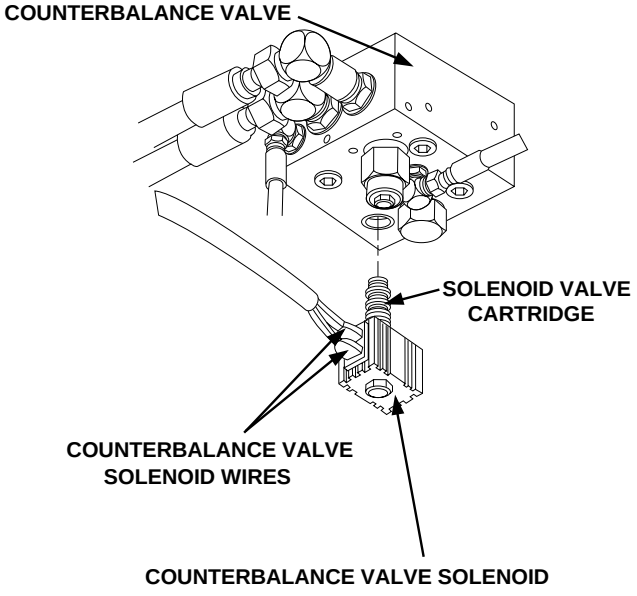
(11) Remove nut and solenoid from cartridge.

(12) Install cartridge in counterbalance valve.

(13) Install solenoid on cartridge with nut.







f6. ONE MAIN WINCH WILL NOT OPERATE IN EITHER DIRECTION

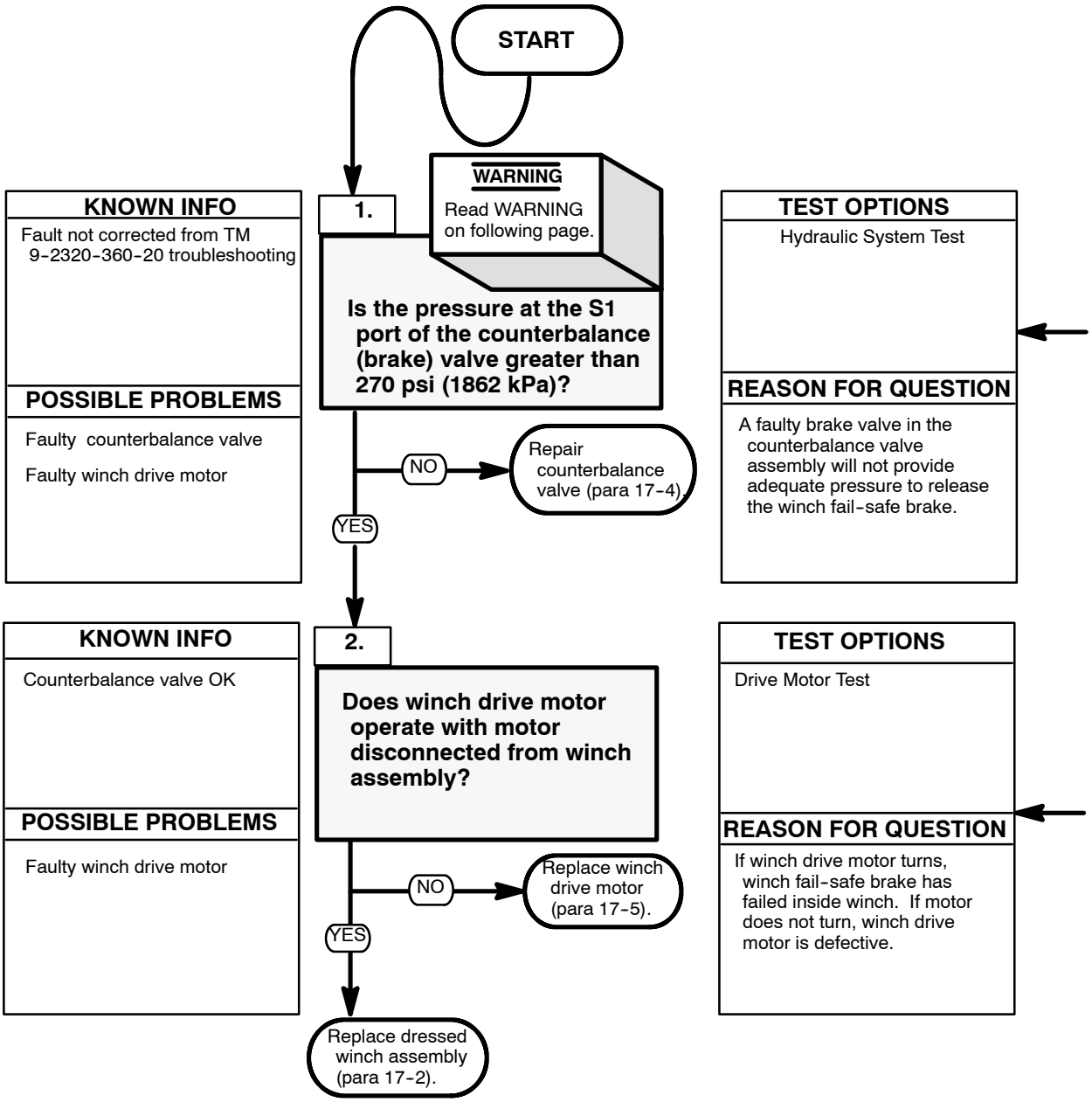
INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Personnel Required:
Two

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)

Materials/Parts
Lockwasher (2) (Item 130, Appendix G)



WARNING

Never disconnect any hydraulic hose while engine is running. Allow several minutes after shutdown for engine pressure to drop.

HYDRAULIC SYSTEM TEST

NOTE

- Winch testing should be done with 10 ft (3 m) of cable payed out and no load on cable.
- Winch hydraulic reservoir filter should be at least warm to the touch and engine on high idle during troubleshooting.

(1) Remove brake hose from S1 port on counterbalance valve.

(2) Install tee, pressure gage and pressure hose on counterbalance valve.

(3) Start engine, engage PTO and high idle (TM 9-2320-360-10).

(4) Pull up or push down winch control lever and observe pressure.

(5) Release winch control lever, disengage high idle and PTO, and shut off engine (TM 9-2320-360-10).

(6) Remove pressure hose, pressure gage and tee from counterbalance valve.

(7) Remove brake hose from hydraulic systems tester.

(8) Install brake hose on S1 port of counterbalance valve.

DRIVE MOTOR TEST

NOTE

- Winch hydraulic reservoir should beat least warm to the touch and engine on high idle during winch troubleshooting
- Winch assembly will leak gear oil when drive motor is removed.

(1) Remove two screws, lockwashers and drive motor from winch assembly with aid of assistant.

(2) Start engine and engage PTO and high idle (TM 9-2320-360-10).

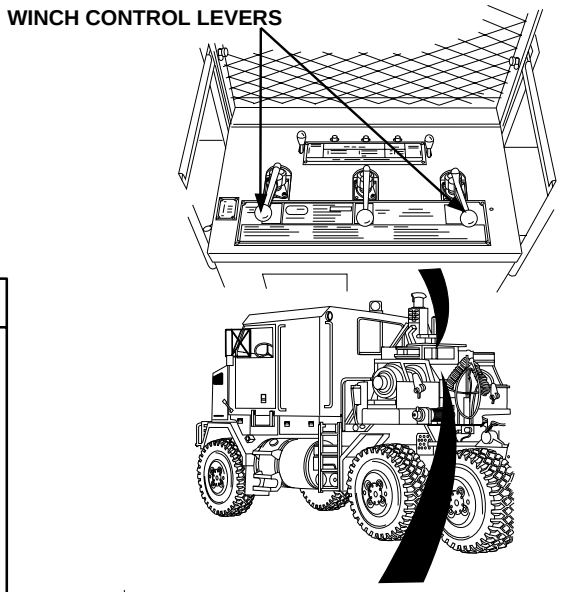
(3) Operate winch drive motor by pulling up and pushing down on control lever while assistant supports motor.

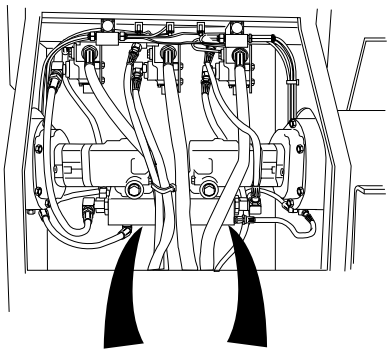
(4) Disengage high idle and PTO and shut off engine (TM 9-2320-360-10).

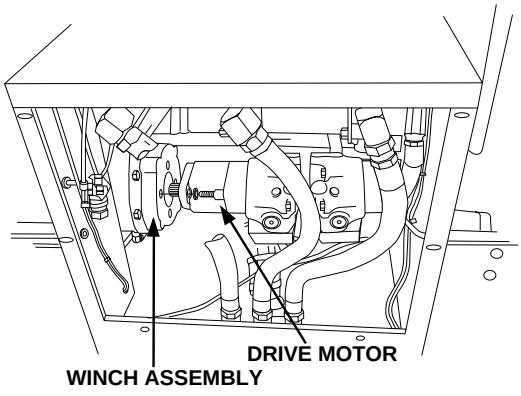
NOTE

If results of troubleshooting indicate faulty winch drive motor, do not do step (5)

(5) Install drive motor on winch assembly with two new lockwashers and screws with aid of assistant.







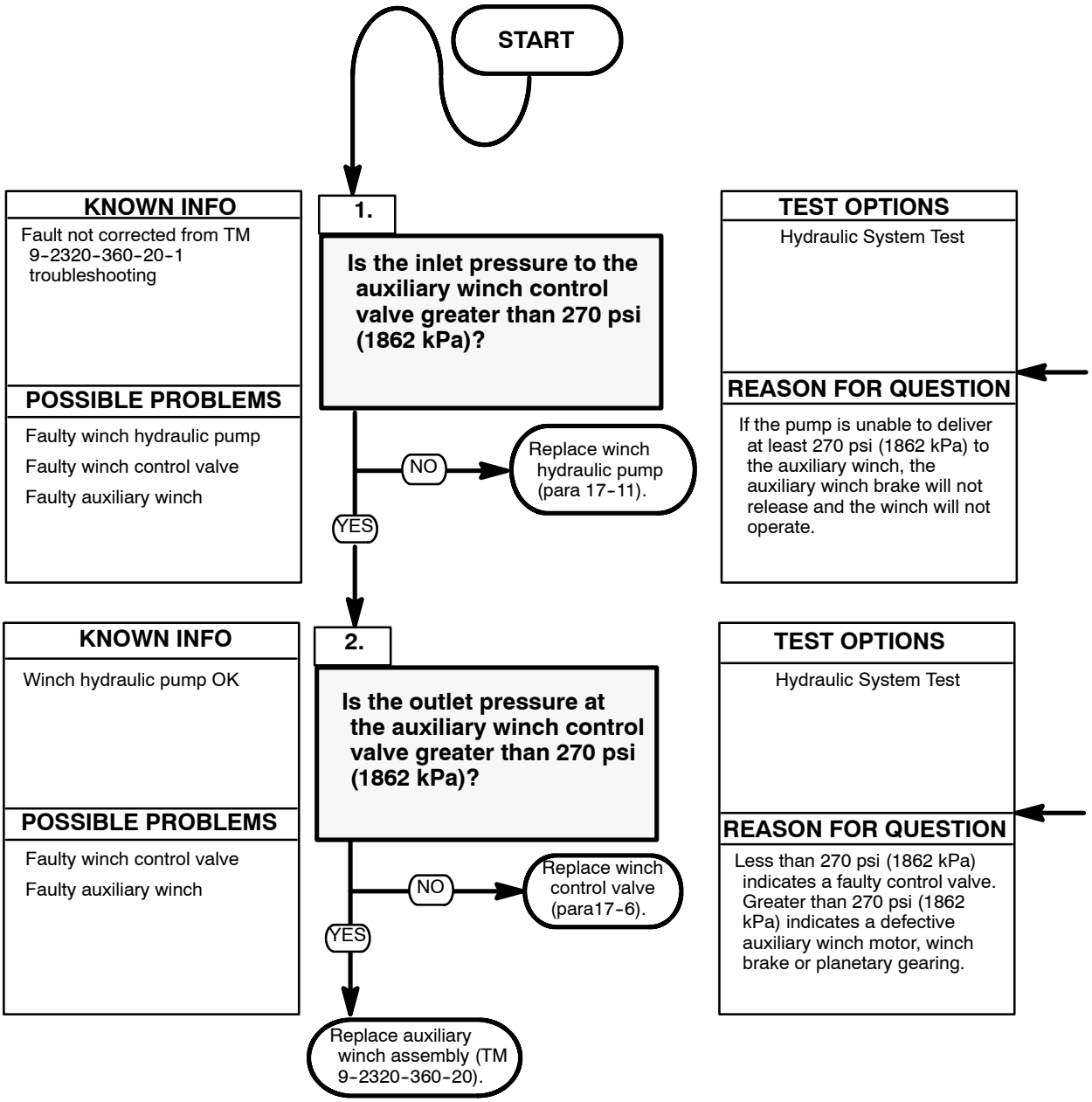
f7. AUXILIARY WINCH DOES NOT OPERATE

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)

Personnel Required:
Two



HYDRAULIC SYSTEM TEST

WARNING

Never disconnect any hydraulic hose while engine is running. Allow several minutes before shutting engine off for pressure to drop

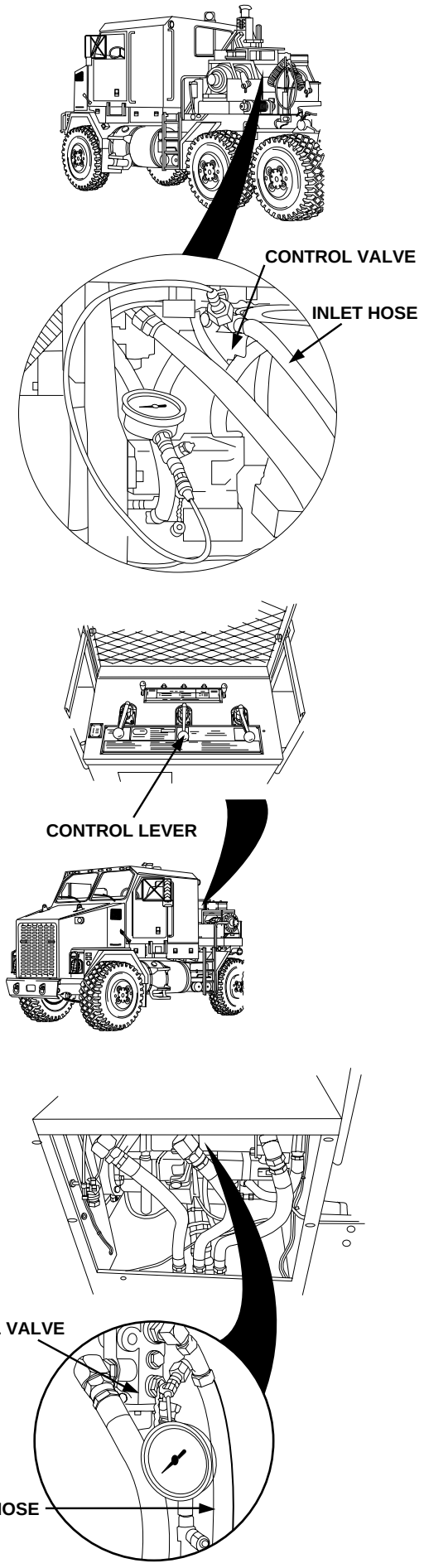
NOTE

- Winch testing should be done with 10 ft (3 m) of cable payed out.
- Winch hydraulic reservoir filter should be at least warm to the touch and engine on high idle during troubleshooting.
- Winch hydraulic pump contains three separate sections.

(1) Remove winch console panels (TM 9-2320-360-20).
(2) Remove inlet hose from control valve.
(3) Install tee, pressure gage and pressure hose on control valve.
(4) Disengage auxiliary winch kickout (TM 9-2320-360-10).
(5) Start engine and engage PTO and high idle (TM 9-2320-360-10).
(6) Pull up or push down control valve lever, and observe pressure.
(7) Disengage high idle and PTO and shut engine off (TM 9-2320-360-10).
(8) Remove pressure hose, pressure gage and tee from control valve.
(9) Install inlet hose on control valve.

HYDRAULIC SYSTEM TEST

(1) Remove outlet hose from control valve.
(2) Install tee, pressure gage and pressure hose on control valve.
(3) Start engine (TM 9-2320-360-10).
(4) Pull up and hold winch control lever while observing pressure.
(5) Release winch control lever and shut engine off (TM 9-2320-360-10).
(6) Remove pressure hose, pressure gage and tee from control valve.
(7) Install outlet hose on control valve.

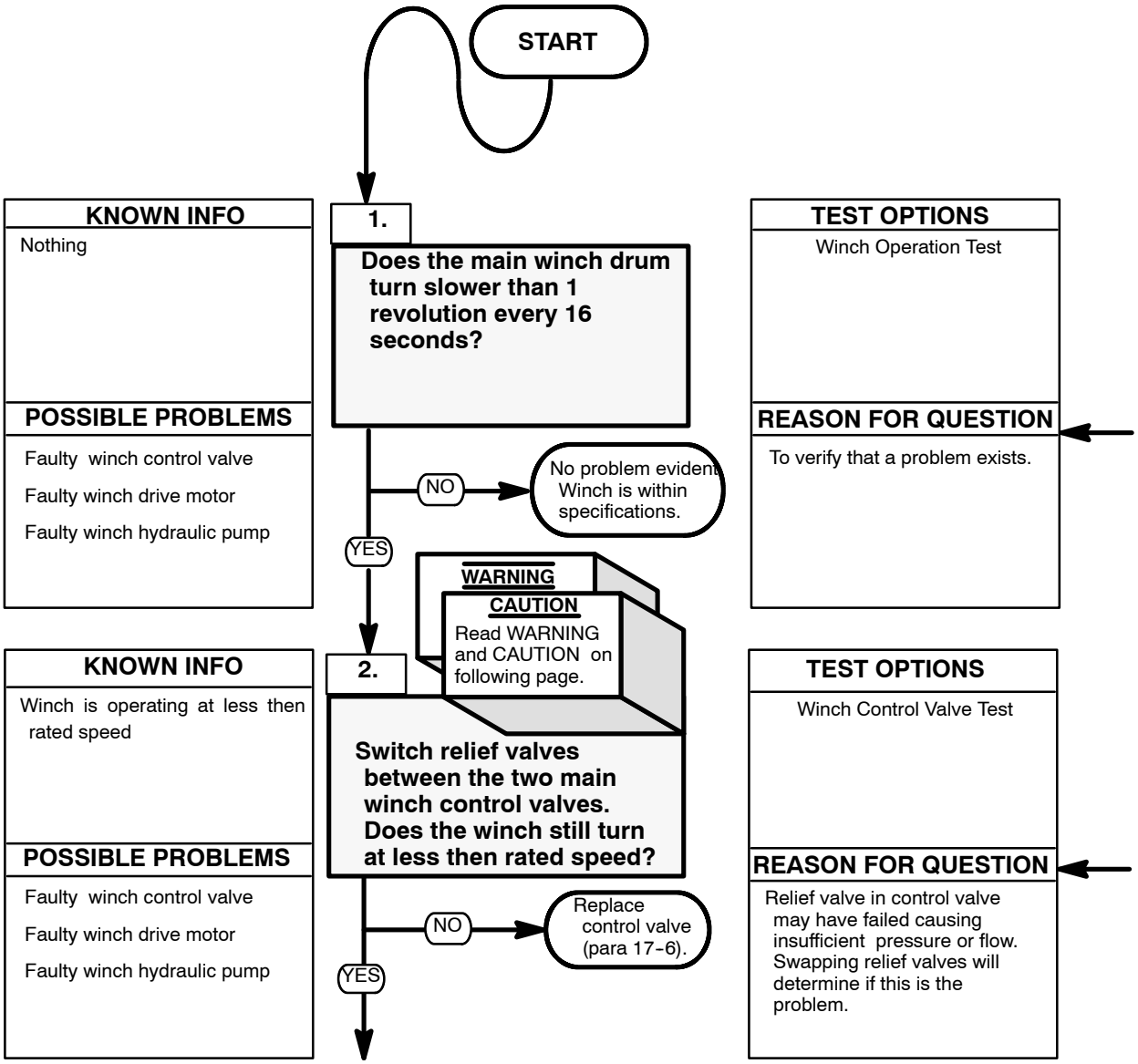


f8. ONE MAIN WINCH WILL NOT PULL AT RATED LINE SPEED

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Combination, 1 1/2 In. (Item 214, Appendix E)



NOTE

- One revolution of the winch drum every 16 seconds approximately equals the rated line speed of 13 feet/minute.
- All tests within this fault must be preformed with main winch cable connected to a load. Another M1070 tractor, or equivalent, can be used for this purpose.
- Winch hydraulic reservoir filter should be at least warm to the touch and engine on high idle during troubleshooting.

WINCH OPERATION TEST

(1) Operate faulty main winch (TM 9-2320-360-10).

(2) Pay out enough cable so that the winch cable is down to the third layer.

(3) Attach winch cable to load.

(4) Mark starting position on winch drum.

(5) Set WINCH SPEED CONTROL to LOW position (TM 9-2320-360-10).

(6) Push down winch control lever and record the time required to make one drum revolution.

(7) Shut off engine (TM 9-2320-360-10).

WINCH CONTROL VALVE TEST

WARNING

- **Never switch relief valves between the main winch control valves and the auxiliary winch control valve. The pressure settings are different between the main and auxiliary winches.**
- **Relief valve pressure settings are factory preset and should not be adjusted. Never attempt to adjust the relief valve setting. Failure to comply may result in injury to personnel.**

CAUTION

Use extra care when removing relief valves from control valves. Failure to comply may result in damage to relief valve or control valve.

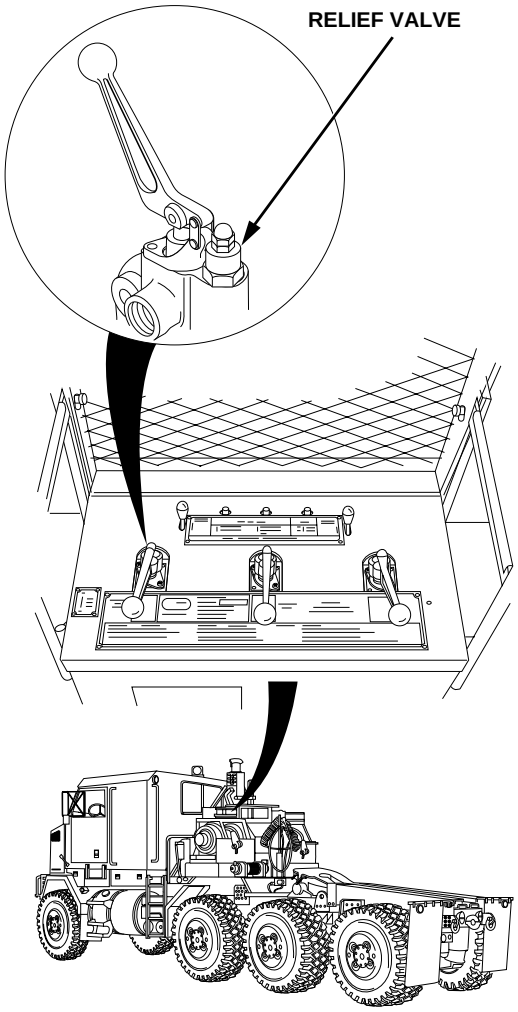
(1) Switch relief valves between the two main winch control valves.

(2) Operate faulty main winch (TM 9-2320-360-10).

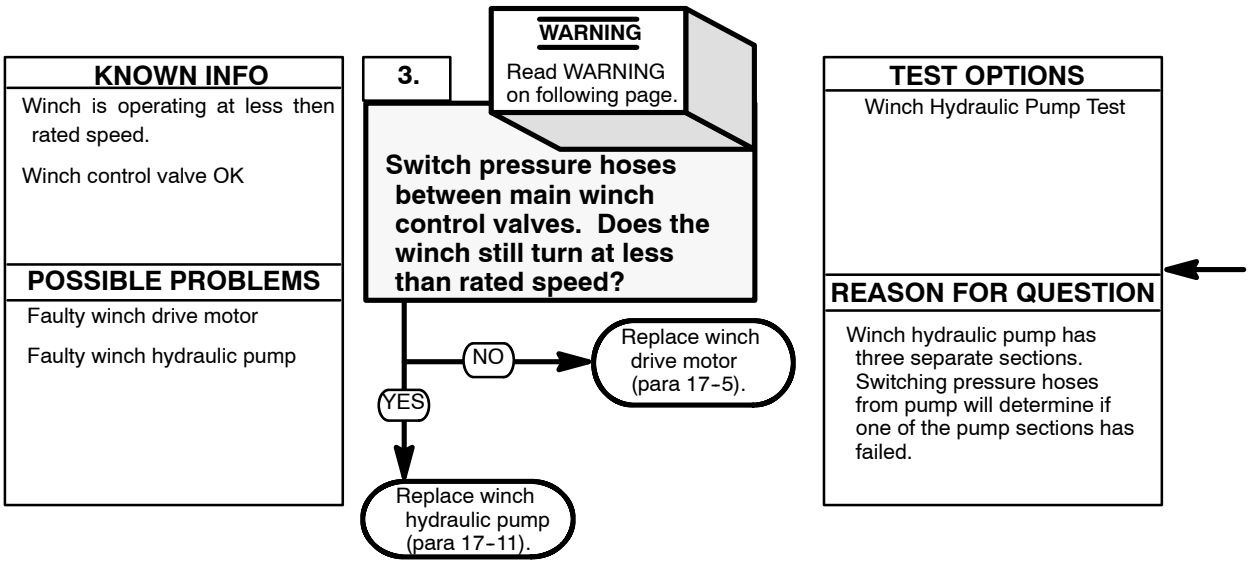
(3) Push down winch control lever and record the time required to make one drum revolution.

(4) Shut off engine (Tm 9-2320-360-10).

(5) Switch relief valves back to their original positions.



f8. ONE MAIN WINCH WILL NOT PULL AT RATED LINE SPEED (CONT)



WINCH HYDRAULIC PUMP TEST

WARNING

Never disconnect any hydraulic hose with the engine running. Allow several minutes after engine is shut off for pressure to drop.

(1) Remove winch console panels (TM 9-2320-360-20).

(2) Switch main winch pressure hoses between the two main winch control valves.

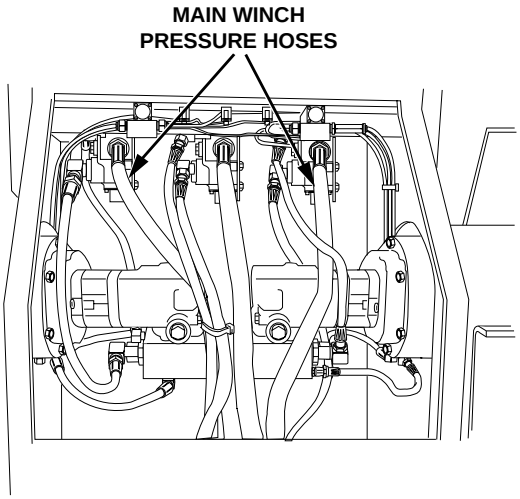
(3) Operate faulty main winch (TM 9-2320-360-10).

(4) Push down winch control lever and record the time required to make one drum revolution.

(5) Shut off engine (TM 9-2320-360-10).

(6) Switch main winch pressure hoses back to their original positions.

(7) Install winch console panels (TM 9-2320-360-20).



Section III. MAINTENANCE PROCEDURES

2-6. MAINTENANCE INTRODUCTION

This section provides general procedures for equipment maintenance at the Direct Support and General Support levels. If a special procedure is needed for maintenance of a component, the detailed procedure will be located in the chapter covering maintenance of that component.

2-7. GENERAL REMOVAL INSTRUCTIONS

a. Work Required. Remove only those parts needing repair or replacement. Do not disassemble a component any further than needed.

b. Preparation.

WARNING

Vehicle may move unexpectedly when working on it. Unless otherwise noted, parking brake must be applied and wheels chocked before performing maintenance. Failure to comply may result in injury or death to personnel.

(1) Before removing any part of the electrical, winch hydraulic, or air systems, ensure system is not energized or pressurized. Disconnect battery cables. Relieve all pressure from air system. Ensure parking brake is applied and that all controls are in OFF position before starting a removal procedure.

(2) Chock wheels: Wheel chocks should be positioned directly in front of and behind one of the rear wheels to keep vehicle from rolling.

c. Lifting. Always use a lifting device when lifting heavy parts. Ensure that load limit of lifting device exceeds weight being lifted. Position lifting device and sling before disconnecting part for removal.

d. Identification. Tag and mark all similar parts, such as electrical leads and hoses, before disconnecting and removing them. This will make proper assembly easier. Identify mating ends of electric, hydraulic, and air lines before they are disconnected.

e. Hoses. Hose numbers are identified in detailed procedures by a four-digit number. This corresponds with the numbers used on the air and hydraulic schematic.

f. Electrical Wires. Wire numbers are identified in detailed procedures by a four-digit number. This number corresponds with the numbers used on the electrical schematic.

2-8. GENERAL DISASSEMBLY INSTRUCTIONS

a. Cleanliness. Work area must be kept as clean as possible. This will prevent contamination of internal parts. This is true for valves, cylinders, and other hydraulic or air system parts.

b. Expendable Parts. Gaskets, packings, and seals removed during repair must be discarded and replaced with new parts. These items are usually damaged during removal. In the same way, lockwires, lockwashers, cotter pins, and like items must be replaced at time of assembly. Self-locking fasteners that loosen up must be replaced, not tightened.

c. Removing Seals. When removing gaskets, packings, or seals, do not use any tool that will scratch the surfaces next to these items.

d. Parts Protection. To prevent moisture and dirt from entering open housings, lines, and other openings, apply protective caps and plugs as soon as possible after disassembly. Wrap all removed parts in clean paper.

2-9. GENERAL CLEANING INSTRUCTIONS

a. Cleaning Solvents

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/ massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

- Never use fuel to clean parts. Fuel is highly flammable. Serious personal injury may result if fuel ignites during cleaning.

CAUTION

- Petroleum solvents may damage parts that are in contact with hydraulic fluids.
- Do not clean tires, lubricate seals, rubber hoses, or electrical components with solvent mixture.

Use only approved cleaning solvents to clean parts. Solvent cleaning compound (MIL-PRF-680) is commonly used. Always work in a well-ventilated area.

b. Removing Deposits

WARNING

Compressed air used for cleaning and drying purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.). Failure to comply may result in injury to personnel.

After soaking parts in solvent, wash away deposits by flushing or spraying. Where necessary, brush with a soft bristle brush moistened in solvent. Use compressed air to dry all parts, except bearings. Bearings must be allowed to air dry.

c. Tools. Do not use abrasive wheels or compounds for cleaning parts unless called for in detailed instructions. These procedures may weaken highly stressed parts.

d. Ball and Roller Bearings. When cleaning ball or roller bearings, place them in a basket and suspend them in a container of solvent cleaning compound. If needed, use a brush to remove caked grease, chips, etc. Avoid rotating bearing before solid particles are removed to prevent damaging races and balls. When bearings have been cleaned, coat them lightly with lubricating oil to remove solvent.

e. Rubber Parts. Do not clean preformed packings or other rubber parts in solvent cleaning compound. These parts should be wiped clean with a clean, dry, lint-free cloth.

f. Exterior Parts

WARNING

Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection is required. Failure to comply may result in injury to personnel.

Steam clean all exterior parts thoroughly before removing. This will make inspection and disassembly easier.

2-9. GENERAL CLEANING INSTRUCTIONS (CONT)

g. Engine, Cab, and Body

WARNING

Face shield must be used by personnel operating spray gun. Failure to comply may result in injury to personnel.

Use a spray gun and solvent mixture for cleaning exterior of engine, cab, and body. Allow mixture to remain on item surface for about 10 minutes before rinsing. Rinse with hot water under 80 to 120 psi (550 to 830 kPa), if available. An ordinary garden hose with nozzle may be used if other equipment is not available. Rinse thoroughly.

h. Degreasing Machine. A degreasing machine may be used to remove heavy grease and oil accumulations from metal parts.

i. Passages. Check all oil passages and cavities for dirt or blockage. A thin, flexible wire should be run through oil passages to ensure they are not clogged. Individual passages that are dirty may be cleaned using a pressure spray gun and solvent cleaning compound.

j. Electrical Parts. Electrical parts, such as coils, junction blocks, switches, and igniters, which use insulating materials, should not be soaked or sprayed with cleaning solutions. Clean these parts with a clean, lint-free cloth.

k. Fuel Tanks. Pay special attention to all warnings and cautions when working on fuel tanks.

l. Battery

WARNING

Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.

Exterior surfaces of the electrical system and battery should be cleaned with a solution of baking soda and water. Apply solution with a bristle brush to remove any corrosion.

m. Winch Hydraulic System

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/ massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

- **The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).**
- **Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.**
- **Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.**
- **Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.**
- **Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.**

CAUTION

Never use gasoline or other petroleum base products to clean or preserve hydraulic system parts. Use of petroleum base products may change the lubricating properties of hydraulic oil and cause damage to equipment.

When cleaning winch hydraulic system parts, use dry cleaning solvent, P-D-680. Clean and dry parts thoroughly to ensure no residue remains. If a coating of preservative is required before assembly, apply a light film of preservative oil. If petroleum free solvents are not available, use the same hydraulic fluid contained in the winch hydraulic system.

2-10. GENERAL INSPECTION INSTRUCTIONS

a. Inspection. Inspection consists of checking for defects such as distortion, wear, cracks, and pitting. Clean all parts before inspection.

b. Sealing Surfaces. Inspect all surfaces in contact with gaskets, packings, or seals. Ensure there are no nicks, burrs, or scratches. If any defect is found, replace or repair it as outlined in para 2-11.

c. Bearings. Check bearings for rusted or pitted balls, races, or separators. Check balls and races for brinelling, abrasion, and discoloration. Following are causes for bearing rejection:

(1) Cuts or grooves parallel to ball or roller rotation.

(2) Pits

(3) Cracks.

d. Drain Plugs. When removing drain plugs from transmission, engine, or hydraulic system components, inspect sediment adhering to plug. A few fine particles are normal. A build-up of grit or fine metal particles may indicate part failure. This inspection is effective in determining defective parts prior to internal inspection of parts.

e. Gears. Gear inspection cannot be described in detail here. There are too many differences in size and shape of gears. The following steps can be used to make a general visual inspection of all gears. Follow all steps listed within repair instructions for final inspection.

(1) Normal Wear. Loss of metal from the surface of gear teeth. Wear must not prevent gears from meshing or performing properly.

(2) Initial Pitting. This may occur when a pair of gears is first started in service. It may continue until most high spots have been reduced, as long as contact surfaces are not affected. This pitting is not necessarily serious.

(3) Destructive Pitting. This type of pitting occurs after initial pitting, often at an increasing rate. This will destroy contact area and reduce the gear's ability to carry a load. Rapid destruction will occur with use.

(4) Abrasive Wear. This damage is caused by the fine particles carried in the lubricant or imbedded in the gear teeth. These particles may come from many sources: metal detached from gear teeth or bearings, abrasives not completely removed before assembly, sand or scale from castings, or other impurities in oil or air.

(5) Scoring. Slight scoring, scuffing, galling, or other surface damage is identified by tears or scratches in the direction of sliding. It starts in areas having the highest stress and speed. This is usually at the tip of the teeth.

(6) Burning. Burning is indicated by discoloration and loss of hardness due to excessive temperature. This is caused by too much friction resulting from overload, overspeed, lack of backlash, or faulty lubrication. If discoloring can be wiped off with clean cloth, such discoloring usually can be traced to oil burn-stains, which are not serious.

(7) Rolling. This damage occurs mainly on plastic gears. Rolling is when material is pushed out of shape without breaking off. This is caused by heavy, even loads, sliding, or overheating.

(8) Brinelling. This can be identified by tiny indentation or ridges on the shoulder or race of a bearing.

f. Splines. Inspect shaft splines for wear, pitting, rolling, peening, and fatigue cracks.

2-10. GENERAL INSPECTION INSTRUCTIONS (CONT)

g. Tubing and Hose

CAUTION

Hoses and nylon tubing that are kinked or chafed must be replaced. Hoses must be secured and routed properly. Failure to comply may result in sudden, unexpected hose failure.

Check all hose surfaces for broken or frayed fabric. Check for breaks caused by sharp kinks or rubbing against other parts of the truck. Inspect hoses and lines for kinking. Inspect the fitting threads for damage.

h. Electrical Parts. Inspect all wiring harnesses for chafed or burned insulation. Inspect all terminal connectors for loose connections and broken parts.

i. Metal Parts

Visually inspect all castings and weldments for cracks.

2-10.1. GENERAL WELDING INSTRUCTIONS

WARNING

Eye and hearing protection must be worn at all times when using power tools for grinding, cutting, sawing and drilling. Failure to do so may result in injury to personnel. Chemical Agent Resistant Coating (CARC) paint contains isocyanate which is highly irritating to skin and respiratory system. High concentrations of isocyanate can produce symptoms of itching and reddening of skin, a burning sensation in the throat and nose, and watering of the eyes. In extreme concentrations, isocyanate can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention.

The following precautions must be taken whenever using CARC paint:

- **Protective equipment (gloves, goggles, ventilation mask) must be worn when using CARC paint.**
- **NEVER cut CARC-coated materials without high-efficiency, air-purifying respirators in use.**
- **DO NOT grind or sand painted equipment without high-efficiency, air-purifying respirators in use.**
- **BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.**
- **Use only in well-ventilated areas. Check with local environmental office for methods and locations approved for painting in accordance with local and state environmental regulations.**
- **ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.**

- Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC 9-237. Protective clothing and goggles must be worn; adequate protective equipment used, a suitable fire extinguisher kept nearby, and requirements of TC 9-237 strictly followed.

2-10.1. GENERAL WELDING INSTRUCTIONS (CONT)

CAUTION

Do not attempt to weld on HET tractor without observing the following conditions. Failure to comply may result in damage to the electrical system of the HET M1070.

Preparing the HET M1070 or welding. Perform the following steps before welding on the HET M1070:

(1) Disconnect batteries (TM 9-2320-360-20-2).

(2) Disconnect DDEC II or DDEC III/IV Electronic Control Module (ECM) (TM 9-2320-360-20-2).

(3) Disconnect 12-volt alternator (TM 9-2320-360-20-2).

(4) Disconnect 24-volt alternator (TM 9-2320-360-20-2).

(5) Disconnect CTIS controller (TM 9-2320-360-20-2).

(6) Disconnect CTI power manifold (TM 9-2320-360-20-2).

2-11. GENERAL REPAIR INSTRUCTIONS

a. Nicks, Burrs, and Scratches. Remove nicks, burrs, and scratches from surfaces with crocus cloth.

b. Exterior Parts. Chassis and exterior painted parts may be resurfaced where paint is damaged or where parts have been repaired.

c. Protective Parts

NOTE

The following procedure is used with polished and machined steel parts not protected by cadmium, tin, copper, or other plating or surface treatment. Bare metal surfaces must be free of moisture when protective coating is applied.

Protect bare metal surfaces from rusting when not actually undergoing repair work. Dip parts in, or spray them with, corrosion preventive compound. Aluminum parts may require protection in atmospheres having a high salt content.

d. Stud Installation. When installing studs in engine block and axle housings, use a driver designed for the stud to be installed. A worn stud driver may damage the end thread and make it necessary to use a die before a nut can be installed. This procedure will remove cadmium plating and allow corrosion, which will make future disassembly difficult and cause stud to be backed out with nut. Before installing a stud, inspect hole for chips and liquid. Blow out any foreign matter. Start stud by hand.

e. Electrical Parts. Replace all broken, worn, or burned electrical wiring. Wires with several broken strands must be replaced. Broken strands will increase the resistance of the wire and impair efficiency of electrical components, especially the ignition system. Wire numbers must be permanently identified on any new wiring.

f. Hoses. Replace all broken, frayed, crimped, or soft flexible lines and hoses. Replace stripped or damaged fittings. Replace entire flexible hose if fittings are damaged. Hose clamps should not crimp hoses. Hose numbers must be permanently identified on any new hoses.

2-11. GENERAL REPAIR INSTRUCTIONS (CONT)

g. Fasteners. Replace any bolt, screw, nut, or fitting with damaged threads. Inspect tapped holes for thread damage.

h. Dents. Straighten minor body dents by tapping with a soft-faced hammer while using a wooden block for backing.

i. Sheet Metal Repair. Repair minor sheet metal cracks by installing patches.

2-12. GENERAL ASSEMBLY INSTRUCTIONS

a. Preparation. Remove protective coating from new parts before installation.

b. Preformed Packing Installation. Lubricate all preformed packings with a thin coating of light mineral oil before installation. Uniformly press the preformed packing into position.

c. Pipe Joints

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Failure to comply may result in component failure.

Use nonhardening pipe-joint compound when joining piping.

d. Gaskets. Remove all traces of previous gasket and sealant before installing new gasket.

e. Silicone Sealant

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

Silicone sealant is often used instead of a gasket to seal mating parts. The mating parts must be clean, dry, and free of oil or grease for proper adhesion. After silicone sealant has been applied, the mating parts must be assembled immediately. Excess silicone sealant should be wiped off after assembling the mating parts.

f. Oil Seals. Install oil seals with seal lip facing towards lubricant, applying an even force to outer edge of seal. Coat oil seals evenly with grease before installing. If oil seals will be installed over keyed or splined shafts, use a guide. This will prevent sharp edge of keyway or splines from cutting the seal. Construct guides of very thin gage sheet metal and shape to required diameter. However, ensure guide edges are not sharp. Bend them slightly inward so they do not cut the seal.

g. Seal Rings. Coat seal rings with oil and carefully install into their bores. If seal rings must be installed over threaded parts, temporarily wrap the threads with tape to protect the seal ring.

h. Bearings and Shafts. During assembly of shafts and bearings in housings, first mount bearing on shaft. Then install the assembly by applying force to shaft. When mounting bearings on shafts, always apply force to the inner races of the bearing.

i. Bearing Lubrication. Lubricate bearings before reassembly with the type of lubricant normally used in the related housing or container. This will provide lubrication during the first run-in until lubricant from system can reach the bearings.

2-13. GENERAL INSTALLATION INSTRUCTIONS

a. Put hoses, tubes, lines, and electrical wiring in place by matching identification tags, markings on equipment, identification numbers given in task, and schematic presented at the end of this manual.

b. Use sealing compounds as required in each maintenance task.

c. Screws and nuts must be tightened to values given in maintenance task or Appendix E, Torque Limits.

Section IV. PREPARATION FOR STORAGE OR SHIPMENT

2-14. PREPARATION FOR STORAGE OR SHIPMENT

a. Refer to (AR 750-1) for detailed administrative storage instructions.

b. Refer to (TB 9-2300-422-20) for security procedures.

c. Refer to (TM 9-2320-360-20) to prepare vehicle for storage or shipment.

2-15. STORAGE MAINTENANCE PROCEDURES

Refer to (TM 9-2320-360-20) for detailed storage maintenance procedures.

Section V. PRE-EMBARKATION INSPECTION OF MATERIEL IN UNITS ALERTED FOR OVERSEAS MOVEMENT

2-16. PRE-EMBARKATION INSPECTION

Refer to (TB 9-2300-281-35) for pre-embarkation requirements.

CHAPTER 3
ENGINE MAINTENANCE

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Section I. INTRODUCTION

3-1. INTRODUCTION

This chapter contains maintenance instructions for replacement and repair of engine components at the Direct Support maintenance level. Some subassemblies and parts must be removed before engine components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. SERVICE UPON RECEIPT

3-2. GENERAL MAINTENANCE INSTRUCTIONS

a. Follow these maintenance instructions when removing and installing engine:

(1) When unpacking items, remove packing material (for example: barrier paper, tape, plastic bags, and protective caps).

(2) Cap or tape over engine inlets and exhaust ducts to prevent foreign objects from getting inside the engine. Keep dust, dirt, and other objects out of internal parts of the engine.

CAUTION

Do not use tape to close off fuel or oil openings. Sticky surface of tape will mix with fuel or oil and will get in the engine lines.

(3) Cap or tape over open tubes, hoses, fittings, and engine openings as soon as parts are taken off.

(4) Use suitable container to catch oil and coolant when removing hoses, fittings, and plugs.

(5) Handle and store removed engine components carefully.

(6) Inspect parts as removed for breaks, dents, cracks, surface defects, or other obvious damage. Turn in bad parts. Set aside good parts for later use.

(7) When possible, replace gaskets, packings, and seals removed during repair work. Replace lockwire, lockwashers, and cotter pins at time of reassembly.

(8) Replace broken, worn, or burned electrical wiring.

(9) Replace broken, frayed, crimped, or soft flexible hoses. Replace stripped or damaged fittings. Replace entire connected flexible hoses if fittings are damaged.

(10) Tag and mark shims, connectors, wires, valves, fittings, and mating ends of lines before disconnecting or removing. Identify similar parts to ensure correct assembly.

(11) Use hoists, jacks, and other aids when lifting engine.

b. Follow these inspection instructions when removing and installing engine:

(1) Inspect mounting surfaces and surfaces in contact with gaskets, seals, or machined surfaces. Look for burrs or scratches which might damage parts or seals upon installation. Remove any defects found.

(2) Remove drain plugs from engine system components and inspect sediment sticking to plug. Grit or fine metal particles may indicate actual or potential component failure. A few fine particles are normal. This inspection will help to show defective parts before internal inspection of the components.

(3) Inspect hose surfaces for broken or frayed fabric. Check for breaks caused by sharp kinks or contact with other parts of the vehicle. Inspect fitting threads for damage. Replace any defective parts. After assembly and during initial vehicle operation period, check for leaks. Inspect wiring harnesses for chafed or burned insulation. Inspect terminal connectors for loose connections and broken parts. Visually inspect castings and weldments for cracks.

Section III. MAINTENANCE PROCEDURES

3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Cab removed (para 16-2).
Exhaust pipe removed (TM 9-2320-360-20).
Inner fenders removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jackstands (3) (Item 93, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Sling Assemblies (2) (Item 160, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 168, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Combination, 1-1/4 In. (Item 215, Appendix E)
Wrench, Crow's Foot, 1/2 In., 3/8 In. Drive, (Item 221, Appendix E)
Wrench, Open-End, 1 In. and 1-1/8 In., (Item 226, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
Wrench, Torque, 0-150 Lb-In. (Item 234, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Compound, Antiseize (Item 18, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Rope, 50 Ft (Item 53, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknuts (10) (Item 87, Appendix F)
Locknuts (6) (Item 80.1, Appendix F)
Locknuts (5) (Item 81, Appendix F)
Locknuts (5) (Item 96, Appendix F)
Locknut (Item 89, Appendix F)
Locknut (Item 92, Appendix F)
Lockwasher (Item 119, Appendix F)
Lockwasher (Item 116, Appendix F)
Lockwasher (Item 117, Appendix F)
Lockwasher (Item 118, Appendix F)
Lockwasher (Item 120, Appendix F)
Lockwasher (Item 122, Appendix F)
Lockwasher (Item 135, Appendix F)
Packings, Preformed (2) (Item 158, Appendix F)
Packing, Preformed (Item 160, Appendix F)
Packing, Preformed (Item 161, Appendix F)
Packing, Preformed (Item 179, Appendix F)
U-Bolt Assembly (2) (Item 331, Appendix F)

Personnel Required
Three

NOTE

The special operational requirements of the HET Tractor have dictated a compact design with the engine/transmission under the cab. Consequently, engine removal is facilitated by removing the cab. The best way (fastest, most efficient, and safest) to remove and replace the engine/transmission assembly is to first remove the cab. Removing the cab provides the safest working environment. It allows personnel greater access, reduces the likelihood of damage to components, and minimizes working in cramped quarters with limited visibility. Finally, it provides for the most efficient use of personnel, thus reducing vehicle down time.

3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

a. Removal

NOTE

Vehicle maintenance time can be reduced by using three personnel on steps (1) thru (21), (22) thru (54), and (55) thru (71).

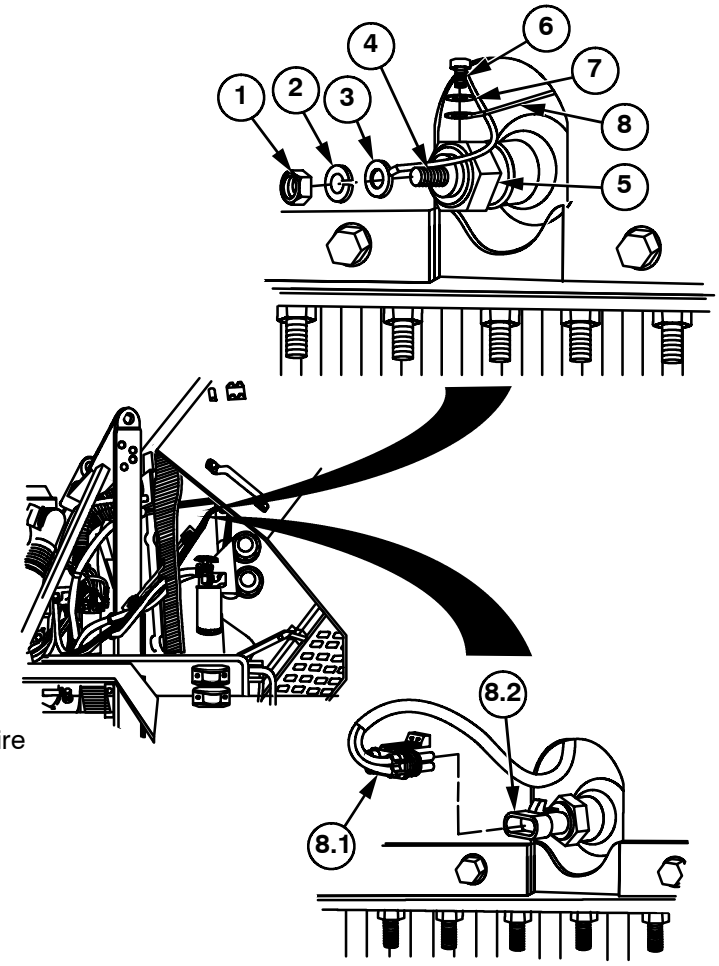
NOTE

- Steps (1 and 2) apply only to vehicles with DDEC II engines.
- Step (2.1) applies to vehicles with DDEC III/IV engines.

(1) Remove nut (1), lockwasher (2), and wire no. 068 (3) from stud (4) on coolant level sender (5). Discard lockwasher.

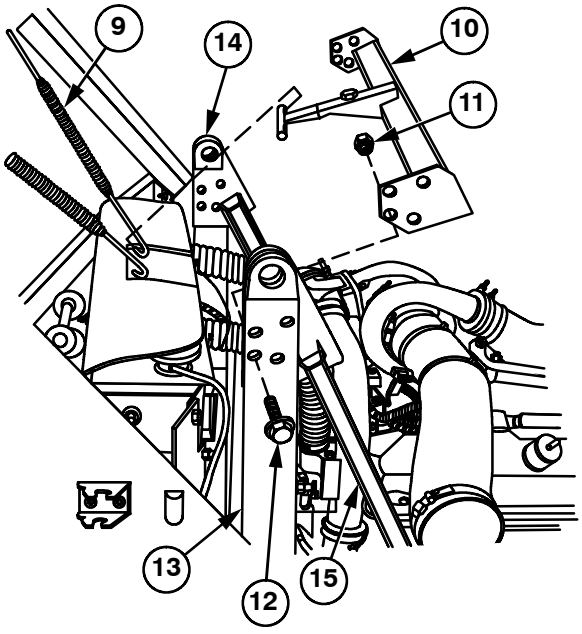
(2) Remove screw (6), lockwasher (7), and wire no. 1788 (8) from coolant level sender (5). Discard lockwasher.

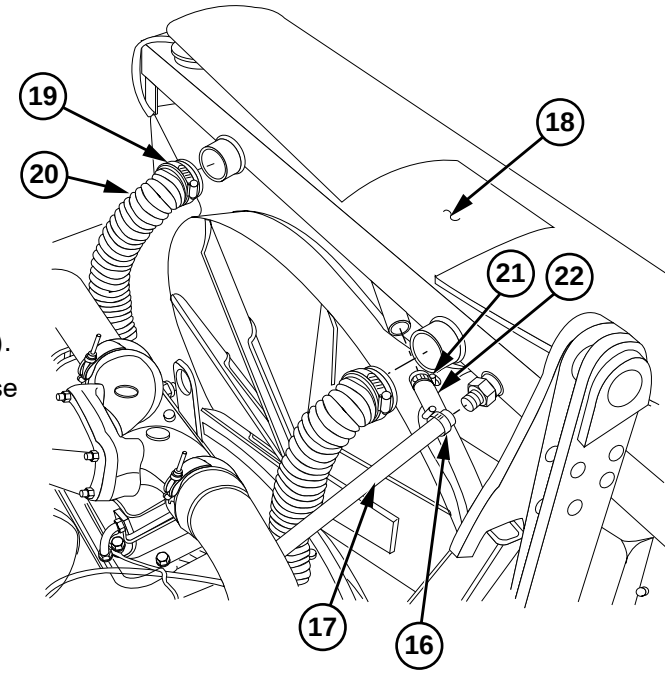
(2.1) Disconnect connector (8.1) from coolant level sensor (8.2).



(3) Disconnect two hood springs (9) from spring attachment (10).

(4) Remove eight locknuts (11), screws (12), and spring attachment (10) from hardlifts (13 and 14) and hardlift supports (15) with aid of assistant. Discard locknuts.

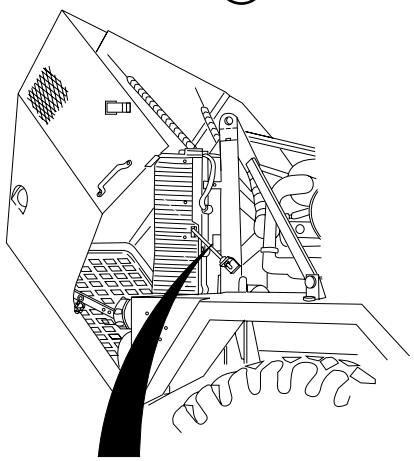




(5) Loosen clamp (16) and remove deareation hose (17) from radiator (18).

(6) Loosen two clamps (19) and remove two upper radiator hoses (20) from radiator (18).

(7) Loosen clamp (21) and remove bypass hose (22) from radiator (18).

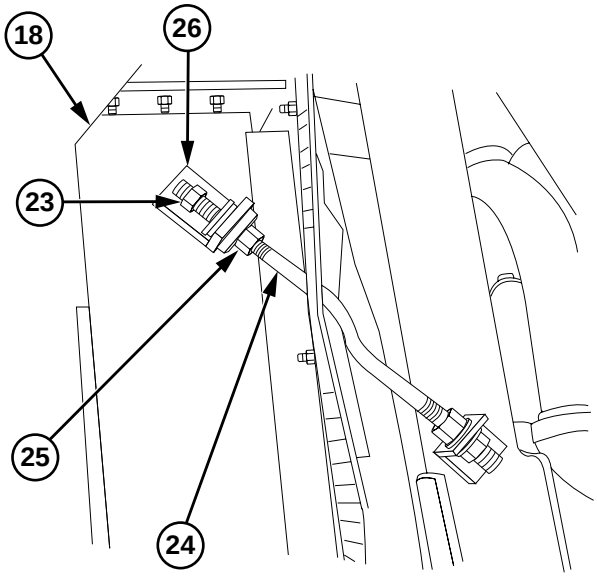


CAUTION

Do not completely remove nuts from tie rods. Failure to comply will allow hood to pull radiator forward and damage to radiator and hood may result.

NOTE

Right and left tie rods are the same. Left tie rod is shown.



(8) Loosen two outside nuts (23) on tie rods (24) until nuts (23) are flush with ends of tie rods (24).

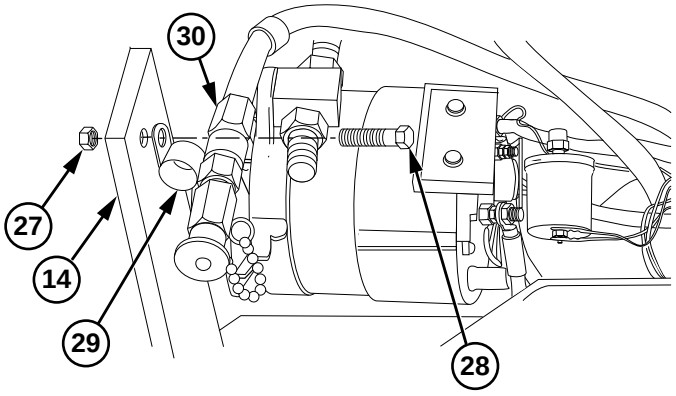
(9) Tighten two inside nuts (25) on tie rods (24) against tie rod supports (26) until radiator (18) is positioned upright.

(10) Tighten two outside nuts (23) on tie rods (24) against tie rod supports (26).

3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(11) Remove locknut (27), screw (28), and clip (29) from hardlift (14). Discard locknut.

(12) Remove clip (29) from hose no. 2682 (30).



(13) Loosen two clamps (31) and remove coolant hoses no. 2866 (32) and no. 2867 (33) from coolant filter (34).

(14) Remove nut (35), lockwasher (36), screw (37), and cushion clip (38) from radiator (18). Discard lockwasher.

(15) Remove air lines no. 2036 (39) and no. 2039 (40) from elbows (41).

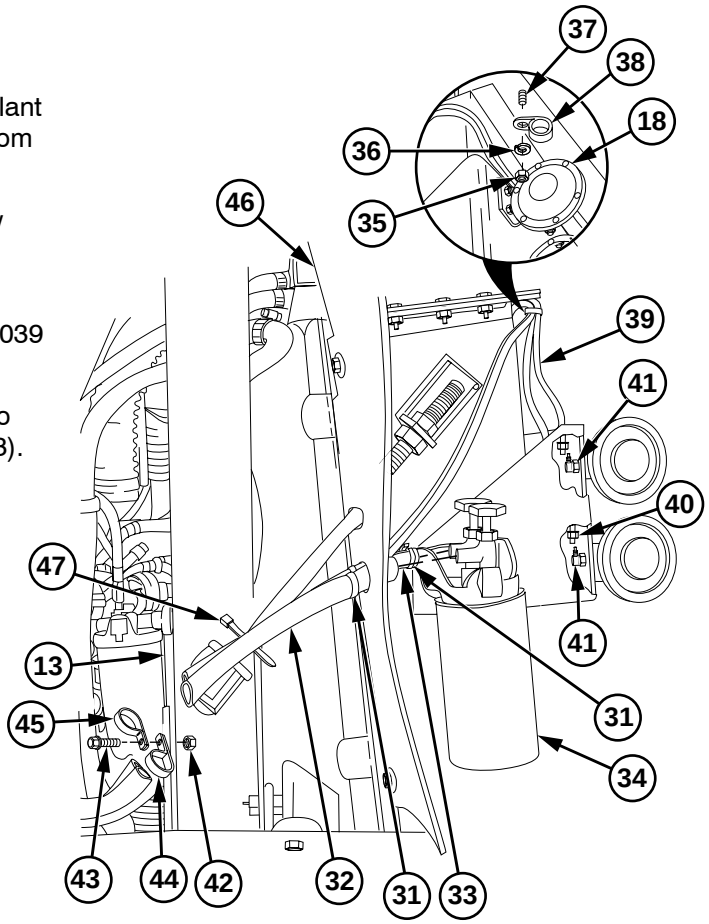
(16) Remove locknut (42), screw (43), and two cushion clips (44 and 45) from hardlift (13). Discard locknut.

(17) Pull two coolant hoses (32 and 33) and hoses (39 and 40) through radiator baffle (46).

NOTE

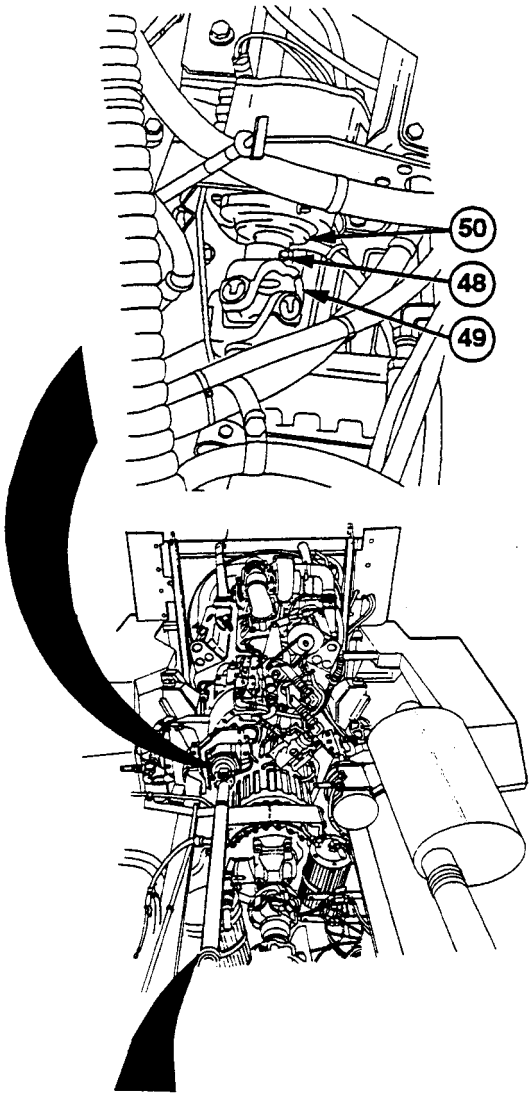
Location of plastic cable ties should be marked before removal.

(18) Remove plastic cable ties (47) from components as required.



(19) Loosen screw (48) on yoke (49).

(20) Slide back and remove yoke (49) from PTO (50).

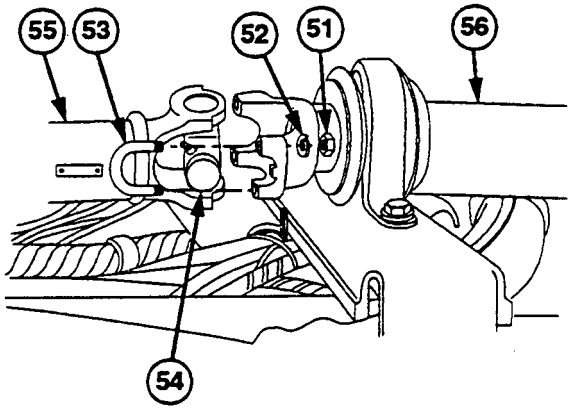


CAUTION

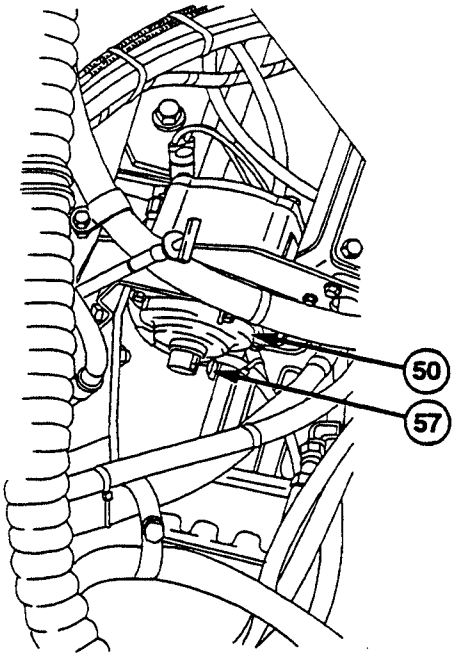
Hold U-joint bearing caps secure. Bearing caps may fall off and needle bearings may be damaged or lost.

(21) Remove four nuts (51), lockwashers (52), and two U-bolts (53) from universal joint (54). Discard lockwashers, nuts, and U-bolts.

(22) Remove front shaft (55) from rear shaft (56).

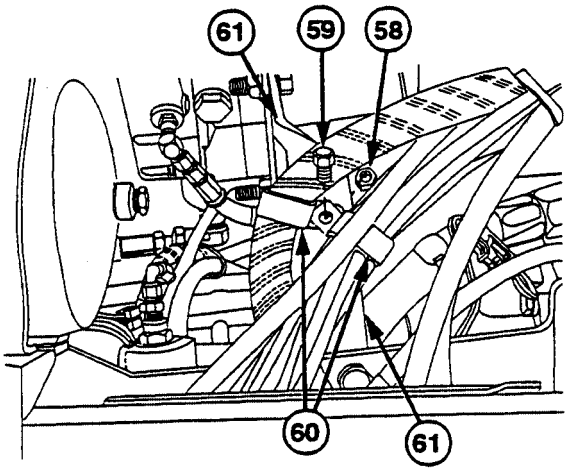


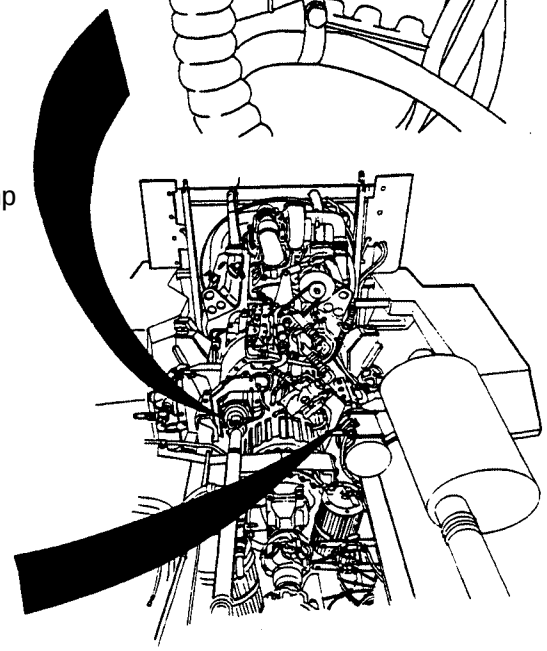
3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

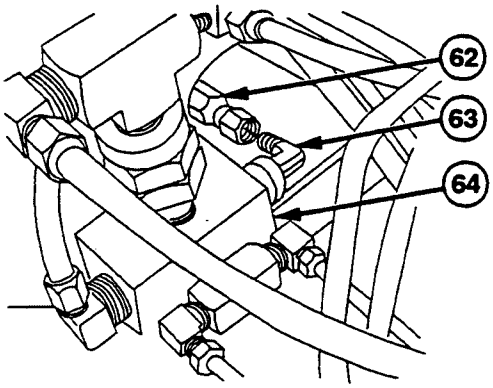


(23) Remove key (57) from PTO (50).

(24) Remove locknut (58), screw (59), and two cushion clips (60) from power steering pump support (61). Discard locknut.







(25) Remove fan clutch air line no. 2758 (62) from elbow (63) on air manifold (64).

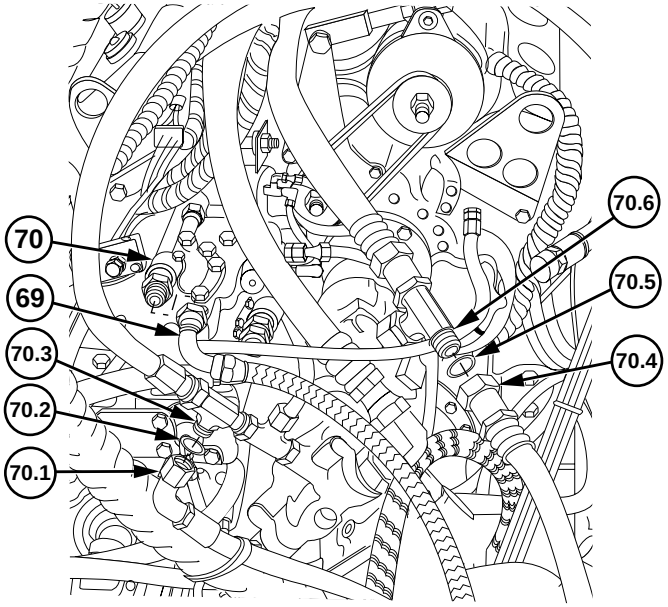
CAUTION

Handle air compressor discharge line carefully. Failure to comply may result in permanent kinking of line.

(26) Remove air compressor discharge line no. 2001 (69) from air compressor (70).

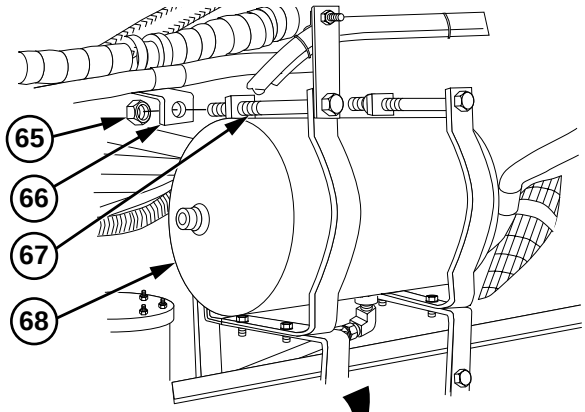
(26.1) Remove steering hose no. 2918 (70.1) and preformed packing (70.2) from tee (70.3). Discard preformed packing.

(26.2) Remove steering hose no. 2906 (70.4) and preformed packing (70.5) from tee (70.6). Discard preformed packing.



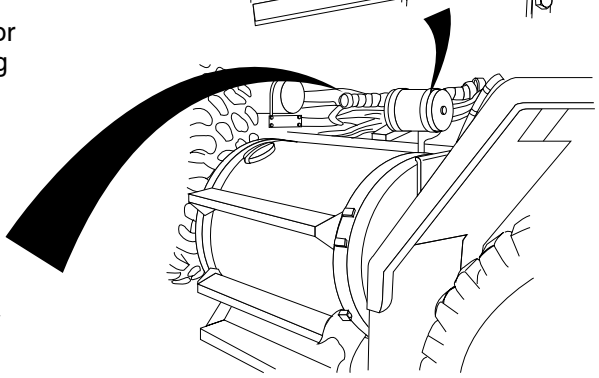
(27) Remove locknut (65) and standoff bracket (66) from screw (67) and purge tank (68).

(27.1) Install locknut (65) on screw (67). Do not tighten.

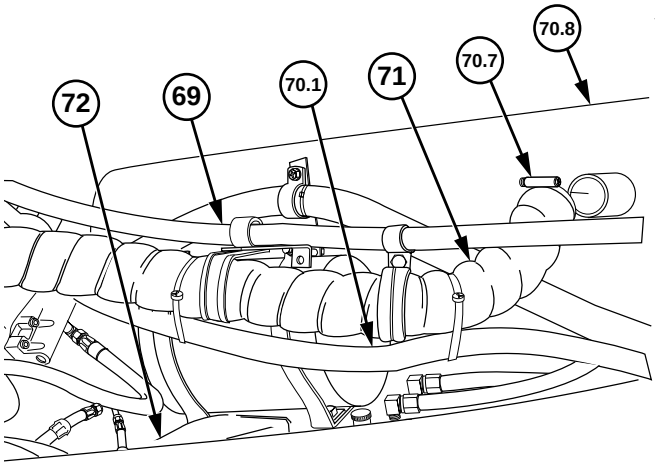


(27.2) Loosen clamp (70.7) and remove aspirating hose (71) from muffler (70.8).

(27.3) Move aspirating hose (71), air compressor discharge line no. 2001 (69), and steering hose no. 2918 (70.1) away from top of engine/transmission assembly (72).



MUFFLER REMOVED FOR CLARITY



3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(28) Deleted.

(29) Deleted.

(30) Deleted.

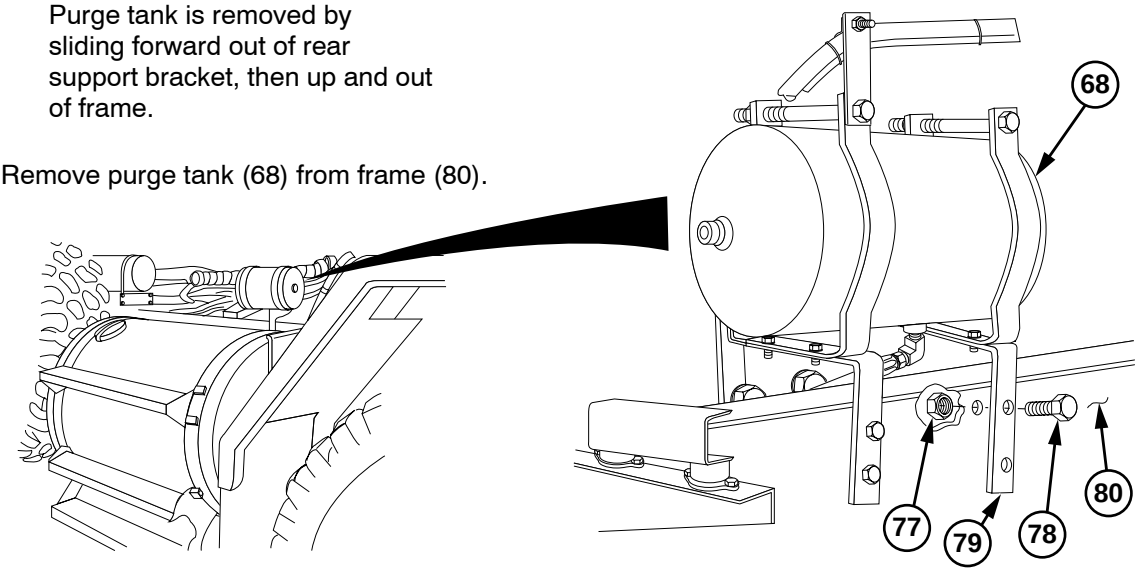
(31) Remove two locknuts (77) and screws (78) from front support bracket (79) and right side of frame (80). Discard locknuts.

(32) Deleted.

NOTE

Purge tank is removed by sliding forward out of rear support bracket, then up and out of frame.

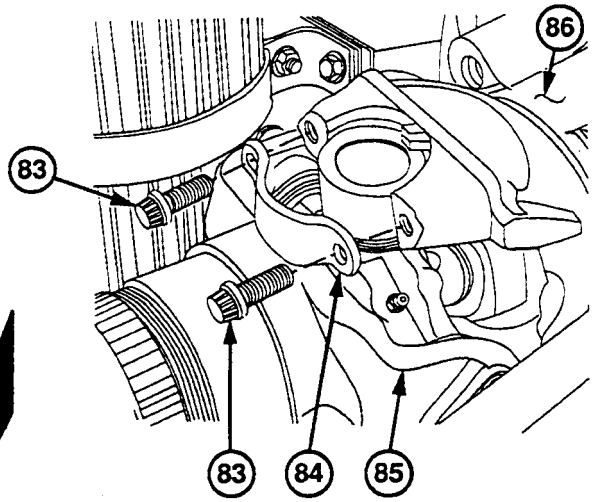
(33) Remove purge tank (68) from frame (80).

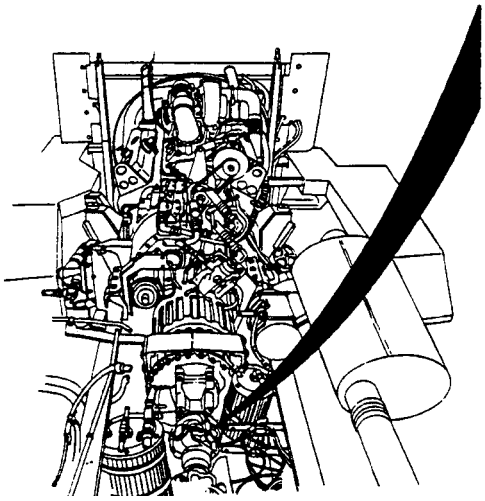


MUFFLER REMOVED FOR CLARITY

(34) Remove four screws (83) and two clamps (84) from transmission propeller shaft (85).

(35) Compress propeller shaft (85) and remove from transmission (86).





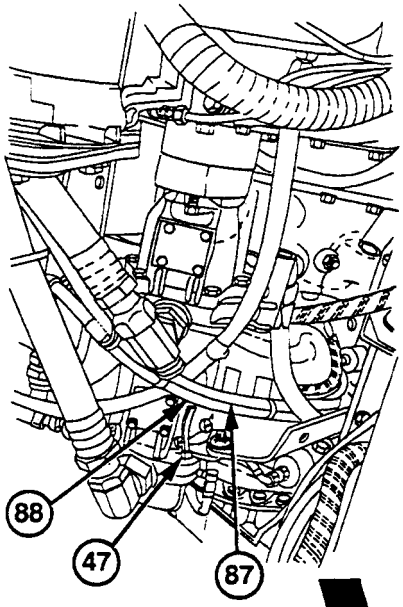
NOTE

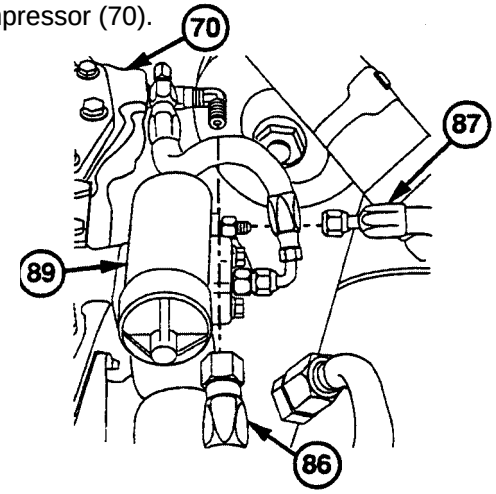
Location of plastic cable ties should be marked before removal.

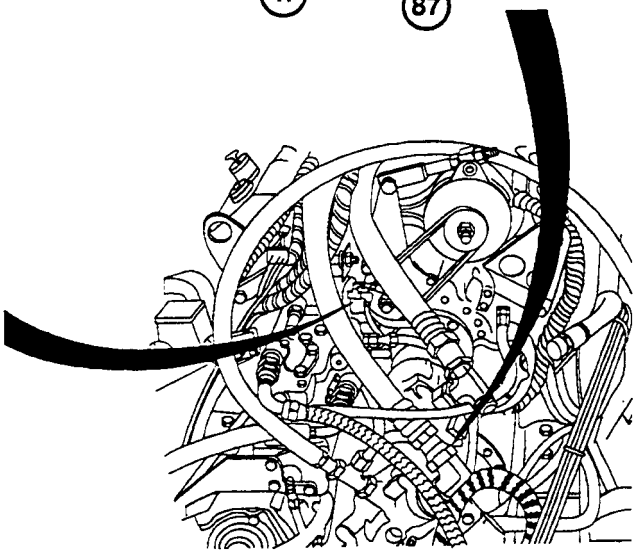
(36) Remove plastic cable ties (47) from hose no. 2159 (87) and hose no. 2096 (88).

(37) Remove hose no. 2159 (87) from air compressor governor (89).

(38) Remove hose no. 2096 (86) from air compressor (70).







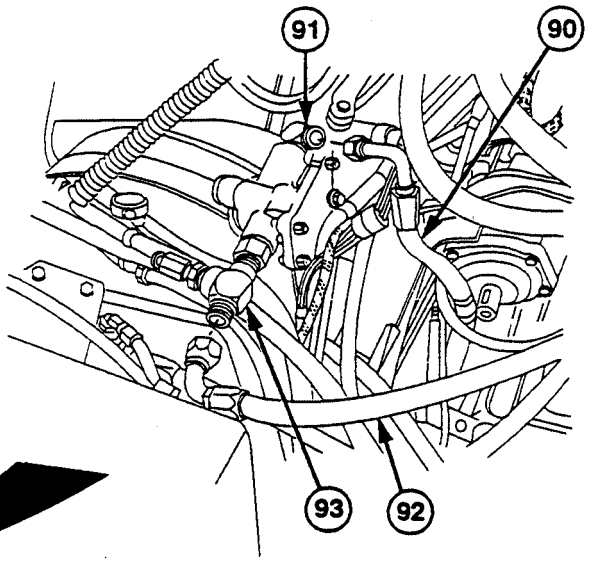
3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

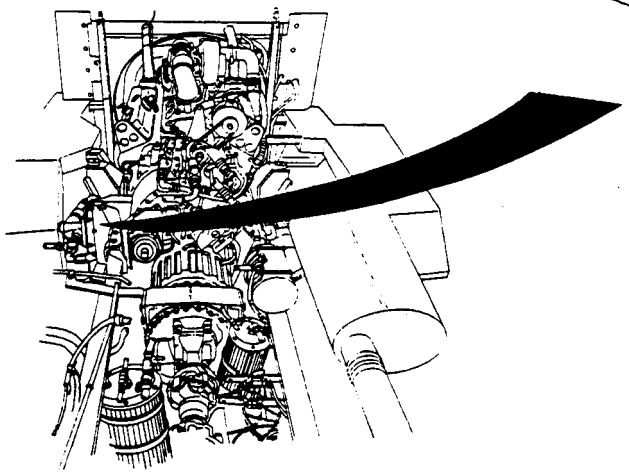
CAUTION

Ends of transmission oil lines must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

(39) Remove transmission oil line no. 2311 (90) from elbow (91). Cover transmission oil line.

(40) Remove transmission oil line no. 2310 (92) from tee (93). Cover transmission oil line.





(41) Remove tee (94), sampling valve (95), and preformed packing (96) from transmission oil filter (97). Discard preformed packing.

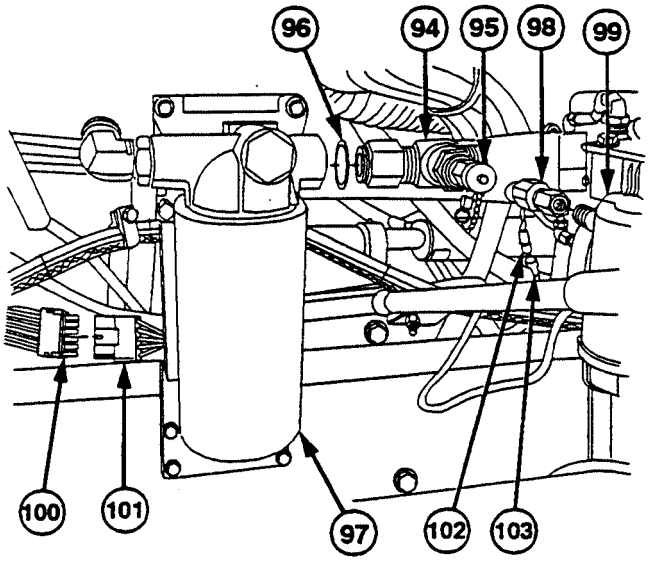
CAUTION

End of fuel supply line must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

(42) Remove fuel supply line no. 2261 (98) from fuel/water separator (99). Cover fuel supply line.

(43) Remove six-pin electrical connector (100) from electrical connector (101).

(44) Remove two-pin electrical connector (102) from electrical connector (103).

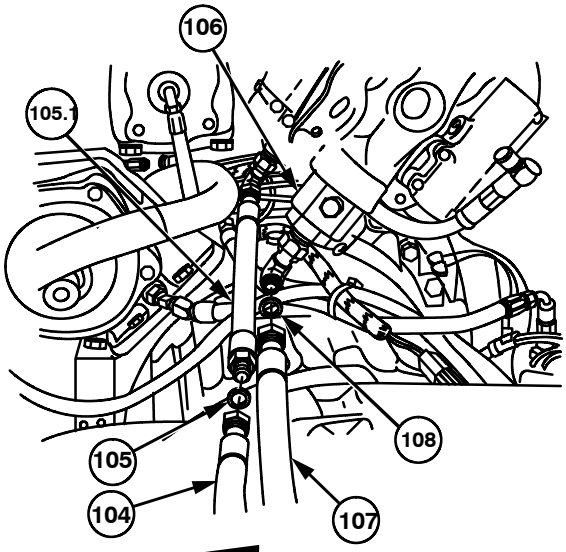


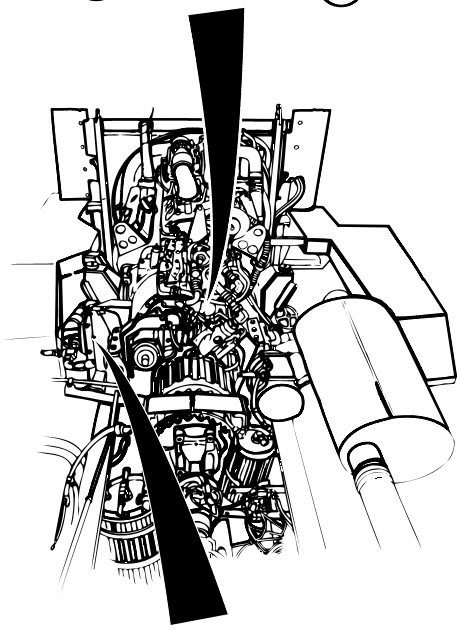
CAUTION

Ends of power steering pressure lines must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

(45) Remove hose no. 2879 (104) and preformed packing (105) from hose no. 2879 (105.1). Cover steering hoses. Discard preformed packing.

(46) Remove hose no. 2274 (107) and preformed packing (108) from power steering pump (106). Cover steering hose. Discard preformed packing.

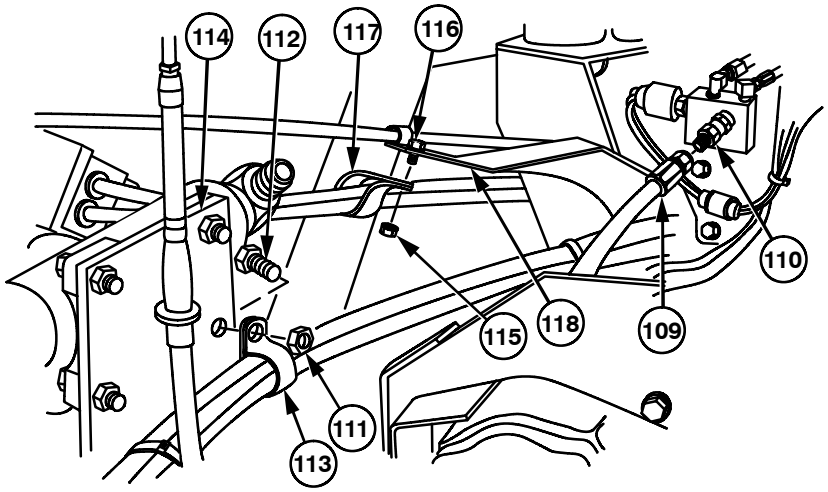




(47) Remove fuel return line no. 2260 (109) from check valve (110).

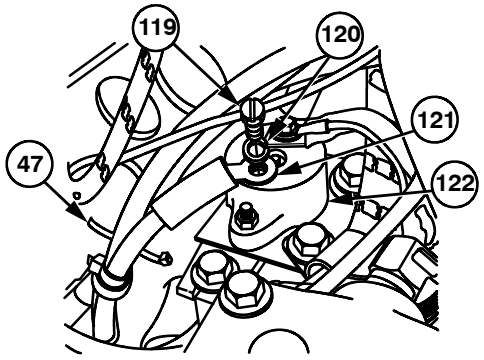
(48) Remove locknut (111), screw (112), and cushion clip (113) from transmission oil filter bracket (114). Discard locknut.

(49) Remove locknut (115), screw (116), and cushion clip (117) from bracket (118). Discard locknut.



3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

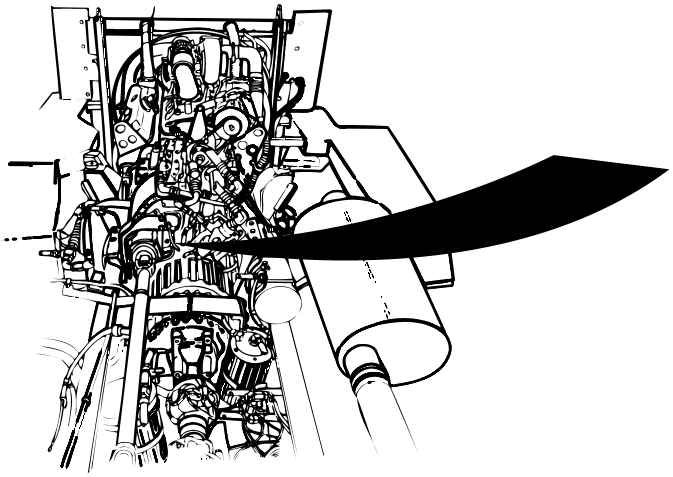
(50) Remove screw (119), lockwasher (120), and wire no. 1622 (121) from circuit breaker (122). Discard lockwasher.

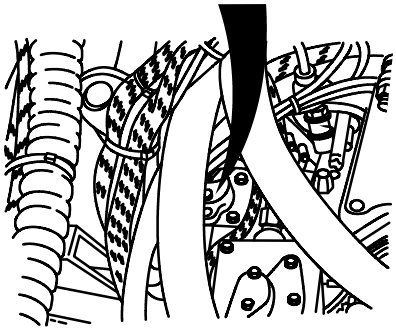


NOTE

Location of plastic cable ties should be marked before removal.

(51) Remove plastic cable ties (47) from wire no. 1622 (121) as required.



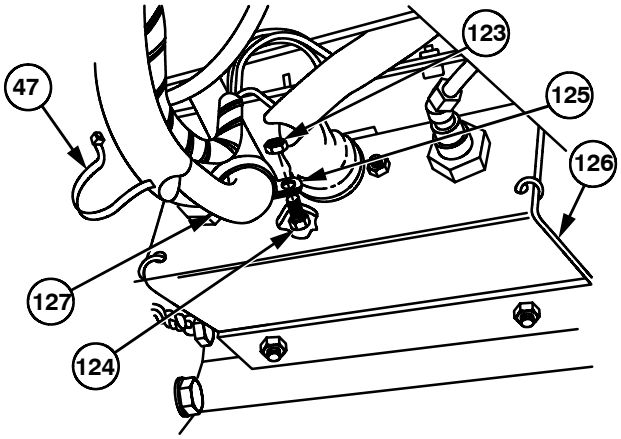


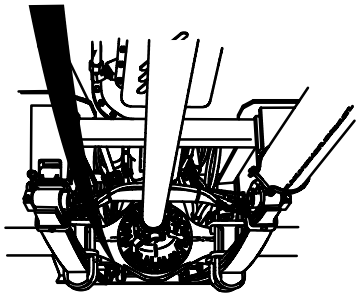
NOTE

Location of plastic cable ties should be marked before removal.

(52) Remove plastic cable ties (47) from hoses as required.

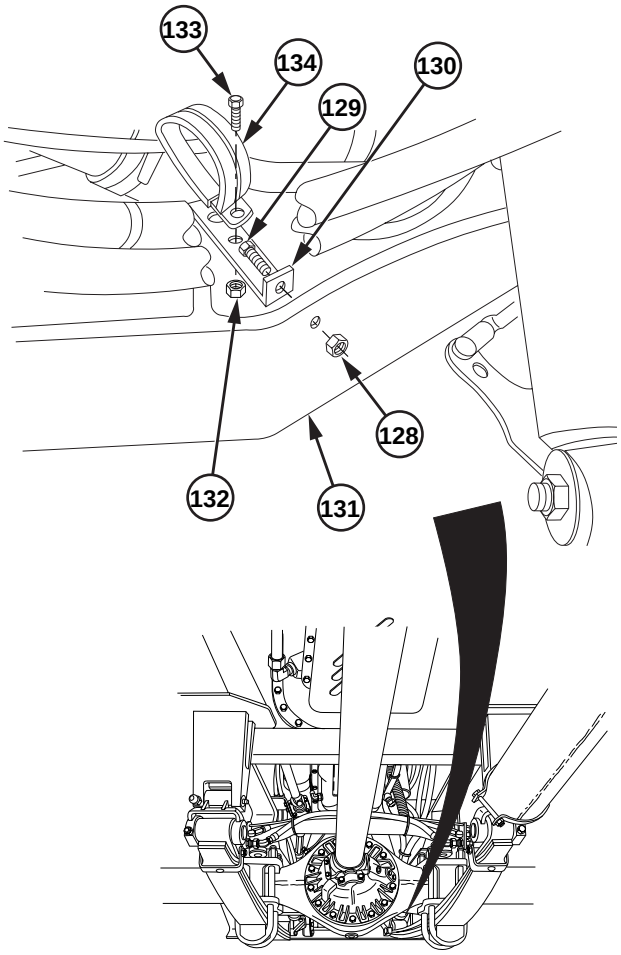
(53) Remove locknut (123), screw (124), and cushion clip (125) from front gladhand mounting bracket (126) and hose no. 2393 (127). Discard locknut.





(54) Remove locknut (128), screw (129), and standoff bracket (130) from right drop frame (131). Discard locknut.

(55) Remove locknut (132), screw (133), and cushion clip (134) from standoff bracket (130). Discard locknut.



(56) Place drain pan under radiator (18) to catch draining transmission fluid.

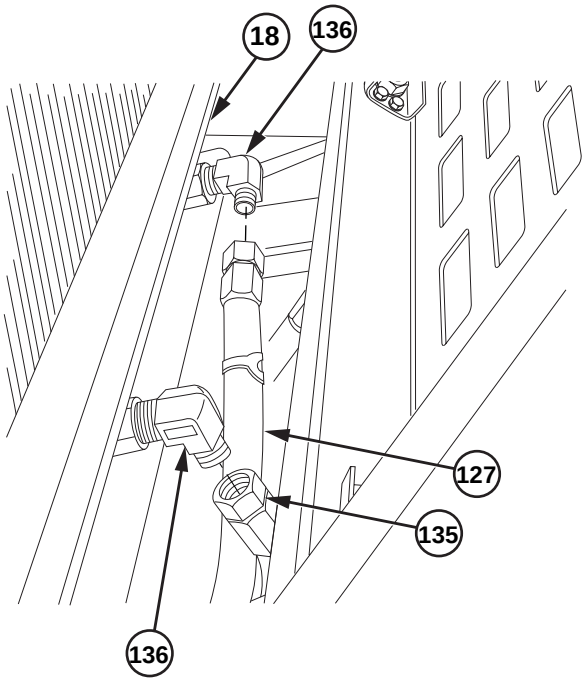
CAUTION

Ends of transmission cooler oil lines must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

NOTE

Transmission fluid will discharge rapidly from disconnected hoses and elbows.

(57) Remove transmission oil cooler hoses no. 2382 (135) and no. 2393 (127) from two elbows (136). Cover hoses and elbows with aid of assistant.



3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(58) Deleted.

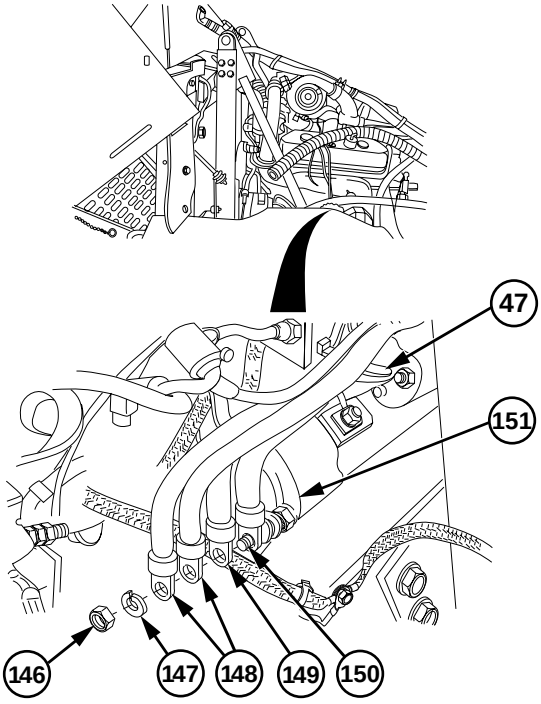
(59) Deleted.

NOTE

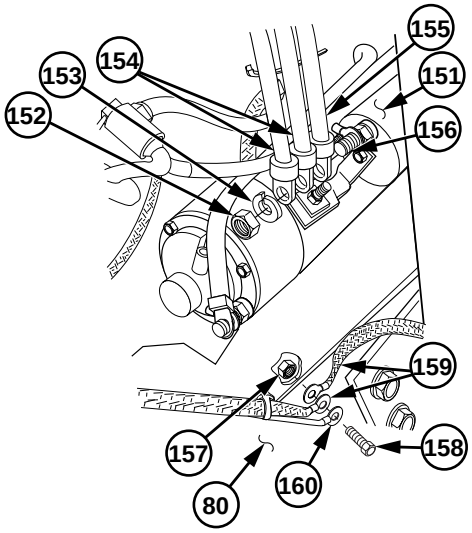
- Tag and mark cables before removing from starter.
- Vehicles equipped with arctic kit will have additional battery cables.
- Locations of plastic cable ties should be marked before removal.

(60) Remove plastic cable ties (47) from battery cables as required.

(61) Remove nut (146), lockwasher (147), two negative (-) battery cables no. 1138 (148), and arctic kit battery cable no. 1128 (149) (if installed) from stud (150) on starter motor (151). Discard lockwasher.



(62) Remove nut (152), lockwasher (153), two positive (+) battery cables no. 1139 (154), and arctic kit battery cable (155) (if installed) from stud (156) on starter motor (151). Discard lockwasher.



NOTE

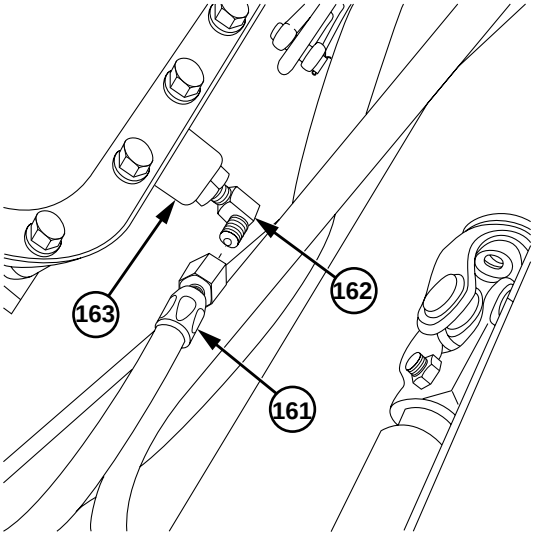
- Pull all cables from engine.
- Vehicles with serial number 73043 and higher will not have wire no. 1435.

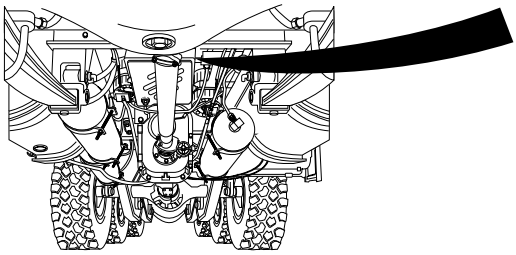
(63) Remove locknut (157), screw (158), two ground straps (159), and wire no. 1435 (160) from left side of frame (80). Discard locknut.

CAUTION

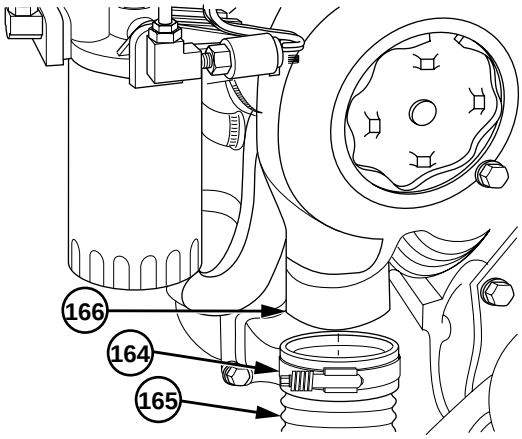
Ends of transmission hose must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

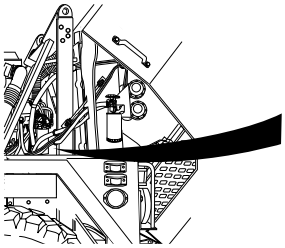
(64) Remove hose no. 2857 (161) from elbow (162) on transmission modulator (163). Cover hose.





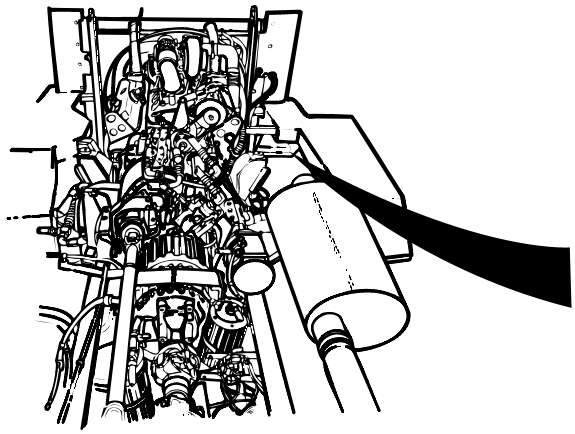
(65) Loosen clamp (164) and remove lower radiator hose (165) from water pump (166).

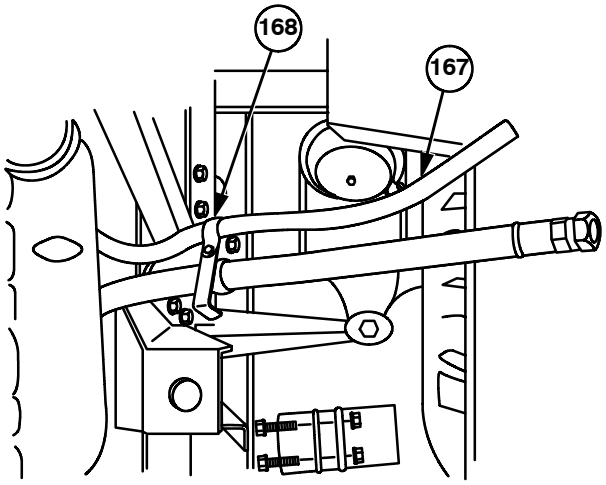




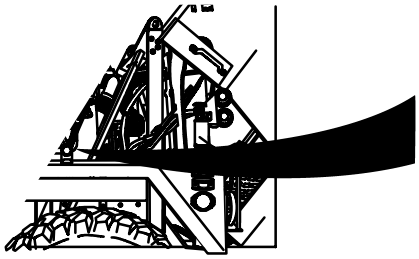
3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

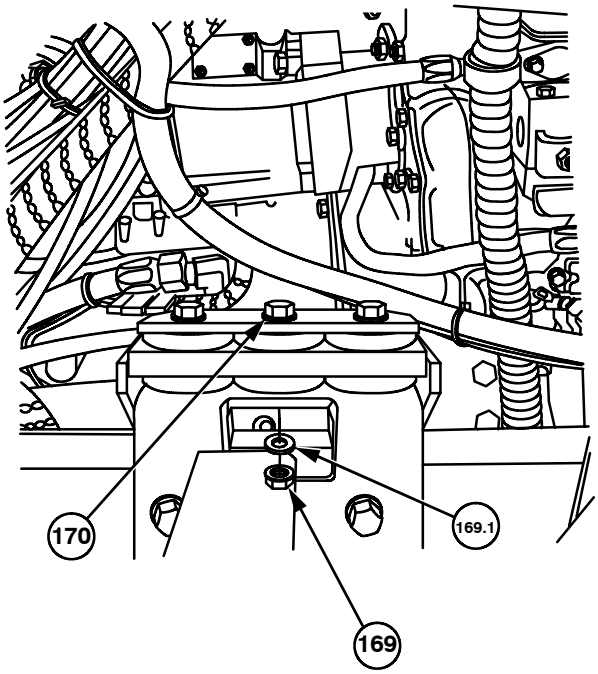
(66) Pull heater hose (167) out through cushion clip (168).



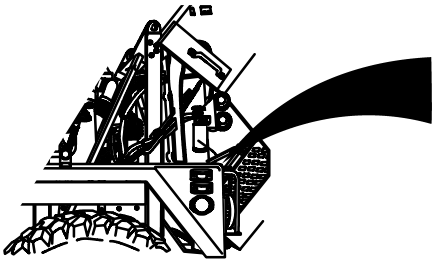


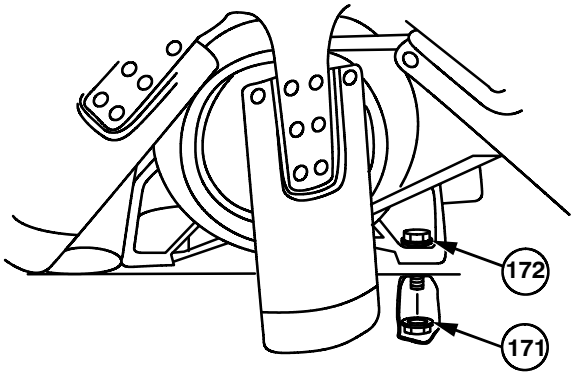
(67) Remove six locknuts (169) and washers (169.1) from screws (170). Discard lock





(68) Remove two locknuts (171) from screws (172). Discard locknuts.





(69) Attach lifting chain (173) to lifting brackets (174). Refer to table 3-1 for correct lengths.

Table 3-1. Chain Lengths

Chain Location	Length
Chain attached to front lifting bracket	36 in. (91 cm)
Chain attached to left rear lifting bracket	29.5 in. (75 cm)
Chain attached to right rear lifting bracket	29.5 in. (75 cm)

WARNING

- **Engine/transmission assembly weighs 4206 lb (1908 kg). Stay clear of engine/transmission assembly when it is supported by lifting device. If engine falls, serious injury or death may result.**
- **Use guide straps or rope to guide engine/transmission assembly while lifting. Failure to comply may result in injury to personnel.**

(70) Support engine/transmission assembly (72) with lifting device and chain.

(71) Attach guide ropes to lifting brackets (174) on engine/transmission assembly (72).

CAUTION

Ensure all lines, hoses, and electrical cables remaining with engine/transmission are secured to engine/transmission, and that those remaining with chassis are free from engine/transmission before lifting. Failure to comply may result in damage to air lines, hoses, and electrical cables.

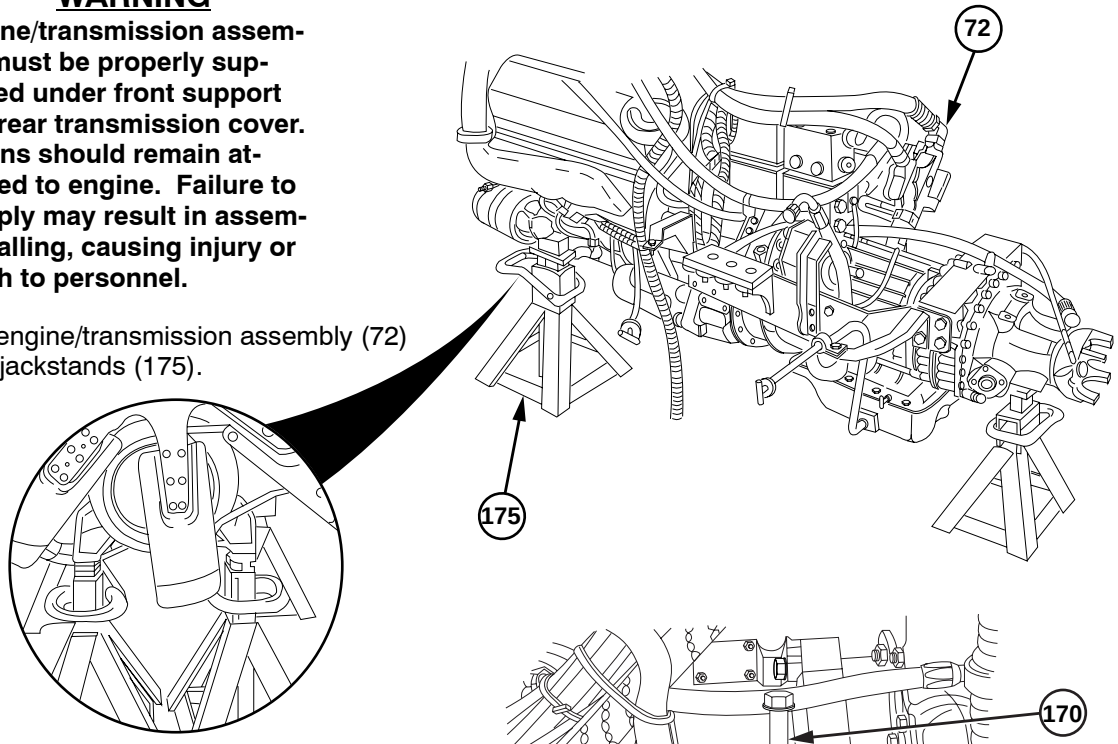
(72) Remove engine/transmission assembly (72) from frame (80) with aid of assistants.

3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

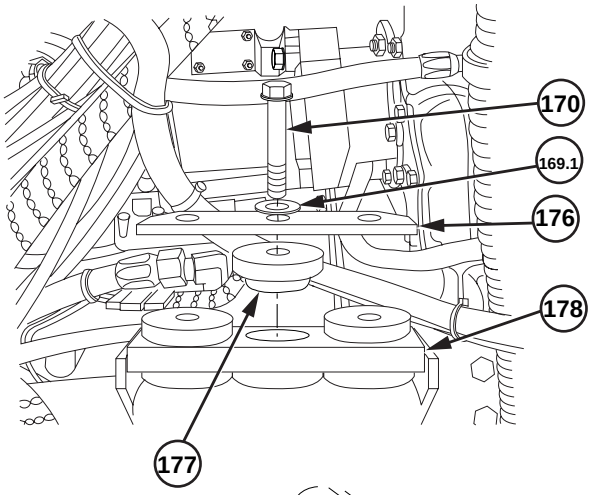
WARNING

Engine/transmission assembly must be properly supported under front support and rear transmission cover. Chains should remain attached to engine. Failure to comply may result in assembly falling, causing injury or death to personnel.

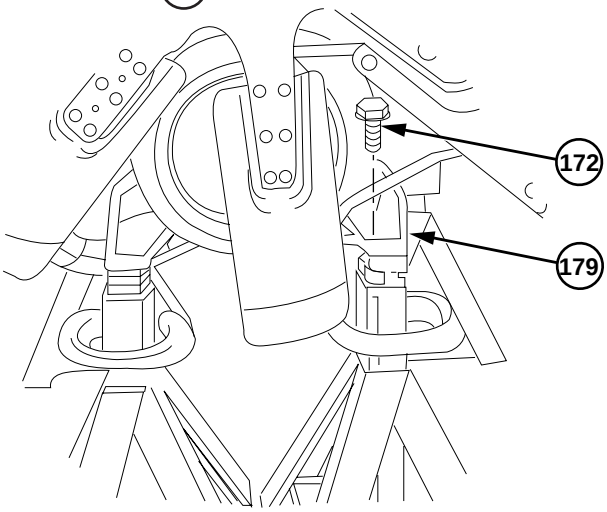
(73) Support engine/transmission assembly (72) on three jackstands (175).



(74) Remove two plates (176), six mounting biscuits (177), screws (170), and washers (169.1) from two cradles (178).



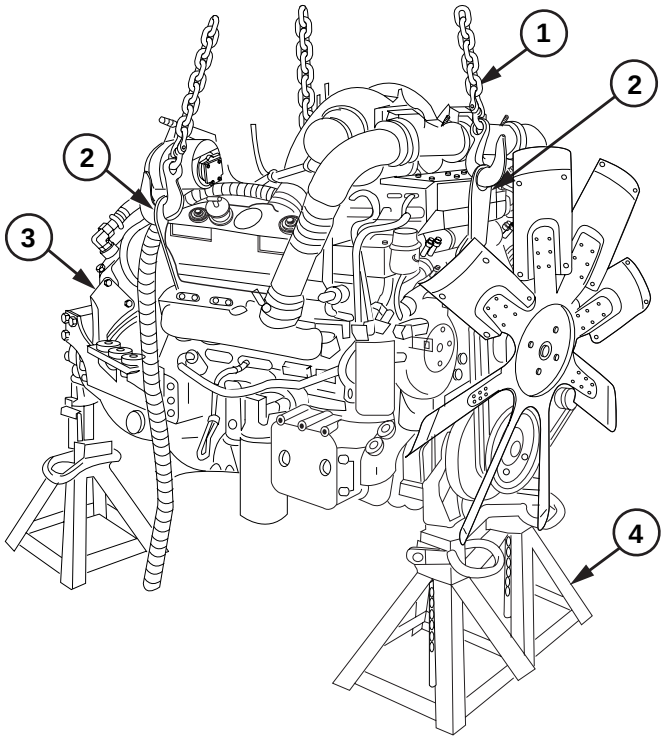
(75) Remove two screws (172) from trunnion support (179).



b. Installation

(1) Attach lifting chain (1) to lifting brackets (2). Refer to table 3-1 for correct chain lengths.

(2) Attach guide ropes to lifting brackets (2) on left and right of engine/transmission assembly (3).



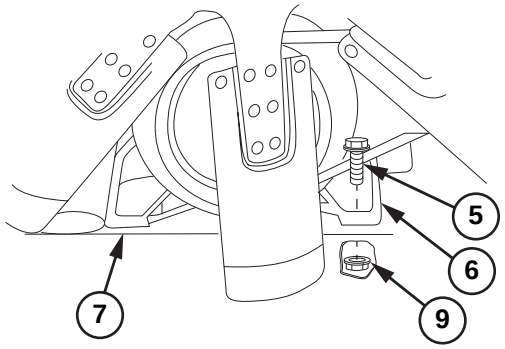
WARNING

- **Engine/transmission assembly weighs 4206 lb (1908 kg). Stay clear of engine/transmission assembly when it is supported by lifting device. If engine falls, serious injury or death may result.**
- **Use guide straps or rope to guide engine/transmission assembly while lifting. Failure to comply may result in injury to personnel.**

CAUTION

Ensure all lines, hoses, and electrical cables are secured to engine/transmission assembly and chassis to prevent damage to them when lowering engine/transmission assembly.

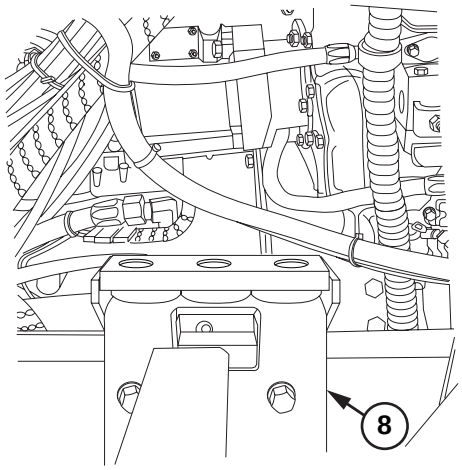
(3) Lift engine/transmission assembly (3) 2 in. (5 cm) off jackstands (4).



(4) Install two screws (5) in trunnion support (6).

(5) Position engine/transmission assembly (3) on front crossmember (7) and two engine mount frames (8) with aid of two assistants.

(6) Install two new locknuts (9) on screws (5). Torque to 210 lb-ft (285 N·m).



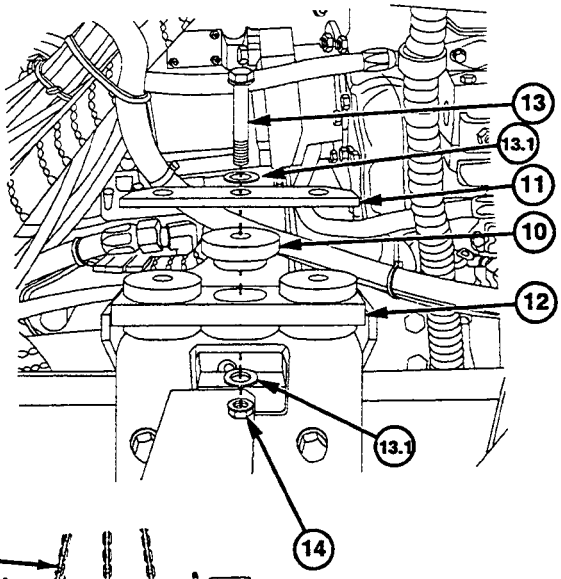
3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

NOTE

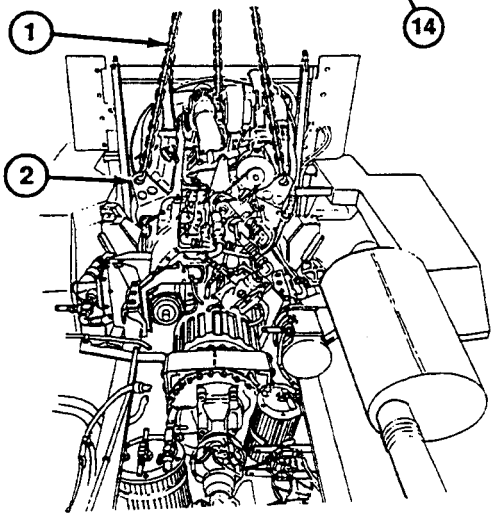
It may be necessary to pry on rear of engine/transmission assembly to align cradles with engine mount frame.

(7) Install six mounting biscuits (10) and two plates (11) on two cradles (12) with six screws (13) and washers (13.1).

(8) Install six washers (13.1) and new locknuts (14) on screws (13).



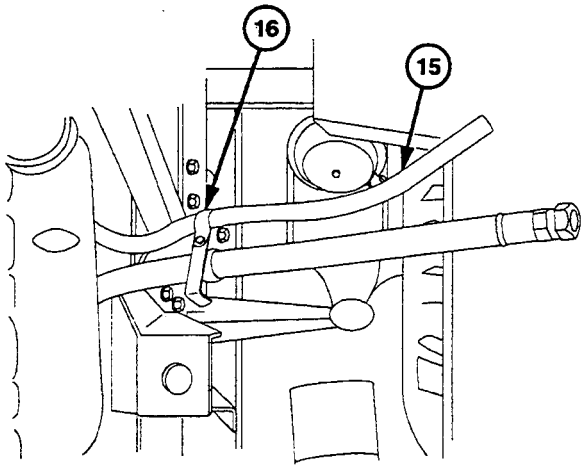
(9) Remove lifting chain (1) from lifting brackets (2).



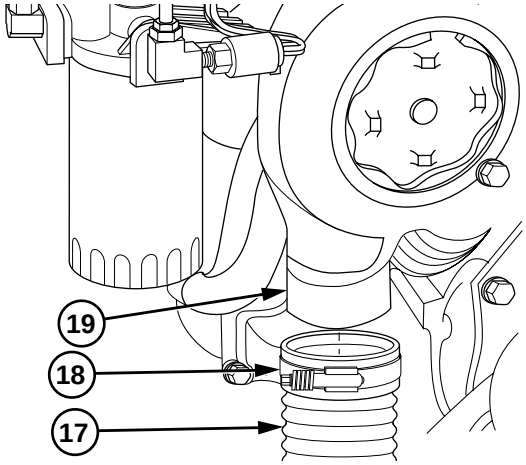
NOTE

Vehicle maintenance time can be reduced by using three personnel on steps (10) thru (22), (23) thru (59), and (60) thru (81).

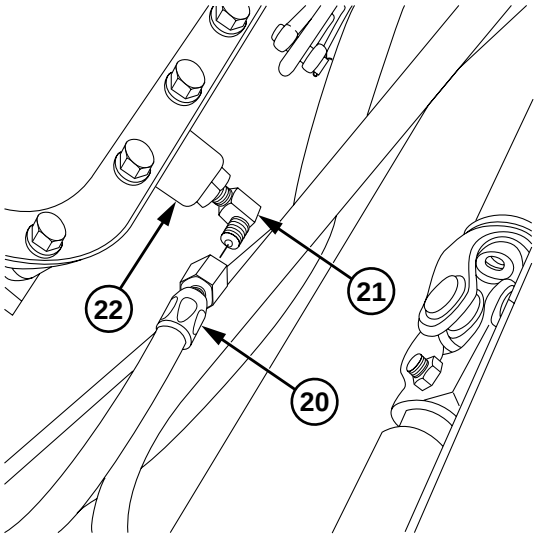
(10) Push heater hose (15) through cushion clip (16).



(11) Install lower radiator hose (17) and clamp (18) on water pump (19). Torque to 100 lb-in. (11 N·m).



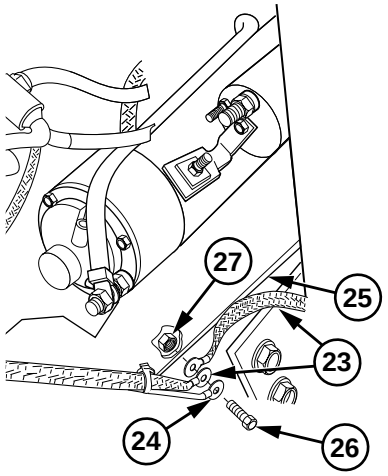
(12) Install hose no. 2857 (20) on elbow (21) on transmission modulator (22).



NOTE

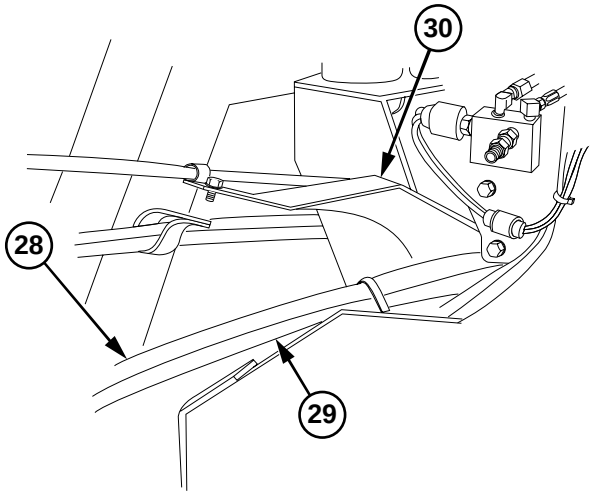
Vehicles with serial number 73043 and higher will not have wire no. 1435.

(13) Install two ground straps (23) and wire no. 1435 (24) on left frame (25) with screw (26) and new locknut (27).

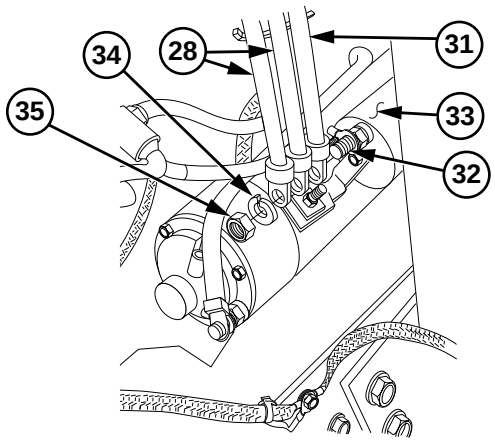


3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(14) Route positive (+) cable no. 1139 (28) and negative (-) cable no. 1138 (29) behind engine dipstick bracket (30).



(15) Install arctic kit battery cable (31) (if installed) and two positive (+) cables no. 1139 (28) on stud (32) of starter motor (33) with new lockwasher (34) and nut (35).

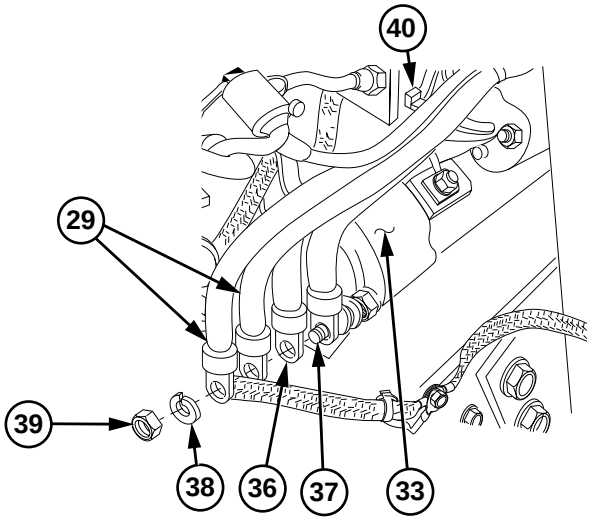


(16) Install arctic kit battery cable (36) (if installed) and two negative (-) cables no. 1138 (29) on stud (37) of starter motor (33) with new lockwasher (38) and nut (39).

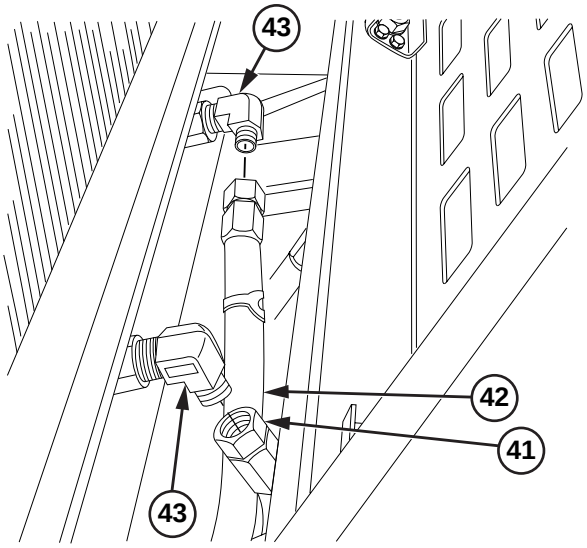
NOTE

Plastic cable ties should be positioned in locations marked during removal.

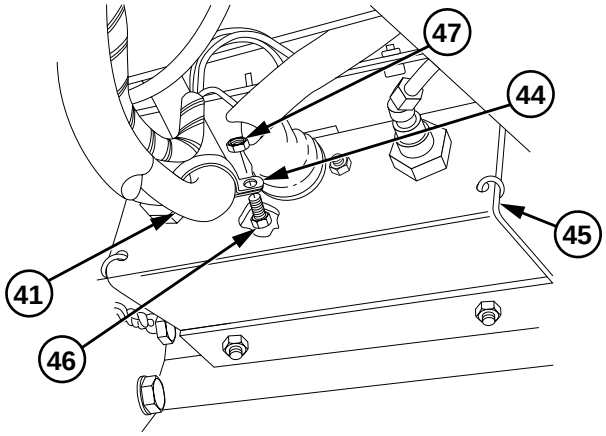
(17) Secure battery cables with plastic cable ties (40) as required.



(18) Install transmission oil cooler hose no. 2393 (41) and hose no. 2382 (42) on elbows (43).



(19) Install cushion clip (44) on hose no. 2393 (41) and front gladhand mounting bracket (45) with screw (46) and new locknut (47).



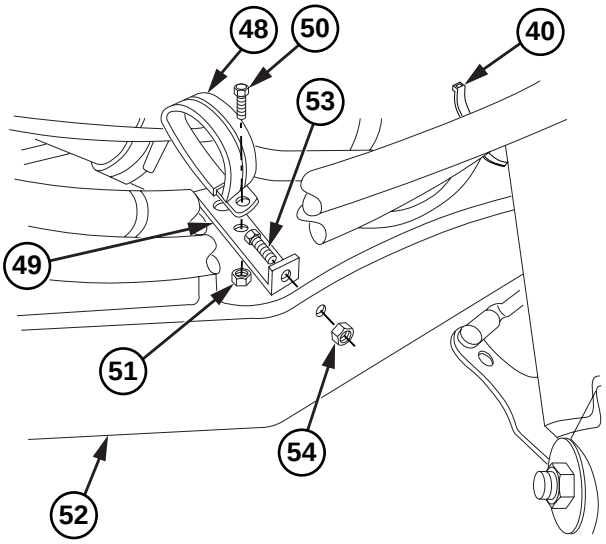
(20) Install cushion clip (48) on standoff bracket (49) with screw (50) and new locknut (51).

(21) Install standoff bracket (49) on right drop frame (52) with screw (53) and new locknut (54).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(22) Secure components with plastic cable ties (40) as required.



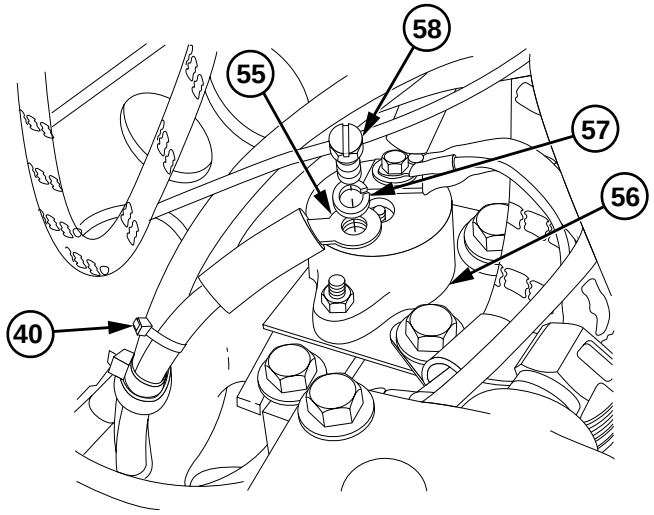
3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(23) Install wire no. 1622 (55) on circuit breaker (56) with new lockwasher (57) and screw (58).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

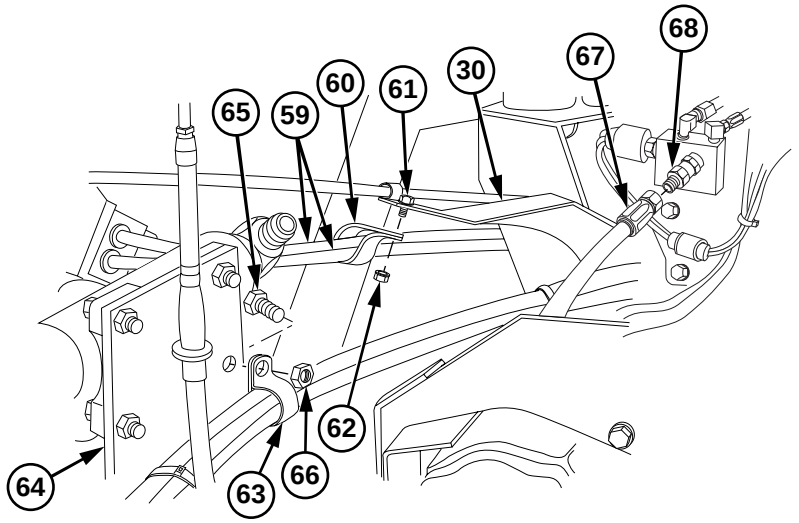
(24) Secure wire no. 1622 (55) with plastic cable ties (40) as required.



(25) Install slave cables (59) on engine dipstick bracket (30) with clip (60), screw (61), and new locknut (62).

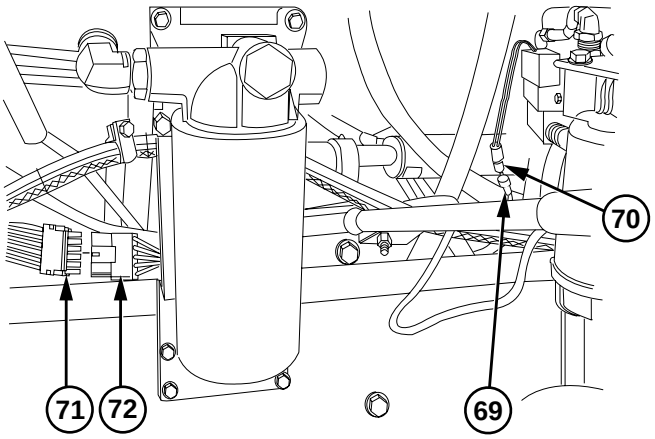
(26) Install cushion clip (63) on transmission oil filter bracket (64) with screw (65) and new locknut (66).

(27) Install fuel return line no. 2260 (67) on check valve (68).



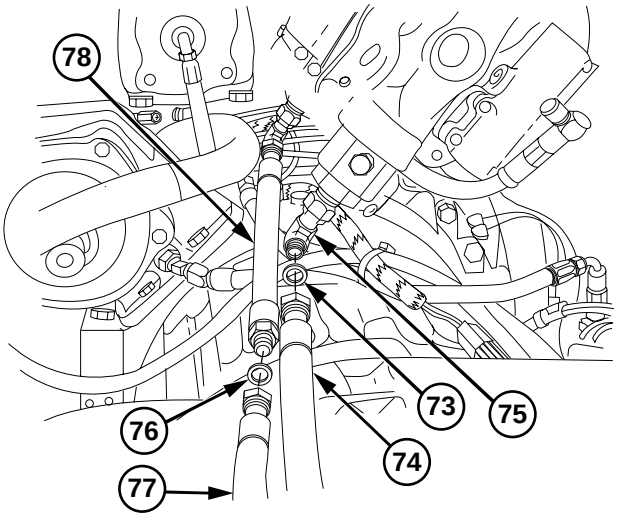
(28) Install two-pin electrical connector (69) on electrical connector (70).

(29) Install six-pin electrical connector (71) on electrical connector (72).



(30) Install new preformed packing (73) and hose no. 2274 (74) on elbow (75).

(31) Install new preformed packing (76) and hose no. 2879 (77) on hose no. 2879 (78).



NOTE

Fuel supply line is routed under power steering pump and over CTIS air hoses.

(32) Install fuel supply line no. 2261 (79) on fuel/water separator (80).

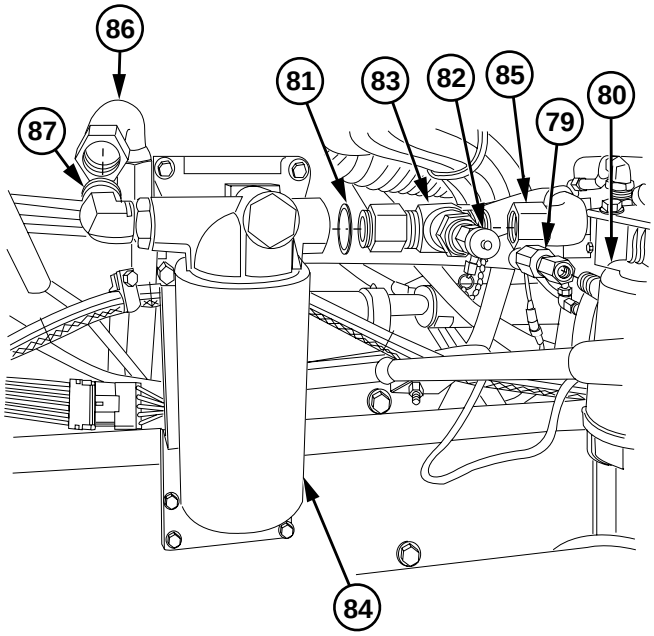
(33) Install preformed packing (81), sampling valve (82), and tee (83) on transmission oil filter (84).

NOTE

CTIS air line no. 2120 must be above transmission oil line no. 2310 before doing step (34).

(34) Install transmission oil line no. 2310 (85) on tee (83).

(35) Install transmission oil line no. 2311 (86) on elbow (87).



3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(36) Route hose no. 2096 (88) and no. 2159 (89) between transmission (90) and power steering pump support bracket (91) to air compressor (92).

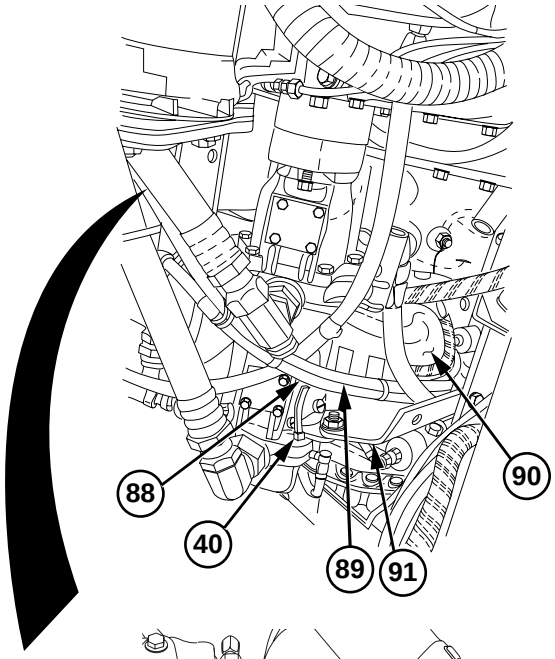
(37) Install hose no. 2096 (88) on air compressor (92).

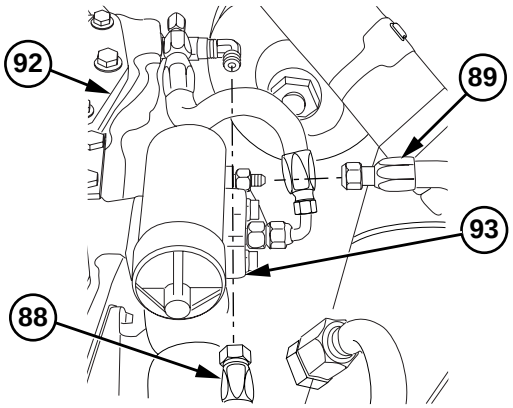
(38) Install hose no. 2159 (89) on air compressor governor (93).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(39) Secure hose no. 2096 (88) and hose no. 2159 (89) with plastic cable ties (40) as required.



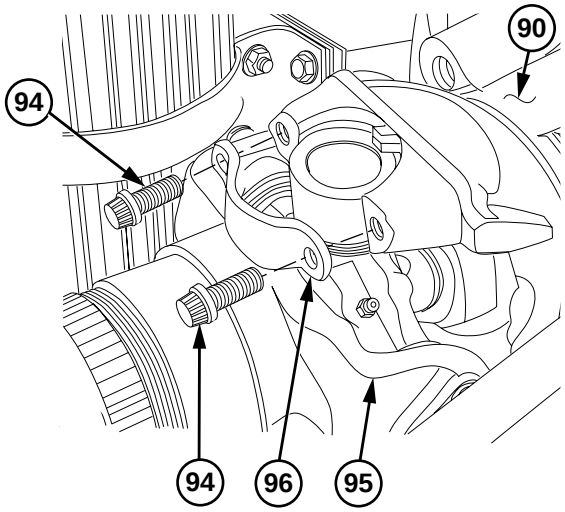


WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(40) Coat threads of four screws (94) with adhesive-sealant.

(41) Install propeller shaft (95) on transmission (90) with two clamps (96) and four screws (94). Torque to 115-135 lb-ft (156-183 N·m).



NOTE

Purge tank is installed by tilting up and sliding back into rear support bracket.

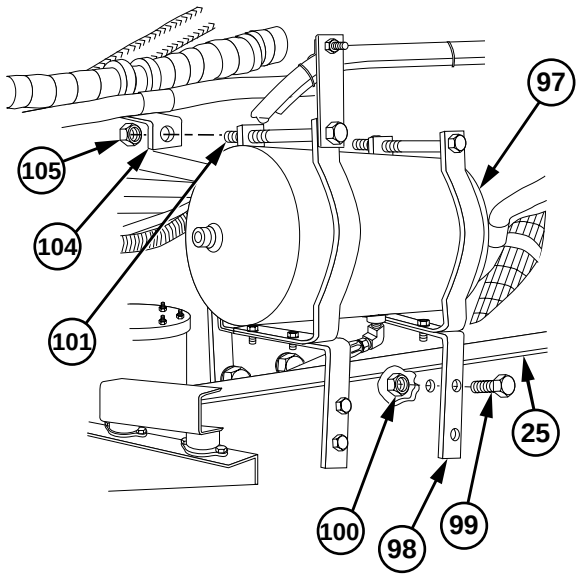
(42) Install purge tank (97) on right side frame (25).

(43) Install front support bracket (98) on purge tank (97) and right frame (25) with two screws (99) and new locknuts (100).

(44) Deleted.

(45) Remove locknut (105) from screw (101). Discard locknut.

(46) Install standoff bracket (104) on screw (101) and purge tank (97) with new locknut (105).

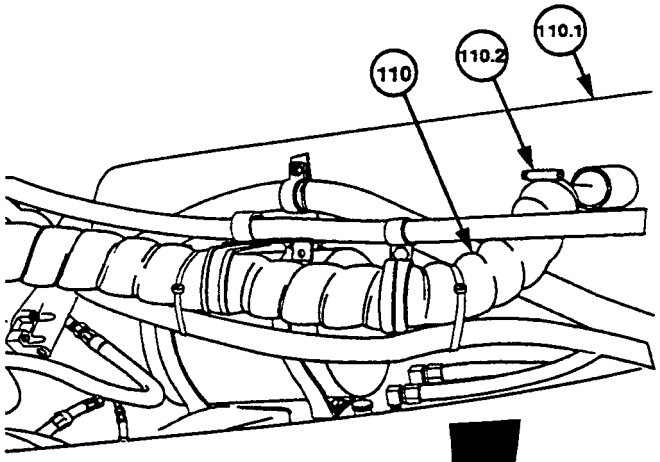


(47) Deleted.

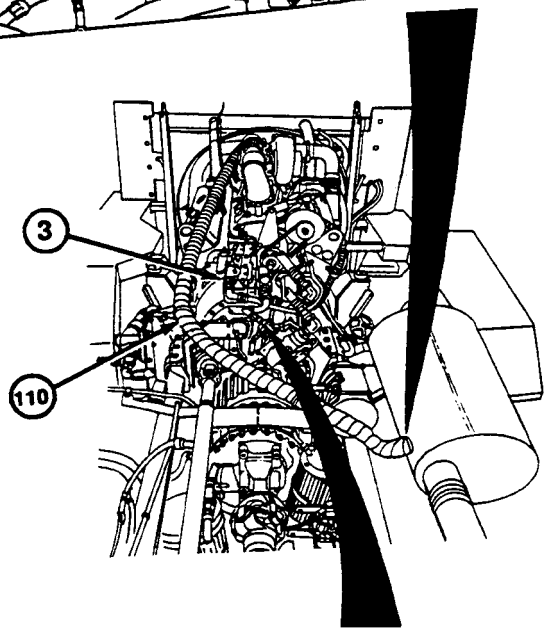
(48) Deleted.

3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(48.1) Install aspirating hose (110) on muffler (110.1) with clamp (110.2).



(49) Position aspirating hose (110) across top of engine/transmission assembly (3).



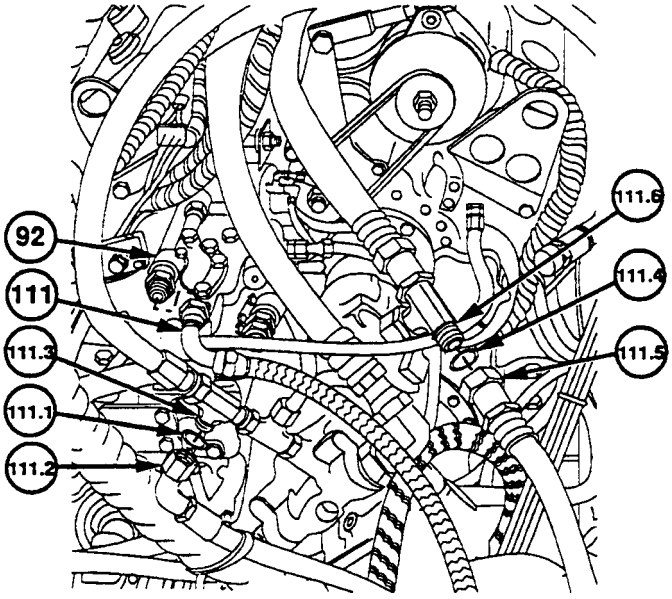
CAUTION

Handle air compressor discharge line carefully. Failure to comply may result in permanent kinking of line.

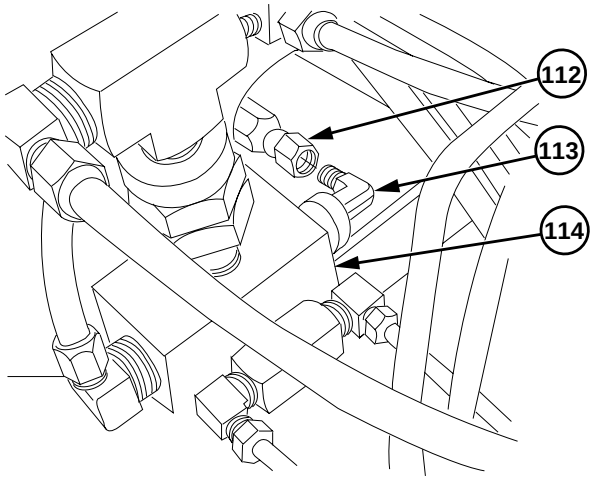
(50) Install air compressor discharge line no. 2001 (111) on air compressor (92).

(50.1) Install new preformed packing (111.1) and steering hose no. 2918 (111.2) on tee (111.3).

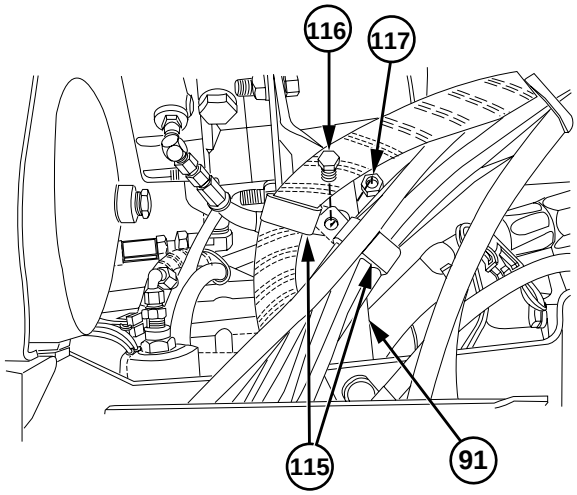
(50.2) Install new preformed packing (111.4) and steering hose no. 2096 (111.5) on tee (111.6).



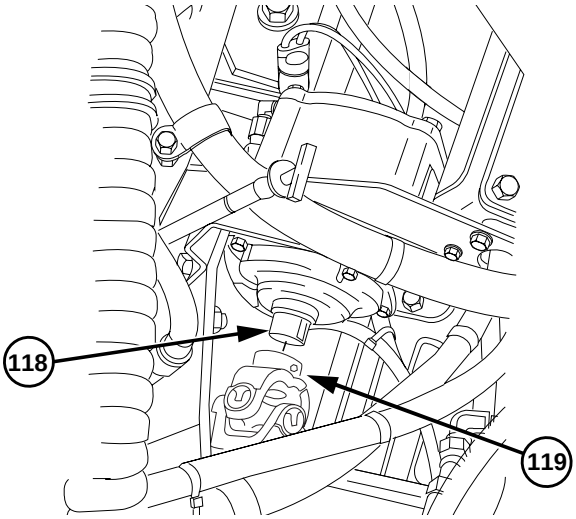
(51) Install fan clutch air line no. 2758 (112) on elbow (113) on air manifold (114).



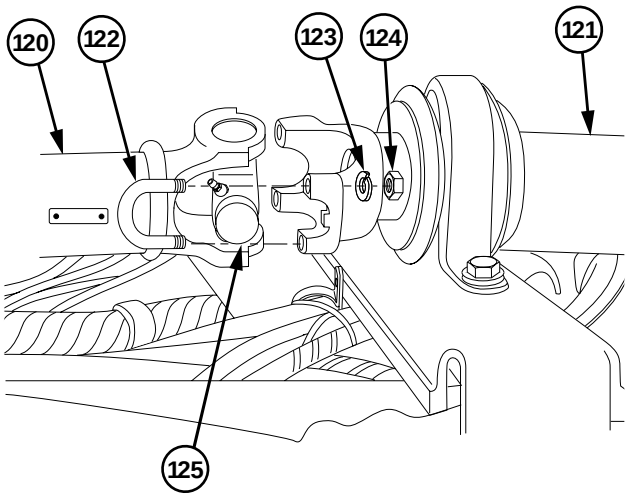
(52) Install two cushion clips (115) on power steering pump support bracket (91) with screw (116) and new locknut (117).



(53) Coat PTO output shaft (118) and inside surface of yoke (119) with antiseize compound.



3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)



(54) Install front shaft (120) on rear shaft (121).

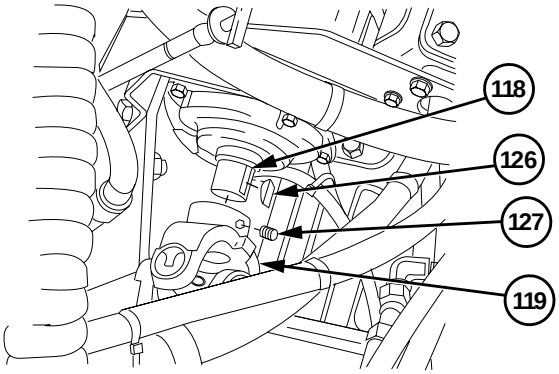
(55) Install two new U-bolts (122), four new lockwashers (123), and new nuts (124) on universal joint (125). Torque to 13-18 lb-ft (18-24 N·m).

(56) Install key (126) on PTO output shaft (118).

(57) Install yoke (119) on PTO output shaft (118).

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

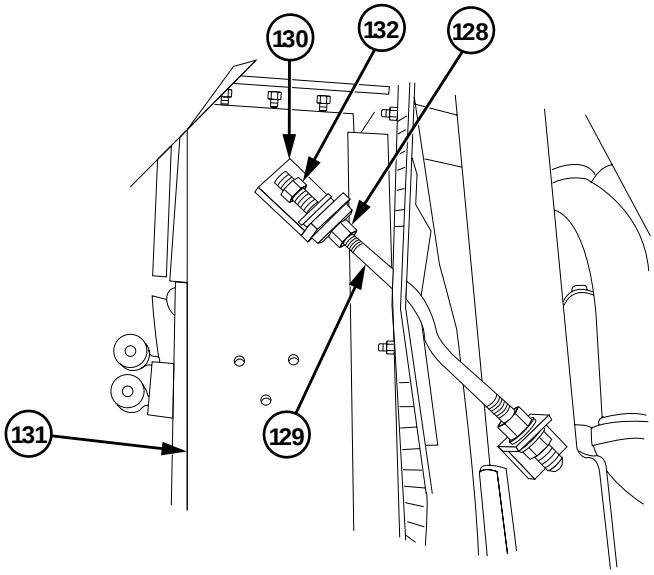


(58) Coat threads of screw (127) with adhesive-sealant.

(59) Install screw (127) on yoke (119).

NOTE

- When tie rods are properly installed there should be 1.75 in. (4.45 cm) between top of radiator and hardlift bracket.
- Do not use nuts on large end of mount to tighten. Only use nuts on small end to tighten and mushroom mount.



(60) Back off two inside nuts (128) on tie rods (129) from two tie rod supports (130) to allow radiator (131) to tilt back.

(61) Tighten two outside nuts (132) on tie rods (129) against tie rod supports (130).

(62) Tighten two inside nuts (128) on tie rods (129) against tie rod supports (130).

(63) Route two coolant hoses no. 2866 (133) and no. 2867 (134) and air lines no. 2039 (135) and no. 2036 (136) through radiator baffle (137).

(64) Install air lines no. 2039 (135) and no. 2036 (136) on elbows (138).

(65) Install cushion clip (139) on radiator (131) with screw (140), new lockwasher (141), and nut (142).

(66) Install two cushion clips (143) and hoses no. 2039 (135) and no. 2036 (136) to hardlift (144) with screw (145) and new locknut (146).

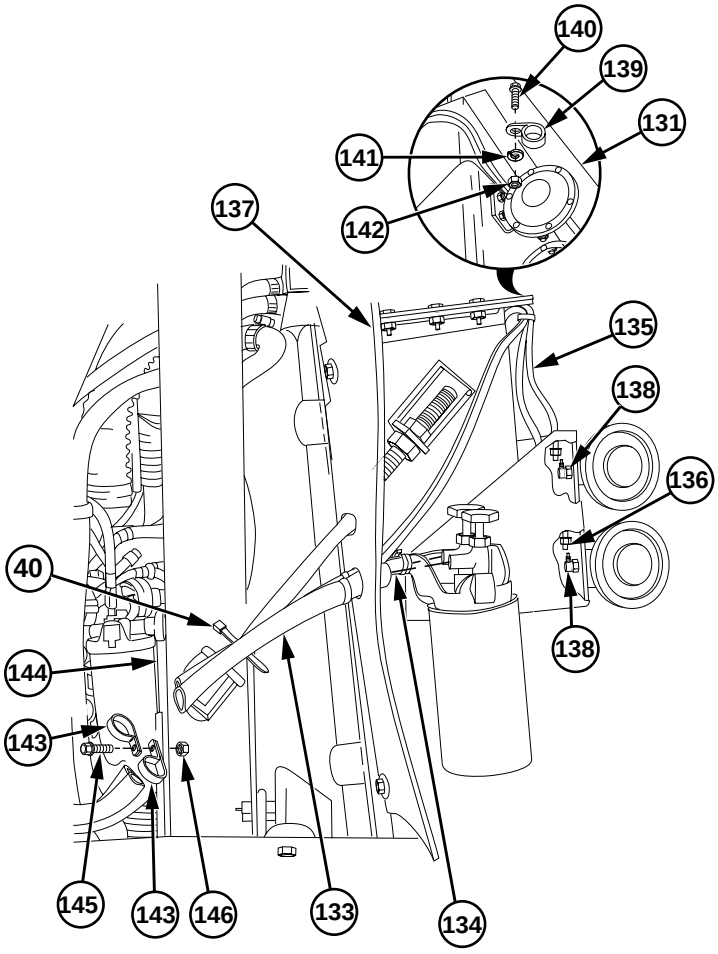
CAUTION

Ensure all lines, hoses, and cables are free of moving components and are secured properly. Failure to comply may result in equipment damage.

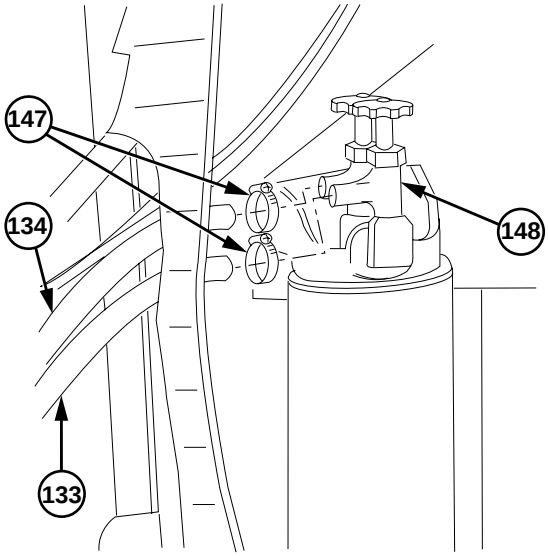
NOTE

Plastic cable ties should be positioned in locations marked during removal.

(67) Secure components with plastic cable ties (40) as required.



(68) Install two coolant hoses no. 2866 (133) and no. 2867 (134) and clamps (147) on coolant filter (148). Torque to 40 lb–in. (4.5 N·m).

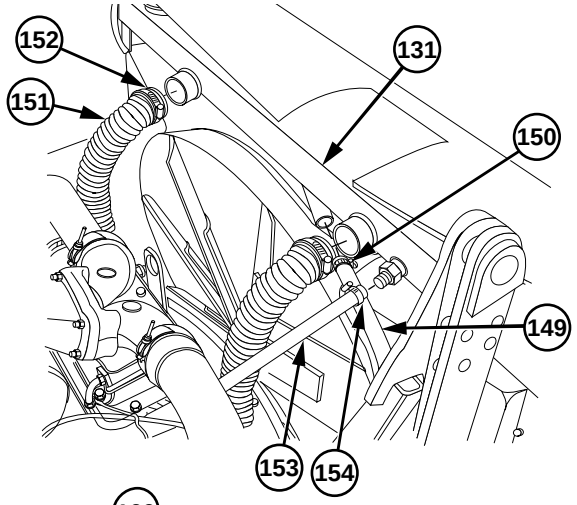


3-3. ENGINE/TRANSMISSION ASSEMBLY REPLACEMENT (CONT)

(69) Install bypass hose (149) and clamp (150) on radiator (131).

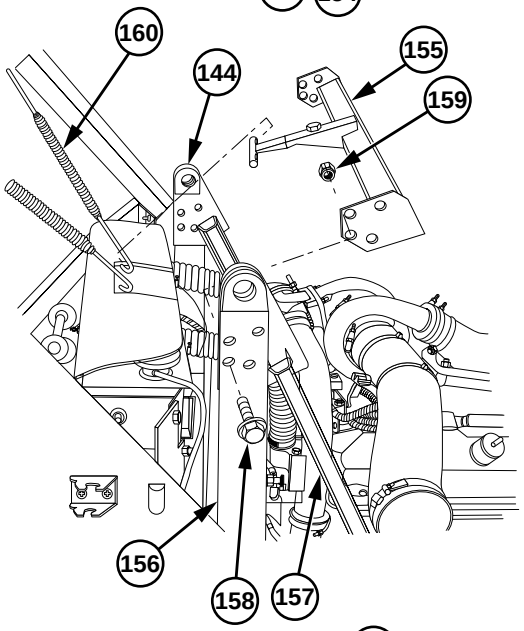
(70) Install two upper radiator hoses (151) and clamps (152) on radiator (131). Torque to 100 lb-in. (11 N·m).

(71) Install deareation hose (153) and clamp (154) on radiator (131).



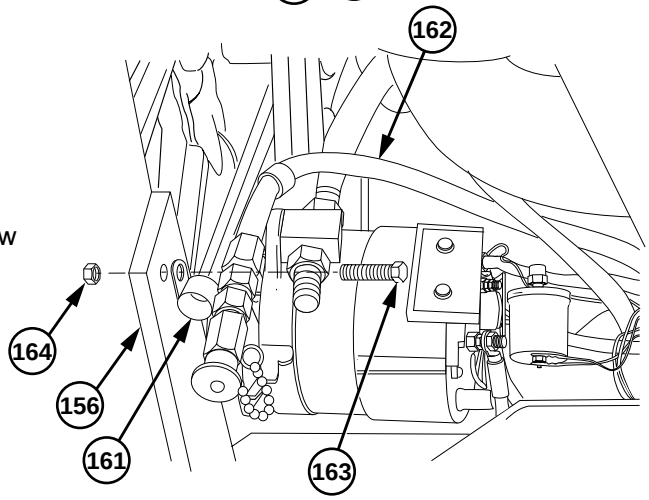
(72) Install spring attachment (155) on hardlifts (144 and 156) and hardlift supports (157) with eight screws (158) and new locknuts (159) with aid of assistant.

(73) Install two hood springs (160) on spring attachment (155).



(74) Install clip (161) on hose no. 2682 (162).

(75) Install clip (161) on hardlift (156) with screw (163) and new locknut (164).

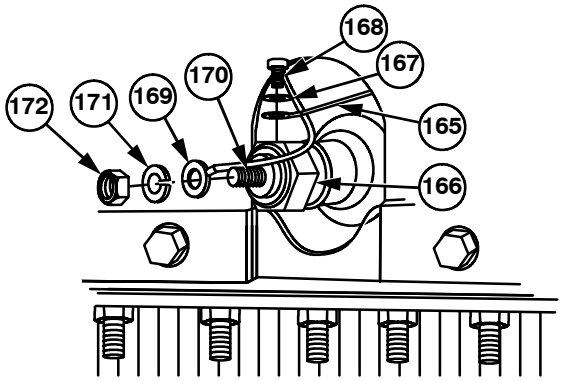


NOTE

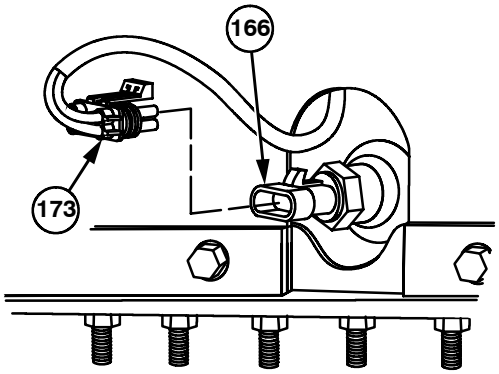
- Steps (76 and 77) apply only to vehicles with DDEC II engines.
- Step (78) applies only to vehicles with DDEC III/IV engines.

(76) Install wire no. 1788 (165) on coolant level sender (166) with new lockwasher (167) and screw (168).

(77) Install wire no. 068 (169) on stud (170) on coolant level sender (166) with new lockwasher (171) and nut (172).



(78) Connect connector (173) to coolant level sensor (174).



(79) Deleted.

c. Follow-On Maintenance

(1) Install exhaust pipe (TM 9-2320-360-20).

(2) Install cab (para 16-2).

(3) Install inner fender (TM 9-2320-360-20).

3-4. ENGINE CONTAINER UNPACKING/PACKING

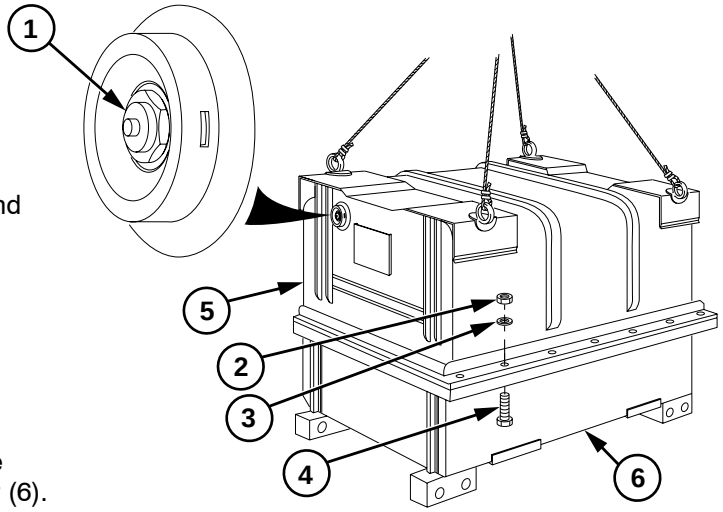
This task covers:
Removal
Installation

INITIAL SETUP

Equipment Conditions
Engine prepared for storage (para 3-5).

Materials/Parts
Lockwashers (40) (Item 122, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Sling Assembly (Item 160, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)



a. Upper Container Removal

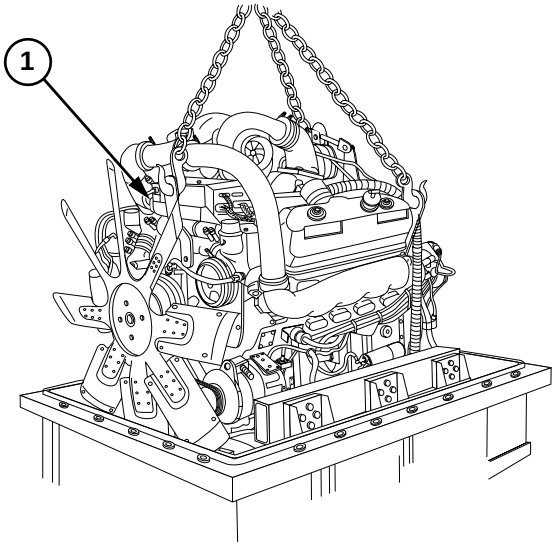
(1) Release air pressure at vent valve (1).

(2) Remove 30 nuts (2), lockwashers (3), and screws (4).Discard lockwashers.

WARNING

Keep out from under heavy parts. Falling parts may cause serious injury or death.

(3) Attach suitable lifting device and remove upper container (5) from lower container (6).



b. Engine Removal

WARNING

Engine weighs approximately 3081 lb (1399 kg). Support engine during removal. Failure to comply may result in serious injury to personnel. Keep out from under heavy parts. Falling parts may cause serious injury or death to personnel.

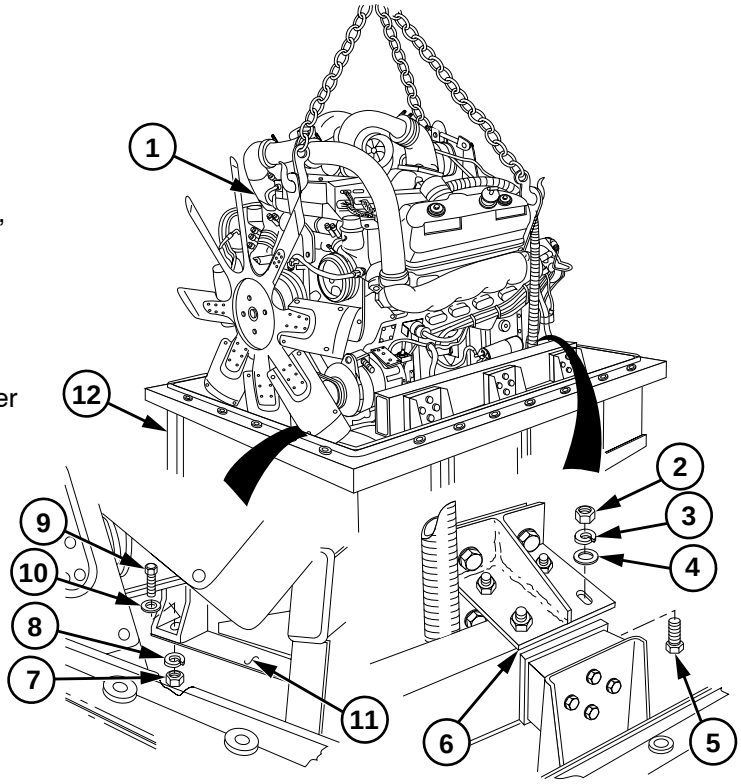
(1) Attach suitable lifting device to engine (1).

(2) Remove four nuts (2), lockwashers (3), washers (4), and screws (5) from rear support (6). Discard lockwashers.

(3) Repeat step (2) for other side.

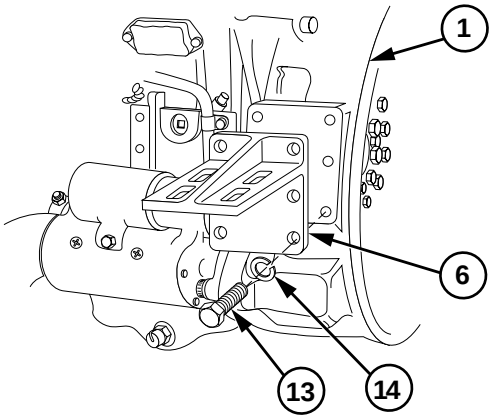
(4) Remove two nuts (7), lockwashers (8), screws (9), and washers (10) from inner frame (11). Discard lockwashers.

(5) Remove engine (1) from lower container (12).



(6) Remove four screws (13), lockwashers (14), and rear support (6) from engine (1). Discard lockwashers.

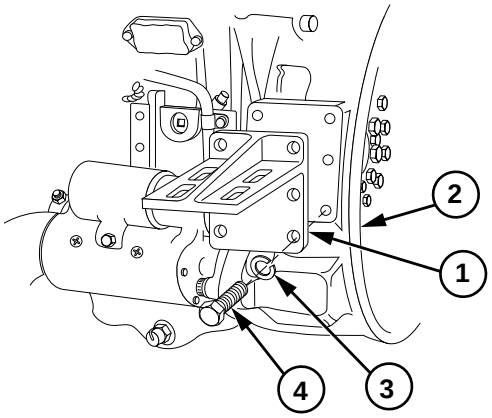
(7) Repeat step (6) for other support.



c. Engine Installation

(1) Install rear support (1) on engine (2) with four new lockwashers (3) and screws (4). Do not tighten.

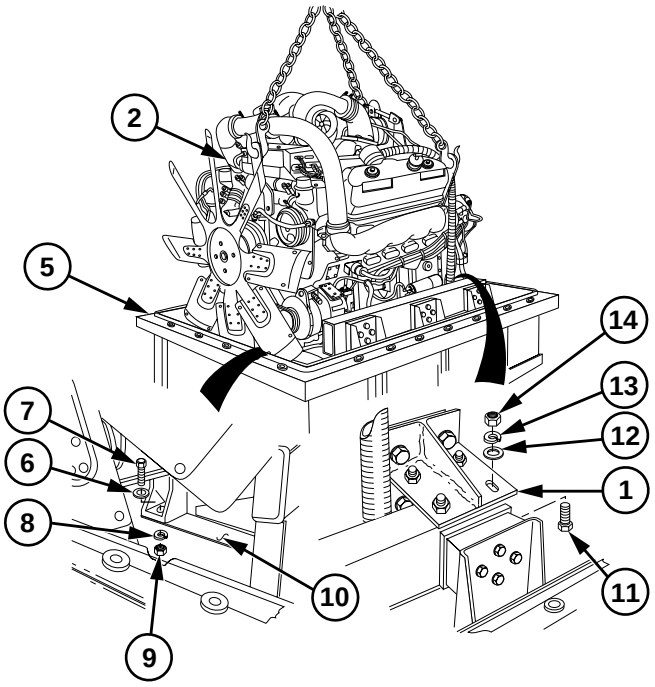
(2) Repeat step (1) for other support.



3-4. ENGINE CONTAINER PACKING/UNPACKING (CONT)

WARNING

Engine weighs approximately 3801 lb (1399 kg). Support engine during removal. Failure to comply may result in serious injury to personnel. Keep out from under heavy parts. Falling parts may cause serious injury or death to personnel.



(3) Align and install engine (2) in lower container (5).

(4) Install two washers (6), screws (7), new lockwashers (8), and nuts (9) on inner frame (10).

(5) Install four screws (11), washers (12), new lockwashers (13), and nuts (14) on rear support (1).

(6) Repeat step (5) for other support.

(7) Tighten 12 screws (4) to 71–83 lb–ft (96–112 N·m).

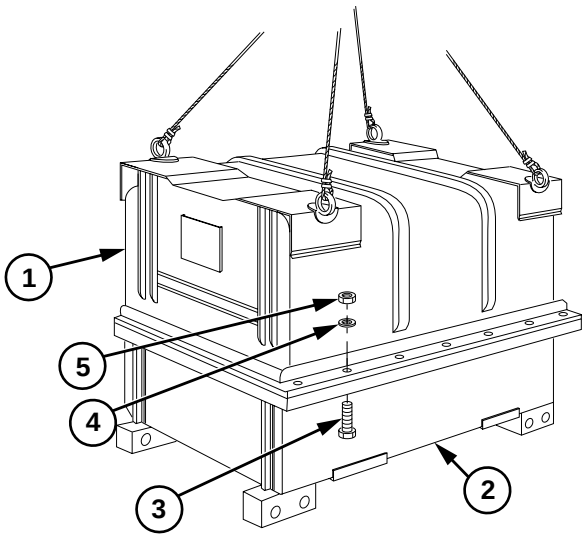
(8) Tighten nuts (9 and 14) to 31–37 lb–ft (42–50 N·m).

(9) Remove lifting device.

d. Upper Container Installation

WARNING

Keep out from under heavy parts. Falling parts may result in serious injury to personnel.



(1) Install upper container (1) on lower container (2).

NOTE

When tightening nuts, use criss-cross pattern working around container.

(2) Install 30 screws (3), washers (4), and nuts (5) in upper container (1) and lower container (2). Torque to 31–37 lb–ft (42–50 N·m).

3-5. ENGINE REPLACEMENT

This task covers:
a. Removal
b. Engine Preparation
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transmission removed (para 7-4).
Engine oil drained (LO 9-2320-360-12).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 1/2 In. Female - 3/8 In. Male (Item 5, Appendix E)
Jackstands, 7-Ton (8) (Item 93, Appendix E)
Screws (4) (Item 150, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Sling Assembly (2) (Item 160, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench, Crow's Foot, 3/4 In. (Item 219, Appendix E)
Wrench, Crow's Foot, 5/8 In. (Item 220, Appendix E)
Wrench, Open End, 1-7/8 In. & 1-11/16 In. (Item 225, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-75 Lb-In. (Item 237, Appendix E)
Screws, Guide (4)(Figure C-4, Appendix C)

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Compound, Sealing (Item 22.1, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Gaskets (2) (Item 30, Appendix F)
Locknuts (2) (Item 96, Appendix F)
Lockwashers (16) (Item 122, Appendix F)
Lockwashers (2) (Item 120, Appendix F)
Lockwasher (Item 119, Appendix F)
Lockwasher (Item 121, Appendix F)
Preformed Packings (2) (Item 165, Appendix F)
Preformed Packing (Item 177, Appendix F)
Washers, Pressure (2) (Item 337, Appendix F)

Special Environmental Conditions
Engine on hard, level surface.

Personnel Required
Two

a. Removal

(1) Place oil drain pan under steering pump (1) to catch draining fluid.

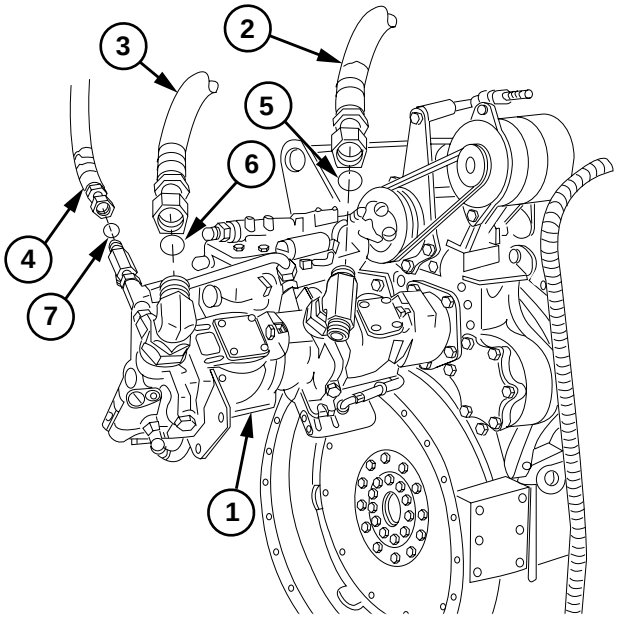
CAUTION

Ends of lines and fittings must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

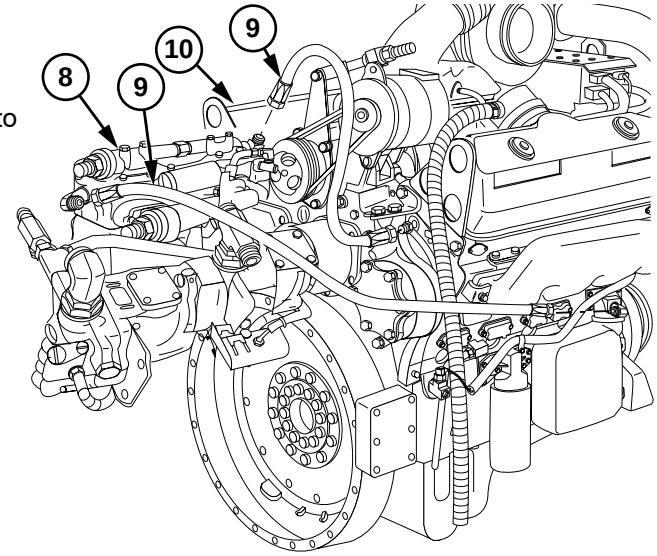
NOTE

Tag and mark hoses before removal.

(2) Remove hose no. 2278 (2), hose no. 2302 (3), hose no. 2701 (4), and three preformed packings (5, 6, and 7) from steering pump (1). Discard preformed packings.



3-5. ENGINE REPLACEMENT (CONT)



(3) Place drain pan under air compressor (8) to catch draining fluid.

(4) Remove two hoses no. 2628 (9) from air compressor (8) and engine (10).

WARNING

Steering pump weighs approximately 112 lb (51 kg). Properly support steering pump during removal. Failure to comply may result in serious personnel injury.

(5) Attach suitable lifting device to steering pump (1).

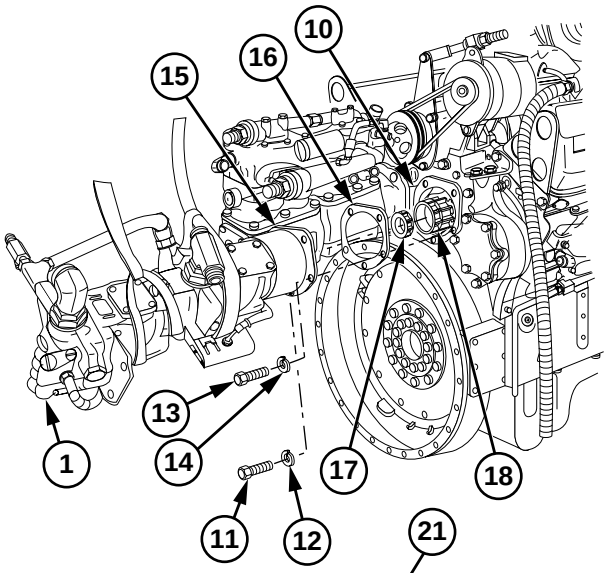
(6) Remove four screws (11), lockwashers (12), screw (13), and lockwasher (14) from adapter housing (15) and engine (10). Discard lockwashers.

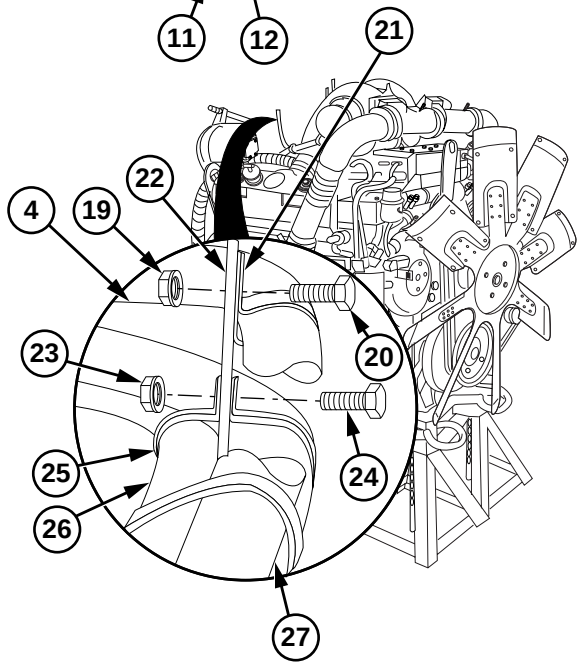
NOTE

Gently strike steering pump with soft-faced mallet to unseat mounting flange from engine.

(7) Remove steering pump (1), adapter housing (15), gasket (16), drive coupling (17), and drive coupling (18) from engine (10) with aid of assistant. Discard gasket.

(8) Place steering pump (1) and adapter housing (15) on clean flat surface and remove lifting device.





(9) Remove locknut (19), screw (20), clip (21), and hose no. 2278 (4) from standoff bracket (22). Discard locknut.

(10) Remove locknut (23), screw (24), and two cushion clips (25) from standoff bracket (22) and transmission oil cooler hoses no. 2701 (26) and no. 2302 (27). Discard locknut.

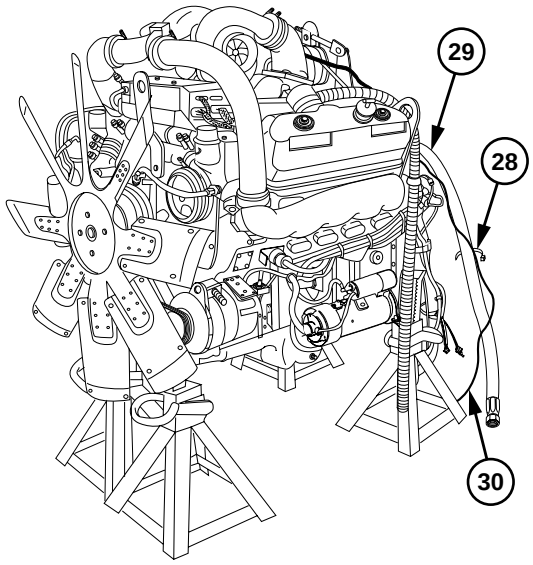
CAUTION

Ends of lines and fittings must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

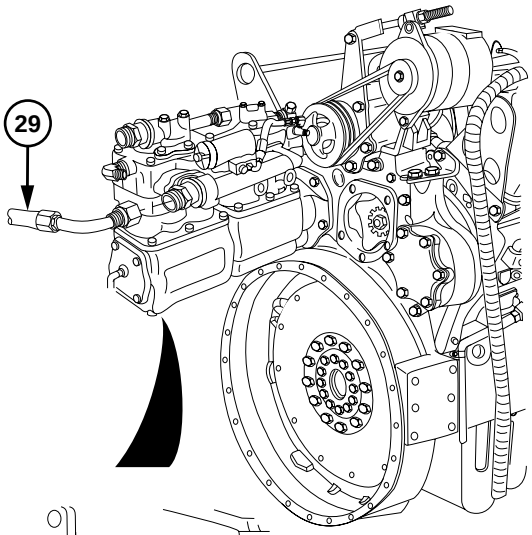
NOTE

Location of plastic cable ties should be marked before removal.

(11) Remove cable ties (28) from hose no. 2600 (29) and ether start hose (30).



(12) Remove hose no. 2600 (29) from air compressor (8).

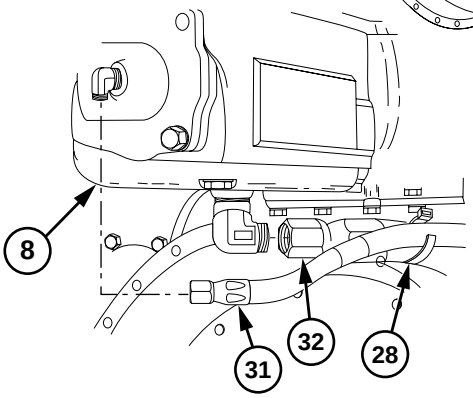


NOTE

Location of plastic cable ties should be marked before removal.

(13) Remove cable ties (28) from oil line no. 2629 (31) and oil line no. 2630 (32).

(14) Remove oil line no. 2630 (32) from air compressor (8).



3-5. ENGINE REPLACEMENT (CONT)

WARNING

Air compressor weighs approximately 100 lb (45 kg) Properly support air compressor during removal. Failure to comply may result in serious personnel injury.

(15) Attach suitable lifting device to air compressor (8).

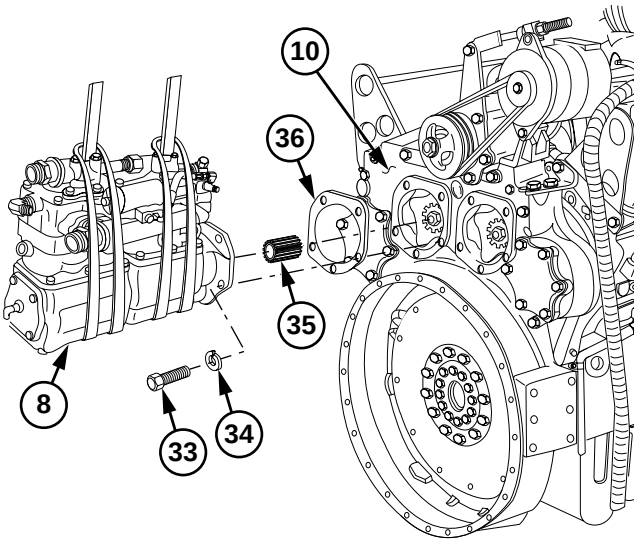
(16) Remove four screws (33) and lockwashers (34) from air compressor (8). Discard lockwashers.

NOTE

Gently strike air compressor with soft-faced mallet to unseat mounting flange from engine.

(17) Remove air compressor (8), drive coupling (35), and gasket (36) from engine (10) with aid of assistant. Discard gasket.

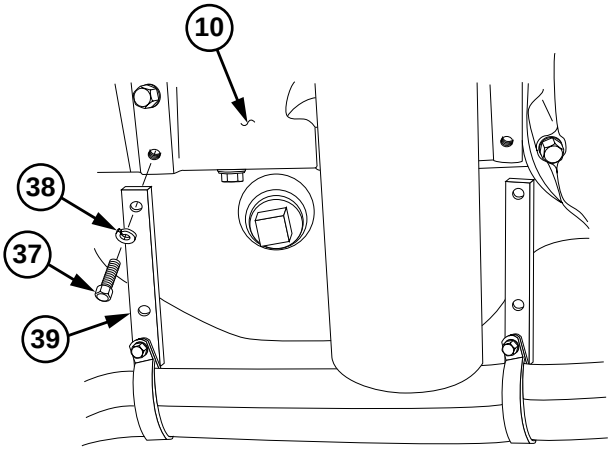
(18) Place air compressor (8) on clean flat surface and remove lifting device.

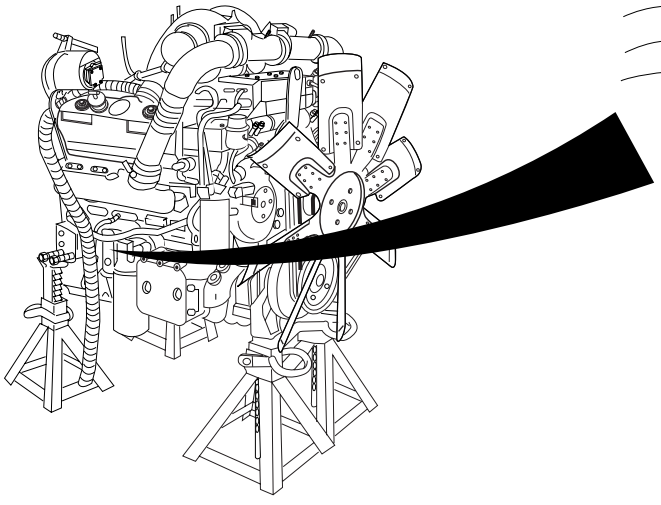


NOTE

Hoses no. 2393 and 2382 will be removed with two brackets.

(19) Remove two screws (37), lockwashers (38), and brackets (39) from engine (10). Discard lockwashers.

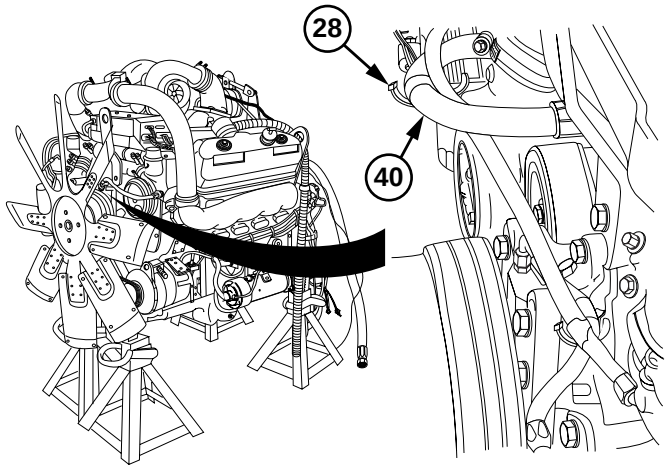




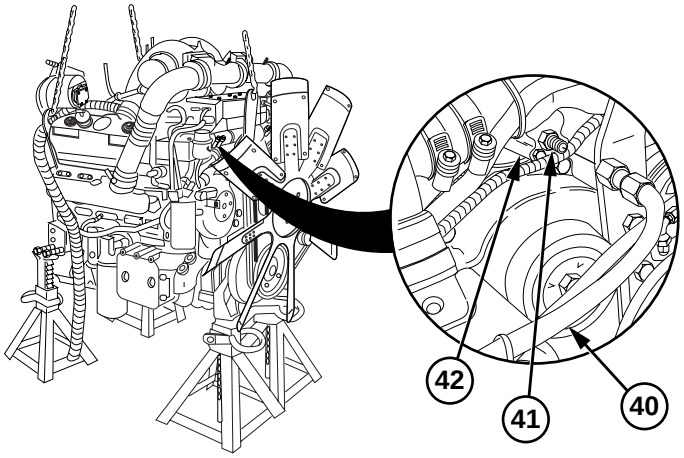
NOTE

Location of plastic cable ties should be marked before removal.

(20) Remove cable tie (28) from fuel line no. 2261 (40).



(21) Remove fuel line no. 2261 (40) from fitting (41) on fuel pump (42).

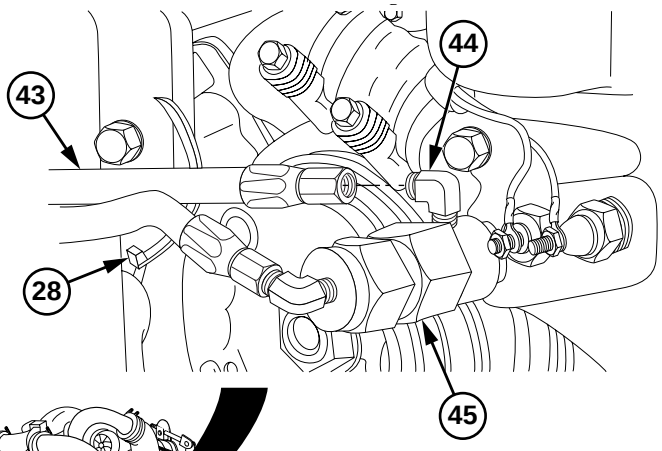


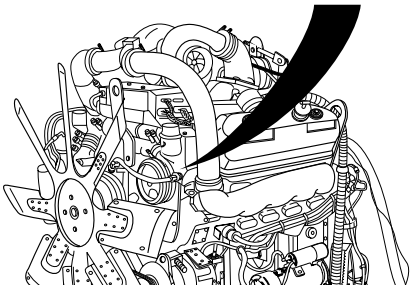
NOTE

Location of plastic cable ties should be marked before removal.

(22) Remove cable ties (28) from air line no. 2758 (43).

(23) Remove air line no. 2758 (43) from elbow (44) on fan control valve (45).

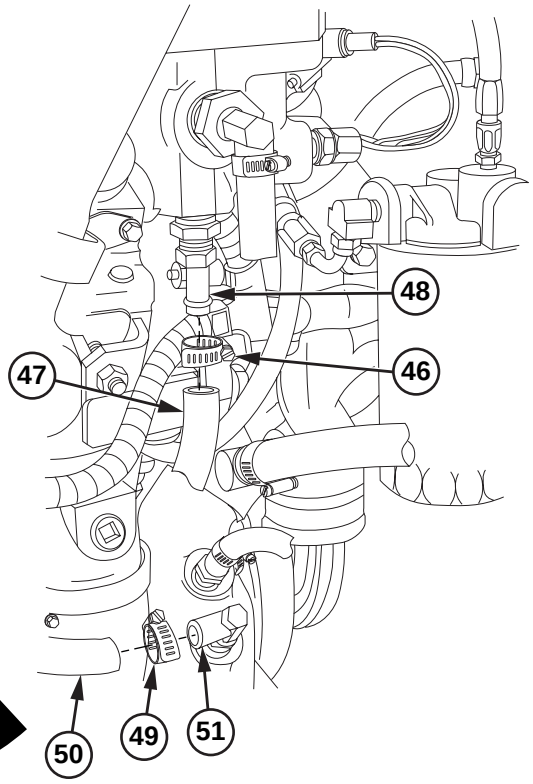


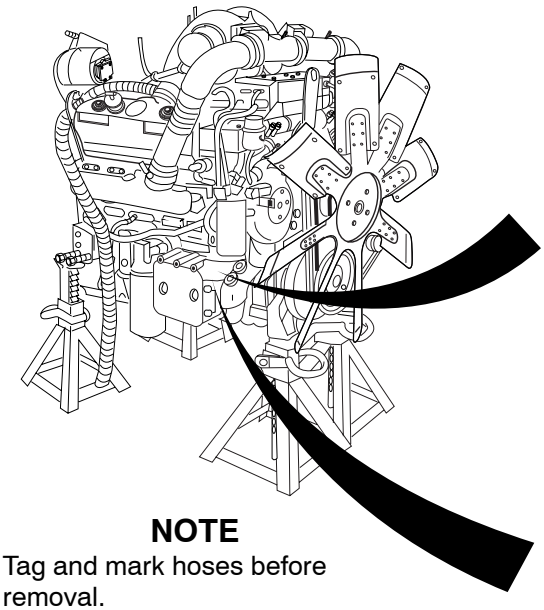


3-5. ENGINE REPLACEMENT (CONT)

(24) Loosen clamp (46) and remove heater hose no. 2652 (47) from fitting (48).

(25) Loosen clamp (49) and remove heater hose no. 2651 (50) from elbow (51).





NOTE

Tag and mark hoses before removal.

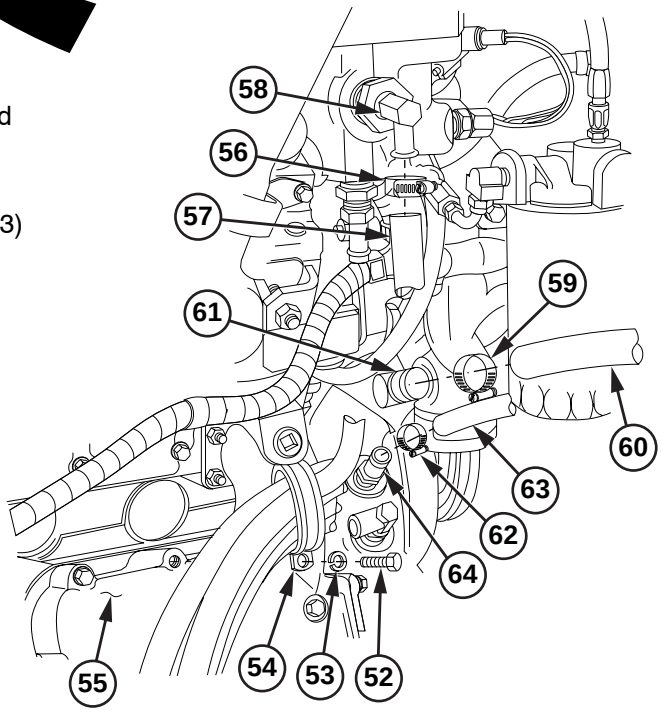
(26) Remove screw (52), lockwasher (53), and clip (54) from oil cooler (55). Discard lockwasher.

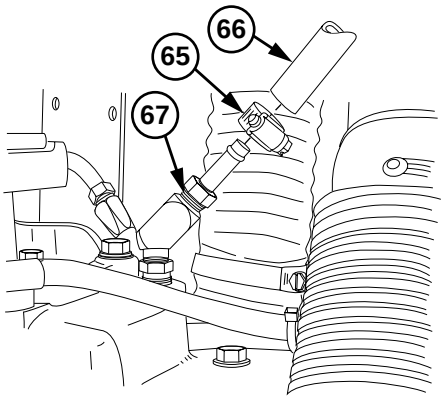
(27) Install screw (52) and new lockwasher (53) in oil cooler (55).

(28) Loosen clamp (56) and remove hose no. 2867 (57) from elbow (58).

(29) Loosen clamp (59) and remove hose no. 2834 (60) from elbow (61).

(30) Loosen clamp (62) and remove hose no. 2866 (63) from fitting (64).





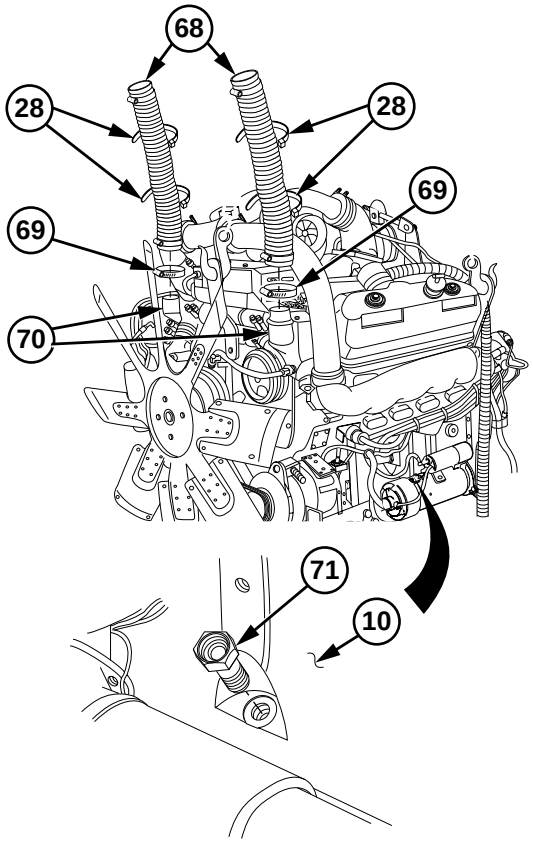
(31) Loosen clamp (65) and remove deaeration hose (66) from fitting (67).

NOTE

Location of plastic cable ties should be marked before removal.

(32) Remove cable ties (28) from two upper radiator hoses (68).

(33) Loosen two clamps (69) and remove two upper radiator hoses (68) from right and left side thermostat housings (70).

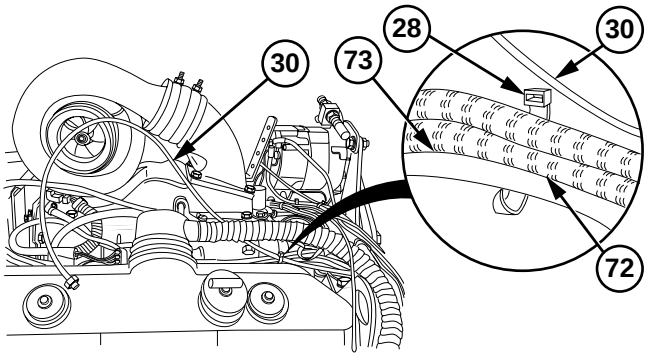


(34) Remove adapter (71) from engine (10).

NOTE

Location of plastic cable ties should be marked before removal.

(35) Remove cable ties (28) from wire harness (72), ether start hose (30), and air restriction indicator hose no. 2381 (73).



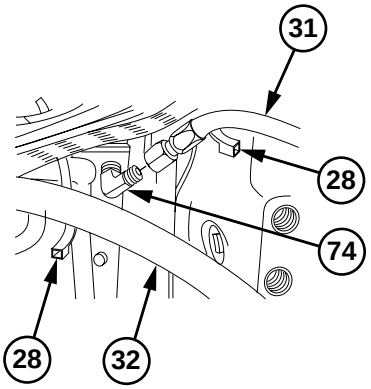
3-5. ENGINE REPLACEMENT (CONT)

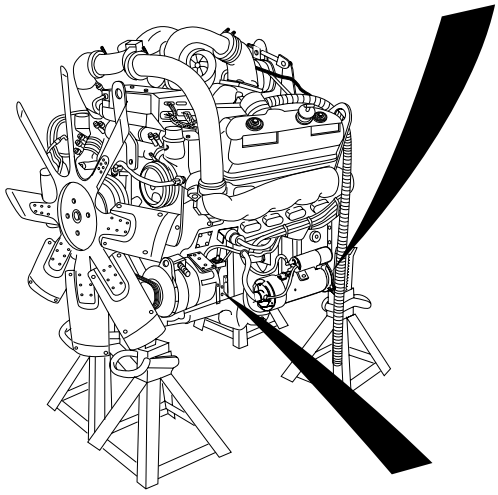
NOTE

Location of plastic cable ties should be marked before removal.

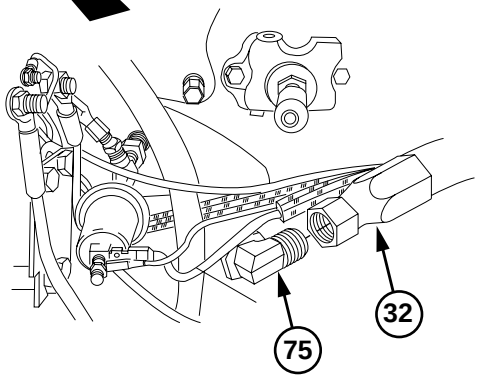
(36) Remove cable ties (28) from hose no. 2629 (31) and hose no. 2630 (32).

(37) Remove hose no. 2629 (31) from elbow (74).





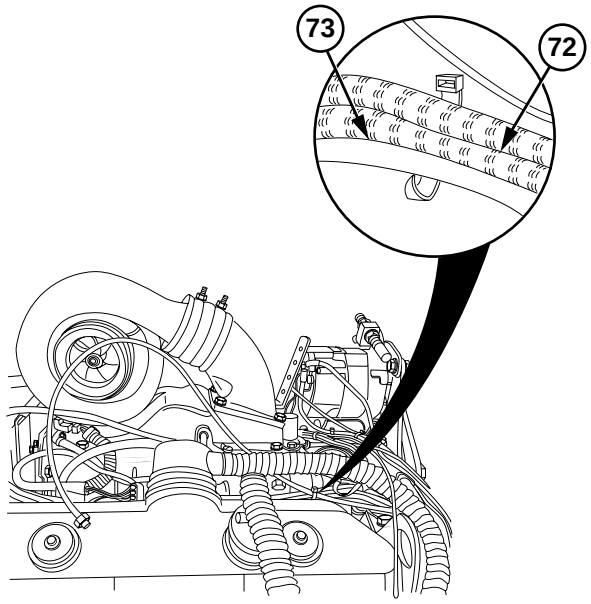
(38) Remove hose no. 2630 (32) from elbow (75).



(39) Deleted.

(40) Deleted.

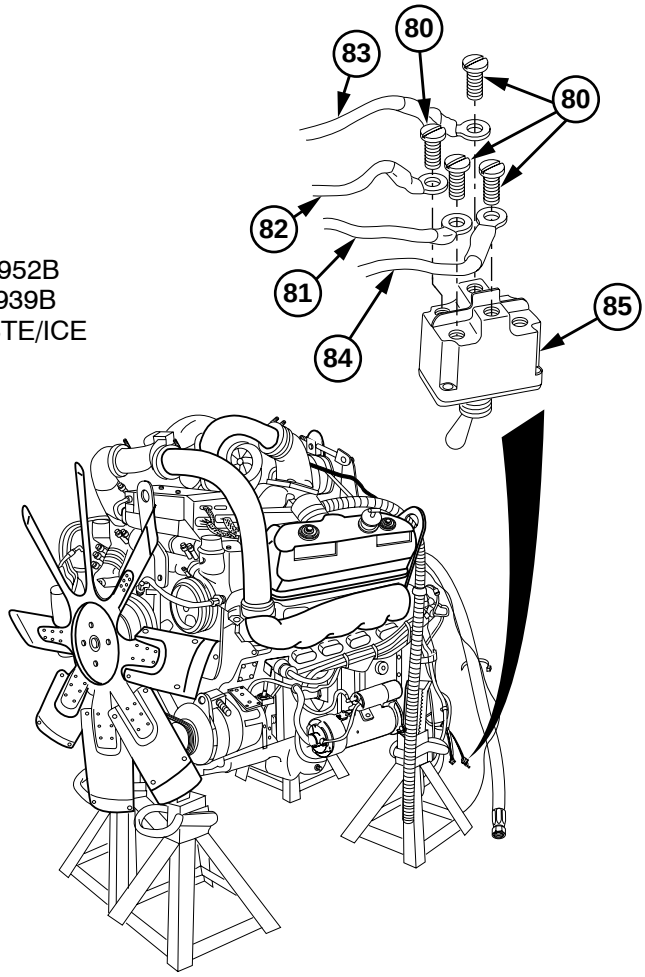
(41) Remove air restriction indicator hose no. 2381 (73) from wire harness (72).



NOTE

Tag and mark wires before removal.

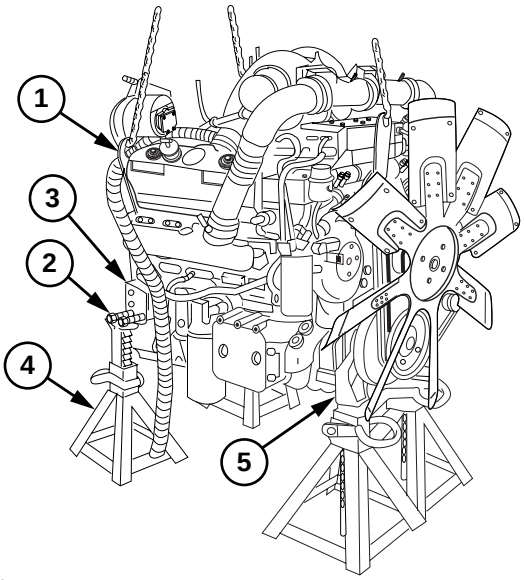
(42) Remove four screws (80), wire no. 1952B (81), wire no. 1940B (82), wire no. 1939B (83), and wire no. 1938B (84) from STE/ICE ZERO OFFSET switch (85).



3-5. ENGINE REPLACEMENT (CONT)

b. Engine Preparation

(1) Deleted.



(2) Remove replacement engine (1) from shipping container (para 3-4).

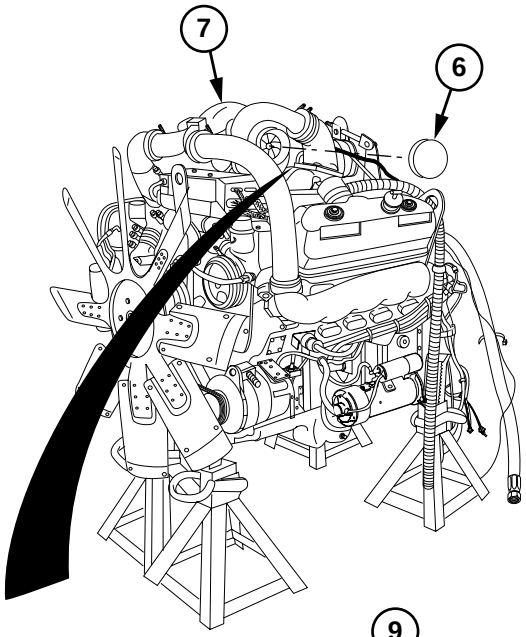
WARNING

Grade 8 screws must be used to support engine. Failure to comply may result in engine falling causing injury or death to personnel.

(3) Install four screws (2) to flywheel housing (3) on rear of replacement engine (1).

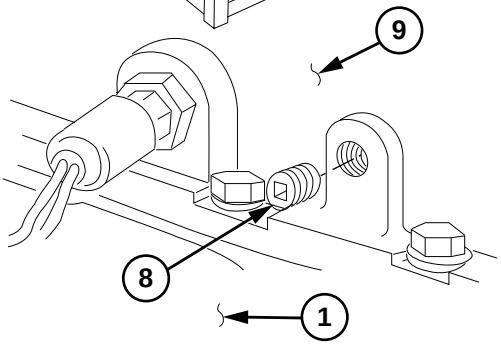
(4) Place replacement engine (1) on four suitable stands (4) supported at engine flywheel housing screws (2) and engine front mount (5).

(5) Remove lifting device from replacement engine (1).



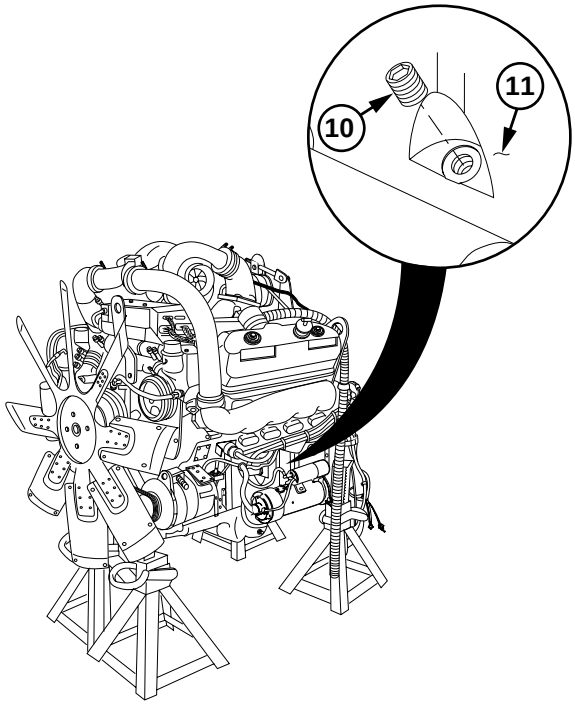
(6) Remove cover (6) from inlet and outlet of turbocharger (7) on replacement engine (1).

(7) Remove plugs, covers, and tape from fittings, hoses and openings.



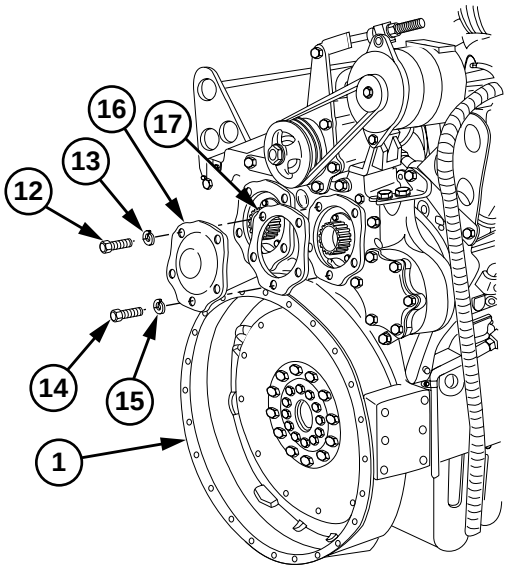
(8) Remove pipe plug (8) from blower inlet housing (9) on replacement engine (1).

(9) Remove pipe plug (10) from dipstick hole in engine block (11).



(10) Remove eight screws (12), lockwashers (13), two screws (14), pressure washers (15), accessory drive covers (16), and gaskets (17) from replacement engine (1). Discard lockwashers and pressure washers.

(11) Install two gaskets (17), accessory drive covers (16), new pressure washers (15), screws (14), eight new lockwashers (13), and screws (12) on old engine (1).

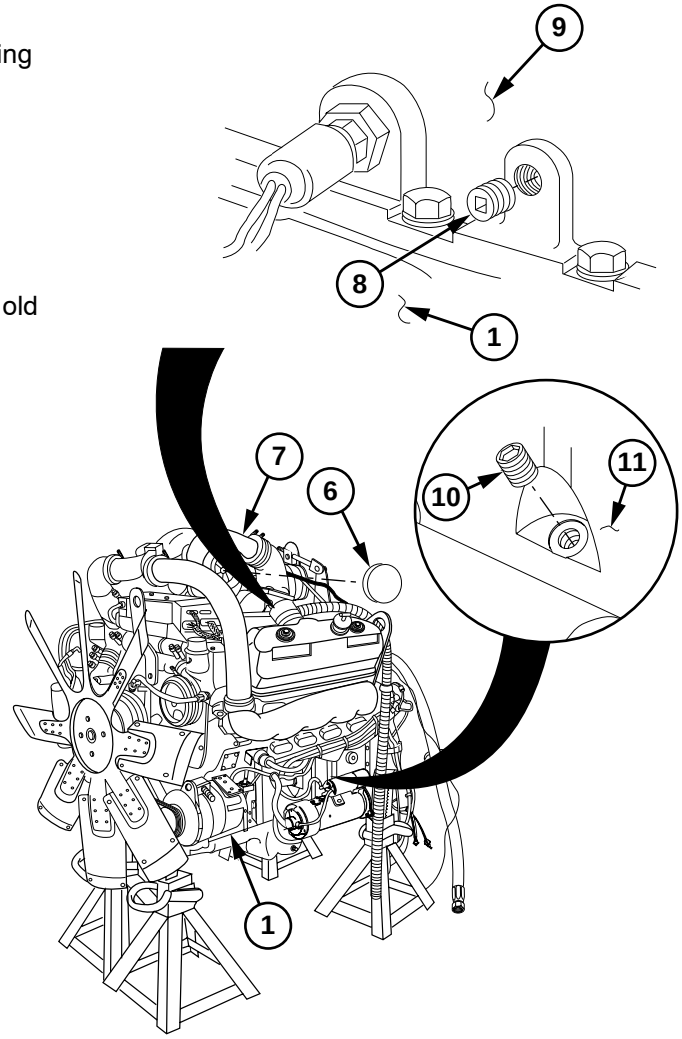


3-5. ENGINE REPLACEMENT (CONT)

(12) Install pipe plug (8) in blower inlet housing (9) on old engine (1).

(13) Install pipe plug (10) in dipstick hole on old engine block (11).

(14) Install cover (6) on inlet and outlet of turbocharger (7) on old engine (1).



(15) Attach suitable lifting device to old engine (1).

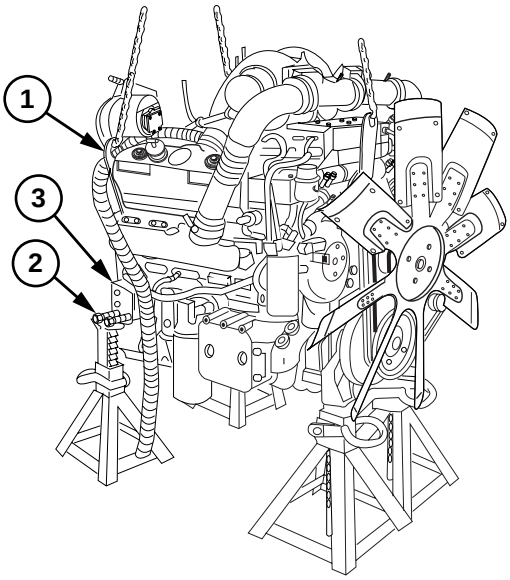
(16) Lift old engine (1) and remove four screws (2) from flywheel housing (3).

NOTE

Refer to para 3-4 to install engine in shipping container.

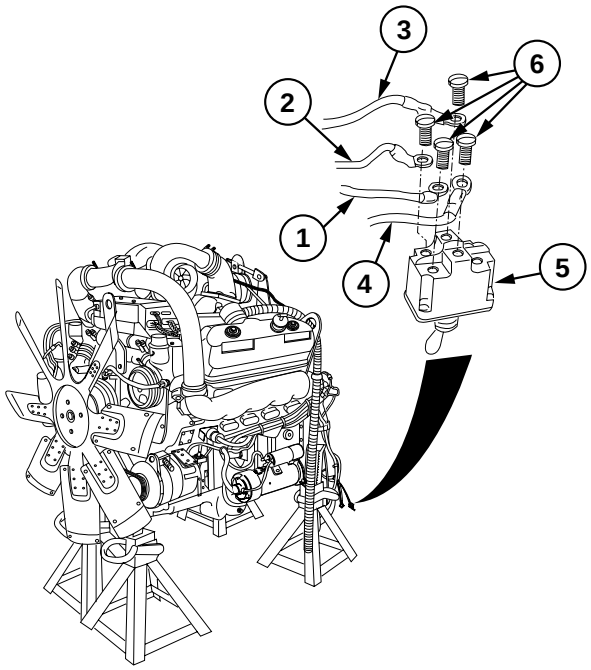
(17) Install old engine (1) in shipping container.

(18) Remove lifting device from old engine (1).



c. Installation

(1) Install wire no. 1952B (1), wire no. 1940B (2), wire no. 1939B (3), and wire no. 1938B (4) on STE/ICE ZERO OFFSET switch (5) with four screws (6).



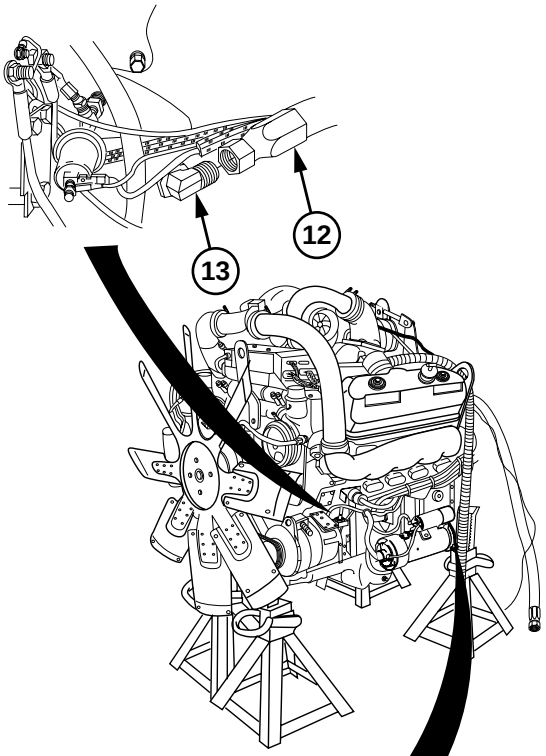
(2) Deleted.

(3) Deleted.

(4) Deleted.

3-5. ENGINE REPLACEMENT (CONT)

(5) Install hose no. 2630 (12) on elbow (13).

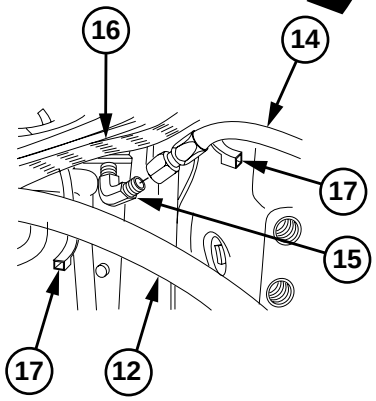


(6) Install hose no. 2629 (14) on elbow (15).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

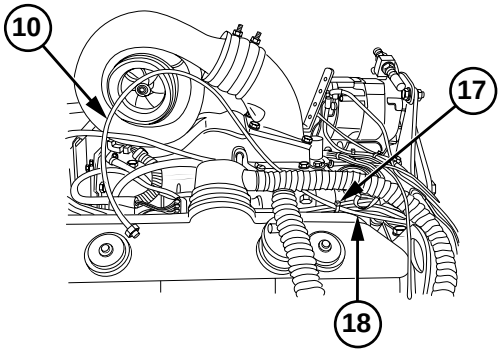
(7) Secure hose no. 2629 (14), hose no. 2630 (12) and wire harness (16) with cable ties (17).



NOTE

Plastic cable ties should be positioned in locations marked during removal.

(8) Secure ether start hose (10) and air restriction indicator hose no. 2381 (18) with plastic cable ties (17).



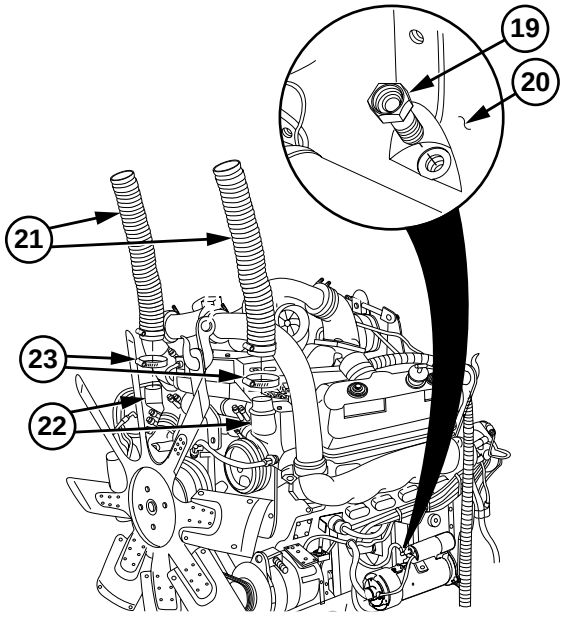
WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well ventilated areas. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

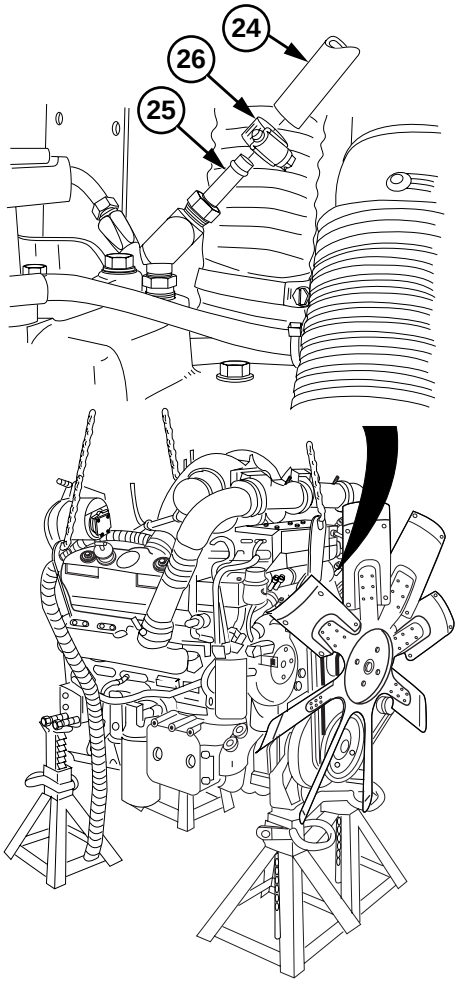
(9) Coat threads of engine dipstick tube adapter (19) with pipe thread sealing compound.

(10) Install engine dipstick tube adapter (19) on engine (20).

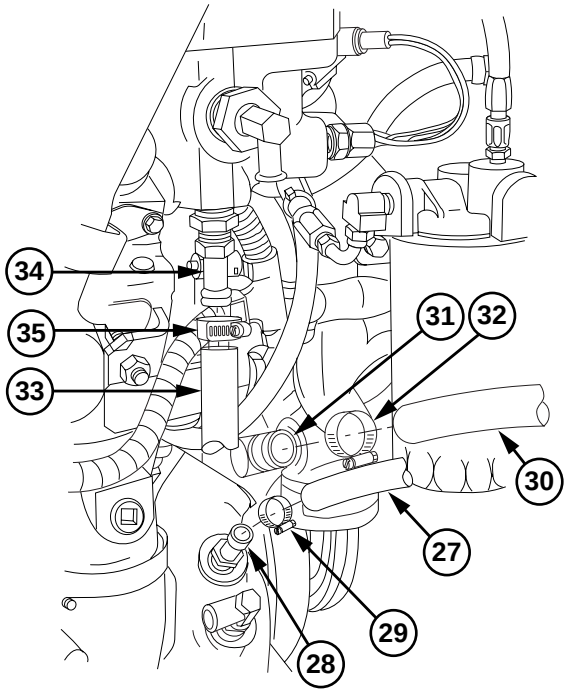
(11) Install two upper radiator hoses (21) on right and left side of thermostat housings (22) with two clamps (23). Torque to 100 lb–in. (11 N·m).



(12) Install deaeration hose (24) on fitting (25) with clamp (26).



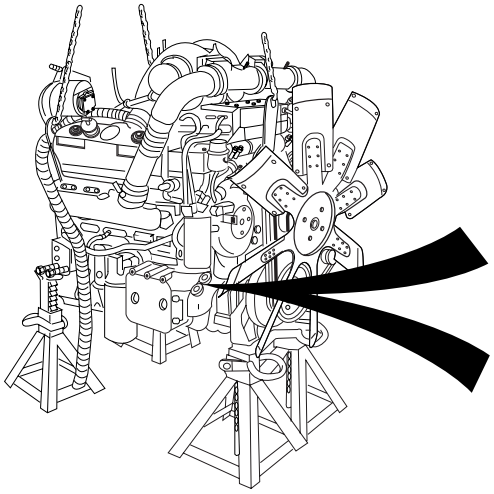
3-5. ENGINE REPLACEMENT (CONT)



(13) Install hose no. 2866 (27) on fitting (28) with clamp (29). Torque to 40 lb-in. (4.5 N·m).

(14) Install hose no. 2834 (30) on elbow (31) with clamp (32). Torque to 40 lb-in. (4.5 N·m).

(15) Install heater hose no. 2652 (33) on fitting (34) with clamp (35). Torque to 30 lb-in. (3.4 N·m). Torque to 40 lb-in. (4.5 N·m).

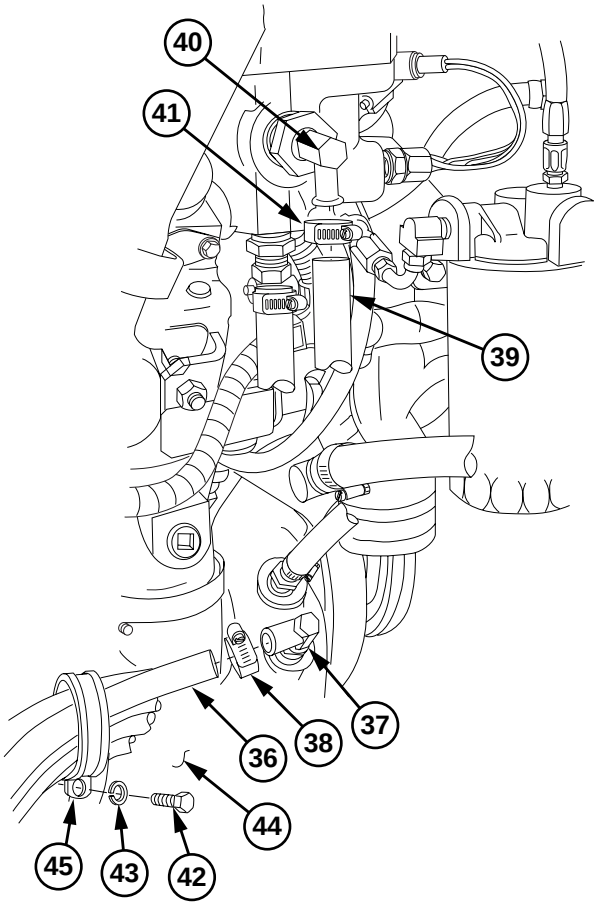


(16) Install heater hose no. 2651 (36) on elbow (37) with clamp (38). Torque to 40 lb-in. (4.5 N·m).

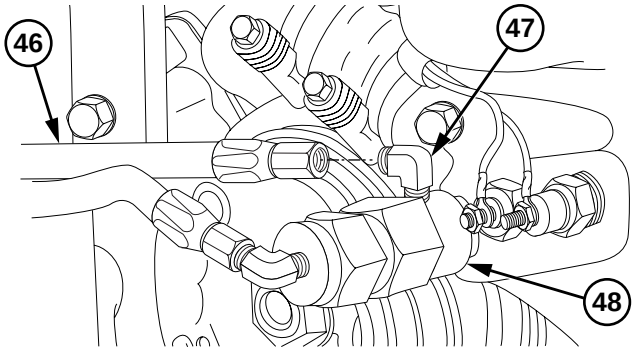
(17) Install hose no. 2867 (39) on elbow (40) with clamp (41). Torque to 40 lb-in. (4.5 N·m).

(18) Remove screw (42) and lockwasher (43) from oil cooler (44). Discard lockwasher.

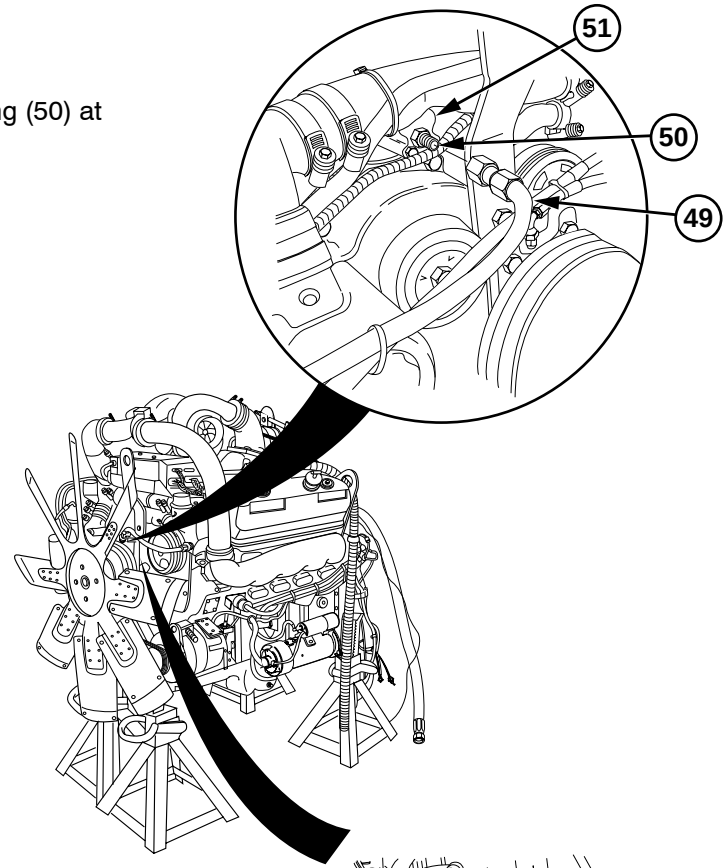
(19) Install clip (45) on oil cooler (44) with new lockwasher (43) and screw (42).



(20) Install air line no. 2758 (46) on elbow (47) at fan control valve (48).



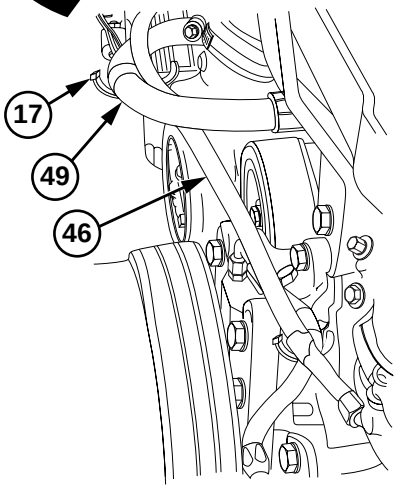
(21) Install fuel line no. 2261 (49) on fitting (50) at fuel pump (51).



NOTE

Plastic cable ties should be positioned in locations marked during removal.

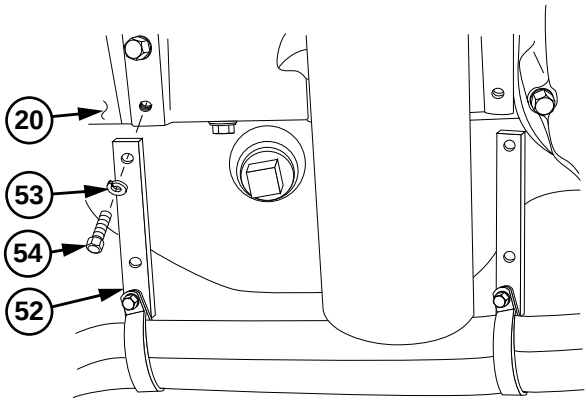
(22) Secure air line no. 2758 (46) and fuel line no. 2261 (49) with cables ties (17).



3-5. ENGINE REPLACEMENT (CONT)

(23) Install brackets (52) on engine (20) with two new lockwashers (53) and screws (54).

(24) Install two guide screws (55) into lower holes of engine (20).



WARNING

Air compressor weighs approximately 100 lb (45 kg). Properly support air compressor during installation. Failure to comply may result in serious personnel injury.

(25) Attach suitable lifting device to air compressor (56).

(26) Position air compressor (56) on guide screws (55) with aid of assistant.

WARNING

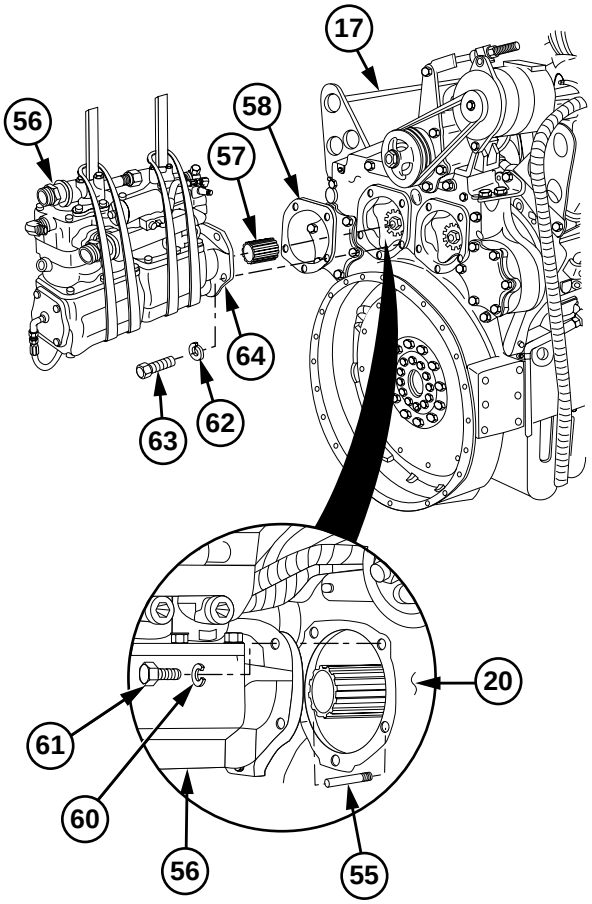
Sealing compound can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Drive coupling must be aligned with drive gears on engine. Failure to comply may result in equipment damage.

NOTE

Air compressor and mating surfaces on engine must be clean. Rubber seal on gasket must face away from engine.



(26.1) Apply sealing compound to engine side of new gasket (58).

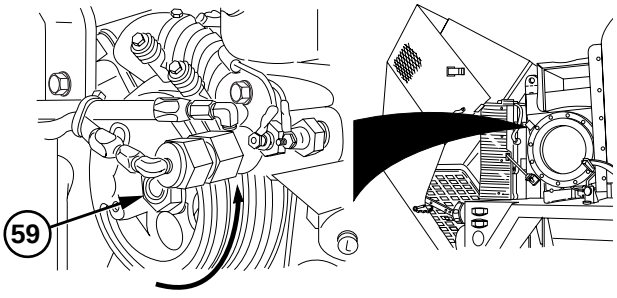
(27) Install drive coupling (57) and gasket (58) on air compressor (56) while assistant turns camshaft pulley (59).

(28) Position air compressor (56) on engine (20) with two new lockwashers (60) and screws (61) with aid of assistant.

(29) Remove two guide screws (55) and position two new lockwashers (62) and screws (63) in lower holes of compressor mounting flange (64).

(30) Remove lifting device from air compressor (56).

(31) Tighten four screws (61 and 63) to 73–83 lb–ft (99–113 N·m).



(32) Install oil line no. 2630 (12) on air compressor (56).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(33) Secure oil lines no. 2629 (14) and no. 2630 (12) with plastic cable ties (17).

(34) Install air hose no. 2600 (65) on air compressor (56).

(35) Install two guide screws (66) in lower holes of engine (20).

WARNING

Steering pump weighs approximately 112 lb (51 kg) Properly support steering pump during installation. Failure to comply may result in serious personnel injury.

(36) Attach suitable lifting device to steering pump (67).

(37) Install drive gear (68) and drive coupling (69) on steering pump (67).

WARNING

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

CAUTION

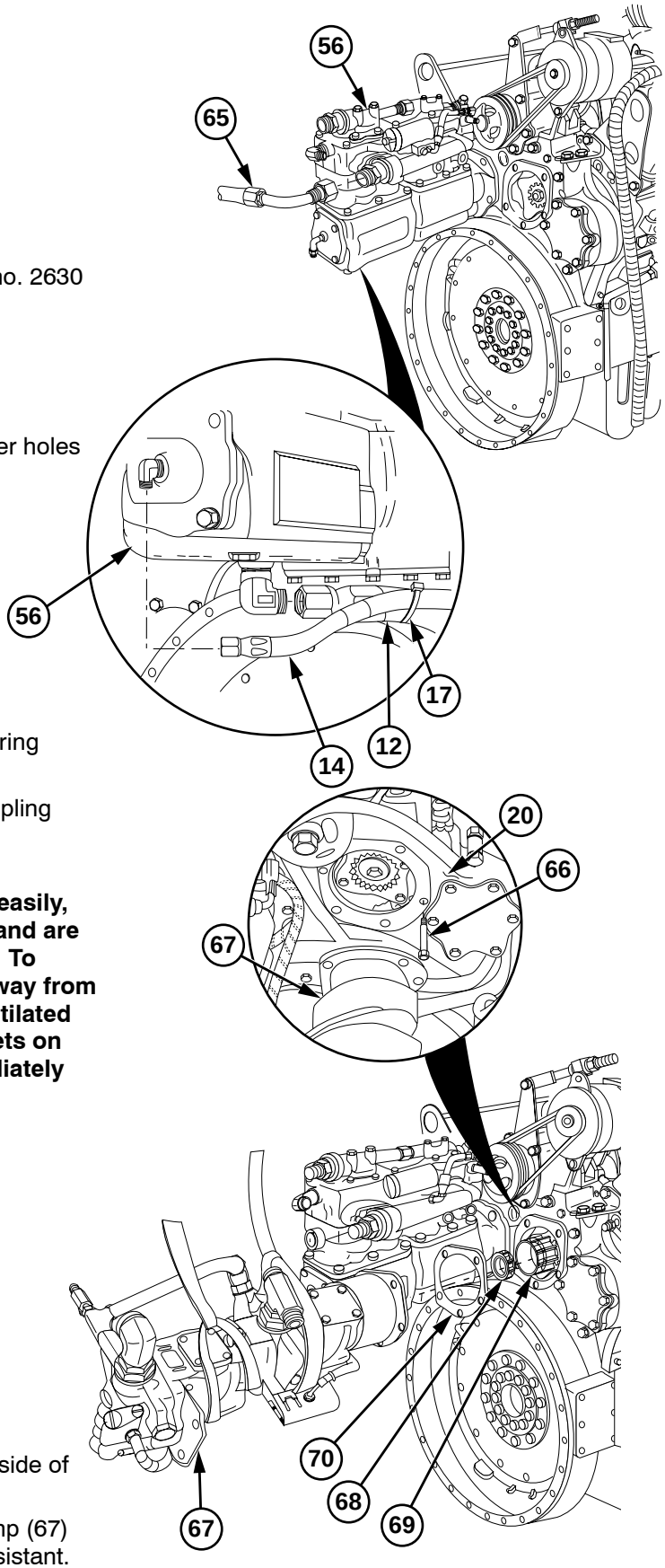
Drive coupling must be aligned with drive gears on engine. Failure to comply may result in equipment damage.

NOTE

Steering pump and mating surfaces on engine must be clean. Rubber seal on gasket must face away from engine.

(37.1) Apply sealing compound to engine side of new gasket (70).

(38) Install gasket (70) and steering pump (67) on guide screws (66) with aid of assistant.



3-5. ENGINE REPLACEMENT (CONT)

(39) Position two new lockwashers (71), two screws (72), new lockwasher (73), and screw (74) on steering pump adapter (75) and engine (20).

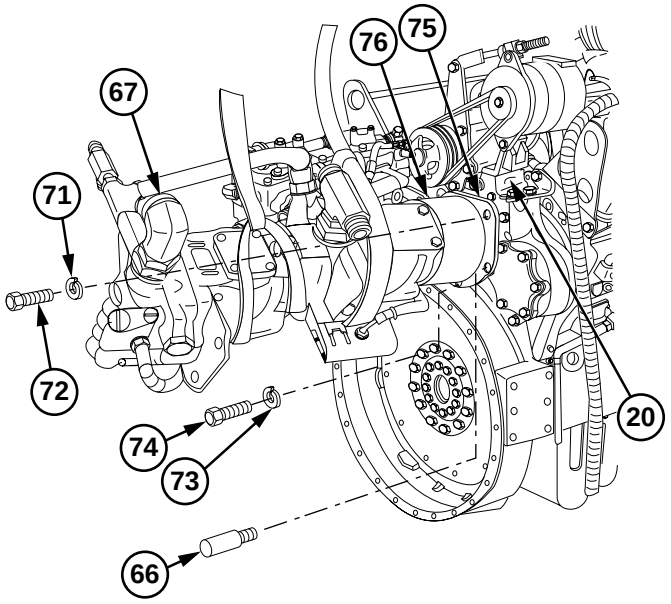
(40) Remove two guide screws (66) from engine (20).

(41) Position two remaining screws (72) and new lockwashers (71) through adapter housing (76) into engine (20) while assistant operates lifting device.

(42) Tighten four screws (72) to 73–83 lb–ft (99–113 N·m) using crow's foot wrench.

(43) Tighten screw (74) to 48–58 lb–ft (65–79 N·m) using crow's foot wrench.

(44) Remove lifting device from steering pump (67).

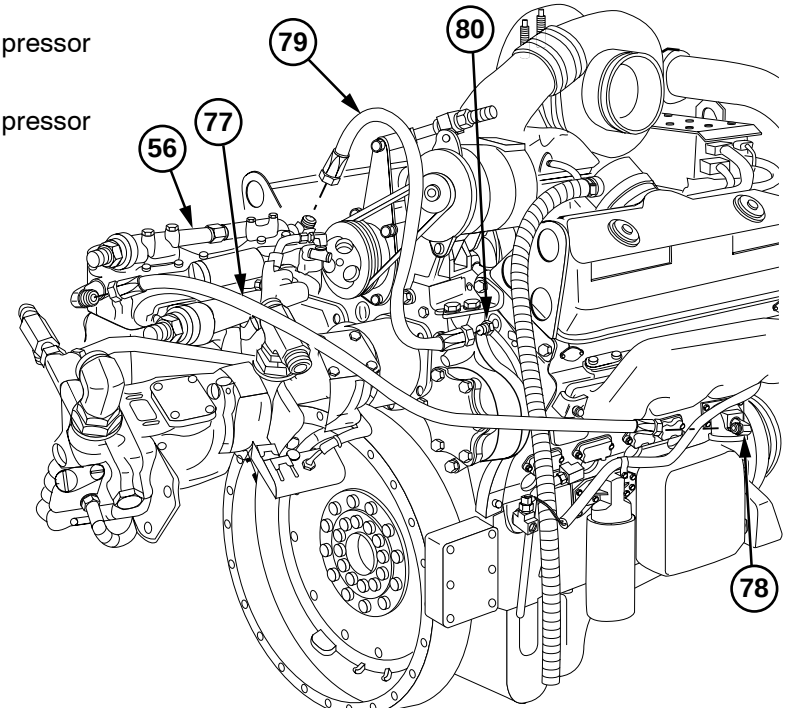


NOTE

Hose no. 2628 from air compressor to elbow is 27 in. (68 cm) long. Hose no. 2628 from air compressor to fitting is 30 in. (76 cm) long.

(45) Install hose no. 2628 (77) on air compressor (56) and elbow (78).

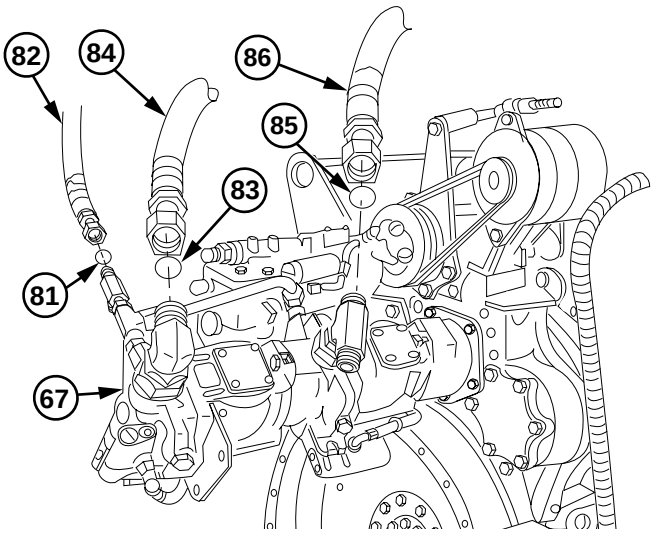
(46) Install hose no. 2628 (79) on air compressor (56) and fitting (80).



(47) Install new preformed packing (81) and hose no. 2701 (82) on steering pump (67).

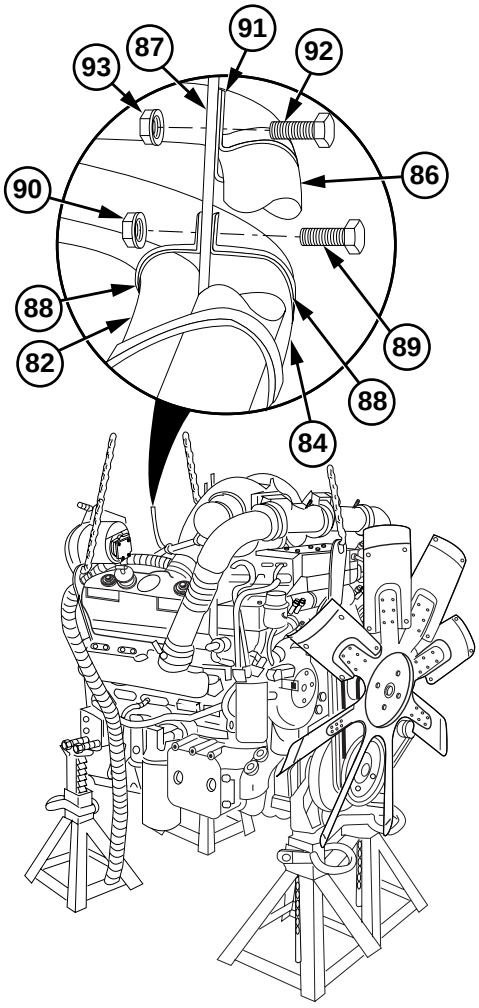
(48) Install new preformed packing (83) and hose no. 2302 (84) on steering pump (67). Do not tighten.

(49) Install new preformed packing (85) and hose no. 2278 (86) on steering pump (67). Do not tighten.



(50) Install two transmission oil cooler hoses no. 2302 (84) and no. 2701 (82) on standoff bracket (87) with two cushion clips (88), screws (89), and new locknuts (90).

(51) Install hose no. 2278 (86) on standoff bracket (87) with cushion clip (91), screw (92), and new locknut (93).



d. Follow-On Maintenance

Install transmission (para 7-4).

3-6. ENGINE BLOCK BREATHER TUBE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Blower removed (para 4-6).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

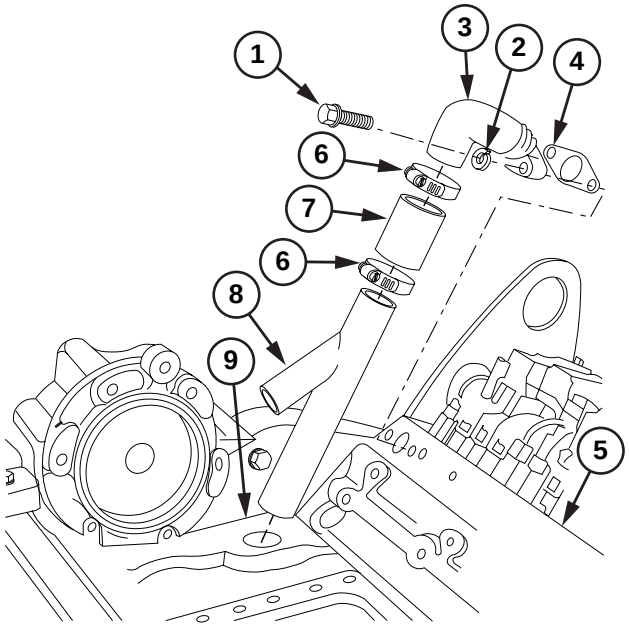
Materials/Parts
Gasket (Item 45, Appendix F)
Lockwashers (2) (Item 118, Appendix F)

a. Removal

(1) Remove two screws (1), lockwashers (2), elbow (3), and gasket (4) from cylinder head (5). Discard gasket and lockwashers.

(2) Remove two clamps (6) and hose (7) from elbow (3) and pipe (8).

(3) Remove pipe (8) from engine block (9).



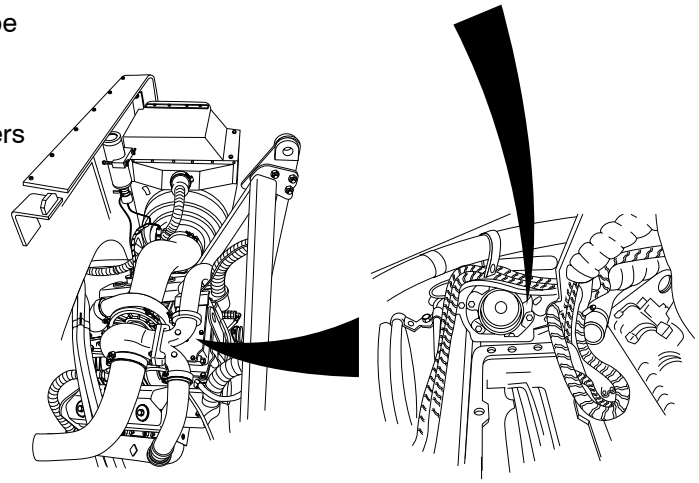
b. Installation

NOTE
When properly installed, top of pipe will be 4.5 in. (114 mm) above cylinder block.

(1) Install pipe (8) in engine block (9).

(2) Install hose (7) with two clamps (6) on pipe (8) and elbow (3).

(3) Install new gasket (4) and elbow (3) on cylinder head (5) with two new lockwashers (2) and screws (1).



c. Follow-On Maintenance

Install blower (para 4-6).

3-7. DDEC II SYNCHRONOUS REFERENCE SENSOR (SRS) AND TIMING REFERENCE SENSOR (TRS) REPLACEMENT/ADJUSTMENT

This task covers:
a. Removal
b. Installation
c. Adjustment
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
ECM removed (TM 9-2320-360-20).
No. 1 right fuel injector removed (para 4-2).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Alignment Tool, SRS/TRS (Item 196, Appendix E)
Socket, Sockethead Screw, 3/16 In. (Item 172, Appendix E)

Tools and Special Tools (Cont)
Timing Tool, Crank Position (Item 197, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

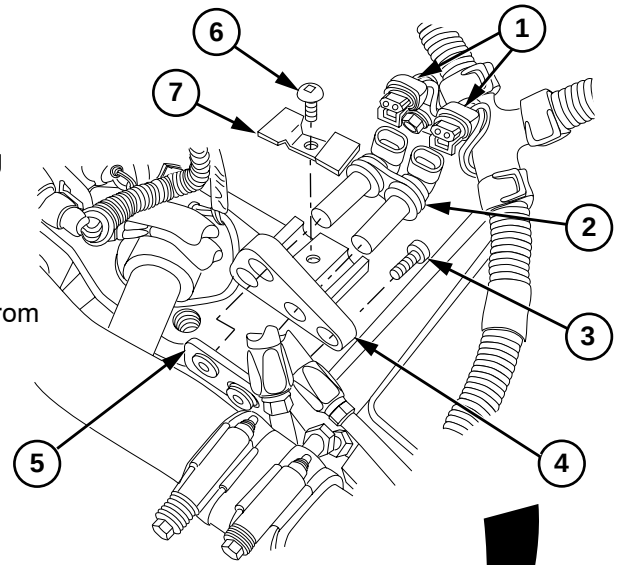
a. Removal

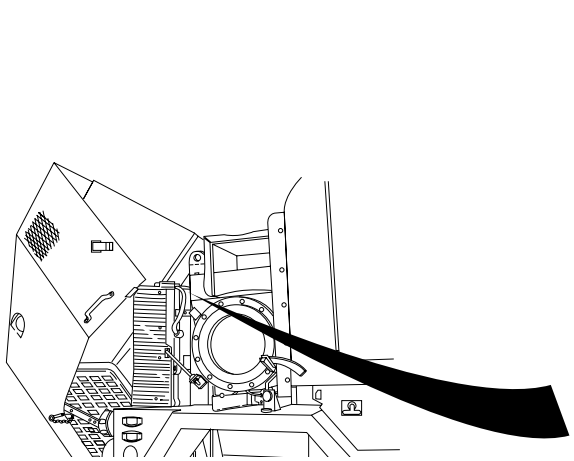
(1) Disconnect two connectors (1) from synchronous reference sensor and timing reference sensor (SRS/TRS) (2).

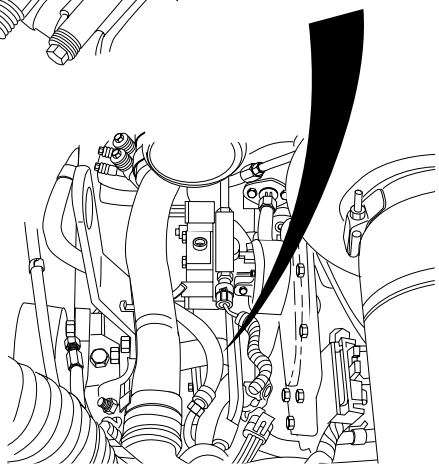
(2) Remove two sockethead screws (3) and bracket (4) from front end plate (5).

(3) Remove screw (6) and retaining clip (7) from bracket (4).

(4) Remove SRS/TRS (2) from bracket (4).







3-7. DDEC II SYNCHRONOUS REFERENCE SENSOR (SRS) AND TIMING REFERENCE SENSOR (TRS) REPLACEMENT/ADJUSTMENT (CONT)

b. Installation

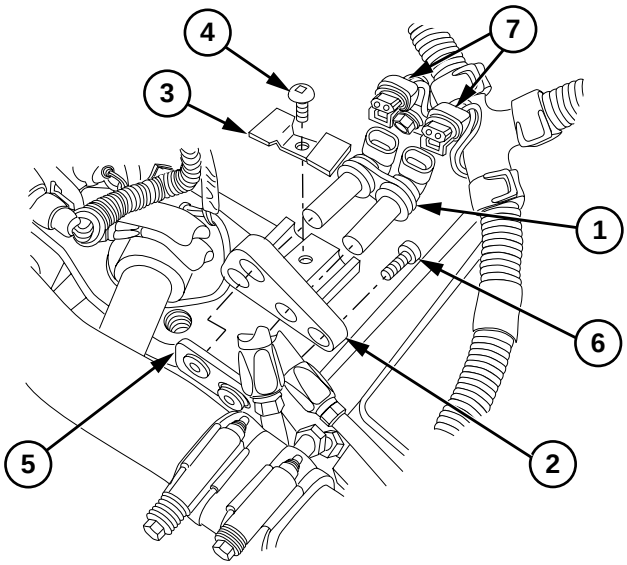
(1) Install SRS/TRS (1) in bracket (2).

(2) Position retaining clip (3) on bracket (2).

(3) Install, but do not tighten, screw (4) on retaining clip (3).

(4) Install bracket (2) on front end plate (5) with two sockethead screws (6).

(5) Connect two connectors (7) to SRS/TRS (1).

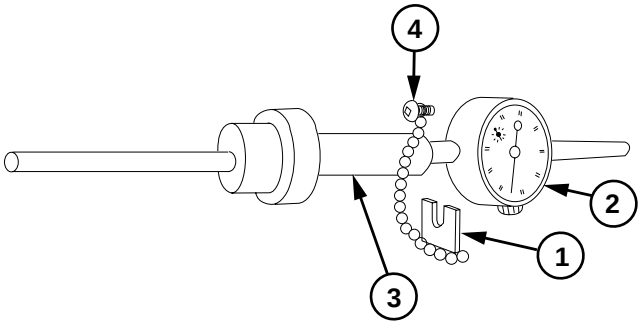


c. Adjustment

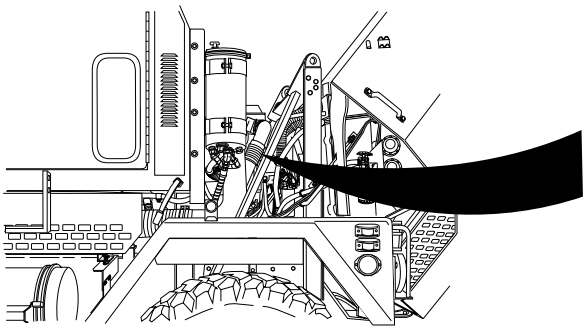
CAUTION

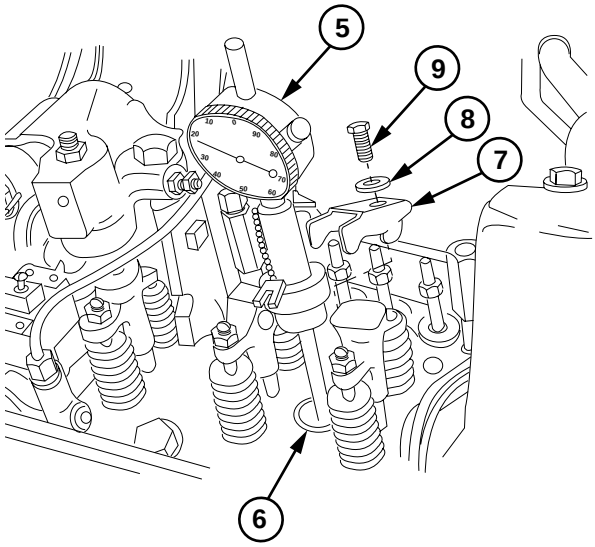
Ensure spacer is installed between dial indicator and top of holder. Failure to comply may result in damage to dial indicator if piston is already at top of travel when tool is installed.

(1) Install slotted spacer (1) between dial indicator (2) and top of holder (3). Tighten clamp screw (4).



(2) Install timing tool (5) in injector bore (6) with clamp (7), washer (8), and screw (9). Torque to 240–300 lb–in. (27–34 N·m).

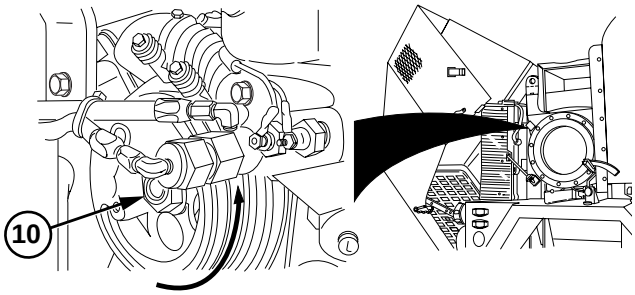




(3) Turn camshaft (10) slowly counterclockwise until large dial hand (11) starts moving.

(4) Continue turning camshaft (10) slowly counterclockwise until large dial hand (11) stops moving.

(5) Turn camshaft (10) slowly in opposite direction until large dial hand (11) barely starts to move. Piston is now at top-dead-center.



NOTE

Dial indicator must be zeroed before piston downward travel can be measured. Do steps (6) thru (8) to zero dial indicator.

(6) Loosen clamp screw (4) and remove slotted spacer (1).

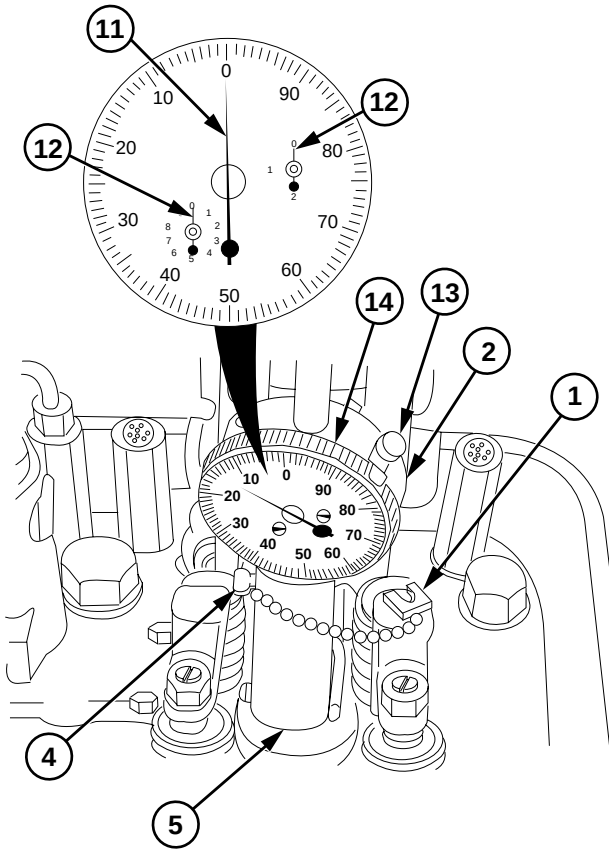
(7) Lower timing tool (5) until two small dial hands (12) are at zero and the large dial hand (11) is near zero. Tighten clamp screw (4).

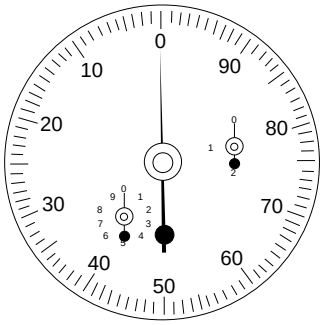
(8) Loosen bezel screw (13) and rotate outer ring (14) of dial until zero lines up with large dial hand (11). Tighten bezel screw (13).

CAUTION

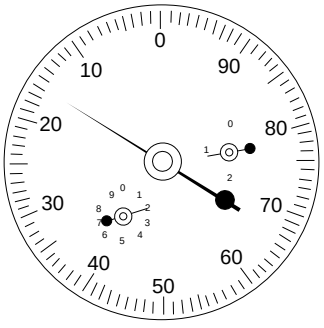
If pulley loosens during procedure, tighten to torque values specified in para 19-12. Failure to comply may result in loss of crankshaft pulley and possible engine damage.

(9) Zero dial indicator (2) and turn camshaft (10) slowly counterclockwise, until dial indicates exactly 1.216 in. (30.89 mm).





ZERO POSITION



1.216 IN . POSITION

3-7. DDEC II SYNCHRONOUS REFERENCE SENSOR (SRS) AND TIMING REFERENCE SENSOR (TRS) REPLACEMENT/ADJUSTMENT (CONT)

(10) Tap end of camshaft pulley (15) to take up end play.

(11) Insert alignment tool (16) between TRS (17) and double teeth (18) on pulse wheel (19).

(12) Loosen two sockethead screws (20).

(13) Loosen screw (21).

NOTE

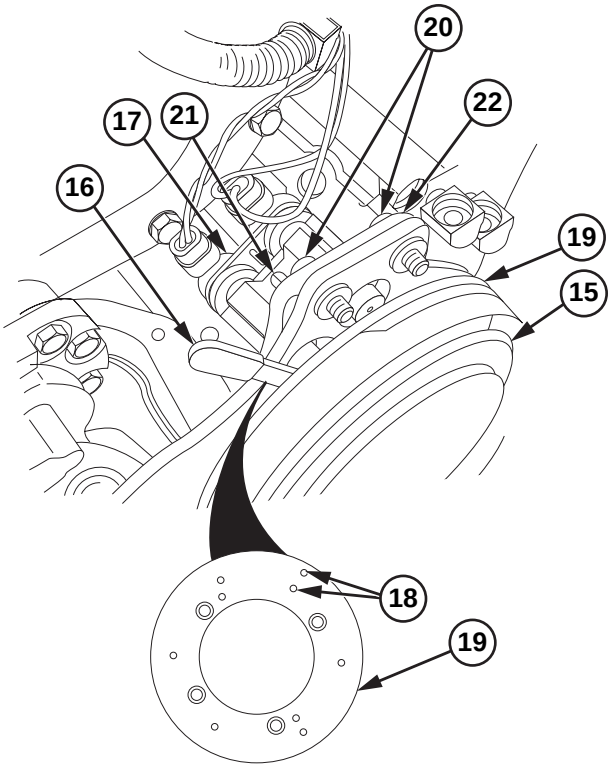
Ensure alignment tool surface is flush with double teeth and TRS.

(14) Move bracket (22) to align end of TRS (17) with groove in alignment tool (16).

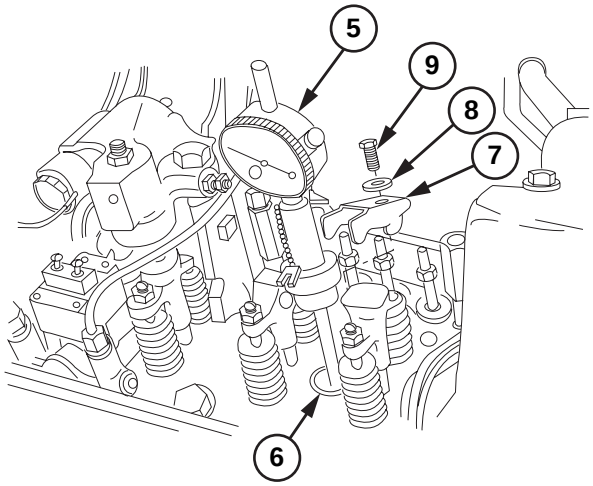
(15) Tighten two sockethead screws (20).

(16) Tighten screw (21) while pushing TRS (17) toward pulse wheel (19).

(17) Remove alignment tool (16) from pulse wheel (19).



(18) Remove screw (9), washer (8), clamp (7), and timing tool (5) from injector bore (6).



d. Follow-On Maintenance

(1) Install no. 1 right fuel injector (para 4-2).

(2) Install ECM (TM 9-2320-360-20).

(3) Clear historical codes (para 2-4).

3-7.1. DDEC III/IV SYNCHRONOUS REFERENCE SENSOR (SRS) AND TIMING REFERENCE SENSOR (TRS) REPLACEMENT/ADJUSTMENT

This task covers:
a. Removal
b. Installation/Adjustment
c. Follow-On Maintenance

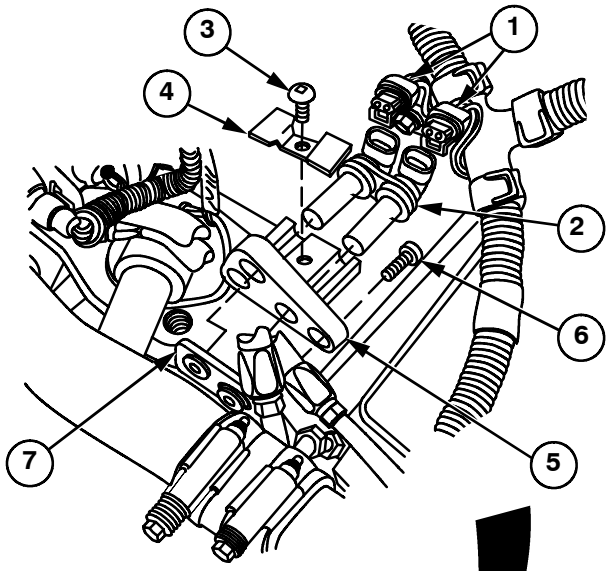
INITIAL SETUP

Equipment Conditions
ECM removed (TM 9-2320-360-20).
No. 1 right fuel injector removed (para 4-2).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Alignment Tool, SRS/TRS (Item 196.1 Appendix E)
Socket, Sockethead Screw, 3/16 In. (Item 172, Appendix E)
Hammer, Hand (Soft-faced) (Item 63, Appendix E)

Tools and Special Tools (Cont)
Timing Tool, Crank Position (Item 197, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Personnel Required
Two



a. Removal

(1) Disconnect two connectors (1) from synchronous reference sensor and timing reference sensor (SRS/TRS) (2).

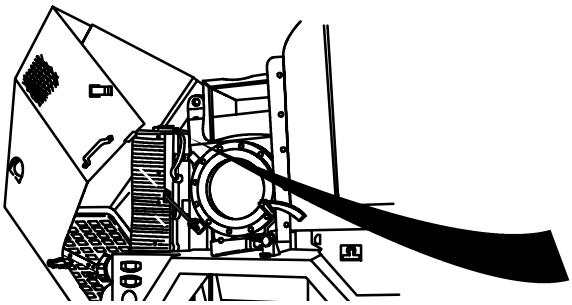
(2) Remove screw (3) and retaining clip (4) from bracket (5).

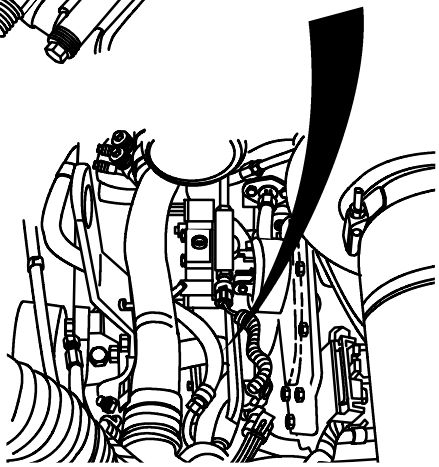
(3) Remove SRS/TRS (2) from bracket (5).

NOTE

Do step (4) only if mounting bracket is damaged.

(4) Remove two sockethead screws (6) and bracket (5) from front end plate (7).





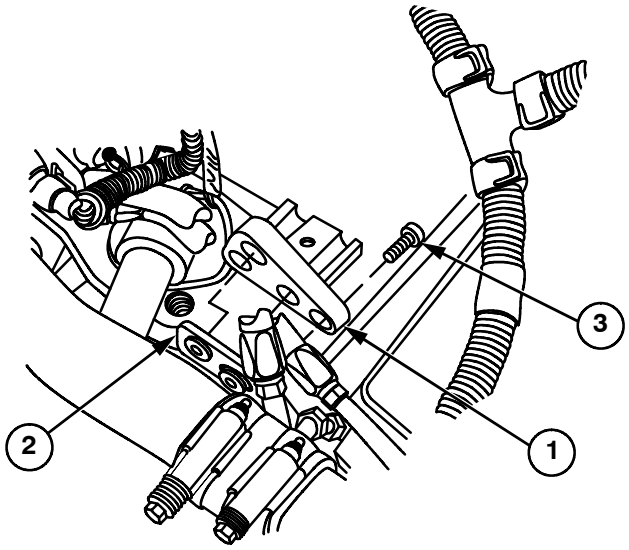
3-7.1. DDEC III/IV SYNCHRONOUS REFERENCE SENSOR (SRS) AND TIMING REFERENCE SENSOR (TRS) REPLACEMENT/ADJUSTMENT (CONT)

b. Installation/Adjustment

NOTE

If mounting bracket was not removed, skip to step (16).

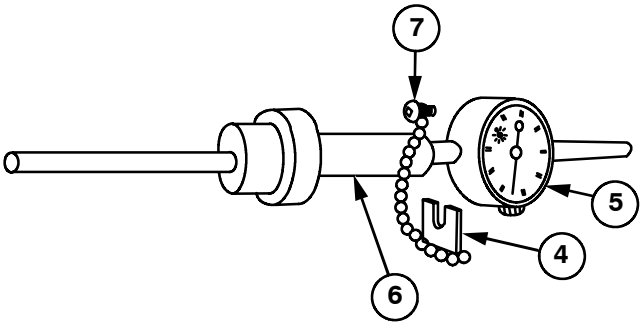
(1) Install bracket (1) on front end plate (2) with two sockethead screws (3). Do not tighten.



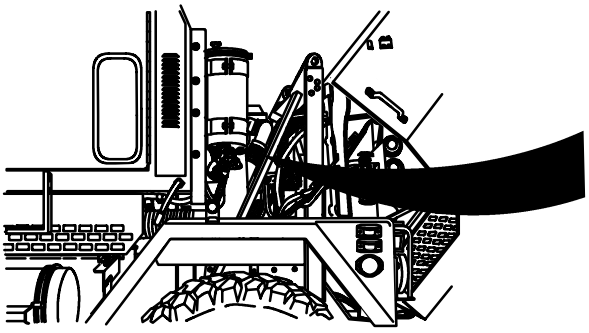
CAUTION

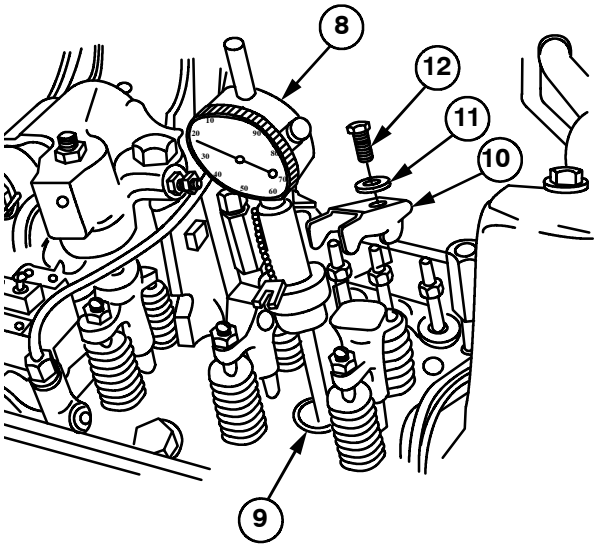
Ensure spacer is installed between dial indicator and top of holder. Failure to comply may result in damage to dial indicator if piston is already at top of travel when tool is installed.

(2) Install slotted spacer (4) between dial indicator (5) and top of holder (6). Tighten clamp screw (7).



(3) Install timing tool (8) in injector bore (9) with clamp (10), washer (11), and screw (12). Torque to 240-300 lb-in. (27-34 N·m).

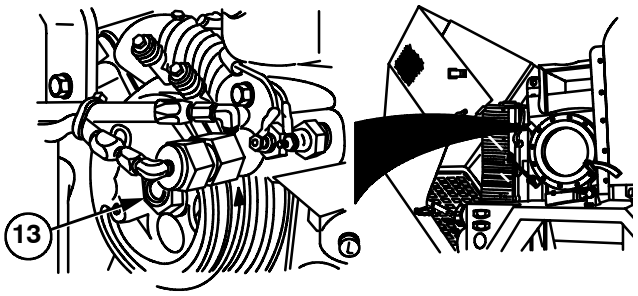




(4) Turn camshaft (13) slowly counterclockwise until large dial hand (14) starts moving.

(5) Continue turning camshaft (13) slowly counterclockwise until large dial hand (14) stops moving.

(6) Turn camshaft (13) slowly in opposite direction until large dial hand (14) barely starts to move. Piston is now at top-dead-center.



NOTE

Dial indicator must be zeroed before piston downward travel can be measured. Do steps (7) thru (9) to zero dial indicator.

(7) Loosen clamp screw (7) and remove slotted spacer (4).

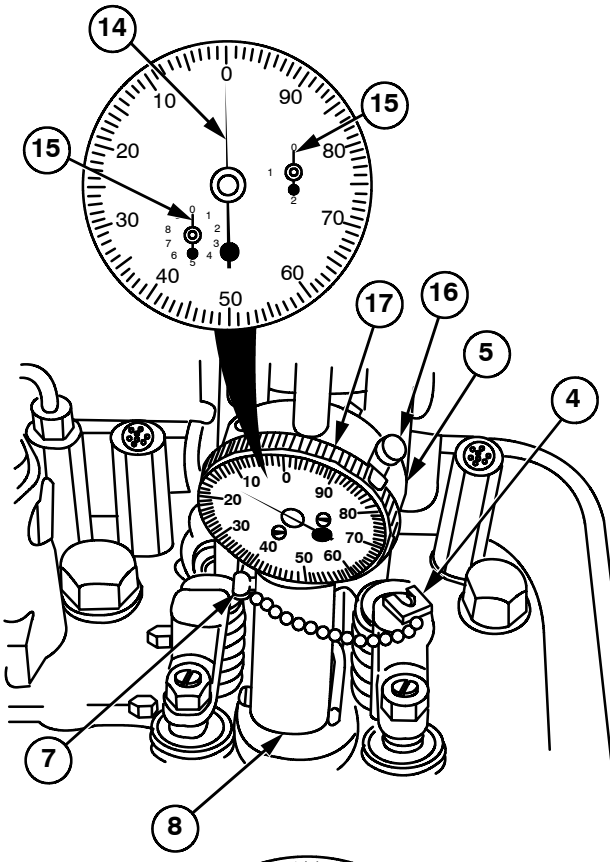
(8) Lower timing tool (8) until two small dial hands (15) are at zero and the large dial hand (14) is near zero. Tighten clamp screw (7).

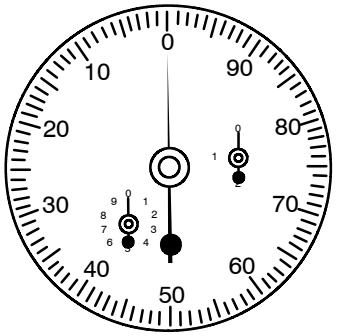
(9) Loosen bezel screw (16) and rotate outer ring (17) of dial until zero lines up with large dial hand (14). Tighten bezel screw (16).

CAUTION

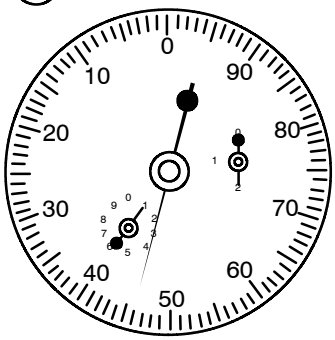
If pulley loosens during procedure, tighten to torque values specified in para 19-12. Failure to comply may result in loss of camshaft pulley and possible engine damage.

(10) Zero dial indicator (5) and turn camshaft (13) slowly counterclockwise, until dial indicates exactly 2.146 in. (54.51 mm).





ZERO POSITION



2.146 IN. POSITION

3-7.1. DDEC III/IV SYNCHRONOUS REFERENCE SENSOR (SRS) AND TIMING REFERENCE SENSOR (TRS) REPLACEMENT/ADJUSTMENT (CONT)

(11) Tap end of camshaft pulley (18) with soft-faced hammer to take up end play.

(12) Insert alignment tool (19) in TRS sensor hole (20) of bracket (21).

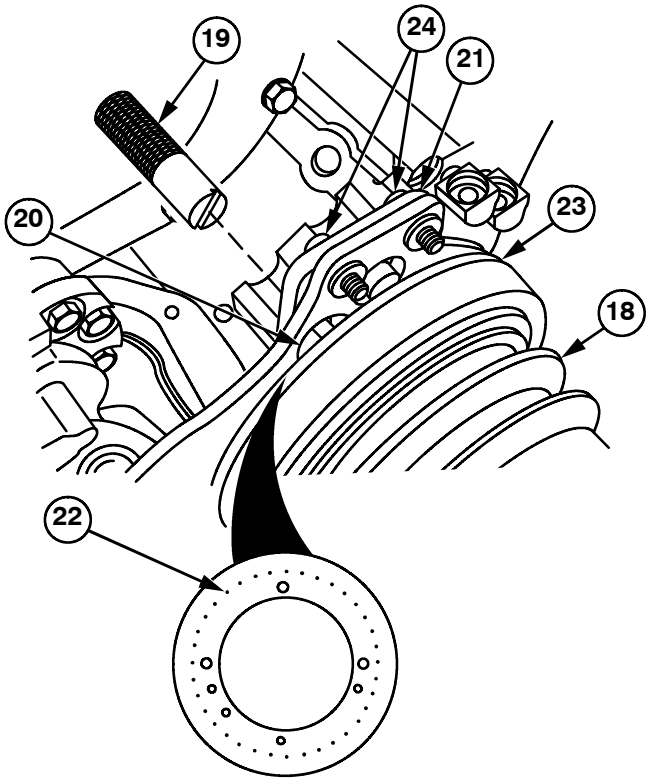
NOTE

There is a notch on the edge of the pulse wheel next to the correct TRS timing pin.

(13) Move bracket (21) until notch in tool engages with TRS timing pin (22) on pulse wheel (23).

(14) Tighten two sockethead screws (24) and remove alignment tool (19).

(15) Tap end of camshaft pulley (18) again to take up end play.



(16) Install SRS/TRS (25) in bracket (21) with retaining clip (26) and screw (27). Do not tighten.

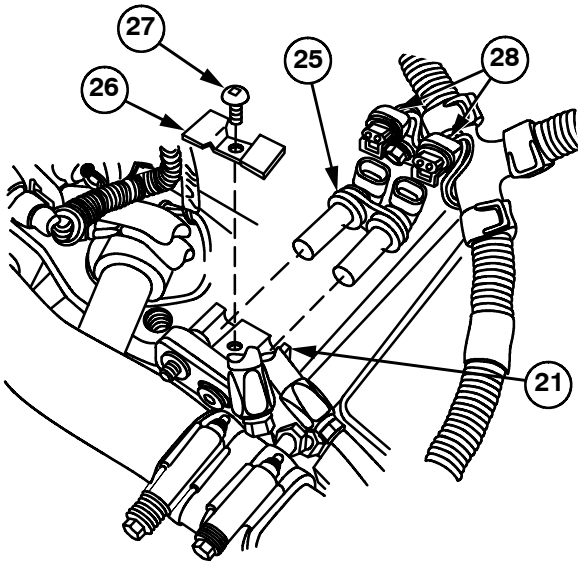
NOTE

When properly adjusted, there should be .018 - .022 in. (.46 - .56 mm) between pulse wheel teeth and the end of the sensor.

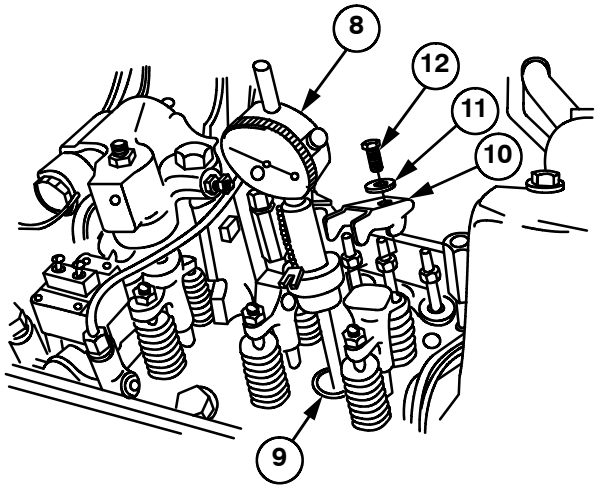
(17) Position a .020 in. (.50 mm) feeler gage between TRS sensor (25) and the TRS pin on the pulse wheel (23).

(18) Slide the SRS/TRS (25) against feeler gage and tighten screw (27).

(19) Connect two connectors (28) to SRS/TRS (25).



(20) Remove screw (12), washer (11), clamp (10), and timing tool (8) from injector bore (9).



c. Follow-On Maintenance

(1) Install no. 1 right fuel injector (para 4-2).

(2) Install ECM (TM 9-2320-360-20).

(3) Clear inactive codes (TM 9-2320-360-20-3).

3-8. AIR BOX COVERS REPLACEMENT

This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation
e. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Air cleaner assembly removed (left side only) (TM 9-2320-360-20).
Batteries disconnected (left side only) (TM 9-2320-360-20).
Inner fenders removed (TM 9-2320-360-20).

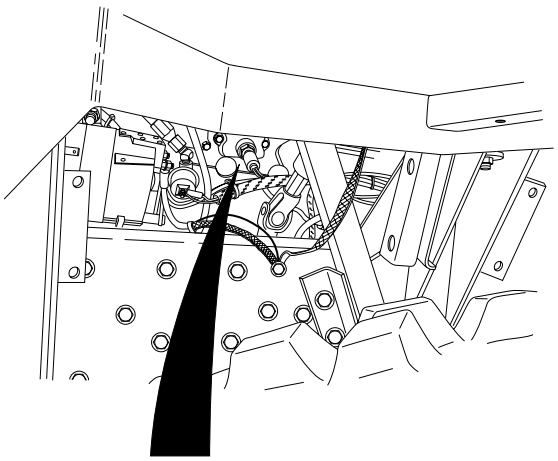
Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Gaskets (4) (Item 65, Appendix F)
Gaskets (2) (Item 64, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

a. Removal

(1) Deleted.

3-8. AIR BOX COVERS REPLACEMENT (CONT)



WARNING

Ensure engine is cool before performing maintenance. Failure to comply may result in severe burns.

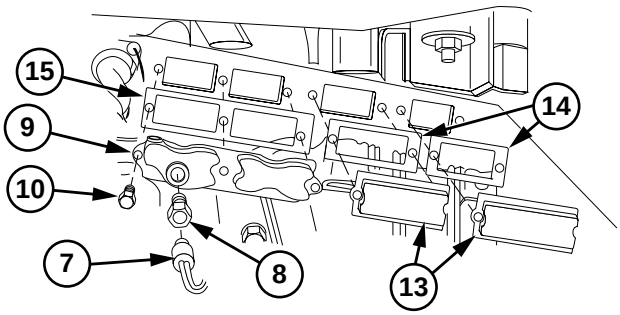
NOTE

- Do step (2) for left air box covers only.
- Clip is on right air box covers only.

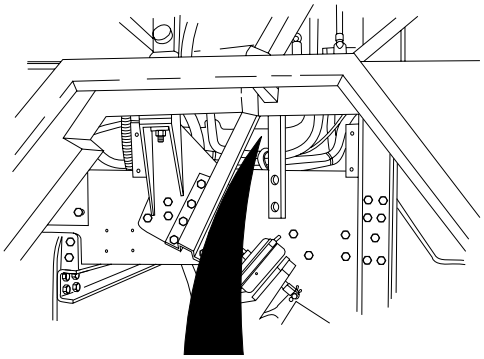
(2) Remove air box pressure transducer (7) and reducer (8) from air box cover (9).

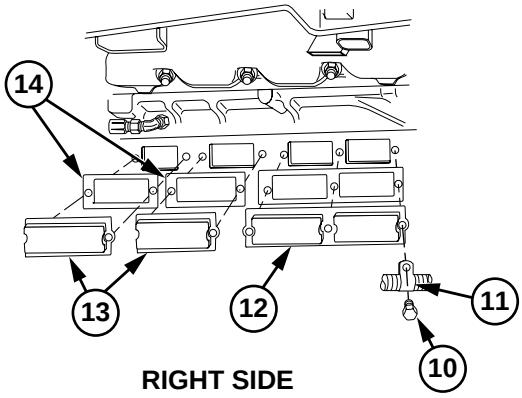
(3) Remove seven screws (10) and clip (11) from air box covers (9, 12, and 13).

(4) Remove air box covers (9, 12, and 13), two gaskets (14), and gasket (15). Discard gaskets.



LEFT SIDE

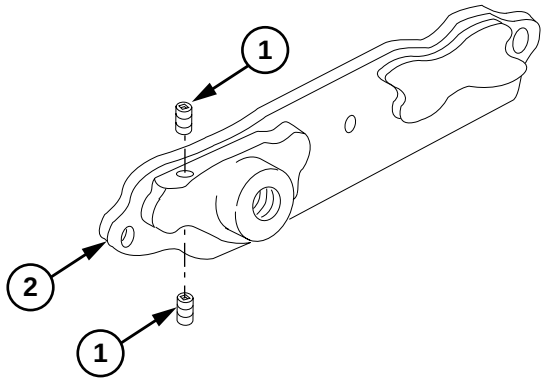




RIGHT SIDE

b. Disassembly

Remove two pipe plugs (1) from air box cover (2).



c. Assembly

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Coat threads of two pipe plugs (1) with pipe thread sealing compound.

(2) Install two pipe plugs (1) on air box cover (2).

d. Installation

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(1) Coat two new gaskets (1) and new gasket (2) with silicone adhesive-sealant.

(2) Install two gaskets (1) and gasket (2) on engine block (3).

NOTE

Clip is on right air box covers only.

(3) Install three air box covers (4 thru 6) and clip (7) on engine block (3) with seven screws (8). Torque to 96-144 lb-in. (11-16 N·m).

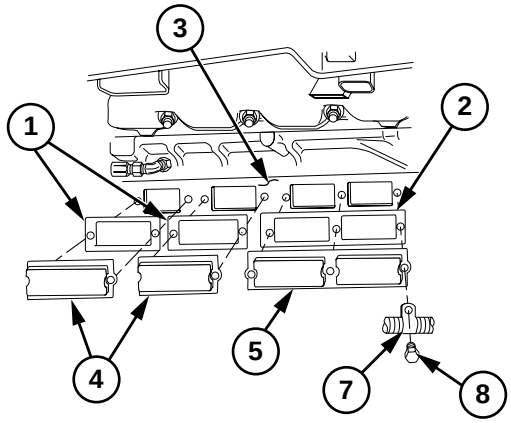
NOTE

Do steps (4) thru (6) for left air box covers only.

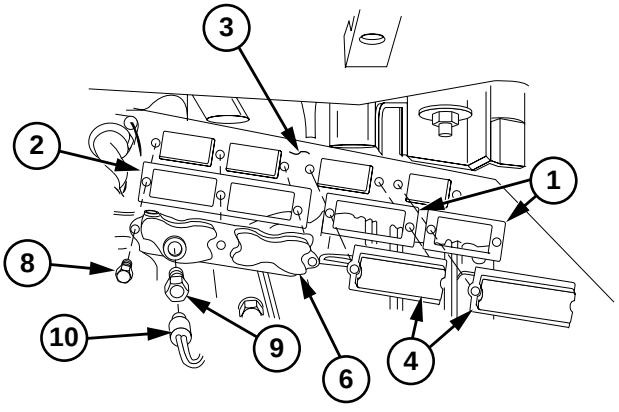
(4) Coat threads of reducer (9) and air box pressure transducer (10) with pipe thread sealing compound.

(5) Install reducer (9) on air box cover (6).

(6) Install air box pressure transducer (10) on reducer (9).



RIGHT SIDE



LEFT SIDE

3-8. AIR BOX COVERS REPLACEMENT (CONT)

(7) Deleted.

e. Follow-On Maintenance

(1) Install air cleaner assembly (left side only) (TM 9-2320-360-20).

(2) Connect batteries (left side only) (TM 9-2320-360-20).

(3) Install inner fender (TM 9-2320-360-20).

3-9. AIR BOX DRAINS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Front wheel/tire removed (TM 9-2320-360-20).
Inner fenders removed (TM 9-2320-360-20).

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

a. Removal

NOTE
Left and right air box drains are replaced the same way. Left side is shown.

(1) Deleted.

3-9. AIR BOX DRAINS REPLACEMENT (CONT)

NOTE

- Location of plastic cable ties should be marked before removal.
- Wire harness and hoses must be pulled out of the way.

(2) Remove plastic cable ties (7) from hose (8) and wiring harness (9).

WARNING

Ensure engine is cool before performing maintenance. Failure to comply may result in severe burns.

(3) Remove screw (10) from clip (11).

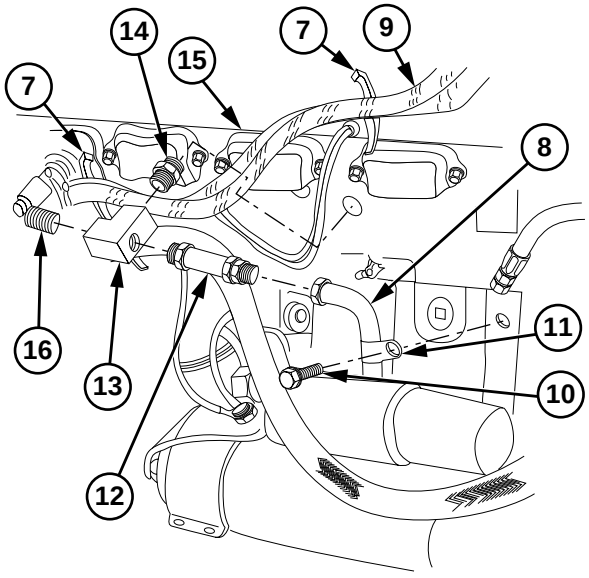
(4) Remove hose (8) from check valve (12).

(5) Remove clip (11) from hose (8).

(6) Remove tee (13) and fitting (14) from engine block (15).

(7) Remove check valve (12) from tee (13).

(8) Remove plug (16) from tee (13).



ENGINE SHOWN REMOVED FROM CHASSIS FOR CLARITY

b. Installation

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Coat threads of fitting (1) with pipe thread sealing compound.

(2) Install fitting (1) and tee (2) in engine block (3).

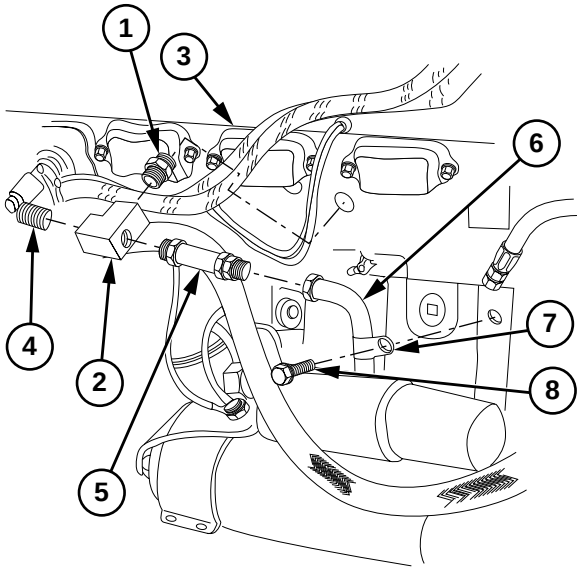
(3) Coat plug (4) and check valve (5) with pipe thread sealing compound.

(4) Install plug (4) in tee (2).

(5) Install check valve (5) on tee (2).

(6) Install hose (6) on check valve (5).

(7) Install hose (6) on engine block (3) with clip (7) and screw (8).

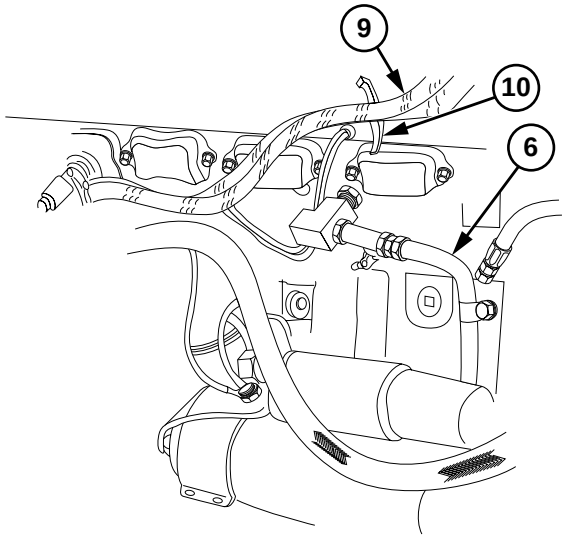


ENGINE SHOWN REMOVED FROM CHASSIS FOR CLARITY

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(8) Secure wiring harness (9) to hose (6) with plastic cable ties (10).



ENGINE SHOWN REMOVED FROM CHASSIS FOR CLARITY

(9) Deleted.

c. Follow-On Maintenance

(1) Install front wheel/tire (TM 9-2320-360-20).

(2) Install inner fender (TM 9-2320-360-20).

3-10. CYLINDER HEAD REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Left thermostat housing removed (left cylinder head only) (para 5-3).
Right thermostat housing removed (right cylinder head only) (para 5-4).
Exhaust manifold removed (para 3-23).
Valve bridges removed (para 3-11).
Fuel injectors removed (para 4-2).
Radiator and shroud removed (TM 9-2320-360-20).
12-volt (rear) alternator/bracket and strap removed (right cylinder head only) (TM 9-2320-360-20).
Injector wire harness removed (para 4-3).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Blocks, Wooden (Figure C-3, Appendix C)
Compressor Unit, Air (Item 24, Appendix E)
Fixture, Lifting (Item 42, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Set, Cylinder Head Guide Stud (Item 157, Appendix E)

Tools and Special Tools (Cont)
Straight Edge (Item 185, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Adhesive, Spray (Item 10.1, Appendix B)
Compound, International, No. 2 (Item 21, Appendix B)
Connector, Electrical, Butt (Item 19, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Gaskets (2) (Item 45, Appendix F)
Gasket (Item 36, Appendix F)
Lockwashers (4) (Item 118, Appendix F)
Lockwashers (4) (Item 121, Appendix F)
Lockwasher (Item 122, Appendix F)
Overhaul Kit, Cylinder Head (Item 154, Appendix F)

Personnel Required
Two

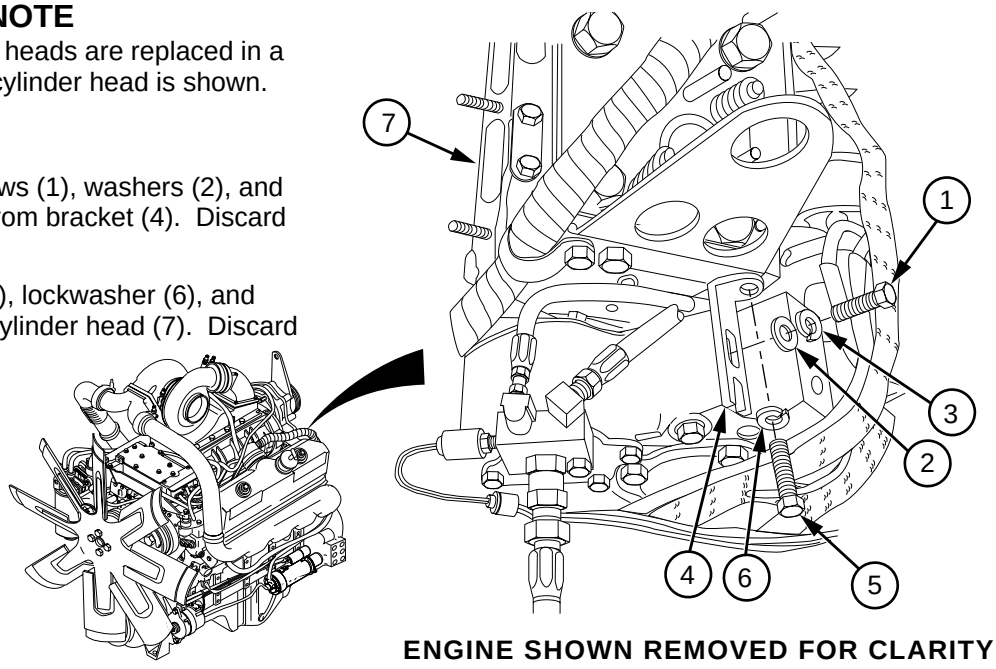
NOTE

Left and right cylinder heads are replaced in a similar manner. Left cylinder head is shown.

a. Removal

(1) Remove two screws (1), washers (2), and lockwashers (3) from bracket (4). Discard lockwashers.

(2) Remove screw (5), lockwasher (6), and bracket (4) from cylinder head (7). Discard lockwasher.



ENGINE SHOWN REMOVED FOR CLARITY

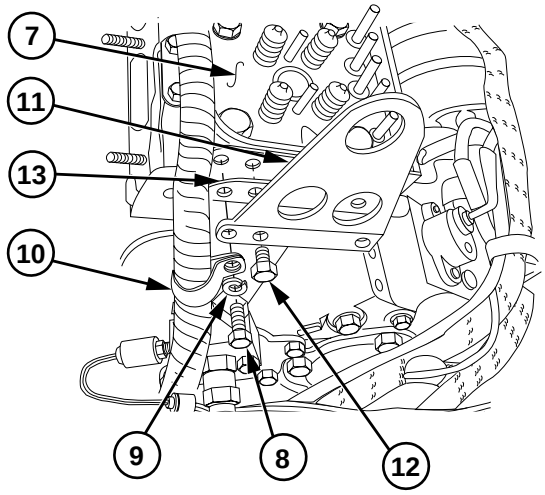
(3) Remove screw (8), lockwasher (9), and cushion clip (10) from engine lifting bracket (11). Discard lockwasher.

NOTE

Do step (4) for left cylinder head only.

(4) Remove screw (12) from engine lifting bracket (11).

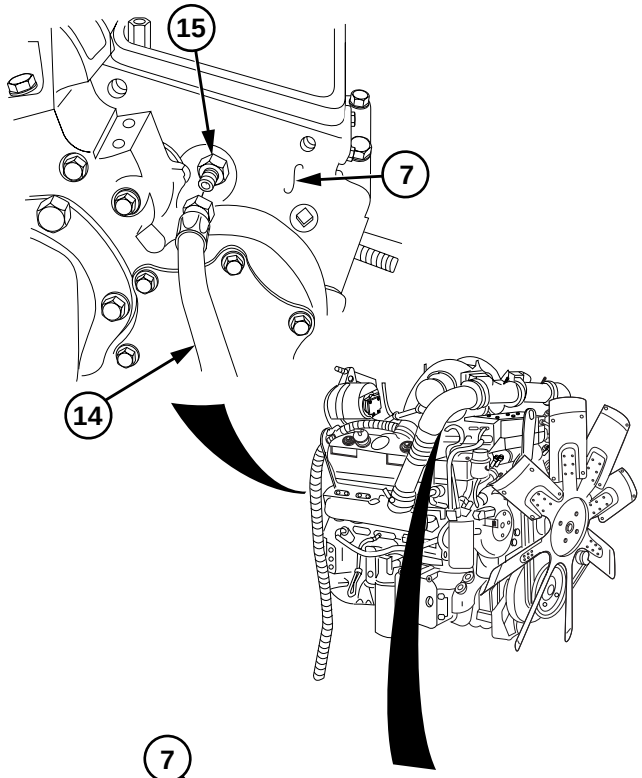
(5) Remove engine lifting bracket (11) and gasket (13) from cylinder head (7). Discard gasket.



NOTE

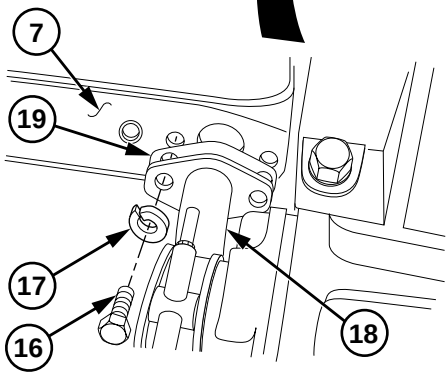
Do steps (6) thru (8) for right cylinder head only.

(6) Remove coolant hose no. 2628 (14) from fitting (15) on cylinder head (7).



(7) Remove two screws (16) and lockwashers (17) from cylinder head (7). Discard lockwashers.

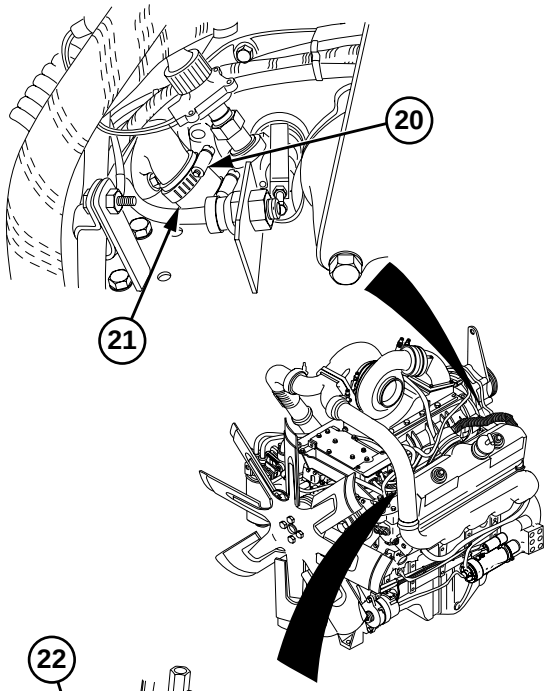
(8) Move breather tube (18) away from cylinder head (7). Remove and discard gasket (19).



3-10. CYLINDER HEAD REPLACEMENT (CONT)

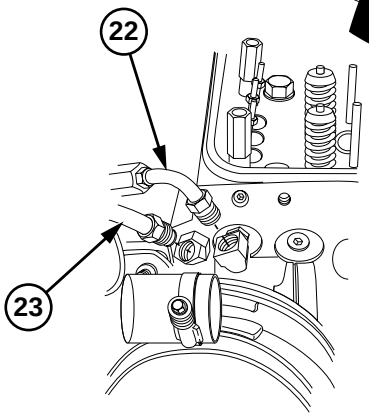
NOTE
Do step (9) for left cylinder head only.

(9) Loosen clamp (20) on breather hose (21).



NOTE
Tag fuel lines before removal.

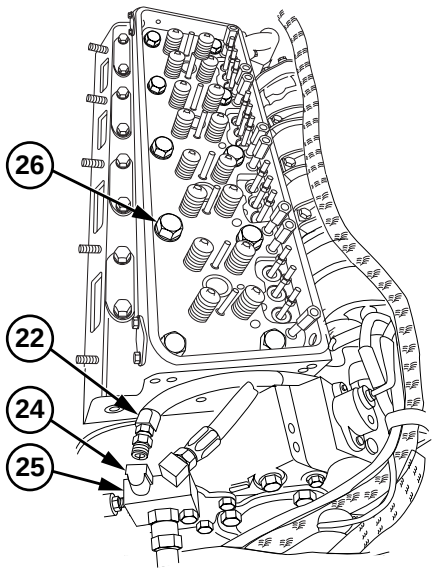
(10) Remove two fuel lines (22 and 23).



NOTE
Do step (11) for left cylinder head only.

(11) Remove fuel line (22) from fitting (24) on fuel manifold (25).

(12) Loosen, but do not remove, 10 screws (26).

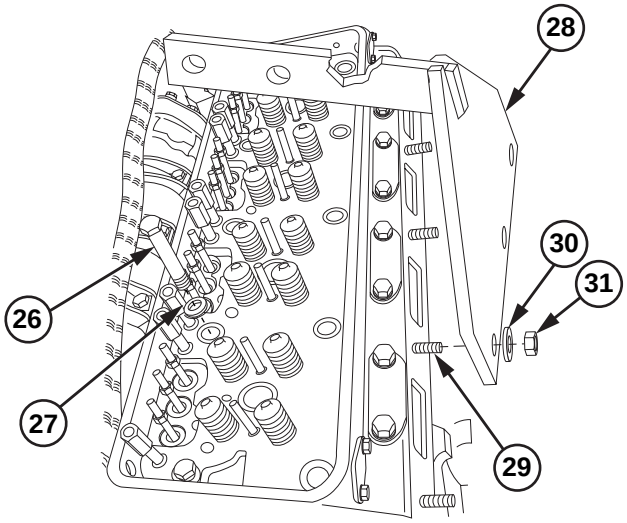


NOTE

Leave upper left and right screws installed until step (16).

(13) Remove eight screws (26) and washers (27).

(14) Install lifting fixture (28) over three studs (29) with three washers (30) and nuts (31).



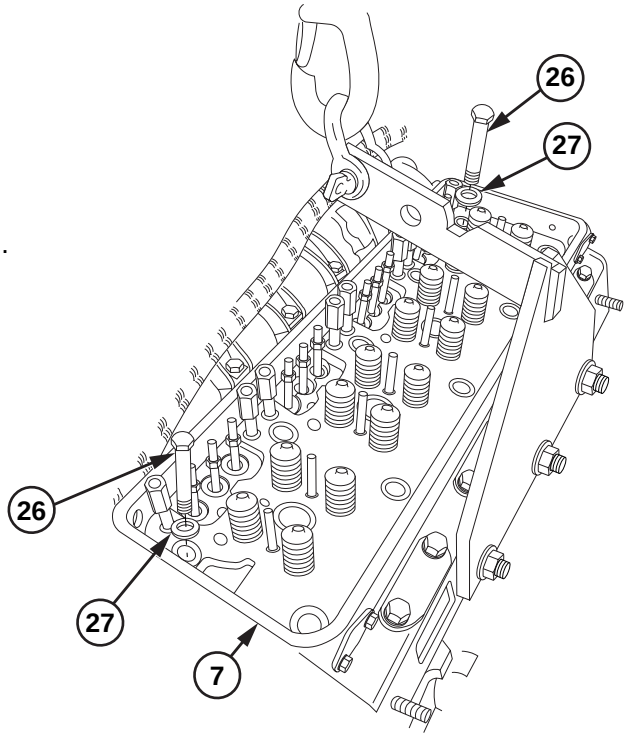
(15) Install suitable lifting device to support weight of cylinder head (7).

(16) Remove two screws (26) and washers (27).

CAUTION

After cylinder head is removed, cover camshaft pockets to prevent debris from entering engine. Failure to comply may result in damage to valve train.

(17) Using lifting device, remove cylinder head (7) and place on wooden blocks.

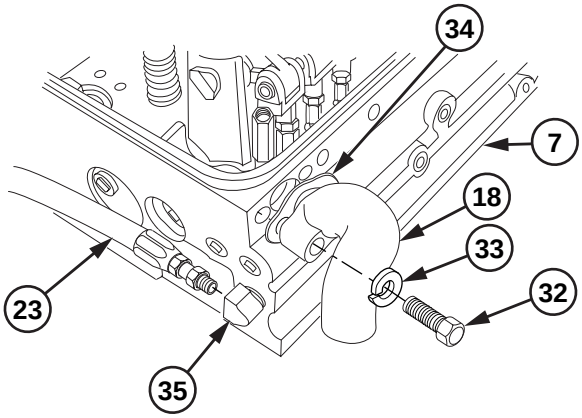


NOTE

Do steps (18) and (19) for left cylinder head only.

(18) Remove two screws (32), lockwashers (33), breather tube (18), and gasket (34) from cylinder head (7). Discard gasket and lockwashers.

(19) Remove fuel line (23) from fitting (35) on cylinder head (7).

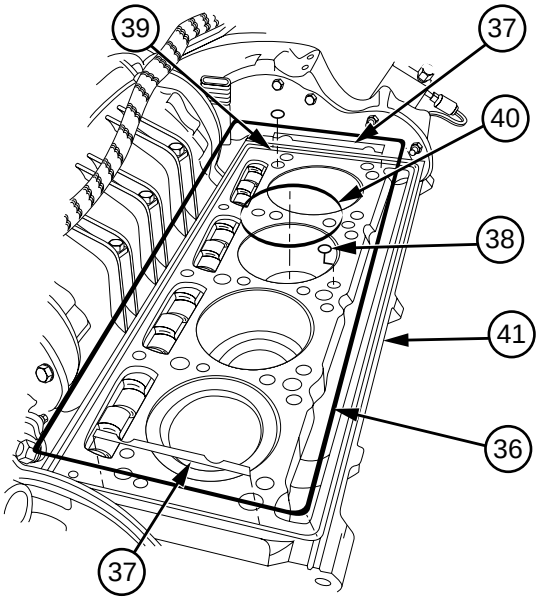


3-10. CYLINDER HEAD REPLACEMENT (CONT)

NOTE

Compression gaskets are color coded black, red, or no paint on outside edge. Be sure to note color for placement.

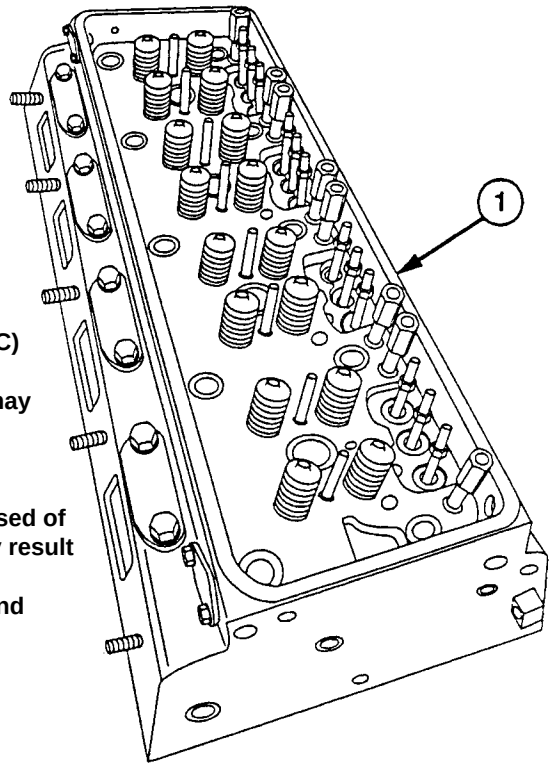
(20) Remove seal strip gasket (36), 2 support shims (37), 16 water seals (38), oil seal (39), and 4 compression gaskets (40) from engine block (41). Discard seals and gaskets.



b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.



- **The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).**
- **Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.**
- **Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.**
- **Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.**
- **Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury**

(1) Clean cylinder head (1) with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry cylinder head (1) with compressed air.

(3) Inspect cylinder head mounting surface to be sure it is clean and free from burrs.

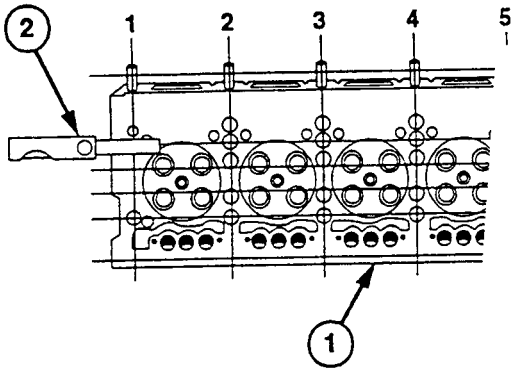
(4) Position cylinder head (1) upside-down on wooden blocks.

(5) Align straightedge along lines 1, 2, 3, 4, and 5 on cylinder head (1). Measure for warp with feeler gage (2) at points where lines 6, 7, 8, 9, 10, and 11 intersect straightedge.

(6) If warp measurement exceeds 0.004 in. (0.1 mm), cylinder head (1) must be replaced.

(7) Align straightedge along lines 6, 7, 8, 9, 10, and 11 on cylinder head (1). Measure at points where lines 1, 2, 3, 4, and 5 intersect straightedge

(8) If warp measurement exceeds 0.008 in. (0.2 mm), cylinder head (1) must be replaced.



WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury

(9) Clean cylinder block head gasket surface (3) with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

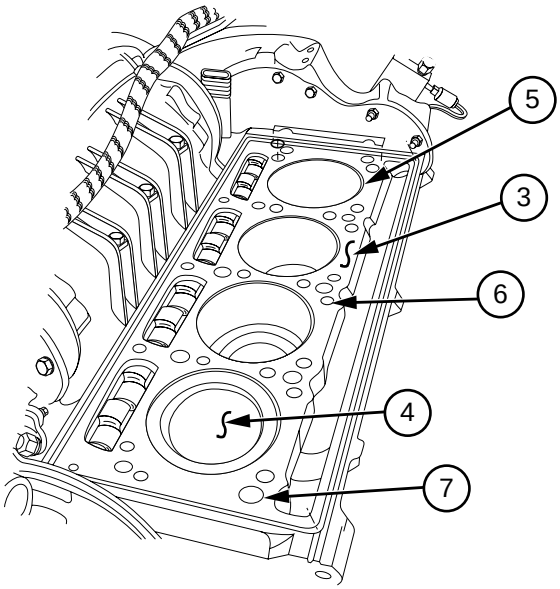
(10) Dry cylinder block head gasket surface (3) with compressed air.

(11) Inspect piston crowns (4) to be sure they are clean and free of foreign material.

(12) Inspect head gasket surface (3), counter-bores (5), and seal grooves (6) to be sure they are clean and free of foreign material.

(13) Inspect counterbores (5) for burrs or sharp edges.

(14) Inspect screw holes (7) for accumulation of water or foreign material.



3-10. CYLINDER HEAD REPLACEMENT (CONT)

c. Installation

CAUTION

- Never install used compression gaskets. Installing used gaskets may cause compression leaks.
- Seal strip has one colored edge to prevent it from being installed improperly. It must be installed with color facing out away from pistons all the way around groove. Failure to comply may result in oil leaks.

NOTE

If compression gaskets are color coded, color codes should be same for all compression gaskets.

(1) Install 4 new compression gaskets (1) and new seal strip gasket (4) on engine block (5).

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

CAUTION

Water seals can move out of position during cylinder head installation. To prevent this, a spray adhesive can be used to hold seals in place. Do not apply adhesive directly to seals. Wipe off any adhesive that gets on fire deck or liner bores. Failure to comply may result in damage to equipment.

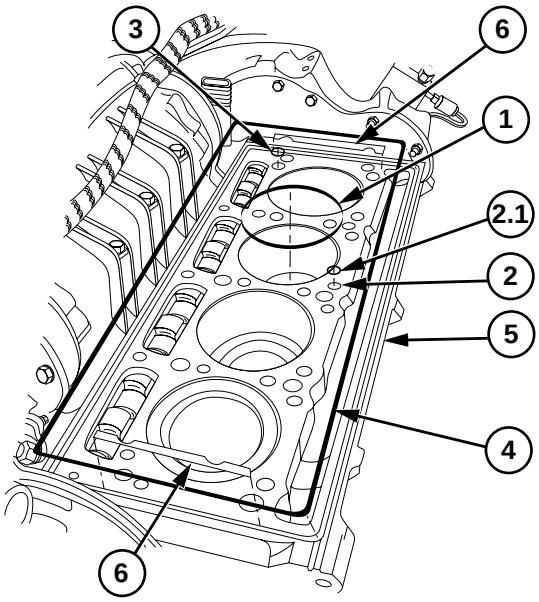
(1.1) Spray a light, uniform coating of spray adhesive into the water seal counterbores (2).

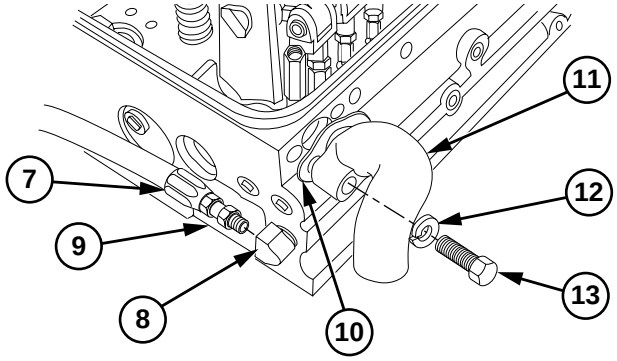
NOTE

Allow the adhesive to dry to a high-tack consistency (sticky) before installing seals.

(1.2) Install 16 new water seals (2.1) and new oil seal (3) on engine block (5).

(2) Remove paper covering from back of two support shims (6) and install glued side down.



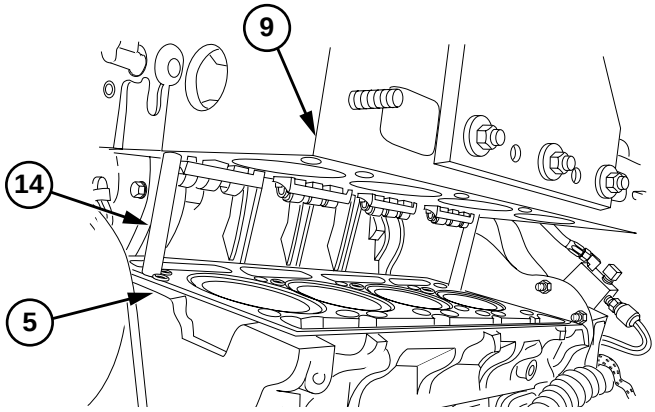


NOTE

Do steps (3) and (4) for left cylinder head only.

(3) Install fuel line (7) on fitting (8) on cylinder head (9).

(4) Install new gasket (10) and breather tube (11) on cylinder head (9) with two new lockwashers (12) and screws (13).



(5) Install two cylinder head guide studs (14) into top corners of engine block (5).

(6) Align cylinder head (9) with guide studs while assistant operates suitable lifting device.

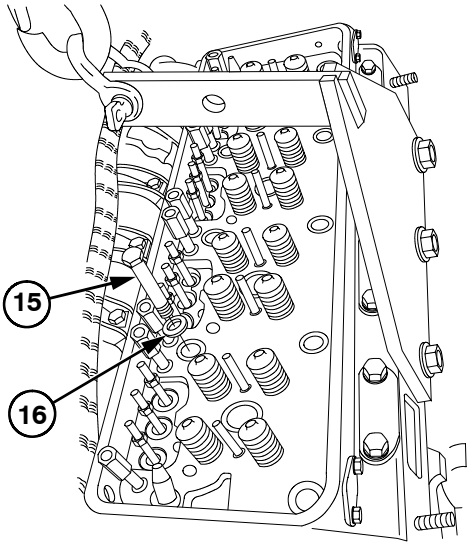
CAUTION

Make a final check of the compression gaskets, seals, and shims to ensure they are in place. Any gasket or seal left out of place may result in engine damage.

(7) Lower cylinder head (9) on engine block (5).

(8) Coat threads of 10 screws (15) with international compound no. 2.

(9) Install eight cylinder head washers (16) and screws (15). Do not tighten.

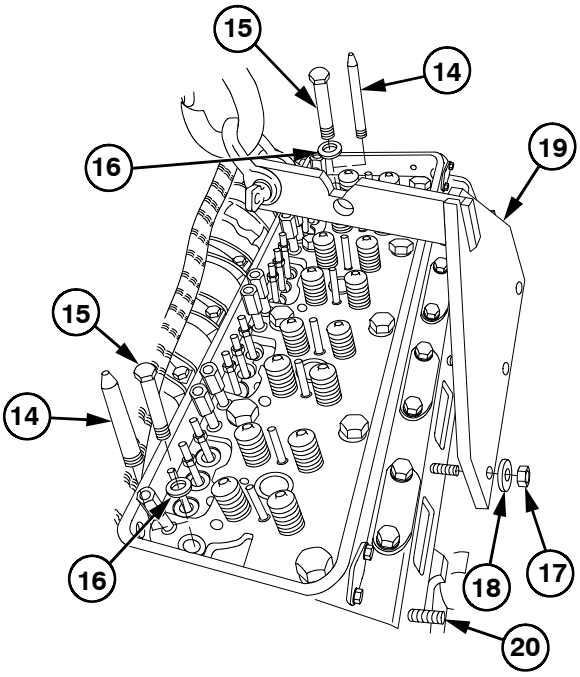


NOTE

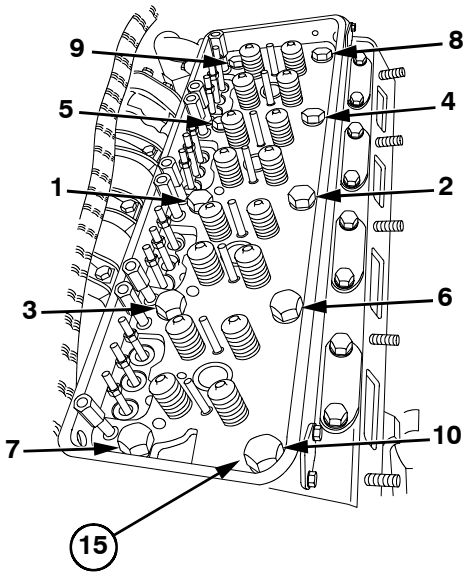
Cylinder head screws are tightened in step (12).

(10) Remove two guide studs (14) and install two remaining cylinder head washers (16) and screws (15). Do not tighten.

(11) Remove three nuts (17), washers (18), and lifting fixture (19) from studs (20).



(12) Tighten 10 cylinder head screws (15) in order shown to 50 lb-ft (68 N·m). In same order, tighten to 100 lb-ft (136 N·m).



NOTE

Hold the wrench at the torque given in step (12.1) for 2-3 seconds to allow the screws to turn while the compression seals shrink to their compressed thickness.

(12.1) In the same order, tighten 10 cylinder head screws (15) to 150 lb-ft (203 N·m).

NOTE

Perform step (12.2) completely on each screw before continuing to the next screw. The wrench socket that is used should be marked at four locations, 90 degrees apart.

(12.2)

(a). Starting with screw no. 1 in the sequence, loosen the screw until loose (at least one-half turn).

(b). Tighten screw to 100 lb-ft (136 N·m).

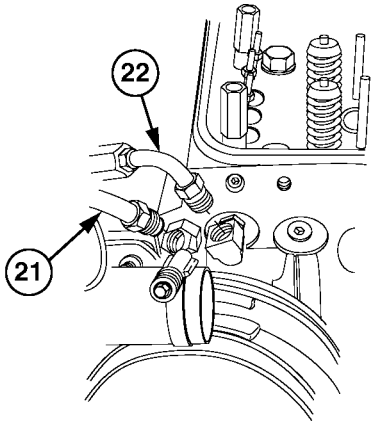
(c). Note the location of the marks on the wrench socket. Make a corresponding mark on the cylinder head for reference.

(d) Rotate the screw an additional quarter-turn (90 degrees).

(e) Repeat these steps for each screw in the sequence.

3-10. CYLINDER HEAD REPLACEMENT (CONT)

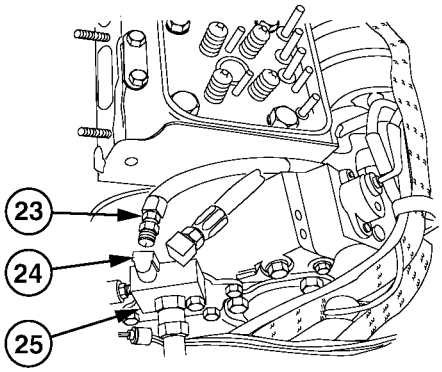
(13) Connect two fuel lines (21 and 22).



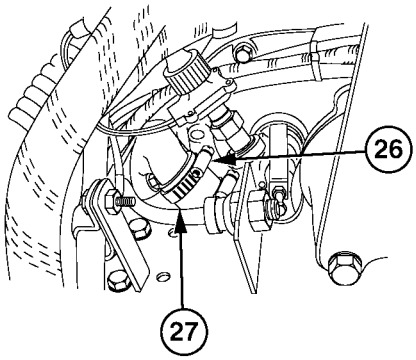
NOTE

Do steps (14) and (15) for left cylinder head only.

(14) Install fuel line (23) on fitting (24) on fuel manifold (25).



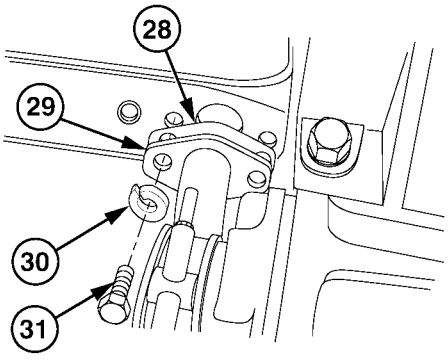
(15) Tighten clamp (26) on breather hose (27).



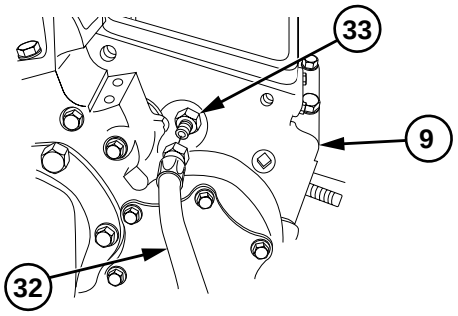
NOTE

Do steps (16) and (17) for right cylinder head only.

(16) Install new gasket (28) and breather tube (29) with two new lockwashers (30) and screws (31).



(17) Install coolant hose no. 2628 (32) on fitting (33) on cylinder head (9).

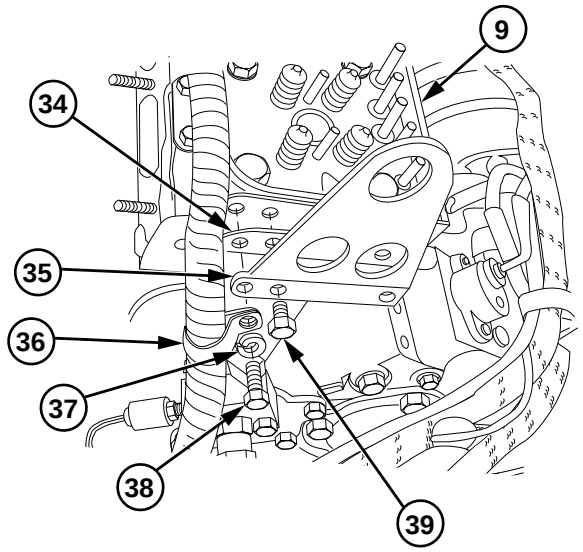


(18) Install new gasket (34), engine lifting bracket (35), and cushion clip (36) on cylinder head (9) with new lockwasher (37) and screw (38). Torque to 46 lb-ft (62 N·m).

NOTE

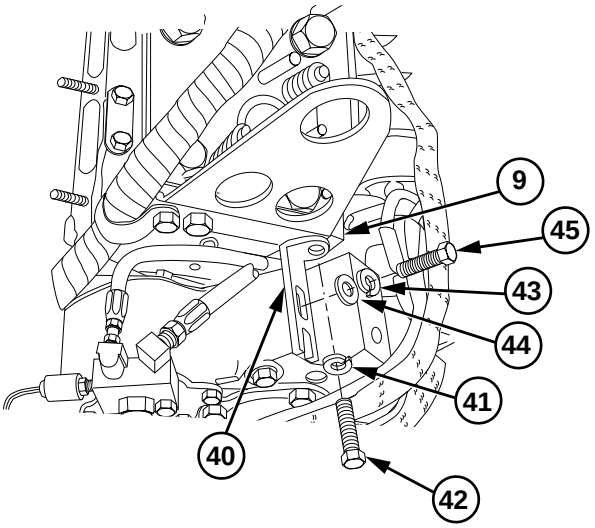
Do step (19) for left cylinder head only.

(19) Install screw (39) on cylinder head (9).



(20) Install bracket (40) with new lockwasher (41) and screw (42) on cylinder head (9).

(21) Install two new lockwashers (43), washers (44), and screws (45). Torque to 46 lb-ft (62 N·m).



d. Follow-On Maintenance

(1) Install fuel injectors (para 4-2).

(2) Install injector wiring harness (para 4-3).

(3) Install valve bridges (para 3-11).

(4) Install exhaust manifold (para 3-23).

(5) Install left thermostat housing (left cylinder head only) (para 5-3).

(6) Install right thermostat housing (right cylinder head only) (para 5-4).

(7) Install radiator and shroud (TM 9-2320-360-20).

(8) Install 12-volt (rear) alternator/bracket and strap (right cylinder head only) (TM 9-2320-360-20).

3-11. VALVE BRIDGE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Rocker arms removed (para 3-18).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Gages, Feeler (2) (Item 50, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Oil, Lubricating (Item 47, Appendix B)
Tags, Identification (Item 56, Appendix B)

a. Removal

NOTE

- Tag valve bridges so they may be installed in original locations at installation.
- Remove remaining fifteen valve bridges in same way.

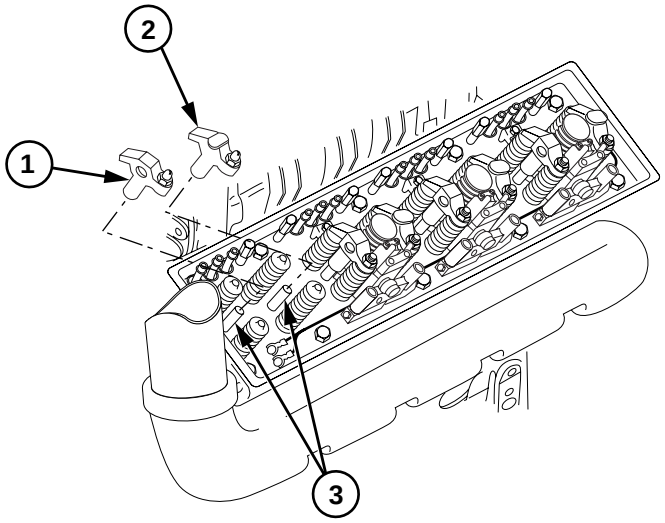
(1) Remove valve bridge (1 or 2) from valve bridge guides (3).

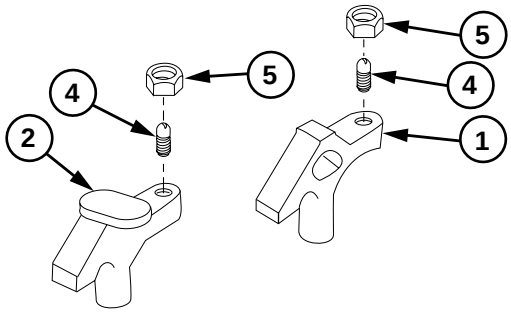
(2) Place valve bridge (1 or 2) in soft-jawed vise.

(3) Remove screw (4) and nut (5) from valve bridge (1 or 2).

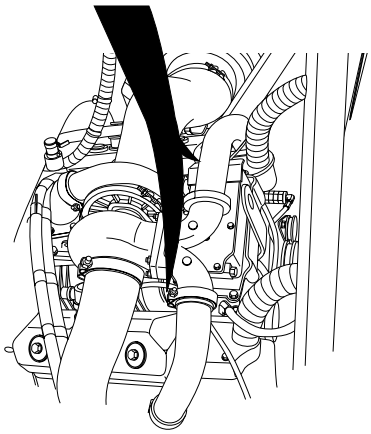
(4) Remove nut (5) from screw (4).

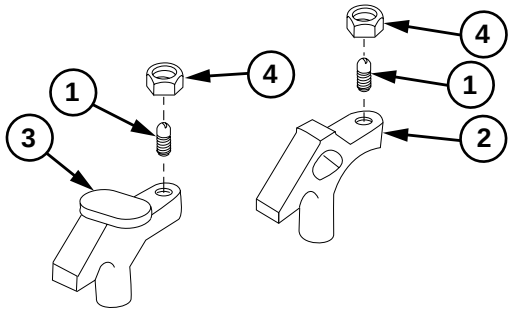
(5) Remove valve bridge (1 or 2) from vise.





INJECTOR REMOVED FOR CLARITY



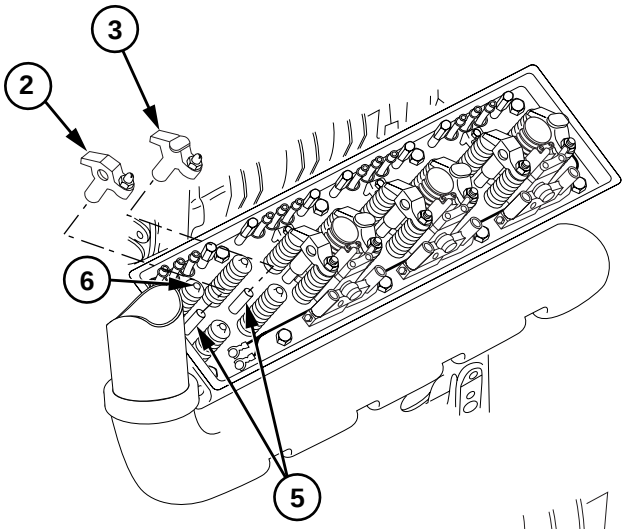


b. Installation

(1) Install screw (1) into valve bridge (2 or 3).

(2) Install nut (4) on screw (1). Do not tighten.

(3) Install valve bridge (2 or 3) on bridge guide (5), making sure groove in bridge fits over top of valve stem (6).

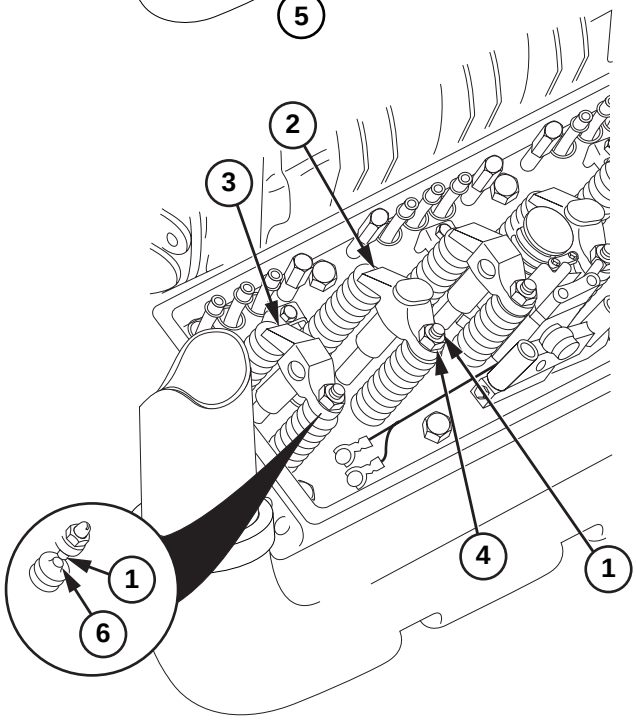


(4) Push down firmly on top of valve bridge (2 or 3) and turn adjusting screw (1) until it just touches valve stem (6).

(5) Turn screw (1) an additional 1/4 turn and tighten nut (4) finger tight.

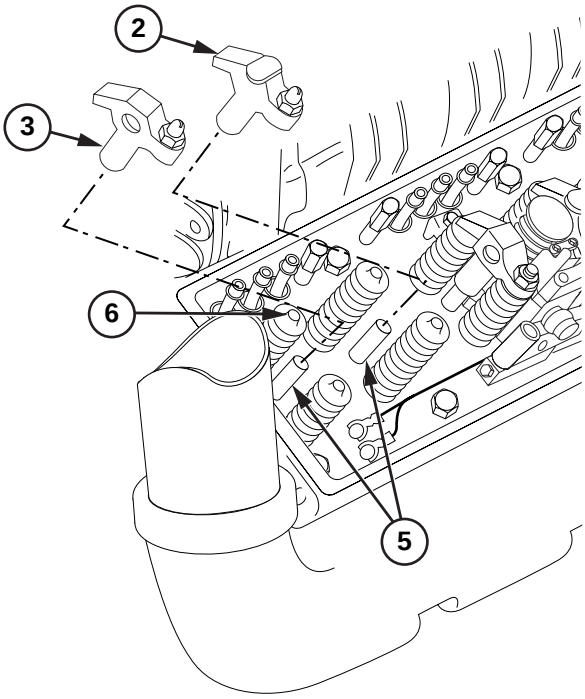
(6) Remove valve bridge (2 or 3) and mount in soft-jawed vise.

(7) Hold screw (1) and tighten nut (4) to 240-300 lb-in. (27-34 N·m).



INJECTOR REMOVED FOR CLARITY

3-11. VALVE BRIDGE REPAIR (CONT)



(8) Coat valve bridge (2 or 3) and valve bridge guide (5) with lubricating oil.

(9) Install valve bridge (2 or 3) on valve bridge guide (5) making sure groove in bridge fits over top of valve stem (6).

(10) Insert one 0.0015 in. feeler gage between front end of valve bridge (2 or 3) and exhaust valve stem (6).

(11) Insert one 0.0015 in. feeler gage between rear end of valve bridge (2 or 3) and exhaust valve stem (6).

(12) Press down firmly on top center of valve bridge (2 or 3) and check that both feeler gages are tight.

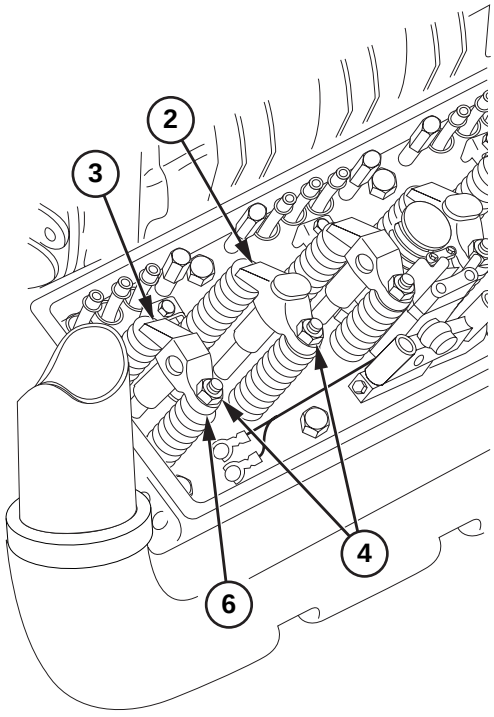
(13) Remove both feeler gages.

NOTE

Do step (14) if feeler gages are not tight.

(14) Place valve bridge (2 or 3) in soft-jawed vise and loosen nut (4). Repeat steps (3) thru (13) until proper clearance is obtained.

(15) Repeat steps (1) through (14) for 15 remaining valve bridges.



INJECTOR REMOVED FOR CLARITY

c. Follow-On Maintenance

Install rocker arms (para 3-18).

3-12. CRANKSHAFT PULLEY REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

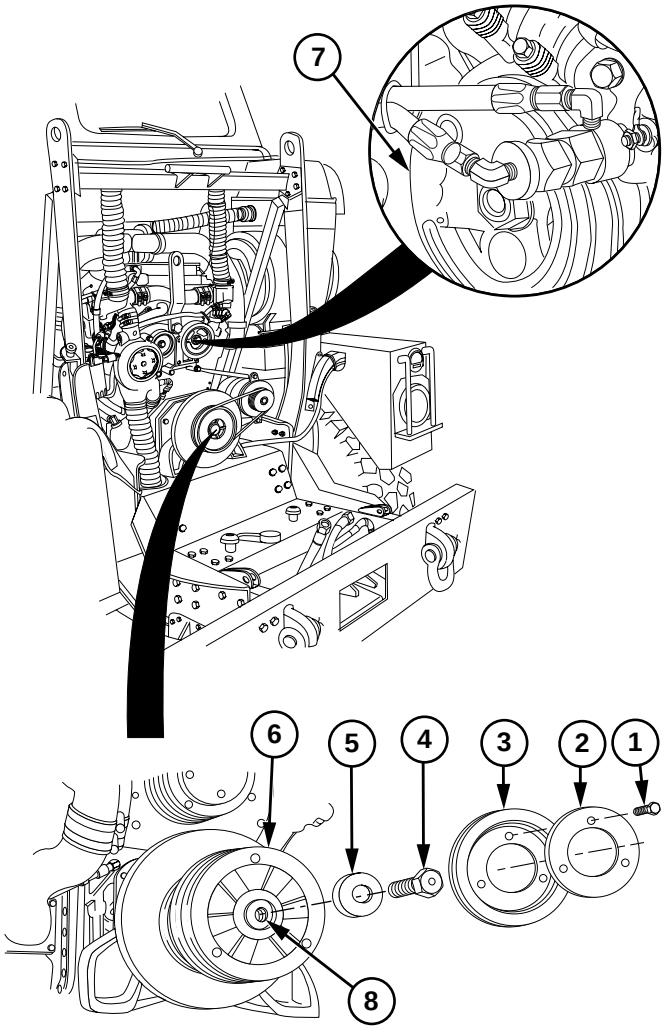
Equipment Condition
Radiator removed (TM 9-2320-360-20).
Fan belts removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hammer, Soft-Faced (Item 63, Appendix E)
Puller, 3-Leg (Item 120, Appendix E)
Wrench Set, Socket, 3/4 In. (Item 231, Appendix E)

Tools and Special Tools (Cont)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Oil, Lubricating (Item 47, Appendix B)

Personnel Required
Two



a. Removal

(1) Remove three screws (1), pulley spacer (2), and accessory pulley (3).

(2) Remove screw (4) and washer (5) from crankshaft pulley (6) while assistant holds camshaft pulley (7).

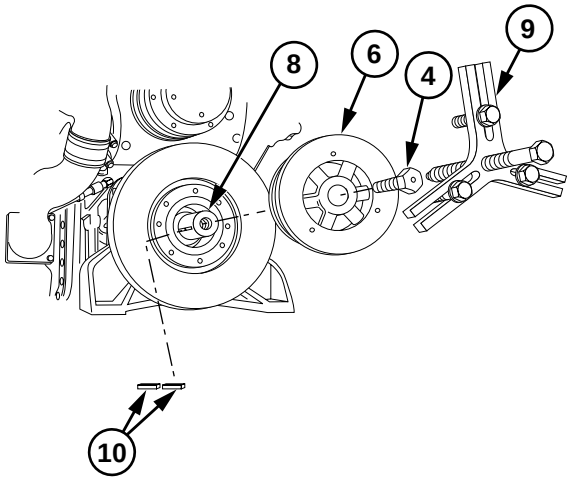
(3) Install screw (4) in crankshaft (8).

3-12. CRANKSHAFT PULLEY REPLACEMENT (CONT)

(4) Remove crankshaft pulley (6) from crankshaft (8) using 3-leg puller (9).

(5) Remove two keys (10) from crankshaft (8).

(6) Remove screw (4) from crankshaft (8).

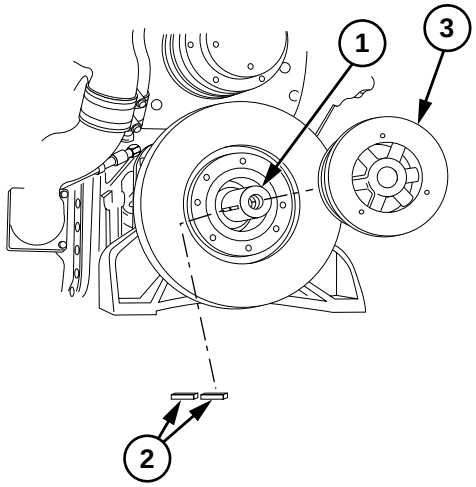


b. Installation

(1) Lubricate end of crankshaft (1) with lubricating oil.

(2) Install two keys (2) in end of crankshaft (1).

(3) Install crankshaft pulley (3) on crankshaft (1).



(4) Install washer (4) and screw (5) in crankshaft (1). Torque to 180 lb-ft (224 N·m).

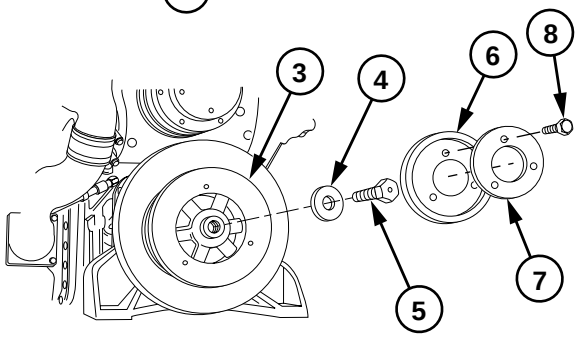
(5) Strike head of screw (5).

(6) Tighten screw (5) to 300 lb-ft (407 N·m) and strike screw again.

(7) Tighten screw (5) to 300 lb-ft (407 N·m).

(8) Install accessory pulley (6) and pulley spacer (7) on crankshaft pulley (3).

(9) Install three screws (8) in support plate (7). Torque to 25-30 lb-ft (34-41 N·m).



c. Follow-On Maintenance

(1) Install fan belts (TM 9-2320-360-20).

(2) Install radiator (TM 9-2320-360-20).

3-13. DDEC PULSE WHEEL REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
24-volt (front) alternator strap removed (TM 9-2320-360-20).
Fan clutch removed (TM 9-2320-360-20).

Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Lockwasher (Item 106, Appendix F)
Lockwasher (Item 134, Appendix F)
Lockwasher (Item 141, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Wrench Set, Socket, 3/4 in. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 lb-ft (Item 236, Appendix E)
Wrench, Torque, 0-600 lb-ft (Item 233, Appendix E)

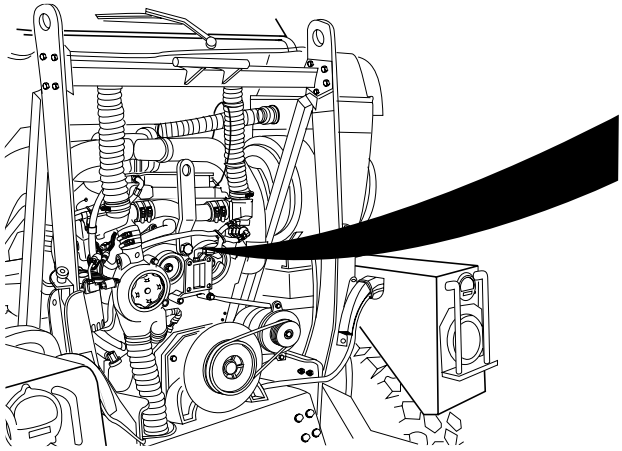
Personnel Required
Two

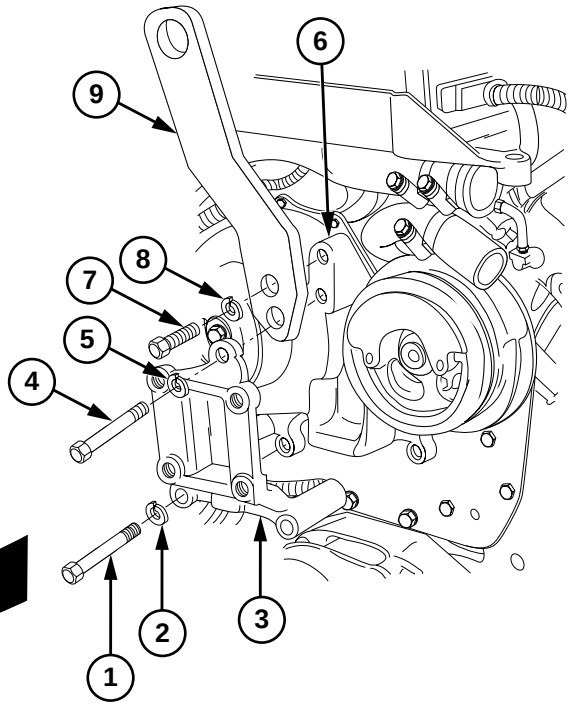
a. Removal

(1) Remove screw (1) and lockwasher (2) from fan clutch support (3). Discard lockwasher.

(2) Remove screw (4), lockwasher (5), and fan clutch support (3) from front cover (6). Discard lockwasher.

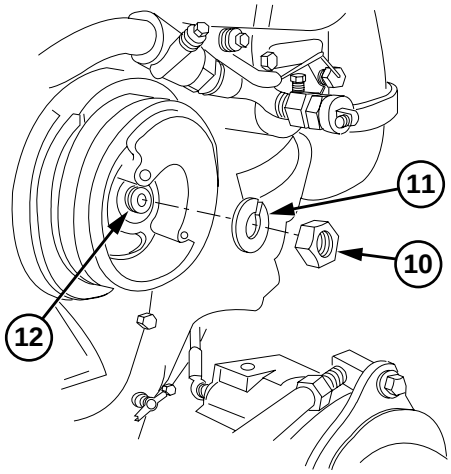
(3) Remove screw (7), lockwasher (8), and engine lifting bracket (9) from front cover (6). Discard lockwasher.



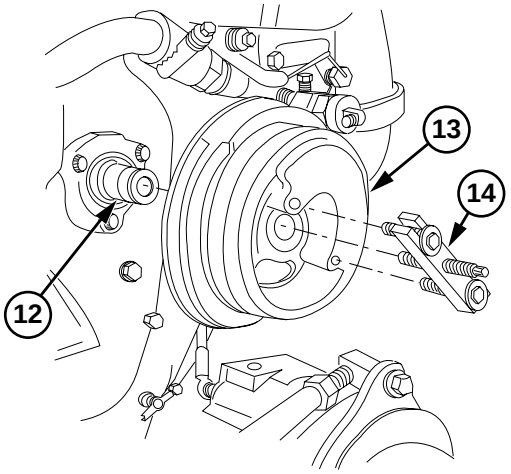


3-13. DDEC PULSE WHEEL REPLACEMENT (CONT)

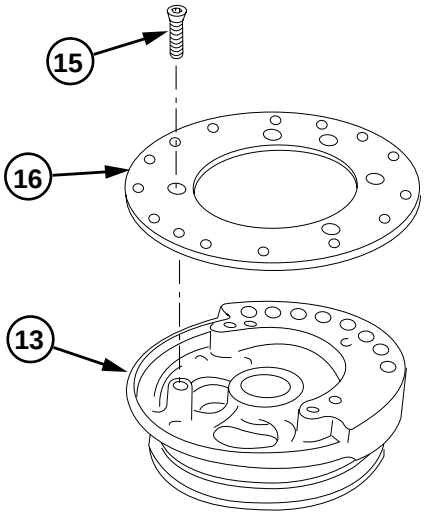
(4) Remove nut (10) and lockwasher (11) from left side camshaft (12). Discard lockwasher.



(5) Remove camshaft pulley (13) from left side camshaft (12) using puller (14).



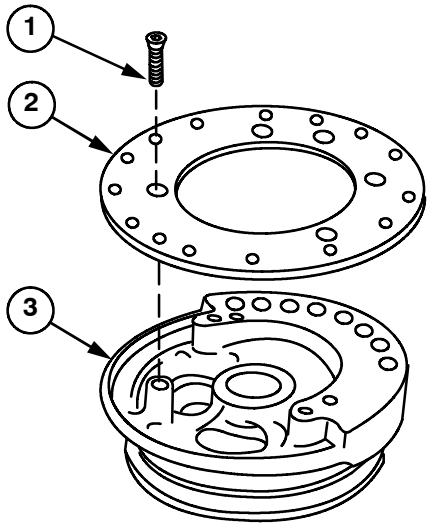
(6) Remove four screws (15) and DDEC pulse wheel (16) from camshaft pulley (13).



b. Installation

WARNING

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

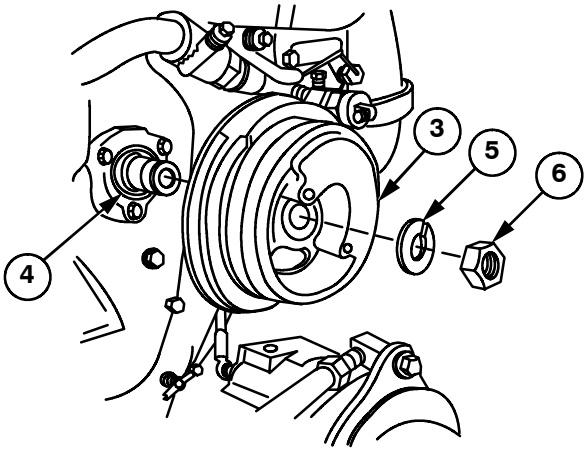


NOTE

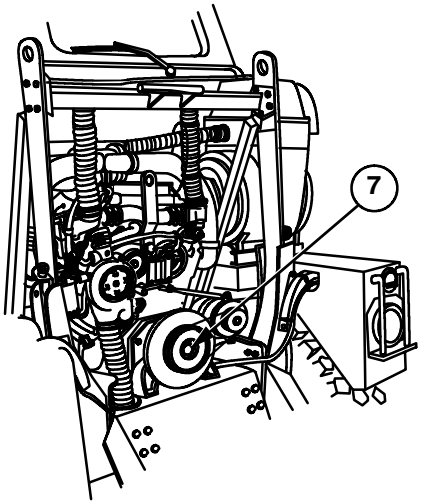
- Two alignment pins on pulse wheel must be installed in alignment holes on back of camshaft pulley.
- DDEC II engines have a 13 tooth pulse wheel; DDEC III/IV engines have a 36 tooth pulse wheel.

(1) Coat threads of four screws (1) with adhesive-sealant.

(1.1) Install DDEC pulse wheel (2) on camshaft pulley (3) with four screws (1).



(2) Install camshaft pulley (3) on left side camshaft (4) with new lockwasher (5) and nut (6). Tighten to 300 lb-ft (407 N·m) while assistant holds crankshaft pulley center screw (7).



3-13. DDEC PULSE WHEEL REPLACEMENT (CONT)

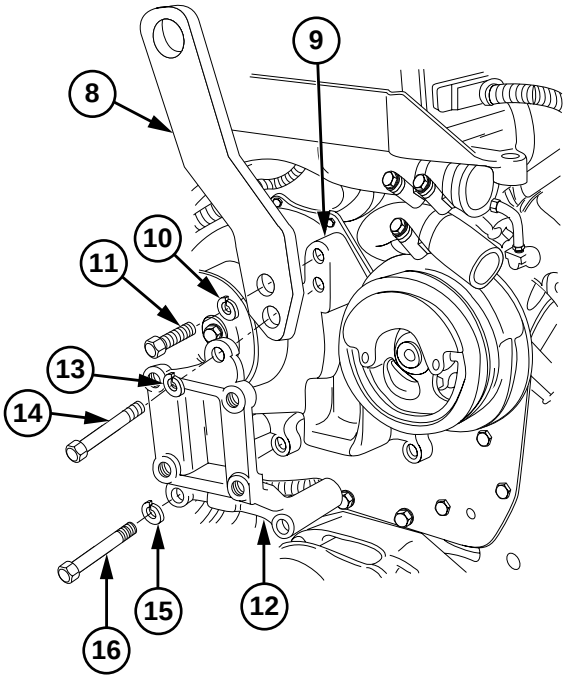
(3) Install engine lifting bracket (8) on front cover (9) with new lockwasher (10) and screw (11). Do not tighten.

(4) Install fan clutch support (12) on front cover (9) with new lockwasher (13) and screw (14). Do not tighten.

(5) Install new lockwasher (15) and screw (16) in fan clutch support (12).

(6) Tighten screws (11 and 16) to 140-170 lb-ft (190-203 N·m).

(7) Tighten screw (14) to 90-100 lb-ft (122-136 N·m).



c. Follow-On Maintenance

(1) Install 24-volt (front) alternator strap (TM 9-2320-360-20).

(2) Install fan clutch (TM 9-2320-360-20).

(3) Adjust SRS/TRS (para 3-7 or 3-7.1).

3-14. CRANKSHAFT VIBRATION DAMPER REPAIR

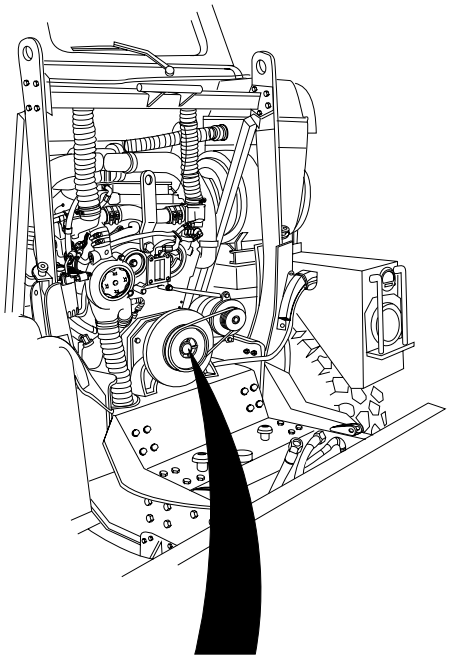
This task covers:
a. Removal
b. Disassembly
c. Assembly
d. Installation
e. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Crankshaft pulley removed (para 3-12).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Oil, Lubricating (Item 45, Appendix B)
Pins (2) (Item 213, Appendix F)
Ring, Seal (Item 249, Appendix F)



a. Removal

CAUTION

Use care when removing vibration damper. Do not pound or pry on vibration damper. Failure to comply may damage damper.

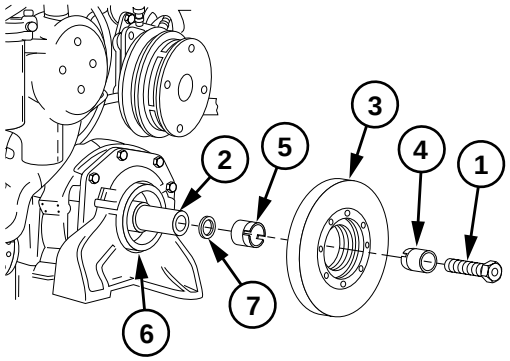
(1) Install screw (1) in end of crankshaft (2). Loosen vibration damper (3).

(2) Remove screw (1) and outer sleeve spacer (4) from crankshaft (2).

(3) Remove vibration damper (3) from crankshaft (2) using puller.

(4) Turn cone (5) clockwise and remove from crankshaft (2) inside trunnion support (6).

(5) Remove seal ring (7) from cone (5). Discard seal ring.



3-14. CRANKSHAFT VIBRATION DAMPER REPAIR (CONT)

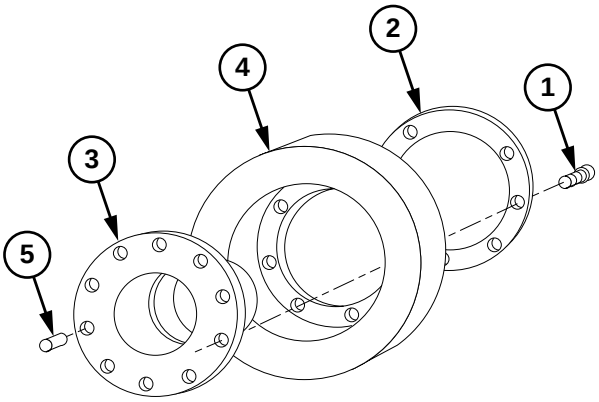
b. Disassembly

(1) Remove eight screws (1), mounting plate (2), and hub (3) from vibration damper (4).

NOTE

Do step (2) only if pins are damaged.

(2) Remove two pins (5) from hub (3). Discard pins.



c. Assembly

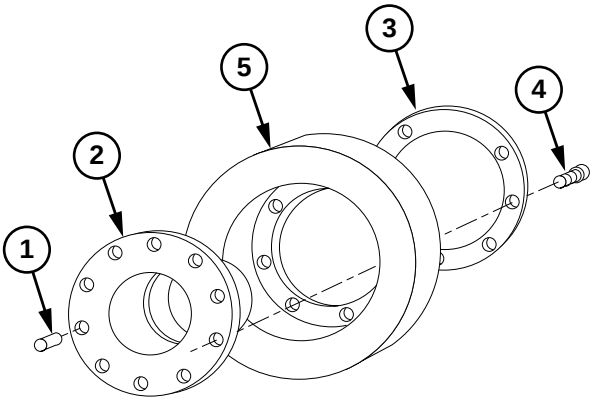
NOTE

If pins were removed, do steps (1) and (2).

(1) Insert two new pins (1) in unthreaded bores in hub (2).

(2) Press two pins (1) through hub (2) until pins stick out from hub 3/8 in. (9.5 mm).

(3) Install hub (2), mounting plate (3), and eight screws (4) in vibration damper (5). Torque to 75–85 lb-ft (102–115 N·m).



d. Installation

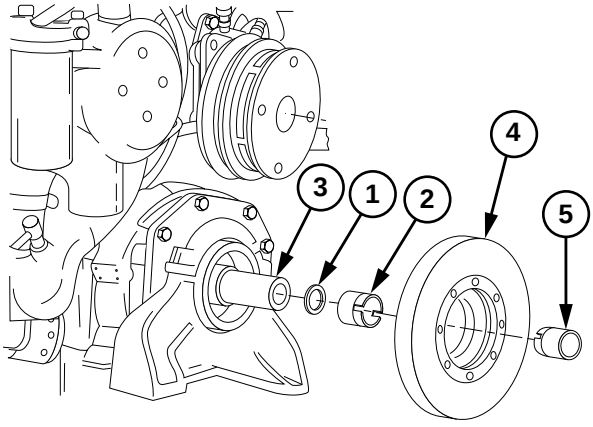
(1) Install new seal ring (1) in inner cone (2).

(2) Coat inner cone (2) and crankshaft (3) with lubricating oil.

(3) Turn inner cone (2) clockwise and install with tapered end pointing out on crankshaft (3).

(4) Install vibration damper (4) on crankshaft (3).

(5) Install outer sleeve spacer (5) on crankshaft (3) with tapered end pointing toward vibration damper (4).



e. Follow-On Maintenance

Install crankshaft pulley (para 3-12).

3-15. VIBRATION DAMPER AND FRONT COVER REPLACEMENT

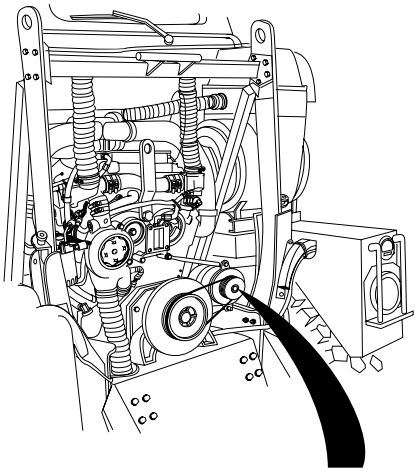
This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
ECM removed (TM 9-2320-360-20).
Fan clutch removed (TM 9-2320-360-20).
Water pump removed (para 5-5).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

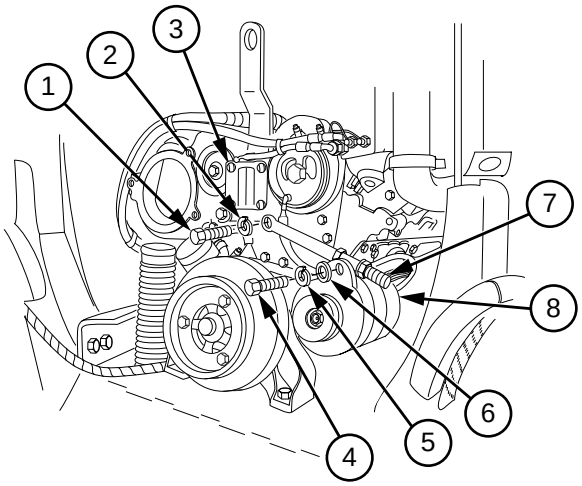
Materials/Parts
Grease, Automotive and Artillery (Item 32, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Gasket (Item 44, Appendix F)
Lockwashers (10) (Item 127, Appendix F)
Lockwashers (3) (Item 106, Appendix F)
Lockwasher (Item 122, Appendix F)
Lockwasher (Item 134, Appendix F)
Seal, Oil (Item 314, Appendix F)



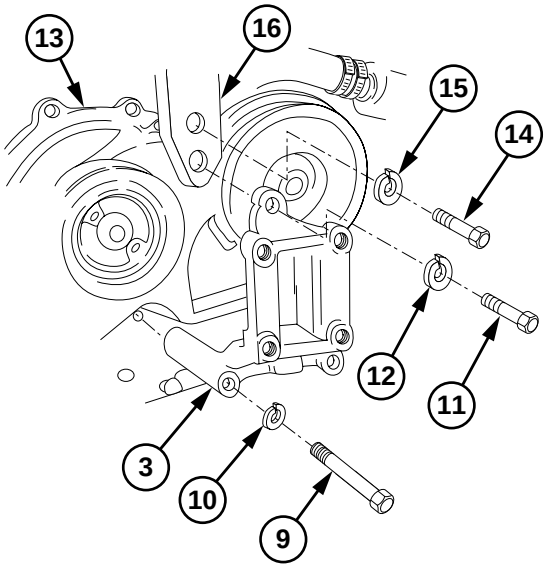
a. Removal

(1) Remove screw (1) and lockwasher (2) from fan clutch support (3). Discard lockwasher.

(2) Remove screw (4), lockwasher (5), washer (6), and alternator adjusting bar (7) from alternator (8).



3-15. VIBRATION DAMPER AND FRONT COVER REPLACEMENT (CONT)



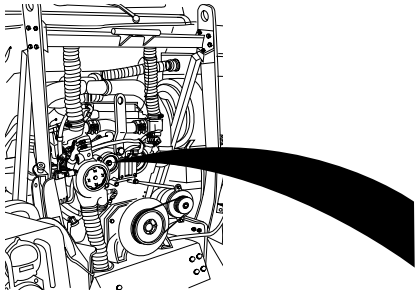
(3) Remove screw (9) and lockwasher (10) from fan clutch support (3).

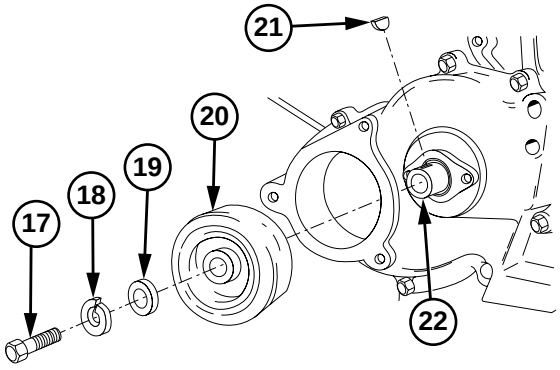
(4) Remove screw (11), lockwasher (12), and fan clutch support (3) from front cover (13). Discard lockwasher.

(5) Remove screw (14), lockwasher (15), and engine lifting bracket (16) from front cover (13). Discard lockwasher.

(6) Remove screw (17), lockwasher (18), and washer (19) from vibration damper (20). Discard lockwasher.

(7) Remove vibration damper (20) and key (21) from shaft (22) using puller.





NOTE

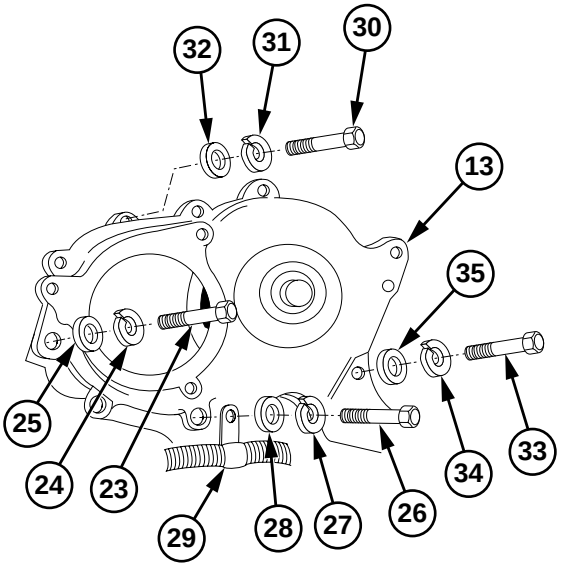
Tag and mark screws, lockwashers, washers, and front cover before removal.

(8) Remove screw (23), lockwasher (24), and washer (25) from front cover (13). Discard lockwasher.

(9) Remove screw (26), lockwasher (27), washer (28), and clip (29) from front cover (13). Discard lockwasher.

(10) Remove screw (30), lockwasher (31), and washer (32) from front cover (13). Discard lockwasher.

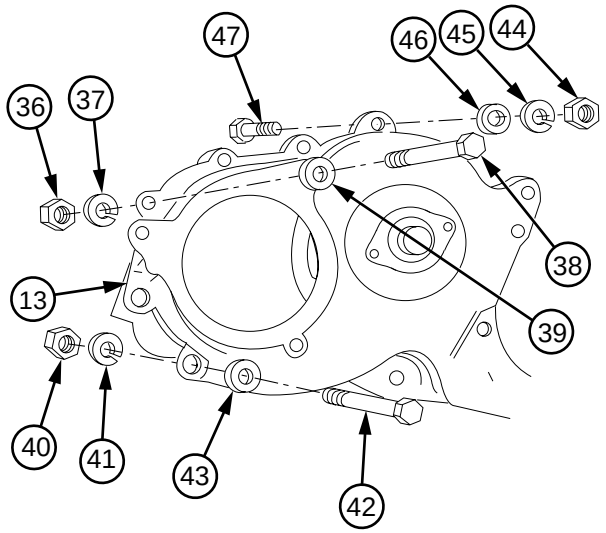
(11) Remove screw (33), lockwasher (34), and washer (35) from front cover (13). Discard lockwasher.



(12) Remove nut (36), lockwasher (37), screw (38), and washer (39) from front cover (13). Discard lockwasher.

(13) Remove nut (40), lockwasher (41), screw (42), and washer (43) from front cover (13). Discard lockwasher.

(14) Remove three nuts (44), lockwashers (45), washers (46), and screws (47) from front cover (13).



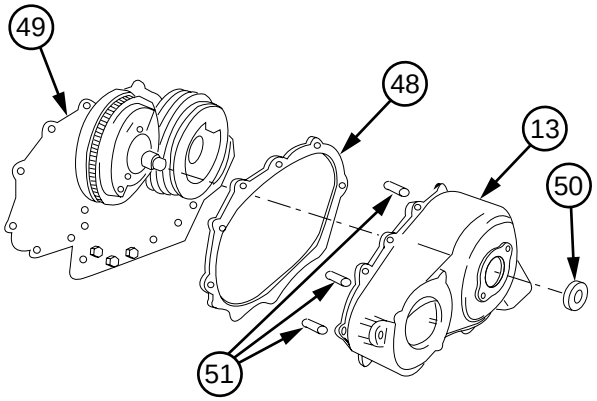
(15) Remove front cover (13) and gasket (48) from end plate (49). Discard gasket.

(16) Remove oil seal (50) from front cover (13). Discard oil seal.

NOTE

Do step (17) if dowel pins fail inspection.

(17) Remove three dowel pins (51) from front cover (13).



b. Cleaning/Inspection

CAUTION

Use care when scraping gasket material from front cover. Damage to equipment may result.

(1) Scrape gasket material from front cover.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/ massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean metal parts with solvent cleaning compound.

3-15. VIBRATION DAMPER AND FRONT COVER REPLACEMENT (CONT)

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Dry parts with compressed air.

(4) Inspect cover for cracks or other damage.

(5) Replace damaged parts.

c. Installation

NOTE

Do step (1) if dowel pins were removed.

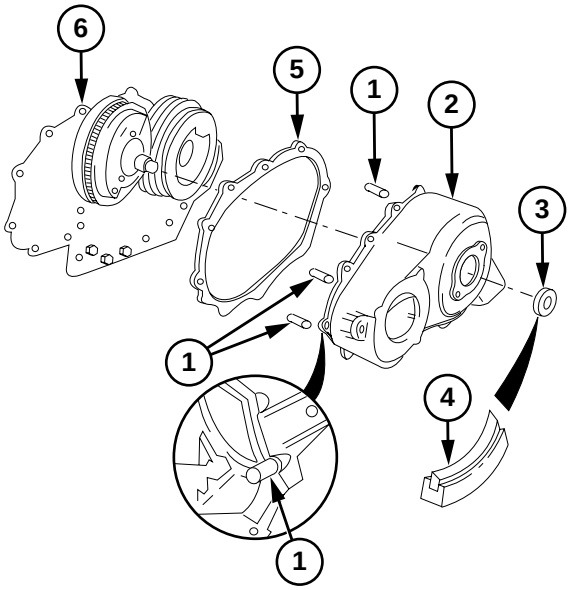
(1) Install three dowel pins (1) on front cover (2).

(2) Install new oil seal (3) in front cover (2) with seal lip (4) pointing inward.

(3) Coat new gasket (5) with grease and install on front cover (2).

(4) Align dowel pins (1) on front cover (2) with holes in end plate (6).

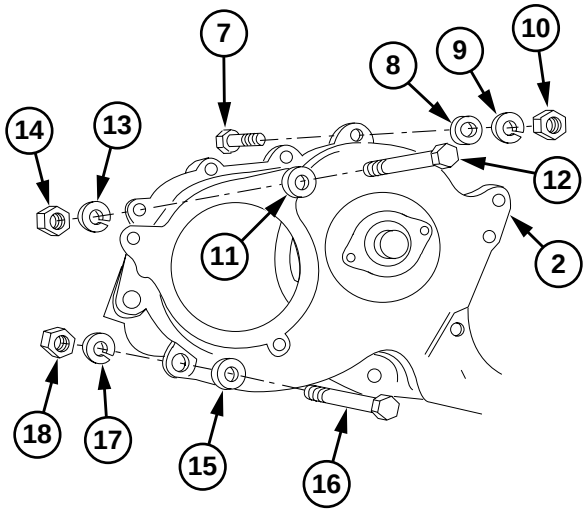
(5) Install front cover (2) on end plate (6).



(6) Install three screws (7), washers (8), new lockwashers (9), and nuts (10) on front cover (2). Do not tighten.

(7) Install washer (11), screw (12), new lockwasher (13), and nut (14) on front cover (2). Do not tighten.

(8) Install washer (15), screw (16), new lockwasher (17), and nut (18) on front cover (2). Do not tighten.



(9) Install washer (19), new lockwasher (20), and screw (21) on front cover (2). Do not tighten.

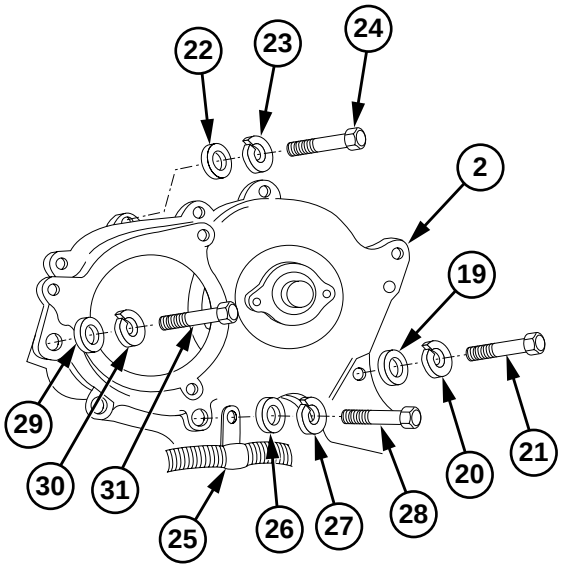
(10) Install washer (22), new lockwasher (23), and screw (24) on front cover (2). Do not tighten.

(11) Install clip (25) on front cover (2) with washer (26), new lockwasher (27), and screw (28). Do not tighten.

(12) Install washer (29), new lockwasher (30), and screw (31) on front cover (2). Do not tighten.

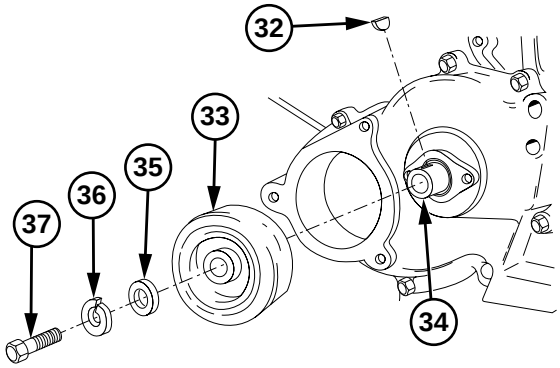
(13) Tighten three nuts (10), screw (28), and screw (31) to 30–35 lb–ft (41–47 N·m).

(14) Tighten nut (14), nut (18), screw (21), screw (24), and screw (31) to 35–40 lb–ft (47–54 N·m).



(15) Install key (32) and vibration damper (33) on shaft (34).

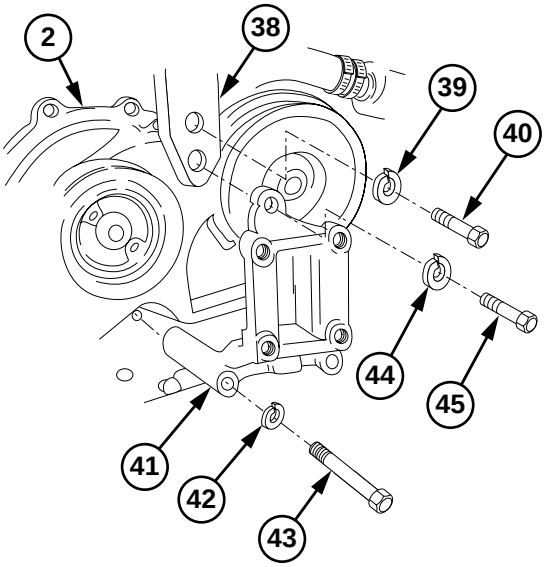
(16) Install washer (35), new lockwasher (36), and screw (37) on vibration damper (33). Torque to 25 lb–ft (34 N·m).



(17) Install engine lifting bracket (38), new lockwasher (39), and screw (40). Do not tighten screw.

(18) Install fan clutch support (41), new lockwasher (42), and screw (43) in front cover (2). Do not tighten.

(19) Install lockwasher (44) and screw (45) in fan clutch support (41). Do not tighten.



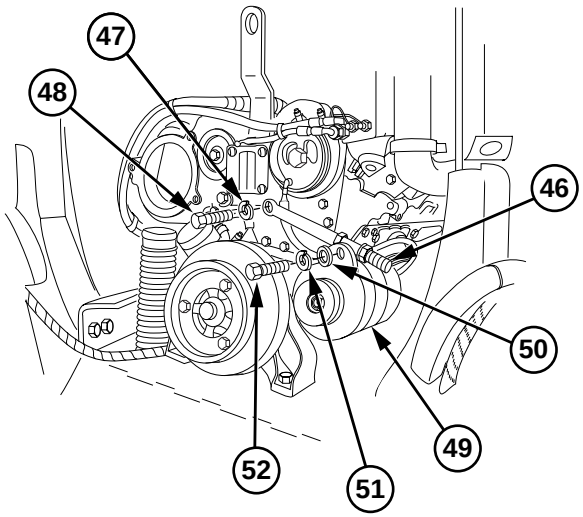
3-15. VIBRATION DAMPER AND FRONT COVER REPLACEMENT (CONT)

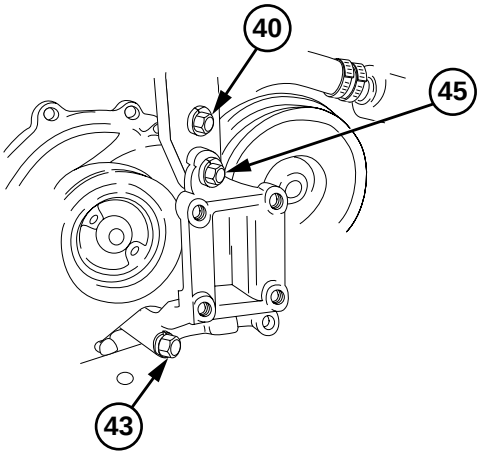
(20) Install alternator adjusting bar (46), new lockwasher (47), and screw (48). Do not tighten.

(21) Tighten screws (40, 45, and 48) to 140-150 lb-ft (190-203 N·m).

(22) Tighten screw (43) to 90-100 lb-ft (122-136 N·m).

(23) Install alternator adjusting bar (46) on alternator (49) with washer (50), new lockwasher (51), and screw (52).





c. Follow-On Maintenance

(1) Install water pump (para 5-5).

(2) Install fan clutch (TM 9-2320-360-20).

(3) Install ECM (TM 9-2320-360-20).

3-16. CRANKSHAFT REAR OIL SEAL REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Flexplate removed (para 3-17).

Materials/Parts
Cloth, Crocus (Item 16, Appendix B)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Drill, Electric, Portable, 1/4 In. (Item 34, Appendix E)
Drill, Twist (Item 33, Appendix E)
Expander, Seal, (Item 37, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Dial Indicator, Magnetic (Item 32, Appendix E)
Installer, Seal (Item 83, Appendix E)
Screws, Sheet Metal (2) (Item 153, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Washers (2) (Item 210, Appendix E)

a. Removal

WARNING

Protective goggles must be worn when drilling holes. Failure to comply may result in injury to personnel.

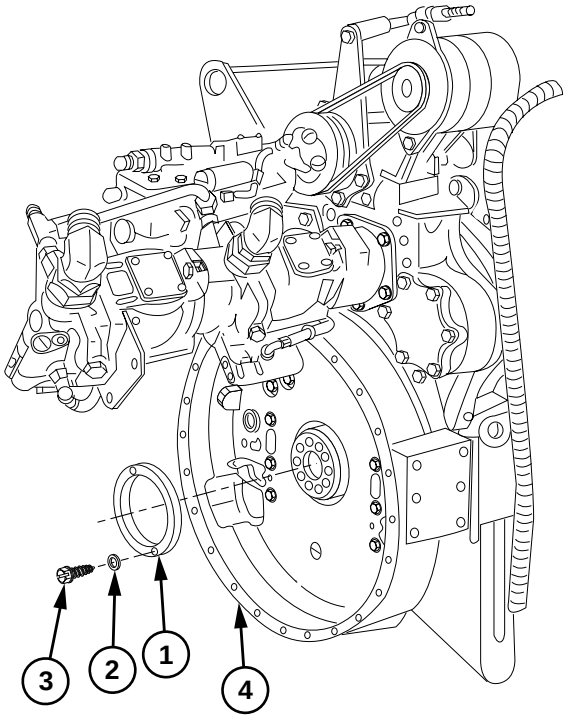
(1) Drill two 1/8 in. (3.2 mm) holes directly opposite each other in seal casing (1).

(2) Install two washers (2) and sheet metal screws (3) in drilled holes.

NOTE

Seal is removed by prying against washers with pry bar.

(3) Remove seal (1) from flywheel housing (4).



b. Cleaning/Inspection

(1) Inspect rear oil seal contact surface for deep scratching.

(2) Smooth scratches with crocus cloth.

3-16. CRANKSHAFT REAR OIL SEAL REPLACEMENT (CONT)

c. Installation

(1) Install two guide studs (1) in crankshaft (2).

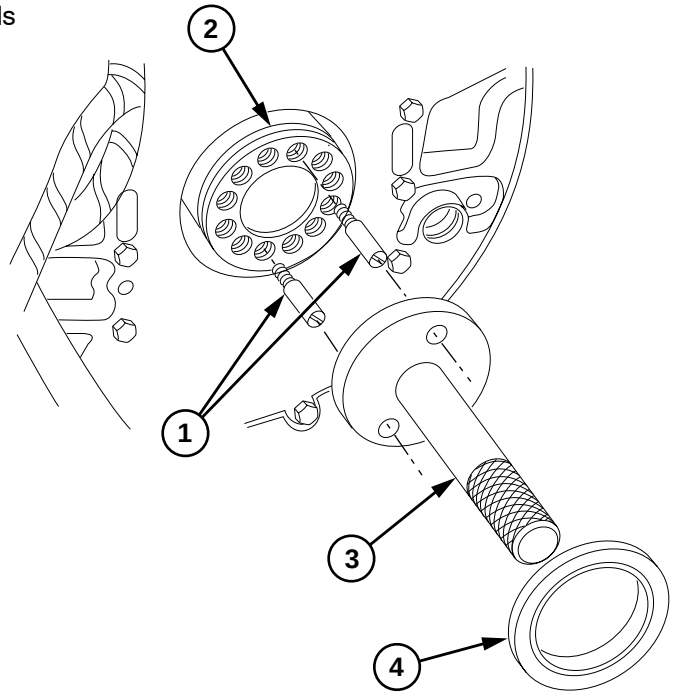
(2) Place oil seal expander (3) over guide studs (1) against the end of the crankshaft (2).

CAUTION

Seals are designed for use on either right or left rotating engines. Arrow on seal must point in counterclockwise direction. Failure to install correct rotation seal will result in seal damage and oil leaks.

NOTE

Do not lubricate teflon seal lip or outside diameter of crankshaft before seal installation. Teflon lip seals must be installed dry. This is to allow transfer of teflon to crankshaft for proper sealing.



(3) With lip of seal (4) pointed toward engine, slide seal (4) over expander (3) and onto crankshaft (2).

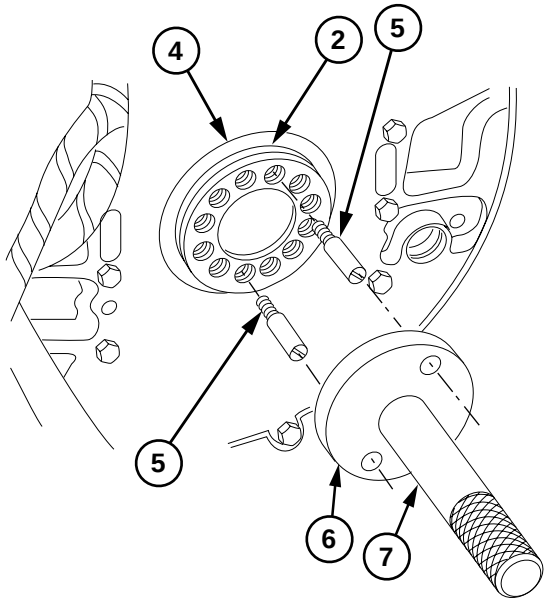
(4) Remove seal expander (3) and two guide studs (1).

(5) Install two seal installer guide studs (5) in crankshaft (2).

(6) Install oil seal installer (6) on guide studs (5) using handle (7).

(7) Drive seal (4) in place until installer (6) seats squarely on end of crankshaft (2).

(8) Remove seal installer (6) and two seal installer guide studs (5).



(9) Attach magnetic dial indicator (8) on end of crankshaft (2).

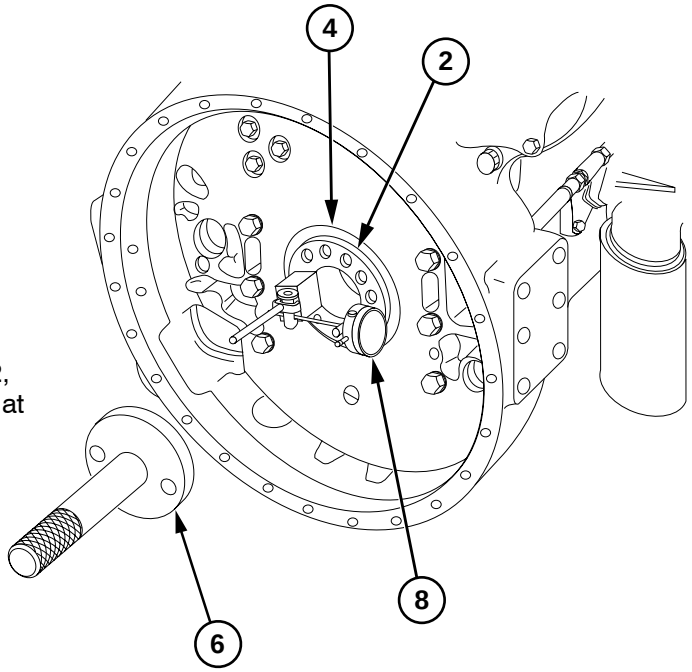
(10) Position point of magnetic dial indicator (8) on crankshaft seal (4).

CAUTION

When using front crankshaft capscrew to bar over engine, always turn in clockwise direction. Turning over in counterclockwise direction may loosen capscrew and vibration damper. Engine damage may result.

(11) Rotate crankshaft and note readings at 12, 9, 6, and 3 o'clock positions. Total runout at each position should not exceed 0.015 in. (0.38 mm).

(12) If any reading is over 0.015 in. (0.38 mm), place seal installer (6) over seal (4) and lightly tap at high points.



c. Follow-On Maintenance

Install flexplate (para 3-17).

3-17. FLEXPLATE ASSEMBLY REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Transmission removed (para 7-4).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

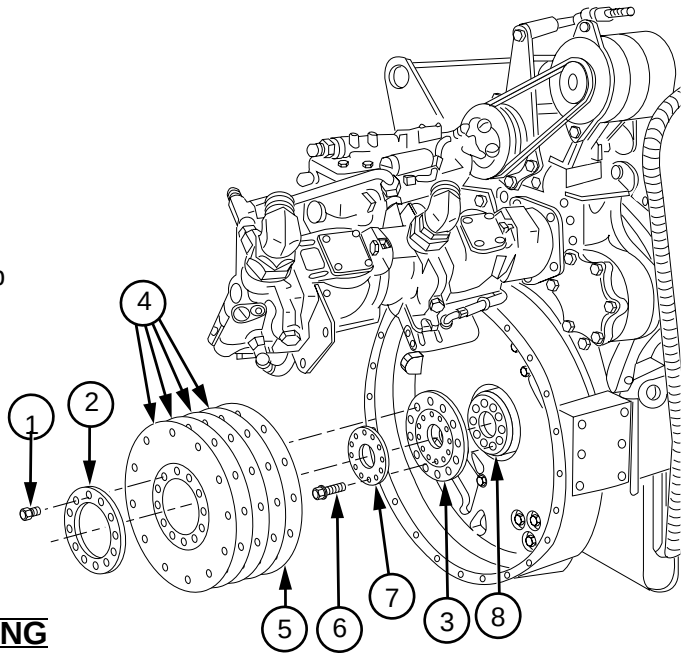
Materials/Parts
Compound, No. 2, International (Item 21, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)

a. Removal

(1) Remove 12 screws (1) and plate (2) from hub (3).

(2) Remove four disks (4) and disk (5) from hub (3).

(3) Remove 12 screws (6), plate (7), and hub (3) from crankshaft (8).



b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean disks with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry disks with compressed air.

(3) Inspect disks for breaks, excessive wear, or signs of overheating.

(4) Replace any broken, worn, or overheated disks.

c. Installation

(1) Align screw holes in hub (1) with crankshaft (2) in flywheel housing (3).

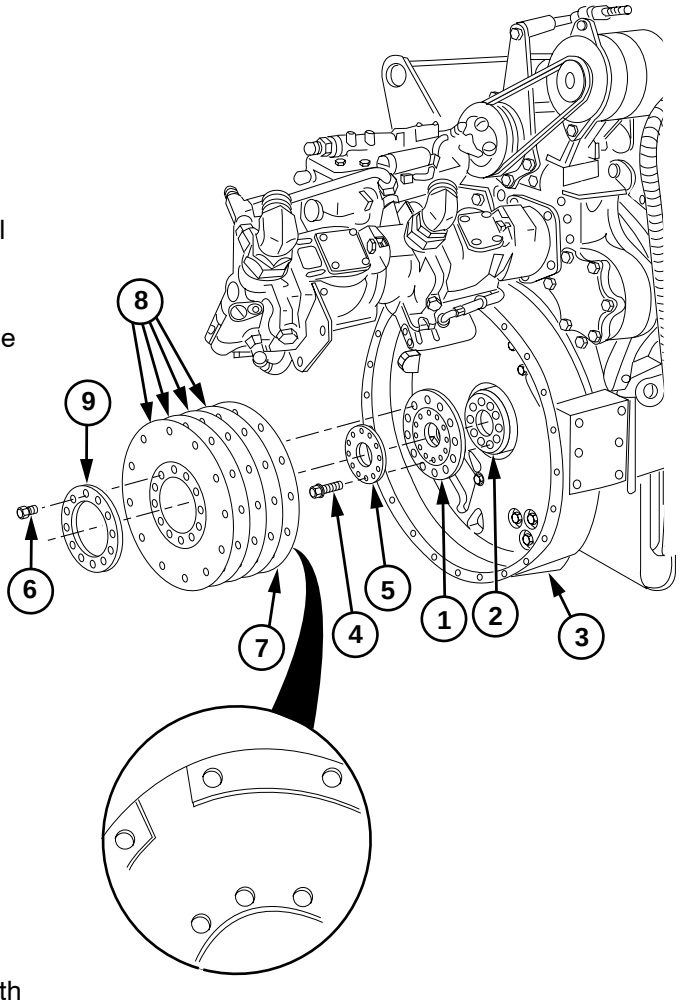
WARNING

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

(2) Coat 12 screws (4) with no. 2 international compound.

(3) With rough side toward engine, install hub (1) and plate (5) with 12 screws (4). Torque to 50 lb-ft (68 N·m). Tighten additional 1/4 turn.

(4) Coat 12 screws (6) with international no. 2 compound.



CAUTION

Disk with reinforcement plates must be installed first with plates facing engine. Failure to comply may cause damage to equipment.

NOTE

Each disk has one small hole for alignment purposes. Each small hole must be aligned with small holes on other disks.

(5) Align holes in disk (7), four disks (8), and plate (9) with hub (1).

(6) Install disk (7), 4 disks (8), and plate (9) with 12 screws (6). Torque to 96-115 lb-ft (130-156 N·m).

d. Follow-On Maintenance

Install transmission (para 7-4).

3-18. ROCKER ARM REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Engine brake retarder removed (para 3-26).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Fuel Line Nut (Item 222, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Caps, Shipping and Sealing (Item 13, (Appendix B)
Oil, Lubricating (Item 45, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Plug (Item 228, Appendix F)
Rings, Seal (4) (Item 272, Appendix F)

a. Removal

NOTE

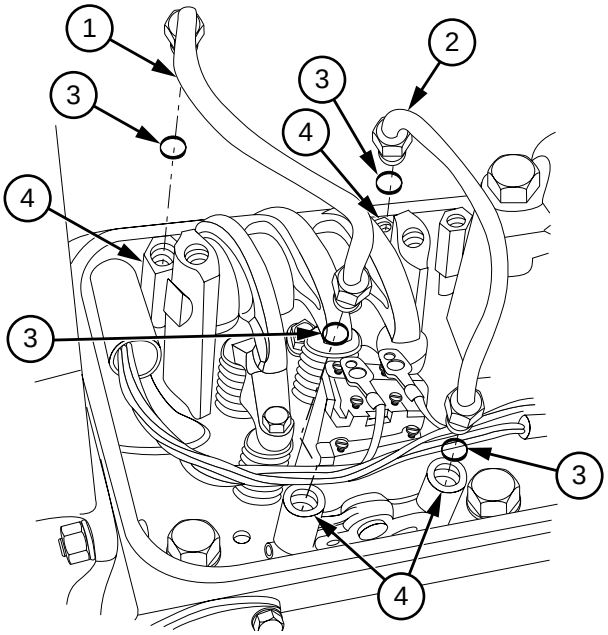
- All sets of rocker arms are replaced the same way. One set is shown.
- Tag and mark fuel tubes before removal.

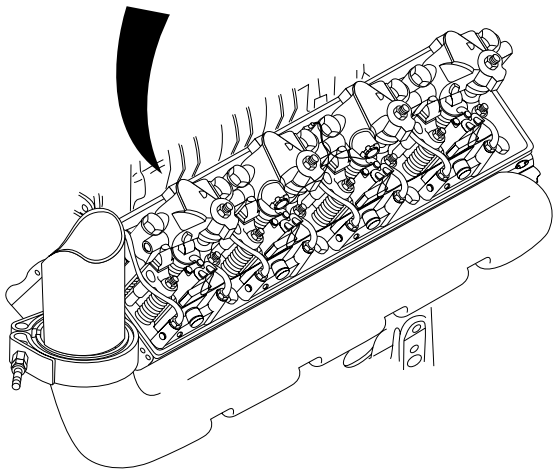
(1) Remove two fuel tubes (1 and 2) and four seal rings (3) from fuel tube connectors (4). Discard seal rings.

CAUTION

Fuel line connectors must be covered to prevent foreign material from entering fuel system. Failure to comply may result in damage to engine.

(2) Cover four fuel tube connectors (4) with caps.





(3) Hold three push rods (5) and loosen three locknuts (6).

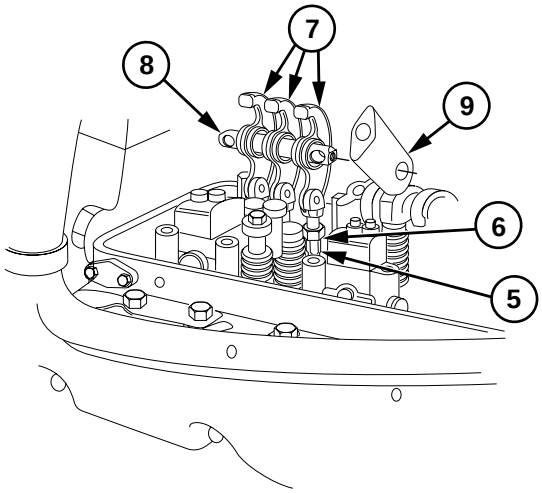
CAUTION

Do not force rocker arms all the way back with shaft in place. Failure to comply may result in damage to push rods.

(4) Move three rocker arms (7), shaft (8), and two brackets (9) up and toward center of engine to permit shaft (8) to be removed.

(5) Remove two brackets (9) from shaft (8).

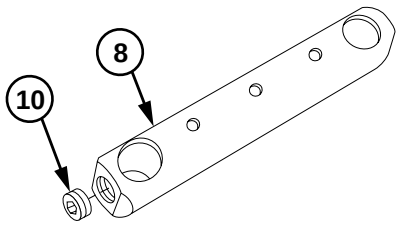
(6) Remove shaft (8) from rocker arms (7).



NOTE

Do step (7) only if rocker shaft fails inspection.

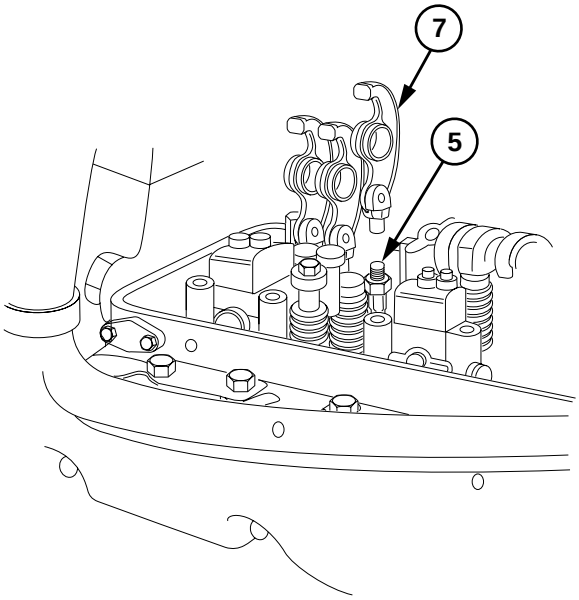
(7) Remove plug (10) from shaft (8). Discard plug.



NOTE

Tag rocker arms before removal.

(8) Remove three rocker arms (7) from three push rods (5).



3-18. ROCKER ARM REPLACEMENT (CONT)

b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean metal parts in solvent cleaning compound.

(2) Inspect rocker arm assembly and brackets for cracks and other damage.

CAUTION

The measured clearance between bushing and shaft must not be greater than 0.004 in. (0.102 mm). Damage to equipment may result.

(3) Measure clearance between bushing and shaft. Replace rocker arm if clearance between bushing and shaft exceeds 0.004 in. (0.102 mm).

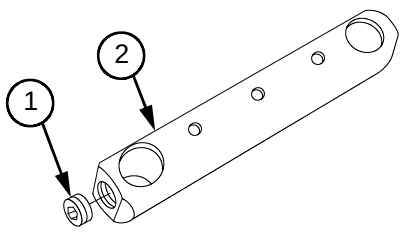
(4) Inspect rocker shaft for loose or missing plug.

(5) Replace damaged parts.

CAUTION

Failure to inspect and replace defective fuel tubes may result in fuel tube leakage, dilution of the engine lubricating oil, and subsequent engine damage.

(6) Inspect fuel tubes and nuts for signs of binding, abnormal kinks or bends, or other damage. Replace any fuel pipes or nuts that show any signs of damage.



c. Installation

NOTE

Do step (1) only if plug was removed.

(1) Install new plug (1) in shaft (2).

NOTE

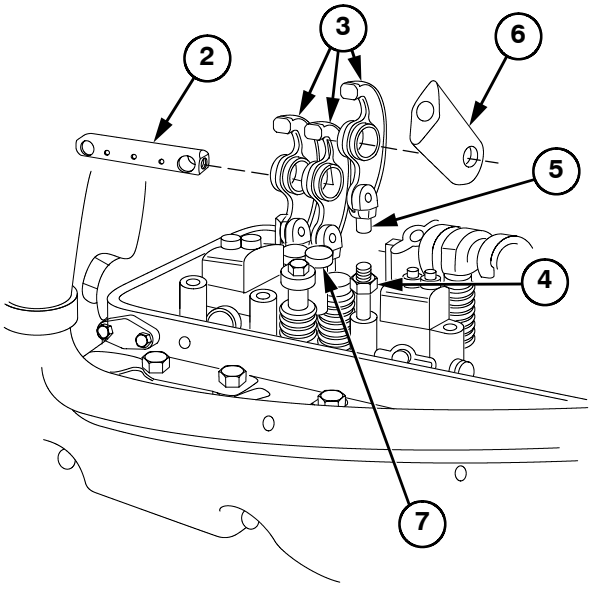
Install rocker arms in positions marked during removal.

(2) Thread each of three rocker arms (3) onto three push rods (4) until end of each pushrod is flush with or above inside of each clevis yoke (5).

(3) Coat shaft (2) with oil and slide it through three rocker arms (3).

(4) Install two brackets (6), one over each end of shaft (2), with finished face next to rocker arms (3).

(5) Position rocker arms (3) down on valve bridge (7).

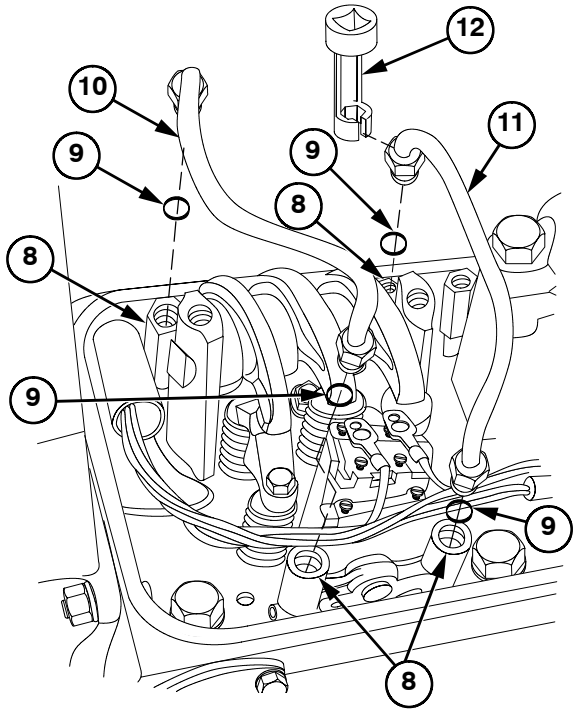


(6) Remove caps from four fuel tube connectors (8).

CAUTION

Do not overtighten fuel tubes. Leaks can develop which may cause severe damage to engine.

(7) Install four new seal rings (9) and two fuel tubes (10 and 11) on fuel tube connectors (8). Torque to 160 lb-in. (18.1 N·m) using fuel line nut wrench (12).



f. Follow-On Maintenance

Install engine brake retarder (para 3-26).

3-19. OIL COOLER AND HOUSING REPAIR

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Radiator removed (TM 9-2320-360-20).
Lower radiator hose removed (TM 9-2320-360-20).
Engine oil filter element removed (TM 9-2320-360-20).
Inner fender removed (right side only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Bit Set, Screwdriver (Item 9.1, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, Click-Type, 15-100 Lb-Ft (Item 238, Appendix E)
Wrench, Torque, 0-150 Lb-In. (Item 234, Appendix E)

Materials/Parts (Cont)
Adhesive-Sealant (Item 6, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Tags, Identification (Item 56, Appendix B)
Clamp (Item 8, Appendix F)
Gaskets (2) (Item 37, Appendix F)
Gasket (Item 22, Appendix F)
Gasket (Item 28, Appendix F)
Gasket (Item 34, Appendix F)
Gasket (Item 57, Appendix F)
Gasket (Item 63, Appendix F)
Gasket (Item 68, Appendix F)
Lockwashers (20) (Item 119, Appendix F)
Lockwashers (8) (Item 127, Appendix F)
Seal (Item 291, Appendix F)

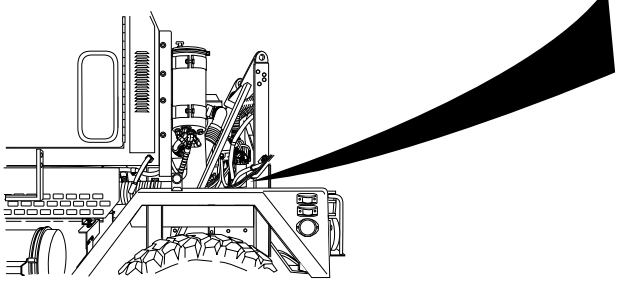
Personnel Required
Two

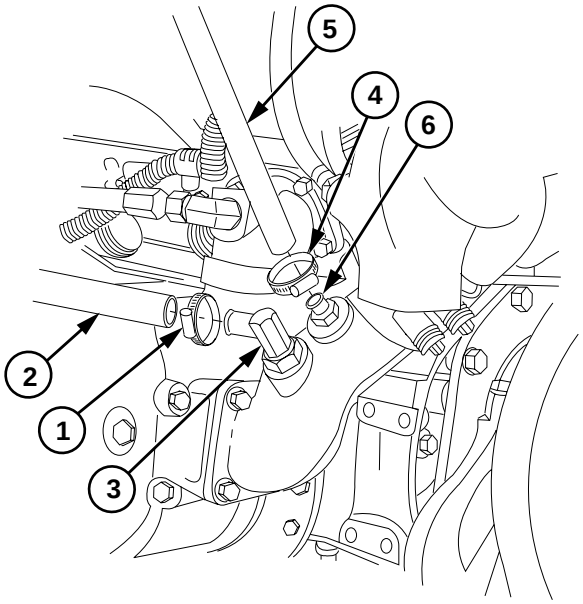
a. Removal

NOTE
Tag and mark hoses before removal.

(1) Loosen clamp (1) and remove hose no. 2651 (2) from elbow (3).

(2) Loosen clamp (4) and remove hose no. 2866 (5) from fitting (6).





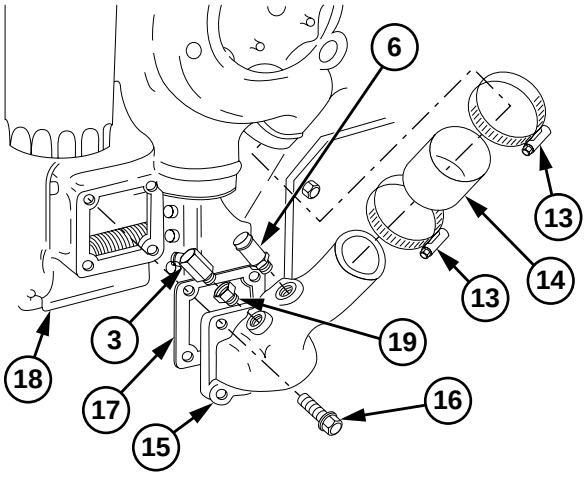
(3) Deleted.

(4) Loosen two clamps (13) and slide hose (14) down onto oil cooler inlet elbow (15).

(5) Remove four screws (16), oil cooler inlet elbow (15), and gasket (17) from oil cooler (18). Discard gasket.

(6) Remove hose (14) and two clamps (13).

(7) Remove fitting (6), elbow (3), and bushing (19) from oil cooler inlet elbow (15).

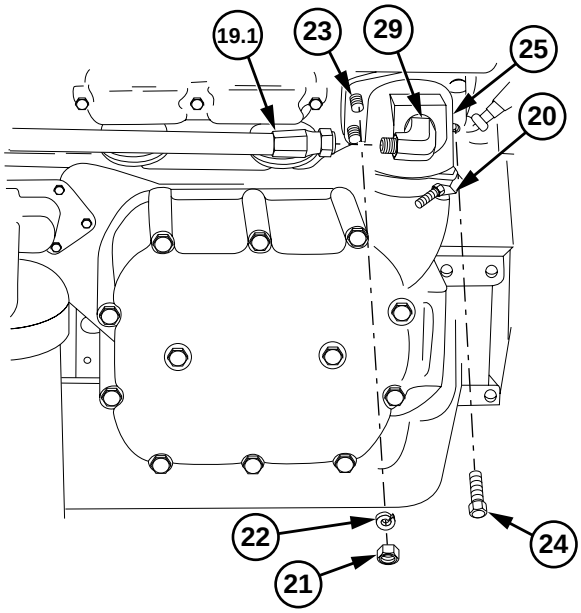


(7.1) Remove hose no. 2628 (19.1) from elbow (29).

(8) Loosen clamp (20).

(9) Remove two nuts (21) and lockwashers (22) from studs (23). Discard lockwashers.

(10) Remove two screws (24) from flange elbow (25).



3-19. OIL COOLER AND HOUSING REPAIR (CONT)

(11) Slide clamp (20) and seal (26) down oil cooler (18).

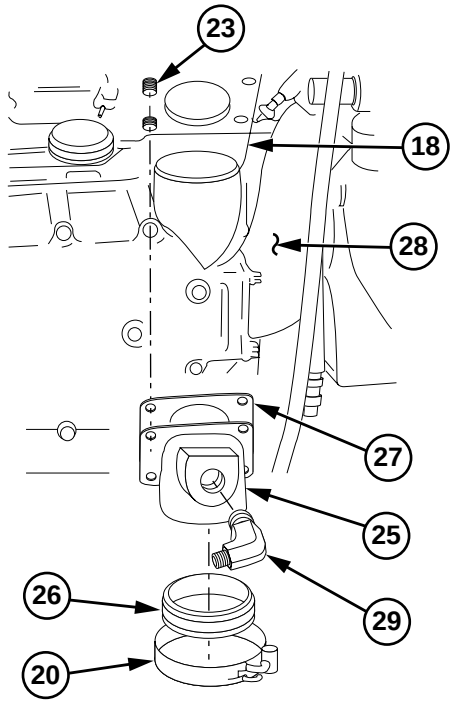
(12) Remove flange elbow (25), clamp (20), seal (26), and gasket (27). Discard seal, clamp, and gasket.

NOTE

Do step (13) if studs are damaged.

(13) Remove two studs (23) from engine block (28).

(14) Remove elbow (29) from flange elbow (25).



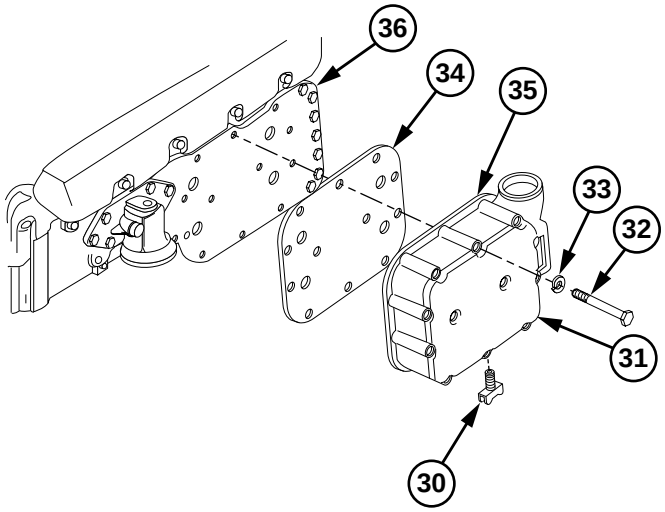
NOTE

Place suitable container under oil cooler housing.

(15) Remove drain cock (30) from bottom of oil cooler housing (31).

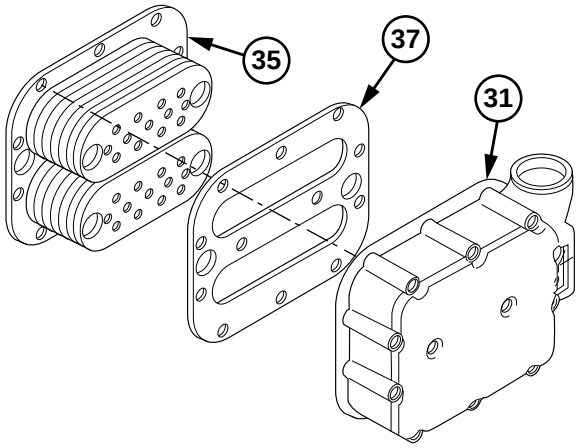
(16) Remove 12 mounting screws (32), lockwashers (33), oil cooler housing (31), gasket (34), and core (35) from cover plate (36) with aid of assistant. Discard lockwashers.

(17) Remove gasket (34) from oil cooler housing (31). Discard gasket.

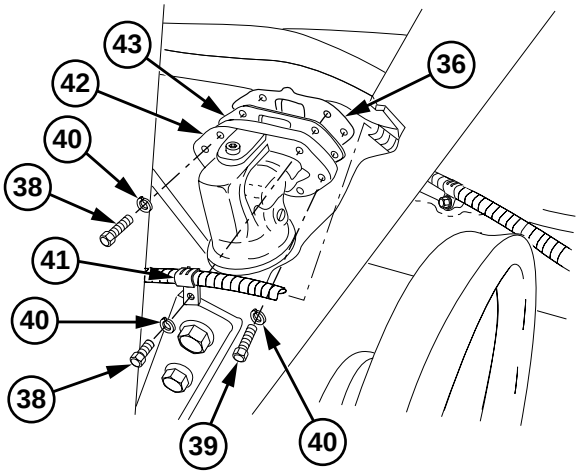


ENGINE SHOWN REMOVED FROM CHASSIS FOR CLARITY

(18) Separate core (35) and gasket (37) from oil cooler housing (31). Discard gasket.



(19) Remove four screws (38), two screws (39), six lockwashers (40), wire harness clip (41), oil filter head (42), and gasket (43) from cover plate (36). Discard lockwashers and gasket.

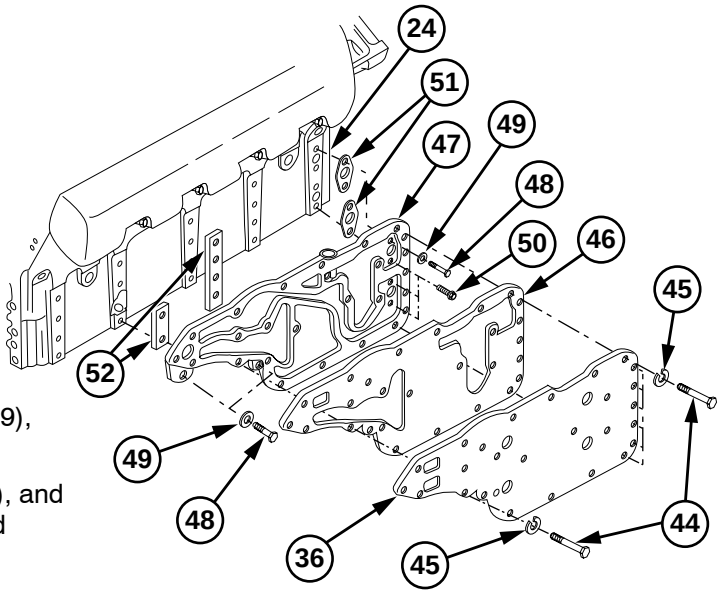


(20) Remove eight screws (44) and lockwashers (45) from cover plate (36). Discard lockwashers.

(21) Remove cover plate (36) and gasket (46) from adapter (47). Discard gasket.

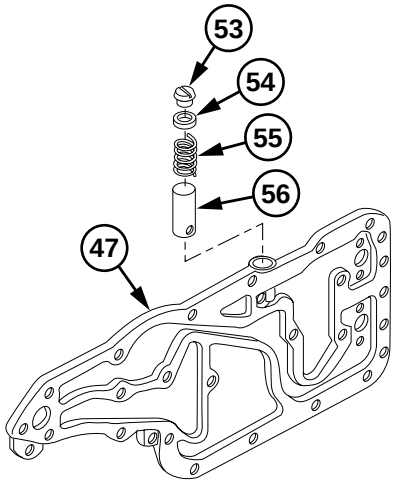
(22) Remove three screws (48), washers (49), and screws (50) from adapter (47).

(23) Remove adapter (47), two gaskets (51), and spacers (52) from engine (24). Discard gaskets.



3-19. OIL COOLER AND HOUSING REPAIR (CONT)

(24) Remove plug (53), gasket (54), spring (55), and valve (56) from adapter (47). Discard gasket.



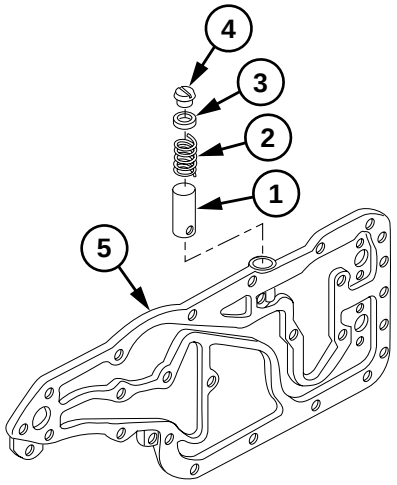
b. Installation

(1) Install valve (1) with open end up, spring (2), new gasket (3), and plug (4) in adapter (5). Torque to 30 lb-ft (41 N·m).

(2) Coat two new gaskets (6) with grease.

WARNING

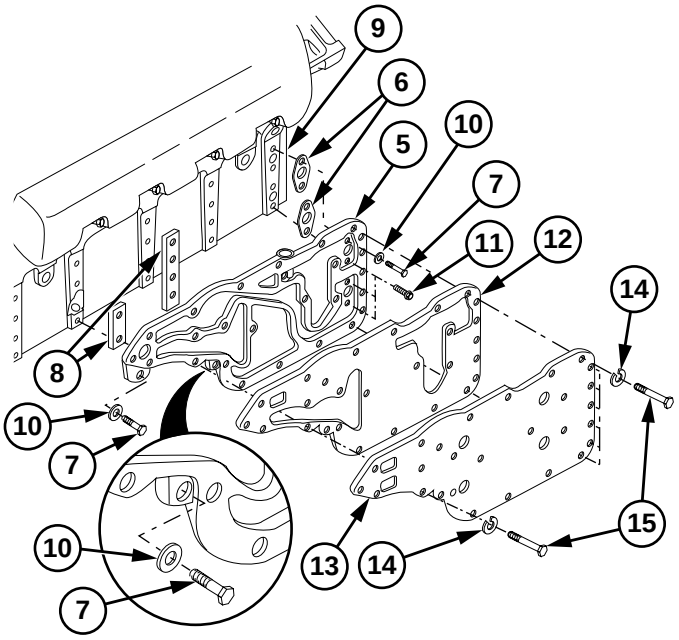
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

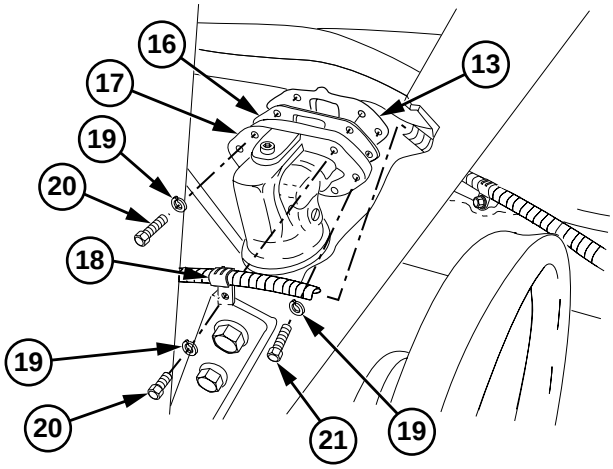


(3) Coat threads of three screws (7) with adhesive-sealant.

(4) Install two spacers (8), new gaskets (6), and adapter (5) on engine (9) with three washers (10), screws (7), and screws (11). Torque to 30-35 lb-ft (41-47 N·m).

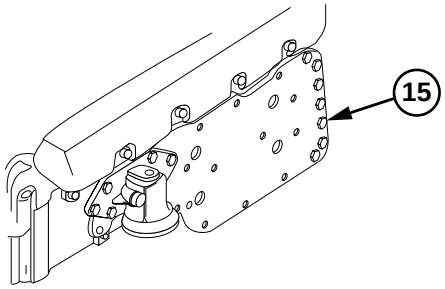
(5) Install new gasket (12) and cover plate (13) on adapter (5) with eight new lockwashers (14) and screws (15). Do not tighten.

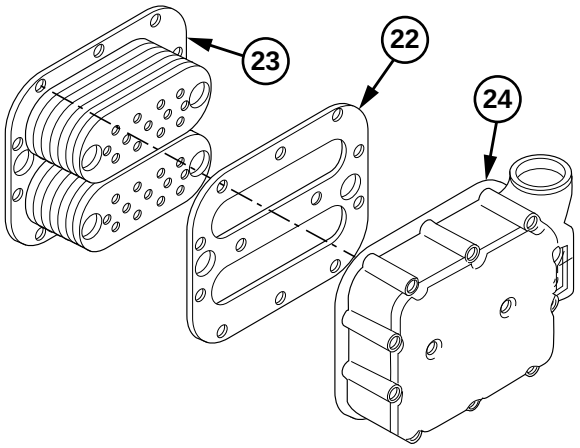




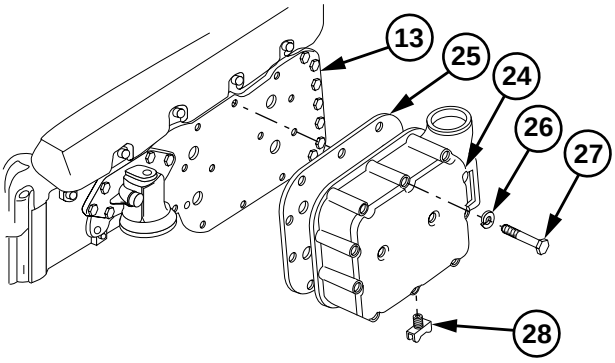
(6) Install new gasket (16), oil filter head (17), and wire harness clip (18) on cover plate (13) with six new lockwashers (19), four screws (20), and two screws (21). Torque to 30–35 lb–ft (41–47 N·m).

(7) Tighten eight screws (15) to 180 lb–in. (20.3 N·m).





(8) Install new gasket (22) and core (23) on oil cooler housing (24).

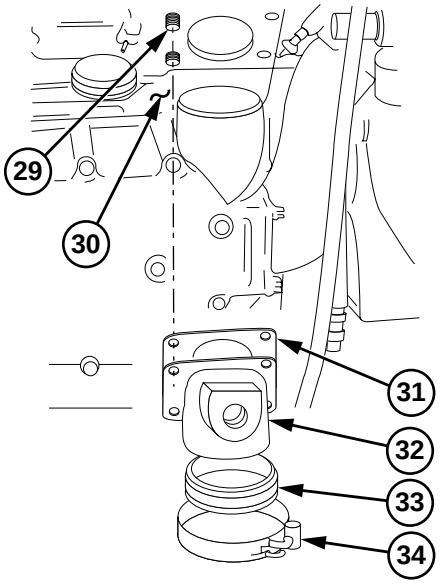


(9) Install new gasket (25) on oil cooler housing (24).

(10) Install oil cooler housing (24) on cover plate (13) with 12 new lockwashers (26) and screws (27) with aid of assistant. Torque to 180 lb–in. (20.3 N·m).

(11) Install drain cock (28) in bottom of oil cooler housing (24).

3-19. OIL COOLER AND HOUSING REPAIR (CONT)



NOTE

Do step (12) if studs were removed.

(12) Install two studs (29) on engine block (30).

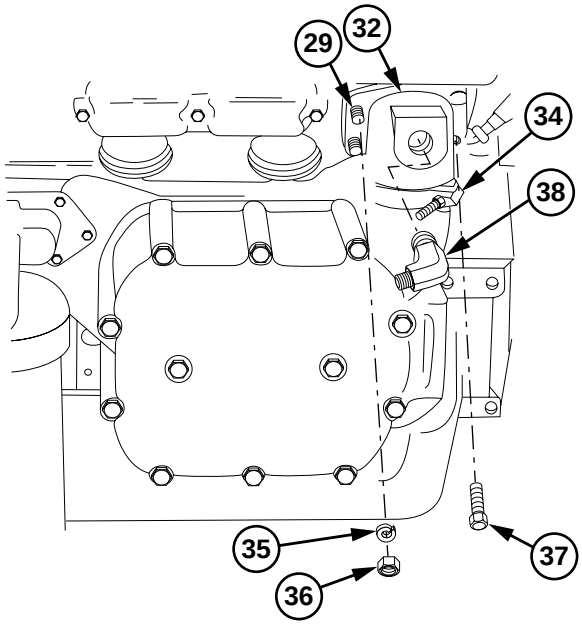
(13) Place new gasket (31) over studs (29).

(14) Position flange elbow (32), new seal (33), and new clamp (34) on engine block (30).

(15) Install two new lockwashers (35) and nuts (36) on studs (29). Do not tighten.

(16) Install two screws (37) on flange elbow (32). Torque to 30–35 lb–ft (41–47 N·m).

(17) Tighten two nuts (36) to 30–35 lb–ft (41–47 N·m).



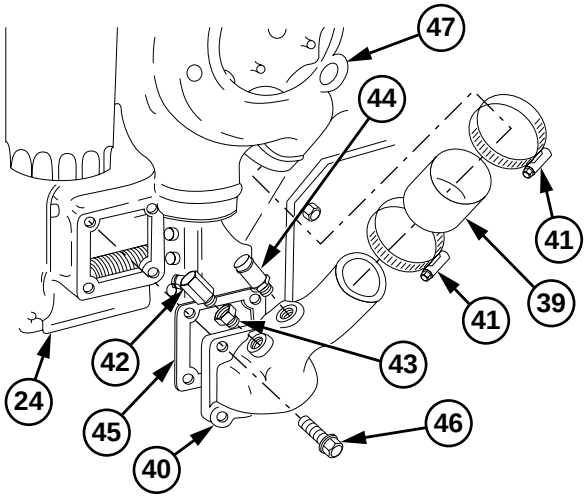
WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(17.1) Coat threads of elbow (38) with pipe thread sealing compound.

(18) Install elbow (38) in flange elbow (32).

(19) Tighten clamp (34).



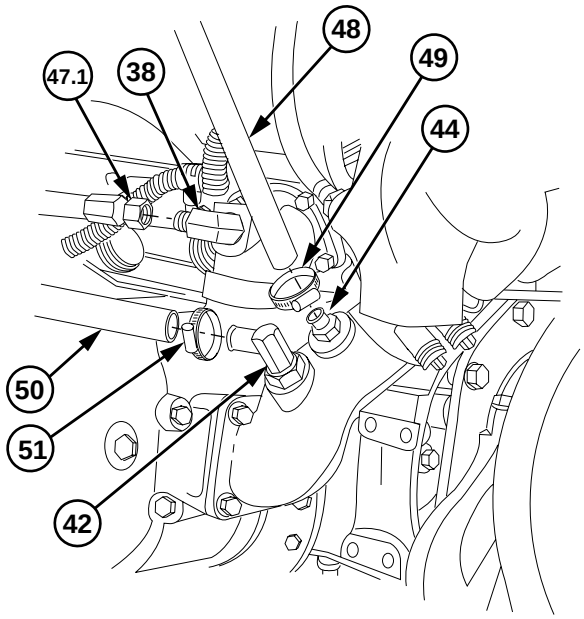
(20) Install hose (39) on oil cooler inlet elbow (40) with two clamps (41). Do not tighten.

(21) Coat threads of elbow (42), bushing (43), and fitting (44) with pipe thread sealing compound.

(22) Install bushing (43), elbow (42), and fitting (44) on oil cooler inlet elbow (40).

(23) Install new gasket (45) and oil cooler inlet elbow (40) on oil cooler (24) with four screws (46).

(24) Install hose (39) on water pump (47) with two clamps (41).



(24.1) Install hose no. 2826 (47.1) on elbow (38).

(25) Install hose no. 2866 (48) on fitting (44) and tighten clamp (49). Torque to 40 lb-in. (4.5 N·m).

(26) Install hose no. 2651 (50) on elbow (42) with clamp (51). Torque to 40 lb-in. (4.5 N·m).

(27) Deleted.

c. Follow-On Maintenance

(1) Install engine oil filter element (TM 9-2320-360-20).

(2) Install lower radiator hose (TM 9-2320-360-20).

(3) Install radiator (TM 9-2320-360-20).

(4) Install inner fender (TM 9-2320-360-20).

3-20. OIL PAN AND GASKET REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front bumper removed (TM 9-2320-360-20).
Axle no. 1 shock absorber bracket removed (TM 9-2320-360-20).
Front wheels/tires removed (TM 9-2320-360-20).
Axle no. 1 tie rod removed (TM 9-2320-360-20).
Transfer case to axle no. 1 propeller shaft removed (TM 9-2320-360-20).

Tools and Special Tools
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jackstands (4) (Item 93, Appendix E)

Tools and Special Tools (Cont)
Pan, Oil Drain (Item 102, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

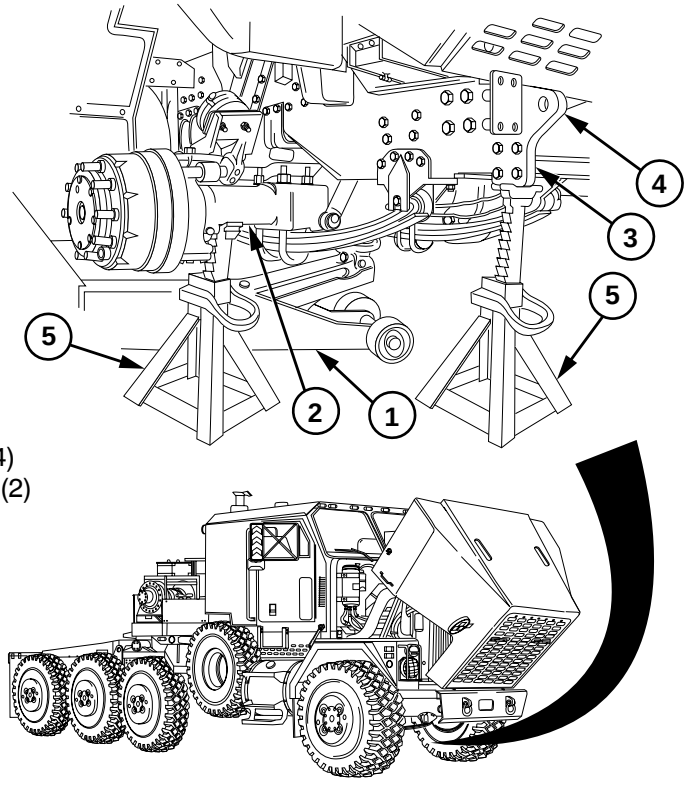
Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Oil, Fuel, Diesel (Item 38, Appendix B)
Oil, Lubricating (Item 45, Appendix B)
Gasket (Item 23, Appendix F)
Locknuts (2) (Item 96, Appendix F)

a. Removal

(1) Position floor jack (1) under axle (2) and raise HET Tractor.

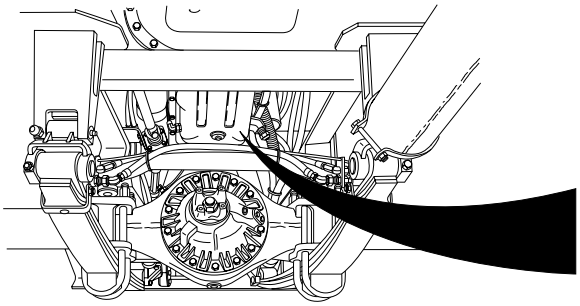
NOTE
There must be at least 4 in. (10 cm) between axle stops and axle housing to remove oil pan.

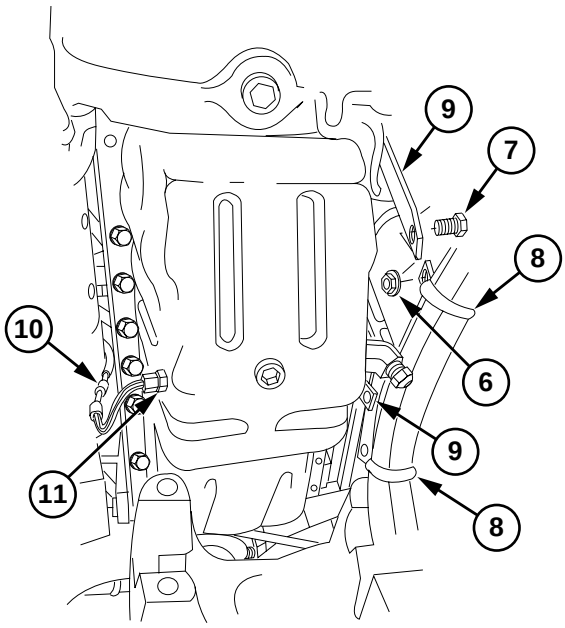
(2) Support frame (3) under front tow eyes (4) with two jackstands (5) and support axle (2) with two jackstands (5).



(3) Remove two locknuts (6), screws (7), and cushion clips (8) from brackets (9). Discard locknuts.

(4) Disconnect electrical connector (10) from STE/ICE oil temperature sensor (11).





WARNING

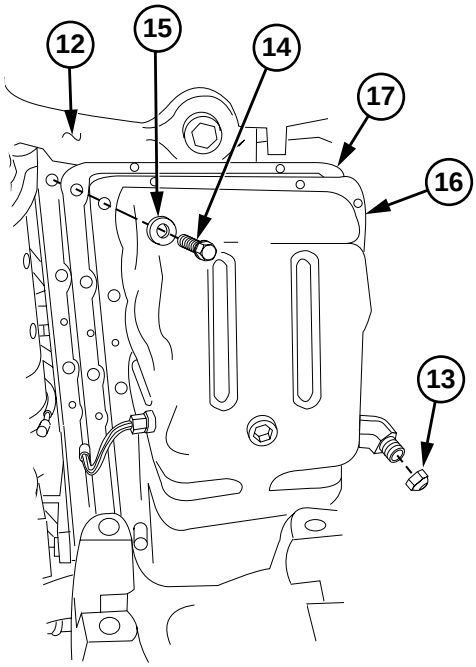
When servicing this vehicle, performing maintenance, or disposing of materials such as engine oil, consult your Unit/local hazardous waste disposal center or safety office for local regulatory guidance. If further information is needed, please contac the Army environmental hotline at 1-800-872-3845. Improper disposal of this material may result in damage to environment or injury to personnel.

(5) Place drain pan under engine block (12).

(6) Remove drain cap (13) and drain oil.

(7) Remove 18 screws (14) and washers (15) from oil pan (16).

(8) Remove oil pan (16) and gasket (17) from underside of engine block (12). Discard gasket.

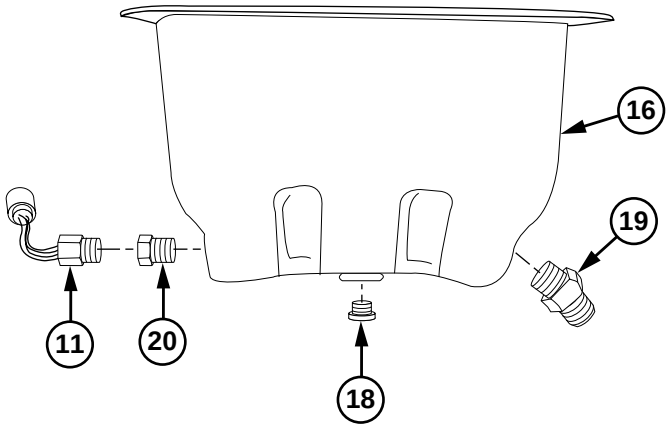


3-20. OIL PAN AND GASKET REPLACEMENT (CONT)

(9) Remove plug (18) from oil pan (16).

(10) Remove elbow (19) from oil pan (16).

(11) Remove STE/ICE oil temperature sensor (11) and bushing (20) from oil pan (16).



b. Cleaning/Inspection

(1) Clean old gasket material from oil pan and engine block.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/ shield, gloves, etc.).

(2) Clean oil pan with fuel oil. Dry with compressed air.

(3) Inspect pan for dents and cracks. Check for misaligned flanges or raised surfaces around screw holes by placing pan on large flat surface. Replace pan if damaged.

c. Installation

WARNING

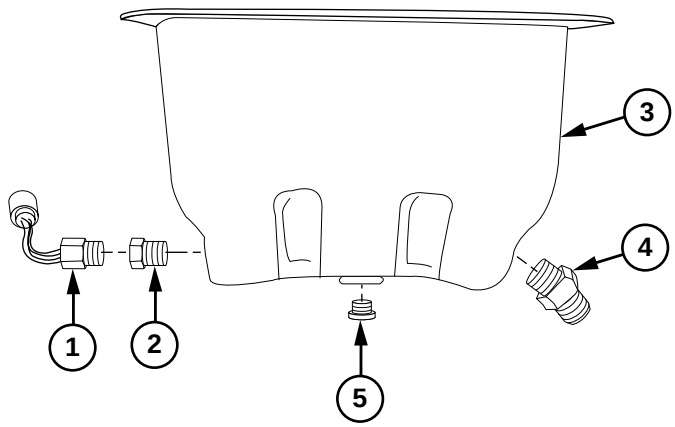
Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Coat threads of STE/ICE oil temperature sensor (1) and bushing (2) with pipe thread sealing compound.

(2) Install STE/ICE oil temperature sensor (1) and bushing (2) on oil pan (3).

(3) Coat threads of elbow (4) and plug (5) with pipe thread sealing compound.

(4) Install elbow (4) and plug (5) on oil pan (3).

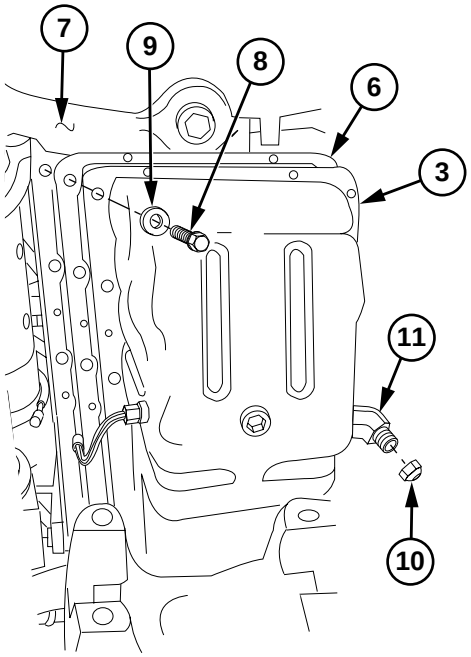


WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(4.1) Cover plug (5) with silicone sealant.

(5) Position new gasket (6) and oil pan (3) on engine block (7).



WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(6) Coat threads of 18 screws (8) with adhesive-sealant.

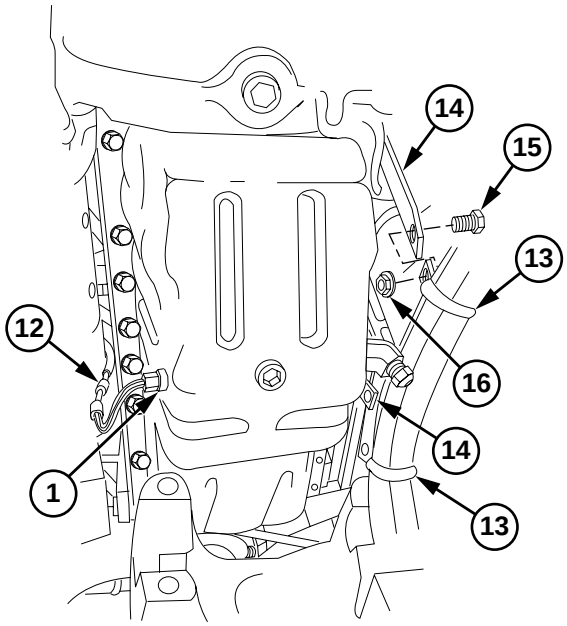
NOTE

Ensure flanged shoulder bolts are used in installation.

(7) Install 18 washers (9) and screws (8) on oil pan (3). Do not tighten.

(8) Starting with two center screws and working alternately toward each end of pan, tighten screws (8) to 120-240 lb-in. (13.5-27 N·m).

(9) Install drain cap (10) on elbow (11).



(10) Connect electrical connector (12) to STE/ICE oil temperature sensor (1).

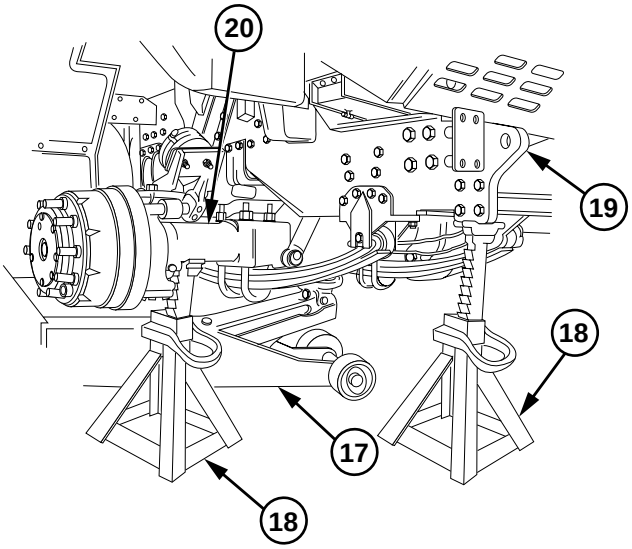
(11) Install two cushion clips (13) on brackets (14) with two screws (15) and new locknuts (16).

3-20. OIL PAN AND GASKET REPLACEMENT (CONT)

(12) Raise HET Tractor with floor jack (17) and remove two jackstands (18) from under front tow eyes (19).

(13) Position two jackstands (18) under axle (20).

(14) Lower HET Tractor onto jackstands (18) and remove floor jack (17).



d. Follow-On Maintenance

(1) Fill oil pan with new oil (LO 9-2320-360-12). Check oil level.

(2) Install transfer case to axle no. 1 propeller shaft (TM 9-2320-360-20).

(3) Install axle no. 1 tie rod (TM 9-2320-360-20).

(4) Install front wheels/tires (TM 9-2320-360-20).

(5) Install axle no. 1 shock absorber bracket (TM 9-2320-360-20).

(6) Install front bumper (TM 9-2320-360-20).

(7) Start engine. Check oil pressure. Run for 20 minutes and check oil level (TM 9-2320-360-10).

(8) Check for leaks (TM 9-2320-360-10).

(9) Remove wheel chocks.

3-21. OIL PRESSURE RELIEF VALVE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

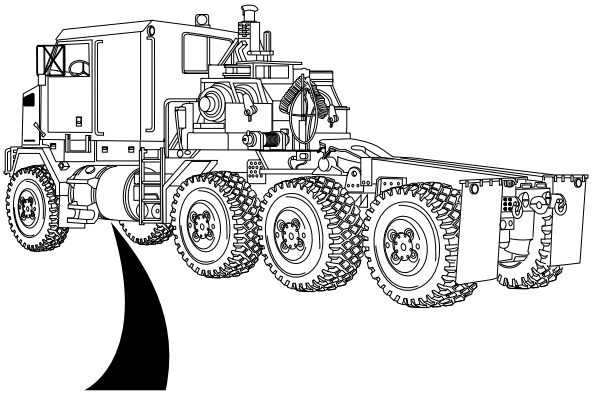
INITIAL SETUP

Equipment Condition
Oil pan removed (3-20).

Materials/Parts
Gasket (Item 35, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

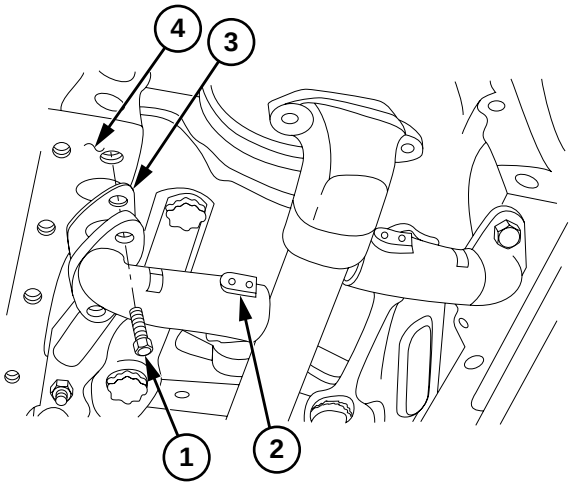
a. Removal

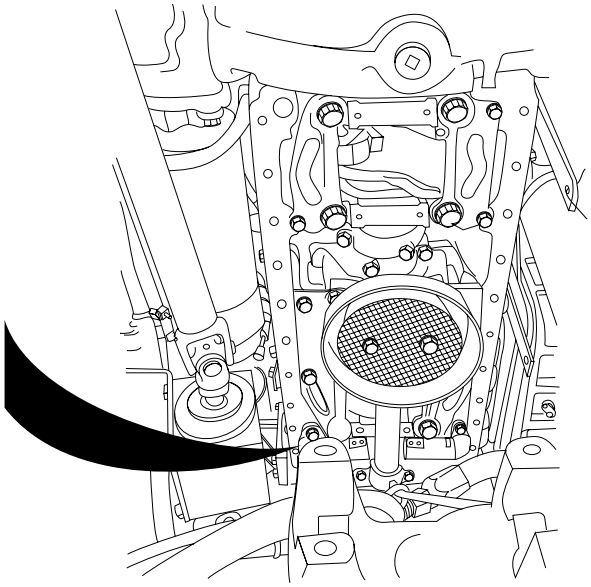


WARNING

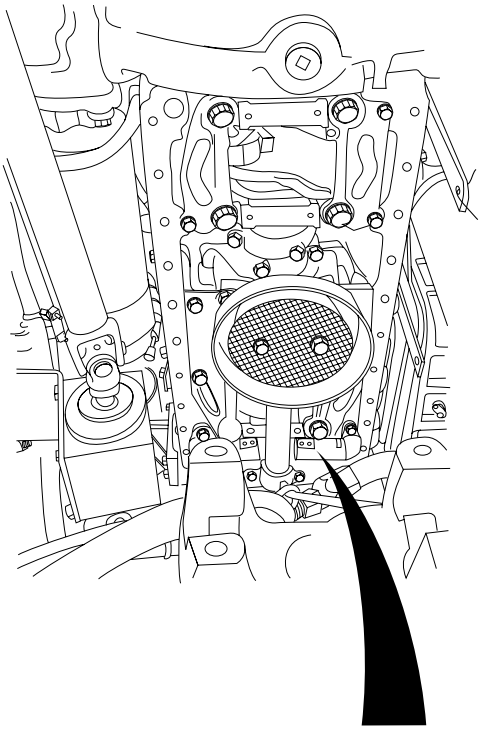
Oil is present above oil pressure relief valve. Wear approved eye protection when removing valve. Failure to comply may result in injury to personnel.

Remove two screws (1), oil pressure relief valve (2), and gasket (3) from engine (4). Discard gasket.





3-21. OIL PRESSURE RELIEF VALVE REPLACEMENT (CONT)

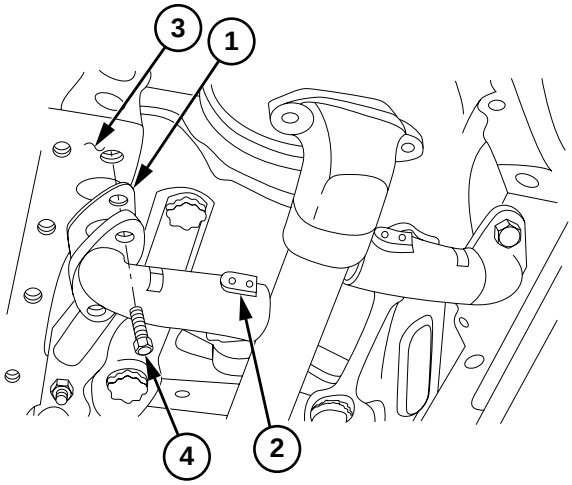


b. Installation

NOTE

Oil pressure relief valve is mounted on right side of engine.

Install new gasket (1) and oil pressure relief valve (2) on engine (3) with two screws (4). Torque to 30-35 lb-ft (41-47 N·m).



c. Follow-On Maintenance

Install oil pan (para 3-20).

3-22. OIL PRESSURE REGULATOR VALVE REPLACEMENT

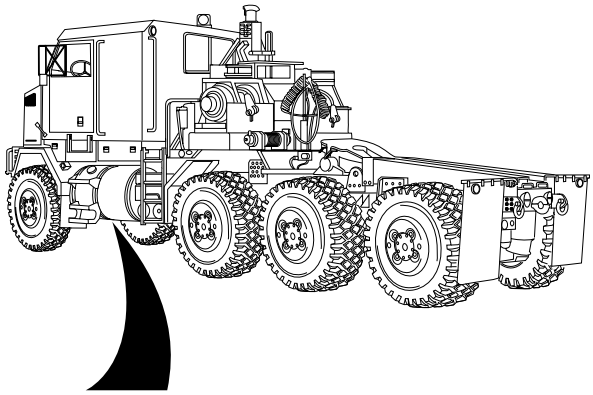
This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Oil pan removed (3-20).

Materials/Parts
Gasket (Item 35, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

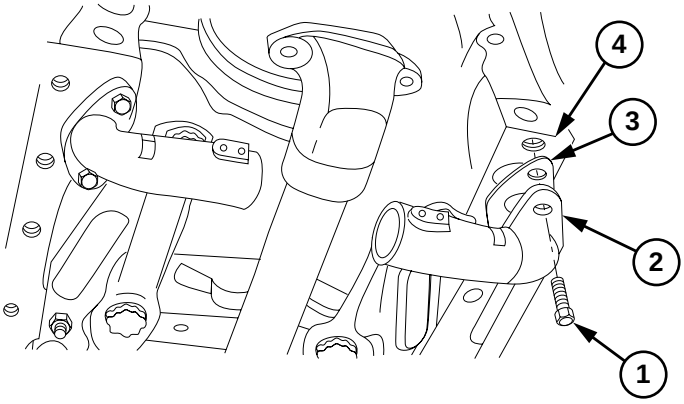


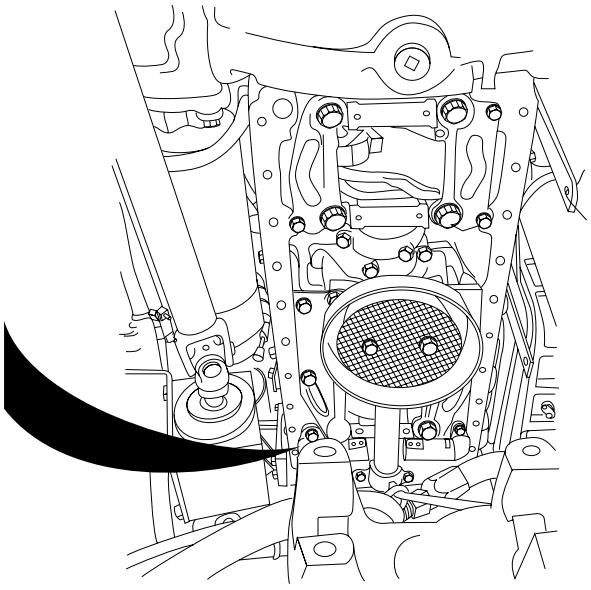
a. Removal

WARNING

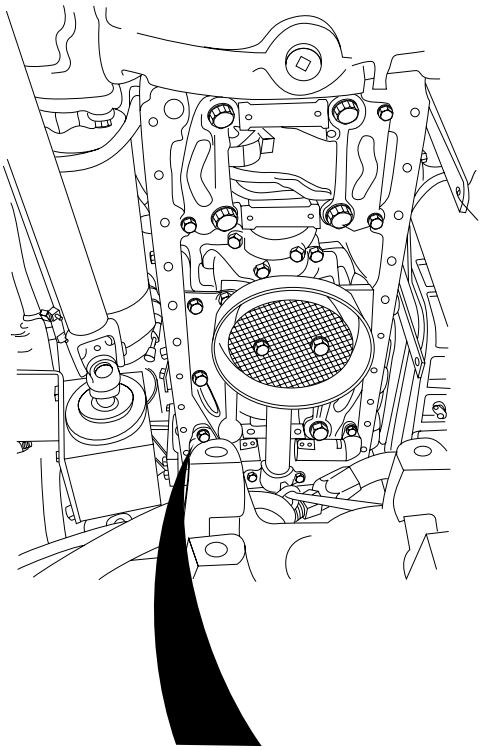
Oil is present above oil pressure regulator valve. Wear approved eye protection when removing valve. Failure to comply may result in injury to personnel.

Remove two screws (1), oil pressure regulator valve (2), and gasket (3) from engine (4). Discard gasket.





3-22. OIL PRESSURE REGULATOR VALVE REPLACEMENT (CONT)

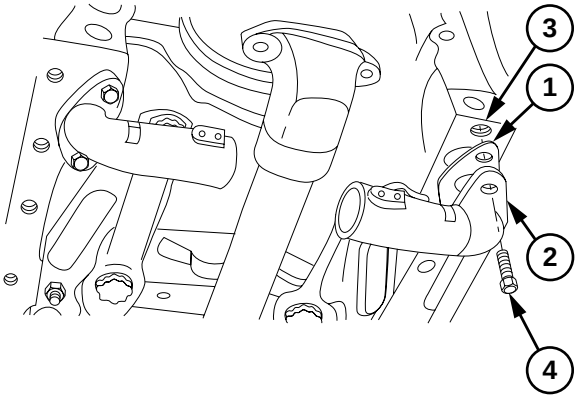


b. Installation

NOTE

Oil pressure regulator valve is mounted on left side of engine.

Install new gasket (1) and oil pressure regulator valve (2) on engine (3) with two screws (4). Torque to 30–35 lb-ft (41–47 N·m).



c. Follow-On Maintenance

Install oil pan (para 3-20).

3-23. EXHAUST MANIFOLD AND GASKET REPLACEMENT

This task covers:
a. Removal
b. Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.
Engine hood opened (TM 9-2320-360-10).
Air cleaner removed (left exhaust manifold only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Clamps (2) (Item 7, Appendix F)
Gaskets (4) (Item 40, Appendix F)
Locknuts (5) (Item 76, Appendix F)

a. Removal

WARNING

Ensure exhaust manifold and exhaust tube are cool before performing maintenance. Failure to comply may result in serious injury to personnel.

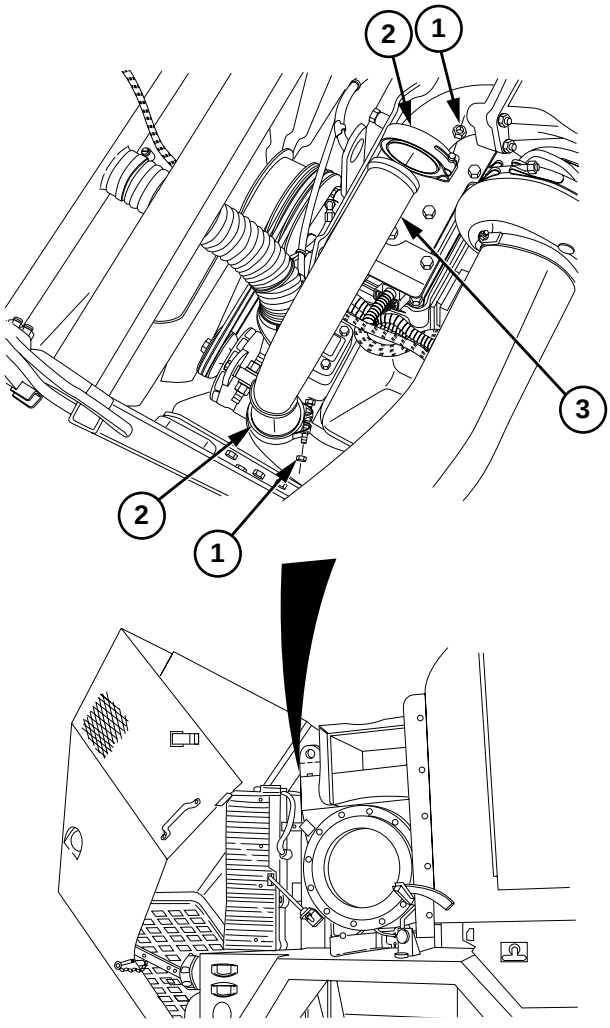
NOTE

Left and right manifolds are removed the same way. Left manifold is shown.

(1) Remove two locknuts (1) from clamps (2) on exhaust tube (3). Discard locknuts.

(2) Remove two clamps (2) and exhaust tube (3) from engine compartment.

(3) Remove two clamps (2) from exhaust tube (3). Discard clamps.



3-23. EXHAUST MANIFOLD AND GASKET REPLACEMENT (CONT)

(4) Loosen three locknuts (4).

(5) Remove two locknuts (5) and two crabs (6) from exhaust manifold (7). Discard locknuts.

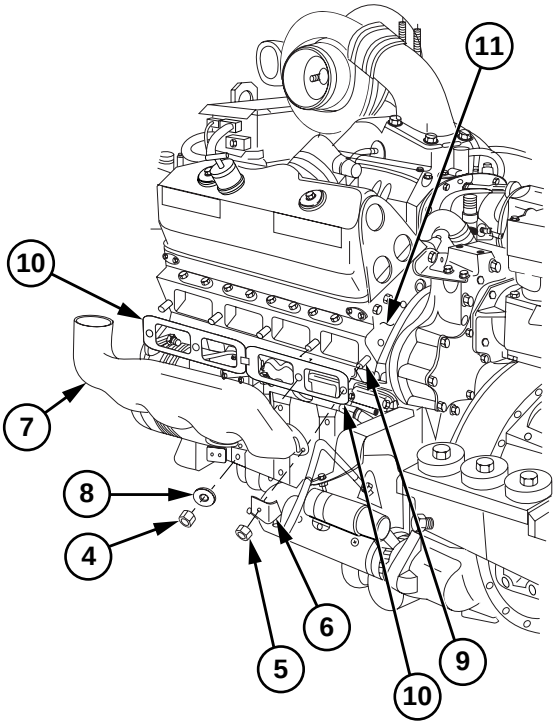
(6) Remove exhaust manifold (7), three locknuts (4), and washers (8) from studs (9). Discard locknuts.

(7) Remove two gaskets (10) from cylinder head (11). Discard gaskets.

NOTE

Do step (8) only if stud(s) fail inspection.

(8) Remove stud(s) (9) from cylinder head (11).



ENGINE REMOVED FROM TRUCK FOR CLARITY

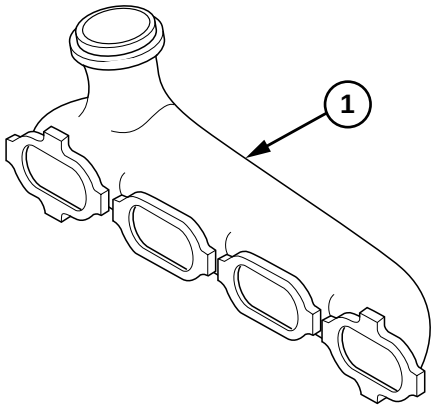
b. Inspection

CAUTION

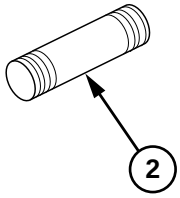
It is important to clean manifold to prevent loose scale from entering and damaging turbocharger.

(1) Remove loose scale and carbon from internal walls of exhaust manifold (1).

(2) Inspect manifold (1) for cracks and breaks.



(3) Inspect for broken, worn, or stripped threads on studs (2). Replace stud(s) if damaged.



c. Installation

NOTE

Do step (1) only if stud(s) were removed.

(1) Install stud(s) (1) on cylinder head (2). Torque to 24-40 lb-ft (34-54 N·m).

NOTE

Gaskets may look reuseable, but once removed they must be replaced.

(2) Install two new gaskets (3) with crimped side facing cylinder head (2).

NOTE

Washers must be installed with crown at center of washer facing out.

(3) Install three washers (4) and new locknuts (5) on studs (1). Do not tighten.

NOTE

Exhaust manifold locating pads must rest on cylinder block locating pads.

(4) Position exhaust manifold (6) on studs (1).

NOTE

Exhaust tube may not fit if turbocharger was removed. Turbocharger clamp may have to be loosened and turbocharger adjusted to align with tube.

(5) Install exhaust tube (7) with two new clamps (8) on exhaust manifold (6) and turbocharger (9).

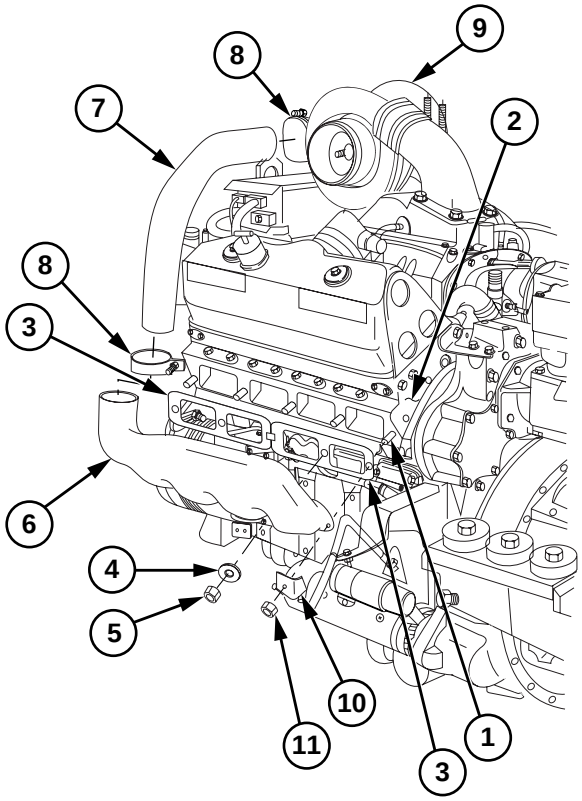
(6) Install two crabs (10) and locknuts (11). Do not tighten.

CAUTION

Be sure to tighten nuts from center nut outward. Tightening outside nuts first can crack exhaust manifold.

(7) Tighten locknuts (5) to 30-35 lb-ft (41-47 N·m).

(8) Tighten locknuts (11) to 30-35 lb-ft (41-47 N·m).



d. Follow-On Maintenance

(1) Install air cleaner (left exhaust manifold only) (TM 9-2320-360-20).

(2) Close engine hood (TM 9-2320-360-10).

(3) Remove wheel chocks.

3-24. WATER PUMP DRIVE GEAR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Front cover removed (para 3-15).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Remover, Pulley, Cam Gear and Water Pump (Item 136, Appendix E)
Remover, Water Pump Pulley (Item 136, Appendix E)
Vise, Machinist's (Item 207, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench Set, Socket, 3/4 In. (Item 231, Appendix E)

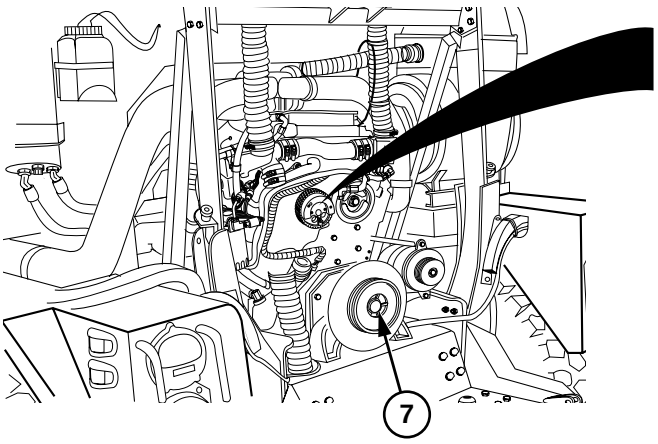
Tools and Special Tools (Cont)
Wrench, Combination, 1-5/16 In. (Item 216, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

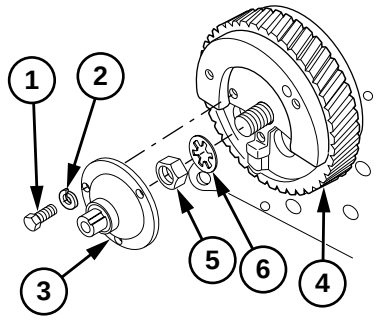
Materials/Parts
Lockwashers (3) (Item 119, Appendix F)
Lockwasher (Item 141, Appendix F)

a. Removal

(1) Remove three screws (1), lockwashers (2), and hub (3) from drive gear (4). Discard lockwashers.

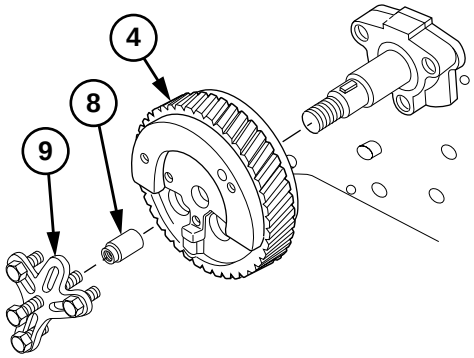
(2) Remove retaining nut (5) and lockwasher (6) from drive gear (4) while assistant holds crankshaft screw (7). Discard lockwasher.

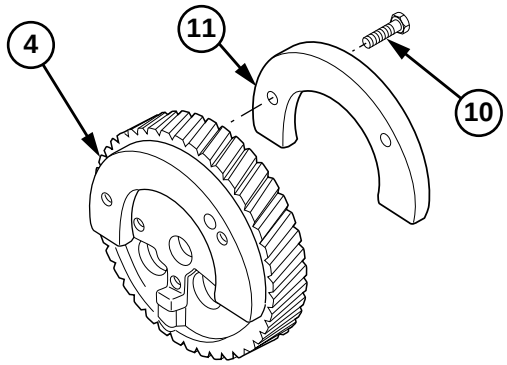




(3) Remove drive gear (4) with water pump pulley remover (8) and puller (9).

(4) Remove puller (9) and water pump pulley remover (8) from drive gear (4).

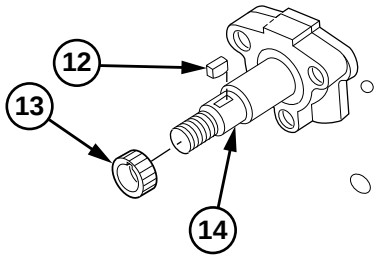




(5) Install drive gear (4) in vise.

(6) Remove two drive screws (10) from balance weight (11).

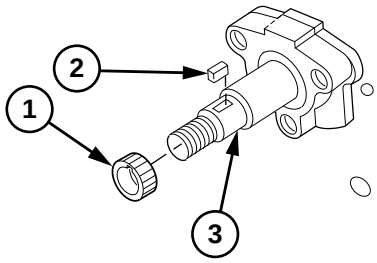
(7) Remove balance weight (11) from drive gear (4).

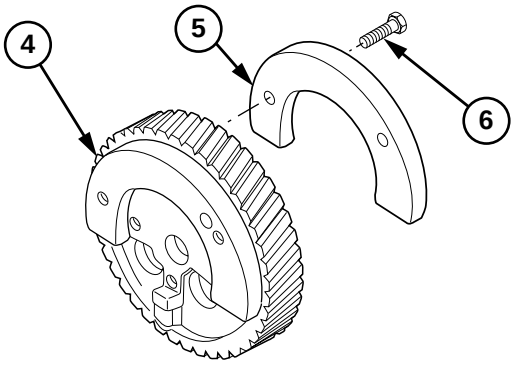


(8) Remove key (12) and spacer (13) from shaft (14).

b. Installation

(1) Install spacer (1) then key (2) on shaft (3).





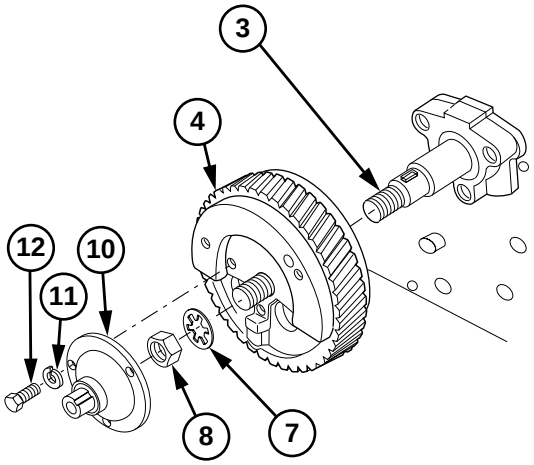
(2) Install drive gear (4) in vise.

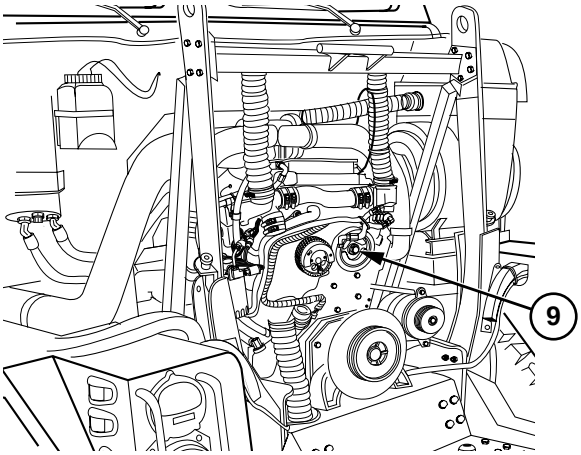
(3) Install balance weight (5) on gear (4) with two screws (6). Torque to 35–40 lb–ft (47–54 N·m).

3-24. WATER PUMP DRIVE GEAR REPLACEMENT (CONT)

(4) Install drive gear (4), new lockwasher (7), and retaining nut (8) on shaft (3) while assistant holds camshaft nut (9). Torque nut to 300-325 lb-ft (407-441 N·m).

(5) Install hub (10) with three new lockwashers (11) and screws (12). Torque to 175 lb-in. (20 N·m).





c. Follow-On Maintenance

Install front cover (para 3-15).

3-25. TACHOMETER DRIVE GEAR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Tachometer sending unit removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

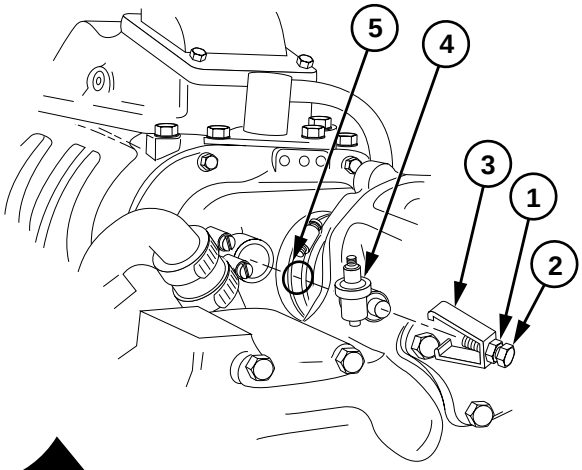
Materials/Parts
Gasket (Item 47, Appendix F)

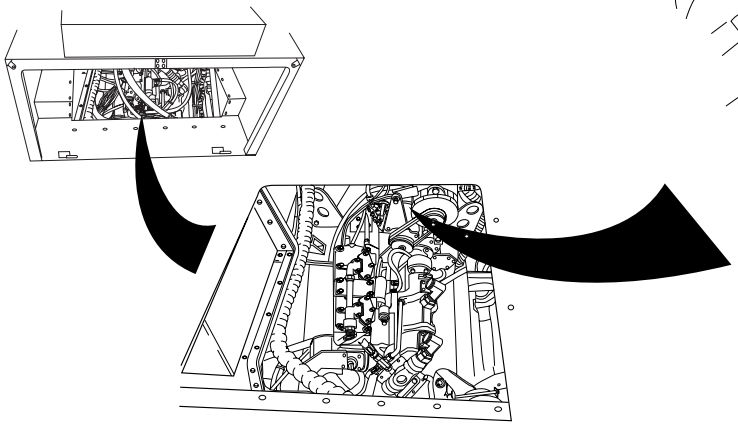
a. Removal

(1) Loosen jamnut (1).

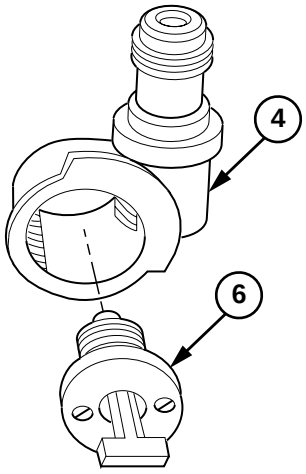
(2) Loosen screw (2) and remove clamp (3).

(3) Remove tachometer drive housing (4) and gasket (5). Discard gasket.





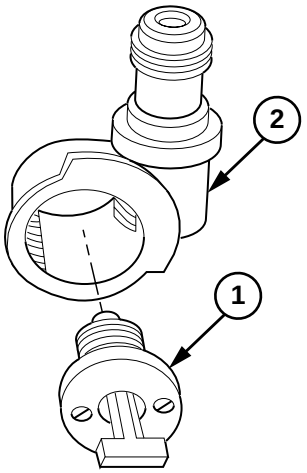
(4) Remove tachometer drive gear (6) from tachometer drive housing (4).



3-25. TACHOMETER DRIVE GEAR REPLACEMENT (CONT)

b. Installation

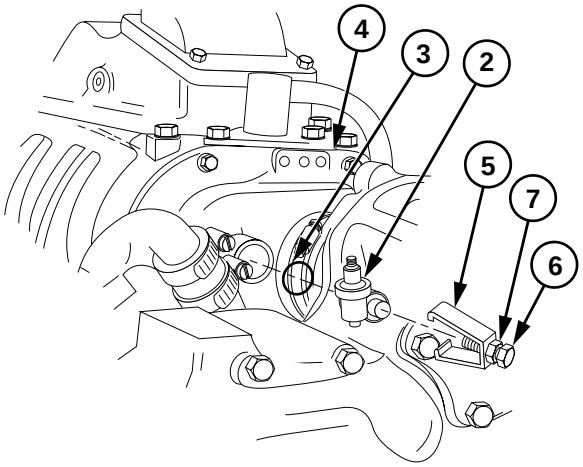
(1) Install tachometer drive gear (1) in tachometer drive housing (2).



(2) Install new gasket (3) and housing (2) on blower cover (4).

(3) Install clamp (5) and tighten screw (6).

(4) Tighten jamnut (7) on screw (6).



c. Follow-On Maintenance

(1) Install tachometer sending unit (TM 9-2320-360-20).

(2) Start engine (TM 9-2320-360-10).

(3) Check tachometer operation (TM 9-2320-360-10).

(4) Shut off engine (TM 9-2320-360-10).

3-26. ENGINE BRAKE RETARDER REPLACEMENT

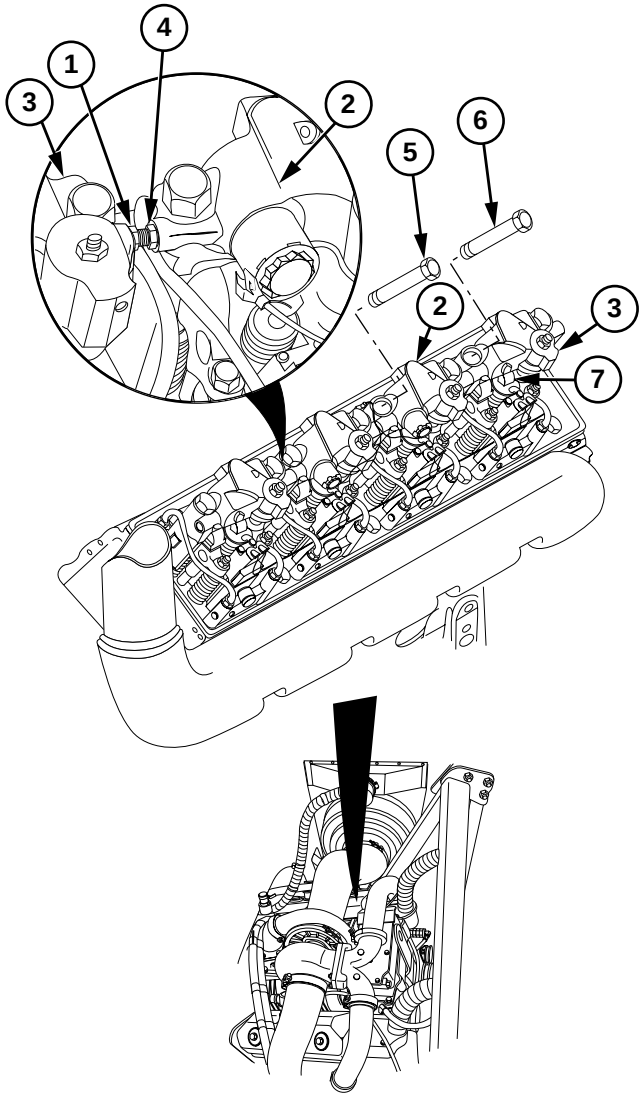
This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Batteries disconnected (TM 9-2320-360-20).
Engine brake retarder wire harness removed (para 6-16).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Ring, Seal (Item 248, Appendix F)



a. Removal

NOTE

- All engine brake retarders are replaced the same way. Forward set on left cylinder head is shown.
- Supply brakes are equipped with solenoids.

(1) Loosen connector nut (1) between right brake (2) and left brake (3).

(2) Screw connector (4) into left brake (3) to clear right brake (2).

(3) Remove two mounting screws (5) from right brake (2) and two mounting screws (6) from left brake (3).

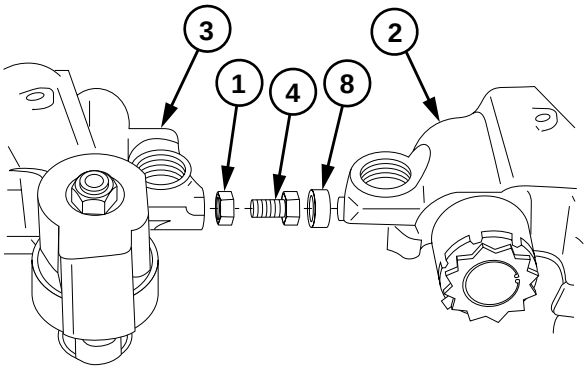
(4) Remove right brake (2) and left brake (3) from injector rocker clevis (7).

3-26. ENGINE BRAKE RETARDER REPLACEMENT (CONT)

(5) Remove connector (4) and nut (1) from left brake (3).

(6) Remove seal ring (8) from right brake (2). Discard seal ring.

(7) Repeat steps (1) thru (6) for remaining right and left brakes.

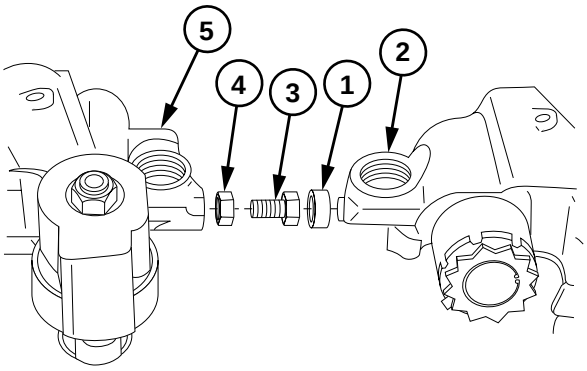


b. Installation

(1) Install new seal ring (1) in right brake (2).

(2) Install connector (3) with nut (4) in left brake (5).

(3) Screw in connector (3) about 1/2 in. (13 mm).



NOTE

Engine mounting surface must be clean before positioning right and left brakes on engine.

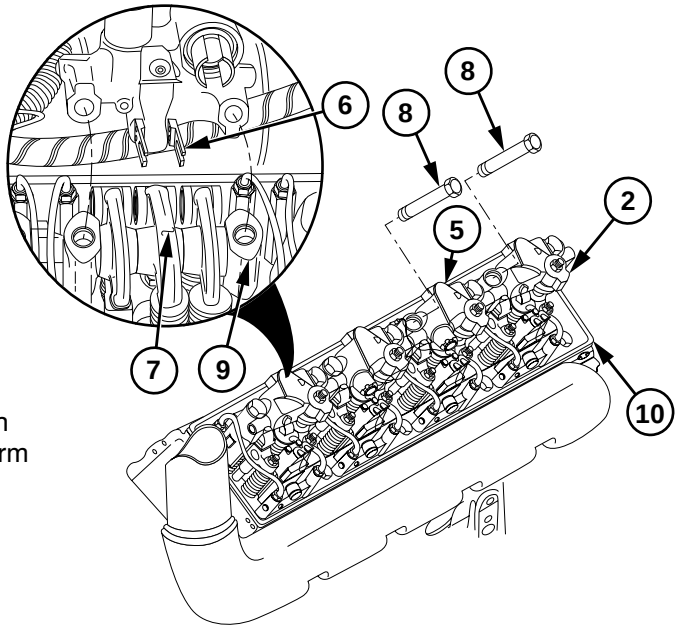
(4) Position master piston fork assembly (6) over injector rocker clevis (7).

(5) Install right brake (2) and left brake (5) with four mounting screws (8) through rocker arm shaft (9) to cylinder head (10).

(6) Tighten screws (8) to 45 lb-ft (61 N·m).

(7) Tighten screws (8) to 88-92 lb-ft (119-124 N·m).

(8) Move master piston fork assembly (6) up and down several times to make sure it rides freely on injector rocker clevis (7).

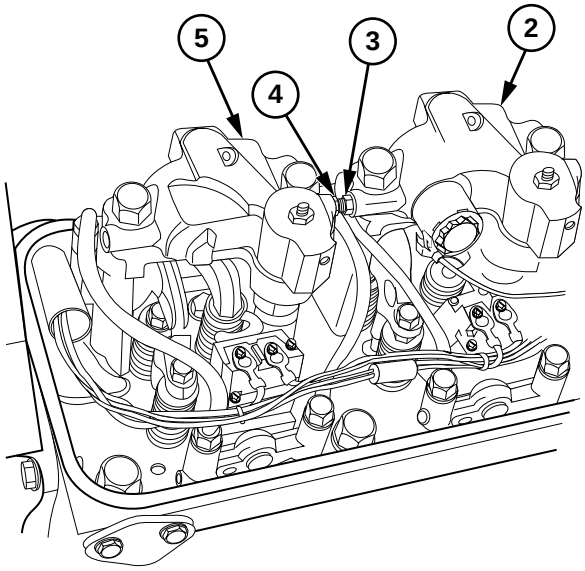


CAUTION

Connector must be backed off to allow movement of brake and rocker arm assemblies. Failure to comply may result in damage to equipment.

NOTE

Forward set on left cylinder head is shown.



(9) Unscrew connector (3) from left brake (5) until connector (3) contacts right brake (2).

(10) Back off connector (3) 1/3 turn away from right brake (2).

(11) Hold connector (3) and tighten nut (4) against left brake (5).

(12) Repeat steps (1) thru (11) for remaining right and left brakes

c. Follow-On Maintenance

(1) Adjust exhaust valve clearance (para 3-27).

(2) Adjust fuel injector timing (para 3-27).

(3) Adjust engine brake retarder (para 3-27).

(4) Install engine brake retarder wire harness (para 6-16).

(5) Connect batteries (TM 9-2320-360-20).

(6) Start and run engine for 10 minutes (TM 9-2320-360-10).

(7) Turn on engine brake switch (TM 9-2320-360-10).

(8) Open throttle to full engine speed and release.

(9) Check engine brake operation when returning to idle.

(10) Repeat full-throttle and release procedure six to eight times to bleed air from engine brake system.

(11) Shut off engine (TM 9-2320-360-10).

3-27. ENGINE TUNE-UP SERVICE/ADJUST/CALIBRATE

This task covers:
a. Exhaust Valve Clearance Adjustment
b. Engine Brake Retarder Adjustment
c. Fuel Injector Timing Adjustment
d. Follow-On Maintenance

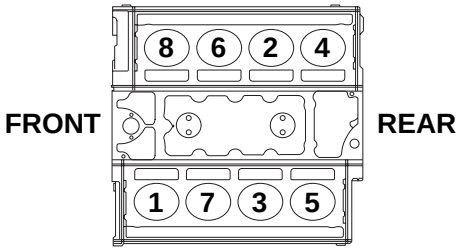
INITIAL SETUP

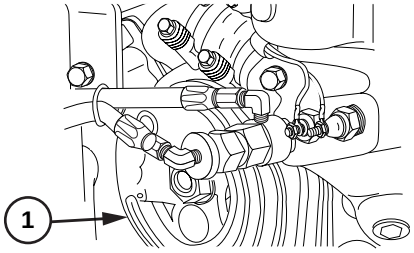
Equipment Condition
Engine temperature 100^{0}F (38^{0}C) or less
Rocker covers removed (TM 9-2320-360-20)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Timing Gage, Injector (Item 194, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

NOTE

- To reduce maintenance time, para 3-27a and 3-27b may be done for each cylinder at the same time without rotating engine.
- Exhaust valve and brake retarder adjustments for all cylinders can be completed during one revolution of the crankshaft if para 3-27a and 3-27b are performed in cylinder sequence shown.





a. Exhaust Valve Clearance Adjustment

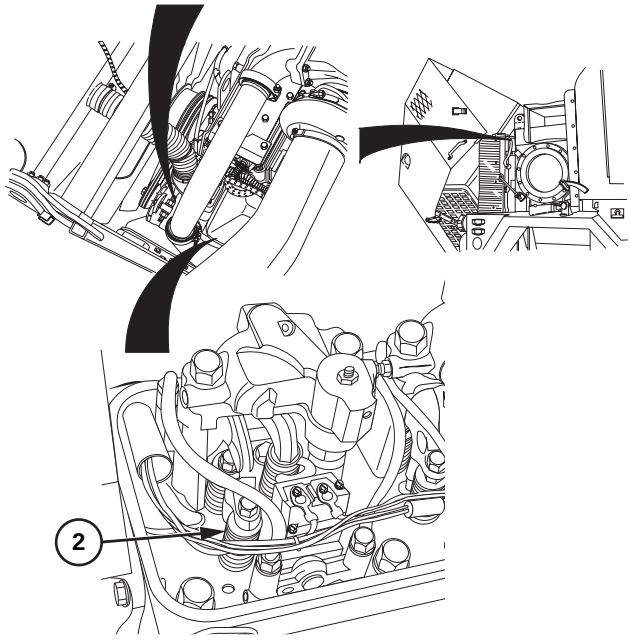
CAUTION

Do not turn camshaft pulley counterclockwise. Failure to comply may result in engine damage. If pulley loosens during procedure, it must be torqued.

NOTE

Exhaust valves are fully closed when push rod sides of rocker arms are at their lowest point and injector follower is fully depressed.

(1) Rotate crankshaft by turning camshaft pulley (1) clockwise until exhaust valves (2) are fully closed.



(2) Loosen locknut (3) on exhaust valve rocker arm push rod (4).

NOTE

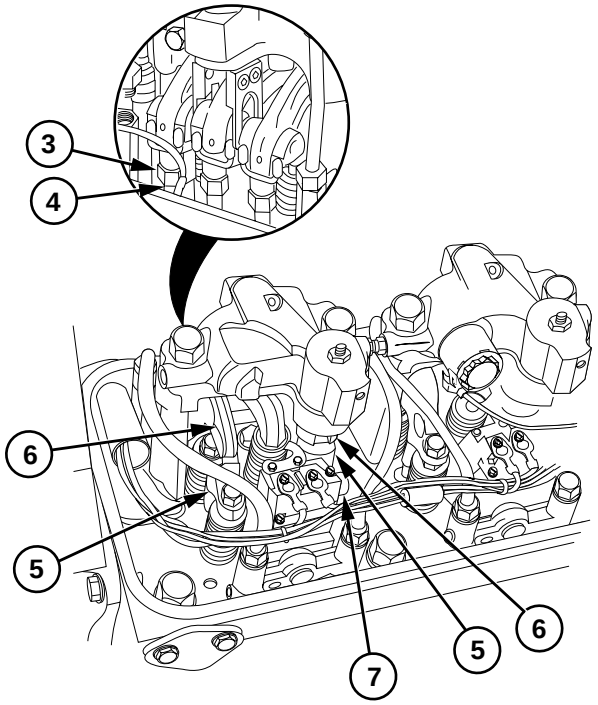
If a .012 in. – .020 in. feeler gage will pass between the valve bridge and the valve rocker arm pallet, the valve clearance is OK, go to step (6).

(3) Insert feeler gage between valve bridge (5) and valve rocker arm pallet (6).

(4) Adjust push rod (4) until slight drag is felt on .016 in. feeler gage.

(5) Remove feeler gage and tighten push rod locknut (3). Check clearance.

(6) Repeat steps (1) thru (5) to adjust exhaust valves (7) on remaining seven cylinders.



b. Engine Brake Retarder Adjustment

CAUTION

Ensure exhaust valves are closed and injector follower is fully depressed to prevent damage to engine.

NOTE

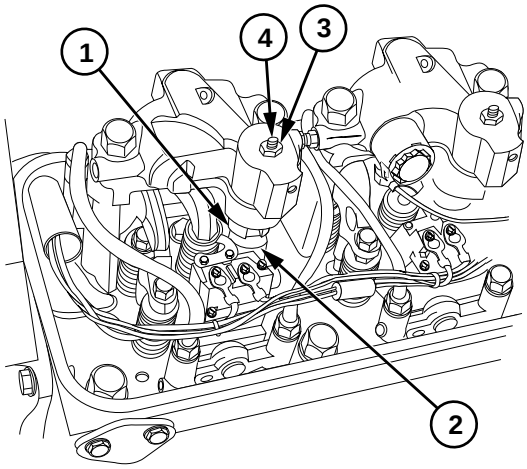
Exhaust valves are fully closed when push rod sides of rocker arms are at their lowest point and injector follower is fully depressed.

(1) Insert 0.059 in. feeler gage between slave piston foot (1) and exhaust valve bridge (2).

(2) Loosen locknut (3) and turn adjusting screw (4) until slight drag is felt on feeler gage.

(3) Check both feet of slave piston (1) with feeler gage.

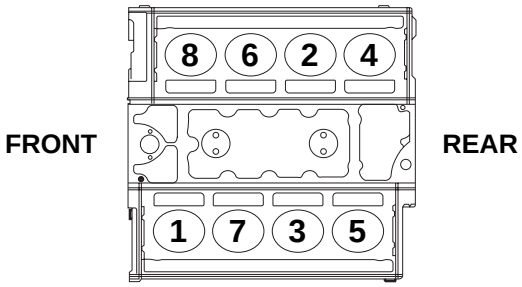
(4) Hold adjusting screw (4). Torque locknut (3) to 180–216 lb–in. (20.3–24.4 N·m). Check clearance.



3-27. ENGINE TUNE-UP SERVICE/ADJUST/CALIBRATE (CONT)

NOTE

Fuel injector timing adjustment for all cylinders can be completed during one revolution of the crankshaft if para 3-27c is performed in cylinder sequence shown.



c. Fuel Injector Timing Adjustment

NOTE

Exhaust valves are fully opened when push rod sides of rocker arms are at their highest point.

(1) Rotate crankshaft by turning camshaft pulley (1) clockwise until exhaust valves (2) are fully opened.

(2) Insert 1.520 injector gage (3) in hole at top of fuel injector body (4).

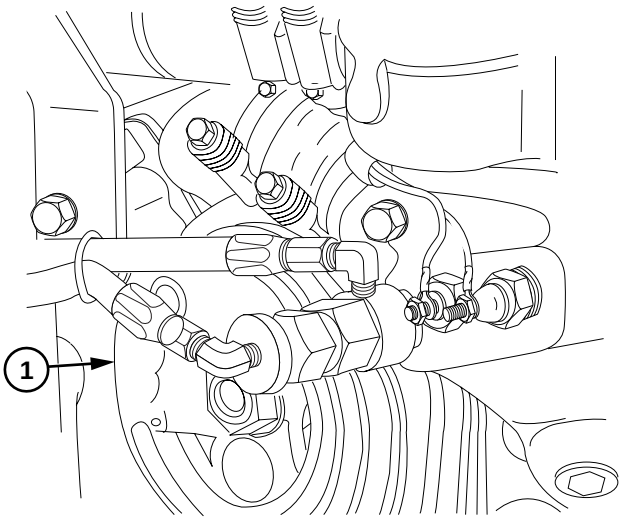
(3) Loosen locknut (5) on injector rocker arm push rod (6).

(4) Turn push rod (6) and adjust injector rocker arm (7) so flat side of injector gage (3) passes just over top of injector follower (2).

(5) Hold push rod (6) and tighten locknut (5).

(6) Insert injector gage (3) in fuel injector body (4) and check clearance of injector follower (2). Repeat steps (2) thru (5) if further adjustment is necessary.

(7) Repeat steps (1) thru (6) to adjust timing of remaining seven fuel injectors (8).



d. Follow-On Maintenance

(1) Install rocker covers (TM 9-2320-360-20).

(2) Start engine and operate for 10 minutes (TM 9-2320-360-20).

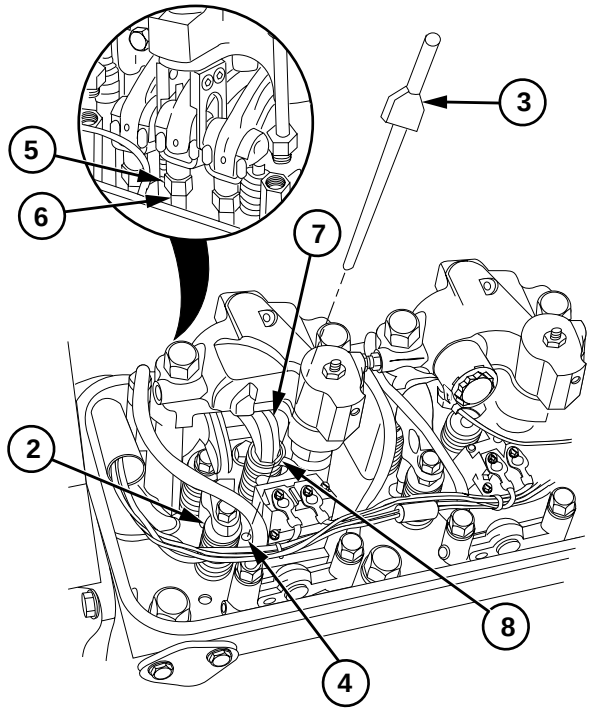
(3) Turn on engine brake retarder switch (TM 9-2320-360-20).

(4) Open throttle to full engine speed and release.

(5) Check brake operation while engine is returning to idle.

(6) Repeat full throttle and release procedure six to eight times to bleed air from engine brake system.

(7) Turn engine off (TM 9-2320-360-10).



3-28. ENGINE TESTING

This task covers:
a. Compression Check
b. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Air cleaner assembly removed (TM (TM 9-2320-360-20).
Exhaust pipe removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Gage Set, Cylinder Compression (Item 54, Appendix E)
Wrench, Fuel Line Nut (Item 222, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Rags (Item 51, Appendix B)
Tie, Cable, Plastic (Item 60, Appendix B)
Clamps (2) (Item 7, Appendix F)
Fuel Pipe, Jumper (Item 13, Appendix F)
Gasket (Item 29, Appendix F)
Locknuts (2) (Item 81, Appendix F)
Locknut (Item 96, Appendix F)
Lockwashers (2) (Item 120, Appendix F)
Rings, Seal (34) (Item 272, Appendix F)

Personnel Required
Two

NOTE

Engine temperature should remain between 180-200°F (93-97°C) during engine testing procedure.

a. Compression Check

(1) Start engine and run until normal operating temperature is reached (TM 9-2320-360-10).

(2) Stop engine (TM 9-2320-360-10).

3-28. ENGINE TESTING (CONT)

WARNING

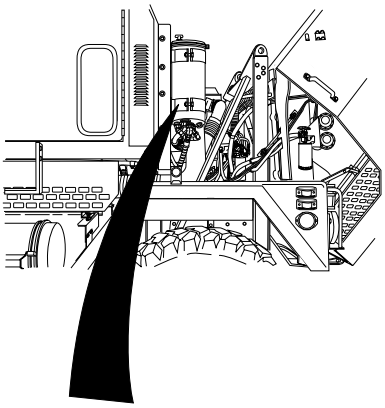
- **Exhaust manifolds and engine parts are hot. Use care to prevent personal injury.**
- **Use caution when working near hood mounting bracket that extends beyond firewall. Failure to comply may result in injury to personnel.**

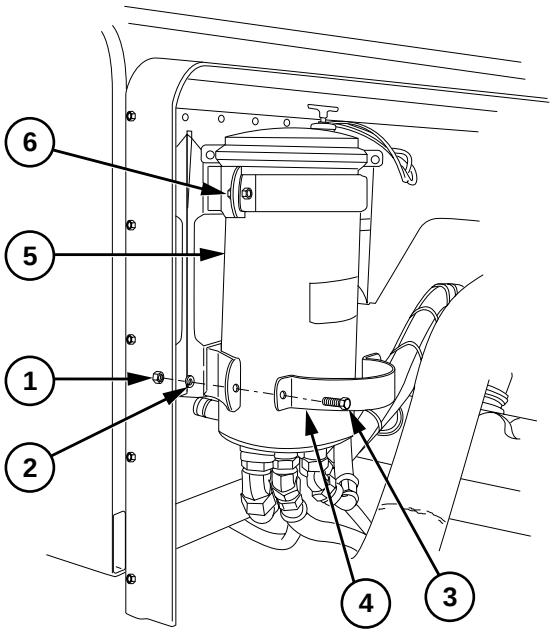
CAUTION

Clean around rocker cover before removing each cover from engine. This will keep dust or dirt from entering cylinder heads.

NOTE

- Right and left side cylinder compression checks are performed in the same manner.
- Both rocker covers are replaced in a similar manner. Right cover is shown.
- Do steps (1) thru (10) for right rocker cover only.





(3) Remove two nuts (1), lockwashers (2), screws (3), and lower band (4) from steering reservoir (5). Discard lockwashers.

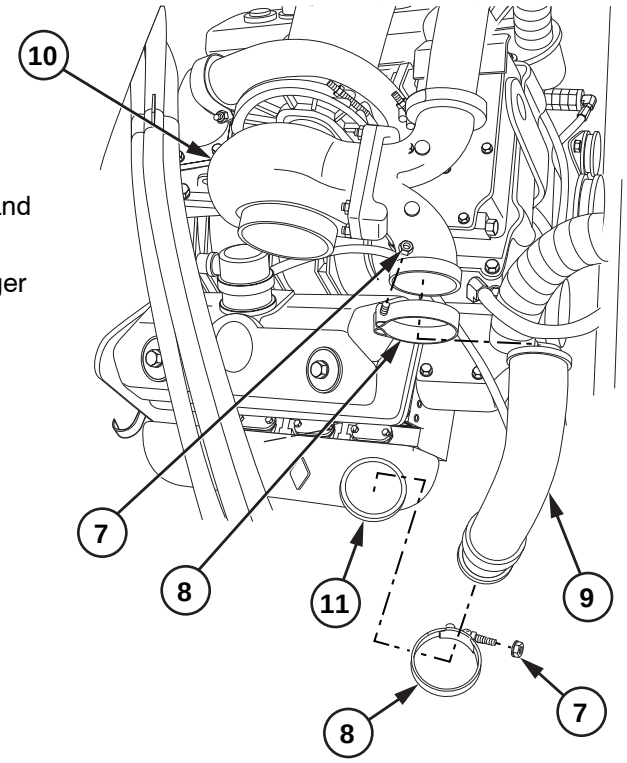
WARNING

Support steering reservoir before loosening band. Failure to comply may result in injury to personnel.

(4) Loosen two nuts (6).

(5) Raise steering reservoir (5) about 5 in. (13 cm) and support.

(6) Tighten two nuts (6).

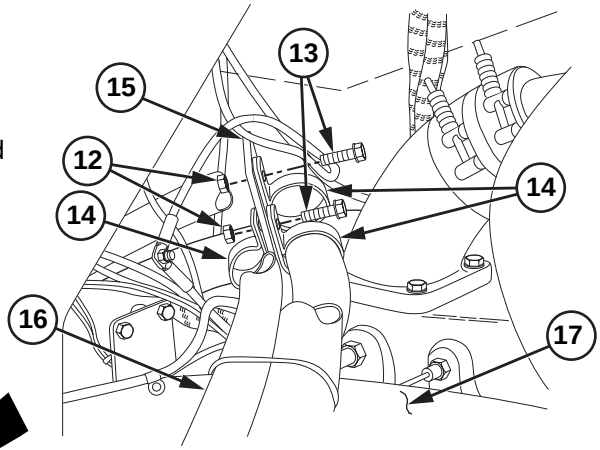


(7) Remove two locknuts (7) and clamps (8) from exhaust tube (9). Discard locknuts and clamps.

(8) Remove exhaust tube (9) from turbocharger (10) and exhaust manifold (11).

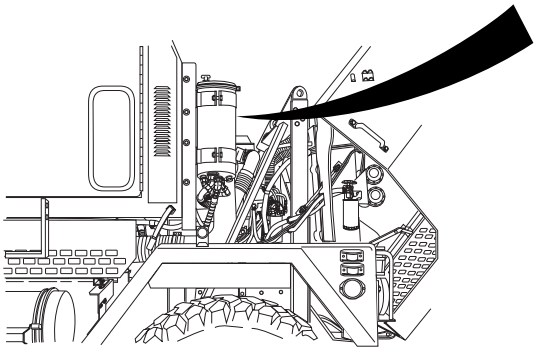
WARNING

Exhaust manifolds and engine parts are hot. Use care to prevent personal injury.



(9) Remove two locknuts (12), screws (13), and three clips (14) from bracket (15). Discard locknuts.

(10) Secure power steering hoses (16) away from rocker cover (17).



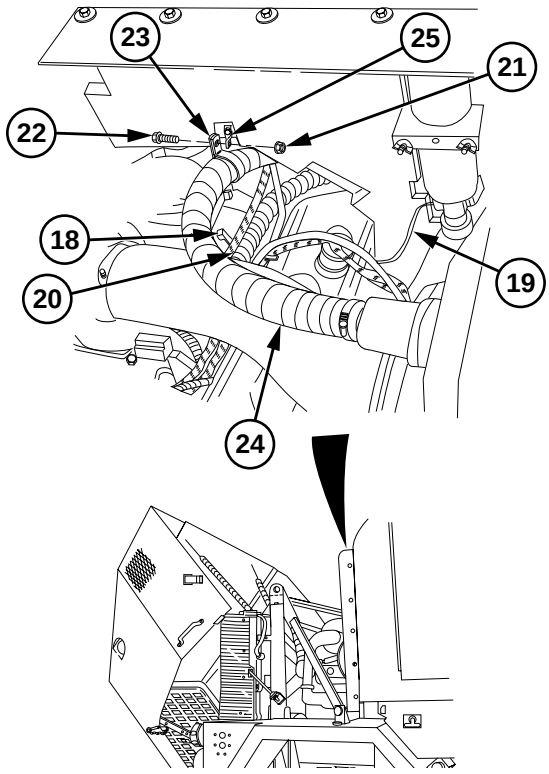
3-28. ENGINE TESTING (CONT)

NOTE

- Location of plastic cable tie should be marked before removal.
- Do steps (11) and (12) for left rocker cover only.

(11) Remove plastic cable tie (18) securing ether start hose (19) to breather tube (20).

(12) Remove locknut (21), screw (22), and clip (23), and air aspiration hose no. 2938 (24) from firewall (25). Discard locknut.

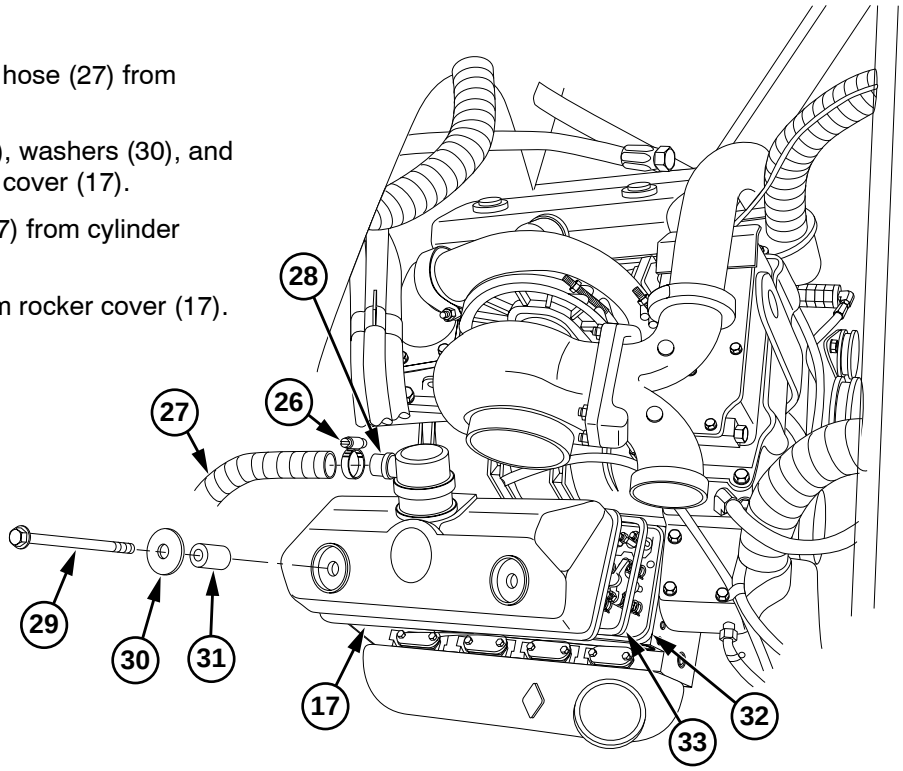


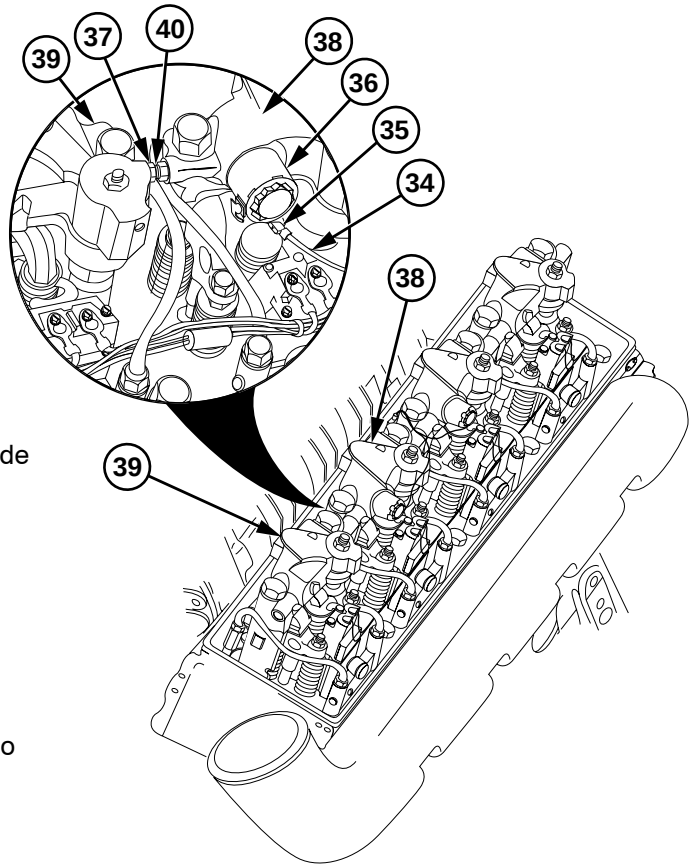
(13) Remove clamp (26) and hose (27) from breather retainer (28).

(14) Remove two screws (29), washers (30), and mounts (31) from rocker cover (17).

(15) Remove rocker cover (17) from cylinder head (32).

(16) Remove gasket (33) from rocker cover (17). Discard gasket.





NOTE

Supply brakes are equipped with solenoids. Do step (17) for supply brakes only.

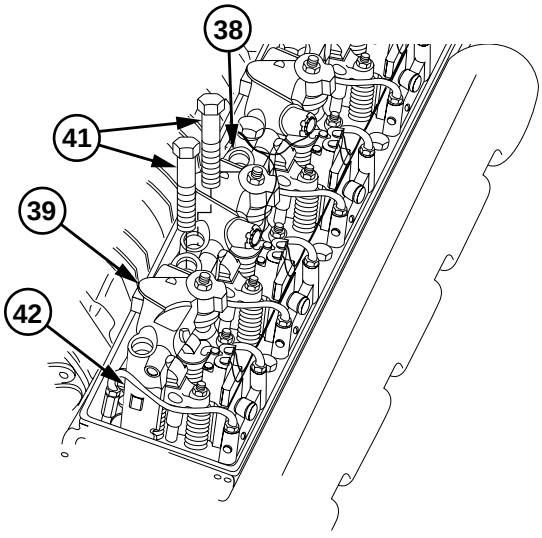
(17) Remove solenoid valve wire (34) and spade connector (35) from solenoid valve (36).

(18) Loosen connector nut (37) between right brake (38) and left brake (39).

NOTE

Forward brake set on left side is shown.

(19) Screw connector (40) into left brake (39) to clear right brake (38).



(20) Remove two screws (41) and brake (38 or 39) from two mounting posts (42).

3-28. ENGINE TESTING (CONT)

NOTE

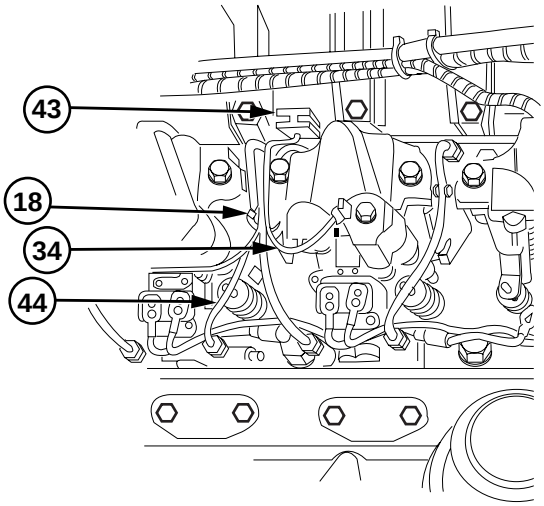
Do steps (21) and (22) for middle two cylinders only.

(21) Remove rubber harness support (43) from fuel pipes (44).

NOTE

Location of plastic cable ties should be marked before removal.

(22) Remove plastic cable tie (18) from fuel pipe (44) and solenoid valve wire (34).

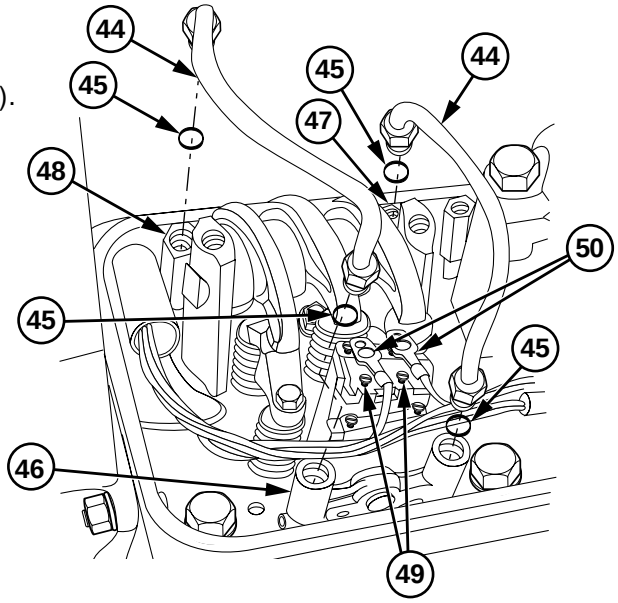


(23) Remove two fuel pipes (44) and four seal rings (45) from injector (46), fuel return connector (47), and fuel inlet connector (48). Discard seal rings.

CAUTION

Screws are designed not to be removed. Loosen screws only two turns. Failure to comply may result in damage to injector.

(24) Loosen two retaining screws (49) and remove two wire terminals (50) from injector (46).

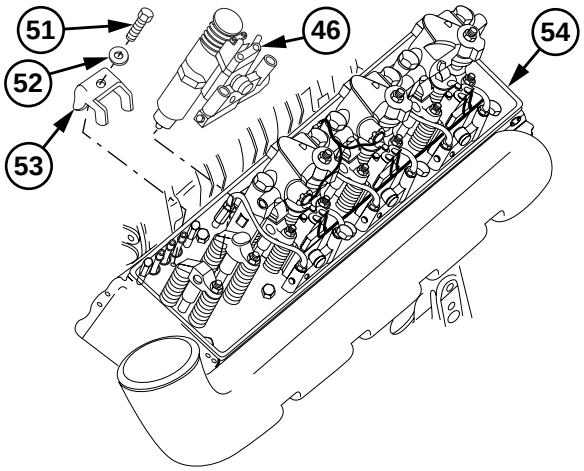


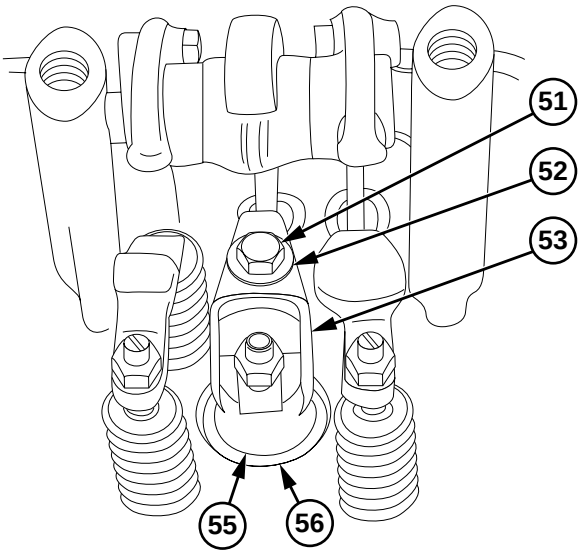
NOTE

Rocker arm assembly can be lifted for easier access to injector screw.

(25) Remove screw (51), convex washer (52), and clamp (53) from cylinder head (54) and injector (46).

(26) Remove injector (46) from cylinder head (54).

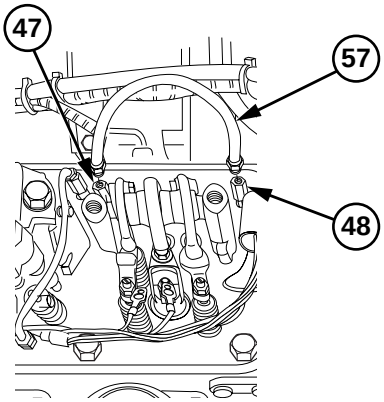




NOTE

Gage adapter must be installed with gage fitting facing out.

(27) Install gage adapter (55) in injector tube (56) with clamp (53), convex washer (52), and screw (51). Torque screw to 240–300 lb–in. (27.1–33.9 N·m).



NOTE

Jumper fuel pipe is carefully bent to desired shape to make connection between fuel inlet and return connectors.

(28) Install jumper fuel pipe (57) on fuel inlet connector (48) and fuel return connector (47). Torque to 145 lb–in. (16.3 N·m).

NOTE

Holes in rocker arm shaft must be aligned with holes in mounting posts.

(29) Install brake (38 or 39) on two mounting posts (42) with two screws (41). Torque to 90–100 lb–ft (122–136 N·m).

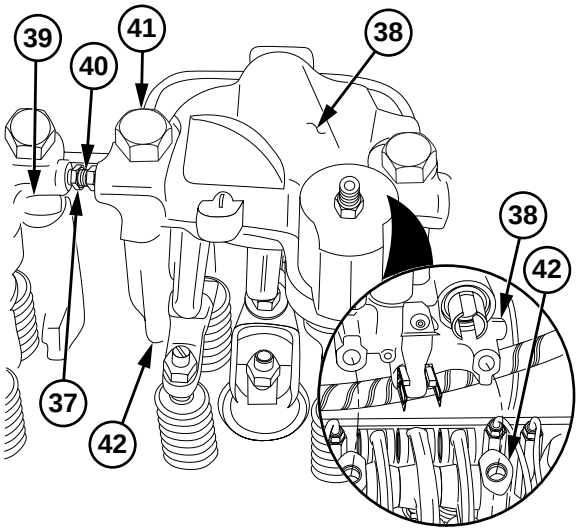
CAUTION

Connector must be backed off to allow movement of brake and rocker arm assemblies. Failure to comply may result in damage to equipment.

(30) Unscrew connector (40) from left brake (39) until connector contacts right brake (38).

(31) Back off connector (40) 1/3 turn away from right brake (38).

(32) Hold connector (40) and tighten nut (37) against left brake (39).



3-28. ENGINE TESTING (CONT)

(33) Install gage (58) on gage adapter (54).

WARNING

Approved hearing protection devices and protective goggles must be worn when performing steps (34) and (35). Failure to comply may result in injury to personnel.

(34) Start engine with aid of assistant and run at idle (about 600 rpm).

(35) Record compression pressure shown on gage (58).

NOTE

Compression pressure in any one cylinder at a given altitude above sea level must not be less than minimum shown in table 3-2.

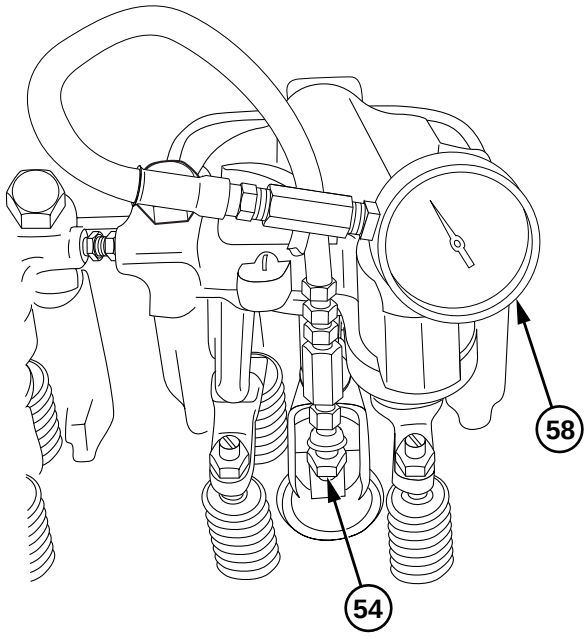


Table 3-2. Compression Pressure Specifications

Minimum Compression Pressure at 600 RPM		Altitude above Sea Level	
psi	kPa	feet	meters
450	3101	500	152
415	2859	2,500	762
385	2653	5,000	1,524
355	2446	7,500	2,286
330	2274	10,000	3,048

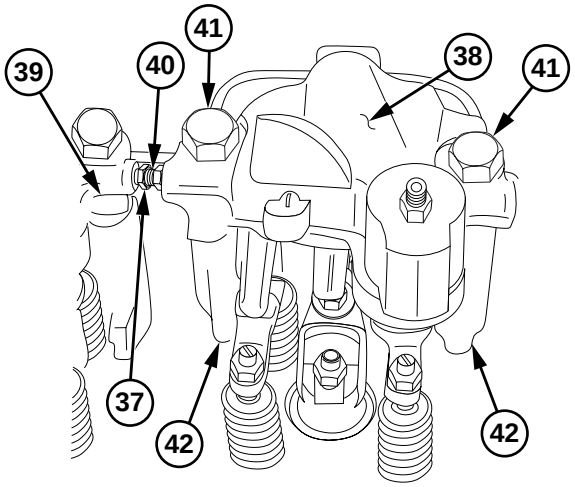
(36) Shut off engine (TM 9-2320-360-10).

(37) Remove gage (58) from gage adapter (54).

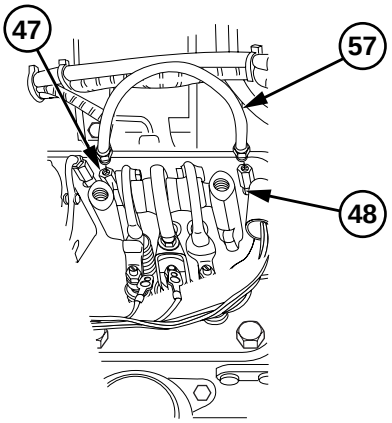
(38) Loosen connector nut (37) between left brake (39) and right brake (38).

(39) Screw connector (40) into left brake (39) to clear right brake (38).

(40) Remove two screws (41) and brake (38 or 39) from two mounting posts (42).



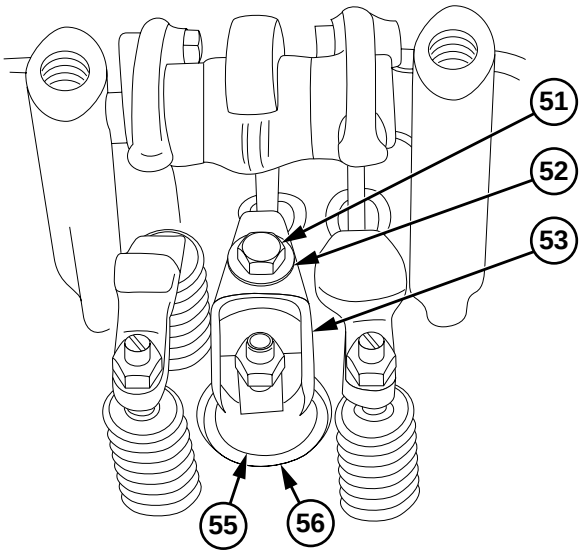
(41) Remove jumper fuel pipe (57) from fuel inlet connector (48) and fuel return connector (47).



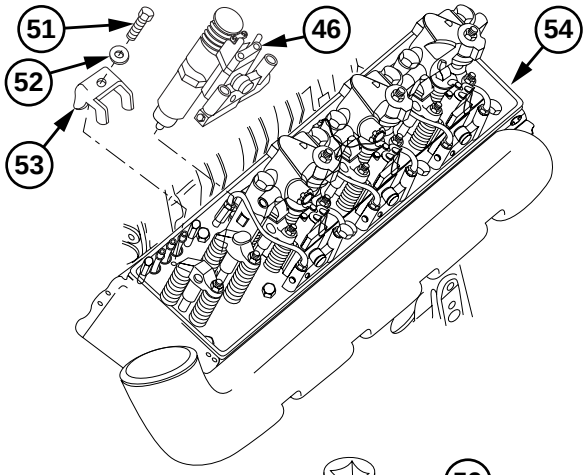
NOTE

Rocker arm assembly can be lifted for easier access to injector screw.

(42) Remove screw (51), convex washer (52), clamp (53), and gage adapter (55) from injector tube (56).

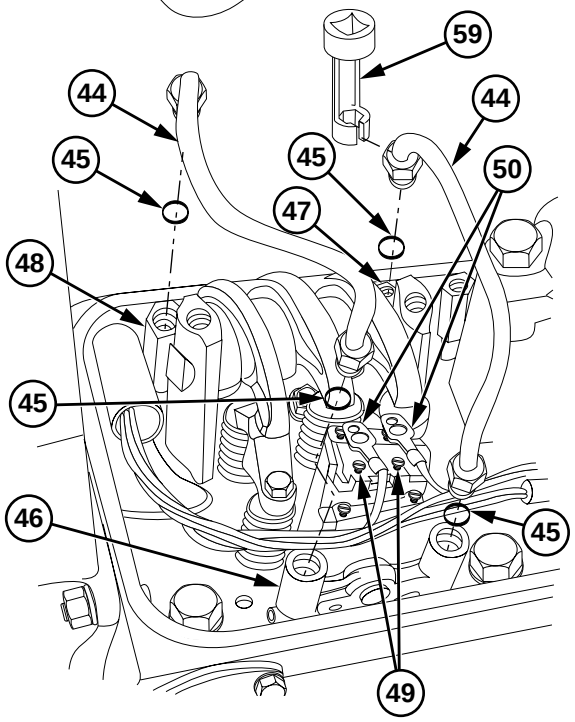


3-28. ENGINE TESTING (CONT)



(43) Install injector (46) in cylinder head (54) with clamp (53), convex washer (52), and screw (51).

(44) Tighten screw (51) to 240–300 lb–in. (27.1–33.9 N·m).

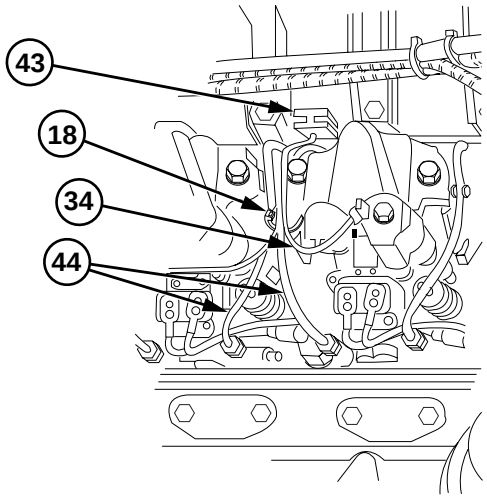


(45) Install two wire terminals (50) and tighten two retaining screws (49) on injector (46).

(46) Install four new seal rings (45) and two pipes (44) on injector (46) and fuel return connector (47) and fuel inlet connector (48) using fuel line nut wrench (59). Torque to 145 lb–in. (16.4 N·m).

NOTE

Do step (47) for middle two cylinders only.



(47) Install rubber harness support (43) on fuel pipes (44).

NOTE

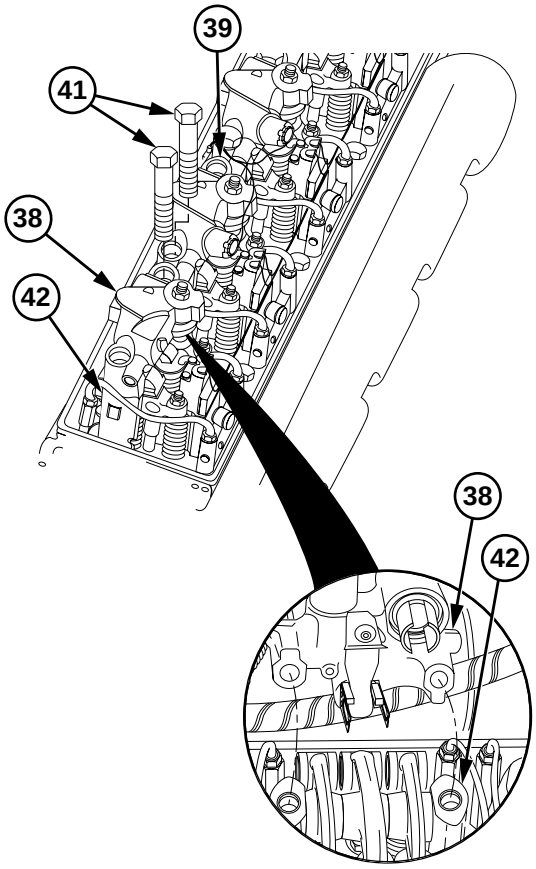
Plastic cable tie should be positioned in location marked during removal.

(48) Secure solenoid valve wire (34) to fuel pipes (44) with plastic cable tie (18).

NOTE

Holes in rocker arm shaft must be aligned with holes in mounting posts.

(49) Install brake (38 or 39) on two mounting posts (42) with two screws (41). Torque to 90–100 lb–ft (122–136 N·m).



CAUTION

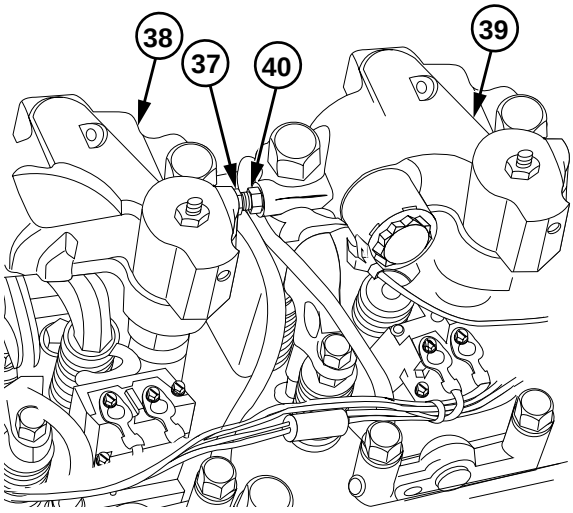
Connector must be backed off to allow movement of brake and rocker arm assemblies. Failure to comply may result in damage to equipment.

(50) Unscrew connector (40) from left brake (38) until connector contacts right brake (39).

(51) Back off connector (40) 1/3 turn away from right brake (39).

(52) Hold connector (40) and tighten nut (37) against left brake (38).

(53) Repeat steps (15) thru (52) for each cylinder.



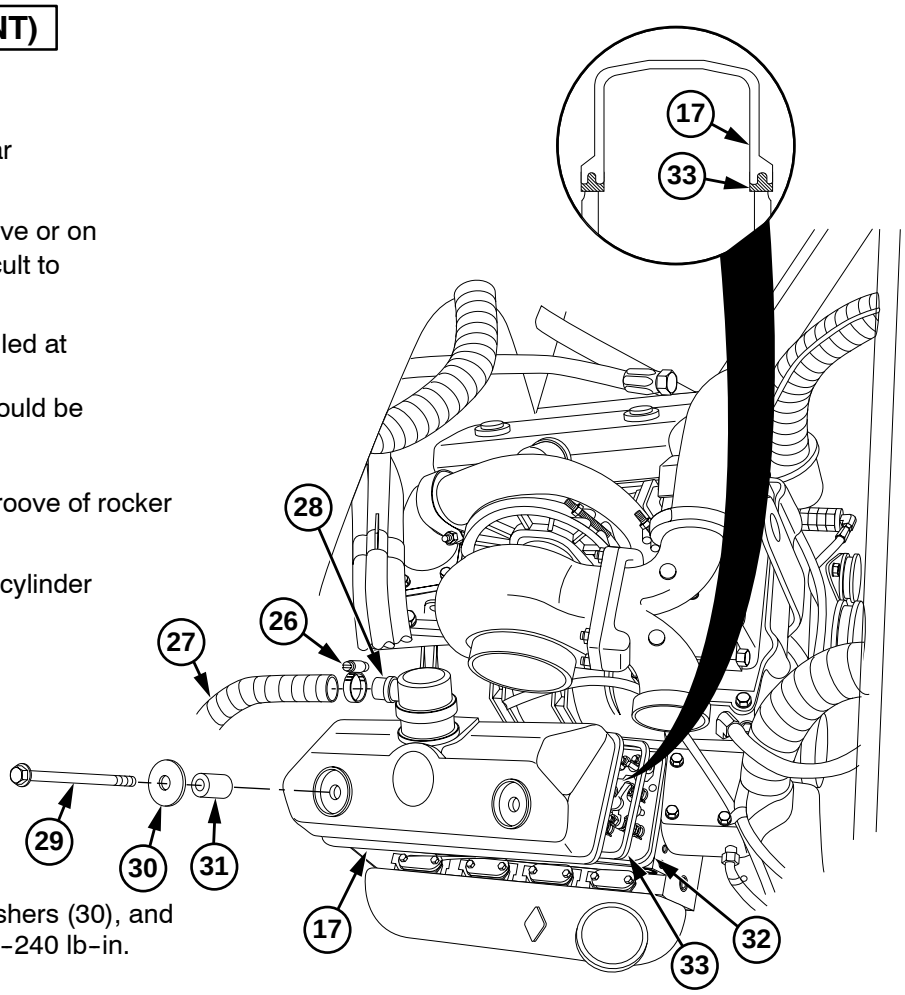
3-28. ENGINE TESTING (CONT)

NOTE

- New gasket may appear oversized.
- Oil in rocker cover groove or on gasket will make it difficult to install.
- Gasket should be installed at four corners first. Then remainder of gasket should be pressed into place.

(54) Install new gasket (33) in groove of rocker cover (17).

(55) Install rocker cover (17) on cylinder head (32).



(56) Install two mounts (31), washers (30), and screws (29). Torque to 180–240 lb–in. (20.3–27.1 N·m).

(57) Install hose (27) on breather retainer (28) with clamp (26).

NOTE

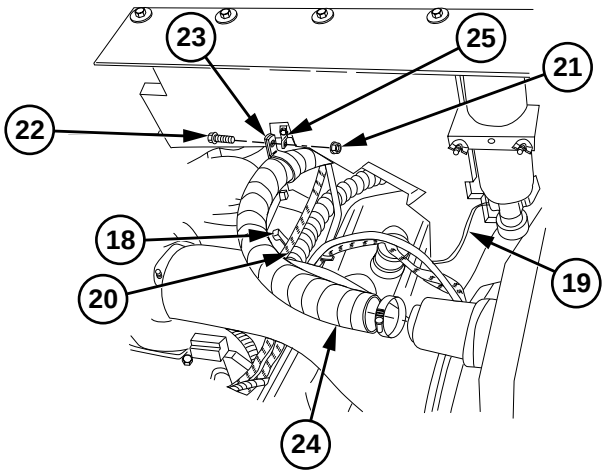
Do steps (59) and (60) for left rocker cover only.

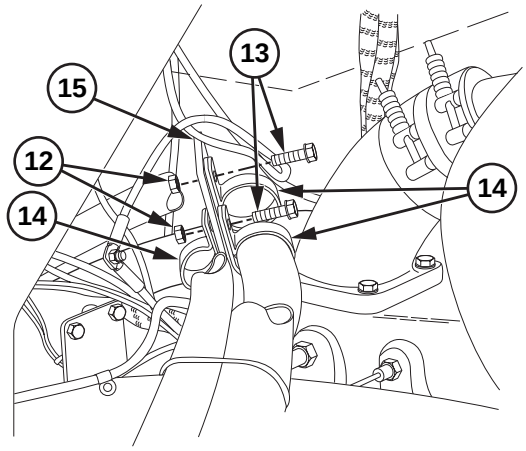
(58) Install clip (23) on air aspiration hose no. 2938 (24) and firewall (25) with screw (22) and locknut (21).

NOTE

Plastic cable tie should be positioned in location marked during removal.

(59) Secure ether start hose (19) to breather tube (20) with plastic cable tie (18).

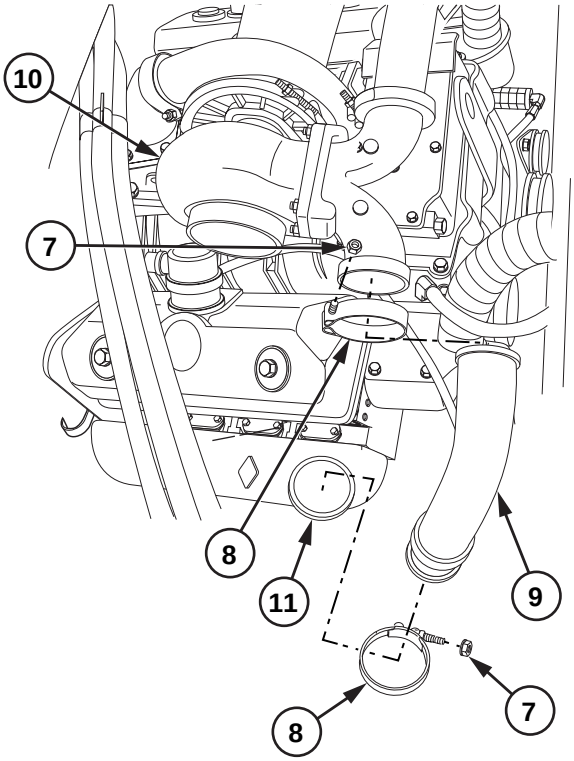




NOTE

Do steps (60) thru (66) for right rocker cover only.

(60) Install three clips (14) on bracket (15) with two screws (13) and new locknuts (12).



(61) Install exhaust tube (9) on turbocharger (10) and exhaust manifold (11) with two new clamps (8) and new locknuts (7).

3-28. ENGINE TESTING (CONT)

(62) Position lower band (4) on bracket (60) with two screws (3), new lockwashers (2), and nuts (1). Do not tighten.

WARNING

Support steering reservoir. Failure to comply may result in injury to personnel.

NOTE

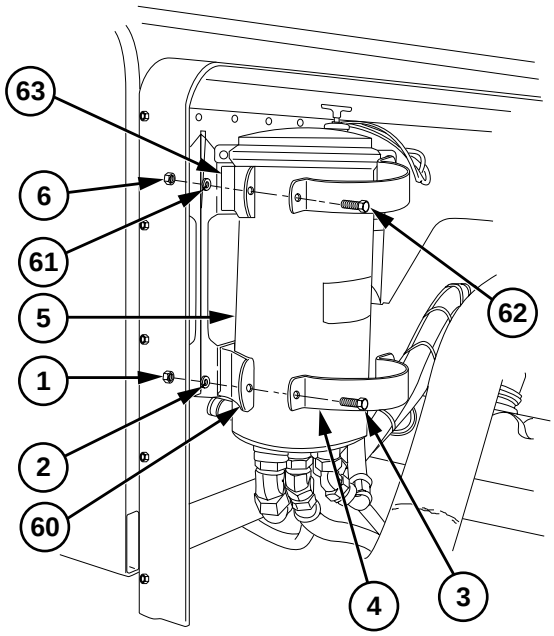
Ensure 0.5 in. (13 mm) of clearance is maintained between top of upper rear bracket and bottom of cover band clamp.

(63) Lower steering reservoir (5) into lower band (4).

(64) Tighten two nuts (1) to 30 lb-ft (41 N·m).

(65) Remove two nuts (6), lockwashers (61), and screws (62) from upper band (63).

(66) Install two screws (62), new lockwashers (61), and nuts (6) on upper band (63). Torque to 30 lb-ft (41 N·m).



b. Follow-On Maintenance

(1) Install exhaust pipe (TM 9-2320-360-20).

(2) Install air cleaner assembly (TM 9-2320-360-20).

(3) Start engine (TM 9-2320-360-10).

(4) Check for leaks around rocker cover gasket.

(5) Shut off engine (TM 9-2320-360-10).

(6) Close engine hood (TM 9-2320-360-10).

CHAPTER 4
FUEL SYSTEM MAINTENANCE

Contents

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Blower Replacement	4-6	4-19
Blower Bypass Valve Replacement	4-7	4-23
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Blower Drive Seal Ring Replacement	4-10	4-36
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Section I. INTRODUCTION

4-1. INTRODUCTION

This chapter contains maintenance instructions for removal, repair, and installation of the fuel system at the Direct Support maintenance level. Some parts must be removed before fuel system components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

4-2. INJECTOR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Placing in Service
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Rocker arms removed (para 3-18).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Oil, Diesel Fuel (Item 38, Appendix B)
Caps, Shipping (Item 13, Appendix B)

a. Removal

CAUTION
Screws are designed not to be removed. Loosen screws only two turns. Failure to comply may result in damage to injector.

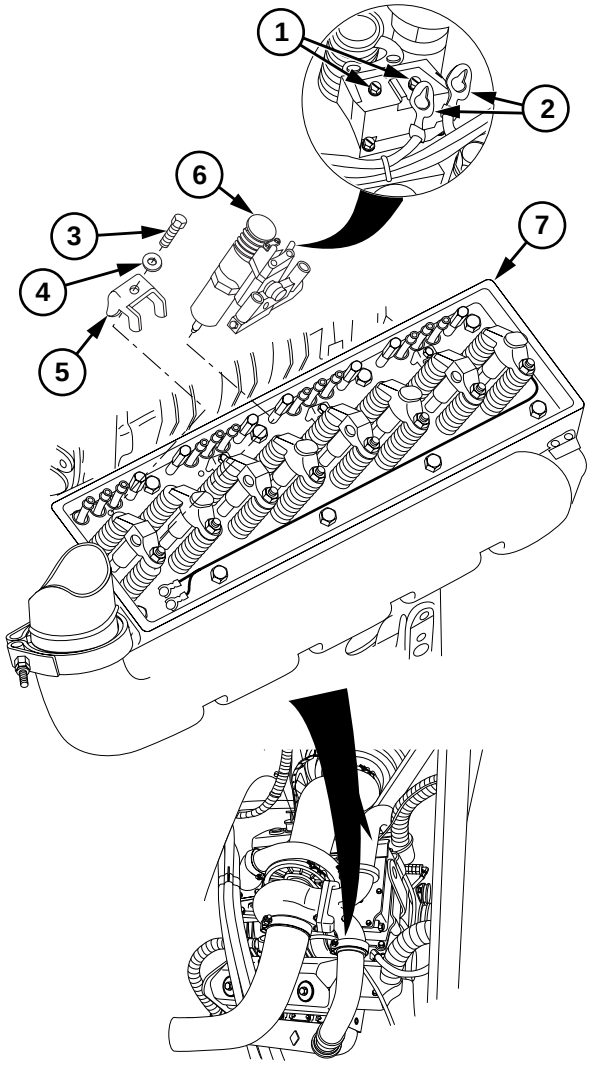
NOTE
All injectors are replaced the same way.

(1) Loosen two wire terminal retaining screws (1) and remove wire harness (2).

(2) Remove screw (3), convex washer (4), and clamp (5).

NOTE
Injector tube hole in cylinder head must be covered to keep dirt out.

(3) Remove injector (6) from cylinder head (7).



WARNING
Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(4) Clean exterior of each injector (6) with diesel fuel. Dry with compressed air.

b. Installation

(1) Remove cover from injector tube hole (1).

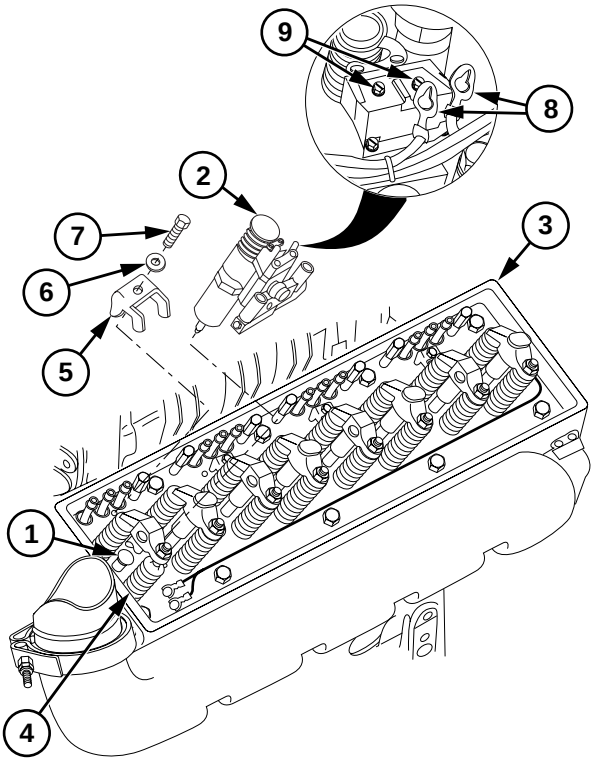
(2) Install injector (2) in injector tube hole (1) in cylinder head (3). Align injector (2) visually for equal clearance between valve springs (4).

CAUTION

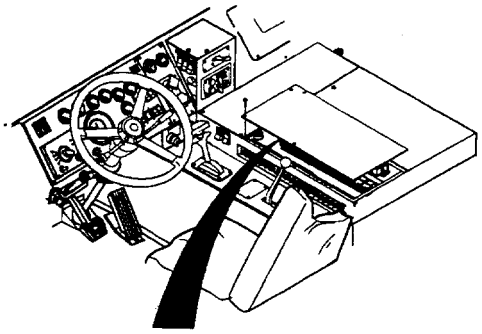
Ensure clamp does not interfere with valve springs. Damage to equipment may result.

(3) Install clamp (5), convex washer (6) with curve down, and screw (7). Torque to 240–300 lb-in. (27.1–33.9 N·m).

(4) Connect wire harness (8) to injector (2) with retaining screws (9).



4-2. INJECTOR REPLACEMENT (CONT)



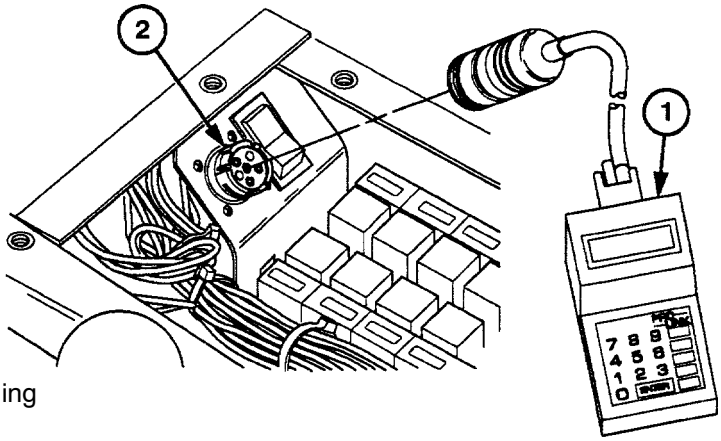
NOTE

Subparagraph c. applies only to DDEC III/IV engines.

c. Placing in Service

CAUTION

Whenever a DDEC III/IV injector is removed from engine, it should be reinstalled in its original location to maintain proper cylinder balance. If reinstalled in a different cylinder head location, injector calibration must be rechecked with DDR and updated, if necessary. Failure to observe these steps may result in reduced engine performance.



(1) Connect Diagnostic Data Reader (DDR) (1) into diagnostic connector (2).

(2) Turn ignition to ON position without running engine.

(3) From “DDEC III/IV Select Menu,” select [ENGINE] and press ENTER key.

(4) Scroll to “FUEL INJECTOR INFO” and press ENTER.

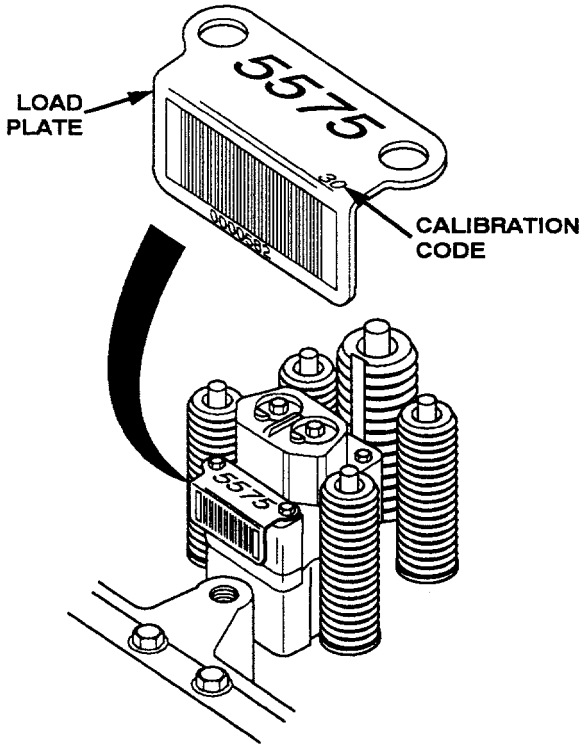
(5) Scroll to “CAL UPDATE” and press ENTER.

(6) From “CAL UPDATE” select [VIEW] and press ENTER.

NOTE

Injector calibration codes and bar codes may be missing on early-production DDEC replacement injectors. The DDEC III/IV calibration code for these injectors is “01”.

(7) Compare calibration code(s) shown on display with two-digit calibration code(s) on replaced injector(s). If no changes are required, press FUNCTION key, turn off ignition, and disconnect DDR.



(8) If any calibration code on display is different from calibration code on replaced injector for that cylinder, press FUNCTION to return to “CAL UPDATE” menu.

(9) From “CAL UPDATE” select [UPDATE] and press ENTER.

(10) Type four-digit “Update Injector Calibration” password for DDR and press ENTER. This feature is not password protected, type “0000” and press ENTER.

(11) An information message will appear telling you to use UP and DOWN arrow keys to select FUNCTION, LEFT and RIGHT arrow keys to change option, and TYPE # (injector calibration code). Press ENTER.

(12) An asterisk (*) will highlight first cylinder number in list. Scroll to cylinder requiring change and type in new two-digit injector calibration code number. Press ENTER.

NOTE

ENTER key must be pressed before DDR will allow selection of another cylinder number.

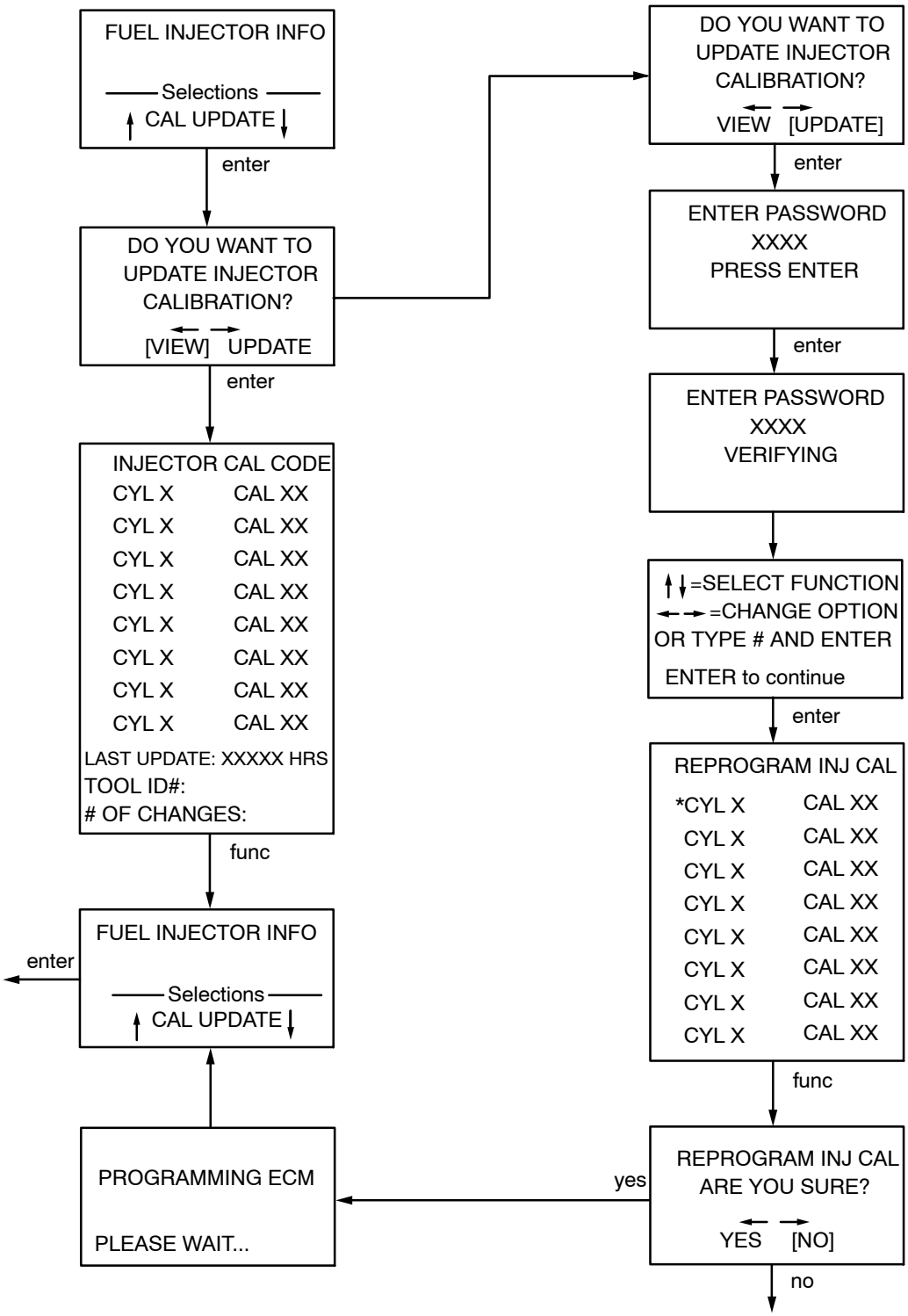
(13) When all cylinders have been updated with required calibration code numbers, press FUNCTION key.

(14) Select [YES] from display and press ENTER to reprogram ECM with revised injector calibration codes.

NOTE

Engine may be started immediately after inputting injector calibration data.

4-2. INJECTOR REPLACEMENT (CONT)



d. Follow-On Maintenance

(1) Install rocker arms (para 3-18).

(2) Adjust exhaust valve clearance (para 3-27).

(3) Adjust injector timing (para 3-27).

(4) DDEC II: Clear historical codes (para 2-4).
DDEC III/IV: Clear inactive codes (TM 9-2320-360-20-3).

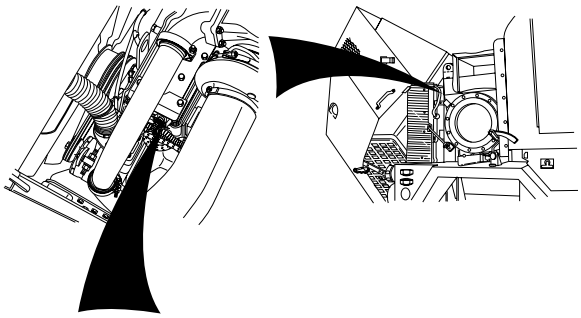
4-3. INJECTOR WIRING HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Batteries disconnected (TM 9-2320-360-20).
Rocker covers removed (TM 9-2320-360-20).
ECM removed (right side harness only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

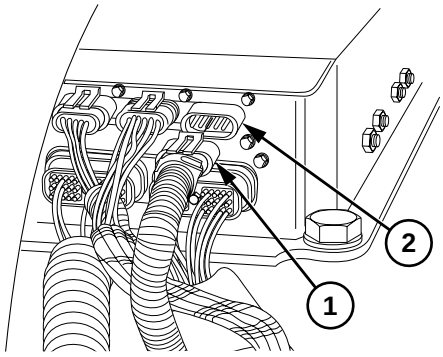


a. Removal

NOTE

- Do step (1) for left side wiring harness only.
- Connector is removed by gently prying on clip and pulling on connector.

(1) Remove fuel injector wire harness connector (1) from ECM (2).



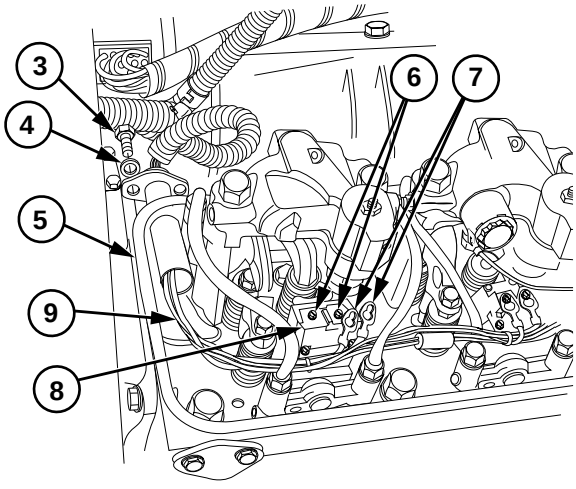
(2) Remove two screws (3) and washers (4) from cylinder head (5).

CAUTION

Screws are designed not to be removed. Loosen screws only two turns. Failure to comply may result in damage to injector.

(3) Loosen eight screws (6) and remove fuel injector wires (7) from four fuel injectors (8).

(4) Remove fuel injector wiring harness (9) from cylinder head (5).



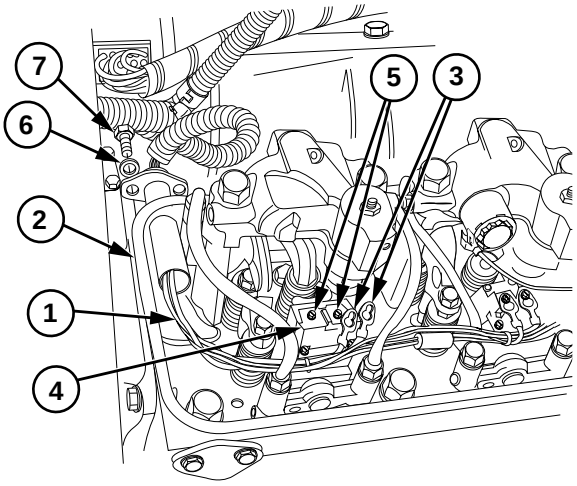
b. Installation

(1) Insert fuel injector wire harness (1) in cylinder head (2).

(2) Install fuel injector wires (3) on fuel injectors (4).

(3) Tighten eight screws (5).

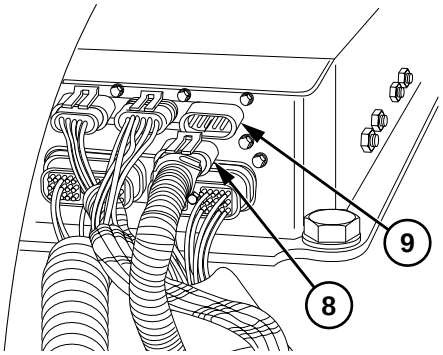
(4) Install fuel injector wire harness (1) on cylinder head (2) with two washers (6) and screws (7).

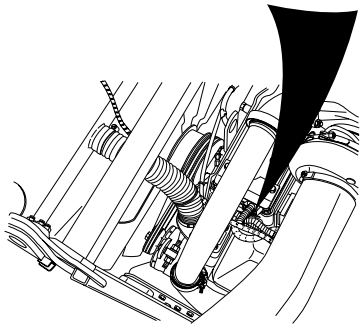


NOTE

Do step (5) for left side wiring harness only.

(5) Install fuel injector wiring harness connector (8) on ECM (9).





c. Follow-On Maintenance

(1) Install rocker covers (TM 9-2320-360-20).

(2) Install ECM (right side wire harness only) (TM 9-2320-360-20).

(3) Connect batteries (TM 9-2320-360-20).

(4) Clear historical codes, mode 40 (para 2-4).

4-4. FUEL SUPPLY PUMP/COUPLING FORK REPAIR

This task covers:
- a. Removal
- b. Disassembly
- c. Cleaning/Inspection
- d. Assembly
- e. Installation
- f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Electronic control module removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Tool Set, Fuel Pump (Item 205, Appendix E)
Blocks, Wooden (Figure C-3, Appendix C)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Socket, Pipe Plug (Item 165, Appendix E)
Socket Set, Deep Well, 12 Point, 1/2 In. Drive (Item 167, Appendix E)
Vise, Machinist's (Item 207, Appendix E)
Wrench Set, Line (Item 229, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts

Fork Coupling Fuel
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Cloth, Crocus (Item 16, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Oil, Lubricating (Item 45, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Gasket (Item 55, Appendix F)
Gasket, Fuel Pump to Eng (Item 70, Appendix F)
Lockwashers (8) (Item 118, Appendix F)
Screws, Nylon Patch (3) (Item 283, Appendix F)
Seals, Oil (2) (Item 313, Appendix F)

a. Removal

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET OF VEHICLE.

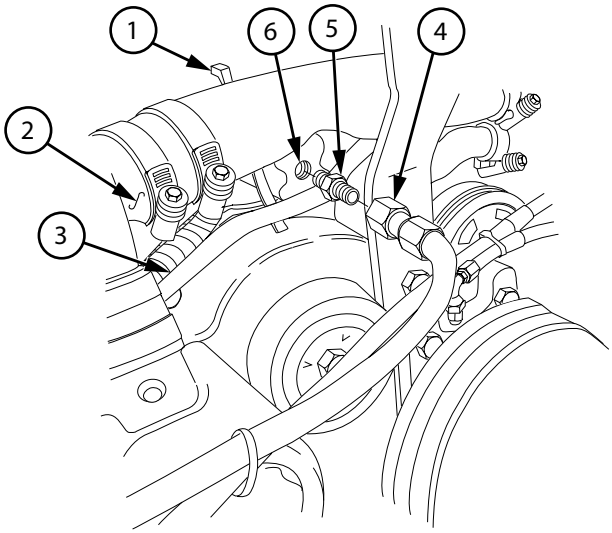
NOTE

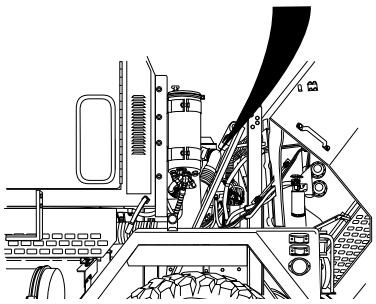
Location of plastic cable ties should be marked before removal.

(1) Remove plastic cable ties (1) from crossover tube (2) and hose (3) as required.

(2) Remove fuel hose (4) from fitting (5).

(3) Remove fitting (5) from fuel supply pump (6).





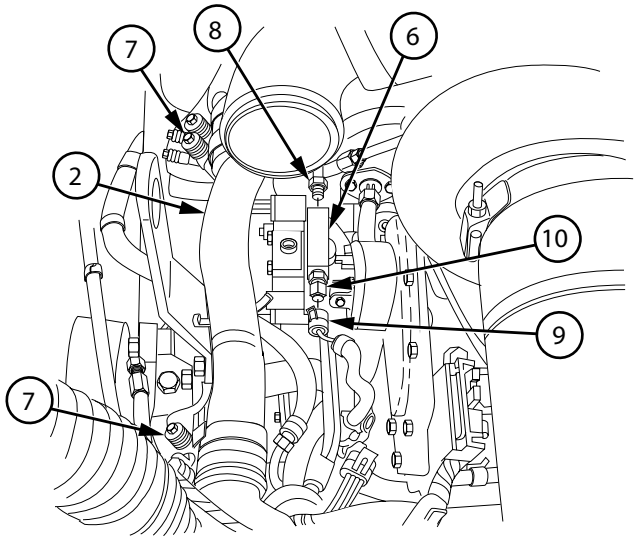
(4) Loosen two inside clamps (7) on crossover tube (2).

(5) Rotate crossover tube (2) away from fuel supply pump (6).

(6) Tighten two inside clamps (7).

(7) Remove fuel hose (8) from fuel supply pump (6).

(8) Disconnect wire harness (9) from fuel temperature sensor (10).

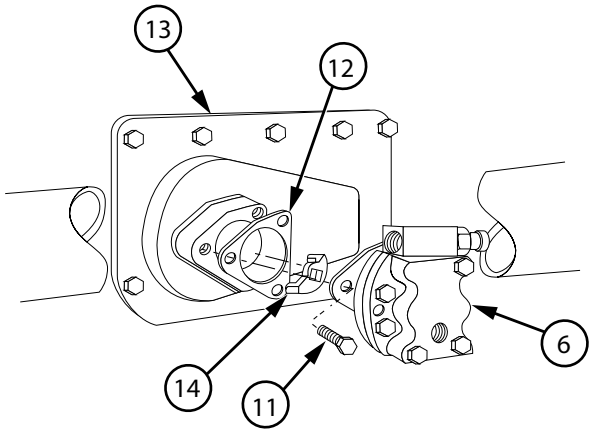


(9) Remove three screws (11), fuel supply pump (6), and gasket (12) from blower housing (13). Discard gasket and screws.

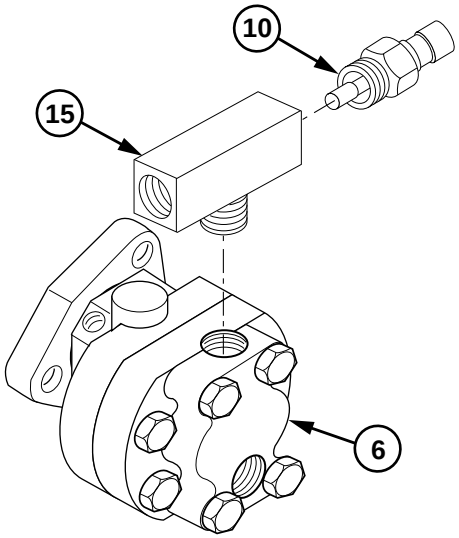
NOTE

Fork may stay with fuel supply pump or blower housing.

(10) Remove fork (14) from fuel supply pump (6). Discard fork.



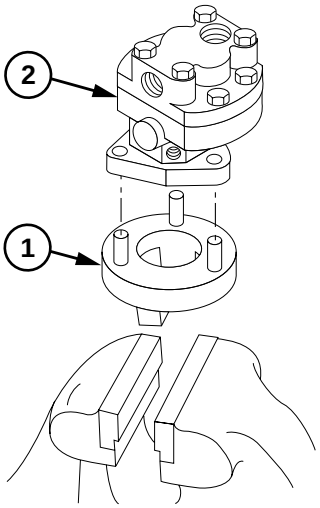
4-4. FUEL SUPPLY PUMP/COUPLING FORK REPAIR (CONT)



(11) Remove fuel temperature sensor (10) from tee (15).

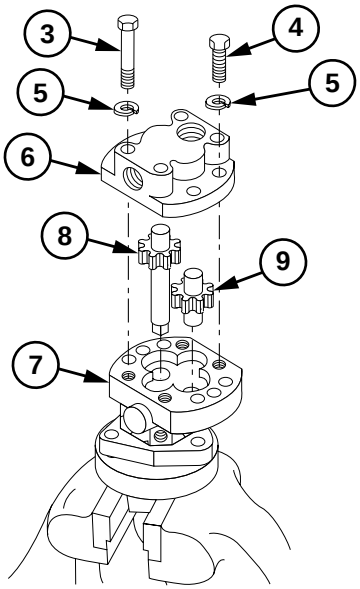
(12) Remove tee (15) from fuel supply pump (6).

b. Disassembly



(1) Position fuel pump holder (1) in vise.

(2) Position fuel supply pump (2) in fuel pump holder (1).



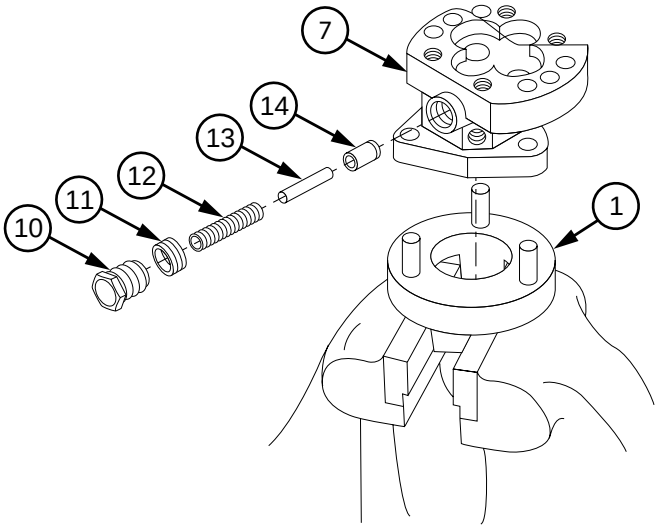
(3) Remove eight screws (3 and 4), lockwashers (5), and cover (6) from housing (7). Discard lockwashers.

CAUTION

Fuel pump drive shaft and gear are one piece. Do not attempt to remove gear from shaft. Failure to comply may result in damage to equipment.

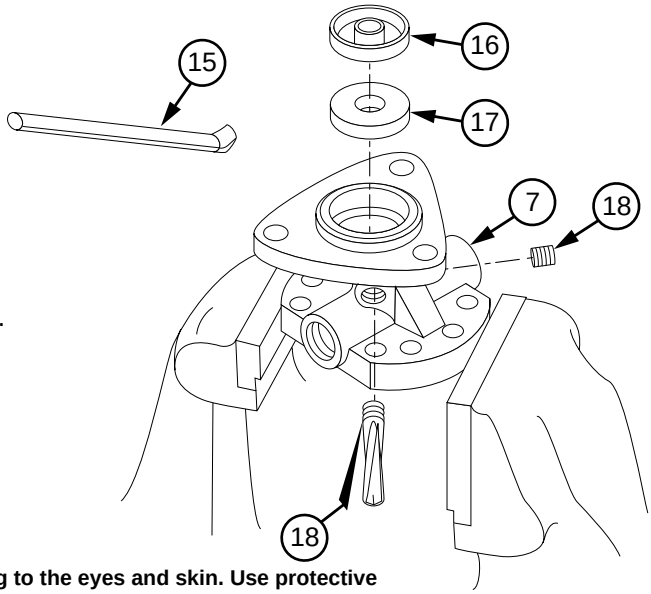
(4) Remove drive shaft and gear assembly (8) from housing (7).

(5) Remove drive shaft and gear assembly (9) from housing (7).



(6) Remove plug (10), gasket (11), spring (12), pin (13), and valve (14) from housing (7). Discard gasket.

(7) Remove fuel pump holder (1) from vise.



(8) Install housing (7) in vise.

(9) Using oil seal remover (15), remove two oil seals (16 and 17) from housing (7). Discard seals.

(10) Remove two pipe plugs (18) from housing (7).

c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean fuel pump with solvent cleaning compound.

(2) Inspect parts for damage. Replace damaged parts.

(3) Inspect mating surfaces of housing and cover. Mating surfaces must be flat and smooth and fit together tightly.

(4) Inspect valve. If valve is lightly scored, use crocus cloth to remove marks. If marks cannot be removed with crocus cloth, replace valve.

4-4. FUEL SUPPLY PUMP/COUPLING FORK REPAIR (CONT)

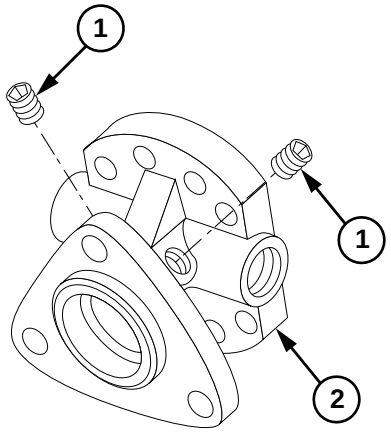
d. Assembly

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

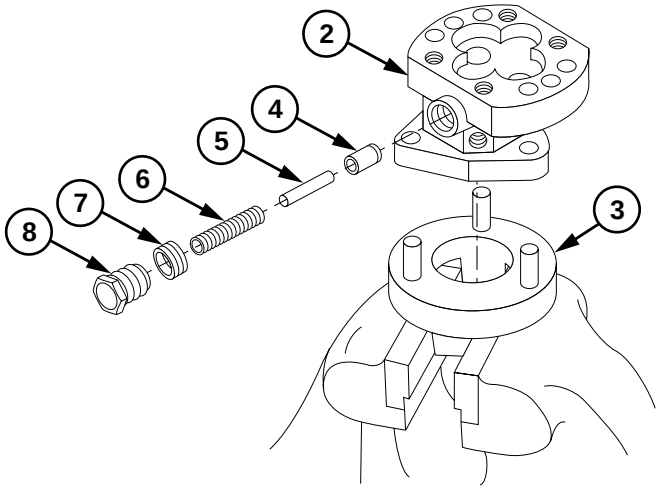
NOTE

Bottom hole is left open to act as a drain.



(1) Coat threads of two pipe plugs (1) with pipe thread sealing compound.

(2) Install plugs (1) in upper holes of fuel pump housing (2).



(3) Position fuel pump holder (3) in vise.

(4) Position fuel pump housing (2) in holder (3).

(5) Coat valve (4) with lubricating oil.

(6) Install valve (4), pin (5), spring (6), new gasket (7), and plug (8) in housing (2).

(7) Coat two new oil seals (9 and 10) with lubricating oil.

(8) Position fuel pump housing (2) on top of two wooden blocks.

NOTE

When oil seals are properly installed, seal lips will face each other.

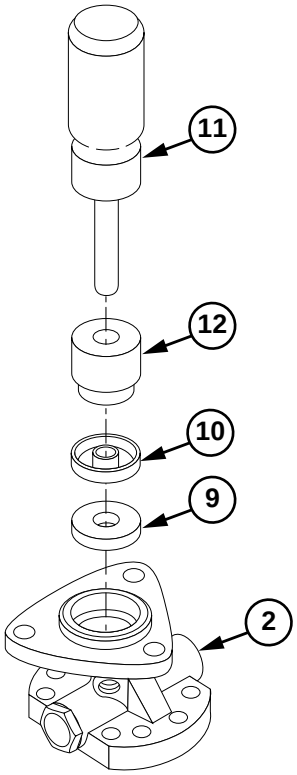
(9) Install new inner oil seal (9) on pilot (pin) of oil seal installer (11).

(10) Install inner oil seal (9) in housing (2) until seated.

(11) Install adapter (J1508-9) (12) on oil seal installer handle (11).

(12) Install new outer seal (10) on pilot of oil seal installer (11).

(13) Install outer oil seal (10) in housing (2) until seated.



(14) Position fuel pump housing (2) in holder (3).

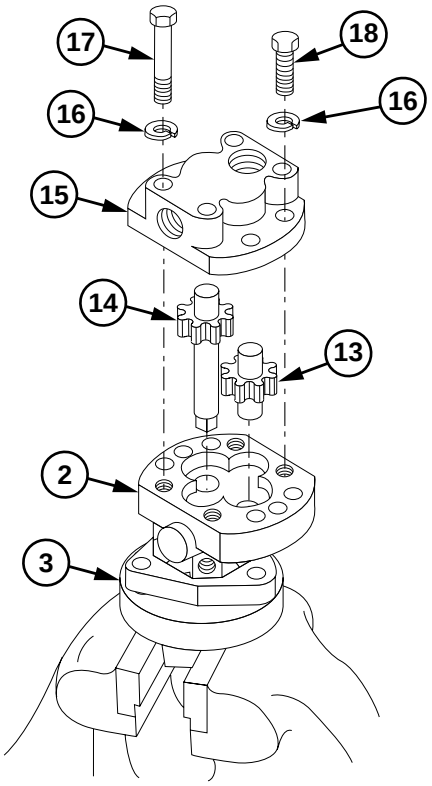
(15) Coat two drive shaft and gear assemblies (13 and 14) with lubricating oil. Install assemblies (13 and 14) in housing (2).

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

CAUTION

- When applying adhesive-sealant to pump cover, ensure adhesive-sealant stays out of gear compartment. Damage to gear compartment may result.
- Apply only a thin coat of adhesive-sealant to pump. Excessive sealant will reduce efficiency of pump.

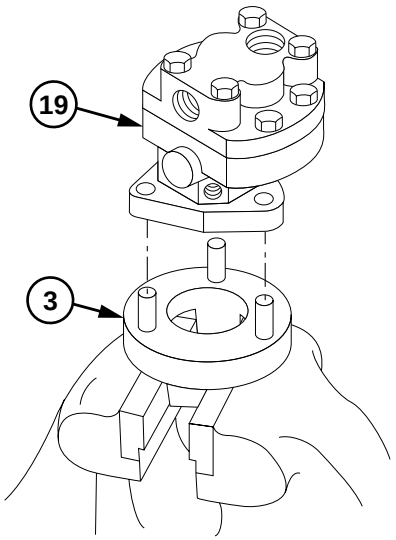


(16) Coat mating surface of cover (15) with adhesive-sealant.

(17) Install cover (15) on housing (2) with eight new lockwashers (16) and screws (17 and 18). Tighten screws evenly and alternately to 108 lb-in. (12.2 N·m).

4-4. FUEL SUPPLY PUMP/COUPLING FORK REPAIR (CONT)

(18) Remove pump (19) from fuel pump holder (3).



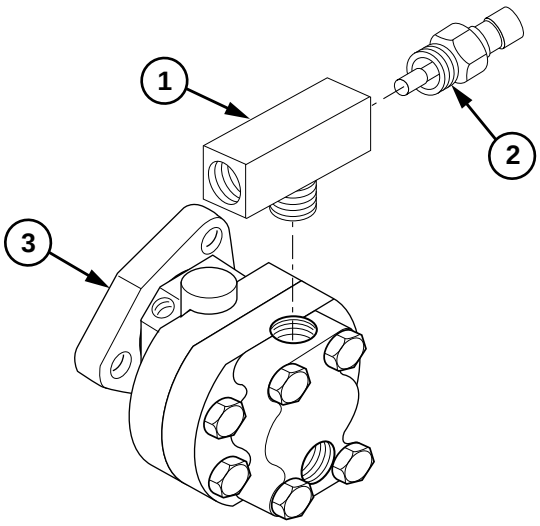
e. Installation

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.



(1) Coat threads of tee (1) and fuel temperature sensor (2) with pipe thread sealing compound.

(2) Install tee (1) on fuel supply pump (3).

(3) Install fuel temperature sensor (2) on tee (1).

(4) Coat new gasket (4) with grease.

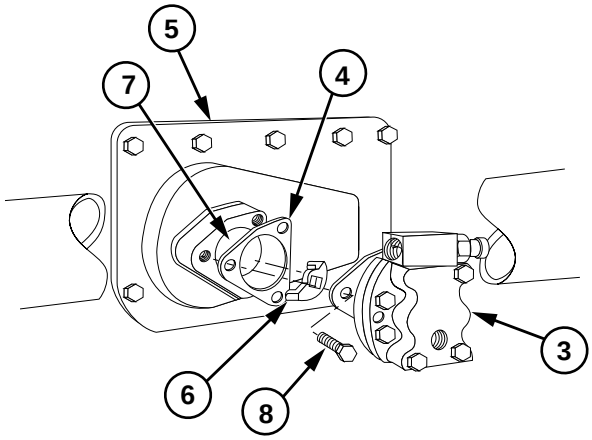
(5) Install new gasket (4) on blower housing (5).

(6) Install new fork (6) on fuel supply pump (3).

CAUTION

- Slot in fork must align with blower shaft and fuel pump.
- Do not overtighten screws. Failure to comply may result in damage to equipment.

(7) Align fork (6) with blower shaft (7). Install fuel supply pump (3) on blower housing (5) with three new screws (8).



(8) Connect wire harness (9) to fuel temperature sensor (2).

(9) Install fuel hose (10) on fuel supply pump (3).

(10) Loosen two inside clamps (11) on crossover tube (12).

(11) Rotate crossover tube (12) upright toward fuel supply pump (3).

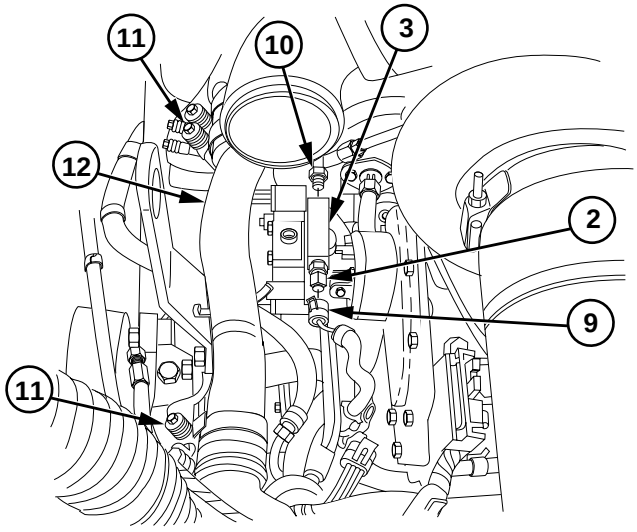
CAUTION

Clamps must be positioned next to bead on crossover tube. Do not position clamps over bead. Failure to comply may result in coolant leak and damage to equipment.

NOTE

When clamp is properly tightened, washer stacks should be nearly collapsed flat and screw tip should extend beyond clamp 3/16 in. (8 mm).

(12) Tighten two inside clamps (11) on crossover tube (12) to 90 lb–in. (10.1 N·m).



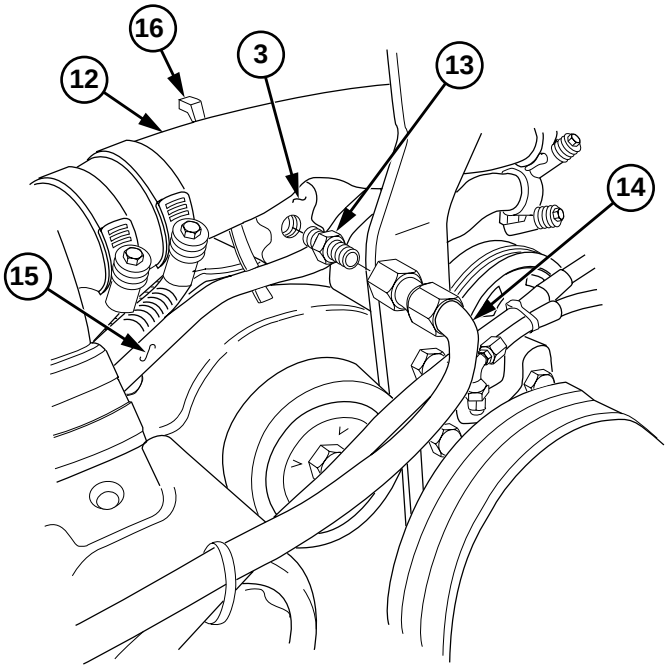
4-4. FUEL SUPPLY PUMP/COUPLING FORK REPAIR (CONT)

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.



(13) Coat threads of fitting (13) with pipe thread sealing compound.

(14) Install fitting (13) on fuel supply pump (3).

(15) Install fuel hose (14) on fitting (13).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(16) Secure hose (15) to crossover tube (12) with plastic cable ties (16) as required.

f. Follow-On Maintenance

(1) Install electronic control module (TM 9-2320-360-20).

(2) Start engine (TM 9-2320-360-10).

(3) Check for leaks.

(4) Shut off engine (TM 9-2320-360-10).

4-5. AIR INLET HOUSING/ADAPTER REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Turbocharger removed (para 4-11).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Open-End, 1 In. and 1-1/8 In., (Item 226, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Gasket (Item 67, Appendix F)
Lockwashers (10) (Item 121, Appendix F)
Packings, Preformed (2) (Item 189, Appendix F)

a. Removal

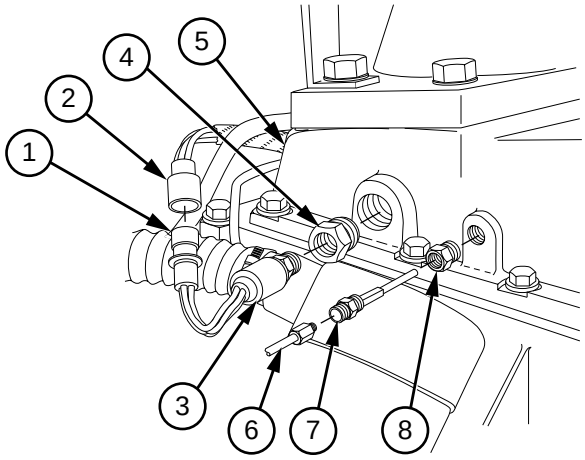
(1) Disconnect STE/ICE connector (1) from STE/ICE engine wire harness (2).

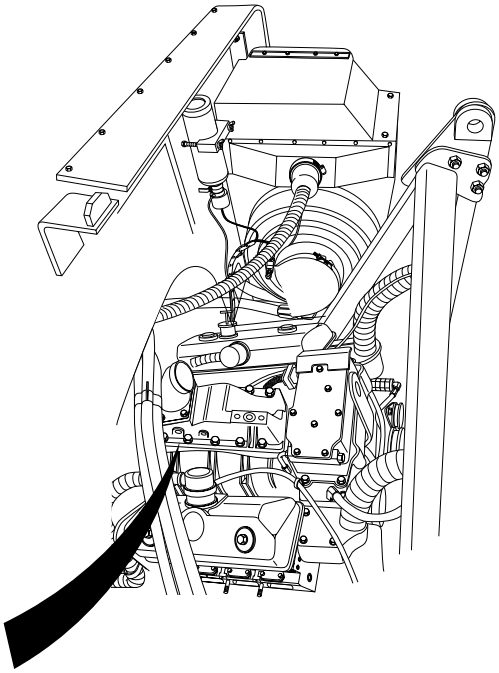
(2) Remove STE/ICE sensor (3) and fitting (4) from air inlet housing (5).

(3) Remove ether line (6) from atomizer (7).

(4) Remove atomizer (7) from reducer (8).

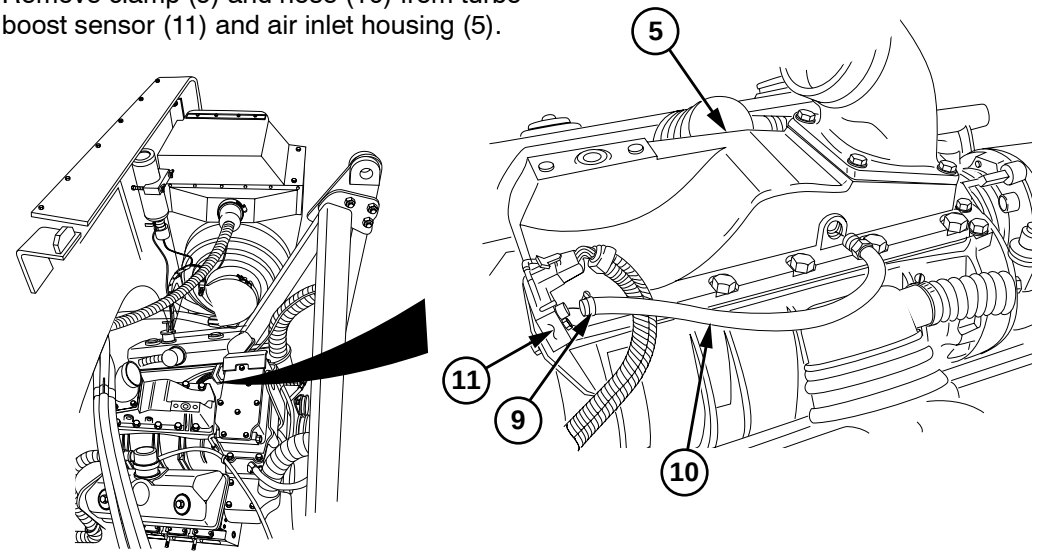
(5) Remove reducer (8) from air inlet housing (5).





4-5. AIR INLET HOUSING/ADAPTER REPLACEMENT (CONT)

(6) Remove clamp (9) and hose (10) from turbo boost sensor (11) and air inlet housing (5).



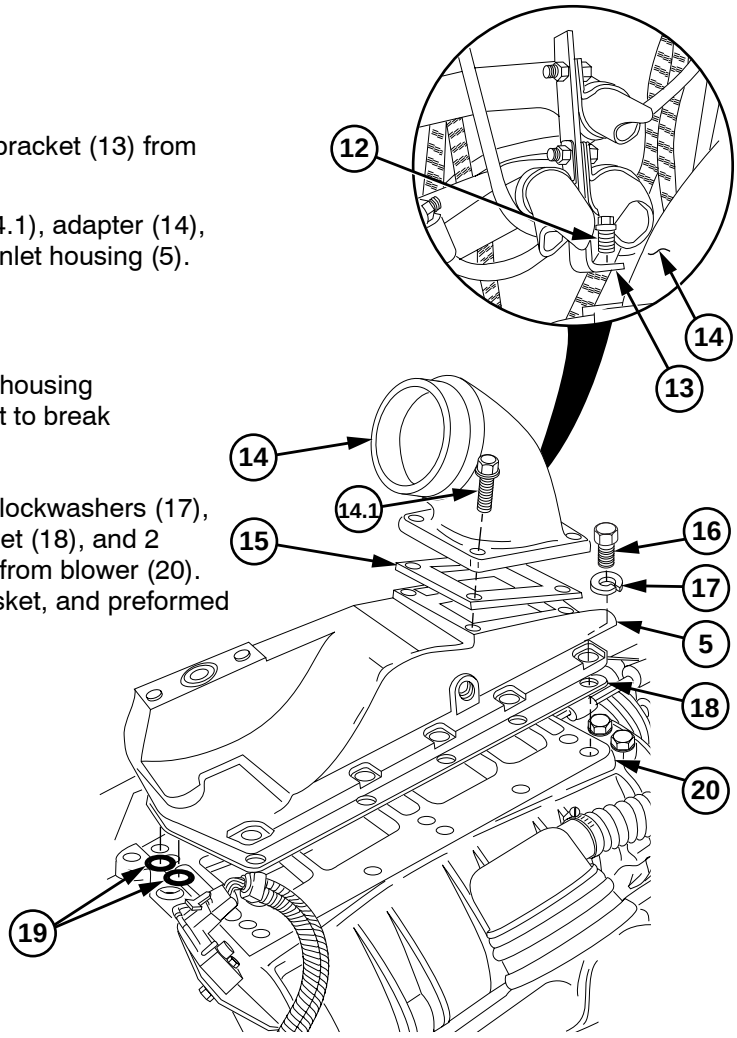
(6.1) Remove screw (12) and bracket (13) from adapter (14).

(7) Remove three screws (14.1), adapter (14), and gasket (15) from air inlet housing (5). Discard gasket.

NOTE

Gently strike air inlet housing with soft-faced mallet to break free from blower.

(8) Remove 10 screws (16), lockwashers (17), air inlet housing (5), gasket (18), and 2 preformed packings (19) from blower (20). Discard lockwashers, gasket, and preformed packings.



b. Cleaning/Inspection

CAUTION

Use care when scraping gasket material from machined surface. Damage to equipment may result.

(1) Ensure gasket material is completely removed from adapters and blower.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean metal parts in solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Dry metal parts with compressed air.

(4) Inspect upper and lower air inlet adapters for cracks, warping, distortion, or other damage.

(5) Replace damaged parts.

4-5. AIR INLET HOUSING/ADAPTER REPLACEMENT (CONT)

c. Installation

NOTE

Gaskets should be positioned with rubber seal facing up.

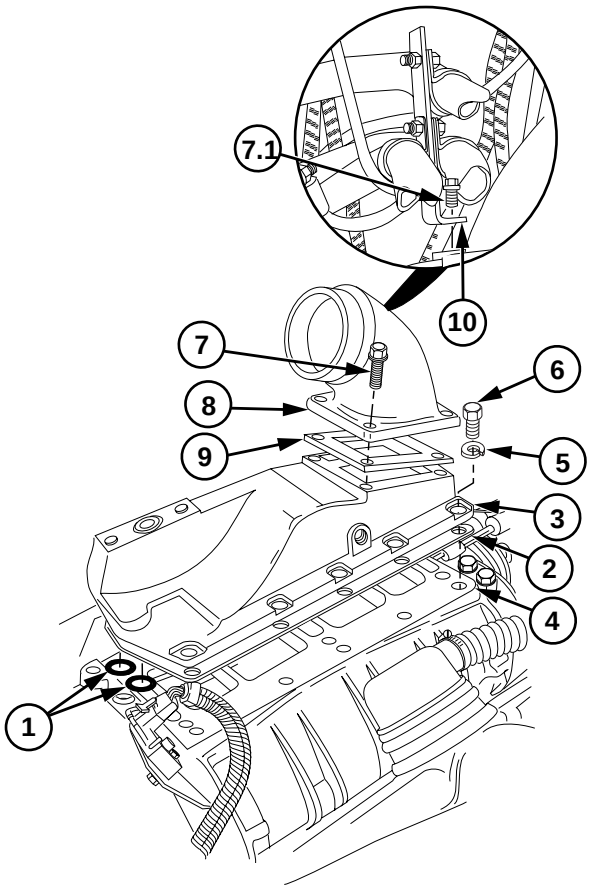
(1) Install 2 new preformed packings (1), new gasket (2), and air inlet housing (3) on blower (4) with 10 new lockwashers (5) and screws (6). Torque to 45 lb-ft (61 N·m) starting with center screws and working out toward each end.

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(1.1) Coat threads on three screws (7) and screw (7.1) with adhesive-sealant.

(2) Install new gasket (8), adapter (9), and bracket (10) on air inlet housing (3) with three screws (7) and screw (7.1). Torque to 240 lb-in. (27.1 N·m).



WARNING

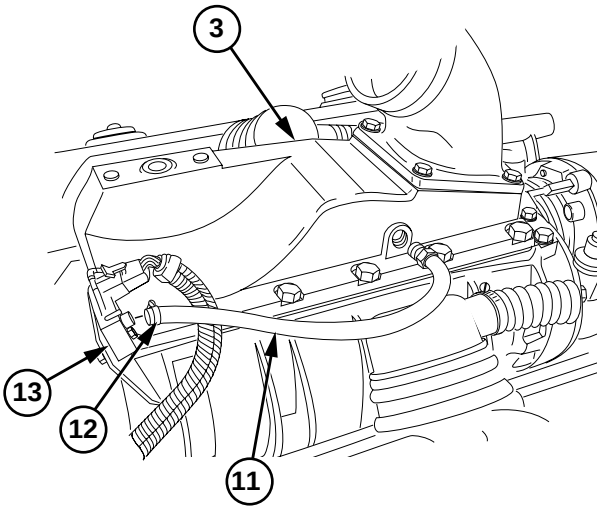
Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.

(3) Coat threads of hose (11) with pipe sealing compound.

(4) Install clamp (12) and hose (11) on air inlet housing (3) and turbo boost sensor (13).



(5) Coat threads of fitting (14) and STE/ICE sensor (15) with pipe thread sealing compound.

(6) Install fitting (14) and STE/ICE sensor (15) on air inlet housing (3).

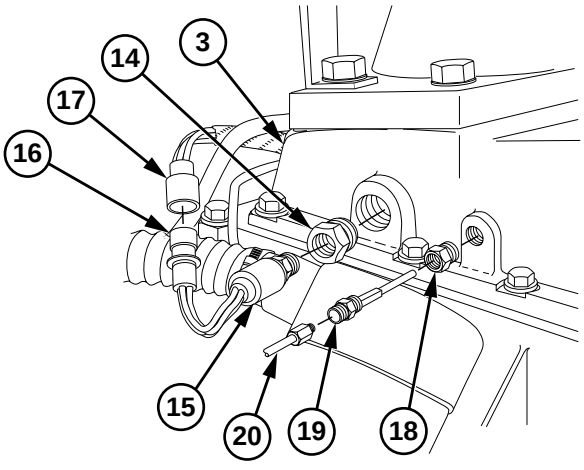
(7) Connect STE/ICE connector (16) to STE/ICE engine wire harness (17).

(8) Coat threads of reducer (18) and atomizer (19) with pipe thread sealing compound.

(9) Install reducer (18) on air inlet housing (3).

(10) Install atomizer (19) on reducer (18).

(11) Install ether line (20) on atomizer (19).



d. Follow-On Maintenance

Install turbocharger (para 4-11).

4-6. BLOWER REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Rocker covers removed (TM 9-2320-360-20).
Air inlet adapter removed (para 4-5).
Fuel pump removed (para 4-4).
Tachometer drive gear removed (para 3-25).
Blower accessory drive hub removed (para 4-9).

Materials/Parts
Grease, Automotive and Artillery (Item 32, Appendix B)
Connector (Item 9, Appendix F)
Gasket (Item 49, Appendix F)
Ring, Retaining (Item 245, Appendix F)
Ring, Seal (Item 270, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Tool, Alignment, Blower Shaft (Item 195, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Personnel Required
Two

a. Removal

NOTE

Remove cable ties as required.

(1) Remove loom (1) from connector (2).
(1.1) Loosen nut (2.1) on adapter (3).
(2) Remove connector (2) from blower drive support (4).
(3) Remove adapter (3), nut (2.1), seal ring (5) and connector (2) from blower (6). Discard seal ring, nut, connector, and adapter.
(4) Loosen clamp (7) on seal ring (8).

WARNING

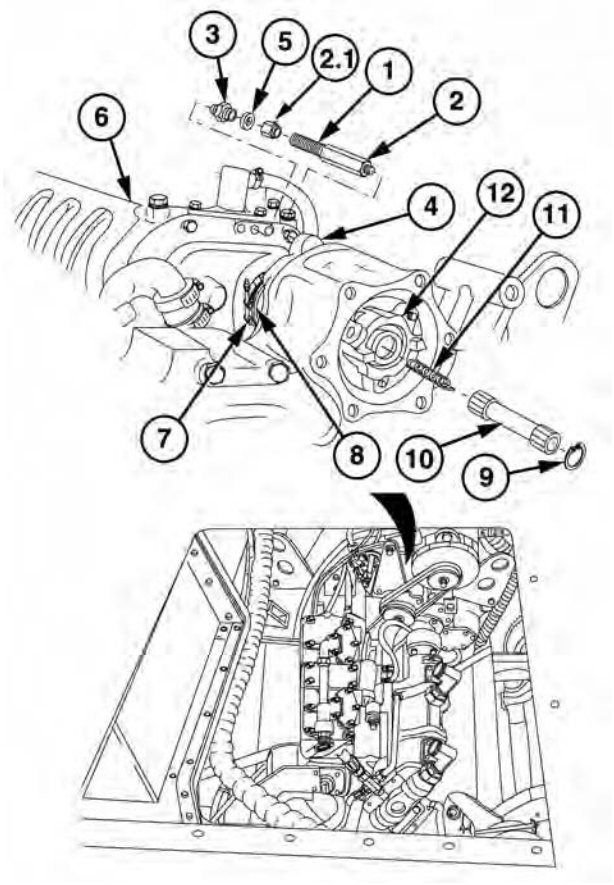
Wear protective goggles and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(5) Remove retaining ring (9) from blower drive shaft (10). Discard retaining ring.

NOTE

Spring may fall out when shaft is removed.

(6) Remove blower drive shaft (10) and spring (11) from drive adapter (12).



4-6. BLOWER REPLACEMENT (CONT)

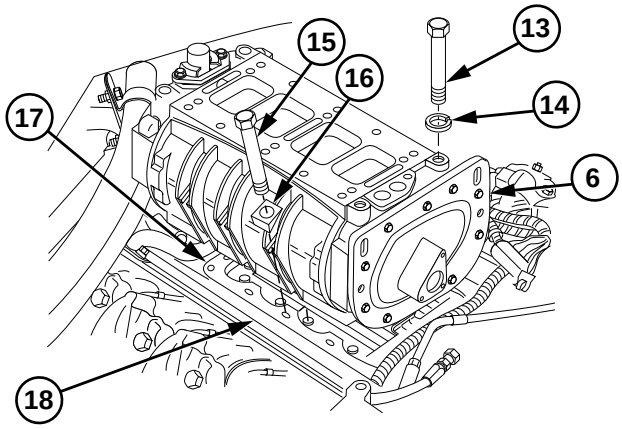
(7) Remove four screws (13) and washers (14) from blower (6).

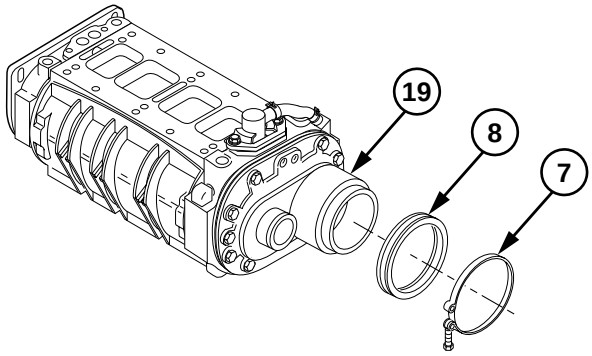
(8) Remove six screws (15) and retainers (16) from blower (6).

WARNING

Blower weighs 70 lb (32 kg). Assistance is required when removing blower. Failure to comply may result in injury to personnel.

(9) Remove blower (6) and gasket (17) from engine block (18) with aid of assistant. Discard gasket.



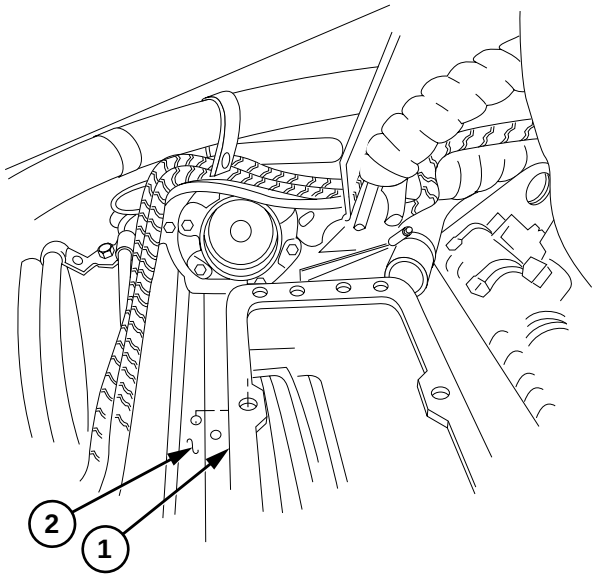


(10) Remove clamp (7) and seal ring (8) from drive end cover (19). Discard seal ring.

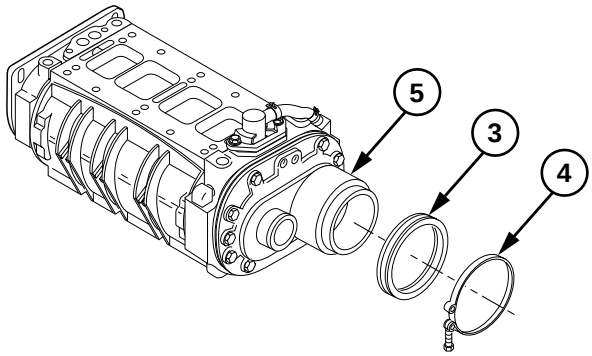
b. Installation

(1) Coat bottom of new gasket (1) with grease.

(2) Position gasket (1) on engine block mounting flange (2).



(3) Position new seal ring (3) and clamp (4) over drive end cover (5).



WARNING

Blower weighs 70 lb (32 kg). Assistance is required when installing blower. Failure to comply may result in injury to personnel.

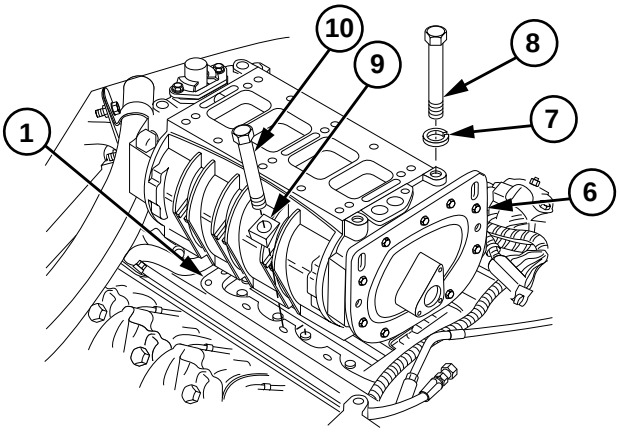
NOTE

To aid in blower installation, hoses and wiring harnesses should be secured out of the way.

(4) Position blower assembly (6) on gasket (1) with aid of assistant.

(5) Position four washers (7) and screws (8) on blower (6) finger tight.

(6) Install six retainers (9) and screws (10) on blower (6) finger tight.



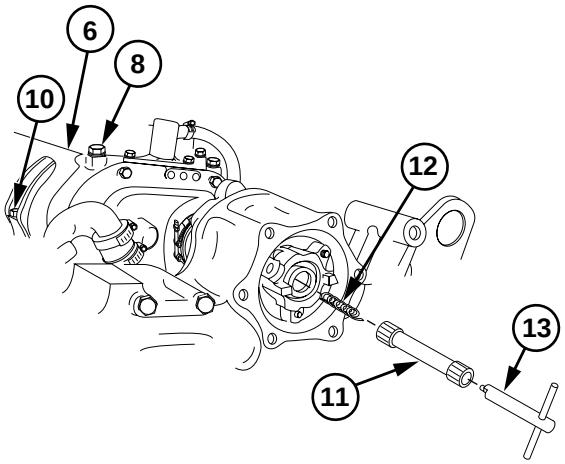
NOTE

Blower is in correct position when drive shaft can be removed and installed without drag.

(7) Install blower drive shaft (11) and spring (12) using blower shaft alignment tool (13).

(8) Tighten four screws (8) to 40–45 lb–ft (54–61 N·m).

(9) Tighten six screws (10) in 60 lb–in. (6.8 N·m) increments uniformly until tightened to 30–35 lb–ft (42–48 N·m).



4-6. BLOWER REPLACEMENT (CONT)

WARNING

Wear protective goggles and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released, causing severe eye injury.

NOTE

Blower shaft should move in and out freely. If blower shaft does not move freely, loosen screws and repeat steps (8) and (9).

(10) Push in on blower drive shaft (11) and secure with new retaining ring (14).

(11) Remove blower shaft alignment tool (13) from blower drive shaft (11).

CAUTION

Blower seal ring must be centered evenly over groove between blower and drive support. Failure to comply will result in oil leak and possible equipment damage.

(12) Position seal ring (3) over blower drive support (15) and blower (6).

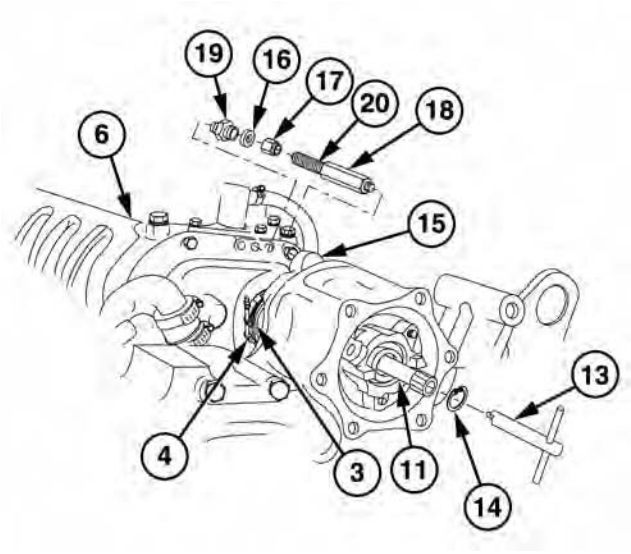
(13) Position clamp (4) in groove of seal ring (3). Tighten clamp.

(14) Position new seal ring (16), nut (17), connector (18), and adapter (19) on blower (6) as an assembly.

(15) Install adapter (19) on blower (6).

(16) Install connector (18) on blower drive support (15).

(17) Tighten nut (17) on adapter (19).



NOTE

- Ensure slit in loom is positioned opposite of fuel line. Failure to comply may result in damage to oil supply tube or fuel line.
- Connector is removed by gently prying on clip and pulling on connector.
- Install cable ties as required.

(18) Install loom (20) on connector (18).

4-6. BLOWER REPLACEMENT (CONT)

c. Follow-On Maintenance

(1) Install fuel pump (para 4-4).

(2) Install air inlet adapter (para 4-5).

(3) Install rocker covers (TM 9-2320-360-20).

(4) Install tachometer drive gear (para 3-25).

(5) Install accessory drive hub (para 4-9).

4-7. BLOWER BYPASS VALVE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

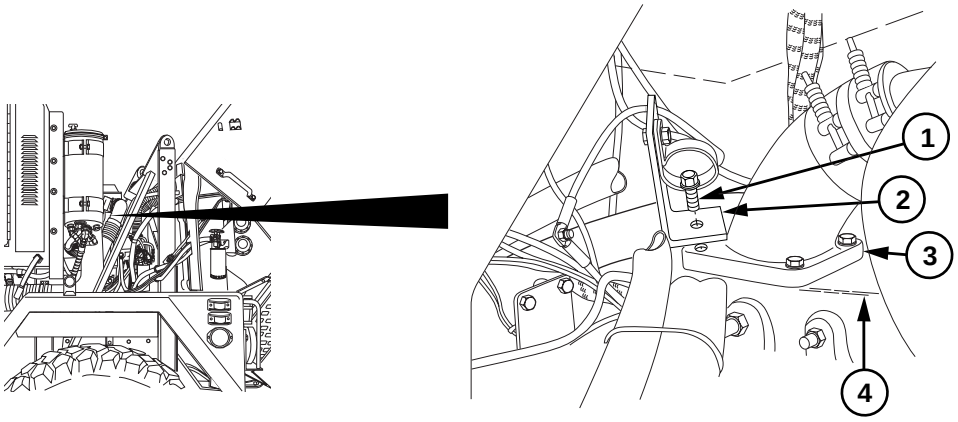
Equipment Conditions
Engine hood opened (TM 9-2320-360-10).
Batteries disconnected (TM 9-2320-360-20).
Doghouse door panel removed (TM 9-2320-360-20).
Front engine access panel removed (TM 9-2320-360-20).
Lower engine access panel removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

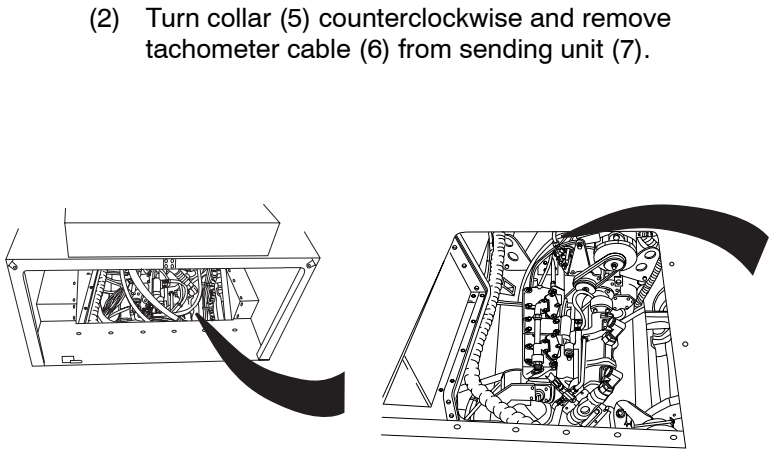
Materials/Parts
Packing, Preformed (Item 195, Appendix F)

a. Removal

(1) Remove screw (1) and standoff bracket (2) from adapter (3) on air inlet housing (4).



(2) Turn collar (5) counterclockwise and remove tachometer cable (6) from sending unit (7).

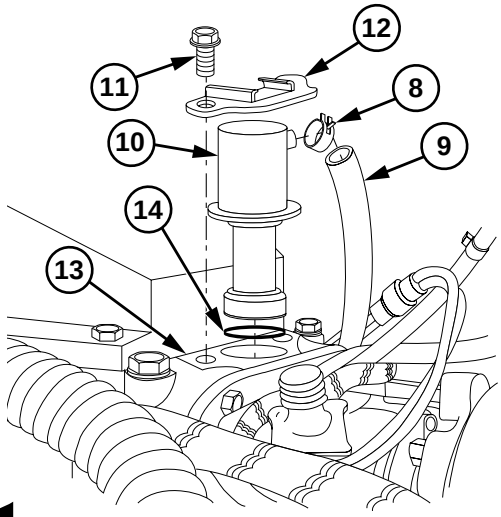


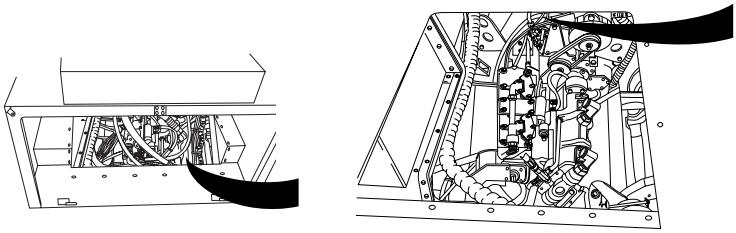
4-7. BLOWER BYPASS VALVE REPLACEMENT (CONT)

(3) Remove clamp (8) and hose (9) from blower bypass valve (10).

(4) Remove two screws (11), bracket (12), and blower bypass valve (10) from blower (13).

(5) Remove preformed packing (14) from blower bypass valve (10). Discard preformed packing.



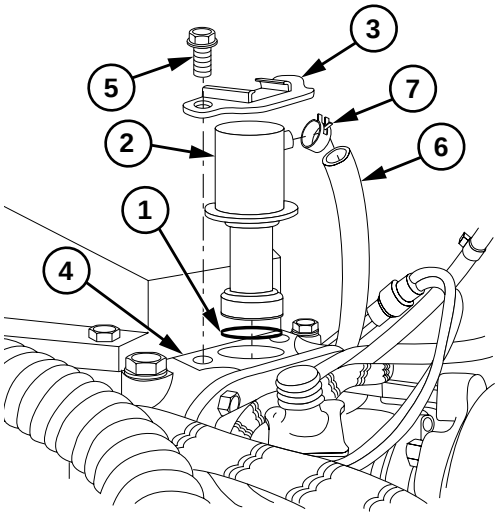


b. Installation

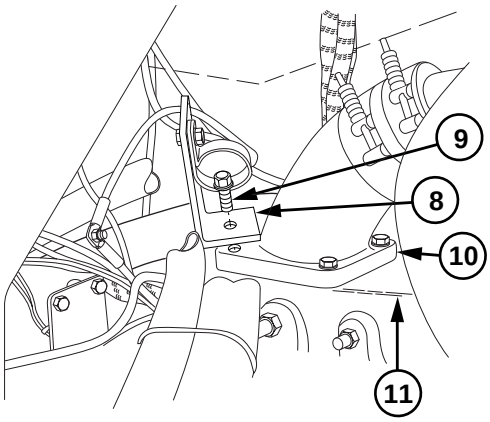
(1) Install new preformed packing (1) on blower bypass valve (2).

(2) Install blower bypass valve (2) and bracket (3) on blower (4) with two screws (5).

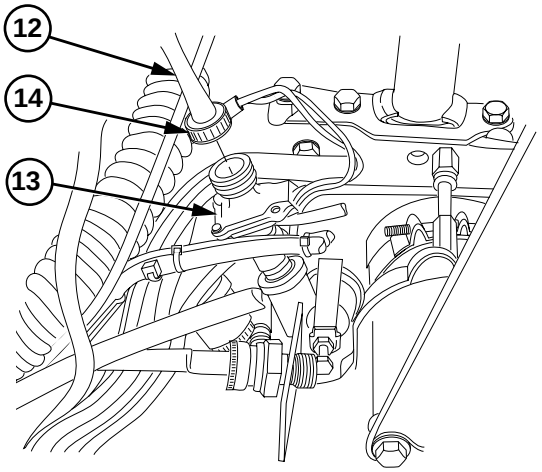
(3) Install hose (6) on blower bypass valve (2) with clamp (7).



(4) Install standoff bracket (8) on adapter (9) and air inlet housing (10) with screw (11).



(5) Install tachometer cable (12) on sending unit (13) and turn collar (14) clockwise to tighten.



c. Follow-On Maintenance

(1) Connect batteries (TM 9-2320-360-20).

(2) Install lower engine access panel (TM 9-2320-360-20).

(3) Install front engine access panel (TM 9-2320-360-20).

(4) Install doghouse door panel (TM 9-2320-360-20).

(5) Close engine hood (TM 9-2320-360-10).

4-8. BLOWER DRIVE SUPPORT REPAIR

This task covers:
- a. Removal
- b. Disassembly
- c. Cleaning/Inspection
- d. Assembly
- e. Installation
- f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Blower removed (para 4-6).

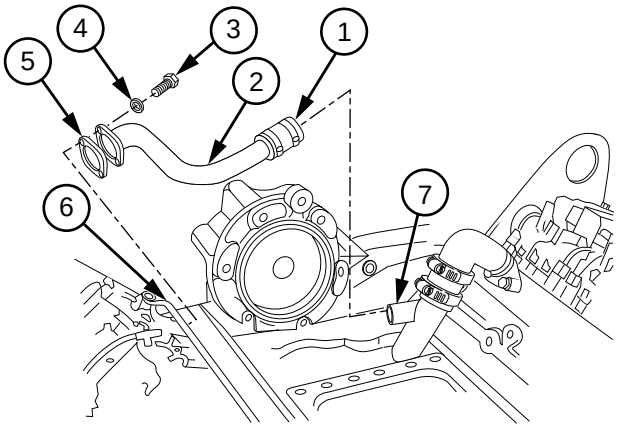
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Caliper Set, Micrometer (Item 15, Appendix E)
Caps, Vise Jaw (Item 17, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Gage Set, Telescoping (Item 56, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Dial Indicator, Magnetic (Item 32, Appendix E)
Press, Hydraulic (Item 116, Appendix E)
Vise, Machinists (Item 207, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

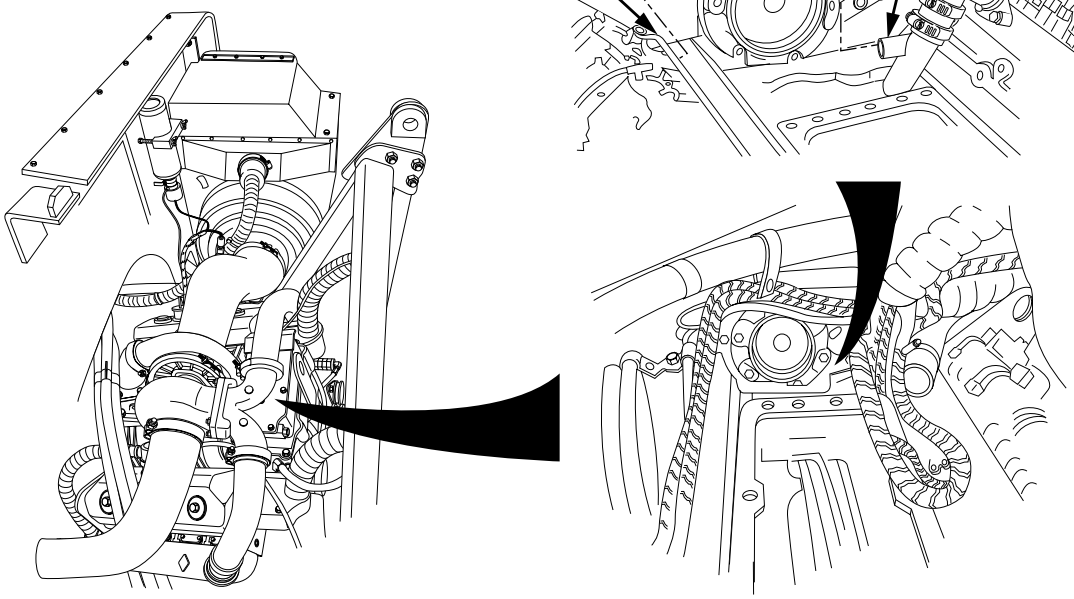
Materials/Parts
Grease, Automotive and Artillery Item 32, Appendix B)
Oil, Lubricating (Item 47, Appendix B)
Cleaning Compound, Solvent(Item 54, Appendix B)
Gasket (Item 45, Appendix F)
Gasket (Item 54, Appendix F)
Keywasher (Item 73, Appendix F)
Lockwashers (2) (Item 118, Appendix F)
Pin (Item 211, Appendix F)
Pin (Item 212, Appendix F)
Washers, Copper (2) (Item 334, Appendix F)

a. Removal

(1) Loosen clamp (1) on crossover pipe (2).

(2) Remove two screws (3), lockwashers (4), gasket (5), and crossover pipe (2) from right cylinder head (6) and breather tube (7). Discard lockwashers and gasket.



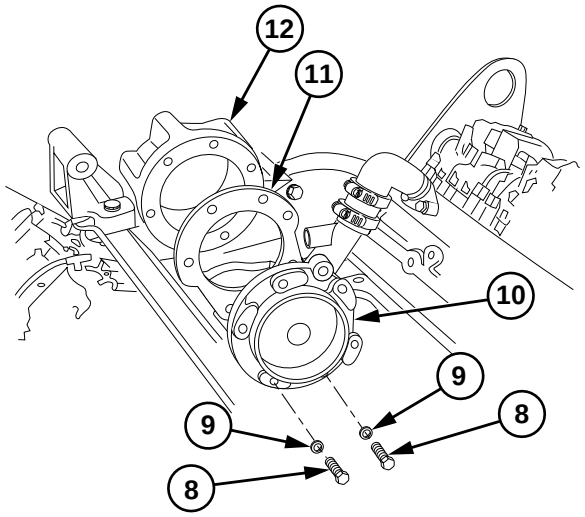


(3) Remove two screws (8) and copper washers (9) from blower driver assembly (10). Discard copper washers.

NOTE

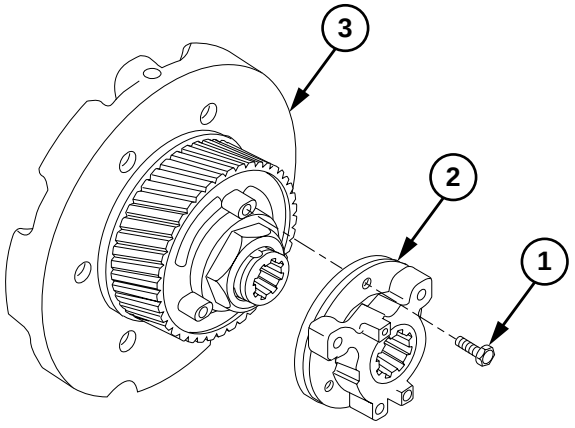
Location of blower drive assembly on flywheel housing must be marked before removal.

(4) Remove blower drive assembly (10) and gasket (11) from rear plate (12). Discard gasket.

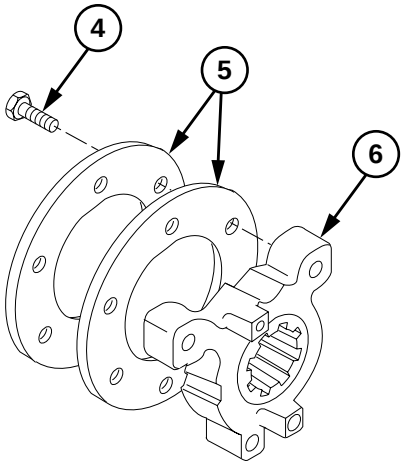


b. Disassembly

(1) Remove three screws (1) and accessory drive hub (2) from blower drive assembly (3).



(2) Remove three screws (4) and two spring plates (5) from accessory drive hub (6).



4-8. BLOWER DRIVE SUPPORT REPAIR (CONT)

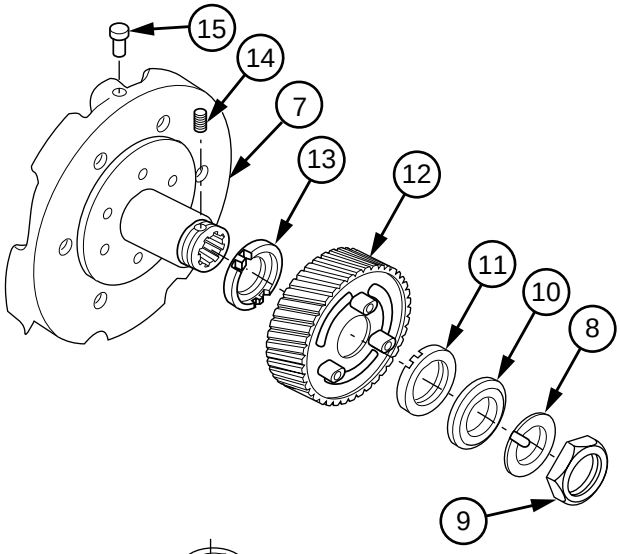
(3) Position blower drive support (7) in soft-jawed vise.

(4) Bend tangs of keywasher (8) away from nut (9).

(5) Remove nut (9), keywasher (8), thrust washer (10), thrust bearing (11), drive gear (12), and thrust bearing (13) from blower drive support (7). Discard keywasher.

(6) Remove pin (14) and pin (15) from blower drive support (7). Discard pin.

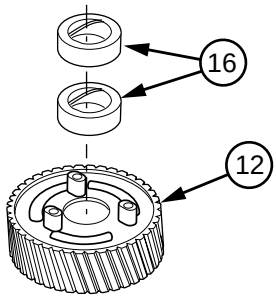
(7) Remove blower drive support (7) from vise.



NOTE

Do step (8) only if bearings fail inspection.

(8) Press two sleeve bearings (16) from drive gear (12).



c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestivetract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean metal parts in solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry parts, except bearings, with compressed air. Allow bearings to air dry.

(3) Ensure oil passages are clear.

(4) Inspect threads for peeled or crossed condition.

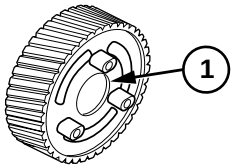
(5) Check to ensure thrust washer thickness is between 0.2350 and 0.2450 in. (5.99 and 6.223 mm).

(6) Check to ensure that thrust bearing thickness is between 0.0590 and 0.0610 in. (1.498 and 1.549 mm). Inspect thrust bearings for scoring.

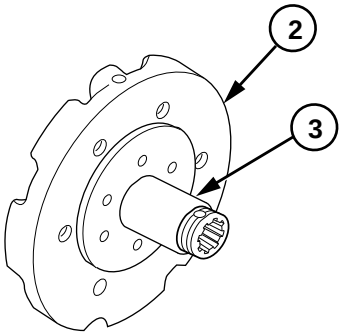
(7) Inspect drive gear teeth for scoring, pitting, and burning (blue or dark spots). Replace if teeth are defective.

(8) Inspect auxiliary drive hub for cracks, breaks, stripped threads, or worn-out splines in bore. Replace if damaged.

(9) Inspect both flex spring plates for cracks, distortion, or other damage. Replace if defective.

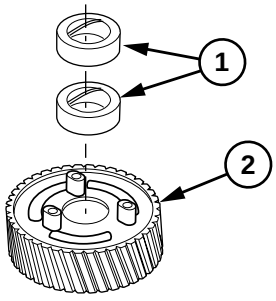


(10) Check that inside diameter of drive gear bushings (1) is between 1.6260 and 1.6265 in. (41.300 and 41.313 mm). Record diameter.



(11) Check diameter of blower drive support (2) at base of shaft (3). Diameter must be between 1.6240 and 1.6265 in. (41.249 and 41.275 mm). Record diameter.

(12) Subtract diameter recorded in step (10) from diameter recorded in step (11). Clearance between blower drive support (2) and support bushing (1) is between 0.0010 and 0.0025 in. (0.025 and 0.063 mm) when parts are new. Limit is 0.0050 in. (0.127 mm) for used parts.



d. Assembly

NOTE

Do step (1) only if bearings were removed.

(1) Press two sleeve bearings (1) into drive gear (2) flush with drive gear.

4-8. BLOWER DRIVE SUPPORT REPAIR (CONT)

(2) Position blower drive support (3) in soft-jawed vise.

(3) Lightly coat blower drive support (3), support bushing (1), thrust bearings (4 and 5), and thrust washer (6) with lubricating oil.

(4) Install pin (7) and pin (8) in blower drive support (3).

(5) Install thrust bearing (4) on blower drive support (3).

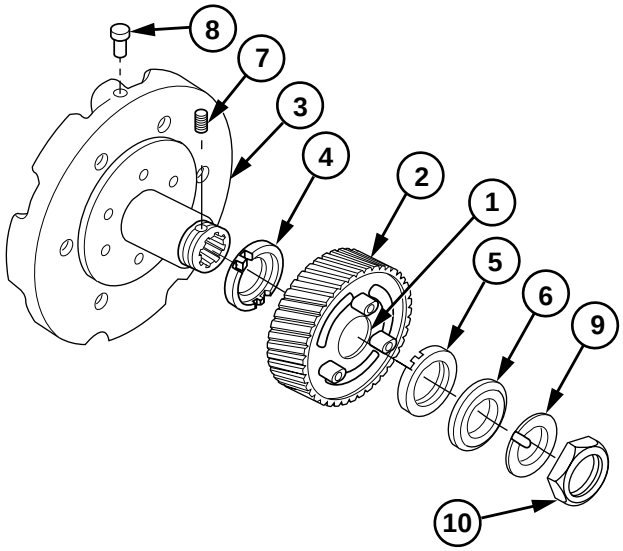
(6) Install drive gear (2) with flat side toward blower drive support (3).

(7) Install thrust bearing (5) and thrust washer (6) with notches fitting in bearing.

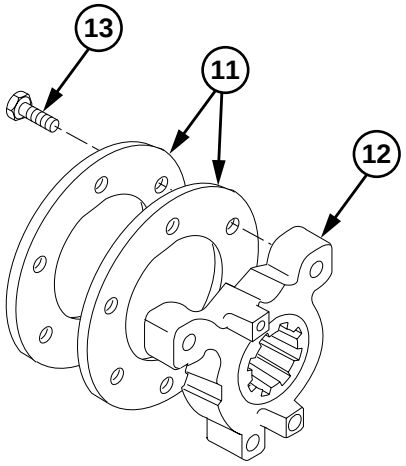
(8) Install new keywasher (9) and nut (10) flat side down. Torque to 50-60 lb-ft (68-81 N·m).

(9) Measure clearance between thrust washer (6) and thrust bearing (5). Clearance must not be less than 0.005 in. or more than 0.010 in. (0.13 mm or 0.25 mm).

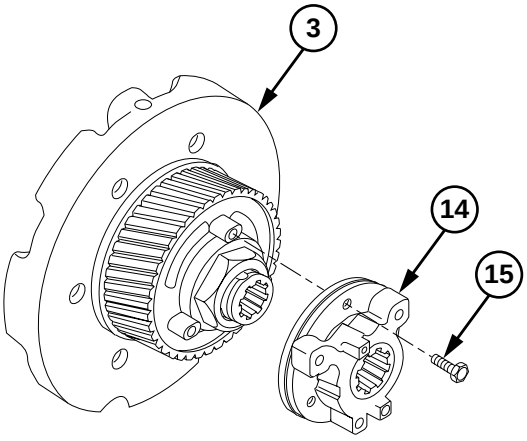
(10) Bend tangs of new keywasher (9) against nut (10).



(11) Install two spring plates (11) on accessory drive hub (12) with three screws (13). Torque to 35-40 lb-ft (48-54 N·m).



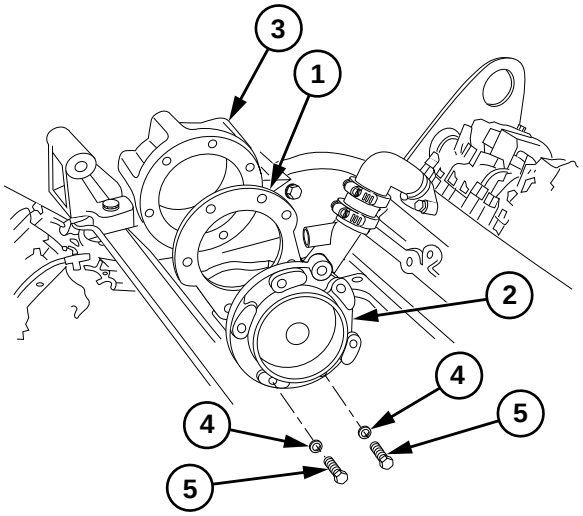
(12) Install accessory drive hub assembly (14) on blower drive support (3) with three screws (15). Torque to 35-40 lb-ft (48-54 N·m).



e. Installation

(1) Lightly coat both sides of new gasket (1) with grease.

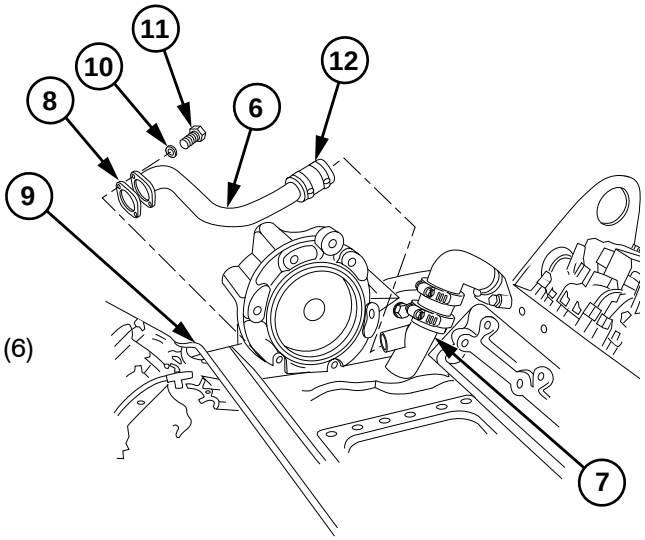
(2) Install new gasket (1) and blower drive assembly (2) on rear plate (3) with two new copper washers (4) and screws (5). Torque to 25–30 lb–ft (34–41 N·m).



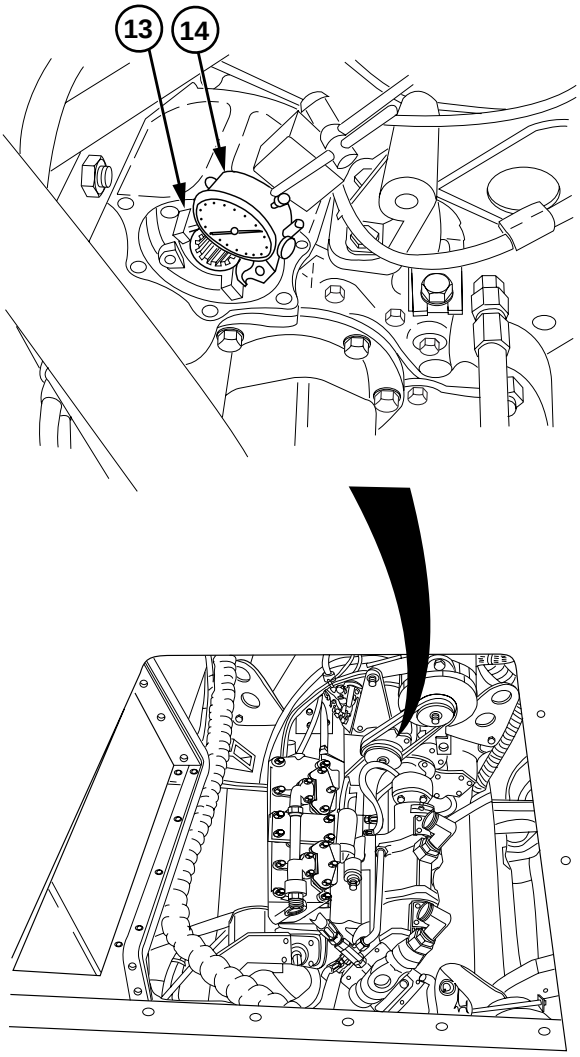
(3) Position crossover pipe (6) on breather tube (7).

(4) Install new gasket (8) and crossover pipe (6) on cylinder head (9) with two new lockwashers (10) and screws (11).

(5) Tighten clamp (12).



4-8. BLOWER DRIVE SUPPORT REPAIR (CONT)



NOTE

Used gear backlash cannot be over 0.010 in. (0.25 mm). New gear backlash cannot be checked at face of blower drive gear; check at accessory drive hub.

(6) Check backlash of blower drive gear (13) with magnetic dial indicator (14).

f. Follow-On Maintenance

Install blower (para 4-6).

4-9. BLOWER ACCESSORY DRIVE HUB REPAIR

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions

12-volt (rear) alternator bracket removed (TM 9-2320-360-20).
Access panels removed (TM 9-2320-360-20).

Tools and Special Tools

Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Press, Hydraulic (Item 116, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts

Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Gasket (Item 61, Appendix F)
Lockwashers (2) (Item 127, Appendix F)

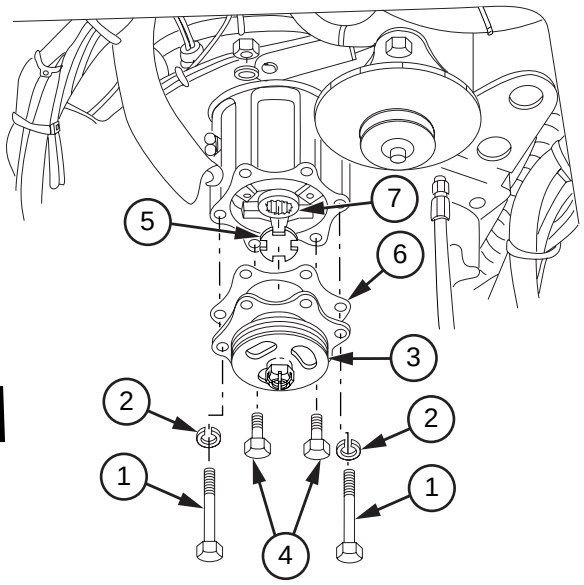
a. Removal

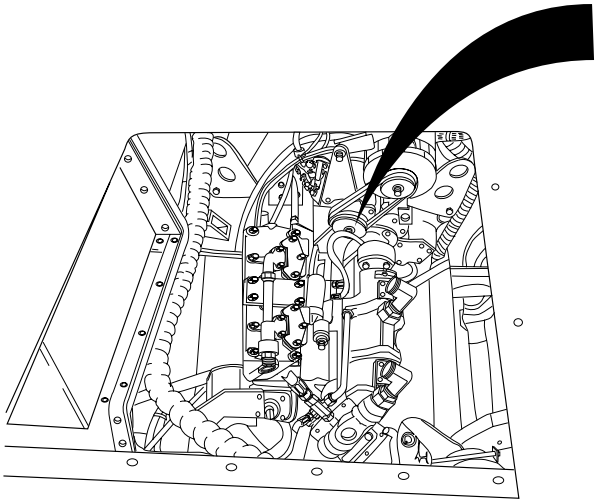
NOTE

Tag and mark hardware before removal.

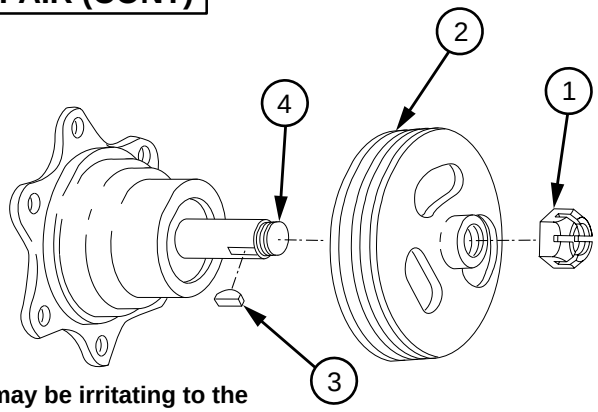
(1) Remove two screws (1) and lockwashers (2) from pulley assembly (3). Discard lockwashers.

(2) Remove two screws (4), pulley assembly (3), coupling (5), and gasket (6) from drive hub (7). Discard gasket.





4-9. BLOWER ACCESSORY DRIVE HUB REPAIR (CONT)



b. Disassembly

Remove nut (1), pulley (2), and key (3) from shaft (4).

c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

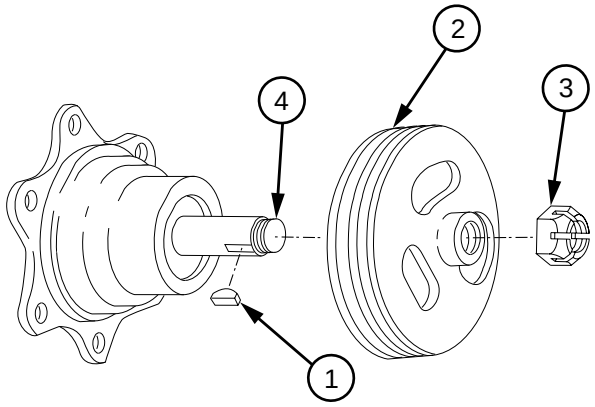
(1) Clean metal parts in solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry parts with compressed air.

(3) Inspect splines on bore of hub. If defective, replace hub.



d. Assembly

Install key (1), pulley (2), and nut (3) on shaft (4).

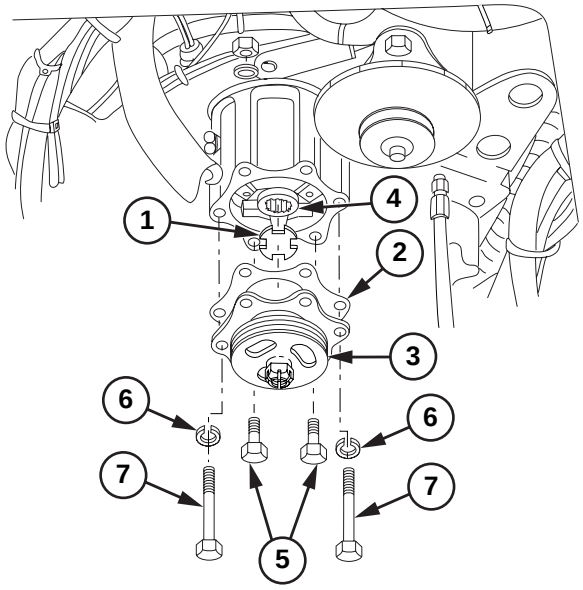
e. Installation

NOTE

Rubber side of gasket faces engine.

(1) Install coupling (1), new gasket (2), and pulley assembly (3) on drive hub (4) with two screws (5).

(2) Install two new lockwashers (6) and screws (7) on pulley assembly (3). Torque to 35–40 lb–ft (48–54 N·m).



f. Follow-On Maintenance

(1) Install 12–volt (rear) alternator bracket (TM 9–2320–360–20).

(2) Install access panels (TM 9–2320–360–20).

4-10. BLOWER DRIVE SEAL RING REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Access panels removed (TM 9-2320-360-20).

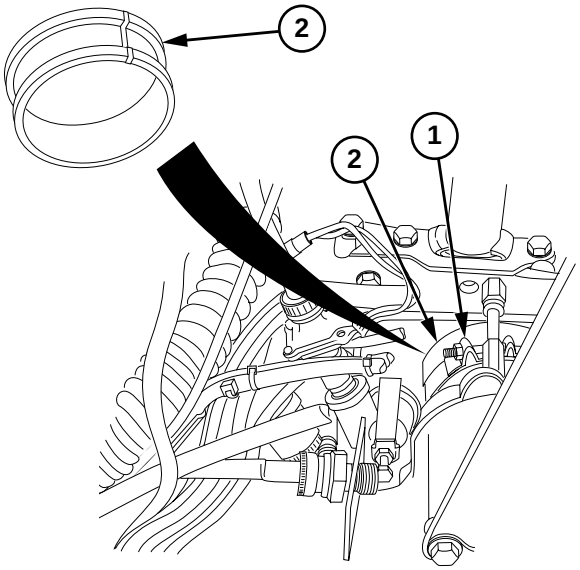
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

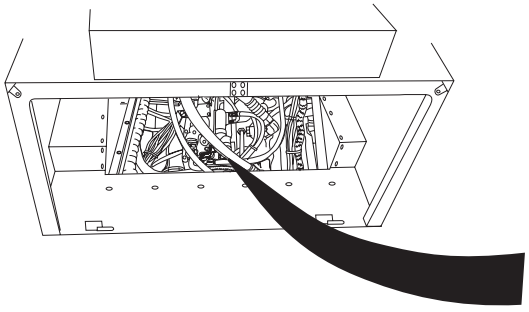
Materials/Parts
Cement, General Purpose, Synthetic Base (Item 14, Appendix B)

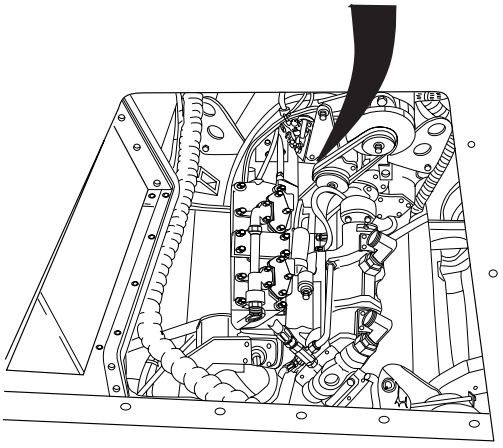
a. Removal

(1) Loosen seal ring clamp (1) and slide clamp off blower drive seal ring (2).

(2) Cut and remove blower drive seal ring (2).







b. Installation

NOTE

Cut ends of blower drive seal must be straight and clean.

(1) Cut new blower drive seal ring (1) straight across.

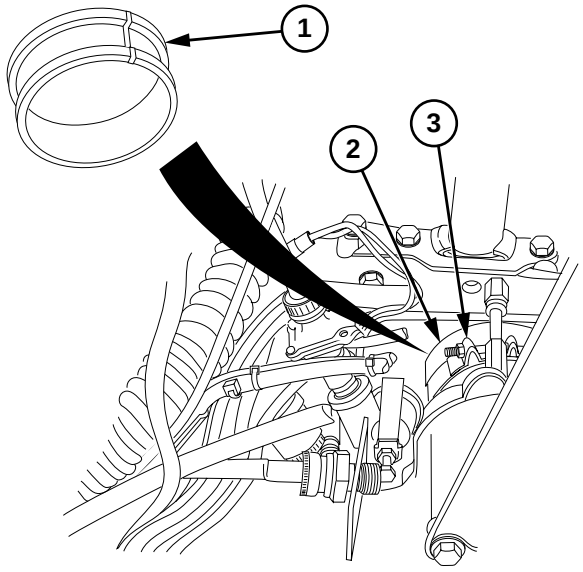
WARNING

General purpose cement can burn easily and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If cement gets on skin or clothing, wash immediately with soap and water.

(2) Coat one end of new seal ring (1) with general purpose cement.

CAUTION

Blower drive seal ring must be centered evenly over groove between blower and drive support. Failure to comply will result in oil leak and possible damage to equipment.



(3) Install seal ring (1) on blower drive (2) with cement-coated end on top.

(4) Slide other end of seal ring (1) up to mate cement-coated end.

(5) Hold jointed ends of blower drive seal ring (1) together for 30 seconds.

(6) Position clamp (3) between raised edges of seal ring (1).

(7) Tighten clamp (3).

c. Follow-On Maintenance

(1) Start engine (TM 9-2320-360-10).

(2) Let engine idle for 3 or 4 minutes. Check around blower drive seal ring for leaks.

(3) Install access panels (TM 9-2320-360-20).

4-11. TURBOCHARGER REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Batteries disconnected (TM 9-2320-360-20).
Exhaust pipe removed (TM 9-2320-360-20).
Air intake hose removed (TM 9-2320-360-20).
Exhaust tubes removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wench Set, Socket, 3/8 in. drive (Item 232, Appendix E)
Wench, Torque, 0-150 Lb-In (Item 234 Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Adhesive, Spray (Item 10.1, Appendix B)
Oil, Lubricating (Item 43, Appendix B)
Rags (Item 51, Appendix B)
Cleaning Compound, Solvent(Item 54, Appendix B)
Gasket (Item 62, Appendix F)
Locknuts (4) (Item 78, Appendix F)
Lockwashers (2) (Item 121, Appendix F)
Lockwasher (Item 119, Appendix F)
Packing, Preformed (Item 190, Appendix F)

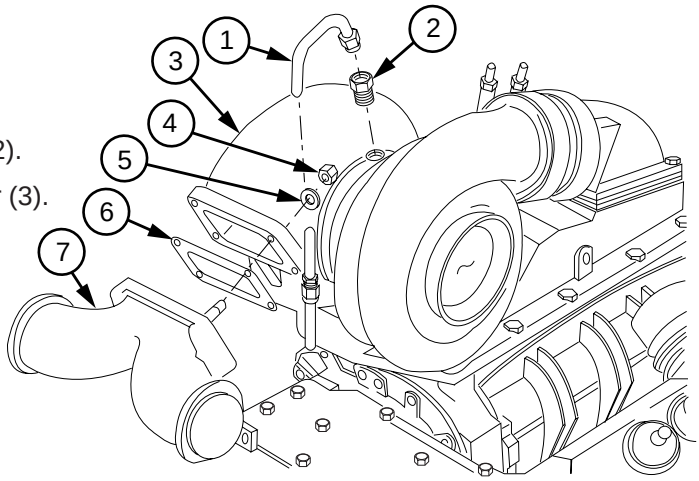
a. Removal

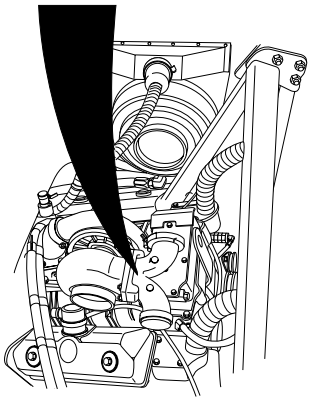
(1) Disconnect oil hose (1) from connector (2).

(2) Remove connector (2) from turbocharger (3).

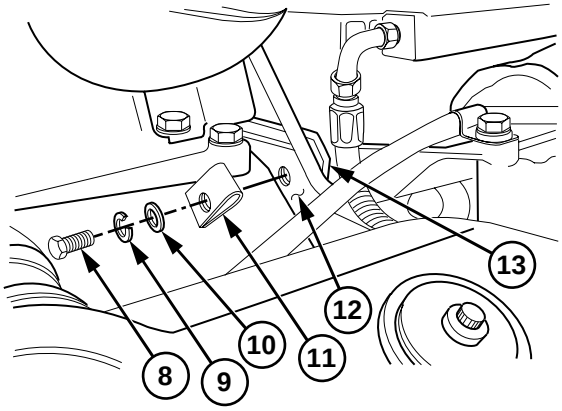
NOTE
Studs may come out of tee with nuts.

(3) Remove four nuts (4), washers (5), gasket (6), and tee (7) from turbocharger (3). Discard gasket.





(4) Remove screw (8), lockwasher (9), washer (10), and clip (11) from front blower cover (12) and ECM bracket (13). Discard lockwasher.



(5) Loosen two clamps (14) on hose (15).

(6) Remove two screws (16) and lockwashers (17) from turbocharger (3). Discard lockwashers.

NOTE

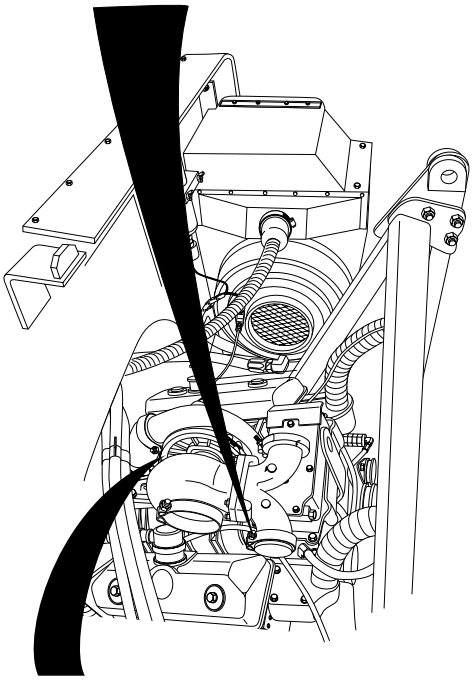
If hose sticks to turbocharger, pry hose loose.

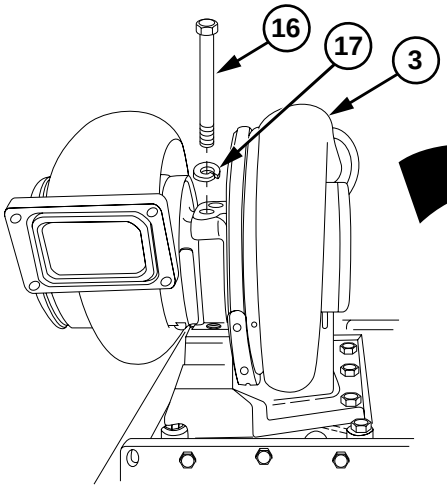
(7) Remove turbocharger (3) from air inlet housing (18) and adapter (19).

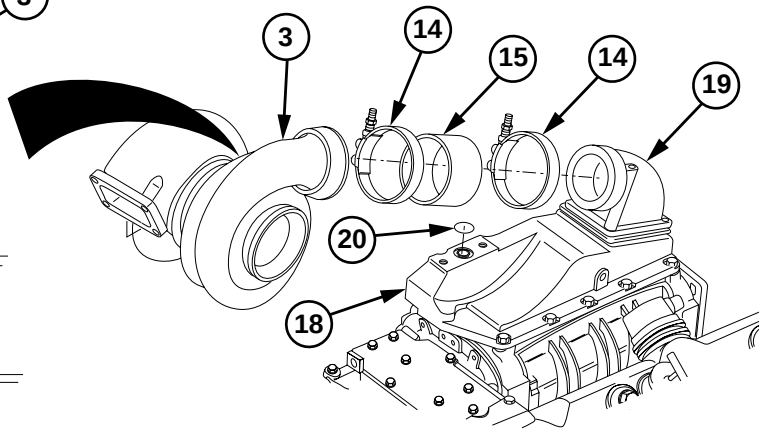
(8) Remove hose (15) and two clamps (14).

(9) Remove preformed packing (20) from air inlet housing (18). Discard preformed packing.

(10) Cover opening of adapter (19) with clean cloth.







4-11. TURBOCHARGER REPLACEMENT (CONT)

b. Cleaning/Inspection

(1) Inspect hose for cracks, splitting, or dry rot.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean metal parts in solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Dry metal parts with compressed air.

(4) Inspect housing for cracks or other damage.

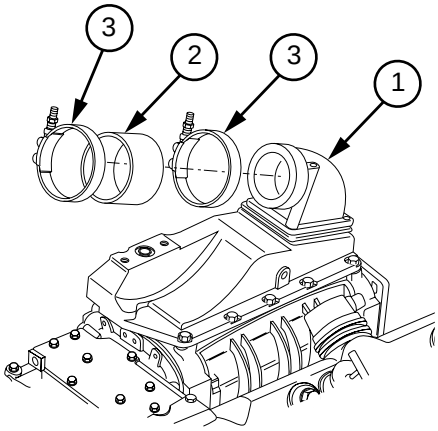
(5) Replace damaged parts.

c. Installation

(1) Remove cloth from adapter (1).

(2) Install hose (2) on adapter (1).

(3) Slide two clamps (3) over hose (2).



WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

CAUTION

Preformed packing can move out of position during turbocharger installation. To prevent this, a spray adhesive can be used to hold seal in place. Do not apply adhesive directly to seal. Failure to comply may result in damage to equipment.

(3.1) Spray a light, uniform coating of spray adhesive into the seal counterbore (3.1) in air inlet housing (5).

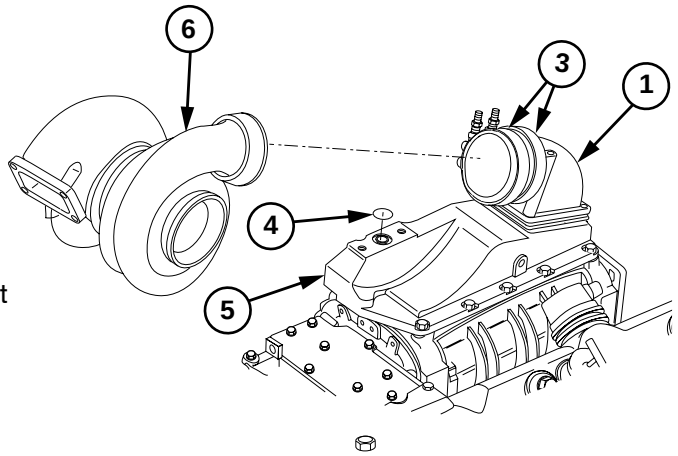
NOTE

Allow the adhesive to dry to a high-tack consistency (sticky) before installing seal.

(4) Install new preformed packing (4) in air inlet housing (5).

(5) Slide air outlet end of turbocharger (6) into hose (2).

(6) Position turbocharger (6) on air inlet housing (5).



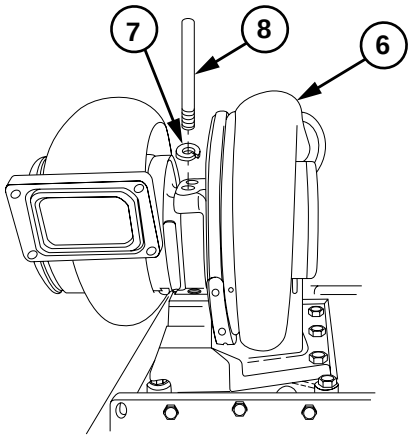
(7) Install two new lockwashers (7) and screws (8) in turbocharger (6). Torque to 45-50 lb-ft (61-67 N·m).

NOTE

When installing clamps, position nuts vertically to side of blower.

(8) Position one clamp (3) over adapter (1) and one clamp (3) over turbocharger (6).

(9) Tighten clamps (3) until the spring is fully compressed, approximately 50-60 lb-in. (6-7 N·m).



(10) Install connector (10) on turbocharger (6).

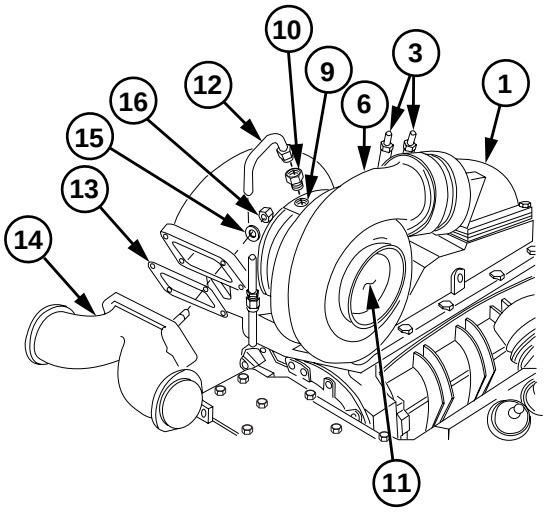
CAUTION

Center housing must be filled with oil before starting engine. Failure to comply may result in damage to turbocharger.

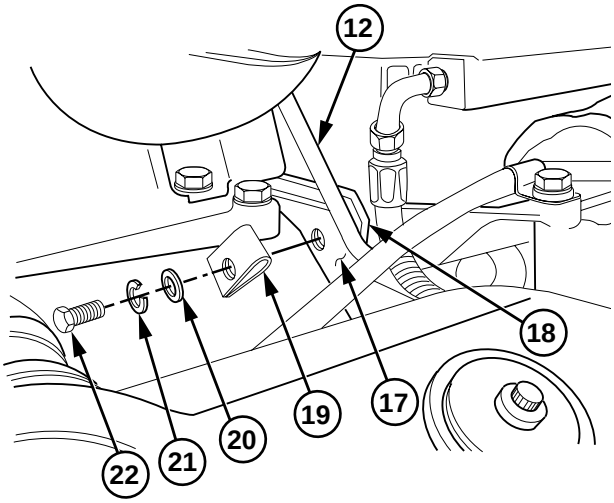
(11) Fill center housing (9) with approximately 1 cup lubricating oil through connector (10) while spinning compressor wheel (11).

(12) Connect oil hose (12) to connector (10).

(13) Install new gasket (13) and tee (14) on turbocharger (6) with four washers (15) and new locknuts (16). Torque to 35-39 lb-ft (47-53 N·m).



(14) Secure oil hose (12) to front blower cover (17) and ECM bracket (18) with clip (19), washer (20), new lockwasher (21), and screw (22).



c. Follow-On Maintenance

(1) Install air intake hose (TM 9-2320-360-20).

(2) Install exhaust pipe (TM 9-2320-360-20).

(3) Install exhaust tubes (TM 9-2320-360-20).

(4) Connect batteries (TM 9-2320-360-20).

(5) Start engine. Run at idle for 10 minutes (TM 9-2320-360-10).

(6) Check turbocharger gaskets and ducts for leaks.

(7) Increase engine speed and listen for smooth operation of turbocharger.

(8) Shut off engine (TM 9-2320-360-10).

4-12. TURBOCHARGER OIL SUPPLY HOSE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

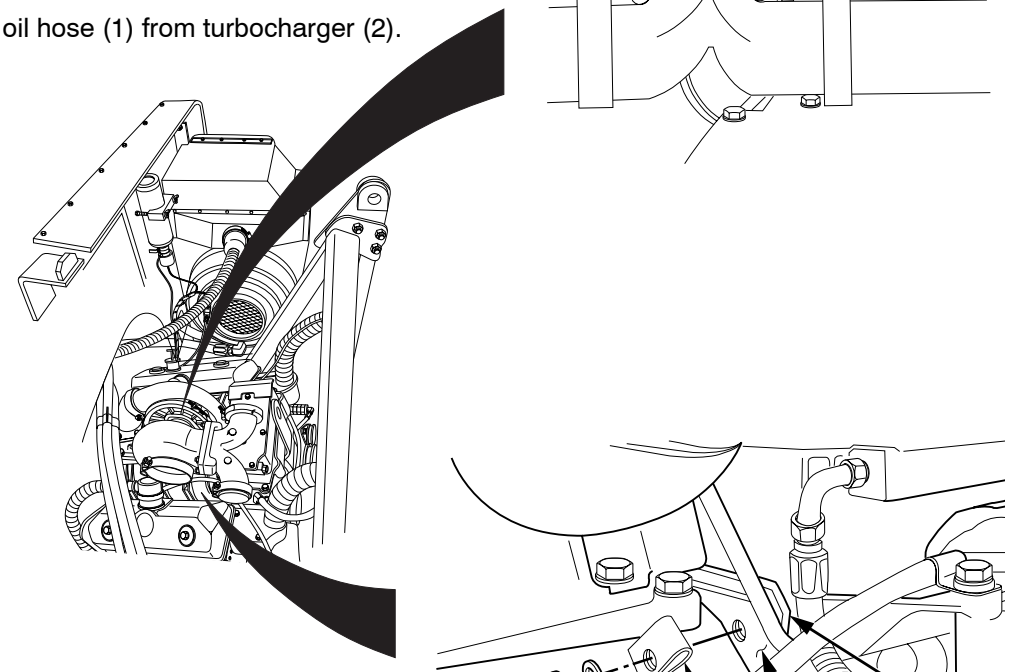
Equipment Conditions
Radiator and shroud removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

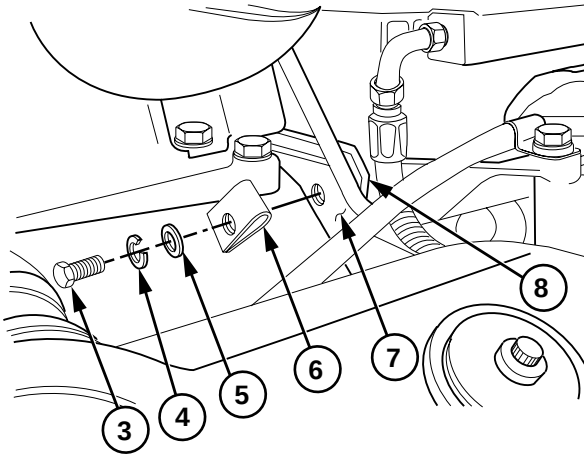
Materials/Parts
Lockwasher (Item 119, Appendix F)

a. Removal

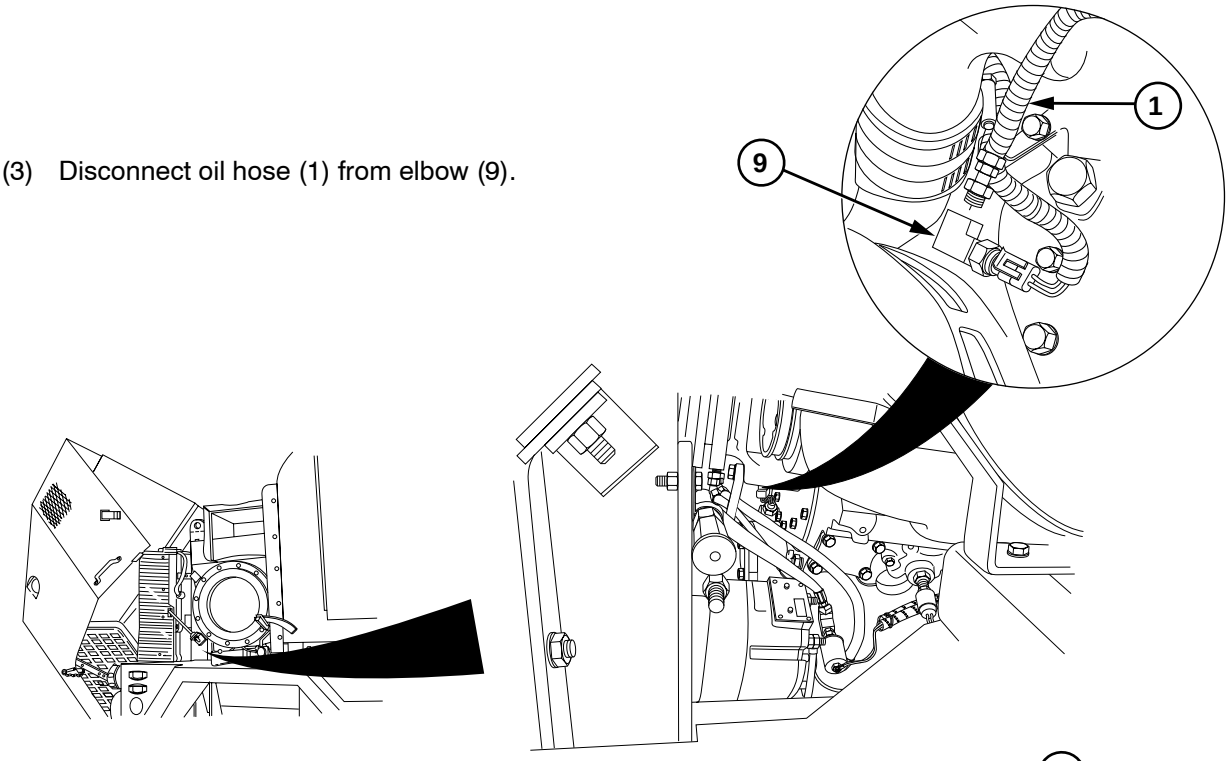
(1) Disconnect oil hose (1) from turbocharger (2).



(2) Remove screw (3), lockwasher (4), washer (5), and clip (6) from front blower cover (7) and ECM bracket (8). Discard lockwasher.

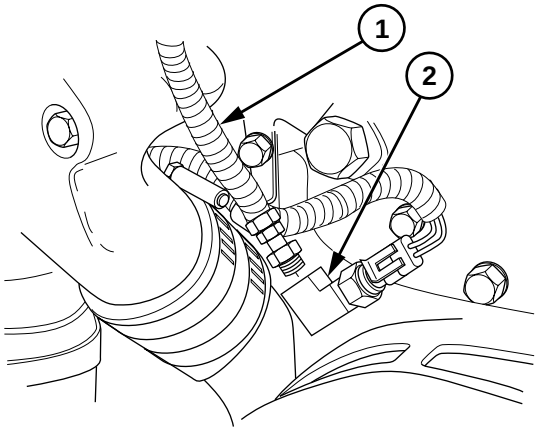


(3) Disconnect oil hose (1) from elbow (9).

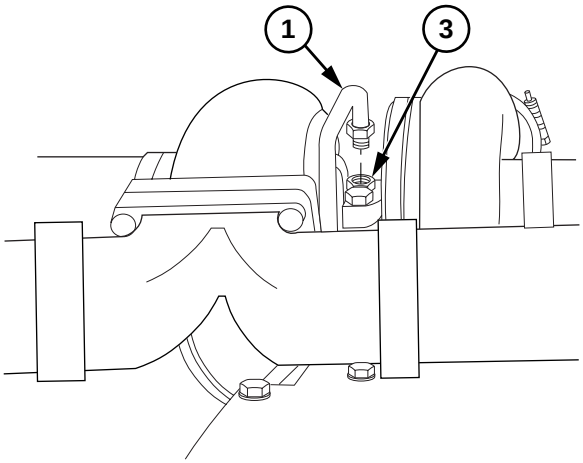


b. Installation

(1) Connect oil hose (1) to elbow (2).

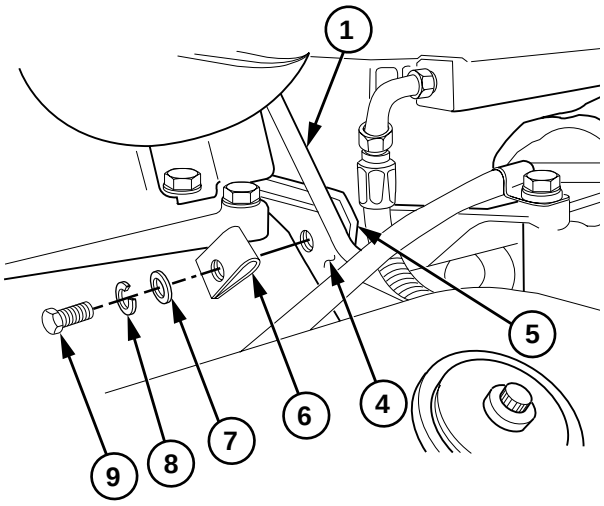


(2) Connect oil hose (1) to connector (3).



4-12. TURBOCHARGER OIL SUPPLY HOSE REPLACEMENT (CONT)

(3) Secure oil hose (1) to front blower cover (4) and ECM bracket (5) with clip (6), washer (7), new lockwasher (8), and screw (9).



c. Follow-On Maintenance

Install radiator and shroud (TM 9-2320-360-20).

4-13. SECONDARY FUEL FILTER HEAD REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine hood opened (TM 9-2320-360-10).
Batteries disconnected (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Removal Tool, Filter (Item 129, Appendix E)

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Oil, Fuel, Diesel (Item 38, Appendix B)
Tags, Identification (Item 56, Appendix B)
Filter, Fuel (Item 12, Appendix F)

a. Removal

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read: NO SMOKING WITHIN 50 FEET OF VEHICLE.

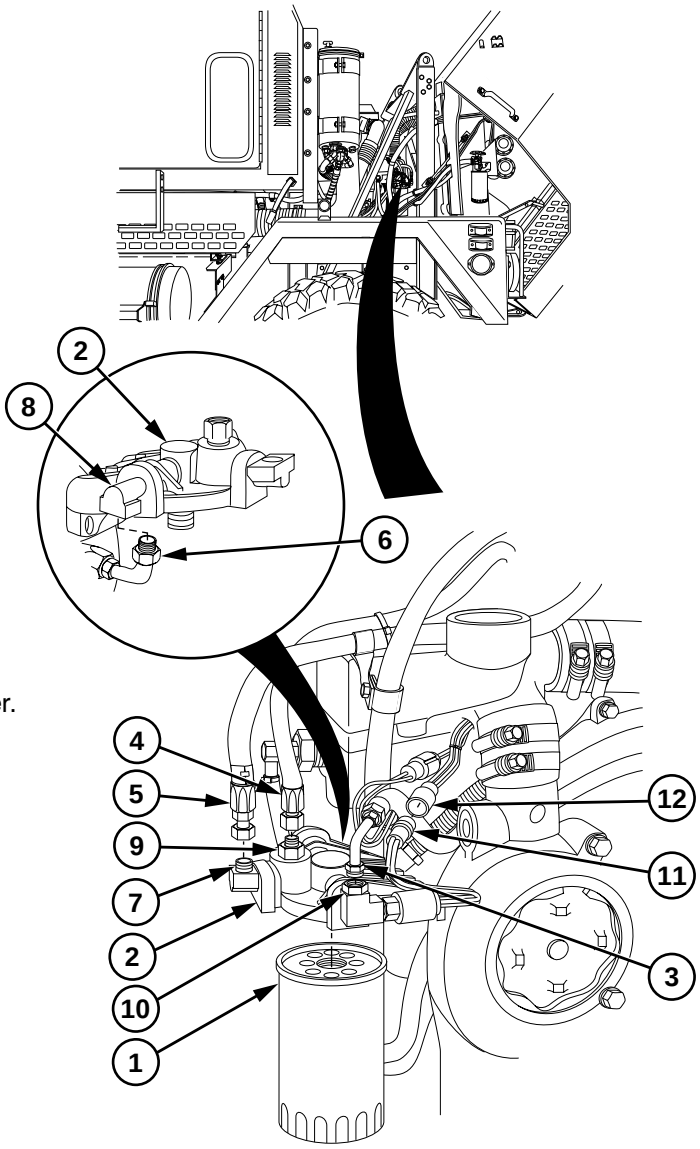
(1) Remove fuel filter (1) from head (2) by turning counterclockwise. Discard fuel filter.

NOTE

Tag and mark fuel lines before removing.

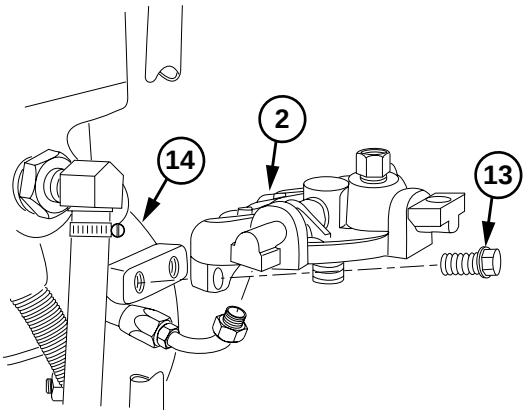
(2) Disconnect four fuel lines (3 thru 6) from elbows (7 and 8) and reducers (9 and 10).

(3) Disconnect plug (11) from receptacle (12).



4-13. SECONDARY FUEL FILTER HEAD REPLACEMENT (CONT)

(4) Remove two screws (13) and head (2) from engine (14).

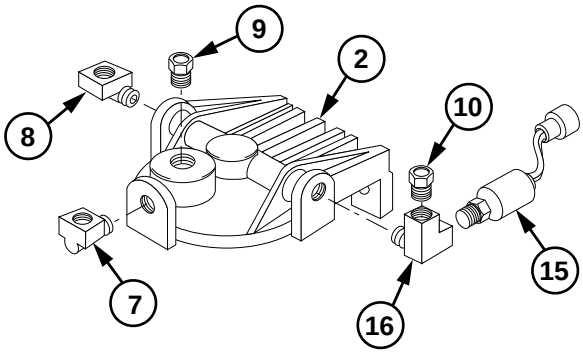


(5) Remove STE-ICE sensor (15) from tee (16).

(6) Remove reducer (9) from head (2).

(7) Remove reducer (10) from tee (16).

(8) Remove two elbows (7 and 8) and tee (16) from head (2).



b. Installation

WARNING

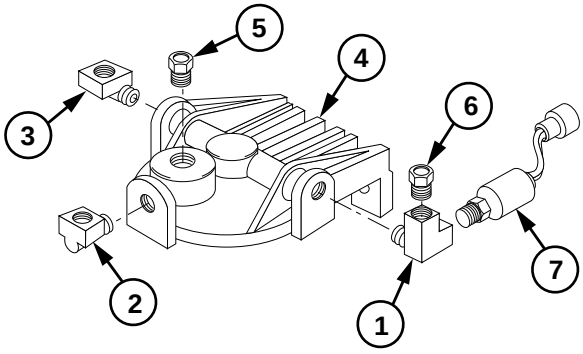
Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Coat threads of tee (1) and two elbows (2 and 3) with pipe thread sealing compound.

(2) Install tee (1) and two elbows (2 and 3) on head (4).

NOTE

One reducer contains a calibrated restrictor.

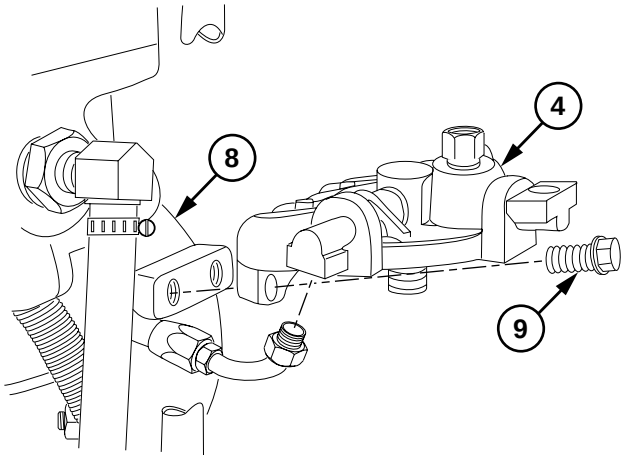


(3) Install restricted reducer (5) on head (4).

(4) Install reducer (6) on tee (1).

(5) Install STE-ICE sensor (7) on tee (1).

(6) Install head (4) on engine (8) with two screws (9).



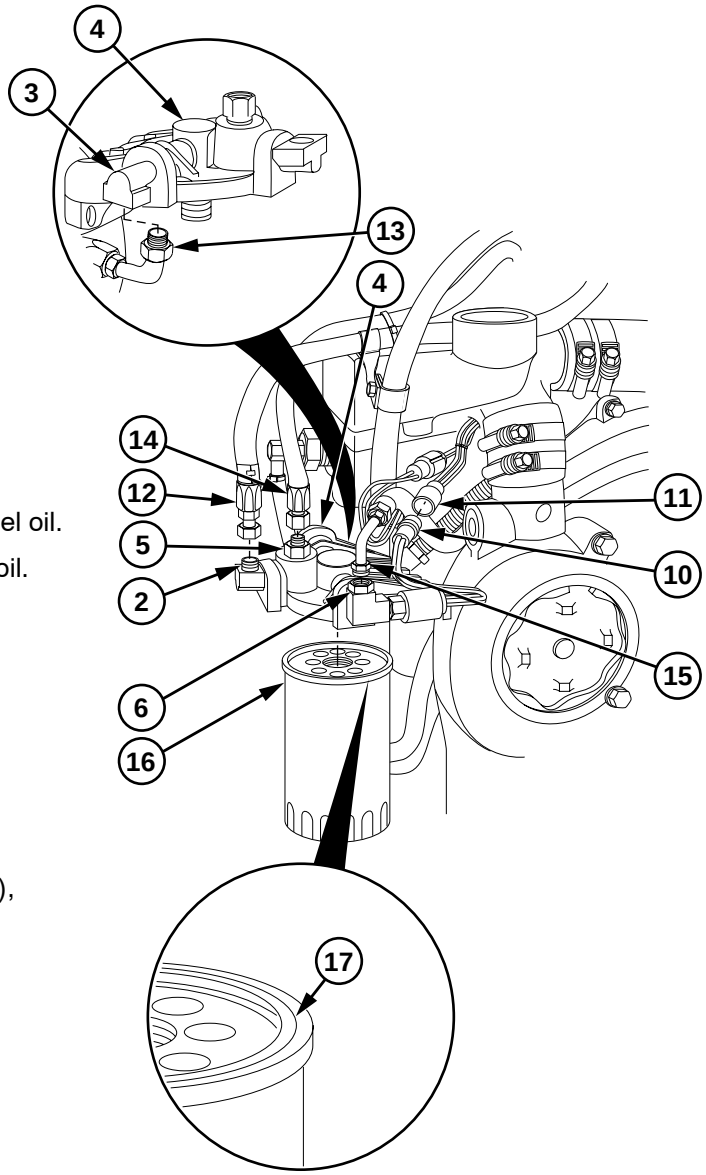
(7) Connect plug (10) to receptacle (11).

(8) Connect fuel lines (12 and13) to elbows (2 and 3).

(9) Connect fuel lines (14 and 15) to reducers (5 and 6).

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read: NO SMOKING WITHIN 50 FEET OF VEHICLE.



(10) Fill new fuel filter (16) with clean diesel fuel oil.

(11) Moisten new gasket (17) with diesel fuel oil.

CAUTION

Do not install secondary fuel filter with filter wrench. Hand-tighten only. Damage to filter may result.

(12) Install new fuel filter (16) and new gasket (17) on head (4) by turning clockwise.

(13) Tighten until gasket (17) touches head (4), then tighten additional one-half turn.

c. Follow-On Maintenance

(1) Connect batteries (TM 9-2320-360-20).

(2) Start engine (TM 9-2320-360-10).

(3) Check fuel filters for leaks.

(4) Shut off engine (TM 9-2320-360-10).

(5) Close engine hood (TM 9-2320-360-20).

CHAPTER 5
COOLING SYSTEM MAINTENANCE

Contents

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Section I. INTRODUCTION

5-1. INTRODUCTION

This chapter contains maintenance instructions for replacement and repair of cooling system components at the Direct Support maintenance level. Some parts must be removed before cooling system components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

5-2. RADIATOR TEST/REPAIR

This task covers
a. Disassembly
b. Cleaning/Inspection
c. Assembly
d. Testing
e. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Radiator removed (TM 9-2320-360-20).
Radiator sight glass removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Radiator (Item 2, Appendix E)
Jackstands (4) (Item 93, Appendix E)
Plug Set, Radiator (Item 115, Appendix E)
Plywood (Figure C-5, Appendix C)
Pressure Tester, Radiator (Item 117, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Adhesive-Sealant, Permatex No. 1 (Item 9, Appendix B)
Gaskets (2) (Item 16, Appendix F)
Lockwashers (140) (Item 119, Appendix F)

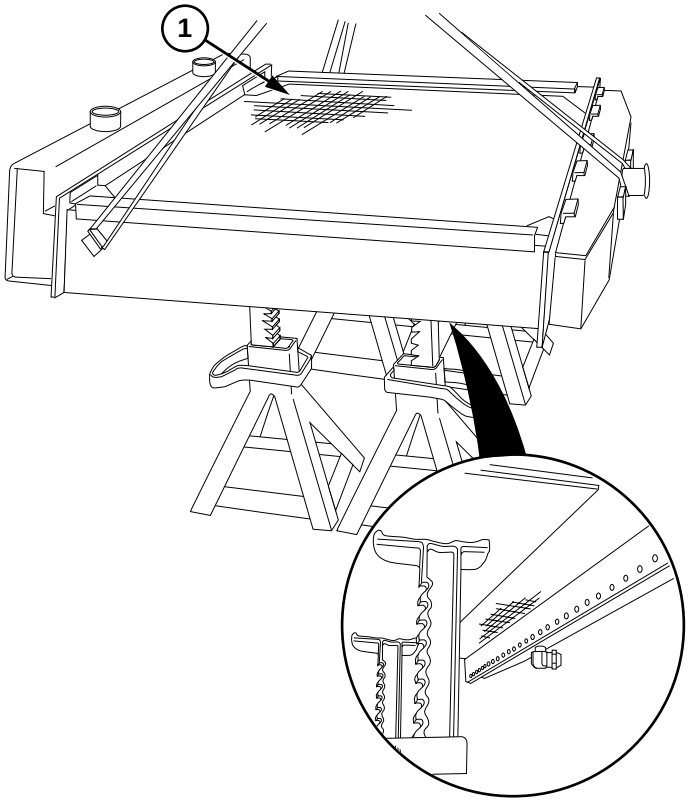
Personnel Required
MOS 44B (2)

a. Disassembly

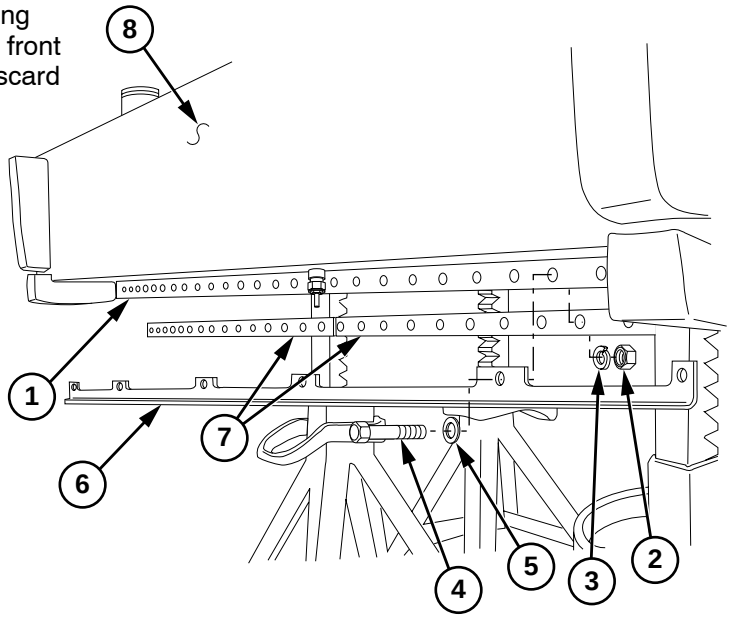
CAUTION
Failure to properly support radiator core as described in step (1) will result in damage to core.

NOTE
Jackstands should be positioned at highest level for easier access to lower side of radiator.

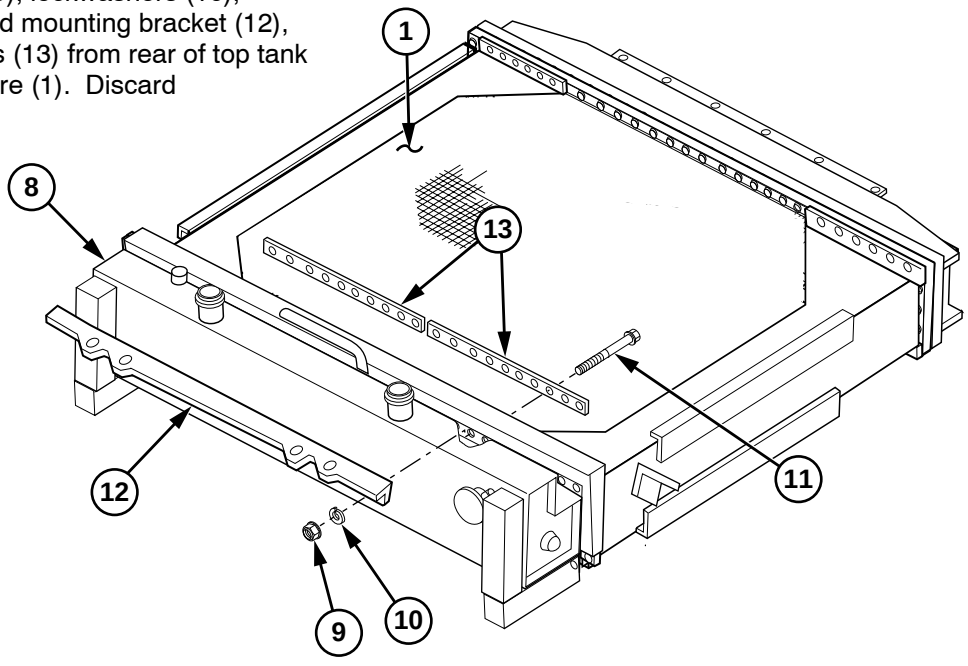
(1) Position radiator core (1) on plywood supported by four jackstands.



(2) Remove 32 nuts (2), lockwashers (3), screws (4), 4 washers (5), baffle mounting bracket (6), and 2 bolting strips (7) from front of top tank (8) and radiator core (1). Discard lockwashers.



(3) Remove 32 nuts (9), lockwashers (10), screws (11), shroud mounting bracket (12), and 2 bolting strips (13) from rear of top tank (8) and radiator core (1). Discard lockwashers.

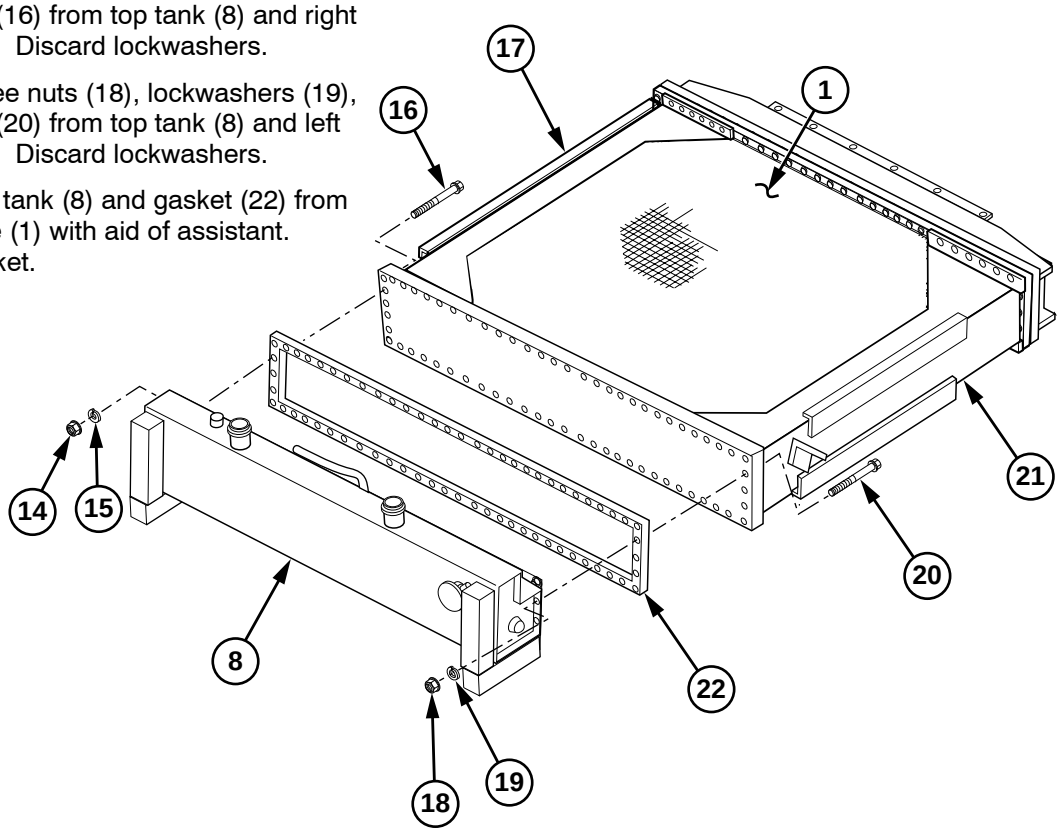


5-2. RADIATOR TEST/REPAIR (CONT)

(4) Remove three nuts (14), lockwashers (15) and screws (16) from top tank (8) and right column (17). Discard lockwashers.

(5) Remove three nuts (18), lockwashers (19), and screws (20) from top tank (8) and left column (21). Discard lockwashers.

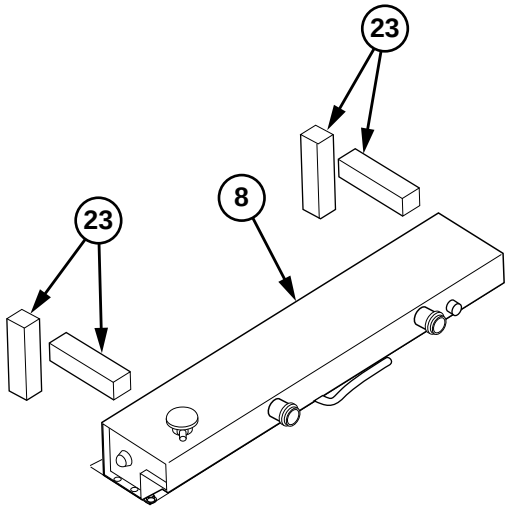
(6) Remove top tank (8) and gasket (22) from radiator core (1) with aid of assistant. Discard gasket.



NOTE

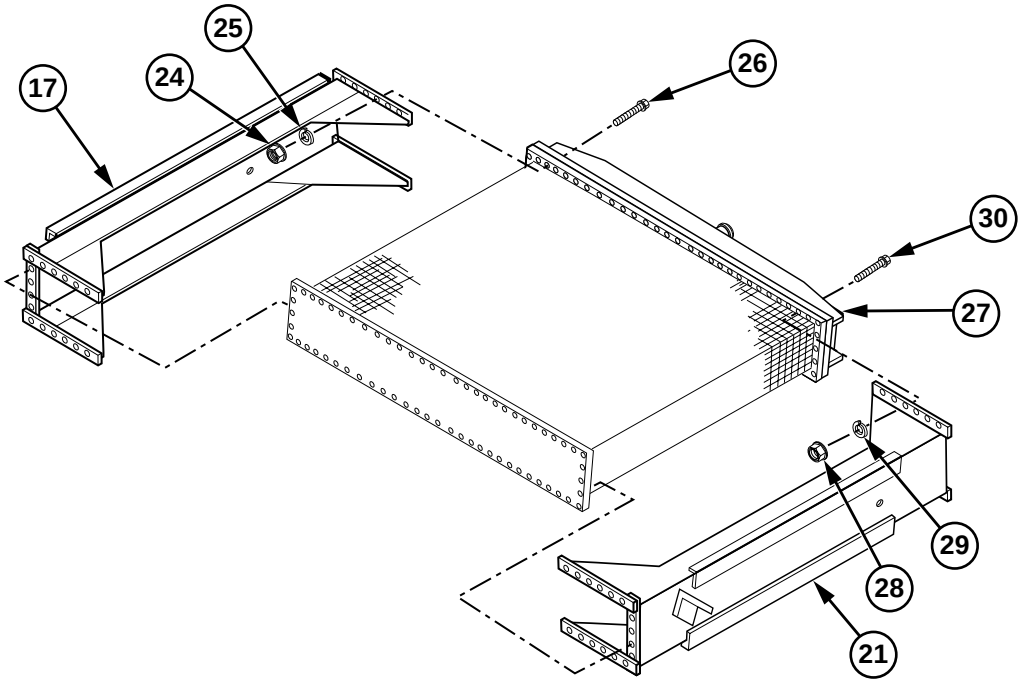
Do step (7) only if foam blocks fail inspection.

(7) Remove and discard four foam blocks (23) from top tank (8).

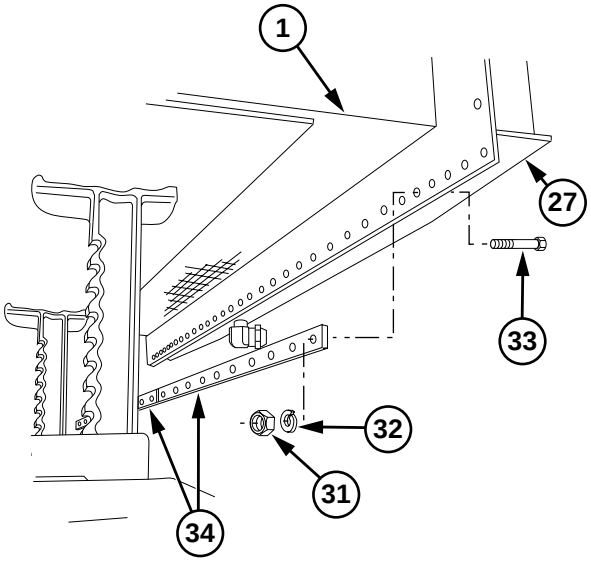


(8) Remove 15 nuts (24), lockwashers (25), and screws (26) from right column (17) and bottom tank (27) with aid of assistant. Discard lockwashers.

(9) Remove 15 nuts (28), lockwashers (29), and screws (30) from left column (21) and bottom tank (27) with aid of assistant. Discard lockwashers.



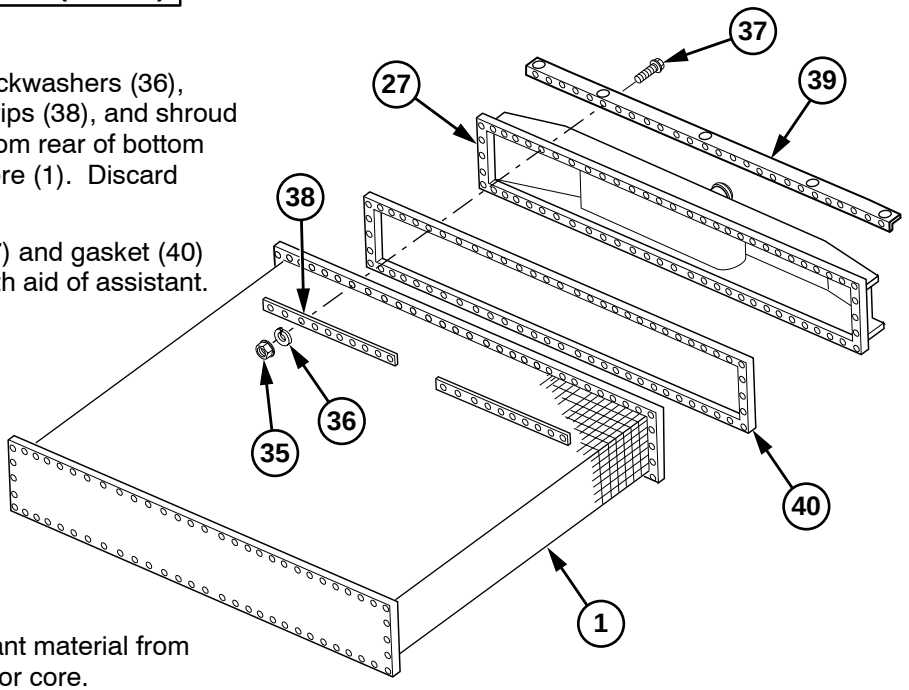
(10) Remove 20 nuts (31), lockwashers (32), screws (33), and 2 bolting strips (34) from front of bottom tank (27) and radiator core (1) with aid of assistant. Discard lockwashers.



5-2. RADIATOR TEST/REPAIR (CONT)

(11) Remove 20 nuts (35), lockwashers (36), screws (37), 2 bolting strips (38), and shroud mounting bracket (39) from rear of bottom tank (27) and radiator core (1). Discard lockwashers.

(12) Remove bottom tank (27) and gasket (40) from radiator core (1) with aid of assistant. Discard gasket.



b. Cleaning/Inspection

(1) Scrape gasket and sealant material from radiator tanks and radiator core.

(2) Inspect radiator tanks for cracks, dents, and other damage. Replace damaged tanks.

(3) Inspect radiator core for plugged tubes. Light should be visible through all tubes that are not sealed.

(4) Refer to TB 750-254 for additional cleaning information.

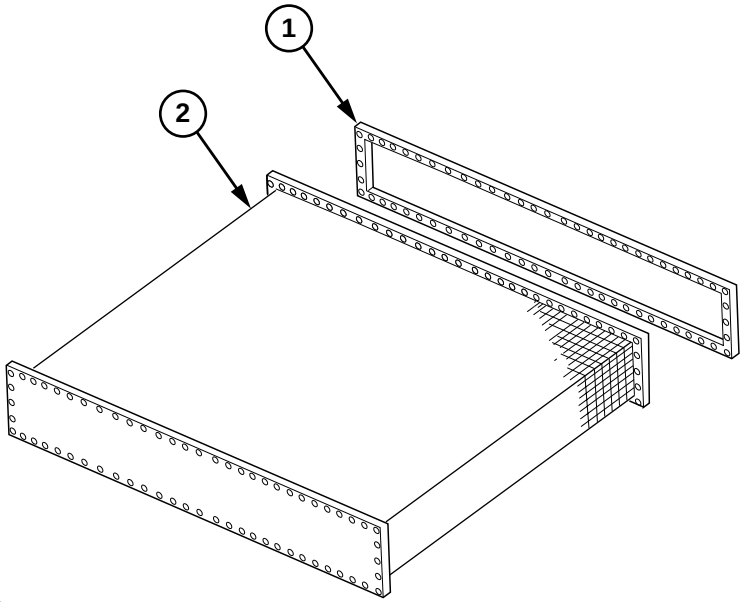
c. Assembly

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

CAUTION

Gasket must be secured to radiator core before adhesive-sealant sets. Failure to comply may result in radiator leaking.



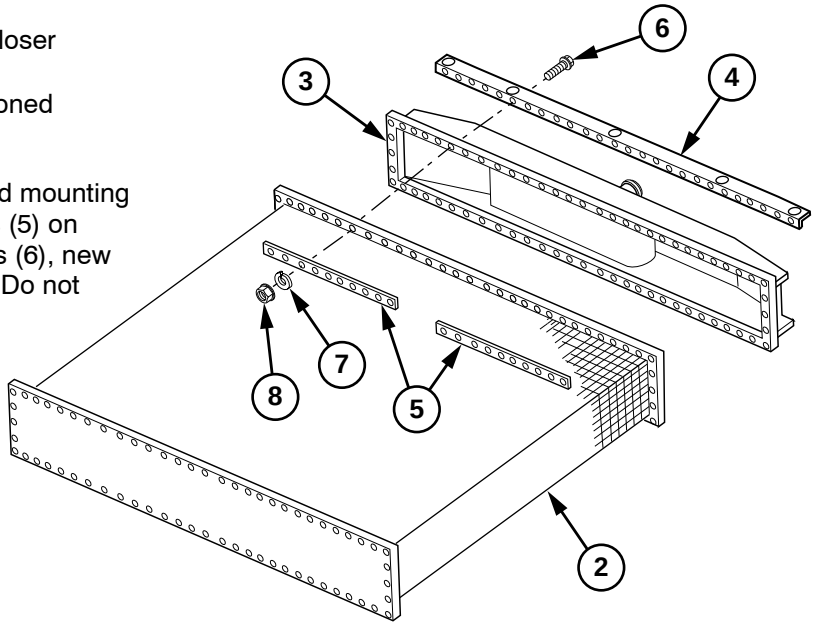
(1) Coat ends and joint on gasket (1) with adhesive-sealant.

(2) Position gasket (1) on radiator core (2).

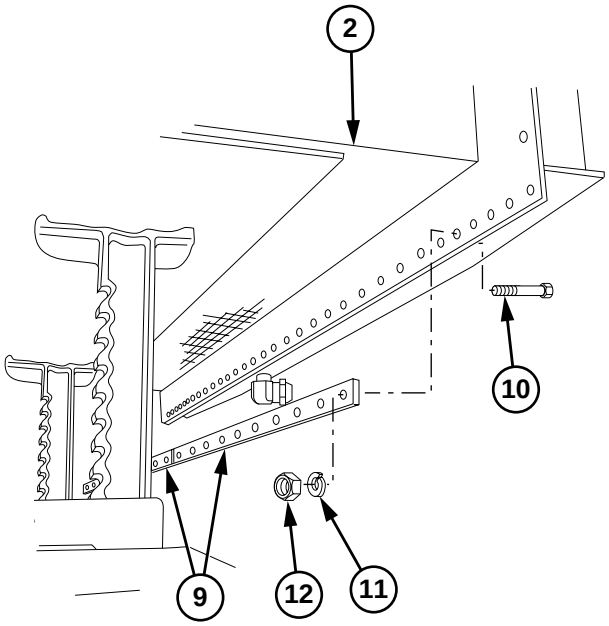
NOTE

- Five shroud mounting brackets are installed on side of radiator opposite transmission cooler line openings in bottom tank.
- Holes on bolting strip are closer to one end than the other. These ends must be positioned to outside edge of radiator.

(3) Position bottom tank (3), shroud mounting bracket (4), and 2 bolting strips (5) on radiator core (2) with 20 screws (6), new lockwashers (7), and nuts (8). Do not tighten.



(4) Position 2 bolting strips (9) on radiator core (2) with 20 screws (10), new lockwashers (11), and nuts (12). Do not tighten.



5-2. RADIATOR TEST/REPAIR (CONT)

NOTE

When properly installed, fan shroud mounting holes in side members should be on same side as shroud mounting brackets. Radiator tie rod brackets should be positioned toward top tank.

(5) Position left column (13) on bottom tank (3) with 15 screws (14), new lockwashers (15), and nuts (16) with aid of assistant. Do not tighten.

(6) Position right column (17) on bottom tank (3) with 15 screws (18), new lockwashers (19), and nuts (20) with aid of assistant. Do not tighten.

WARNING

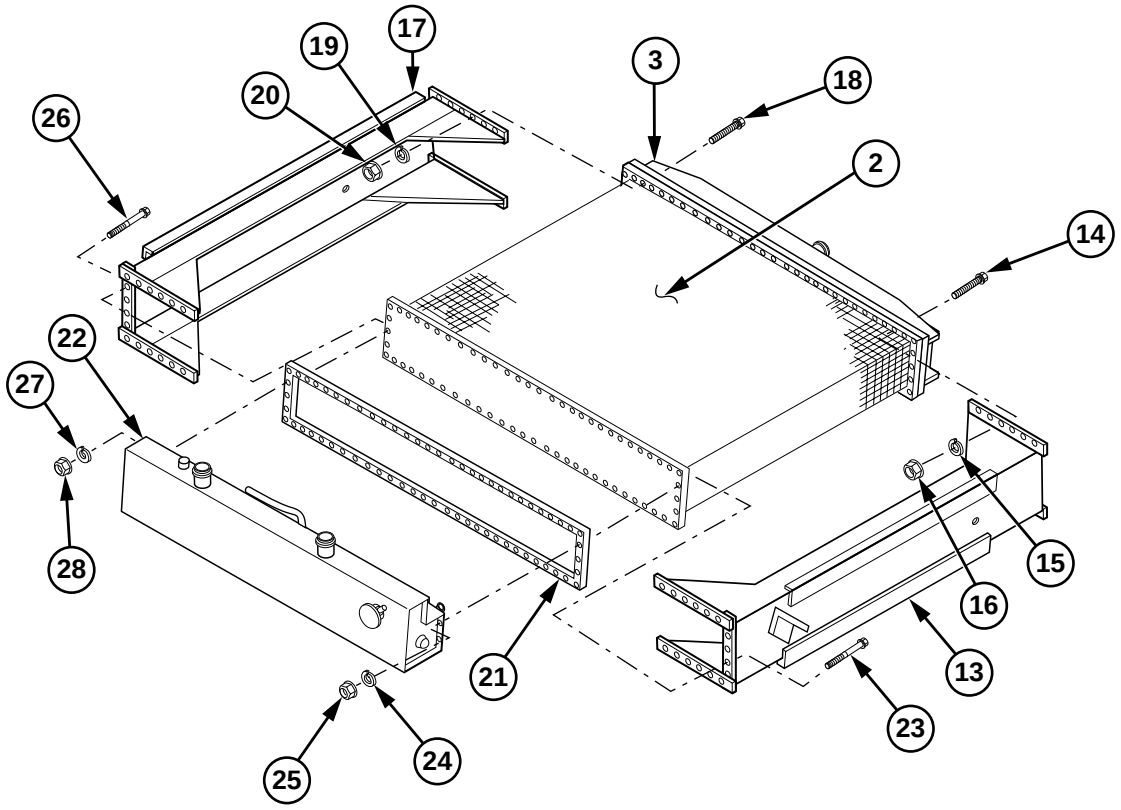
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(7) Coat ends and joint of gasket (21) with adhesive-sealant.

(8) Position gasket (21) on radiator core (2).

(9) Position top tank (22) on left column (13) with three screws (23), new lockwashers (24), and nuts (25). Do not tighten.

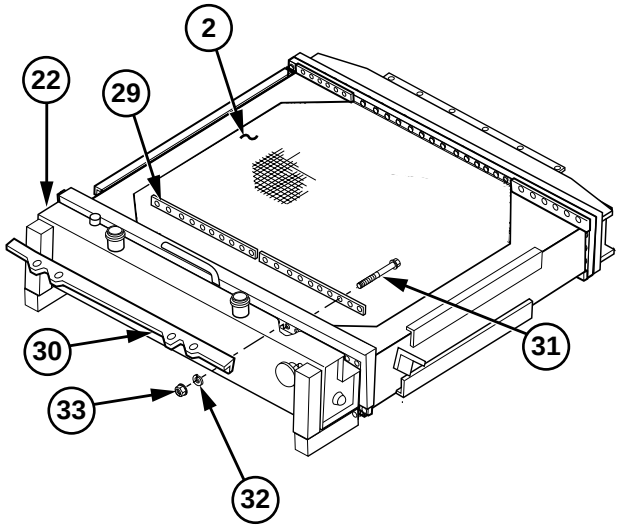
(10) Position top tank (22) on right column (17) with three screws (26), new lockwashers (27), and nuts (28). Do not tighten.



NOTE

- When properly installed, shroud mounting brackets and outlet necks on top tank should be on same side as fan shroud mounting holes in side members.
- Holes on bolting strip are closer to one end than the other. These ends must be positioned to outside edge of radiator.

(11) Position top tank (22), 2 bolting strips (29), and mounting bracket (30) on radiator core (2) with 32 screws (31), new lockwashers (32), and nuts (33) with aid of assistant. Do not tighten.



(12) Position 2 bolting strips (34) and baffle mounting bracket (35) on radiator core (2) with 4 washers (36), 32 screws (37), new lockwashers (38), and nuts (39). Do not tighten.

(13) Tighten nuts (8, 12, 16, 20, 25, 28, 33, and 39) to 204–252 lb–in. (23–28.5 N·m).

WARNING

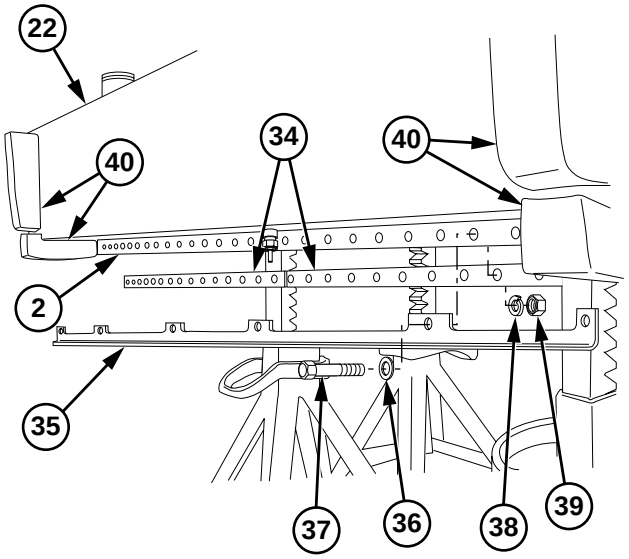
On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

NOTE

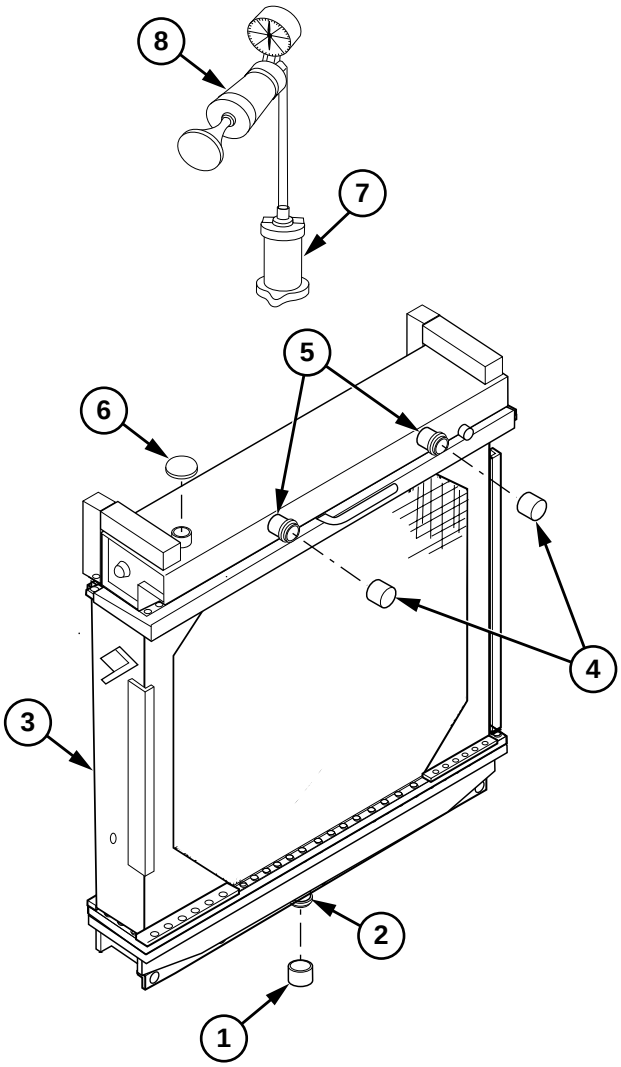
Do steps (14) and (15) only if foam blocks were removed.

(14) Coat four foam blocks (40) with silicone adhesive–sealant.

(15) Install four foam blocks (40) on top tank (22).



5-2. RADIATOR TEST/REPAIR (CONT)



d. Testing

(1) Install plug (1) in lower radiator outlet neck (2).

(2) Position and secure radiator (3) in upright position.

(3) Install two plugs (4) in upper radiator inlet necks (5).

(4) Remove radiator cap (6) and fill with water.

(5) Install adapter (7) on radiator (3).

(6) Install radiator tester (8) on adapter (7).

(7) Pressurize radiator (3) to 10 psi (69 kPa) using tester (8).

NOTE

Pay special attention to leaks at gasket mating areas and transmission cooler openings.

(8) Observe radiator (3) for water leaks and loss of pressure on tester (8).

(9) Remove tester (8), adapter (7), and three plugs (1 and 4) from radiator.

(10) Install radiator cap (6) on radiator (3).

e. Follow-On Maintenance

(1) Install radiator sight glass (TM 9-2320-360-20).

(2) Install radiator (TM 9-2320-360-20).

5-3. LEFT THERMOSTAT HOUSING REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Thermostat removed (TM 9-2320-360-20).
STE-ICE temperature sensor removed, DDEC III/IV only (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Brush, Wire (Item 14, Appendix B)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Combination, 1-1/4 In. (Item 215, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

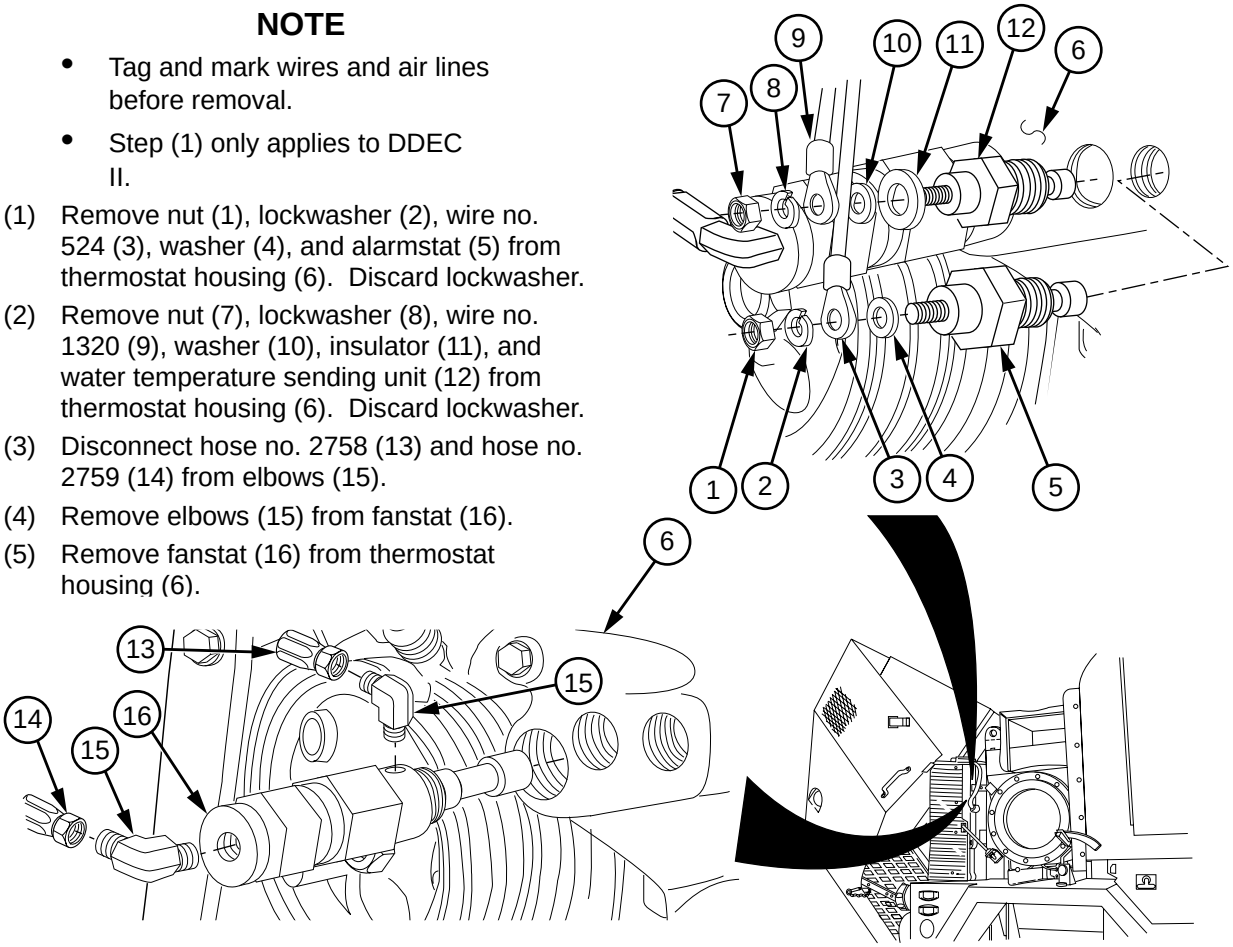
Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Wrench, Torque, 0-150 Lb-In. (Item 234, Appendix E)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Gasket (Item 39, Appendix F)
Lockwasher (Item 116, Appendix F)
Lockwasher (Item 127, Appendix F)
Lockwasher (Item 117, Appendix F)

a. Removal

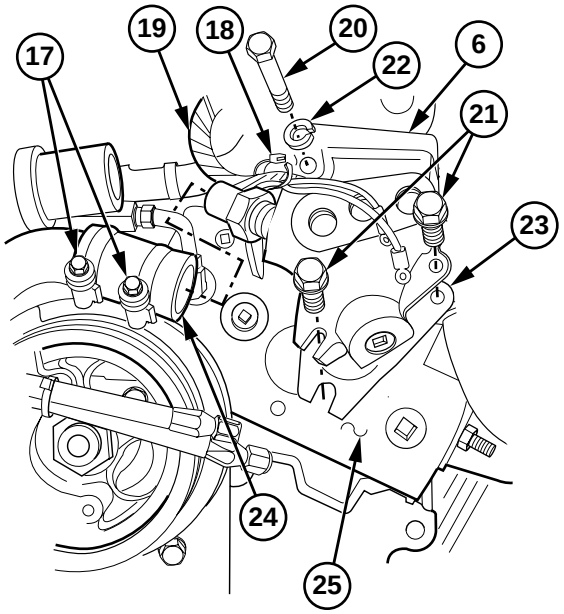
NOTE

- Tag and mark wires and air lines before removal.
- Step (1) only applies to DDEC II.

(1) Remove nut (1), lockwasher (2), wire no. 524 (3), washer (4), and alarmstat (5) from thermostat housing (6). Discard lockwasher.
(2) Remove nut (7), lockwasher (8), wire no. 1320 (9), washer (10), insulator (11), and water temperature sending unit (12) from thermostat housing (6). Discard lockwasher.
(3) Disconnect hose no. 2758 (13) and hose no. 2759 (14) from elbows (15).
(4) Remove elbows (15) from fanstat (16).
(5) Remove fanstat (16) from thermostat housing (6).



5-3. LEFT THERMOSTAT HOUSING REPLACEMENT (CONT)



(6) Loosen two clamps (17).

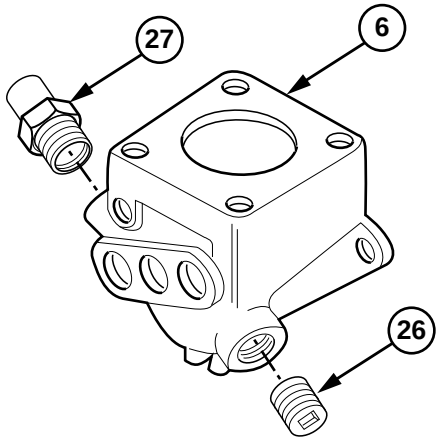
NOTE

Location of plastic cable ties should be marked before removal.

(7) Remove cable tie (18) securing wiring harness (19) from thermostat housing (6).

(8) Remove three screws (20 and 21) and lockwasher (22) from thermostat housing (6). Discard lockwasher.

(9) Remove thermostat housing (6), gasket (23), hose (24), and two clamps (17) from engine (25). Discard gasket.



(10) Remove plug (26) from thermostat housing (6).

(11) Remove connector (27) from thermostat housing (6).

b. Cleaning/Inspection

CAUTION

Wear eye protection and use care when scraping gasket material from machined surface of housing. Damage to housing may result.

(1) Scrape gasket material from thermostat housing.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

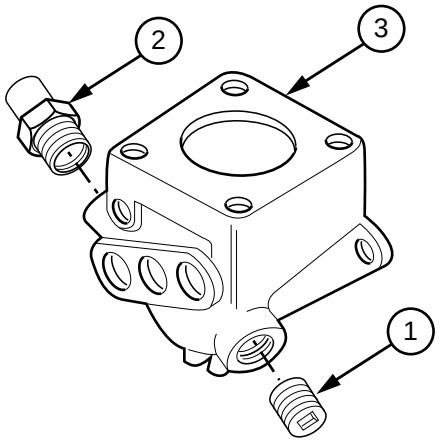
(2) Clean metal parts with solvent cleaning compound and wire brush.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Dry metal parts with compressed air.

(4) Inspect thermostat housing for cracks or other damage. Replace damaged parts.



c. Installation

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.

(1) Coat threads of plug (1) and connector (2) with pipe thread sealing compound.

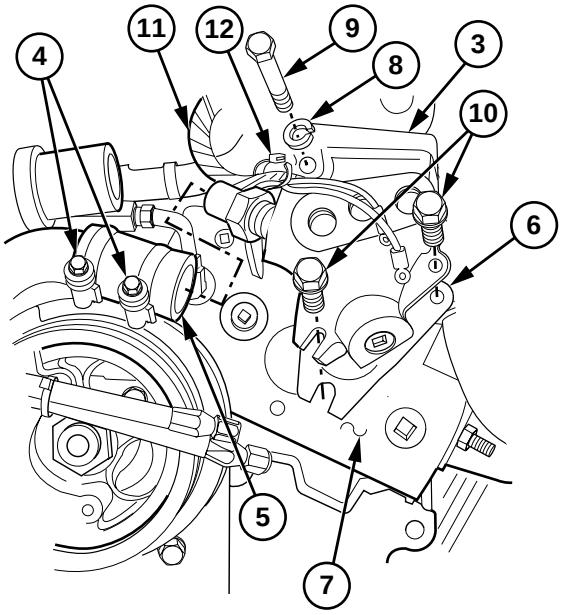
(2) Install connector (2) on thermostat housing (3).

(3) Install plug (1) in thermostat housing (3).

5-3. LEFT THERMOSTAT HOUSING REPLACEMENT (CONT)

(4) Position two clamps (4), hose (5), new gasket (6), and thermostat housing (3) on engine (7).

(5) Install new lockwasher (8) and three screws (9 and 10) on thermostat housing (3). Torque to 30–35 lb-ft (41–47 N·m).



NOTE

Plastic cable ties should be positioned in locations marked during removal.

(6) Secure wiring harness (11) to thermostat housing (3) with plastic cable tie (12).

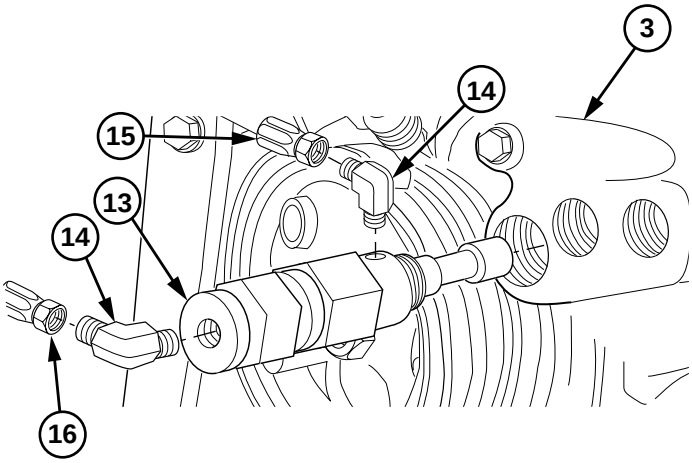
NOTE

When clamps are properly tightened, washer stacks should be nearly collapsed flat and screw tip should extend beyond clamp approximately 3/16 in. (8 mm).

(7) Tighten two clamps (4) to 90 lb-in. (10.1 N·m).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.



(8) Coat threads of fanstat (13) with pipe thread sealing compound.

(9) Install fanstat (13) in thermostat housing (3).

(10) Install two elbows (14) in fanstat (13).

(11) Connect hose no. 2758 (15) and no. 2759 (16) to elbows (14).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(12) Coat threads of water temperature sending unit (17) with pipe thread sealing compound.

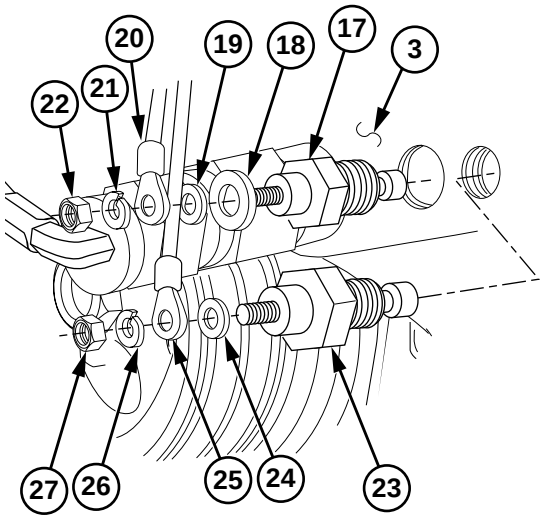
(13) Install water temperature sending unit (17), insulator (18), washer (19), wire no. 1320 (20), new lockwasher (21), and nut (22) on thermostat housing (3).

(14) Coat threads of alarmstat (23) with pipe thread sealing compound.

NOTE

Step (15) only applies to DDEC II.

(15) Install alarmstat (23), washer (24), wire no. 524 (25), new lockwasher (26), and nut (27) on thermostat housing (3).



d. Follow-On Maintenance

(1) Install thermostat (TM 9-2320-360-20).

(1.1) Install STE-ICE temperature sensor, DDEC III/IV only (TM 9-2320-360-20).

(2) Start and warm up engine (TM 9-2320-360-10).

(3) Check WATER TEMP gage for normal operating temperature and check for leaks (TM 9-2320-360-10).

(4) Shut off engine (TM 9-2320-360-10).

5-4. RIGHT THERMOSTAT HOUSING REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Thermostat removed (TM 9-2320-360-20).
Coolant Temperature Sensor removed, DDEC III/IV only (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Gasket (Item 43, Appendix F)
Lockwashers (2) (Item 127, Appendix F)
Lockwasher (Item 121, Appendix F)

a. Removal

(1) Loosen clamp (1) and remove hose (2) from elbow (3).

(2) Loosen clamp (4) and remove hose (5) from fitting (6).

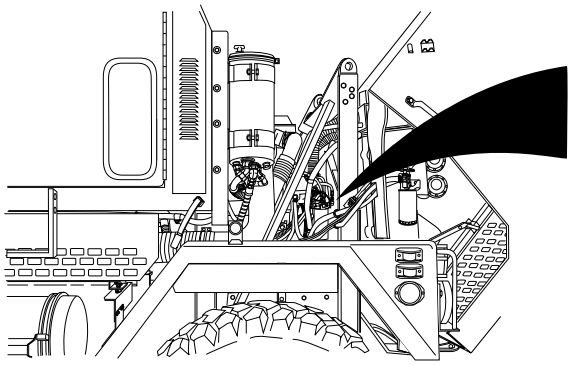
NOTE
Steps (3) and (4) apply only to DDEC II engines.

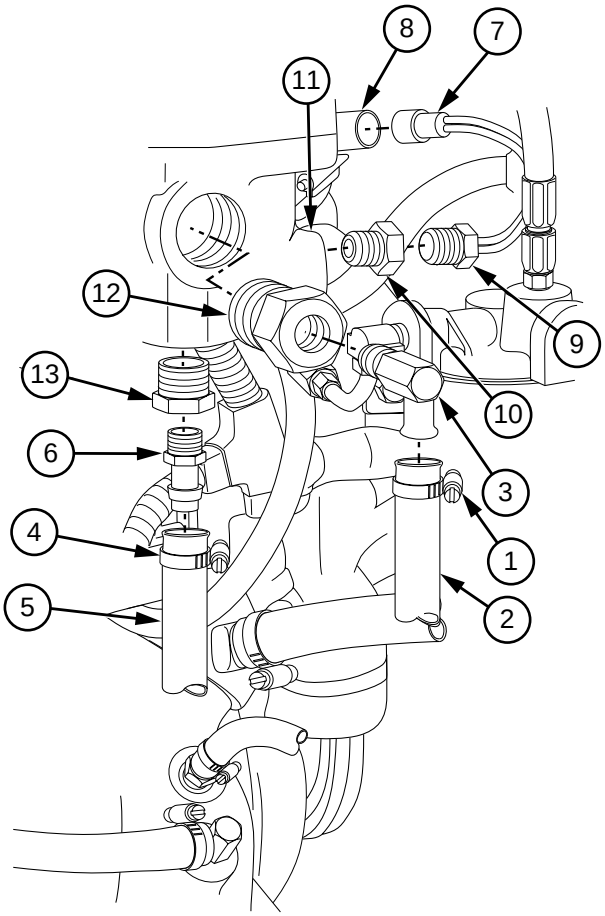
(3) Remove plug (7) from receptacle (8).

(4) Remove STE/ICE water temperature sensor (9) and fitting (10) from thermostat housing (11).

(5) Remove elbow (3) and fitting (12) from thermostat housing (11).

(6) Remove fitting (6) and fitting (13) from thermostat housing (11).

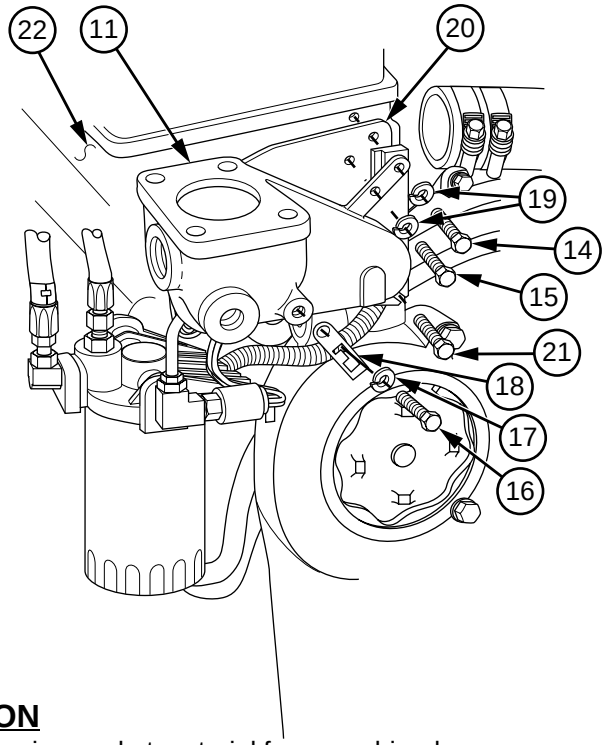




(7) Remove three screws (14 thru 16), lockwasher (17), clip (18), and two lockwashers (19). Discard lockwashers.

(8) Remove thermostat housing (11) and gasket (20). Discard gasket.

(9) Remove screw (21) from cylinder head (22).



b. Cleaning/Inspection

CAUTION

Wear eye protection and use care when scraping gasket material from machined surface of housing. Damage to housing could result.

(1) Scrape gasket material from thermostat housing.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean metal parts with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Dry metal parts with compressed air.

(4) Inspect housing for cracks or other damage.

(5) Replace damaged parts.

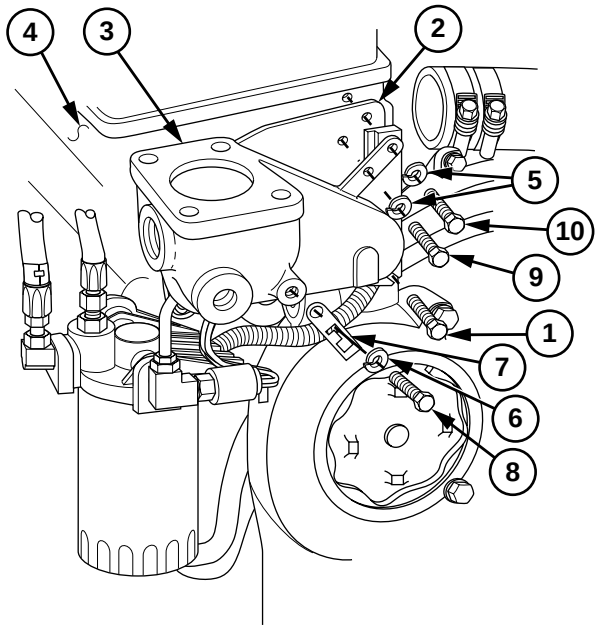
5-4. RIGHT THERMOSTAT HOUSING REPLACEMENT (CONT)

c. Installation

(1) Thread in screw (1) about three turns.

(2) Install new gasket (2) and thermostat housing (3) on cylinder head (4) with two new lockwashers (5), lockwasher (6), clip (7), and screws (8 thru 10).

(3) Tighten all screws to 30-35 lb-ft (41-47 N·m).



WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(4) Coat threads of fittings (11 thru 14) and elbow (15) with pipe thread sealing compound.

(5) Install two fittings (11 and 12) in thermostat housing (3).

(6) Install fitting (13) and elbow (15) in thermostat housing (3).

NOTE

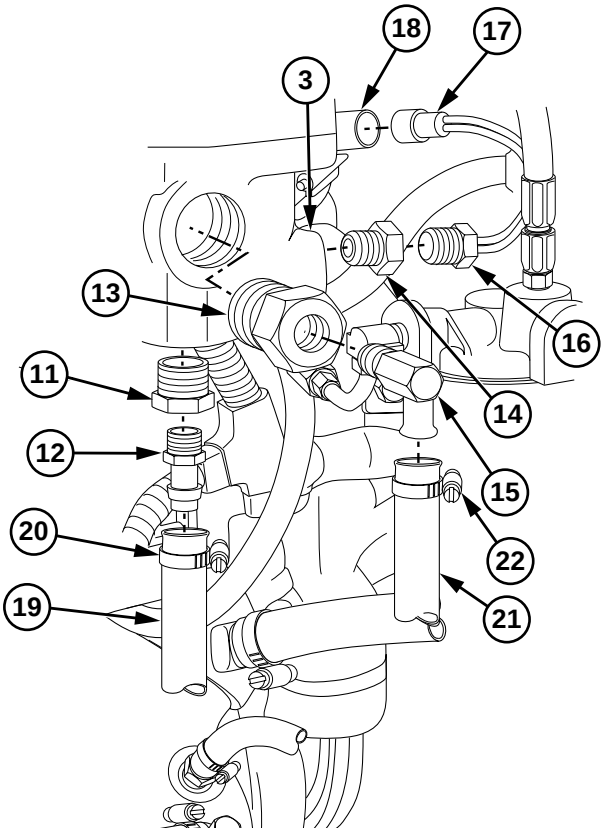
Steps (7) and (8) only apply to DDEC II.

(7) Install fitting (14) and STE/ICE water temperature sensor (16) in thermostat housing (3).

(8) Connect plug (17) to receptacle (18).

(9) Install hose (19) on fitting (12) with clamp (20).

(10) Install hose (21) on elbow (15) with clamp (22).



d. Follow-On Maintenance

(1) Install thermostat (TM 9-2320-360-20).

(1.1) Install coolant temperature sensor, DDEC III/IV only (TM 9-2320-360-20).

(2) Start engine and check for leaks (TM 9-2320-360-10).

(3) Check WATER TEMP gage for normal operating temperature (TM 9-2320-360-10)

(4) Shut off engine (TM 9-2320-360-10).

5-5. WATER PUMP REPLACEMENT

This task covers
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Cooling system drained (TM 9-2320-360-20).
Fan removed (TM 9-2320-360-20).
Secondary fuel filter head removed (para 4-13).
Inner fender removed (right side only) (TM 9-2320-360-20).

Tools and Specials Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Dial Indicator, Magnetic (Item 32, Appendix E)
Pliers, Retaining Ring (Item 107, Appendix E)
Pliers, Retaining Ring (Item 110, Appendix E)
Wrench, Torque, 0-150 Lb-In. (Item 234, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

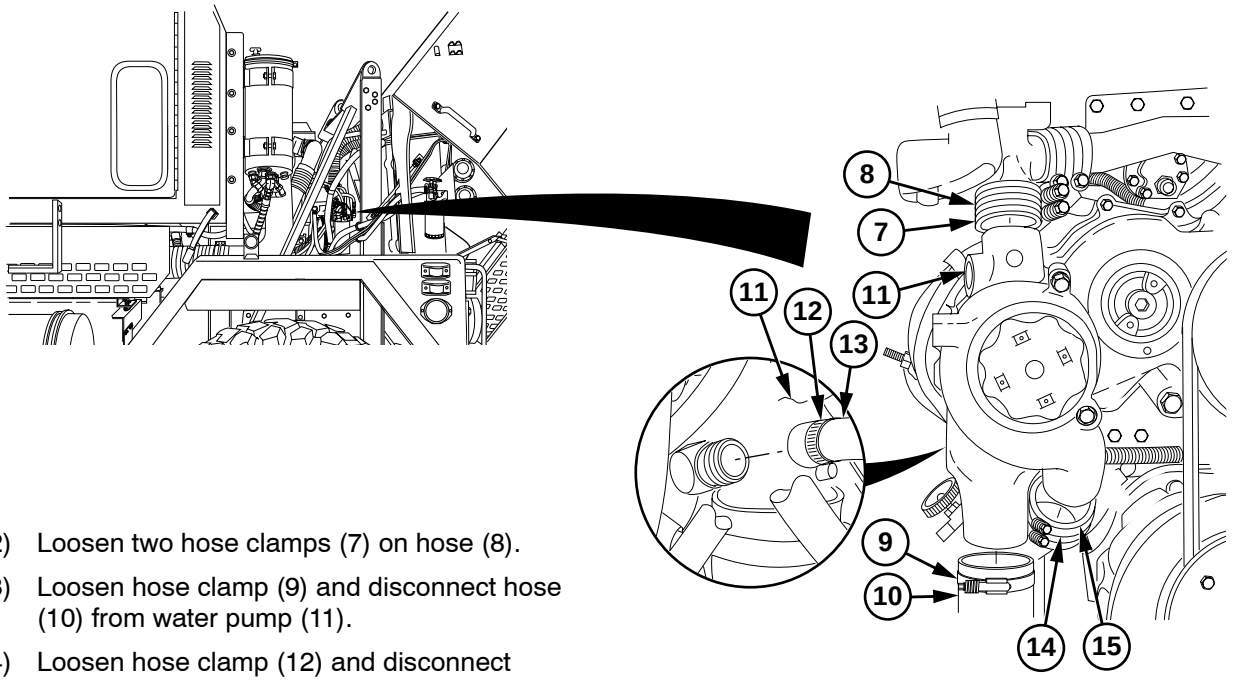
Tools and Specials Tools (Cont)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Chips, Soap (Item 15, Appendix B)
Lockwashers (3) (Item 121, Appendix F)
Ring, Retaining (Item 244, Appendix F)
Ring, Seal (Item 256, Appendix F)
Ring, Seal (Item 257, Appendix F)

Personnel Required
Two

a. Removal

(1) Deleted.



(2) Loosen two hose clamps (7) on hose (8).

(3) Loosen hose clamp (9) and disconnect hose (10) from water pump (11).

(4) Loosen hose clamp (12) and disconnect hose (13) from water pump (11).

(5) Loosen two hose clamps (14) on hose (15).

5-5. WATER PUMP REPLACEMENT (CONT)

(6) Remove screw (16) and lockwasher (17) from water pump (11). Discard lockwasher.

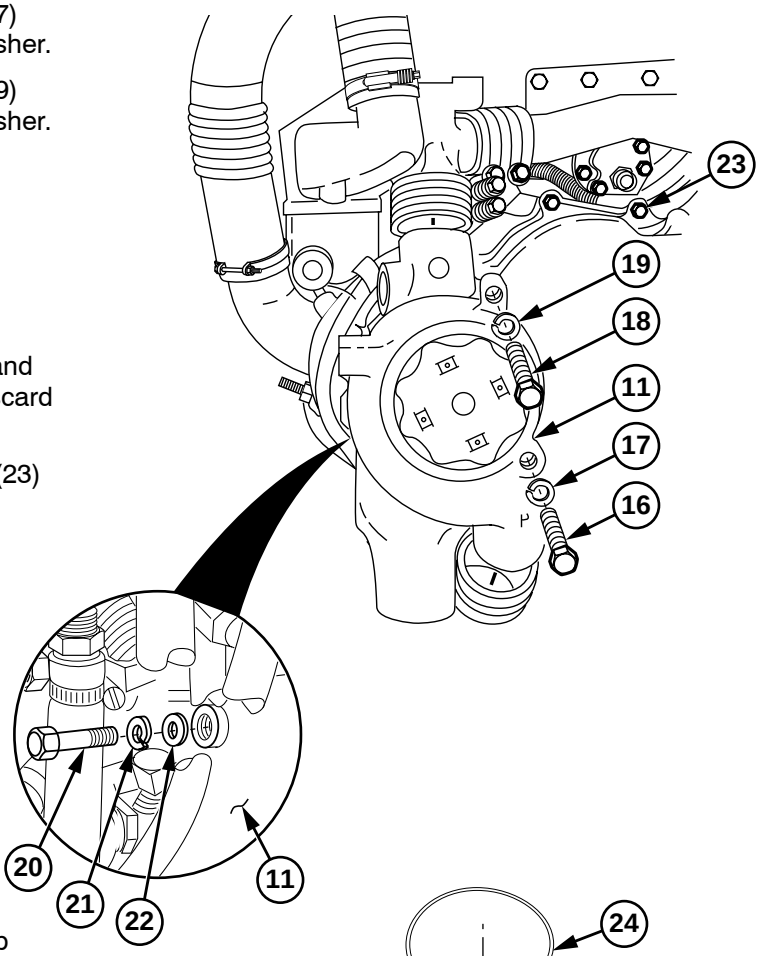
(7) Remove screw (18) and lockwasher (19) from water pump (11). Discard lockwasher.

CAUTION

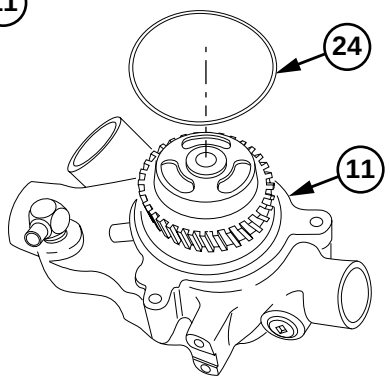
Failure to properly support water pump before removing final screw may result in damage to water pump.

(8) Remove screw (20), lockwasher (21), and washer (22) from water pump (11). Discard lockwasher.

(9) Remove water pump (11) from engine (23) with aid of assistant.

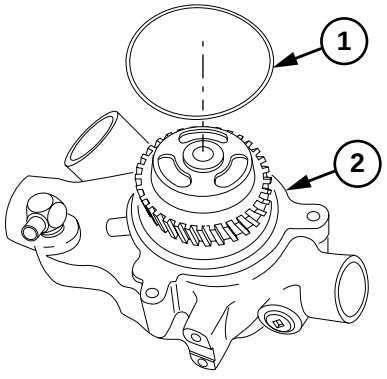


(10) Remove seal ring (24) from water pump (11). Discard seal ring.



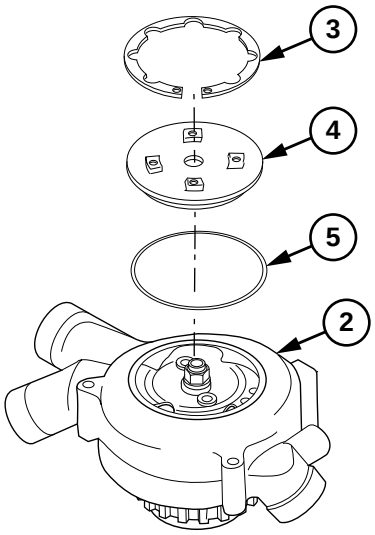
b. Installation

(1) Install new seal ring (1) on water pump (2).



WARNING

- **Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and may cause severe eye injury.**
- **Due to size and tension of retaining ring in step (2), ensure suitable retaining ring pliers are used for safety. Press a hammer against the access cover to help prevent injury should the retaining ring slip off the pliers.**



NOTE

Do step (2) only if original pump is being reinstalled. Replacement pump will have access cover already removed.

(2) Remove retaining ring (3), access cover (4), and seal ring (5) from water pump (2). Discard seal ring.

(3) Install water pump (2) on front cover (6) with aid of assistant.

NOTE

Water pump lower holes may be lubricated with soap solution to aid in installation.

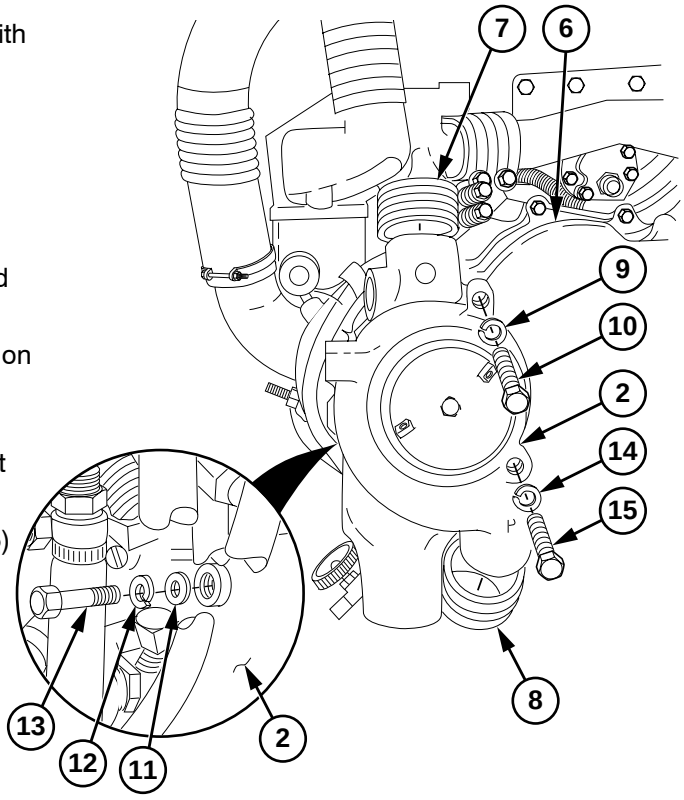
(4) Install water pump (2) on two hoses (7 and 8) with aid of assistant. Do not tighten.

(5) Install new lockwasher (9) and screw (10) on water pump (2). Do not tighten.

(6) Install washer (11), new lockwasher (12), and screw (13) on water pump (2). Do not tighten.

(7) Install new lockwasher (14) and screw (15) on water pump (2). Do not tighten.

(8) Tighten three screws (10, 13, and 15) to 240–300 lb–in. (27.1–34 N·m).



5-5. WATER PUMP REPLACEMENT (CONT)

(9) Install 5/16-18 x 2 in. screw (16) into impeller (17).

NOTE

Limits for gear backlash are 0.001 in. to 0.006 in. (0.025 mm to 0.15 mm). If backlash cannot be adjusted, replace pump.

(10) Place plunger of dial indicator (18) against screw (16). Move impeller (17) and read backlash.

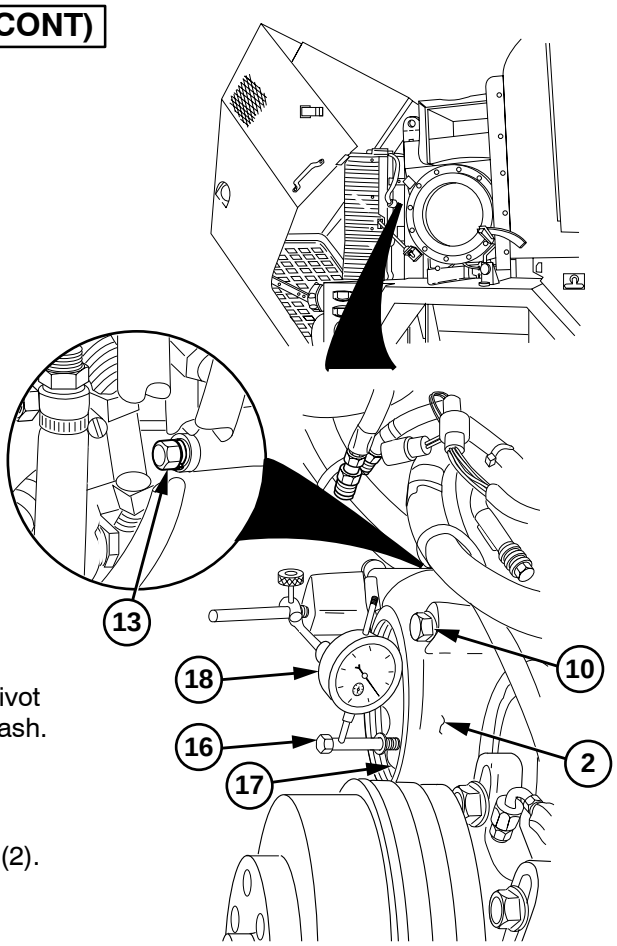
NOTE

If backlash is outside limits, do steps (11) and (12).

(11) Loosen two screws (10 and 13) and pivot water pump (2) to obtain proper backlash.

(12) Tighten screws (10 and 13) to 30 lb-ft (34 N·m).

(13) Remove screw (16) from water pump (2).

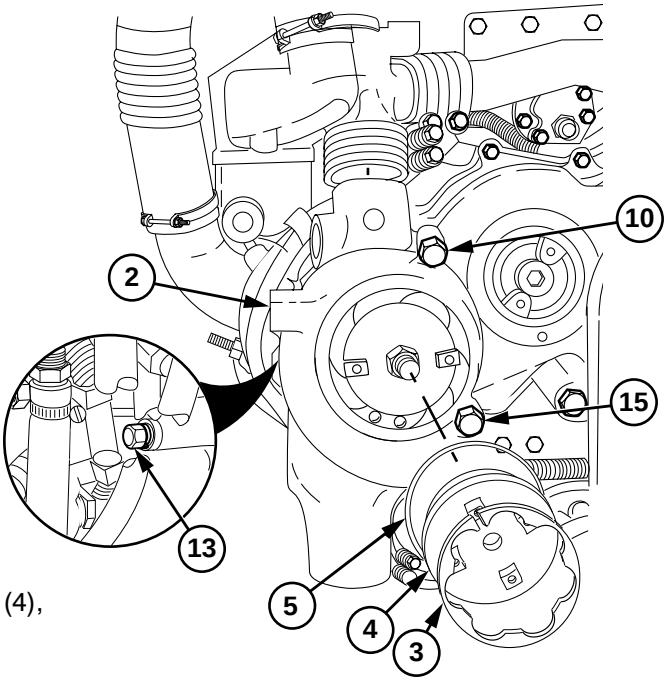


(14) Tighten screws (10, 13, and 15) to 45 to 50 lb-ft (61 to 67 N·m).

WARNING

- **Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and may cause severe eye injury.**
- **Due to size and tension of retaining ring in step (15), ensure suitable retaining ring pliers are used for safety. Press a hammer against the access cover to help prevent injury should the retaining ring slip off the pliers.**

(15) Install new seal ring (5), access cover (4), and new retaining ring (3) on water pump (2).



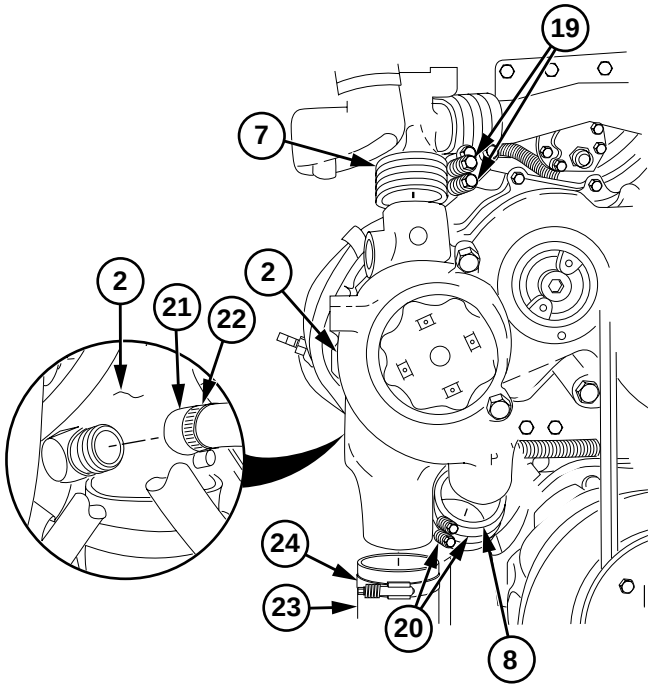
NOTE

When clamps are properly tightened, washer stacks should be nearly collapsed flat and screw tip should extend beyond clamp approximately 3/16 in. (8 mm).

(16) Secure two hoses (7 and 8) with four hose clamps (19 and 20) on water pump (2). Torque to 90 lb-in. (10.1 N·m).

(17) Install hose (21) on water pump (2) with clamp (22).

(18) Install hose (23) on water pump (2) with clamp (24). Torque to 100 lb-in. (11 N·m).



(19) Deleted.

f. Follow-On Maintenance

(1) Install fan (TM 9-2320-360-20).

(2) Install secondary fuel filter head (para 4-13).

(3) Fill cooling system (TM 9-2320-360-20).

(4) Install inner fender (TM 9-2320-360-20).

5-6. FAN CLUTCH REPAIR

This task covers
a. Disassembly
b. Cleaning/Inspection
c. Assembly
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Fan clutch removed (TM 9-2320-360-20).

Tools and Specials Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Tool Kit, Fan Clutch Overhaul (Item 203, Appendix E)
Blocks, Wooden (Figure C-3, Appendix C)
Caps, Vise Jaw (Item 17, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Gage, Feeler (Item 50, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Pliers, Retaining Ring (Item 109, Appendix E)
Pliers, Retaining Ring (Item 111, Appendix E)
Press, Hydraulic (Item 116, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Socket, Sockethead, Screw, 3/16 In. (Item 172, Appendix E)
Vise, Machinists (Item 207, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

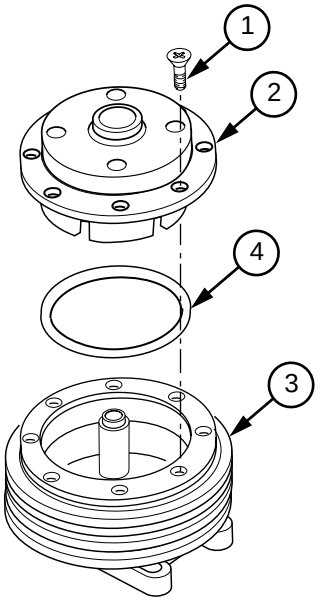
Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Compound, Sealing, Lubricating (Item 27, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Oil, Lubricating (Item 45, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Ring, Retaining (Item 235, Appendix F)
Ring, Retaining (Item 236, Appendix F)
Ring, Retaining (Item 237, Appendix F)
Overhaul Kit (Item 155, Appendix F)
Packing, Preformed (Item 175, Appendix F)

NOTE
All tool numbers referred to in procedure are used in Tool Kit, Fan Clutch Overhaul.

a. Disassembly

(1) Remove eight screws (1) and bearing retainer (2) from fan pulley (3).

(2) Remove preformed packing (4) from bearing retainer (2). Discard preformed packing.

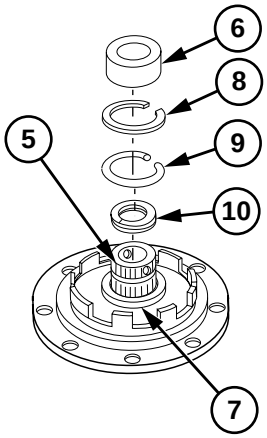


CAUTION

Ensure supports are placed under inside fan hub and not under outside bearing retainer. Damage to fan hub may result.

(3) Support fan hub (5) with wooden blocks.

(4) Use tool no. 10 (6) to press bearing (7) down 1/16 in. (1.5 mm).



WARNING

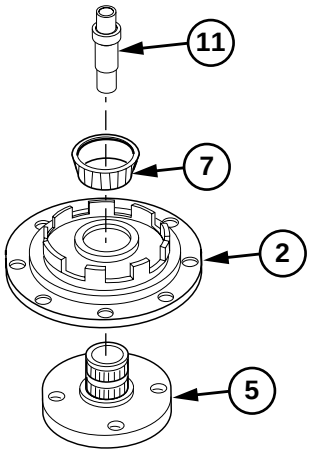
Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(5) Remove retaining ring (8) and spacer (9) from fan hub (5). Discard retaining ring.

NOTE

Retaining ring in step (6) is removed by lifting end of ring and uncoiling it out of groove.

(6) Remove retaining ring (10) from groove inside fan hub (5). Discard retaining ring.



(7) Support bearing retainer (2) with wooden blocks.

(8) Use short end of tool no. 1 (11) to press fan hub (5) out of bearing retainer (2).

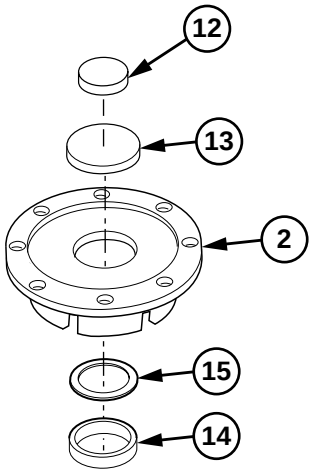
(9) Remove bearing (7) from bearing retainer (2).

(10) Support bearing retainer (2) with suitable blocking.

CAUTION

Ensure tool no. 8 and tool no. 3 are centered on top of oil seal. Failure to comply may result in damage to equipment.

(11) Use tool no. 3 (12) and tool no. 8 (13) to press bearing race (14) and oil seal (15) out of bearing retainer (2). Discard oil seal.



5-6. FAN CLUTCH REPAIR (CONT)

(12) Support fan hub (5) with wooden blocks.

(13) Use tool no. 9 (16) to press out expansion plug (17). Discard expansion plug.

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(14) Remove retaining ring (18) from fan hub (5). Discard retaining ring.

(15) Support fan hub (5) with wooden blocks.

NOTE

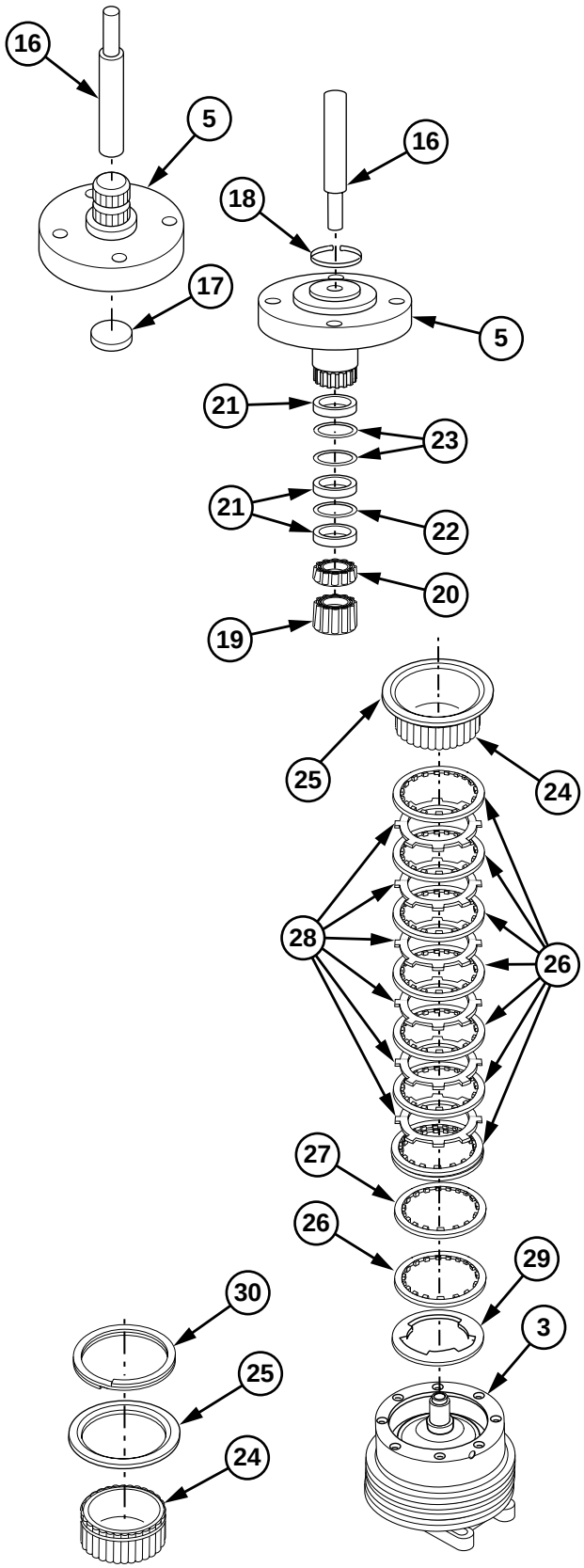
Number and type of shims may vary among fan clutches.

(16) Use small end of tool no. 9 (16) to press out roller bearing (19), roller bearing (20), thrust washers (21), one needle bearing (22), and shims (23).

(17) Remove splined hub (24), back plate (25), eight fiber splined plates (26), one metal splined plate (27), six clutch plates (28), and pressure plate (29) from fan pulley (3).

(18) Remove eight fiber splined plates (26), one metal splined plate (27), six clutch plates (28), and pressure plate (29) from splined hub (24).

(19) Remove retaining ring (30) and back plate (25) from splined hub (24). Discard retaining ring.

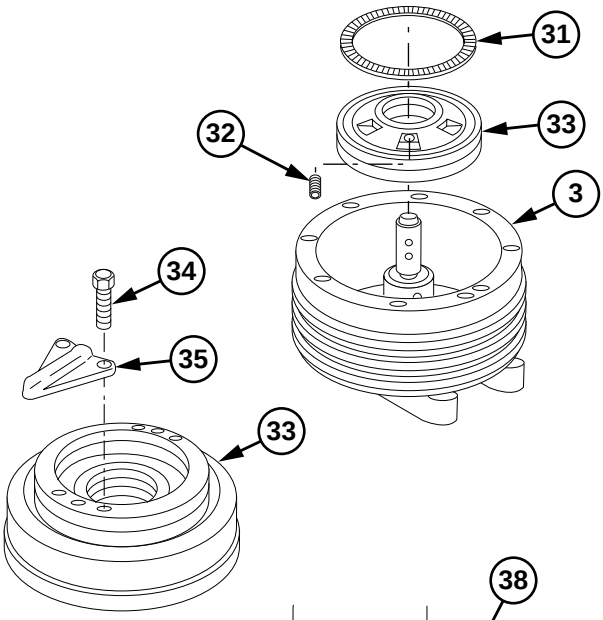


(20) Remove needle bearing (31) from fan pulley (3).

(21) Remove setscrew (32) from load cell assembly (33).

(22) Remove load cell assembly (33) from fan pulley (3) using puller.

(23) Remove four screws (34) and two oilers (35) from load cell assembly (33).



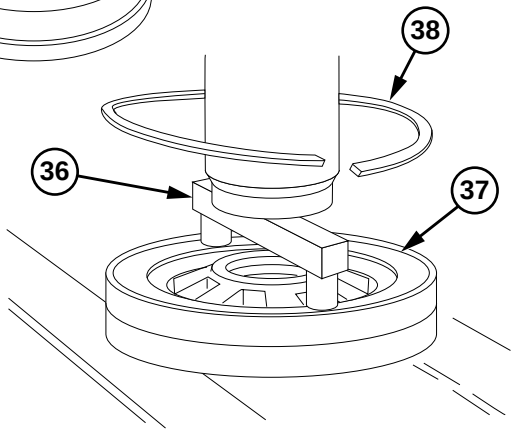
WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

CAUTION

- Ensure tool no. 6 is centered on thrust washer. Failure to comply may result in damage to retaining ring and thrust washer.
- Pressing thrust washer more than 1/32 in. (0.8 mm) may damage parts in load cell.

(24) Use tool no. 6 (36) to press down thrust washer (37) 1/32 in. (0.8 mm). Remove retaining ring (38). Discard retaining ring.

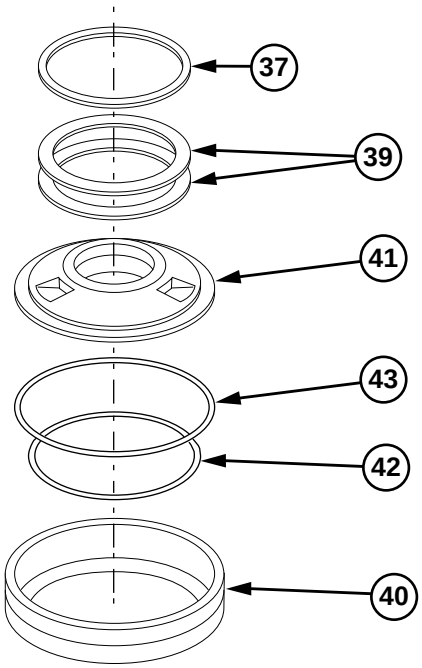


(25) Remove thrust washer (37) and two springs (39).

(26) Support piston housing (40) with wooden blocks.

(27) Tap piston housing (40) from fan clutch body (41) with soft-faced hammer.

(28) Remove two preformed packings (42 and 43) from clutch body (41). Discard preformed packings.



5-6. FAN CLUTCH REPAIR (CONT)

CAUTION

Ensure support is placed beneath bracket and shaft assembly. Failure to comply may result in damage to fan pulley.

(29) Support bracket and shaft assembly (44) with wooden blocks.

(30) Use tool no. 5 (45) to press bearing (46) down 1/16 in. (1.5 mm).

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

(31) Remove two preformed packings (47), retaining ring (48), and spacer (49) from shaft assembly (44). Discard preformed packings, retaining ring, and spacer.

(32) Support fan pulley (3) with wooden blocks.

(33) Use tool no. 8 (13), press out bracket and shaft assembly (44).

(34) Remove bearing (46) from fan pulley (3).

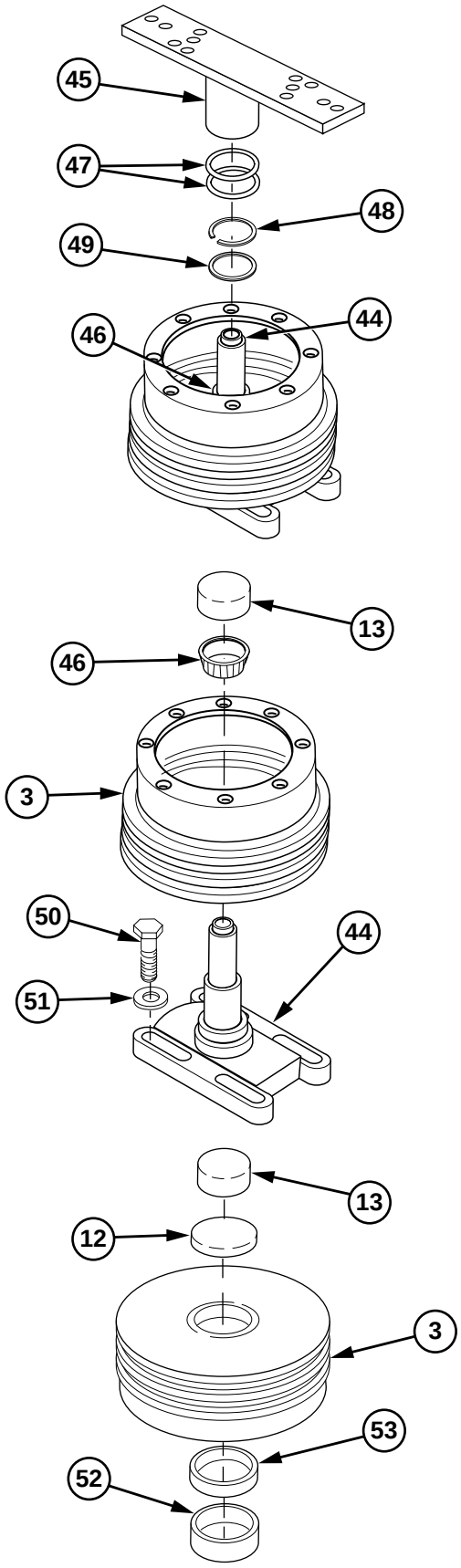
(35) Remove two screws (50) and washers (51) from bracket and shaft assembly (44).

CAUTION

Ensure tool no. 8 and tool no. 3 are centered on top of oil seal. Damage to fan pulley and oil seal may result.

(36) Support fan pulley (3) with wooden blocks.

(37) Use tool no. 8 (13) and tool no. 3 (12) to press out bearing race (52) and oil seal (53). Discard oil seal.



b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/ massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean all metal parts with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry all parts, except bearings, with compressed air.

(3) Blow air through passageways in shaft and bracket assembly to make sure passageways are not blocked.

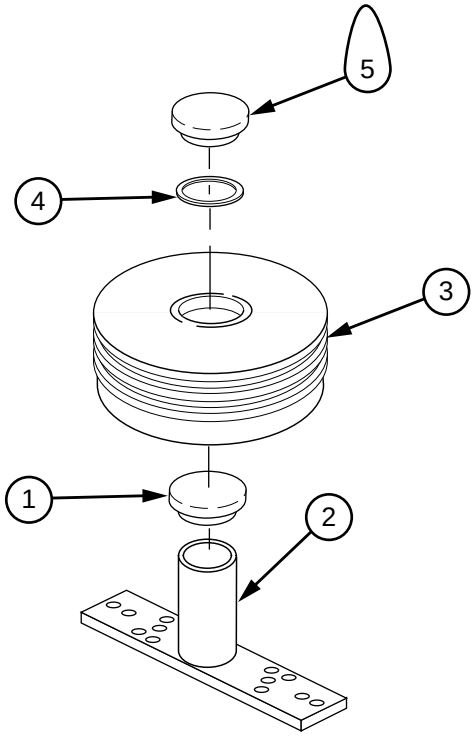
(4) Remove burrs from setscrew contact point.

(5) Replace any spline plates or clutch plates that look or smell burned.

(6) Inspect clutch plates for wear spots. Replace clutch plates if wear spots exceed 0.010 in. (0.254 mm), or if clutch plate is bent.

(7) Inspect spline plates for wear. Replace spline plates if worn to bottom of wear grooves on surface of plate.

(8) Inspect all metal parts for scratches, grooves, scoring, dents, nicks, and burrs. Replace damaged parts.



c. Assembly

(1) Install tool no. 2 (1) on tool no. 5 (2).

(2) Support fan pulley (3) with tool no. 2 (1) and tool no. 5 (2).

(3) Coat new seal (4) and tool no. 4 (5) with lubricating oil.

CAUTION

All tools should be centered and oil seal properly aligned with fan pulley to prevent improper installation. Damage to oil seal may result.

(4) Press new oil seal (4) flat side up, into fan pulley (3) until tool no. 4 (5) contacts tool no. 2 (1).

5-6. FAN CLUTCH REPAIR (CONT)

(5) Support fan pulley (3) with suitable blocking.

(6) Coat bearing race (6) with lubricating oil.

(7) Use tool no. 2 (1) to press bearing race (6), thin edge up, into fan pulley (3) until tool contacts fan pulley.

(8) Coat bearing (7) with lubricating oil.

(9) Install bearing (7), numbered side up, in bearing race (6).

(10) Attach tool no. 5 (2) to fan pulley (3) using 5/16-6 x 2 in. (51 mm) screws (8) from fan drive overhaul tool kit. Finger tighten screws.

(11) Support fan pulley (3) and tool no. 5 (2) with wooden blocks.

(12) Place two screws (9) and washers (10), threads up, on fan pulley (3).

(13) Coat bracket and shaft assembly (11) with lubricating oil.

(14) Use tool no. 8 (12) to press bracket and shaft assembly (11) into fan pulley (3) over two screws (9).

(15) Remove tool no. 5 (2) from fan pulley (3).

(16) Install new spacer (13) and new retaining ring (14) on bracket and shaft assembly (11).

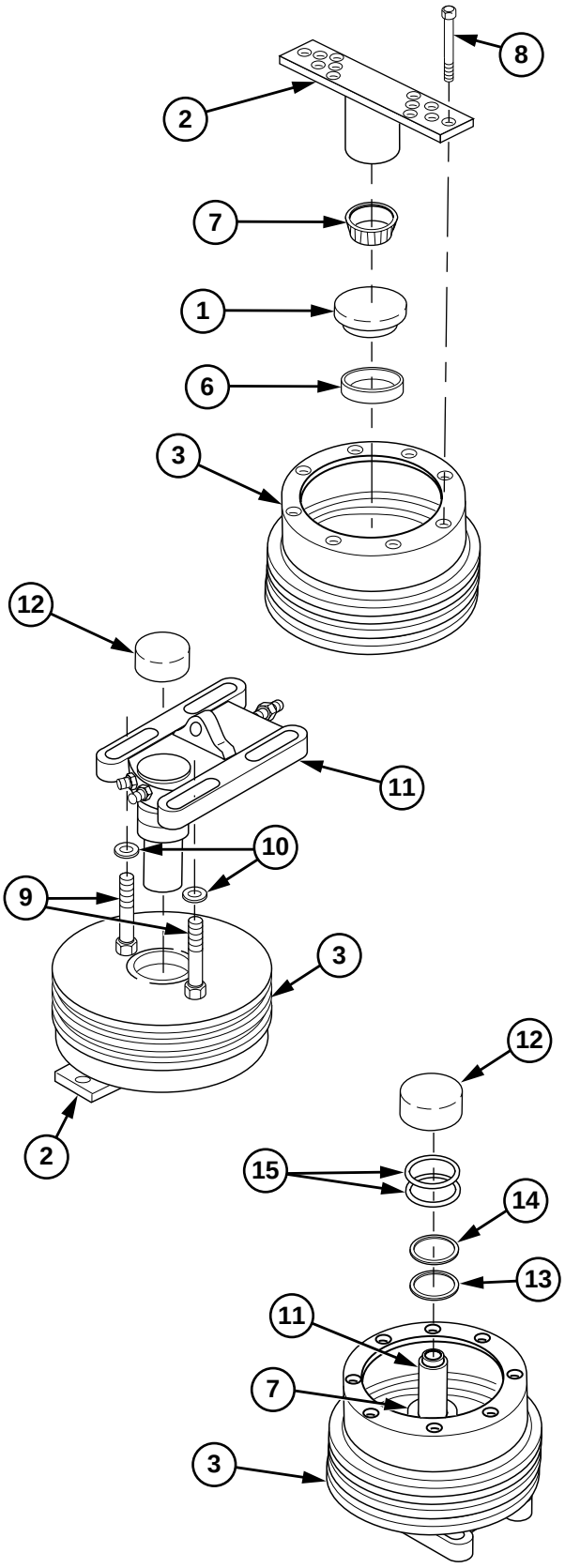
CAUTION

Ensure blocks are placed under pulley, not under bracket and shaft assembly. Failure to comply may result in damage to bracket and shaft assembly.

(17) Support fan pulley (3) with wooden blocks.

(18) Use tool no. 8 (12) to tap bracket and shaft assembly (11) down approximately 1/16 in. (1.5 mm) to seat spacer (13) and retaining ring (14) on bearing (7).

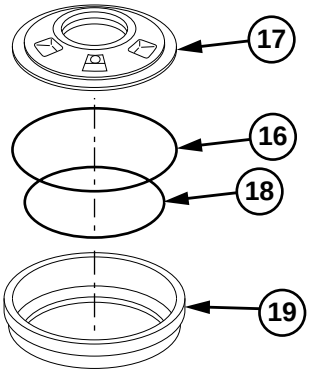
(19) Coat two new preformed packings (15) with lubricating oil and install on bracket and shaft assembly (11).



(20) Coat new preformed packing (16) with lubricating oil and install on clutch body (17).

(21) Coat new preformed packing (18) with lubricating oil and install on piston housing (19).

(22) Install clutch body (17) on piston housing (19).



(23) Coat two springs (20) with lubricating oil and install springs, concave side up, on clutch body (17).

(24) Coat thrust washer (21) with oil and install, flat side up, on springs (20).

NOTE

Ensure blocking does not touch inside clutch body.

(25) Support outside piston housing (19) with wooden blocks.

WARNING

Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and may cause severe eye injury.

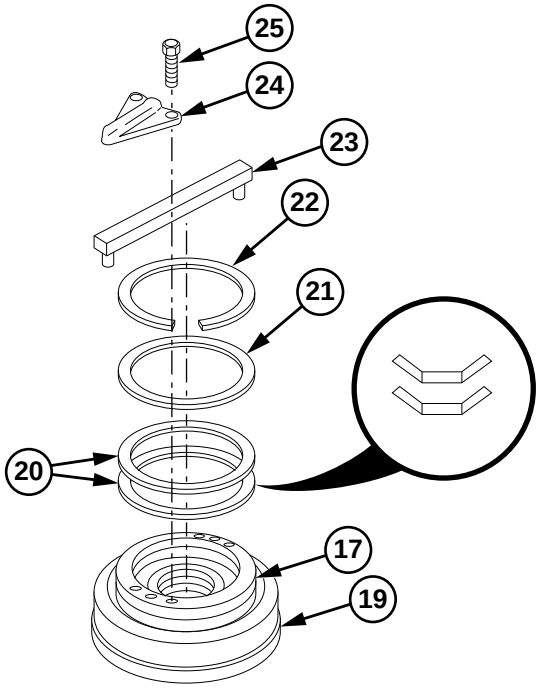
(26) Position new retaining ring (22) on piston housing (19).

CAUTION

Do not press thrust washer down more than 1/32 in. (0.8 mm) or thrust washer and springs may be damaged.

(27) Use tool no. 6 (23) to press thrust washer (21) down 1/32 in. (0.8 mm) and install retaining ring (22) in piston housing (19).

(28) Install two oilers (24) with four screws (25). Torque to 45 lb-in. (5.1 N·m).



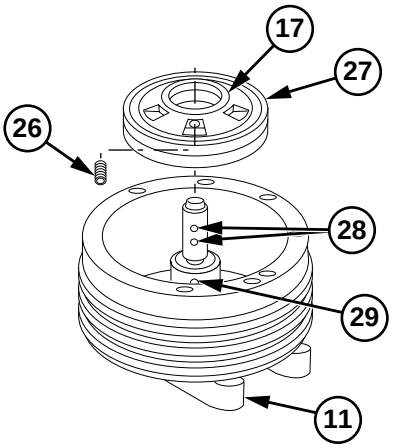
5-6. FAN CLUTCH REPAIR (CONT)

(29) Position setscrew (26) on load cell assembly (27). Do not tighten.

(30) Position load cell assembly (27) on bracket and shaft assembly (11) until upper surface of clutch body (17) is flush with, or just below shoulder of shaft.

CAUTION

Setscrew must rest in center of hole. Ensure setscrew is centered when tightened. Damage to shaft may result.



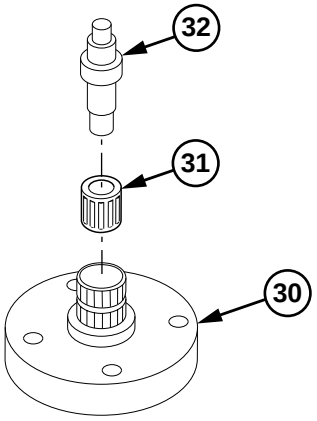
(31) Align setscrew (26) with oil holes (28) and setscrew hole (29) on bracket and shaft assembly (11).

(32) Tighten setscrew (26).

(33) Support fan hub (30) with wooden blocks.

NOTE

- Narrow (0.75 in. long) roller bearing is installed first.
- Roller bearing is installed correctly when shoulder of tool no. 1 contacts fan hub.

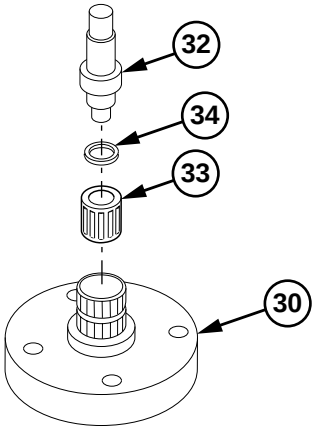


(34) Coat roller bearing (31) with lubricating oil.

(35) Use long end of tool no. 1 (32) to press roller bearing (31) numbered side up, in fan hub (30).

NOTE

- Wider roller bearing (1 in. long) is second roller bearing installed.
- Roller bearing is correctly installed when shoulder of tool no. 1 contacts fan hub.



(36) Coat roller bearing (33) with lubricating oil.

(37) Use short end of tool no. 1 (32) to press roller bearing (33) numbered side up, in fan hub (30).

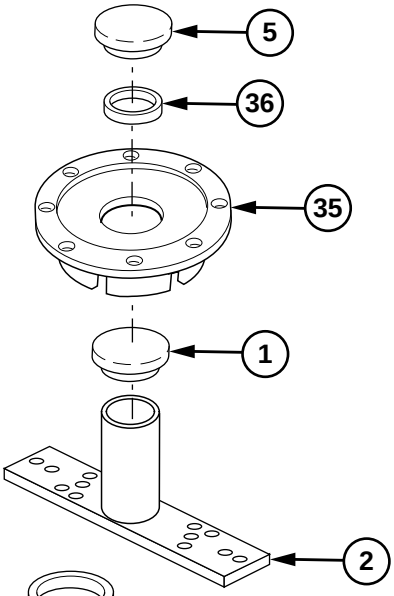
(38) Install new retaining ring (34) in fan hub (30).

(39) Install tool no. 2 (1) on tool no. 5 (2).

(40) Use tool no. 2 (1) and tool no. 5 (2) to support bearing retainer (35).

(41) Coat new oil seal (36) with lubricating oil.

(42) Use tool no. 4 (5) to press oil seal (36), flat side up, in bearing retainer (35) until tool no. 4 bottoms out against tool no. 2 (1).

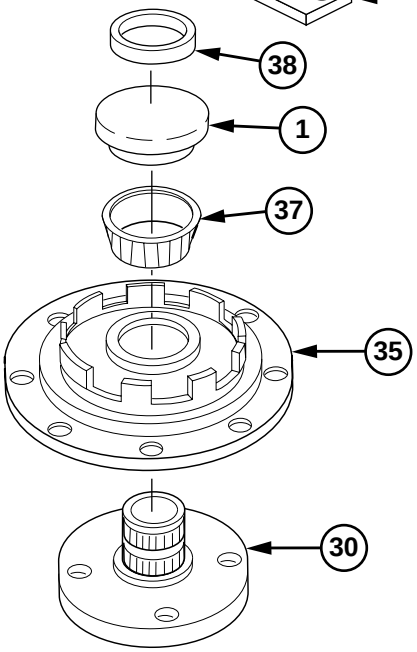


(43) Support bearing retainer (35) with wooden blocks.

(44) Coat bearing race (37) with lubricating oil.

(45) Use tool no. 2 (1) to press bearing race (37), thin edge up, into place until tool contacts bearing retainer (35).

(46) Coat new oil seal (38) with lubricating oil and install oil seal (38) and inner fan hub (30) in bearing retainer (35).



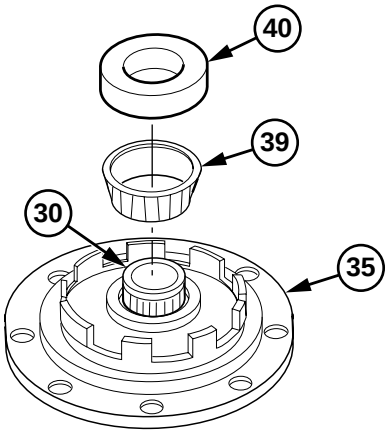
CAUTION

Ensure blocking is under fan hub before installing bearing or damage to bearing retainer may result.

(47) Support inner fan hub (30) with wooden blocks.

(48) Coat bearing (39) with lubricating oil.

(49) Use tool no. 10 (40) to press bearing (39), numbered side up, over fan hub (30) into bearing retainer (35) until tool contacts fan hub (30).

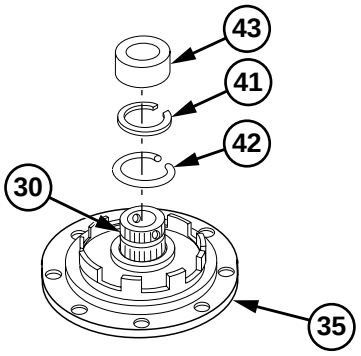


5-6. FAN CLUTCH REPAIR (CONT)

WARNING

Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

(50) Install new retaining ring (41) and spacer (42) on fan hub (30).

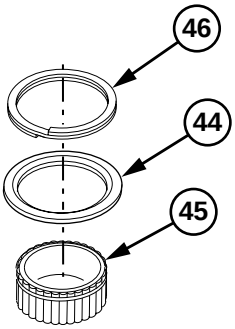


CAUTION

Ensure blocking is installed under bearing retainer and not under inner fan hub before pressing fan hub or damage to fan hub may result.

(51) Support bearing retainer (35).

(52) Use tool no. 3 (43) to tap fan hub (30) down approximately 1/16 in. (1.5 mm) to seat bearing against spacer (42) and retaining ring (41).



(53) Install back plate (44), flat side down, on splined hub (45).

CAUTION

Ensure retaining ring fits completely in groove of splined hub and groove of back plate or retaining ring, splined hub, and back of plate may be damaged.

(54) Install new retaining ring (46) on splined hub (45).

CAUTION

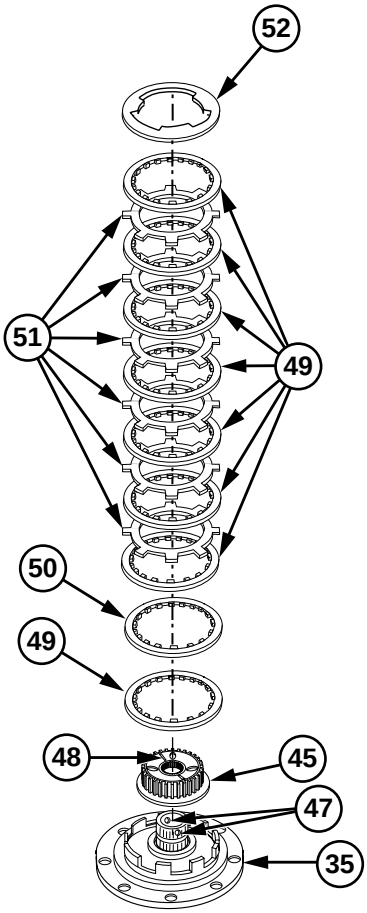
Oil holes in fan hub must align with oil notches in splined hub or clutch may be damaged.

(55) Align oil holes (47) with notches (48) and install splined hub (45) on bearing retainer (35).

(56) Install one fiber splined plate (49) and one metal splined plate (50) on splined hub (45).

(57) Install alternating seven fiber splined plates (49) and six clutch plates (51) on splined hub (45).

(58) Install pressure plate (52), with tabs up, on splined hub (45).



(59) Position bearing retainer (35) in press.

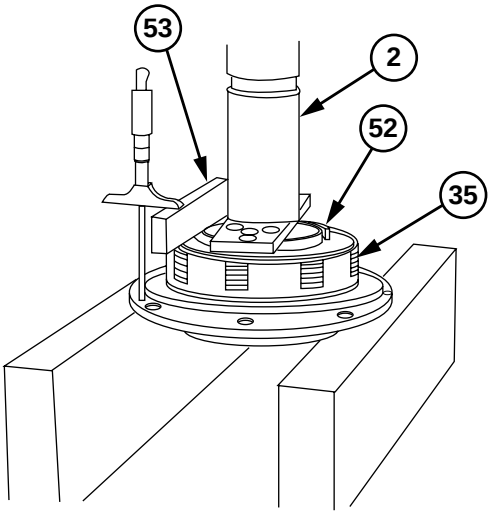
NOTE

Tool no. 5 should be positioned on raised tabs of pressure plate, with center of tool over center of bearing retainer.

(60) Position tool no. 5 (2) across pressure plate (52).

CAUTION

Press is used only to stabilize plates. Do not apply excessive pressure to pressure plate. Failure to comply may result in damage to bearing retainer.



(61) Use tool no. 5 (2) to apply light pressure on pressure plate (52).

(62) Position tool no. 7 (53) across flat surface of pressure plate (52).

(63) Measure and record distance A between top of tool no. 7 (53) and outer flange of bearing retainer (35).

(64) Measure and record distance B between top of tool no. 7 (53) and outer flange of bearing retainer (35) on opposite side from distance A.

(65) Calculate C by adding distance A to distance B. Record answer.

(66) Calculate D by dividing C by 2. Record answer.

(67) Calculate E by subtracting 1.0 in (25 mm) from D. Record answer.

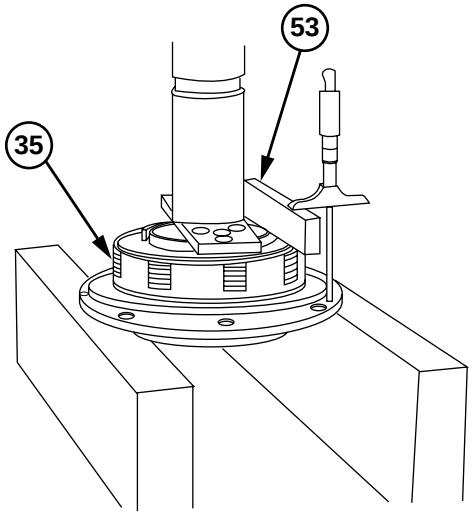
(68) Calculate F by adding 0.125 in. (3.17 mm) to E. Record answer.

(69) Position tool no. 8 (12) on bracket and shaft assembly (11).

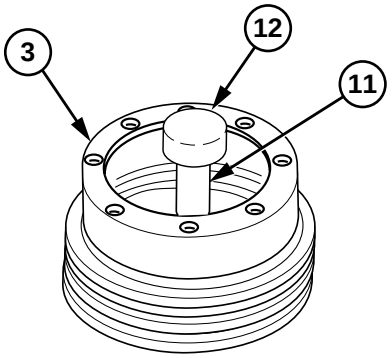
(70) Position fan pulley (3) in press.

CAUTION

Press is used only to stabilize bracket and shaft. Do not apply excessive pressure to bracket and shaft. Failure to comply may damage fan pulley.



(71) Use tool no. 8 (12) to apply light pressure to bracket and shaft assembly (11).

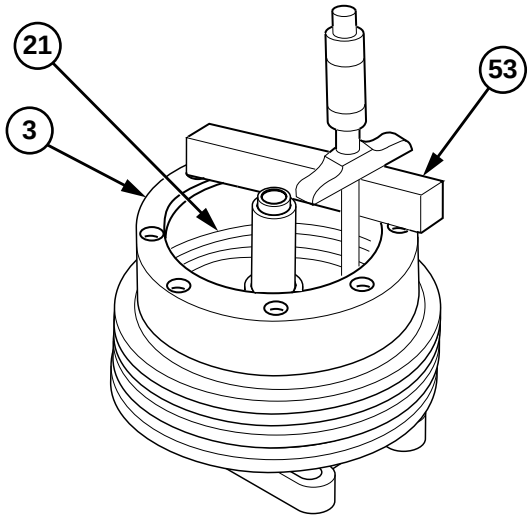


5-6. FAN CLUTCH REPAIR (CONT)

NOTE

Do not place tool no. 7 over screw holes. Improper measurements may result.

(72) Place tool no. 7 (53) on fan pulley (3).



NOTE

Take measurements next to retaining ring.

(73) Measure and record distance G between top of tool no. 7 (53) and thrust washer (21).

(74) Measure and record distance H between top of tool no. 7 (53) and thrust washer (21) on opposite side from measurement G.

(75) Calculate I by adding G to H. Record answer.

(76) Calculate J by dividing I by 2. Record answer.

(77) Calculate K by subtracting 1.00 in. (25 mm) from J. Record answer.

(78) Calculate L by subtracting K from F.

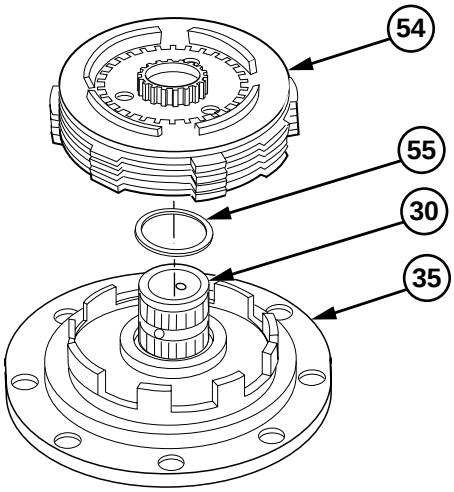
(79) Calculate shim gap by subtracting 0.136 in. (3.45 mm) from L.

Table 5-1. Shim Chart

If shim gap is:	Select shim:
0.000–0.004 in. (0.0.101 mm)	None
0.005–0.014 in. (0.127–0.355 mm)	0.010 in. (0.254 mm)
0.015–0.024 in. (0.381–0.609 mm)	0.020 in. (0.508 mm)
0.025–0.034 in. (0.635–0.863 mm)	0.030 in. (0.762 mm)
0.035–0.044 in. (0.889–1.117 mm)	0.040 in. (1.016 mm)
0.045–0.054 in. (1.143–1.371 mm)	0.050 in. (1.27 mm)

NOTE

- To aid in installation, remove clutch assembly carefully so all parts stay together.
- If no shim is required per table 5–1, go to step (84).



(80) Remove clutch assembly (54) from bearing retainer (35).

(81) Coat shim (55) with grease.

(82) Install shim (55) on fan hub (30).

CAUTION

Oil holes in fan hub must line up with oil notches in splined hub or clutch may be damaged during operation.

(83) Align oil holes (47) with notches (48) and install clutch assembly (54) on bearing retainer (35).

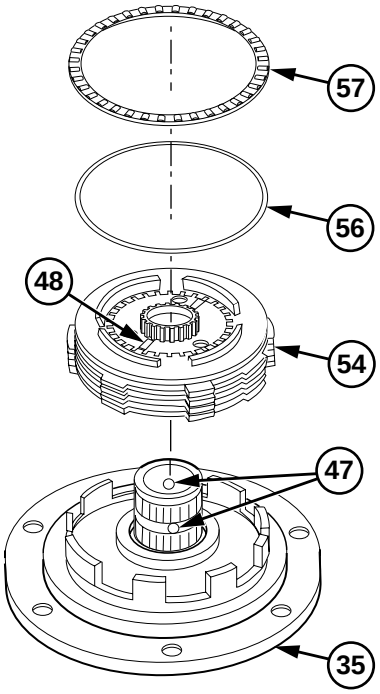
NOTE

If clutch assembly has come apart, do steps (54) thru (58).

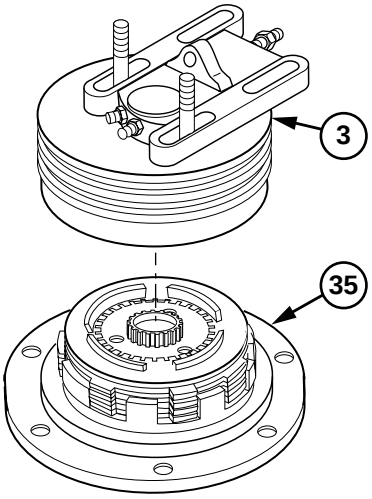
(84) Coat new preformed packing (56) and needle bearing (57) with lubricating oil.

(85) Install new preformed packing (56) on bearing retainer (35).

(86) Install needle bearing (57) on clutch assembly (54).



(87) Install fan pulley (3) on bearing retainer (35).



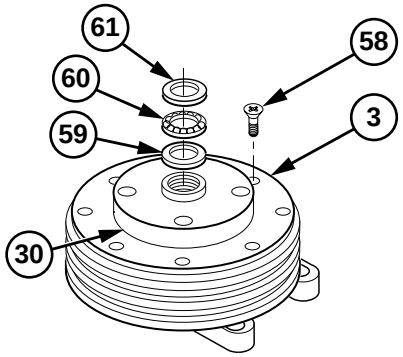
NOTE

Clutch assembly will fall apart if not held together while turning fan clutch over.

(88) Support fan pulley (3) with wooden blocks.

(89) Install eight screws (58) and torque to 240 lb-in. (27 N·m).

(90) Install thrust washer (59), needle bearing (60), and thrust washer (61) on fan hub (30).



5-6. FAN CLUTCH REPAIR (CONT)

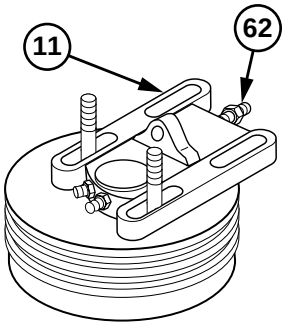
WARNING

When using compressed air, be sure to use effective chip guarding and personal protective equipment (goggles/ shield, gloves, etc.) to avoid personal injury.

NOTE

Do not turn fan clutch upside down, thrust washers and needle bearing will fall out.

(91) Apply compressed air four times at 100 psi (690 kPa) into port (62) on bracket and shaft assembly (11).



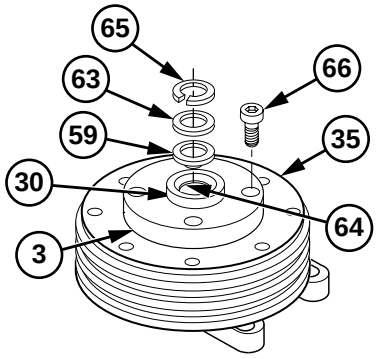
(92) Keep air pressure applied at 100 psi (690 kPa) and install shims (63) between thrust washer (59) and bottom of retaining ring groove (64).

(93) Install retaining ring (65) on fan hub (30).

(94) Release air pressure.

CAUTION

Screws must go through holes on opposite sides of fan hub or improper adjustment may result and cause damage to fan clutch during operation.

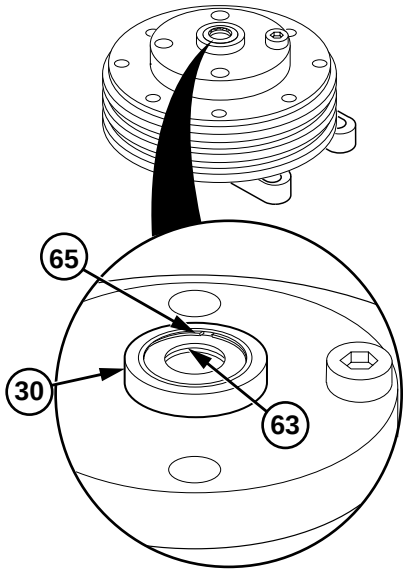


(95) Install two 1/2-13 x 2 in. (51 mm) screws (66) from fan drive overhaul tool kit through fan hub (30) and finger tighten against bearing retainer (35).

(96) Rotate fan pulley (3) and bearing retainer (35) four turns.

CAUTION

Screws in fan hub must be finger tight and retaining ring must be against top of groove or incorrect measurement will be taken. Improper shim adjustment and possible damage to fan clutch may result.



(97) Use feeler gage to measure gap between shims (63) and retaining ring (65).

NOTE

Shim stack should be arranged so that thickest shims are against thrust washer and retaining ring, with thinner shims between.

(98) Add or remove shims (63) as needed, to leave 0.0015–0.003 in. (0.045–0.076 mm) gap between shim (63) and retaining ring (65).

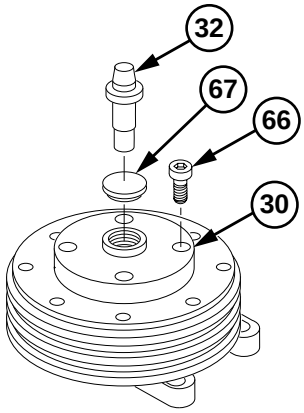
WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(99) Coat expansion plug (67) with adhesive-sealant.

CAUTION

Ensure screws from fan drive overhaul tool kit are installed while installing expansion plug to prevent damage to bearings.



(100) Use tool no. 1 (32) to install expansion plug (67), numbered side down, in fan hub (30).

(101) Remove two 1/2–13 x 2 in. (51 mm) screws (66) from fan hub (30).

5-6. FAN CLUTCH REPAIR (CONT)

d. Testing

(1) Install tool no. 5 (1) and two tools no. 11 (2) on fan hub (3) with two 1/2-13 x 2 in. (51 mm) screws (4).

CAUTION

Jaws of vise must not touch fan mounting hub or fan mounting hub and attaching parts may be damaged.

(2) Place clutch assembly (5) in vise with soft jaws.

WARNING

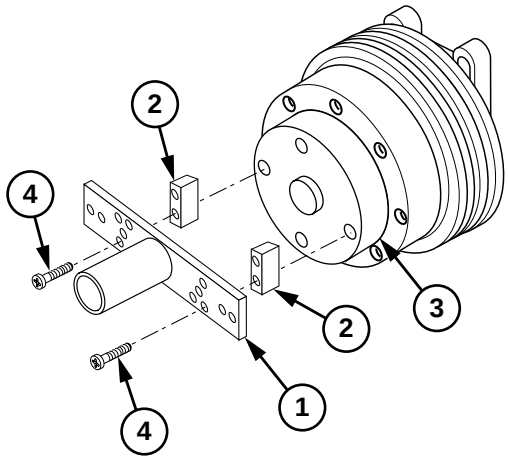
When using compressed air, be sure to use effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.) to avoid personal injury.

(3) Apply compressed air at 100 psi (690 kPa) and spin fan hub (3) four times. Fan hub should require approximately 240 lb-in. (27.2 N·m) or less to turn.

(4) Release air pressure.

(5) Turn fan hub (3) with socket extension installed in 1/2 in. drive hole in tool no. 5 (1). Fan hub should require a minimum of 140 lb-ft (189.84 N·m) to turn.

(6) Remove tool no. 5 (1), two tools no. 11 (2), and two 1/2-13 x 2 in. (51 mm) screws (4) from fan hub (3).



e. Follow-On Maintenance

Install fan clutch (TM 9-2320-360-20).

5-7. AFTERCOOLER REPLACEMENT

This task covers
a. Removal
b. Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Blower removed (para 4-6).

Tools and Specials Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

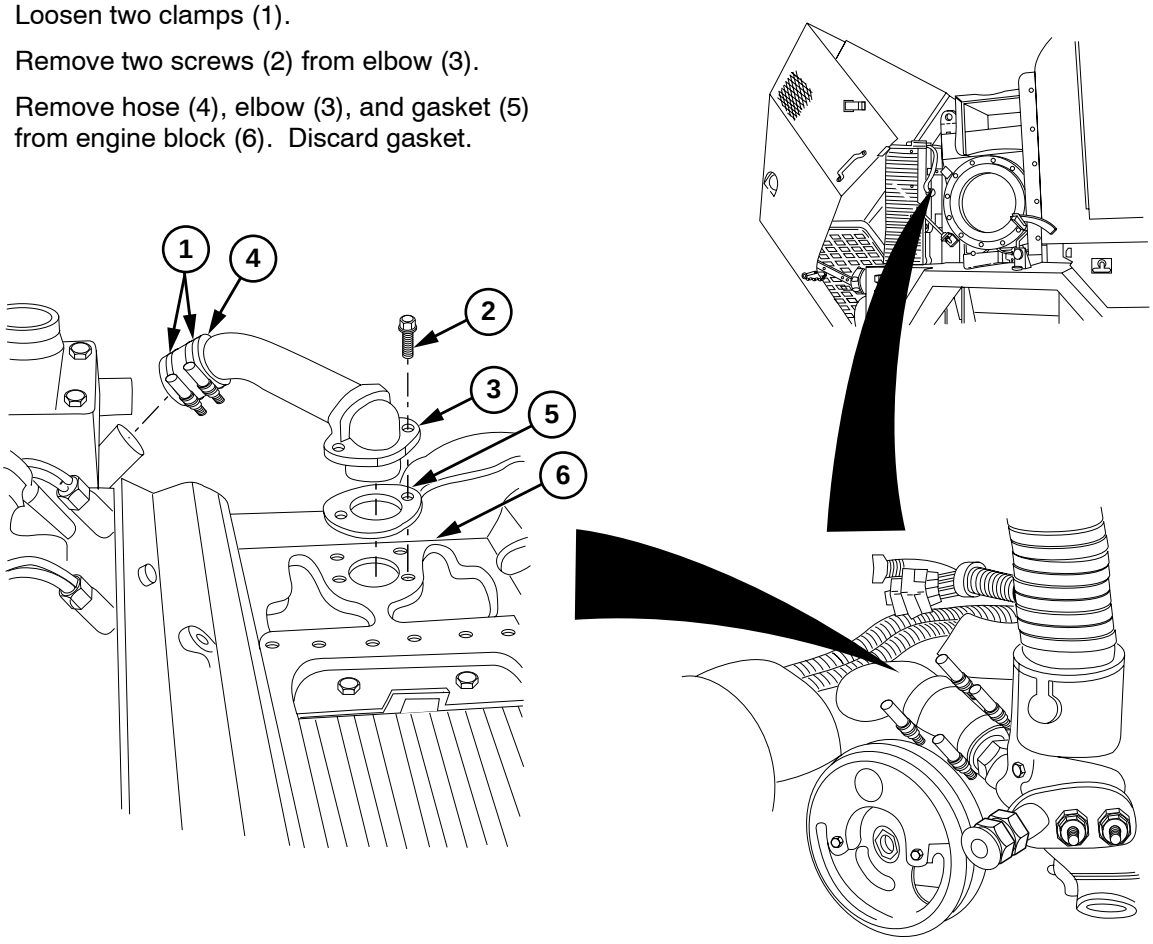
Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Oil, Lubricating (Item 45, Appendix B)
Gasket (Item 53, Appendix F)
Packings, Preformed (4) (Item 188, Appendix F)
Screws, Self-Locking (8) (Item 284, Appendix F)

a. Removal

(1) Loosen two clamps (1).

(2) Remove two screws (2) from elbow (3).

(3) Remove hose (4), elbow (3), and gasket (5) from engine block (6). Discard gasket.



5-7. AFTERCOOLER REPLACEMENT (CONT)

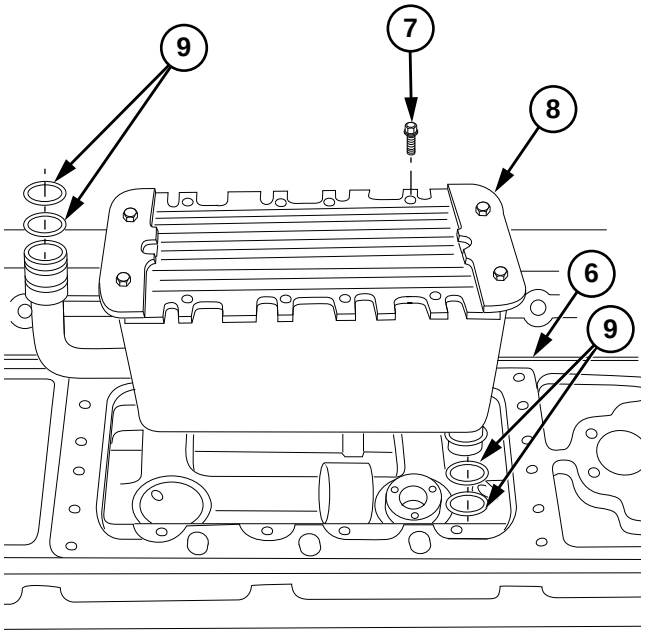
(4) Remove eight self-locking screws (7) from aftercooler (8). Discard screws.

CAUTION

Remove aftercooler carefully by lifting rear of aftercooler first. Fins are delicate and can be easily damaged.

(5) Remove aftercooler (8) from engine block (6).

(6) Remove four preformed packings (9) from aftercooler (8). Discard preformed packings.



b. Inspection

Inspect water openings for blockage.

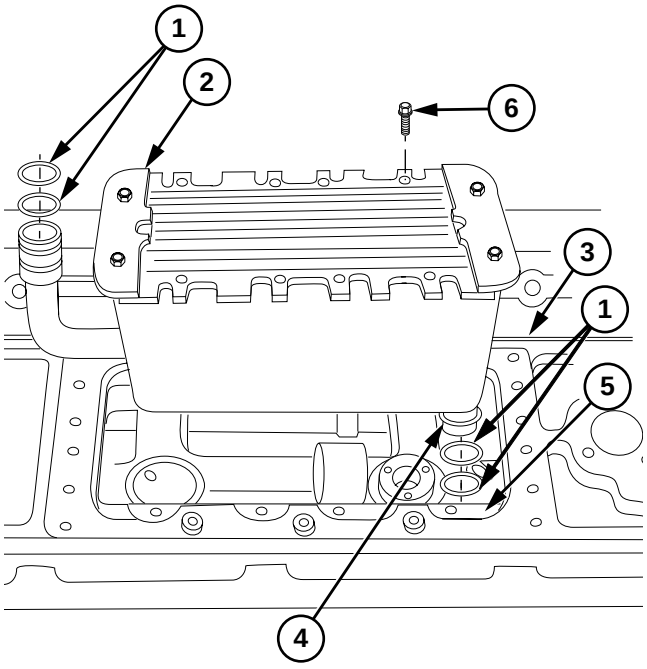
c. Installation

(1) Coat four new preformed packings (1) with lubricating oil.

(2) Install four new preformed packings (1) on aftercooler (2).

(3) Position aftercooler (2) in engine block (3), front outlet tube first, so inlet tube (4) fits into adapter (5).

(4) Secure aftercooler (2) with eight new self-locking screws (6). Do not tighten.



WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(5) Coat flange of elbow (7) and hose (8) with silicone adhesive-sealant.

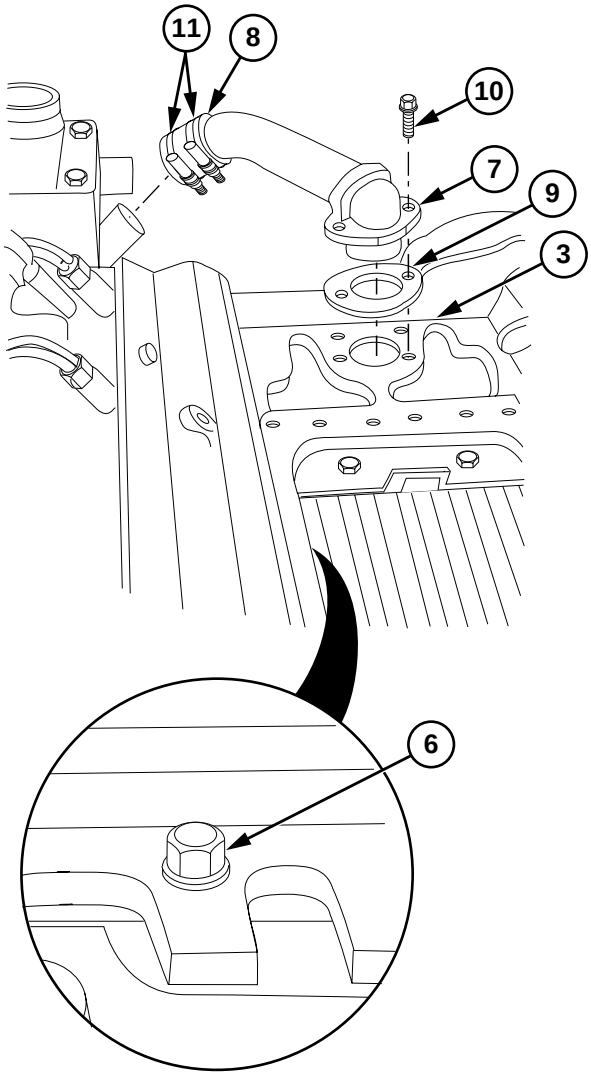
(6) Install new gasket (9) and elbow (7) on engine block (3) with two screws (10).

NOTE

When clamps are properly tightened, washer stacks should be nearly collapsed flat and screw tip should extend beyond clamp approximately 3/16 in. (8 mm).

(7) Install hose (8) and two clamps (11) on elbow (7). Torque to 90 lb-in. (10.1 N·m).

(8) Tighten two screws (10) to 178 lb-in. (20 N·m).



(9) Tighten eight self-locking screws (6) to 178 lb-in. (20 N·m)

d. Follow-On Maintenance

(1) Install blower (para 4-6).

(2) Start engine and check engine operation (TM 9-2320-360-10).

CHAPTER 6
ELECTRICAL SYSTEM MAINTENANCE

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Section I. INTRODUCTION

6-1. INTRODUCTION

This chapter contains maintenance instructions for replacement and repair of the electrical system at the Direct Support maintenance level. Some parts must be removed before electrical system components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

6-2. 12-VOLT ALTERNATOR REPAIR

This task covers
a. Disassembly
b. Cleaning/Inspection
c. Testing
d. Assembly
e. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Alternator removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Automotive Fuel and Electrical System Repair (Item 199, Appendix E)
Caliper Set, Micrometer (Item 15, Appendix E)
Caps, Vise Jaw (Item 17, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Press, Hydraulic (Item 116, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Vise, Machinist's (Item 207, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Cloth, Crocus (Item 16, Appendix B)
Compound, Insulating (Item 20, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Gasket (Item 60, Appendix F)
Gasket (Item 69, Appendix F)
Locknuts (3) (Item 98, Appendix F)
Locknut (Item 100, Appendix F)
Lockwashers (3) (Item 137, Appendix F)
Lockwashers (2) (Item 118, Appendix F)
Lockwashers (2) (Item 119, Appendix F)
Lockwashers (2) (Item 142, Appendix F)

Personnel Required
MOS 63G

a. Disassembly

(1) Remove tenz nut (1) from ignition (IGN) stud (2) on regulator holder (3).

CAUTION
Voltage regulator is still connected by two wires. Regulator cannot be removed until after step (5). Failure to comply may result in damage to alternator.

(2) Remove four screws (4) and voltage regulator (5) from regulator holder (3).

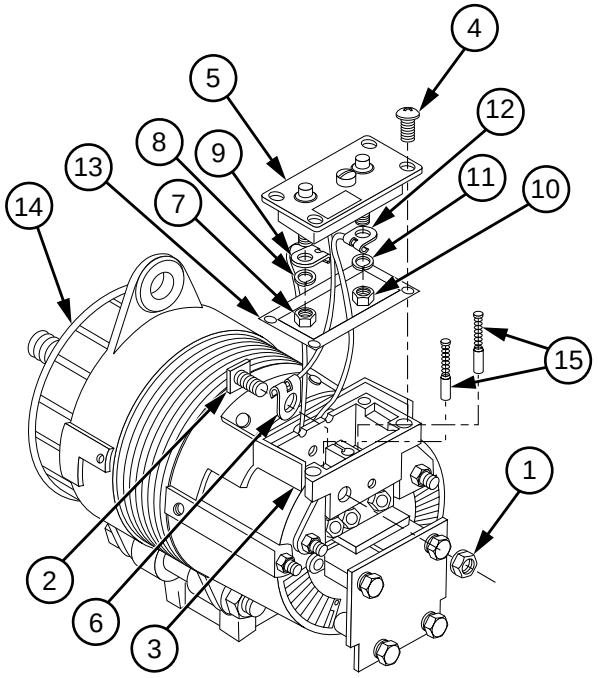
(3) Remove ignition (IGN) stud (2) and wire (6) from regulator holder (3).

(4) Remove nut (7), lockwasher (8), and black wire (9) from negative (-) terminal of voltage regulator (5). Discard lockwasher.

(5) Remove nut (10), lockwasher (11), and red wire (12) from positive (+) terminal of voltage regulator (5). Discard lockwasher.

(6) Remove voltage regulator (5) and gasket (13) from alternator (14). Discard gasket.

(7) Remove two brushes (15) from regulator holder (3).



NOTE

Vise is used to securely hold pulley for step (9).

(8) Position alternator (14) in vise.

(9) Remove locknut (16) from shaft (17). Discard locknut.

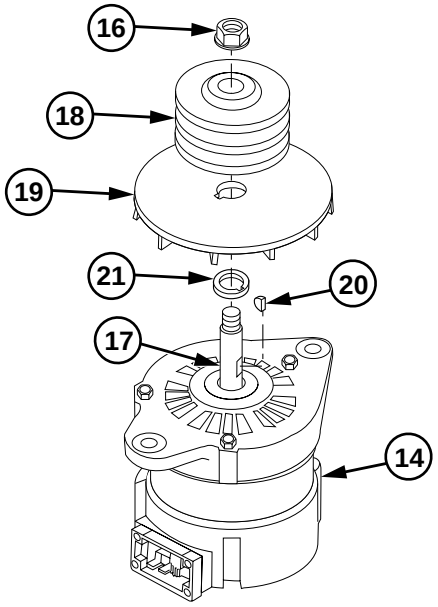
(10) Remove alternator (14) from vise.

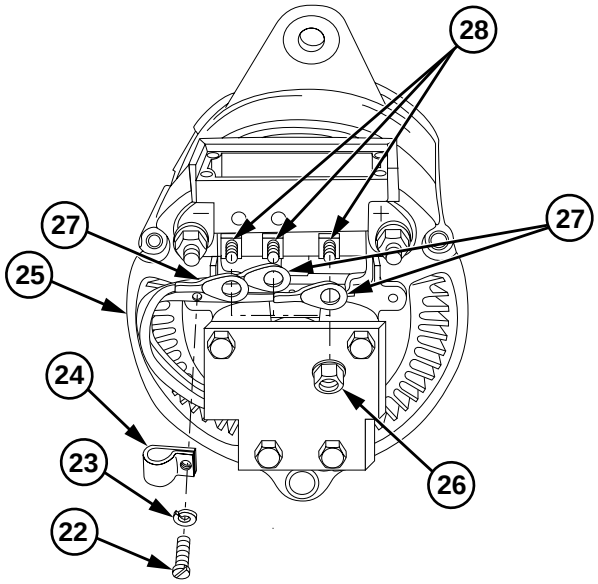
(11) Remove pulley (18) from shaft (17).

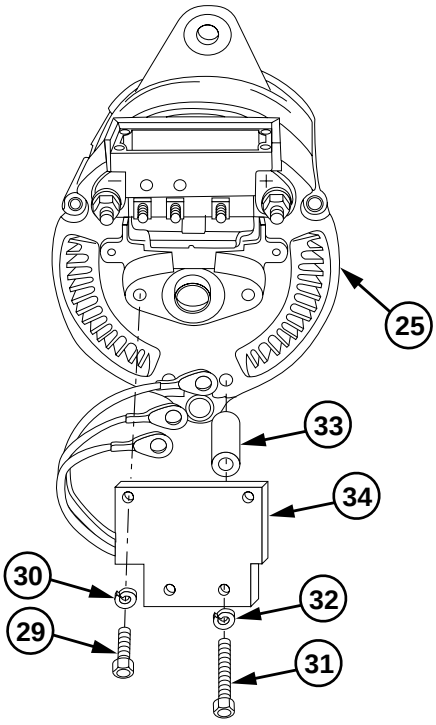
(12) Remove cooling plate (19), key (20), and spacer (21) from shaft (17).

(13) Remove screw (22), lockwasher (23), and clip (24) from slip ring end housing (25). Discard lockwasher.

(14) Remove three tenz nuts (26) and wires (27) from terminals (28).







(15) Remove two screws (29), lockwashers (30), screws (31), lockwashers (32), spacers (33), and capacitor (34) from slip ring end housing (25). Discard lockwashers.

6-2. 12-VOLT ALTERNATOR REPAIR (CONT)

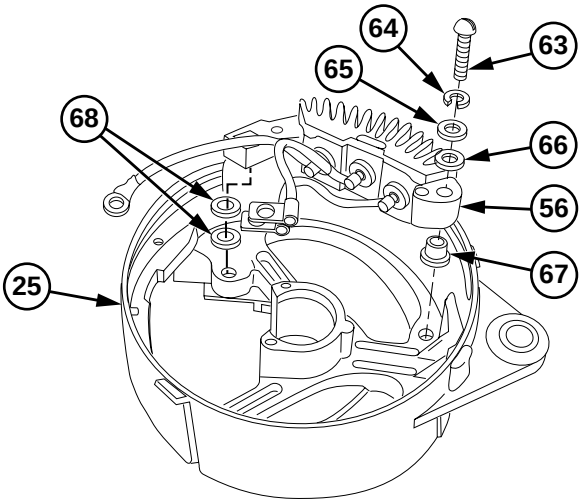
(16) Remove three locknuts (35), washers (36), and screws (37) from drive end housing (38) and slip ring end housing (25). Discard locknuts.

CAUTION

When removing rotor, completely separate rotor from stator. Stator will still be attached to slip ring housing. Do not attempt to separate stator from slip ring housing. Failure to comply may result in damage to stator wires.

NOTE

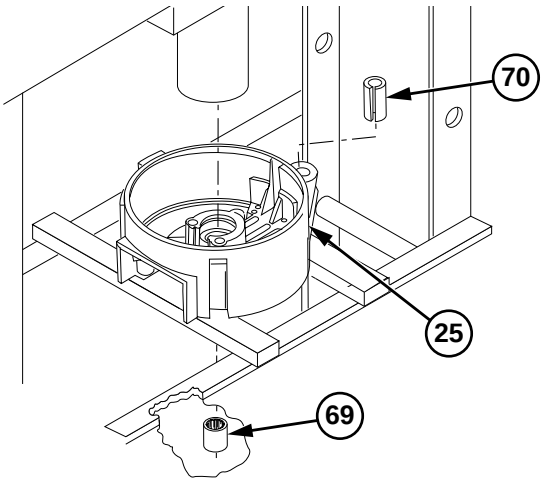
Rotor will remain attached to drive end housing during removal.

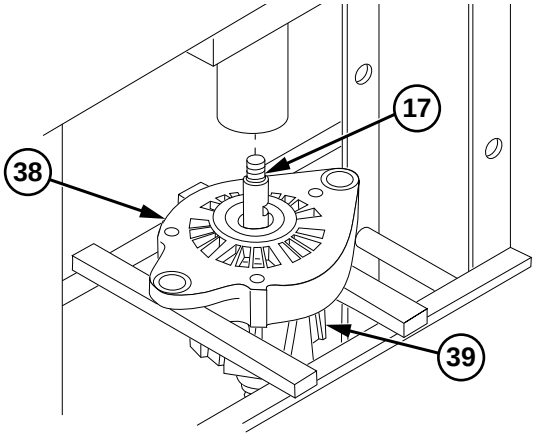


(17) Remove drive end housing (38) and rotor assembly (39) from slip ring end housing (25) and stator (40).

(18) Remove three tenz nuts (41) and stator (40) from slip ring end housing (25).

(18.1) Remove two screws (41.1) and capacitor (41.2) from positive rectifier (44) and negative rectifier (56).





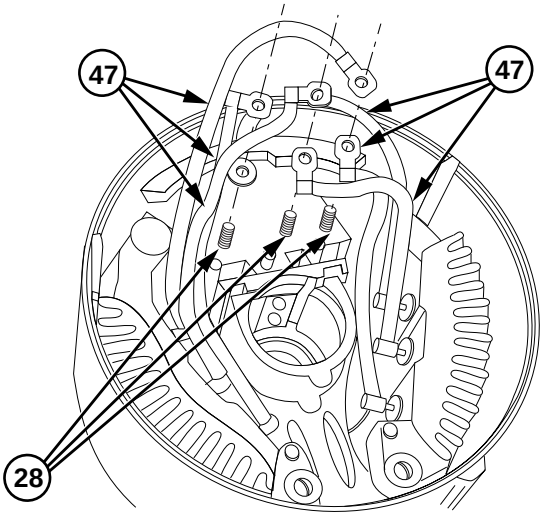
(19) Remove screw (42) and wire (43) from positive rectifier (44).

(20) Remove tenz nut (45) and positive terminal screw (46) from positive rectifier (44) and slip ring end housing (25).

NOTE

Tag and mark wires before removal.

(21) Remove six rectifier wires (47) from three terminals (28).

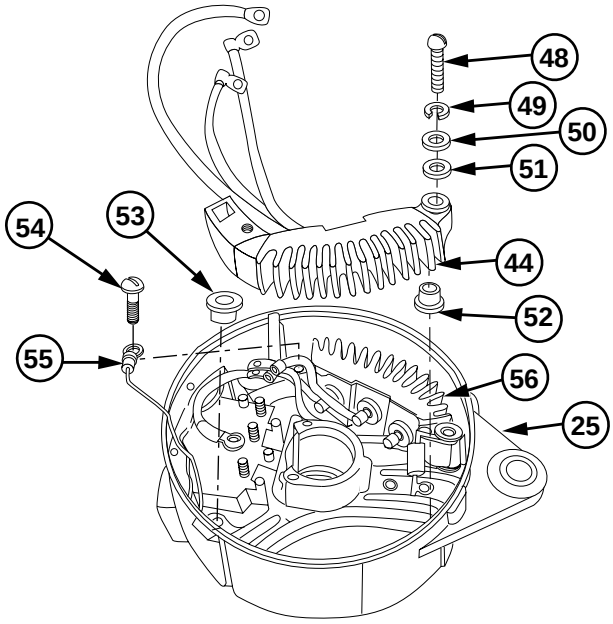


CAUTION

Do not remove lower bushing from positive rectifier. Failure to comply may damage bushing.

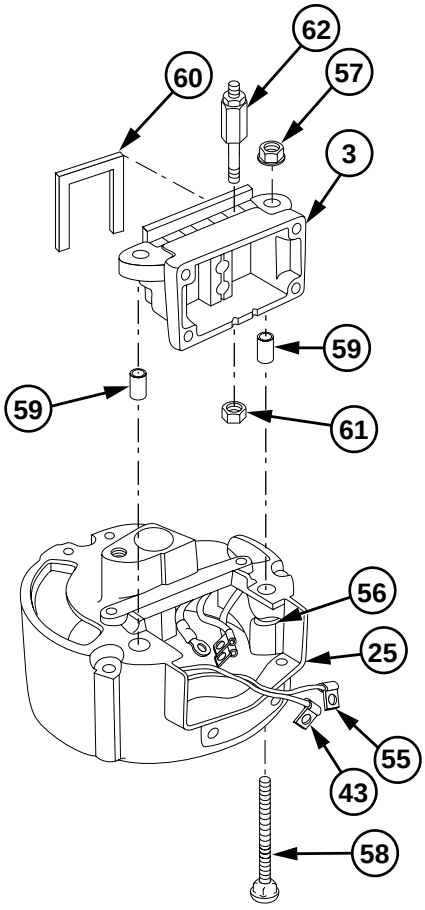
(22) Remove lower mounting screw (48), lockwasher (49), washer (50), plastic washer (51), positive rectifier (44) with lower bushing (52), and bushing (53) from slip ring end housing (25). Discard lockwasher.

(23) Remove screw (54) and wire (55) from negative rectifier (56).



(24) Remove tenz nut (57), negative terminal screw (58), two insulation bushings (59), regulator holder (3), gasket (59), wire (43), and wire (55) from negative rectifier (56) and slip ring end housing (25). Discard gasket.

(25) Remove three nuts (61) and terminal studs (62) from regulator holder (3).

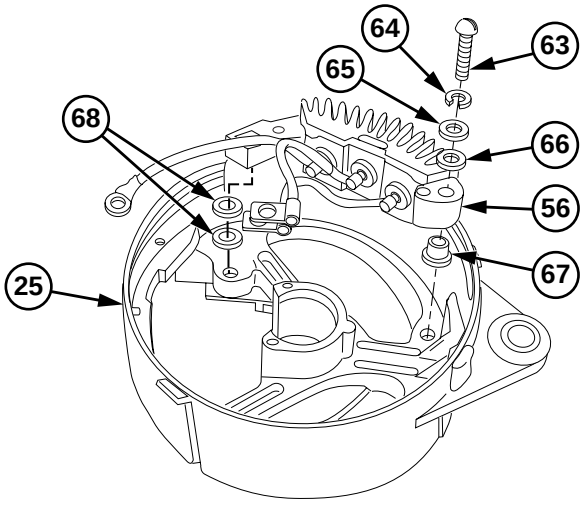


6-2. 12-VOLT ALTERNATOR REPAIR (CONT)

CAUTION

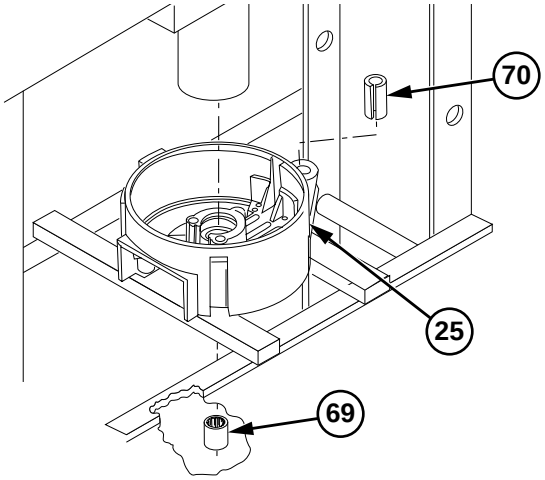
Do not remove lower bushing from negative rectifier. Failure to comply may damage bushing.

(26) Remove lower mounting screw (63), lockwasher (64), washer (65), plastic washer (66), negative rectifier (56) with bushing (67), and two washers (68) from slip ring end housing (25). Discard lockwasher.



(27) Position slip ring end housing (25) in press and remove bearing (69).

(28) Remove bushing (70) from slip ring end housing (25).

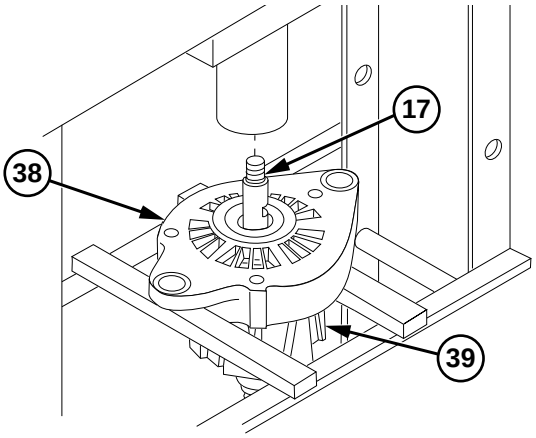


(29) Position drive end housing (38) and rotor assembly (39) in press with threaded end of shaft (17) pointing upward.

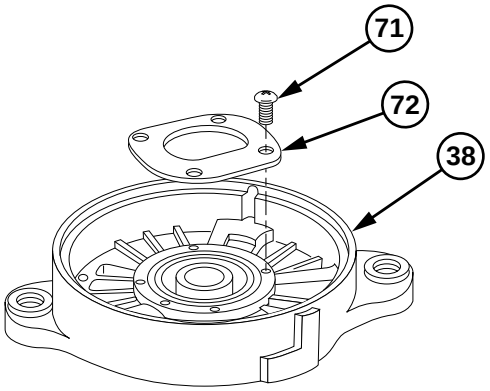
CAUTION

Protect rotor assembly from striking floor while pressing from drive end housing. Failure to comply may result in damage to rotor assembly.

(30) Press rotor assembly (39) out from drive end housing (38).

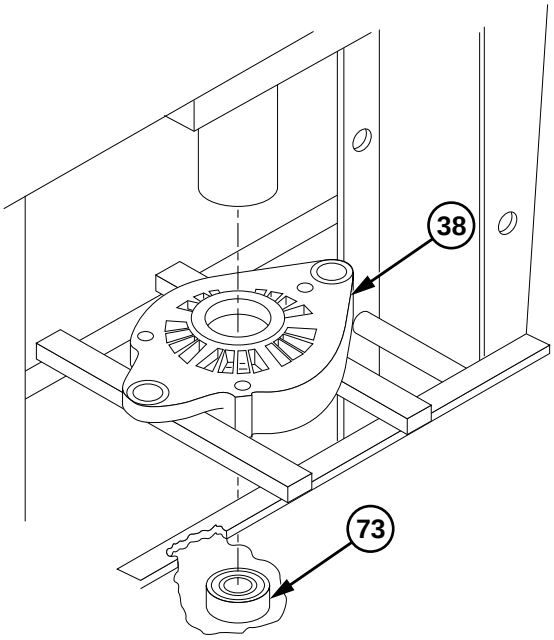


(31) Remove four screws (71) and bearing retainer (72) from drive end housing (38).



(32) Position drive end housing (38) in press with bearing (73) side down.

(33) Press bearing (73) out of drive end housing (38).



b. Testing

(1) Touch negative (–) test lead of multimeter to bare metal surface on positive rectifier (1).

NOTE

If multimeter does not indicate low resistance in step (2), positive rectifier is defective. Replace rectifier.

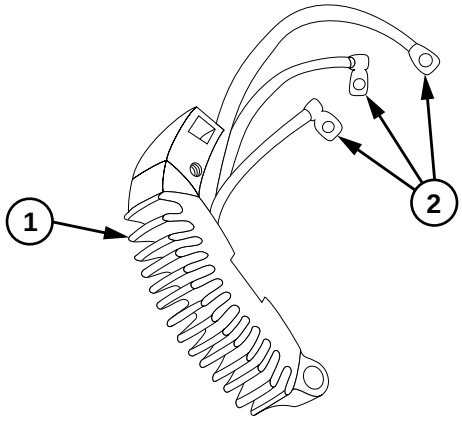
(2) Touch positive (+) test lead of multimeter separately to each of three eyelet terminals (2).

(3) Touch positive (+) test lead to bare metal surface on positive rectifier (1).

NOTE

If multimeter does not indicate infinity in step (4), positive rectifier is defective. Replace rectifier.

(4) Touch negative (–) test lead separately to each of three eyelet terminals (2).



6-2. 12-VOLT ALTERNATOR REPAIR (CONT)

(5) Touch negative (–) test lead to bare metal surface on negative rectifier (3).

NOTE

If multimeter does not indicate infinity in step (6), positive rectifier is defective. Replace rectifier.

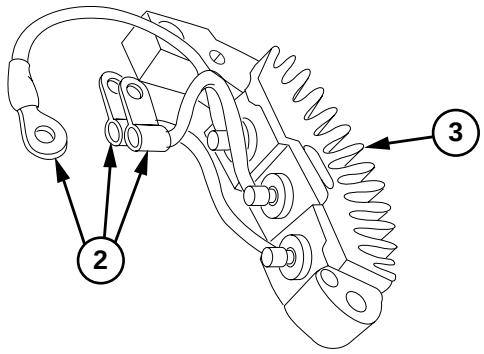
(6) Touch positive (+) test lead separately to each of three eyelet terminals (2).

(7) Touch positive (+) test lead to bare metal surface on negative rectifier (3).

NOTE

If multimeter does not indicate low resistance in step (8), positive rectifier is defective. Replace rectifier.

(8) Touch negative (–) test lead separately to each of three eyelet terminals (2).



NOTE

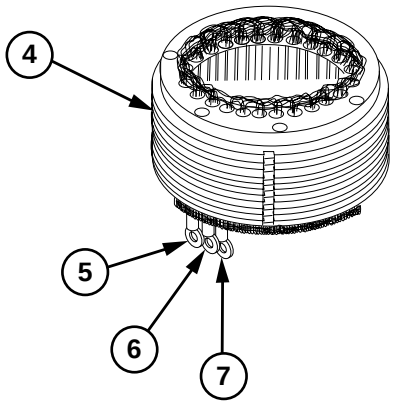
If resistance reading in step (9) is low, stator is grounded and requires replacement.

(9) Touch one test lead to bare metal surface of stator (4) and other test lead separately to each pair of three stator ring terminals (5, 6, and 7).

NOTE

If resistance is not 1.0 ohm or less, stator is defective. Replace stator.

(10) Touch test leads to pairs of stator ring terminals (5 and 6), (6 and 7), and (5 and 7), and read resistance across each set of terminals.



NOTE

If multimeter does not indicate an open circuit in either test, rotor coil is grounded. Replace rotor.

(11) Touch one test lead to bare metal surface on shaft (8) and other test lead separately to each slip ring (9).

NOTE

If resistance is not 10.0 ohms or less, replace rotor.

(12) Touch test leads to each slip ring (9).

NOTE

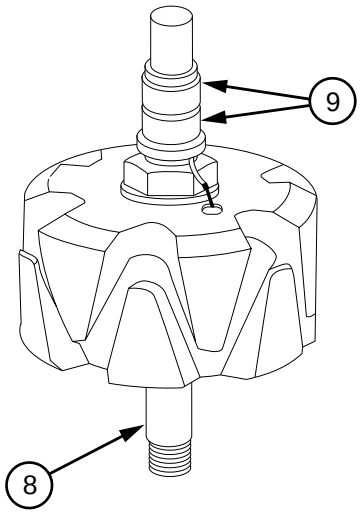
Minimum outside diameter (OD) of slip rings is 1.057 in. (26.85 mm). If measurement is less, replace rotor.

(13) Measure outside diameter (OD) of slip rings (9).

NOTE

Minimum outside diameter (OD) of shaft is 0.669 in. (17 mm). If measurement is less, replace rotor.

(14) Measure diameter of shaft (8).



c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

CAUTION

Do not soak stator or rotor in solvents. Damage to insulation may result.

(1) Clean stator and rotor with solvent cleaning compound and clean cloth.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry stator and rotor with compressed air or dry cloth.

(3) Clean all other components, except bearings, in solvent cleaning compound.

6-2. 12-VOLT ALTERNATOR REPAIR (CONT)

(4) Inspect electrical assemblies for damage, frayed or bare wires, or loose connections.

(5) Inspect mechanical assemblies for damage. Check for old or excess grease.

(6) Clean rectifier assembly holes and terminal screws to ensure good electrical contact.

(7) Clean carbon coating off slip rings with crocus cloth

(8) Inspect brushes for burnt appearance, cracks, broken edges.

(9) Check brush wear and replace if length measures less than 3/16 in. (4.76 mm).

(10) Check drive end housing bearing for smooth rotation. If bearing binds, replace bearing.

(11) Check slip ring housing bearing for missing rollers. If rollers are missing, replace bearing.

d. Assembly

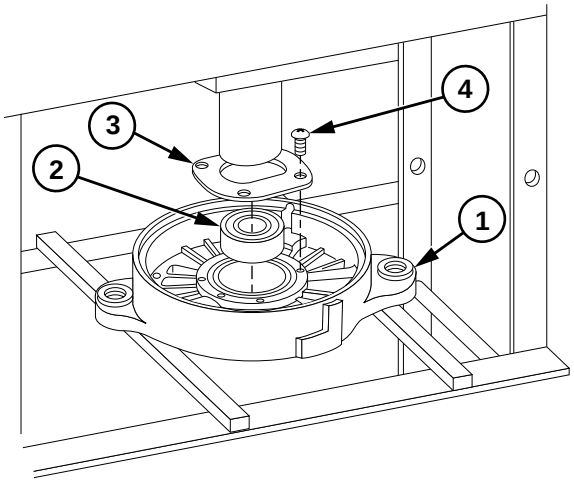
(1) Position drive end housing (1) in press.

CAUTION

Apply pressure only on outer portion of race when pressing bearing into drive end housing. Failure to comply may result in equipment damage.

(2) Press bearing (2) in drive end housing (1).

(3) Install bearing retainer (3) in drive end housing (1) with four screws (4).

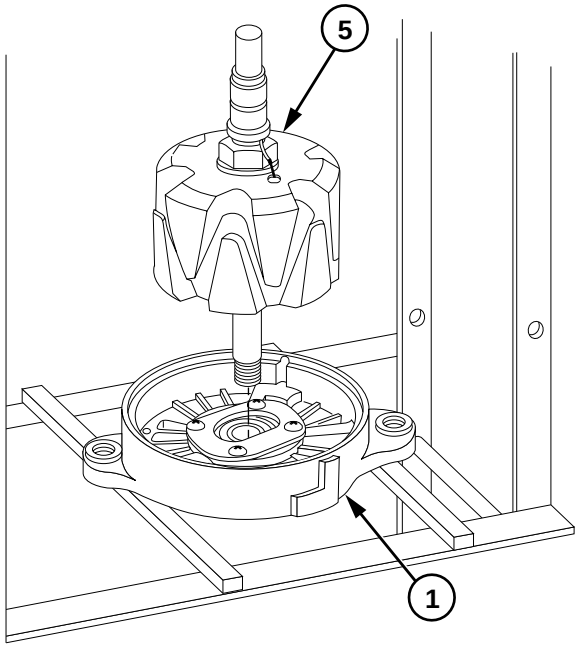


NOTE

Threaded end of shaft must point downward.

(4) Install rotor assembly (5) in drive end housing (1).

(5) Remove rotor assembly (5) from press.



(6) Position slip ring end housing (6) in press.

NOTE

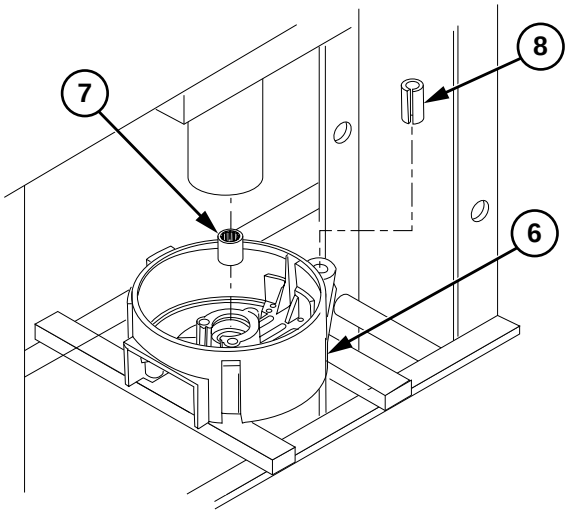
When properly installed, bearing seats on lip inside bearing bore.

(7) Press bearing (7) in slip ring end housing (6).

(8) Press bushing (8) in slip ring end housing (6).

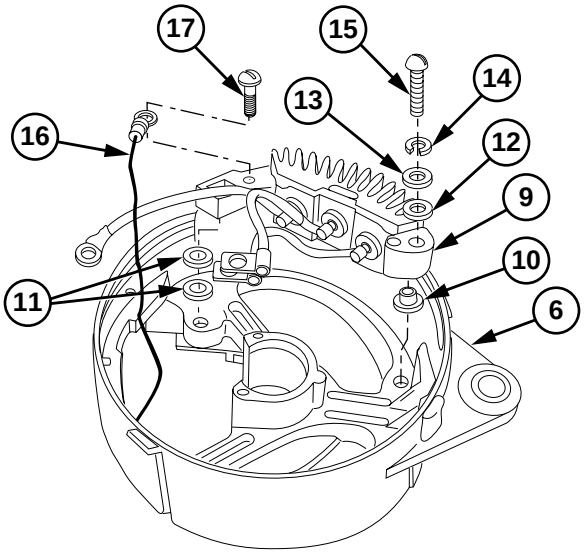
(9) Remove slip ring end housing (6) from press.

(10) Coat bearing (7) rollers with grease.

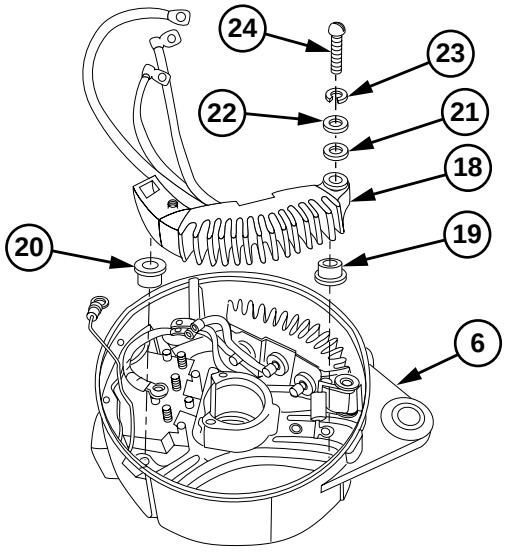


(11) Install negative (–) rectifier (9) in slip ring end housing (6) with bushing (10), two washers (11), plastic washer (12), washer (13), new lockwasher (14), and mounting screw (15).

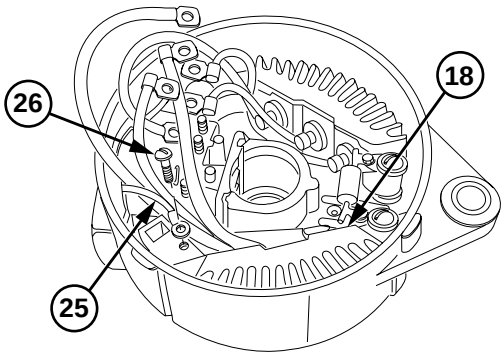
(12) Install black wire (16) on negative (–) rectifier (9) with screw (17).



(13) Install positive (+) rectifier (18) in slip ring end housing (6) with bushing (19), bushing (20), plastic washer (21), washer (22), new lockwasher (23), and mounting screw (24).



6-2. 12-VOLT ALTERNATOR REPAIR (CONT)



(14) Install red wire (25) on positive (+) rectifier (18) with screw (26).

(15) Install three terminal studs (27) in regulator holder (28) with three nuts (29).

CAUTION

Red and black rectifier wires should be positioned in grooves between regulator holder and slip ring end housing. Failure to comply may result in damaged wiring.

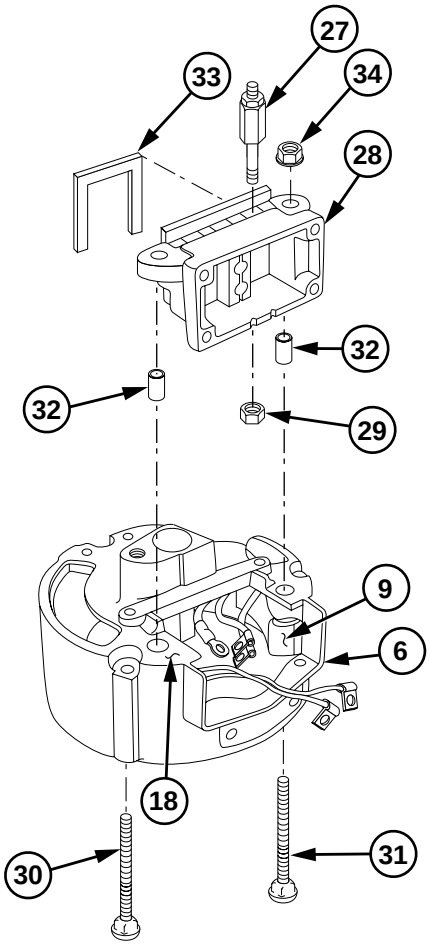
(16) Install positive (+) terminal screw (30), negative (-) terminal screw (31), two insulation bushings (32), regulator holder (28), new gasket (33), and two tenz nuts (34) in slip ring end housing (6), positive (+) rectifier (18), and negative (-) rectifier (9).

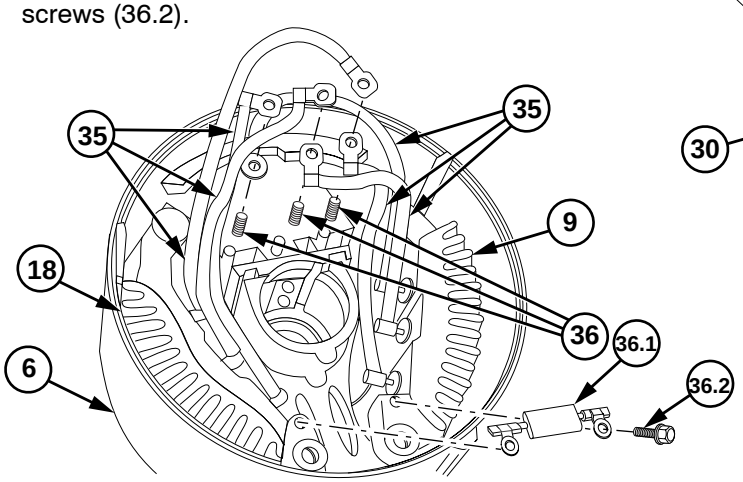
NOTE

Rectifier leads should be firmly seated in regulator holder.

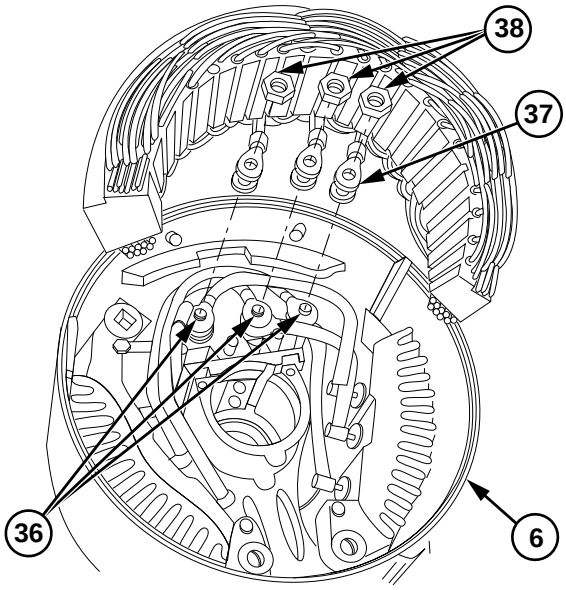
(17) Install six rectifier leads (35) on three regulator studs (36).

(17.1) Install capacitor (36.1) on positive rectifier (18) and negative rectifier (9) with two screws (36.2).



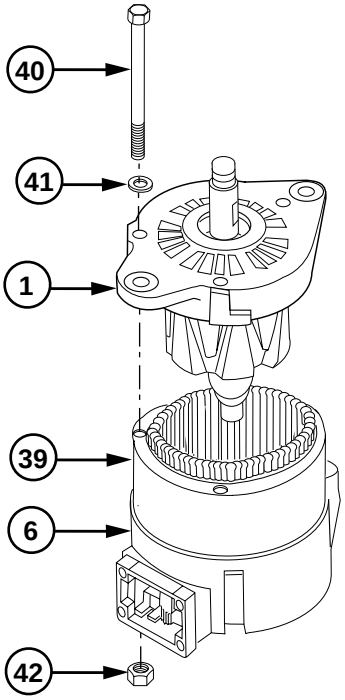


(18) Install six stator ring terminals (37) on slip ring end housing (6) and three regulator studs (36) with three tenz nuts (38).

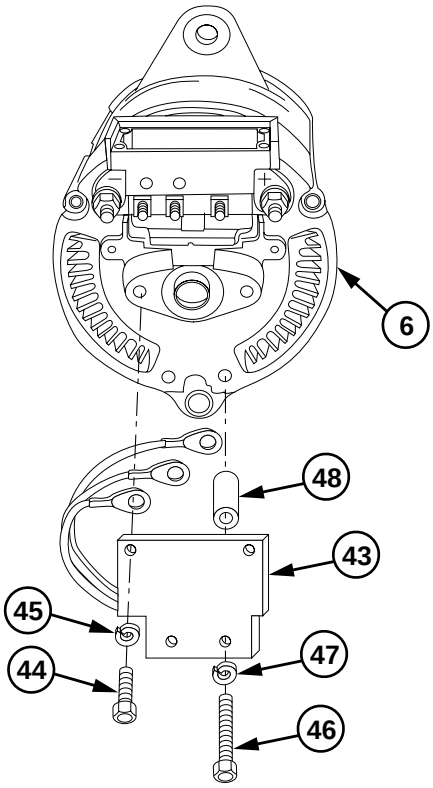


(19) Align screw holes on slip ring end housing (6), stator (39), and drive end housing (1).

(20) Install slip ring end housing (6) on drive end housing (1) with three screws (40), washers (41), and new locknuts (42).



(21) Install capacitor (43) on slip ring end housing (6) with two screws (44), new lockwashers (45), screws (46), new lockwashers (47), and spacers (48).



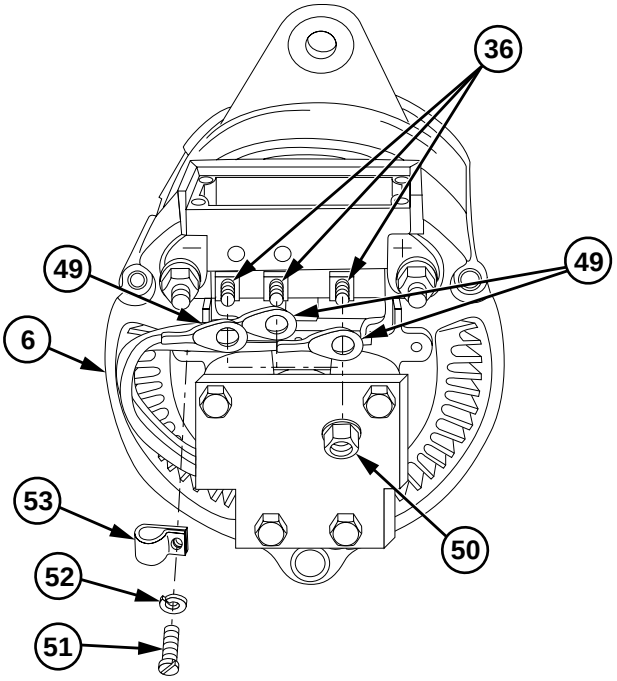
6-2. 12-VOLT ALTERNATOR REPAIR (CONT)

NOTE

Capacitor wires have three different lengths. Wires should be routed accordingly.

(22) Install three wires (49) on regulator studs (36) with tenz nuts (50).

(23) Secure three wires (49) to slip ring end housing (6) with screw (51), new lockwasher (52), and clip (53).



(24) Position spacer (54), key (55), cooling plate (56), pulley (57), and new locknut (58) on shaft (59). Do not tighten.

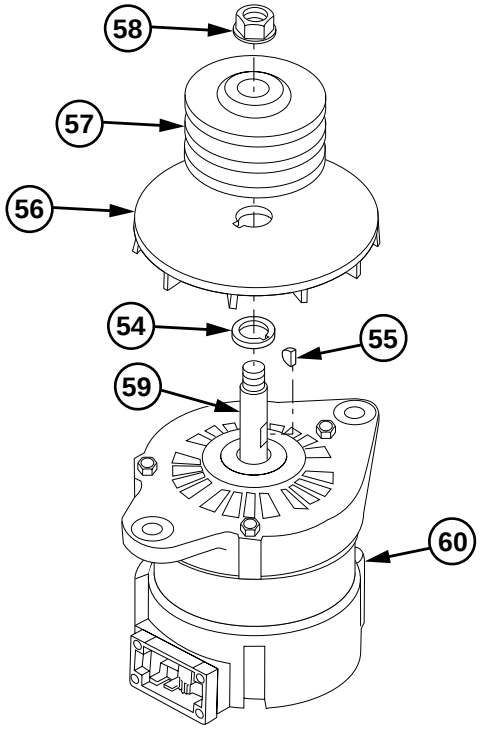
NOTE

Vise is used to securely hold pulley for step (26).

(25) Position alternator (60) in vise.

(26) Tighten locknut (58) to 70–80 lb-ft (95–108 N·m).

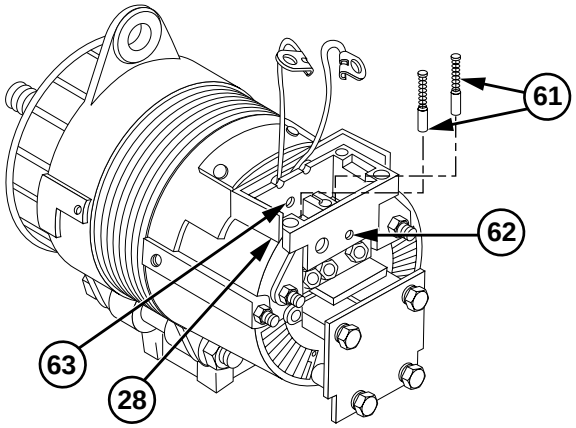
(27) Remove alternator (60) from vise.



NOTE

If using original brushes, wear pattern must match radius of slip rings.

(28) Insert two brushes (61) in regulator holder (28).



NOTE

Brush springs are held compressed with 1/16 in. sockethead screw key to aid installation of voltage regulator.

(29) Compress brush springs (61). Install 1/16 in. sockethead screw key through pilot hole (62) in rear of regulator holder (28), over springs (61), and into pilot hole (63) inside regulator holder (28).

CAUTION

Regulator can only be installed one way. Position regulator so brush pins are on side facing pulley. Failure to comply may result in equipment damage.

NOTE

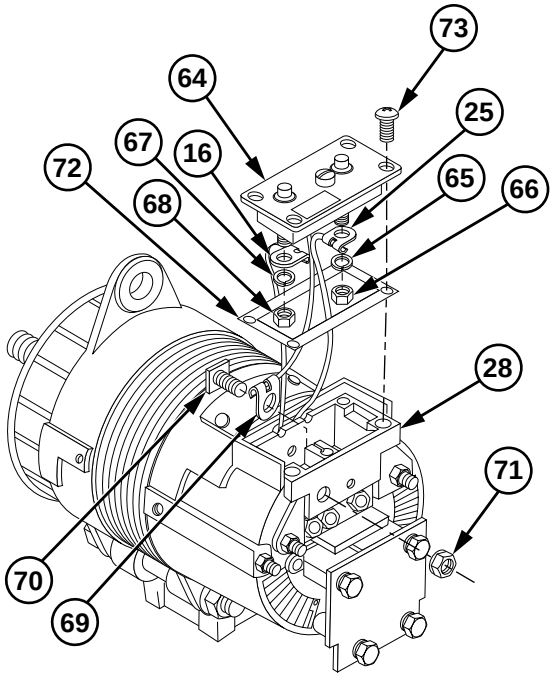
Regulator must be positioned close to holder to allow installation of wires.

(30) Install red wire (25) on positive (+) terminal of voltage regulator (64) with new lockwasher (65) and nut (66).

(31) Install black wire (16) on negative (–) terminal of voltage regulator (64) with new lockwasher (67) and nut (68).

(32) Install blue wire (69) and ignition (IGN) stud (70) in regulator holder (28).

(33) Install tenz nut (71) on ignition (IGN) stud (70).



CAUTION

Brush retaining pin must be removed before tightening screws. Failure to comply may result in damage to regulator.

(34) Position new gasket (72) and voltage regulator (64) on regulator holder (28) with four screws (73). Do not tighten.

(35) Remove sockethead screw key from rear of regulator holder (28).

(36) Tighten four screws (73) on voltage regulator (64).

e. Follow-On Maintenance

Install alternator (TM 9–2320–360–20).

6-3. 24-VOLT ALTERNATOR REPAIR

This task covers
- a. Disassembly
- b. Cleaning/Inspection
- c. Testing
- d. Assembly
- e. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Alternator removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Automotive Fuel and Electrical System Repair (Item 199, Appendix E)
Caliper Set, Micrometer (Item 15, Appendix E)
Caps, Vise Jaw (Item 17, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Press, Hydraulic (Item 116, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Vise, Machinist's (Item 207, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Cloth, Crocus (Item 16, Appendix B)
Compound, Insulating (Item 20, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Gasket (Item 60, Appendix F)
Gasket (Item 69, Appendix F)
Locknuts (3) (Item 98, Appendix F)
Locknut (Item 100, Appendix F)
Lockwashers (3) (Item 137, Appendix F)
Lockwashers (2) (Item 118, Appendix F)
Lockwashers (2) (Item 119, Appendix F
Lockwashers (2) (Item 142, Appendix F)

Personnel Required
MOS 63G

a. Disassembly

(1) Remove tenz nut (1) from ignition (IGN) stud (2) on regulator holder (3).

CAUTION
Voltage regulator is still connected by two wires. Regulator cannot be removed until after step (5). Failure to comply may result in damage to alternator.

(2) Remove four screws (4) and voltage regulator (5) from regulator holder (3).

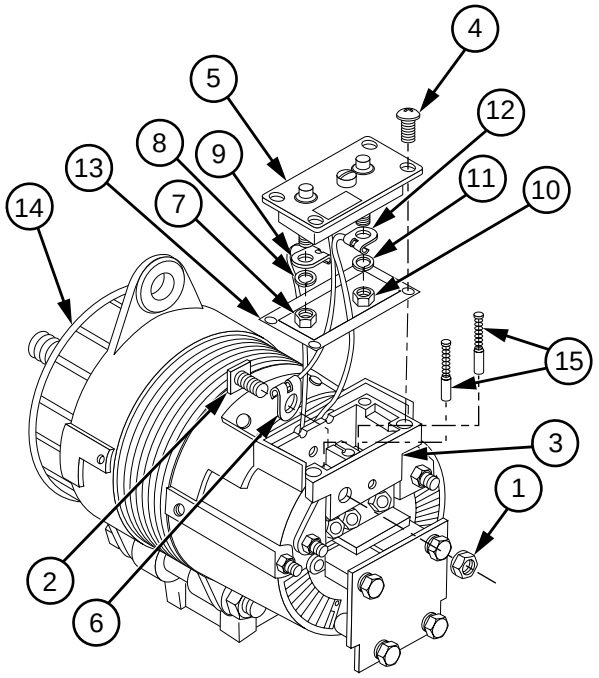
(3) Remove ignition (IGN) stud (2) and blue wire (6) from regulator holder (3).

(4) Remove nut (7), lockwasher (8), and black wire (9) from negative (-) terminal of voltage regulator (5). Discard lockwasher.

(5) Remove nut (10), lockwasher (11), and red wire (12) from positive (+) terminal of voltage regulator (5). Discard lockwasher.

(6) Remove voltage regulator (5) and gasket (13) from alternator (14). Discard gasket.

(7) Remove two brushes (15) from regulator holder (3).



NOTE

Vise is used to securely hold pulley for step (9).

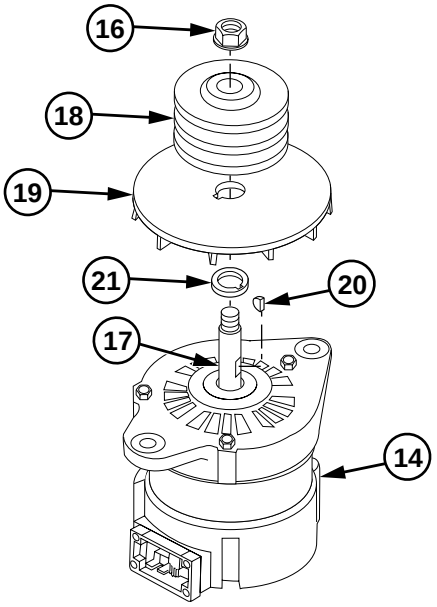
(8) Position alternator (14) in vise.

(9) Remove locknut (16) from shaft (17). Discard locknut.

(10) Remove alternator (14) from vise.

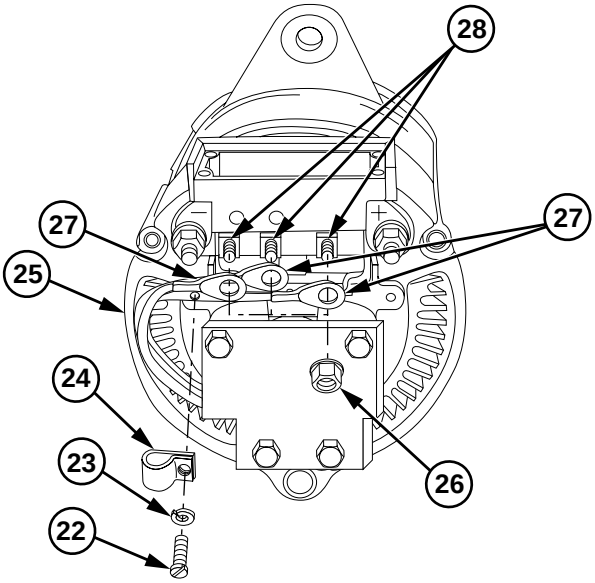
(11) Remove pulley (18) from shaft (17).

(12) Remove cooling plate (19), key (20), and spacer (21) from shaft (17).

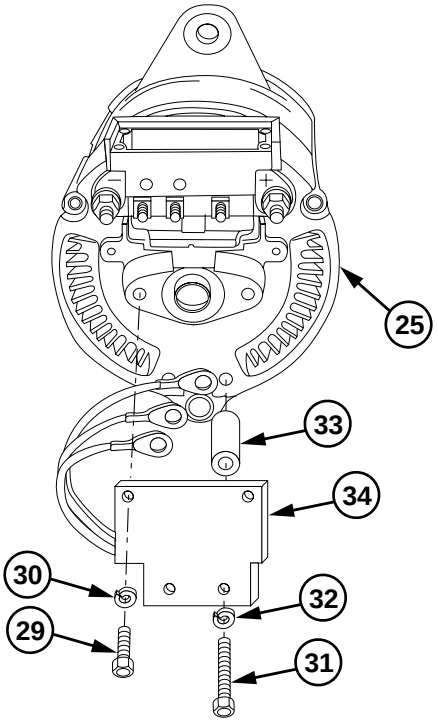


(13) Remove screw (22), lockwasher (23), and clip (24) from slip ring end housing (25). Discard lockwasher.

(14) Remove three tenz nuts (26) and wires (27) from terminals (28).



(15) Remove two screws (29), lockwashers (30), screws (31), lockwashers (32), spacers (33), and capacitor (34) from slip ring end housing (25). Discard lockwashers.



6-3. 24-VOLT ALTERNATOR REPAIR (CONT)

(16) Remove three locknuts (35), washers (36), and screws (37) from drive end housing (38) and slip ring end housing (25). Discard locknuts.

CAUTION

When removing rotor, completely separate rotor from stator. Stator will still be attached to slip ring housing. Do not attempt to separate stator from slip ring housing. Failure to comply may result in damage to stator wires.

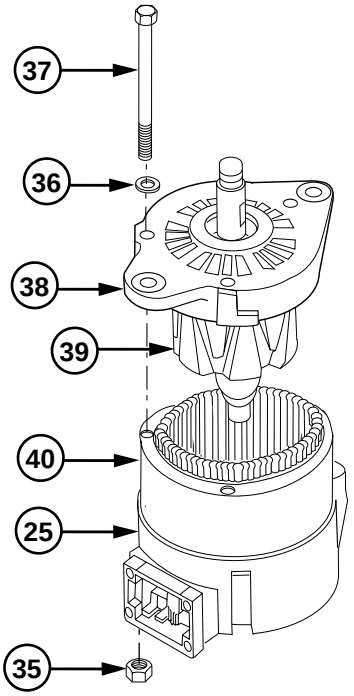
NOTE

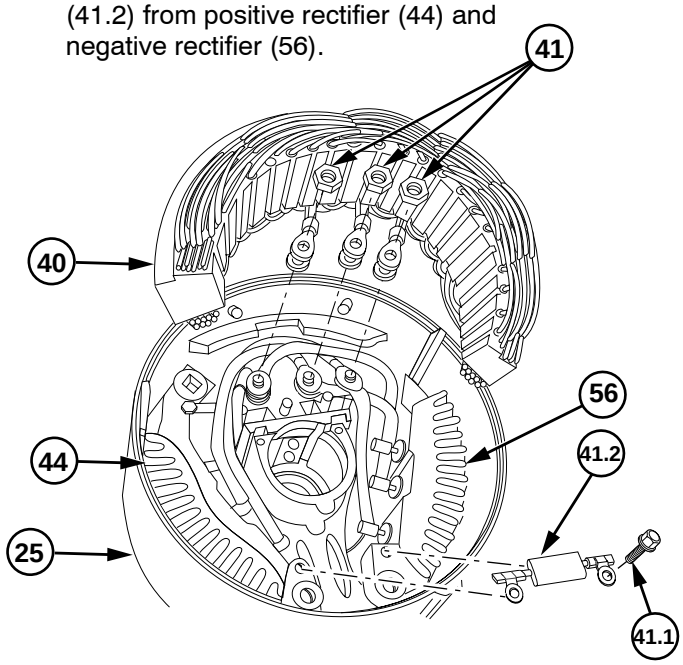
Rotor will remain attached to drive end housing during removal.

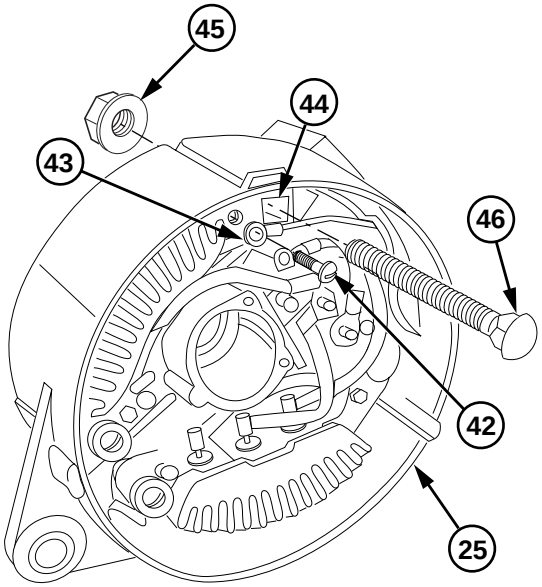
(17) Remove drive end housing (38) and rotor assembly (39) from slip ring end housing (25) and stator (40).

(18) Remove three tenz nuts (41) and stator (40) from slip ring end housing (25).

(18.1) Remove two screws (41.1) and capacitor (41.2) from positive rectifier (44) and negative rectifier (56).







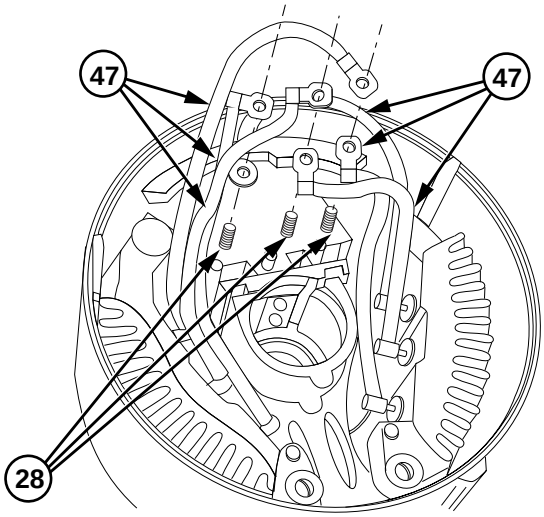
(19) Remove screw (42) and wire (43) from positive rectifier (44).

(20) Remove tenz nut (45) and positive terminal screw (46) from positive rectifier (44) and slip ring end housing (25).

NOTE

Tag and mark wires before removal.

(21) Remove six rectifier wires (47) from three terminals (28).

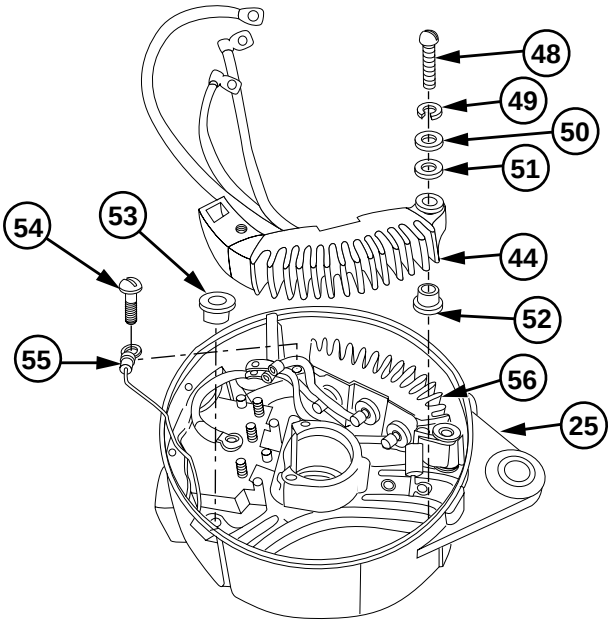


CAUTION

Do not remove lower bushing from positive rectifier. Failure to comply may damage bushing.

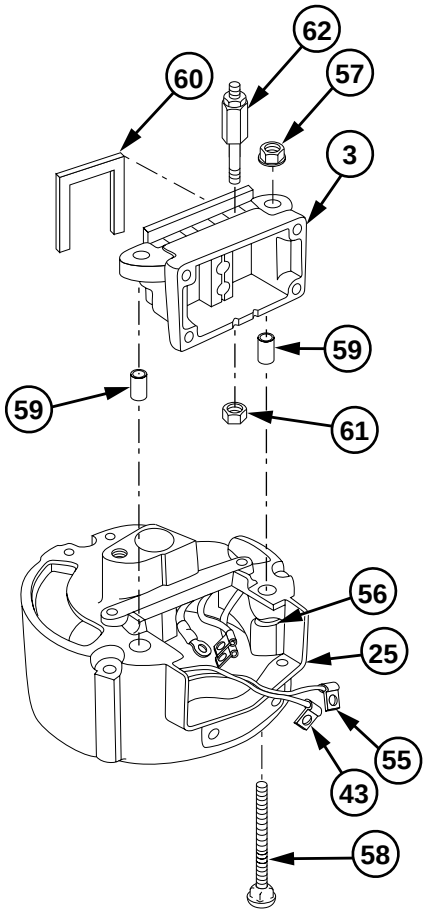
(22) Remove lower mounting screw (48), lockwasher (49), washer (50), plastic washer (51), positive rectifier (44) with bushing (52), and bushing (53) from slip ring end housing (25). Discard lockwasher.

(23) Remove screw (54) and wire (55) from negative rectifier (56).



(24) Remove tenz nut (57), negative terminal screw (58), two insulation bushings (59), regulator holder (3), gasket (60), wire (43), and wire (55) from negative rectifier (56) and slip ring end housing (25).

(25) Remove three nuts (61) and terminal studs (62) from regulator holder (3).

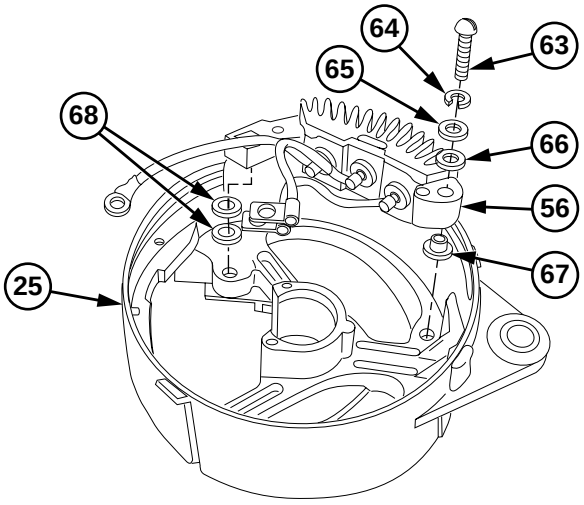


6-3. 24-VOLT ALTERNATOR REPAIR (CONT)

CAUTION

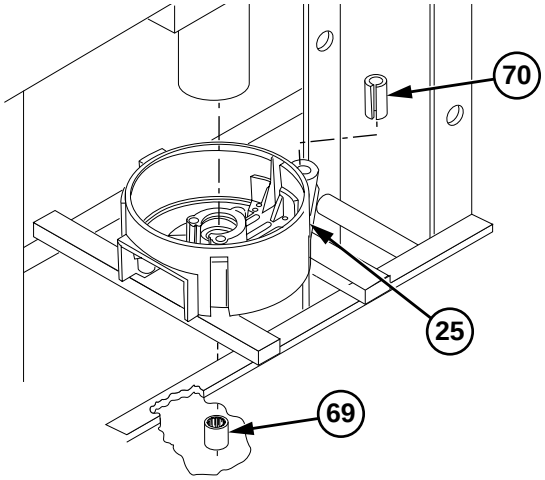
Do not remove lower bushing from negative rectifier. Failure to comply may damage bushing.

(26) Remove lower mounting screw (63), lockwasher (64), washer (65), plastic washer (66), negative rectifier (56) with bushing (67), and two washers (68) from slip ring end housing (25). Discard lockwasher.



(27) Position slip ring end housing (25) in press and remove bearing (69).

(28) Remove bushing (70) from slip ring end housing (25).

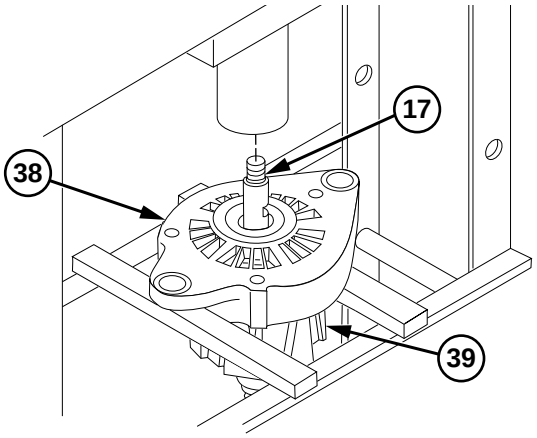


(29) Position drive end housing (38) and rotor assembly (39) in press with threaded end of shaft (17) pointing upward.

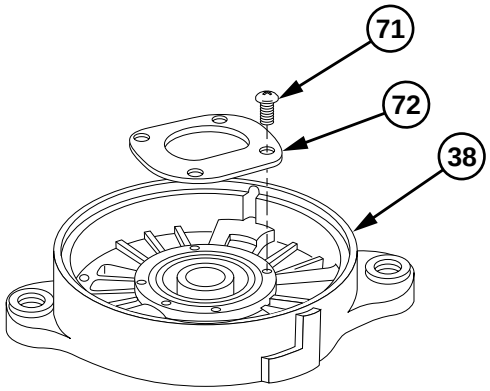
CAUTION

Protect rotor assembly from striking floor while pressing from drive end housing. Failure to comply may result in damage to rotor assembly.

(30) Press rotor assembly (39) out from drive end housing (38).

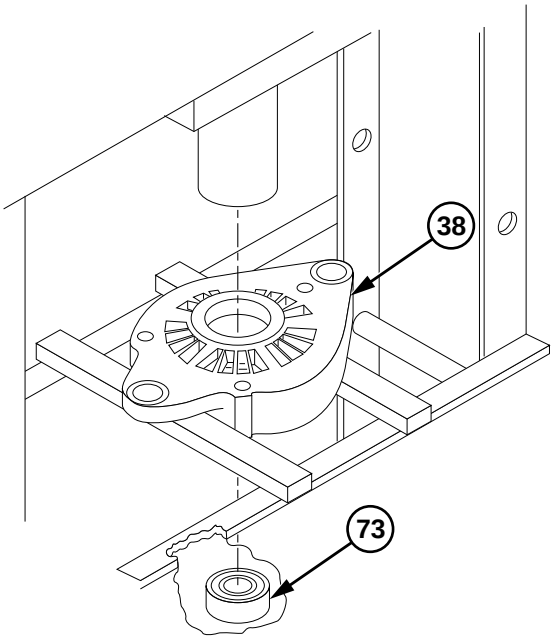


(31) Remove four screws (71) and bearing retainer (72) from drive end housing (38).



(32) Position drive end housing (38) in press with bearing (73) side down.

(33) Press bearing (73) out of drive end housing (38).



b. Testing

(1) Touch negative (–) test lead of multimeter to bare metal surface on positive rectifier (1).

NOTE

If multimeter does not indicate low resistance in step (2), positive rectifier is defective. Replace rectifier.

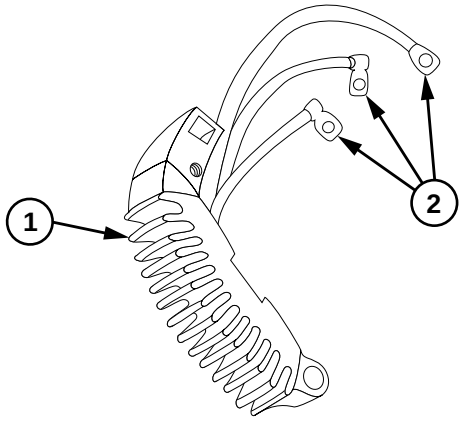
(2) Touch positive (+) test lead of multimeter separately to each of three eyelet terminals (2).

(3) Touch positive (+) test lead to bare metal surface on positive rectifier (1).

NOTE

If multimeter does not indicate infinity in step (4), positive rectifier is defective. Replace rectifier.

(4) Touch negative (–) test lead separately to each of three eyelet terminals (2).



6-3. 24-VOLT ALTERNATOR REPAIR (CONT)

(5) Touch negative (–) test lead to bare metal surface on negative rectifier (3).

NOTE

If multimeter does not indicate infinity in step (6), positive rectifier is defective. Replace rectifier.

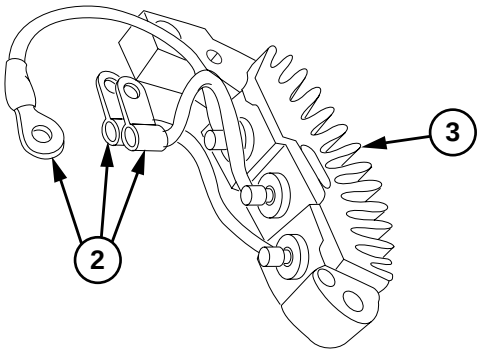
(6) Touch positive (+) test lead separately to each of three eyelet terminals (2).

(7) Touch positive (+) test lead to bare metal surface on negative rectifier (3).

NOTE

If multimeter does not indicate low resistance in step (8), positive rectifier is defective. Replace rectifier.

(8) Touch negative (–) test lead separately to each of three eyelet terminals (2).



NOTE

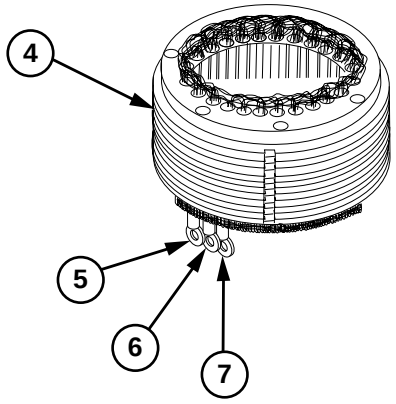
If resistance reading in step (9) is low, stator is grounded and requires replacement.

(9) Touch one test lead to bare metal surface of stator (4) and other test lead separately to each pair of three stator ring terminals (5, 6, and 7).

NOTE

If resistance is not 1.0 ohm or less, stator is defective. Replace stator.

(10) Touch test leads to pairs of stator ring terminals (5 and 6), (6 and 7), and (5 and 7), and read resistance across each set of terminals.



NOTE

If multimeter does not indicate an open circuit in either test, rotor coil is grounded. Replace rotor.

(11) Touch one test lead to bare metal surface on shaft (8) and other test lead separately to each slip ring (9).

NOTE

If resistance is not 10.0 ohms or less, replace rotor.

(12) Touch test leads to each slip ring (9).

NOTE

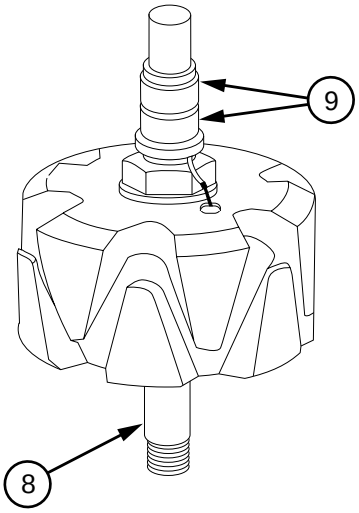
Minimum outside diameter (OD) of slip rings is 1.057 in. (26.85 mm). If measurement is less, replace rotor.

(13) Measure outside diameter (OD) of slip rings (9).

NOTE

Minimum outside diameter (OD) of shaft is 0.669 in. (17 mm). If measurement is less, replace rotor.

(14) Measure diameter of shaft (8).



c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

- **The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).**
- **Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.**
- **Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.**
- **Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.**
- **Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.**

CAUTION

Do not soak stator or rotor in solvents. Damage to insulation may result.

(1) Clean stator and rotor with solvent cleaning compound and clean cloth.

6-3. 24-VOLT ALTERNATOR REPAIR (CONT)

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry stator and rotor with compressed air or dry cloth.

(3) Clean all other components, except bearings, in solvent cleaning compound.

(4) Inspect electrical assemblies for damage, frayed or bare wires, or loose connections.

(5) Inspect mechanical assemblies for damage. Check for old or excess grease.

(6) Clean rectifier assembly holes and terminal screws to ensure good electrical contact.

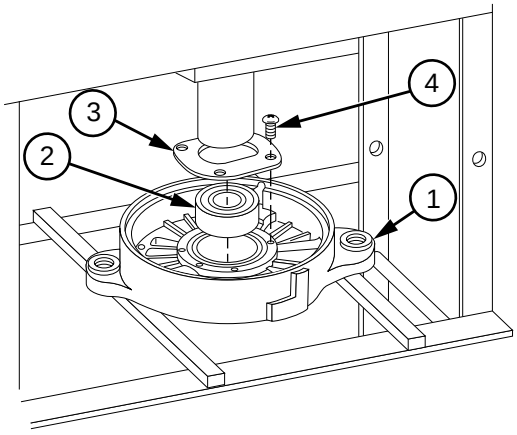
(7) Clean carbon coating off slip rings with crocus cloth

(8) Inspect brushes for burnt appearance, cracks, broken edges.

(9) Check brush wear and replace if length measures less than 0.19 in. (4.8 mm).

(10) Check drive end housing bearing for smooth rotation. If bearing binds, replace bearing.

(11) Check slip ring housing bearing for missing rollers. If rollers are missing, replace bearing.



d. Assembly

(1) Position drive end housing (1) in press.

CAUTION

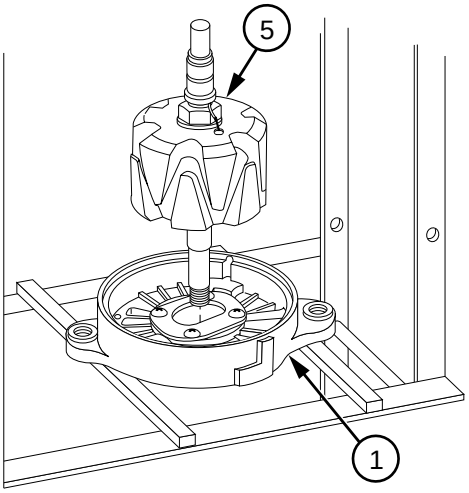
Apply pressure only on outer portion of race when pressing bearing into drive end housing. Failure to comply may result in equipment damage.

(2) Press bearing (2) in drive end housing (1).

(3) Install bearing retainer (3) in drive end housing (1) with four screws (4).

NOTE

Threaded end of shaft must point downward.



(4) Install rotor assembly (5) in drive end housing (1).

(5) Remove rotor assembly (5) from press.

(6) Position slip ring end housing (6) in press.

NOTE

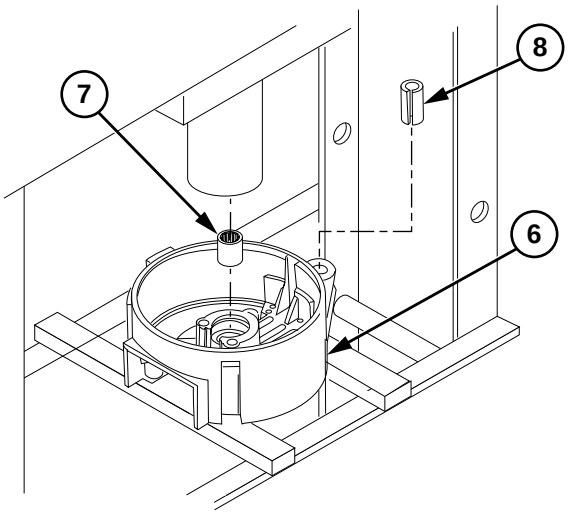
When properly installed, bearing seats on lip inside bearing bore.

(7) Press bearing (7) in slip ring end housing (6).

(8) Press bushing (8) in slip ring end housing (6).

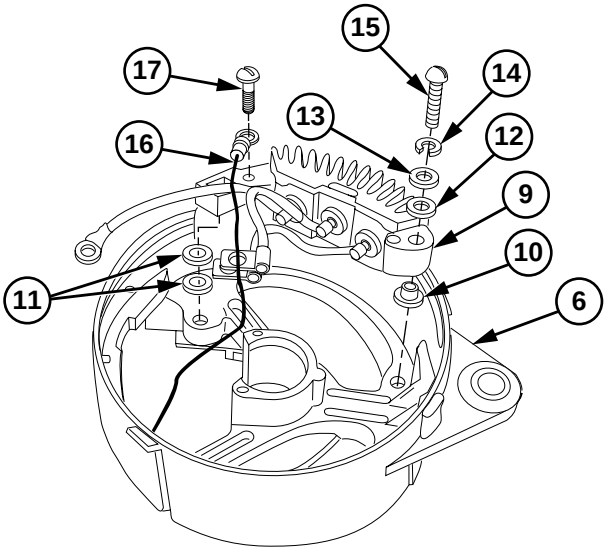
(9) Remove slip ring end housing (6) from press.

(10) Coat bearing (7) rollers with grease.

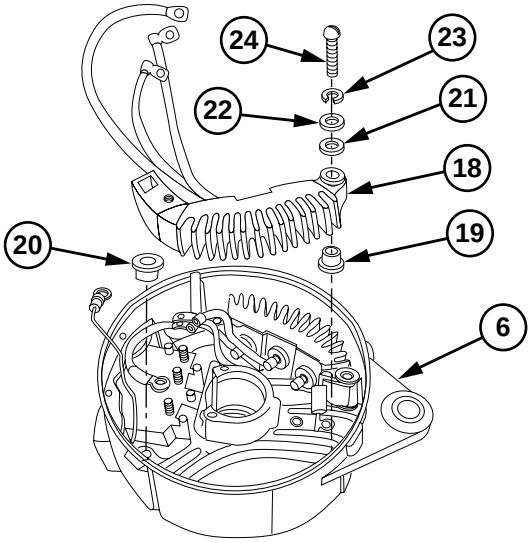


(11) Install negative (–) rectifier (9) in slip ring end housing (6) with bushing (10), two washers (11), plastic washer (12), washer (13), lockwasher (14), and mounting screw (15).

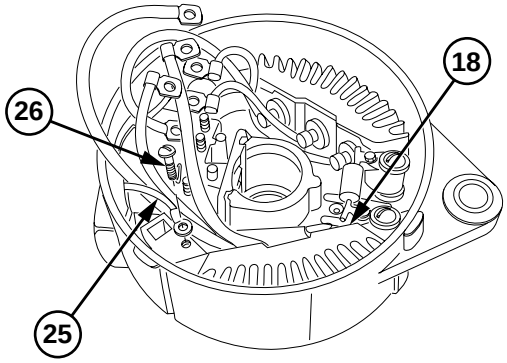
(12) Install black wire (16) on negative (–) rectifier (9) with screw (17).



(13) Install positive (+) rectifier (18) in slip ring end housing (6) with bushing (19), bushing (20), plastic washer (21), washer (22), new lockwasher (23), and mounting screw (24).



6-3. 24-VOLT ALTERNATOR REPAIR (CONT)



(14) Install red wire (25) on positive (+) rectifier (18) with screw (26).

(15) Install three terminal studs (27) on regulator holder (28) with three nuts (29).

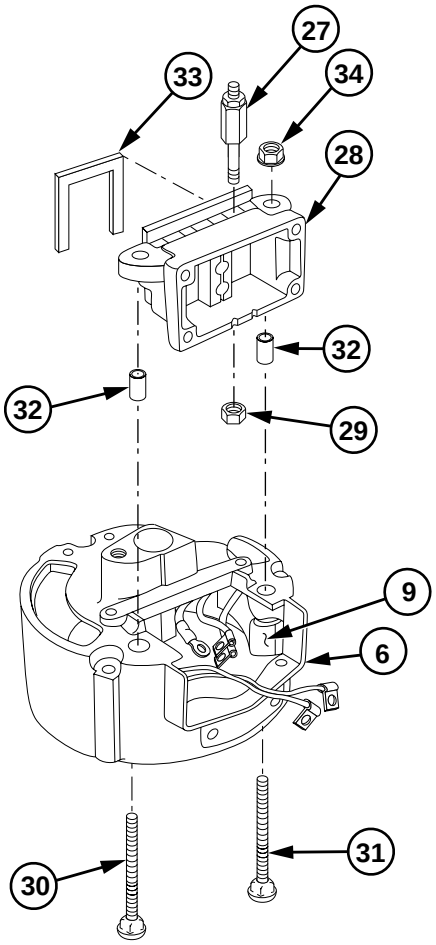
CAUTION

Red and black rectifier wires should be positioned in grooves between regulator holder and slip ring end housing. Failure to comply may result in damaged wiring.

(16) Install positive (+) terminal screw (30), negative (-) terminal screw (31), two insulation bushings (32), regulator holder (28), new gasket (33), and two tenz nuts (34) in slip ring end housing (6), positive (+) rectifier (18), and negative (-) rectifier (9).

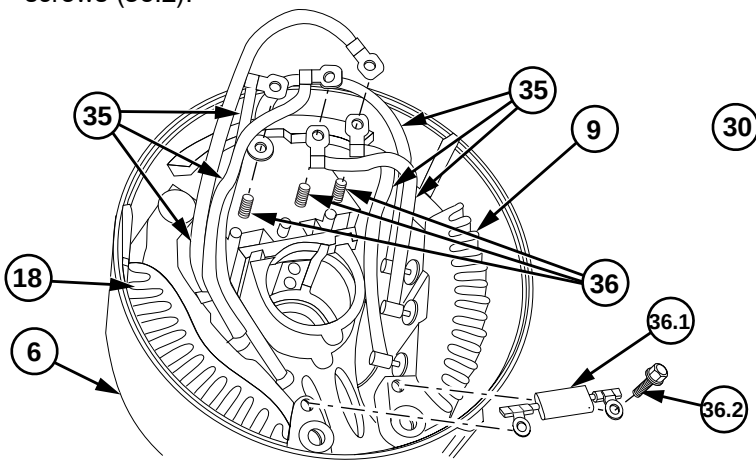
NOTE

- Rectifier leads should be firmly seated in regulator holder.
- Wires should be positioned in locations marked during removal.

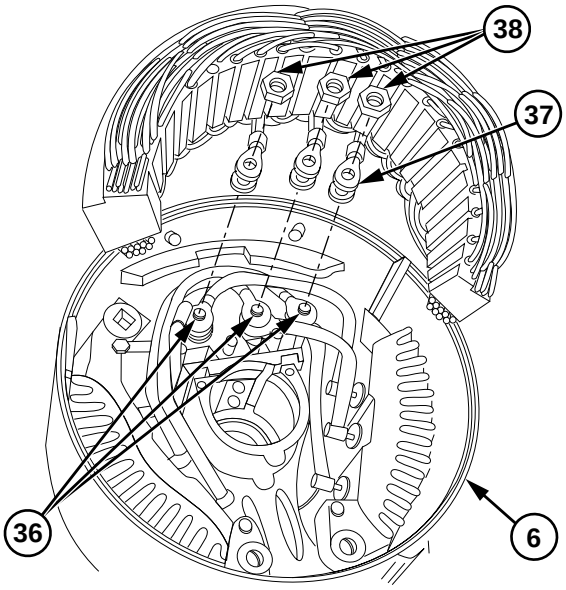


(17) Install six rectifier leads (35) on three regulator studs (36).

(17.1) Install capacitor (36.1) on positive rectifier (18) and negative rectifier (9) with two screws (36.2).

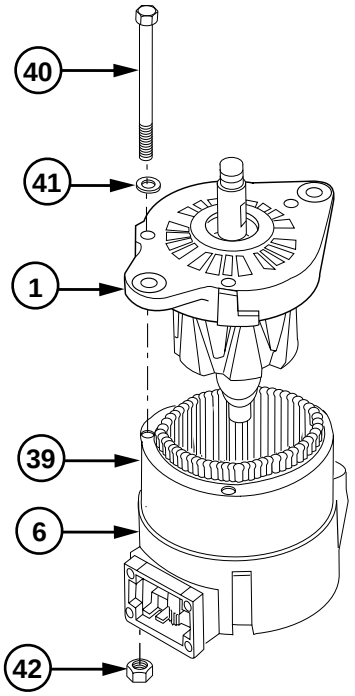


(18) Install stator ring terminals (37) on slip ring end housing (6) and regulator studs (36) with three tenz nuts (38).

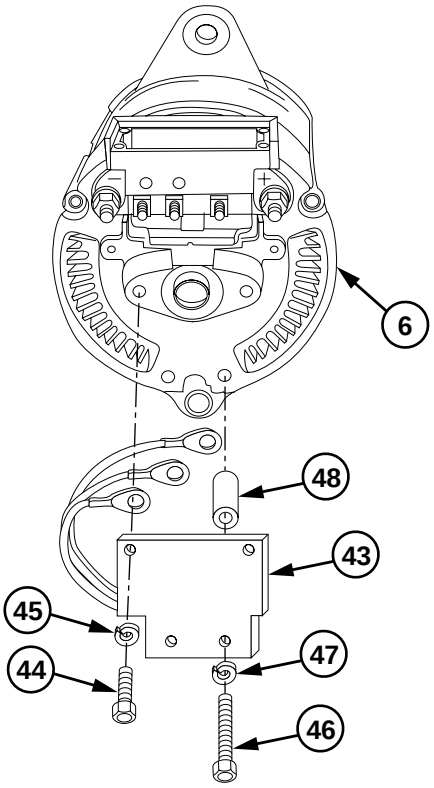


(19) Align screw holes on slip ring end housing (6), stator (39), and drive end housing (1).

(20) Install slip ring end housing (6) on drive end housing (1) with three screws (40), washers (41), and new locknuts (42).



(21) Install capacitor (43) on slip ring end housing (6) with two screws (44), new lockwashers (45), screws (46), new lockwashers (47), and spacers (48).



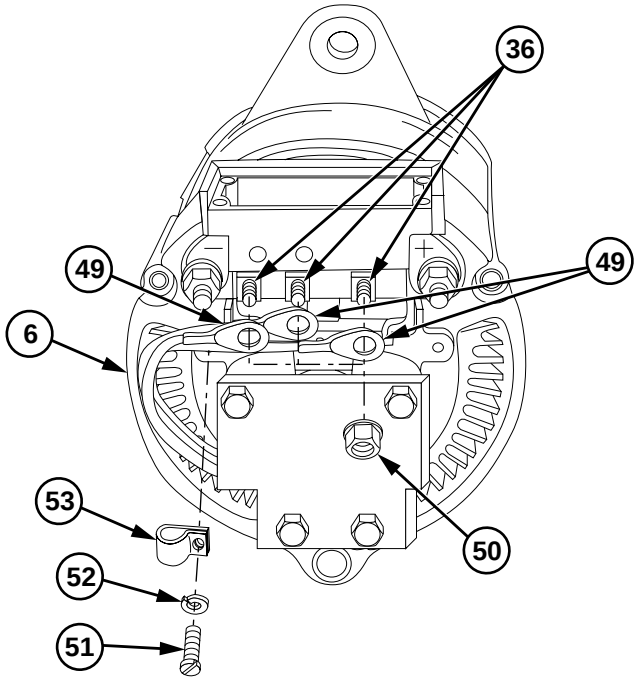
6-3. 24-VOLT ALTERNATOR REPAIR (CONT)

NOTE

Capacitor wires have three different lengths. Wires should be routed accordingly.

(22) Install three wires (49) on three regulator studs (36) with three tenz nuts (50).

(23) Secure three wires (49) to slip ring end housing (6) with screw (51), new lockwasher (52), and clip (53).



(24) Position spacer (54), key (55), cooling plate (56), pulley (57), and new locknut (58) on shaft (59). Do not tighten.

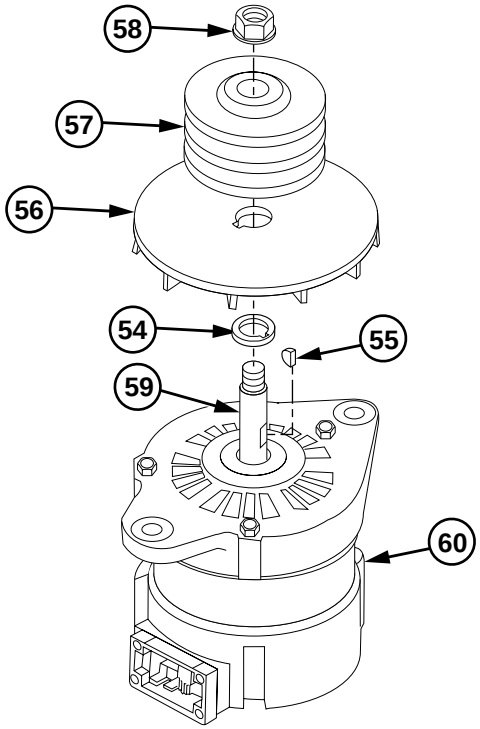
NOTE

Vise is used to hold pulley securely for step (26).

(25) Position alternator (60) in vise.

(26) Tighten locknut (58) to 70–80 lb–ft (95–108 N·m).

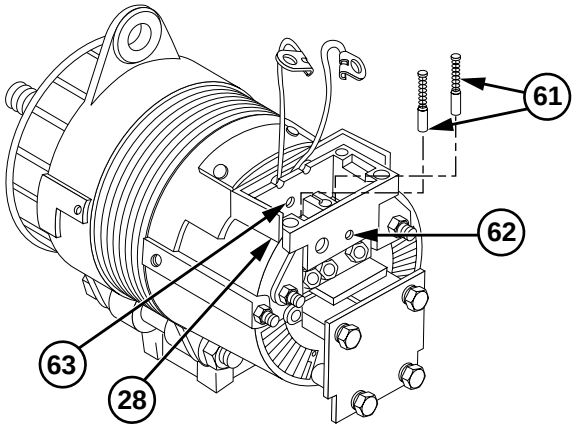
(27) Remove alternator (60) from vise.



NOTE

If using original brushes, wear pattern must match radius of slip rings.

(28) Insert two brushes (61) into regulator holder (28).



NOTE

Brush springs are held compressed with 1/16 in. sockethead screw key to aid installation of voltage regulator.

(29) Compress brush springs (61). Install 1/16 in. sockethead screw key through pilot hole (62) in regulator holder (28), over springs (61), and into pilot hole (63) inside regulator holder (28).

CAUTION

Regulator can only be installed one way. Position regulator so regulator pins align with brush openings. Failure to comply may result in damage to equipment.

NOTE

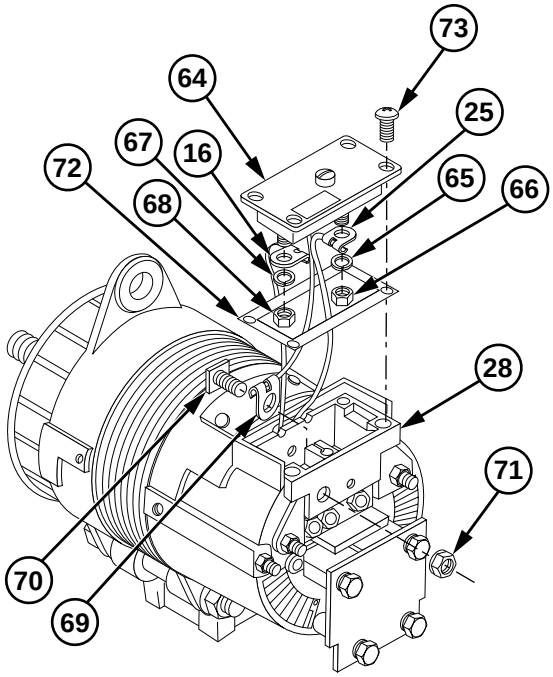
Regulator must be positioned close to housing to allow installation of wires.

(30) Install red wire (25) on positive (+) terminal of voltage regulator (64) with new lockwasher (65) and nut (66).

(31) Install black wire (16) on negative (–) terminal of voltage regulator (64) with new lockwasher (67) and nut (68).

(32) Install blue wire (69) and ignition (IGN) stud (70) in regulator holder (28).

(33) Install tenz nut (71) on ignition (IGN) stud (70).



CAUTION

Brush retaining pin must be positioned in grooves between regulator holder and slip ring end housing. Failure to comply may result in damaged wiring.

(34) Position new gasket (72) and voltage regulator (64) on regulator holder (28) with four screws (73). Do not tighten.

(35) Remove sockethead screw key from rear of regulator holder (28).

(36) Tighten four screws (73) on voltage regulator (64).

e. Follow-On Maintenance

Install alternator (TM 9-2320-360-20).

6-4. STARTER REPAIR

This task covers
a. Disassembly
b. Cleaning/Inspection
c. Testing
d. Assembly
e. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Starter removed (TM 9-2320-360-20).

Tools and Specials Tools
Tool Kit, Automotive Fuel and Electrical System Repair (Item 199, Appendix E)
Caliper, Venier (Item 16, Appendix E)
Caliper Set, Micrometer (Item 15, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Hook, Wire (Figure C-6, Appendix C)
Multimeter (Item 98, Appendix E)
Wrench Set, Impact (Item 228, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 2.1, Appendix B)
Adhesive-Sealant (Item 6, Appendix B)
Adhesive-Sealant (Item 10, Appendix B)

Materials/Parts (Cont)
Cloth, Crocus (Item 16, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Oil, Lubricating (Item 44, Appendix B)
Oil, Lubricating Gear (Item 41, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Lockplates (4) (Item 104, Appendix F)
Lockwashers (9) (Item 138, Appendix F)
Lockwashers (4) (Item 137, Appendix F)
Lockwasher (Item 135, Appendix F)
Lockwasher (Item 122, Appendix F)
Packings, Preformed (2) (Item 168, Appendix F)
Packings, Preformed (2) (Item 193, Appendix F)
Packing, Preformed (Item 192, Appendix F)
Packing, Preformed (Item 194, Appendix F)
Seal, Oil (Item 316, Appendix F)

Personnel Required
MOS 63G

a. Disassembly

(1) Remove nut (1), lockwasher (2), and ground lead (3) from terminal no. 4 (4). Discard lockwasher.

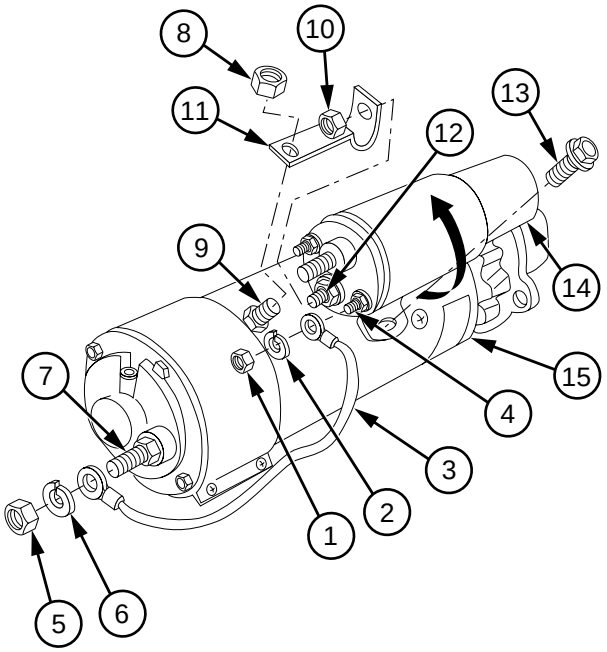
(2) Remove nut (5), lockwasher (6), and ground lead (3) from ground stud (7). Discard lockwasher.

CAUTION
Use open-end wrench to hold bottom nut while removing top nut. Failure to comply may damage field coil.

(3) Remove nut (8) from field coil stud (9).

(4) Remove nut (10) and jumper strap (11) from terminal no. 3 (12).

(5) Remove two screws (13) and solenoid (14) from field ring (15).



(6) Remove nut (16), washer (17), and insulator (18) from field coil stud (9).

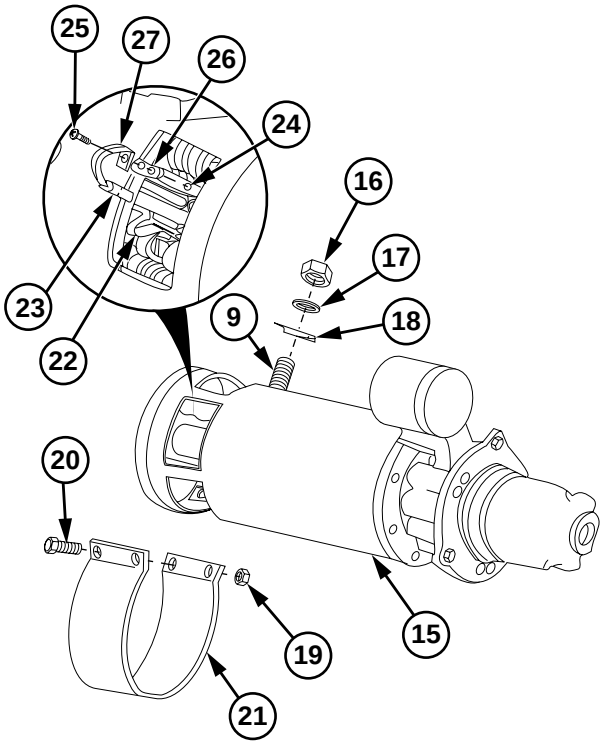
(7) Remove two nuts (19), screws (20), and brush opening band (21) from field ring (15).

NOTE

Refer to appendix C for fabrication of wire hook.

(8) Pull eight springs (22) upward and remove eight brushes (23) from four brush holders (24) using wire hook.

(9) Remove eight screws (25), four lockplates (26), and eight brush leads (27) from four brush holders (24). Discard lockplates.

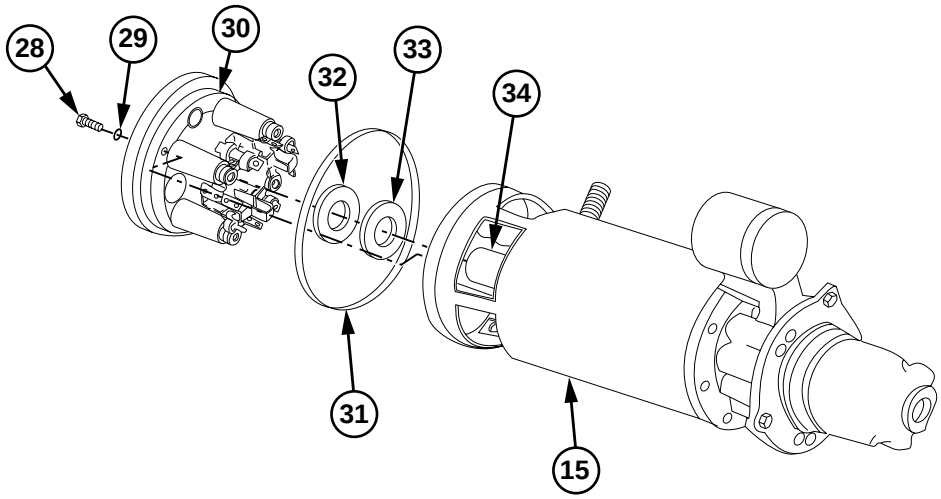


(10) Remove four screws (28), lockwashers (29), commutator end housing (30), and preformed packing (31) from field ring (15). Discard lockwashers and preformed packing.

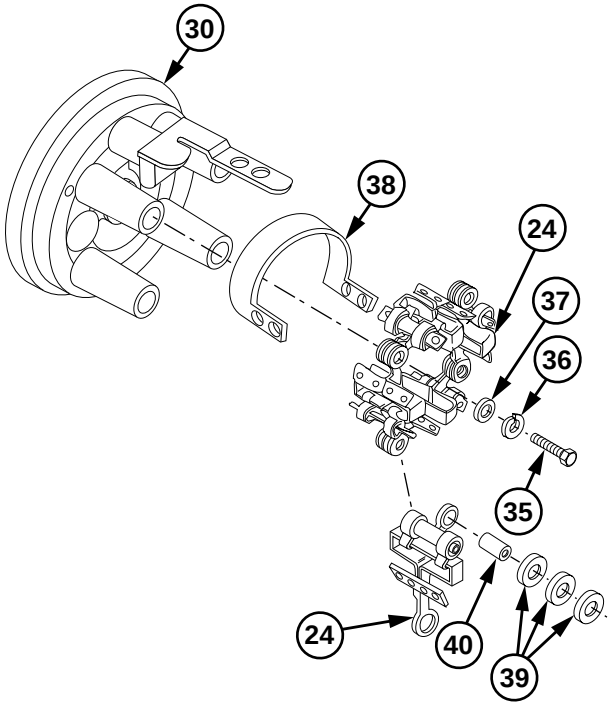
NOTE

Washers may be on armature or commutator end housing.

(11) Remove fiber washer (32) and thrust washer (33) from armature shaft (34).



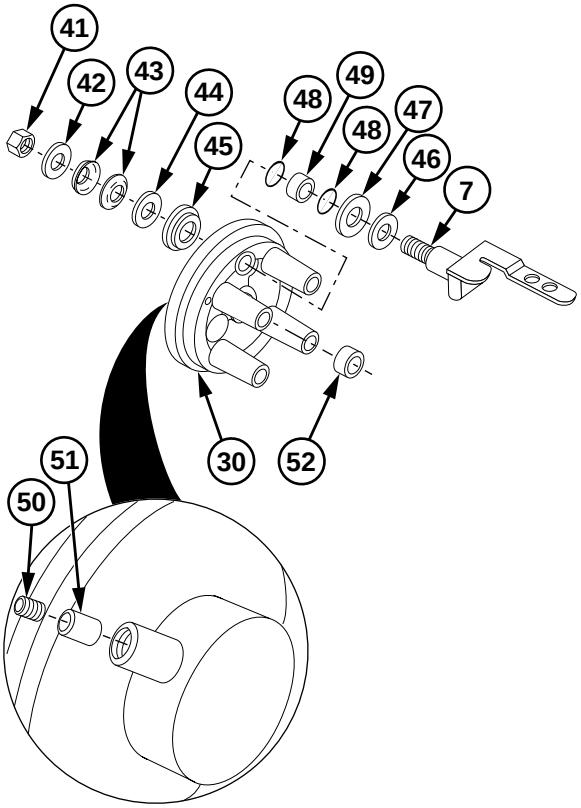
6-4. STARTER REPAIR (CONT)



(12) Position commutator end housing (30) in vise.

(13) Remove four screws (35), lockwashers (36), washers (37), brush holders (24), and jumper (38) from commutator end housing (30). Discard lockwashers.

(14) Remove 12 insulation washers (39) and 4 bushings (40) from brush holders (24).



(15) Turn commutator end housing (30) over and secure in vise.

(16) Remove nut (41), washer (42), two belleville washers (43), one washer (44), and insulator (45) from ground stud (7).

(17) Remove ground stud (7), washer (46), plastic washer (47), two preformed packings (48), and bushing (49) from commutator end housing (30). Discard preformed packings.

(18) Remove plug (50) and wick (51) from commutator end housing (30).

NOTE

Do step (19) only if bushing fails inspection.

(19) Remove bushing (52) from commutator end housing (30).

(20) Remove six rubber plugs (53) from nose housing (54).

(21) Remove six screws (55), nose housing (54), and preformed packing (56) from shift housing (57). Discard preformed packing.

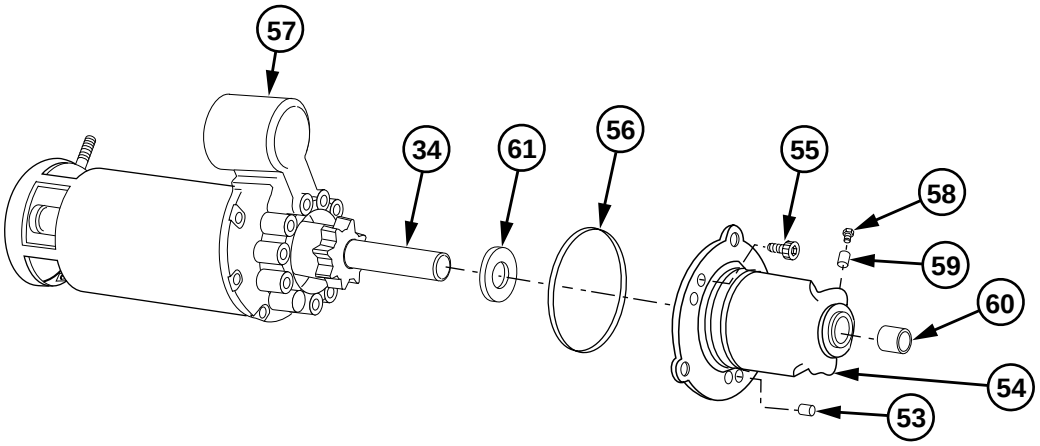
(22) Remove plug (58) and wick (59) from nose housing (54).

NOTE

Do step (23) only if bushing fails inspection.

(23) Remove bushing (60) from nose housing (54).

(24) Remove thrust washer (61) from armature shaft (34).



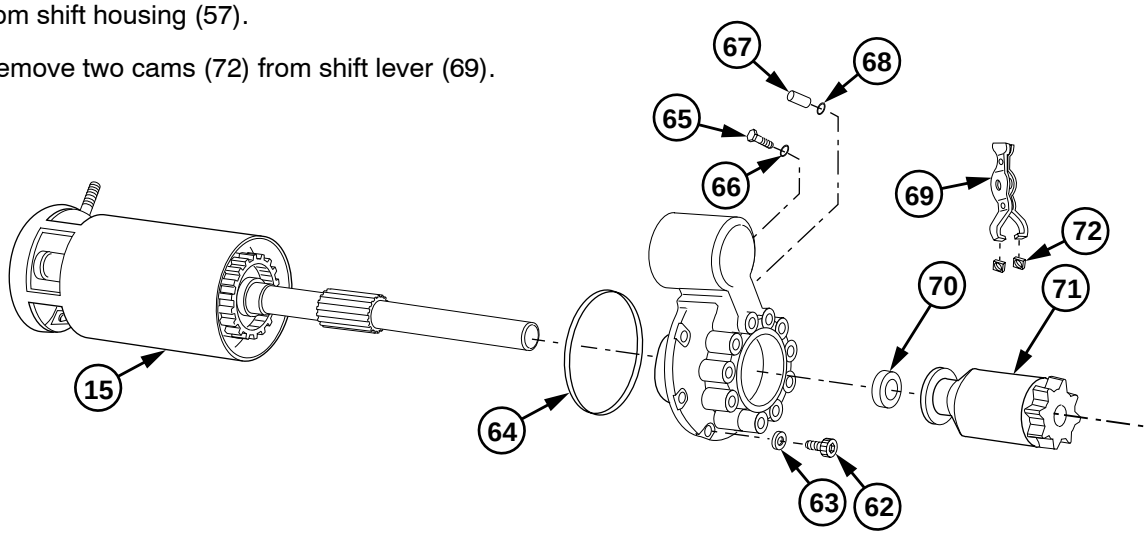
(25) Remove five screws (62) and lockwashers (63) from shift housing (57). Discard lockwashers.

(26) Remove shift housing (57) and preformed packing (64) from field ring (15). Discard preformed packing.

(27) Remove screw (65), washer (66), shaft (67), and preformed packing (68) from shift housing (57). Discard preformed packing.

(28) Remove shift lever (69), brake washer (70), and drive assembly (71) from shift housing (57).

(29) Remove two cams (72) from shift lever (69).



6-4. STARTER REPAIR (CONT)

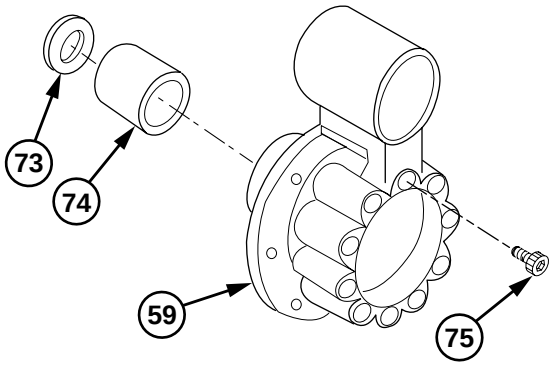
(30) Remove oil seal (73) from shift housing (59).

NOTE

Do step (31) only if bushing fails inspection.

(31) Remove bushing (74) from shift housing (59).

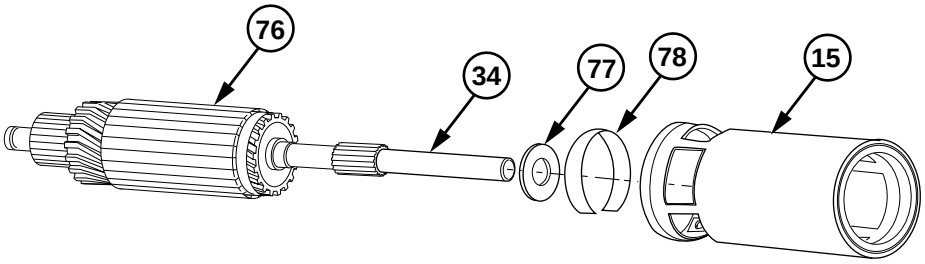
(32) Remove screw (75) from shift housing (59).



(33) Remove armature (76) from field ring (15).

(34) Remove thrust washer (77) from armature shaft (34).

(35) Remove paper insulator (78) from field ring (15).



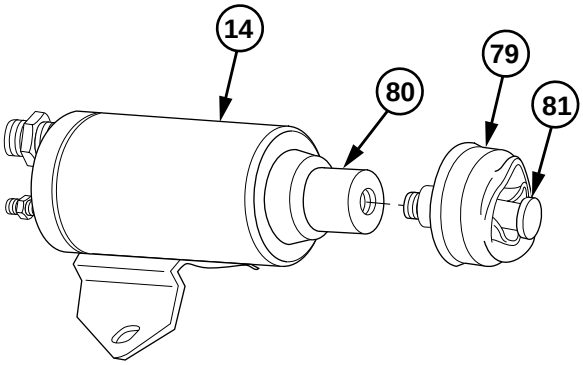
(36) Push rubber boot (79) on solenoid (14) back to expose plunger (80).

CAUTION

Plunger must be wrapped with crocus cloth to protect plunger when removing link spool in step (38). Failure to comply may result in kinks on plunger and damage to equipment.

(37) Wrap strip of crocus cloth twice around plunger (80).

(38) Remove link spool (81) and rubber boot (79) from plunger (80) using adjustable joint pliers to hold plunger (80).



b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury

CAUTION

Do not dip solenoid, armature, field coil, or drive assembly in solvent cleaning compound. Failure to comply may result in damage to components.

(1) Clean solenoid, armature, field coil, and drive assembly with cloth dipped in solvent cleaning compound.

(2) Clean brush holder assembly, insulation washers, bushings, and spacers by dipping in solvent cleaning compound.

(3) Clean all other metal components with solvent cleaning compound and wire brush.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(4) Dry all parts with compressed air.

(5) Inspect solenoid rubber boot for cracks or tears. Replace if solenoid boot is damaged.

(6) Inspect brushes for excessive wear. Brushes less than 0.625 in. (16 mm) length must be replaced.

(7) Inspect brush holders for heat damage or defective springs. Replace faulty brush holders.

(8) Inspect all insulation washers and bushings. Broken, cracked, or burned insulators must be replaced.

(9) Inspect nose housing bushing for wear. Maximum inside diameter allowed is 0.753 in. (19.1 mm).

(10) Inspect CE housing bushing for wear. Maximum inside diameter allowed is 0.756 in. (19.2 mm).

(11) Inspect shift housing bushing and seal for wear. Maximum inside diameter allowed is 0.878 in. (22.3 mm).

(12) Inspect shift shaft and shift housing. Replace if grooves are found in shift shaft or pivot hole in shift housing is out of round.

(13) Inspect gear teeth and splines on drive assembly for wear and damage. Replace drive assembly if gear rotates in both directions or does not move freely in and out of assembly.

(14) Check splines on armature shaft for wear or damage.

(15) Inspect and measure armature commutator surface. Replace if surface is pitted, scored, burned, or coated with hard carbon or oil. Replace if commutator diameter is less than 2.063 in. (5.240 cm).

(16) Inspect inside of field ring and field coil. If burn marks are found, field coil must be replaced. If pole pieces and armature show wear due to rubbing, commutator end housing, shift housing, and nose housing bushings must be replaced.

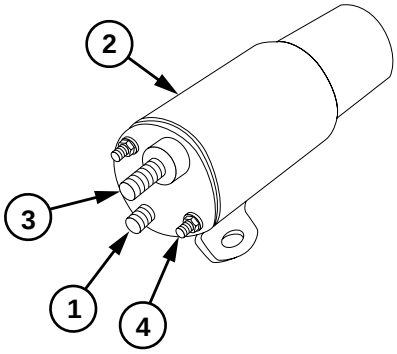
6-4. STARTER REPAIR (CONT)

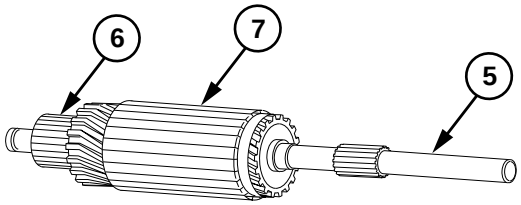
c. Testing

(1) Connect one multimeter test lead to terminal no. 1 (1) and second test lead to a bare metal surface on switch housing (2). Ohmeter should read no continuity (infinity). Low resistance indicates coil is grounded and switch assembly must be replaced.

(2) Connect one multimeter test lead to terminal no. 3 (3) and second test lead to terminal no. 4 (4). If readings fall outside 0–5 ohms, switch must be replaced.

(3) Connect one multimeter test lead to splined end of armature shaft (5). Run second test lead across all commutator (6) contacts. Ohmeter should read no continuity (infinity). Low resistance indicates a ground and armature (7) must be replaced.

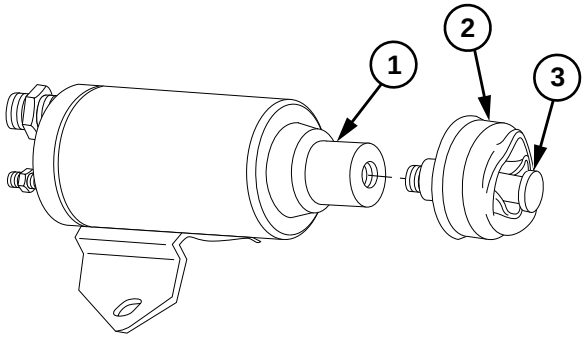




d. Assembly

CAUTION

Plunger must be wrapped with crocus cloth to protect plunger when installing link spool in step (2). Failure to comply may result in kinks on plunger and damage to equipment.

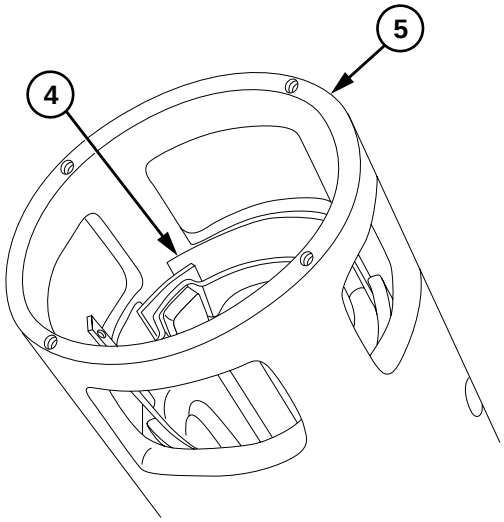


(1) Wrap strip of crocus cloth twice around plunger (1).

(2) Install rubber boot (2) and link spool (3) on plunger (1) using adjustable joint pliers to hold plunger (1).

NOTE

Paper insulator is positioned between field ring and field coil jumper.



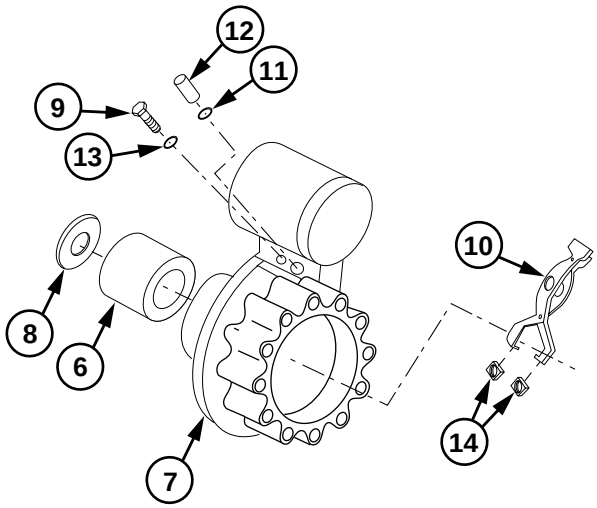
(3) Install paper insulator (4) in field ring (5).

NOTE

Do step (4) if bushing was removed.

(4) Install bushing (6) in shift housing (7).

(5) Install new oil seal (8) in shift housing (7).



WARNING

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

(6) Coat threads of screw (9) with adhesive-sealant (Item 10, Appendix B).

(7) Install shift lever (10) in shift housing (7) with new preformed packing (11), shaft (12), washer (13), and screw (9).

(8) Lightly coat cams (14) with grease.

NOTE

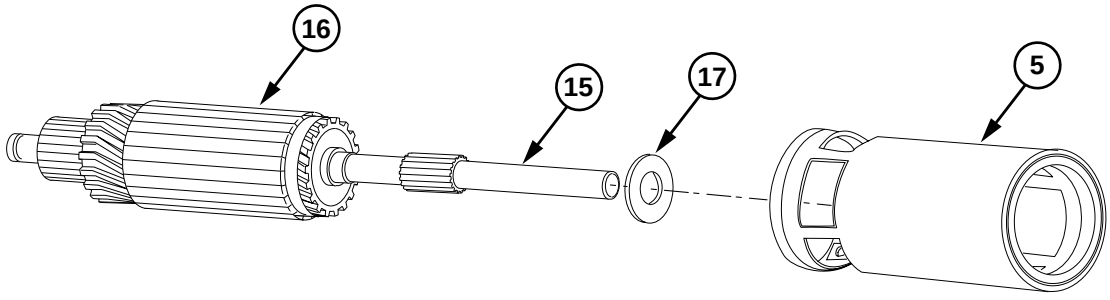
When properly installed, cams are positioned in groove on drive.

(9) Install two cams (14) on shift lever (10).

(10) Coat splines of armature shaft (15) with thin film of lubricating oil.

(11) Install armature (16) in field ring (5).

(12) Install thrust washer (17) on armature shaft (15).



6-4. STARTER REPAIR (CONT)

WARNING

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

(13) Coat threads of screws (18) with adhesive-sealant (Item 6, Appendix B).

(14) Install new preformed packing (19) and shift housing (7) on field ring (5) with five new lockwashers (20) and screws (18).

(15) Slide armature shaft (15) into shift housing (7) until 0.5 in. (12.7 mm) of shaft is visible.

(16) Install brake washer (21) on armature shaft (15).

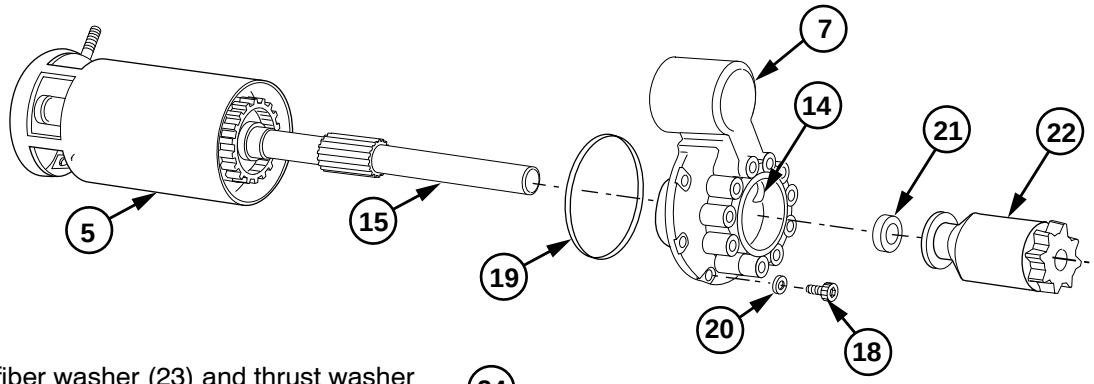
(16.1) Coat splines of armature shaft (15) and drive assembly (22) with grease.

(16.2) Coat brake washer (21) and drive assembly (22) contact surface with grease.

NOTE

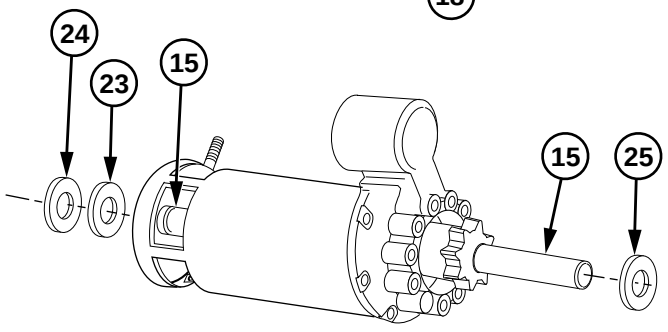
Shaft may have to be rotated to align splines on shaft and drive.

(17) Swing shift lever cams (14) out of shift housing (7) and position drive assembly (22) on cams (14) and armature shaft (15).



(18) Install fiber washer (23) and thrust washer (24) on armature shaft (15).

(19) Install thrust washer (25) on armature shaft (15).



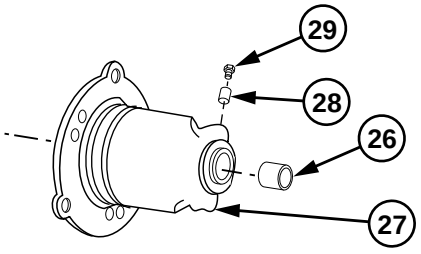
NOTE

- Do step (20) if bushing was removed.
- Hole in bushing is off center. Narrow edge goes in first.
- Hole in bushing must be aligned with wick bore in nose housing.

(20) Install bushing (26) in nose housing (27).

(21) Soak wick (28) in lubricating gear oil.

(22) Install wick (28) and plug (29) in nose housing (27).



WARNING

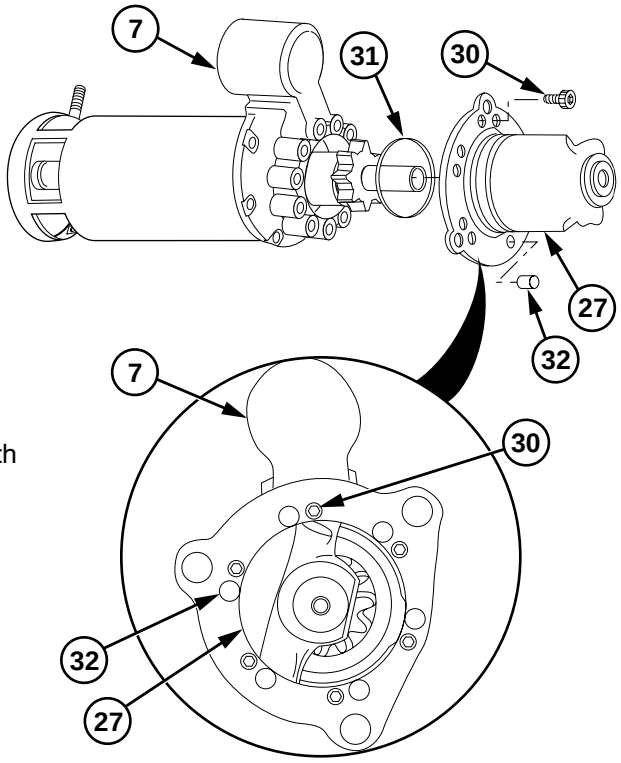
Adhesive-sealant can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(23) Coat threads of screws (30) with adhesive-sealant (Item 6, Appendix B).

(23.1) Coat mating surface of nose housing (27) with adhesive-sealant (Item 2.1, Appendix B).

(24) Install new preformed packing (31) and nose housing (27) on shift housing (7) with six screws (30).

(25) Install six rubber plugs (32) in nose housing (27).



NOTE

- Do step (26) if bushing was removed.
- Hole in bushing must be aligned with wick bore in nose housing.

(26) Install bushing (33) in commutator end housing (34).

(27) Soak wick (35) in lubricating gear oil.

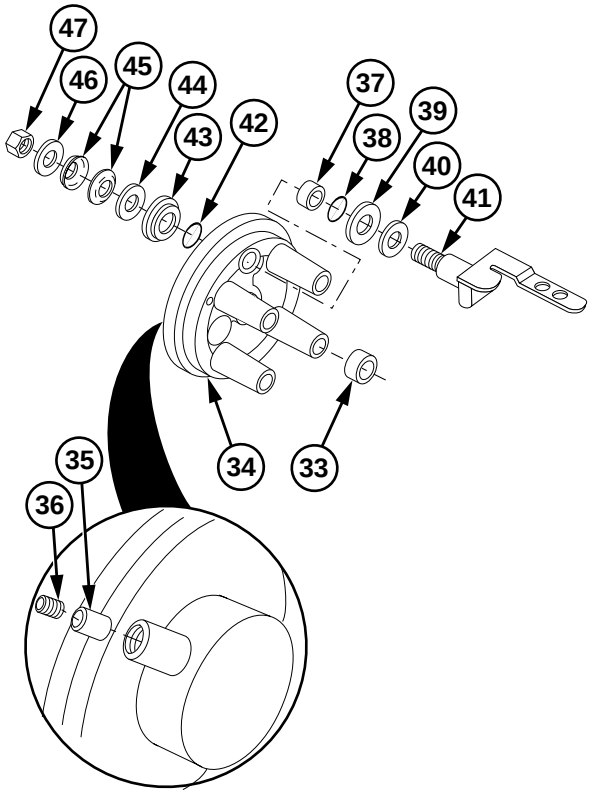
(28) Install wick (35) and plug (36) in commutator end housing (34).

(29) Install insulation bushing (37), new preformed packing (38), plastic washer (39), washer (40), and ground stud (41) in commutator end housing (34).

NOTE

Tapered side of insulator goes on first.

(30) Position new preformed packings (42), insulator (43), washer (44), two belleville washers (45), washer (46), and nut (47) on ground stud (41). Do not tighten.

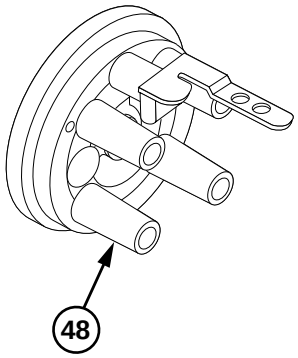


6-4. STARTER REPAIR (CONT)

NOTE

Four 1.5 in. (38 mm) pieces of welding rod or similar material may be used for guide pins.

(31) Insert four guide pins in mounting posts (48).



NOTE

Insulation bushings must pass through insulation washers and sit flush on mounting posts.

(32) Install insulation bushing (49) and insulation washers (50) on each of four mounting posts (48).

NOTE

Align ground jumper tab with ground stud tab.

(33) Position ground jumper (51) on commutator end housing (34).

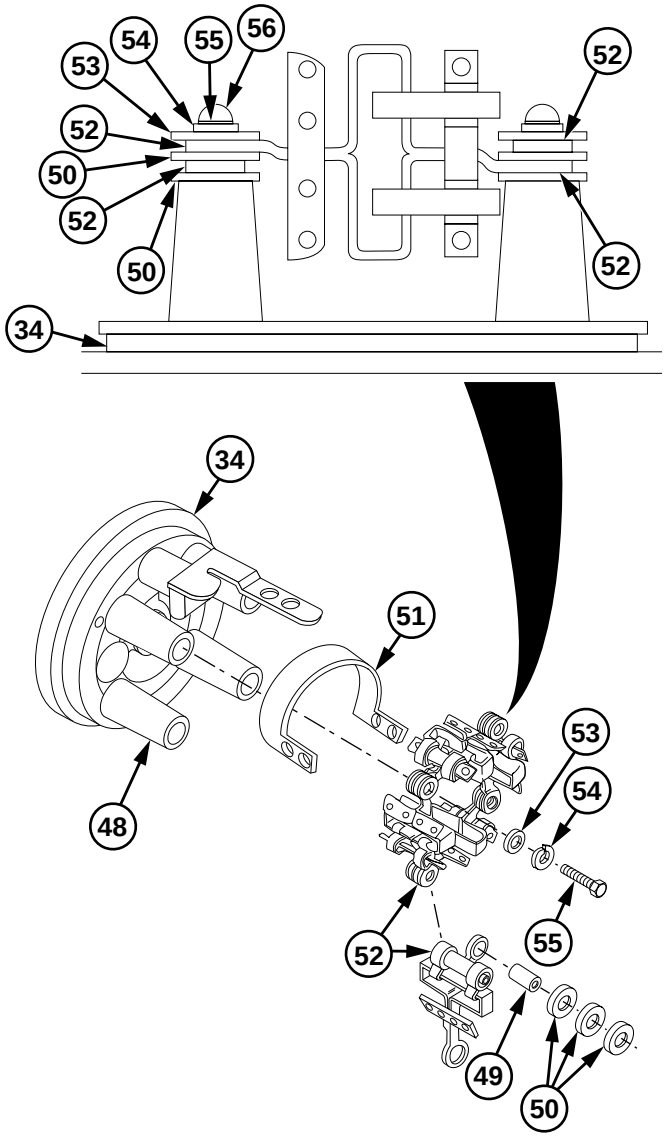
NOTE

- Holes in brush holder must line up with holes in ground stud and jumper.
- Left mounting leg of brush holder is higher than right mounting leg. When properly installed, left mounting leg will overlap right mounting leg of next brush holder.

(34) Install brush holder (52), insulation washer (50), and brush holder (52) on each of four mounting posts (48).

(35) Remove four guide pins from mounting posts (48).

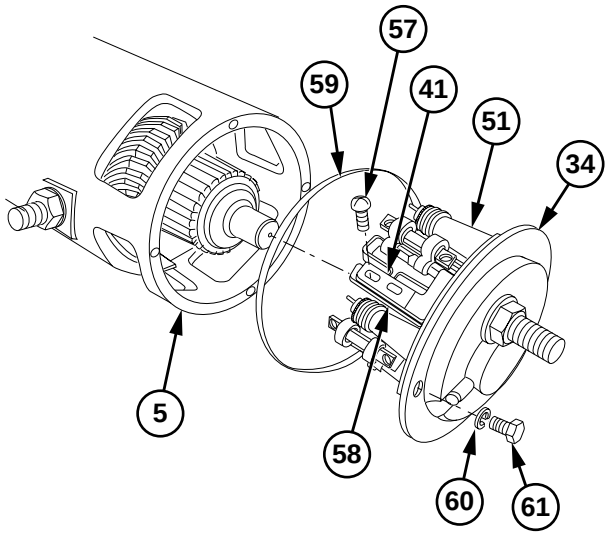
(36) Install insulation washer (53), washer (54), and new lockwasher (55) on each four mounting posts (48) with screw (56).



NOTE

Brush mounting screw is temporarily installed to hold ground jumper in place during assembly.

(37) Install brush mounting screw (57) through ground stud tab (41), ground jumper tab (51), and brush holder contact plate (58).

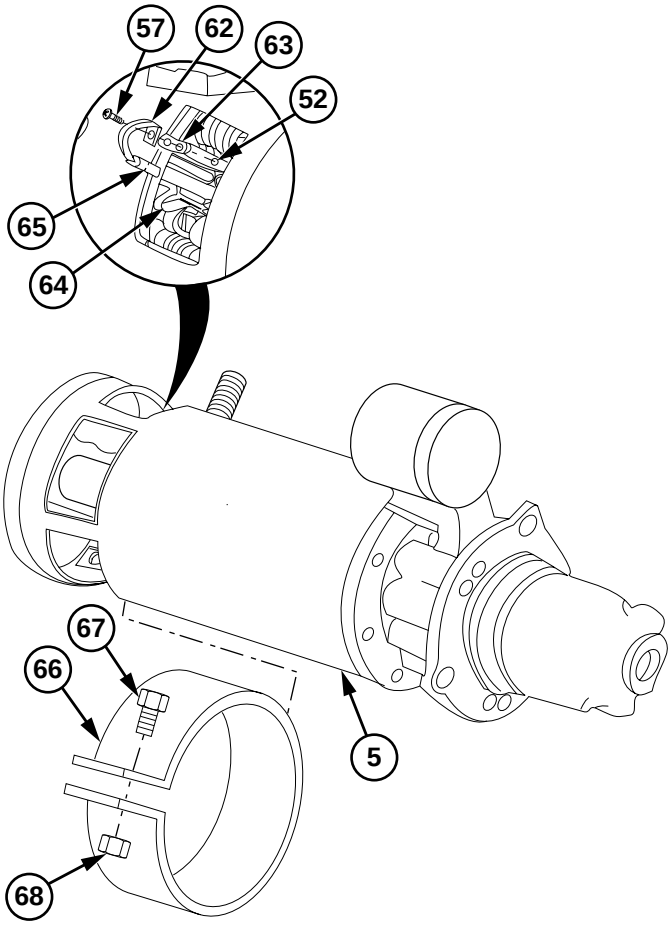


WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(38) Install new preformed packing (59) on commutator end housing (34).

(39) Install commutator end housing (34) on field ring (5) with four new lockwashers (60) and screws (61). Torque to 62–66 lb–in. (7–7.5 Nm).



(40) Remove brush mounting screw (57).

(41) Coat threads of eight screws (57) with adhesive–sealant (Item 6, Appendix B).

(42) Install eight brush leads (62) on four brush holders (52) with four lockplates (63) and eight screws (57).

NOTE

Refer to appendix C for fabrication of wire hook.

(43) Pull eight springs (64) upward and install eight brushes (65) on four brush holders (52) using wire hook.

(44) Install brush opening band (66) on field ring (5) with two screws (67) and nuts (68).

6-4. STARTER REPAIR (CONT)

NOTE

- Solenoid link spool must engage into shift lever.
- To aid in solenoid installation, starter drive should be positioned all the way out of armature. Solenoid should be installed with mounting legs facing away from field ring, then rotated into mounting position.

(45) Install solenoid (69) on field ring (5) with two screws (70).

(46) Install jumper strap (71) on terminal no. 3 (72) with nut (73).

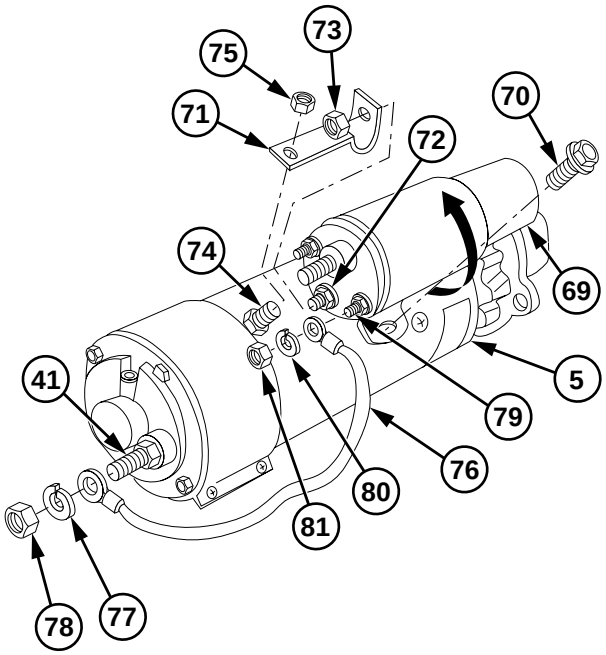
CAUTION

Use an open-end wrench to hold bottom nut while installing top nut. Failure to comply may damage field coil.

(47) Install jumper strap (71) on field coil stud (74) with nut (75).

(48) Install ground lead (76) on ground stud (41) with new lockwasher (77) and nut (78).

(49) Install ground lead (76) on terminal no. 4 (79) with new lockwasher (80) and nut (81).



e. Follow-On Maintenance

Install starter (TM 9-2320-360-20).

6-4.1. STARTER REPAIR (M00177075ME)

This task covers:
a. Disassembly
b. Cleaning/Inspection
c. Testing
d. Assembly

INITIAL SETUP

Equipment Conditions
Starter on clean work surface.

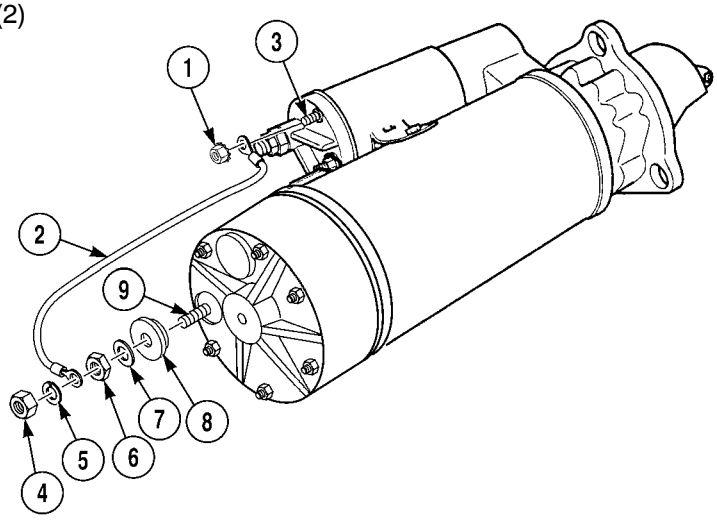
Tools and Specials Tools
Fuel, Automotive and Electrical System Repair (Item 199, Appendix E)
Caliper Set, Micrometer, Outside (Item 15, Appendix F)
Gage Set, Telescoping (Item 56, Appendix E)
Goggles, Industrial (Item 57, Appendix F)
Multimeter (Item 98, Appendix E)
Vise, Machinist's (Item 207, Appendix E)
Wrench Set, Socket 3/8 in. Drive (Item 232, Appendix E)
Wrench, Torque (0–150 lb-in [0-60 N·m]) (Item 234, Appendix E)
Wrench, Torque (0–175 lb-in [0-237 N·m]) (Item 236, Appendix E)

Materials/Parts
Grease (Item 31, Appendix B)
Oil, Lubricating (Item 43, Appendix B)
Sealing Compound (Item 22.1, Appendix B)
Solvent, Drycleaning (Item 54, Appendix B)
Lockplate (4) (Item 102, Appendix F)
Lockwasher (5) (Item 225.1, Appendix E)
Lockwasher (2) (Item 132.1, Appendix F)
Lockwasher (2) (Item 132.2, Appendix F)
Packing, Preformed (Item 165.1, Appendix F)
Packing, Preformed (2) (Item 167.1, Appendix F)
Packing, Preformed (Item 168.1, Appendix F)
Packing, Preformed (Item 168.2, Appendix F)
Packing, Preformed (Item 168.3, Appendix F)
Screw (8) (Item 276.1, Appendix F)
Seal, Oil (Item 286.1, Appendix F)
Washer, Fiber (Item 334.1, Appendix F)
Washer, Seal (6) (Item 338.1, Appendix F)

a. Disassembly

(1) Remove tenz nut (1) and ground wire (2) from terminal No. 4 (3).

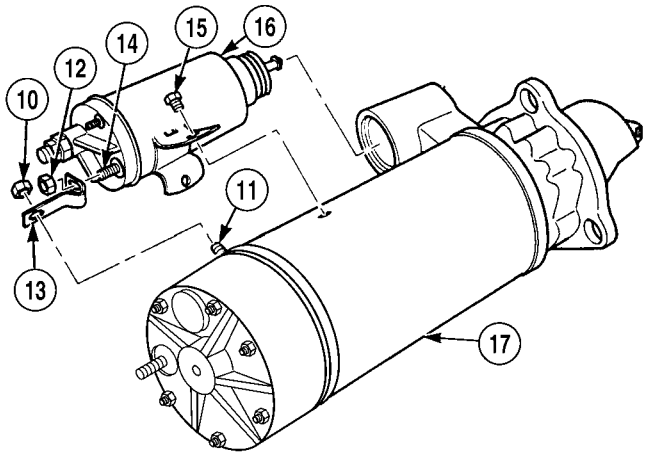
(2) Remove nut (4), lockwasher (5), ground wire (2), nut (6), washer (7), and insulator (8) from ground stud (9). Discard lockwasher.



6-4.1. STARTER REPAIR (M00177075ME) (CONT)

CAUTION

Hold bottom nut while removing top nut. Failure to comply may damage equipment.



(3) Remove nut (10) from field coil stud (11).

(4) Remove nut (12) and jumper strap (13) from terminal no. 3 (14).

(5) Remove two screws (15) and solenoid (16) from field ring (17).

(6) Remove six screws (18), seal washers (19), and commutator end housing (20) from field ring (17). Discard seal washers.

(7) Remove insulator (21) from commutator end housing (20).

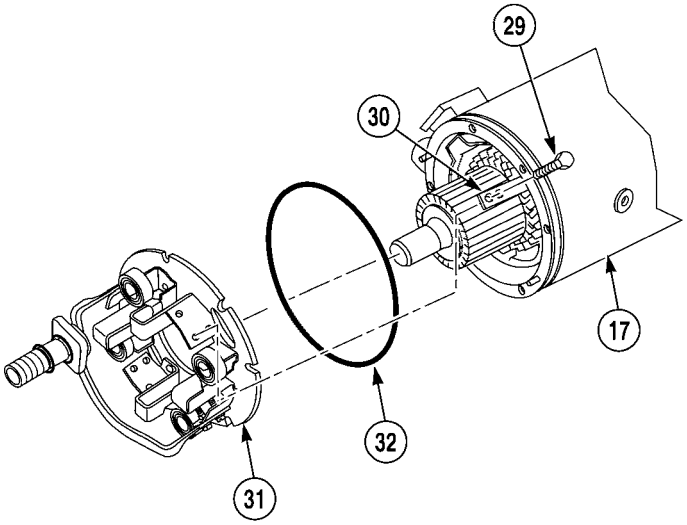
(8) Remove fiber washer (22) and washer (23) from armature shaft (24). Discard fiber washer.

(9) Remove four screws (25) from four brushes (26).

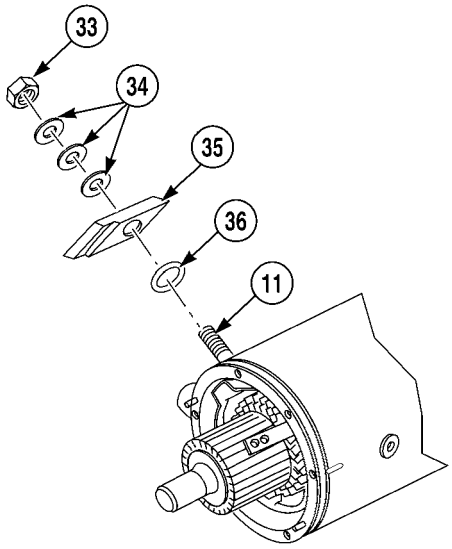
(10) Using a wire hook, pull four springs (27) upward and remove brushes (26) from brush holders (28).

(11) Remove four screws (29) from field coil (30) and brush plate (31).

(12) Remove brush plate (31) and preformed packing (32) from field ring (17). Discard preformed packing.



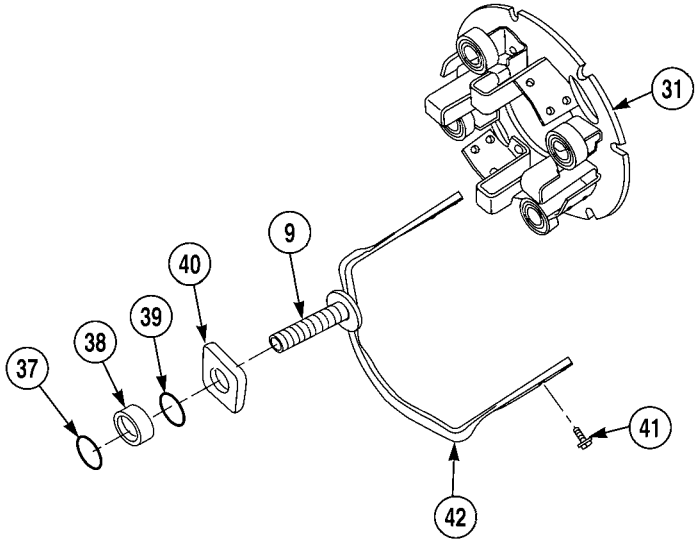
(13) Remove nut (33), three washers (34), insulator (35), and preformed packing (36) from field coil stud (11). Discard preformed packing.



(14) Remove preformed packing (37), spacer (38), preformed packing (39), and insulator (40) from ground stud (9). Discard preformed packings.

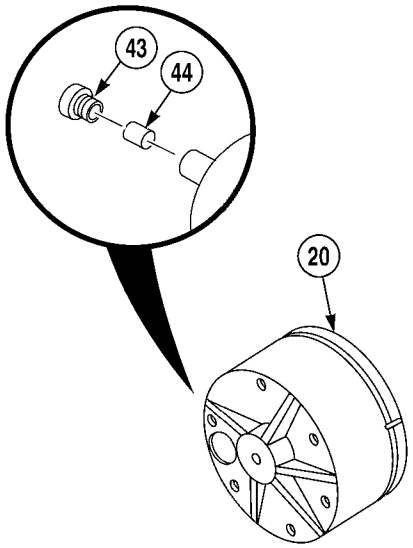
(15) Remove four screws (41) from ground jumper (42) and brush plate (31).

(16) Remove ground jumper (42) from brush plate (31).



6-4.1. STARTER REPAIR (M00177075ME) (CONT)

(17) Remove plug (43) and wick (44) from commutator end housing (20).



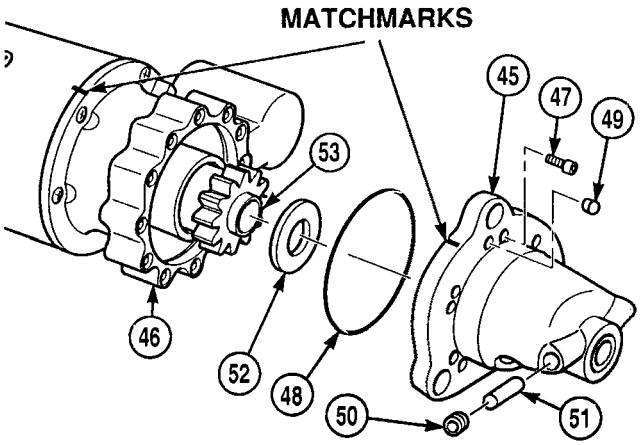
(18) Matchmark nose housing (45) and shift housing (46).

(19) Remove six screws (47), nose housing (45), and preformed packing (48) from shift housing (46). Discard preformed packing.

(20) Remove six rubber plugs (49) from nose housing (45).

(21) Remove plug (50) and wick (51) from nose housing (45).

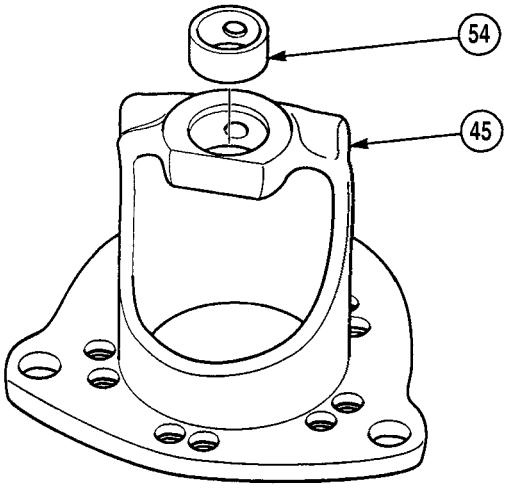
(22) Remove washer (52) from drive assembly (53).

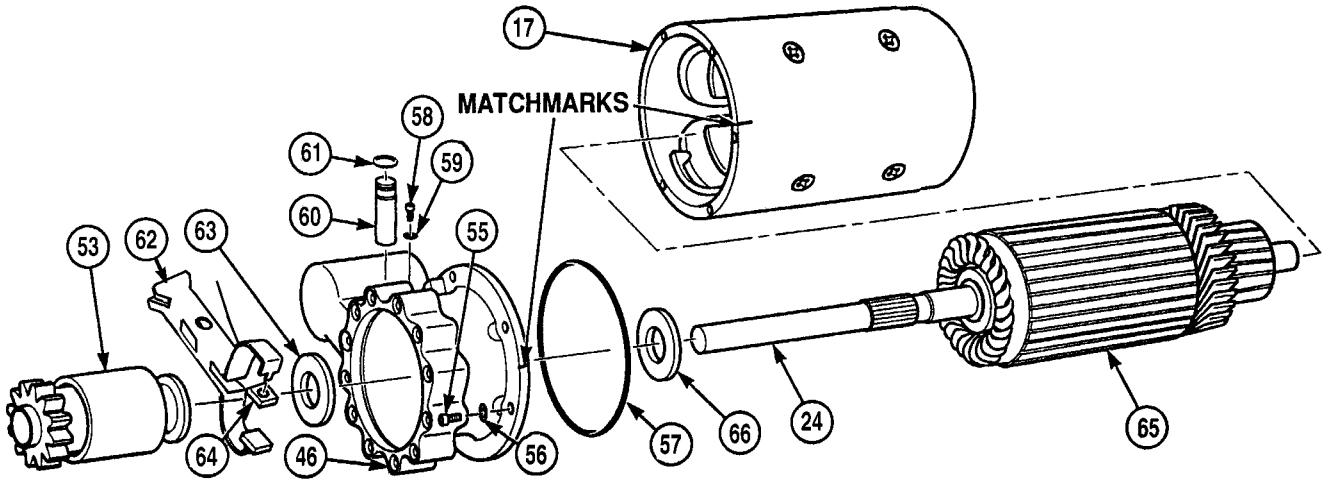


NOTE

Perform Step (23) if bushing fails inspection.

(23) Remove bushing (54) from nose housing (45).





(24) Matchmark shift housing (46) and field ring (17).

(25) Remove five screws (55) and lockwashers (56) from shift housing (46). Discard lockwashers.

(26) Remove shift housing (46) and preformed packing (57) from field ring (17). Discard preformed packing.

(27) Remove screw (58), washer (59), shaft (60), and preformed packing (61) from shift housing (46). Discard preformed packing.

NOTE

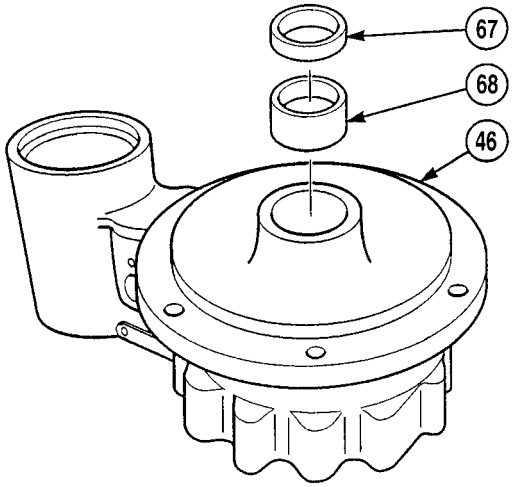
Note position of shift lever prior to removal to ensure proper installation.

(28) Remove shift lever (62), drive assembly (53), and brake washer (63) from shift housing (46).

(29) Remove two cams (64) from shift lever (62).

(30) Remove armature (65) from shift housing (46).

(31) Remove thrust washer (66) from armature shaft (24).



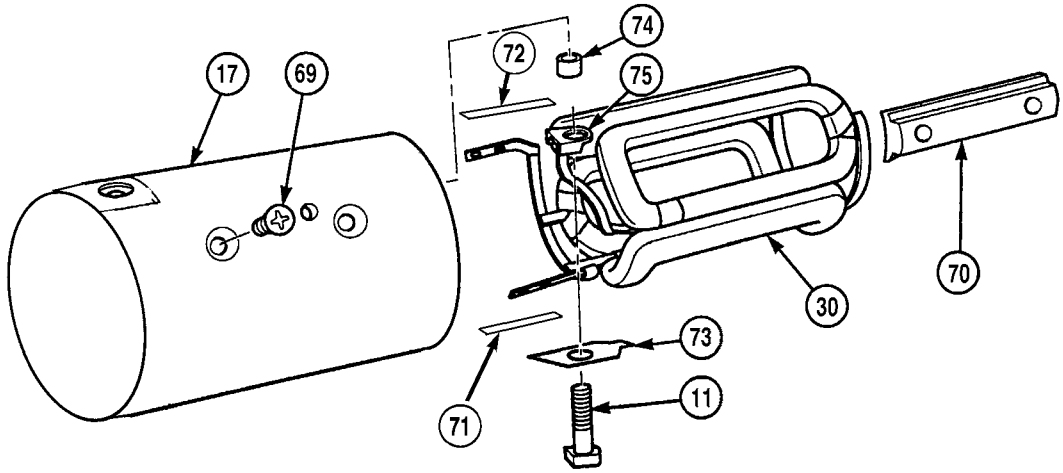
(32) Remove oil seal (67) from shift housing (46). Discard oil seal.

NOTE

Perform Step (33) if bushing fails inspection.

(33) Remove bushing (68) from shift housing (46).

6-4.1. STARTER REPAIR (M00177075ME) (CONT)



(34) Position field ring (17) in vise.

NOTE

Note location of insulators (71) and (72) prior to removal to ensure proper installation.

(35) Remove eight screws (69), four pole pieces (70), and two insulator strips (71) and (72) from field ring (17). Discard screws.

b. Cleaning/Inspection

WARNING

- **Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

CAUTION

Do not dip solenoid, armature, field coil, or drive assembly in drycleaning solvent, or damage to components may result.

(1) Clean solenoid, armature, field coil, and drive assembly with cleaning cloth dipped in drycleaning solvent.

(2) Clean brush holder assembly, insulation washers, bushings, and spacers by dipping in drycleaning solvent.

(3) Clean all other components with drycleaning solvent and wire brush.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc). Failure to comply may result in injury or death to personnel.

(4) Dry all parts with compressed air.

(5) Inspect solenoid rubber boot for cracks or tears. If boot is damaged, replace solenoid.

(6) Inspect brushes for excessive wear. Brushes less than 0.625 in. (15.58 cm) long must be replaced.

(7) Inspect brush holders for heat damage or defective springs. Replace faulty brush holders.

(8) Inspect all insulation washers and bushings. Broken, cracked, or burned insulators must be replaced.

(9) Inspect nose bushing for wear. If inside diameter is greater than 0.753 in. (1.91 cm), bushing must be replaced.

(10) Inspect commutator end housing bushing for wear. If inside diameter is greater than 0.756 in. (1.92 cm), housing bushing must be replaced.

(11) Inspect shift housing bushing for wear. If inside diameter is greater than 0.878 in. (2.23 cm), bushing must be replaced.

(12) Inspect shift shaft and shift housing. If grooves are found in shift shaft, or pivot hole in shift housing is not round, replace shift shaft or shift housing.

(13) Inspect gear teeth and splines on drive assembly for wear or damage. If gear rotates in both directions, or does not move freely in and out of assembly, replace gear.

(14) Check splines on armature shaft for wear or damage.

(15) Inspect armature commutator surface. If surface is pitted, scored, burned, or coated with hard carbon or oil, replace armature.

(16) Measure armature commutator surface. If commutator diameter is less than 2.063 in. (5.24 cm), replace armature.

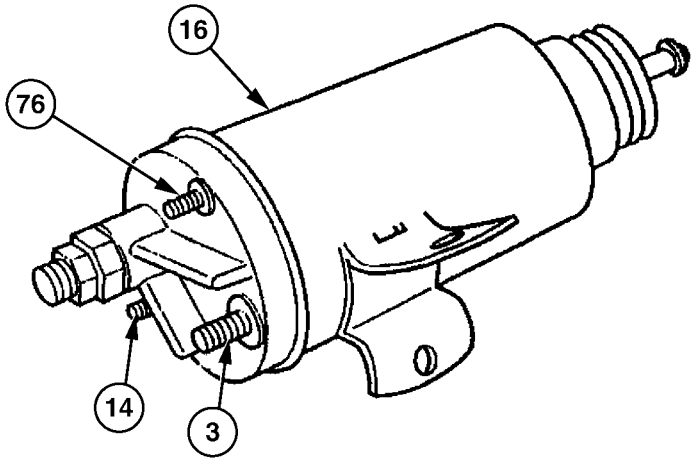
(17) Inspect inside of field ring and field coil. If burn marks are found, replace field coil. If pole pieces and armature show wear due to rubbing, commutator end housing, shift housing, and nose housing bushings must be replaced.

6-4.1. STARTER REPAIR (M00177075ME) (CONT)

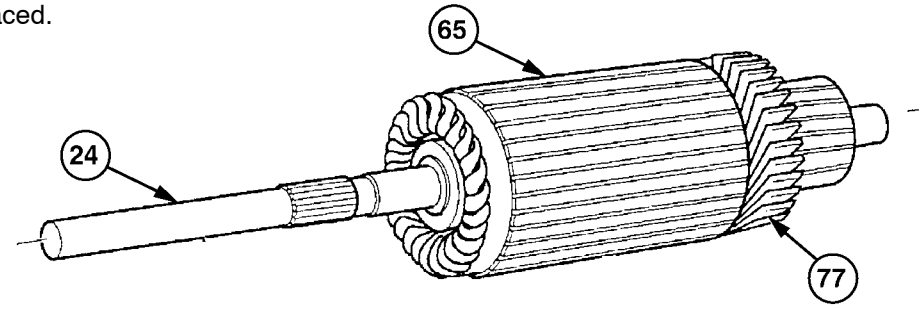
c. Testing

(1) Connect one multimeter test lead to terminal no. 1 (76) and second test lead to a known good ground. Multimeter should read no continuity (infinity). Low resistance indicates coil is grounded and switch assembly must be replaced.

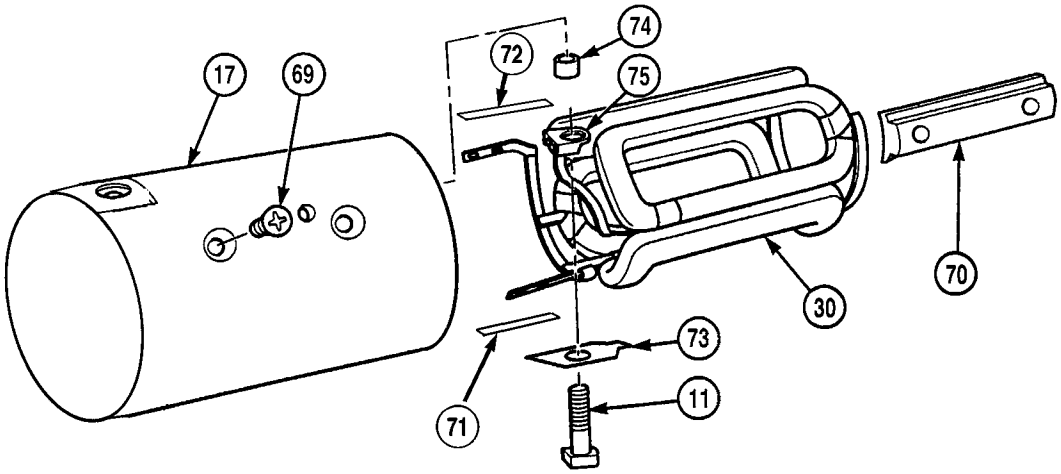
(2) Connect one multimeter test lead to terminal no. 3 (14) and second test lead to terminal no. 4 (3). If multimeter reads outside 0 to 5 ohms, solenoid (16) must be replaced.



(3) Connect one multimeter test lead to splined end of armature shaft (24). Run second test lead across all commutator (77) contacts. Multimeter should read no continuity (infinity). Low resistance indicates a ground, armature (65) must be replaced.



d. Assembly



(1) Position field ring (17) in vise.

NOTE

Field coil stud hole in field coil jumper should be aligned with filed coil stud hole in field ring.

(2) Position field coil (30) in field ring (17).

(3) Position bushing (74) between field coil jumper (75) and field ring (17).

NOTE

Flat side of stud faces brush opening.

(4) Install field coil stud (11) through field coil jumper (75) and washer (73).

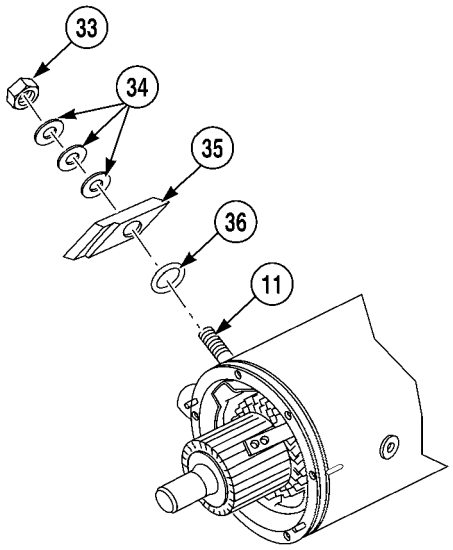
NOTE

Install insulator strips in locations noted prior to removal.

(5) Position two insulator strips (71) and (72) between field coil (30) and field ring (17).

(6) Install four pole pieces (70) in field ring (17) with eight screws (69). Tighten screws to 18 to 22 lb-ft (24 to 30 N·m).

6-4.1. STARTER REPAIR (M00177075ME) (CONT)



NOTE

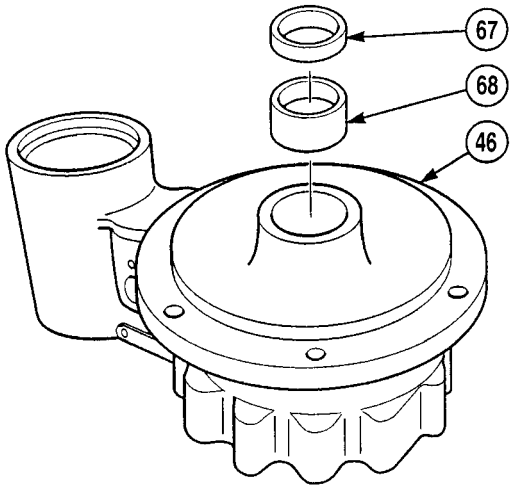
When properly installed, bushing should be on field coil stud as far as it will go and preformed packing should be flush with housing.

(7) Install preformed packing (36) on field coil stud (11).

NOTE

Curved side of insulator faces field ring; notched end faces brush openings.

(8) Install insulator (35), three washers (34), and nut (33) on field coil stud (11). Tighten nut to 18 to 22 lb-ft (24 to 30 N·m).



NOTE

Perform Step (9) if bushing was removed.

(9) Install bushing (68) in shift housing (46).

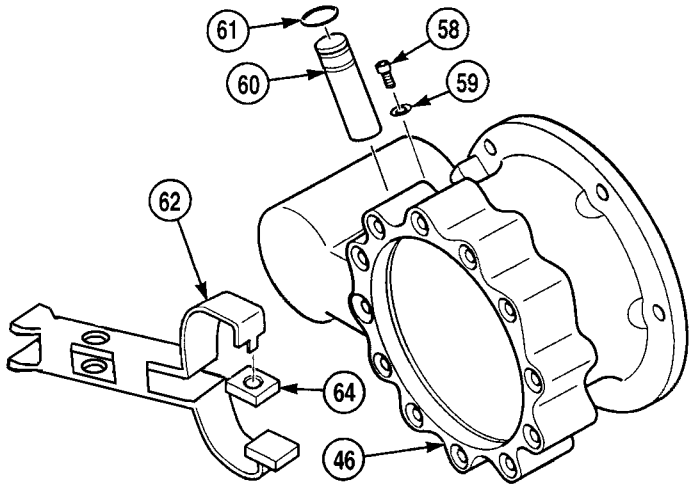
(10) Install oil seal (67) in shift housing (46).

WARNING

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

NOTE

Install shift lever as noted during removal to ensure proper operation.



(11) Coat threads of screw (58) with sealing compound.

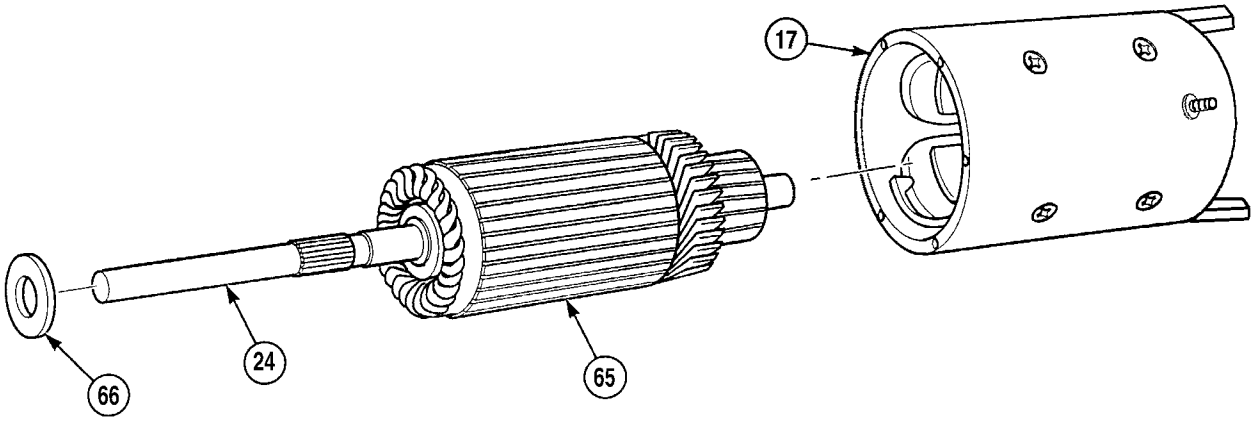
(12) Install shift lever (62) in shift housing (46) with preformed packing (61), shaft (60), washer (59), and screw (58).

NOTE

When properly installed, cams will be positioned in grooves on shift lever.

(13) Install two cams (64) on shift lever (62).

(14) Lightly coat cams (64) with grease.



(15) Coat splines of armature shaft (24) with light film of lubricating oil.

(16) Install armature (65) in field ring (17).

(17) Install thrust washer (66) on armature shaft (24).

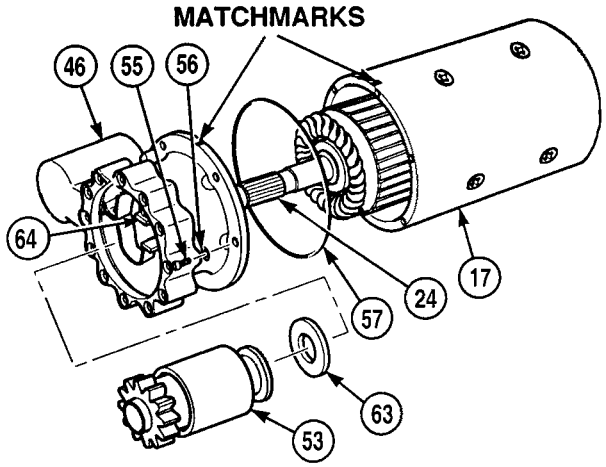
6-4.1. STARTER REPAIR (M00177075ME) (CONT)

WARNING

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

(18) Coat threads of five screws (55) with sealing compound.

(19) Align matchmarks and install preformed packing (57) and shift housing (46) on field ring (17) with five lockwashers (56) and screws (55).



(20) Slide armature shaft (24) into shift housing (46) until 0.5 in. (1.27 cm) of armature shaft (24) sticks through base of shift housing (46).

(21) Install brake washer (63) on armature shaft (24).

NOTE

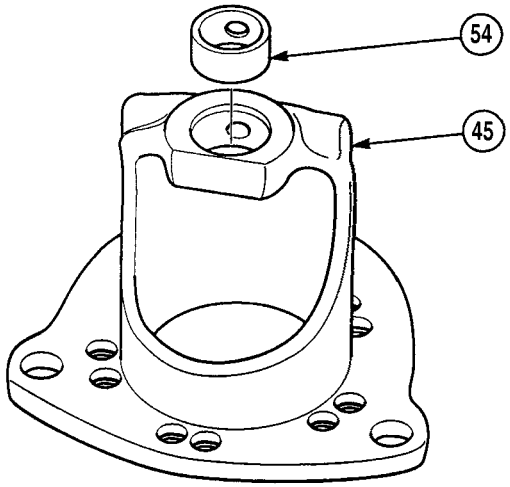
Shaft may have to be rotated to align splines.

(22) Gently pull cams (64) away from armature shaft (24), position drive assembly (53) on armature shaft, and allow cams (64) to position in groove of drive assembly (53).

(23) Slide armature shaft (24) through drive assembly (53).

NOTE

- Perform Step (23) if bushing was removed.
- Hole in bushing is off-center. Narrow edge goes in first.
- Hole in bushing must be aligned with wick bore in nose housing.



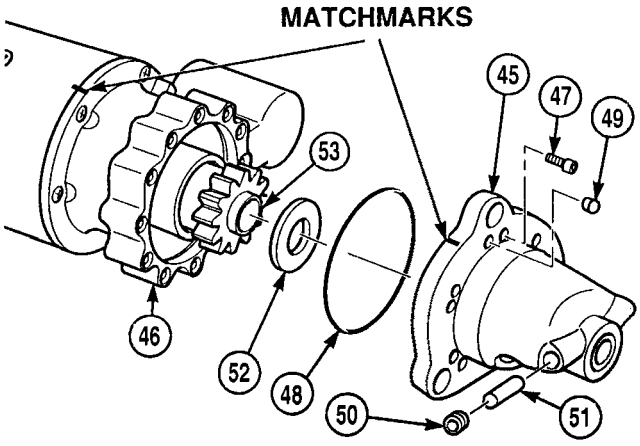
(24) Install bushing (54) in nose housing (45).

(25) Install thrust washer (52) on drive assembly (53).

(26) Install six rubber plugs (49) in nose housing (45).

(27) Soak wick (51) in lubricating oil.

(28) Install wick (51) and plug (50) in nose housing (45).



WARNING

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

(29) Coat threads of six screws (47) with sealing compound.

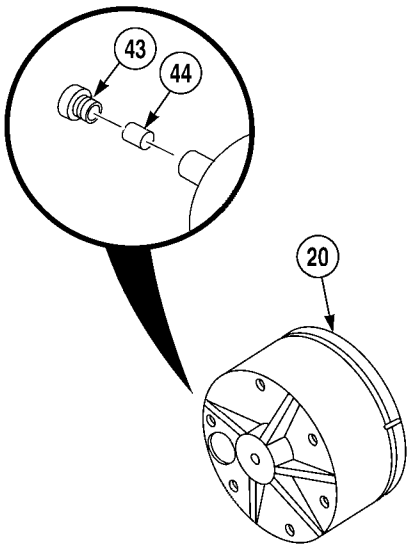
(30) Align matchmarks and install preformed packing (48) and nose housing (45) on shift housing (46) with six screws (47).

NOTE

Hole in bushing must be aligned with wick bore in commutator end housing.

(31) Soak wick (44) in lubricating oil.

(32) Install wick (44) and plug (43) in commutator end housing (20).



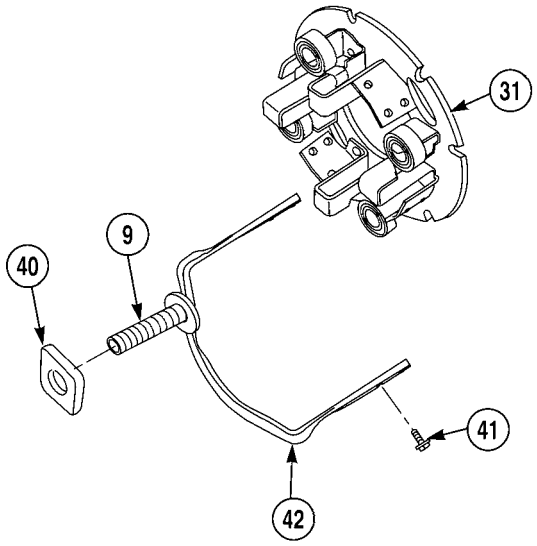
6-4.1. STARTER REPAIR (M00177075ME) (CONT)

(33) Install ground jumper (42) on brush plate (31) with four screws (41).

NOTE

Indented side of insulator goes over ground stud.

(34) Position insulator (40) on ground stud (9).

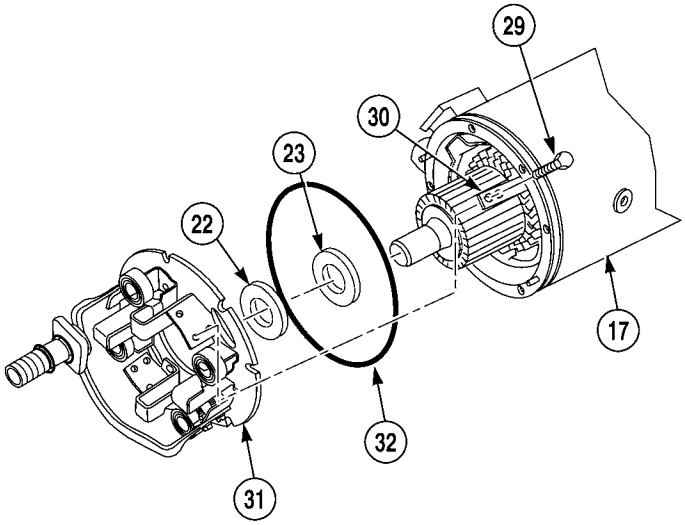


(35) Apply lubricating oil to preformed packing (32).

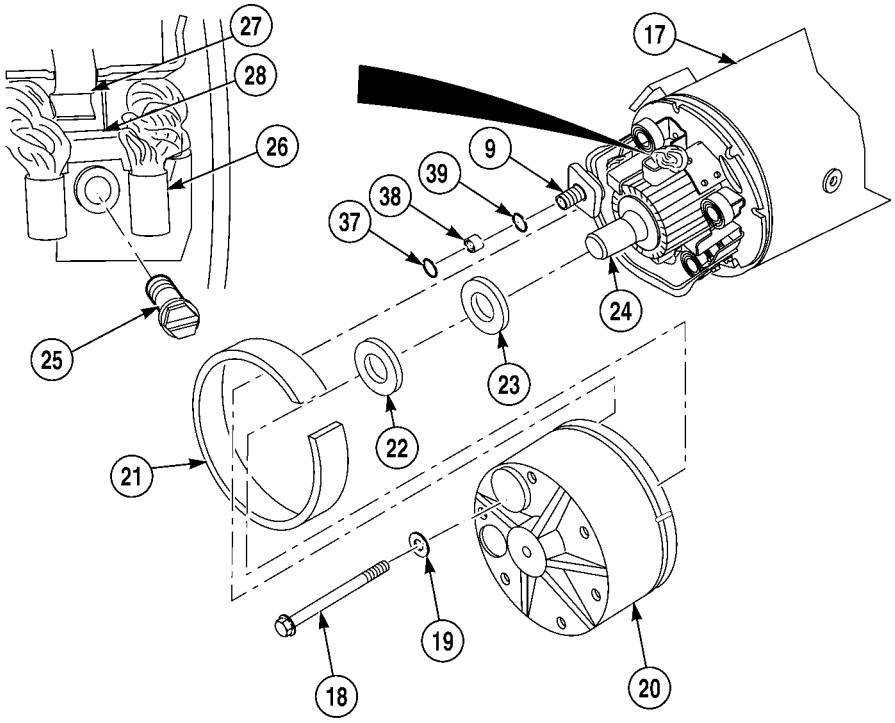
(36) Install preformed packing (32) on field ring (17).

NOTE

- Prior to installing new brush plate assembly, remove brushes from brush plate assembly.
- Pins in field ring must align with holes in brush plate.



(37) Install brush plate (31) onto field coil (30) using four screws (29).



(38) Pull four springs (27) upward and install brushes (26) in brush holders (28).

(39) Install four brushes (26) on brush holders (28) with screws (25).

NOTE

Brush wires may have to be flattened to install insulator.

(40) Install washer (23) and fiber washer (22) onto armature shaft (24).

(41) Install insulator (21) over brushes (24).

WARNING

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

(42) Coat threads of six screws (18) with sealing compound.

(43) Install commutator end housing (20) on field ring (17) with six seal washers (19) and screws (18). Tighten screws to 60 to 66 lb-in (7 to 8 N·m).

(44) Install preformed packing (39), spacer (38), and preformed packing (37) on ground stud (10).

6-4.1. STARTER REPAIR (M00177075ME) (CONT)

NOTE

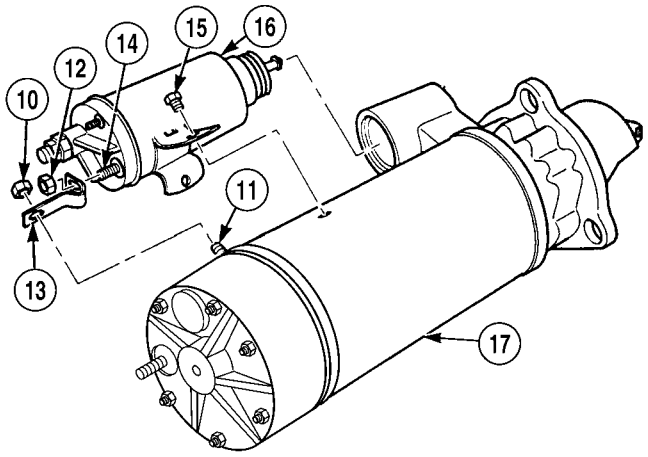
- Solenoid link spool must engage into shift lever.
- To aid in solenoid installation, starter drive should be positioned all the way out of armature. Solenoid should be installed with mounting legs facing away from field ring, then rotated into mounting position.
- To aid in installation, rubber boot may have to be manually inserted into housing to allow alignment of mounting screws.

(45) Install solenoid (16) on field ring (17) with two screws (15).

CAUTION

Hold bottom nut while installing top nut, or damage to equipment may result.

(46) Install jumper strap (13) on terminal no. 3 (14) and field coil stud (11) with nuts (12) and (10).



6-5. STEERING COLUMN HARNESS/SWITCH REPLACEMENT

This task covers
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Steering wheel removed (TM9-2320-360-20).
Turn signal handle removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Electrical Repair (Item 201, Appendix E)
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Socket, Contact (Item 325, Appendix F)
Terminals (6) (Item 330, Appendix F)
Wire Seals (6) (Item 345, Appendix F)
Wire Seal (Item 346, Appendix F)

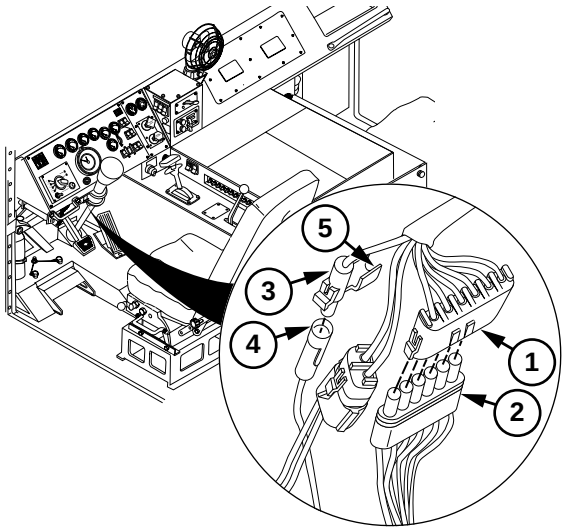
a. Removal

NOTE
Connector is removed by gently prying up on clip and pulling on connector.

(1) Remove 6-pin electrical connector (1) from electrical connector (2).

(2) Remove horn button electrical connector (3) from electrical connector (4).

(3) Unlatch and open secondary lock (5) on two connectors (1 and 3).

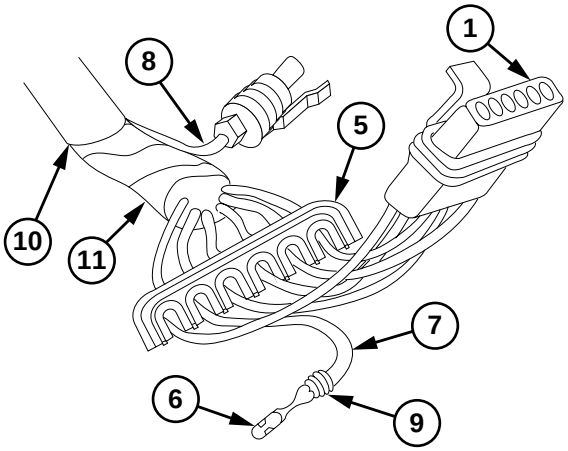


(4) Insert pin removal tool in cavity on connector (1) until seated to release lock tangs on terminal (6).

(5) Pull wire (7) back, turn connector (1), and remove tool.

(6) Repeat steps (4) and (5) for remaining five wires (7) and horn button wire (8).

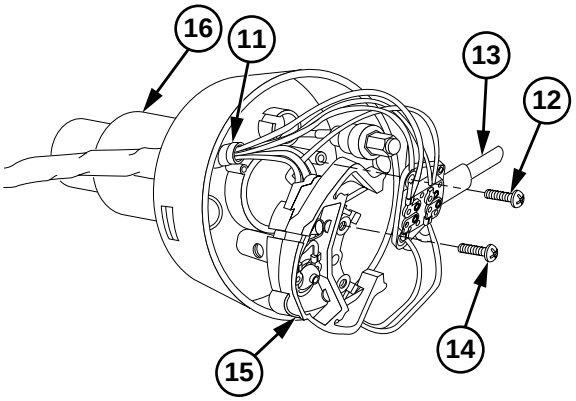
NOTE
Do not cut terminal from yellow horn button wire.



(7) Cut terminals (6) directly behind wire seals (9) on six wires (7). Discard terminals and seals.

(8) Remove wire casing (10) from wire harness (11) and horn button wire (8).

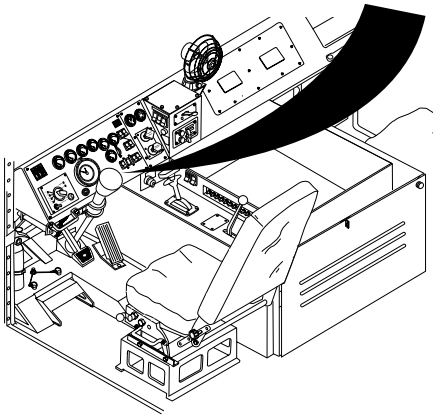
6-5. STEERING COLUMN HARNESS/SWITCH REPLACEMENT (CONT)



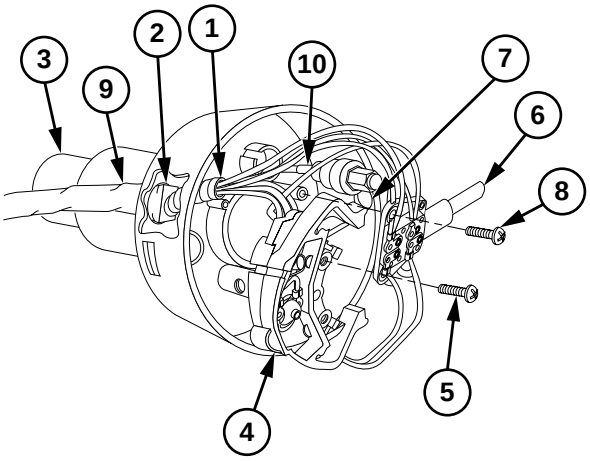
(9) Remove two screws (12) from hazard switch (13).

(10) Remove two screws (14) from turn signal switch (15).

(11) Remove turn signal switch (15), hazard switch (13), and wire harness (11) from steering column (16) as one unit.



b. Installation



(1) Route wire harness (1) through hole (2) in steering column (3).

(2) Install turn signal switch (4) on steering column (3) with two screws (5).

(3) Position hazard switch (6) through hole (7) on right side of steering column (3).

(4) Install hazard switch (6) on steering column (3) with two screws (8).

(5) Install wire casing (9) on wire harness (1) and yellow horn button wire (10).

(6) Insert 1 in. (2.5 cm) of wire (11) through new wire seal (12).

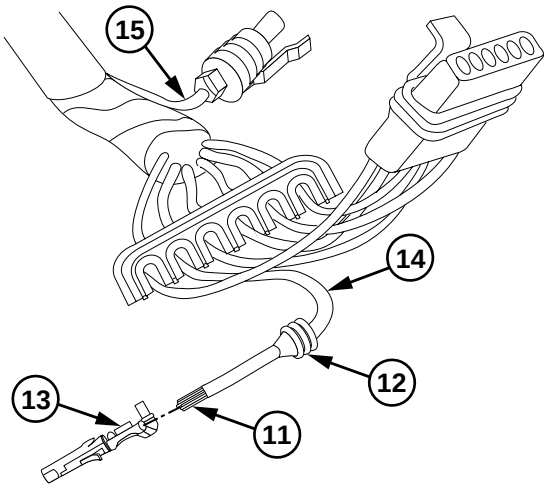
CAUTION

Strip wire after placing it through seal to prevent damage to individual cable strands.

(7) Strip end of wire (11) leaving 0.25 in. (0.64 cm) of bare wire using wire strippers.

(8) Insert new terminal (13) in locating hole of crimp tool using proper hole according to gage of wire (11).

(9) Slide seal (12) down to end of insulation (14) on wire (11).



NOTE

Wire and seal should be positioned so larger wings of terminal will crimp around seal and and smaller wings will crimp around exposed bare wire.

(10) Position wire (11) on terminal (13).

(11) Press handles of crimp tool together until ratchet releases and crimp is complete.

(12) Repeat steps (6) thru (11) for remaining five wires (11) and horn button wire (15).

NOTE

See table 6-1 for proper positioning of wires in connector. Letters are located on connector.

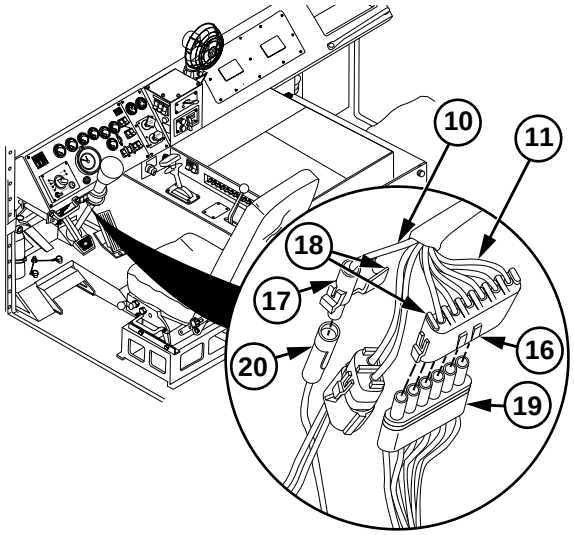
(13) Push six wires (11) in connector (16) until seated.

(14) Push horn button wire (10) in connector (17) until seated.

(15) Latch secondary locks (18) on two connectors (16 and 17).

(16) Install 6-pin electrical connector (19) in electrical connector (16).

(17) Install horn button electrical connector (20) on electrical connector (17).



6-5. STEERING COLUMN HARNESS/SWITCH REPLACEMENT (CONT)

Table 6-1. Wire Positions

Position	Wire Color
A	Blue
B	Green
C	White
D	Brown
E	Red
F	Black

c. Follow-On Maintenance

(1) Install turn signal handle (TM 9-2320-360-20).

(2) Install steering wheel (TM 9-2320-360-20).

(3) Turn ENGINE switch to ON position and check operation of turn signal and hazard switch.

(4) Turn ENGINE switch to OFF position.

6-6. CAB WIRE HARNESS REPLACEMENT

This task covers
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Batteries disconnected (TM 9-2320-360-20).
Top doghouse insulation removed (TM 9-2320-360-20).
Lower engine access panel removed (TM 9-2320-360-20).
Shifter guard removed (TM 9-2320-360-20).
Instrument panel removed (TM 9-2320-360-20).
Engine switch removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Electrical Repair (Item 201, Appendix E)
Tool Kit, Genl Mech (Item 202, Appendix E)

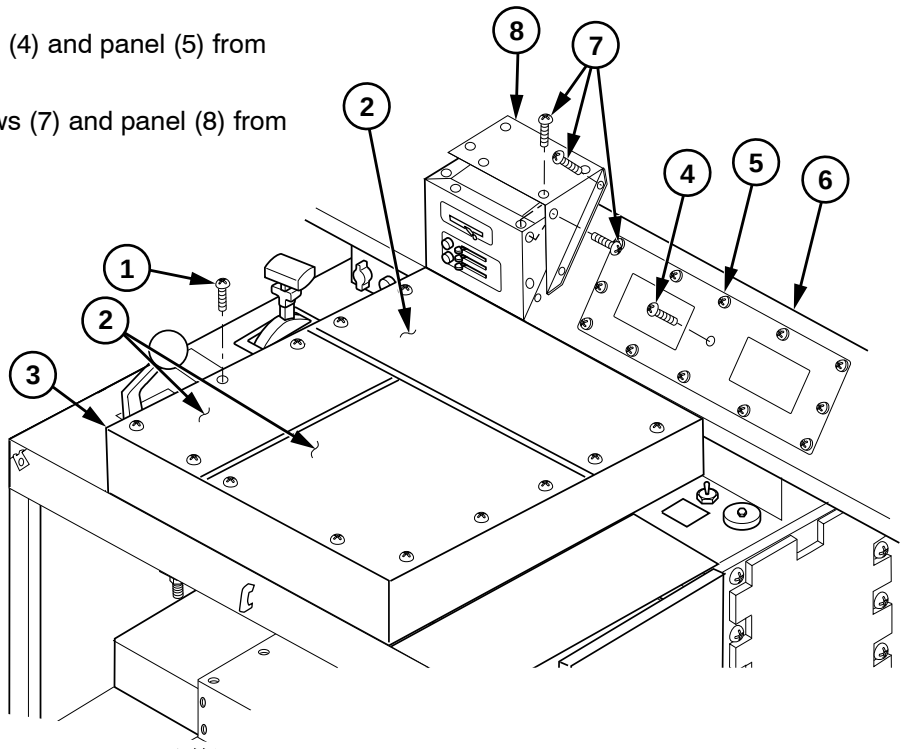
Materials/Parts
Connectors, Butt (2) (Item 29, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknuts (19) (Item 96, Appendix F)
Lockwashers (4) (Item 115, Appendix F)
Lockwashers (2) (Item 117, Appendix F)
Snap Clip (Item 323, Appendix F)
Terminal (Item 329, Appendix F)
Terminal (Item 330, Appendix F)
Wire Seal (Item 345, Appendix F)
Wire Seal (Item 346, Appendix F)

a. Removal

(1) Remove 19 screws (1) and 3 panels (2) from console (3).

(2) Remove 13 screws (4) and panel (5) from dash (6).

(3) Remove nine screws (7) and panel (8) from dash (6).



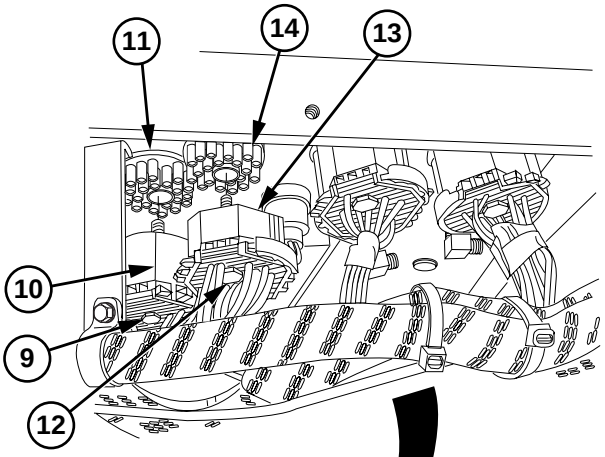
6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

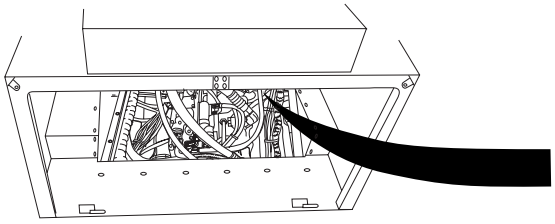
NOTE

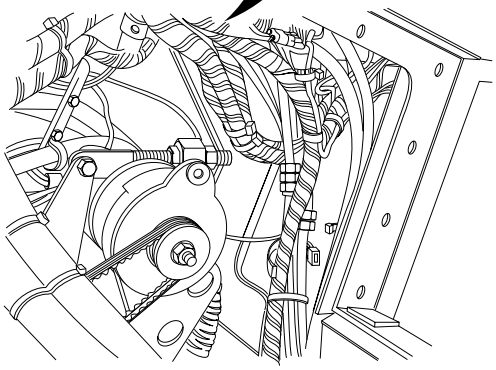
Mark locations of cab connectors before removing from console.

(4) Loosen screw (9) and remove yellow harness connector (10) from yellow cab connector (11).

(5) Loosen screw (12) and remove red harness connector (13) from red cab connector (14).

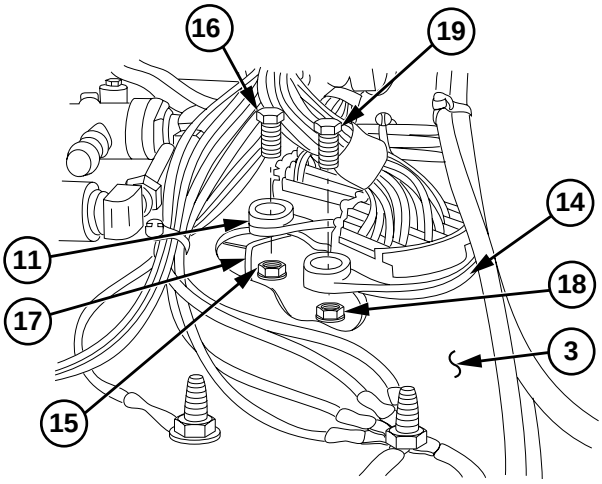


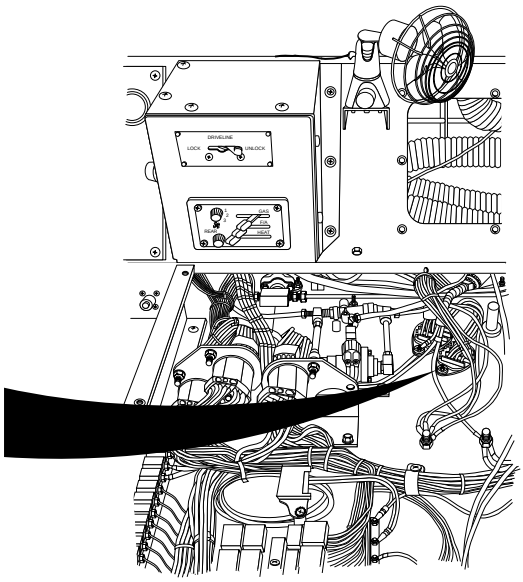




(6) Remove two locknuts (15), screws (16), standoff bracket (17), and yellow cab connector (11) from console (3). Discard locknuts.

(7) Remove two locknuts (18), screws (19), and red cab connector (14) from console (3). Discard locknuts.





NOTE

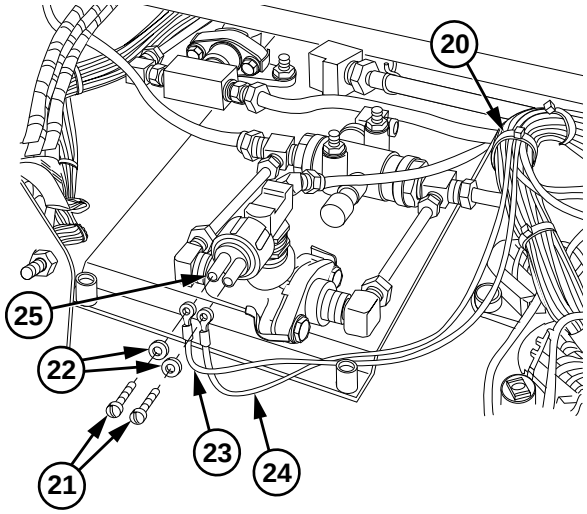
Location of plastic cable ties should be marked before removal.

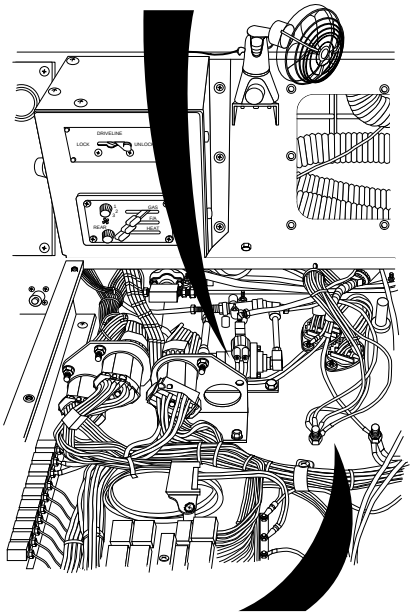
(8) Remove plastic cable ties (20) from wires as required.

NOTE

Tag and mark wires before removing.

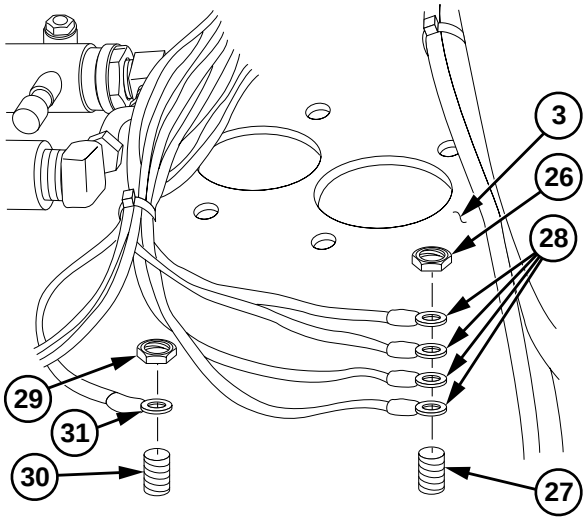
(9) Remove two screws (21), lockwashers (22), wire no. 1092 (23), and ground wire no. 1435 (24) from driveline lockup switch (25). Discard lockwashers.





(10) Remove locknut (26), screw (27), and four ground wires no. 1435 (28) from console (3). Discard locknut.

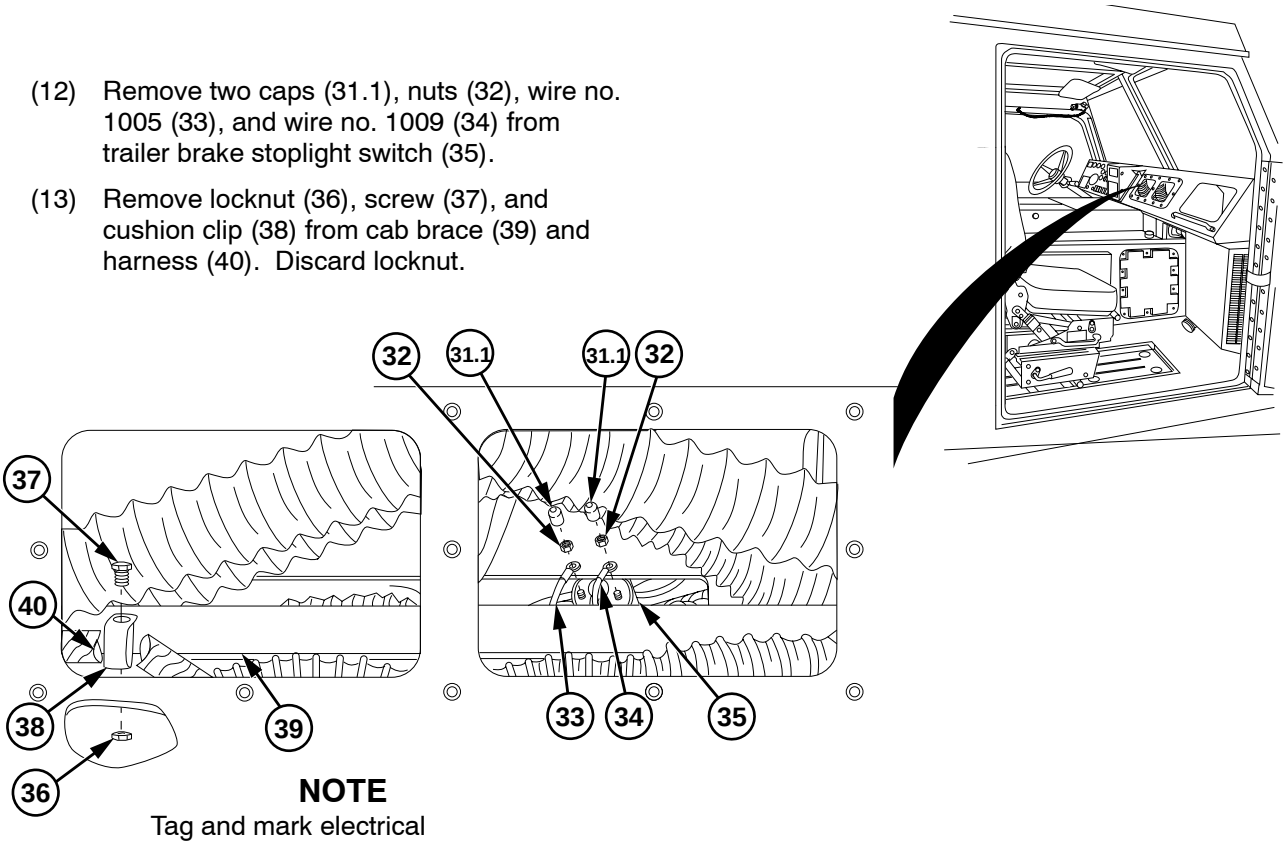
(11) Remove locknut (29), screw (30), and ground wire no. 1435 (31) from console (3). Discard locknut.



6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

(12) Remove two caps (31.1), nuts (32), wire no. 1005 (33), and wire no. 1009 (34) from trailer brake stoplight switch (35).

(13) Remove locknut (36), screw (37), and cushion clip (38) from cab brace (39) and harness (40). Discard locknut.



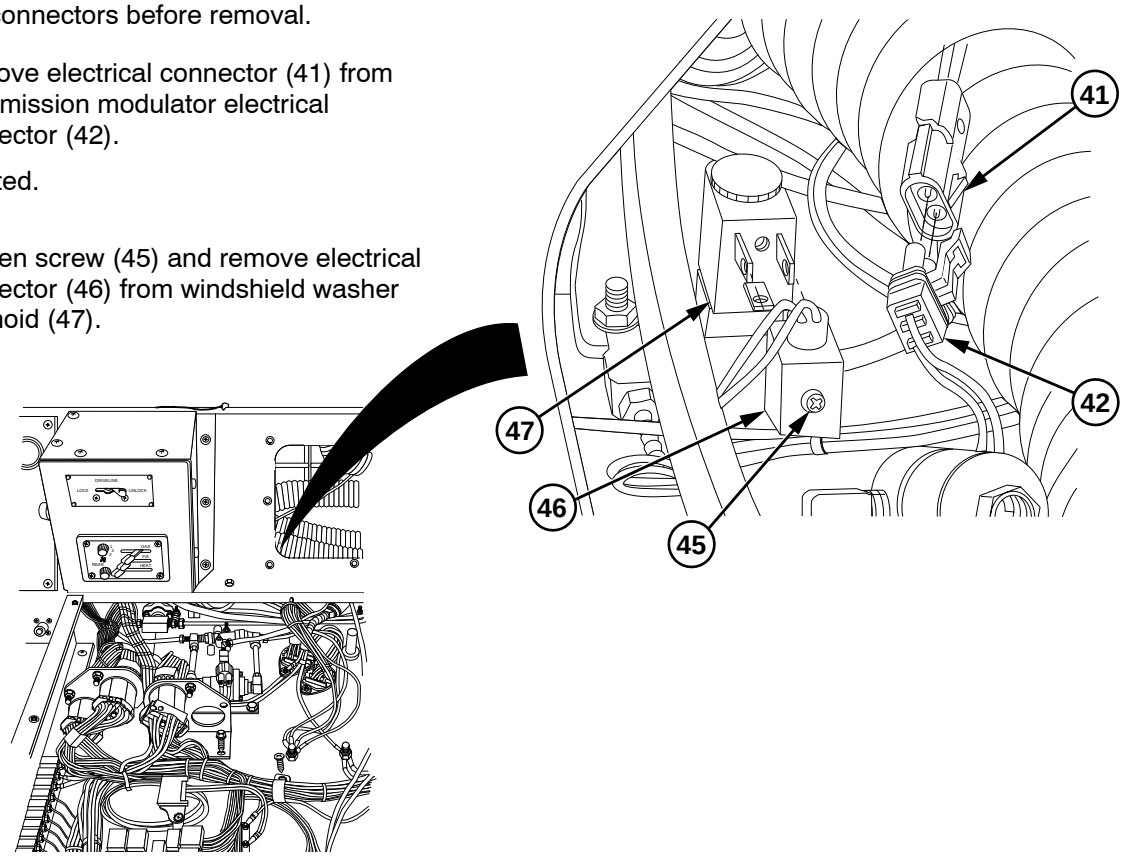
NOTE

Tag and mark electrical connectors before removal.

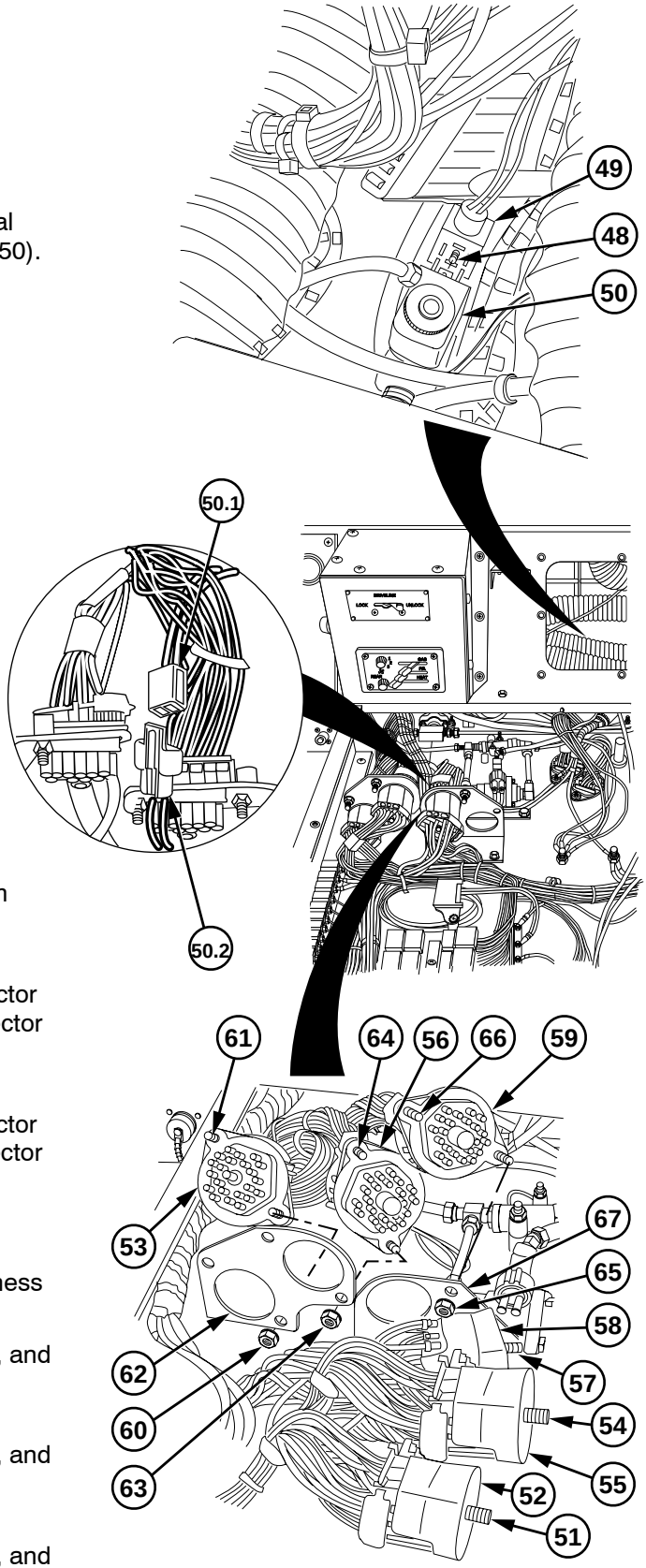
(14) Remove electrical connector (41) from transmission modulator electrical connector (42).

(15) Deleted.

(16) Loosen screw (45) and remove electrical connector (46) from windshield washer solenoid (47).



(17) Loosen screw (48) and remove electrical connector (49) from city horn solenoid (50).



(17.1) Remove electrical connector (50.1) from ECB wire harness connector (50.2).

(18) Loosen screw (51) and remove black electric control box wire harness connector (52) from black cab wire harness connector (53).

(19) Loosen screw (54) and remove white electric control box wire harness connector (55) from white cab wire harness connector (56).

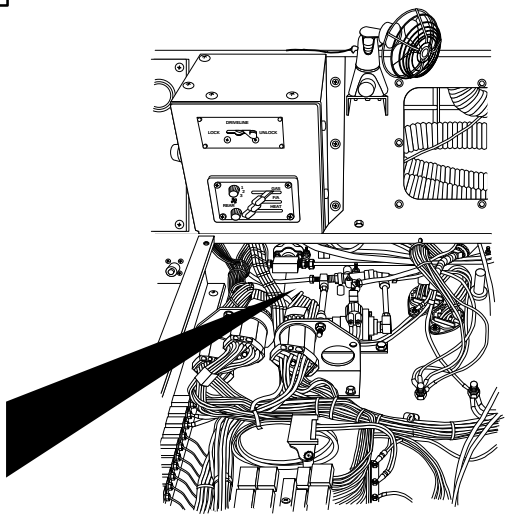
(20) Loosen screw (57) and remove black electric control box/light wire harness connector (58) from black cab wire harness connector (59).

(21) Remove two locknuts (60), screws (61), and black connector (53) from bracket (62). Discard locknuts.

(22) Remove two locknuts (63), screws (64), and white connector (56) from bracket (62). Discard locknuts.

(23) Remove two locknuts (65), screws (66), and black connector (59) from bracket (67). Discard locknuts.

6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

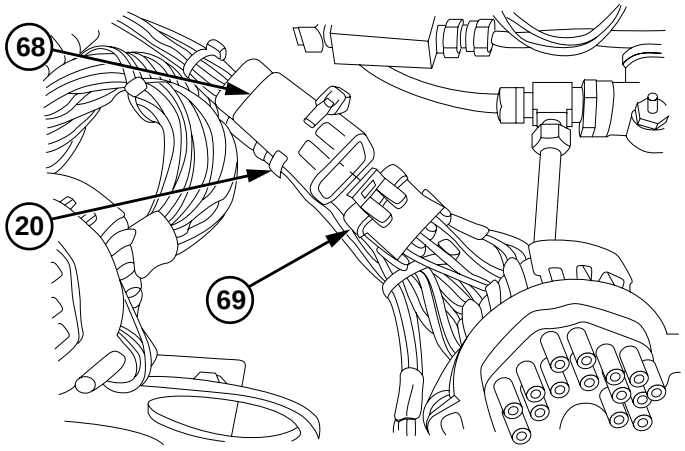


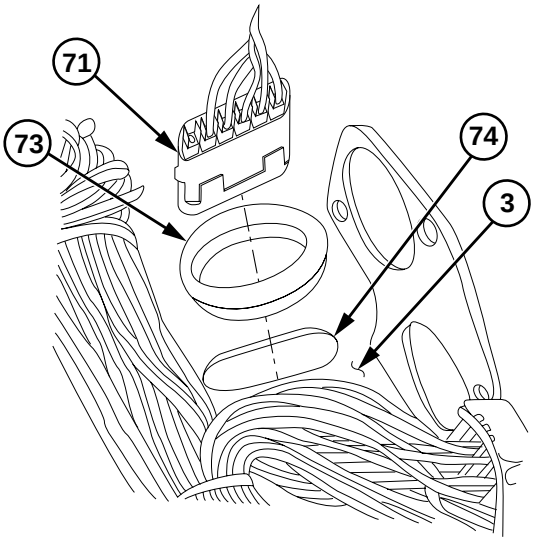
NOTE

Location of plastic cable ties should be marked before removal.

(24) Remove plastic cable ties (20) from vernier control (68).

(25) Remove vernier control (68) from electrical connector (69).





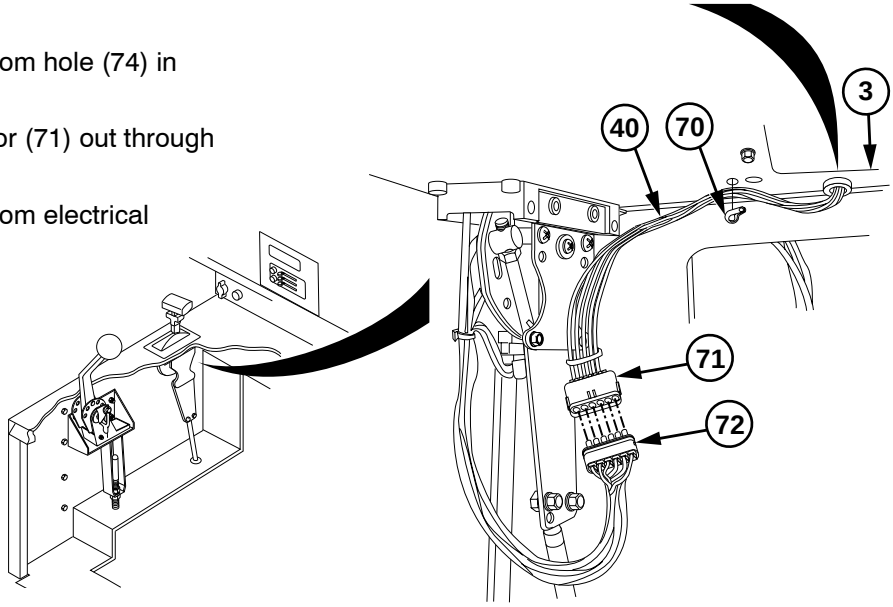
(26) Cut and remove snap clip (70) from console (3) and harness (40). Discard snap clip.

(27) Remove electrical connector (71) from transmission shift control assembly electrical connector (72).

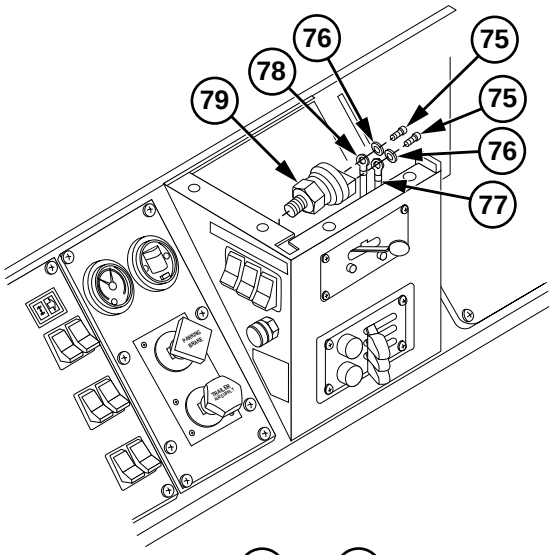
(28) Remove grommet (73) from hole (74) in console (3).

(29) Route electrical connector (71) out through hole (74) in console (3).

(30) Remove grommet (73) from electrical connector (71).



(31) Remove two screws (75), washers (76), wire no. 1487 (77), and wire no. 1036 (78) from ether start switch (79).



(32) Remove wire no. 1340 (80) from rear heater switch (81).

(33) Remove wire no. 1082 (82) from front heater switch (83).

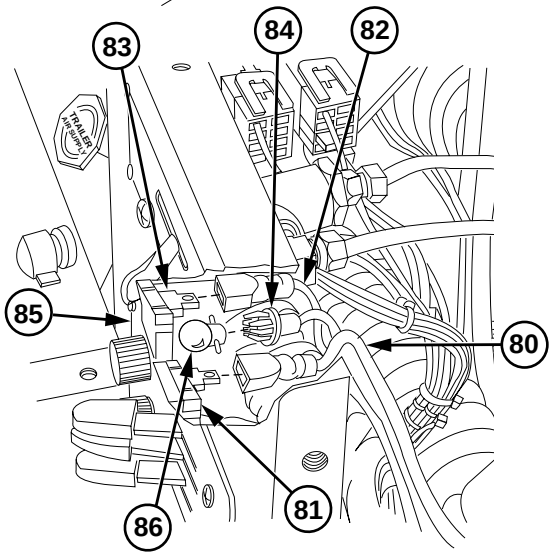
(34) Remove connector (84) from heater panel (85).

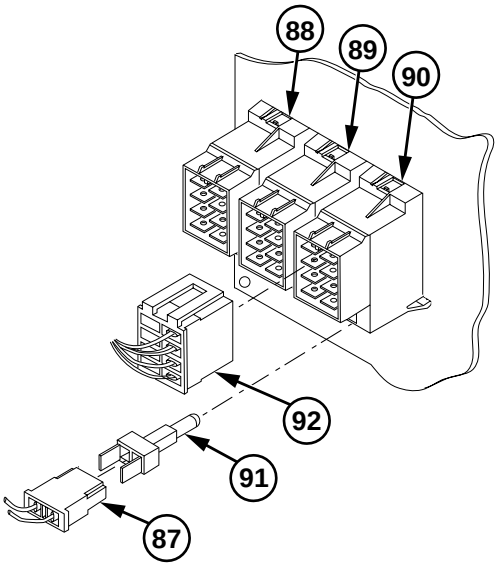
(35) Remove light (86) from connector (84).

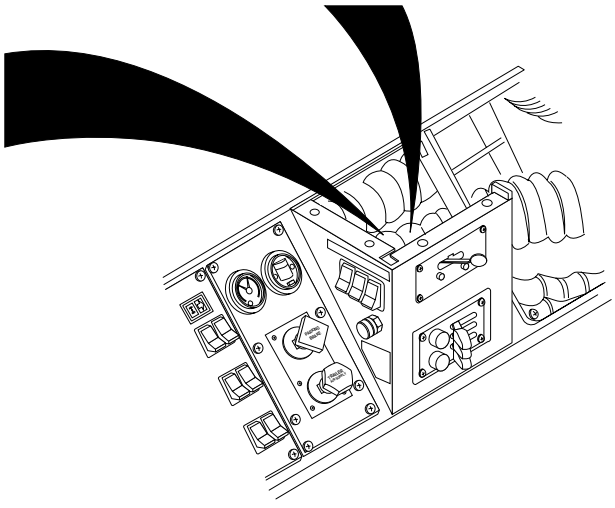
(36) Remove three connectors (87) from PTO switch (88), gas particulate filter switch (89), and chemical alarm switch (90).

(37) Remove three light assemblies (91) from connectors (87).

(38) Remove three electrical connectors (92) from PTO switch (88), gas particulate filter switch (89), and chemical alarm switch (90).







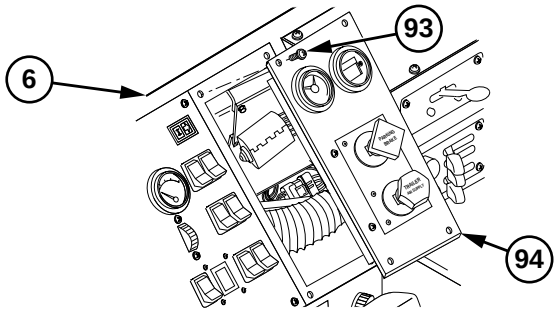
6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

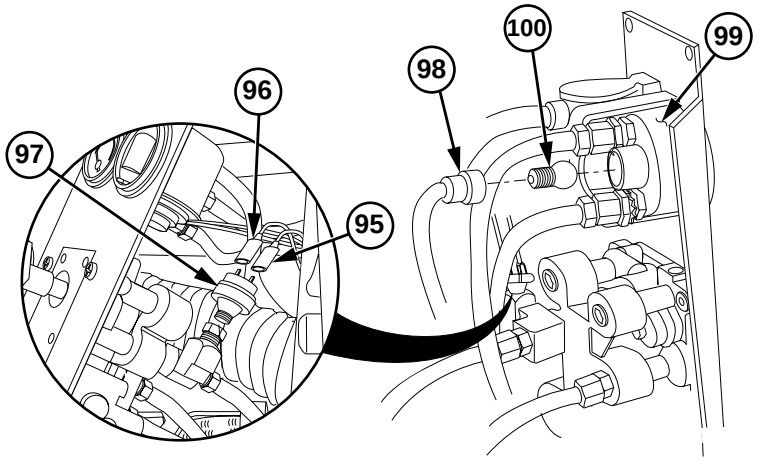
(39) Remove four screws (93) and trailer brake dash plate (94) from dash (6).

(40) Remove wire no. 1719B (95) and wire no.1719C (96) from PTO safety switch (97).

(41) Remove connector (98) from air pressure gage (99).

(42) Remove light (100) from connector (98).

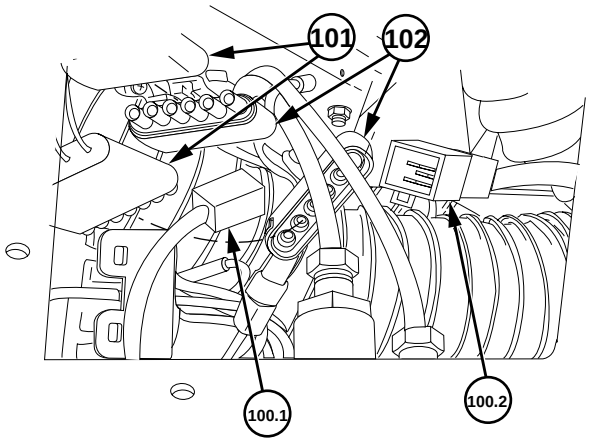


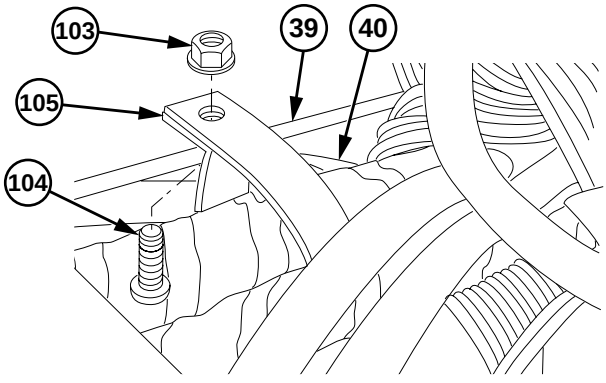


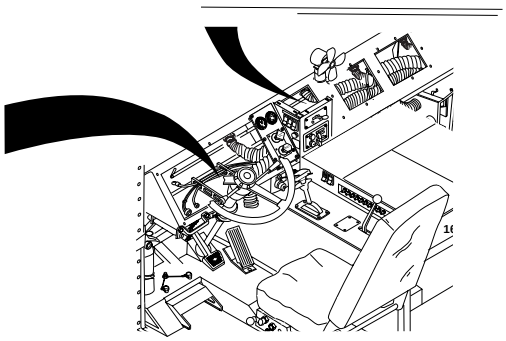
(42.1) Remove electrical connector (100.1) from cab rear wire harness connector (100.2).

(43) Remove two electrical connectors (101) from two cab rear wire harness connectors (102).

(44) Remove locknut (103), screw (104), and cushion clip (105) from cab brace (39) and harness (40). Discard locknut.

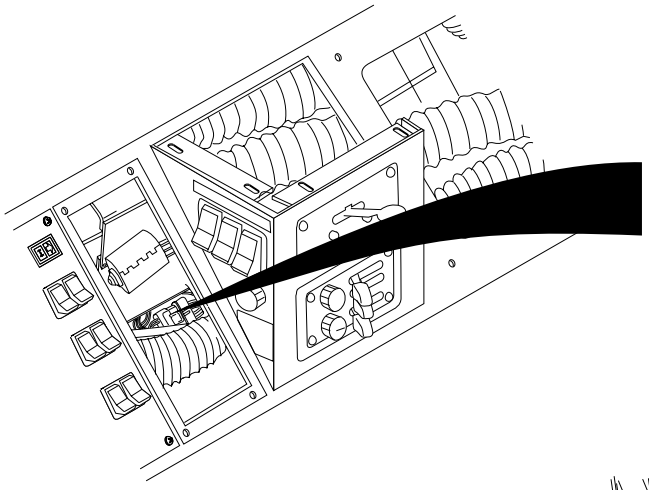


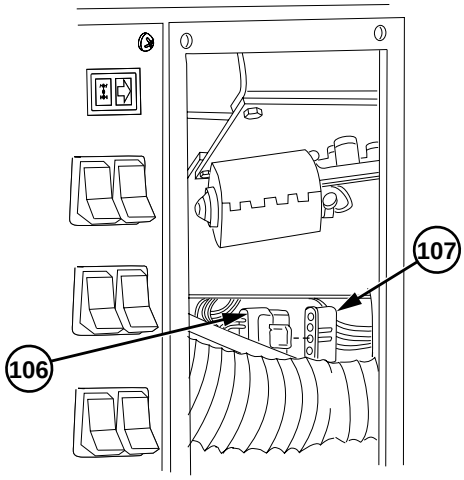




INSTRUMENT PANEL REMOVED FOR CLARITY

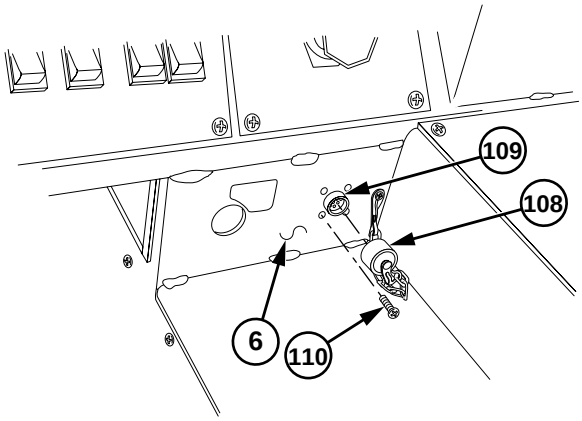
(45) Remove electrical connector (106) from wiper motor electrical connector (107).



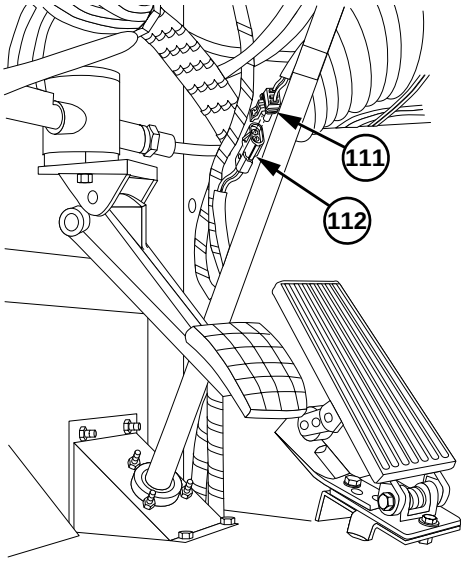


(46) Remove cover (108) from work light connector (109).

(47) Remove four screws (110) and work light connector (109) from dash (6).



(48) Remove electrical connector (111) from throttle sensor electrical connector (112).



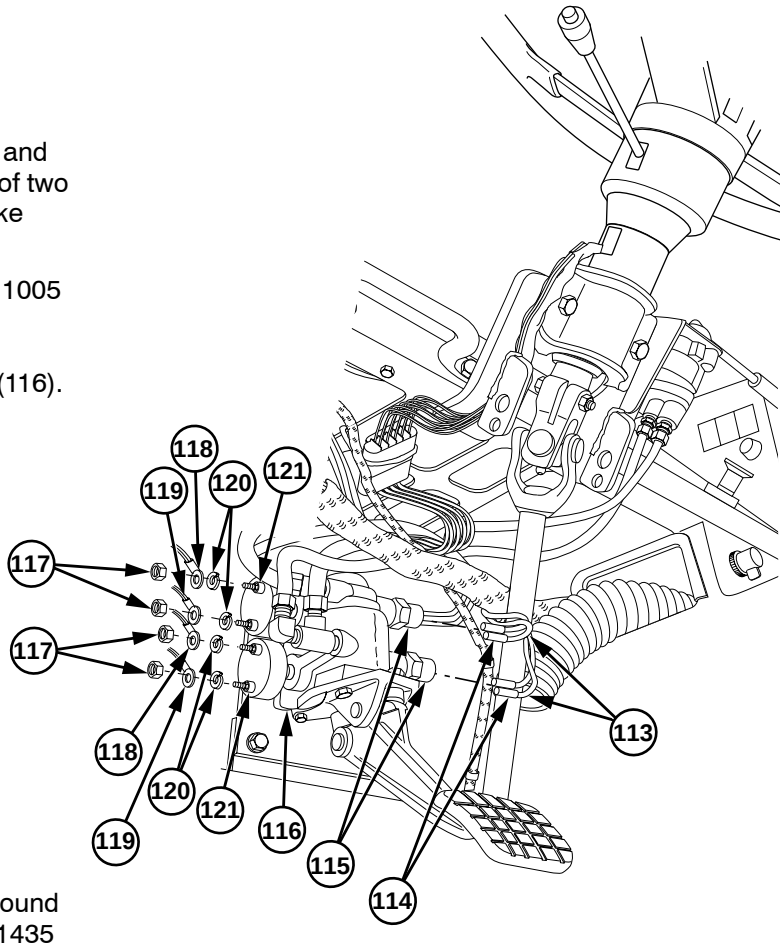
6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

NOTE

Tag and mark wires before removal.

(49) Remove one each wire no. 1120 (113) and ground wire no. 1435 (114) from each of two low air pressure switches (115) on brake treadle valve (116).

(50) Remove four nuts (117), two wires no. 1005 (118), two wires no. 1009 (119), and lockwashers (120) from two stoplight switches (121) on brake treadle valve (116). Discard lockwashers.

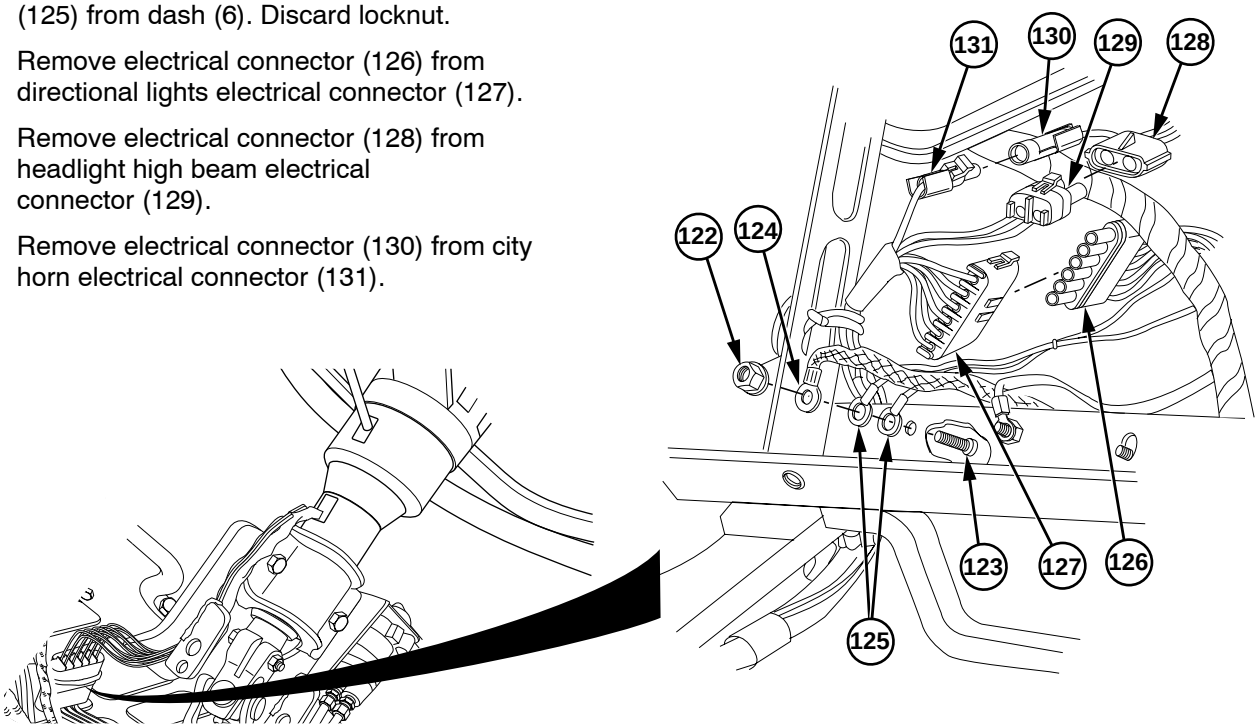


(51) Remove locknut (122), screw (123), ground strap (124), and two ground wires no. 1435 (125) from dash (6). Discard locknut.

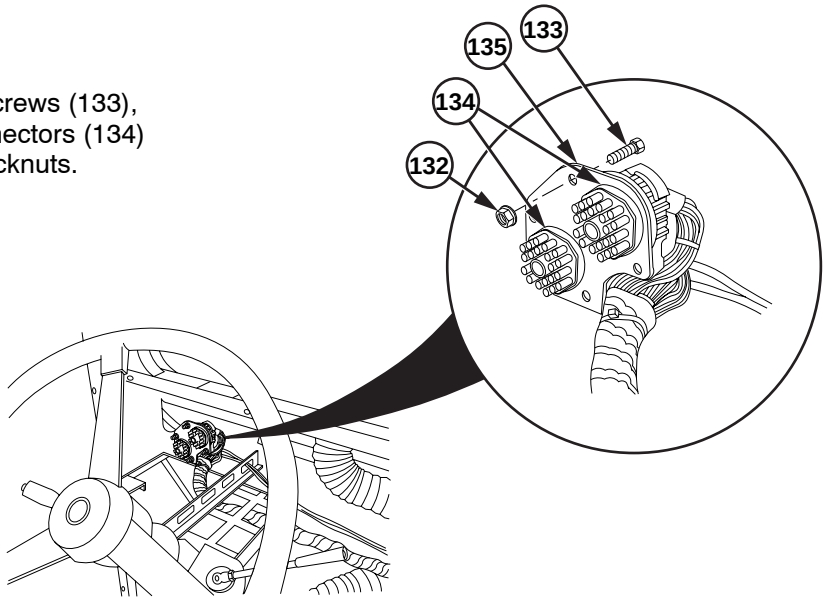
(52) Remove electrical connector (126) from directional lights electrical connector (127).

(53) Remove electrical connector (128) from headlight high beam electrical connector (129).

(54) Remove electrical connector (130) from city horn electrical connector (131).



(55) Remove four locknuts (132), screws (133), and two cab wire harness connectors (134) from bracket (135). Discard locknuts.



(56) Remove electrical connector (136) from left side map light electrical connector (137).

(57) Unlatch and open secondary lock (138) on connector (136).

NOTE

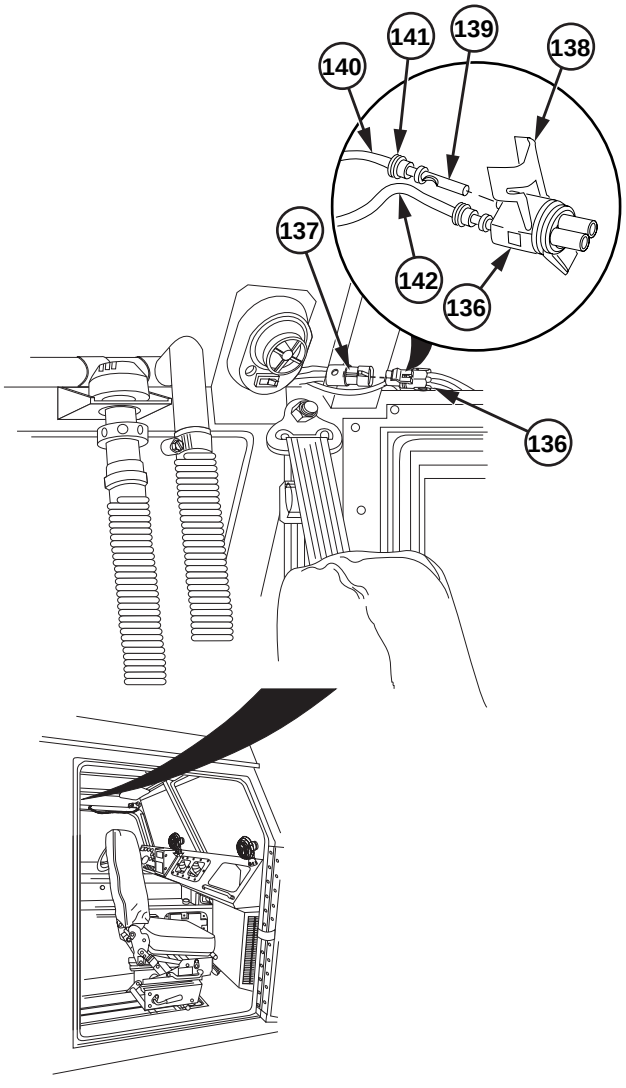
Both wires in connector are removed the same way.

(58) Insert pin removal tool into cavity on connector (136) until seated to release lock tangs on terminal (139).

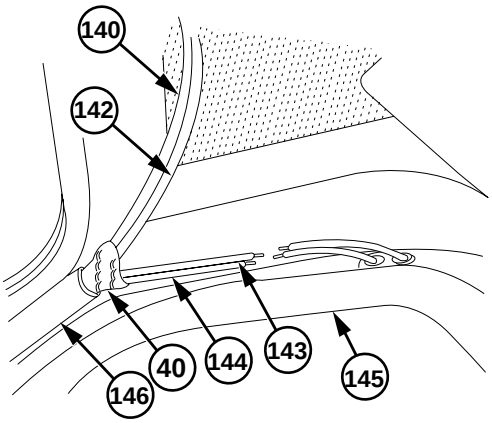
(59) Pull ground wire no. 1435 (140) back, turn connector (136), and remove tool.

(60) Cut terminal (139) directly behind wire seal (141). Discard terminals and seal.

(61) Do steps (58) thru (60) for wire no. 1189 (142).



6-6. CAB WIRE HARNESS REPLACEMENT (CONT)



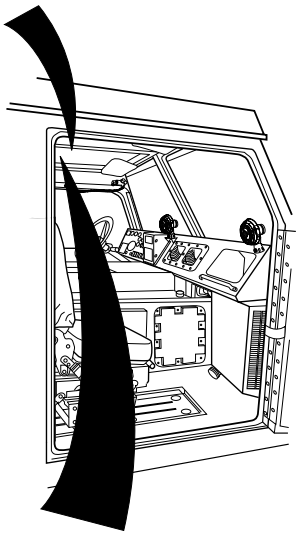
NOTE

Allow enough wire to remain in cab to splice in new harness.

(62) Cut wire no. 1680 (143) and wire no. 1012 (144) where they exit cab (145).

(63) Pull ground wire no. 1435 (140), wire no. 1189 (142), wire no. 1680 (143), and wire no. 1012 (144) down through tube (146).

(64) Remove wire harness (40) from cab (145).



b. Installation

NOTE

Evenly distribute any slack in harness. Do not make any connections.

(1) Position wire harness (1) in cab (2).

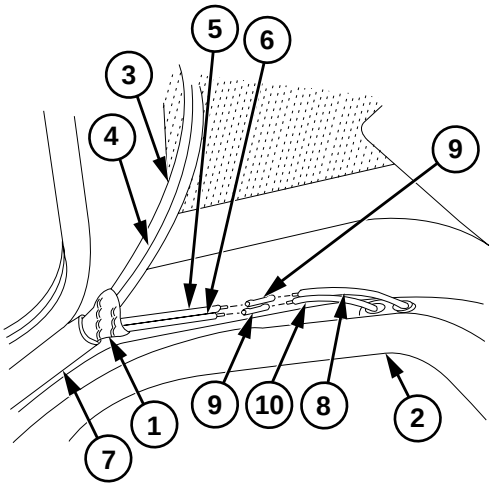
(2) Route ground wire no. 1435 (3), wire no. 1189 (4), wire no. 1680 (5), and wire no. 1012 (6) up through tube (7).

NOTE

Harness connection is made at upper left corner of windshield.

(3) Connect harness wire no. 1680 (5) to cab wire no. 1680 (8) with connector (9).

(4) Connect harness wire no. 1012 (6) to cab wire no. 1012 (10) with connector (9).



(5) Install 1 in. (2.5 mm) of wire no. 1189 (4) through new wire seal (11).

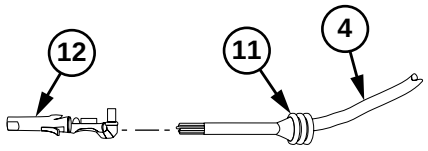
CAUTION

Strip wire after placing it through seal to prevent damage to individual cable strands.

(6) Using wire strippers, strip end of wire no. 1189 (4) leaving 0.25 in. (0.64 cm) of bare wire.

NOTE

Use proper hole according to gage of wire.



(7) Insert new terminal (12) in locating hole of crimping tool.

(8) Slide seal (11) down to end of insulation on wire no. 1189 (4).

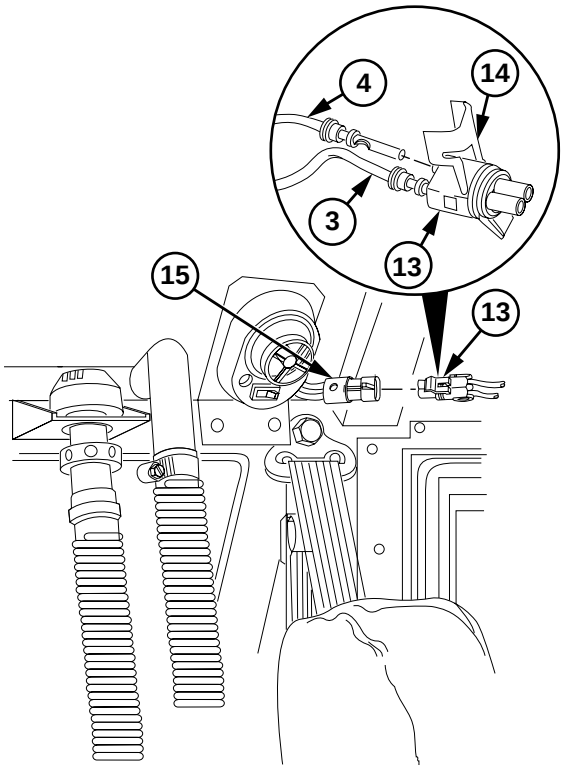
NOTE

Wire and seal should be positioned so larger wings of terminal will crimp around seal and smaller wings will crimp around exposed bare wire.

(9) Position wire no. 1189 (4) on terminal (12).

(10) Press handles of crimping tool together until ratchet releases and crimp is complete.

(11) Repeat steps (5) thru (10) for ground wire no. 1435 (3).



(12) Install wire no. 1189 (4) in A position and ground wire no. 1435 (3) in B position on connector (13).

NOTE

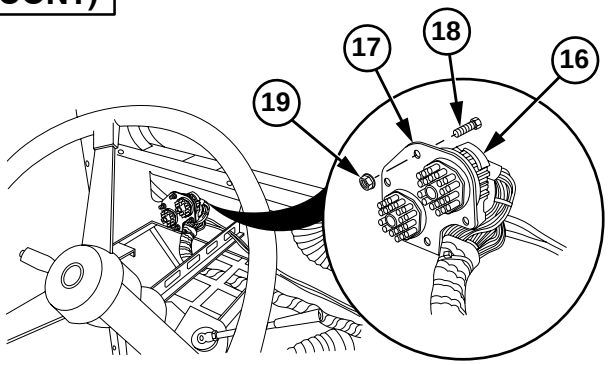
Connector must be snapped closed after wires are inserted.

(13) Close and latch secondary lock (14) on connector (13).

(14) Install electrical connector (13) in left map light connector (15).

6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

(15) Install two cab wire harness connectors (16) on bracket (17) with four screws (18) and new locknuts (19).



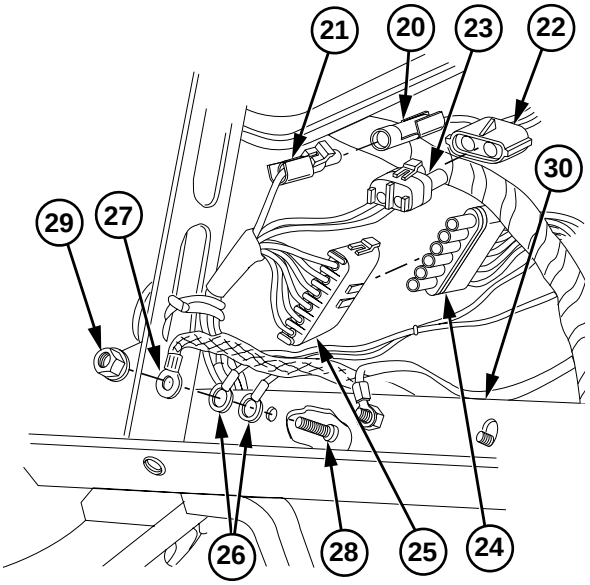
INSTRUMENT PANEL REMOVED FOR CLARITY

(16) Install electrical connector (20) on city horn electrical connector (21).

(17) Install electrical connector (22) on headlight high beam electrical connector (23).

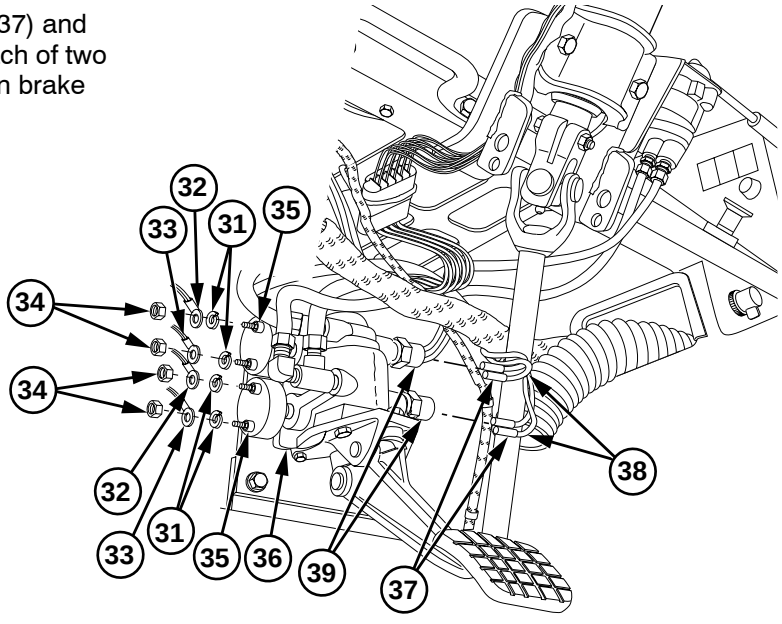
(18) Install electrical connector (24) on directional lights electrical connector (25).

(19) Install two ground wires no. 1435 (26), ground strap (27), screw (28), and new locknut (29) on dash (30).

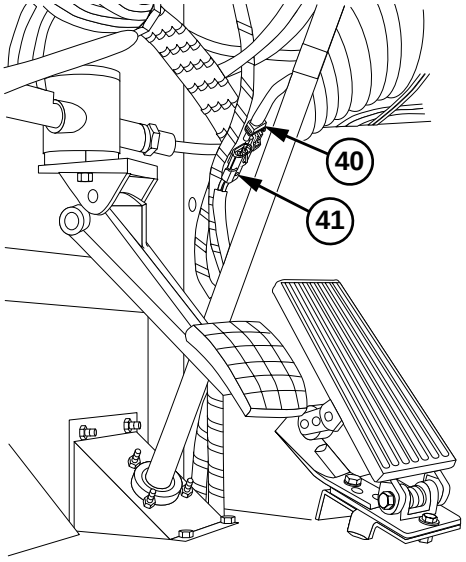


(20) Install four new lockwashers (31), two wires no.1005 (32), wires no. 1009 (33), and four nuts (34) on two stoplight switches (35) on brake treadle valve (36).

(21) Install one each wire no. 1120 (37) and ground wire no. 1435 (38) on each of two low air pressure switches (39) on brake treadle valve (36).



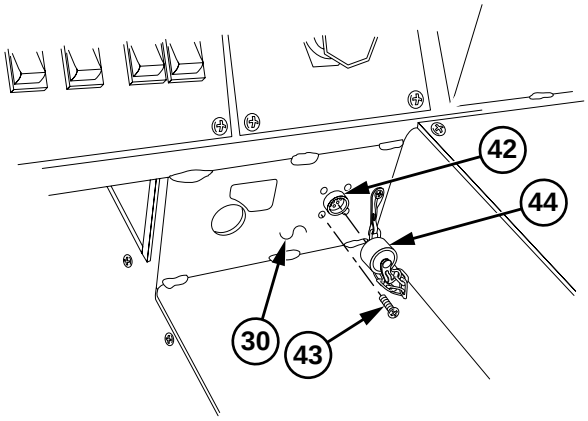
(22) Install electrical connector (40) on throttle sensor electrical connector (41).

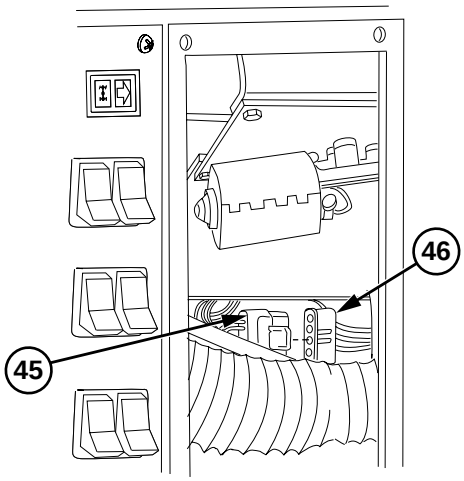


(23) Install work light connector (42) on dash (30) with four screws (43).

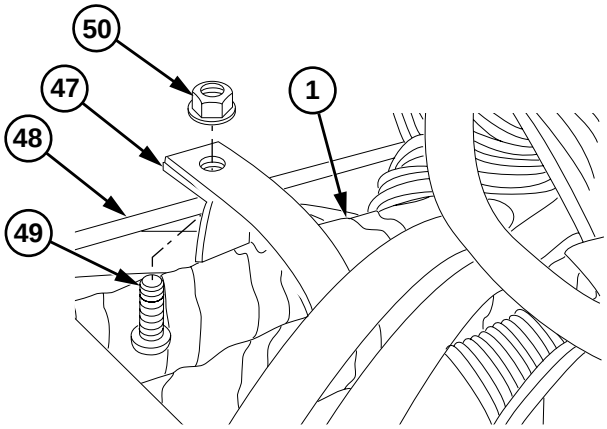
(24) Install cover (44) on work light connector (42).

(25) Install electrical connector (45) on wiper motor electrical connector (46).





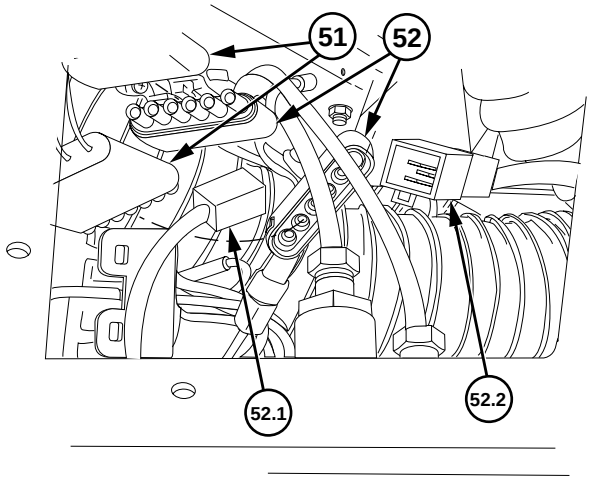
(26) Install cushion clip (47) on harness (1) and cab brace (48) with screw (49) and new locknut (50).



6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

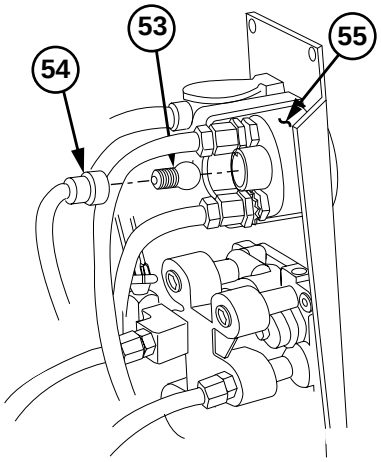
(27) Install two electrical connectors (51) on two cab rear wire harness connectors (52).

(27.1) Install electrical connector (52.1) on cab rear wire harness connector (52.2).

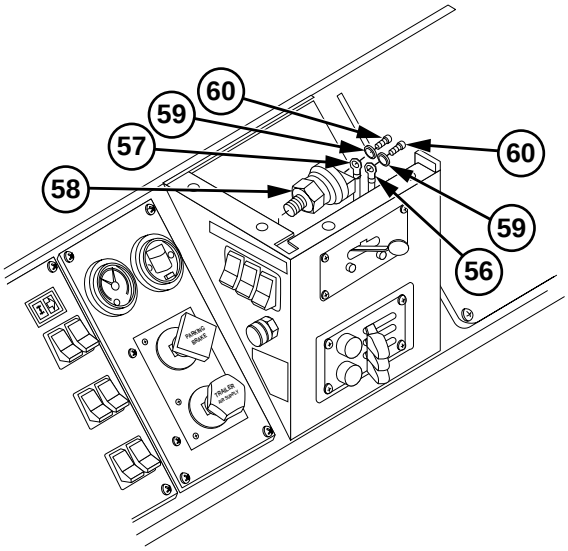


(28) Install light (53) in connector (54).

(29) Install connector (54) in air pressure gage (55).



(30) Install wire no. 1487 (56) and wire no. 1036 (57) on ether start switch (58) with two washers (59) and screws (60).

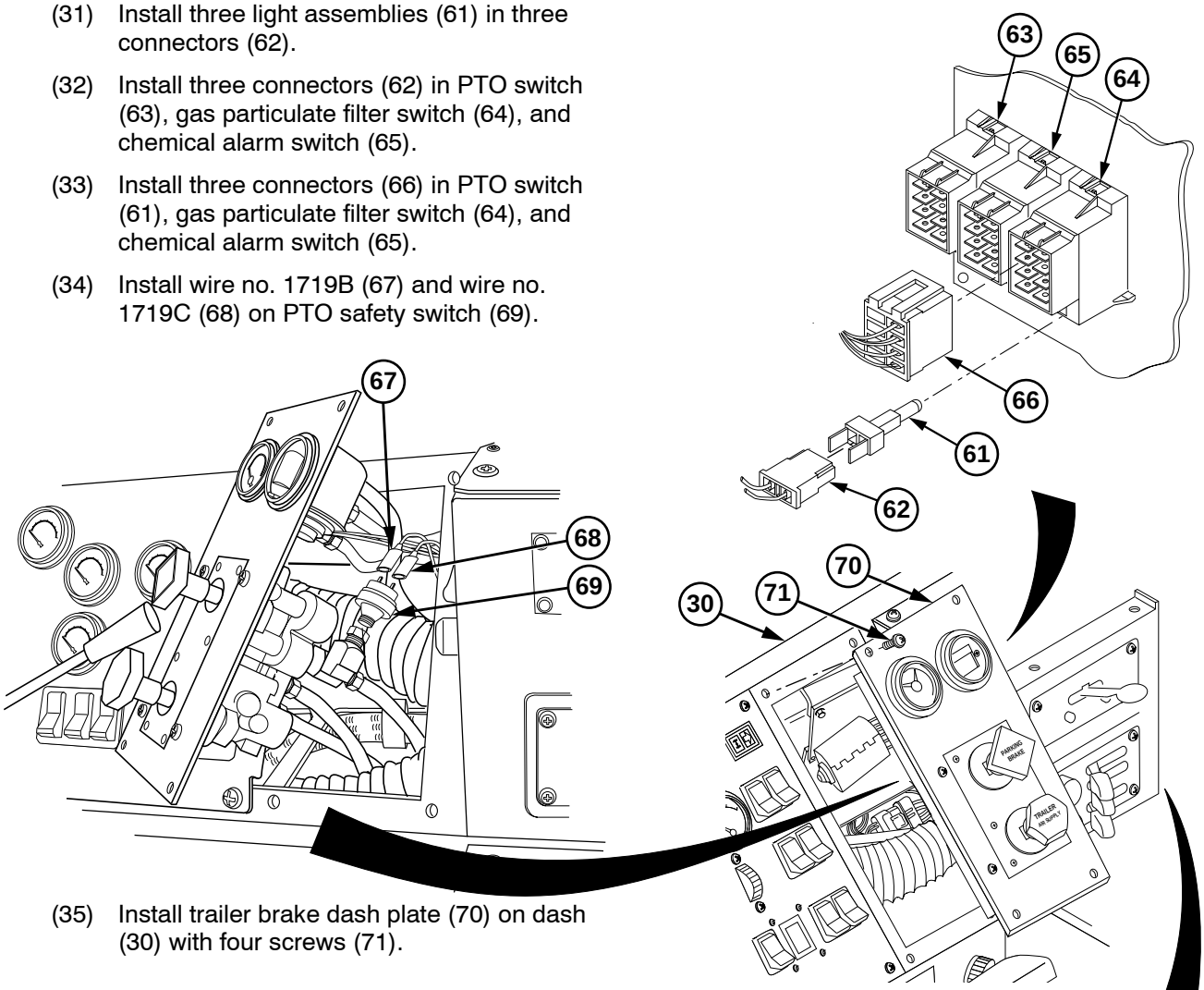


(31) Install three light assemblies (61) in three connectors (62).

(32) Install three connectors (62) in PTO switch (63), gas particulate filter switch (64), and chemical alarm switch (65).

(33) Install three connectors (66) in PTO switch (61), gas particulate filter switch (64), and chemical alarm switch (65).

(34) Install wire no. 1719B (67) and wire no. 1719C (68) on PTO safety switch (69).



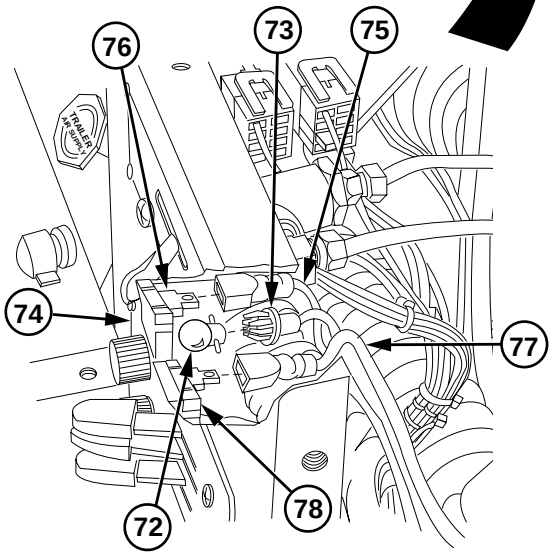
(35) Install trailer brake dash plate (70) on dash (30) with four screws (71).

(36) Install light (72) in connector (73).

(37) Install connector (73) in heater panel (74).

(38) Install wire no. 1082 (75) on front heater switch (76).

(39) Install wire no. 1340 (77) on rear heater switch (78).



6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

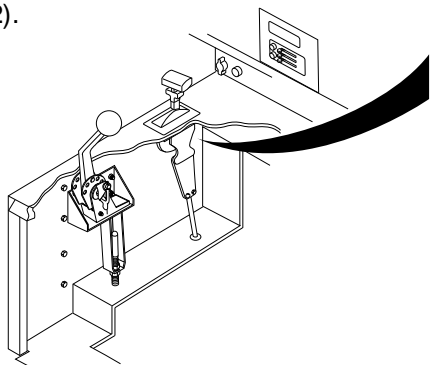
(40) Install grommet (79) on electrical connector (80).

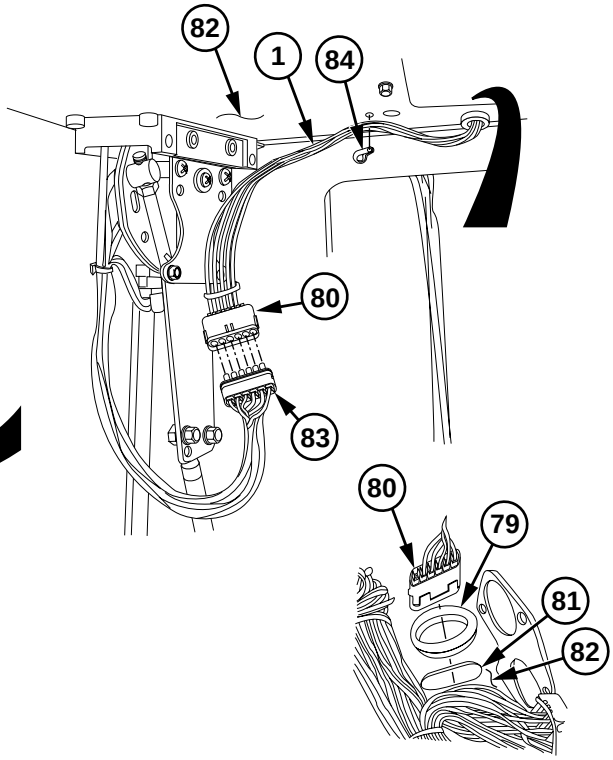
(41) Route electrical connector (80) through hole (81) in console (82).

(42) Install grommet (79) in hole (81) in console (82).

(43) Install electrical connector (80) on transmission shift control assembly electrical connector (83).

(44) Install new clip (84) on harness (1) and console (82).



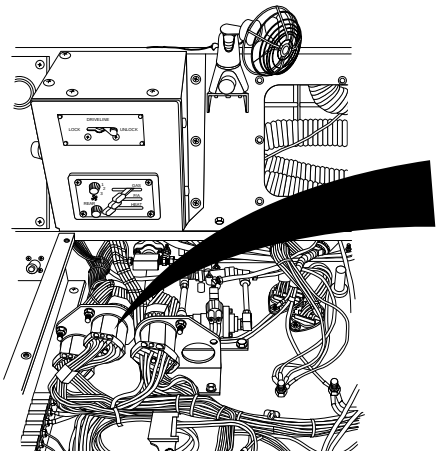


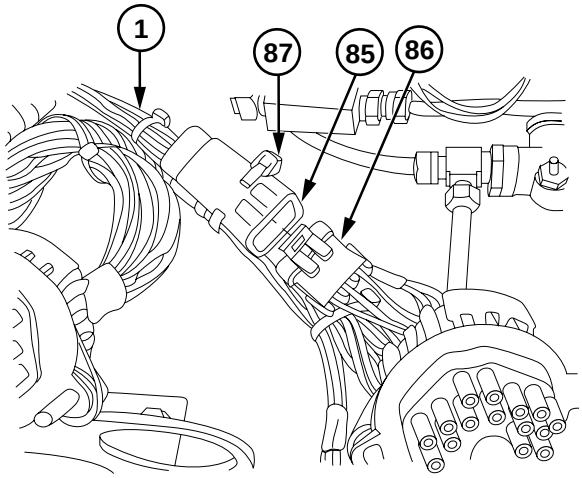
(45) Install vernier control (85) on electrical connector (86).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(46) Secure vernier control (85) to harness (1) with plastic cable tie (87).





(47) Install black cab wire harness connector (88) on bracket (89) with two screws (90) and new locknuts (91).

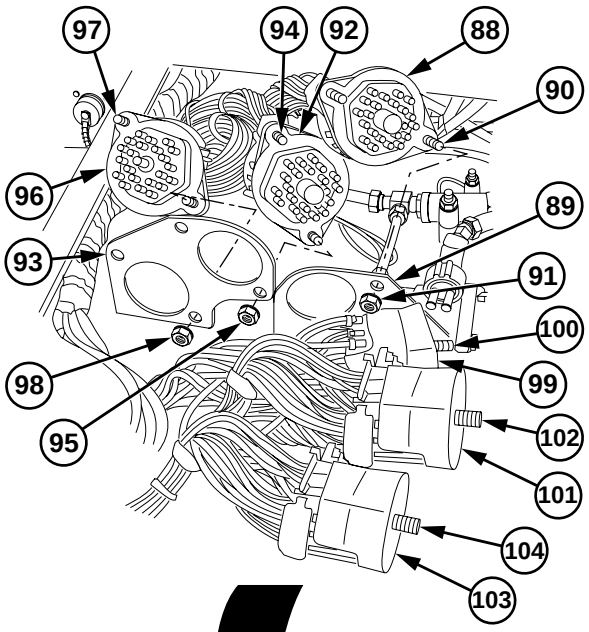
(48) Install white cab wire harness connector (92) on bracket (93) with two screws (94) and new locknuts (95).

(49) Install black cab wire harness connector (96) on bracket (93) with two screws (97) and new locknuts (98).

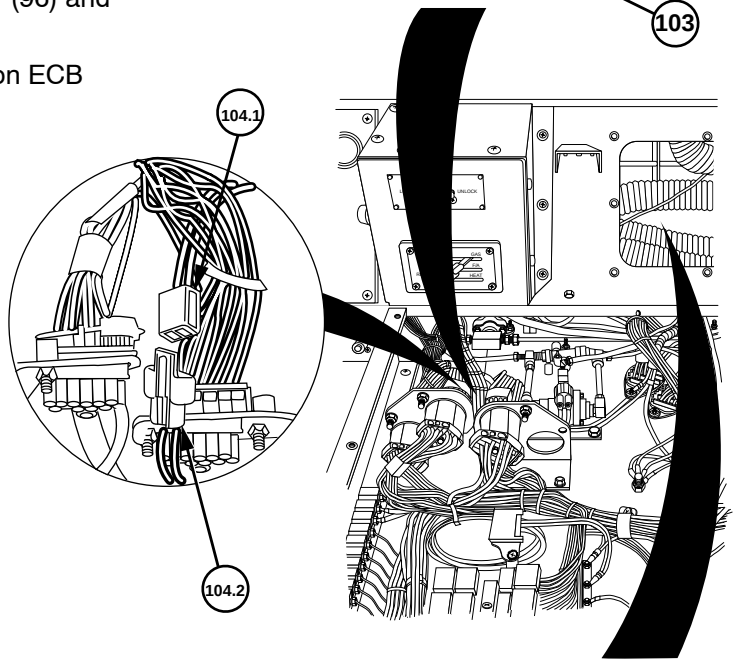
(50) Install electric control box/light wire harness connector (99) on black connector (88) and tighten screw (100).

(51) Install white electric control box wire harness connector (101) on white connector (92) and tighten screw (102).

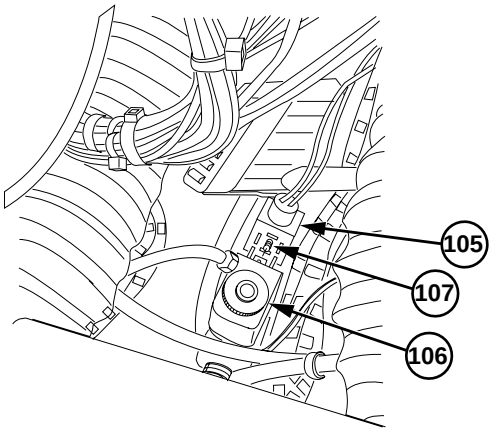
(52) Install black electric control box wire harness connector (103) on black connector (96) and tighten screw (104).



(52.1) Install electrical connector (104.1) on ECB wire harness (104.2).



(53) Install connector (105) on horn solenoid (106). Tighten screw (107).

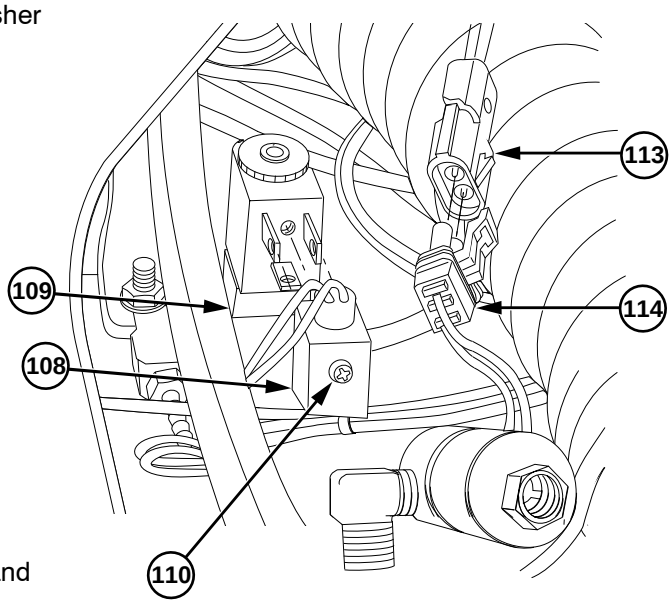


6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

(54) Install connector (108) on windshield washer solenoid (109). Tighten screw (110).

(55) Deleted.

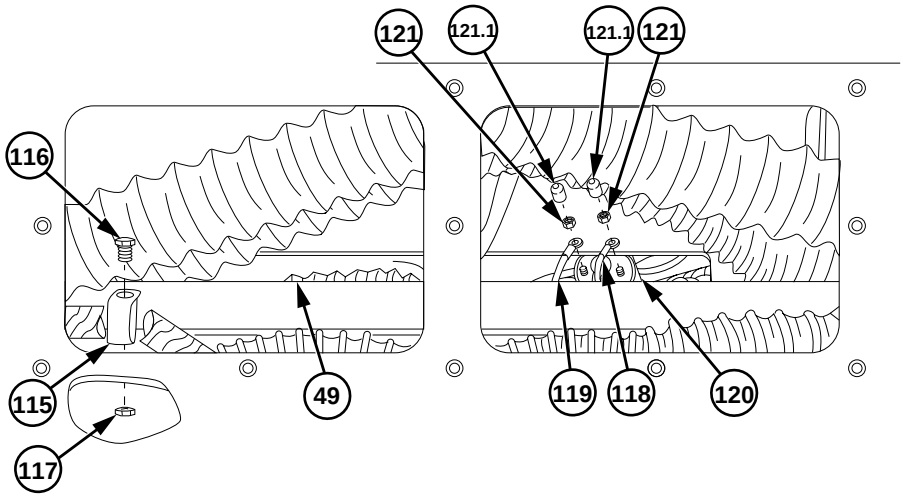
(56) Install electrical connector (113) on transmission modulator electrical connector (114).



(57) Install cushion clip (115) on harness (1) and cab brace (49) with screw (116) and new locknut (117).

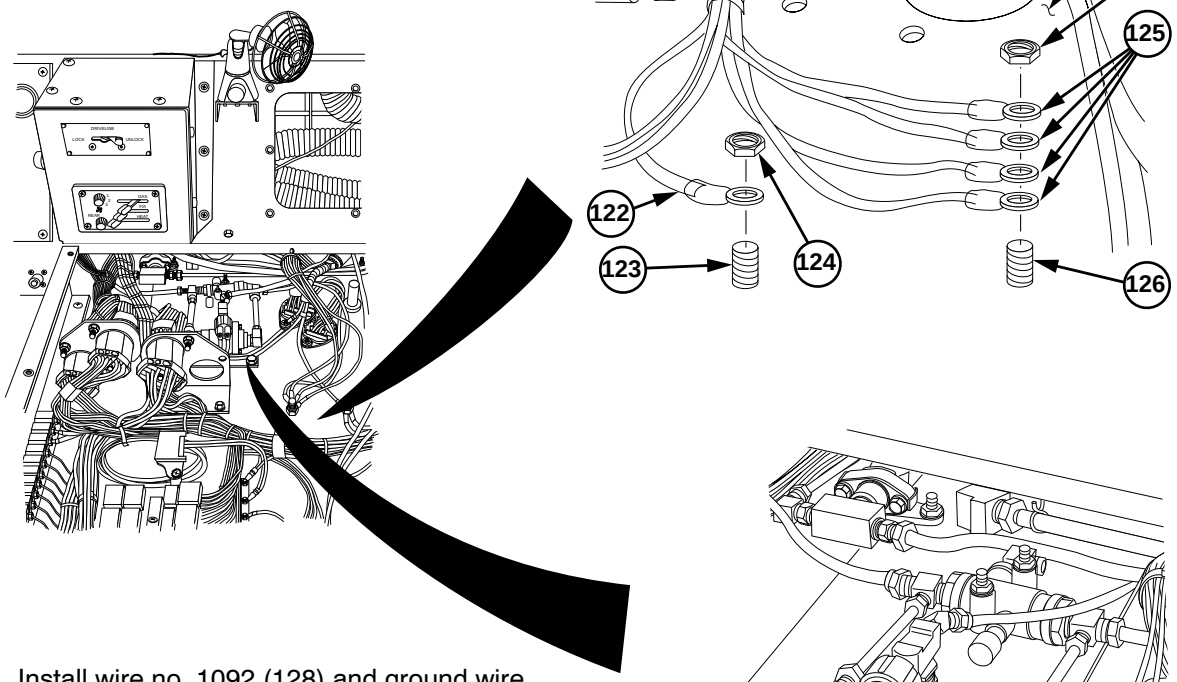
(58) Install wire no.1005 (118) and wire no. 1009 (119) on trailer brake stoplight switch (120) with two nuts (121).

(58.1) Install two caps (121.1) on trailer brake stoplight switch (120).

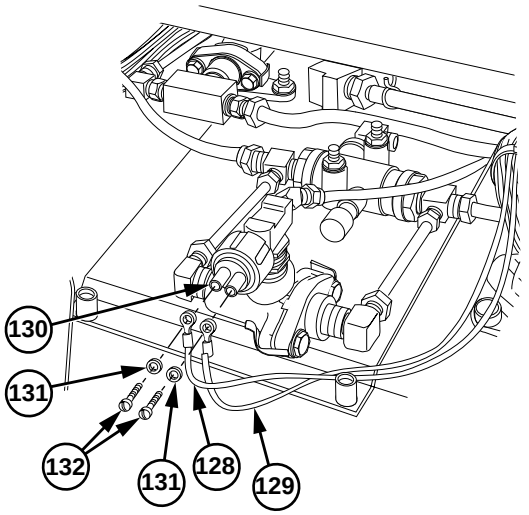


(59) Install ground wire no. 1435 (122), screw (123), and new locknut (124) on console (82).

(60) Install four ground wires no. 1435 (125), screw (126) and new locknut (127) on console (82).

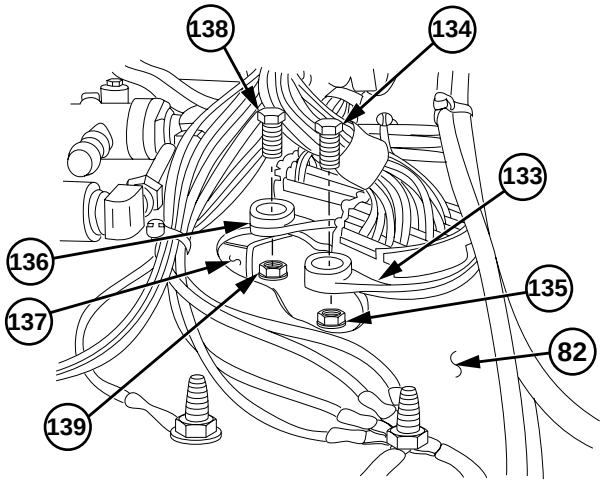


(61) Install wire no. 1092 (128) and ground wire no. 1435 (129) on driveline lockup switch (130) with two new lockwashers (131) and screws (132).



(62) Install red cab connector (133) on console (82) with two screws (134) and new locknuts (135).

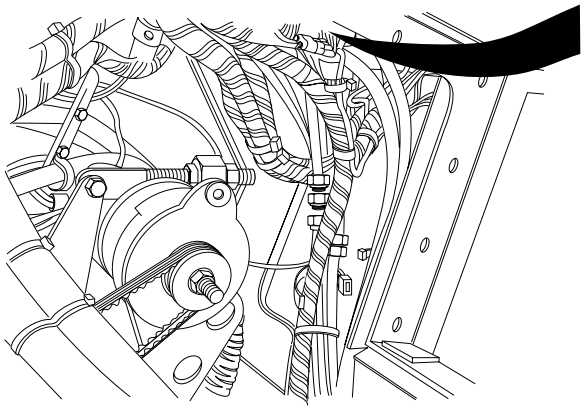
(63) Install yellow cab connector (136) and standoff bracket(137) on console (82) with two screws (138) and new locknuts (139).

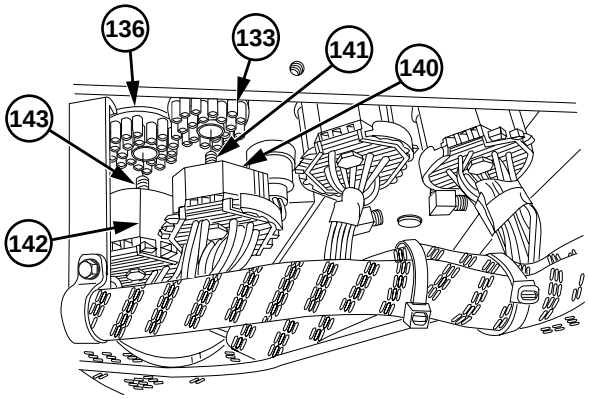


6-6. CAB WIRE HARNESS REPLACEMENT (CONT)

(64) Install cab wire harness red connector (140) on red cab connector (133) and tighten screw (141).

(65) Install cab wire harness yellow connector (142) on yellow cab connector (136) and tighten screw (143).

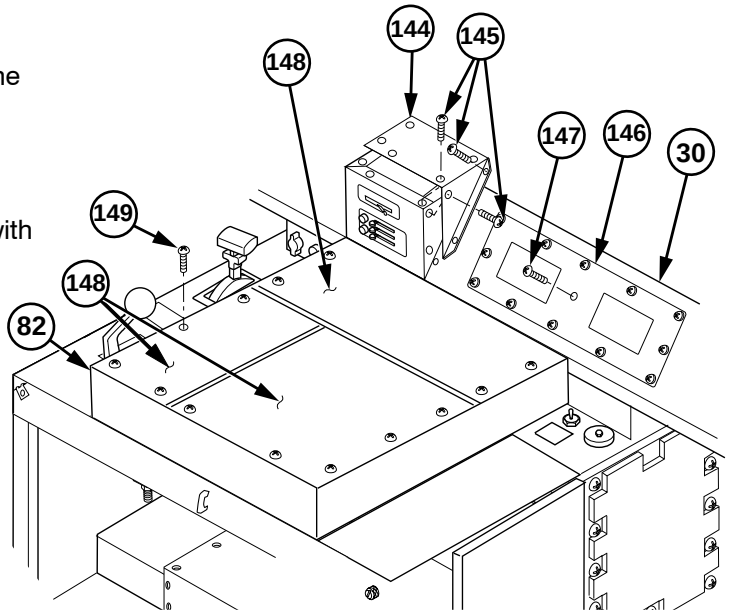




(66) Install panel (144) on dash (30) with nine screws (145).

(67) Install panel (146) on dash (30) with 13 screws (147).

(68) Install 3 panels (148) on console (82) with 19 screws (149).



c. Follow-On Maintenance

(1) Install engine switch (TM 9-2320-360-20).

(2) Install instrument panel (TM 9-2320-360-20).

(3) Connect batteries (TM 9-2320-360-20).

(4) Install shifter guard (TM 9-2320-360-20).

(5) Install top doghouse insulation (TM 9-2320-360-20).

(6) Install lower engine access panel (TM 9-2320-360-20).

6-7. REAR CAB WIRE HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Batteries disconnected (TM 9-2320-360-20).
Back seat cushion/frame removed (TM 9-2320-360-10).
Footrest removed (TM 9-2320-360-10).
Ventilator lower plenum chamber removed (TM 9-2320-360-20).

Materials/Parts
Ties, Cable, Plastic (Item 60, Appendix B)
Gaskets (5) (Item 15, Appendix F)
Lockwasher (Item 118, Appendix F)
Snap Clips (12) (Item 323, Appendix F)
Snap Clips (5) (Item 324.1, Appendix F)
Snap Clip (Item 324.2, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

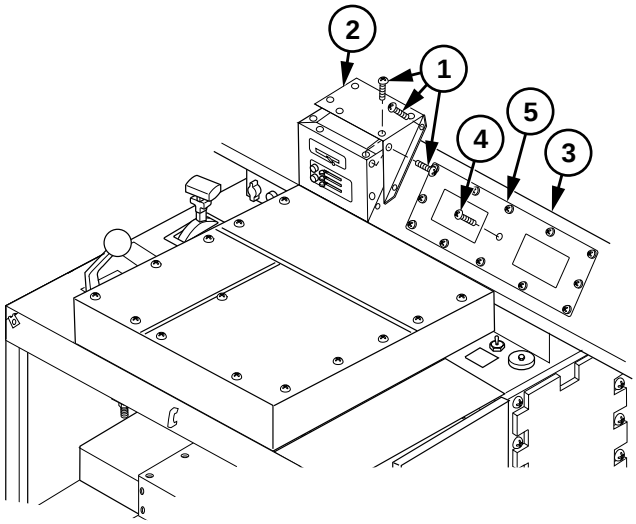
a. Removal

NOTE

- Electrical connectors are removed by gently prying on tab and pulling on connector.
- Snap clips are unlocked by pulling lock button out.

(1) Remove nine screws (1) and panel (2) from dash (3).

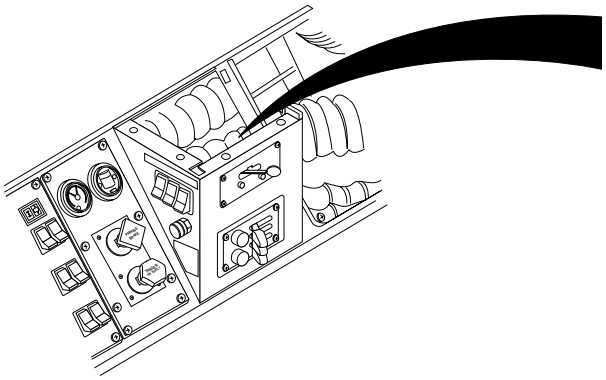
(2) Remove 13 screws (4) and panel (5) from dash (3).

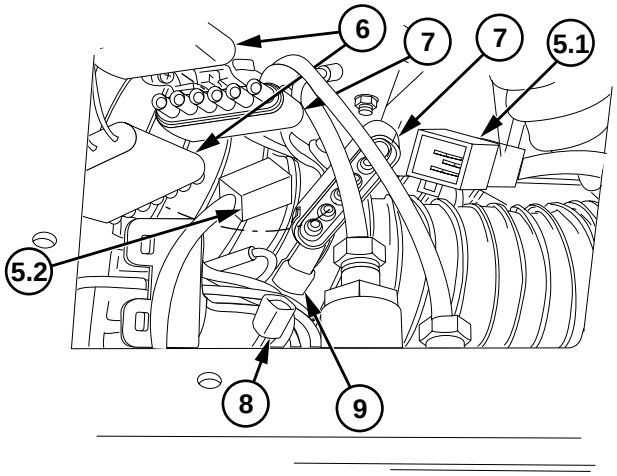


(2.1) Remove electrical connector (5.1) from cab wire harness connector (5.2)

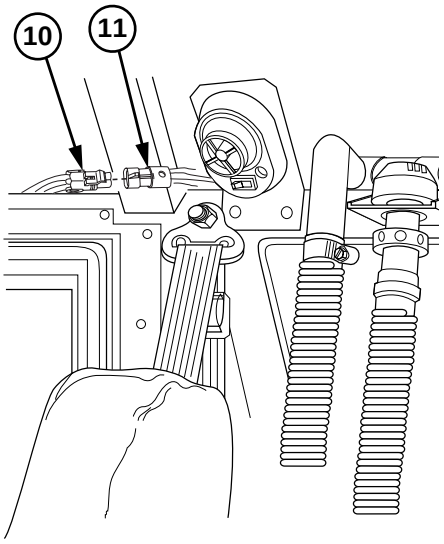
(3) Remove two rear cab light harness connectors (6) from cab wire harness connectors (7).

(4) Remove electrical connector (8) from rear heater switch electrical connector (9).





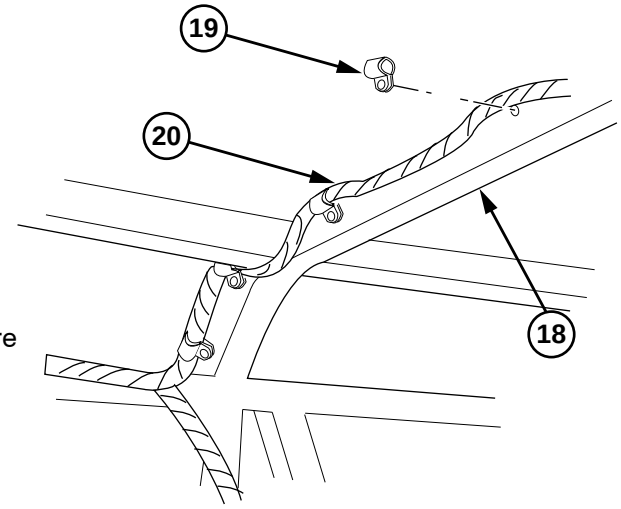
6-7. REAR CAB WIRE HARNESS REPLACEMENT (CONT)



(5) Remove electrical connector (10) from right side map light electrical connector (11).

(6) Deleted.

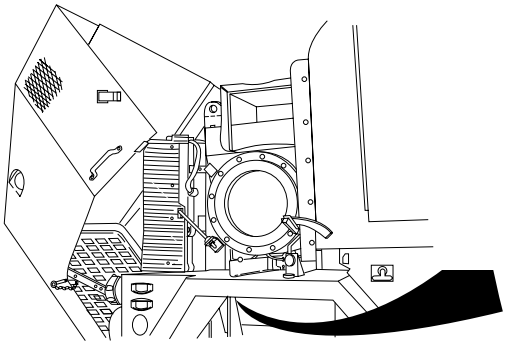
(7) Deleted.

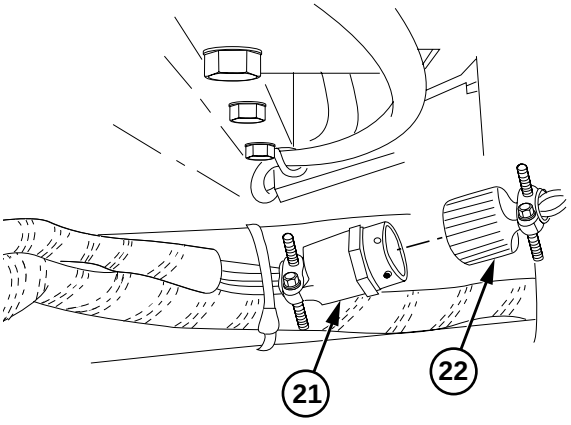


(8) Cut and remove four snap clips (19) from cab roof (18).

(9) Remove four snap clips (19) from cab wire harness (20). Discard snap clips.

(10) Remove electrical connector (21) from chemical alarm electrical connector (22).

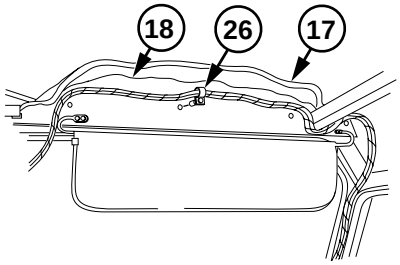


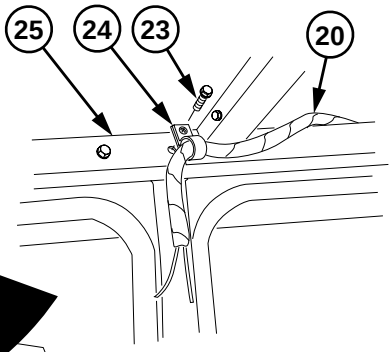


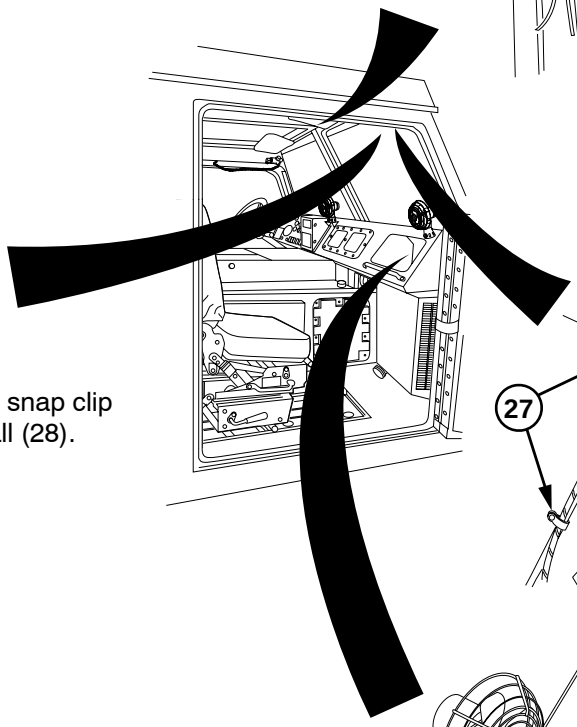
(11) Remove screw (23) and cushion clip (24) from cab wire harness (20) and cab front brace (25).

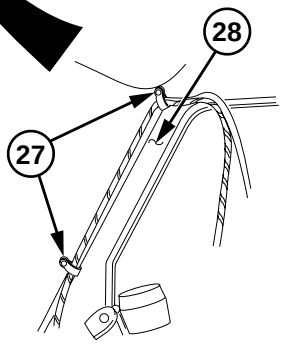
(12) Pull insulation (17) 3 in. (76.2 mm) from cab roof (18).

(13) Cut and remove four snap clips (26) from cab roof (18). Discard snap clips.









(14) Cut and remove snap clip (27) and snap clip (27.1) from passenger side cab wall (28). Discard snap clips.

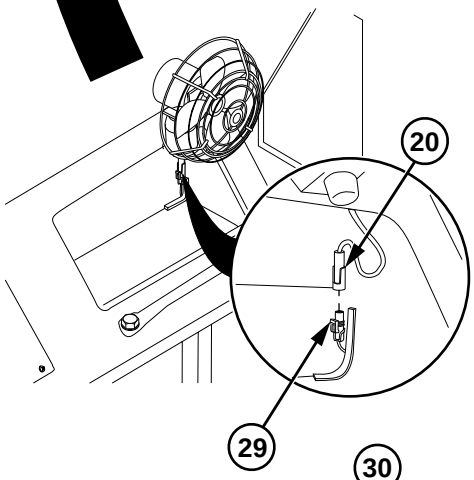
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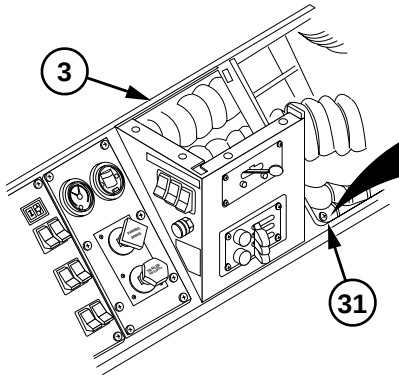
NOTE

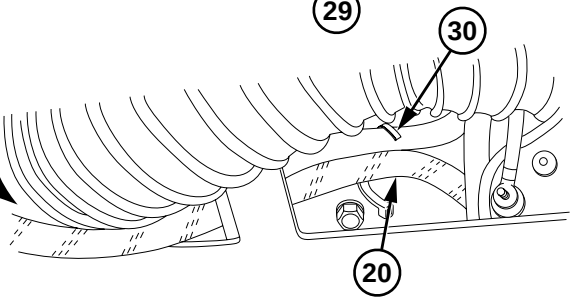
Location of plastic cable ties should be marked before removal.

(16) Remove plastic cable ties (30) from cab wire harness (20).

(17) Remove right half of cab wire harness (20) through dash (3) and access hole (31).







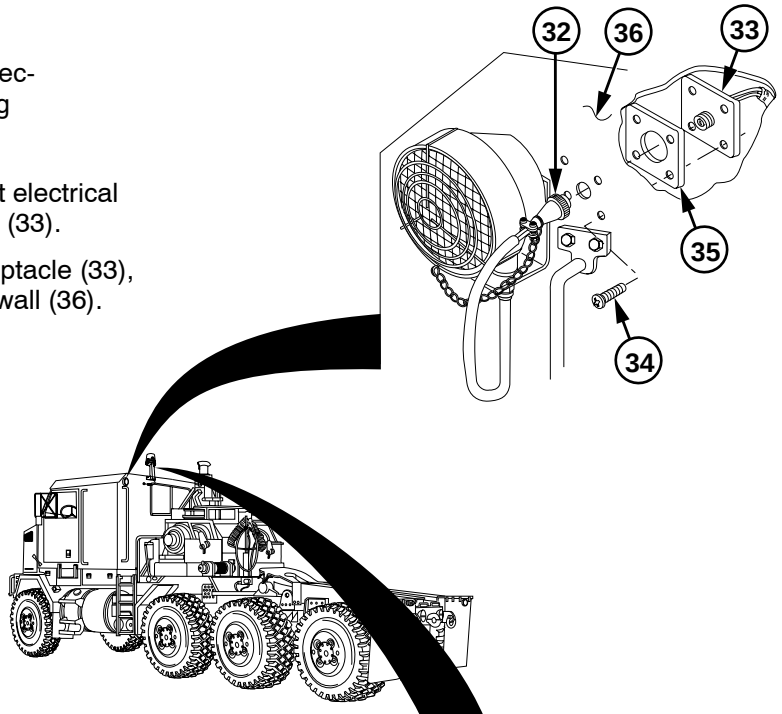
6-7. REAR CAB WIRE HARNESS REPLACEMENT (CONT)

NOTE

Covers and electrical connectors are removed by turning collar counterclockwise.

(18) Remove driver's side work light electrical connector (32) from receptacle (33).

(19) Remove four screws (34), receptacle (33), and gasket (35) from cab rear wall (36). Discard gasket.

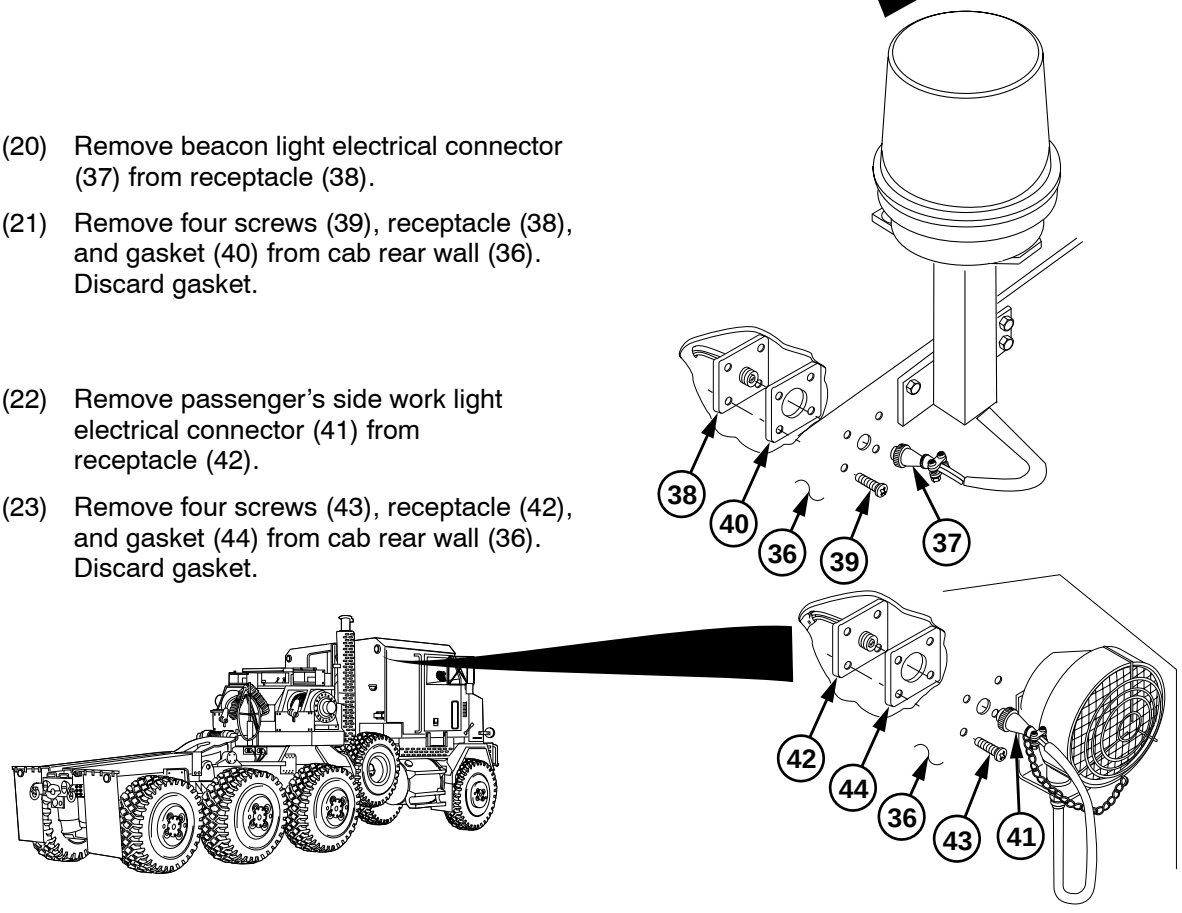


(20) Remove beacon light electrical connector (37) from receptacle (38).

(21) Remove four screws (39), receptacle (38), and gasket (40) from cab rear wall (36). Discard gasket.

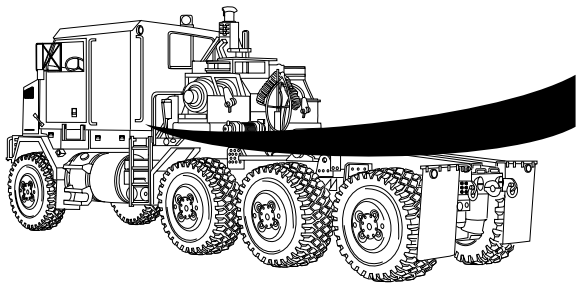
(22) Remove passenger's side work light electrical connector (41) from receptacle (42).

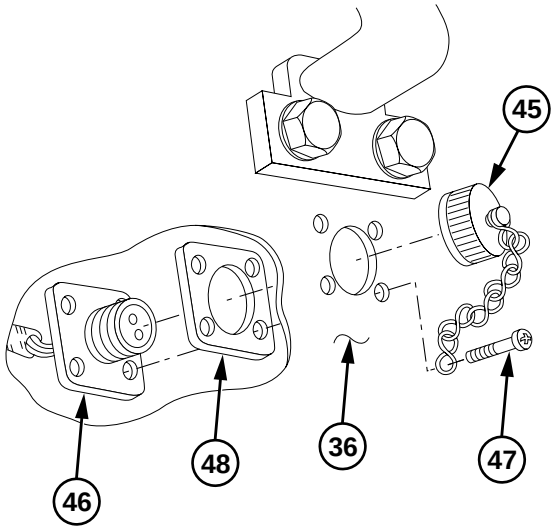
(23) Remove four screws (43), receptacle (42), and gasket (44) from cab rear wall (36). Discard gasket.



(24) Remove cover (45) from driver's side lower work light receptacle (46).

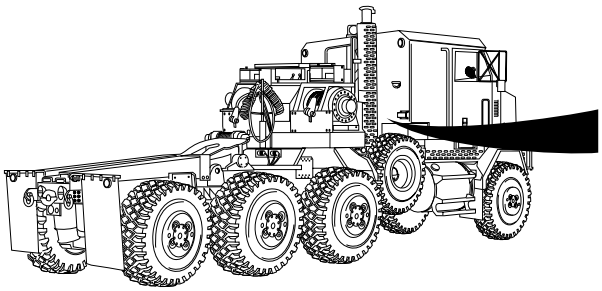
(25) Remove four screws (47), receptacle (46), and gasket (48) from cab rear wall (36). Discard gasket.

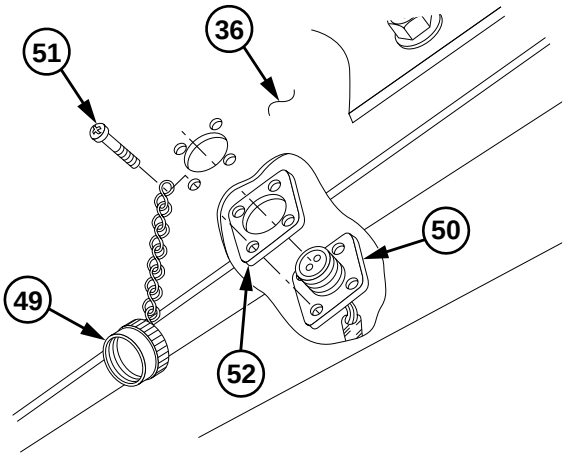




(26) Remove cover (49) from passenger's side lower work light receptacle (50).

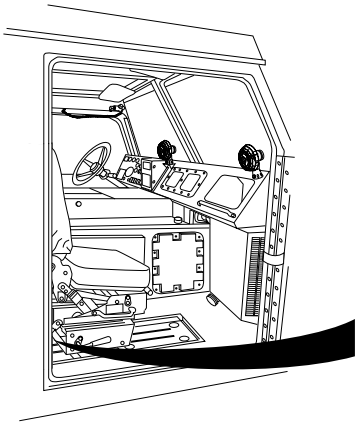
(27) Remove four screws (51), receptacle (50), and gasket (52) from cab rear wall (36). Discard gasket.

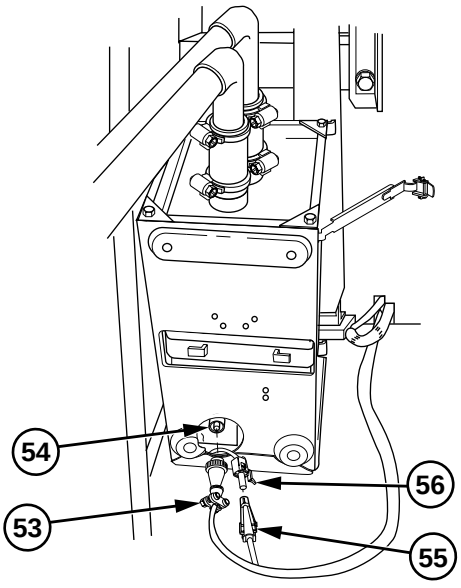




(28) Remove electrical connector (53) from GPFU precleaner electrical connector (54).

(29) Remove electrical connector (55) from GPFU precleaner electrical connector (56).





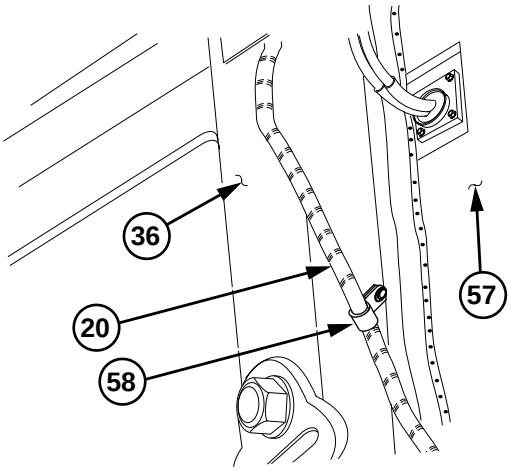
6-7. REAR CAB WIRE HARNESS REPLACEMENT (CONT)

(30) Pull rear insulation (57) back about 3 in. (76.2 mm) from cab rear wall (36).

(31) Cut and remove eight snap clips (58) from wire harness (20) and cab rear wall (36). Discard snap clips.

(32) Deleted.

(33) Deleted.

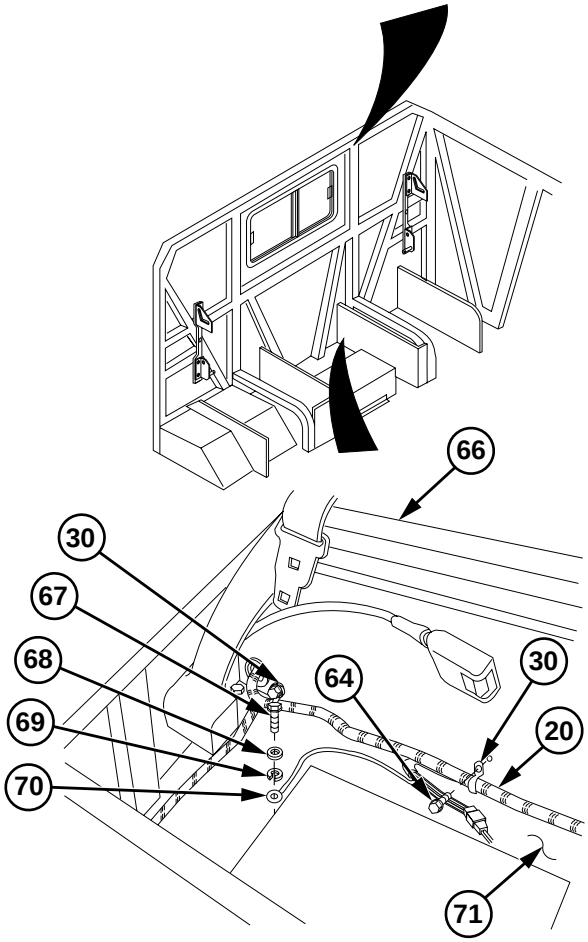


NOTE

Location of plastic cable ties should be marked before removal.

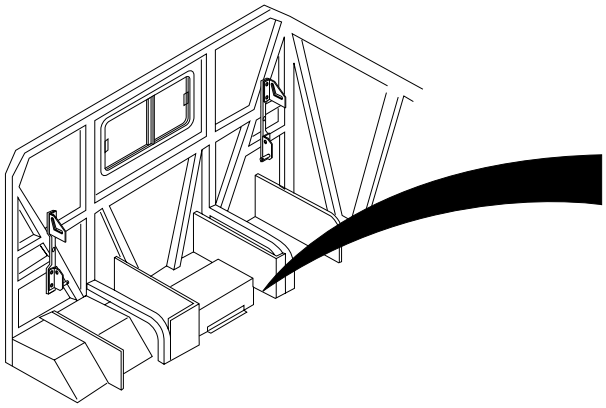
(34) Remove five screws (64) and plastic cable ties (30) from cab wire harness (20) and rear seat bracket (66).

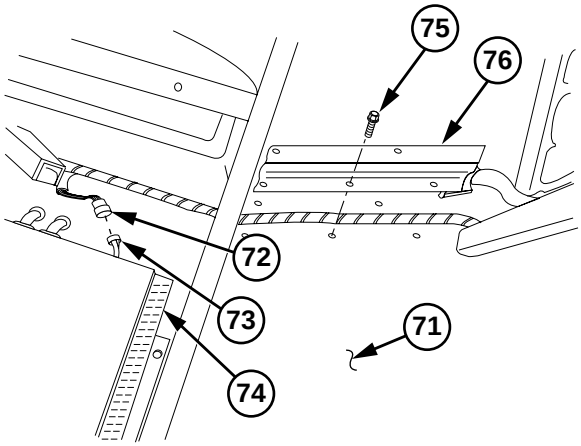
(35) Remove screw (67), washer (68), lockwasher (69), and wire no. 1435 (70) from cab floor (71). Discard lockwasher.



(36) Remove electrical connector (72) from electrical connector (73) on rear heater (74).

(37) Remove five screws (75) and cover plate (76) from cab floor (71).

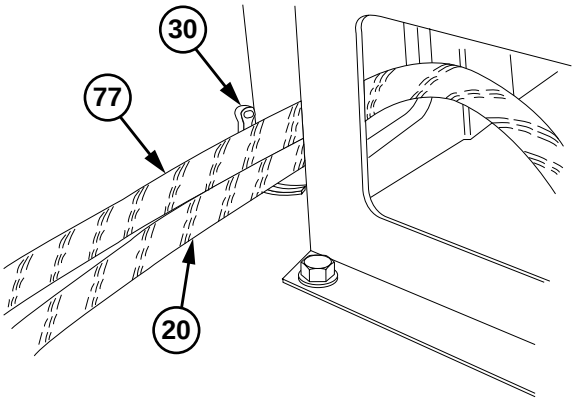


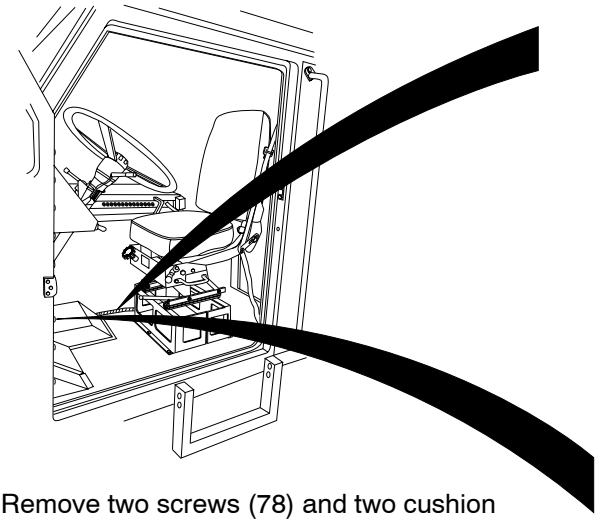


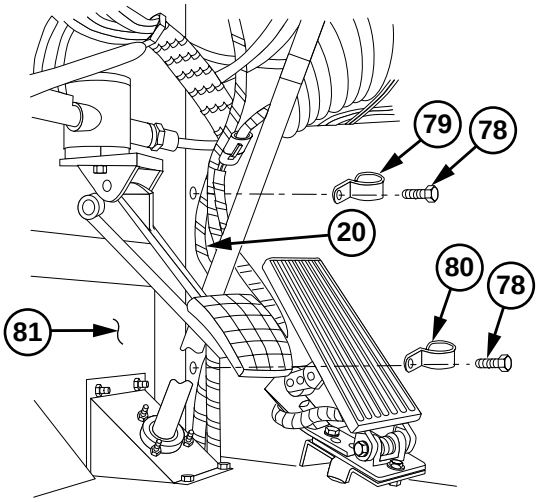
NOTE

Location of plastic cable ties should be marked before removal.

(38) Remove plastic cable ties (30) from cab wire harness (20) and CTI wire harness (77).





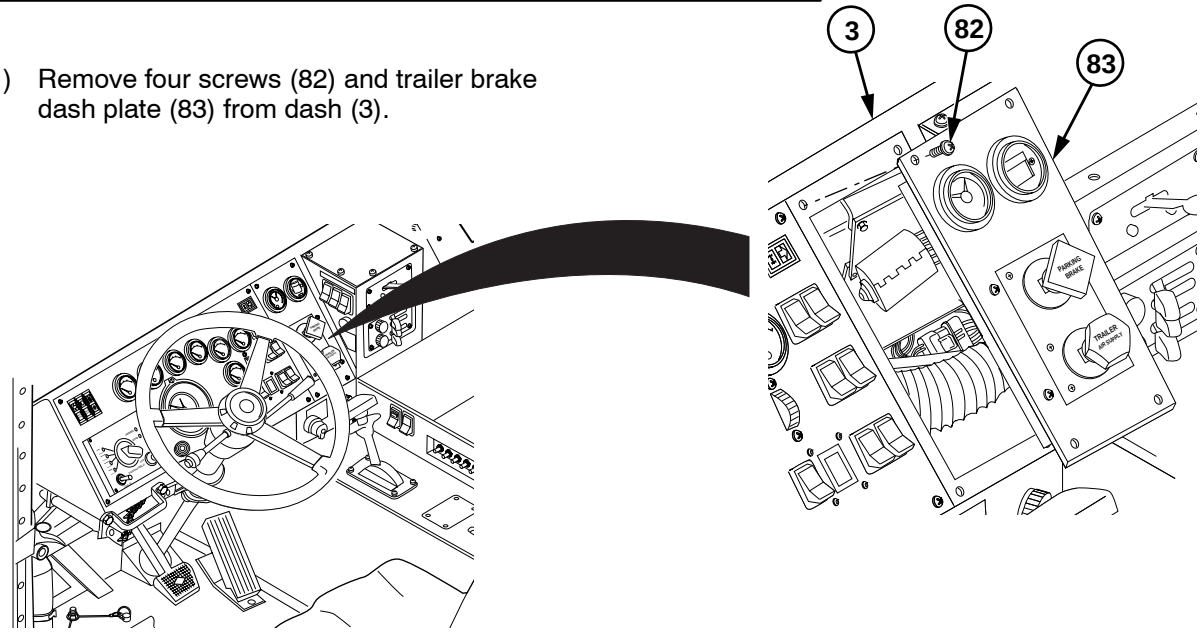


(39) Remove two screws (78) and two cushion clips (79 and 80) from driver's side front wall (81).

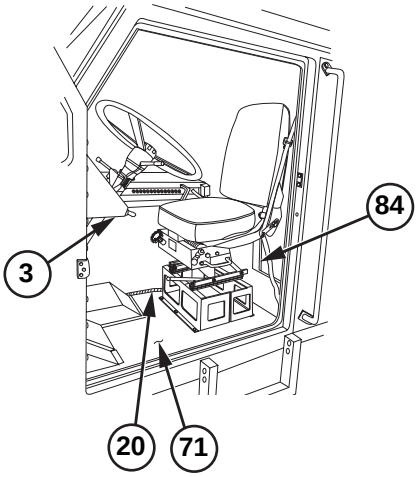
(40) Remove two cushion clips (79 and 80) from cab wire harness (20).

6-7. REAR CAB WIRE HARNESS REPLACEMENT (CONT)

(41) Remove four screws (82) and trailer brake dash plate (83) from dash (3).

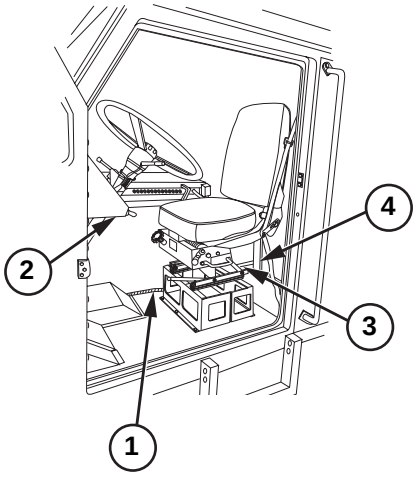


(42) Remove left side of cab wire harness (20) through backseat supports (84), cab floor (71), and opening in dash (3).

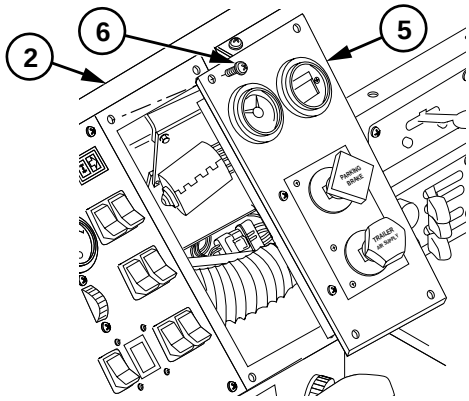


b. Installation

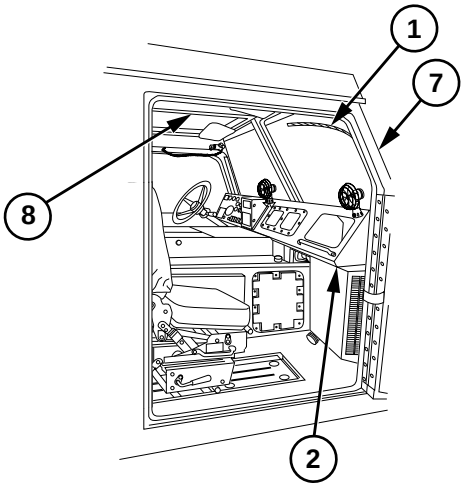
(1) Route left side cab wire harness (1) through dash (2), floor channel (3), and back seat supports (4).



(2) Install trailer brake dash plate (5) on dash (2) with four screws (6).

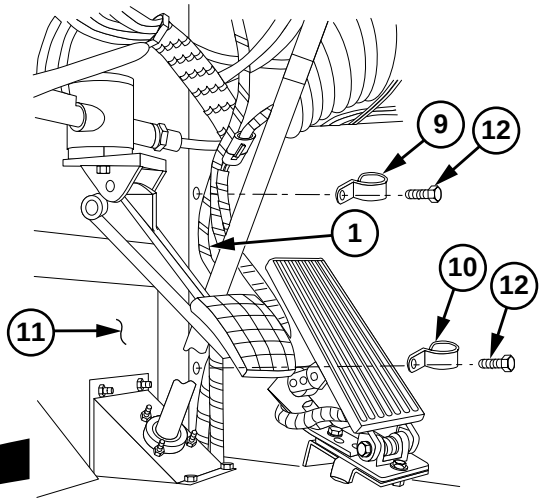


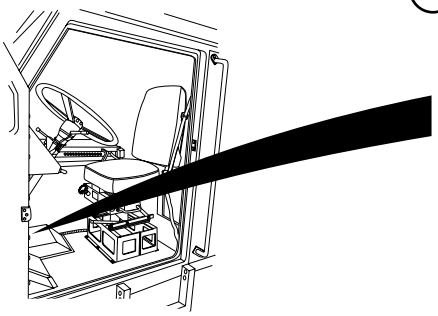
(3) Route right side cab wire harness (1) through dash (2), passenger side cab wall (7), and cab roof (8).



(4) Install two cushion clips (9 and 10) on cab wire harness (1).

(5) Install two cushion clips (9 and 10) on cab wall (11) with screws (12).

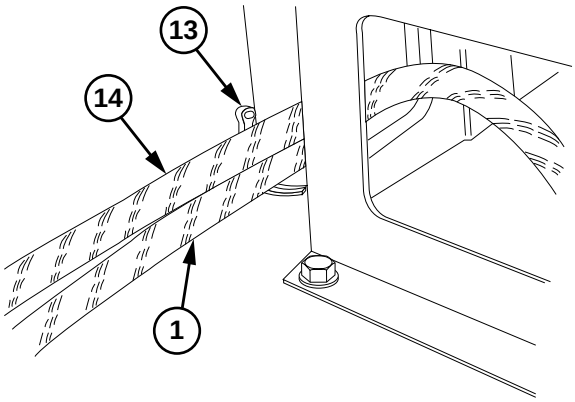




NOTE

Plastic cable ties should be positioned in locations marked during removal.

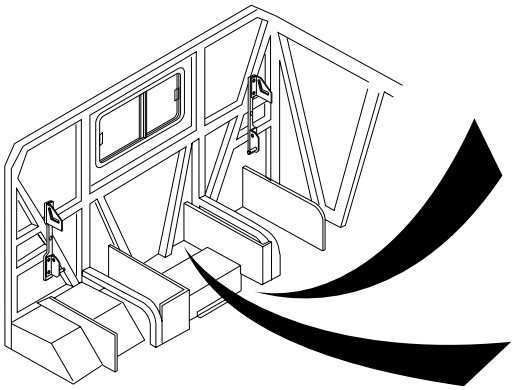
(6) Install plastic cable ties (13) on cab wire harness (1) and CTI wire harness (14).

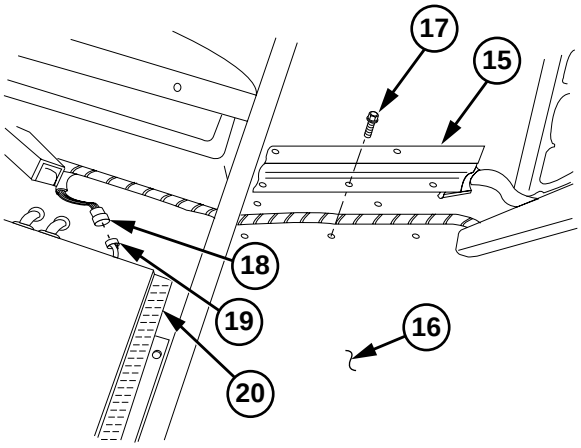


6-7. REAR CAB WIRE HARNESS REPLACEMENT (CONT)

(7) Install cover plate (15) on cab floor (16) with five screws (17).

(8) Install electrical connector (18) to electrical connector (19) on rear heater (20).



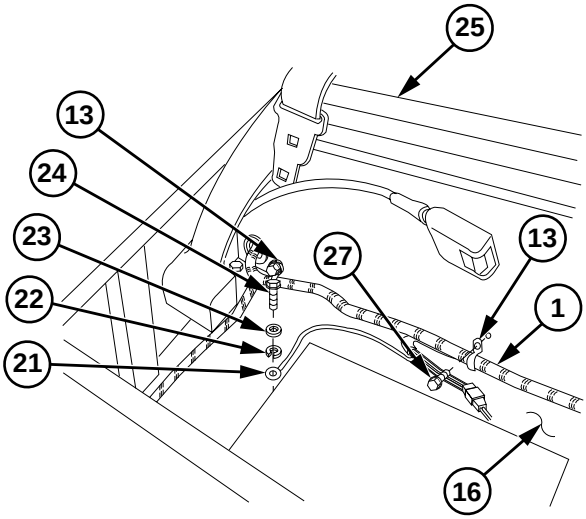


(9) Install wire no. 1435 (21) on cab floor (16) with new lockwasher (22), washer (23), and screw (24).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(10) Install cab wire harness (1) on rear seat bracket (25) and cab floor (16) with five plastic cable ties (13) and screws (27).



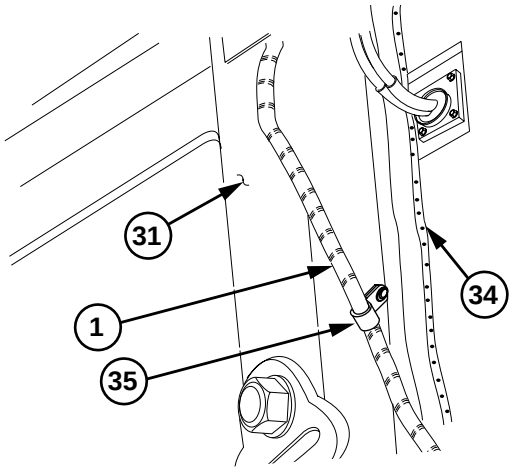
(11) Deleted.

(12) Deleted.

NOTE

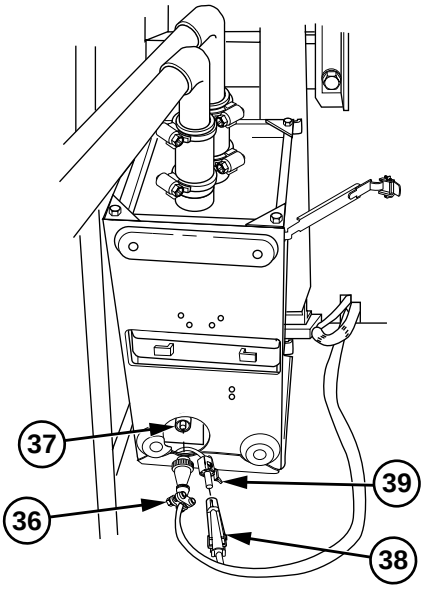
- Snap clips are installed with lock button pulled out.
- To lock snap clips push in lock button after snap clip is seated.

(13) Pull insulation (34) back 3 in. (76.2 mm) from cab rear wall (31) and install cab wire harness (1) to cab rear wall (31) with eight new snap clips (35).



(14) Install electrical connector (36) to GPFU precleaner electrical connector (37).

(15) Install electrical connector (38) to GPFU precleaner electrical connector (39).



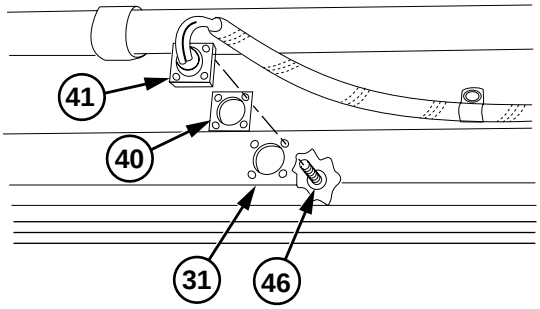
NOTE

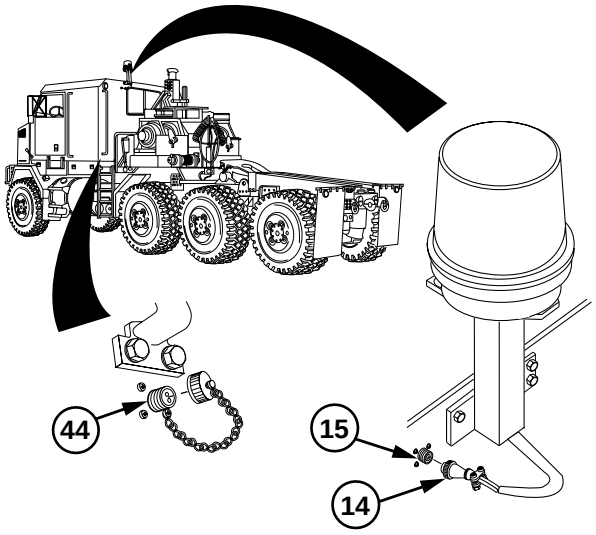
When receptacle is properly positioned, alignment tang will face up.

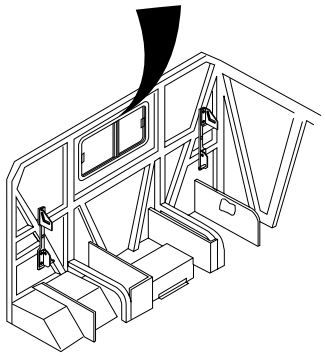
(16) Position five new gaskets (40) and receptacles (41 thru 45) on cab rear wall (31).

(17) Install 5 receptacles (41 thru 45) on cab wall (31) with 20 screws (46).

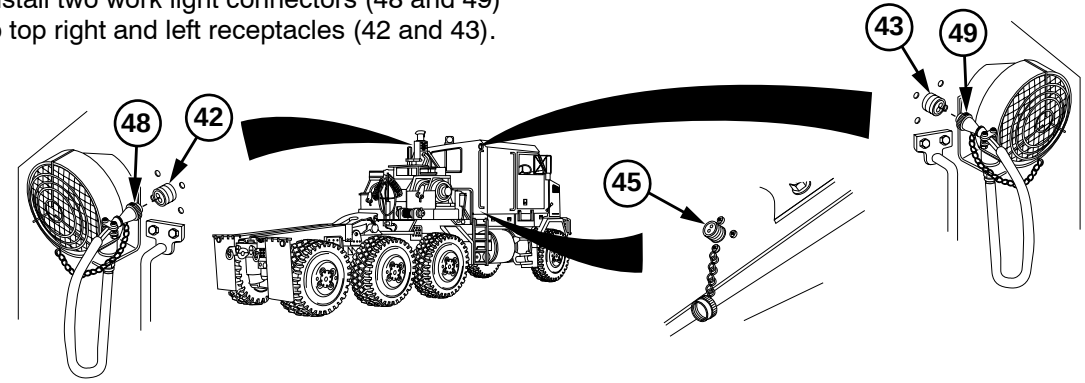
(18) Install beacon light connector (47) to center receptacle (41).



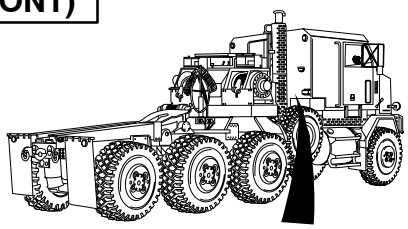




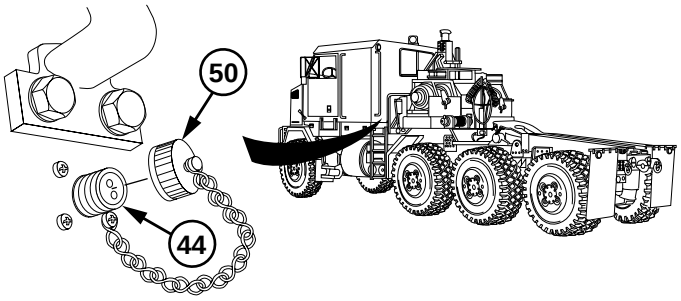
(19) Install two work light connectors (48 and 49) to top right and left receptacles (42 and 43).

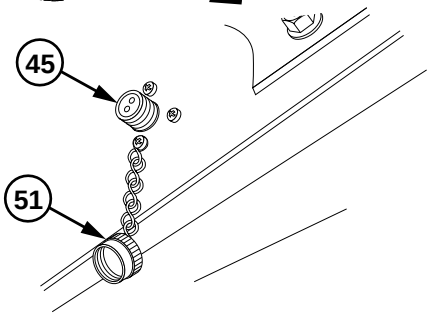


6-7. REAR CAB WIRE HARNESS REPLACEMENT (CONT)



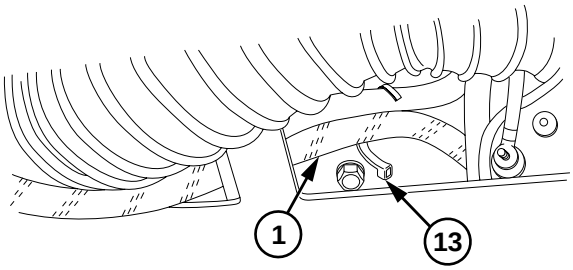
(20) Install two covers (50 and 51) to lower right and left side receptacles (44 and 45).





NOTE

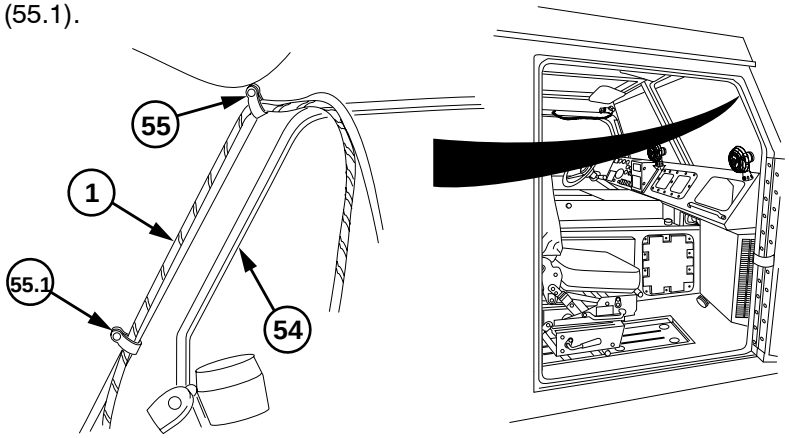
Plastic cable ties should be positioned in locations marked during removal.



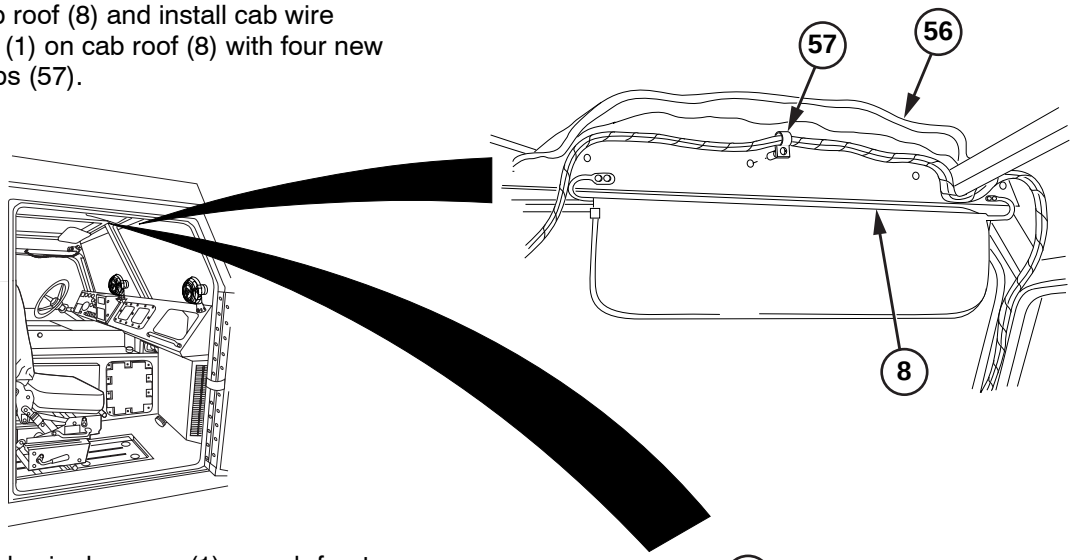
(21) Install plastic cable tie (13) on cab wire harness (1).

(22) Deleted.

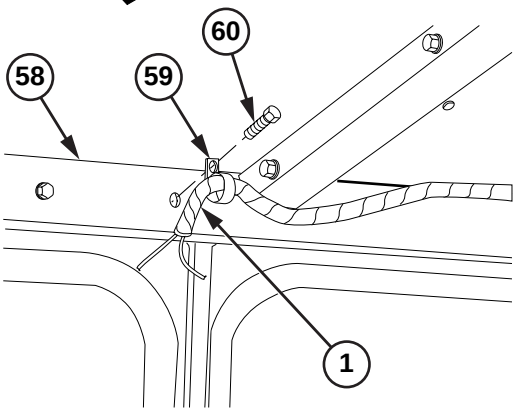
(23) Install cab wire harness (1) on passenger side cab wall (54) with new snap clip (55) and snap clip (55.1).



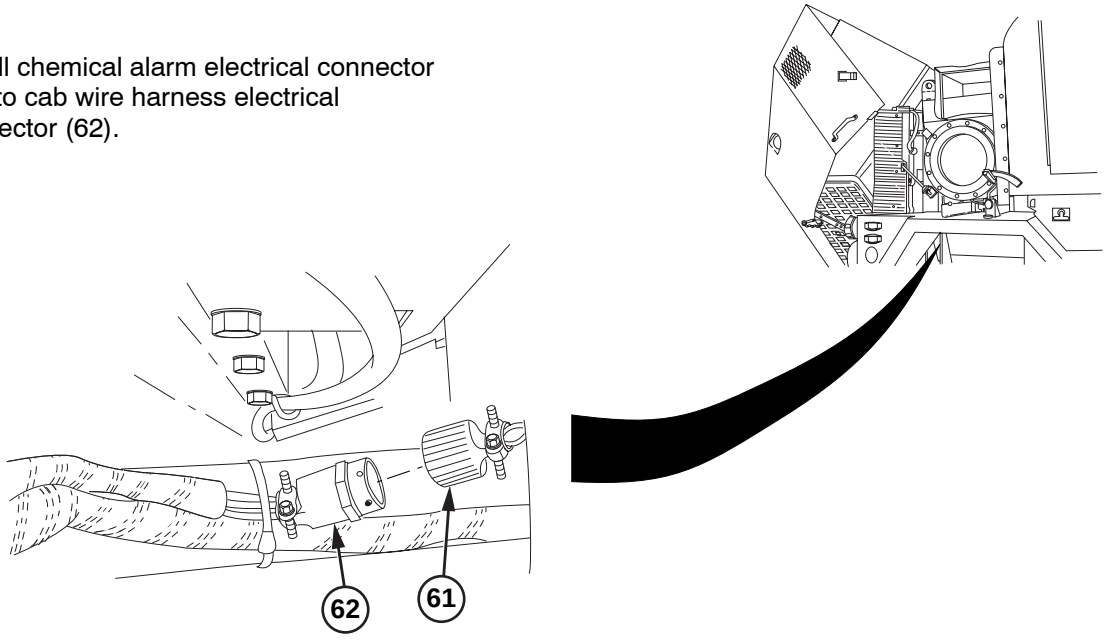
(24) Pull insulation (56) back 3 in. (76.2 mm) from cab roof (8) and install cab wire harness (1) on cab roof (8) with four new snap clips (57).



(25) Install cab wire harness (1) on cab front brace (58) with cushion clip (59) and screw (60).



(26) Install chemical alarm electrical connector (61) to cab wire harness electrical connector (62).

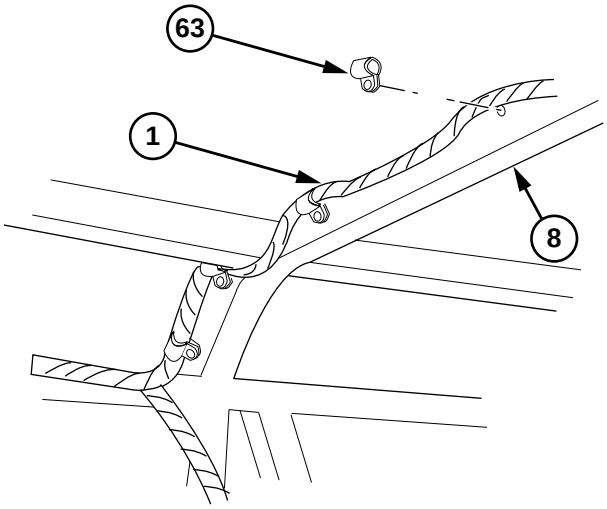


6-7. REAR CAB WIRE HARNESS REPLACEMENT (CONT)

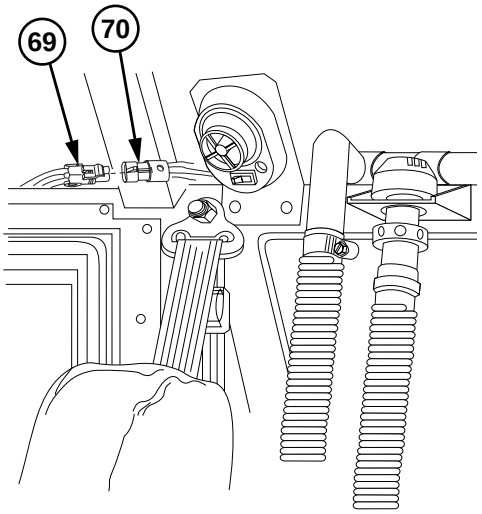
(27) Install cab wire harness (1) on cab roof (8) with four new snap clips (63).

(28) Deleted.

(29) Deleted.



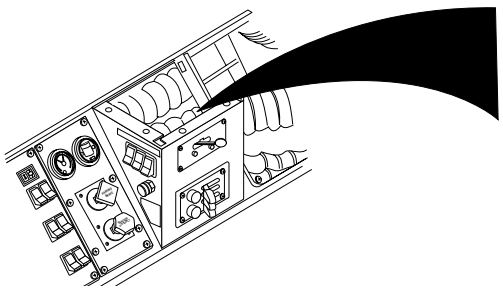
(30) Install electrical connector (69) to right side map light electrical connector (70).

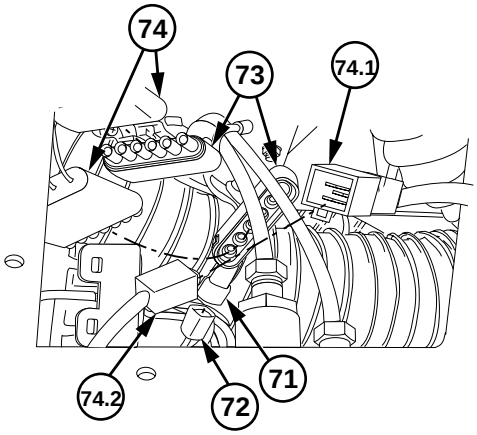


(31) Install electrical connector (71) to rear heater switch electrical connector (72).

(32) Install two rear cab light harness connectors (73) to cab wire harness electrical connectors (74).

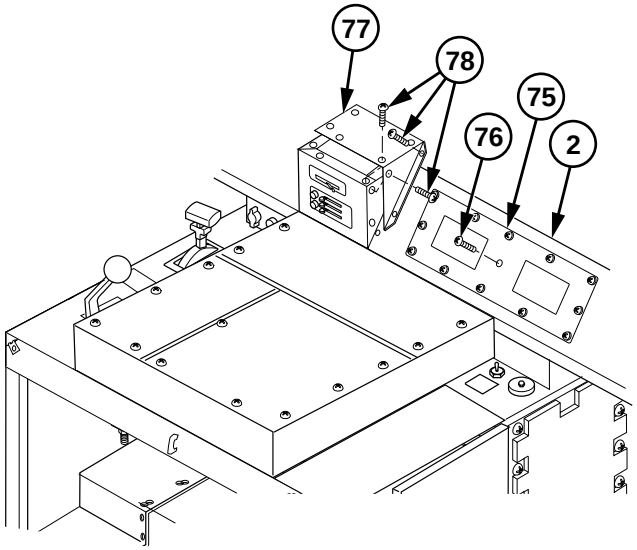
(32.1) Install electrical connector (74.1) on cab wire harness connector (74.2).





(33) Install panel (75) on dash (2) with 13 screws (76).

(34) Install panel (77) on dash (2) with nine screws (78).



c. Follow-On Maintenance

(1) Install ventilator lower plenum chamber (TM 9-2320-360-20).

(1.1) Connect batteries (TM 9-2320-360-20).

(2) Turn Ignition switch to ON position (TM 9-2320-360-10).

(3) Check cab electrical system for proper operation.

(4) Turn Ignition switch to OFF position (TM 9-2320-360-10).

(5) Install backseat cushion/frame (TM 9-2320-360-20).

(6) Backseat returned to lower position (TM 9-2320-360-10).

(7) Install footrest (TM 9-2320-360-10).

6-8. CHASSIS WIRE HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

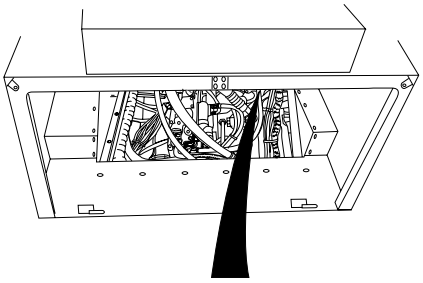
Equipment Conditions
Engine hood opened (TM 9-2320-360-10).
Exhaust heat shield removed (TM 9-2320-360-20).
Batteries disconnected (TM 9-2320-360-20).
Access panels removed (TM 9-2320-360-20).
Stowage box removed (TM 9-2320-360-20).
Catwalk removed (TM 9-2320-360-20).
Inner fender removed (left side only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-150 Lb-In. (Item 234, Appendix E)

Materials/Parts
Grease, Anticorrosion (Item 31, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknuts (31) (Item 96, Appendix F)
Locknuts (6) (Item 81, Appendix F)
Locknuts (4) (Item 75, Appendix F)
Locknuts (2) (Item 89, Appendix F)
Locknuts (3) (Item 92, Appendix F)
Locknuts (2) (Item 94, Appendix F)
Lockwashers (7) (Item 120, Appendix F)
Lockwashers (6) (Item 118, Appendix F)
Lockwashers (4) (Item 122, Appendix F)
Lockwashers (3) (Item 117, Appendix F)

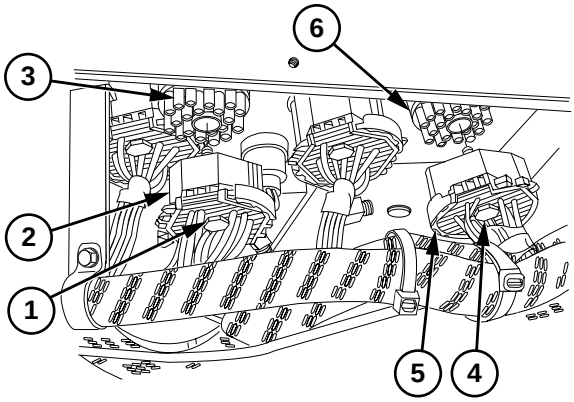
a. Removal

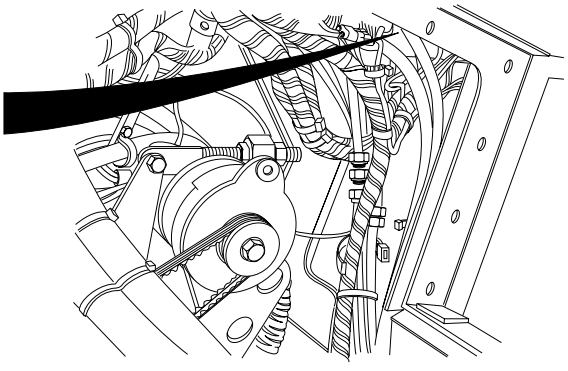
NOTE
Tag and mark wires before removal.



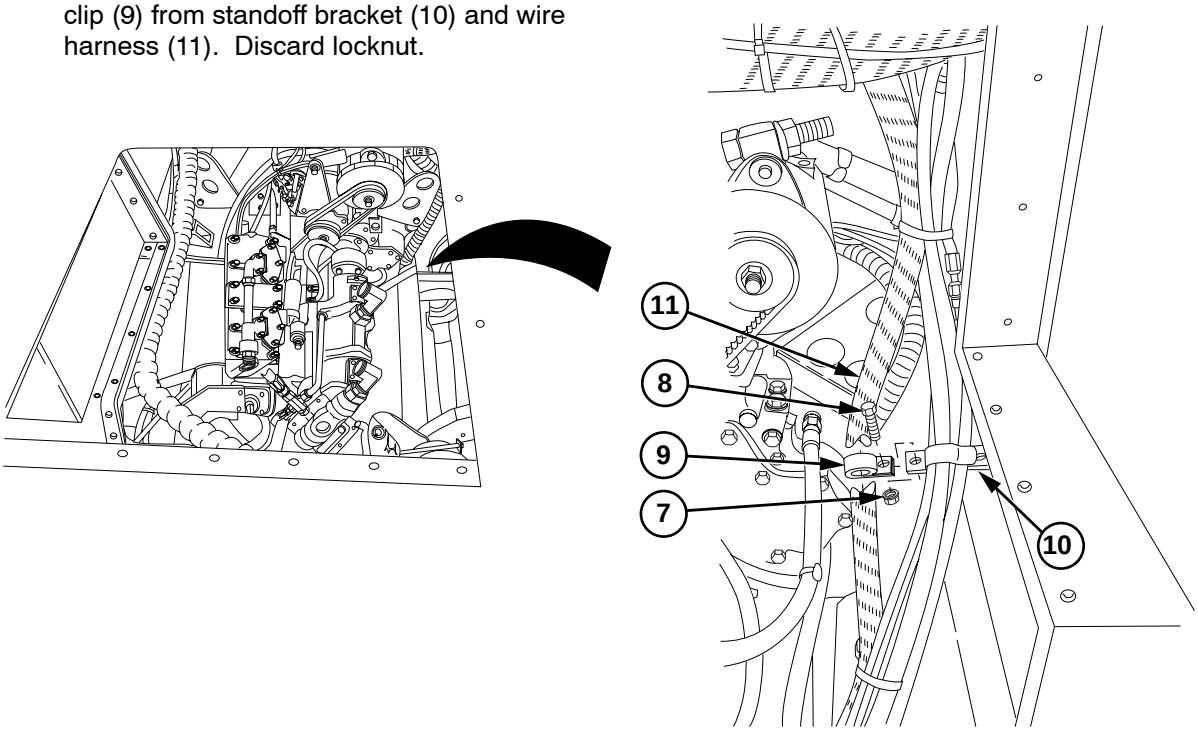
(1) Loosen screw (1) and remove red harness connector (2) from red cab connector (3).

(2) Loosen screw (4) and remove orange harness connector (5) from orange cab connector (6).

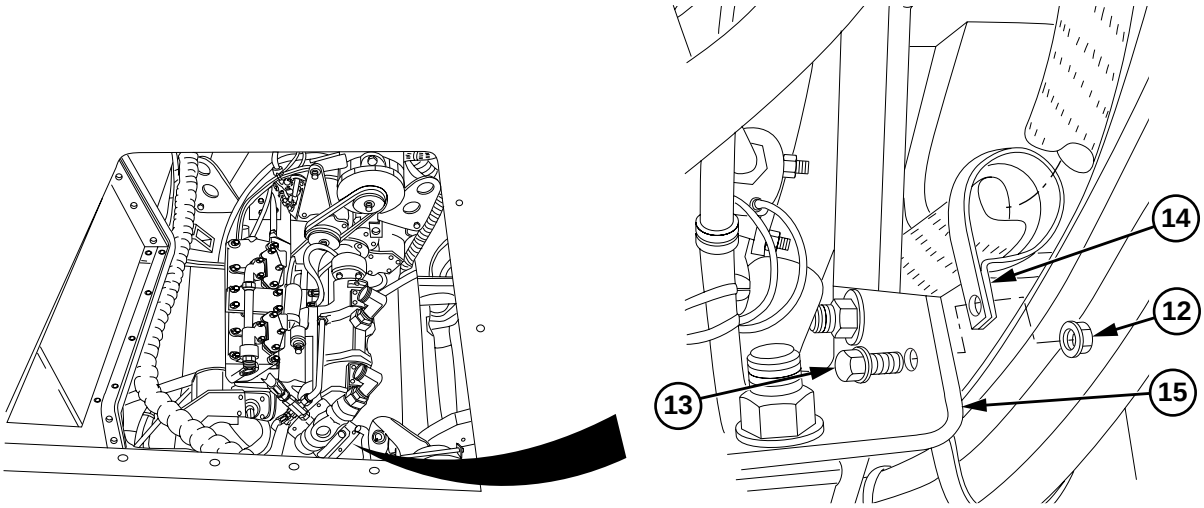




(3) Remove locknut (7), screw (8), and cushion clip (9) from standoff bracket (10) and wire harness (11). Discard locknut.

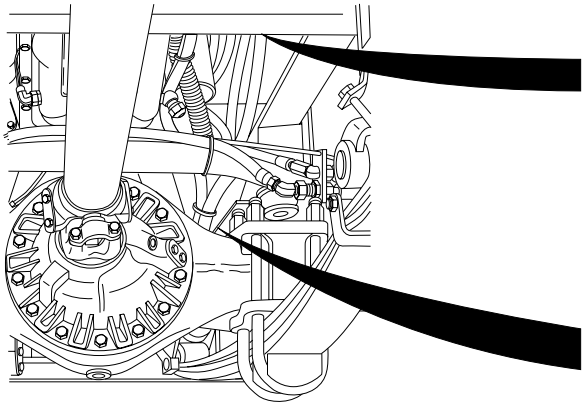


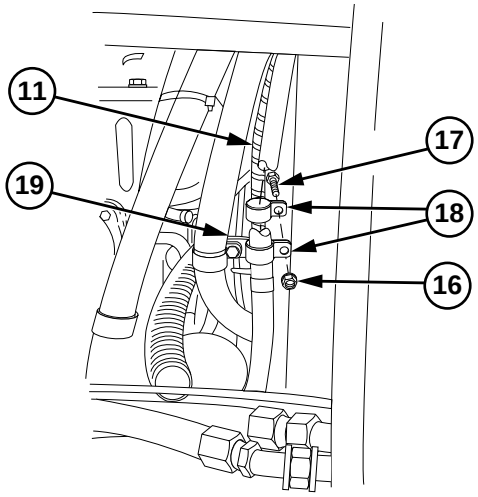
(4) Remove locknut (12), screw (13), and cushion clip (14) from right side engine/ transmission cradle (15) and wire harness (11). Discard locknut.

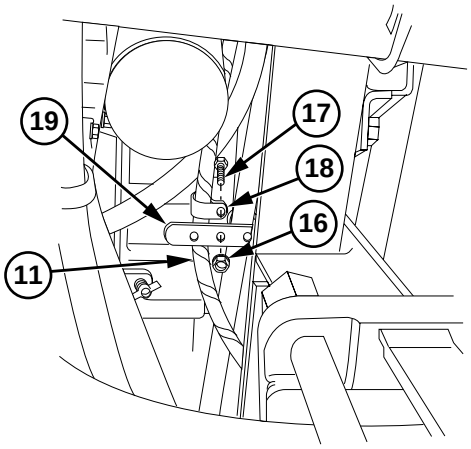


6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

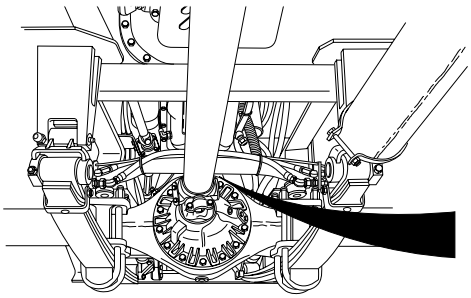
(5) Remove two locknuts (16), screws (17), and cushion clips (18) from standoff brackets (19) and harness (11). Discard locknuts.

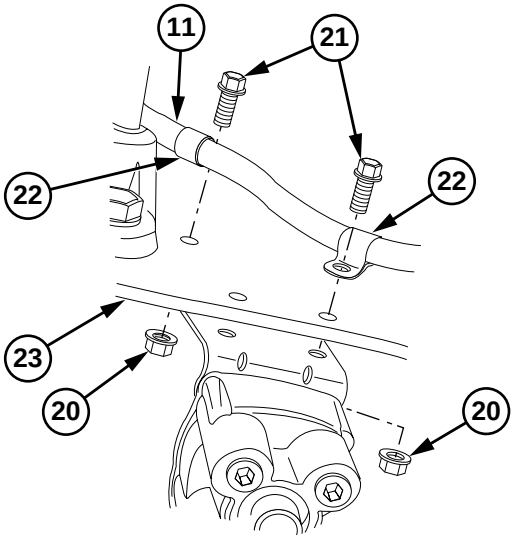






(6) Remove two locknuts (20), screws (21), and cushion clips (22) from front crossmember (23) and harness (11). Discard locknuts.



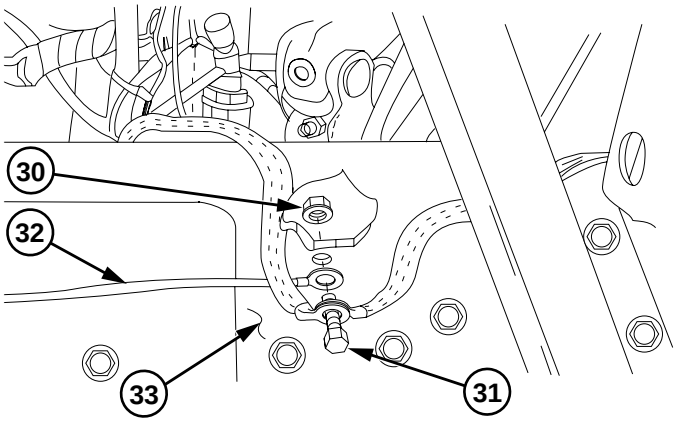


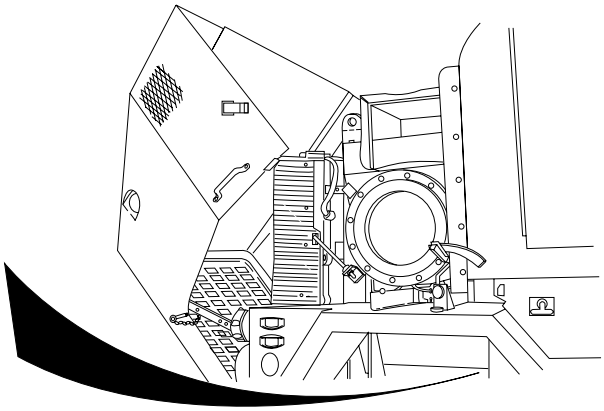
(7) Deleted.

NOTE

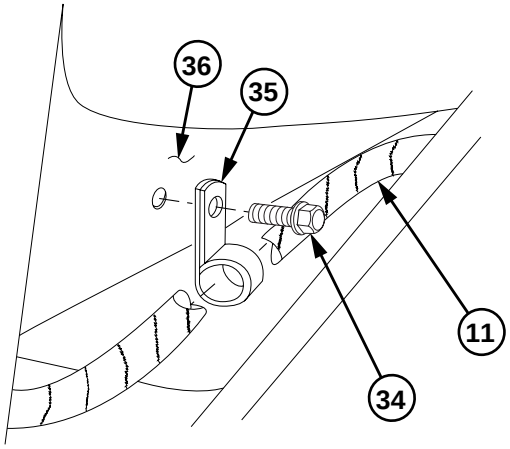
- Perform step (8) for vehicles up to serial number 73042.
- Perform step (9) for vehicles with serial number 73043 and higher.

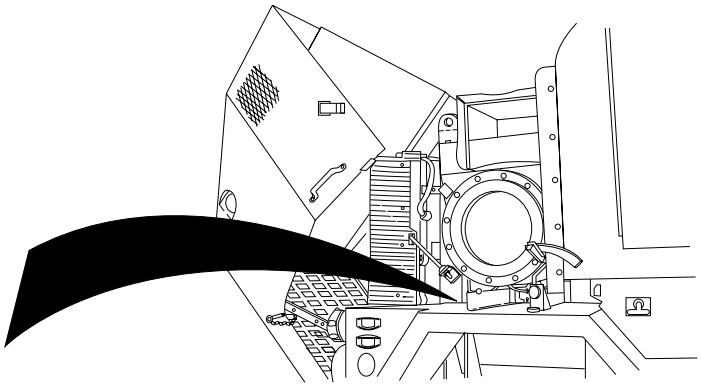
(8) Remove locknut (30), screw (31), and ground wire no. 1435 (32) from left frame (33). Discard locknut.





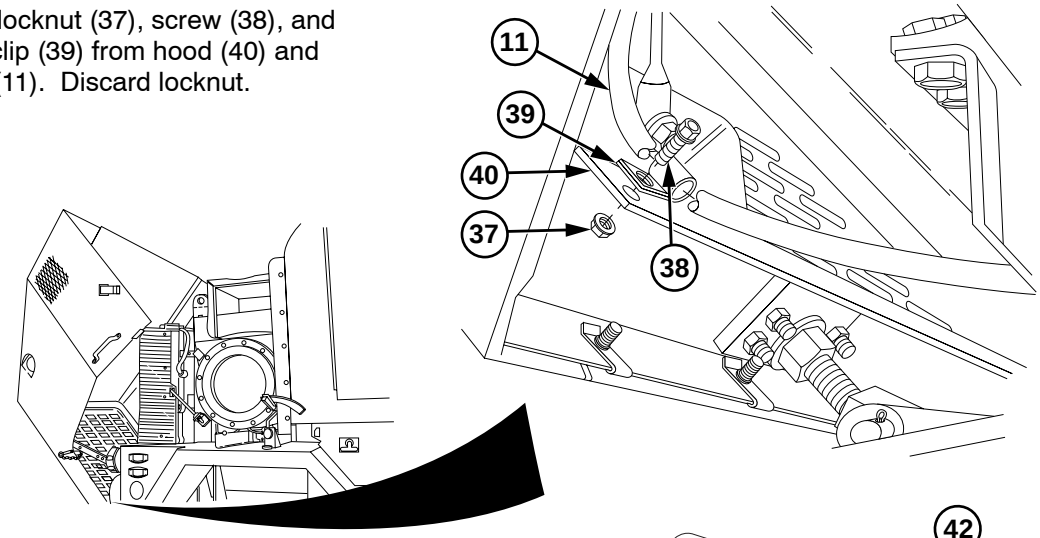
(9) Remove screw (34) and cushion clip (35) from fan shroud (36) and harness (11).





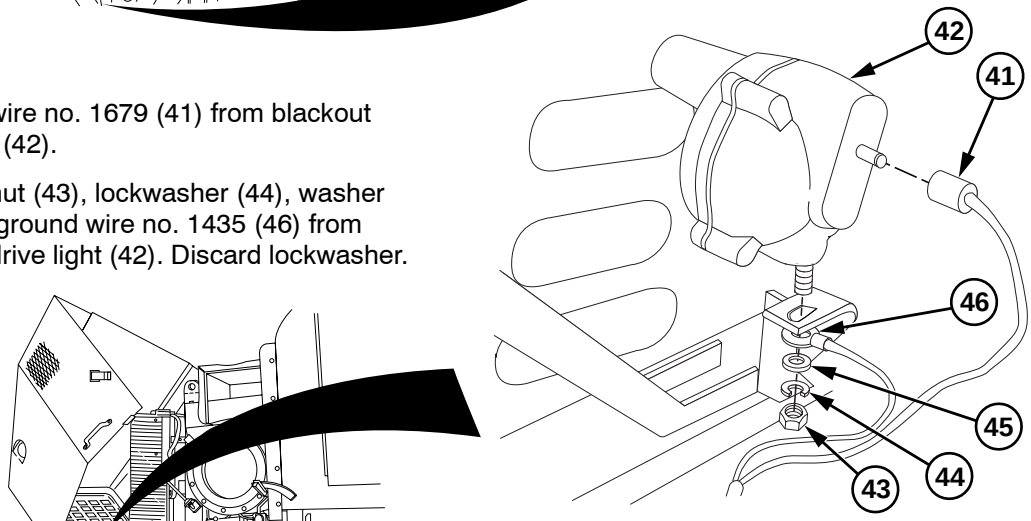
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

(10) Remove locknut (37), screw (38), and cushion clip (39) from hood (40) and harness (11). Discard locknut.



(11) Remove wire no. 1679 (41) from blackout drive light (42).

(12) Remove nut (43), lockwasher (44), washer (45), and ground wire no. 1435 (46) from blackout drive light (42). Discard lockwasher.



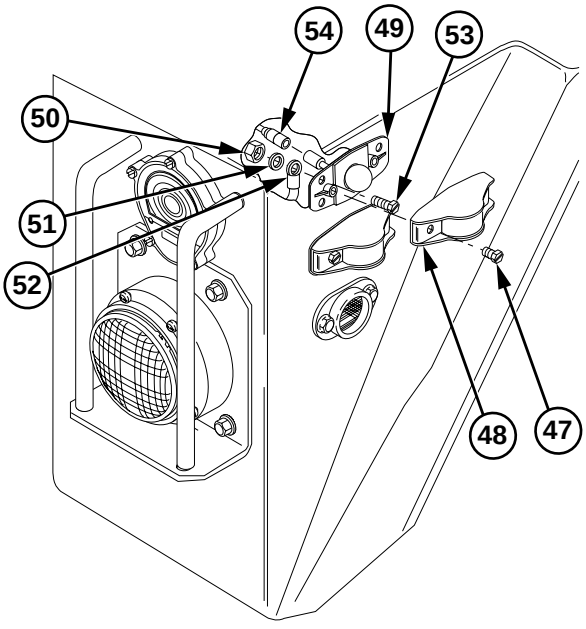
NOTE

Marker light cover must be removed to hold mounting screw while locknut and ground wire are removed. Do not replace marker light covers until new wire harness is installed.

(13) Remove two screws (47) and marker light cover (48) from left marker light base (49).

(14) Remove locknut (50), washer (51), and ground wire no. 1435 (52) from mounting screw (53). Discard locknut.

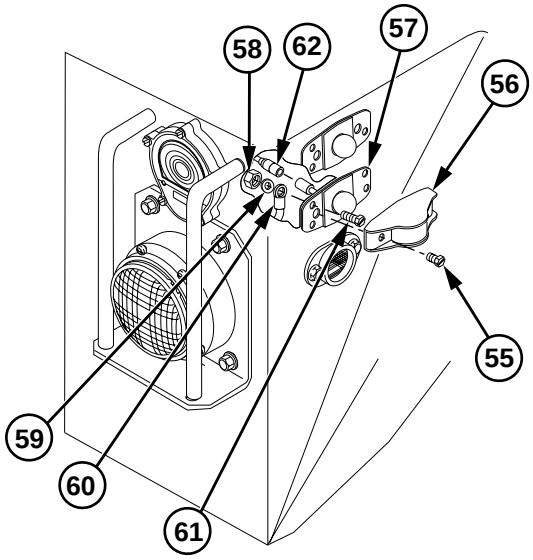
(15) Remove wire no. 1012 (54) from left marker light base (49).



(16) Remove two screws (55) and marker light cover (56) from left marker light base (57).

(17) Remove locknut (58), washer (59), and ground wire no. 1435 (60) from mounting screw (61). Discard locknut.

(18) Remove wire no. 1002 (62) from left marker light base (57).



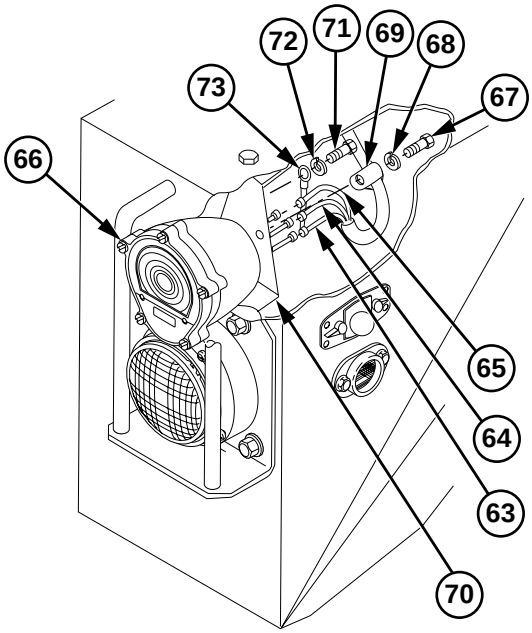
(19) Remove wire no. 1012 (63), wire no. 1002 (64), and wire no. 1680 (65) from left front composite light (66).

(20) Remove screw (67), lockwasher (68), and cushion clip (69) from left front composite light (66) and mounting bracket (70). Discard lockwasher.

CAUTION

Composite light must be supported to prevent from falling when mounting screw is removed. Failure to comply may result in damage to composite light.

(21) Remove screw (71), lockwasher (72), and ground wire no. 1435 (73) from left front composite light (66) and mounting bracket (70). Discard lockwasher.



6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

(22) Remove two screws (74) and lockwashers (75) from two headlight guards (76). Discard lockwashers.

NOTE

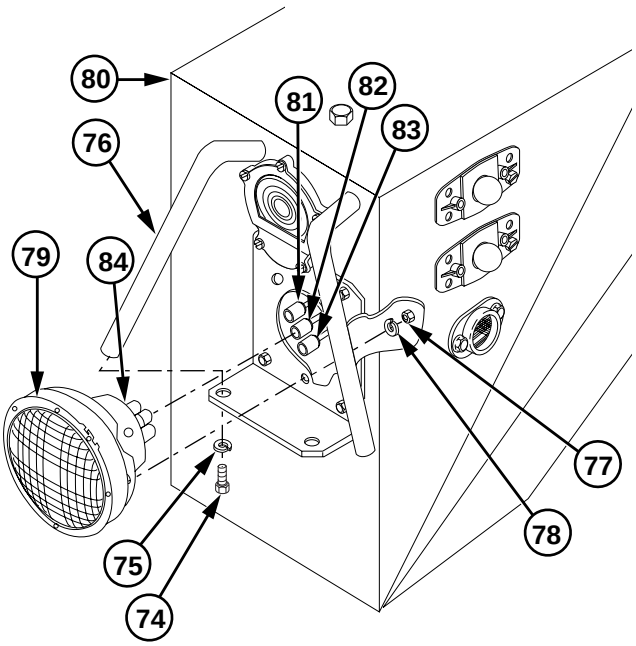
Swing headlight guards away from headlight assembly.

(23) Remove three nuts (77), lockwashers (78), and left headlight assembly (79) from fender (80). Discard lockwashers.

NOTE

Tag and mark connectors before removing wires. Each harness wire has a numbered metal tag attached.

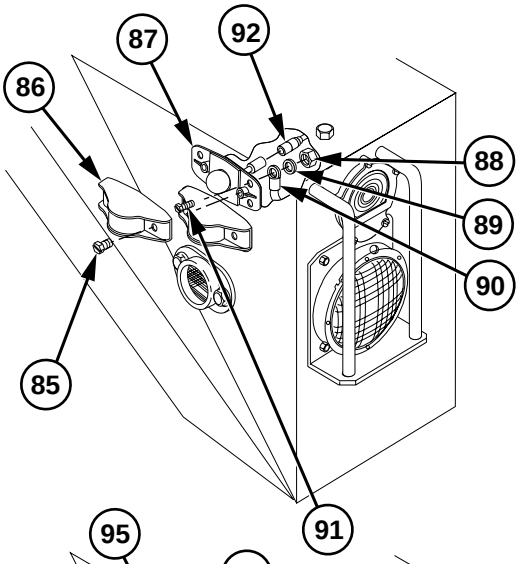
(24) Remove wire no. 1006 (81), wire no. 1007 (82), and ground wire no. 1435 (83) from three connectors (84) on left headlight assembly (79).



(25) Remove two screws (85) and marker light cover (86) from right marker light base (87).

(26) Remove locknut (88), washer (89), and ground wire no. 1435 (90) from mounting screw (91). Discard locknut.

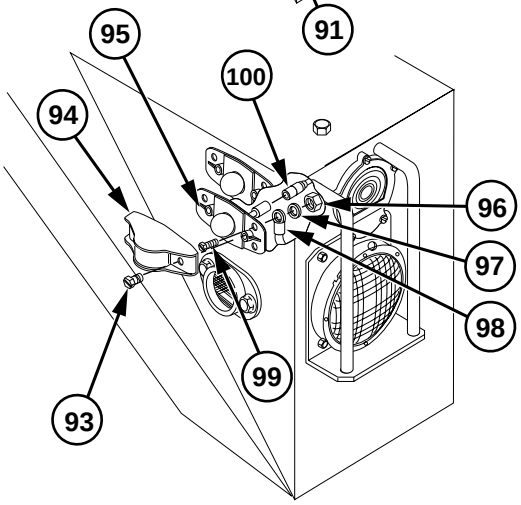
(27) Remove wire no. 1012 (92) from right marker light base (87).



(28) Remove two screws (93) and marker light cover (94) from right marker light base (95).

(29) Remove locknut (96), washer (97), and ground wire no. 1435 (98) from mounting screw (99). Discard locknut.

(30) Remove wire no. 1001 (100) from right marker light base (95).



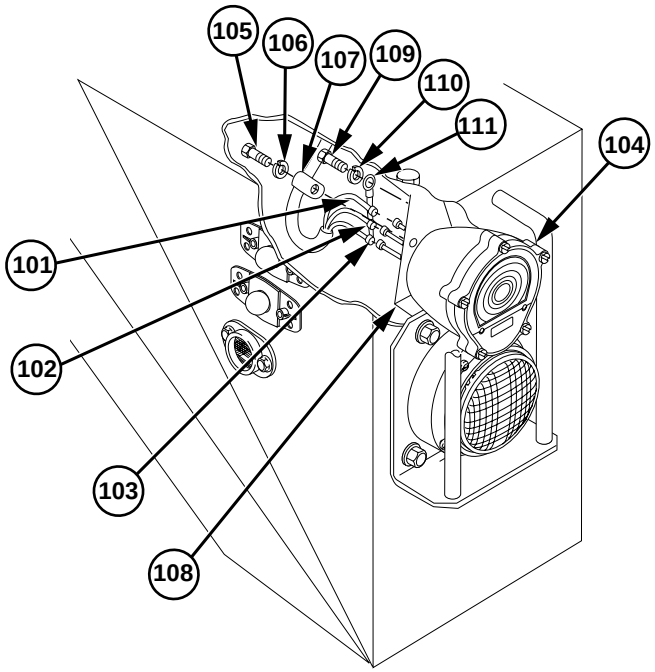
(31) Remove wire no. 1012 (101), wire no. 1001 (102), and wire no. 1680 (103) from right front composite light (104).

(32) Remove screw (105), lockwasher (106), and cushion clip (107) from right front composite light (104) and mounting bracket (108). Discard lockwasher.

CAUTION

Composite light must be supported to prevent from falling when mounting screw is removed. Failure to comply may result in damage to composite light.

(33) Remove screw (109), lockwasher (110), and ground wire no. 1435 (111) from right front composite light (104) and mounting bracket (108). Discard lockwasher.



(34) Remove two screws (112) and lockwashers (113) from two headlight guards (114). Discard lockwashers.

NOTE

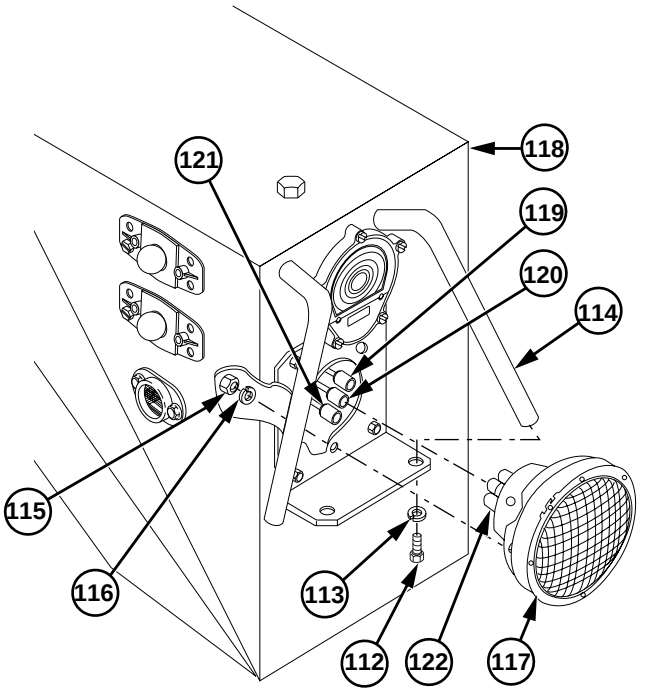
Swing headlight guards out away from headlight assembly.

(35) Remove three nuts (115), lockwashers (116), and right headlight assembly (117) from fender (118). Discard lockwashers.

NOTE

Tag and mark connectors before removing wires. Each harness wire has a numbered metal tag attached.

(36) Remove wire no. 1006 (119), wire no. 1007 (120), and ground wire no. 1435 (121) from three connectors (122) on right headlight assembly (117).

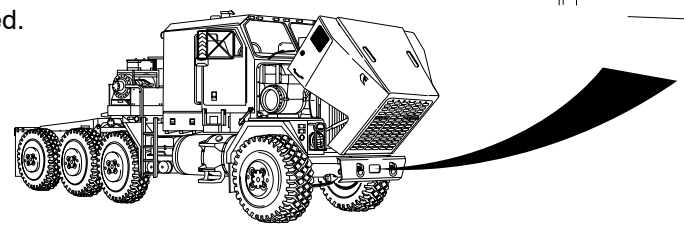


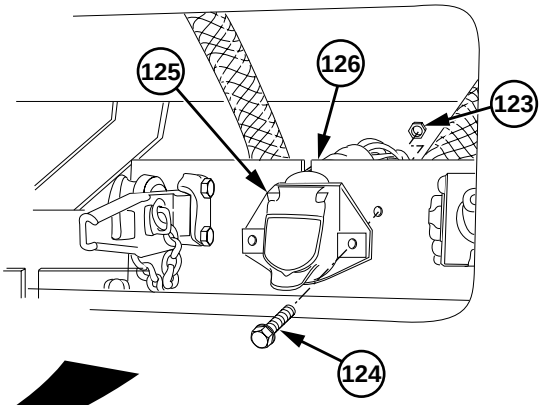
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

(37) Remove two locknuts (123), screws (124), and 7-pin electrical connector (125) from bracket (126). Discard locknuts.

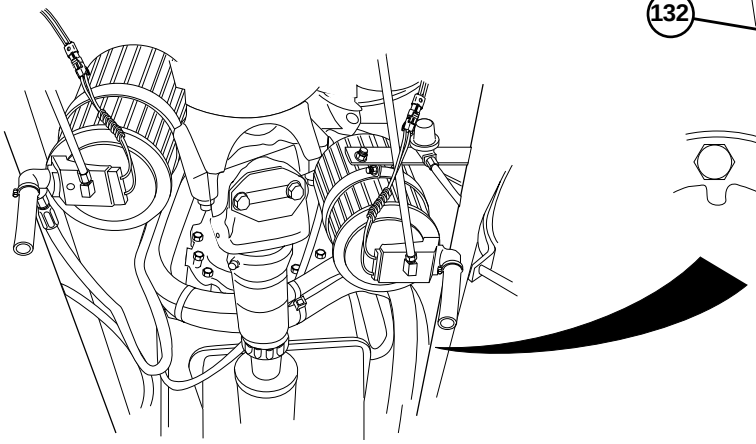
(38) Deleted.

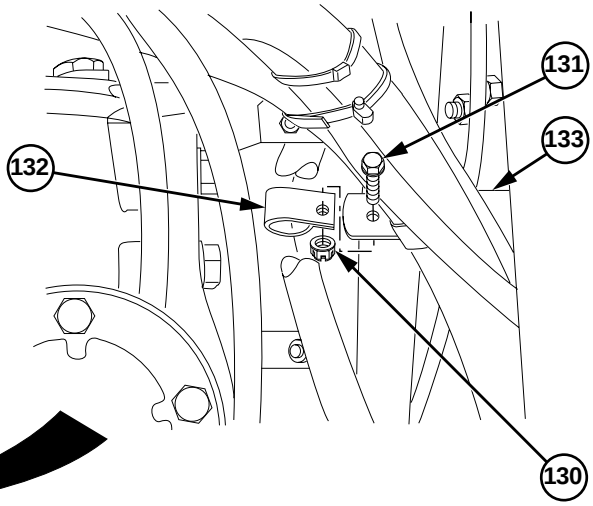
(39) Deleted.



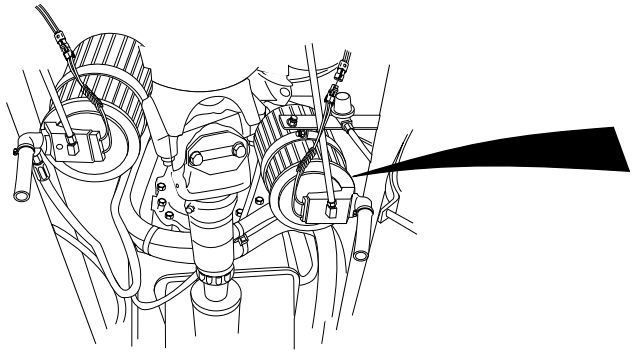


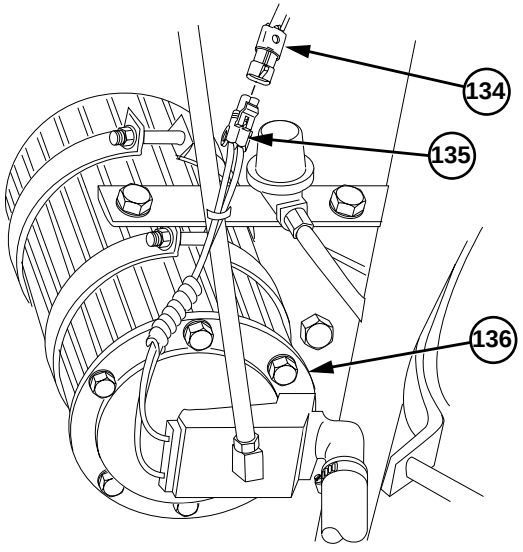
(40) Remove locknut (130), screw (131), and cushion clip (132) from standoff bracket (133) and harness (11). Discard locknut.



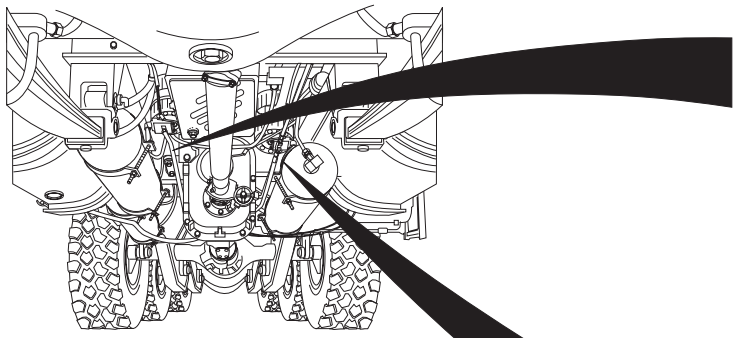


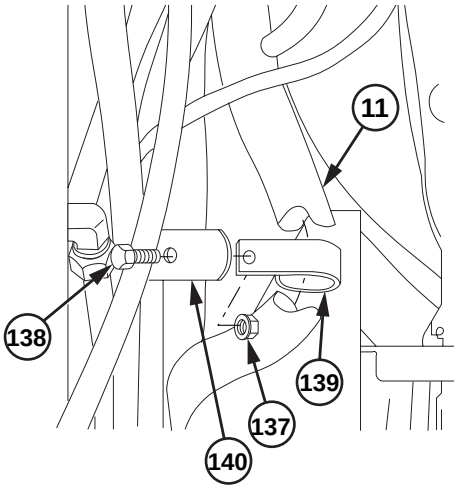
(41) Remove electrical connector (134) from electrical connector (135) on right air dryer (136).



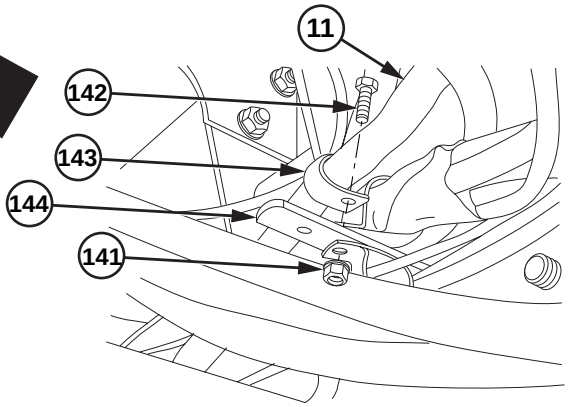


(42) Remove locknut (137), screw (138), and cushion clip (139) from standoff bracket (140) and harness (11). Discard locknut.

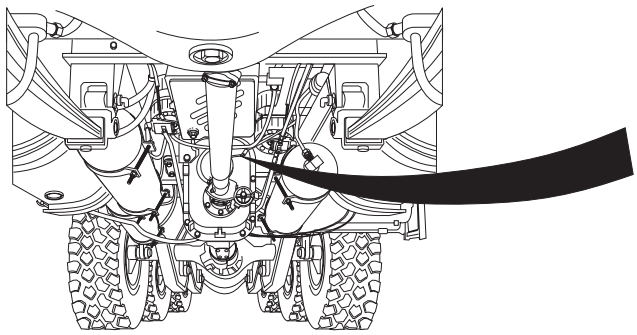


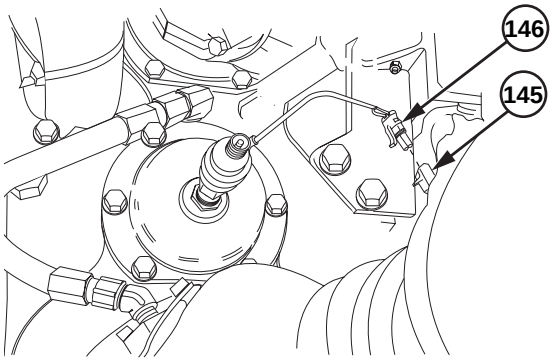


(43) Remove locknut (141), screw (142), and cushion clip (143) from standoff bracket (144) and harness (11). Discard locknut.



(44) Remove wire no. 1519 (145) from CTI signal generator (146).

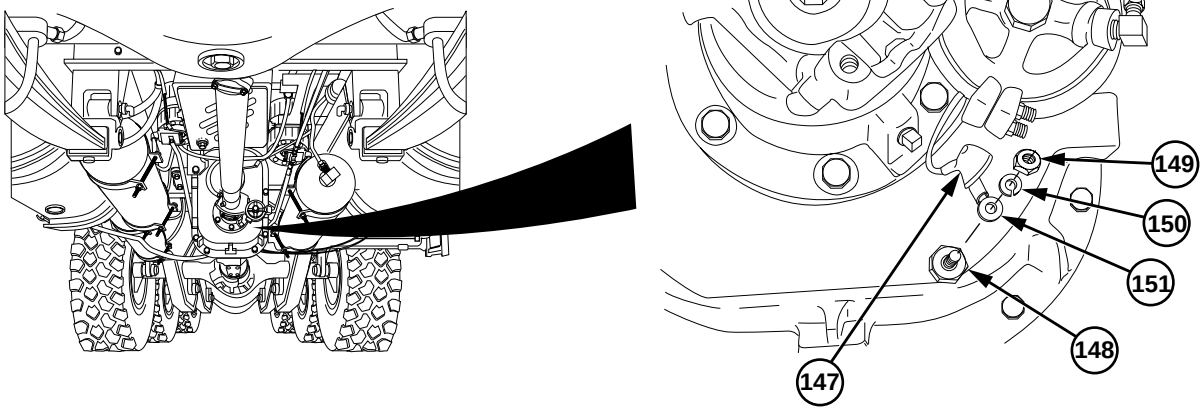




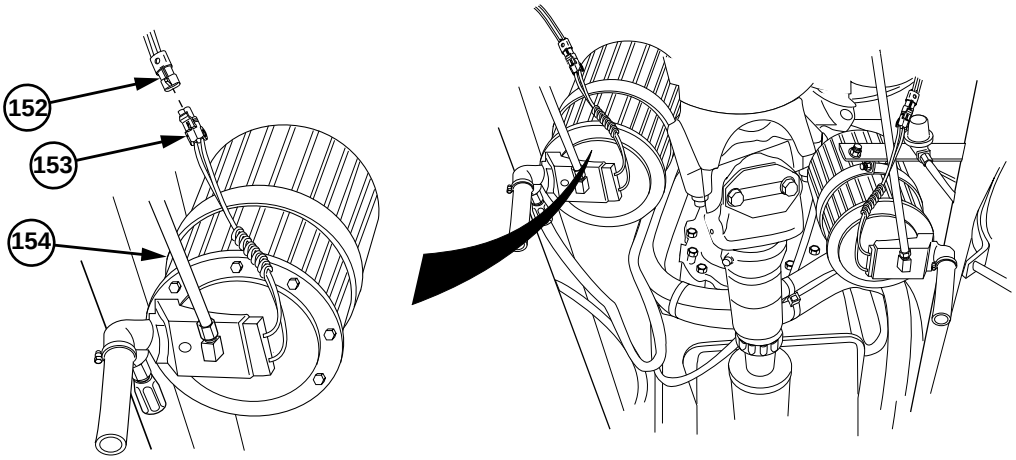
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

(45) Lift and slide boot (147) from transfer case oil temperature sensor sending unit (148).

(46) Remove nut (149), lockwasher (150), and wire no. 1063 (151) from transfer case oil temperature sending unit (148). Discard lockwasher.



(47) Remove electrical connector (152) from electrical connector (153) on left air dryer (154).

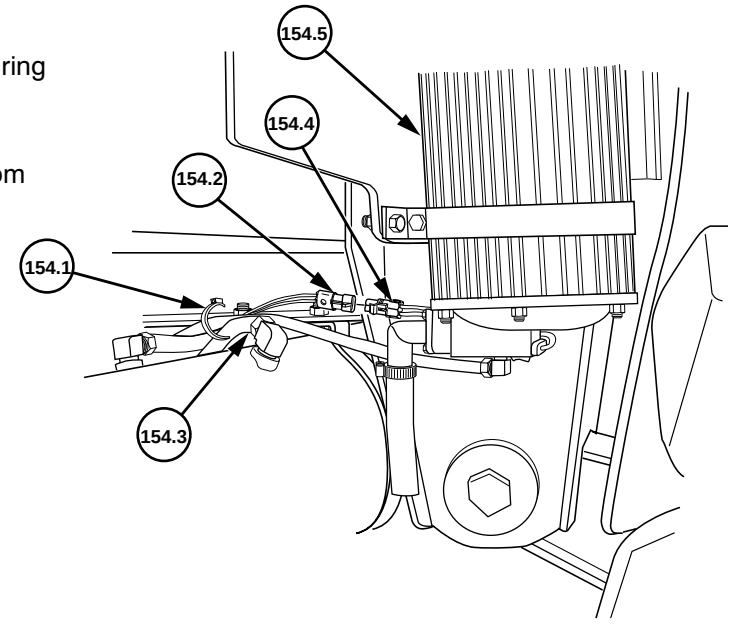


NOTE

Location of plastic cable ties should be marked before removal.

(47.1) Cut and remove cable ties (154.1) securing electrical connector (154.2) to hose no. 2081 (154.3).

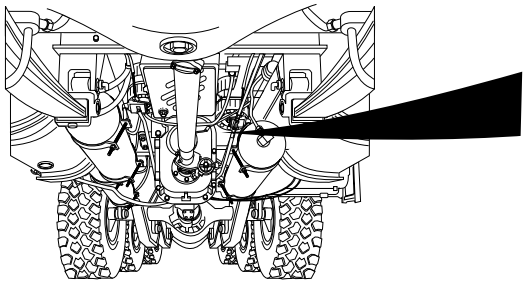
(47.2) Remove electrical connector (154.2) from electrical connector (154.4) on aftercooler (154.5).

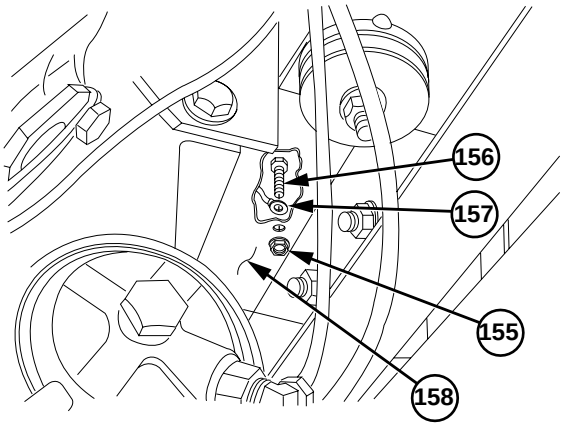


NOTE

Vehicles with serial number up to 73042 will have one ground wire no. 1435. Vehicles with serial number 73043 and higher will have two ground wires no. 1435.

(48) Remove locknut (155), screw (156), and ground wire(s) no. 1435 (157) from left front transfer case mounting bracket (158). Discard locknut.



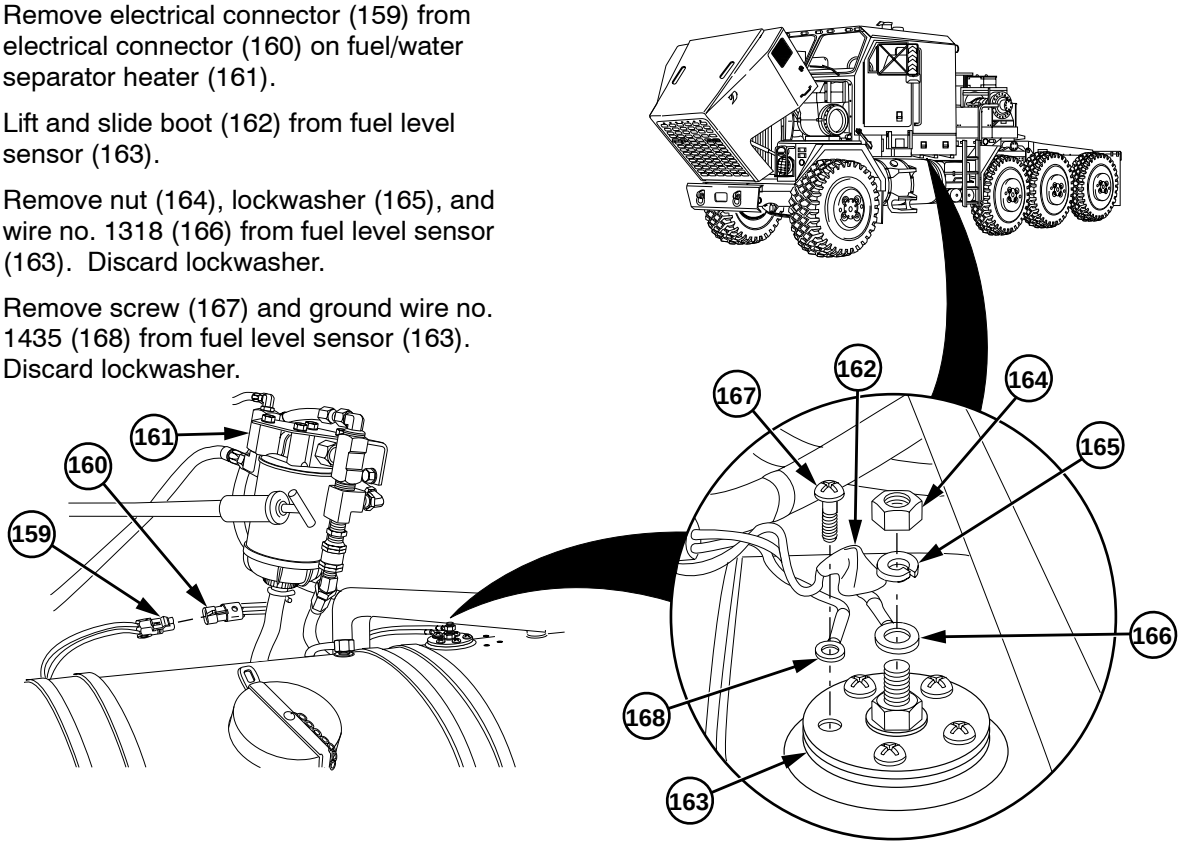


(49) Remove electrical connector (159) from electrical connector (160) on fuel/water separator heater (161).

(50) Lift and slide boot (162) from fuel level sensor (163).

(51) Remove nut (164), lockwasher (165), and wire no. 1318 (166) from fuel level sensor (163). Discard lockwasher.

(52) Remove screw (167) and ground wire no. 1435 (168) from fuel level sensor (163). Discard lockwasher.



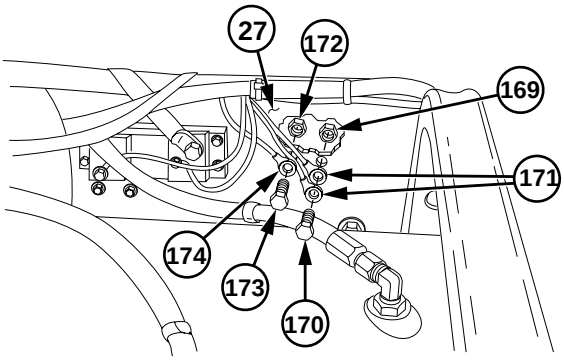
(53) Remove locknut (169), screw (170), and two 12-volt ground wires no. 1435 (171) from left frame (27). Discard locknut.

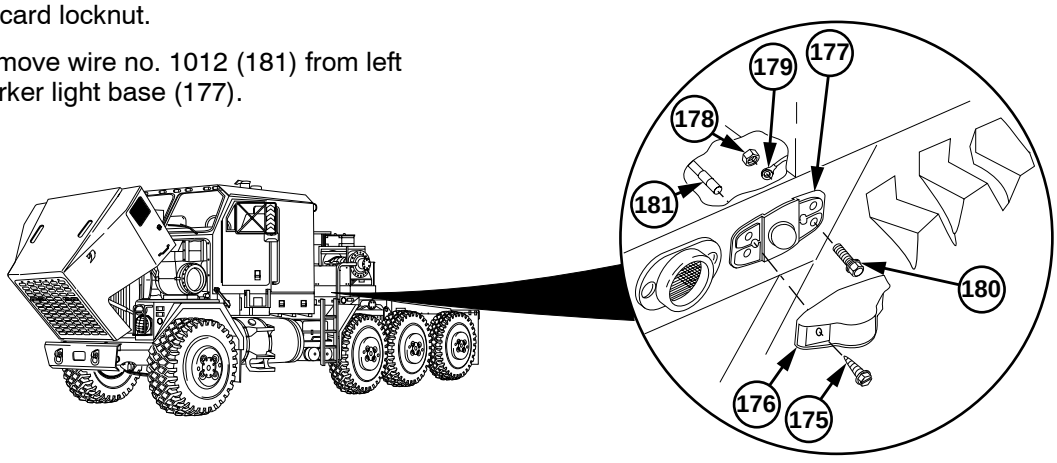
(54) Remove locknut (172), screw (173), and 24-volt ground wire no. 1435C (174) from left frame (27). Discard locknut.

(55) Remove two screws (175) and marker light cover (176) from left marker light base (177).

(56) Remove locknut (178) and ground wire no. 1435 (179) from mounting screw (180). Discard locknut.

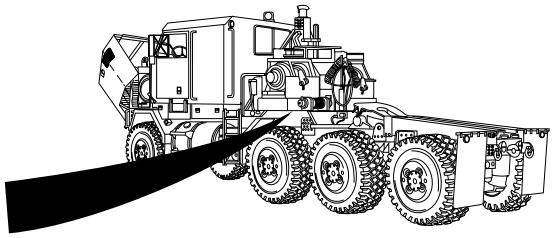
(57) Remove wire no. 1012 (181) from left marker light base (177).

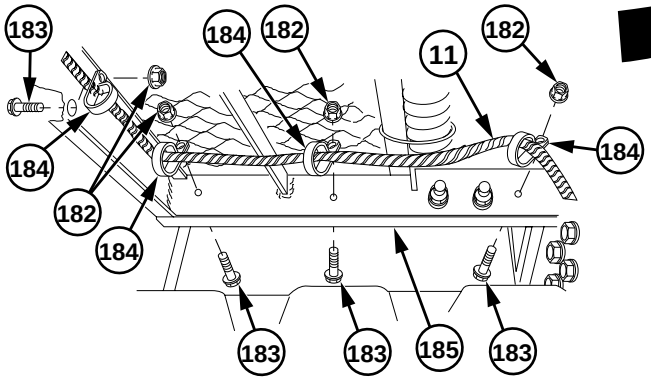




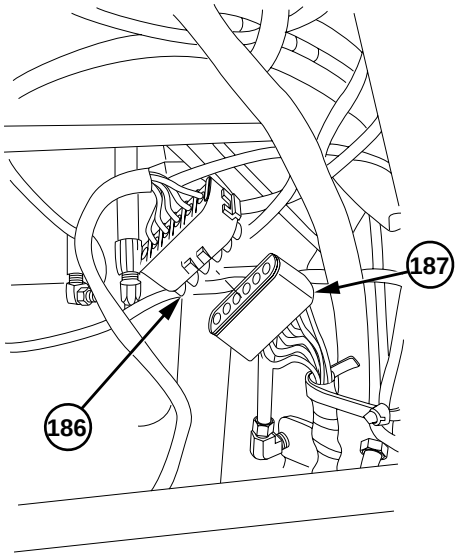
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

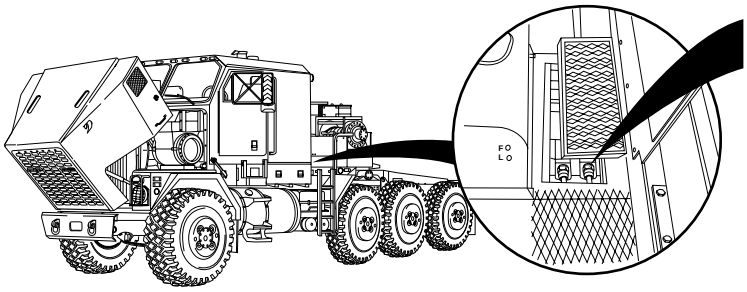
(58) Remove four locknuts (182), screws (183), and cushion clips (184) from winch platform (185) and harness (11). Discard locknuts.





(59) Remove electrical connector (186) from winch electrical system connector (187).

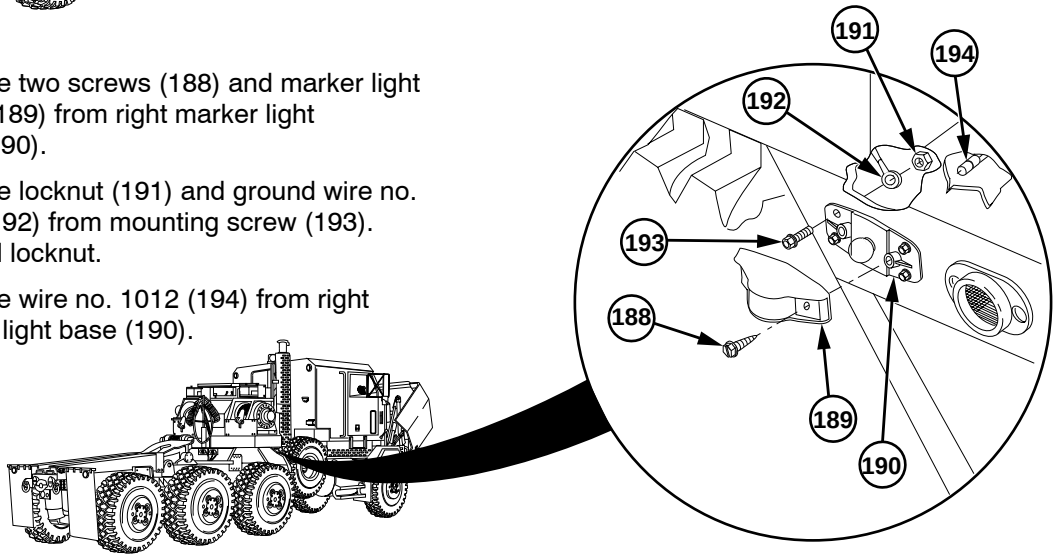




(60) Remove two screws (188) and marker light cover (189) from right marker light base (190).

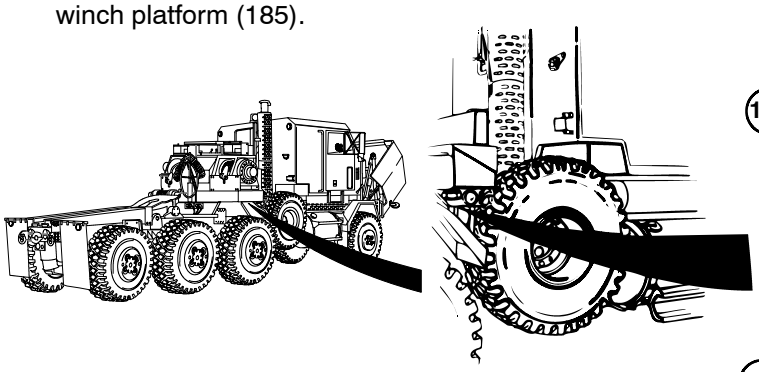
(61) Remove locknut (191) and ground wire no. 1435 (192) from mounting screw (193). Discard locknut.

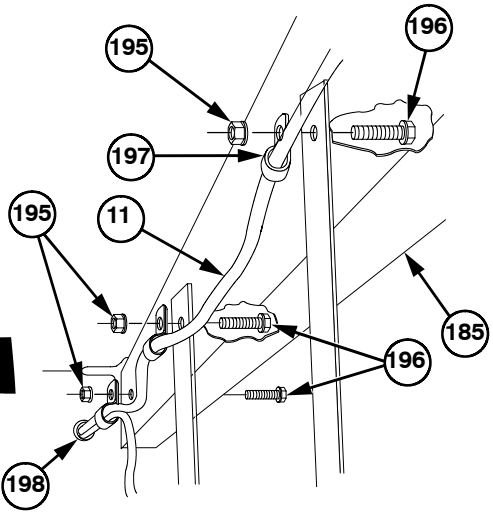
(62) Remove wire no. 1012 (194) from right marker light base (190).



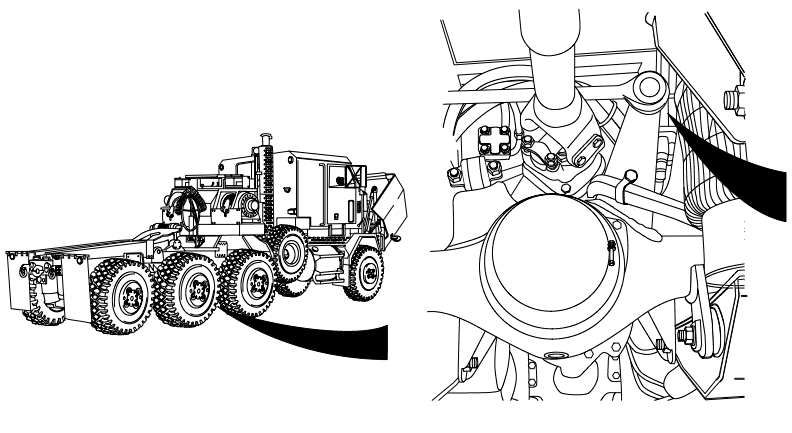
(63) Remove three locknuts (195), screws (196), and cushion clips (197) from winch platform (185) and harness (11). Discard locknuts.

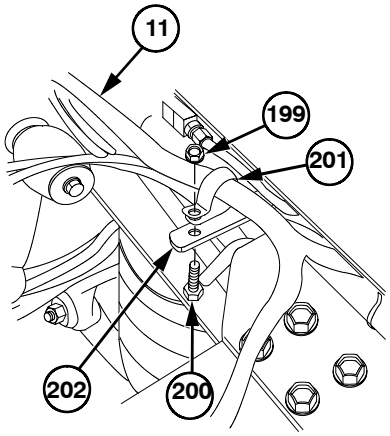
(64) Pull harness (11) through grommet (198) in winch platform (185).



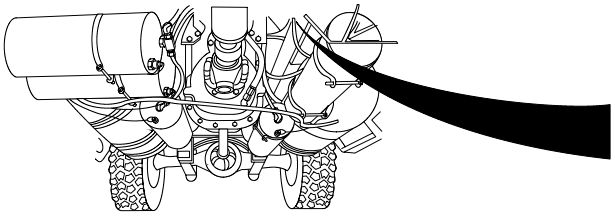


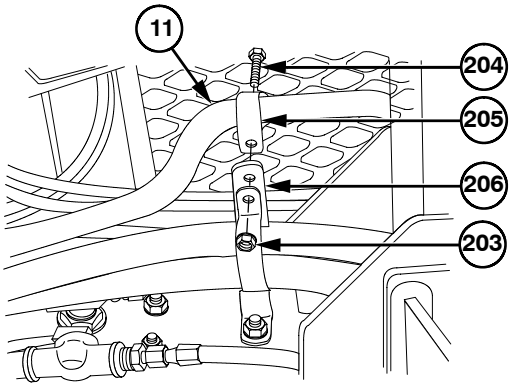
(65) Remove locknut (199), screw (200), and cushion clip (201) from standoff bracket (202) and harness (11). Discard locknut.





(66) Remove locknut (203), screw (204), and cushion clip (205) from standoff bracket (206) and harness (11). Discard locknut.





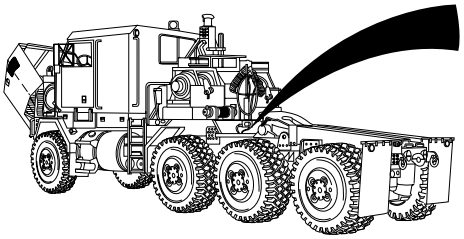
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

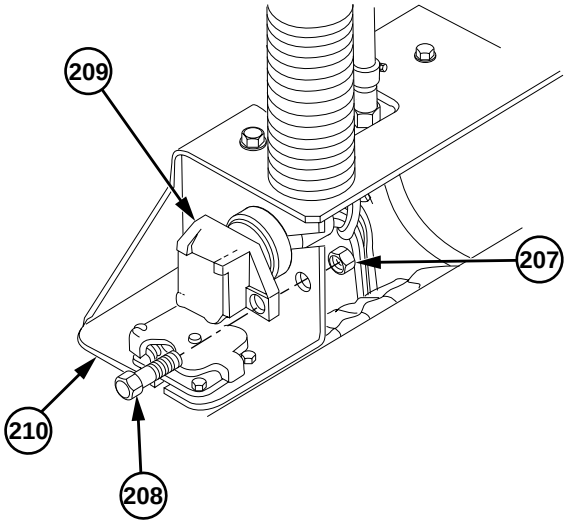
(67) Remove two locknuts (207), screws (208), and 7-pin electrical connector (209) from mounting bracket (210). Discard locknuts.

(68) Deleted.

(69) Deleted.

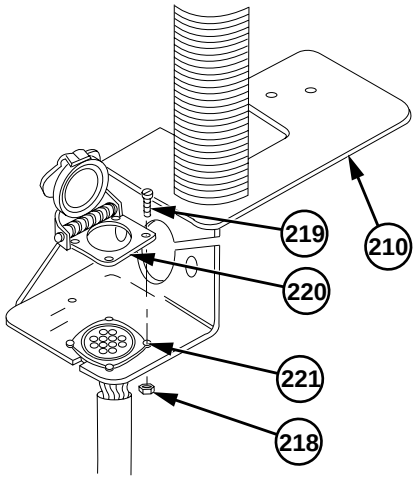
(70) Deleted.



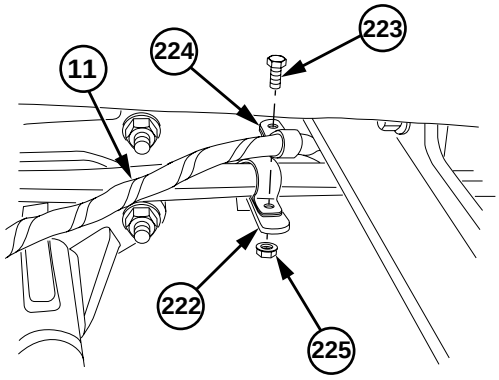


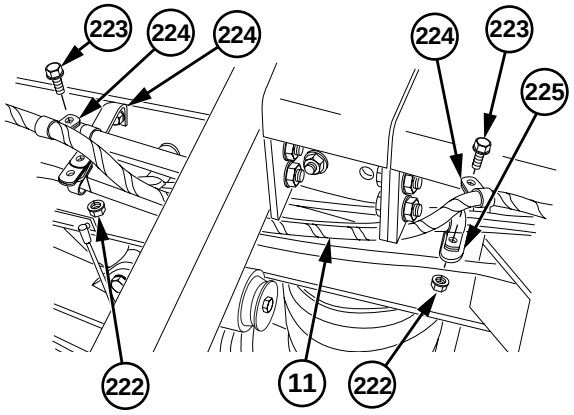
(71) Remove four locknuts (218), screws (219), and 12-pin trailer electrical connector cover (220) from mounting bracket (210). Discard locknuts.

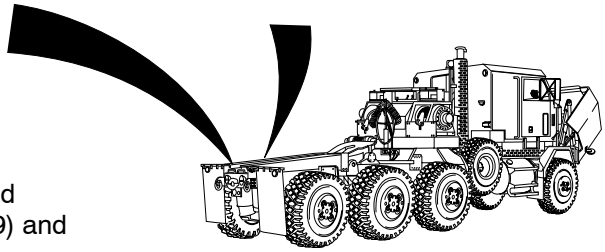
(72) Remove 12-pin trailer electrical connector (221) from mounting bracket (210).



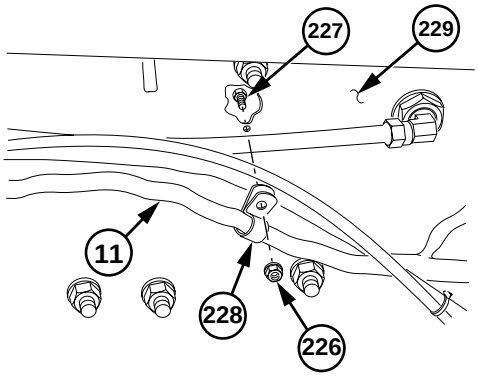
(73) Remove three locknuts (222), screws (223), and cushion clips (224) from standoff brackets (225) and harness (11). Discard locknuts.

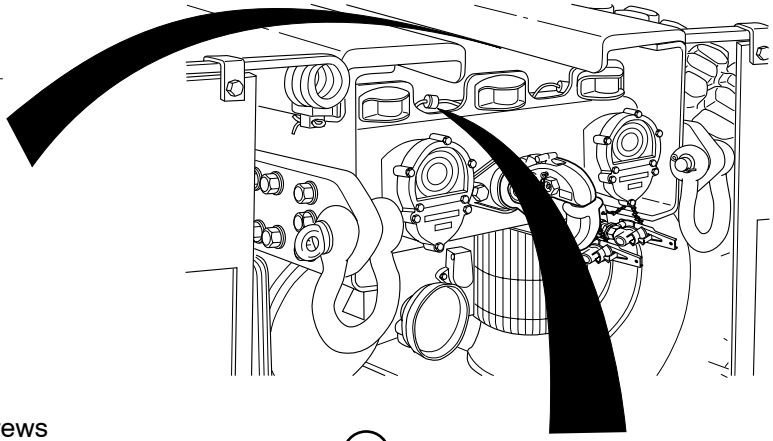






(74) Remove locknut (226), screw (227), and cushion clip (228) from right frame (229) and harness (11). Discard locknut.

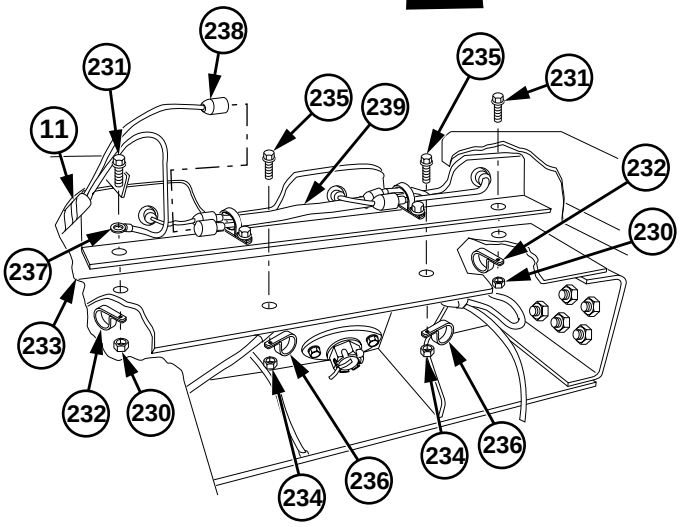




(75) Remove two locknuts (230), screws (231), cushion clips (232), and ground wire no. 1435 (237) from rear crossmember (233) and harness (11). Discard locknuts.

(76) Remove two locknuts (234), screws (235), and cushion clips (236) from rear crossmember (233) and harness (11). Discard locknuts.

(77) Disconnect wire no. 1012 (238) of harness (11) from rear marker light wire harness (239).



6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

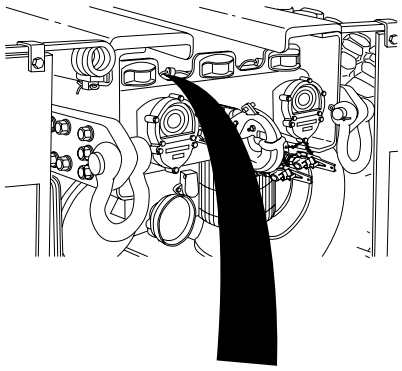
(78) Remove wire no. 1004A (240), wire no. 1012 (241), wire no. 1680 (242), and wire no. 1678 (243) from right rear composite light (244).

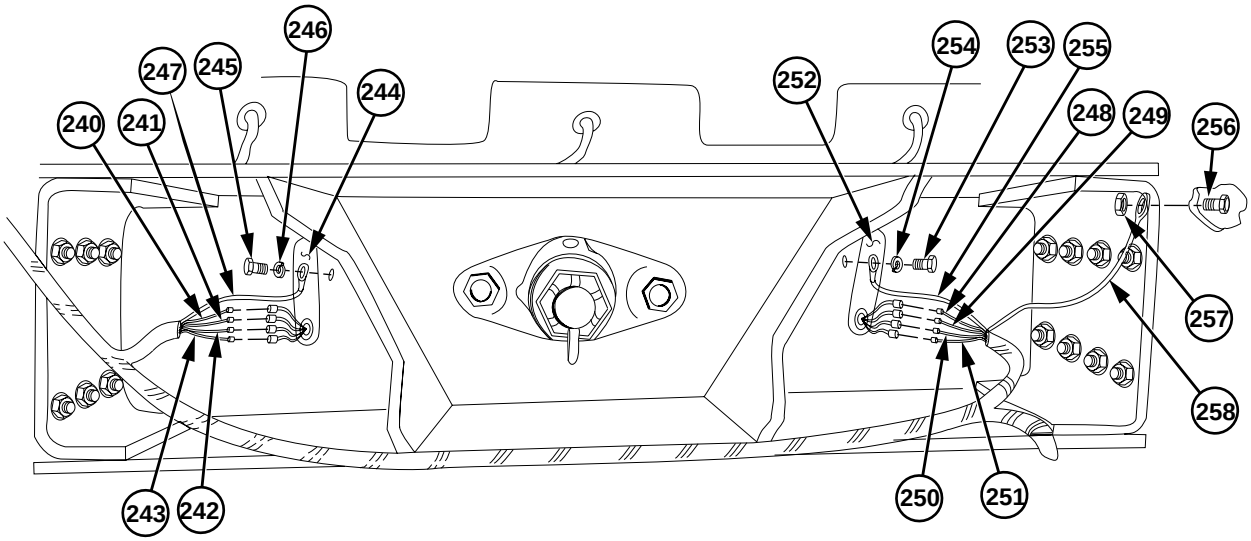
(79) Remove screw (245), lockwasher (246), and ground wire no. 1435 (247) from right rear composite light (244). Discard lockwasher.

(80) Remove wire no. 1003A (248), wire no. 1012 (249), wire no. 1680 (250), and wire no. 1678 (251) from left rear composite light (252).

(81) Remove screw (253), lockwasher (254), and ground wire no. 1435 (255) from left rear composite light (252). Discard lockwasher.

(82) Remove screw (256), locknut (257), and ground wire no. 1435 (258) from left frame (27). Discard locknut.

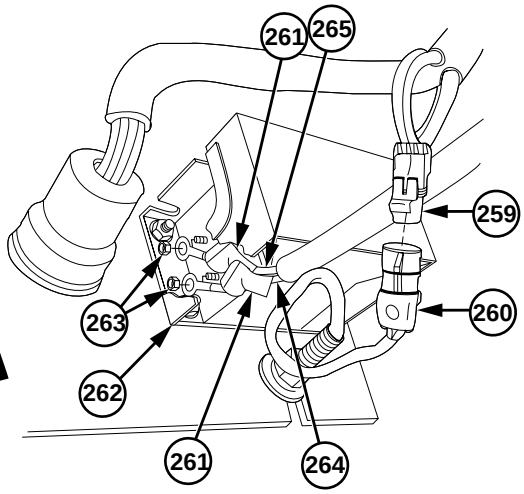


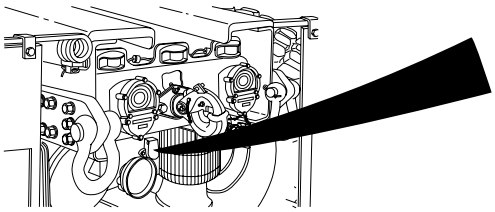


(83) Remove electrical connector (259) from backup light electrical connector (260).

(84) Lift and slide two boots (261) from backup alarm (262).

(85) Remove two nuts (263), wire no. 1149 (264), and ground wire no. 1435 (265) from backup alarm (262).





(86) Remove locknut (266), screw (267), and cushion clip (268) from rear crossmember (233) and bracket (269). Discard locknut.

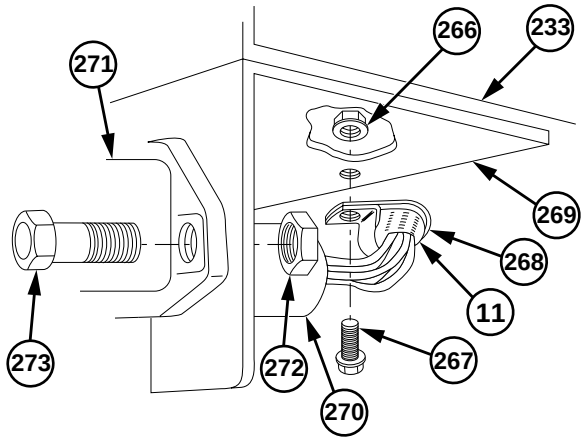
(87) Deleted.

(88) Remove two locknuts (272), screws (273), and 7-pin electrical connector (271) from bracket (269). Discard locknuts.

(89) Deleted.

(90) Deleted.

(91) Remove chassis wire harness (11) from HET Tractor.



b. Installation

NOTE

Evenly distribute any slack in harness. Do not make any connections.

(1) Route chassis wire harness (1) through HET Tractor.

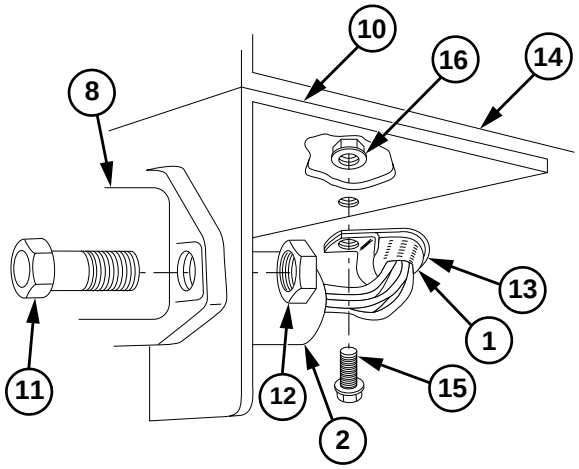
(2) Deleted.

(3) Deleted.

(4) Install 7-pin electrical connector (8) on bracket (10) with two screws (11) and new locknuts (12).

(5) Deleted.

(6) Install cushion clip (13) on harness (1) and rear crossmember (14) with screw (15) and new locknut (16).



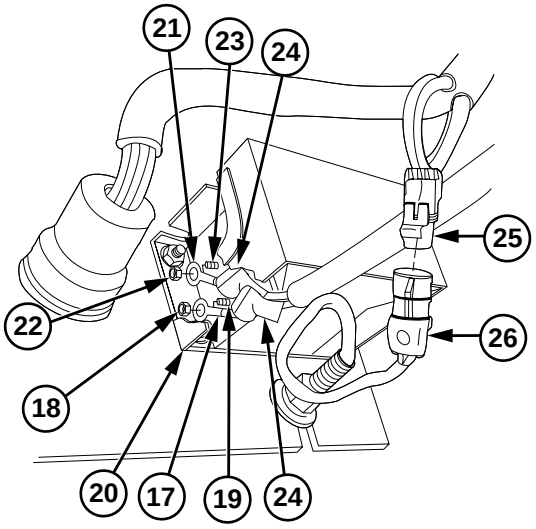
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

(7) Install ground wire no. 1435 (17) and nut (18) on negative terminal (19) of backup alarm (20).

(8) Install wire no. 1149 (21) and nut (22) on positive terminal (23) of backup alarm (20).

(9) Slide two boots (24) on backup alarm (20).

(10) Install electrical connector (25) on backup light electrical connector (26).



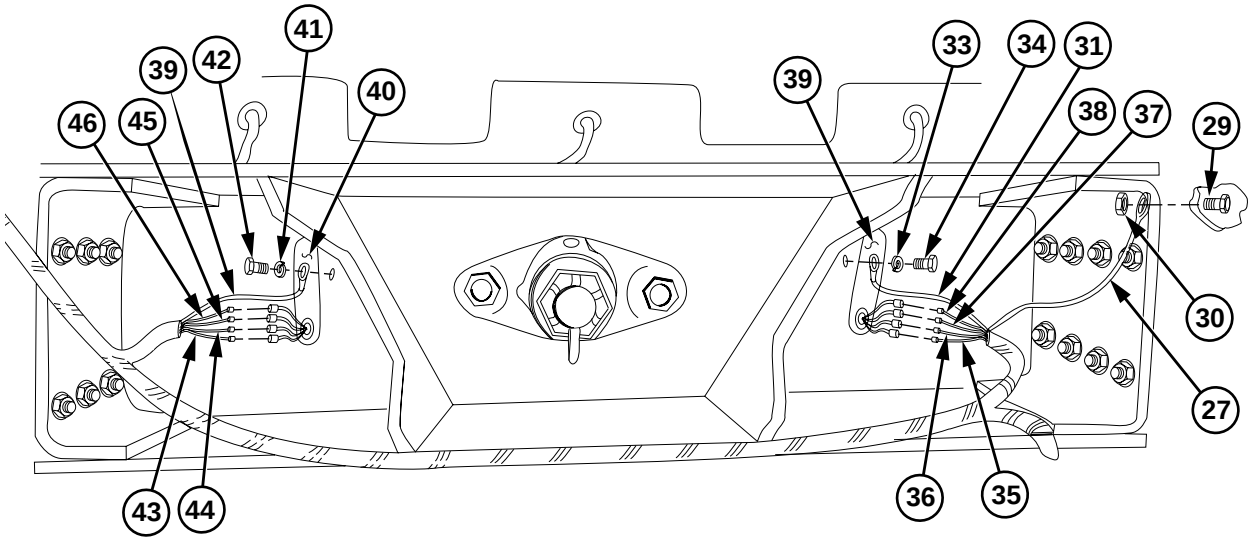
(11) Install ground wire no. 1435 (27) on left frame (28) with screw (29) and new locknut (30).

(12) Install ground wire no. 1435 (31) on left rear composite light (32) with new lockwasher (33) and screw (34).

(13) Install wire no. 1678 (35), wire no. 1680 (36), wire no. 1012 (37), and wire no. 1003A (38) on left rear composite light (32).

(14) Install ground wire no. 1435 (39) on right rear composite light (40) with new lockwasher (41) and screw (42).

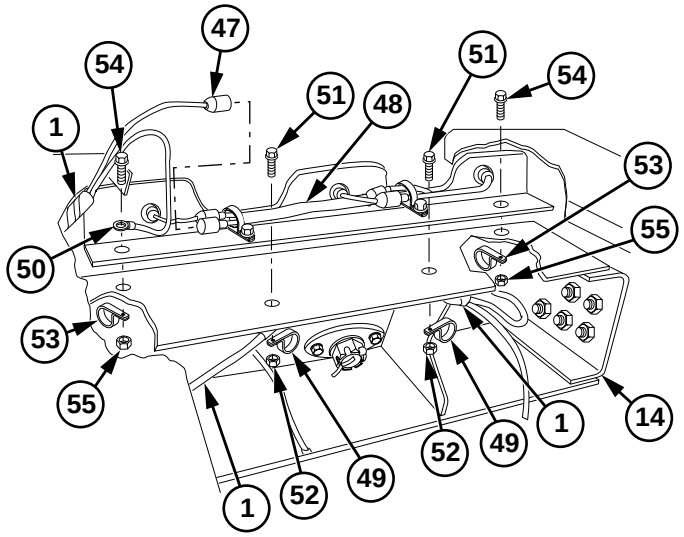
(15) Install wire no. 1678 (43), wire no. 1680 (44), wire no. 1012 (45), and wire no. 1004A (46) on right rear composite light (40).



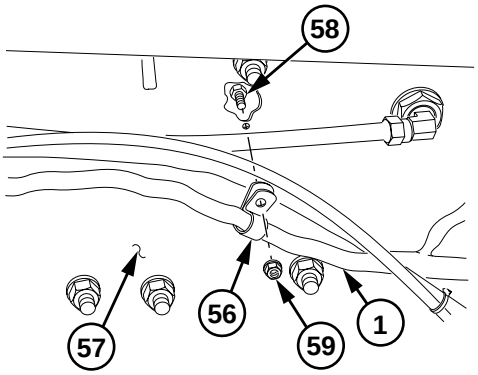
(16) Connect wire no. 1012 (47) of harness (1) to rear marker light wire harness (48).

(17) Install two cushion clips (49) on rear crossmember (14) and harness (1) with two screws (51) and new locknuts (52).

(18) Install two cushion clips (53) and ground wire no. 1435 (50) on rear crossmember (14) and harness (1) with two screws (54) and new locknuts (55).



6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

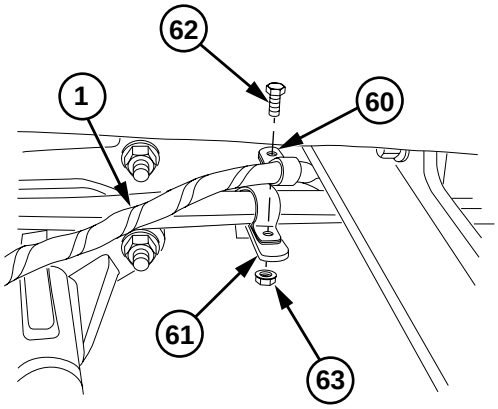


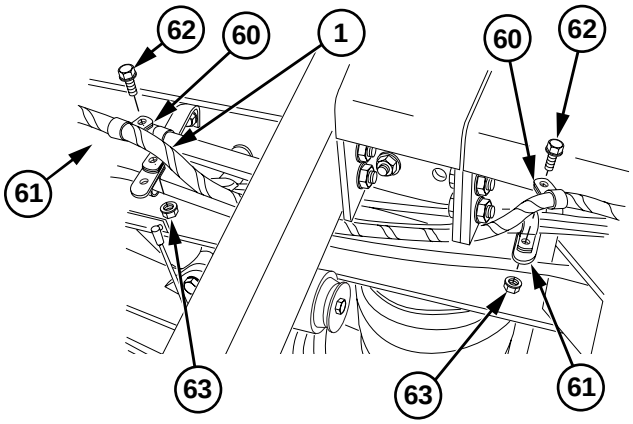
(19) Install cushion clip (56) on right frame (57) and harness (1) with screw (58) and new locknut (59).

CAUTION

The cushion clips above axle no. 3 must be installed in the second hole of the standoff bracket. Failure to comply may result in height control valve rod contacting air lines or wiring harnesses.

(20) Install three cushion clips (60) on standoff brackets (61) and harness (1) with three screws (62) and new locknuts (63).





NOTE

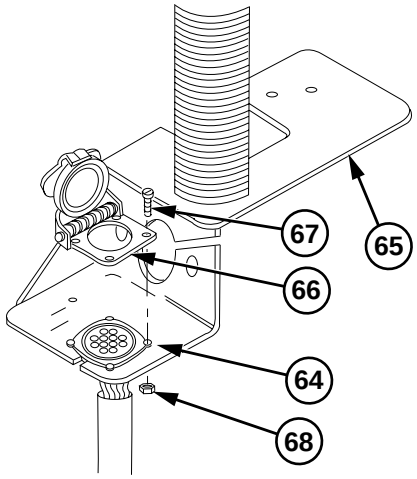
Position connector in bracket so alignment tab inside connector socket faces front of truck and hinged end of cover.

(21) Install 12-pin trailer electrical connector (64) on mounting bracket (65).

NOTE

Hinged end of cover must face front of truck.

(22) Install 12-pin trailer electrical connector cover (66) on mounting bracket (65) with four screws (67) and new locknuts (68).

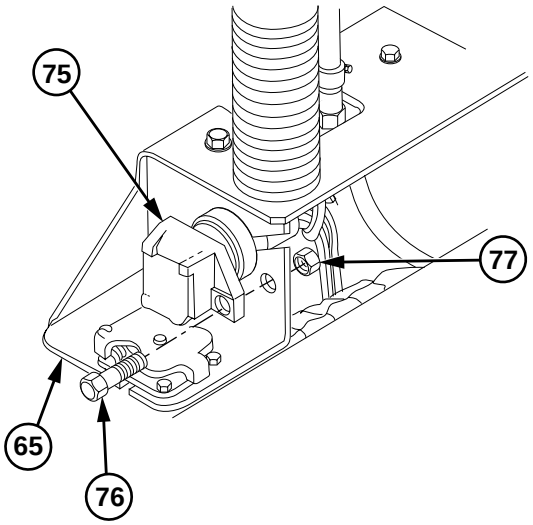


(23) Deleted.

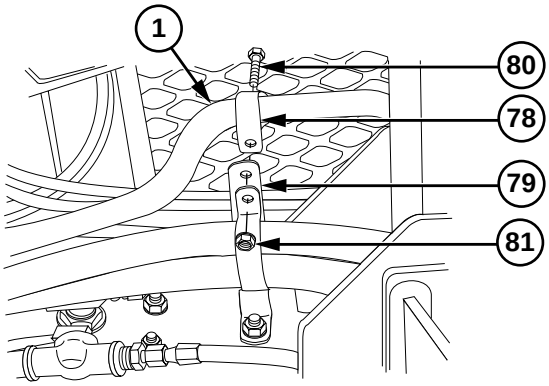
(24) Deleted.

(25) Deleted.

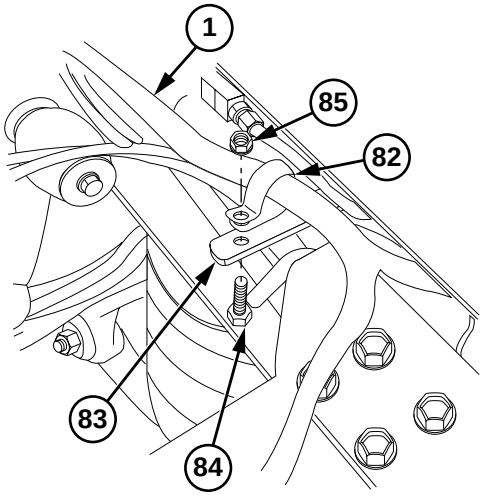
(26) Install 7-pin electrical connector (75) on mounting bracket (65) with two screws (76) and new locknuts (77).



(27) Install cushion clip (78) on standoff bracket (79) and harness (1) with screw (80) and new locknut (81).



(28) Install cushion clip (82) on standoff bracket (83) and harness (1) with screw (84) and new locknut (85).



6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

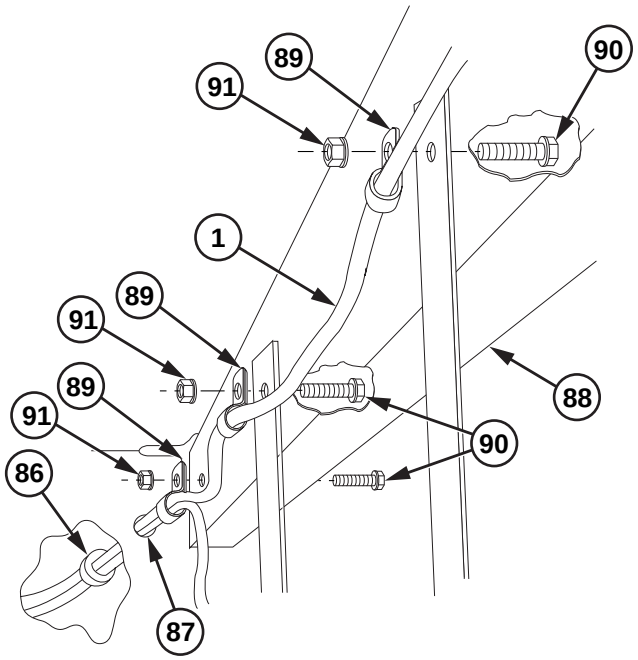
(29) Pull grommet (86) through hole (87) to outside of winch platform (88).

(30) Route harness (1) through hole (87) in winch platform (88).

(31) Route harness (1) through grommet (86).

(32) Install grommet (86) in hole (87).

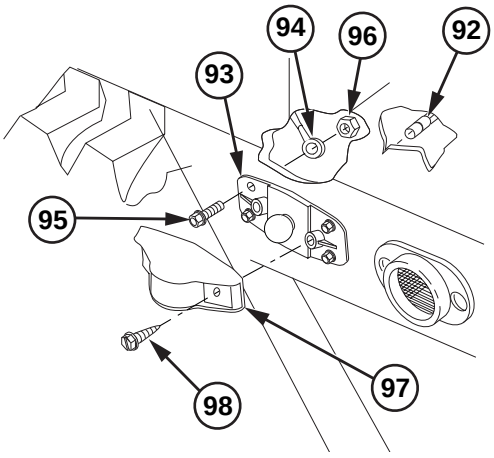
(33) Install three cushion clips (89) on winch platform (88) and harness (1) with three screws (90) and new locknuts (91).



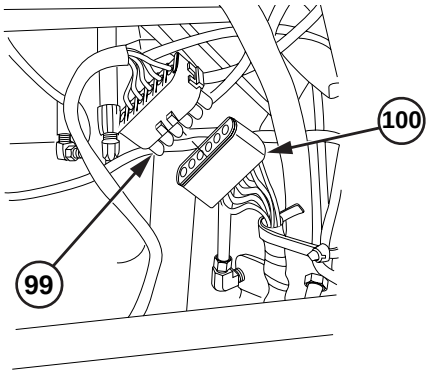
(34) Install wire no. 1012 (92) on right marker light base (93).

(35) Install ground wire no. 1435 (94) on mounting screw (95) with new locknut (96).

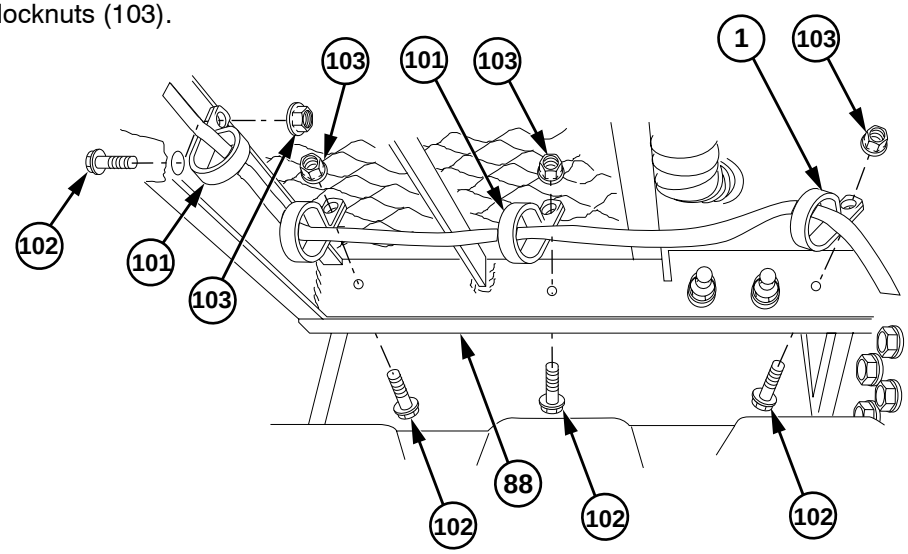
(36) Install marker light cover (97) on right marker light base (93) with two screws (98).



(37) Install electrical connector (99) on winch system electrical connector (100).



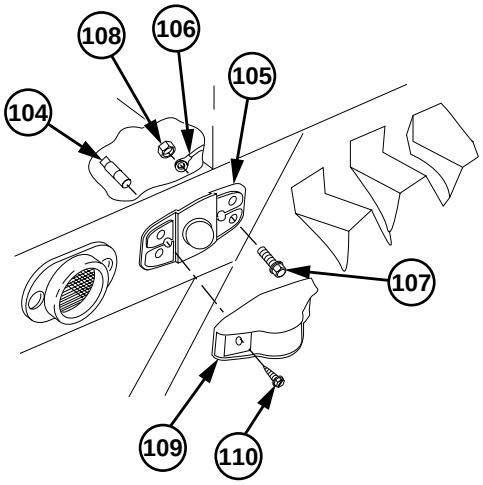
(38) Install four cushion clips (101) on winch platform (88) and harness (1) with four screws (102) and new locknuts (103).



(39) Install wire no. 1012 (104) on left marker light base (105).

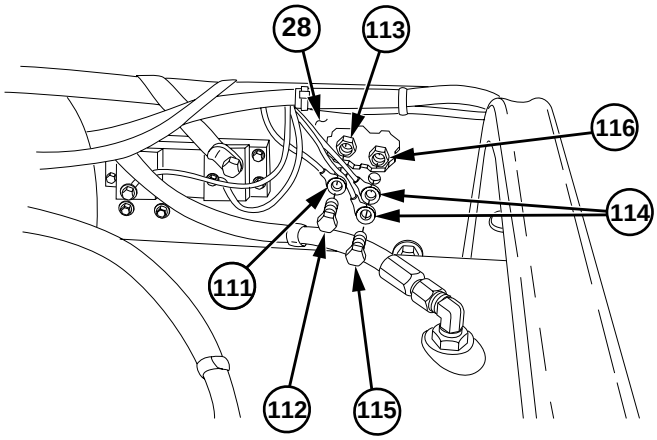
(40) Install ground wire no. 1435 (106) on mounting screw (107) with new locknut (108).

(41) Install marker light cover (109) on left marker light base (105) with two screws (110).



(42) Install 24-volt ground wire no. 1435C (111) on left frame (28) with screw (112) and new locknut (113).

(43) Install two 12-volt ground wires no. 1435 (114) on left frame (28) with screw (115), and new locknut (116).



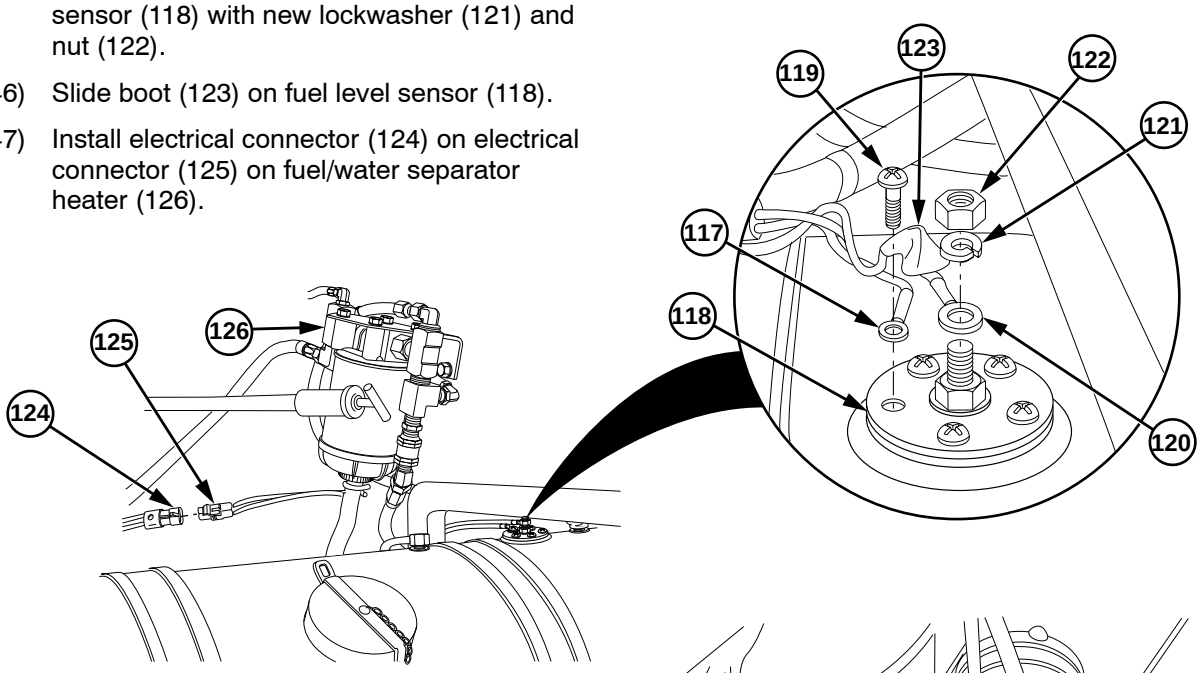
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

(44) Install ground wire no. 1435 (117) on fuel level sensor (118) with screw (119).

(45) Install wire no. 1318 (120) on fuel level sensor (118) with new lockwasher (121) and nut (122).

(46) Slide boot (123) on fuel level sensor (118).

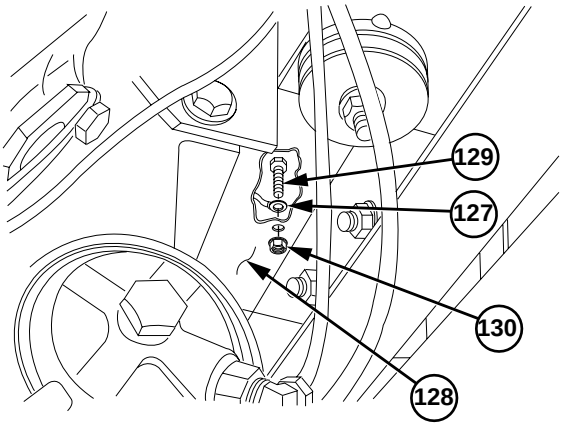
(47) Install electrical connector (124) on electrical connector (125) on fuel/water separator heater (126).



NOTE

Vehicles with serial number up to 73042 will have one ground wire no. 1435. Vehicles with serial number 73043 and higher will have two ground wires no. 1435.

(48) Install ground wire(s) no. 1435 (127) on left front transfer case mounting bracket (128) with screw (129) and new locknut (130).

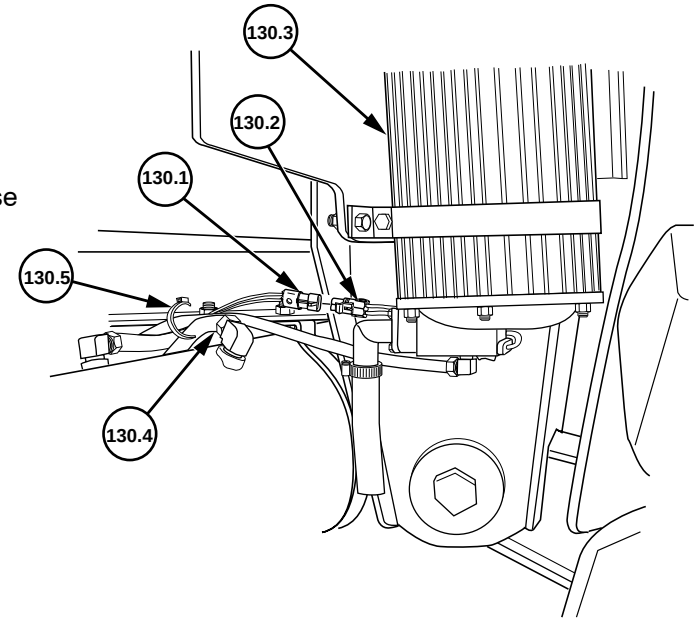


NOTE

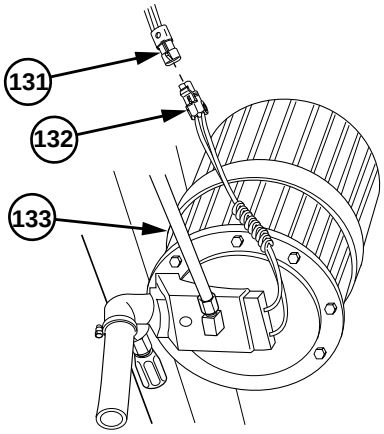
Plastic cable ties should be positioned in locations marked during removal.

(48.1) Install electrical connector (130.1) on electrical connector (130.2) on aftercooler (130.3).

(48.2) Secure electrical connector (130.1) to hose no. 2081 (130.4) with plastic cable ties (130.5).



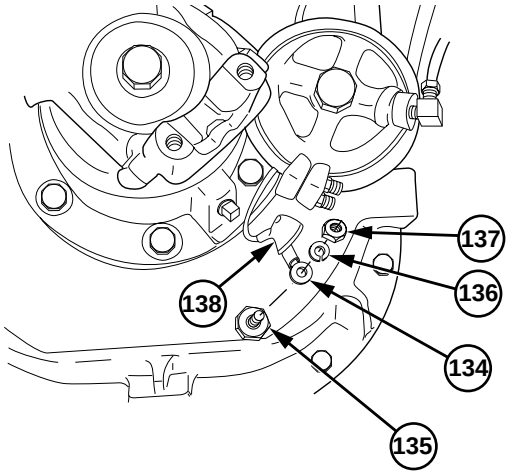
(49) Install electrical connector (131) on electrical connector (132) on left air dryer (133).



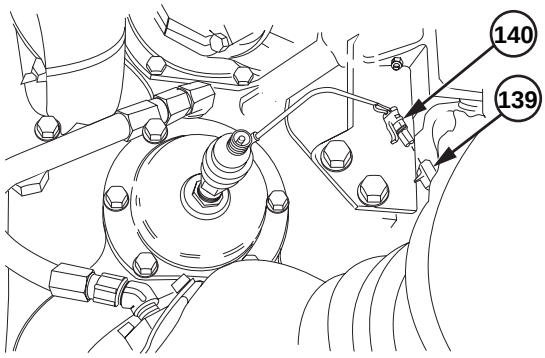
(50) Install wire no. 1063 (134) on transfer case oil temperature sending unit (135) with new lockwasher (136) and nut (137).

(50.1) Apply anticorrosion grease to terminal on sending unit (135).

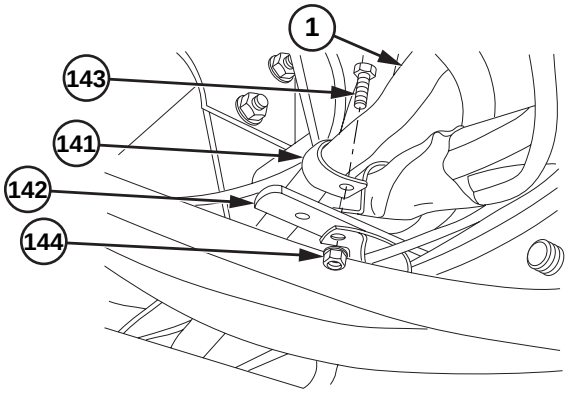
(51) Slide boot (138) on sending unit (135).



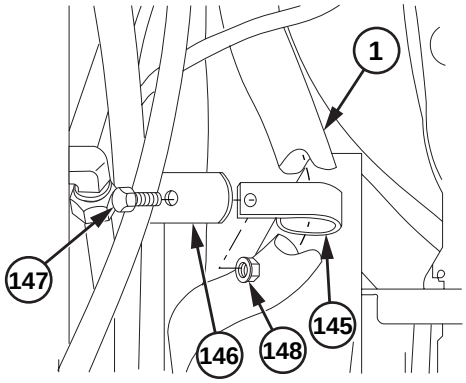
(52) Install wire no. 1519 (139) on CTI signal generator (140).



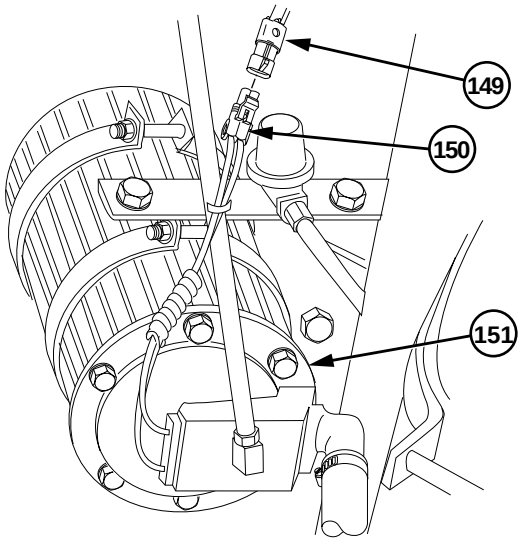
(53) Install cushion clip (141) on standoff bracket (142) and harness (1) with screw (143) and new locknut (144).



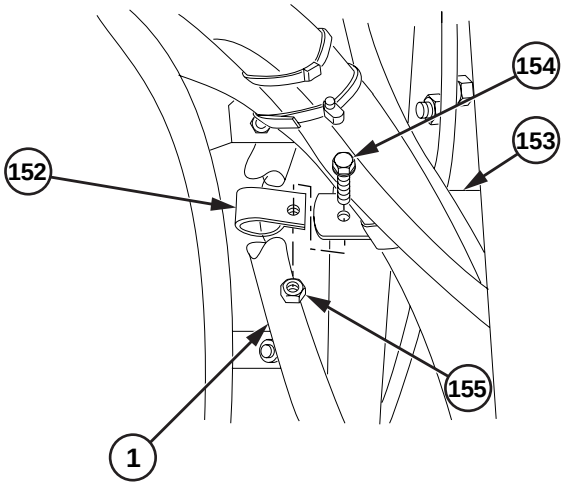
(54) Install cushion clip (145) on standoff bracket (146) and harness (1) with screw (147) and new locknut (148).



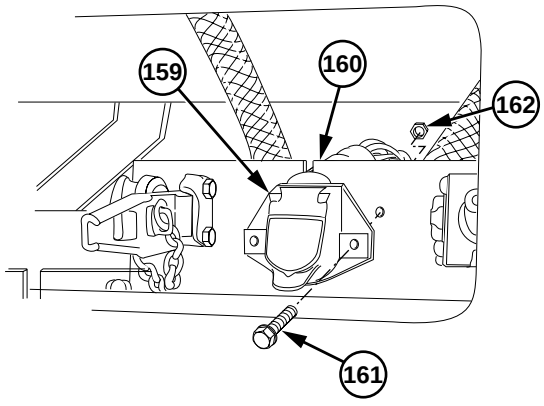
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)



(55) Install electrical connector (149) on electrical connector (150) on right air dryer (151).



(56) Install cushion clip (152) on standoff bracket (153) and harness (1) with screw (154) and new locknut (155).



(57) Install 7-pin connector (159) on bracket (160) with two screws (161) and new locknuts (162).

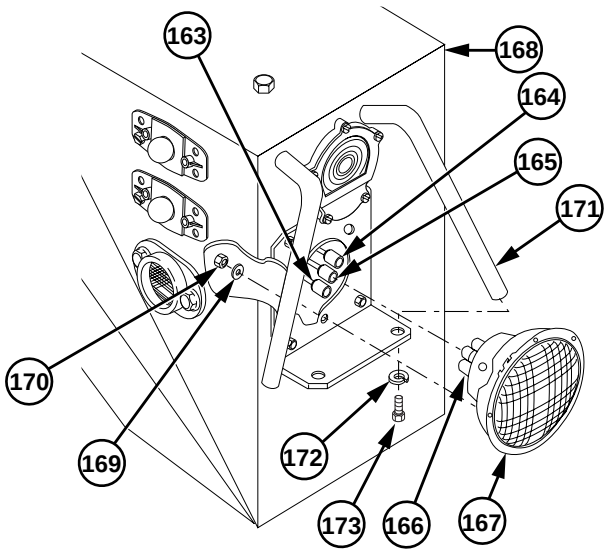
(58) Deleted.

(59) Deleted.

(60) Install ground wire no. 1435 (163), wire no. 1007 (164), and wire no. 1006 (165) on three connectors (166) in right headlight assembly (167).

(61) Install right headlight assembly (167) on fender (168) with three new lockwashers (169) and nuts (170).

(62) Install two headlight guards (171) with two new lockwashers (172) and screws (173).

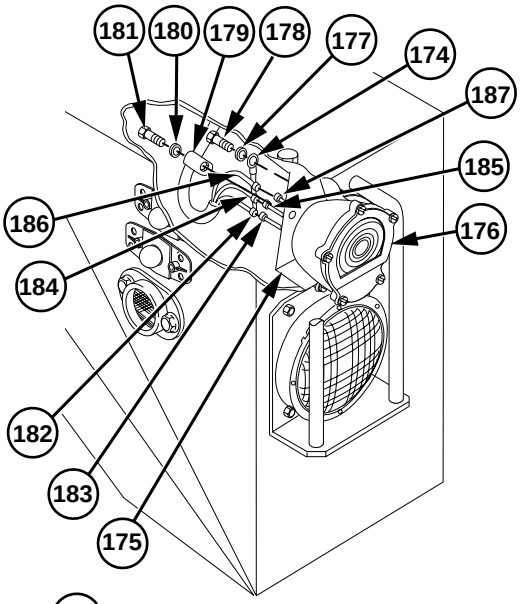


(63) Install ground wire no. 1435 (174) on mounting bracket (175) and right front composite light (176) with new lockwasher (177) and screw (178).

(64) Install cushion clip (179) on harness (1).

(65) Install cushion clip (179) on mounting bracket (175) and right front composite light (176) with new lockwasher (180) and screw (181).

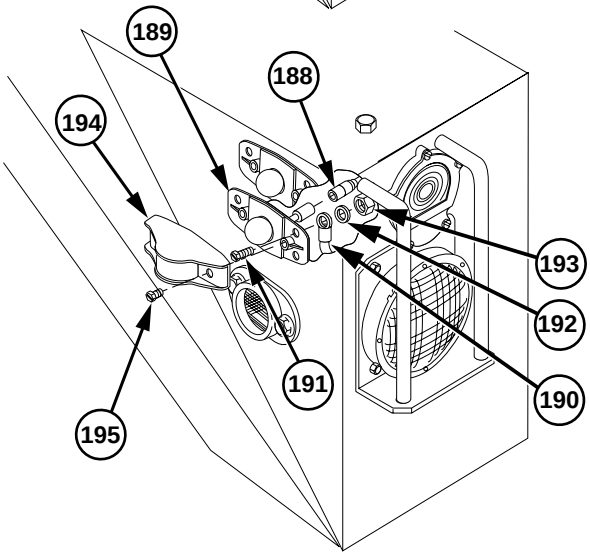
(66) Install wire no. 1680 (182) on connector no. 20 (183), wire no. 1001 (184) on connector no. 460 (185), and wire no. 1012 (186) on connector no. 491 (187) of right front composite light (176).



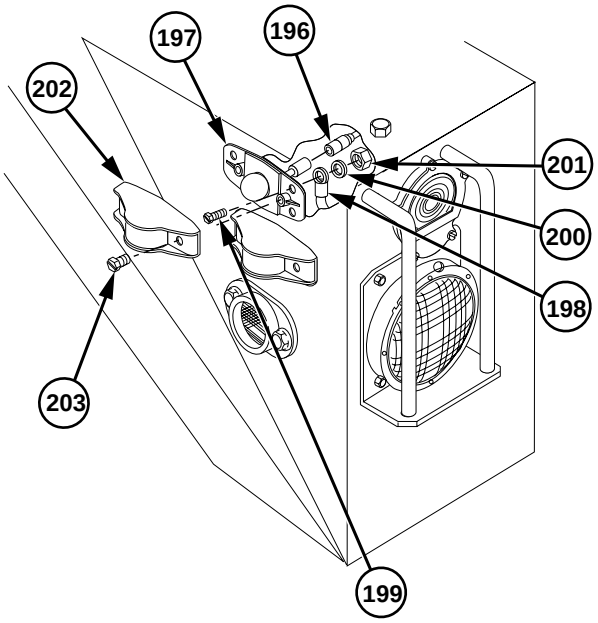
(67) Install wire no. 1001 (188) on right marker light base (189).

(68) Install ground wire no. 1435 (190) on mounting screw (191) with washer (192) and new locknut (193).

(69) Install marker light cover (194) on right marker light base (189) with two screws (195).



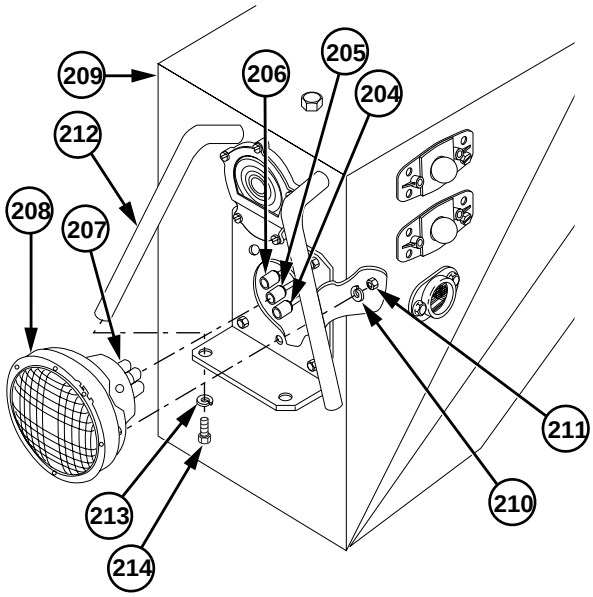
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)



(70) Install wire no. 1012 (196) on right marker light base (197).

(71) Install ground wire no. 1435 (198) on mounting screw (199) with washer (200) and new locknut (201).

(72) Install marker light cover (202) on right marker light base (197) with two screws (203).



(73) Install ground wire no. 1435 (204), wire no. 1007 (205), and wire no. 1006 (206) on three connectors (207) in left headlight assembly (208).

(74) Install left headlight assembly (208) on fender (209) with three new lockwashers (210) and nuts (211).

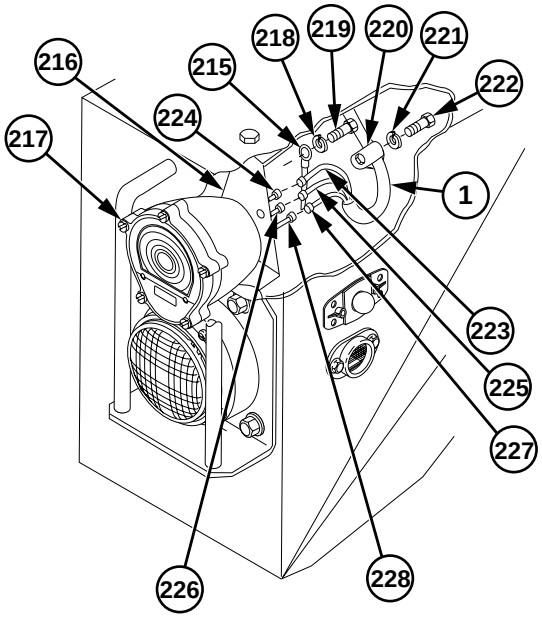
(75) Install two headlight guards (212) with two new lockwashers (213) and screws (214).

(76) Install ground wire no. 1435 (215) on mounting bracket (216) and left front composite light (217) with new lockwasher (218) and screw (219).

(77) Install cushion clip (220) on harness (1).

(78) Install cushion clip (220) on mounting bracket (216) and left front composite light (217) with new lockwasher (221) and screw (222).

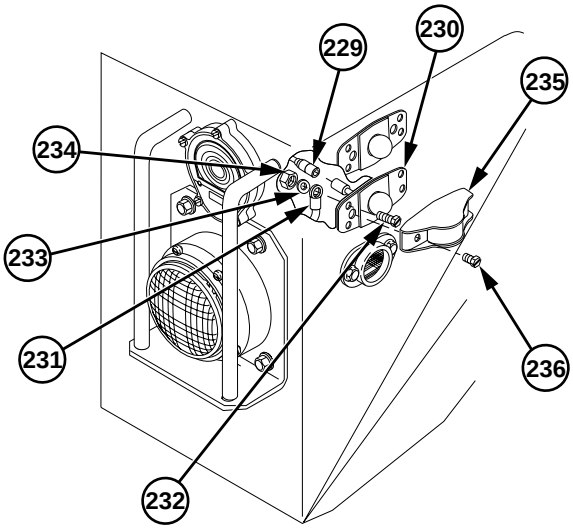
(79) Install wire no. 1012 (223) on connector no. 491 (224), wire no. 1002 (225) on connector no. 460 (226), and wire no. 1680 (227) on connector no. 20 (228) of left front composite light (217).



(80) Install wire no. 1002 (229) on left marker light base (230).

(81) Install ground wire no. 1435 (231) on mounting screw (232) with washer (233) and new locknut (234).

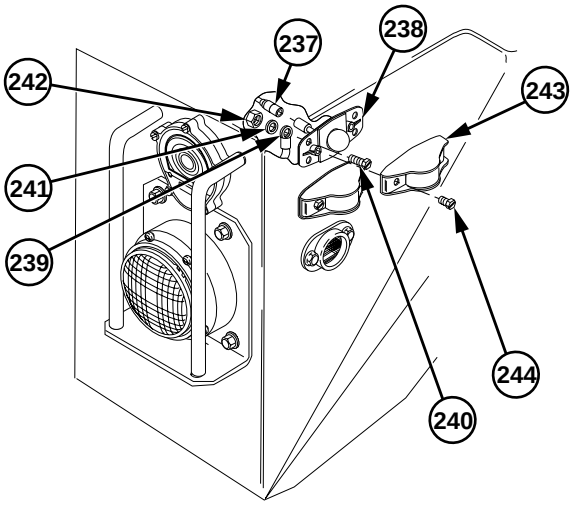
(82) Install marker light cover (235) on left marker light base (230) with two screws (236).



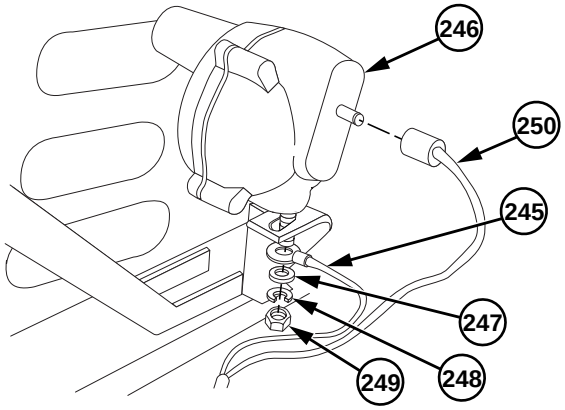
(83) Install wire no. 1012 (237) on left marker light base (238).

(84) Install ground wire no. 1435 (239) on mounting screw (240) with washer (241) and new locknut (242).

(85) Install marker light cover (243) on left marker light base (238) with two screws (244).

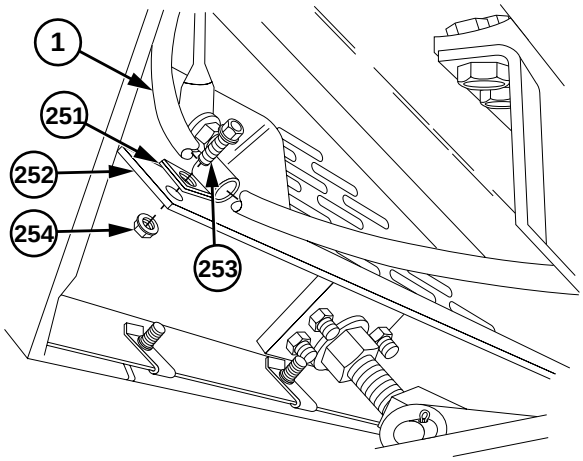


6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

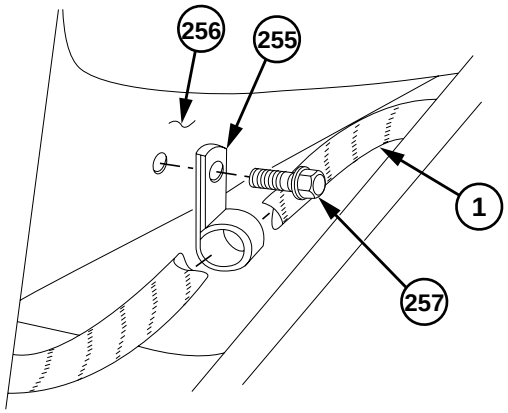


(86) Install ground wire no. 1435 (245) on blackout drive light (246) with washer (247), new lockwasher (248), and nut (249).

(87) Install wire no. 1679 (250) on blackout drive light (246).



(88) Install cushion clip (251) on harness (1) and hood (252) with screw (253) and new locknut (254).

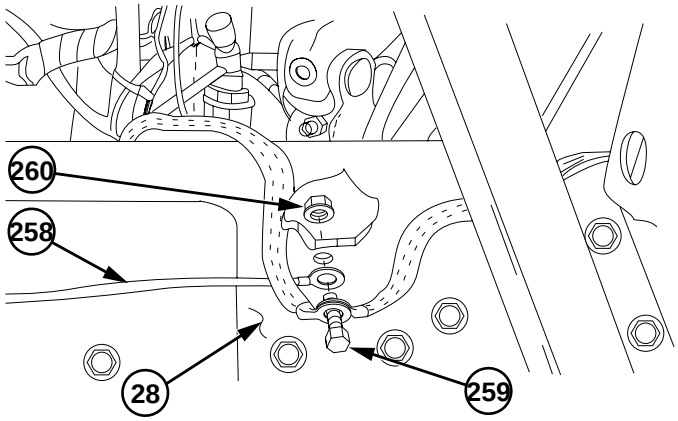


(89) Install cushion clip (255) on harness (1) and fan shroud (256) with screw (257).

NOTE

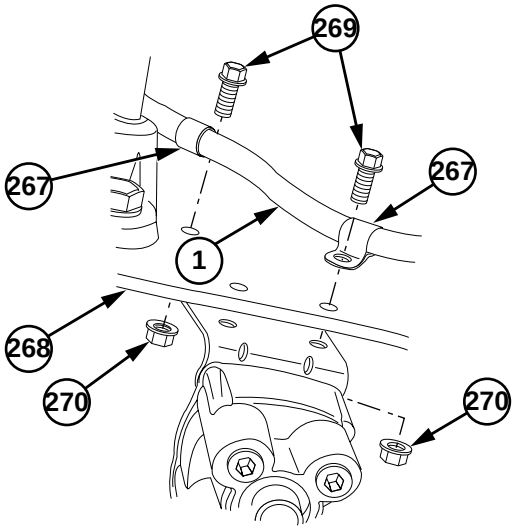
- Perform step (90) for vehicles up to serial number 73042.
- Perform step (92) for vehicles with serial number 73043 and higher.

(90) Install ground wire no. 1435 (258) on left frame (28) with screw (259) and new locknut (260).



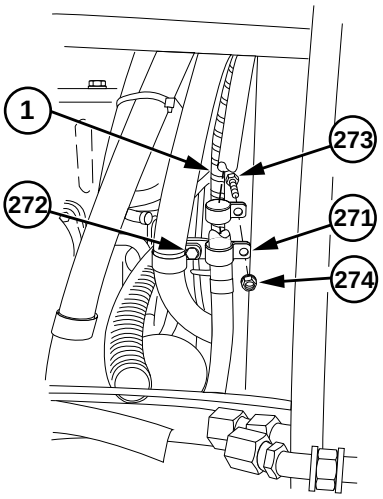
(91) Deleted.

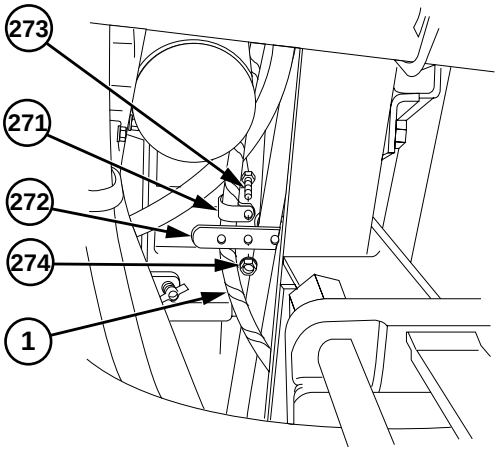
(92) Install two cushion clips (267) on harness (1) and front crossmember (268) with two screws (269) and new locknuts (270).



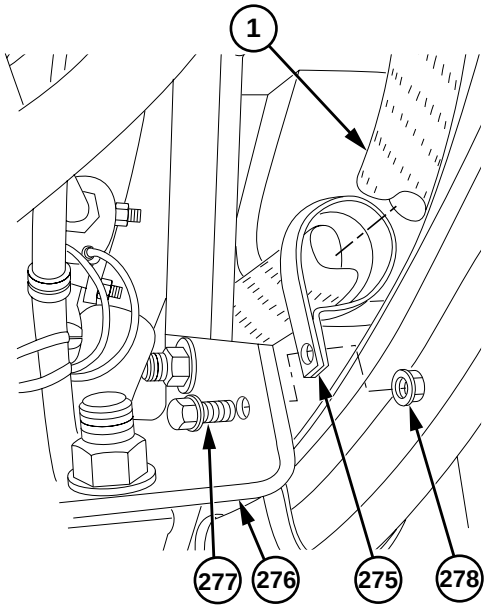
6-8. CHASSIS WIRE HARNESS REPLACEMENT (CONT)

(93) Install two cushion clips (271) on harness (1) and two standoff brackets (272) with two screws (273) and new locknuts (274).

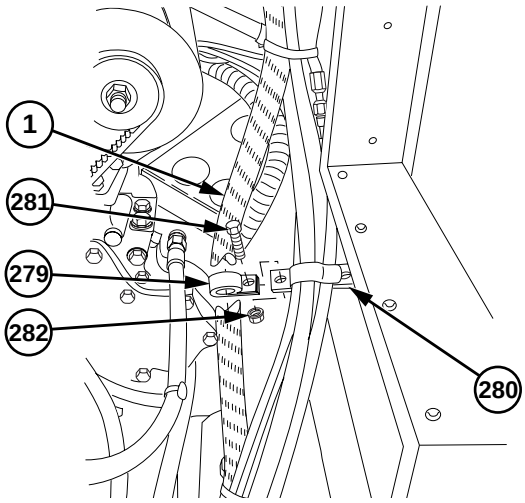




(94) Install cushion clip (275) on harness (1) and right side engine/transmission cradle (276) with screw (277) and new locknut (278).

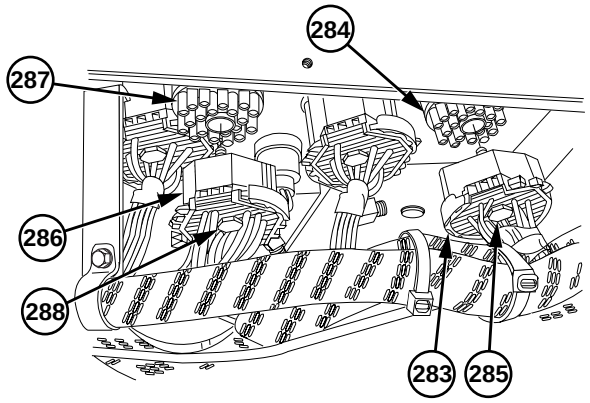


(95) Install cushion clip (279) on harness (1) and standoff bracket (280) with screw (281) and new locknut (282).



(96) Install orange harness connector (283) on orange cab connector (284) and tighten screw (285).

(97) Install red harness connector (286) on red cab connector (287) and tighten screw (288).



c. Follow-On Maintenance

(1) Install catwalk (TM 9-2320-360-20).

(2) Install stowage box (TM 9-2320-360-20).

(3) Install access panels (TM 9-2320-360-20).

(4) Connect batteries (TM 9-2320-360-20).

(5) Install exhaust heat shield (TM 9-2320-360-20).

(6) Close engine hood (TM 9-2320-360-10).

(7) Install inner fender (TM 9-2320-360-20).

6-9. STE-ICE WIRE HARNESS REPLACEMENT

This task covers:
Removal
Installation

Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Engine hood opened (TM 9-2320-360-10).
Batteries disconnected (TM 9-2320-360-20).
Access panels removed (TM 9-2320-360-20).
Stowage box removed (TM 9-2320-360-20).
Inner fender removed (left side only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-150 Lb-In. (Item 234, Appendix E)

Materials/Parts
Grease, Anticorrosion (Item 31, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)

Materials/Parts (Cont)
Locknuts (2) (Item 96, Appendix F)
Locknut (Item 101, Appendix F)
Locknut (Item 81, Appendix F)
Lockwashers (4) (Item 139, Appendix F)
Lockwasher (Item 113, Appendix F)
Lockwasher (Item 114, Appendix F)
Lockwasher (Item 116, Appendix F)
Lockwasher (Item 122, Appendix F)
Lockwasher (Item 135, Appendix F)
Lockwasher (Item 137, Appendix F)
Lockwasher (Item 144, Appendix F)

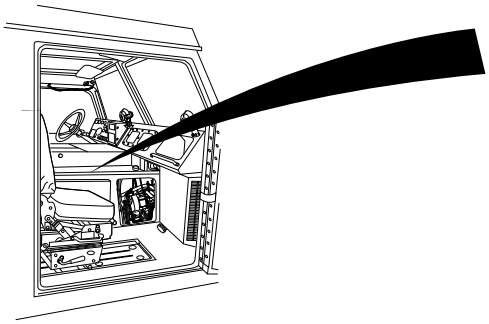
Personnel Required
Two

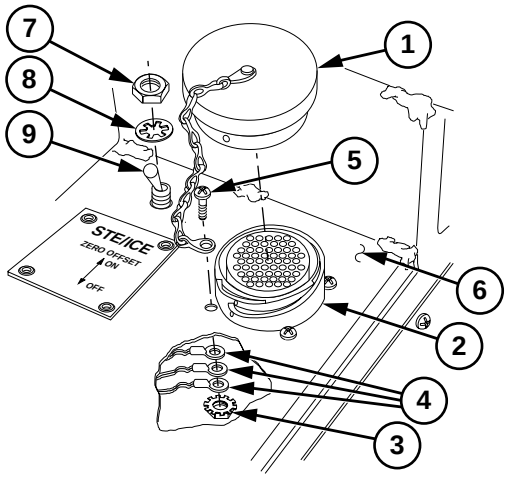
a. STE-ICE Engine Wire Harness Removal

(1) Remove cover (1) from STE-ICE connector (2).

(2) Remove four locknuts (3), three ground wires (4), screws (5), and STE-ICE connector (2) from doghouse (6). Discard locknuts.

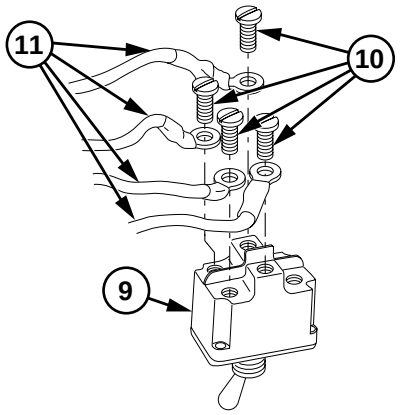
(3) Remove nut (7), lockwasher (8), and STE-ICE ZERO OFFSET switch (9) from doghouse (6). Discard lockwasher.



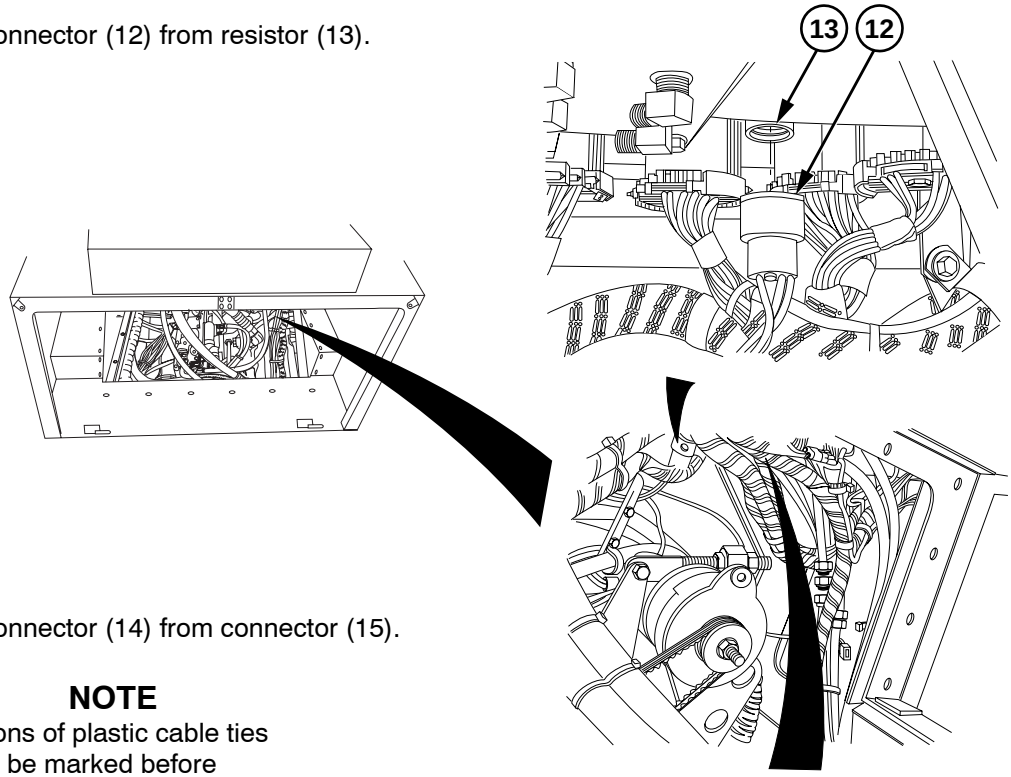


NOTE
Tag and mark wires before removal.

(4) Remove four screws (10) and wires (11) from STE-ICE ZERO OFFSET switch (9).



(5) Remove connector (12) from resistor (13).



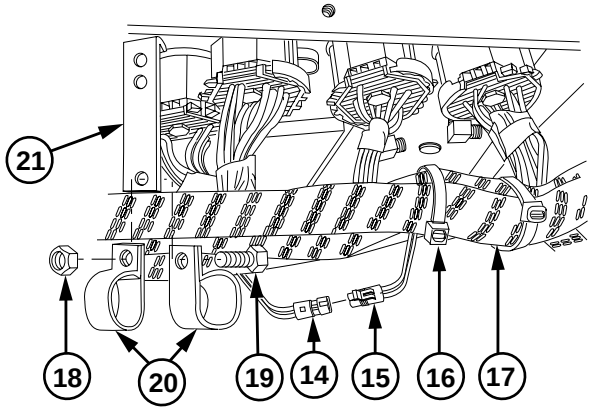
(6) Remove connector (14) from connector (15).

NOTE

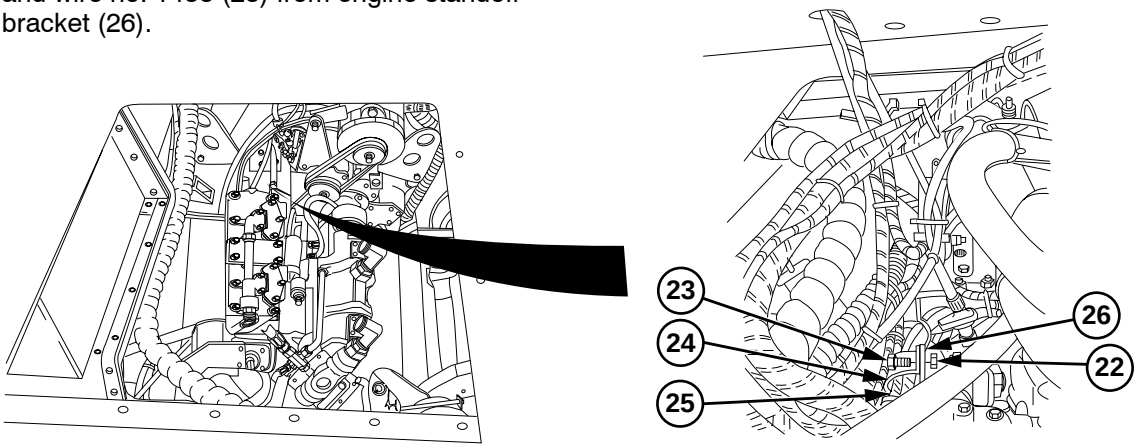
Locations of plastic cable ties should be marked before removal.

(7) Remove plastic cable ties (16) securing STE-ICE wire harness (17).

(8) Remove locknut (18), screw (19), and two clips (20) from cab standoff bracket (21). Discard locknut.



(9) Remove locknut (22), screw (23), clip (24), and wire no. 1435 (25) from engine standoff bracket (26).

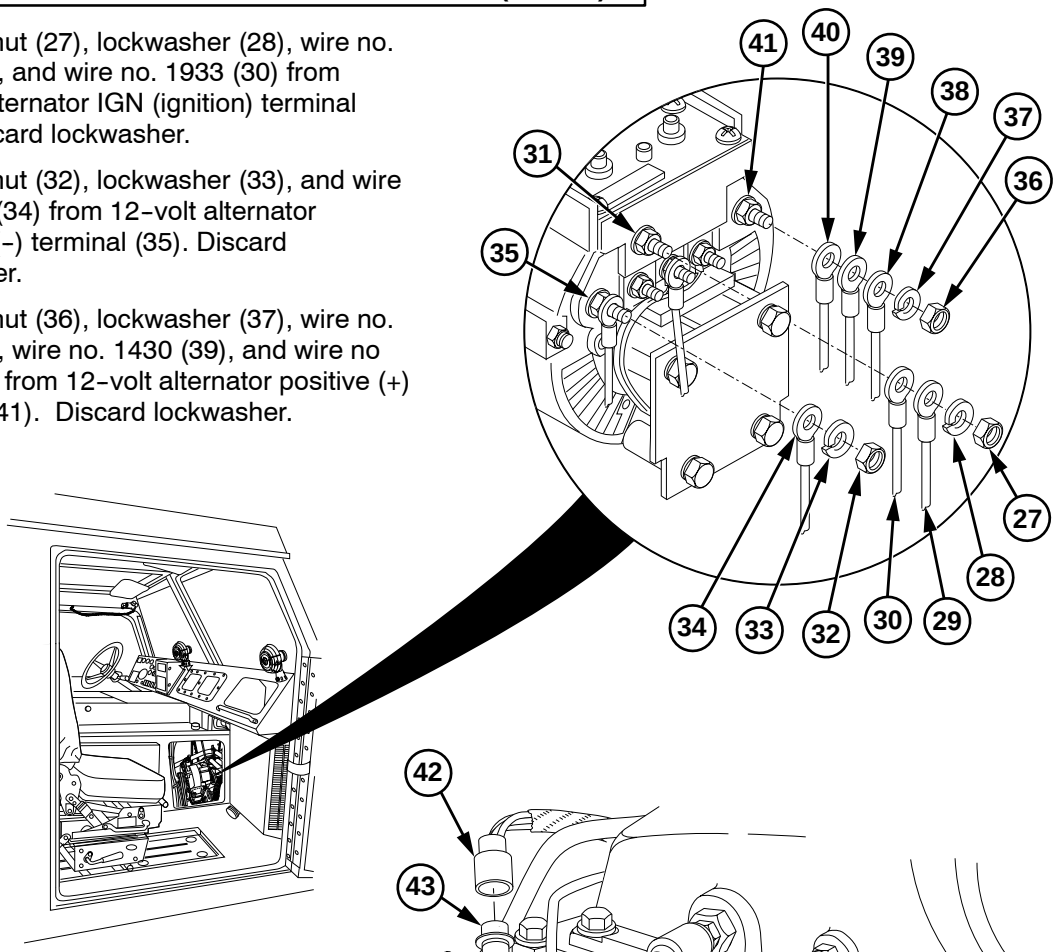


6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)

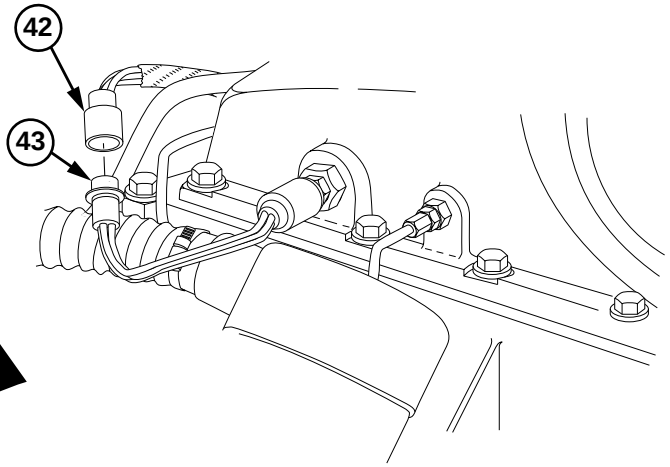
(10) Remove nut (27), lockwasher (28), wire no. 1020 (29), and wire no. 1933 (30) from 12-volt alternator IGN (ignition) terminal (31). Discard lockwasher.

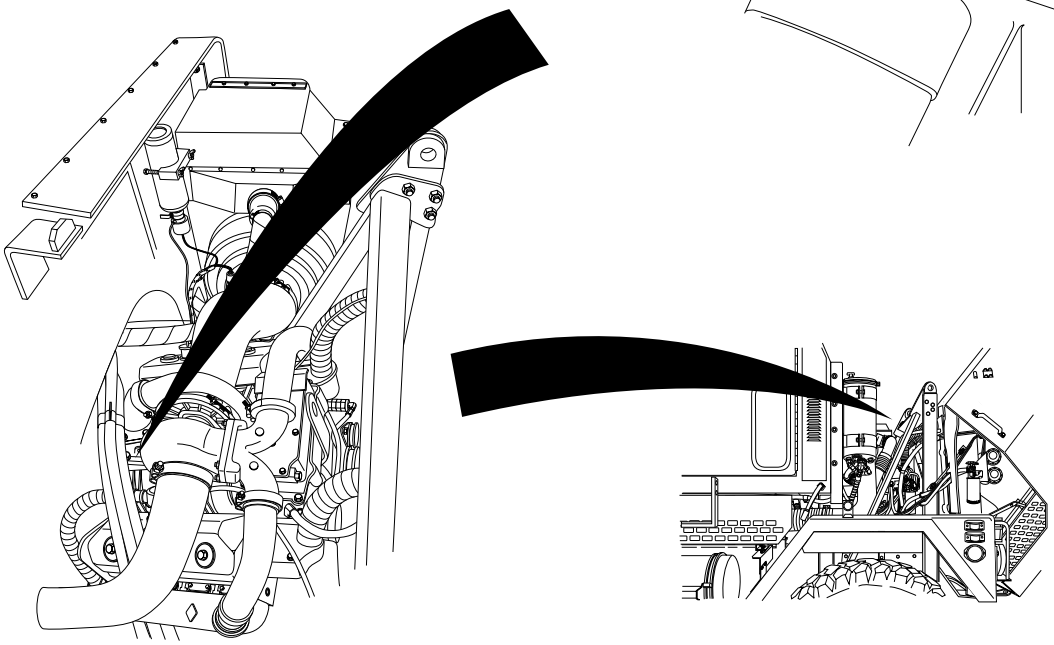
(11) Remove nut (32), lockwasher (33), and wire no. 1815 (34) from 12-volt alternator negative (-) terminal (35). Discard lockwasher.

(12) Remove nut (36), lockwasher (37), wire no. 1831 (38), wire no. 1430 (39), and wire no 1871 (40) from 12-volt alternator positive (+) terminal (41). Discard lockwasher.



(13) Remove connector (42) from turbo boost sensor (43).

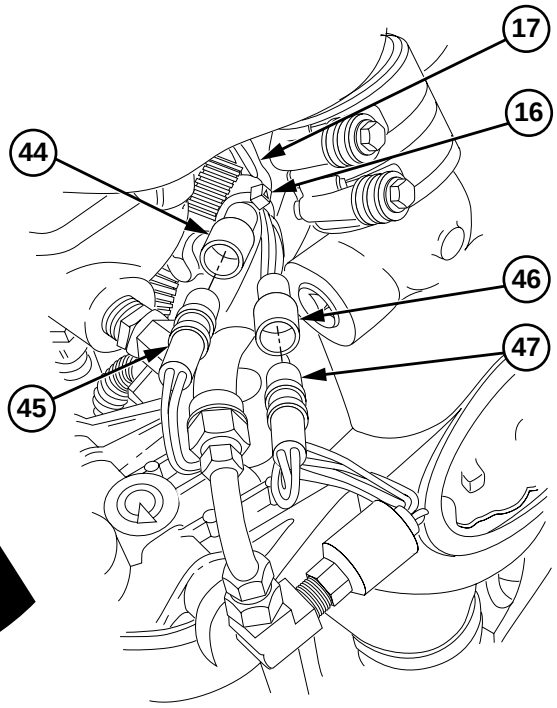




NOTE

Locations of plastic cable ties should be marked before removal.

(14) Remove plastic cable ties (16) securing STE-ICE wire harness (17).

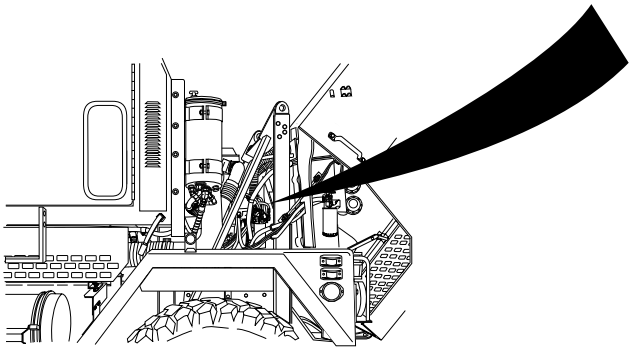


NOTE

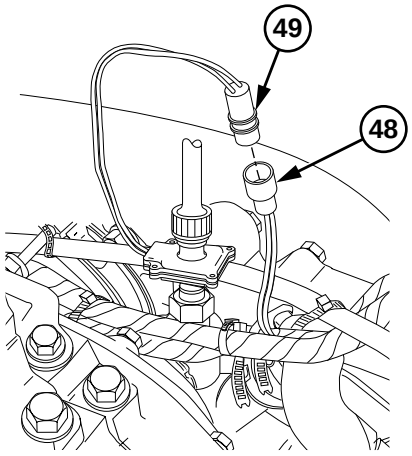
Fuel pressure transducer connector and water temperature connector are not interchangeable.

(15) Remove connector (44) from water temperature sensor (45).

(16) Remove connector (46) from fuel pressure transducer (47).



(17) Remove connector (48) from tachometer pulse generator (49).

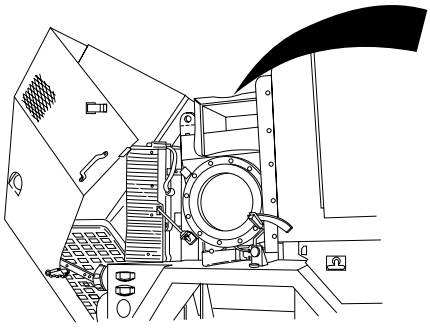


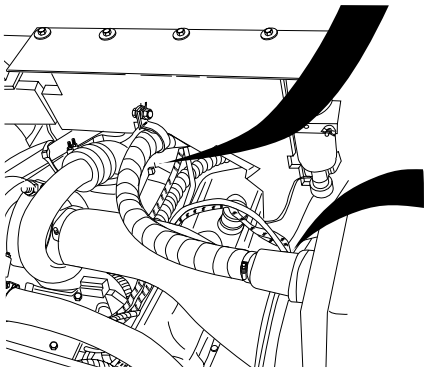
NOTE

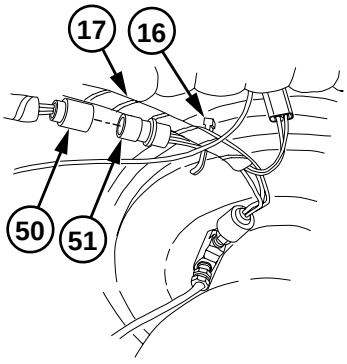
Locations of plastic cable ties should be marked before removal.

(18) Remove plastic cable ties (16) securing STE-ICE wire harness (17).

(19) Remove connector (50) from air cleaner sensor (51).







6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)

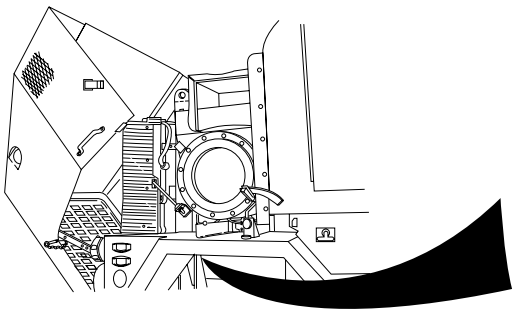
(20) Deleted.

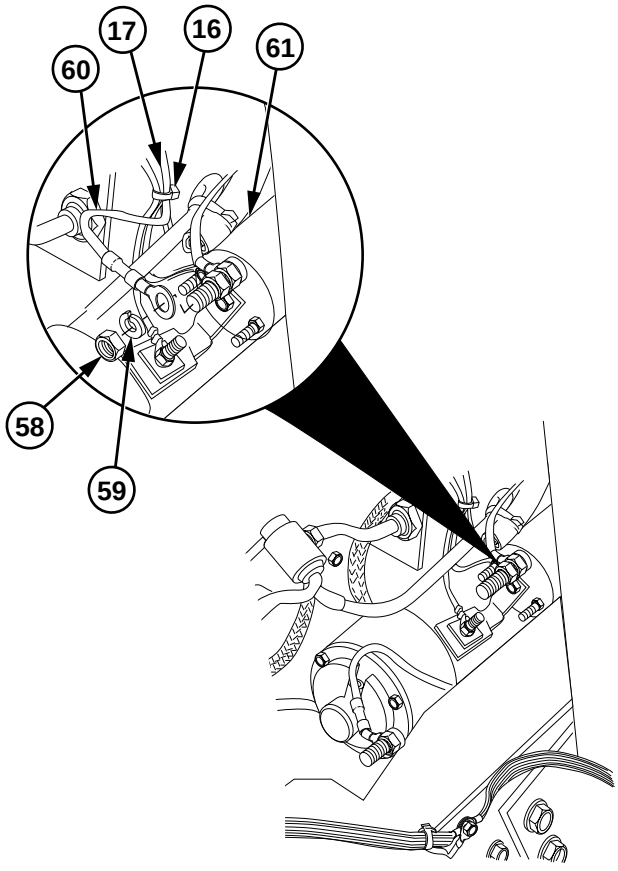
NOTE

Locations of plastic cable ties should be marked before removal.

(21) Remove plastic cable ties (16) securing STE-ICE wire harness (17).

(22) Remove nut (58), lockwasher (59), and wire no. 1816 (60) from starter solenoid (61). Discard lockwasher.

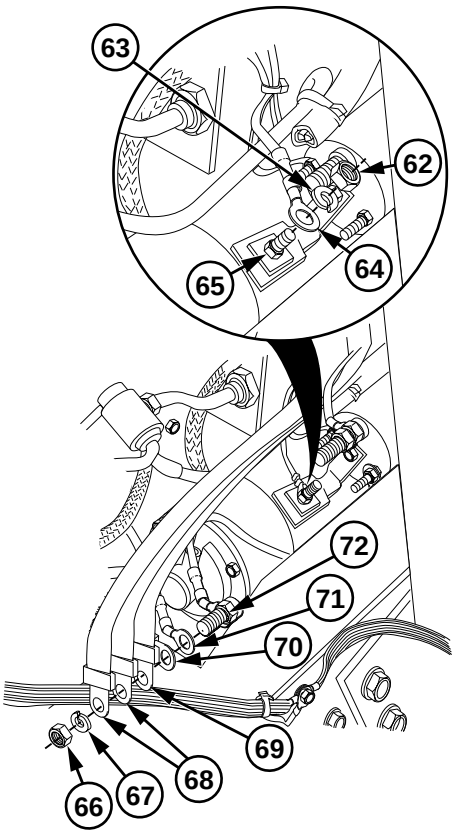




STEERING COLUMN REMOVED FOR CLARITY

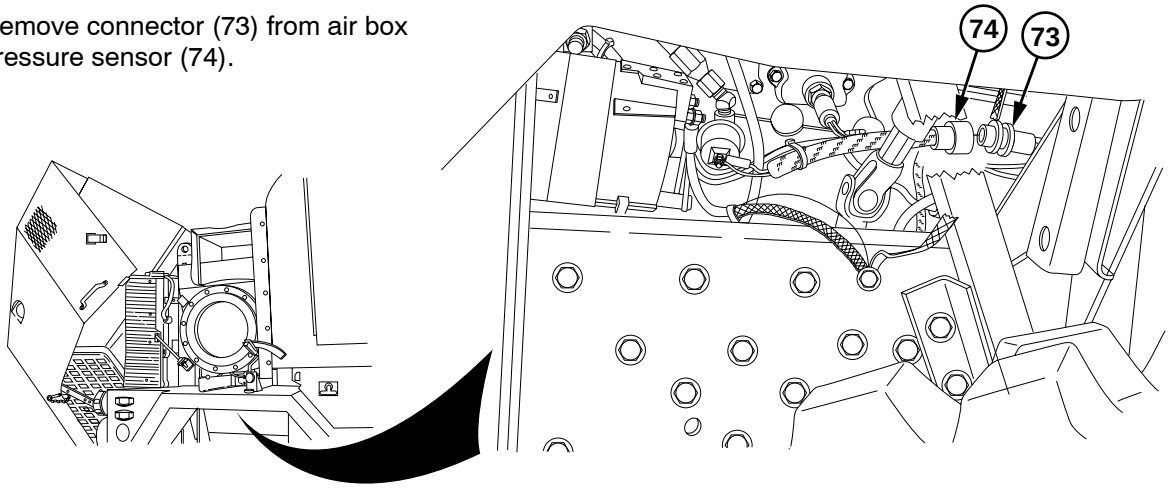
(23) Remove nut (62), lockwasher (63), and wire no. 1818 (64) from starter motor field terminal (65). Discard lockwasher.

(24) Remove nut (66), lockwasher (67), two negative (–) cables no. 1138 (68), negative (–) cable no. 1128 (69), ground strap (70), and wire no. 1819 (71) from starter motor negative (–) terminal (72). Discard lockwasher.



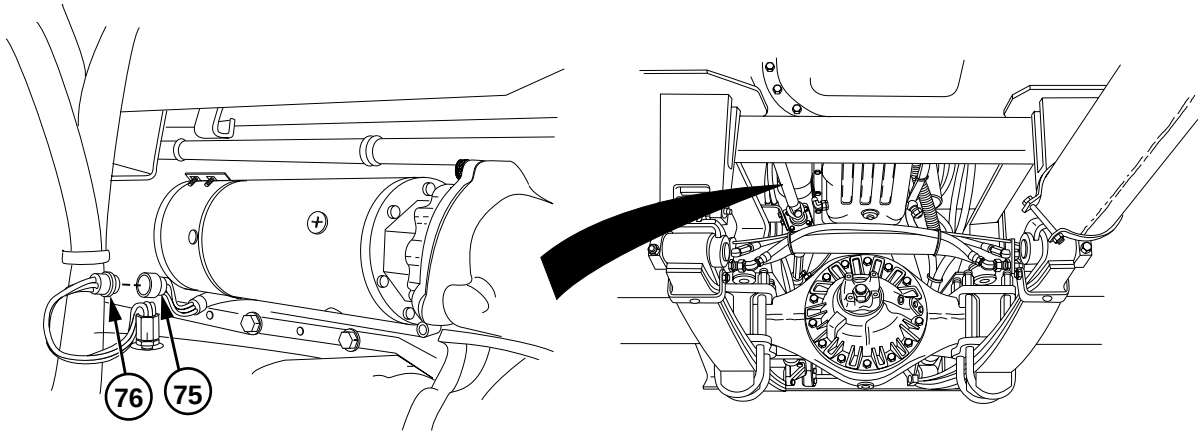
STEERING COLUMN REMOVED FOR CLARITY

(25) Remove connector (73) from air box pressure sensor (74).



6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)

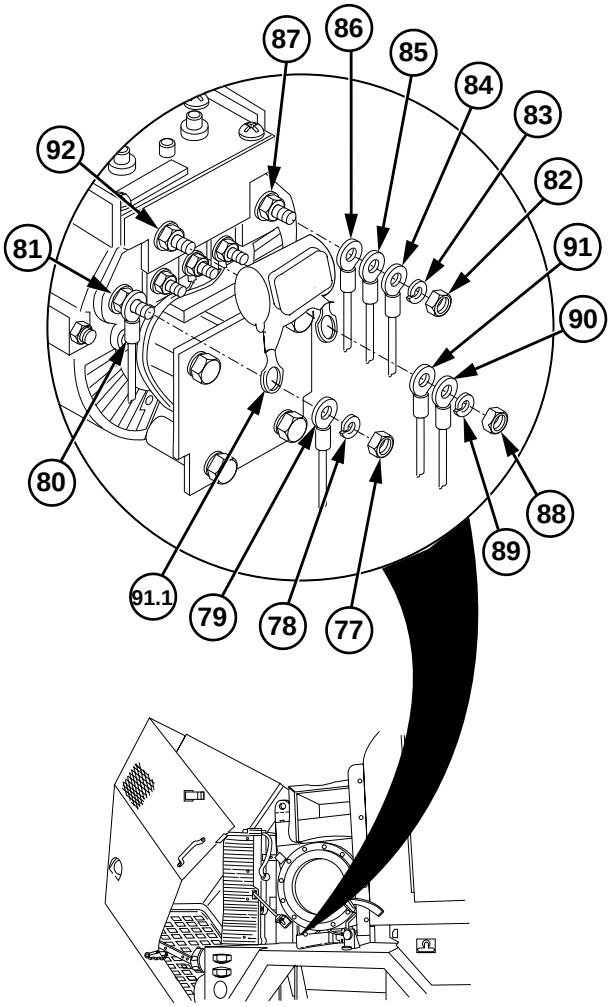
(26) Remove connector (75) from oil temperature sensor (76).



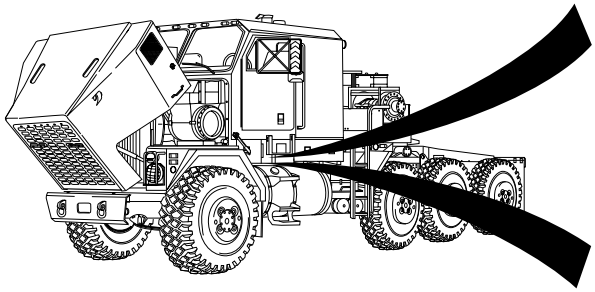
(27) Remove nut (77), lockwasher (78), wire no. 1128 (79), and wire no. 1815 (80) from 24-volt alternator negative (-) terminal (81). Discard lockwasher.

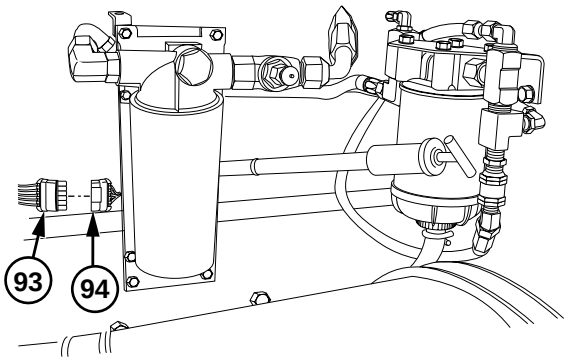
(28) Remove nut (82), lockwasher (83), wire no. 1280 (84), wire no. 1831 (85), and wire no. 1820 (86) from 24-volt alternator positive (+) terminal (87). Discard lockwasher.

(29) Remove nut (88), lockwasher (89), wire no. 1020 (90), wire no. 1953 (91) and EMI capacitor (91.1) from 24-volt alternator IGN terminal (92). Discard lockwasher.



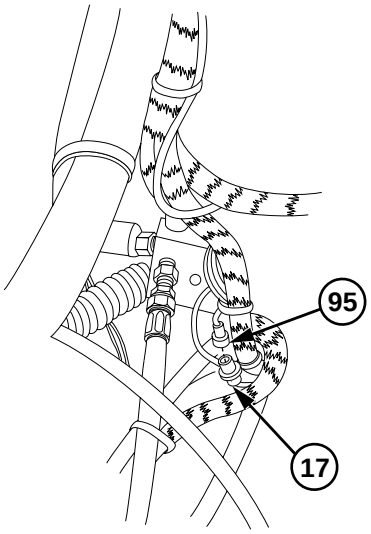
(30) Disconnect 6-pin connector (93) from STE-ICE chassis wire harness (94).





(31) Disconnect fuel pressure transducer plug (95) from STE-ICE engine wire harness (17).

(32) Remove STE-ICE engine wire harness (17) from HET Tractor with aid of assistant.



b. STE-ICE Engine Wire Harness Installation

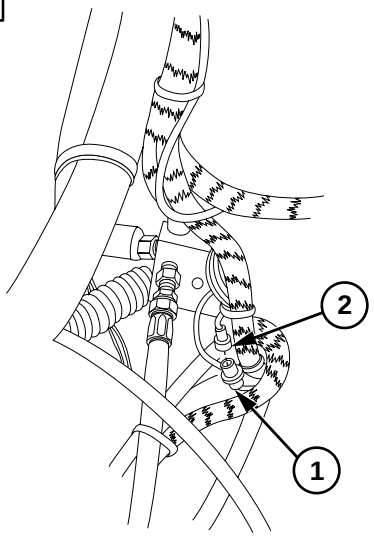
NOTE

- Evenly distribute any slack in harness. Do not make any connections.
- STE-ICE 4-pin connectors are not interchangeable. Refer to table 6-3 for proper locations.

Table 6-3. STE-ICE Connector Locations

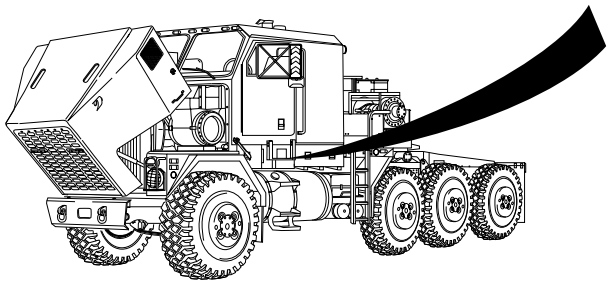
Connector Location	Wire Numbers at Plug
Engine Oil Temp	1952, 1938A, 1824, 1825
Air Box Pressure	1945, 1946, 1824, 1825
Fuel Return psi	1949, 1951, 1824, 1825
Turbo Outlet pressure	1943, 1944, 1824, 1825
Water temperature	1939, 1940, 1824, 1825
Fuel psi	1941, 1942, 1824, 1825
Cleaner pressure drop	1947, 1947, 1824, 1825

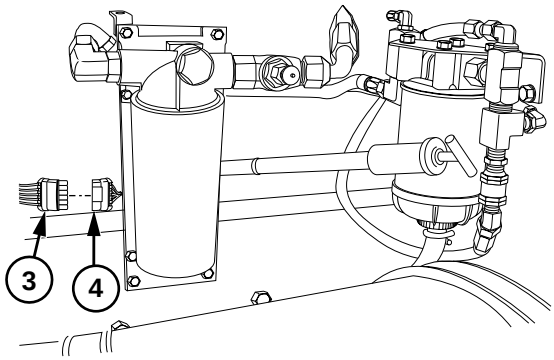
6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)



(1) Position STE-ICE engine wire harness (1) in HET Tractor.

(2) Connect fuel pressure transducer plug (2) to STE-ICE engine wire harness (1).





(3) Connect 6-pin connector (3) to STE-ICE chassis wire harness (4).

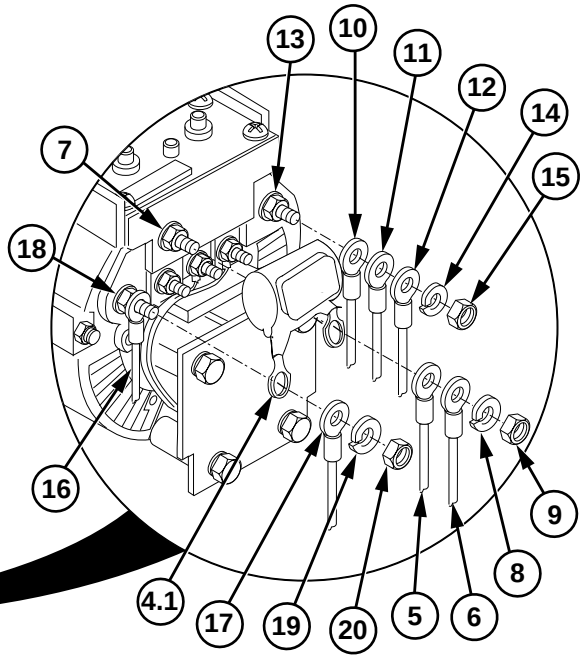
CAUTION

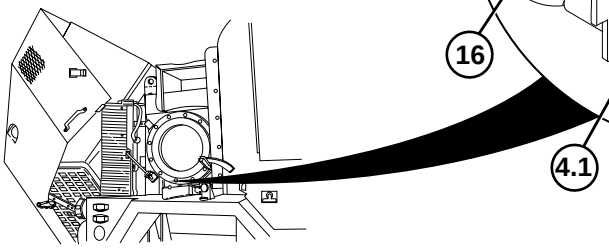
Ensure wires to alternator are loose enough to allow for alternator belt adjustment. Failure to comply may result in damage to wire harness.

(4) Install EMI capacitor (4.1), wire no. 1953 (5), and wire no. 1020 (6) on 24-volt alternator IGN (ignition) terminal (7) with new lockwasher (8) and nut (9).

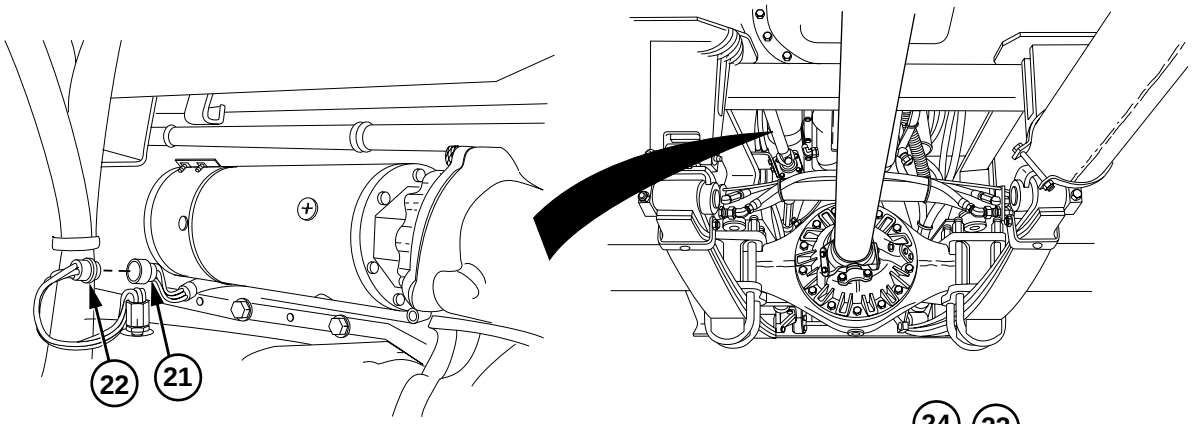
(5) Install wire no. 1820 (10), wire no. 1831 (11), and wire no. 1280 (12) on 24-volt alternator positive (+) terminal (13) with new lockwasher (14) and nut (15).

(6) Install wire no. 1815 (16) and wire no. 1128 (17) on 24-volt alternator negative (-) terminal (18) with new lockwasher (19) and nut (20).

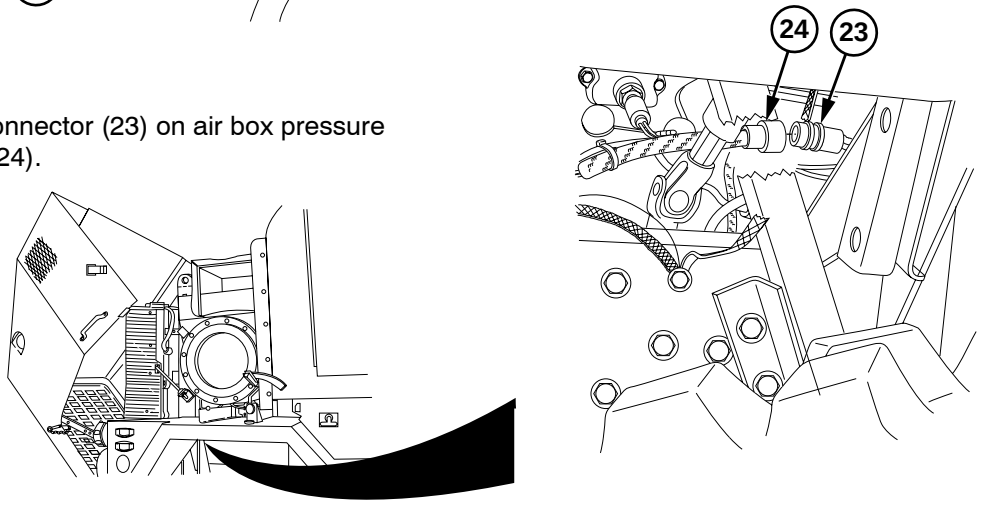




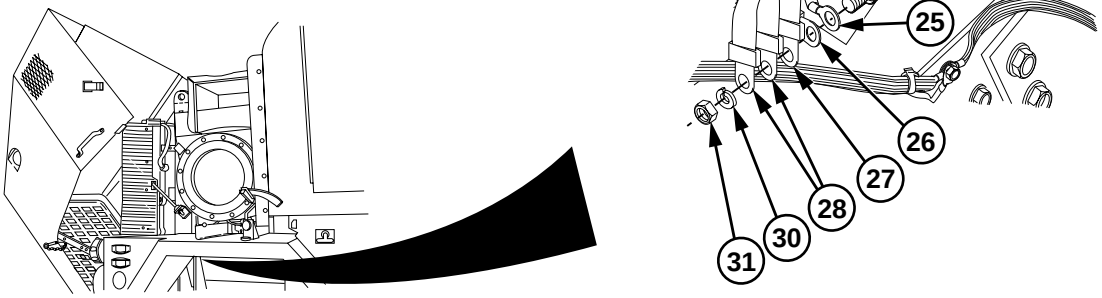
(7) Install connector (21) on oil temperature sensor (22).



(8) Install connector (23) on air box pressure sensor (24).



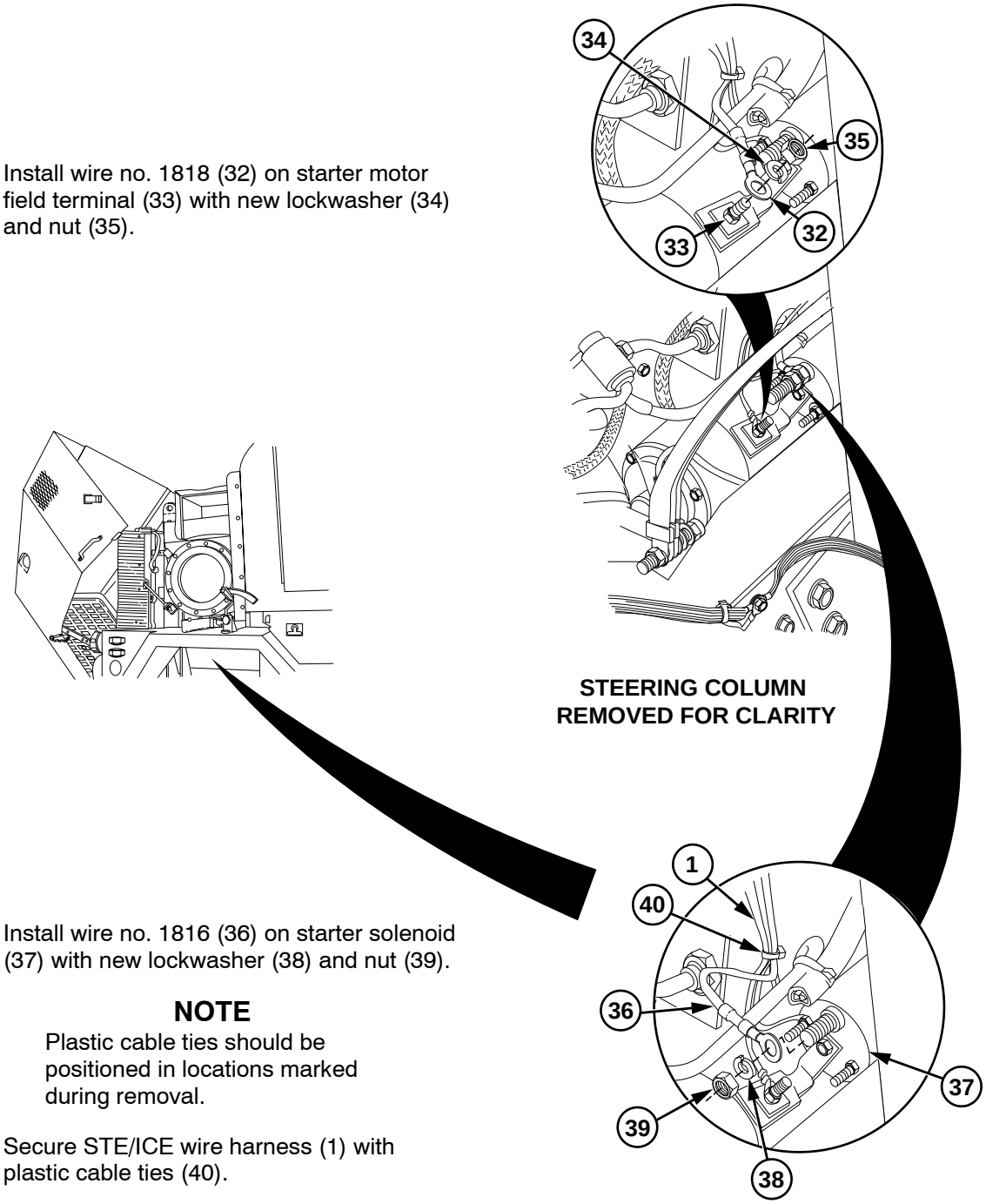
(9) Install wire no. 1819 (25), ground strap (26), negative (-) cable no. 1128 (27), and two negative (-) cables no. 1138 (28) on starter motor negative (-) terminal (29) with new lockwasher (30) and nut (31).



STEERING COLUMN REMOVED FOR CLARITY

6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)

(10) Install wire no. 1818 (32) on starter motor field terminal (33) with new lockwasher (34) and nut (35).



(11) Install wire no. 1816 (36) on starter solenoid (37) with new lockwasher (38) and nut (39).

NOTE

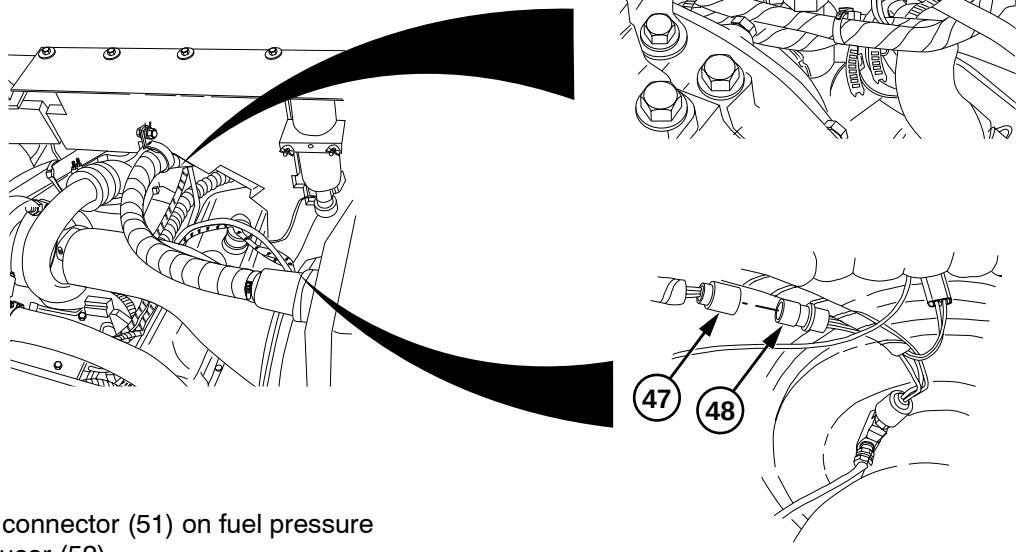
Plastic cable ties should be positioned in locations marked during removal.

(12) Secure STE/ICE wire harness (1) with plastic cable ties (40).

(13) Deleted.

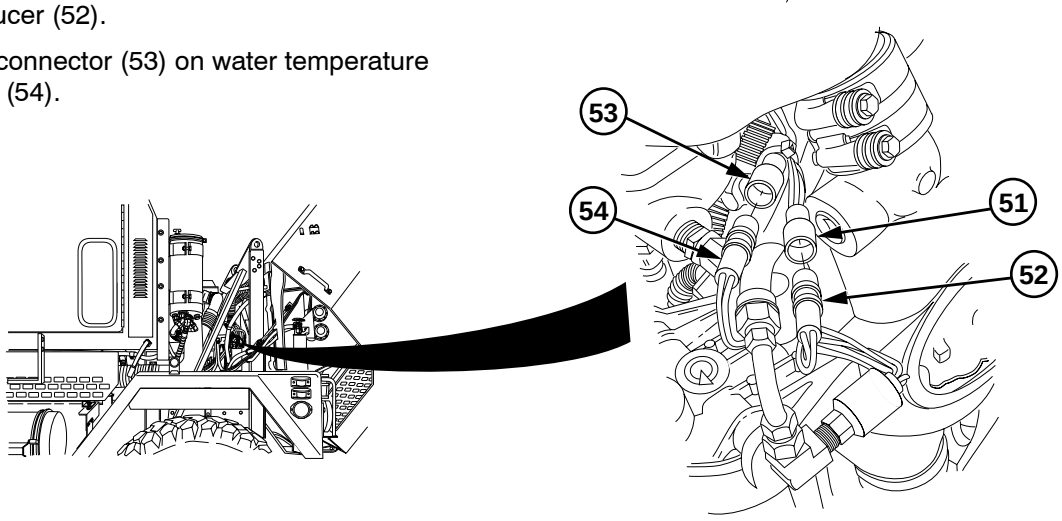
(14) Install connector (47) on air cleaner sensor (48).

(15) Install connector (49) on tachometer pulse generator (50).



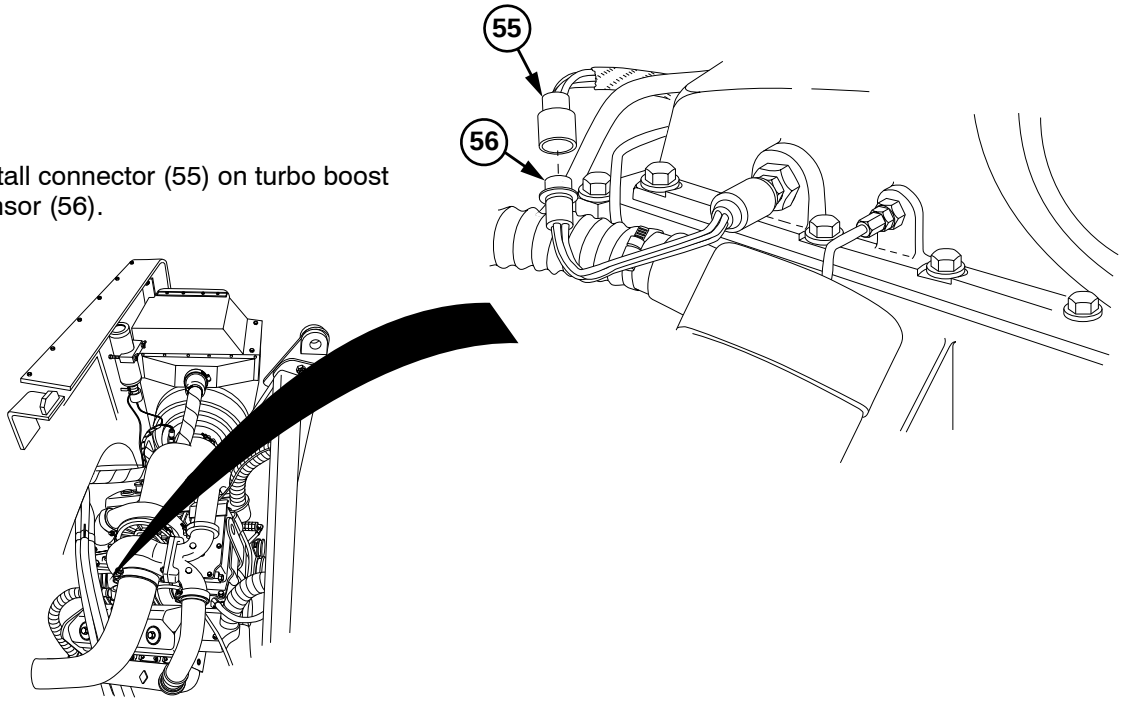
(16) Install connector (51) on fuel pressure transducer (52).

(17) Install connector (53) on water temperature sensor (54).



6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)

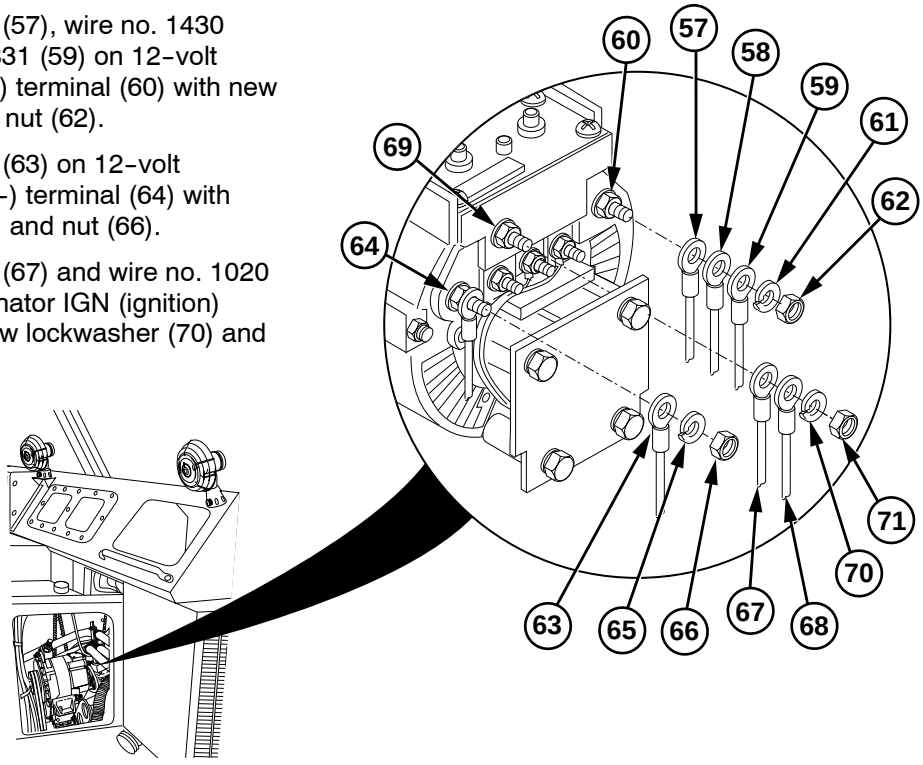
(18) Install connector (55) on turbo boost sensor (56).



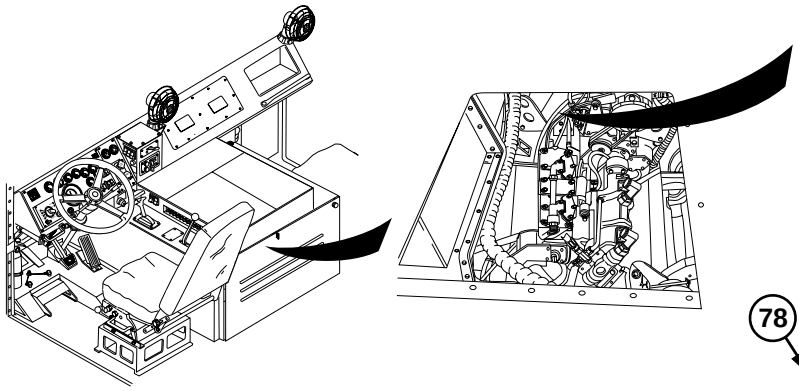
(19) Install wire no. 1817 (57), wire no. 1430 (58), and wire no. 1831 (59) on 12-volt alternator positive (+) terminal (60) with new lockwasher (61) and nut (62).

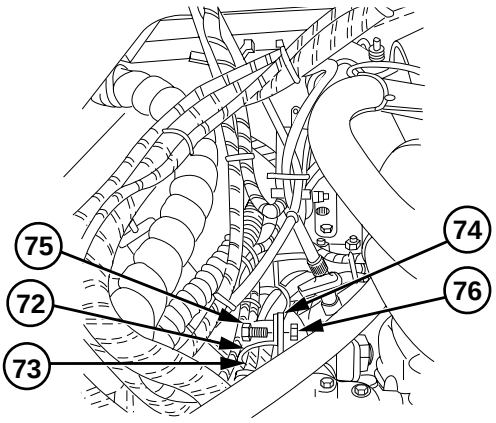
(20) Install wire no. 1815 (63) on 12-volt alternator negative (-) terminal (64) with new lockwasher (65) and nut (66).

(21) Install wire no. 1933 (67) and wire no. 1020 (68) on 12-volt alternator IGN (ignition) terminal (69) with new lockwasher (70) and nut (71).



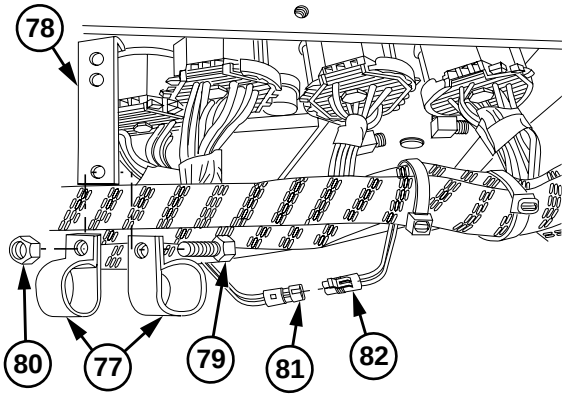
(22) Install clip (72) and wire no. 1435 (73) on engine standoff bracket (74) with screw (75) and new locknut (76).



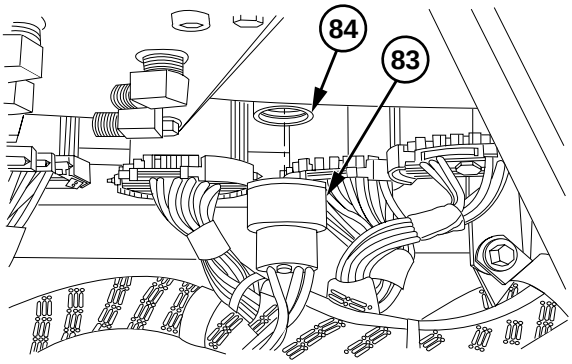


(23) Install two clips (77) on cab standoff bracket (78) with screw (79) and new locknut (80).

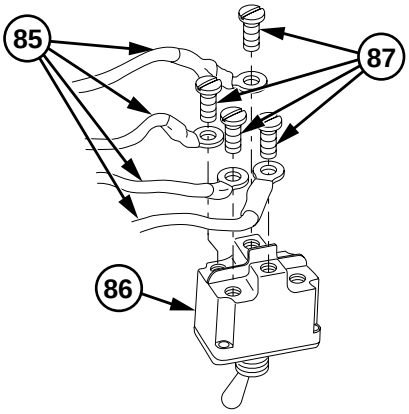
(24) Install connector (81) on connector (82).



(25) Install connector (83) on resistor (84).



(26) Install four wires (85) on STE-ICE ZERO OFFSET switch (86) with screws (87).

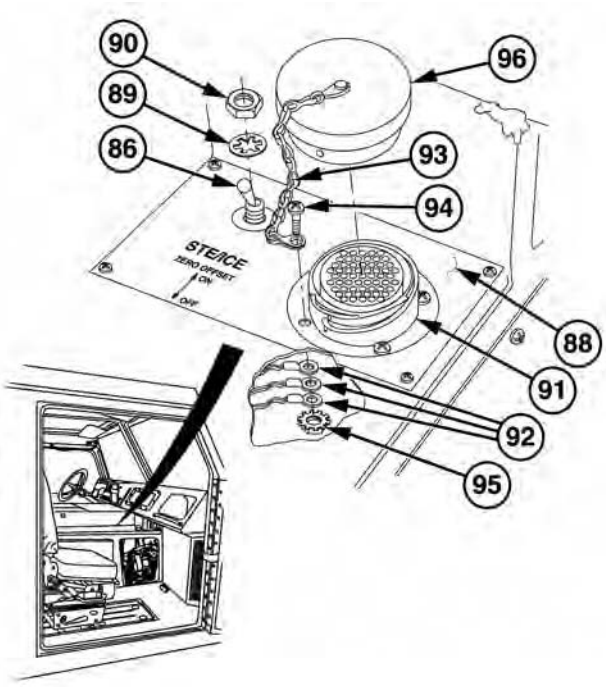


6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)

(27) Install STE-ICE ZERO OFFSET switch (86) on doghouse (88) with new lockwasher (89) and nut (90).

(28) Install STE-ICE connector (91), three ground wires (92), and chain (93) on doghouse (88) with four screws (94) and new locknuts (95).

(29) Install cover (96) on STE-ICE connector (91).



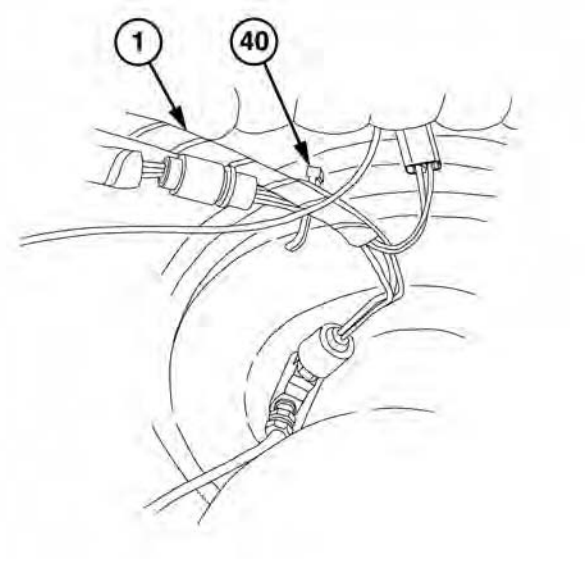
CAUTION

The STE-ICE wire harness must be secured and positioned away from hot or rotating parts. Failure to comply will result in damage to equipment.

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(30) Secure STE-ICE wire harness (1) with plastic cable ties (40).



c. STE-ICE Chassis Wire Harness Removal

NOTE

Wires no. 1813, no. 1822, and no. 1814 are removed from battery box at the same time STE-ICE wire harness is removed.

(1) Remove STE-ICE wire harness (1) from battery box (2).

NOTE

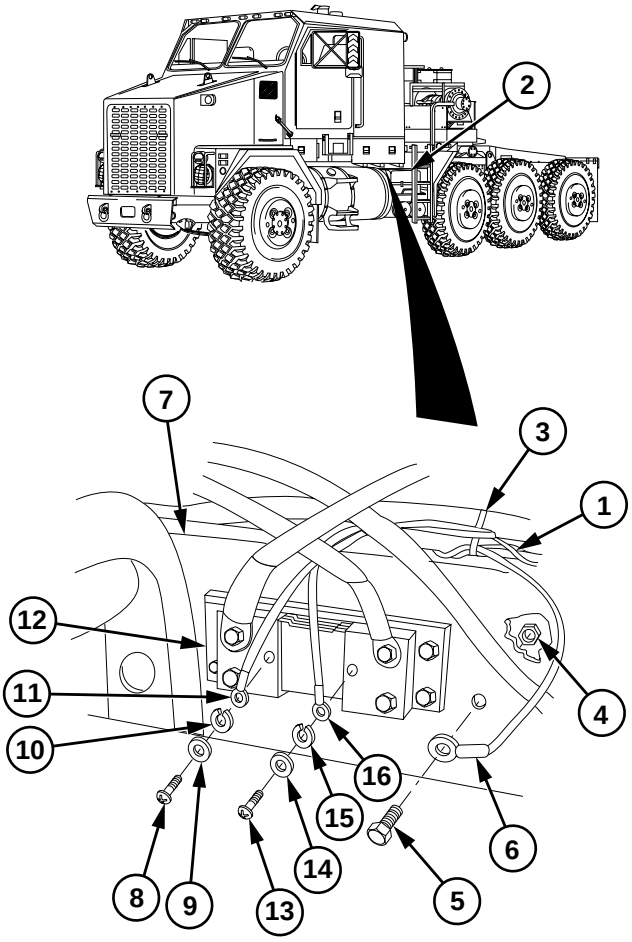
Locations of plastic cable ties should be marked before removal.

(2) Remove plastic cable ties (3) securing STE-ICE wire harness (1).

(3) Remove locknut (4), screw (5), and wire no. 1821 (6) from frame (7) with aid of assistant. Discard locknut.

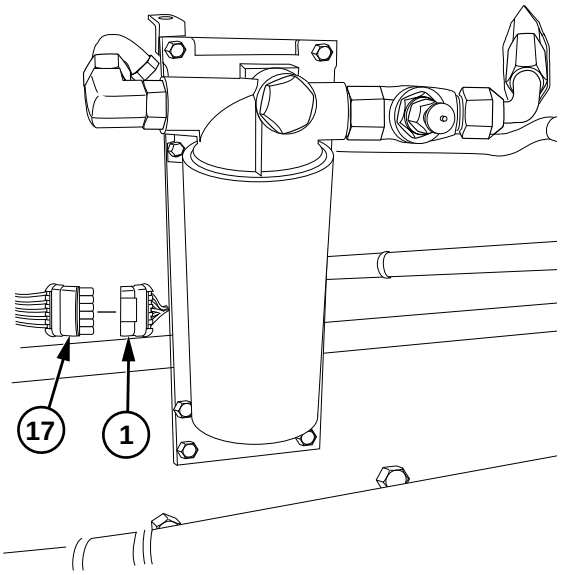
(4) Remove screw (8), washer (9), lockwasher (10), and wire no. 1828 (11) from shunt (12). Discard lockwasher.

(5) Remove screw (13), washer (14), lockwasher (15), and wire no. 1829 (16) from shunt (12). Discard lockwasher.



(6) Disconnect 6-pin connector (17) from STE-ICE engine wire harness (1).

(7) Remove STE-ICE chassis wire harness (1) from HET Tractor.



6-9. STE-ICE WIRE HARNESS REPLACEMENT (CONT)

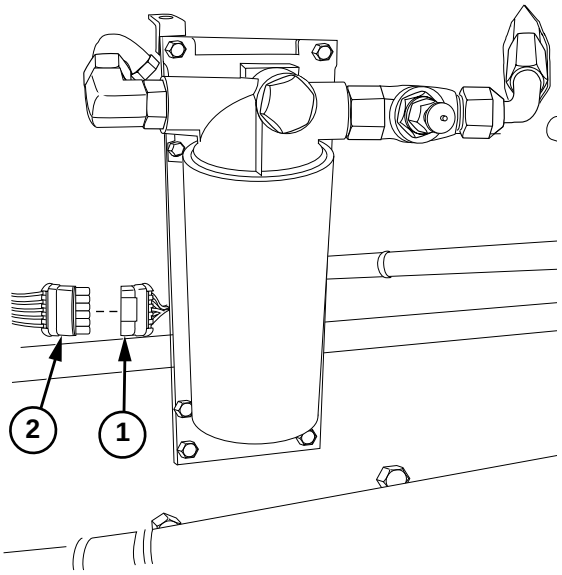
d. STE-ICE Chassis Wire Harness Installation

NOTE

- Evenly distribute any slack in harness. Do not make any connections.
- The 6-pin connector end should be toward front of vehicle; 3-part end is threaded into battery box.

(1) Position STE-ICE chassis wire harness (1) in HET Tractor.

(2) Connect 6-pin connector (2) to STE-ICE engine wire harness (1).



(3) Install wire no. 1829 (3) on shunt (4) with new lockwasher (5), washer (6), and screw (7).

(4) Install wire no. 1828 (8) on shunt (4) with new lockwasher (9), washer (10), and screw (11).

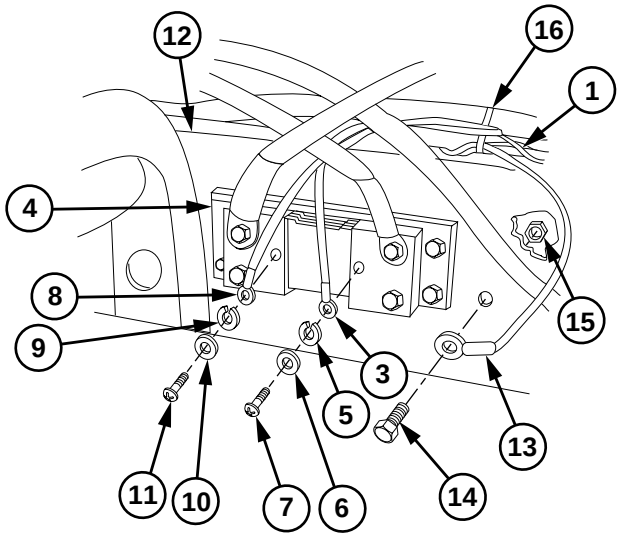
(5) Coat 1 in. (2.5 cm) area around hole in frame (12) with anti-corrosion grease.

(6) Install wire no. 1821 (13) on frame (12) with screw (14) and new locknut (15) with aid of assistant.

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(7) Secure STE-ICE wire harness (1) with plastic cable ties (16).



e. Follow-On Maintenance

(1) Install stowage box (TM 9-2320-360-20).

(2) Install engine access panels (TM 9-2320-360-20).

(3) Connect batteries (TM 9-2320-360-20).

(4) Close engine hood (TM 9-2320-360-10).

(5) Install inner fender (TM 9-2320-360-20).

6-10. DDEC POWER HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Engine hood opened (TM 9-2320-360-10).
Batteries disconnected (TM 9-2320-360-20).
Lower engine access panels removed (TM 9-2320-360-20).
Stowage box removed (TM 9-2320-360-20).
Front engine access panels removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Lockwashers (3) (Item 126, Appendix F)
Lockwashers (2) (Item 112, Appendix F)

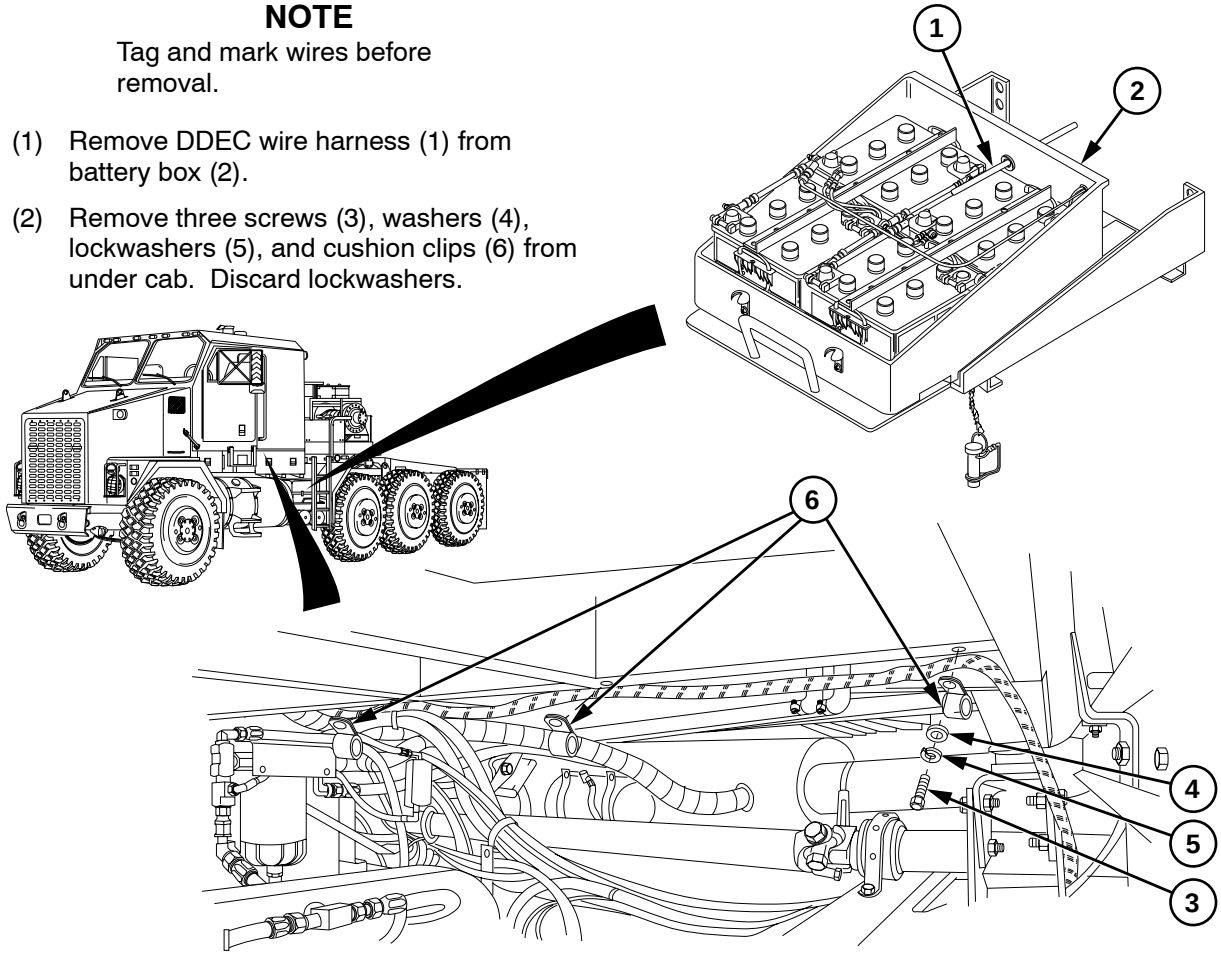
Personnel Required
Two

a. Removal

NOTE
Tag and mark wires before removal.

(1) Remove DDEC wire harness (1) from battery box (2).

(2) Remove three screws (3), washers (4), lockwashers (5), and cushion clips (6) from under cab. Discard lockwashers.

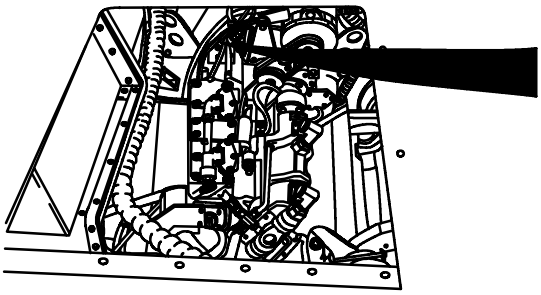


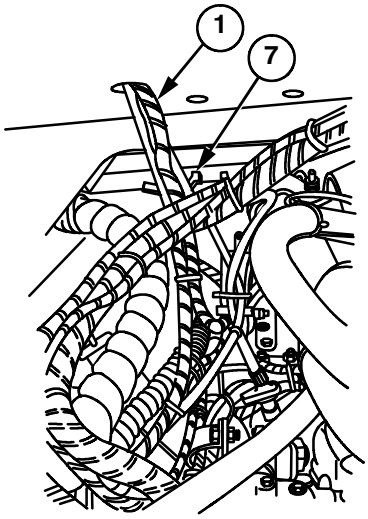
6-10. DDEC POWER HARNESS REPLACEMENT (CONT)

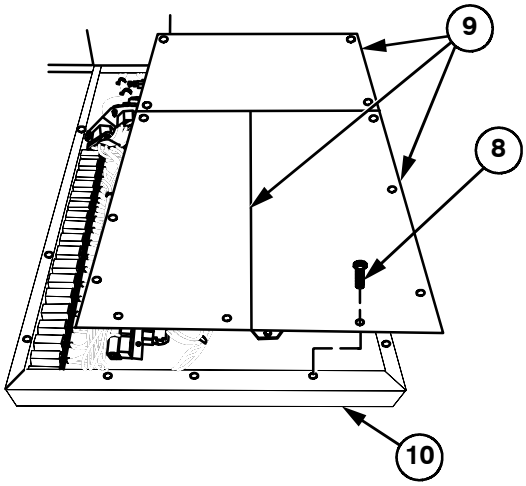
NOTE

Location of plastic cable ties should be marked before removal.

(3) Remove plastic cable ties (7) securing DDEC wire harness (1).







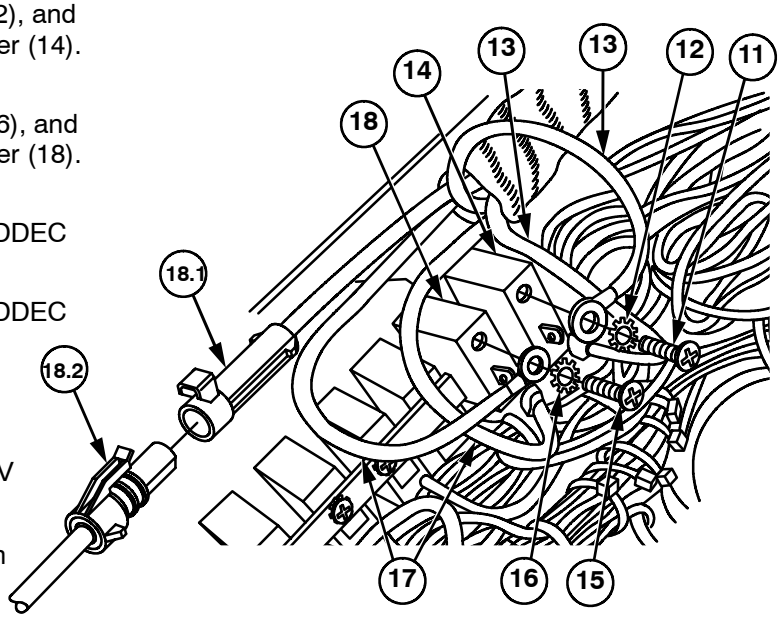
(4) Remove 19 screws (8) and 3 covers (9) from electronic control box (10).

(5) Remove screw (11), lockwasher (12), and wire no. 240 (13) from circuit breaker (14). Discard lockwasher.

(6) Remove screw (15), lockwasher (16), and wire no. 241 (17) from circuit breaker (18). Discard lockwasher.

(7) Disconnect wire no. 240 (13) from DDEC circuit breaker (14).

(8) Disconnect wire no. 241 (17) from DDEC circuit breaker (18).



NOTE

Step (8.1) applies to DDEC III/IV vehicles only.

(8.1) Disconnect wire no. 953 (18.1) from control box harness (18.2).

(9) Push DDEC wire harness (1) from electronic control box (10) into engine compartment.

NOTE

Location of plastic cable ties should be marked before removal.

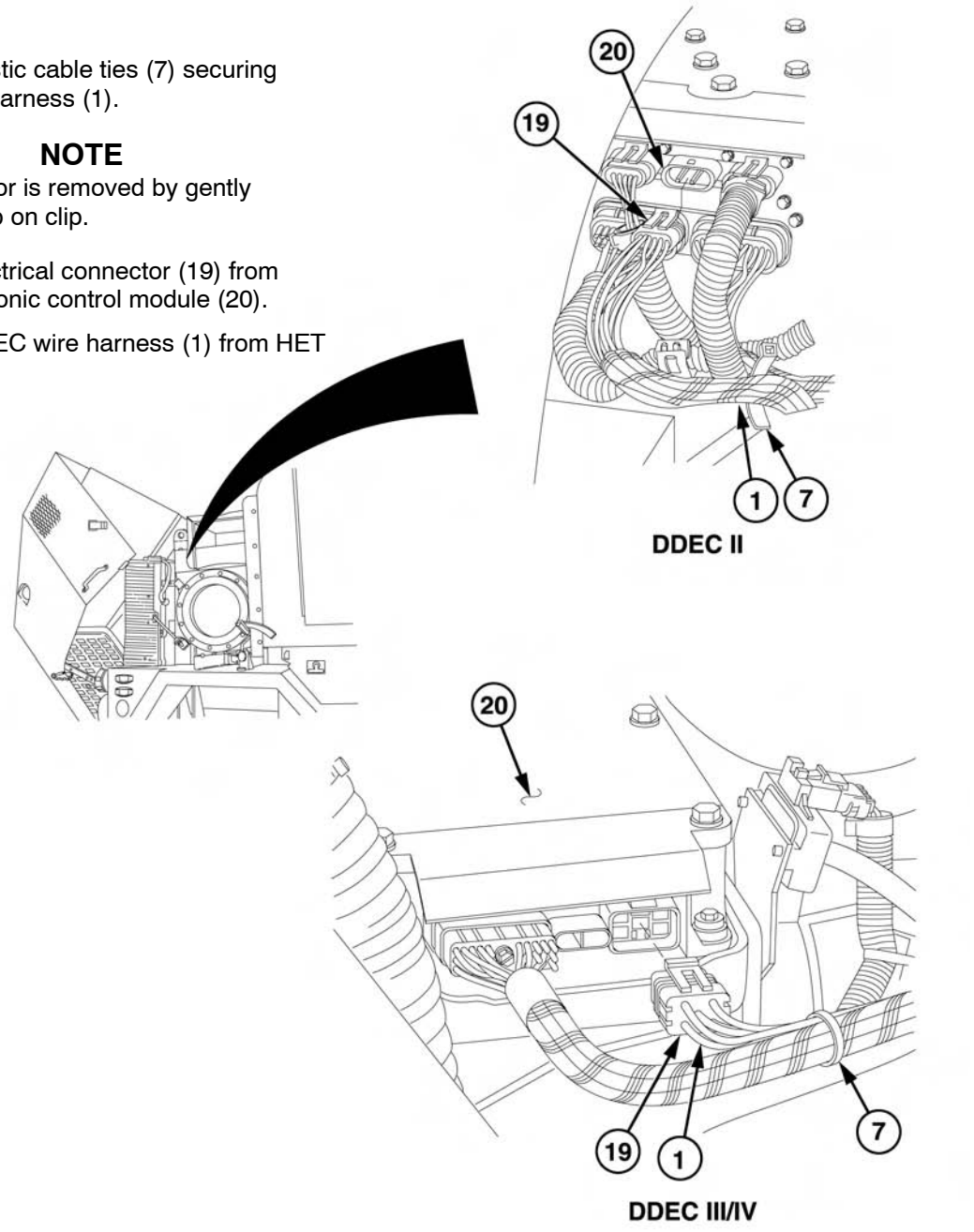
(10) Remove plastic cable ties (7) securing DDEC wire harness (1).

NOTE

Connector is removed by gently prying up on clip.

(11) Remove electrical connector (19) from DDEC electronic control module (20).

(12) Remove DDEC wire harness (1) from HET Tractor.



6-10. DDEC POWER HARNESS REPLACEMENT (CONT)

b. Installation

NOTE

- Evenly distribute any slack in harness. Do not make any connections.
- The 4-part end of the harness is threaded into electric control box through the hole in firewall. The 3-part end is threaded into battery box through center hole in battery box.

(1) Position DDEC wire harness (1) in HET Tractor with aid of assistant.

(2) Install electrical connector (2) on DDEC electronic control module (3).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(3) Secure DDEC wire harness (1) with plastic cable ties (4).

(4) Connect wire no. 240 (5) to bottom terminal of DDEC circuit breaker (6).

(5) Connect wire no. 241 (7) to bottom terminal of DDEC circuit breaker (8).

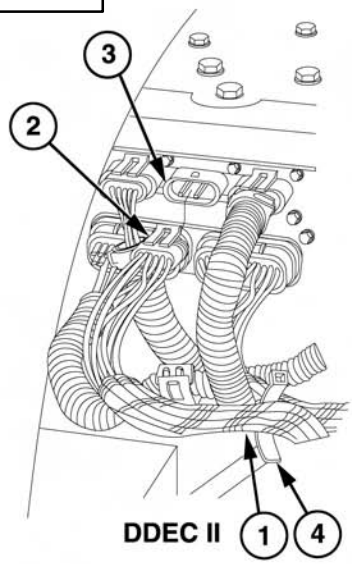
(6) Install wire no. 240 (5) on top terminal of DDEC circuit breaker (6) with new lockwasher (9) and screw (10).

(7) Install wire no. 241 (7) on top terminal of DDEC circuit breaker (8) with new lockwasher (11) and screw (12).

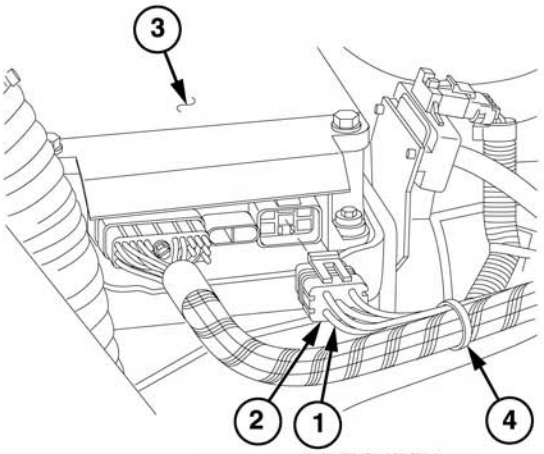
NOTE

Step (7.1) applies only to DDEC III/IV vehicles.

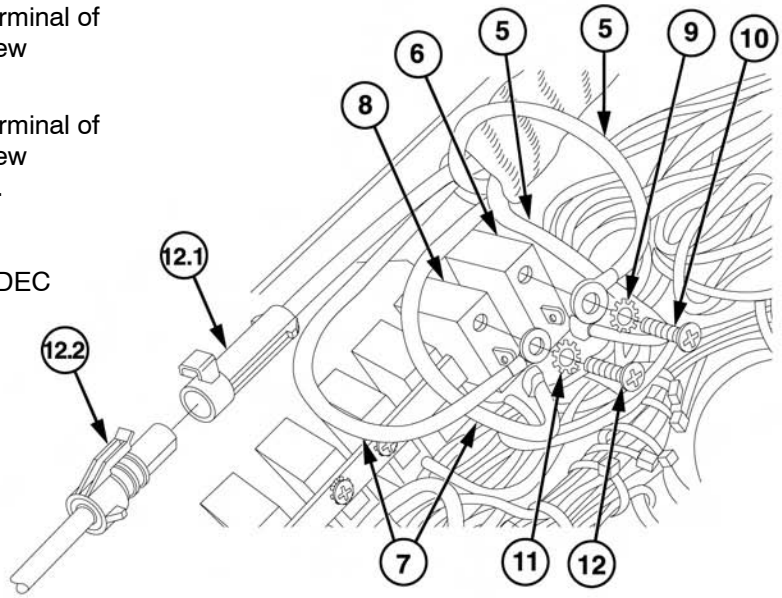
(7.1) Connect wire no. 953 (12.1) to control box harness (12.2).



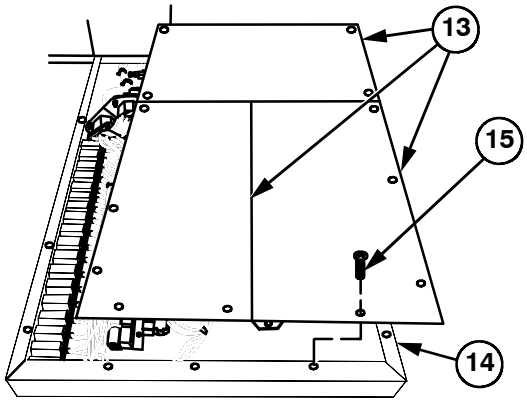
DDEC II



DDEC III/IV



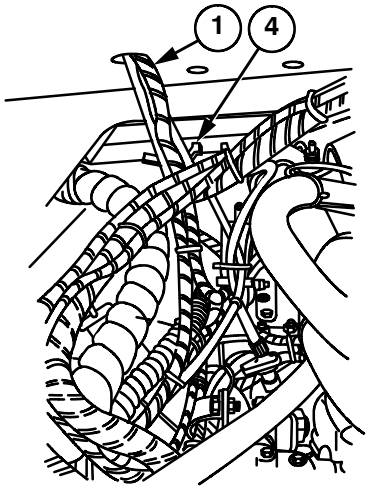
(8) Install 3 covers (13) on electronic control box (14) with 19 screws (15).



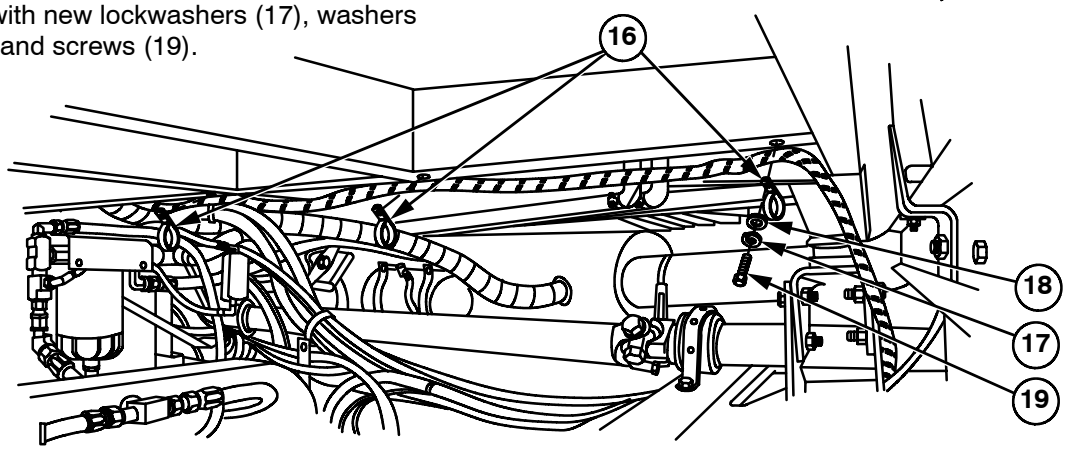
NOTE

Plastic cable ties should be positioned in locations marked during removal.

(9) Secure DDEC wire harness (1) with plastic cable ties (4).



(10) Install three cushion clips (16) on bottom of cab with new lockwashers (17), washers (18), and screws (19).



c. Follow-On Maintenance

(1) Install stowage box (TM 9-2320-360-20).

(2) Install front engine access panels (TM 9-2320-360-20).

(3) Install lower engine access panel (TM 9-2320-360-20).

(4) Connect batteries (TM 9-2320-360-20).

(5) Close engine hood (TM 9-2320-360-10).

6-11. ENGINE WIRE HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Engine hood opened (TM 9-2320-360-10).
Batteries disconnected (TM 9-2320-360-20).
Access panels removed (TM 9-2320-360-20).
Inner fender removed (left side only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknut (Item 96, Appendix F)
Locknut (Item 101, Appendix F)
Lockwashers (4) (Item 117, Appendix F)
Lockwashers (2) (Item 137, Appendix F)
Lockwashers (2) (Item 116, Appendix F)
Lockwashers (2) (Item 118, Appendix F)
Lockwasher (Item 120, Appendix F)

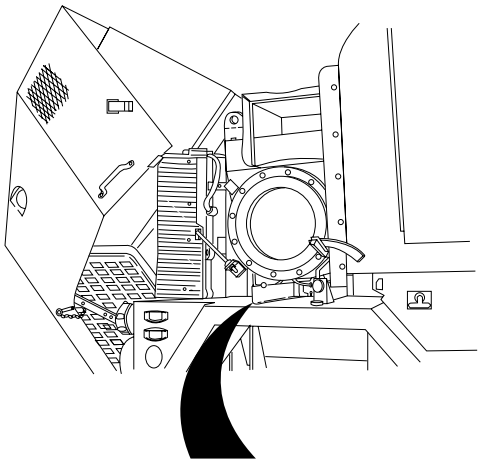
a. Removal

WARNING

Engine must be cool before performing maintenance. Failure to comply may result in injury to personnel.

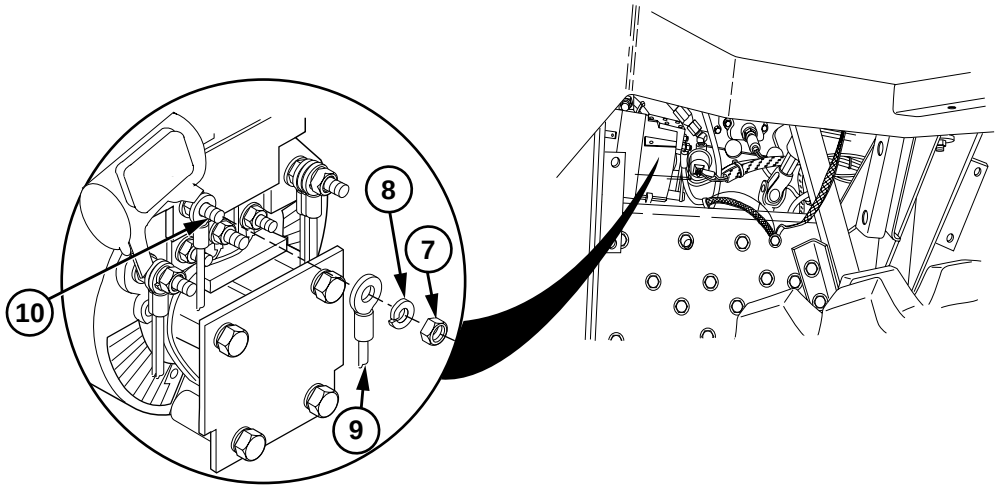
NOTE

Tag and mark wires before removal.



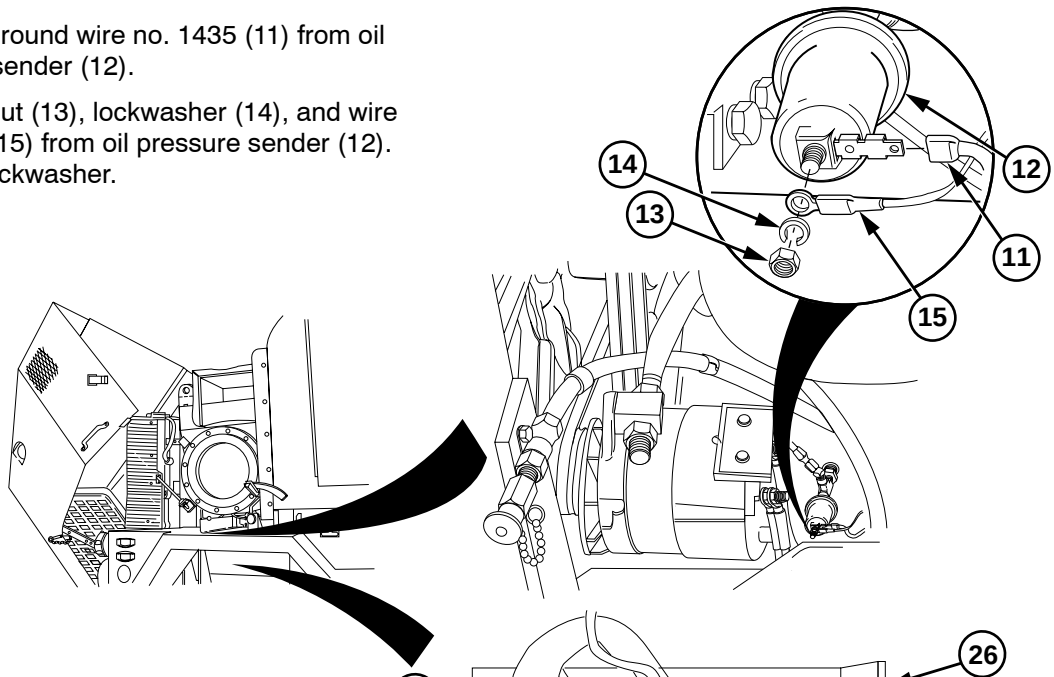
(1) Deleted.

(2) Remove nut (7), lockwasher (8), and wire no. 1020 (9) from 24V alternator ignition terminal (10). Discard lockwasher.



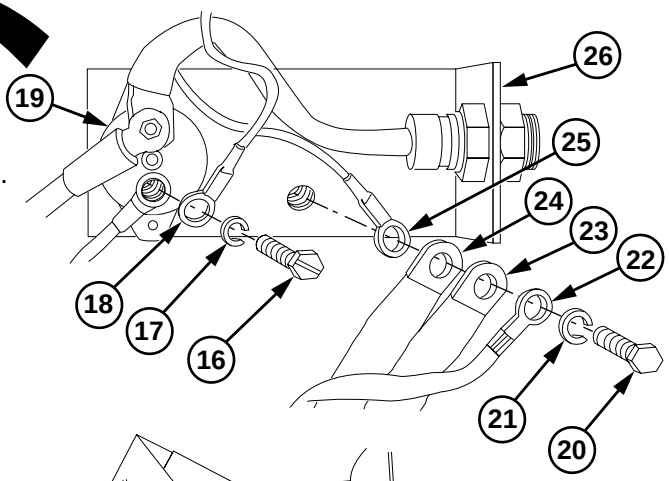
(3) Remove ground wire no. 1435 (11) from oil pressure sender (12).

(4) Remove nut (13), lockwasher (14), and wire no. 1113 (15) from oil pressure sender (12). Discard lockwasher.



(5) Remove screw (16), lockwasher (17), and wire no. 1431 (18) from circuit breaker (19). Discard lockwasher.

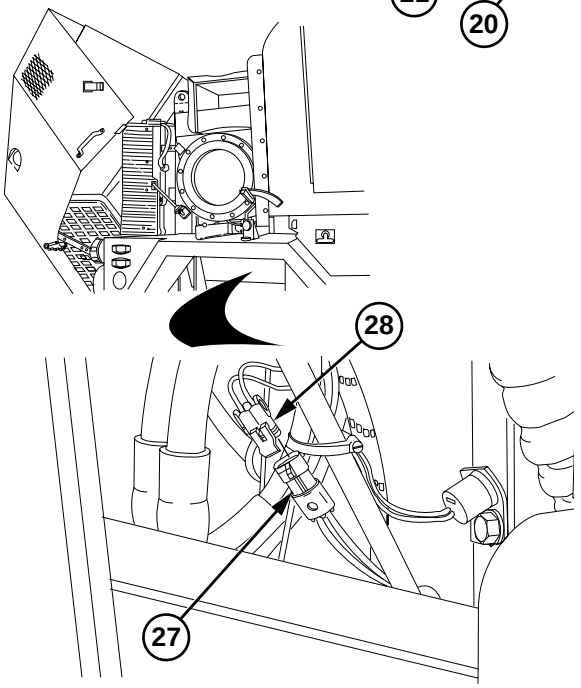
(6) Remove screw (20), lockwasher (21), wire no. 1128 (22), ground strap (23), ground strap (24), and ground wire no. 1435 (25) from bracket (26). Discard lockwasher.



NOTE

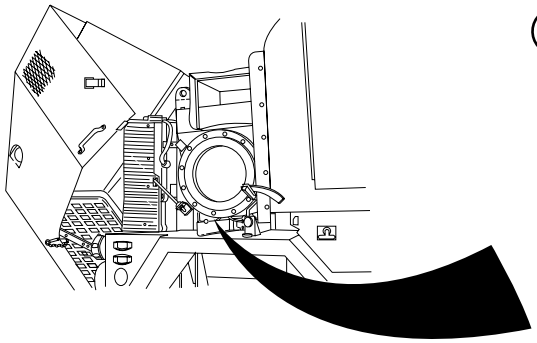
Connectors are removed by gently prying on tab and pulling on connector.

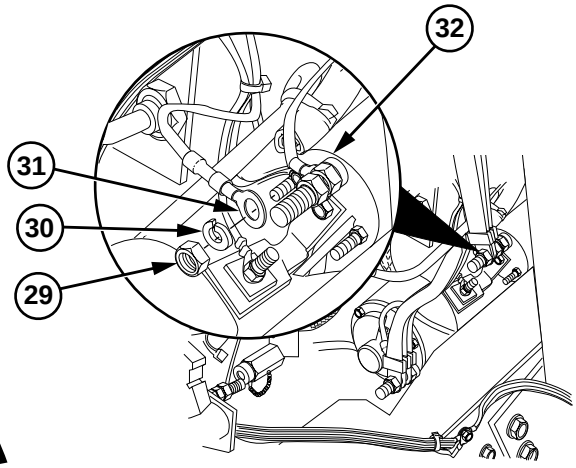
(7) Remove connector (27) from ether start temperature sensor (28).



6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)

(8) Remove nut (29), lockwasher (30), and wire no. 1045 (31) from starter solenoid (32). Discard lockwasher.



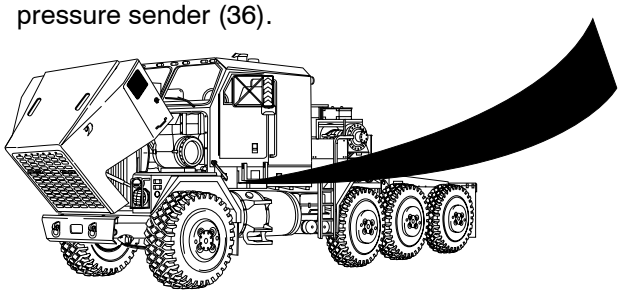


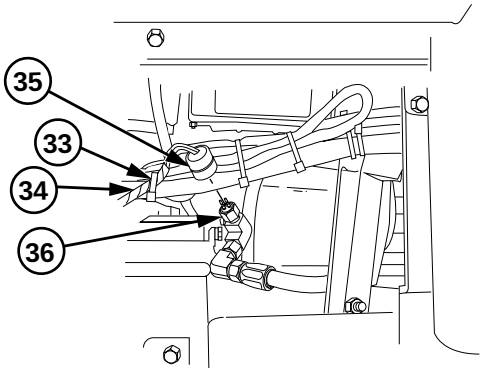
NOTE

Locations of plastic cable ties should be marked before removal.

(9) Remove plastic cable ties (33) securing engine wire harness (34) at left side of engine as required.

(10) Remove connector (35) from PTO oil pressure sender (36).

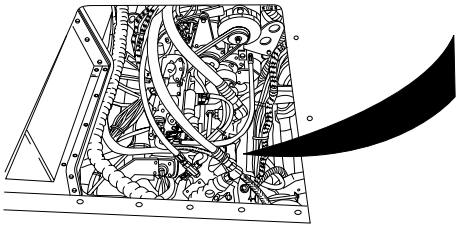


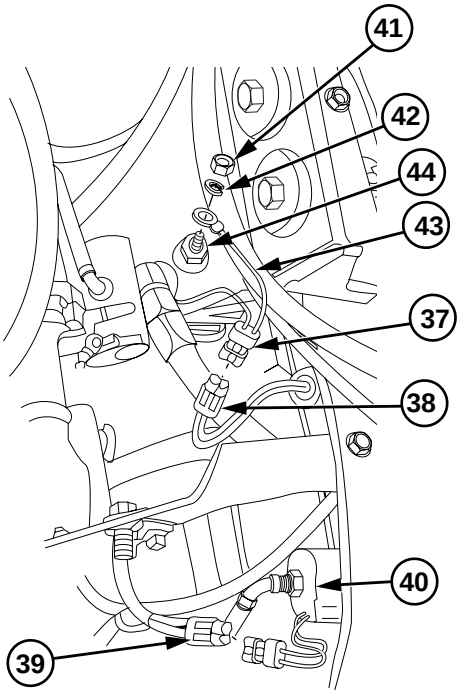


(11) Remove connector (37) from transmission lockup solenoid (38).

(12) Remove connector (39) from PTO solenoid (40).

(13) Remove nut (41), lockwasher (42), and wire no. 1068 (43) from transmission temperature sending unit (44). Discard lockwasher.

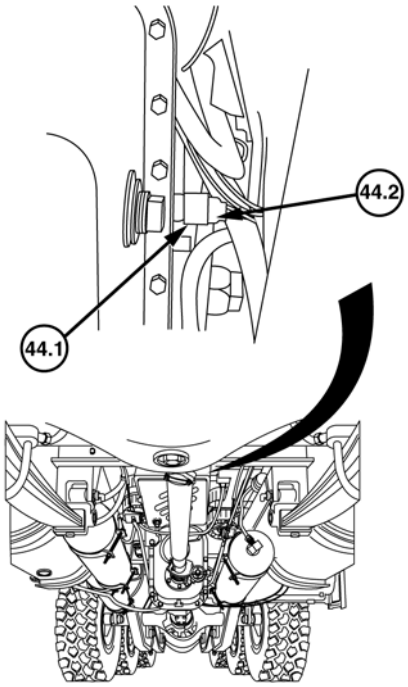




NOTE

Perform step (13.1) if transmission is equipped with transmission reverse pressure switch.

(13.1) Disconnect connector MC54 (44.1) from transmission reverse pressure switch (44.2).

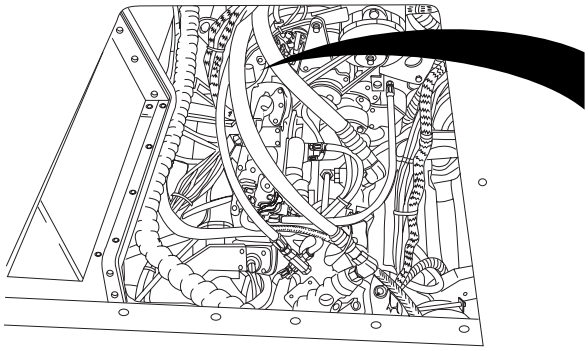


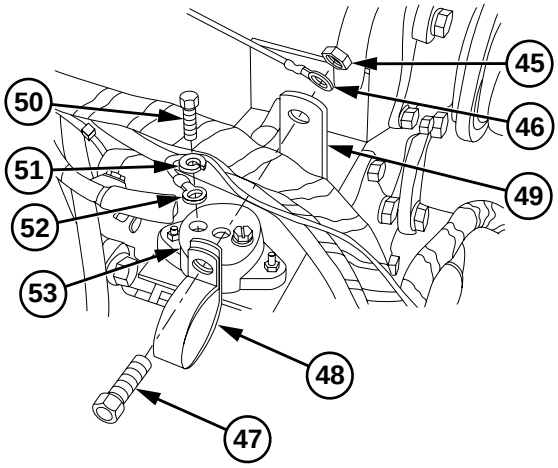
NOTE

Ground wire no. 1435 is only used on DDEC II vehicles.

(14) Remove locknut (45), ground wire no. 1435 (46), screw (47), and cushion clip (48) from engine standoff bracket (49). Discard locknut.

(15) Remove screw (50), lockwasher (51), and wire no. 1866 (52) from circuit breaker (53). Discard lockwasher.





NOTE

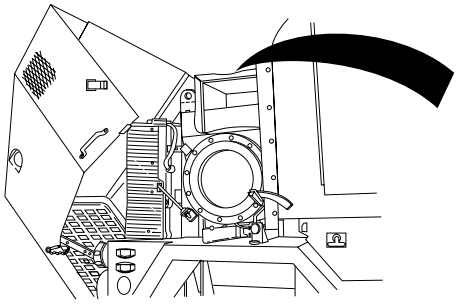
Location of plastic cable ties should be marked before removal.

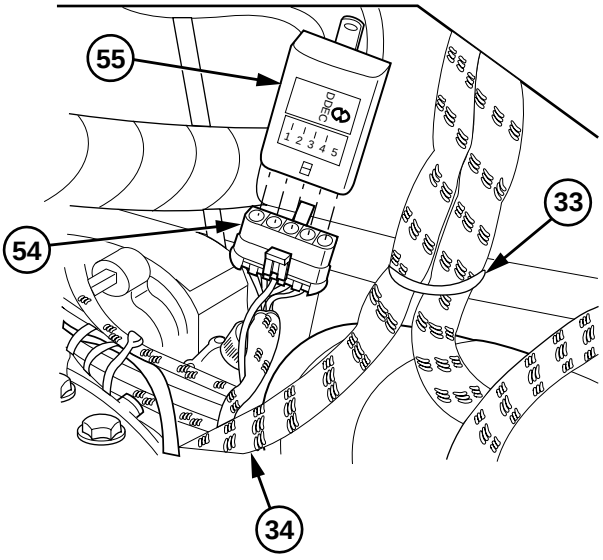
(16) Remove plastic cable ties (33) holding engine wire harness (34) at rear of engine.

NOTE

Step (17) applies only to DDEC II vehicles.

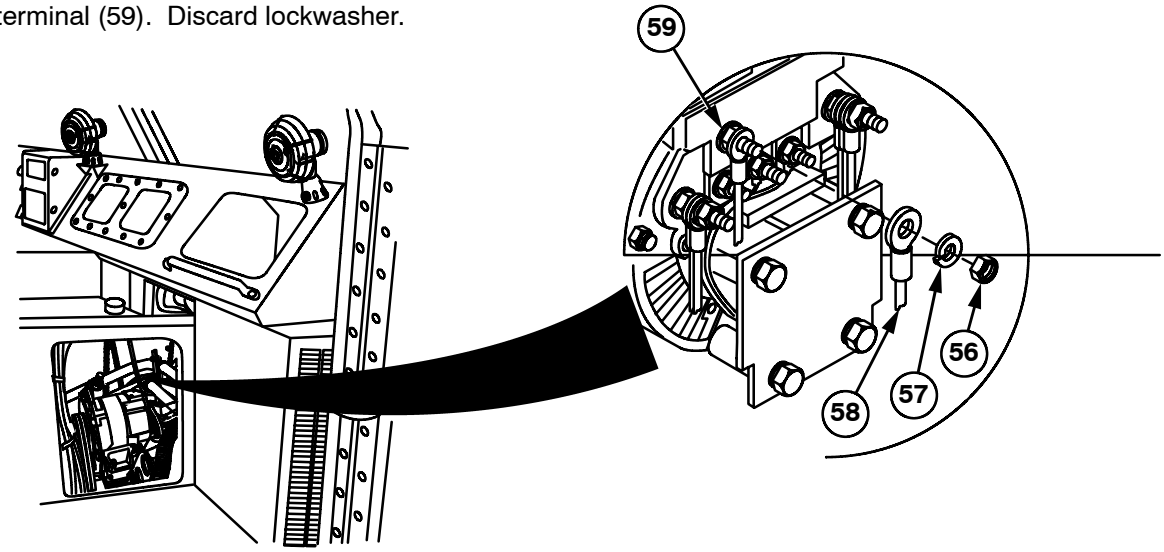
(17) Remove connector (54) from coolant level module (55).





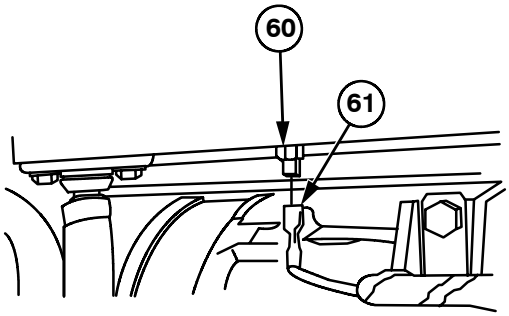
6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)

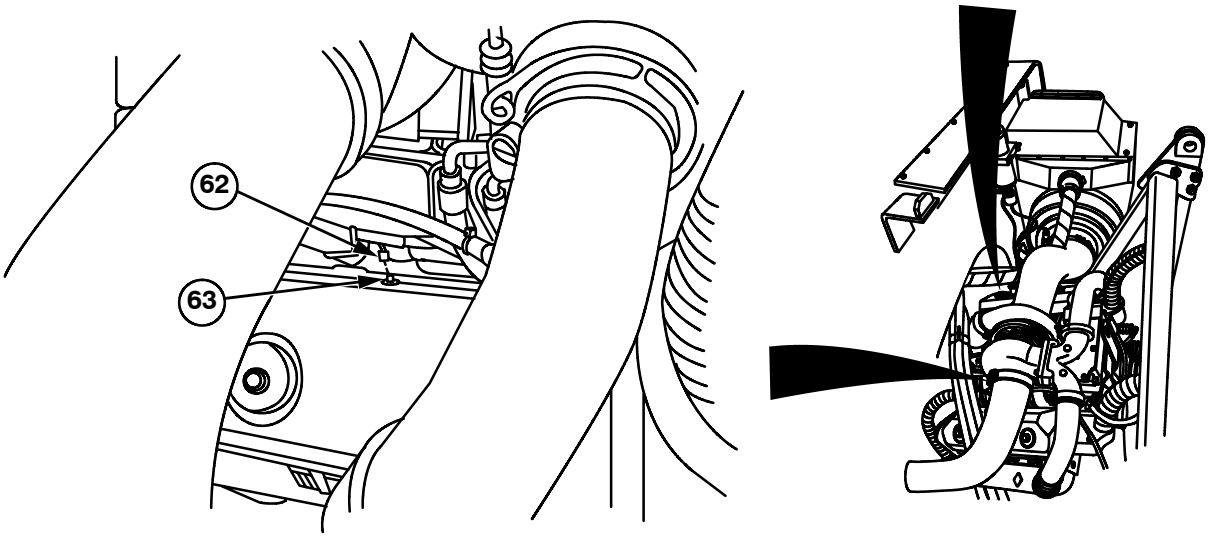
(18) Remove nut (56), lockwasher (57), and wire no. 1020A (58) from 12-volt alternator IGN (ignition) terminal (59). Discard lockwasher.



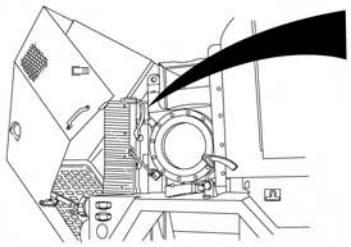
(19) Remove wire no. 1716 (60) from left engine brake terminal (61).

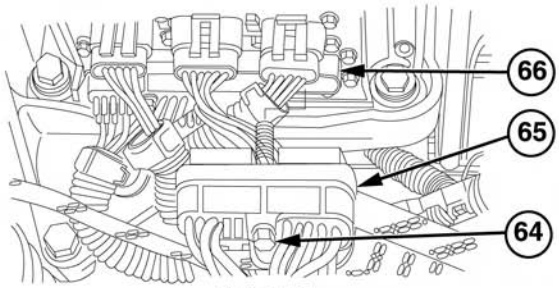
(20) Remove wire no. 1715 (62) from right engine brake terminal (63).



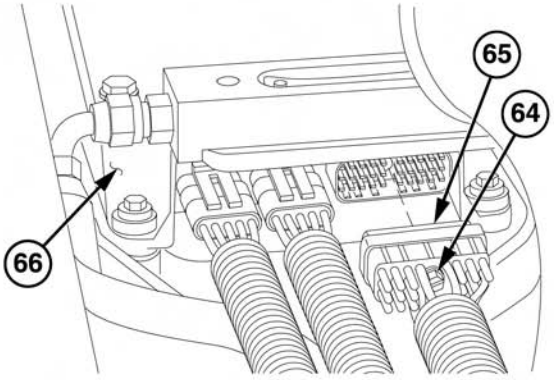


(21) Loosen screw (64) and remove connector (65) from ECM (66).





DDEC II



DDEC III/IV

(22) Remove nut (67), lockwasher (68), and wire no. 1320 (69) from coolant temperature sending unit (70). Discard lockwasher.

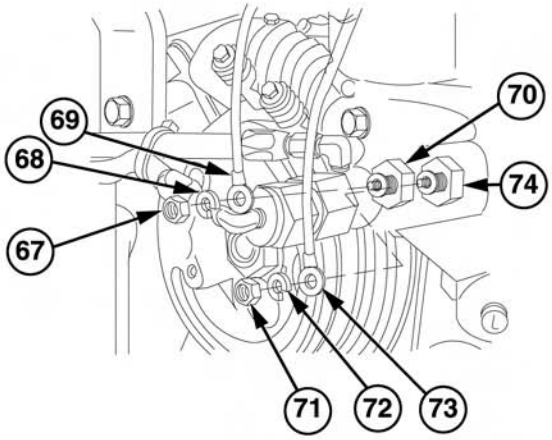
NOTE

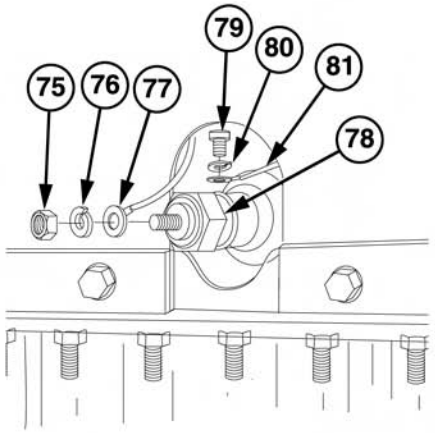
Steps (23, 24, and 25) apply only to DDEC II vehicles.

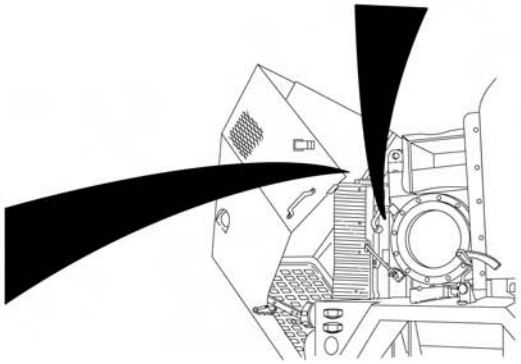
(23) Remove nut (71), lockwasher (72), and wire no. 524 (73) from alarmstat (74). Discard lockwasher.

(24) Remove nut (75), lockwasher (76), and wire no. 068 (77) from coolant level sensor (78). Discard lockwasher.

(25) Remove screw (79), lockwasher (80), and wire no. 1788 (81) from coolant level sensor78). Discard lockwasher.





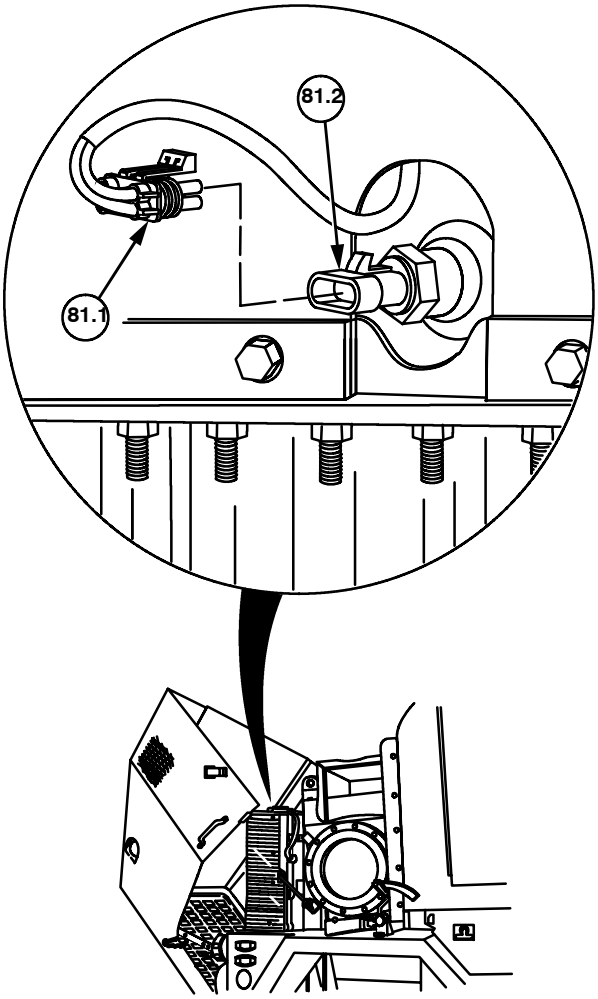


6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)

NOTE

Step (25.1) applies only to DDEC III/IV vehicles.

(25.1) Remove connector (81.1) from coolant level sensor (81.2).

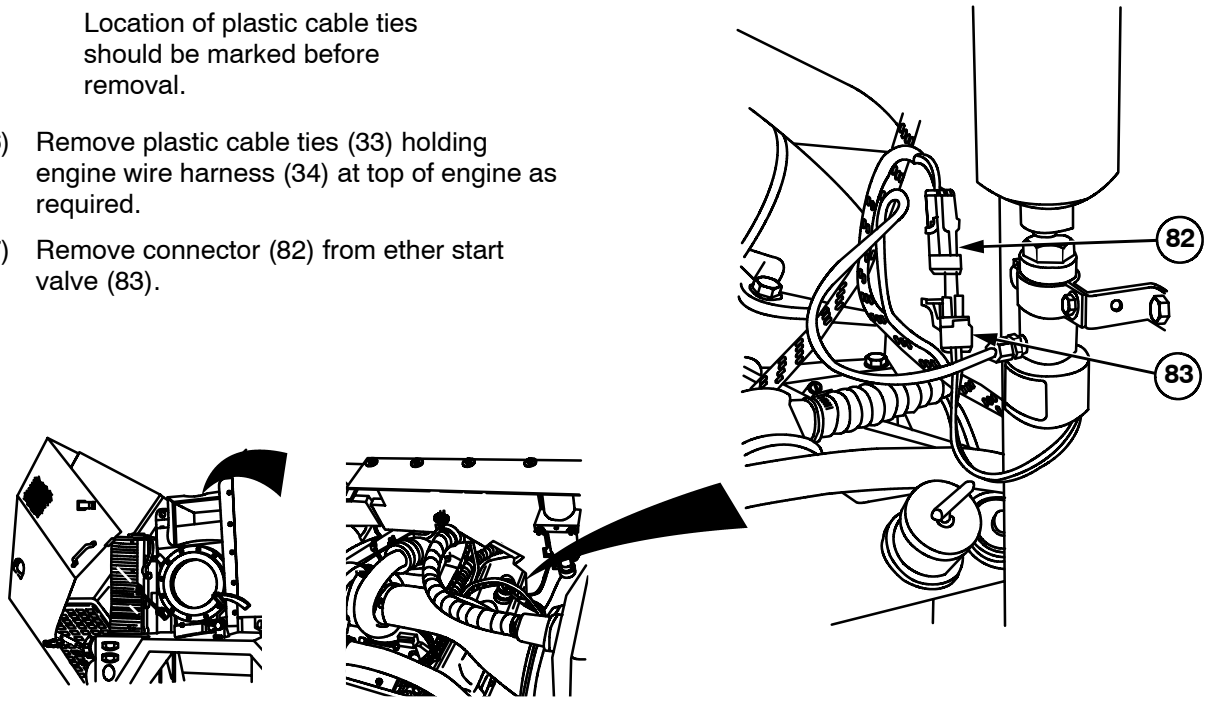


NOTE

Location of plastic cable ties should be marked before removal.

(26) Remove plastic cable ties (33) holding engine wire harness (34) at top of engine as required.

(27) Remove connector (82) from ether start valve (83).



6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)

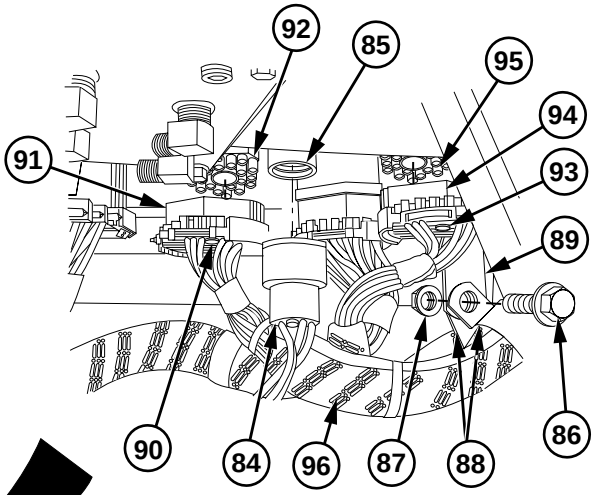
(28) Remove engine harness connector (84) from STE/ICE harness connector (85).

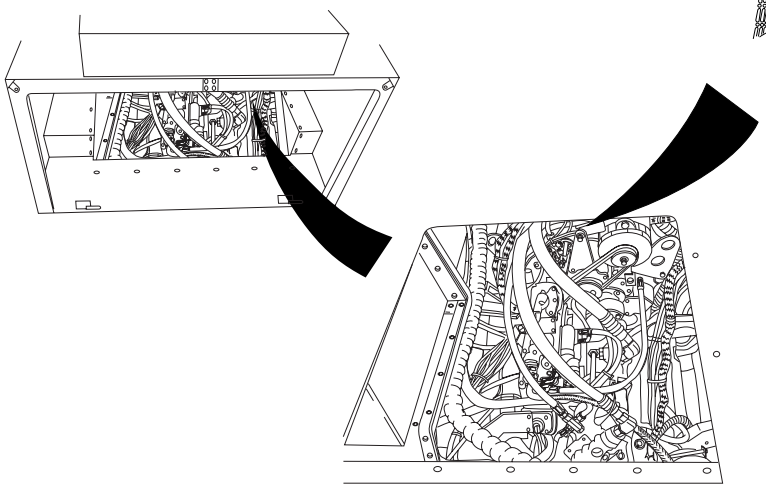
(29) Remove screw (86), locknut (87), and two clips (88) from cab stand off bracket (89).

(30) Loosen screw (90) and remove green connector (91) from receptacle (92).

(31) Loosen screw (93) and remove yellow connector (94) from receptacle (95).

(32) Remove engine wire harness (96) from HET Tractor.





b. Installation

NOTE

Evenly distribute any slack in harness. Do not make any connections.

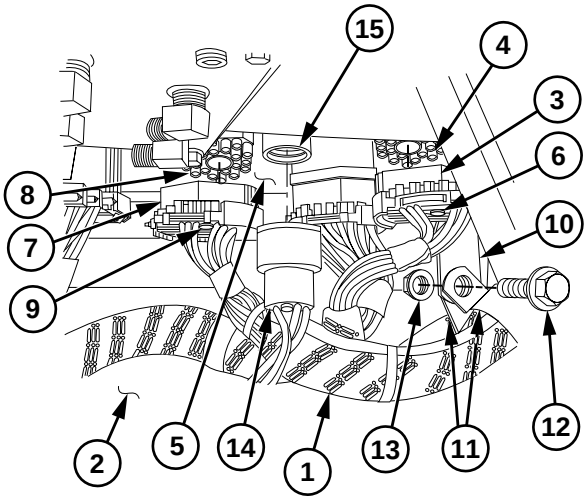
(1) Position wire harness (1) on engine (2).

(2) Install yellow connector (3) on receptacle (4) in doghouse (5) and tighten screw (6).

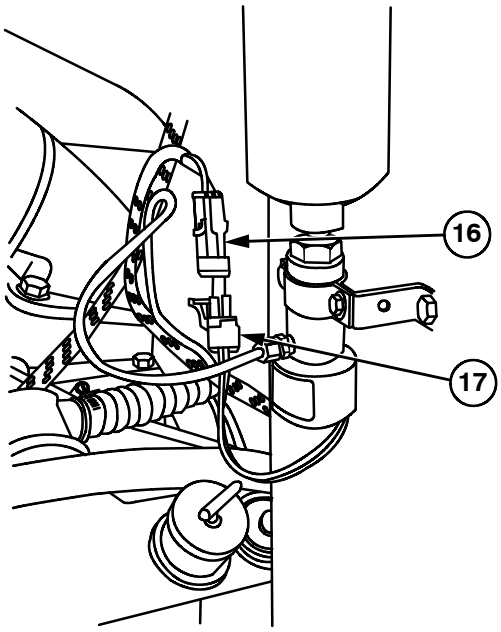
(3) Install green connector (7) on receptacle (8) in doghouse (5) and tighten screw (9).

(4) Install engine wire harness (1) on cab stand off bracket (10) with two clips (11), screw (12), and new locknut (13).

(5) Install engine harness connector (14) on STE/ICE harness connector (15).



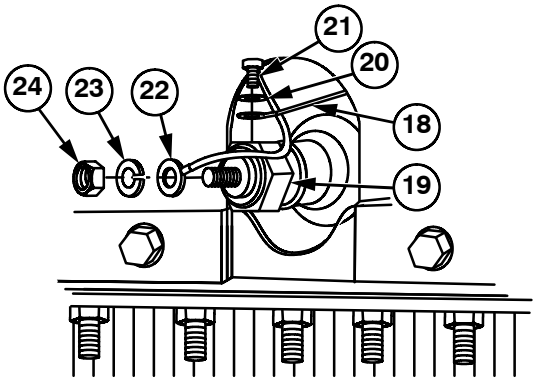
(6) Install connector (16) on ether start valve (17).



NOTE

Steps (7, 8, and 9) apply only to DDEC II vehicles.

(7) Install wire no. 1788 (18) on coolant level sensor (19) with new lockwasher (20), and screw (21).

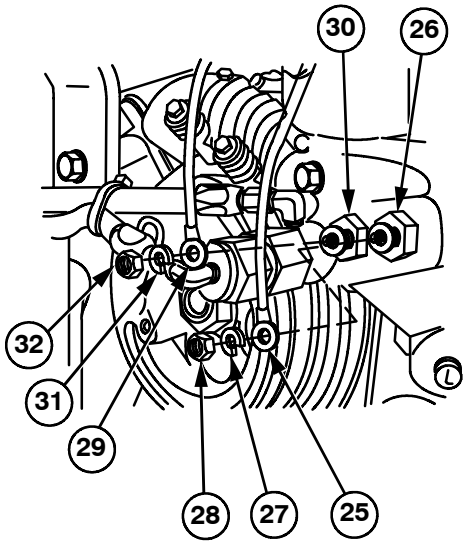


(8) Install wire no. 068 (22) on coolant level sensor (19) with new lockwasher (23) and nut (24).

6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)

(9) Install wire no. 524 (25) on alarmstat (26) with new lockwasher (27) and nut (28).

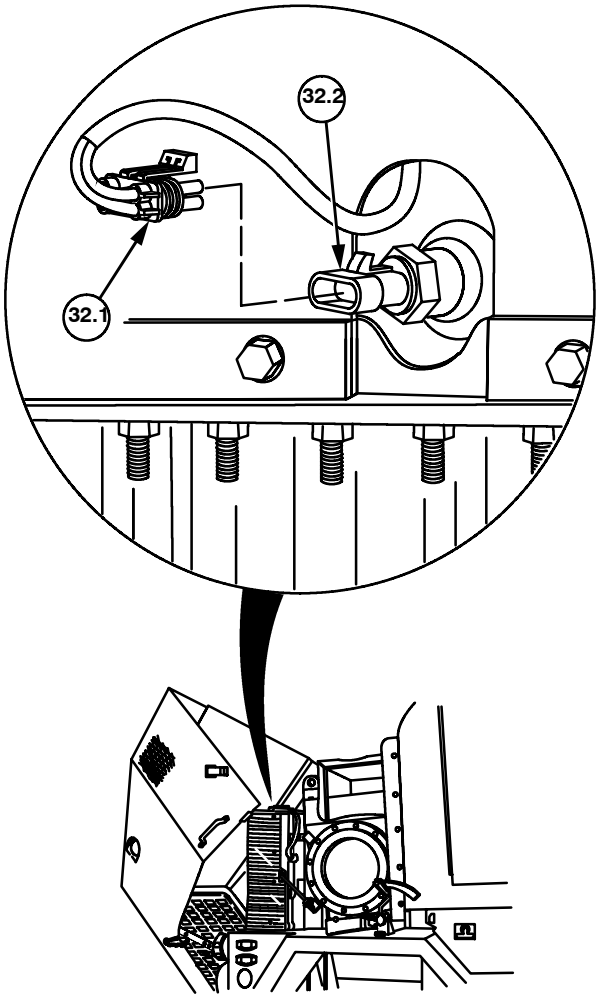
(10) Install wire no. 1320 (29) on coolant temperature sending unit (30) with new lockwasher (31) and nut (32).



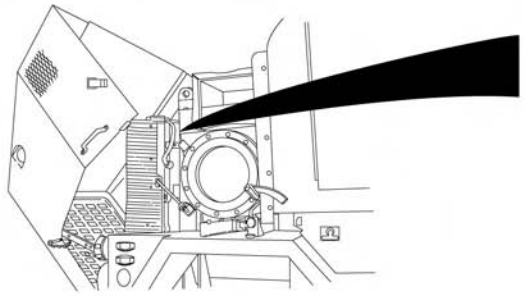
NOTE

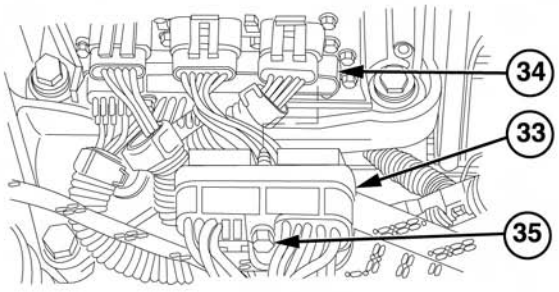
Step (10.1) applies only to DDEC III/IV vehicles.

(10.1) Install connector (32.1) to coolant level sensor (32.2).

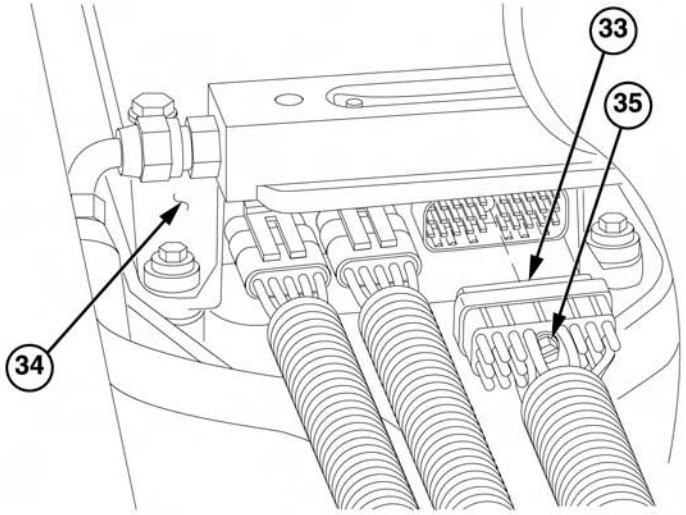


(11) Install electrical connector (33) on ECM (34) and tighten screw (35).





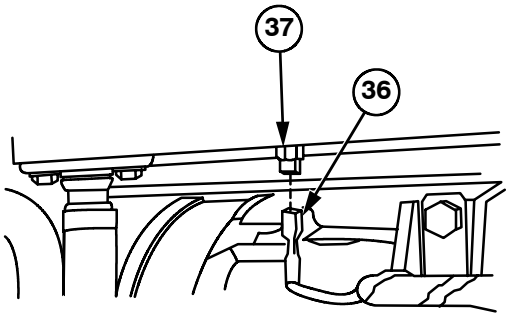
DDEC II



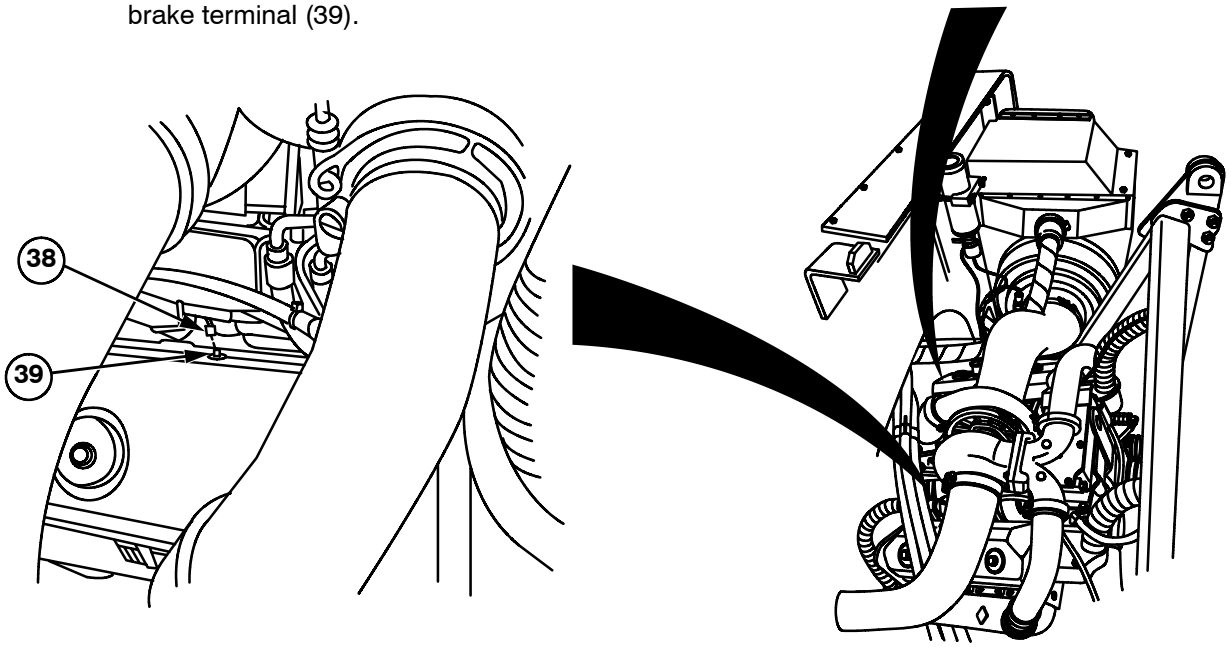
DDEC III/IV

6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)

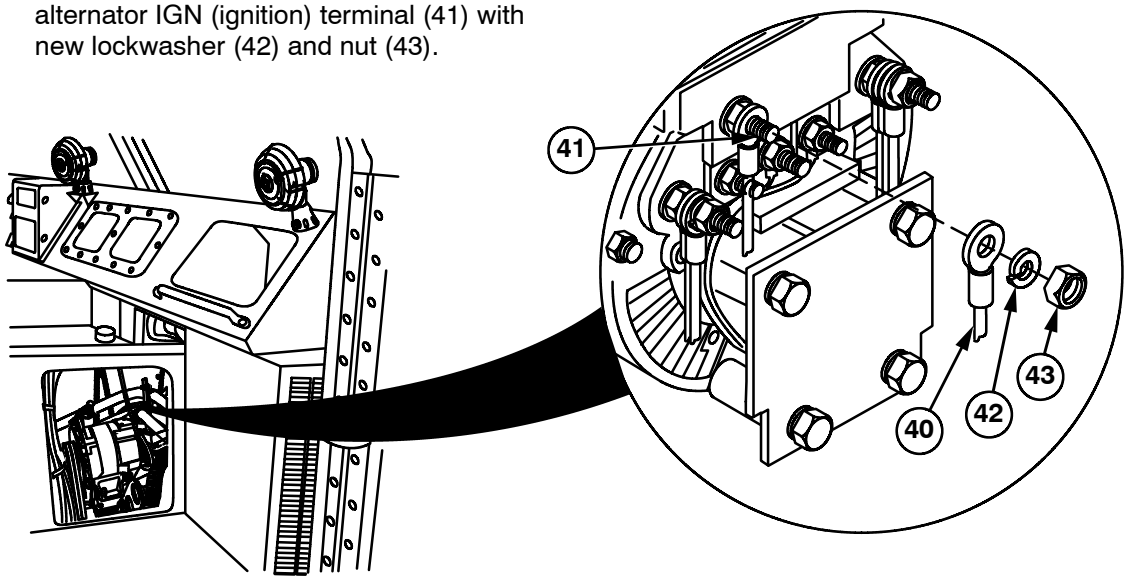
(12) Install wire no. 1716 (36) on left engine brake terminal (37).



(13) Install wire no. 1715 (38) on right engine brake terminal (39).



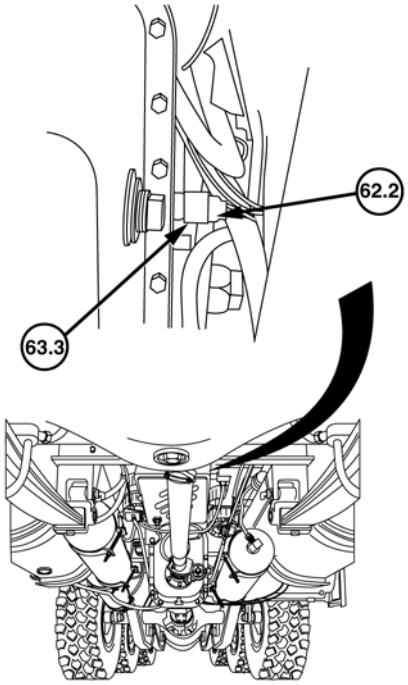
(14) Install wire no. 1020A (40) on 12-volt alternator IGN (ignition) terminal (41) with new lockwasher (42) and nut (43).

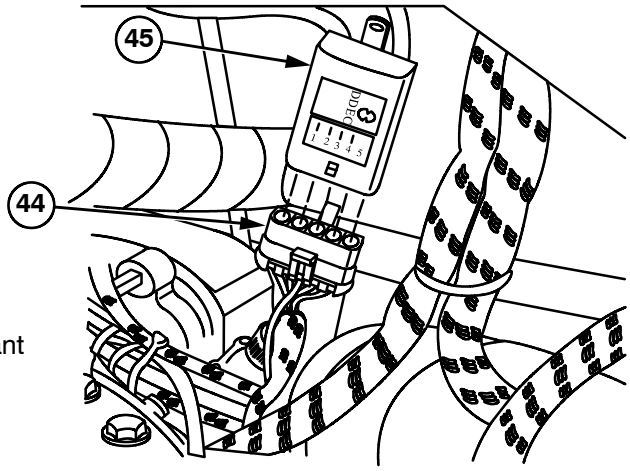


NOTE

Perform step (20.1) if transmission is equipped with transmission reverse pressure switch.

(20.1) Install connector MC54 (62.2) on transmission reverse pressure switch (62.3).

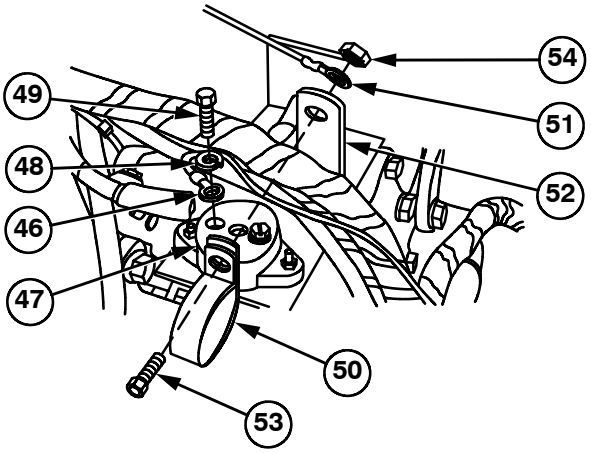




NOTE

Step (15) applies only to DDEC II vehicles.

(15) Install electrical connector (44) on coolant level module (45).

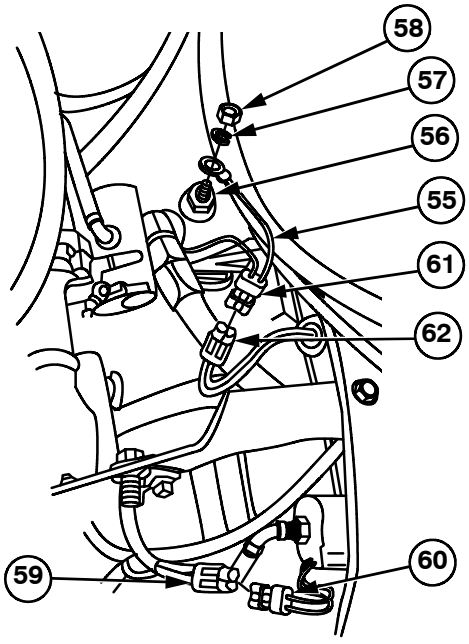


(16) Install wire no. 1866 (46) on circuit breaker (47) with new lockwasher (48) and screw (49).

NOTE

Ground wire no. 1435 is only to DDEC II vehicles.

(17) Install cushion clip (50) and ground wire no. 1435 (51) on engine standoff bracket (52) with screw (53) and new locknut (54).



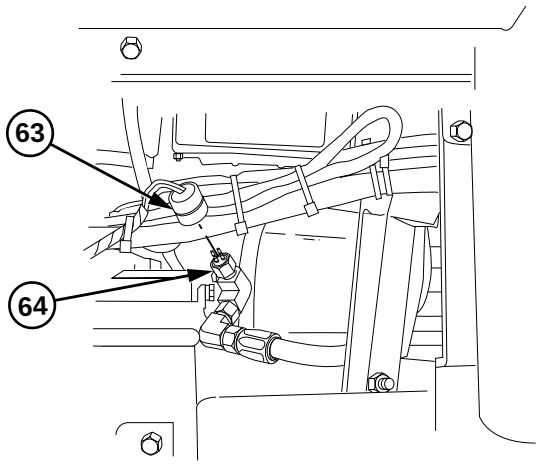
(18) Install wire no. 1068 (55) on transmission temperature sending unit (56) with new lockwasher (57) and nut (58).

(19) Install electrical connector (59) on PTO solenoid (60).

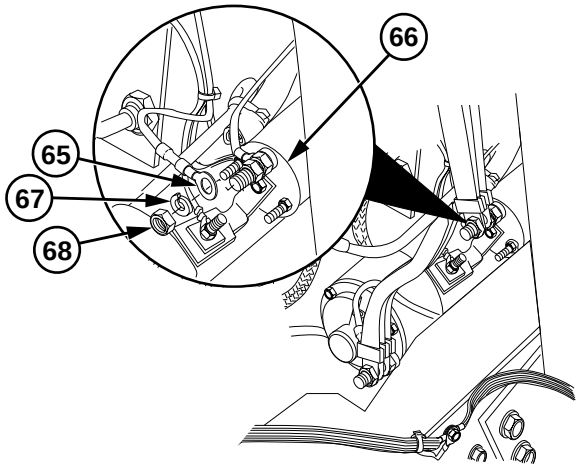
(20) Install connector (61) on transmission lockup solenoid (62).

6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)

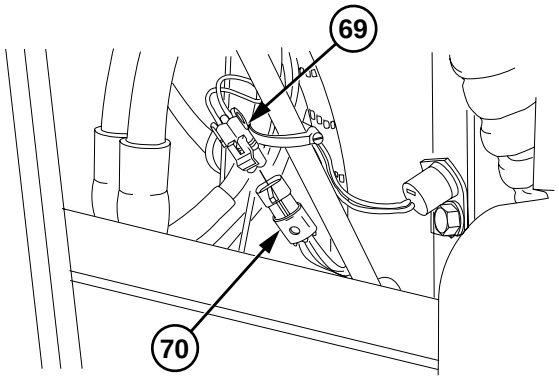
(21) Install connector (63) on PTO oil pressure sender (64).



(22) Install wire no. 1045 (65) on starter solenoid (66) with new lockwasher (67) and nut (68).

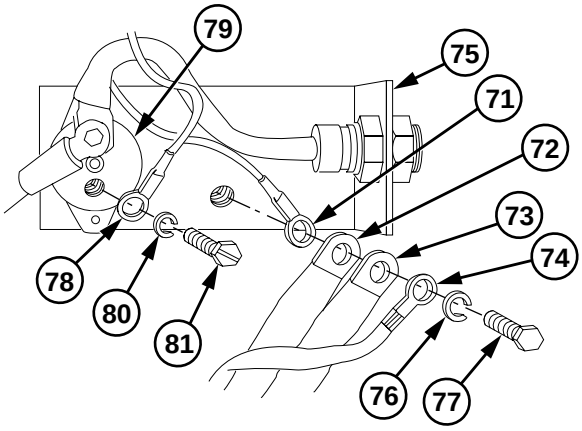


(23) Install connector (69) on ether start temperature sensor (70).



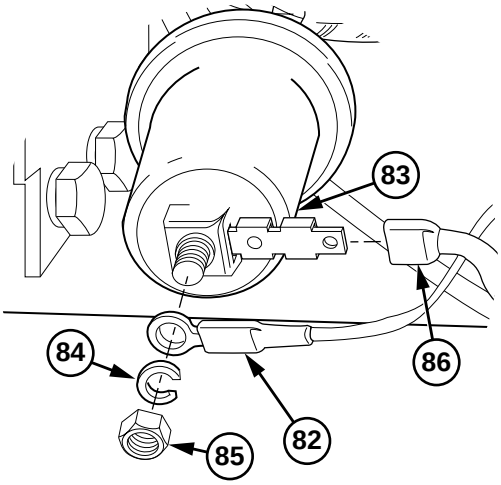
(24) Install ground wire no. 1435 (71), ground strap (72), ground strap (73), and wire no. 1128 (74) on bracket (75) with new lockwasher (76) and screw (77).

(25) Install wire no. 1431 (78) on circuit breaker (79) with new lockwasher (80) and screw (81).



(26) Install wire no. 1113 (82) on oil pressure sender (83) with new lockwasher (84) and nut (85).

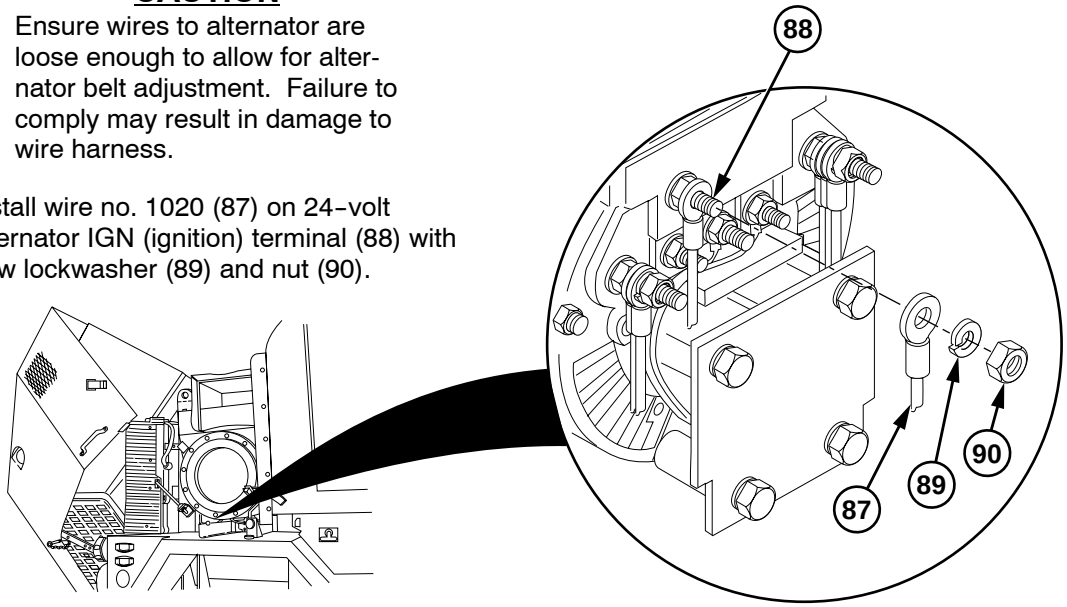
(27) Install ground wire no. 1435 (86) on oil pressure sender (83).



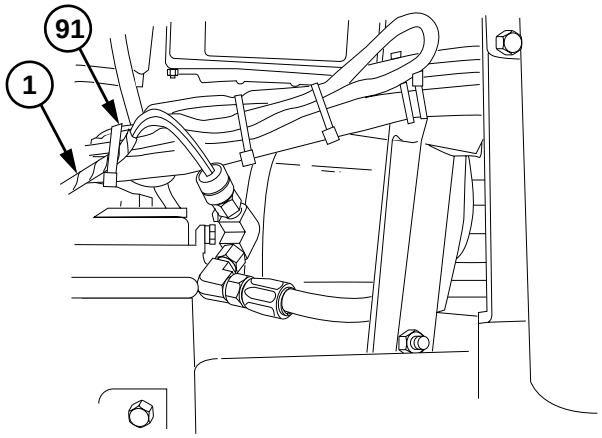
CAUTION

Ensure wires to alternator are loose enough to allow for alternator belt adjustment. Failure to comply may result in damage to wire harness.

(28) Install wire no. 1020 (87) on 24-volt alternator IGN (ignition) terminal (88) with new lockwasher (89) and nut (90).



6-11. ENGINE WIRE HARNESS REPLACEMENT (CONT)



NOTE

Plastic cable ties should be positioned in locations marked during removal.

(29) Secure engine wire harness (1) with plastic cable ties (91).

(30) Deleted.

c. Follow-On Maintenance

(1) Connect batteries (TM 9-2320-360-20).

(2) Turn ignition switch to ON position (TM 9-2320-360-10).

(3) Check electrical system for proper operation.

(4) Turn ignition switch to OFF position (TM 9-2320-360-10).

(5) Install access panels (TM 9-2320-360-20).

(6) Close engine hood (TM 9-2320-360-20).

(7) Install inner fender (TM 9-2320-360-20).

6-12. ELECTRONIC CONTROL BOX/LIGHTS WIRE HARNESS REPLACEMENT

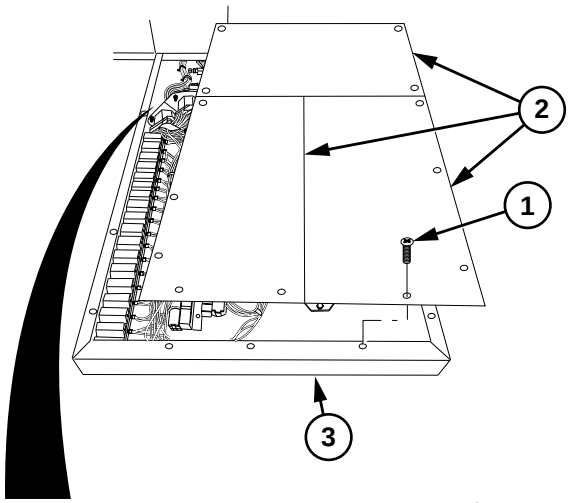
This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Batteries disconnected (TM 9-2320-360-20).
Top doghouse insulation removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Ties, Cable, Plastic (Item 60, Appendix B)
Locknut (Item 91, Appendix F)
Lockwashers (3) (Item 128, Appendix F)
Lockwashers (3) (Item 112, Appendix F)

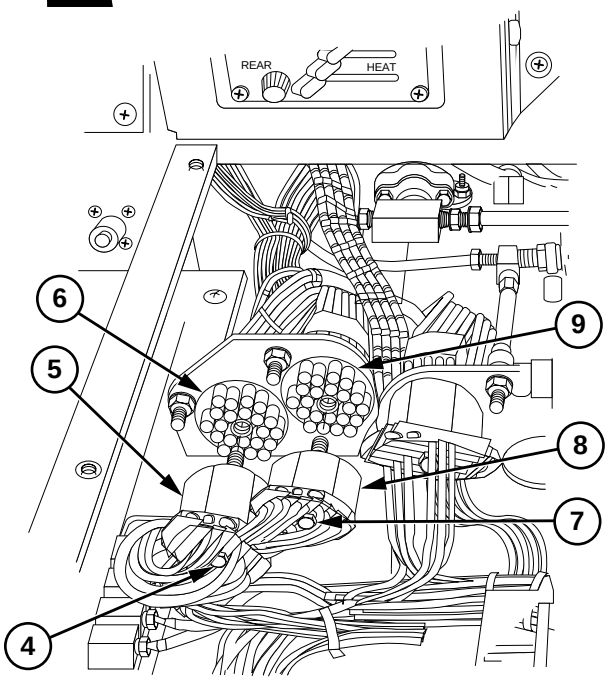


a. Removal

(1) Remove 19 screws (1) and 3 panels (2) from electronic control box (3).

(2) Loosen screw (4) and remove electrical connector (5) from cab wire harness receptacle (6).

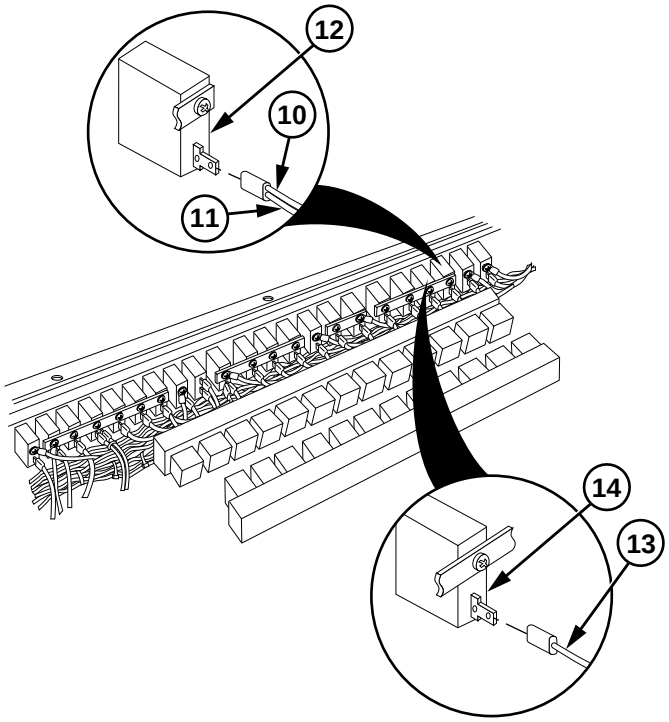
(3) Loosen screw (7) and remove electrical connector (8) from cab wire harness receptacle (9).



6-12. ELECTRONIC CONTROL BOX/LIGHTS WIRE HARNESS REPLACEMENT (CONT)

(4) Remove wire no. 1292 (10) and wire no. 1927 (11) from headlights circuit breaker (12).

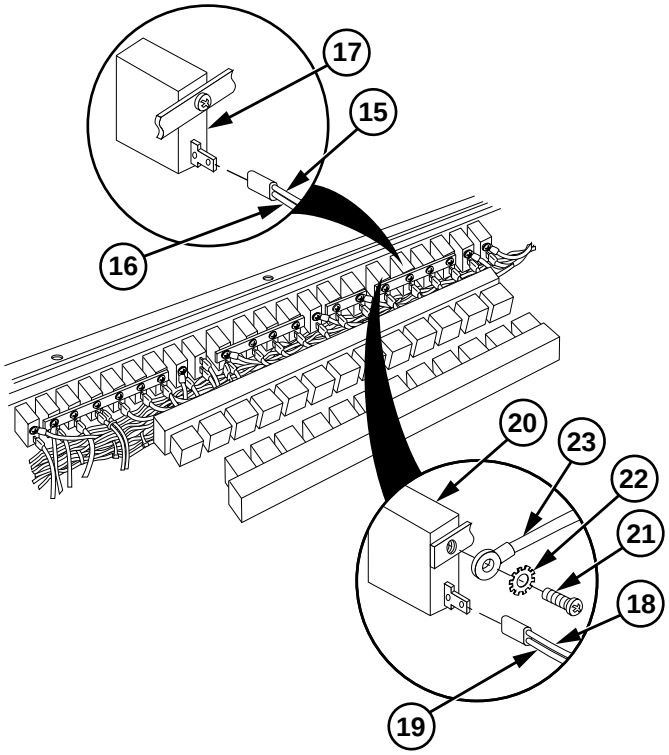
(5) Remove wire no. 1835 (13) from clearance lights circuit breaker (14).



(6) Remove wire no. 1891 (15) and wire no. 1413 (16) from beacon backup circuit breaker (17).

(7) Remove wire no. 1040 (18) and wire no. 1040C (19) from work lights/horn circuit breaker (20).

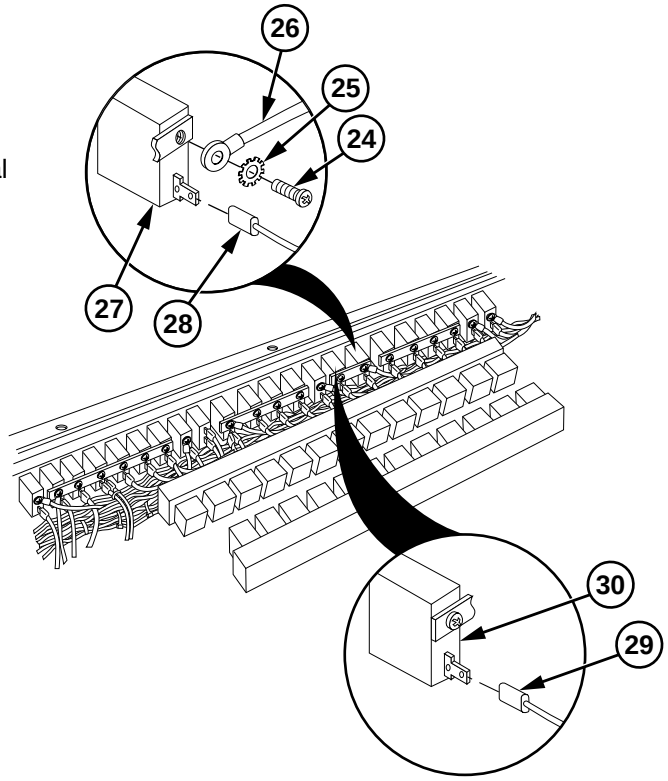
(8) Remove screw (21), lockwasher (22), and wire no. 1175 (23) from work lights/horn circuit breaker (20). Discard lockwasher.



(9) Remove screw (24), lockwasher (25), and wire no. 1109 (26) from turn signal circuit breaker (27). Discard lockwasher.

(10) Remove wire no. 1925 (28) from turn signal circuit breaker (27).

(11) Remove wire no. 1009 (29) from stoplight circuit breaker (30).



NOTE

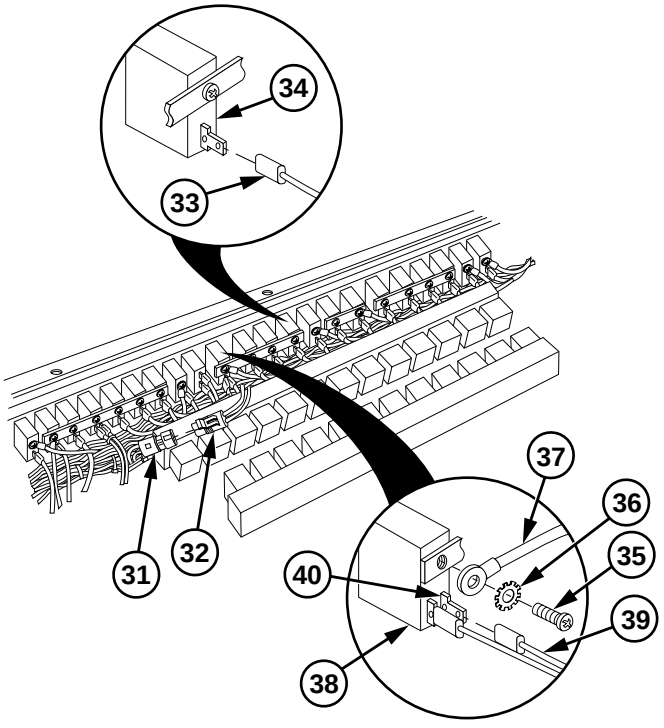
Connector is removed by gently prying up on clip and pulling on connector.

(12) Remove electrical connector (31) from electronic control box wire harness connector (32).

(13) Remove wire no. 1276 (33) from gages/warning lights circuit breaker (34).

(14) Remove screw (35), lockwasher (36), and wire no. 1075A (37) from wiper circuit breaker (38). Discard lockwasher.

(15) Remove wire no. 1919 (39) from wire no. 1020A connector (40).



6-12. ELECTRONIC CONTROL BOX/LIGHTS WIRE HARNESS REPLACEMENT (CONT)

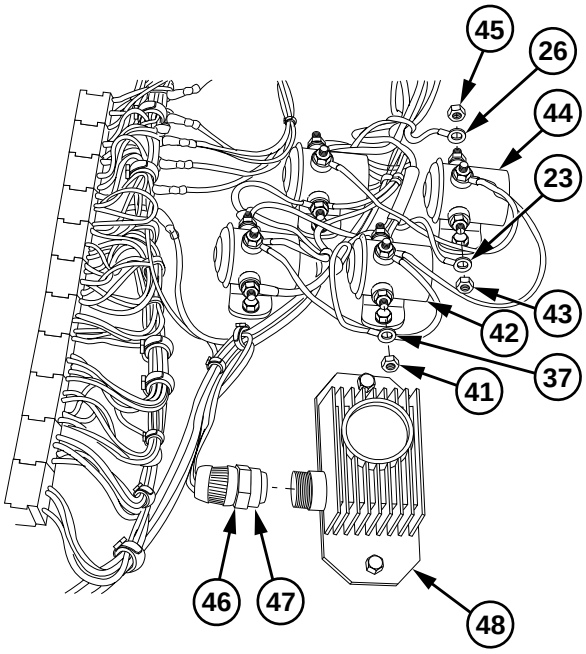
(16) Remove nut (41) and wire no. 1075A (37) from relay (42).

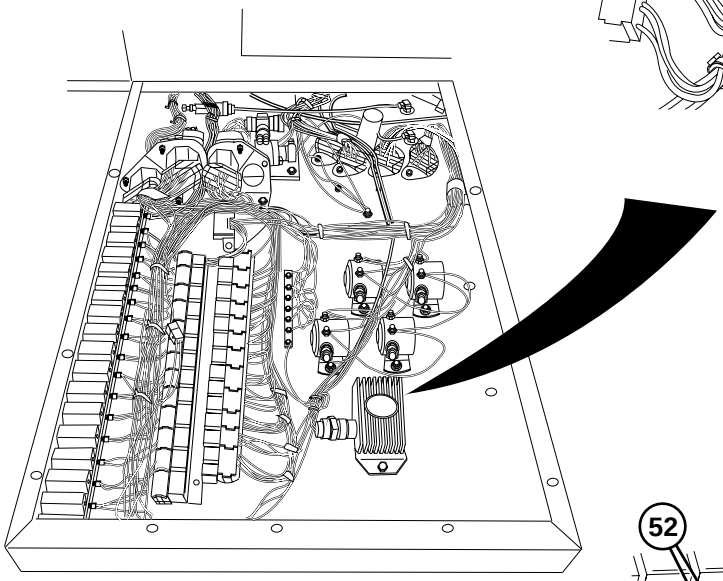
(17) Remove nut (43) and wire no. 1175 (23) from relay (44).

(18) Remove nut (45) and wire no. 1109 (26) from relay (44)

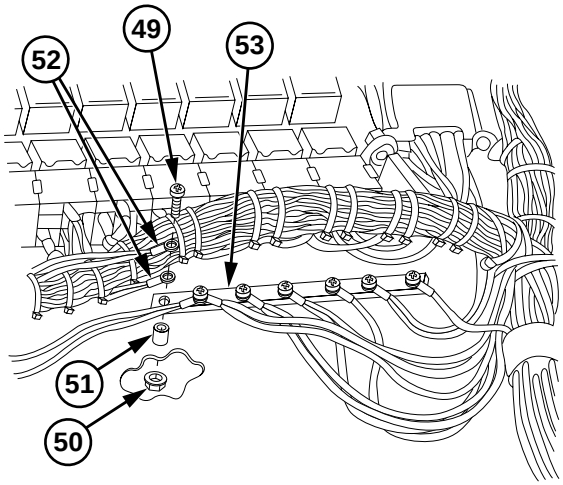
(19) Remove retainer (46) by turning counterclockwise.

(20) Remove electrical connector (47) from flasher unit (48) and retainer (46).





(21) Remove screw (49), locknut (50), spacer (51), and double ground wire no. 1435 (52) from ground strip (53). Discard locknut.



NOTE

All relays are removed the same way.

(22) Remove relay no. 1 (54) from socket (55).

(23) Remove relay no. 2 (56) from socket (57).

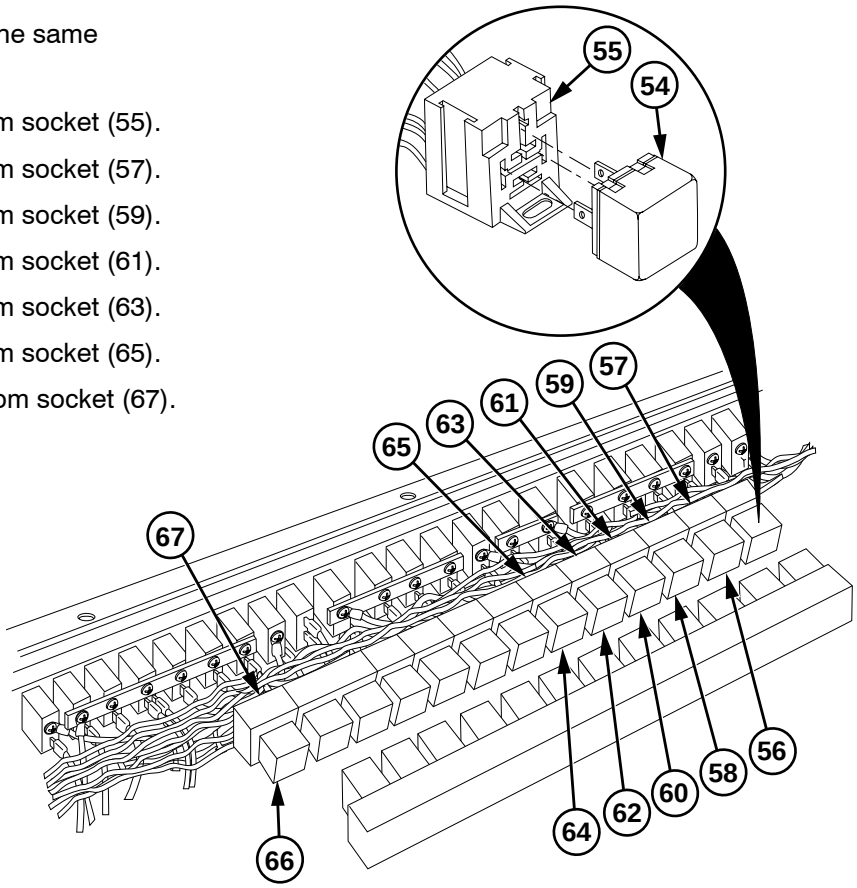
(24) Remove relay no. 3 (58) from socket (59).

(25) Remove relay no. 4 (60) from socket (61).

(26) Remove relay no. 5 (62) from socket (63).

(27) Remove relay no. 6 (64) from socket (65).

(28) Remove relay no. 29 (66) from socket (67).

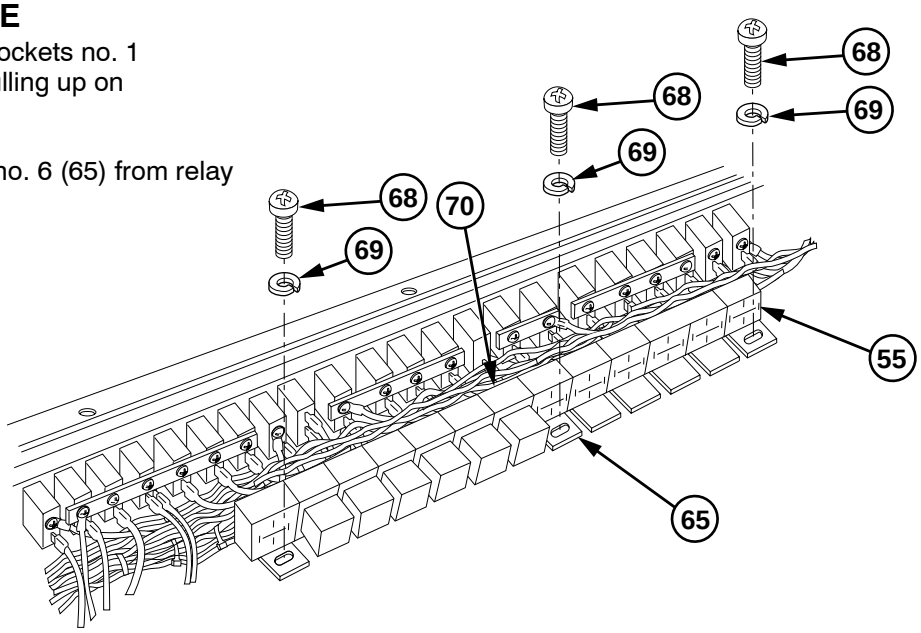


(29) Remove three screws (68) and lockwashers (69) from relay socket no. 1 (55), relay socket no. 6 (65), and relay socket no. 29 (67). Discard lockwashers.

NOTE

Hold down relay sockets no. 1 thru no. 6 while pulling up on relay socket no. 9.

(30) Remove relay socket no. 6 (65) from relay socket no. 9 (70).



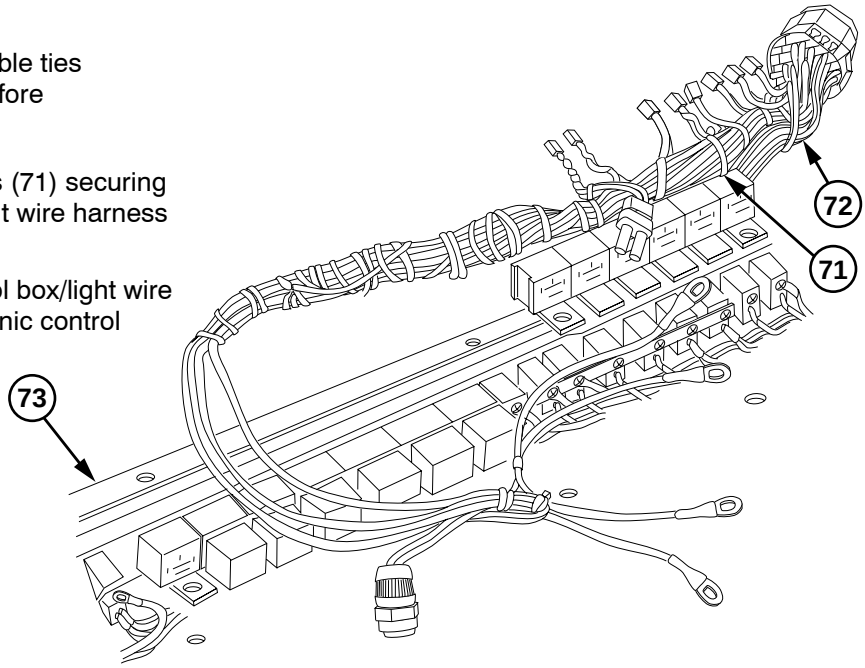
6-12. ELECTRONIC CONTROL BOX/LIGHTS WIRE HARNESS REPLACEMENT (CONT)

NOTE

Location of plastic cable ties should be marked before removal.

(31) Remove plastic cable ties (71) securing electronic control box/light wire harness (72).

(32) Remove electronic control box/light wire harness (72) from electronic control box (73).



b. Installation

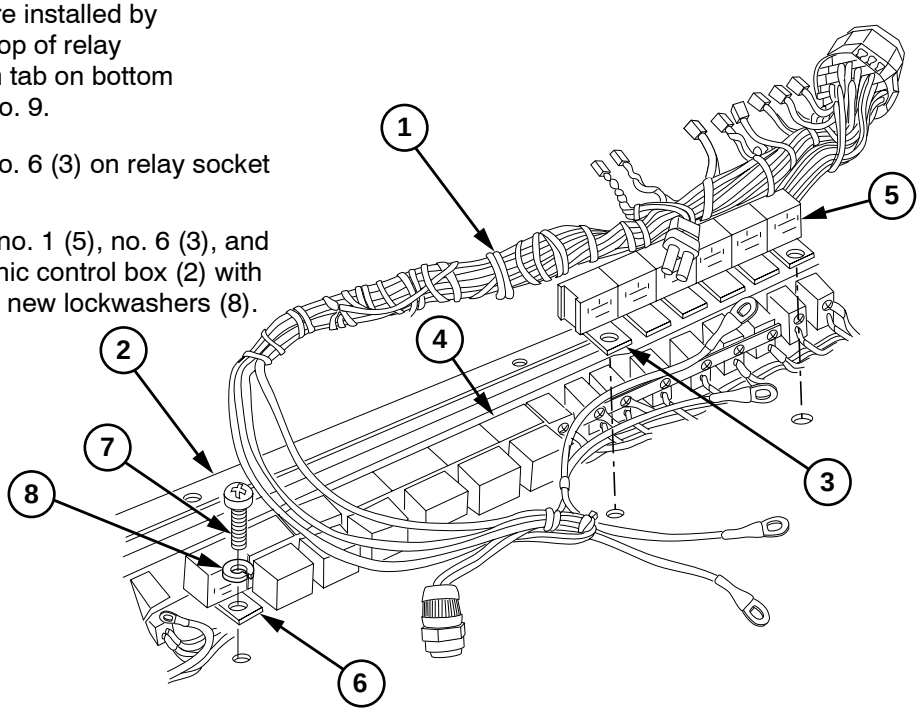
(1) Position electronic control box/light wire harness (1) in electronic control box (2).

NOTE

Relay sockets are installed by aligning slot on top of relay socket no. 6 with tab on bottom of relay socket no. 9.

(2) Install relay socket no. 6 (3) on relay socket no. 9 (4).

(3) Install relay sockets no. 1 (5), no. 6 (3), and no. 29 (6) on electronic control box (2) with three screws (7) and new lockwashers (8).



(4) Install relay no. 29 (9) in socket (6).

(5) Install relay no. 6 (10) in socket (3).

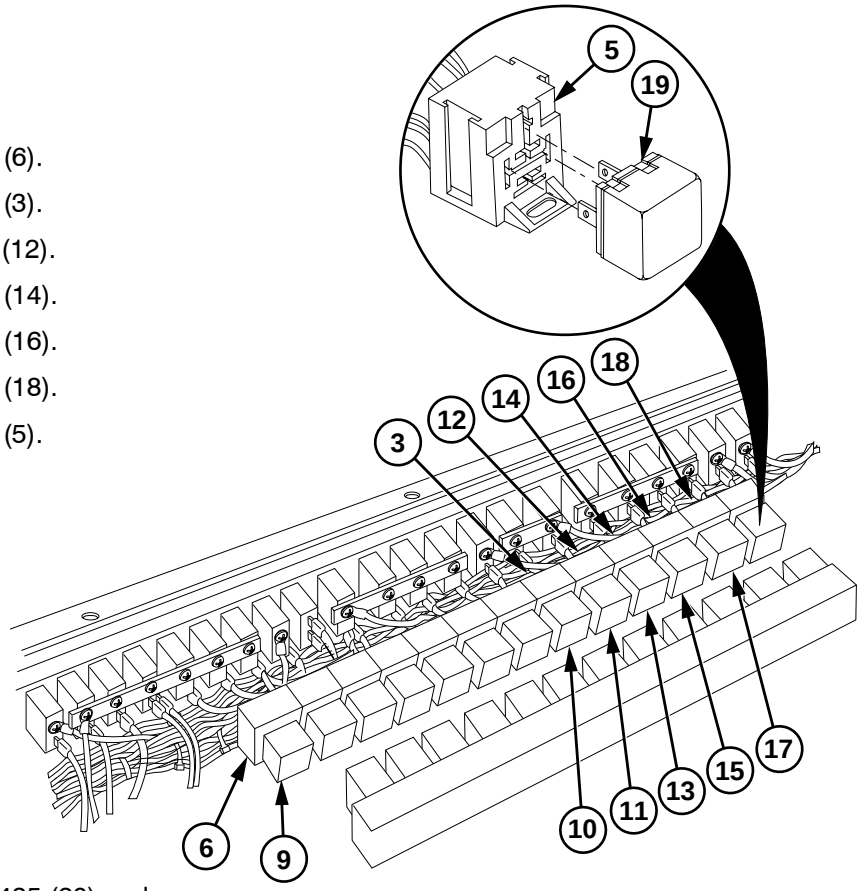
(6) Install relay no. 5 (11) in socket (12).

(7) Install relay no. 4 (13) in socket (14).

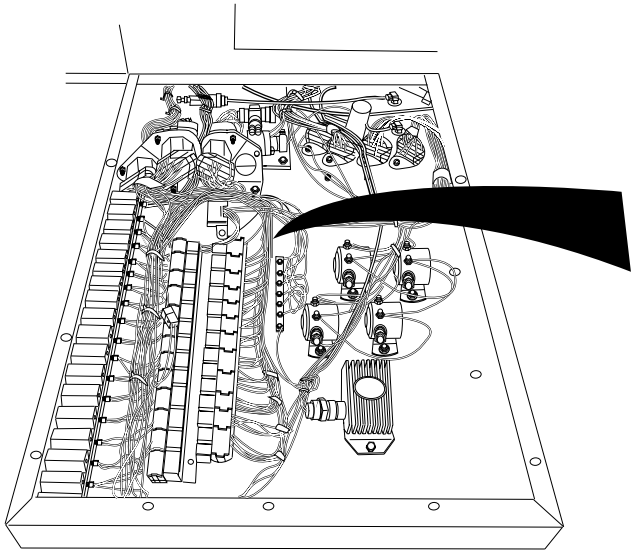
(8) Install relay no. 3 (15) in socket (16).

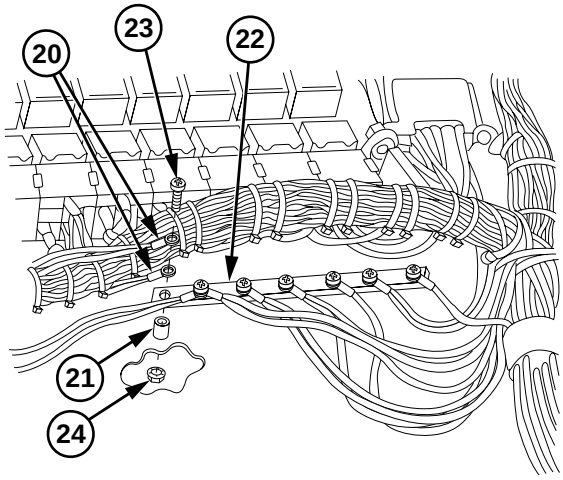
(9) Install relay no. 2 (17) in socket (18).

(10) Install relay no. 1 (19) in socket (5).



(11) Install double ground wire no. 1435 (20) and spacer (21) on ground strip (22) with screw (23) and new locknut (24).





6-12. ELECTRONIC CONTROL BOX/LIGHTS WIRE HARNESS REPLACEMENT (CONT)

NOTE

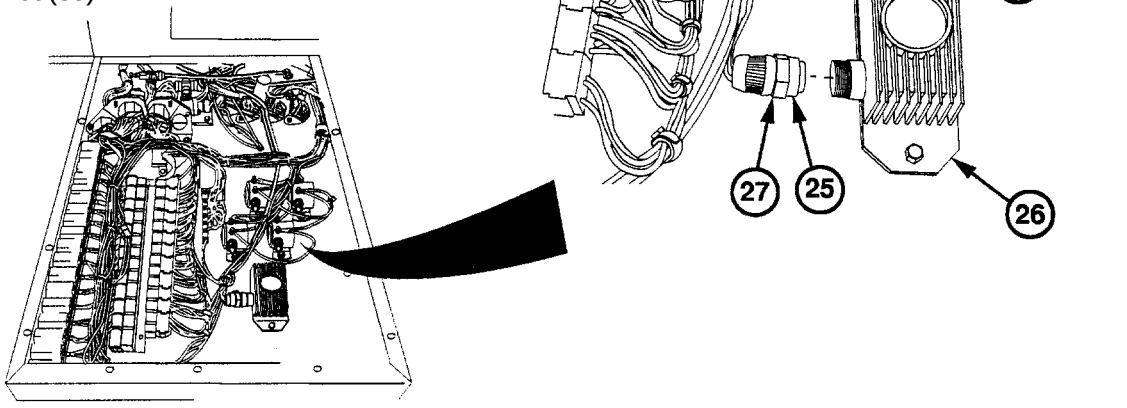
Slot on connector must line up with tab on flasher.

(12) Install electrical connector (25) on flasher unit (26) and tighten retainer (27).

(13) Install wire no. 1109 (28) on relay (29) with nut (30).

(14) Install wire no. 1175 (31) on relay (29) with nut (32).

(15) Install wire no. 1075A (33) on relay (34) with nut (35).

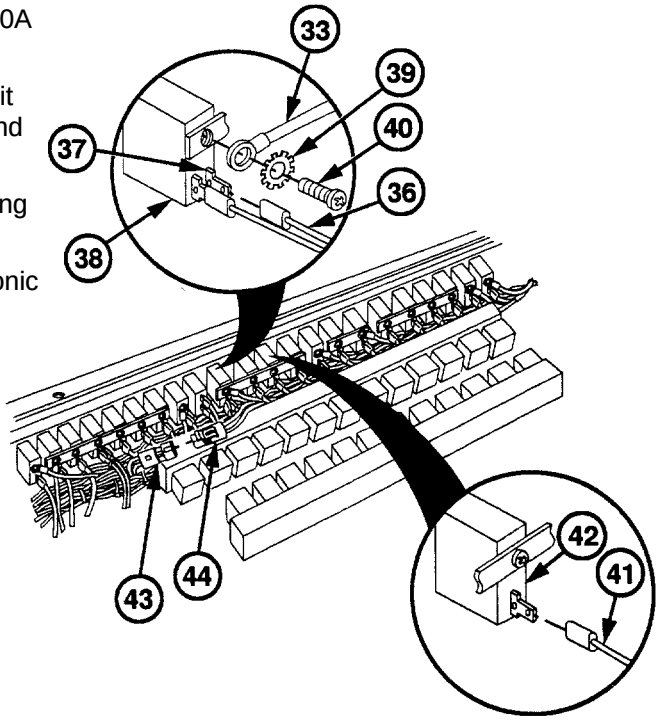


(16) Install wire no. 1919 (36) on wire no. 1020A connector (37).

(17) Install wire no. 1075A (33) on wiper circuit breaker (38) with new lockwasher (39) and screw (40).

(18) Install wire no. 1276 (41) on gages/warning lights circuit breaker (42).

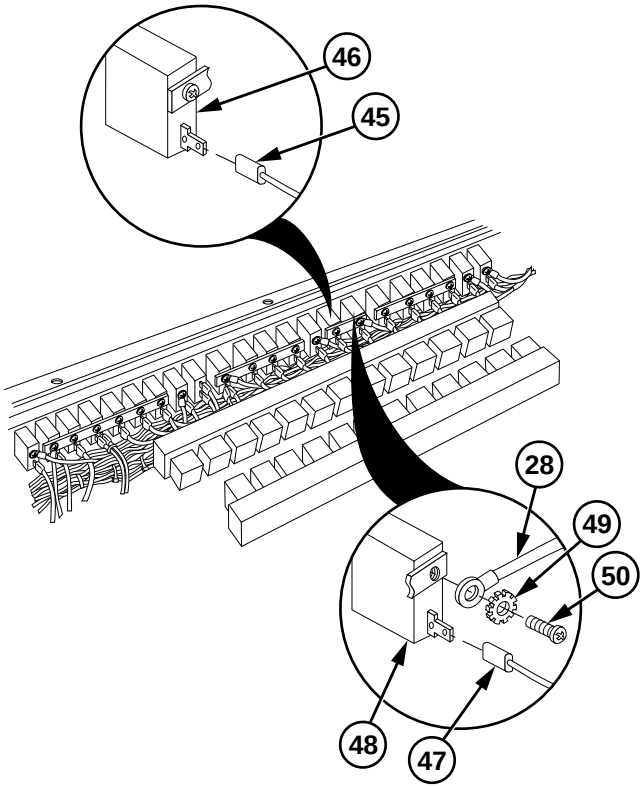
(19) Install electrical connector (43) on electronic control box wire harness connector (44).



(20) Install wire no. 1009 (45) on stoplight circuit breaker (46).

(21) Install wire no. 1925 (47) on turn signal circuit breaker (48).

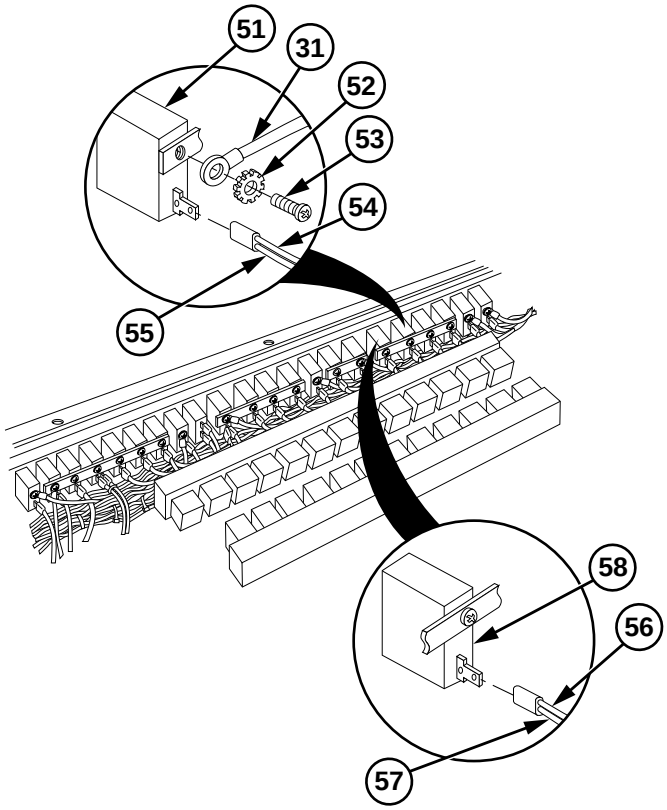
(22) Install wire no. 1109 (28) on turn signal circuit breaker (48) with new lockwasher (49) and screw (50).



(23) Install wire no. 1175 (31) on work lights/horn circuit breaker (51) with new lockwasher (52) and screw (53).

(24) Install wire no. 1040 (54) and wire no. 1040C (55) on work lights/horn circuit breaker (51).

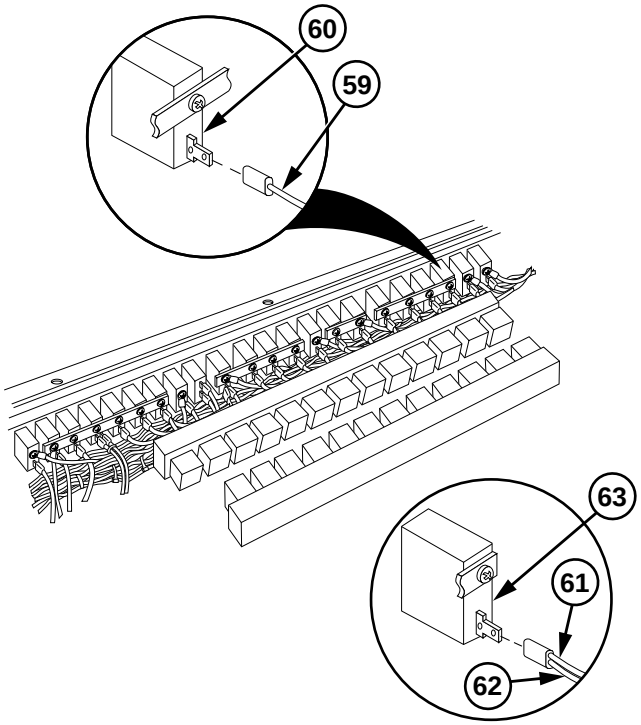
(25) Install wire no. 1891 (56) and wire no. 1413 (57) on beacon/back up circuit breaker (58).



6-12. ELECTRONIC CONTROL BOX/LIGHTS WIRE HARNESS REPLACEMENT (CONT)

(26) Install wire no. 1835 (59) on clearance lights circuit breaker (60).

(27) Install wire no. 1292 (61) and wire no. 1927 (62) on headlights circuit breaker (63).

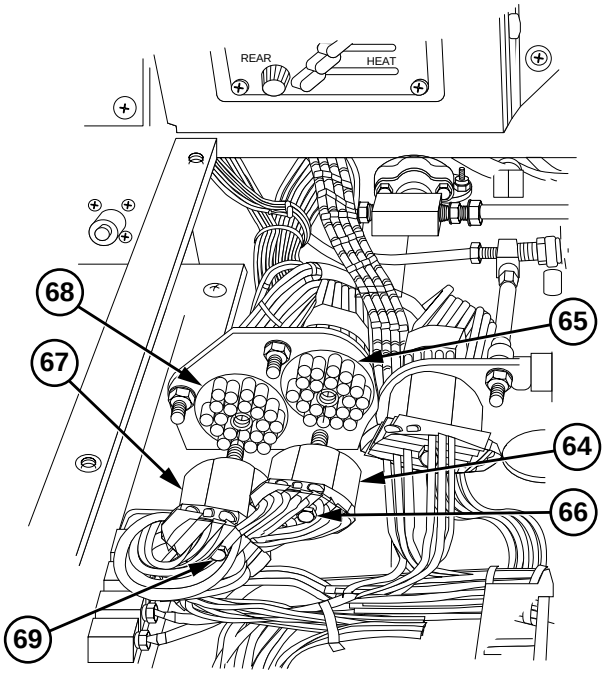


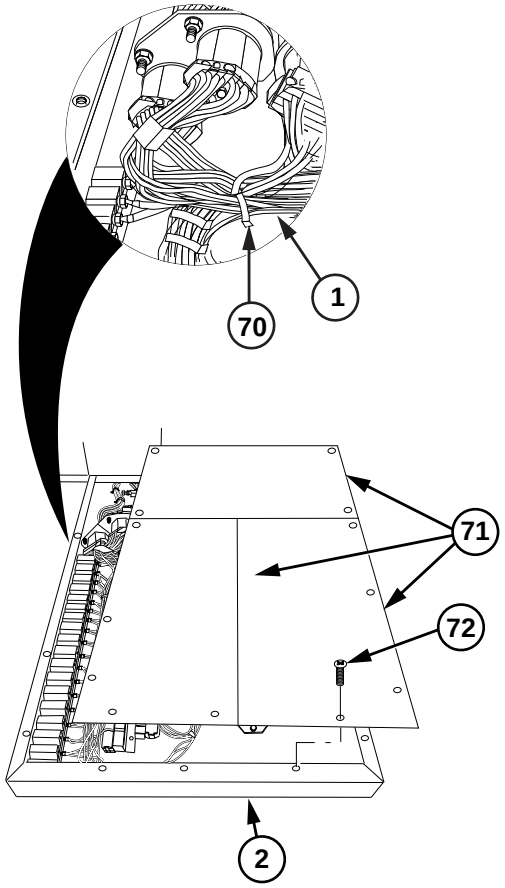
NOTE

Slot on electrical connector must line up with tab on receptacle.

(28) Install electrical connector (64) on cab wire harness receptacle (65) and tighten screw (66).

(29) Install connector (67) on cab wire harness receptacle (68) and tighten screw (69).





NOTE

Plastic cable ties should be positioned in locations marked during removal.

(30) Secure electronic control box/light wire harness (1) with plastic cable ties (70).

(31) Install 3 panels (71) on electronic control box (2) with 19 screws (72).

c. Follow-On Maintenance

(1) Install top doghouse insulation (TM 9-2320-360-20).

(2) Connect batteries (TM 9-2320-360-20).

6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

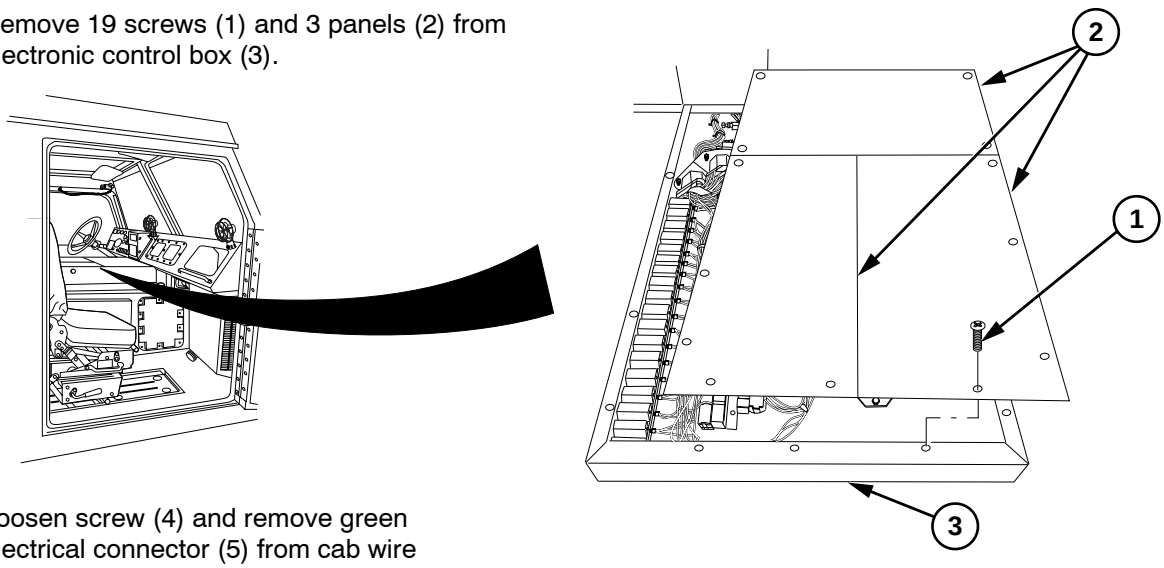
Equipment Condition
Diagnostic request switch removed, DDEC III/IV only (TM 9-2320-360-20).
Batteries disconnected (TM 9-2320-360-20).
Access panels removed (TM 9-2320-360-20).

Materials/Parts
Ties, Cable, Plastic (Item 60, Appendix B)
Locknuts (5) (Item 91, Appendix F)
Locknuts (4) (Item 96, Appendix F)
Lockwashers (8) (Item 128, Appendix F)
Lockwashers (3) (Item 112, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

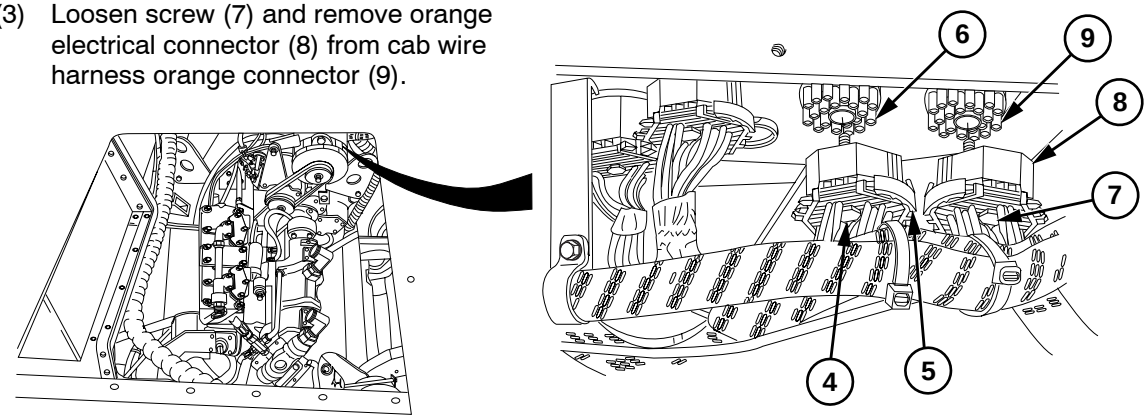
a. Removal

(1) Remove 19 screws (1) and 3 panels (2) from electronic control box (3).



(2) Loosen screw (4) and remove green electrical connector (5) from cab wire harness green connector (6).

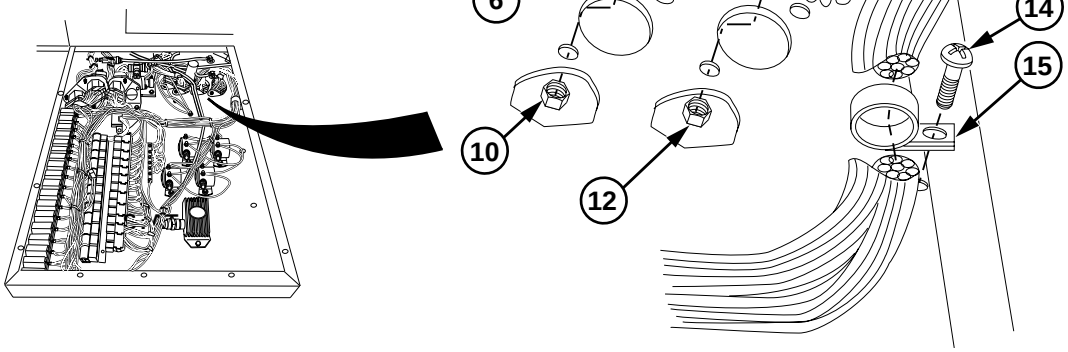
(3) Loosen screw (7) and remove orange electrical connector (8) from cab wire harness orange connector (9).



(4) Remove two locknuts (10), screws (11), and cab wire harness green connector (6) from electronic control box (3). Discard locknuts.

(5) Remove two locknuts (12), screws (13), and cab wire harness orange connector (9) from electronic control box (3). Discard locknuts.

(6) Remove screw (14) and cushion clip (15) from electronic control box (3).

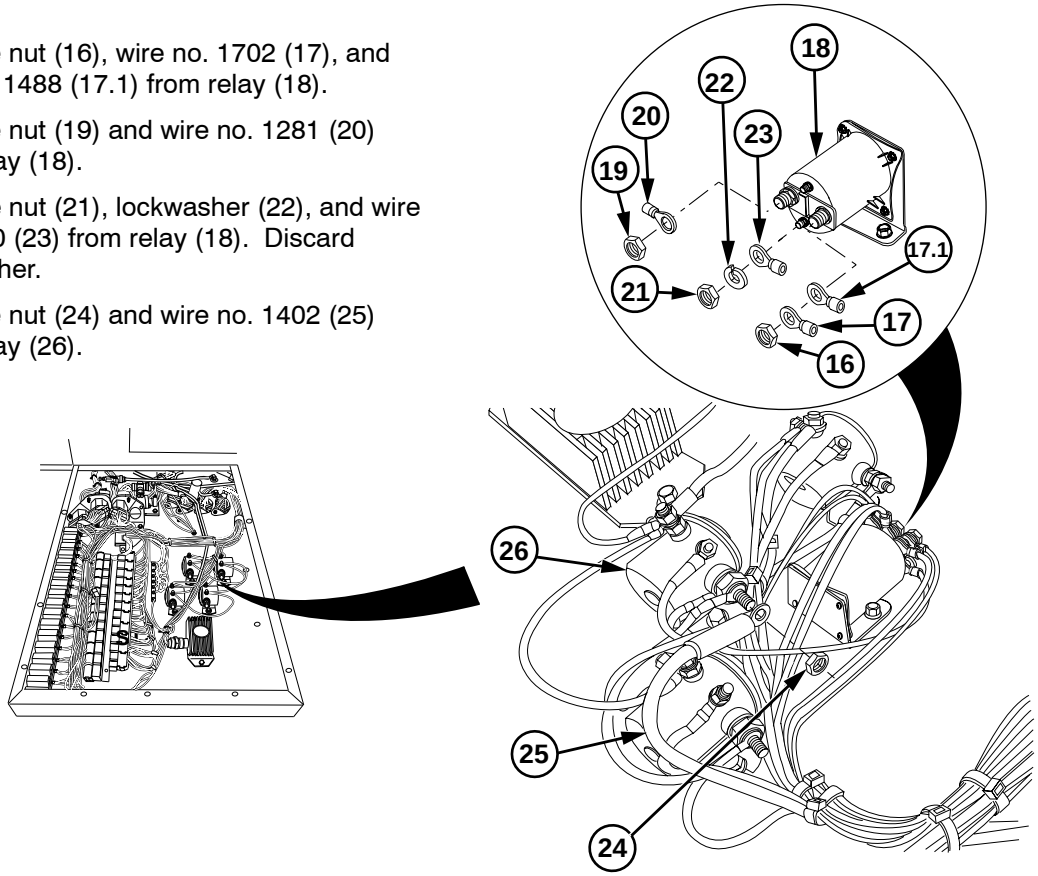


(7) Remove nut (16), wire no. 1702 (17), and wire no. 1488 (17.1) from relay (18).

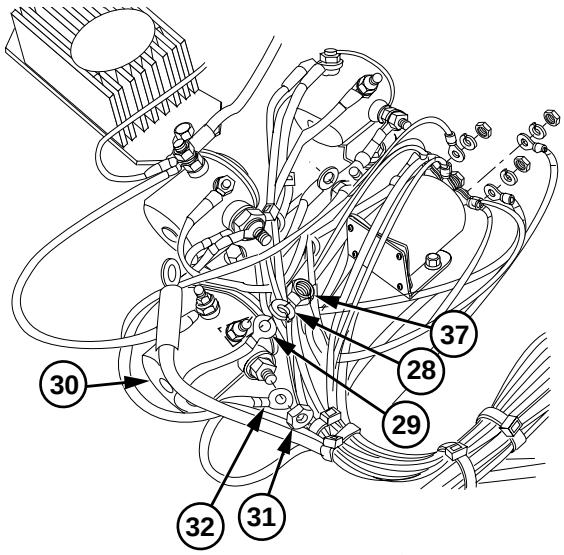
(8) Remove nut (19) and wire no. 1281 (20) from relay (18).

(9) Remove nut (21), lockwasher (22), and wire no. 1640 (23) from relay (18). Discard lockwasher.

(10) Remove nut (24) and wire no. 1402 (25) from relay (26).

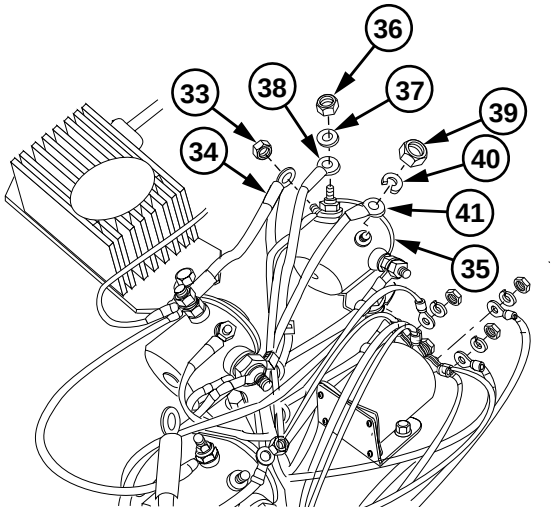


6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)



(11) Remove nut (27), lockwasher (28), and wire no. 1189 (29) from relay (30). Discard lockwasher.

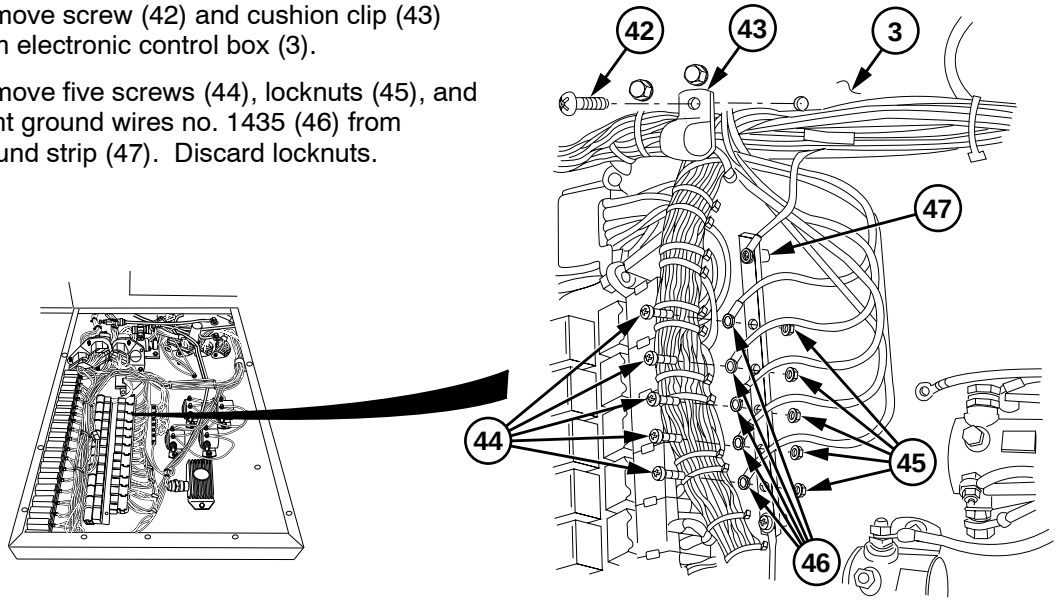
(12) Remove nut (31) and wire no. 1107 (32) from relay (30).



(13) Remove nut (33) and wire no. 1045 (34) from relay (35).

(14) Remove nut (36), lockwasher (37), and ground wire no. 1435 (38) from relay (35). Discard lockwasher.

(15) Remove nut (39), lockwasher (40), and wire no. 1055 (41) from relay (35). Discard lockwasher.



(16) Remove screw (42) and cushion clip (43) from electronic control box (3).

(17) Remove five screws (44), locknuts (45), and eight ground wires no. 1435 (46) from ground strip (47). Discard locknuts.

NOTE

Step (18) applies only to DDEC II vehicles.

(18) Remove two screws (48) and lockwashers (49) from DDEC diagnostic connector (50). Discard lockwashers.

NOTE

Steps (18.1) and (18.2) apply only to DDEC III/IV.

(18.1) Remove cap (50.01), four nuts (50.02), and four machine screws (50.03) from harness (50.04).

(18.2) Remove two nuts (50.05) (if present), two screws (50.06), and bracket (50.07) from electronic control box (3).

(18.3) Remove electrical connector (50.1) from cab wire harness connector (50.2).

(19) Loosen screw (51) and remove black electrical connector (52) from receptacle (53).

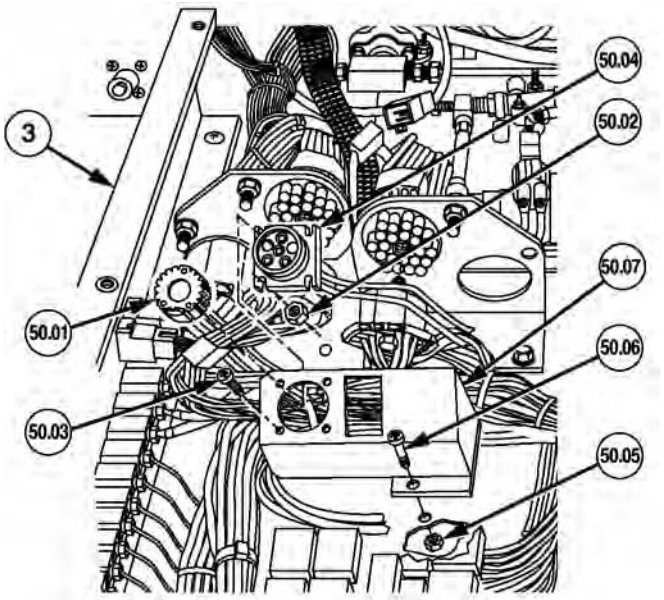
(20) Loosen screw (54) and remove white electrical connector (55) from receptacle (56).

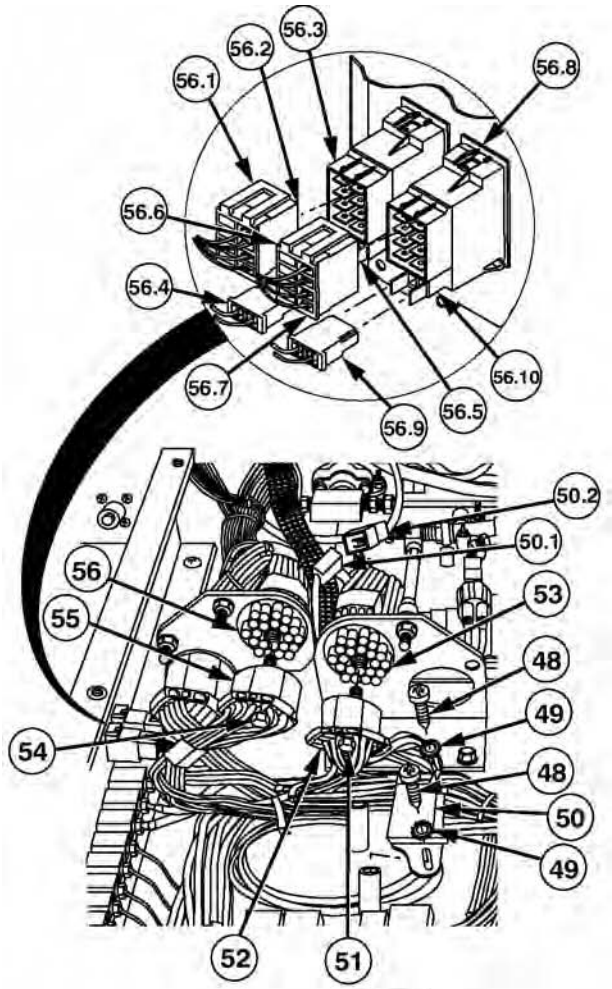
(20.1) Release tab (56.1) and remove connector (56.2) from switch (56.3).

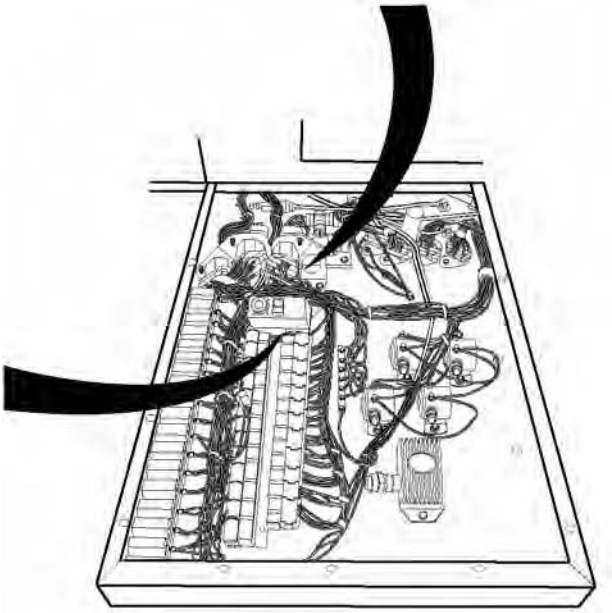
(20.2) Remove connector (56.4) and light assembly (56.5) from switch (56.3).

(20.3) Release tab (56.6) and remove connector (56.7) from switch (56.8).

(20.4) Remove connector (56.9) and light assembly (56.10) from switch (56.8).





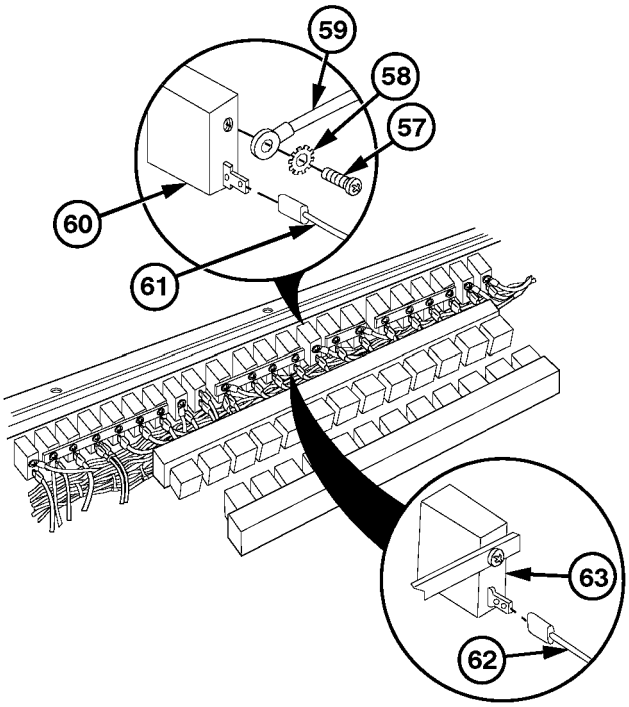


6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

(21) Remove screw (57), lockwasher (58), and wire no. 1107 (59) from tachograph circuit breaker (60). Discard lockwasher.

(22) Remove wire no. 1931 (61) from tachograph circuit breaker no. 22 (60).

(23) Remove wire no. 1712 (62) from engine brake circuit breaker (63).

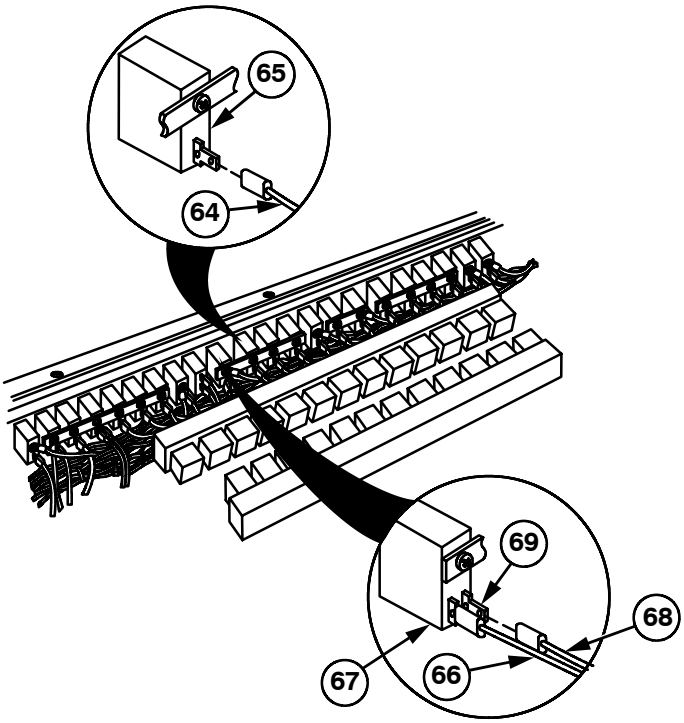


6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

(24) Remove wire no. 1084 (64) from blackout light circuit breaker no. 9 (65).

(25) Remove wire no. 1020A (66) from wiper circuit breaker no. 10 (67).

(26) Remove wire no 1919 (68) from connector (69) on wire no. 1020A (66).

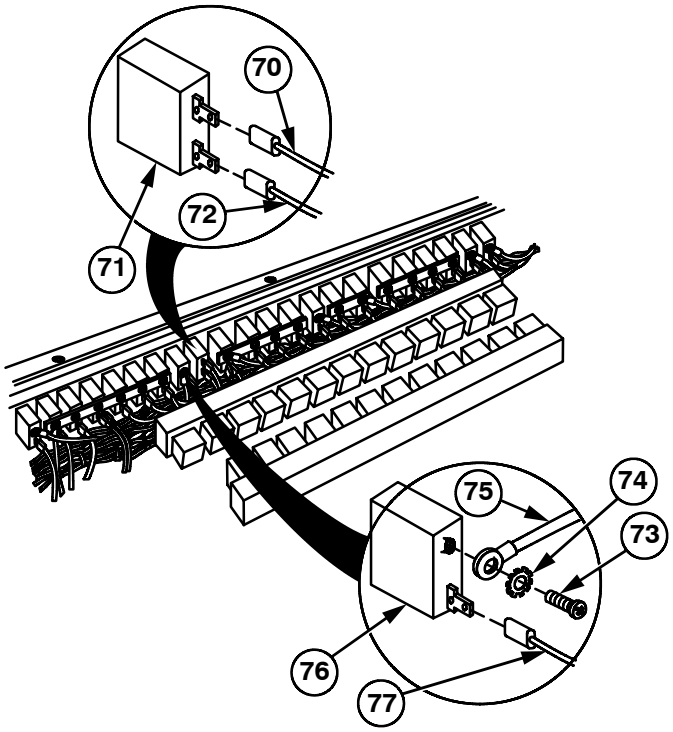


(27) Remove wire no. 1866 (70) from DDEC circuit breaker (71).

(28) Remove wire no. 1867 (72) from DDEC circuit breaker (71).

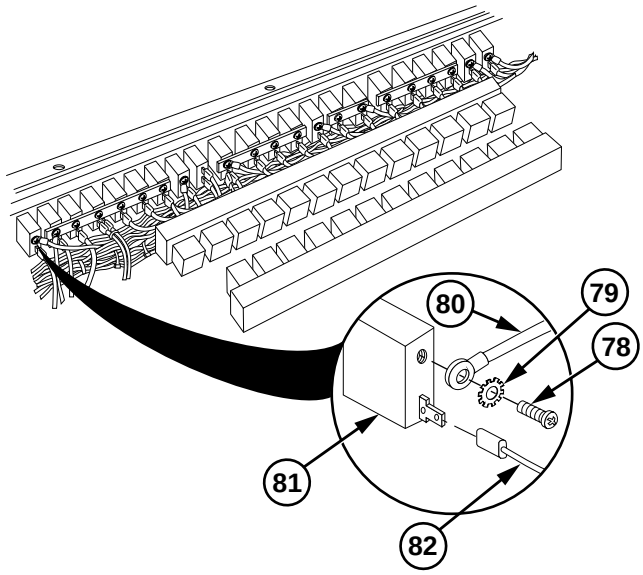
(29) Remove screw (73), lockwasher (74), and wire no. 1402 (75) from ignition circuit breaker (76). Discard lockwasher.

(30) Remove wire no. 1536 (77) from ignition circuit breaker (76).



(31) Remove screw (78), lockwasher (79), and wire no. 1281 (80) from trailer turn signal circuit breaker (81). Discard lockwasher.

(32) Remove wire no. 1282 (82) from trailer turn signal circuit breaker (81).



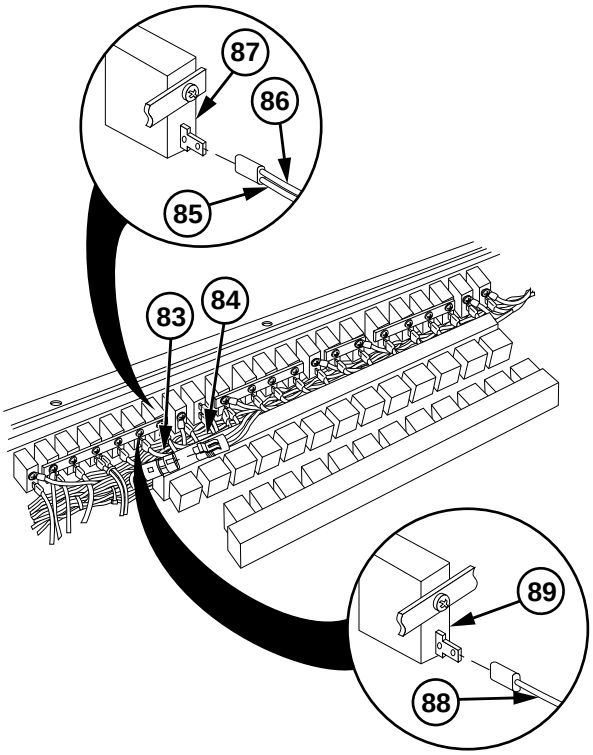
NOTE

Connector is removed by gently prying up on clip and pulling on connector.

(33) Remove electrical connector (83) from electronic control box/light wire harness connector (84).

(34) Remove wire no. 1082 (85) and wire no. 1340 (86) from heater circuit breaker (87).

(35) Remove wire no. 1886 (88) from CTI circuit breaker (89).



6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

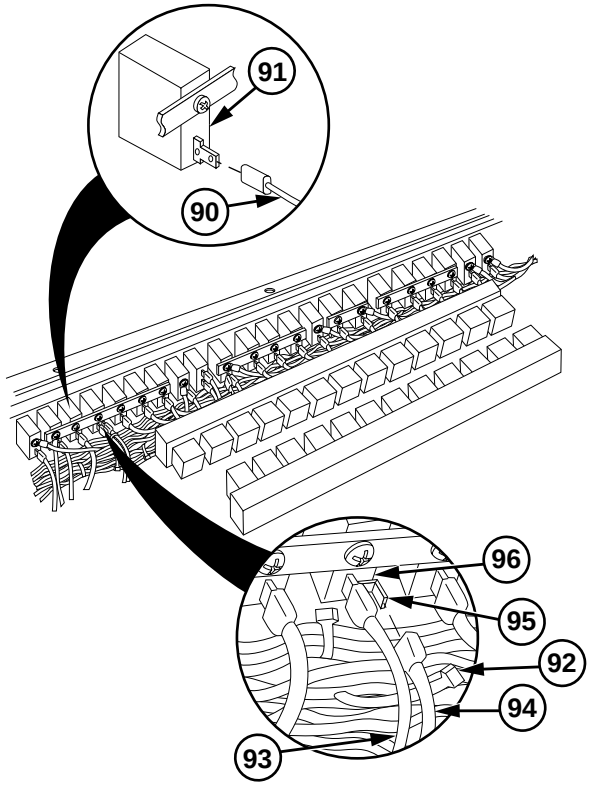
(36) Remove wire no. 1739 (90) from winch/PTO/air dryer/GPF/HI IDLE circuit breaker (91).

NOTE

Location of plastic cable ties should be marked before removal.

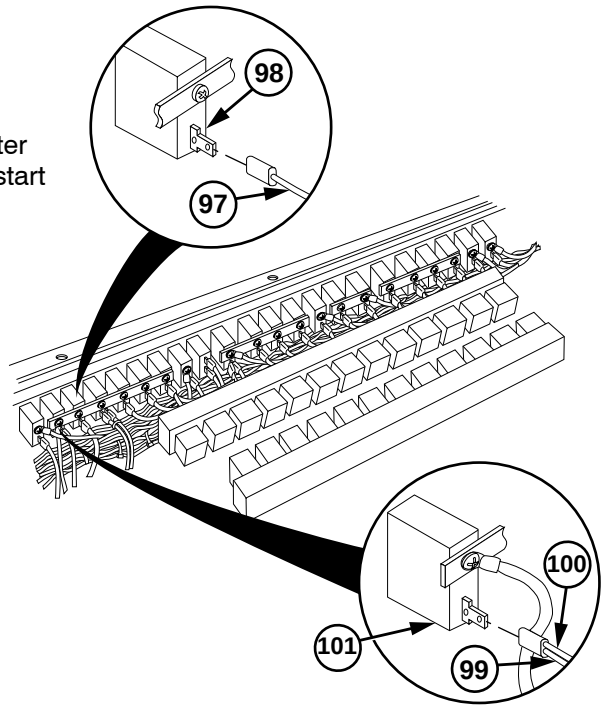
(37) Remove plastic cable tie (92) securing radio harness (93) to wire no. 1717 (94).

(38) Remove wire no. 1717 (94) from connector (95) on radio harness (93) at radio/chemical alarm circuit breaker (96).



(39) Remove wire no. 1487 (97) from fuel/water separator/transmission modulator/ether start circuit breaker (98).

(40) Remove wire no. 1676 (99) and wire no. 1020 (100) from trailer lights circuit breaker (101).



NOTE

All relays are removed the same way.

(41) Remove relay no. 9 (102) from socket (103).

(42) Remove relay no. 27 (104) from socket (105).

(43) Remove relay no. 28 (106) from socket (107).

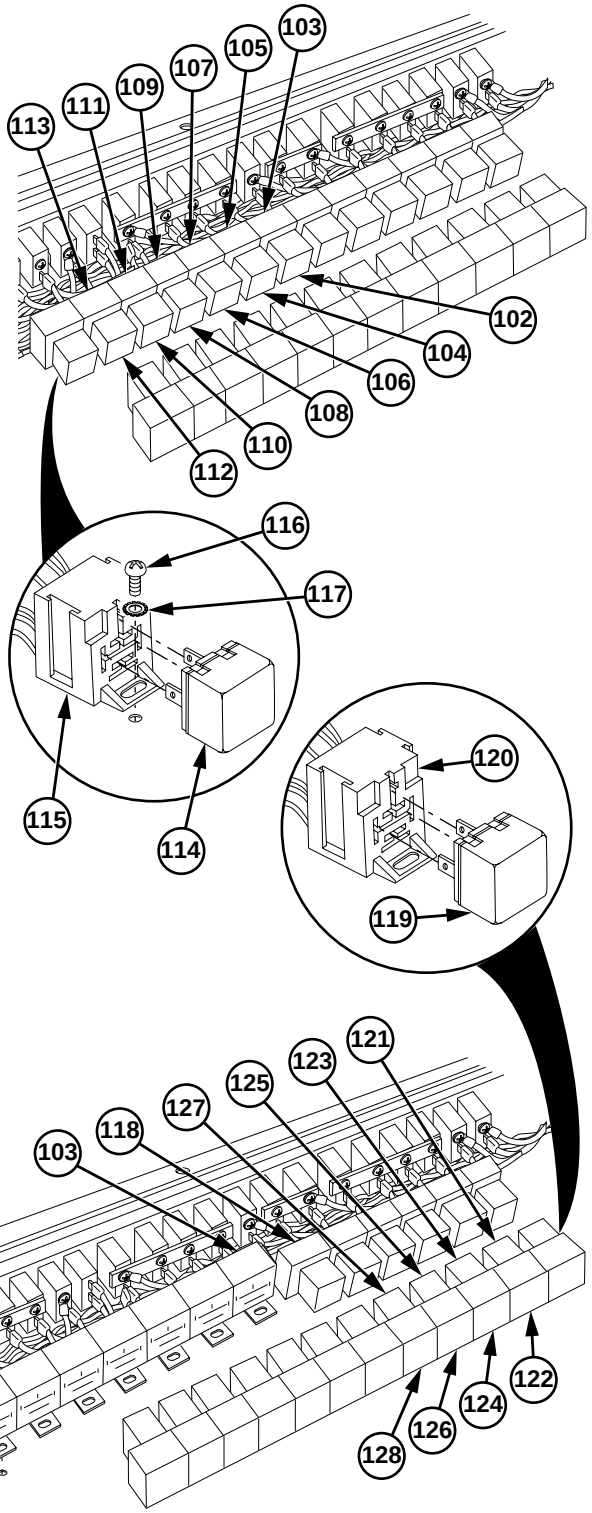
(44) Remove relay no. 30 (108) from socket (109).

(45) Remove relay no. 8 (110) from socket (111).

(46) Remove relay no. 10 (112) from socket (113).

(47) Remove relay no. 29 (114) from socket (115).

(48) Remove screw (116) and lockwasher (117) from relay socket no. 29 (115). Discard lockwasher.



NOTE

Pulling up on relay socket no. 9 will separate relay sockets from relay socket no. 6.

(49) Remove relay socket no. 9 (103) from relay socket no. 6 (118).

(50) Remove relay no. 11 (119) from socket (120).

(51) Remove relay no. 16 (121) from socket (122).

(52) Remove relay no. 17 (123) from socket (124).

(53) Remove relay no. 18 (125) from socket (126).

(54) Remove relay no. 19 (127) from socket (128).

6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

(55) Remove relay no. 20 (129) from socket (130).

(56) Remove relay no. 24 (131) from socket (132).

(57) Remove relay no. 25 (133) from socket (134).

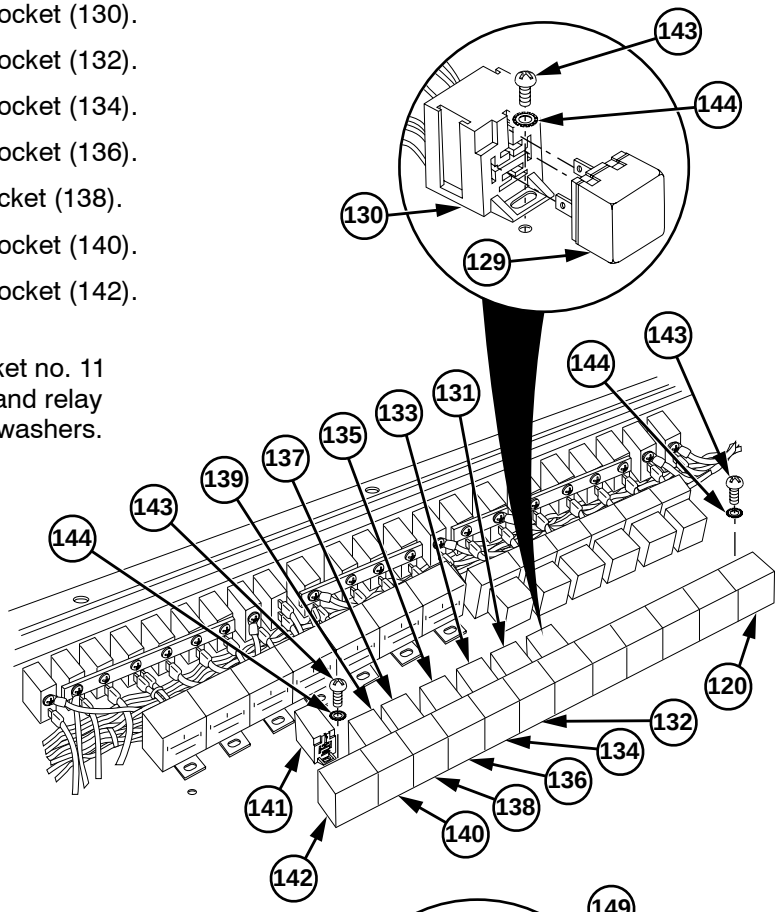
(58) Remove relay no. 15 (135) from socket (136).

(59) Remove relay no. 7 (137) from socket (138).

(60) Remove relay no. 26 (139) from socket (140).

(61) Remove relay no. 12 (141) from socket (142).

(62) Remove three screws (143) and lockwashers (144) from relay socket no. 11 (120), relay socket no. 20 (130), and relay socket no. 12 (142). Discard lockwashers.



NOTE

Locations of plastic cable ties should be marked before removal.

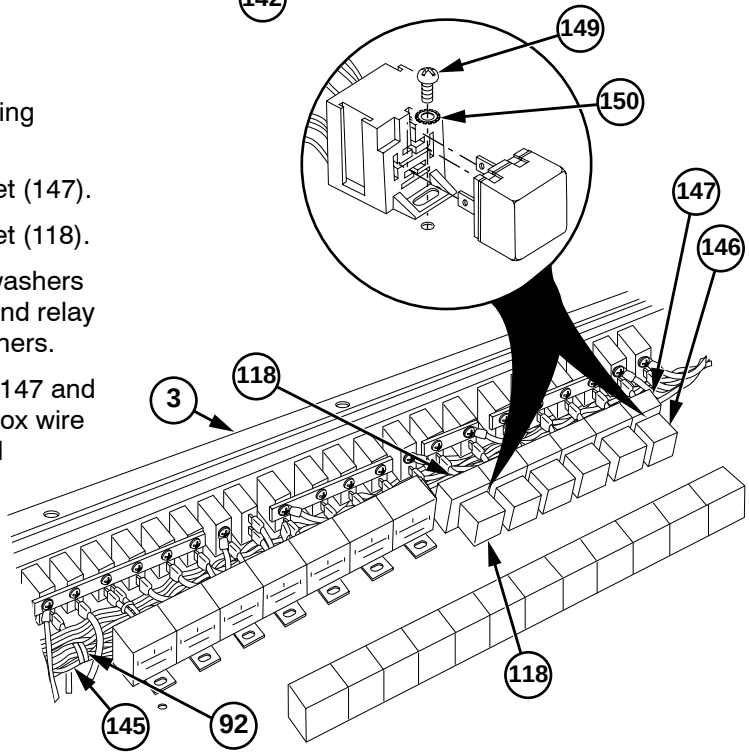
(63) Remove plastic cable ties (92) securing control box wire harness (145).

(64) Remove relay no. 1 (146) from socket (147).

(65) Remove relay no. 6 (148) from socket (118).

(66) Remove two screws (149) and lockwashers (150) from relay socket no. 1 (147) and relay socket no. 6 (118). Discard lockwashers.

(67) Lift up on relay sockets no. 1 thru 6 (147 and 118) and remove electronic control box wire harness (145) from electronic control box (3).



b. Installation

NOTE

Evenly distribute any slack in harness. Do not make any connections.

(1) Lift up on relay sockets no. 1 thru 6 (1 and 2) and position electronic control box wire harness (3) in electronic control box (4).

(2) Install relay sockets no. 1 (1) and no. 6 (2) on electronic control box (4) with new lockwashers (5) and screws (6).

NOTE

Relays no. 9, 7, and 26 are 24-volt (gold) relays. All others are 12 volt (silver).

(3) Install relay no. 6 (7) in socket (2).

(4) Install relay no. 1 (8) in socket (1).

(5) Install relay socket no. 11 (9), relay socket no. 20 (10), and relay socket no. 12 (11) on electronic control box (4) with three new lockwashers (12) and screws (13).

(6) Install relay no. 12 (14) in socket (11).

(7) Install relay no. 26 (15) in socket (16).

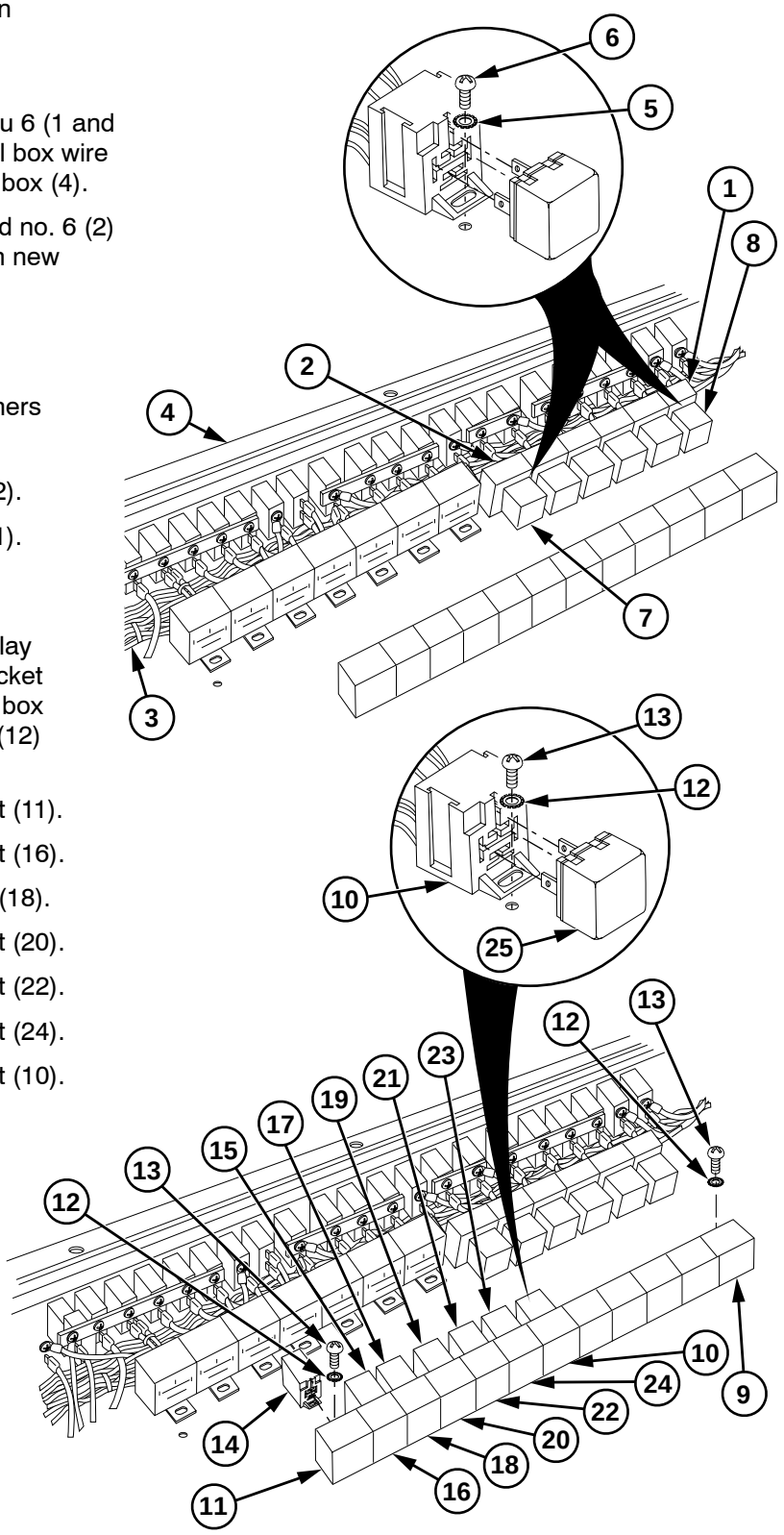
(8) Install relay no. 7 (17) in socket (18).

(9) Install relay no. 15 (19) in socket (20).

(10) Install relay no. 25 (21) in socket (22).

(11) Install relay no. 24 (23) in socket (24).

(12) Install relay no. 20 (25) in socket (10).



6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

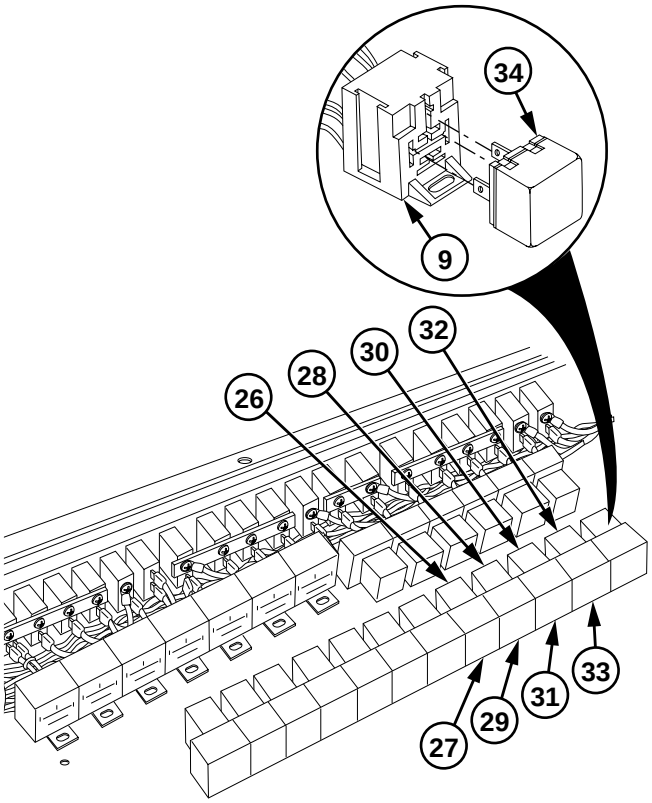
(13) Install relay no. 19 (26) in socket (27).

(14) Install relay no. 18 (28) in socket (29).

(15) Install relay no. 17 (30) in socket (31).

(16) Install relay no. 16 (32) in socket (33).

(17) Install relay no. 11 (34) in socket (9).



NOTE

Relay sockets are installed by aligning tab on relay socket no. 9 with slot on relay socket no. 6 and pushing relay sockets no. 9, 27, 28, 30, 8, 10, and 29 down in position.

(18) Install relay socket no. 9 (35) in relay socket no. 6 (2).

(19) Install relay socket no. 29 (36) on electronic control box (4) with new lockwasher (37) and screw (38).

(20) Install relay no. 9 (39) in socket (35).

(21) Install relay no. 27 (40) in socket (41).

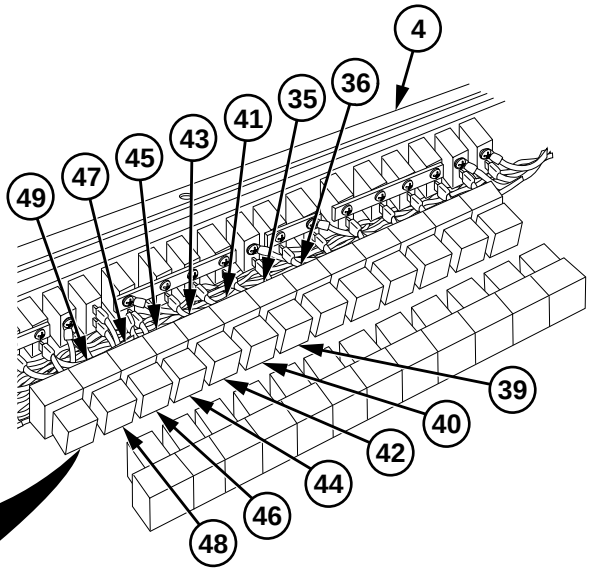
(22) Install relay no. 28 (42) in socket (43).

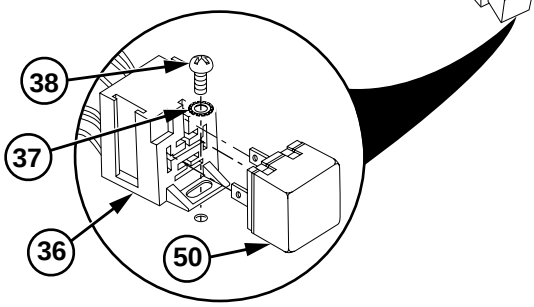
(23) Install relay no. 30 (44) in socket (45).

(24) Install relay no. 8 (46) in socket (47).

(25) Install relay no. 10 (48) in socket (49).

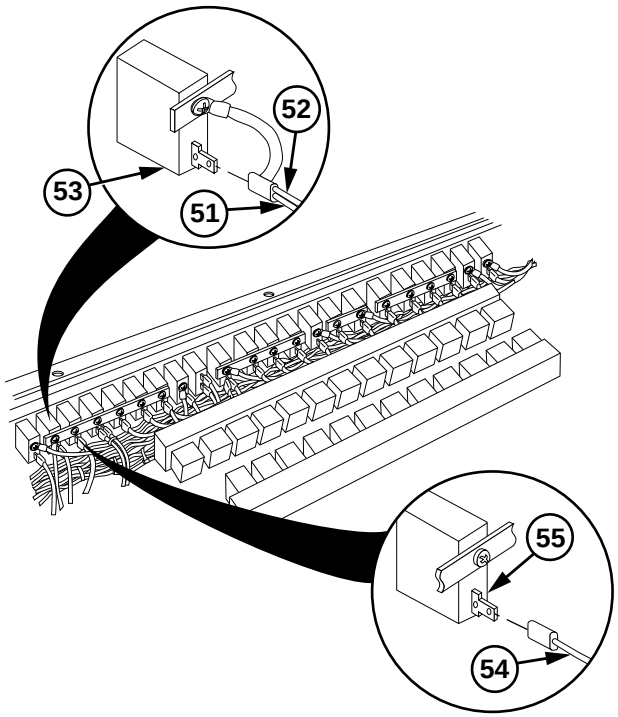
(26) Install relay no. 29 (50) in socket (36).





(27) Install wire no. 1676 (51) and wire no. 1020 (52) on trailer lights circuit breaker (53).

(28) Install wire no. 1487 (54) on fuel/water separator/transmission modulator/ether start circuit breaker (55).



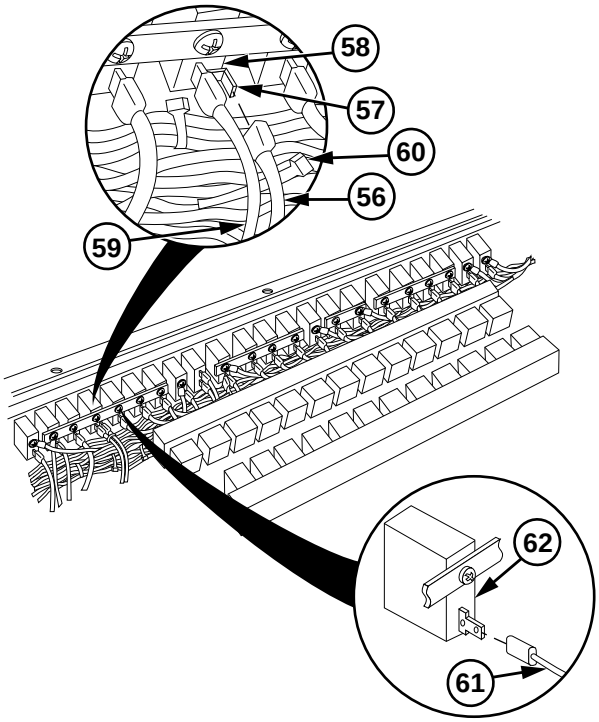
(29) Install wire no. 1717 (56) on radio wire harness connector (57) at radio/chemical alarm circuit breaker (58).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(30) Secure radio wire harness (59) to wire no. 1717 (56) with plastic cable ties (60).

(31) Install wire no. 1739 (61) on winch/PTO/air dryer/GPF/HI IDLE circuit breaker (62).

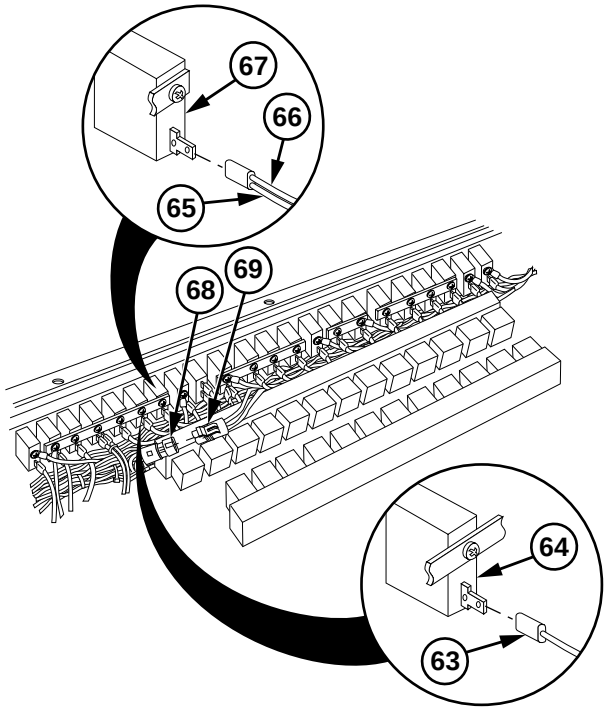


6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

(32) Install wire no. 1886 (63) on CTI circuit breaker (64).

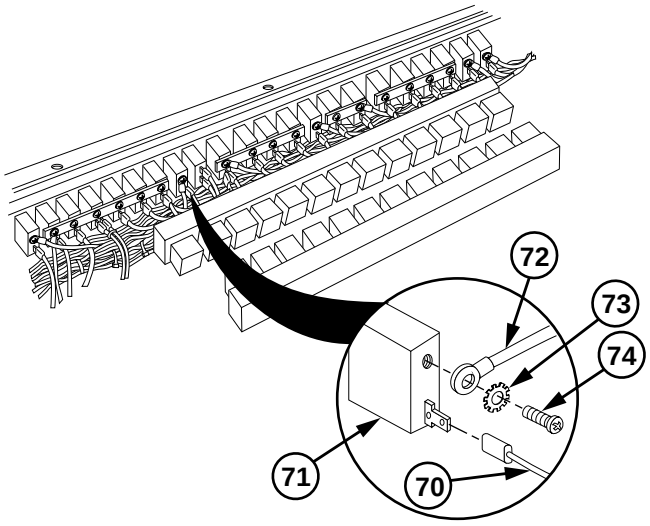
(33) Install wire no. 1082 (65) and wire no. 1340 (66) on heater circuit breaker (67).

(34) Install electrical connector (68) on electronic control box/light wire harness connector (69).



(35) Install wire no. 1282 (70) on trailer turn signal circuit breaker (71).

(36) Install wire no. 1281 (72) on trailer turn signal circuit breaker (71) with new lockwasher (73) and screw (74).

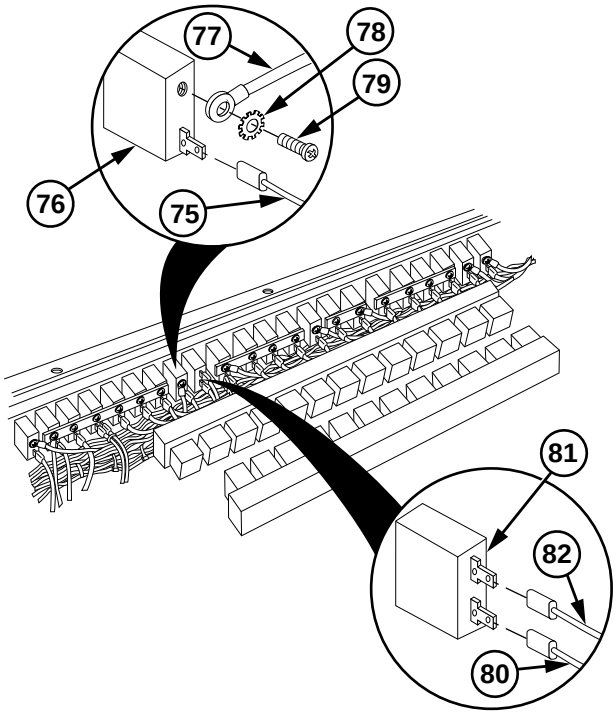


(37) Install wire no. 1536 (75) on ignition circuit breaker (76).

(38) Install wire no. 1402 (77) on ignition circuit breaker (76) with new lockwasher (78) and screw (79).

(39) Install wire no. 1867 (80) on DDEC circuit breaker (81).

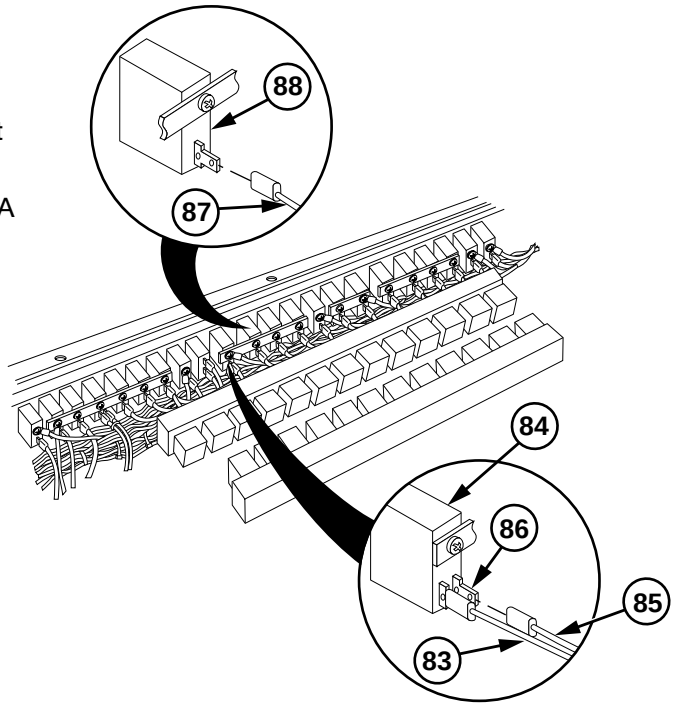
(40) Install wire no. 1866 (82) on DDEC circuit breaker (81).



(41) Install wire no. 1020A (83) on wiper circuit breaker (84).

(42) Install wire no. 1919 (85) on wire no 1020A connector (86).

(43) Install wire no. 1084 (87) on blackout light circuit breaker (88).



6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

(44) Install wire no. 1712 (89) on engine brake circuit breaker (90).

(45) Install wire no. 1931 (91) on tachograph circuit breaker (92).

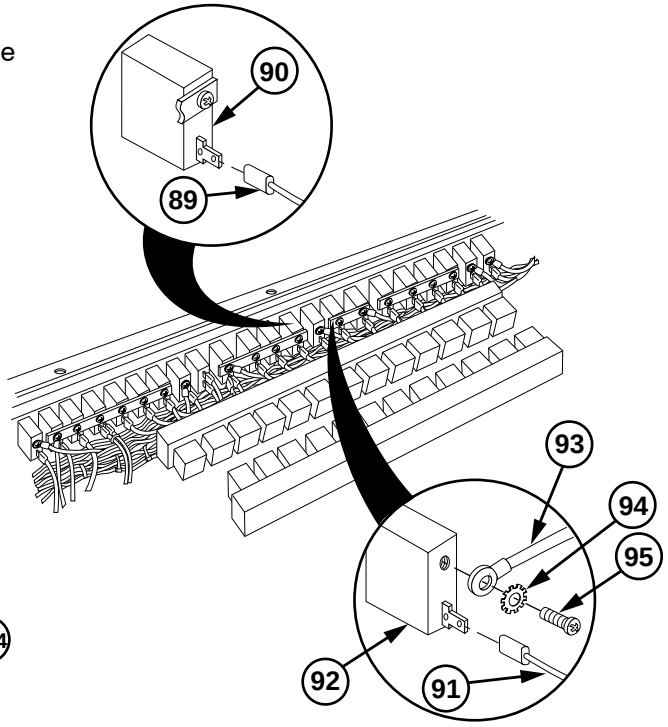
(46) Install wire no. 1107 (93) on tachograph circuit breaker (92) with new lockwasher (94) and screw (95).

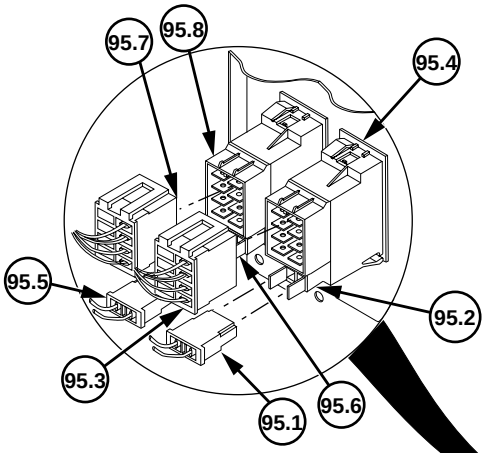
(46.1) Install connector (95.1) on light assembly (95.2).

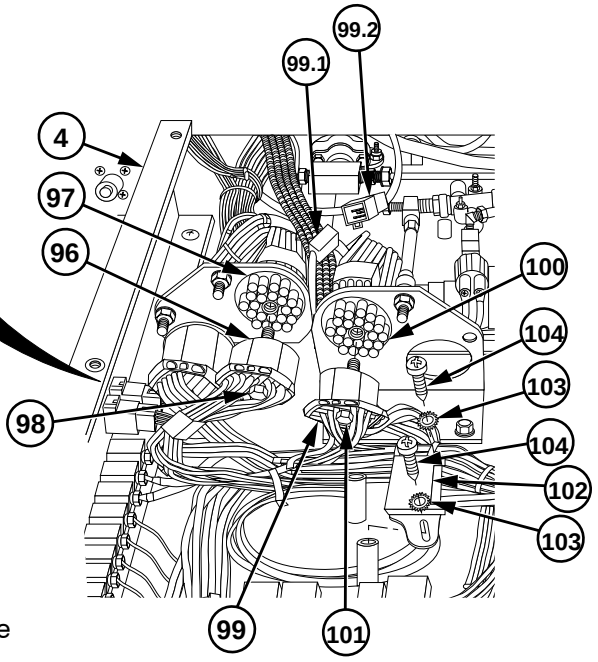
(46.2) Install connector (95.3) on switch (95.4).

(46.3) Install connector (95.5) on light assembly (95.6).

(46.4) Install connector (95.7) on switch (95.8).







NOTE

Post in connector must line up with tab on receptacle.

(47) Install white electrical connector (96) on receptacle (97) and tighten screw (98).

(48) Install black electrical connector (99) on receptacle (100) and tighten screw (101).

(48.1) Install electrical connector (99.1) on cab wire harness connector (99.2).

NOTE

Step (49) applies only to DDEC II vehicles.

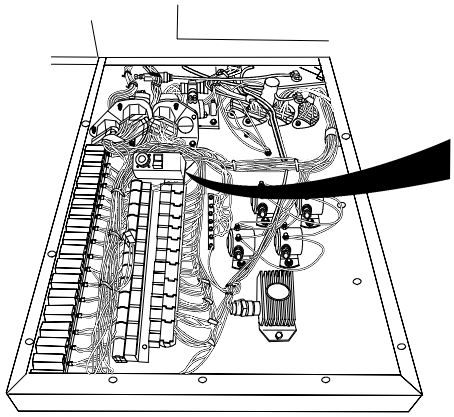
(49) Install DDEC diagnostic connector (102) on electronic control box (4) with two new lockwashers (103) and screws (104).

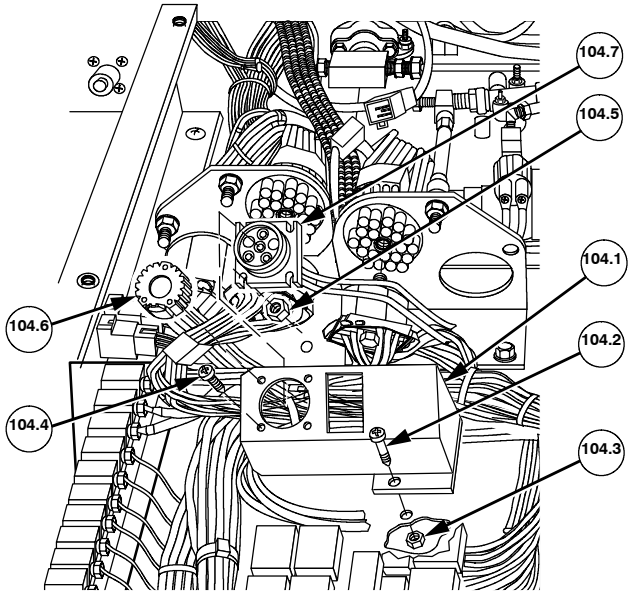
NOTE

- If installing new electronic control box, holes for installing bracket are tapped.
- Steps (49.1) and (49.2) apply only to DDEC III/IV vehicles.

(49.1) Install bracket (104.1) on electronic control box (4) with two screws (104.2), and two nuts (104.3) (if required).

(49.2) Install harness (104.7) on bracket (104.1) with four screws (104.4), four nuts (104.5), and cap (104.6).



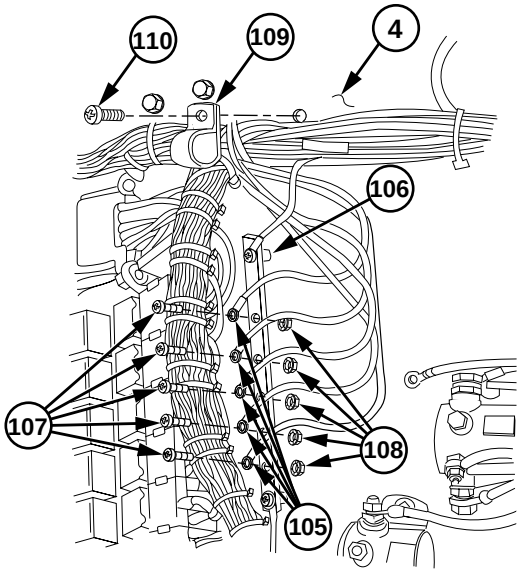


NOTE

Ground wires should be placed in locations marked during removal.

(50) Install eight ground wires no. 1435 (105) on ground strip (106) with five screws (107) and new locknuts (108).

(51) Install cushion clip (109) on electronic control box (4) with screw (110).



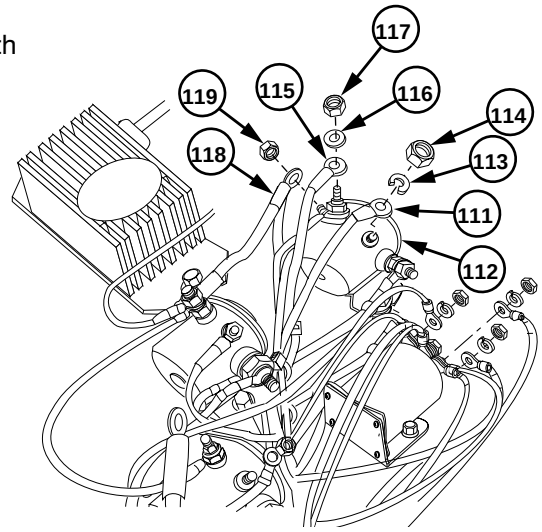
(52) Install wire no. 1055 (111) on relay (112) with new lockwasher (113) and nut (114).

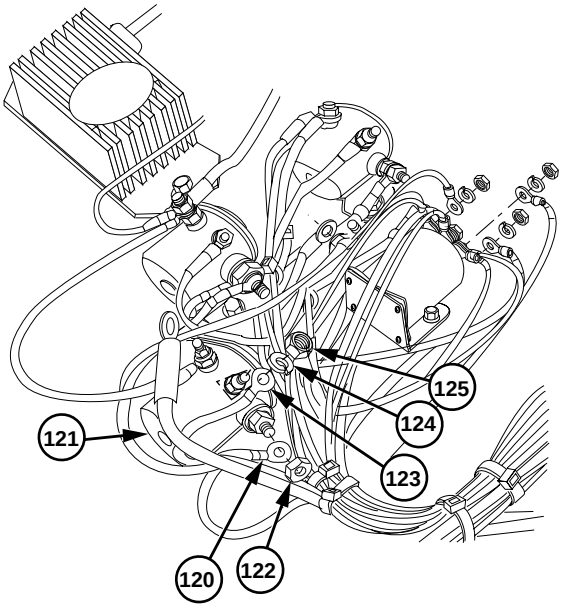
(53) Install ground wire no. 1435 (115) on relay (112) with new lockwasher (116) and nut (117).

(54) Install wire no. 1045 (118) on relay (112) with nut (119).

(55) Install wire no. 1107 (120) on relay (121) with nut (122).

(56) Install wire no. 1189 (123) on relay (121) with new lockwasher (124) and nut (125).





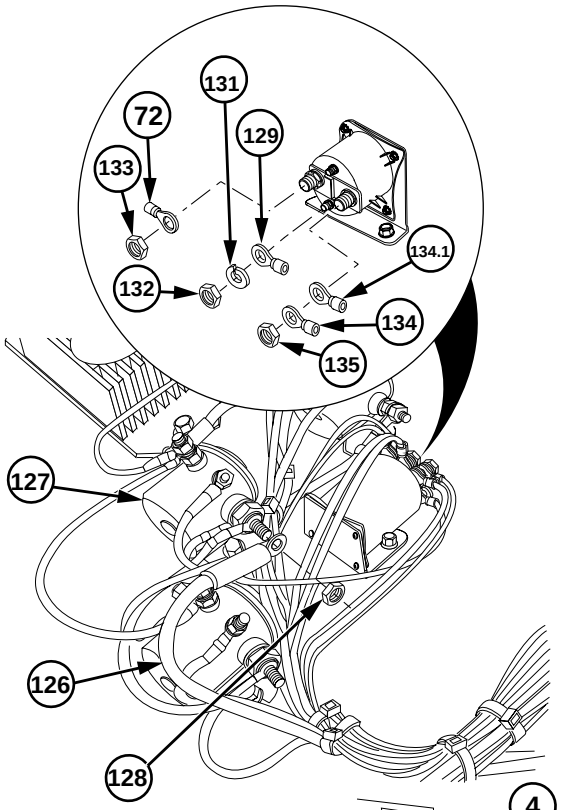
6-13. ELECTRONIC CONTROL BOX WIRE HARNESS REPLACEMENT (CONT)

(57) Install wire no. 1402 (126) on relay (127) with nut (128).

(58) Install wire no. 1640 (129) on relay (130) with new lockwasher (131) and nut (132).

(59) Install wire no. 1281 (72) on relay (130) with nut (133).

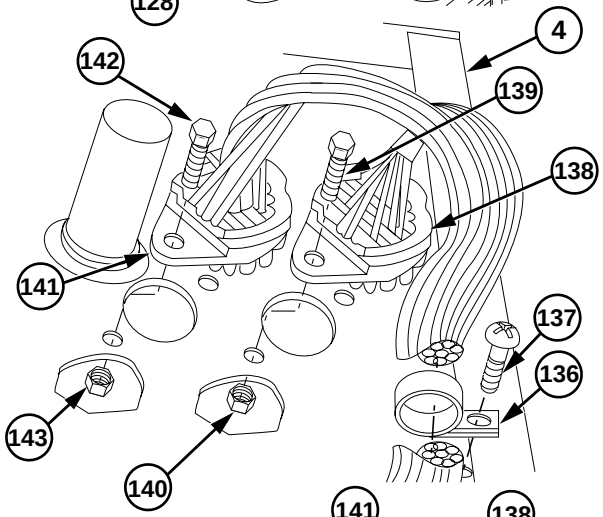
(60) Install wire no. 1702 (134) and wire no. 1488 (134.1) on relay (130) with nut (135).



(61) Install cushion clip (136) on electronic control box (4) with screw (137).

(62) Install cab wire harness orange connector (138) on electronic control box (4) with two screws (139) and new locknuts (140).

(63) Install cab wire harness green connector (141) on electronic control box (4) with two screws (142) and new locknuts (143).

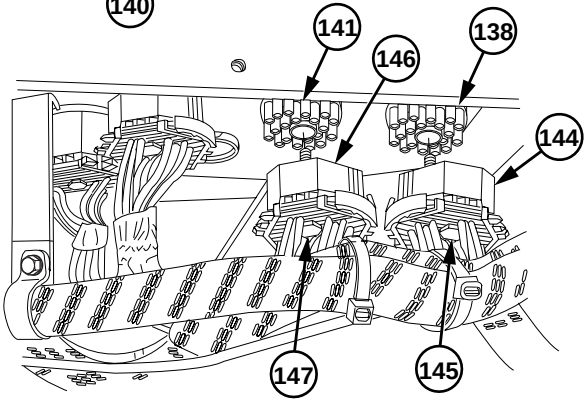


NOTE

Post in connector must align with tab on receptacle.

(64) Install orange connector (144) on cab wire harness orange connector (138) and tighten screw (145).

(65) Install green connector (146) on cab wire harness green connector (141) and tighten screw (147).

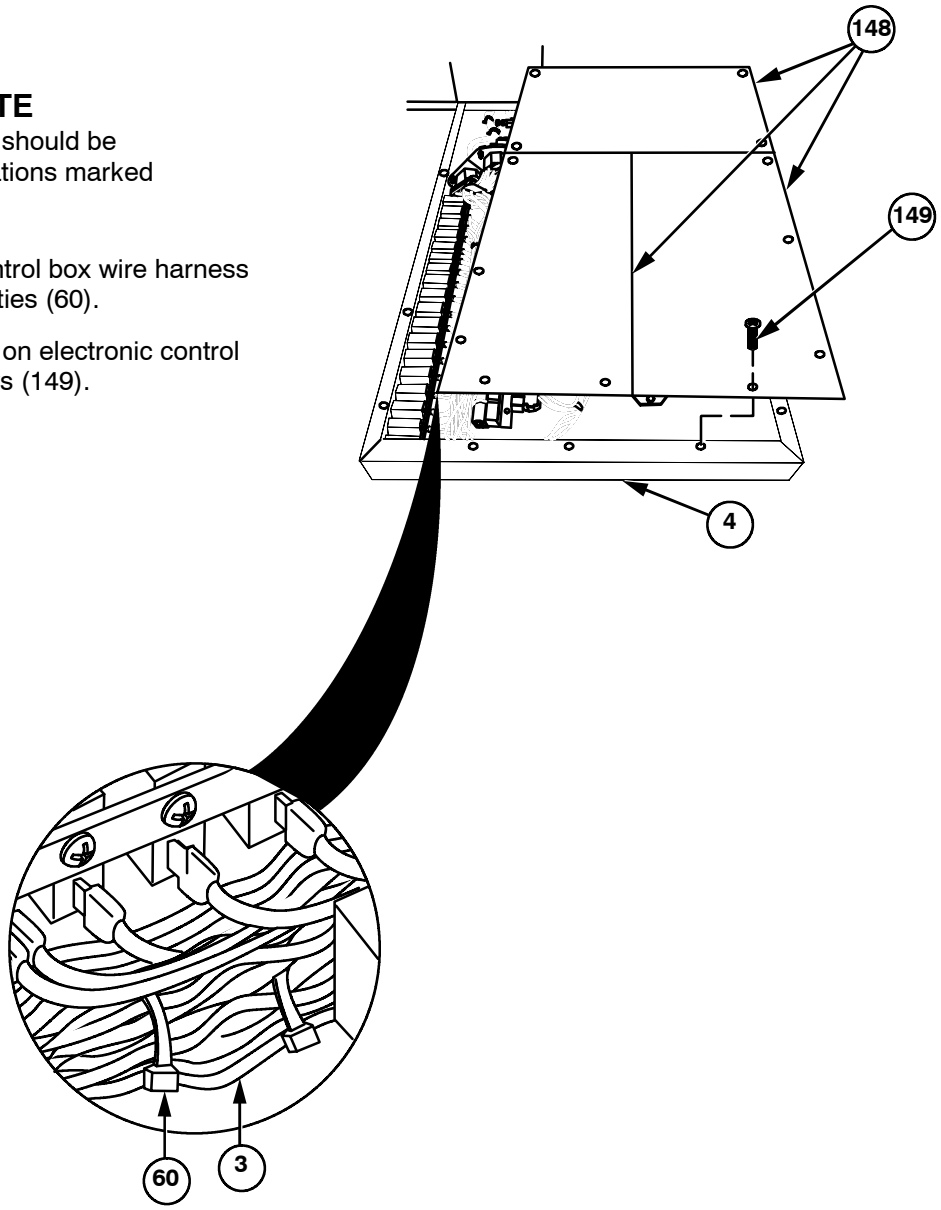


NOTE

Plastic cable ties should be positioned in locations marked during removal.

(66) Secure electronic control box wire harness (3) with plastic cable ties (60).

(67) Install 3 panels (148) on electronic control box (4) with 19 screws (149).



c. Follow-On Maintenance

(1) Install access panels (TM 9-2320-360-20).

(2) Connect batteries (TM 9-2320-360-20).

(3) Install diagnostic request switch, DDEC III/IV only (TM 9-2320-360-20).

6-14. RADIO WIRE HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

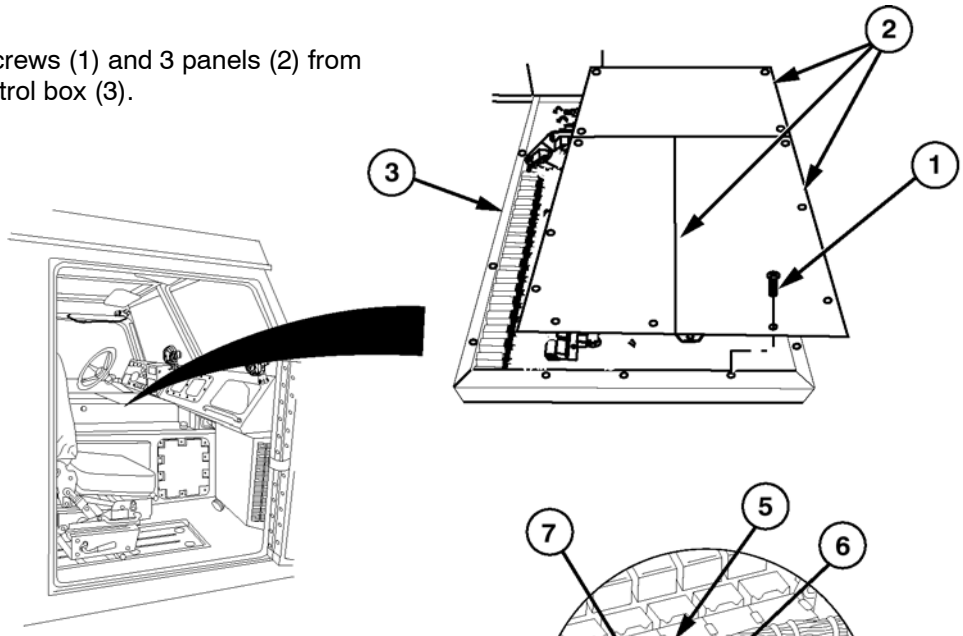
Equipment Condition
Batteries disconnected (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknut (Item 91, Appendix F)

a. Removal

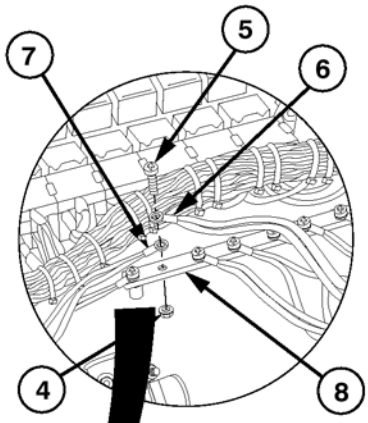
(1) Remove 19 screws (1) and 3 panels (2) from electronic control box (3).

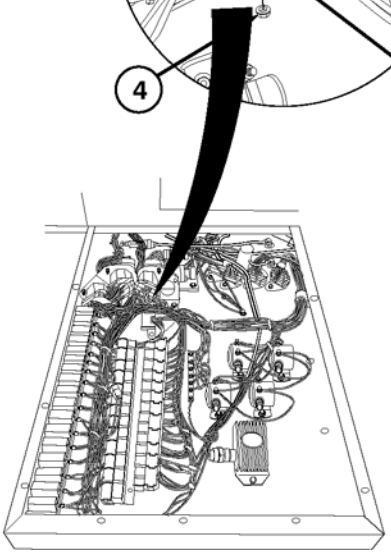


NOTE

- Tag and mark wires before removal.
- Two ground wires are connected by one electrical connector.

(2) Remove locknut (4), screw (5), two ground wires no. 1435 (6), and two black radio harness wires (7) from terminal strip (8). Discard locknut.





NOTE

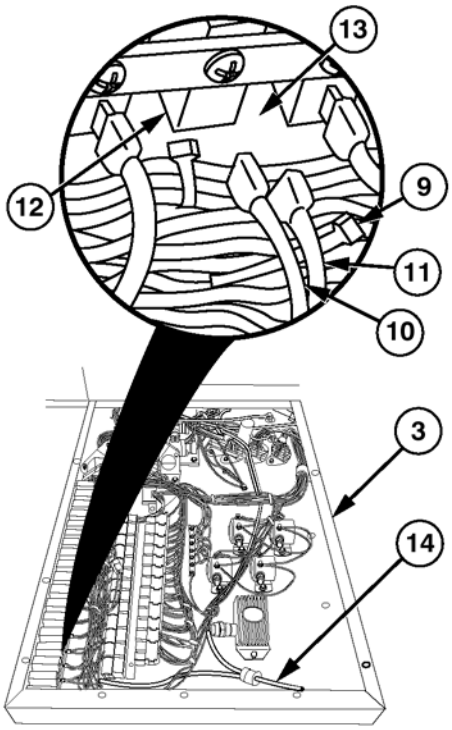
Locations of plastic cable ties should be marked before removal.

(3) Remove plastic cable tie (9) from red radio harness wires (10) and wire no. 1717 (11).

(4) Remove two wires (10) from RADIO CHEMICAL circuit breaker (12).

(5) Remove wire no. 1717 (11) from red radio harness connector (13).

(6) Remove radio wire harness (14) from electronic control box (3).



b. Installation

(1) Route radio wire harness (1) through side of electronic control box (2).

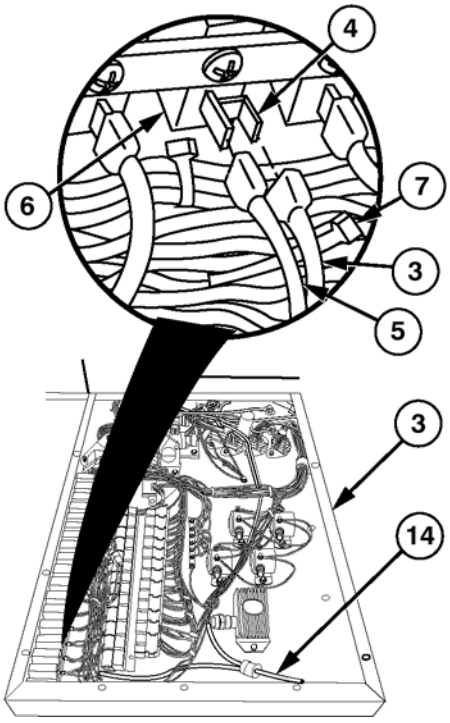
(2) Install wire no. 1717 (3) on red radio harness connector (4).

(3) Install two red radio harness wires (5) and wire no. 1717 (3) on RADIO CHEMICAL circuit breaker (6).

NOTE

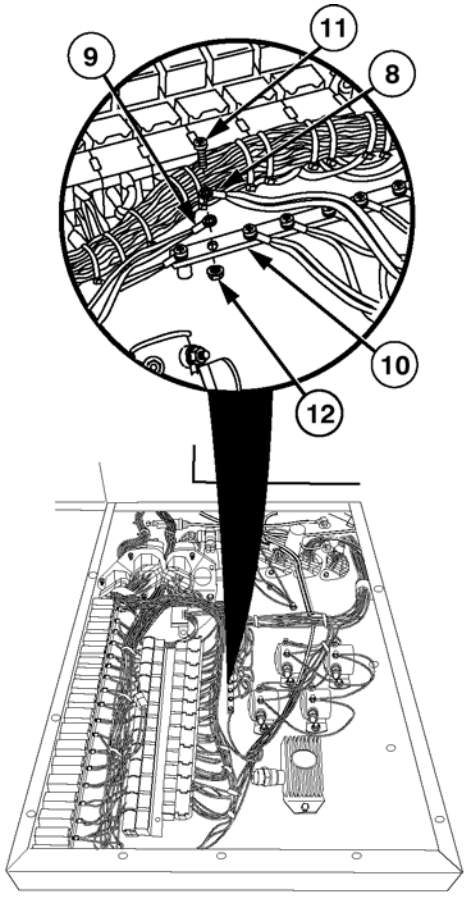
Plastic cable ties should be positioned in locations marked during removal.

(4) Install plastic cable tie (7) on red radio harness wires (5) and wire no. 1717 (3).

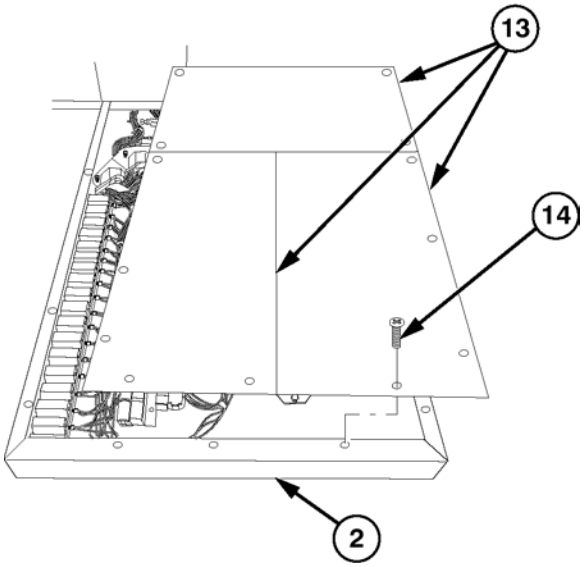


6-14. RADIO WIRE HARNESS REPLACEMENT (CONT)

(5) Install two ground wires no. 1435 (8) and two black radio harness wires (9) on terminal strip (10) with screw (11) and new locknut (12).



(6) Install 3 panels (13) on electronic control box (2) with 19 screws (14).



c. Follow-On Maintenance

Connect batteries (TM 9-2320-360-20).

6-15. DDEC II WIRE HARNESS REPLACEMENT

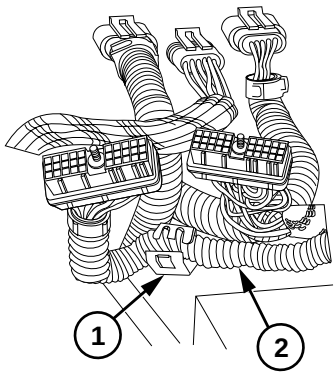
This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
ECM removed (TM 9-2320-360-20).
Inner fender removed (right side only) (TM 9-2320-360-20).

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)



a. Removal

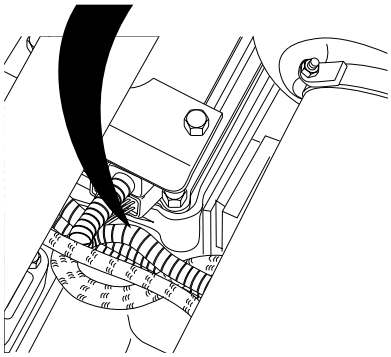
WARNING

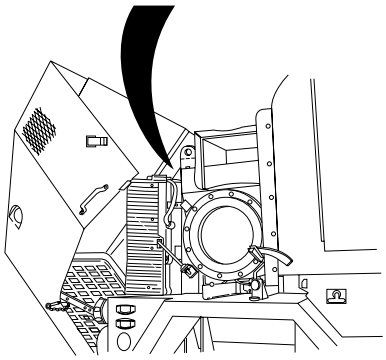
Engine must be cool before performing maintenance. Failure to comply may result in injury to personnel.

NOTE

Tag and mark wires before removal.

(1) Open clip (1) and remove DDEC II wire harness (2) from clip (1).



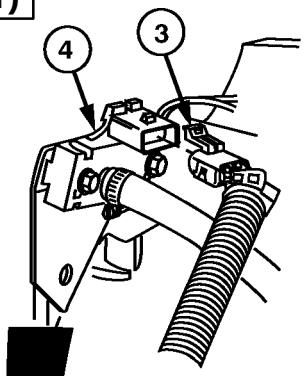


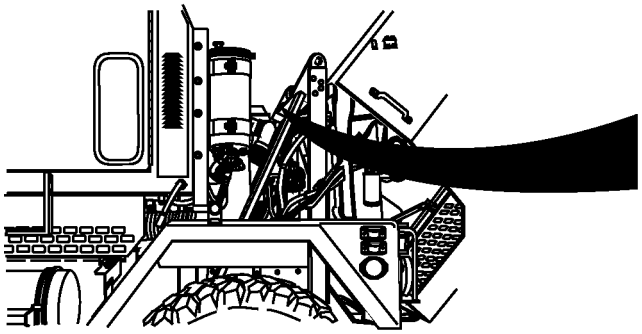
6-15. DDEC II WIRE HARNESS REPLACEMENT (CONT)

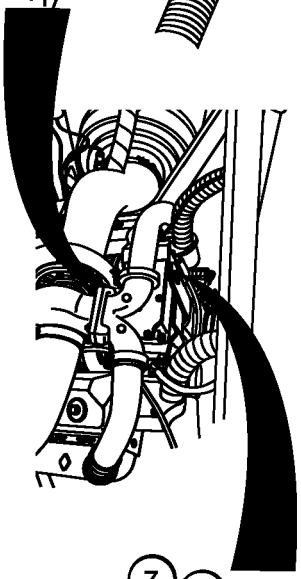
NOTE

Connectors are removed by gently prying on tab and pulling on connector.

(2) Remove electrical connector (3) from turbo boost sensor (4).

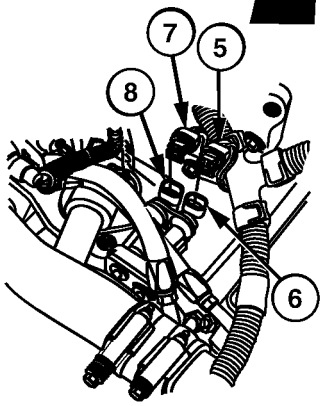




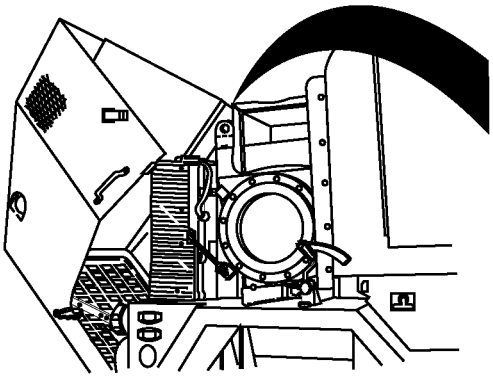


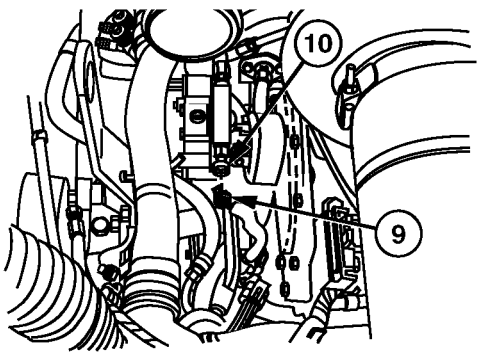
(3) Remove electrical connector (5) from SRS sensor (6).

(4) Remove electrical connector (7) from TRS sensor (8).



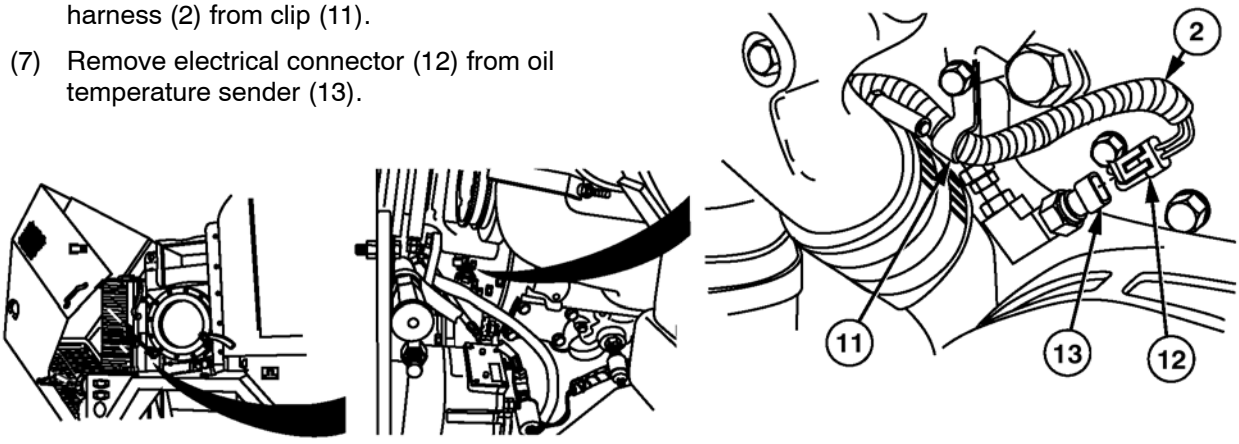
(5) Remove electrical connector (9) from fuel temperature sensor (10).



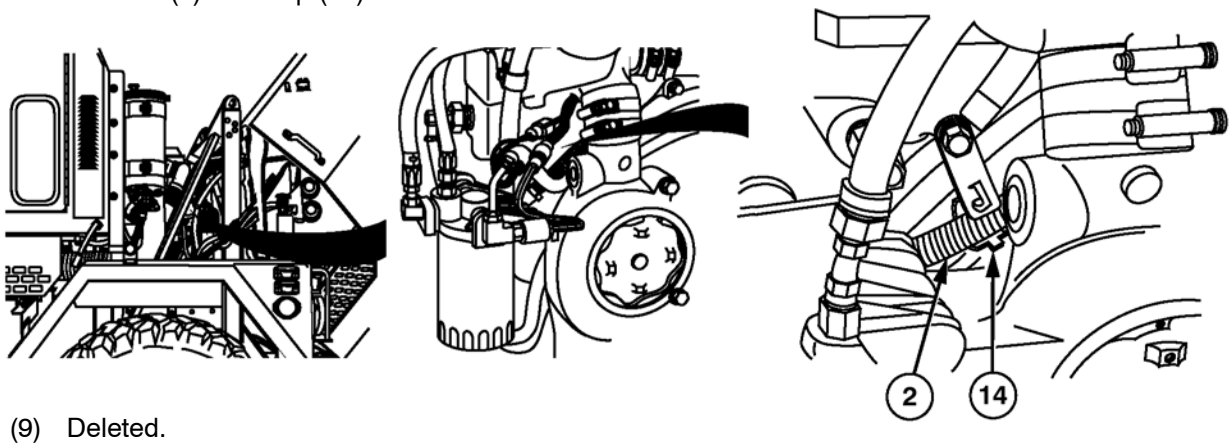


(6) Open clip (11) and remove DDEC II wire harness (2) from clip (11).

(7) Remove electrical connector (12) from oil temperature sender (13).

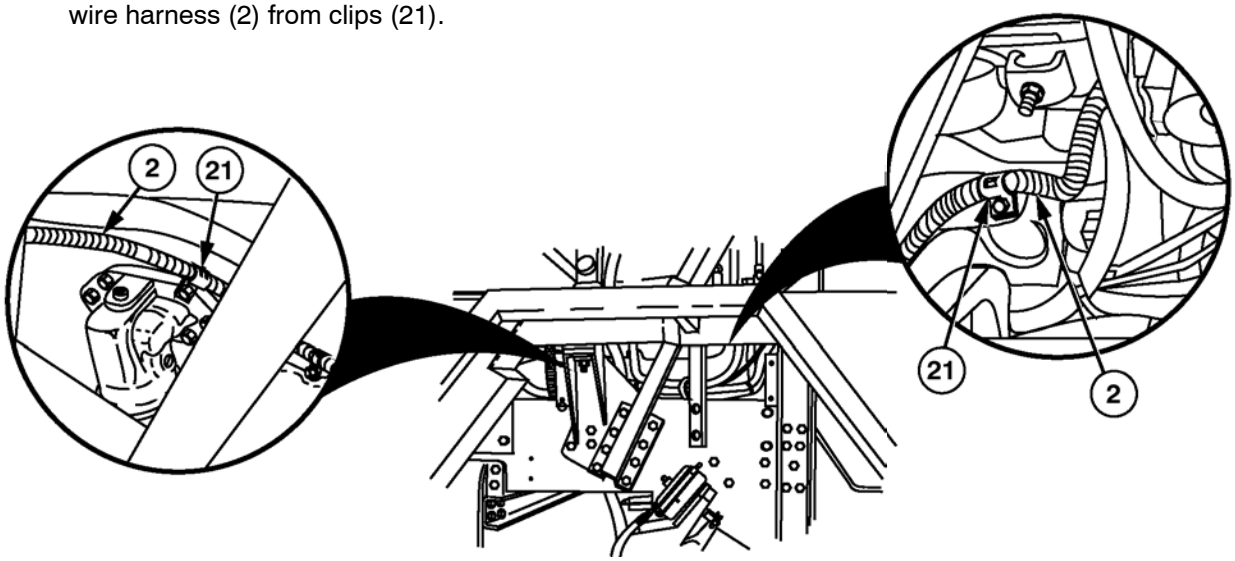


(8) Open clip (14) and remove DDEC II wire harness (2) from clip (14).



(9) Deleted.

(10) Open two clips (21) and remove DDEC II wire harness (2) from clips (21).

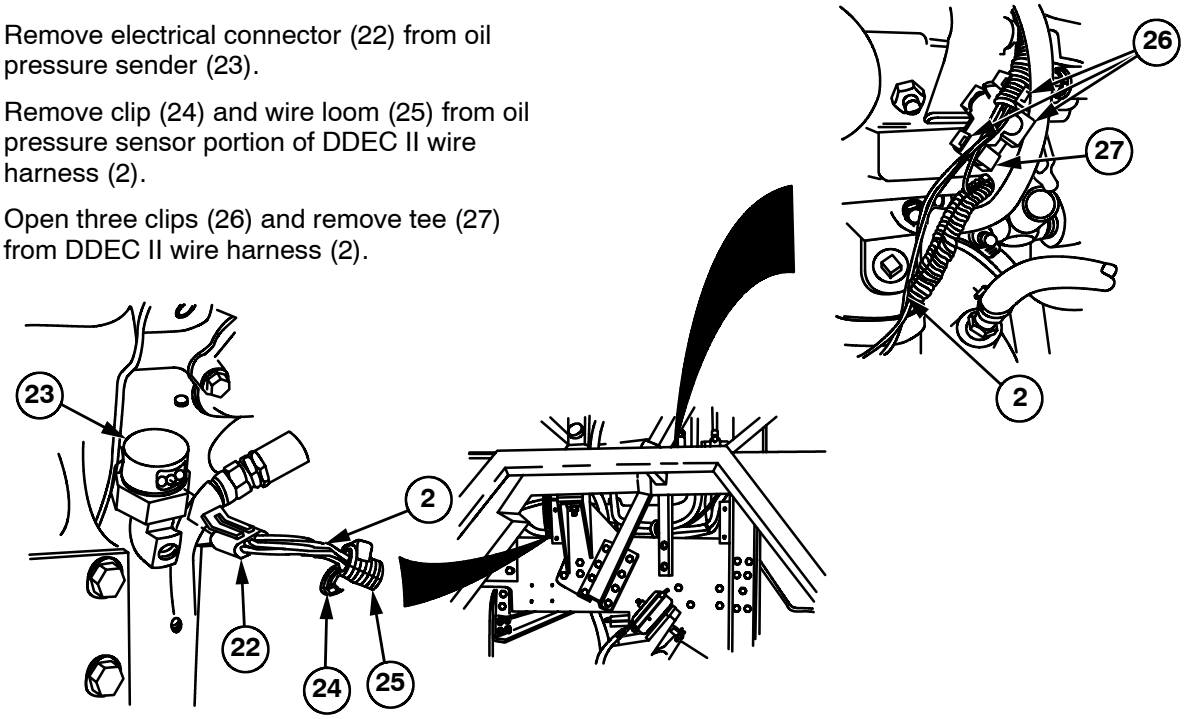


6-15. DDEC II WIRE HARNESS REPLACEMENT (CONT)

(11) Remove electrical connector (22) from oil pressure sender (23).

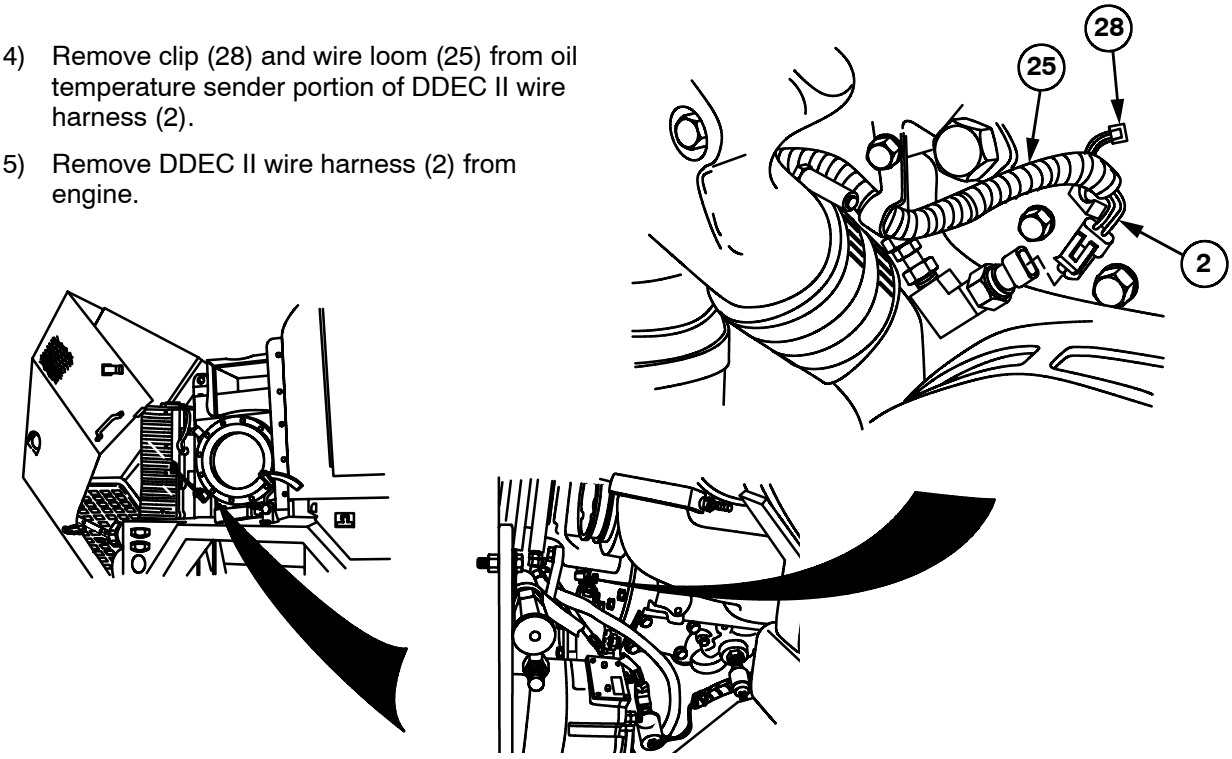
(12) Remove clip (24) and wire loom (25) from oil pressure sensor portion of DDEC II wire harness (2).

(13) Open three clips (26) and remove tee (27) from DDEC II wire harness (2).



(14) Remove clip (28) and wire loom (25) from oil temperature sender portion of DDEC II wire harness (2).

(15) Remove DDEC II wire harness (2) from engine.



b. Installation

NOTE

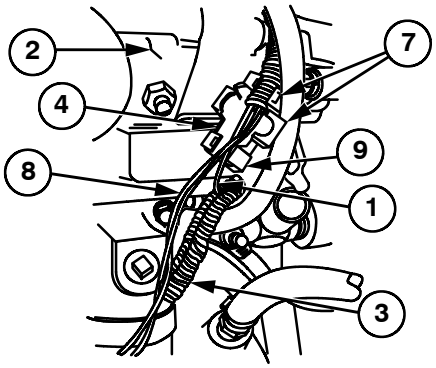
Evenly distribute any slack in harness. Do not make any connections.

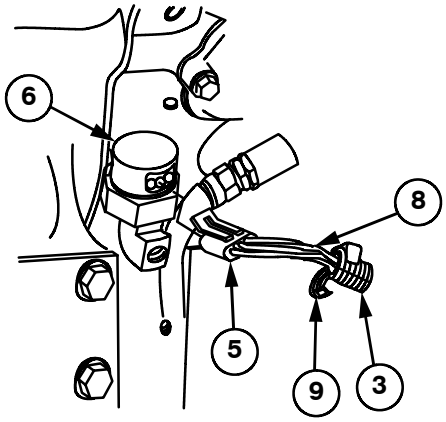
(1) Position DDEC II wire harness (1) on engine (2) with wire loom (3) and tee (4) from oil temperature and oil pressure sensor wires.

(2) Install electrical connector (5) on oil pressure sender (6).

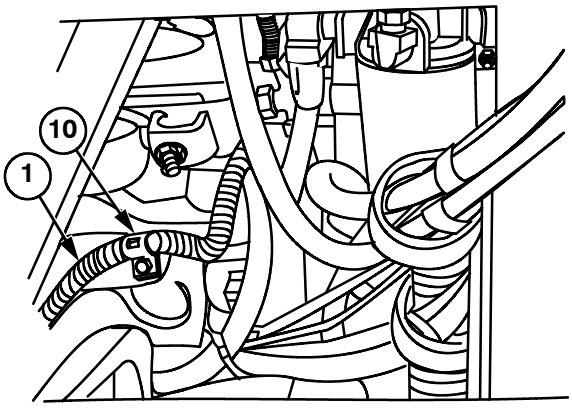
(3) Install wire loom (3) and tee (4) on wire harness (1) with two clips (7).

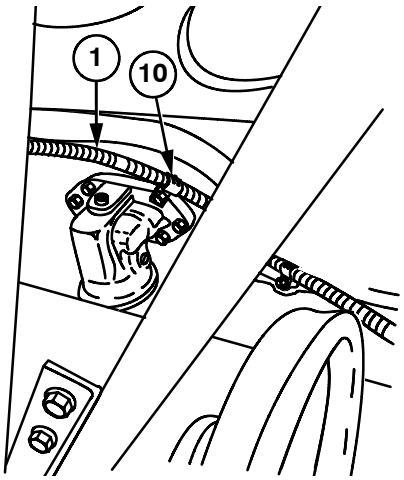
(4) Install wire loom (3) to oil pressure sensor wire (8) and secure with clip (9).





(5) Install DDEC II wire harness (1) in two clips (10) and close clips.



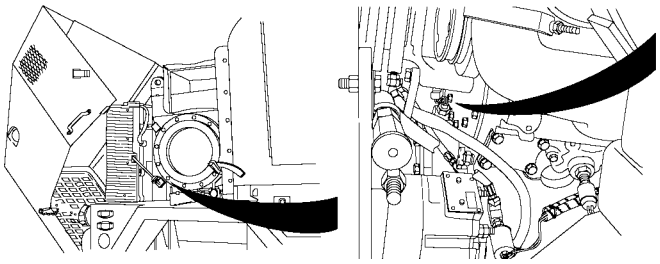


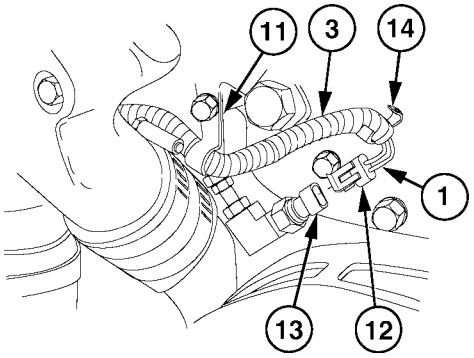
6-15. DDEC II WIRE HARNESS REPLACEMENT (CONT)

(6) Install DDEC II wire harness (1) in clip (11) and close clip.

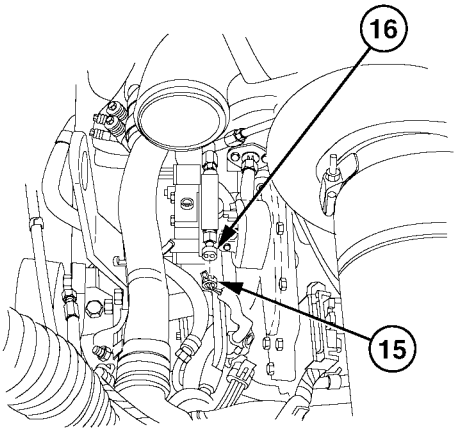
(7) Install electrical connector (12) on oil temperature sender (13).

(8) Install DDEC II wire harness (1) and wire loom (3) in clip (14) and close clip.



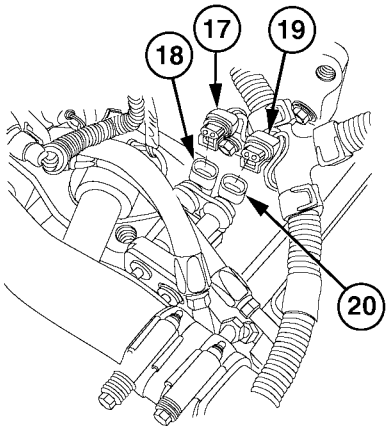


(9) Install electrical connector (15) on fuel temperature sensor (16).

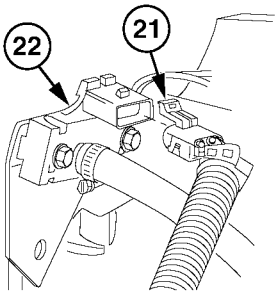


(10) Install electrical connector (17) on TRS sensor (18).

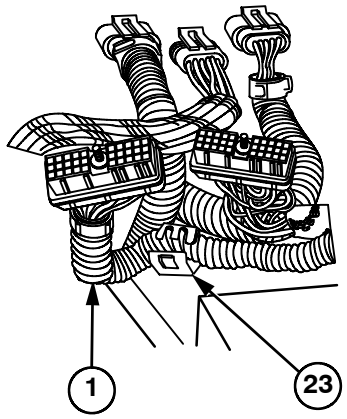
(11) Install electrical connector (19) on SRS sensor (20).

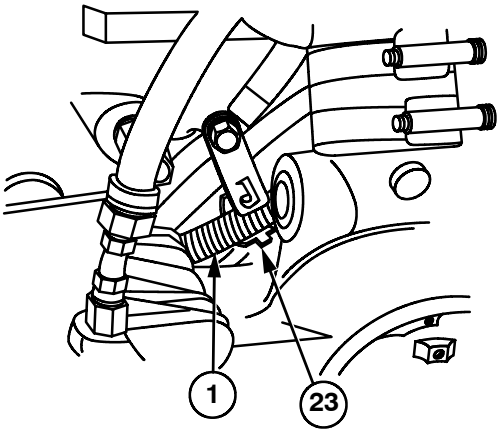


(12) Install electrical connector (21) on turbo boost sensor (22).



(13) Install DDEC II wire harness (1) in two clips (23) and close clips.





(14) Deleted.

c. Follow-On Maintenance

(1) Install ECM (TM 9-2320-360-20).

(2) Install inner fender (TM 9-2320-360-20).

6-15.1. DDEC III/IV WIRE HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
ECM removed (TM 9-2320-360-20).
Inner fender removed (right side only) (TM 9-2320-360-20).

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

a. Removal

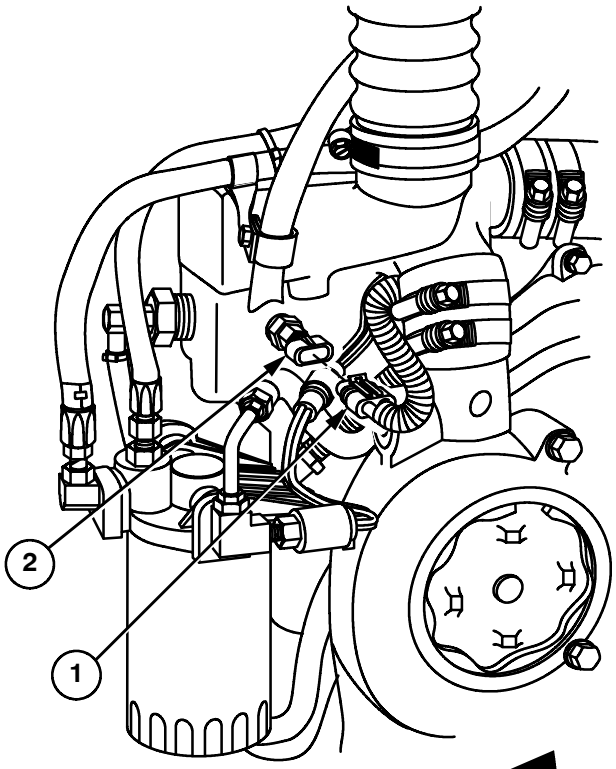
WARNING

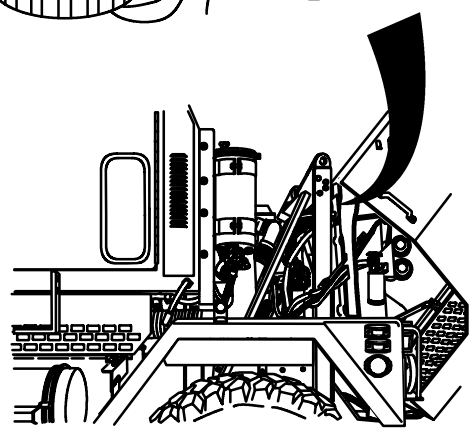
Engine must be cool before performing maintenance. Failure to comply may result in injury to personnel.

NOTE

Tag and mark wires before removal.

(1) Remove electrical connector (1) from coolant temperature sensor (2).

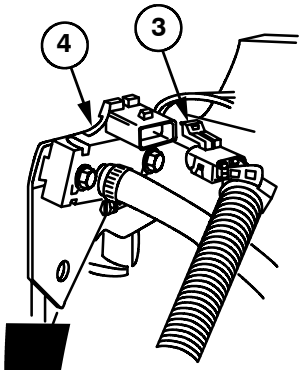


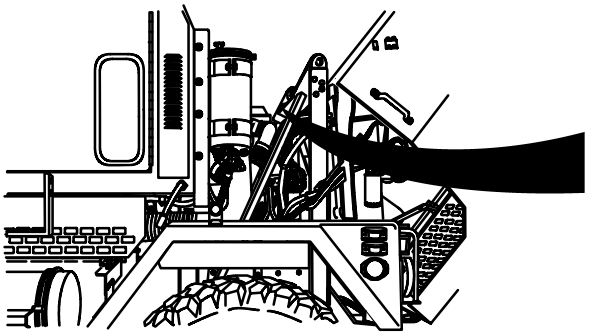


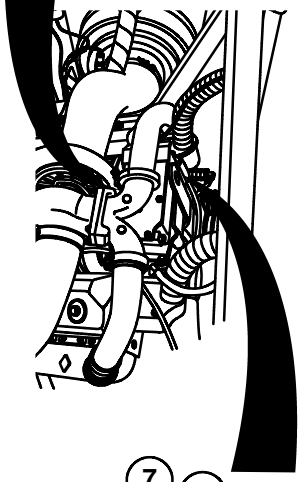
NOTE

Connectors are removed by gently prying on tab and pulling on connector.

(2) Remove electrical connector (3) from turbo boost sensor (4).

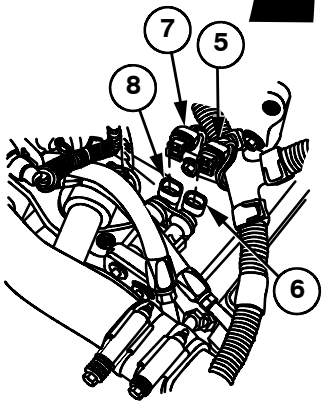




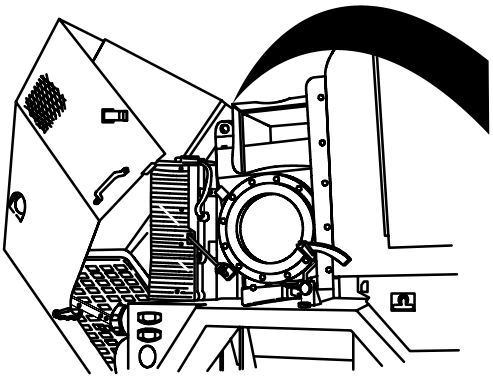


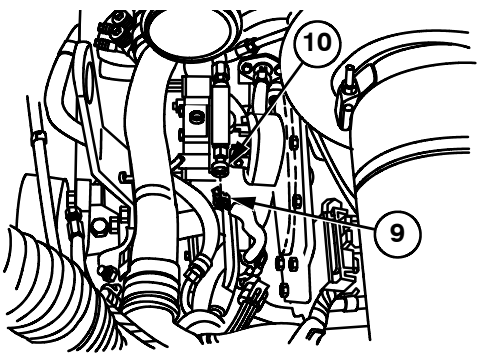
(3) Remove electrical connector (5) from SRS sensor (6).

(4) Remove electrical connector (7) from TRS sensor (8).



(5) Remove electrical connector (9) from fuel temperature sensor (10).

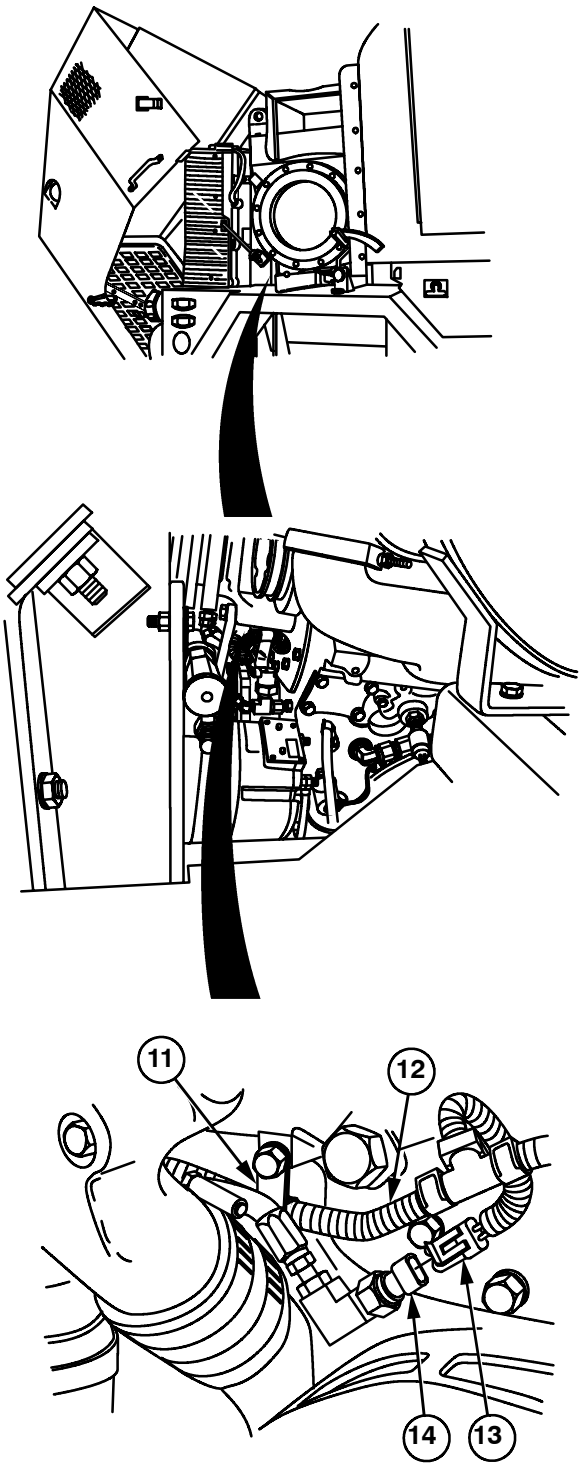




6-15.1. DDEC III/IV WIRE HARNESS REPLACEMENT (CONT)

(6) Open clip (11) and remove DDEC III/IV wire harness (12) from clip.

(7) Remove electrical connector (13) from oil temperature sender (14).



(8) Open clip (15) and remove DDEC III/IV wire harness (12) from clip.

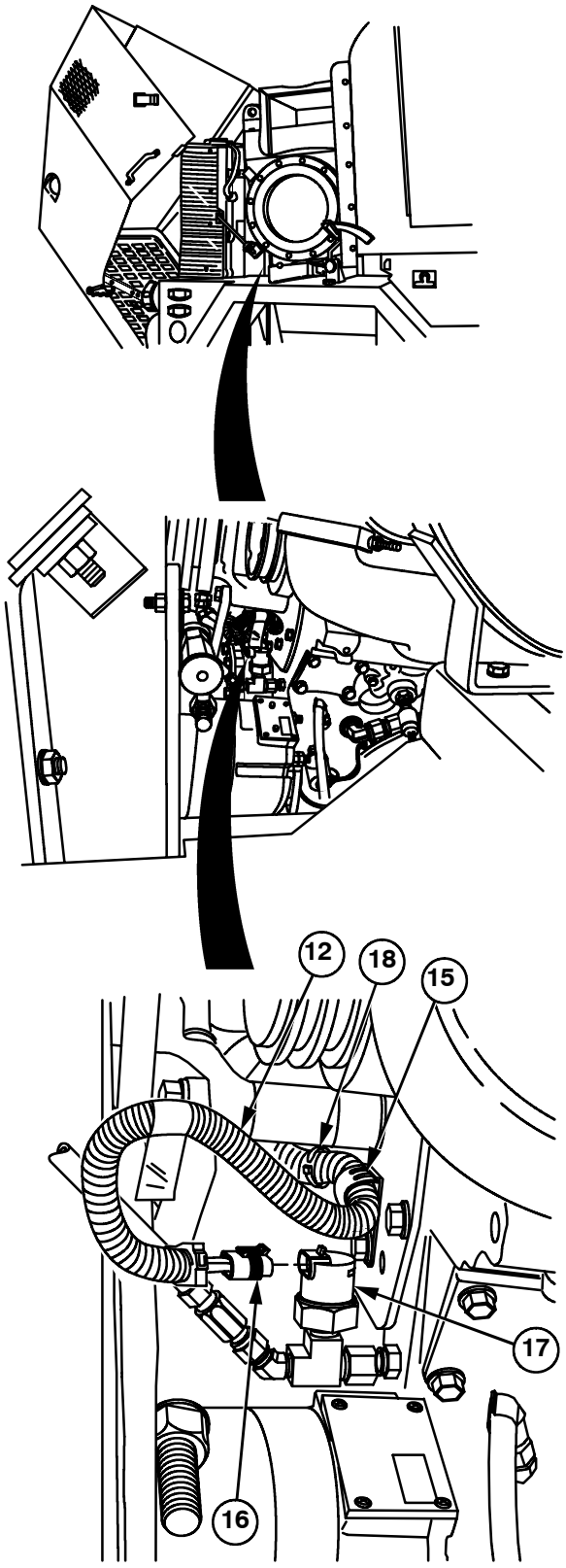
(9) Remove electrical connector (16) from oil pressure sender (17).

NOTE

Location of plastic cable ties should be marked before removal.

(10) Remove plastic cable ties (18) from DDEC III/IV wire harness (12) as required.

(11) Remove DDEC III/IV wire harness (12) from engine.



6-15.1. DDEC III/IV WIRE HARNESS REPLACEMENT (CONT)

b. Installation

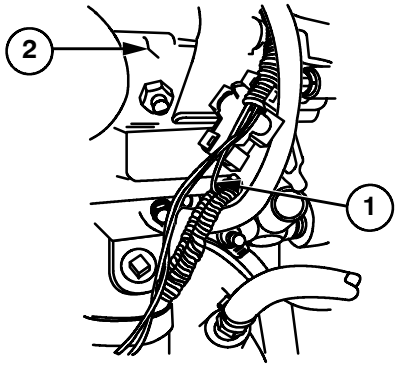
NOTE

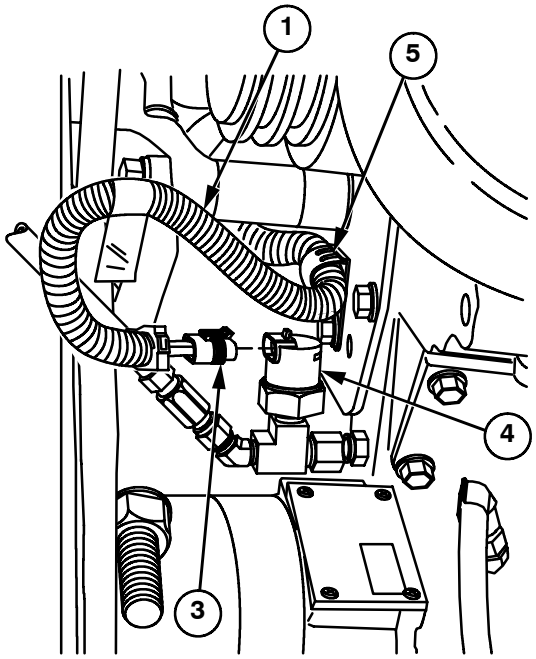
Evenly distribute any slack in harness. Do not make any connections.

(1) Position DDEC III/IV wire harness (1) on engine (2).

(2) Install electrical connector (3) on oil pressure sender (4).

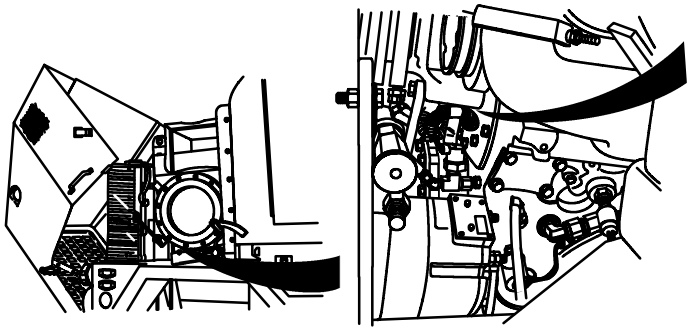
(3) Install DDEC III/IV wire harness (1) in clip (5) and close clips.

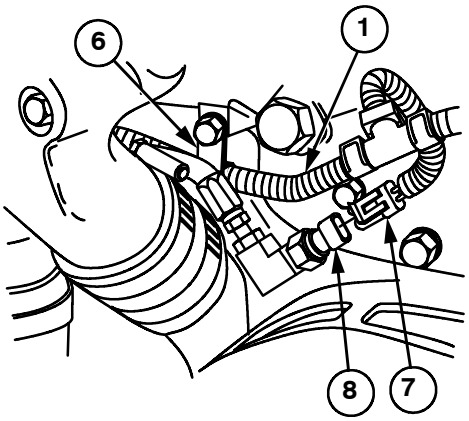




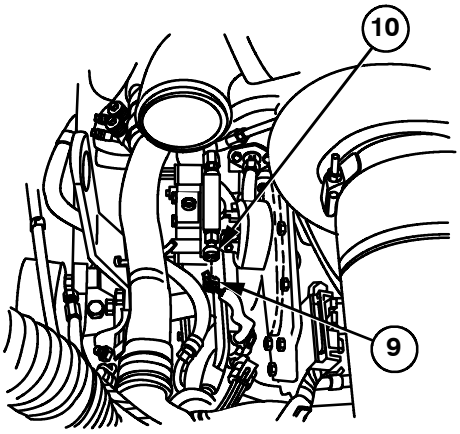
(4) Install DDEC III/IV wire harness (1) in clip (6) and close clip.

(5) Install electrical connector (7) on oil temperature sender (8).



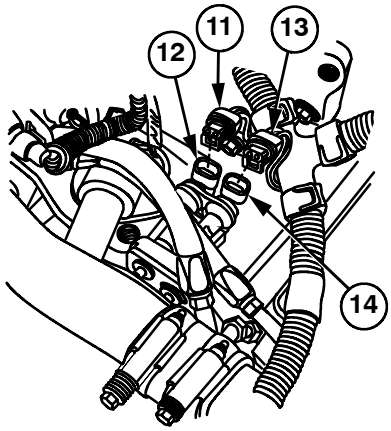


(6) Install electrical connector (9) on fuel temperature sensor (10).

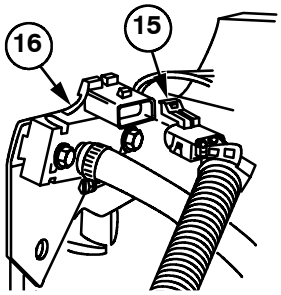


(7) Install electrical connector (11) on TRS sensor (12).

(8) Install electrical connector (13) on SRS sensor (14).



(9) Install electrical connector (15) on turbo boost sensor (16).



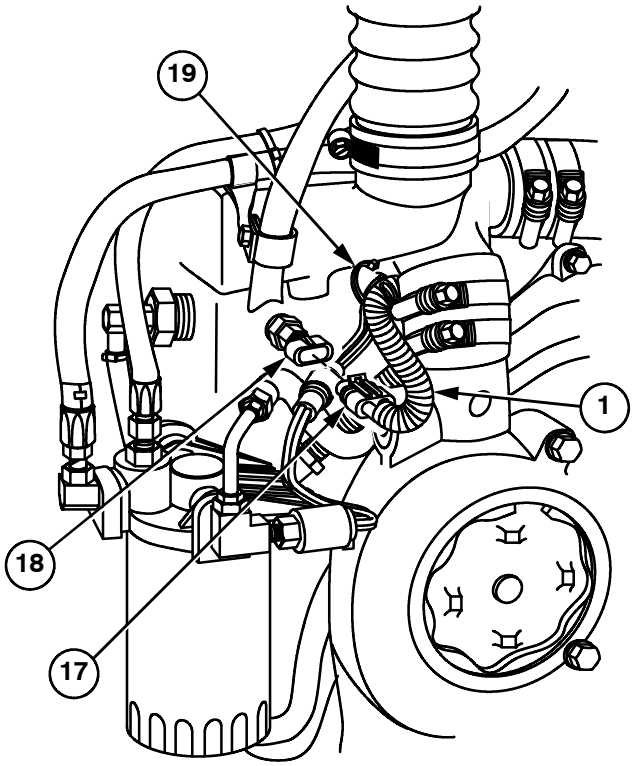
6-15.1. DDEC III/IV WIRE HARNESS REPLACEMENT (CONT)

(10) Install electrical connector (17) on coolant temperature sensor (18).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(11) Secure DDEC III/IV wire harness (1) with plastic cable ties (19) as required.



c. Follow-On Maintenance

(1) Install ECM (TM 9-2320-360-20).

(2) Install inner fender (TM 9-2320-360-20).

6-16. ENGINE BRAKE RETARDER WIRE HARNESS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Condition
Batteries disconnected (TM 9-2320-360-20).
Rocker covers removed (TM 9-2320-360-20).

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

a. Removal

NOTE

- Engine brake wire harness is removed from left and right cylinder heads the same way.
- Location of plastic cable ties should be marked before removal.
- Tag and mark wires before removal.

(1) Remove plastic cable tie (1) securing engine brake wire harness (2).

CAUTION

Pull back protective sleeve on connectors prior to removing. Do not pull on wires of harness to remove connectors. Failure to comply may result in damage to solenoid and/or harness.

(2) Disconnect two connectors (3) from engine brake solenoids (4).

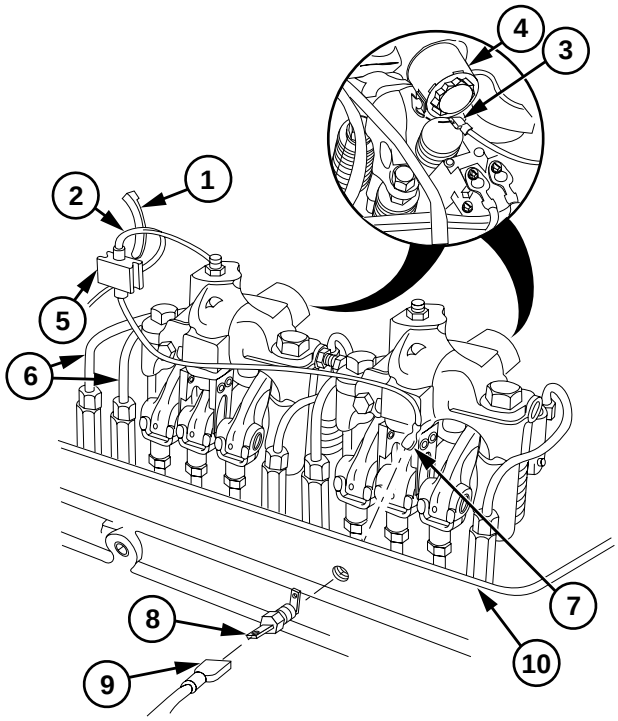
(3) Remove rubber harness support (5) from injector lines (6).

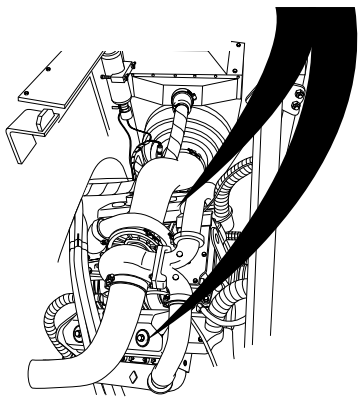
(4) Disconnect spade connector (7) from terminal assembly (8).

(5) Disconnect spade connector (9) from terminal assembly (8).

(6) Remove terminal assembly (8) from cylinder head (10).

(7) Remove engine brake wire harness (2) from cylinder head (10).





b. Installation

NOTE

Engine brake wire harness is installed in left and right cylinder heads the same way.

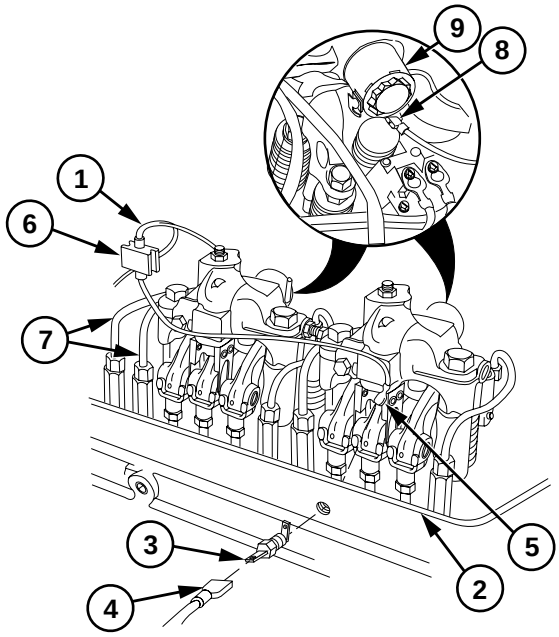
(1) Install engine brake wire harness (1) on cylinder head (2).

(2) Install terminal assembly (3) in cylinder head (2).

(3) Connect spade connector (4) to terminal assembly (3).

(4) Connect spade connector (5) to terminal assembly (3).

(5) Install rubber harness support (6) to injector lines (7).



NOTE

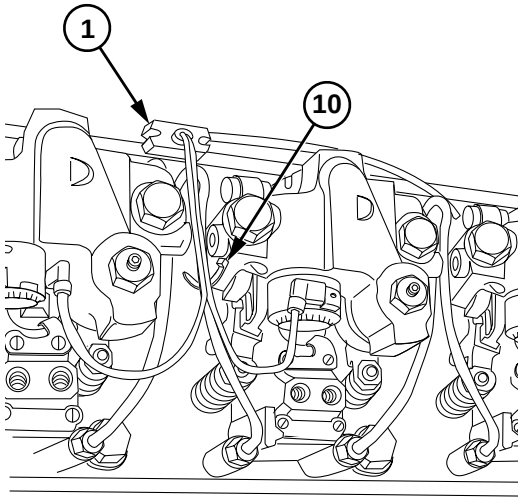
Ensure that the locking connector is fully engaged on the male terminal. Inspect to ensure sufficient clearance exists between the locking connector and the brake solenoid boss. If necessary, the male terminal can be bent slightly to provide adequate clearance.

(6) Connect two connectors (8) to engine brake solenoids (9).

CAUTION

Plastic cable ties should be positioned in locations marked during removal. Failure to comply may result in damage to wire harness or connector.

(7) Secure engine brake wire harness (1) with plastic cable tie (10).



c. Follow-On Maintenance

(1) Install rocker covers (TM 9-2320-360-20).

(2) Connect batteries (TM 9-2320-360-20).

CHAPTER 7
TRANSMISSION MAINTENANCE

Contents

	Para	Page
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Section I. INTRODUCTION

7-1. INTRODUCTION

This chapter contains instructions for replacement and repair of transmission components at the Direct Support maintenance level. Some parts must be removed before transmission parts can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. SERVICE AND INSPECTION

7-2. GENERAL MAINTENANCE INSTRUCTIONS

a. Maintenance. Follow these basic instructions when working on the transmission.

(1) Handle transmission parts carefully to prevent nicking, scratching, or denting. Some parts rely upon a smooth surface to create a seal. They may leak if surfaces are scratched.

(2) Do not use metal tools when removing gaskets or packing. Use a pointed wooden dowel to remove packing from grooves. Use wooden or plastic scrapers on gasket surfaces.

b. Cleaning. Follow these cleaning instructions when working on the transmission.

(1) All parts must be clean to permit proper inspection of subassemblies and parts. Ensure that no debris or foreign material enters the transmission.

7-2. GENERAL MAINTENANCE INSTRUCTIONS (CONT)

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

CAUTION

DO NOT use caustic soda solution in place of steam cleaning method. Use only solvent cleaning compound to clean friction-faced clutch plates.

(2) Thoroughly clean metal transmission parts, except bearings, with solvent cleaning compound (Item 54, Appendix B) or by steam cleaning method.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(3) Drip-dry and air-dry bearings, then oil (Item 44, Appendix B). Dry other parts with compressed air. Oil steam-cleaned parts immediately after drying to prevent rust.

(4) Clean oil passages by working a piece of soft wire back and forth through them. Flush with solvent cleaning compound (Item 54, Appendix B). Dry with compressed air.

c. Inspection. Follow these inspection instructions when working on the transmission.

(1) Inspect all surfaces which contact gaskets, packing, or seals. Ensure there are no nicks, burrs, or scratches. Remove or correct any defect with crocus cloth (Item 16, Appendix B) before assembly.

(2) Inspect all bores for wear, scratches, grooves, burrs, or dirt. Remove scratches and burrs with crocus cloth (Item 16, Appendix B) and clean. Remove all foreign matter from bores and clean. Replace all deeply scratched, grooved, and excessively worn parts.

(3) Inspect splined parts for stripped, twisted, chipped, or burred splines. Remove burrs with soft stone and replace parts if other defects are found. Spline wear is not considered defective except when it affects tightness of the assembly.

(4) Inspect springs for signs of overheating, permanent set, or wear due to rubbing of adjacent parts. Replace springs if damage is found.

Section III. MAINTENANCE PROCEDURES

7-3. TRANSMISSION CONTAINER UNPACKING/PACKING

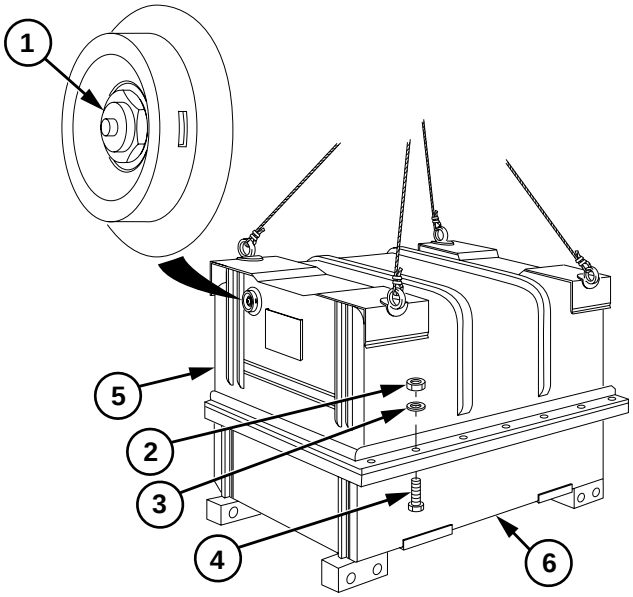
This task covers:
a. Upper Container Removal
b. Transmission Removal
c. Transmission Installation
d. Upper Container Installation

INITIAL SETUP

Equipment Conditions
Transmission prepared for storage (para 7-4).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Sling Assembly (Item 160, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Lockwashers (8) (Item 108, Appendix F)
Lockwashers (8) (Item 109, Appendix F)



a. Upper Container Removal

(1) Release air pressure at vent valve (1).

(2) Remove 22 nuts (2), lockwashers (3), and screws (4). Discard lockwashers.

WARNING

Keep out from under heavy parts. Falling parts may cause serious injury or death to personnel.

(3) Attach suitable lifting device and remove upper container (5) from lower container (6).

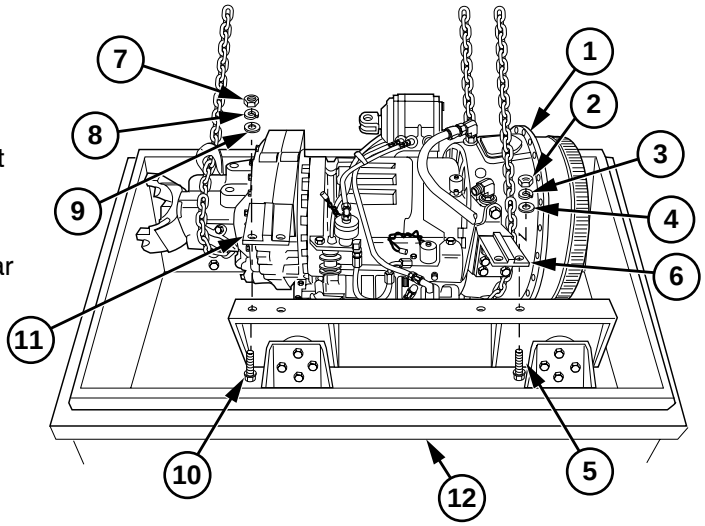
7-3. TRANSMISSION CONTAINER UNPACKING/PACKING (CONT)

b. Transmission Removal

(1) Attach suitable lifting device to transmission (1).

(2) Remove four nuts (2), lockwashers (3), washers (4), and screws (5) from two front mounts (6). Discard lockwashers.

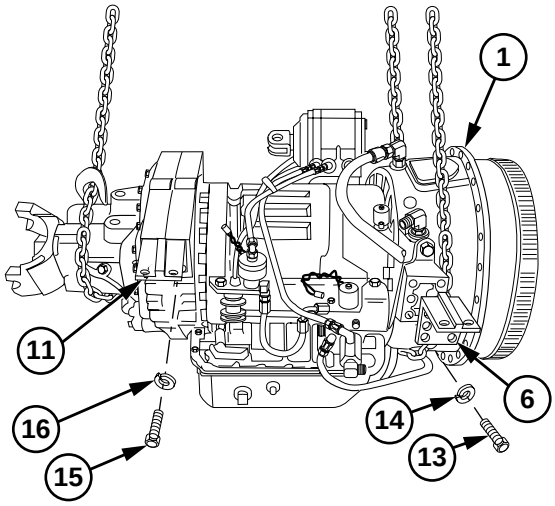
(3) Remove four nuts (7), lockwashers (8), washers (9), and screws (10) from two rear mounts (11). Discard lockwashers.



WARNING

Transmission weighs approximately 1125 lb (510 kg). Support transmission during removal. Failure to comply may result in serious injury to personnel.

(4) Remove transmission (1) from lower container (12).



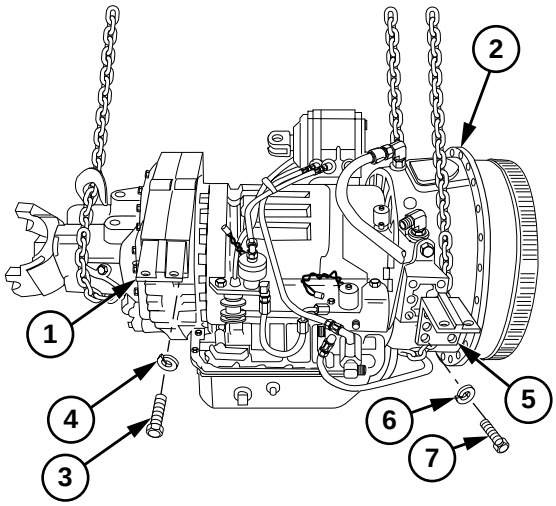
(5) Remove eight screws (13), lockwashers (14) and two front mounts (6) from transmission (1). Discard lockwashers.

(6) Remove eight screws (15), lockwashers (16) and two rear mounts (11) from transmission (1). Discard lockwashers.

c. Transmission Installation

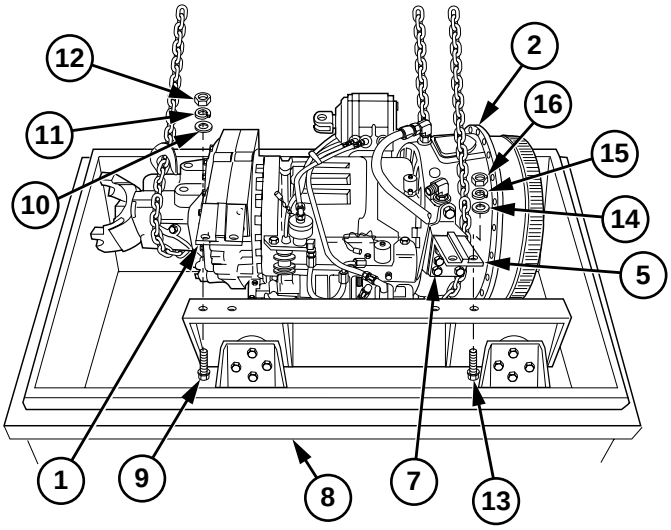
(1) Install two rear mounts (1) on transmission (2) with eight screws (3) and new lockwashers (4). Do not tighten.

(2) Install two front mounts (5) on transmission (2) with eight screws (6) and new lockwashers (7). Do not tighten.



WARNING

Transmission weighs approximately 1125 lb (510 kg). Support transmission during removal. Failure to comply may result in serious injury to personnel.



(3) Align and install transmission (2) in lower container (8).

(4) Install four screws (9), washers (10), new lockwashers (11), and nuts (12) on two rear mounts (1). Do not tighten.

(5) Install four screws (13), washers (14), new lockwashers (15), and nuts (16) on two front mounts (5). Do not tighten.

(6) Torque eight screws (3) to 71–83 lb–ft (96–113 N·m).

(7) Torque eight screws (6) to 98–115 lb–ft (133–156 N·m).

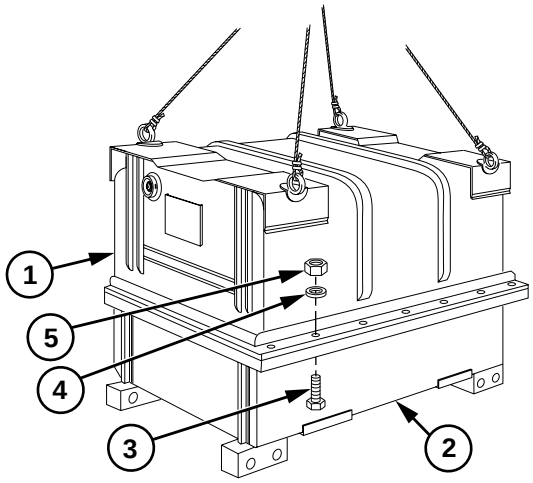
(8) Torque eight nuts (12) and (16) to 31–37 lb–ft (42–50 N·m).

(9) Remove lifting device.

d. Upper Container Installation

WARNING

Keep out from under heavy parts. Falling parts may result in serious injury to personnel.



(1) Install upper container (1) on lower container (2).

NOTE

When tightening nuts, use criss-cross pattern working around container.

(2) Install 22 screws (3), new lockwashers (4), and nuts (5) in upper container (1) and lower container (2). Torque to 31–37 lb–ft (42–50 N·m).

7-4. TRANSMISSION REPLACEMENT

This task covers:
a. Removal
b. Transmission Preparation
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine/Transmission assembly removed (para 3-3).
Transmission oil drained (LO 9-2320-360-12).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202 , Appendix E)
Adapter, Socket Wrench, 1/2 In. Female - 3/8 In. Male (Item 5, Appendix E)
Jackstands (4) (Item 93, Appendix E)
Lift, Transmission and Differential (Item 95, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Screws (4) (Item 150, Appendix E)
Sling Assemblies (2) (Item 160, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Crow's Foot, 3/4 In. (Item 219, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Screw, Guide (Figure C-4, Appendix C)

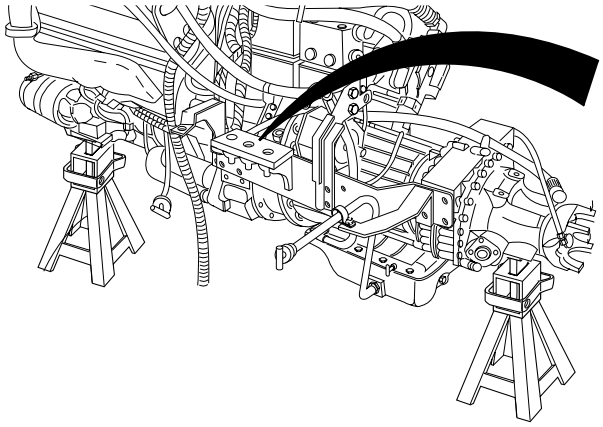
Tools and Special Tools (Cont)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

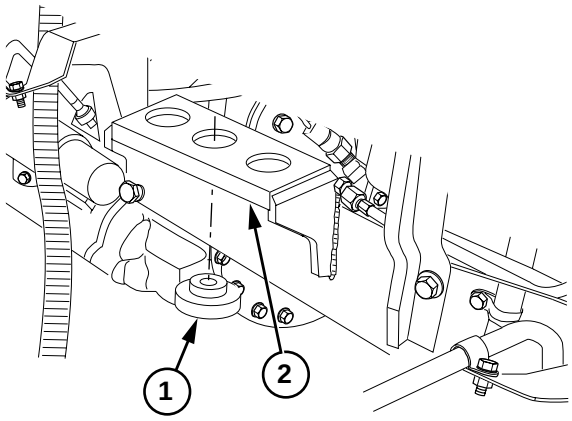
Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Tags, Identification (Item 56, Appendix B
Tape, Masking (Item 58, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknuts (4) (Item 86, Appendix F)
Locknuts (2) (Item 81, Appendix F)
Lockwashers (24) (Item 107, Appendix F)
Lockwashers (16) (Item 106, Appendix F)
Lockwashers (8) (Item 124, Appendix F)
Lockwashers (3) (Item 119, Appendix F)
Lockwasher (Item 117, Appendix F)
Packings, Preformed (2) (Item 181, Appendix F)
Packings, Preformed (2) (Item 186, Appendix F)
Packing, Preformed (Item 158, Appendix F)
Washer, Copper (Item 333.1, Appendix F)

Personnel Required
Two

a. Removal

(1) Remove six mounting biscuits (1) from two cradles (2).





(2) Place drain pan below elbow (3) to catch draining fluid.

CAUTION

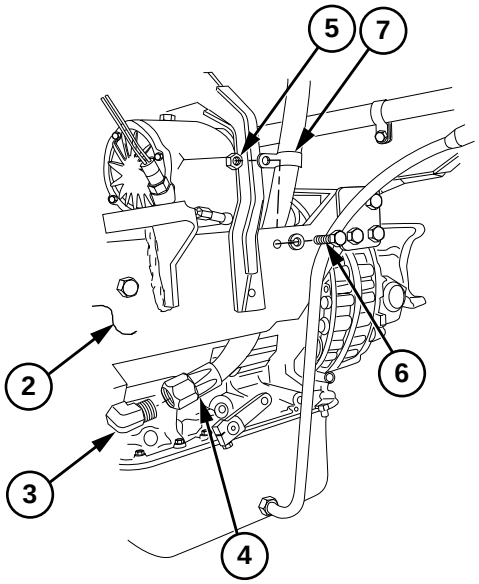
Plug removed lines and cap fittings to prevent contaminants from entering systems. Failure to comply may result in systems failure.

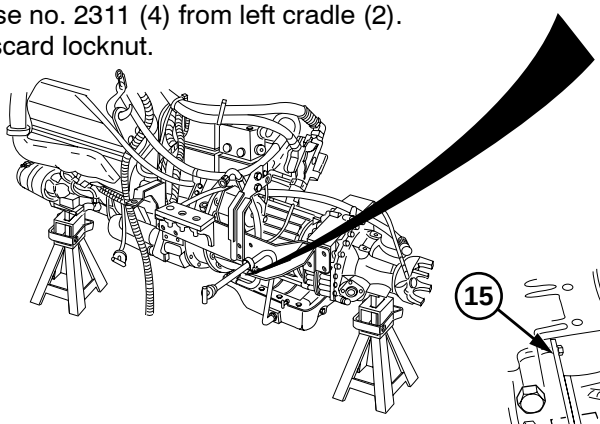
NOTE

Tag and mark hoses before removal.

(3) Remove hose no. 2311 (4) from elbow (3).

(4) Remove locknut (5), screw (6), clip (7), and hose no. 2311 (4) from left cradle (2). Discard locknut.





(5) Place drain pan below two elbows (8 and 9) to catch draining fluid.

NOTE

Location of plastic cable ties should be marked before removal.

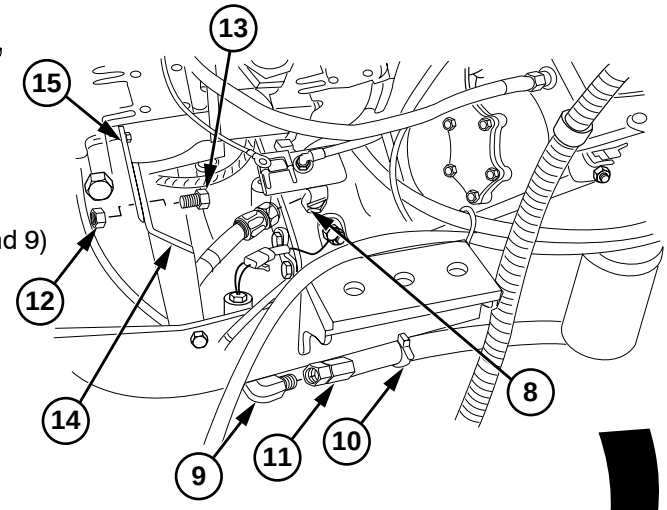
(6) Remove cable ties (10) from hose no. 2393 (11).

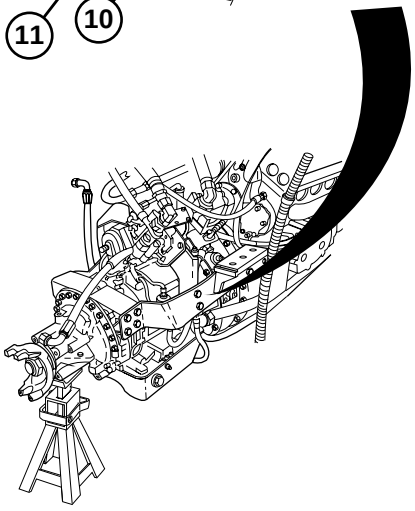
(7) Remove hose no. 2393 (11) from elbow (9).

CAUTION

Do not remove the two screws that secure the bracket to steering pump. Failure to comply may result in damage to equipment.

(8) Remove two locknuts (12) and screws (13) from two steering pump brackets (14 and 15). Discard locknuts.





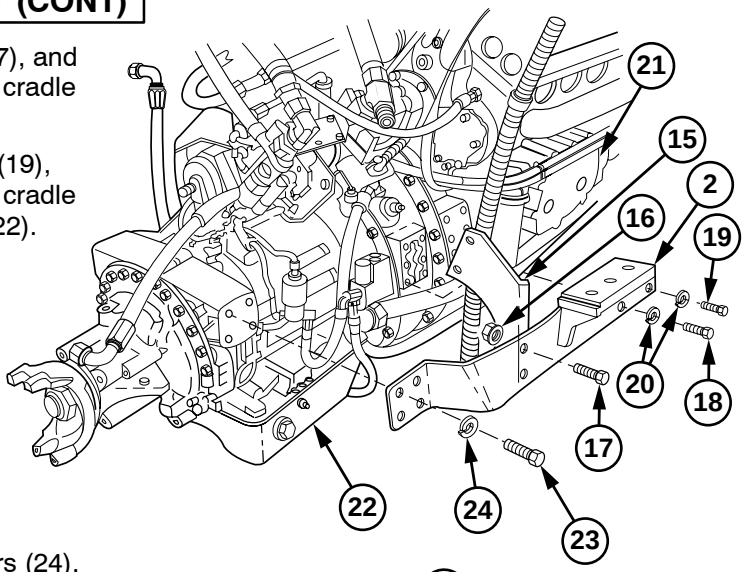
7-4. TRANSMISSION REPLACEMENT (CONT)

(9) Remove two locknuts (16), screws (17), and steering pump bracket (15) from right cradle (2). Discard locknuts.

(10) Remove two screws (18), six screws (19), and eight lockwashers (20) from right cradle (2) and engine/transmission (21 and 22). Discard lockwashers.

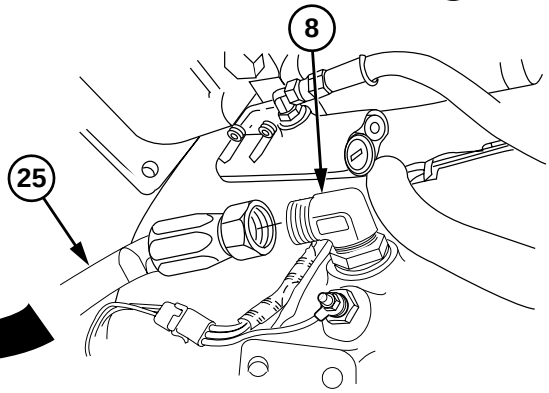
WARNING

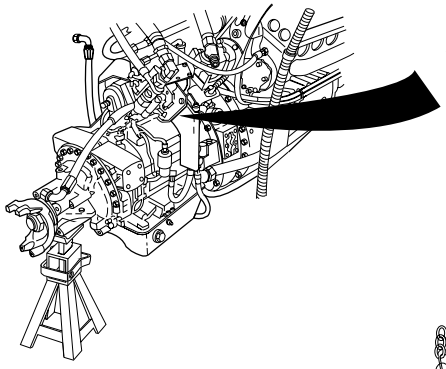
Cradle weighs approximately 30 lb (13.6 kg). Properly support cradle during removal. Failure to comply may result in injury to personnel.



(11) Remove four screws (23), lockwashers (24), and right cradle (2) from transmission (22) with aid of assistant. Discard lockwashers.

(12) Remove hose no. 2382 (25) from elbow (8).



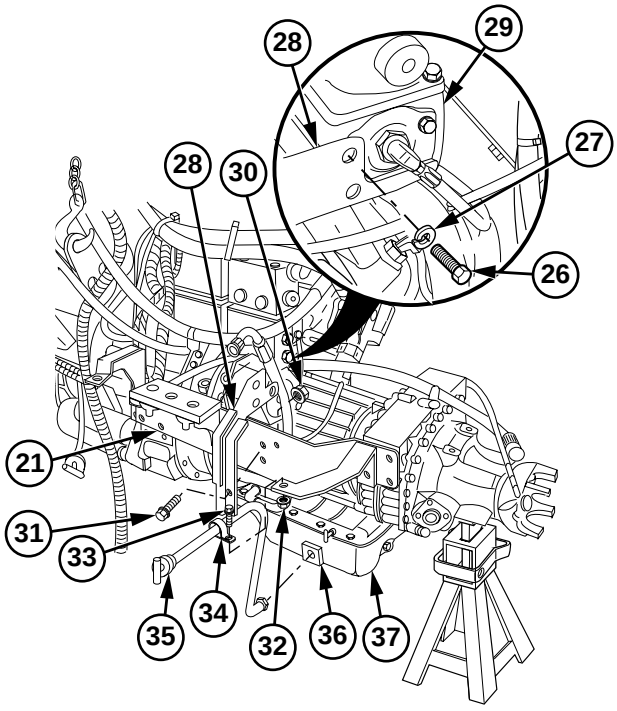


(13) Remove three screws (26) and lockwashers (27) from support bracket (28) and air compressor (29). Discard lockwashers.

(14) Remove two locknuts (30), screws (31), and support bracket (28) from left cradle (2).

(15) Remove locknut (32), screw (33), and clip (34) from transmission dipstick tube (35) and support bracket (36). Discard locknut.

(16) Remove dipstick tube (35) from transmission oil pan (37).



(16.1) Remove locknut (37.1), screw (37.2), and clip (37.3) from engine dipstick tube (39) and engine dipstick tube support bracket (44).

NOTE

Some engines do not have copper washer.

(17) Loosen collar (38) and remove engine dipstick tube (39) and copper washer (39.1) from adapter (40). Discard washer.

(18) Remove two screws (41), six screws (42), eight lockwashers (43), and engine dipstick tube support bracket (44) from left cradle (2) and engine/transmission (21 and 22). Discard lockwashers.

WARNING

Cradle weighs approximately 30 lb (13.6 kg). Properly support cradle during removal. Failure to comply may result in injury to personnel.

(19) Remove four screws (45), lockwashers (46), transmission dipstick tube support bracket (36), and left cradle (2) from transmission (22) with aid of assistant. Discard lockwashers.

(20) Install three screws (47) on air compressor (29).

WARNING

Grade 8 screws must be used to support engine. Failure to comply may cause engine to fall and result in personnel injury.

NOTE

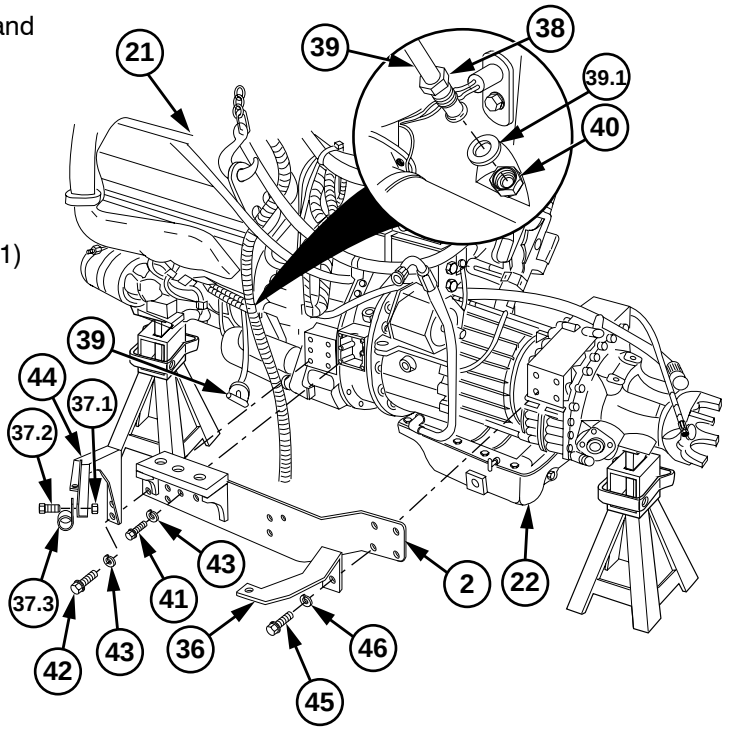
Screws should be installed 1.25 in. (3.18 cm) into engine flywheel housing.

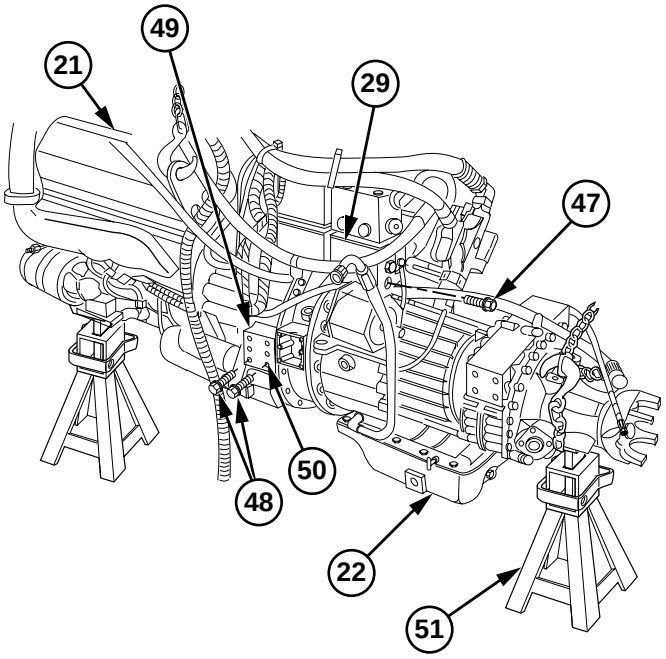
(21) Install four screws (48) into engine flywheel housing (49) right and left side bottom holes (50).

NOTE

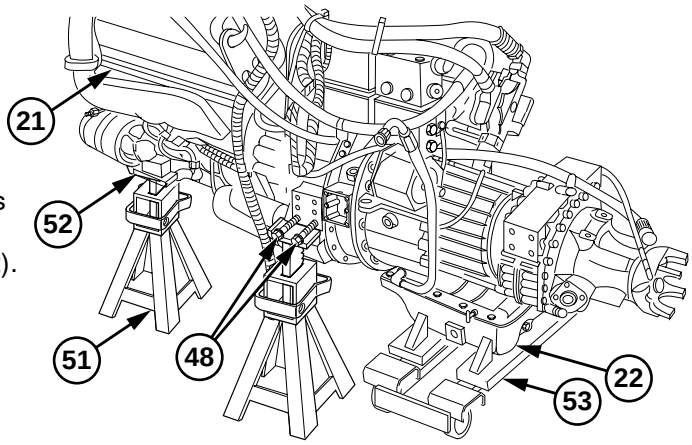
Engine/transmission should be raised enough to allow transmission lift to be positioned under transmission.

(22) Lift engine/transmission (21 and 22) and remove jackstand (51) from rear of transmission (22).



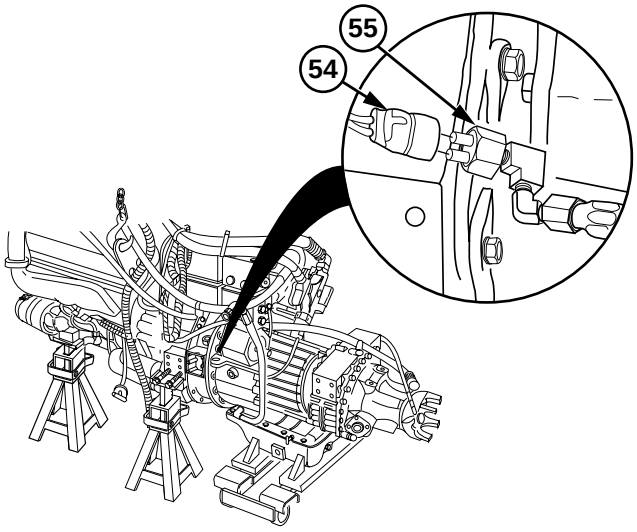


7-4. TRANSMISSION REPLACEMENT (CONT)



(23) Lower engine/transmission (21 and 22) and support engine with four jackstands (51) at engine flywheel housing screws (48) and engine front mount (52).

(24) Position transmission lift (53) under transmission (22).



(25) Remove electrical connector (54) from PTO sensor (55).

NOTE

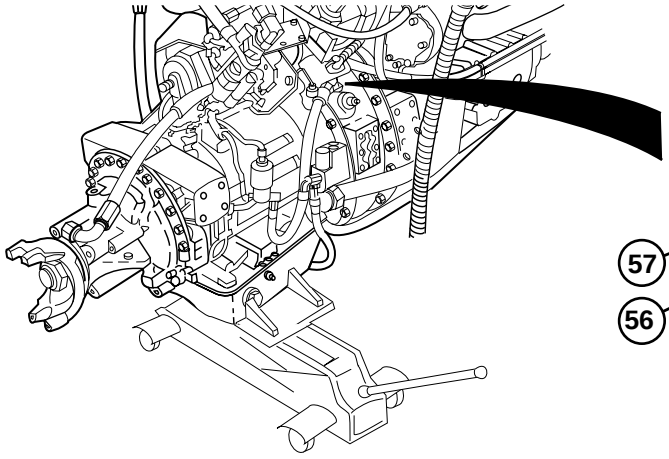
Location of plastic cable tie should be marked before removal.

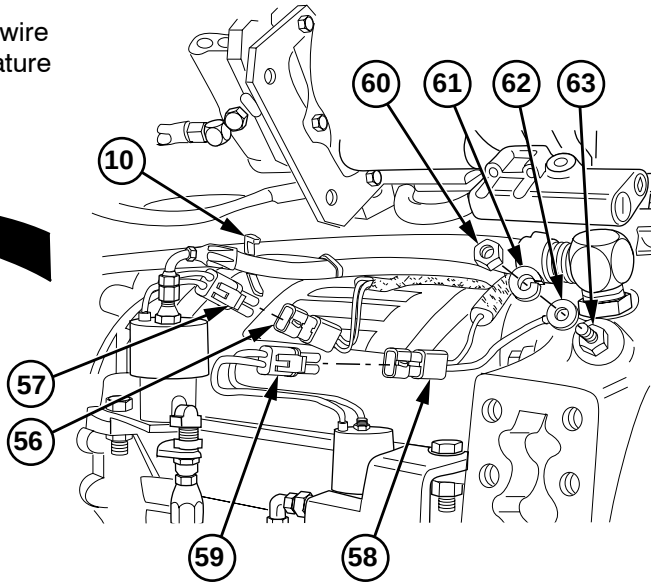
(26) Remove cable tie (10) from wire harness (56).

(27) Remove wire harness (56) from PTO solenoid electrical connector (57).

(28) Remove electrical connector (58) from transmission lockup solenoid electrical connector (59).

(29) Remove nut (60), lockwasher (61), and wire no.1068 (62) from transmission temperature sensor (63). Discard lockwasher.

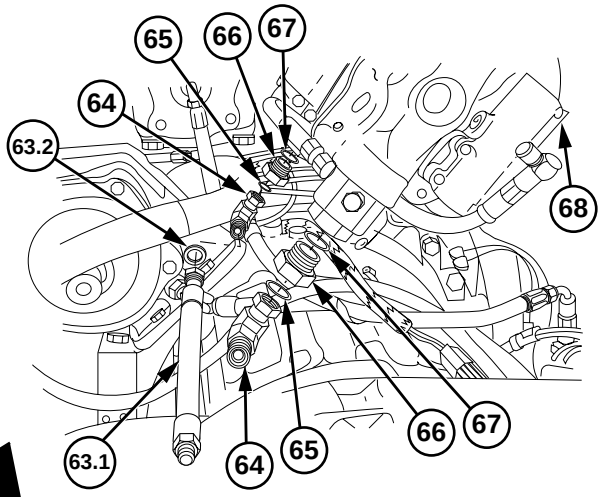


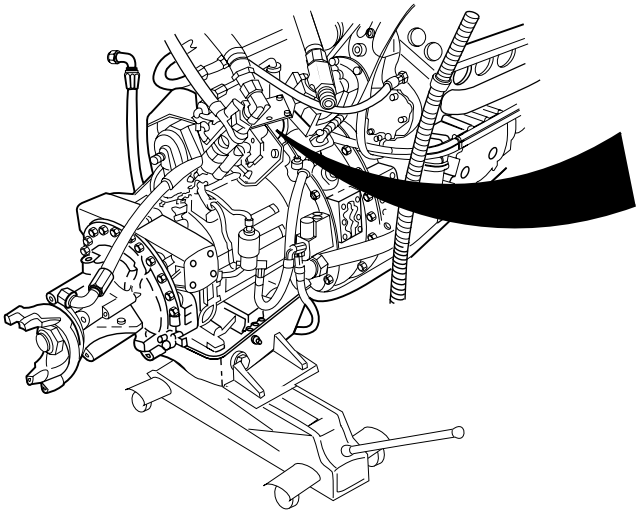


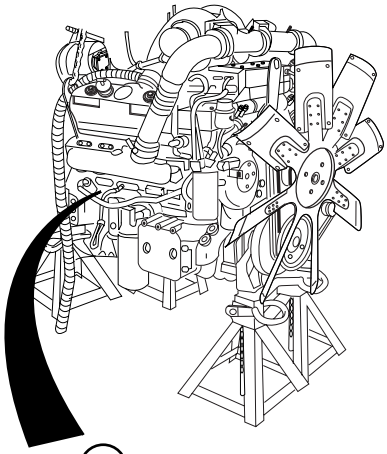
(29.1) Remove hose no. 2879 (63.1) and preformed packing (63.2) from elbow (64). Discard preformed packing.

(30) Remove two elbows (64) and preformed packings (65) from two adapters (66). Discard preformed packings.

(31) Remove two adapters (66) and preformed packings (67) from steering pump (68). Discard preformed packings.







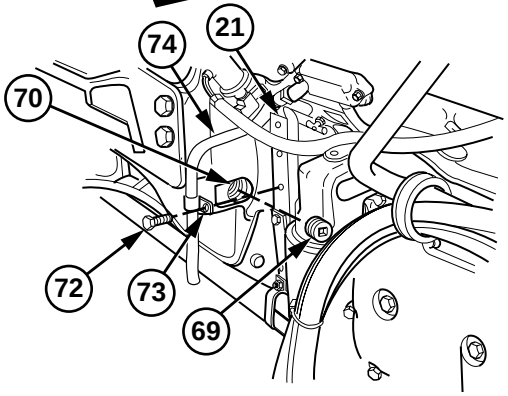
(32) Remove plug (69) from flywheel access hole (70) on lower right side of engine flywheel housing (71).

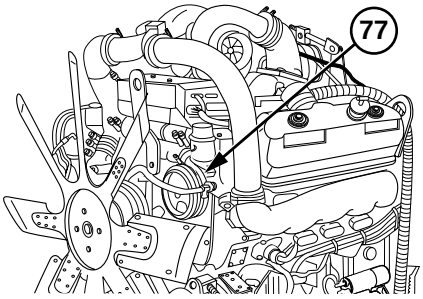
(33) Remove screw (72), clip (73), and air box hose (74) from right side of engine (21).

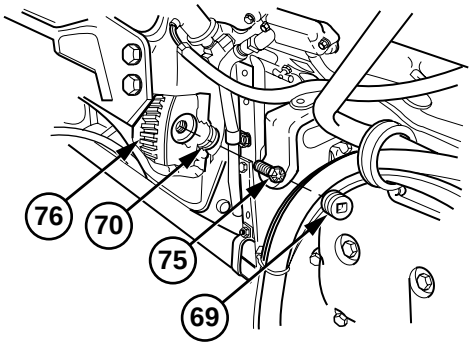
CAUTION

Camshaft pulley must only be turned clockwise. Turning counterclockwise may result in loosening camshaft pulley.

(34) Remove 12 screws (75) from flexplate (76) through flywheel access hole (70) while assistant turns camshaft pulley (77) to line up screws (75) with access hole (70).







(35) Install plug (69) in flywheel access hole (70).

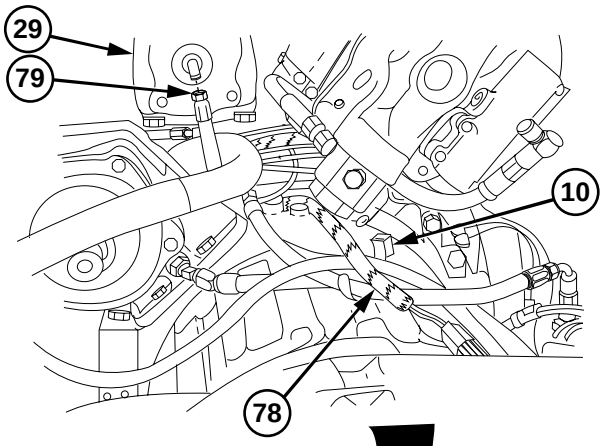
7-4. TRANSMISSION REPLACEMENT (CONT)

NOTE

Location of plastic cable ties should be marked before removal.

(36) Remove cable ties (10) securing wires (78) to hoses.

(37) Remove oil line no. 2629 (79) from air compressor (29).

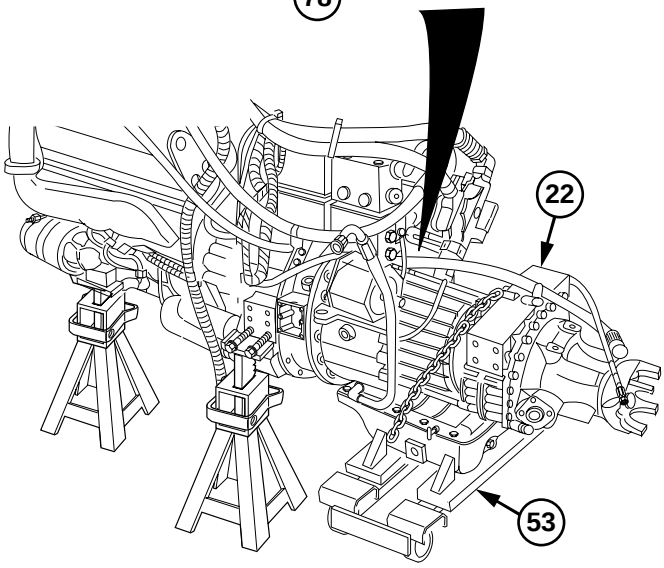


NOTE

Do not lift engine/transmission off support stands.

(38) Raise transmission lift (53) to support transmission (22) during removal.

(39) Secure transmission (22) to transmission lift (53).

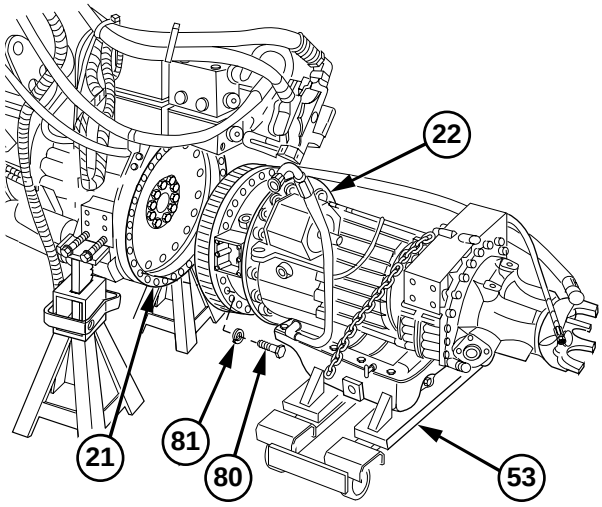


WARNING

Transmission weighs approximately 1125 lb (510 kg). Support transmission during removal. Failure to comply may result in serious injury to personnel.

(40) Remove 24 screws (80) and lockwashers (81) from transmission (22) and engine (21). Discard lockwashers.

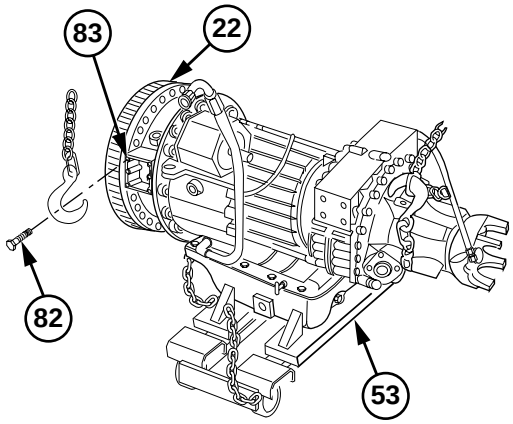
(41) Remove transmission (22) from engine (21) with aid of assistant.



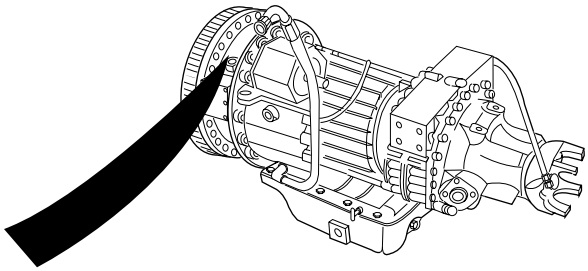
(42) Install two screws (82) into transmission (22) torque converter housing front upper holes (83).

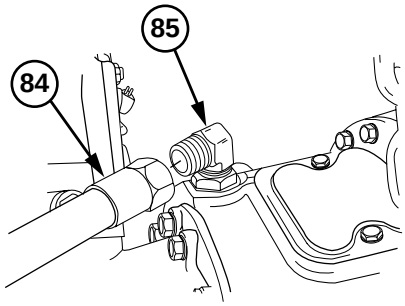
(43) Attach suitable lifting device to two screws (82) and rear of replacement transmission (22).

(44) Remove transmission (22) from transmission lift (53) and place on clean, flat surface.



(45) Remove hose no. 2310 (84) from elbow (85).





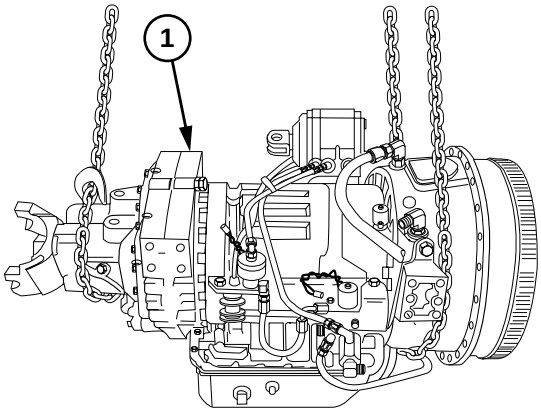
b. Transmission Preparation

NOTE

Refer to para 7-3 for procedure to unpack transmission.

(1) Remove replacement transmission (1) from shipping crate and place on clean, flat surface.

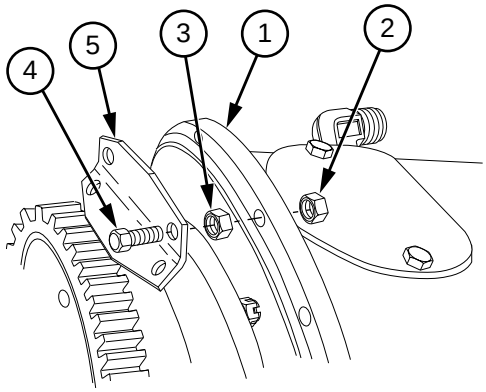
(2) Remove lifting device from replacement transmission (1).



7-4. TRANSMISSION REPLACEMENT (CONT)

(3) Remove six nuts (2), spacer nuts (3), screws (4), and three flywheel support shipping brackets (5) from replacement transmission (1).

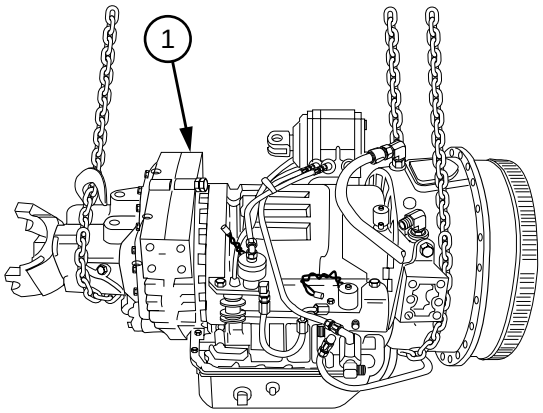
(4) Install three flywheel support shipping brackets (5) to transmission (1) with six screws (4), spacer nuts (3), and nuts (2).



NOTE

Refer to para 7-3 for procedure to pack transmission.

(5) Attach suitable lifting device to transmission (1) and install in shipping crate.



b.1. Cleaning/Inspection

(1) Remove and discard transmission external oil filter (TM 9-2320-360-20).

WARNING

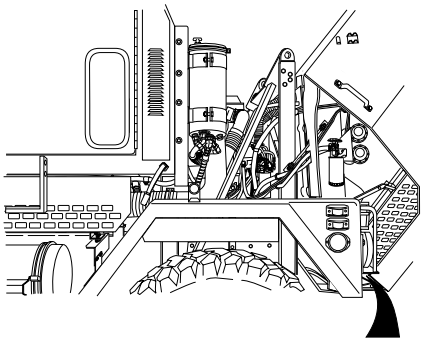
Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

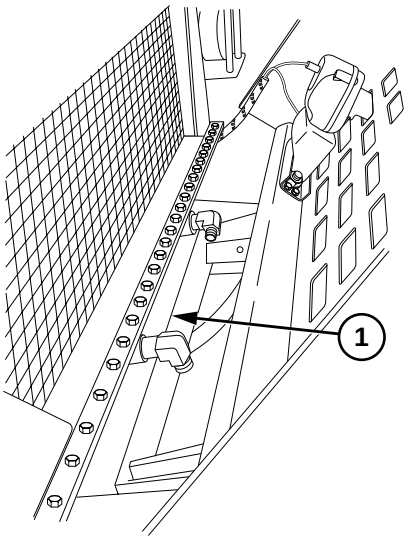
•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Flush external transmission filter base with solvent cleaning compound.

(3) Install new transmission external oil filter (TM 9-2320-360-20).

(4) Inspect all transmission hoses for brittleness and cracks. Bend hose slightly at fitting while shining a flashlight down inside the hose. Replace any hose that exhibits internal cracking.





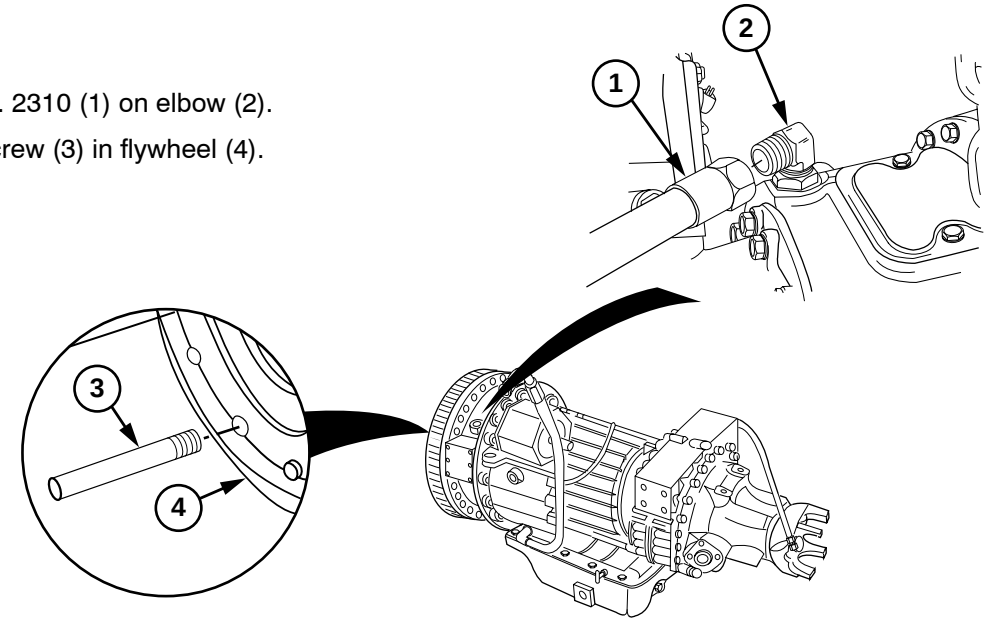
(5) Flush all transmission hoses with fresh oil. Flushing is completed when oil exiting hose has the same consistency as oil entering the hose.

(6) Flush transmission oil cooler (1) with fresh oil.

c. Installation

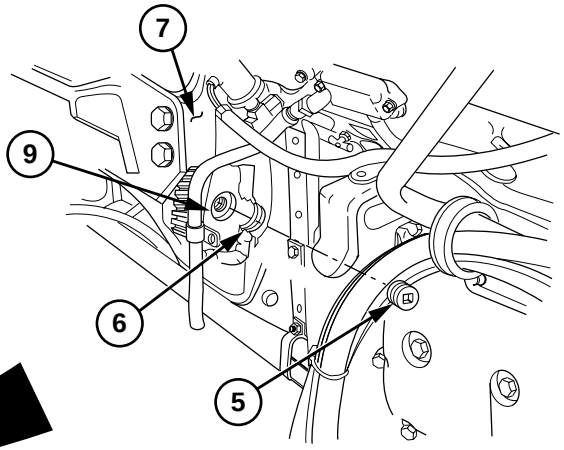
(1) Install hose no. 2310 (1) on elbow (2).

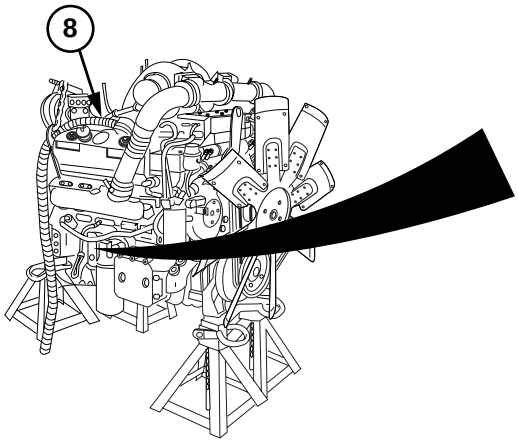
(2) Install guide screw (3) in flywheel (4).



(3) Remove plug (5) from flywheel access hole (6) in flywheel housing (7) on lower right side of engine (8).

(4) Align hole in flexplate (9) with access hole (6) in flywheel housing (7).

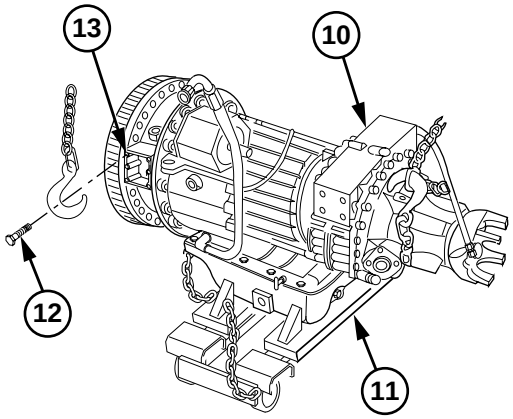




(5) Attach suitable lifting device to transmission (10).

(6) Position and secure transmission (10) on transmission lift (11).

(7) Remove two screws (12) from transmission (10) torque converter housing front upper holes (13).



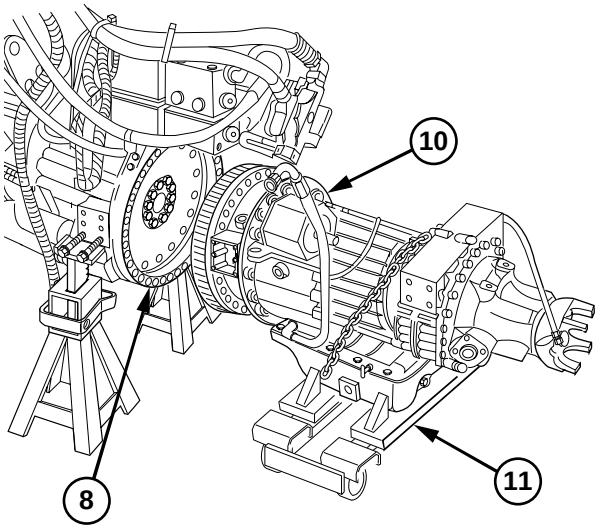
WARNING

Transmission weighs approximately 1125 lb (510 kg). Properly support transmission during installation. Failure to comply may result in serious injury to personnel.

NOTE

Alignment stud must go through hole in flexplate and access hole in flywheel housing.

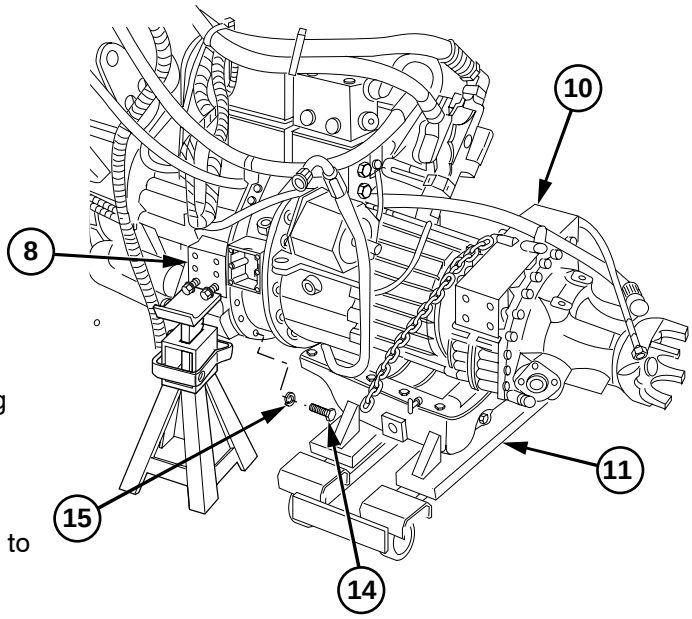
(8) Raise transmission (10) with transmission lift (11) and install on engine (8) with aid of assistant.



7-4. TRANSMISSION REPLACEMENT (CONT)

WARNING

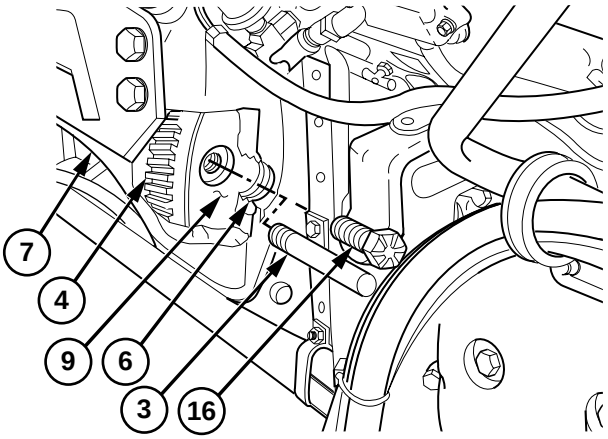
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive sealant gets on skin or clothing, wash immediately with soap and water.



(9) Coat threads of 24 transmission mounting screws (14) with adhesive-sealant.

(10) Install 24 new lockwashers (15) and transmission mounting screws (14) on transmission (10) and engine (8). Torque to 50-60 lb-ft (68-81 N·m).

(11) Remove transmission lift (11) from transmission (10).



(12) Remove guide screw (3) from flywheel (4) through flywheel access hole (6) in flywheel housing (7).

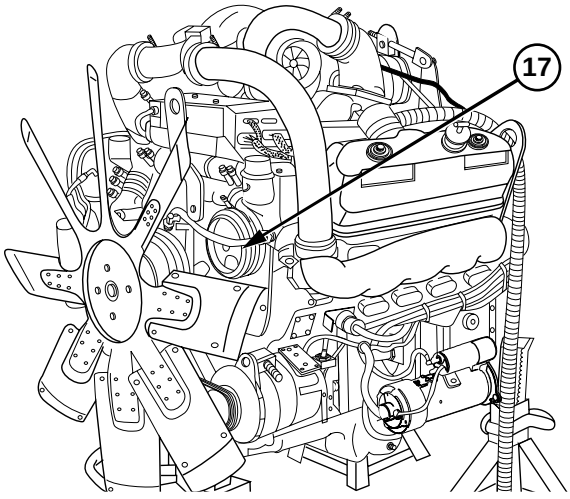
(13) Coat threads of 12 flexplate mounting screws (16) with adhesive-sealant.

CAUTION

Camshaft pulley must only be turned clockwise. Turning counterclockwise may result in loosening camshaft pulley.

NOTE

Do not tighten flexplate screws until all 12 screws are installed.

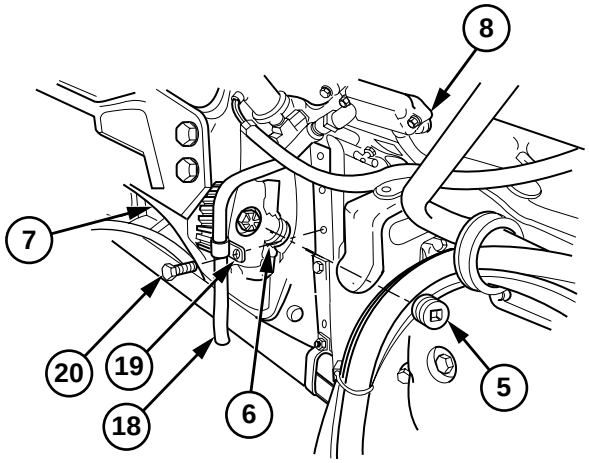


(14) Install 12 flexplate mounting screws (16) in flywheel (4) and flexplate (9) through access hole (6) while assistant turns camshaft pulley (17) to align holes in flexplate (9) with access hole (6). Do not tighten.

(15) Tighten 12 flexplate mounting screws (16) to 80-90 lb-ft (108-122 N·m).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.



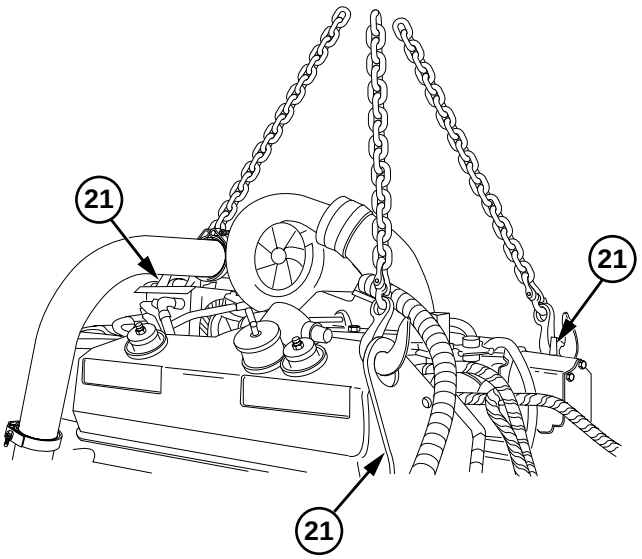
(16) Coat plug (5) with pipe thread sealing compound.

(17) Install plug (5) in flywheel access hole (6) of flywheel housing (7) on lower right side of engine (8).

(18) Install air box hose (18) on right side of engine (8) with clip (19) and screw (20).

NOTE

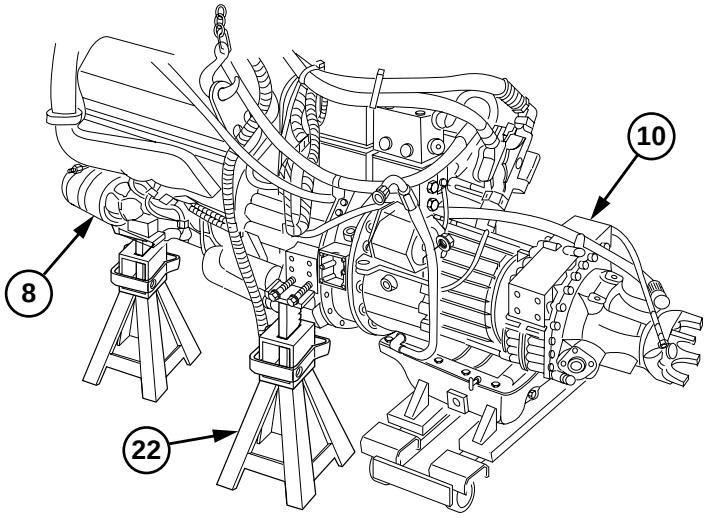
Chain should be adjusted to the following lengths:
Chain attached to front lifting bracket – 36 in. (91 cm)
Chain attached to left rear lifting bracket – 29.5 in. (75 cm)
Chain attached to right rear lifting bracket – 29.5 in.(75 cm)



(19) Attach suitable lifting device to engine lifting brackets (21).

WARNING

Engine/transmission assembly weighs approximately 4206 lb (1908 kg). Properly support transmission during installation. Stay clear of engine/transmission assembly when it is supported by lifting device. Failure to comply may result in serious injury to personnel.



(20) Raise engine/transmission (8 and 10) with suitable lifting device and remove two jackstands (22) from rear of engine (8).

7-4. TRANSMISSION REPLACEMENT (CONT)

CAUTION

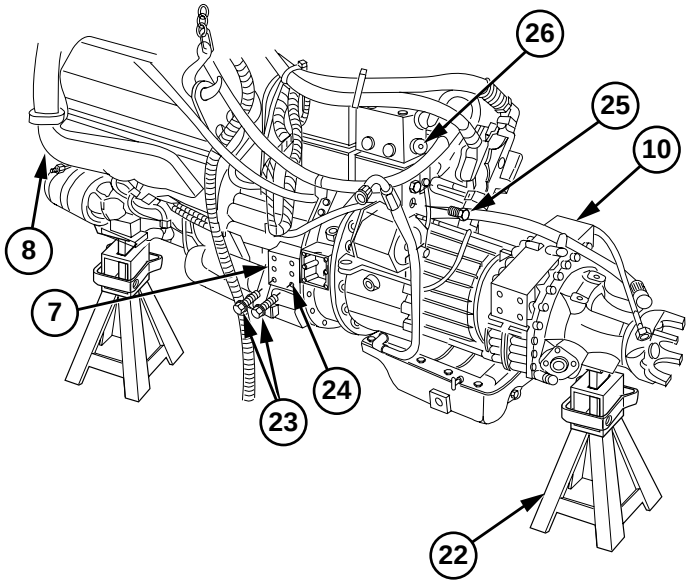
Jackstand must be positioned to clear transmission drain tube. Failure to comply may result in damage to drain tube.

(21) Place jackstand (22) under rear of transmission (10).

(22) Lower engine/transmission (8 and 10) onto jackstands (22).

(23) Remove four screws (23) from flywheel housing (7) right and left bottom holes (24).

(24) Remove three screws (25) from air compressor (26). Discard lockwashers.



WARNING

Cradle weighs approximately 30 lb (13.6 kg). Properly support cradle during installation. Failure to comply may result in injury to personnel.

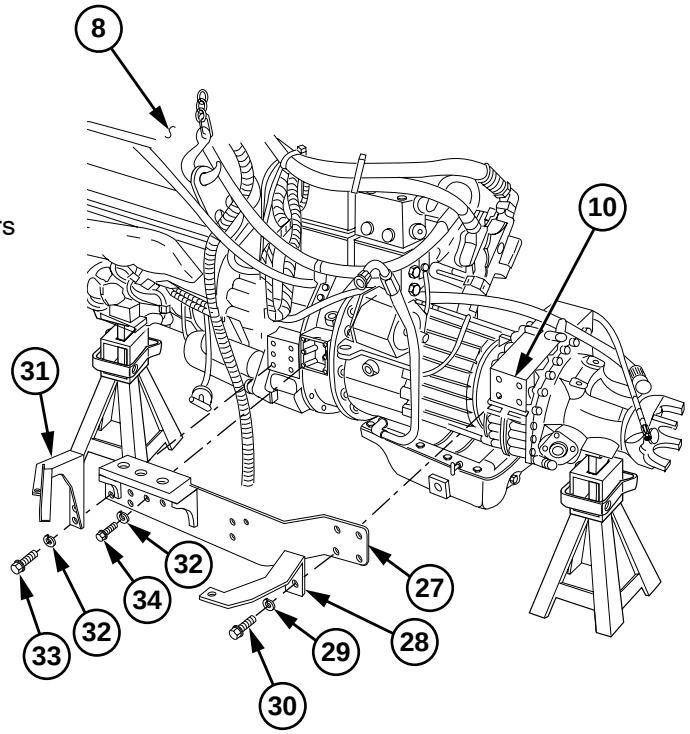
(25) Install left cradle (27) and transmission dipstick tube support bracket (28) on transmission (10) with four new lockwashers (29) and screws (30) with aid of assistant. Do not tighten.

(26) Install engine dipstick tube support bracket (31) and left cradle (27) on engine/transmission (8 and 10) with eight new lockwashers (32), six screws (33), and two screws (34). Do not tighten.

(27) Tighten two screws (34) to 123–144 lb–ft (167–195 N·m).

(28) Tighten six screws (33) to 170 lb–ft (230 N·m).

(29) Tighten four screws (30) to 213–244 lb–ft (289–331 N·m).



WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive sealant gets on skin or clothing, wash immediately with soap and water.

(30) Coat threads of three screws (25) with adhesive-sealant.

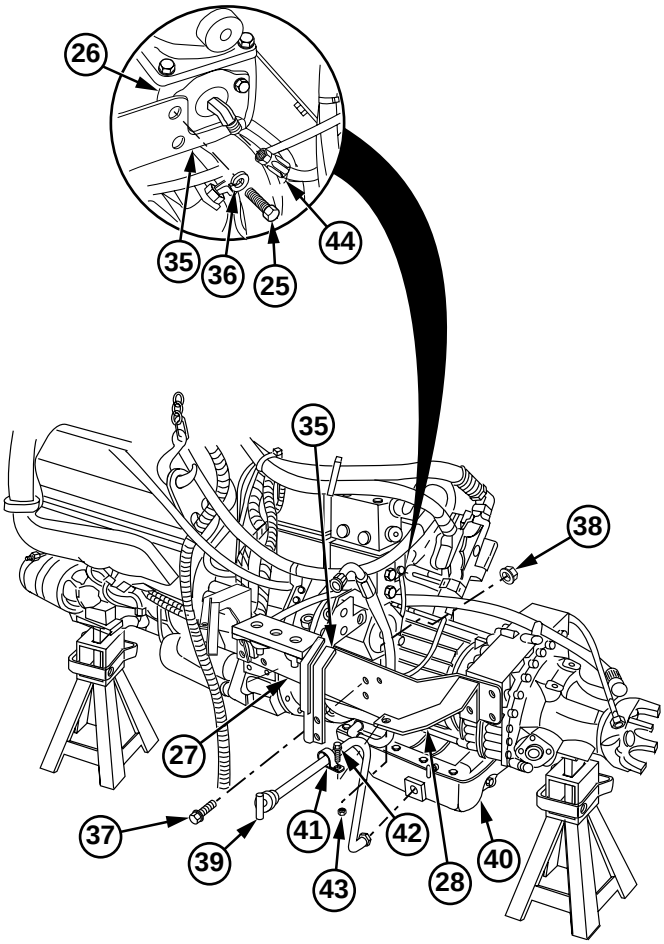
(31) Install air compressor support bracket (35) on air compressor (26) with three new lockwashers (36) and screws (25). Torque to 156-180 lb-in. (18-20 N·m).

(32) Install air compressor support bracket (35) on left cradle (27) with two screws (37) and new locknuts (38).

(33) Install transmission dipstick tube (39) on transmission oil pan (40).

(34) Install transmission dipstick tube (39) on transmission dipstick tube support bracket (28) with clip (41), screw (42), and new locknut (43).

(35) Install oil line no. 2629 (44) on air compressor (26).

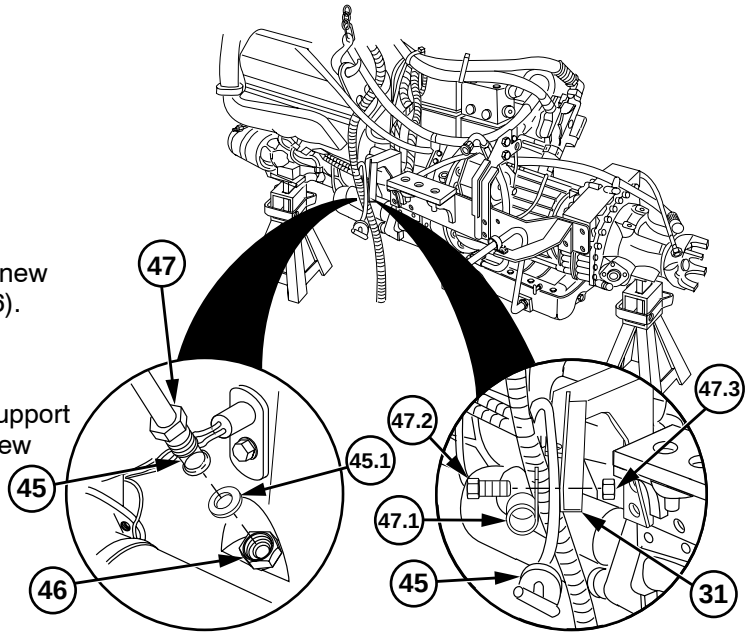


NOTE

Some engines did not have copper washer. Copper washers can be installed on all engines to reduce oil seepage.

(36) Install engine dipstick tube (45) and new copper washer (45.1) on adapter (46). Tighten collar (47).

(36.1) Install clip (47.1) on engine dipstick tube (45) and engine dipstick tube support bracket (31) with screw (47.2) and new locknut (47.3).



7-4. TRANSMISSION REPLACEMENT (CONT)

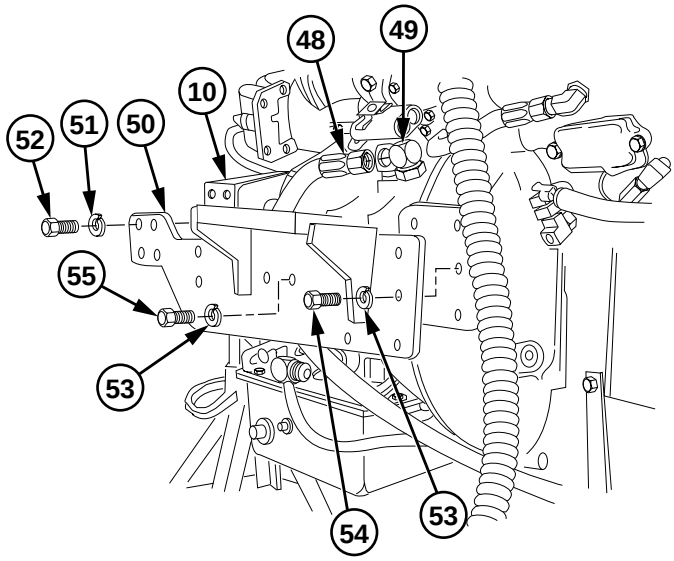
(37) Install hose no. 2382 (48) on elbow (49).

WARNING

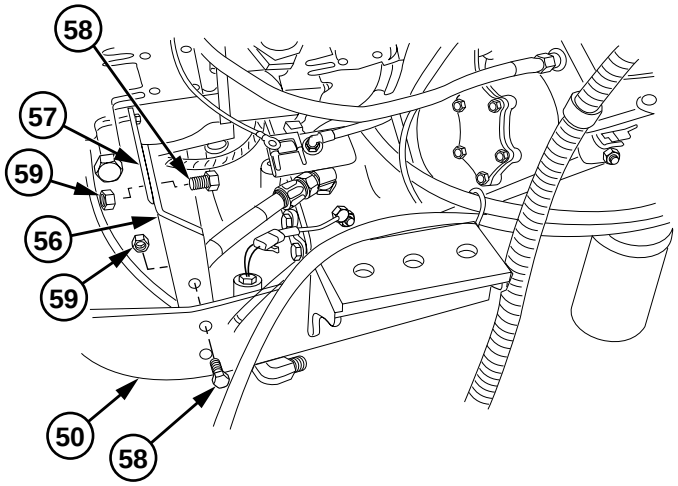
Cradle weighs approximately 30 lb (13.6 kg). Properly support cradle during installation. Failure to comply may result in injury to personnel.

(38) Install right cradle (50) on transmission (10) with four new lockwashers (51) and screws (52) with aid of assistant. Do not tighten.

(39) Install eight new lockwashers (53), six screws (54), and two screws (55) on right cradle (50) and engine/transmission (8 and 10). Do not tighten.



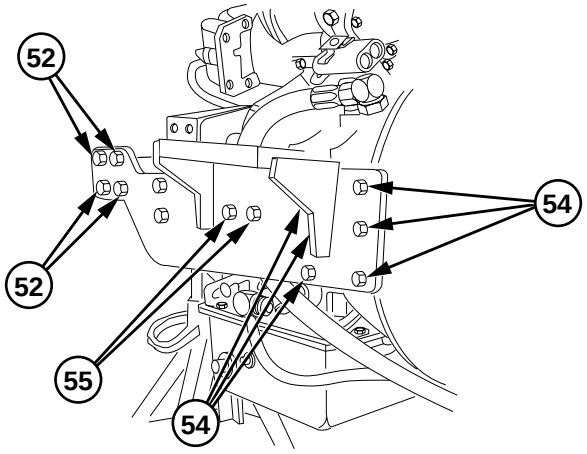
(40) Install steering pump bracket (56) on right cradle (50) and bracket (57) with four screws (58) and new locknuts (59).



(41) Tighten two screws (55) to 123–144 lb–ft (167–195 N·m).

(42) Tighten six screws (54) to 170 lb–ft (230 N·m).

(43) Tighten four screws (52) to 213–244 lb–ft (289–331 N·m).

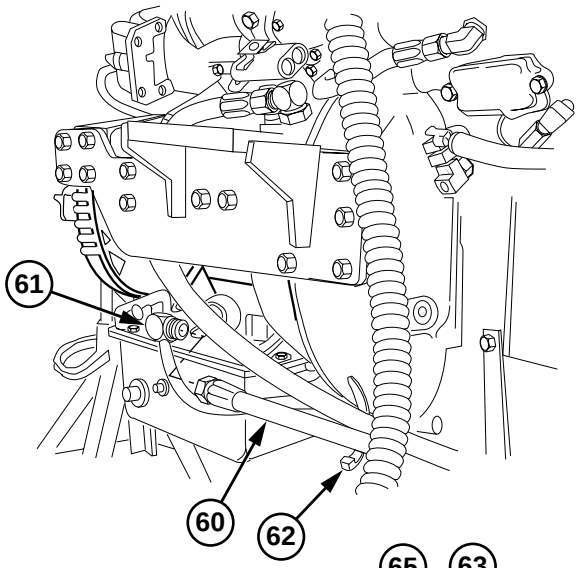


(44) Install hose no. 2393 (60) on elbow (61).

NOTE

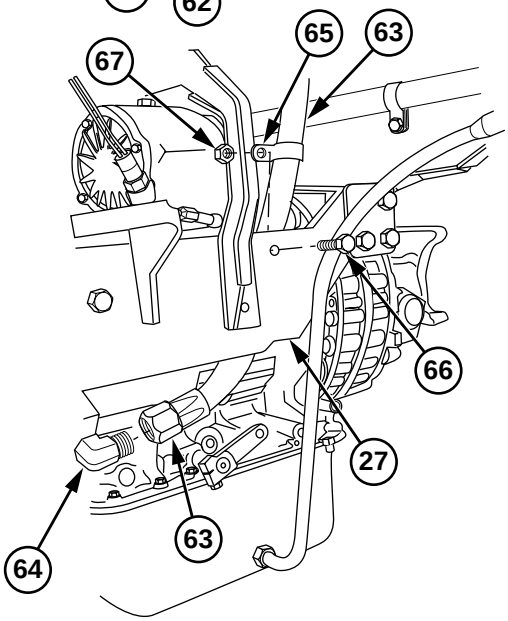
Position new plastic cable ties in locations marked during removal.

(45) Install plastic cable ties (62) on hose no. 2393 (60).



(46) Install hose no. 2311 (63) on elbow (64).

(47) Install clip (65), screw (66), new locknut (67), and hose no. 2311 (63) on left cradle (27).

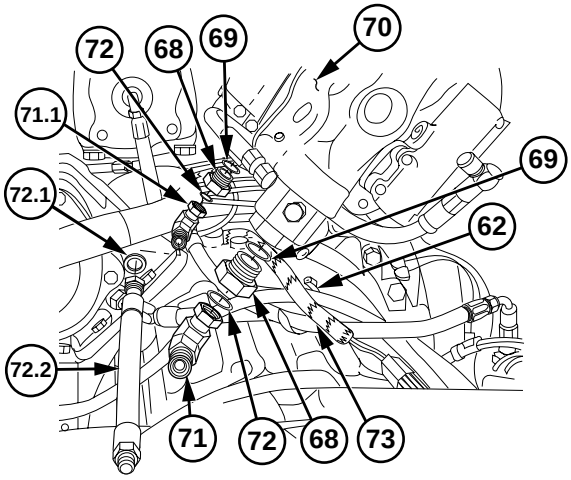


(48) Install two adapters (68) and new preformed packings (69) on steering pump (70).

(49) Install two elbows (71 and 71.1) and new preformed packings (72) on two adapters (68).

(49.1) Install new preformed packing (72.1) and hose no. 2879 (72.2) on elbow (71.1).

(50) Install plastic cable tie (62) to secure wires (73) to hoses.



7-4. TRANSMISSION REPLACEMENT (CONT)

(51) Install wire no.1068 (74) on transmission temperature sensor (75) with new lockwasher (76) and nut (77).

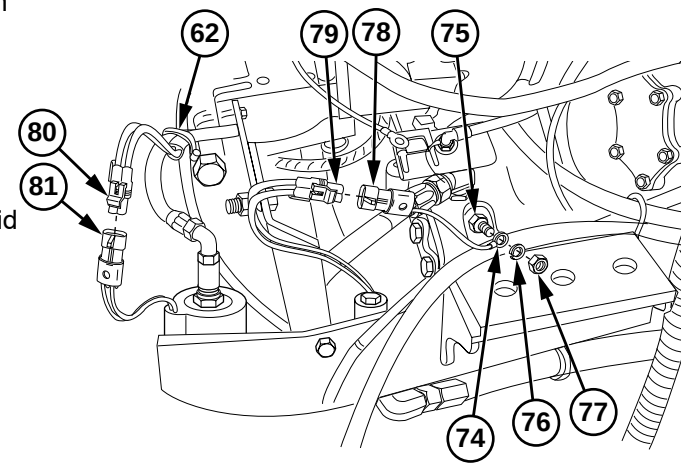
(52) Install electrical connector (78) on transmission lockup solenoid electrical connector (79).

(53) Install wire harness (80) on PTO solenoid electrical connector (81).

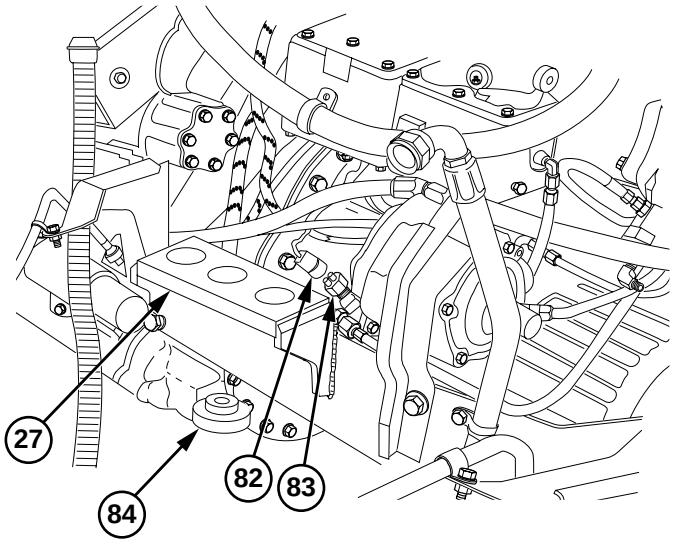
NOTE

Position new plastic cable tie in location marked during removal.

(54) Install plastic cable tie (62) on wire harness (80).



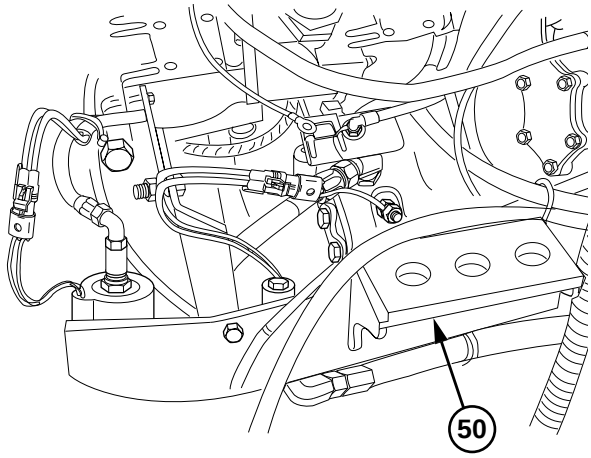
(55) Install electrical connector (82) on PTO sensor (83).



NOTE

Biscuits should be secured to cradles with masking tape.

(56) Install six mounting biscuits (84) on two cradles (27 and 50).



d. Follow-On Maintenance

Install engine/transmission assembly (para 3-3).

7-5. OIL PAN AND GASKET REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transmission oil drained (LO 9-2320-360-12).
Transmission dipstick removed (TM 9-2320-360-10).
Transfer case to no. 1 axle propeller shaft removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Gasket (Item 17, Appendix F)
Gasket (Item 19, Appendix F)

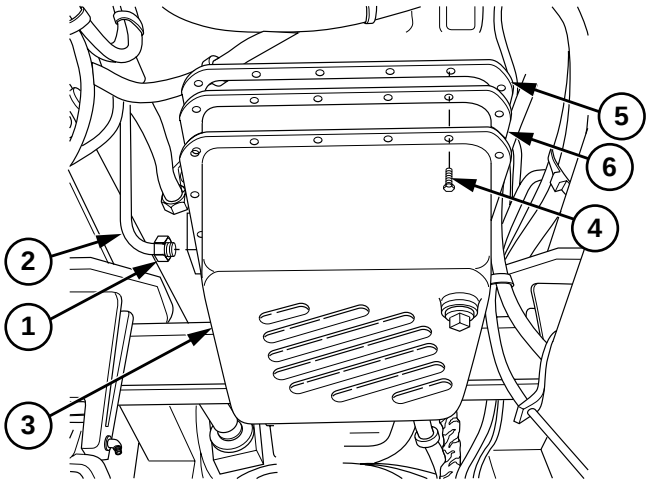
a. Removal

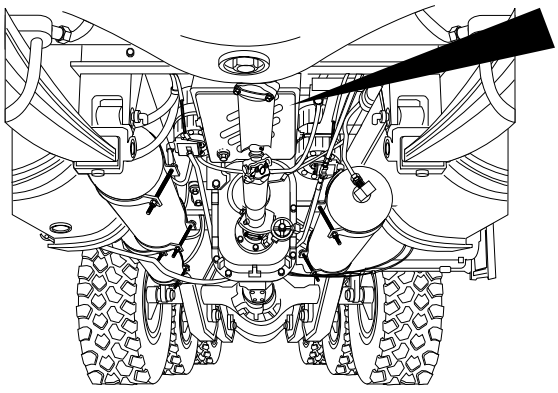
(1) Loosen collar (1) and remove dipstick tube (2) from oil pan (3).

NOTE
Support oil pan while removing screws.

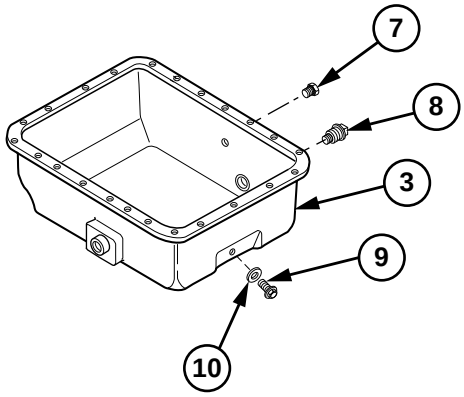
(2) Remove 23 screws (4) and oil pan (3) from transmission (5).

(3) Remove gasket (6) from oil pan (3). Discard gasket.





(4) Remove plugs (7, 8, and 9) and gasket (10) from oil pan (3). Discard gasket.

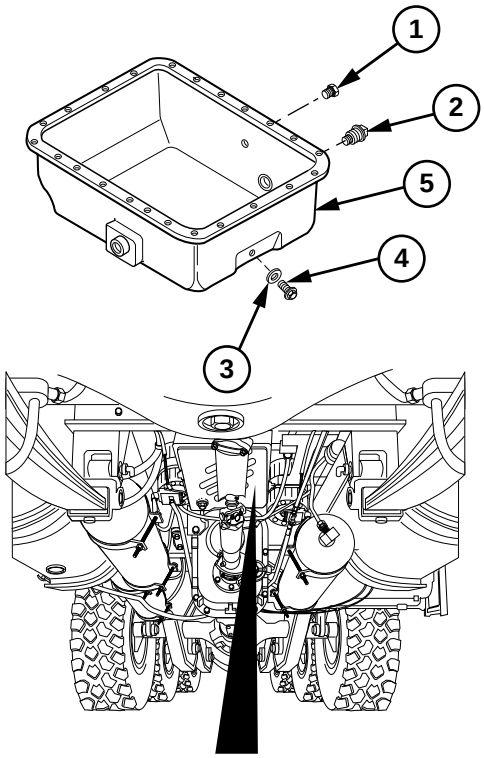


7-5. OIL PAN AND GASKET REPLACEMENT (CONT)

b. Installation

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.



(1) Coat threads of plugs (1 and 2) with pipe thread sealing compound.

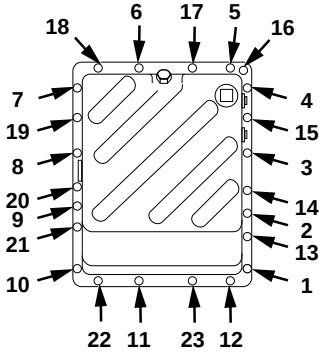
(2) Install new gasket (3) and plugs (1, 2, and 4) in oil pan (5).

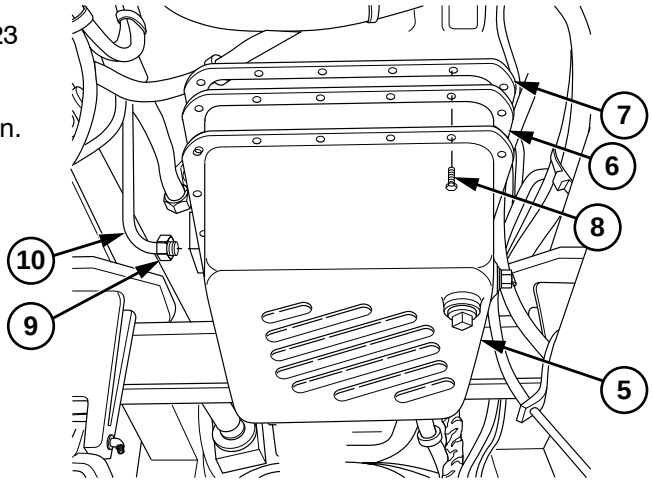
(3) Coat lip of oil pan (5) with lubricating oil and install new gasket (6) on oil pan (5).

NOTE

Oil pan has to be drawn evenly to transmission.

(4) Install oil pan (5) on transmission (7) with 23 screws (8). Tighten every other screw in one direction around oil pan until all 23 screws have been torqued to 120-156 lb-in. (13.6-17.6 N·m).





(5) Coat threads of collar (9) with pipe thread sealing compound.

(6) Install dipstick tube (10) in oil pan (5) and tighten collar (9).

c. Follow-On Maintenance

(1) Install transmission dipstick (TM 9-2320-360-10).

(2) Fill transmission with oil (LO 9-2320-360-12).

(3) Install transfer case to no. 1 axle propeller shaft (TM 9-2320-360-20).

7-6. GOVERNOR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked (TM 9-2320-360-10).

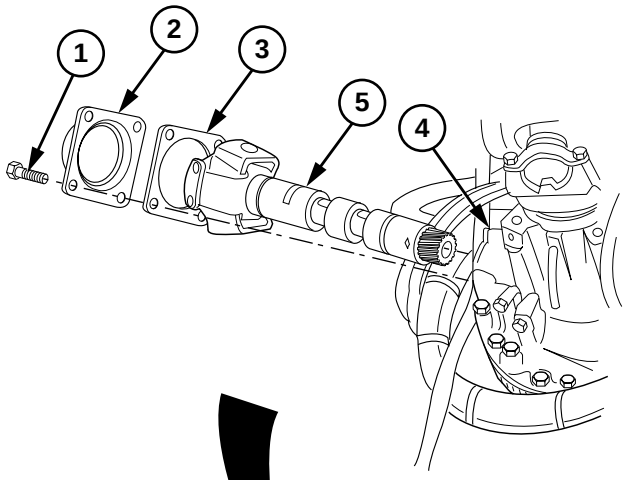
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Gasket (Item 20, Appendix F)

a. Removal.

(1) Remove four screws (1), cover (2), and gasket (3) from transmission (4). Discard gasket.

(2) Turn governor (5) clockwise and remove from transmission (4).

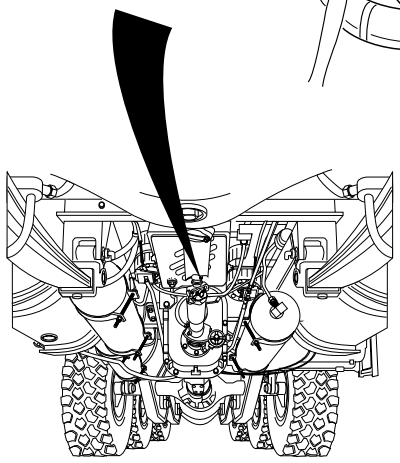


b. Installation

(1) Install governor (5) in transmission (4) by turning governor (5) counterclockwise.

(2) Align holes in new gasket (3) and cover (2) with holes in transmission (4).

(3) Install new gasket (3) and cover (2) on transmission (4) with four screws (1). Torque to 120-180 lb-in. (13.6-20.3 N·m).



c. Follow-On Maintenance

Remove wheel chocks (TM 9-2320-360-20).

7-7. INTERNAL FILTER ELEMENT REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow -On Maintenance

INITIAL SETUP

Equipment Conditions
Oil pan and gasket removed (para 7-5).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Oil, Lubricating (Item 44, Appendix B)
Packing, Preformed (Item 191, Appendix F)
Screw, Self-Locking (Item 285, Appendix F)

a. Removal

NOTE
Some transmissions may have a single spacer.

(1) Remove self-locking screw (1), washer (2), filter element (3), and two spacers (4) from transmission (5). Discard self-locking screw.

(2) Remove preformed packing (6) from filter element (3). Discard preformed packing.

b. Installation

(1) Coat new preformed packing (6) with lubricating oil.

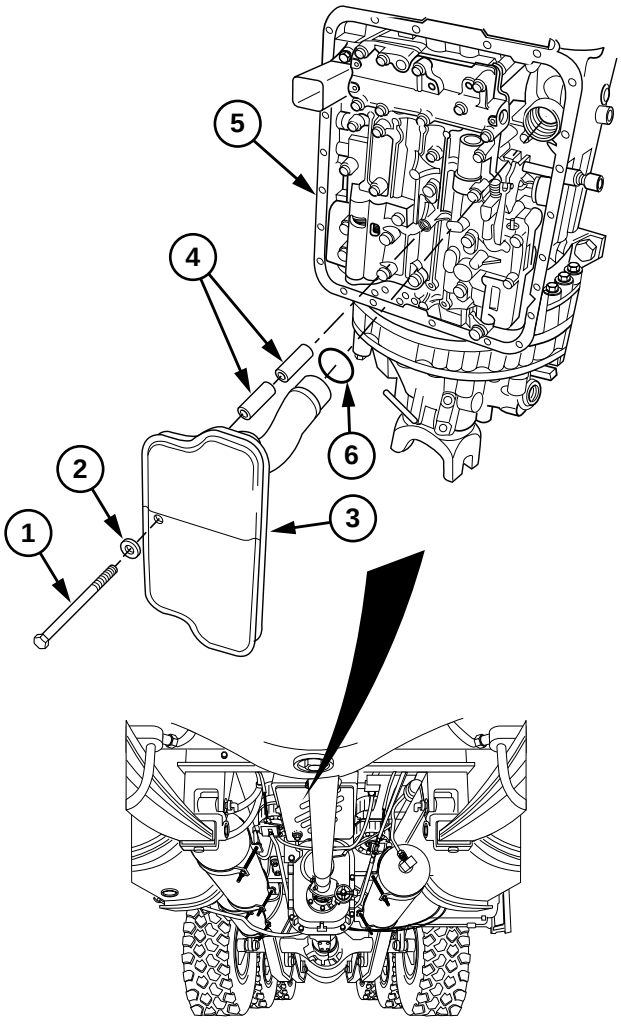
(2) Install new preformed packing (6) on filter element (3).

CAUTION
Two spacers (PN 23013623) must be used with filter PN 23013625; a single spacer (PN 29516469) must be used with filter PN 29505563.

(3) Install washer (2) and new self-locking screw (1) through filter element (3) and two spacers (4).

(4) Install filter element (3) on transmission (5).

(5) Tighten screw (1) to 120-180 lb-in. (13.6-20.3 N·m).



c. Follow-On Maintenance

Install oil pan and gasket (para 7-5).

7-8. OUTPUT YOKE, DUST SHIELD, AND OIL SEAL REPAIR

This task covers:
a. Disassembly
b. Assembly
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transmission to transfer case propeller shaft removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 3/4 In. Female-1 In. Male (Item 6, Appendix E)
Handle, Driver (Item 67, Appendix E)
Holder, Yoke (Figure C-15, Appendix C)
Installer, Oil Seal, Output (Item 81, Appendix E)
Multiplier, Torque (Item 99, Appendix E)
Socket, 3-1/8 In. (Item 162, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

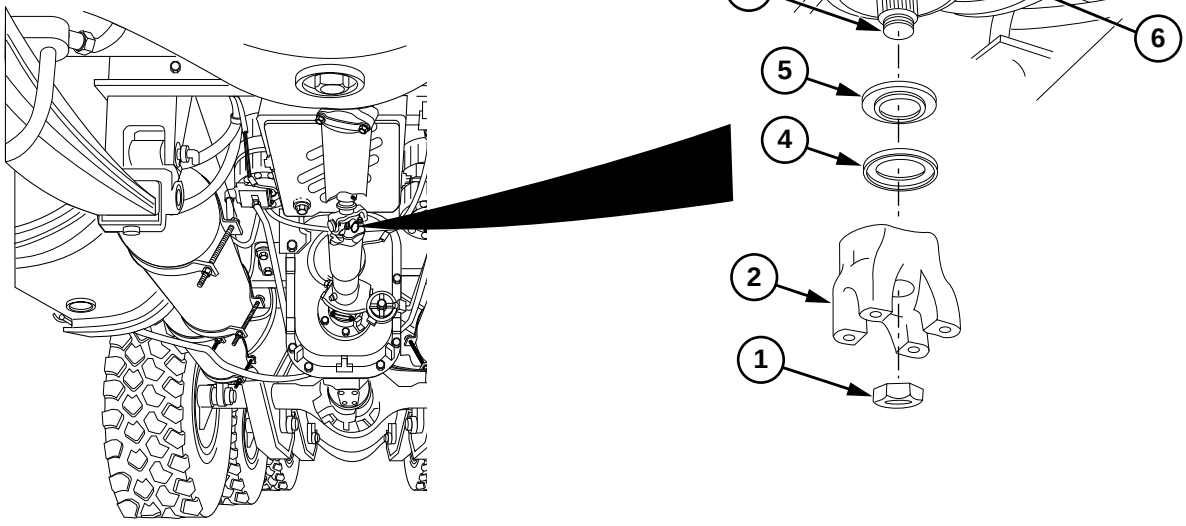
Materials/Parts
Adhesive-Sealant, Silicone, RTV (Item 2, Appendix B)
Grease, High Temperature (Item 34.1 Appendix B)
Oil, Lubricating (Item 44, Appendix B)
Seal, Oil (Item 315, Appendix F)
Nut (Item 148, Appendix F)

Personnel Required
Two

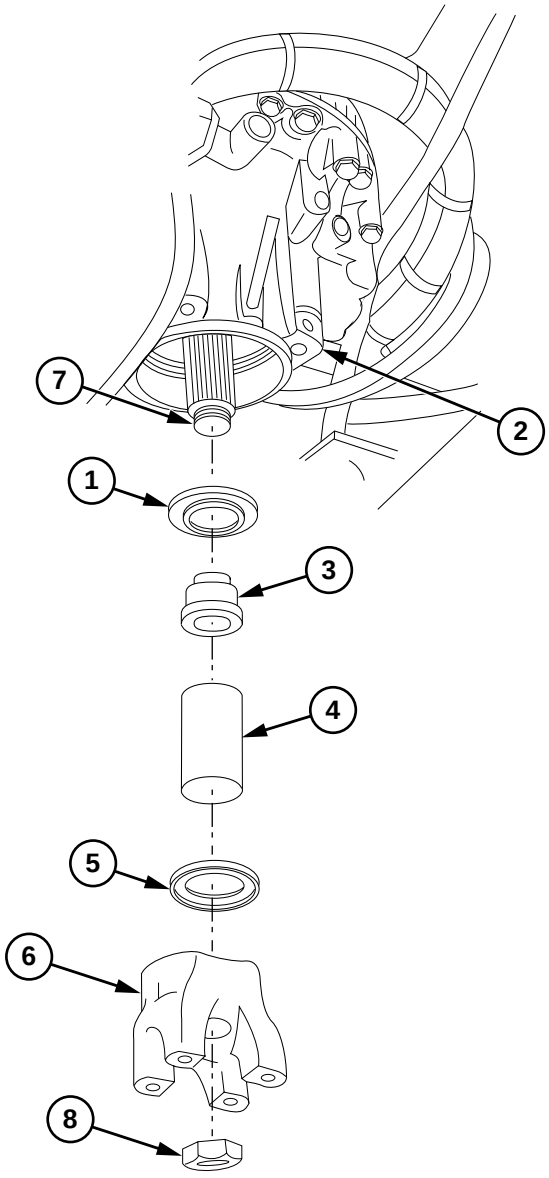
a. Disassembly

(1) Remove nut (1) and yoke (2) from output shaft (3) with aid of assistant. Discard nut.

(2) Remove dust shield (4) and oil seal (5) from rear cover (6). Discard oil seal.



7-8. OUTPUT YOKE, DUST SHIELD, AND OIL SEAL REPAIR (CONT)



b. Assembly

(1) Install new oil seal (1) with seal lip facing rear cover (2) using oil seal installer (3) and handle (4).

(2) Install dust shield (5) in rear cover (2), flat side first, so rear edge of shield is flush with surface of rear cover.

(2.1) Coat inner surface of oil seal (1) with high temperature grease.

(3) Install yoke (6) on output shaft (7).

(4) Coat threads of output shaft (7) and retainer nut (8) with lubricating oil.

WARNING

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

(4.1) Apply adhesive to the splines of output shaft (7) between yoke (6) and new retainer nut (8).

(5) Install new nut (8) on output shaft (7) with aid of assistant. Torque to 600–800 lb-ft (814–1085 N·m).

c. Follow-On Maintenance

Install transmission to transfer case propeller shaft (TM 9-2320-360-20).

7-9. TRANSMISSION LOCKUP SOLENOID REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Lower engine access panel removed (TM 9-2320-360-20).

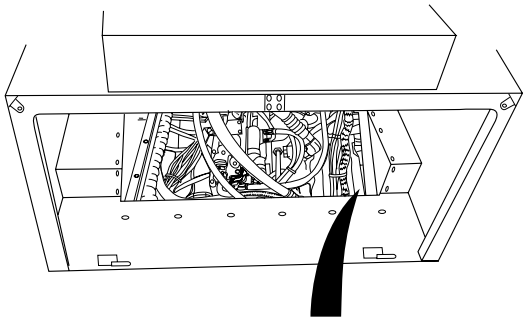
Tools and Special Tools
Tool Kit, Electrical Repair (Item 201, Appendix E)
Tool Kit, Genl Mech (Item 202, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Tie, Cable, Plastic (Item 60, Appendix B)
Locknut (Item 86, Appendix F)
Lockwashers (2) (Item 126, Appendix F)
Seals, Cable (2) (Item 346, Appendix F)
Sockets, Contact (2) (Item 325, Appendix F)

a. Removal

NOTE
Location of plastic cable tie should be marked before removal.

(1) Remove plastic cable ties (1) securing electrical connector (2).

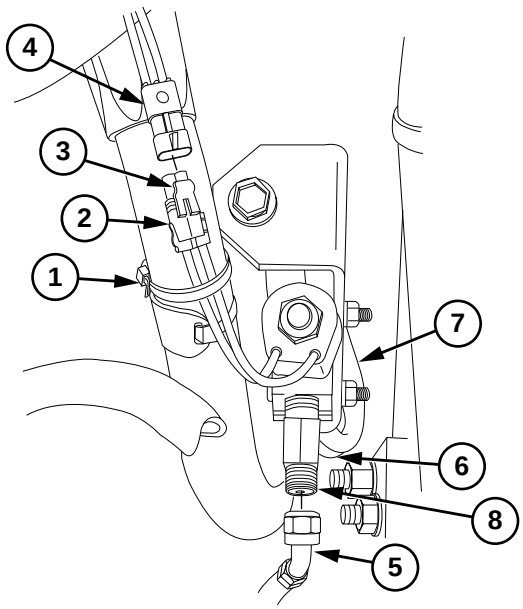


NOTE
Connector is removed by gently prying up on locking tab and pulling on connector.

(2) Lift locking tab (3) and remove electrical connector (2) from electrical connector (4).

(3) Place drain pan under hoses (5, 6, and 7).

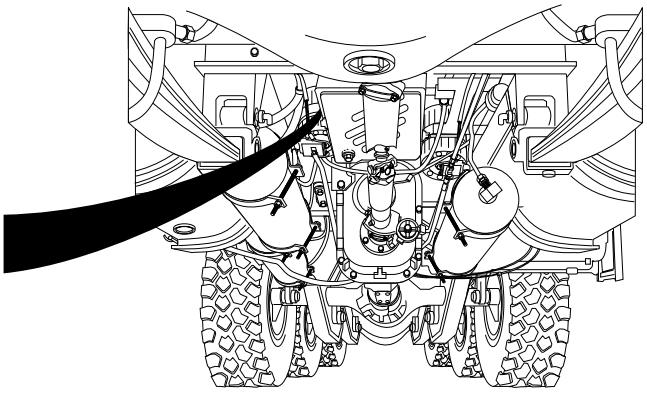
(4) Remove hose no. 2851 (5) from tee (8).

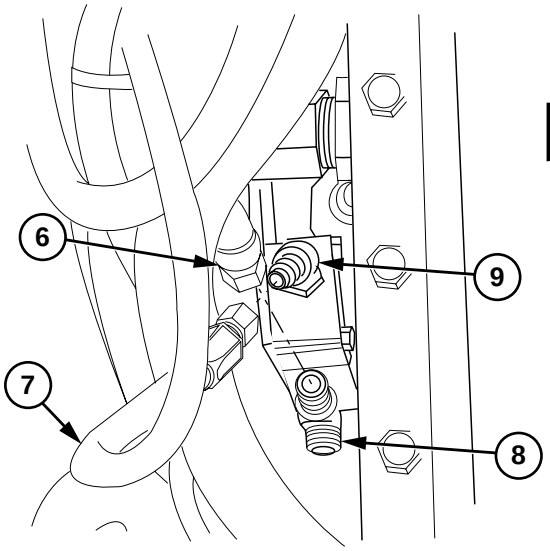


7-9. TRANSMISSION LOCKUP SOLENOID REPLACEMENT (CONT)

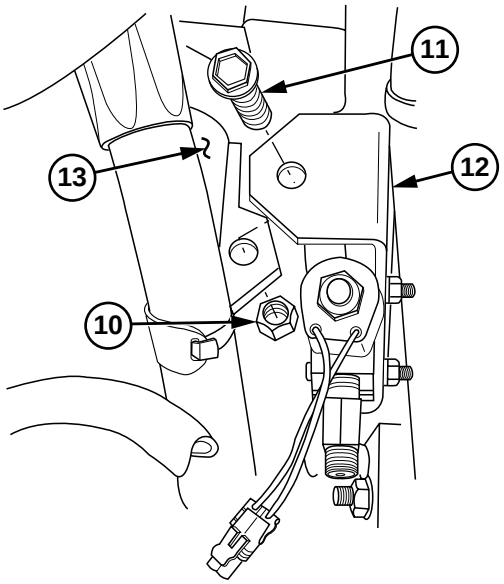
(5) Remove hose no. 2672 (6) from tee (8).

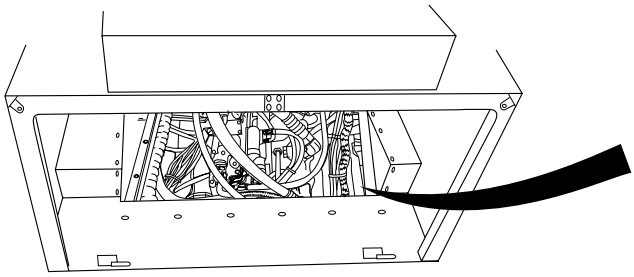
(6) Remove hose no. 2646 (7) from elbow (9).





(7) Remove locknut (10), screw (11), and bracket (12) from transmission (13). Discard locknut.

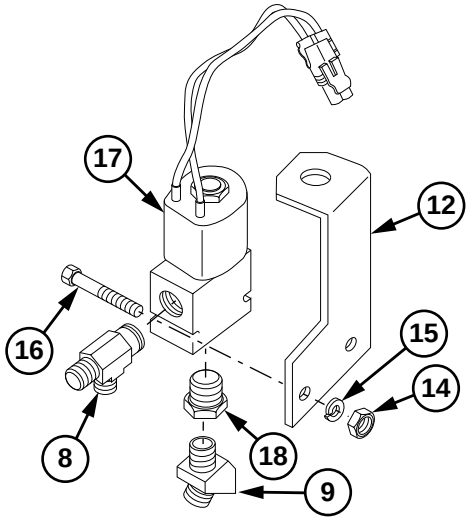




(8) Remove two nuts (14), lockwashers (15), screws (16), and lockup solenoid (17) from bracket (12). Discard lockwashers.

(9) Remove elbow (9) and adapter (18) from lockup solenoid (17).

(10) Remove tee (8) from lockup solenoid (17).



(11) Unlatch and open secondary lock (19) on connector (2).

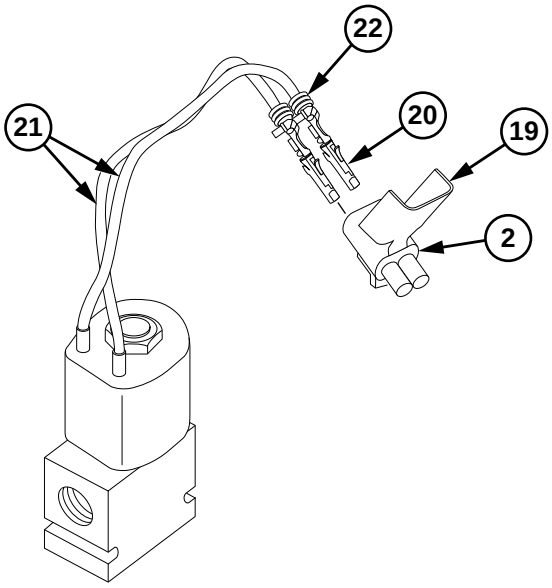
WARNING

Tip of removal tool is very sharp. Use caution when using tool. Failure to comply may result in injury to personnel.

(12) Insert removal tool into cavity on connector (2) until seated to release lock tangs on terminals (20).

(13) Pull wires (21) back, turn connector (2), and remove removal tool.

(14) Cut terminals (20) directly behind wire seals (22). Discard terminal and seal.



b. Installation

(1) Insert 1 in. (2.5 cm) of wire (1) through new wire seal (2).

CAUTION

Strip wire after placing it through seal to prevent damage to individual wire strands.

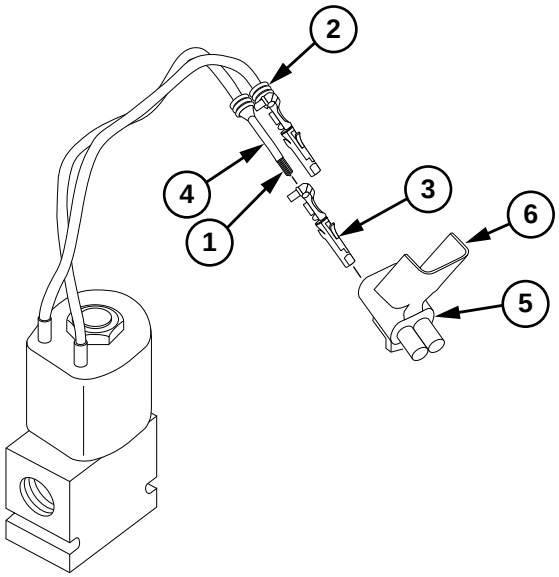
(2) Using wire strippers, strip end of wire (1) leaving 0.25 in. (0.64 cm) of bare wire.

(3) Insert new terminal (3) in locating hole of crimp tool using proper hole according to the gage of wire (1).

(4) Slide seal (2) down to end of insulation (4) on wire (1).

NOTE

Wire and seal should be positioned so larger wings of terminal will crimp around seal and smaller wings will crimp around exposed bare wire.



(5) Position wire (1) on terminal (2).

(6) Press handles of crimp tool together until ratchet releases and crimp is complete.

(7) Push new terminal (3) and wire (1) through connector (5) until seated.

(8) Repeat steps (1) thru (7) for other wire.

(9) Push two wires (1) in connector (5) until seated.

(10) Latch secondary lock (6) on connector (5).

7-9. TRANSMISSION LOCKUP SOLENOID REPLACEMENT (CONT)

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

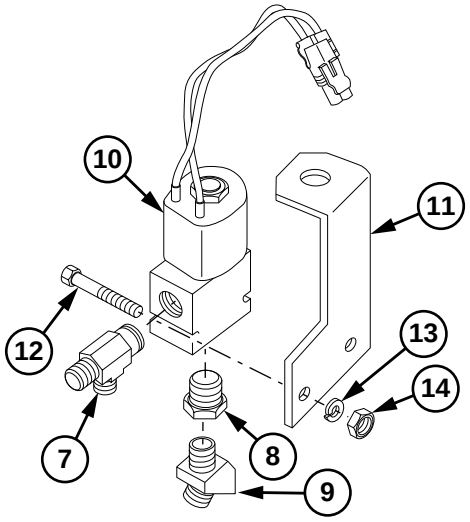
Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.

(11) Coat threads of tee (7), adapter (8), and elbow (9) with pipe thread sealing compound.

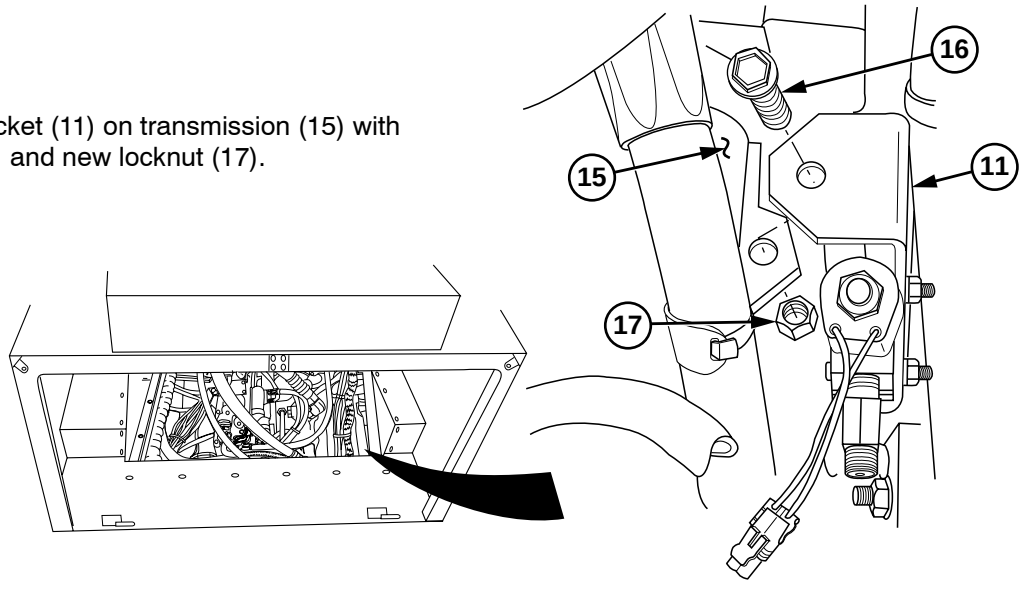
(12) Install tee (7) on lockup solenoid (10).

(13) Install adapter (8) and elbow (9) on lockup solenoid (10).

(14) Install lockup solenoid (10) on bracket (11) with two screws (12), new lockwashers (13), and nuts (14).

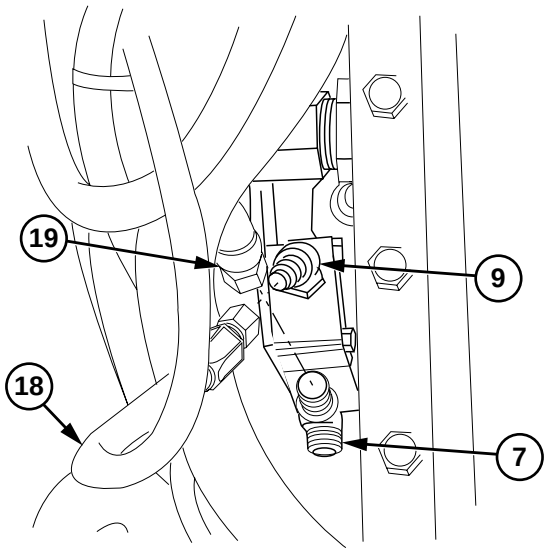


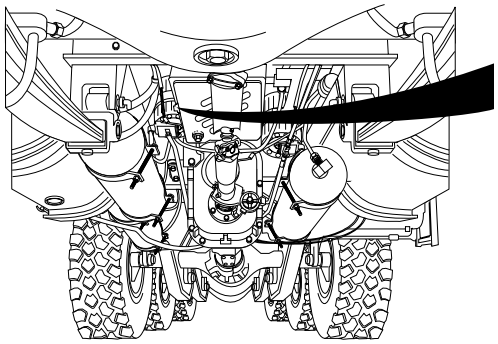
(15) Install bracket (11) on transmission (15) with screw (16) and new locknut (17).



(16) Install hose no. 2646 (18) on elbow (9).

(17) Install hose no. 2672 (19) on tee (7).





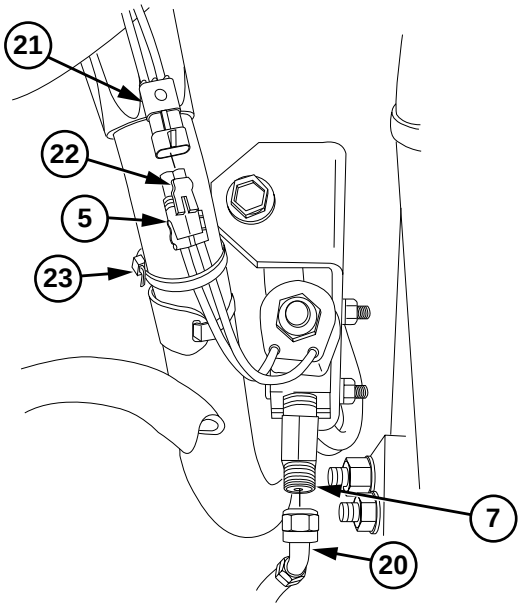
(18) Install hose no. 2851 (20) on tee (7).

(19) Install electrical connector (21) on electrical connector (5) until locking tab (22) snaps in place.

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(20) Secure electrical connector (5) with plastic cable tie (23).



c. Follow-On Maintenance

(1) Remove wheel chocks.

(2) Start engine (TM 9-2320-360-10).

(3) Check for leaks.

(4) Check transmission operation (TM 9-2320-360-10).

(5) Check engine brake retarder operation (TM 9-2320-360-10).

(6) Shut off engine (TM 9-2320-360-10).

(7) Install lower engine access panel (TM 9-2320-360-20).

CHAPTER 8
TRANSFER CASE MAINTENANCE

Contents

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Oil Seal and Yoke Replacement	8-5	8-16
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Section I. INTRODUCTION

8-1. INTRODUCTION

This chapter contains maintenance instructions for replacement and repair of the transfer case and components at the Direct Support maintenance level. Some parts must be removed before the transfer case and components can be accessed. They are referenced to other paragraphs of this manual or in TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

8-2. TRANSFER CASE CONTAINER UNPACKING/PACKING

This task covers:
a. Upper Container Removal
b. Transfer Case Removal
c. Transfer Case Installation
d. Upper Container Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Sling Assemblies (2) (Item 160, Appendix E)
Wrench, Torque, 0–175 Lb–Ft (Item 236, Appendix E)

Materials/Parts
Lockwashers (8) (Item 122, Appendix F)

a. Upper Container Removal

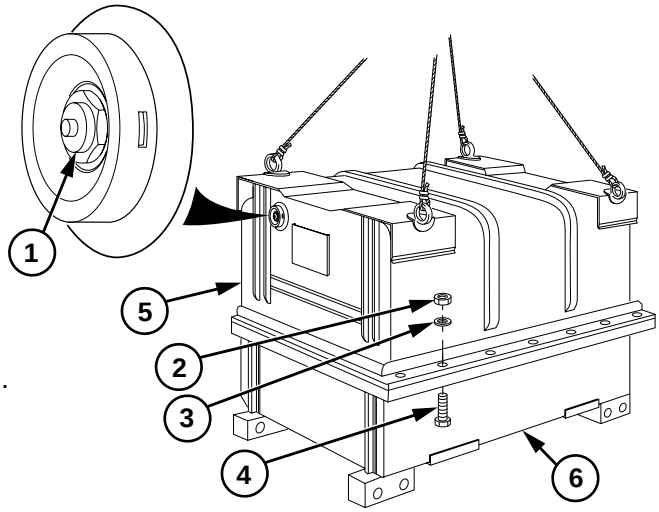
(1) Release air pressure at vent valve (1).

(2) Remove 20 nuts (2), washers (3), and screws (4).

WARNING

Keep out from under heavy parts. Falling parts may cause serious injury or death.

(3) Attach suitable lifting device and remove upper container (5) from lower container (6).



b. Transfer Case Removal

(1) Attach suitable lifting device to transfer case (1).

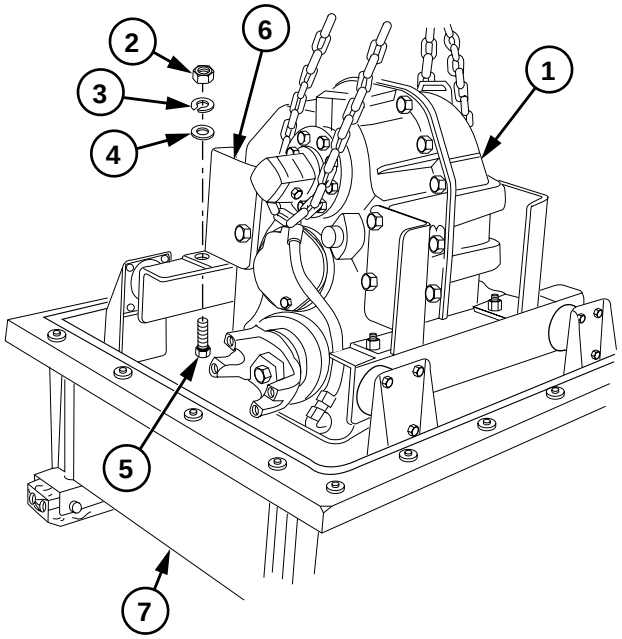
(2) Remove eight nuts (2), lockwashers (3), washers (4), and screws (5) from four brackets (6). Discard lockwashers.

WARNING

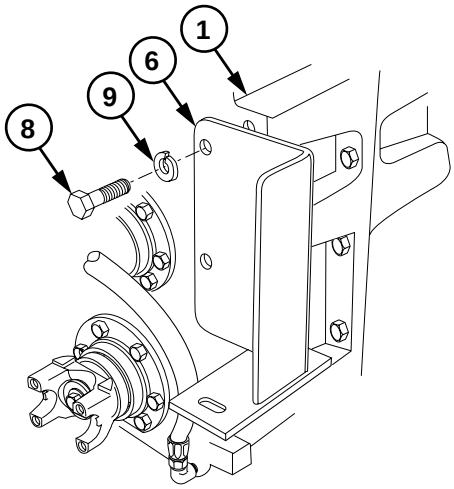
Transfer case weighs 965 lb (438 kg). Keep out from under transfer case when supported by lifting device to prevent serious injury to personnel.

CAUTION

To prevent contamination, auxiliary steering pump cover plate must remain installed until transfer case is installed in vehicle. Failure to comply may result in damage to equipment.

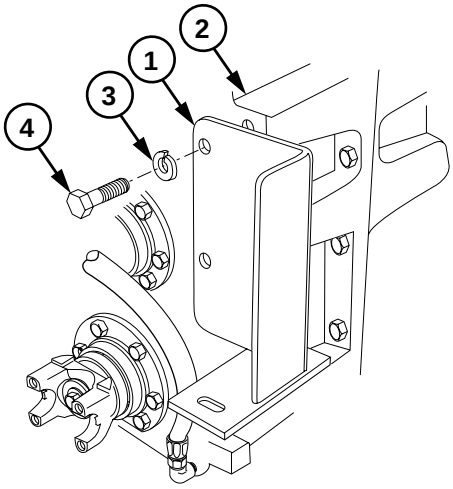


(3) Remove transfer case (1) from lower container (7).



(4) Remove two screws (8), lockwashers (9), and bracket (6) from transfer case (1). Discard lockwashers.

(5) Repeat step (4) for other three brackets.



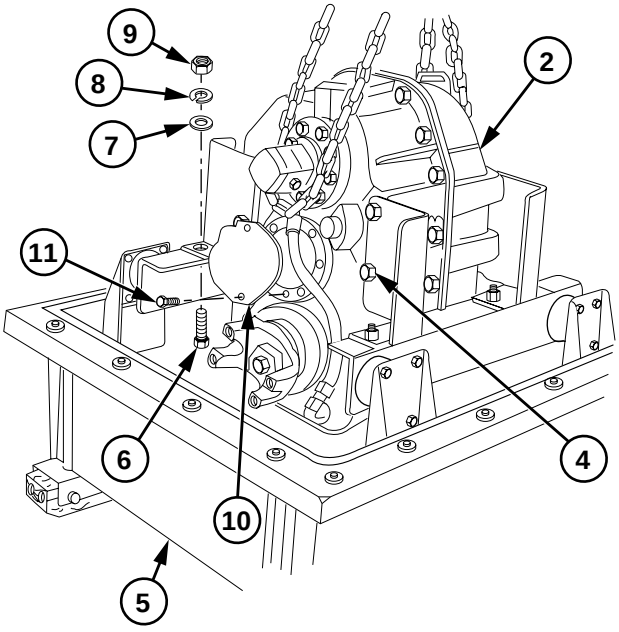
c. Transfer Case Installation

(1) Install bracket (1) on transfer case (2) with two new lockwashers (3) and screws (4). Do not tighten.

(2) Repeat step (1) for other three brackets.

WARNING

Transfer case weighs 965 lb (438 kg). Keep out from under transfer case when supported by lifting device to prevent serious injury to personnel.



(3) Align and install transfer case (2) in lower container (5) with eight screws (6), washers (7), new lockwashers (8), and nuts (9).

(4) Tighten nuts (9) to 31–37 lb–ft (42–50 N·m).

(5) Tighten screws (4) to 71–83 lb–ft (96–112) N·m).

(6) Remove lifting device.

(7) Install cover plate (10) on transfer case (2) with two screws (11).

8-2. TRANSFER CASE CONTAINER UNPACKING/PACKING (CONT)

d. Upper Container Installation

WARNING

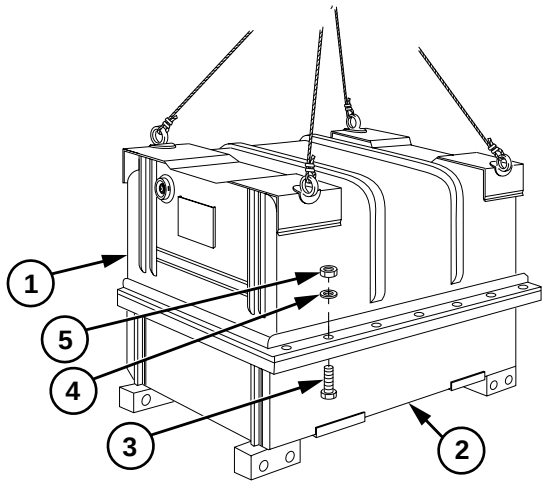
Keep out from under heavy parts. Falling parts may result in serious injury.

(1) Install upper container (1) on lower container (2).

NOTE

When tightening nuts, use criss-cross pattern working around container.

(2) Install 20 screws (3), washers (4), and nuts (5) in upper container (1) and lower container (2). Torque to 31–37 lb–ft (42–50 N·m).



8-3. TRANSFER CASE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transfer case in LOW range (TM 9-2320-360-10).
Transfer case input shaft removed (TM 9-2320-360-20).
Front axle propshaft removed (TM 9-2320-360-20).
No. 2 axle input propshaft removed (TM 9-2320-360-20).
No. 5 air reservoir removed (TM 9-2320-360-20).
Transfer case drained (LO 9-2320-360-12).

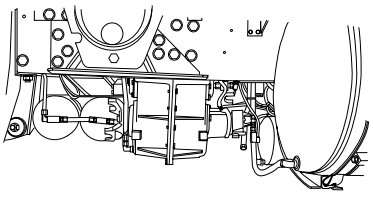
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Dolly Type), 10-Ton (Item 90, Appendix E)
Lift, Transmission and Differential (Item 95, Appendix E)
Jackstands, 7-Ton (2) (Item 93, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

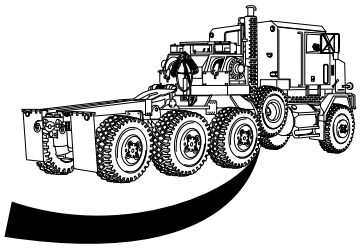
Materials/Parts
Adhesive-Sealant (Item 3, Appendix B)
Adhesive-Sealant (Item 5, Appendix B)
Adhesive-Sealant (Item 6, Appendix B)
Grease, Anticorrosion (Item 31, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Fasteners, Ratchet (7) (Item 11, Appendix F)
Locknuts (4) (Item 87, Appendix F)
Lockwashers (2) (Item 119, Appendix F)
Lockwasher (Item 117, Appendix F)
Pin, Cotter (Item 218, Appendix F)

Personnel Required
Two

Special Environmental Conditions
HET Tractor parked on hard, level surface.

a. Removal





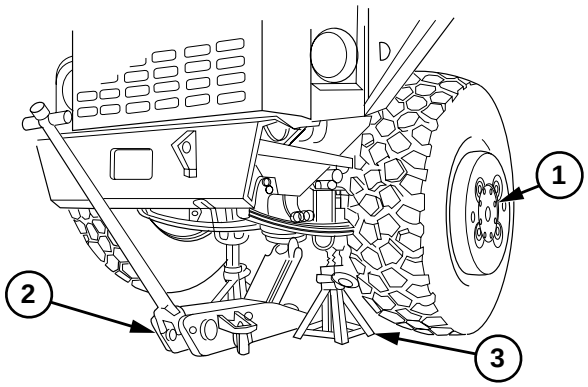
WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.

NOTE

There must be 42 in. (104 cm) between bottom of right frame rail and ground to remove transfer case.

(1) Raise axle no. 1 with floor jack (2) and support axle (1) with two jackstands (3).



8-3. TRANSFER CASE REPLACEMENT (CONT)

NOTE

Location of plastic cable ties should be marked before removal.

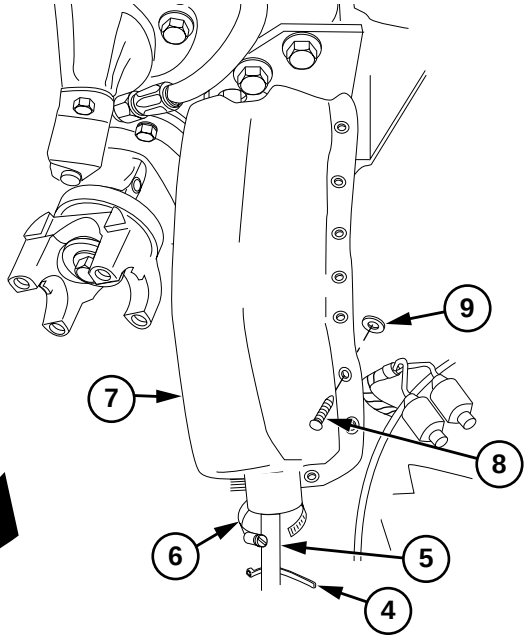
(2) Remove plastic cable ties (4) from cable (5).

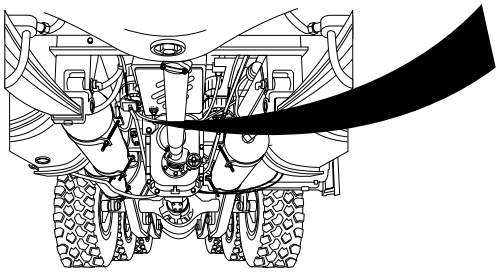
(3) Remove clamp (6) from rubber boot (7) under cab.

(4) Cut seven ratchet fasteners (8) above washers (9).

(5) Remove seven washers (9) and fasteners (8) from boot (7). Discard fasteners.

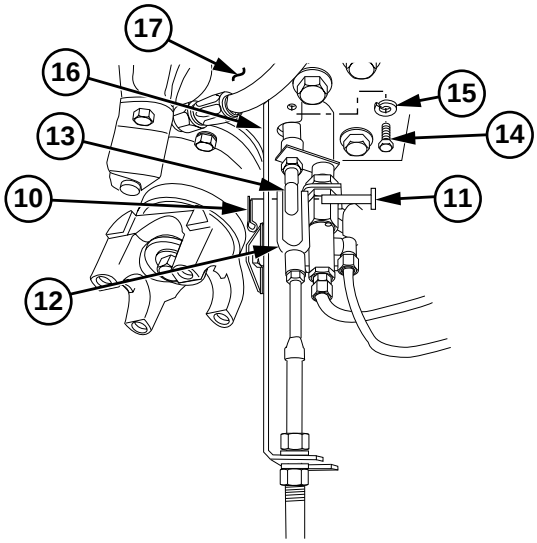
(6) Remove boot (7) from cable (5).

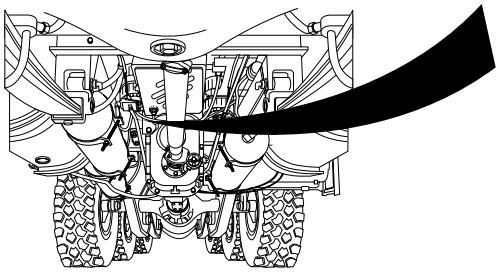




(7) Remove cotter pin (10), pin (11), and yoke (12) from link (13). Discard cotter pin.

(8) Remove two screws (14), lockwashers (15), and bracket (16) from transfer case (17). Discard lockwashers.





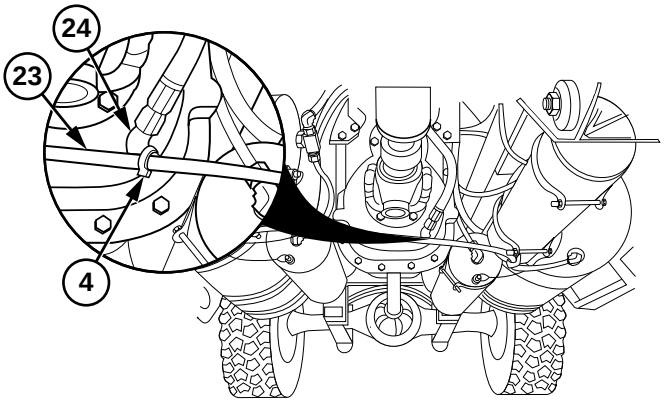
(9) Lift and slide boot (18) from sending unit (19).

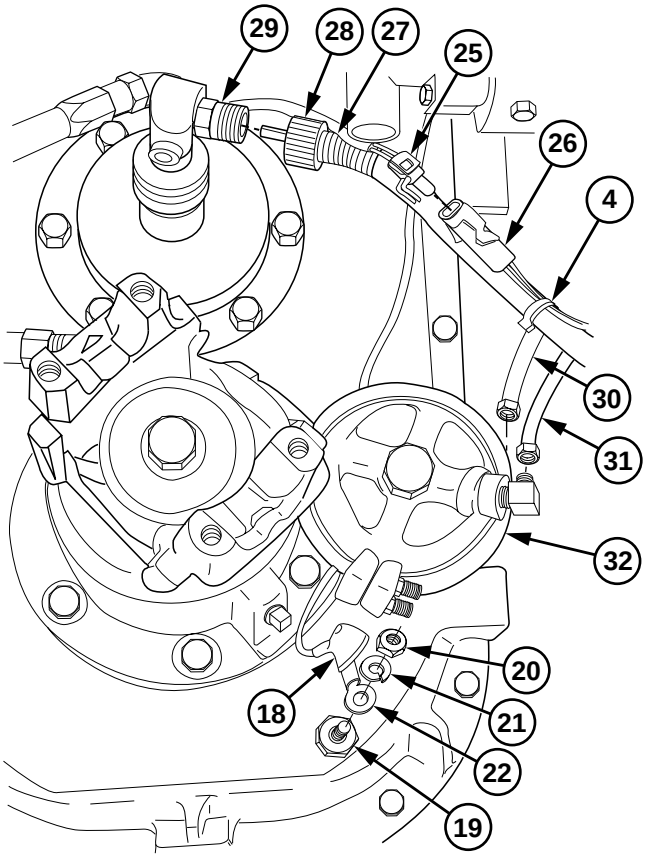
(10) Remove nut (20), lockwasher (21), and wire (22) from sending unit (19). Discard lockwasher.

NOTE

Location of plastic cable ties should be marked before removal.

(11) Remove plastic cable ties (4) that secure fuel crossover hose (23) to elbow (24).

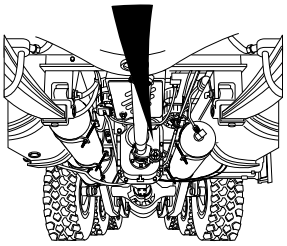




NOTE

Fuel crossover hose must be positioned at front end of transfer case to aid in removal of transfer case.

(12) Disconnect electrical connector (25) from electrical connector (26).



NOTE

Location of plastic cable ties should be marked before removal.

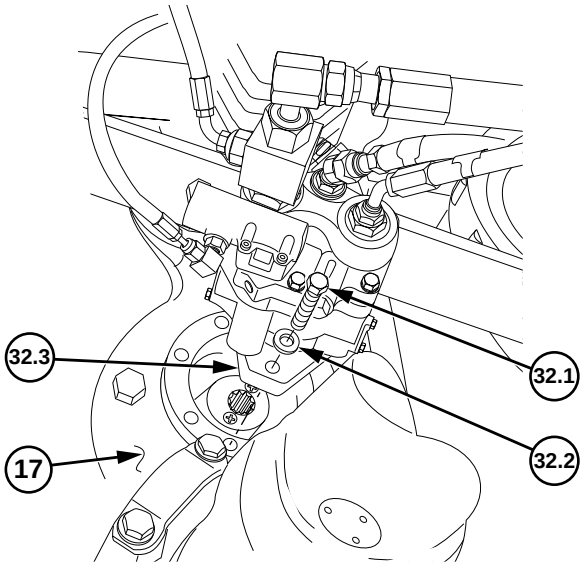
(13) Remove plastic cable ties (4) that secure electrical connector (26) to speedometer cable (27).

(14) Turn cap (28) counterclockwise and remove speedometer cable (27) from speedometer sending unit (29).

(15) Remove hose no. 2874 (30) and hose no. 2769 (31) from shift chamber (32).

(15.1) Remove two screws (32.1), washers (32.2), and auxiliary steering pump (32.3) from transfer case (17).

(15.2) Secure steering pump (32.3) away from transfer case (17).



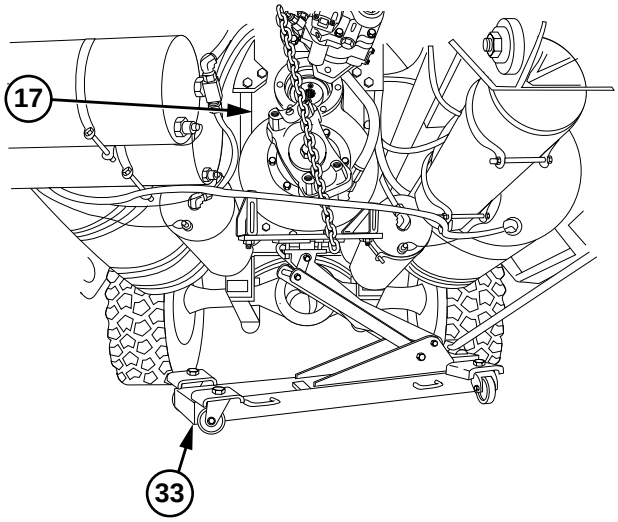
8-3. TRANSFER CASE REPLACEMENT (CONT)

WARNING

Transfer case weighs 965 lb (438 kg). Keep out from under transfer case when supported by lifting device to prevent serious injury to personnel.

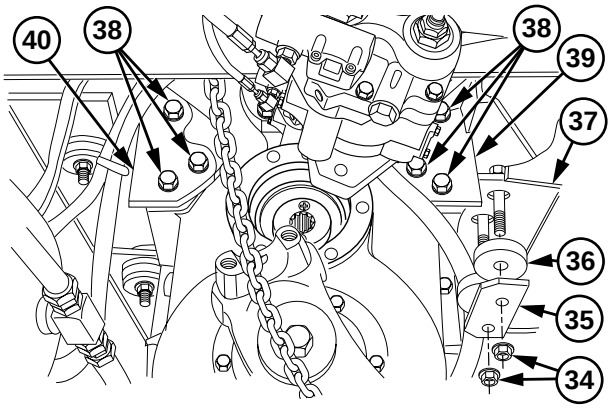
(16) Position transmission lift (33) under center of transfer case (17).

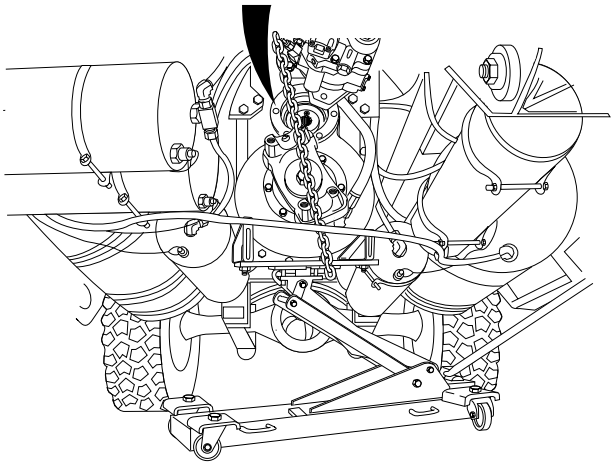
(17) Secure transfer case (17) to transmission lift (33).



(18) Remove two locknuts (34), plate (35), and two mounting biscuits (36) from right transfer case mounting bracket (37). Discard locknuts.

(19) Loosen, but do not remove, 12 screws (38) from front and back of right and left transfer case support brackets (39 and 40).





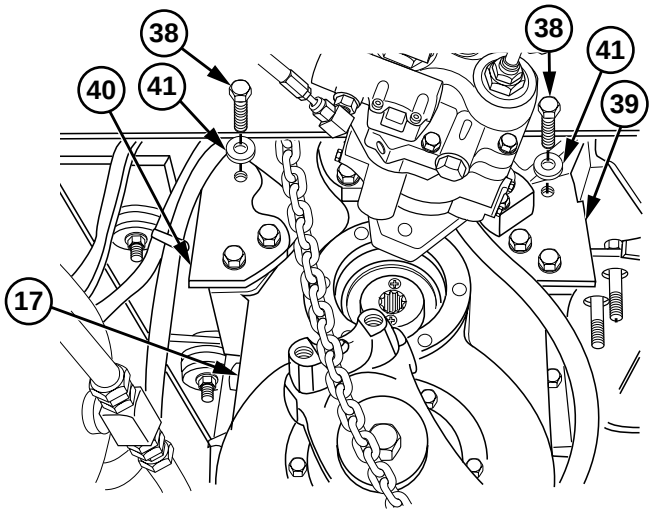
(20) Remove six screws (38) and washers (41) from front and back of left transfer case support bracket (40).

(21) Remove six screws (38) and washers (41) from front and back of right transfer case support bracket (39).

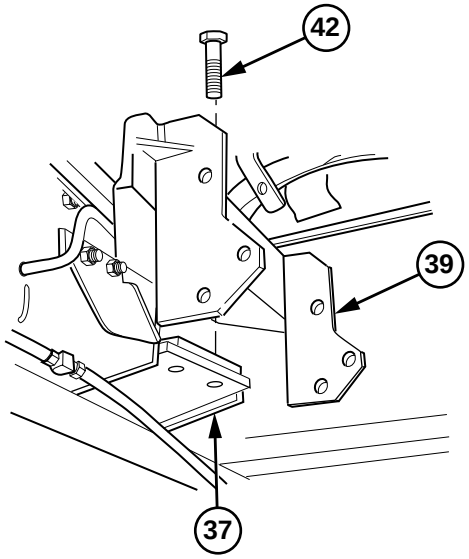
WARNING

Right transfer case bracket may drop from mounting bracket as transfer case is lowered. Keep out from below HET Tractor to prevent serious injury.

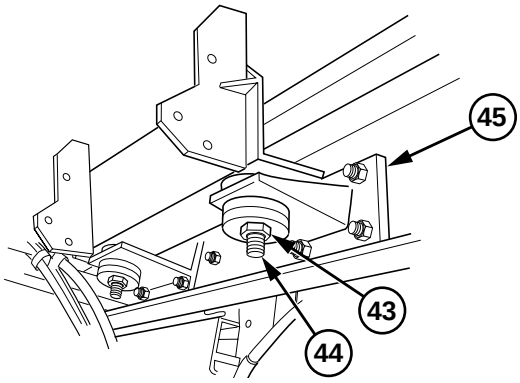
(22) Lower transfer case (17) and remove from under vehicle.



(23) Remove two screws (42) and right transfer case support bracket (39) from mounting bracket (37).



(24) Loosen, but do not remove, two locknuts (43) on two screws (44) on left transfer case mounting bracket (45).



8-3. TRANSFER CASE REPLACEMENT (CONT)

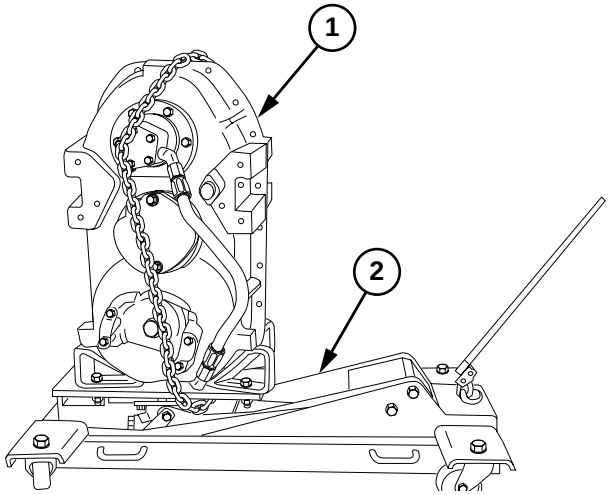
b. Installation

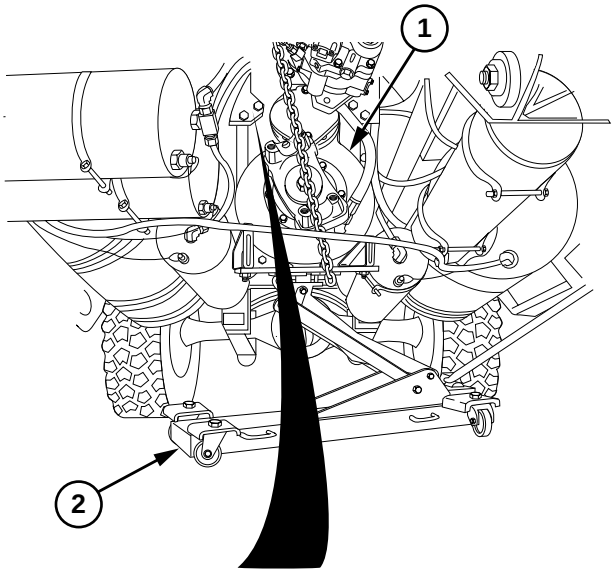
WARNING

Transfer case weighs 965 lb (438 kg). Keep out from under transfer case when supported by lifting device to prevent serious injury to personnel.

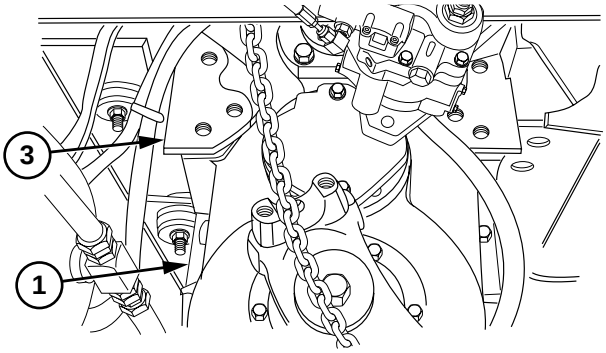
(1) Position transfer case (1) on transmission lift (2).

(2) Secure transfer case (1) to transmission lift (2).





(3) Raise transmission lift (2) and align transfer case (1) in left transfer case support bracket (3) with aid of assistant.



WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(4) Coat threads of six screws (4) with adhesive-sealant (Item 5, Appendix B).

(5) Install six washers (5) and screws (4) through front and back of left transfer case support bracket (3) and into transfer case (1). Do not tighten.

(6) Coat threads of six screws (6) with adhesive-sealant (Item 5, Appendix B).

(7) Install right transfer case support bracket (7) on transfer case (1) with six washers (8) and screws (6). Do not tighten.

(8) Tighten 12 screws (4 and 6) to 187 lb-ft (252 N·m).

(9) Install two screws (9) through right transfer case support bracket (7) and right transfer case mounting bracket (10).

(10) Lower transfer case (1) on mounting bracket (10) and remove transmission lift (2).

(11) Install two mounting biscuits (11), one plate (12), and two new locknuts (13) on right mounting bracket (10). Torque to 212 lb-ft (286 N·m).

(12) Remove two locknuts (14) from two screws (15) on left transfer case support bracket (3) and replace with new locknuts (14). Torque to 212 lb-ft (286 N·m).

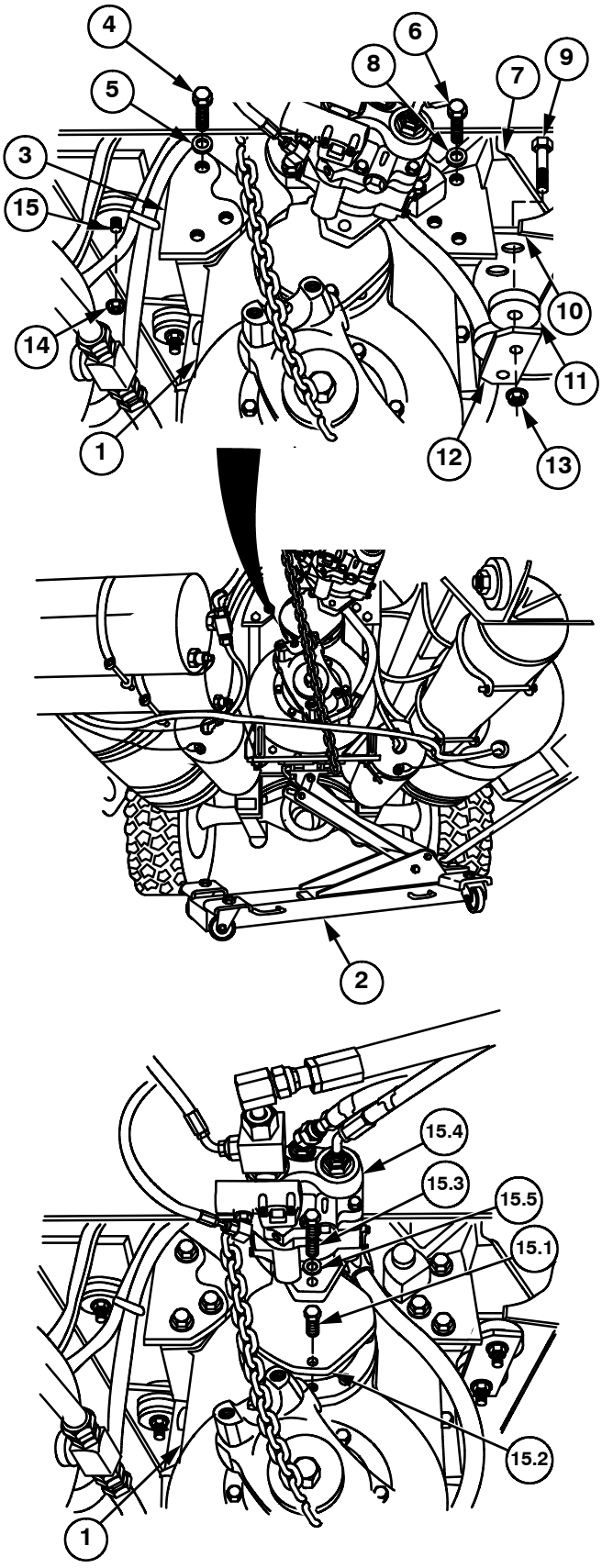
NOTE

- Do step (12.1) if new transfer case is being installed.
- Save cover plate for use with old transfer case.

(12.1) Remove two screws (15.1) and cover plate (15.2) from transfer case (1).

(12.2) Coat threads of two screws (15.3) with adhesive-sealant (Item 6, Appendix B).

(12.3) Coat face of auxiliary steering pump (15.4) with adhesive-sealant (Item 3, Appendix B) and install on transfer case (1) with two washers (15.5) and screws (15.3).



8-3. TRANSFER CASE REPLACEMENT (CONT)

(13) Install hose no. 2874 (16) and hose no. 2769 (17) on shift chamber (18).

NOTE

Tab on speedometer cable must be aligned with slot in speedometer adapter.

(14) Install speedometer cable (19) on speedometer drive housing (20).

(15) Connect electrical connector (21) to electrical connector (22).

NOTE

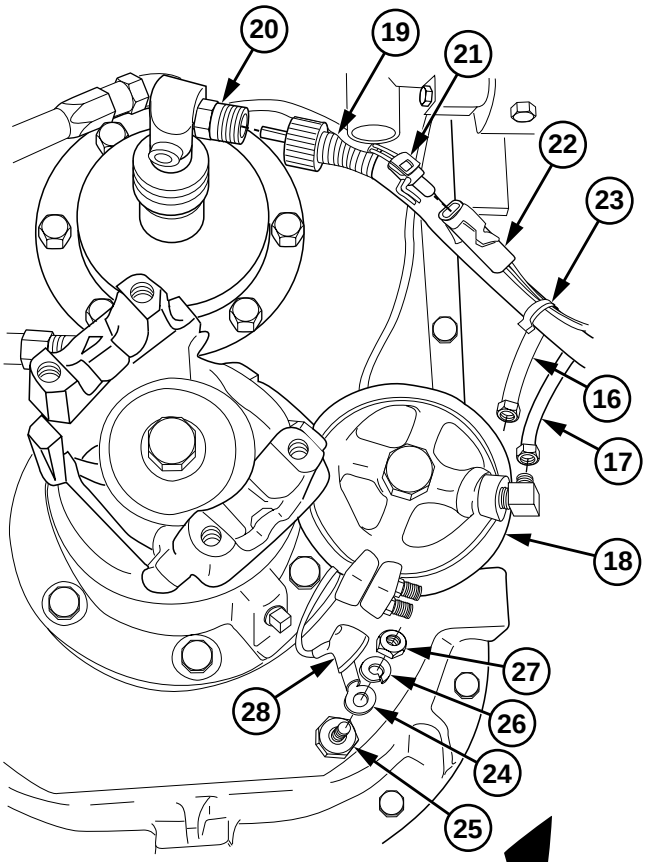
Plastic cable ties should be positioned in locations marked during removal.

(16) Secure electrical connector (22) to speedometer cable (19) with plastic cable tie (23).

(17) Install wire (24) on sending unit (25) with new lockwasher (26) and nut (27).

(17.1) Coat terminal of sending unit (25) with anticorrosion grease.

(18) Slide boot (28) on sending unit (25).



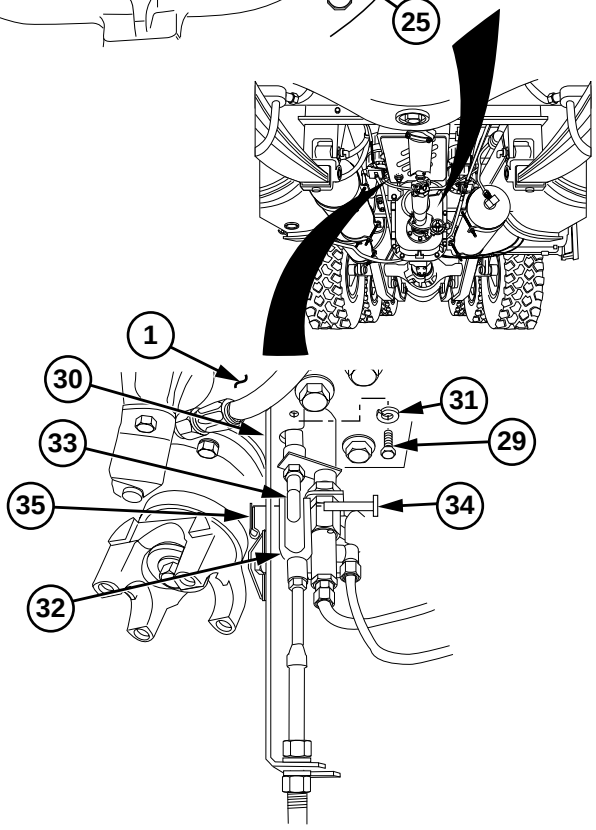
WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(19) Coat threads of two screws (29) with adhesive-sealant (Item 6, Appendix B).

(20) Install bracket (30) on transfer case (1) with two new lockwashers (31) and screws (29).

(21) Install yoke (32) on link (33) with pin (34) and new cotter pin (35).



(22) Install boot (36) on cable (37).

(23) Install seven new fasteners (38) and washers (39) on boot (36).

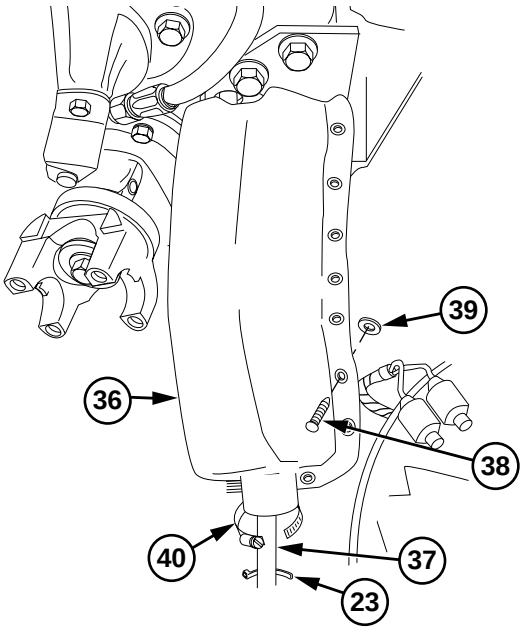
(24) Install clamp (40) on boot (36).

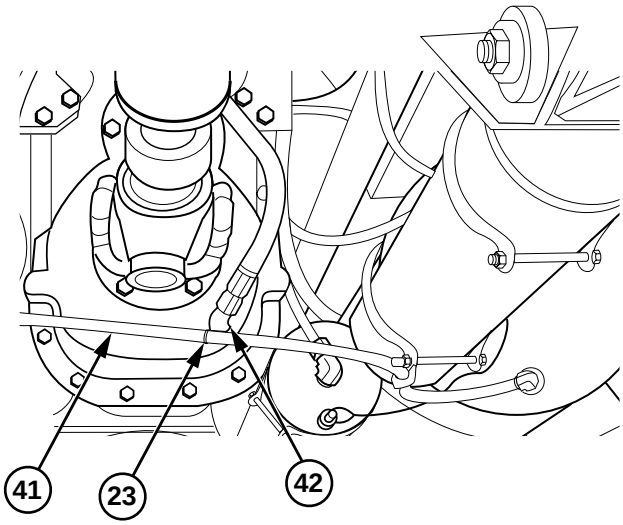
NOTE

Plastic cable ties should be positioned in locations marked during removal.

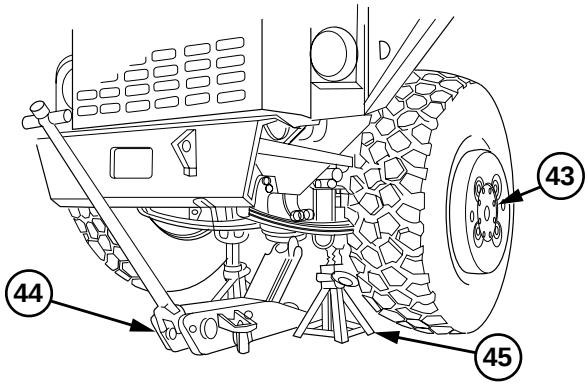
(25) Secure cable (37) with plastic cable tie (23).

(26) Secure fuel crossover tube (41) to elbow (42) with plastic cable tie (23).





(27) Raise axle no. 1 (43) with floor jack (44). Remove two jackstands (45) and lower floor jack.



c. Follow-On Maintenance

(1) Install no. 5 air reservoir (TM 9-2320-360-20).

(2) Install no. 2 axle input propshaft (TM 9-2320-360-20).

(3) Install front axle propshaft (TM 9-2320-360-20).

(4) Install transfer case input propshaft (TM 9-2320-360-20).

(5) Fill transfer case (LO 9-2320-360-12).

8-4. TRANSFER CASE SUPPORT ASSEMBLIES REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

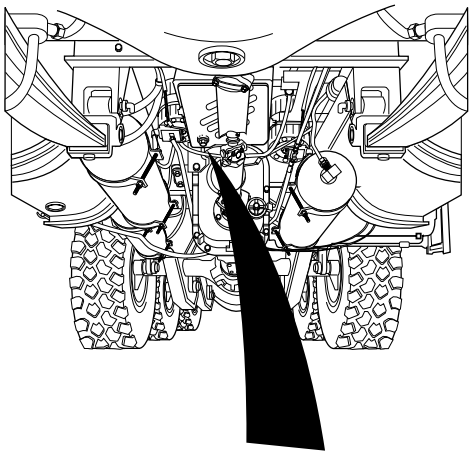
Equipment Conditions
Transfer case mounting bracket removed (para 14-12).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 5, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Fasteners, Ratchet (7) (Item 11, Appendix F)

WARNING

Do not attempt to replace both left and right brackets at the same time. Failure to comply may result in transfer case not being properly supported. Transfer case could fall and cause injury to personnel.



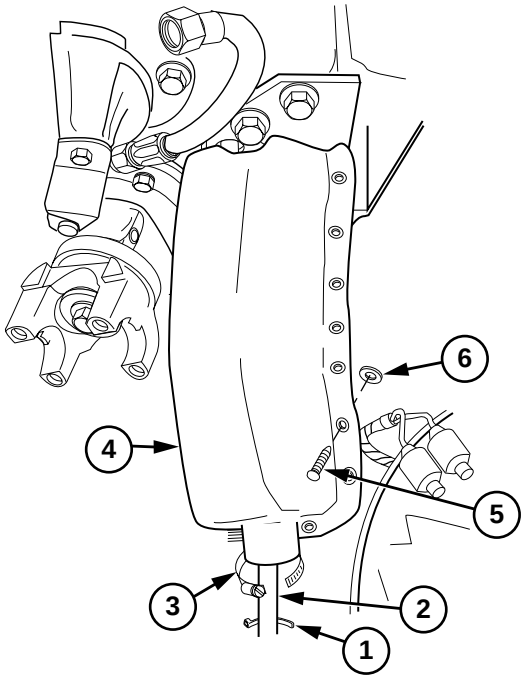
NOTE

Left and right brackets are replaced the same way.

a. Removal

NOTE

- Do steps (1) thru (5) for right bracket only.
- Location of plastic cable ties should be marked before removal.



(1) Remove plastic cable ties (1) from cable (2) as required.

(2) Remove hose clamp (3) from boot (4) under cab.

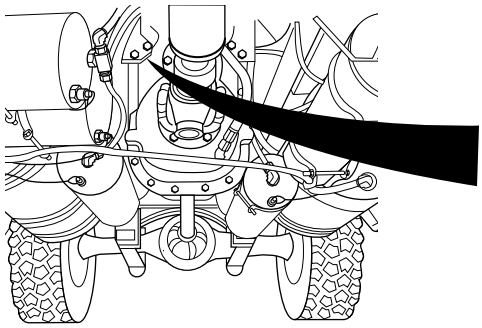
(3) Cut seven ratchet fasteners (5) above washers (6).

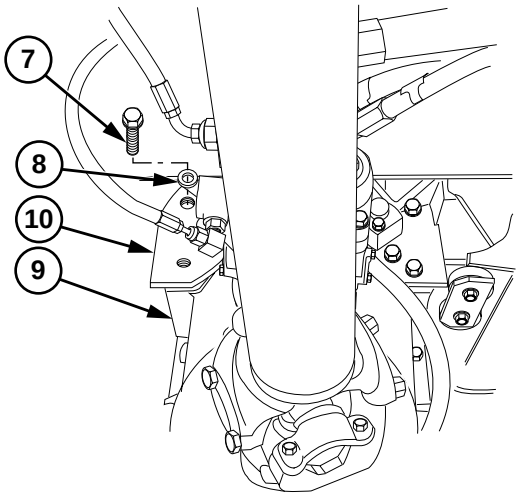
(4) Remove seven washers (6) and fasteners (5) from boot (4). Discard fasteners.

(5) Remove boot (4) from cable (2).

(6) Remove six screws (7) and washers (8) from transfer case (9).

(7) Remove bracket (10).





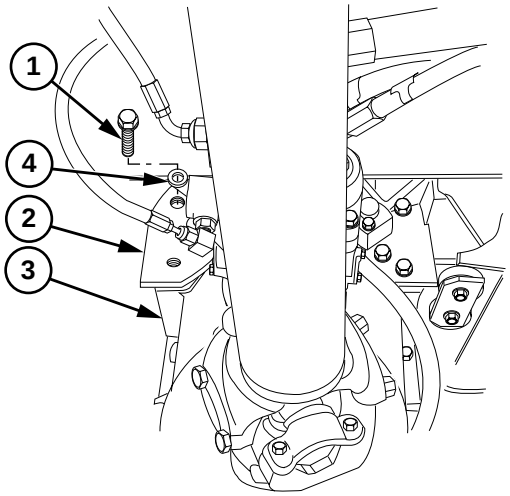
b. Installation

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(1) Coat threads of six screws (1) with adhesive-sealant.

(2) Install bracket (2) on transfer case (3) with six washers (4) and screws (1).



NOTE

Do steps (3) thru (5) for right bracket only.

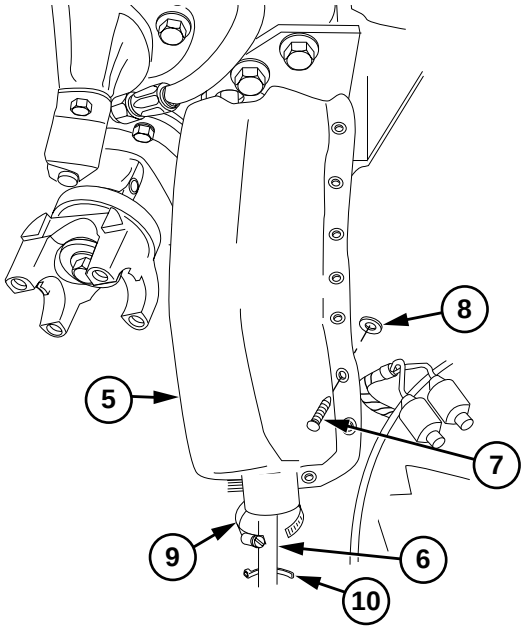
(3) Install boot (5) on cable (6) with seven new ratchet fasteners (7) and washers (8).

(4) Install clamp (9) on boot (5).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(5) Secure cable (6) with plastic cable ties (10).



c. Follow-On Maintenance

Install transfer case mounting bracket (para 14-12).

8-5. OIL SEAL AND YOKE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transfer case oil drained (LO 9-2320-360-12).
Propeller shaft removed (TM 9-2320-360-20).
Transfer case in LOW range (TM 9-2320-360-10).
Driveline selector in LOCK position (TM 9-2320-360-10).

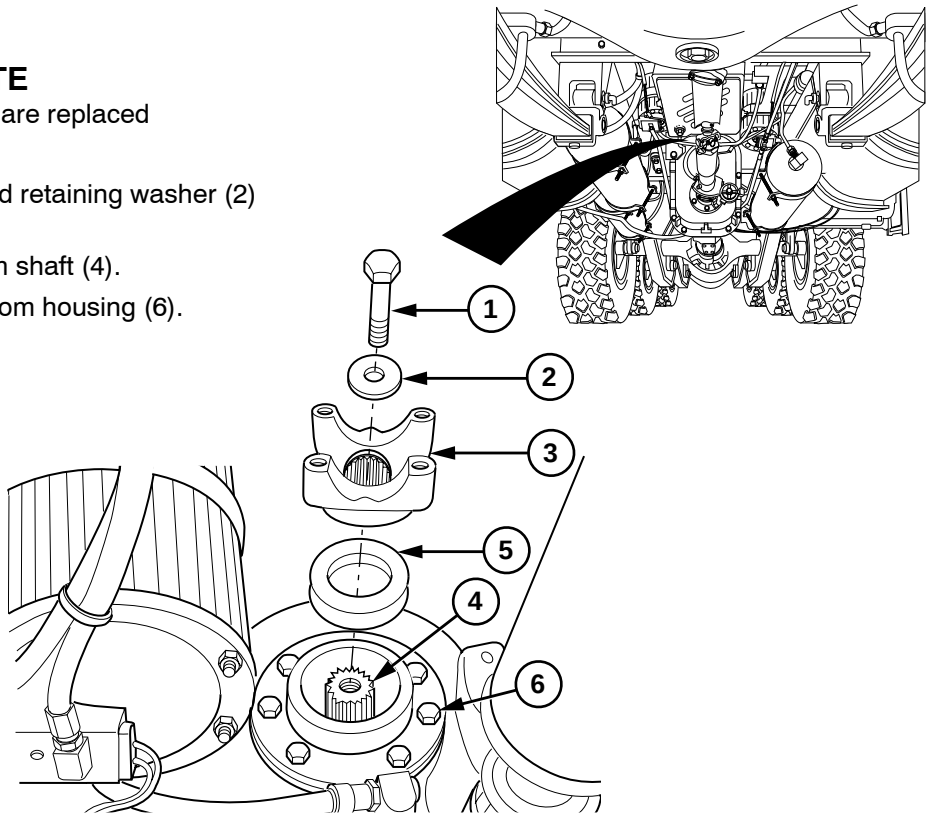
Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Adhesive-Sealant (Item 5, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Seal, Oil (Item 304, Appendix F)
Seal, Oil (Item 309, Appendix F)
Seal, Oil (Item 310, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Holder, Yoke (Figure C-15, Appendix C)
Multiplier, Torque (Item 99, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

a. Removal

NOTE
All three oil seals are replaced the same way.

(1) Remove screw (1) and retaining washer (2) from yoke (3).
(2) Remove yoke (3) from shaft (4).
(3) Remove oil seal (5) from housing (6). Discard seal.



b. Installation

(1) Coat lip of new oil seal (1) with grease.

(2) Install new oil seal (1) in housing (2).

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(3) Coat end surface of shaft (3) with silicone adhesive-sealant.

(4) Install and seat yoke (4) against shaft (3).

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(5) Coat threads of screw (5) with adhesive-sealant.

(6) Install retaining washer (6) and screw (5) on yoke (4). Torque to values given in table 8-1.

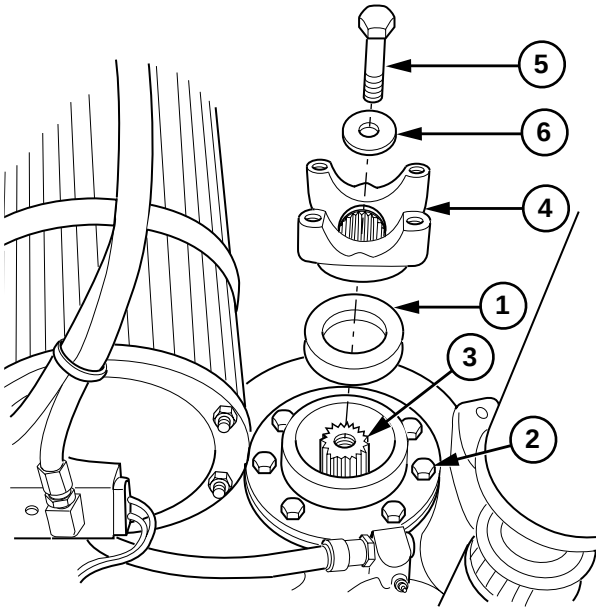


Table 8-1. Torque Values

YOKE	TORQUE (LB-FT)	TORQUE (N·m)
Rear Output	308	418
Front Output	375	508
Front Input	375	508

c. Follow-On Maintenance

(1) Install propeller shafts (TM 9-2320-360-20).

(2) Fill transfer case with oil (LO 9-2320-360-12).

8-7. LUBRICATION PUMP REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)
Vise, Machinist's (Item 207, Appendix E)

Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Lockwashers (4) (Item 119, Appendix F)

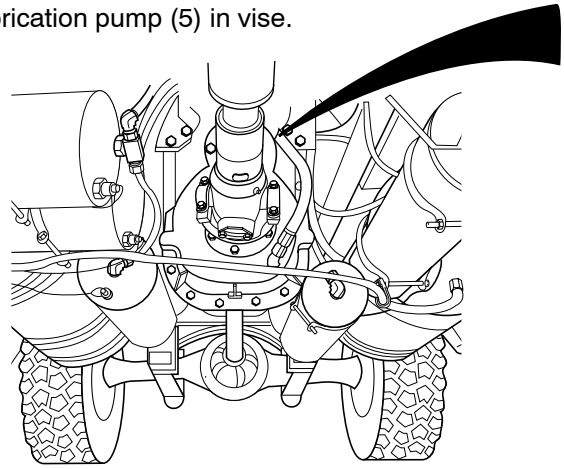
a. Removal

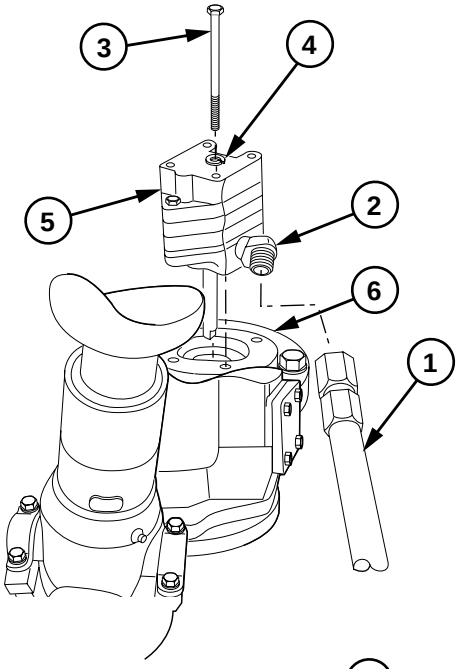
(1) Disconnect lubrication hose no. 2831 (1) from fitting (2).

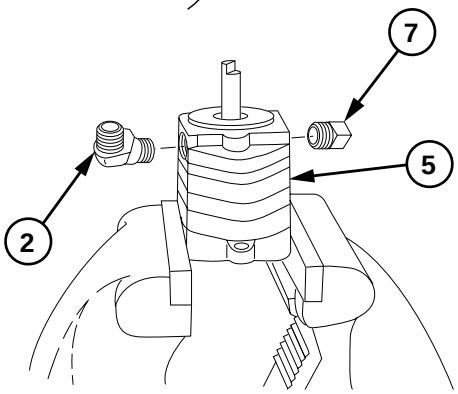
(2) Remove four screws (3) and lockwashers (4) from lubrication pump (5). Discard lockwashers.

(3) Remove lubrication pump (5) from bearing cover (6).

(4) Place lubrication pump (5) in vise.







(5) Remove fitting (2) from lubrication pump (5).

(6) Remove plug (7) from lubrication pump (5).

b. Installation

WARNING

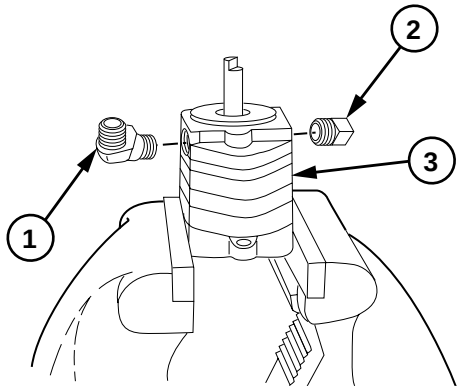
Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Coat threads of fitting (1) and plug (2) with pipe thread sealing compound.

NOTE

Lubrication pump is marked with a D and S side. Fitting is installed on S of lubrication pump. Plug is installed on D of pump.

(2) Install fitting (1) and plug (2) on lubrication pump (3).



WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

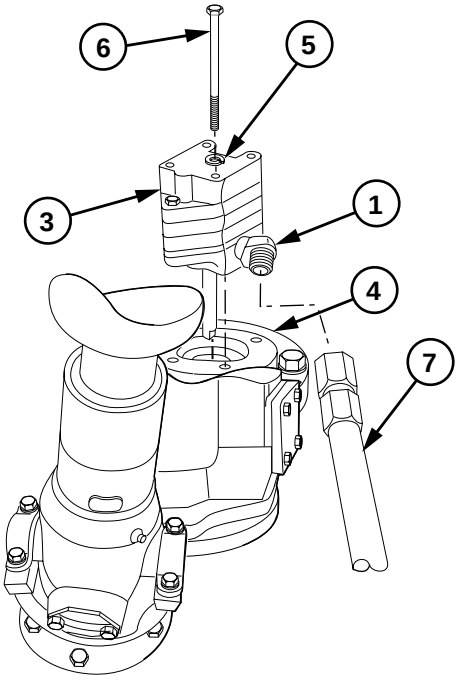
(3) Coat pump mounting surface of bearing cover (4) with silicone adhesive-sealant.

NOTE

Ensure spline on shaft engages slot on drive plate when doing step (4).

(4) Install lubrication pump (3) on bearing cover (4) with four new lockwashers (5) and screws (6). Torque to 180 lb-in. (20 N·m).

(5) Connect lubrication hose no. 2831 (7) on fitting (1).



c. Follow-On Maintenance

Remove wheel chocks.

CHAPTER 9
FRONT AXLE MAINTENANCE

Contents

	Para	Page
Introduction	9-1	9-1
Axle No. 1 Replacement	9-2	9-2
Axle No. 1 Oil Seal and Yoke Replacement	9-3	9-11
Axle No. 1 Pivot, Spindle, and Axle Shaft Repair	9-4	9-13

Section I. INTRODUCTION

9-1. INTRODUCTION

This chapter contains maintenance instructions for replacement and repair of axle no. 1 at the Direct Support maintenance level. Some subassemblies and parts must be removed before the axle and components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

9-2. AXLE NO. 1 REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Steering wheel turned full left.
Front bumper removed (TM 9-2320-360-20).
Front shock absorbers removed (TM 9-2320-360-20).
Front differential and wheel ends drained (LO 9-2320-360-12).
Transfer case to axle no. 1 propeller shaft removed (TM 9-2320-360-20).
Brake drums removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 3/4 In. Female - 1 In. Male (Item 6, Appendix E)
Jack, Floor, 10-Ton (Item 90, Appendix E)
Jack Kit, Hydraulic Hand (Item 92, Appendix E)
Jackstands (4) (Item 93, Appendix E)
Lift, Transmission and Differential (Item 95, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Tape, Measuring, 12 ft (Item 189, Appendix E)

Tools and Special Tools (Cont)
Wrench Set, Socket, 3/4 In. (Item 231, Appendix E)
Wrench, Impact, Electric, 1 In. (Item 223, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Oil, Lubricating (Item 48, Appendix B)
Lockwashers (8) (Item 133, Appendix F)
Lockwashers (4) (Item 122, Appendix F)
Pin, Cotter (Item 219, Appendix F)

Special Environmental Conditions
HET Tractor parked on hard, level surface.

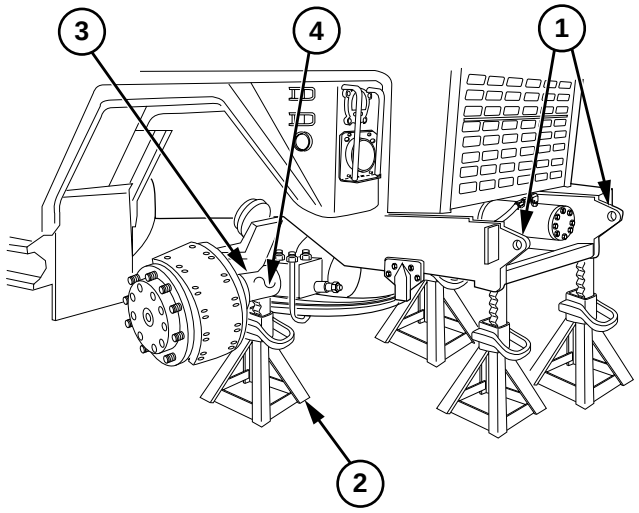
Personnel Required
Two

a. Removal

(1) Raise HET Tractor until bottom of tow eyes (1) are a minimum of 28 in. (71 cm) above the ground.

(2) Place jackstands (2) under front tow eyes (1) and lower HET Tractor on jackstands (2).

(3) Place jackstands (2) under both axle housing ends (3). Support axle (4) on jackstands (2).



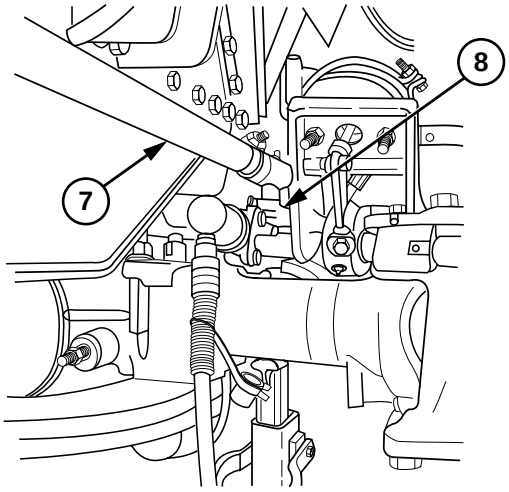
WARNING

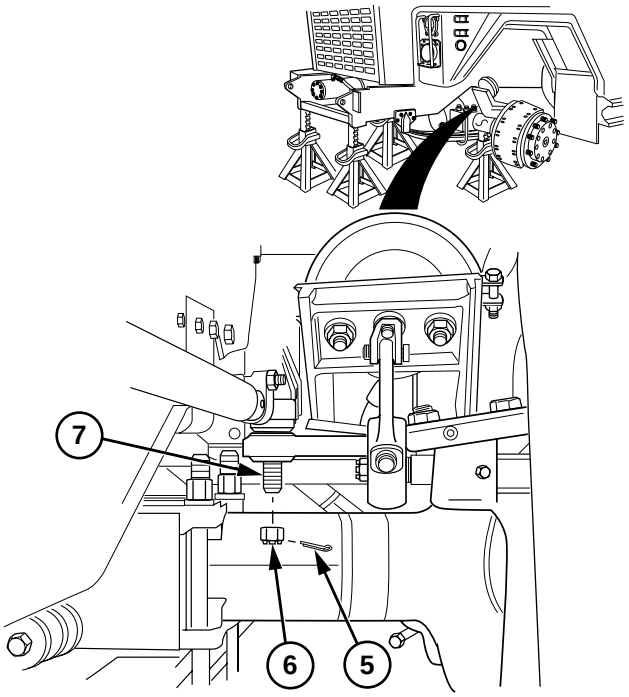
Drag link must be supported after removing hardware to prevent it from falling. Failure to comply may result in injury to personnel.

(4) Remove cotter pin (5) from nut (6). Discard cotter pin.

(5) Remove nut (6) from drag link (7).

(6) Remove drag link (7) from axle steering arm (8) using hydraulic hand jack.



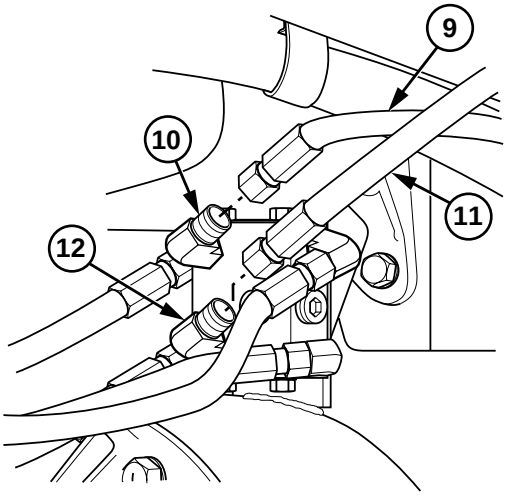


(7) Remove hose no. 2543 (9) from fitting (10).

(8) Remove hose no. 2102 (11) from fitting (12).

WARNING

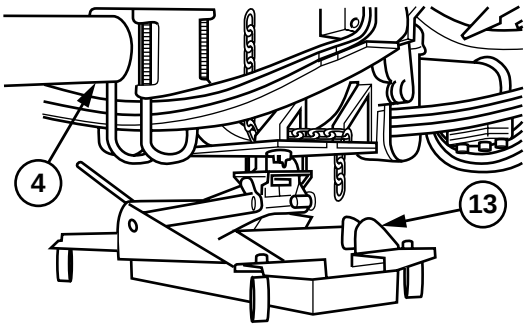
- **Axle/suspension weighs 1975 lb (897 kg). Keep hands and feet out from under axle. Failure to comply may result in injury or death to personnel.**
- **Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.**



(9) Position transmission lift (13) under axle (4).

(10) Secure axle (4) to transmission lift (13).

(11) Raise transmission lift (13) to support axle (4).

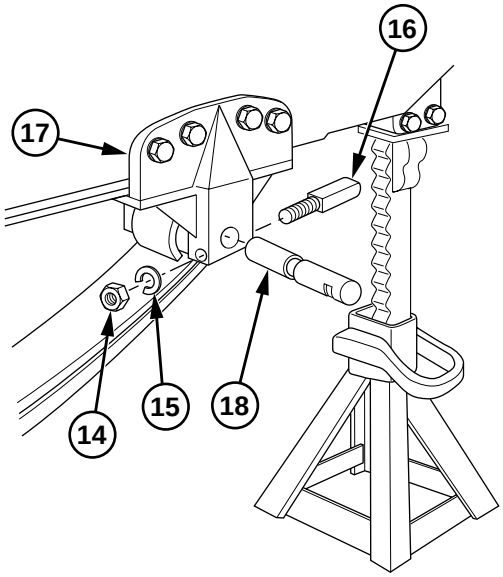


9-2. AXLE NO. 1 REPLACEMENT (CONT)

NOTE

Right and left side spring pins are replaced the same way. Right side is shown.

(12) Remove two nuts (14), lockwashers (15), and spring lock pins (16) from front brackets (17). Discard lockwashers.



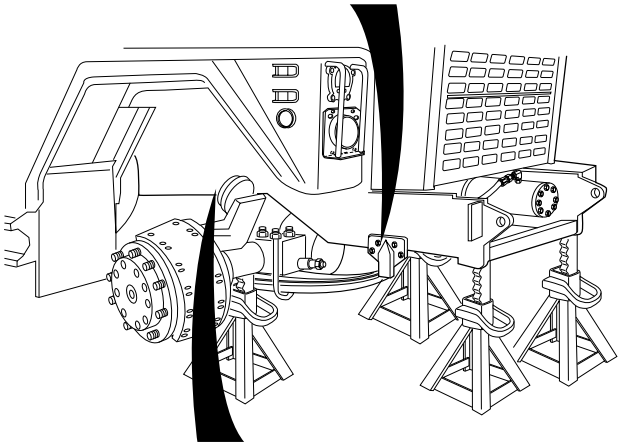
WARNING

Keep fingers out of pin hole in spring brackets and spring eyes when removing spring pins. Failure to comply may result in injury to personnel.

CAUTION

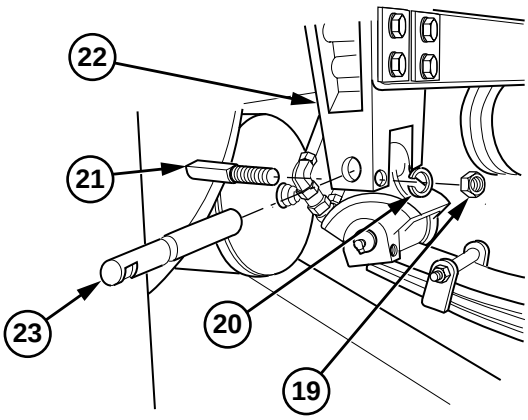
Do not strike spring pin on grease fitting end. Grease fitting may be damaged.

(13) Remove two spring pins (18) from front brackets (17).



(14) Remove two nuts (19), lockwashers (20), and spring lock pins (21) from rear brackets (22). Discard lockwashers.

(15) Remove two spring pins (23) from rear brackets (22).

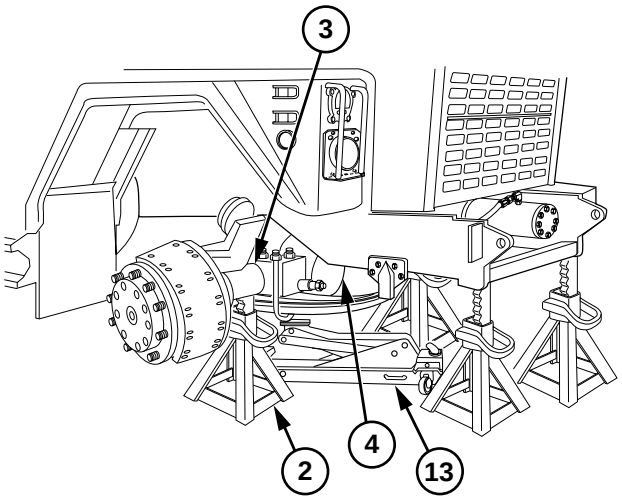


(16) Raise axle (4) and remove jackstands (2) from housing ends (3).

WARNING

Axle/suspension weighs 1975 lb (897 kg). Keep hands and feet out from under axle. Failure to comply may result in injury or death to personnel.

(17) Lower lift (13) and remove axle (4) from HET Tractor with aid of assistant.



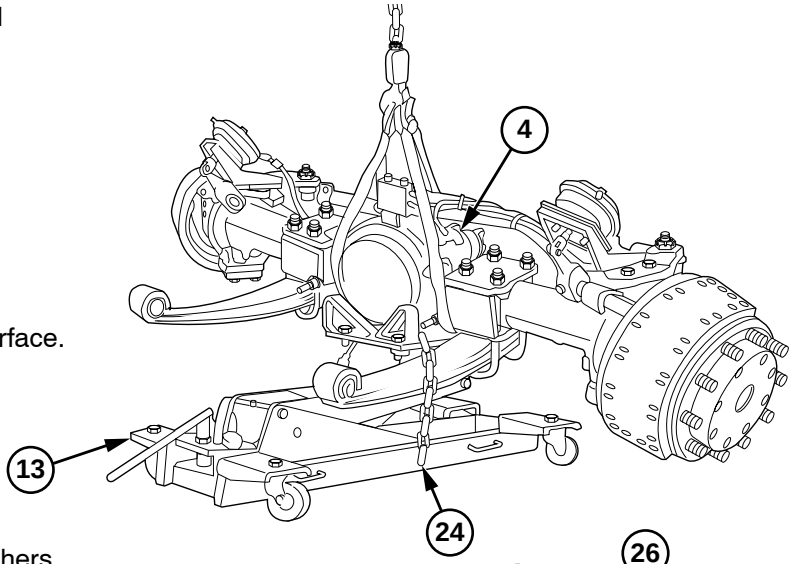
(18) Remove chain (24) from axle (4) and transmission lift (13).

CAUTION

Keep lifting device clear of springs and U-bolts. Failure to comply may result in equipment damage.

(19) Attach lifting device to axle (4).

(20) Lift axle (4) and set on hard, level surface.



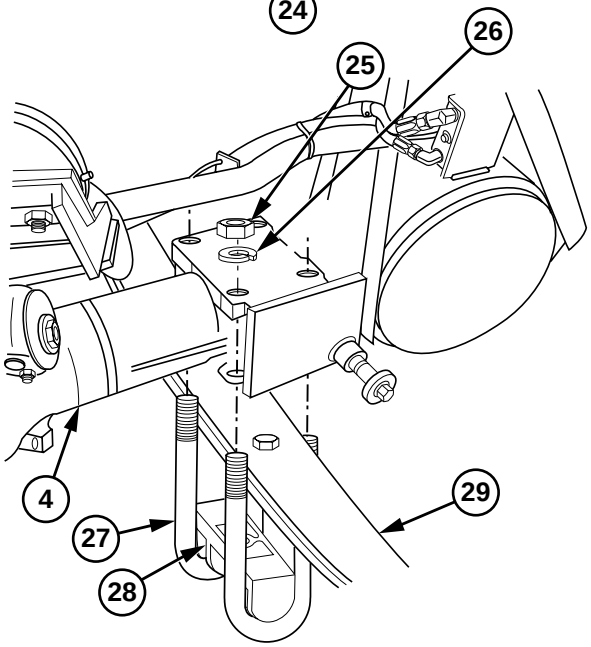
(21) Remove eight nuts (25) and lockwashers (26) from four U-bolts (27). Discard lockwashers.

WARNING

Spring assemblies weigh 192 lb (87 kg). Keep hands and feet out from under spring assemblies. Failure to comply may result in injury to personnel.

(22) Lift axle (4) with lifting device and remove four U-bolts (27), two spring shoes (28), and springs (29) from axle (4).

(23) Lower axle (4) and remove lifting device.

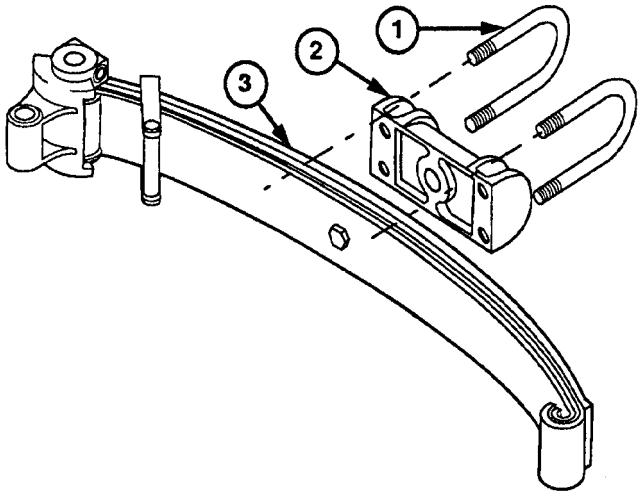


9-2. AXLE NO. 1 REPLACEMENT (CONT)

b. Installation

WARNING

Spring assemblies weigh 192 lb (87 kg). Keep hands and feet out from under spring assemblies. Failure to comply may result in injury to personnel.



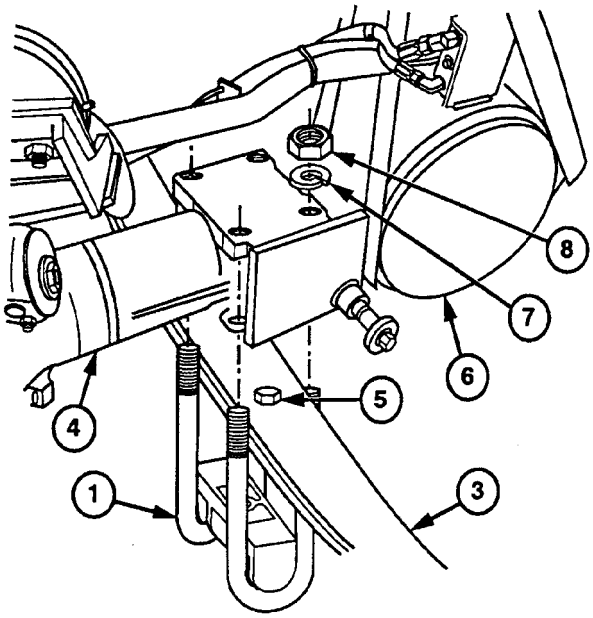
NOTE

- U-bolts have a slight bow. U-bolts must be installed so they bow toward center of spring.
- Spring center bolt must align with hole in spring shoe.

(1) Position four U-bolts (1) on two spring shoes (2) and install on two springs (3) with aid of assistant.

WARNING

Axle weighs 1625 lb (738 kg). Keep hands and feet out from under axle. Failure to comply may result in injury or death to personnel.



(2) Attach lifting device to axle (4).

(3) Lift axle (4) enough to allow placement of springs (3) under axle (4).

NOTE

Spring center bolt must align with hole in bottom of axle.

(4) Lower axle (4) and position center bolt (5) of spring (3) in aligning hole on axle differential (6) with aid of assistant.

(5) Install four new lockwashers (7) and nuts (8) on two U-bolts (1) of spring (3).

(6) Repeat steps (4) and (5) for remaining spring (3).

(7) Tighten eight nuts (8) to 450-550 lb-ft (610-746 N·m).

WARNING

Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.

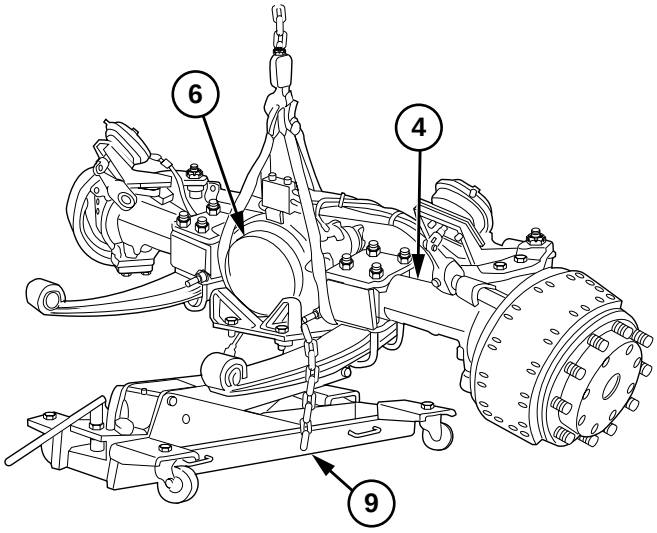
(8) Raise axle (4) and position transmission lift (9) under axle differential (6).

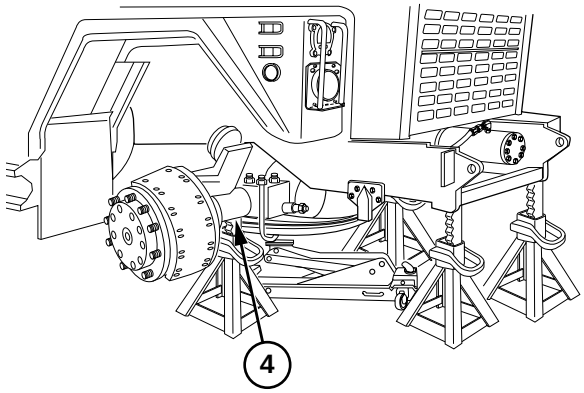
(9) Position axle (4) on transmission lift (9).

(10) Secure axle (4) to transmission lift (9).

(11) Remove lifting device from axle (4).

(12) Position axle (4) under HET Tractor with aid of assistant.

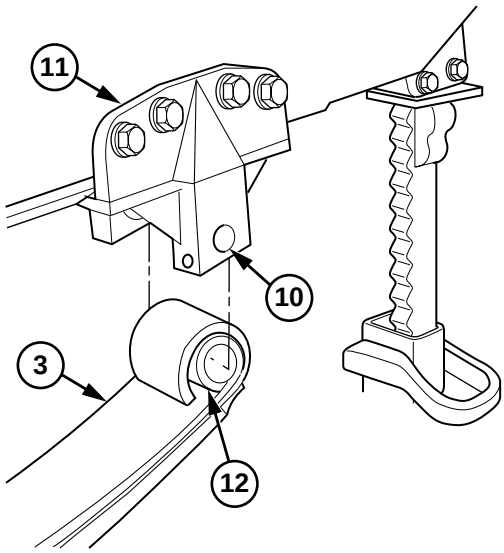


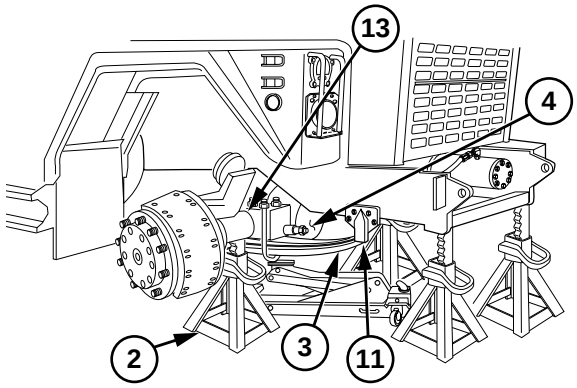


(13) Coat spring pin hole (10) in front brackets (11) and spring eyes (12) with lubricating oil.

(14) Raise axle (4) with aid of assistant, and position front of springs (3) in front brackets (11).

(15) Support axle housings (13) with jackstands (2).





9-2. AXLE NO. 1 REPLACEMENT (CONT)

WARNING

Keep fingers out of pin hole in spring brackets and spring eyes when installing spring pins. Failure to comply may result in serious injury to personnel.

CAUTION

Do not strike spring pin on grease fitting end. Grease fitting may be damaged.

NOTE

Slotted end of pin must be at outer side of spring pin hole when installed. Slot in spring pin must be at bottom of bracket and aligned with spring lock pin hole.

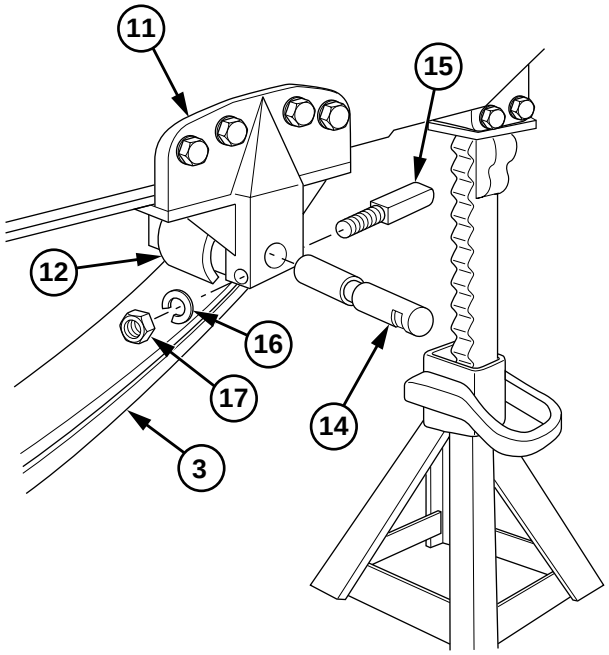
(16) Insert spring pin (14) in front bracket (11) and spring eye (12).

CAUTION

Do not allow spring lock pin to enter slot on an angle. It will wedge and gall when locked on an angle. It will become loose and allow pin to turn and wear hanger bracket, resulting in failure of pin, spring, or bracket.

NOTE

- Flat surface on spring lock pin faces up.
- Spring lock pin hole on bracket is only machined on one side. Spring lock pin must be installed on non-machined side. Lockwasher and nut must be on machined side.



(17) Insert spring lock pin (15) in front bracket (11) until key taper aligns with spring pin locking slot.

(18) Tap spring lock pin (15) to lock taper to spring pin (14).

(19) Install new lockwasher (16) and nut (17) on spring lock pin (15). Torque to 55 lb-ft (75 N·m).

(20) Repeat steps (16) thru (19) for remaining spring.

(21) Coat spring pin hole (18) in spring link (19) and spring eyes (20) with lubricating oil.

WARNING

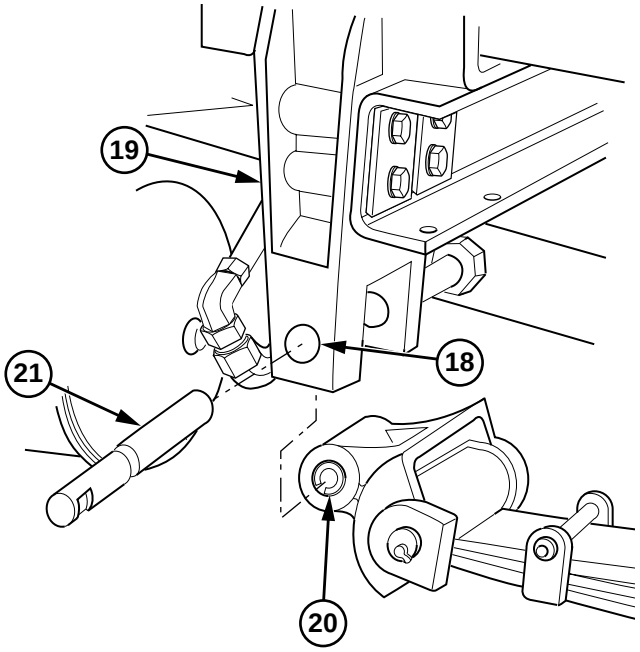
Keep fingers out of pin hole in spring brackets and spring eyes when installing spring pins. Failure to comply may result in serious injury to personnel.

CAUTION

Do not strike spring pin on grease fitting end. Grease fitting may be damaged.

NOTE

Slotted end of pin must be at outer side of spring pin hole when installed. Slot in spring pin must be at bottom of bracket and aligned with spring lock pin hole.



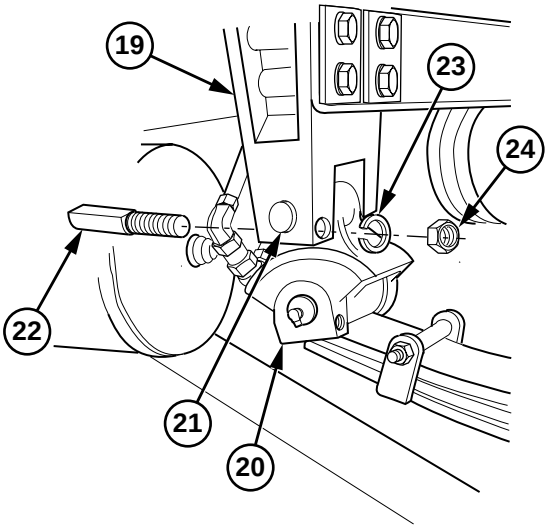
(22) Align spring link (19) with spring eye (20) and insert spring pin (21).

CAUTION

Do not allow spring lock pin to enter slot on an angle. It will wedge and gall when locked on an angle. It will become loose and allow pin to turn and wear hanger bracket, resulting in failure of pin, spring, or bracket.

NOTE

Flat surface on spring lock pin faces up.



(23) Insert spring lock pin (22) in spring link (19) until key taper aligns with spring pin locking slot.

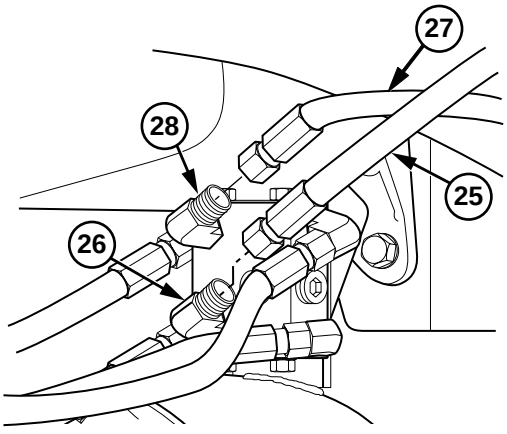
(24) Tap spring lock pin (22) to lock taper to spring pin (21).

(25) Install new lockwasher (23) and nut (24) on spring lock pin (22). Torque to 55 lb-ft (75 N·m).

(26) Repeat steps (21) thru (25) for remaining spring.

(27) Install hose no. 2102 (25) on fitting (26).

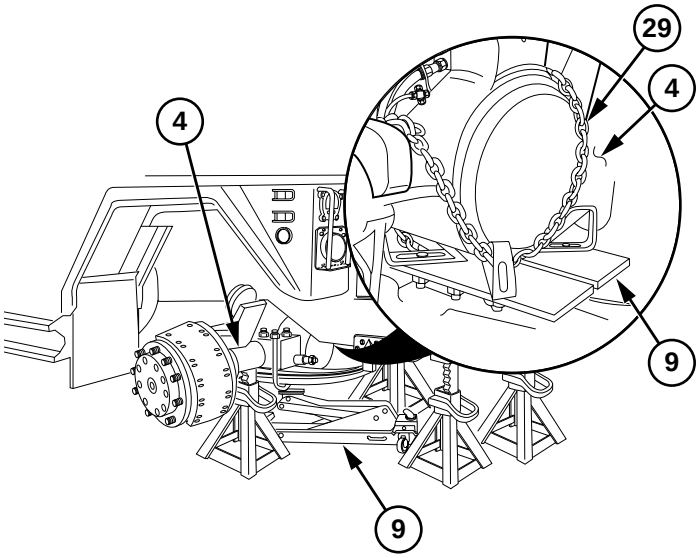
(28) Install hose no. 2543 (27) on fitting (28).



9-2. AXLE NO. 1 REPLACEMENT (CONT)

(29) Remove chain (29) from axle (4) and transmission lift (9).

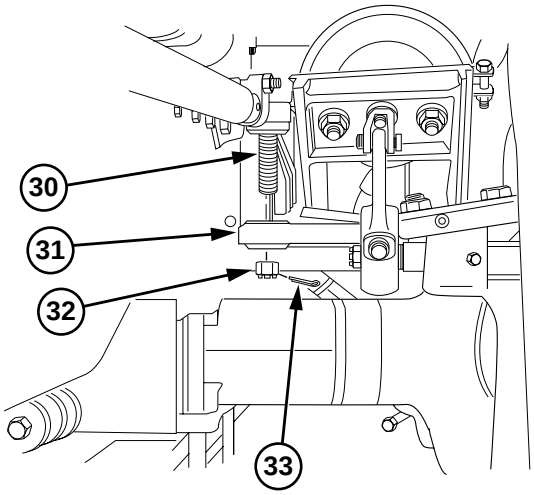
(30) Remove transmission lift (9) from under axle (4).



(31) Insert drag link (30) in steering arm (31).

(32) Install nut (32) on drag link (30). Torque to 165 lb-ft (224 N·m). Continue to tighten until hole in drag link is aligned with slot in nut.

(33) Install new cotter pin (33) through nut (32).



(34) Position floor jack (34) under axle differential (6).

(35) Raise HET Tractor and remove two jackstands (2).

(36) Lower front of HET Tractor to normal operating height and remove floor jack.

c. Follow-On Maintenance

(1) Install transfer case to axle no. 1 propeller shaft (TM 9-2320-360-20).

(2) Install front shock absorbers (TM 9-2320-360-20).

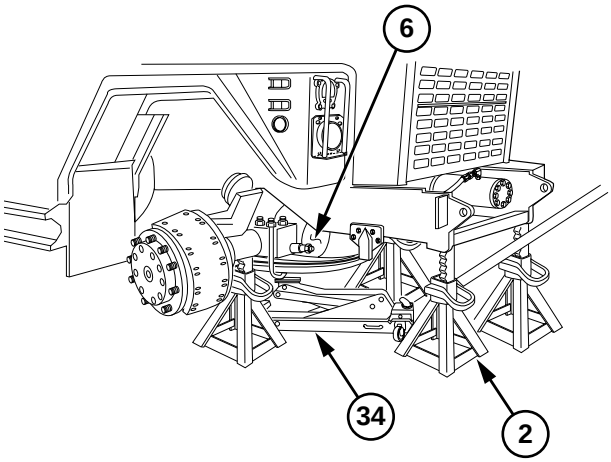
(3) Install front bumper (TM 9-2320-360-20).

(4) Fill front differential (LO 9-2320-360-12).

(5) Fill front wheel ends (LO 9-2320-360-12).

(6) Install axle no. 1 brake drums (TM 9-2320-360-20).

(7) Adjust steering system (para 13-8).



9-3. AXLE NO. 1 OIL SEAL AND YOKE REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transfer case to no. 1 axle propeller shaft removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 3/4 In. Female - 1 In. Male (Item 6, Appendix E)
Holder, Yoke (Figure C-15, Appendix C)
Multiplier, Torque (Item 99, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Socket, 55 mm (Item 163.1, Appendix E)
Wrench Set, Socket, 1 In. Drive (Item 230, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Sealant, Adhesive (Item 6, Appendix B)
Oil, Lubricating (Item 41, Appendix B)
Locknut (Item 150, Appendix F)
Seal, Oil (Item 305, Appendix F)

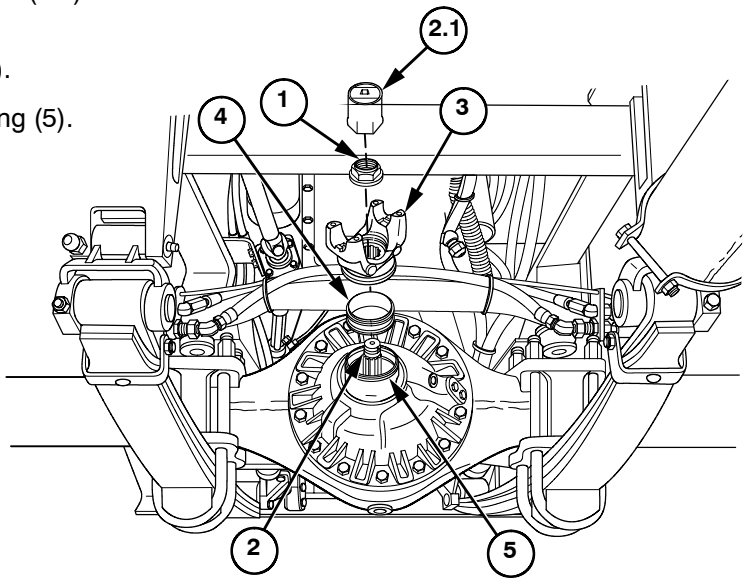
Personnel Required
Two

a. Removal

(1) Unstake and remove locknut (1) from shaft (2) using yoke holder and socket (2.1). Discard locknut.

(2) Remove yoke (3) from shaft (2).

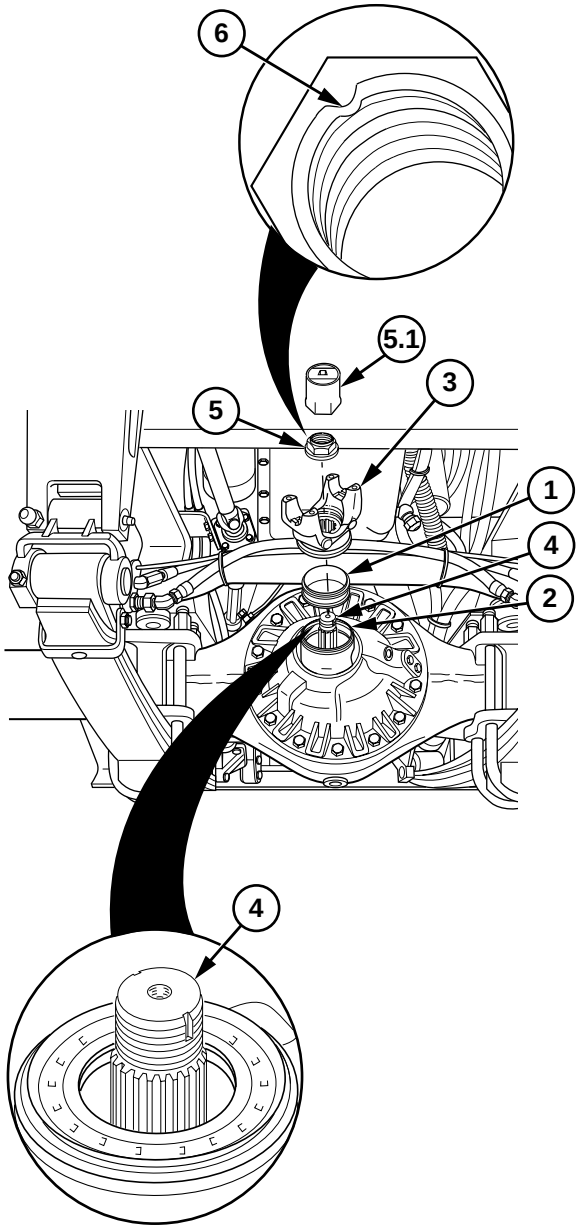
(3) Remove oil seal (4) from housing (5). Discard seal.



b. Cleaning/Inspection

Clean foreign material from housing where outside lip of seal seats.

9-3. AXLE NO. 1 OIL SEAL AND YOKE REPLACEMENT (CONT)



c. Installation

(1) Coat new oil seal (1) with lubricating oil.

NOTE

- Oil seal must be installed so that spring side is against housing.
- Oil seal is properly installed when top of seal is 1/16 in. (1.59 mm) below surface of housing.

(2) Install new oil seal (1) in housing (2).

(3) Install yoke (3) on shaft (4).

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(3.1) Coat face of yoke (3), and splines of shaft (4), with silicone adhesive sealant.

(3.2) Coat threads of new locknut (5) and threads of shaft (4) with adhesive sealant.

(4) Install new locknut (5) on shaft (4) using socket (5.1). Torque to 486-572 lb-ft (659-775 N·m) using yoke holder with aid of assistant.

(4.1) Inspect to see that adhesive has squeezed out around locknut (5). If adhesive is not visible around entire circumference, repeat steps (3.1) and (4).

(5) Stake edge (6) of locknut (5) in notches of shaft (4) directly 180 degrees apart.

d. Follow-On Maintenance

(1) Install transfer case to axle no. 1 propeller shaft (TM 9-2320-360-20).

(2) Check differential oil level. Add oil if necessary. (LO 9-2320-360-12).

9-4. AXLE NO. 1 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions

Differential drained (axle no. 1 only) (LO 9-2320-360-12).
Axle no. 1 brake bracket and camshaft removed (para 11-3).
Tie rod end removed (TM 9-2320-360-20).
Front brake chamber removed (TM 9-2320-360-20).
Drag link removed (left side only) (para 13-2).

Tools and Special Tools

Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Cover, King Pin Preload (Item 26, Appendix E)
Extractor, King Pin (Item 39, Appendix E)
Gage, Depth, Micrometer (Item 48, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Hammer, Slide (Item 64, Appendix E)
Multiplier, Torque (Item 99, Appendix E)
Pliers, Retaining Ring (Item 110, Appendix E)
Press, Hydraulic (Item 116, Appendix E)
Puller Kit, Mechanical, Slide Hammer (Item 125, Appendix E)
Socket, Sockethead Screw, 3/4 In. (Item 168, Appendix E)

Tools and Special Tools (Cont)

Wrench Set, Socket, 3/4 In. (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
Adapter, Removal Tool (Figure C-19, Appendix C)

Materials/Parts

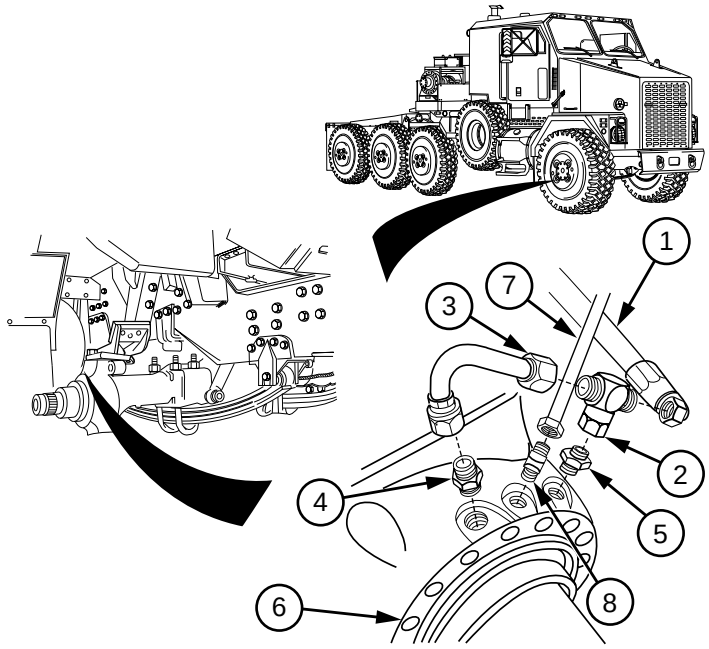
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Adhesive-Sealant (Item 4, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Cloth, Crocus (Item 16, Appendix B)
Grease, General Purpose (Item 34, Appendix B)
Oil, Lubricating (Item 44, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Tags, Identification (Item 56, Appendix B)
Cross (2) (Item 9.1, Appendix F)
Sealing Kit (Item 295, Appendix F)
Seals, Oil (Item 306, Appendix F)

Personnel Required

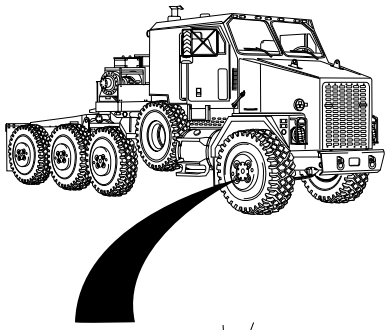
Two

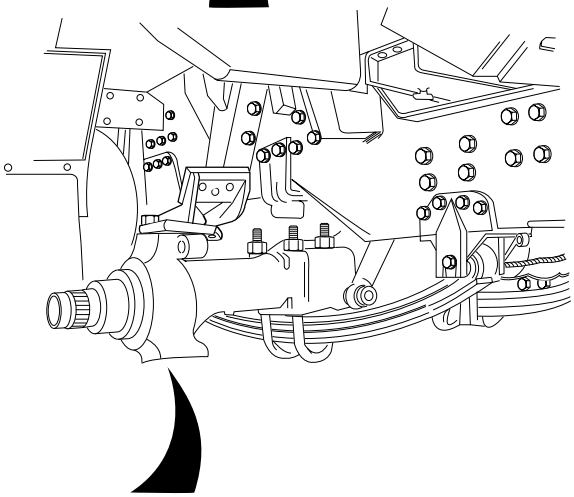
a. Removal

(1) Remove hose (1) from tee (2).
(2) Remove tube assembly (3) from tee (2) and fitting (4).
(3) Remove tee (2) from fitting (5).
(4) Remove fitting (5) from spindle (6).
(5) Remove fitting (4) from spindle (6).
(6) Remove hose (7) from elbow (8).
(7) Remove elbow (8) from spindle (6).



9-4. AXLE NO. 1 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)





NOTE

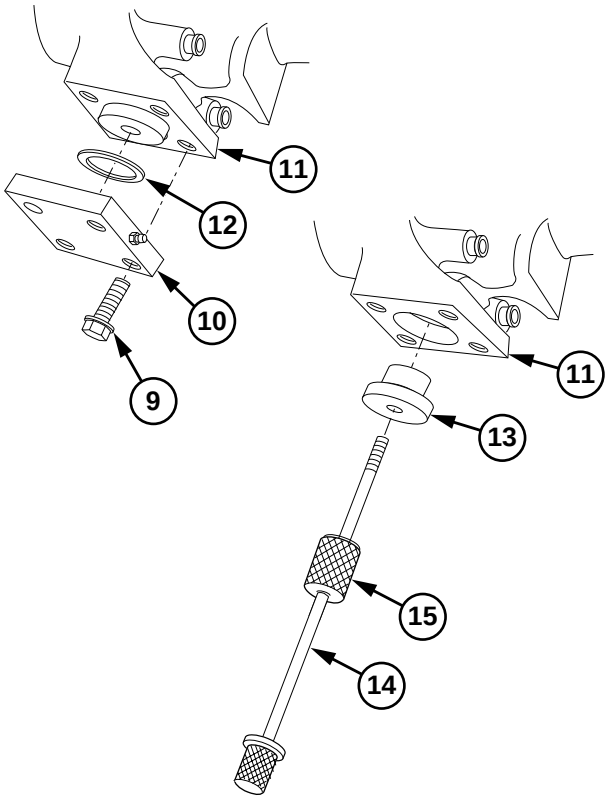
- Removal procedure is the same for both ends of axle.
- Four screws removed from lower cover in step (8) are not same size as screws removed from swivel arm in step (12). Identify screws after removal to aid in installation.

(8) Remove four screws (9) and lower cover (10) from pivot and spindle assembly (11). Tag screws.

NOTE

Shim may stay on pivot and spindle assembly.

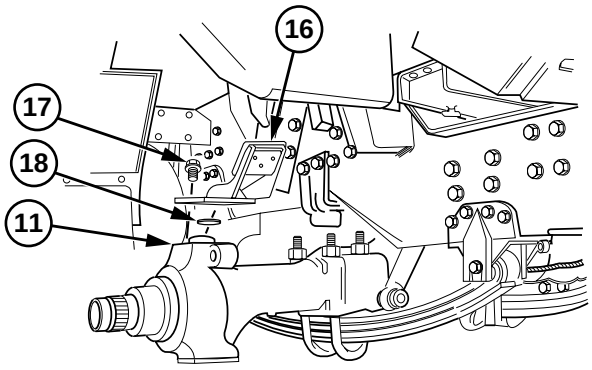
(9) Remove shim (12) from lower cover (10). Tag shim.



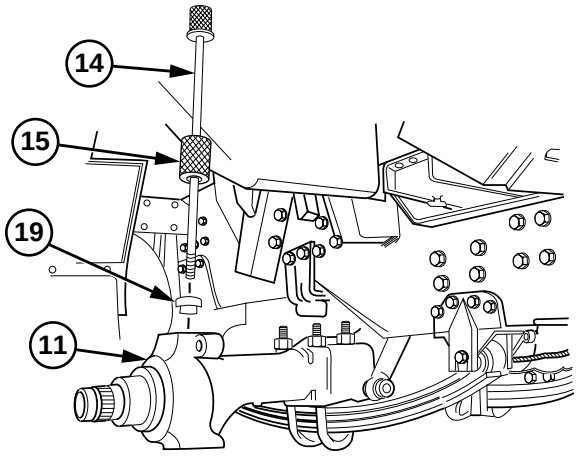
(10) Remove link pin (13) from pivot and spindle assembly (11) using king pin extractor (14) and slide hammer (15).

(11) Matchmark steering arm (16) with pivot and spindle assembly (11).

(12) Remove four screws (17), steering arm (16), and shim (18) from pivot and spindle assembly (11). Tag screws and shim.



(13) Remove link pin (19) from pivot and spindle assembly (11) using king pin extractor (14) and slide hammer (15).



(14) Remove pivot and spindle assembly (11) from axle housing (20) with aid of assistant. Place assembly on clean work surface.

NOTE

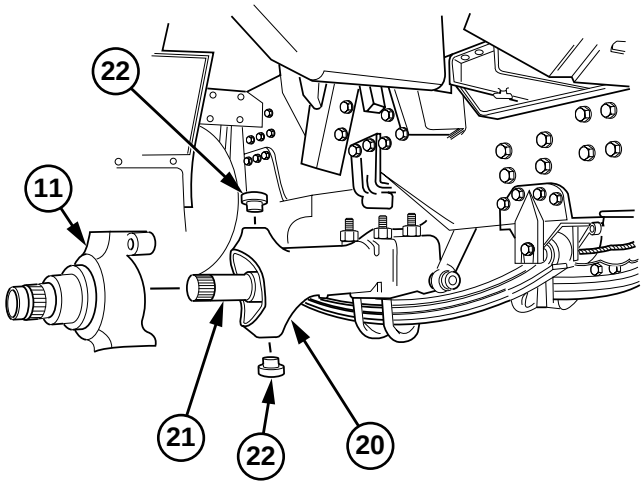
Differential oil may drain from axle housing.

(15) Remove axle shaft (21) from axle housing (20).

NOTE

Do step (16) only if link collars fail inspection.

(16) Remove link collars (22) from axle housing (20) using puller.

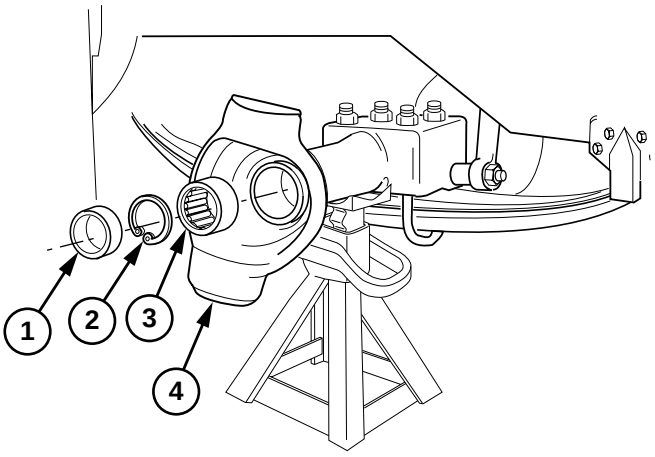


9-4. AXLE NO. 1 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

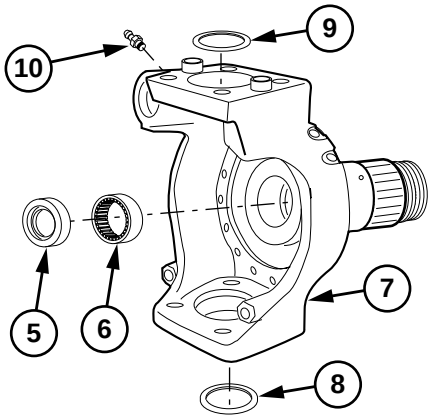
b. Disassembly

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.



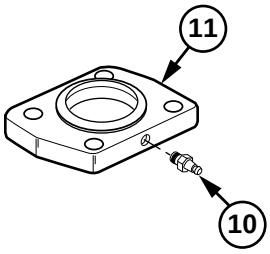
(1) Remove seal (1), retaining ring (2), and bearing (3) from axle housing (4). Discard seal.

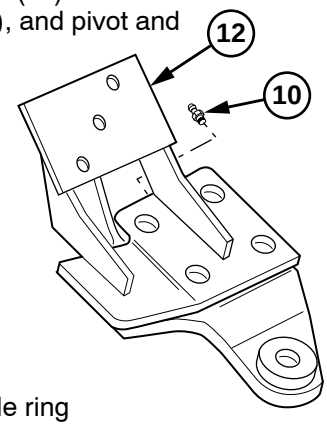


(2) Remove seal (5) and bearing (6) from pivot and spindle housing (7). Discard seal.

(3) Remove two oil seals (8 and 9) from pivot and spindle housing (7). Discard seals.

(4) Remove three grease fittings (10) from lower cover (11), steering arm (12), and pivot and spindle housing (7).

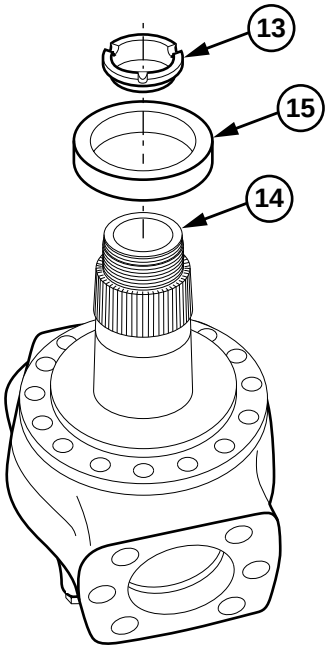




NOTE

Do step (5) only if spindle ring fails inspection criteria.

(5) Remove spindle ring (13) from spindle (14).



CAUTION

Use chisel on seal race surface only. Do not allow chisel to contact spindle. Failure to comply may result in damage to equipment.

NOTE

Do step (6) only if seal race fails inspection.

(6) Remove seal race (15) from spindle (14) with chisel.

(7) Loosen jamnut (16) on steering stop bolt (17).

(7.1) Remove steering stop bolt (17) and jamnut (16) from pivot and spindle housing (7).

NOTE

Do step (8) only if pins fail inspection.

(8) Remove two pins (19) from pivot and spindle housing (7).

(9) Remove two grease fittings (20) from block (21).

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(10) Remove two retaining rings (22) from block (21). Discard retaining rings.

(11) Remove two retaining rings (23) from shaft (24). Discard retaining rings.

(12) Remove two screws (25) from caps (26). Discard screws.

(13) Remove two caps (26) from cross (27) using adapter (27.1). Discard caps.

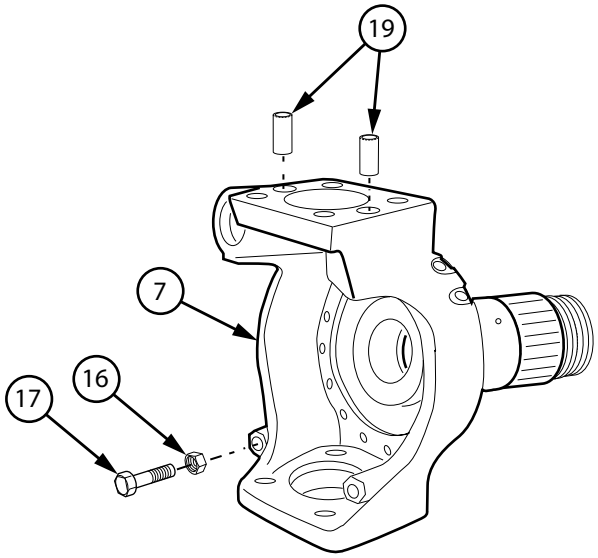
(14) Remove shaft (24) from block (21).

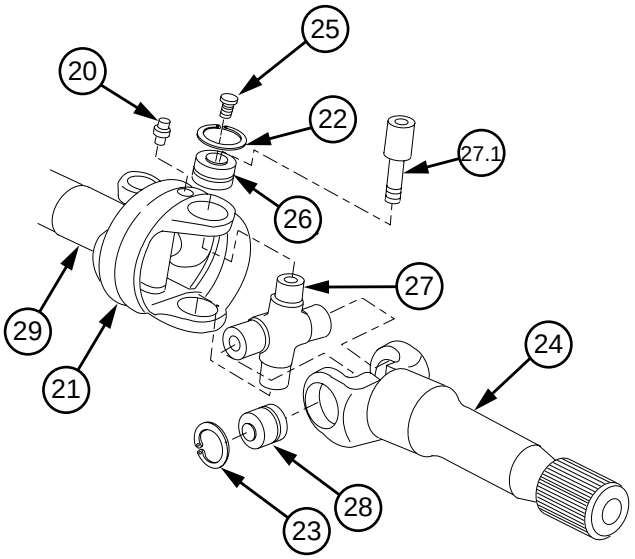
NOTE

Tag and mark cross to aid in installation.

(15) Remove two caps (28) and cross (27) from shaft (24) using press. Discard caps and cross.

(16) Repeat steps (10) through (15) to remove other shaft (29) from block (21).





c. Cleaning/Inspection

(1) Clean old gasket material from housing and caps.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean sealant residue from threaded holes with solvent cleaning compound.

(3) Clean all metal parts with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.).

(4) Dry all parts except bearings with compressed air. Allow bearings to air dry.

(5) Remove all small nicks or burrs with crocus cloth.

(6) Coat all parts with light coat of lubricating oil.

(7) Inspect housing and caps for damage.

(8) Inspect all parts with machined surfaces for deep scratches or wear grooves.

(9) Replace all damaged parts.

9-4. AXLE NO. 1 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

d. Assembly

WARNING

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

NOTE

Do steps (1) and (2) only if seal race was removed.

(1) Coat inside surface of seal race (1) and spindle ring (3) with adhesive-sealant.

(2) Install seal race (1) on spindle (2).

NOTE

Do step (3) only if spindle ring was removed.

(3) Install spindle ring (3) on spindle (2).

(4) Install jamnut (5) and steering stop bolt (7) on pivot and spindle housing (6).

(4.1) Tighten jam nut (5) on steering stop bolt (7).

(5) Install three grease fittings (8) in lower cover (9), steering arm (10), and pivot and spindle housing (6).

(6) Lightly coat new seal (11) and bearing (12) with grease.

NOTE

Seal is installed with flat side facing out.

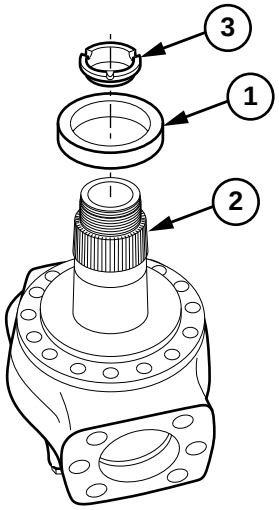
(7) Install bearing (12) and new seal (11) on pivot and spindle housing (6).

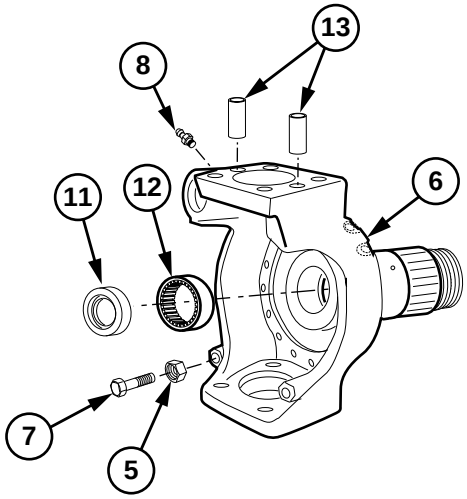
NOTE

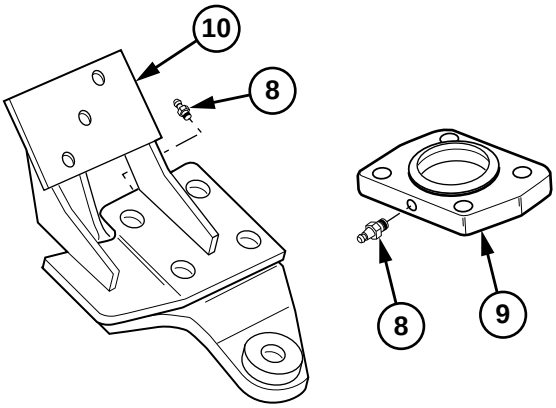
Do step (8) only if pins were removed.

(8) Install two pins (13) in pivot and spindle housing (6).

(9) Lightly coat new seal (14) and bearing (15) with grease.







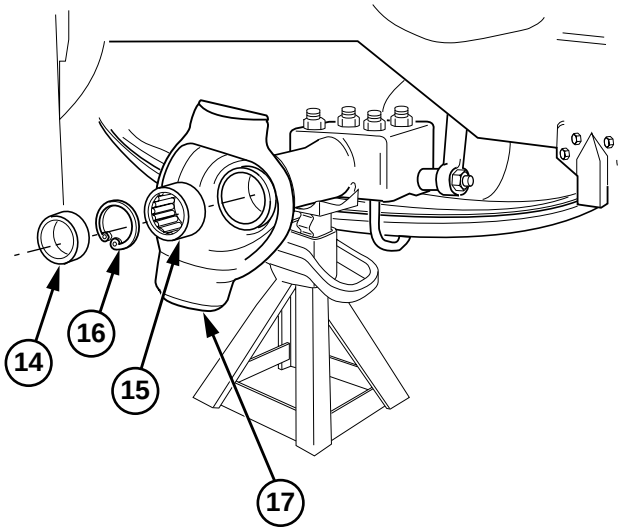
WARNING

Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

NOTE

Seal is installed with flat side facing out.

(10) Install bearing (15), retaining ring (16), and new seal (14) in axle housing (17).



CAUTION

Use care when installing caps. Needle bearings may fall out of position and be damaged.

(11) Install new cross (18) on shaft (19) with two caps (20).

WARNING

Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(12) Install two new retaining rings (21) on shaft (19).

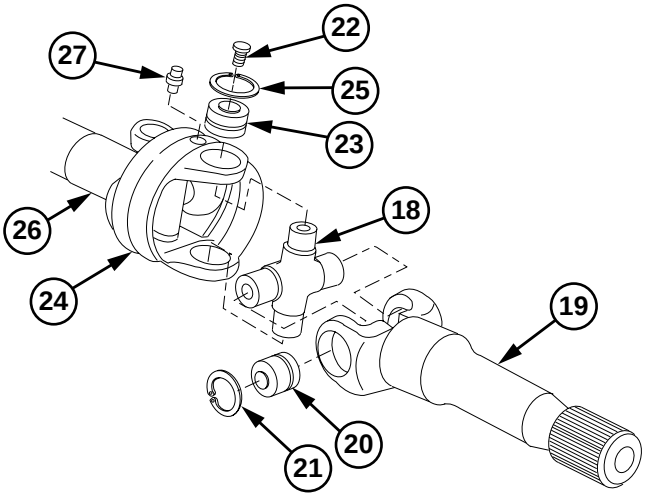
(13) Install two new screws (22) in new caps (23).

(14) Install shaft (19) in block (24) with two caps (23).

(15) Install two new retaining rings (25) in block (24).

(16) Repeat steps (1) through (5) to install other shaft (26) into block (24).

(17) Install two grease fittings (27) in block (24).



e. Installation

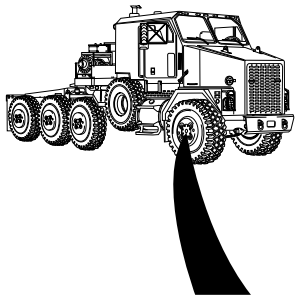
NOTE

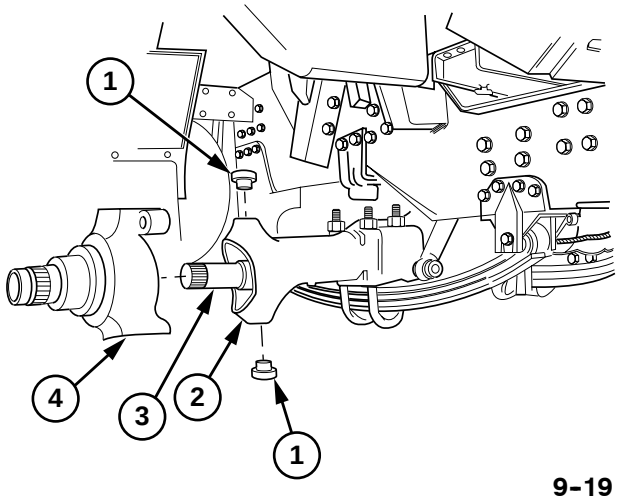
- Installation procedures are the same for both ends of axle.
- Do step (1) only if link collars were removed.

(1) Insert link collars (1) into axle housing (2).

(2) Install axle shaft (3) in axle housing (2).

(3) Install pivot and spindle assembly (4) on axle housing (2) with aid of assistant.





9-4. AXLE NO. 1 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

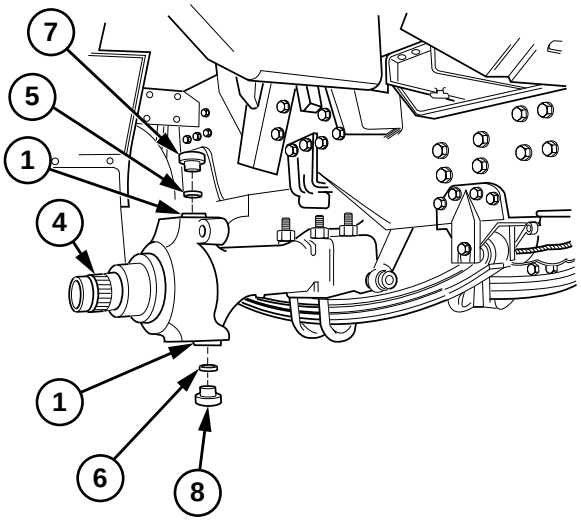
(4) Coat link collars (1), seals (5 and 6), and link pins (7 and 8) with grease.

NOTE

Seal must be installed with metal side against link pin.

(5) Install seal (5) on link pin (7).

(6) Install link pin (7) through pivot and spindle assembly (4) into link collar (1) until metal edge of seal (5) is visible inside pivot and spindle assembly (4).



NOTE

Seal must be installed with metal side against link pin.

(7) Install seal (6) on link pin (8).

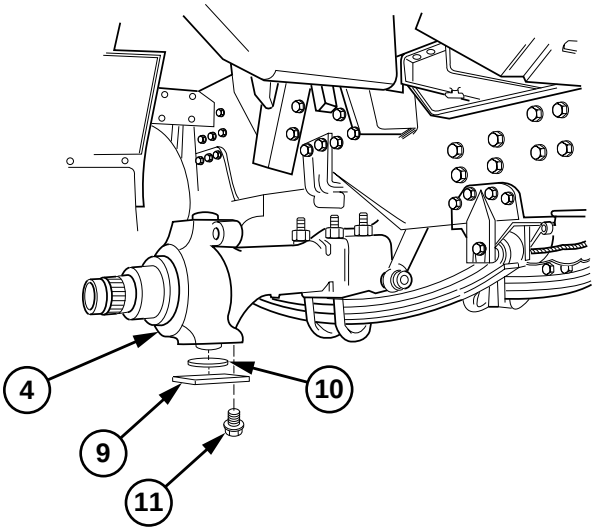
(8) Install link pin (8) through pivot and spindle assembly (4) into link collar (1) until metal edge of seal (6) is visible inside pivot and spindle assembly (4).

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(9) Coat mating surfaces of lower cover (9) and pivot and spindle assembly (4) with silicone adhesive-sealant.

(10) Install shim (10) and lower cover (9) on pivot and spindle assembly (4) with four screws (11). Torque to 250 lb-ft (340 N·m), then to 500 lb-ft (670 N·m), then to 720-800 lb-ft (976-1085 N·m).



(11) Calculate shim height and install as follows:

(a) Install king pin preload cover (12) on upper pivot face (13) with four screws (14). Torque to 200 lb-ft (271 N·m).

(b) Install central screw (15) on tool (12). Torque to 200 lb-ft (271 N·m).

(c) Loosen screw (15) slightly until pivot and spindle assembly (4) moves freely.

NOTE

Measurement in step (11)(d) must be made from either of the two screws closest to the spindle.

(d) Verify pivot and spindle assembly (4) requires no more than 57 lb-ft (77 N·m) to start rotation from centered position.

(e) Measure distance between top of link pin (7) and upper pivot face (13) using depth micrometer gage.

NOTE

Refer to table 9-1 for shim requirement.

(f) Remove four screws (14) and king pin preload cover (12) from upper pivot face (13).

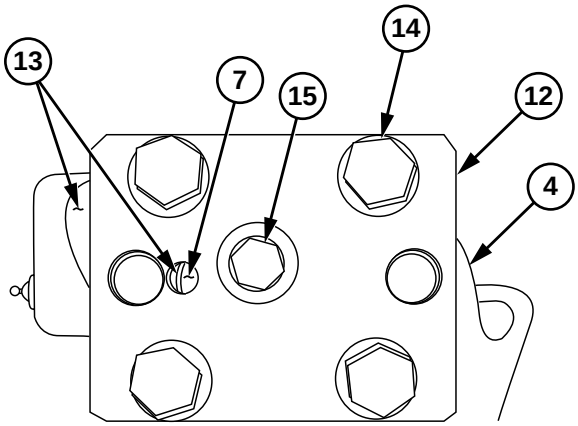


Table 9-1. Determining Shim Thickness

Distance Between Pivot and Spindle Assembly and Link Pin	Shim Thickness
0.018 to 0.022 in. (0.45 to 0.55 mm)	0.016 in. (0.4 mm)
0.022 to 0.026 in. (0.55 to 0.65 mm)	0.020 in. (0.5 mm)
0.026 to 0.030 in. (0.65 to 0.75 mm)	0.024 in. (0.6 mm)
0.030 to 0.033 in. (0.75 to 0.85 mm)	0.028 in. (0.7 mm)
0.033 to 0.037 in. (0.85 to 0.95 mm)	0.031 in. (0.8 mm)
0.037 to 0.041 in. (0.95 to 1.05 mm)	0.035 in. (0.9 mm)
0.041 to 0.045 in. (1.05 to 1.15 mm)	0.039 in. (1.0 mm)

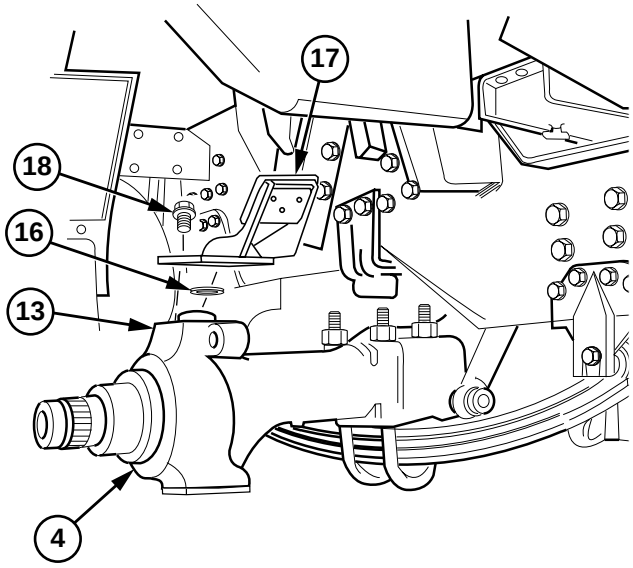
9-4. AXLE NO. 1 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(g) Coat upper surface of upper pivot face (13) with silicone adhesive-sealant.

(h) Install shim(s) (16) on pivot and spindle assembly (4). If multiple shims are used, install shims on the pivot and spindle assembly in order from thinnest to thickest with thinnest shim contacting pivot and spindle assembly and thickest shim contacting cover.



(12) Position steering arm (17) on pivot and spindle assembly (4) by aligning marks made during disassembly.

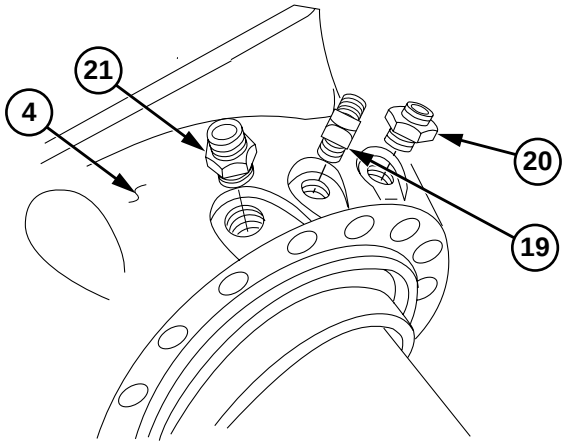
(13) Install four screws (18) in pivot and spindle assembly (4). Torque to 250 lb-ft (340 N·m), then to 500 lb-ft (670 N·m), then to 720-800 lb-ft (976-1085 N·m).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.



(14) Coat threads of elbow (19), fitting (20), and fitting (21) with pipe thread sealing compound.

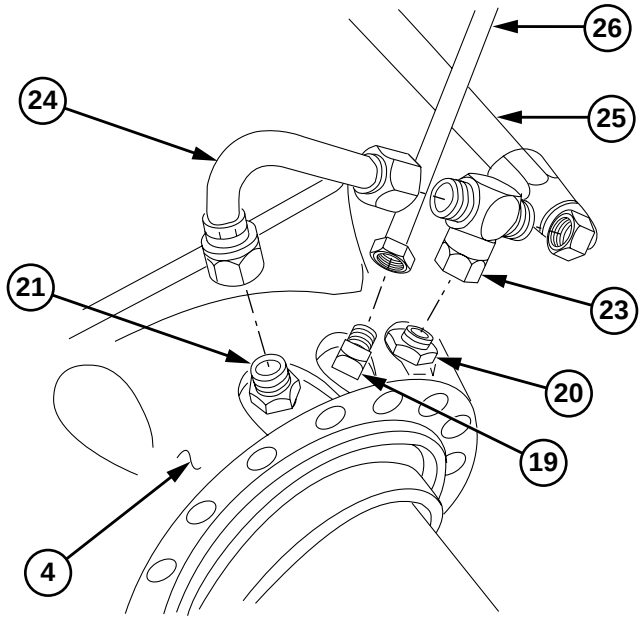
(15) Install fitting (21), elbow (19), and fitting (20) on spindle (4).

(16) Install tee (23) on fitting (20).

(17) Install tube assembly (24) on tee (23) and fitting (21).

(18) Install hose (25) on tee (23).

(19) Install hose (26) on elbow (19).



f. Follow-On Maintenance

(1) Install axle no. 1 brake bracket and camshaft (para 11-3).

(2) Install tie rod end (TM 9-2320-360-20).

(3) Install front brake chamber (TM 9-2320-360-20).

(4) Install drag link (left side only) (para 13-2).

(5) Fill differential (LO 9-2320-360-12).

(6) Adjust steering stops (para 13-9).

CHAPTER 10
REAR AXLES MAINTENANCE

Contents

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Axle No. 3 Locking Cylinder Replacement/Adjustment	10-6.1	10-38.1
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Section I. INTRODUCTION

10-1. INTRODUCTION

This chapter contains maintenance instructions for replacement and repair of axle no. 2, axle no. 3, and axle no. 4 at the Direct Support maintenance level. Some subassemblies and parts must be removed before the axles and components can be removed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

10-2. AXLE NO. 2 REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Brake drums removed (axle no. 2 only) (TM 9-2320-360-20).
Differential and wheel ends drained (axle no. 2 only) (LO 9-2320-360-12).
Air springs removed (axle no. 2 only) (TM 9-2320-360-20).
Shock absorbers removed (axle no. 2 only) (TM 9-2320-360-20).
Propeller shafts removed (transfer case to axle no. 2 and axle no. 2 to axle no. 3) (TM 9-2320-360-20).
Lateral torque rod removed (para 15-3).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 1/2 In. Female - 3/4 In. Male (Item 3, Appendix E)
Jack, Floor 10-Ton (Item 90, Appendix E)
Jackstands (4) (Item 93, Appendix E)
Lift, Transmission and Differential (Item 95, Appendix E)
Multiplier, Torque (Item 99, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Impact, Electric, 1 In. (Item 223, Appendix E)

Tools and Special Tools (Cont)
Wrench, Open-End, 1-11/16 In. and 1-7/8 In., (Item 225, Appendix E)
Wrench Set, Socket, 1 In. Drive (Item 230, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

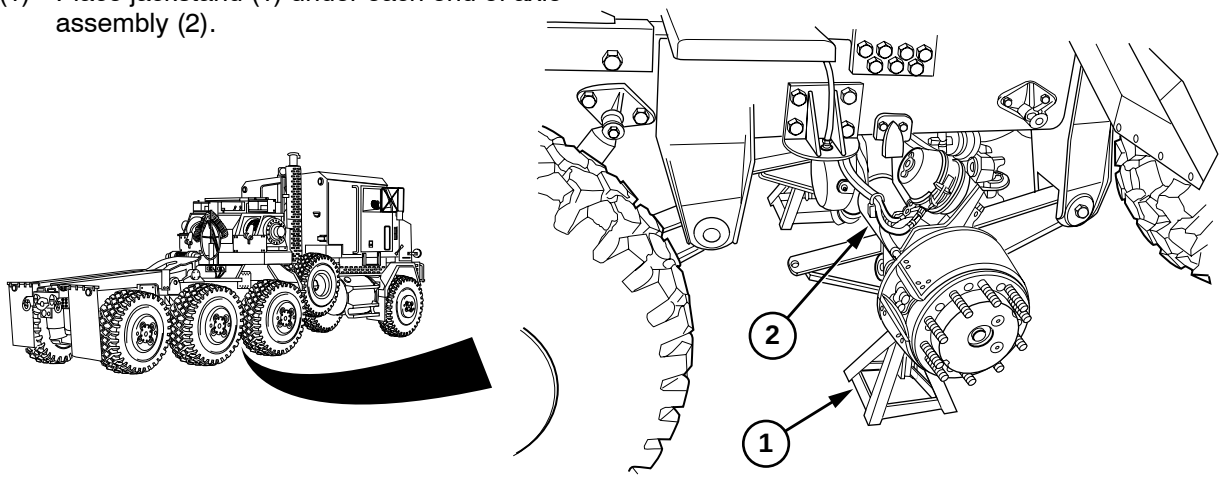
Materials/Parts
Adhesive-Sealant (Item 8, Appendix B)
Caps, Shipping and Sealing (Item 13, Appendix B)
Oil, Lubricating (Item 48, Appendix B)
Ties, Cable, Plastic, (Item 60, Appendix B)
Bolt Kits, Beam Hanger (2) (Item 3, Appendix F)
Bolt Kits, Bushing (2) (Item 4, Appendix F)
Locknuts (4) (Item 87, Appendix F)

Special Environmental Conditions
HET Tractor parked on hard, level surface.

Personnel Required
Two

a. Removal

(1) Place jackstand (1) under each end of axle assembly (2).

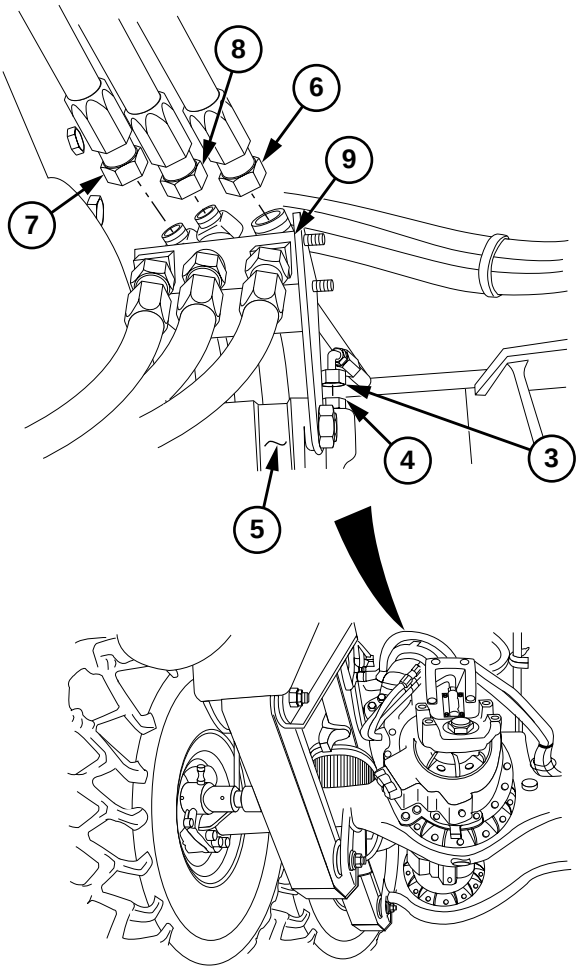


NOTE

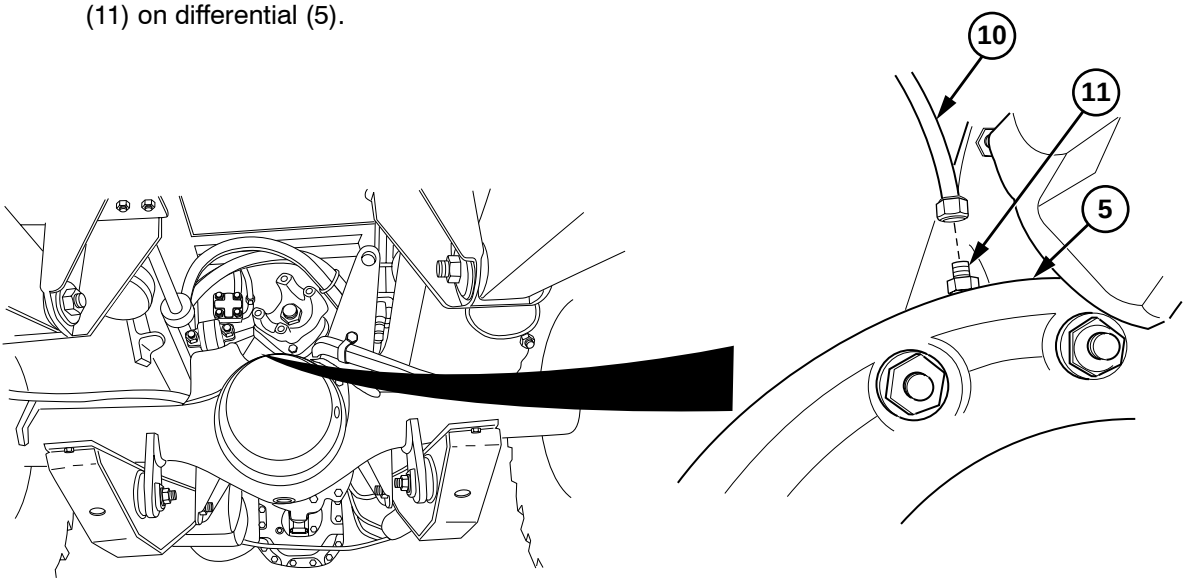
Protective caps should be placed on fittings uncovered in steps (2) thru (4).

(2) Remove hose no. 2339 (3) from fitting (4) on differential (5).

(3) Remove hoses no. 2104 (6), no. 2075 (7), and no. 2545 (8) from manifold (9).



(4) Remove axle breather hose (10) from fitting (11) on differential (5).



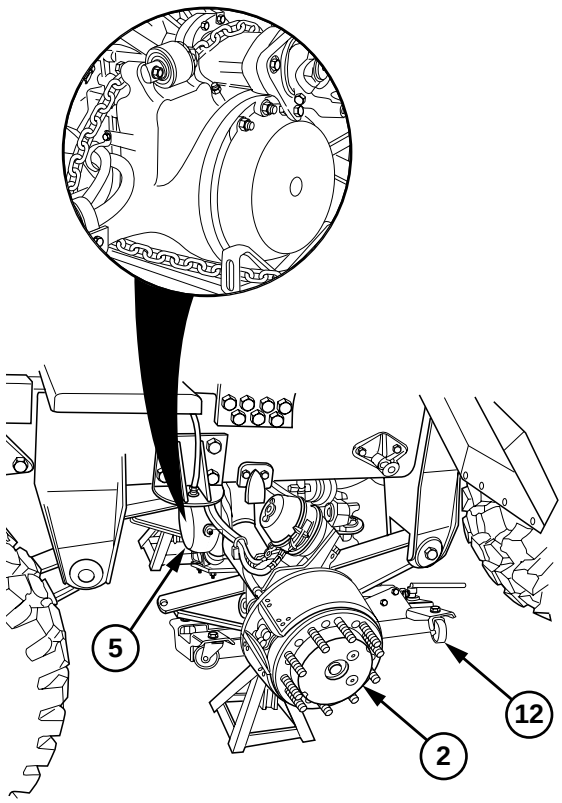
10-2. AXLE NO. 2 REPLACEMENT (CONT)

WARNING

Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.

(5) Place transmission lift (12) under axle differential (5) to support axle (2).

(6) Secure axle (2) to transmission lift (12).

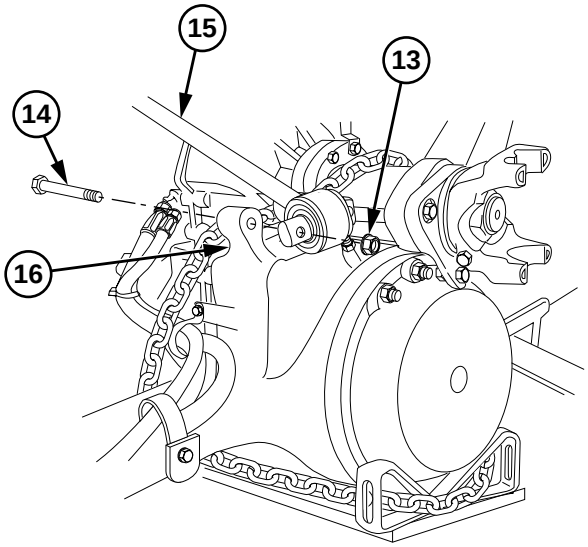


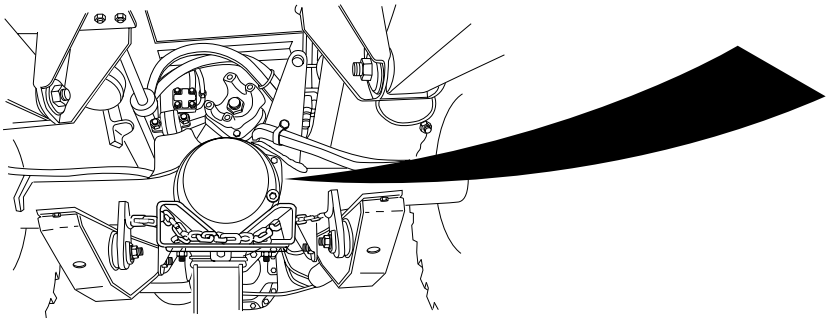
WARNING

Axle assembly may rotate forward during removal of longitudinal torque rod. Keep hands and feet away from axle. Failure to comply may result in serious injury to personnel.

(7) Remove two locknuts (13), screws (14), and longitudinal torque rod (15) from axle housing (16). Discard locknuts.

(8) Secure longitudinal torque rod (15) out of the way after removing it from axle (2).

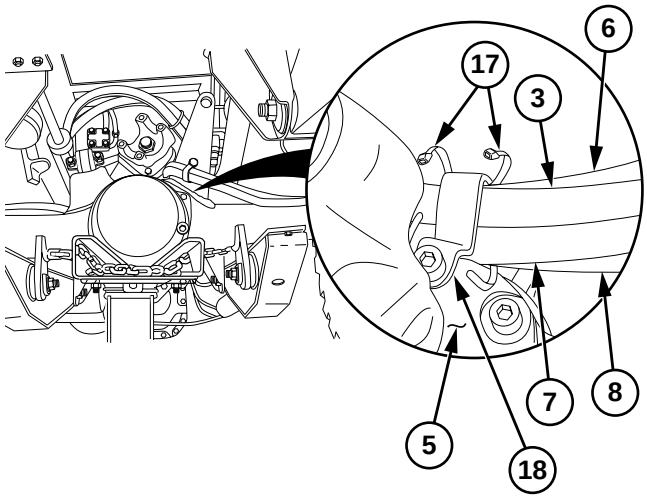




NOTE

Location of plastic cable ties should be marked before removal.

(9) Remove plastic cable ties (17) securing four hoses (3, 6, 7, and 8) to bracket (18) on differential (5).



WARNING

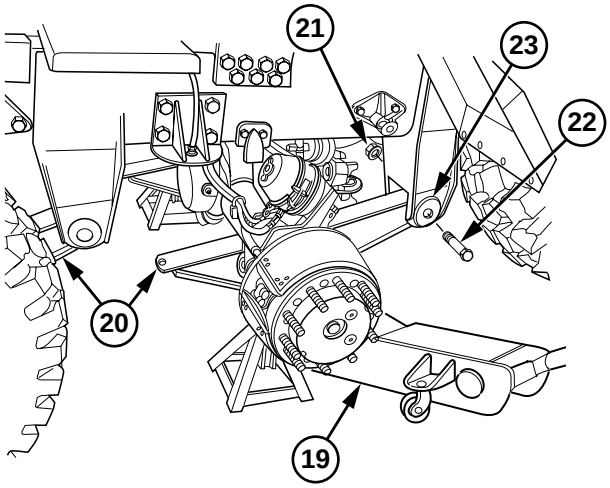
Suspension beam is heavy and can fall. Keep out from under suspension beam. Failure to comply may result in injury to personnel.

NOTE

Both suspension beams are removed the same way. Right side is shown.

(10) Place floor jack (19) under center of suspension beam (20).

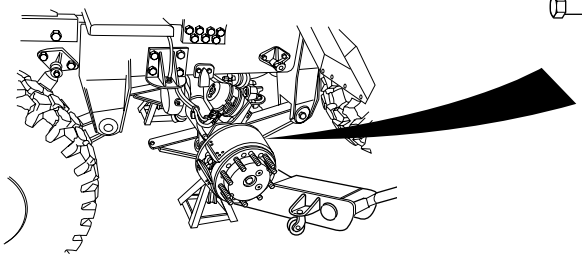
(11) Remove locknut (21) and screw (22) from suspension beam (20) and frame hanger (23) with aid of assistant. Discard locknut and screw.

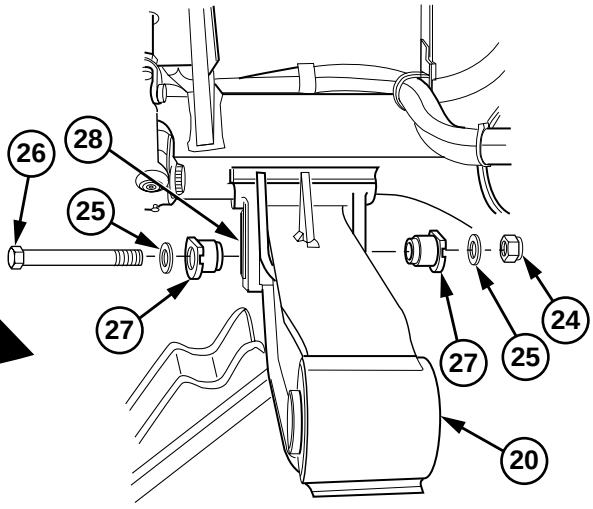


NOTE

Screw, washer, and outside collar are removed together.

(12) Remove locknut (24), two washers (25), screw (26), and two collars (27) from suspension beam (20) and axle bracket (28) with aid of assistant. Discard locknut, washers, screw, and collars.



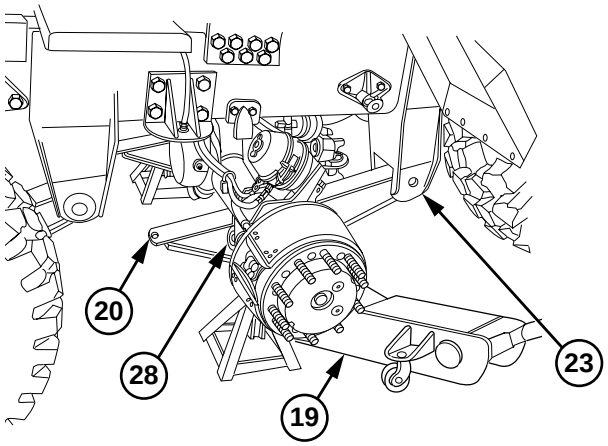


10-2. AXLE NO. 2 REPLACEMENT (CONT)

NOTE

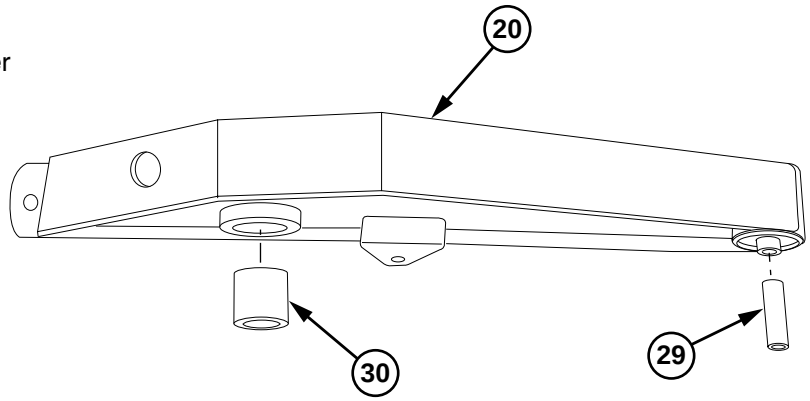
It may be necessary to tap suspension beam out of axle bracket and frame bracket.

(13) Lower floor jack (19) and remove suspension beam (20) from axle bracket (28) and frame hanger (23).



(14) Remove delrin liner (29) and steel sleeve (30) from suspension beam (20). Discard delrin liner and steel sleeve.

(15) Repeat steps (10) thru (14) for other suspension beam.



WARNING

Axle weighs approximately 1925 lb (874 kg). Keep out from under axle. Failure to comply may result in injury or death to personnel.

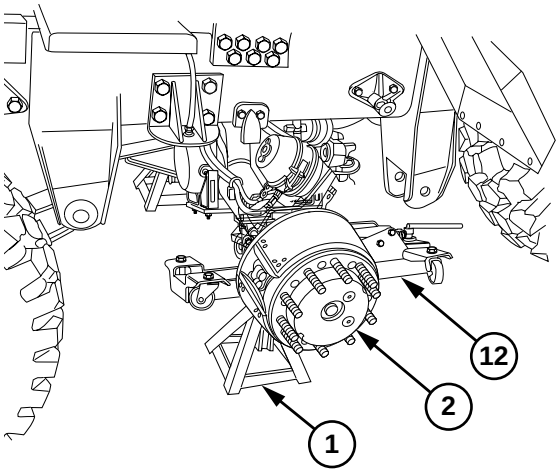
NOTE

Air pressure must be greater than 65 psi (448 kPa) to provide sufficient clearance to remove axle.

(16) Raise transmission lift (12) enough to lift axle assembly (2) and remove jackstands (1).

(17) Lower transmission lift (12) and axle (2) to its lowest position.

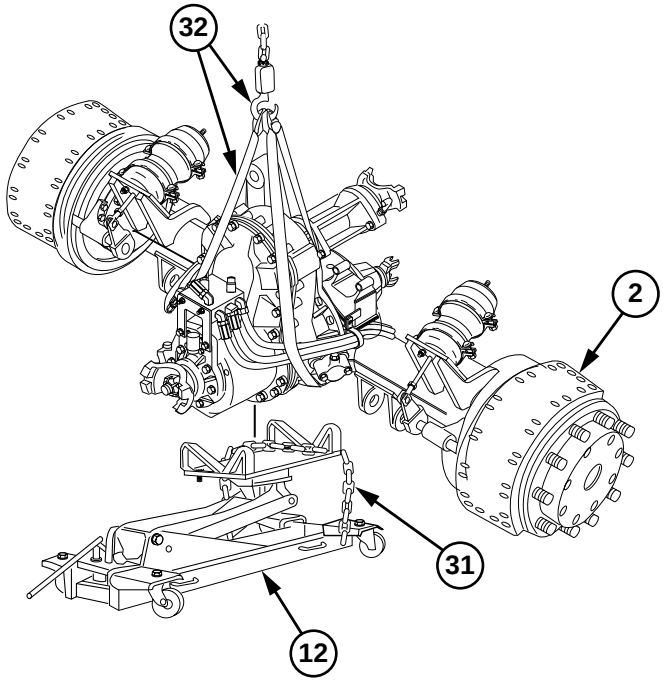
(18) Remove transmission lift (12) and axle (2) from under HET tractor.



(19) Remove chain (31) from axle (2) and transmission lift (12).

(20) Attach lifting device (32) to axle (2).

(21) Lift axle (2) and remove from transmission lift (12).



b. Installation

(1) Remove brake drums (1) from new axle (2) (TM 9-2320-360-20).

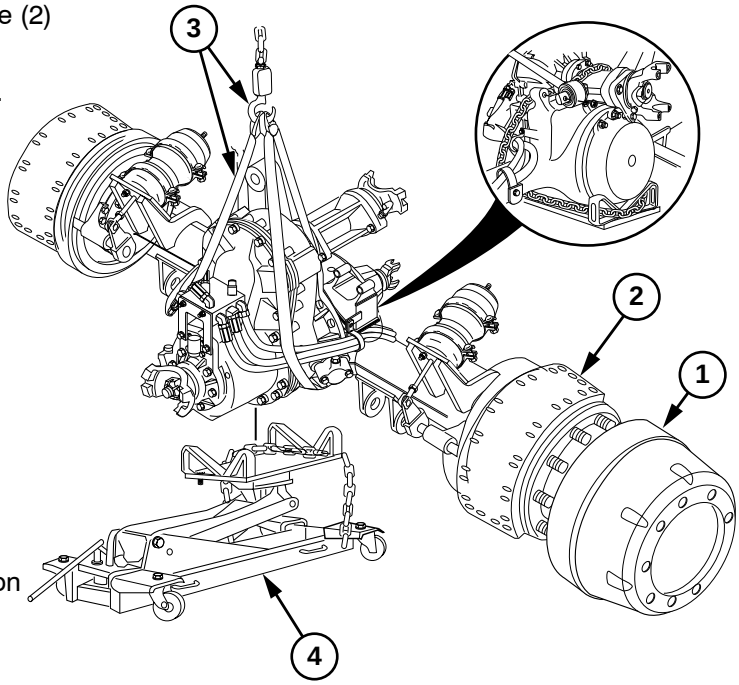
(2) Attach lifting device (3) to new axle (2).

WARNING

- **Axle weighs approximately 1925 lb (874 kg). Keep out from under axle. Failure to comply may result in injury or death to personnel.**
- **Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.**

(3) Lift axle (2) and position on transmission lift (4).

(4) Secure axle (2) to transmission lift (4).



10-2. AXLE NO. 2 REPLACEMENT (CONT)

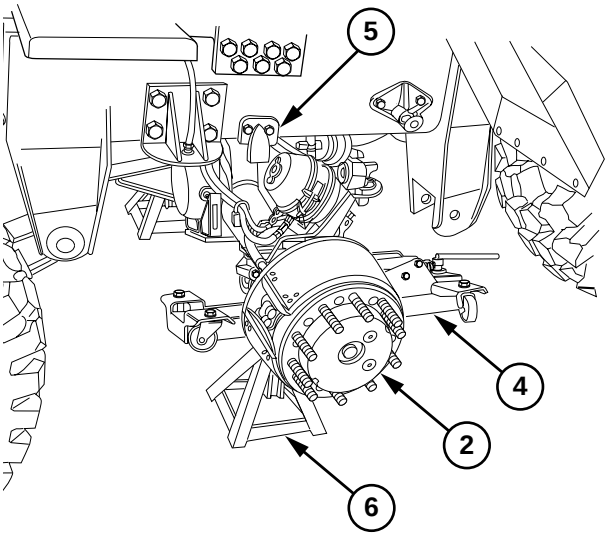
NOTE

Air pressure must be greater than 65 psi (448 kPa) to provide sufficient clearance to install axle.

(5) Position transmission lift (4) and axle (2) under HET tractor.

(6) Raise transmission lift (4) and position axle (2) directly under axle stops (5).

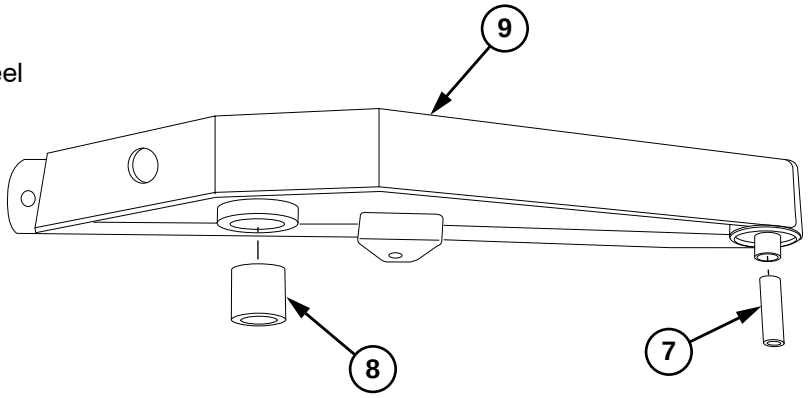
(7) Position jackstand (6) under each end of axle (2).



NOTE

Both suspension beams are installed the same way. Right side is shown.

(8) Install new delrin liner (7) and new steel sleeve (8) in suspension beam (9).



WARNING

Suspension beam is heavy and can fall. Keep out from under suspension beam. Failure to comply may result in injury to personnel.

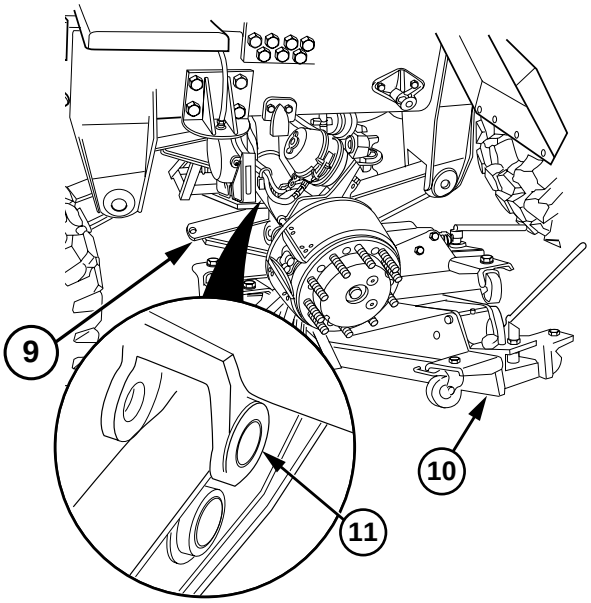
(9) Position suspension beam (9) on floor jack (10).

(10) Position floor jack (10) and suspension beam (9) under axle bracket (11).

NOTE

Axle position may need slight adjustment. The weight of axle should be still supported by transmission lift.

(11) Raise floor jack (10) until suspension beam (9) is positioned correctly in axle bracket (11).



WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

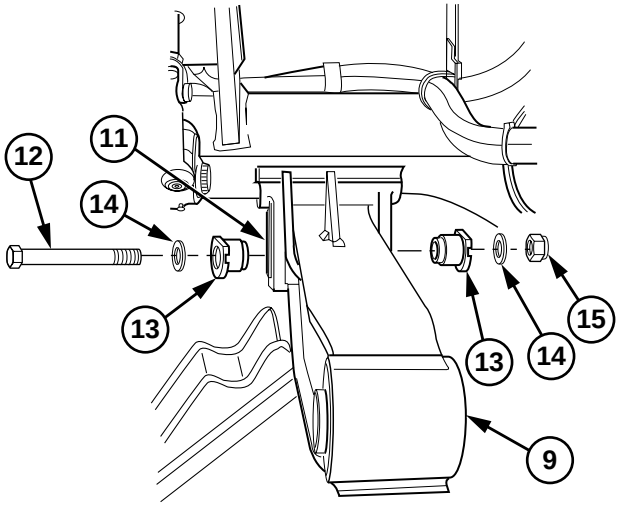
(12) Coat threads of new screw (12) with adhesive-sealant.

NOTE

Outside collar, washer, and screw are installed together.

(13) Install suspension beam (9) in axle bracket (11) with two new collars (13), new screw (12), and two new washers (14).

(14) Install new locknut (15) on screw (12). Do not tighten.



NOTE

Axle may need slight adjustment.

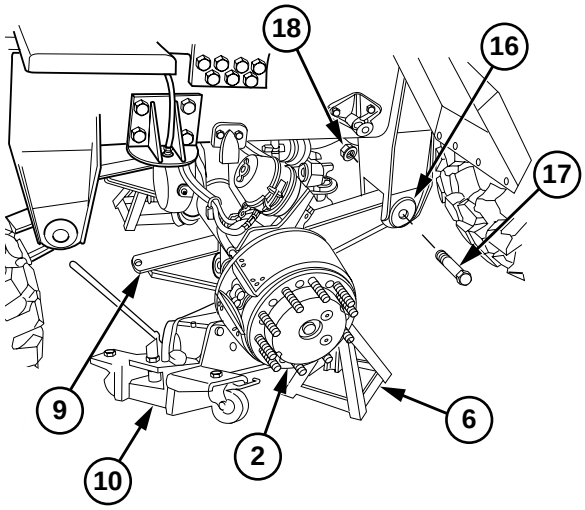
(15) Raise floor jack (10) until suspension beam (9) is positioned correctly in frame hanger (16).

(16) Install suspension beam (9) on frame hanger (16) with new screw (17) and new locknut (18). Do not tighten.

(17) Raise jackstand (6) to support side of axle (2).

(18) Remove floor jack (10) from below suspension beam (9).

(19) Repeat steps (8) thru (18) for other suspension beam.



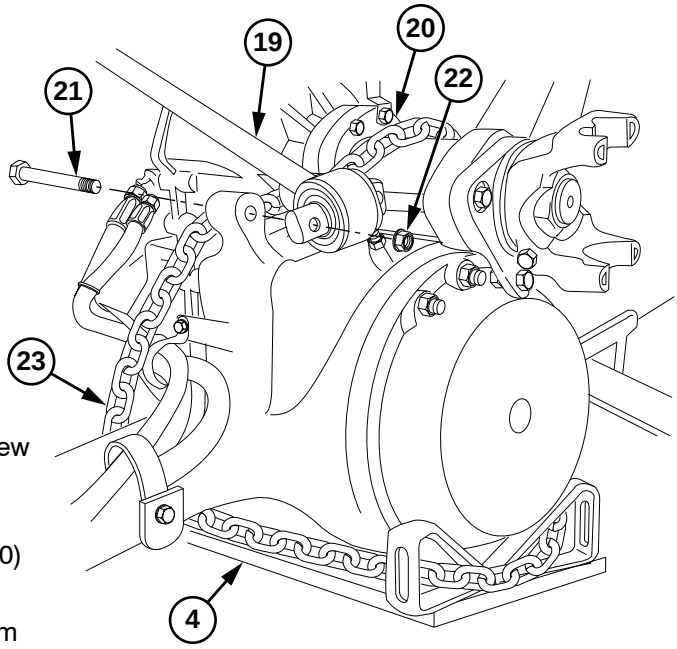
10-2. AXLE NO. 2 REPLACEMENT (CONT)

WARNING

Keep hands and feet clear of axle until axle is secured by torque rod. Failure to comply may result in injury to personnel.

NOTE

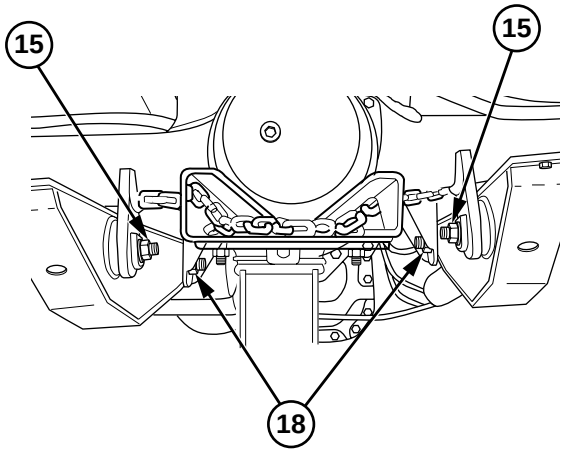
It may be necessary to raise front of differential with floor jack to aid installation of longitudinal torque rod.



(20) Install longitudinal torque rod (19) on axle assembly (20) with two screws (21) and new locknuts (22). Torque to 212 lb-ft (287 N·m).

(21) Remove chain (23) from axle assembly (20) and transmission lift (4).

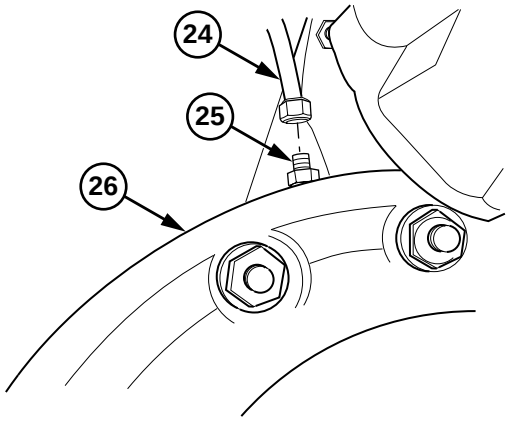
(22) Lower transmission lift (4) and remove from under HET Tractor.



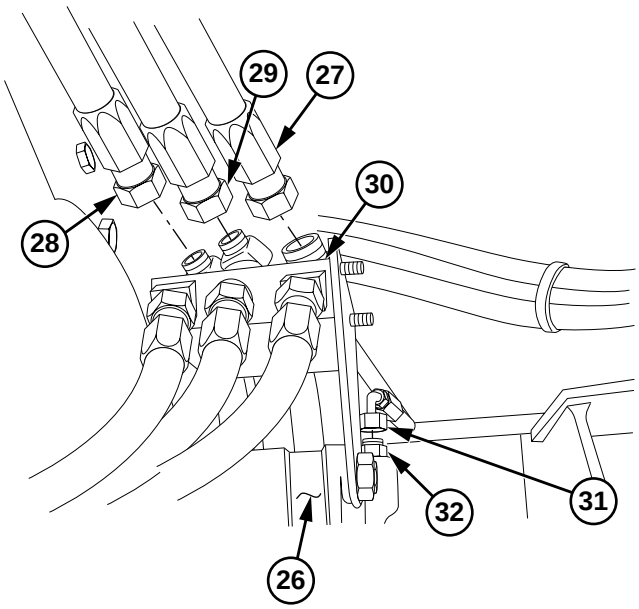
(23) Tighten two locknuts (15) to 495 lb-ft (671 N·m) and two locknuts (18) to 800 lb-ft (1085 N·m).

NOTE

Protective caps should be removed from fittings covered during removal.

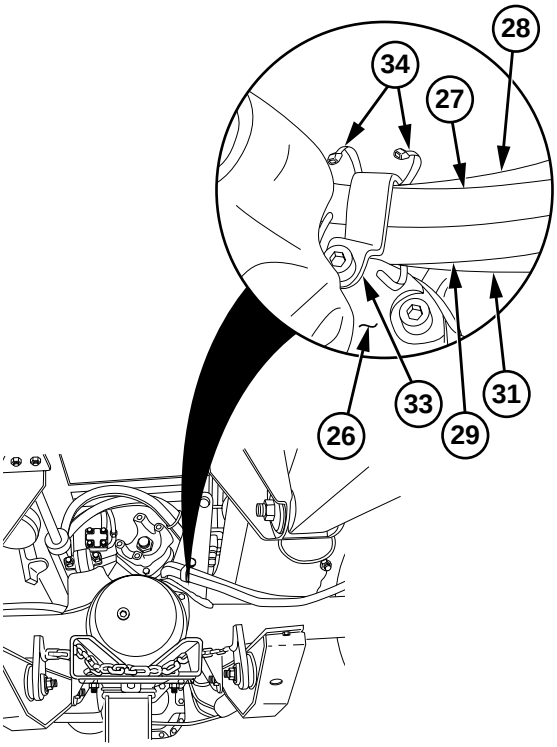


(24) Install axle breather hose (24) on fitting (25) on differential (26).



(25) Install hose no. 2104 (27), no. 2075 (28), and no. 2545 (29) on manifold (30).

(26) Install hose no. 2339 (31) on fitting (32) on differential (26).



NOTE

Plastic cable ties should be positioned in locations marked during removal.

(27) Secure hoses (27, 28, 29, and 31) to bracket (33) on differential (26) with plastic cable ties (34).

c. Follow-On Maintenance

(1) Install air springs (TM 9-2320-360-20).

(2) Install transfer case to no. 2 axle and no. 2 axle to no. 3 axle propeller shafts (TM 9-2320-360-20).

(3) Install shock absorbers (TM 9-2320-360-20).

(4) Fill axle differential and wheel ends (LO 9-2320-360-12).

(5) Install brake drums (TM 9-2320-360-20).

(6) Install lateral torque rod (para 15-3).

(7) Align axle no. 2 (para 10-5).

10-3. AXLE NO. 3 REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Brake drums removed (axle no. 3 only) (TM 9-2320-360-20).
Differential and wheel ends drained (axle no. 3 only) (LO 9-2320-360-12).
Air springs removed (axle no. 3 only) (TM 9-2320-360-20).
Shock absorbers removed (axle no. 3 only) (TM 9-2320-360-20).
Propeller shafts removed (axle no. 2 to axle no. 3 and axle no. 3 to axle no. 4) (TM 9-2320-360-20).
Lateral torque rod removed (para 15-3).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 1/2 In. Female - 3/4 In. Male (Item 3, Appendix E)
Jack, Floor, 10-Ton (Item 90, Appendix E)
Jackstands (4) (Item 93, Appendix E)
Lift, Transmission and Differential (Item 95, Appendix E)
Multiplier, Torque (Item 99, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Impact, Electric, 1 In. (Item 223, Appendix E)

Tools and Special Tools (Cont)
Wrench, Open-End, 1-11/16 In. and 1-7/8 In., (Item 225, Appendix E)
Wrench Set, Socket, 1 In. Drive (Item 230, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

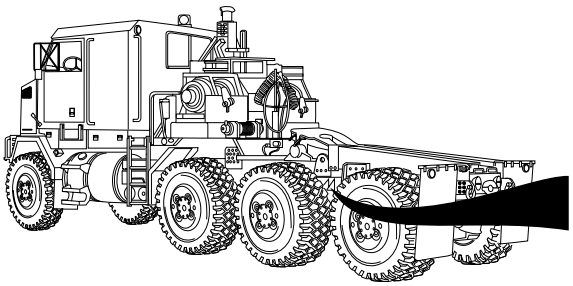
Materials/Parts
Adhesive-Sealant (Item 8, Appendix B)
Caps, Shipping and Sealing (Item 13, Appendix B)
Oil, Lubricating (Item 48, Appendix B)
Ties, Cable, Plastic, (Item 60, Appendix B)
Bolt Kits, Beam Hanger (2) (Item 3, Appendix F)
Bolt Kits, Bushing (2) (Item 4, Appendix F)
Locknuts (2) (Item 87, Appendix F)
Lockwashers (2) (Item 118, Appendix F)

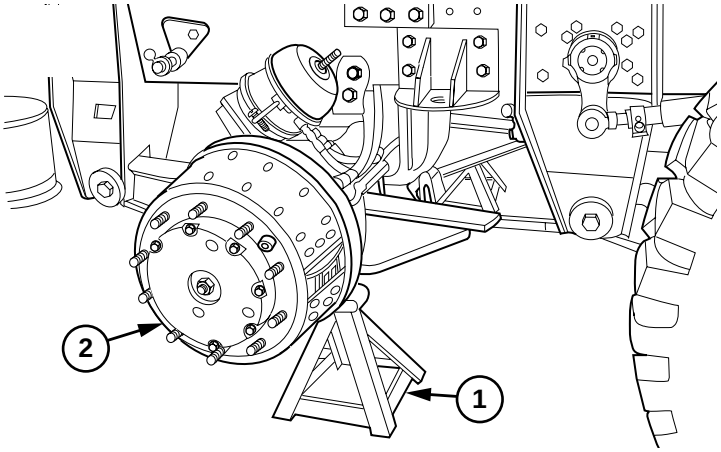
Special Environmental Conditions
HET Tractor parked on hard, level surface.

Personnel Required
Two

a. Removal

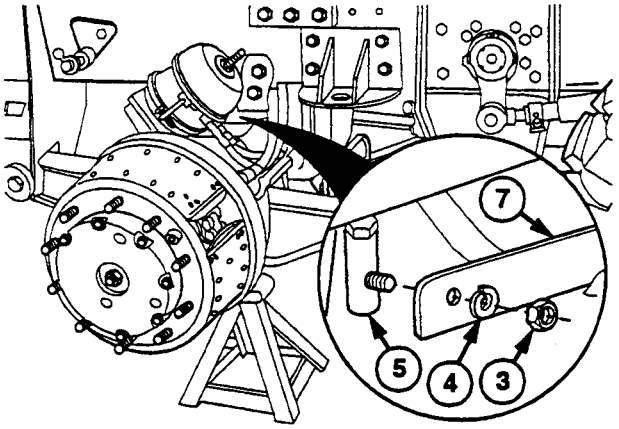
(1) Place jackstand (1) under each end of axle assembly (2).

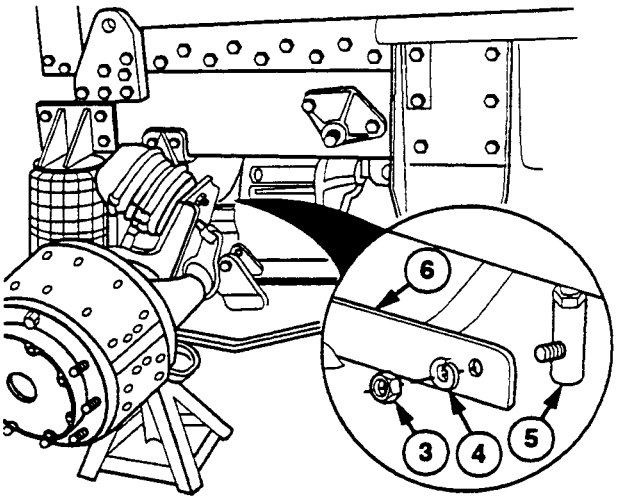




(2) Remove nut (3), lockwasher (4), and ball joint (5) from right side bracket (6). Discard lockwasher.

(3) Repeat step (2) for left side bracket (7).



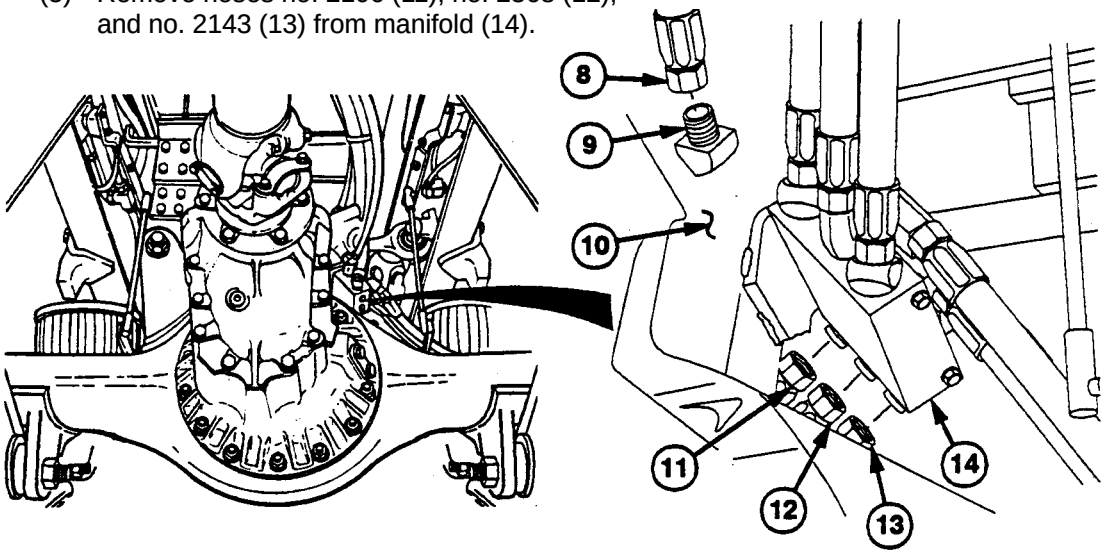


NOTE

Protective caps should be placed on fittings uncovered in steps (4) and (5).

(4) Remove hose no. 2422 (8) from fitting (9) on differential (10).

(5) Remove hoses no. 2106 (11), no. 2368 (12), and no. 2143 (13) from manifold (14).



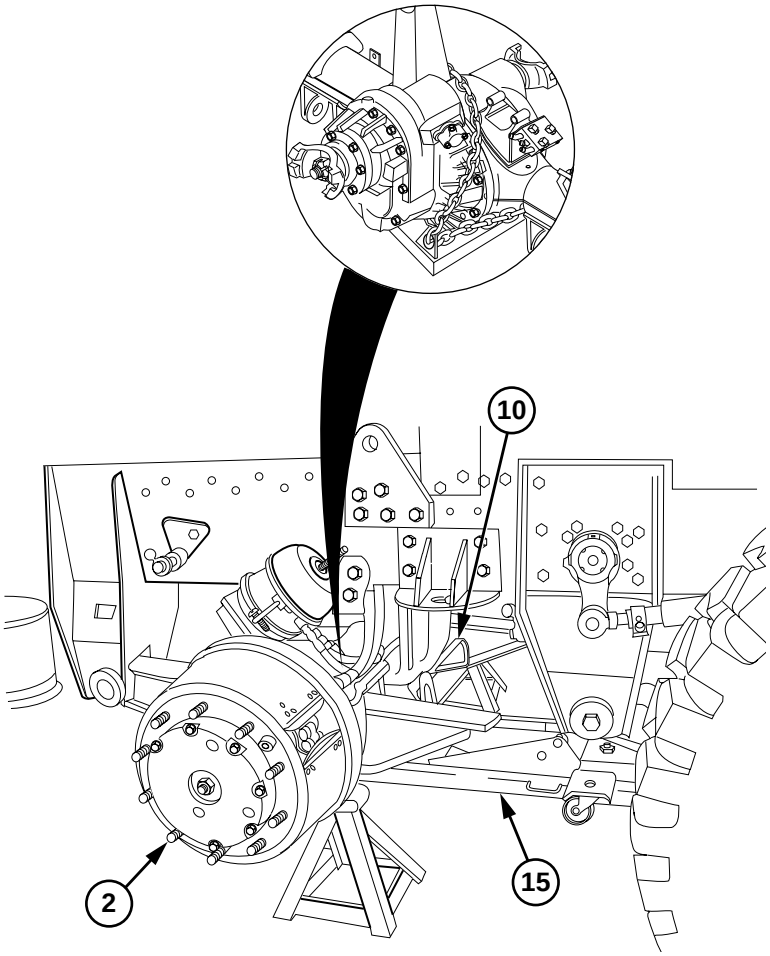
10-3. AXLE NO. 3 REPLACEMENT (CONT)

WARNING

Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.

(6) Place transmission lift (15) under axle differential (10) to support axle (2).

(7) Secure axle (2) to transmission lift (15).

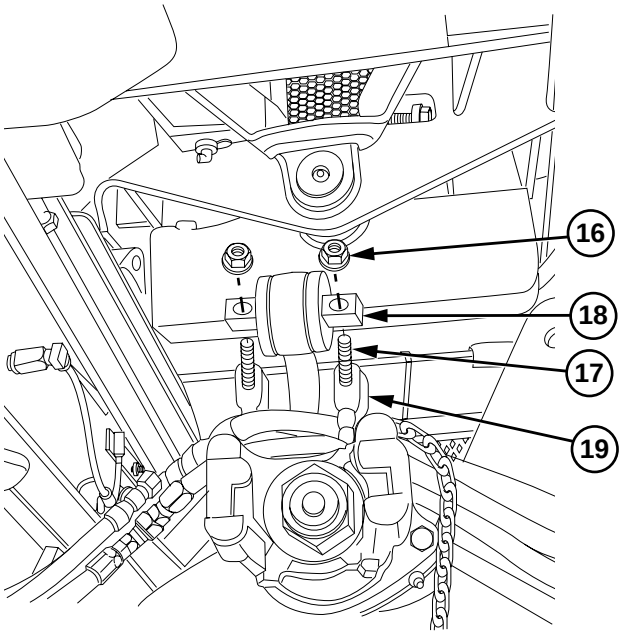


WARNING

Axle assembly may rotate forward during removal of longitudinal torque rod. Keep hands and feet away from axle. Failure to comply may result in serious injury to personnel.

(8) Remove two locknuts (16), screws (17), and longitudinal torque rod (18) from axle housing (19). Discard locknuts.

(9) Secure longitudinal torque rod (18) out of the way after removing it from axle housing (19).



WARNING

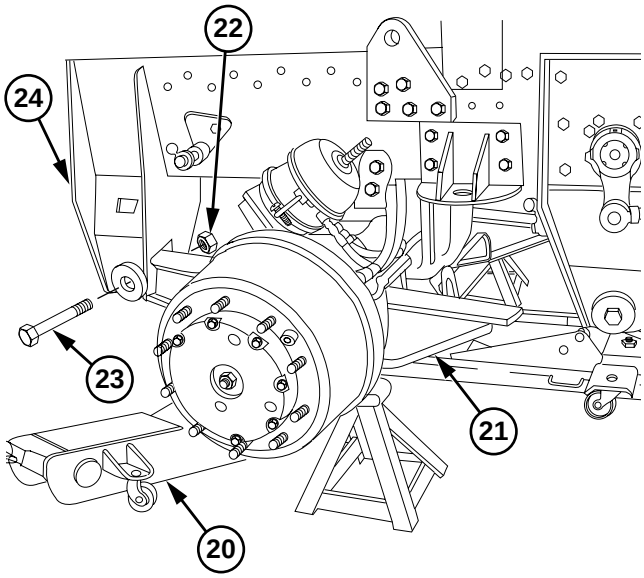
Suspension beam is heavy and can fall. Keep out from under suspension beam. Failure to comply may result in injury to personnel.

NOTE

Both suspension beams are removed the same way. Left side is shown.

(10) Place floor jack (20) under center of suspension beam (21).

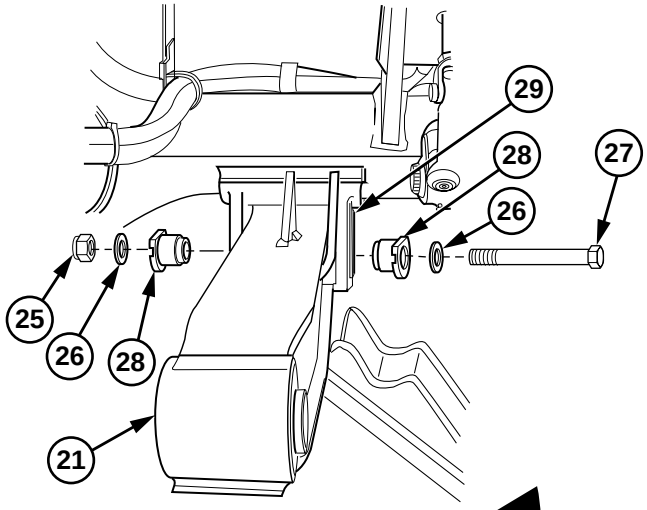
(11) Remove locknut (22) and screw (23) from suspension beam (21) and frame hanger (24). Discard locknut and screw.

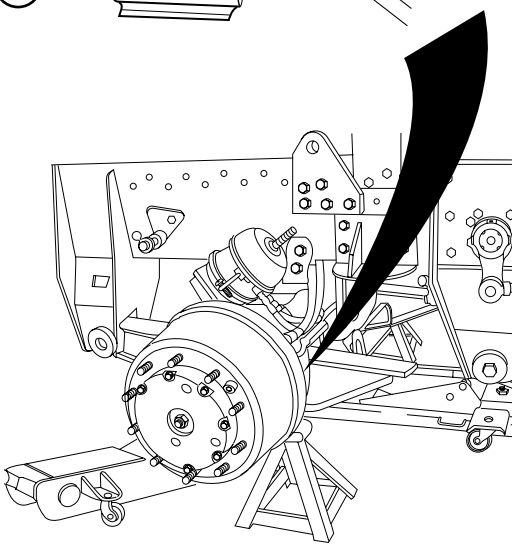


NOTE

Screw, washer, and outside collar are removed together.

(12) Remove locknut (25), two washers (26), screw (27), and two collars (28) from suspension beam (21) and axle bracket (29). Discard locknuts, washers, screws, and collars.



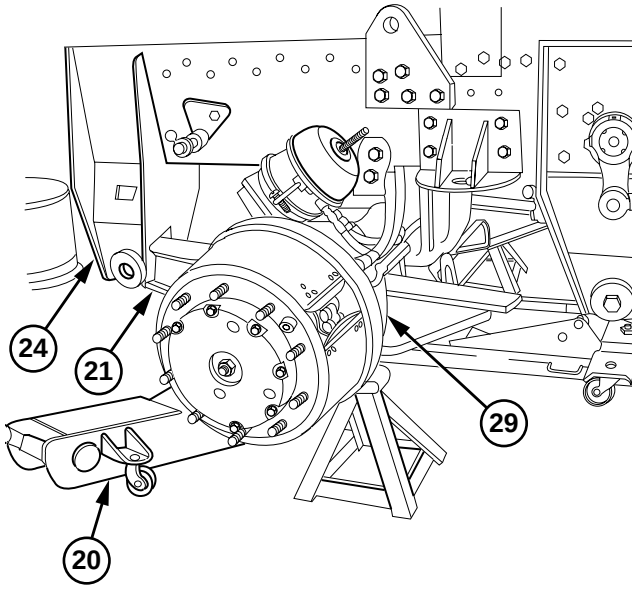


10-3. AXLE NO. 3 REPLACEMENT (CONT)

NOTE

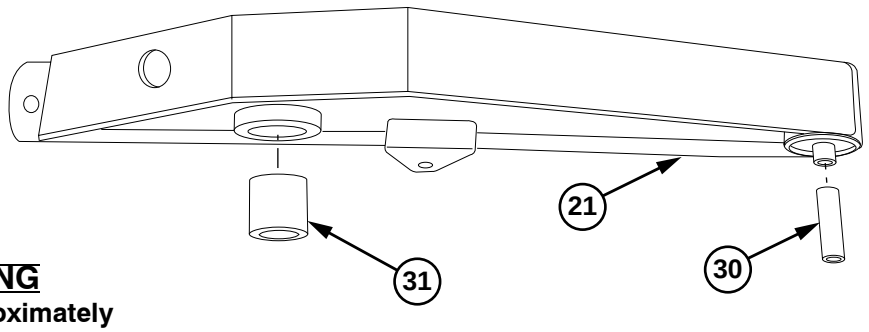
It may be necessary to tap suspension beam out of axle bracket and frame hanger.

(13) Lower floor jack (20) and remove suspension beam (21) from axle bracket (29) and frame hanger (24).



(14) Remove delrin liner (30) and steel sleeve (31) from suspension beam (21). Discard delrin liner and steel sleeve.

(15) Repeat steps (10) thru (14) for other suspension beam.



WARNING

Axle weighs approximately 1760 lb (798 kg). Keep out from under axle. Failure to comply may result in injury or death to personnel.

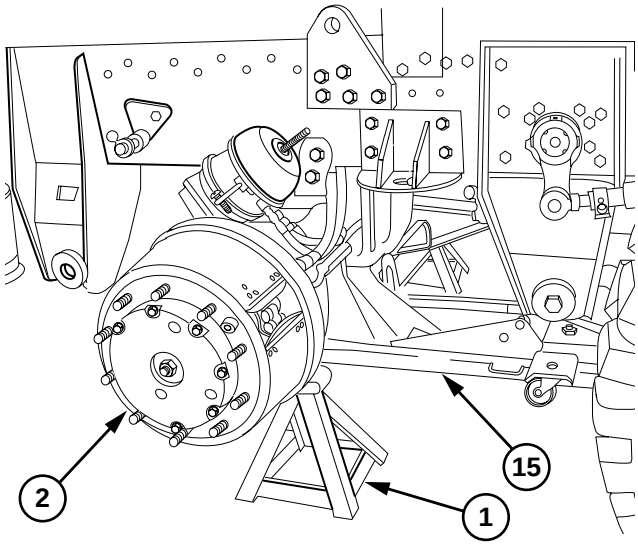
NOTE

Air pressure must be greater than 65 psi (448 kPa) to provide sufficient clearance to remove axle.

(16) Raise transmission lift (15) enough to lift axle assembly (2) and remove jackstands (1).

(17) Lower transmission lift (15) and axle (2) to lowest position.

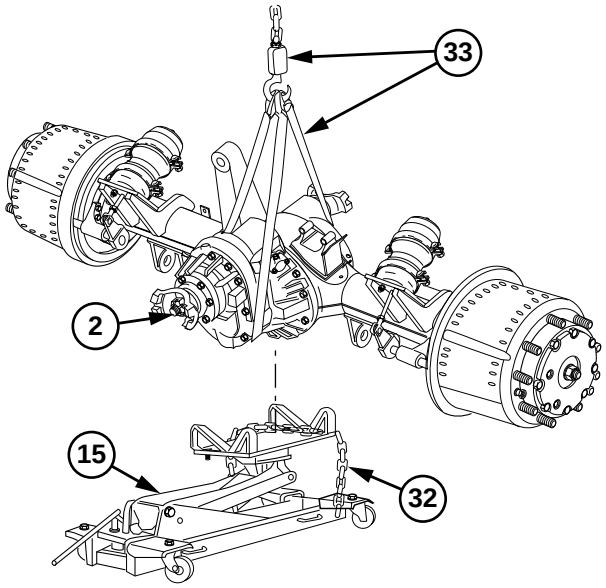
(18) Remove transmission lift (15) and axle assembly (2) from under HET Tractor with aid of assistant.



(19) Remove chain (32) from axle (2) and transmission lift (15).

(20) Attach lifting device (33) to axle (2).

(21) Lift axle (2) and remove transmission lift (15).



b. Installation

(1) Remove brake drums (1) from new axle (2) (TM 9-2320-360-20).

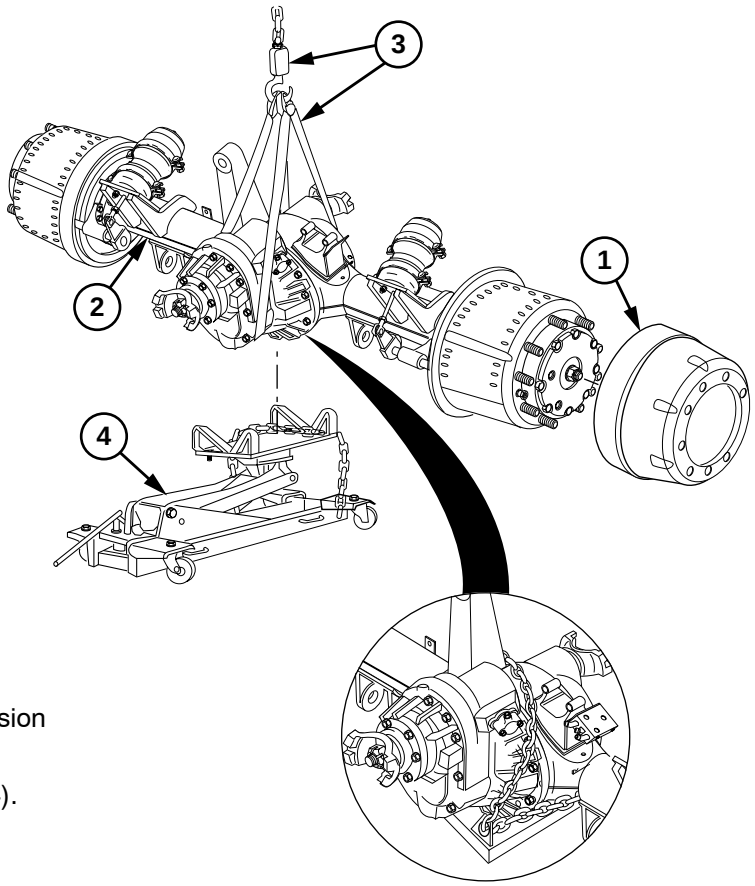
(2) Attach lifting device (3) to new axle (2).

WARNING

- **Axle weighs approximately 1760 lb (798 kg). Keep out from under axle. Failure to comply may result in injury or death to personnel.**
- **Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.**

(3) Lift axle (2) and position on transmission lift (4).

(4) Secure axle (2) to transmission lift (4).



10-3. AXLE NO. 3 REPLACEMENT (CONT)

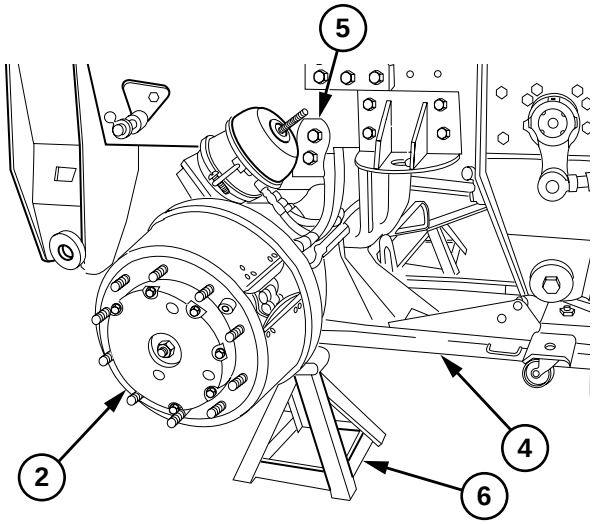
NOTE

Air pressure must be greater than 65 psi (448 kPa) to provide sufficient clearance to install axle.

(5) Position transmission lift (4) and axle (2) under HET tractor.

(6) Raise transmission lift (4) and position axle (2) directly under axle stops (5).

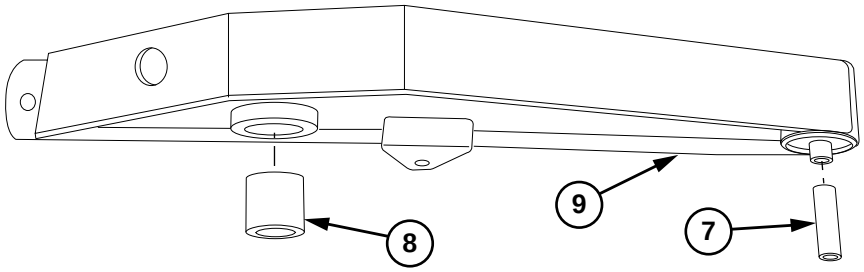
(7) Position jackstand (6) under each end of axle (2).



NOTE

Both suspension beams are installed the same way. Left side is shown.

(8) Install new delrin liner (7) and new steel sleeve (8) in suspension beam (9).



WARNING

Suspension beam is heavy and can fall. Keep out from under suspension beam. Failure to comply may result in injury to personnel.

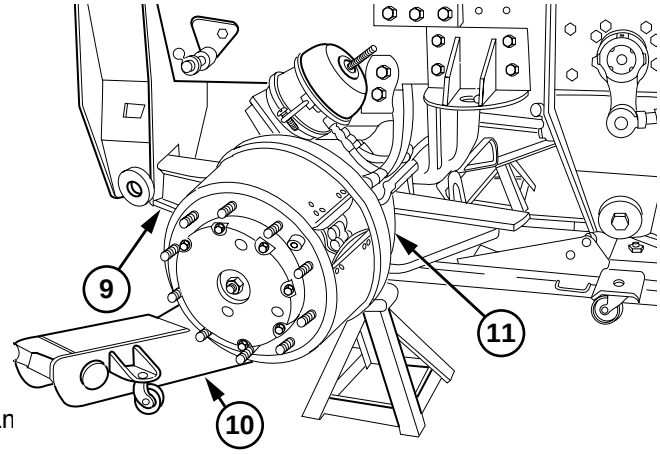
(9) Position suspension beam (9) on floor jack (10).

(10) Position floor jack (10) and suspension beam (9) below axle bracket (11).

NOTE

Axle position may need slight adjustment. The weight of axle should be supported by transmission lift.

(11) Raise floor jack (10) until suspension beam (9) is positioned correctly in axle bracket (11).



WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

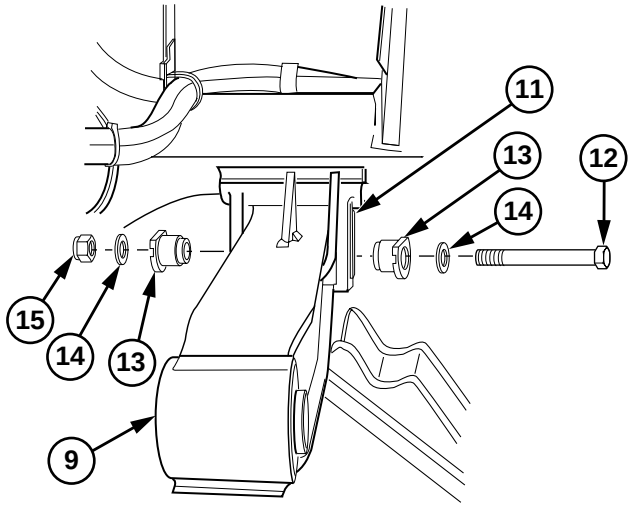
(12) Coat threads of new screw (12) with adhesive-sealant.

NOTE

Outside collar, washer, and screw are installed together.

(13) Install suspension beam (9) in axle bracket (11) with two new collars (13), new screw (12), and two new washers (14).

(14) Install new locknut (15) on screw (12). Do not tighten.



NOTE

Axle may need slight adjustment.

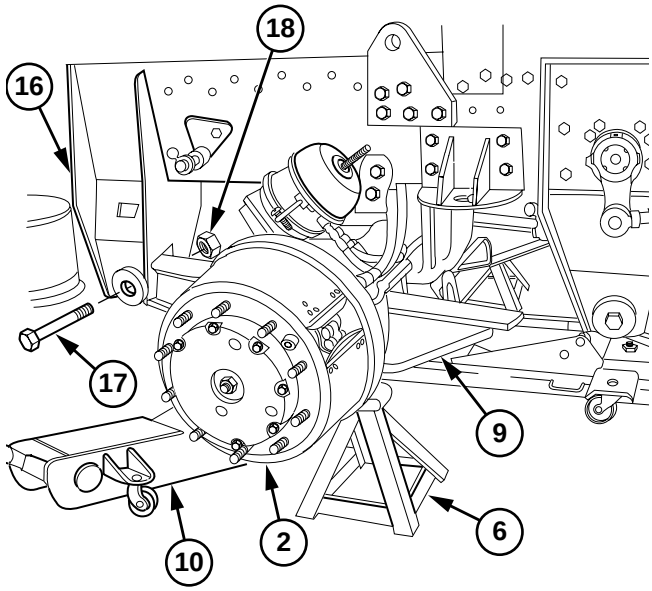
(15) Raise floor jack (10) until suspension beam (9) is positioned correctly in frame bracket (16).

(16) Install suspension beam (9) on frame bracket (16) with new screw (17) and new locknut (18). Do not tighten.

(17) Raise jackstand (6) to support side of axle (2).

(18) Remove floor jack (10) from below suspension beam (9).

(19) Repeat steps (8) thru (18) for other suspension beam.



10-3. AXLE NO. 3 REPLACEMENT (CONT)

WARNING

Keep hands and feet clear of axle until axle is secured by torque rod. Failure to comply may result in injury to personnel.

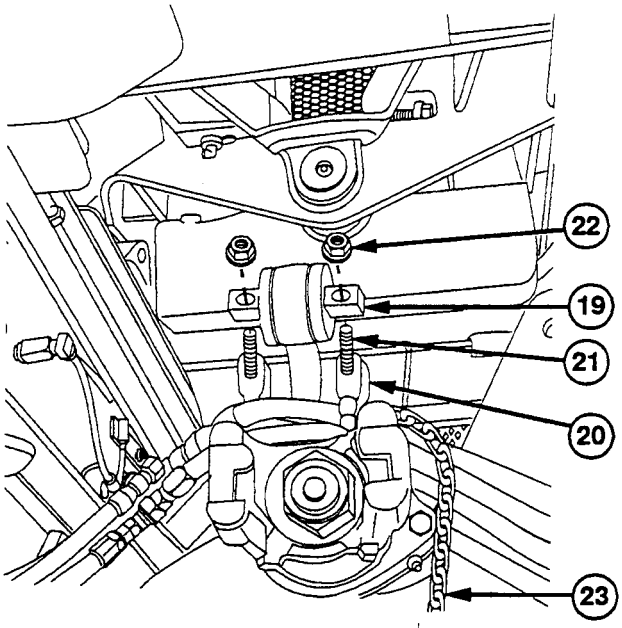
NOTE

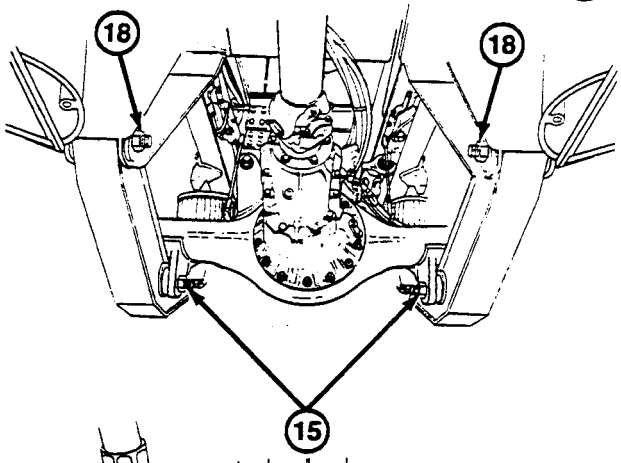
It may be necessary to raise front of differential with floor jack to aid installation of longitudinal torque rod.

(20) Install longitudinal torque rod (19) on axle assembly (20) with two screws (21) and new locknuts (22). Torque to 212 lb-ft (287 N·m).

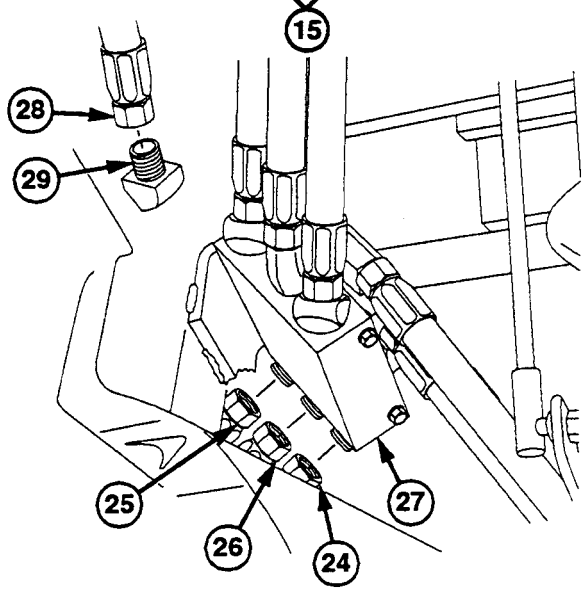
(21) Remove chain (23) from axle assembly (20) and transmission lift (4).

(22) Lower transmission lift (4) and remove from under HET Tractor.





(23) Tighten two locknuts (15) to 495 lb-ft (671 N·m) and two locknuts (18) to 800 lb-ft (1085 N·m).

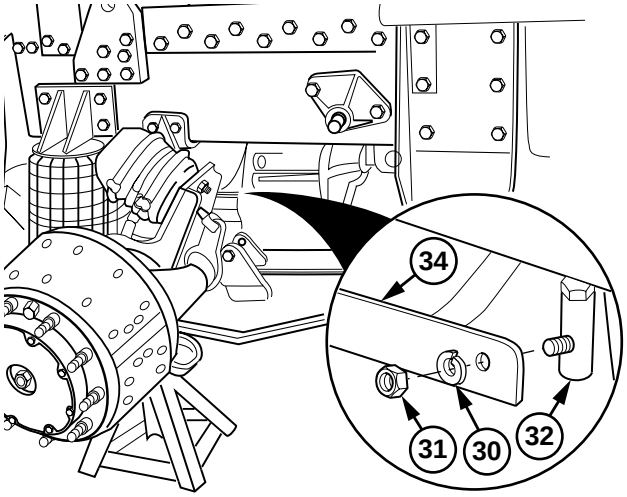


NOTE

Protective caps should be removed from fittings covered during removal.

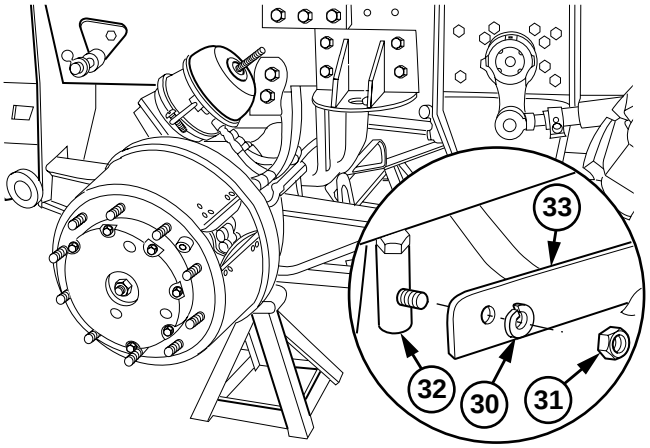
(24) Install hose no. 2143 (24), no. 2106 (25), and no. 2368 (26) on manifold (27).

(25) Install hose no. 2422 (28) on fitting (29).



(26) Install new lockwasher (30), nut (31), and ball joint (32) on right bracket (33).

(27) Repeat step (26) for left bracket (34).



c. Follow-On Maintenance

(1) Install air springs (TM 9-2320-360-20).

(2) Install no. 2 axle to no. 3 axle and no. 3 axle to no. 4 axle propeller shafts (TM 9-2320-360-20).

(3) Install shock absorbers (TM 9-2320-360-20).

(4) Fill axle differential and wheel ends (LO 9-2320-360-12).

(5) Install brake drums (TM 9-2320-360-20).

(6) Install lateral torque rod (para 15-3).

(7) Adjust ride height (TM 9-2320-360-20).

(8) Align axle no. 3 (para 10-5).

10-4. AXLE NO. 4 REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Brake drums removed (axle no. 4 only) (TM 9-2320-360-20).
Differential and wheel ends drained (axle no. 4 only) (LO 9-2320-360-12).
Air springs removed (axle no. 4 only) (TM 9-2320-360-20).
Shock absorbers removed (axle no. 4 only) (TM 9-2320-360-20).
Propeller shaft removed (axle no. 3 to axle no. 4) (TM 9-2320-360-20).
Lateral torque rod removed (para 15-3).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 1/2 In. Female - 3/4 In. Male (Item 3, Appendix E)
Jack, Floor 10-Ton (Item 90, Appendix E)
Jack Kit, Hydraulic Hand (Item 92, Appendix E)
Jackstands (2) (Item 93, Appendix E)
Lift, Transmission and Differential (Item 95, Appendix E)
Multiplier, Torque (Item 99, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench Set, Socket, 1 In. Drive (Item 230, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)

Tools and Special Tools (Cont)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Impact, Electric, 1 In. (Item 223, Appendix E)
Wrench, Open-End, 1-11/16 In. and 1-7/8 In. (Item 225, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 8, Appendix B)
Caps, Shipping and Sealing (Item 13, Appendix B)
Oil, Lubricating (Item 48, Appendix B)
Ties, Cable, Plastic, (Item 60, Appendix B)
Bolt Kit, Beam Hanger (Item 3, Appendix F)
Bolt Kit, Bushing (Item 4, Appendix F)
Locknuts (2) (Item 87, Appendix F)
Pins, Cotter (2) (Item 219, Appendix F)
Pins, Cotter (2) (Item 221, Appendix F)

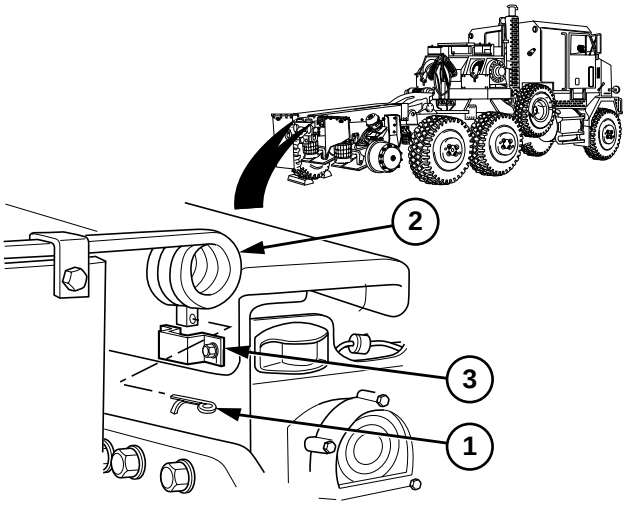
Special Environmental Conditions
HET Tractor parked on hard, level surface.

Personnel Required
Two

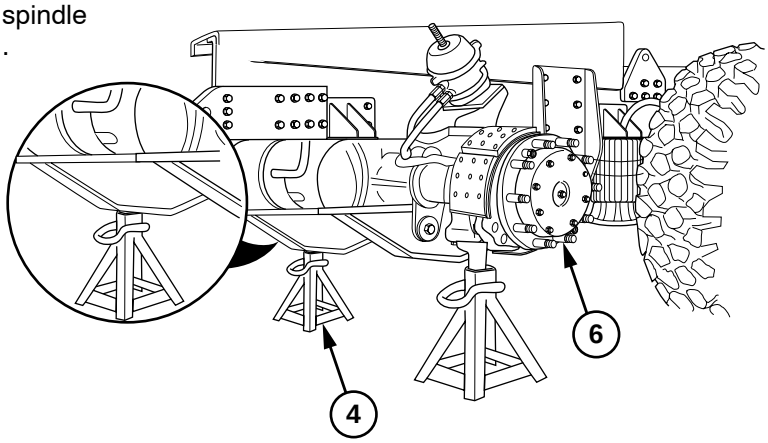
a. Removal

NOTE
Left and right mud flaps are removed the same way. Left mud flap is shown.

(1) Remove cotter pin (1) and mud flap bracket (2) from bracket (3). Discard cotter pin.



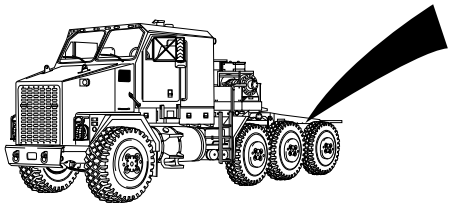
(2) Place jackstand (4) under pivot and spindle assembly (5) at each end of axle (6).

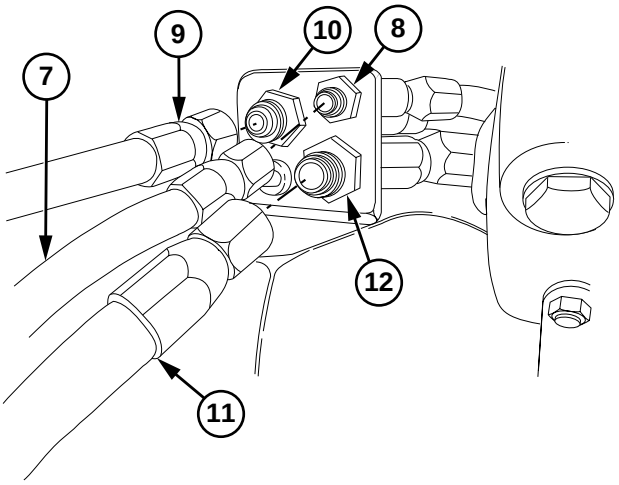


(3) Remove hose no. 2141 (7) from fitting (8).

(4) Remove hose no. 2016 (9) from fitting (10).

(5) Remove hose no. 2873 (11) from fitting (12).



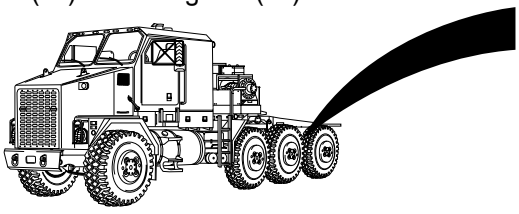


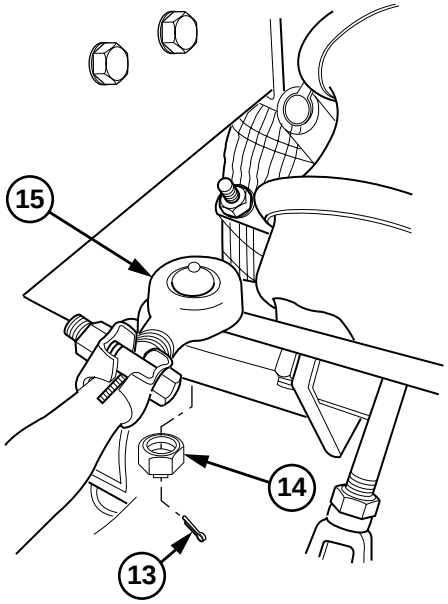
WARNING

Support drag link after removing hardware to prevent it from falling. Failure to comply may result in injury.

(6) Remove cotter pin (13) from nut (14). Discard cotter pin.

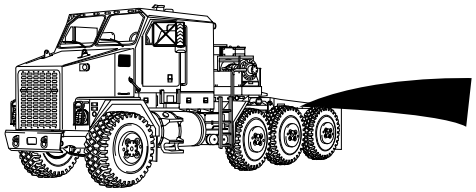
(7) Remove nut (14) from drag link (15).

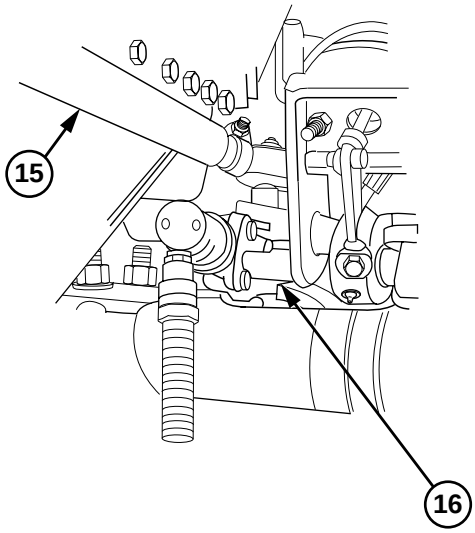




10-4. AXLE NO. 4 REPLACEMENT (CONT)

(8) Remove drag link (15) from axle steering arm (16) using hydraulic hand jack.

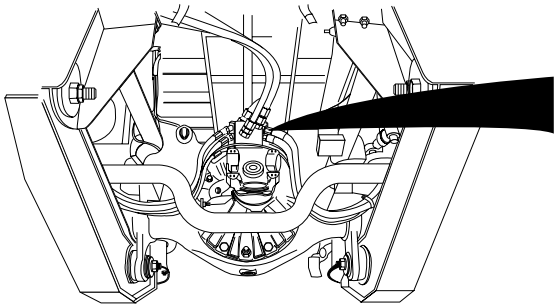


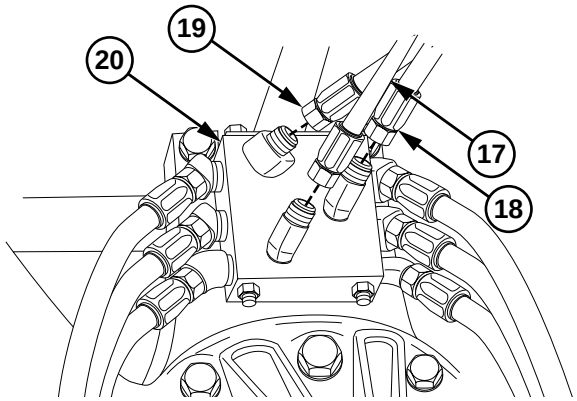


NOTE

Protective caps should be placed on fittings uncovered in step (9).

(9) Remove three hoses no. 2144 (17), 2369 (18), and 2873 (19) from manifold (20).



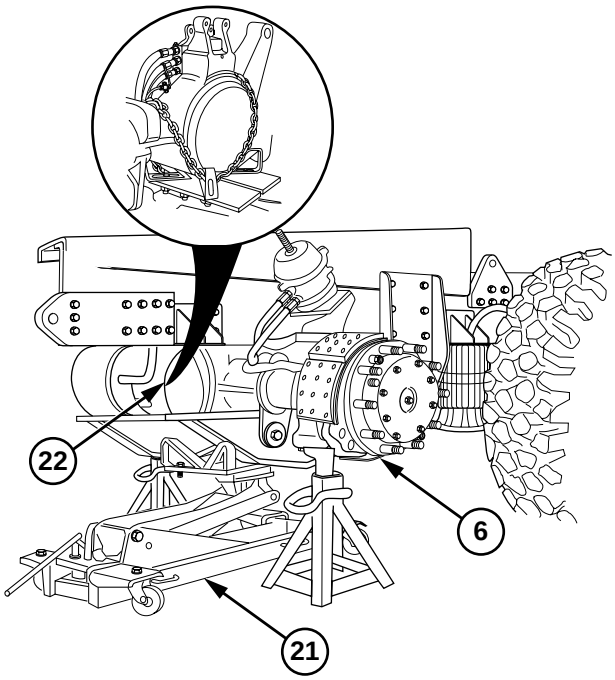


WARNING

Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.

(10) Place transmission lift (21) under axle differential (22) to support axle (6).

(11) Secure axle (6) to transmission lift (21).

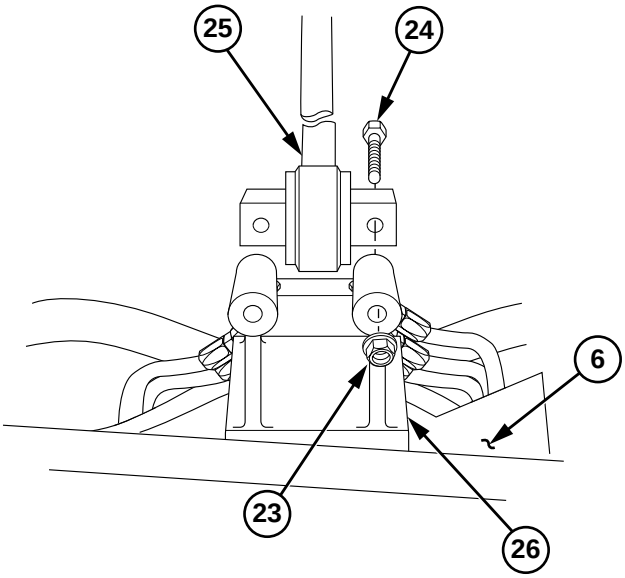


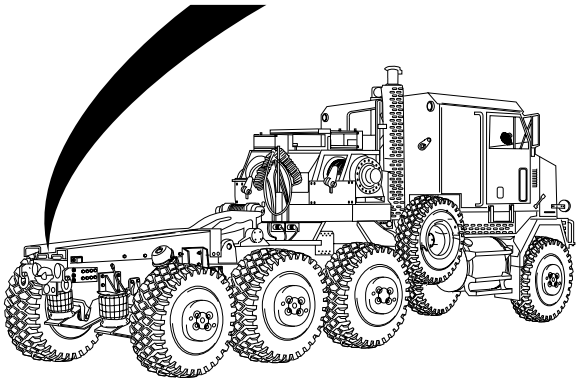
WARNING

Axle may rotate forward during removal of longitudinal torque rod. Keep hands and feet away from axle. Failure to comply may result in serious injury to personnel.

(12) Remove two locknuts (23), screws (24), and longitudinal torque rod (25) from axle housing (26). Discard locknuts.

(13) Secure longitudinal torque rod (25) out of the way after removing it from axle (6).





WARNING

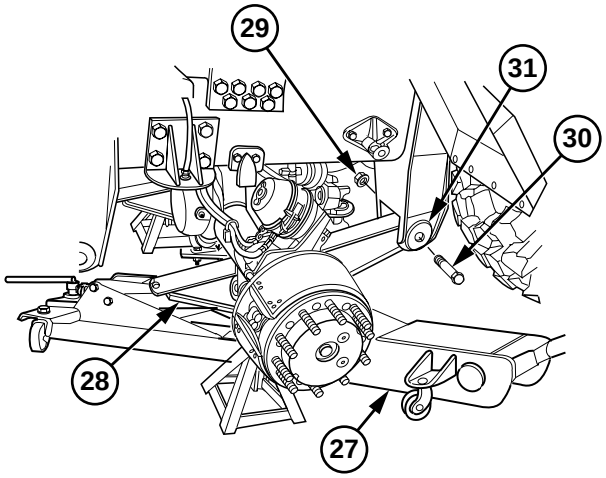
Suspension beam is heavy and can fall. Keep out from under suspension beam. Failure to comply may result in injury to personnel.

NOTE

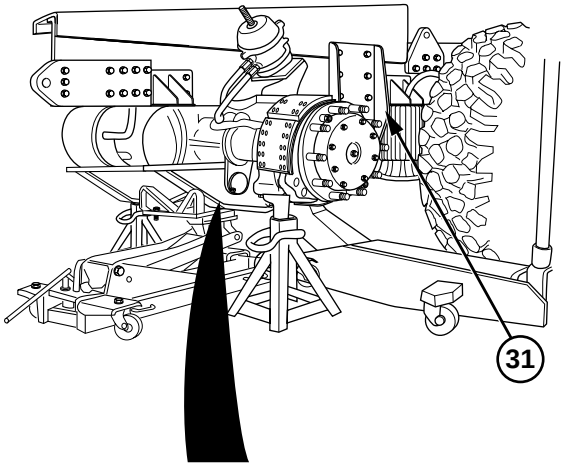
Both suspension beams are removed the same way. Right side is shown.

(14) Place floor jack (27) under center of suspension beam (28).

(15) Remove locknut (29) and screw (30) from suspension beam (28) and frame hanger (31) with aid of assistant. Discard locknut and screw.



10-4. AXLE NO. 4 REPLACEMENT (CONT)



NOTE

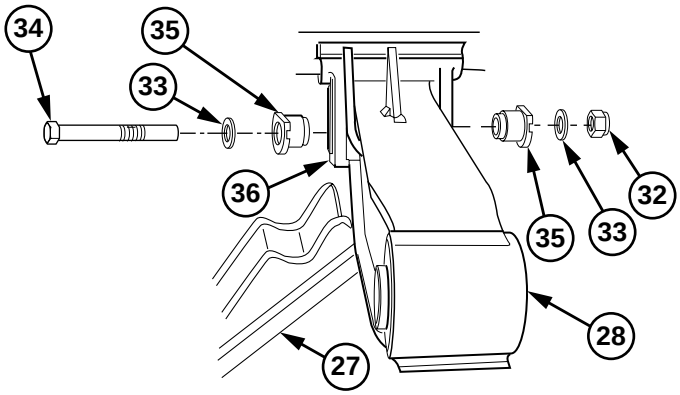
Screw, washer, and outside collar are removed together.

(16) Remove locknut (32), two washers (33), screw (34), and two collars (35) from suspension beam (28) and axle bracket (36). Discard locknut, washers, screw, and collars.

NOTE

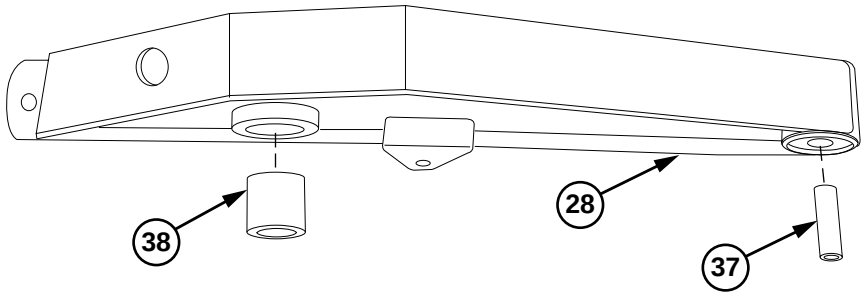
It may be necessary to tap suspension beam out of axle bracket and frame hanger.

(17) Lower floor jack (27) and remove suspension beam (28) from axle bracket (36) and frame hanger (31).



(18) Remove delrin liner (37) and steel sleeve (38) from suspension beam (28). Discard delrin liner and steel sleeve.

(19) Repeat steps (14) thru (18) for other suspension beam.



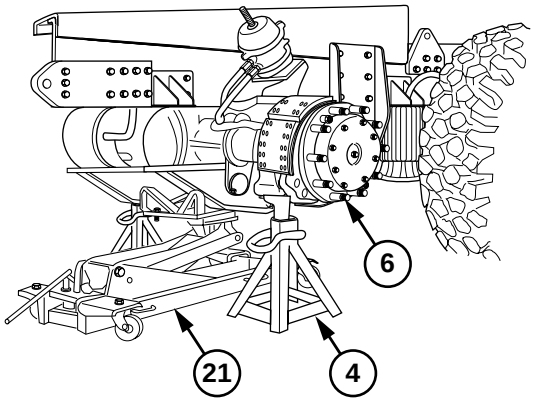
WARNING

Axle weighs 1760 lb (798 kg). Keep out from under axle. Failure to comply may result in injury or death to personnel.

NOTE

Air pressure must be greater than 65 psi (448 kPa) to provide sufficient clearance to install axle.

(20) Raise transmission lift (21) enough to lift axle (6) and remove jackstands (4).



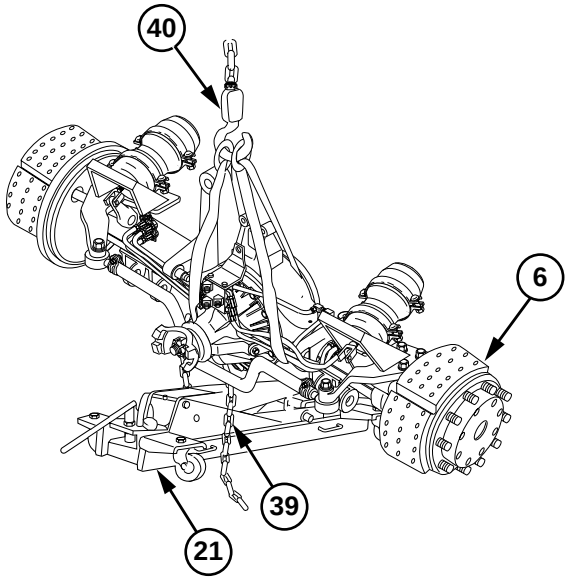
(21) Lower transmission lift (21) and axle (6) to lowest position.

(22) Remove transmission lift (21) and axle (6) from under HET Tractor with aid of assistant.

(23) Remove chain (39) from axle (6) and transmission lift (21).

(24) Attach lifting device (40) to axle (6).

(25) Lift axle (6) and remove transmission lift (21).



b. Installation

(1) Remove brake drums (1) from new axle (2) (TM 9-2320-360-20).

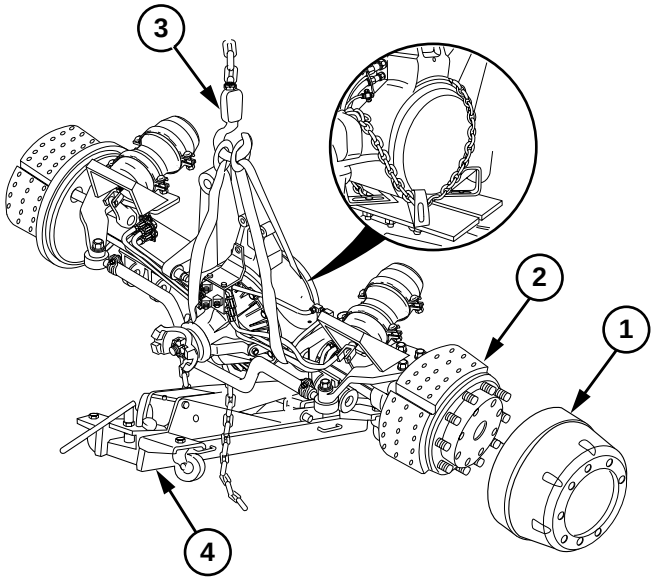
(2) Attach lifting device (3) to new axle (2).

WARNING

- **Axle weighs 1760 lb (798 kg). Keep out from under axle. Failure to comply may result in injury or death to personnel.**
- **Support axle with transmission lift. Secure axle to transmission lift with strap or chain. Failure to comply may result in serious injury to personnel.**

(3) Lift axle (2) and position on transmission lift (4).

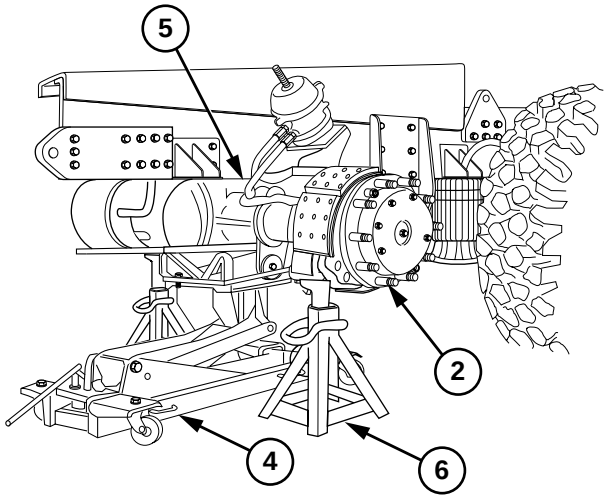
(4) Secure axle (2) to transmission lift (4).



10-4. AXLE NO. 4 REPLACEMENT (CONT)

NOTE

Air pressure must be greater than 65 psi (448 kPa) to provide sufficient clearance to install axle.



(5) Position transmission lift (4) and axle (2) under HET tractor.

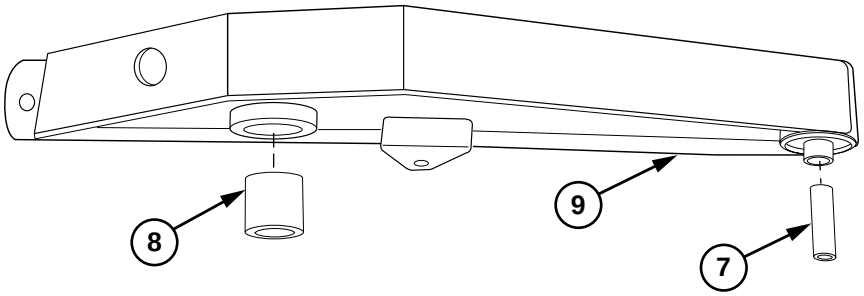
(6) Raise transmission lift (4) and position axle (2) directly under axle stops (5).

(7) Position jackstand (6) under each end of axle (2).

NOTE

Both suspension beams are installed the same way. Right side is shown.

(8) Install new delrin liner (7) and new steel sleeve (8) in suspension beam (9).



WARNING

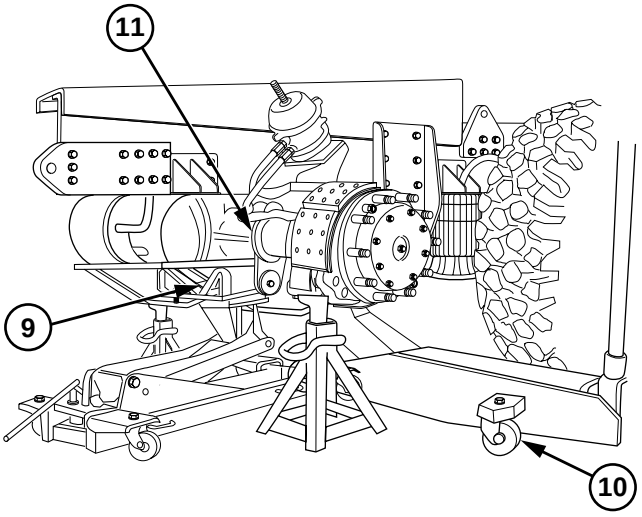
Suspension beam is heavy and can fall. Keep out from under suspension beam. Failure to comply may result in injury to personnel.

(9) Position suspension beam (9) on floor jack (10).

(10) Position floor jack (10) and suspension beam (9) below axle bracket (11).

NOTE

Axle position may need slight adjustment. The weight of axle should be supported by transmission lift.

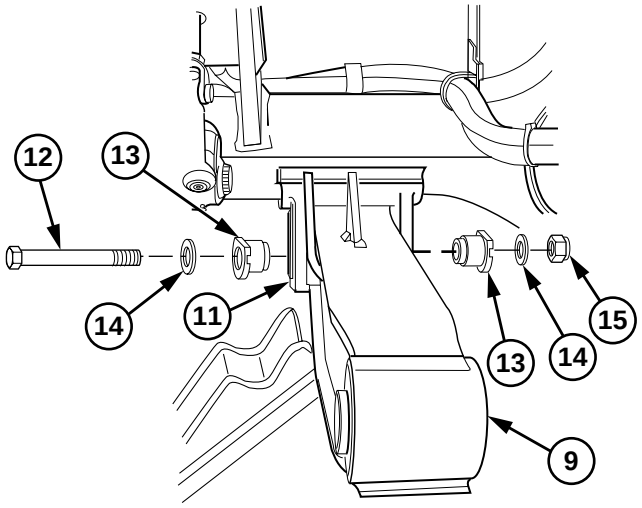


(11) Raise floor jack (10) until suspension beam (9) is positioned correctly in axle bracket (11).

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(12) Coat threads of new screw (12) with adhesive-sealant.



NOTE

Screw, washer, and outside collar are installed together.

(13) Install suspension beam (9) in axle bracket (11) with two new collars (13), new screw (12), and two new washers (14).

(14) Install new locknut (15) on screw (12). Do not tighten.

NOTE

Axle may need slight adjustment.

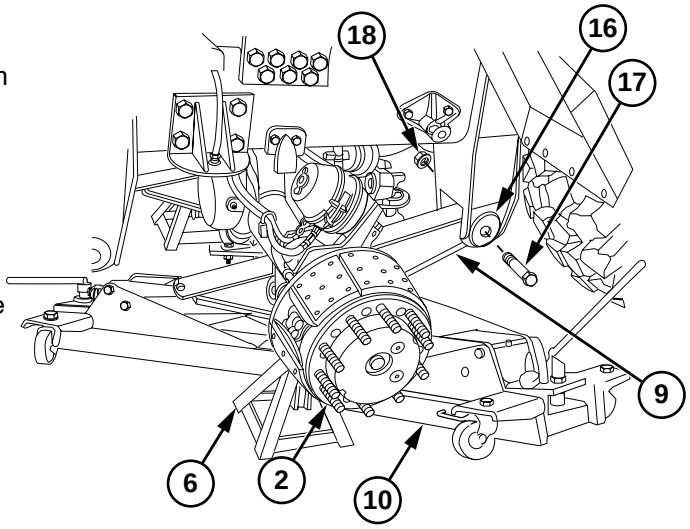
(15) Raise floor jack (10) until suspension beam (9) is positioned correctly in frame hanger (16).

(16) Install suspension beam (9) on frame hanger (16) with new screw (17) and new locknut (18). Do not tighten.

(17) Raise jackstand (6) enough to support side of axle (2).

(18) Remove floor jack (10) from below suspension beam (9).

(19) Repeat steps (8) thru (18) for other suspension beam.



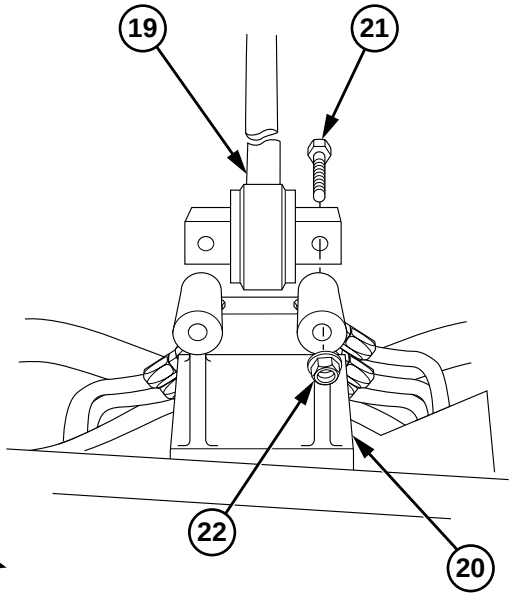
10-4. AXLE NO. 4 REPLACEMENT (CONT)

WARNING

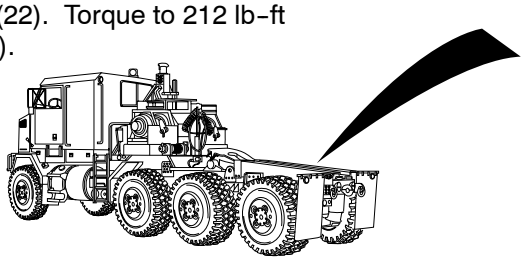
Keep hands and feet clear of axle until axle is secured by torque rod. Failure to comply may result in injury to personnel.

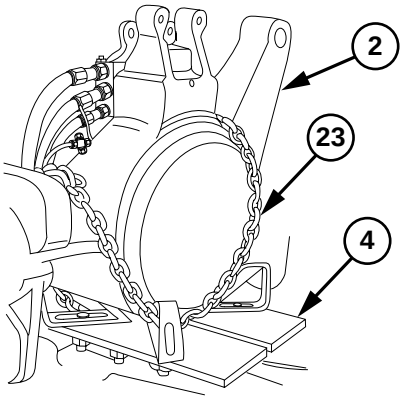
NOTE

It may be necessary to raise front of differential with floor jack to aid in installation of longitudinal torque rod.



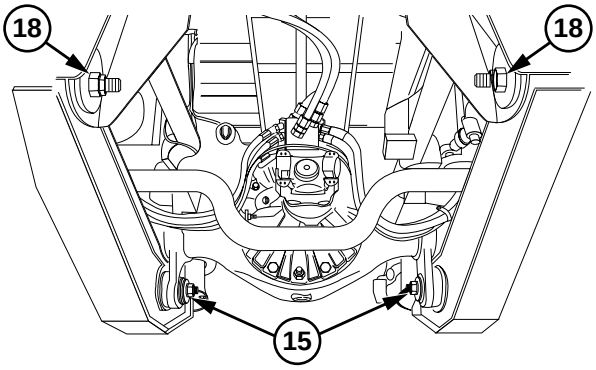
(20) Install longitudinal torque rod (19) on axle housing (20) with two screws (21) and new locknuts (22). Torque to 212 lb-ft (287 N·m).





(21) Remove chain (23) from axle (2) and transmission lift (4).

(22) Lower transmission lift (4) and remove from HET Tractor.

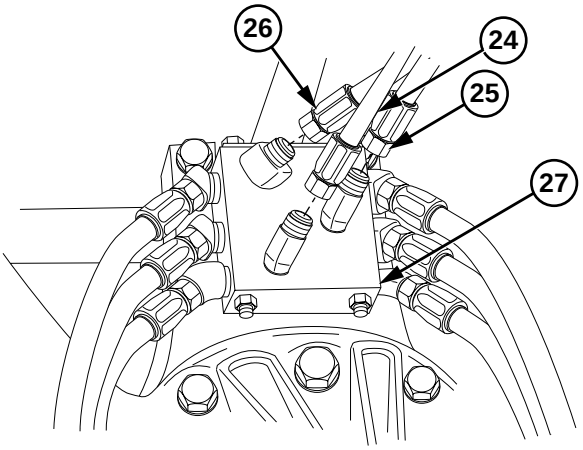


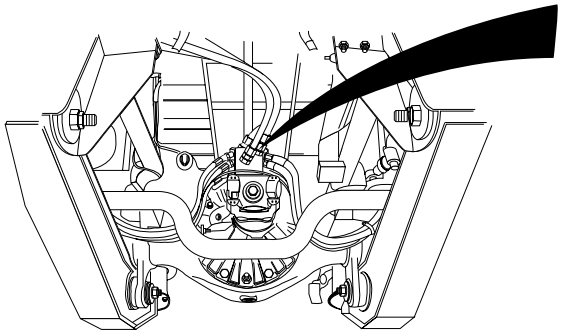
(23) Tighten two locknuts (15) to 495 lb-ft (671 N·m) and two locknuts (18) to 800 lb-ft (1085 N·m).

NOTE

Protective caps should be removed from fittings covered during removal.

(24) Install hose no. 2144 (24), no. 2369 (25), and no. 2873 (26) on manifold (27).





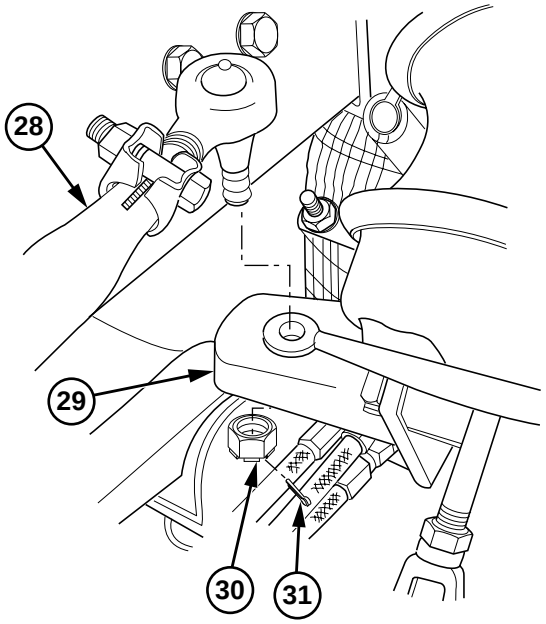
WARNING

Support drag link when installing hardware to prevent it from falling. Failure to comply may result in injury.

(25) Insert rear of drag link (28) in steering arm (29).

(26) Install nut (30) on drag link (28). Torque to 165 lb-ft (224 N·m). Continue to tighten until slot in nut (30) is aligned with hole in drag link (28).

(27) Install new cotter pin (31) through nut (30) and drag link (28).

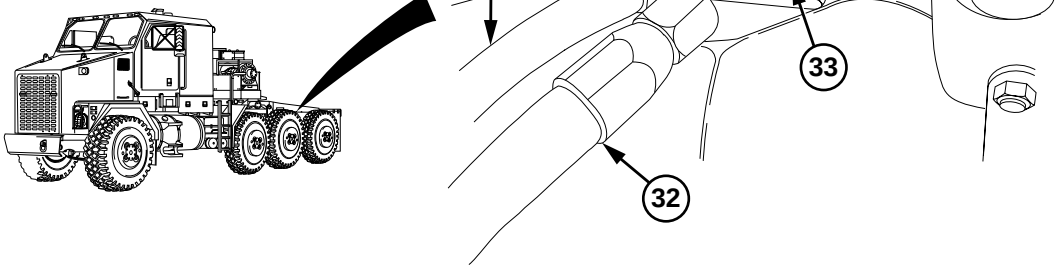


10-4. AXLE NO. 4 REPLACEMENT (CONT)

(28) Install hose no. 2873 (32) on fitting (33).

(29) Install hose no. 2016 (34) on fitting (35).

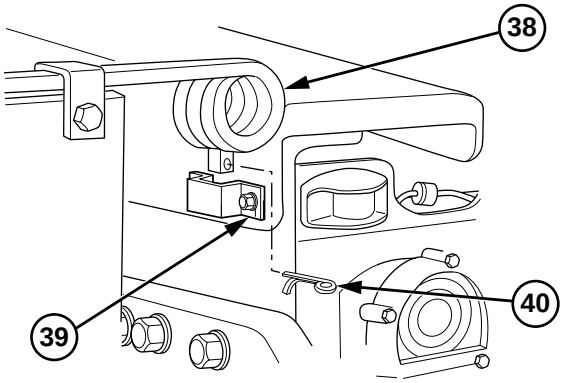
(30) Install hose no. 2141 (36) on fitting (37).

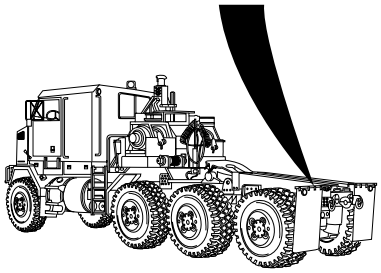


NOTE

Left and right mud flaps are installed the same way. Left mud flap is shown.

(31) Install mud flap bracket (38) on bracket (39) with new cotter pin (40).





c. Follow-On Maintenance

(1) Install air springs (TM 9-2320-360-20).

(2) Install axle no. 3 to axle no. 4 propeller shaft (TM 9-2320-360-20).

(3) Install shock absorbers (TM 9-2320-360-20).

(4) Fill axle differential and wheel ends (LO 9-2320-360-12).

(5) Install brake drums (TM 9-2320-360-20).

(6) Install lateral torque rod (para 15-3).

(7) Align axle no. 4 (para 10-5).

10-5. AXLE ALIGNMENT

This task covers:
a. Alignment
b. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Wheels/tires removed from affected axle (TM 9-2320-360-20).
Input propeller shaft removed from affected axle (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jackstands (2) (Item 93, Appendix E)
Square, Combination, Protractor Head (Item 180, Appendix E)
Straightedge (Item 185, Appendix E)

Tools and Special Tools (Cont)
Tape, Measuring (Item 188, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (4) (Item 87, Appendix F)
Spacers (Item 326, Appendix F)

Special Environmental Conditions
Het Tractor parked on hard, level surface.

Personnel Required
Two

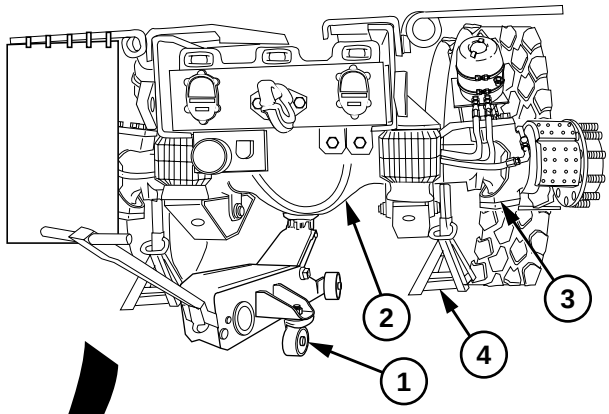
a. Alignment

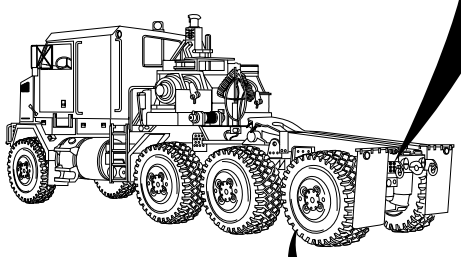
(1) Place floor jack (1) under differential (2).

NOTE
Ride height is measured between axle housing and bottom of frame.

(2) Raise differential (2) with floor jack (1) to achieve 9 in. (23 cm) ±1/2 in. ride height clearance.

(3) Support axle (3) with jackstands (4).

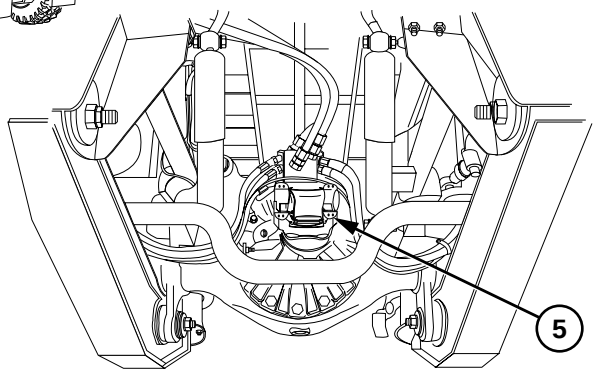




MUD FLAP REMOVED FOR CLARITY

NOTE
- Driveline angle of axles no. 2 and 3, should be 3.0 degrees. Axle no. 4 should have driveline angle of 4.3 degrees.
- If measurement taken in step (4) is correct, go to step (9).

(4) Position combination square on input yoke (5) to check driveline angle.

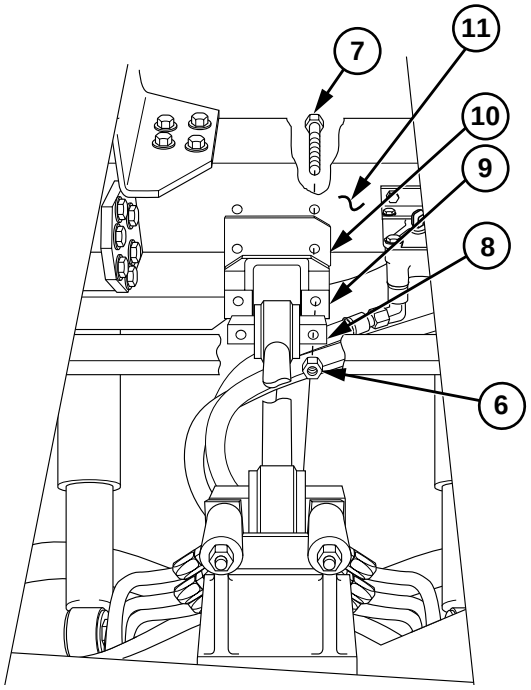


10-5. AXLE ALIGNMENT (CONT)

NOTE

Front of differential can be supported with floor jack to aid in removal or installation of spacers.

(5) Remove two locknuts (6), screws (7), longitudinal torque rod (8), bracket (9), and spacers (10) from crossmember (11). Discard locknuts.

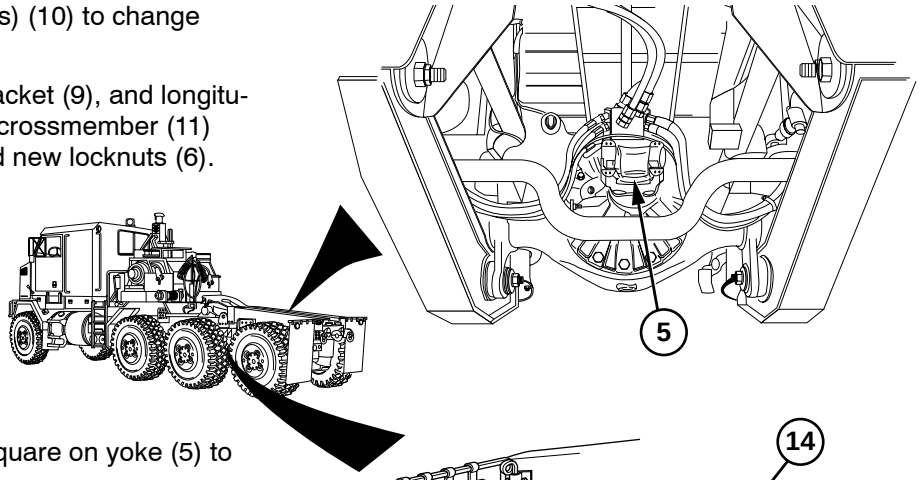


NOTE

- Spacer thickness is 0.125 in. (3.15 mm). Do not use more than six spacers.
- Adding one spacer will increase driveline angle by approximately 1 degree. Removing one spacer will decrease driveline angle by approximately 1 degree.

(6) Add or remove spacer(s) (10) to change driveline angle.

(7) Install spacers (10), bracket (9), and longitudinal torque rod (8) on crossmember (11) with two screws (7) and new locknuts (6).



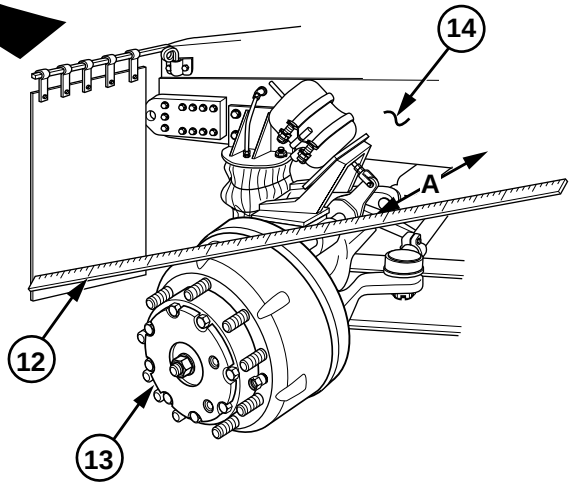
(8) Position combination square on yoke (5) to recheck driveline angle.

NOTE

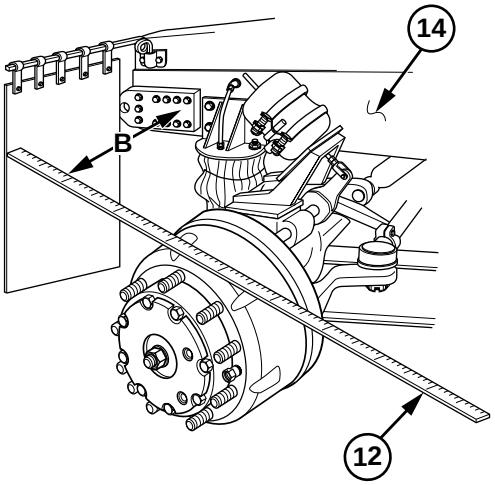
Axle no. 4 should be positioned straight ahead.

(9) Place straightedge (12) against machine-surfaced outer edge of right brake drum (13).

(10) Measure and record distance A between front of straightedge (12) and right frame rail (14).

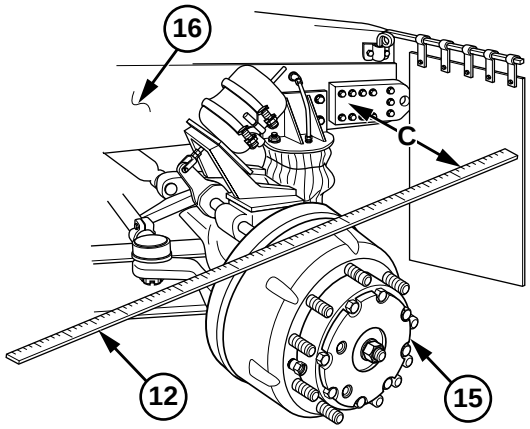


(11) Measure and record distance B between rear of straightedge (12) and right frame rail (14).



(12) Place straightedge (12) against machine-surface outer edge of left brake drum (15).

(13) Measure and record distance C between front of straightedge (12) and left frame rail (16).



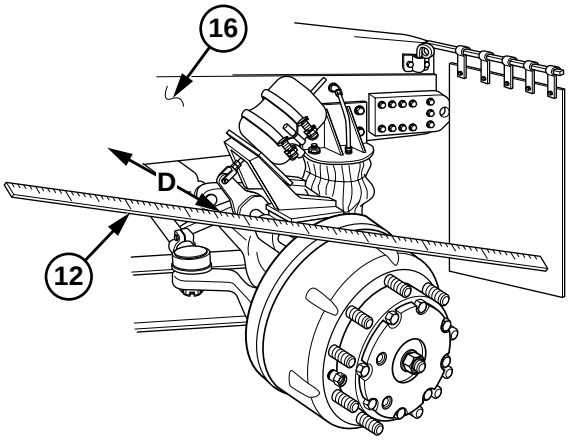
(14) Measure and record distance D between rear of straightedge (12) and left frame rail (16).

NOTE

- If measurement in step (15) is within 0.125 in. (3.18 mm) or less than measurement in step (16), no additional spacing is required. Go to step (23).
- If measurement in step (15) is 0.125 in. (3.18 mm) or more than measurement in step (16), spacers must be removed from torque rod.
- If measurement in step (16) is 0.125 in. (3.18 mm) or more than measurement in step (15), spacers must be added to torque rod.

(15) Add distance A to distance B and divide by 2.

(16) Add distance C to distance D and divide by 2.

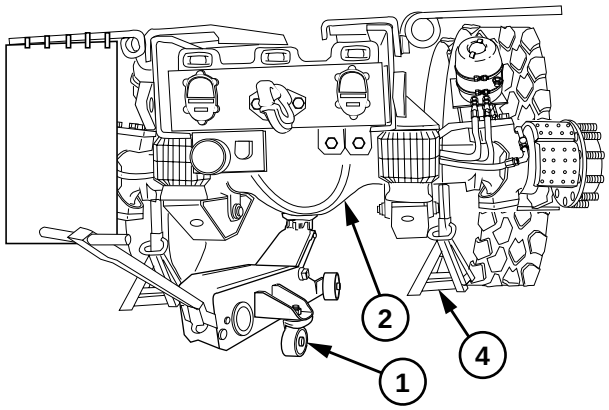


10-5. AXLE ALIGNMENT (CONT)

NOTE
Lowering axle will aid in installing or removing spacers.

(17) Raise floor jack (1) and remove jackstands (4).

(18) Lower differential (2) with floor jack (1) to add or remove spacers (17).

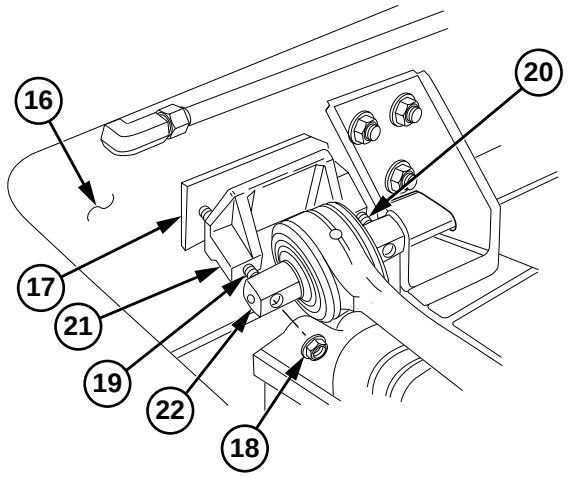


(19) Remove two locknuts (18), screw (19), screw (20), spacers (17), bracket (21), and torque rod (22) from left frame rail (16). Discard locknuts.

NOTE
Spacer thickness is 0.125 in. (3.15 mm). Do not use more than six spacers.

(20) Add or remove spacers (17) so measurements in steps (15) and (16) are equal to or less than 0.125 in. (3.18 mm) difference.

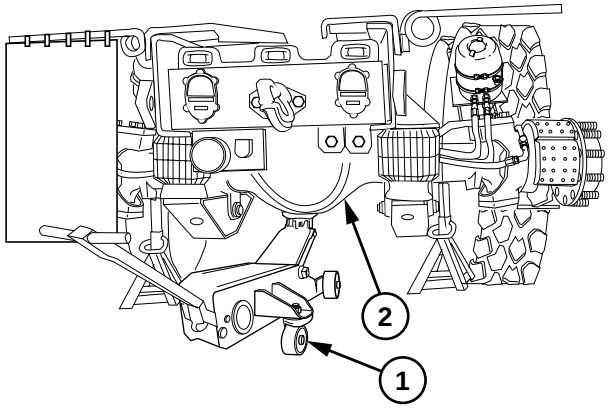
(21) Install bracket (21), torque rod (22), spacers (17), screw (19), screw (20), and two new locknuts (18) on left frame rail (16) with aid of assistant. Torque to 212 lb-ft (287 N·m).



NOTE
Axle must be returned to 9 in. (23 cm) ride height before doing step (22).

(22) Repeat steps (9) thru (16).

(23) Lower floor jack (1) and remove from differential (2).



b. Follow-On Maintenance

(1) Install input propeller shaft (TM 9-2320-360-20).

(2) Install wheels/tires (TM 9-2320-360-20).

10-6. AXLE NO. 2, 3, AND 4 OIL SEAL AND YOKE REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transfer case in low range (TM 9-2320-360-10).
Driveline lock-up valve in LOCK position (TM 9-2320-360-10).
Air pressure at 120-125 psi (827-861 kPa).
Propeller shaft removed (table 10-1).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 3/4 In. Female - 1 In. Male (Item 6, Appendix E)
Holder, Yoke (Figure C-15, Appendix C)
Multiplier, Torque (Item 99, Appendix E)
Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
Socket, 55 mm (Item 163.1, Appendix E)
Socket, 63 mm (Item 163.2, Appendix E)

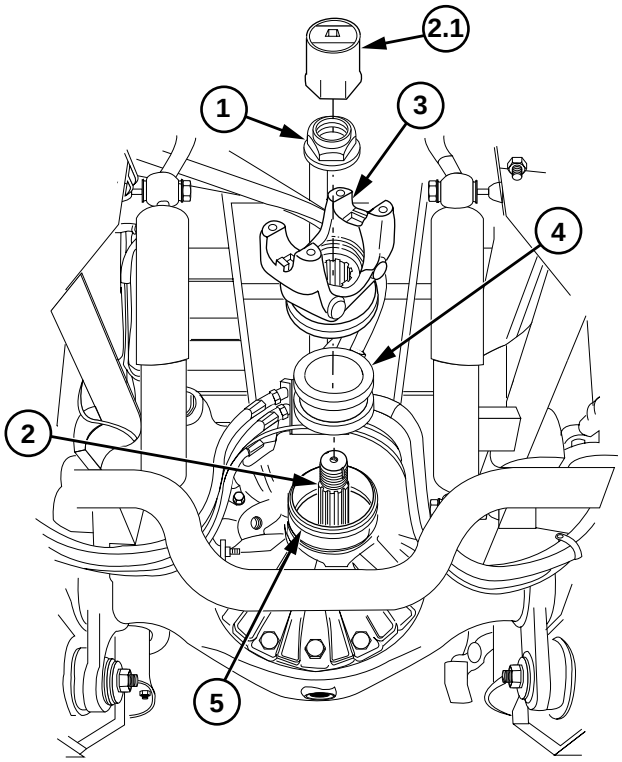
Tools and Special Tools (Cont)
Wrench Set, Socket, 1 In. Drive (Item 230, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Sealant, Adhesive (Item 6, Appendix B)
Oil, Lubricating (Item 48, Appendix B)
Nut, Adjusting (4) (2 each Axle No. 2 and No. 3) (Item 149, Appendix F)
Nut, Adjusting (Axle No. 4) (Item 150, Appendix F)
Seal, Oil (2 each Axle No. 2 and No. 3, 1 each Axle 4) (Item 305, Appendix F)

Personnel Required
Two

Table 10-1. Propeller Shaft Removed

Yoke/Seal to be replaced	Propeller Shaft
Axle No. 2 Input	Transfer Case to Axle No. 2
Axle No. 2 Output	Axle No. 2 to Axle No. 3
Axle No. 3 Input	Axle No. 2 to Axle No. 3
Axle No. 3 Output	Axle No. 3 to Axle No. 4
Axle No. 4 Input	Axle No. 3 to Axle No. 4



a. Removal

NOTE
All seals and yokes on axles no. 2, no. 3, and no. 4 are replaced in the same manner. No. 4 axle is shown.

(1) Unstake and remove locknut (1) from shaft (2) using yoke holder and socket (2.1) with aid of assistant. Discard locknut.
(2) Remove yoke (3) from shaft (2).
(3) Remove oil seal (4) from housing (5). Discard seal.

10-6. AXLE NO. 2, 3, AND 4 OIL SEAL AND YOKE REPLACEMENT (CONT)

b. Cleaning/Inspection

Clean foreign material from housing where outside lip of seal seats.

c. Installation

(1) Coat new oil seal (1) with lubricating oil.

NOTE

- Oil seal must be installed so that spring side is against housing.
- Oil seal is properly installed when top of seal is 1/16 in. (1.59 mm) below surface of housing.

(2) Install new oil seal (1) in housing (2).

(3) Install yoke (3) on shaft (4).

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(3.1) Coat face of yoke (3) and splines of shaft (4) with silicone adhesive-sealant.

(3.2) Coat threads of new locknut (5) and threads of shaft (4) with adhesive sealant.

(4) Install new locknut (5) on shaft (4) using socket (5.1). Torque locknut as specified in table 10-2 using yoke holder with aid of assistant.

(4.1) Inspect to see that adhesive has squeezed out around locknut (5). If adhesive is not visible around entire circumference, repeat steps (3.1) and (4).

(5) Stake edge (6) of locknut (5) in notches of shaft (4) directly 180 degrees apart.

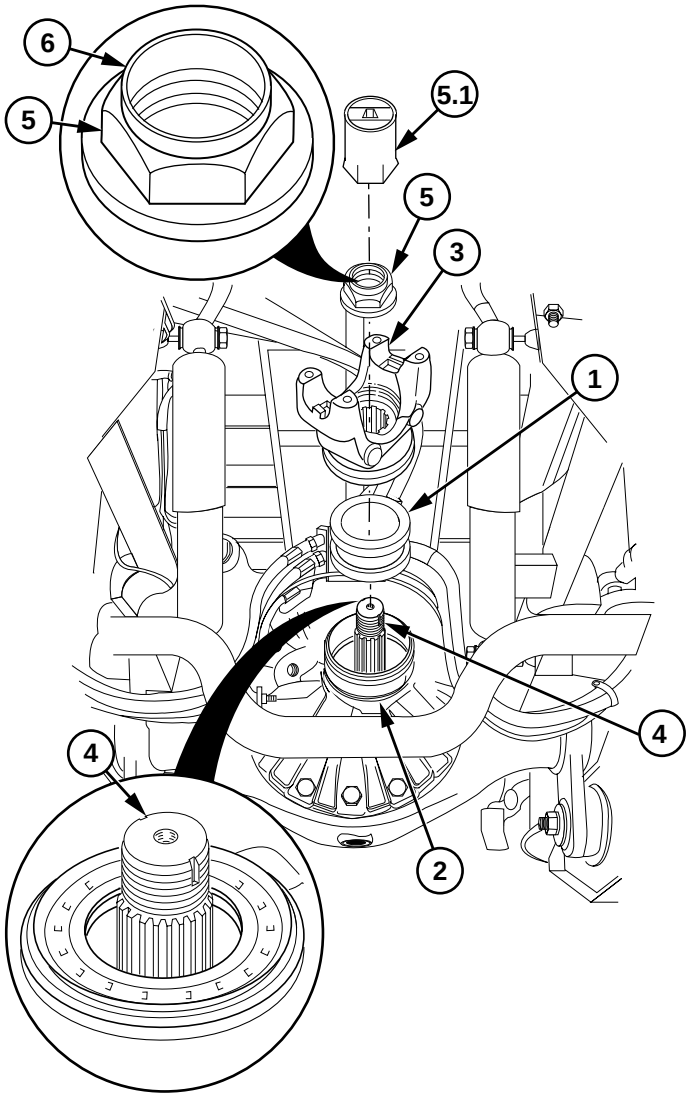


Table 10-2. Torque Values

Yoke/Seal Replaced	Torque Value
Axle No. 2 Input	680-796 lb-ft (922-1079 N·m)
Axle No. 2 Output	680-796 lb-ft (922-1079 N·m)
Axle No. 3 Input	680-796 lb-ft (922-1079 N·m)
Axle No. 3 Output	486-572 lb-ft (659-776 N·m)
Axle No. 4 Input	486-572 lb-ft (659-776 N·m)

d. Follow-On Maintenance

(1) Install propeller shaft (TM 9-2320-360-20).

(2) Check differential and wheel end oil level. Add oil if necessary (LO 9-2320-360-12).

10-6.1. AXLE NO. 3 LOCKING CYLINDER REPLACEMENT/ADJUSTMENT

This task covers:
a. Removal
b. Disassembly
c. Adjustment
d. Follow-On Maintenance

INITIAL SETUP

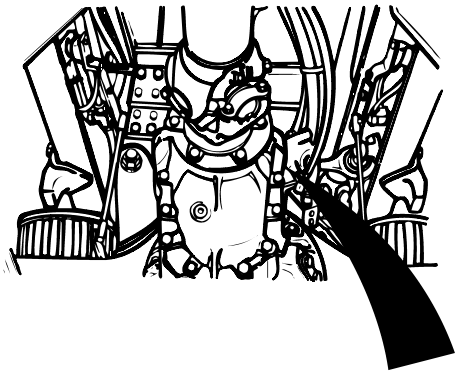
Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.
Air system drained (TM 9-2320-360-10).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Caliper Set, Micrometer, 0-6 In. (Item 15, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 2, Appendix B)
Tags, Identification (Item 56, Appendix B)
Shim Kit (Item 322.1, Appendix F)

a. Removal

(1) Remove air line no. 2422 (1) from fitting (2).



NOTE

- Tag and mark which screw location contains shim kit.
- Only discard shim kits if a new locking cylinder is to be installed.

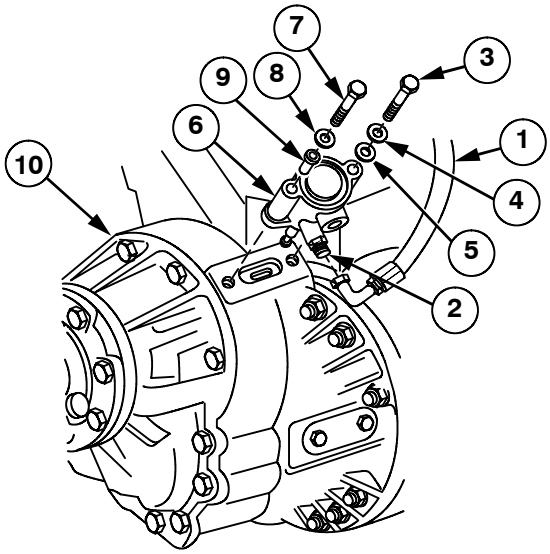
(2) Remove screw (3), washer (4), and shim kit (5) from locking cylinder (6). Discard shim kit.

(3) Remove screw (7), washer (8), and plastic washer (9) from locking cylinder (6).

NOTE

To remove locking cylinder pull toward front of truck and outward.

(4) Remove locking cylinder (6) from differential (10).



10-6.1. AXLE NO. 3 LOCKING CYLINDER REPLACEMENT/ADJUSTMENT (CONT)

b. Installation

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

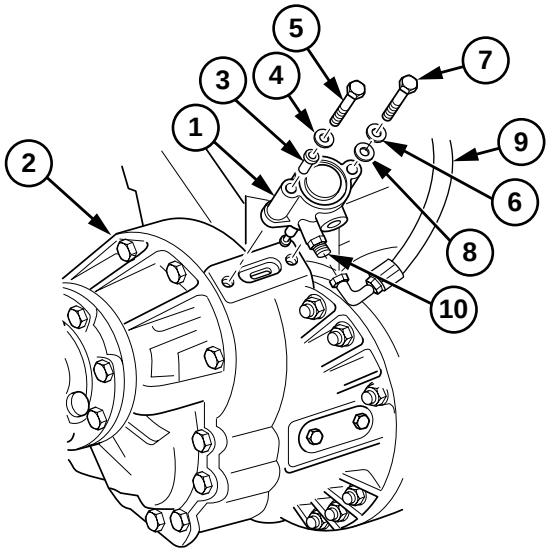
(1) Coat mating surface of locking cylinder (1) with silicone adhesive-sealant.

(2) Install locking cylinder (1) on differential (2).

(3) Install plastic washer (3), washer (4), and screw (5) on locking cylinder (1).

NOTE

- If a new locking cylinder was installed, perform steps (4) and (6). If the same locking cylinder was installed, perform steps (5) and (7).
- Install screw only to keep screw hole in locking cylinder aligned with differential. Screw should be positioned so that three or four threads of screw are engaged.



(4) Install washer (6) and screw (7) on locking cylinder (1).

(5) Install washer (6), shim kit (8) and screw (7) on locking cylinder (1).

(6) Tighten screw (5) on locking cylinder (1) to 22-32 lb-ft (30-43 N·m).

(7) Tighten screws (5) and (7) on locking cylinder (1) to 22-32 lb-ft (30-43 N·m).

(8) Install air line no. 2422 (9) on fitting (10).

c. Adjustment

NOTE

Perform adjustment only if a new locking cylinder was installed.

(1) Remove wheel chocks.

(2) Start engine and build up air pressure to 125 psi (862 kPa) (Tm 9-2320-360-10).

(3) Shift transfer case to low (TM 9-2320-360-10).

(4) Move driveline control to LOCK position (TM 9-2320-360-10).

(5) Drive HET Tractor forward or backward 5 ft (1.5 m).

(6) Turn engine switch to OFF (TM 9-2320-360-10).

(7) Chock wheels.

(8) Tighten screw (1) slowly until screw contacts fork in differential (2).

(9) Measure distance between face of washer (3) and top of locking cylinder (4) and record measurement as A.

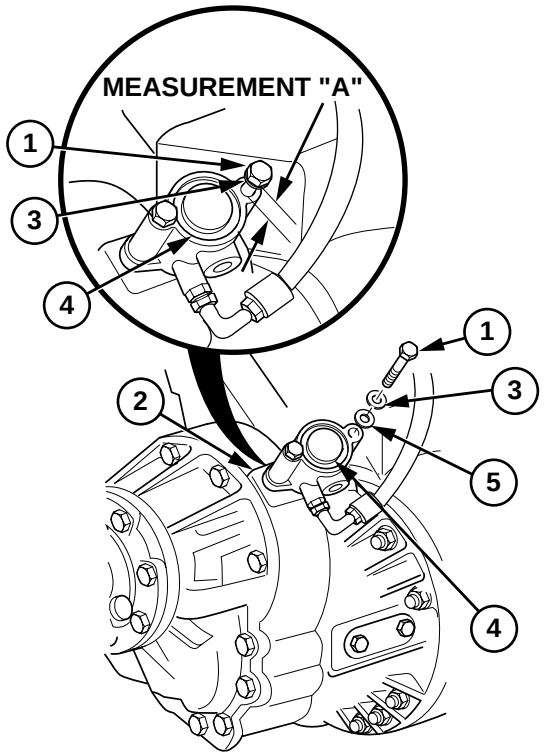
(10) Determine shim kit thickness. Shim kit thickness is A - 0.004 to 0.020 in. (0.102 to 0.508 mm).

(11) Remove screw (1) and washer (3) from locking cylinder (4).

NOTE

Shim kit thickness was determined in step (9).

(12) Install shim kit (5), washer (3), and screw (1). Torque to 22-32 lb-ft (30-43 N·m).



d. Follow-On Maintenance

(1) Check axle oil level (LO 9-2320-360-12).

(2) Check for oil and air leaks.

(3) Remove wheel chocks.

10-7. AXLE NO. 4 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR

This task covers:
- a. Removal
- b. Disassembly
- c. Cleaning/Inspection
- d. Assembly
- e. Installation
- f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
- Differential drained (axle no. 4 only) (LO 9-2320-360-12).
- Brake bracket and camshaft removed (para 11-3).
- Tie rod end removed (TM 9-2320-360-20).
- Rear brake chamber removed (TM 9-2320-360-20).
- Drag link removed (left side only) (para 13-3).

Tools and Special Tools
- Tool Kit, Genl Mech (Item 202, Appendix E)
- Adapter, Removal Tool (Figure C-19, Appendix C)
- Compressor Unit, Air (Item 24, Appendix E)
- Cover, King Pin Preload (Item 26, Appendix E)
- Extractor, King Pin (Item 39, Appendix E)
- Gage, Depth, Micrometer (Item 48, Appendix E)
- Goggles, Industrial (Item 57, Appendix E)
- Hammer, Slide (Item 64, Appendix E)
- Multiplier, Torque (Item 99, Appendix E)
- Pliers, Retaining Ring (Item 110, Appendix E)
- Press, Hydraulic (Item 116, Appendix E)

Tools and Special Tools (Cont)
- Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
- Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
- Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
- Adhesive-Sealant, Silicone (Item 2, Appendix B)
- Adhesive-Sealant (Item 4, Appendix B)
- Cloth, Crocus (Item 16, Appendix B)
- Compound, Sealing, Pipe Thread (Item 28, Appendix B)
- Grease, General Purpose,(Item 34, Appendix B)
- Oil, Lubricating (Item 44, Appendix B)
- Cleaning Compound, Solvent(Item 54, Appendix B)
- Tags, Identification (Item 56, Appendix B)
- Cross (2) (Item 9.1, Appendix F)
- Seals, Oil (2) (Item 306, Appendix F)
- Sealing Kit (Item 295, Appendix F)

Personnel Required
- Two

a. Removal

(1) Remove hose (1) from tee (2).

(2) Remove tube assembly (3) from tee (2) and fitting (4).

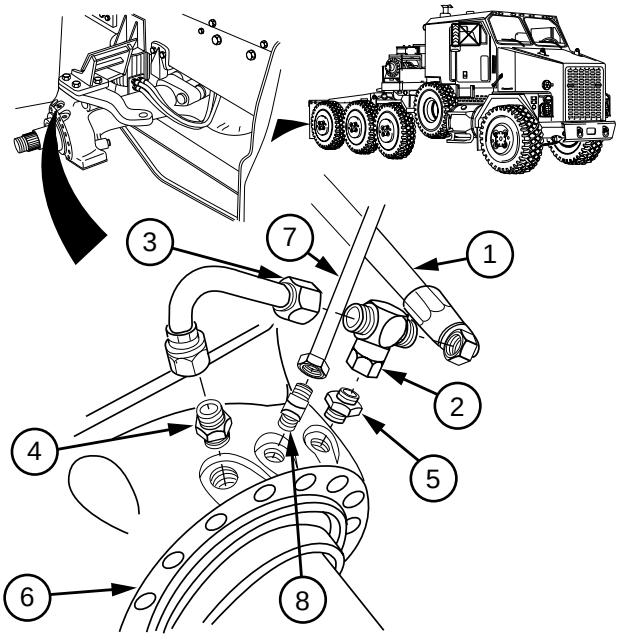
(3) Remove tee (2) from fitting (5).

(4) Remove fitting (5) from pivot and spindle assembly (6).

(5) Remove fitting (4) from pivot and spindle assembly (6).

(6) Remove hose (7) from elbow (8).

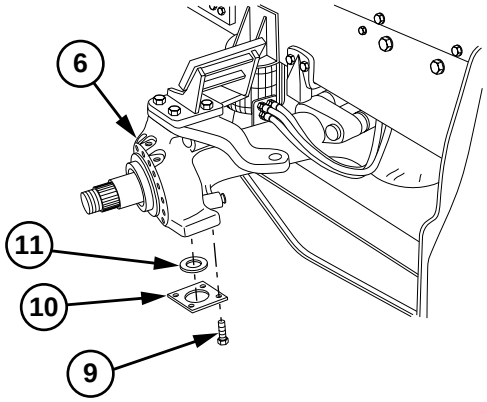
(7) Remove elbow (8) from pivot and spindle assembly (6).



10-7. AXLE NO. 4 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

WARNING

Steering arms are heavy. Use caution when removing steering arms. Failure to comply may result in injury.



NOTE

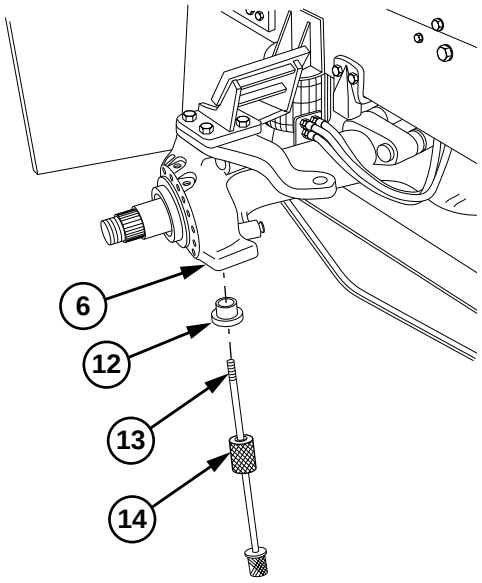
- Removal procedure is the same for both ends of axle.
- Four screws removed from lower cover in step (8) are not same size as screws removed from steering arm in step (12). Identify screws after removal to avoid improper installation.

(8) Remove four screws (9) and lower cover (10) from pivot and spindle assembly (6). Tag screws.

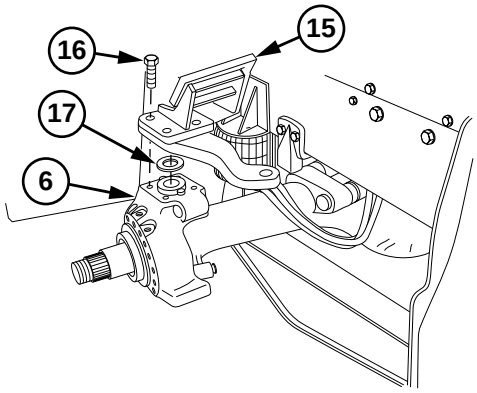
NOTE

Shims may stay on pivot and spindle assembly.

(9) Remove shim(s) (11) from lower cover (10). Tag shim(s).



(10) Remove link pin (12) from pivot and spindle assembly (6) using king pin extractor (13) and slide hammer (14).



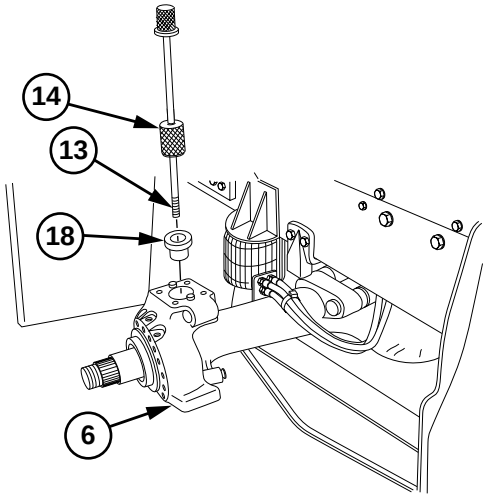
(11) Mark steering arm (15) and pivot and spindle assembly (6).

NOTE

Shims may stay on pivot and spindle assembly.

(12) Remove four screws (16), steering arm (15), and shims (17) from pivot and spindle assembly (6). Tag screws and shims.

(13) Remove link pin (18) from pivot and spindle assembly (6) using king pin extractor (13) and slide hammer (14).



(14) Remove pivot and spindle assembly (6) from axle housing (19) with aid of assistant. Place pivot and spindle assembly on clean work surface.

NOTE

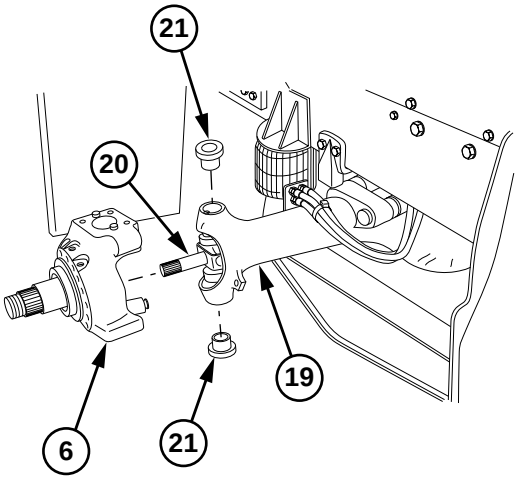
Differential oil may drain from axle housing.

(15) Remove axle shaft (20) from axle housing (19).

NOTE

Do step (16) only if link collars fail inspection.

(16) Remove link collars (21) from axle housing (19) using puller.

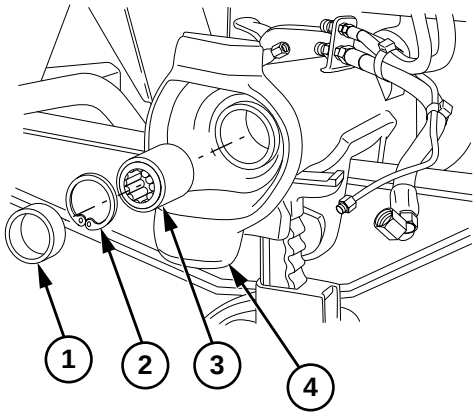


b. Disassembly

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(1) Remove seal (1), retaining ring (2), and bearing (3) from axle housing (4). Discard seal.

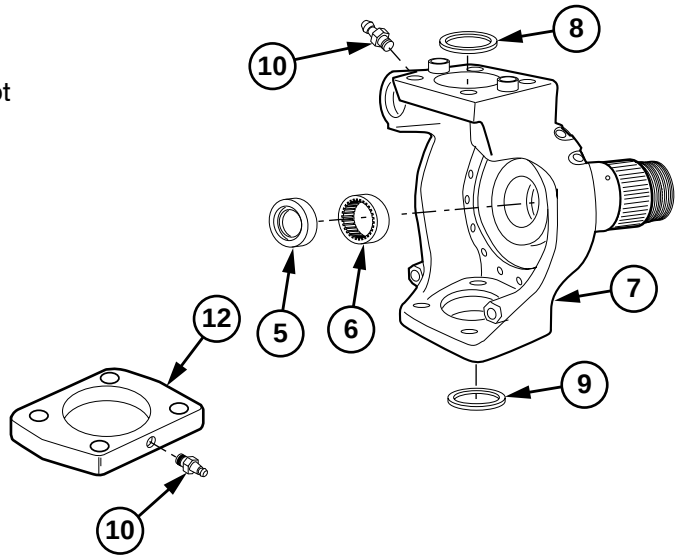


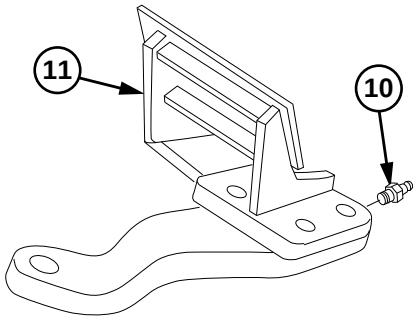
10-7. AXLE NO. 4 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

(2) Remove seal (5) and bearing (6) from pivot and spindle housing (7). Discard seal.

(3) Remove two oil seals (8 and 9) from pivot and spindle housing (7). Discard seals.

(4) Remove three grease fittings (10) from steering arm (11), lower cover (12), and pivot and spindle housing (7).

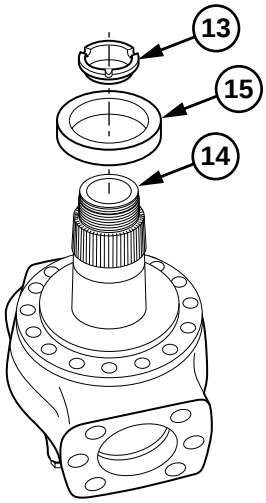




NOTE

Do step (5) if spindle ring fails inspection.

(5) Remove spindle ring (13) from spindle (14).



CAUTION

Use chisel on seal race surface only. Do not allow chisel to contact spindle. Failure to comply may result in damage to equipment.

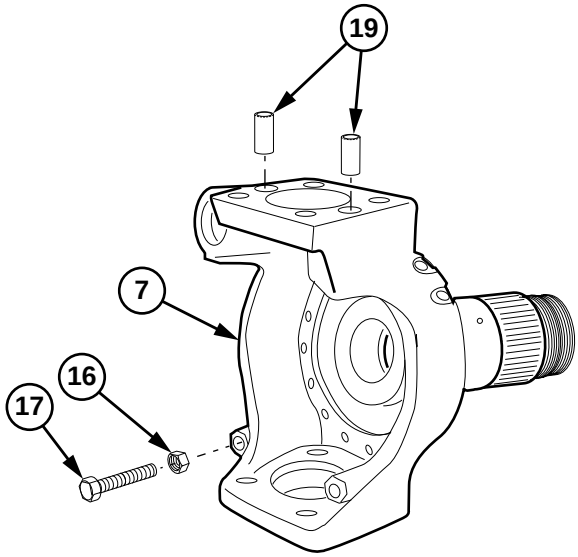
NOTE

Do step (6) if seal race fails inspection.

(6) Remove seal race (15) from spindle (14) with chisel.

(7) Loosen jamnut (16) on steering stop bolt (17).

(7.1) Remove steering stop bolt (17) and jamnut (16) from pivot and spindle housing (7).



NOTE

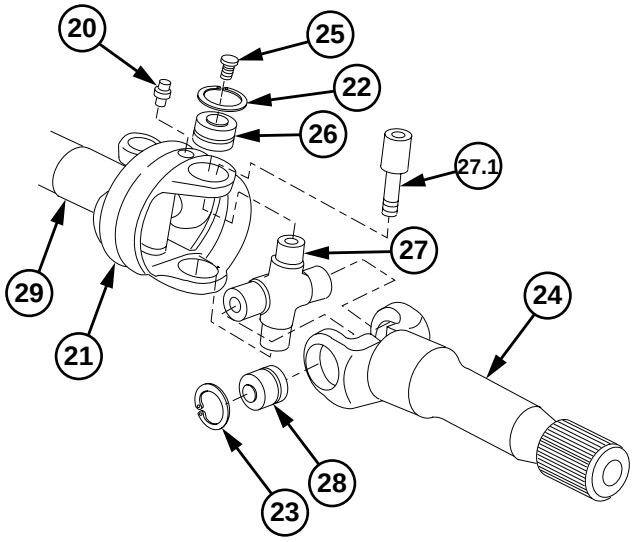
Do step (8) if pins fail inspection.

(8) Remove two pins (19) from pivot and spindle housing (7).

(9) Remove two grease fittings (20) from block (21).

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.



(10) Remove two retaining rings (22) from block (21). Discard retaining rings.

(11) Remove two retaining rings (23) from shaft (24). Discard retaining rings.

(12) Remove two screws (25) from caps (26). Discard screws.

(13) Remove two caps (26) from cross (27) using removal tool and adapter (27.1). Discard caps.

(14) Remove shaft (24) from block (21).

NOTE

Tag and mark cross to aid in installation.

(15) Remove two caps (28) and cross (27) from shaft (24) using press. Discard caps and cross.

(16) Repeat steps (10) through (15) to remove other shaft (29) from block (21).

c. Cleaning/Inspection

(1) Clean old gasket material from housing and caps.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean sealant residue from threaded holes with solvent cleaning compound.
(3) Clean all metal parts with solvent cleaning compound.

WARNING

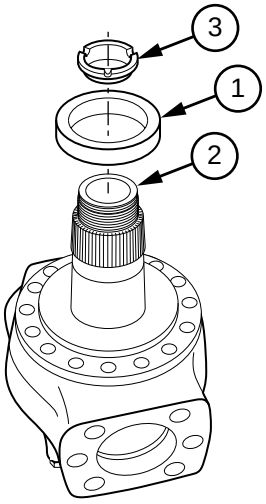
Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.).

(4) Dry all parts except bearings with compressed air. Allow bearings to air dry.
(5) Remove all small nicks or burrs with crocus cloth.
(6) Coat all parts with light coat of lubricating oil.
(7) Inspect housing and caps for damage.
(8) Inspect all parts with machined surfaces for deep scratches or wear grooves.
(9) Replace all damaged parts.

d. Assembly

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive-sealant away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.



(1) Coat inside surface of seal race (1) and spindle ring (3) with adhesive-sealant.
(2) Install seal race (1) on spindle (2) if removed.
(3) Install spindle ring (3) on spindle (2).

10-7. AXLE NO. 4 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

(4) Install jamnut (6) and steering stop bolt (7) on pivot and spindle housing (5).

(4.1) Tighten jamnut (6) on steering stop bolt (7).

(5) Install three grease fittings (8) in steering arm (9), lower cover (10), and pivot and spindle housing (5).

(6) Lightly coat new seal (11) and bearing (12) with grease.

NOTE

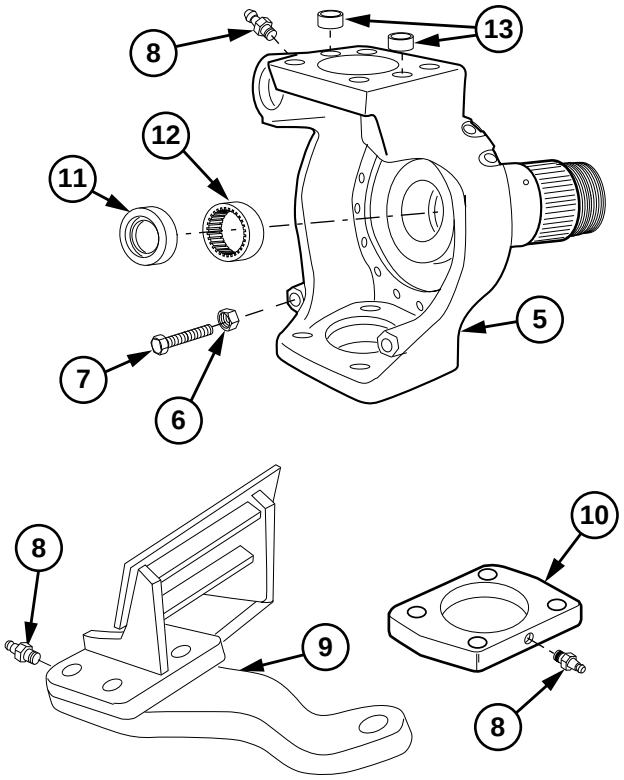
Seal is installed with flat side facing out.

(7) Install bearing (12) and new seal (11) on pivot and spindle housing (5).

NOTE

Do step (8) if pins were removed.

(8) Install two pins (13) on pivot and spindle housing (5).



(9) Lightly coat new seal (14) and bearing (15) with grease.

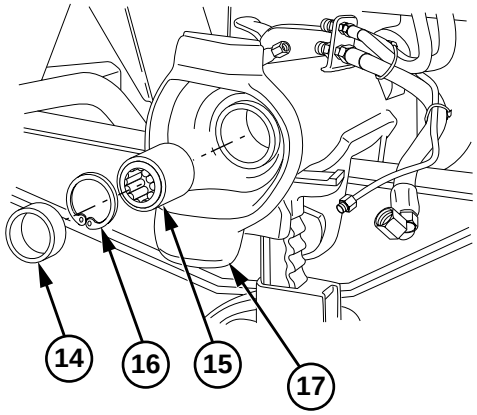
WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

NOTE

Seal is installed with flat side facing out.

(10) Install bearing (15), retaining ring (16), and new seal (14) on axle housing (17).



(11) Install new cross (18) on shaft (19) with two caps (20).

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(12) Install two new retaining rings (21) on shaft (19).

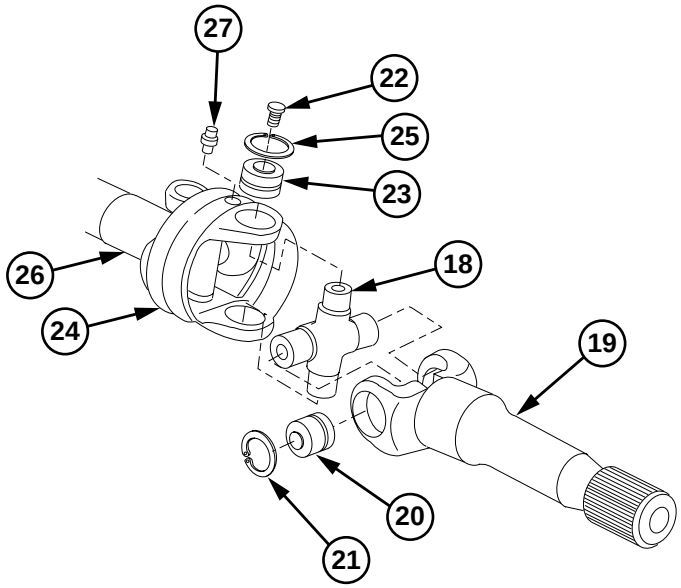
(13) Install two new screws (22) in new caps (23).

(14) Install shaft (19) in block (24) with two caps (23).

(15) Install two new retaining rings (25) in block (24).

(16) Repeat steps (1) through (5) to install other shaft (26) into block (24).

(17) Install two grease fittings (27) in block (24).



e. Installation

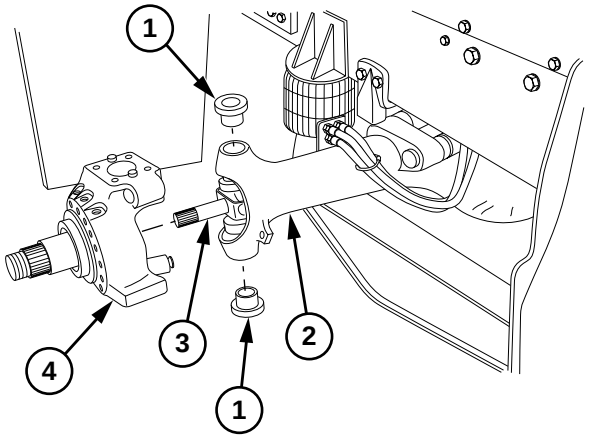
NOTE

- Both pivot and spindle assemblies are installed the same way.
- Do step (1) if link collars were removed.

(1) Insert link collars (1) into axle housing (2).

(2) Install axle shaft (3) in axle housing (2).

(3) Install pivot and spindle assembly (4) on axle housing (2) with aid of assistant.



(4) Coat link collars (1), seals (5 and 6), and link pins (7 and 8) with grease.

NOTE

Seal must be installed with metal side against link pin.

(5) Install seal (5) on link pin (8).

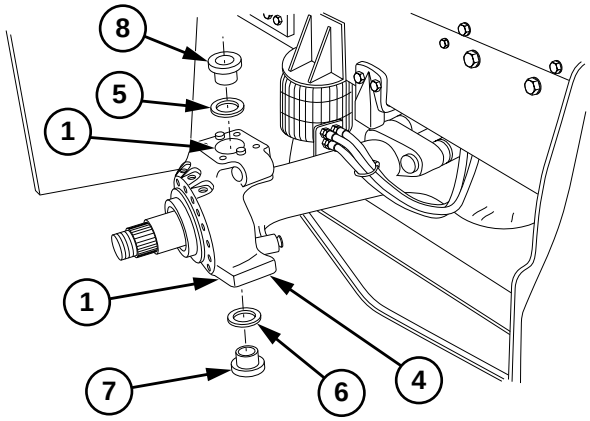
(6) Install link pin (8) through pivot and spindle assembly (4) into link collar (1) until metal edge of seal (5) is visible inside pivot and spindle assembly (4).

NOTE

Seal must be installed with metal side against link pin.

(7) Install seal (6) on link pin (7).

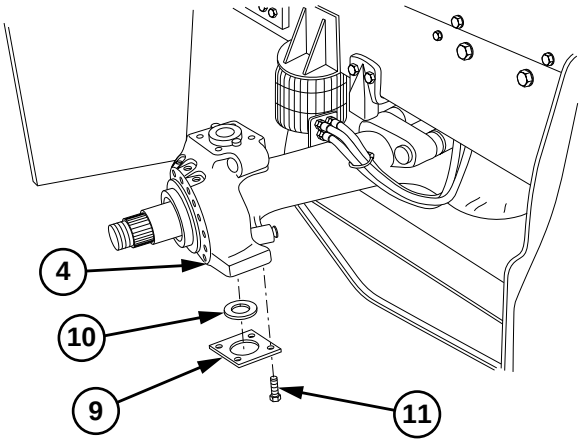
(8) Install link pin (7) through pivot and spindle assembly (4) into link collar (1) until metal edge of seal (6) is visible inside pivot and spindle assembly (4).



10-7. AXLE NO. 4 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.



(9) Coat mating surfaces of lower cover (9) and pivot and spindle assembly (4) with silicone adhesive-sealant.

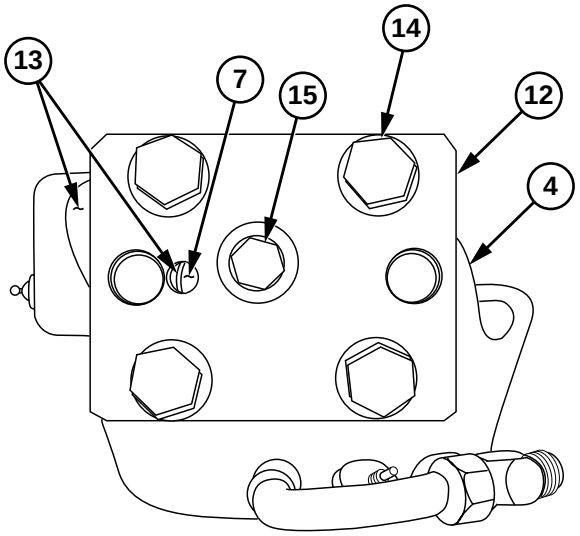
(10) Install shim (10) and lower cover (9) on pivot and spindle assembly (4) with four screws (11). Torque to 250 lb-ft (340 N·m), then to 500 lb-ft (670 N·m), then to 720-800 lb-ft (976-1085 N·m).

(11) Calculate shim height and install as follows:

(a) Install king pin preload cover (12) on upper pivot face (13) with four screws (14). Torque to 200 lb-ft (271 N·m).

(b) Install central screw (15) on king pin preload cover (12). Torque to 200 lb-ft (271 N·m).

(c) Loosen screw (15) slightly until pivot and spindle assembly (4) moves freely.



NOTE

Measurement in step (11)(d) must be made from either of the two screws closest to the spindle.

(d) Verify pivot and spindle assembly (4) requires no more than 57 lb-ft (77 N·m) to start rotation from centered position.

(e) Measure distance between top of link pin (7) and upper pivot face (13) using depth micrometer gage.

NOTE

Refer to table10-3 for shim requirement.

(f) Remove four screws (14) and king pin preload cover (12) from upper pivot face (13).

Table 10-3. Determining Shim Thickness

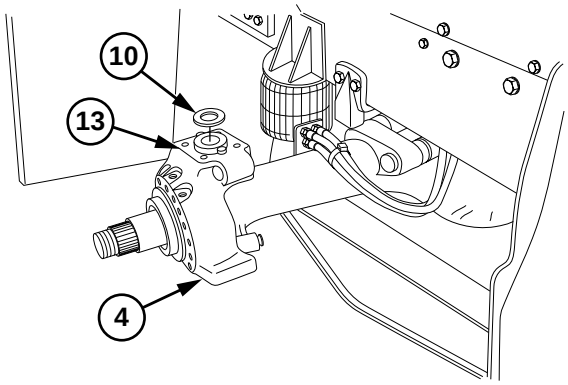
Distance Between Pivot and Spindle Assembly and Link Pin	Shim Thickness
0.018 to 0.022 in. (0.45 to 0.55 mm)	0.016 in. (0.4 mm)
0.022 to 0.026 in. (0.55 to 0.65 mm)	0.020 in. (0.5 mm)
0.026 to 0.030 in. (0.65 to 0.75 mm)	0.024 in. (0.6 mm)
0.030 to 0.033 in. (0.75 to 0.85 mm)	0.028 in. (0.7 mm)
0.033 to 0.037 in. (0.85 to 0.95 mm)	0.031 in. (0.8 mm)
0.037 to 0.041 in. (0.95 to 1.05 mm)	0.035 in. (0.9 mm)
0.041 to 0.045 in. (1.05 to 1.15 mm)	0.039 in. (1.0 mm)

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

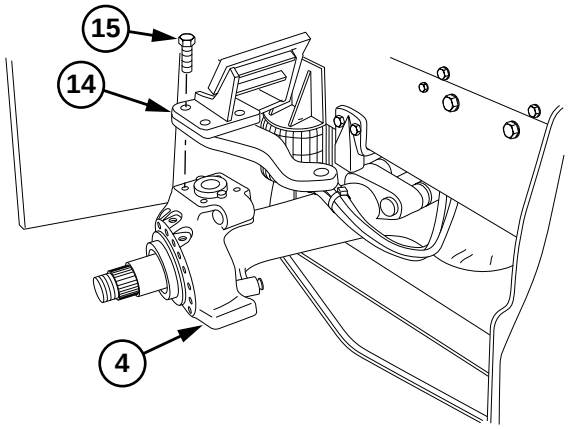
(g) Coat upper surface of upper pivot face (13) with silicone adhesive-sealant.

(h) Install shim(s) (10) on pivot and spindle assembly (4). If multiple shims are used, install shims on the pivot and spindle assembly in order from thinnest to thickest with thinnest shim contacting pivot and spindle assembly and thickest shim contacting cover.



(12) Position steering arm (14) on pivot and spindle assembly (4) by aligning marks made during disassembly.

(13) Install four screws (15) in pivot and spindle assembly (4). Torque to 250 lb-ft (340 N·m), then to 500 lb-ft (670 N·m), then to 720-800 lb-ft (976-1085 N·m).



10-7. AXLE NO. 4 PIVOT, SPINDLE, AND AXLE SHAFT REPAIR (CONT)

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.

(14) Coat threads of elbow (16), fitting (17), and fitting (18) with pipe thread sealing compound.

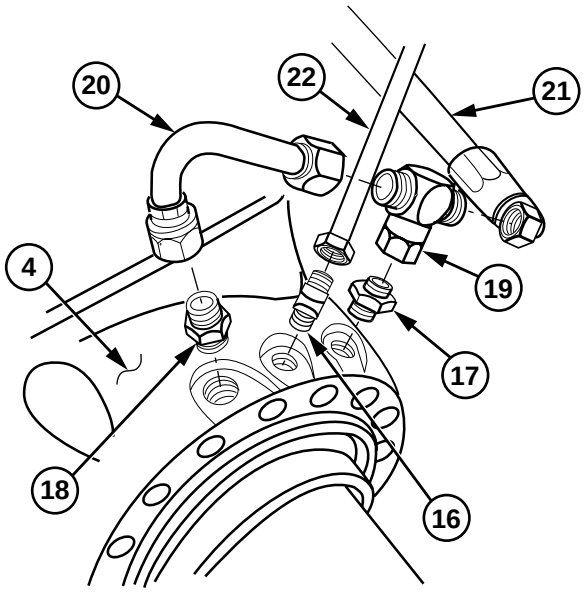
(15) Install fitting (18), elbow (16), and fitting (17) on pivot and spindle assembly (4).

(16) Install tee (19) on fitting (17).

(17) Install tube assembly (20) on tee (19) and fitting (18).

(18) Install hose (21) on tee (19).

(19) Install hose (22) on elbow (16).



f. Follow-On Maintenance

(1) Install brake bracket and camshaft (para 11-3).

(2) Install rear brake chamber (TM 9-2320-360-20).

(3) Install tie rod end (TM 9-2320-360-20).

(4) Install drag link (left side only (para 13-3).

(5) Fill differential (LO 9-2320-360-12).

(6) Adjust steering stops (para 13-9).

10-8. AXLE NO. 2 AND AXLE NO. 3 SPINDLE AND AXLE SHAFT REPAIR

This task covers:
a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Brake bracket removed (11-4).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Caps, Vise Jaw (Item 17, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Nut, 1/4 In. (Item 100, Appendix E)
Screw, 1/4 In. x 3 In. (Item 146, Appendix E)
Socket, Sockethead Screw, 12 mm (Item 174, Appendix E)
Vise, Machinist's (Item 207, Appendix E)
Washer, Flat, 1/4 In. (Item 208, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 3, Appendix B)
Adhesive-Sealant (Item 4, Appendix B)
Adhesive-Sealant (Item 6, Appendix B)
Cloth, Crocus (Item 16, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Grease, General Purpose (Item 34, Appendix B)
Oil, Lubricating (Item 44, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)

a. Removal

NOTE
Axle no. 2 and axle no. 3 spindles and axle shafts are replaced the same way. Axle no. 2 is shown.

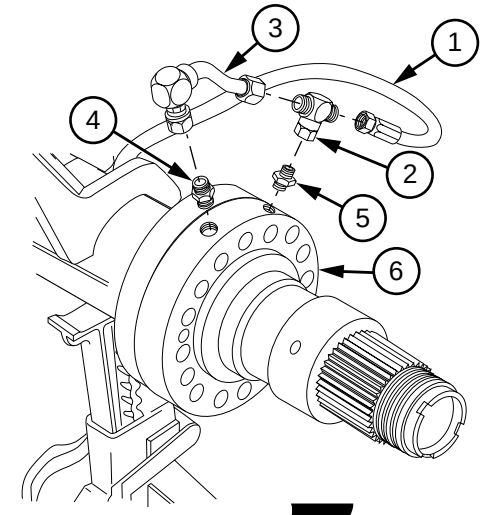
(1) Remove hose (1) from tee (2).

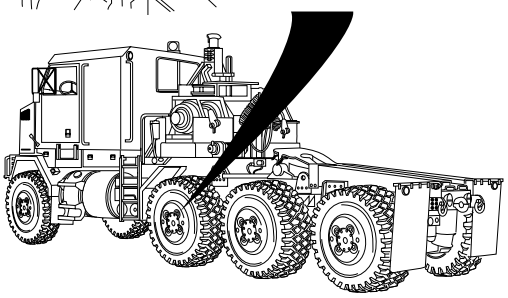
(2) Remove tube assembly (3) from tee (2) and fitting (4).

(3) Remove tee (2) from fitting (5).

(4) Remove fitting (5) from spindle (6).

(5) Remove fitting (4) from spindle (6).



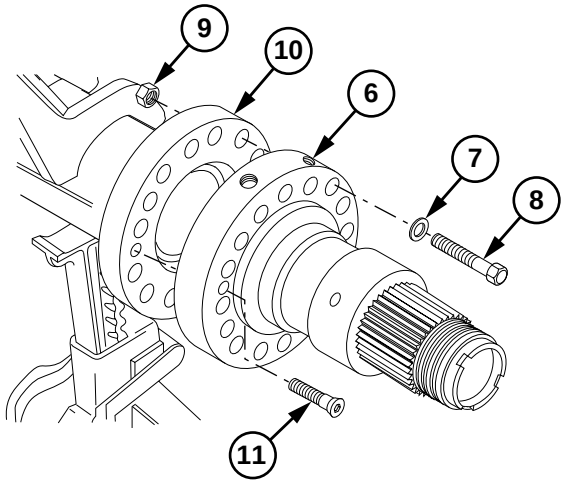


10-8. AXLE NO. 2 AND AXLE NO. 3 SPINDLE AND AXLE SHAFT REPAIR (CONT)

WARNING

Screw, washer, and nut are installed in step (6) to retain spindle during removal. Failure to install them may result in spindle falling, causing injury to personnel.

(6) Loosely install washer (7), screw (8), and nut (9) through top hole of axle housing (10) and spindle (6).



WARNING

Spindle is heavy. Use caution when removing. Failure to comply may cause injury.

(7) Remove two screws (11) from spindle (6).

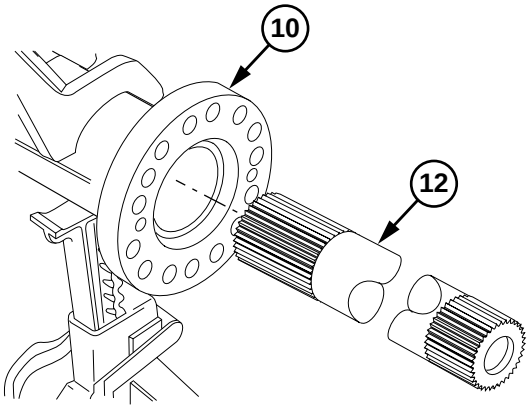
NOTE

It may be necessary to strike end of spindle with soft faced hammer to separate from axle housing.

(8) Separate spindle (6) from axle housing (10).

(9) Remove nut (9), screw (8), and washer (7) while supporting spindle (6).

(10) Remove spindle (6) from axle housing (10).



WARNING

Collar slides loosely on axle shaft. Use caution when handling axle shaft. Failure to comply may result in injury.

(11) Remove axle shaft assembly (12) from axle housing (10).

b. Disassembly

NOTE

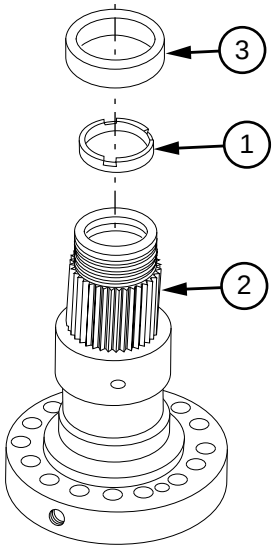
Do step (1) if spindle ring fails inspection.

(1) Remove spindle ring (1) from spindle (2).

NOTE

Do step (2) if seal ring fails inspection.

(2) Remove seal ring (3) from spindle (2).



c. Cleaning/Inspection

(1) Clean old gasket material from housing and caps.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean sealant residue from threaded holes with solvent cleaning compound.

(3) Clean all metal parts with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.).

(4) Dry all parts except bearings with compressed air. Allow bearings to air dry.

(5) Remove all small nicks or burrs with crocus cloth.

(6) Coat all parts with light coat of lubricating oil.

(7) Inspect housing and caps for damage.

(8) Inspect all parts with machined surfaces for deep scratches or wear grooves.

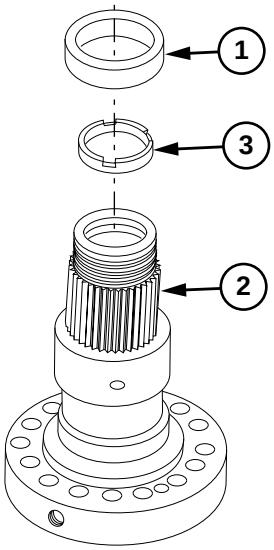
(9) Replace all damaged parts.

10-8. AXLE NO. 2 AND AXLE NO. 3 SPINDLE AND AXLE SHAFT REPAIR (CONT)

d. Assembly

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive-sealant away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.



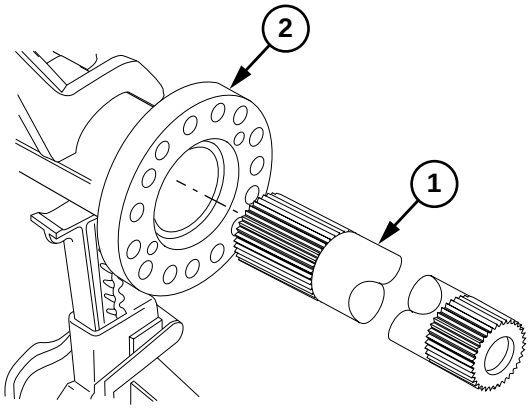
NOTE

Do steps (1) thru (3) only if parts were removed.

(1) Coat inside surface of seal ring (1) with adhesive-sealant (Item 3, Appendix B).

(2) Install seal ring (1) on spindle (2).

(3) Install spindle ring (3) on spindle (2).



e. Installation

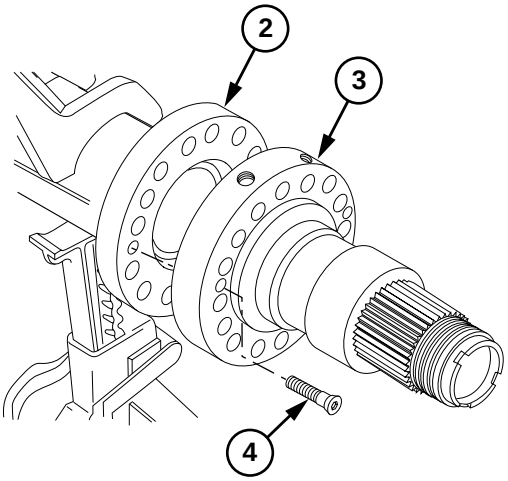
NOTE

Press down on outside end of axle shaft when installing in order to get axle engaged in carrier.

(1) Install axle shaft assembly (1) in axle housing (2).

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive-sealant away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.



(2) Coat mating surface of spindle (3) with adhesive-sealant (Item 4, Appendix B).

(3) Install spindle (3) on axle housing (2).

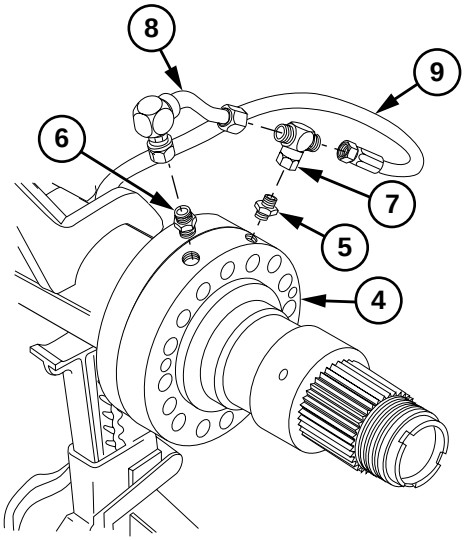
(4) Install two screws (4) in spindle (3) while supporting spindle (3). Tighten screws to 180-240 lb-in. (20-27 N·m).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.



(5) Coat threads of fitting (5) and fitting (6) with pipe thread sealing compound.

(6) Install fitting (5) and fitting (6) on spindle (3).

(7) Install tee (7) on fitting (5).

(8) Install tube assembly (8) on tee (7) and fitting (6).

(9) Install hose (9) on tee (7).

f. Follow-On Maintenance

Install brake bracket (para 11-4).

CHAPTER 11
BRAKE SYSTEM MAINTENANCE

Contents

	Para	Page
Introduction	11-1	11-1
Deleted	11-2	
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Axle No. 2 and Axle No. 3 Brake Bracket/Camshaft Repair	11-4	11-8
Brake Treadle Valve Repair	11-5	11-13
Air Compressor Replacement	11-6	11-24

Section I. INTRODUCTION

11-1. INTRODUCTION

This chapter contains instructions for replacement and repair of the brake system at the Direct Support maintenance level. Some subassemblies and parts must be removed before the brakes and components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

PARAGRAPH 11-2 DELETED

All data on pages 11-2 and 11-3 deleted.

11-3. AXLE NO. 1 AND AXLE NO. 4 BRAKE BRACKET/CAMSHAFT REPAIR

This task covers
a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Brake shoes removed (TM 9-2320-360-20).
Slack adjuster removed (TM 9-2320-360-20).
Wheel hub removed (para 12-3).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Pliers, Retaining Ring (Item 108, Appendix E)
Socket, Sockethead Screw, 14 mm (Item 173, Appendix E)

Tools and Special Tools (Cont)
Wrench, Torque, 0-600 Ft-Lb (Item 233, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Oil, Lubricating (Item 46, Appendix B)
Seals (2) (Item 287, Appendix F)
Seals (2) (Item 289, Appendix F)

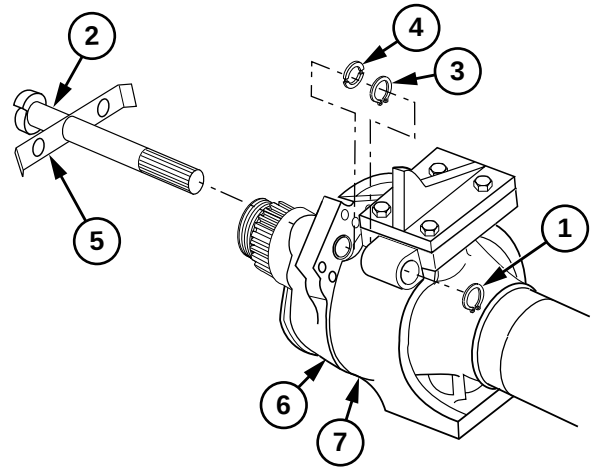
a. Removal

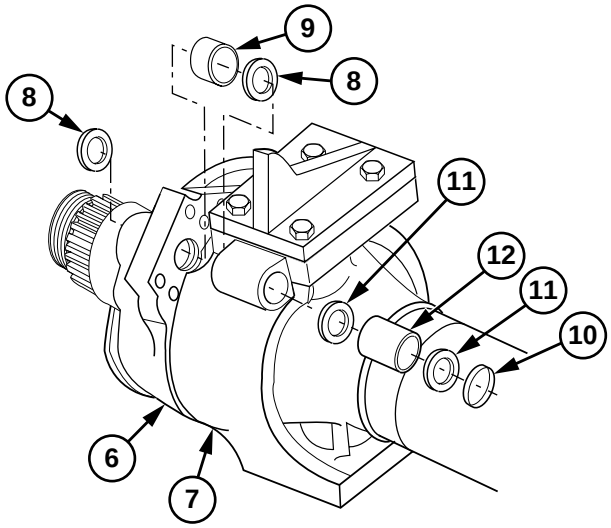
WARNING

- **Left and right camshafts are different and not interchangeable. Using wrong camshaft may result in inoperative brakes and injury to personnel.**
- **Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.**

NOTE

Axle no. 1 and axle no. 4 camshafts are replaced the same way. Axle no. 1 is shown.





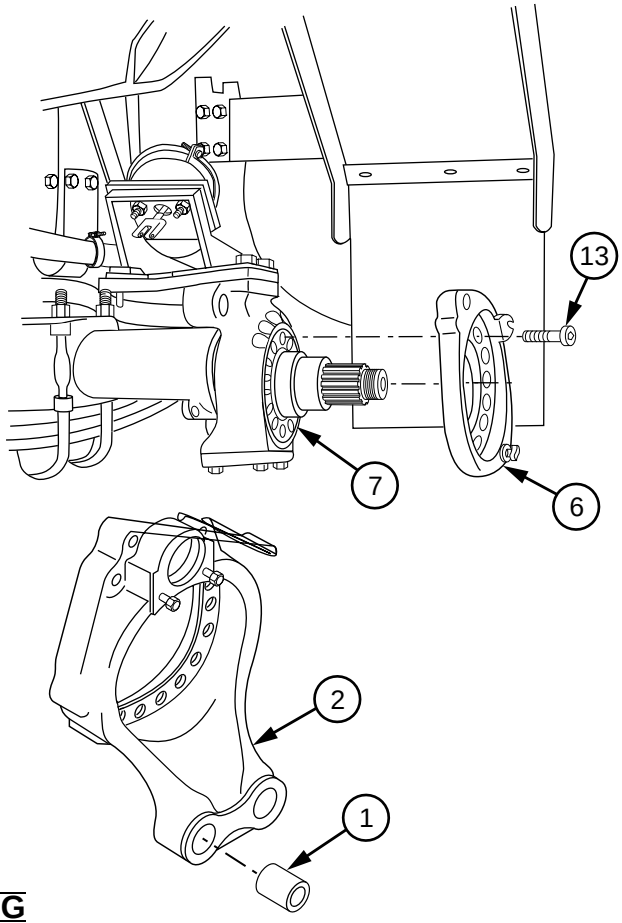
(1) Remove retaining ring (1) from camshaft (2).

(2) Remove retaining ring (3), washer (4), and thrust washer (5) from brake bracket (6) and spindle assembly (7) while pulling camshaft (2).

(3) Remove two seals (8) and bushing (9) from brake bracket (6). Discard seals.

(4) Remove spacer (10), two seals (11), and bushing (12) from spindle assembly (7). Discard seals.

(5) Remove 16 sockethead screws (13) and brake bracket (6) from spindle assembly (7).



b. Disassembly

NOTE

Remove bushings only if they fail inspection.

(1) Remove two bushings (1) from brake bracket (2).

c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/ massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean brake bracket and parts with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry parts with compressed air.

(3) Check brake bracket for expanded anchor pin holes and for cracks. Replace damaged brake brackets and anchor pin bushings.

(4) Check anchor pins for corrosion and wear. Replace damaged anchor pins.

(5) Check camshafts for cracks, wear, and corrosion. Check the cam head, bearing journals, and splines. Replace damaged camshafts.

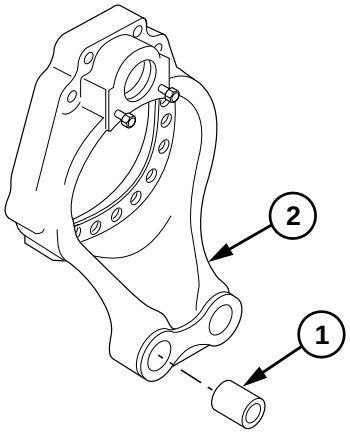
11-3. AXLE NO. 1 AND AXLE NO. 4 BRAKE BRACKET/CAMSHAFT REPAIR (CONT)

d. Assembly

NOTE

Install bushings only if they were removed.

(1) Install two bushings (1) in brake bracket (2).

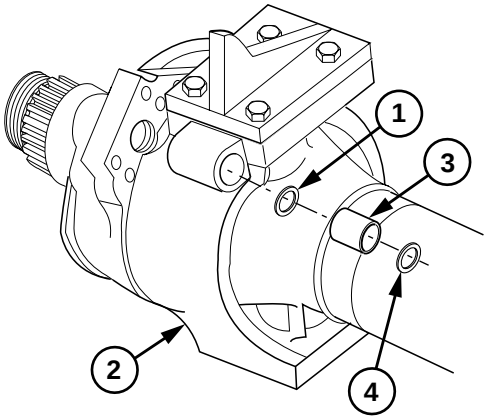


e. Installation

CAUTION

All brake camshaft seals must be installed with numbered side of seal facing spindle and seal lips facing away from spindle. Failure to comply may result in seals coming out of position and brakes not releasing.

(1) Install new seal (1), numbered side first, in spindle assembly (2).



CAUTION

Bushing should be installed 0.75 in. (1.9 cm) in spindle assembly. Installing bushing further will plug grease passage.

(2) Install bushing (3) in spindle assembly (2).

(3) Install new seal (4), numbered side first, in spindle assembly (2).

NOTE

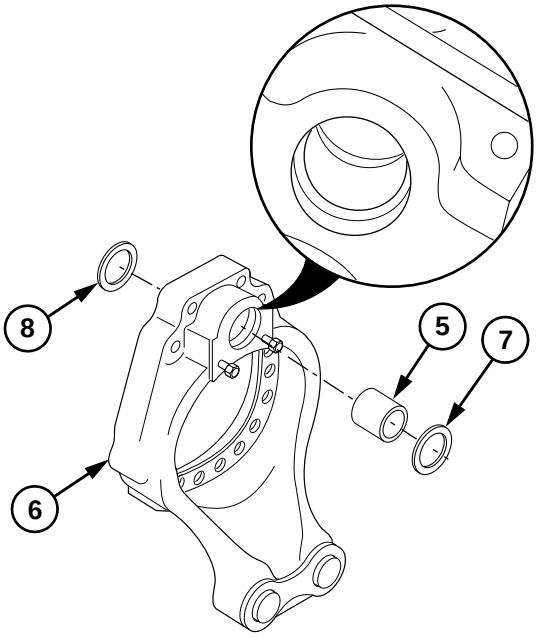
Bushing should be installed until it is flush with inside machined land surface.

(4) Install bushing (5) in brake bracket (6).

NOTE

Inner seal should be installed with lip facing bushing.

(5) Install new seal (7), numbered side first, in brake bracket (6).



CAUTION

Outer seal must not be installed any deeper than flush with spindle assembly. Failure to comply will cause grease leak and/or plugged grease passage.

(6) Install new seal (8), numbered side first, in brake bracket (6).

NOTE

When properly positioned, S-cam opening in brake bracket will line up with camshaft housing.

(7) Position brake bracket (6) on spindle assembly (2).

WARNING

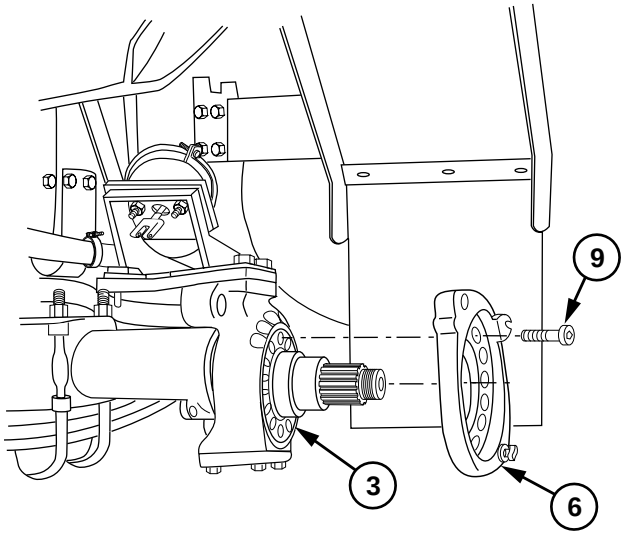
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep compound away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(8) Coat threads of 16 sockethead screws (9) with adhesive-sealant.

(9) Install 16 sockethead screws (9) on brake bracket (6). Torque to 204 lb-ft (280 N·m).

(10) Lightly coat brake camshaft (10) with lubricating oil.

(11) Position thrust washer (11) next to brake bracket (6).



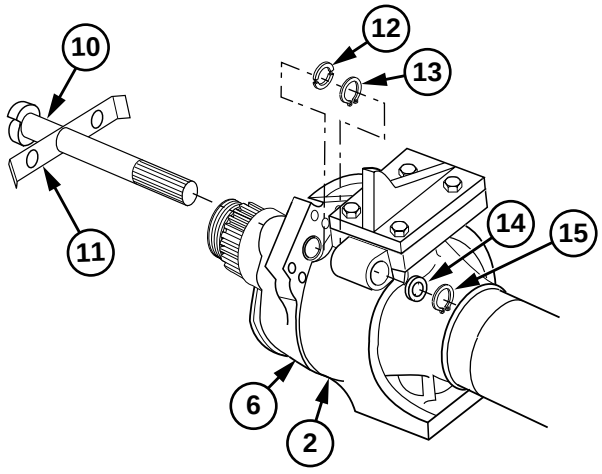
NOTE

Camshaft end should stick out back of brake bracket. Do not insert camshaft through spindle assembly until step (14).

(12) Insert camshaft (10) through thrust washer (11) and brake bracket (6).

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.



(13) Install washer (12) and retaining ring (13) on camshaft (10).

(14) Insert camshaft (10) through spindle assembly (2) while sliding retaining ring (13) and washer (12) in position on camshaft (10).

(15) Install spacer (14) and retaining ring (15) on camshaft (10).

f. Follow-on Maintenance

(1) Install slack adjuster (TM 9-2320-360-20).

(2) Install brake shoes (TM 9-2320-360-20).

(3) Install wheel hub (para 12-3).

(4) Lubricate camshaft (LO 9-2320-360-12).

11-4. AXLE NO. 2 AND AXLE NO. 3 BRAKE BRACKET/CAMSHAFT REPAIR

This task covers
a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
e. Follow-On Maintenance

INITIAL SETUP

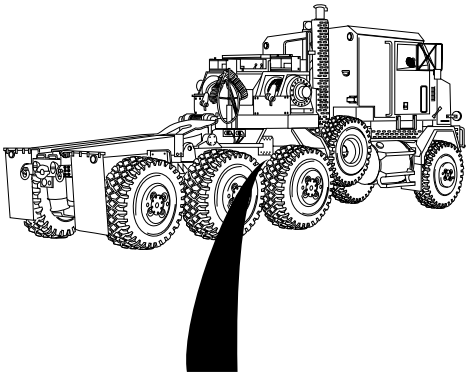
Equipment Conditions
Wheel hub removed (para 12-3).
Brake shoes removed (TM 9-2320-360-20).
Slack adjuster removed (TM 9-2320-360-20).

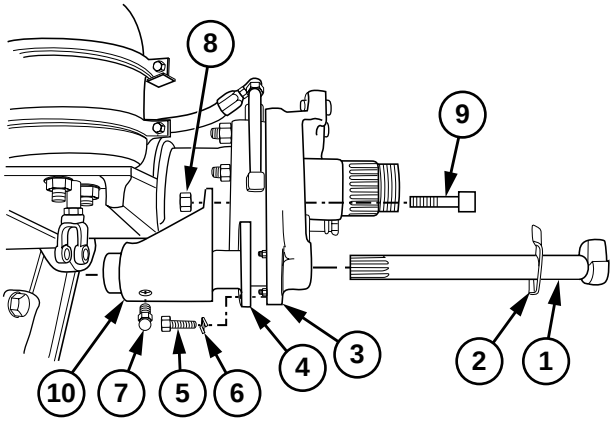
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Socket, Sockethead Screw, 14 mm (Item 173, Appendix E)
Vice, Machinist's (Item 207, Appendix E
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Oil, Lubricating (Item 46, Appendix B)
Locknuts (15) (Item 83, Appendix F)
Lockwashers (4) (Item 131, Appendix F)
Seals (3) (Item 287, Appendix F)
Seal (Item 288, Appendix F)

a. Removal

NOTE
Axle no. 2 and axle no. 3 camshafts are removed the same way. Axle no. 2 is shown.





(1) Remove camshaft (1) with thrust washer (2) from brake bracket (3) and inner camshaft mounting plate (4).

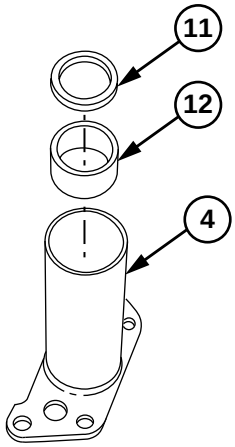
(2) Remove four screws (5), lockwashers (6), and inner camshaft mounting plate (4) from brake bracket (3). Discard lockwashers.

(3) Remove grease fitting (7) from inner camshaft mounting plate (4).

(4) Remove five locknuts (8), screws (9), and outer camshaft mounting plate (10) from brake bracket (3). Discard locknuts.

(5) Position inner camshaft mounting plate (4) in vise.

(6) Remove seal (11) and bushing (12) from inner camshaft mounting plate (4). Discard seal.



NOTE

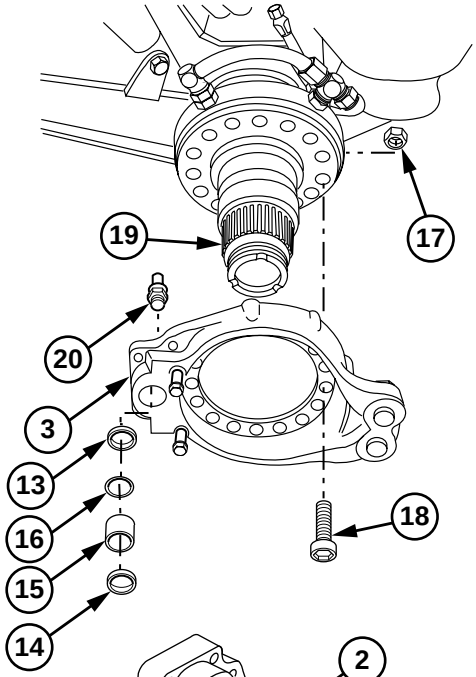
Seals can be driven out in either direction.

(7) Remove oil seal (13), seal (14), bushing (15), and seal (16) from brake bracket (3). Discard seals and oil seal.

(8) Remove 10 locknuts (17) and sockethead screws (18) from brake bracket (3) while supporting brake bracket. Discard locknuts.

(9) Remove brake bracket (3) from spindle (19).

(10) Remove two grease fittings (20) from brake bracket (3).

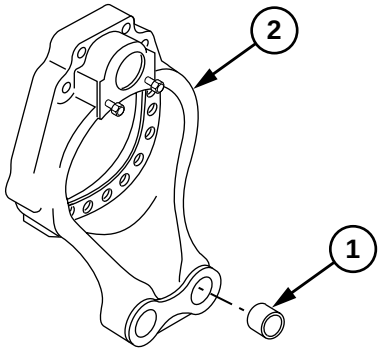


b. Disassembly

NOTE

Remove bushings only if they fail inspection.

(1) Remove two bushings (1) from brake bracket (2).



11-4. AXLE NO. 2 AND AXLE NO. 3 BRAKE BRACKET/CAMSHAFT REPAIR (CONT)

c. Cleaning/Inspection

WARNING

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in well-ventilated area. Avoid contact with skin, eyes, and clothing, and don't breath vapors. DO NOT use near open flame or excessive heat. The flash point is 100-138°F (38-59°C). If you become dizzy while using cleaning solvent, get fresh air immediately and medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

(1) Clean brake bracket and parts with dry cleaning solvent.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry parts with compressed air.

(3) Check brake bracket for expanded anchor pin holes and for cracks. Replace damaged brake brackets and anchor pin bushings.

(4) Check anchor pins for corrosion and wear. Replace damaged anchor pins.

(5) Check camshafts for cracks, wear, and corrosion. Check the cam head, bearing journals, and splines. Replace damaged camshafts.

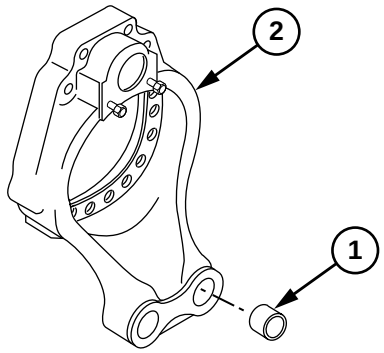
(6) Check camshaft bracket for broken welds, cracks, and correct alignment. Replace damaged brackets.

d. Assembly

NOTE

Install bushings only if they were removed.

(1) Install two bushings (1) in brake bracket (2).



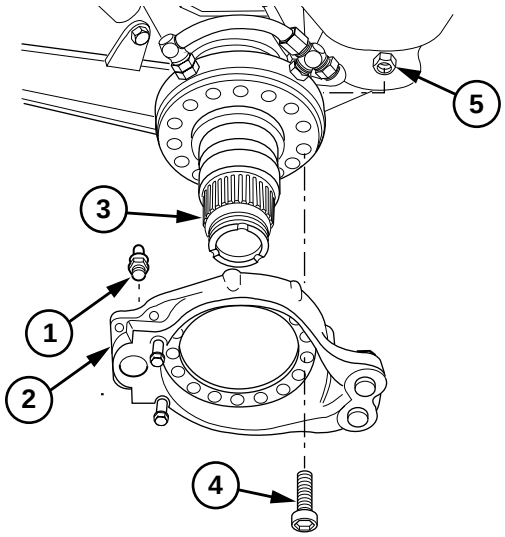
e. Installation

(1) Install two grease fittings (1) in brake bracket (2).

(2) Position brake bracket (2) on spindle (3) .

(3) Install 10 sockethead screws (4) through brake bracket (2).

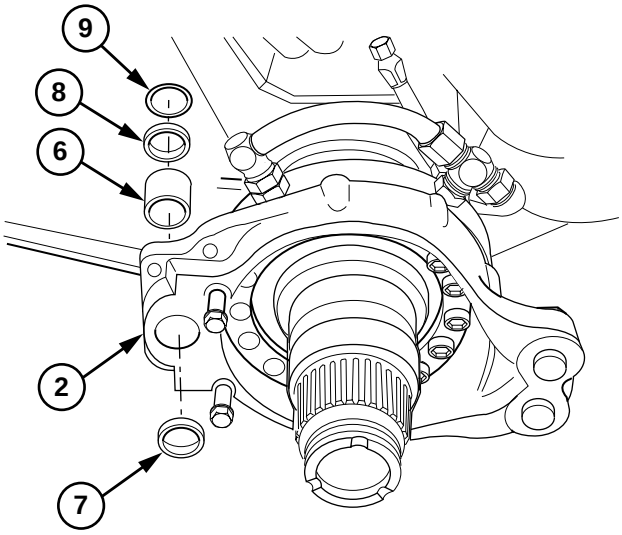
(4) Install 10 new locknuts (5) on screws (4). Torque to 204 lb-ft (280 N·m).



(5) Install bushing (6) in brake bracket (2).

CAUTION

- Outer seal must not be installed any deeper than flush with spindle assembly. Failure to comply will cause grease leak and/or plugged grease passage.
- All brake camshaft seals must be installed with numbered side of seal facing spindle and seal lips facing away from spindle. Failure to comply may result in seal coming out of position and brakes not releasing.



(6) Install new outer seal (7), lip side first, in brake bracket (2).

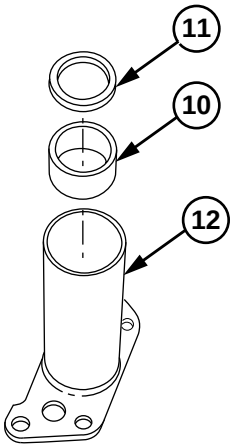
(7) Install new inner seal (8), numbered side first, in brake bracket (2).

(8) Install new oil seal (9) in brake bracket (2).

NOTE

Bushing should be installed until it is flush with inside machined land surface.

(9) Install bushing (10) and new seal (11), numbered side first, in inner camshaft mounting plate (12).



11-4. AXLE NO. 2 AND AXLE NO. 3 BRAKE BRACKET/CAMSHAFT REPAIR (CONT)

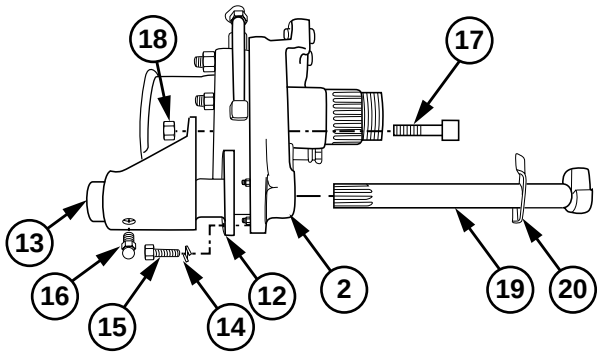
(10) Position inner camshaft mounting plate (12) and outer camshaft mounting plate (13) on brake bracket (2) with four new lockwashers (14) and screws (15). Do not tighten.

(11) Install grease fitting (16) on inner camshaft mounting plate (12).

(12) Tighten four screws (15) to 110 lb-ft (149 N·m).

(13) Install outer camshaft mounting plate (13) on brake bracket (2) with five screws (17) and new locknuts (18). Torque to 110 lb-ft (149 N·m).

(14) Install camshaft (19) with thrust washer (20) in brake bracket (2) and inner camshaft mounting plate (12).



f. Follow-on Maintenance

(1) Install slack adjuster (TM 9-2320-360-20).

(2) Install brake shoes (TM 9-2320-360-20).

(3) Install wheel hub (para 12-3).

(4) Lubricate camshaft (LO 9-2320-360-12).

11-5. BRAKE TREADLE VALVE REPAIR

This task covers:
- a. Disassembly
- b. Cleaning/Inspection
- c. Assembly
- d. Testing
- e. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Brake treadle removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Pliers, Retaining Ring (Item 108, Appendix E)
Pliers, Retaining Ring (Item 109, Appendix E)
Plug, Pipe, 1/4 In. (8) (Item 114, Appendix E)
Plugs, Pipe, 1/2 In. (2) (Item 113, Appendix E)
Vise, Machinist's (Item 207, Appendix E)
Wrench, Torque, 0-75 Lb-In. (Item 237, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Chips, Soap (Item 15, Appendix B)
Cloth, Crocus (Item 16, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Lockwashers (3) (Item 136, Appendix F)
Parts Kit, Air Flow (Item 207, Appendix F)
Pins, Cotter (2) (Item 214, Appendix F)

Personnel Required
Two

a. Disassembly

(1) Remove cotter pin (1) from pin (2). Discard cotter pin.

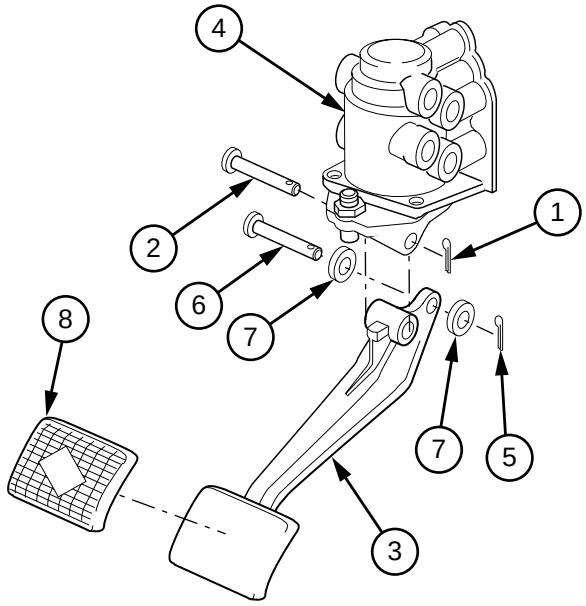
(2) Remove pin (2) and pedal (3) from cover (4).

(3) Remove cotter pin (5) from pin (6). Discard cotter pin.

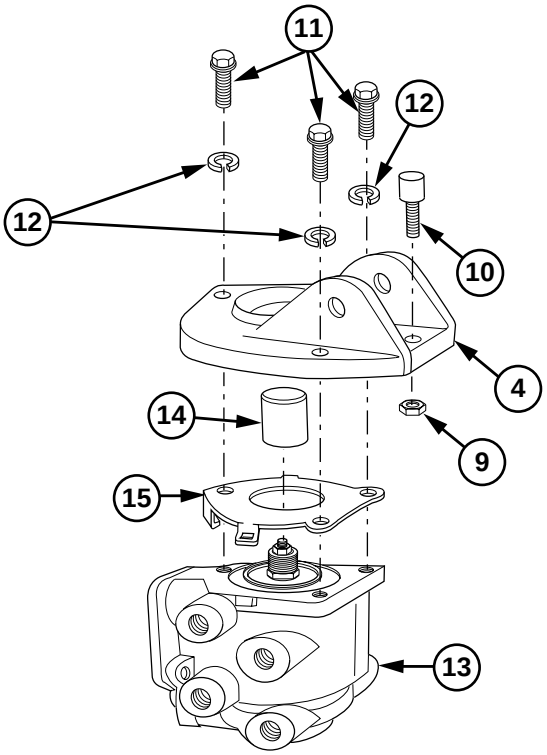
(4) Remove pin (6) and two rollers (7) from pedal (3).

NOTE
Do step (5) only if pad is damaged.

(5) Remove pad (8) from pedal (3).



11-5. BRAKE TREADLE VALVE REPAIR (CONT)



(6) Remove nut (9) and stop button (10) from cover (4).

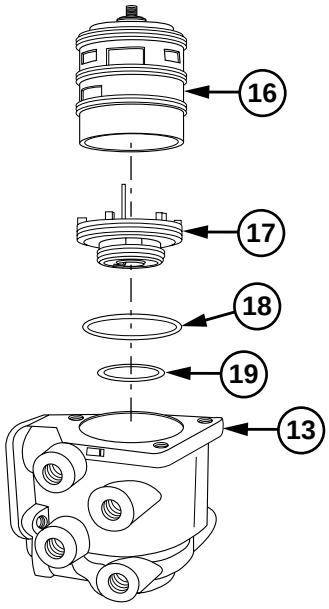
(7) Remove three screws (11), lockwashers (12), and cover (4) from housing (13). Discard lockwashers.

(8) Remove sleeve (14) from housing (13).

NOTE

Three tabs must be pryed out to remove retaining plate.

(9) Remove retaining plate (15) from housing (13).



(10) Remove lower static piston assembly (16) from housing (13).

NOTE

Upper static piston can be removed by tapping housing on wooden block.

(11) Remove upper static piston (17) from housing (13).

(12) Remove preformed packing (18) and preformed packing (19) from piston (17). Discard preformed packings.

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(13) Remove retaining ring (20) from piston (17).

(14) Remove inlet cartridge (21) from piston (17).

WARNING

Internal pistons are under moderate spring tension. Keep pistons compressed when removing locknut. Failure to comply may result in injury to personnel.

(15) Compress pistons (22 and 23) and remove locknut (24), guide (25), and spring (26) from stem bolt (27) with aid of assistant. Discard locknut.

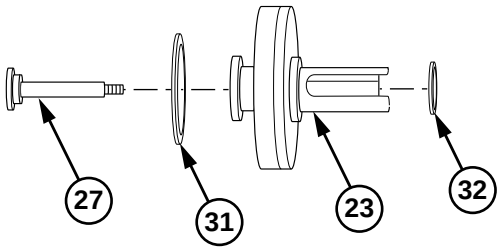
NOTE

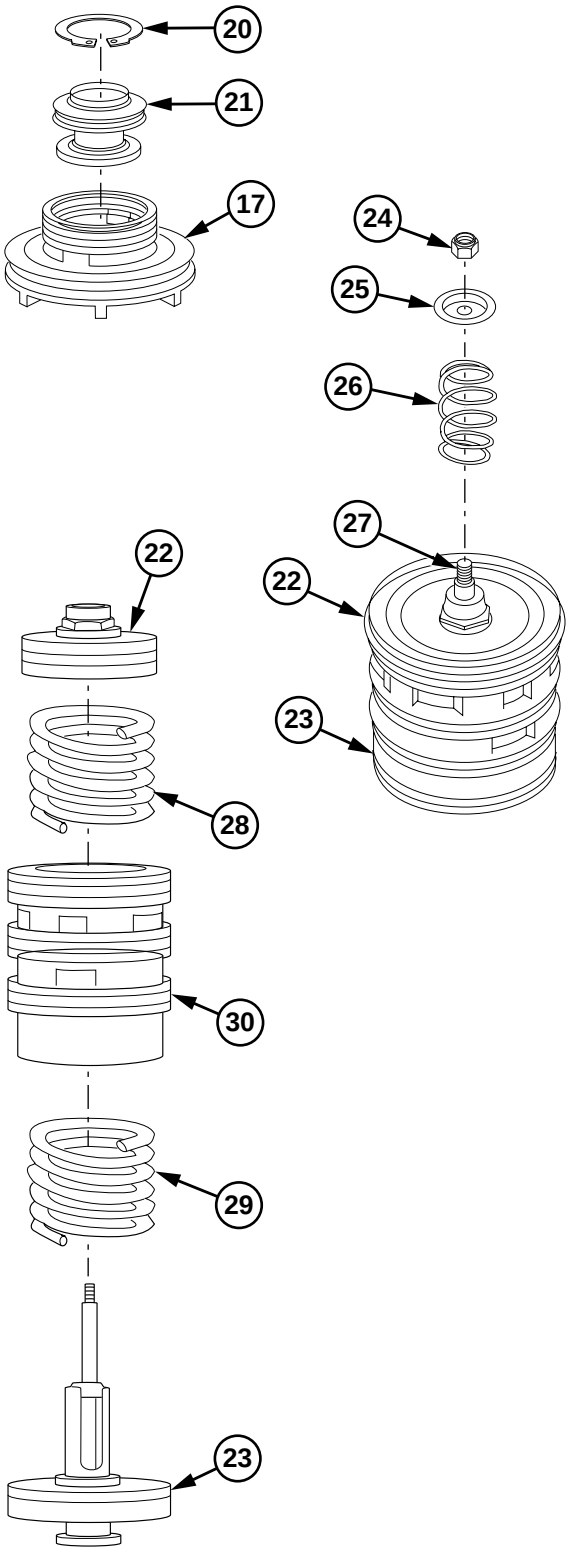
Thin gage spring is located on relay piston side of lower static piston housing.

(16) Remove lower piston (22), spring (28), spring (29), and relay piston (23) from lower static piston body (30).

(17) Remove stem bolt (27) from relay piston (23).

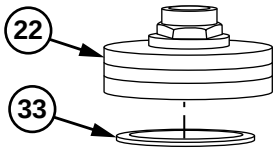
(18) Remove preformed packing (31) and preformed packing (32) from relay piston (23). Discard preformed packings.



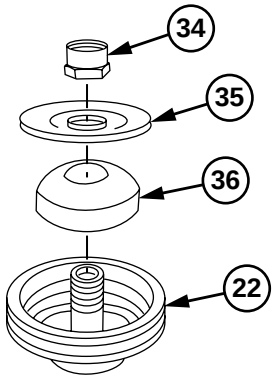


11-5. BRAKE TREADLE VALVE REPAIR (CONT)

(19) Remove preformed packing (33) from lower piston (22). Discard preformed packing.



(20) Remove nut (34), spring seat (35), and resilient mount (36) from lower piston (22).

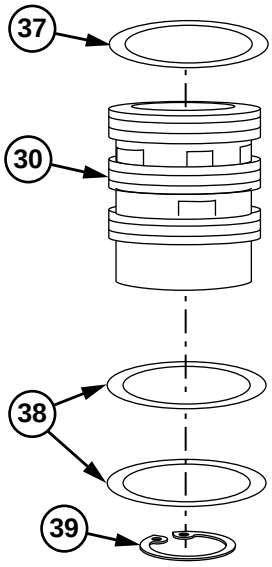


(21) Remove preformed packing (37) and two preformed packings (38) from lower static piston body (30). Discard preformed packings.

WARNING

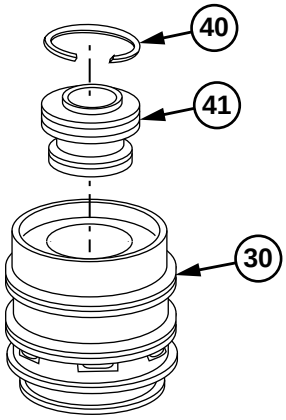
Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

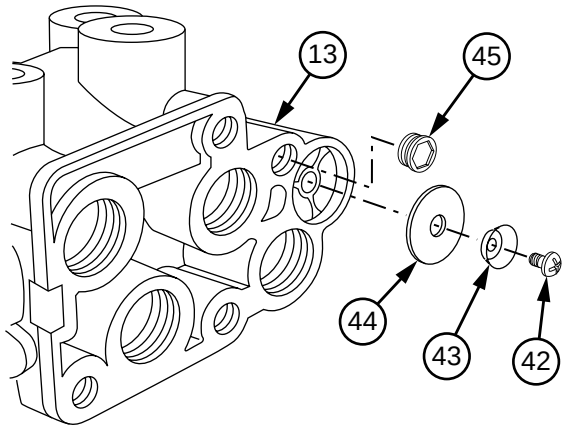
(22) Remove retaining ring (39) from lower static piston body (30).



(23) Remove retaining ring (40) from lower static piston body (30).

(24) Remove valve stem guide (41) from lower static piston body (30).





(25) Remove screw (42), retainer (43), and diaphragm (44) from housing (13).

(26) Remove pipe plug (45) from housing (13).

b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

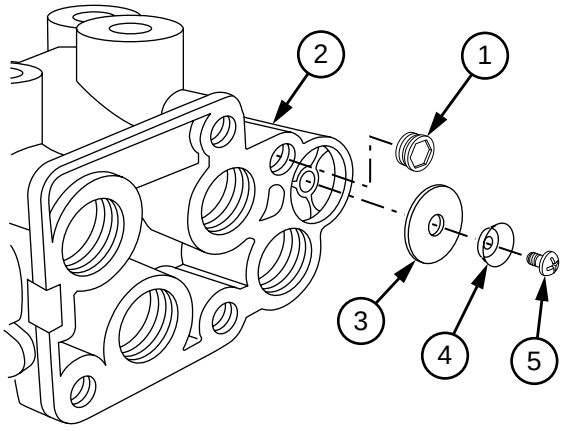
•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean metal parts in solvent cleaning compound.
(2) Inspect parts for damage, cracks, breaks, or deterioration.
(3) Inspect rubber parts for cracks or deterioration.
(4) Inspect machined surfaces for deep scratches.
(5) Remove small nicks or burrs from pistons and housings with crocus cloth.
(6) Replace unserviceable parts.

c. Assembly

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

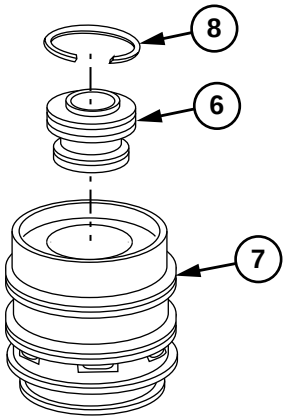


(1) Coat threads of pipe plug (1) with pipe thread sealing compound.
(2) Install pipe plug (1) in housing (2).
(3) Install diaphragm (3), retainer (4), and screw (5) in housing (2).

11-5. BRAKE TREADLE VALVE REPAIR (CONT)

CAUTION

Lubricate all preformed packings, bores, and mating surfaces with silicone lubricant before assembly. Failure to comply may result in damage to equipment.

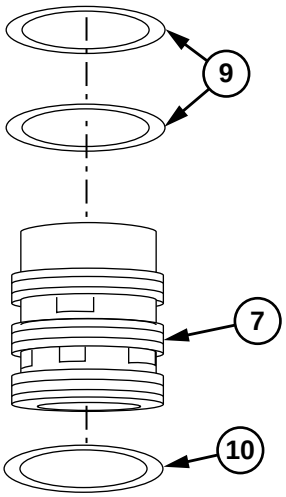


(4) Install valve stem guide (6) in lower static piston body (7).

WARNING

Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

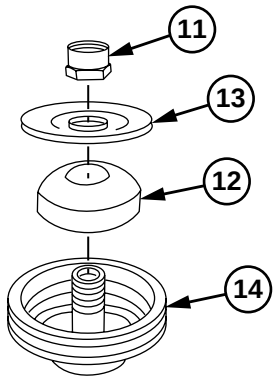
(5) Install retaining ring (8) in lower static piston body (7).



(6) Install two new preformed packings (9) and new preformed packing (10) on lower static piston body (7).

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

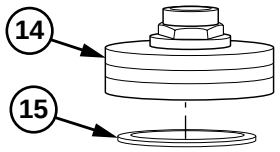


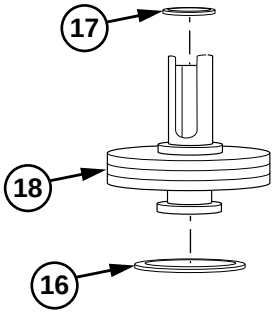
(7) Coat threads of nut (11) with adhesive-sealant.

NOTE

Do not lubricate resilient mount.

(8) Install resilient mount (12), spring seat (13), and nut (11) on lower piston (14).





(9) Install new preformed packing (15) on lower piston (14).

(10) Install new preformed packing (16) and new preformed packing (17) on relay piston (18).

NOTE

Thin gage spring is located on relay piston side of lower static piston housing.

(11) Install spring (19) and relay piston (18) in bottom of lower static piston body (7).

(12) Install spring (20) and lower piston (14) in top of lower static piston body (7).

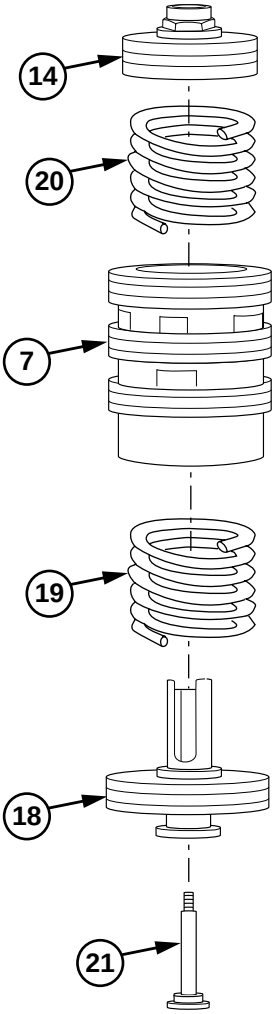
(13) Install stem bolt (21) in relay piston (18).

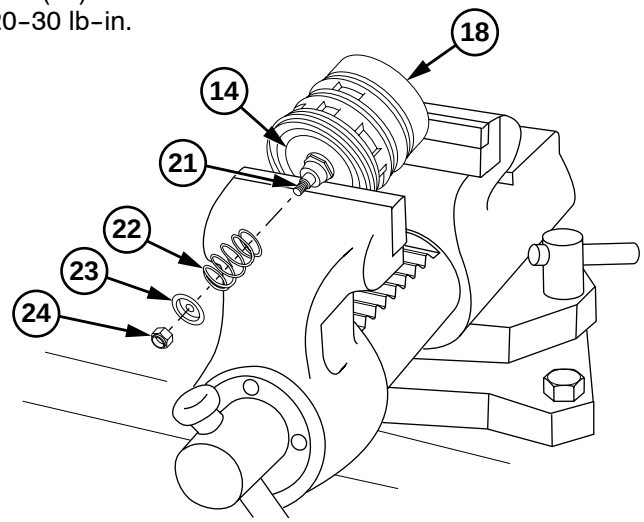
(14) Position pistons (14 and 18) in soft-jawed vise.

WARNING

Internal pistons are under moderate spring tension. Keep pistons compressed when installing locknut. Failure to comply may result in injury to personnel.

(15) Compress pistons (14 and 18) using vise and install spring (22), guide (23), and new locknut (24) on stem bolt (21) with aid of assistant. Torque to 20-30 lb-in. (2.3-3.4 N·m).





11-5. BRAKE TREADLE VALVE REPAIR (CONT)

(16) Install inlet cartridge (25) in upper static piston (26).

WARNING

Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(17) Install retaining ring (27) in upper static piston (26).

(18) Install new preformed packing (28) and new preformed packing (29) on upper static piston (26).

(19) Install upper static piston (26) in housing (2).

(20) Install lower static piston body (7) in housing (2).

NOTE

Three tabs on retainer must lock on housing.

(21) Install retaining plate (30) on housing (2).

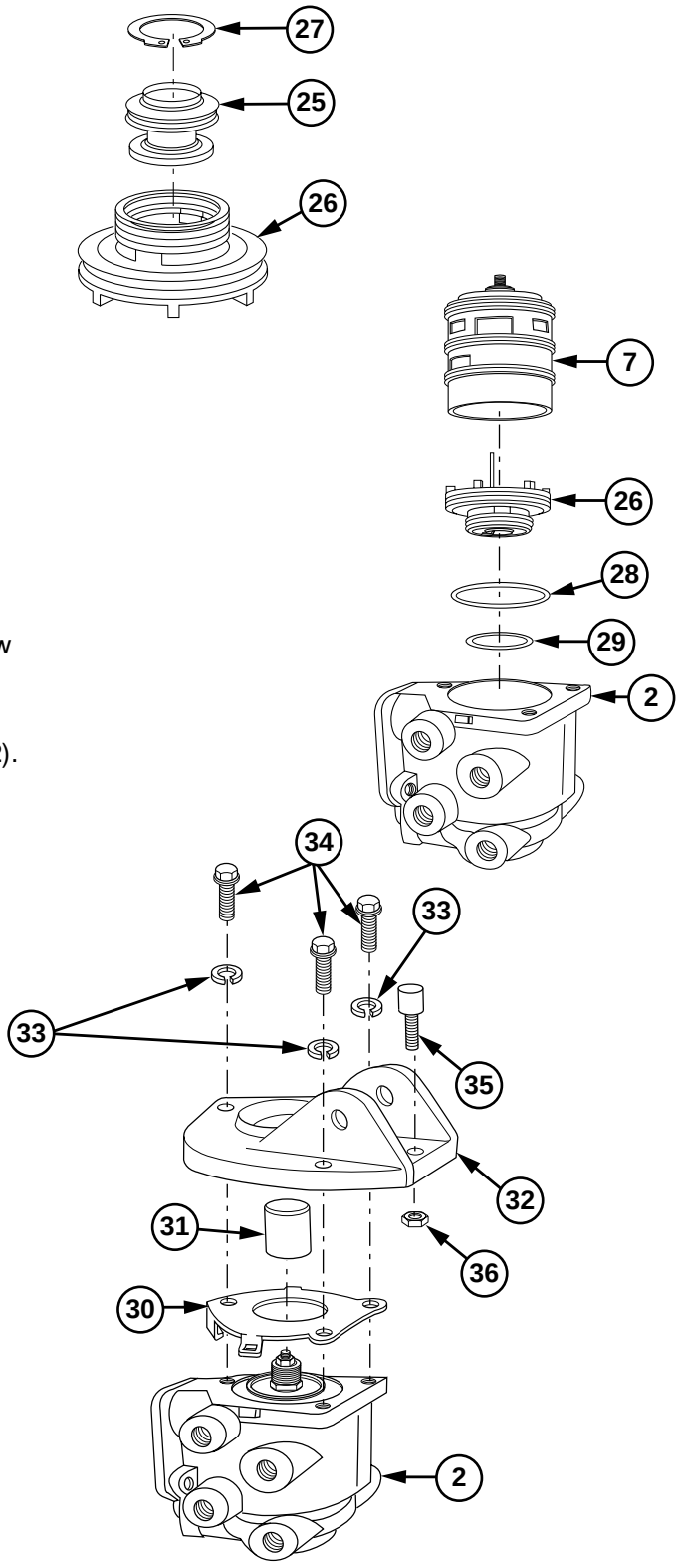
(22) Install sleeve (31) on housing (2).

(23) Install cover (32) on housing (2) with three new lockwashers (33) and screws (34).

NOTE

Plunger must be in contact with spring seat. Adjust stop button so rollers and plunger contact each other. Roller must turn freely by hand.

(24) Install stop button (35) and nut (36) on cover (32).



NOTE

Do step (25) only if pad was removed.

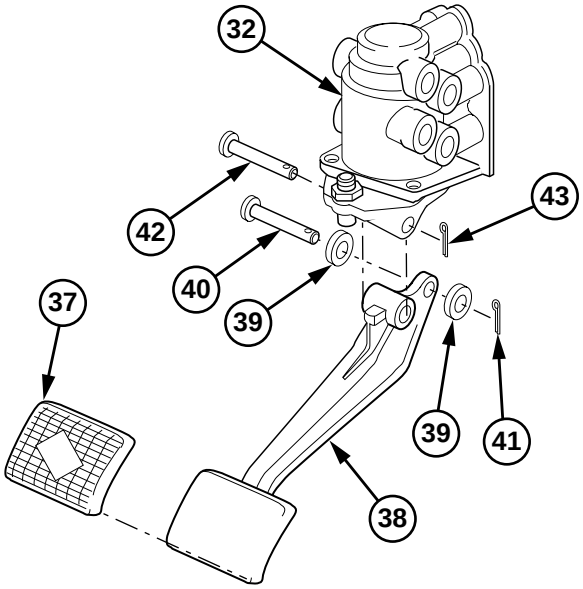
(25) Install pad (37) on pedal (38).

(26) Install two rollers (39) and pin (40) on pedal (38).

(27) Install new cotter pin (41) in pin (40).

(28) Install pedal (38) on cover (32) with pin (42).

(29) Install new cotter pin (43) in pin (42).



d. Testing

(1) Install eight pipe plugs (1) in four ports (2) on each side of treadle valve (3).

(2) Install two pipe plugs (4) in upper ports (5 and 6) on backside of treadle valve (3).

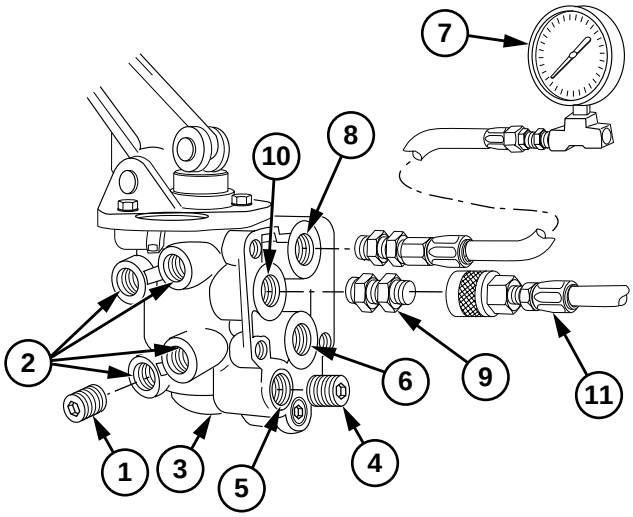
(3) Install air pressure gage (7) in lower delivery port (8) on backside of treadle valve (3).

(4) Install air supply fitting (9) in lower supply port (10) on backside of treadle valve (3).

NOTE

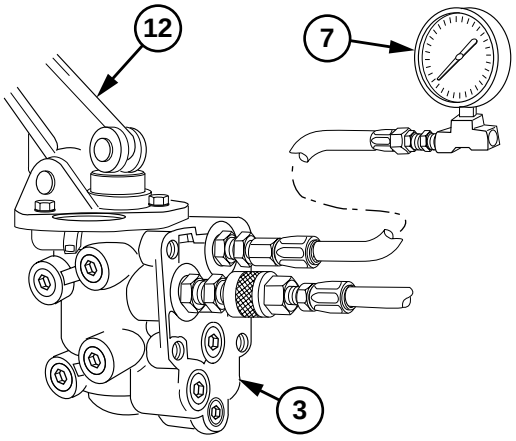
Air pressure should be between 80–120 psi (552–827 kPa).

(5) Install air supply line (11) on air supply fitting (9).



(6) Press pedal (12) to several positions between fully released and fully applied. Delivered pressure on gage (7) should vary proportionately with movement of pedal (12).

(7) Press pedal (12) until treadle valve (3) is fully applied. Reading on gage (7) should fall off to zero when pedal (12) is released.



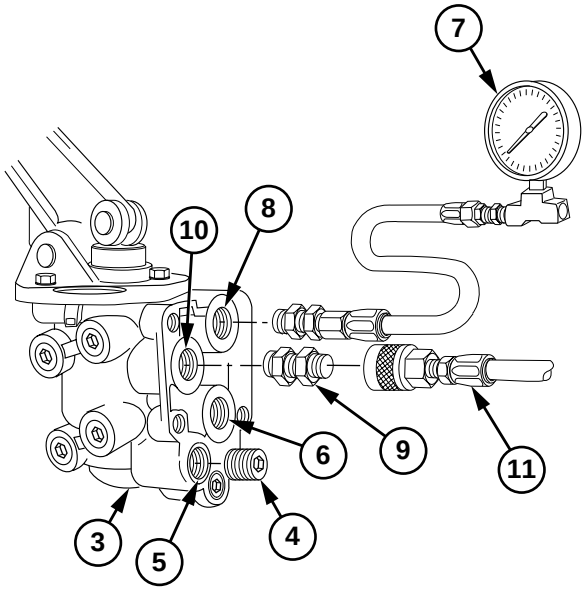
11-5. BRAKE TREADLE VALVE REPAIR (CONT)

(8) Remove air supply line (11) from air supply fitting (9).

(9) Remove two pipe plugs (4) from upper ports (5 and 6) on backside of treadle valve (3).

(10) Remove air pressure gage (7) from lower delivery port (8) on backside of treadle valve (3).

(11) Remove air supply fitting (9) from lower supply port (10) on backside of treadle valve (3).

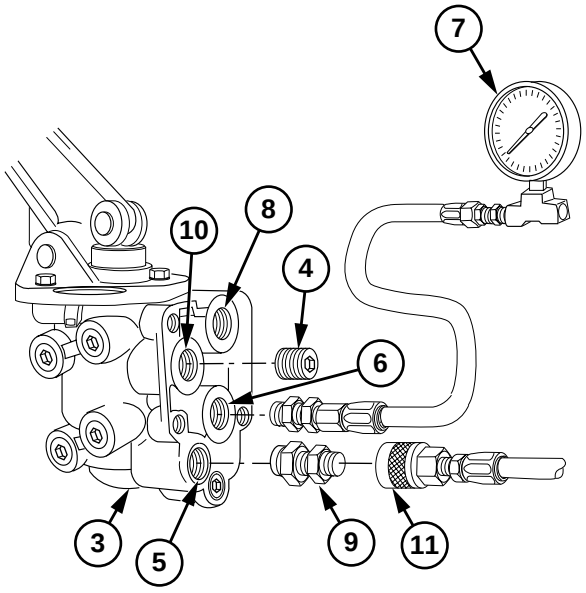


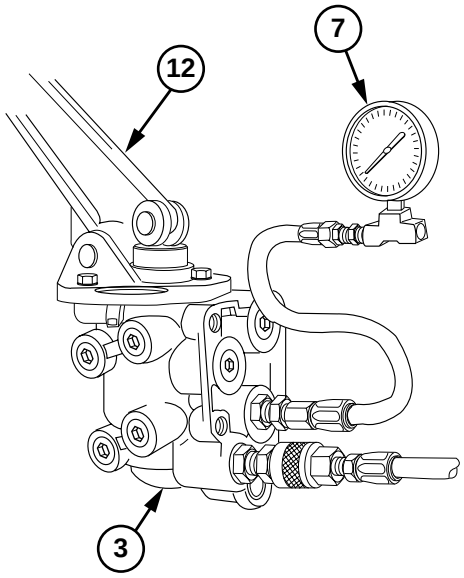
(12) Install two pipe plugs (4) in lower ports (8 and 10) on backside of treadle valve (3).

(13) Install air pressure gage (7) in upper delivery port (6) on backside of treadle valve (3).

(14) Install air supply fitting (9) in upper supply port (5) on backside of treadle valve (3).

(15) Install air supply line (11) on air supply fitting (9).

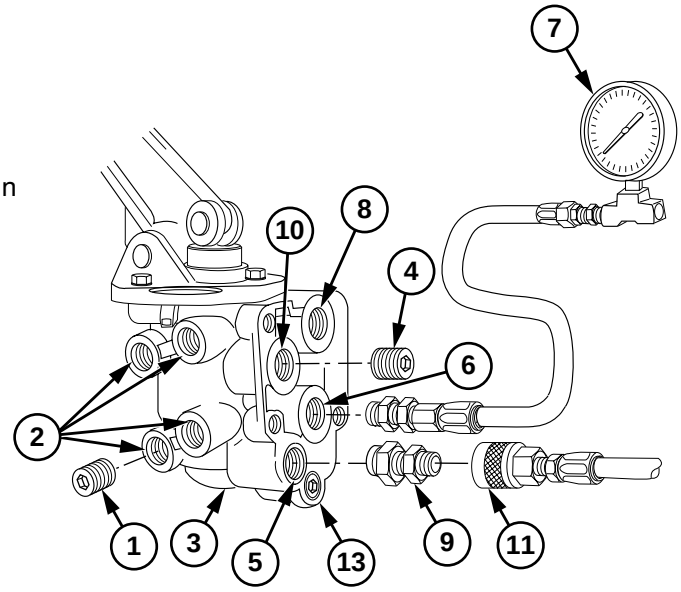




(16) Press pedal (12) to several positions between fully released and fully applied. Delivered pressure on gage (7) should vary proportionately with movement of pedal (12).

(17) Press pedal (12) until treadle valve (3) is fully applied. Reading on gage should fall off to zero when pedal (12) is released.

(18) Press and hold pedal (12) with treadle valve (3) fully applied.



(19) Coat exhaust port (13) and body of treadle valve (3) with soap solution.

(20) Air leakage of exhaust port (13) must not exceed 1 in. (2.5 cm) bubble in 3 seconds in both applied and released positions.

(21) Remove air supply line (11) from air supply fitting (9).

(22) Remove air supply fitting (9) from upper supply port (5) on backside of treadle valve (3).

(23) Remove air pressure gage (7) from upper delivery port (6) on backside of treadle valve (3).

(24) Remove two pipe plugs (4) from lower ports (8 and 10) on backside of treadle valve (3).

(25) Remove eight pipe plugs (1) from four ports (2) on each side of treadle valve (3).

e. Follow-On Maintenance

Install brake treadle (TM 9-2320-360-20).

11-6. AIR COMPRESSOR REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Cooling system drained (TM 9-2320-360-20).
Steering reservoir drained (LO 9-2320-360-12).
Air system drained (TM 9-2320-360-10).
Batteries disconnected (TM 9-2320-360-20).
Top doghouse insulation removed (TM 9-2320-360-20).
Front engine access panel removed (TM 9-2320-360-20).
Lower engine access panel removed (TM 9-2320-360-20).
Inner fender removed (left side only) TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hoist, Hand Operated (Item 69, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Screws, Guide (Figure C-4, Appendix C)
Sling, Endless Strap (Item 161, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Open-End, 1-5/8 In. and 1-13/16 In. (Item 224, Appendix E)
Wrench, Open-End, 1-7/8 and 1-11/16 In. (Item 225, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)

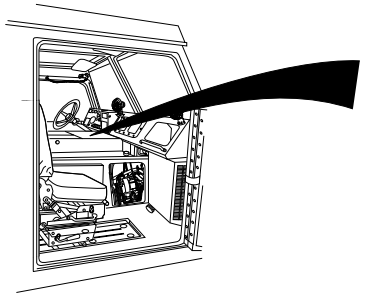
Tools and Special Tools (Cont)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, Click-Type, 15-100 Lb-Ft (Item 238, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

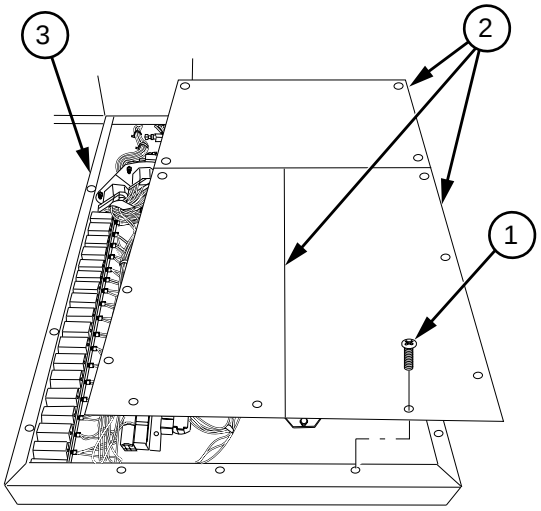
Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Compound, Sealing (Item 22.1, Appendix B)
Grease, Automotive and Artillery (GAA) (Item 32, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Gasket (Item 30, Appendix F)
Locknuts (2) (Item 86, Appendix F)
Locknut (Item 96, Appendix F)
Lockwashers (3) (Item 119, Appendix F)
Lockwashers (4) (Item 122, Appendix F)
Packings, Preformed (2) (Item 161, Appendix F)

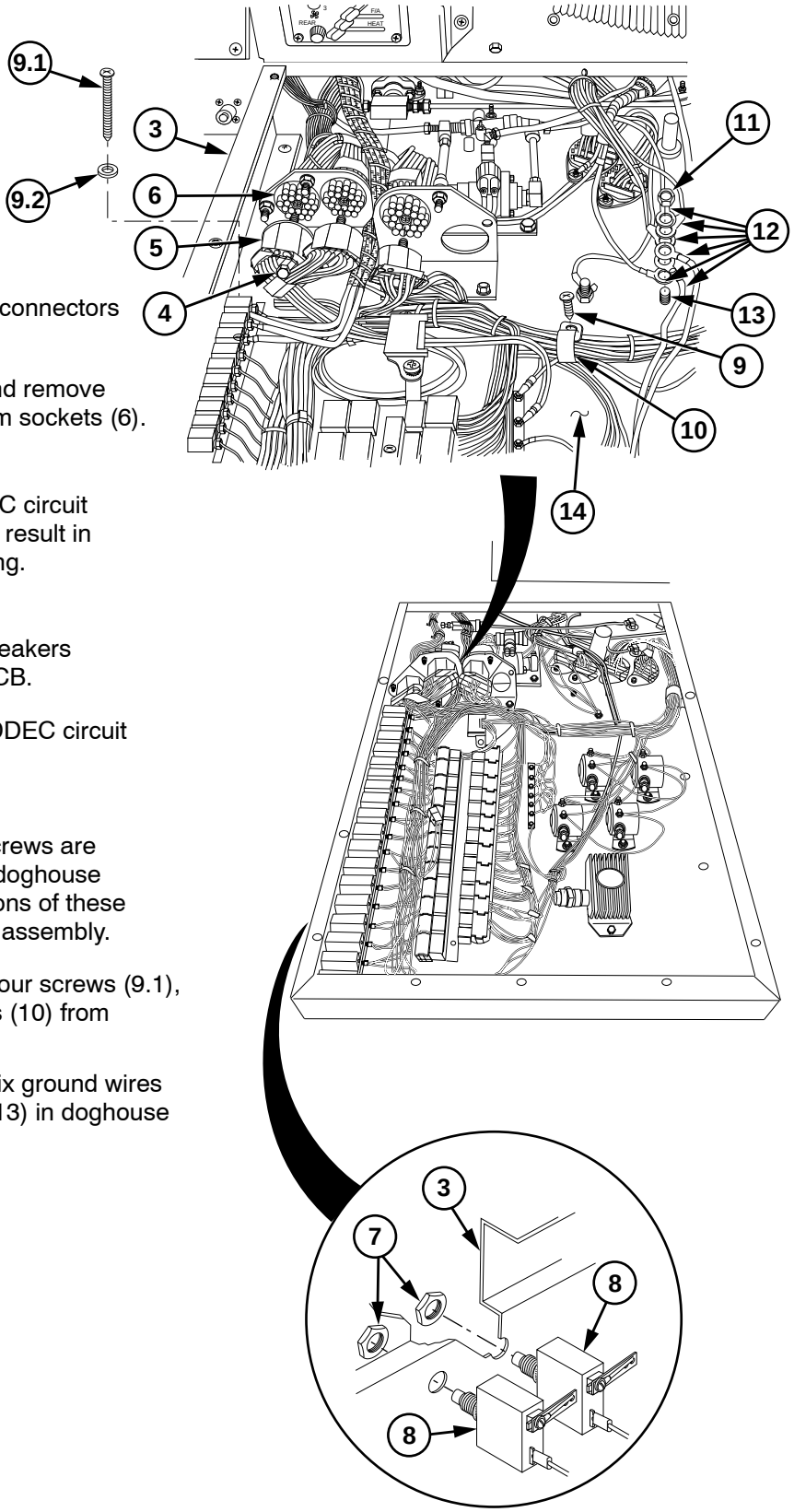
Personnel Required
Two

a. Removal

(1) Remove 19 screws (1) and 3 covers (2) from electronic control box (ECB) (3).







NOTE

Tag and mark harness connectors before disconnection.

(2) Loosen three screws (4) and remove harness connectors (5) from sockets (6).

CAUTION

Failure to remove DDEC circuit breakers from ECB will result in damage to vehicle wiring.

NOTE

Tag and mark circuit breakers before removal from ECB.

(3) Remove two nuts (7) and DDEC circuit breakers (8) from ECB (3).

NOTE

The four 2 in. (5 cm) screws are used to retain the top doghouse insulation. Mark locations of these four screws for proper assembly.

(4) Remove eight screws (9), four screws (9.1), washers (9.2) and two clips (10) from ECB (3).

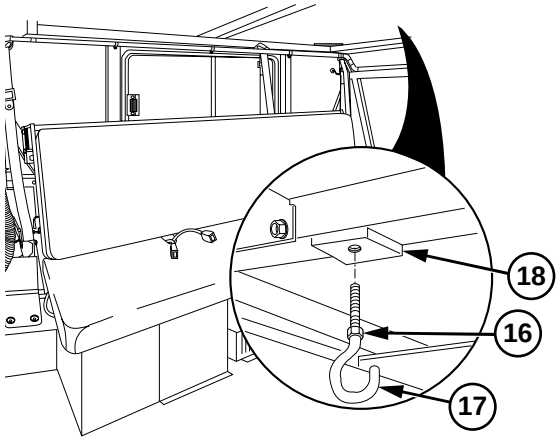
(5) Remove locknut (11) and six ground wires no. 1435 (12) from screw (13) in doghouse (14). Discard locknut.

11-6. AIR COMPRESSOR REPLACEMENT (CONT)

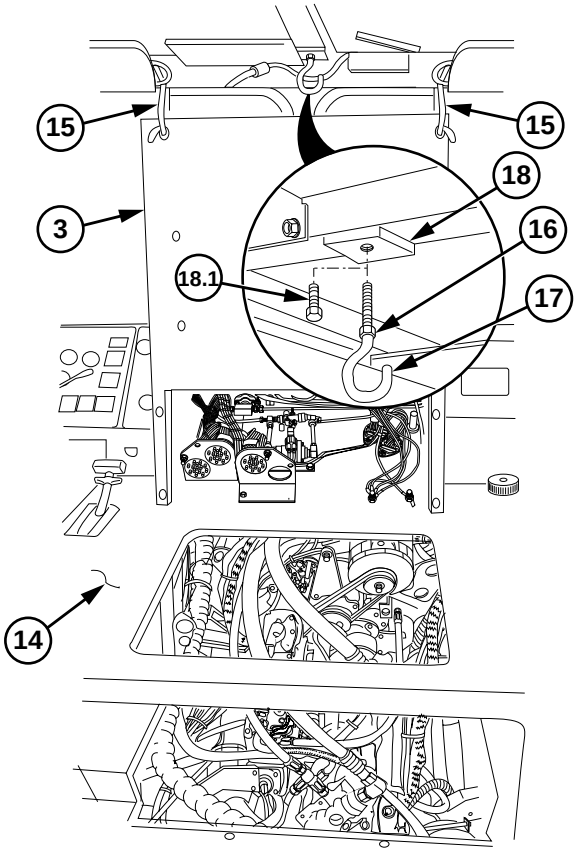
(6) Tilt rear of ECB (3) upward and position on doghouse (14). Secure with plastic cable ties (15).

(7) Loosen jam nut (16) and remove rear seat eye bolt (17) from cab ceiling (18).

(7.1) Remove screw (18.1) from center of cab ceiling (18).



(8) Install eye bolt (17) in threaded hole in center of cab ceiling (18) and tighten jam nut (16).

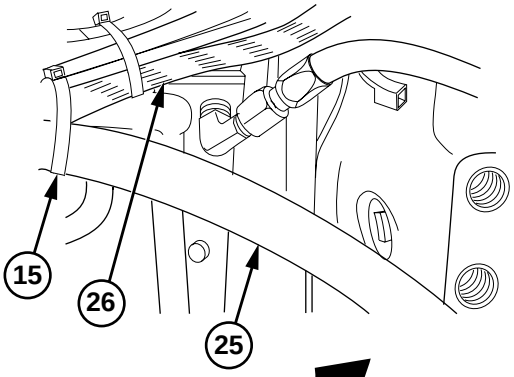


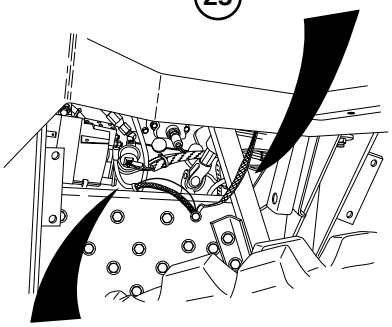
(9) Deleted.

NOTE

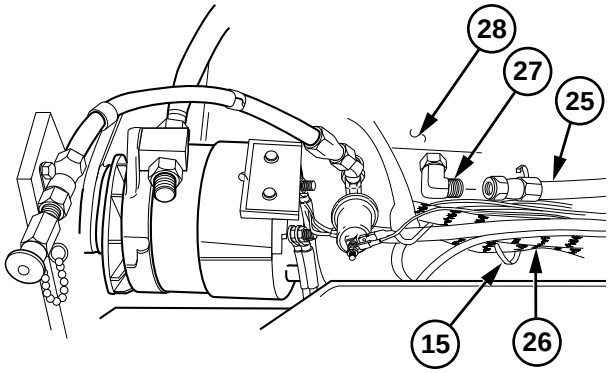
Location of plastic cable ties should be marked before removal.

(10) Remove plastic cable ties (15) securing oil line no. 2630 (25) to wire harness (26).





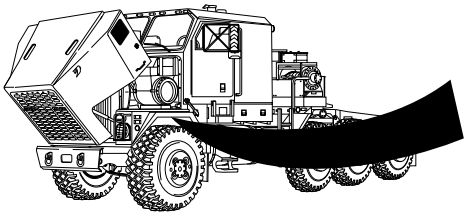
(11) Remove oil line no. 2630 (25) from elbow (27) on left side of engine (28).

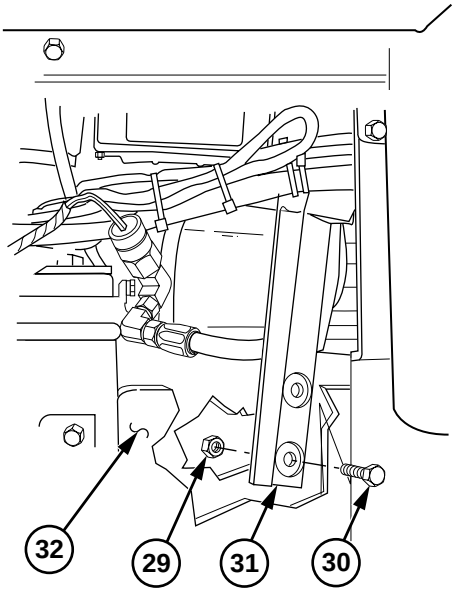


NOTE

Screws and locknuts attaching air compressor mounting bracket to transmission mount must be removed from under HET Tractor.

(12) Remove two locknuts (29) and screws (30) from mounting bracket (31) on cradle (32) with aid of assistant. Discard locknuts.





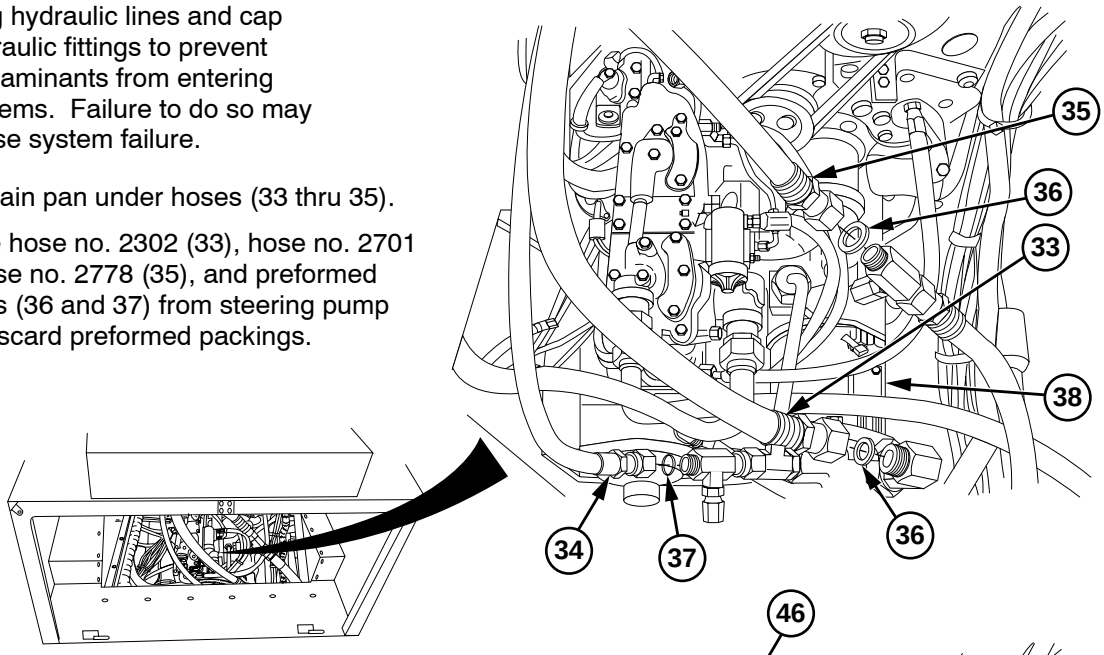
11-6. AIR COMPRESSOR REPLACEMENT (CONT)

CAUTION

Plug hydraulic lines and cap hydraulic fittings to prevent contaminants from entering systems. Failure to do so may cause system failure.

(13) Place drain pan under hoses (33 thru 35).

(14) Remove hose no. 2302 (33), hose no. 2701 (34), hose no. 2778 (35), and preformed packings (36 and 37) from steering pump (38). Discard preformed packings.



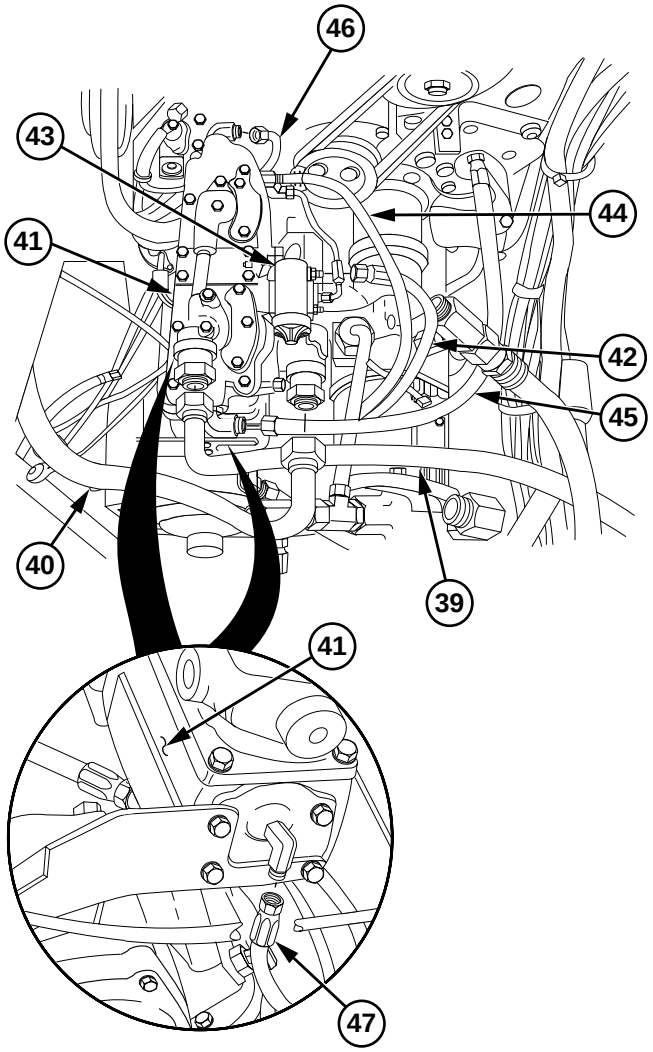
(15) Remove air line no. 2001 (39) and air line no. 2600 (40) from compressor (41).

(16) Remove air line no. 2159 (42) from air governor (43).

(17) Remove air line no. 2096 (44) from compressor (41).

(18) Remove two coolant lines no. 2628 (45 and 46) from compressor (41).

(19) Remove oil line no. 2629 (47) from compressor (41).

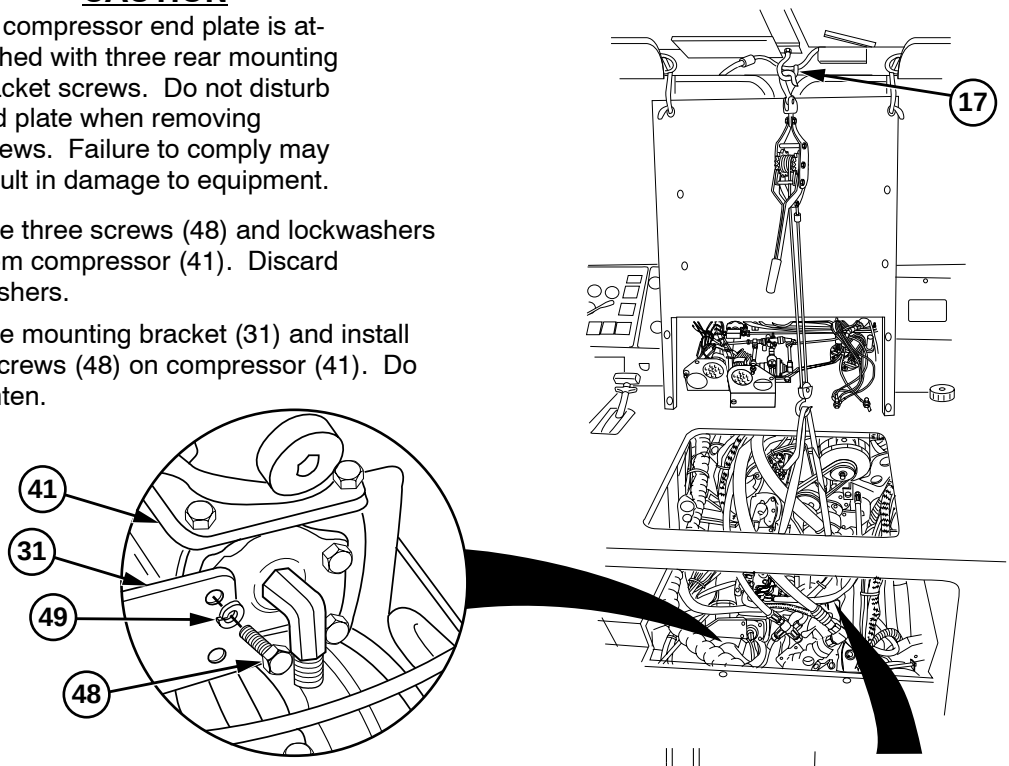


CAUTION

Air compressor end plate is attached with three rear mounting bracket screws. Do not disturb end plate when removing screws. Failure to comply may result in damage to equipment.

(20) Remove three screws (48) and lockwashers (49) from compressor (41). Discard lockwashers.

(21) Remove mounting bracket (31) and install three screws (48) on compressor (41). Do not tighten.



WARNING

Air compressor weighs 100 lb (45 kg). If dropped, compressor may cause serious injury.

(22) Attach two lifting straps (50) and suitable lifting device to compressor (41) and eye bolt (17).

(23) Remove four screws (51) and lockwashers (52) from compressor (41). Discard lockwashers.

NOTE

Gently strike compressor with soft-faced mallet to unseat mounting flange from engine.

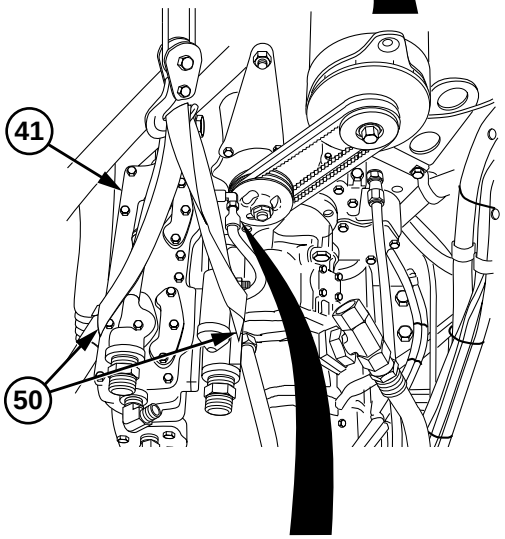
(24) Remove compressor (41) and gasket (53) from engine (28) with aid of assistant. Discard gasket.

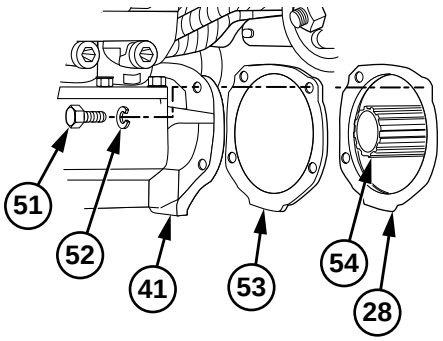
NOTE

Drive coupling may stay on air compressor.

(25) Remove drive coupling (54) from engine (28).

(26) Remove two lifting straps (50) and suitable lifting device from compressor (41) and eye bolt (17).





11-6. AIR COMPRESSOR REPLACEMENT (CONT)

(27) Remove oil line no. 2630 (25) from elbow (55) on air compressor (41).

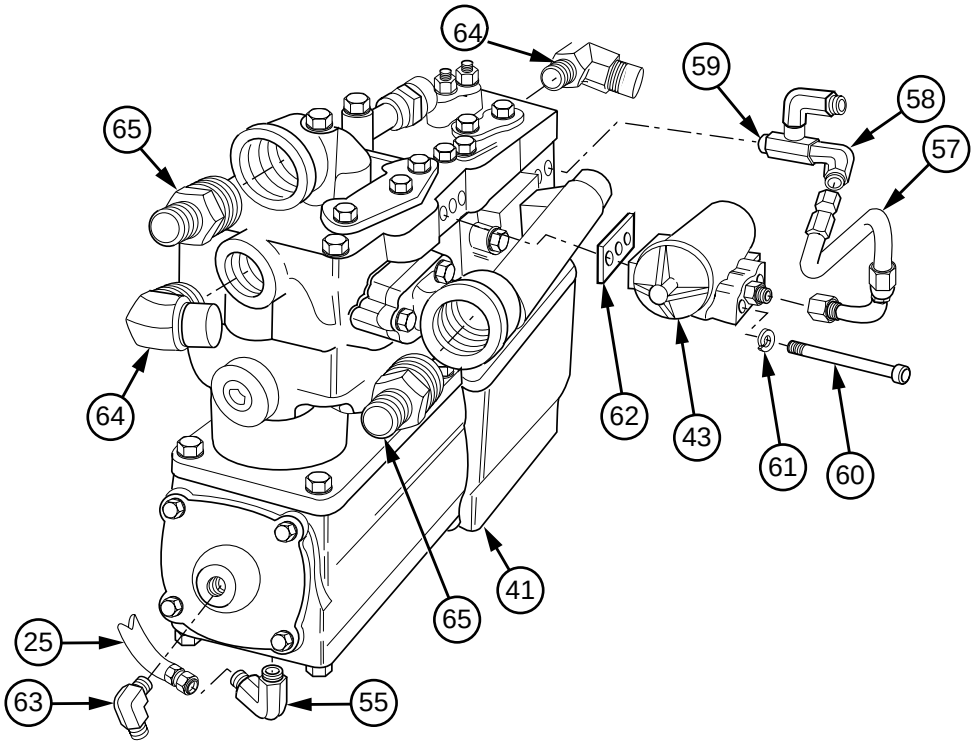
(28) Remove elbow (55) from compressor (41).

(29) Remove hose no. 2114 (57) from elbow (58) and governor (43).

(30) Remove tee (59) from air compressor (41).

(31) Remove two screws (60), lockwashers (61), governor (43), and gasket (62) from air compressor (41). Discard lockwashers and gasket.

(32) Remove three elbows (63 and 64) and two adapters (65) from air compressor (41).



b. Cleaning/Inspection

(1) Clean old gasket material from engine and air compressor mounting flange.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean sealant residue from threaded holes with solvent cleaning compound.

(3) Inspect drive hub, drive plate, mounting flange, housing, and end plate for damage.

(4) Apply light coat of grease to splines of air compressor driven gear.

c. Installation

(1) Install new gasket (1) and governor (2) on air compressor (3) with two new lockwashers (4) and screws (5).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound at hose connections. Damage to equipment may result.

(2) Coat threads of tee (6), two adapters (7), and two elbows (8), elbow (9), and elbow (10) with pipe thread sealing compound.

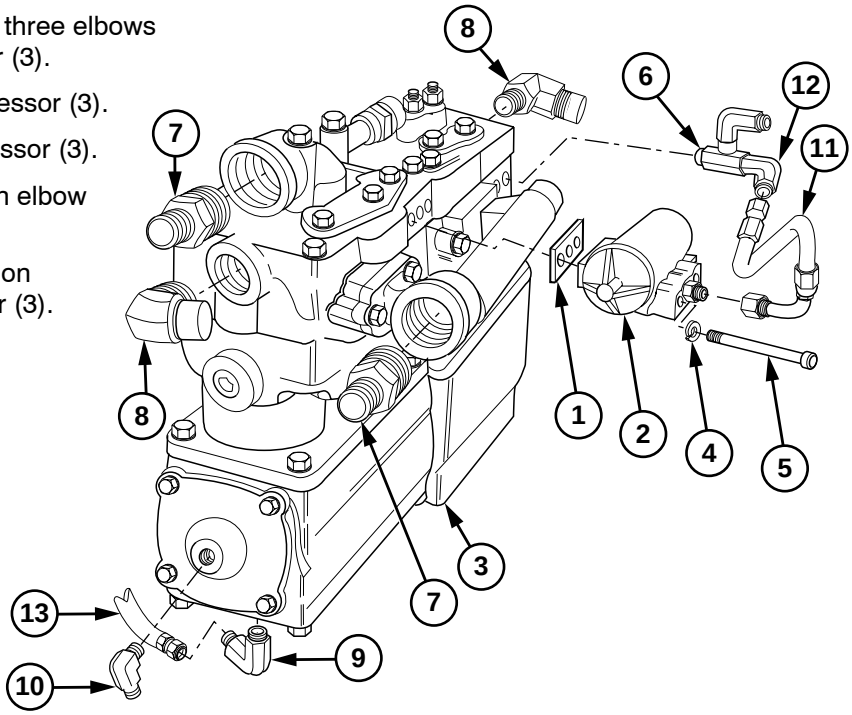
(3) Install two adapters (7) and three elbows (8 and 9) on air compressor (3).

(4) Install elbow (10) on compressor (3).

(5) Install tee (6) on air compressor (3).

(6) Install hose no. 2114 (11) on elbow (12) and governor (2).

(7) Install oil line no. 2630 (13) on elbow (9) on air compressor (3).



(8) Install two guide screws (14) in lower holes of engine (15).



11-6. AIR COMPRESSOR REPLACEMENT (CONT)

(9) Install two lifting straps (16) and suitable lifting device on compressor (3) and eye bolt (17).

(10) Install drive coupling (18) in engine (15).

WARNING

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

NOTE

- Air compressor and mating surfaces on engine must be clean.
- Rubber seal on gasket faces away from engine.

(10.1) Apply sealing compound to engine side of new gasket (19).

(11) Position gasket (19) and compressor (3) on guide screws (14) with aid of assistant.

CAUTION

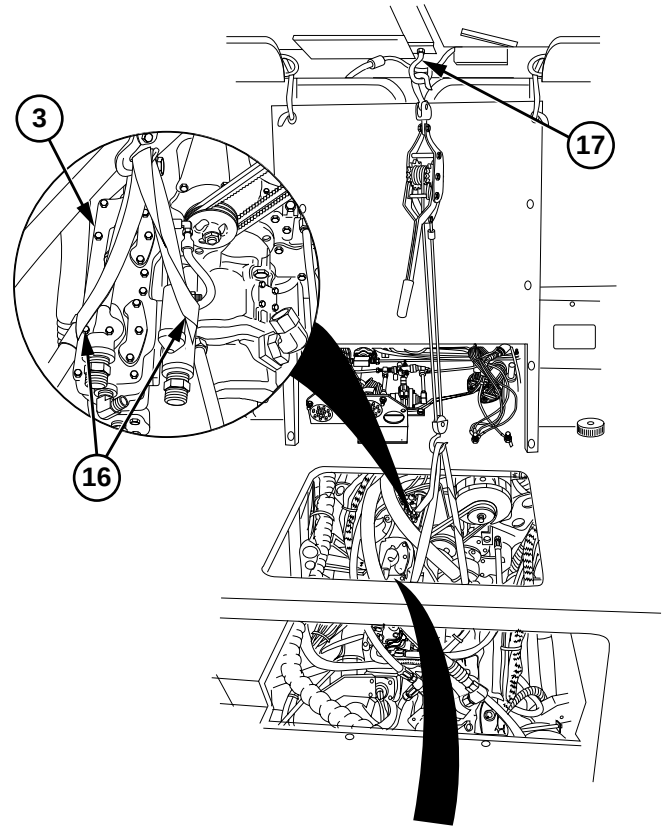
Compressor drive hub must be mated with engine drive plate. If hub does not align, rotate crankshaft by turning nut in center of pulley on front of left camshaft clockwise. Failure to comply may result in damage to equipment.

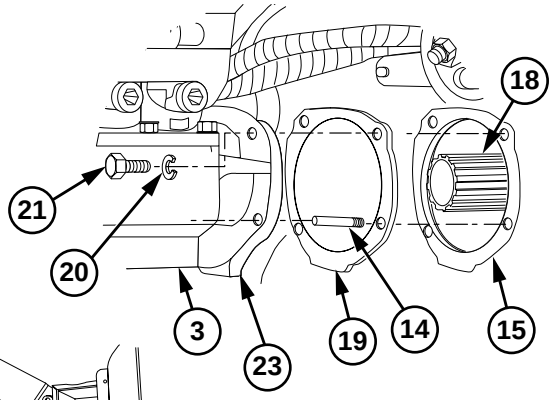
(12) Install new gasket (19) and compressor (3) on engine (15) with two new lockwashers (20) and screws (21) while assistant uses camshaft pulley (22) to bar over engine.

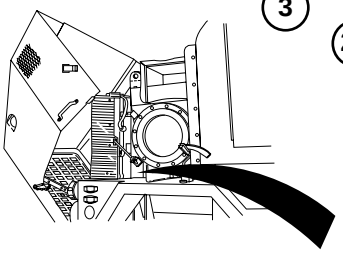
(13) Remove two guide screws (14) and install two new lockwashers (20) and screws (21) in lower holes of compressor mounting flange (23).

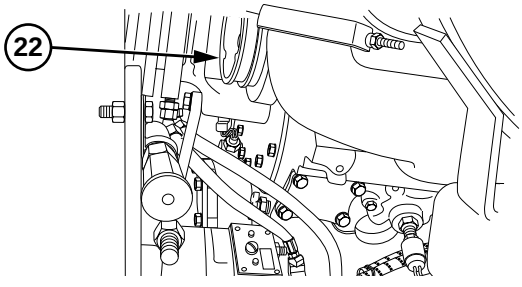
(14) Remove two lifting straps (16) and suitable lifting device from compressor (3) and eye bolt (17).

(15) Tighten four screws (21) to 80 lb-ft (108 N·m).





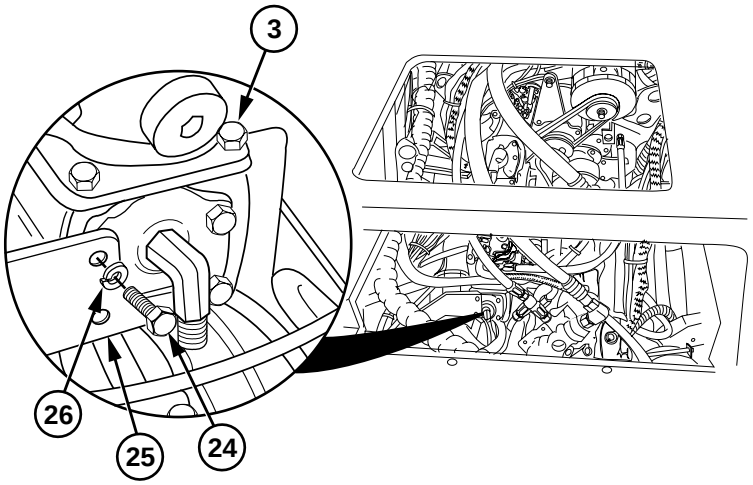




CAUTION

Air compressor end plate is attached with three rear mounting bracket screws. Do not disturb end plate when removing screws. Failure to comply may result in damage to equipment.

(16) Remove three screws (24) from compressor (3).

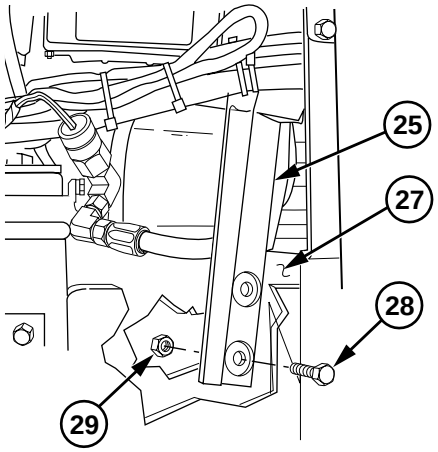


WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(17) Coat threads of three screws (24) with adhesive-sealant.

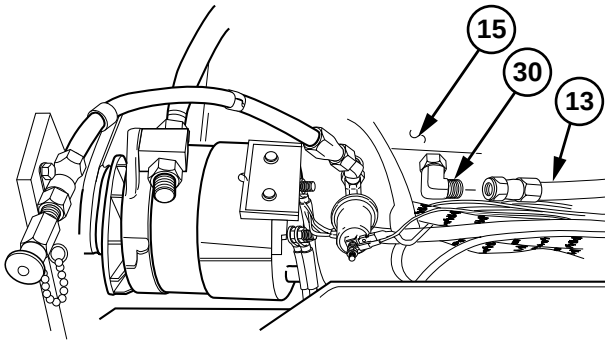
(18) Install mounting bracket (25) on compressor (3) with three new lockwashers (26) and screws (24). Do not tighten.



NOTE

Screws and locknuts attaching air compressor mounting bracket to transmission mount may be installed from under HET Tractor.

(19) Install mounting bracket (25) on cradle (27) with two screws (28) and new locknuts (29).



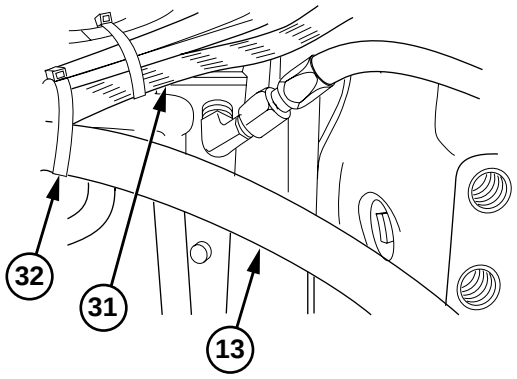
(20) Install oil line no. 2630 (13) on elbow (30) on left side of engine (15).

11-6. AIR COMPRESSOR REPLACEMENT (CONT)

NOTE

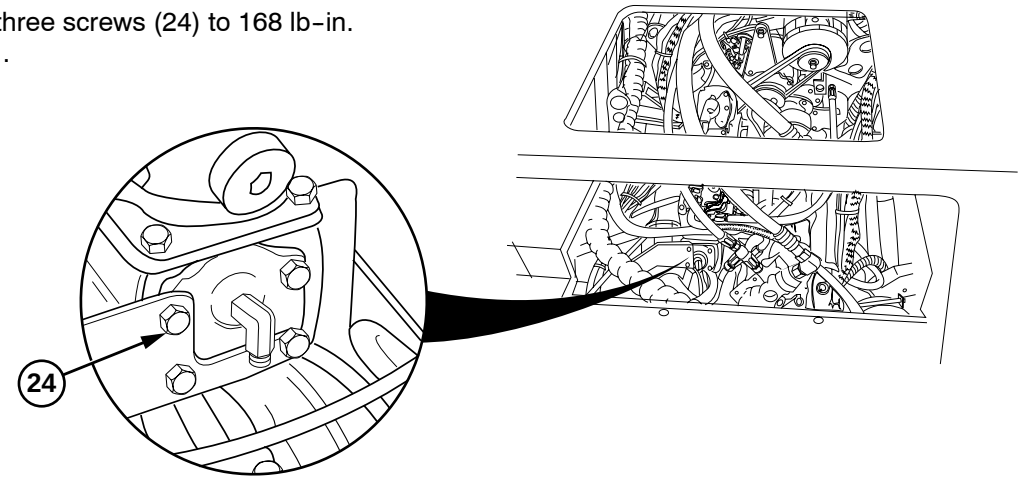
Plastic cable ties should be positioned in locations marked during removal.

(21) Secure oil line no. 2630 (13) to wire harness (31) with plastic cable ties (32).



(22) Deleted.

(23) Tighten three screws (24) to 168 lb-in. (19 N·m).



(24) Install oil line no. 2629 (39) on compressor (3).

(25) Install two coolant lines no. 2628 (40 and 41) on compressor (3).

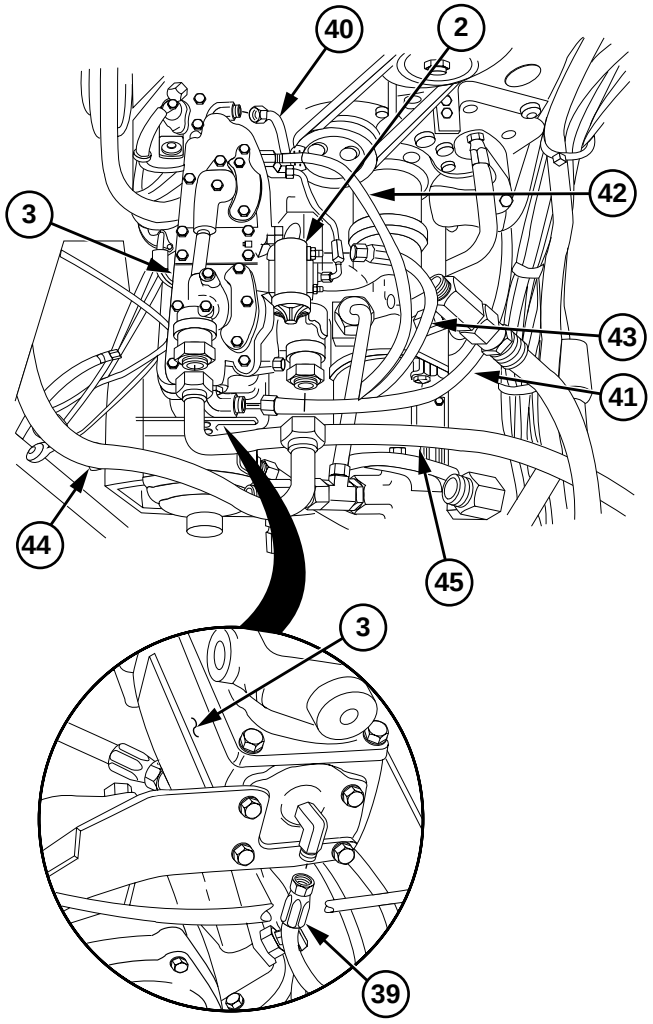
(26) Install air line no. 2096 (42) on compressor (3).

(27) Install air line no. 2159 (43) on governor (2).

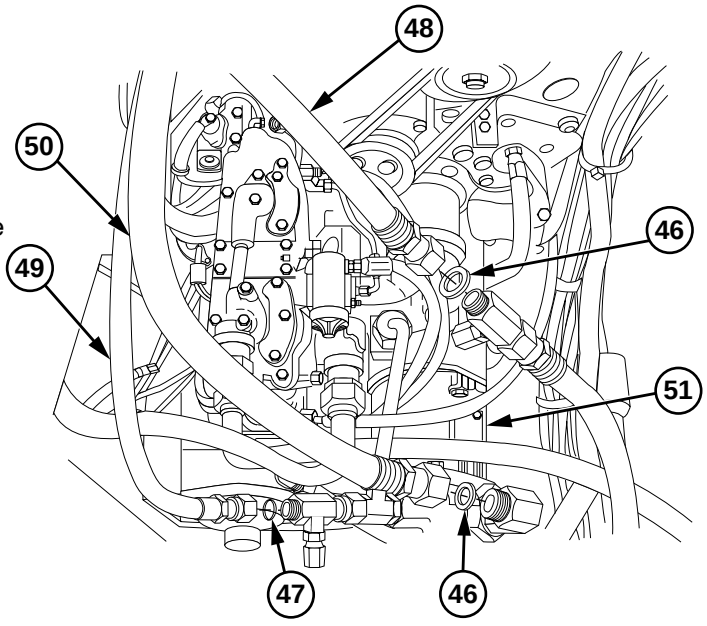
CAUTION

Air compressor discharge must be installed on compressor so that it does not contact any other hoses. Damage to equipment may result.

(28) Install air line no. 2600 (44) and air line no. 2001 (45) on compressor (3).



(29) Install three new preformed packings (46 and 47), hose no. 2778 (48), hose no. 2701 (49), and hose no. 2302 (50) on steering pump (51).

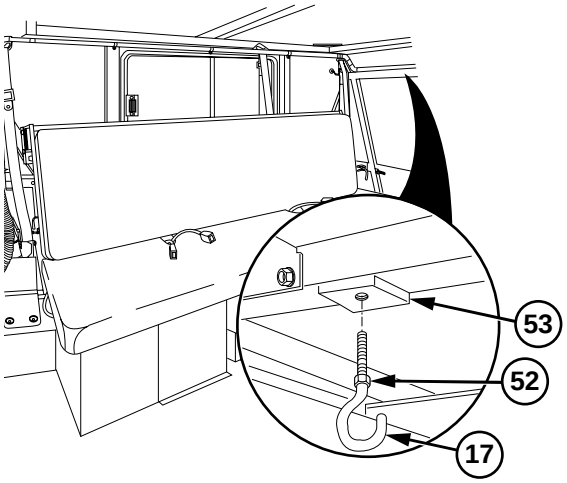


11-6. AIR COMPRESSOR REPLACEMENT (CONT)

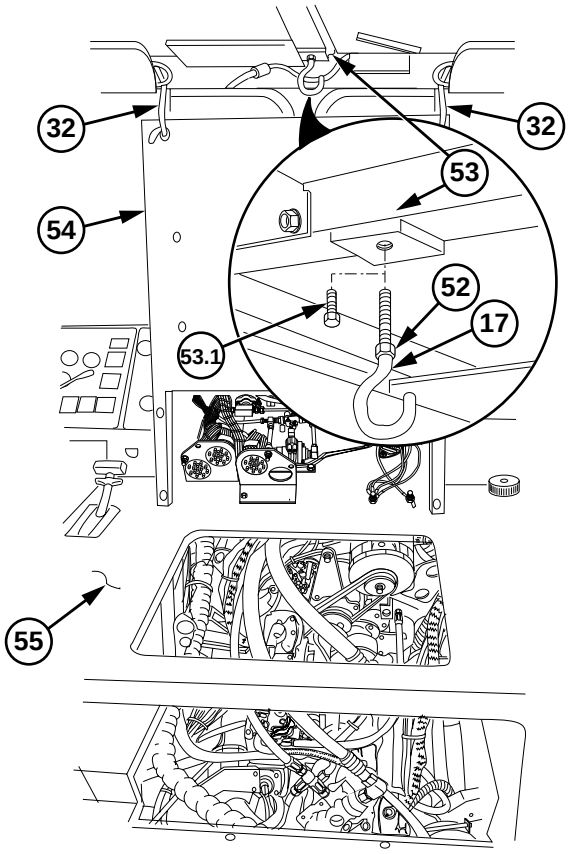
(30) Loosen jam nut (52) and remove eye bolt (17) from center of cab ceiling (53).

(30.1) Install screw (53.1) in center of cab ceiling (53).

(31) Install eye bolt (17) in threaded hole on side of cab ceiling (53) and tighten jam nut (52).



(32) Remove plastic cable ties (32). Lower ECB (54) onto doghouse (55).



(33) Install six ground wires no. 1435 (56) on doghouse (55) with screw (57) and new locknut (58).

NOTE

DDEC circuit breakers should be positioned in locations marked during removal.

(34) Install two DDEC circuit breakers (59) with nuts (60) in ECB (54).

WARNING

Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open, flush eyes with water for 15 minutes and get immediate medical attention.

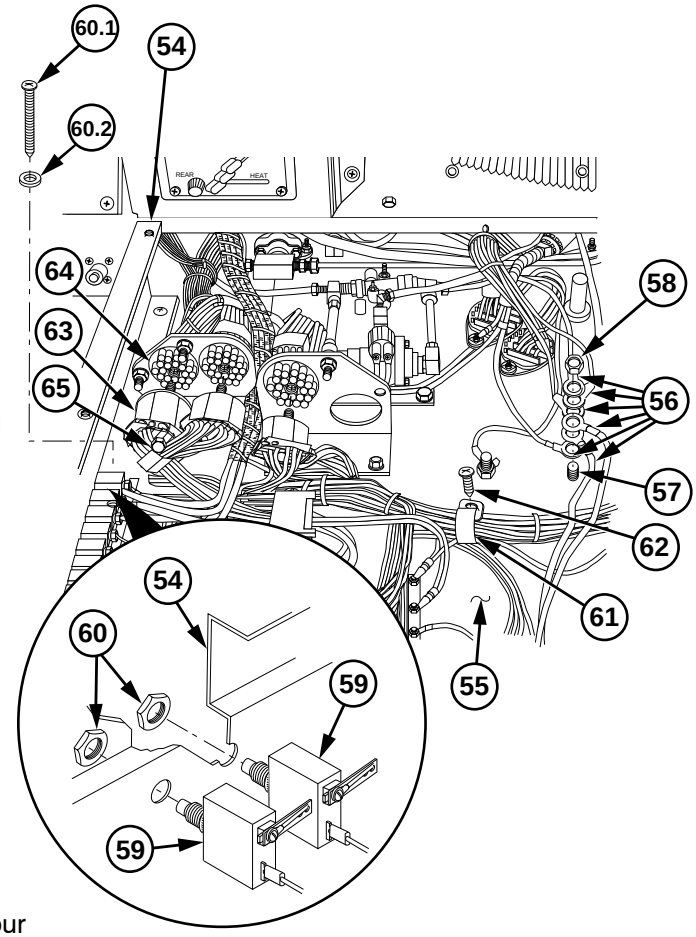
NOTE

The four 2 in. (5 cm) screws are used to retain the top doghouse insulation. These screws must be placed in locations marked during removal.

(35) Coat threads of four screws (60.1) with adhesive-sealant.

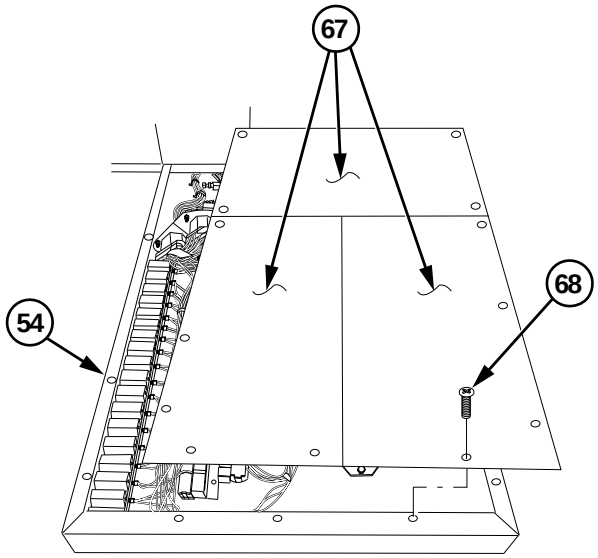
(35.1) Install ECB (54) and two clips (61) on doghouse (55) with eight screws (62), four screws (60.1) and washers (60.2).

(36) Install three harness connectors (63) in sockets (64). Tighten three screws (65).



11-6. AIR COMPRESSOR REPLACEMENT (CONT)

(37) Install 3 covers (67) on ECB (54) with 19 screws (68).



d. Follow-On Maintenance

(1) Fill cooling system (TM 9-2320-360-20).
(2) Fill steering reservoir (LO 9-2320-360-12).
(3) Connect batteries (TM 9-2320-360-20).
(4) Start engine (TM 9-2320-360-10).
(5) Build up air pressure to 120-125 psi (827-862 kPa).
(6) Check steering system operation (TM 9-2320-360-10).
(7) Shut off engine (TM 9-2320-360-10).
(8) Check for leaks.
(9) Install front engine access panel (TM 9-2320-360-20).
(10) Install lower engine access panel (TM 9-2320-360-20).
(11) Install top doghouse insulation (TM 9-2320-360-20).
(12) Install inner fender (TM 9-2320-360-20).

CHAPTER 12
WHEEL AND TIRE MAINTENANCE

Contents

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Introduction	12-1	12-1
Brake Drum Inspection/Repair	12-2	12-2
Planetary and Hub Repair	12-3	12-4

Section I. INTRODUCTION

12-1. INTRODUCTION

This chapter contains maintenance instructions for replacement and repair of the wheel and tire at the Direct Support maintenance level. Some subassemblies and parts must be removed before the wheels and tires and components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

12-2. BRAKE DRUM INSPECTION/REPAIR

This task covers
a. Inspection and Repair
b. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Brake drum removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Gage, Brake Drum Micrometer (Item 45.1, Appendix E)
Lathe, Brake Drum (Item 94, Appendix E)

Materials/Parts
Cloth, Crocus (Item 16, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)

Personnel Required
Two

a. Inspection and Repair

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

•Brake drum may be coated with dust. Breathing dust may be harmful to personnel. Do not use compressed air to clean brake drum. Wear filter mask approved for use against brake dust.

(1) Clean brake drum (1) with solvent cleaning compound.

NOTE

Brake drum must be round within 0.003 in. (0.076 mm). If drum is out of round, go to step (3).

(2) Check brake drum (1) for badly scored finish, heat cracks, or other damage. If drum is scored, machine drum. Go to step (3).

WARNING

Brake drum weighs 134 lb (61 kg). Use lifting device or get assistance to lift drum. Failure to comply may result in injury.

(3) Install brake drum (1) on turning equipment.

NOTE

Machine drum only enough to obtain a smooth, clean finish, free of pits, grooves, or cracks.

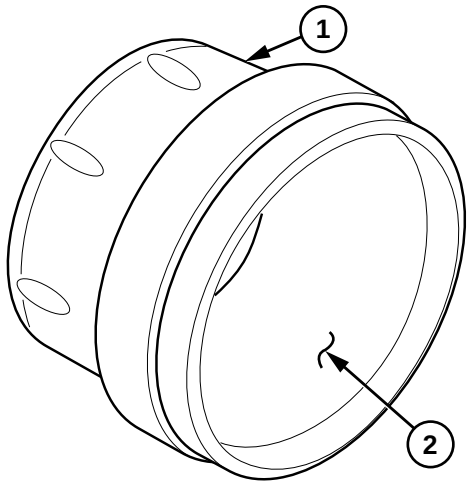
(4) Reface braking surface (2) with brake drum lathe, removing a maximum of 0.01 in. (0.25 mm) per cut.
(5) Remove brake drum (1) from turning equipment.

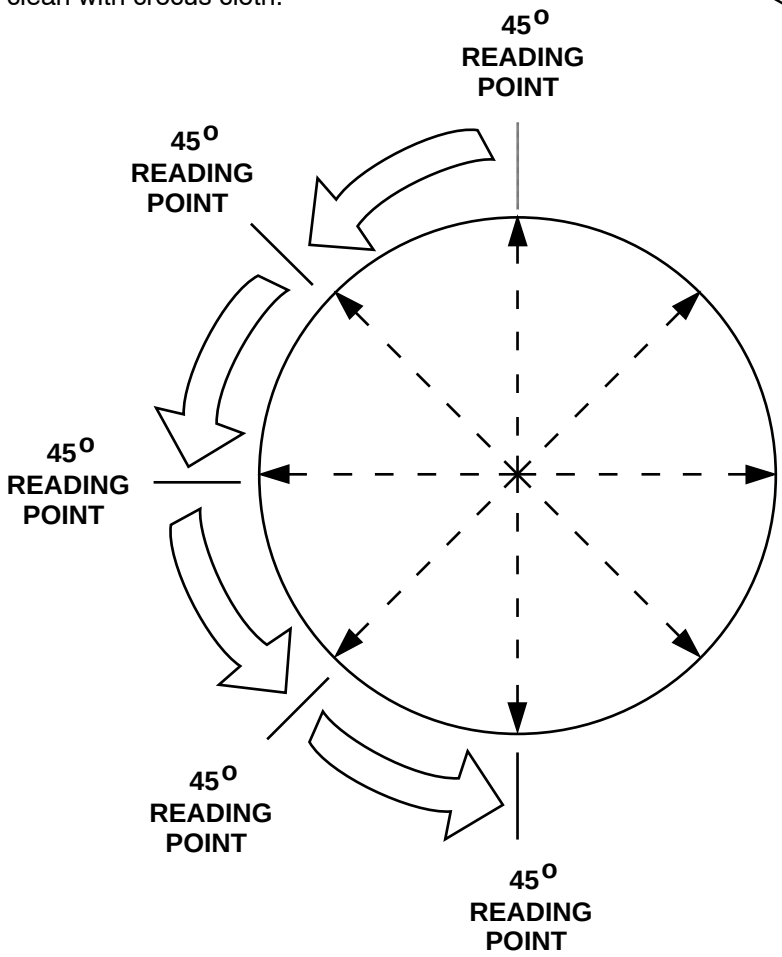
WARNING

Do not use brake drum that exceeds maximum wear specifications. Failure to comply may result in brake failure and serious injury or death.

(6) Discard brake drum (1) if inside diameter is larger than 16.625 in. (42.228 cm) after repair.

(7) Check braking surface (2) for glossy or heat spots. If glossy or heat spots are visible, clean with crocus cloth.





b. Follow-On Maintenance

Install brake drum (TM 9-2360-34-20).

12-3. PLANETARY AND HUB REPAIR

This task covers
- a. Removal
- b. Disassembly
- c. Cleaning/Inspection
- d. Assembly
- e. Installation
- f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
- Brake drum removed (TM 9-2320-360-20).
- Driveline control in locked position (TM 9-2320-360-10).
- Transfer case in low range (TM 9-2320-360-10).

Tools and Special Tools
- Tool Kit, Genl Mech (Item 202, Appendix E)
- Adapter, Socket Wrench, 3/4 In. Female - 1 In. Male (Item 6, Appendix E)
- Compressor Unit, Air (Item 24, Appendix E)
- Goggles, Industrial (Item 57, Appendix E)
- Guide Sleeve (Item 62, Appendix E)
- Remover/Setter, Stud (Item 137, Appendix E)
- Seal Driver, CTI (Item 154, Appendix E)
- Seal Driver, CTI (Item 155, Appendix E)
- Socket, Sockethead Screw, 12 mm (Item 174, Appendix E)
- Socket, Spanner (Item 179, Appendix E)

Tools and Special Tools (Cont)
- Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
- Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
- Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

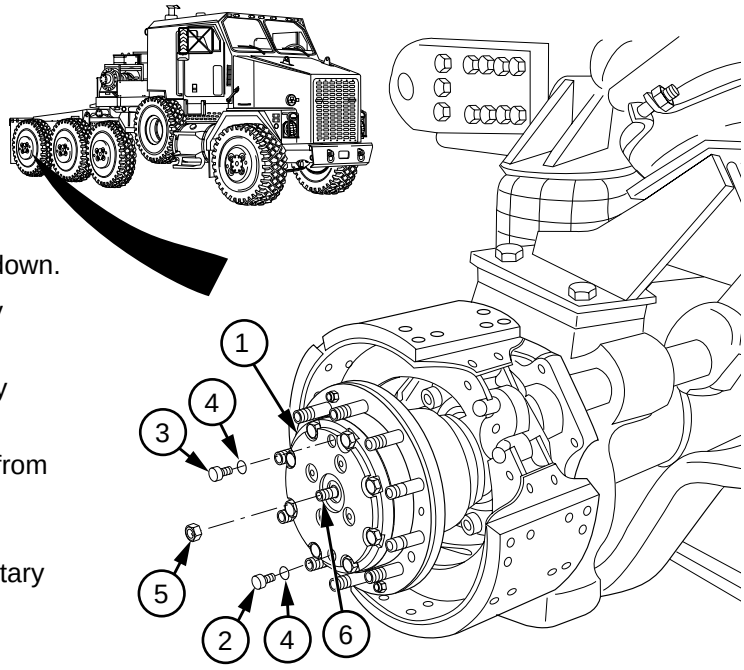
Materials/Parts
- Adhesive-Sealant, Silicone (Item 2, Appendix B)
- Adhesive-Sealant (Item 4, Appendix B)
- Cloth, Crocus (Item 16, Appendix B)
- Oil, Lubricating (Item 44, Appendix B)
- Cleaning Compound, Solvent(Item 54, Appendix B)
- Nuts, Tristop (8) (Item 152, Appendix F)
- Packings, Preformed (2) (Item 166, Appendix F)
- Seal Kit, CTI (Item 293, Appendix F)
- Washer, Locking (Item 336, Appendix F)

Personnel Required
- Two

a. Removal

NOTE

All planetaries and hubs are repaired the same way. No. 4 axle right side is shown.



(1) Place drain pan under planetary assembly (1).

(2) Position hub so that drain plug (2) is down.

(3) Remove lower plug (2) from planetary assembly (1).

(4) Remove upper plug (3) from planetary assembly (1).

(5) Remove two preformed packings (4) from plugs (2 and 3). Discard preformed packings.

(6) Remove nut (5) from plug (6) in planetary assembly (1).

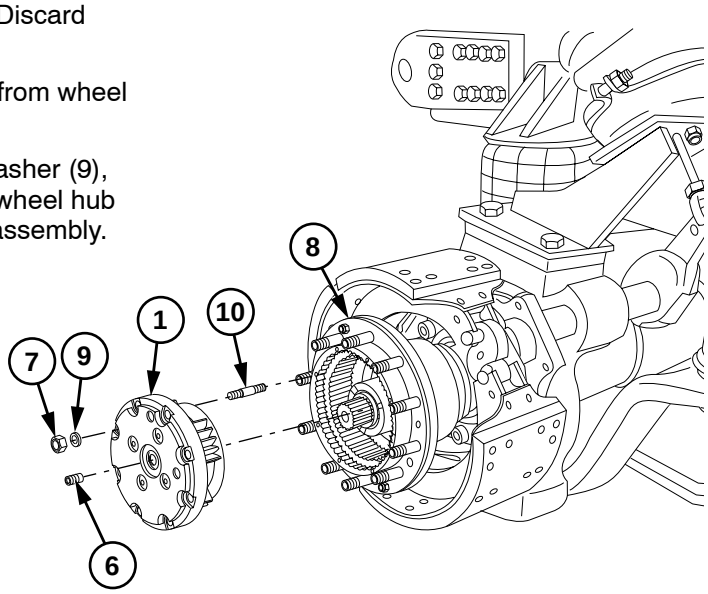
(7) Loosen one of eight locknuts (7) from wheel hub (8).

(8) Remove remaining seven locknuts (7) and washers (9) from wheel hub (8). Discard locknuts.

(9) Separate planetary assembly (1) from wheel hub (8) by tightening plug (6).

(10) Remove remaining locknut (7), washer (9), and planetary assembly (1) from wheel hub (8) while assistant lifts planetary assembly. Discard locknut.

(11) Remove plug (6) from planetary assembly (1).



NOTE

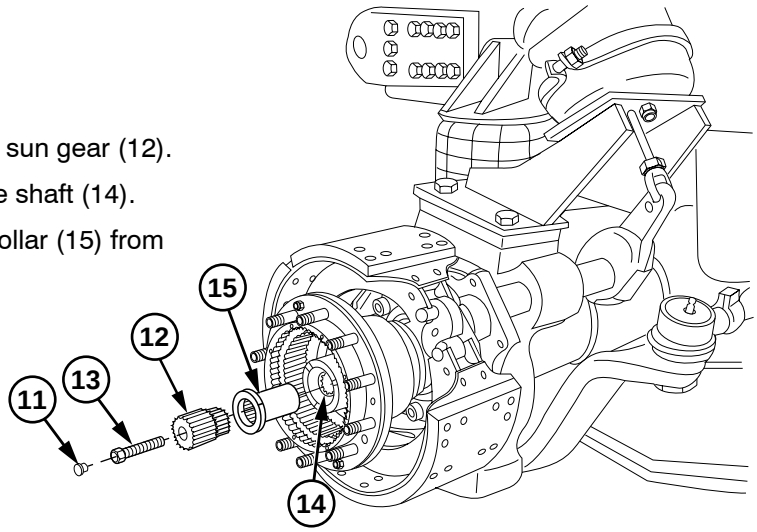
Do step (12) only if studs fail inspection.

(12) Remove eight studs (10) from wheel hub (8).

(13) Remove end thrust (11) from sun gear (12).

(14) Remove screw (13) from axle shaft (14).

(15) Remove sun gear (12) and collar (15) from axle shaft (14).



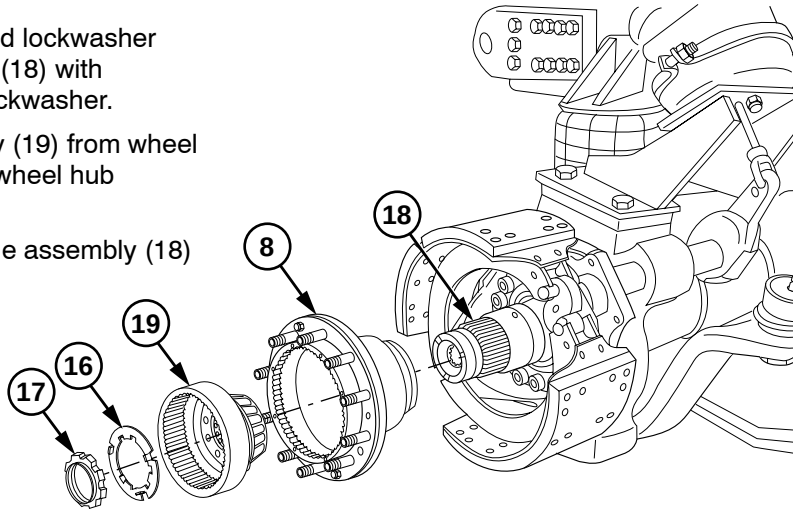
12-3. PLANETARY AND HUB REPAIR (CONT)

(16) Bend tabs on lockwasher (16) up and away from spindle nut (17).

(17) Remove spindle nut (17) and lockwasher (16) from spindle assembly (18) with spanner socket. Discard lockwasher.

(18) Remove ring gear assembly (19) from wheel hub (8) while assistant lifts wheel hub assembly.

(19) Remove hub (8) from spindle assembly (18) with aid of assistant.



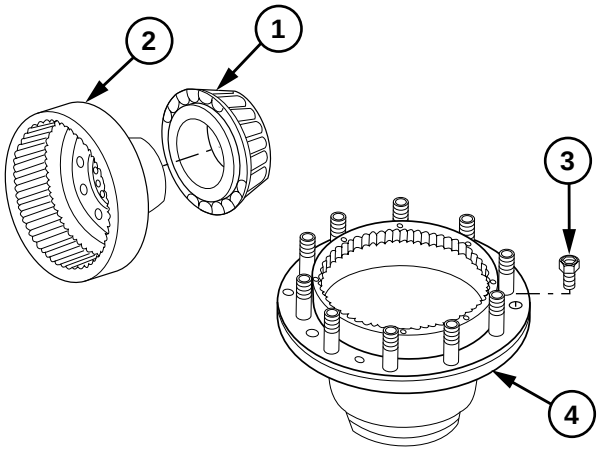
b. Disassembly

NOTE

Do step (1) only if taper bearing fails inspection.

(1) Remove taper bearing (1) from ring gear assembly (2).

(2) Remove two fittings (3) from hub (4).



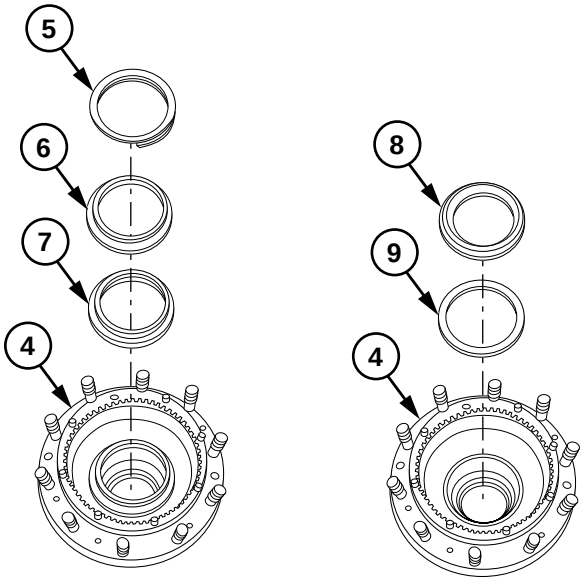
WARNING

Wear eye protection and use care when removing snap rings. Snap rings are under spring tension and can act as projectiles when released causing severe eye injury.

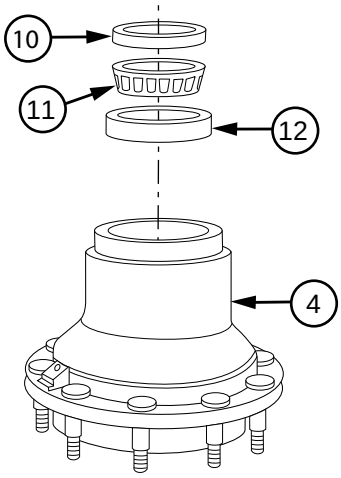
(3) Remove snap ring (5) from hub (4). Discard snap ring.

(4) Remove outside ring (6) and outside seal (7) from hub (4). Discard ring and seal.

(5) Remove inner seal (8) and guide ring (9) from hub (4). Discard seal and ring.



(6) Remove seal (10) and taper bearing (11) from hub (4).

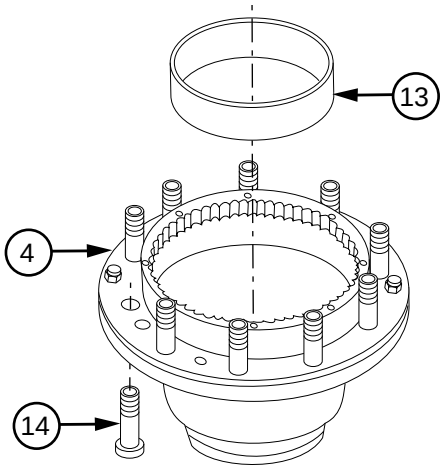


NOTE

Do steps (7) and (8) only if bearing races fail inspection.

(7) Remove bearing race (12) from hub (4).

(8) Remove bearing race (13) from hub (4).



NOTE

- Do step (9) only if studs fail inspection.
- Four studs are longer than the other six to retain wheel cover. Mark locations of these studs for proper assembly.

(9) Remove stud(s) (14) from hub (4).

c. Cleaning/Inspection

(1) Clean old gasket material from housing and/or caps.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(2) Clean sealant residue from threaded holes with solvent cleaning compound.

(3) Wash all metal parts in solvent cleaning compound.

12-3. PLANETARY AND HUB REPAIR (CONT)

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.).

(4) Dry all parts, except bearings, with compressed air. Allow bearings to air dry.

(5) Remove all small nicks or burrs with crocus cloth.

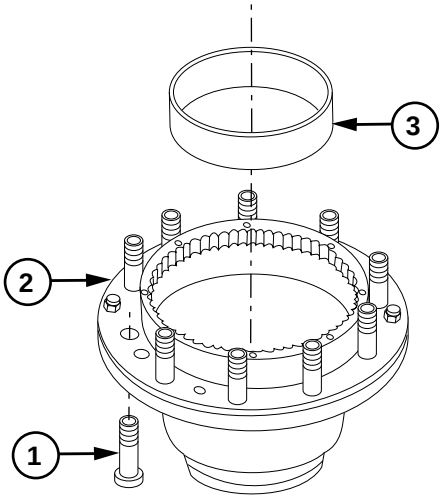
(6) Lightly coat all parts with lubricating oil.

(7) Inspect housing and caps for damage.

(8) Inspect all parts with machined surfaces for deep scratches or wear grooves.

(9) Inspect studs for damaged threads or breakage.

(10) Replace damaged parts.



d. Assembly

NOTE

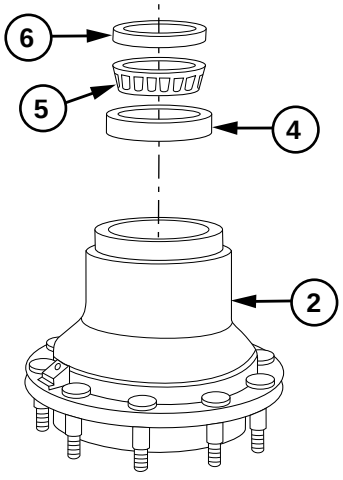
- Do step (1) only if studs were removed.
- Install the four longer studs in locations marked during removal.

(1) Install studs (1) in wheel hub (2).

NOTE

Do steps (2) and (3) only if bearing races were removed.

(2) Install bearing race (3) in hub (2).



(3) Install bearing race (4) in hub (2).

(4) Pack taper bearing (5) with grease and coat bearing race (4) with grease.

NOTE

Oil seal is properly installed when raised inner lip on seal is flush with hub.

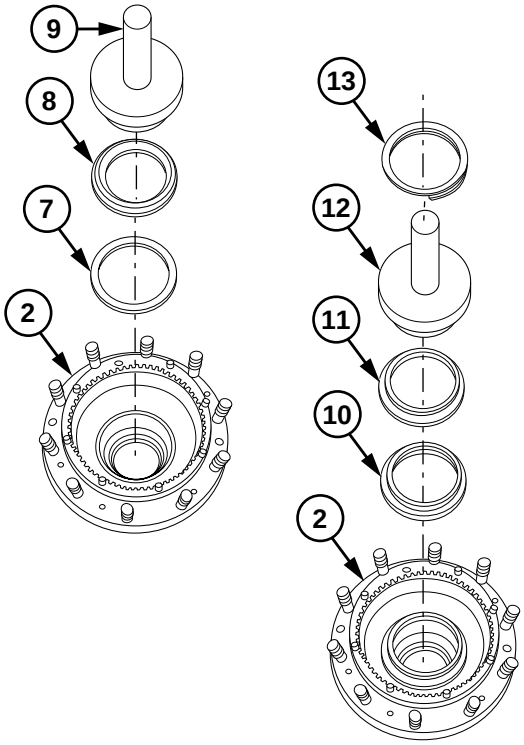
(5) Install taper bearing (5) and new oil seal (6) in hub (2).

NOTE

Spring side of inner seal faces inside of hub.

(6) Install new guide ring (7) and new inner seal (8) in hub (2) using seal driver (9).

(7) Install new outside seal (10) and outside ring (11) in hub (2) using seal driver (12).



WARNING

Wear eye protection and use care when removing snap rings. Snap rings are under spring tension and can act as projectiles when released causing severe eye injury.

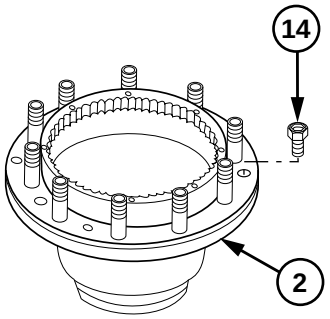
(8) Install new snap ring (13) in hub (2).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep compound away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(9) Coat threads of two fittings (14) with pipe thread sealing compound.

(10) Install two fittings (14) in hub (2).

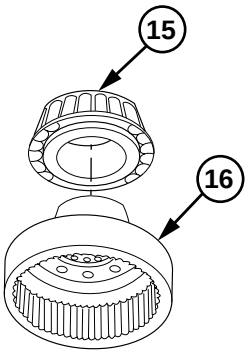


NOTE

Do step (11) only if taper bearing was removed.

(11) Install taper bearing (15) on ring gear assembly (16).

(12) Pack taper bearing (15) with grease.

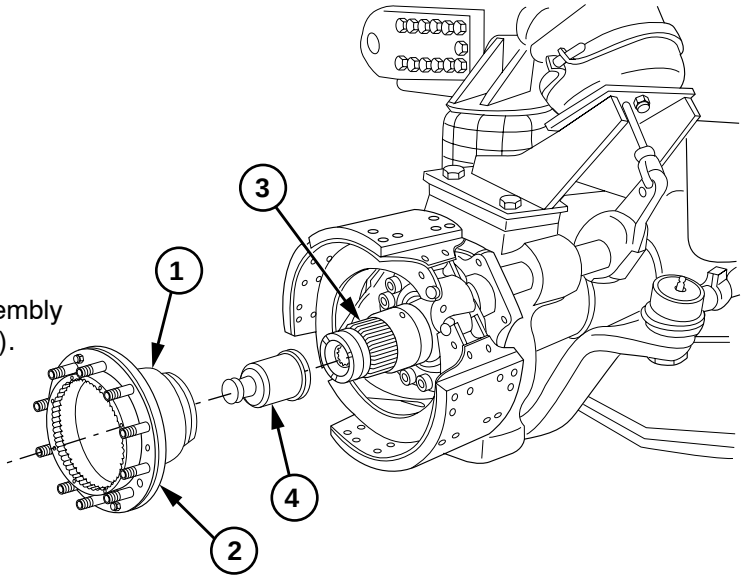


12-3. PLANETARY AND HUB REPAIR (CONT)

e. Installation

CAUTION

- Use guide sleeve to prevent damage to CTI seal cartridge.
- Do not allow grease or oil to remain on spindle or CTI seal cartridge. CTI seal cartridge uses Teflon-coated seals. Failure to comply may result in damage to Teflon coating.



(1) Wipe clean seals (1) in wheel hub assembly (2) and splines on spindle assembly (3).

(2) Install guide sleeve (4) over splines of spindle assembly (3).

(3) Install hub assembly (2) on spindle assembly (3) with aid of assistant.

(4) Remove guide sleeve (4) from spindle assembly (3).

(5) Install ring gear assembly (5) into hub assembly (2) while assistant lifts hub assembly (2).

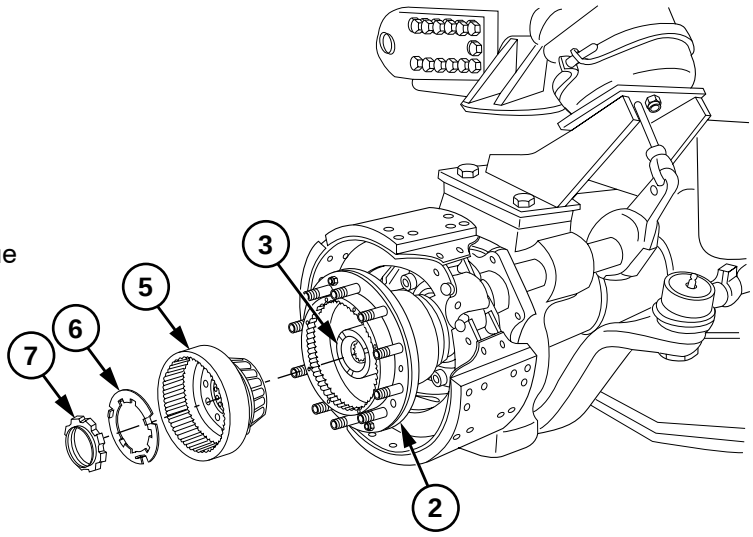
(6) Install new lockwasher (6) and spindle nut (7) on spindle assembly (3) with spanner socket. Tighten nut to 247-290 lb-ft (335-393 N·m).

(7) Rotate hub assembly (2) and torque spindle nut (7) to 247-290 lb-ft (335-393 N·m).

CAUTION

Spindle nut must be loosened 1/16 turn. Failure to comply may result in damage to wheel bearing or spindle.

(8) Loosen spindle nut (7) 1/16 turn, continue turning only until tabs on lockwasher (6) align with slots in spindle nut (7).



CAUTION

- Lockwasher must be properly positioned on spindle nut shoulder. Lockwasher must remain loose on spindle nut when tightening nut. If lockwasher is not free to move, it is trapped under the nut and must be reassembled in the proper position. Failure to comply may result in improper wheel bearing preload.
- Two tabs on lockwasher must be securely bent into notches on spindle nut. Failure to comply may result in loss of bearing preload and cause damage to equipment.

NOTE

- Lockwasher must be loose on spindle nut.
- Ensure lock tabs do not make contact with planetary gears.

(9) Bend two tabs on lockwasher (6) against spindle nut (7).

(9.1) Check that spindle nut (7) is secured by lockwasher (6) and cannot rotate.

WARNING

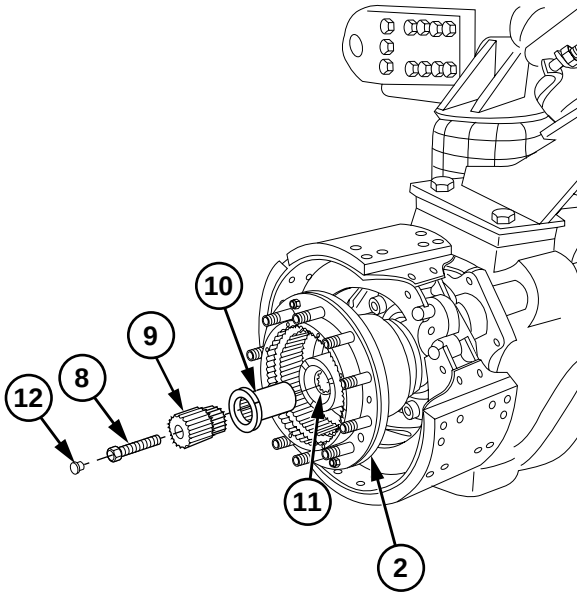
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep compound away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(10) Coat threads of screw (8) with adhesive-sealant.

(11) Install screw (8), sun gear (9) and collar (10), on axle shaft (11). Torque to 135-165 lb-ft (183-224 N·m).

(12) Coat end thrust (12) with grease.

(13) Install end thrust (12) on sun gear (9).



WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

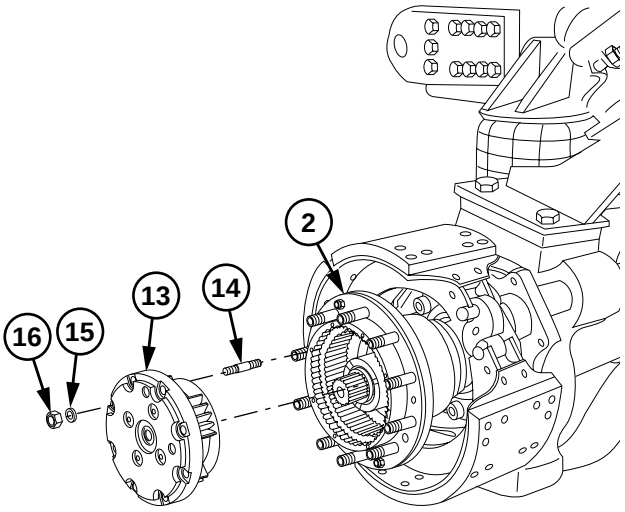
(14) Coat mating surfaces of hub assembly (2) and planetary assembly (13) with silicone adhesive-sealant.

(15) Install studs (14) on hub assembly (2). Torque to 22 lb-ft (30 N·m).

(16) Install planetary assembly (13) on studs (14) and hub assembly (2).

(17) Coat threads of eight studs (14) with adhesive-sealant.

(18) Install eight washers (15) and new locknuts (16) on hub assembly (2). Torque to 38-45 lb-ft (52-61 N·m).



12-3. PLANETARY AND HUB REPAIR (CONT)

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

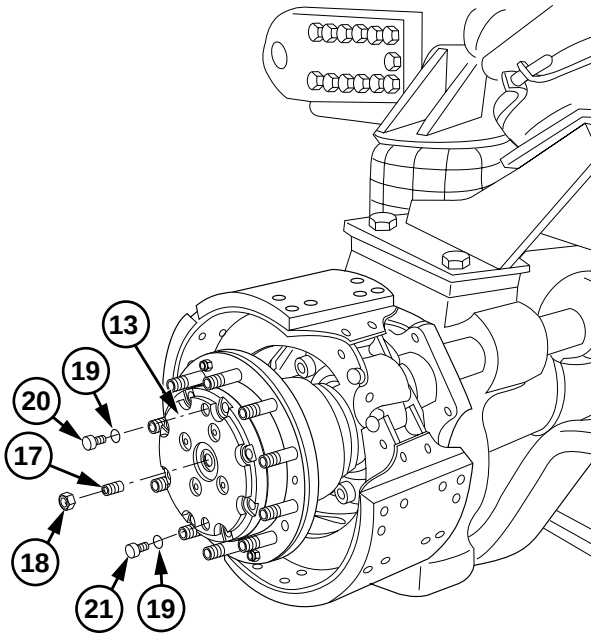
(19) Coat threads of plug (17) with silicone adhesive-sealant.

(20) Install plug (17) until seated on planetary assembly (13), then back out one full turn.

(21) Install nut (18) on plug (17). Tighten to 80 lb-ft (108 N·m).

(22) Install two new preformed packings (19) on plugs (20 and 21).

(23) Install plugs (20 and 21) in planetary assembly (13). Torque plugs to 40 lb-ft (54 N·m).



f. Follow-On Maintenance

(1) Install brake drum (TM 9-2320-360-20).

(2) Fill wheel end (LO 9-2320-360-12).

CHAPTER 13
STEERING SYSTEM MAINTENANCE

Contents

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Front Steering Gear Replacement	13-5	13-10
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Section I. INTRODUCTION

13-1. INTRODUCTION

This chapter contains instructions for replacement and repair of steering system components at the Direct Support maintenance level. Some parts must be removed before the steering system components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

13-2. FRONT DRAG LINK REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front pitman arm removed (para 13-4).

Materials/Parts
Pin, Cotter (Item 219, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack Kit, Hydraulic Hand (Item 92, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

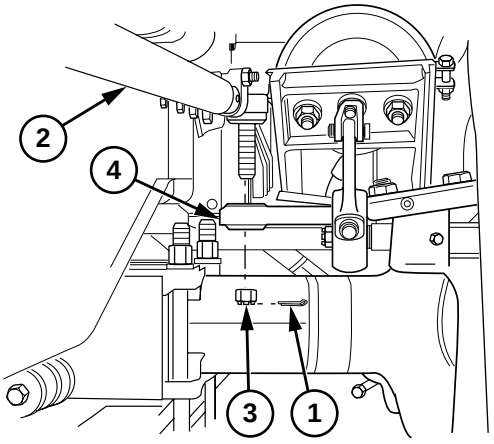
a. Removal

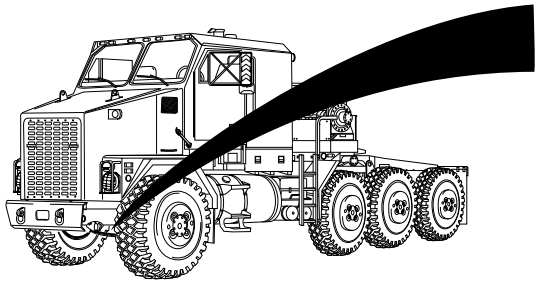
WARNING

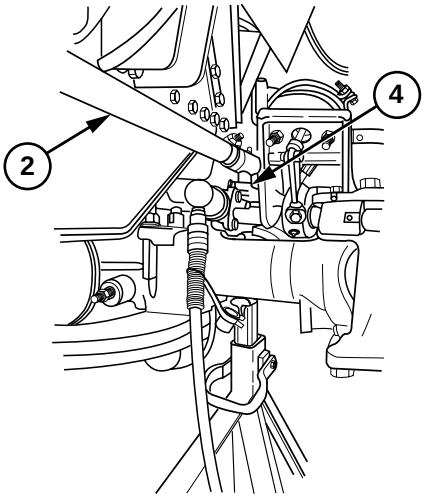
Drag link must be supported after hardware to prevent it from falling. Failure to comply may result in injury.

(1) Remove cotter pin (1) from rear of drag link (2). Discard cotter pin.

(2) Remove nut (3) from drag link (2).





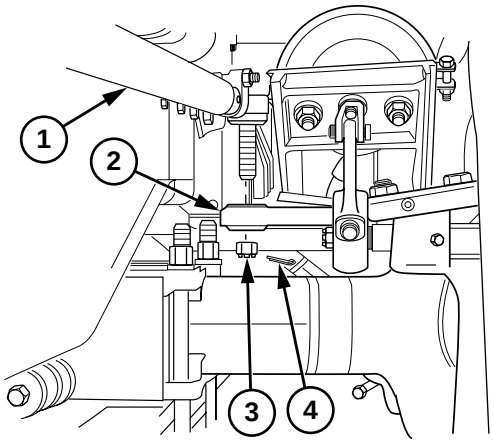


(3) Remove drag link (2) from axle steering arm (4) using hydraulic hand jack.

b. Installation

WARNING

Support drag link during installation to prevent it from falling. Failure to comply may result in injury.



(1) Install rear of drag link (1) in axle steering arm (2).

(2) Install nut (3) on drag link (1). Torque nut (3) to 165 lb-ft (224 N·m). Continue to tighten until slot in nut (3) is aligned with hole in drag link.

(3) Install new cotter pin (4) through nut (3) and drag link (1).

c. Follow-On Maintenance

(1) Install front pitman arm (para 13-4).

(2) Lubricate drag link (LO 9-2320-360-12).

(3) Adjust steering system (para 13-8).

(4) Start engine (TM 9-2320-360-10).

(5) Road test vehicle to check for proper operation of steering.

(6) Shut off engine (TM 9-2320-360-10).

13-3. REAR DRAG LINK REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack Kit, Hydraulic Hand (Item 92, Appendix E)

Tools and Special Tools (Cont)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

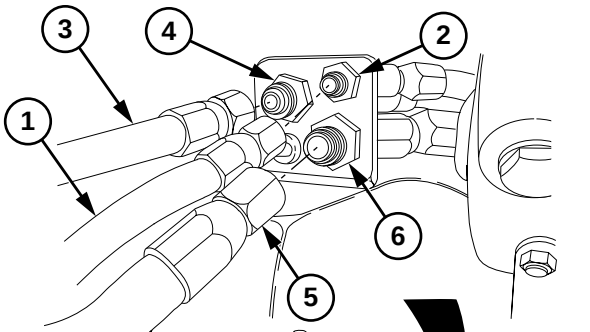
Materials/Parts
Lockwasher (Item 106, Appendix F)
Pin, Cotter (Item 219, Appendix F)

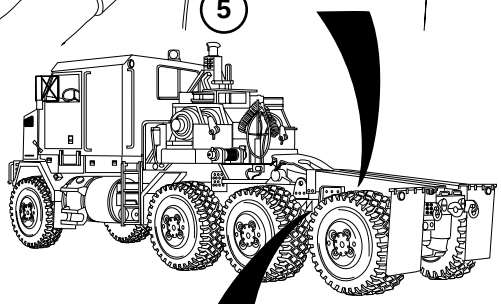
a. Removal

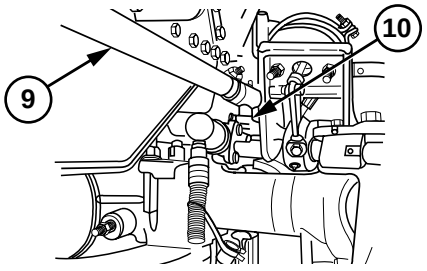
WARNING

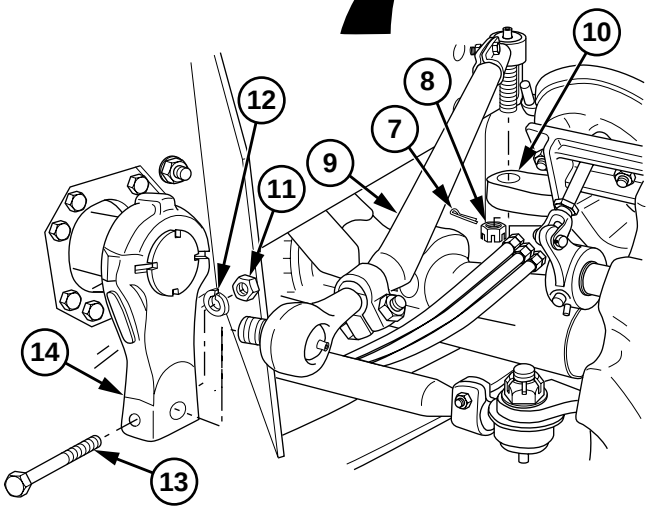
Drag link must be supported after hardware to prevent it from falling. Failure to comply may result in injury.

(1) Remove hose no. 2141 (1) from fitting (2).
(2) Remove hose no. 2016 (3) from fitting (4).
(3) Remove hose no. 2873 (5) from fitting (6).
(4) Remove cotter pin (7) from nut (8). Discard cotter pin.
(5) Remove nut (8) from drag link (9).
(6) Remove rear end of drag link (9) from axle steering arm (10) using hydraulic hand jack.









(7) Remove nut (11), lockwasher (12), and screw (13) from pitman arm (14). Discard lockwasher.
(8) Remove drag link (9) from pitman arm (14).

b. Installation

WARNING

Support drag link during installation to prevent it from falling. Failure to comply may result in injury.

NOTE

Slot in drag link must align with slot in pitman arm.

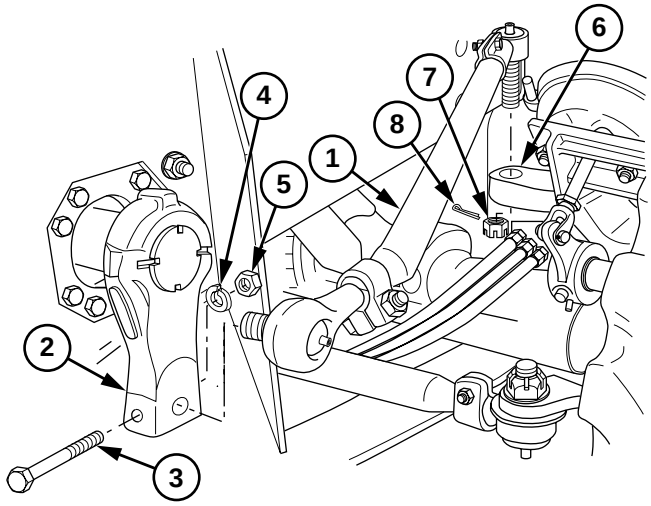
(1) Position front of drag link (1) in pitman arm (2).

(2) Secure pitman arm (2) to drag link (1) with screw (3), new lockwasher (4), and nut (5). Torque to 90 lb-ft (122 N·m).

(3) Insert rear of drag link (1) in steering arm (6).

(4) Install nut (7) on drag link (1). Torque to 165 lb-ft (224 N·m). Continue to tighten until slot in nut (7) is aligned with hole in drag link.

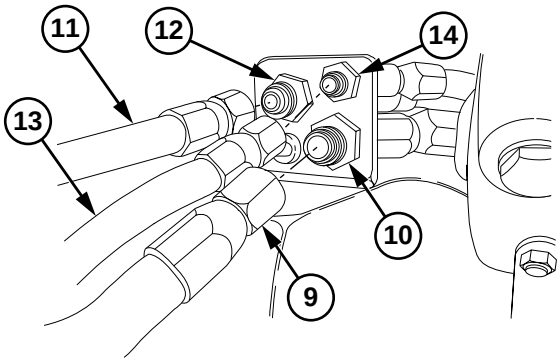
(5) Install new cotter pin (8) through nut (7) and drag link (1).



(6) Install hose no. 2873 (9) on fitting (10).

(7) Install hose no. 2016 (11) on fitting (12).

(8) Install hose no. 2141 (13) on fitting (14).



c. Follow-On Maintenance

(1) Lubricate drag link (LO 9-2320-360-12).

(2) Adjust steering system (para 13-8).

(3) Start engine (TM 9-2320-360-10).

(4) Road test vehicle to check for proper operation of steering.

(5) Shut off engine (TM 9-2320-360-10).

13-4. PITMAN ARMS REPLACEMENT

This task covers:
- Removal
- Cleaning/Inspection
- Installation
- Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
- Engine shut off (TM 9-2320-360-10).
- Parking brake on (TM 9-2320-360-10).
- Wheels chocked.

Tools and Special Tools
- Tool Kit, Genl Mech (Item 202, Appendix E)
- Compressor Unit, Air (Item 24, Appendix E)
- Goggles, Industrial (Item 57, Appendix E)
- Puller Kit, Mechanical (Item 124, Appendix E)
- Socket, Sockethead Screw, 3/4 In. Drive (Item 168, Appendix E)
- Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)

Tools and Special Tools (Cont)
- Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
- Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
- Compound, Antiseize (Item 18, Appendix B)
- Lockwashers (2) (Item 106, Appendix F)
- Retainer Kit, Pitman Arm (2) (Item 233, Appendix F)

a. Rear Pitman Arm Removal

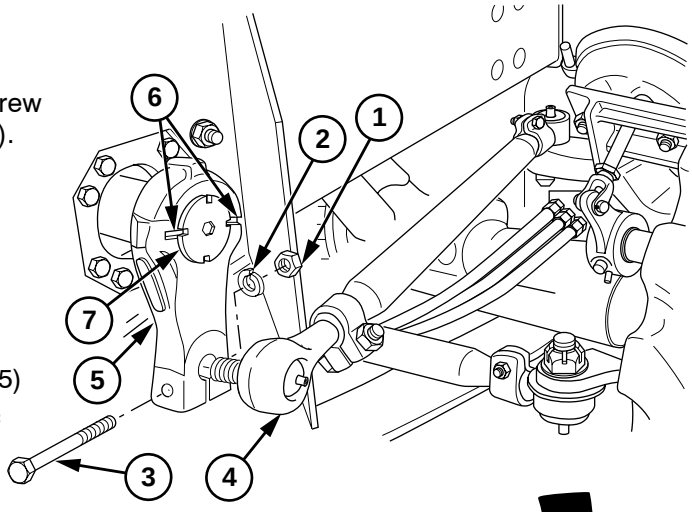
(1) Remove nut (1), lockwasher (2), and screw (3) from drag link (4) and pitman arm (5). Discard lockwasher.

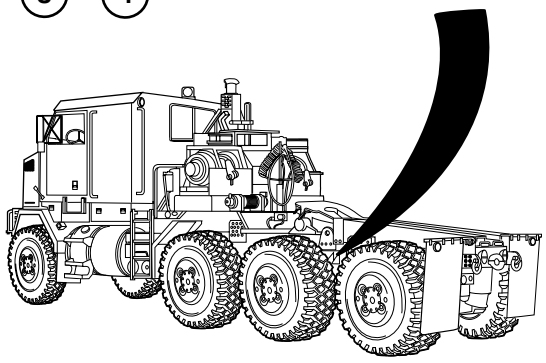
NOTE

It may be necessary to raise rear axle to release pressure on drag link.

(2) Remove drag link (4) from pitman arm (5)

(3) Bend two locktabs (6) toward outside of retainer (7) on pitman arm (5)



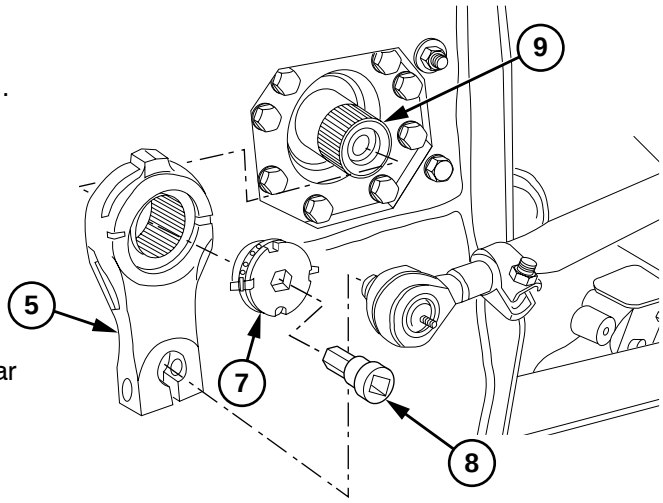


(4) Remove retainer (7) from pitman arm (5) using 3/4 in. sockethead screw socket (8). Discard retainer.

WARNING

Pitman arm may fall during removal in step (5). To prevent injury, keep out from under pitman arm.

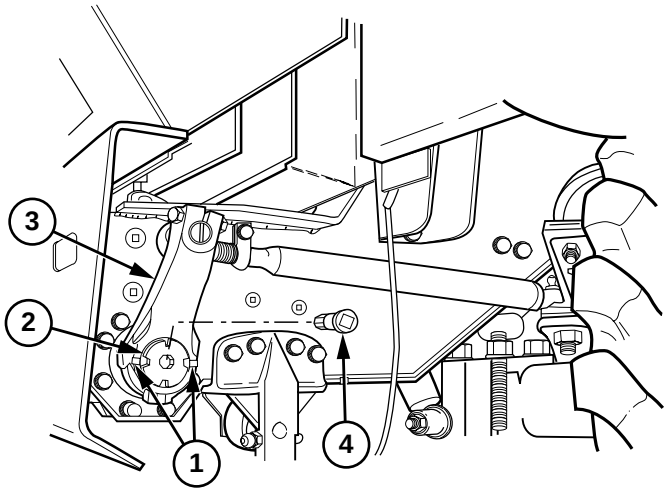
(5) Remove pitman arm (5) from steering gear (9) using puller.



b. Front Pitman Arm Removal

(1) Bend two locktabs (1) toward outside of retainer (2) on pitman arm (3).

(2) Remove retainer (2) from pitman arm (3) using 3/4 in. sockethead screw socket (4). Discard retainer.



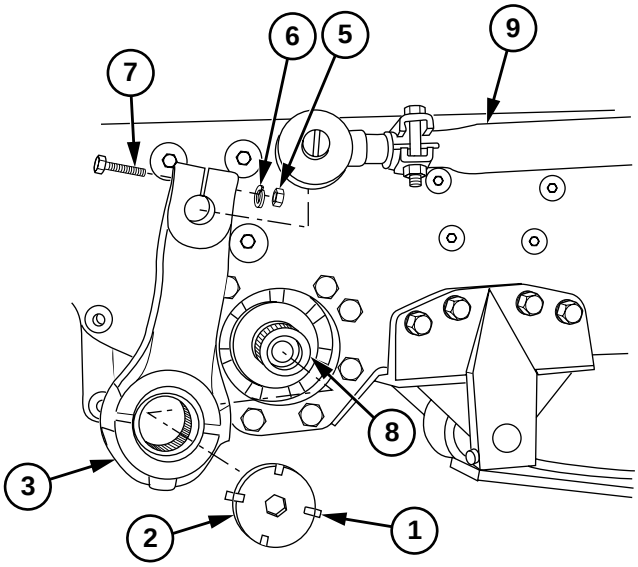
(3) Remove nut (5), lockwasher (6), and screw (7) from pitman arm (3). Discard lockwasher.

WARNING

Pitman arm and drag link may fall during removal in step (4). To prevent injury, keep out from under pitman arm and drag link.

(4) Remove pitman arm (3) from steering gear (8) using puller.

(5) Remove pitman arm (3) from drag link (9).



13-4. PITMAN ARMS REPLACEMENT (CONT)

c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean splines of steering gear and grooves of pitman arm with solvent cleaning compound.

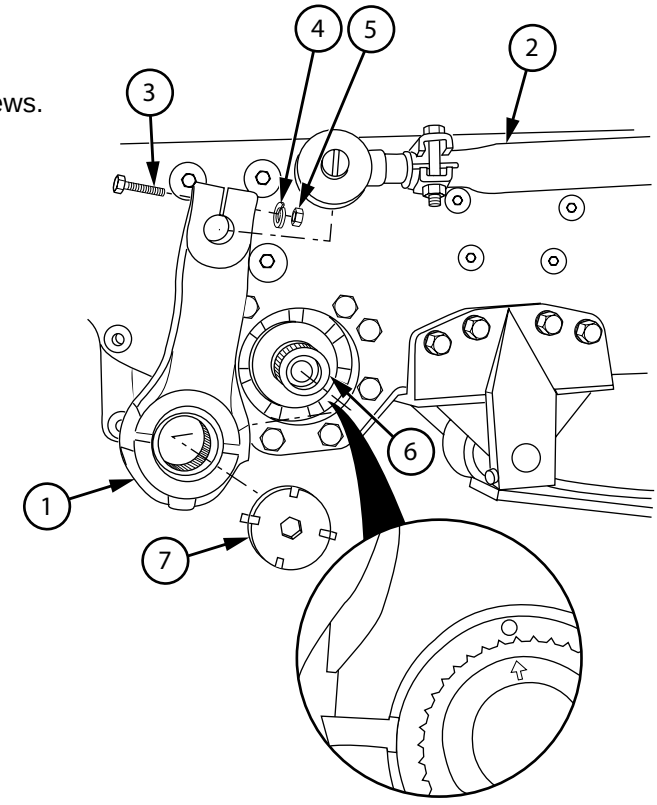
(2) Inspect splines of steering gear and grooves of pitman arm for damage.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.).

(3) Dry all parts with compressed air.

(4) Check for loose steering gear mounting screws.



d. Front Pitman Arm Installation

(1) Coat inside surfaces of pitman arm (1) with antiseize compound.

NOTE

Slot in drag link must align with slot in pitman arm.

(2) Install pitman arm (1) on drag link (2) with screw (3), new lockwasher (4), and nut (5).

NOTE

It may be necessary to raise front axle to permit installation of drag link.

(3) Align timing marks on steering gear (6) and pitman arm (1).

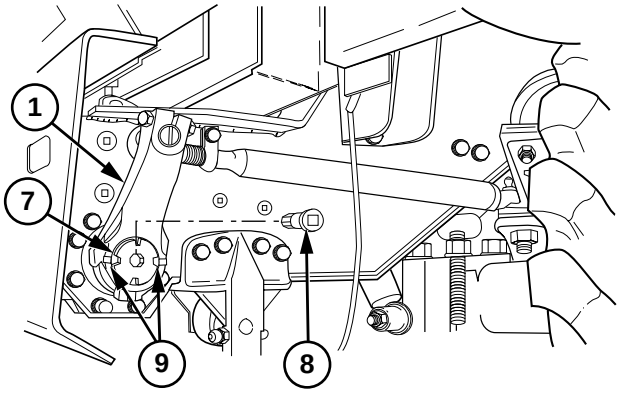
(4) Position pitman arm (1) on steering gear (6).

(5) Coat new retainer (7) with antiseize compound.

(6) Install retainer (7) on pitman arm (1) using 3/4 in. sockethead screw socket (8).

(7) Tighten retainer (7) to 450 lb-ft (610 N·m).

(8) Engage locktabs (9) with slots on pitman arm (1).



e. Rear Pitman Arm Installation

(1) Coat inside surfaces of pitman arm (1) with antiseize compound.

(2) Align timing marks on steering gear (2) and pitman arm (1).

(3) Position pitman arm (1) on steering gear (2).

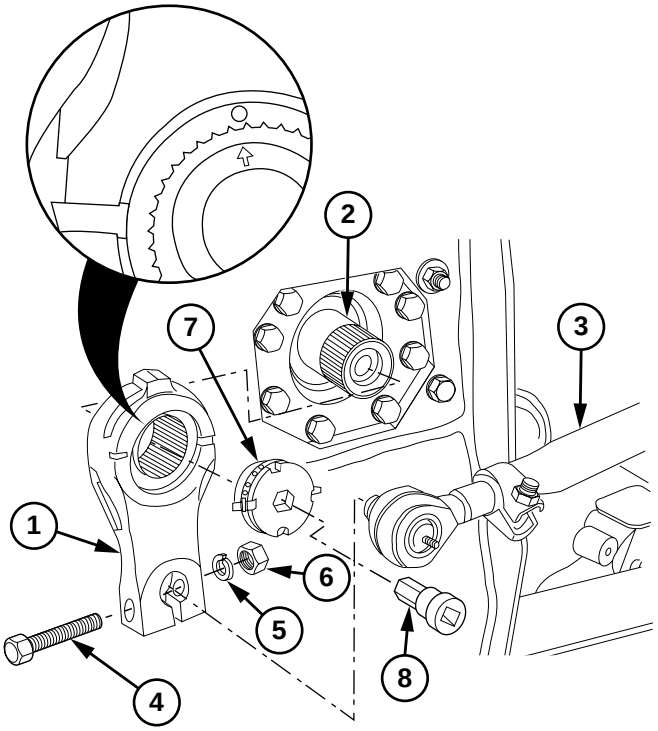
NOTE

It may be necessary to raise rear axle to permit installation of drag link.

(4) Install drag link (3) on pitman arm (1) with screw (4), new lockwasher (5), and nut (6). Torque to 90 lb-ft (122 N·m).

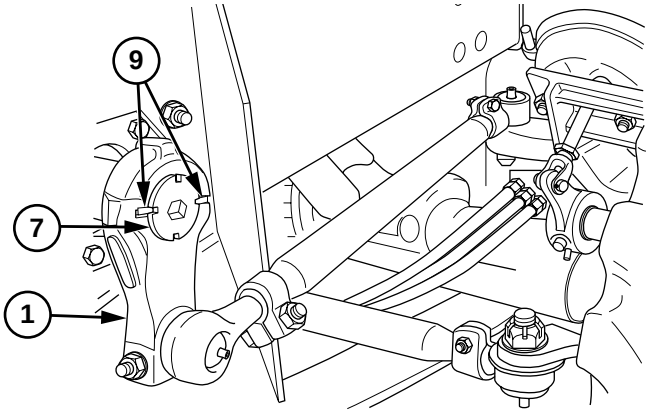
(5) Coat new retainer (7) with antiseize compound.

(6) Install retainer (7) on pitman arm (1) using 3/4 in. sockethead screw socket (8).



(7) Tighten retainer (7) to 450 lb-ft (610 N·m).

(8) Engage locktabs (9) with slots on pitman arm (1).



f. Follow-On Maintenance

(1) Start engine (TM 9-2320-360-10).

(2) Road test vehicle to check for proper operation of steering.

(3) Shut off engine (TM 9-2320-360-10).

13-5. FRONT STEERING GEAR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Steering reservoir drained (LO 9-2320-360-12).
Front crosstube removed (para 14-2).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Lift, Transmission and Differential (Item 95, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Puller Kit, Mechanical (Item 124, Appendix E)
Socket, Sockethead Screw, 3/4 In. (Item 168, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Compound, Antiseize (Item 18, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Locknut (Item 80, Appendix F)
Lockwashers (8) (Item 106, Appendix F)
Packing, Preformed (Item 158, Appendix F)
Packing, Preformed (Item 160, Appendix F)
Packing, Preformed (Item 183, Appendix F)
Retainer Kit, Pitman Arm (Item 233, Appendix F)

Personnel Required
Two

a. Removal

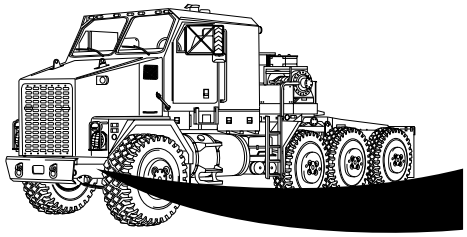
(1) Bend two locktabs (1) toward outside of retainer (2) on pitman arm (3).

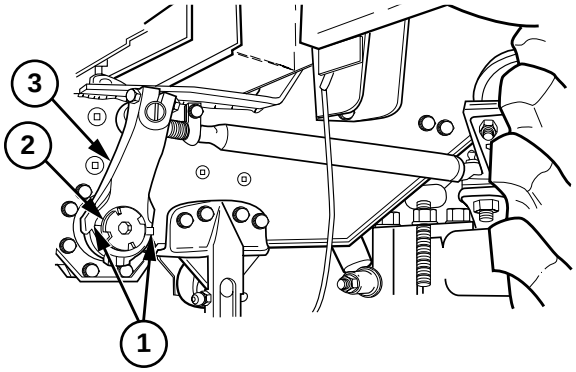
(2) Remove retainer (2) from pitman arm (3) using 3/4 in. sockethead screw socket (4). Discard retainer.

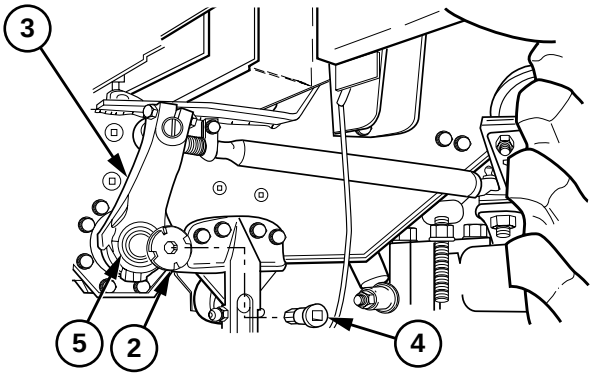
WARNING

Pitman arm and drag link may fall during removal. Keep out from under pitman arm and drag link. Failure to comply may result in injury to personnel.

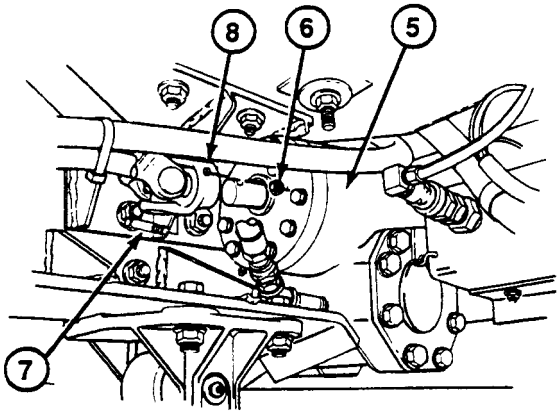
(3) Remove pitman arm (3) from steering gear (5) using puller.







(4) Remove locknut (6), screw (7) and yoke (8) from steering gear (5). Discard locknut.



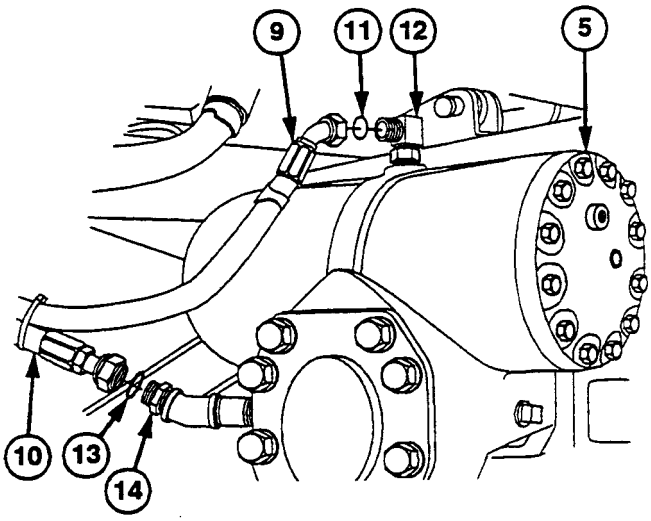
(5) Place drain pan under hose no. 2301 (9) and hose no. 2726 (10) to catch draining fluid.

CAUTION

Steering hoses and elbows should be covered immediately after removal. Failure to comply will result in system contamination

(6) Remove hose no. 2301 (9) and preformed packing (11) from elbow (12). Discard preformed packing.

(7) Remove hose no. 2726 (10) and preformed packing (13) from adapter (14). Discard preformed packing.

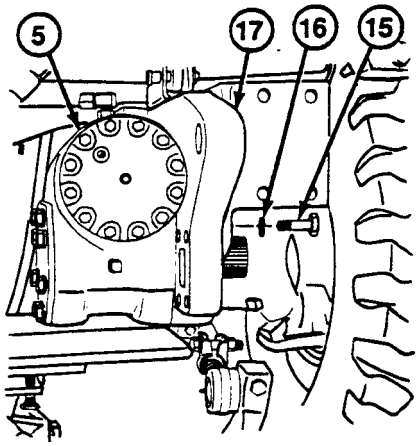


WARNING

Steering gear weighs 175 lb (79 kg). Support steering gear when removing hardware to prevent it from falling. Failure to comply may result in injury.

(8) Position transmission lift under steering gear (5).

(9) Remove eight screws (15), lockwashers (16), and steering gear (5) from left front tow eye (17). Discard lockwashers.



13-5. FRONT STEERING GEAR REPLACEMENT (CONT)

NOTE

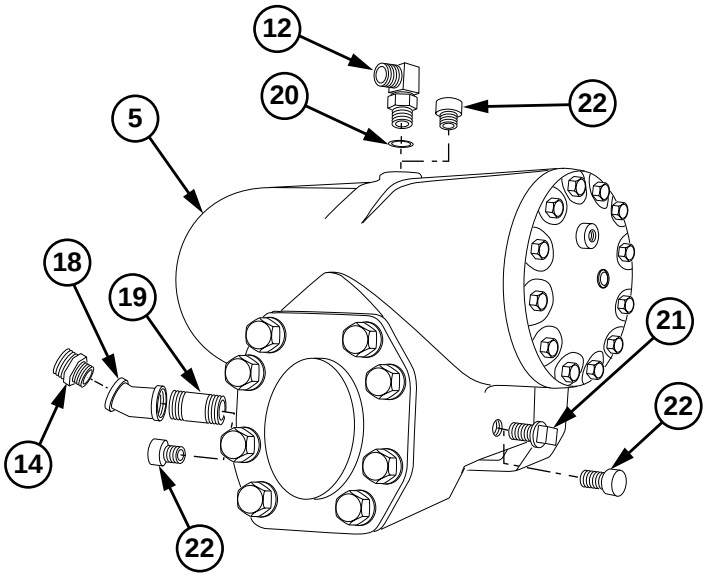
For proper assembly, adapter and elbow positions should be marked before removal.

(10) Remove adapter (14), elbow (18), and pipe (19) from steering gear (5).

(11) Remove elbow (12) and preformed packing (20) from steering gear (5). Discard preformed packing.

(12) Remove plug (21) from steering gear (5).

(13) Install shipping plugs (22) in steering gear (5).



b. Installation

(1) Remove shipping plugs (1) from steering gear (2).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

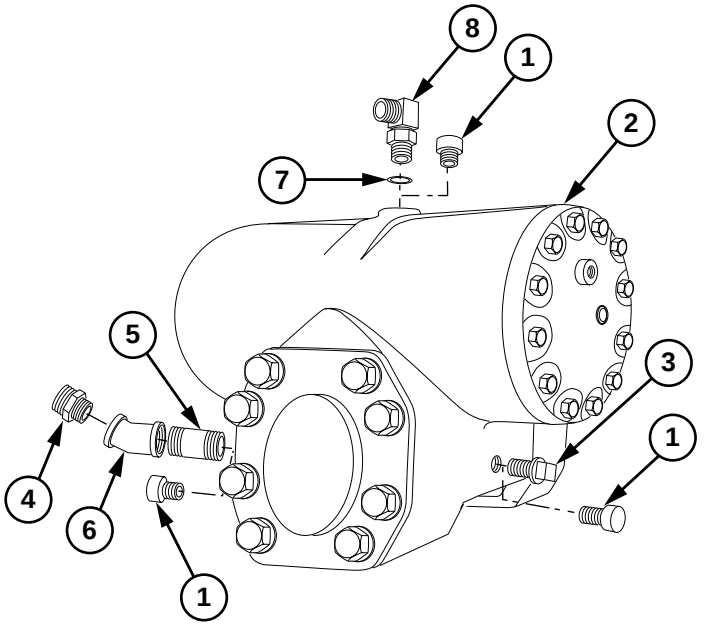
Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.

(2) Coat threads of plug (3), adapter (4), and pipe (5) with pipe thread sealing compound.

(3) Install plug (3) on steering gear (2).

(4) Install pipe (5), elbow (6), and adapter (4) on steering gear (2).

(5) Install new preformed packing (7) and elbow (8) on steering gear (2).



WARNING

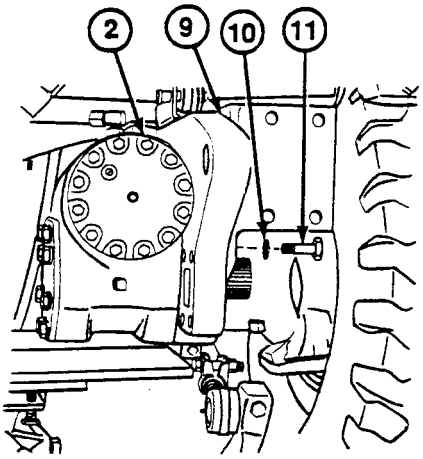
Steering gear weighs 175 lb (79 kg). Support steering gear when installing hardware to prevent it from falling. Failure to comply may result in injury.

(6) Position steering gear (2) on transmission lift.

NOTE

Steering gear mounting surface should be clean of paint and all other foreign material.

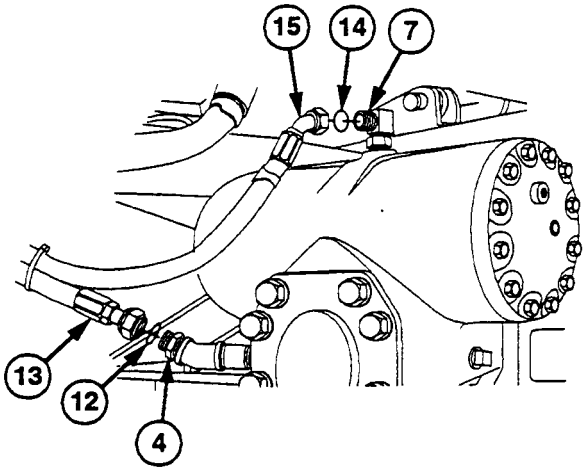
(7) Install steering gear (2) on left front tow eye (9) with eight new lockwashers (10) and screws (11). Torque to 180 lb-ft (244 N·m) torque.



(8) Remove transmission lift from under steering gear (2).

(9) Install new preformed packing (12) and hose no. 2726 (13) on adapter (4).

(10) Install new preformed packing (14) and hose no. 2301 (15) on elbow (7).

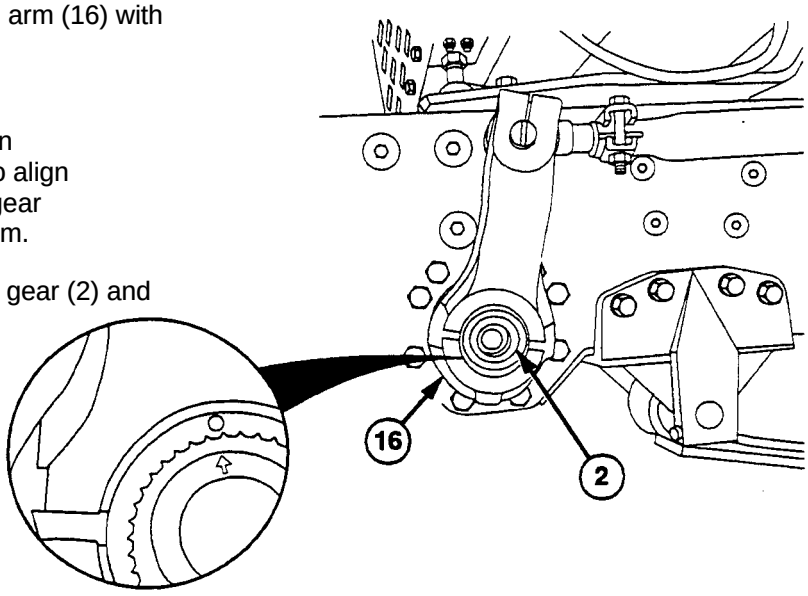


(11) Coat inside surfaces of pitman arm (16) with antiseize compound.

NOTE

It may be necessary to turn steering gear input shaft to align timing marks on steering gear output shaft and pitman arm.

(12) Align timing marks on steering gear (2) and pitman arm (16).



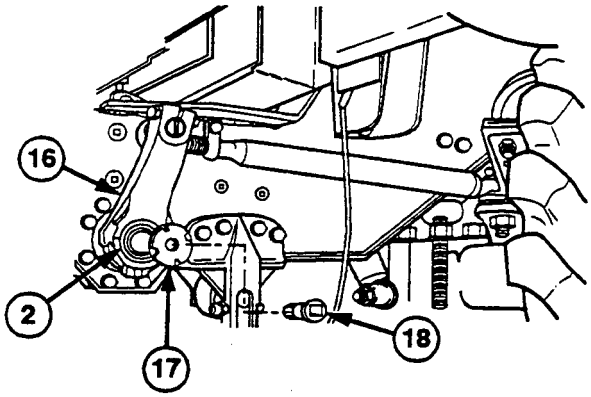
13-5. FRONT STEERING GEAR REPLACEMENT (CONT)

(13) Position pitman arm (16) on steering gear (2).

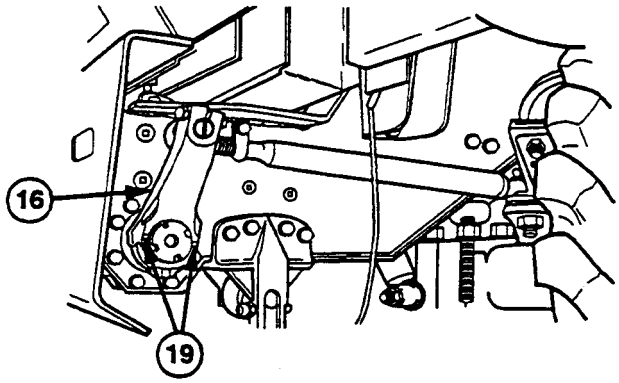
(14) Coat new retainer (17) with antiseize compound.

(15) Install retainer (17) on pitman arm (16) using 3/4 in. sockethead screw socket (18).

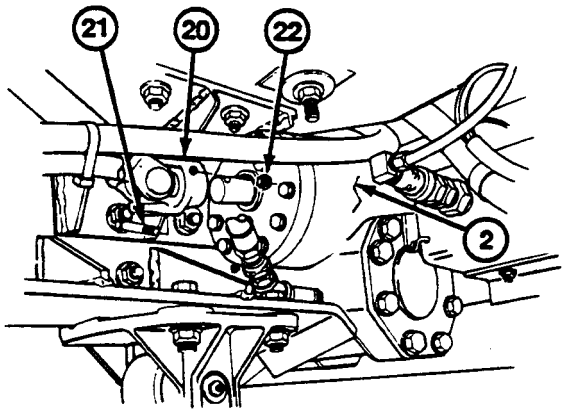
(16) Tighten retainer (17) to 450 lb-ft (610 N·m).



(17) Engage locktabs (19) with slots on pitman arm (16).



(18) Install yoke (20) on steering gear (2) with screw (21) and new locknut (22). Torque to 35-40 lb-ft (47-54 N·m).



c. Follow-On Maintenance

(1) Fill steering reservoir (LO 9-2320-360-12).

(2) Start engine (TM 9-2320-360-10).

(3) Check steering hose connections for leaks.

(4) Shut off engine (TM 9-2320-360-10).

(5) Install front crosstube (para 14-2).

(6) Adjust steering stops (para 13-9) (if original gear was not reinstalled).

13-6. REAR STEERING GEAR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Steering reservoir drained (LO 9-2320-360-12).
Air system drained (TM 9-2320-360-10).
Left fifth wheel ramp removed (TM 9-2320-360-20).
Longitudinal torque rod removed (axle no. 4) (para 15-4).

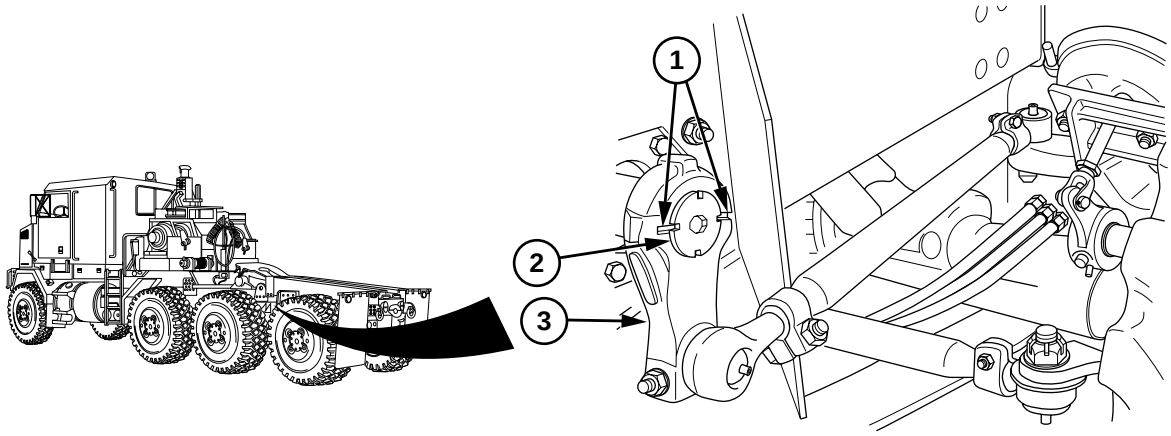
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Puller Kit, Mechanical (Item 124, Appendix E)
Sling, Endless Strap (Item 161, Appendix E) (Item 168, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Compound, Antiseize (Item 18, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Rags (Item 51, Appendix B)
Locknuts (2) (Item 87, Appendix F)
Locknuts (18) (Item 88, Appendix F)
Locknuts (2) (Item 92, Appendix F)
Locknut (Item 80, Appendix F)
Lockwashers (8) (Item 106, Appendix F)
Preformed Packing (Item 158, Appendix F)
Preformed Packing (Item 160, Appendix F)
Preformed Packing (Item 183, Appendix F)
Retainer Kit, Pitman Arm (Item 233, Appendix F)

Personnel Required
Two

a. Removal

(1) Bend two locktabs (1) toward outside of retainer (2) on pitman arm (3).



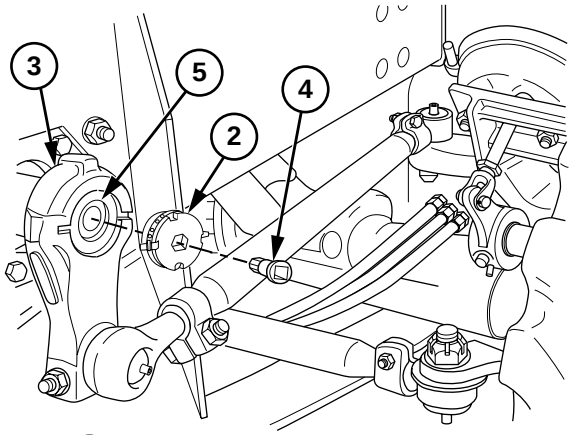
13-6. REAR STEERING GEAR REPLACEMENT (CONT)

(2) Remove retainer (2) from pitman arm (3) using 3/4 in. sockethead screw socket (4). Discard retainer.

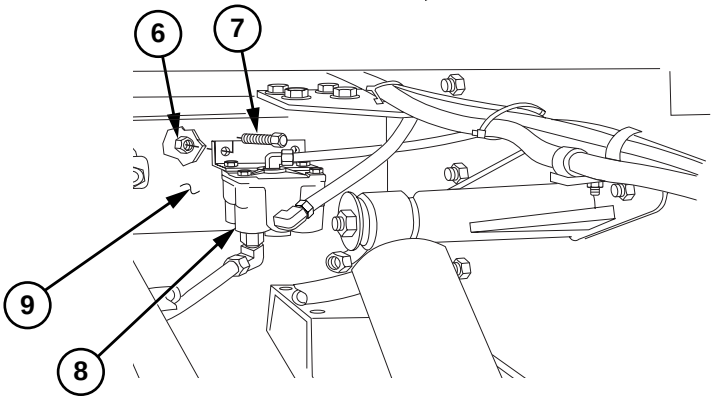
WARNING

Pitman arm and drag link may fall during removal. Keep out from under pitman arm and drag link. Failure to comply may result in injury to personnel.

(3) Remove pitman arm (3) from steering gear (5) using puller.



(4) Remove two locknuts (6), screws (7), and rear service brake relay valve (8) from crossmember no. 4 (9). Discard locknuts.



(5) Remove locknut (10), screw (11), and yoke (12) from steering gear (5). Discard locknut.

(6) Place container under hose no. 2276 (13) and hose no. 2275 (14) to catch draining fluid.

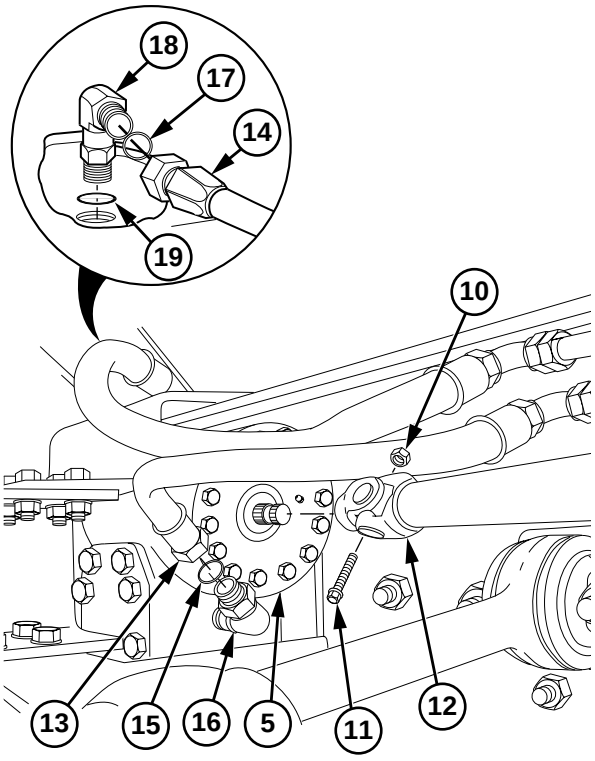
CAUTION

Steering hoses and elbows should be covered immediately after removal. Failure to comply may result in system contamination

(7) Remove hose no. 2276 (13) and preformed packing (15) from adapter (16). Discard preformed packing.

(8) Remove hose no. 2275 (14) and preformed packing (17) from elbow (18). Discard preformed packing.

(9) Remove elbow (18) and preformed packing (19) from steering gear (5). Discard preformed packing.



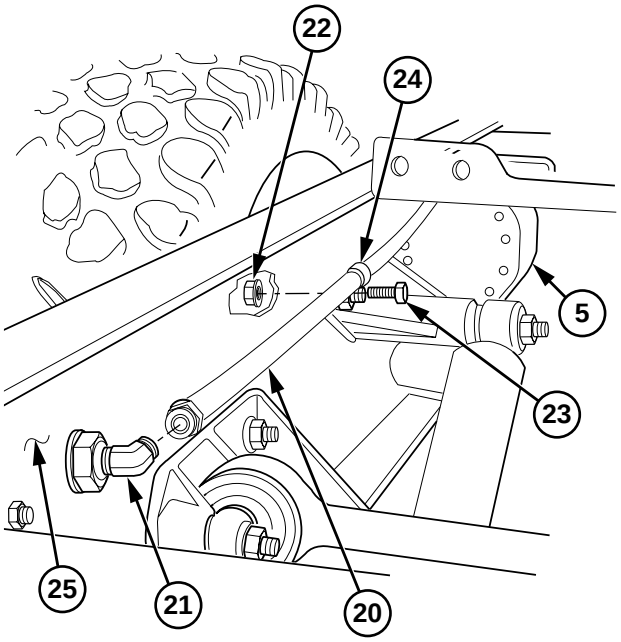
WARNING

- **Air suspension system may still be pressurized even though air pressure gage reads 0 psi. Remove air line slowly to allow air to escape. Failure to comply may result in air line blowing off causing serious injury to personnel.**
- **Air suspension will drop when air line is removed. Stay clear of suspension. Failure to comply may result in serious injury to personnel.**

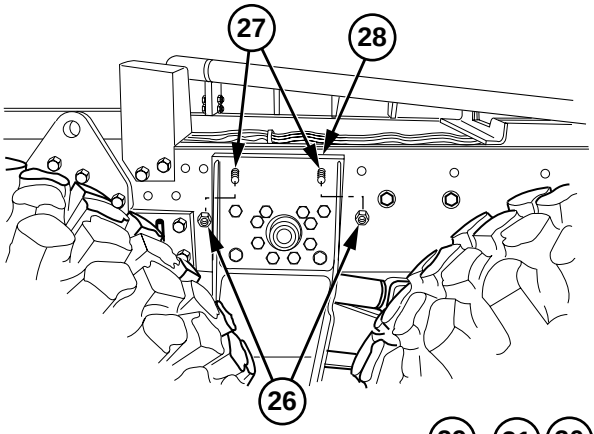
(10) Remove hose no. 2047 (20) from elbow (21).

(11) Remove locknut (22), screw (23), clip (24), and hose no. 2047 (20) from frame (25). Discard locknut.

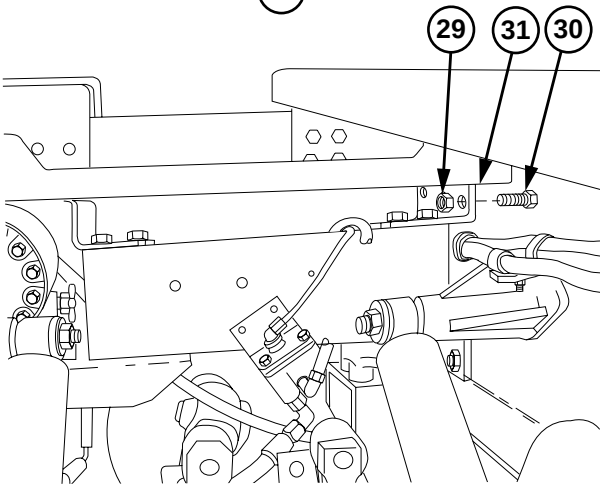
(12) Pull hose no. 2047 (20) forward past steering gear (5).



(13) Remove two locknuts (26) from screws (27) on frame hanger (28). Discard locknuts.



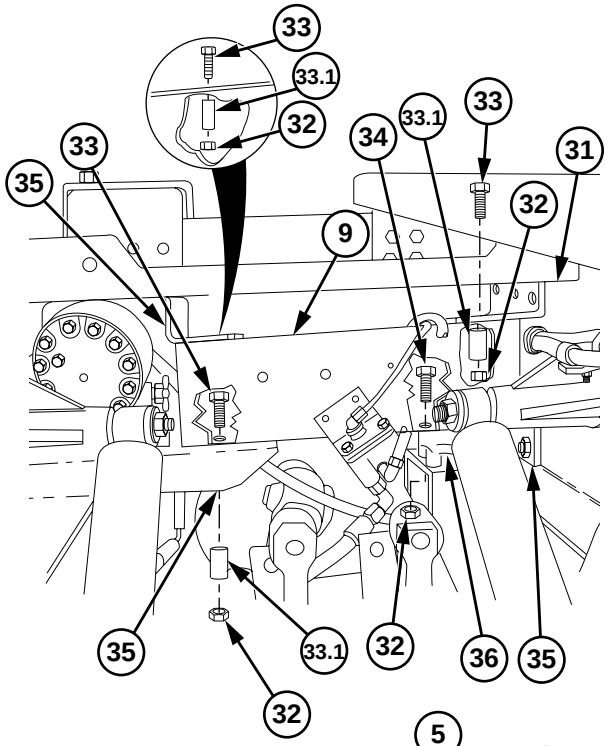
(14) Remove two locknuts (29) and screws (30) from upper right angle bracket (31). Discard locknuts.



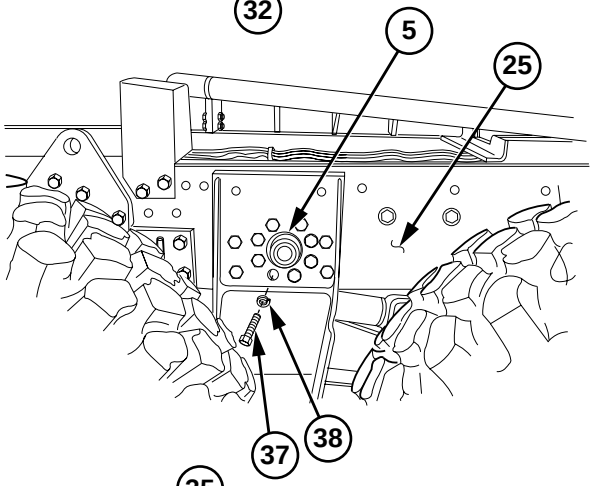
13-6. REAR STEERING GEAR REPLACEMENT (CONT)

(15) Remove 16 locknuts (32), 12 screws (33), sleeves (33.1), and 4 screws (34) from upper right angle bracket (31), three angle brackets (35), and no. 4 crossmember (9) with aid of assistant. Discard locknuts.

(16) Remove no. 4 crossmember (9), upper right angle bracket (31) and spacer (36) from three angle brackets (35) with aid of assistant.



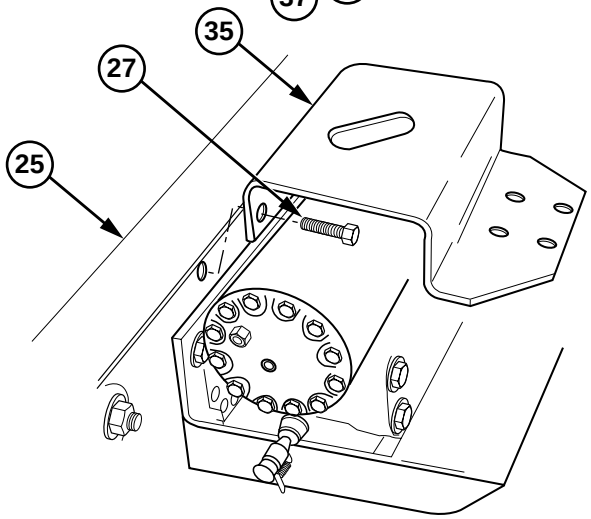
(17) Remove eight screws (37) and lockwashers (38) from frame (25) and steering gear (5). Discard lockwashers.



WARNING

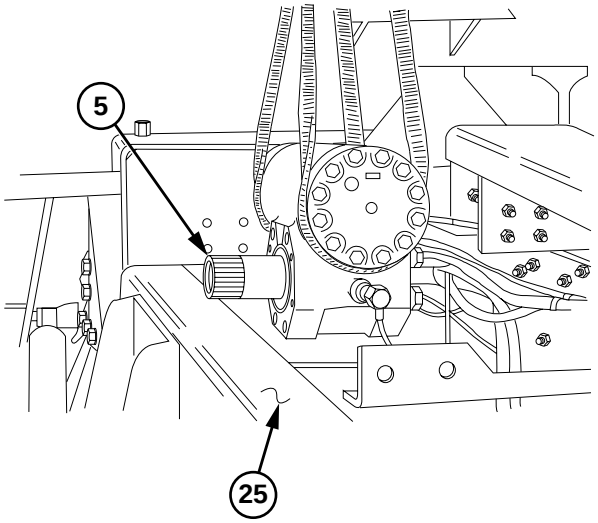
Steering gear weighs 175 lb (79 kg). Support steering gear when removing hardware to prevent it from falling. Failure to comply may result in injury.

(18) Remove top left angle bracket (35) and two screws (27) from frame (25).



(19) Install sling around both ends of steering gear (5) and attach to suitable lifting device.

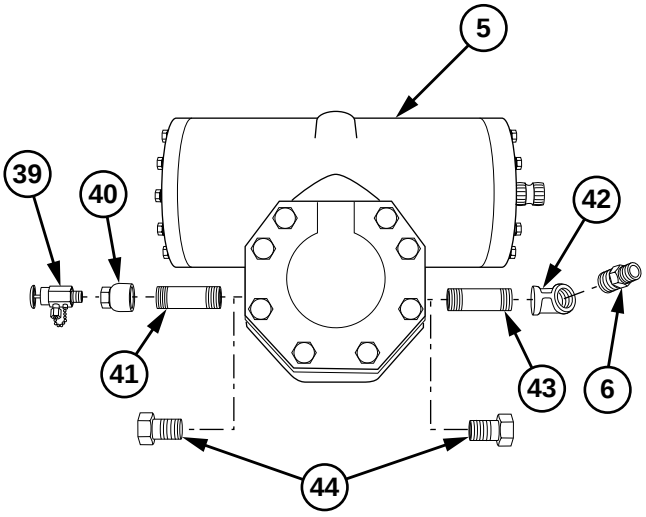
(20) Remove steering gear (5) from frame (25) with aid of assistant.



(21) Remove sampling valve (39), adapter (40), and pipe (41) from steering gear (5).

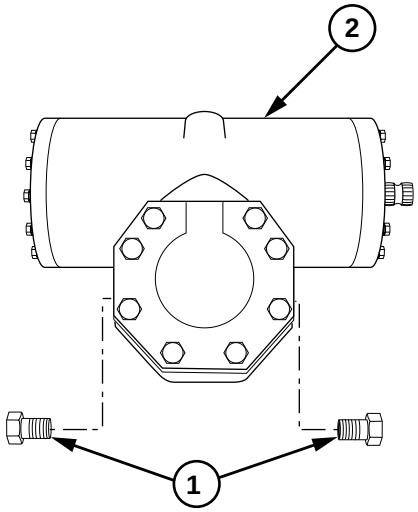
(22) Remove adapter (6), elbow (42), and pipe (43) from steering gear (5).

(23) Install shipping plugs (44) in steering gear (5).



b. Installation

(1) Remove shipping plugs (1) from steering gear (2).



13-6. REAR STEERING GEAR REPLACEMENT (CONT)

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

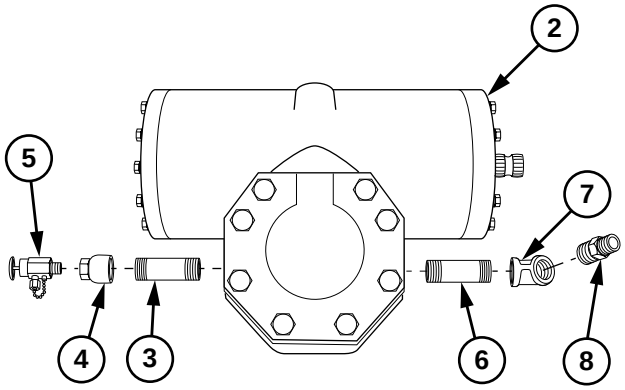
Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.

(2) Coat threads of pipe (3), adapter (4) and sampling valve (5) with pipe thread sealing compound.

(3) Install pipe (3), adapter (4), and sampling valve (5) on steering gear (2).

(4) Coat threads of pipe (6), elbow (7), and adapter (8) with pipe thread sealing compound.

(5) Install pipe (6), elbow (7), and adapter (8) on steering gear (2).



WARNING

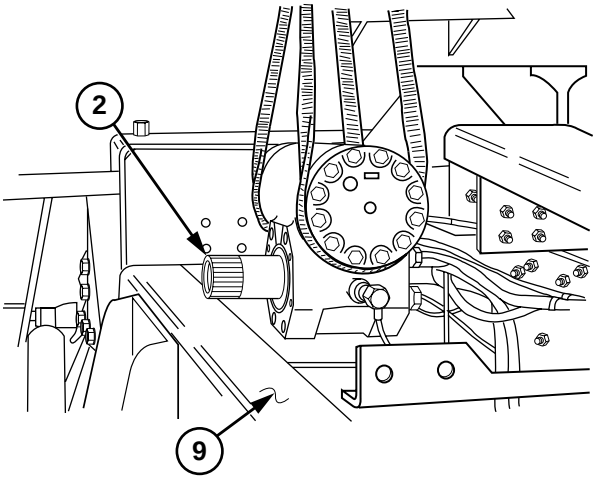
Steering gear weighs 175 lb (79 kg). Support steering gear when installing hardware to prevent it from falling. Failure to comply may result in injury.

(6) Install sling around both ends of steering gear (2) and attach to lifting device.

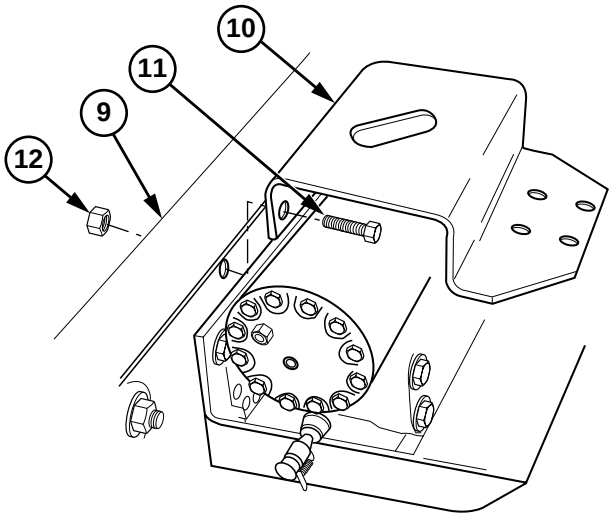
NOTE

- Steering gear mounting surface should be clear of all foreign material.
- Steering gear, angle bracket, and two screws must be installed simultaneously.

(7) Position steering gear (2) on frame (9) with aid of assistant.

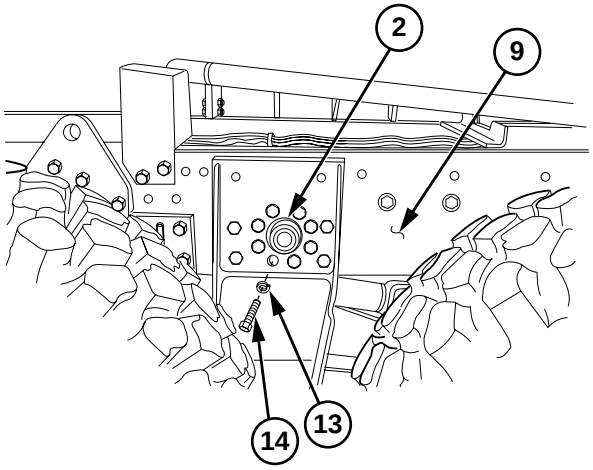


(8) Install top left angle bracket (10) on frame (9) with two screws (11) and new locknuts (12). Do not tighten.



(9) Install eight new lockwashers (13) and screws (14) in steering gear (2) and frame (9). Torque to 180 lb–ft (245 N·m).

(10) Remove sling and lifting device from steering gear (2).



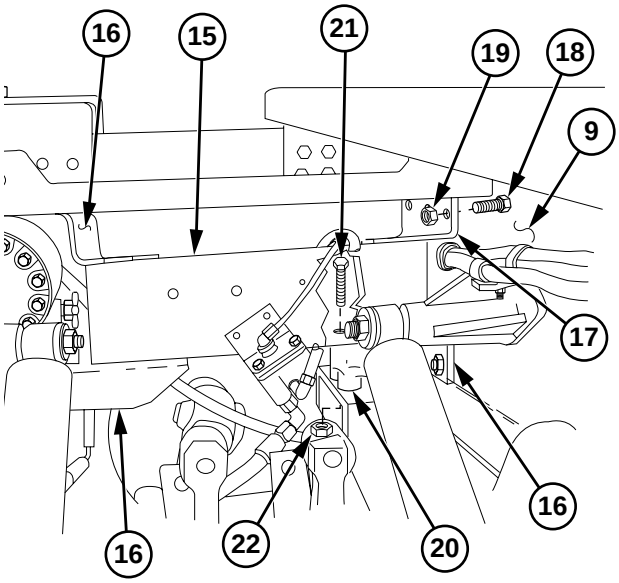
NOTE

Rear service brake relay valve hoses no. 2872 and no. 2369 must be routed between crossmember and right side frame.

(11) Position crossmember (15) between three angle brackets (16) with aid of assistant.

(12) Position upper right angle bracket (17) on frame (9) with two screws (18) and new locknuts (19). Do not tighten.

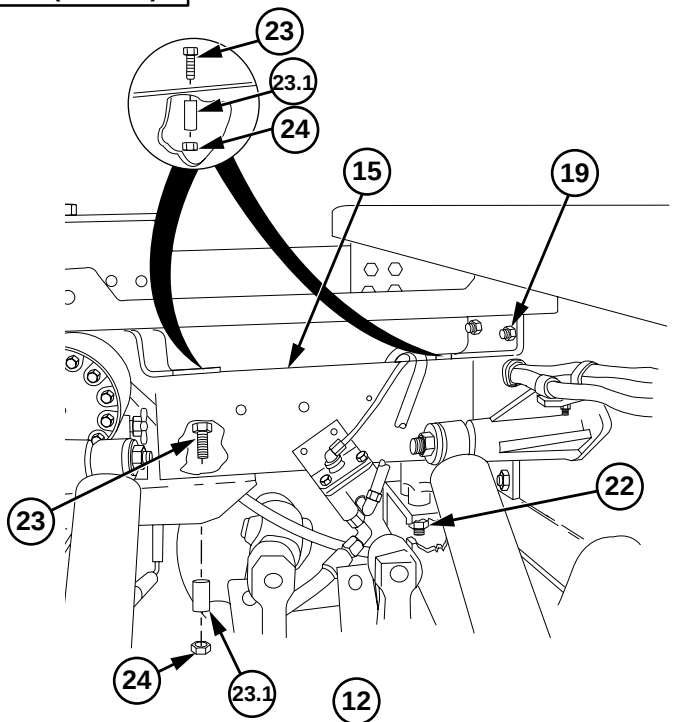
(13) Position spacer (20) on crossmember (15) with four screws (21) and new locknuts (22). Do not tighten.



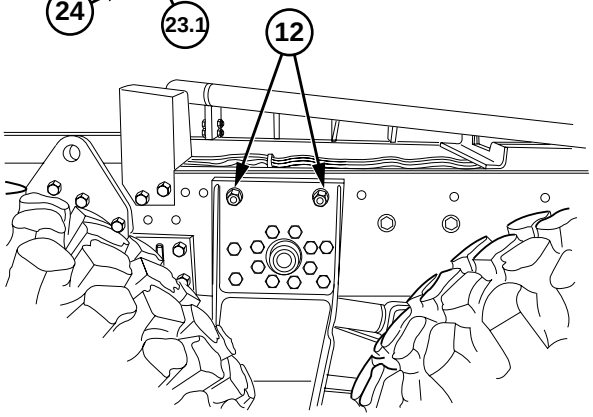
13-6. REAR STEERING GEAR REPLACEMENT (CONT)

(14) Install 12 screws (23), sleeves (23.1), and new locknuts (24) on crossmember (15) with aid of assistant. Torque to 380 lb-ft (515 N·m).

(15) Tighten four locknuts (22) to 550 lb-ft (515 N·m).

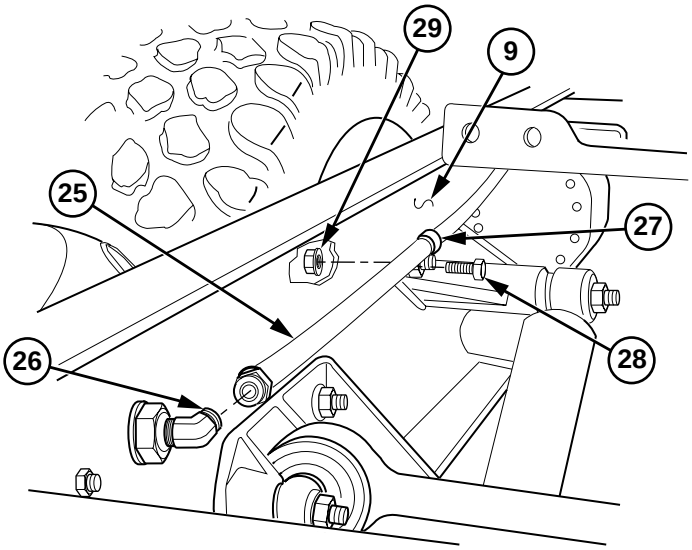


(16) Tighten two locknuts (12) and two locknuts (19) to 220 lb-ft (298 N·m).



(17) Install hose no. 2047 (25) on elbow (26).

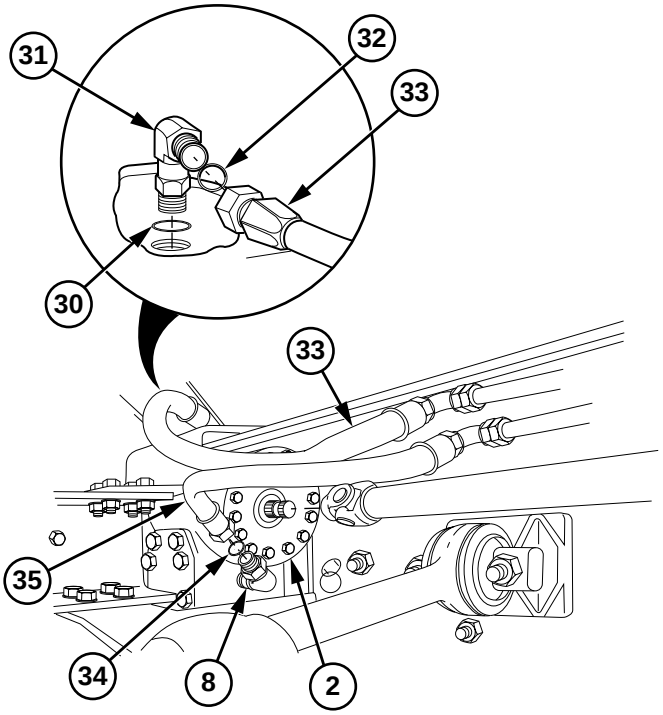
(18) Install hose no. 2047 (25) and clip (27) on frame (9) with screw (28) and new locknut (29).



(19) Install new preformed packing (30) and elbow (31) on steering gear (2).

(20) Install new preformed packing (32) and hose no. 2275 (33) on elbow (31).

(21) Install new preformed packing (34) and hose no. 2276 (35) on adapter (8).



(22) Coat inside surfaces of pitman arm (36) with antiseize compound.

NOTE

It may be necessary to turn steering gear input shaft to align timing marks on steering gear output shaft and pitman arm.

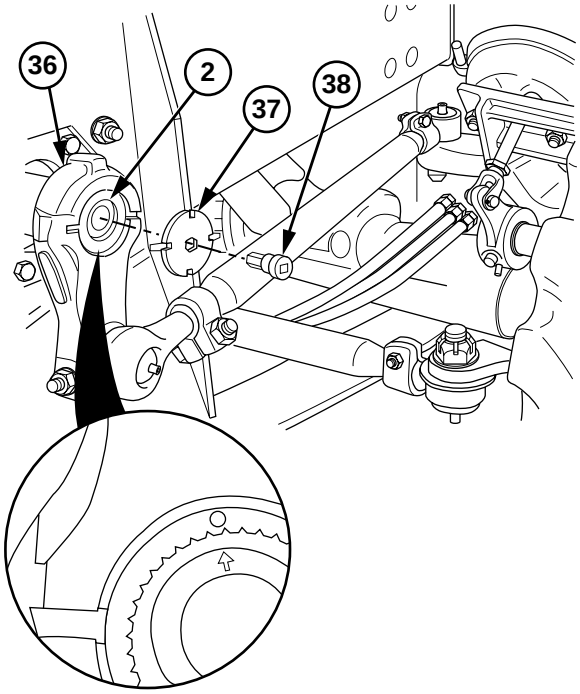
(23) Align timing marks on steering gear (2) and pitman arm (36).

(24) Position pitman arm (36) on steering gear (2).

(25) Coat new retainer (37) with antiseize compound.

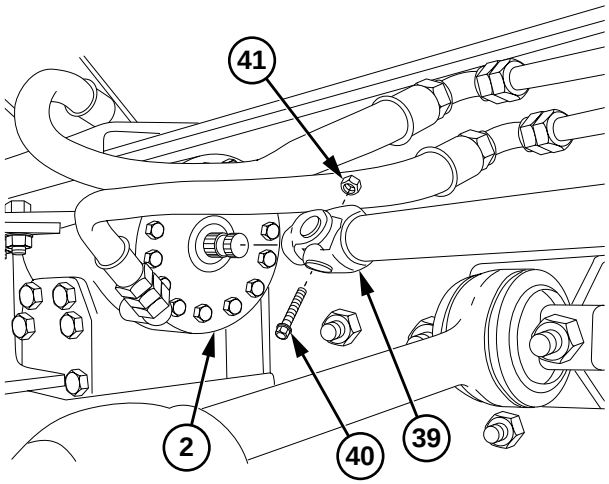
(26) Install retainer (37) on pitman arm (36) using 3/4 in. sockethead screw socket (38).

(27) Tighten retainer (37) to 450 lb–ft (610 N·m).

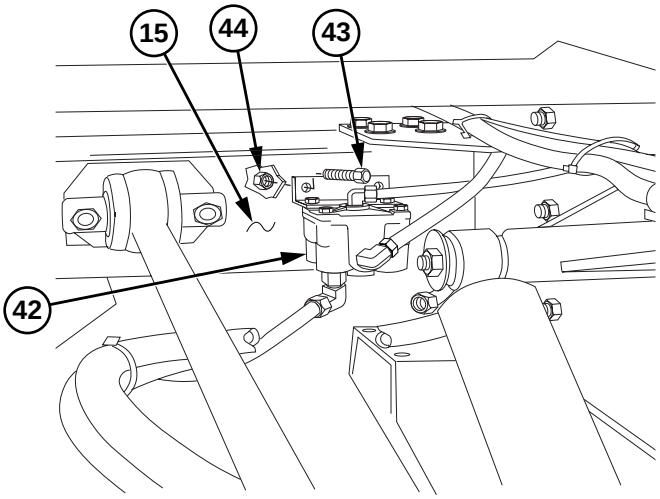


13-6. REAR STEERING GEAR REPLACEMENT (CONT)

(28) Install yoke (39) on steering gear (2) with screw (40) and new locknut (41). Torque to 35-40 lb-ft (47-54 N·m).



(29) Install rear service brake relay valve (42) on crossmember (15) with two screws (43) and new locknuts (44).



c. Follow-On Maintenance

(1) Fill power steering reservoir (LO 9-2320-360-12).

(2) Start engine (TM 9-2320-360-10).

(3) Build up air pressure to 120-125 psi (827-862 kPa).

(4) Check air hose connections for leaks.

(5) Check steering hose connections for leaks.

(6) Shut off engine (TM 9-2320-360-10).

(7) Install longitudinal torque rod (axle no. 4) (para 15-4).

(8) Install left fifth wheel ramp/extension (TM 9-2320-360-20).

(9) Adjust steering stops (if original gear was not reinstalled) (para 13-9).

13-7. STEERING PUMP REPLACEMENT

This task covers:
a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Cooling system drained (TM 9-2320-360-20).
Steering reservoir drained (LO 9-2320-360-12).
Batteries disconnected (TM 9-2320-360-20).
Top doghouse insulation removed (TM 9-2320-360-20).
Front engine access panel removed (TM 9-2320-360-20).
Lower engine access panel removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hoist, Hand Operated (Item 69, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Screws, Guide (2) (Figure C-4, Appendix C)
Sling, Endless Strap (Item 161, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Crows Foot, 3/4 In., 3/8 In. Drive (Item 219, Appendix E)
Wrench, Open-End, 1-7/8 In. and 1-11/16 In. (Item 225, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

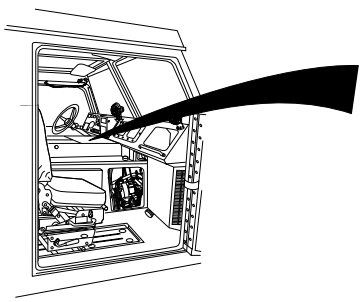
Tools and Special Tools (Cont)
Wrench, Torque, Click-Type, 15-100 Lb-Ft, (Item 238, Appendix E)
Wrench, Torque, Click-Type, 30-250 Lb-Ft (Item 239, Appendix E)

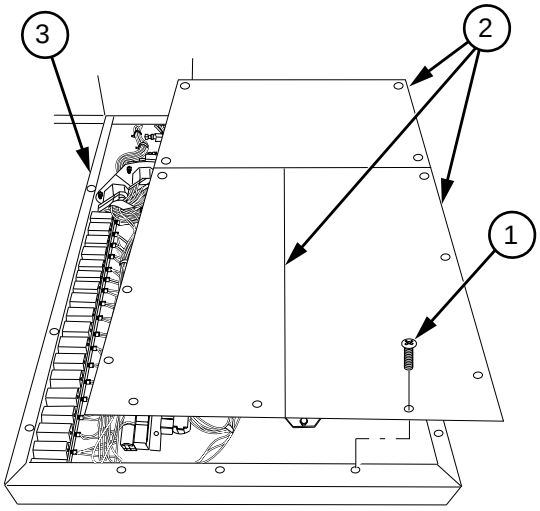
Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Compound, Sealing (Item 22.1, Appendix B)
Grease (Item 34, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Ties, Plastic, Cable (Item 60, Appendix B)
Gasket (Item 30, Appendix F)
Gasket (Item 47.1, Appendix F)
Locknut (Item 96, Appendix F)
Lockwashers (6) (Item 122, Appendix F)
Lockwasher (Item 121, Appendix F)
Packings, Preformed (4) (Item 181, Appendix F)
Packings, Preformed (4) (Item 158, Appendix F)
Packings, Preformed (2) (Item 160, Appendix F)
Packings, Preformed (2) (Item 161, Appendix F)
Packings, Preformed (2) (Item 176, Appendix F)
Packings, Preformed (2) (Item 178, Appendix F)
Packings, Preformed (2) (Item 186, Appendix F)
Packing, Preformed (Item 177, Appendix F)

Personnel Required
Two

a. Removal

(1) Remove 19 screws (1) and 3 covers (2) from electronic control box (ECB) (3).





13-7. STEERING PUMP REPLACEMENT (CONT)

NOTE

Tag and mark harness connectors before disconnection.

(2) Loosen three screws (4) and remove harness connectors (5) from sockets (6).

NOTE

Tag and mark circuit breakers before removal from ECB.

(3) Remove two nuts (7) and DDEC circuit breakers (8) from ECB (3).

NOTE

The four 2 in. (5 cm) screws are used to retain the top doghouse insulation. Mark locations of these four screws for proper assembly.

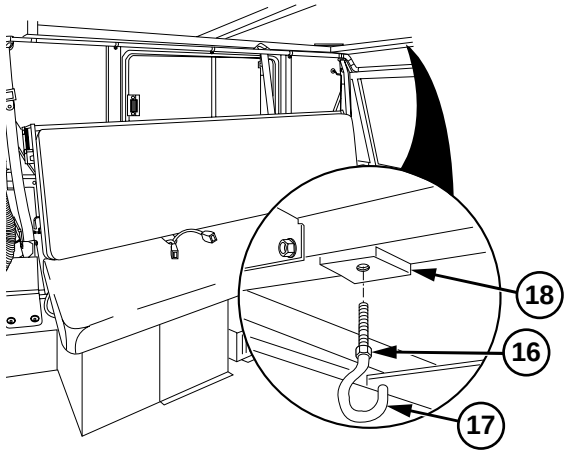
(4) Remove eight screws (9), four screws (9.1), washers (9.2) and two clips (10) from ECB (3).

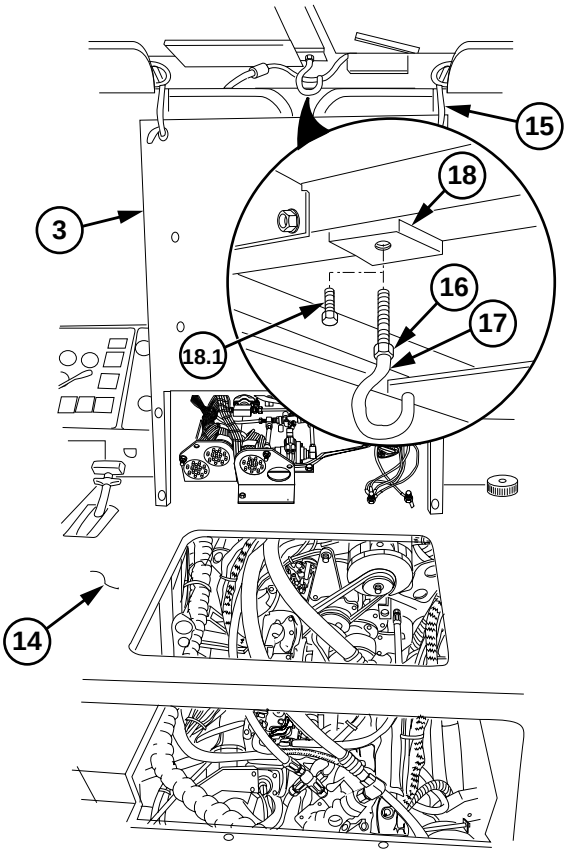
(5) Remove locknut (11) and six ground wires no. 1435 (12) from screw (13) in doghouse (14). Discard locknut.

(6) Tilt rear of ECB (3) upward and position on doghouse (14). Secure with plastic cable ties (15).

(7) Loosen jam nut (16) and remove rear seat eye bolt (17) from cab ceiling (18).

(7.1) Remove screw (18.1) from cab ceiling (18).





(8) Install eye bolt (17) in threaded hole in center of cab ceiling (18) and tighten jam nut (16).

CAUTION

Plug removed lines and cap fittings to prevent debris from entering systems. Failure to do so may cause failure of systems.

NOTE

Tag and mark six hoses before disconnection.

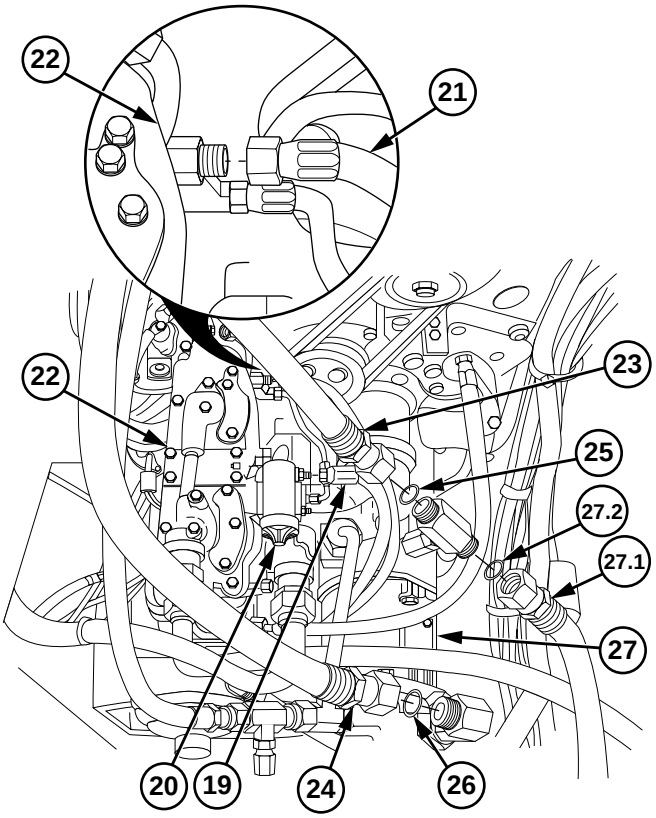
(9) Disconnect hose no. 2159 (19) from air governor (20).

(10) Disconnect hose no. 2096 (21) from air compressor (22).

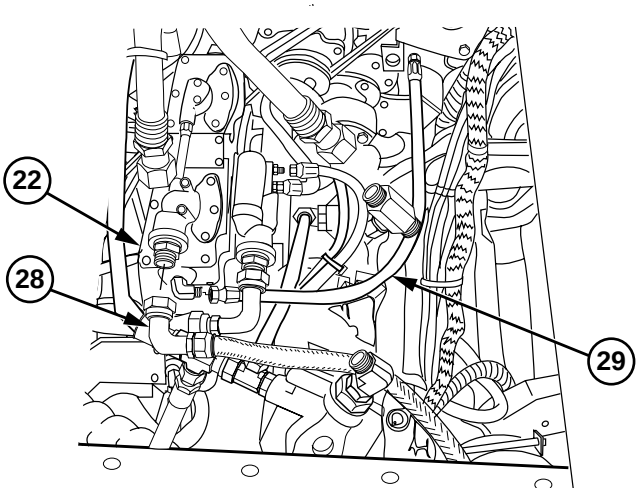
(11) Place suitable drain pan under hoses (23 and 24).

(12) Remove hose no. 2778 (23) and hose no. 2302 (24) and preformed packings (25 and 26) from steering pump (27). Discard preformed packings.

(12.1) Remove hose no. 2906 (27.1) and preformed packing (27.2) from steering pump (27). Discard preformed packing.

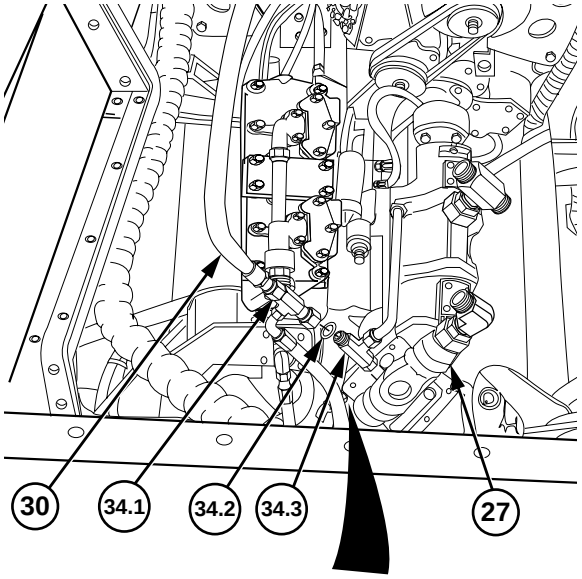


13-7. STEERING PUMP REPLACEMENT (CONT)



(13) Disconnect hose no. 2001 (28) from air compressor (22).

(14) Disconnect hose no. 2628 (29) from air compressor (22).



(15) Place suitable drain pan under hoses (30 thru (32) to catch draining steering fluid.

(16) Disconnect hose no. 2879 (31) and remove preformed packing (34) from hose no. 2879 (31.1). Discard preformed packing.

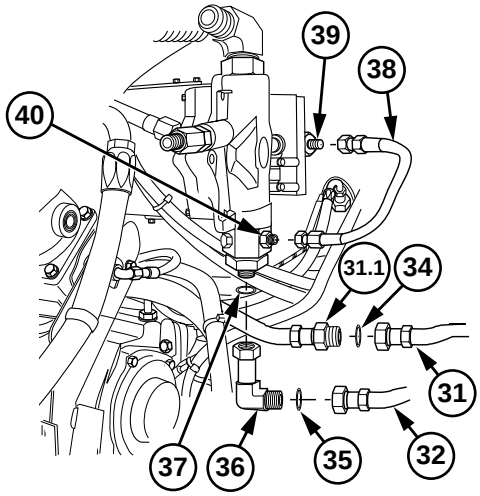
(16.1) Remove tee (34.1) and preformed packing (34.2) from tee (34.3). Discard preformed packing.

(16.2) Remove hose no. 2274 (32) and preformed packing (35) from elbow (36). Discard preformed packing.

(17) Remove elbow (36) and preformed packing (37) from steering pump (27). Discard preformed packing.

(18) Remove hose (38) from elbow (39).

(19) Remove hose (38) from fitting (40).



CAUTION

Do not remove the two screws that secure bracket to steering pump. Failure to comply may result in damage to equipment.

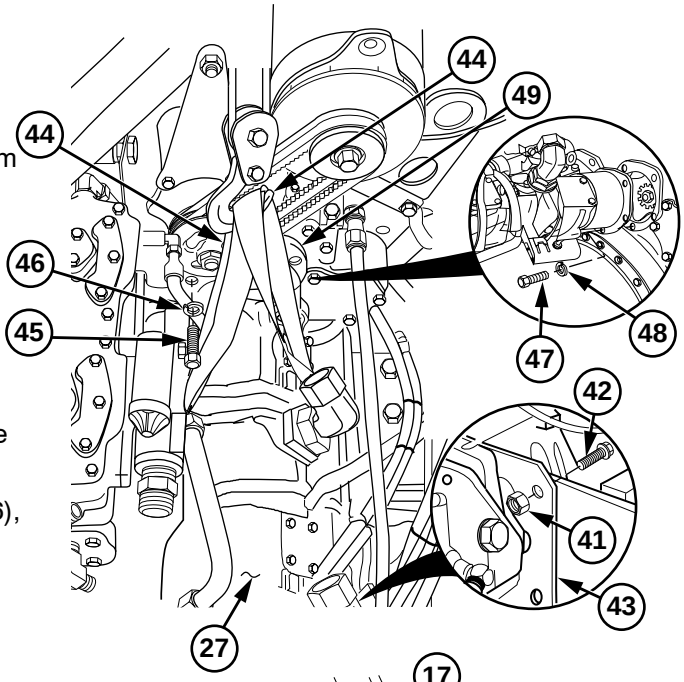
(20) Remove two nuts (41) and screws (42) from steering pump bracket (43).

NOTE

Rear lifting strap supports steering pump. Front lifting strap guides steering pump.

(21) Attach two lifting straps (44) and suitable lifting device to steering pump (27) and eye bolt (17).

(22) Remove four screws (45), lockwashers (46), screw (47), and lockwasher (48) from adapter housing (49) while assistant supports steering pump (27) with lifting device. Discard lockwashers.



WARNING

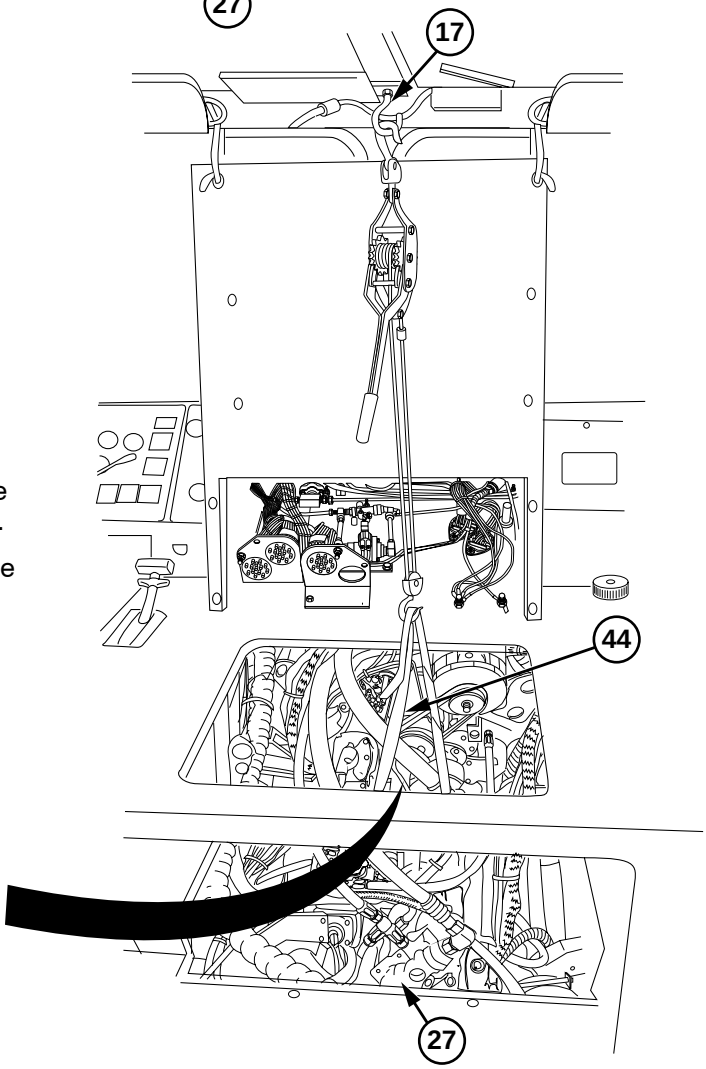
Steering pump weighs approximately 112 lb (51 kg). If dropped, pump may cause serious injury.

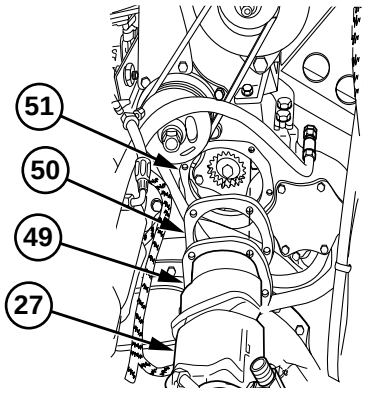
NOTE

Gently strike steering pump with soft-faced mallet to unseat mounting flange from engine.

(23) Remove steering pump (27), adapter housing (49), and gasket (50) from engine (51) with aid of assistant. Discard gasket.

(24) Remove two lifting straps (44) and suitable lifting device from steering pump (27) and eye bolt (17).





13-7. STEERING PUMP REPLACEMENT (CONT)

NOTE

Drive couplings may come out with adapter housing or remain in engine during pump removal.

(25) Remove drive couplings (52 and 53) from inside adapter housing (49).

(25.1) Remove spring pin (53.1) and retainer (53.2) from drive coupling (53).

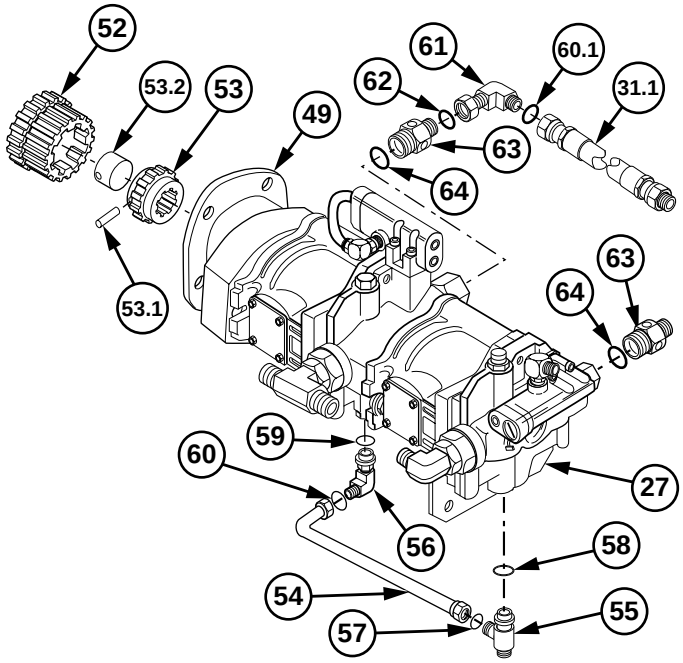
(26) Remove tube (54) from tee (55) and elbow (56).

(27) Remove tee (55) and two preformed packings (57 and 58) from steering pump (27). Discard preformed packings.

(28) Remove elbow (56) and two preformed packings (59 and 60) from steering pump (27). Discard preformed packings.

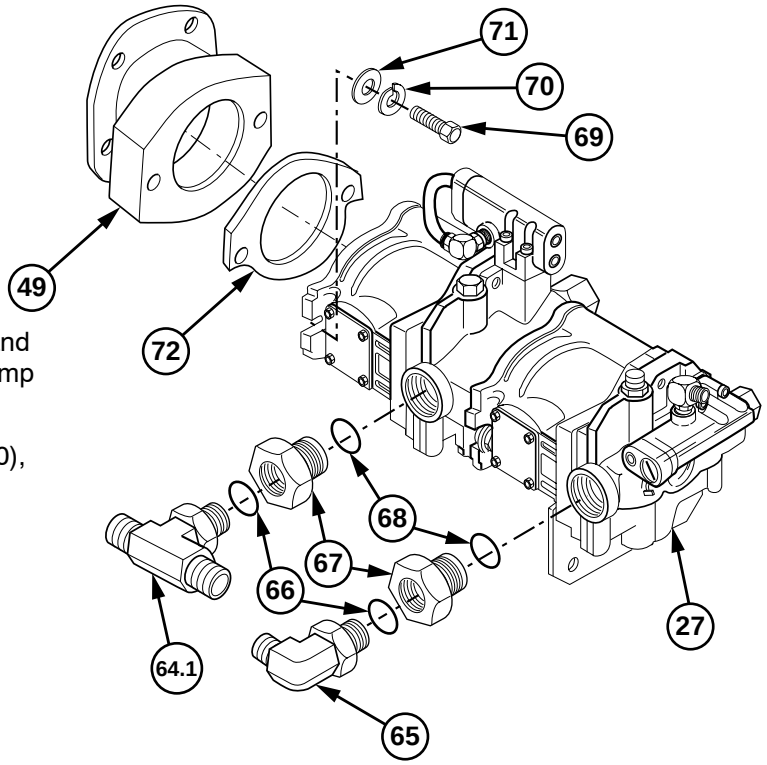
(28.1) Remove hose no. 2879 (31.1) and preformed packing (60.1) from elbow (61). Discard preformed packing.

(29) Remove elbow (61), preformed packing (62), two adapters (63), and preformed packings (64) from steering pump (27). Discard preformed packings.



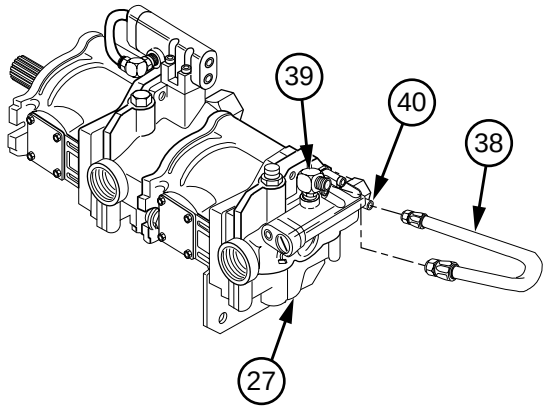
(30) Remove tee (64.1), elbow (65), two preformed packings (66), adapters (67), and preformed packings (68) from steering pump (27). Discard preformed packings.

(31) Remove two screws (69), lockwashers (70), washers (71), gasket (72), and adapter housing (49) from steering pump (27). Discard lockwashers and gasket.



NOTE

If steering pump is being replaced with a new steering pump, remove shipping plugs from new steering pump and install them in old steering pump. Do steps (32) and (33) to reinstall old hose and elbow on old steering pump.



(32) Install hose (38) on fitting (40).

(33) Install hose (38) on elbow (39).

b. Cleaning/Inspection

(1) Clean old gasket material from engine and steering pump mounting flange.

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

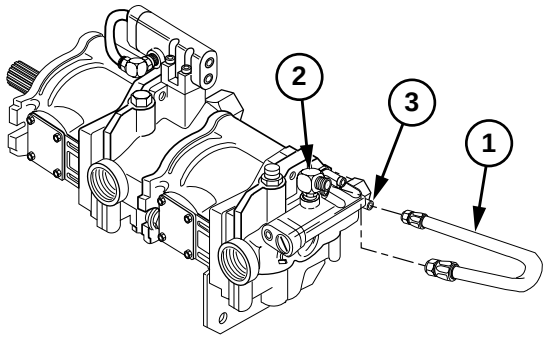
(2) Clean sealant residue from threaded holes with solvent cleaning compound.

(3) Inspect drive hub, drive plate, mounting flange, housing, and end plate for damage.

(4) Apply light coat of grease to splines of drive couplings.

13-7. STEERING PUMP REPLACEMENT (CONT)

c. Installation



NOTE

If new steering pump is being installed, begin with step (1). If old steering pump is being reinstalled, begin with step (3).

(1) Remove hose (1) from elbow (2).

(2) Remove hose (1) from fitting (3).

WARNING

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

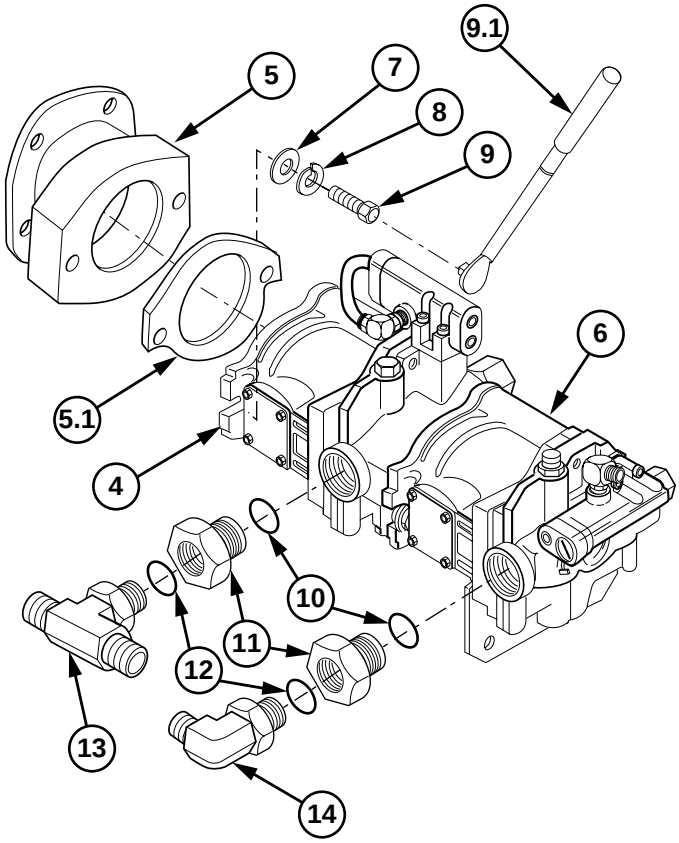
NOTE

Rubber seal on gasket faces adapter housing.

(3) Apply sealing compound to steering pump mounting surface (4).

(4) Install new gasket (5.1) and adapter housing (5) on steering pump (6) with two washers (7), new lockwashers (8), and screws (9). Torque to 45 lb-ft (61 N·m) using click-type torque wrench (9.1).

(5) Install two new preformed packings (10), adapters (11), new preformed packings (12), tee (13), and elbow (14) on steering pump (6).



(6) Install two new preformed packings (15), adapters (16), new preformed packing (17), and elbow (18) on steering pump (6).

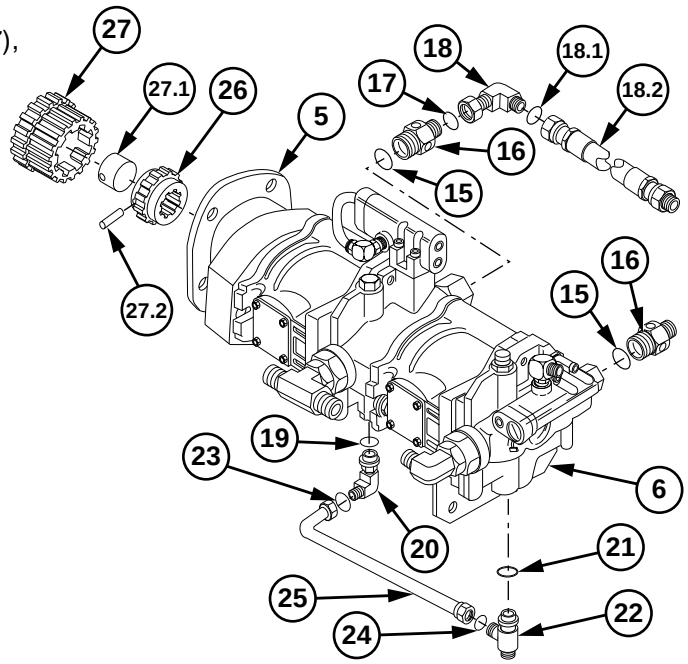
(6.1) Install new preformed packing (18.1) and hose no. 2879 (18.2) on elbow (18).

(7) Install new preformed packing (19) and elbow (20) on steering pump (6).

(8) Install new preformed packing (21) and tee (22) on steering pump (6).

(9) Install two new preformed packings (23 and 24) and tube (25) on elbow (20) and tee (22).

(9.1) Align holes on retainer (27.1) and drive coupling (26) and install spring pin (27.2).

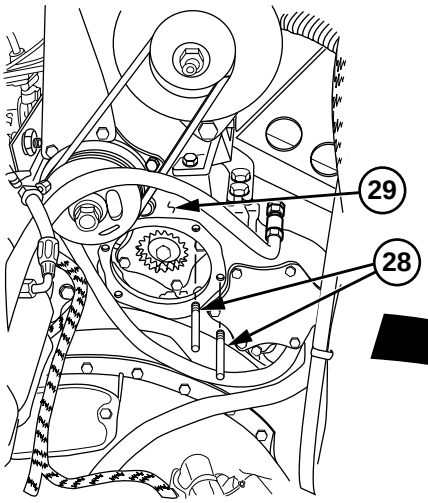


CAUTION

Large drive coupling must remain over small drive coupling at all times. Failure to comply may result in pin separating from small drive coupling.

(10) Install drive couplings (26 and 27) in adapter housing (5).

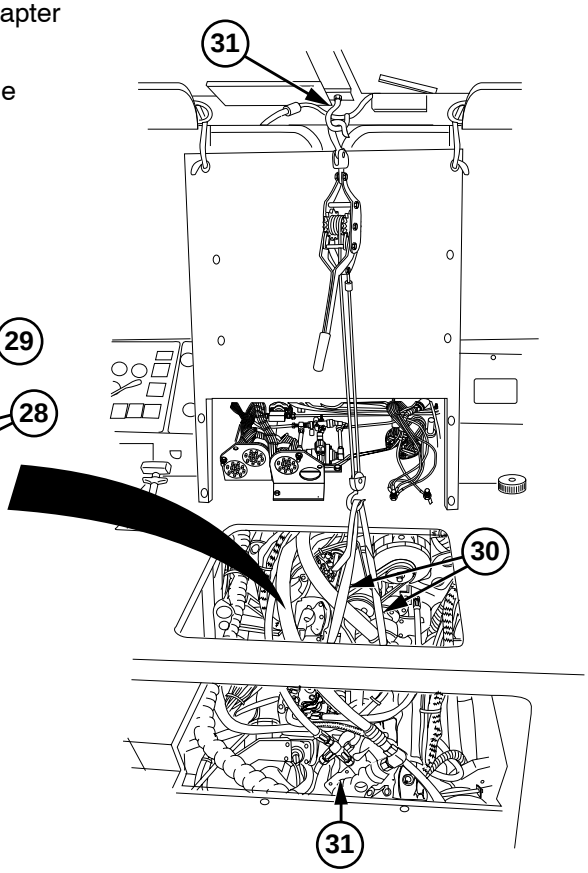
(11) Install two guide screws (28) in right side holes of engine (29).



NOTE

Rear lifting strap supports steering pump. Front lifting strap guides steering pump.

(12) Install two lifting straps (30) and suitable lifting device on steering pump (6) and eye bolt (31).



13-7. STEERING PUMP REPLACEMENT (CONT)

WARNING

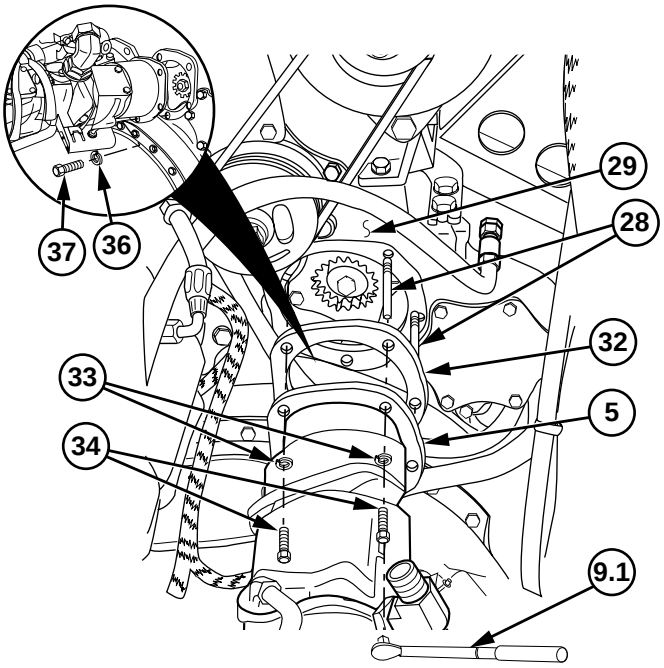
Sealing compound can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

Rubber seal on gasket faces away from engine.

(12.1) Apply sealing compound to engine side of new gasket (32).

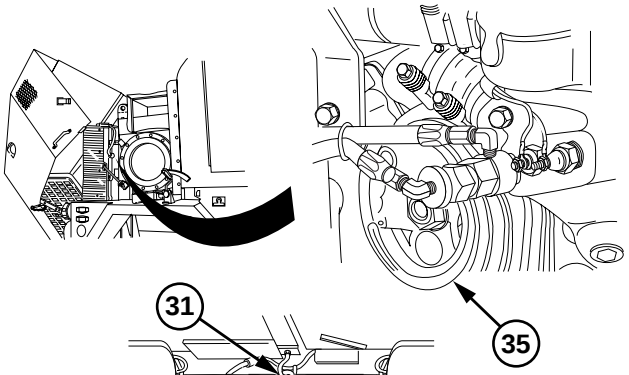
(13) Position gasket (32) and adapter housing (5) on aligning guide screw studs (28) with aid of assistant.



CAUTION

Steering pump drive hub must be mated with engine drive plate. If hub does not align, rotate crankshaft by turning nut in center of pulley on front of left camshaft clockwise. Failure to comply may result in damage to drive couplings.

(14) Install gasket (32) and adapter housing (5) on engine (29) with two new lockwashers (33) and screws (34) while assistant uses camshaft pulley (35) to bar over engine.



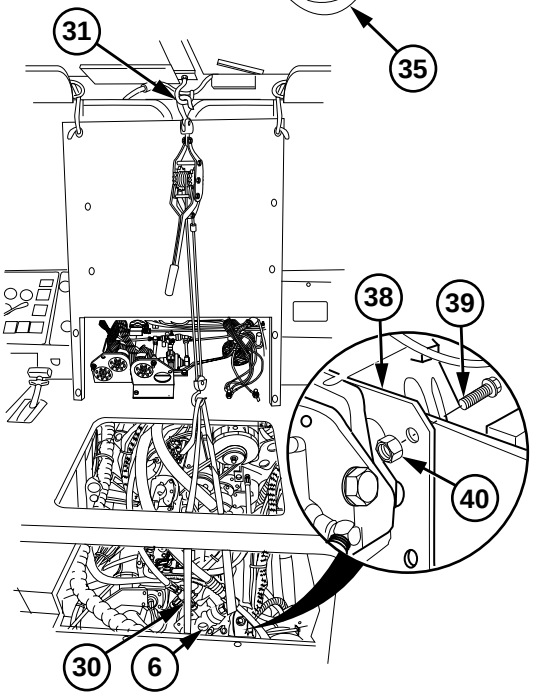
(15) Remove two guide screws (28) from engine (29).

(16) Remove two lifting straps (30) and lifting device from steering pump (6) and eye bolt (31).

(17) Install two new lockwashers (33), remaining screws (34), new lockwasher (36), and screw (37) through adapter housing (5) into engine (29). Do not tighten.

(18) Secure steering pump bracket (38) with two screws (39) and nuts (40).

(19) Tighten four screws (34) to 80 lb-ft (108 N·m) and screw (37) to 55 lb-ft (75 N·m) using click type torque wrench (9.1).



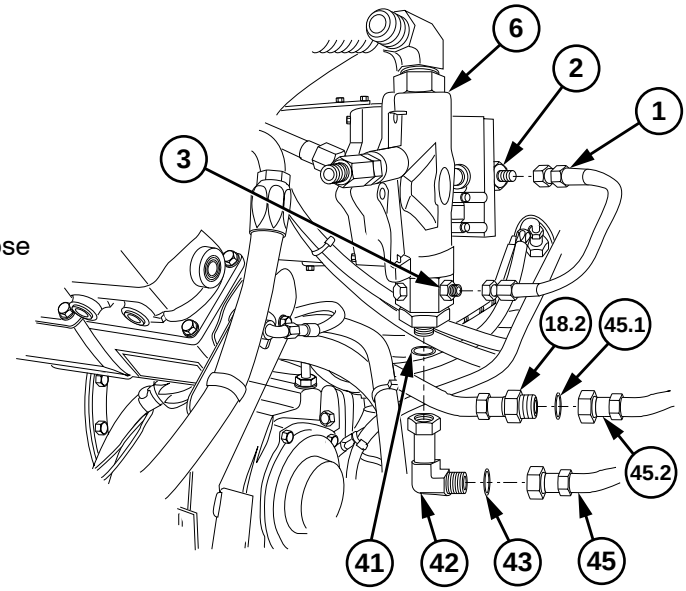
(20) Install hose (1) on fitting (3).

(21) Install hose (1) on elbow (2).

(22) Install new preformed packing (41) and elbow (42) on steering pump (6).

(23) Install new preformed packing (43) and hose no. 2274 (45) on elbow (42).

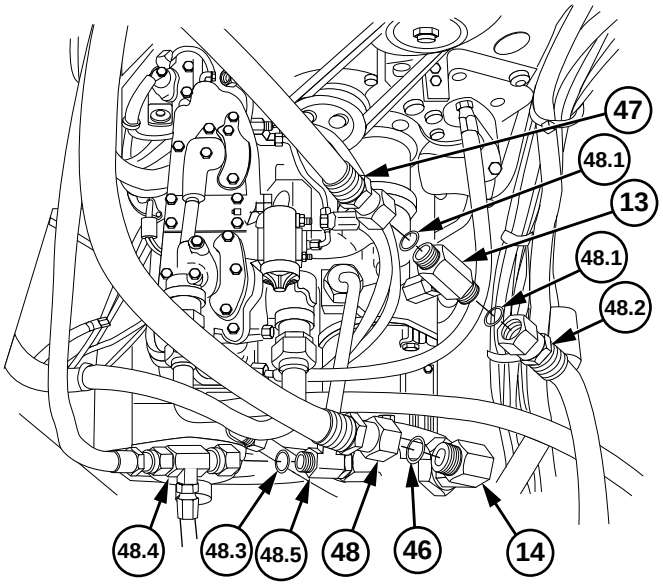
(23.1) Install new preformed packing (45.1) and hose no. 2879 (45.2) on hose no. 2879 (18.2).



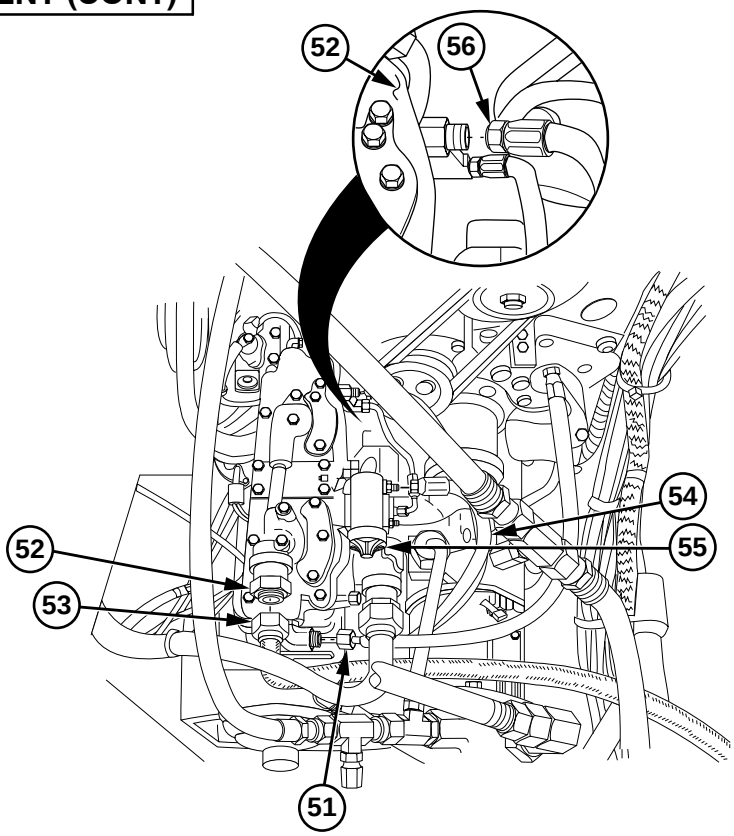
(24) Install new preformed packing (46) and hose no. 2302 (48) on elbow (14).

(25) Install two new preformed packings (48.1), hose no. 2778 (47), and hose no. 2906 (48.2) on tee (13).

(25.1) Install new preformed packing (48.3) and tee (48.4) on tee (48.5).



13-7. STEERING PUMP REPLACEMENT (CONT)

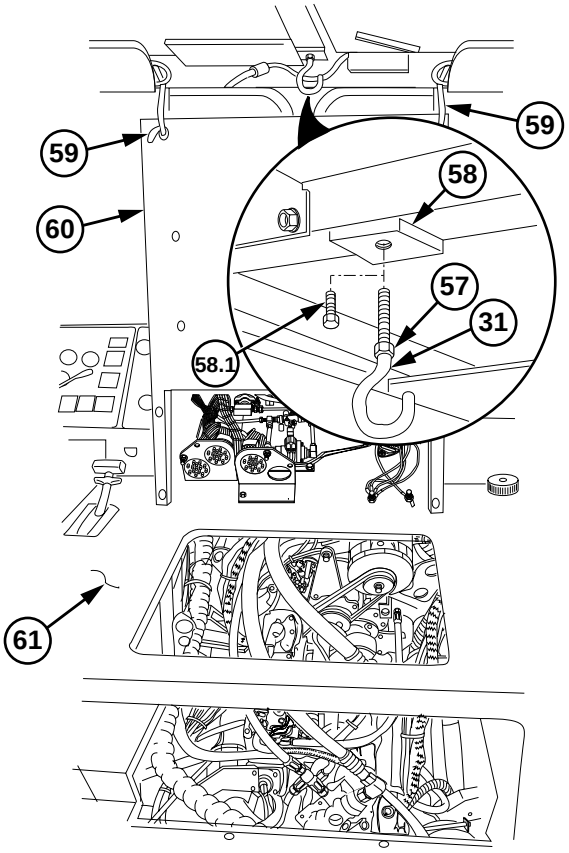


(26) Install hose no. 2628 (51) on air compressor (52).

(27) Install hose no. 2001 (53) on air compressor (52).

(28) Install hose no. 2159 (54) on air governor (55).

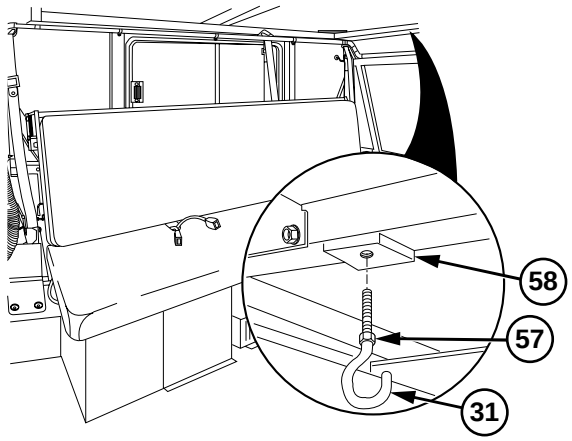
(29) Install hose no. 2096 (56) on air compressor (52).



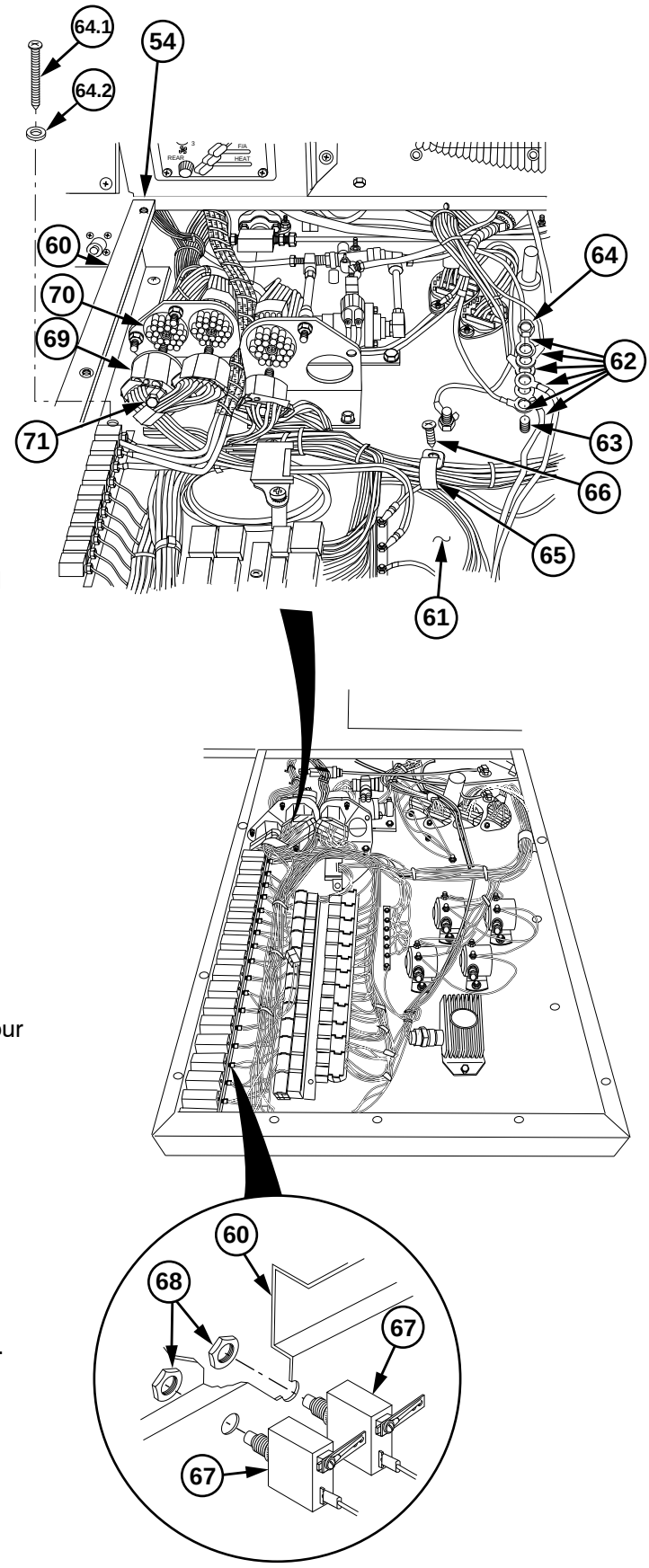
(30) Loosen jam nut (57) and remove eye bolt (31) from cab ceiling (58).

(30.1) Install screw (58.1) in cab ceiling (58).

(31) Install eye bolt (31) in cab ceiling (58) and tighten jam nut (57).



(32) Remove plastic cable ties (59). Lower ECB (60) onto doghouse (61).



NOTE

ECB must be slid back to create opening to gain access to locknut.

(33) Install six ground wires no. 1435 (62) on doghouse (61) with screw (63) and new locknut (64).

WARNING

Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open, flush eyes with water for 15 minutes and get immediate medical attention.

NOTE

The four 2 in. (5 cm) screws are used to retain the top doghouse insulation. These screws must be placed in locations marked during removal.

(34) Coat threads of four screws (64.1) with adhesive-sealant.

(34.1) Install ECB (54) and two clips (65) on doghouse (61) with eight screws (66), four screws (64.1) and washers (64.2).

NOTE

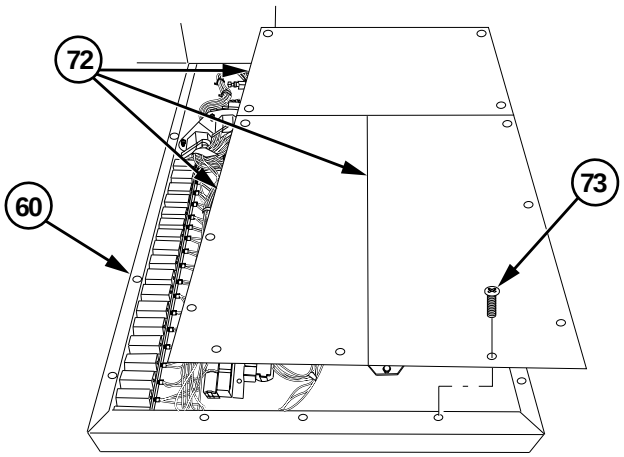
DDEC circuit breakers should be positioned in locations marked during removal.

(35) Install two DDEC circuit breakers (67) in ECB (60) with two nuts (68).

(36) Install three harness connectors (69) in sockets (70). Tighten three screws (71).

13-7. STEERING PUMP REPLACEMENT (CONT)

(37) Install 3 covers (72) on ECB (60) with 19 screws (73).



d. Follow-On Maintenance

(1) Fill cooling system (TM 9-2320-360-20).

(2) Fill steering reservoir (LO 9-2320-360-12).

(3) Connect batteries (TM 9-2320-360-20).

(4) Start engine (TM 9-2320-360-10).

(5) Check steering pump for leaks (TM 9-2320-360-10).

(6) Adjust steering pump pressure (para 13-8d).

(7) Shut off engine (TM 9-2320-360-10).

(8) Install front engine access panel (TM 9-2320-360-20).

(9) Install lower engine access panel (TM 9-2320-360-20).

(10) Install top doghouse insulation (TM 9-2320-360-20).

13-7.1. AUXILIARY STEERING PUMP REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Steering reservoir drained (LO 9-2320-360-12).
Transfer case to no. 1 axle propshaft removed (TM 9-2320-360-20).
Transfer case to no. 2 axle propshaft removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Wrench, Adjustable, Automobile (Item 212.1, Appendix E)
Wrench, Combination, 1-3/8 In. (Item 213, Appendix E)

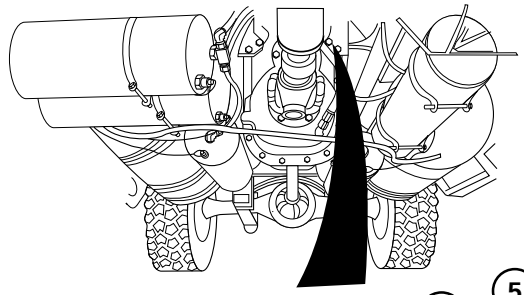
Materials/Parts
Adhesive-Sealant (Item 3, Appendix B)
Adhesive-Sealant (Item 6, Appendix B)
Tags, Identification (Item 56, Appendix B)
Packings, Preformed (3) (Item 160.1, Appendix F)
Packings, Preformed (2) (Item 158, Appendix F)
Packing, Preformed (Item 160.1, Appendix F)
Packing, Preformed (Item 177, Appendix F)
Packing, Preformed (Item 179, Appendix F)
Packing, Preformed (Item 181.1, Appendix F)
Packing, Preformed (Item 182.1, Appendix F)

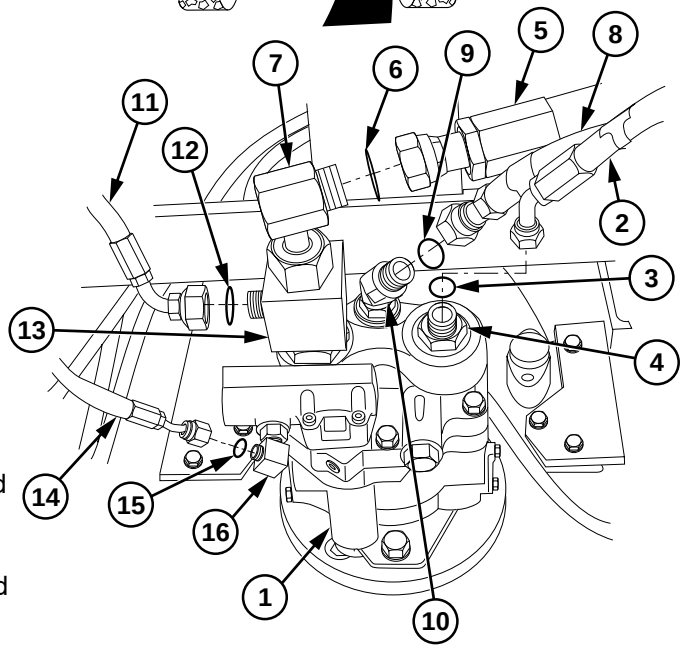
CAUTION

Plug removed lines and cap fittings to prevent debris from entering system. Failure to do so may cause failure of system.

NOTE

Tag and mark hoses before removal.





a. Removal

(1) Place suitable drain pan under auxiliary steering pump (1).

(2) Remove hose no. 2723 (2) and preformed packing (3) from adapter (4). Discard preformed packing.

(3) Remove hose no. 2906 (5) and preformed packing (6) from elbow (7). Discard preformed packing.

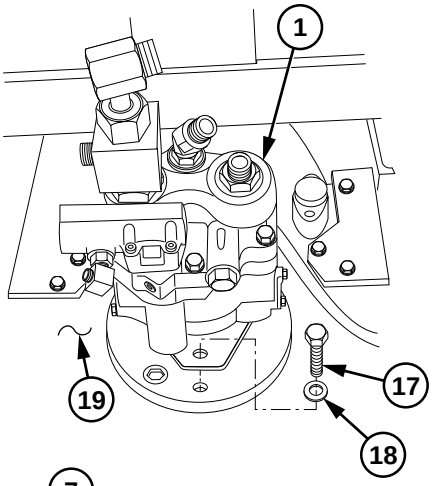
(4) Remove hose no. 2918 (8) and preformed packing (9) from elbow (10). Discard preformed packing.

(5) Remove hose no. 2935 (11) and preformed packing (12) from tee (13). Discard preformed packing.

(6) Remove hose no. 2916 (14) and preformed packing (15) from elbow (16). Discard preformed packing.

13-7.1. AUXILIARY STEERING PUMP REPLACEMENT (CONT)

(7) Remove two screws (17), washers (18), and auxiliary steering pump (1) from transfer case (19).



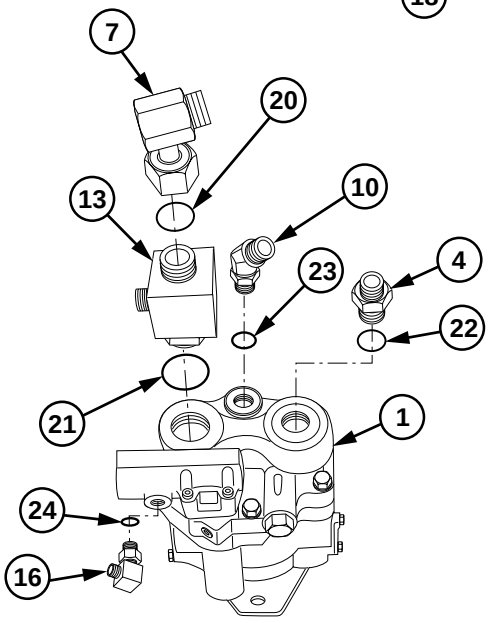
(8) Remove elbow (7) and preformed packing (20) from tee (13). Discard preformed packing.

(9) Remove tee (13) and preformed packing (21) from auxiliary steering pump (1). Discard preformed packing.

(10) Remove adapter (4) and preformed packing (22) from auxiliary steering pump (1). Discard preformed packing.

(11) Remove elbow (10) and preformed packing (23) from auxiliary steering pump (1). Discard preformed packing.

(12) Remove elbow (16) and preformed packing (24) from auxiliary steering pump (1). Discard preformed packing.



b. Installation

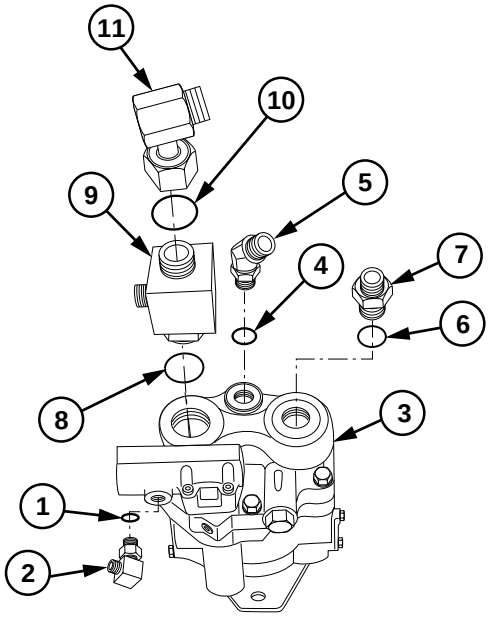
(1) Install new preformed packing (1) and elbow (2) on auxiliary steering pump (3).

(2) Install new preformed packing (4) and elbow (5) on auxiliary steering pump (3).

(3) Install new preformed packing (6) and adapter (7) on auxiliary steering pump (3).

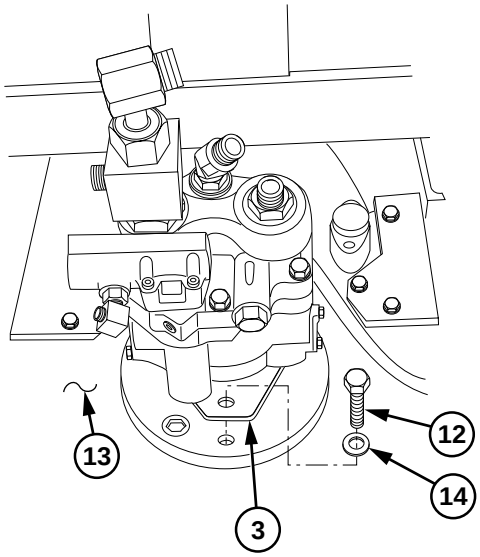
(4) Install new preformed packing (8) and tee (9) on auxiliary steering pump (3).

(5) Install new preformed packing (10) and elbow (11) on tee (9).



WARNING

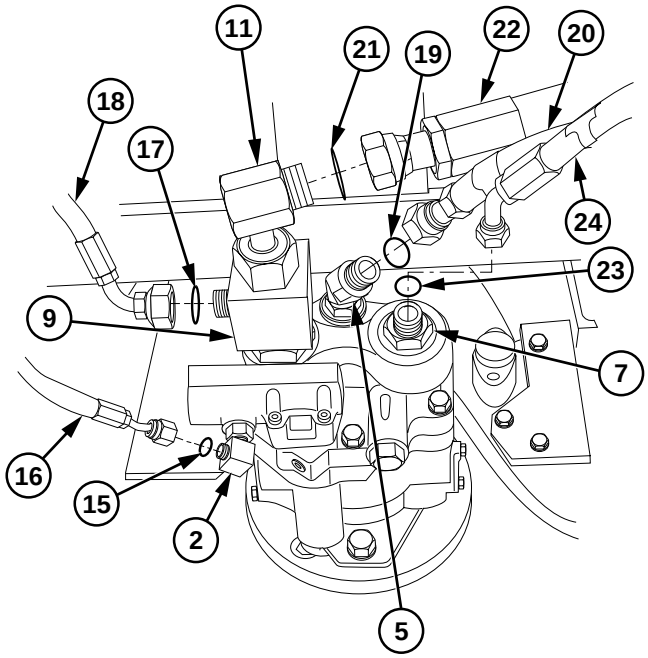
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.



(6) Coat threads of two screws (12) with adhesive-sealant (Item 6, Appendix B).

(7) Coat face of auxiliary steering pump (3) with adhesive-sealant (Item 3, Appendix B).

(8) Install auxiliary steering pump (3) on transfer case (13) with two washers (14) and screws (12).



(9) Install new preformed packing (15) and hose no. 2916 (16) on elbow (2).

(10) Install new preformed packing (17) and hose no. 2935 (18) on tee (9).

(11) Install new preformed packing (19) and hose no. 2918 (20) on elbow (5).

(12) Install new preformed packing (21) and hose no. 2906 (22) on elbow (11).

(13) Install new preformed packing (23) and hose no. 2723 (24) on adapter (7).

c. Follow-On Maintenance

(1) Fill steering reservoir (LO 9-2320-360-12).

(2) Start engine (TM 9-2320-360-10).

(3) Check auxiliary steering pump for leaks.

(4) Shut off engine (TM 9-2320-360-10).

(5) Install transfer case to no. 1 axle propshaft (TM 9-2320-360-20).

(6) Install transfer case to no. 2 axle propshaft (TM 9-2320-360-20).

13-7.2. AUXILIARY STEERING PUMP MANIFOLD REPAIR

This task covers:
a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

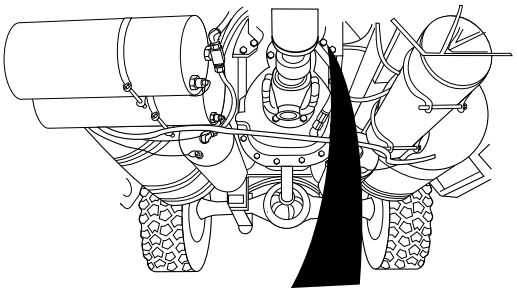
INITIAL SETUP

Equipment Conditions
Steering reservoir drained (LO 9-2320-360-12).
Transfer case to no. 1 axle propshaft removed (TM 9-2320-360-20).
Transfer case to no. 2 axle propshaft removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Vise, Machinist's (Item 207, Appendix E)

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Locknuts (2) (Item 96, Appendix F)
Packings, Preformed (4) (Item 176, Appendix F)
Packings, Preformed (3) (Item 160.1, Appendix F)
Packings, Preformed (3) (Item 182.1, Appendix F)
Packing, Preformed (Item 158, Appendix F)
Packing, Preformed (Item 194.1, Appendix F)
Seal Kits (3) (Item 295.1, Appendix F)
Seal Kit (Item 295.2, Appendix F)

CAUTION
Plug removed lines and cap fittings to prevent debris from entering system. Failure to do so may cause failure of system.



NOTE
Tag and mark hoses before removal.

a. Removal

(1) Place suitable drain pan under auxiliary steering pump manifold (1).

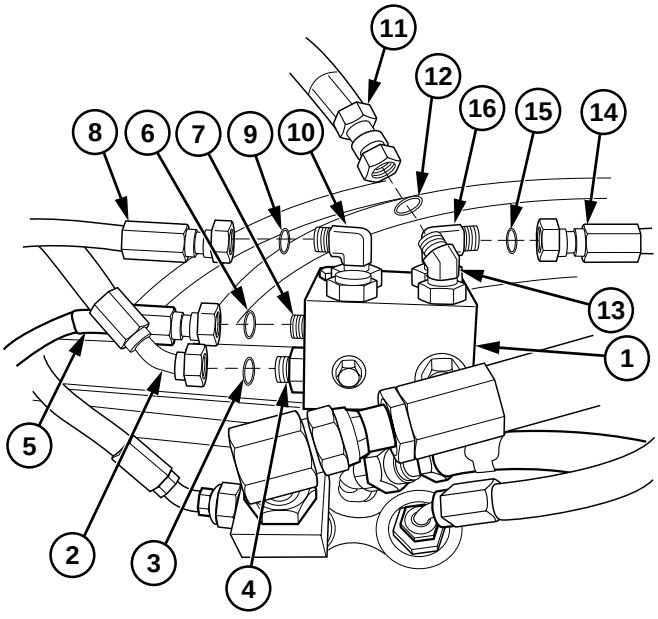
(2) Remove hose no. 2879 (2) and preformed packing (3) from adapter (4). Discard preformed packing.

(3) Remove hose no. 2916 (5) and preformed packing (6) from adapter (7). Discard preformed packing.

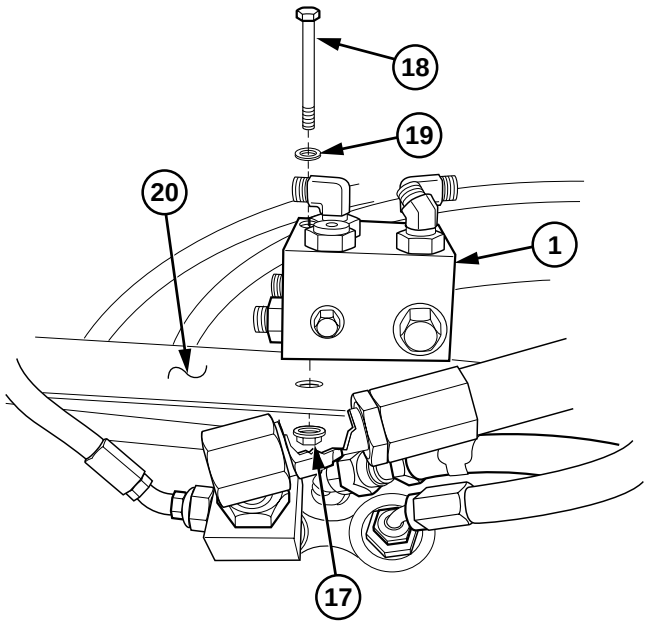
(4) Remove hose no. 2935 (8) and preformed packing (9) from elbow (10). Discard preformed packing.

(5) Remove hose no. 2301 (11) and preformed packing (12) from elbow (13). Discard preformed packing.

(6) Remove hose no. 2723 (14) and preformed packing (15) from elbow (16). Discard preformed packing.



(7) Remove two locknuts (17), screws (18), washers (19), and auxiliary steering pump manifold (1) from angle assembly (20). Discard locknuts.



b. Disassembly

NOTE

Mark locations of valves, plugs, fittings, and elbows before removal.

(1) Remove valve (1) from auxiliary steering pump manifold (2).

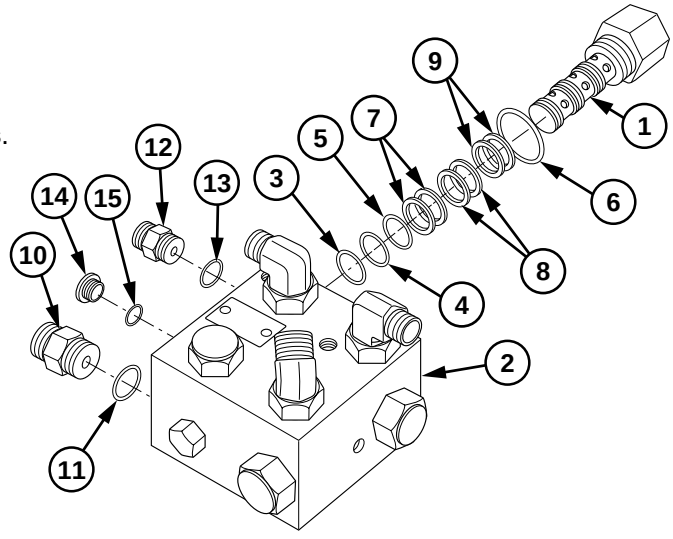
(2) Remove four preformed packings (3 thru 6) from valve (1). Discard preformed packings.

(3) Remove six backup washers (7 thru 9) from valve (1). Discard backup washers.

(4) Remove adapter (10) and preformed packing (11) from auxiliary steering pump manifold (2). Discard preformed packing.

(5) Remove adapter (12) and preformed packing (13) from auxiliary steering pump manifold (2). Discard preformed packing.

(6) Remove plug (14) and preformed packing (15) from auxiliary steering pump manifold (2). Discard preformed packing.



13-7.2. AUXILIARY STEERING PUMP MANIFOLD REPLACEMENT (CONT)

(7) Remove elbow (16) and preformed packing (17) from auxiliary steering pump manifold (2). Discard preformed packing.

(8) Remove plug (18) from auxiliary steering pump manifold (2).

(9) Remove preformed packing (19), preformed packing (20), and backup washer (21) from plug (18). Discard preformed packings and backup washer.

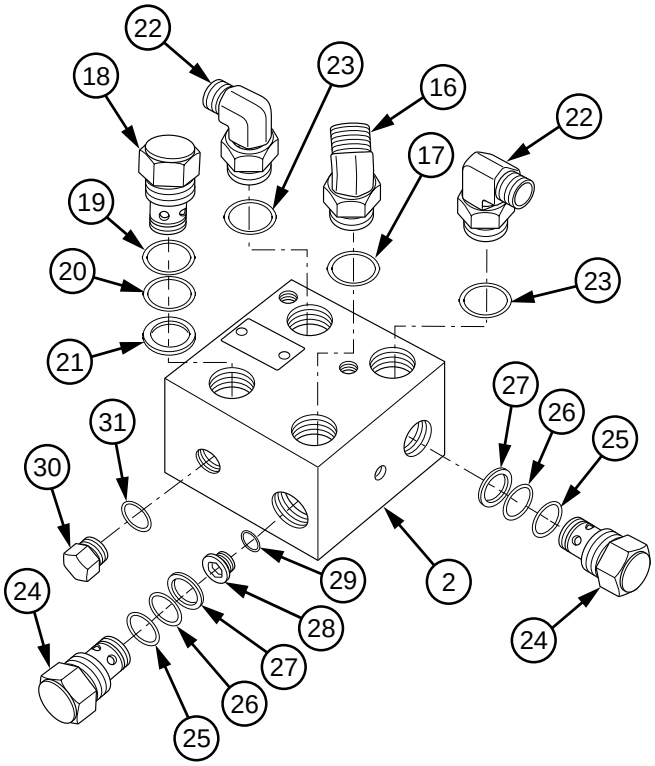
(10) Remove two elbows (22) and preformed packings (23) from auxiliary steering pump manifold (2). Discard preformed packings.

(11) Remove two plugs (24) from auxiliary steering pump manifold (2).

(12) Remove two preformed packings (25), two preformed packings (26), two backup washers (27) from two plugs (24). Discard preformed packings and backup washers.

(13) Remove orifice plug (28) and preformed packing (29) from auxiliary steering pump manifold (2).

(14) Remove plug (30) and preformed packing (31) from auxiliary steering pump manifold (2). Discard preformed packing.



c. Cleaning/Inspection

WARNING

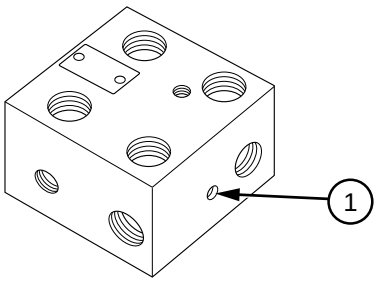
Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

- **The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).**
- **Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.**
- **Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.**
- **Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.**
- **Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.**

(1) Clean all parts in solvent cleaning compound,

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).



(2) Dry parts with compressed air.

(3) Check threads in manifold. Replace manifold if any threads are damaged.

(4) Check ball plug (1). If plug is leaking or missing, replace manifold.

d. Assembly

(1) Install new preformed packing (1) and plug (2) on auxiliary steering pump manifold (3).

(2) Install new preformed packing (4) and orifice plug (5) on auxiliary steering pump manifold (3).

(3) Install two new backup washers (6), new preformed packings (7), and new preformed packings (8) on plugs (9).

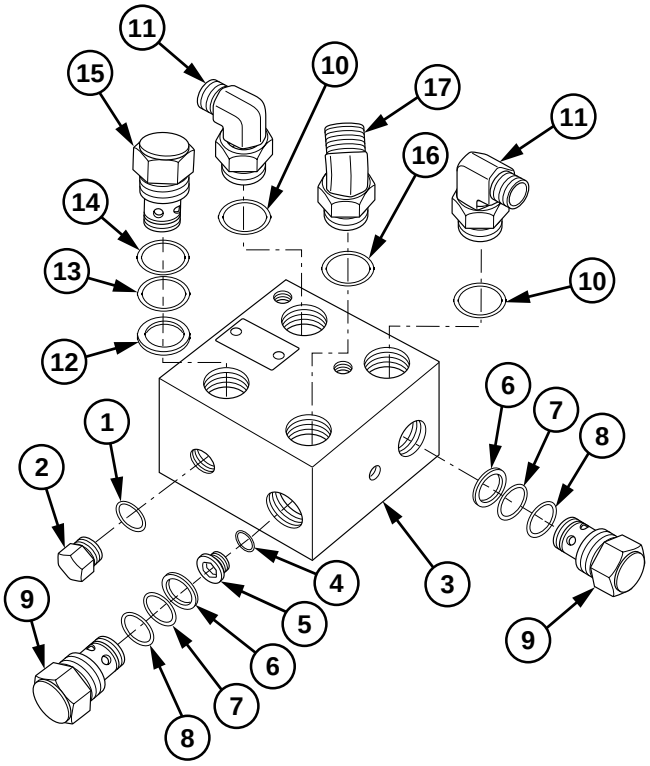
(4) Install two plugs (9) on auxiliary steering pump manifold (3).

(5) Install two new preformed packings (10) and elbows (11) on auxiliary steering pump manifold (3).

(6) Install new backup washer (12), new preformed packing (13), and new preformed packing (14) on plug (15).

(7) Install plug (15) on auxiliary steering pump manifold (3).

(8) Install new preformed packing (16) and elbow (17) on auxiliary steering pump manifold (3).



(9) Install new preformed packing (18) and plug (19) on auxiliary steering pump manifold (3).

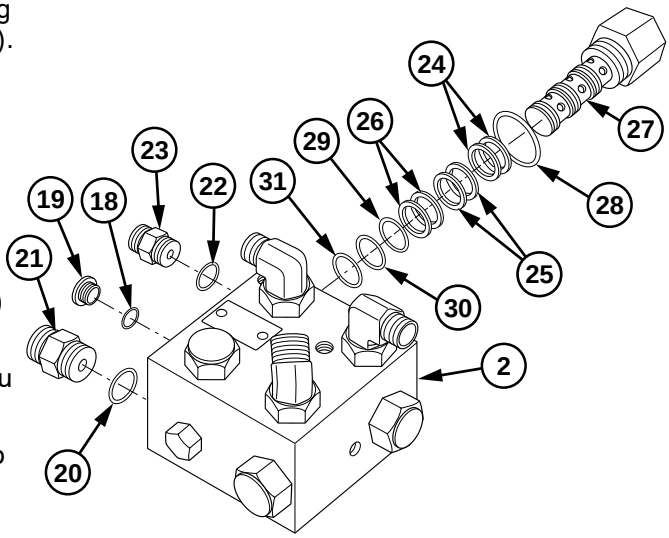
(10) Install new preformed packing (20) and adapter (21) on auxiliary steering pump manifold (3).

(11) Install new preformed packing (22) and adapter (23) on auxiliary steering pump manifold (3).

(12) Install six new backup washers (24 thru 26) on valve (27).

(13) Install four new preformed packings (28 thru 31) on valve (27).

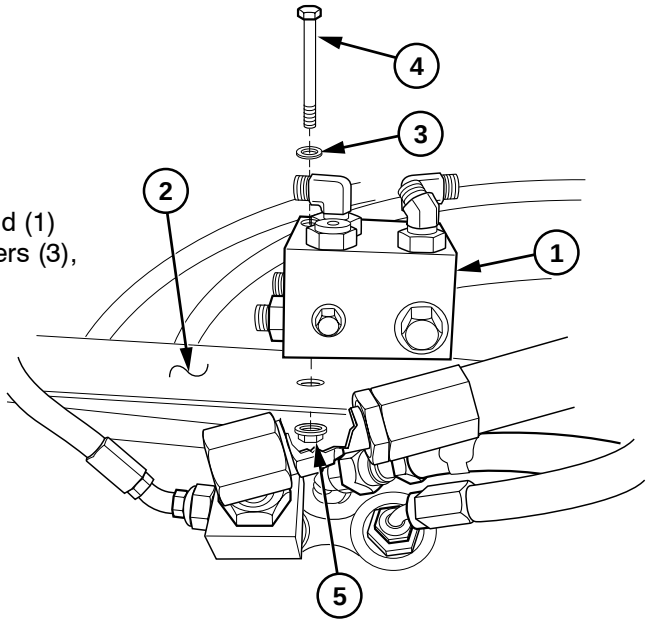
(14) Install valve (27) on auxiliary steering pump manifold (3).



13-7.2. AUXILIARY STEERING PUMP MANIFOLD REPLACEMENT (CONT)

e. Installation

(1) Install auxiliary steering pump manifold (1) on angle assembly (2) with two washers (3), screws (4), and new locknuts (5).



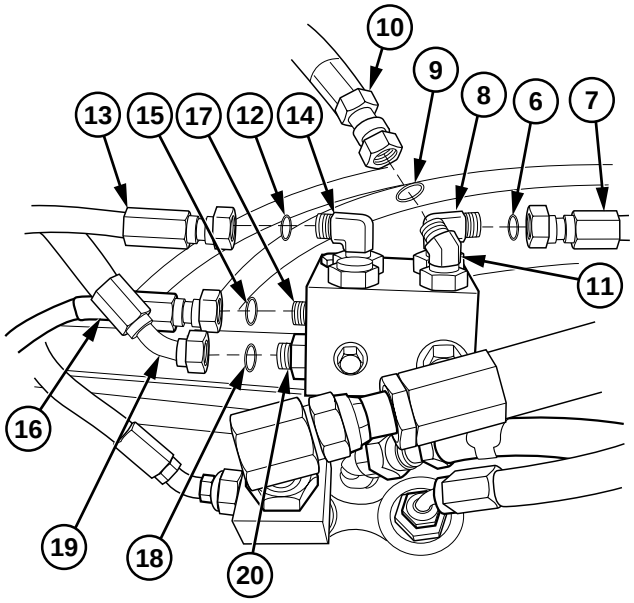
(2) Install new preformed packing (6) and hose no. 2723 (7) on elbow (8).

(3) Install new preformed packing (9) and hose no. 2301 (10) on elbow (11).

(4) Install new preformed packing (12) and hose no. 2935 (13) on elbow (14).

(5) Install new preformed packing (15) and hose no. 2916 (16) on adapter (17).

(6) Install new preformed packing (18) and hose no. 2879 (19) on adapter (20).



f. Follow-On Maintenance

(1) Fill steering reservoir (LO 9-2320-360-12).

(2) Start engine (TM 9-2320-360-10).

(3) Check auxiliary steering pump manifold for leaks.

(4) Shut off engine (TM 9-2320-360-10).

(5) Install transfer case to no. 1 axle propshaft (TM 9-2320-360-20).

(6) Install transfer case to no. 2 axle propshaft (TM 9-2320-360-20).

13-8. STEERING SYSTEM ADJUSTMENT

This task covers:
Adjustment

INITIAL SETUP

Equipment Conditions
CTIS in highway mode (TM 9-2320-360-10).
Tires inflated to 75 psi (517 kPa).
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels straight ahead.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jack Kit, Hydraulic Hand (Item 92, Appendix E)
Jackstands (5) (Item 93, Appendix E)
Plates, Steel (2) (Figure C-13, Appendix C)
Socket, 33 mm, 3/4 In. Drive (Item 163, Appendix E)
Square, Combination, Protractor Head (Item 180, Appendix E)
Tape, Measuring, 12 Ft (Item 189, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Locknuts (2) (Item 80, Appendix F)
Locknuts (2) (Item 103, Appendix F)
Lockwashers (2) (Item 106, Appendix F)
Pins, Cotter (2) (Item 219, Appendix F)
Pins, Cotter (2) (Item 221, Appendix F)
Pins, Cotter (2) (Item 223, Appendix F)

Special Environmental Conditions
HET Tractor parked on hard, level surface.

Personnel Required
Three

a. Toe-In Adjustment

(1) Start engine (TM 9-2320-360-10).

(2) Drive HET Tractor straight back about 20 ft (6 m), then straight forward about 20 ft (6 m). Park with wheels straight.

(3) Shut off engine (TM 9-2320-360-10).

(4) Chock wheels (axle no. 2 or axle no. 3).

(5) Manually release both spring brakes on axle no. 4 (TM 9-2320-360-10).

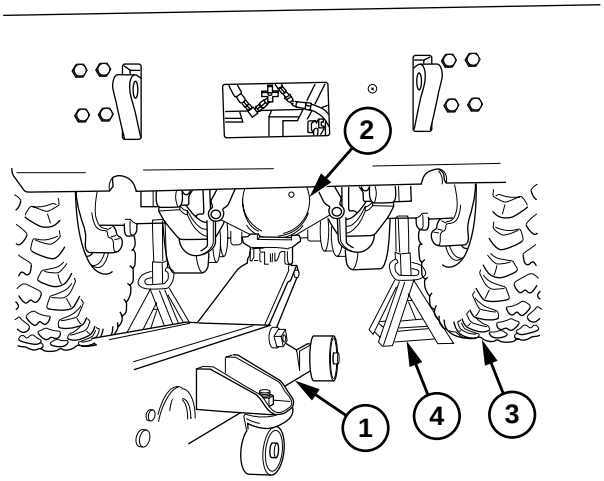
13-8. STEERING SYSTEM ADJUSTMENT (CONT)

WARNING

Floor jack must be positioned on flat surface. Placing jack on uneven or soft surface could result in truck falling, causing serious injury or death to personnel.

(6) Position floor jack (1) under axle no. 1 (2).

(7) Raise axle no. 1 (2) until tires (3) are 2-4 in. (5-10 cm) off ground.



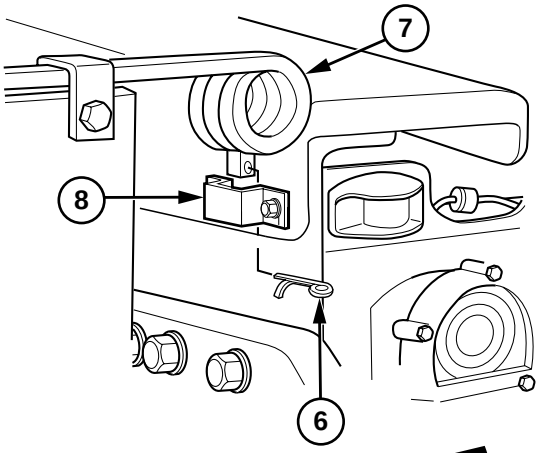
WARNING

Jackstands must be positioned on flat surface, not more than 10 in. (25.4 cm) from wheels. Placing jackstands on uneven or soft surface could result in truck falling, causing serious injury or death to personnel.

(8) Position two jackstands (4) under axle no. 1 (2).

(9) Lower floor jack (1) and support axle no. 1 (2) on jackstands.

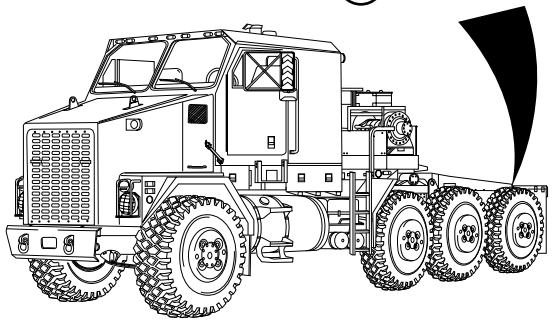
(10) Repeat steps (6) thru (9) for axle no. 4 (5).



NOTE

Left and right mud flaps are removed the same way. Left mud flap is shown.

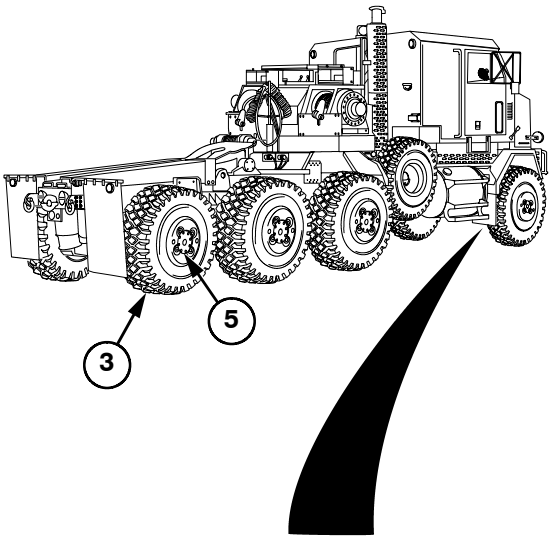
(11) Remove cotter pin (6) and mud flap bracket (7) from bracket (8). Discard cotter pin.



NOTE

Tires must be marked on lug (high spot) of tire tread.

(12) Scribe line around tires (3) on axle no. 1 (2) and axle no. 4 (5) by securely holding punch on tire tread (9) while rotating tire (3) by hand.



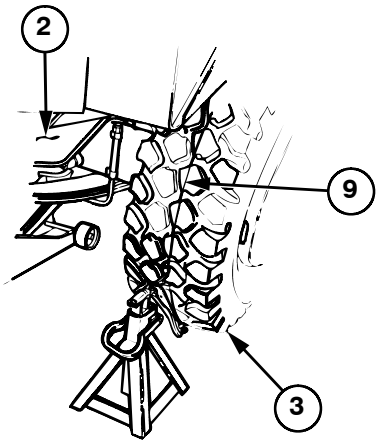
NOTE

Tires must not be rotated while performing steps (13) thru (15).

(13) Measure and mark four tires (3) on scribe lines made in step (12), 18–20 in. (46–51 cm) above ground at front and rear of each tire (3).

(14) Measure and record distance A at front and rear of front tires (3), between scribe lines at marks made in step (13) with aid of assistant.

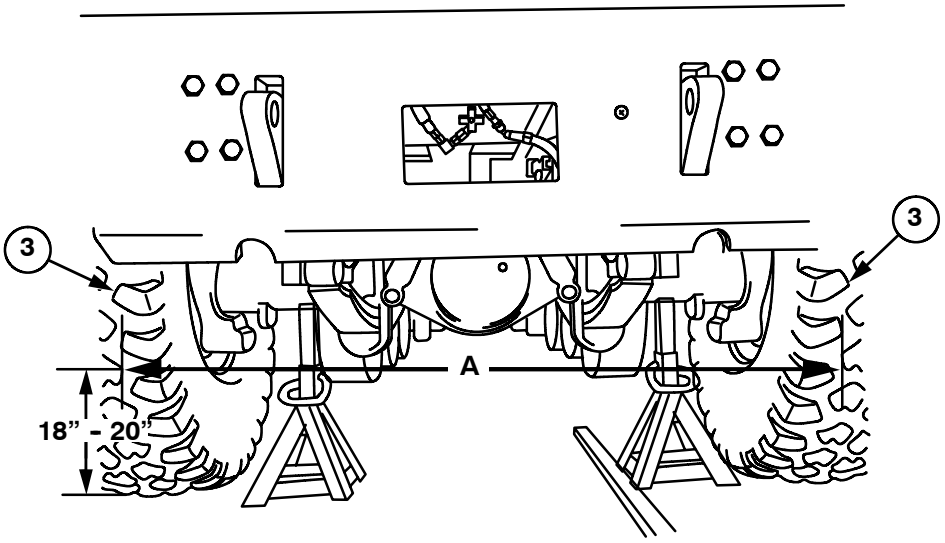
(15) Measure and record distance A at front and rear of rear tires (3), between scribe lines at marks made in step (13) with aid of assistant.



NOTE

Preferred distance between tires is 1/16 in. (1.6 mm) less across front than across rear. Acceptable difference is from 0–1/4 in. (0–6.4 mm) less across front than across rear.

(16) Compare front and rear distances measured between tires (3) on axle no.1 (2) and axle no. 4 (5).



13-8. STEERING SYSTEM ADJUSTMENT (CONT)

NOTE

- If distances are within specifications, toe-in adjustment is correct. Go to subpara (b).
- Axle no. 1 and axle no. 4 tie rods are adjusted in a similar manner. Axle no. 4 is shown.
- Left tie rod end has fine threads, right tie rod end has course threads.

(17) Remove locknut (10) and screw (11) from clamp (12). Discard locknut.

(18) Remove cotter pin (13) and nut (14) from tie rod end (15) on one side of HET Tractor only using socket (16). Discard cotter pin.

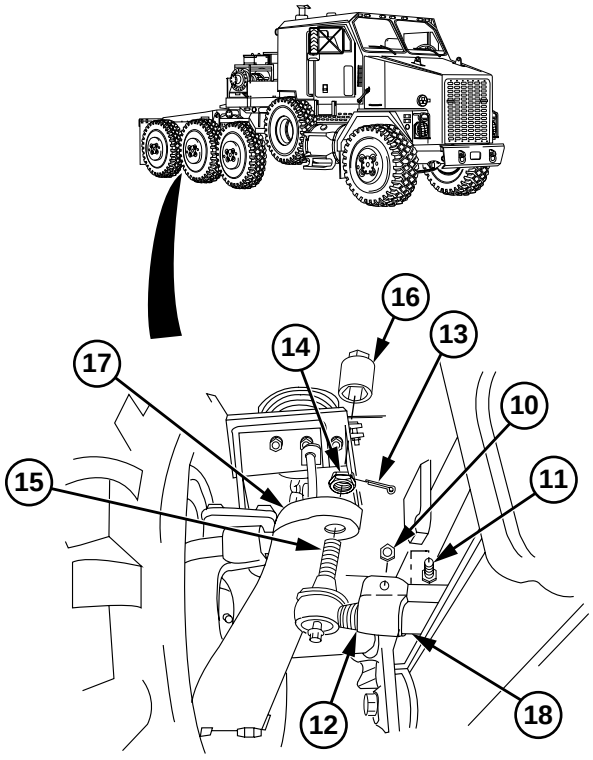
WARNING

Support tie rod end when removing hardware to prevent it from falling. Failure to comply may result in injury.

(19) Remove tie rod end (15) from steering arm (17).

NOTE

- Initial distance between tie rod grease fittings should be 61.5 in. (156 cm) for axle no. 1 and 59.6 in. (151 cm) for axle no. 4.
- Lengthening axle no. 1 tie rod will decrease front-side measurement; shortening will increase front-side measurement.
- Lengthening axle no. 4 tie rod will increase front-side measurement; shortening will decrease front-side measurement.



(20) Turn tie rod end (15) counterclockwise to lengthen or clockwise to shorten tie rod (18).

(21) Install screw (11) and new locknut (10) on clamp (12) to secure tie rod end (15) on tie rod (18).

(22) Install tie rod end (15) on steering arm (17).

(23) Tighten new locknut (10) on screw (11).

(24) Install nut (14) on tie rod end (15). Torque to 165-180 lb-ft (224-244 N·m) using socket (16).

(25) Verify adjustment by repeating steps (14) thru (16).

(26) Continue tightening nut (14) until hole in tie rod end (15) aligns with slots in nut (14).

(27) Install new cotter pin (13) through nut (14) and tie rod end (15).

(28) Repeat steps (17) thru (27) for axle no. 1 (2).

(29) Manually apply both spring brakes on axle no. 4 (5) (TM 9-2320-360-10).

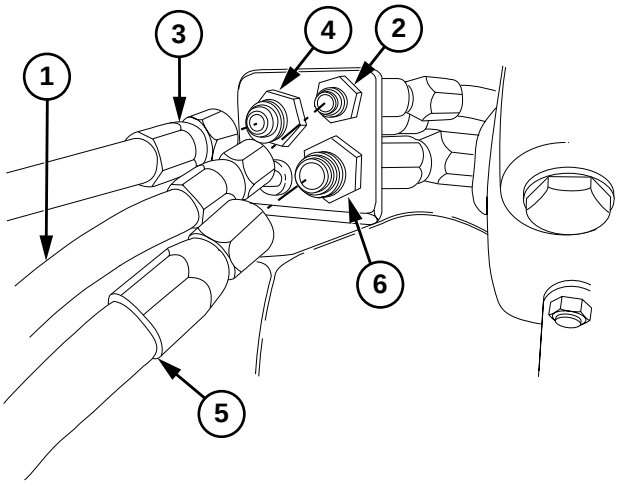
b. Steering Gear Pitman Arm Angle Adjustment

(1) Remove hose no. 2141 (1) from fitting (2).

(2) Remove hose no. 2016 (3) from fitting (4).

(3) Remove hose no. 2873 (5) from fitting (6).



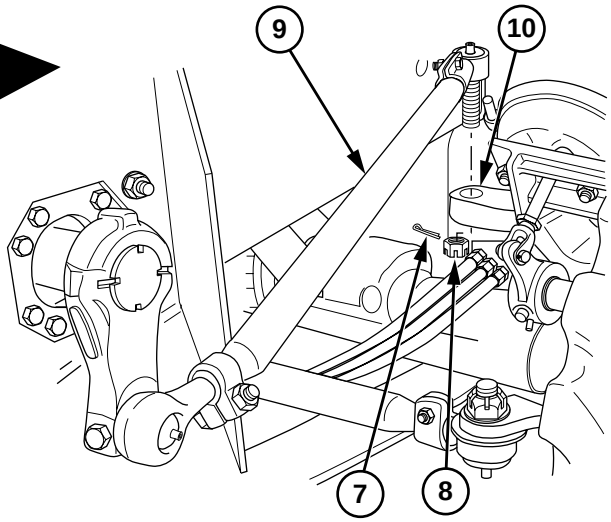


WARNING

Support drag link after removing hardware to prevent it from falling. Failure to comply may result in injury.

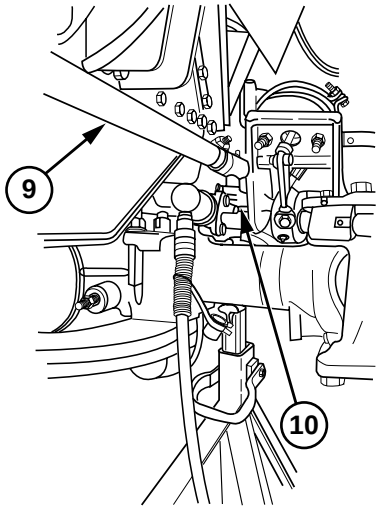
NOTE

Axle no. 1 and axle no. 4 drag links are removed from steering arm the same way. Axle no. 1 is shown.



(4) Remove cotter pin (7) from nut (8). Discard cotter pin.

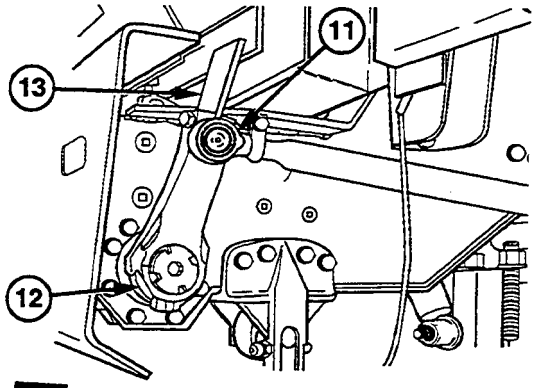
(5) Remove nut (8) from drag link (9).



(6) Remove drag link (9) from steering arm (10) using hydraulic hand jack.

(7) Repeat steps (4) thru (6) for axle no. 4.

13-8. STEERING SYSTEM ADJUSTMENT (CONT)



(8) Loosen nut (11) on front pitman arm (12).

(9) Clamp 3/16 in. (4.75 mm) steel plate (13) in front pitman arm (12) by tightening nut (11).

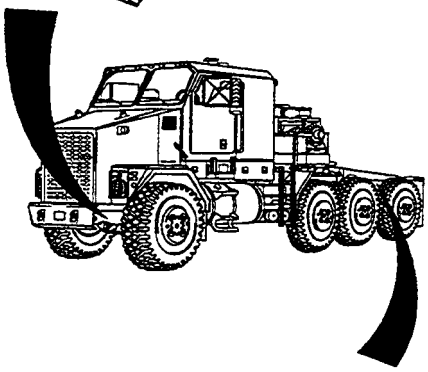
(10) Loosen nut (14) on rear pitman arm (15).

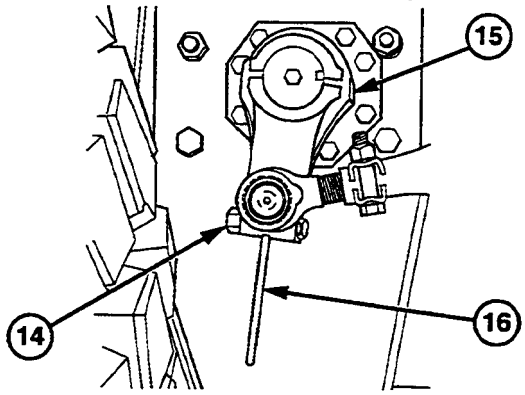
(11) Clamp 3/16 in. (4.75 mm) steel plate (16) in rear pitman arm (15) by tightening nut (14).

NOTE

Correct front pitman arm angle is when pitman arm is angled backward 6 °.

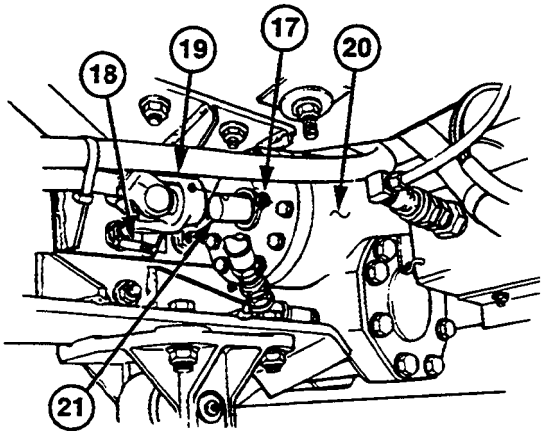
(12) Position combination square on steel plate (13) and measure front pitman arm (12) angle.





NOTE

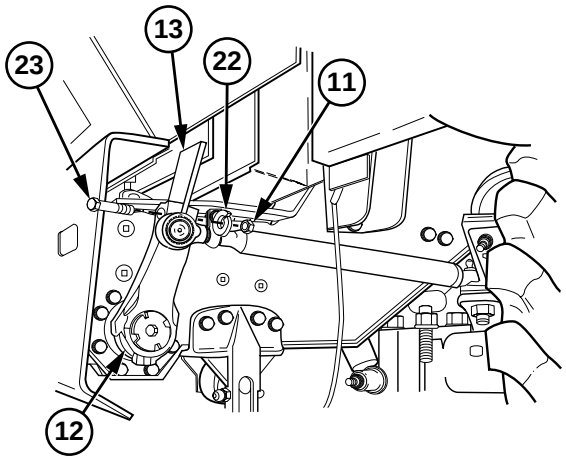
- Do not disconnect pitman arm from steering gear or steering gear from frame.
- Do steps (13) thru (15) to correct front pitman arm angle.



(13) Remove locknut (17), screw (18), and steering shaft no. 1 (19) from front steering gear no. 1 (20). Discard locknut.

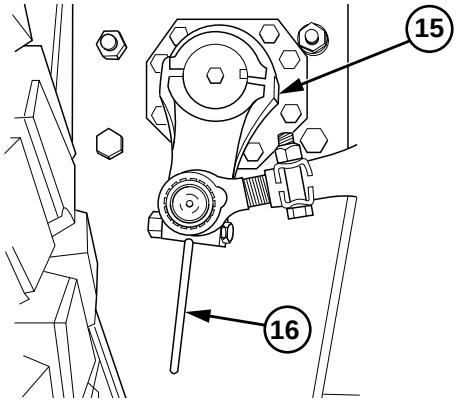
(14) Rotate steering gear input shaft (21) until front pitman arm (12) moves backward to an angle of 6 °.

(15) Install steering shaft no. 1 (19) on front steering gear (20) with screw (18) and new locknut (17). Torque to 35-40 lb-ft (47-54 N·m).



(16) Remove nut (11), lockwasher (22), screw (23), and steel plate (13) from front pitman arm (12). Discard lockwasher.

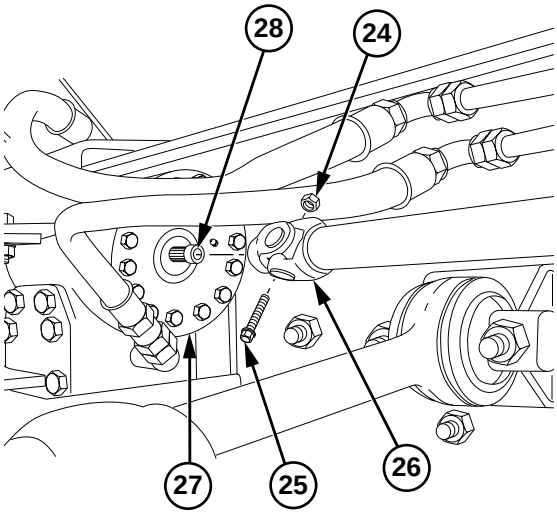
(17) Install screw (23), new lockwasher (22), and nut (11) on front pitman arm (12). Torque to 90 lb-ft (122 N·m).



NOTE

Correct rear pitman arm angle is when pitman arm is angled forward 9°.

(18) Position combination square on steel plate (16) and measure rear pitman arm (15) angle.



NOTE

Do steps (19) thru (21) to correct rear pitman arm angle.

(19) Remove locknut (24), screw (25), and steering shaft no. 5 (26) from rear steering gear (27). Discard locknut.

(20) Rotate rear steering gear input shaft (28) until pitman arm (15) moves forward to an angle of 9°.

(21) Install steering shaft (26) on steering gear (27) with screw (25) and new locknut (24). Torque to 35-40 lb-ft (47-54 N·m).

13-8. STEERING SYSTEM ADJUSTMENT (CONT)

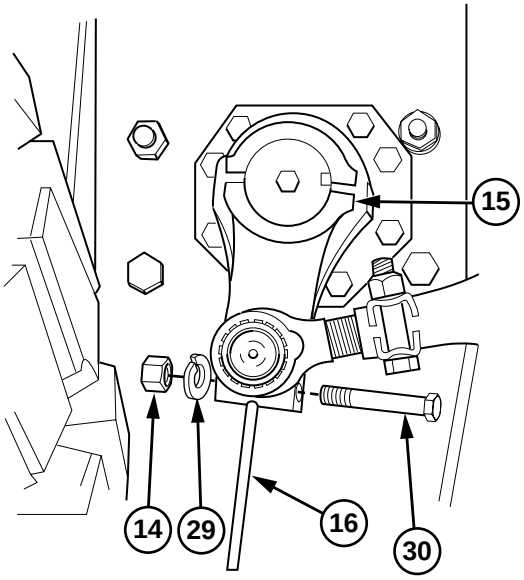
(22) Remove nut (14), lockwasher (29), screw (30), and steel plate (16) from rear pitman arm (15). Discard lockwasher.

(23) Install screw (30), new lockwasher (29), and nut (14) on rear pitman arm (15). Torque to 90 lb-ft (122 N·m).

NOTE

If front pitman arm comes in contact with bumper, repeat steps (13 thru 15) to adjust pitman arm so it does not come in contact with bumper.

(23) Start engine (TM 9-2320-360-10) and turn steering wheel to its full left position to check front pitman arm.



c. Drag Link Adjustment

CAUTION

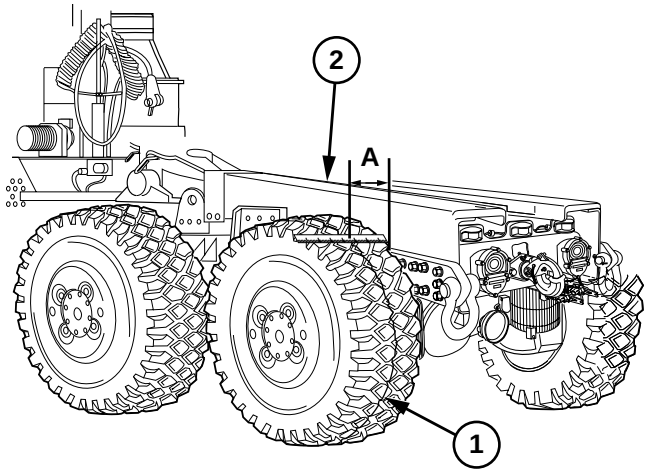
Axles must be positioned straight ahead before continuing with alignment procedure. Failure to comply may result in HET Tractor dogtracking or excessive tire wear.

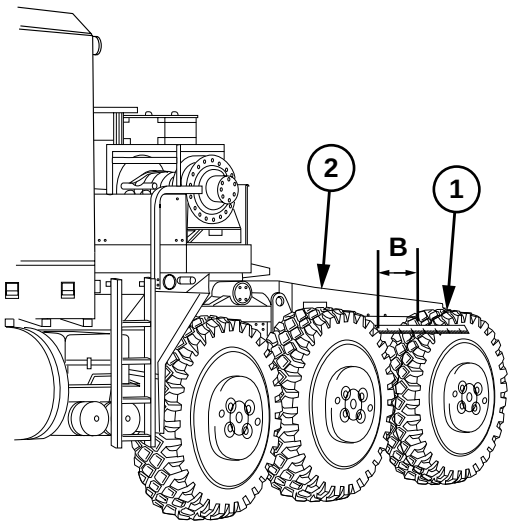
NOTE

Axle no. 1 and axle no. 4 are positioned in the same manner. Axle no. 4 is shown.

(1) Measure and record distance A between rear of left scribe line (1) and left frame (2).

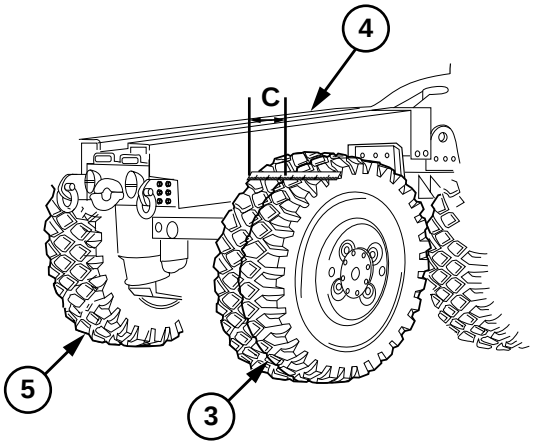
(2) Measure and record distance B between front of left scribe line (1) and left frame (2).





(3) Measure and record distance C between rear of right scribe line (3) and right frame (4).

(4) Measure and record distance D between front of right scribe line (3) and right frame (4).



NOTE

- When measurements found in steps (5) and (6) are equal, wheel are pointed straight ahead.
- Front measurement should be less than or equal to rear measurement.

(5) Subtract front distance B from rear distance A and record.

(6) Subtract front distance D from rear distance C and record.

NOTE

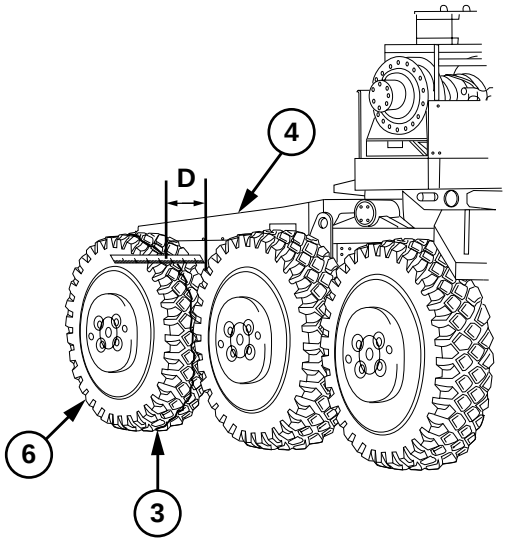
If measurements are unequal, do step (7).

(7) Reposition wheels (5 and 6) and repeat steps (1) thru (6).

NOTE

Add 3/8 in. (9.53 mm) to front measurements of axle no. 1 to allow for thickness of drop frame.

(8) Repeat steps (1) thru (7) for axle no. 1.



13-8. STEERING SYSTEM ADJUSTMENT (CONT)

CAUTION

Drag link must drop directly into hole in steering arm. If steering arm or pitman arm is moved when installing drag link, HET Tractor alignment will be incorrect and dogtracking or tire wear may result.

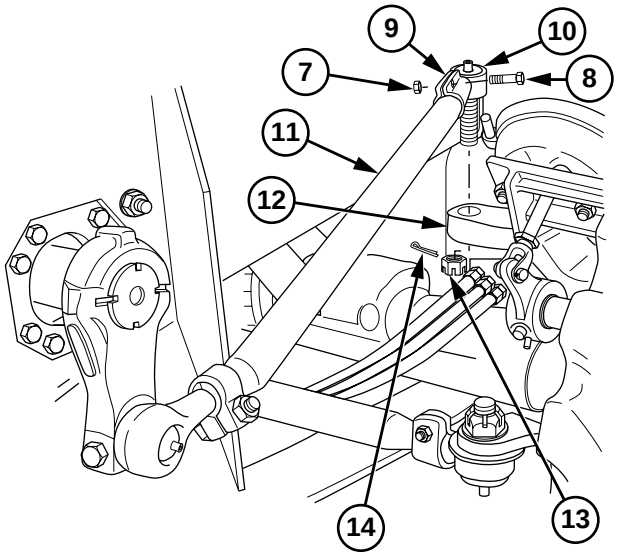
NOTE

- If drag link does not drop directly into steering arm, do steps (9) and (10).
- Axle no. 1 and axle no. 4 drag links are positioned in the same manner. Axle no. 4 is shown.
- Initial distance between drag link grease fittings is 40 in. (101.6 cm) for axle no. 1 and 34 in. (86.4 cm) for axle no. 4.

(9) Remove locknut (7) and screw (8) from drag link clamp (9). Discard locknut.

(10) Rotate drag link end (10) clockwise to shorten and counterclockwise to lengthen drag link (11).

(11) Install drag link (11) on steering arm (12).



CAUTION

The front clamp on the axle no.1 drag link must be positioned so the clamp screw is vertical. Failure to comply may result in screw contacting the frame, causing damage to equipment.

NOTE

Go to step (13) if drag link was not adjusted.

(12) Tighten drag link clamp (9) with screw (8) and new locknut (7). Torque to 70 lb-ft (95 N·m).

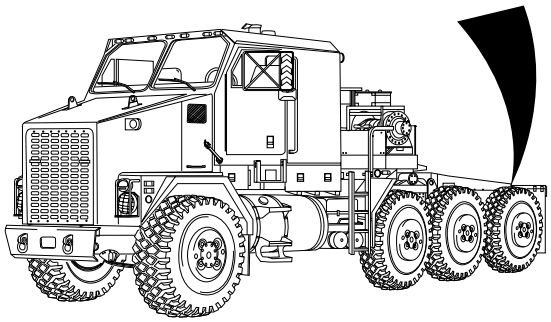
(13) Repeat steps (1) thru (6) to verify adjustment.

(14) Install nut (13) on drag link (11). Torque to 165 lb-ft (224 N·m).

(15) Continue tightening until hole in drag link end (10) aligns with slots in nut (13).

(16) Install new cotter pin (14) through nut (13) and drag link end (10).

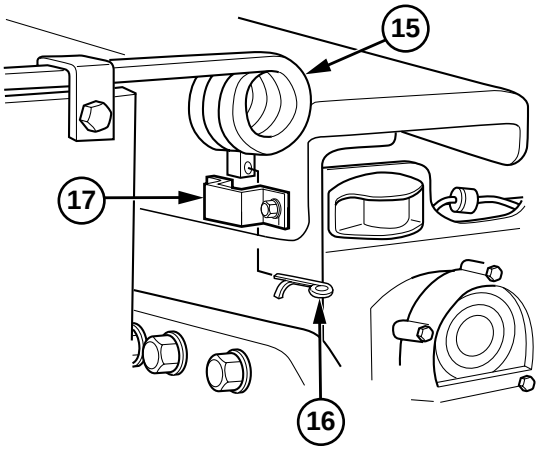
(17) Repeat steps (9) thru (16) for axle no. 1.



NOTE

Left and right mud flaps are installed in the same way. Left mud flap is shown.

(18) Install mud flap bracket (15) and new cotter pin (16) on bracket (17).



13-9. STEERING STOP BOLT REPLACEMENT/ADJUSTMENT

This task covers:
- Removal
- Installation
- Adjustment
- Follow-On Maintenance

INITIAL SETUP

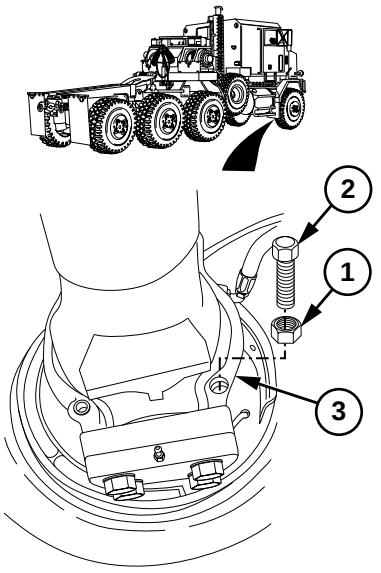
Equipment Conditions
- Steering system adjusted (para 13-8).
- CTIS in highway mode (TM 9-2320-360-10).
- Tires inflated to 75 psi (517 kPa).
- Engine shut off (TM 9-2320-360-10).
- Parking brake on (TM 9-2320-360-10).
- Wheels straight ahead.

Personnel Required
- Two

Tools and Special Tools
- Tool Kit, Genl Mech (Item 202, Appendix E)
- Hydraulic Test Kit (Item 72, Appendix E)
- Jack, Floor (Item 90, Appendix E)
- Jackstands (5) (Item 93, Appendix E)
- Plate, Steel (Figure C-13, Appendix C)
- Template, Steering Radius (Figure C-22, Appendix C)
- Tape, Measuring, 12 Ft (Item 189, Appendix E)
- Wrench, Torque, 0-175 Lb-Ft (Item 236 Appendix E)
- Plumb Bob (Item 115.1, Appendix E)

NOTE

Both front and rear axle stops are removed the same way. Axle no. 1 is shown.



a. Removal

(1) Loosen jam nut (1) on steering stop bolt (2).

(2) Remove steering stop bolt (2) and jam nut (1) from spindle (3).

b. Installation.

(1) Install steering stop bolt (2) and jam nut (1) on spindle (3).

(2) Tighten jam nut (1) on steering stop bolt (2).

c. Adjustment

(1) Start engine (TM 9-2320-360-10).

(2) Drive HET Tractor straight back about 20 ft (6 m), then straight forward about 20 ft (6 m). Park with wheels straight.

(3) Shut off engine (TM 9-2320-360-10).

(4) Chock wheels (axle no. 2 or axle no. 3).

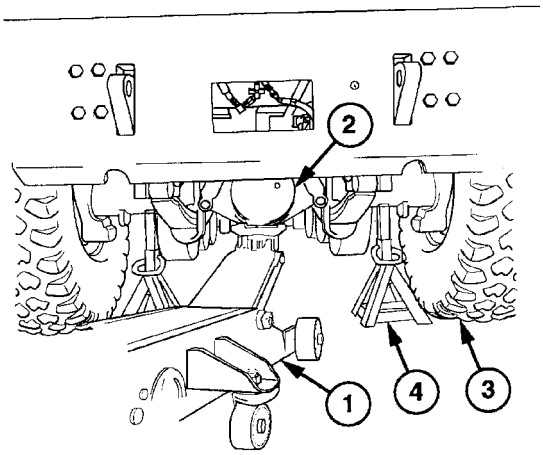
(5) Deleted.

WARNING

Floor jack must be positioned on flat surface. Placing jack on uneven or soft surface could result in truck falling, causing serious injury or death to personnel.

(6) Position floor jack (1) under axle no. 1 (2).

(7) Raise axle no. 1 (2) until tires (3) are 2–4 in. (5–10 cm) off ground.

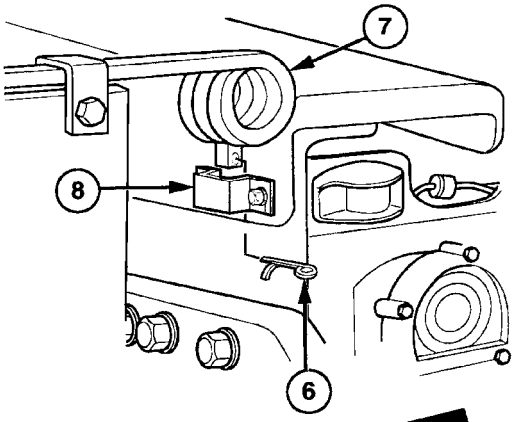


WARNING

Jackstands must be positioned on flat surface, next to spring hangers and suspension beams. Failure to comply may result in wheels contacting jack stands. Placing jackstands on uneven or soft surface could result in truck falling, causing serious injury or death to personnel.

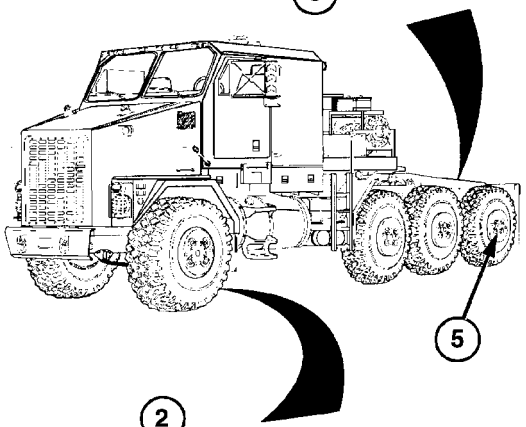
(8) Position two jackstands (4) under axle no. 1 (2).

(9) Lower floor jack (1) and support axle no. 1 (2) on jackstands.



(10) Repeat steps (6) thru (9) for axle no. 4 (5).

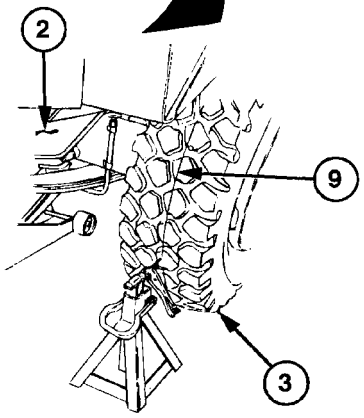
(11) Deleted.



NOTE

Tires must be marked on lug (high spot) of tire tread.

(12) Scribe line around tires (3) on axle no. 1 (2) by securely holding punch on tire tread (9) while rotating tire (3) by hand.



(13) thru (28) Deleted.

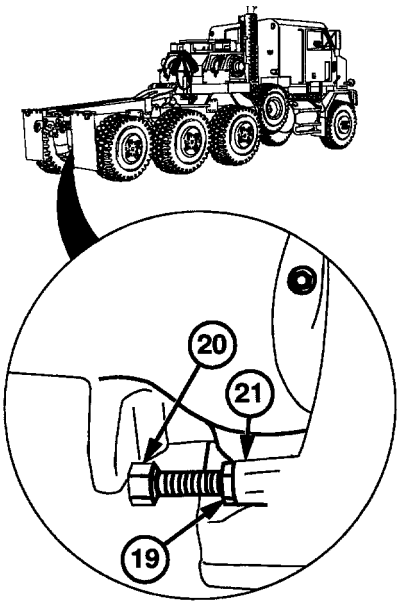
13-9. STEERING STOP BOLT REPLACEMENT/ADJUSTMENT (CONT)

(29) Loosen jam nut (19) on both rear steering stop bolts (20).

(30) Turn both rear steering stop bolts (20) into spindles (21) as far as possible.

CAUTION

Wheels must be positioned straight ahead before continuing with procedure. Failure to comply may cause steering stops to be adjusted improperly and result in damage to equipment.



NOTE

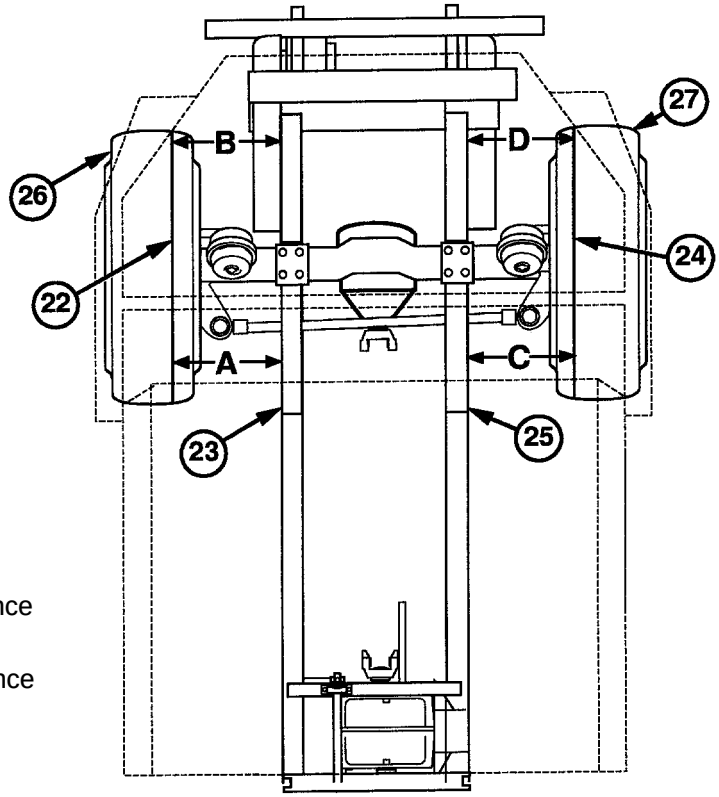
Add 3/8 in. (9.53 mm) to front measurements of axle no. 1 to allow for thickness of drop frame.

(31) Measure and record distance A between rear of left scribe line (22) and left frame (23).

(32) Measure and record distance B between front of left scribe line (22) and left frame (23).

(33) Measure and record distance C between rear of right scribe line (24) and right frame (25).

(34) Measure and record distance D between front of right scribe line (24) and right frame (25).



NOTE

- Front measurement should be less than or equal to rear measurement.
- When measurements found in steps (35) and (36) are equal, wheels are pointed straight ahead.

(35) Subtract front distance B from rear distance A and record.

(36) Subtract front distance D from rear distance C and record.

NOTE

If measurements are unequal, do step (37).

(37) Reposition wheels (26) and (27) and repeat steps (31) thru (36).

(37) Reposition wheels (26) and (27) and repeat steps (31) thru (36).

(38) Measure and mark front tires, 27–30 in. (68–76 cm) above ground at front and rear of each tire on scribe lines made in step (12).

(39) Drop plumb bob to floor at the intersection of the scribe lines and marks made in step (38).

(40) Draw a line connecting the points made in step (39).

NOTE

To adjust right steering stops do steps (41) thru (50.3).

(41) Turn steering wheel to full right position with aid of assistant.

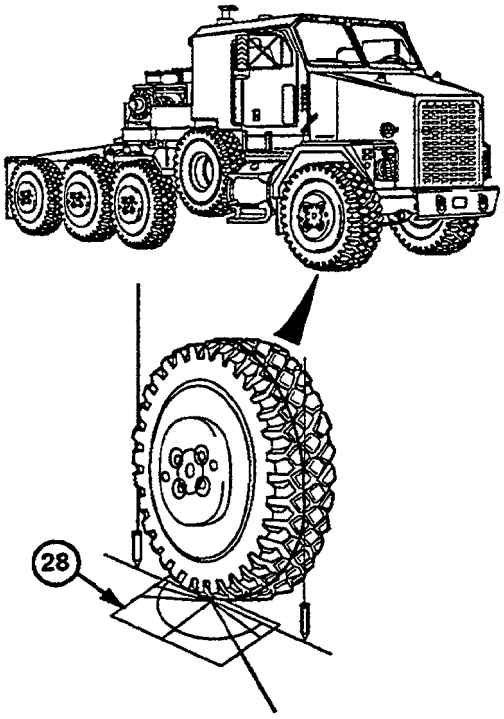
(42) Drop plumb bob to floor at the intersection of the scribe lines and marks made in step (38).

(43) Draw a line connecting points made in step (42).

NOTE

Proper steering radius for axle no. 1 is 36 degrees, +/– 1.5 degrees.

(44) Measure turning radius of right wheel using template (28).



13-9. STEERING STOP BOLT REPLACEMENT/ADJUSTMENT (CONT)

NOTE

- Go to step (49) if adjustment is correct.
- Steering stop bolt should be turned clockwise to increase steering radius; counter-clockwise to decrease steering radius.

(45) Turn steering wheel to straight ahead position.

(46) Loosen jam nut (29) and adjust right steering stop bolt (30).

(47) Tighten jam nut (29) on right steering stop bolt (30).

(48) Repeat steps (41) thru (44) to verify adjustment.

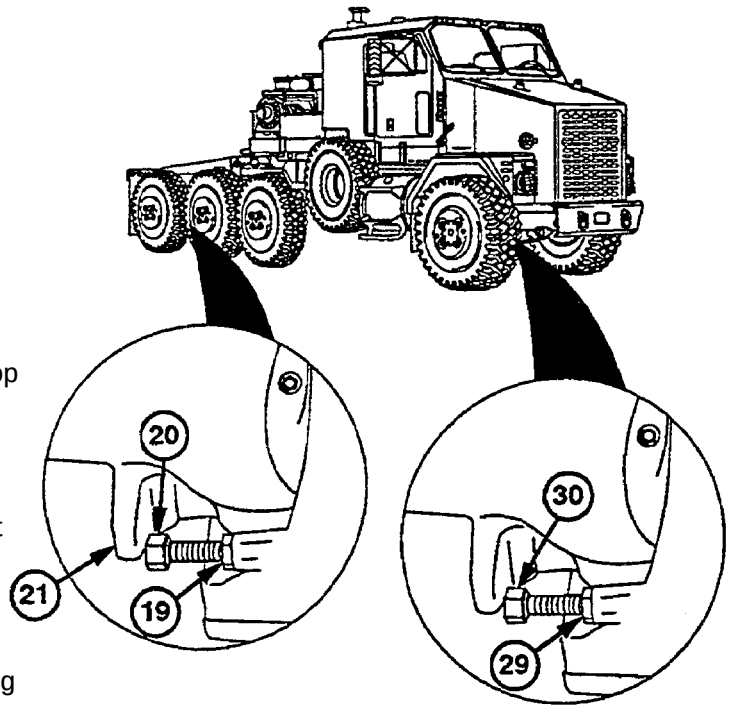
(49) Turn right rear steering stop bolt (20) out until bolt contacts axle housing (21).

(50) Turn right rear steering stop bolt (20) in one turn.

(50.1) Tighten jam nut (19) on right rear steering stop bolt (20).

(50.2) Turn steering wheel to the straight ahead position.

(50.3) Turn the steering wheel back to full right position and confirm that there is a minimum of 1/16 in. (1.59 mm) gap between steering stop bolt (20) and axle housing (21).



NOTE

To adjust left steering stops do steps (51) thru (63).

(51) Turn steering wheel to full left position with aid of assistant.

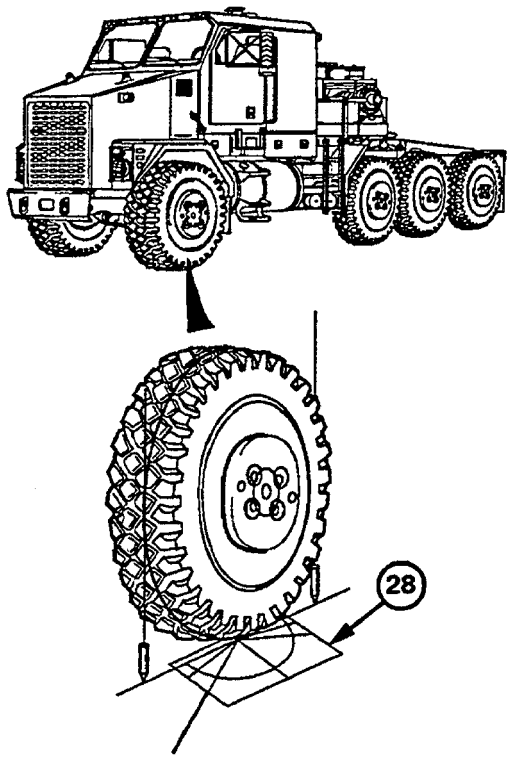
(52) Drop plumb bob to floor at the intersection of the scribe lines and marks made in step (38).

(53) Draw a line connecting the points made in step (52).

NOTE

Proper steering radius for axle no. 1 is 36 degrees, +/– 1.5 degrees.

(54) Measure turning radius of left wheel using template (28).



13-9. STEERING STOP BOLT REPLACEMENT/ADJUSTMENT (CONT)

NOTE

- Go to step (59) if adjustment is correct.
- Steering stop bolt should be turned clockwise to increase steering radius; counter-clockwise to decrease steering radius.

(55) Turn steering wheel to straight ahead position with aid of assistant.

(56) Loosen jam nut (31) and adjust left steering stop bolt (32).

(57) Tighten jam nut (31) on left steering stop bolt (32).

(58) Repeat steps (51) thru (54) to verify adjustment.

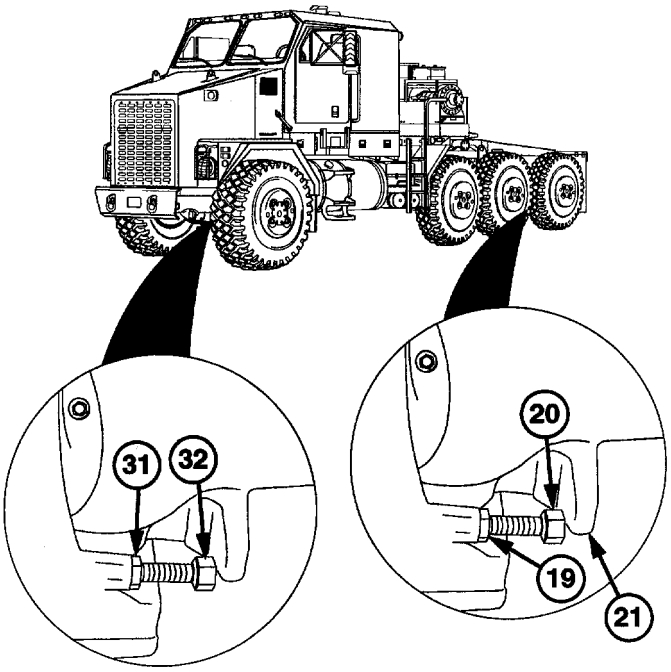
(59) Turn left rear steering stop bolt (20) out until bolt contacts axle housing (21).

(60) Turn left rear steering stop bolt (20) in one turn.

(61) Tighten jam nut (19) on right rear steering stop bolt (20).

(62) Turn steering wheel to the straight ahead position.

(63) Turn the steering wheel back to full left position and confirm that there is a minimum of 1/16 in. (1.59 mm) gap between steering stop bolt (20) and axle housing (21).



d. Steering Gear Relief Adjustment.

NOTE

Do steps (1) thru (14) to adjust front steering gear, steps (15) thru (28) to adjust rear steering gear.

(1) Remove hose no. 2301 (1) and elbow (2) from front steering gear (3).

(2) Install flowmeter (4) on hose no. 2301 (1) and steering gear (3).

CAUTION

The relief valve plungers on front steering gear must be adjusted so there is 1/16 in. (1.6 mm) between spindles and steering stops. A steel plate must be held between steering stop and axle housing to obtain this space. Failure to comply may result in damage to suspension, brake, steering, or frame components.

NOTE

- Turning relief plunger in will increase space between axle stops; out will decrease space between axle stops.
- Leakage will occur if relief valve plungers are turned beyond flush with plunger boss.

(3) Turn rear relief valve plunger (5) out until flush with plunger boss (6).

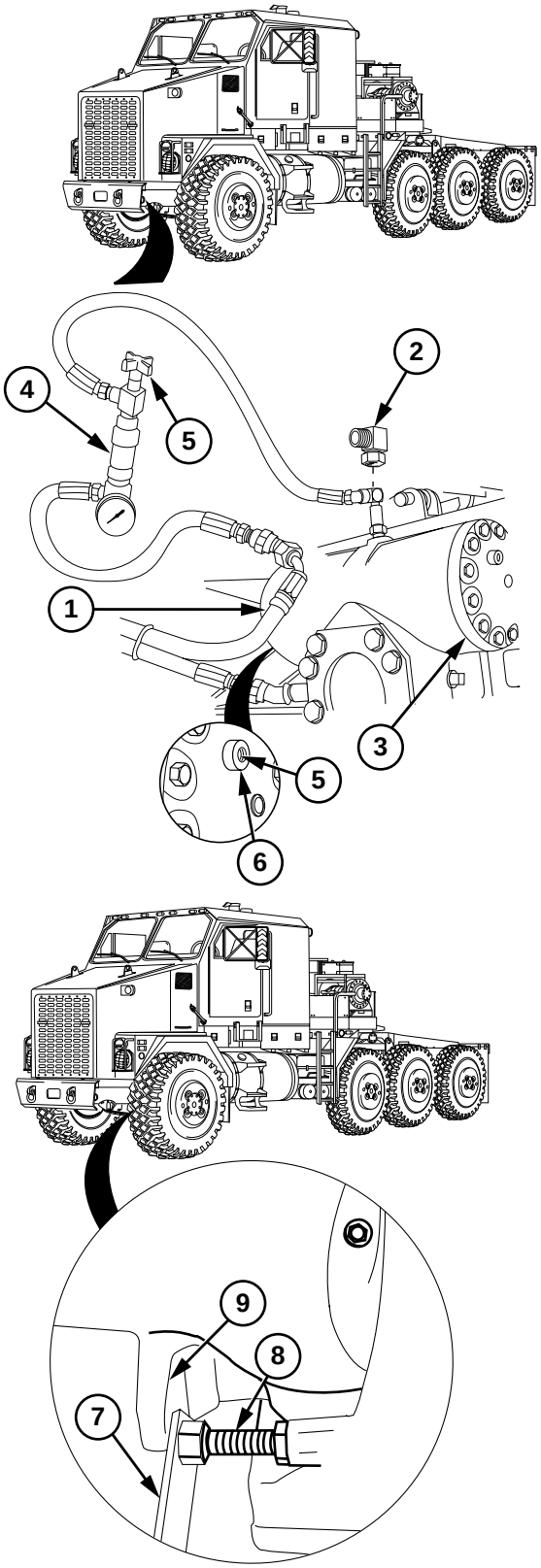
(4) Start engine (TM 9-2320-360-10).

WARNING

Keep hands and fingers from between steering stop and axle housing. Failure to comply will result in injury to personnel.

(5) Place steel plate (7) between steering stop bolt (8) and axle housing (9) while assistant holds steering wheel in full right position.

(6) Turn rear relief plunger (5) in until pressure gage reads 500-650 psi (3448-4482 kPa).



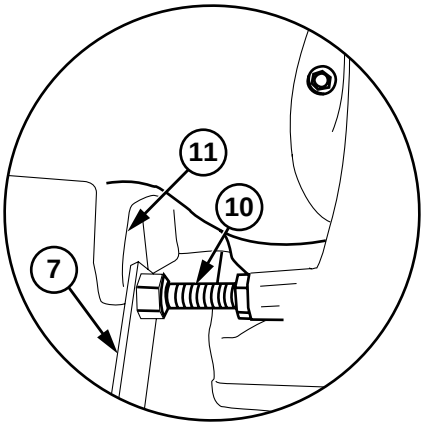
13-9. STEERING STOP BOLT REPLACEMENT/ADJUSTMENT (CONT)

(7) Release steering wheel, remove steel plate (7) and return to full right position to verify that pressure drops.

(8) Turn front relief valve plunger (8) out until flush with plunger boss (9).

WARNING

Keep hands and fingers from between steering stop and axle housing. Failure to comply will result in injury to personnel.

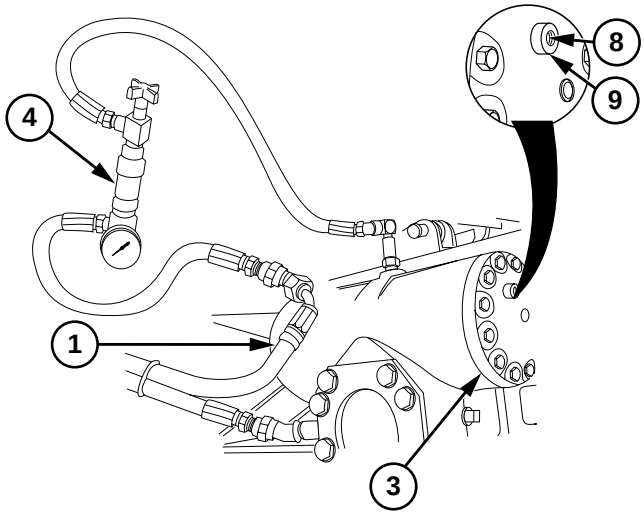


(9) Place steel plate (7) between steering stop bolt (10) and axle housing (11) while assistant holds steering wheel in full left position.

(10) Turn front relief plunger (8) in until pressure gage reads 500–650 psi (3448–4482 kPa).

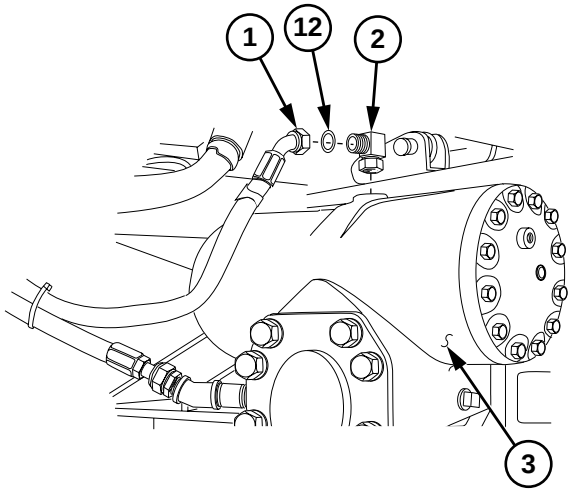
(11) Release steering wheel, remove steel plate (7) and return to full left position to verify that pressure drops.

(12) Shut off engine (TM 9-2320-360-10).



(13) Remove flowmeter (4) from hose no. 2301 (1) and steering gear (3).

(14) Install elbow (2), new preformed packing (12) and hose no. 2301 (1) on steering gear (3).



(15) Remove hose no. 2275 (13) and elbow (14) from rear steering gear (15).

(16) Install flowmeter (4) on hose no. 2275 (13) and steering gear (15).

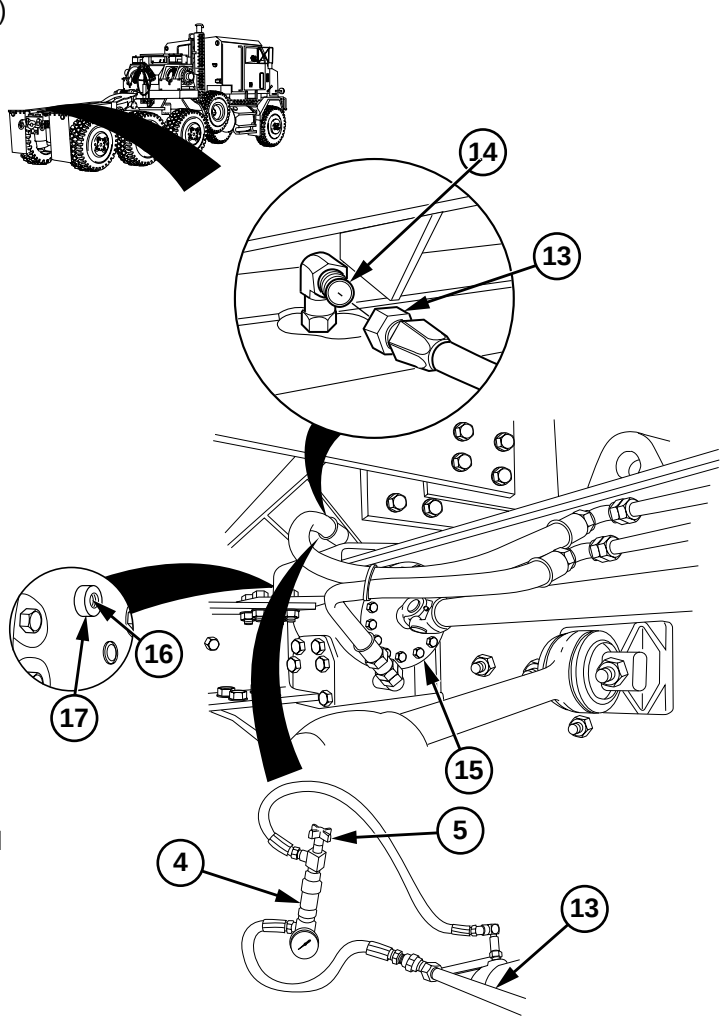
CAUTION

The relief valve plungers on rear steering gear must be adjusted so there is 1/16 in. (1.6 mm) between spindles and steering stops. A steel plate must be held between steering stop and axle housing to obtain this space. Failure to comply may result in damage to suspension, brake, steering. or frame components.

NOTE

- Turning relief plunger in will increase space between axle stops; out will decrease space between axle stops.
- Leakage will occur if relief valve plungers are turned beyond flush with plunger boss.

(17) Turn rear relief valve plunger (16) out until flush with plunger boss (17).



13-9. STEERING STOP BOLT REPLACEMENT/ADJUSTMENT (CONT)

(18) Start engine (TM 9-2320-360-10).

WARNING

Keep hands and fingers from between steering stop and axle housing. Failure to comply will result in injury to personnel.

(19) Place steel plate (7) between steering stop bolt (18) and axle housing (19) while assistant holds steering wheel in full right position.

(20) Turn rear relief plunger (16) in until pressure gage reads 500-650 psi (3448-4482 kPa).

(21) Release steering wheel, remove steel plate (7) and return to full right position to verify that pressure drops.

(22) Turn front relief valve plunger (20) out until flush with plunger boss (21).

(23) Place steel plate (7) between steering stop bolt (22) and axle housing (23) while assistant holds steering wheel in full left position.

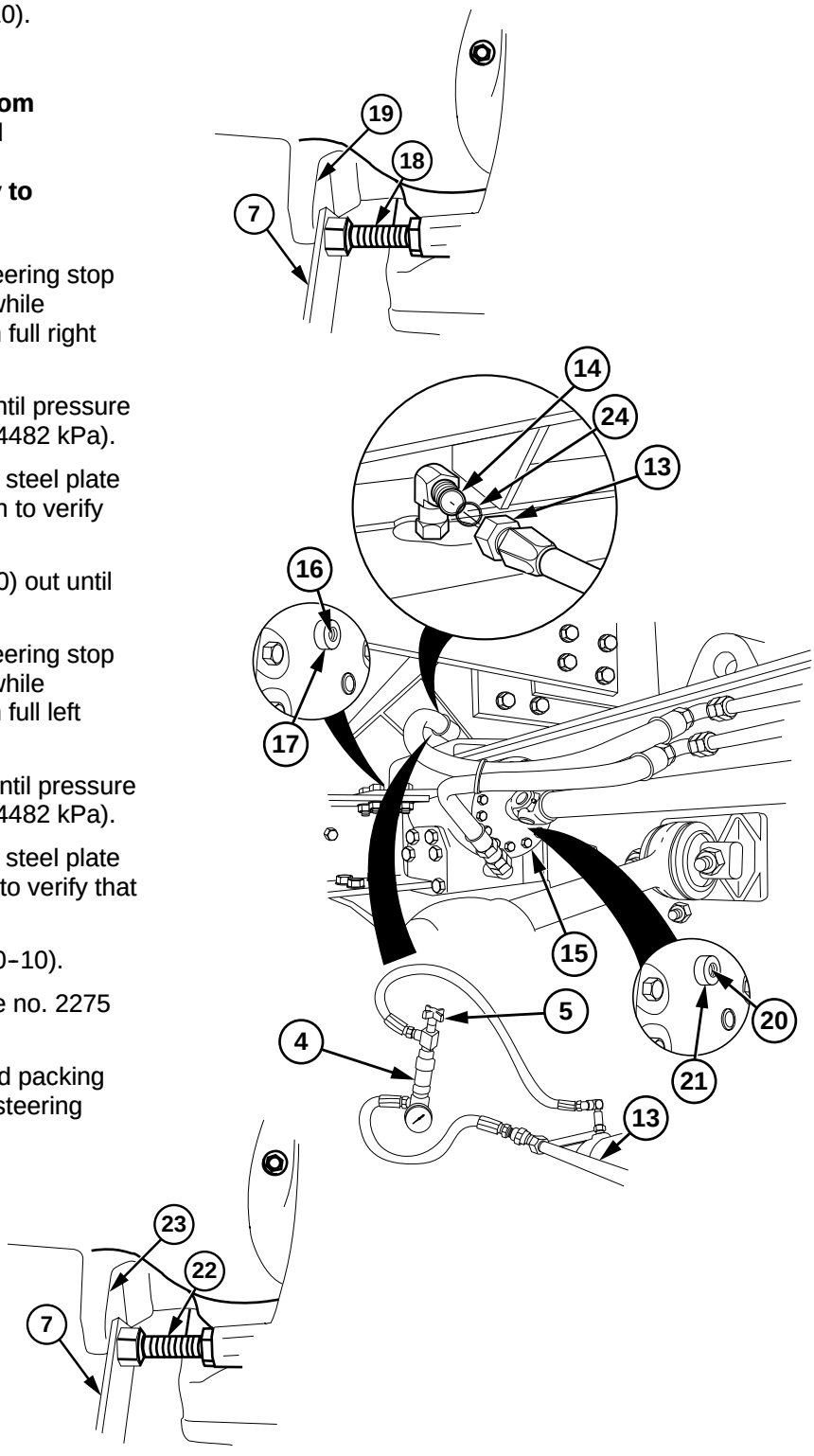
(24) Turn front relief plunger (20) in until pressure gage reads 500-650 psi (3448-4482 kPa).

(25) Release steering wheel, remove steel plate (7) and return to full left position to verify that pressure drops.

(26) Shut off engine (TM 9-2320-360-10).

(27) Remove flowmeter (4) from hose no. 2275 (13) and rear steering gear (15).

(28) Install elbow (14), new preformed packing (24) and hose no. 2275 (13) on steering gear (15).



e. Follow-On Maintenance.

(1) Check and fill power steering reservoir (LO 9-2320-360-12).

(2) Remove wheel chocks.

13-10. STEERING PUMP PRESSURE ADJUSTMENT

This task covers:
a. Adjustment

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Personnel Required
Two

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Hydraulic Test Kit (Item 72, Appendix E)

Materials/Parts
Packing, Preformed (2) (Item NO TAG, Appendix F)

a. Adjustment.

(1) Remove hose no. 2301 (1) and elbow (2) from front steering gear (3).

(2) Install flow meter (4) on hose no. 2301 (1) and steering gear (3).

WARNING

Use caution when working on running engine. Tools, clothing, or hands may get caught and cause serious injury to personnel.

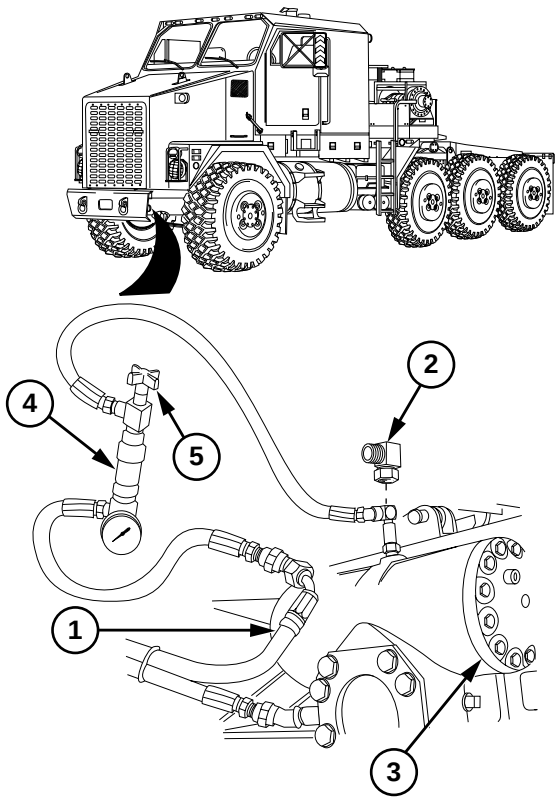
(3) Start engine (TM 9-2320-360-10).

CAUTION

Do not increase engine speed above idle. Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may result in damage to equipment.

(4) Close load valve (5) and observe pressure gage. Open the load valve (5).

(5) Shut off engine (TM 9-2320-360-10).



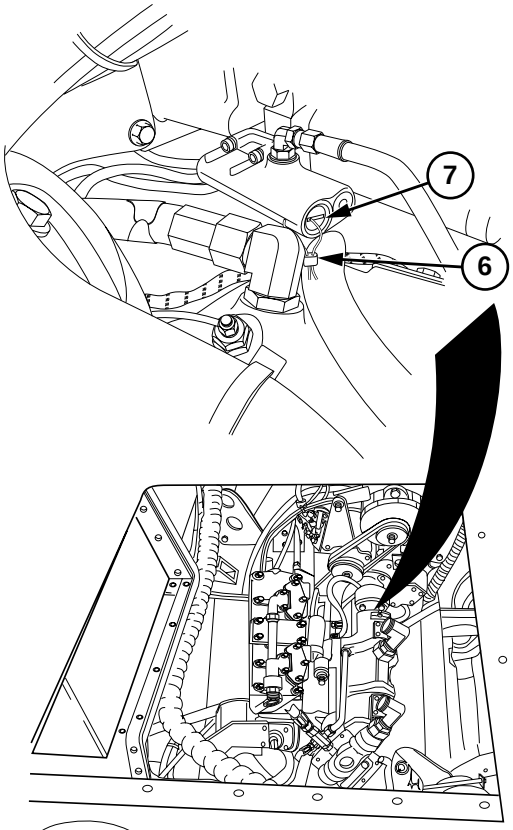
13-10. STEERING PUMP PRESSURE ADJUSTMENT (CONT)

NOTE

If pressure is not 1900-2100 psi (13101-14480 kPa), do steps (6) thru (10).

(6) Remove lower engine access panel (TM 9-2320-360-20).

(7) Cut and remove lockwire (6) from compensator (7).



WARNING

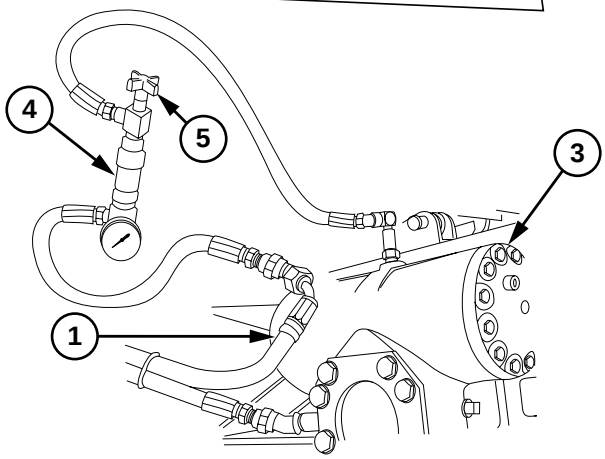
Use caution when working on running engine. Tools, clothing, or hands may get caught and cause serious injury to personnel.

(8) Start engine (TM 9-2320-360-10).

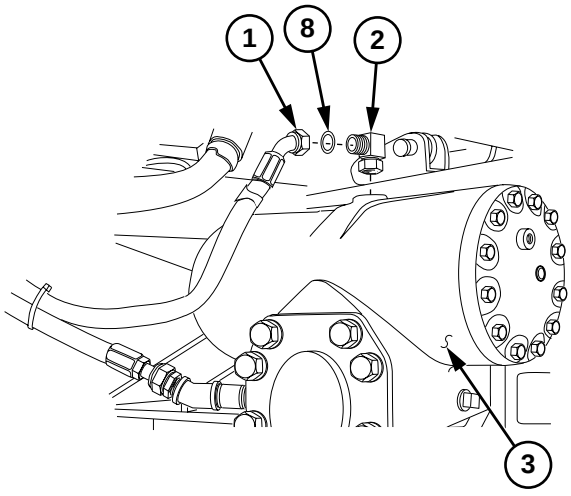
(9) Close load valve (5) and adjust front steering pump compensator (7) until pressure gage reads 2000 psi (13790 kPa) with aid of assistant. Open load valve (5).

(10) Shut off engine (TM 9-2320-360-10).

(11) Remove flow meter (4) from hose no. 2301 (1) and front steering gear (3).



(12) Install elbow (2), new preformed packing (8) and hose no. 2301 (1) on front steering gear (3).



(13) Remove hose no. 2275 (9) and elbow (10) from rear steering gear (11).

(14) Install flowmeter (4) on hose no. 2275 (9) and steering gear (11).

WARNING

Use caution when working on running engine. Tools, clothing, or hands may get caught and cause serious injury to personnel.

(15) Start engine (TM 9-2320-360-10).

CAUTION

Do not increase engine speed above idle. Closing the load valve will drop the flow to zero and put the pump into relief. This should be limited to 10 seconds. Failure to comply may result in damage to equipment.

(16) Close load valve (5) and observe pressure gage. Open load valve (5).

(17) Shut off engine (TM 9-2320-360-10).

(18) Remove lower engine access panel (TM 9-2320-360-20).

(19) Cut and remove lockwire (12) from compensator (13).

WARNING

Use caution when working on running engine. Tools, clothing, or hands may get caught and cause serious injury to personnel.

(20) Start engine (TM 9-2320-360-10).

(21) Close load valve (5) and adjust rear steering pump compensator (13) until pressure gage reads 1700 psi (11722 kPa) with aid of assistant. Open load valve (5).

(22) Shut off engine (TM 9-2320-360-10).

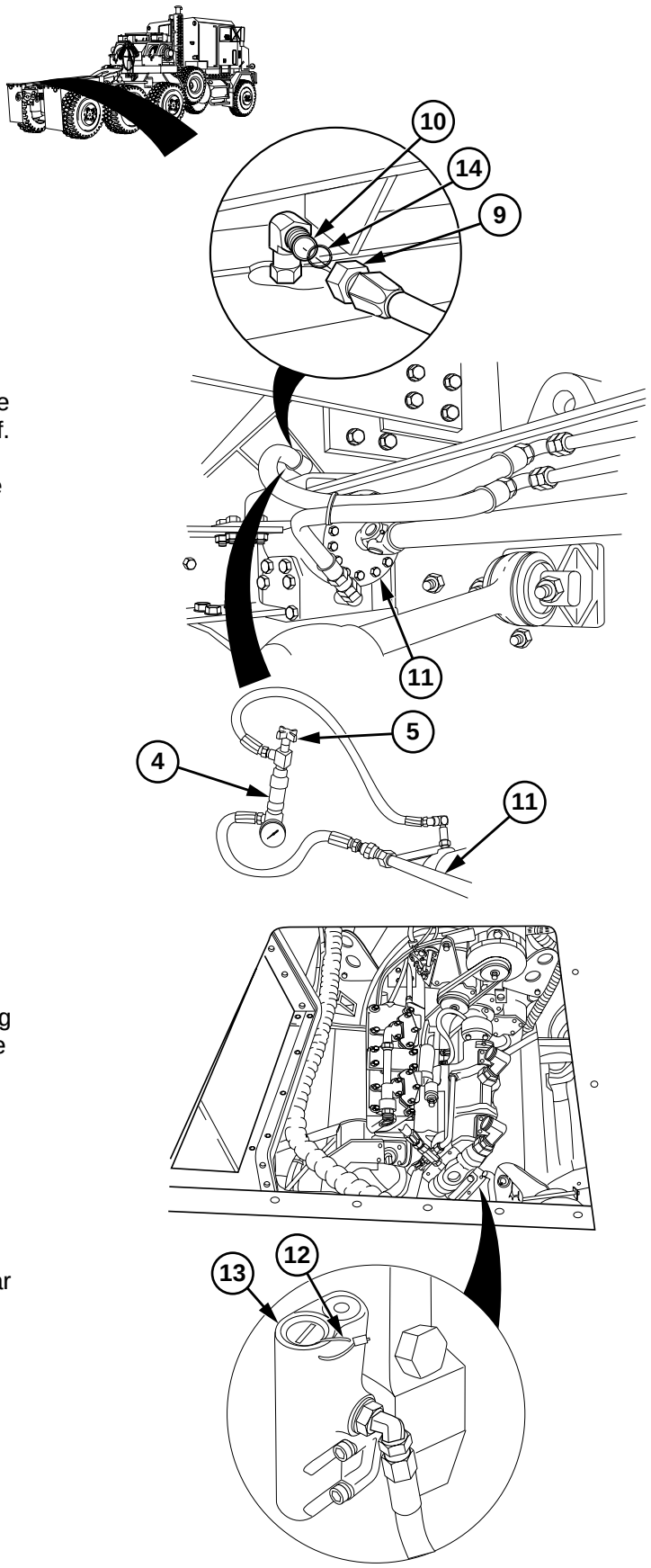
(23) Remove flowmeter (4) from hose no. 2275 (9) and rear steering gear (11).

(24) Install elbow (10), new preformed packing (14) and hose no. 2275 (9) on steering gear (11).

b. Follow-On Maintenance.

(1) Check and fill power steering reservoir (LO 9-2320-360-12).

(2) Remove wheel chocks.



CHAPTER 14
FRAME MAINTENANCE

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Section I. INTRODUCTION

14-1. INTRODUCTION

This chapter contains instructions for replacement and repair of frame components at the Direct Support maintenance level. Some parts must be removed before the frame components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

14-2. FRONT CROSSTUBE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front bumper removed (TM 9-2320-360-20).

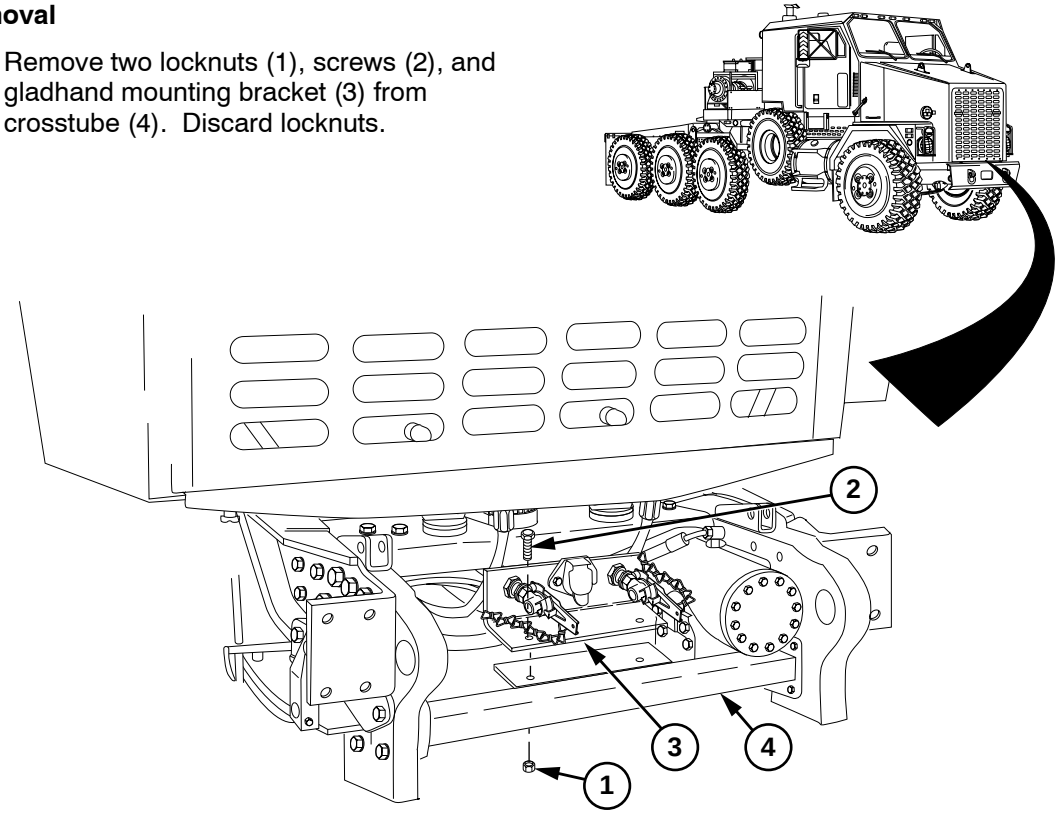
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack Kit, Hydraulic, Hand (Item 92, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 5, Appendix B)
Locknuts (2) (Item 81, Appendix F)

Personnel Required
Two

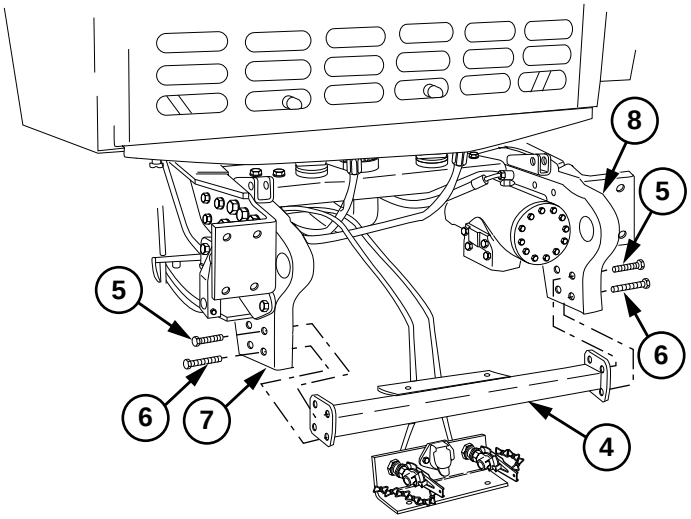
a. Removal

(1) Remove two locknuts (1), screws (2), and gladhand mounting bracket (3) from crosstube (4). Discard locknuts.



(2) Remove two screws (5) and screws (6) from right tow eye (7).

(3) Remove two screws (5) , screws (6), and crosstube (4) from left tow eye (8).



b. Installation

WARNING

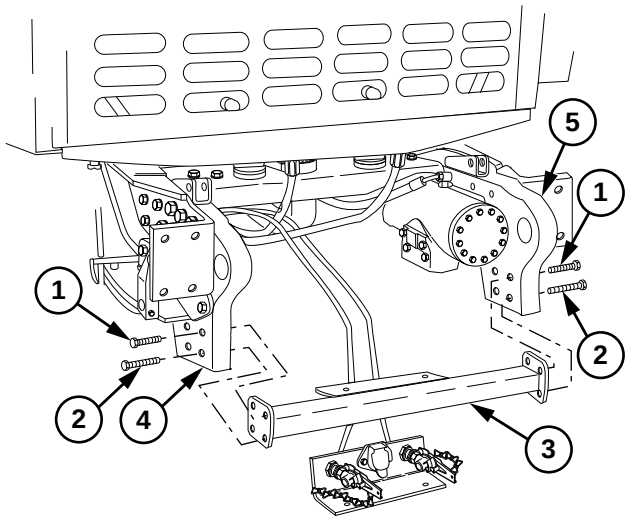
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

(1) Coat threads of eight screws (1 and 2) with adhesive-sealant.

NOTE

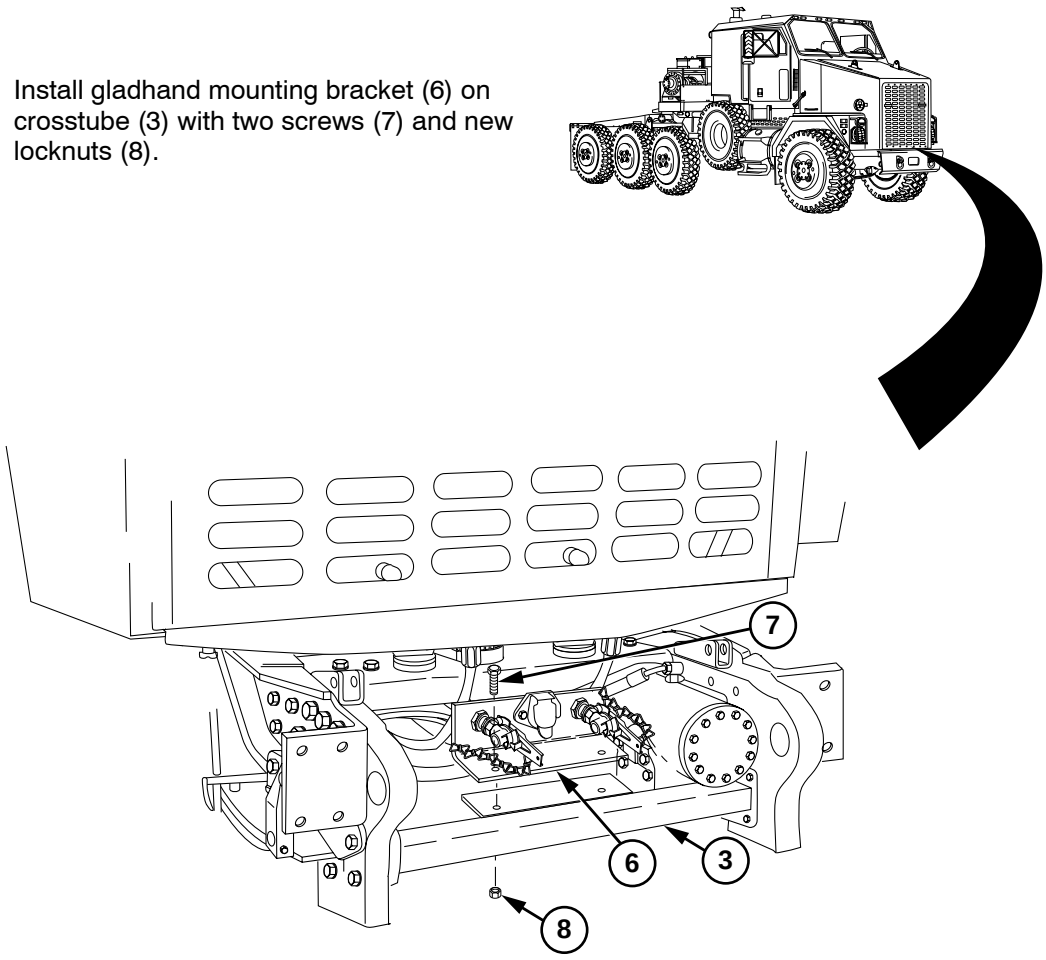
- Hydraulic hand jack kit may be used to spread tow eyes, if required.
- Larger screws are installed in top holes of tow eyes and crosstube.

(2) Install crosstube (3) on right and left tow eyes (4 and 5) with four screws (1) and screws (2). Torque to 110-lb-ft (149 N·m).



14-2. FRONT CROSSTUBE REPLACEMENT (CONT)

(3) Install gladhand mounting bracket (6) on crosstube (3) with two screws (7) and new locknuts (8).



c. Follow-On Maintenance

Install front bumper (TM 9-2320-360-20).

14-3. FRONT SPRING BRACKETS REPLACEMENT

This task covers:
- a. Front Bracket Removal
- b. Front Bracket Installation
- c. Rear Bracket Removal
- d. Rear Bracket Installation
- e. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front bumper removed (TM 9-2320-360-20).
Front wheel/tire removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jackstands (2) (Item 93, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 5, Appendix B)
Oil, Lubricating (Item 48, Appendix B)
Locknuts (12) (Item 87, Appendix F)
Lockwashers (2) (Item 122, Appendix F)

Personnel Required
Two

a. Front Bracket Removal

WARNING

Do not work on HET Tractor when supported only by jack or hoist. It may fall and cause severe injury or death.

NOTE

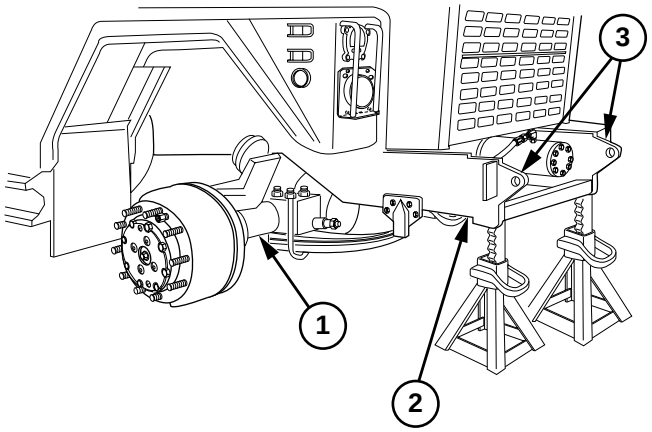
Left and right brackets are replaced the same way. Right brackets are shown.

(1) Position floor jack under axle (1) and raise HET Tractor.

NOTE

When properly supported, axle will hang on spring without carrying any vehicle weight.

(2) Support frame (2) under front tow eyes (3) with two jackstands.



14-3. FRONT SPRING BRACKETS REPLACEMENT (CONT)

(3) Remove nut (4) and lockwasher (5) from spring lockpin (6). Discard lockwasher.

CAUTION

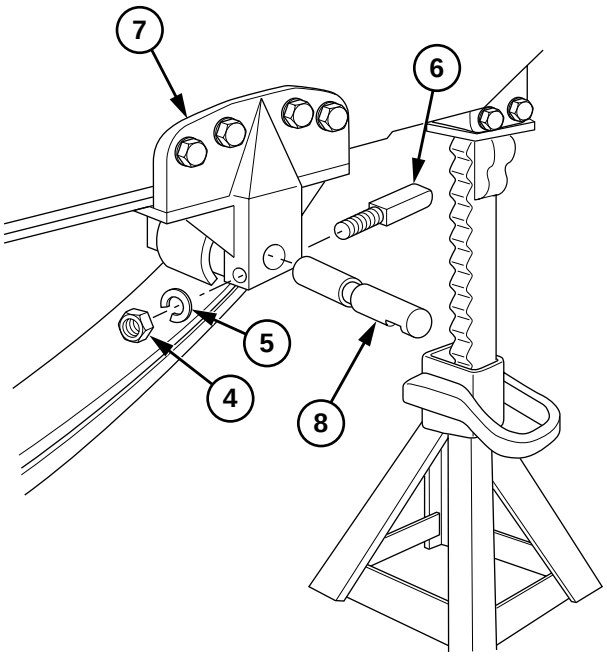
Do not strike spring lockpin directly. Locknut should be partially threaded on spring lockpin before striking. Failure to comply will damage spring lockpin.

(4) Tap spring lockpin (6) from front bracket (7).

WARNING

Spring will pull back slightly when spring is removed. Keep hands clear of pin and spring when removing pin. Failure to comply may result in serious injury.

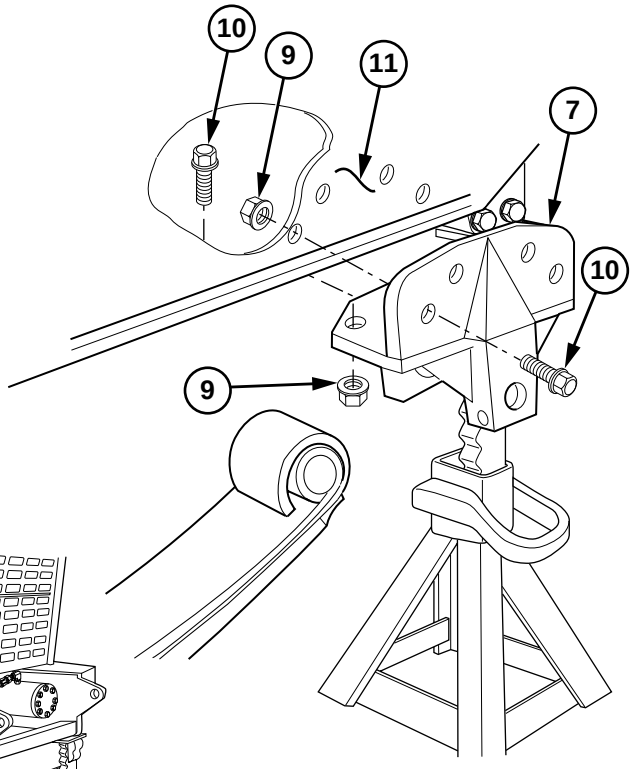
(5) Remove pin (8) from front bracket (7).

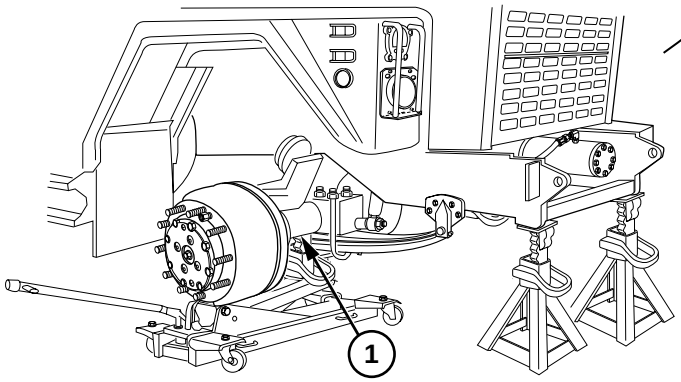


(6) Remove six locknuts (9) and screws (10) from front bracket (7) with aid of assistant. Discard locknuts.

(7) Lower floor jack and axle (1).

(8) Remove front bracket (7) from drop frame (11).





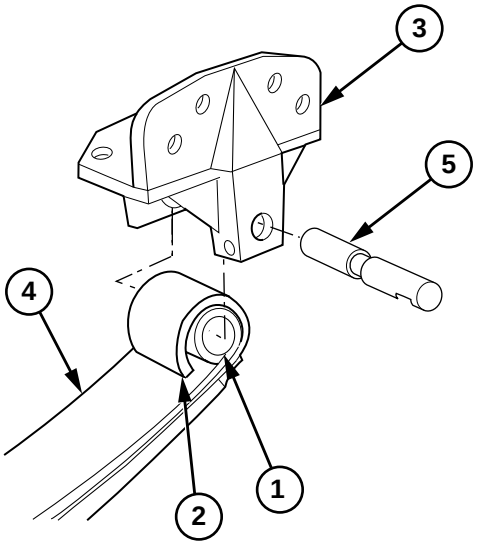
b. Front Bracket Installation

(1) Coat spring pin hole (1) in spring eye (2) and front bracket (3) with lubricating oil.

NOTE

Slotted end of pin must be aligned with spring lockpin hole when installed.

(2) Position front bracket (3) on spring (4) with pin (5).



CAUTION

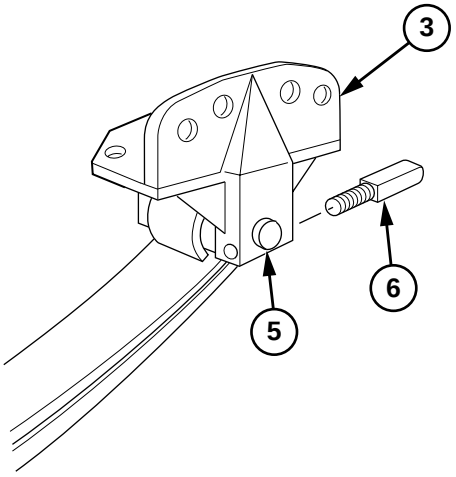
Do not allow key to enter slot on and angle. It will wedge and gall when locked on an angle. It will become loose and allow pin to turn and wear hanger bracket, resulting in failure of pin, spring eye, or bracket.

NOTE

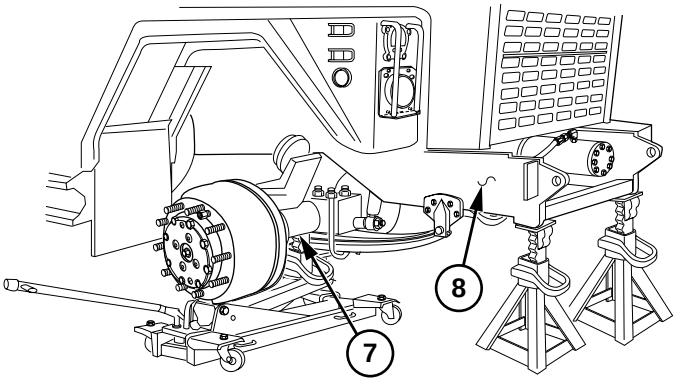
Spring lockpin hole on bracket is only machined on one side. Spring lockpin must be installed in non-machined side; lockwasher and nut must be on machined side.

(3) Position spring lockpin (6) in front bracket (3) until spring lockpin taper aligns with locking slot in pin (5).

(4) Tap spring lockpin (6) to lock pin (5) in front bracket (3).



(5) Raise floor jack and axle (7) until holes in front bracket (3) are aligned with holes in drop frame (8).

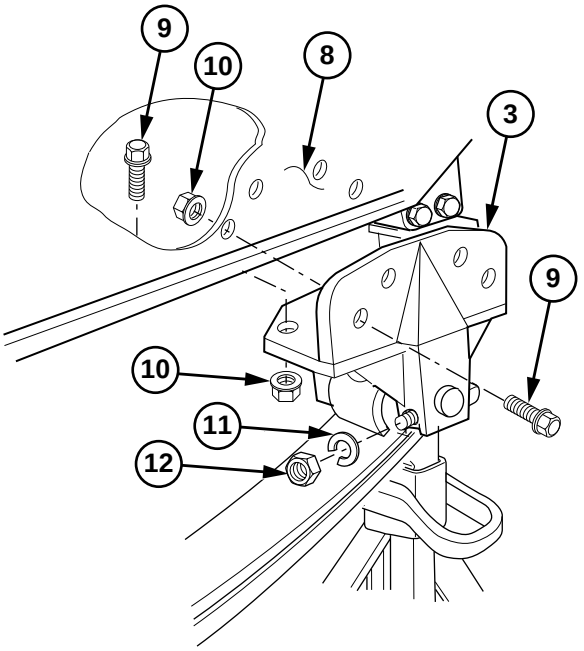


14-3. FRONT SPRING BRACKETS REPLACEMENT (CONT)

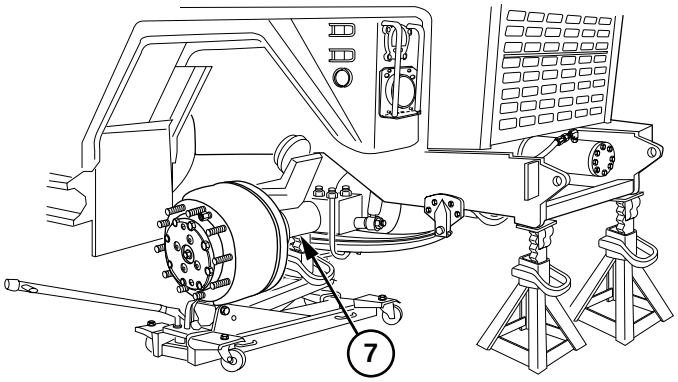
(6) Install front bracket (3) on dropframe (8) with six screws (9) and new locknuts (10) with aid of assistant. Torque to 212 lb-ft (287 N·m).

(7) Install new lockwasher (11) and nut (12) on spring lockpin (6). Torque to 55 lb-ft (75 N·m).

(8) Raise floor jack slightly and remove jackstands from under front tow eyes (13).



(9) Lower and remove floor jack from under axle (7).



c. Rear Bracket Removal

WARNING

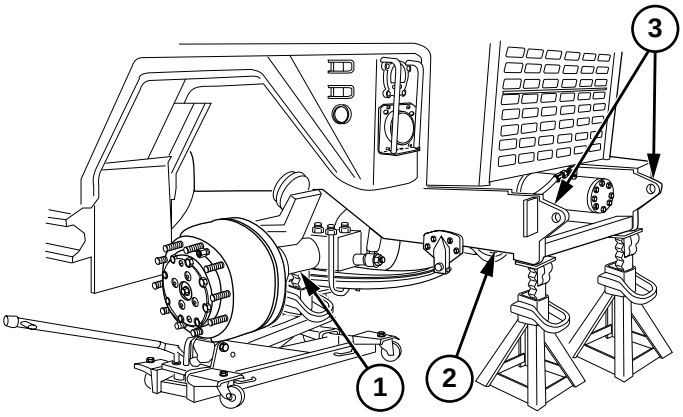
Do not work on HET Tractor when supported only by jack or hoist. It may fall and cause severe injury or death.

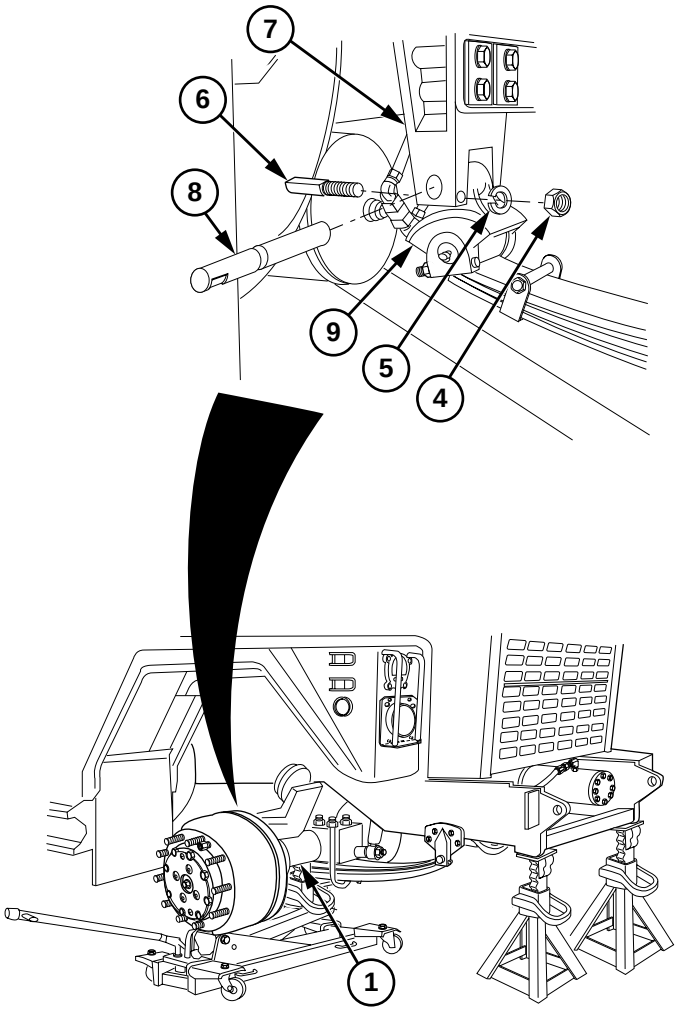
(1) Position floor jack under axle (1) and raise HET Tractor.

NOTE

When properly supported, axle will hang on spring without carrying any vehicle weight.

(2) Support frame (2) under front tow eyes (3) with two jackstands.





(3) Remove nut (4) and lockwasher (5) from spring lockpin (6). Discard lockwasher.

CAUTION

Do not strike spring lockpin directly. Locknut should be partially threaded on spring lock pin before striking. Failure to comply will damage spring lockpin.

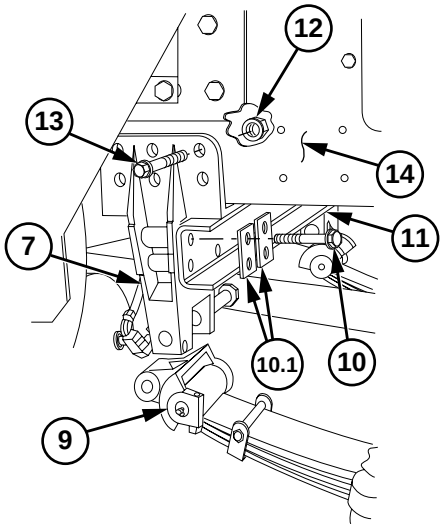
(4) Tap spring lockpin (6) from rear bracket (7).

WARNING

Spring will pull back slightly when spring is removed. Keep hands clear of pin and spring when removing pin. Failure to comply may result in serious injury.

(5) Remove pin (8) from rear bracket (7) and spring link (9).

(6) Lower floor jack and axle (1) and remove spring link (9) from rear bracket (7).



(7) Remove eight screws (10), four spacers (10.1), and cross channel (11) from rear bracket (7).

(8) Remove six locknuts (12), screws (13), and rear bracket (7) from frame (14) with aid of assistant. Discard locknuts.

14-3. FRONT SPRING BRACKETS REPLACEMENT (CONT)

b. Rear Bracket Installation

(1) Coat inside of spring link bushing (1) and spring pin hole (2) with lubricating oil.

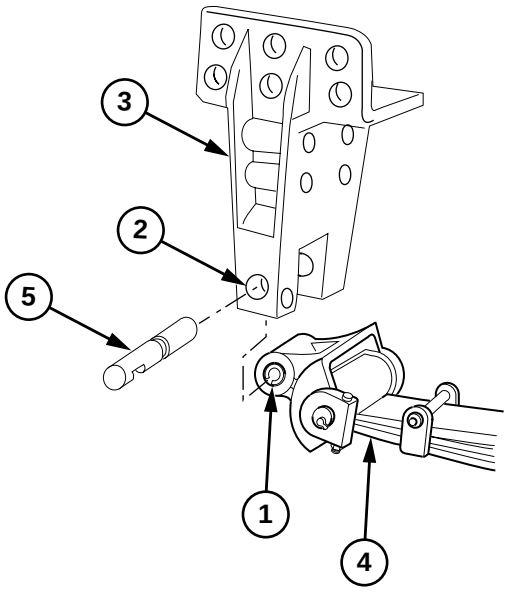
NOTE

Slotted end of pin must be aligned with spring lockpin hole when installed.

(2) Position rear bracket (3) on spring (4) with pin (5).

CAUTION

Do not allow spring lockpin to enter slot on and angle. It will wedge and gall when locked on an angle. It will become loose and allow pin to turn and wear hanger bracket, resulting in failure of pin, spring eye, or bracket

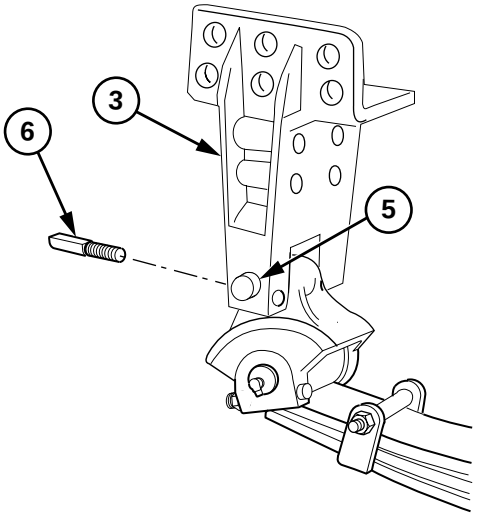


NOTE

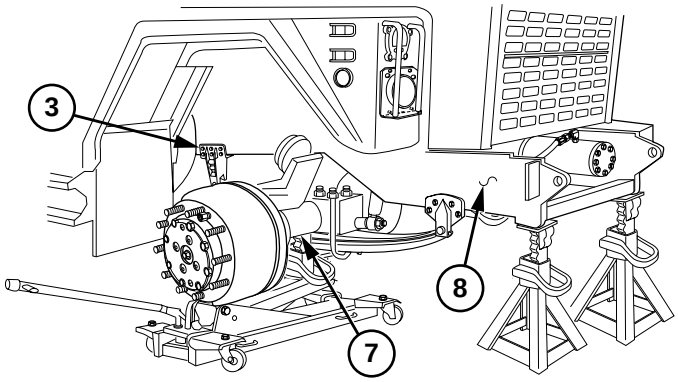
Spring lockpin hole on bracket is only machined on one side. Spring lockpin must be installed in nonmachined side; lock-washer and nut must be on machined side.

(3) Position spring lockpin (6) in rear bracket (3) until spring lockpin taper aligns with locking slot in pin (5).

(4) Tap spring lockpin (6) to lock pin (5) in rear bracket (3).



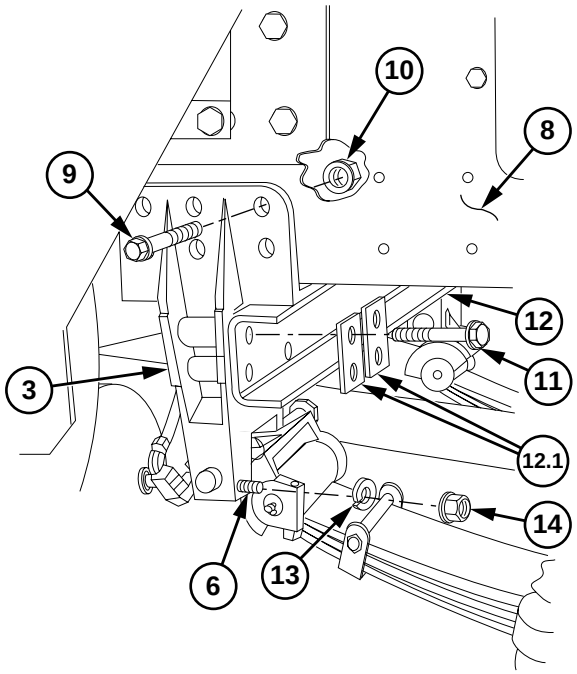
(5) Raise floor jack and axle (7) until holes in rear bracket (3) and frame (8) align.



(6) Position rear bracket (3) on frame (8) with six screws (9) and new locknuts (10). Do not tighten.

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.



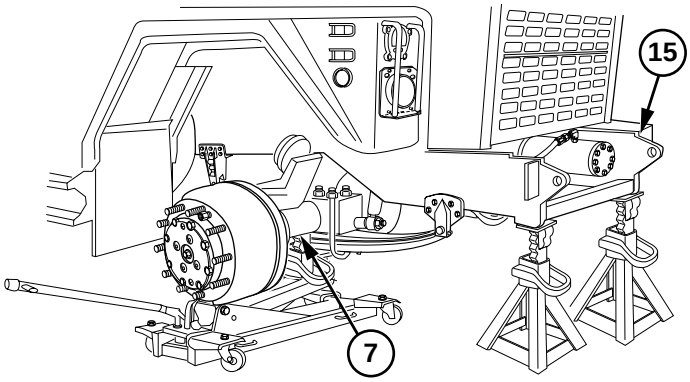
(7) Coat threads of eight screws (11) with adhesive-sealant.

(8) Position cross channel (12) on rear bracket (3) with four spacers (12.1) and eight screws (11). Do not tighten.

(9) Tighten six locknuts (10) to 212 lb-ft (287 N·m).

(10) Tighten eight screws (11) to 280 lb-ft (379 N·m).

(11) Install new lockwasher (13) and nut (14) on spring lockpin (6). Torque to 55 lb-ft (75 N·m).



(12) Raise floor jack slightly and remove jackstands from under front tow eyes (15).

(12.1) Position jackstand under axle (7)

(13) Lower and remove floor jack from under axle (7).

e. Follow-On Maintenance

(1) Install front wheel/tire (TM 9-2320-360-20).

(2) Install front bumper (TM 9-2320-360-20).

(3) Grease spring pins (LO 9-2320360-12).

14-4. RADIATOR MOUNTING BRACKET REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

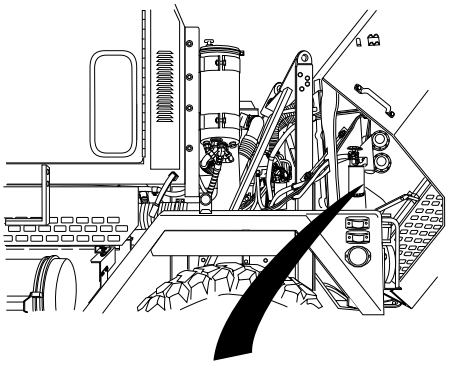
Equipment Conditions
Engine hood opened (TM 9-2320-360-10).
Front crosstube removed (para 14-2).
Front steering gear removed (left radiator mounting bracket only) (para 13-5).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (8) (Item 87, Appendix F)

NOTE

Left and right brackets are replaced the same way.

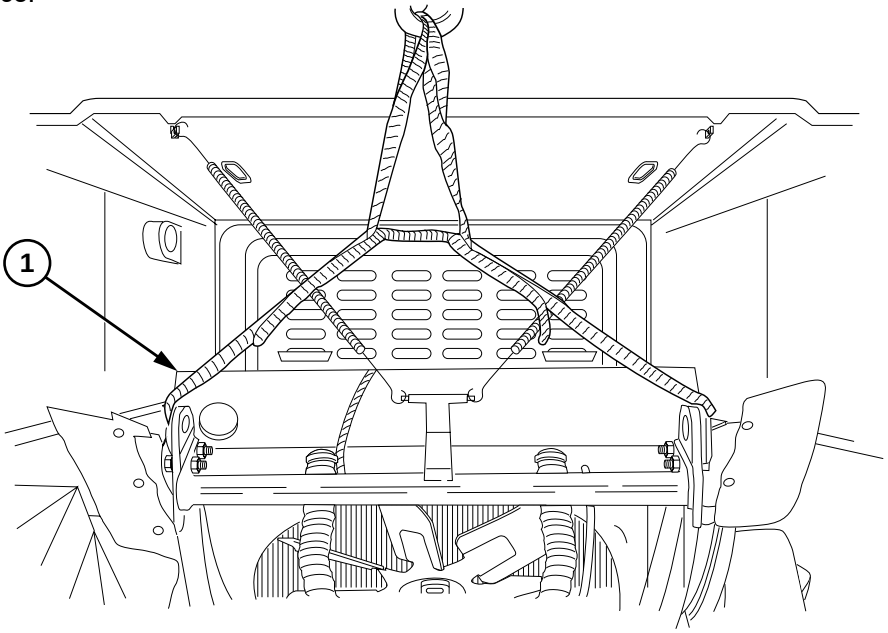


a. Removal

CAUTION

Do not raise radiator. Damage to radiator, fan, and shroud may result.

(1) Support radiator (1) from above with suitable lifting device.



NOTE

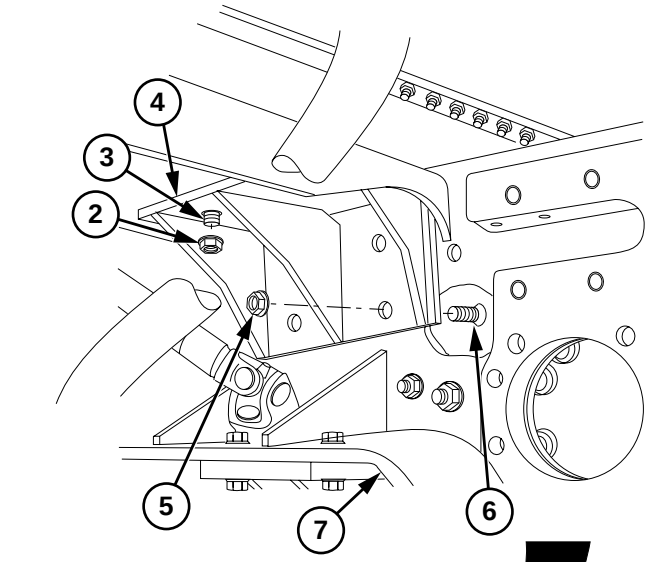
Screws are trapped by radiator and cannot be removed.

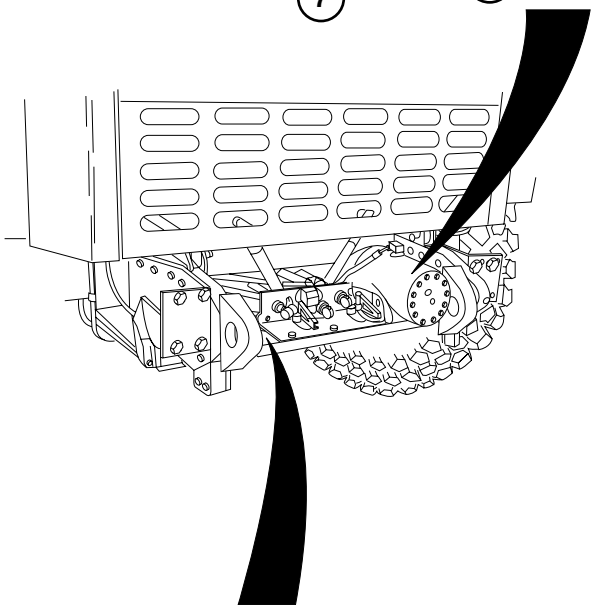
(2) Remove four locknuts (2) from screws (3) on bracket (4). Discard locknuts.

NOTE

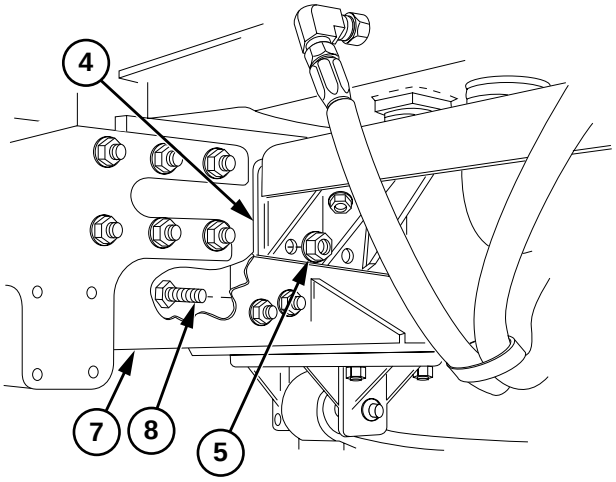
Do step (3) for left mounting bracket, step (4) for right mounting bracket.

(3) Remove four locknuts (5), sockethead screws (6), and bracket (4) from dropframe (7). Discard locknuts.





(4) Remove four locknuts (5), screws (8), and bracket (4) from dropframe (7). Discard locknuts.



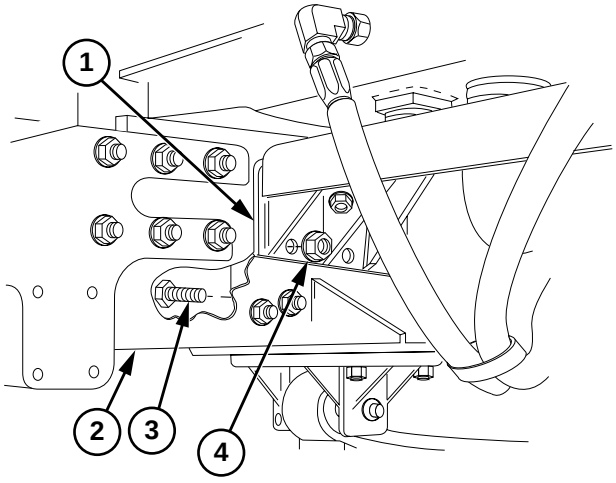
14-4. RADIATOR MOUNTING BRACKET REPLACEMENT (CONT)

b. Installation

NOTE

Do step (1) for right mounting bracket, step (2) for left mounting bracket.

(1) Position bracket (1) on dropframe (2) with four screws (3) and new locknuts (4). Do not tighten.

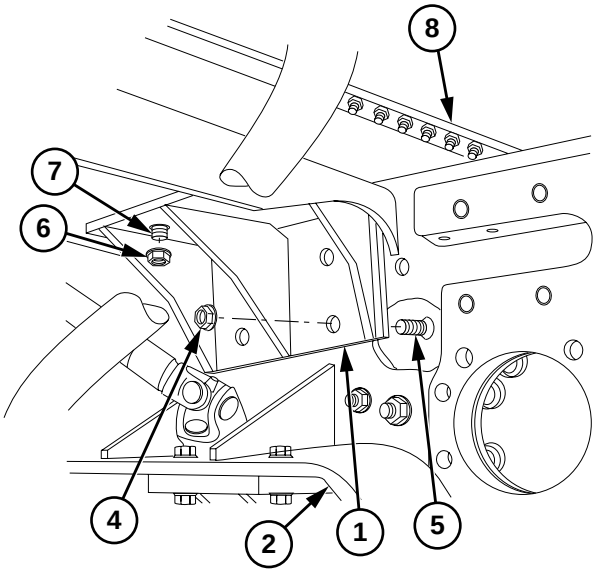


(2) Position bracket (1) on dropframe (2) with four sockethead screws (5) and new locknuts (4). Do not tighten.

(3) Install four new locknuts (6) on screws (7). Torque to 212 lb-ft (287 N·m).

(4) Tighten locknuts (4) to 212 lb-ft (287 N·m).

(5) Remove lifting device supporting radiator (8).



c. Follow-On Maintenance

(1) Install front steering gear (if removed) (para 13-5).

(2) Install front crosstube (para 14-2).

(3) Close engine hood (TM 9-2320-360-10).

14-5. ENGINE MOUNTING BRACKET REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Lower radiator hose removed (right engine mounting bracket only) (TM 9-2320-360-20).
Radiator removed (TM 9-2320-360-20).
Front steering shaft removed (left engine mounting bracket only) (TM 9-2320-360-20)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (15) (Item 87, Appendix F)

Personnel Required
Two

NOTE

Left and right brackets are replaced in a similar way. Right bracket is shown.

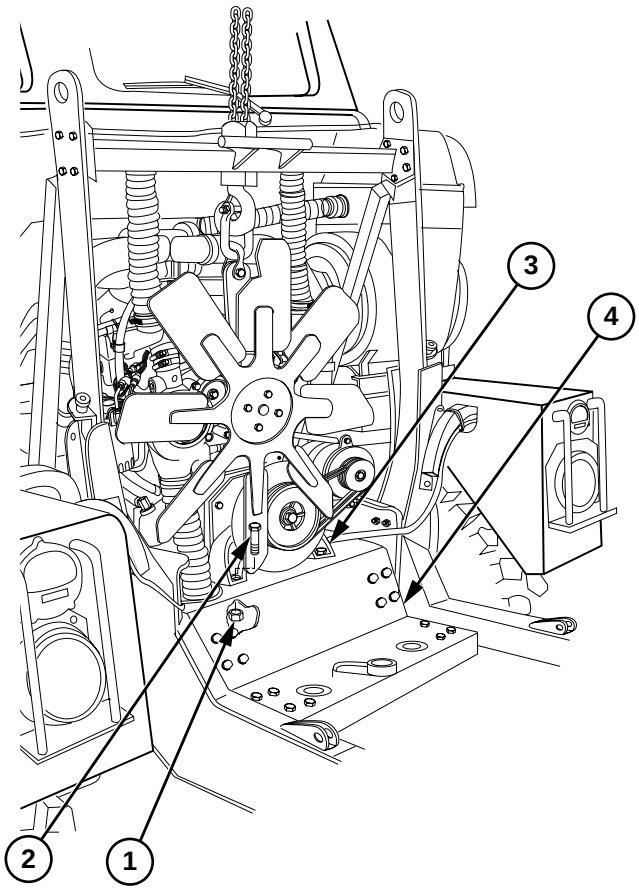
a. Removal

(1) Remove two locknuts (1) and screws (2) from engine (3) and crossmember (4). Discard locknuts.

NOTE

Engine should be lifted only 0.125 in. (3.17 mm) to take weight off front crossmember.

(2) Support engine (3) with lifting device.



14-5. ENGINE MOUNTING BRACKET REPLACEMENT (CONT)

NOTE

Do step (3) for right bracket only.

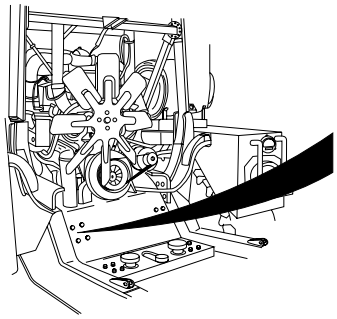
(3) Remove quickedge molding (5) from bracket (6).

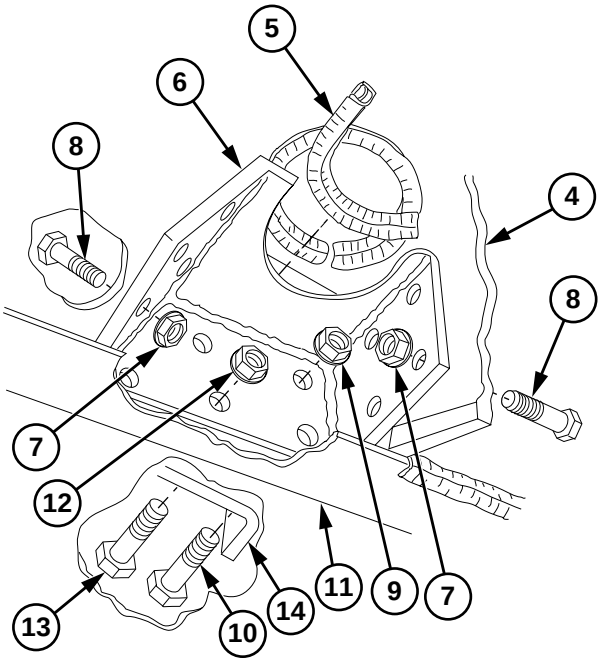
(4) Remove eight locknuts (7) and screws (8) from bracket (6) and crossmember (4). Discard locknuts.

(5) Remove two locknuts (9) and screws (10) from bracket (6) and dropframe (11).

(6) Remove three locknuts (12) and screws (13) from bracket (6) and hardlift (14).

(7) Remove bracket (6) from crossmember (4).





b. Installation

(1) Position bracket (1) on hardlift (2) with three screws (3) and new locknuts (4). Do not tighten.

(2) Position two screws (5) and new locknuts (6) on bracket (1) and dropframe (7). Do not tighten.

(3) Position eight screws (8) and new locknuts (9) on bracket (1) and front crossmember (10). Do not tighten.

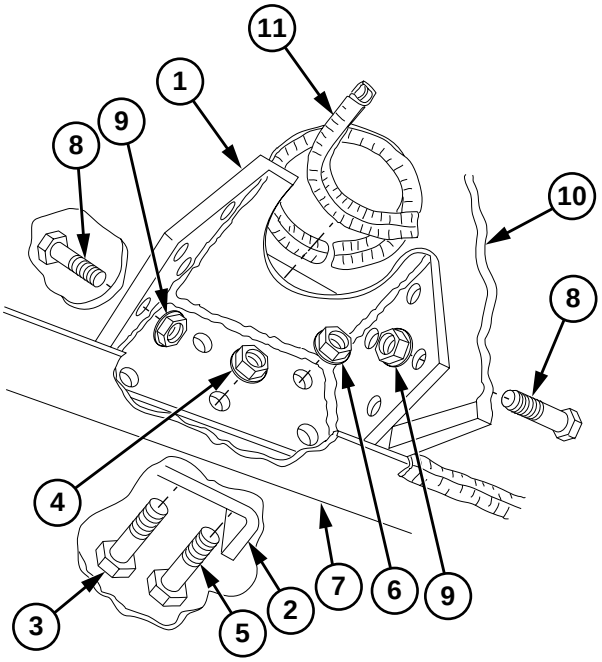
NOTE

Do step (4) for right bracket only.

(4) Install quickedge molding (11) on bracket (1).

NOTE

If both mounting brackets were removed, both should be installed before any hardware is tightened.



(5) Tighten three locknuts (4) to 375 lb-ft (508.4 N·m).

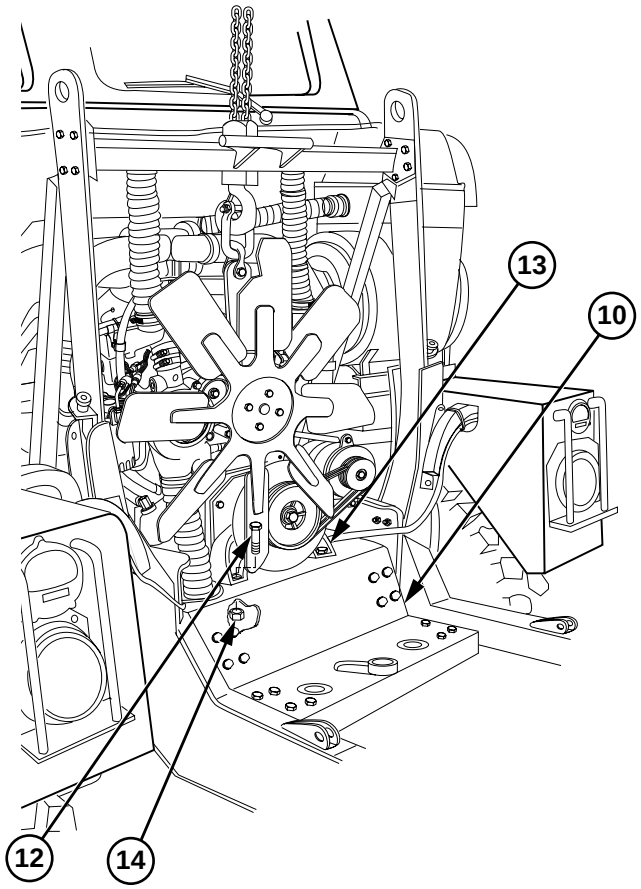
(6) Tighten two locknuts (6) and eight locknuts (9) to 212 lb-ft (302 N·m).

(7) Install two screws (12) through engine (13) and crossmember (10).

(8) Lower engine (13) onto front crossmember (10).

(9) Install two new locknuts (14) on screws (12). Torque to 212 lb-ft (302 N·m).

(10) Remove lifting device.



c. Follow-On Maintenance

(1) Install front steering shaft (left engine mounting bracket only) (TM 9-2320-360-20).

(2) Install radiator (TM 9-2320-360-20).

(3) Install lower radiator hose (right engine mounting bracket only) (TM 9-2320-360-20).

14-6. FRONT CROSSMEMBER REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front shock absorber brackets removed (TM 9-2320-360-20).
Engine mounting brackets removed (para 14-5).
Front steering gear removed (para 13-5).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

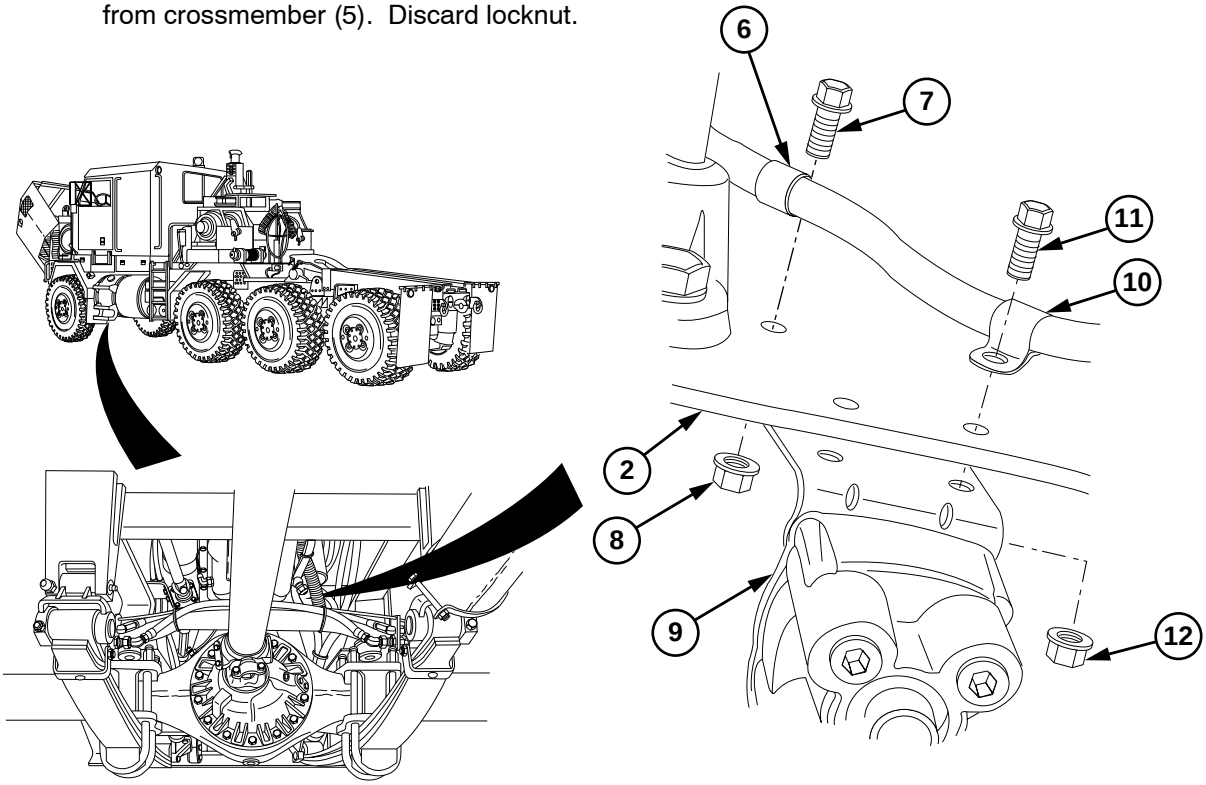
Materials/Parts
Locknuts (8) (Item 87, Appendix F)
Locknuts (2) (Item 81, Appendix F)
Locknut (Item 96, Appendix F)

Personnel Required
Two

a. Removal

(1) Remove two locknuts (1), screws (2), clip (3), and front service brake relay valve (4) from crossmember (5). Discard locknuts.

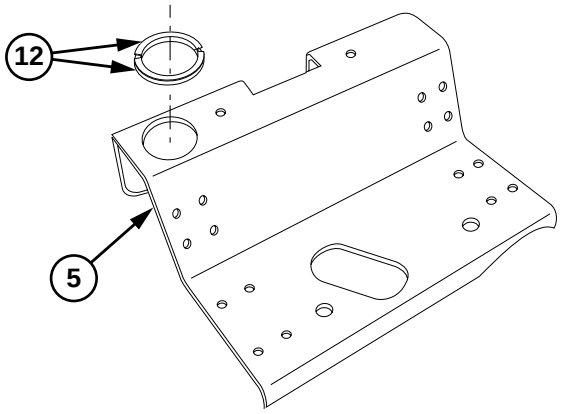
(2) Remove locknut (6), screw (7), and clip (8) from crossmember (5). Discard locknut.

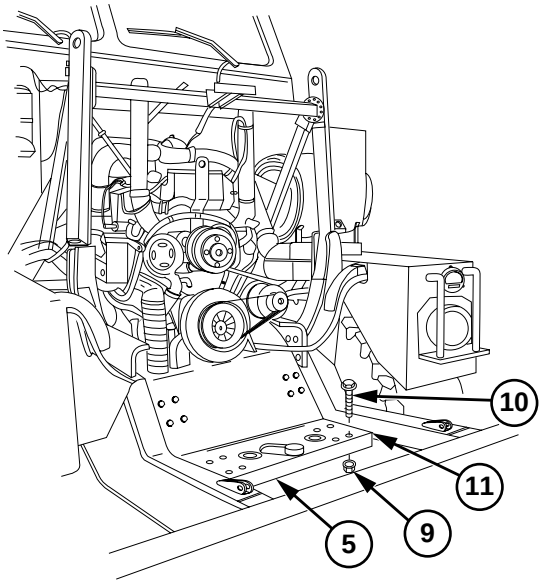


(3) Remove eight locknuts (9) and screws (10) from two radiator brackets (11). Discard locknuts.

(4) Remove front crossmember (5) from HET Tractor with aid of assistant.

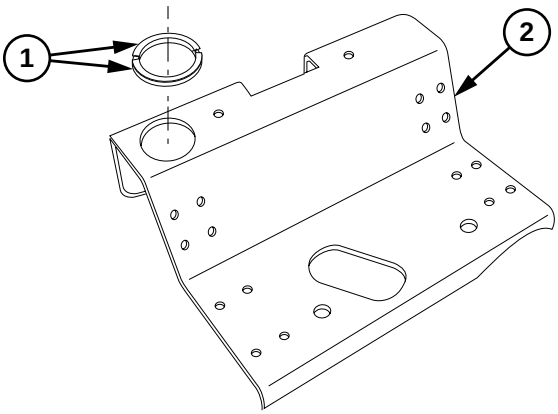
(5) Remove two quickedge moldings (12) from crossmember (5).



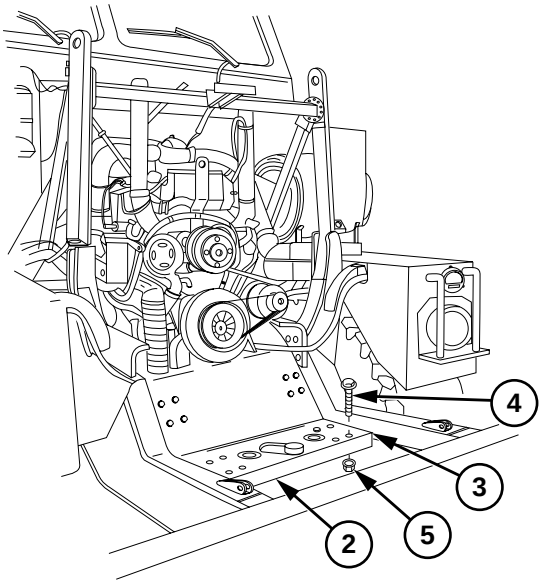


b. Installation

(1) Install two quickedge moldings (1) on crossmember (2).



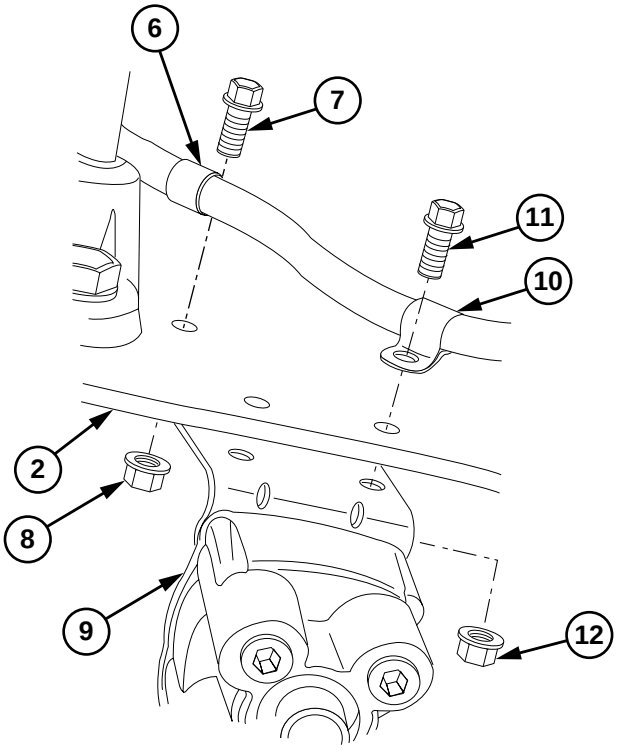
(2) Install front crossmember (2) on radiator brackets (3) with eight screws (4) and new locknuts (5) with aid of assistant. Tighten locknuts to 212 lb–ft (288 N·m).



14-6. FRONT CROSSMEMBER REPLACEMENT (CONT)

(3) Install clip (6) on crossmember (2) with screw (7) and new locknut (8).

(4) Install front service brake relay valve (9) and clip (10) on crossmember (2) with two screws (11) and new locknuts (12).



c. Follow-On Maintenance

(1) Install engine mounting brackets (para 14-5).

(2) Install front steering gear (para 13-5).

(3) Install front shock absorber brackets (TM 9-2320-360-20).

14-7. HARDLIFT REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

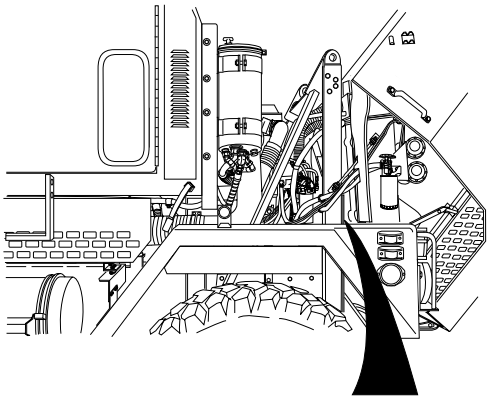
INITIAL SETUP

Equipment Conditions
Radiator removed (TM 9-2320-360-20).
Data and warning plates removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Ties, Cable Plastic (Item 60, Appendix B)
Locknuts (7) (Item 88, Appendix F)
Locknuts (6) (Item 87, Appendix F)
Locknuts (2) (Item 96, Appendix F)
Locknuts (2) (Item 81, Appendix F)

Personnel Required
Two



NOTE

Right and left hardlifts are replaced the same way. Right side is shown.

a. Removal

(1) Remove two locknuts (1), washers (2), and screws (3) from fender (4) and bracket (5). Discard locknuts.

CAUTION

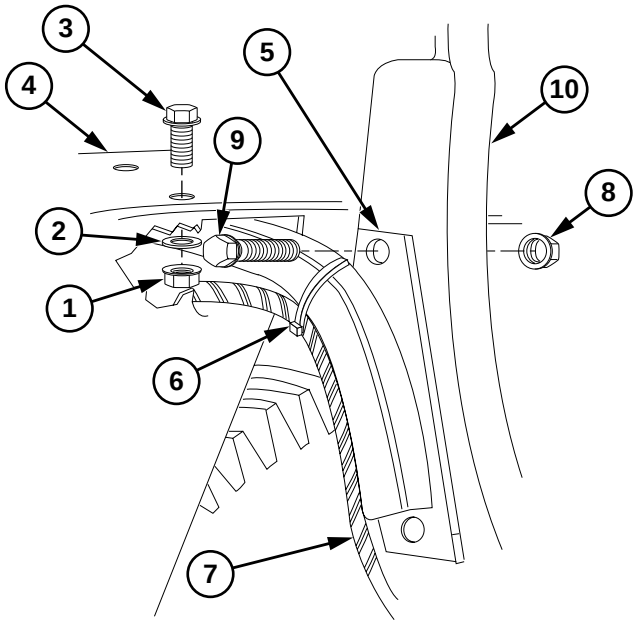
Do not stand on fender once bracket is removed. Failure to comply may result in damage to fender.

NOTE

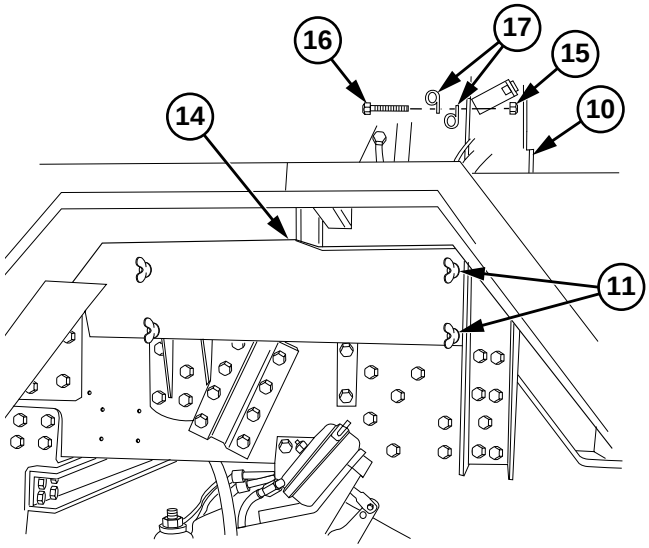
Location of plastic cable ties should be marked before removal.

(2) Remove plastic cable ties (6) from wire harness (7) and bracket (5).

(3) Remove two locknuts (8), screws (9), and bracket (5) from hardlift (10) and fender (4). Discard locknuts.



14-7. HARDLIFT REPLACEMENT (CONT)



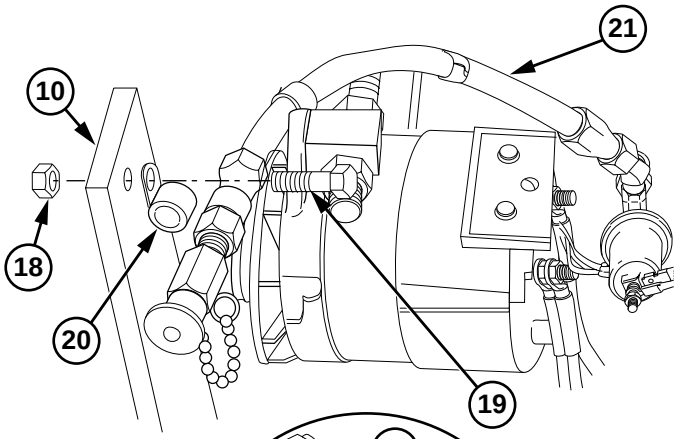
(4) Turn two studs (11) counterclockwise 1/4 turn to unlock inner fender (14) from hardlift (10).

NOTE

Do step (5) for right hardlift only.

(5) Remove locknut (15), screw (16), and clips (17) from hardlift (10). Discard locknut.

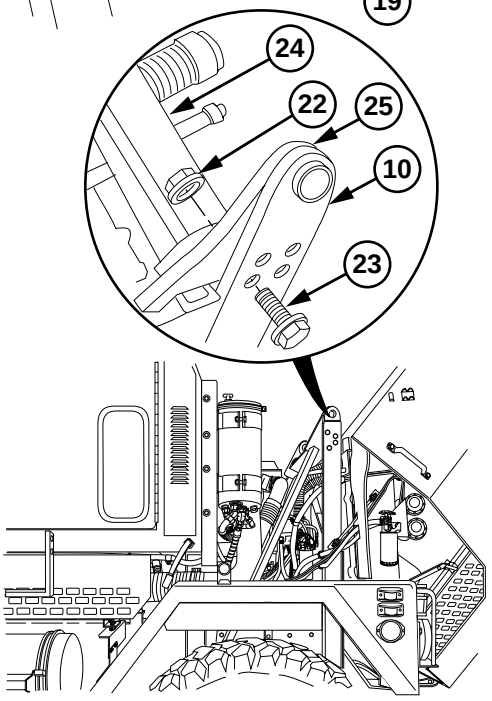
TIRE REMOVED FOR CLARITY



NOTE

Do step (6) for left hardlift only.

(6) Remove locknut (18), screw (19), clip (20), and hose (21) from hardlift (10). Discard locknut.

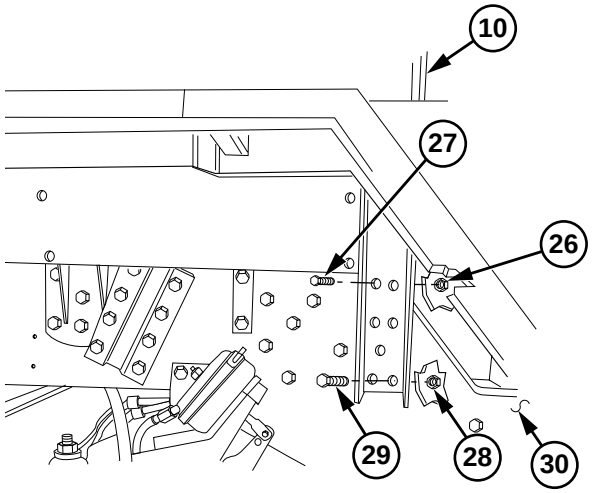


(7) Remove four locknuts (22) and screws (23) from hardlift (10), hardlift support (24), and hood support (25). Discard locknuts.

(8) Remove four locknuts (26) and screws (27) from upper portion of hardlift (10). Discard locknuts.

(9) Remove three locknuts (28) and screws (29) from lower portion of hardlift (10). Discard locknuts.

(10) Remove hardlift (10) from dropframe (30) with aid of assistant.



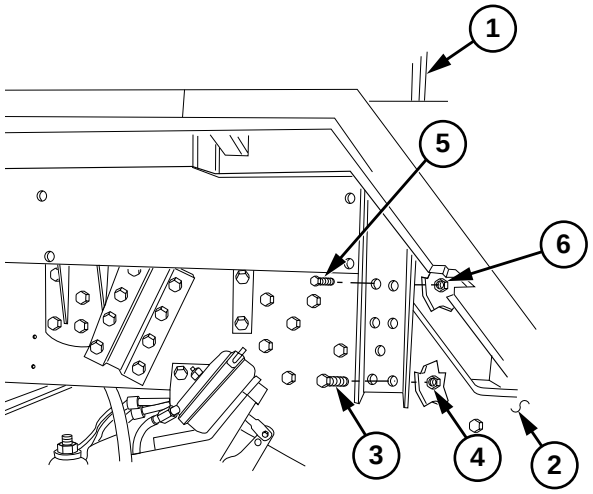
TIRE REMOVED FOR CLARITY

b. Installation

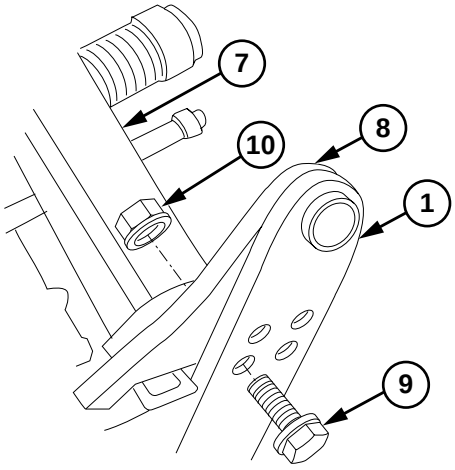
(1) Position hardlift (1) on dropframe (2) with aid of assistant.

(2) Position lower portion of hardlift (1) on dropframe (2) with three screws (3) and new locknuts (4). Do not tighten.

(3) Position upper portion of hardlift (1) on dropframe (2) with four screws (5) and new locknuts (6). Do not tighten.



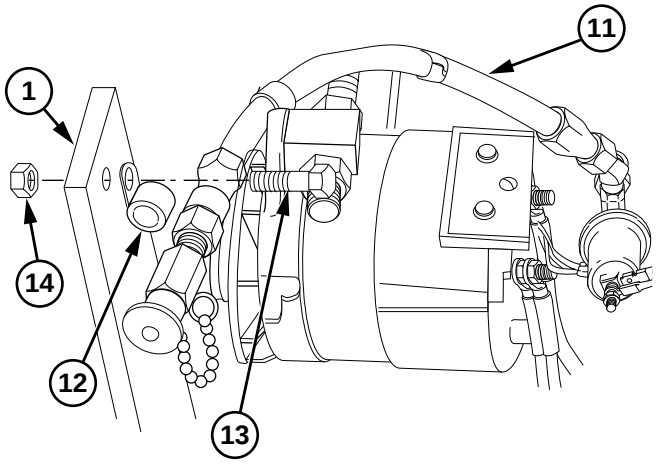
TIRE REMOVED FOR CLARITY



(4) Install hood support (7) on hardlift support (8) and hardlift (1) with four screws (9) and new locknuts (10). Torque to 212 lb-ft (287 N·m).

(5) Tighten locknuts (4 and 6) to 375 lb-ft (508 N·m).

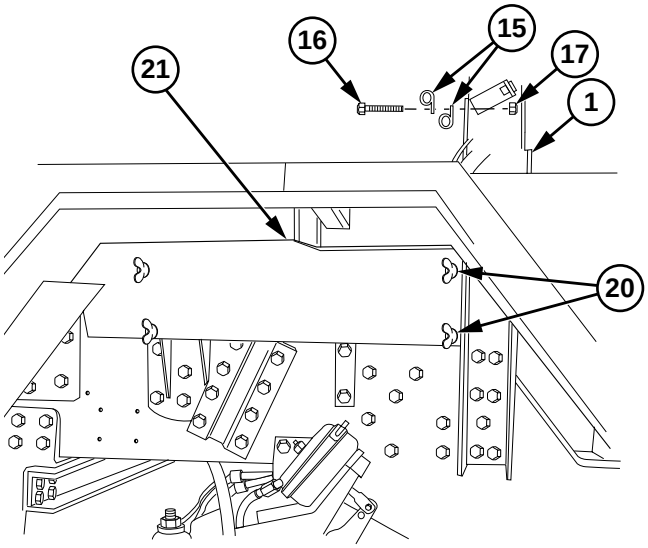
14-7. HARDLIFT REPLACEMENT (CONT)



NOTE

Do step (6) for left hardlift only.

(6) Install hose (11) on hardlift (1) with clip (12), screw (13), and new locknut (14).



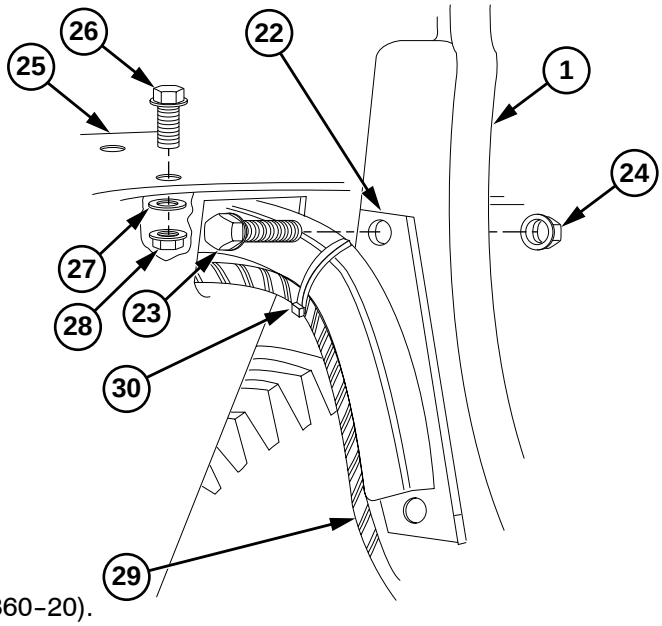
TIRE REMOVED FOR CLARITY

NOTE

Do step (7) for right hardlift only.

(7) Install clips (15) on hardlift (1) with screw (16) and new locknut (17).

(8) Turn two studs (20) clockwise to lock inner fender (21) to hardlift (1).



(9) Install bracket (22) on hardlift (1) with two screws (23) and new locknuts (24).

(10) Install fender (25) on bracket (22) with two screws (26), washers (27), and new locknuts (28).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(11) Secure wire harness (29) to bracket (22) with plastic cable ties (30).

c. Follow-On Maintenance

(1) Install radiator (TM 9-2320-360-20).

(2) Install data and warning plates (TM 9-2320-360-20).

14-8. HARDLIFT SUPPORT REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Engine hood opened (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (12) (Item 87, Appendix F)

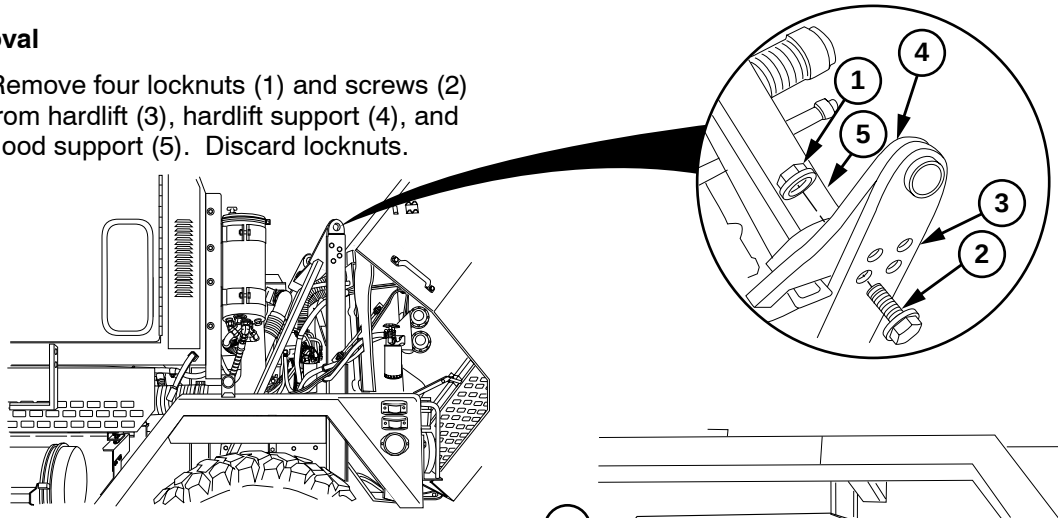
Personnel Required
Two

NOTE

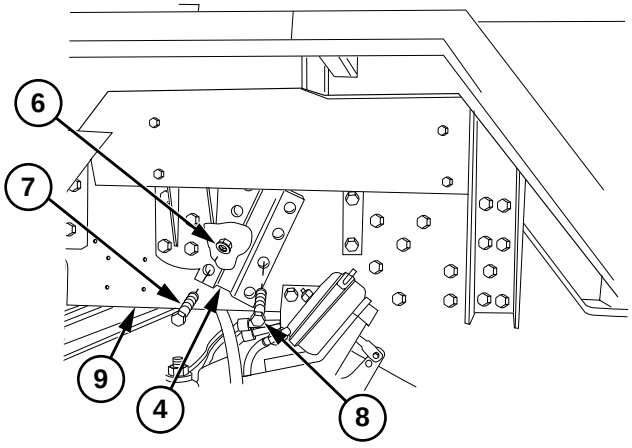
Right and left hardlift supports are replaced the same way. Right side is shown.

a. Removal

(1) Remove four locknuts (1) and screws (2) from hardlift (3), hardlift support (4), and hood support (5). Discard locknuts.



(2) Remove eight locknuts (6), four screws (7), four screws (8), and hardlift support (4) from frame (9) with aid of assistant. Discard locknuts.



TIRE REMOVED FOR CLARITY

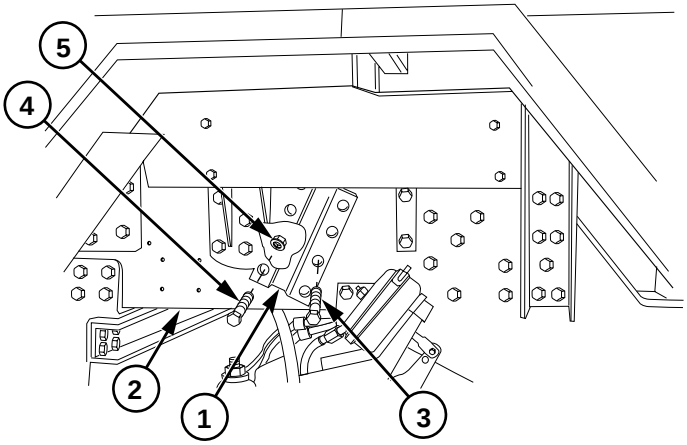
14-8. HARDLIFT SUPPORT REPLACEMENT (CONT)

b. Installation

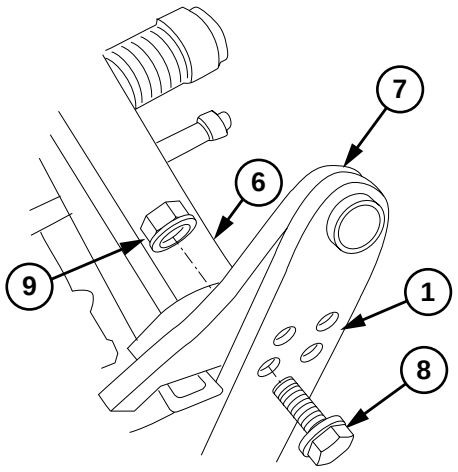
NOTE

Top of hardlift support is between hardlift and hood support when properly positioned.

(1) Position hardlift support (1) on frame (2) with four screws (3), four screws (4), and eight new locknuts (5) with aid of assistant. Do not tighten.



TIRE REMOVED FOR CLARITY



(2) Position hood support (6) on hardlift support (7) and hardlift (1) with four screws (8) and new locknuts (9). Do not tighten.

(3) Tighten 12 locknuts (5 and 9) to 212 lb-ft (287 N·m).

c. Follow-On Maintenance

Close engine hood (TM 9-2320-360-10).

14-9. ENGINE MOUNT FRAME REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Transfer case to axle no. 1 propeller shaft removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Block, Wooden (Figure C-3, Appendix C)
Jack, Floor (Item 90, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

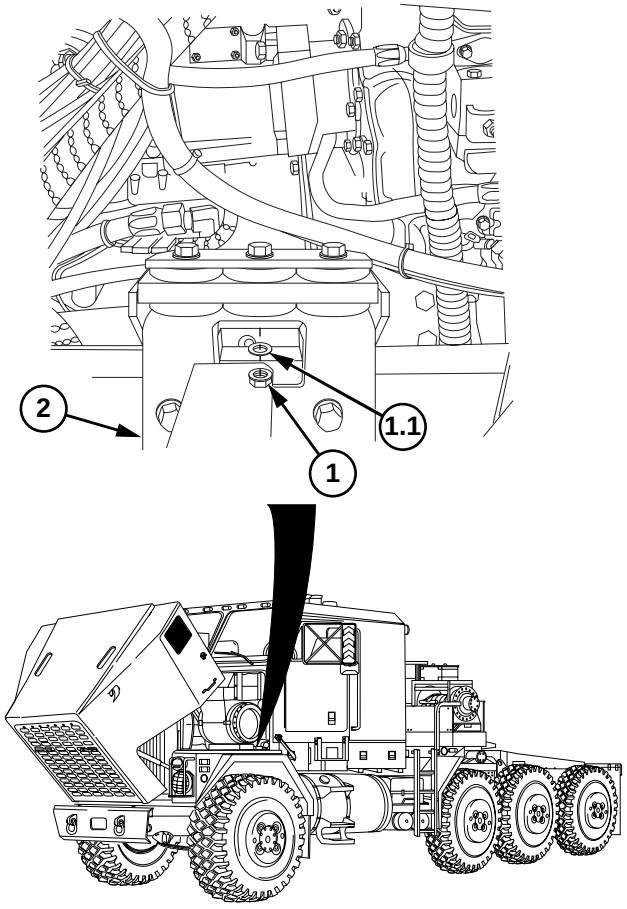
Materials/Parts
Locknuts (12) (Item 87, Appendix F)
Locknuts (7) (Item 92, Appendix F)
Locknuts (6) (Item 80.1, Appendix F)
Locknuts (4) (Item 81, Appendix F)

a. Removal

CAUTION

Do not attempt to remove more than one engine mount frame at a time. Failure to comply may result in damage to equipment.

(1) Remove three locknuts (1) and washers (1.1) from engine mount frame (2). Discard locknuts.

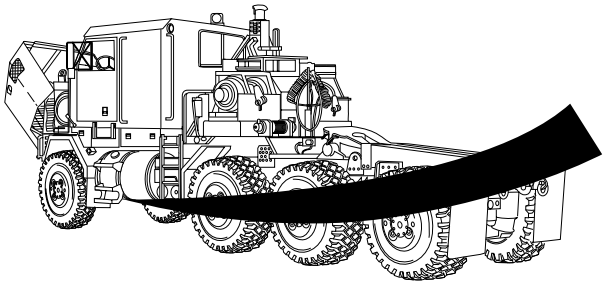


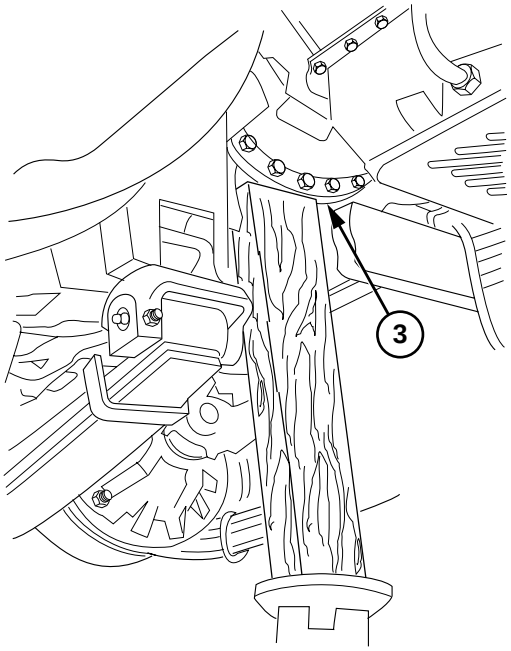
14-9. ENGINE MOUNT FRAME REPLACEMENT (CONT)

NOTE

When engine is properly supported, there should be 1 in. (2.5 cm) between cradle and engine mount frame.

(2) Support engine (3) with hydraulic jack and wooden block.





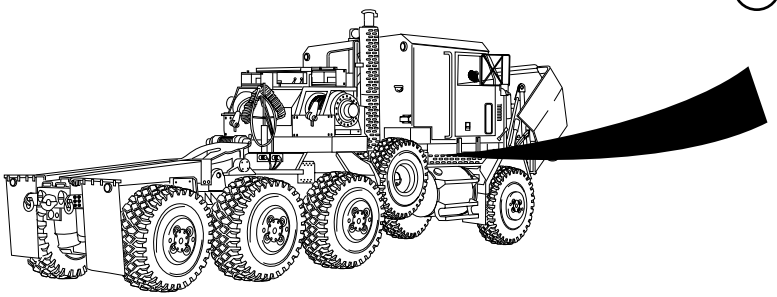
NOTE

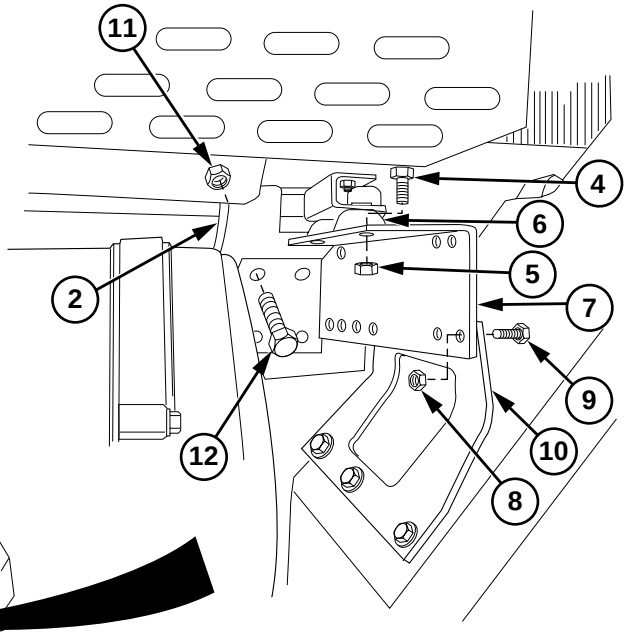
Do steps (3) thru (6) and step (10) when removing right engine mount frame.

(3) Remove four screws (4), locknuts (5), and two biscuits (6) from bracket (7). Discard locknuts.

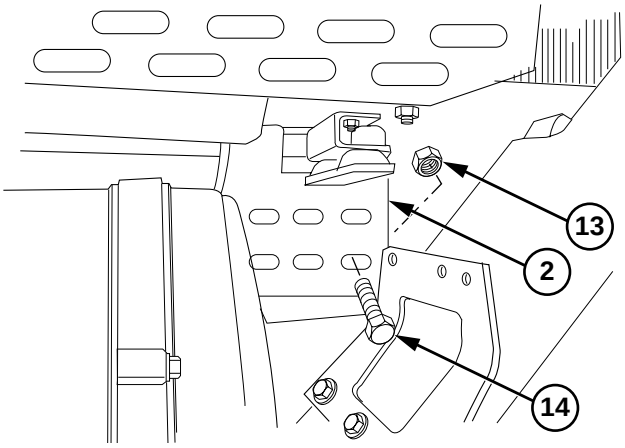
(4) Remove four locknuts (8) and screws (9) from bracket (7) and bracket (10). Discard locknuts.

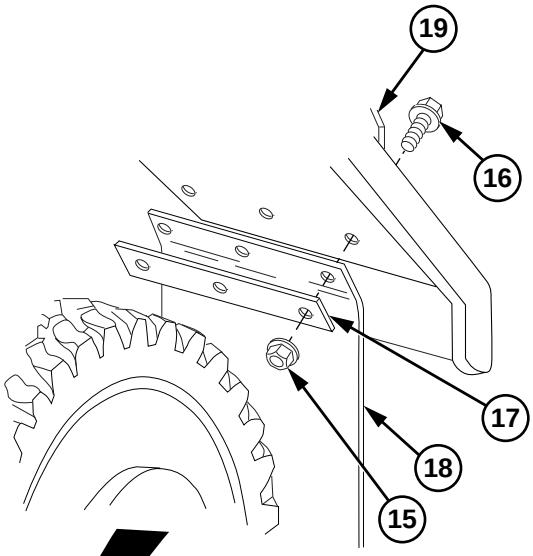
(5) Remove four locknuts (11), screws (12), and bracket (7) from engine mount frame (2). Discard locknuts.





(6) Remove two locknuts (13) and screws (14) from engine mount frame (2) with aid of assistant. Discard locknuts.

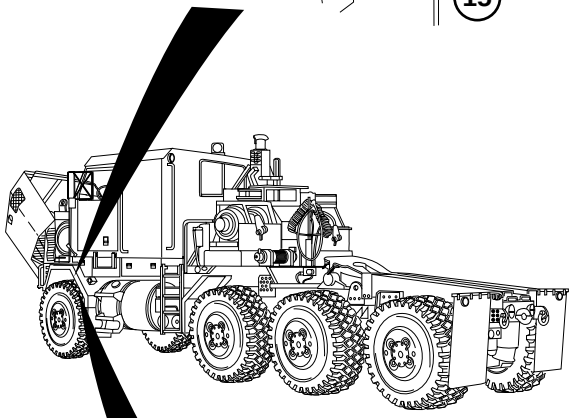


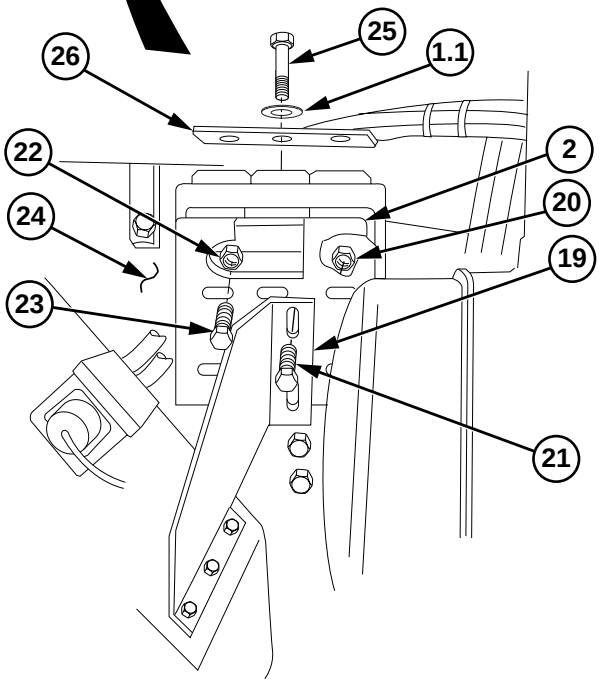


NOTE

Do steps (7) thru (10) when removing left engine mount frame.

(7) Remove three locknuts (15), screws (16), spacer (17), and mud flap (18) from bracket (19). Discard locknuts.





(8) Remove two locknuts (20), screws (21), and bracket (19) from engine mount frame (2) with aid of assistant. Discard locknuts.

(9) Remove four locknuts (22) and screws (23) from engine mount frame (2) and frame (24) with aid of assistant. Discard locknuts.

(10) Remove three screws (25), washers (1.1), plate (26), and engine mount frame (2) from frame (24).

14-9. ENGINE MOUNT FRAME REPLACEMENT (CONT)

b. Installation

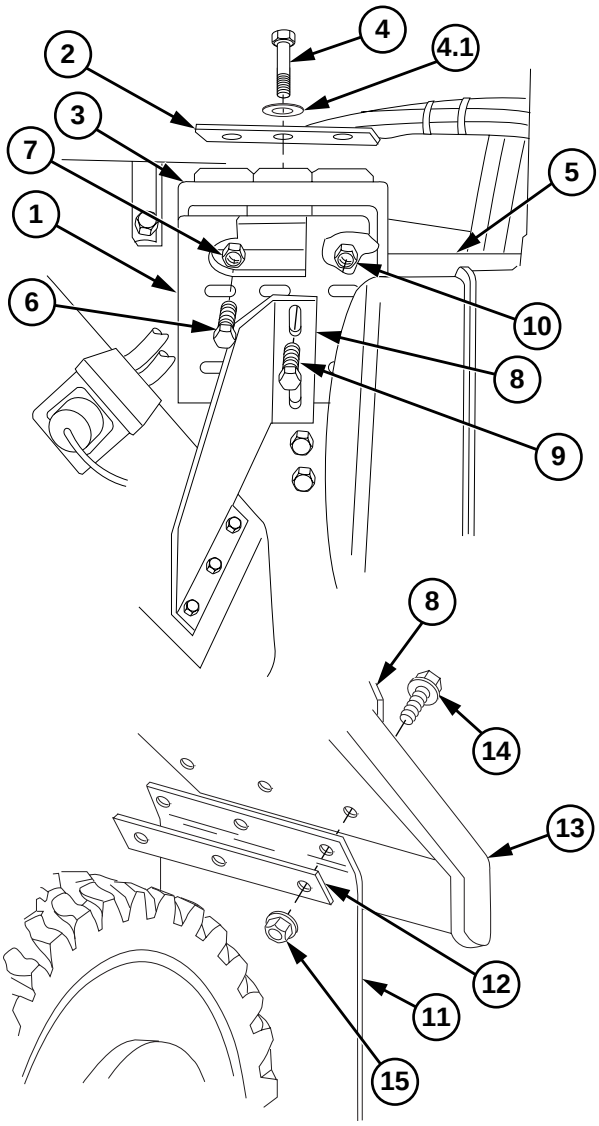
(1) Install engine mount frame (1) and plate (2) on cradle (3) with three screws (4) and washers (4.1).

NOTE

Perform steps (2) thru (6) and steps (13) and (14) when installing left engine mount frame.

(2) Position engine mount frame (1) on frame (5) with four screws (6) and new locknuts (7). Do not tighten.

(3) Position bracket (8) on engine mount frame (1) with two screws (9) and new locknuts (10). Do not tighten.



(4) Position bracket (8), mud flap (11), and spacer (12) on left side fender (13) with three screws (14) and new locknuts (15). Do not tighten.

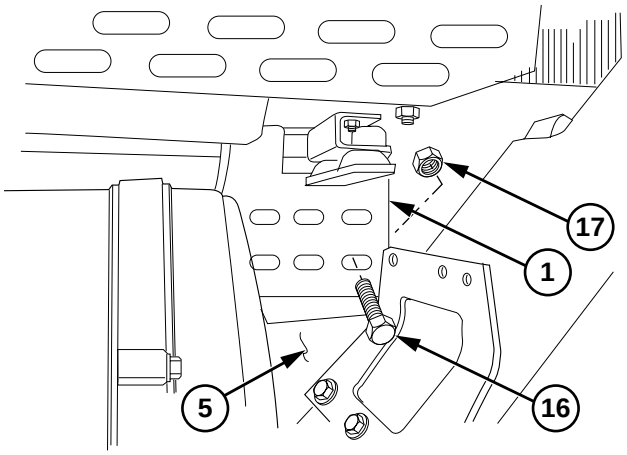
(5) Tighten four locknuts (7) and two locknuts (10) to 212 lb-ft (287 N·m).

(6) Tighten three locknuts (15).

NOTE

Do steps (7) thru (14) when installing right engine mount frame.

(7) Position engine mount frame (1) on frame (5) with two screws (16) and new locknuts (17). Do not tighten.



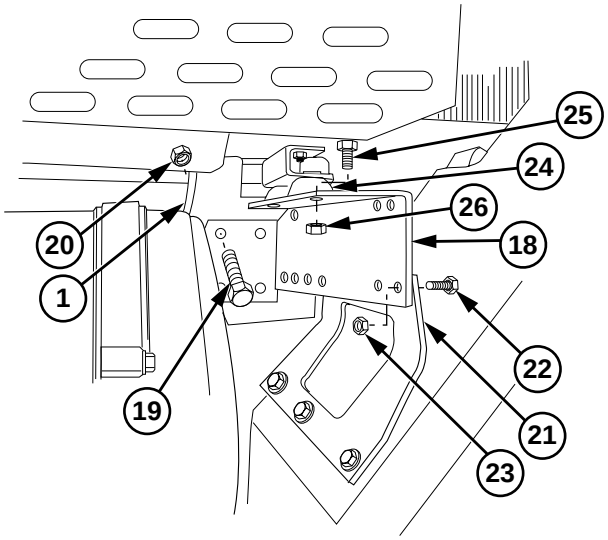
(8) Position bracket (18) on engine mount frame (1) with four screws (19) and new locknuts (20). Do not tighten.

(9) Position bracket (18) on bracket (21) with four screws (22) and new locknuts (23). Do not tighten.

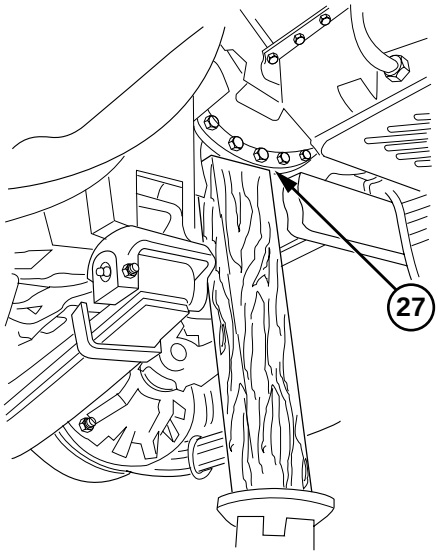
(10) Tighten two locknuts (17) and four locknuts (20) to 212 lb-ft (287 N·m).

(11) Tighten four locknuts (20).

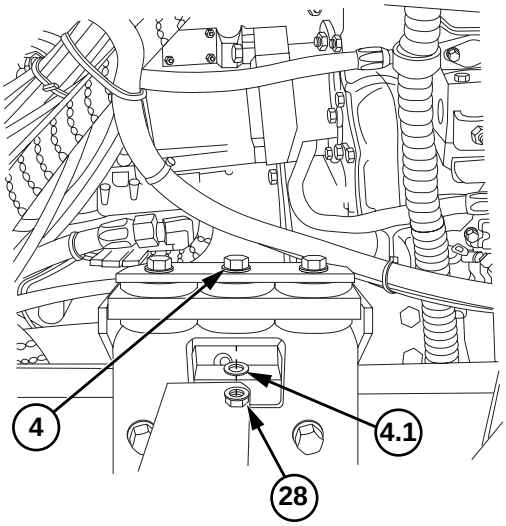
(12) Install two biscuits (24) on bracket (18) with four screws (25) and new locknuts (26).



(13) Remove hydraulic jack and wooden block supporting engine (27).



(14) Install three washers (4.1) and new locknuts (28) on screws (4).



c. Follow-On Maintenance

Install transfer case to axle no. 1 propeller shaft (TM 9-2320-360-20).

14-10. REAR CAB MOUNT REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Battery box pulled out (TM 9-2320-360-10).
Exhaust heat shield removed (TM 9-2320-360-20).
Stowage box removed (TM 9-2320-360-20).

Materials/Parts
Chips, Soap (Item 15, Appendix B)
Locknuts (22) (Item 86, Appendix F)
Locknuts (2) (Item 87, Appendix F)
Locknuts (2) (Item 95, Appendix F)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack Kit, Hydraulic, Hand (Item 92, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Personnel Required
Two

NOTE

Front and rear cab mounts look the same but are not interchangeable.

a. Removal

(1) Remove two locknuts (1) and washers (2) from screws (3). Discard locknuts.

NOTE

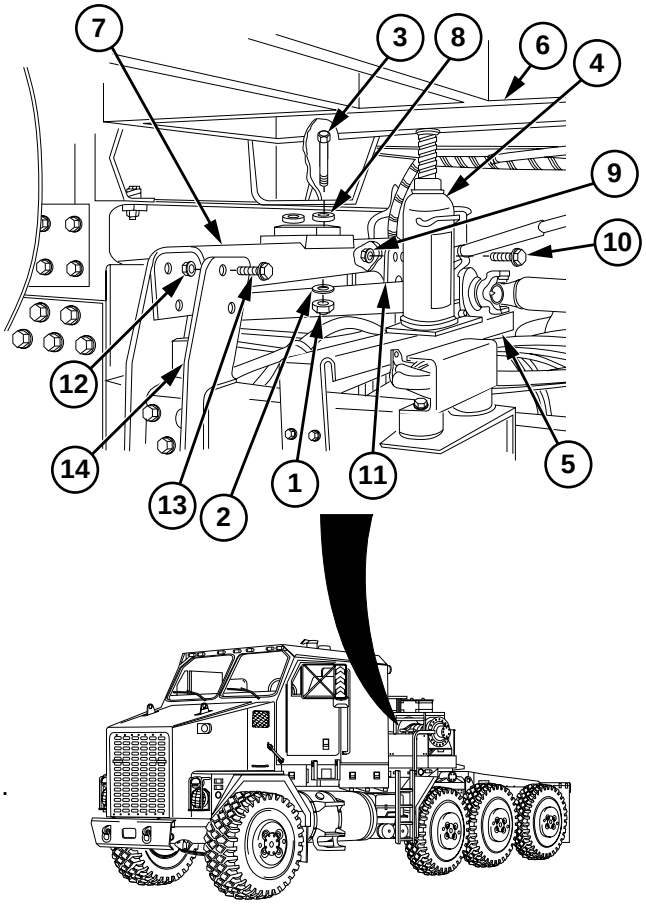
Lift cab until there is 1.125 in. (28.58 mm) between upper and lower cab mounts.

(2) Position hydraulic jack (4) on PTO shaft support (5) and raise cab (6) from crossmember (7).

(3) Remove two spacers (8) and screws (3) from cab (6) and crossmember (7).

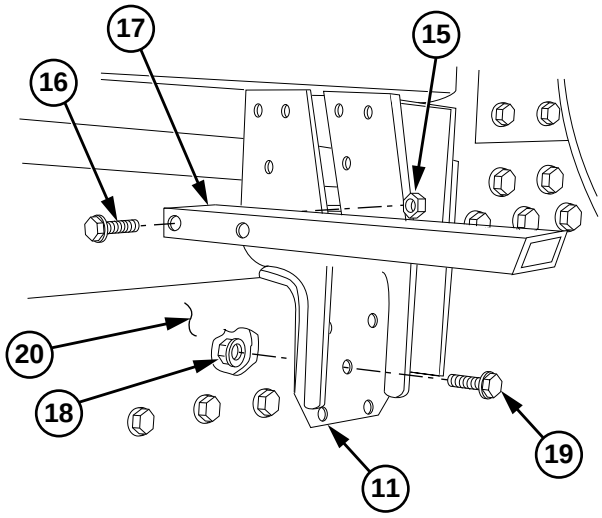
(4) Remove six locknuts (9) and screws (10) from left cab mount (11). Discard locknuts.

(5) Remove six locknuts (12), screws (13) and crossmember (7) from right cab mount (14). Discard locknuts.



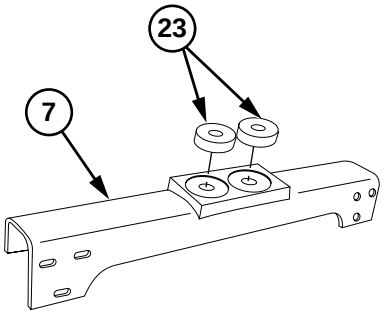
(6) Remove two locknuts (15), screws (16), and stowage box rear mounting bracket (17) from left cab mount (11). Discard locknuts.

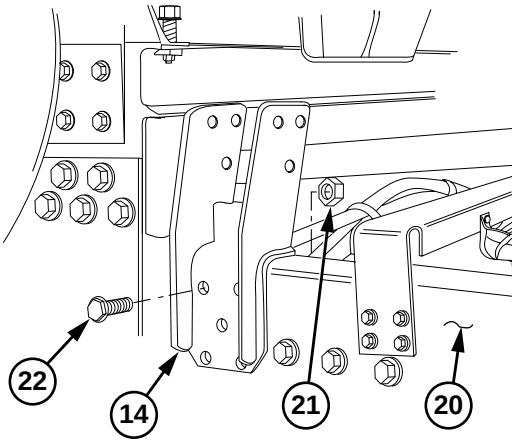
(7) Remove five locknuts (18), screws (19), and left cab mount (11) from frame (20) with aid of assistant. Discard locknuts.



(8) Remove five locknuts (21), screws (22), and right cab mount (14) from frame (20) with aid of assistant. Discard locknuts.

(9) Remove two rubber biscuits (23) from crossmember (7).



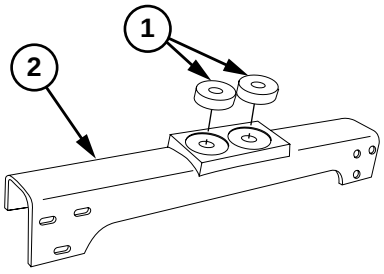


b. Installation

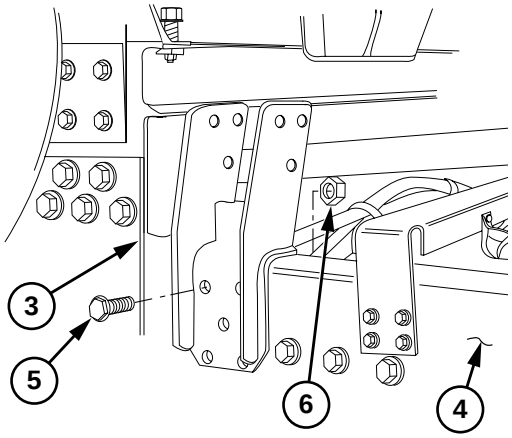
NOTE

Soapy water can be applied to rubber biscuits to aid in installation.

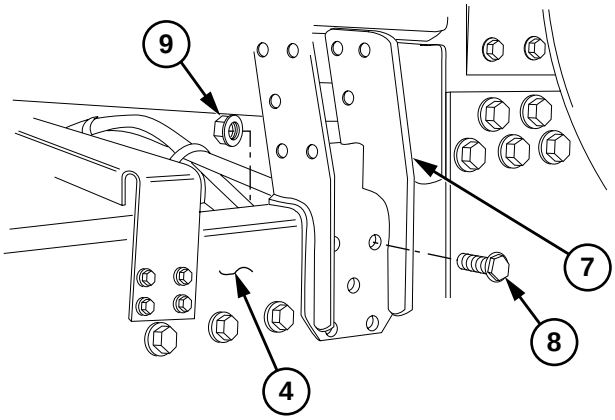
(1) Install two rubber biscuits (1) in crossmember (2).



(2) Position right cab mount (3) on frame (4) with five screws (5) and new locknuts (6) with aid of assistant. Do not tighten.



14-10. REAR CAB MOUNT REPLACEMENT (CONT)

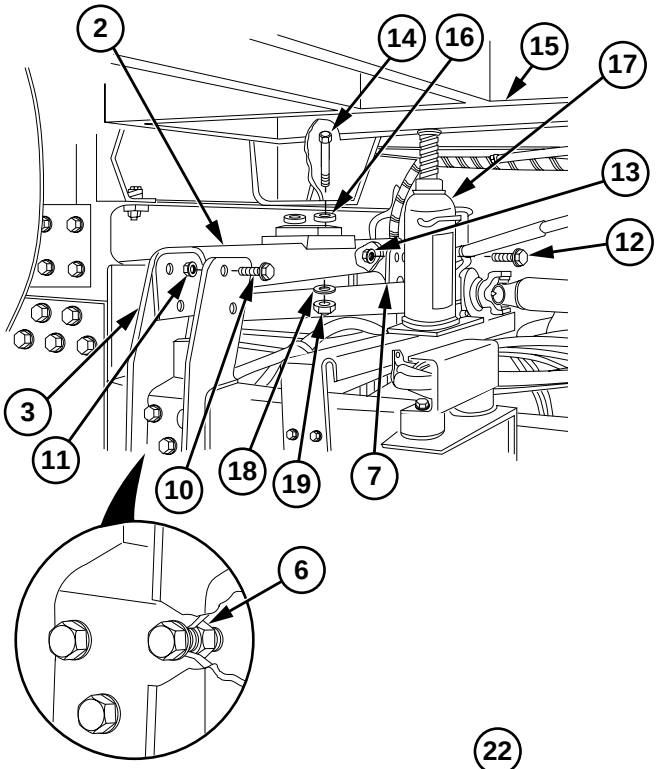


(3) Position left cab mount (7) on frame (4) with five screws (8) and new locknuts (9) with aid of assistant. Do not tighten.

NOTE

Right side of crossmember has slotted holes.

(4) Position crossmember (2) on left and right cab mounts (3 and 7) with aid of assistant.



(5) Position right cab mount (3) on crossmember (2) with six screws (10) and new locknuts (11). Do not tighten.

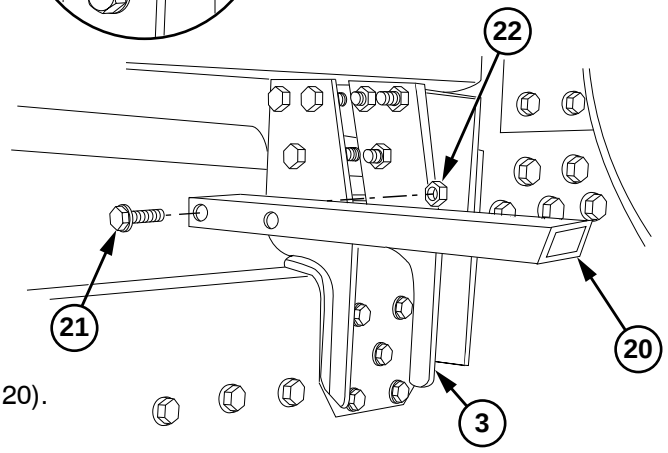
(6) Position left cab mount (7) on crossmember (2) with six screws (12) and new locknuts (13). Do not tighten.

(7) Install two screws (14) through cab (15), spacers (16), and crossmember (2).

(8) Tighten five locknuts (6), five locknuts (9), six locknuts (11), and six locknuts (13) to 107 lb-ft (145 N·m).

(9) Lower cab (15) onto crossmember (2) and remove hydraulic jack (17).

(10) Install two washers (18) and nuts (19) on screws (14). Torque to 212 lb-ft (287 N·m).



(11) Install stowage box rear mounting bracket (20) on left cab mount (7) with two screws (21) and new locknuts (22). Torque to 107 lb-ft (145 N·m).

c. Follow-On Maintenance

(1) Install stowage box (TM 9-2320-360-20).

(2) Install exhaust heat shield (TM 9-2320-360-20).

(3) Push in battery box (TM 9-2320-360-10).

14-11. FRONT CAB MOUNT REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front wheel and tire removed (TM 9-2320-360-20).
Inner fender removed (left side only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Block, Wooden (Figure C-3, Appendix C)
Jack Kit, Hydraulic, Hand (Item 92, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)

Tools and Special Tools (Cont)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Chips, Soap (Item 15, Appendix B)
Tape, Masking (Item 58, Appendix B)
Locknuts (2) (Left cab mount only) (Item 86, Appendix F)
Locknuts (13) (Item 87, Appendix F)

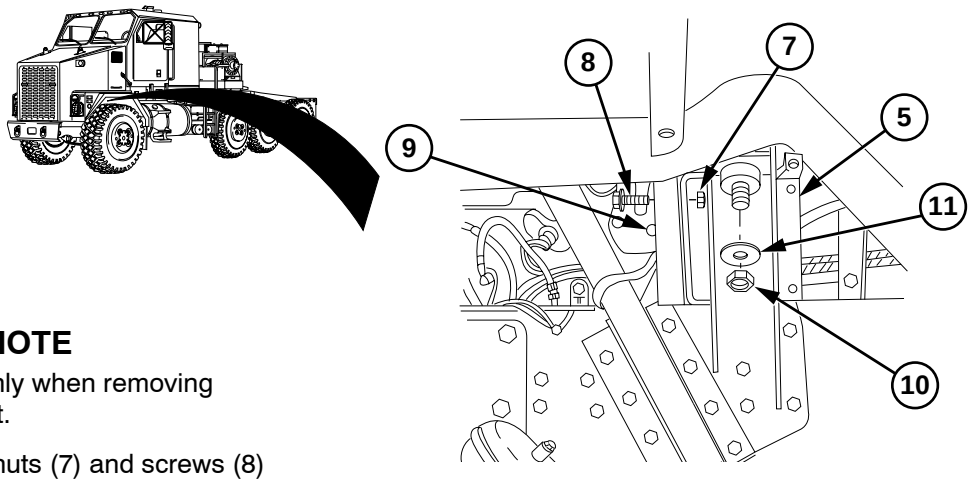
Personnel Required
Two

NOTE

- Left and right cab mounts are replaced in same way. Left side is shown.
- Front and rear cab mounts look the same but are not interchangeable.

a. Removal

(1) Deleted.



NOTE

Do step (2) only when removing left cab mount.

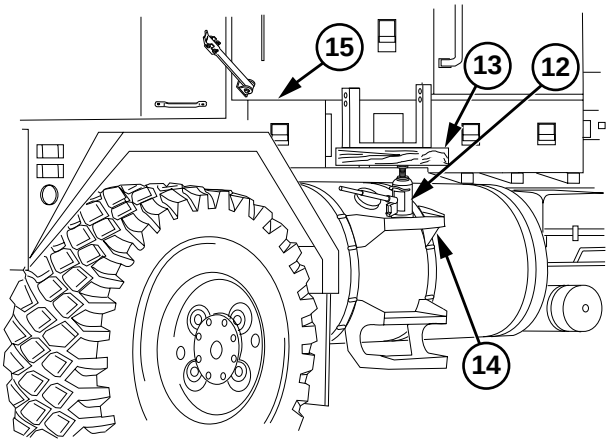
(2) Remove two locknuts (7) and screws (8) from left side front fender center bracket (9) and cab mount (5). Discard locknuts.

(3) Remove locknut (10) and washer (11) from cab mount (5). Discard locknut.

14-11. FRONT CAB MOUNT REPLACEMENT (CONT)

CAUTION

Use block of wood to spread load evenly across step. Failure to comply may damage step.



(4) Place hydraulic jack (12) and wooden block (13) on fuel tank step (14).

NOTE

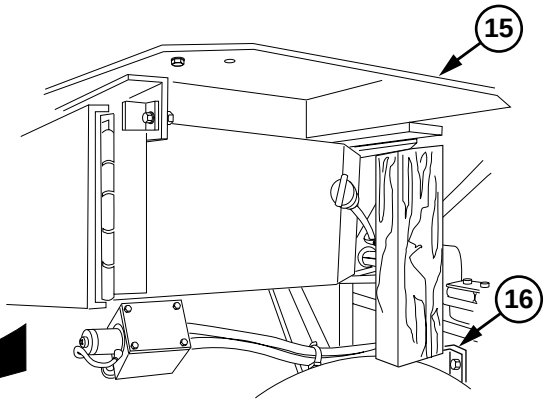
- Cab weighs 2600 lb (1179 kg). Use lifting device of suitable capacity.
- Lift cab only 0.125 in (3.18 mm) to clear cab mount.

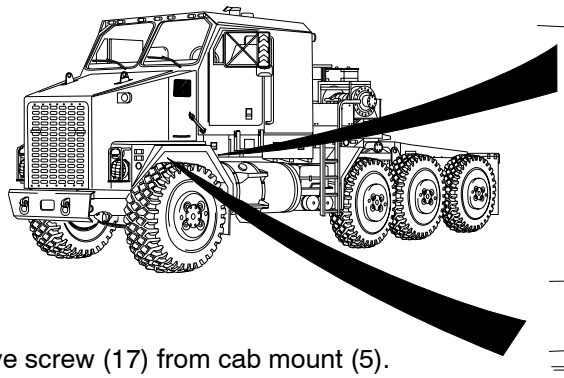
(5) Raise cab (15) from cab mount (5).

NOTE

- Use 16.5 in. wooden block on left side of cab.
- Use 14.5 in. wooden block on right side of cab.

(6) Position wooden block between cab (15) and rear fender bracket (16).

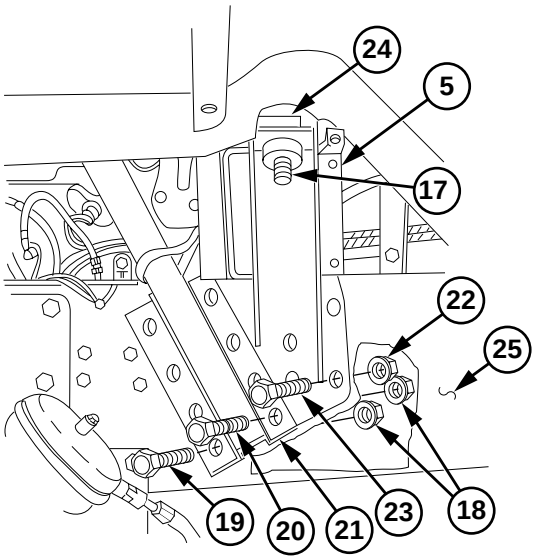




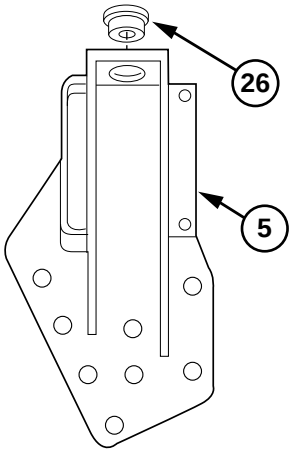
(7) Remove screw (17) from cab mount (5).

(8) Remove eight locknuts (18), four screws (19), and four screws (20) from hardlift support (21) and cab mount (5) with aid of assistant. Discard locknuts.

(9) Remove four locknuts (22), screws (23), and cab mount (5) with spacer (24) from frame (25) with aid of assistant. Discard locknuts.

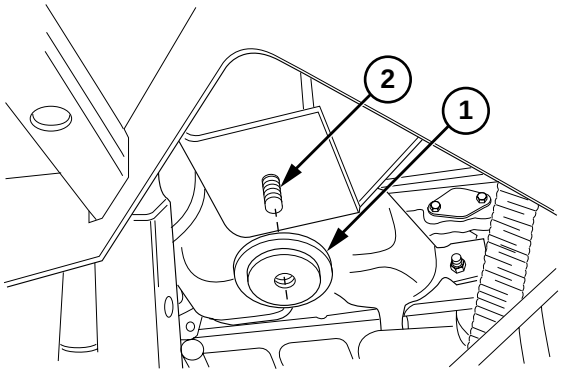


(10) Remove rubber biscuit (26) from cab mount (5).



b. Installation

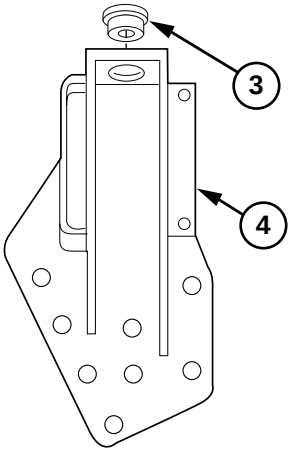
(1) Position spacer (1) on screw (2) and secure with masking tape.



NOTE

Soapy water can be applied to rubber biscuits to aid in installation.

(2) Install rubber biscuit (3) in cab mount (4).



NOTE

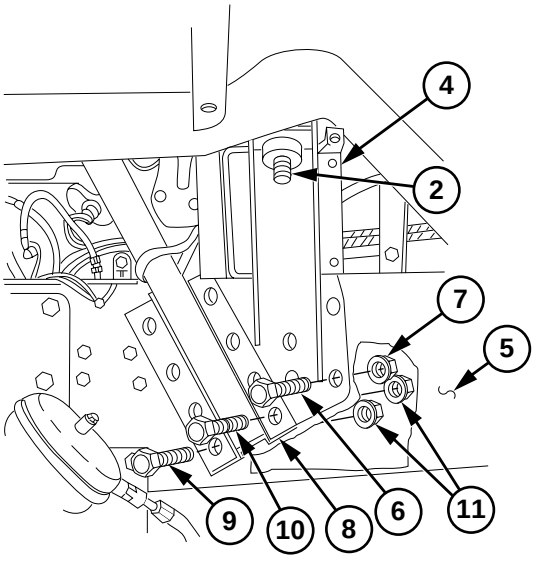
Position cab mount on screw and behind hardlift support.

(3) Position cab mount (4) on frame (5) with four screws (6) and new locknuts (7) with aid of assistant. Do not tighten.

(4) Install cab mount (4) and hardlift support (8) on frame (5) with four screws (9), screws (10) and eight new locknuts (11) with aid of assistant. Torque to 212 lb-ft (287 N·m).

(5) Install screw (2) on cab mount (4).

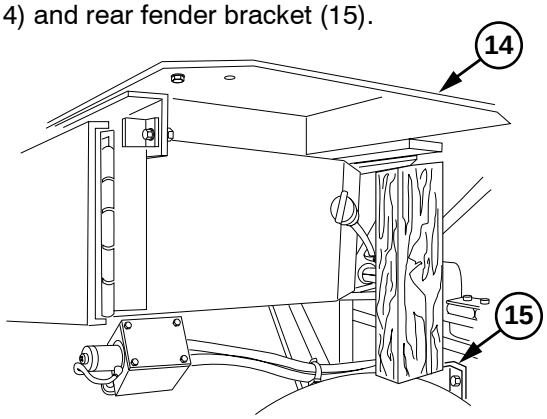
(6) Tighten four locknuts (7) to 212 lb-ft (287 N·m).

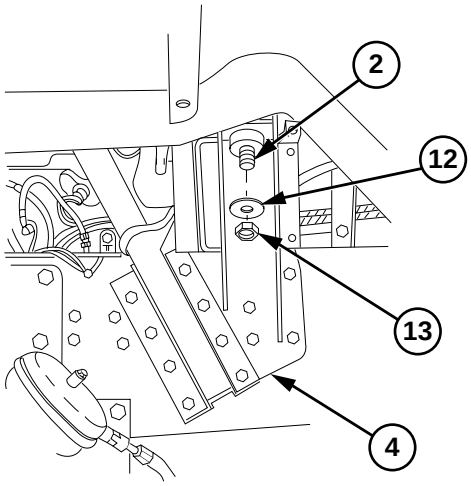


14-11. FRONT CAB MOUNT REPLACEMENT (CONT)

(7) Install washer (12) and new locknut (13) on cab mount (4).

(8) Remove wooden block from between cab (14) and rear fender bracket (15).





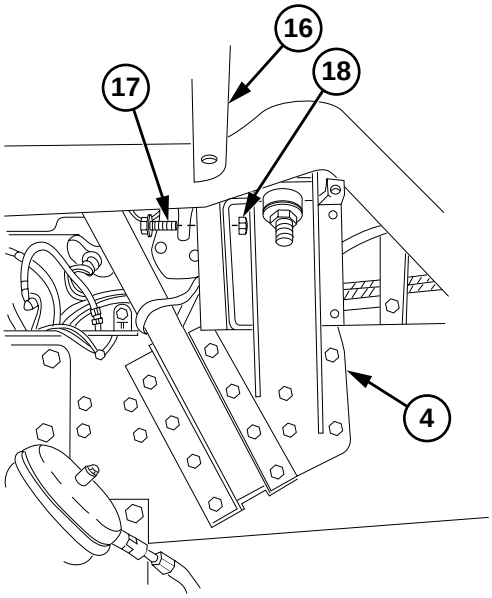
(9) Lower cab (14) on cab mount (4).

(10) Tighten screw (2) and locknut (13) to 212 lb-ft (287 N·m).

NOTE

Perform step (11) only when installing left cab mount

(11) Install left side front fender center bracket (16) on cab mount (4) with two screws (17) and new locknuts (18).



(12) Deleted.

c. Follow-On Maintenance

(1) Install front wheel and tire (TM 9-2320-360-20).

(2) Install inner fender (TM 9-2320-360-20).

14-12. TRANSFER CASE MOUNTING BRACKETS REPLACEMENT

This task covers:
Removal
Installation

Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
No. 1 air reservoir removed (left transfer case mounting bracket only) (TM 9-2320-360-20).
Exhaust heat shield (right transfer case mounting bracket only) (TM 9-2320-360-20).
Battery box pulled out (left transfer case mounting bracket only) (TM 9-2320-360-10).
Left fuel tank removed (left transfer case mounting bracket only) (TM 9-2320-360-20).

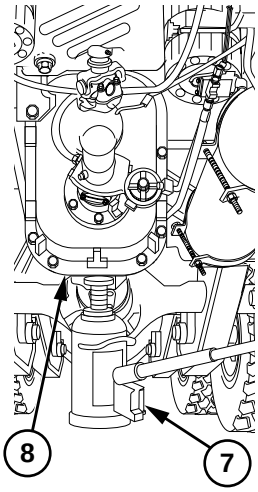
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack Kit, Hydraulic, Hand (Item 92, Appendix E)
Jackstand, 7-Ton (Item 93, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

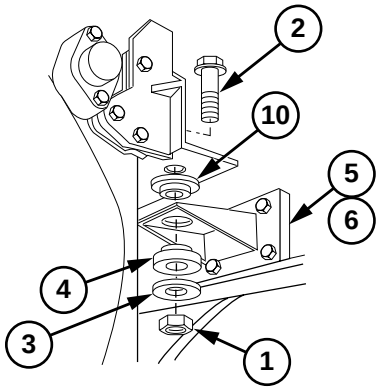
.Materials/Parts
Locknuts (11) (Item 87, Appendix F)
Locknuts (8) (Item 88, Appendix F)

Personnel Required
Two

WARNING

Do not attempt to replace both left and right brackets at the same time. Failure to comply may result in transfer case not being properly supported. Transfer case could fall and cause injury to personnel.



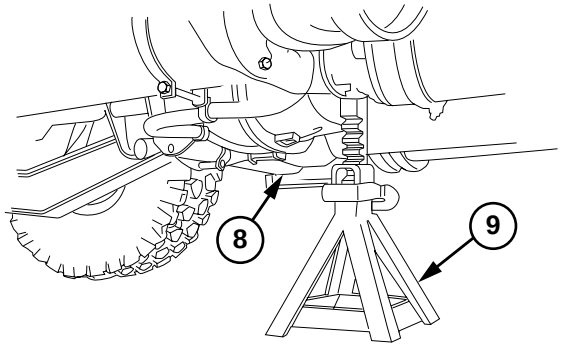


a. Left Mounting Bracket Removal

(1) Remove two locknuts (1), screws (2), spacers (3), and mounting biscuits (4) from transfer case left mounting brackets (5 and 6). Discard locknuts.

NOTE

Transfer case must be lifted until there is 1.5 in. (38 mm) between upper and lower transfer case brackets with biscuits installed.



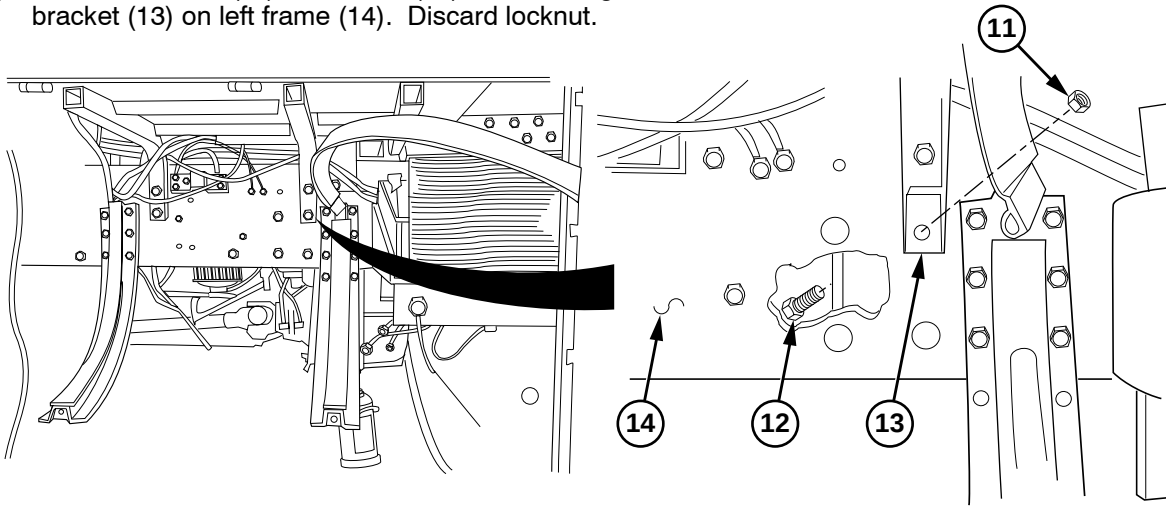
(2) Place bottle jack (7) under transfer case (8) and lift transfer case (8) off brackets (5 and 6).

(3) Support transfer case (8) with jackstand (9).

(4) Remove two upper biscuits (10) from brackets (5 and 6).

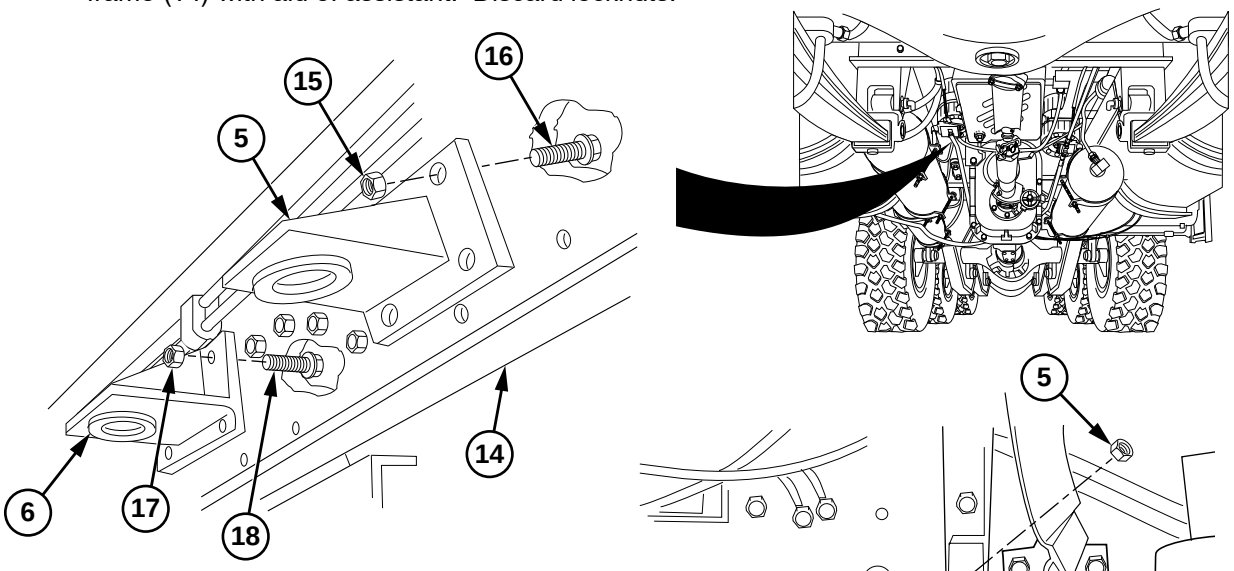
14-12. TRANSFER CASE MOUNTING BRACKETS REPLACEMENT (CONT)

(5) Remove locknut (11) and screw (12) from stowage box center bracket (13) on left frame (14). Discard locknut.



(6) Remove three locknuts (15), screws (16), and left front transfer case mounting bracket (5) from left frame (14) with aid of assistant. Discard locknuts.

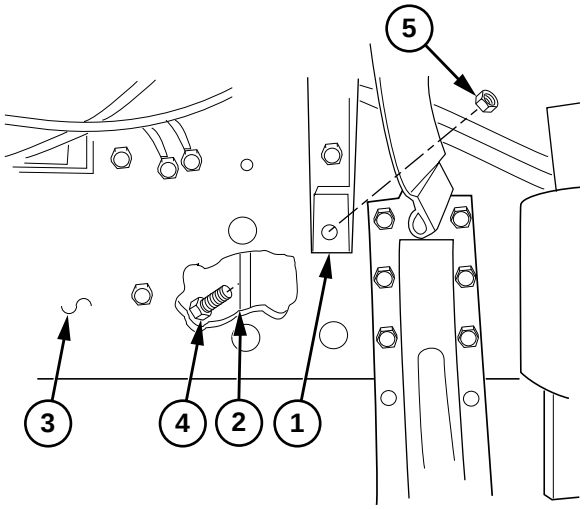
(7) Remove three locknuts (17), screws (18), and left rear transfer case mounting bracket (6) from left frame (14) with aid of assistant. Discard locknuts.



TRANSFER CASE REMOVED FOR CLARITY

b. Left Mounting Bracket Installation

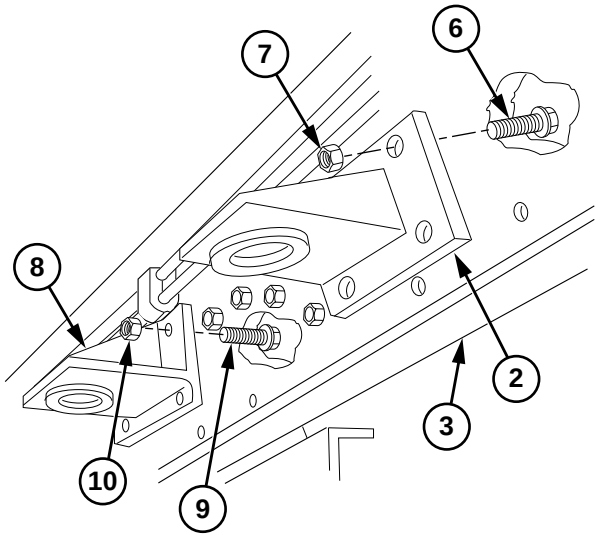
(1) Install stowage box center bracket (1) and left front transfer case mounting bracket (2) on left frame (3) with screw (4) and new locknut (5). Do not tighten.



(2) Secure left front transfer case mount bracket (2) to left frame (3) with three screws (6) and new locknuts (7) with aid of assistant. Torque to 375 lb-ft (508 N·m).

(3) Tighten locknut (5) to 212 lb-ft (286 N·m).

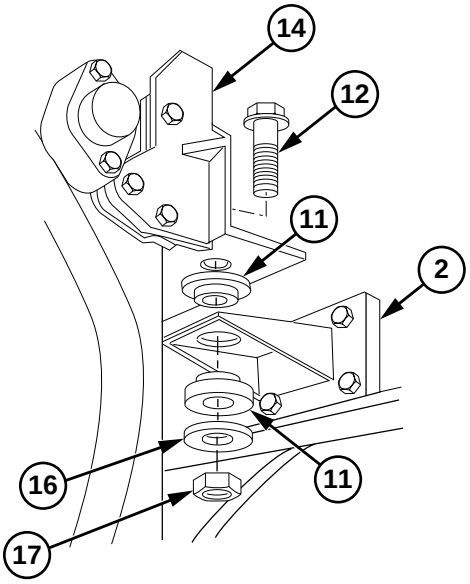
(4) Install left rear transfer case mounting bracket (8) on left frame (3) with four screws (9) and new locknuts (10). Torque to 375 lb-ft (508 N·m).

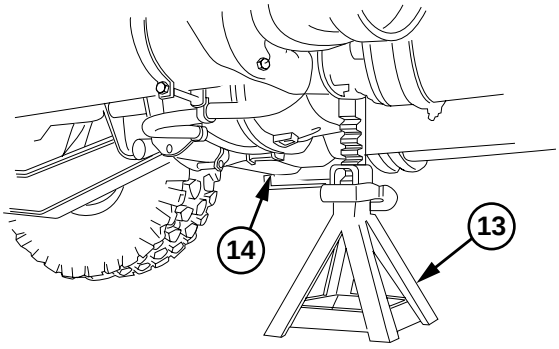


TRANSFER CASE REMOVED FOR CLARITY

(5) Install four mounting biscuits (11) on two transfer case left mounting brackets (2 and 8) with four screws (12).

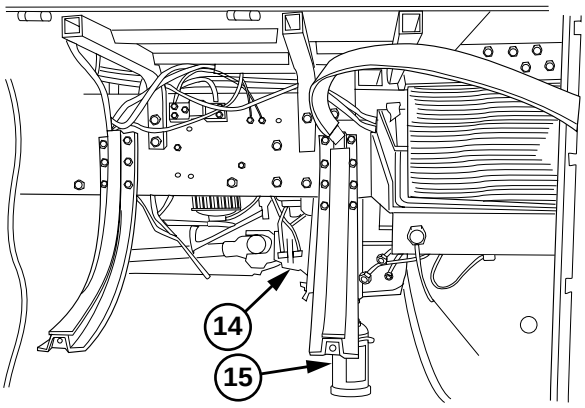
(6) Remove jackstand (13) from under transfer case (14).





(7) Lower transfer case (14) and remove bottle jack (15).

(8) Install two spacers (16) and new locknuts (17) on screws (12). Torque to 212 lb-ft (286 N·m).



14-12. TRANSFER CASE MOUNTING BRACKETS REPLACEMENT (CONT)

c. Right Mounting Bracket Removal

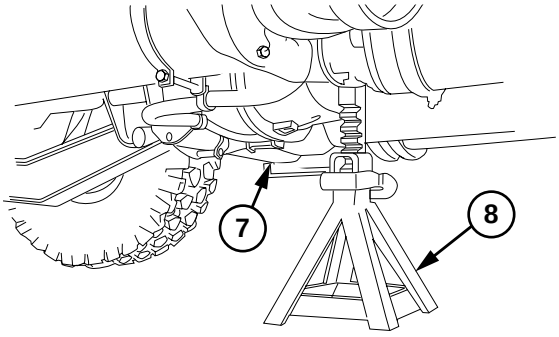
(1) Remove two locknuts (1), screws (2), plate (3), and two mounting biscuits (4) from transfer case right mounting bracket (5). Discard locknuts.

NOTE

Transfer case must be lifted until there is 2 in. (5 cm) between upper and lower transfer case brackets with biscuits installed.

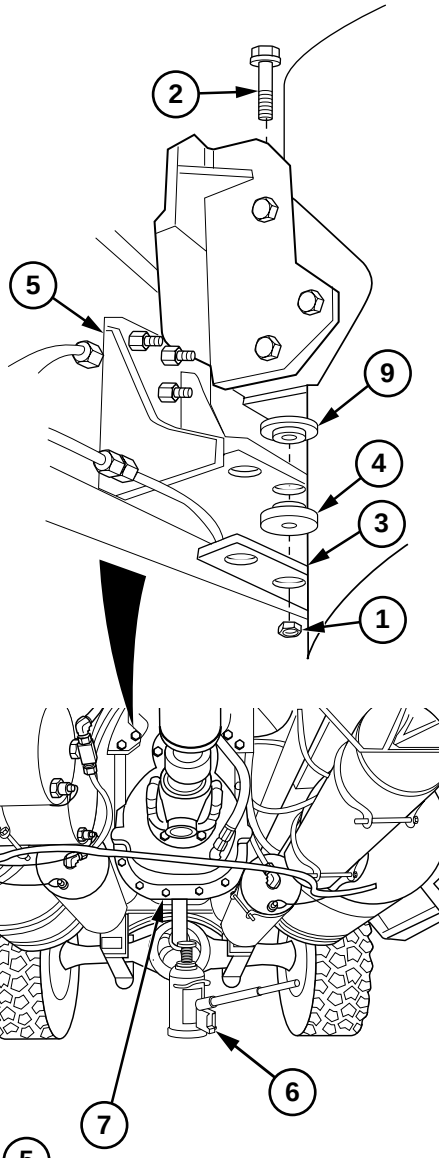
(2) Place bottle jack (6) under transfer case (7) and lift transfer case off bracket (5).

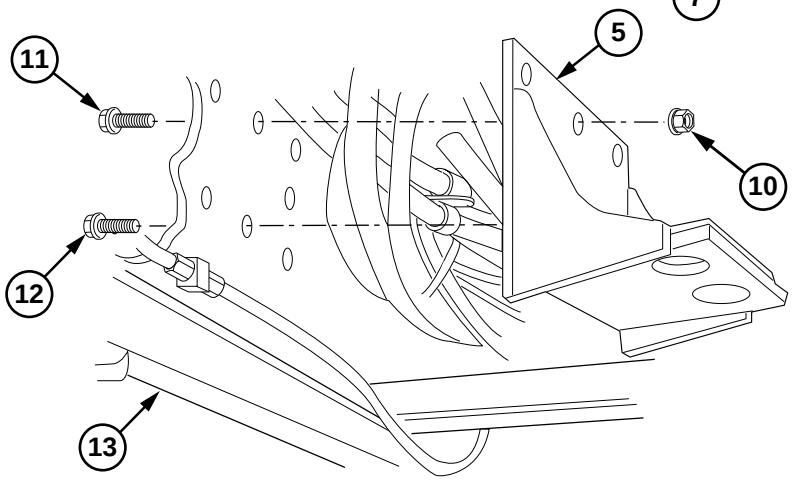
(3) Support transfer case (7) with jackstand (8).



(4) Remove two upper biscuits (9) from bracket (5).

(5) Remove seven locknuts (10), three screws (11), four screws (12), and transfer case right mounting bracket (5) from right side frame (13). Discard locknuts.

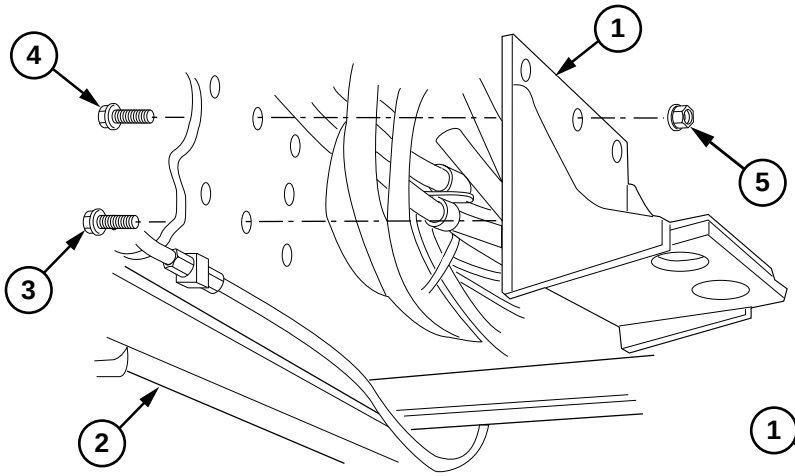




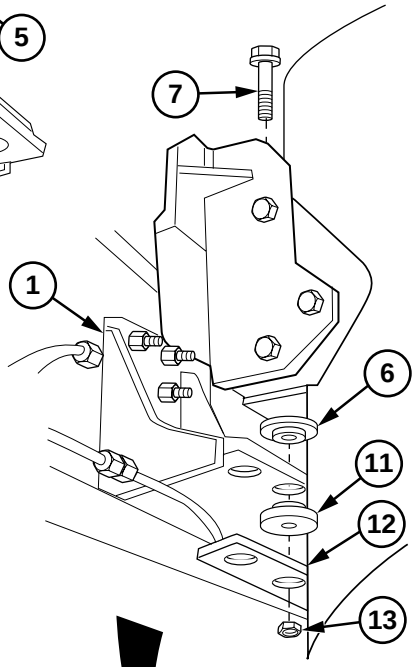
TRANSFER CASE REMOVED FOR CLARITY

d. Right Mounting Bracket Installation

(1) Install transfer case right mount bracket (1) on right side frame (2) with four screws (3), three screws (4), and seven new locknuts (5). Torque to 212 lb-ft (286 N·m).

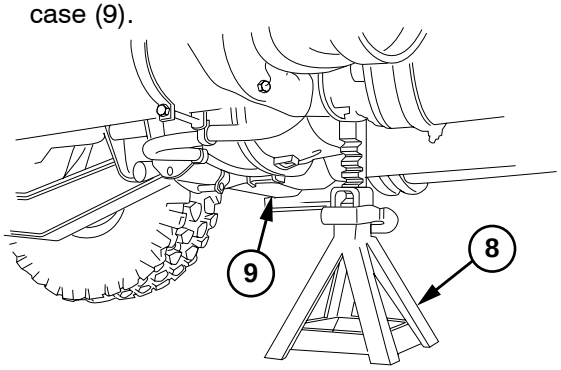


TRANSFER CASE REMOVED FOR CLARITY



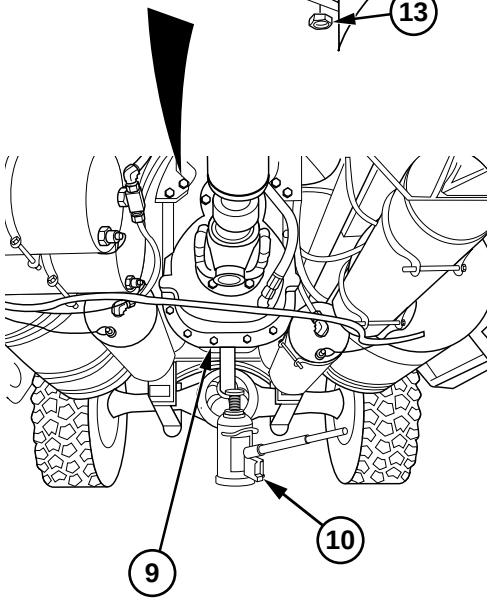
(2) Install two mounting biscuits (6) on bracket (1) with two screws (7).

(3) Remove jackstand (8) from under transfer case (9).



(4) Lower transfer case (9) and remove bottle jack (10).

(5) Install two mounting biscuits (11) and plate (12) on transfer case mount bracket (1) with two locknuts (13). Torque to 212 lb-ft (286 N·m).



e. Follow-On Maintenance

(1) Push in battery tray (left transfer case mounting bracket only) (TM 9-2320-360-10).

(2) Install left fuel tank (left transfer case mounting bracket only) (TM 9-2320-360-20).

(3) Install no. 1 air reservoir (left transfer case mounting bracket only) (TM 9-2320-360-20).

(4) Install exhaust heat shield (right transfer case mounting bracket only) (TM 9-2320-360-20).

14-13. NO. 2 CROSSMEMBER REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Exhaust heat shield removed (TM 9-2320-360-20).
Battery box pulled out (TM 9-2320-360-10).
Transfer case to axle no. 2 propeller shaft removed (TM 9-2320-360-20).
No. 2 longitudinal torque rod removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

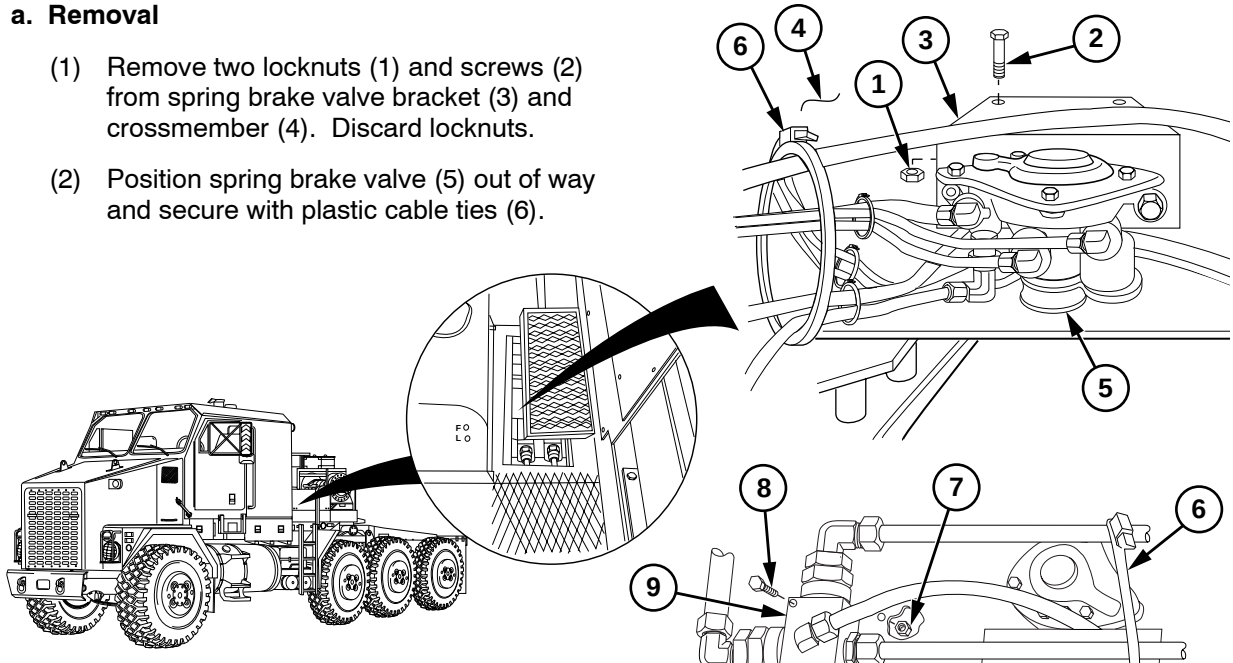
Materials/Parts
Ties, Cable Plastic (Item 60, Appendix B)
Locknuts (16) (Item 87, Appendix F)
Locknuts (12) (Item 88, Appendix F)
Locknuts (6) (Item 92, Appendix F)
Locknuts (2) (Item 96, Appendix F)

Personnel Required
Two

a. Removal

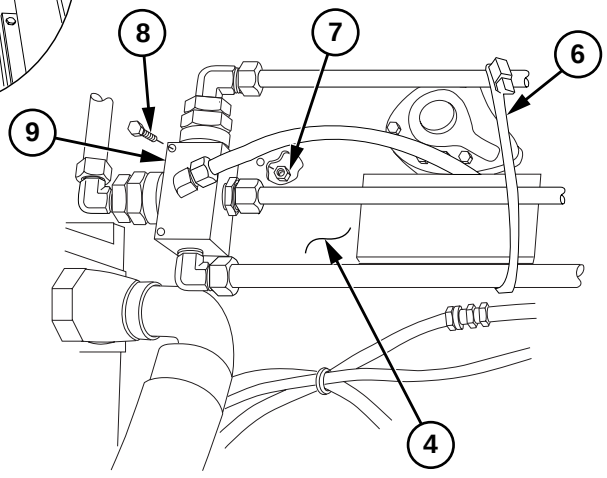
(1) Remove two locknuts (1) and screws (2) from spring brake valve bracket (3) and crossmember (4). Discard locknuts.

(2) Position spring brake valve (5) out of way and secure with plastic cable ties (6).



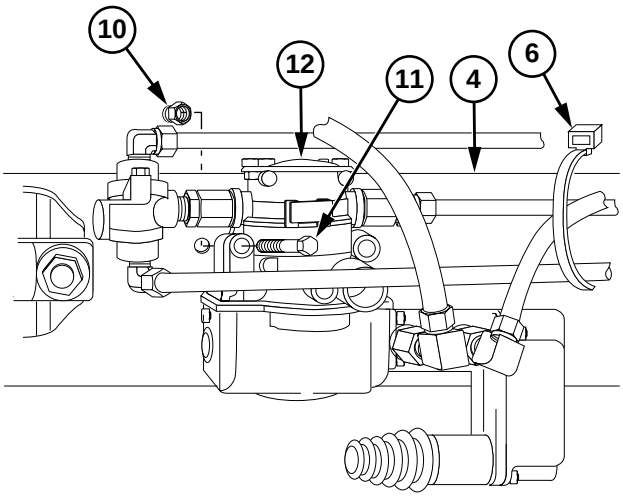
(3) Remove two locknuts (7) and screws (8) from no. 1 manifold assembly (9) and crossmember (4). Discard locknuts.

(4) Position no. 1 manifold assembly (9) out of way and secure with plastic cable ties (6).



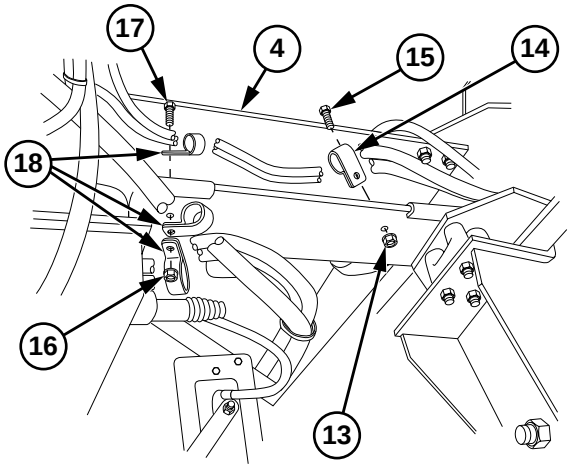
(5) Remove two locknuts (10) and screws (11) from load sensing valve (12) and crossmember (4). Discard locknuts.

(6) Position load sensing valve (12) out of way and secure with plastic cable ties (6).



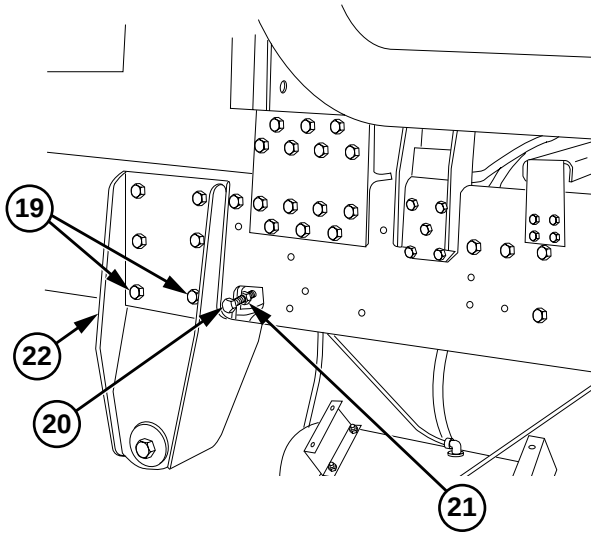
(7) Remove locknut (13), clip (14), and screw (15) from crossmember (4). Discard locknut.

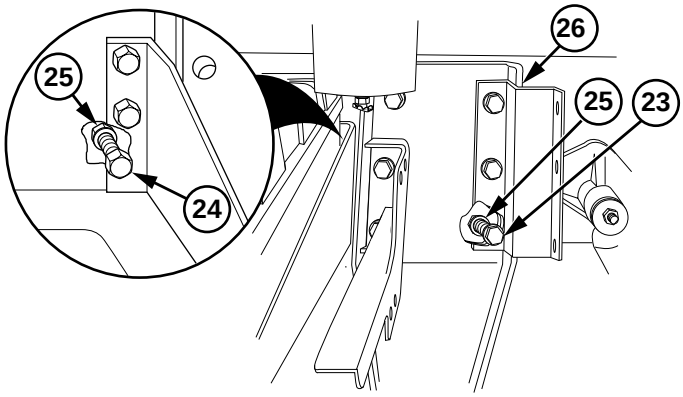
(8) Remove locknut (16), screw (17), and three clips (18) from crossmember (4). Discard locknut.



(9) Loosen two screws (19), screw (20), and three locknuts (21) on right side frame hanger (22). Do not remove.

(10) Loosen two screws (23), screw (24), and three locknuts (25) from left side frame hanger (26). Do not remove.





AFTERCOOLER REMOVED FOR CLARITY

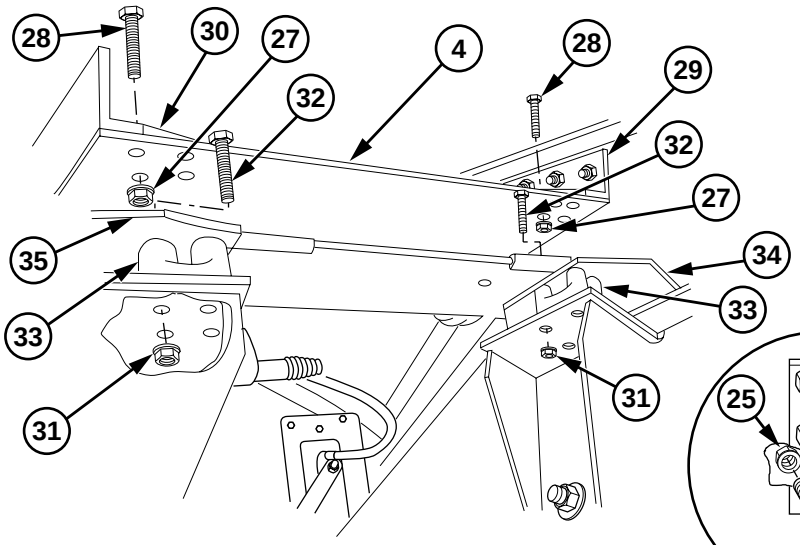
14-13. NO. 2 CROSSMEMBER REPLACEMENT (CONT)

(11) Remove eight locknuts (27) and screws (28) from two upper angles (29 and 30) with aid of assistant. Discard locknuts.

NOTE

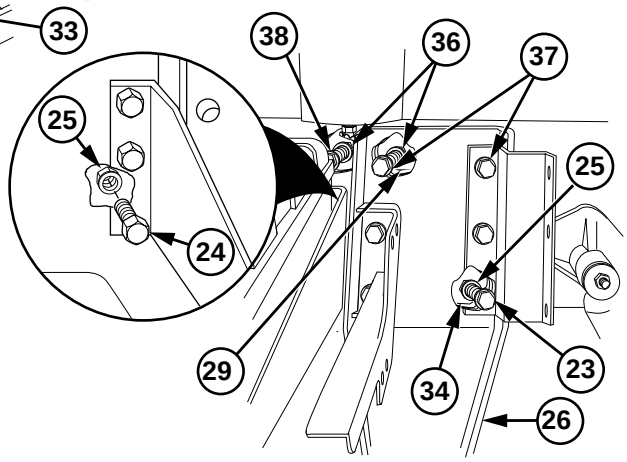
Crossmember is removed by pressing it toward rear of HET Tractor.

(12) Remove eight locknuts (31), screws (32), two spacers (33), and crossmember (4) from two lower angles (34 and 35) with aid of assistant. Discard locknuts.

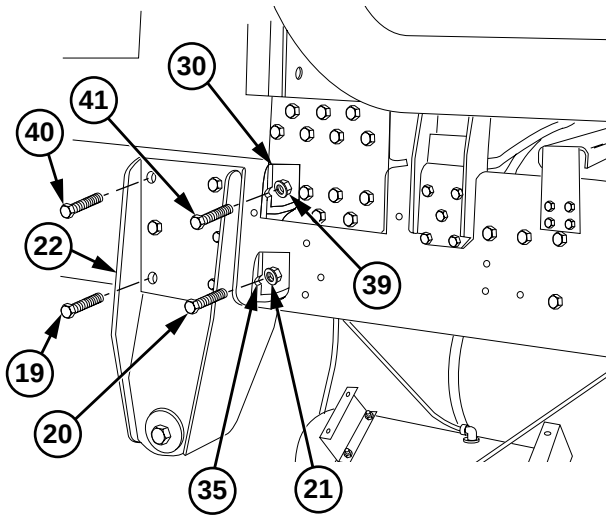


(13) Remove three locknuts (36), two screws (37), screw (38), and left side upper angle (29) from left side frame hanger (26) with aid of assistant. Discard locknuts.

(14) Remove three locknuts (25), two screws (23), screw (24), and left side lower angle (34) from left side frame hanger (26) with aid of assistant. Discard locknuts.



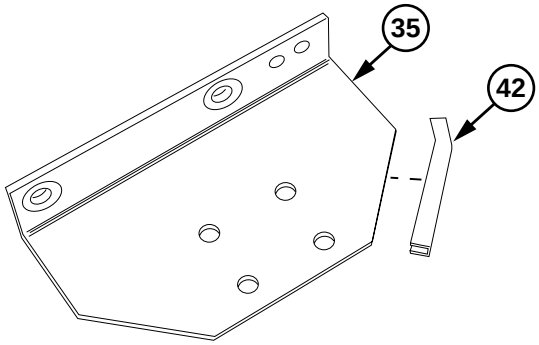
AFTERCOOLER REMOVED FOR CLARITY

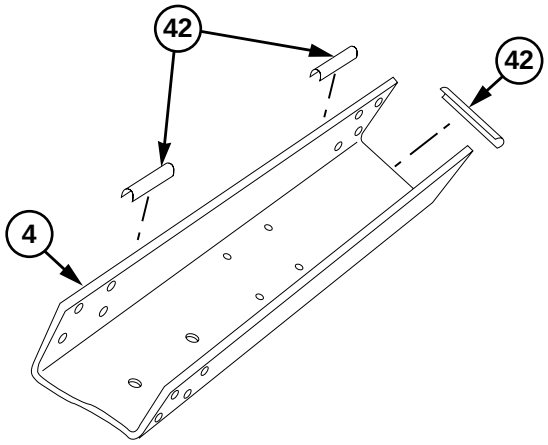


(15) Remove three locknuts (39), two screws (40), screw (41), and right side upper angle (30) from right side frame hanger (22) with aid of assistant. Discard locknuts.

(16) Remove three locknuts (21), two screws (19), screw (20), and right side lower angle (35) from right side frame hanger (22). Discard locknuts.

(17) Remove quickedge moulding (42) from crossmember (4) and right side lower angle (35).



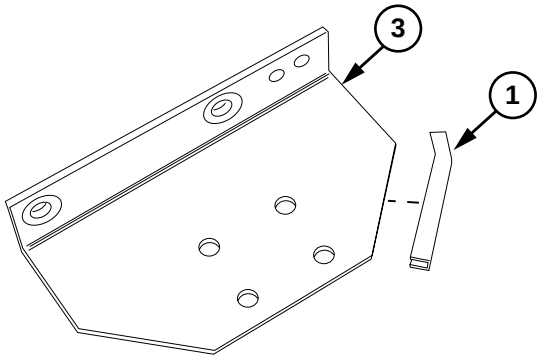


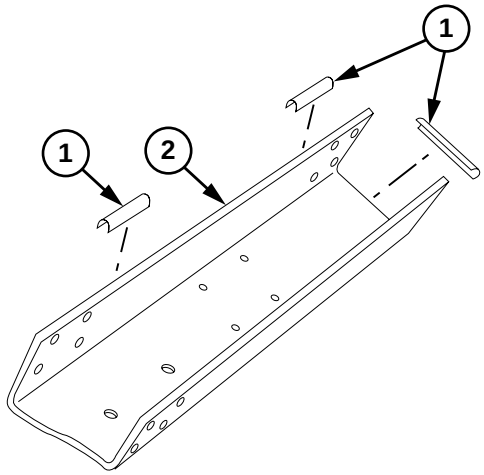
b. Installation

NOTE

Open side of crossmember faces front of HET Tractor.

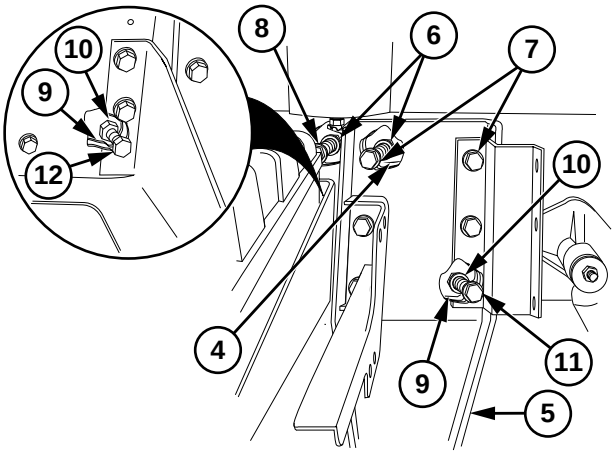
(1) Install quickedge moulding (1) on crossmember (2) and right side lower angle (3).





(2) Position left side upper angle (4) on hanger bracket (5) with three new locknuts (6), two screws (7), and screw (8) with aid of assistant. Do not tighten.

(3) Position left side lower angle (9) on hanger bracket (5) with three new locknuts (10) two screws (11), and screw (12) with aid of assistant. Do not tighten.

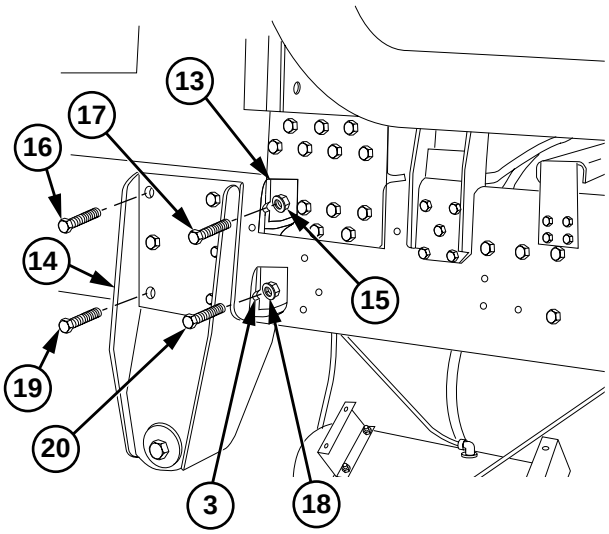


AFTERCOOLER REMOVED FOR CLARITY

14-13. NO. 2 CROSSMEMBER REPLACEMENT (CONT)

(4) Position right side upper angle (13) on hanger bracket (14) with three new locknuts (15), two screws (16), and screw (17) with aid of assistant. Do not tighten.

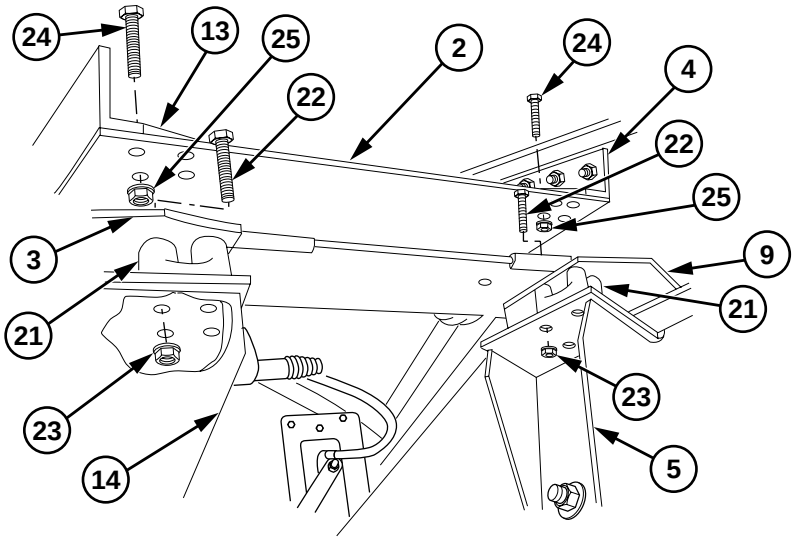
(5) Position right side lower angle (3) on hanger bracket (14) with three new locknuts (18), two screws (19), and screw (20) with aid of assistant. Do not tighten.



(6) Position crossmember (2) between four angles (3, 4, 9, and 13) with aid of assistant.

(7) Position two spacers (21), eight screws (22), and eight new locknuts (23) on crossmember (2). Do not tighten.

(8) Install eight screws (24) and new locknuts (25) on crossmember (2) with aid of assistant. Torque to 212 lb-ft (287 N·m).



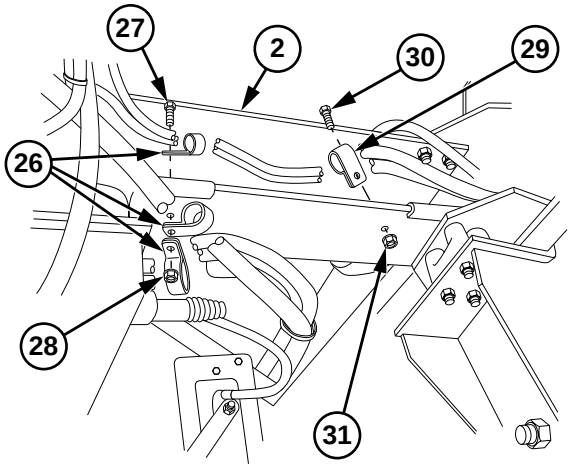
(9) Tighten bottom eight locknuts (23) to 212 lb-ft (287 N·m).

(10) Tighten six locknuts (15 and 18) on right side frame hanger (14) to 212 lb-ft (287 N·m) with aid of assistant.

(11) Tighten six locknuts (6 and 10) on left side frame hanger (5) to 212 lb-ft (287 N·m) with aid of assistant.

(12) Install three clips (26) on crossmember (2) with screw (27) and new locknut (28).

(13) Install clip (29) on crossmember (2) with screw (30) and new locknut (31).

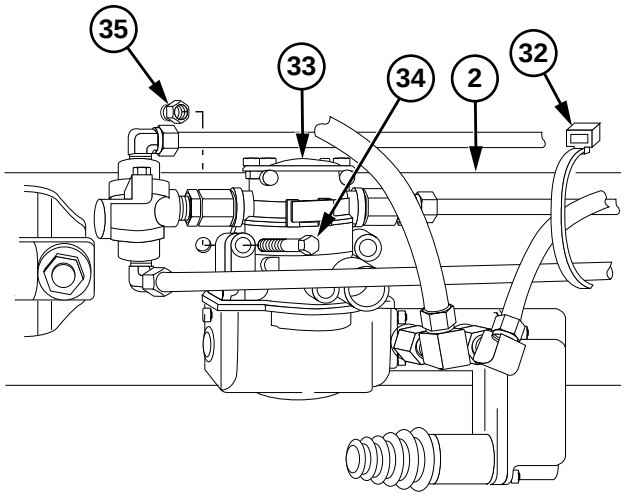


WARNING

Load sensing valve must be supported when removing plastic cable tie. Failure to comply may result in injury from falling valve.

(14) Remove plastic cable ties (32) securing load sensing valve (33).

(15) Install load sensing valve (33) on crossmember (2) with two screws (34) and new locknuts (35).

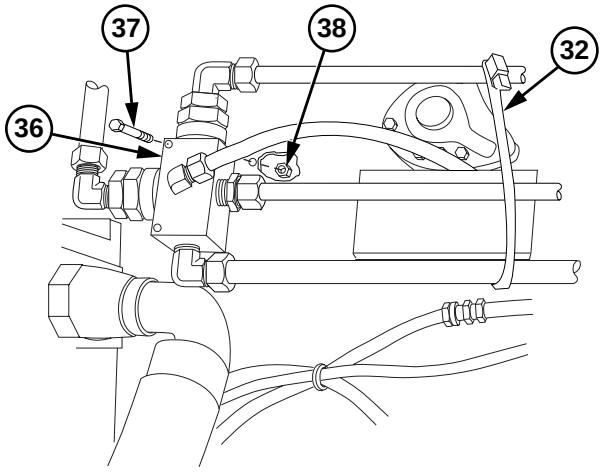


WARNING

Manifold assembly must be supported when removing plastic cable tie. Failure to comply may result in injury from falling manifold assembly.

(16) Remove plastic cable ties (32) securing no. 1 manifold assembly (36).

(17) Install no. 1 manifold assembly (36) on crossmember (2) with two screws (37) and new locknuts (39).



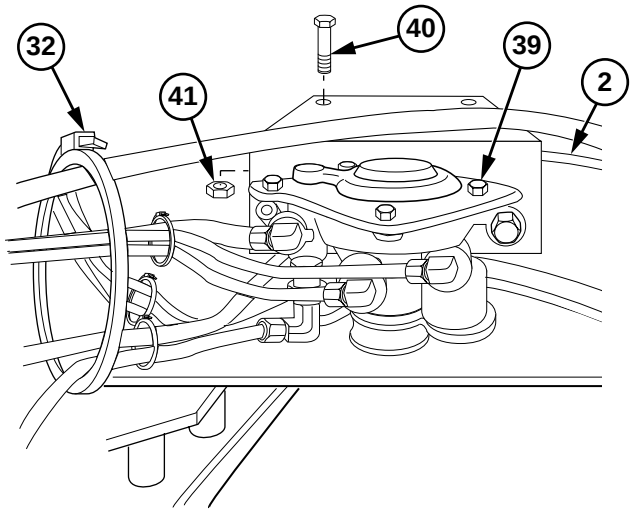
14-13. NO. 2 CROSSMEMBER REPLACEMENT (CONT)

WARNING

Spring brake valve must be supported when removing plastic cable tie. Failure to comply may result in injury from falling valve.

(18) Remove plastic cable tie (32) from spring brake valve (39).

(19) Install spring brake valve (39) on crossmember (2) with two screws (40) and new locknuts (41).



c. Follow-On Maintenance

(1) Install longitudinal torque rod (TM 9-2320-360-20).

(2) Install transfer case to axle no. 2 propeller shaft (TM 9-2320-360-20).

(3) Push in battery box (TM 9-2320-360-10).

(4) Install exhaust heat shield (TM 9-2320-360-20).

14-14. FRAME HANGERS REPLACEMENT

This task covers:
Removal
Installation

Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Air system drained (TM 9-2320-360-10).
Wheels/tires removed (See table 14-1.) (TM 9-2320-360-20).
Fifth wheel catwalk removed (axle no. 3 left frame hanger only) (TM 9-2320-360-20).
Left side rear fender brackets removed (axle no. 2 left frame hanger only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jack Kit, Hydraulic, Hand (Item 92, Appendix E)
Jackstand (Item 93, Appendix E)
Multiplier, Torque (Item 99, Appendix E)
Socket, Sockethead Screw, 3/4 In., 1/2 In. Drive (Item 168, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)

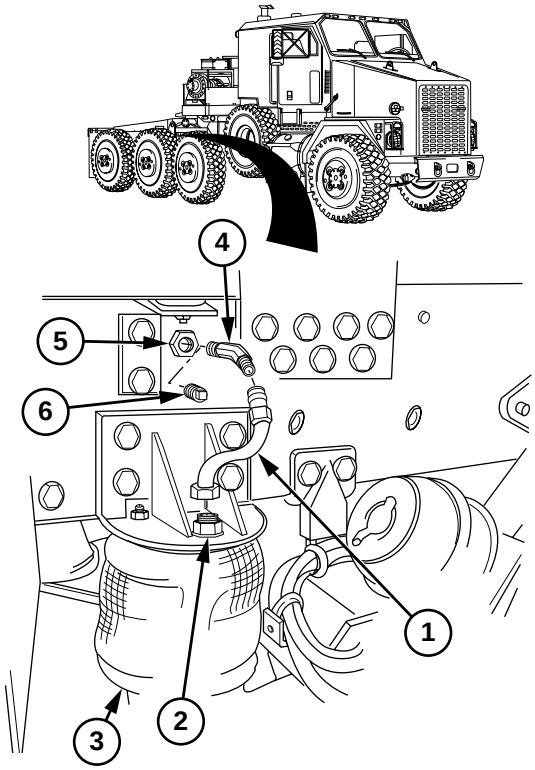
Tools and Special Tools (Cont)
Wrench, Torque 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Tags, Identification (Item 56, Appendix B)
Bushing Bolt Kit (Item 4, Appendix F)
Locknuts (6) (Item 88, Appendix F)
Locknuts (4) (Item 87, Appendix F)
Locknuts (4) (Item 92, Appendix F)
Locknuts (2) (Item 81, Appendix F)
Retainer Kit, Pitman Arm (axle no. 4 left frame hanger only) (Item 233, Appendix F)

Personnel Required
Two

Table 14-1. Tire/Wheel Removal

Axle Frame Hanger Replaced	Wheel/Tire(s) Removed (TM 9-2320-360-20)
Axle No. 2 Right	Axle No. 2 Right and Spare
Axle No. 2 Left	Axle No. 2 Left
Axle No. 3 Right	Axle No. 3 Right and Axle No. 2 Right
Axle No. 3 Left	Axle No. 3 Left and Axle No. 2 Left
Axle No. 4 Right	Axle No. 4 Right and Axle No. 3 Right
Axle No. 4 Left	Axle No. 4 Left and Axle No. 3 Left



a. Axle No. 2 (Right) Frame Hanger Removal

(1) Remove air line no. 2052 (1) from fitting (2) on air spring (3).

(2) Remove air line no. 2052 (1) from elbow (4).

(3) Remove elbow (4) from fitting (5).

(4) Install plug (6) in fitting (5).

(5) Start engine (TM 9-2320-360-10).

(6) Build air pressure to 120-125 psi (827-861 kPa).

(7) Shut off engine (TM 9-2320-360-10).

14-14. FRAME HANGERS REPLACEMENT (CONT)

(8) Raise axle (7) with floor jack to slightly lift suspension arm (8).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(9) Support axle (7) with jackstand.

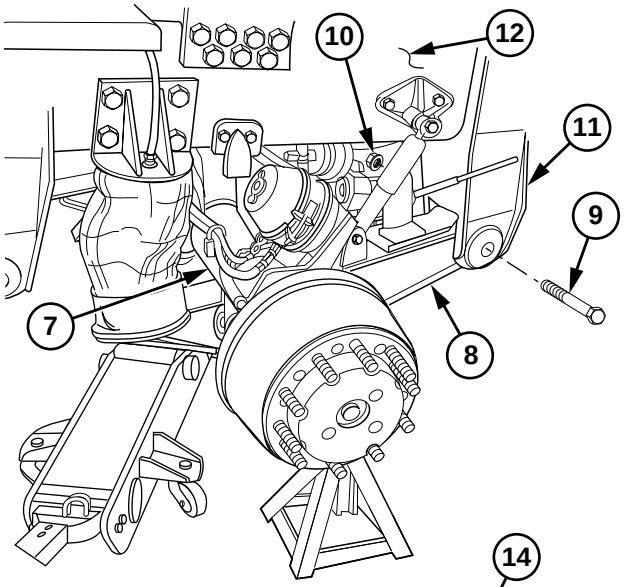
(10) Remove screw (9) and locknut (10) from frame hanger (11). Discard screw and locknut.

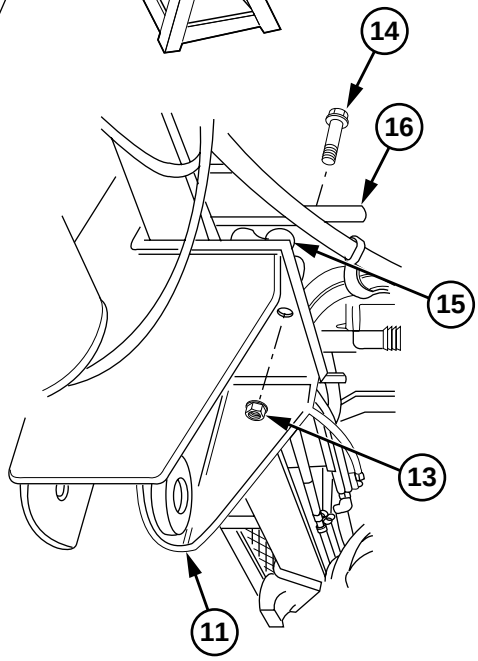
(11) Raise axle (7) with floor jack and lower jackstand.

(12) Lower floor jack and support axle (7) with jackstand.

(13) Position hydraulic jack between suspension arm (8) and frame (12).

(14) Push suspension arm (8) out of frame hanger (11) by raising hydraulic jack.





(15) Remove four locknuts (13), screws (14), and spacer (15) from frame hanger (11) and crossmember (16). Discard locknuts.

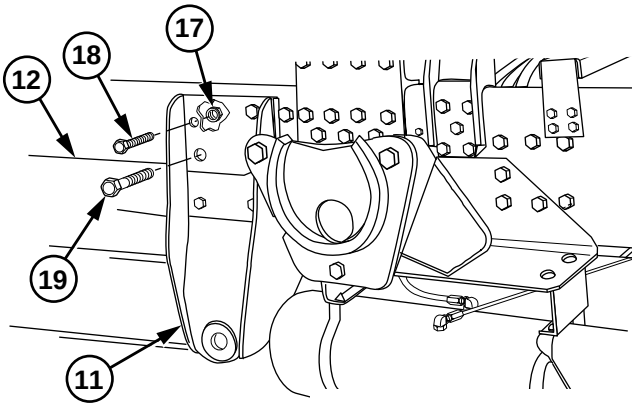
WARNING

Keep out from under frame hanger when removing screws. Frame hanger may fall and cause injury.

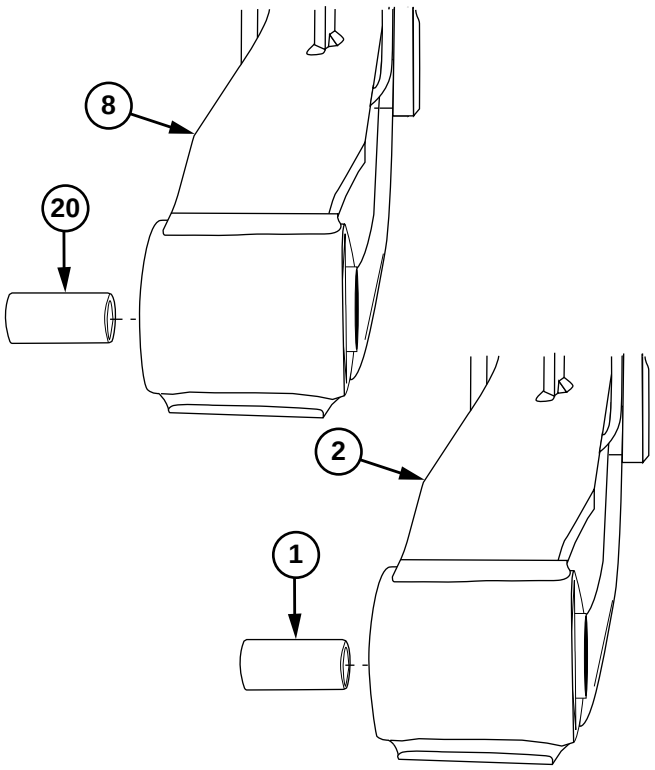
NOTE

Screws are different lengths. Tag and mark screws for proper installation.

(16) Remove six locknuts (17), four screws (18), two screws (19), and frame hanger (11) from frame (12) with aid of assistant. Discard locknuts.



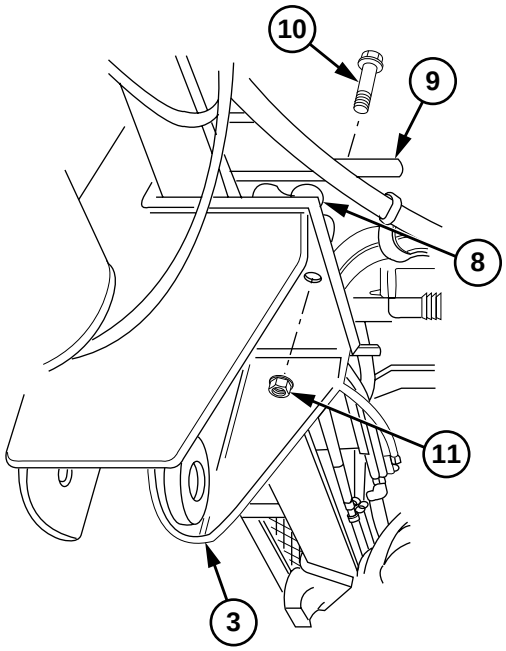
(17) Remove delrin liner (20) from suspension arm (8). Discard delrin liner.



b. Axle No. 2 (Right) Frame Hanger Installation

(1) Install new delrin liner (1) in suspension arm (2).

(2) Position frame hanger (3) on frame (4) with four screws (5), two screws (6), and six new locknuts (7) with aid of assistant. Do not tighten.



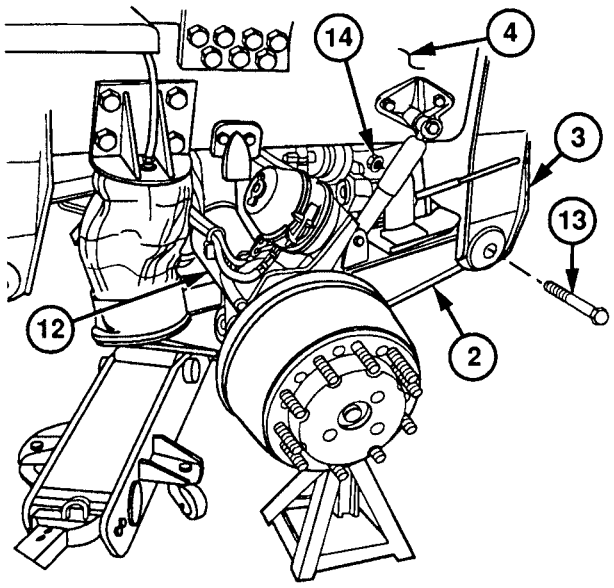
(3) Install frame hanger (3) and spacer (8) on crossmember (9) with four screws (10) and new locknuts (11). Torque to 212 lb-ft (287 N·m).

(4) Tighten six locknuts (7) to 375 lb-ft (508 N·m).

14-14. FRAME HANGERS REPLACEMENT (CONT)

(5) Remove hydraulic jack from frame (4) and suspension arm (2).

(6) Raise axle (12) and suspension arm (2) with floor jack while aligning holes in suspension arm (2) and frame hanger (3).



WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(7) Support axle (12) with jackstand.

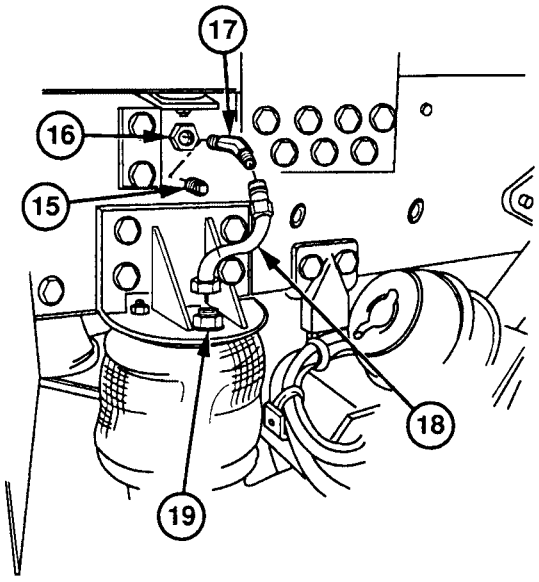
(8) Install suspension arm (2) on frame hanger (3) with new screw (13) and new locknut (14). Torque to 800 lb-ft (1085 N·m).

(9) Drain air system (TM 9-2320-360-10).

WARNING

Air suspension may still be pressurized even though AIR PRESS gage reads 0 psi. Remove plug slowly to allow any air to escape. Failure to comply may result in injury from plug blowing off.

(10) Remove plug (15) from fitting (16).



WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(11) Coat threads of elbow (17) with pipe thread sealing compound.

(12) Install elbow (17) on fitting (16).

(13) Install air line no. 2052 (18) on elbow (17).

(14) Install air line no. 2052 (18) on fitting (19).

c. Axle No. 3 (Right) Frame Hanger Removal

(1) Remove air line no. 2052 (1) from fitting (2) on air bag (3).

(2) Remove air line no. 2052 (1) from elbow (4).

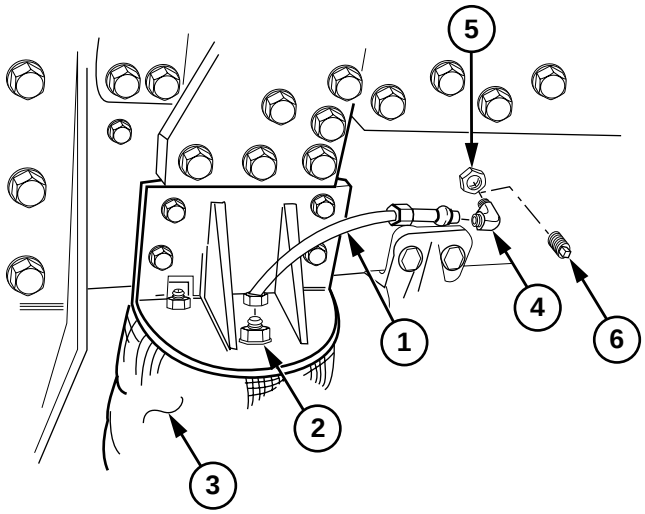
(3) Remove elbow (4) from fitting (5).

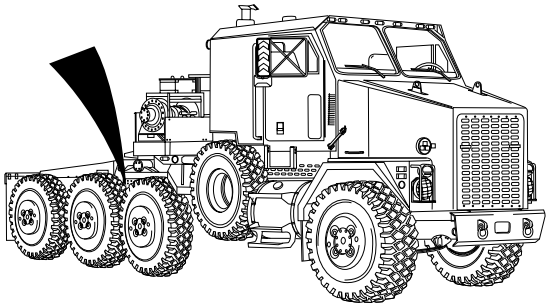
(4) Install plug (6) in fitting (5).

(5) Start engine (TM 9-2320-360-10).

(6) Build air pressure to 120-125 psi (827-861 kPa).

(7) Shut off engine (TM 9-2320-360-10).

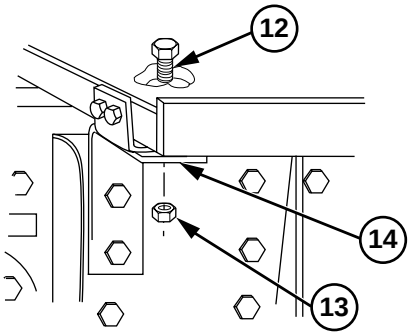




(8) Raise axle (7) with floor jack to slightly lift suspension arm (8).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.



(9) Support axle (7) with jackstand.

(10) Remove screw (9) and locknut (10) from frame hanger (11). Discard screw and locknut.

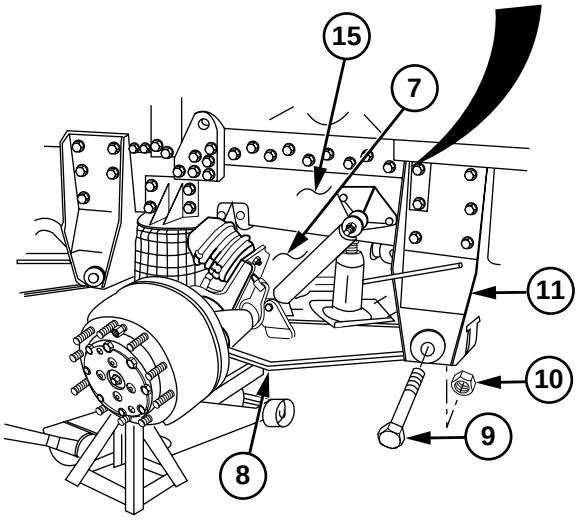
(11) Raise axle (7) with floor jack and lower jackstand.

(12) Lower floor jack and support axle (7) with jackstand.

(13) Remove two screws (12) and locknuts (13) from catwalk bracket (14). Discard locknuts.

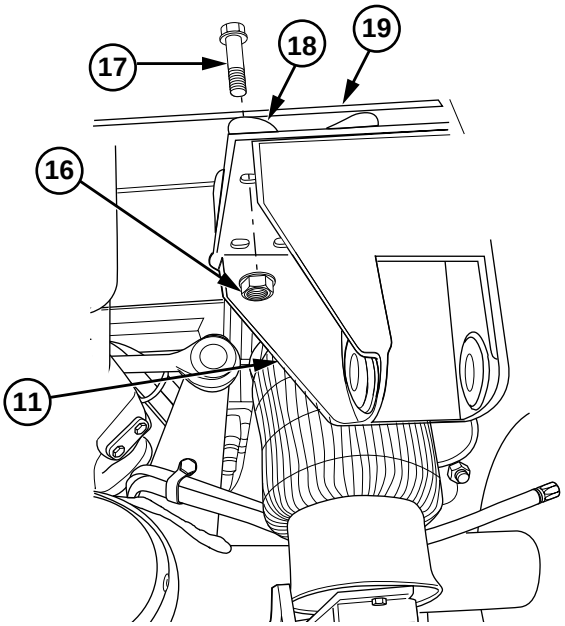
(14) Position hydraulic jack between suspension arm (8) and frame (15).

(15) Push suspension arm (8) out of frame hanger (11) by raising hydraulic jack.



14-14. FRAME HANGERS REPLACEMENT (CONT)

(16) Remove four locknuts (16), screws (17), and spacer (18) from frame hanger (11) and crossmember (19). Discard locknuts.



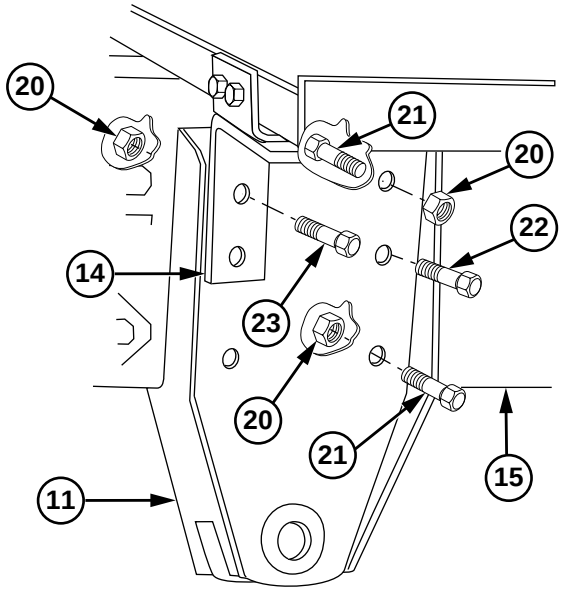
WARNING

Keep out from under frame hanger when removing screws. Frame hanger may fall and cause injury.

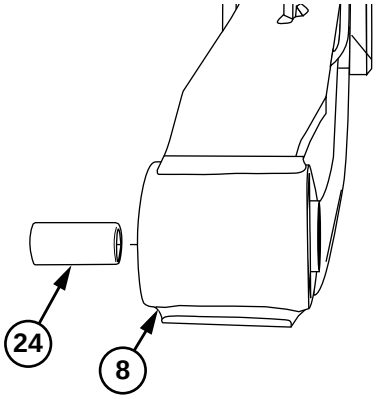
NOTE

Screws are different lengths. Tag and mark screws for proper installation.

(17) Remove six locknuts (20), four screws (21), screw (22), screw (23), bracket (14), and frame hanger (11) from frame (15) with aid of assistant. Discard locknuts.

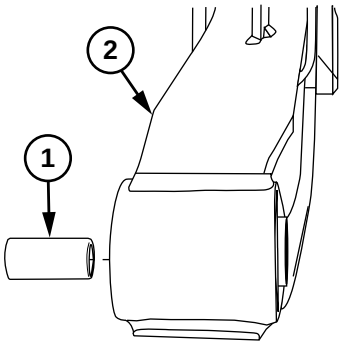


(18) Remove delrin liner (24) from suspension arm (8). Discard delrin liner.

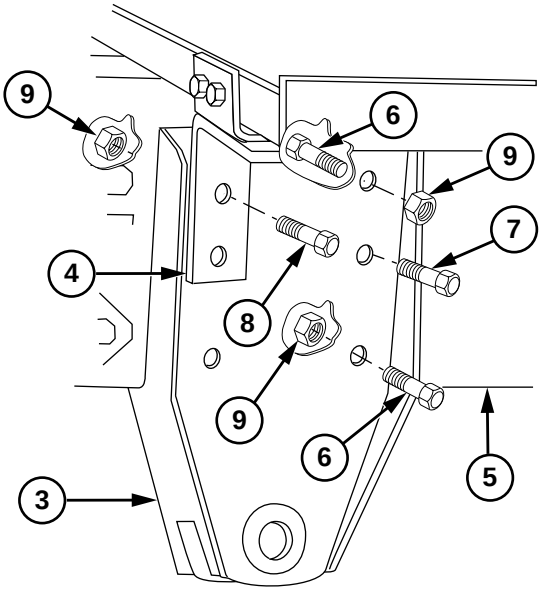


d. Axle No. 3 (Right) Frame Hanger Installation

(1) Install new delrin liner (1) in suspension arm (2).



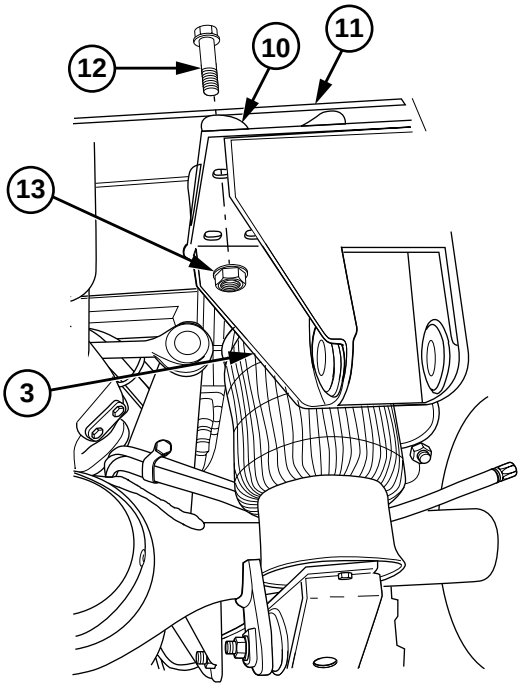
(2) Position frame hanger (3) and bracket (4) on frame (5) with four screws (6), screw (7), screw (8), and six new locknuts (9) with aid of assistant. Do not tighten.

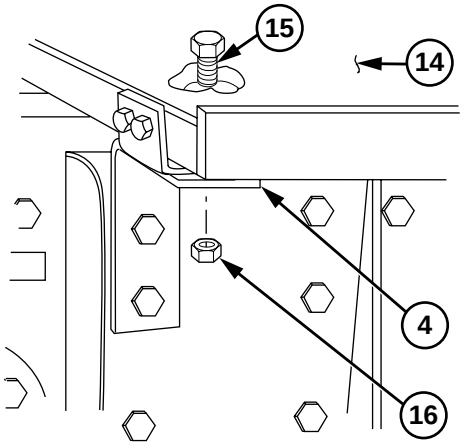


(3) Install frame hanger (3) and spacer (10) on crossmember (11) with four screws (12) and new locknuts (13). Torque to 212 lb-ft (287 N·m).

(4) Tighten six locknuts (9) to 375 lb-ft (508 N·m).

(5) Install bracket (4) on catwalk (14) with two screws (15) and new locknuts (16).

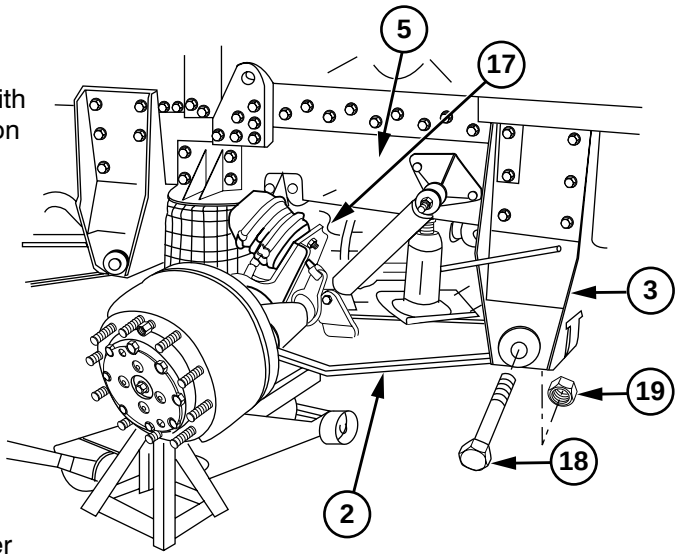




14-14. FRAME HANGERS REPLACEMENT (CONT)

(6) Remove hydraulic jack from between suspension arm (2) and frame (5).

(7) Raise axle (17) and suspension arm (2) with floor jack while aligning holes in suspension arm (2) and frame hanger (3).



WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(8) Support axle (17) with jackstand.

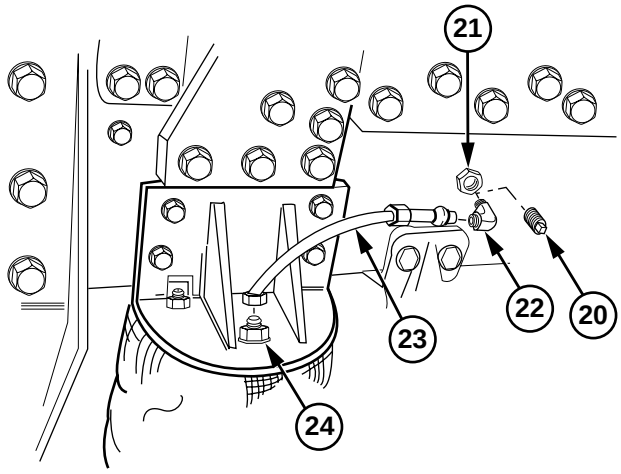
(9) Install suspension arm (2) on frame hanger (3) with new screw (18) and new locknut (19). Torque to 800 lb-ft (1085 N·m).

(10) Drain air system (TM 9-2320-360-10).

WARNING

Air suspension may still be pressurized even though AIR PRESS gage reads 0 psi. Remove plug slowly to allow any air to escape. Failure to comply may result in injury from plug blowing off.

(11) Remove plug (20) from fitting (21).



WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(12) Coat threads of elbow (22) with pipe thread sealing compound.

(13) Install elbow (22) on fitting (21).

(14) Install air line no. 2052 (23) on elbow (22).

(15) Install air line no. 2052 (23) on fitting (24).

e. Axle No. 4 (Right) Frame Hanger Removal

(1) Remove air line no. 2053 (1) from fitting (2) on air bag (3).

(2) Remove air line no. 2053 (1) from elbow (4).

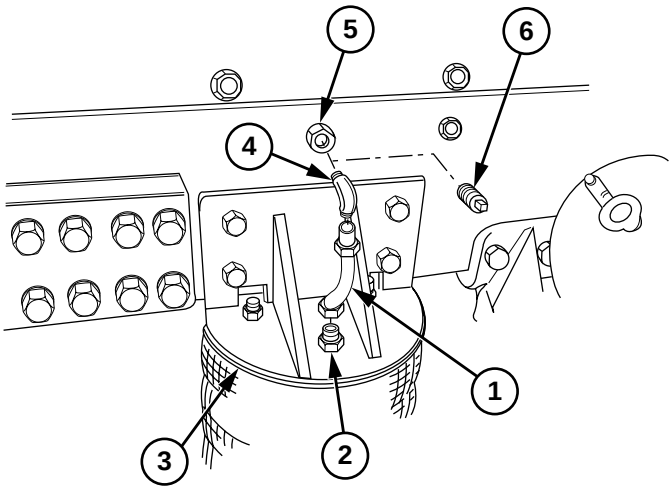
(3) Remove elbow (4) from fitting (5).

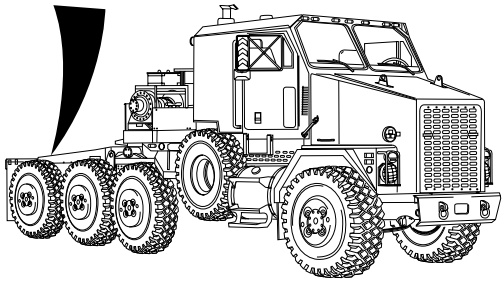
(4) Install plug (6) in fitting (5).

(5) Start engine (TM 9-2320-360-10).

(6) Build air pressure to 120-125 psi (827-861 kPa).

(7) Shut off engine (TM 9-2320-360-10).





(8) Raise axle (7) with floor jack to slightly lift suspension arm (8).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(9) Support axle (7) with jackstand.

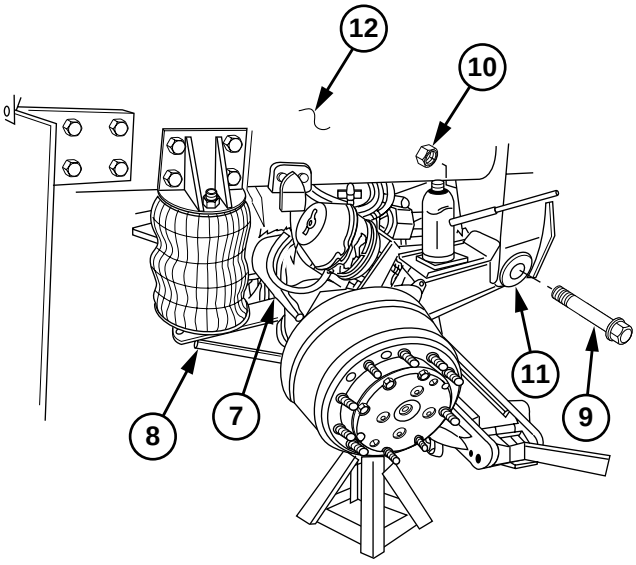
(10) Remove screw (9) and locknut (10) from frame hanger (11). Discard screw and locknut.

(11) Raise axle (7) with floor jack and lower jackstand.

(12) Lower floor jack and support axle (7) with jackstand.

(13) Position hydraulic jack between suspension arm (8) and frame (12).

(14) Push suspension arm (8) out of frame hanger (11) by raising hydraulic jack.



14-14. FRAME HANGERS REPLACEMENT (CONT)

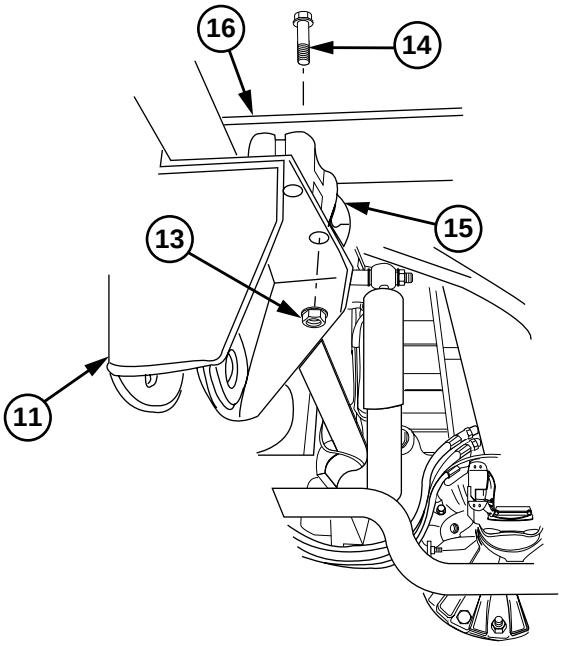
(15) Remove four locknuts (13), screws (14), and spacer (15) from frame hanger (11) and crossmember (16). Discard locknuts.

WARNING

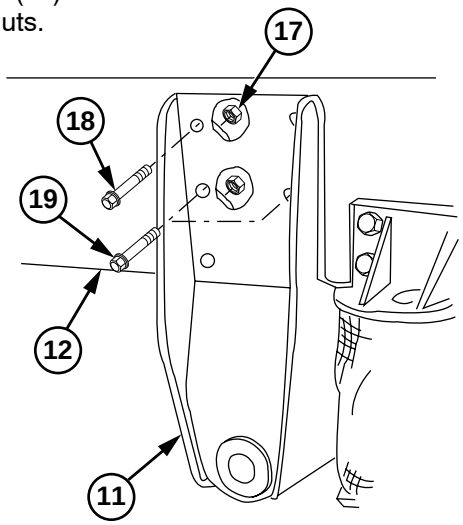
Keep out from under frame hanger when removing screws. Frame hanger may fall and cause injury.

NOTE

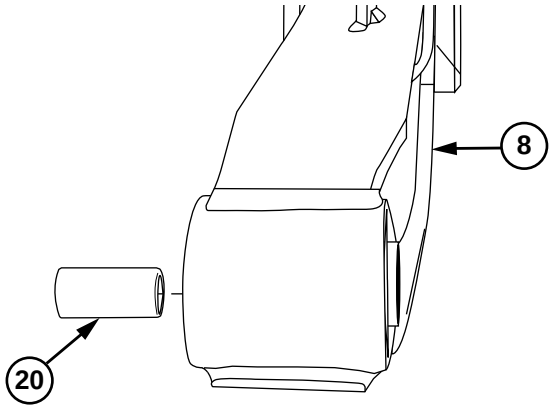
Screws are different lengths. Tag and mark screws for proper installation.

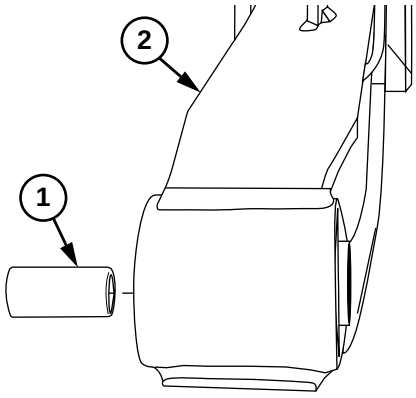


(16) Remove six locknuts (17), four screws (18), two screws (19), and frame hanger (11) from frame (12) with aid of assistant. Discard locknuts.



(17) Remove delrin liner (20) from suspension arm (8). Discard delrin liner.

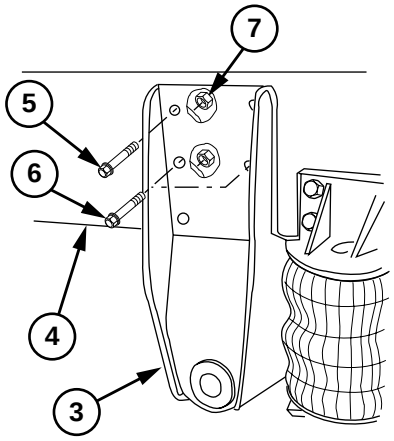




f. Axle No. 4 (Right) Frame Hanger Installation

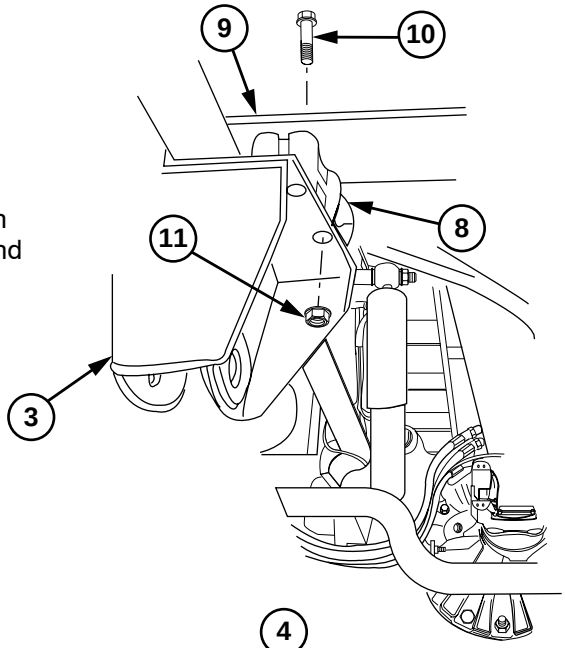
(1) Install new delrin liner (1) in suspension arm (2).

(2) Position frame hanger (3) on frame (4) with four screws (5), two screws (6), and six new locknuts (7) with aid of assistant. Do not tighten.



(3) Install frame hanger (3) and spacer (8) on crossmember (9) with four screws (10) and new locknuts (11). Torque to 380 lb-ft (515 N·m).

(4) Tighten six locknuts (7) to 375 lb-ft (508 N·m).



(5) Remove hydraulic jack from between suspension arm (2) and frame (4).

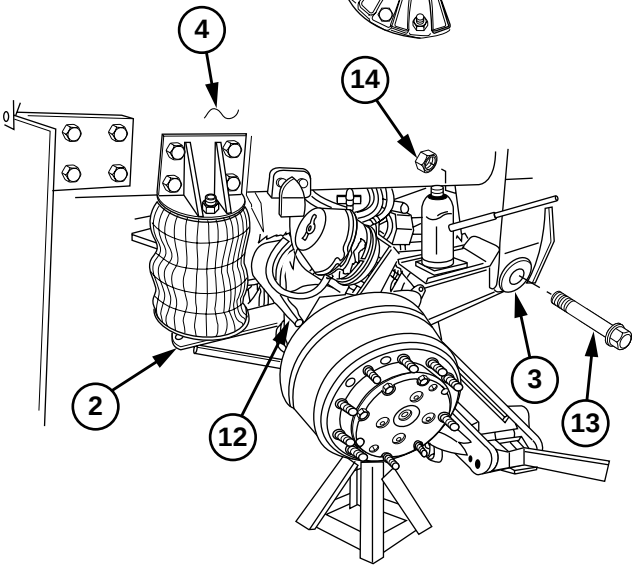
(6) Raise axle (12) and suspension arm (2) with hydraulic jack while aligning holes in suspension arm (2) and frame hanger (3).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(7) Support axle (12) with jackstand.

(8) Install suspension arm (2) on frame hanger (3) with new screw (13) and new locknut (14). Torque to 800 lb-ft (1085 N·m).



14-14. FRAME HANGERS REPLACEMENT (CONT)

(9) Drain air system (TM 9-2320-360-10).

WARNING

Air suspension may still be pressurized even though AIR PRESS gage reads 0 psi. Remove plug slowly to allow any air to escape. Failure to comply may result in injury from plug blowing off.

(10) Remove plug (15) from fitting (16).

WARNING

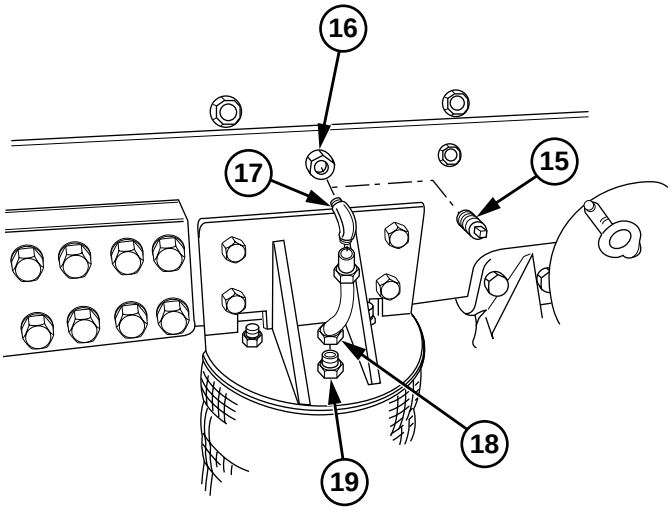
Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

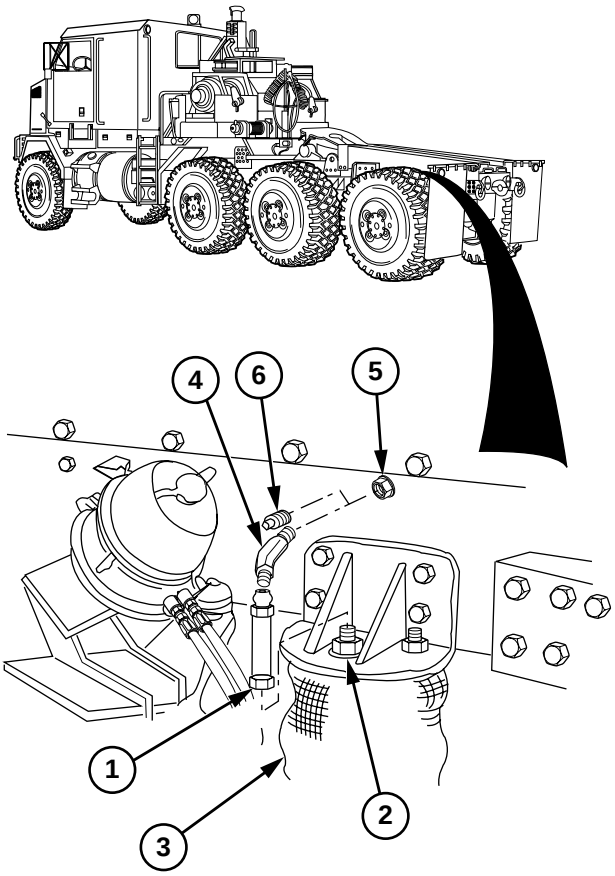
(11) Coat threads of elbow (17) with pipe thread sealing compound.

(12) Install elbow (17) on fitting (16).

(13) Install air line no. 2053 (18) on elbow (17).

(14) Install air line no. 2053 (18) on fitting (19).





g. Axle No. 4 (Left) Frame Hanger Removal

(1) Remove air line no. 2051 (1) from fitting (2) on air bag (3).

(2) Remove air line no. 2051 (1) from elbow (4).

(3) Remove elbow (4) from fitting (5).

(4) Install plug (6) in fitting (5).

(5) Start engine (TM 9-2320-360-10).

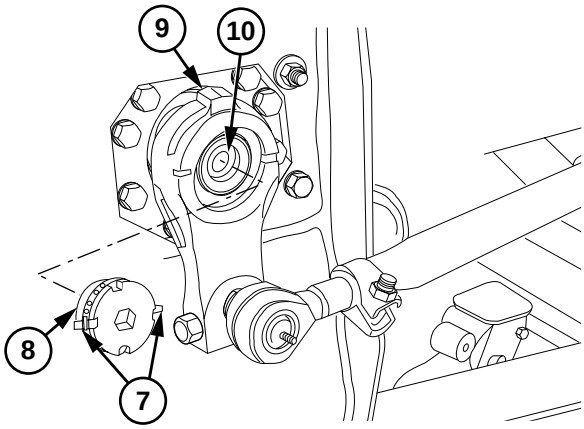
(6) Build air pressure to 120-125 psi (827-861 kPa).

(7) Shut off engine (TM 9-2320-360-10).

(8) Bend back two locktabs (7) toward outside of socket head cap (8) on pitman arm (9).

(9) Remove socket head cap (8) from pitman arm (9). Discard sockethead cap.

(10) Remove pitman arm (9) from steering gear (10).



(11) Raise axle (11) with floor jack to slightly lift suspension arm (12).

WARNING

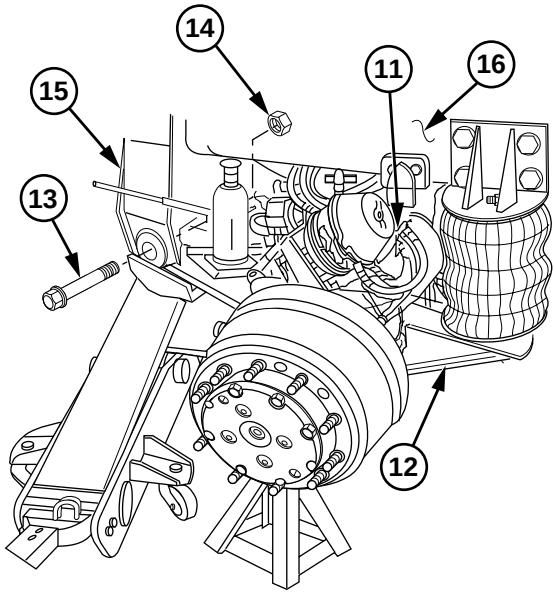
Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(12) Support axle (11) with jackstand.

(13) Remove screw (13) and locknut (14) from frame hanger (15).

(14) Raise axle (11) with floor jack and lower jackstand.

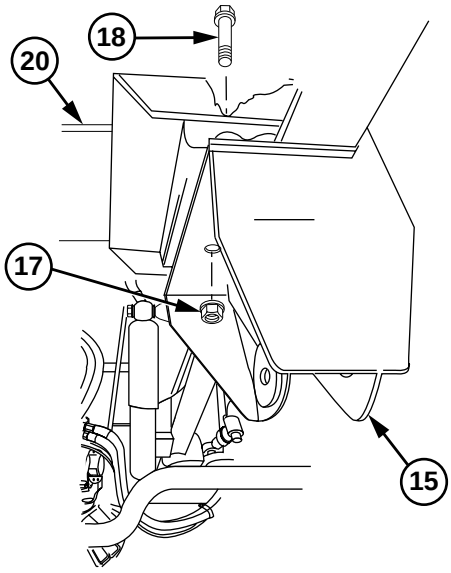
(15) Lower floor jack and support axle (11) with jackstand.



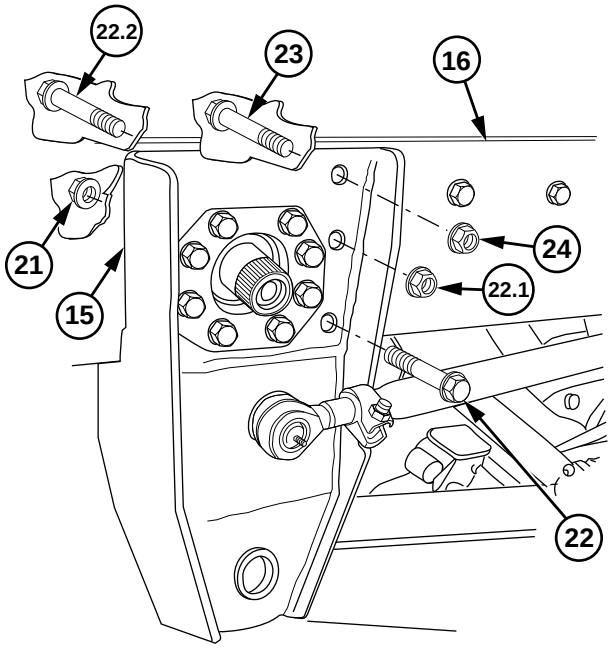
(16) Position hydraulic jack between suspension arm (12) and frame (16).

(17) Push suspension arm (12) out of frame hanger (15) by raising hydraulic jack.

(18) Remove four locknuts (17) and screws (18) from frame hanger (15) and bracket (20). Discard locknuts.



14-14. FRAME HANGERS REPLACEMENT (CONT)



NOTE

- Steering gear must be removed to replace four upper frame hanger screws.
- Screws are different lengths. Tag and mark screws for proper installation.

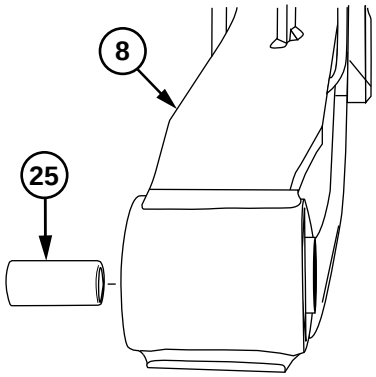
(19) Remove two locknuts (21) from screws (22). Discard locknuts.

(19.1) Remove two locknuts (22.1) from screws (22.2). Discard locknuts.

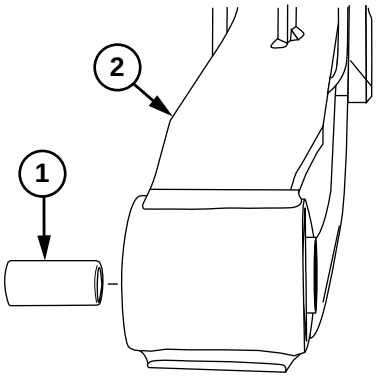
WARNING

Keep out from under frame hanger when removing screws. Frame hanger may fall and cause injury.

(20) Remove two screws (23), locknuts (24), and frame hanger (15) from frame (16) with aid of assistant. Discard locknuts.

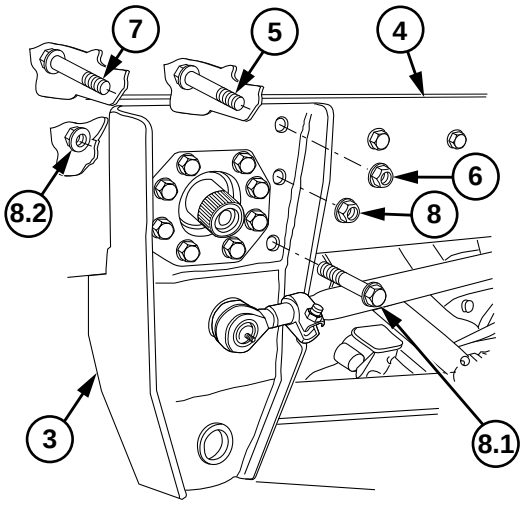


(21) Remove delrin liner (25) from suspension arm (8). Discard delrin liner.

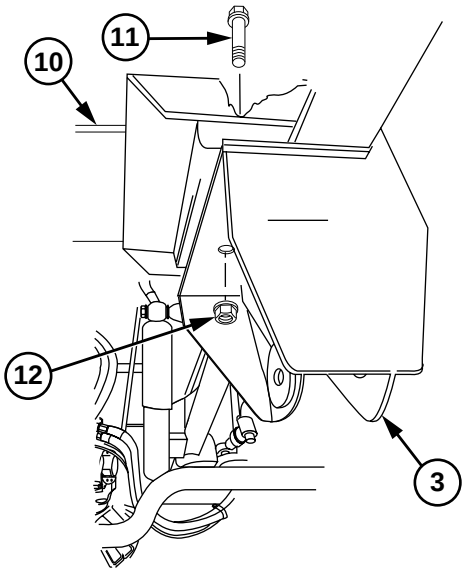


h. Axle No. 4 (Left) Frame Hanger Installation

(1) Install new delrin liner (1) in suspension arm (2).



(2) Position frame hanger (3) on frame (4) with two screws (5), new locknuts (6), two screws (7), new locknuts (8), two screws (8.1), and new locknuts (8.2) with aid of assistant. Do not tighten.



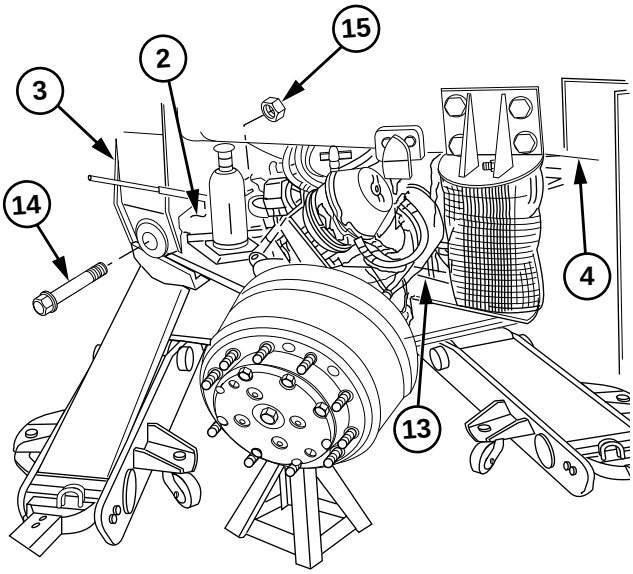
(3) Install frame hanger (3) on crossmember (10) with four screws (11) and new locknuts (12). Torque to 380 lb-ft (515 N·m).

(4) Tighten four locknuts (6 and 8) to 212 lb-ft (287 N·m).

(5) Tighten two locknuts (8.2) to 375 lb-ft (508 N·m).

(6) Remove hydraulic jack from between suspension arm (2) and frame (4).

(7) Raise axle (13) and suspension arm (2) with floor jack while aligning holes in suspension arm (2) and frame hanger (3).



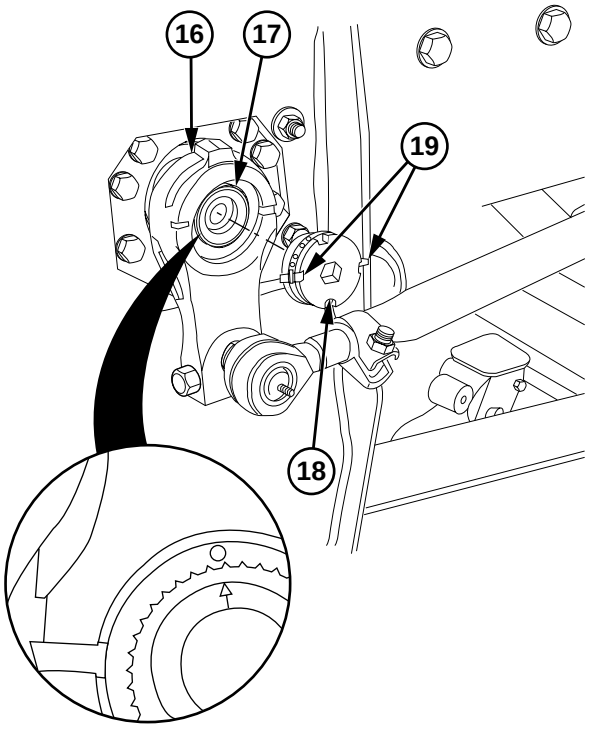
WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(8) Support axle (13) with jackstand.

(9) Install suspension arm (2) on frame hanger (3) with new screw (14) and new locknut (15). Torque to 800 lb-ft (1085 N·m).

14-14. FRAME HANGERS REPLACEMENT (CONT)



(10) Coat inside surface of pitman arm (16) with antiseize compound.

(11) Align timing marks on steering gear (17) and pitman arm (16).

(12) Position pitman arm (16) on steering gear (17).

(13) Coat sockethead cap (18) with antiseize compound.

(14) Install sockethead cap (18) on pitman arm (16). Tighten to 450 lb-ft (610 N·m).

(15) Engage locktabs (19) with slots on pitman arm (16).

(16) Drain air system (TM 9-2320-360-10).

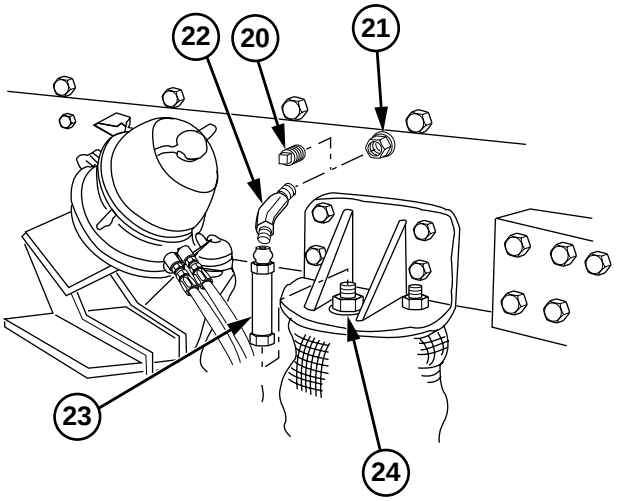
WARNING

Air suspension may still be pressurized even though AIR PRESS gage reads 0 psi. Remove plug slowly to allow any air to escape. Failure to comply may result in injury from plug blowing off.

(17) Remove plug (20) from fitting (21).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.



(18) Coat threads of elbow (22) with pipe thread sealing compound.

(19) Install elbow (22) on fitting (21).

(20) Install air line no. 2051 (23) on elbow (22).

(21) Install air line no. 2051 (23) on fitting (24).

i. Axle No. 3 (Left) Frame Hanger Removal

(1) Remove air line no. 2051 (1) from fitting (2) on air bag (3).

(2) Remove air line no. 2051 (1) from elbow (4).

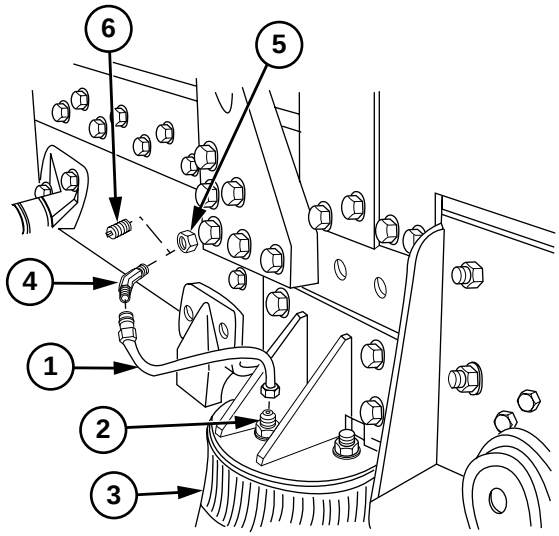
(3) Remove elbow (4) from fitting (5).

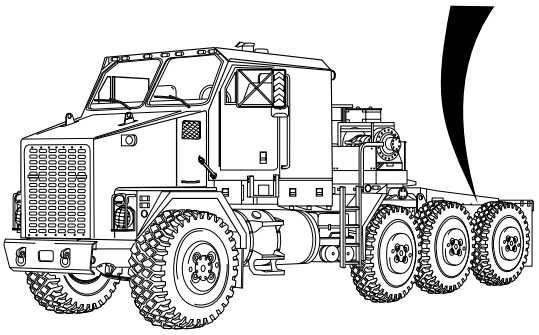
(4) Install plug (6) in fitting (5).

(5) Start engine (TM 9-2320-360-10).

(6) Build air pressure to 120-125 psi (827-861 kPa).

(7) Shut off engine (TM 9-2320-360-10).

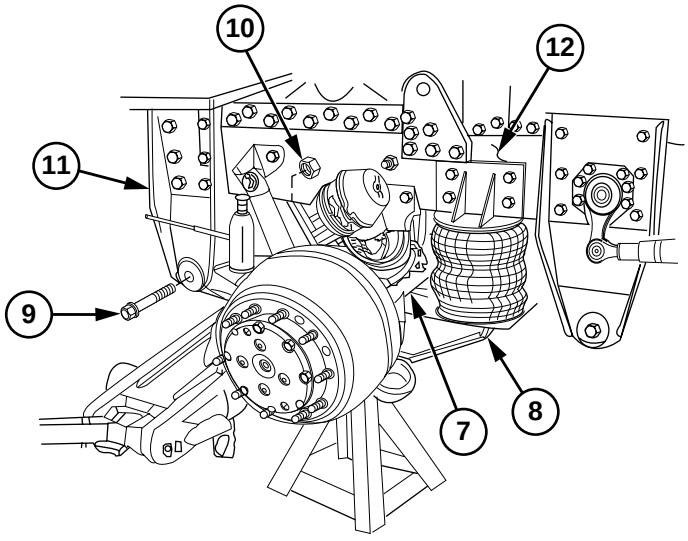




(8) Raise axle (7) with floor jack to slightly lift suspension arm (8).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.



(9) Support axle (7) with jackstand.

(10) Remove screw (9) and locknut (10) from frame hanger (11). Discard screw and locknut.

(11) Raise axle (7) with floor jack and lower jackstand.

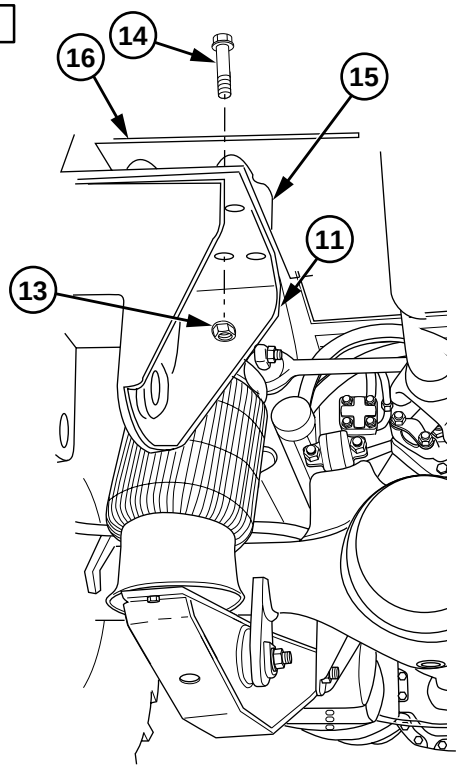
(12) Lower floor jack and support axle (7) with jackstand.

(13) Position hydraulic jack between suspension arm (8) and frame (12).

(14) Push suspension arm (8) out of frame hanger (11) by raising hydraulic jack.

14-14. FRAME HANGERS REPLACEMENT (CONT)

(15) Remove four locknuts (13), screws (14), and spacer (15) from frame hanger (11) and crossmember (16). Discard locknuts.



WARNING

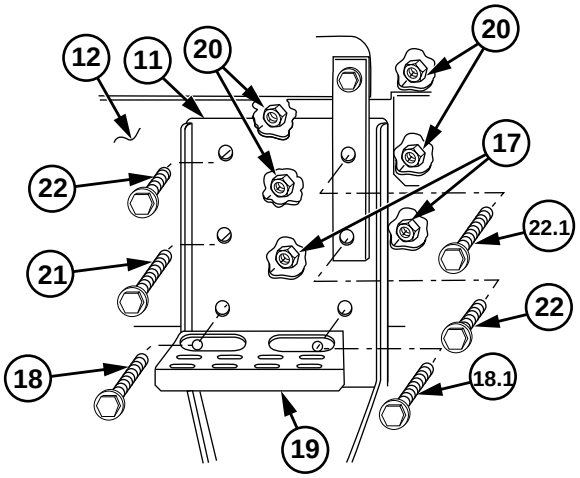
Keep out from under frame hanger when removing screws. Frame hanger may fall and cause injury.

NOTE

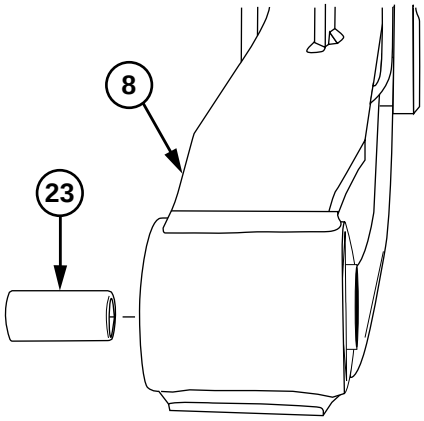
Screws are different lengths. Tag and mark screws for proper installation.

(16) Remove two locknuts (17), screw (18), screw (18.1), and step (19) from frame hanger (11). Discard locknuts.

(17) Remove four locknuts (20), screw (21), two screws (22), screw (22.1), and frame hanger (11) from frame (12). Discard locknuts.

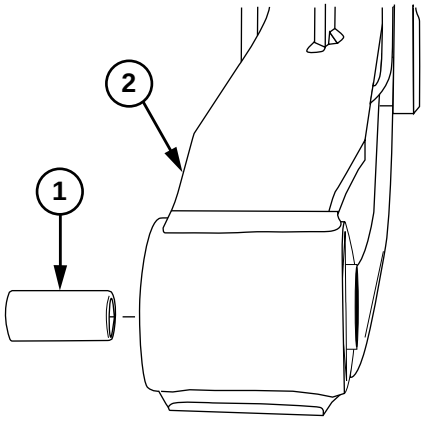


(18) Remove delrin liner (23) from suspension arm (8). Discard delrin liner.



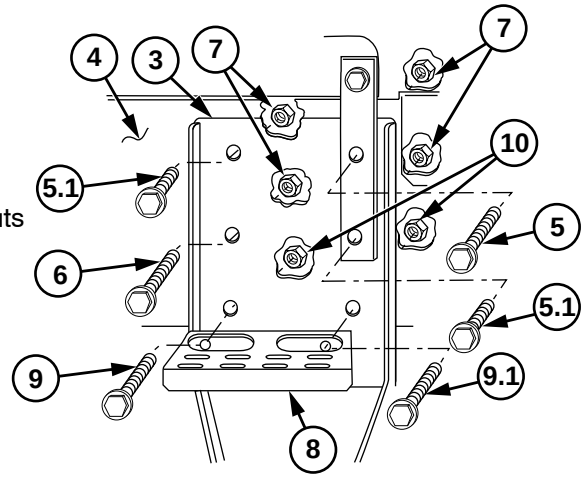
j. Axle No. 3 (Left) Frame Hanger Installation

(1) Install new delrin liner (1) in suspension arm (2).



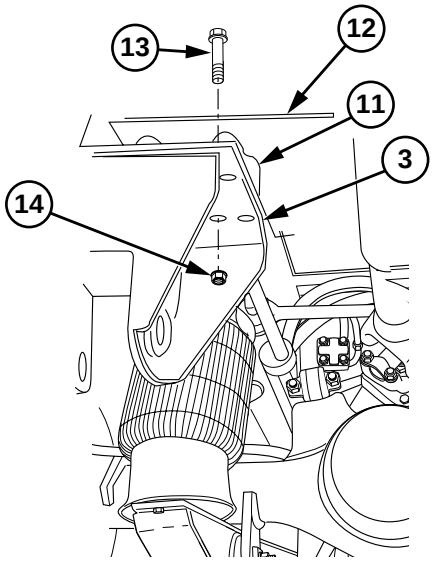
(2) Install frame hanger (3) on frame (4) with screw (5), two screws (5.1), screw (6), and four new locknuts (7) with aid of assistant.

(3) Install step (8) on frame hanger (3) with screw (9), screw (9.1), and two new locknuts (10). Do not tighten.



(4) Install frame hanger (3) and spacer (11) on crossmember (12) with four screws (13) and new locknuts (14). Torque to 212 lb-ft (287 N·m).

(5) Tighten four locknuts (7 and 10) to 375 lb-ft (508 N·m).



(6) Remove hydraulic jack from between suspension arm (2) and frame (4).

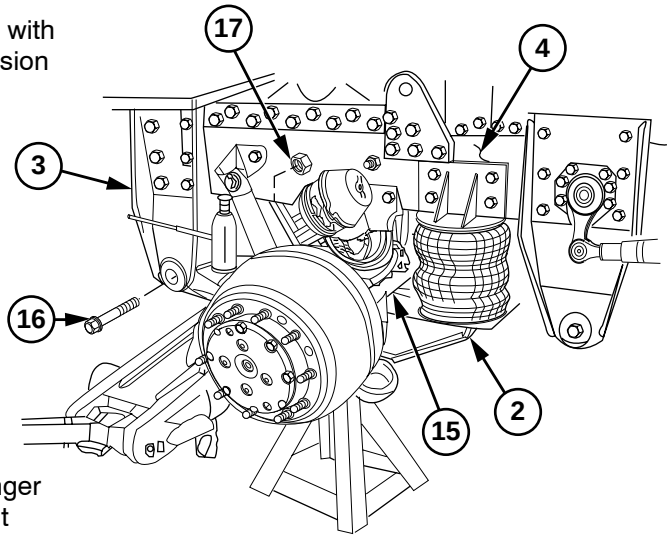
(7) Raise axle (15) and suspension arm (2) with floor jack while aligning holes in suspension arm (2) and frame hanger (3).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.

(8) Support axle (15) with jackstand.

(9) Install suspension arm (2) on frame hanger (3) with new screw (16) and new locknut (17). Torque to 800 lb-ft (1085 N·m).



14-14. FRAME HANGERS REPLACEMENT (CONT)

(10) Drain air system (TM 9-2320-360-10).

WARNING

Air suspension may still be pressurized even though AIR PRESS gage reads 0 psi. Remove plug slowly to allow any air to escape. Failure to comply may result in injury from plug blowing off.

(11) Remove plug (18) from fitting (19).

WARNING

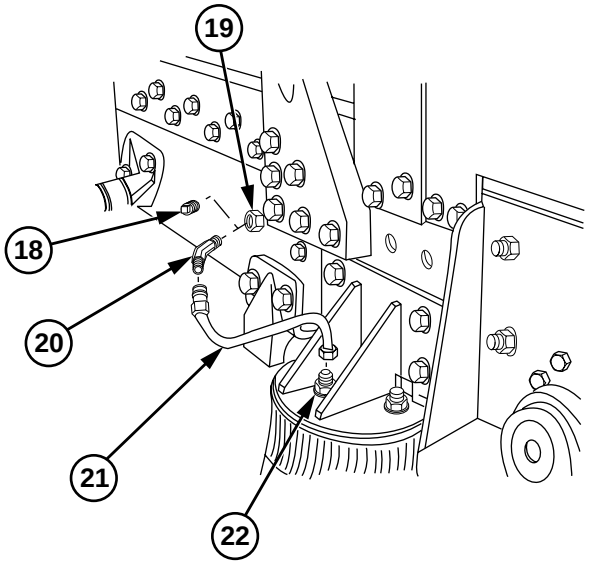
Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

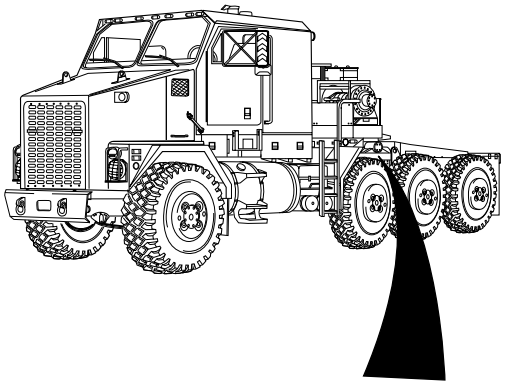
(12) Coat threads of elbow (20) with pipe thread sealing compound.

(13) Install elbow (20) on fitting (19).

(14) Install air line no. 2051 (21) on elbow (20).

(15) Install air line no. 2051 (21) on fitting (22).





k. Axle No. 2 (Left) Frame Hanger Removal

(1) Remove air line no. 2051 (1) from fitting (2) on air bag (3).

(2) Remove air line no. 2051 (1) from elbow (4).

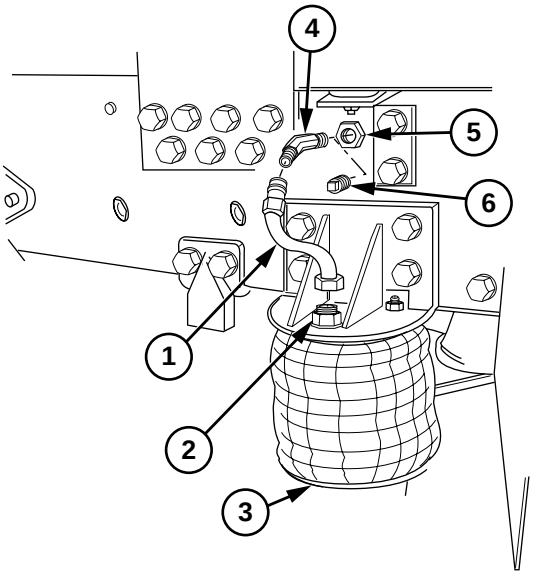
(3) Remove elbow (4) from fitting (5).

(4) Install plug (6) in fitting (5).

(5) Start engine (TM 9-2320-360-10).

(6) Build air pressure to 120-125 psi (827-861 kPa).

(7) Shut off engine (TM 9-2320-360-10).



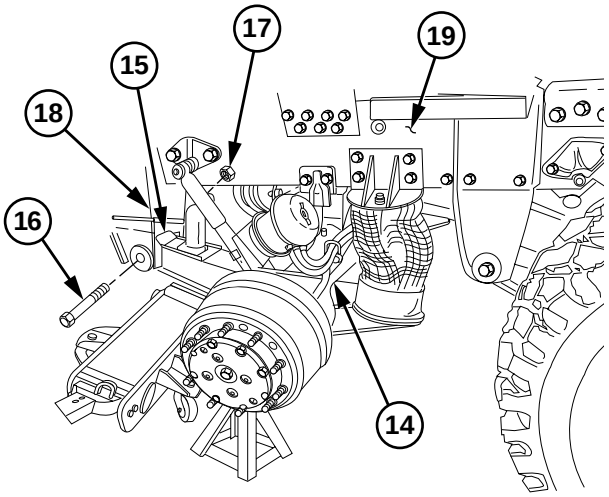
(8) Deleted.

(9) Deleted.

(10) Raise axle (14) with floor jack to slightly lift suspension arm (15).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.



(11) Support axle (14) with jackstand.

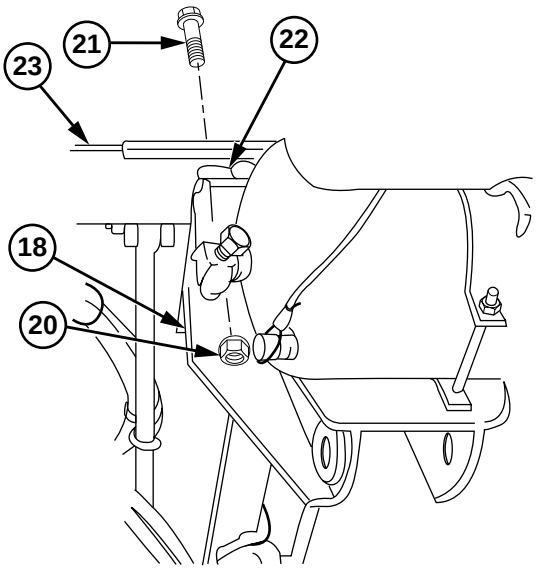
(12) Remove screw (16) and locknut (17) from frame hanger (18). Discard screw and locknut.

(13) Raise axle (14) with floor jack and lower jackstand.

(14) Lower floor jack and support axle (14) with jackstand.

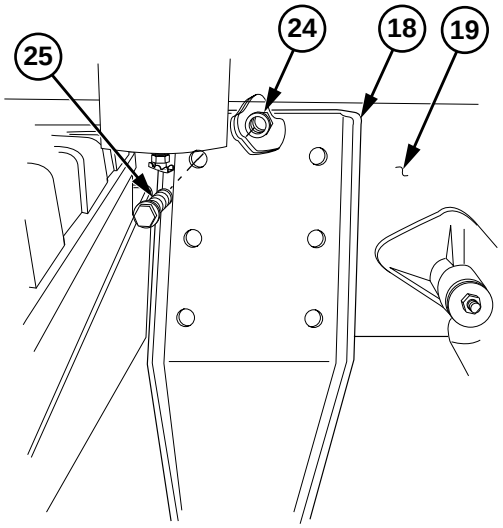
(15) Position hydraulic jack between suspension arm (15) and frame (19).

(16) Push suspension arm (15) out of frame hanger (18) by raising hydraulic jack.



(17) Remove four locknuts (20), screws (21), and spacer (22) from frame hanger (18) and crossmember (23). Discard locknuts.

14-14. FRAME HANGERS REPLACEMENT (CONT)



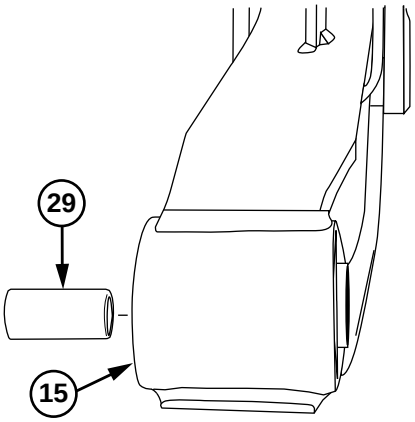
WARNING

Keep out from under frame hanger when removing screws. Frame hanger may fall and cause injury.

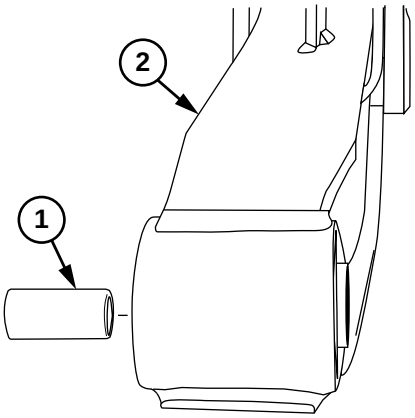
NOTE

Screws are different lengths. Tag and mark screws for proper installation.

(18) Remove locknut (24), screw (25), and frame hanger (18) from frame (19) with aid of assistant. Discard locknut.

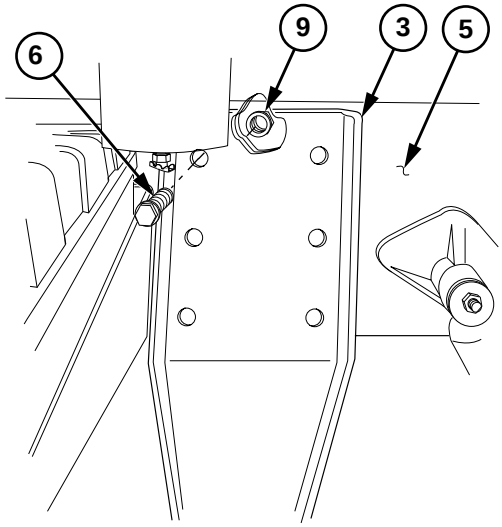


(19) Remove delrin liner (29) from suspension arm (15). Discard delrin liner.

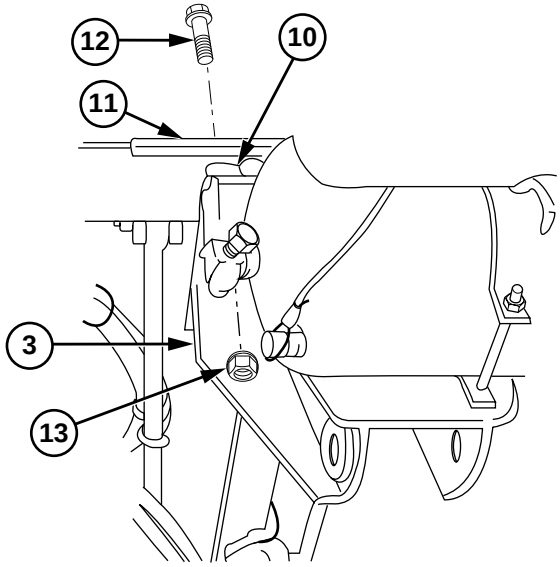


I. Axle No. 2 (Left) Frame Hanger Installation

(1) Install new delrin liner (1) in suspension arm (2).



(2) Install frame hanger (3) on frame (5) with screw (6) and new locknut (9).



(3) Install frame hanger (3) and spacer (10) on crossmember (11) with four screws (12) and new locknuts (13). Torque to 212 lb–ft (287 N·m).

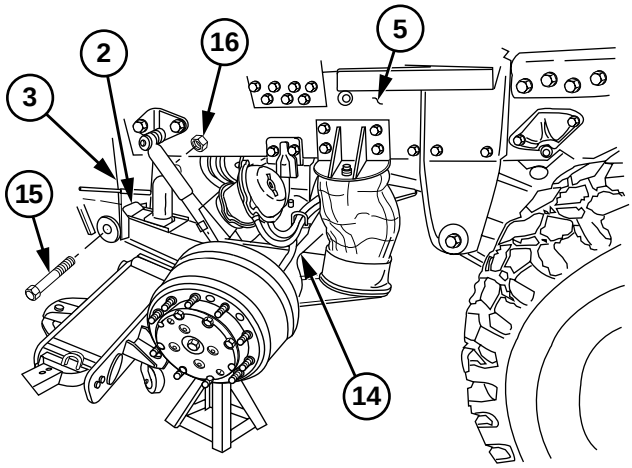
(4) Tighten locknut (9) to 375 lb–ft (508 N·m).

(5) Remove hydraulic jack from between suspension arm (2) and frame (5).

(6) Raise axle (14) and suspension arm (2) with floor jack while aligning holes in suspension arm (2) and frame hanger (3).

WARNING

Do not work on any item supported only by jacks or hoist. Always use blocks or proper stands to support item prior to any work. Equipment may fall and cause injury or death to personnel.



(7) Support axle (14) with jackstand.

(8) Install suspension arm (2) on frame hanger (3) with new screw (15) and new locknut (16). Torque to 800 lb–ft (1085 N·m).

14-14. FRAME HANGERS REPLACEMENT (CONT)

(9) Deleted.

(10) Deleted.

(11) Drain air system (TM 9-2320-360-10).

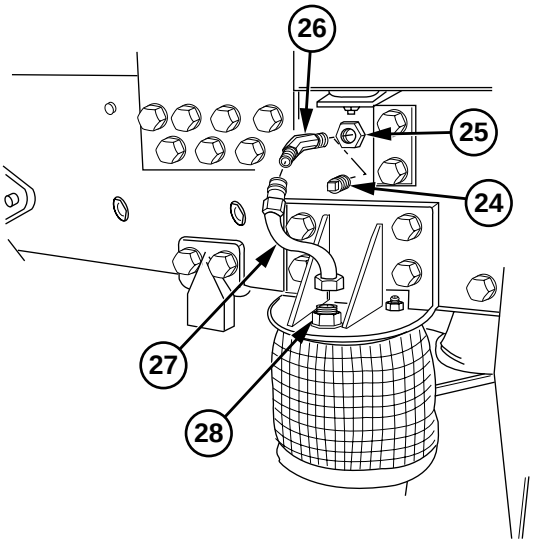
WARNING

Air suspension may still be pressurized even though AIR PRESS gage reads 0 psi. Remove plug slowly to allow any air to escape. Failure to comply may result in injury from plug blowing off.

(12) Remove plug (24) from fitting (25).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.



(13) Coat threads of elbow (26) with pipe thread sealing compound.

(14) Install elbow (26) on fitting (25).

(15) Install air line no. 2051 (27) on elbow (26).

(16) Install air line no. 2051 (27) on fitting (28).

m. Follow-On Maintenance

(1) Install fifth wheel catwalk (axle no. 3 left frame hanger only) (TM 9-2320-360-20).

(2) Install wheels/tires (see table 14-1) (TM 9-2320-360-20).

(3) Install left rear fender brackets (axle no. 2 left frame hanger only) (TM 9-2320-360-20).

14-15. AIR SPRING PLATE REPLACEMENT

This task covers:
Removal
Installation

Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Air spring removed (TM 9-2320-360-20).

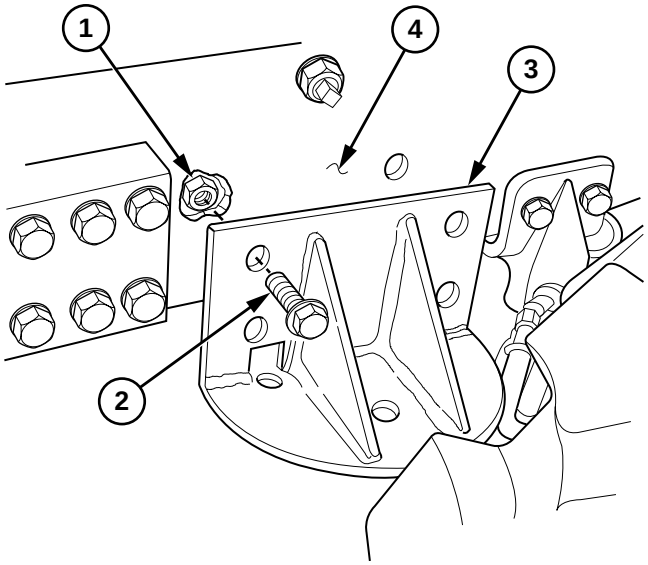
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (4) (Item 87, Appendix F)

Personnel Required
Two

NOTE

All right air spring plates are replaced the same way. Axle no. 4 air spring plate is shown.



a. Right Air Spring Plate Removal

Remove four locknuts (1), screws (2), and right side air spring plate (3) from frame (4) with aid of assistant.

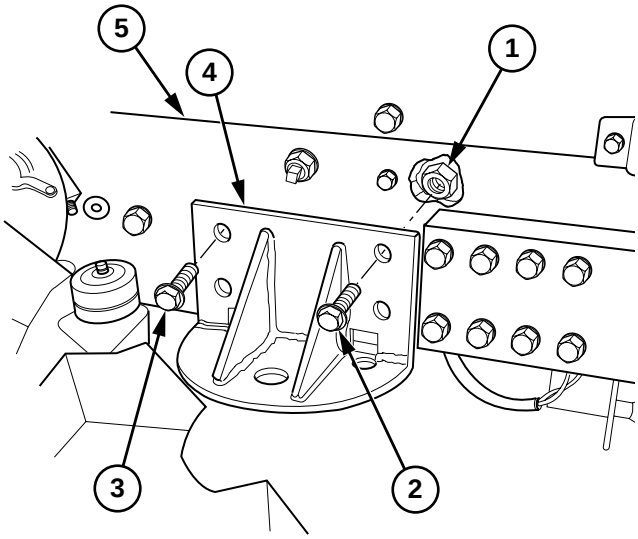
b. Right Air Spring Plate Installation

Install right side air spring plate (3) on frame (4) with four screws (2) and new locknuts (1) with aid of assistant. Torque to 212 lb-ft (287 N·m).

14-15. AIR SPRING PLATE REPLACEMENT (CONT)

NOTE

All left air spring plates are replaced the same way. Axle no. 4 air spring plate is shown.



c. Left Air Spring Plate Removal

Remove four locknuts (1), three screws (2), screw (3), and left side air spring plate (4) from frame (5) with aid of assistant.

d. Left Air Spring Plate Installation

Install left side air spring plate (4) on frame (5) with screw (3), three screws (2), and four new locknuts (1) with aid of assistant. Torque to 212 lb-ft (287 N·m).

e. Follow-On Maintenance

Install air spring (TM 9-2320-360-20).

14-16. NO. 3 CROSSMEMBER REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Catwalk removed (TM 9-2320-360-20).
No. 4 longitudinal torque rod removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (16) (Item 87, Appendix F)
Locknuts (11) (Item 88, Appendix F)
Locknuts (2) (Item 81, Appendix F)
Locknuts (2) (Item 92, Appendix F)
Locknuts (2) (Item 96, Appendix F)

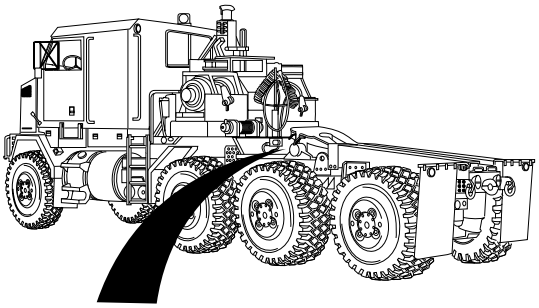
Personnel Required
Two

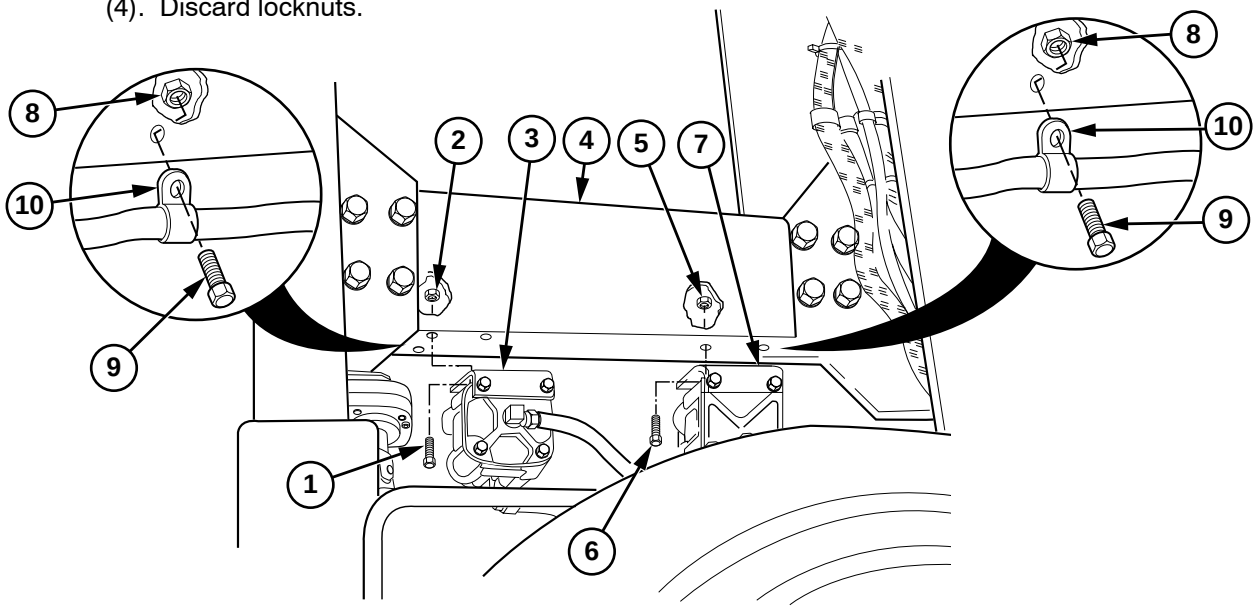
a. Removal

(1) Remove two screws (1), locknuts (2) and axle no. 3 service brake relay valve (3) from no. 3 crossmember (4). Discard locknuts.

(2) Remove two locknuts (5), screws (6), and rear spring brake relay valve (7) from no. 3 crossmember (4). Discard locknuts.

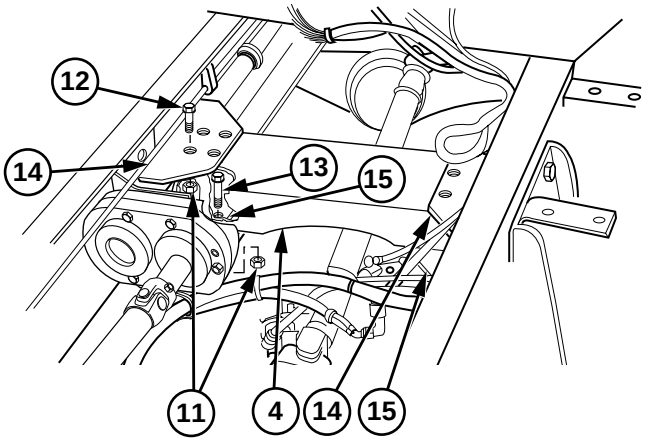
(3) Remove two locknuts (8), screws (9), and clips (10) from rear of no. 3 crossmember (4). Discard locknuts.





14-16. NO. 3 CROSSMEMBER REPLACEMENT (CONT)

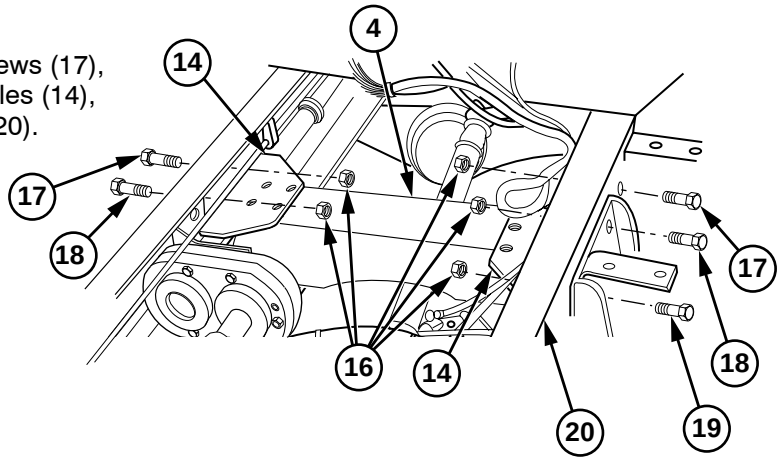
(4) Remove 16 locknuts (11), 8 screws (12), and screws (13) from no. 3 crossmember (4) and 4 angles (14 and 15) with aid of assistant. Discard locknuts.



CAUTION

Power steering lines can be damaged easily. Use care when removing nuts. Failure to comply may result in leaking power steering lines.

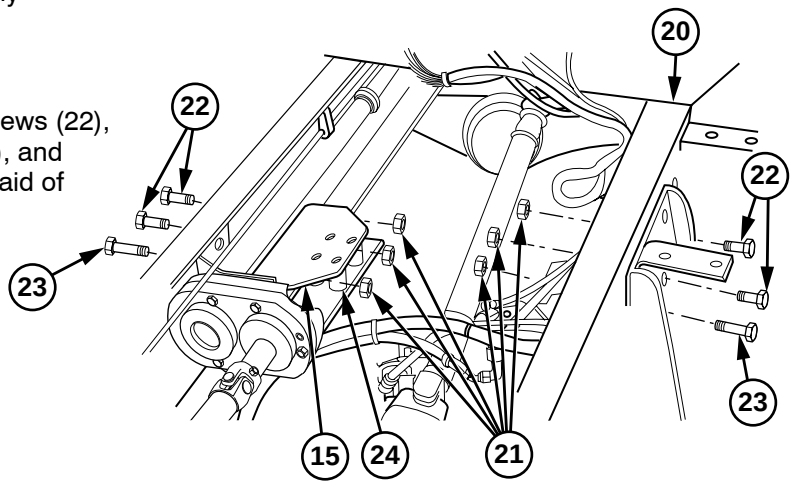
(5) Remove five locknuts (16), two screws (17), screws (18), screw (19), upper angles (14), and crossmember (4) from frame (20). Discard locknuts.



CAUTION

Steering reduction gear must be supported before removing lower angles. Failure to comply may result in damage to equipment.

(6) Remove six locknuts (21), four screws (22), two screws (23), lower angles (15), and spacers (24) from frame (20) with aid of assistant. Discard locknuts.

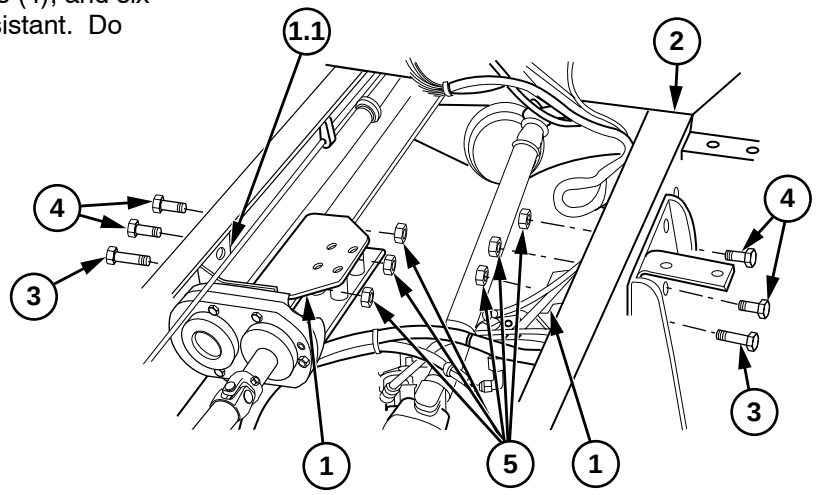


b. Installation

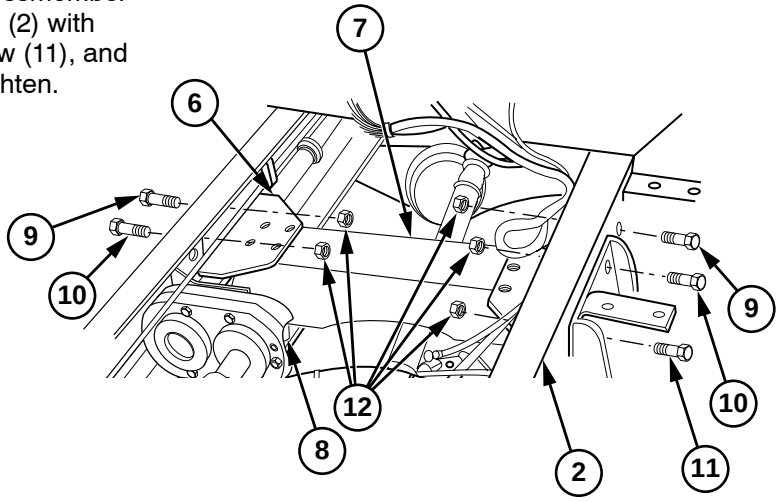
NOTE

- All four angles are different and not interchangeable. Right brackets have eight holes. Left brackets have seven holes.
- Open side of crossmember faces front of vehicle. Curved side of crossmember faces bottom of crossmember.

(1) Position two lower angles (1) and steering reduction gear bracket (1.1) on frame (2) with two screws (3), four screws (4), and six new locknuts (5) with aid of assistant. Do not tighten.



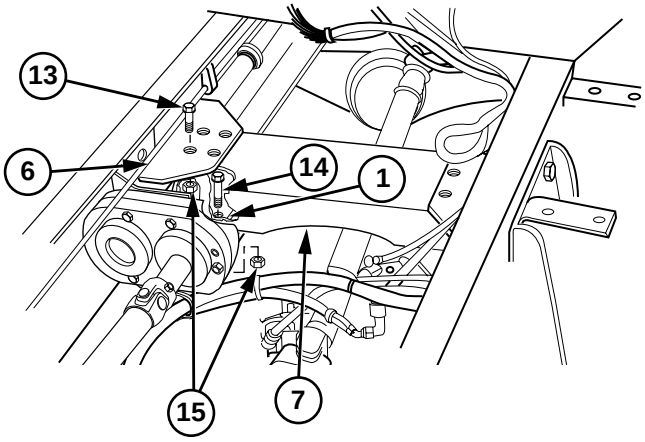
(2) Position two upper angles (6), crossmember (7), and two spacers (8) on frame (2) with two screws (9), screws (10), screw (11), and five new locknuts (12). Do not tighten.

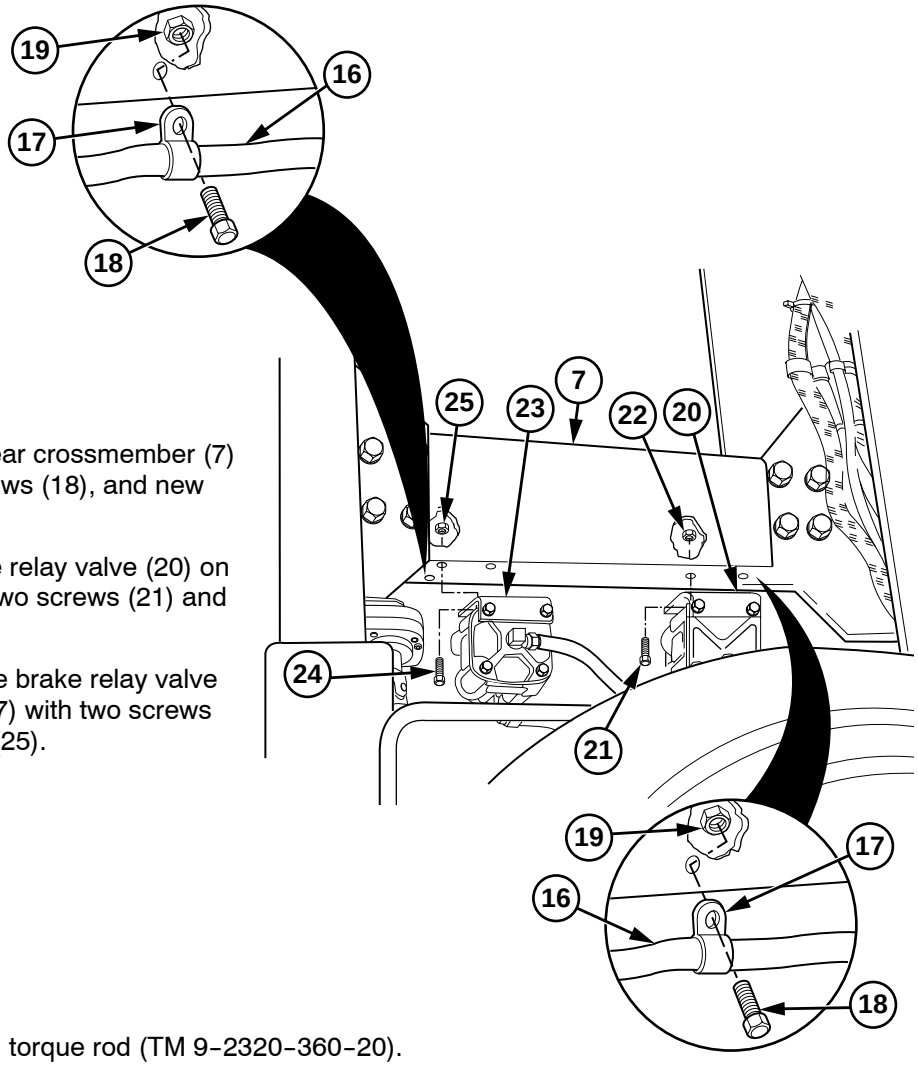


14-16. NO. 3 CROSSMEMBER REPLACEMENT (CONT)

(3) Install 8 screws (13), screws (14), and 16 new locknuts (15) on 4 angles (1 and 6) and crossmember (7) with aid of assistant. Torque to 212 lb-ft (287 N·m).

(4) Tighten 12 locknuts (5 and 12) to 375 lb-ft (508 N·m).





(5) Install air line (16) on rear crossmember (7) with two clips (17), screws (18), and new locknuts (19).

(6) Install rear spring brake relay valve (20) on crossmember (7) with two screws (21) and new locknuts (22).

(7) Install axle no. 3 service brake relay valve (23) on crossmember (7) with two screws (24) and new locknuts (25).

c. Follow-On Maintenance

(1) Install no. 4 longitudinal torque rod (TM 9-2320-360-20).

(2) Install catwalk (TM 9-2320-360-20).

14-17. REAR LIFTING LUGS REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Multiplier, Torque (Item 99, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (6) (Item 88, Appendix F)

Personnel Required
Two

NOTE

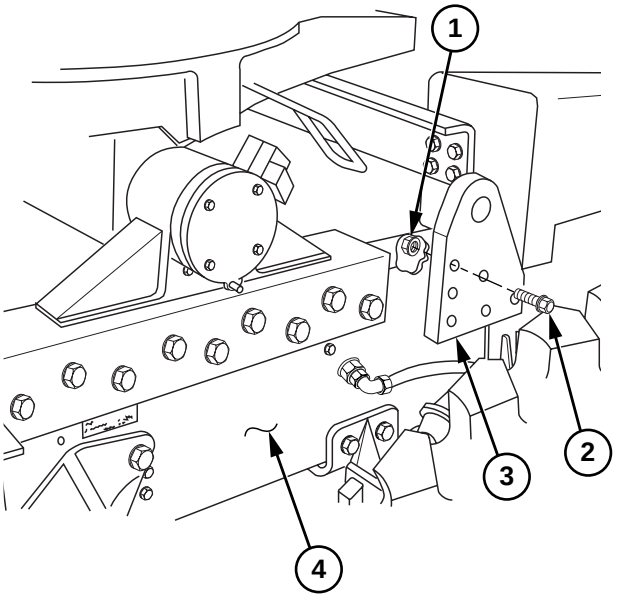
Right and left rear lifting lugs are replaced in the same manner. Left side is shown.

a. Removal

CAUTION

Use care when removing left lifting lug nuts. Power steering lines can be damaged easily. Failure to comply may result in leaking power steering lines and steering failure.

Remove six locknuts (1), screws (2), and rear lifting lug (3) from frame (4) with aid of assistant. Discard locknuts.



b. Installation

Install lifting lug (3) on frame (4) with six screws (2) and new locknuts (1) with aid of assistant. Torque to 375 lb-ft (508 N·m).

c. Follow-On Maintenance

Remove wheel chocks.

14-18. NO. 4 CROSSMEMBER REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
No. 4 longitudinal torque rod removed (para 15-4).
Fifth wheel ramp/extension removed (left side only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Puller Kit, Mechanical (Item 124, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Socket, Sockethead Screw, 14 mm (Item 173, Appendix E
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Compound, Antiseize (Item 18, Appendix B)
Locknuts (4) (Item 87, Appendix F)
Locknuts (22) (Item 88, Appendix F)
Locknuts (2) (Item 92, Appendix F)
Locknut (Item 96, Appendix F)
Locknut (Item 80, Appendix F)
Lockwashers (8) (Item 106, Appendix F)
Packing, Preformed (Item 158, Appendix F)
Packing, Preformed (Item 160, Appendix F)
Packing, Preformed (Item 183, Appendix F)
Retainer Kit, Pitman Arm (Item 233, Appendix F)

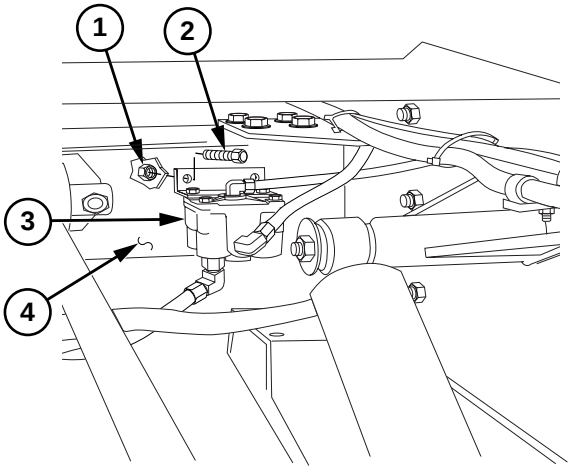
Personnel Required
Two

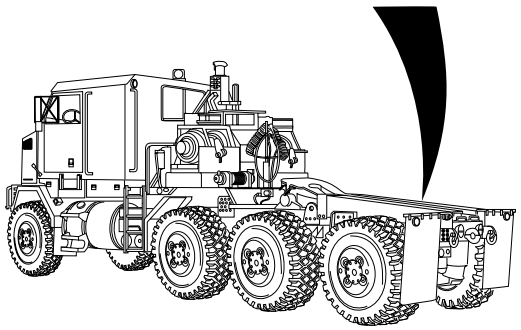
NOTE

It is not necessary to remove steering gear if replacing only crossmember or right angle brackets.

a. Removal

(1) Remove two locknuts (1), screws (2), and rear service brake relay valve (3) from no. 4 crossmember (4). Discard locknuts.

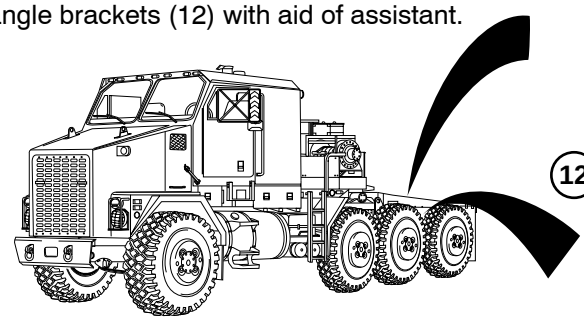


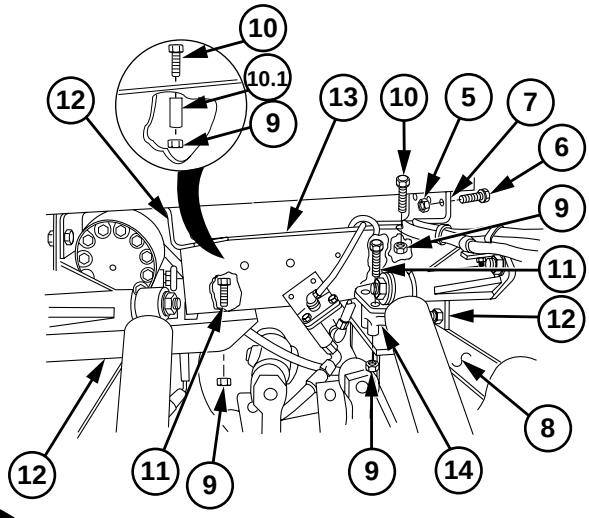


(2) Remove two locknuts (5), screws (6), and angle bracket (7) from right side frame (8).

(3) Remove 16 locknuts (9), 12 screws (10),sleeves (10.1), and 4 screws (11) from upper right angle bracket (7), three angle brackets (12), and crossmember (13) with aid of assistant. Discard locknuts.

(4) Remove crossmember (13), upper right angle bracket (7) and spacer (14) from three angle brackets (12) with aid of assistant.





NOTE

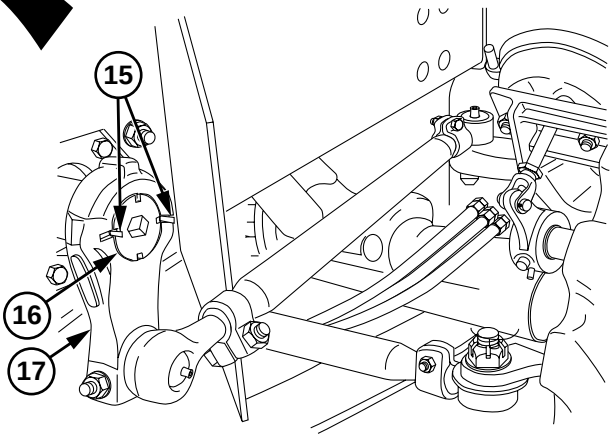
Do steps (5) thru (21) when removing left brackets.

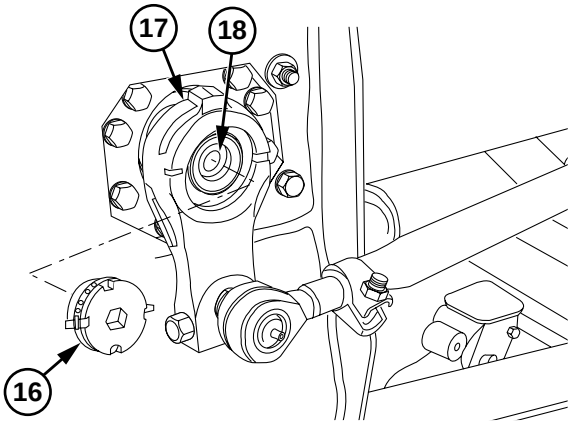
(5) Bend two locktabs (15) toward outside of sockethead cap (16) on pitman arm (17).

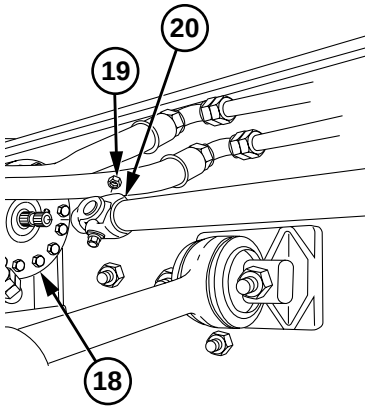
(6) Remove sockethead cap (16) from pitman arm (17). Discard sockethead cap.

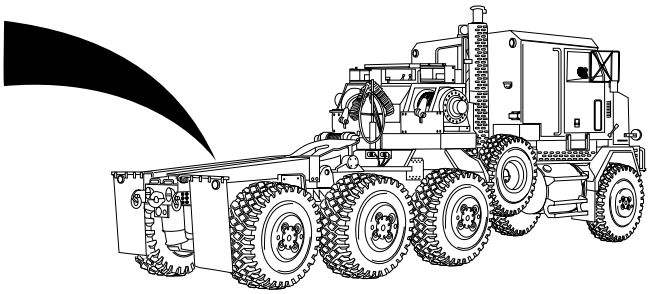
(7) Remove pitman arm (17) from steering gear (18).

(8) Remove locknut (19) and yoke (20) from steering gear (18). Discard locknut.









14-18. NO. 4 CROSSMEMBER REPLACEMENT (CONT)

(9) Place container under hose no. 2276 (21) and hose no. 2275 (22) to catch draining fluid.

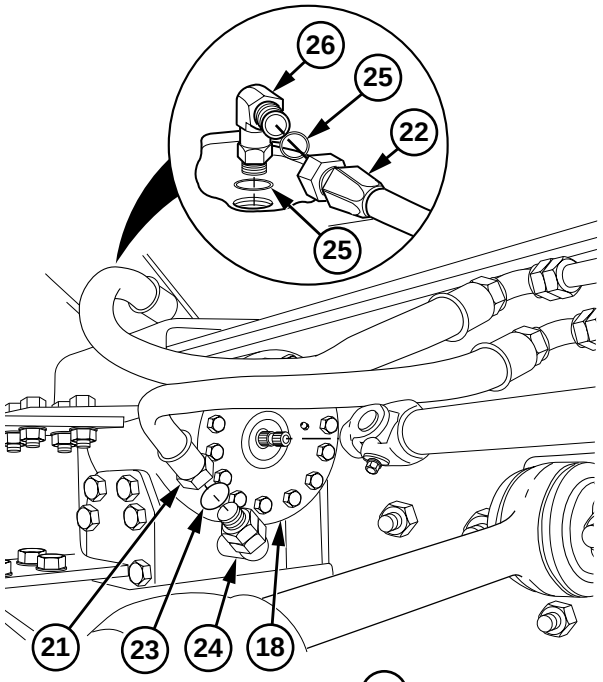
CAUTION

Steering hoses and elbows should be covered immediately after removal. Failure to comply may result in system contamination

(10) Remove hose no. 2276 (21) and preformed packing (23) from elbow (24). Discard preformed packing.

(11) Remove hose no. 2275 (22) and preformed packing (25) from elbow (26). Discard preformed packing.

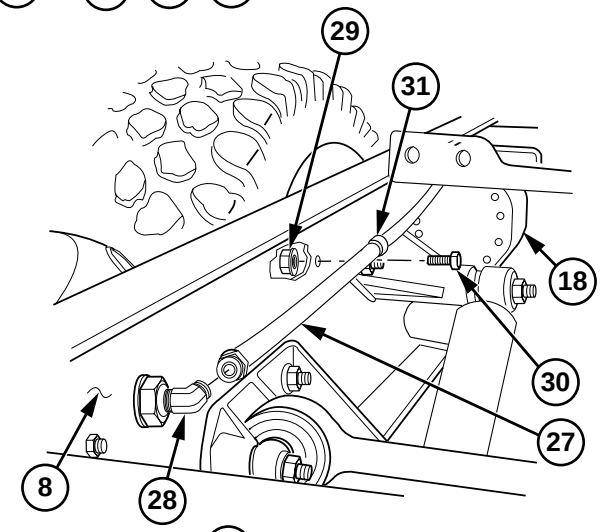
(12) Remove elbow (26) and preformed packing (25) from steering gear (18). Discard preformed packing.



(13) Remove hose no. 2047 (27) from elbow (28).

(14) Remove locknut (29), screw (30), clip (31), and hose no. 2047 (27) from frame (8). Discard locknut.

(15) Pull hose no. 2047 (27) forward past steering gear (18).



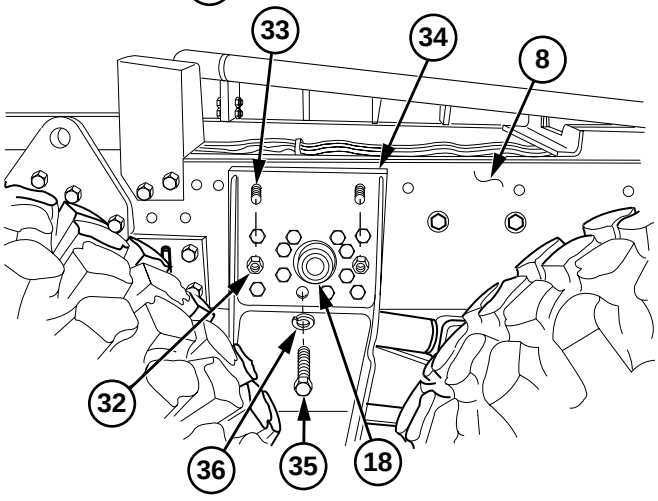
(16) Remove two locknuts (32) from screws (33) on frame hanger (34). Discard locknuts.

WARNING

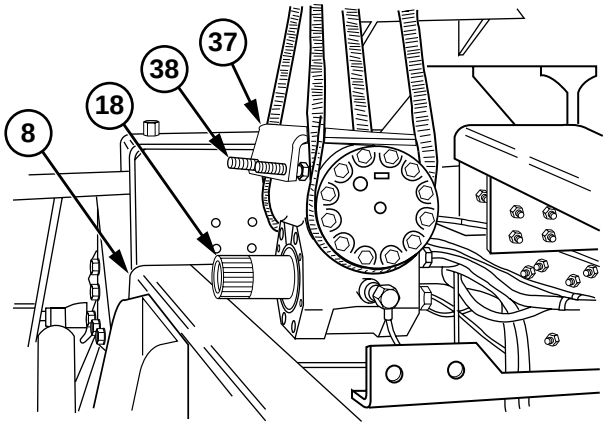
Steering gear weighs 175 lb (79 kg). Support steering gear when removing hardware to prevent it from falling. Failure to comply may result in injury.

(17) Install sling around both ends of steering gear (18) and attach to suitable lifting device.

(18) Remove eight screws (35) and lockwashers (36) from frame (8) and steering gear (18). Discard lockwashers.



(19) Remove steering gear (18), top left angle bracket (37), and two screws (38) from frame (8) with aid of assistant.



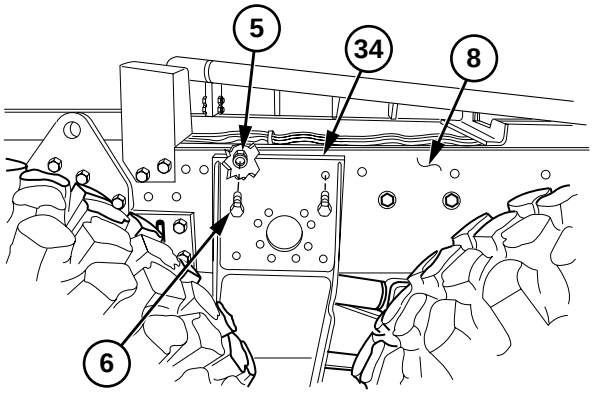
WARNING

Screws must be installed to temporarily support frame hanger when removing steering gear support bracket. Failure to comply may result in injury.

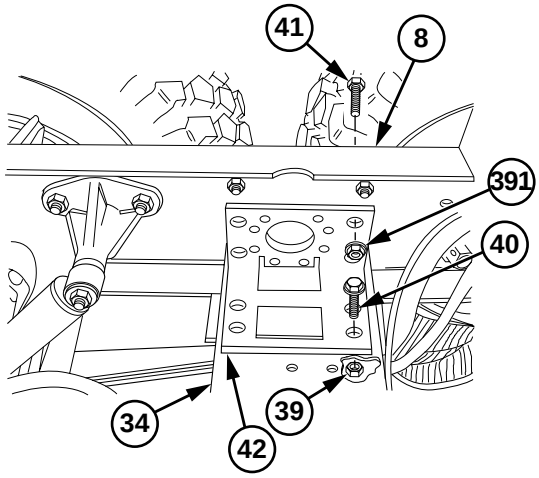
NOTE

Screws and locknuts removed in step (2) are used to support frame hanger.

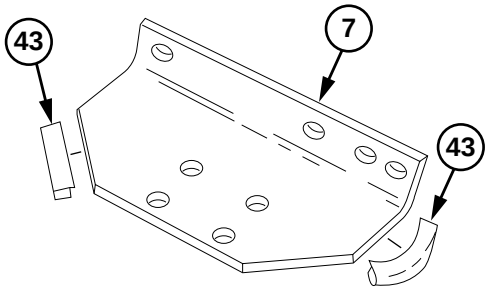
(20) Install two screws (6) and locknuts (5) through left side frame (8) and frame hanger (34). Torque to 220 lb-ft (298 N·m).



(21) Remove four locknuts (39), locknuts (39.1), screws (40), screws (41), and steering gear support bracket (42) from frame (8) and frame hanger (34). Discard locknuts.



(22) Remove two quickedge moldings (43) from angle bracket (7). Discard quickedge molding.



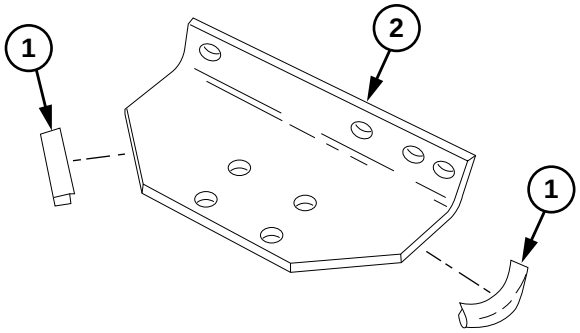
14-18. NO. 4 CROSSMEMBER REPLACEMENT (CONT)

b. Installation

NOTE

Do steps (1) thru (22) when installing left brackets.

(1) Install two 4 in. (10 cm) sections of new quickedge molding (1) on angle bracket (2).

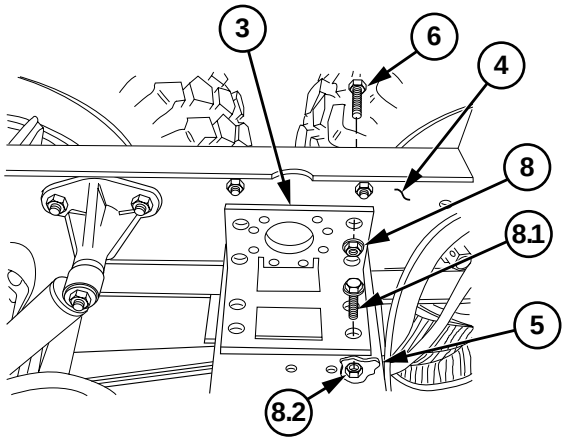


NOTE

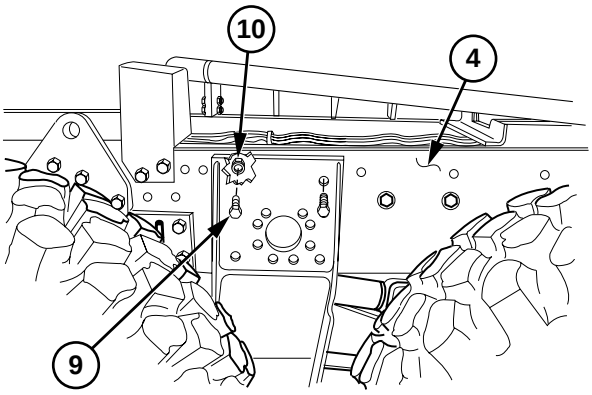
Shorter screws are installed on side of frame hanger.

(2) Install steering gear support bracket (3) on left side frame (4) with four screws (6) and new locknuts (8). Torque to 220 lb-ft (298 N·m).

(2.1) Install four screws (8.1) and new lockwashers (8.2) on steering gear support bracket (3) and frame hanger (5). Torque to 380 lb-ft (515 N·m).



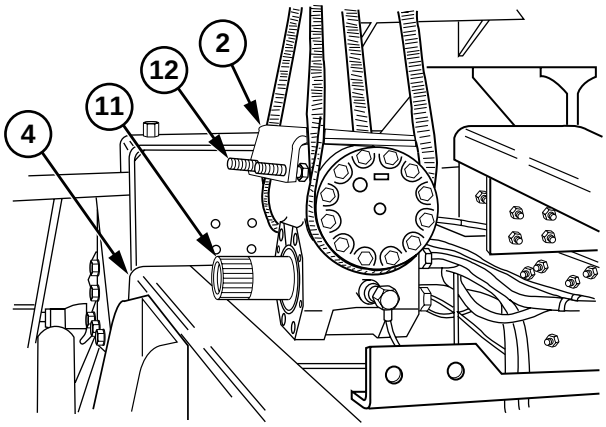
(3) Remove two screws (9) and locknuts (10) from left side frame (4). Discard locknuts.



WARNING

Steering gear weighs 175 lb (79 kg). Support steering gear when installing hardware to prevent it from falling. Failure to comply may result in injury.

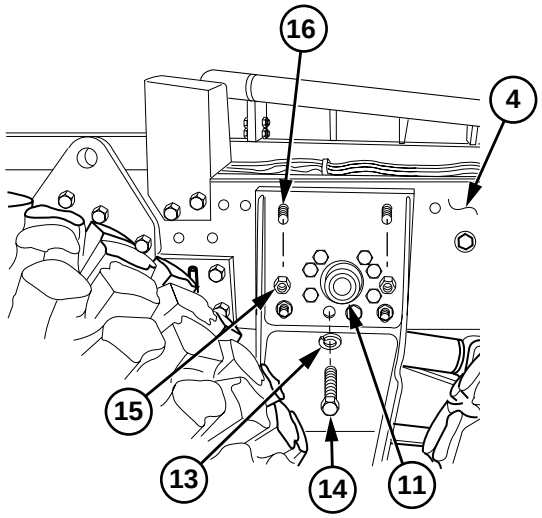
(4) Install sling around both ends of steering gear (11) and attach to lifting device.



NOTE

- Steering gear mounting surface should be clear of all foreign material.
- Steering gear, angle bracket, and two screws must be installed simultaneously.

(5) Position steering gear (11), top left angle bracket (2), and two screws (12) on frame (4).



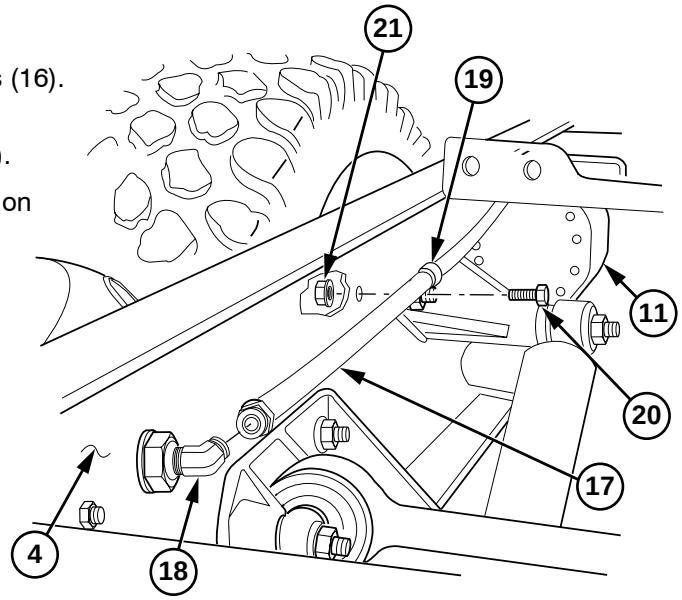
(6) Install eight new lockwashers (13) and screws (14) in steering gear (11) and frame (4). Torque to 180 lb–ft (245 N·m).

(7) Remove sling and lifting device from steering gear (11).

(8) Install two new locknuts (15) on screws (16). Torque to 220 lb–ft (298 N·m).

(9) Route hose no. 2047 (17) to elbow (18).

(10) Install hose no. 2047 (17) and clip (19) on frame (4) with screw (20) and new locknut (21).



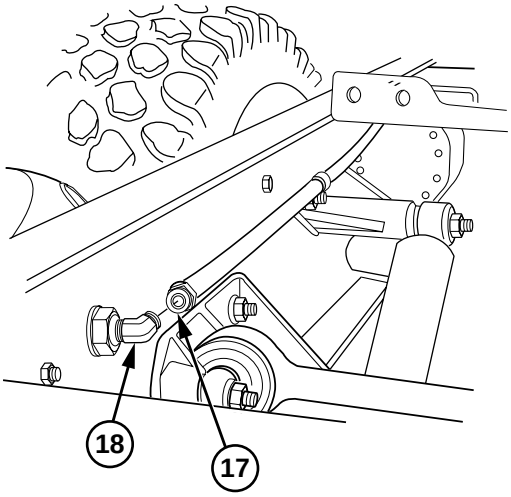
14-18. NO. 4 CROSSMEMBER REPLACEMENT (CONT)

(11) Install new preformed packing (22) and elbow (23) on steering gear (11).

(12) Install new preformed packing (22) and hose no. 2275 (24) on elbow (23).

(13) Install new preformed packing (25) and hose no. 2276 (26) on elbow (27).

(14) Install hose no. 2047 (17) on elbow (18).



(15) Coat inside surfaces of pitman arm (28) with antiseize compound.

(16) Align timing marks on steering gear (11) and pitman arm (28).

(17) Position pitman arm (28) on steering gear (11).

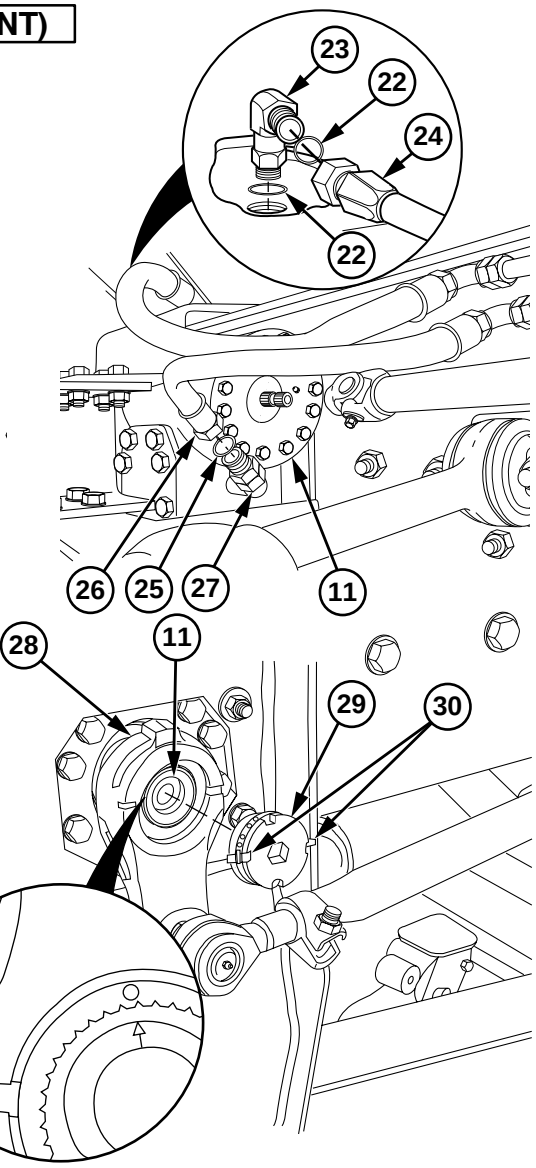
(18) Coat new sockethead cap (29) with antiseize compound.

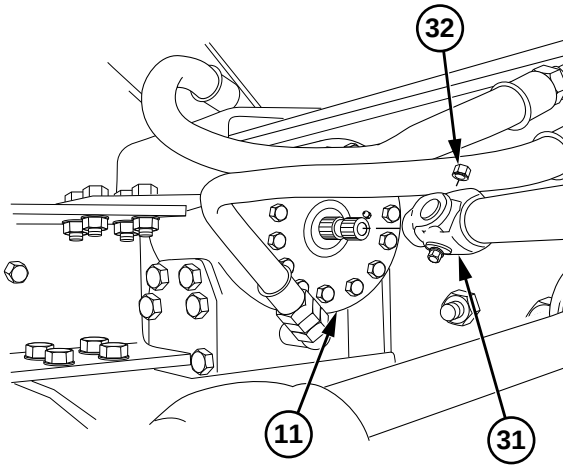
(19) Install sockethead cap (29) on pitman arm (28).

(20) Tighten sockethead cap (29) to 450 lb-ft (610 N·m).

(21) Engage locktabs (30) with slots on pitman arm (28).

(22) Install yoke (31) on steering gear (11) with new locknut (32). Torque to 35-40 lb-ft (47-54 N·m).





(23) Position crossmember (33) between three angle brackets (34) with aid of assistant.

(24) Position angle bracket (35) on right side frame (4) with two screws (36) and new locknuts (37). Do not tighten.

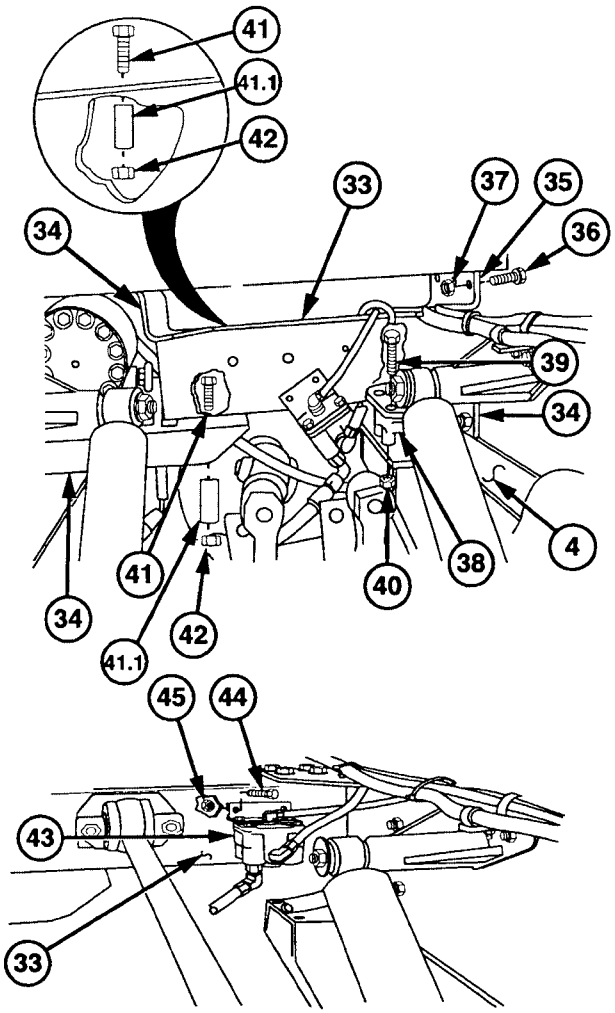
(25) Position spacer (38) on crossmember (33) with four screws (39) and new locknuts (40). Do not tighten.

(26) Position 12 screws (41), sleeves (41.1), and new locknuts (42) on upper right side angle bracket (35) and crossmember (33).

(27) Tighten two locknuts (37) to 220 lb-ft (298 N·m).

(28) Tighten four locknuts (40) to 380 lb-ft (515 N·m).

(29) Tighten four locknuts (42) to 380 lb-ft (515 N·m).



(30) Install rear service brake relay valve (43) on crossmember (33) with two screws (44) and new locknuts (45).

c. Follow-On Maintenance

(1) Install longitudinal torque rod (para 15-4).

(2) Install fifth wheel ramp/extension (left side only) (TM 9-2320-360-20).

NOTE

Do steps (3) thru (9) only if left brackets were replaced.

(3) Fill power steering reservoir (LO 9-2320-360-12).

(4) Start engine (TM 9-2320-360-10).

(5) Build up air pressure to 120-125 psi (827-862 kPa).

(6) Check air hose connections for leaks.

(7) Check steering hose connections for leaks.

(8) Shut off engine (TM 9-2320-360-10).

(9) Adjust steering system (para 13-8).

14-19. REAR CROSSMEMBER REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Pintle hook removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack Kit, Hydraulic, Hand (Item 92, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Locknuts (22) (Item 87, Appendix F)
Locknuts (4) (Item 81, Appendix F)
Locknuts (4) (Item 92, Appendix F)
Locknuts (2) (Item 96, Appendix F)
Lockwashers (4) (Item 120, Appendix F)

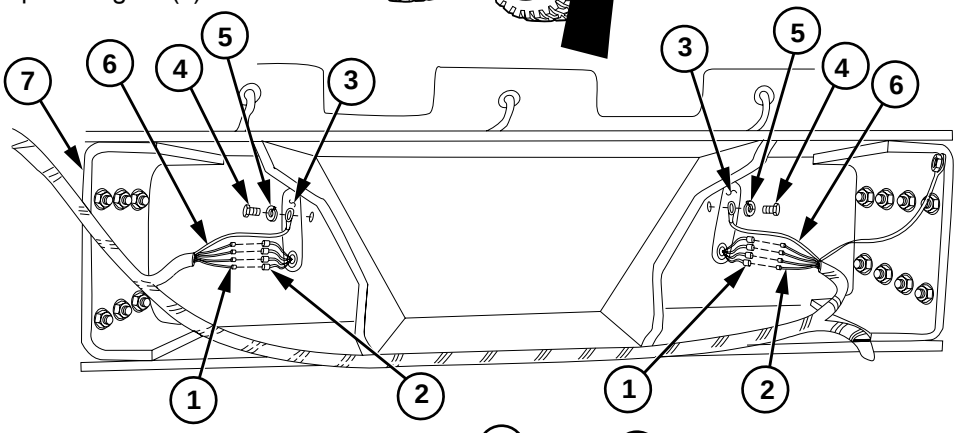
Personnel Required
Two

a. Removal

NOTE

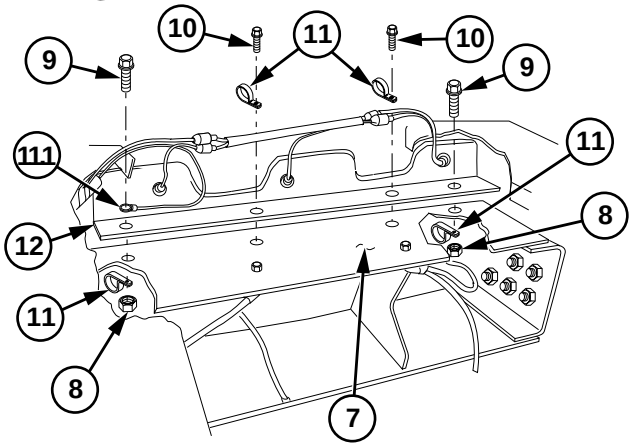
Tag and mark wires before removal.

(1) Disconnect eight plugs (1) from connectors (2) on two rear composite lights (3).



(2) Remove four screws (4), lockwashers (5), two ground wires (6), and two composite lights (3) from rear crossmember (7). Discard lockwashers.

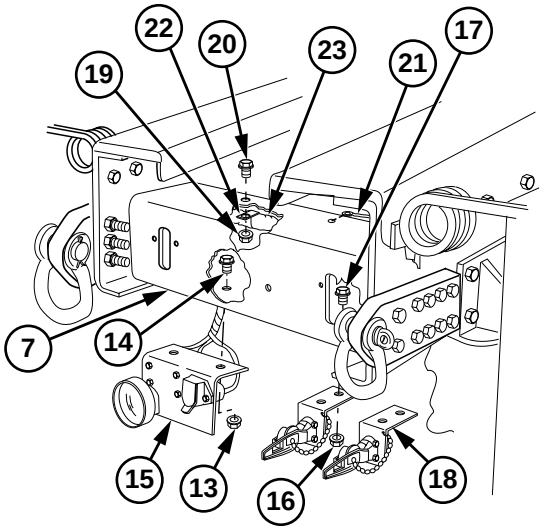
(3) Remove two locknuts (8), two screws (9), two screws (10), four clips (11), ground wire (11.1), and marker light bracket (12) from crossmember (7). Discard locknuts.



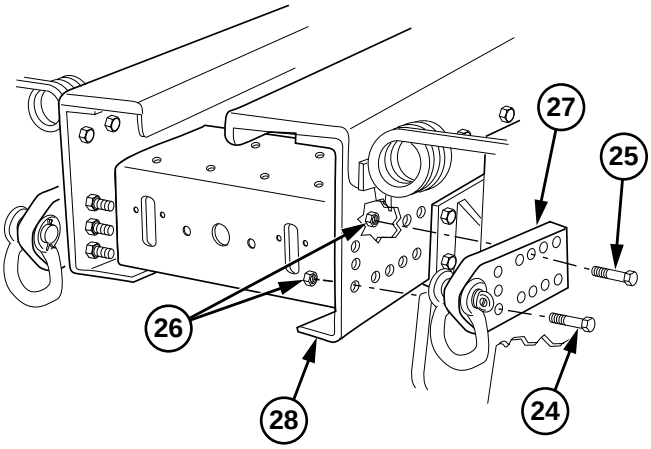
(4) Remove two locknuts (13), screws (14), and backup light mounting bracket (15) from rear crossmember (7). Discard locknuts.

(5) Remove four locknuts (16), screws (17), and two rear gladhand mounting brackets (18) from rear crossmember (7). Discard locknuts.

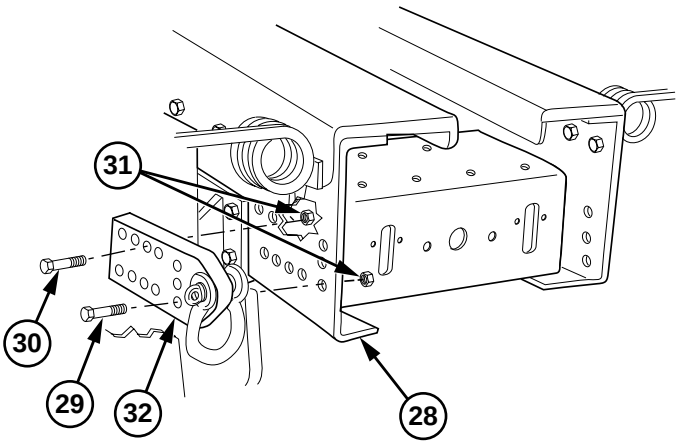
(6) Remove two locknuts (19), screws (20), ground wire no. 1435 (21), two cushion clips (22), and wire harness (23) from rear crossmember (7). Discard locknuts.



(7) Remove 3 screws (24), 8 screws (25), 11 locknuts (26), and right rear tow eye (27) from frame (28). Discard locknuts.



(8) Remove 3 screws (29), 8 screws (30), 11 locknuts (31), and left rear tow eye (32) from frame (28). Discard locknuts.

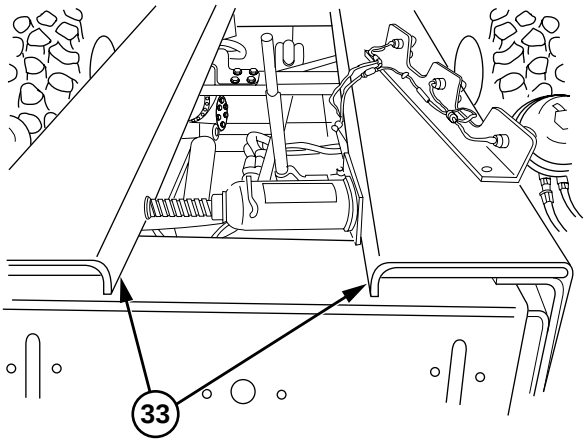


14-19. REAR CROSSMEMBER REPLACEMENT (CONT)

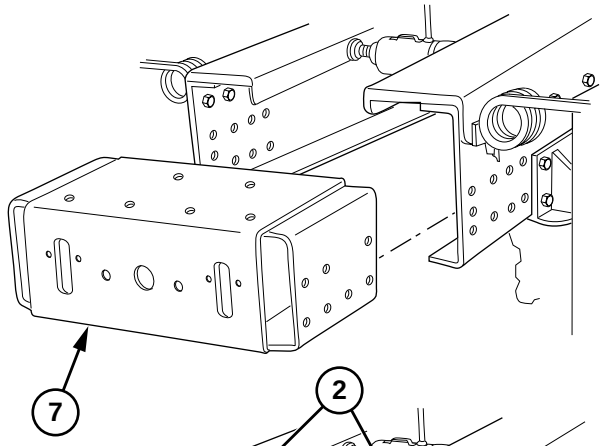
CAUTION

Do not apply excessive force to spread frame or damage may result.

(9) Spread fifth wheel ramps (33) with hydraulic jack.



(10) Slide crossmember (7) to rear of HET Tractor and remove with aid of assistant.



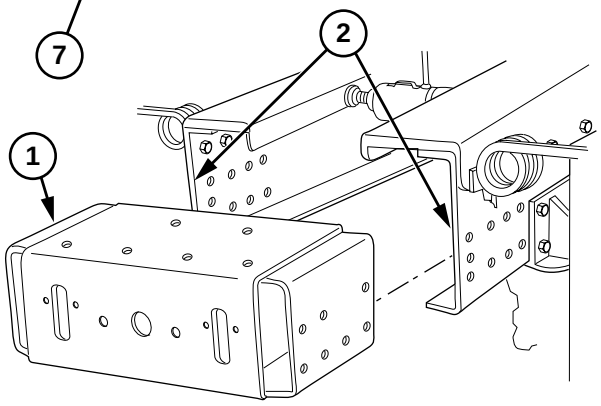
b. Installation

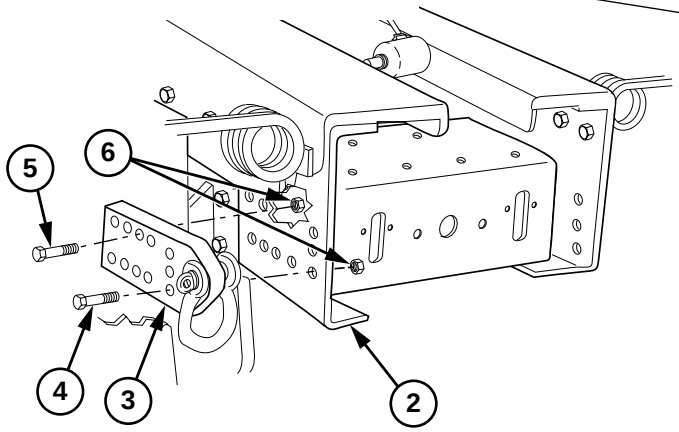
NOTE

Open side of crossmember faces front of vehicle.

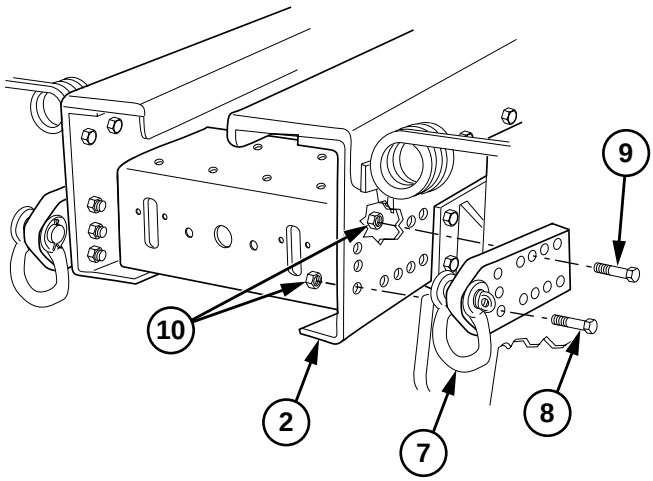
(1) Position crossmember (1) between frame (2) with aid of assistant.

(2) Position left rear tow eye (3) on frame (2) with 3 screws (4), 8 screws (5), and 11 new locknuts (6). Do not tighten.



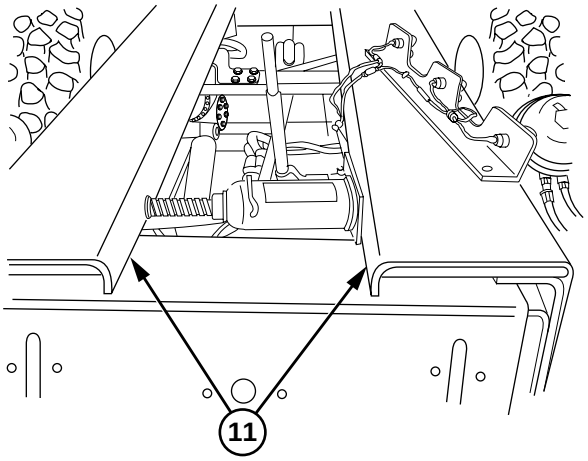


(3) Position right rear tow eye (7) on frame (2) with three screws (8), eight screws (9), and eleven new locknuts (10). Do not tighten.



(4) Remove hydraulic jack from fifth wheel ramps (11).

(5) Tighten 22 locknuts (6 and 10) to 212 lb-ft (288 N·m).



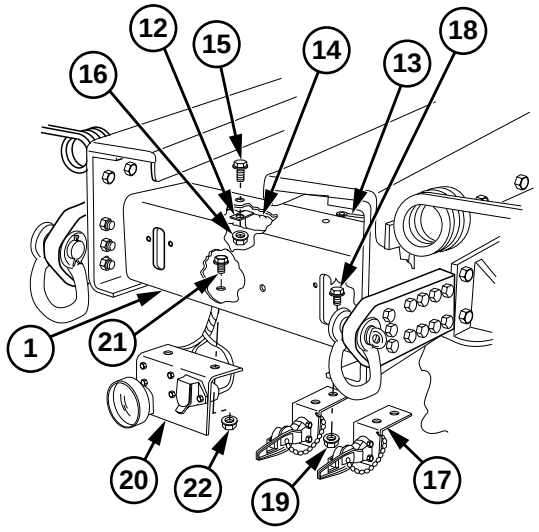
(6) Install two cushion clips (12), ground wire no. 1435 (13), and wire harness (14) on crossmember (1) with two screws (15) and new locknuts (16).

NOTE

- Red gladhand is installed on left side.
- Blue gladhand is installed on right side.

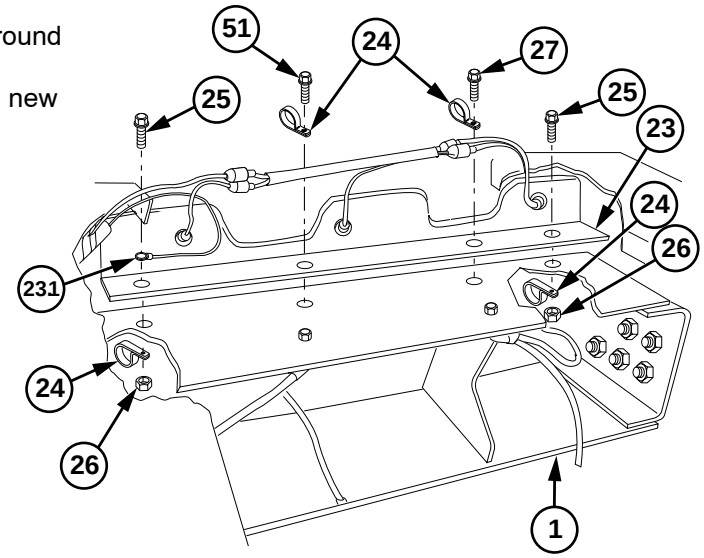
(7) Install two rear gladhand mounting brackets (17) on crossmember (1) with four screws (18) and new locknuts (19).

(8) Install backup light mounting bracket (20) on crossmember (1) with two screws (21) and new locknuts (22).



14-19. REAR CROSSMEMBER REPLACEMENT (CONT)

(9) Install rear marker light bracket (23), ground wire (23.1), and four clips (24) on rear crossmember (1) with two screws (25), new locknuts (26), and two screws (27).



(10) Install two composite lights (28) and ground wires (29) on rear crossmember (1) with four new lockwashers (30) and screws (31).

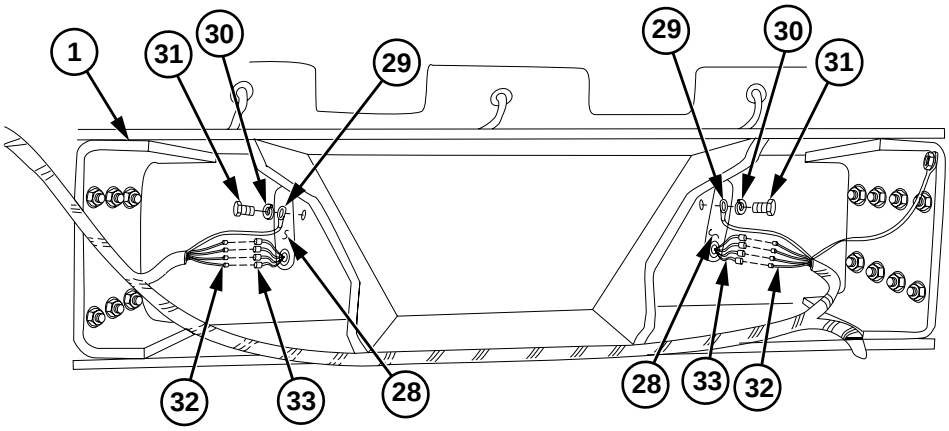
NOTE

Refer to table 14-2 for proper wire connections.

Table 14-2. Wire Connections

Chassis Wire No.	Rear Composite Light Wire No.
1678	23
1012	21
1004A or 1003A	22/460/461
1680	24

(11) Connect eight plugs (32) to connectors (33) on two rear composite lights (28).



c. Follow-On Maintenance

Install pintle hook (TM 9-2320-360-20).

14-20. FRONT TOW EYES REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front crosstube removed (para 14-2).
Engine hood removed (TM 9-2320-360-20).
Front steering gear removed (left tow eye only) (para 13-5).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Adapter, Socket Wrench, 3/4 In. Female - 1 In. Male (Item 6, Appendix E)
Socket, Sockethead Screw, 1/2 In. (Item 169, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 5, Appendix B)
Locknuts (6) (Item 88, Appendix F)

Personnel Required
Two

a. Removal

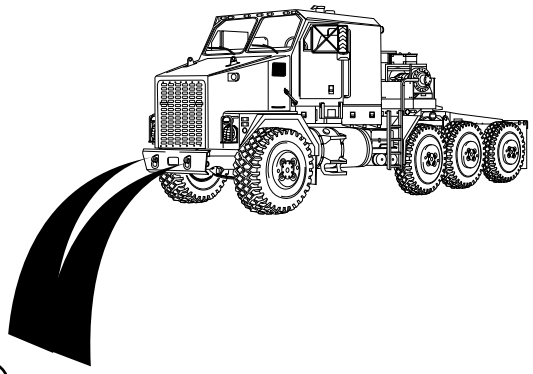
(1) Remove four screws (1) and two hood mounting lugs (2) from dropframes (3 and 4).

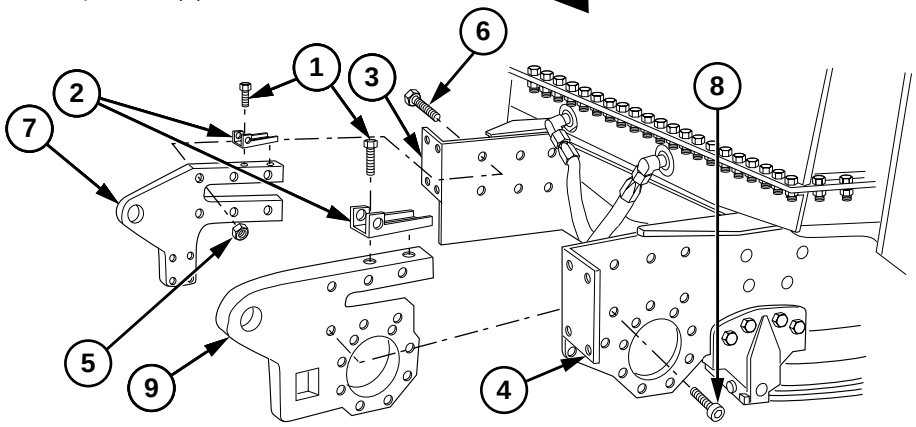
NOTE

Do step (2) for right tow eye and step (3) for left tow eye.

(2) Remove six locknuts (5), screws (6) and right tow eye (7) from dropframe (3). Discard locknuts.

(3) Remove six sockethead screws (8) and left tow eye (9) from dropframe (4) with aid of assistant.





14-20. FRONT TOW EYES REPLACEMENT (CONT)

b. Installation

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

NOTE

- Do steps (1) and (2) for left tow eye. Do step (3) for right tow eye.
- Holes for front crosstube in dropframe and in tow eyes must be aligned before tightening.

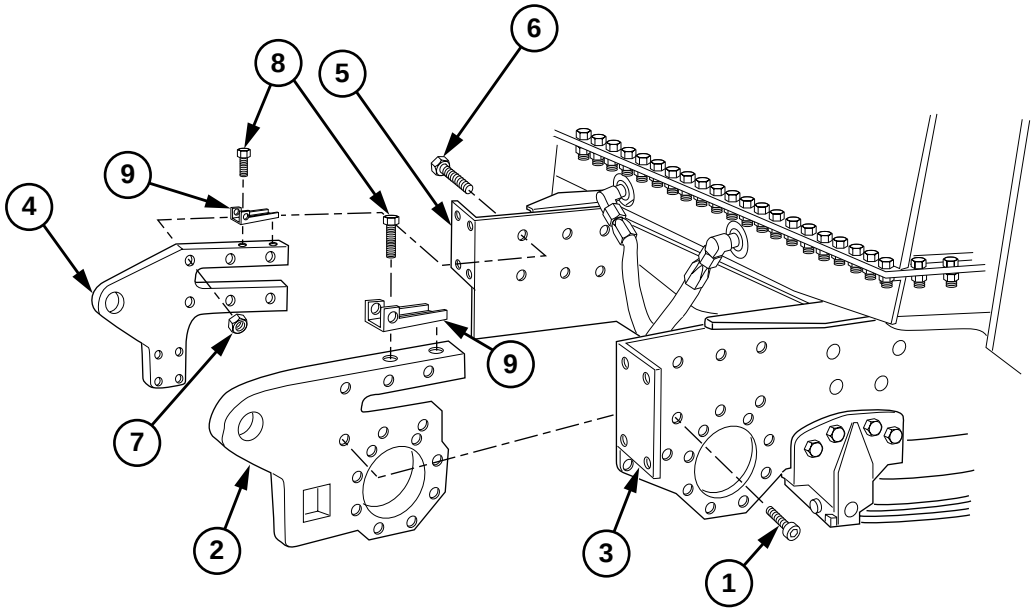
(1) Apply adhesive-sealant to threads of six sockethead screws (1).

(2) Install left tow eye (2) on dropframe (3) with six sockethead screws (1) with aid of assistant. Torque to 250 lb-ft (339 N·m).

(3) Install right tow eye (4) on dropframe (5) with six screws (6) and new locknuts (7). Torque to 375 lb-ft (508 N·m).

(4) Apply adhesive-sealant to threads of four screws (8).

(5) Install two hood mounting lugs (9) to dropframes (3 and 5) with four screws (8).



c. Follow-On Maintenance

(1) Install front steering gear (left tow eye only) (para 13-5).

(2) Install engine hood (TM 9-2320-360-20).

(3) Install front crosstube (para 14-2).

14-21. REAR TOW EYES REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake applied (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (11) (Item 87, Appendix F)

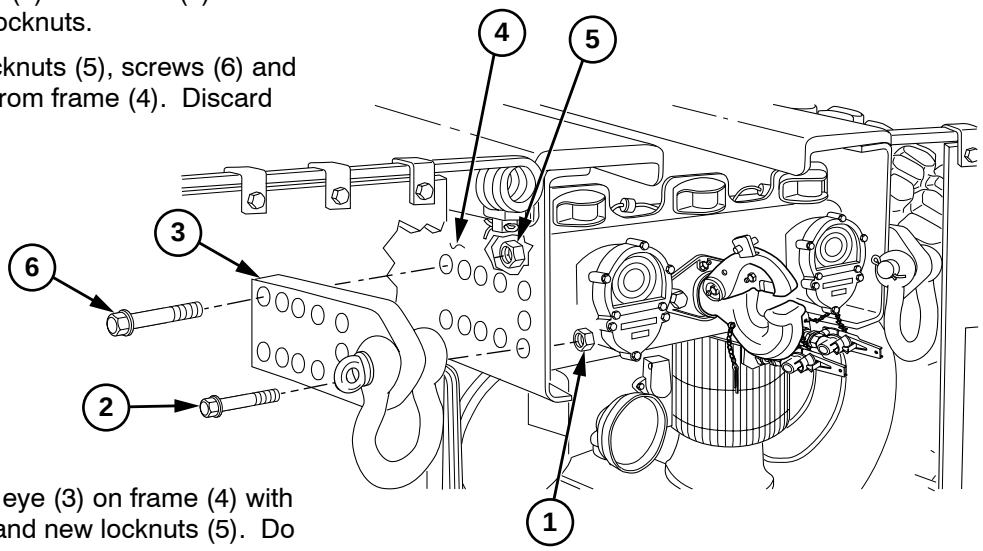
NOTE

Left and right tow eyes are replaced in the same manner. Left tow eye is shown.

a. Removal

(1) Remove three locknuts (1) and screws (2) from rear tow eye (3) and frame (4). Discard locknuts.

(2) Remove eight locknuts (5), screws (6) and rear tow eye (3) from frame (4). Discard locknuts.



b. Installation

(1) Position rear tow eye (3) on frame (4) with eight screws (6) and new locknuts (5). Do not tighten.

(2) Install three screws (2) and new locknuts (1) on rear tow eye (3) and frame (4). Torque to 212 lb-ft (287 N·m).

(3) Tighten locknuts (1) to 212 lb-ft (287 N·m).

c. Follow-On Maintenance

Remove wheel chocks.

14-22. FIFTH WHEEL REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Locknuts (18) (Item 88, Appendix F)

Personnel Required
Two

a. Removal

WARNING

Rear of fifth wheel plate must be resting on angle stop before performing maintenance. Failure to comply may result in injury.

(1) Remove 18 locknuts (1) and screws (2) from fifth wheel (3) with aid of assistant. Discard locknuts.

WARNING

Fifth wheel weighs 925 lb (420 kg). Use lifting device of appropriate capacity to prevent injury to personnel.

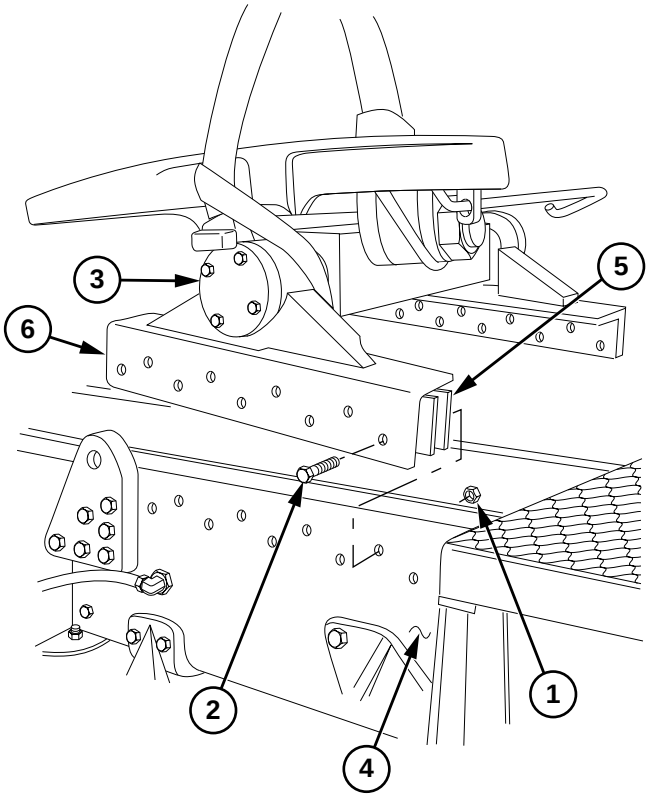
(2) Attach suitable lifting device to fifth wheel (3).

(3) Lift fifth wheel (3) off frame (4) using lifting device.

NOTE

Note number of shims being removed.

(4) Remove shims (5) from between right angle mount (6) and frame (4).



b. Installation

WARNING

Fifth wheel weighs 925 lb (420 kg). Use lifting device of appropriate capacity to prevent injury to personnel.

(1) Position fifth wheel (1) on frame (2) and align holes using lifting device.

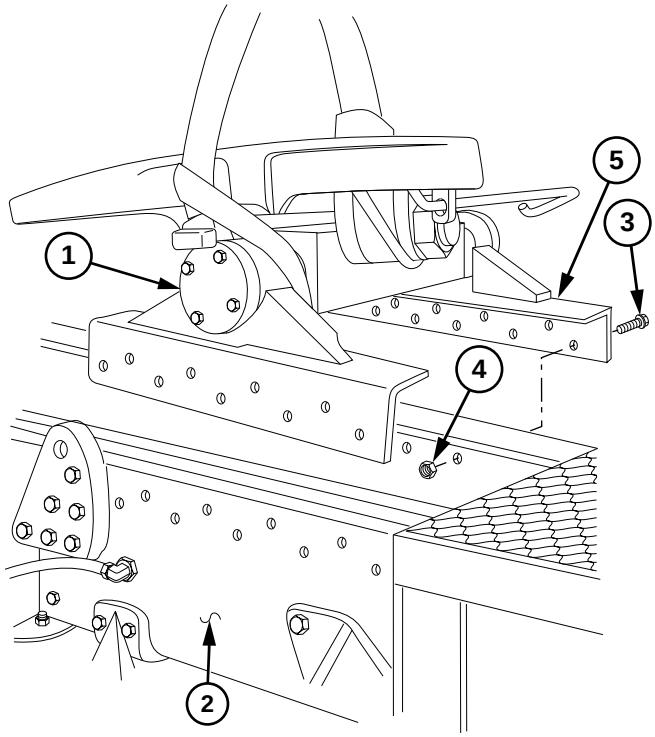
WARNING

Rear of fifth wheel plate must be resting on angle stop before performing maintenance. Failure to comply may result in injury.

NOTE

Screws and locknuts must be installed on left angle mount first.

(2) Install nine screws (3) and new locknuts (4) on left angle mount (5) and frame (2). Torque to 375 lb-ft (509 N·m).



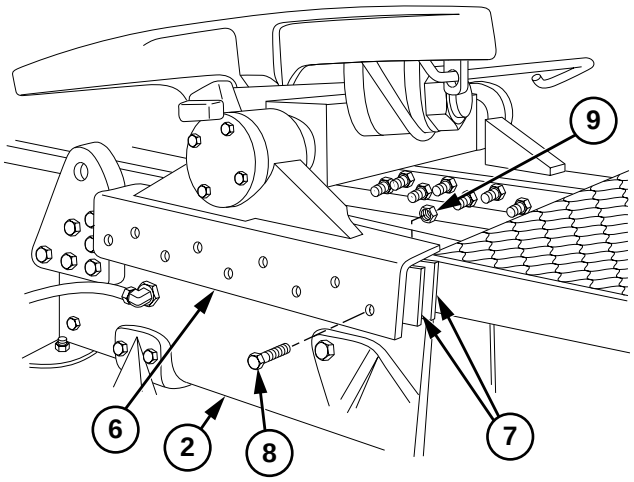
(3) Pull right angle mount (6) out to create gap between angle mount (6) and frame (2).

(4) Measure gap between frame (2) and angle mount (6).

NOTE

Gap must be 1/16 in. (1.6 mm) or less. Add shims as required. Do not use more than four shims.

(5) Install angle mount (6) and shim(s) (7) on frame (2) with nine screws (8) and new locknuts (9). Torque to 375 lb-ft (509 N·m).



14-22. FIFTH WHEEL REPLACEMENT (CONT)

(6) Raise fifth wheel top plate (10) to horizontal position using suitable lifting device.

WARNING

Fifth wheel top plate and ramps may be slippery. Use caution when standing on top plate and ramps. Failure to comply may result in injury to personnel.

CAUTION

Fifth wheel must be shimmed properly to allow top plate to pivot freely on angle mounts. Failure to shim properly may result in damage to fifth wheel.

(7) Check front to back pivot of fifth wheel (1) by standing on ears of fifth wheel top plate (10).

NOTE

If fifth wheel does not pivot, do steps (8) and (9).

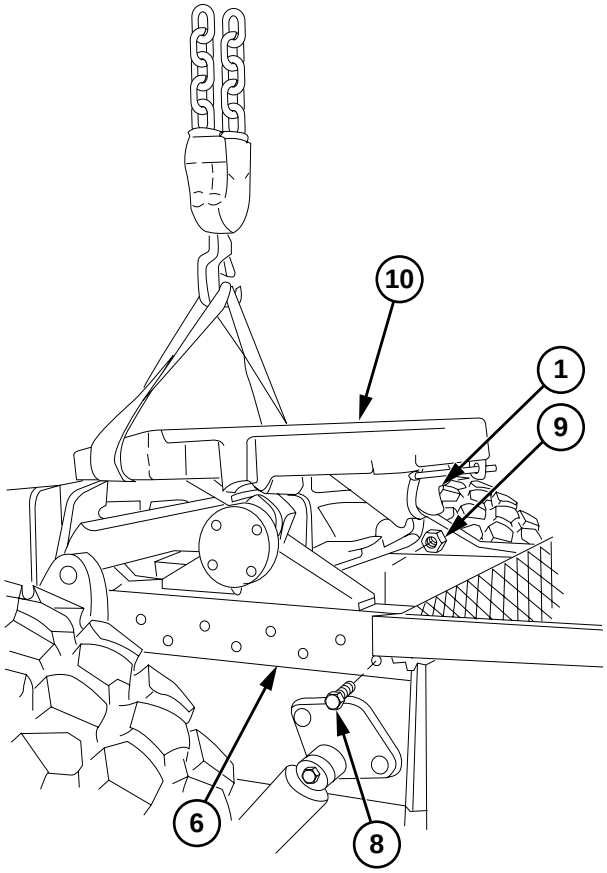
(8) Remove nine locknuts (9) and screws (8) from right angle mount (6). Discard locknuts.

NOTE

Do not use more than four shims.

(9) Repeat steps (4) thru (7) adding or subtracting shims as required to allow fifth wheel to pivot.

(10) Tighten locknuts (9) to 375 lb-ft (509 N·m).



c. Follow-On Maintenance

(1) Lubricate fifth wheel (LO 9-2320-360-12).

(2) Adjust fifth wheel (TM 9-2320-360-20).

(3) Remove wheel chocks.

14-23. FIFTH WHEEL REPAIR

This task covers:
a. Disassembly
b. Cleaning/Inspection
c. Assembly
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Fifth wheel removed (para 14-22).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Wheel Bearing Adjusting Nut, 3-1/2 In. (Item 240, Appendix E)

Materials/Parts
Compound, Antiseize, (Item 18, Appendix B)
Grease, Automotive and Artillery GAA (Item 32, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Bushing (Item 5, Appendix F)
Locknut (Item 84, Appendix F)
Locknut (Item 85, Appendix F)
Pin, Cotter (2) (Item 220, Appendix F)
Pin, Cotter (Item 218, Appendix F)
Pin, Cotter (Item 222, Appendix F)
Pin, Cotter (Item 223, Appendix F)
Pin, Cotter (Item 224, Appendix F)

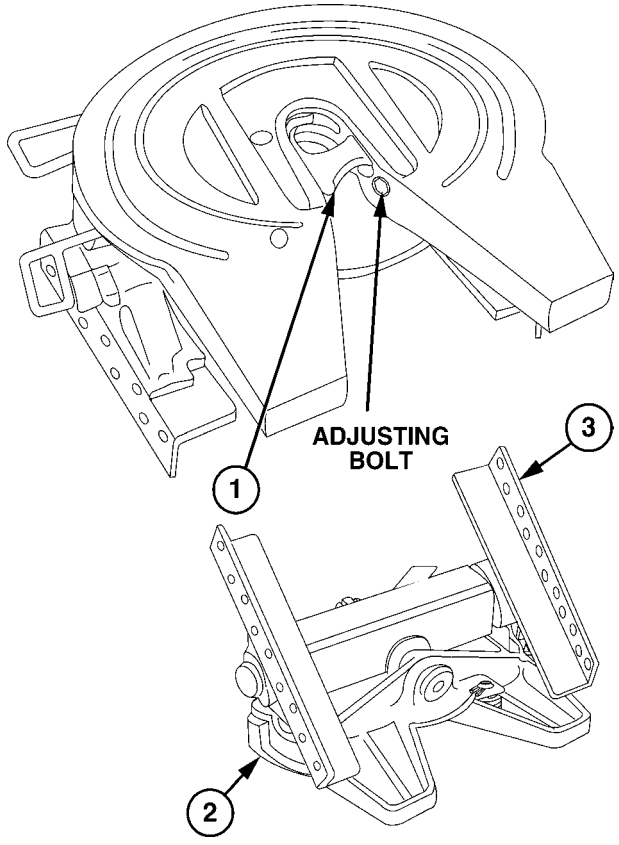
Personnel Required
Two

a. Disassembly

WARNING

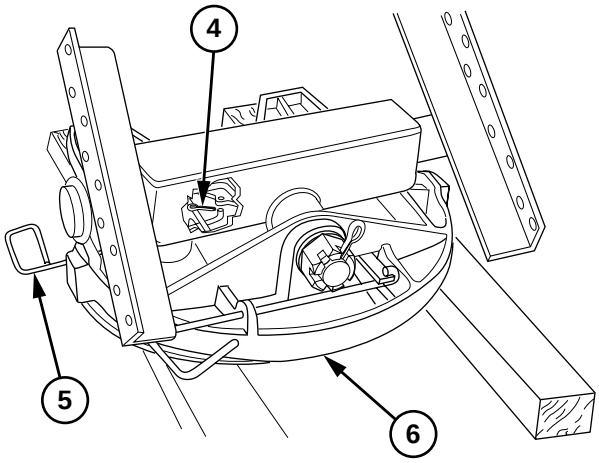
Fifth wheel weighs 925 lb (420 kg). Keep out from under fifth wheel. Falling parts may cause injury.

(1) Move jaws (1) to closed position.



(2) Position fifth wheel (2) on wooden blocks so side mounts (3) face upward.

14-23. FIFTH WHEEL REPAIR (CONT)



(3) Remove cotter pin (4) from secondary lock release handle (5). Discard cotter pin.

(4) Remove secondary release handle (5) from plate (6).

(5) Remove grease fitting (7) from lockpin (8).

(6) Remove cotter pin (9) from lockpin (8) Discard cotter pin.

WARNING

Spring and plunger are under tension. Handle carefully to avoid injury.

(7) Remove lockpin (8) from plate (6).

(8) Remove secondary jaw (10) and spring (11) from plate (6).

NOTE

Mark side mounts and rocker arm assembly for ease of assembly.

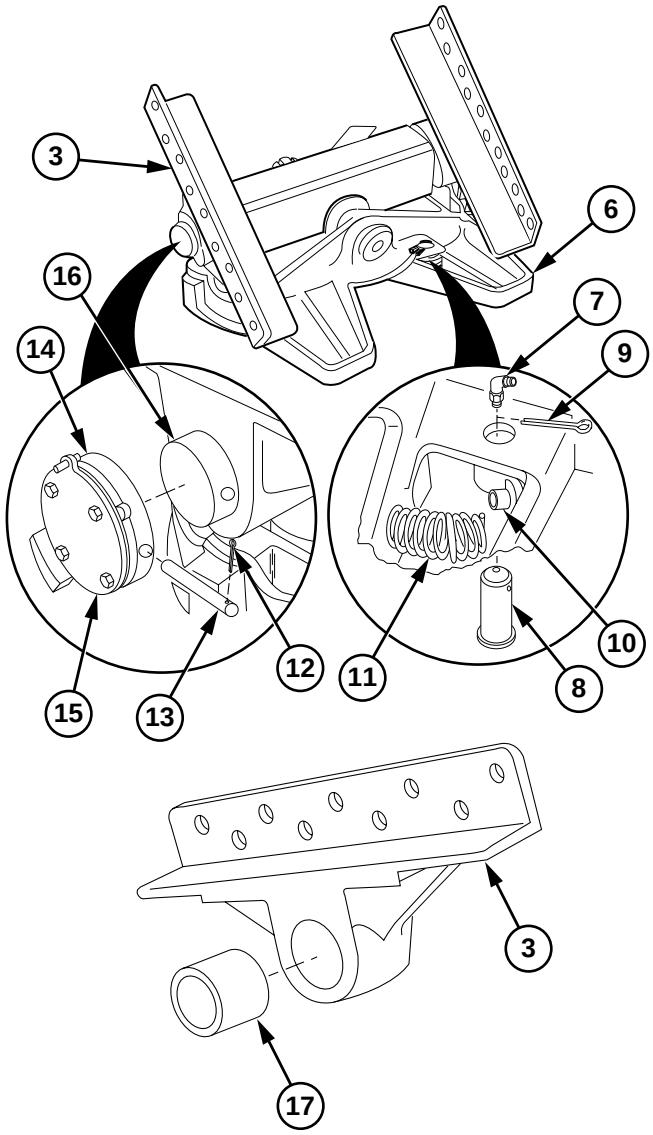
(9) Remove cotter pin (12) from pin (13) on side mount hub (14). Discard cotter pin.

(10) Remove pin (13) from hub assembly (15).

(11) Remove hub assembly (15) from rocker arm assembly (16).

(12) Remove side mount (3) from rocker arm assembly (16) with aid of assistant.

(13) Remove bushing (17) from side mount (3).

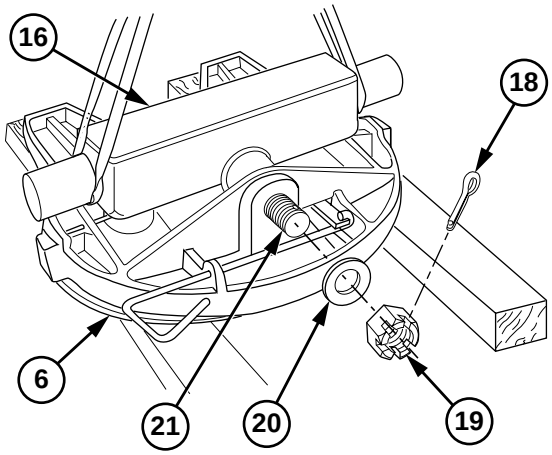


(14) Attach lifting device to rocker arm assembly (16). Put slight tension on lifting device.

(15) Repeat steps (9) thru (14) for other side mount (3).

(16) Remove cotter pin (18), nut (19), and washer (20) from large bolt (21). Discard cotter pin.

(17) Strike bolt (21) with rubber mallet to drive bolt assembly out of plate (6).



(18) Remove rubber bumpers (22) from pins (23) on rocker arm assembly (16).

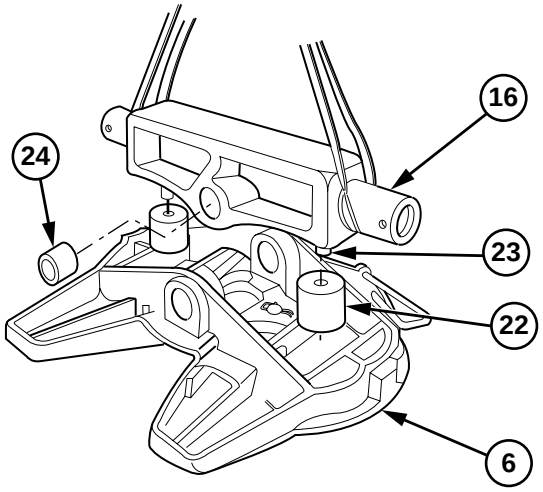
(19) Guide rocker arm assembly (16) from plate (6) while assistant operates lifting device.

(20) Remove bushing (24) from rocker arm assembly (16).

(21) Remove grease fitting (25) from lockpin (26).

(22) Remove cotter pin (27) from lockpin (26). Discard cotter pin.

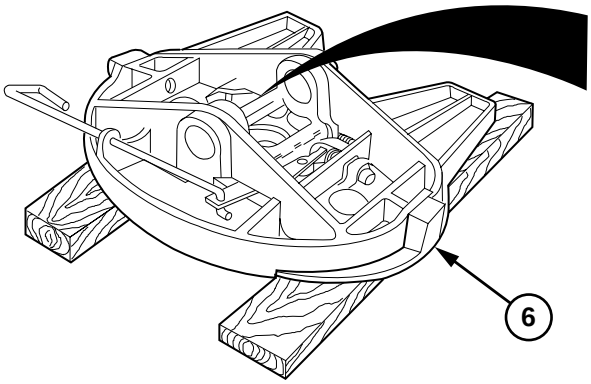
(23) Remove lockpin (26) from plate (6).

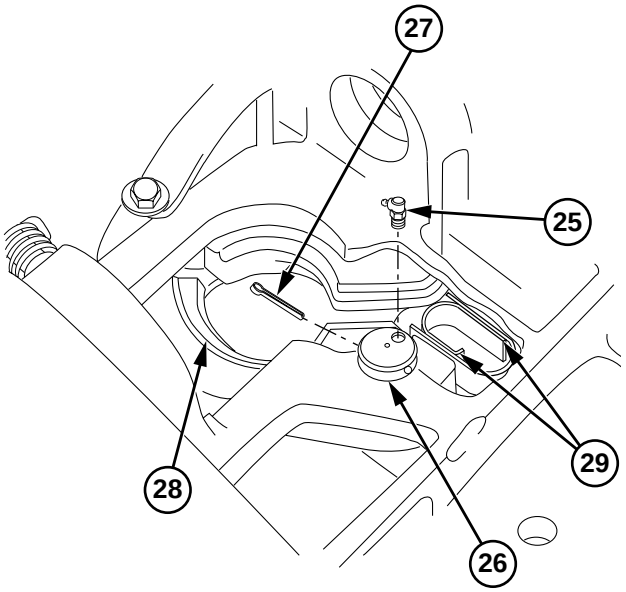


NOTE

Note positioning of U-spring halves before removing from plate.

(24) Remove hinged lock (28) and U-spring (29) from plate (6).





14-23. FIFTH WHEEL REPAIR (CONT)

WARNING

Spring is under tension. Release slowly to prevent injury.

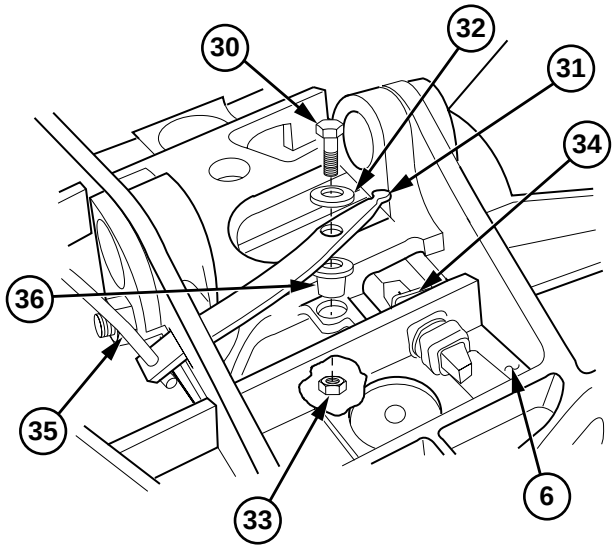
(25) Loosen screw (30) on release lever (31).

(26) Remove screw (30), washer (32), and nut (33) while assistant compresses spring (34).

(27) Slowly release spring (34).

(28) Remove release lever (31) and release handle (35) from plate (6).

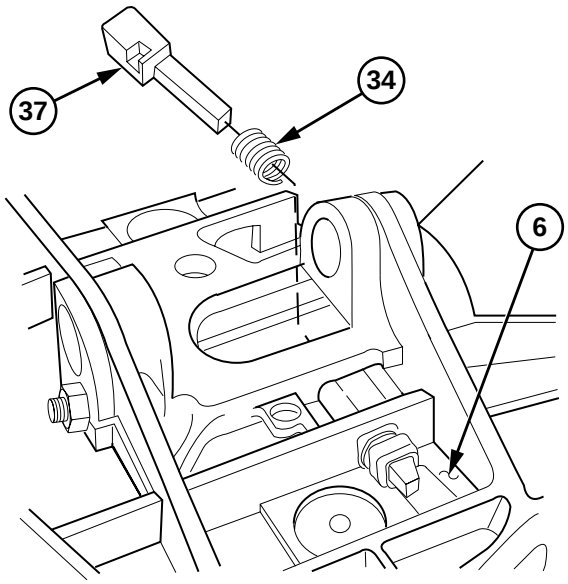
(29) Remove bushing (36) from release lever (31). Discard bushing.



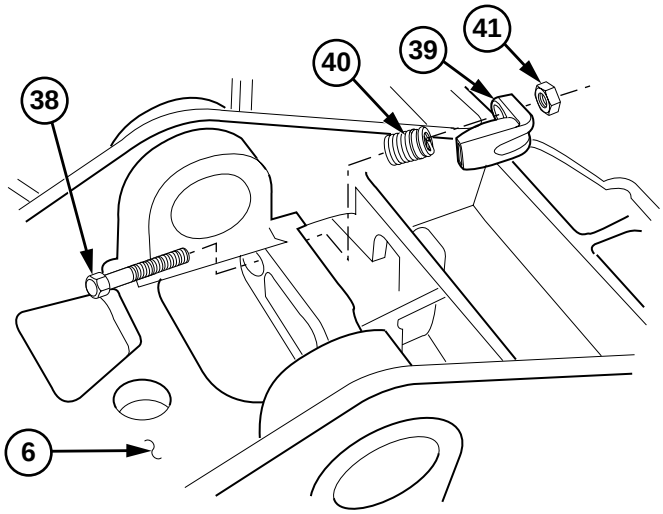
WARNING

Spring and plunger are under tension. Release slowly to prevent injury.

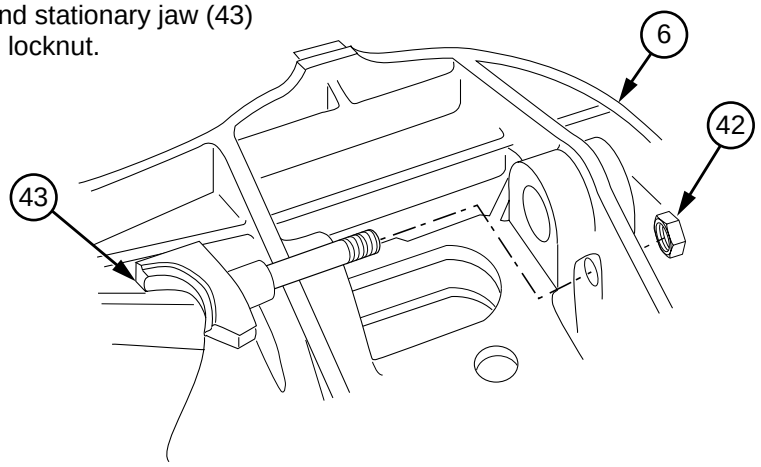
(30) Remove plunger (37) from spring (34) and plate (6).



(31) Remove screw (38), adjusting wedge (39), spring (40) and locknut (41) from plate (6). Discard locknut.



(32) Remove locknut (42) and stationary jaw (43) from plate (6). Discard locknut.



b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

- **The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).**
- **Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.**
- **Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.**
- **Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.**
- **Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.**

(1) Clean all metal parts with solvent cleaning compound.

(2) Remove corrosion from bare metal.

WARNING

Plate weighs 525 lb (238 kg). Keep out from under heavy parts. Falling parts may cause injury.

(3) Inspect both sides of plate for cracks or distortion. Use lifting device to move and support plate

(4) Inspect lockpin holes in plate. New pins must fit tightly. Replace plate if new pins are not tight.

(5) Inspect all parts for damage.

(6) Replace all damaged parts.

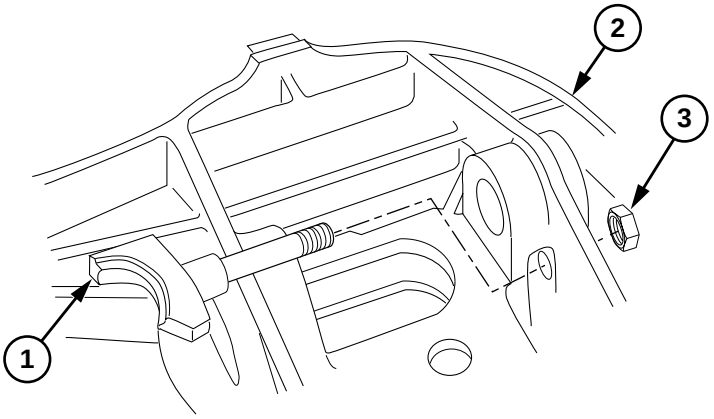
14-23. FIFTH WHEEL REPAIR (CONT)

c. Assembly

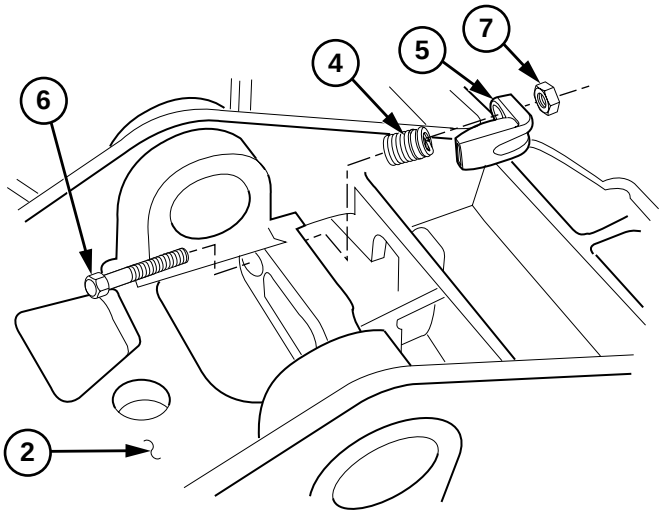
NOTE

Plate should face down on blocks with underside exposed.

(1) Install stationary jaw (1) on plate (2) with new locknut (3).



(2) Install spring (4) and adjusting wedge (5) to plate (2) with screw (6), and new locknut (7). Tighten locknut (7) until only one thread shows.

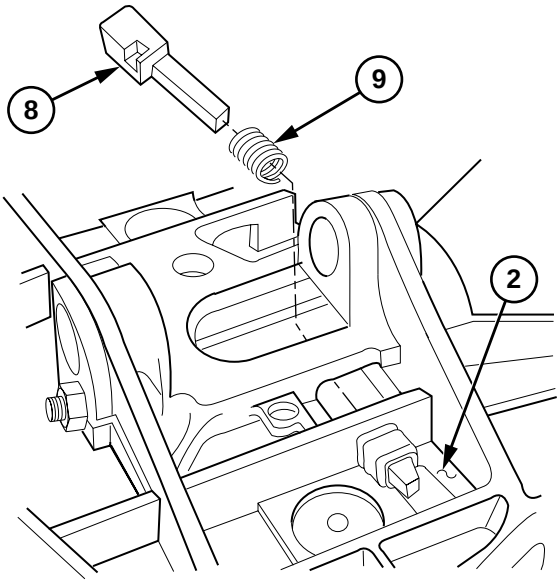


WARNING

Spring and plunger are under tension. Handle carefully to avoid injury.

(3) Apply heavy coat of grease to plunger (8).

(4) Install spring (9) and plunger (8) on plate (2) with aid of assistant.



(5) Install new bushing (10) in release lever (11).

(6) Install release lever (11) in release handle (12).

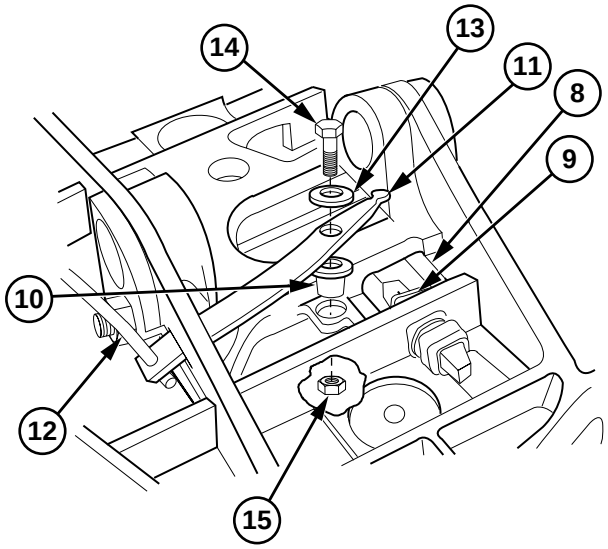
(7) Install release lever (11) in slot in plunger (8).

(8) Install washer (13) and screw (14) in release lever (11) while assistant compresses spring (9).

NOTE

Release lever must move freely. Do not overtighten nut.

(9) Install new locknut (15) on screw (14).



NOTE

U-spring must be installed in position noted during disassembly.

(10) Install U-spring (16) in center of plate (2) as noted during disassembly.

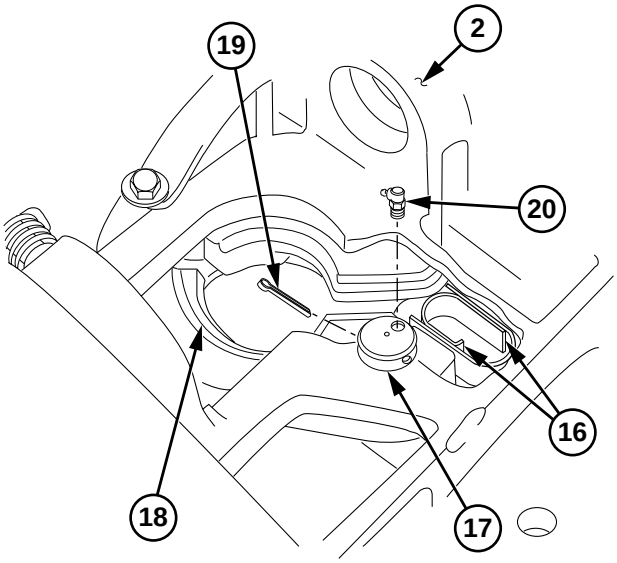
(11) Apply antiseize compound to lockpin (17) and hole in plate (2).

(12) Install hinged lock (18) in plate (2) with lockpin (17).

(13) Attach lifting device to fifth wheel and raise until fifth wheel is in vertical position.

(14) Strike lockpin (17) with hammer until seated in fifth wheel.

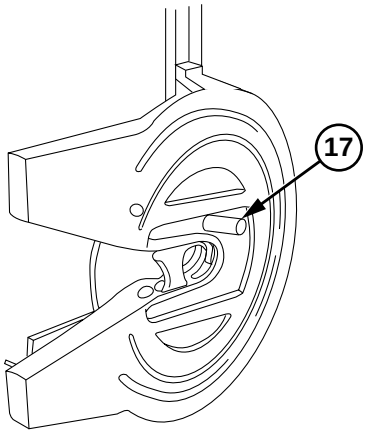
(15) Install new cotter pin (19) thru hole in lockpin (17).



NOTE

Grease fitting must be positioned so that it can be accessed for lubrication.

(16) Install grease fitting (20) in lockpin (17).



14-23. FIFTH WHEEL REPAIR (CONT)

(17) Apply antiseize compound to lockpin hole in plate (2).

NOTE

Hinged lock must be closed for step (19).

(18) Install secondary release lever (21) on plate (2) with lockpin (22). Strike lockpin (22) until seated.

WARNING

Spring is under tension and may cause injury if released.

NOTE

Smaller end of coil fits on secondary release lever.

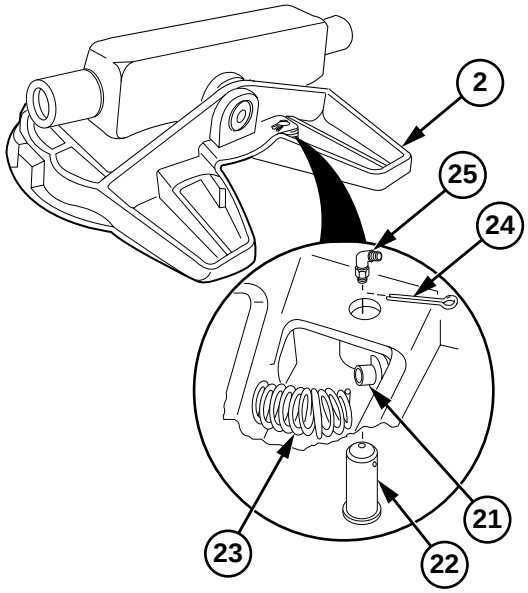
(19) Install spring (23) on secondary release lever (21) and plate (2).

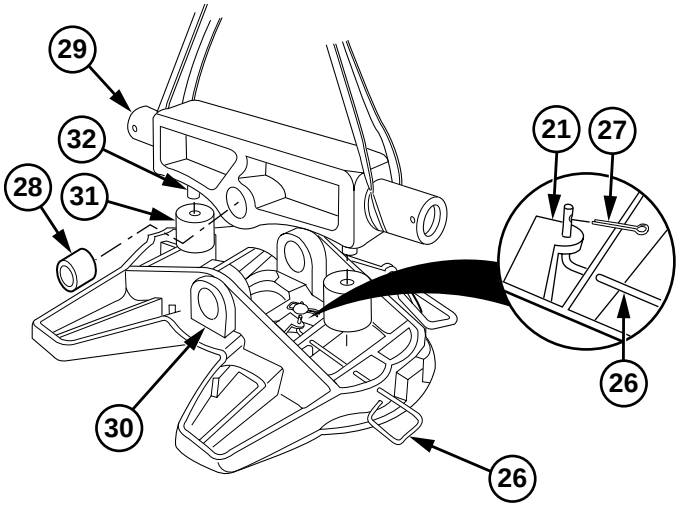
(20) Install new cotter pin (24) in lockpin (22).

NOTE

Grease fitting must be positioned so that it can be accessed for lubrication.

(21) Install grease fitting (25) on lockpin (22).





(22) Install secondary release handle (26) on release lever (21) with new cotter pin (27).

(23) Install bushing (28) in rocker arm (29).

(24) Coat inside of bolt mount (30) with antiseize compound.

(25) Attach suitable lifting device to rocker arm assembly (29).

(26) Install rubber bumpers (31) on pins (32) of rocker arm assembly (29).

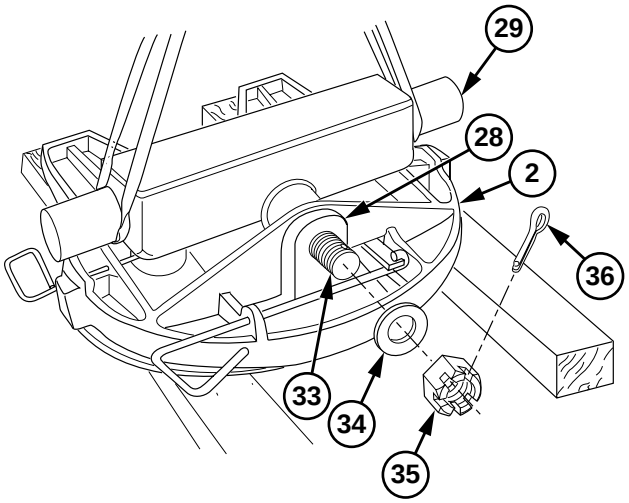
(27) Align holes on plate (2) and rocker arm assembly (29) while assistant operates lifting device.

(28) Install bolt (33) through holes in plate (2) and rocker arm assembly (29).

(29) Coat threads of bolt (33) with antiseize compound.

(30) Install washer (34) and nut (35) on bolt (33) so that slot in nut (35) aligns with with hole in bolt (33).

(31) Install new cotter pin (36) on bolt (33).



(32) Install bushing (37) in side mount (38).

(33) Coat rocker arm pin (39) with grease.

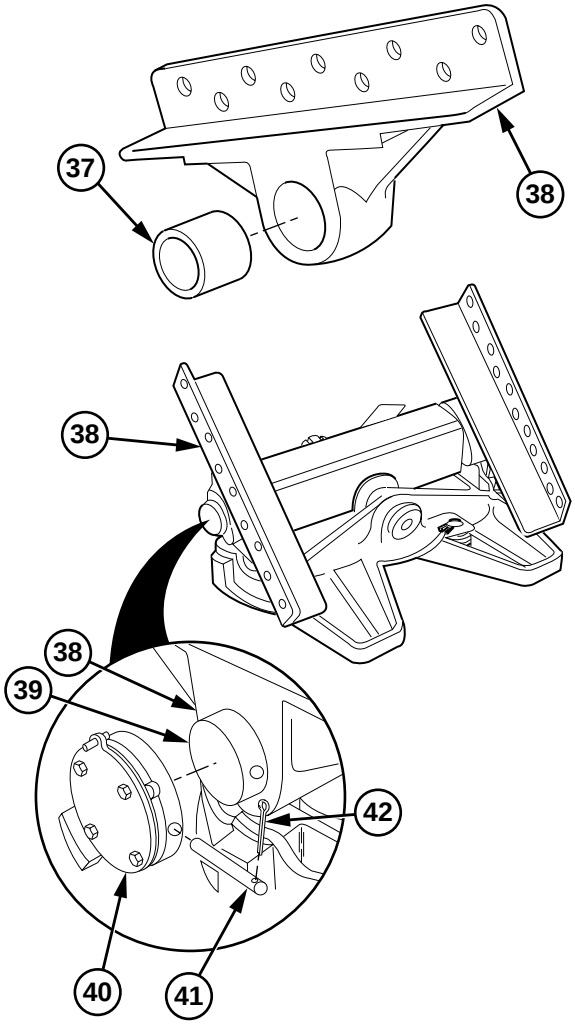
(34) Position side mount (38) on rocker arm pin (39).

(35) Install hub (40) on rocker arm pin (39).

(36) Install pin (41) in hub (40).

(37) Install new cotter pin (42) in pin (41).

(38) Repeat steps (32 thru 37) for other side mount.



d. Follow-On Maintenance

Install fifth wheel (para 14-22).

CHAPTER 15
SUSPENSION MAINTENANCE

Contents

	Para	Page
Introduction	15-1	15-1
Front Spring Repair	15-2	15-2
Lateral Torque Rod Replacement	15-3	15-10
Longitudinal Torque Rod Replacement	15-4	15-15
Rear Suspension Arm Replacement	15-5	15-18

Section I. INTRODUCTION

15-1. INTRODUCTION

This chapter contains instructions for replacement and repair of suspension components at the Direct Support maintenance level. Some parts must be removed before suspension components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

15-2. FRONT SPRING REPAIR

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Front wheel/tires removed (TM 9-2320-360-20)
Front bumper removed (TM 9-2320-360-20).
Front axle stop removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jackstands (3) (Item 93, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Combination, 1-5/16 In. (Item 216, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Oil, Lubricating (Item 48, Appendix B)
Lockwashers (4) (Item 133, Appendix F)
Lockwashers (3) (Item 122, Appendix F)

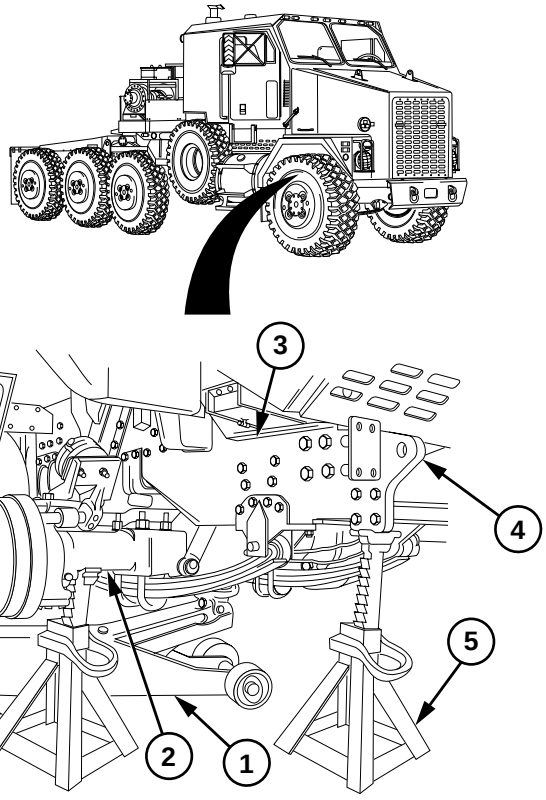
Personnel Required
Two

a. Removal

NOTE
Left and right springs are replaced the same way. Right spring is shown.

(1) Position floor jack (1) under axle (2) and raise HET Tractor.

(2) Support frame (3) under front tow eyes (4) with two jackstands (5) and support axle (2) with jackstand (5).

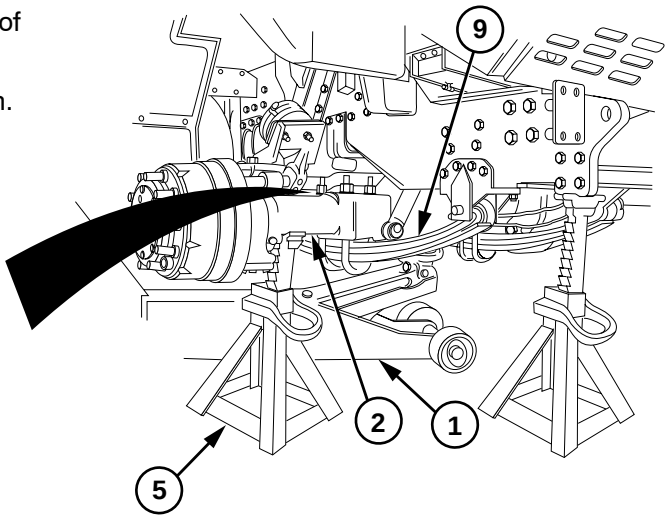


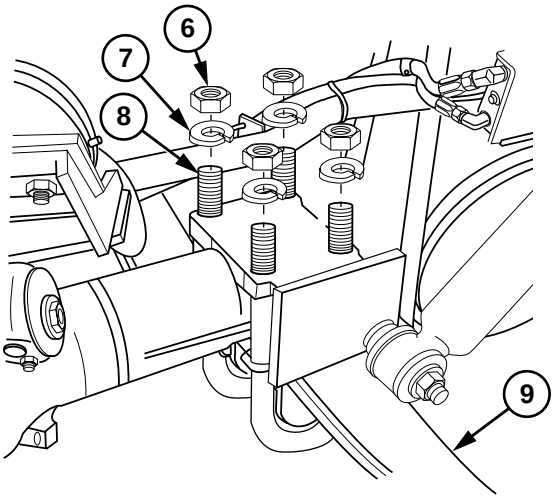
(3) Remove four nuts (6) and lockwashers (7) from two U-bolts (8). Discard lockwashers.

(4) Position floor jack (1) under center of axle (2).

(5) Raise floor jack (1) and axle (2) 1 in. (2.54 cm) off spring (9).

(6) Support axle (2) with jackstand (5).





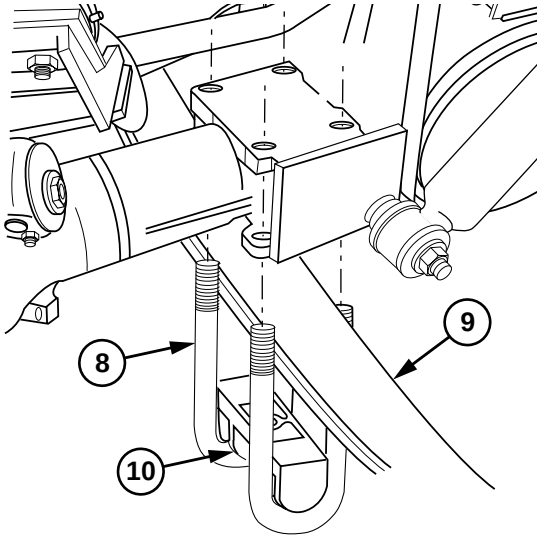
(7) Remove two U-bolts (8) and spring shoe (10) from spring (9).

NOTE

Support, but do not lift, spring.

(8) Position floor jack (1) under spring (9).

(9) Remove nut (11) and lockwasher (12) from spring lockpin (13). Discard lockwasher.



CAUTION

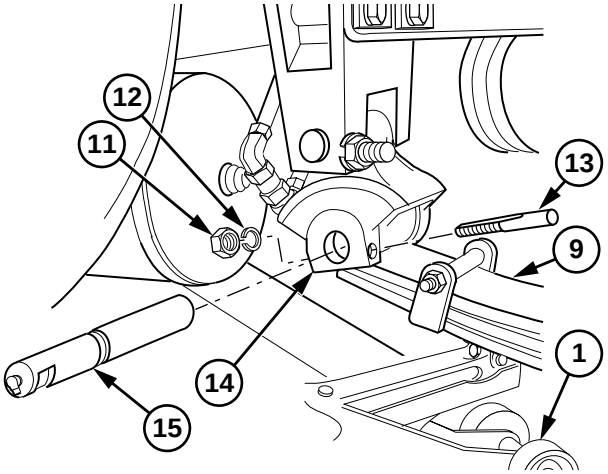
Do not strike directly on spring lockpin. Locknut should be partially threaded on spring lockpin before striking. Failure to comply may damage spring lockpin.

(10) Tap spring lockpin (13) out of spring link (14).

WARNING

Keep hands clear of pin and spring when removing pin. Failure to comply may result in serious injury to personnel.

(11) Remove pin (15) from spring link (14) and spring (9).



15-2. FRONT SPRING REPAIR (CONT)

(12) Remove nut (16) and lockwasher (17) from spring lockpin (18). Discard lockwasher.

CAUTION

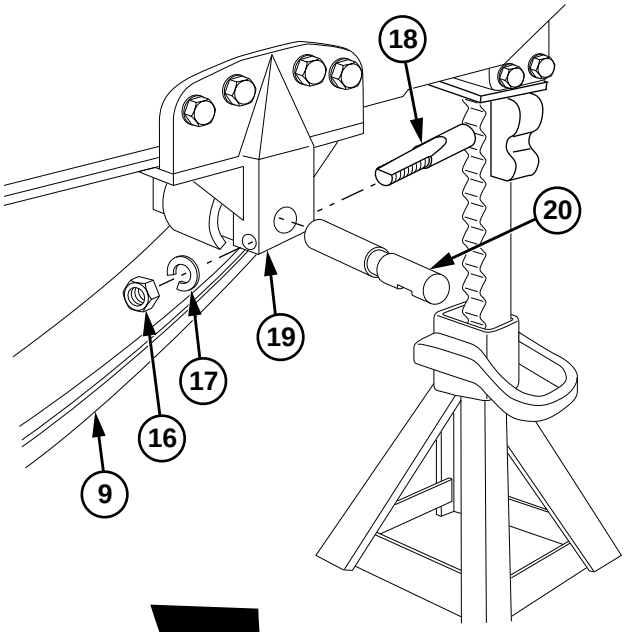
Do not strike directly on spring lockpin. Locknut should be partially threaded on spring lockpin before striking. Failure to comply may damage spring lockpin.

(13) Tap spring lockpin (18) out of front bracket (19).

WARNING

Keep hands clear of pin and spring when removing pin. Failure to comply may result in serious injury to personnel.

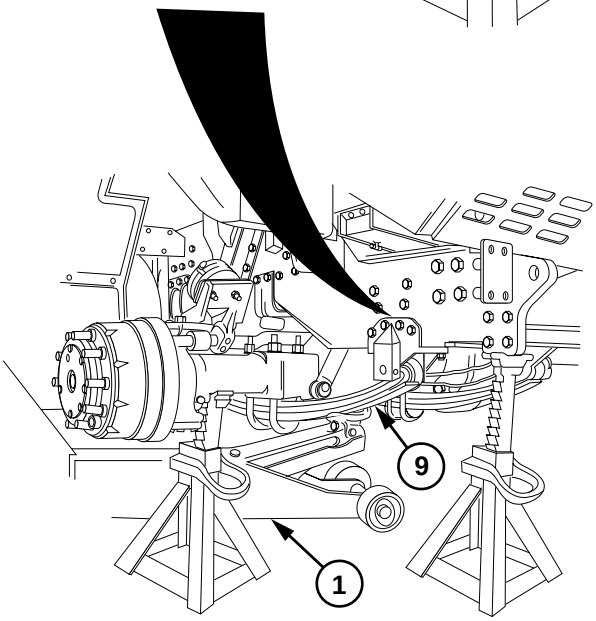
(14) Remove pin (20) from front bracket (19) and spring (9).



(15) Lower floor jack (1) and spring (9).

WARNING

Spring weighs 192 lb (87 kg). Keep out from underneath spring when removing. Failure to comply may result in injury to personnel.



(16) Remove spring (9) from HET Tractor.

(17) Remove spring (9) from floor jack (1).

(18) Remove nut (21) and lockwasher (22) from spring lockpin (23). Discard lockwasher.

CAUTION

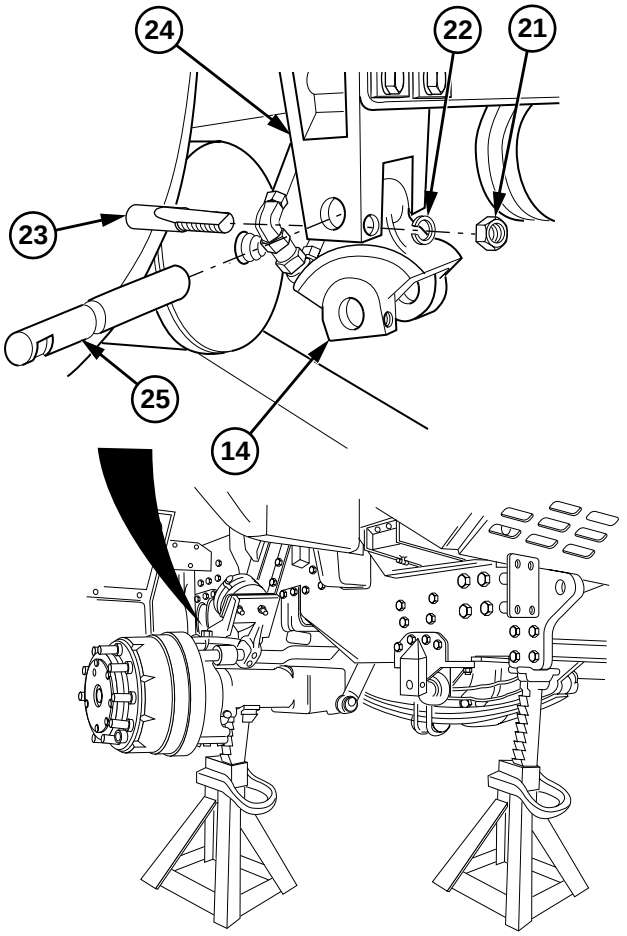
Do not strike directly on spring lockpin. Locknut should be partially threaded on spring lockpin before striking. Failure to comply may damage spring lockpin.

(19) Tap spring lockpin (23) out of rear bracket (24).

WARNING

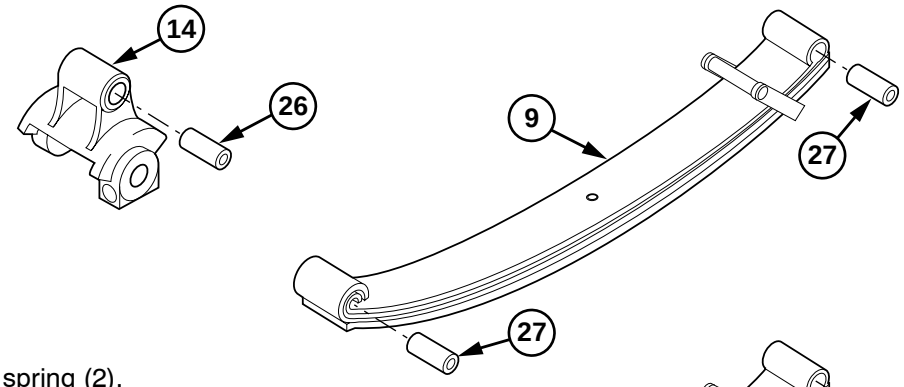
Keep hands clear of pin and spring when removing pin. Failure to comply may result in serious personnel injury.

(20) Remove pin (25) from rear bracket (24) and spring link (14).



(21) Remove bushing (26) from spring link (14).

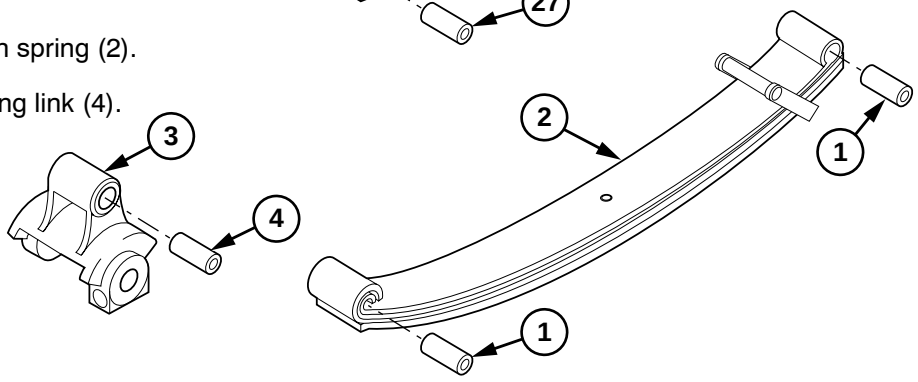
(22) Remove two bushings (27) from spring (9).



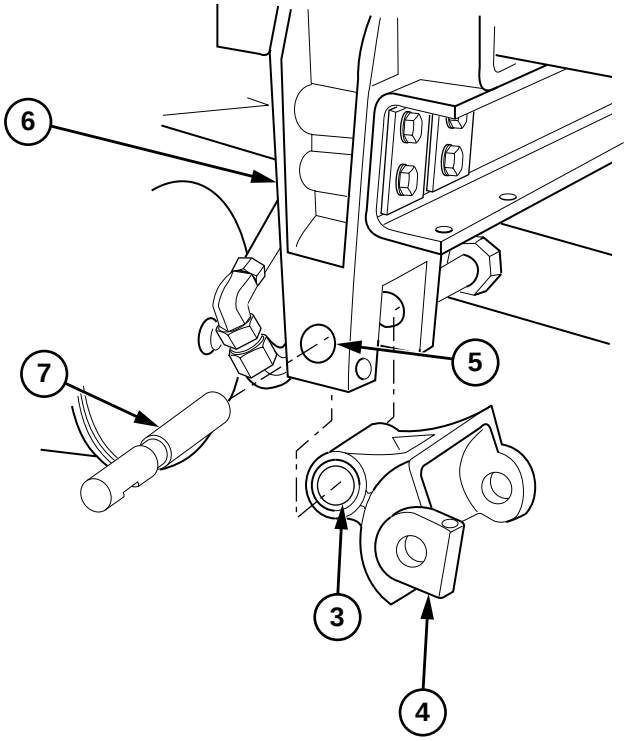
b. Installation

(1) Install two bushings (1) in spring (2).

(2) Install bushing (3) in spring link (4).



15-2. FRONT SPRING REPAIR (CONT)



(3) Coat inside of bushing (3) and spring pin hole (5) in rear bracket (6) with lubricating oil.

NOTE

- Slotted end of pin must be aligned with spring lockpin hole when installed.
- Spring lockpin on spring link should be positioned to the outside.

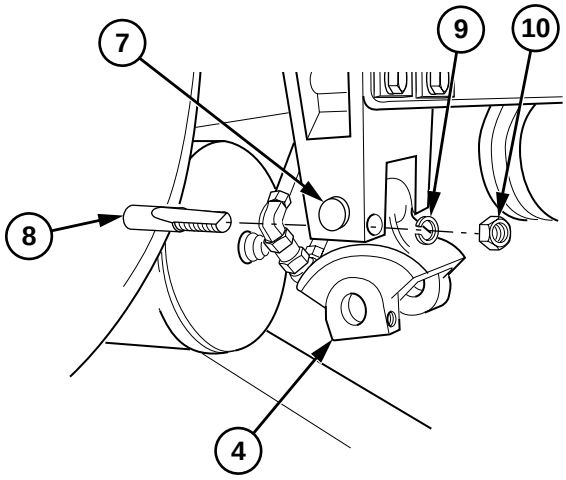
(4) Position spring link (4) on rear bracket (6) with pin (7).

CAUTION

Do not allow spring lockpin to enter slot at an angle. It will wedge and gall when locked at an angle. It will become loose and allow pin to turn and wear spring link resulting in failure of pin, spring eye, or spring link.

NOTE

Spring lockpin hole on bracket is only machined on one side. Spring lockpin must be installed on nonmachined side, lockwasher and nut must be on machined side.



(5) Position spring lockpin (8) in pin (7) until spring lockpin taper aligns with locking slot.

(6) Tap spring lockpin (8) to lock pin (7) in spring link (4).

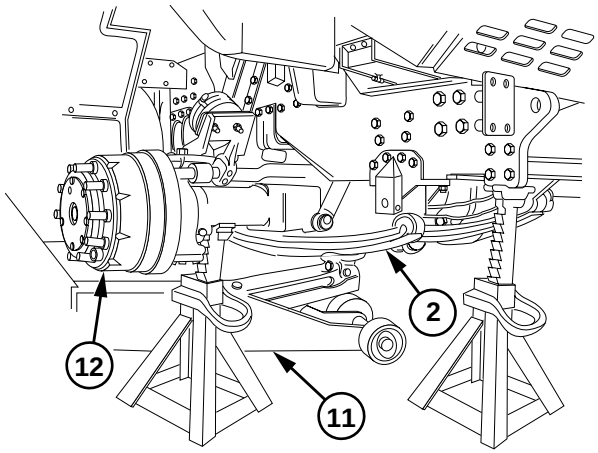
(7) Install new lockwasher (9) and nut (10) on spring lockpin (8). Torque to 55 lb-ft (75 N·m).

WARNING

Spring weighs 192 lb (87 kg). Keep out from underneath spring when removing. Failure to comply may result in injury to personnel.

(8) Position spring (2) on floor jack (11).

(9) Position spring (2) under front axle (12).



(10) Coat inside of bushings (1) and spring pin hole (13) in front bracket (14) with lubricating oil.

(11) Raise floor jack (11) and spring (2) until spring pin hole (15) aligns with front bracket (14) with aid of assistant.

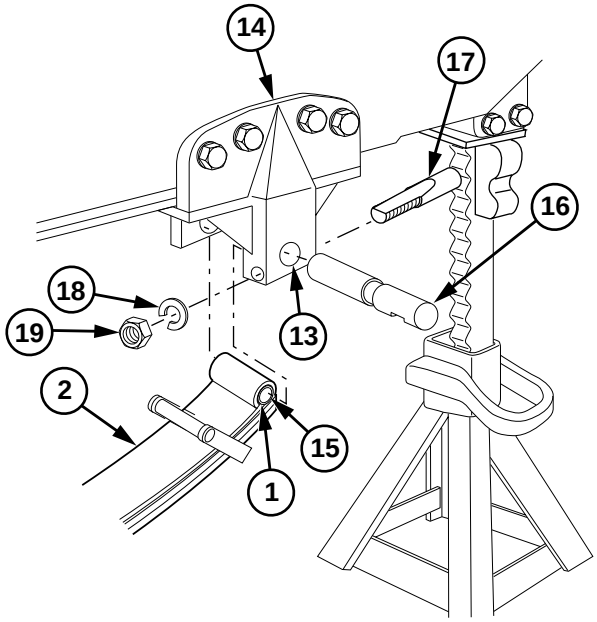
NOTE

Slotted end of pin must align with spring lockpin hole when installed.

(12) Position spring (2) on front bracket (14) with pin (16).

CAUTION

Do not allow spring lockpin to enter slot at an angle. It will wedge and gall when locked at an angle. It will become loose and allow pin to turn and wear hanger bracket resulting in failure of pin, spring bushing or bracket.



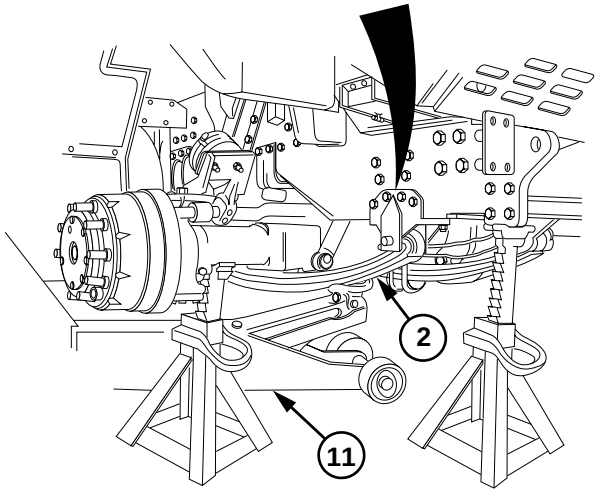
NOTE

Spring lockpin hole on bracket is only machined on one side. Spring lockpin key must be installed on nonmachined side, lockwasher and nut must be on machined side.

(13) Position spring lockpin (17) in front bracket (14) and pin (16) until spring lockpin taper aligns with locking slot.

(14) Tap spring lockpin (17) to lock pin (16) in front bracket (14).

(15) Install new lockwasher (18) and nut (19) on spring lockpin (17). Torque to 55 lb–ft (75 N·m).



15-2. FRONT SPRING REPAIR (CONT)

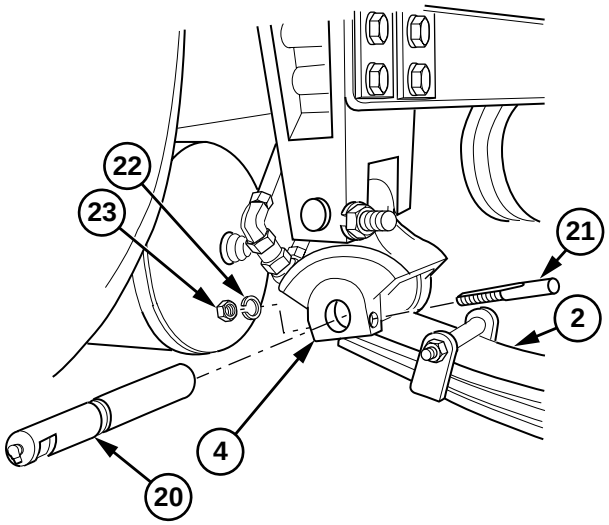
NOTE

Slotted end of pin must align with spring lockpin hole when installed.

(16) Position spring (2) on spring link (4) with pin (20) with aid of assistant.

CAUTION

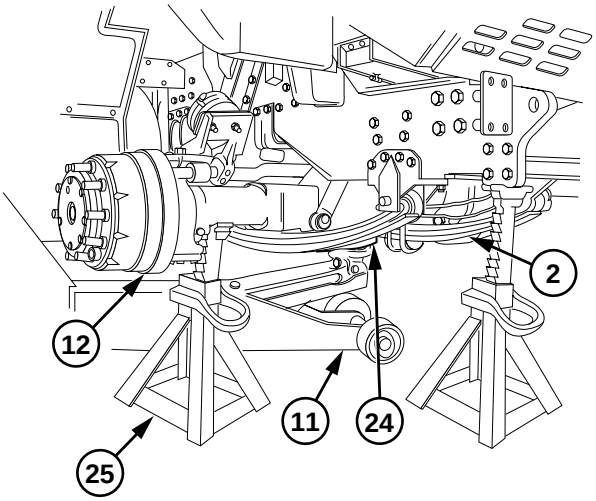
Do not allow spring lockpin to enter slot at an angle. It will wedge and gall when locked at an angle. It will become loose and allow pin to turn and wear hanger bracket resulting in failure of pin, spring bushing or bracket.



(17) Position spring lockpin (21) in spring link (4) and pin (20) until spring lockpin taper aligns with locking slot.

(18) Tap spring lockpin (21) to lock pin (20) in spring link (4).

(19) Install new lockwasher (22) and nut (23) on spring lockpin (21). Torque to 55 lb-ft (75 N·m).



(20) Remove floor jack (11) from under center of spring (2).

(21) Position floor jack (11) under axle differential (24).

(22) Raise axle (12) with floor jack (11).

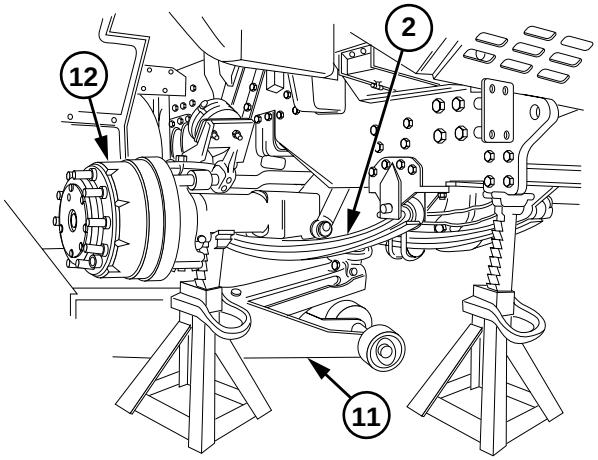
(23) Remove jackstand (25) from axle (12).

WARNING

Keep hands clear of spring and axle housing when lowering axle. Failure to comply may result in serious injury to personnel.

NOTE

- Spring center bolt must align with hole in bottom of axle.
- Hydraulic hand jack can be used to position axle.

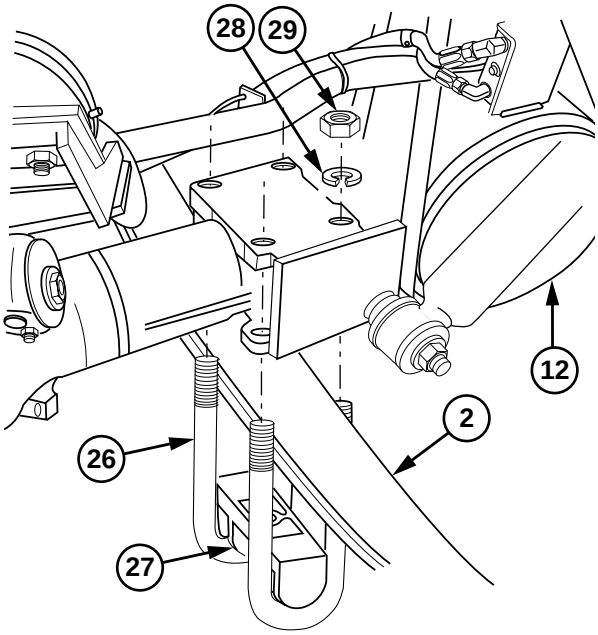


(24) Lower axle (12) with floor jack (11) onto spring (2) with aid of assistant.

(25) Coat threads of two U-bolts (26) with lubricating oil.

NOTE

- U-bolts have a slight bow and must be installed so they bow toward center of spring.
- Spring center bolt must align with hole in spring shoe.



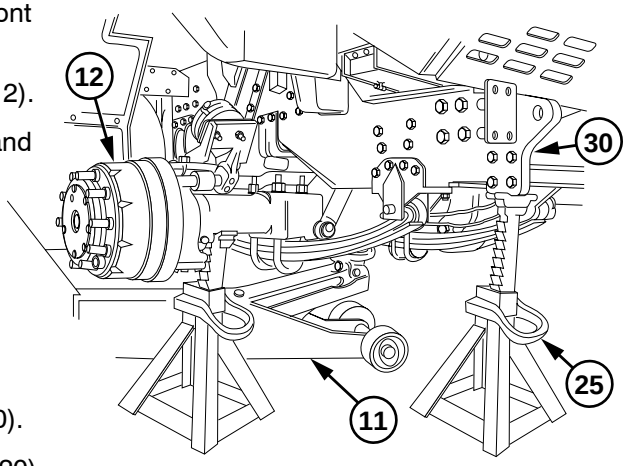
(26) Position spring shoe (27) and two U-bolts (26) on spring (2).

(27) Install four new lockwashers (28) and nuts (29) on U-bolts (26). Torque to 450-550 lb-ft (610-746 N·m).

(28) Raise HET Tractor with floor jack (11) and remove two jackstands (25) from under front tow eyes (30).

(29) Position two jackstands (25) under axle (12).

(30) Lower HET Tractor onto jackstands (25) and remove floor jack (11).



c. Follow-On Maintenance

(1) Grease spring pins (LO 9-2320-360-12).

(2) Install front axle stop (TM 9-2320-360-20).

(3) Install front wheel/tires (TM 9-2320-360-20).

(4) Install front bumper (TM 9-2320-360-20).

15-3. LATERAL TORQUE ROD REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
HET Tractor parked on hard, level surface.
Wheels/Tires removed from affected axle (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jack Kit, Hydraulic Hand (Item 92, Appendix E)
Jackstands (Item 93, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Oil, Lubricating (Item 47, Appendix B)
Locknuts (2) (Item 87, Appendix F)
Locknuts (2) (Item 79, Appendix F)
Locknut (Item 77, Appendix F)

Personnel Required
Two

a. Removal

NOTE

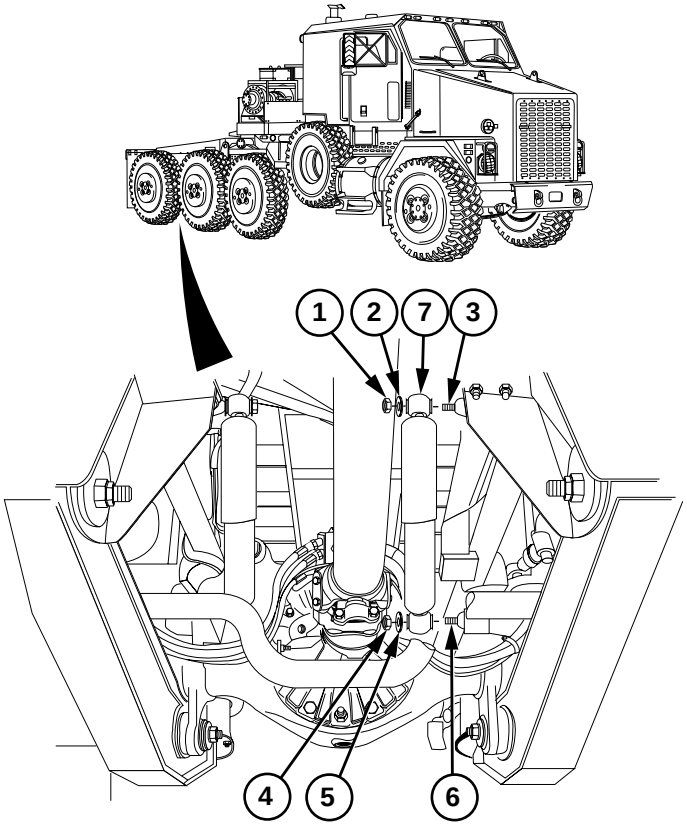
- Begin with step (1) for axle no. 4.
- Begin with step (5) for axle no. 2 and axle no. 3.

(1) Remove locknut (1) and washer (2) from stud (3). Discard locknut.

(2) Remove locknut (4) and washer (5) from stud (6). Discard locknut.

(3) Remove right shock absorber (7) from stud (3) and stud (6).

(4) Deleted.



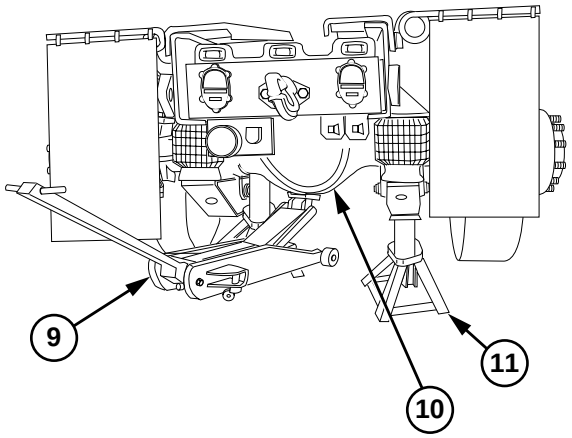
AXLE NO. 4 IS SHOWN

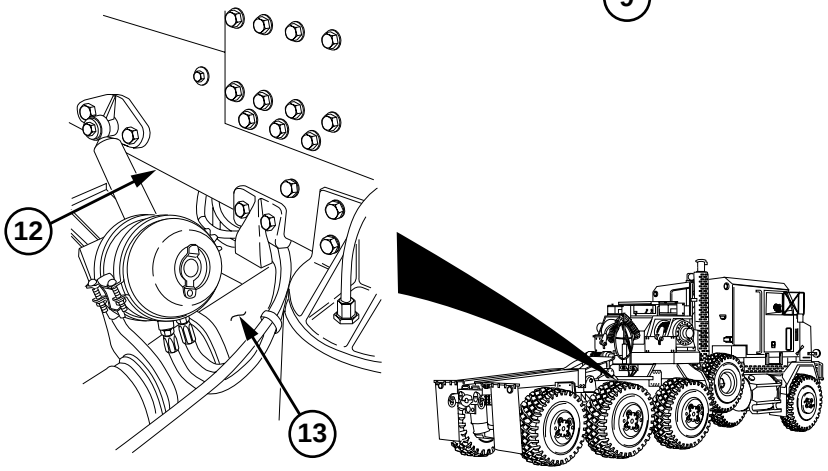
(5) Place floor jack (9) under differential (10).

(6) Raise differential (10) with floor jack (9) and lower jackstands (11).

(7) Lower differential (10) with floor jack (9) to achieve 13 in. (33 cm) between bottom of frame (12) and top of axle housing (13).

(8) Support differential (10) with jackstands (11).





(9) Loosen locknut (14) until flush with end of threads on lateral torque rod (15).

(10) Position hydraulic hand jack (16) between right frame hanger (17) and lateral torque rod (15).

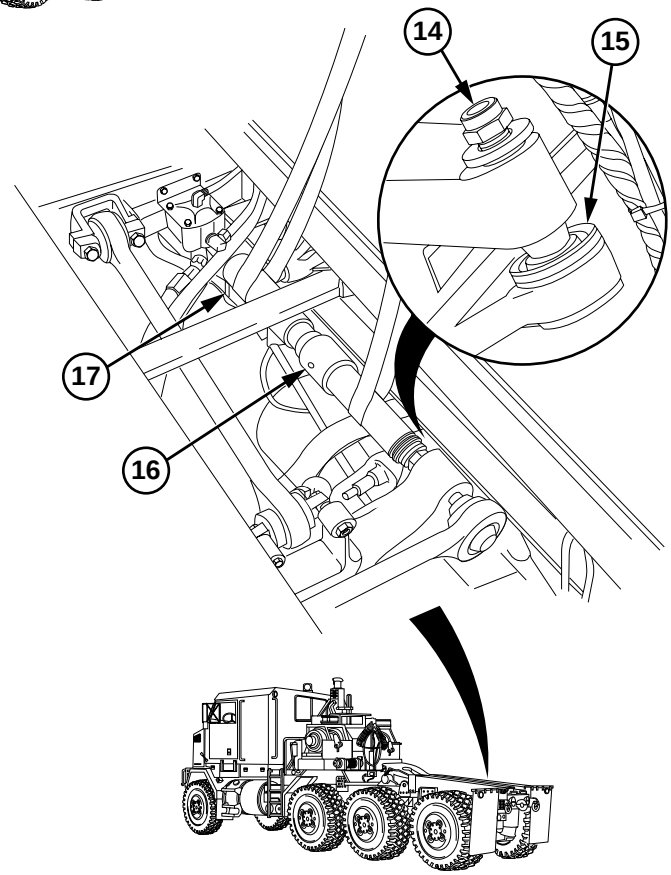
WARNING

Torque rod will release suddenly. Keep out from under torque rod and hydraulic hand jack. Failure to comply may result in injury to personnel.

CAUTION

Hydraulic hand jack must be supported with lifting straps prior to removing torque rod. Failure to comply may result in damage to tools or equipment.

(11) Support hydraulic hand jack (16) with lifting straps.



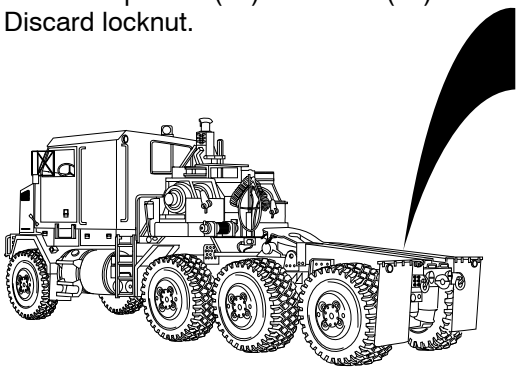
15-3. LATERAL TORQUE ROD REPLACEMENT (CONT)

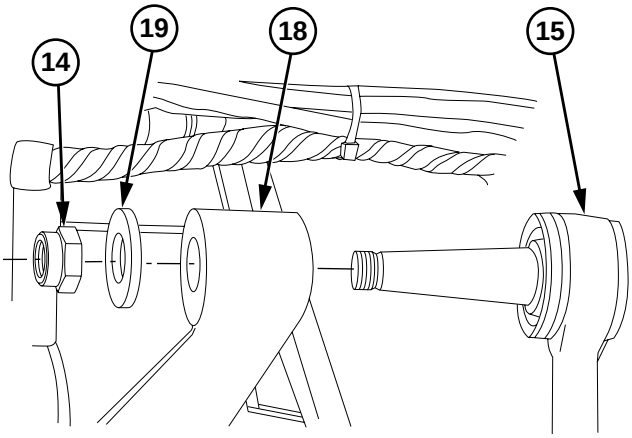
NOTE

It may be necessary to strike torque rod tower with a hammer while applying pressure with hydraulic jack.

(12) Press lateral torque rod (15) loose from axle (18) with aid of assistant.

(13) Remove locknut (14), washer (19), and lateral torque rod (15) from axle (18). Discard locknut.

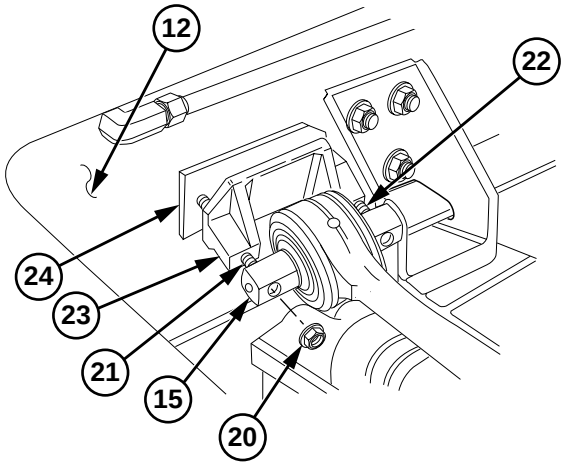




NOTE

Number of spacers will vary. Note number of spacers to aid in installation.

(14) Remove two locknuts (20), screw (21), screw (22), bracket (23), spacer(s) (24), and lateral torque rod (15) from frame (12) with aid of assistant. Discard locknuts.



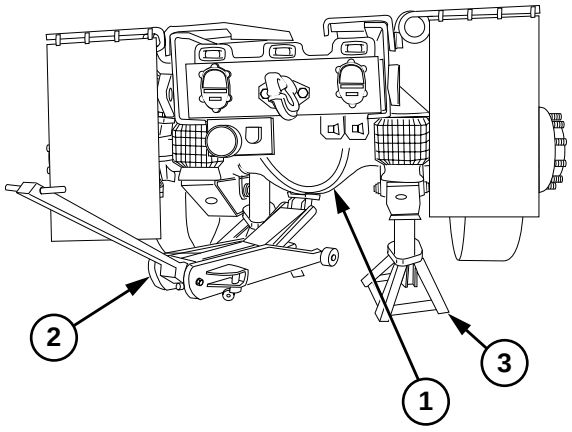
b. Installation

NOTE

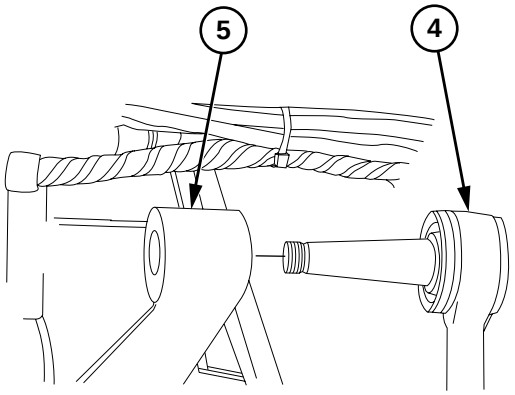
Ride height is measured between axle no. 3 housing and bottom of frame.

(1) Raise differential (1) with floor jack (2) to achieve 9 in. (23 cm) ride height clearance.

(2) Support differential (1) with jackstands (3).



(3) Position lateral torque rod (4) on axle (5).



NOTE

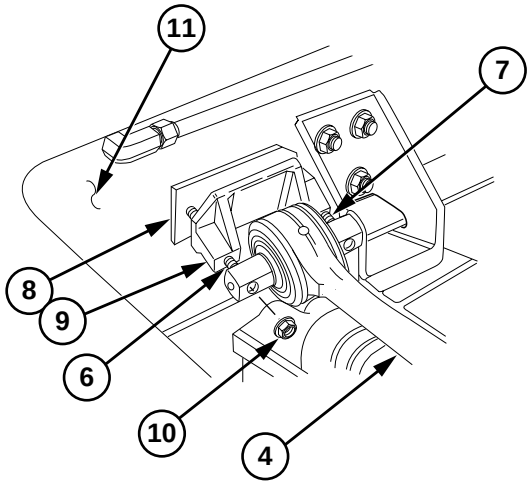
Ball stud taper and tapered bracket hole must be free of all foreign matter before assembly.

(4) Coat threads of screws (6 and 7) and lateral torque rod (4) with lubricating oil.

NOTE

Number of spacers will vary. Same number of spacers that were removed must be installed.

(5) Install spacer(s) (8), bracket (9), lateral torque rod (4), screw (6), screw (7), and two new locknuts (10) on frame (11) with aid of assistant. Torque to 212 lb-ft (287 N·m).

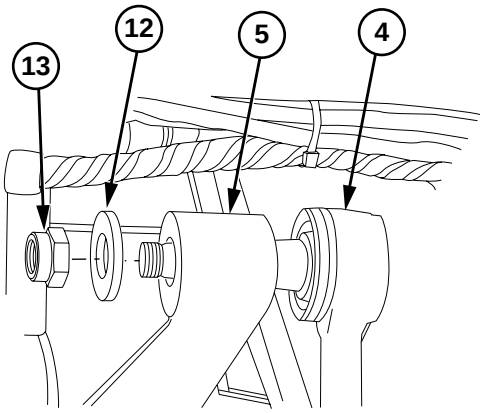


(6) Install washer (12) and new locknut (13) on lateral torque rod (4). Torque to 175-225 lb-ft (237-305 N·m).

NOTE

Torque rod must be properly seated in axle housing. Strike axle housing at torque rod mounting point to seat torque rod.

(7) Strike axle (5) with hammer and tighten locknut (13) to 175-225 lb-ft (237-305 N·m).



15-3. LATERAL TORQUE ROD REPLACEMENT (CONT)

NOTE

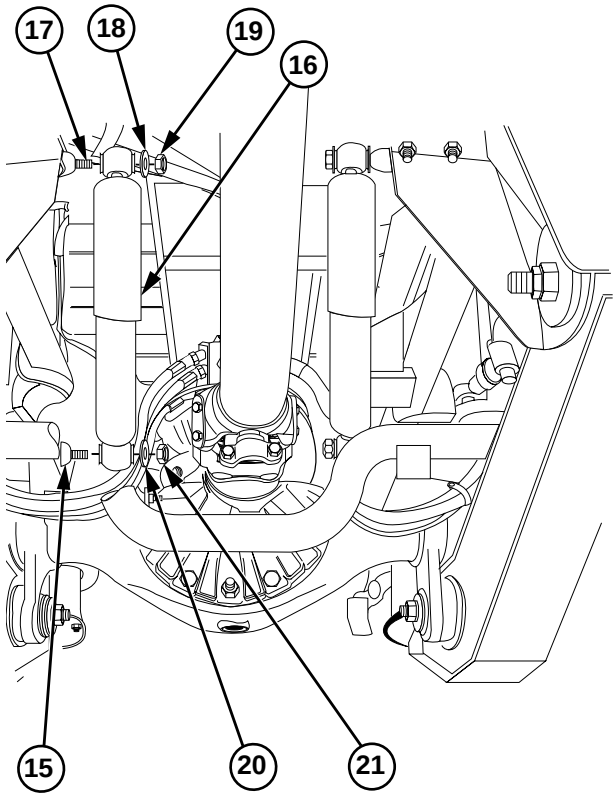
Do steps (8) thru (11) for axle no. 4 only.

(8) Deleted.

(9) Install right shock absorber (16) on stud (17) and stud (15).

(10) Install washer (18) and new locknut (19) on stud (17).

(11) Install washer (20) and new locknut (21) on stud (15).



c. Follow-On Maintenance

(1) Install wheels/tires (TM 9-2320-360-20).

(2) Remove wheel chocks.

15-4. LONGITUDINAL TORQUE ROD REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Hydraulic, 12-Ton (Item 91, Appendix E)
Socket Set, Deep Well, 12 Point, 1/2 In. Drive (Item 167, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

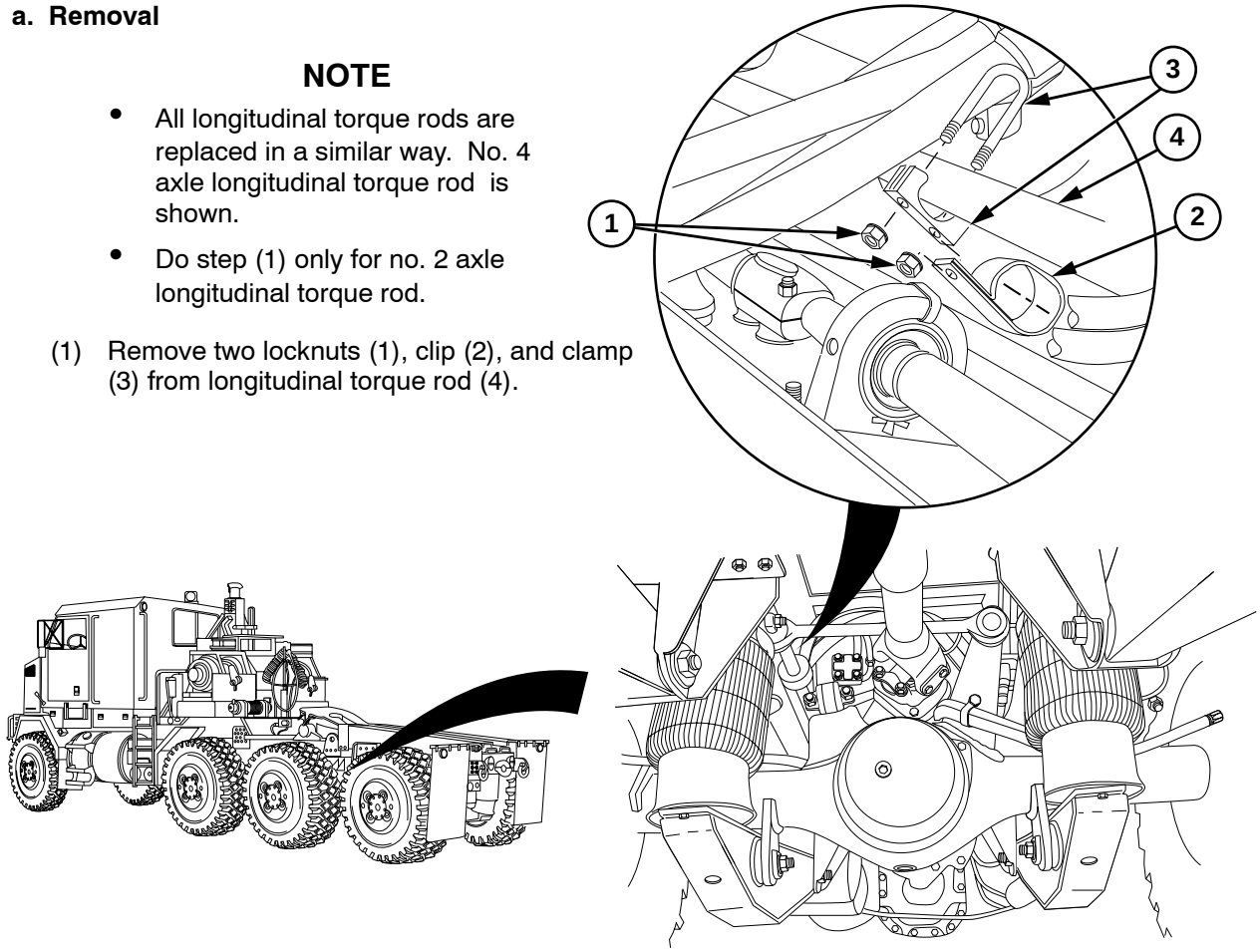
Materials/Parts
Locknuts (4) (Item 87, Appendix F)
Locknuts (2) (no. 2 axle only) (Item 92, Appendix F)
Spacers (2) (Item 326, Appendix F)

a. Removal

NOTE

- All longitudinal torque rods are replaced in a similar way. No. 4 axle longitudinal torque rod is shown.
- Do step (1) only for no. 2 axle longitudinal torque rod.

(1) Remove two locknuts (1), clip (2), and clamp (3) from longitudinal torque rod (4).



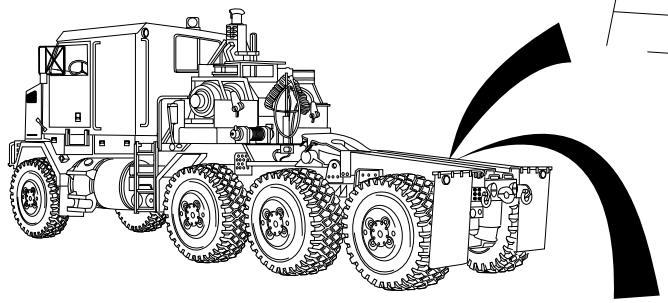
15-4. LONGITUDINAL TORQUE ROD REPLACEMENT (CONT)

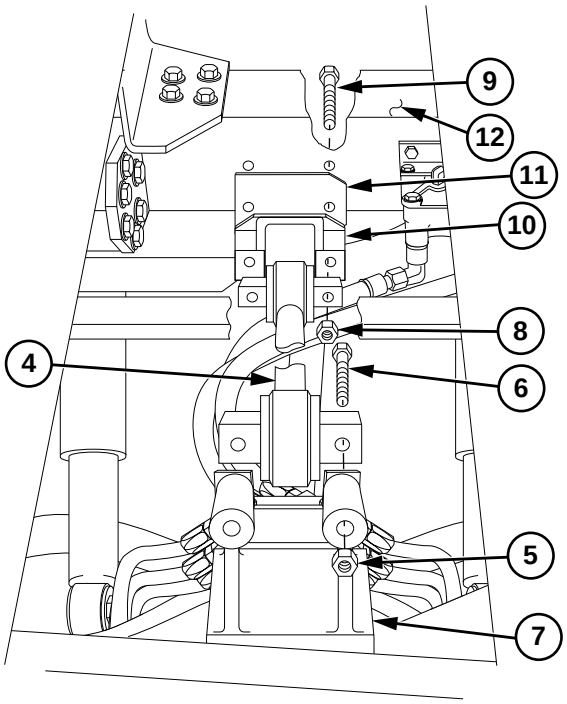
(2) Remove two locknuts (5) and screws (6) from longitudinal torque rod (4) and axle housing (7). Discard locknuts.

NOTE

- Spacers are found on end of longitudinal torque rod connected to crossmember. Number of spacers may vary.
- Front of differential can be supported with floor jack to aid in removal or installation of spacers.

(3) Remove two locknuts (8), screws (9), longitudinal torque rod (4), bracket (10), and spacers (11) from crossmember (12). Discard locknuts and spacers.





b. Installation

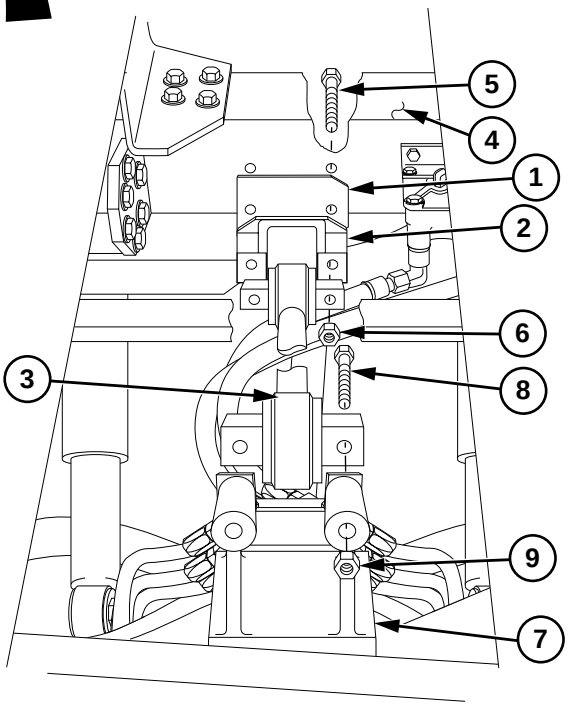
CAUTION

Install same number of spacers as removed. Failure to do so will change driveline angle resulting in equipment damage.

(1) Install spacers (1), bracket (2), and longitudinal torque rod (3) to crossmember (4) with two screws (5) and new locknuts (6). Do not tighten locknuts.

(2) Install longitudinal torque rod (3) on axle housing (7) with two screws (8) and new locknuts (9). Torque to 212 lb-ft (287 N·m).

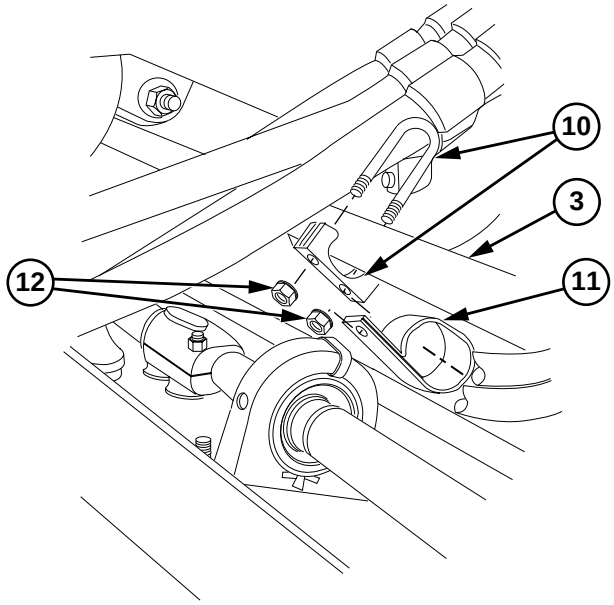
(3) Tighten locknuts (6) to 212 lb-ft (287 N·m).

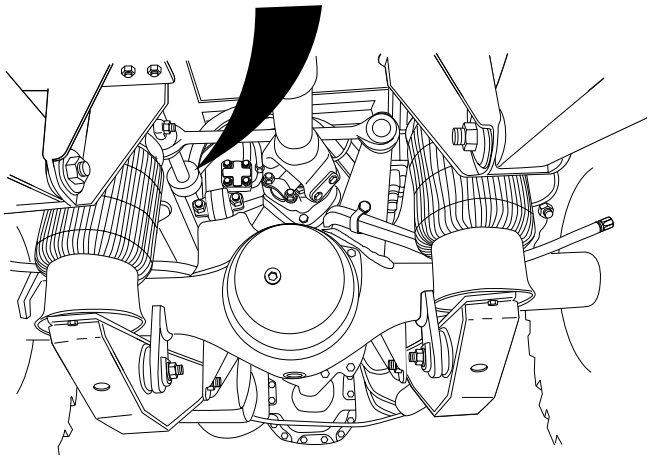


NOTE

Do step (4) only for no. 2 axle longitudinal torque rod.

(4) Install clamp (10) and clip (11) on longitudinal torque rod (3) with new locknuts (12).





c. Follow-On Maintenance

Remove wheel chocks.

15-5. REAR SUSPENSION ARM REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Wheel/tire removed (TM 9-2320-360-20).
Air system drained (TM 9-2320-360-10).
Shock absorbers removed (axle no. 2 and axle no. 3 only) (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jack, Floor (Item 90, Appendix E)
Jackstand (Item 93, Appendix E)
Multiplier, Torque, 4000 lb-ft (Item 99, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Open-End, 1-7/8 & 1-11/16 In. (Item 225, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Adhesive-Sealant (Item 8, Appendix B)
Beam Hanger Bolt Kit (Item 3, Appendix F)
Bushing Bolt Kit (Item 4, Appendix F)
Lockwashers (4) (Item 132, Appendix F)

Personnel Required
Two

a. Removal

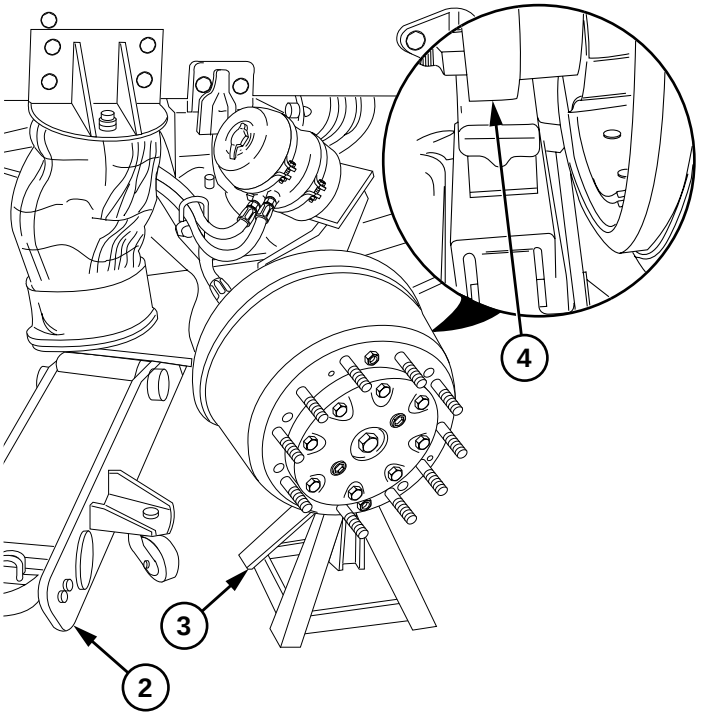
WARNING

Do not work on any item supported only by jack or hoist. Always use jackstands or blocks to support any item prior to work. Equipment may fall and cause injury or death.

NOTE

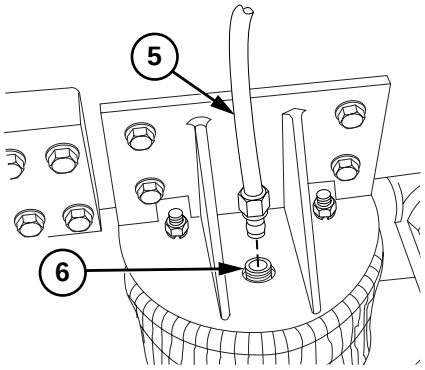
- Right and left suspension arms are replaced the same way. Right side is shown.
- Axle should be level side to side for easier removal.

(1) Lift axle housing (1) with jack (2) and support with jackstand (3) at axle flange (4). Remove floor jack (2).



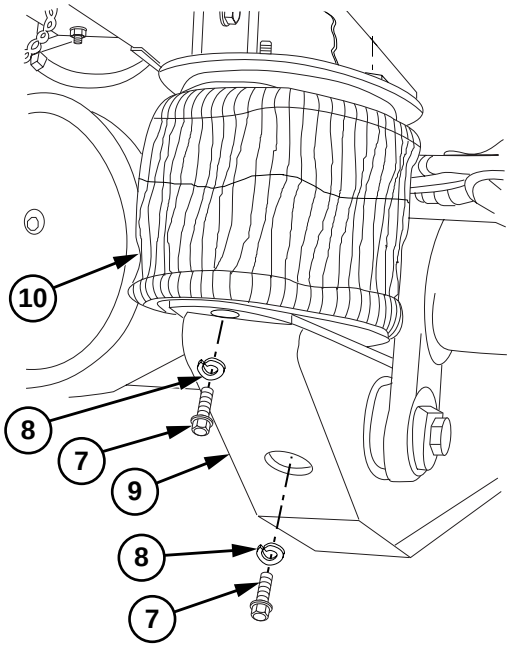
WARNING

- **Air suspension system may still be pressurized even though air pressure gage reads 0 psi. Remove air line slowly to allow air to escape. Failure to comply may result in air line blowing off causing serious injury to personnel.**
- **Air suspension will drop when air line is removed. Stay clear of suspension. Failure to comply may result in serious injury to personnel.**

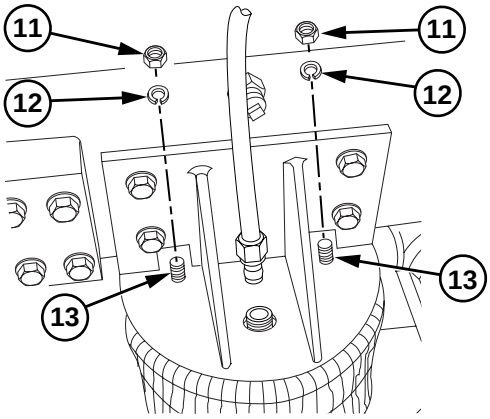


(2) Remove air line (5) from fitting (6).

(3) Remove two screws (7) and lockwashers (8) from suspension arm (9) and air spring (10). Discard lockwashers.

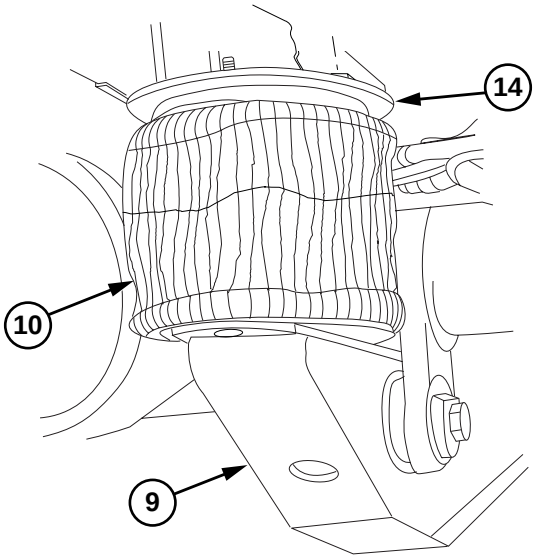


(4) Remove two nuts (11) and lockwashers (12) from studs (13). Discard lockwashers.



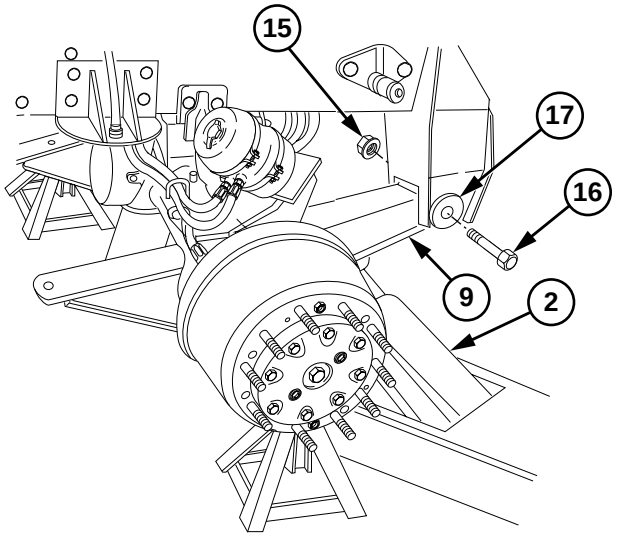
15-5. REAR SUSPENSION ARM REPLACEMENT (CONT)

(5) Remove air spring (10) from spring plate (14) and suspension arm (9).



(6) Support suspension arm (9) with floor jack (2).

(7) Remove locknut (15) and screw (16) from frame hanger (17) and suspension arm (9) with aid of assistant. Discard locknut and screw.

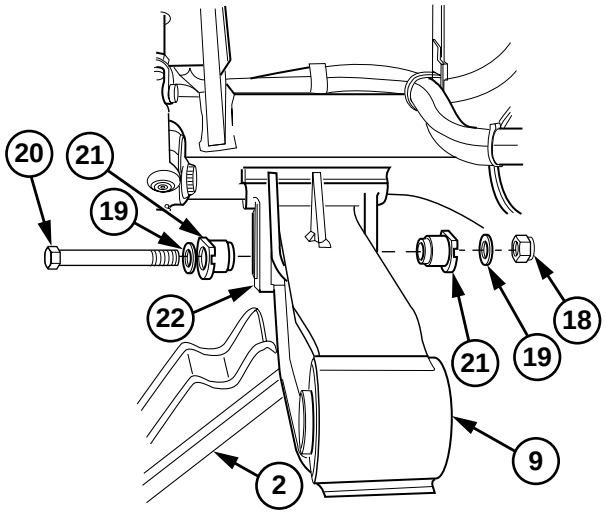


NOTE

Outside collar, washer, and screw are removed together on axle no. 4 only.

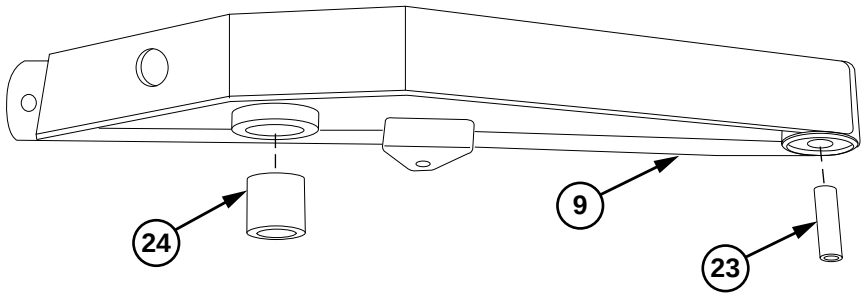
(8) Remove locknut (18), two washers (19), screw (20), two collars (21), and suspension arm (9) from axle (22) with aid of assistant. Discard locknut, screw, washers, and collars.

(9) Remove suspension arm (9) from HET Tractor and floor jack (2).



(10) Remove delrin liner (23) from rear suspension arm (9). Discard liner.

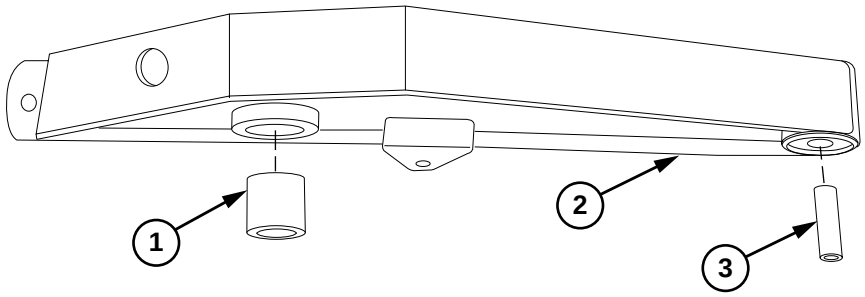
(11) Remove steel sleeve (24) from suspension arm (9). Discard sleeve.



b. Installation

(1) Install new steel sleeve (1) in rear suspension arm (2).

(2) Install new delrin liner (3) in rear suspension arm (2).



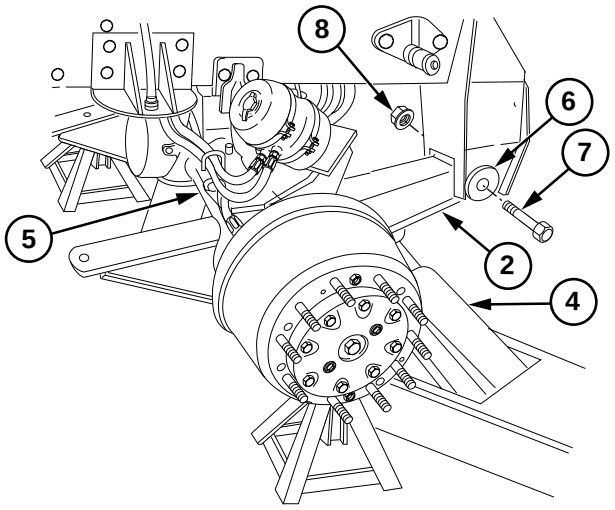
(3) Place suspension arm (2) on floor jack (4).

(4) Position suspension arm (2) on axle (5) and frame hanger (6) with aid of assistant.

CAUTION

Use care when installing screw through delrin liner. Failure to comply may damage liner.

(5) Install suspension arm (2) on frame hanger (6) with new screw (7) and new locknut (8). Torque to 800 lb–ft (1085 N·m).



15-5. REAR SUSPENSION ARM REPLACEMENT (CONT)

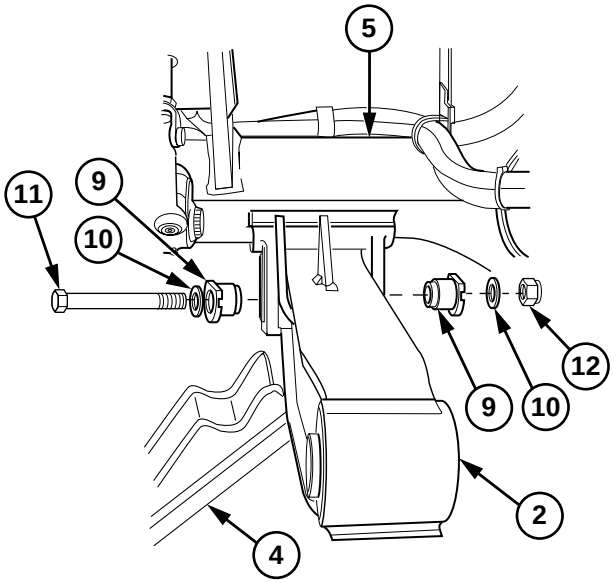
NOTE

Screw, washer, and outside collar are installed together on axle no. 4 only.

(6) Install suspension arm (2) on axle (5) with two new collars (9), new washers (10), and new screw (11) with aid of assistant.

WARNING

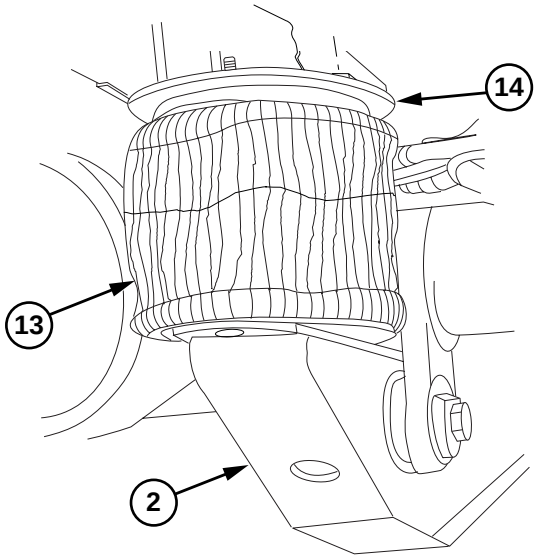
Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep compound away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.



(7) Coat threads of screw (11) with adhesive-sealant.

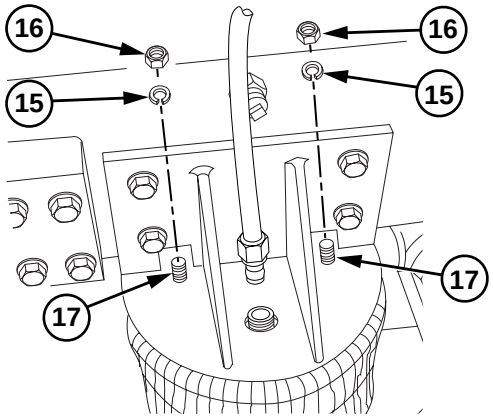
(8) Install new locknut (12) on screw (11). Torque to 495 lb-ft (671 N·m).

(9) Remove floor jack (4) from suspension arm (2).



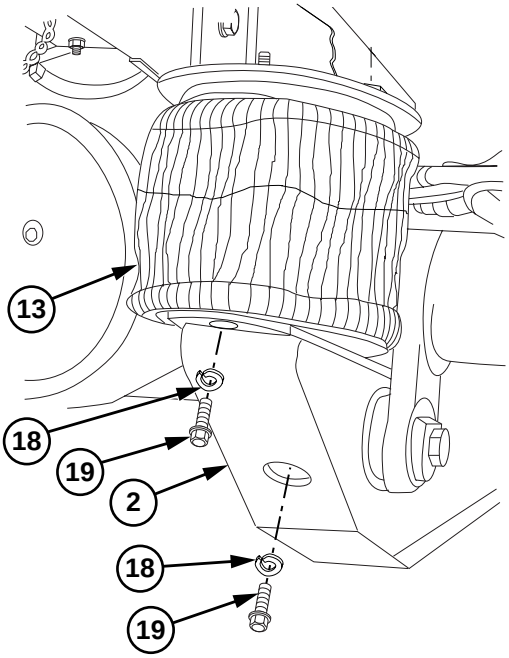
(10) Install air spring (13) on spring plate (14) and suspension arm (2).

(11) Install two new lockwashers (15) and nuts (16) on studs (17). Torque to 25 lb-ft (34 N·m).



(12) Install two new lockwashers (18) and screws (19) on air spring (13) and suspension arm (2). Torque to 50 lb-ft (68 N·m).

(13) Install air line (20) on fitting (21).



c. Follow-On Maintenance

(1) Install shock absorber (axle no. 2 and axle no. 3 only) (TM 9-2320-360-20).

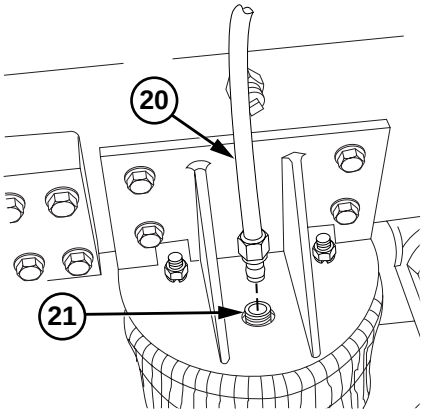
(2) Install wheel/tire (TM 9-2320-360-20).

(3) Start engine (TM 9-2320-360-10).

(4) Build air pressure to 120-125 psi (827-862 kPa) (TM 9-2320-360-10).

(5) Shut off engine (TM 9-2320-360-10).

(6) Check air springs for leaks.



CHAPTER 16
CAB AND BODY MAINTENANCE

Contents

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Section I. INTRODUCTION

16-1. INTRODUCTION

This chapter contains instructions for replacement and repair of cab and body components at the Direct Support maintenance level. Some subassemblies and parts must be removed before cab and body components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

16-2. CAB REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Air system drained (TM 9-2320-360-10).
Spare tire removed (TM 9-2320-360-10).
Steering reservoir drained (LO 9-2320-360-12).
Cooling system drained (TM 9-2320-360-20).
Batteries disconnected (TM 9-2320-360-20).
Access panels removed (TM 9-2320-360-20).
Air cleaner removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jackstands (4) (Item 93, Appendix E)
Sling Assembly (Item 160, Appendix E)
Wrench, Combination, 1-3/8 In. (Item 213, Appendix E)
Wrench, Combination, 2 In. (Item 217, Appendix E)
Wrench, Open-End, 1-5/8 and 1-13/16 In. (Item 224, Appendix E)
Wrench, Open-End, 1-7/8 and 1-11/16 In. (Item 225, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
Wrench, Torque, 0-75 Lb-In. (Item 237, Appendix E)

Materials/Parts
Grease, Anticorrosion (Item 31, Appendix B)
Rope, 50 Ft (Item 53, Appendix B)
Tags, Identification (Item 56, Appendix B)
Tape, Masking (Item 58, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknuts (4) (Item 87, Appendix F)
Locknuts (4) (Item 91, Appendix F)
Locknuts (2) (Item 96, Appendix F)
Locknut (Item 80, Appendix F)
Lockwashers (4) (Item 119, Appendix F)
Lockwasher (Item 116, Appendix F)
Pin, Cotter (Item 216, Appendix F)
Pin, Cotter (Item 218, Appendix F)
Packings, Preformed (2) (Item 165, Appendix F)
Packing, Preformed (Item 163, Appendix F)
Packing, Preformed (Item 164, Appendix F)

Special Environmental Conditions
HET Tractor on hard, level surface.

Personnel Required
Three

a. Removal

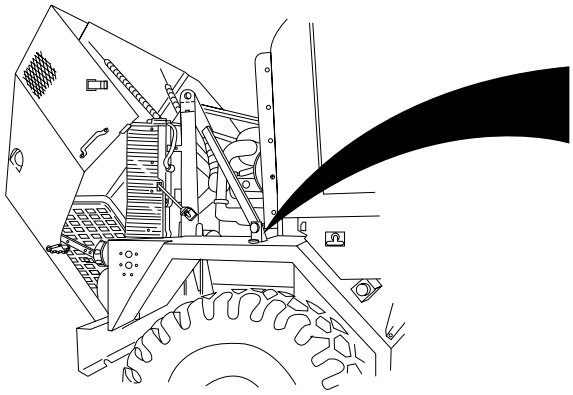
NOTE

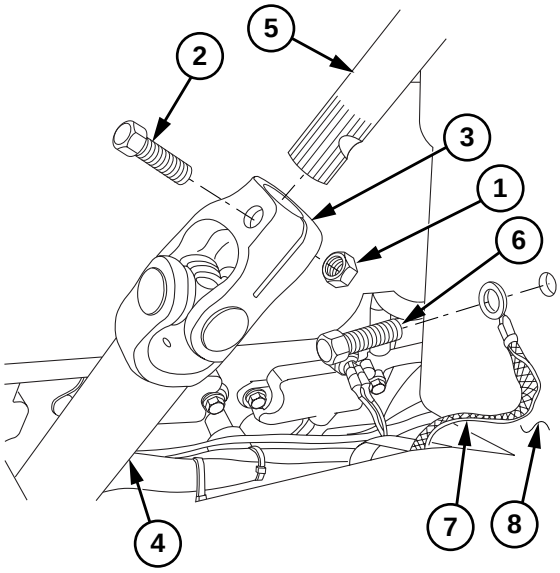
Vehicle maintenance time can be reduced by using three personnel on steps (1) thru (11), (12) thru (35), and (36) thru (47).

(1) Remove locknut (1) and screw (2) from yoke (3) on top steering shaft no. 1 (4). Discard locknut.

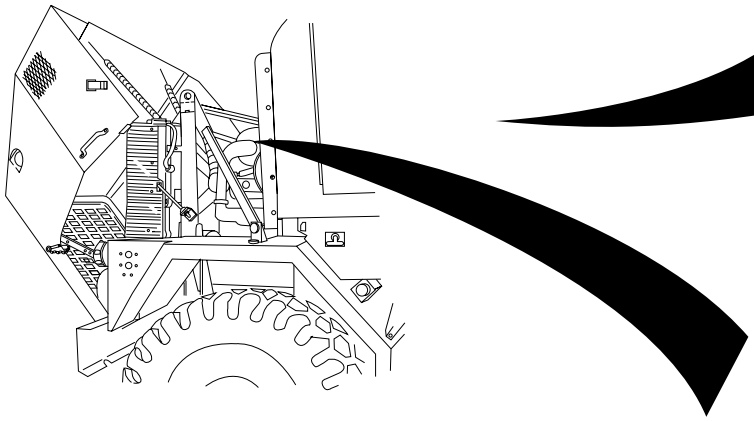
(2) Separate top steering shaft no. 1 (4) from top steering shaft no. 2 (5).

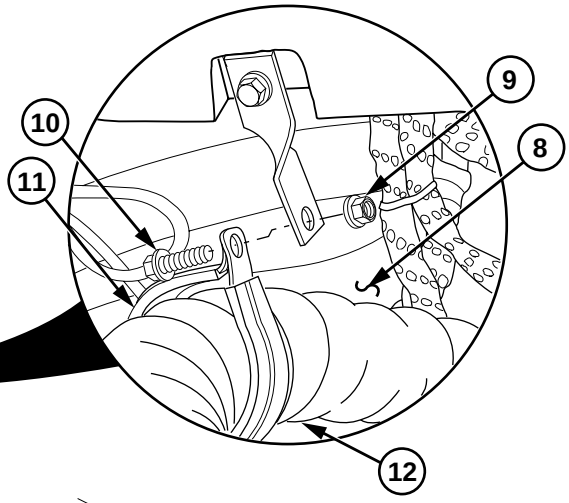
(3) Remove screw (6) and ground strap (7) from cab mount (8).





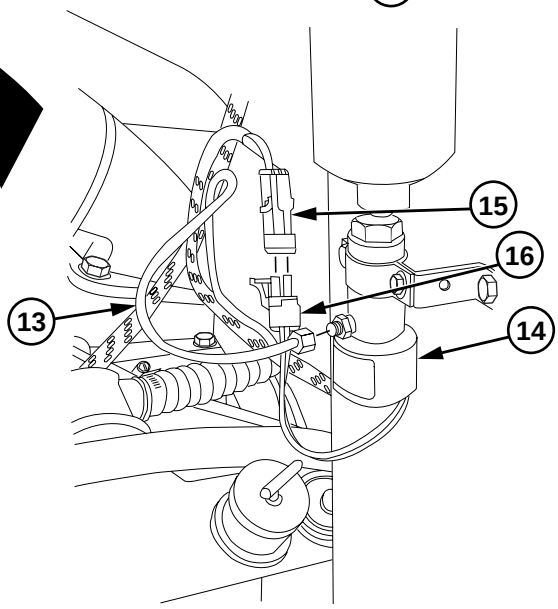
(4) Remove locknut (9), screw (10), cushion clip (11), and air aspiration hose (12) from cab (8). Discard locknut.





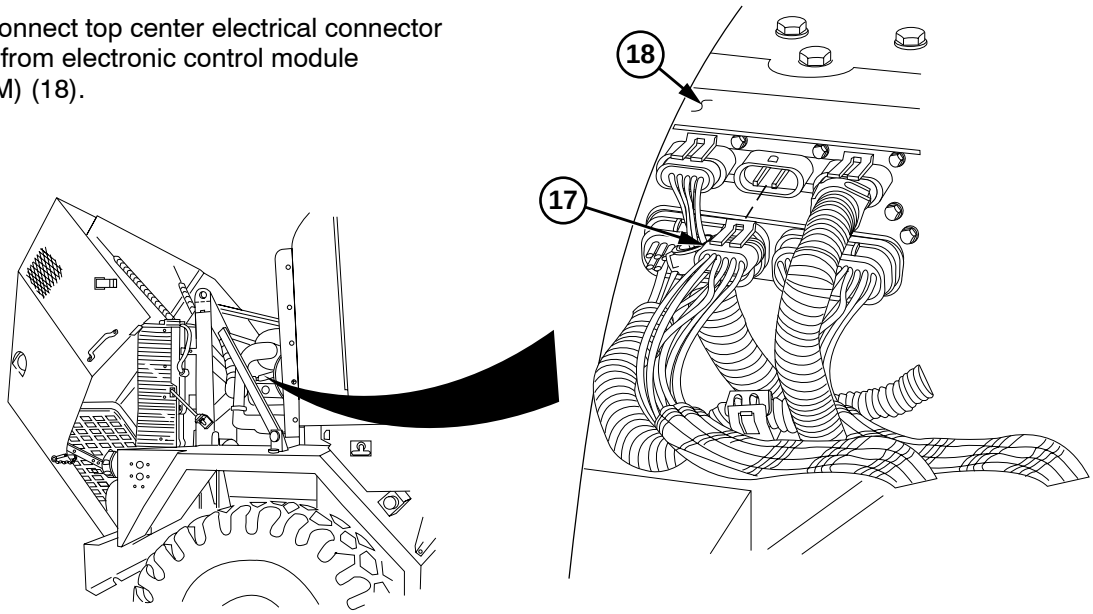
(5) Remove ether start line (13) from ether start base (14).

(6) Disconnect electrical connector (15) from electrical connector (16).



16-2. CAB REPLACEMENT (CONT)

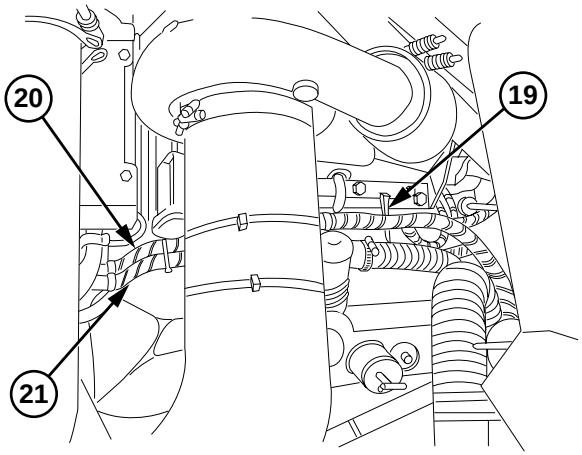
(7) Disconnect top center electrical connector (17) from electronic control module (ECM) (18).



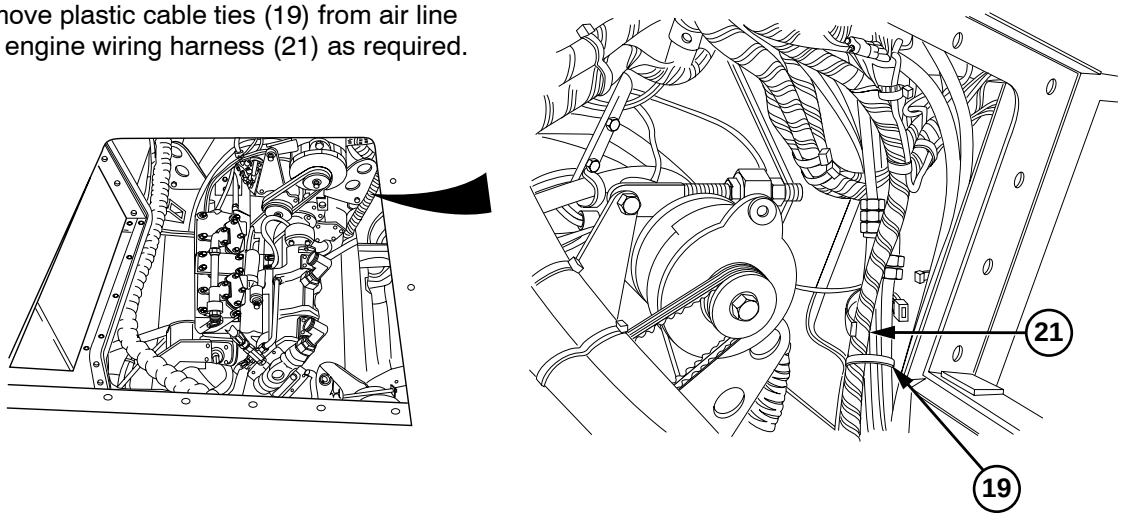
NOTE

Location of plastic cable ties should be marked before removal.

(8) Remove plastic cable ties (19) to separate DDEC 6-way power harness (20) from engine wiring harness (21).



(9) Remove plastic cable ties (19) from air line and engine wiring harness (21) as required.



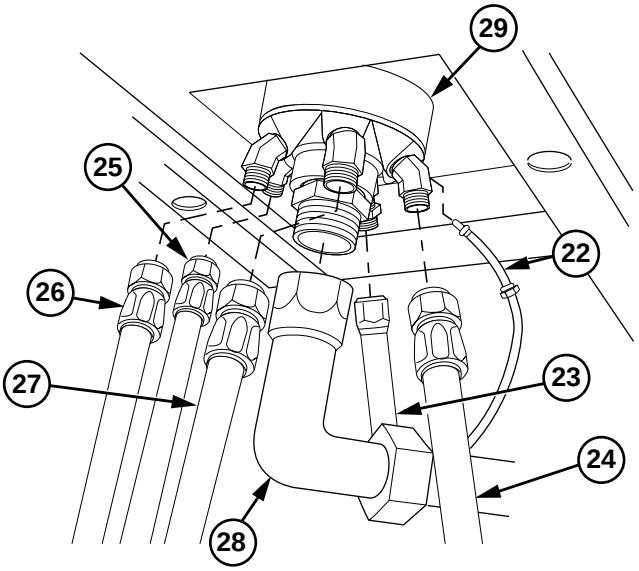
CAUTION

Ends of air lines must be covered after removal to prevent system contamination. Failure to comply may result in damage to equipment.

NOTE

Tag and mark air lines before removing from air manifolds.

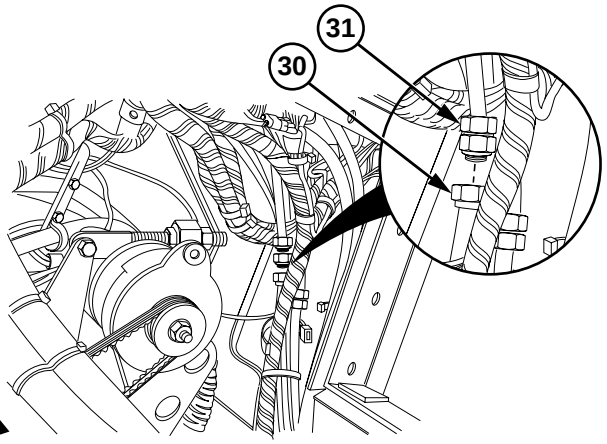
(10) Remove air lines no. 2108 (22), no. 2100 (23), no. 2102 (24), no. 2872 (25), no. 2104 (26), no. 2106 (27), and no. 2120 (28) from CTIS air manifold (29). Cover air lines.

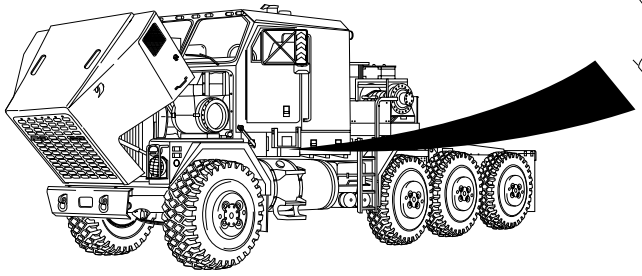


NOTE

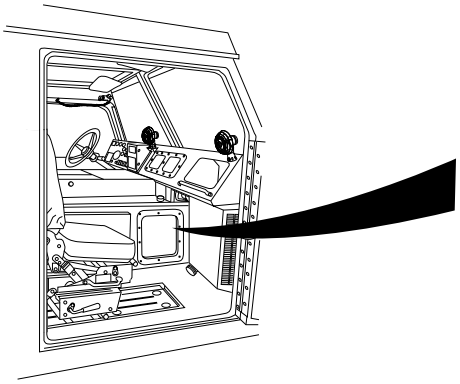
Air lines removed in steps (11) thru (13) are removed through side access panel.

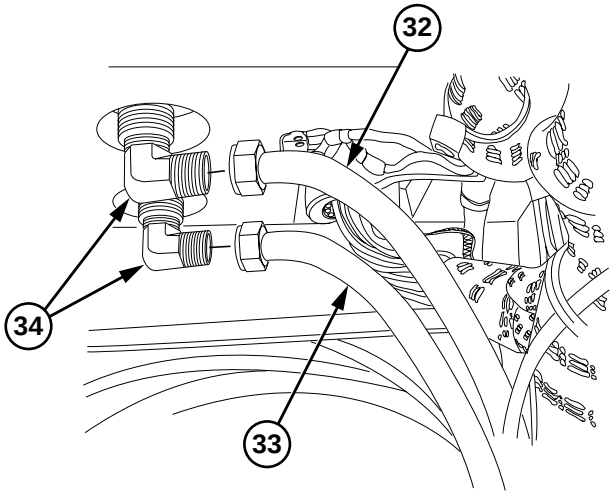
(11) Remove air lines (30) no. 2665, no. 2611, no. 2488, no. 2705, no. 2381, no. 2857, no. 2612, no. 2623, no. 2489, no. 2663, and no. 2662 from unions (31). Cover air lines.





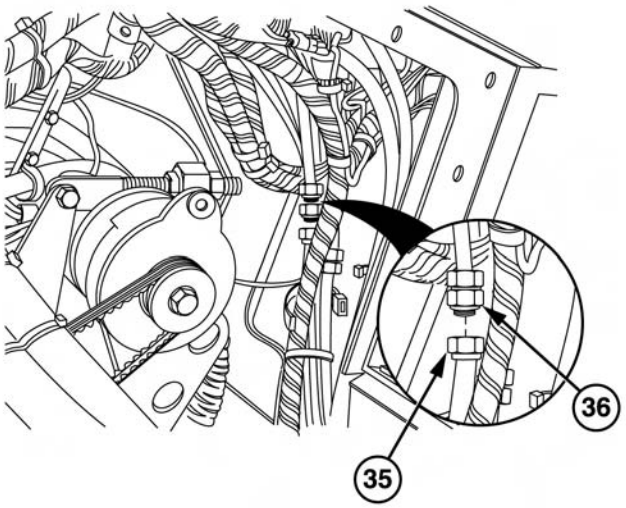
(12) Remove air lines no. 2005 (32) and no. 2619 (33) from elbows (34). Cover air lines.





16-2. CAB REPLACEMENT (CONT)

(13) Remove air lines (35) no. 2762, no. 2769, no. 2039, no. 2767, and no. 2036 from unions (36). Cover air lines.

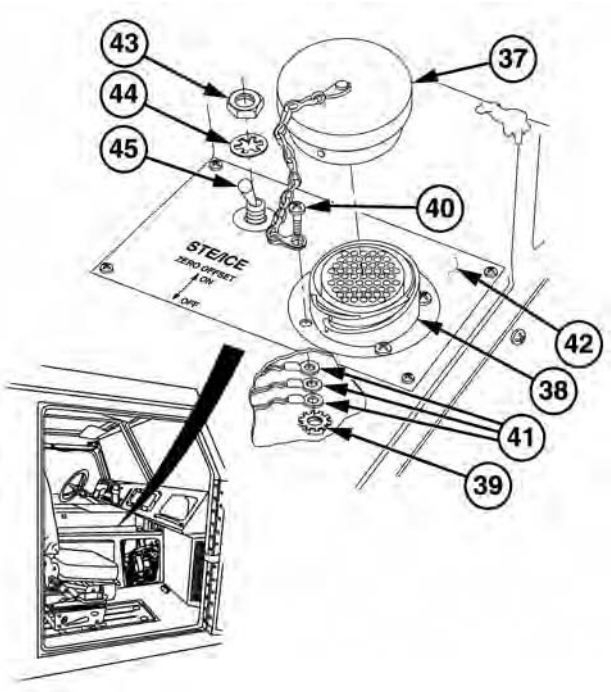


(14) Remove cap (37) from STE/ICE connector (38).

(15) Remove four locknuts (39), screws (40), three ground straps (41), cap (37), and STE/ICE connector (38) from doghouse (42). Discard locknuts.

(16) Remove nut (43), lockwasher (44), and STE/ICE ZERO OFFSET switch (45) from doghouse (42). Discard lockwasher.

(17) Remove 19 screws (46) and 3 top cover plates (47) from doghouse (42).



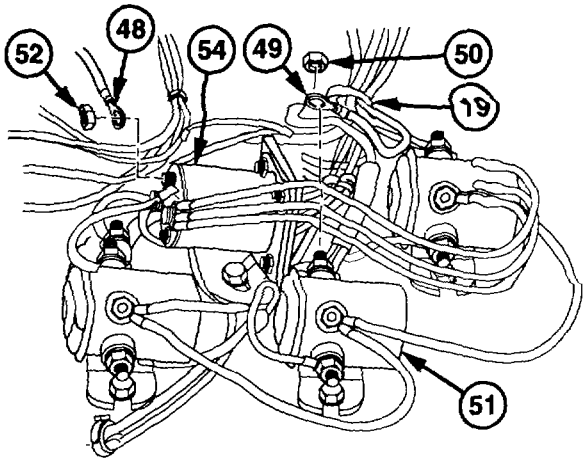
NOTE
Location of plastic cable ties should be marked before removal.

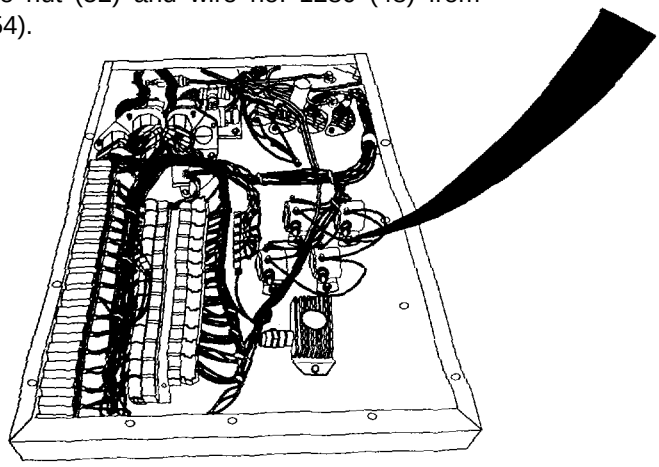
(18) Remove plastic cable ties (19) from wires no. 1280 (48) and no. 1430 (49) as required.

NOTE
Wires no. 1280 and no. 1430 must be disconnected and pulled out from doghouse.

(19) Remove nut (50) and wire no. 1430 (49) from relay (51).

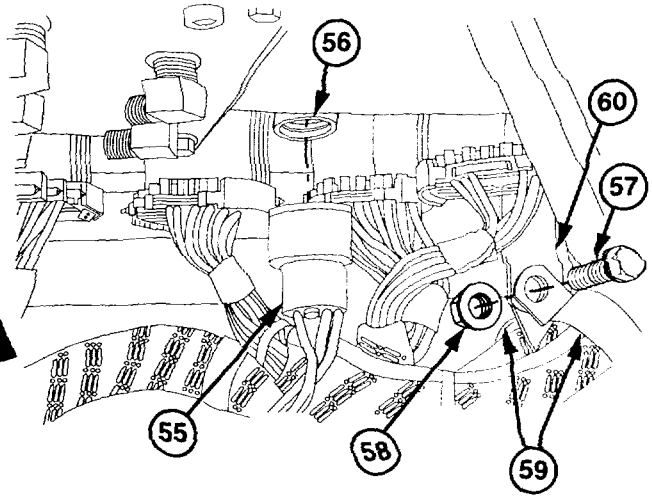
(20) Remove nut (52) and wire no. 1280 (48) from relay (54).

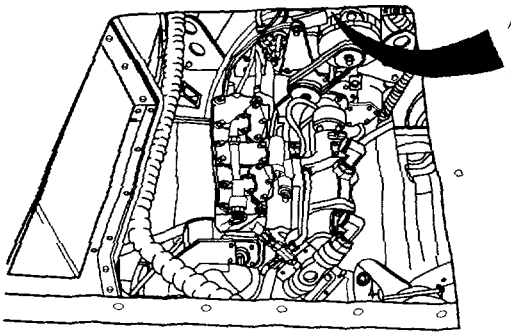




(21) Disconnect 10-pin electrical connector (55) from receptacle (56).

(22) Remove screw (57), locknut (58), and two clips (59) from standoff bracket (60). Discard locknut.



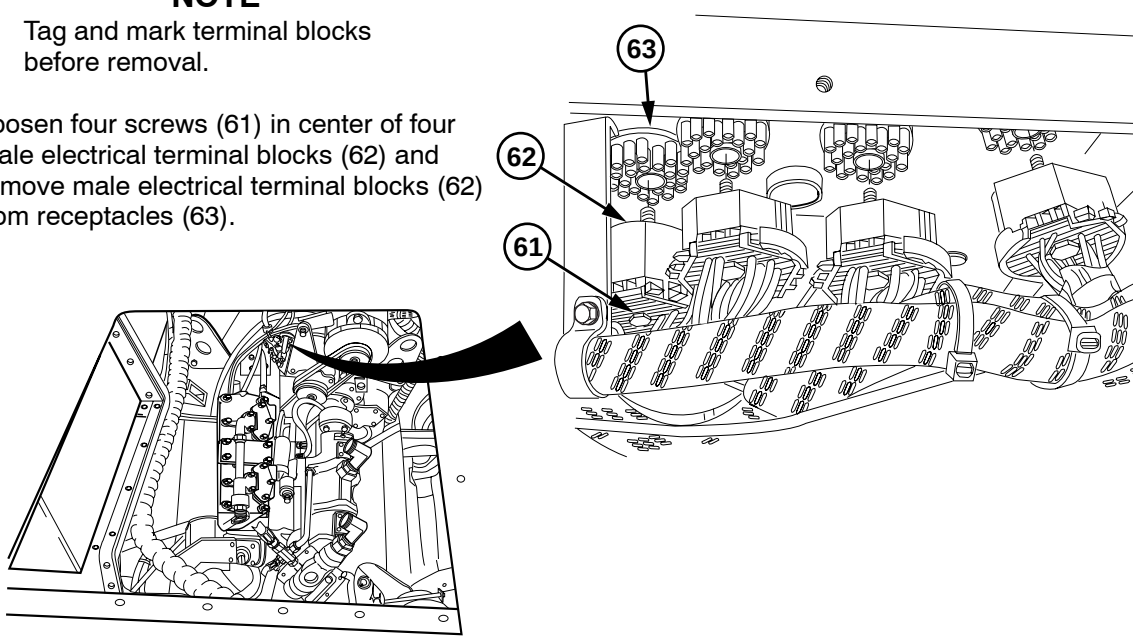


16-2. CAB REPLACEMENT (CONT)

NOTE

Tag and mark terminal blocks before removal.

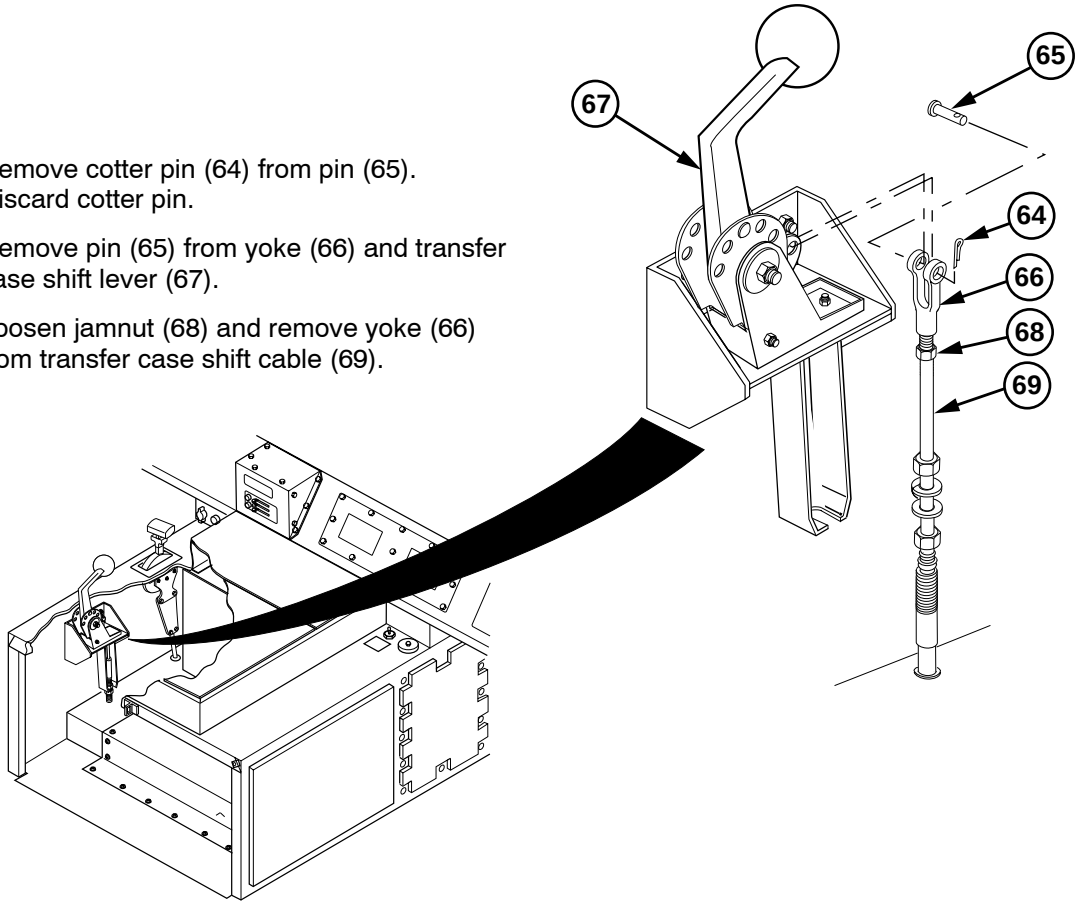
(23) Loosen four screws (61) in center of four male electrical terminal blocks (62) and remove male electrical terminal blocks (62) from receptacles (63).



(24) Remove cotter pin (64) from pin (65). Discard cotter pin.

(25) Remove pin (65) from yoke (66) and transfer case shift lever (67).

(26) Loosen jamnut (68) and remove yoke (66) from transfer case shift cable (69).



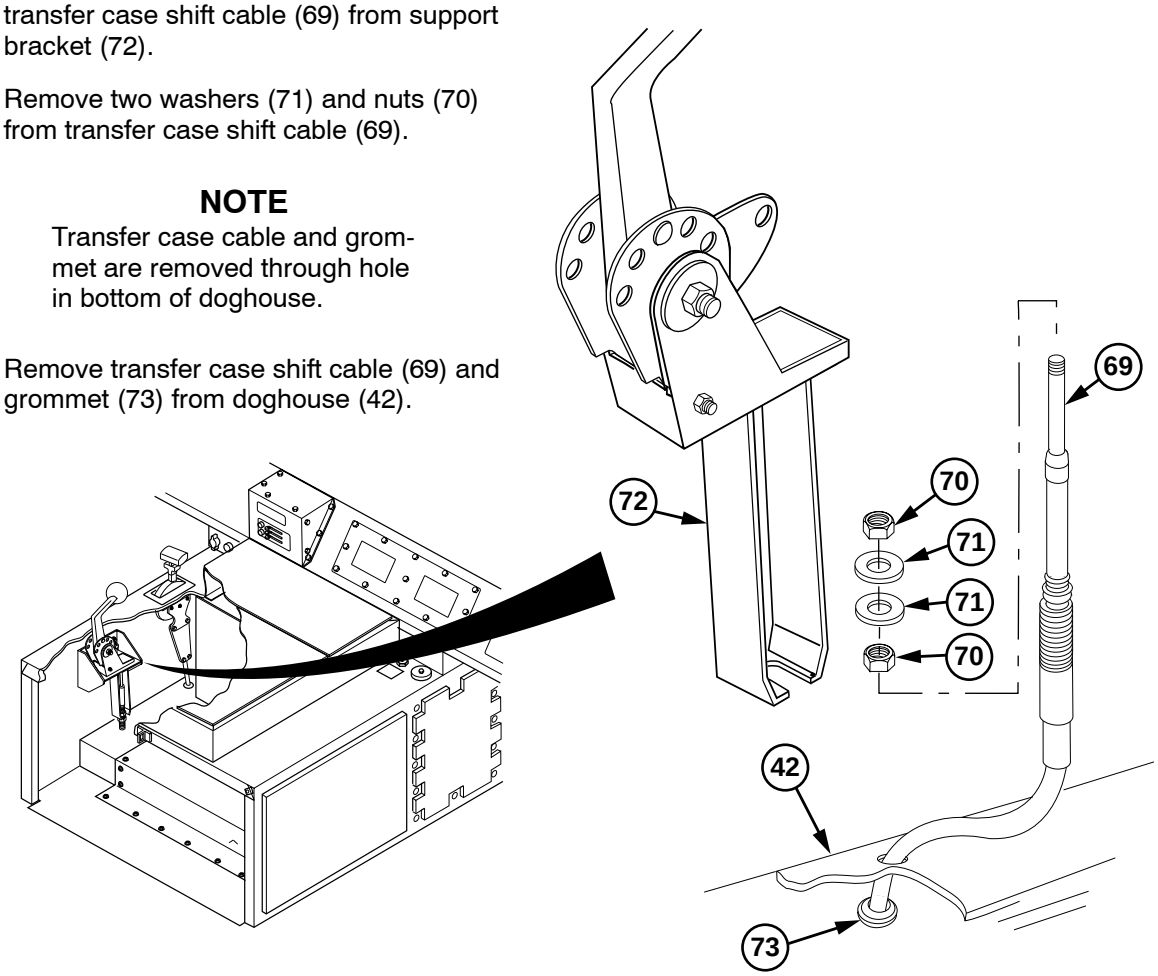
(27) Remove two nuts (70), washers (71), and transfer case shift cable (69) from support bracket (72).

(28) Remove two washers (71) and nuts (70) from transfer case shift cable (69).

NOTE

Transfer case cable and grommet are removed through hole in bottom of doghouse.

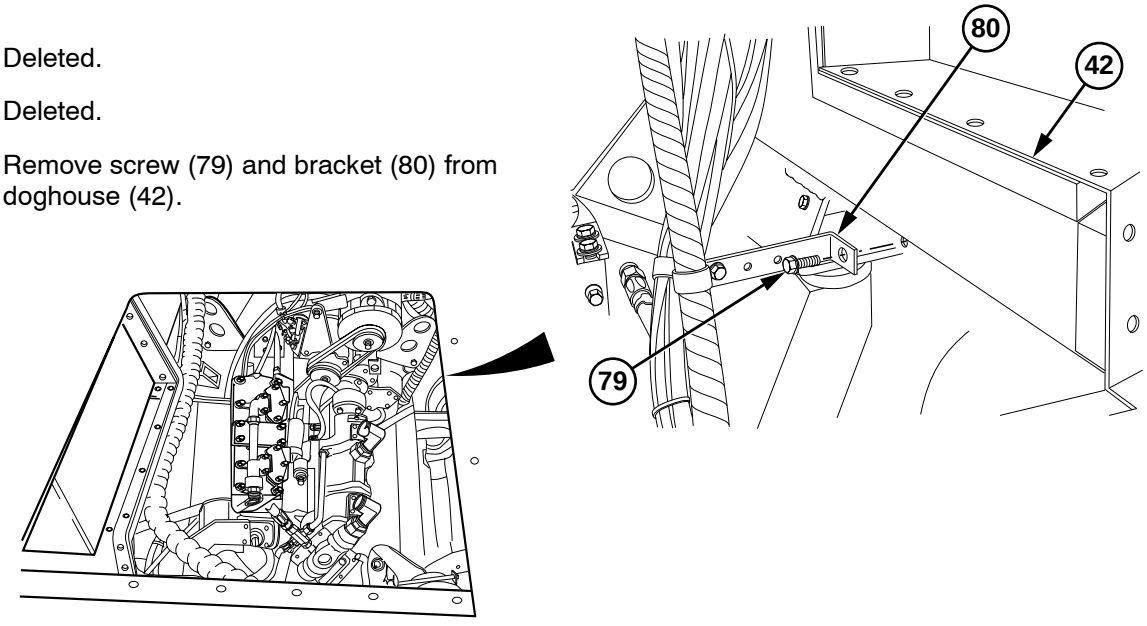
(29) Remove transfer case shift cable (69) and grommet (73) from doghouse (42).



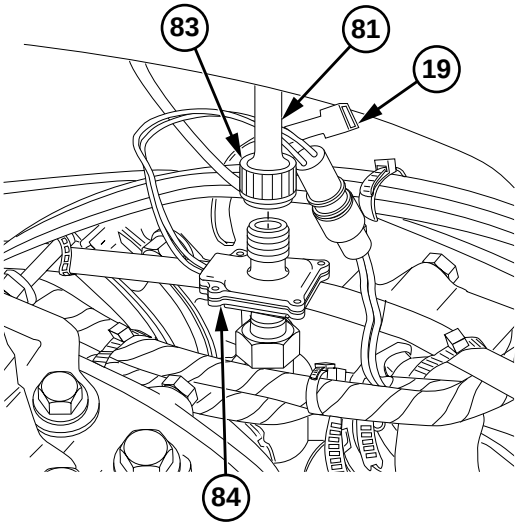
(30) Deleted.

(31) Deleted.

(32) Remove screw (79) and bracket (80) from doghouse (42).



16-2. CAB REPLACEMENT (CONT)

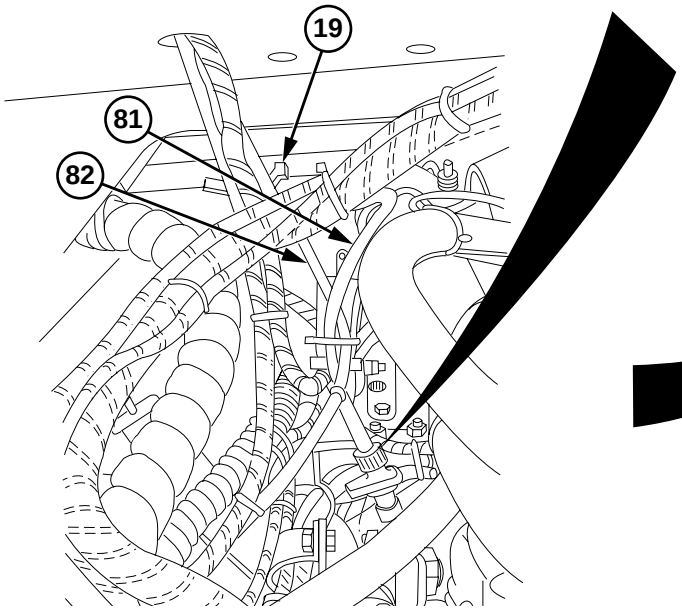


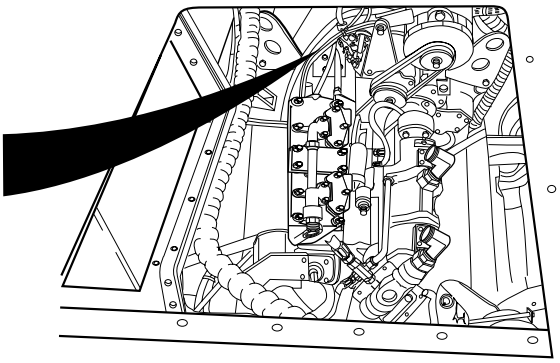
NOTE

Location of plastic cable ties should be marked before removal.

(33) Remove plastic cable ties (19) from tachometer cable (81) and speedometer cable (82) as required.

(34) Turn cap (83) counterclockwise and remove tachometer cable (81) from tachometer sending unit (84).



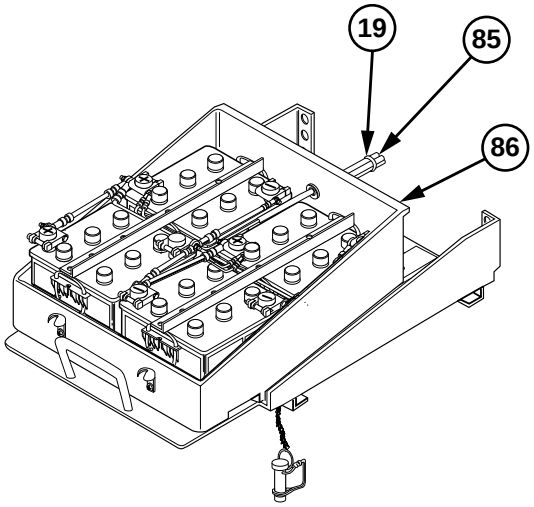


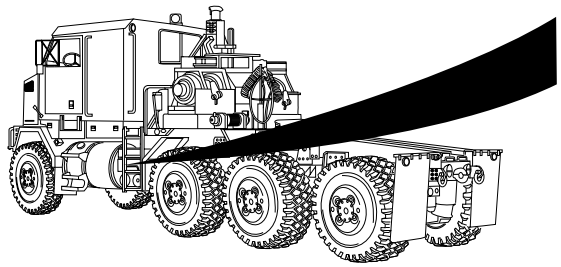
NOTE

Location of plastic cable ties should be marked before removal.

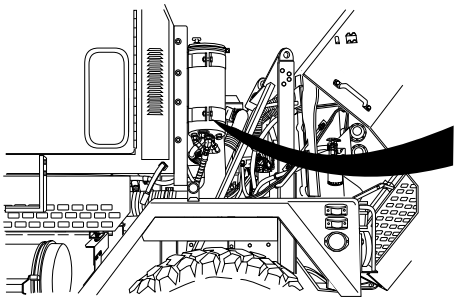
(35) Remove plastic cable ties (19) from wiring harness (85) as required.

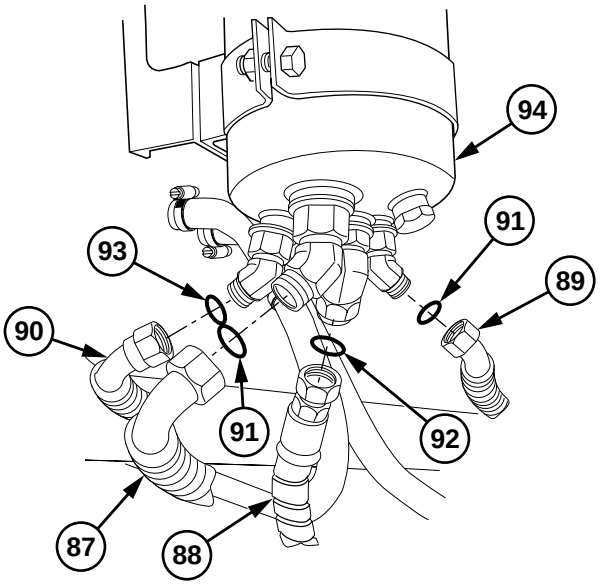
(36) Push DDEC wiring harness (85) out through center hole in rear of battery box (86).





(37) Remove hoses no. 2278 (87), no. 2883 (88), no. 2302 (89), no. 2701 (90), two preformed packings (91), preformed packing (92), and preformed packing (93) from steering reservoir (94). Cover hoses. Discard preformed packings.

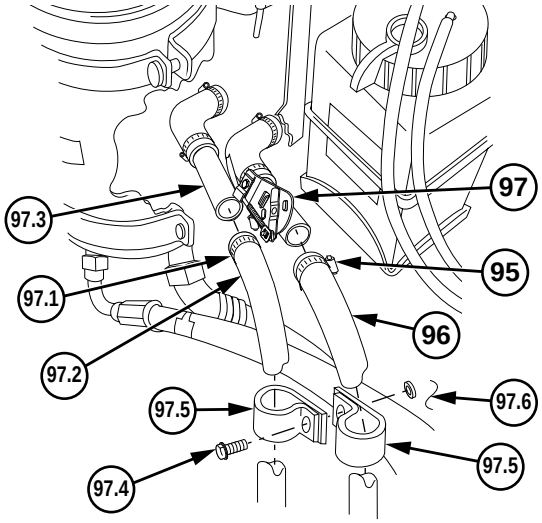




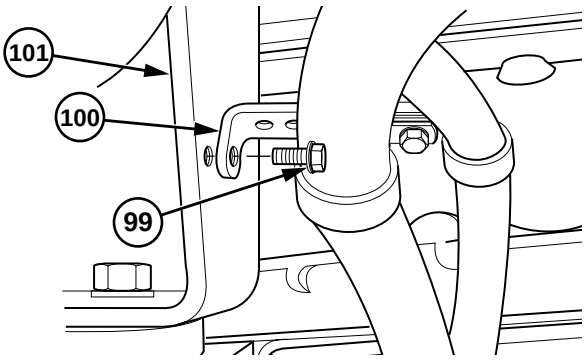
(38) Loosen clamp (95) and remove heater hose (96) from shutoff valve (97).

(39) Loosen clamp (97.1) and remove heater hose (97.2) from pipe (97.3).

(39.1) Remove screw (97.4) and two clips (97.5) from firewall (97.6).



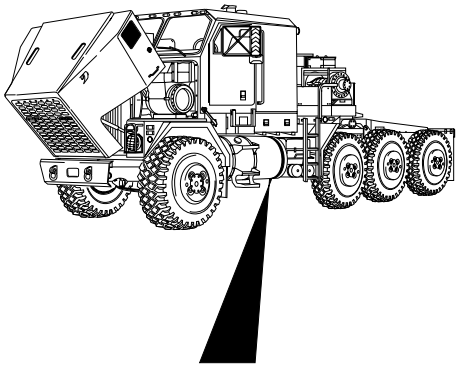
(40) Remove screw (99) and standoff bracket (100) from cab mount (101).

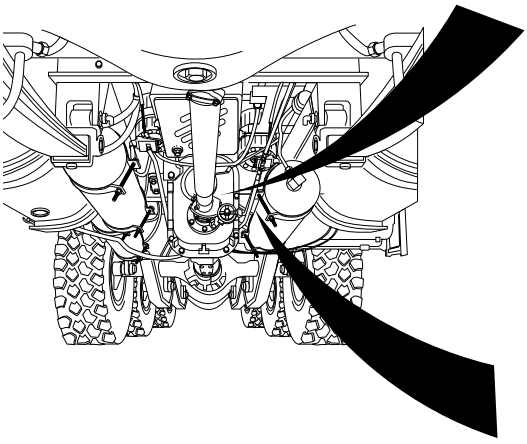


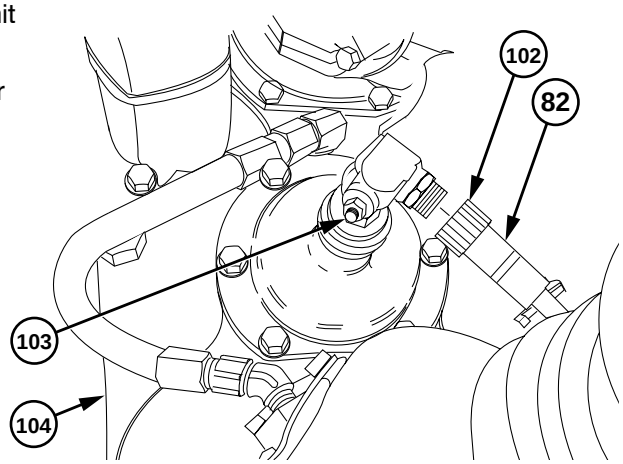
16-2. CAB REPLACEMENT (CONT)

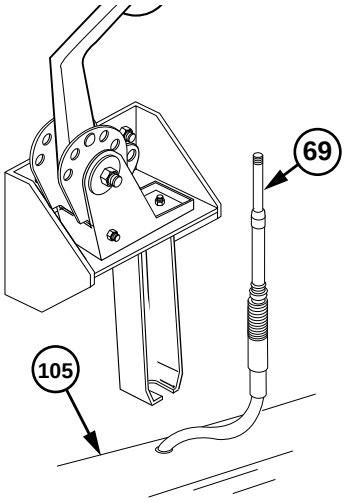
(41) Turn cap (102) and remove speedometer cable (82) from speedometer sending unit (103) on transfer case (104).

(42) Pull speedometer cable (82) and transfer case shift cable (69) through cab (105).







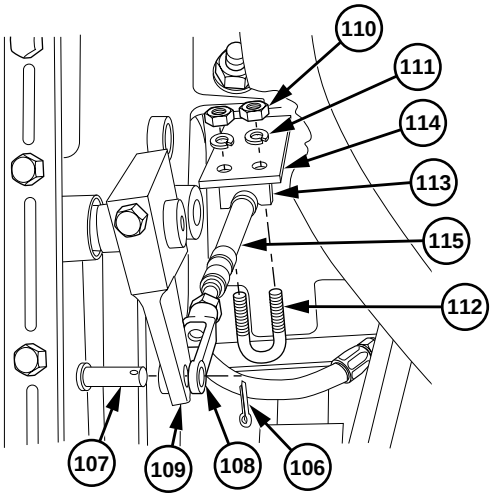


(43) Remove cotter pin (106) from pin (107). Discard cotter pin.

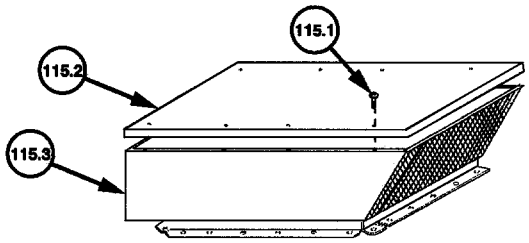
(44) Remove pin (107) from yoke (108) and transmission shift lever (109).

(45) Remove two nuts (110), lockwashers (111), U-bolt (112), and bracket (113) from support bracket (114) and transmission shift cable (115). Discard lockwashers.

(46) Push transmission shift cable (115) into cab (105).



(46.1) Remove eight screws (115.1) and cover (115.2) from upper ventilator case (115.3).

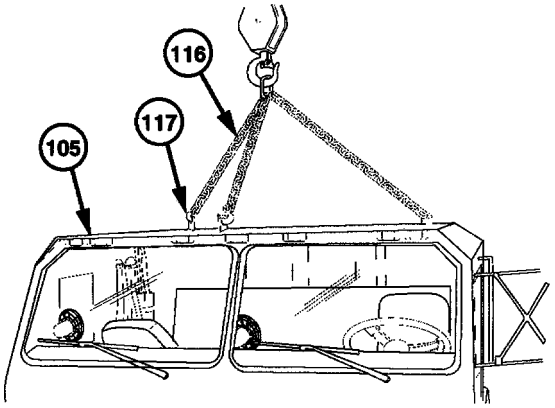


(47) Attach lifting chain (116) to three cab lifting eyes (117). Refer to table 16-1.

Table 16-1. Chain Lengths

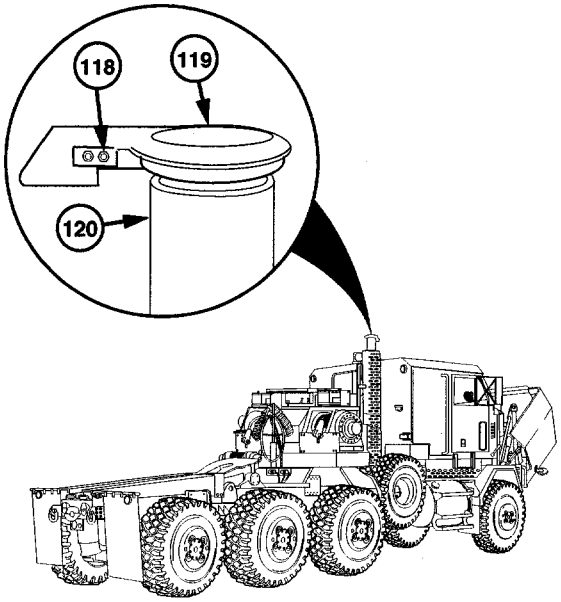
Chain Location	Length
Chain attached to front lifting eye	30.5 in. (77.5 cm)
Chain attached to left rear lifting eye	57.75 in. (146.7 cm)
Chain attached to right rear lifting eye	59 in. (149.9 cm)

(48) Support cab (105) with lifting device and chain (116).

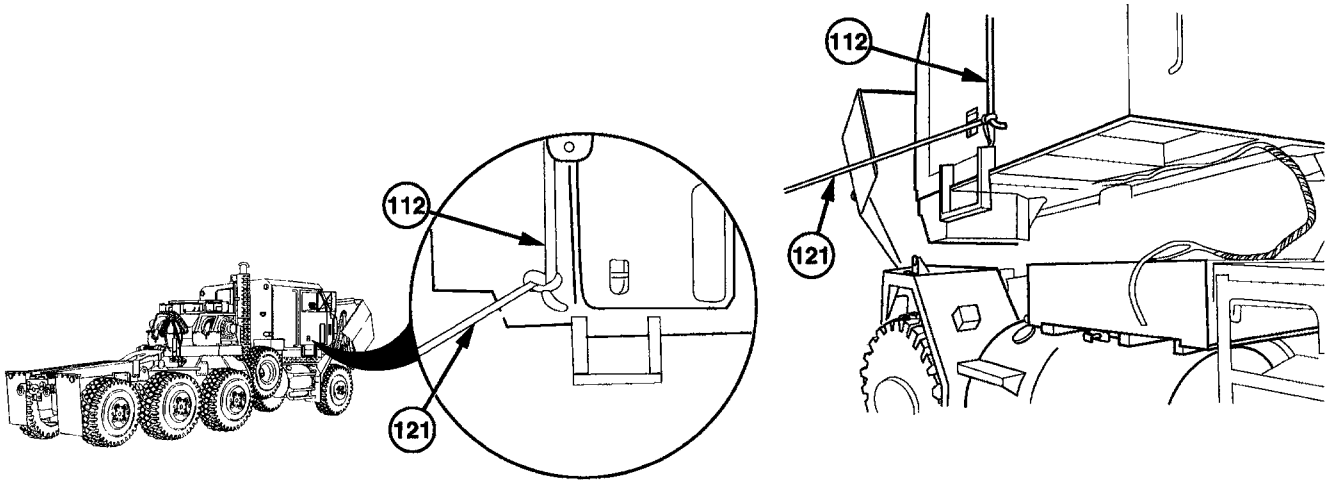


16-2. CAB REPLACEMENT (CONT)

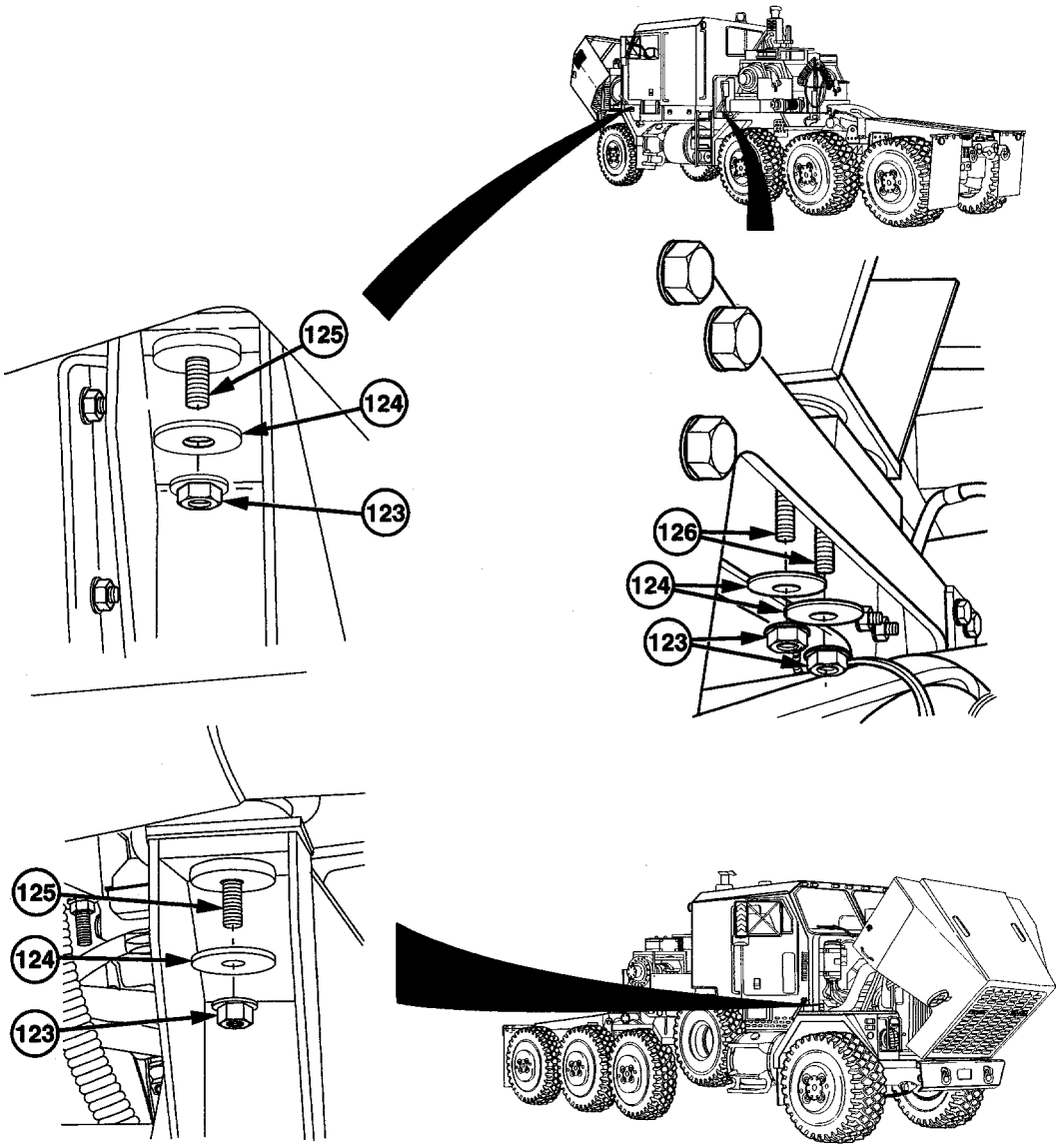
(49) Loosen nut (118) and remove rain cap (119) from tail pipe (120).



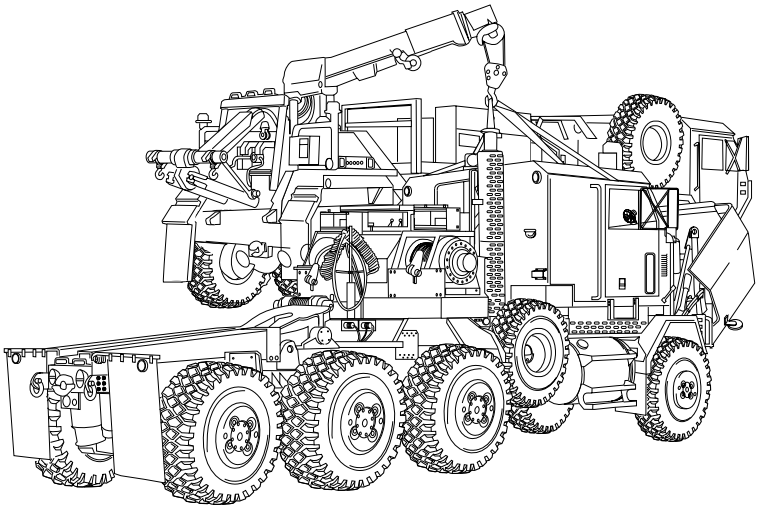
(50) Attach guide rope (121) to left and right grab handles (112).



(51) Remove four locknuts (123) and washers (124) from two screws (125) and screws (126). Discard locknuts.



16-2. CAB REPLACEMENT (CONT)



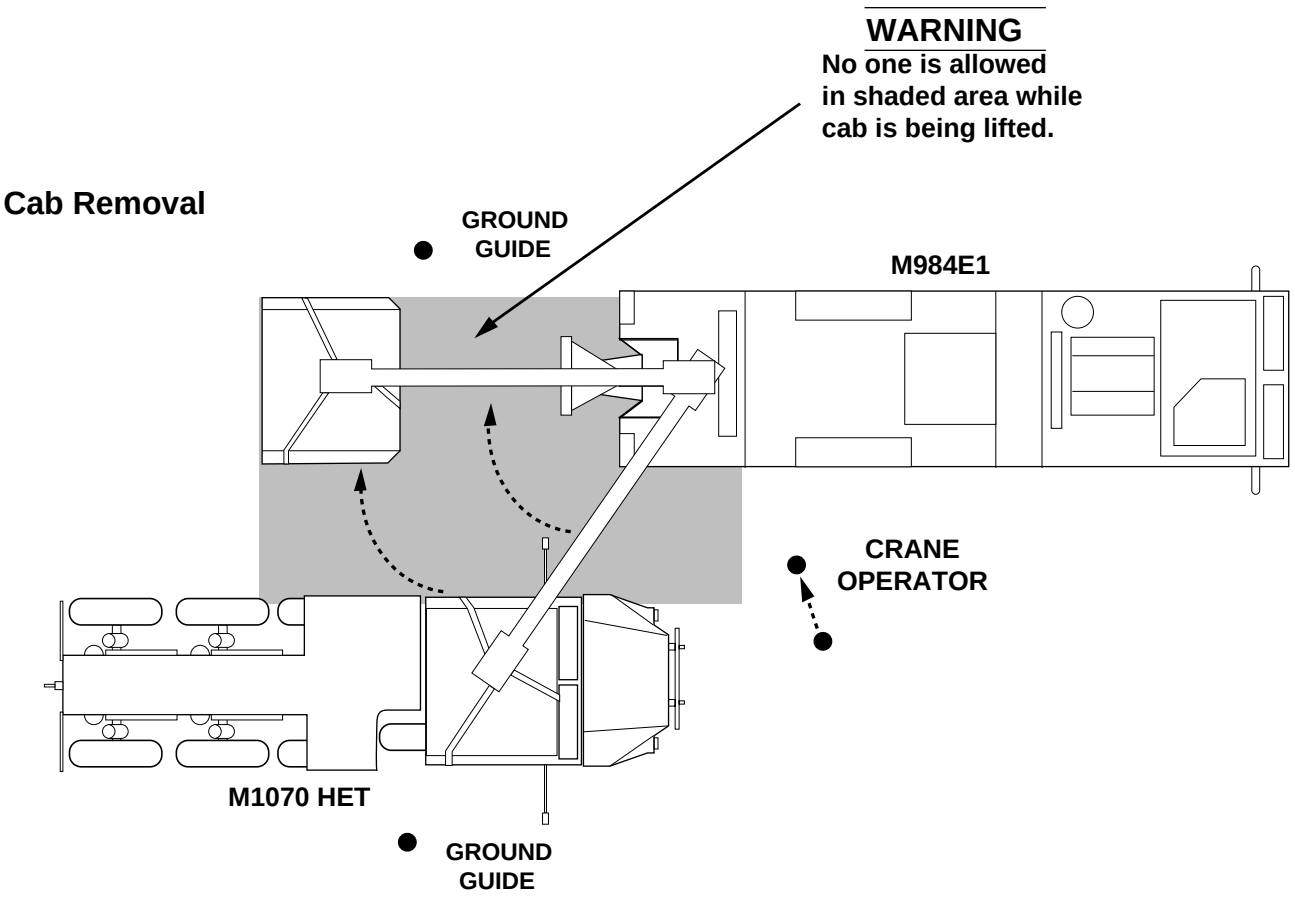


Figure 16-1. Warning Zone Diagram

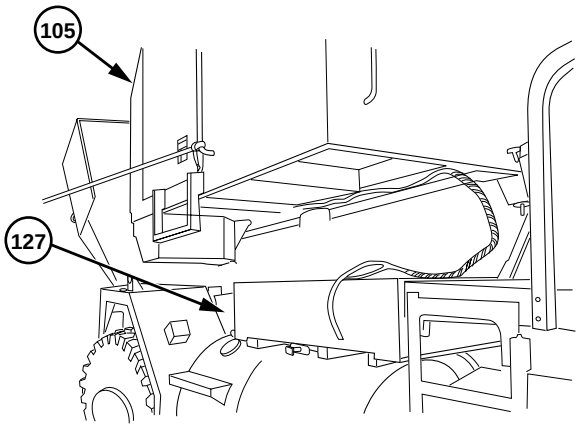
WARNING

- **Cab weighs 2600 lb (1179 kg). Stay clear of cab when it is supported by lifting device. If cab falls, serious injury of death may result. Use 10 ft (3 m) guidelines to help guide cab during removal.**
- **Refer to Figure 16-1, Warning Zone Diagram, for proper placement of personnel when removing cab. Failure to comply may result in serious injury or death to personnel.**
- **Ensure personnel are clear of lifting area. All personnel are within visual sight of each other and not within 15 ft (4.6 mm) of cab when lifting is in process. Failure to comply may result in serious injury or death to personnel.**

CAUTION

- Ensure lifting device is centered over cab before lifting. Failure to comply may result in damage to cab.
- Ensure all hoses and wire harnesses are disconnected before attempting to lift cab. Failure to comply may result in damage to equipment.
- The cab must be lifted 27 in. (68.5 cm) in order to clear chassis components during removal. In order to accomplish this task, a minimum ceiling height of approximately 19 ft, 4 in. (5.89 m) is required to remove the cab indoors. Failure to comply may result in damage to equipment or the facility.

(52) Remove cab (105) from frame (127) with aid of assistants.



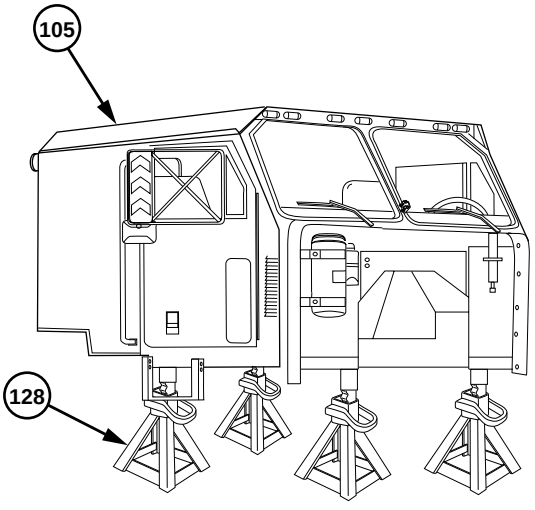
WARNING

Do not allow personnel to work between jackstands and cab or within designated danger zones while lifting device is supporting cab. Failure to comply may result in serious injury or death to personnel.

NOTE

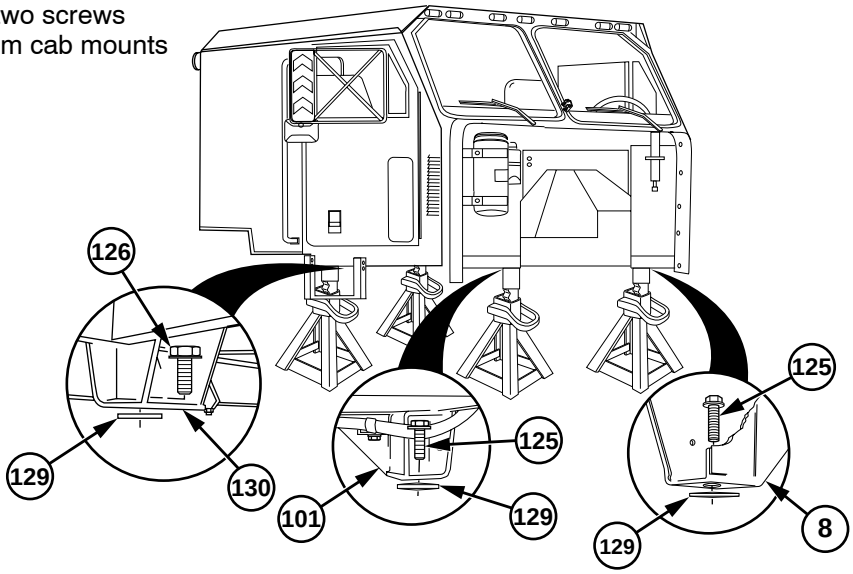
Place jackstands 1 ft (30.5 mm) outside parameter of each cab mount location. Slide jackstand under cab mount when cab is approximately 2 in. (5 cm) above jackstand. Lower cab on jackstands.

(53) Lower cab (105) and support on four jackstands (128).



16-2. CAB REPLACEMENT (CONT)

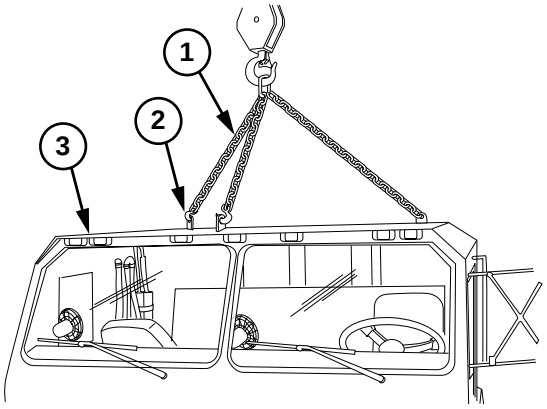
(54) Remove two screws (125), two screws (126), and spacers (129) from cab mounts (8, 101, and 130).



b. Installation

(1) Attach lifting chain (1) to three cab lifting eyes (2). Refer to table 16-1 for proper chain lengths.

(2) Support cab (3) with suitable lifting device and lifting chain.

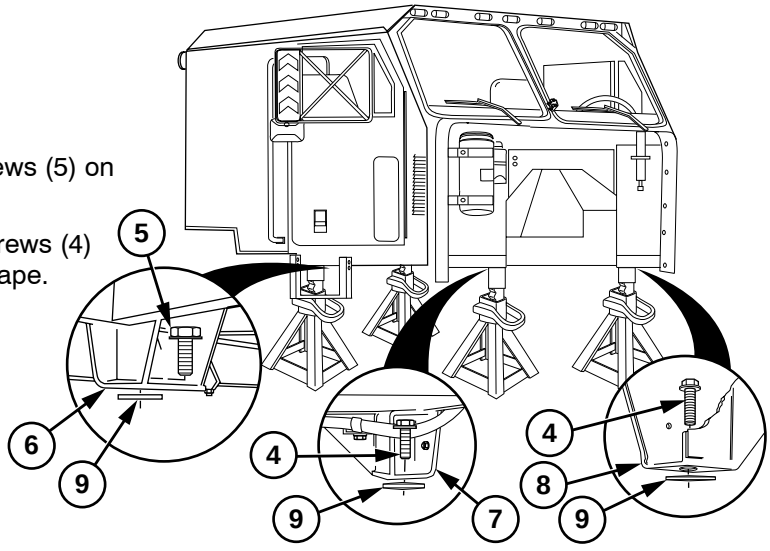


NOTE

Rear cab mount screws have square plate welded on them.

(3) Install two screws (4) and two screws (5) on cab mounts (6, 7, and 8).

(4) Secure four spacers (9) on two screws (4) and two screws (5) with masking tape.



WARNING

- **Cab weighs 2600 lb (1179 kg). Stay clear of cab when it is supported by lifting device. If cab falls, serious injury of death may result. Use 10 ft (3 m) guidelines to help guide cab during installation.**
- **Refer to Figure 16-2, Warning Zone Diagram, for proper placement of personnel when installing cab. Failure to comply may result in serious injury or death to personnel.**
- **Ensure personnel are clear of lifting area. All personnel are within visual sight of each other and not within 15 ft (4.6 mm) of cab when lifting is in process. Failure to comply may result in serious injury or death to personnel.**

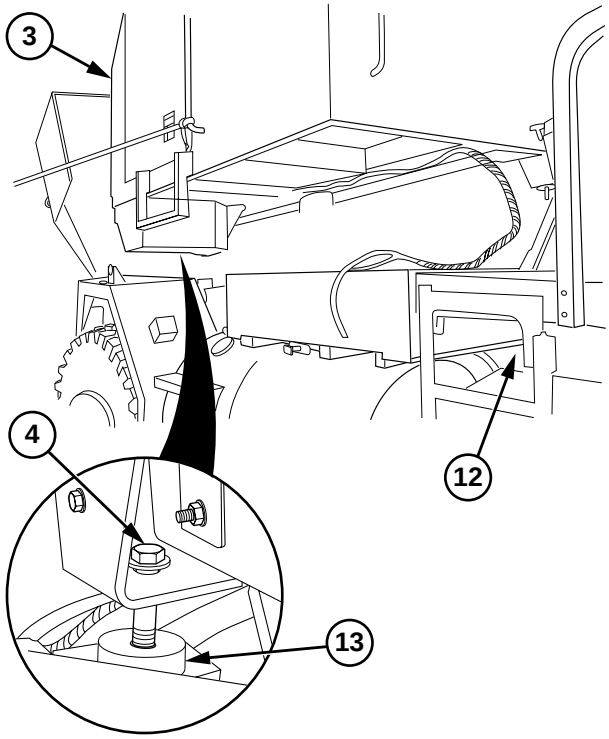
CAUTION

- Ensure lifting device is centered over cab before lifting. Failure to comply may result in damage to cab.
- Ensure all hoses and wire harnesses are secured away from cab mount areas before attempting to install cab. Failure to comply may result in damage to equipment.

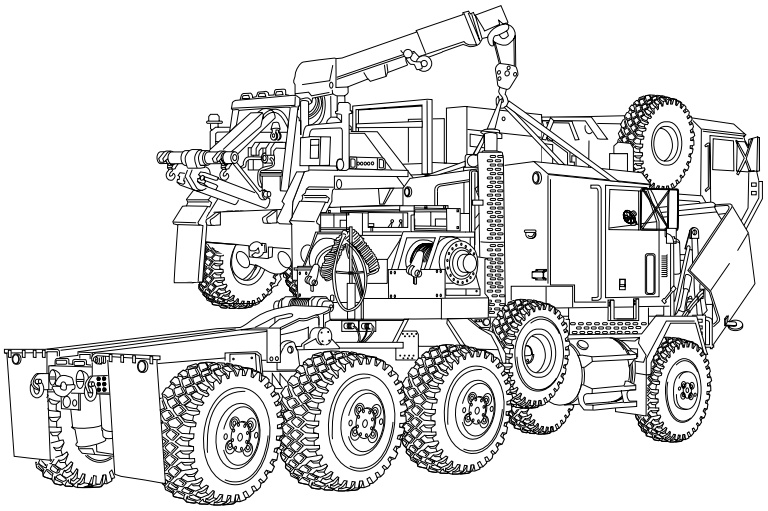
(5) Raise cab (3) and position above frame (12).

(5.1) Lower cab (3) until mounting screws (4) slide in biscuits (13).

(6) Install cab (3) on frame (12) with aid of assistants.



16-2. CAB REPLACEMENT (CONT)



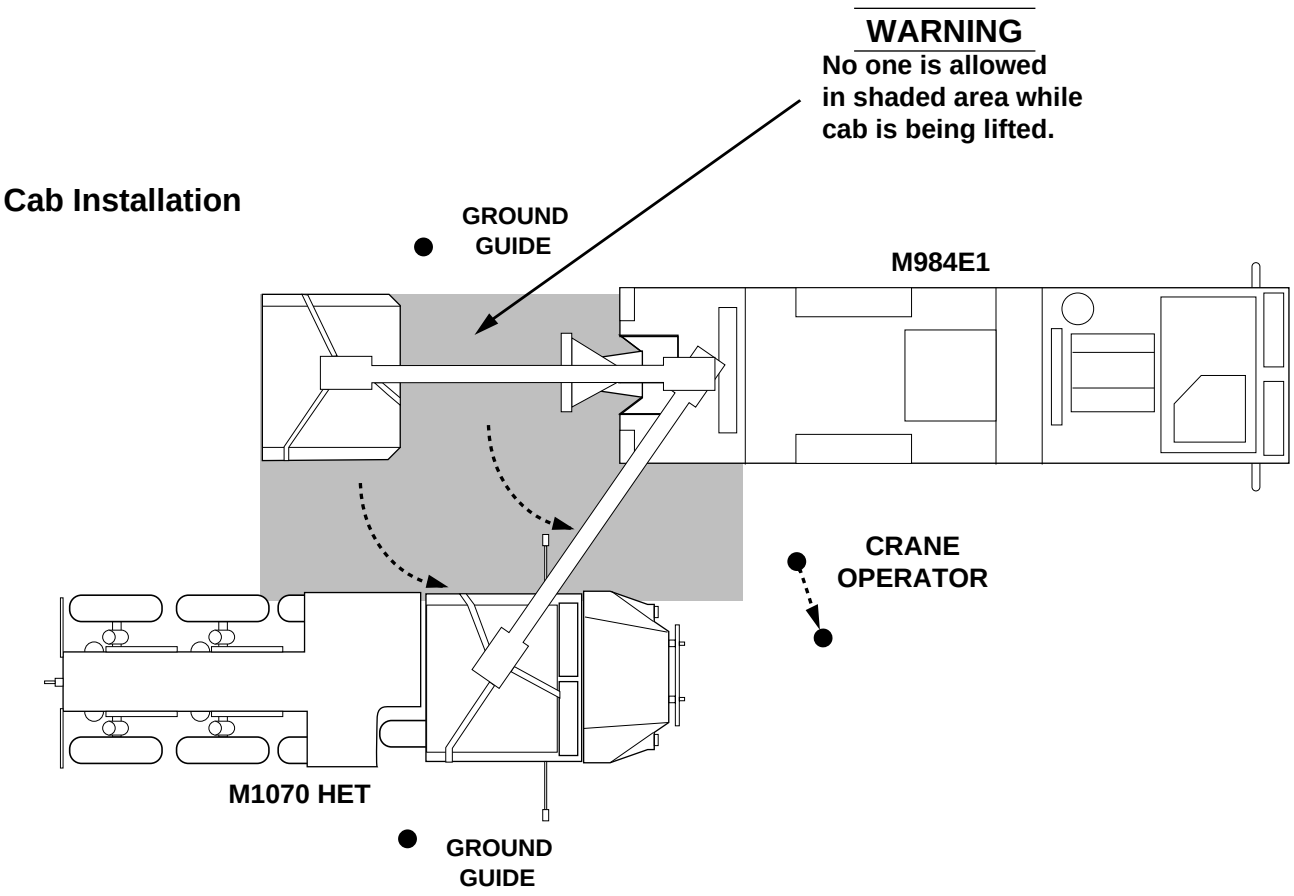
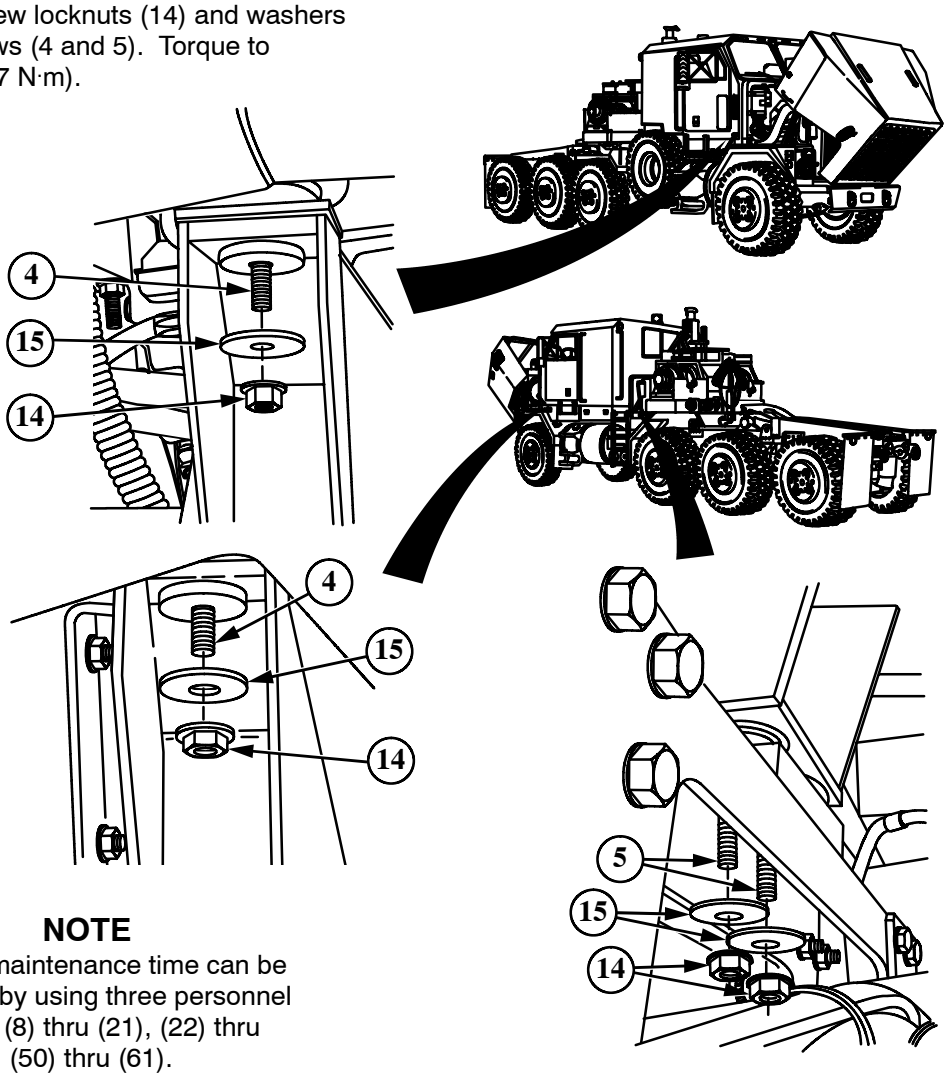


Figure 16-2. Warning Zone Diagram

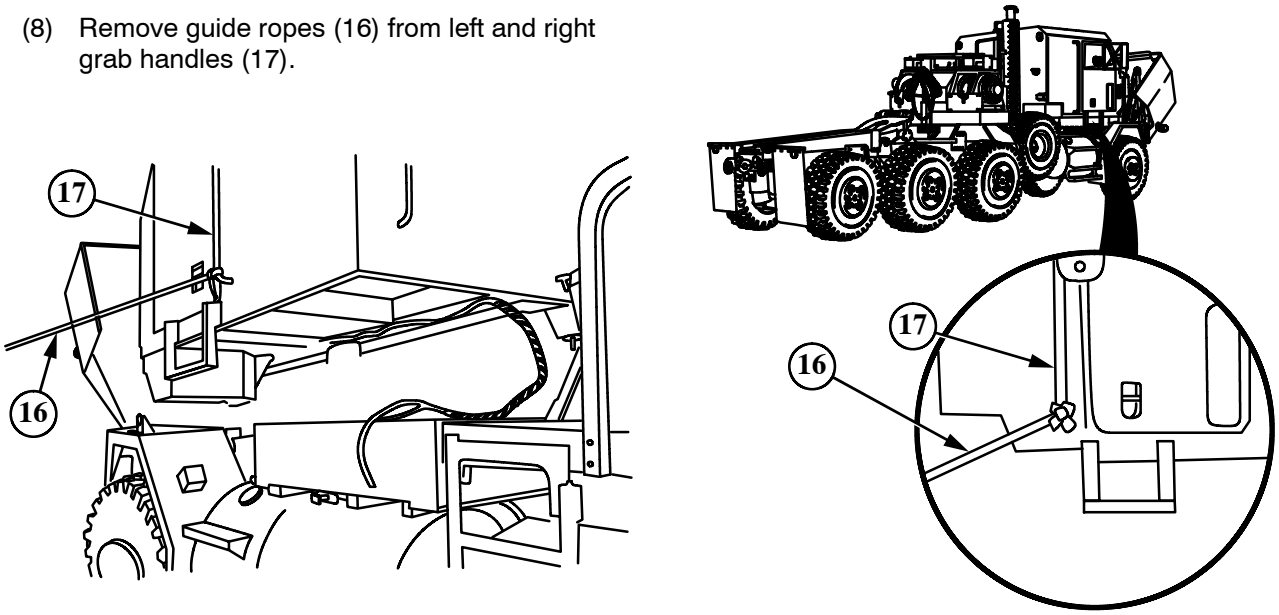
(7) Install four new locknuts (14) and washers (15) on screws (4 and 5). Torque to 212 lb-ft (287 N·m).



NOTE

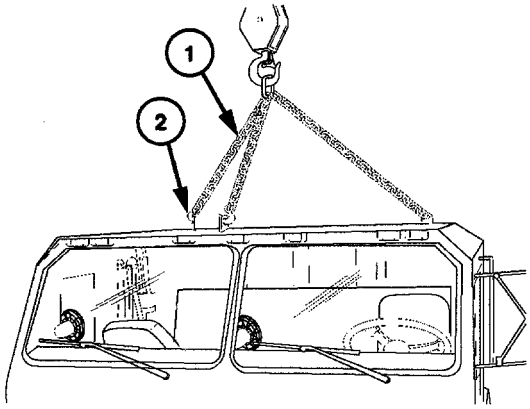
Vehicle maintenance time can be reduced by using three personnel on steps (8) thru (21), (22) thru (49), and (50) thru (61).

(8) Remove guide ropes (16) from left and right grab handles (17).



16-2. CAB REPLACEMENT (CONT)

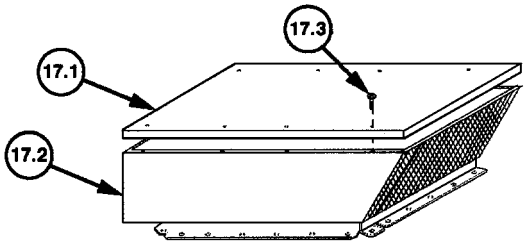
(9) Remove lifting chain (1) from cab lifting eyes (2).



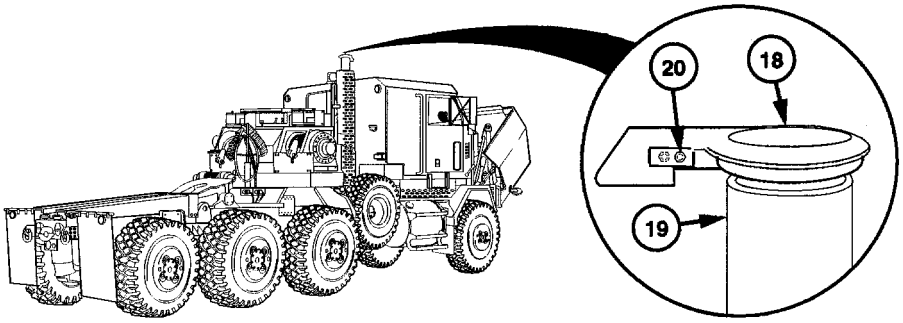
CAUTION

When installing cover, front grille must fit inside of lip on cover. Failure to comply may result in damage to grille.

(9.1) Install cover (17.1) on upper ventilator case (17.2) with eight screws (17.3).



(10) Install rain cap (18) on tail pipe (19) and tighten nut (20).



(11) Pull transmission shift cable (21) out of cab (3).

CAUTION

U-bolt must be located in notch on cable. Failure to comply may result in damage to equipment.

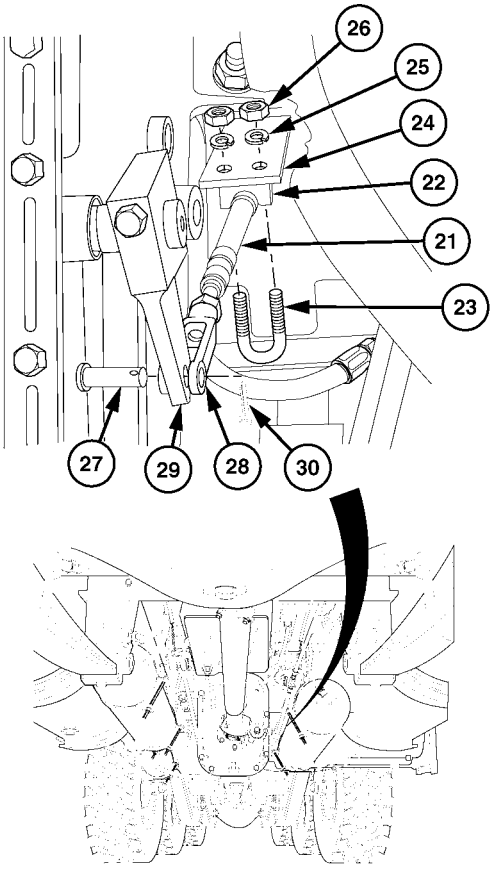
NOTE

Transmission selector must be in reverse position and transmission shift lever rotated to full counterclockwise position before doing step (12).

(12) Install bracket (22), transmission shift cable (21), and U-bolt (23), on support bracket (24) with two new lockwashers (25) and nuts (26).

(13) Install pin (27) in yoke (28) and transmission shift lever (29).

(14) Install new cotter pin (30) in pin (27).



NOTE

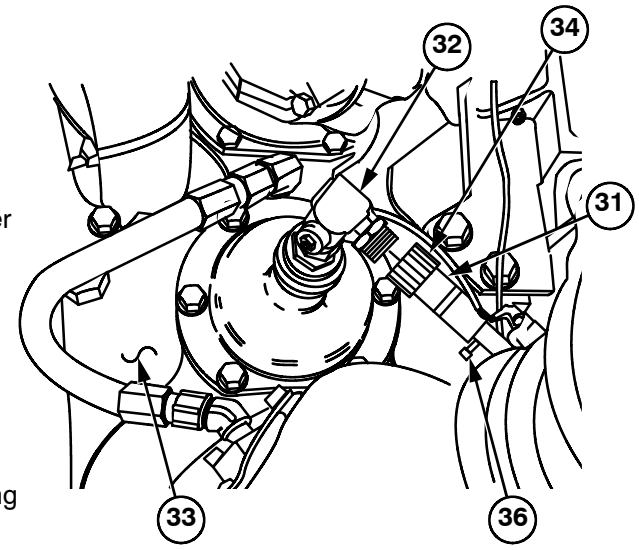
Tab on speedometer cable must be aligned with slot in speedometer adapter during installation.

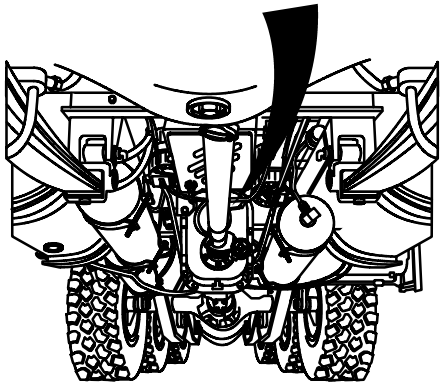
(15) Install speedometer cable (31) on speedometer sending unit (32) on transfer case (33) and turn cap (34) clockwise to tighten.

NOTE

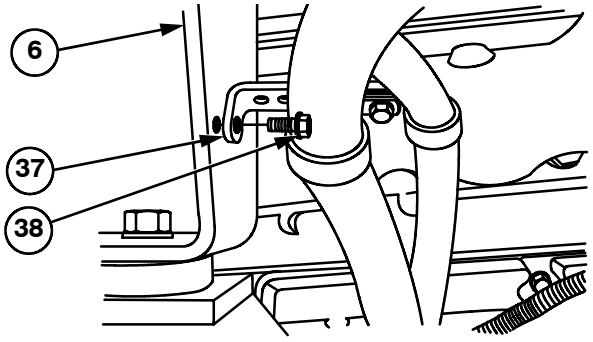
Plastic cable ties should be positioned in locations marked during removal.

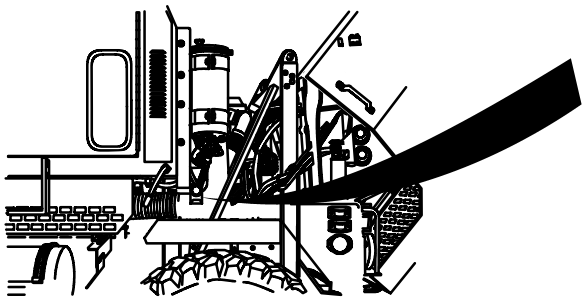
(16) Secure speedometer cable (31) and wiring harness (35) with plastic cable ties (36).





(17) Install standoff bracket (37) on cab mount (6) with screw (38).



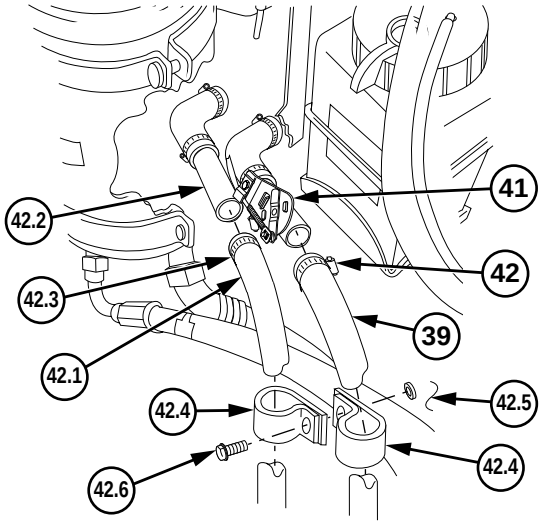


16-2. CAB REPLACEMENT (CONT)

(18) Install heater hose (39) on shutoff valve (41) with clamp (42). Torque clamp to 40 lb-in. (4.5 N·m).

(18.1) Install heater hose (42.1) on pipe (42.2) with clamp (42.3). Torque clamp to 40 lb-in. (4.5 N·m).

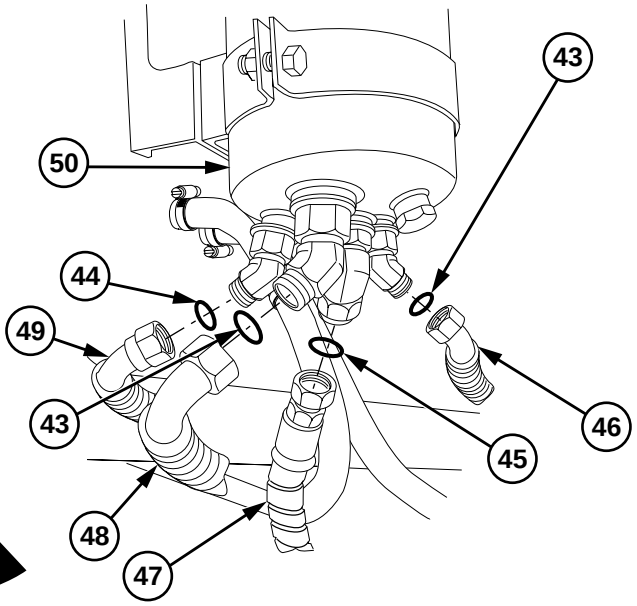
(18.1) Install two clips (42.4) on firewall (42.5) with screw (42.6).

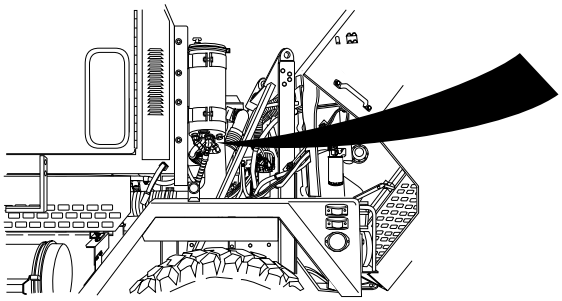


CAUTION

When properly installed, oil hoses must be secured away from exhaust pipe. Failure to comply may result in damage to oil hoses.

(19) Install two new preformed packings (43), new preformed packing (44), new preformed packing (45), and oil hoses no. 2302 (46), no. 2883 (47), no. 2278 (48), and no. 2701 (49) on steering reservoir (50).

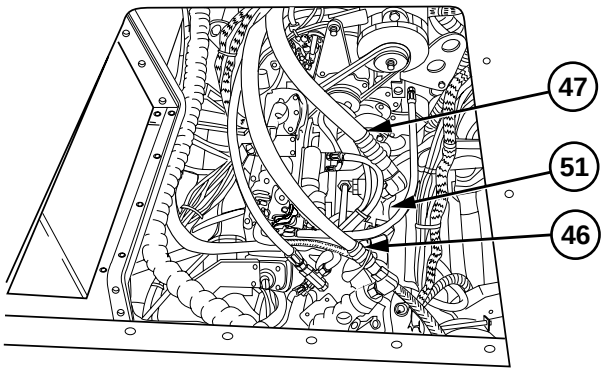




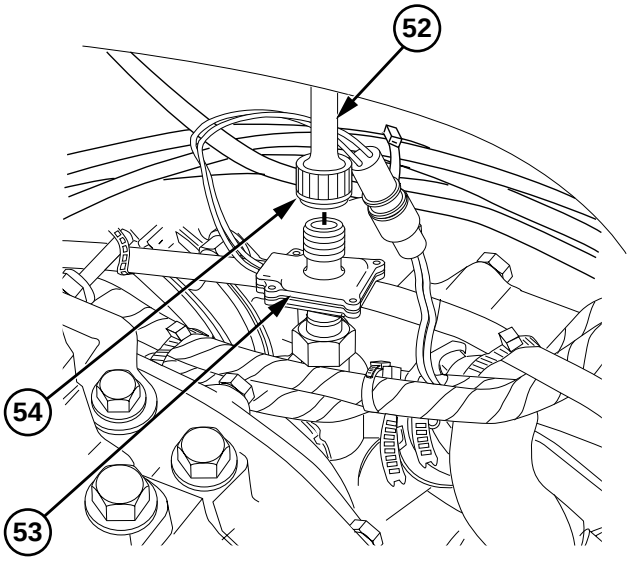
NOTE

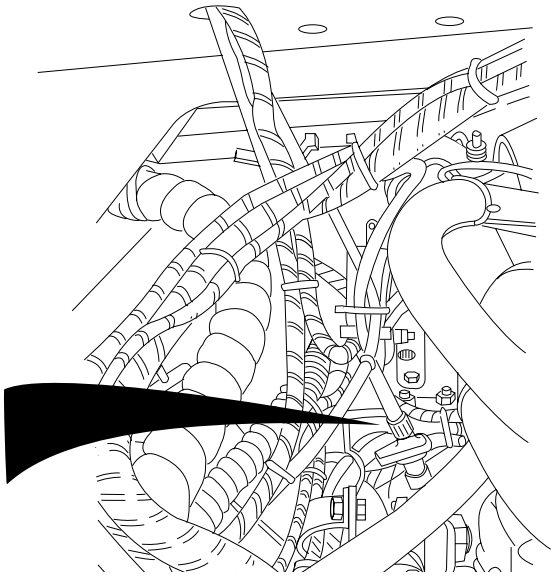
If engine was removed, do step (20).

(20) Tighten hose no. 2302 (46) and hose no. 2278 (47) on steering pump (51).



(21) Install tachometer cable (52) on tachometer sending unit (53) and turn cap (54) clockwise to tighten.



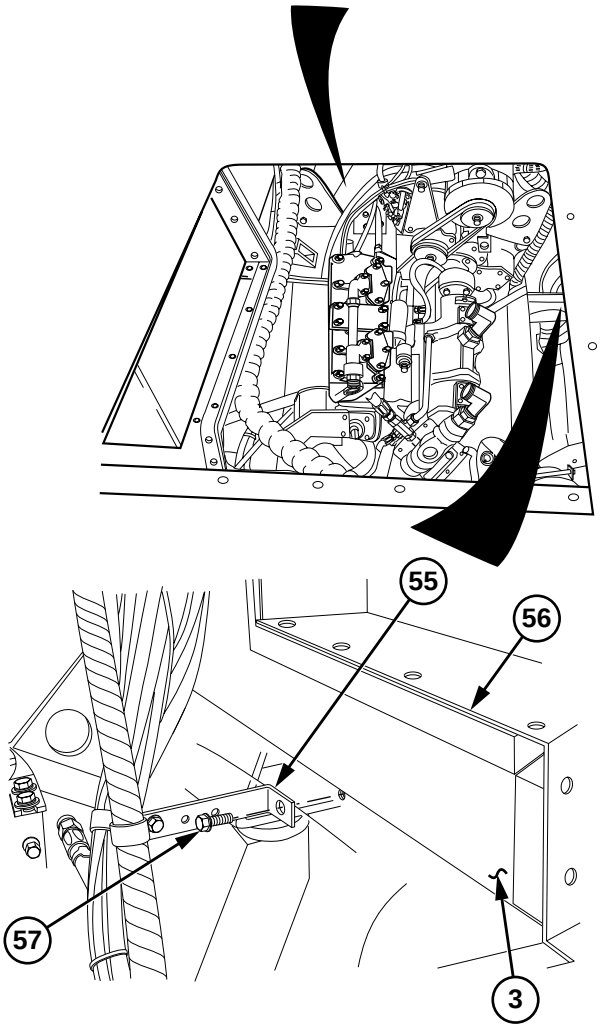


(22) Install bracket (55) on doghouse (56) with screw (57).

(23) Deleted.

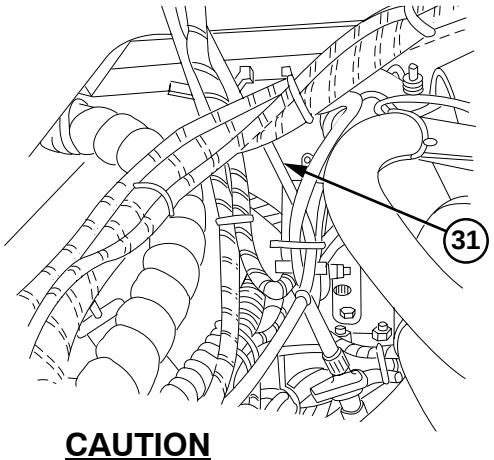
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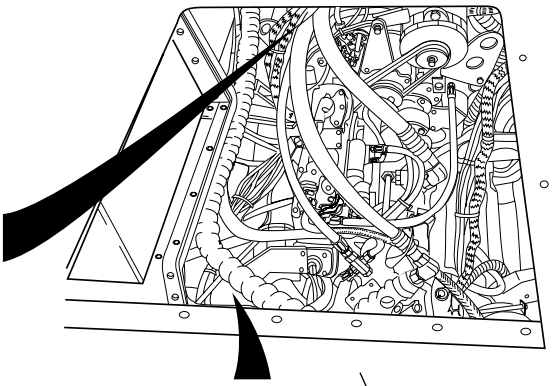
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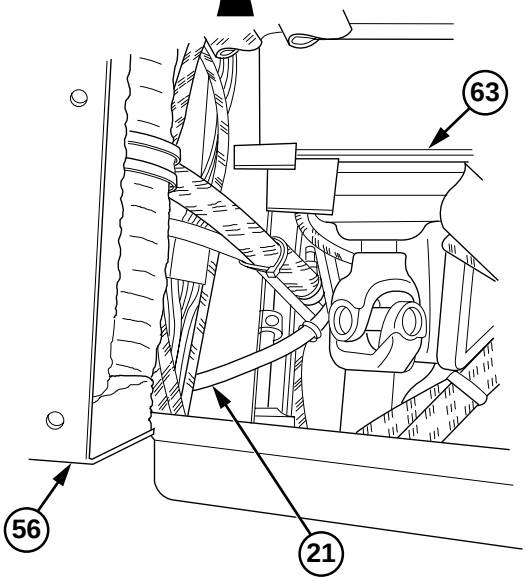


16-2. CAB REPLACEMENT (CONT)

(26) Route speedometer cable (31) and transmission cable (21) through doghouse (56) in front of PTO bracket (63).







CAUTION

Never use plastic cable ties to secure cable. Cable must maintain its natural shape. Failure to comply will result in difficult shifting.

NOTE

Transfer case cable and grommet are installed through hole in bottom of doghouse.

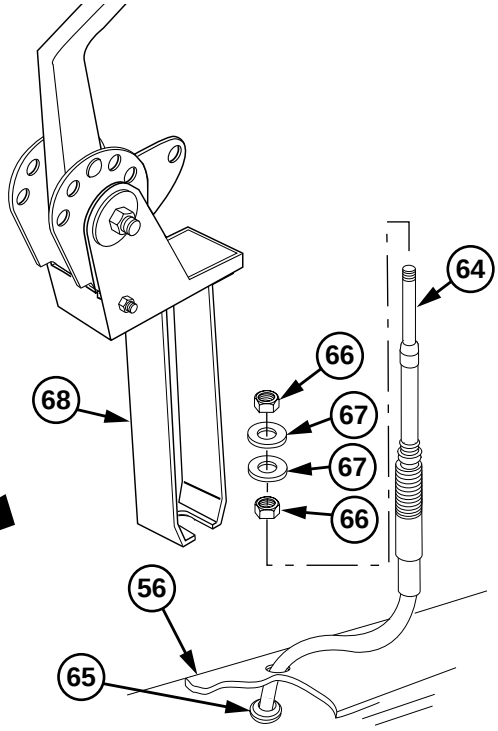
(27) Install transfer case shift cable (64) with grommet (65) in doghouse (56).

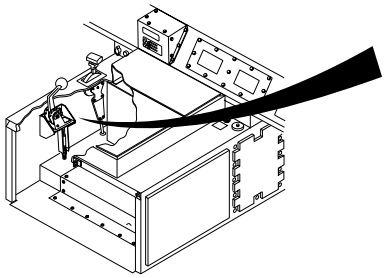
NOTE

Turn nuts until centered on threads of transfer case cable.

(28) Position two nuts (66) and washers (67) on transfer case shift cable (64). Do not tighten.

(29) Install transfer case shift cable (64) on support bracket (68) and tighten two nuts (66).



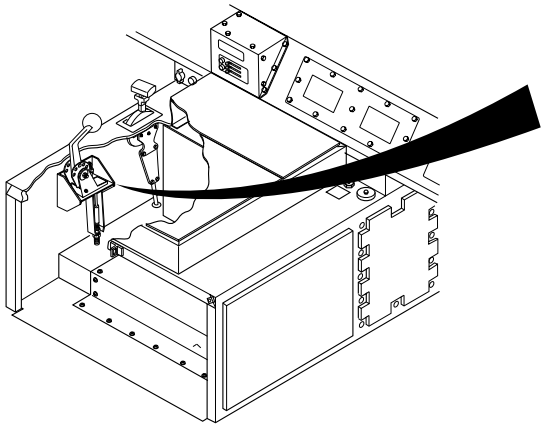


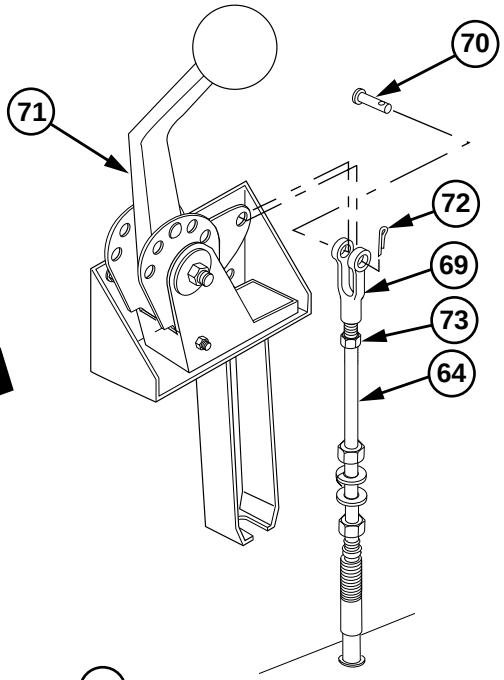
(30) Install yoke (69) on transfer case shift cable (64).

(31) Install pin (70) in transfer case shift lever (71) and yoke (69).

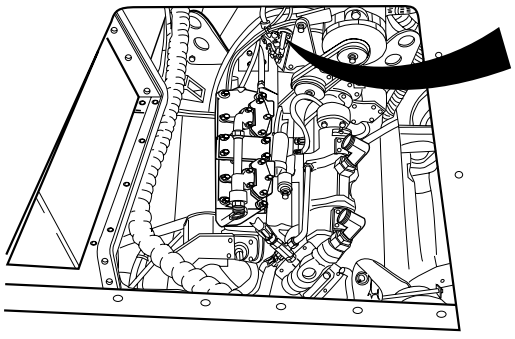
(32) Install new cotter pin (72) in pin (70).

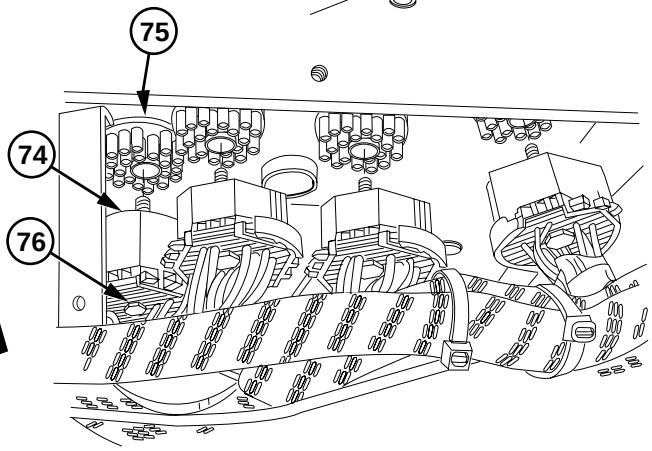
(33) Tighten jamnut (73) on yoke (69).





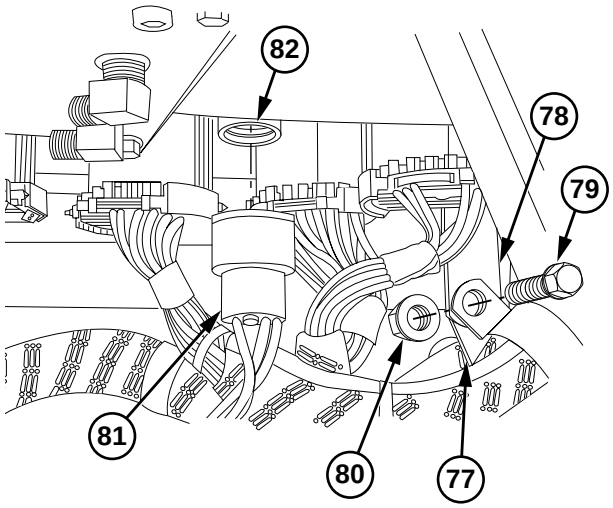
(34) Install four male electrical terminal blocks (74) on four receptacles (75). Tighten four screws (76) in center of male electrical terminal blocks (74).





(35) Install two clips (77) on standoff bracket (78) with screw (79) and new locknut (80).

(36) Connect 10-pin electrical connector (81) to receptacle (82).



16-2. CAB REPLACEMENT (CONT)

NOTE

Route wires through doghouse into cab.

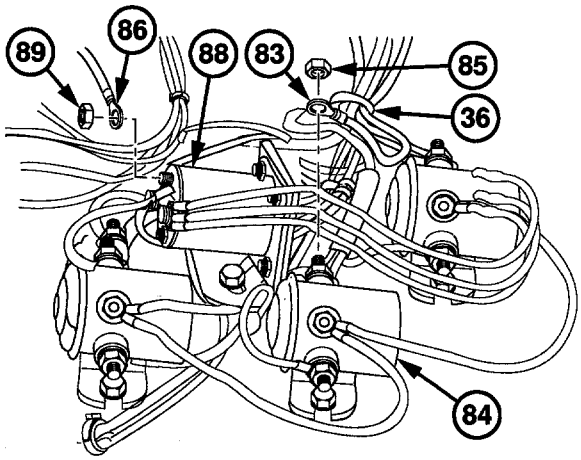
(37) Install wire no. 1430 (83) on relay (84) with nut (85).

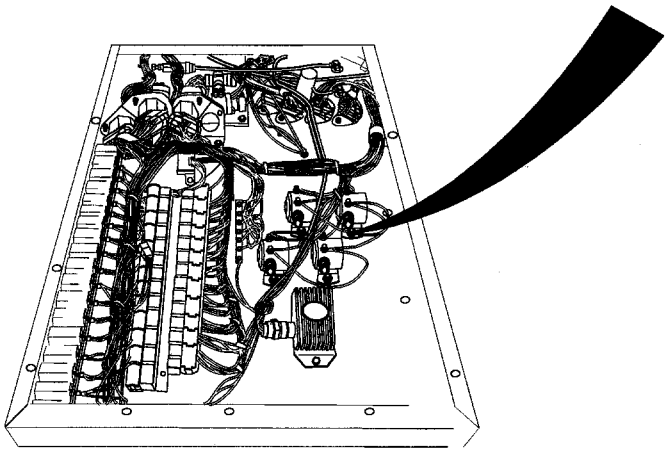
(38) Install wire no. 1280 (86) on relay (88) with nut (89).

NOTE

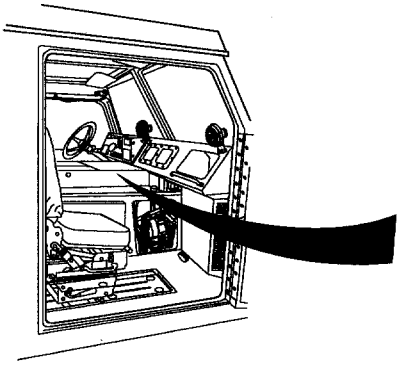
Plastic cable ties should be positioned in locations marked during removal.

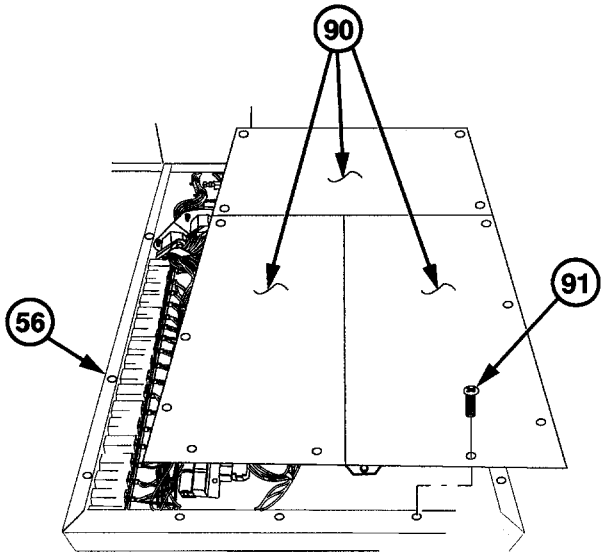
(39) Secure wires no. 1280 (86) and no. 1430 (83) with plastic cable ties (36).





(40) Install 3 top cover plates (90) on doghouse (56) with 19 screws (91).





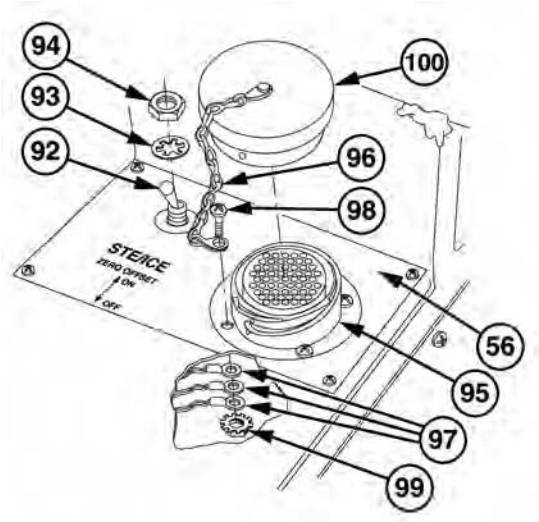
NOTE

Switch should be installed with ON position toward front of truck.

(41) Install STE/ICE ZERO OFFSET switch (92) on doghouse (56) with new lockwasher (93) and nut (94).

(42) Install STE/ICE connector (95), cap chain (96), and three ground straps (97) on doghouse (56) with four screws (98) and new locknuts (99).

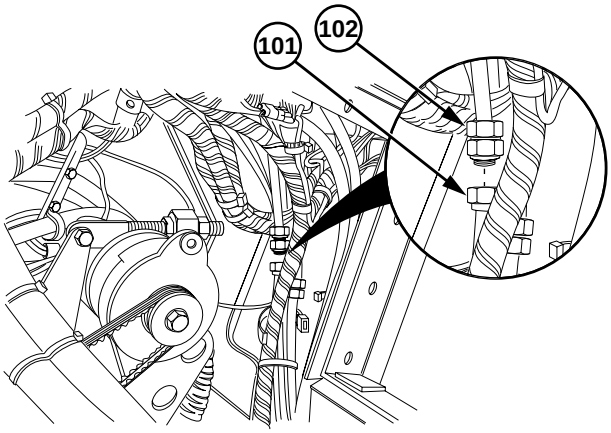
(43) Install cap (100) on STE/ICE connector (95).

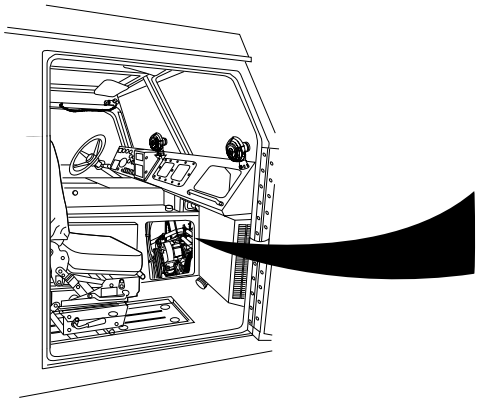


NOTE

Covers should be removed from air lines before installation.

(44) Install air lines (101) no. 2036, no. 2767, no. 2039, no. 2769, and no. 2762 on unions (102).



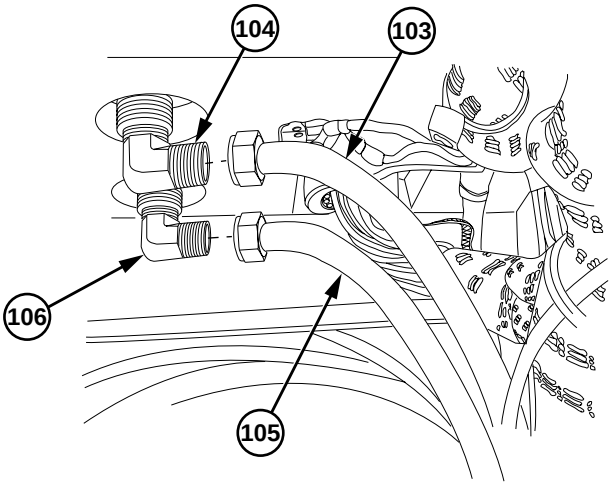


NOTE

Air lines in steps (45) thru (47) are installed through side access panel.

(45) Install air line no. 2005 (103) on outside elbow (104).

(46) Install air line no. 2619 (105) on inside elbow (106).



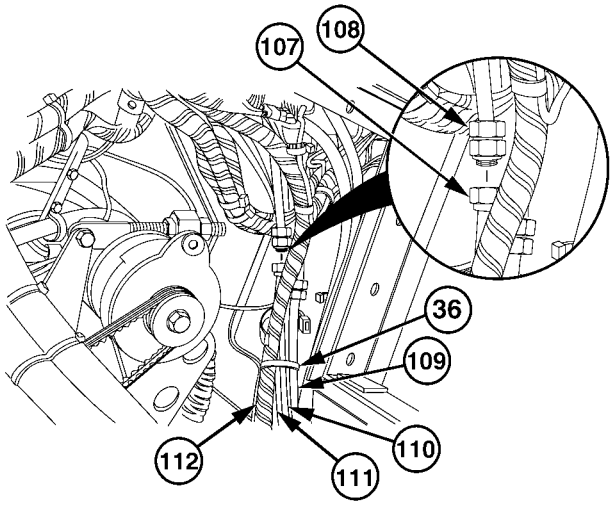
16-2. CAB REPLACEMENT (CONT)

(47) Install air lines (107) no. 2662, no. 2663, no. 2623, no. 2489, no. 2665, no. 2611, no. 2488, no. 2705, no. 2381, no. 2857, and no. 2612 on unions (108).

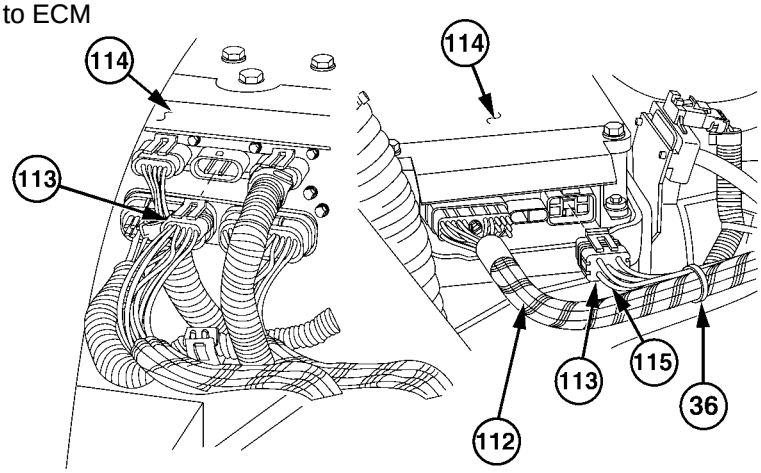
NOTE

Plastic cable ties should be positioned in locations marked during removal.

(48) Secure air lines no. 2381 (109), no. 2039 (110), and no. 2036 (111) to engine wiring harness (112) with plastic cable ties (36).



(49) Connect electrical connector (113) to ECM (114).

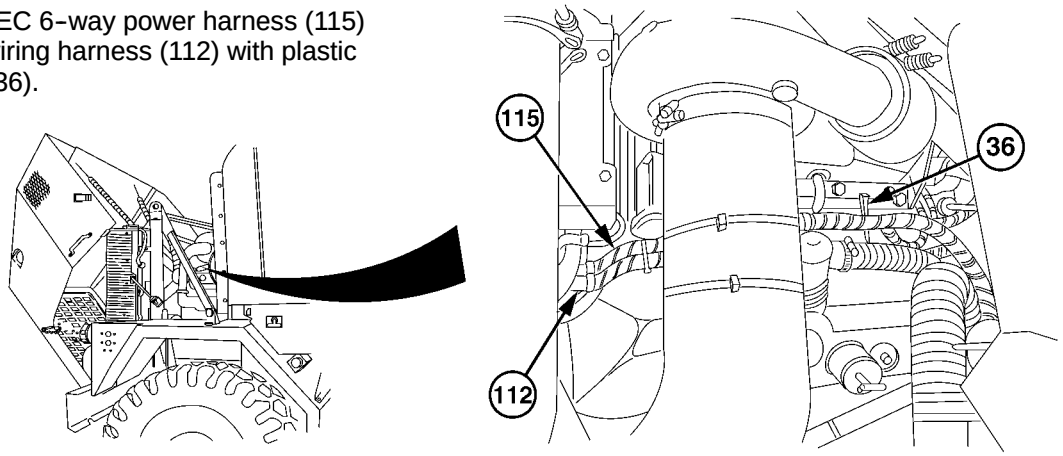


DDEC II DDEC III

NOTE

Plastic cable ties should be positioned in locations marked during removal.

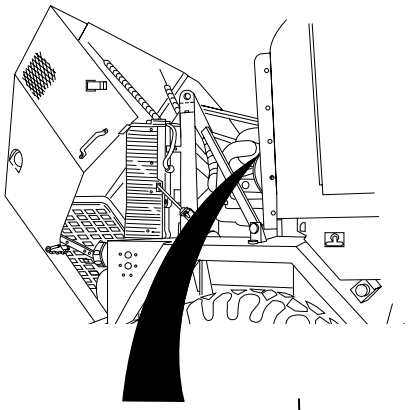
(50) Secure DDEC 6-way power harness (115) to engine wiring harness (112) with plastic cable ties (36).

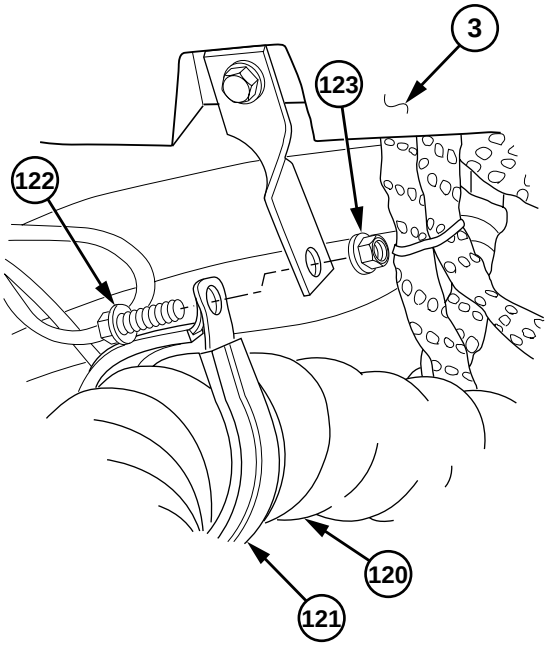


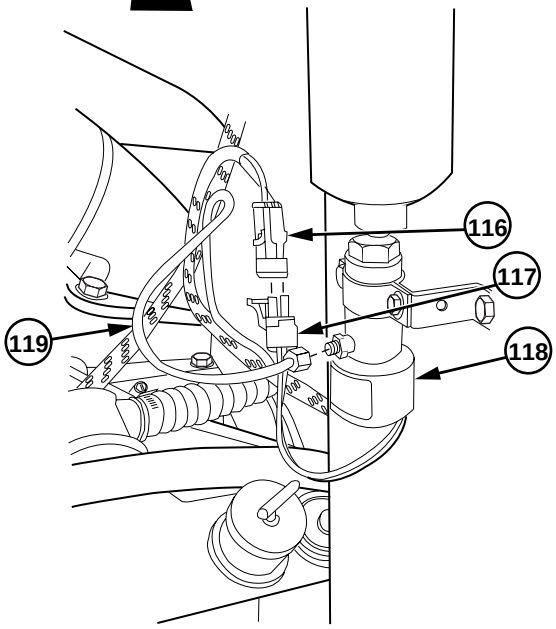
(51) Install electrical connector (116) on electrical connector (117) at ether start base (118).

(52) Install ether start line (119) on ether start base (118).

(53) Install air aspiration hose (120) and cushion clip (121) on cab (3) with screw (122) and new locknut (123).



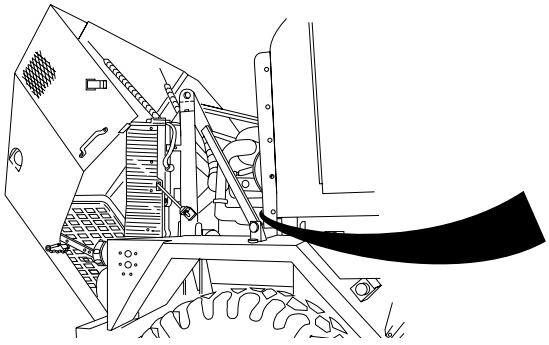


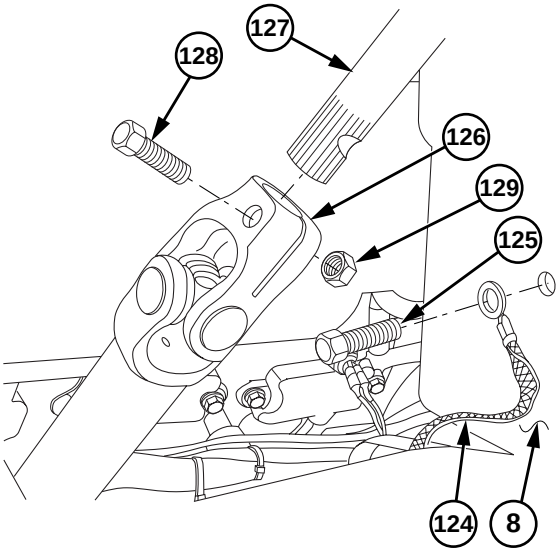


(54) Install ground strap (124) on cab mount (8) with screw (125).

(55) Coat area around screw (125) with anticorrosion grease.

(56) Install yoke (126) on top steering shaft no. 1 (127) with screw (128) and new locknut (129). Torque to 35 lb-ft (47 N·m).



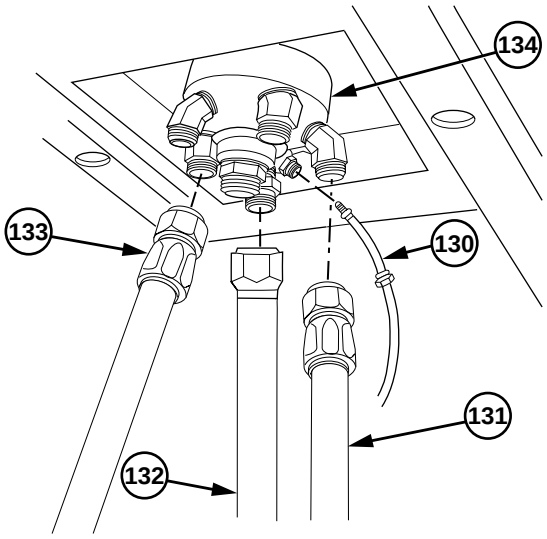


16-2. CAB REPLACEMENT (CONT)

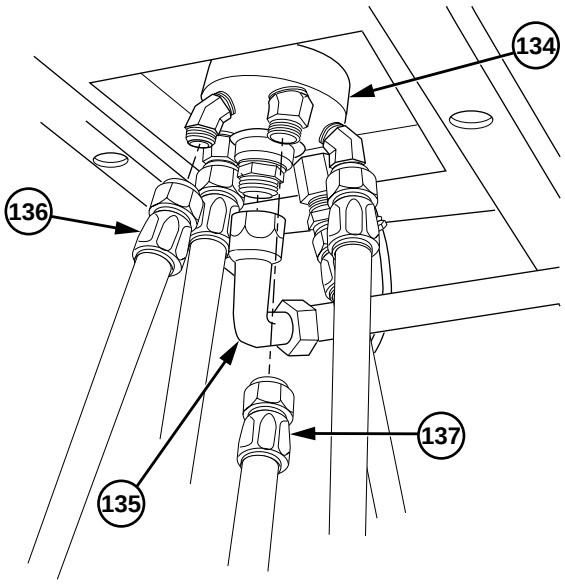
NOTE

Air line no. 2102 must be routed above transmission oil cooler lines no. 2382 and no. 2393.

(57) Install air lines no. 2108 (130), no. 2102 (131), no. 2100 (132), no. 2872 (133) on CTIS air manifold (134).



(58) Install air lines no. 2120 (135), no. 2104 (136), and no. 2106 (137) on CTIS air manifold (134).

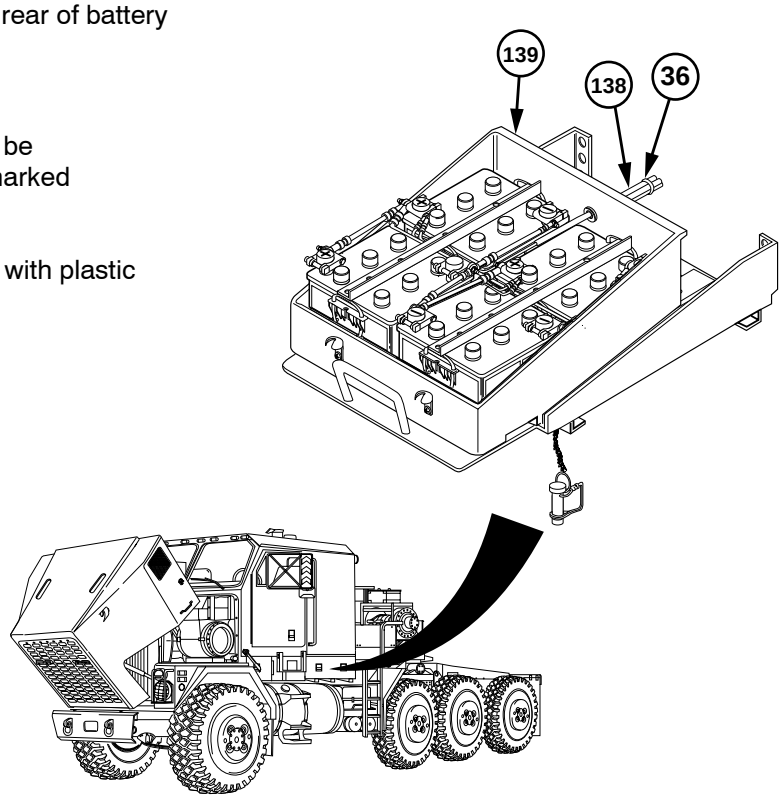


(59) Route DDEC wiring harness (138) and insert through center hole in rear of battery box (139).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(60) Secure wiring harness (138) with plastic cable ties (36).



c. Follow-On Maintenance

(1) Install spare tire (TM 9-2320-360-10).

(2) Fill steering reservoir (LO 9-2320-360-12).

(3) Fill engine (LO 9-2320-360-12).

(4) Fill transmission (LO 9-2320-360-12).

(5) Fill cooling system (LO 9-2320-360-12).

(6) Adjust transmission shift cable (TM 9-2320-360-20).

(7) Adjust transfer case shift cable (TM 9-2320-360-20).

(8) Install air cleaner (TM 9-2320-360-20).

(9) Connect batteries (TM 9-2320-360-20).

(10) Start engine (TM 9-2320-360-10).

(11) Build up air pressure to 120-125 psi.

(12) Shut off engine (TM 9-2320-360-10).

(13) Check for leaks (TM 9-2320-360-10).

(14) Install access panels (TM 9-2320-360-20).

16-3. WINDSHIELD REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Wiper arm removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Adhesive (Item 1, Appendix B)
Chips, Soap (Item 15, Appendix B)

Personnel Required
MOS 44B (2)

a. Removal

NOTE
Left and right windshields are replaced the same way.

(1) Deleted.

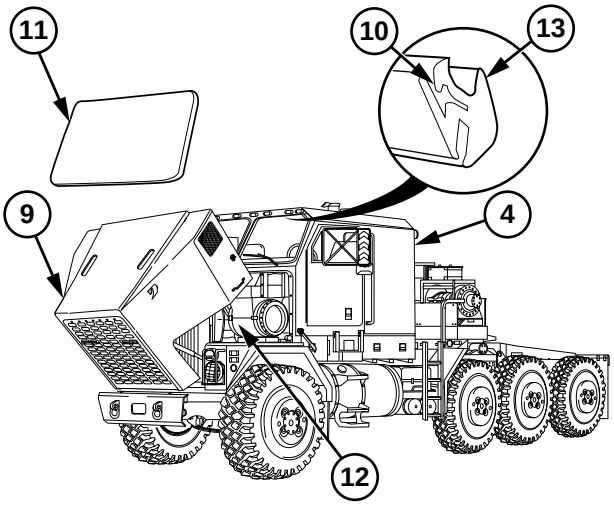
(2) Deleted.

(3) Deleted.

WARNING

Hood is not designed to be a work platform. Using hood as a work platform may result in injury or equipment damage.

(4) Open and secure hood (9).



WARNING

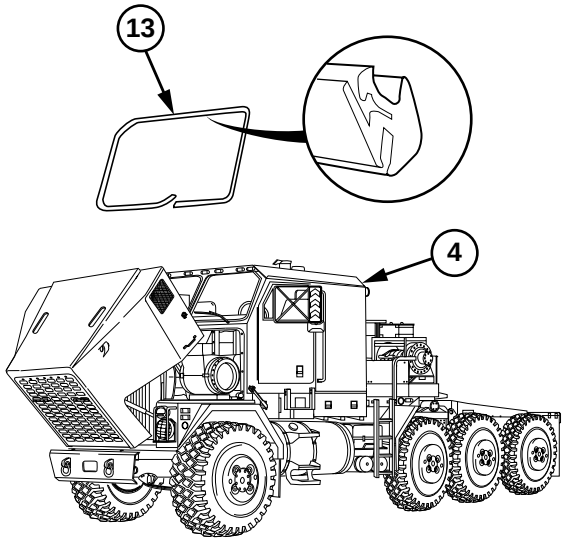
Always wear eye protection and protective clothing when handling glass. Failure to comply may result in injury.

CAUTION

If glass is broken, use care to keep broken pieces out of engine compartment. Failure to comply will result in equipment damage.

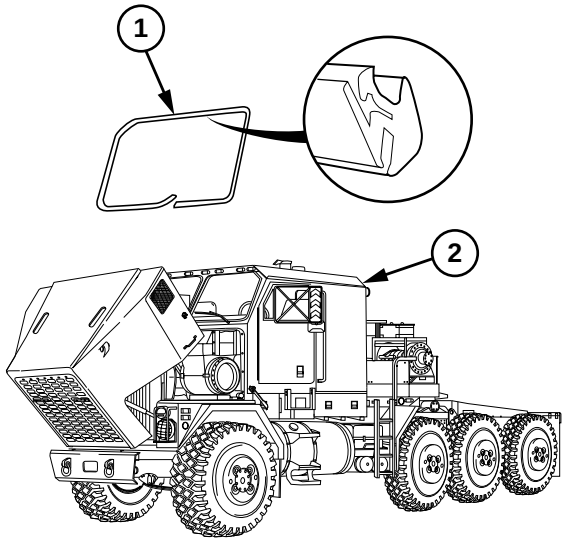
(5) Disengage windshield seal locking strip (10).

(6) Push windshield (11) out from inside cab (4) while assistant supports windshield from engine compartment (12).



(7) Remove windshield seal (13) from opening of cab (4).

16-3. WINDSHIELD REPLACEMENT (CONT)



b. Installation

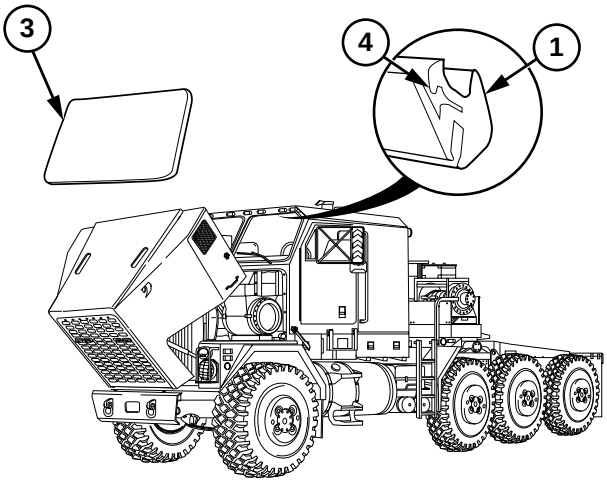
(1) Install windshield seal (1) in opening of cab (2).

WARNING

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

(2) Coat windshield seal ends (1) with adhesive.

(3) Coat windshield seal (1) with soapy water.



(4) Install windshield (3) in windshield seal (1) with aid of assistant.

(5) Engage windshield seal locking strip (4).

c. Follow-On Maintenance

(1) Install wiper arm (TM 9-2320-360-20).

(2) Close hood (TM 9-2320-360-10).

16-4. REAR WINDOW REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

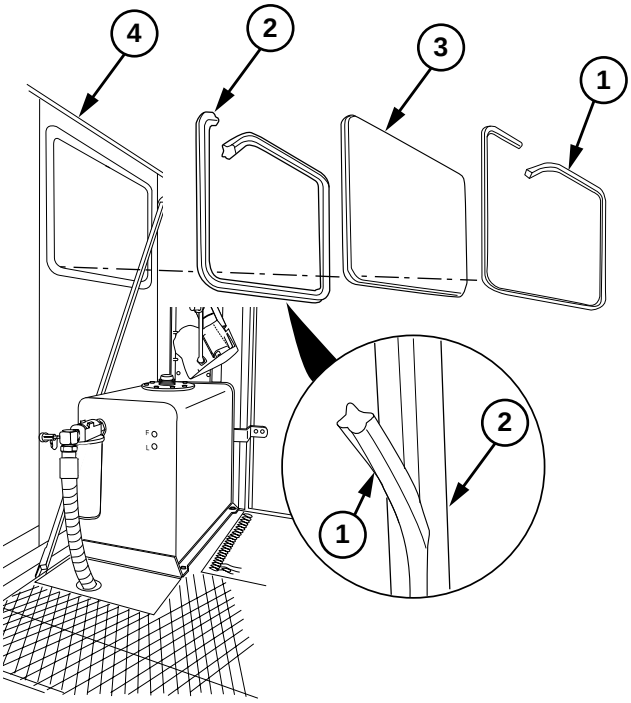
INITIAL SETUP

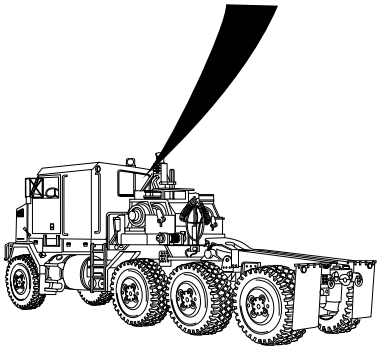
Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Adhesive (Item 1, Appendix B)
Chips, soap (Item 15, Appendix B)

Personnel Required
MOS 44B





a. Removal

(1) Remove locking strip (1) from locking channel (2).

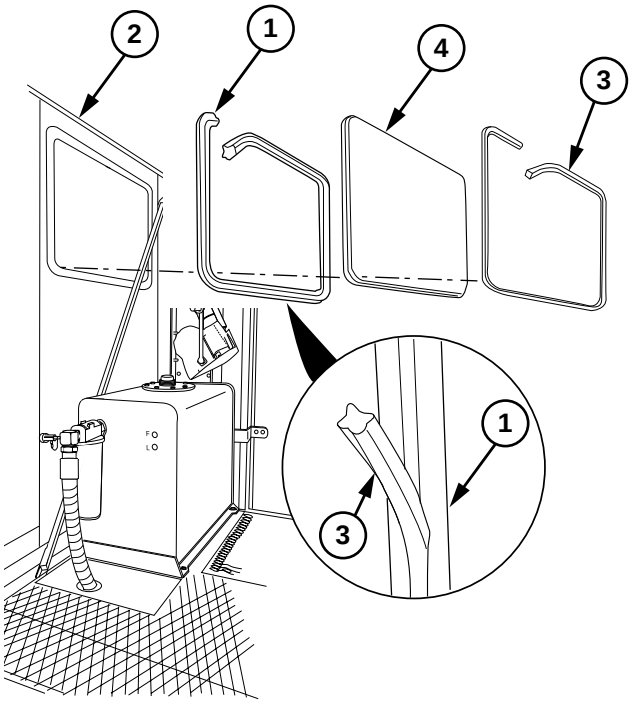
WARNING

Always wear eye protection and protective clothing when handling glass. Failure to comply may result in injury.

(2) Remove rear window (3) from locking channel (2).

(3) Remove locking channel (2) from rear cab wall (4).

16-4. REAR WINDOW REPAIR (CONT)



b. Installation

(1) Install locking channel (1) on cab rear wall (2) with locking slot facing out.

WARNING

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

(1.1) Fill gap between ends of locking channel (1) with adhesive.

(2) Coat locking channel (1) and strip (3) with soapy water.

(3) Install rear window (4) in locking channel (1).

(4) Install locking strip (3) in locking channel (1).

c. Follow-On Maintenance

Remove wheel chocks.

16-5. PEEP WINDOW REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Mirror removed (TM 9-2320-360-20).

Materials/Parts
Adhesive (Item 1, Appendix B)
Chips, soap, (Item 15, Appendix B)

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Personnel Required
MOS 44B

a. Removal

WARNING

Always wear eye protection and protective clothing when handling glass. Failure to comply may result in injury.

(1) Remove locking strip (1) from locking channel (2).

(2) Remove window glass (3) from locking channel (2).

(3) Remove locking channel (2) from door (4).

b. Installation

(1) Install locking channel (2) on door (4) with locking strip (1) facing out.

WARNING

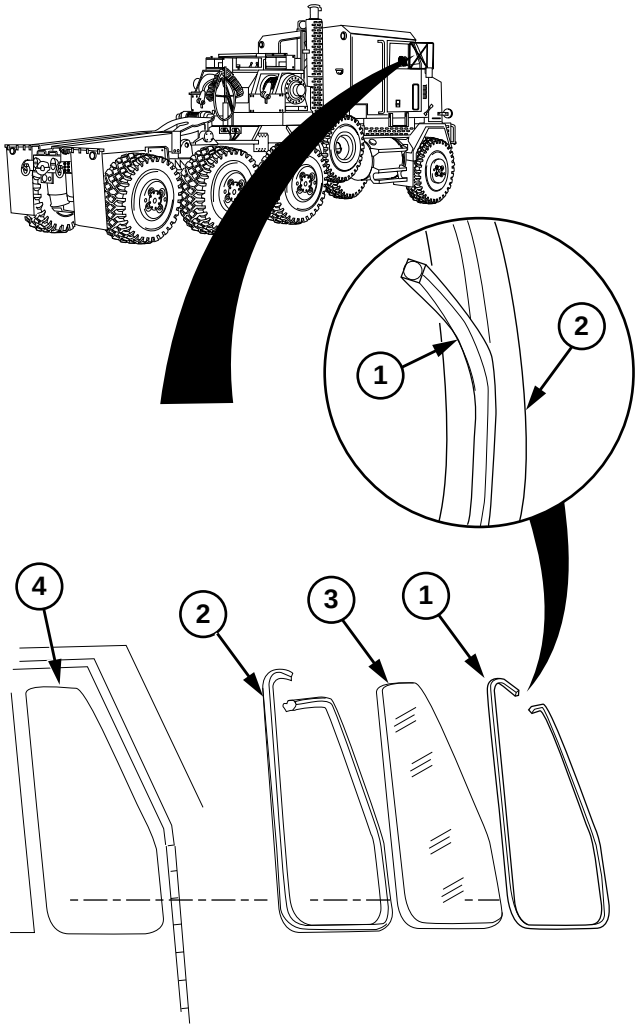
Adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive gets on skin or clothing, wash immediately with soap and water.

(1.1) Fill gap between ends of locking channel (1) with adhesive.

(2) Coat locking channel (2) and locking strip (1) with soapy water.

(3) Install window glass (3) in locking channel (2).

(4) Install locking strip (1) in locking channel (2).



c. Follow-On Maintenance

Install mirror (TM 9-2320-360-20).

16-6. FIBERGLASS REPAIR

This task covers:
a. Inspection
b. Cracks or Splits Repair
c. Hole Repair
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Body and Fender Repair (Item 200, Appendix E)

Materials/Parts
Repair Kit, Glass Reinforced Plastic Laminate (Item 52, Appendix B)

Personnel Required
MOS 44B

a. Inspection

NOTE
Fiberglass surfaces have thin layer of gel coat that may appear cracked in a spiderweb-like pattern due to flexing. No repair is required.

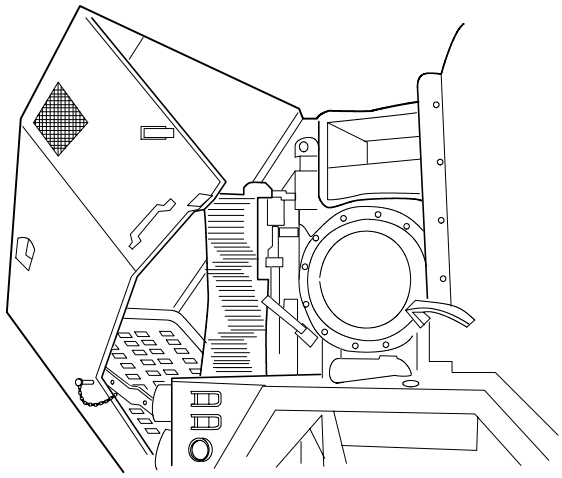
(1) Check cracks to determine if they are surface only or are deep breaks in material thickness.

NOTE
Filler material at bonding flanges may appear to be cracked, unless broken through, no repair is required.

(2) If total penetration crack greater than 1 in. (25.4 mm) exists in critical areas, i.e., hinges, latches, or hood stop areas, repair immediately.

(3) If total penetration cracks exist in noncritical areas, do not repair until size is larger than 3 in. (76.2 mm).

(4) If severe break develops in one area, remove fragmented material and go to subparagraph c., Hole Repair.



b. Cracks or Splits Repair

(1) Use sandpaper to remove dirt and paint 3-4 in. (76.2-100 mm) around area of crack.

NOTE

Surface must be dry before patch is added.

(2) Sand surface where patch will be added.

(3) Bevel edges of crack in a broad "V."

NOTE

Patch should extend beyond break about 2 in. (51 mm).

(4) Cut patch from fiberglass mat and apply resin mixture to underside. Extend patch beyond break about 2 in. (mm). Press firmly in place. Saturate with additional resin. Allow 1-3 hours to cure.

(5) Cover exposed surface with additional resin. Allow 1-3 hours to cure.

(6) For stress areas, lightly sand first patch, then repeat steps (4) and (5).

(7) Sand exposed surface until smooth.

(8) Prime and paint surface.

c. Holes Repair

(1) Remove damaged material. Bevel edges approximately 20 degrees at outside edge of hole.

(2) Remove dirt and paint 3-4 in. (8-10 cm) beyond hole area.

(3) Sand top and underside surface to which patch will be added.

NOTE

Patches should extend past edge of hole 2 in. (51 mm).

(4) Cut two patches of equal size from fiberglass mat.

(5) Coat top and underside surface of area being repaired and saturate both patches with resin mixture.

(6) When tacky, position one patch to inner surface and one patch to outer surface. Press patches together. Allow 1-3 hours to cure.

(7) Repeat steps (3) thru (8) to apply additional coats of resin (for appearance). Sand lightly between coats.

(8) Sand exposed surfaces until smooth.

(9) Prime and paint.

d. Follow-On Maintenance

Remove wheel chocks.

CHAPTER 17
WINCHES MAINTENANCE

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Section I. INTRODUCTION

17-1. INTRODUCTION

This chapter contains instructions for replacement and repair of winch components at the Direct Support maintenance level. Some subassemblies and parts must be removed before winch components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. MAINTENANCE PROCEDURES

17-2. WINCH REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

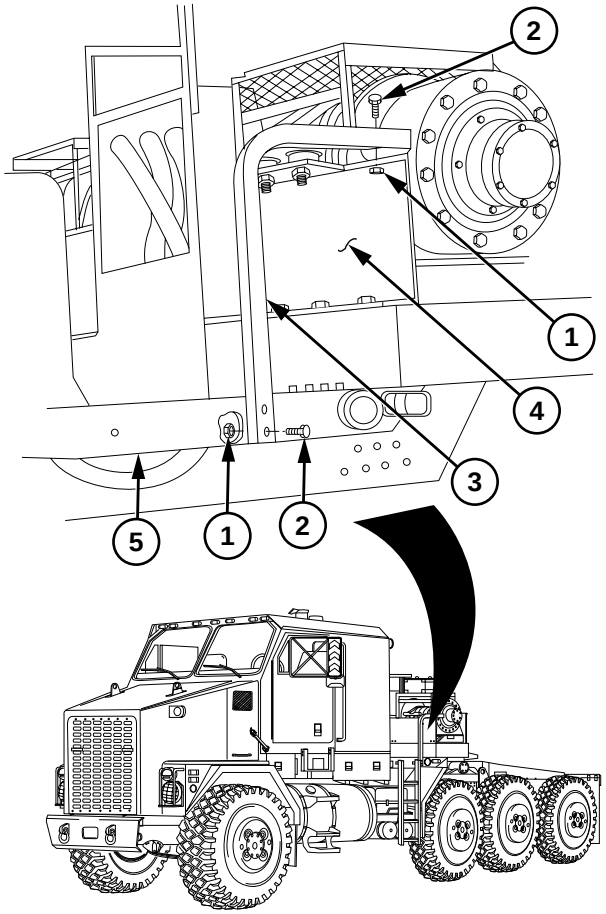
INITIAL SETUP

Equipment Conditions
Chock block stowage block removed (TM 9-2320-360-20).
Control console panels removed (TM 9-2320-360-20).
Winch cable removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Locknuts (4) (Item 81, Appendix F)
Lockwashers (8) (Item 125, Appendix F)

Personnel Required
Two



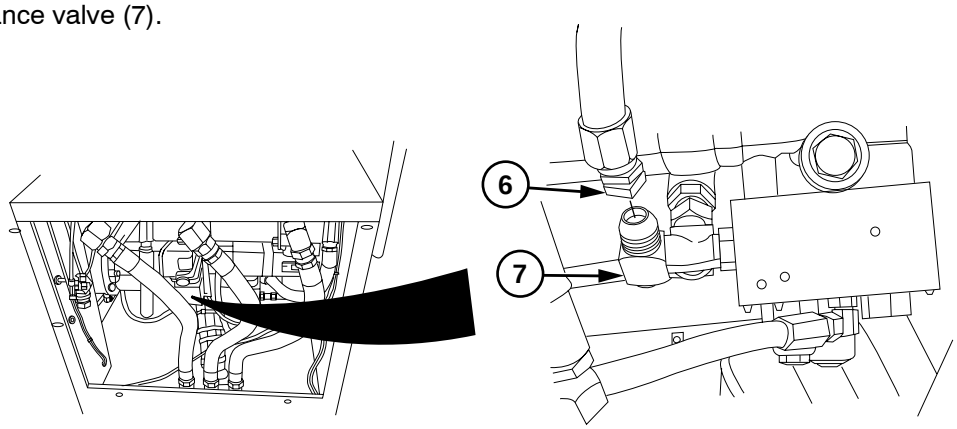
a. Removal

NOTE

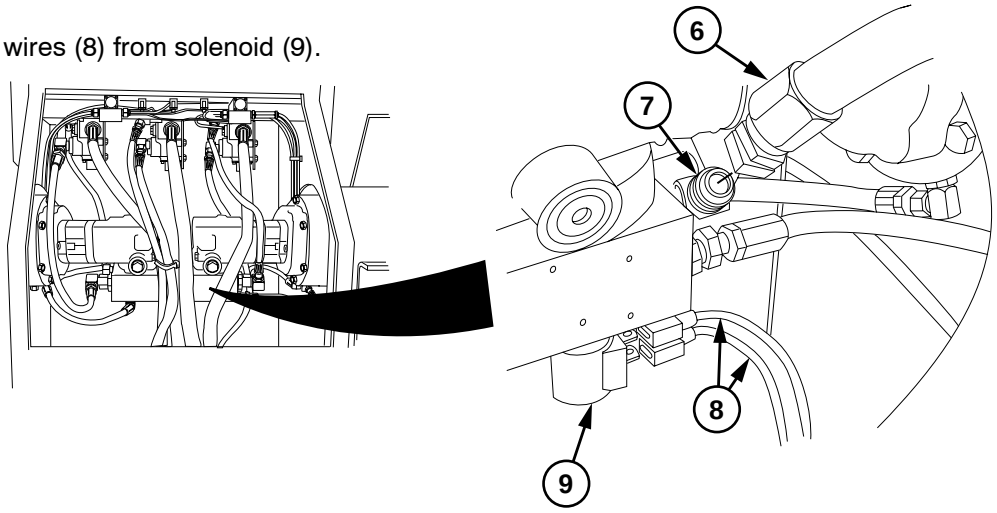
- Both winches are replaced the same way. Left side if shown.
- Do step (1) for left side only.
- Tag and mark air lines before removal.

(1) Remove four locknuts (1), screws (2) and grab handle (3) from winch assembly (4) and winch platform (5). Discard locknuts.

(2) Disconnect two hoses (6) from counterbalance valve (7).



(3) Disconnect wires (8) from solenoid (9).

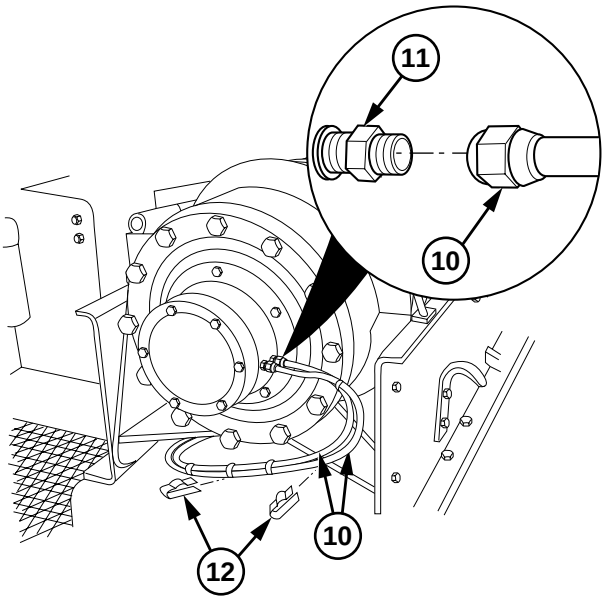


NOTE

Tag and mark air lines before removal.

(4) Remove two air lines (10) from fittings (11).

(5) Remove two clips (12) from air lines (10).



17-2. WINCH REPLACEMENT (CONT)

(6) Remove air line (13) from fitting (11).

(7) Remove clip (14) from air line (13).

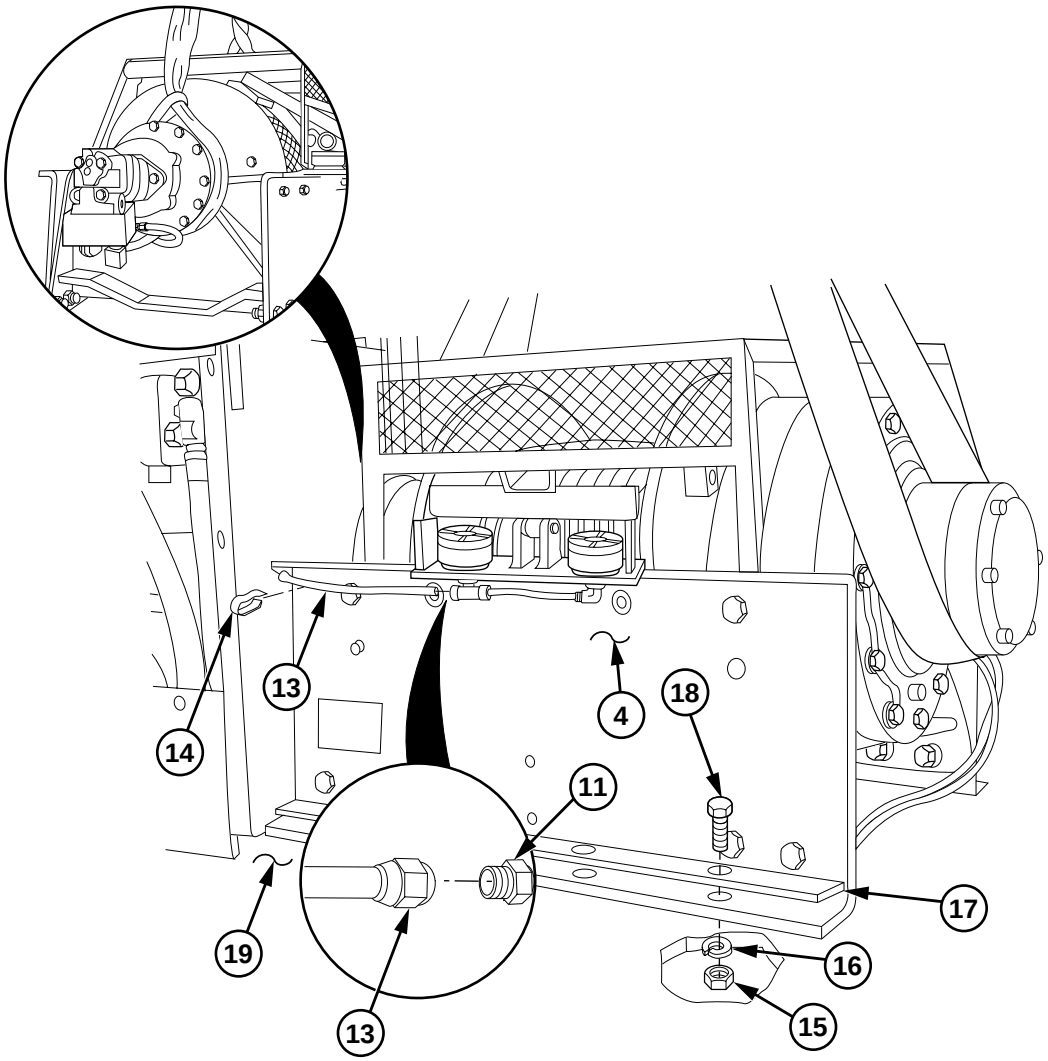
(8) Remove eight nuts (15), lockwashers (16), two plates (17), and eight screws (18) from winch assembly (4). Discard lockwashers.

WARNING

Winch assembly weighs 1900 lb (862 kg). Stay clear of winch assembly while lifting. Failure to do so may result in serious injury or death to personnel.

(9) Attach lifting device to winch assembly (4).

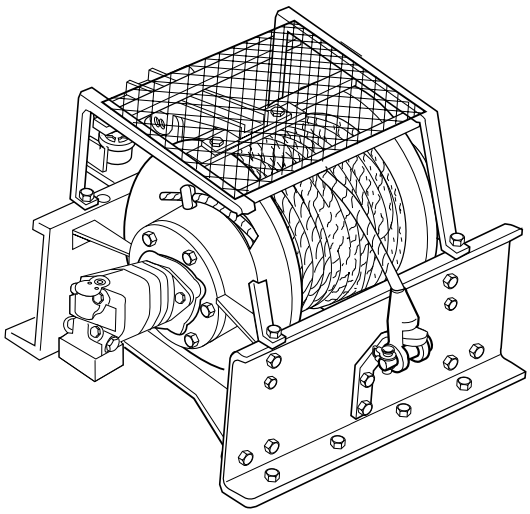
(10) Remove winch assembly (4) from winch frame (19) while assistant operates lifting device.



b. Installation

WARNING

Driver's side and passenger's side winches are not interchangeable. Winch cable slot on drum is on gear end for driver's side winch and on motor end for passenger's side winch. Failure to install correct winch may result in injury to personnel and improper winch operation.



PASSENGER SIDE WINCH

(1) Attach lifting device to winch assembly (1).

(2) Position winch assembly (1) on winch frame (2) while assistant operates lifting device.

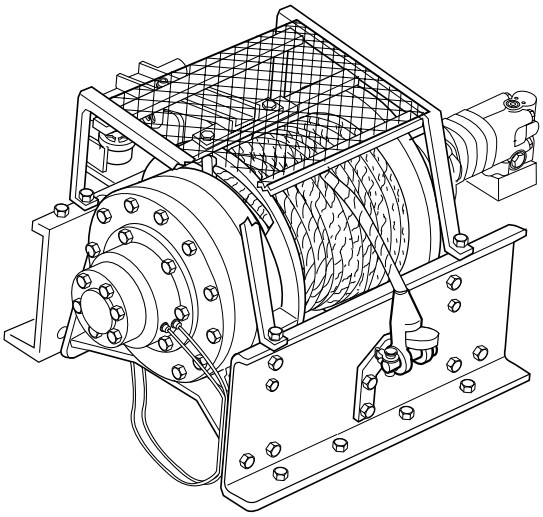
(3) Align holes of winch assembly (1) with holes on winch frame (2).

(4) Install two plates (3) on winch assembly (1) with eight screws (4), new lockwashers (5), and nuts (6). Torque to 600 lb-ft (813 N·m).

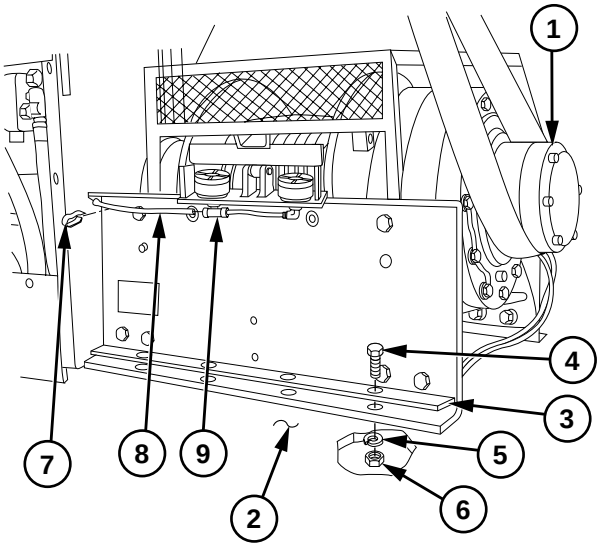
(5) Remove lifting device from winch assembly (1).

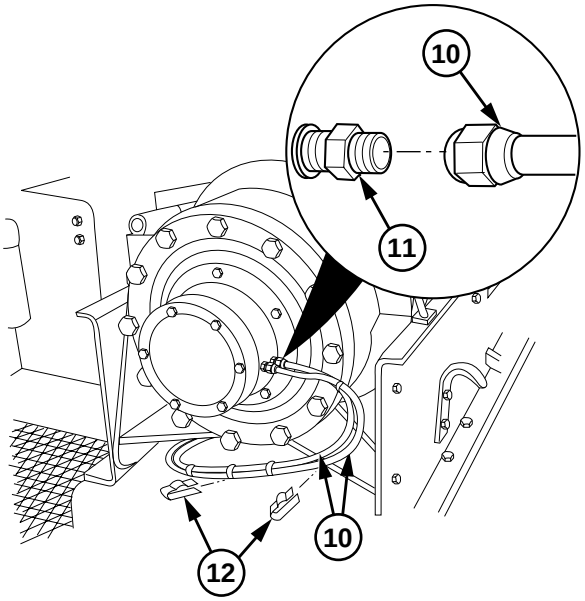
(6) Install clip (7) on air line (8).

(7) Install air line (8) on fitting (9).



DRIVER SIDE WINCH





(8) Connect two air lines (10) to fittings (11).

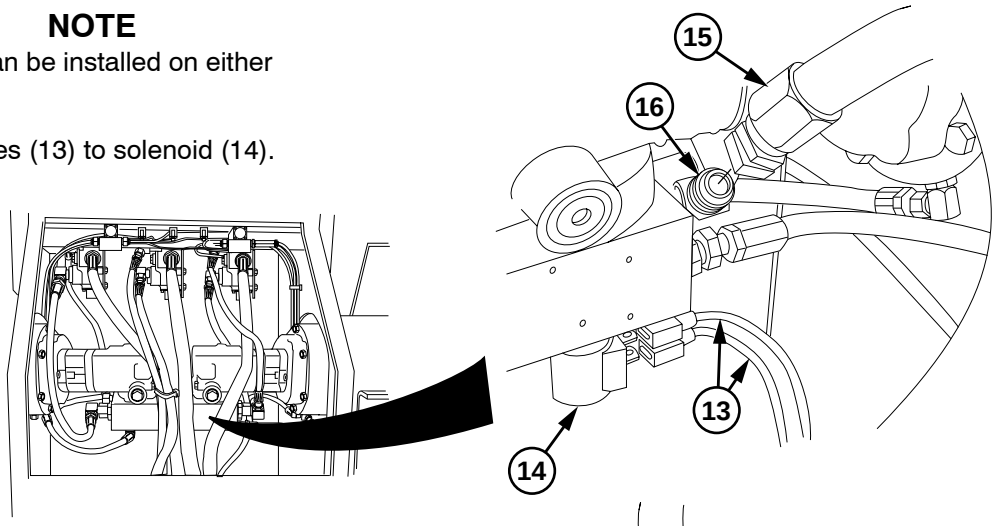
(9) Install two clips (12) on air lines (10).

17-2. WINCH REPLACEMENT (CONT)

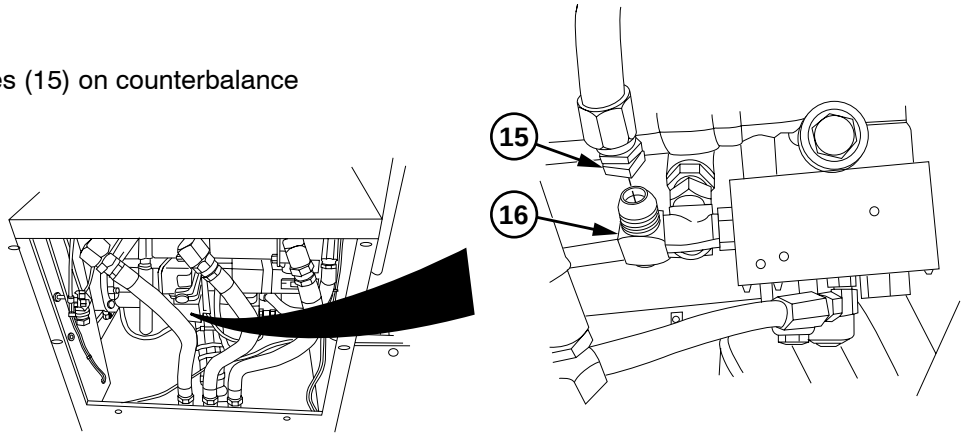
NOTE

Wires can be installed on either terminal.

(10) Connect wires (13) to solenoid (14).



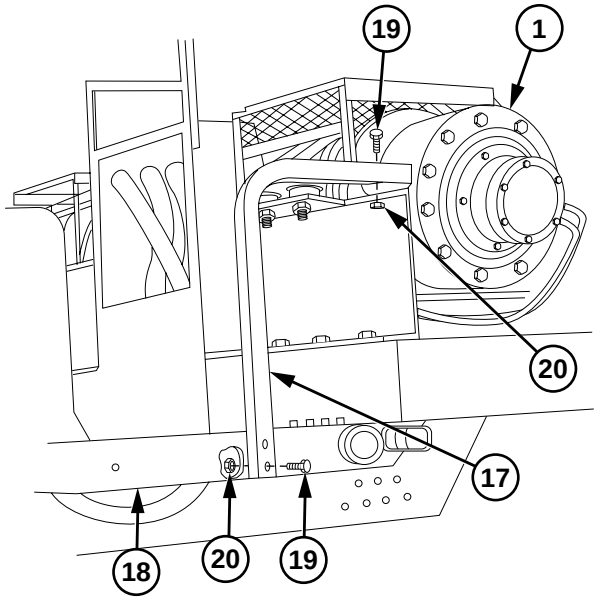
(11) Connect two hoses (15) on counterbalance valve (16).



NOTE

Do step (12) for left side only.

(12) Install grab handle (17) on winch platform (18) and winch assembly (1) with four screws (19) and new locknuts (20).



c. Follow-On Maintenance

(1) Install control console panels (TM 9-2320-360-20).

(2) Install chock block stowage box (TM 9-2320-360-20).

(3) Install winch cable (TM 9-2320-360-20).

17-3. WINCH PLATFORM REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Air system drained (TM 9-2320-360-10).
Battery box pulled out (TM 9-2320-360-10).
Exhaust heat shield removed (TM 9-2320-360-20).
Left rear fender removed (TM 9-2320-360-20).
Right rear fender removed (TM 9-2320-360-20).
Tail pipe assembly support removed (TM 9-2320-360-20).
Clearance lights removed (TM 9-2320-360-20).
Reflectors removed (TM 9-2320-360-20).
Winch ladder removed (TM 9-2320-360-20).
Catwalk removed (TM 9-2320-360-20).
Winch return hose removed (TM 9-2320-360-20).
Winch return manifold removed (TM 9-2320-360-20).
Auxiliary winch removed (TM 9-2320-360-20).
Hydraulic reservoir removed (TM 9-2320-360-20).
Arctic kit battery box removed (if equipped) (TM 9-2320-360-20).
Hydraulic pump removed (para 17-11).
Winches removed (para 17-2).
Control console removed (para 17-7).
Decontamination unit removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Jackstands (4) (Item 93, Appendix E)
Sling Assembly (Item 160, Appendix E)
Socket Set, Deep Well, 12 Point, 1/2 In. Drive (Item 167, Appendix E)
Wrench, Impact, Electric, 1 In. (Item 223, Appendix E)
Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)

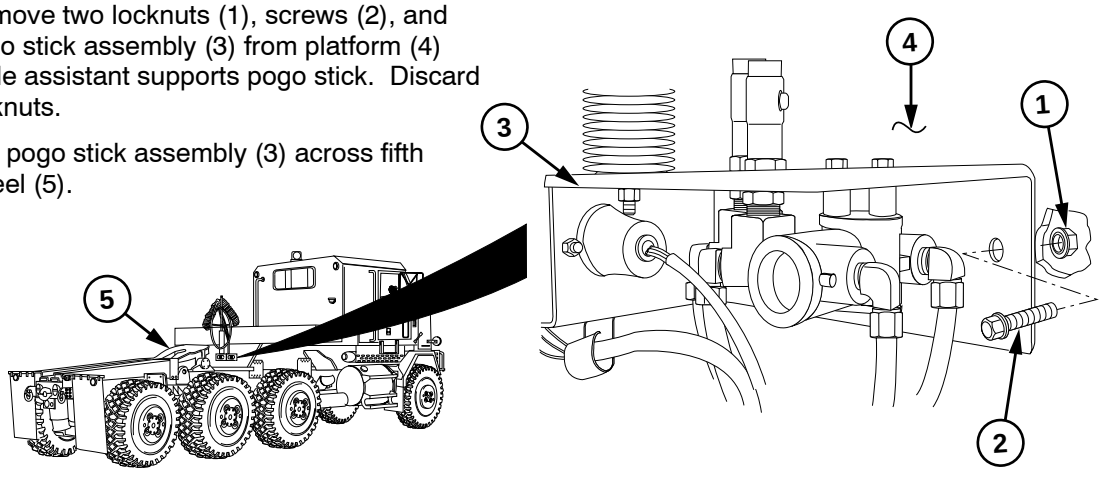
Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Rope, 50 Ft (Item 53, Appendix B)
Ties, Cable, Plastic (Item 60, Appendix B)
Locknuts (56) (Item 88, Appendix F)
Locknuts (4) (Item 86, Appendix F)
Locknuts (4) (Item 96, Appendix F)

Personnel Required
Three

a. Removal

(1) Remove two locknuts (1), screws (2), and pogo stick assembly (3) from platform (4) while assistant supports pogo stick. Discard locknuts.

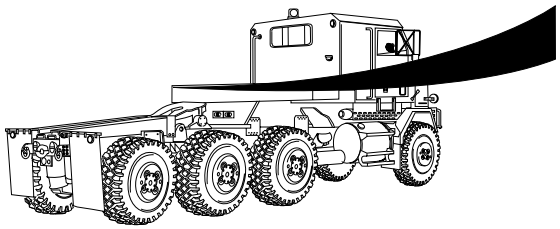
(2) Lay pogo stick assembly (3) across fifth wheel (5).

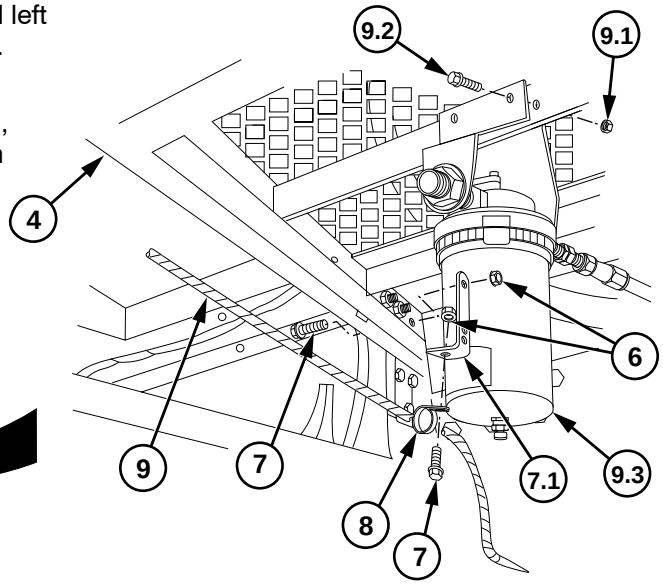


17-3. WINCH PLATFORM REPLACEMENT (CONT)

(3) Remove four locknuts (6), screws (7), two brackets (7.1), two cushion clips (8), and left wire harness (9) from winch platform (4). Discard locknuts.

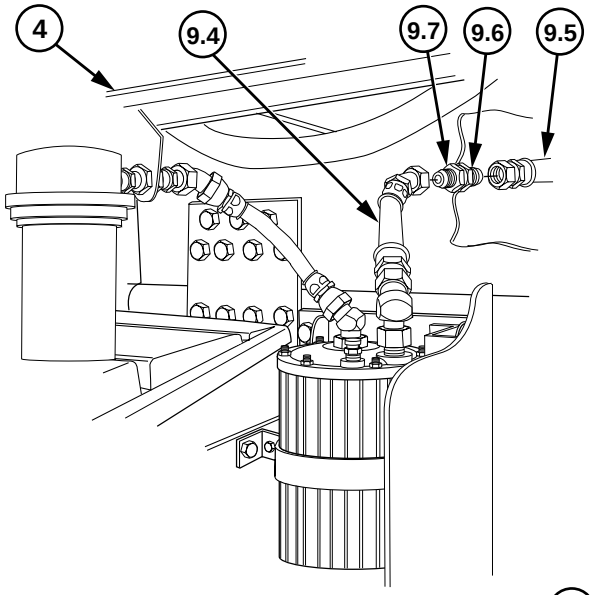
(3.1) Remove two locknuts (9.1), screws (9.2), and coalescing filter assembly (9.3) from winch platform (4). Discard locknuts.





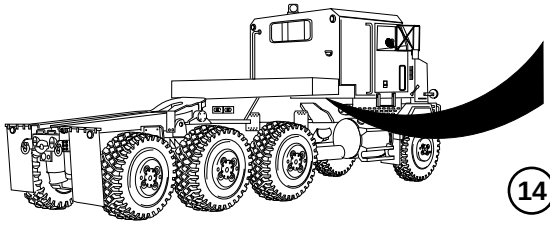
(3.2) Remove hose no. 2001 (9.4) and hose no. 2001 (9.5) from bulkhead fitting (9.6).

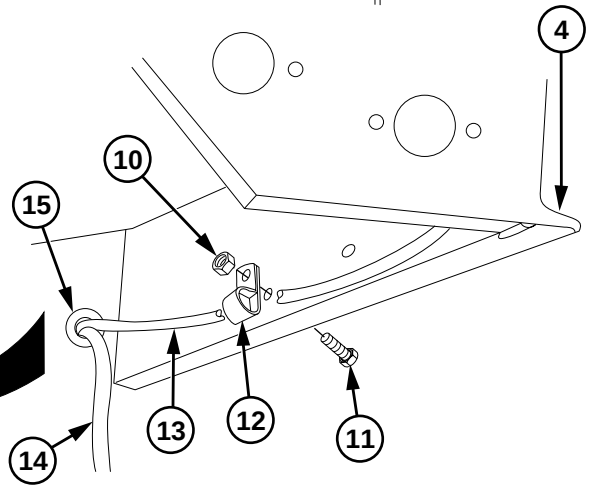
(3.3) Remove nut (9.7) and bulkhead fitting (9.6) from winch platform (4).



(4) Remove locknut (10), screw (11), and cushion clip (12) from right wire harness (13). Discard locknut.

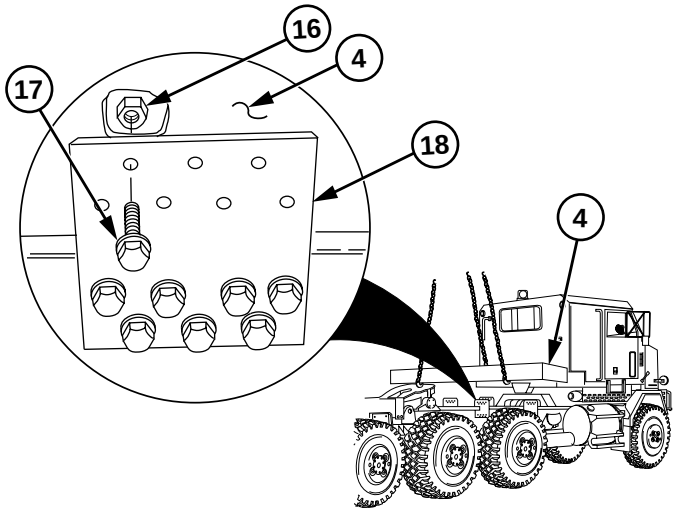
(5) Pull air hose no. 2762 (14), wire harness (13), and grommet (15) through winch platform (4).





WARNING

Winch platform weighs 1225 lb (556 kg). Stay clear of winch assembly while lifting. Failure to do so may result in serious injury or death to personnel.



(6) Attach suitable lifting device to winch platform (4) for support.

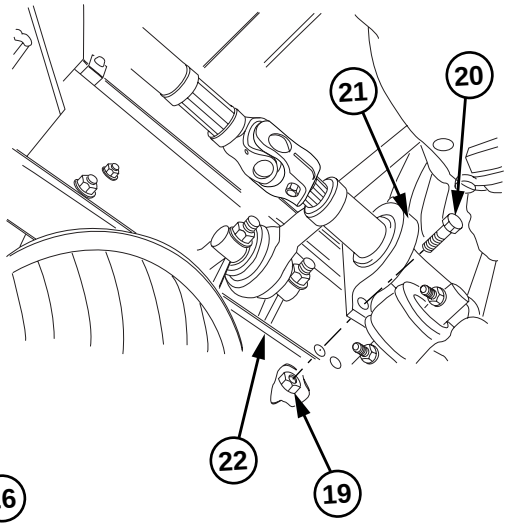
(7) Remove 28 locknuts (16) and screws (17) from winch platform (4) and 4 mounting plates (18) with aid of assistant.

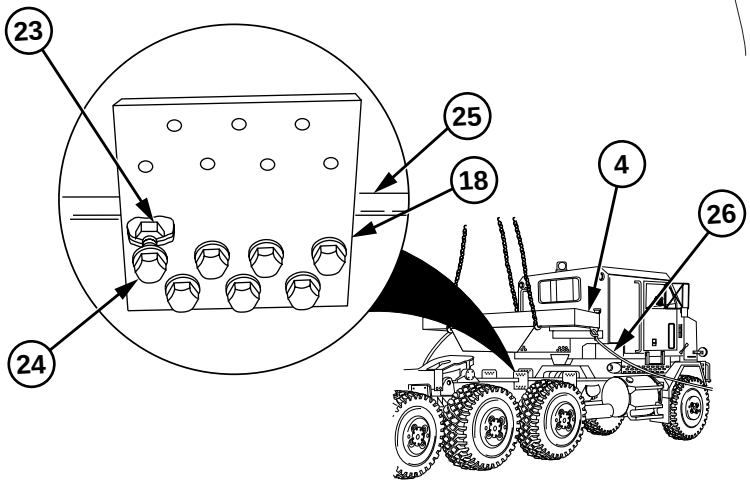
(8) Remove two locknuts (19) and screws (20) from steering shaft carrier bearing (21) and frame (22). Discard locknuts .

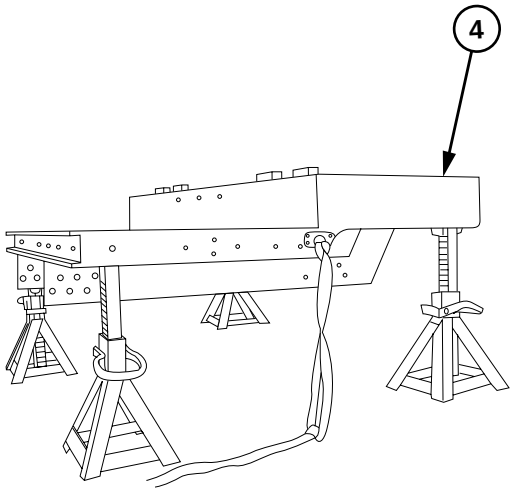
(9) Loosen 28 locknuts (23) and screws (24) from frame rail (25) and four mounting plates (18) with aid of assistant.

(10) Attach guide ropes (26) to left and right side of winch platform (4).

(11) Raise winch platform (4) with lifting device and remove from HET tractor with aid of assistants.



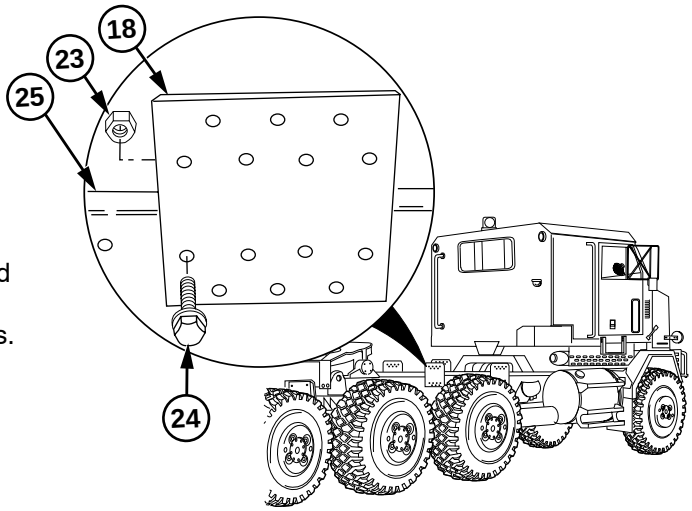




(12) Position winch platform (4) on four jackstands.

(13) Remove lifting device from winch platform (4).

17-3. WINCH PLATFORM REPLACEMENT (CONT)

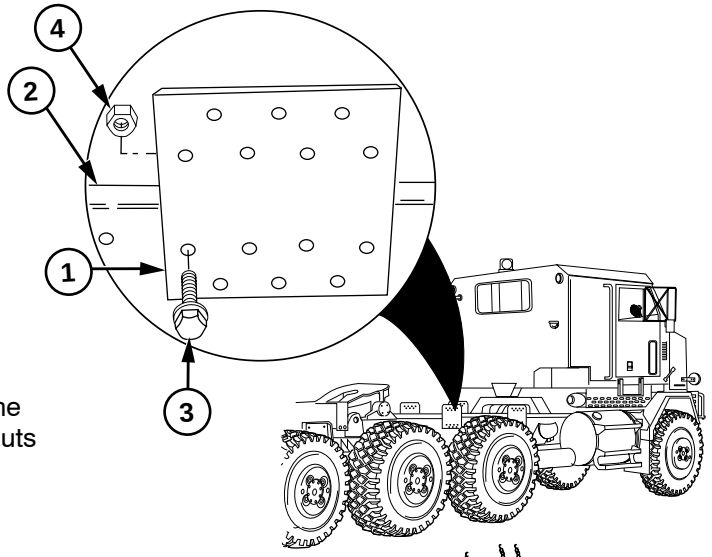


NOTE

Do step (14) only if replacing mounting plates.

(14) Remove 28 locknuts (23), screws (24), and four mounting plates (18) from frame rail (25) with aid of assistant. Discard locknuts.

b. Installation



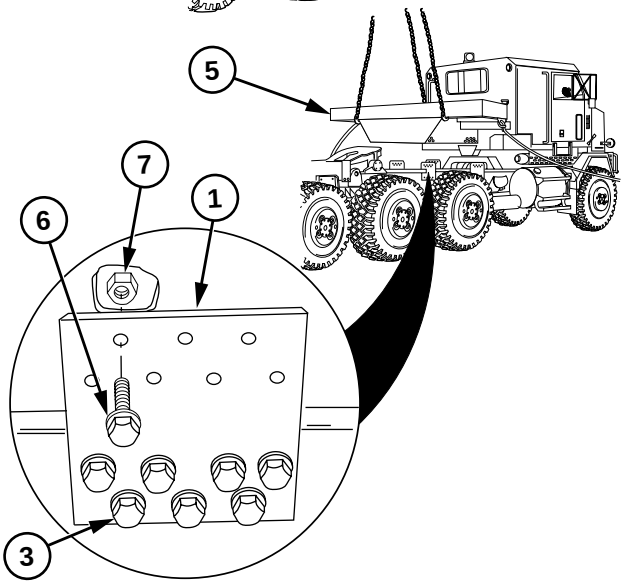
CAUTION

The two lower left screws on driver's side rear plate must be installed from inside of frame rail. Failure to comply may result in damage to steering shafts.

NOTE

Do step (1) only if mounting plates were removed.

(1) Position four mounting plates (1) on frame rail (2) with 28 screws (3) and new locknuts (4) with aid of assistant. Do not tighten.



WARNING

Winch platform weighs 1225 lb (556 kg). Stay clear of winch assembly while lifting. Failure to do so may result in serious injury or death to personnel.

(2) Attach lifting device to winch platform (5).

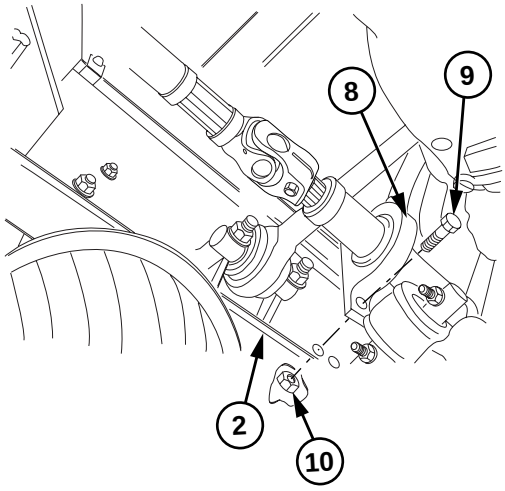
(3) Raise lifting device and winch platform (5) and position on HET tractor with aid of assistant.

(4) Install winch platform (5) on mounting plates (1) with 28 screws (6) and new locknuts (7) with aid of assistant. Torque to 375 lb-ft (508 N·m).

(5) Tighten 28 screws (3) to 375 lb-ft (508 N·m).

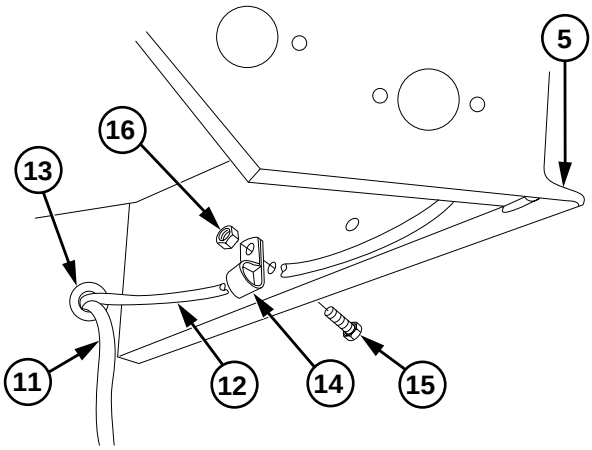
(6) Install steering shaft no. 3 carrier bearing (8) on frame rail (2) with two screws (9) and new locknuts (10). Torque to 44 lb-ft (60 N·m).

(7) Remove lifting device from winch platform (5).



(8) Route air hose no. 2762 (11), right wire harness (12), and grommet (13) through winch platform (5).

(9) Install cushion clip (14) on right wire harness (12) and winch platform (5) with screw (15) and new locknut (16).



WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

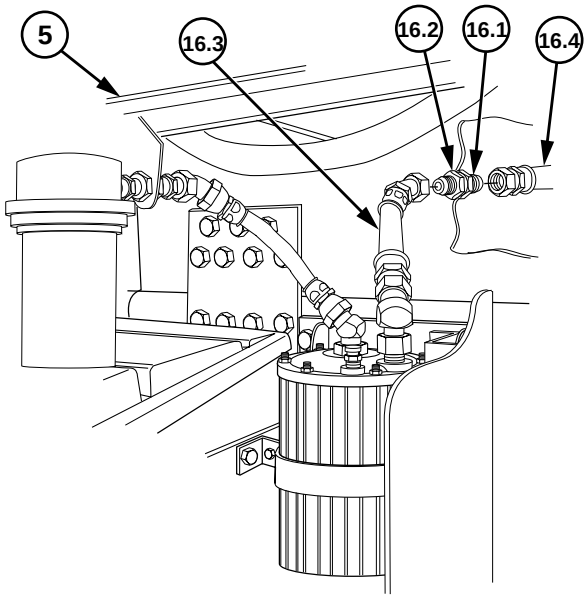
CAUTION

Only apply adhesive-sealant to threads that contact nut.

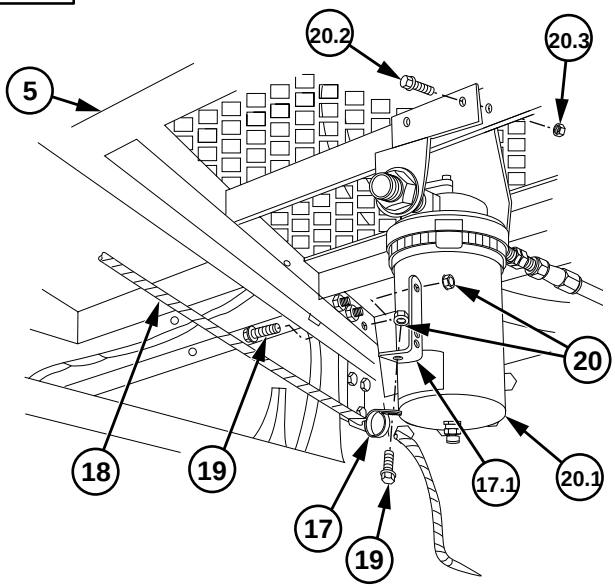
(9.1) Coat middle threads of bulkhead fitting (16.1) with adhesive-sealant.

(9.2) Install bulkhead fitting (16.1) on winch platform (5) with nut (16.2).

(9.3) Install hose no. 2001 (16.3) and hose no. 2001 (16.4) on bulkhead fitting (16.1).

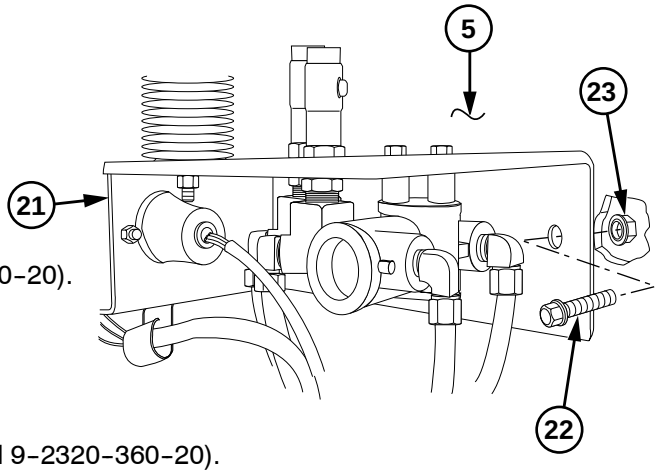


17-3. WINCH PLATFORM REPLACEMENT (CONT)



(10) Install two cushion clips (17) and brackets (17.1) on left wire harness (18) and winch platform (5) with four screws (19) and new locknuts (20).

(10.1) Install coalescing filter (20.1) on winch platform (5) with two screws (20.2) and new locknuts (20.3).



(11) Install pogo stick assembly (21) on winch platform (5) with two screws (22) and new locknuts (23) with aid of assistant. Torque to 110 lb-ft (149 N·m).

c. Follow-On Maintenance

(1) Install decontamination unit (TM 9-2320-360-20).
(2) Install control console (para 17-7).
(3) Install winches (para 17-2).
(4) Install hydraulic pump (para 17-11).
(5) Install arctic kit battery box (if equipped) (TM 9-2320-360-20).
(6) Install hydraulic reservoir (TM 9-2320-360-20).
(7) Install auxiliary winch (TM 9-2320-360-20).
(8) Install winch return manifold (TM 9-2320-360-20).
(9) Install winch return hose (TM 9-2320-360-20).
(10) Install catwalk (TM 9-2320-360-20).
(11) Install winch ladder (TM 9-2320-360-20).
(12) Install reflectors (TM 9-2320-360-20).
(13) Install clearance lights (TM 9-2320-360-20).
(14) Install tail pipe assembly support (TM 9-2320-360-20).
(15) Install right rear fender (TM 9-2320-360-20).
(16) Install left rear fender (TM 9-2320-360-20).
(17) Install exhaust heat shield (TM 9-2320-360-20).
(18) Push in battery box (TM 9-2320-360-10).

17-4. COUNTERBALANCE VALVE BLOCK REPAIR

This task covers:
- a. Removal
- b. Disassembly
- c. Cleaning/Inspection
- d. Assembly
- e. Installation
- f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Winch console panels removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)

Materials/Parts
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Packings, Preformed (2) (Item 182, Appendix F)
Packings, Preformed (2) (Item 183, Appendix F)
Packings, Preformed (2) (Item 198, Appendix F)
Packings, Preformed (2) (Item 199, Appendix F)
Seal Kit, Plug (Item 299, Appendix F)
Seal Kit, Valve Cartridge (Item 298, Appendix F)
Seal Kit, Solenoid Valve (Item 301, Appendix F)

a. Removal

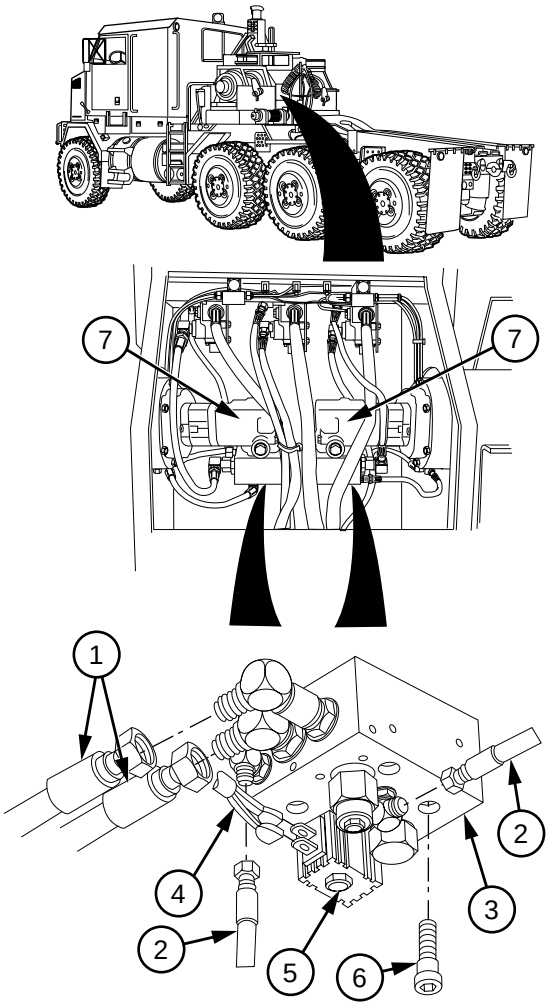
NOTE

- Both counterbalance valves are replaced the same way. Left counterbalance valve is shown.
- Tag and mark wires and hoses before removal.

(1) Disconnect two hoses (1) and two hoses (2) from counterbalance valve (3).

(2) Disconnect wires (4) from solenoid (5).

(3) Remove four screws (6) and counterbalance valve (3) from drive motor (7).



17-4. COUNTERBALANCE VALVE BLOCK REPAIR (CONT)

(4) Remove four preformed packings (8) from counterbalance valve (3). Discard preformed packings.

NOTE

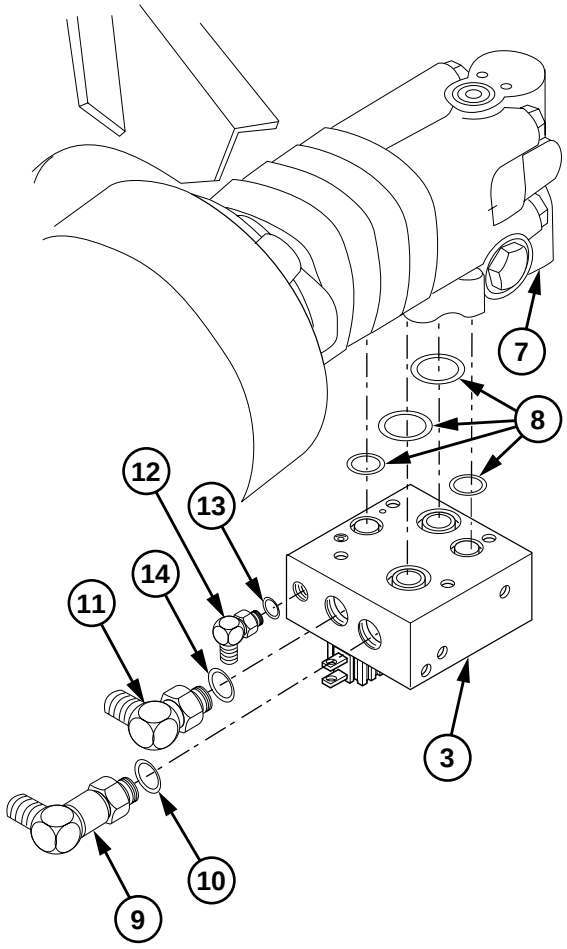
Mark alignment of fittings to aid in installation.

(5) Remove fitting (9) and preformed packing (10) from counterbalance valve (3). Discard preformed packing.

(6) Loosen fitting (11) on counterbalance valve (3).

(7) Remove fitting (12) and preformed packing (13) from counterbalance valve (3). Discard preformed packing.

(8) Remove fitting (11) and preformed packing (14) from counterbalance valve (3). Discard preformed packing.



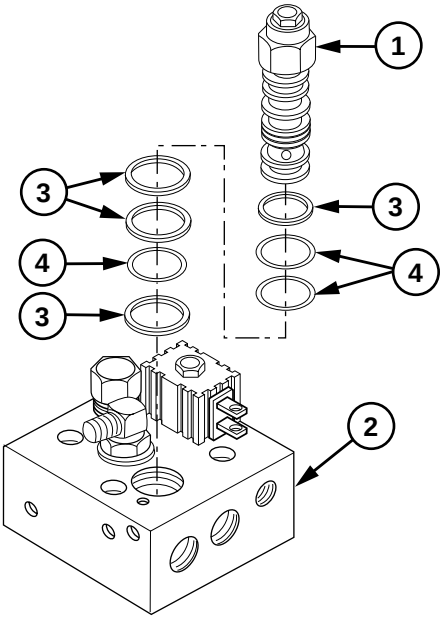
b. Disassembly

NOTE

- Locations of valve cartridges and plug are reversed on passenger and driver side winches. Note locations of valve cartridge and plug for proper assembly.
- Note location of all preformed packings, backup rings, and split rings.

(1) Remove valve cartridge (1) from counterbalance valve (2).

(2) Remove four backup rings (3) and three preformed packings (4) from valve cartridge (1). Discard backup rings and preformed packings.



(3) Remove nut (5) and solenoid (6) from cartridge (7).

(4) Remove cartridge (7) from counterbalance valve (2).

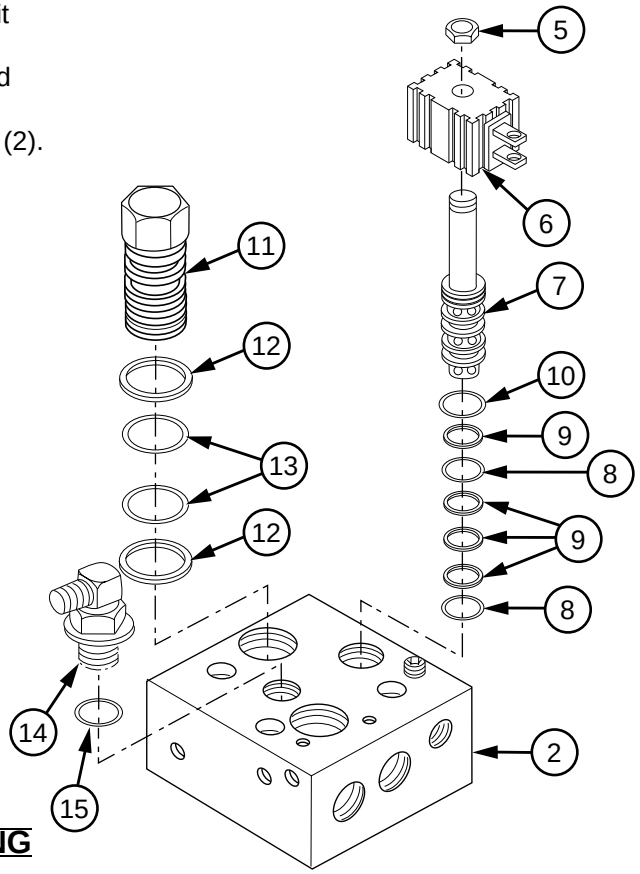
(5) Remove two preformed packings (8), four split rings (9), and preformed packing (10) from cartridge (7). Discard preformed packings and split rings.

(6) Remove plug (11) from counterbalance valve (2).

(7) Remove two backup rings (12) and two preformed packings (13) from counterbalance valve (2). Discard backup rings and preformed packings.

(8) Remove adapter (14) from counterbalance valve (2).

(9) Remove preformed packing (15) from adapter (14). Discard preformed packing.



c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/ massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean all parts in solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry all parts with compressed air.

(3) Inspect all parts for damage. Replace all damaged parts.

17-4. COUNTERBALANCE VALVE BLOCK REPAIR (CONT)

d. Assembly

(1) Install new preformed packing (1) on adapter (2).

NOTE

When properly installed, adapter will face away from valve solenoid.

(2) Install adapter (2) in counterbalance valve (3).

(3) Tighten jamnut (4) on adapter (2).

(4) Install two new preformed packings (5) and two new backup rings (6) on plug (7).

WARNING

Plug and valve cartridge locations determine if counterbalance valve is for driver or passenger side. Plug and valve cartridge must be in correct locations for driver and passenger side winch. Failure to comply may cause injury to personnel and result in reverse winch operation.

(5) Install plug (7) on counterbalance valve (3).

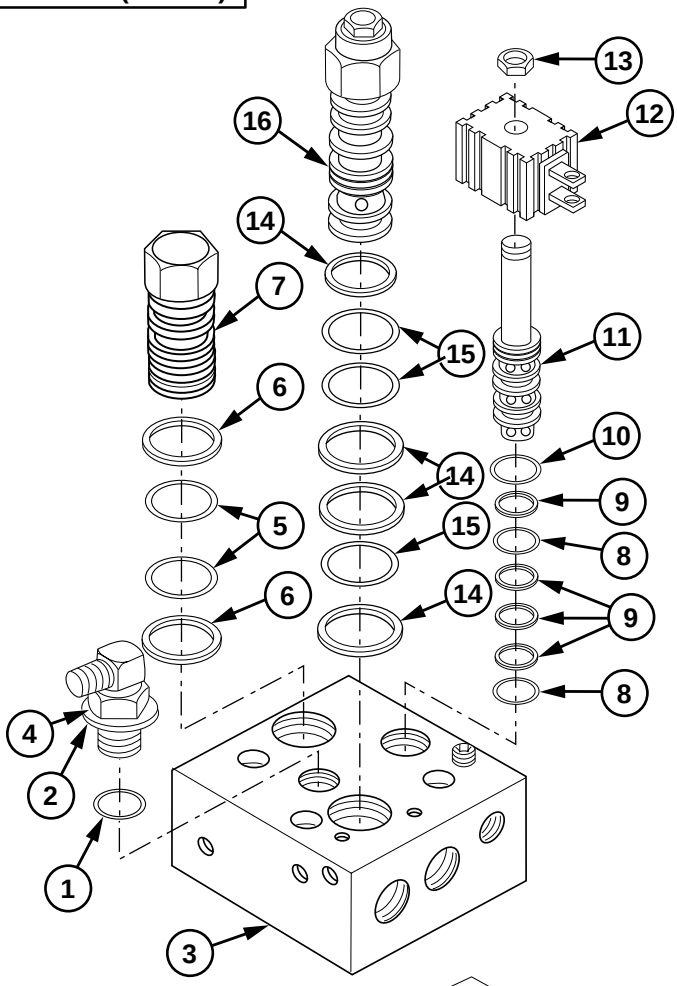
(6) Install two new preformed packings (8), four new split rings (9), and new preformed packing (10) on valve cartridge (11).

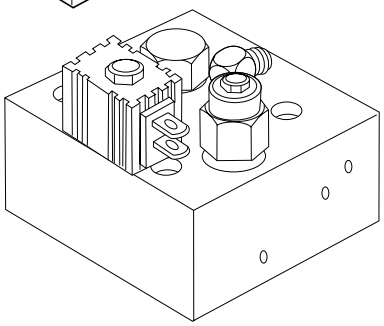
(7) Install cartridge (11) on counterbalance valve (3).

(8) Install solenoid (12) on cartridge (11) with nut (13).

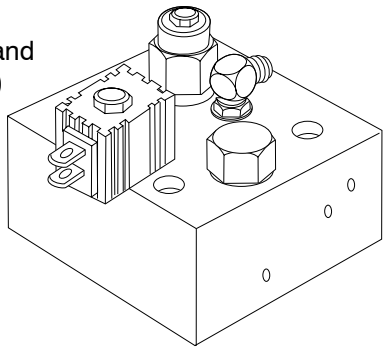
(9) Install four new backup rings (14) and three new preformed packings (15) on valve cartridge (16).

(10) Install valve cartridge (16) on counterbalance valve (3).





PASSENGER SIDE COUNTERBALANCE VALVE



DRIVER SIDE COUNTERBALANCE VALVE

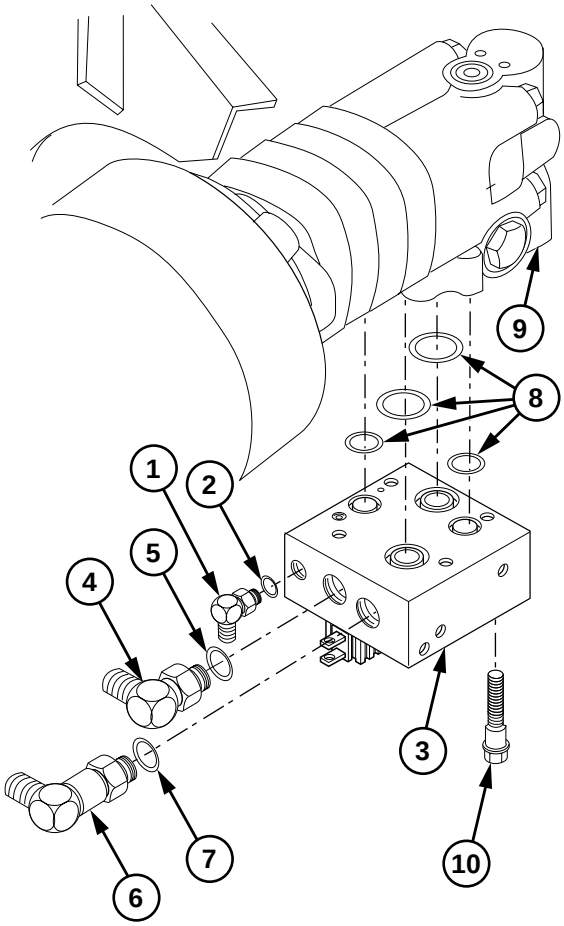
e. Installation

WARNING

Plug and valve cartridge locations determine direction of winch rotation. Plugs and valve cartridges must be in correct locations. On passenger's side winch, valve cartridge is closest to center of console. On driver's side winch, plug is closest to center of console. Failure to comply may cause injury to personnel and result in improper winch operation.

NOTE

Fitting in step (1) must be installed before fitting in step (2).



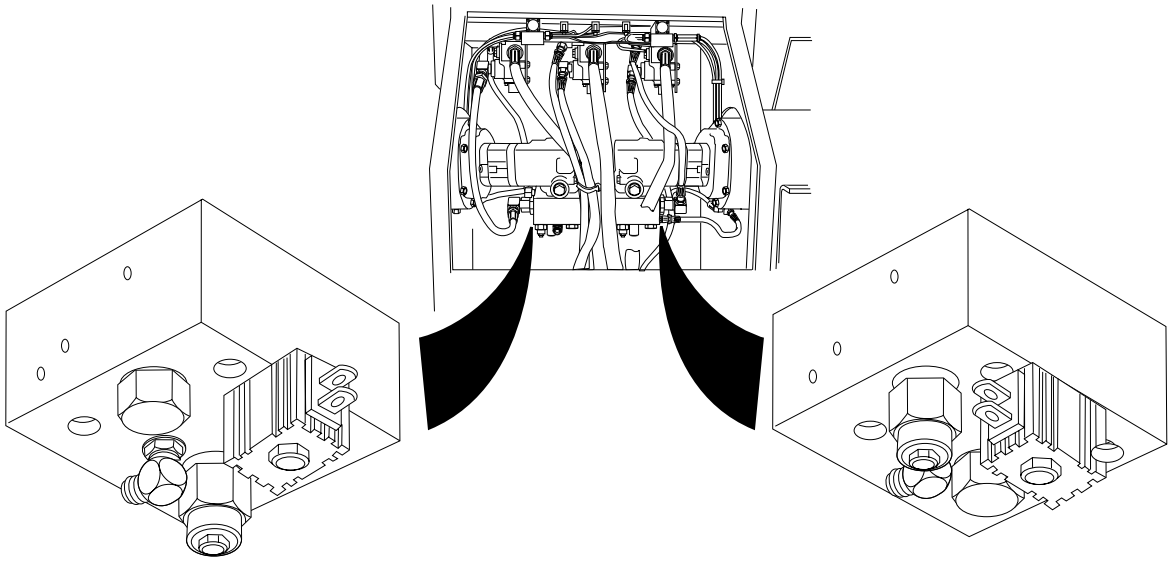
(1) Install fitting (1) and new preformed packing (2) in counterbalance valve (3).

(2) Install fitting (4) and new preformed packing (5) in counterbalance valve (3).

(3) Install fitting (6) and new preformed packing (7) in counterbalance valve (3).

(4) Install four new preformed packings (8) in counterbalance valve (3).

(5) Install counterbalance valve (3) on drive motor (9) with four screws (10).



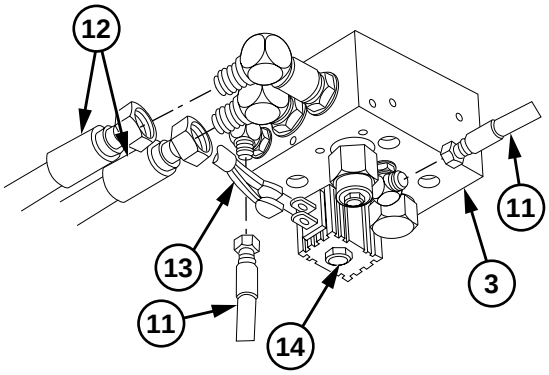
DRIVER SIDE COUNTERBALANCE VALVE

PASSENGER SIDE COUNTERBALANCE VALVE

17-4. COUNTERBALANCE VALVE BLOCK REPAIR (CONT)

(6) Connect two hoses (11) and two hoses (12) to counterbalance valve (3).

(7) Connect wires (13) to solenoid (14).



f. Follow-On Maintenance

(1) Install winch console panels (TM 9-2320-360-20).

(2) Check operation of winch.

17-5. DRIVE MOTOR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

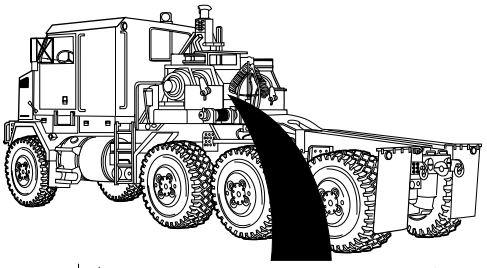
Equipment Conditions
Counterbalance valve removed (para 17-4).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

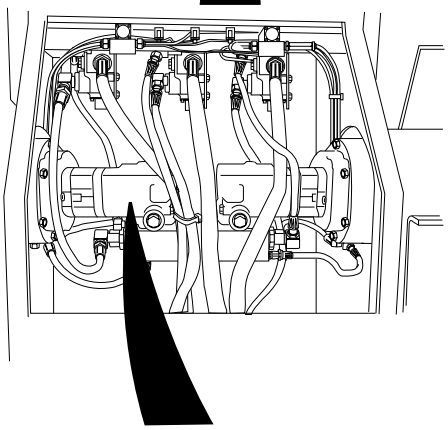
Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Lockwashers (2) (Item 130, Appendix F)

a. Removal

NOTE
Both drive motors are replaced the same way. Left side is shown.



Remove two screws (1), lockwashers (2), and drive motor (3) from winch assembly (4). Discard lockwashers.

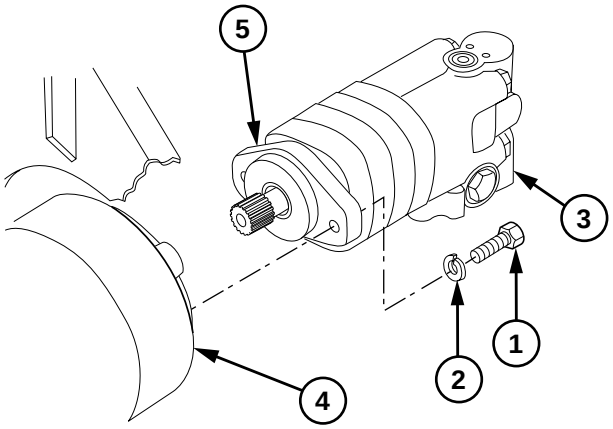


b. Installation

WARNING
On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

(1) Lightly coat edge of bearing housing (5) on drive motor (3) with thin layer of silicone adhesive-sealant.

(2) Install drive motor (3) on winch assembly (4) with two new lockwashers (2) and screws (1).



c. Follow-On Maintenance

Install counterbalance valve (para 17-4).

17-6. CONTROL VALVE REPAIR

This task covers:
- a. Removal
- b. Disassembly
- c. Cleaning/Inspection
- c. Assembly
- e. Installation
- f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Control console panels removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Wrench, Combination, 1-3/8 In. (Item 213, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Combination, 1-1/4 In. (Item 215, Appendix E)
Wrench, Open-End, 15/16 In. and 1-1/16 In. (Item 227, Appendix E)

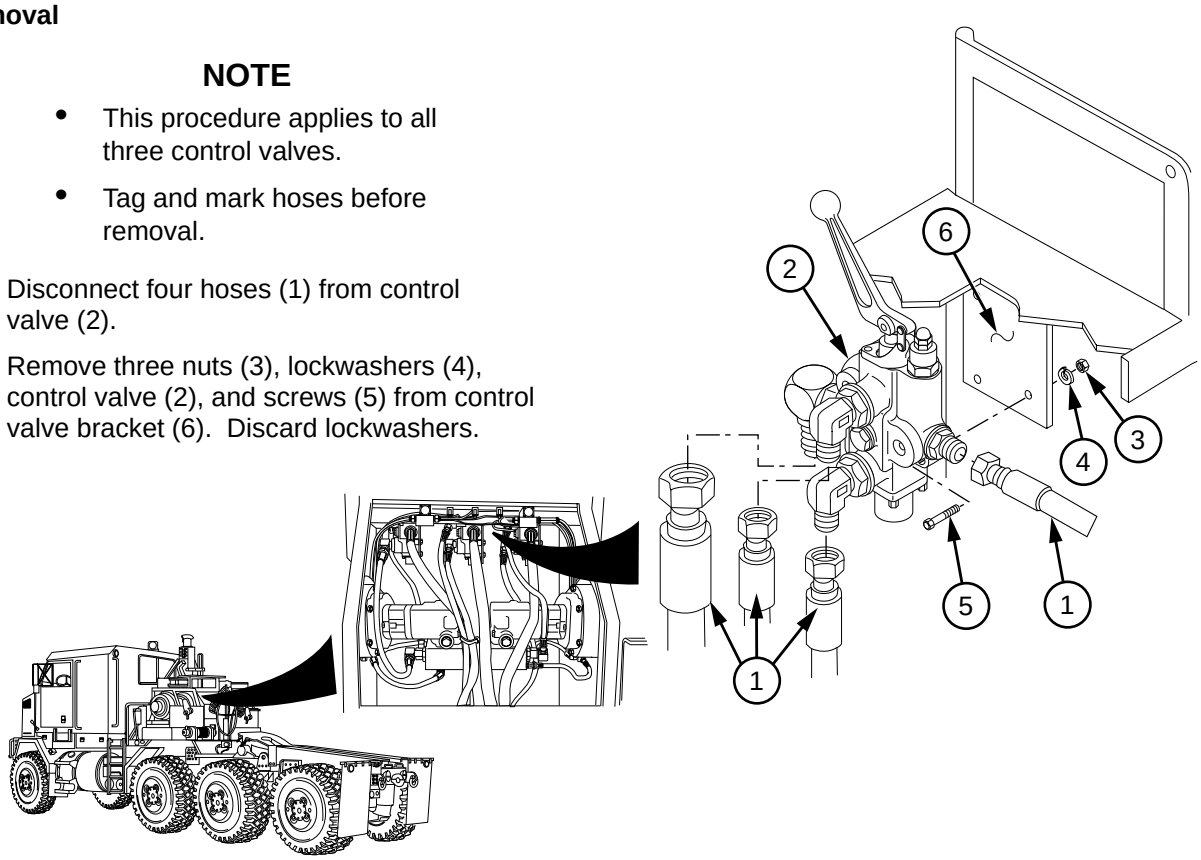
Materials/Parts
Adhesive-Sealant (Item 6, Appendix B)
Grease, Automotive and Artillery (Item 32, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Tags, Identification (Item 56, Appendix B)
Lockwashers (3) (Item 120, Appendix F)
Packings, Preformed (3) (Item 177, Appendix F)
Packing, Preformed (Item 180, Appendix F)

a. Removal

NOTE
- This procedure applies to all three control valves.
- Tag and mark hoses before removal.

(1) Disconnect four hoses (1) from control valve (2).

(2) Remove three nuts (3), lockwashers (4), control valve (2), and screws (5) from control valve bracket (6). Discard lockwashers.



b. Disassembly

(1) Place valve body (1) in vise.

NOTE

To aid in assembly, mark position of elbows on valve body before removal.

(2) Remove two elbows (2) and preformed packings (3) from valve body (1). Discard preformed packings.

(3) Remove adapter (4) and preformed packing (5) from valve body (1). Discard preformed packing.

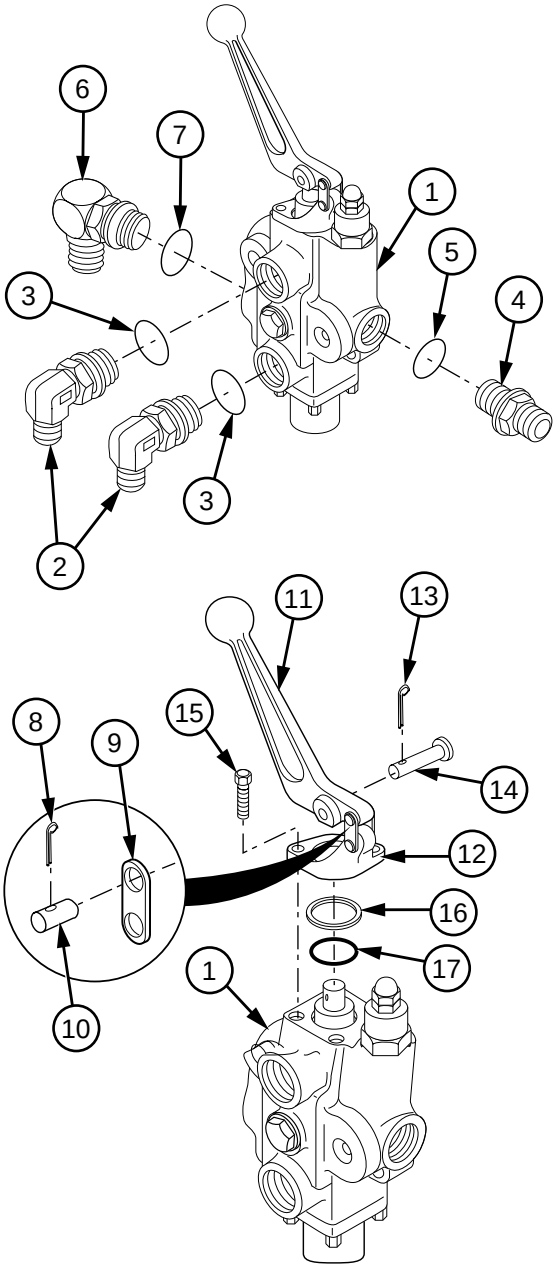
(4) Remove elbow (6) and preformed packing (7) from valve body (1). Discard preformed packing.

(5) Remove two cotter pins (8), linkplate (9), doublepin (10), and handle (11) from handle bracket (12).

(6) Remove cotter pin (13) and pin (14) from handle (11).

(7) Remove two screws (15) and handle bracket (12) from control valve body (1).

(8) Remove retainer (16) and spool seal (17) from control valve body (1).



c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean all metal parts with solvent cleaning compound.

17-6. CONTROL VALVE REPAIR (CONT)

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry parts with compressed air.

(3) Inspect spool for scoring, or binding in bore. Replace control valve if spool is scored or binds.

d. Assembly

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.

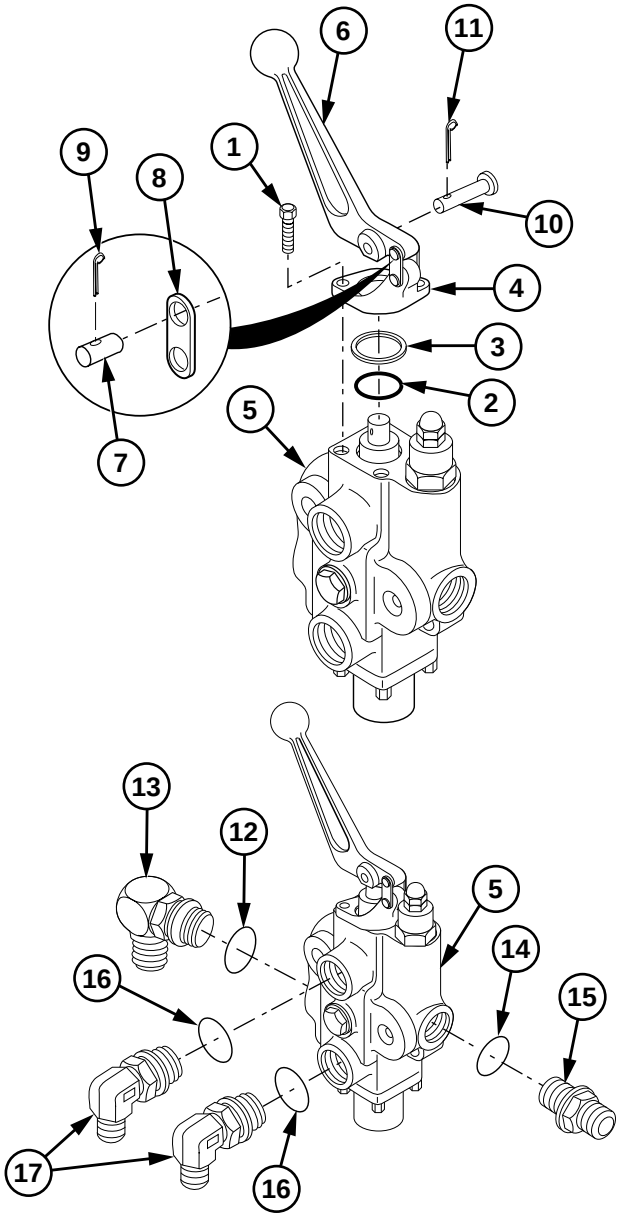
(1) Coat threads of two screws (1) with adhesive-sealant.

(2) Install spool seal (2), retainer (3), and handle bracket (4) on valve body (5) with two screws (1).

(3) Position handle (6) over valve body (5).

(4) Install doublepin (7), linkplate (8), two new cotter pins (9), and handle (6) on handle bracket (4).

(5) Install pin (10) and cotter pin (11) on handle (6).



(6) Install new preformed packing (12) and elbow (13) on valve body (5).

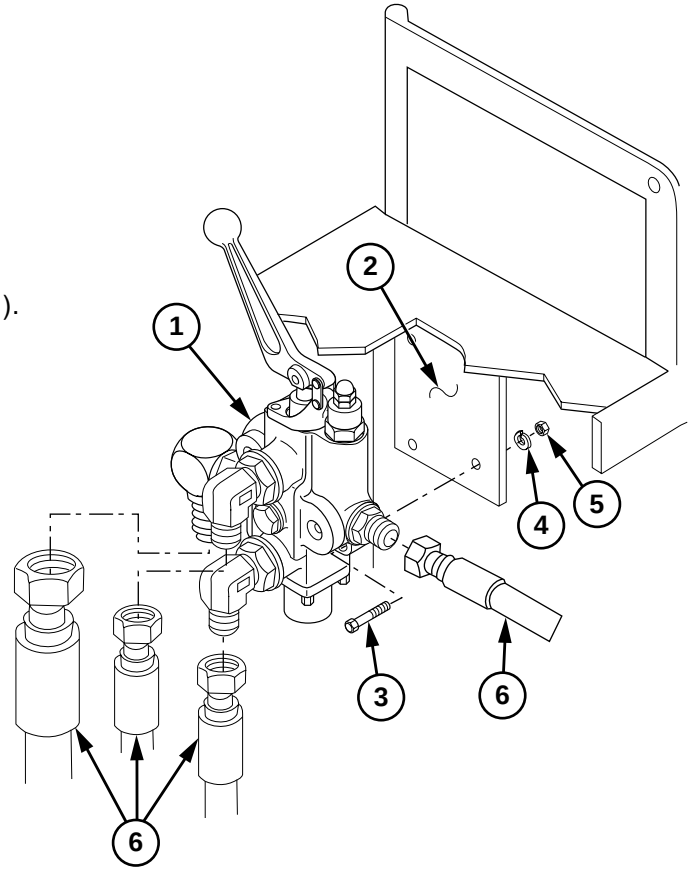
(7) Install new preformed packing (14) and adapter (15) on valve body (5).

(8) Install two new preformed packings (16) and two elbows (17) on valve body (5).

e. Installation

(1) Install control valve (1) on control valve bracket (2) with three screws (3), new lockwashers (4), and nuts (5).

(2) Connect four hoses (6) to control valve (1).



f. Follow-On Maintenance

(1) Install winch control console panels (TM 9-2320-360-20).

(2) Check hydraulic oil.

17-7. CONTROL CONSOLE REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Winch hydraulic reservoir drained (LO 9-2320-360-12).
Control console panels removed (TM 9-2320-360-20).
Winch air lines removed (TM 9-2320-360-20).
Winch toggle switches removed (TM 9-2320-360-20).
Pressure regulator valve removed (TM 9-2320-360-20).
Kickout control valves removed (TM 9-2320-360-20).
Personnel guard removed (TM 9-2320-360-20).
Auxiliary winch hoses removed (TM 9-2320-360-20).
Control valves removed (para 17-6).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Personnel Required
Two

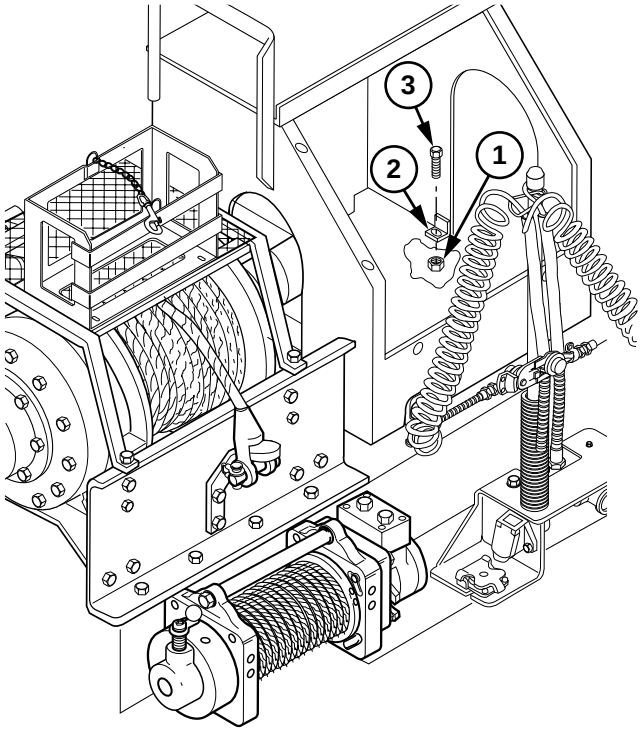
a. Removal

(1) Remove 10 nuts (1) from control console (2) while assistant holds screws (3).

(2) Attach suitable lifting device to control console (2).

CAUTION
Use care when raising console; it may damage remaining hoses.

(3) Remove control console (2) while assistant operates lifting device. Place on level surface.



PASSENGER WINCH REMOVED FOR CLARITY

b. Installation

(1) Attach suitable lifting device to control console (1).

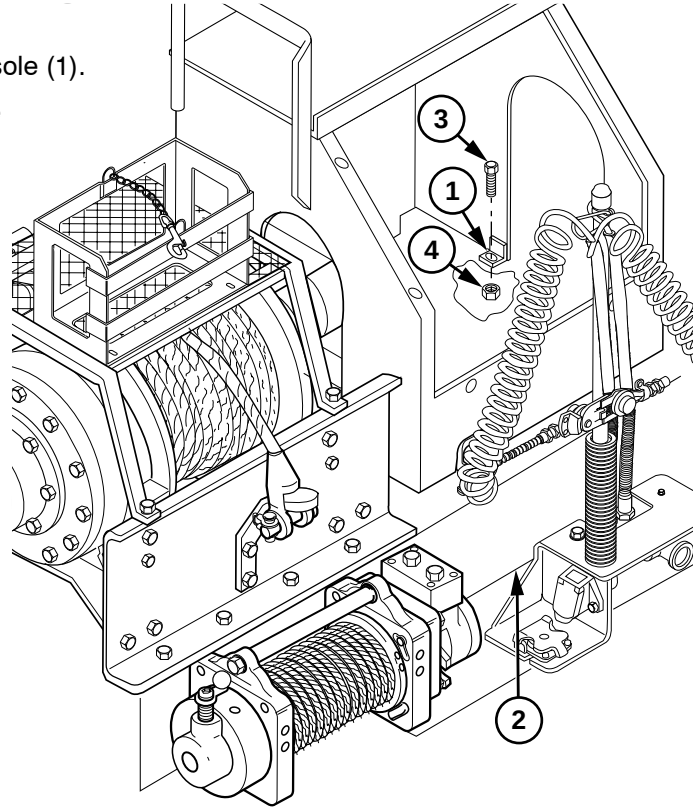
CAUTION

Use care when raising console; it may damage remaining hoses.

(2) Position control console (1) on frame assembly (2) while assistant operates liftin device.

(3) Position 10 screws (3) in control console (1).

(4) Install 10 nuts (4) on screws (3) while assistant holds screws.



PASSENGER WINCH REMOVED FOR CLARITY

c. Follow-On Maintenance

(1) Install auxiliary winch hoses (TM 9-2320-360-20).

(2) Install winch air lines (TM 9-2320-360-20).

(3) Install kickout control valves (TM 9-2320-360-20).

(4) Install pressure regulator valve (TM 9-2320-360-20).

(5) Install winch control valves (para 17-6).

(6) Install winch toggle switches (TM 9-2320-360-20).

(7) Install personnel guard (TM 9-2320-360-20).

(8) Install control console panels (TM 9-2320-360-20).

(9) Fill winch hydraulic reservoir (LO 9-2320-360-12).

17-8. AUXILIARY WINCH COUNTERBALANCE VALVE REPAIR

This task covers:
a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Cleaning Compound, Solvent (Item 54, Appendix B)
Packings, Preformed (2) (Item 201, Appendix F)
Packings, Preformed (2) (Item 183, Appendix F)
Packing, Preformed (Item 157, Appendix F)
Packing, Preformed (Item 197.1, Appendix F)
Seal Kit, Plug (Item 300, Appendix F)
Seal Kit, Valve Cartridge (Item 302, Appendix F)

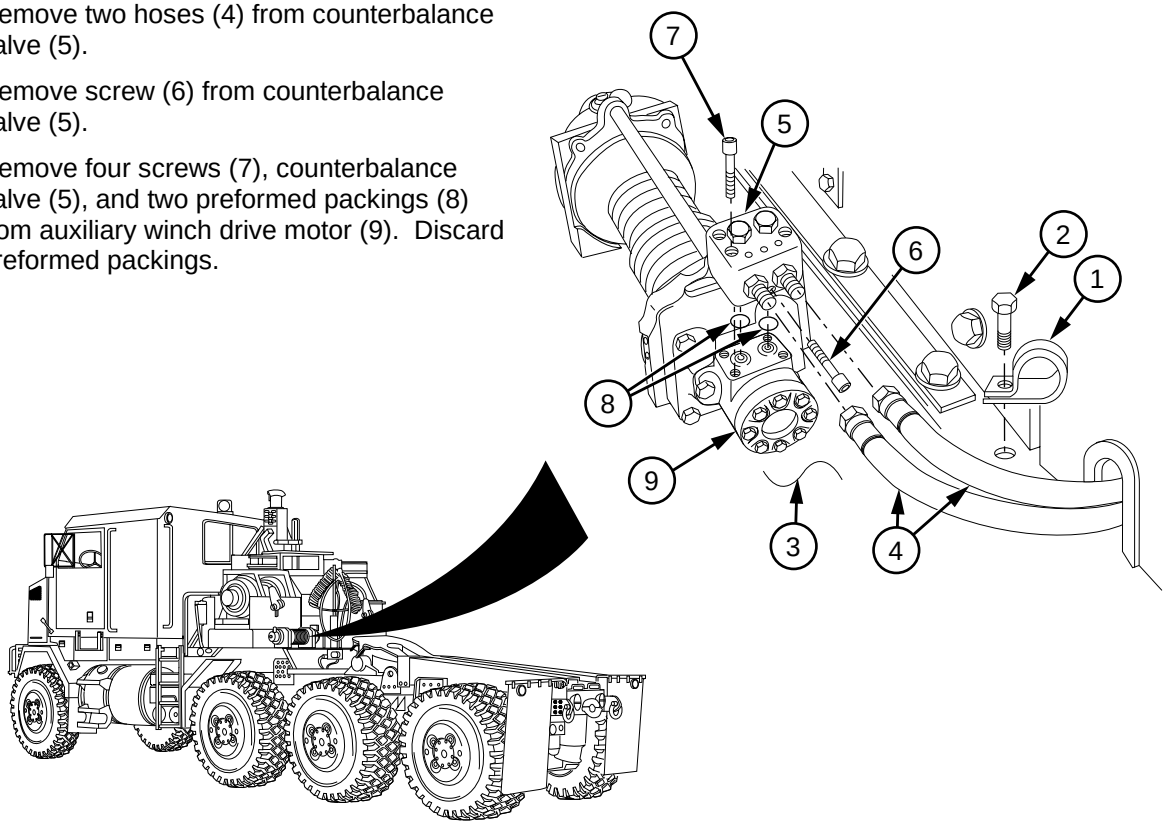
a. Removal

(1) Remove hose clamp (1) and screw (2) from frame (3).

(2) Remove two hoses (4) from counterbalance valve (5).

(3) Remove screw (6) from counterbalance valve (5).

(4) Remove four screws (7), counterbalance valve (5), and two preformed packings (8) from auxiliary winch drive motor (9). Discard preformed packings.



b. Disassembly

(1) Remove plug (1) from counterbalance valve (2).

(2) Remove preformed packing (3) from plug (1). Discard preformed packing.

(3) Remove cartridge (4) from counterbalance valve (2).

(4) Remove two preformed packings (5) and preformed packing (6) from cartridge (4). Discard preformed packings.

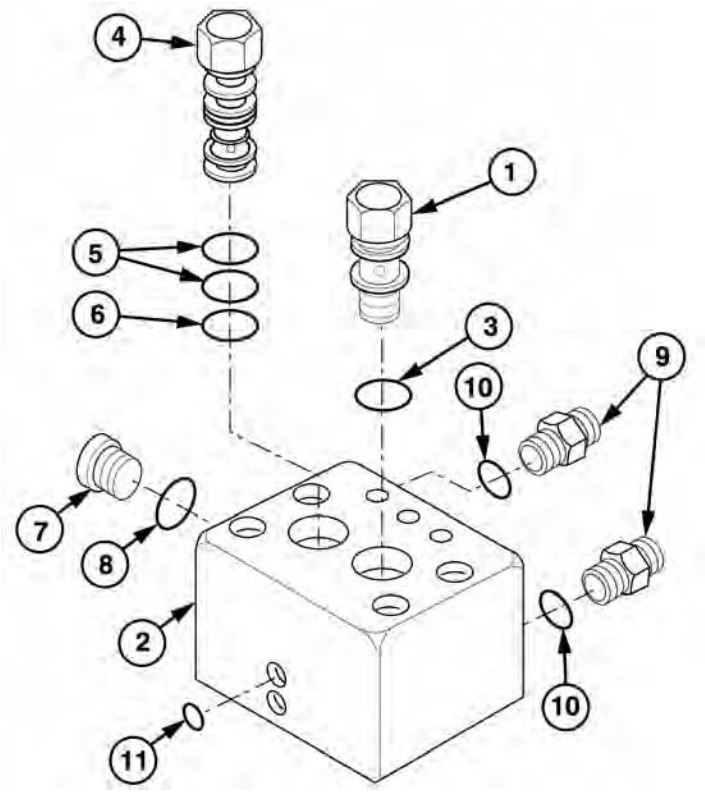
NOTE

Do step (5) only if plug is leaking.

(5) Remove plug (7) and preformed packing (8) from counterbalance valve (2). Discard preformed packing.

(6) Remove two fittings (9) and preformed packings (10) from counterbalance valve (2). Discard preformed packings.

(7) Remove preformed packing (11) from counterbalance valve (2). Discard preformed packing.



c. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean all parts in solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry all parts with compressed air.

(3) Inspect parts for damage. If damage is found, replace parts.

17-8. AUXILIARY WINCH COUNTERBALANCE VALVE REPAIR (CONT)

d. Assembly

(1) Install new preformed packing (1) and plug (2) on counterbalance valve (3).

(2) Install two new preformed packings (4) and new preformed packing (5) on cartridge (6).

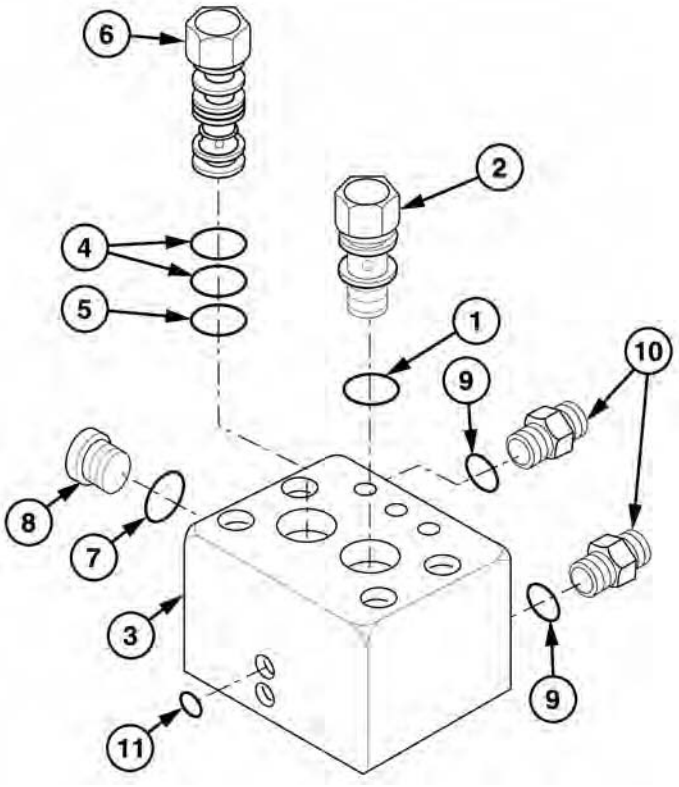
(3) Install cartridge (6) in counterbalance valve (3). Torque to 40-45 lb-ft (54-61 N·m).

(4) Install new preformed packing (7) on plug (8).

(5) Install plug (8) in counterbalance valve (3).

(6) Install two new preformed packings (9) and fittings (10) in counterbalance valve (3).

(7) Install new preformed packing (11) in counterbalance valve (3).



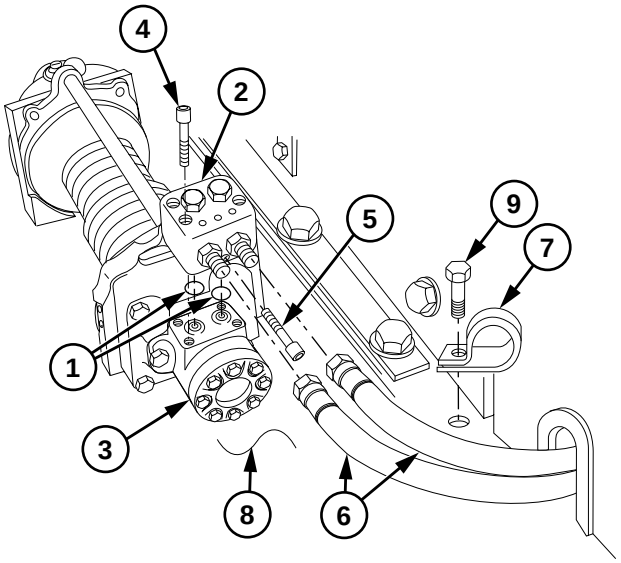
e. Installation

(1) Install two new preformed packings (1) and counterbalance valve (2) on auxiliary winch drive motor (3) with four screws (4).

(2) Install screw (5) on counterbalance valve (2).

(3) Install two hoses (6) on counterbalance valve (2).

(4) Install hose clamp (7) on frame (8) with screw (9).



f. Follow-On Maintenance

Check auxiliary winch operation (TM 9-2320-360-20).

17-9. AUXILIARY WINCH DRIVE MOTOR REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)

Materials/Parts
Lockwashers (2) (Item 122, Appendix F)
Packings, Preformed (2) (Item 201, Appendix F)

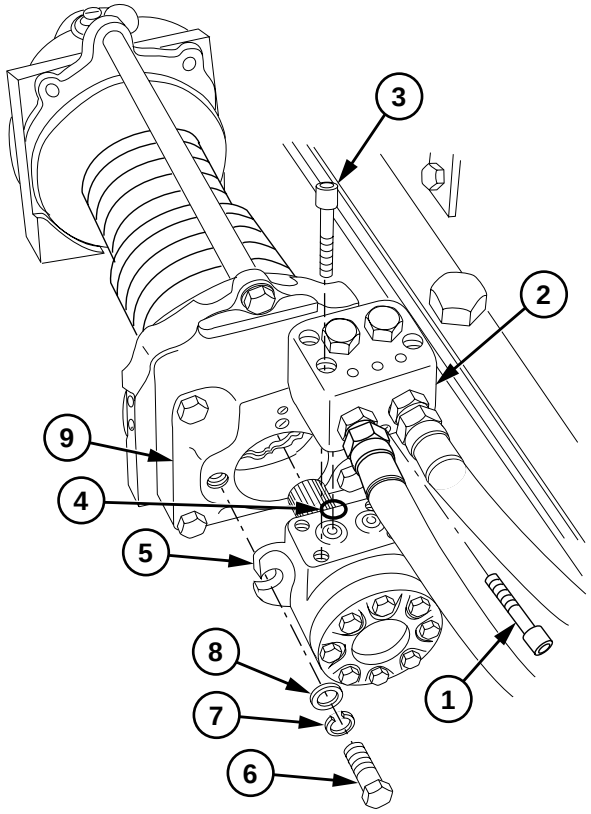
a. Removal

(1) Remove screw (1) from counterbalance valve (2).

(2) Remove four screws (3), counterbalance valve (2), and two preformed packings (4) from drive motor (5). Discard preformed packings.

(3) Remove two screws (6), lockwashers (7), and washers (8) from auxiliary winch (9). Discard lockwashers.

(4) Remove auxiliary winch drive motor (5) from auxiliary winch (9).

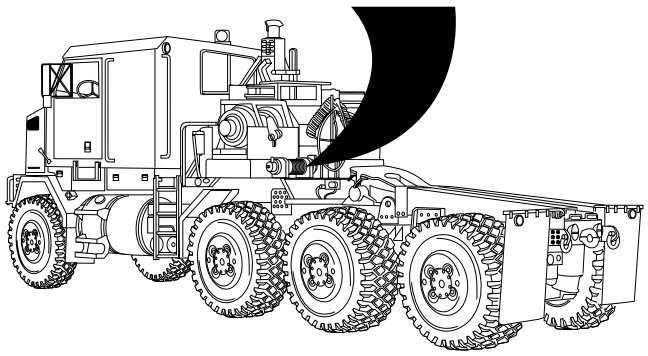


b. Installation

(1) Install auxiliary winch drive motor (5) on auxiliary winch (9) with two washers (8), new lockwashers (7), and screws (6).

(2) Install counterbalance valve (2) and two new preformed packings (4) on auxiliary winch drive motor (5) with four screws (3).

(3) Install screw (1) on counterbalance valve (2).



c. Follow-On Maintenance

Check auxiliary winch operation (TM 9-2320-360-20).

17-10. KICKOUT PISTON AND SEALS REPAIR

This task covers:
a. Disassembly
b. Cleaning/Inspection
c. Assembly
d. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine shut off (TM 9-2320-360-10).
Parking brake on (TM 9-2320-360-10).
Wheels chocked.
Winch drained of lubricant (LO 9-2320-360-12).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Compressor Unit, Air (Item 24, Appendix E)
Goggles, Industrial (Item 57, Appendix E)
Pliers, Retaining Ring (Item 107, Appendix E)
Rods, Threaded (2) (Figure C-14, Appendix C)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts
Adhesive-Sealant, Silicone (Item 2, Appendix B)
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Cleaning Compound, Solvent (Item 54, Appendix B)
Lockwashers (12) (Item 120, Appendix F)
Packings, Preformed (2) (Item 196, Appendix F)
Packing, Preformed (Item 197, Appendix F)
Packing, Preformed (Item 200, Appendix F)
Ring, Retaining (Item 239, Appendix F)

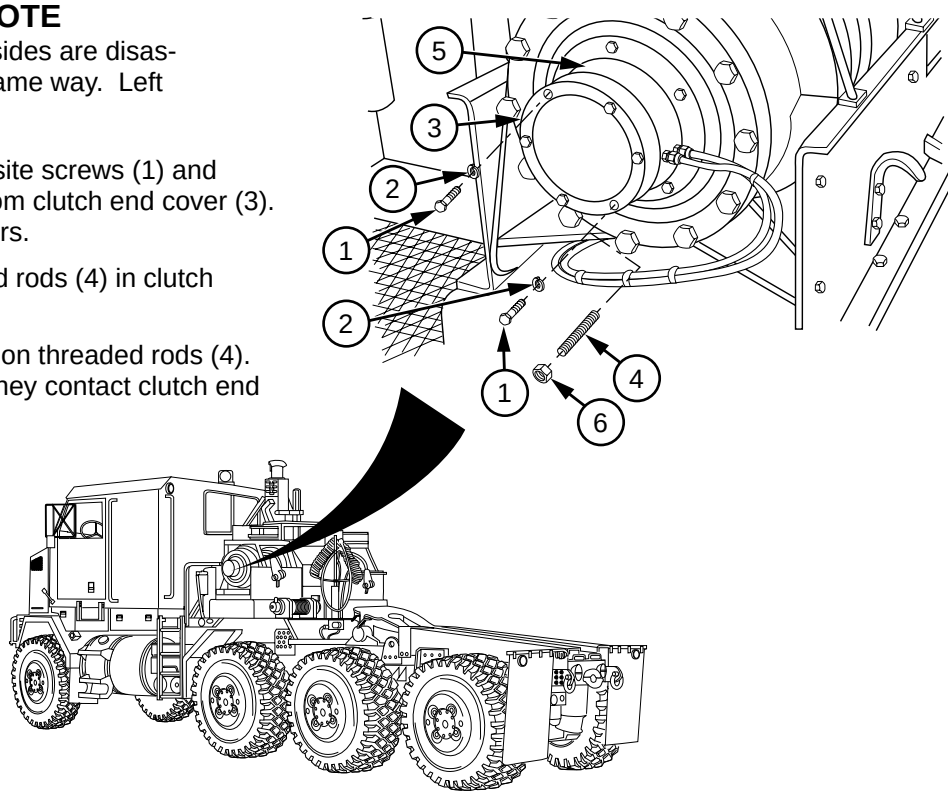
a. Disassembly

NOTE
Right and left sides are disassembled the same way. Left side is shown.

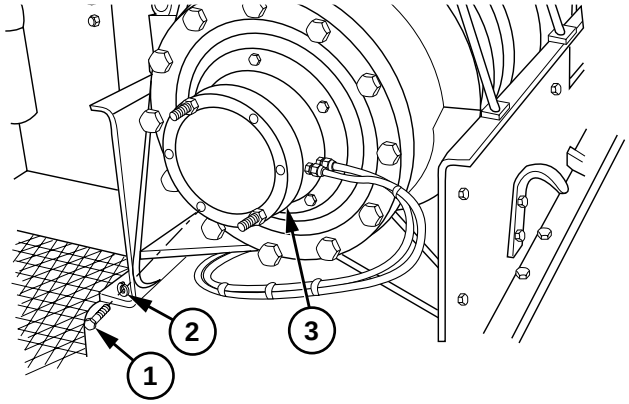
(1) Remove two opposite screws (1) and lockwashers (2) from clutch end cover (3). Discard lockwashers.

(2) Install two threaded rods (4) in clutch adapter (5).

(3) Install two nuts (6) on threaded rods (4). Tighten nuts until they contact clutch end cover (3).



(4) Remove four remaining screws (1) and lockwashers (2) from clutch end cover (3). Discard lockwashers.



WARNING

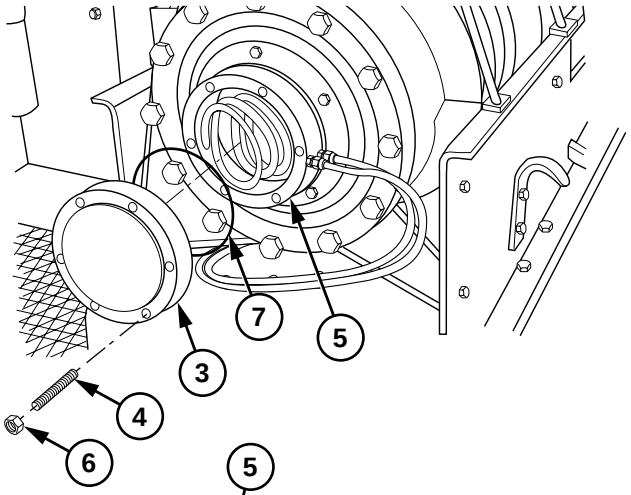
Clutch end cover is under spring pressure. Loosen nuts slowly and evenly until spring tension is relieved. Failure to do so may cause injury to personnel.

(5) Loosen two nuts (6) on threaded rods (4) and remove clutch end cover (3) from clutch adapter (5).

(6) Remove two nuts (6) and clutch end cover (3) from two threaded rods (4).

(7) Remove two threaded rods (4) from clutch adapter (5).

(8) Remove preformed packing (7) from clutch end cover (3). Discard preformed packing.

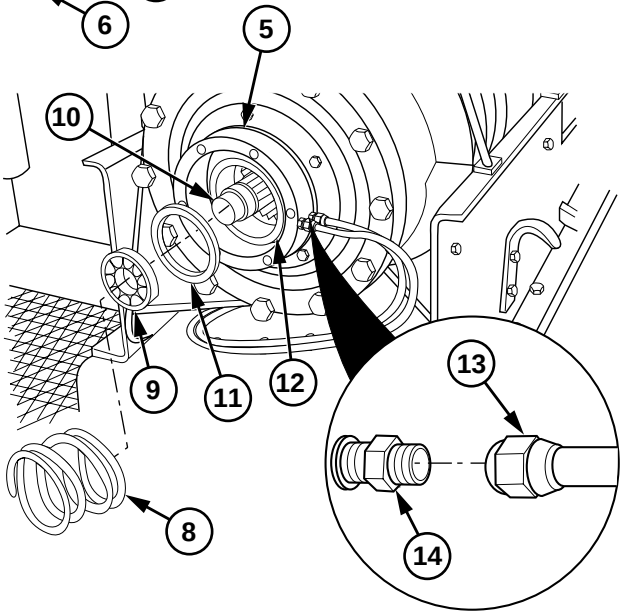


(9) Remove spring (8) from clutch adapter (5).

(10) Remove bearing (9) from shaft (10).

(11) Remove thrust ring (11) from clutch drive gear (12).

(12) Disconnect two air lines (13) from fittings (14).



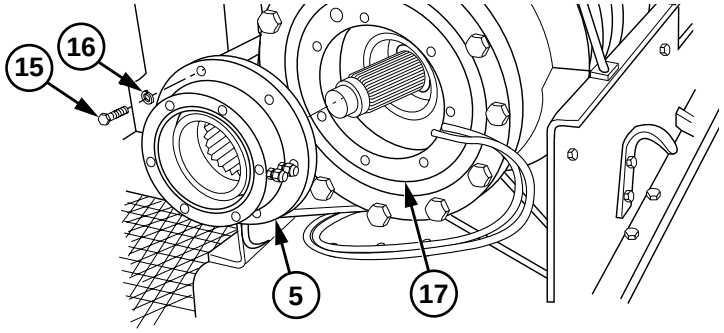
17-10. KICKOUT PISTON AND SEALS REPAIR (CONT)

WARNING

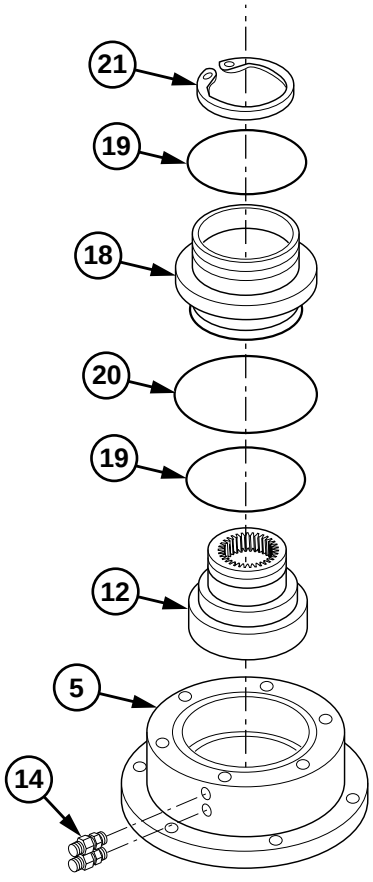
Clutch drive gear and piston may separate from clutch adapter causing injury to personnel.

NOTE

Location of air fittings on clutch adapter should be marked on planetary adapter cover before removal.



(13) Remove six screws (15), lockwashers (16), and clutch adapter (5) from planetary adapter cover (17). Discard lockwashers.



(14) Remove piston (18) with clutch drive gear (12) from clutch adapter (5).

(15) Remove two preformed packings (19) and preformed packing (20) from piston (18). Discard preformed packing.

WARNING

Wear eye protection and use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

(16) Remove retaining ring (21) from clutch drive gear (12). Discard retaining ring.

(17) Remove piston (18) from clutch drive gear (12).

(18) Remove two fittings (14) from clutch adapter (5).

b. Cleaning/Inspection

WARNING

Solvent cleaning compound MIL-PRF-680 Type II and III may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Use respirator as needed. Accidental ingestion can cause irritation of digestive tract and respiratory tract, may cause lung and central nervous system damage. Can be fatal if swallowed. Inhalation of high/massive concentrations can cause coma or be fatal. First aid for ingestion: do not induce vomiting. Seek immediate medical attention. First aid for skin contact: remove contaminated clothing. Wash skin thoroughly with soap and water. If symptoms persist, seek medical attention. First aid for eye contact: flush with water for 15 minutes or until irritation subsides. If symptoms persist, seek medical attention. First aid for inhalation: move to fresh air. If not breathing, provide artificial respiration. If symptoms persist, seek medical attention. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

•The flashpoint for type II solvent cleaning compound is 141-198°F (61-92C) and type III is 200-241°F (93-116C).
•Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment.
•Fire extinguishers should be placed nearby when using solvent cleaning compound. Failure to follow this warning may result in injury or death.
•Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures. Failure to follow this warning may result in injury.
•Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.

(1) Clean all parts with solvent cleaning compound.

WARNING

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

(2) Dry all parts, except bearings, with compressed air.

(3) Inspect piston and clutch adapter for scratches or scoring.

(4) Inspect bearings for corrosion, scoring pitting, binding, or other damage.

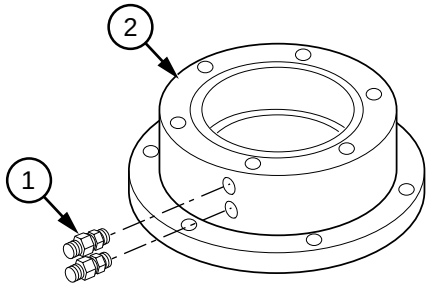
(5) Remove all nicks and burrs from machined surfaces.

(6) Replace all worn or damaged parts.

c. Assembly

WARNING

Adhesive-sealant can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive-sealant gets on skin or clothing, wash immediately with soap and water.



(1) Coat threads of two fittings (1) with pipe thread sealing compound.

(2) Install two fittings (1) in clutch adapter (2).

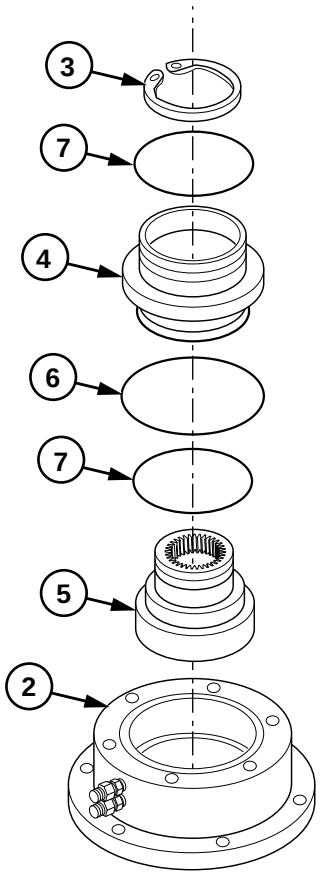
17-10. KICKOUT PISTON AND SEALS REPAIR (CONT)

WARNING

Wear eye protection and use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released causing severe eye injury.

NOTE

Right and left sides are assembled the same way. Left side is shown.



(3) Install new retaining ring (3) and piston (4) on clutch drive gear (5).

(4) Install new preformed packing (6) and two new preformed packings (7) on piston (4).

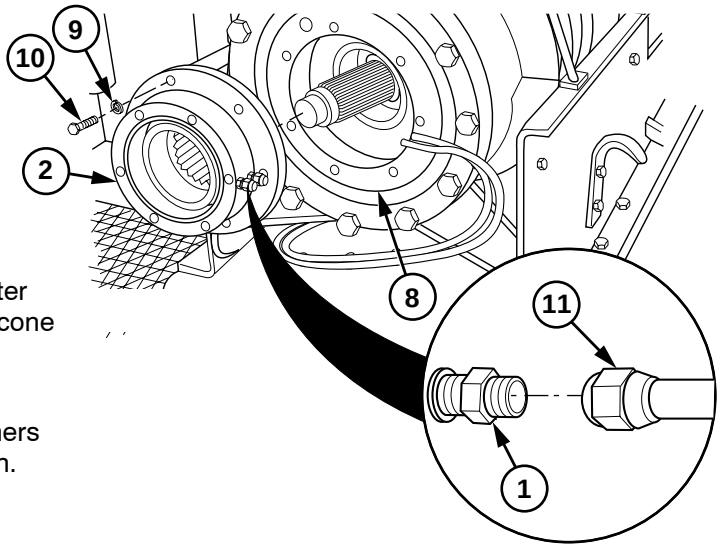
(5) Install piston (4) on clutch adapter (2).

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

NOTE

Clutch adapter should be positioned on planetary adapter cover as marked during removal.



(6) Coat mating surfaces of planetary adapter cover (8) and clutch adapter (2) with silicone adhesive-sealant.

(7) Install clutch adapter (2) on planetary adapter cover (8) with six new lockwashers (9) and screws (10). Torque to 276 lb-in. (31.2 N·m).

(8) Connect two air lines (11) to fittings (1).

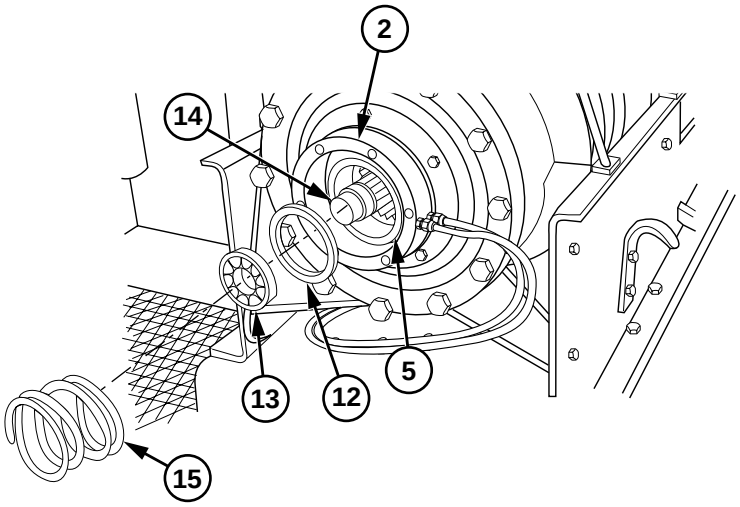
NOTE

Flat surface of thrust ring faces out.

(9) Install thrust ring (12) on clutch drive gear (5).

(10) Install bearing (13) on shaft (14).

(11) Install spring (15) on clutch adapter (2).

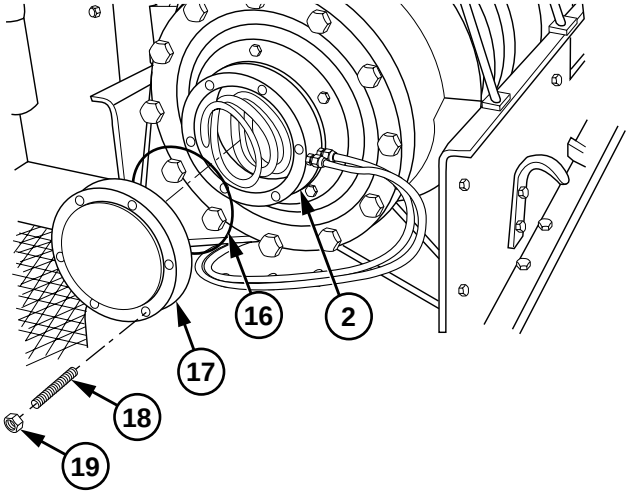


(12) Install new preformed packing (16) on clutch end cover (17).

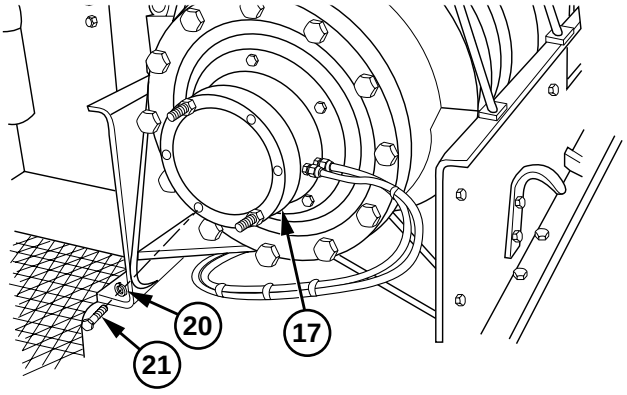
(13) Install two threaded rods (18) on opposite ends of clutch adapter (2).

(14) Install clutch end cover (17) on threaded rods (18).

(15) Install two nuts (19) on threaded rods (18). Tighten until mating surfaces of clutch end cover (17) and clutch adapter (2) meet.

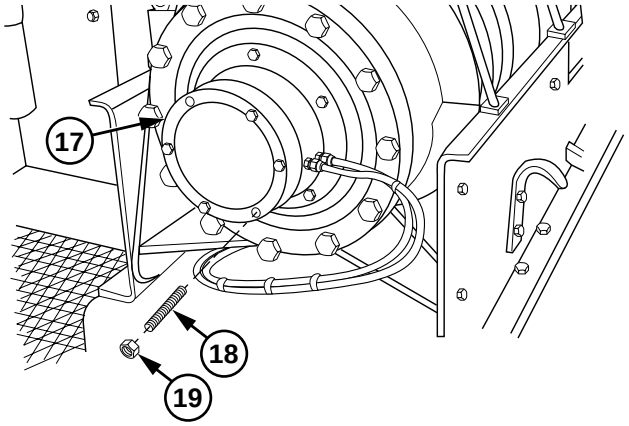


(16) Install four new lockwashers (20) and screws (21) on clutch end cover (17).



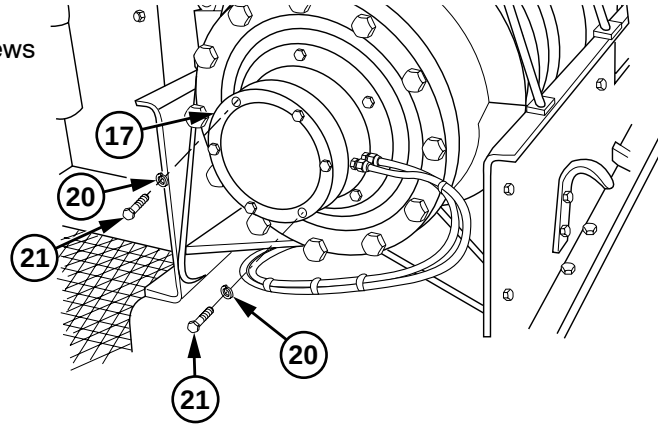
17-10. KICKOUT PISTON AND SEALS REPAIR (CONT)

(17) Remove two nuts (19) and threaded rods (18) from clutch end cover (17).



(18) Install two new lockwashers (20) and screws (21) on clutch end cover (17).

(19) Tighten six screws (21) to 35 lb-ft (47.5 N·m).



c. Follow-On Maintenance

(1) Fill winch with lubricant (LO 9-2320-360-12).

(2) Check winch operation.

(3) Remove wheel chocks.

17-11. HYDRAULIC PUMP REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Hydraulic reservoir drained (LO 9-2320-360-12).
PTO propshaft removed (TM 9-2320-360-20).

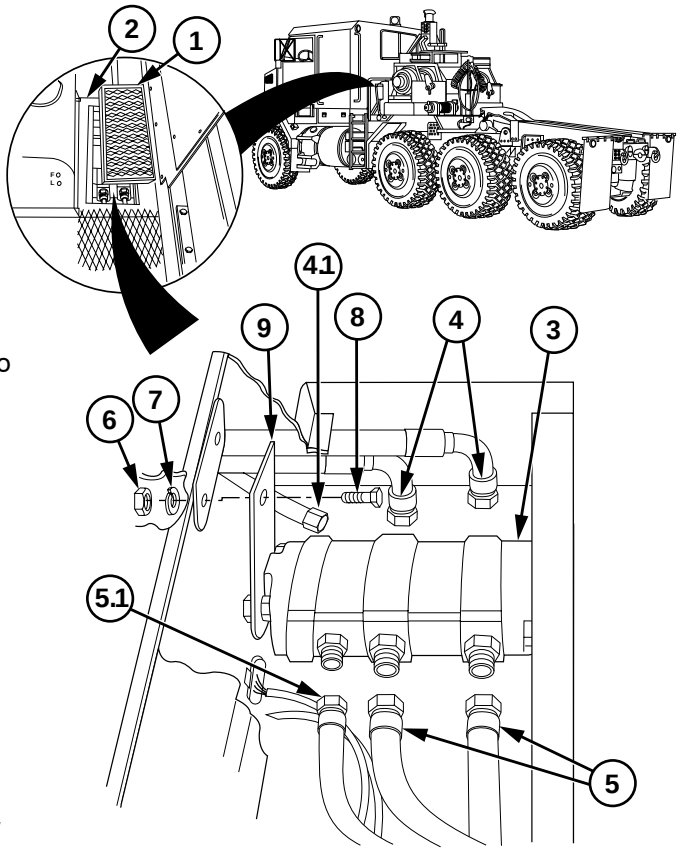
Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Pan Oil Drain (Item 102, Appendix E)
Sling, Endless Strap (Item 161, Appendix E)
Wrench, Adjustable, Automobile (Item 212.1, Appendix E)
Wrench, Open-End, 1-5/8 In. (Item 224, Appendix E)
Wrench, Combination, 1-1/4 In. (Item 215, Appendix E)

Materials/Parts
Tags, Identification (Item 56, Appendix B)
Lockwashers (3) (Item 122, Appendix F)
Lockwasher (Item 123, Appendix F)
Packings, Preformed (3) (Item 179, Appendix F)
Packings, Preformed (2) (Item 181, Appendix F)
Packing, Preformed (Item 177, Appendix F)

Personnel Required
Two

a. Removal

(1) Remove access cover (1) from winch deck (2).



NOTE
Tag and mark all hoses before removal.

(2) Place drain pan under hydraulic pump (3) to catch fluid.

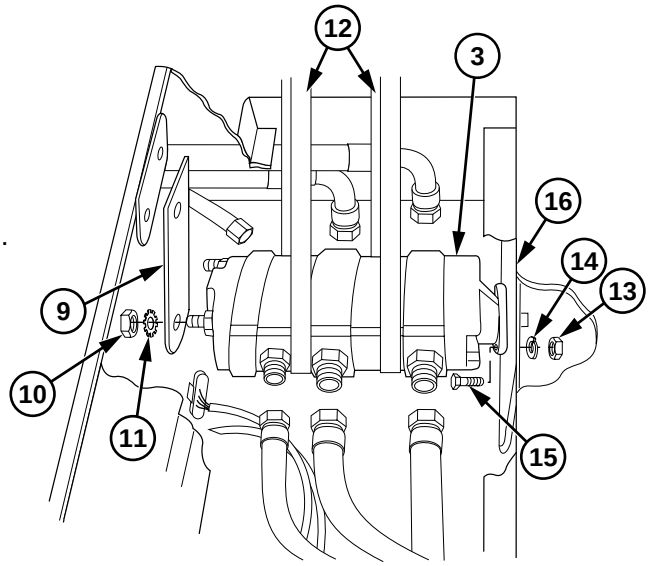
(3) Disconnect two hoses (4), and hose (4.1) from hydraulic pump (3).

(4) Disconnect two hoses (5), and hose (5.1) from hydraulic pump (3).

CAUTION
Support hydraulic pump to prevent it from falling after removing screws. Failure to comply may result in damage to equipment.

(5) Remove nut (6), lockwasher (7), and screw (8) from support plate (9). Discard lockwasher.

17-11. HYDRAULIC PUMP REPLACEMENT (CONT)



(6) Remove nut (10), lockwasher (11), and support plate (9) from hydraulic pump (3). Discard lockwasher.

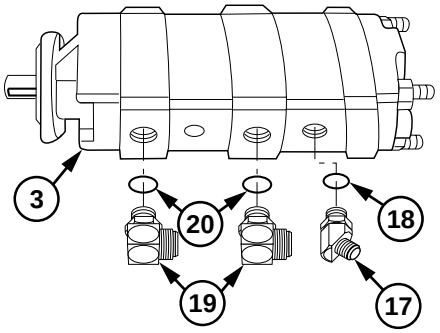
(7) Attach two straps (12) to hydraulic pump (3).

(8) Remove two nuts (13), lockwashers (14), and screws (15) from hydraulic pump (3) and frame (16). Discard lockwashers.

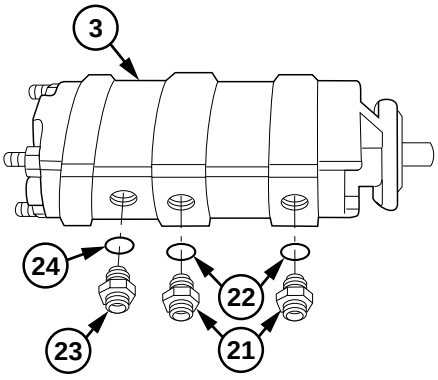
WARNING

Hydraulic pump weighs 80 lb (36 kg). Stay clear of hydraulic pump while lifting. Failure to comply may result in injury to personnel.

(9) Remove hydraulic pump (3) from frame (16) with aid of assistant.



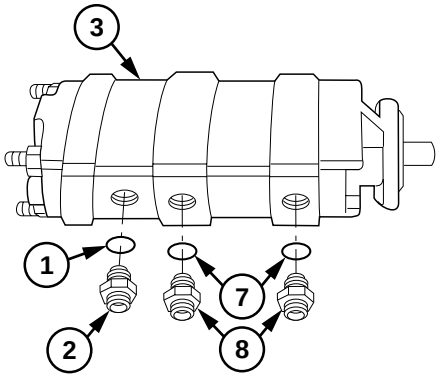
(10) Remove elbow (17), preformed packing (18), two elbows (19), and preformed packings (20) from hydraulic pump (3). Discard preformed packings.



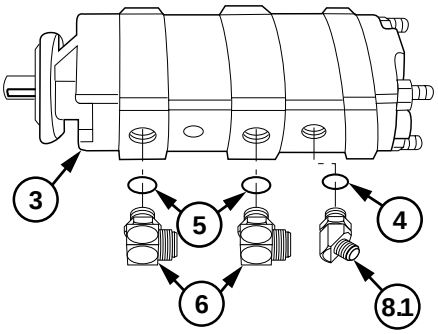
(11) Remove two fittings (21), preformed packings (22), fitting (23), and preformed packing (24) from hydraulic pump (3). Discard preformed packing.

b. Installation

(1) Install new preformed packing (1), fitting (2) two new preformed packings (7), and fittings (8) on hydraulic pump (3).



(2) Install two new preformed packings (5), elbows (6), new preformed packing (4), and fitting (8.1) on hydraulic pump (3).



(3) Attach two straps (9) to hydraulic pump (3).

WARNING

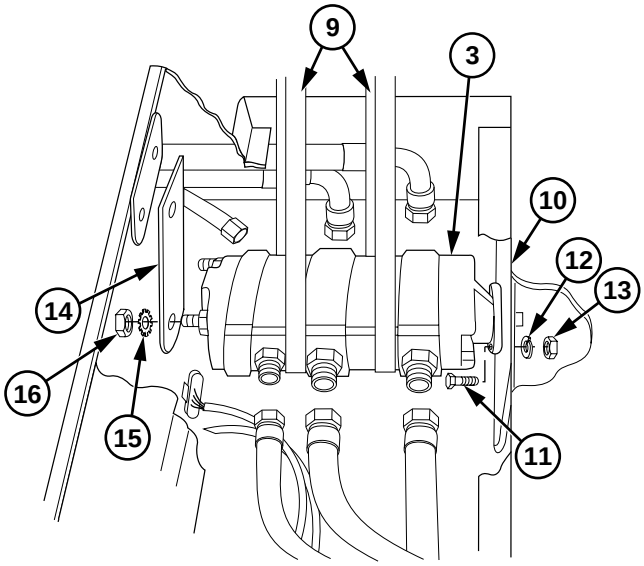
Hydraulic pump weighs 80 lb (36 kg). Support hydraulic pump to prevent it from falling while installing screws. Failure to comply may result in injury to personnel.

(4) Position and support hydraulic pump (3) on frame (10) with aid of assistant.

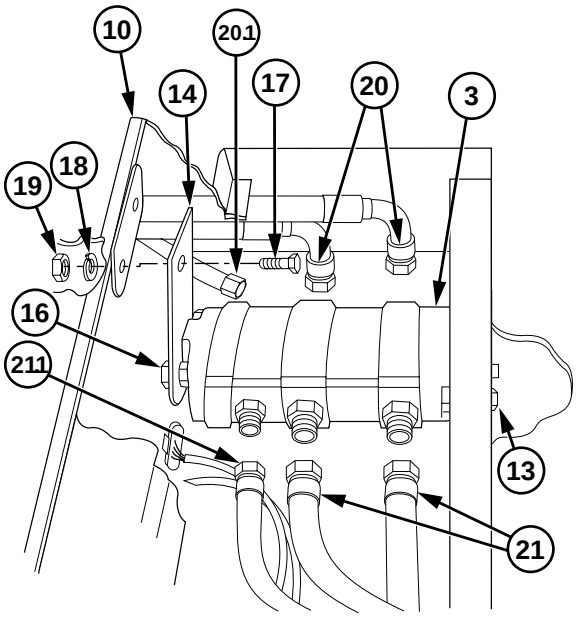
(5) Install two screws (11), new lockwashers (12), and nuts (13) in hydraulic pump (3) and frame (10). Do not tighten.

(6) Remove two straps (9) from hydraulic pump (3).

(7) Position support plate (14) on hydraulic pump (3) with new lockwasher (15) and nut (16). Do not tighten.



17-11. HYDRAULIC PUMP REPLACEMENT (CONT)

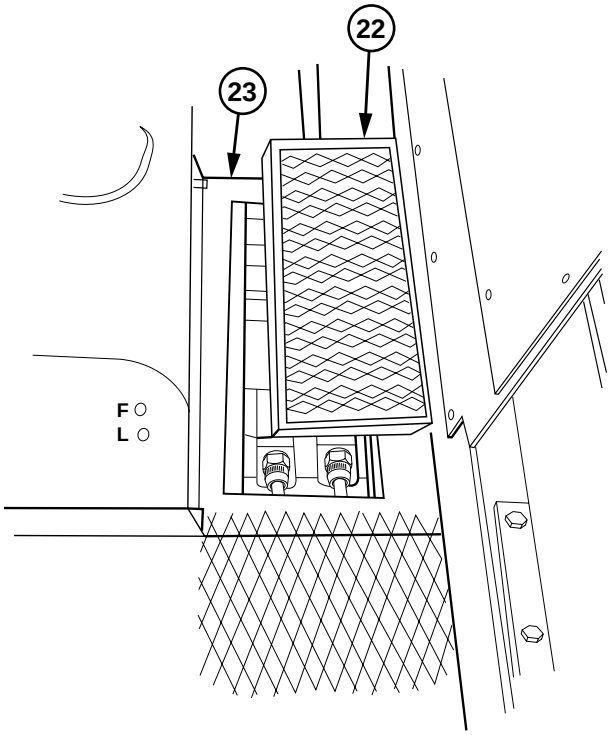


(8) Install screw (17), new lockwasher (18), and nut (19) in support plate (14) and frame (10). Do not tighten.

(9) Tighten nuts (13, 16, and 19).

(10) Connect two hoses (20) and hose (20.1) to hydraulic pump (3).

(11) Connect two hoses (21.1) to hydraulic pump (3).



(12) Install access cover (22) on winch deck (23).

c. Follow-On Maintenance

(1) Fill hydraulic reservoir (TM 9-2320- 360-20).

(2) Install PTO propshaft (TM 9-2320-360-20).

17-12. POWER TAKEOFF REPLACEMENT

This task covers:
a. Removal
b. Installation
c. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Lower engine access panel removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Pan, Oil Drain (Item 102, Appendix E)
Wrench, Combination, 1-1/2 In. (Item 214, Appendix E)
Wrench, Crow's Foot, 9/16 In. (Item 218, Appendix E)
Wrench Set, Socket, 3/8 In. Drive (Item 232, Appendix E)
Wrench, Torque, 0-175 Lb-Ft, (Item 236, Appendix E)

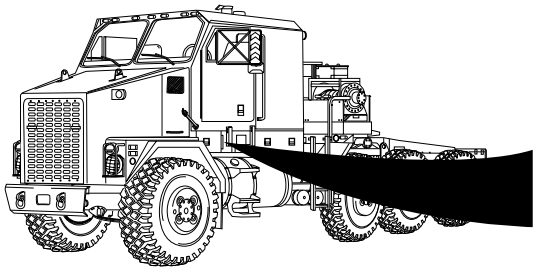
Materials/Parts
Ties, Cable, Plastic (Item 60, Appendix B)
Gasket (Item 25, Appendix F)
Locknuts (2) (Item 86, Appendix F)
Lockwashers (3) (Item 119, Appendix F)
Mounting Parts Kit (Item 145, Appendix F)

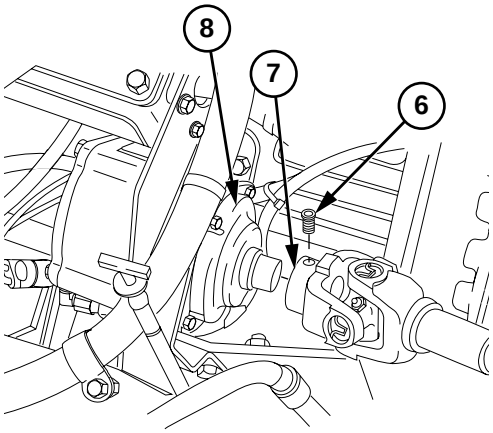
a. Removal

(1) Deleted.

(2) Loosen screw (6) on yoke (7).

(3) Slide back and remove yoke (7) from PTO (8).

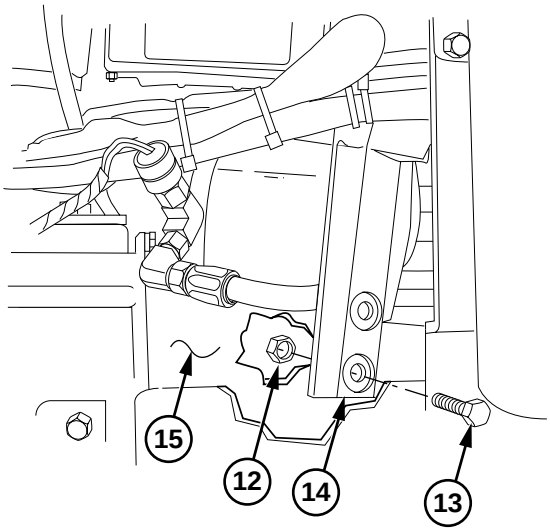




17-12. POWER TAKEOFF REPLACEMENT (CONT)

(4) Deleted.

(5) Remove two locknuts (12) and screws (13) from bracket (14) and cradle (15). Discard locknuts.



(6) Remove three screws (16), lockwashers (17), and bracket (14) from air compressor (11). Discard lockwashers.

(7) Position three screws (16) in air compressor (11). Do not tighten.

(8) Place drain pan under PTO (8) to catch draining fluid.

NOTE

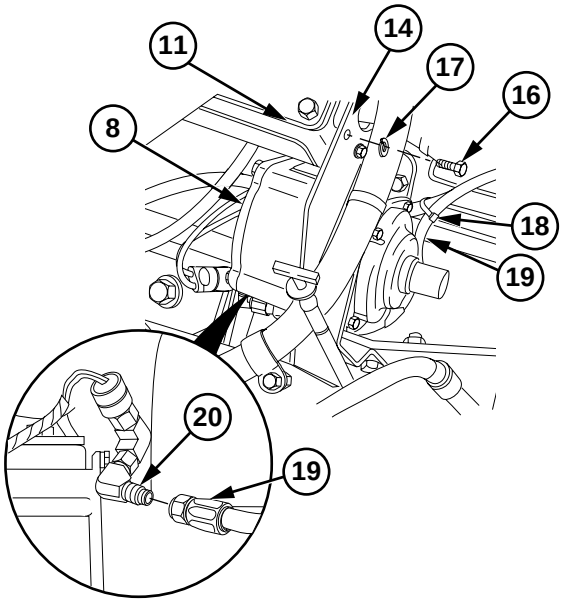
Location of plastic cable ties should be marked before removal.

(9) Remove cable tie (18) from hose no. 2933 (19).

NOTE

Tag and mark hoses before removal.

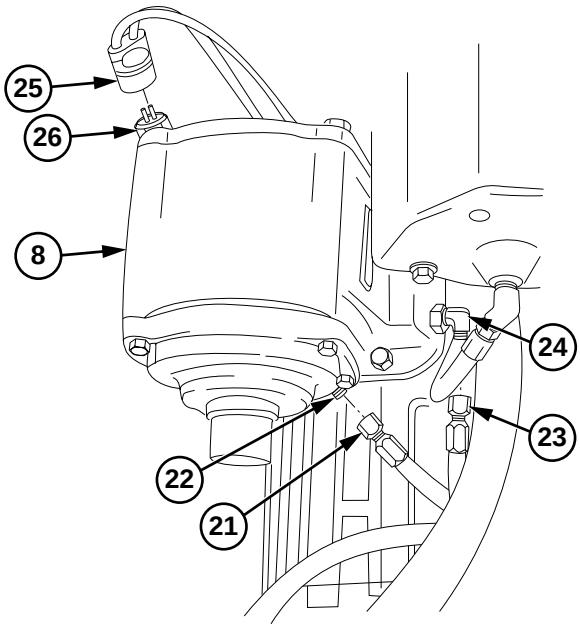
(10) Remove hose no. 2933 (19) from elbow (20).



(11) Remove hose no. 2852 (21) from elbow (22).

(12) Remove hose no. 2934 (23) from elbow (24).

(13) Remove electrical connector (25) from PTO switch (26).



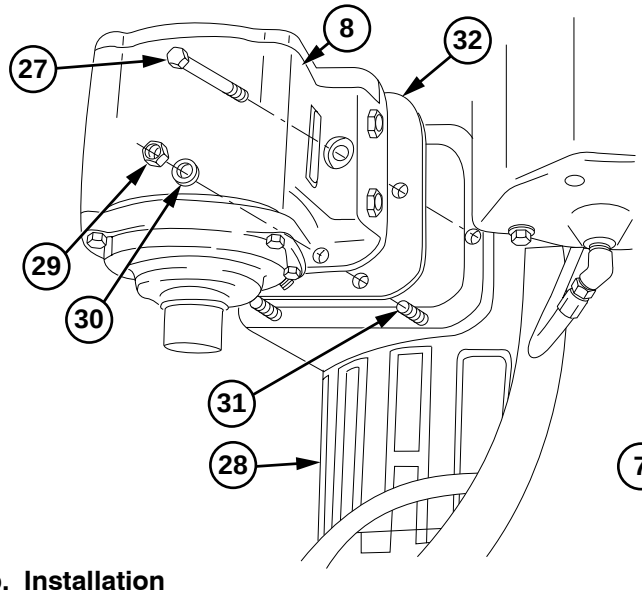
(14) Remove screw (27) from PTO (8) and transmission (28).

NOTE

It may be necessary to loosen all five nuts and raise PTO slightly to remove nuts.

(15) Remove five nuts (29) and washers (30) from studs (31). Discard washers.

(16) Remove PTO (8) and gasket (32) from transmission (28). Discard gasket.

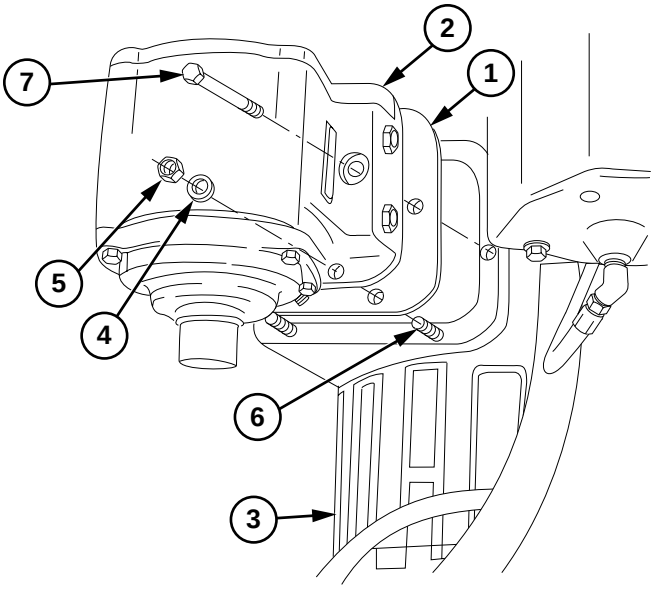


b. Installation

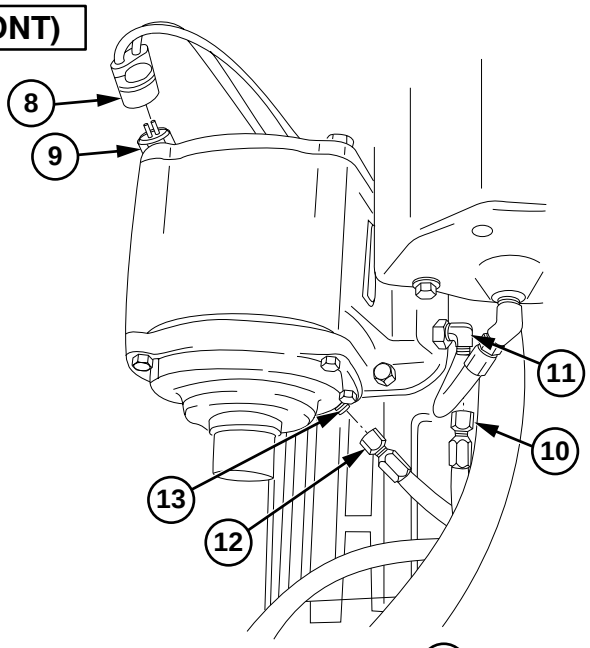
(1) Position new gasket (1) and PTO (2) on transmission (3).

(2) Install five new washers (4) and nuts (5) on studs (6). Torque to 32–37 lb–ft. (43–50 N·m).

(3) Install screw (7) in PTO (2) and transmission (3).



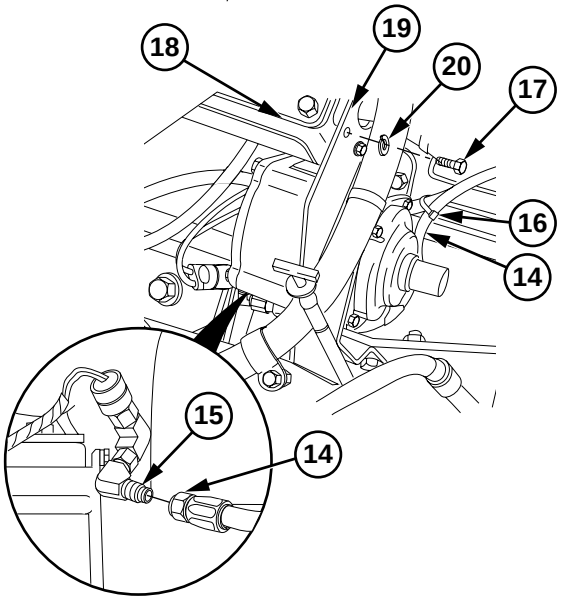
17-12. POWER TAKEOFF REPLACEMENT (CONT)



(4) Install electrical connector (8) on PTO switch (9).

(5) Install hose no. 2934 (10) on elbow (11).

(6) Install hose no. 2852 (12) on elbow (13).



(7) Install hose no. 2933 (14) on elbow (15).

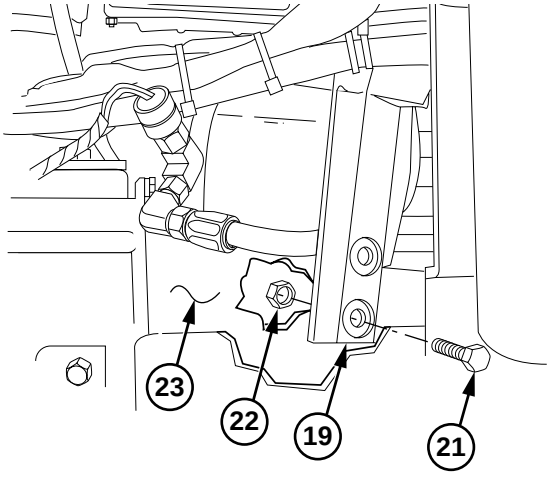
NOTE

Plastic cable tie should be positioned in locations marked during removal.

(8) Secure hose no. 2933 (14) with plastic cable tie (16).

(9) Remove three screws (17) from air compressor (18).

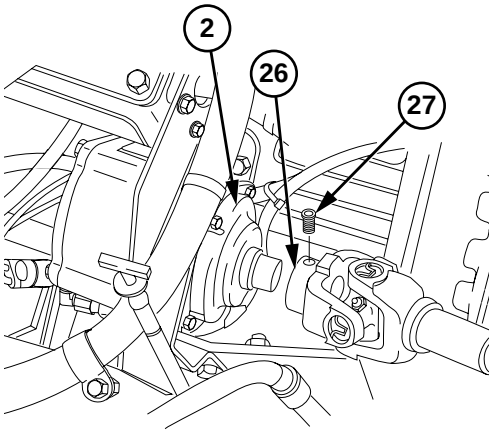
(10) Install bracket (19) on air compressor (18) with three new lockwashers (20) and screws (17).



(11) Install two screws (21) and new locknuts (22) on bracket (19) and cradle (23).

(12) Deleted.

(13) Install yoke (26) on PTO (2) with screw (27).



(14) Deleted.

c. Follow-On Maintenance

Install lower engine access panel (TM 9-2320-360-20).

CHAPTER 18
SPECIAL PURPOSE KITS MAINTENANCE

Contents

	Para	Page
Introduction	18-1	18-1
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DDEC II Vehicle Conversion to Accept DDEC III/IV Dressed Engine	18-4	18-59

Section I. INTRODUCTION

18-1. INTRODUCTION

This chapter contains maintenance instructions for installation of the arctic kit authorized by the Maintenance Allocation Chart (MAC) at the Direct Support maintenance level.

Section II. MAINTENANCE PROCEDURES

18-2. ARCTIC KIT INSTALLATION

This task covers:
a. Installation
b. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Batteries removed (TM 9-2320-360-20)
Cooling system drained (TM 9-2320-360-20).
Exhaust heat shield removed (TM 9-2320-360-20).
Inner fenders removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-300 Lb-In. (Item 235, Appendix E)
Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

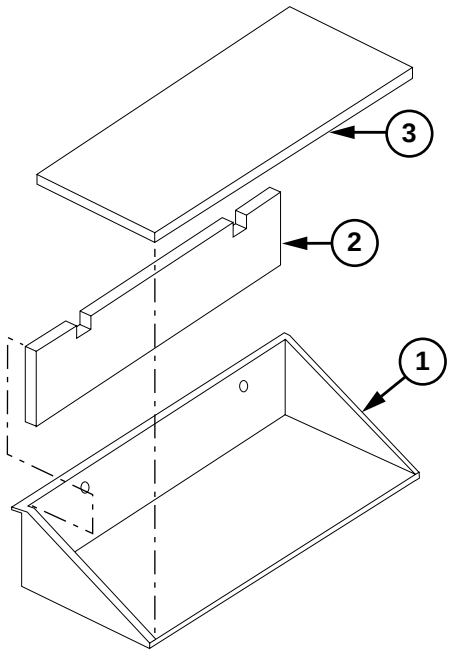
Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Spray, Adhesive (Item 55, Appendix B)
Lockwashers (2) (Item 135, Appendix F)
Lockwasher (Item 127, Appendix F)

a. Installation

WARNING

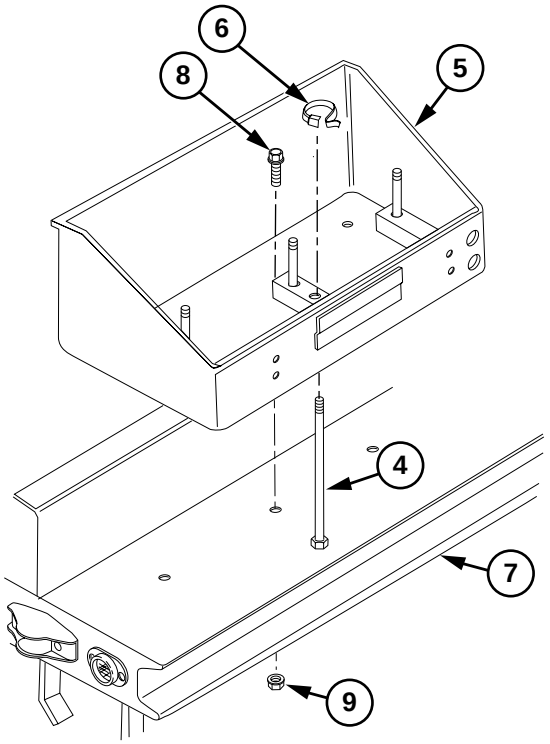
- **Ensure engine is cool before performing maintenance. Failure to comply may result in serious injury to personnel.**
- **Adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive gets on skin or clothing, wash immediately with soap and water.**

(1) Spray adhesive on inside of arctic battery box cover (1). Install insulation panels (2 and 3).



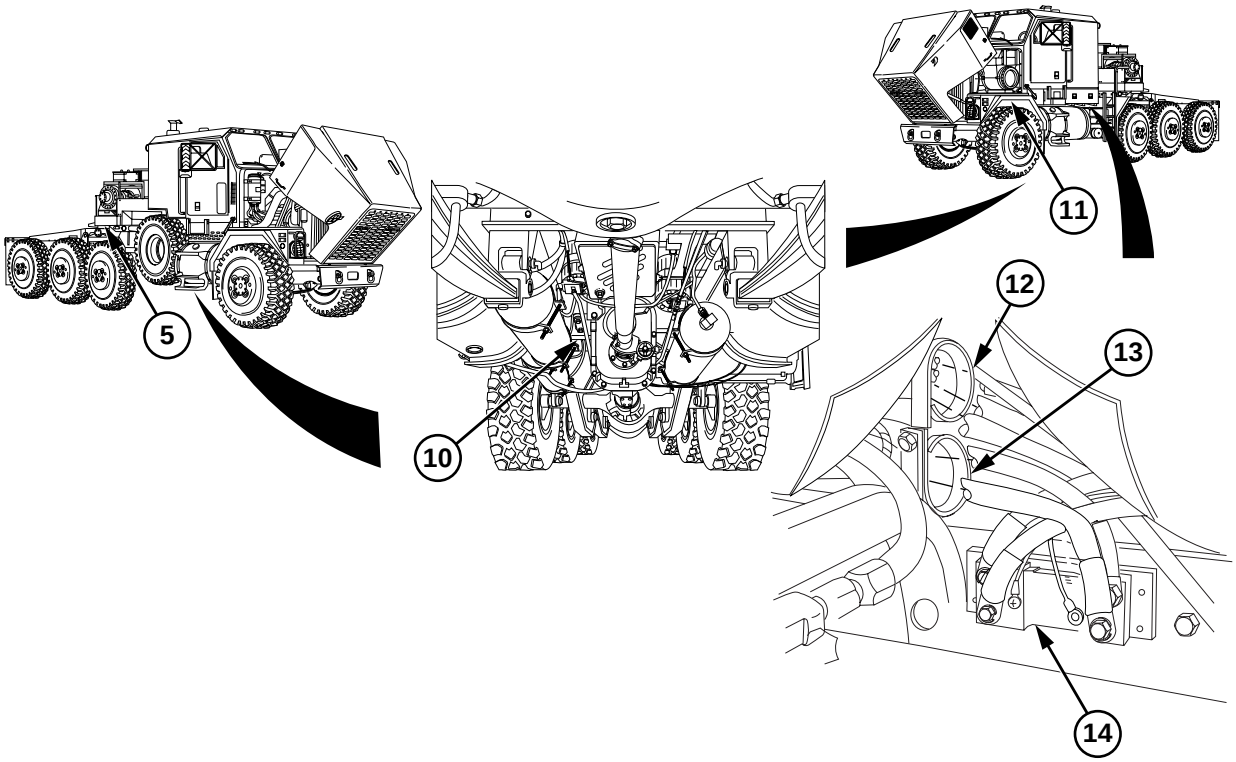
(2) Install four carriage bolts (4) in arctic battery box (5) and secure with plastic cable ties (6).

(3) Install arctic battery box (5) on winch platform (7) with three screws (8) and nuts (9). Torque to 50 lb-ft (68 N·m).



(4) Route positive (+) cable along frame assembly (10) from starter (11) through clip (12) to arctic battery box (5).

(5) Route negative (-) cable along frame assembly (10) from starter (11) through clip (13) to shunt (14).



STOWAGE BOX REMOVED FOR CLARITY

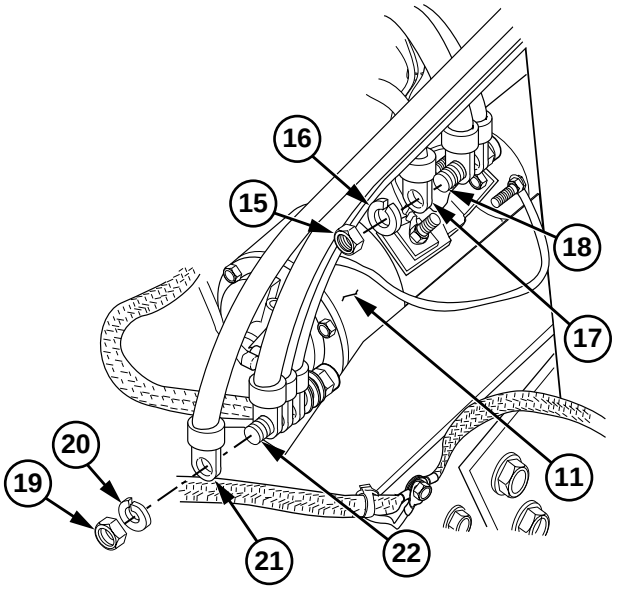
18-2. ARCTIC KIT INSTALLATION (CONT)

(6) Remove nut (15) and lockwasher (16) from starter (11). Discard lockwasher.

(7) Connect positive (+) cable (17) to positive terminal (18) of starter (11) with new lockwasher (16) and nut (15).

(8) Remove nut (19) and lockwasher (20) from starter (11). Discard lockwasher.

(9) Connect negative (–) cable (21) to negative terminal (22) of starter (11) with new lockwasher (20) and nut (19).



STEERING COLUMN REMOVED FOR CLARITY

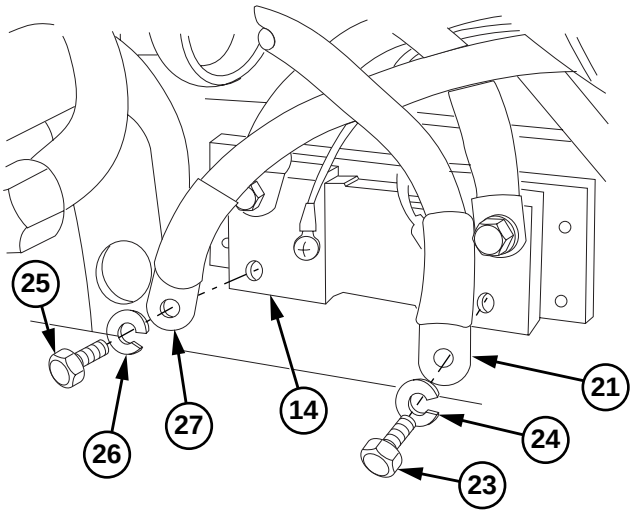
(10) Remove screw (23) and lockwasher (24) from shunt (14). Discard lockwasher.

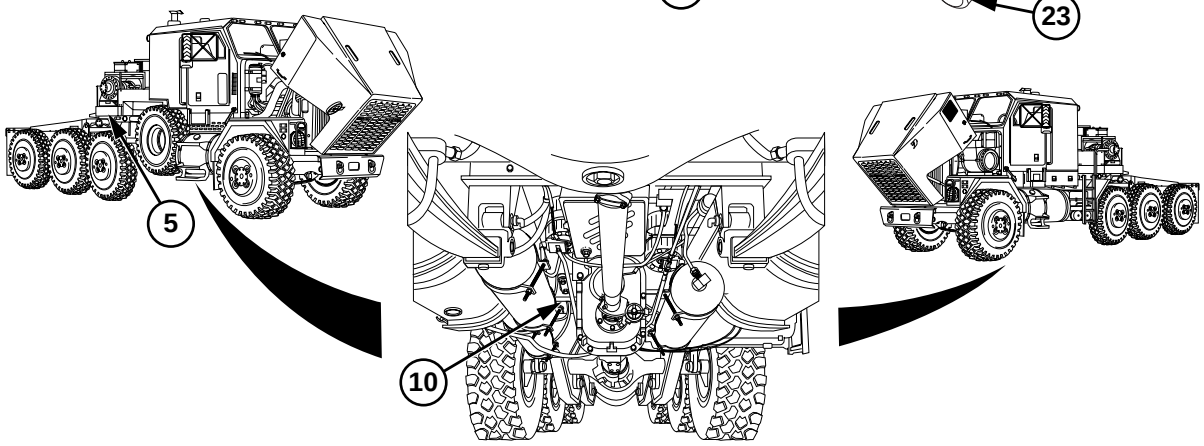
(11) Install negative (–) cable (21) on shunt (14) with new lockwasher (24) and screw (23).

(12) Route negative (–) cable from shunt (14) along frame assembly (10) to arctic battery box (5).

(13) Remove screw (25) and lockwasher (26) from shunt (14). Discard lockwasher.

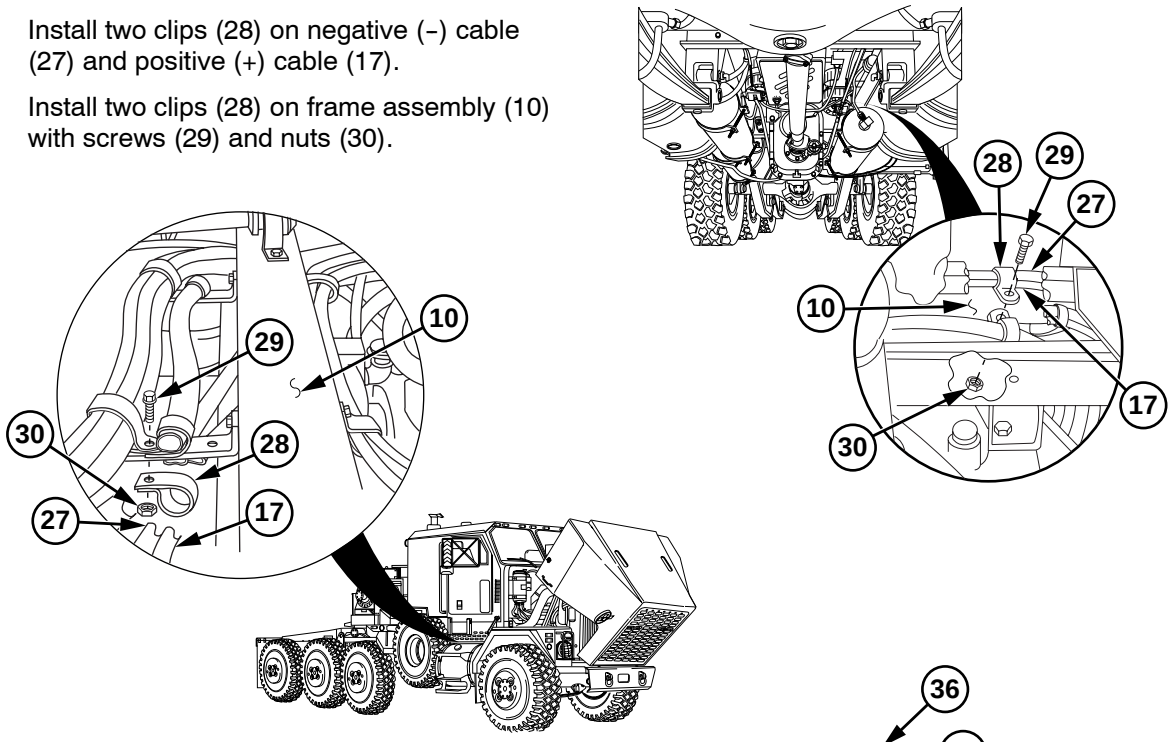
(14) Install negative (–) cable (27) on shunt (14) with new lockwasher (26) and screw (25).





(15) Install two clips (28) on negative (–) cable (27) and positive (+) cable (17).

(16) Install two clips (28) on frame assembly (10) with screws (29) and nuts (30).



CAUTION

Ensure rubber grommets are installed correctly in holes on side of arctic battery box to prevent cables from shorting out on box.

(17) Install two rubber grommets (31 and 32) in arctic battery box (5).

(18) Insert negative (–) cable (27) from shunt (14) through rubber grommet (31).

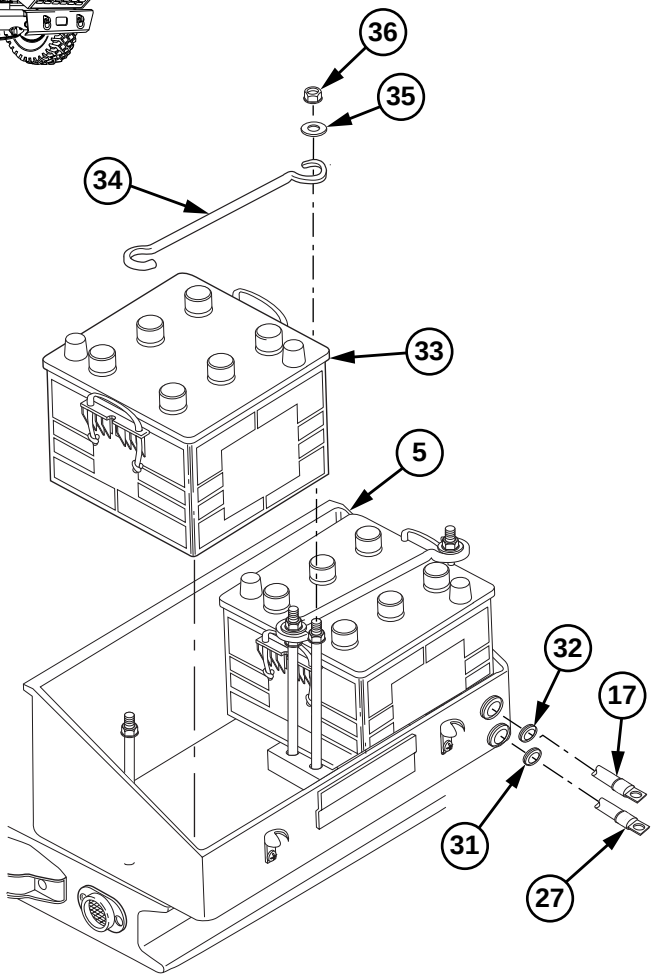
(19) Insert positive (+) cable (17) from starter through rubber grommet (32).

WARNING

Batteries produce explosive gases. Keep sparks and open flame away from batteries. Failure to comply may result in serious injury to personnel.

(20) Install two batteries (33) in arctic battery box (5).

(21) Install two holddowns (34) on batteries (33) with four washers (35) and nuts (36).



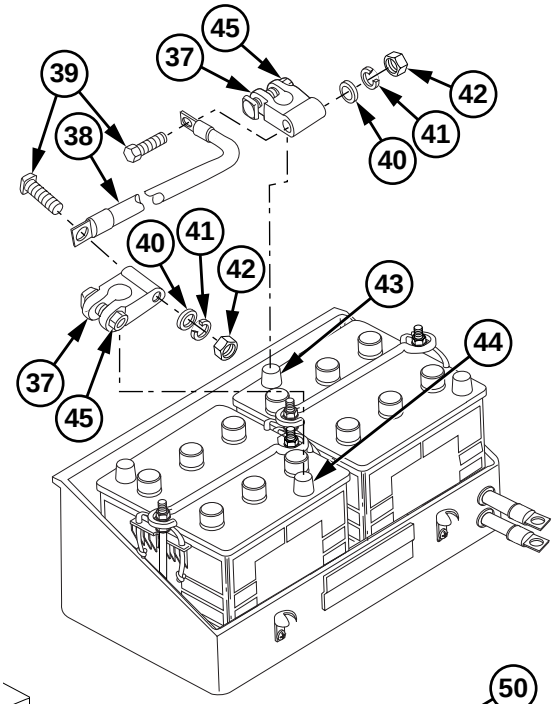
18-2. ARCTIC KIT INSTALLATION (CONT)

(22) Install two cable clamps (37) on jumper cable (38) with two screws (39), washers (40), lockwashers (41), and nuts (42). Torque to 144-192 lb-in. (16.1-21.5 N·m).

(23) Install jumper cable (38) on battery posts (43 and 44).

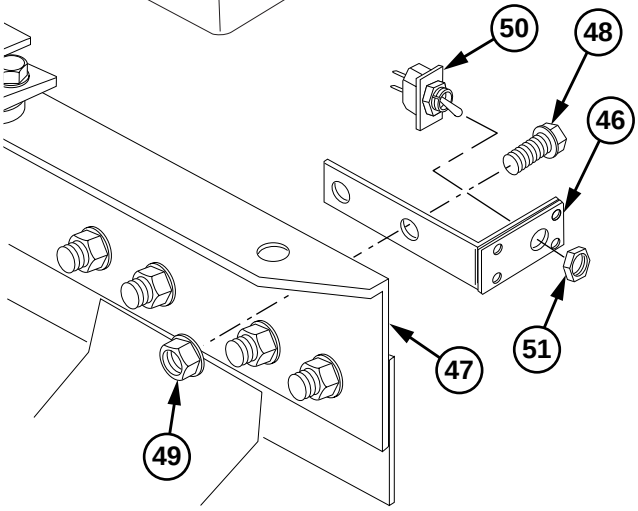
(24) Lightly coat battery posts (43 and 44) with grease.

(25) Tighten two nuts (45) on jumper cable (38). Torque to 84-96 lb-in. (9.4-10.8 N·m).

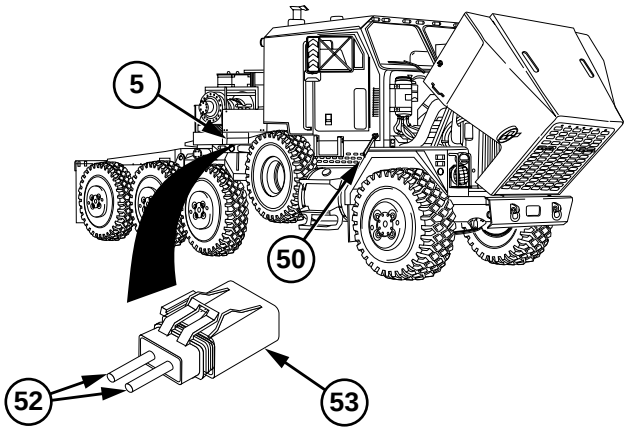


(26) Install toggle switch bracket (46) on muffler bracket (47) with screw (48) and nut (49).

(27) Install toggle switch (50) on bracket (46) with nut (51).



(28) Route wire harness (52) with in-line fuse holder (53) from toggle switch (50) to arctic battery box (5).



(29) Insert wire no. 1435 (54) and wire no. 1373 (55) through rubber grommet (31).

(30) Install wire no. 1435 (54) and negative (–) cable (27) on cable clamp (56) with screw (57), washer (58), lockwasher (59), and nut (60). Torque to 144–192 lb–in. (16.1–21.5 N·m).

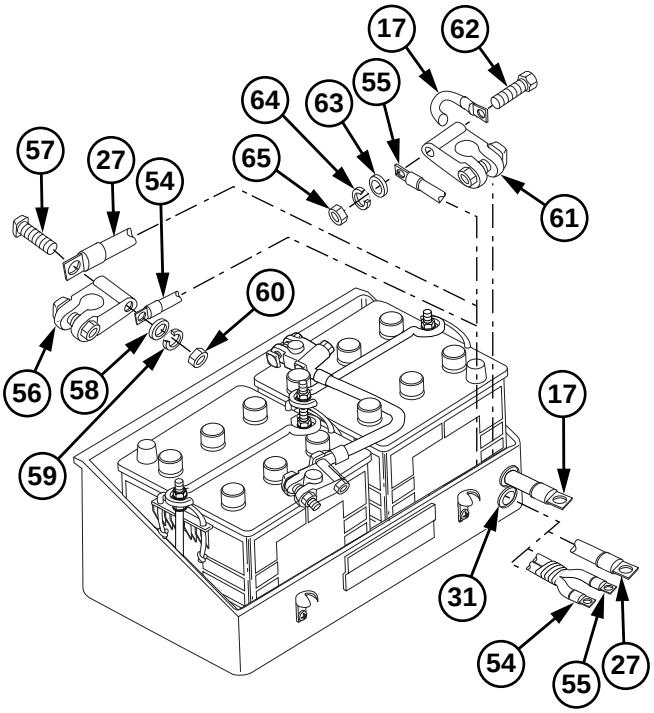
(31) Install wire no. 1373 (55) and positive (+) cable (17) on cable clamp (61) with screw (62), washer (63), lockwasher (64), and nut (65). Torque to 144–192 lb–in. (16.1–21.5 N·m).

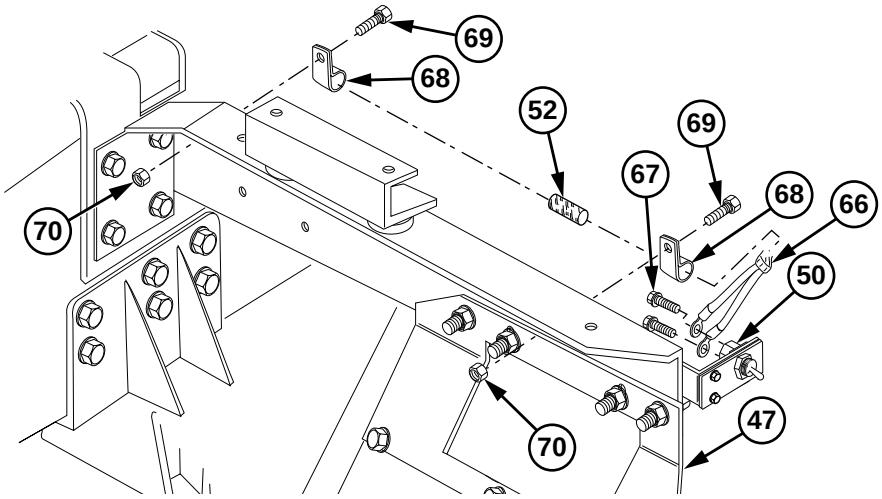
(32) Connect two wires no. 1373 (66) to toggle switch (50) with two screws (67).

(33) Install two clips (68) on wire harness (52).

(34) Position two clips (68) along wire harness (52) at mounting position on muffler bracket (47).

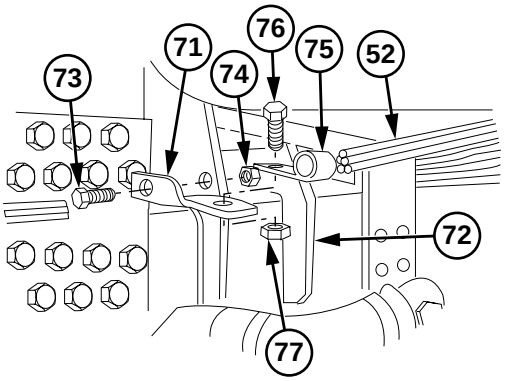
(35) Install two clips (68) on muffler bracket (47) with screws (69) and nuts (70).





(36) Install standoff bracket (71) on right cab mount (72) with screw (73) and nut (74).

(37) Install clip (75) on wire harness (52) and standoff bracket (71) with screw (76) and nut (77).



18-2. ARCTIC KIT INSTALLATION (CONT)

(38) Install two clamps (78) on brackets (79).

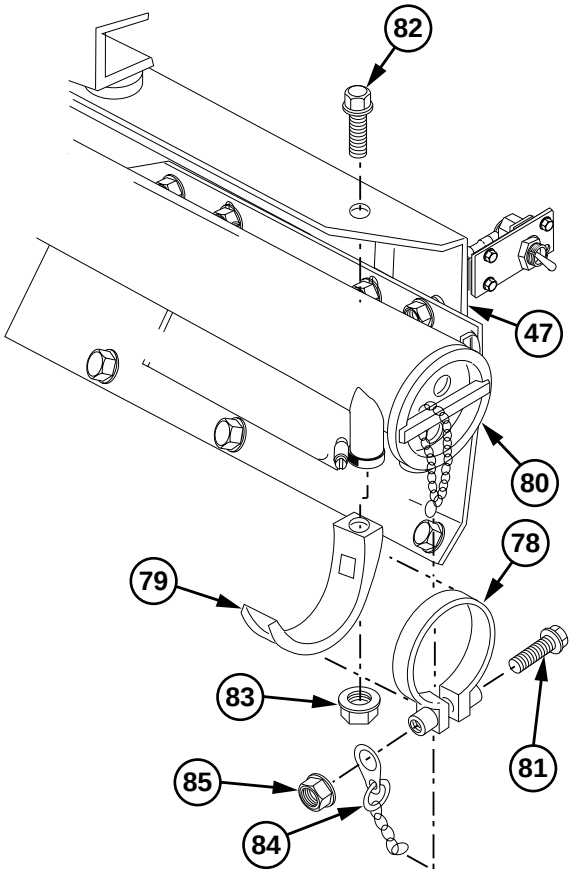
(39) Position water jacket (80) on brackets (79).

(40) Install two screws (81) on clamps (78). Do not tighten.

(41) Install two brackets (79) on muffler bracket (47) with two screws (82) and nuts (83).

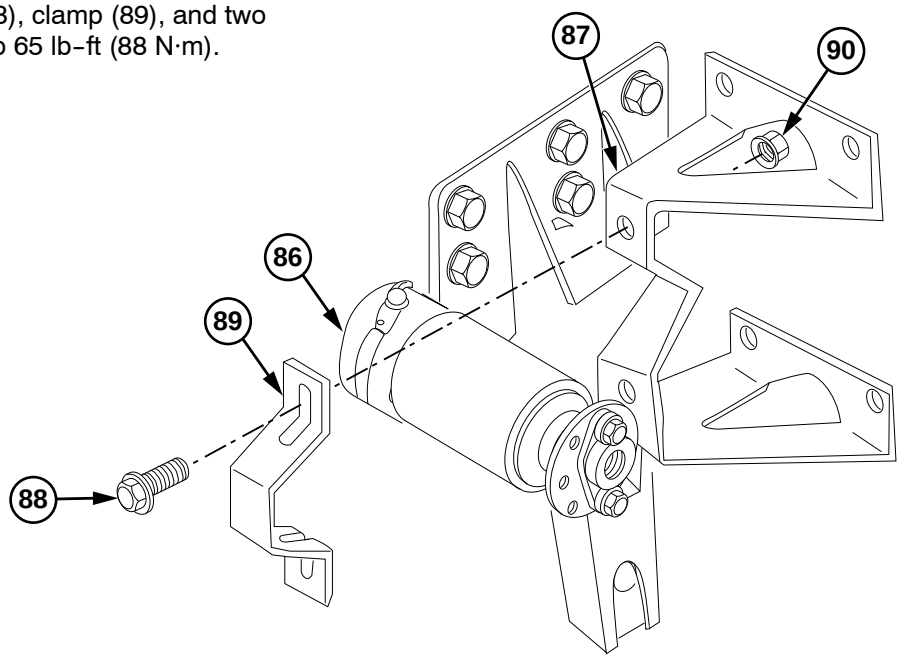
(42) Tighten screws (82) to 75 lb-ft (102 N·m).

(43) Install lanyard (84) with nut (85).



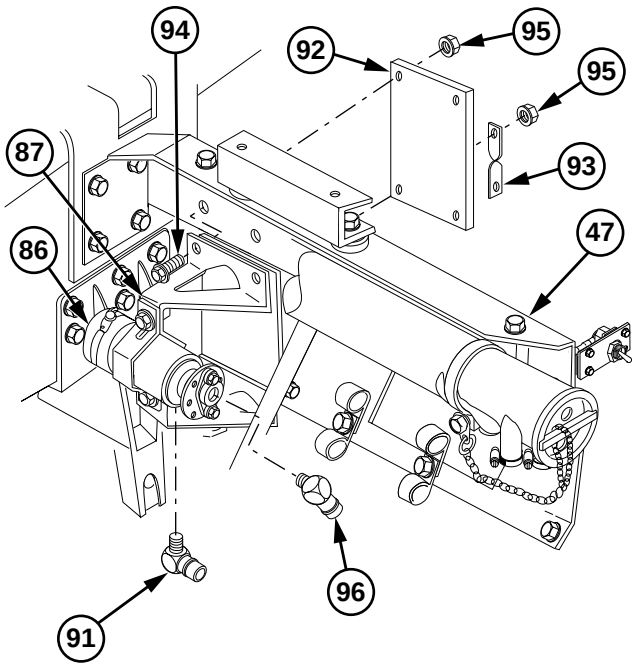
(44) Position coolant pump (86) on support (87).

(45) Install coolant pump (86) on support (87) with two screws (88), clamp (89), and two nuts (90). Torque to 65 lb-ft (88 N·m).



WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

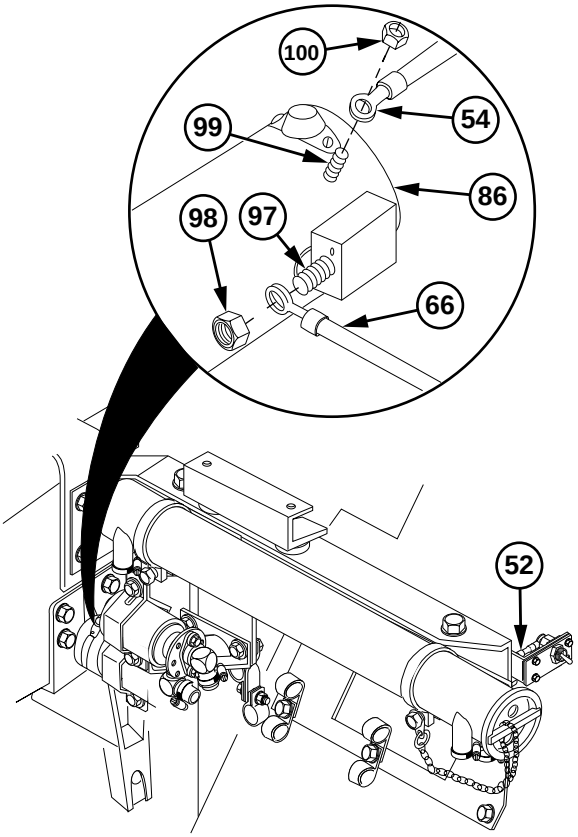


(46) Coat threads of fitting (91) with pipe thread sealing compound and install fitting on pump (86).

(47) Position support (87) and plate (92) on muffler bracket (47).

(48) Install support (87), standoff bracket (93), and plate (92) on muffler bracket (47) with four screws (94) and nuts (95).

(49) Coat threads of fitting (96) with pipe thread sealing compound and install fitting on coolant pump (86).



(50) Connect wire no. 1373 (66) from toggle switch to positive terminal (97) of coolant pump (86) with nut (98).

(51) Connect wire no. 1435 (54) to negative terminal (99) of coolant pump (86) with nut (100).

(52) Install plastic cable ties along wire harness (52) as required.

18-2. ARCTIC KIT INSTALLATION (CONT)

(53) Deleted.

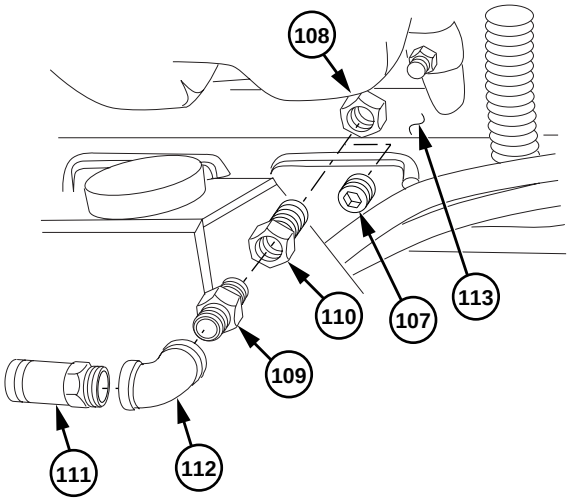
(54) Remove hex plug (107) from adapter (108).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(55) Coat threads of reducer (109), nipple (110), and fitting (111) with pipe thread sealing compound.

(56) Install reducer (109), nipple (110), elbow (111), and fitting (112) on engine (113).



(57) Remove screw (114), lockwasher (115), and clip (116) from upper right thermostat housing (117).

(58) Disconnect plug (118) from socket (119).

(59) Remove STE/ICE water temperature sender (120) from engine (113).

(60) Coat threads of tee (121) with pipe thread sealing compound.

(61) Install fitting (122) on tee (121).

(62) Install tee (121) on engine (113).

(63) Coat threads of nipple (123), reducer coupling (124), and elbow (125) with pipe thread sealing compound.

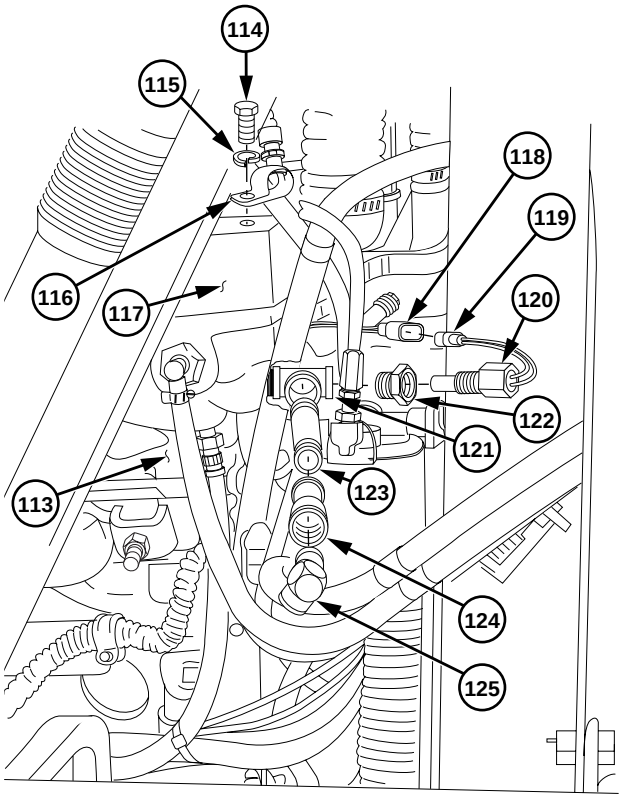
(64) Install nipple (123), reducer coupling (124), and elbow (125) on tee (121).

(65) Install clip (116) on upper right thermostat housing (117) with new lockwasher (115) and screw (114).

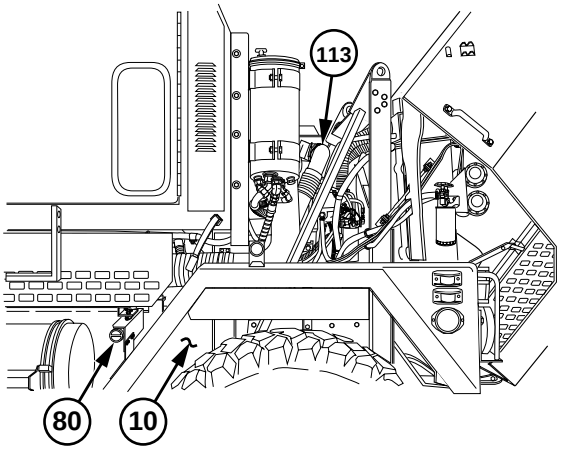
(66) Coat threads of STE/ICE water temperature sender (120) with pipe thread sealing compound.

(67) Install STE/ICE water temperature sender (120) on fitting (122).

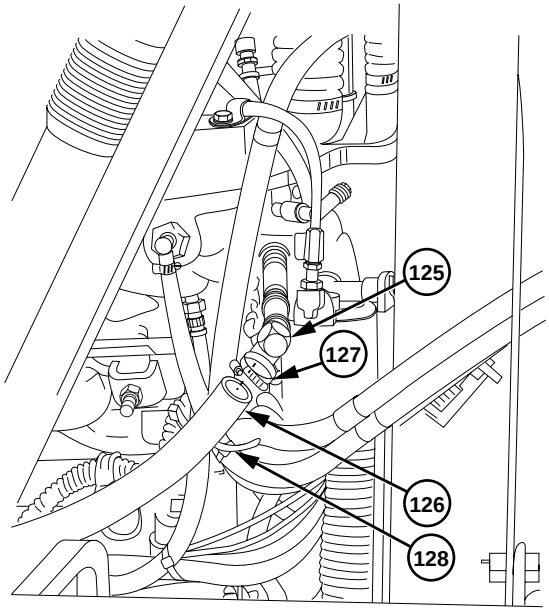
(68) Connect plug (118) to socket (119).



(69) Route coolant hose along frame assembly (10) from water jacket (80) to engine (113).

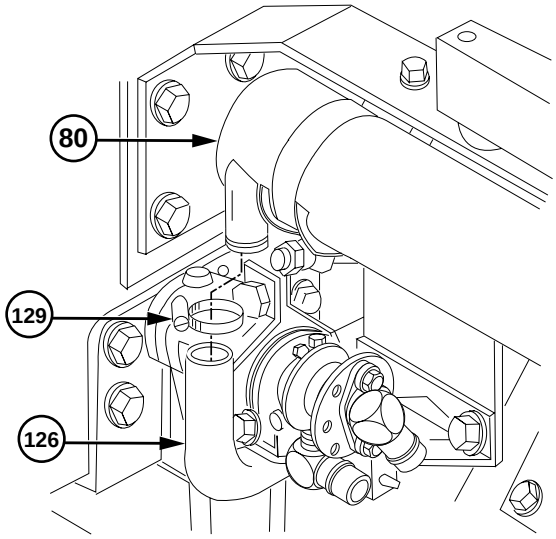


18-2. ARCTIC KIT INSTALLATION (CONT)



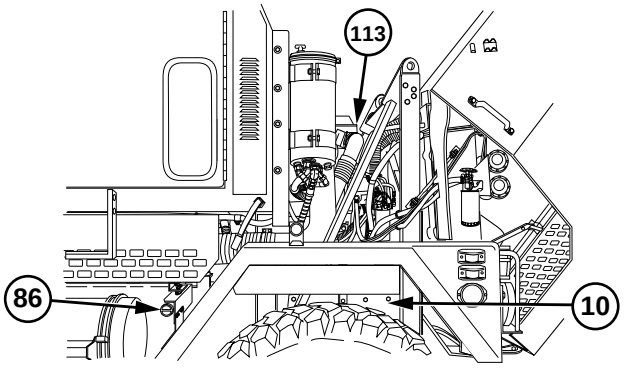
(70) Install coolant hose (126) on elbow (125) with clamp (127).

(71) Secure coolant hose (126) with cable ties (128).



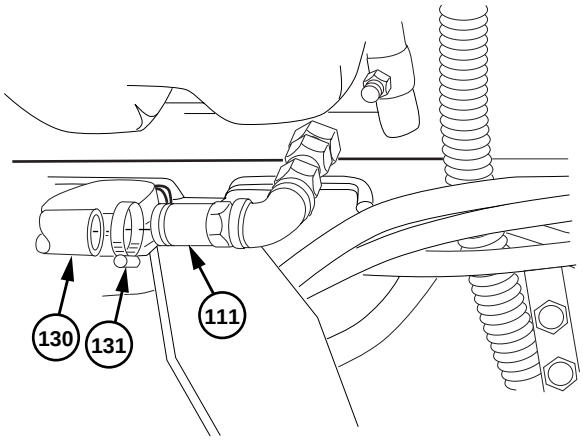
MUFFLER REMOVED FOR CLARITY

(72) Install coolant hose (126) on water jacket (80) with clamp (129).



(73) Route coolant hose along frame assembly (10) from coolant pump (86) to engine (113).

(74) Install coolant hose (130) on fitting (111) with clamp (131).

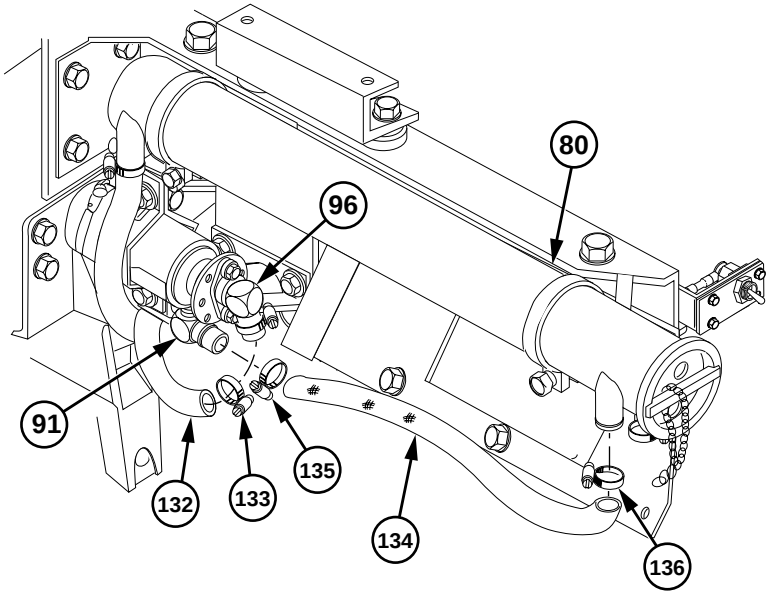


(75) Deleted.

(76) Install coolant hose (132) on fitting (96) with clamp (133).

(77) Install coolant hose (134) on fitting (91) with clamp (135).

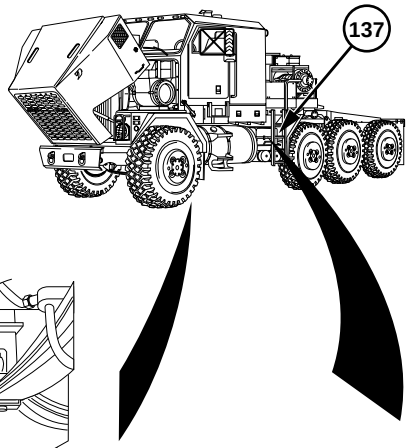
(78) Install coolant hose (134) on water jacket (80) with clamp (136).

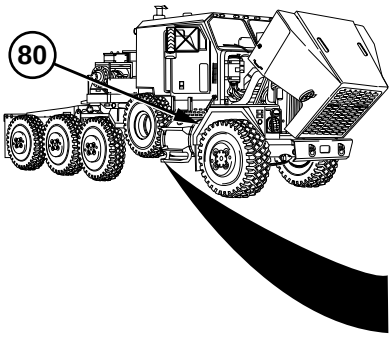


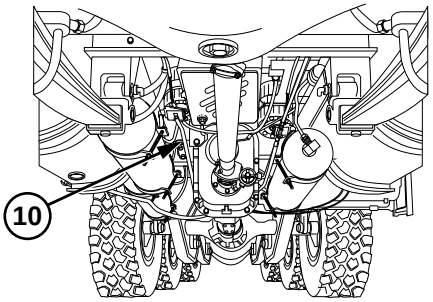
18-2. ARCTIC KIT INSTALLATION (CONT)

(79) Route exhaust hose along frame assembly (10) from water jacket (80) to main battery box (137).

(80) Insert exhaust hose (138) in hole in bottom of main battery box (137).



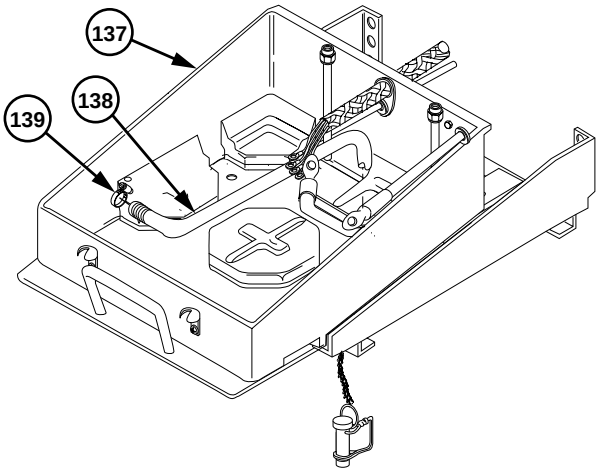




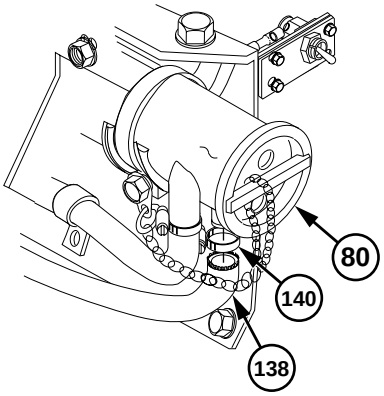
CAUTION

Exhaust hose becomes hot during normal operation. Do not use plastic cable ties to secure exhaust hose. Do not allow the exhaust hose to contact hoses or wire harnesses. Failure to comply may result in damage to equipment.

(81) Install clamp (139) on end of exhaust hose (138) to keep it captive in main battery box (137).



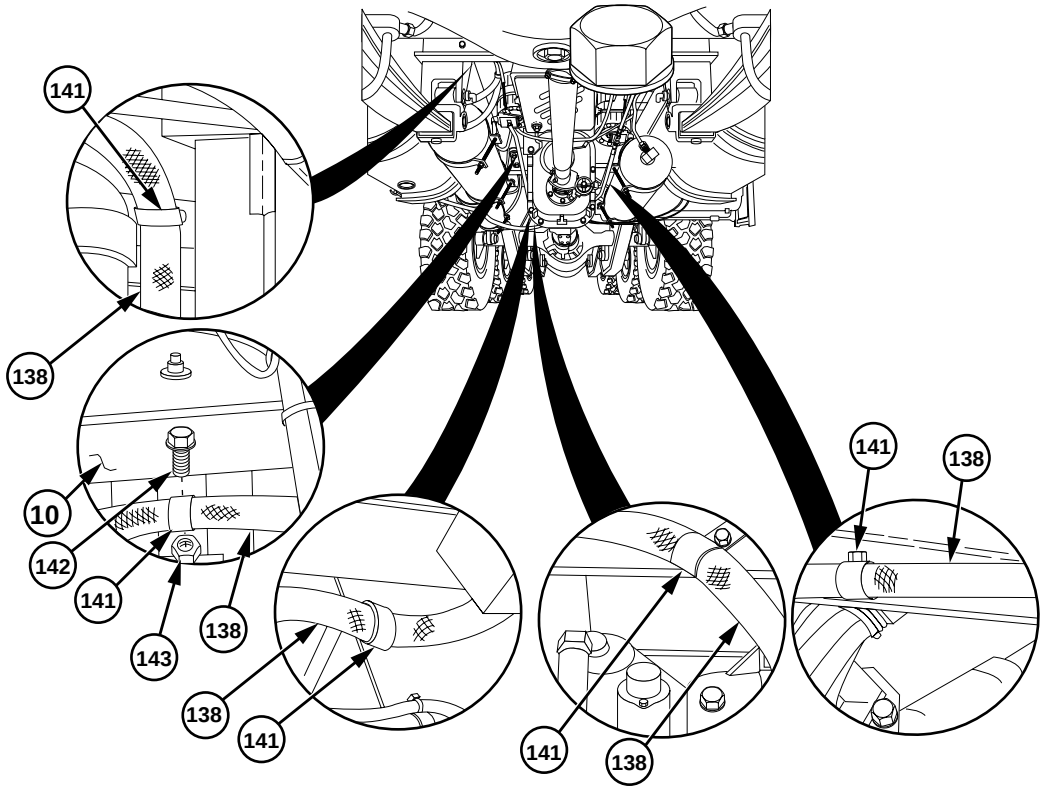
(82) Install exhaust hose (138) on water jacket (80) with clamp (140).



(83) Install five clips (141) on exhaust hose (138).

(84) Position five clips (141) along exhaust hose (138) at mounting positions on frame assembly (10).

(85) Install five clips (141) on frame assembly (10) with five screws (142) and nuts (143).



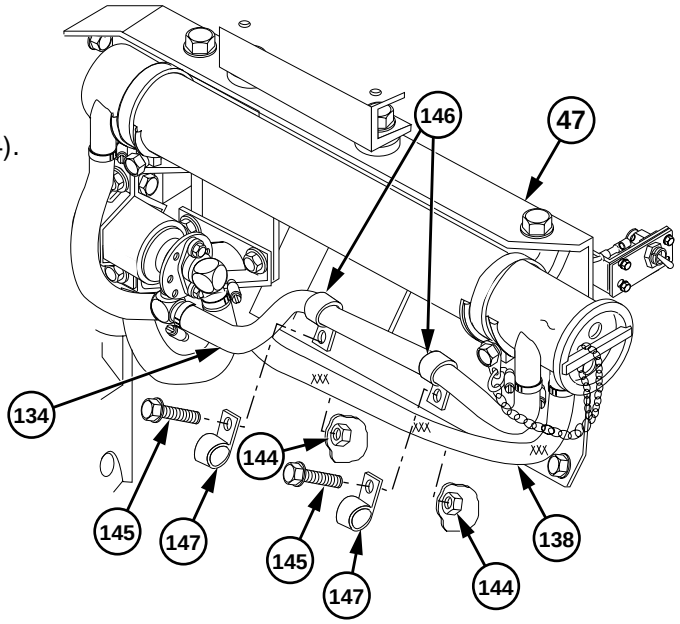
(86) Remove two nuts (144) and screws (145) from muffler bracket (47).

(87) Install two clips (146) on coolant hose (134).

(88) Install two clips (147) on exhaust hose (138).

(89) Position clips (146 and 147) along coolant hose (134) and exhaust hose (138) at mounting position on muffler bracket (47).

(90) Install two screws (145) and nuts (144) on clips (146 and 147). Torque to 50 lb–ft (68 N·m).



18-2. ARCTIC KIT INSTALLATION (CONT)

(91) Install three clips (148) on coolant hose (126).

(92) Position two clips (148) along coolant hose (126) at mounting position on frame assembly (10).

(93) Install two clips (148) on frame assembly (10) with two screws (149) and nuts (150).

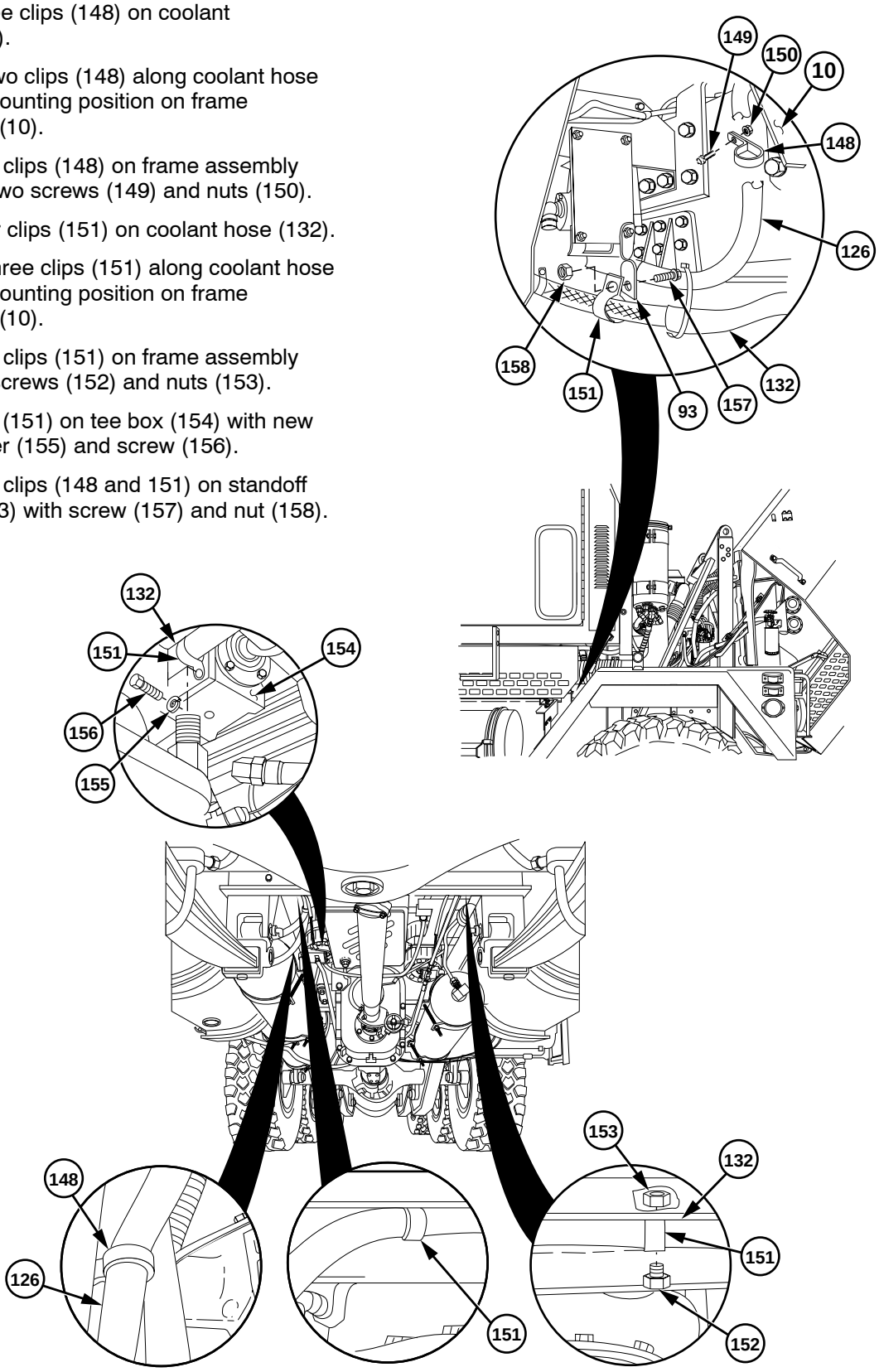
(94) Install four clips (151) on coolant hose (132).

(95) Position three clips (151) along coolant hose (132) at mounting position on frame assembly (10).

(96) Install two clips (151) on frame assembly (10) with screws (152) and nuts (153).

(97) Install clip (151) on tee box (154) with new lockwasher (155) and screw (156).

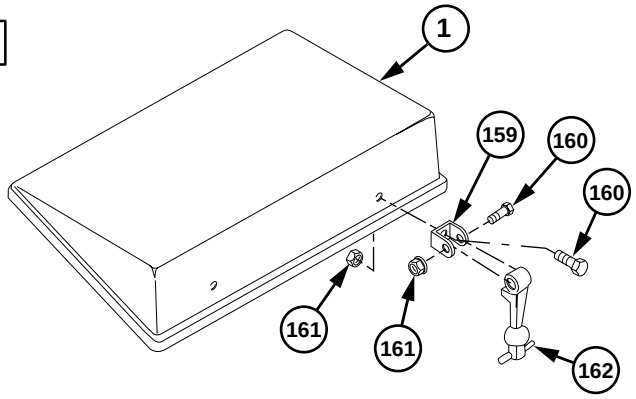
(98) Install two clips (148 and 151) on standoff bracket (93) with screw (157) and nut (158).



18-2. ARCTIC KIT INSTALLATION (CONT)

(99) Install two hood anchor brackets (159) on arctic battery box cover (1) with two screws (160) and nuts (161).

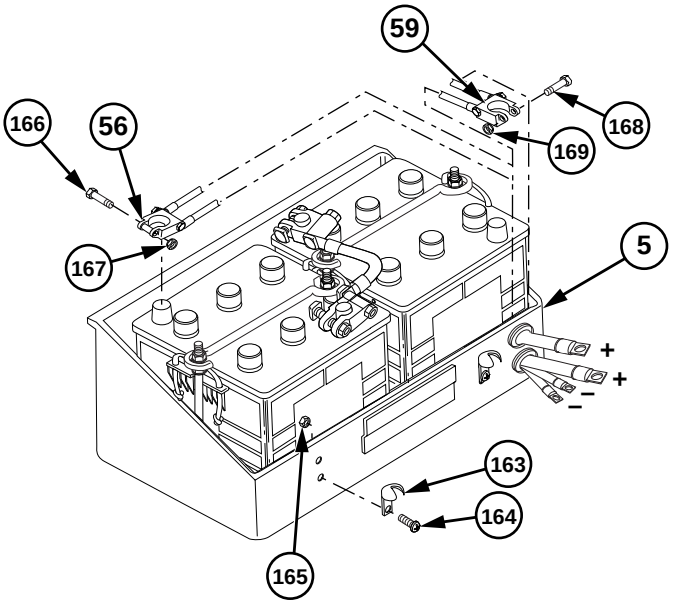
(100) Install two rubber hood hooks (162) on hood anchor brackets (159) with two screws (160) and nuts (161).



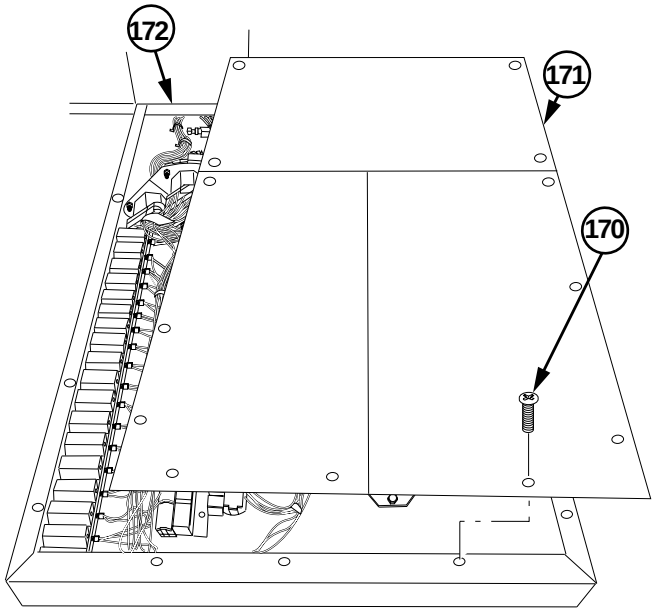
(101) Install two hood brackets (163) on arctic battery box (5) with four screws (164) and nuts (165).

(102) Install screw (166) and nut (167) on cable clamp (56). Torque to 84–96 lb–in. (9.4–10.8 N·m).

(103) Install screw (168) and nut (169) on cable clamp (59). Torque to 84–96 lb–in. (9.4–10.8 N·m).



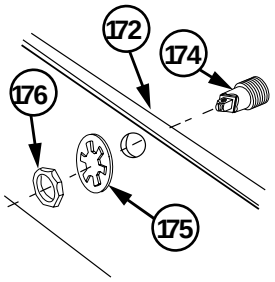
(103.1) Remove 19 screws (170) and three panels (171) from electronic control box (172).



(103.2) Remove plug (173) from electronic control box (172).

(103.3) Install receptacle (174) in electronic control box (172) with lockwasher (175) and nut (176).

(103.4) Install wire no. 1378 (177) on receptacle (174) with screw (178).

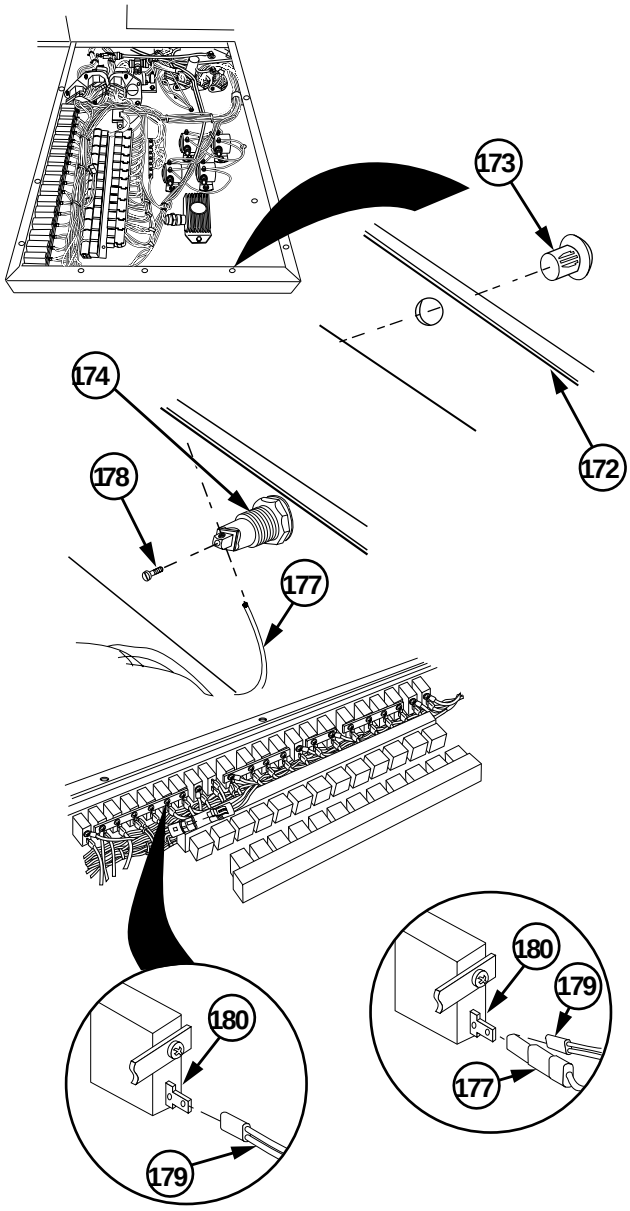


(103.5) Remove wires no. 1340 and no. 1082 (179) from heater circuit breaker (180).

(103.6) Install wire no.1378 (177) on heater circuit breaker (180).

(103.7) Install wires no. 1340 and no. 1082 (179) on wire no.1378 (177).

(103.8) Install three panels (171) on electronic control box (172) with 19 screws (173).



NOTE

12-volt alternator belt, 24-volt alternator belt, and fan belts must be changed to withstand low temperatures of -50 to -26ºF (-46 to -32ºC).

(104) Replace 12-volt (rear) alternator belt (TM 9-2320-360-20).

(105) Replace 24-volt (front) alternator belt (TM 9-2320-360-20).

(106) Replace fan belts (TM 9-2320-360-20).

b. Follow-On Maintenance

(1) Install batteries (TM 9-2320-360-20).

(2) Connect arctic kit batteries (TM 9-2320-360-20).

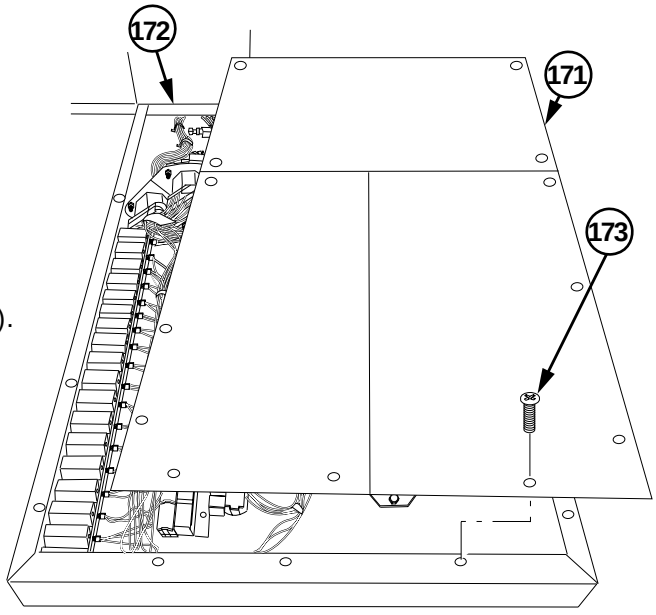
(3) Fill cooling system (TM 9-2320-360-20).

(4) Operate coolant pump and check for leaks (TM 9-2320-360-10).

(5) Close engine hood (TM 9-2320-360-10).

(6) Install exhaust heat shield (TM 9-2320-360-20).

(7) Install inner fender (TM 9-2320-360-20).



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION

This task covers:
a. Installation
b. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
- Engine removed from container and placed on jack stands (out of chassis) (para 3-4)
- Access panels removed (in chassis) (TM 9-2320-360-20)
- Batteries disconnected (in chassis) (TM 9-2320-360-20)
- Inner fenders removed (in chassis) (TM 9-2320-360-20)
- Fan clutch removed (TM 9-2320-360-20)
- 24-volt (front) alternator strap removed (TM 9-2320-360-20)
- Rocker covers removed (TM 9-2320-360-20)

Tools and Special Tools
- Tool Kit, Genl Mech (Item 202, Appendix E)
- Puller Kit, Mechanical, Gear and Brg (Item 124, Appendix E)
- Wrench, Torque, 0-200 lb-in. (Item 235, Appendix E)
- Wrench, Torque, 0-175 lb-ft (Item 236, Appendix E)
- Wrench, Torque, 0-150 lb-in. (Item 234, Appendix E)
- Wrench, Torque, 0-600 lb-ft (Item 233, Appendix E)
- Wrench Combination 1-1/4 (Item 215, Appendix E)
- Wrench Set, Socket, 3/4 in. drive (Item 231, Appendix E)
- Remover, Pulley, Cam Gear (Item 136, Appendix E)

Materials/Parts
- Adhesive-Sealant (Item 6, Appendix B)
- Clamps (2) (Item 7, Appendix F)
- Compound, Antiseize (Item 18, Appendix B)
- Compound, Sealing, Pipe Thread (Item 28, Appendix B)
- Isolators (8) (Item 71.1, Appendix F)
- Locknuts (2) (Item 96, Appendix F)
- Lockwasher (Item 134, Appendix F)
- Lockwasher (Item 135, Appendix F)
- Lockwashers (4) (Item 137, Appendix F)
- Lockwashers (4) (Item 138, Appendix F)
- Lockwashers (2) (Item 141, Appendix F)
- Lockwasher (Item 144, Appendix F)
- Lockwasher (Item 106, Appendix F)
- Lockwashers (2) (Item 117, Appendix F)
- Lockwashers (2) (Item 119, Appendix F)
- Lockwashers (5) (Item 120, Appendix F)
- Lockwasher (Item 122, Appendix F)
- Packing, Preformed (2) (Item 183, Appendix B)
- Screws (4) (Item 277.1, Appendix F)
- Seals (2) (Item 290.1, Appendix F)
- Ties, Cable, Plastic (Item 60, Appendix B)
- Tags, Identification (Item 56, Appendix B)
- Conversion Kit ECM

Personnel Required
- Two

NOTE

- This conversion kit can be installed with the engine in the chassis, or on a dressed engine removed from the vehicle. If the engine is out of the chassis, the Equipment Conditions for "out of chassis" need to be performed. If the engine is still in the vehicle, the "in chassis" Equipment Conditions must be performed. Equipment Conditions without any notation should be performed in either case.
- The DDEC II ECM, which is removed as part of this conversion, should be returned to the supply system for credit. All other parts which are not reused can be discarded.

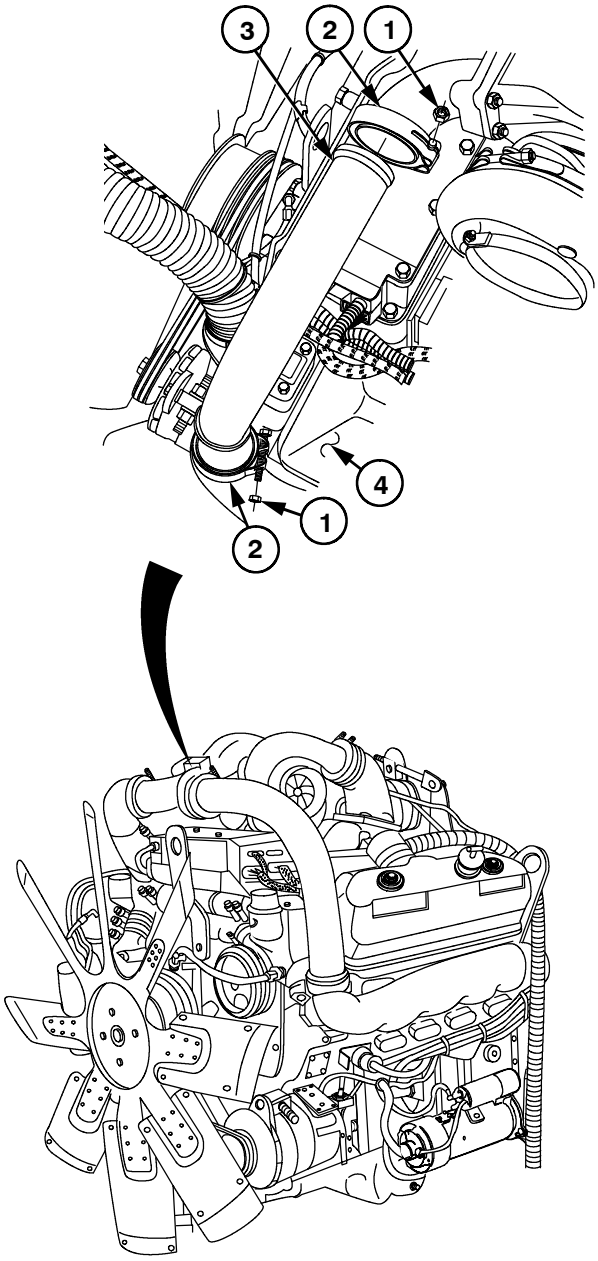
18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

a. Installation

(1) Remove two locknuts (1) from clamps (2) on left exhaust tube (3). Discard locknuts.

(2) Remove two clamps (2) and left exhaust tube (3) from engine (4).

(3) Remove two clamps (2) from left exhaust tube (3). Discard clamps.



NOTE

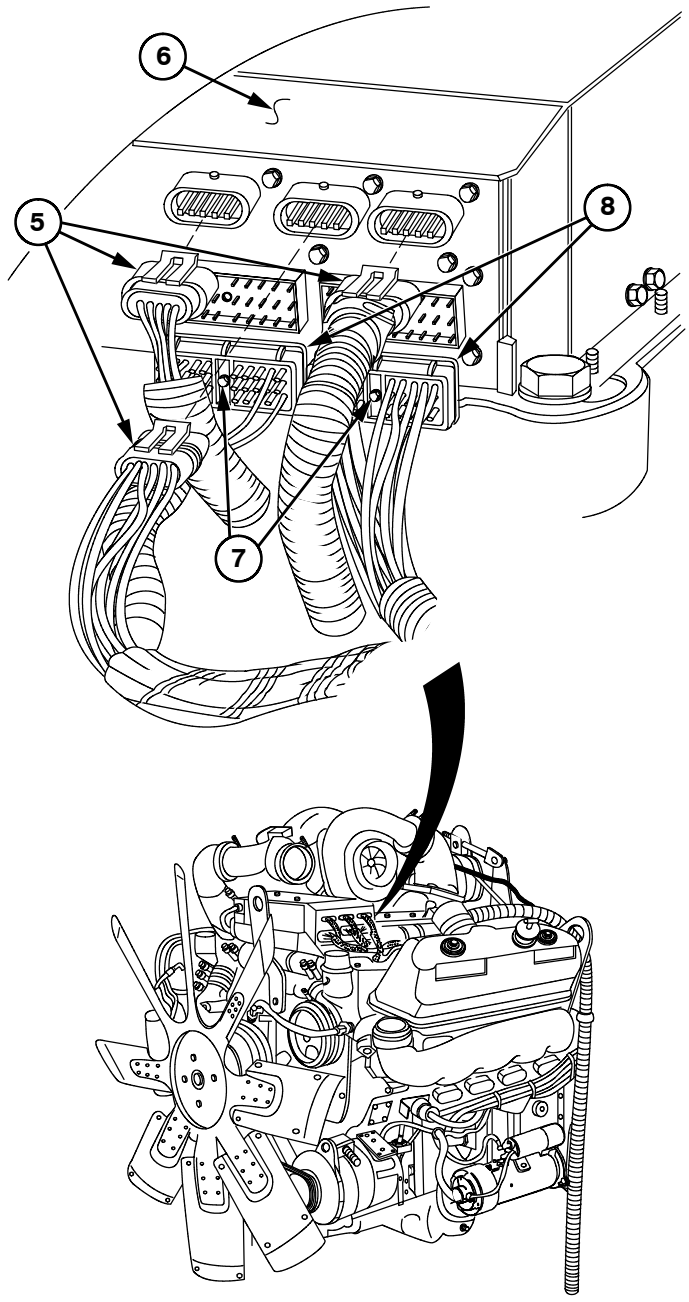
- Connector is removed by gently prying on clip and pulling on connector.
- If engine is out of chassis the center connector will already be removed.

(4) Disconnect three ECM wiring harness connectors (5) from ECM (6).

NOTE

Connector screws are designed to remain with connector.

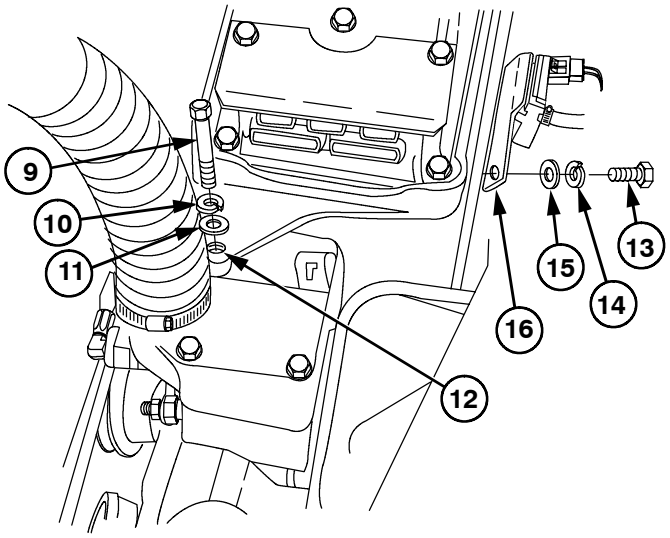
(5) Loosen two screws (7) and remove two ECM wiring harness connectors (8) from ECM (6).



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(6) Remove screw (9), lockwasher (10), and washer (11) from ECM bracket (12). Discard lockwasher.

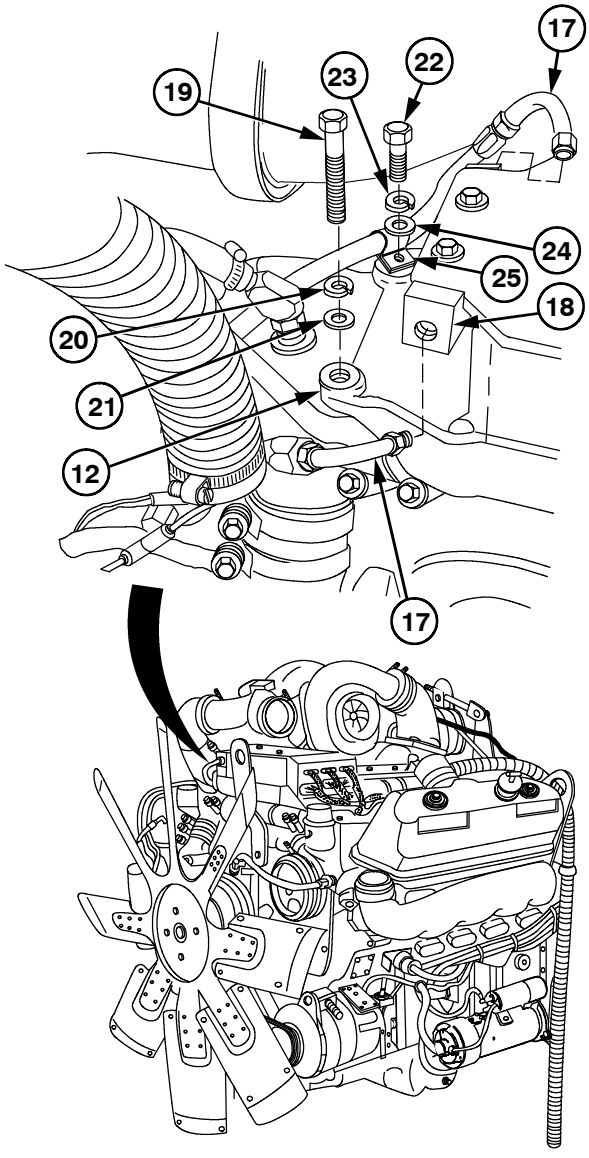
(7) Remove screw (13), lockwasher (14), washer (15), and turbo boost sensor bracket (16) from ECM bracket (12). Discard lockwasher.



(8) Remove two fuel lines (17) from fitting (18).

(9) Remove screw (19), lockwasher (20), and washer (21) from ECM bracket (12). Discard lockwasher.

(10) Remove screw (22), lockwasher (23), washer (24), and clip (25) from ECM bracket (12). Discard lockwasher.

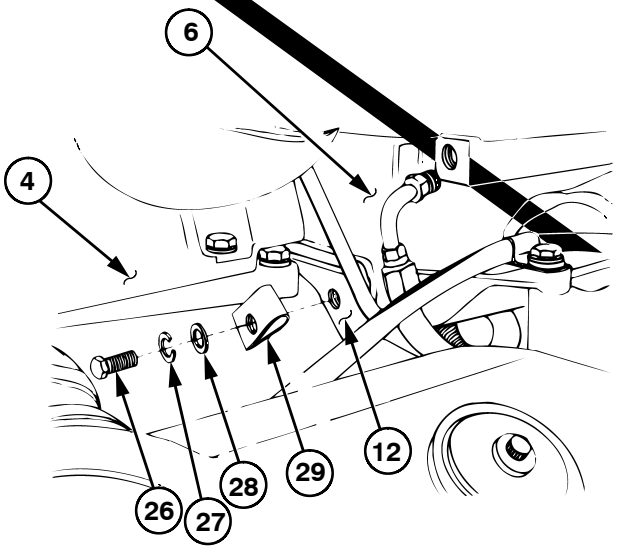


(11) Remove screw (26), lockwasher (27), washer (28), and clip (29) from ECM bracket (12). Discard lockwasher.

(12) Remove ECM bracket (12) and ECM (6) from engine (4).

(13) Remove two screws (30) and heat shield (31) from cooler plate (32).

(14) Remove six screws (33) and cooler plate (32) from ECM (34).



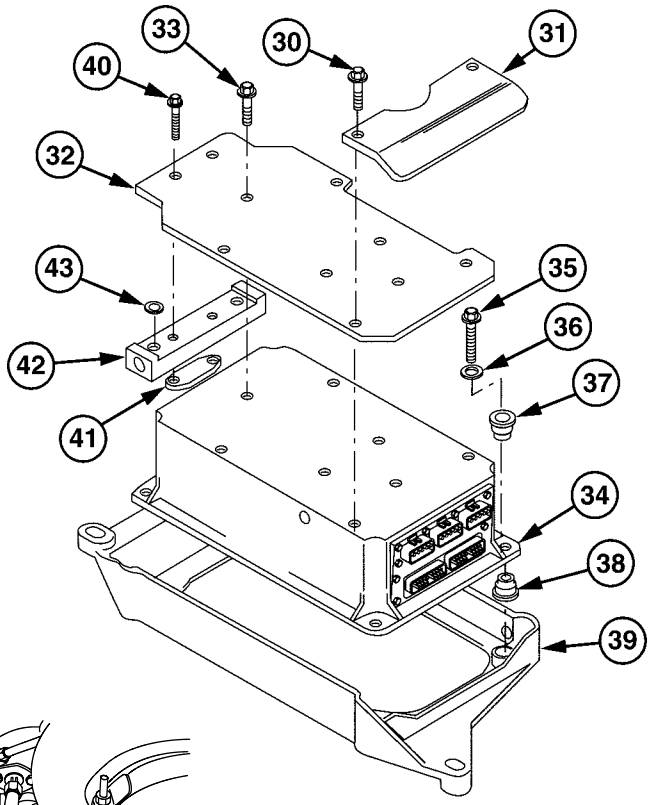
NOTE

Some engines do not have washers. If ECM mounting hardware used washers, discard screws, washers, and isolators. New mounting hardware uses four new screws, eight new isolators and no washers.

(15) Remove four screws (35), washers (36), and isolators (37) from ECM (34). Discard screws, washers, and isolators.

(16) Remove ECM (34) and four isolators (38) from ECM bracket (39). Discard isolators.

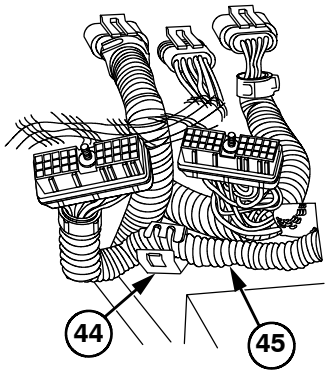
(17) Remove two screws (40), retainer plate (41), fitting (42), and two seals (43) from cooler plate (32). Discard seals.

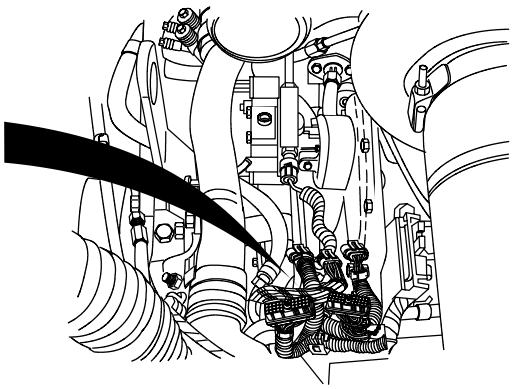


NOTE

- Tag and mark wires before removal.
- Cut and remove plastic cable ties as required.

(18) Open clip (44) and remove DDEC II wire harness (45) from clip (44).



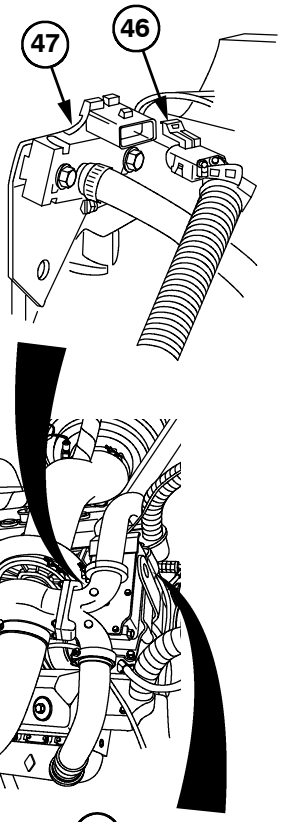


18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

NOTE

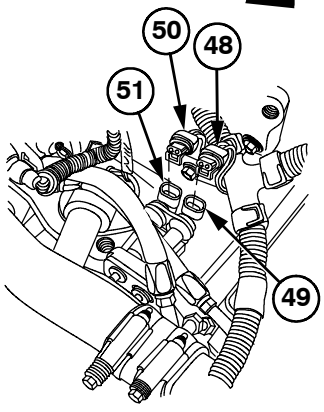
Connectors are removed by gently prying on tab and pulling on connector.

(19) Remove electrical connector (46) from turbo boost sensor (47).

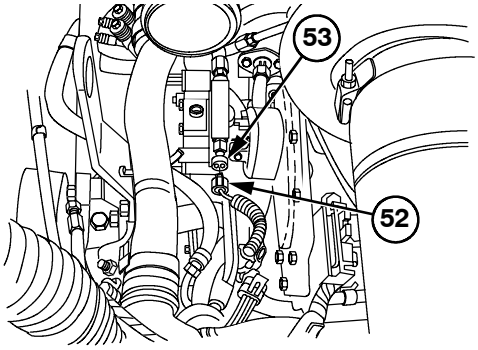


(20) Remove electrical connector (48) from SRS sensor (49).

(21) Remove electrical connector (50) from TRS sensor (51).

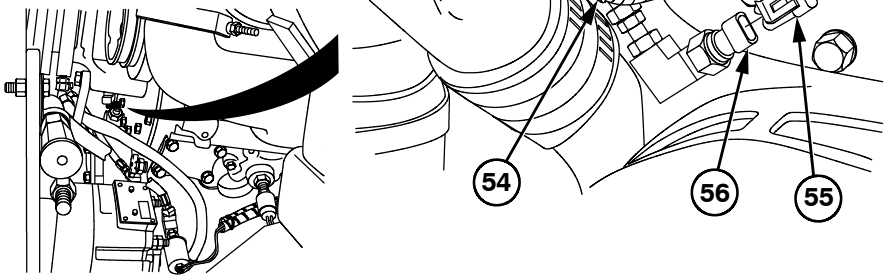


(22) Remove electrical connector (52) from fuel temperature sensor (53).

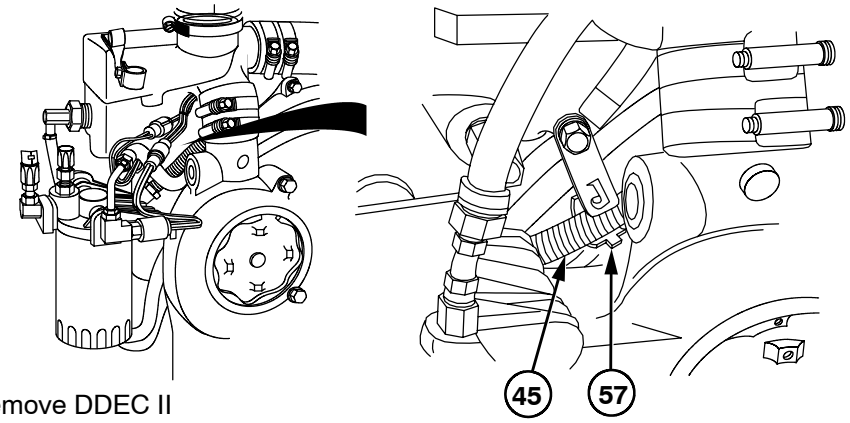


(23) Open clip (54) and remove DDEC II wire harness (45) from clip (54).

(24) Remove electrical connector (55) from oil temperature sender (56).



(25) Open clip (57) and remove DDEC II wire harness (45) from clip (57).



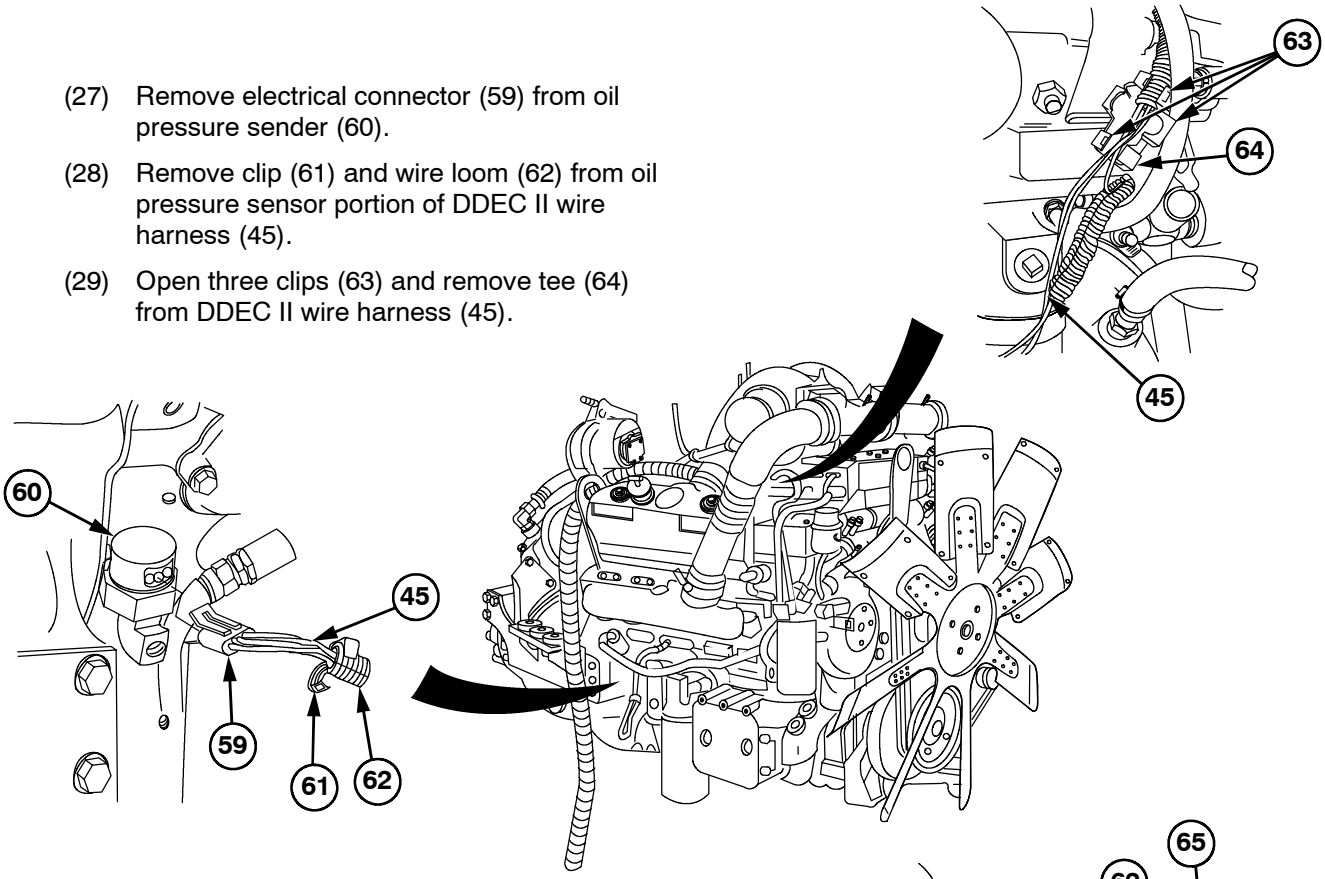
(26) Open two clips (58) and remove DDEC II wire harness (45) from clips (58).

18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(27) Remove electrical connector (59) from oil pressure sender (60).

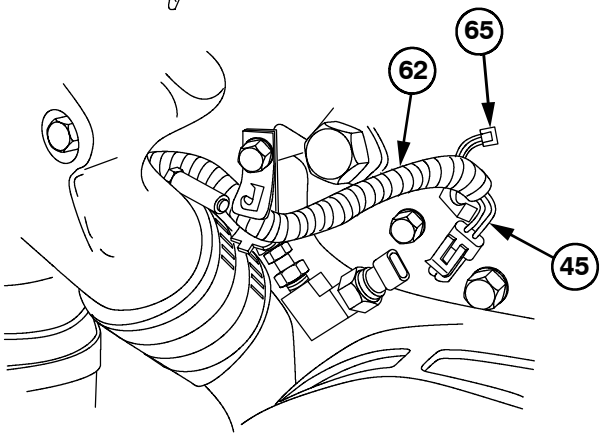
(28) Remove clip (61) and wire loom (62) from oil pressure sensor portion of DDEC II wire harness (45).

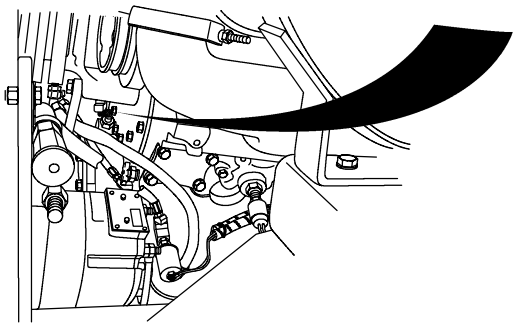
(29) Open three clips (63) and remove tee (64) from DDEC II wire harness (45).



(30) Remove clip (65) and wire loom (62) from oil temperature sender portion of DDEC II wire harness (45).

(31) Remove DDEC II wire harness (45) from engine.

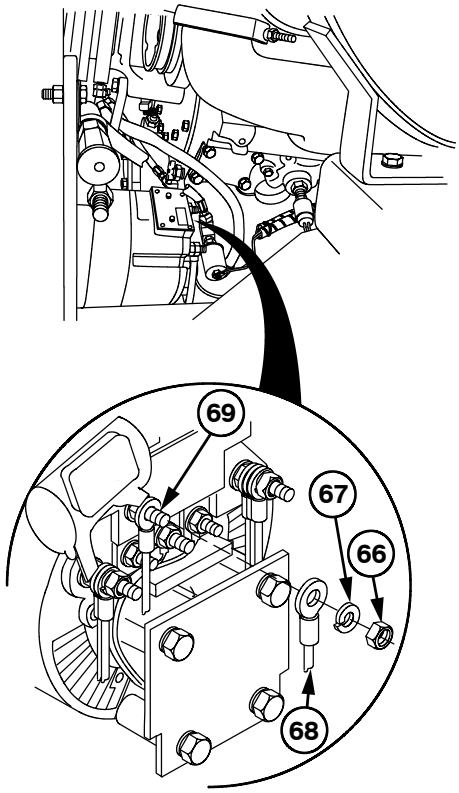




NOTE

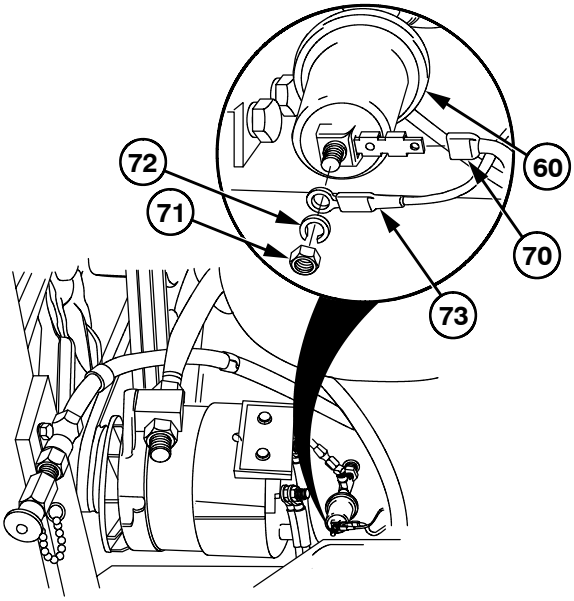
- Tag and mark wires before removal.
- Cut and remove plastic cable ties as required.

(32) Remove nut (66), lockwasher (67), and wire no. 1020 (68) from 24V alternator ignition terminal (69). Discard lockwasher.

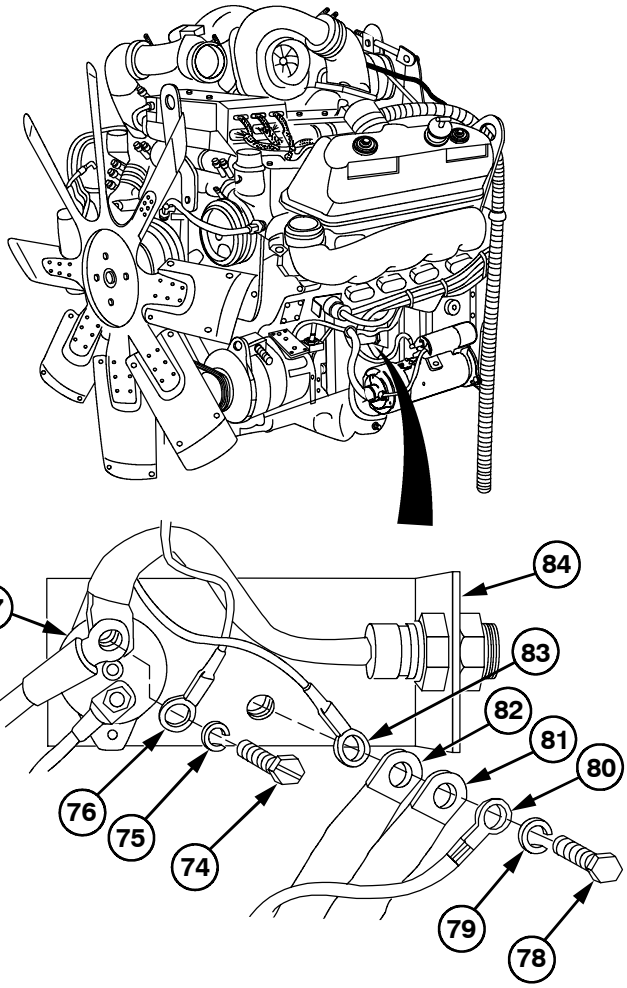


(33) Remove ground wire no. 1435 (70) from oil pressure sender (60).

(34) Remove nut (71), lockwasher (72), and wire no. 1113 (73) from oil pressure sender (60). Discard lockwasher.



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)



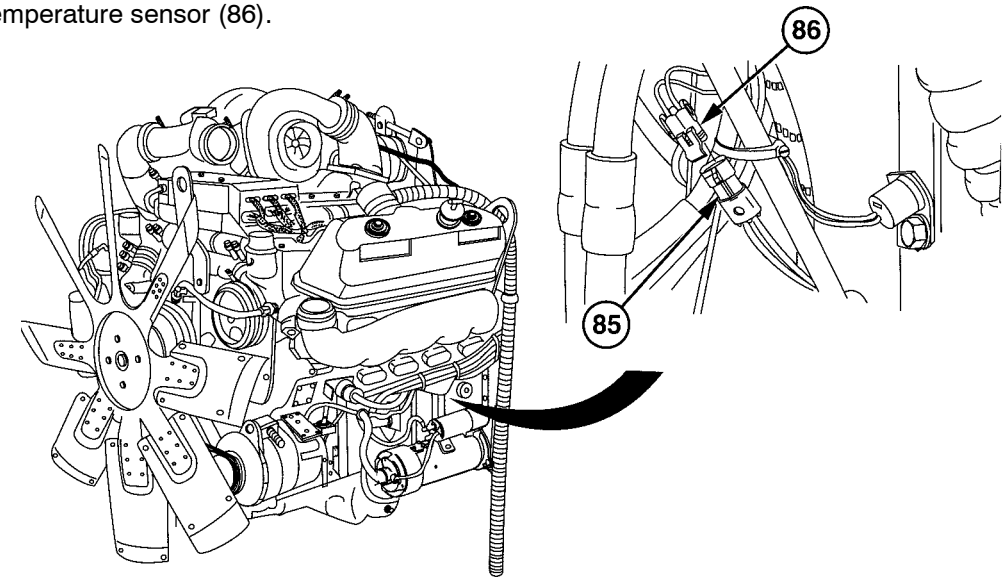
(35) Remove screw (74), lockwasher (75), and wire no. 1431 (76) from circuit breaker (77). Discard lockwasher .

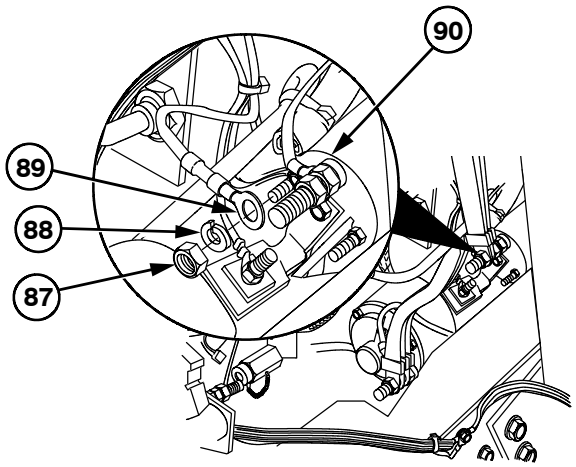
(36) Remove screw (78), lockwasher (79), wire no. 1128 (80), ground strap (81), ground strap (82), and ground wire no. 1435 (83) from bracket (84). Discard lockwasher.

NOTE

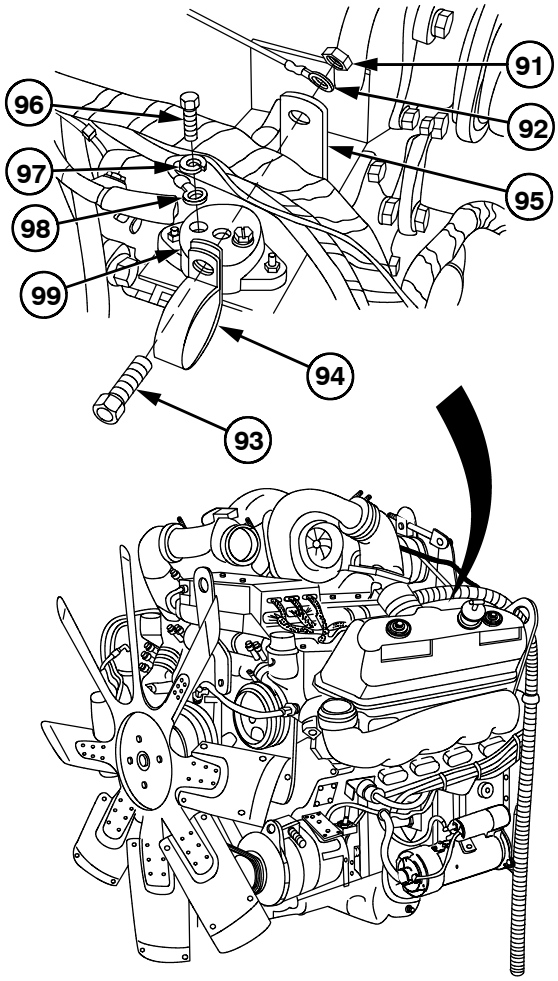
Connectors are removed by gently prying on tab and pulling on connector.

(37) Remove connector MC37 (85) from ether start temperature sensor (86).





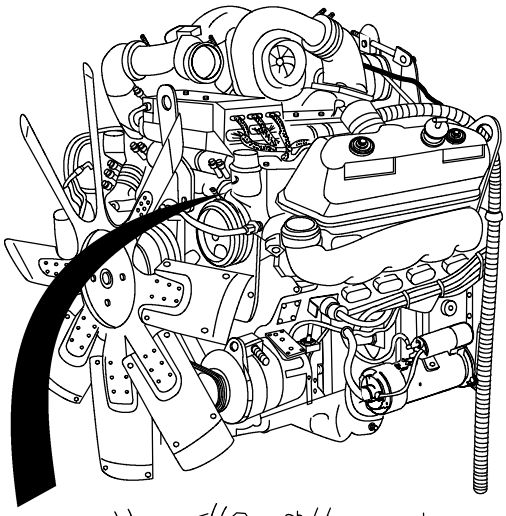
(38) Remove nut (87), lockwasher (88), and wire no. 1045 (89) from starter solenoid (90). Discard lockwasher.



(39) Remove locknut (91), ground wire no. 1435 (92), screw (93), and cushion clip (94) from engine standoff bracket (95). Discard locknut.

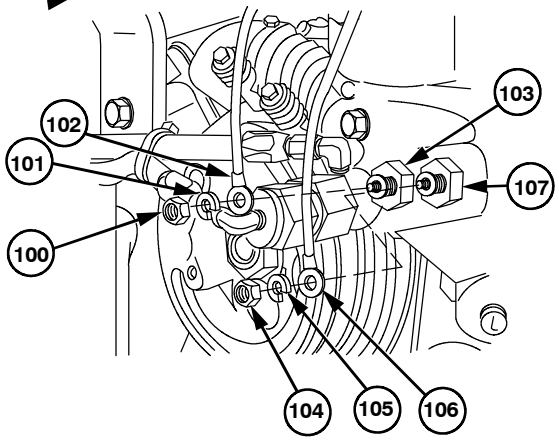
(40) Remove screw (96), lockwasher (97), and wire no. 1866 (98) from circuit breaker (99). Discard lockwasher.

18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

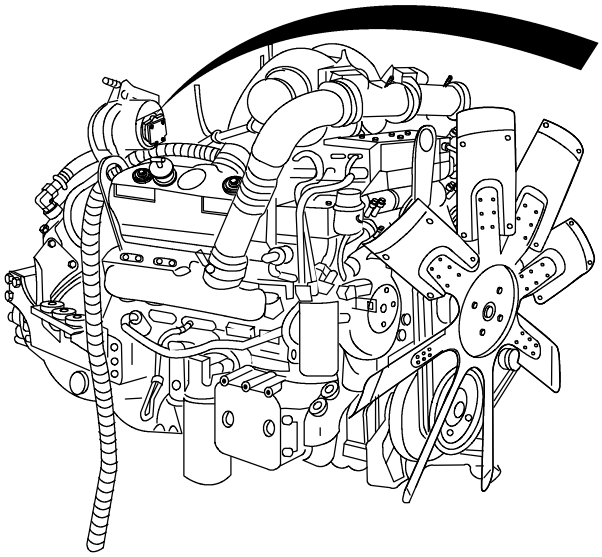


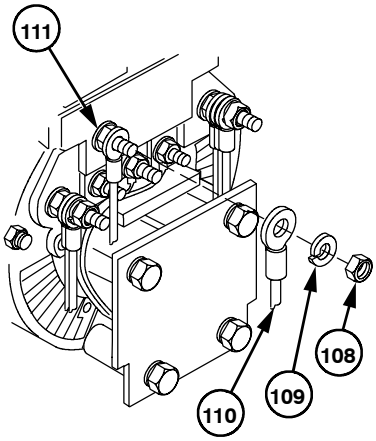
(41) Remove nut (100), lockwasher (101), and wire no. 1320 (102) from coolant temperature sending unit (103). Discard lockwasher.

(42) Remove nut (104), lockwasher (105), and wire no. 524 (106) from alarmstat (107). Discard lockwasher.



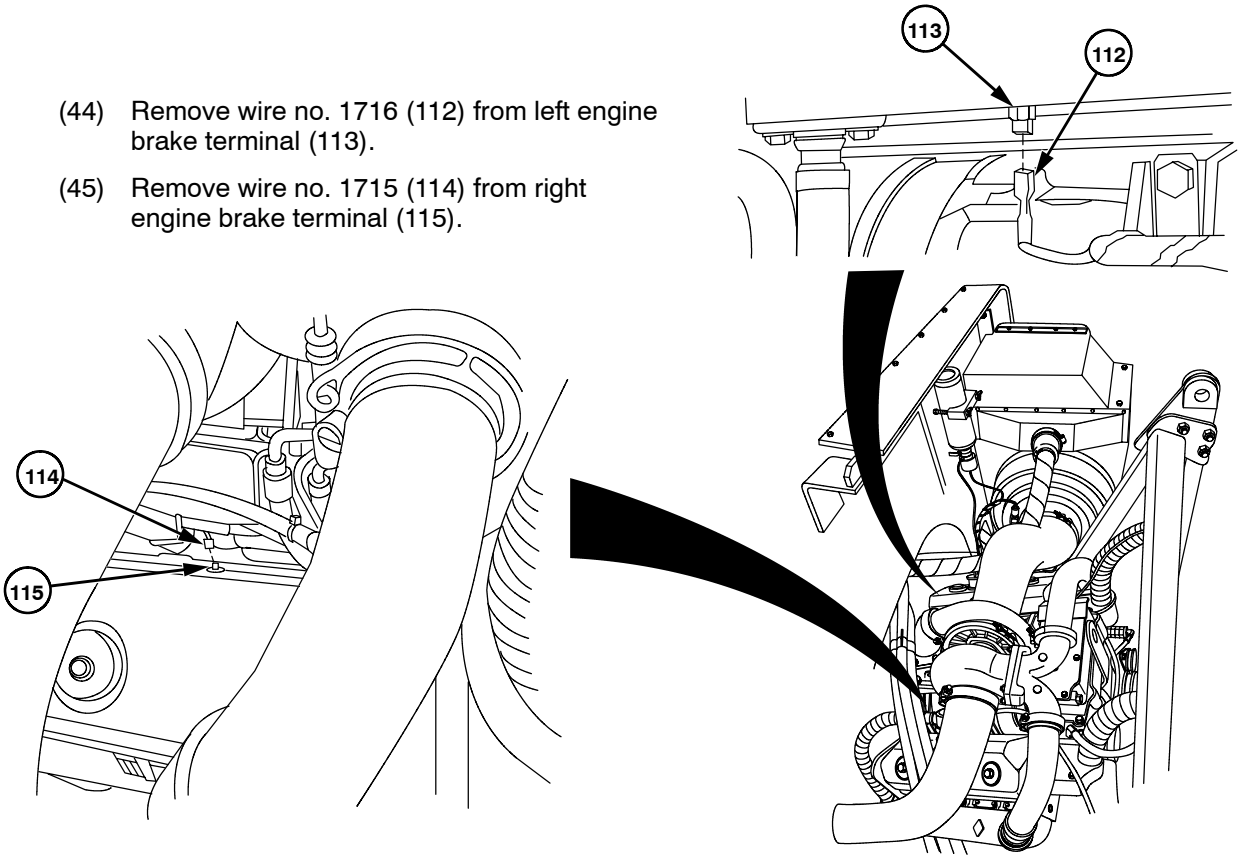
(43) Remove nut (108), lockwasher (109), and wire no. 1020A (110) from 12-volt alternator IGN (ignition) terminal (111). Discard lockwasher.





(44) Remove wire no. 1716 (112) from left engine brake terminal (113).

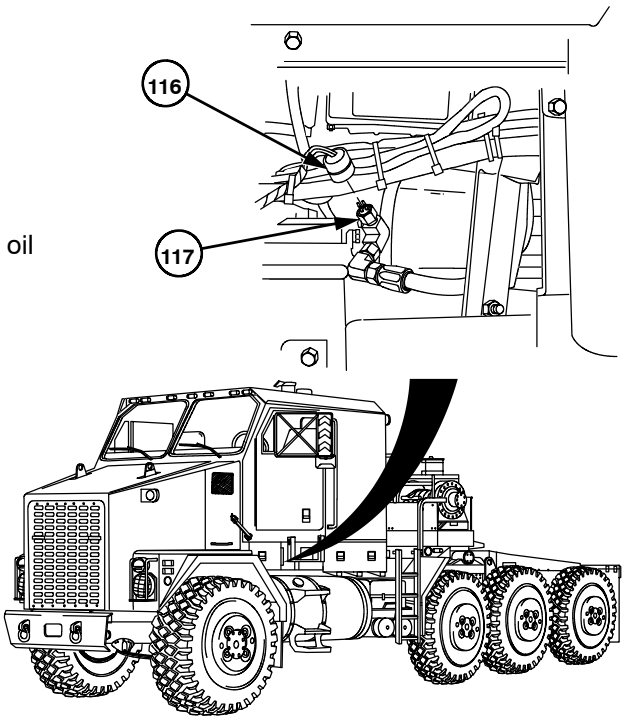
(45) Remove wire no. 1715 (114) from right engine brake terminal (115).



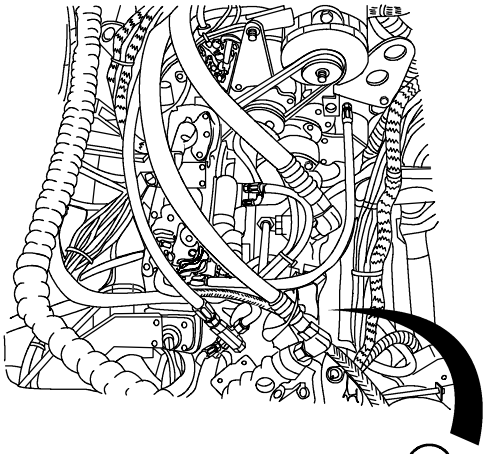
NOTE

- Locations of plastic cable ties should be noted before removal.
- If the engine is removed from the vehicle, skip to step (58).

(46) Remove connector MC12 (116) from PTO oil pressure sender (117).



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)



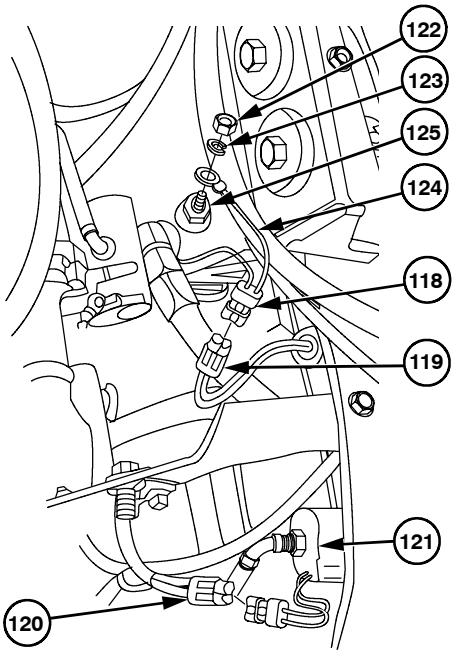
NOTE

- Tag and mark wires before removal.
- Cut and remove plastic cable ties as required.

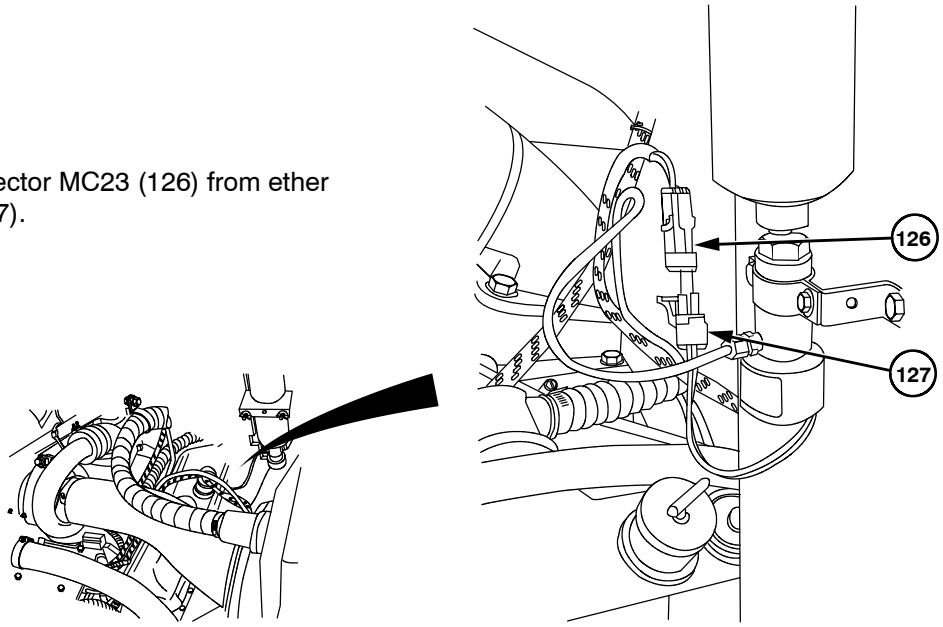
(47) Remove connector MC24 (118) from transmission lockup solenoid (119).

(48) Remove connector MC22 (120) from PTO solenoid (121).

(49) Remove nut (122), lockwasher (123), and wire no. 1068 (124) from transmission temperature sending unit (125). Discard lockwasher.

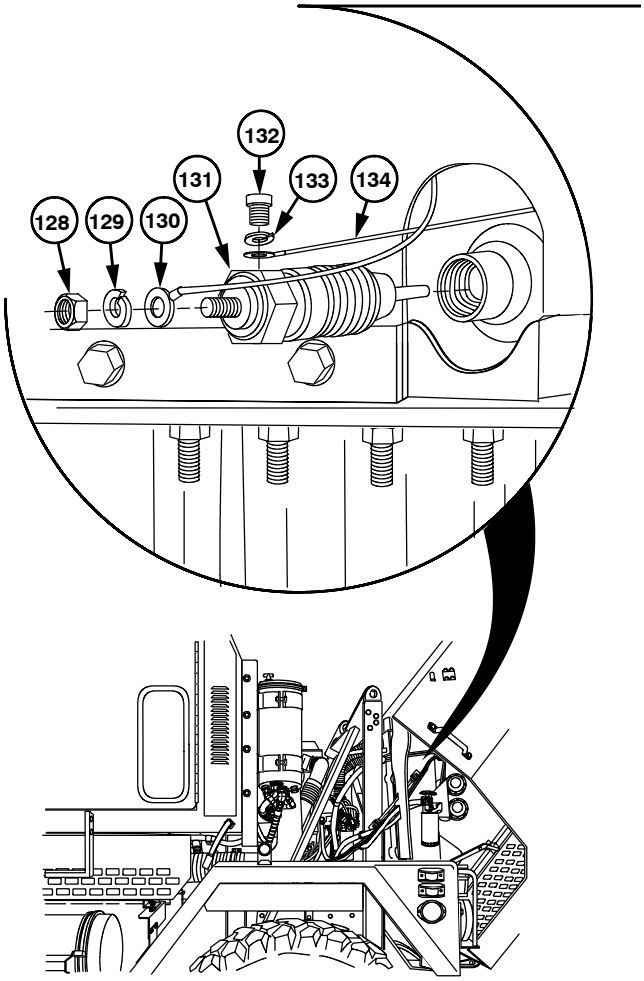


(50) Remove connector MC23 (126) from ether start valve (127).

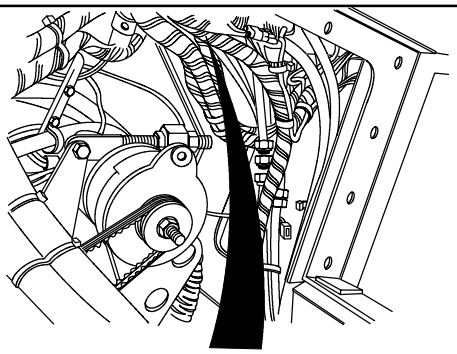


(51) Remove nut (128), lockwasher (129), and wire no. 068 (130) from coolant level sensor (131). Discard lockwasher.

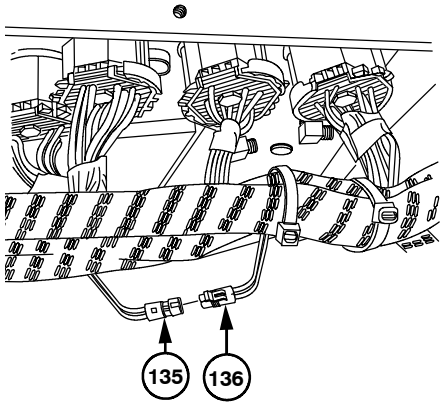
(52) Remove screw (132), lockwasher (133), and wire no. 1788 (134) from coolant level sensor (131). Remove coolant level sensor. Discard lockwasher and coolant level sensor.

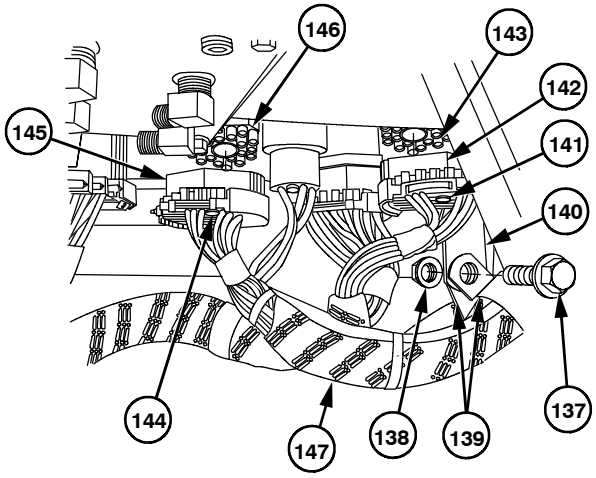


18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)



(53) Remove engine harness connector MC63 (135) from STE-ICE harness connector (136).





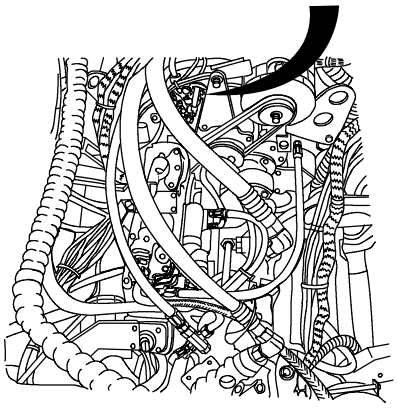
(54) Remove screw (137), locknut (138), and two clips (139) from cab standoff bracket (140).

(55) Loosen screw (141) and remove green connector (142) from receptacle (143).

(56) Loosen screw (144) and remove yellow connector (145) from receptacle (146).

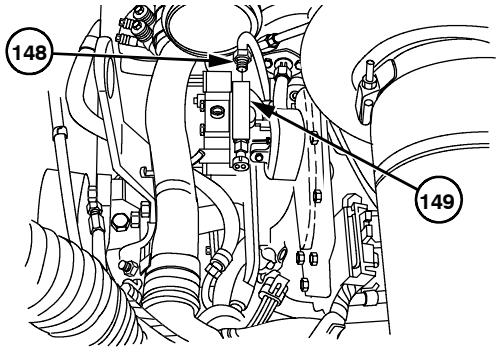
(57) Remove remaining plastic cable ties securing engine wire harness (147) to engine.

(58) Remove engine wire harness (147) from engine.



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET OF VEHICLE.



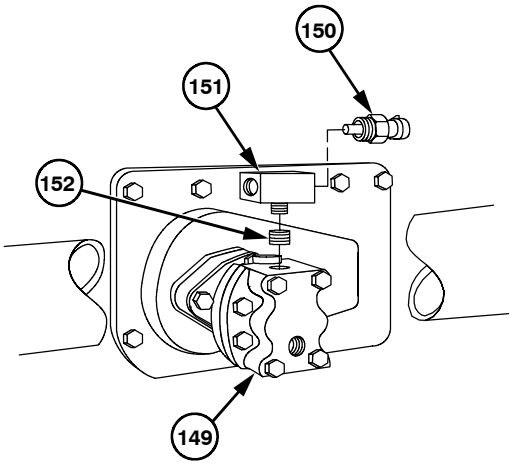
NOTE

- DDEC II fuel lines have male fittings.
- DDEC III/IV fuel lines have female fittings.

(59) Remove original fuel line (148) from fuel pump (149).

(60) Remove fuel temperature sensor (150) from original tee (151).

(61) Remove original tee (151) and bushing (152) from fuel pump (149).

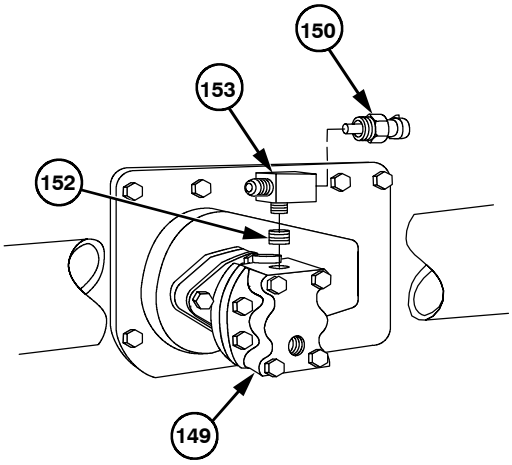


WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

CAUTION

Use pipe thread sealing compound sparingly only on pipe threads. Do not apply compound to hose connections. Damage to equipment may result.

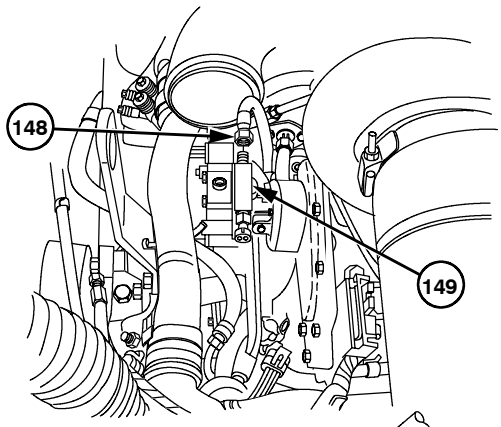


(62) Coat threads of bushing (152), new tee (153), and fuel temperature sensor (150) with pipe thread sealing compound.

(63) Install bushing (152) and new tee (153) on fuel pump (149).

(64) Install fuel temperature sensor (150) on new tee (153).

18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)



(65) Install new fuel line (148) on fuel pump (149).

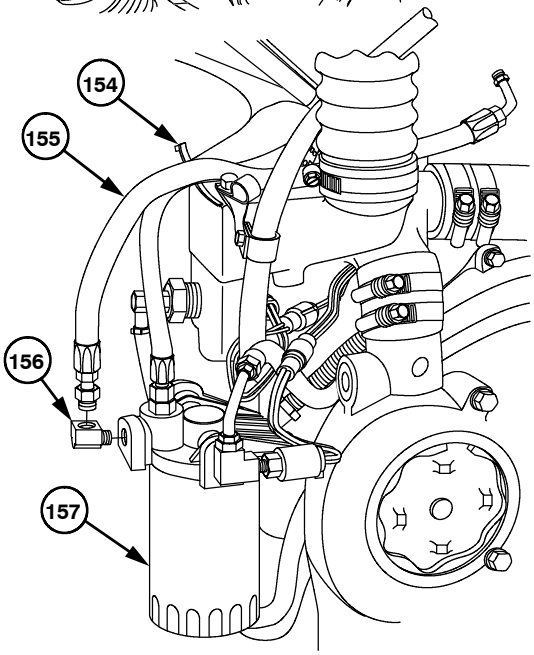
NOTE

Location of plastic ties should be marked before removal.

(66) Remove plastic cable ties (154) from fuel line (155) as required.

(67) Remove original fuel line (155) from fitting (156) on secondary fuel filter (157).

(68) Remove original elbow (156) from secondary fuel filter (157).



(69) Coat threads of new elbow (158) with pipe thread sealing compound.

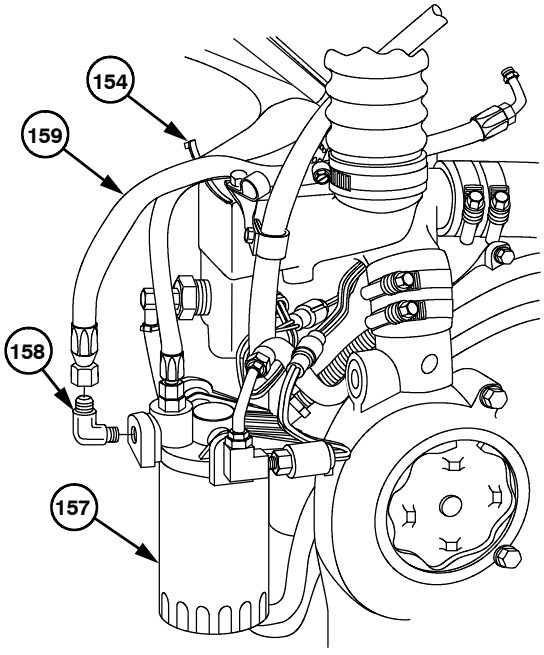
(70) Install new elbow (158) on secondary fuel filter (157).

(71) Install new fuel line (159) on elbow (158) on secondary fuel filter (157).

NOTE

Plastic cable ties should be positioned in locations marked during removal.

(72) Secure fuel line (159) with plastic cable ties (154).



NOTE

Left and right fuel injector harnesses are replaced the same way. Left side is shown.

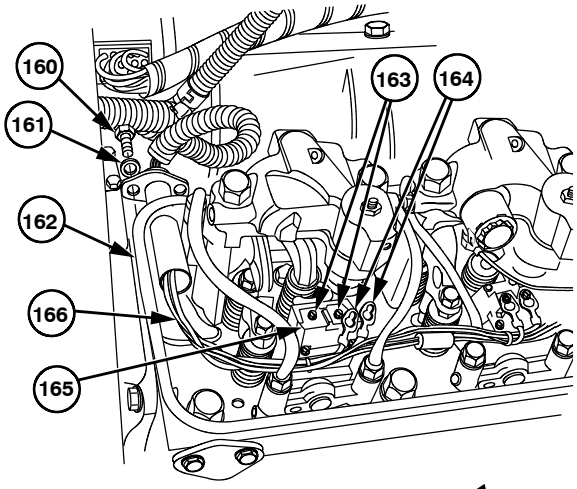
(73) Remove two screws (160) and washers (161) from left cylinder head (162).

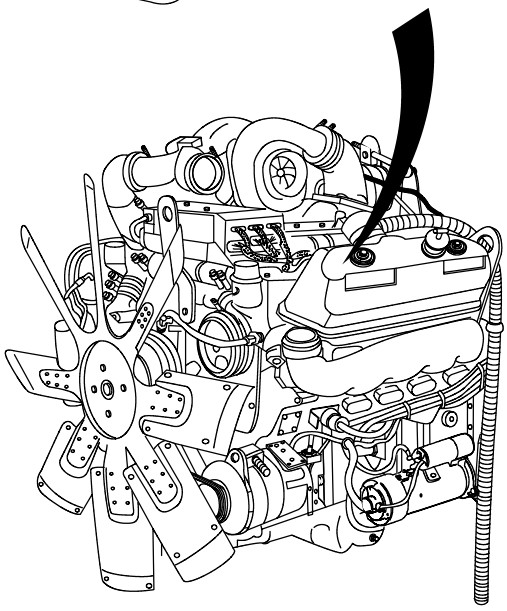
CAUTION

Screws are designed not to be removed. Loosen screws only two turns. Failure to comply may result in damage to injector.

(74) Loosen eight screws (163) and remove fuel injector wires (164) from four fuel injectors (165).

(75) Remove original fuel injector wiring harness (166) from left cylinder head (162).

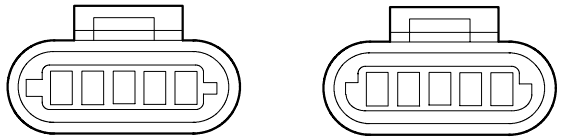




18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

CAUTION

Left and right fuel injector wire harnesses are not interchangeable. Installing the wrong harness may result in engine damage. Refer to illustration for proper connector identification.



FUEL INJECTOR HARNESS LEFT SIDE CONNECTOR

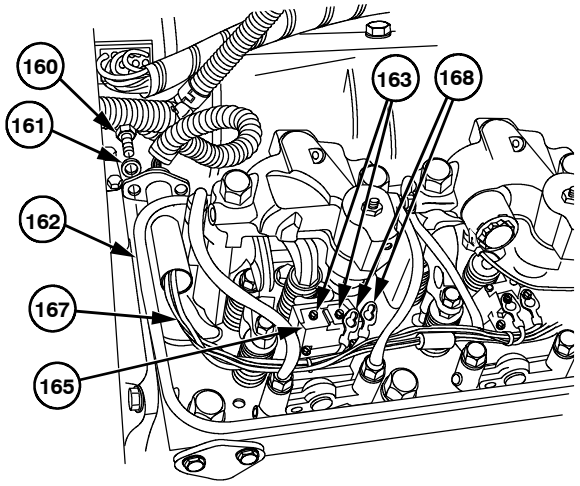
FUEL INJECTOR HARNESS RIGHT SIDE CONNECTOR

(76) Insert new fuel injector wire harness (167) in left cylinder head (162).

(77) Install fuel injector wires (168) on fuel injectors (165).

(78) Tighten eight screws (163).

(79) Install new fuel injector wire harness (167) on left cylinder head (162) with two washers (161) and screws (160).



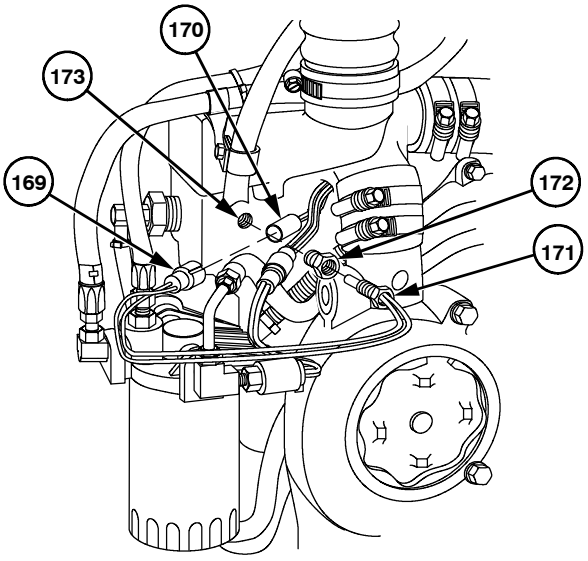
NOTE

Repeat steps (73) through (79) for right cylinder head.

(80) Disconnect plug (169) from STE/ICE wire harness connector (170).

(81) Remove STE-ICE temperature sensor (171) from fitting (172).

(82) Remove fitting (172) from right thermostat housing (173).



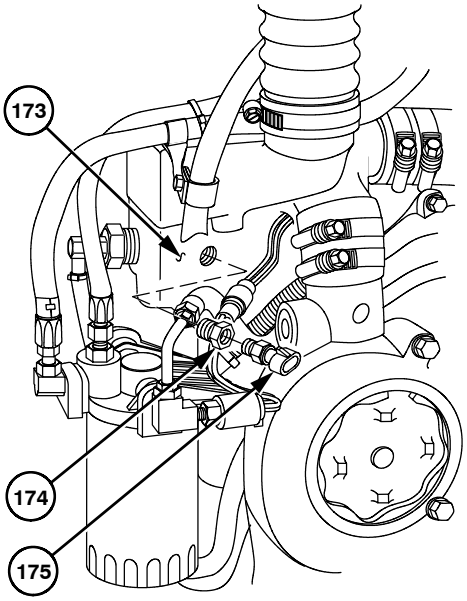
WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

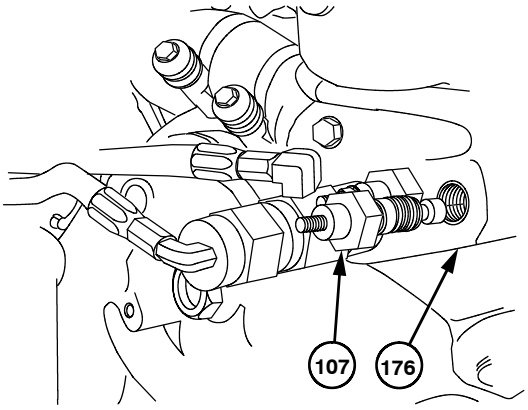
(83) Coat threads of fitting (174) and coolant temperature sensor (175) with pipe thread sealing compound.

(84) Install fitting (174) in right thermostat housing (173).

(85) Install coolant temperature sensor (175) in fitting (174).



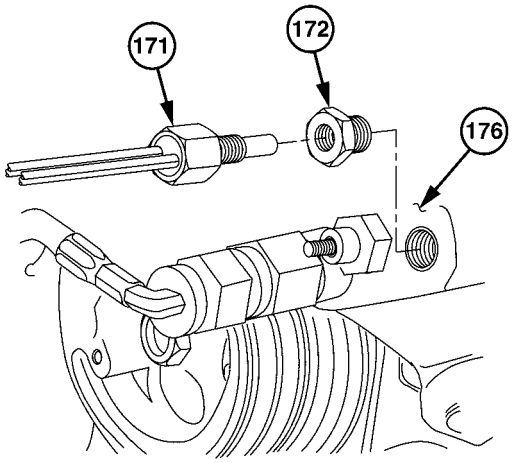
(86) Remove and discard alarmstat (107) from left thermostat housing (176).



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

WARNING

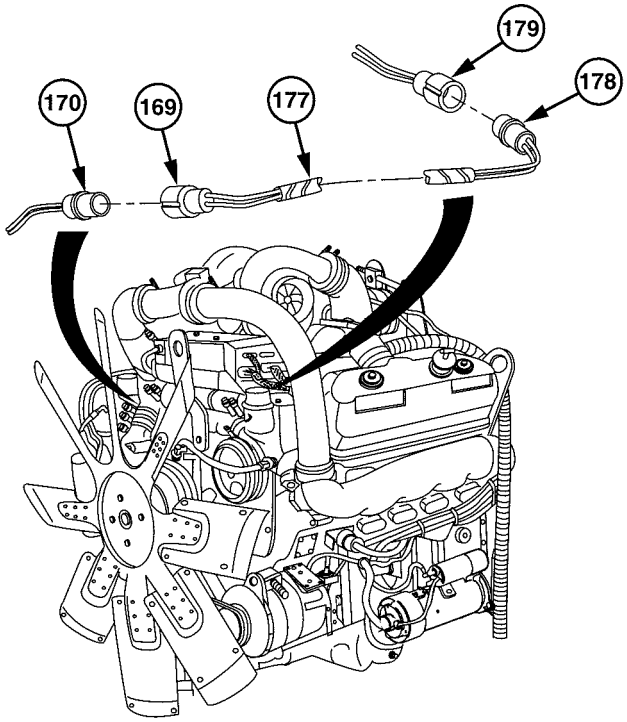
Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.



(87) Coat threads of fitting (172) and STE-ICE temperature sensor (171) with pipe thread sealing compound.

(88) Install fitting (172) in left thermostat housing (176).

(89) Install STE-ICE temperature sensor (171) in fitting (172).



NOTE

Route harness along cylinder heads, around back of engine, parallel to existing wire harnesses.

(90) Position STE/ICE jumper harness (177) on engine.

(91) Install STE-ICE jumper harness plug (169) in STE/ICE wire harness connector (170).

(92) Install STE/ICE jumper harness plug (178) on connector (179).

(93) Remove oil pressure sensor (180) from tee (181).

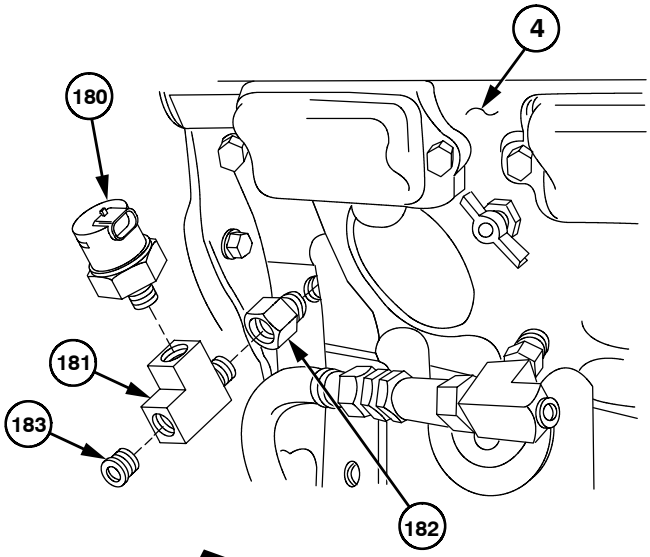
NOTE

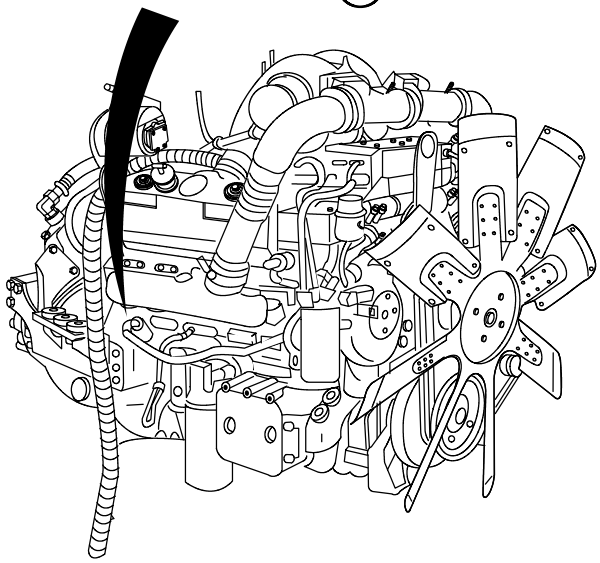
Tee and fitting may come out as an assembly.

(94) Remove tee (181) from fitting (182).

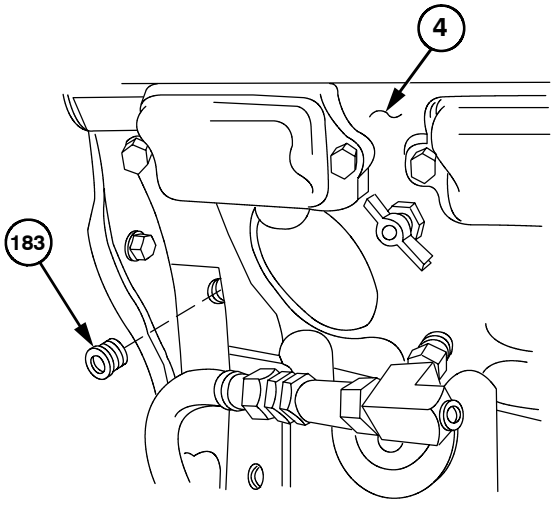
(95) Remove plug (183) from tee (181).

(96) Remove fitting (182) from engine (4).



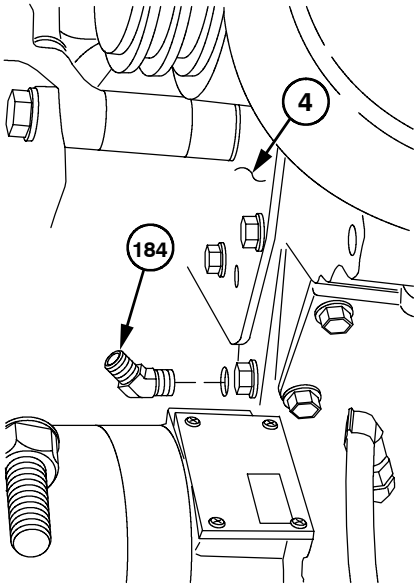


(97) Install plug (183) in engine (4) at DDEC II oil pressure sensor location.



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(98) Remove elbow (184) from engine (4).



WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

(99) Coat all but first two threads of oil pressure sensor (180) with pipe thread sealing compound.

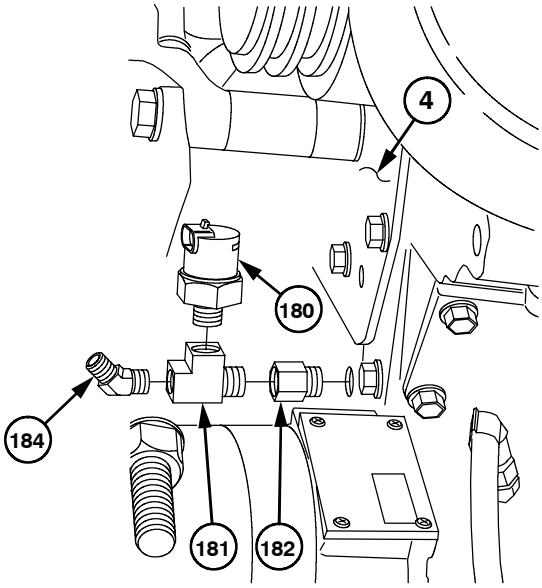
(100) Coat threads of fitting (182), tee (181), and elbow (184) with pipe thread sealing compound.

(101) Install fitting (182) in engine (4).

(102) Install tee (181) in fitting (182).

(103) Install elbow (184) on tee (181).

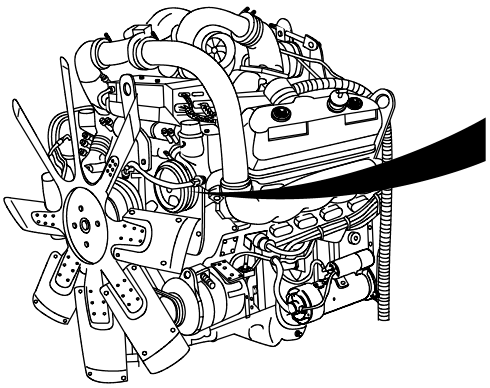
(104) Install oil pressure sensor (180) on tee (181).

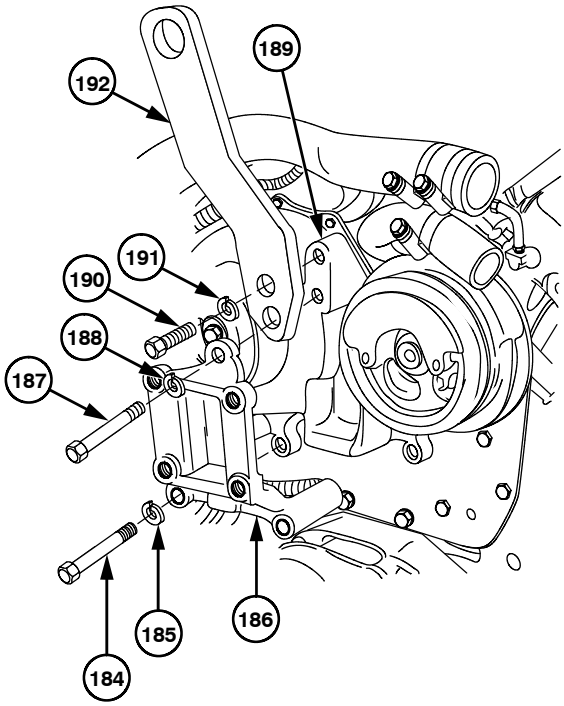


(105) Remove screw (184) and lockwasher (185) from fan clutch support (186). Discard lockwasher.

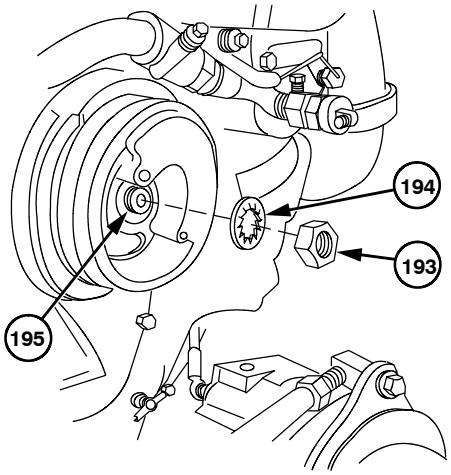
(106) Remove screw (187), lockwasher (188), and fan clutch support (186) from front cover (189). Discard lockwasher.

(107) Remove screw (190), lockwasher (191), and engine lifting bracket (192) from front cover (189). Discard lockwasher.



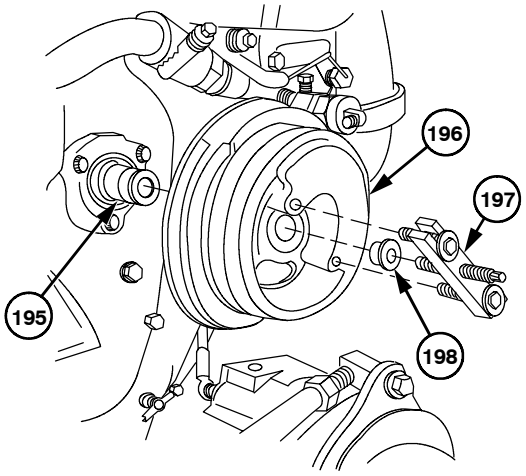


(108) Remove nut (193) and lockwasher (194) from left side of camshaft (195). Discard lockwasher.



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(109) Remove camshaft pulley (196) from left side camshaft (195) using puller (197) and pulley remover (198).

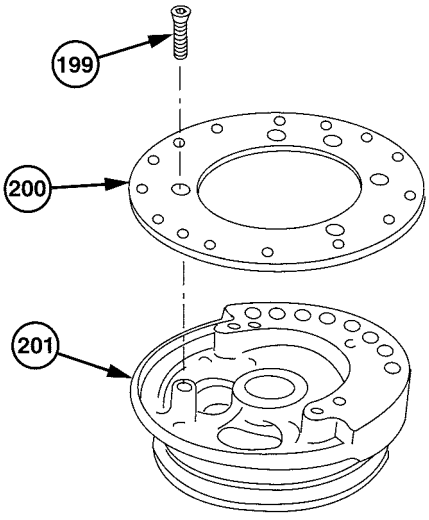


WARNING

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

NOTE

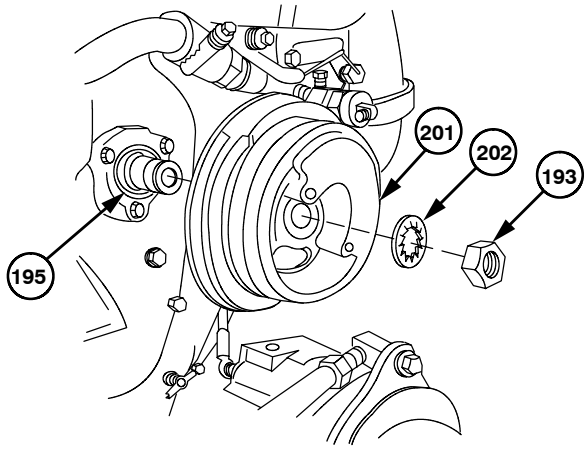
- Two alignment pins on pulse wheel must be installed in alignment holes on back of camshaft pulley.
- DDEC II engines have a 13 tooth pulse wheel; DDEC III/IV engines have a 36 tooth pulse wheel.

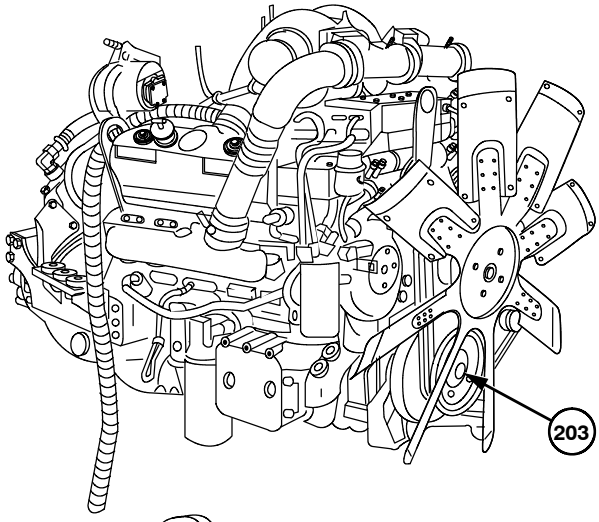


(110) Coat threads of four new screws (199) with adhesive-sealant.

(111) Install DDEC III/IV pulse wheel (200) on camshaft pulley (201) with four screws (199).

(112) Install camshaft pulley (201) on left side camshaft (195) with new lockwasher (202) and nut (193). Tighten to 300 lb-ft (407 N·m) while assistant holds crankshaft pulley center screw (203).





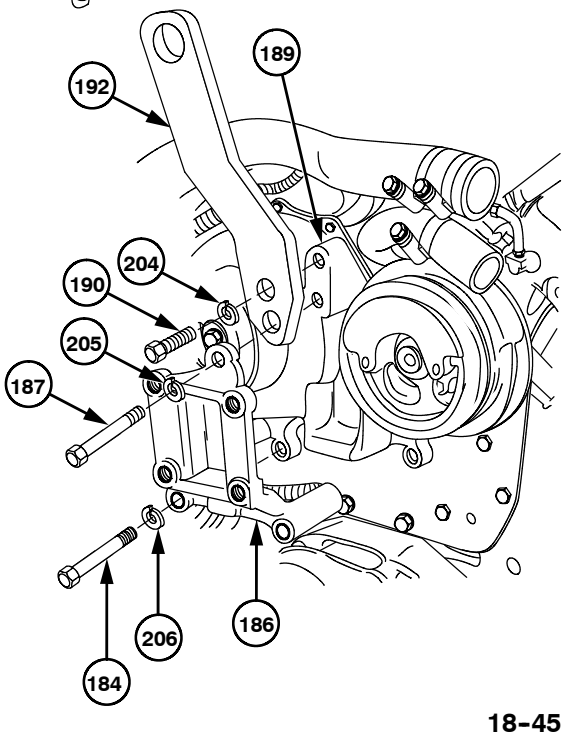
(113) Install engine lifting bracket (192) on front cover (189) with new lockwasher (204) and screw (190). Do not tighten.

(114) Install fan clutch support (186) on front cover (189) with new lockwasher (205) and screw (187) . Do not tighten.

(115) Install new lockwasher (206) and screw (184) in fan clutch support (186).

(116) Tighten screws (184 and 190) to 140-170 lb-ft (190-203 N·m).

(117) Tighten screw (187) to 90-100 lb-ft (122-136 N·m).

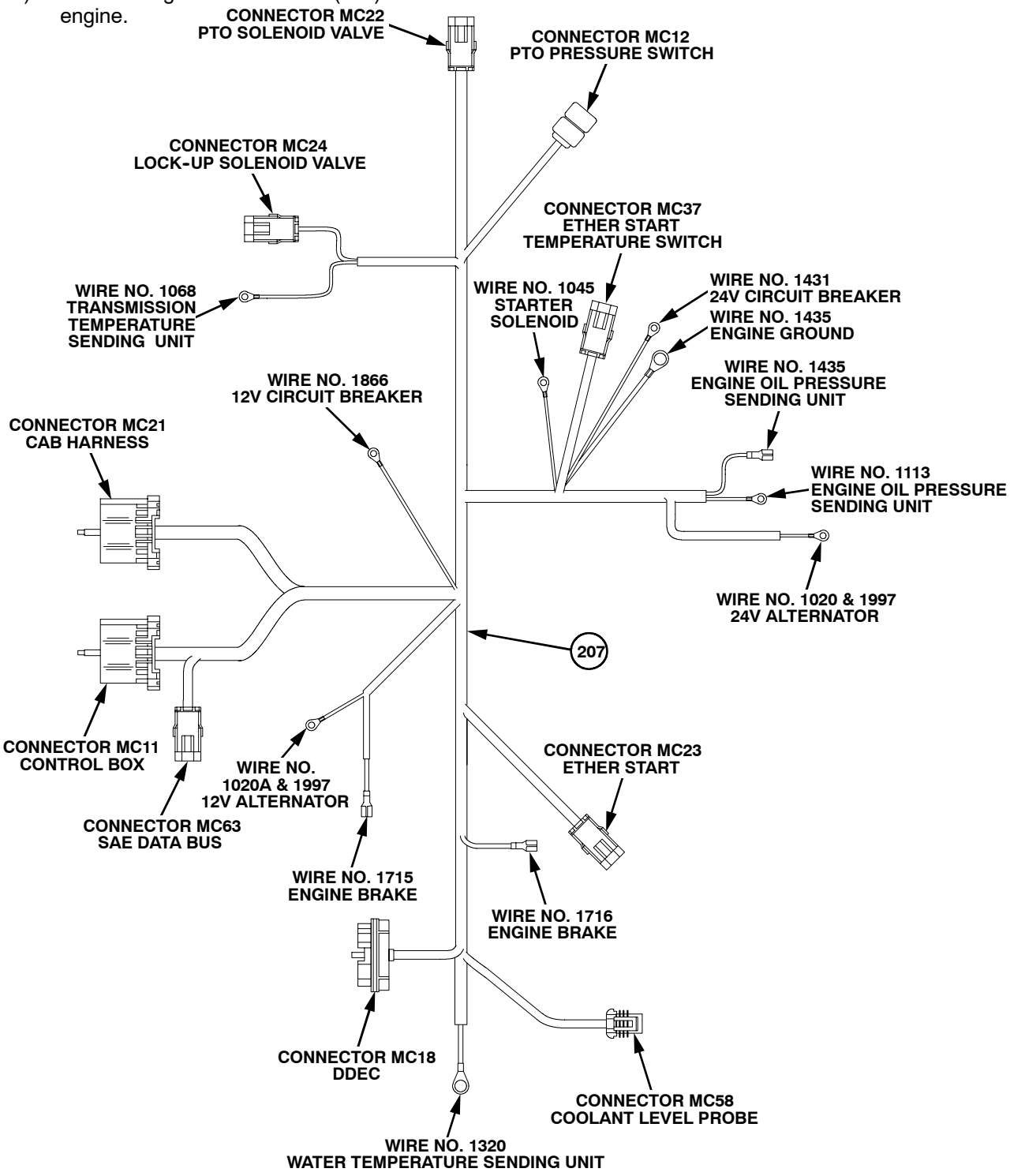


18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

NOTE

Evenly distribute any slack in engine wire harness. Do not make any connections.

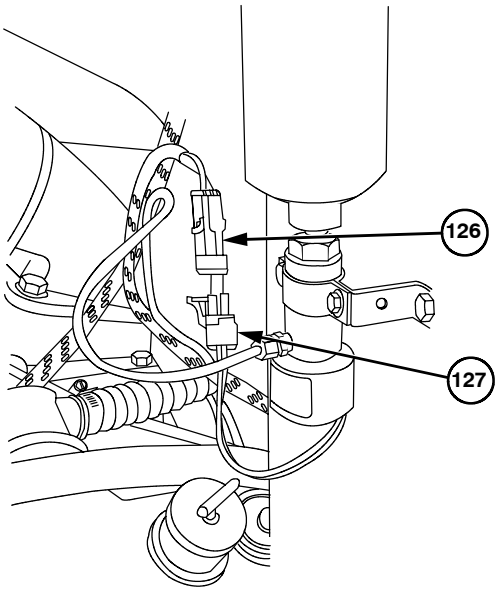
(118) Position engine wire harness (207) on engine.



NOTE

- Secure engine wire harness with plastic cable ties as required.
- If the engine is removed from the vehicle skip to step (129).

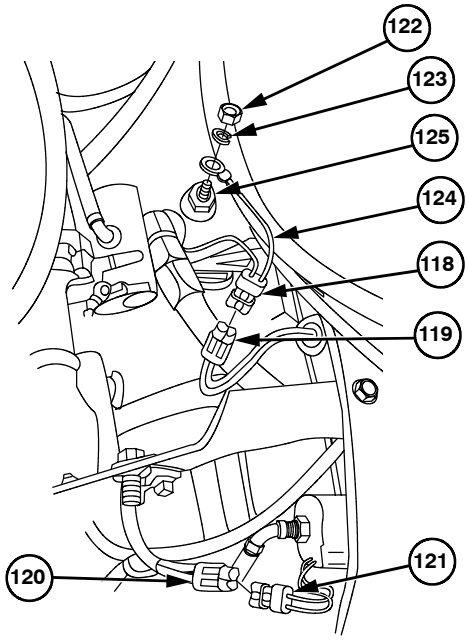
(119) Install connector MC23 (126) on ether start valve (127).



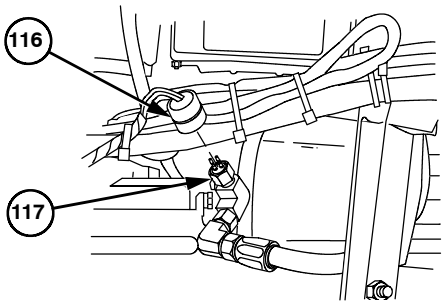
(120) Install wire no. 1068 (124) on transmission temperature sending unit (125) with new lockwasher (123) and nut (122).

(121) Install electrical connector MC22 (120) on PTO solenoid (121).

(122) Install connector MC24 (118) on transmission lockup solenoid (119).

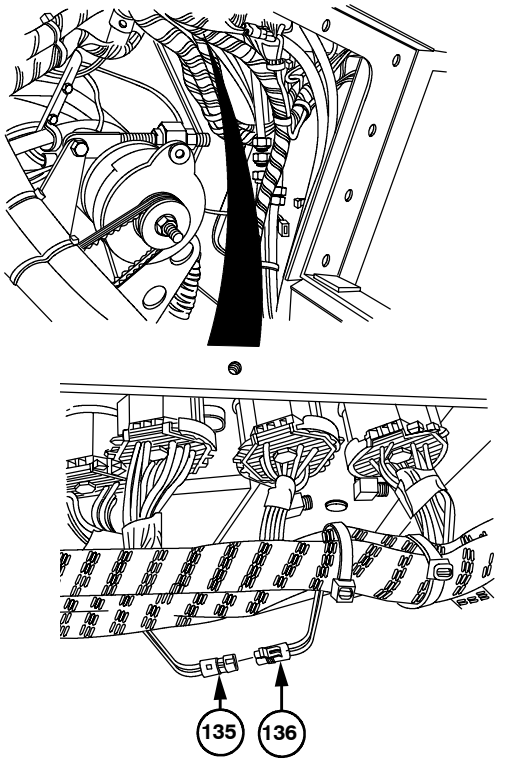


(123) Install connector MC12 (116) on PTO oil pressure sender (117).



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

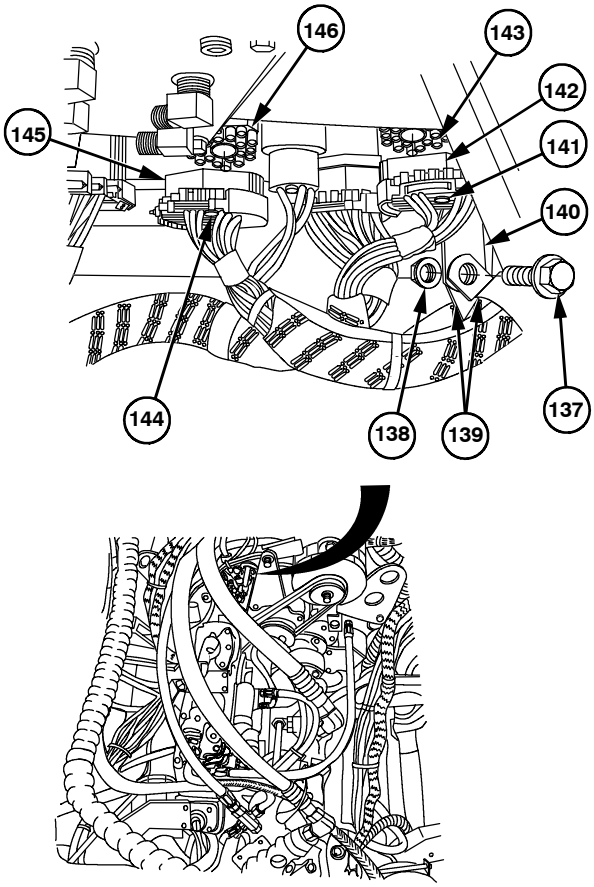
(124) Connect engine harness connector MC63 (135) to STE-ICE harness connector (136).



(125) Install yellow connector (145) to receptacle (146) and tighten screw (144).

(126) Install green connector (142) to receptacle (143) and tighten screw (141).

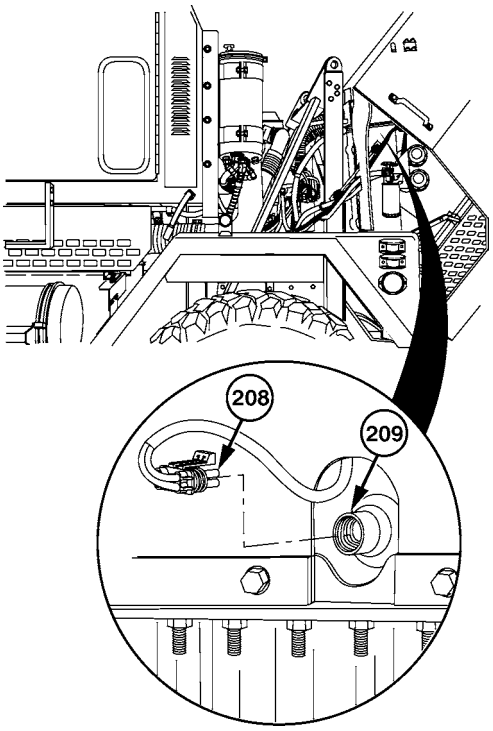
(127) Install two clips (139) to cab standoff bracket (140) with locknut (138) and screw (137).



NOTE

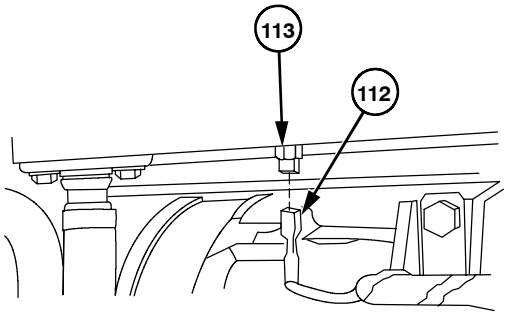
DDEC III/IV coolant level sensor is installed as part of vehicle conversion kit.

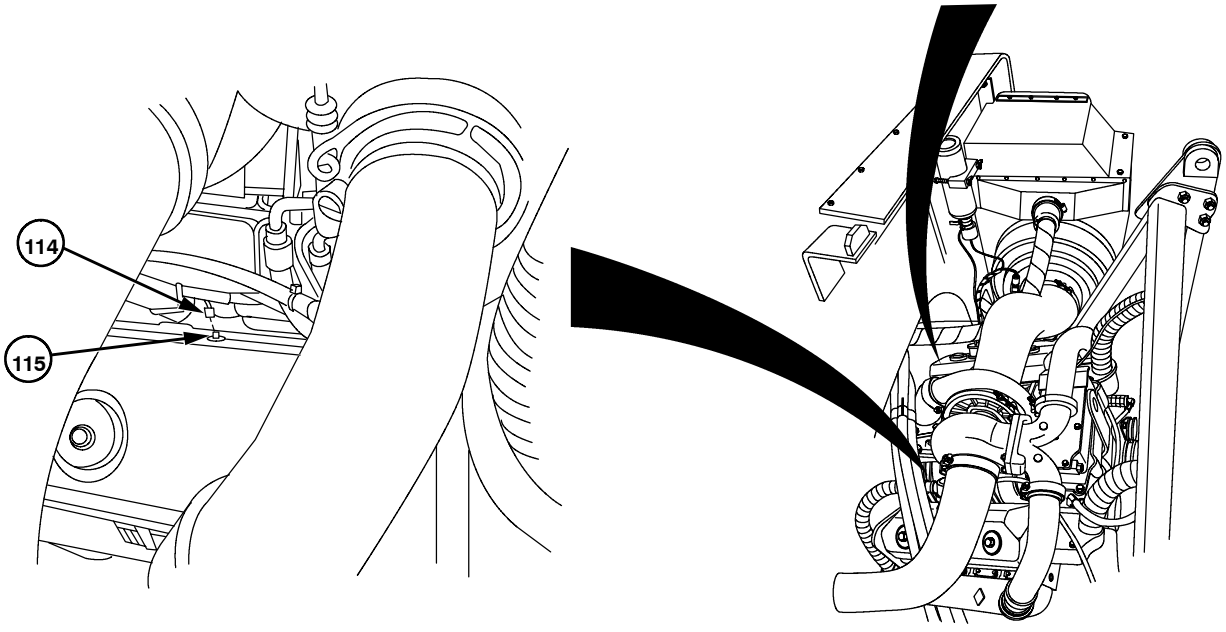
(128) Route coolant level connector MC58 (208) to radiator (209).



(129) Install wire no. 1716 (112) on left engine brake terminal (113).

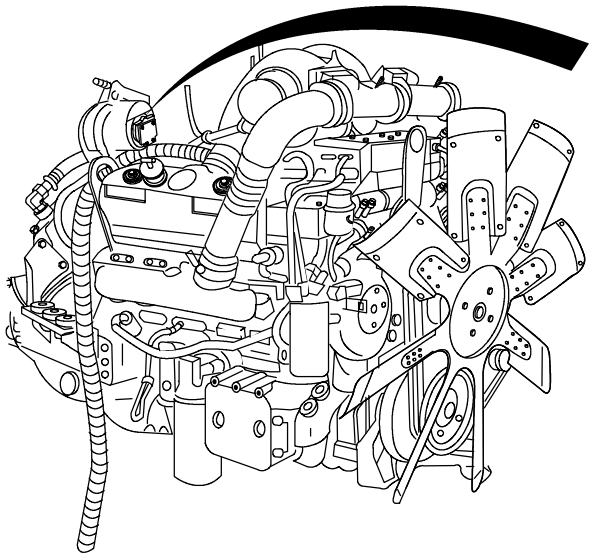
(130) Install wire no. 1715 (114) on right engine brake terminal (115).

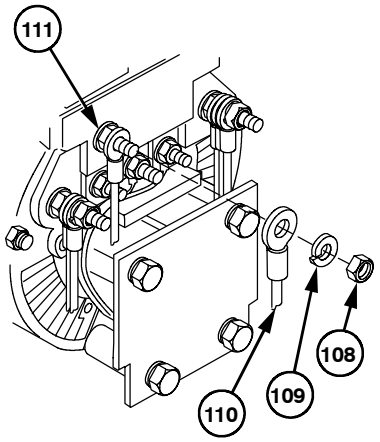




18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

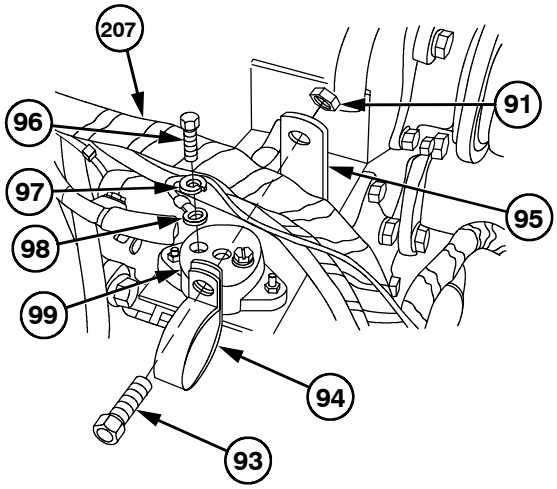
(131) Install wire no. 1020A (110) on 12-volt alternator IGN (ignition) terminal (111) with new lockwasher (109) and nut (108).



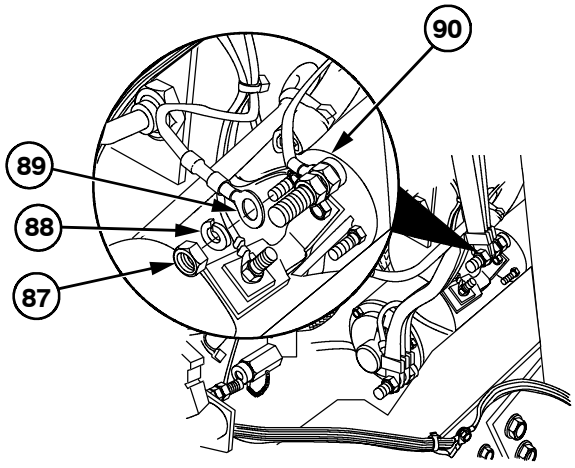


(132) Install wire no. 1866 (98) on circuit breaker (99) with new lockwasher (97) and screw (96).

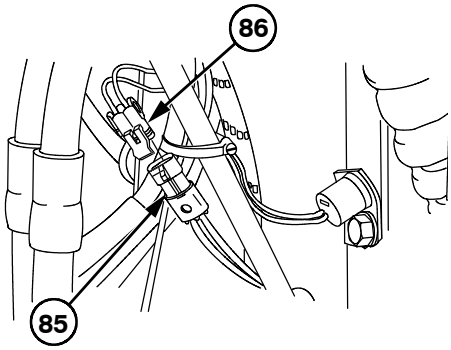
(133) Secure engine wire harness (207) on standoff bracket (95) with cushion clip (94), screw (93) and new locknut (91).



(134) Install wire no. 1045 (89) on starter solenoid (90) with new lockwasher (88) and nut (87).

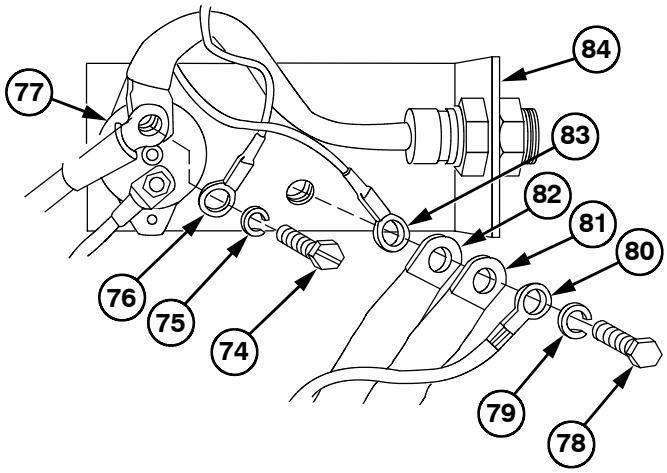


(135) Install connector MC37 (85) on ether start temperature sensor (86).



(136) Install ground wire no. 1435 (83), ground strap (82), ground strap (81), and wire no. 1128 (80) on bracket (84) with new lockwasher (79) and screw (78).

(137) Install wire no. 1431 (76) on circuit breaker (77) with new lockwasher (75) and screw (74).



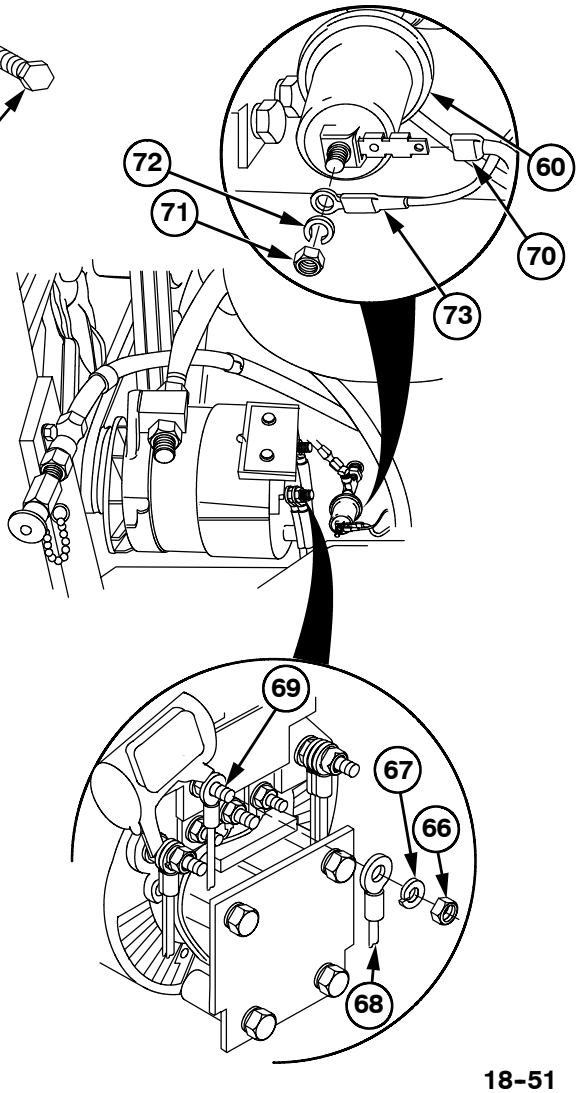
(138) Install wire no. 1113 (73) on oil pressure sender (60) with new lockwasher (72) and nut (71).

(139) Install ground wire no. 1435 (70) on oil pressure sender (60).

CAUTION

Ensure wires to alternator are loose enough to allow for alternator belt adjustment. Failure to comply may result in damage to wire harness.

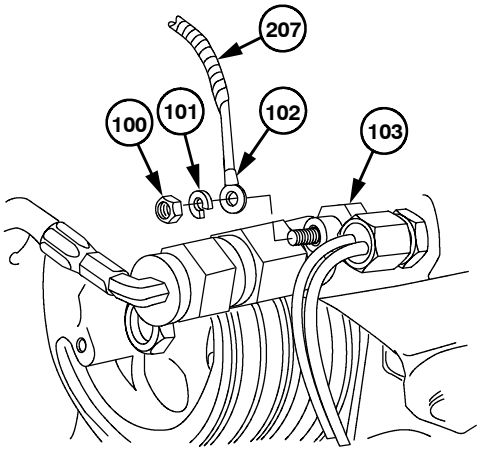
(140) Install wire no. 1020 (68) on 24-volt alternator IGN (ignition) terminal (69) with new lockwasher (67) and nut (66).



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(141) Install wire no. 1320 (102), new lockwasher (101), and nut (100) to coolant temperature sending unit (103).

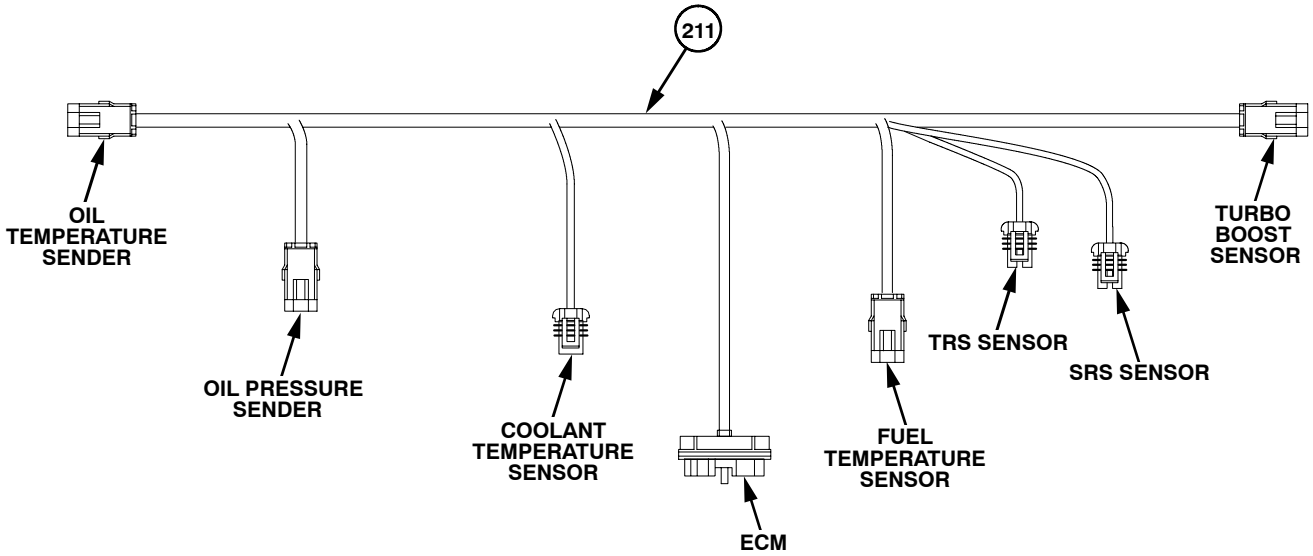
(142) Secure engine wire harness (207) with plastic cable ties.



NOTE

Evenly distribute any slack in DDEC III/IV harness. Do not make any connections.

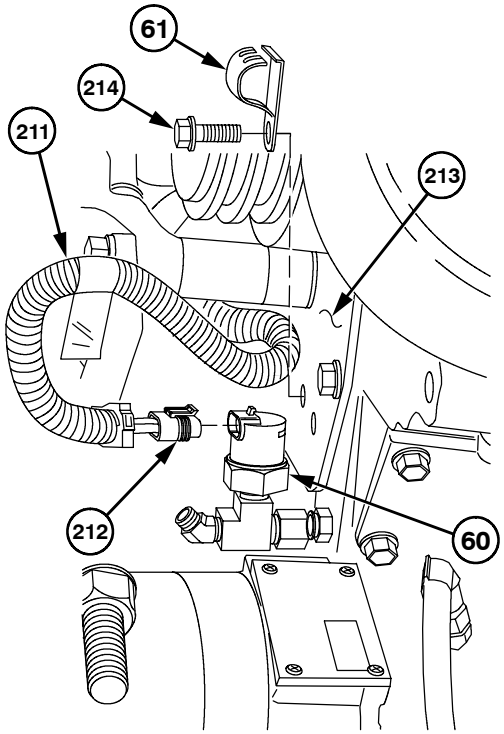
(143) Position DDEC III/IV wire harness (211) on engine.



(144) Install electrical connector (212) on oil pressure sender (60).

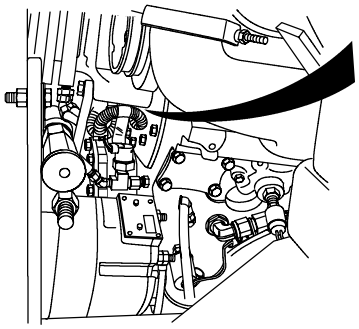
(145) Install new clip (61) on front end plate (213) with existing screw (214).

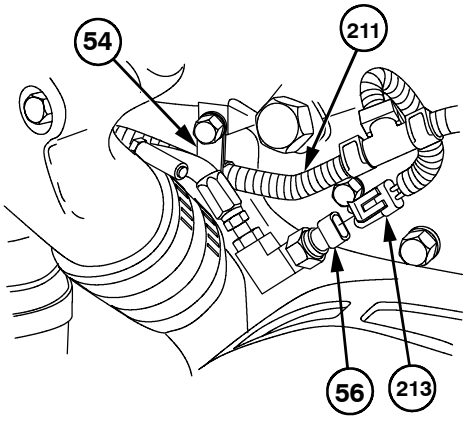
(146) Install DDEC III/IV wire harness (211) in clip (61) and close clip.



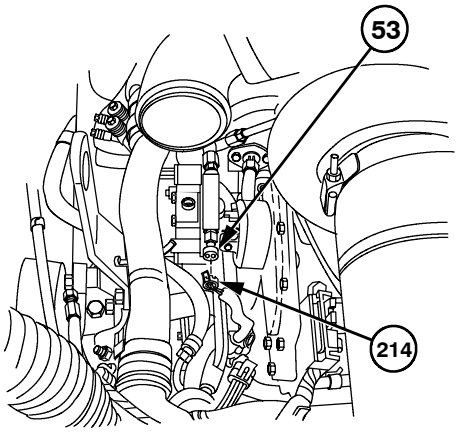
(147) Install DDEC III/IV wire harness (211) in clip (54) and close clip.

(148) Install electrical connector (213) on oil temperature sender (56).





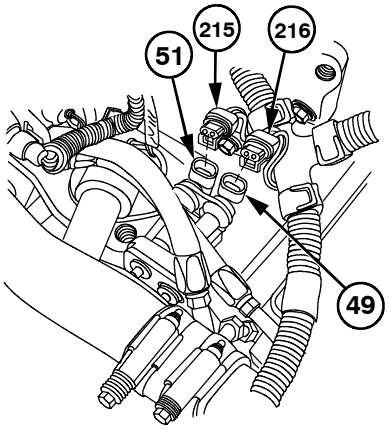
(149) Install electrical connector (214) on fuel temperature sensor (53).



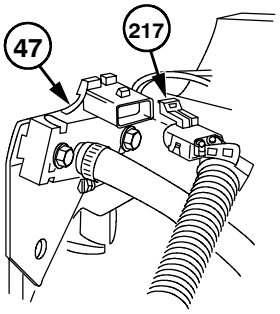
18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(150) Install electrical connector (215) on TRS sensor (51).

(151) Install electrical connector (216) on SRS sensor (49).



(152) Install electrical connector (217) on turbo boost sensor (47).

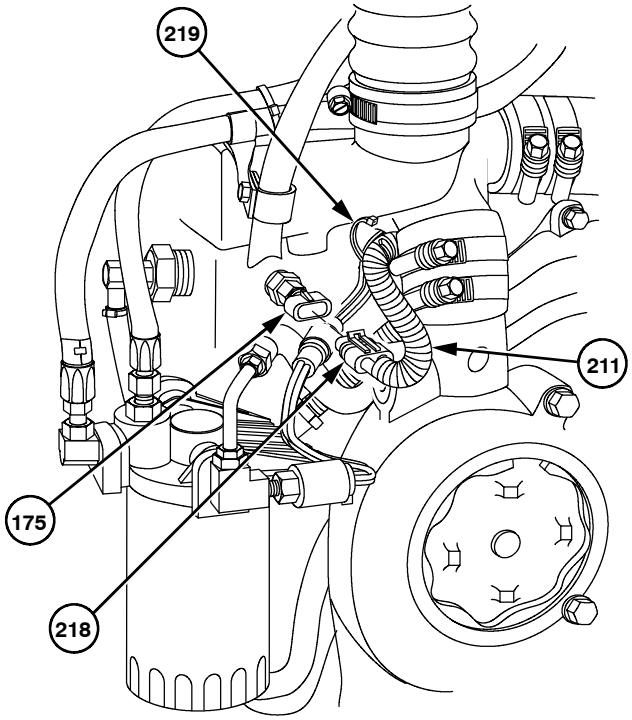


(153) Install electrical connector (218) on coolant temperature sensor (175).

NOTE

Plastic cable ties should be positioned in locations noted during removal.

(154) Secure DDEC III/IV wire harness (211) with plastic cable ties (219) as required.



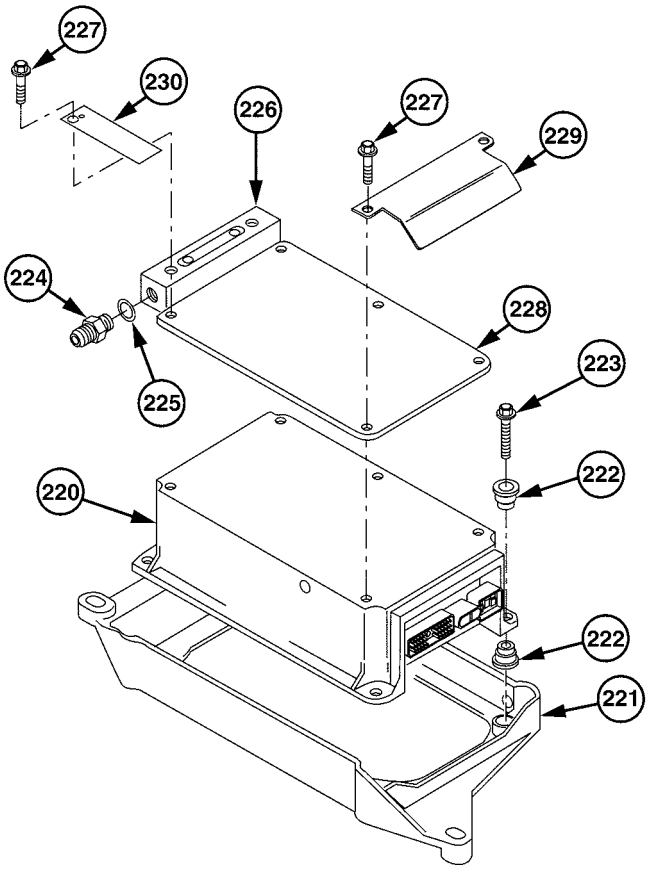
(155) Install ECM (220) on ECM bracket (221) with eight new isolators (222) and four new screws (223).

(156) Install two fittings (224) and new preformed packings (225) on fuel connection assembly (226).

(157) Coat threads of five screws (227) with antiseize compound.

(158) Install cooler plate (228), heat shield (229), and new DDEC III/IV data plate (230) on ECM (220) with five screws (227).

(159) Torque five screws (227) to 180 lb-in. (20 N·m).



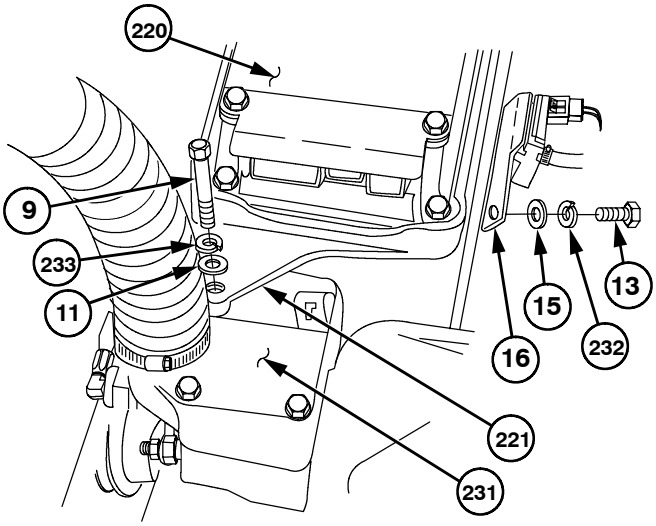
NOTE

Left injector wire harness should be located under ECM bracket.

(160) Position ECM (220) and ECM bracket (221) on thermostat housing (231).

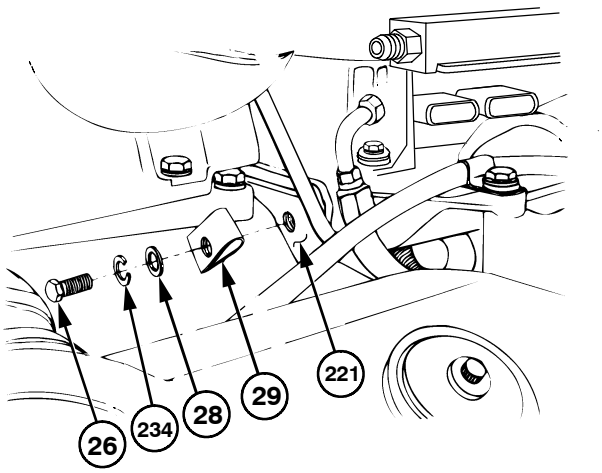
(161) Position turbo boost sensor bracket (16) on ECM bracket (221) with washer (15), new lockwasher (232), and screw (13). Do not tighten screw.

(162) Position washer (11), new lockwasher (233), and screw (9) on ECM bracket (221). Do not tighten screw.



18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(163) Position clip (29), washer (28), new lockwasher (234), and screw (26) on ECM bracket (221). Do not tighten screw.



(164) Position clip (25), washer (24), new lockwasher (235), and screw (22) on ECM bracket (221). Do not tighten screw.

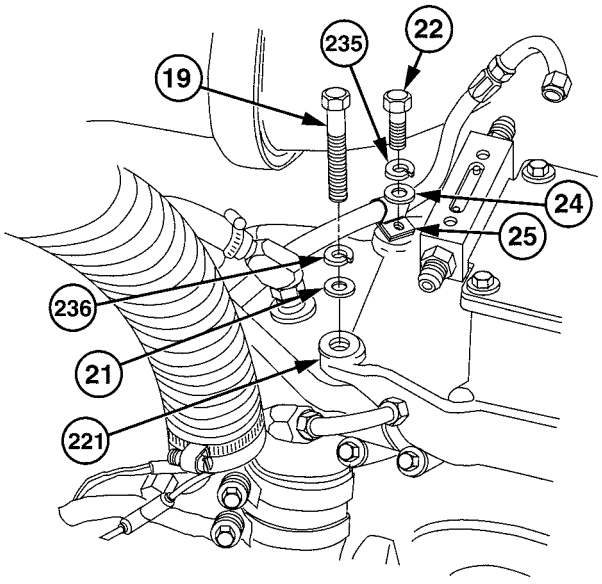
(165) Position washer (21), new lockwasher (236) and screw (19) on ECM bracket (221). Do not tighten screw.

CAUTION

Screws connecting bracket to blower must be tightened first to prevent damage to housing.

(166) Tighten two screws (13 and 26) to 120-156 lb-in. (13.6-17.7 N·m).

(167) Tighten three screws (9, 22, and 19) to 17-20 lb-ft (23-27 N·m).



NOTE

ECM wiring harnesses are designed to be installed in only one location.

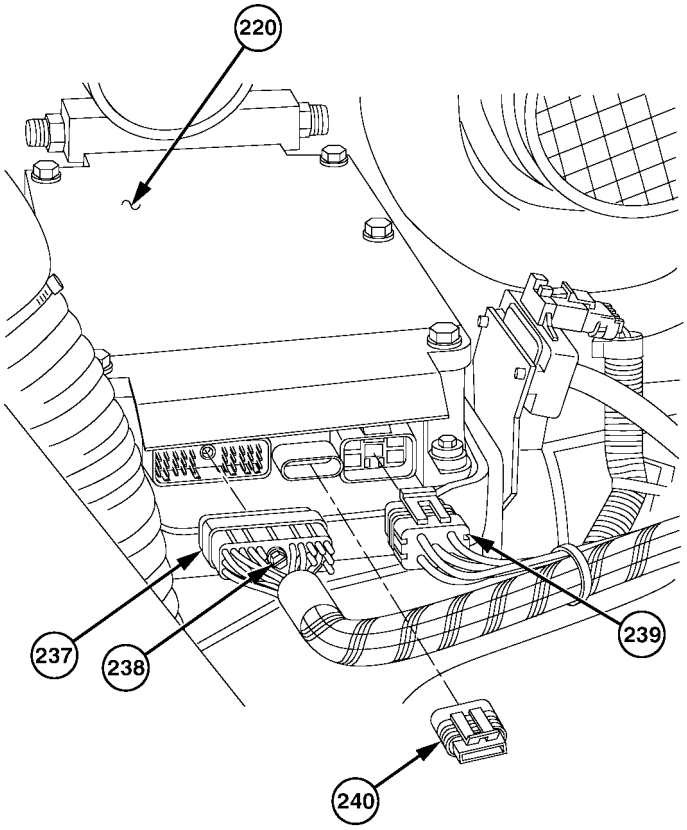
(168) Connect chassis wire harness connector (237) to left side of ECM (220) and tighten screw (238).

NOTE

If engine is out of chassis, power wire harness is connected when engine is installed in vehicle.

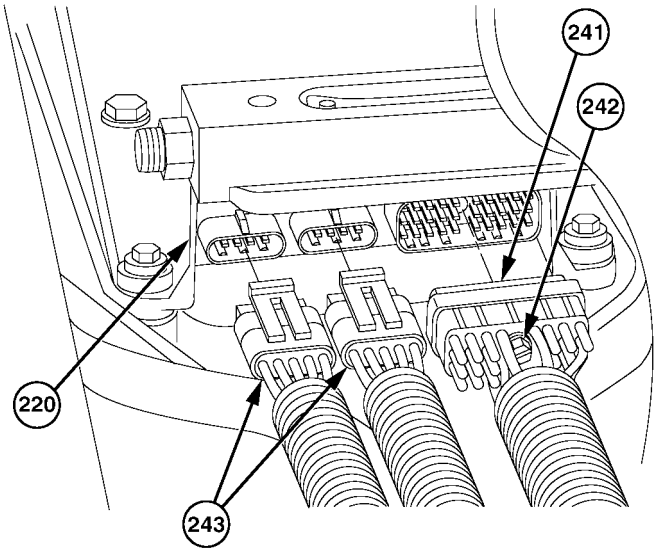
(169) Connect power wire harness connector (239) to left side of ECM (220).

(170) Install communication protective cover (240) to left side of ECM (220).



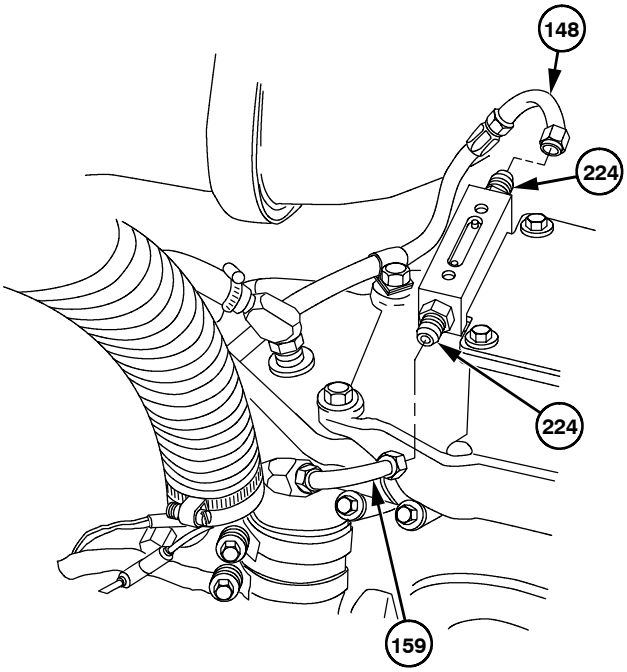
(171) Connect engine wiring harness connector (241) to right side of ECM (220) and tighten screw (242).

(172) Connect two injector wiring harnesses (243) to right side of ECM (220).



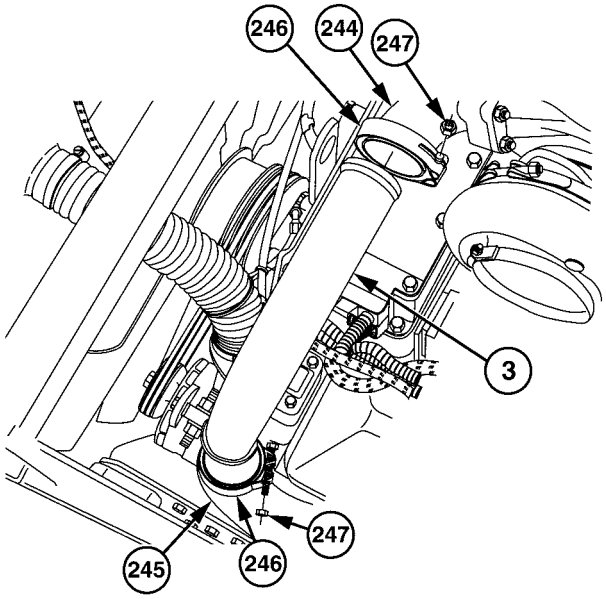
18-3. DDEC II DRESSED ENGINE TO DDEC III/IV DRESSED ENGINE CONVERSION (CONT)

(173) Install two fuel lines (148 and 159) on fittings (224).



(174) Install exhaust tube (3) on turbocharger (244) and exhaust manifold (245) with two new clamps (246).

(175) Install two new locknuts (247) on clamps (246).



b. Follow-On Maintenance

(1) Install rocker covers (TM 9-2320-360-20).

(2) Install fan clutch (TM 9-2320-360-20).

(3) Install 24-volt (front) alternator strap (TM 9-2320-360-20).

(4) Install DDEC III/IV vehicle kit (in chassis) (para 18-4).

(5) Install inner fenders (in chassis) (TM 9-2320-360-20).

(6) Install access panels (in chassis) (TM 9-2320-360-20).

(7) Connect batteries (in chassis) (TM 9-2320-360-20).

(8) Install engine in container (out of chassis) (para 3-4).

18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE

This task covers:
a. Installation
b. Follow-On Maintenance

INITIAL SETUP

Equipment Conditions
Engine hood opened (TM 9-2320-360-10).
Batteries disconnected (TM 9-2320-360-20).
Stowage box removed (TM 9-2320-360-20).
Doghouse access covers removed (TM 9-2320-360-20).
Cooling system drained below radiator top tank (TM 9-2320-360-20).
Top doghouse insulation removed (TM 9-2320-360-20).

Tools and Special Tools
Tool Kit, Genl Mech (Item 202, Appendix E)
Wrench, Torque, 0-200 lb-in. (Item 235, Appendix E)

Materials/Parts
Compound, Sealing, Pipe Thread (Item 28, Appendix B)
Lockwashers (3) (Item 126, Appendix. F)
Lockwashers (2) (Item 112, Appendix F)
Ties, Cable, Plastic (Item 60, Appendix B)

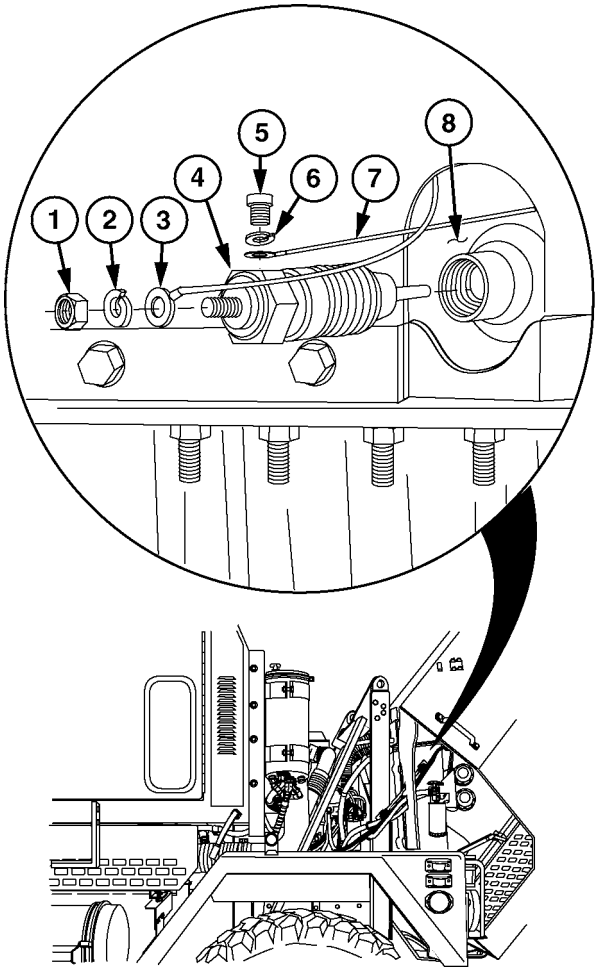
a. Installation

NOTE
Coolant level sensor may already be disconnected.

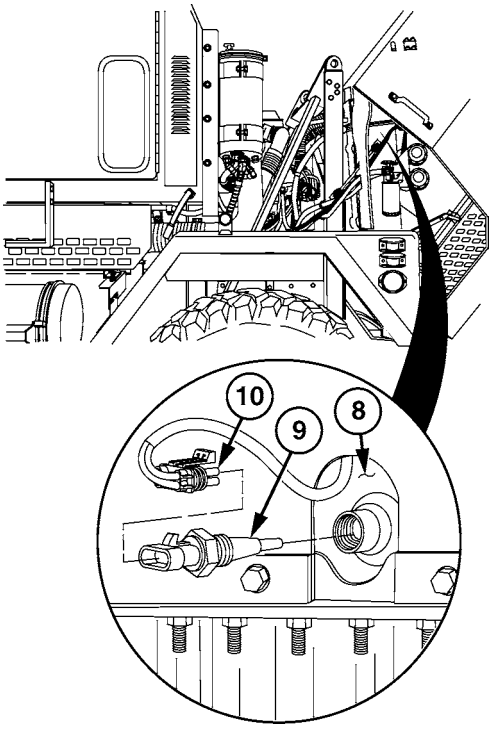
(1) Remove nut (1), lockwasher (2), and wire no. 890 (3) from coolant level sensor (4). Discard lockwasher.

(2) Remove screw (5), lockwasher (6), and wire no. 1788 (7) from coolant level sensor (4). Discard lockwasher.

(3) Remove coolant level sensor (4) from radiator (8).



18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE (CONT)



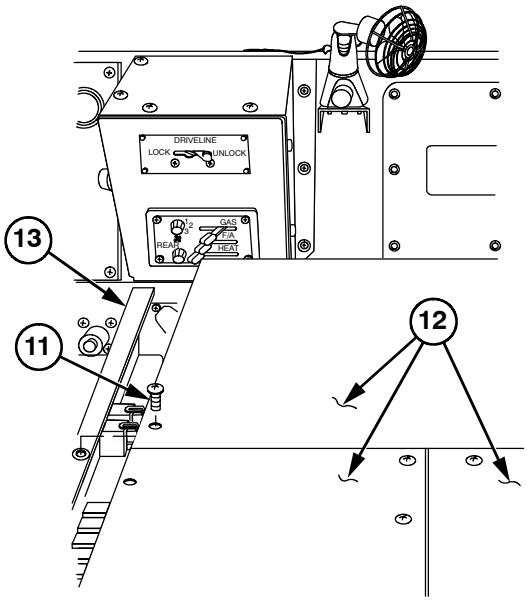
WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

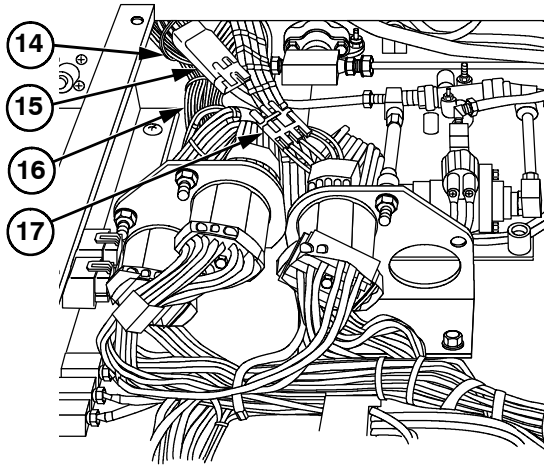
(4) Coat threads of coolant level sensor (9) with pipe thread sealing compound.

(5) Install coolant level sensor (9) in radiator (8). Torque coolant level sensor to 180 lb-in. (20 N·m).

(6) Install connector MC58 (10) on coolant level sensor (9).



(7) Remove 19 screws (11) and three covers (12) from electronic control box (13).

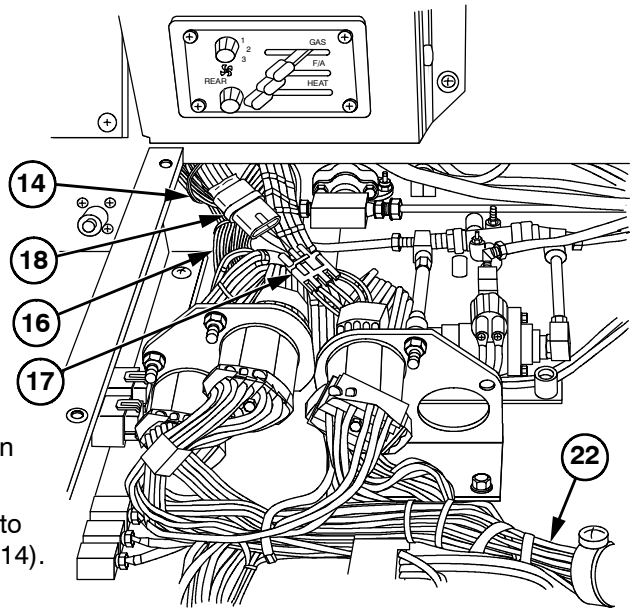


(8) Remove plastic cable tie (14) securing vernier control (15) to wire harness (16).

(9) Remove DDEC II vernier control (15) from connector (17).

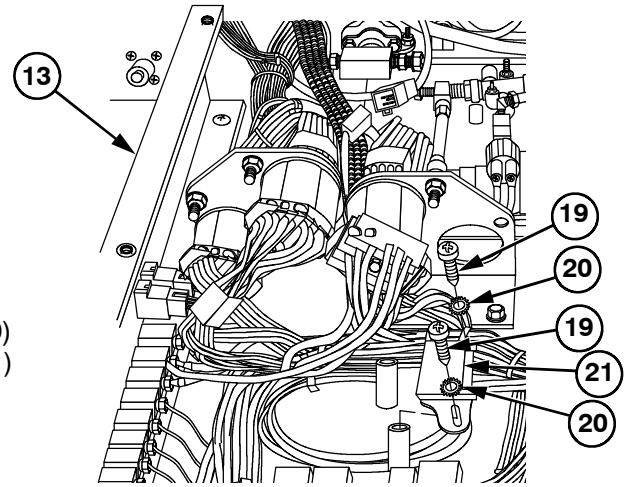
CAUTION

Vernier controls for DDEC II and DDEC III/IV are not interchangeable. Installation of the wrong part will cause either too high, or too low, high idle speed which may result in serious engine damage.



(10) Install DDEC III/IV vernier control (18) on connector (17).

(11) Secure DDEC III/IV vernier control (18) to wire harness (16) with plastic cable tie (14).



(12) Remove two screws (19), lockwashers (20) and DDEC diagnostic connector MC13 (21) from electronic control box (13). Discard lockwashers.

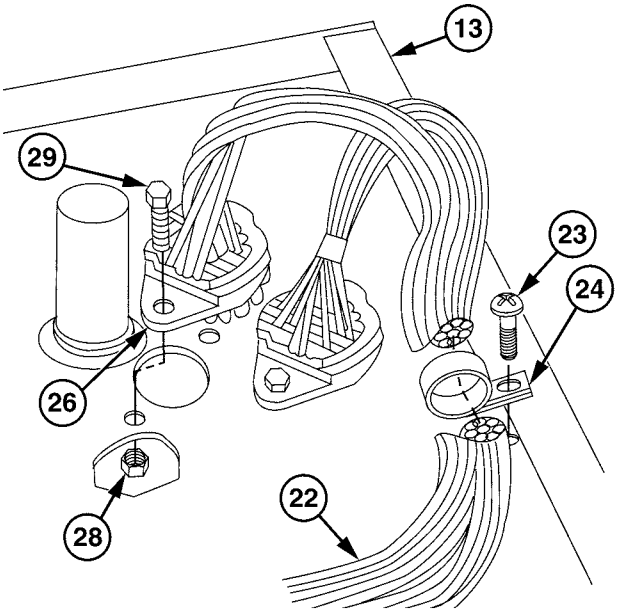
18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE (CONT)

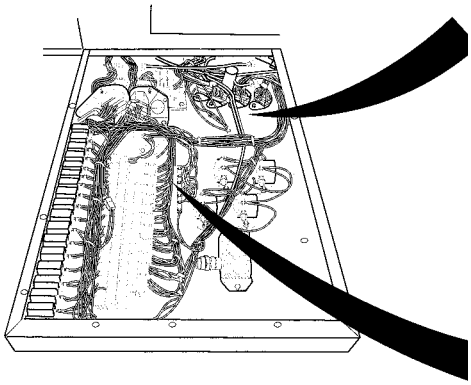
(13) Cut and remove plastic cable ties securing the DDEC diagnostic connector wires to the electrical control box wire harness (22).

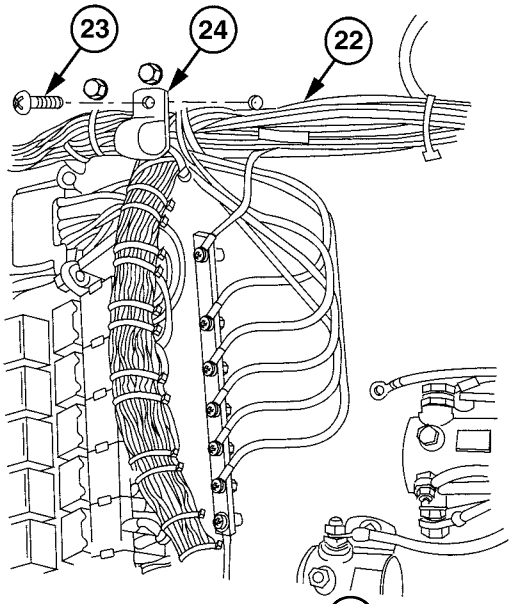
(14) Remove two screws (23) and cushion clips (24) from electrical control box wire harness (22).

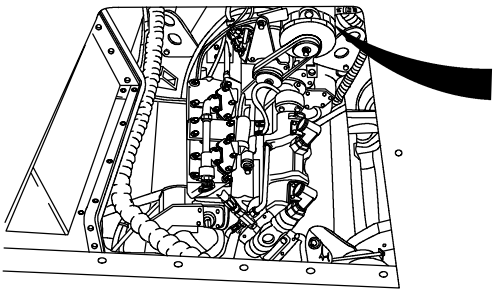
(15) Loosen screw (25) and remove green electrical connector MC11 (26) from cab wire harness green connector (27).

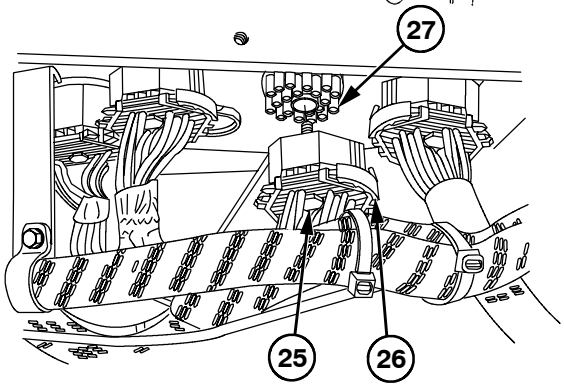
(16) Remove two locknuts (28), screws (29), and cab wire harness connector MC11 (26) from electronic control box (13). Discard locknuts.



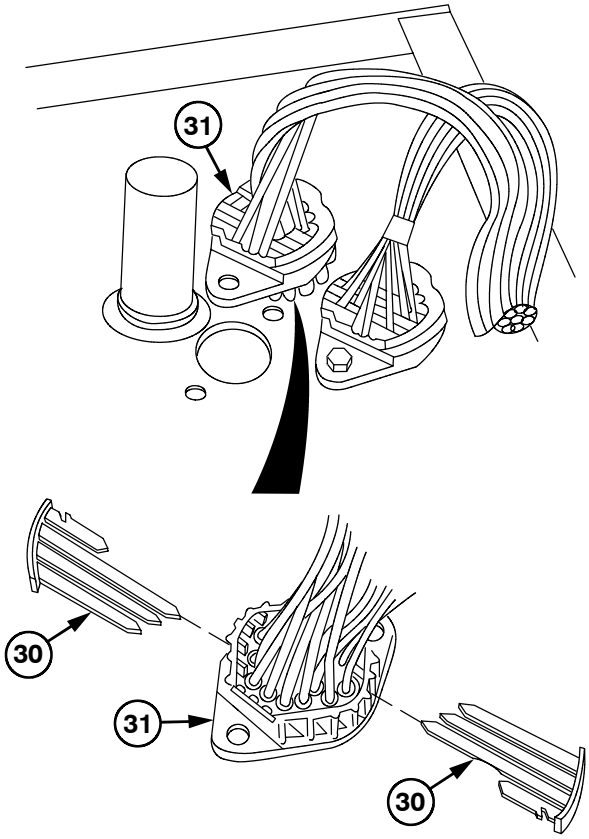




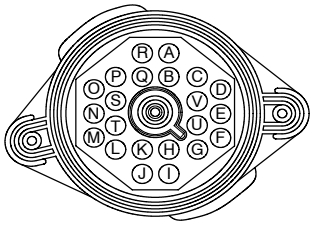




(17) Remove secondary locks (30) from connector MC11 (31).

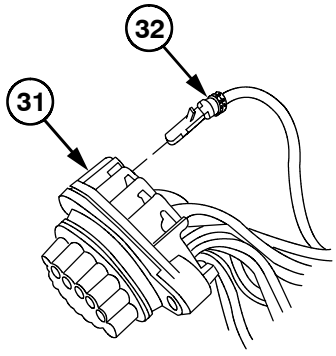


(18) Remove wire terminals (32) from connector MC11 (31), positions E, F, G, K, M, & N.



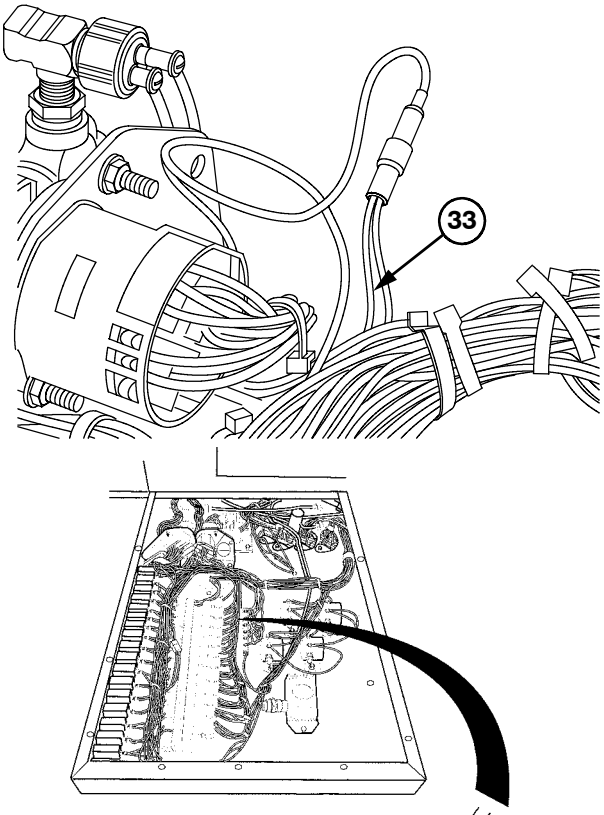
MC11

DDEC II ENGINE HARNESS	
POSITION	CODE
A	1866
B	916
C	419
D	509
E	439
F	901
G	900
H	952
I	417
J	1435
K	451
L	908
M	505
N	902
O	510
P	
Q	1045
R	1435
S	1435
T	508
U	1020
V	1020A



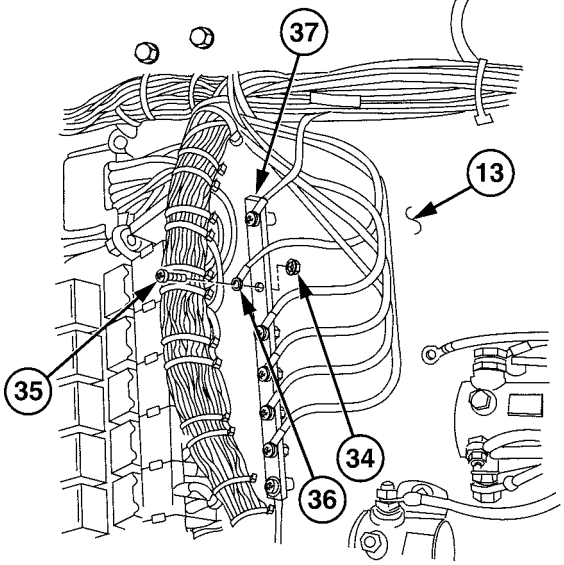
18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE (CONT)

(19) Cut and remove wire no. 439 (33) (from DDEC II diagnostic connector) at 3-way splice.

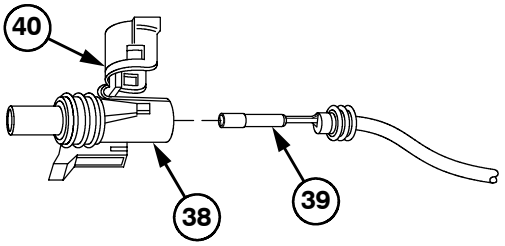


(20) Remove locknut (34), screw (35), and ground wire no. 1435 (36) from ground strip (37). Discard locknut.

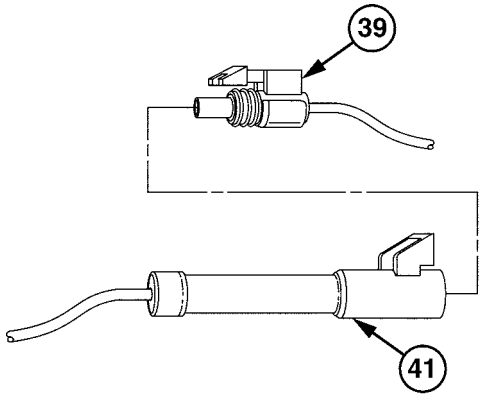
(21) Remove DDEC II diagnostic connector wires from electronic control box (13).



(22) Install female connector (38) on original wire no. 439 (39) (that was removed from connector MC11, position E). Close connector secondary lock (40).



(23) Install wire no. 439 (39) (that was removed from connector MC11, position E) to connector MC59 (41) of kit wire harness.



(24) Move wire no. 508 from position T to position M of connector MC11.

(25) Remove plug (42) from position P of connector MC11.

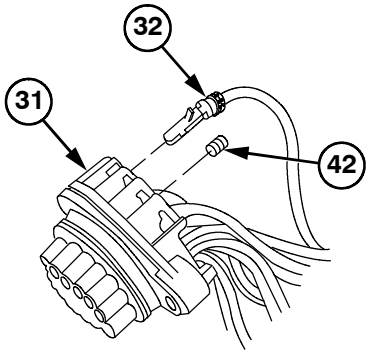
(26) Install five wire terminals (32) from the kit wire harness in connector MC11 (31), positions E, F, G, K, and P until they lock.

(27) Install plugs (42) in connector MC11 (31) positions N & T.

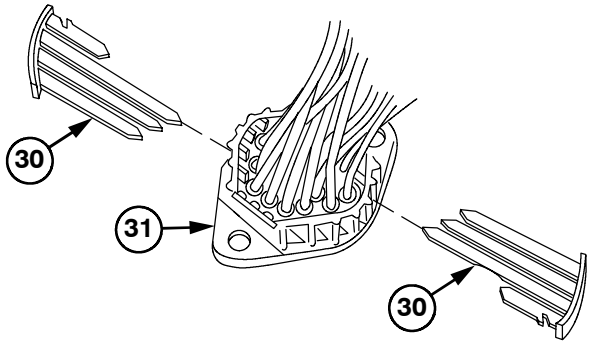
MC11

DDEC III/IV ENGINE HARNESS		
POSITION	CODE	
A	1866	
B	916	
C	419	
D	509	
E	439	
F	901-BLACK	
G	900-RED	
H	952	
I	417	
J	1435	
K	528	
L	908	
M	988	
N	583	X
O	510	
P	953	
Q	1045	
R	1435	
S	1435	
T	979	X
U	1020	
V	1020A	

X - LOCATION TO BE PLUGGED WITH CAVITY SEAL.



(28) Install secondary locks (30) in connector MC11 (31).



18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE (CONT)

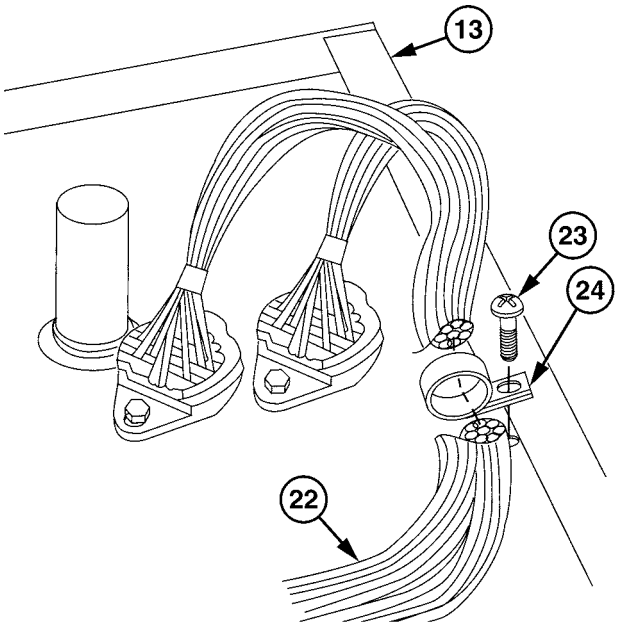
(29) Install ground wire no. 1435 (36) on ground strip (37) with existing screw (35) and new locknut (34).

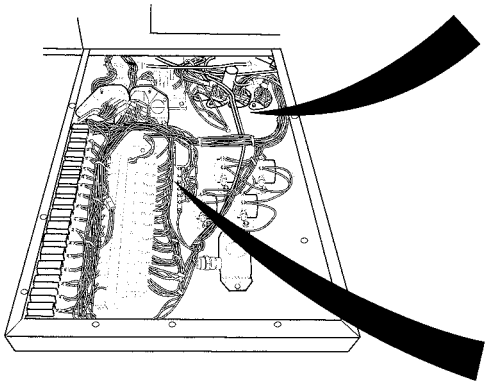
(30) Secure kit wire harness and electric control box wire harness (22) to electronic control box (13) with two screws (23) and cushion clips (24).

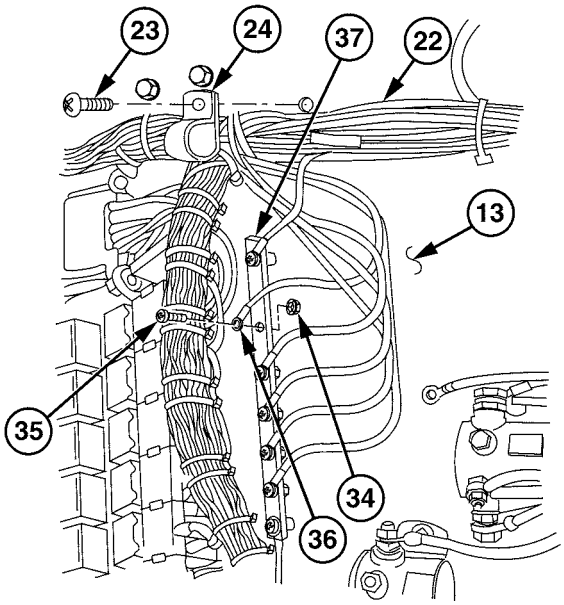
CAUTION

Kit wire harness is covered with metal shielding and must be secured away from other electrical components. Failure to comply may allow the shielding to contact and short out other components, resulting in damage to equipment.

(31) Secure the kit wire harness with plastic cable ties.



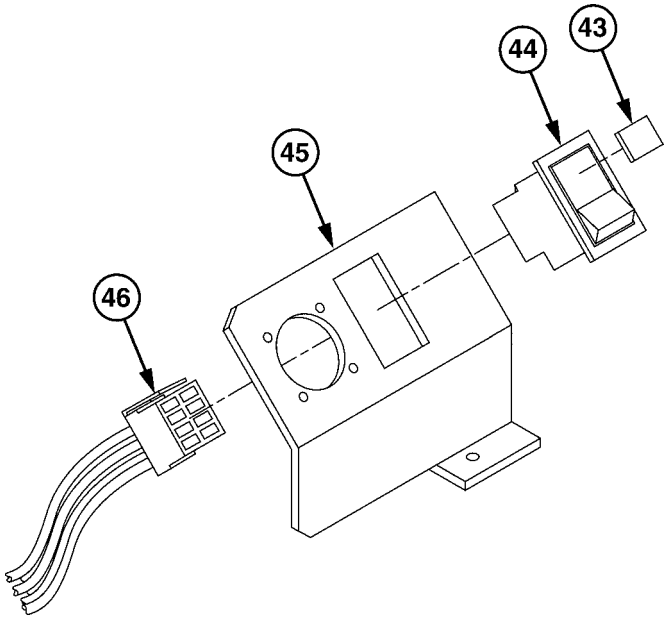




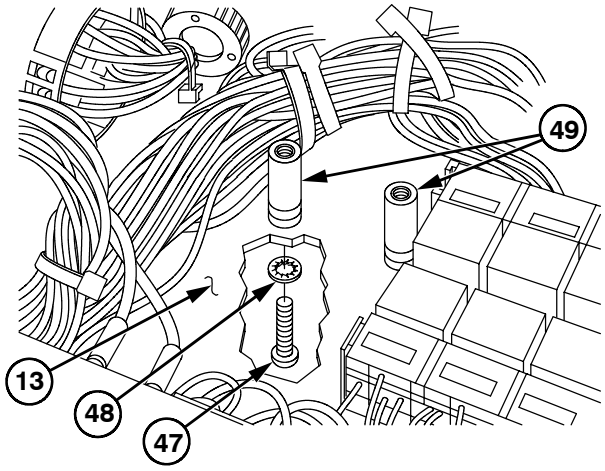
(32) Install applique (43) on switch (44).

(33) Install switch (44) in bracket (45).

(34) Install connector (46) into switch (44).



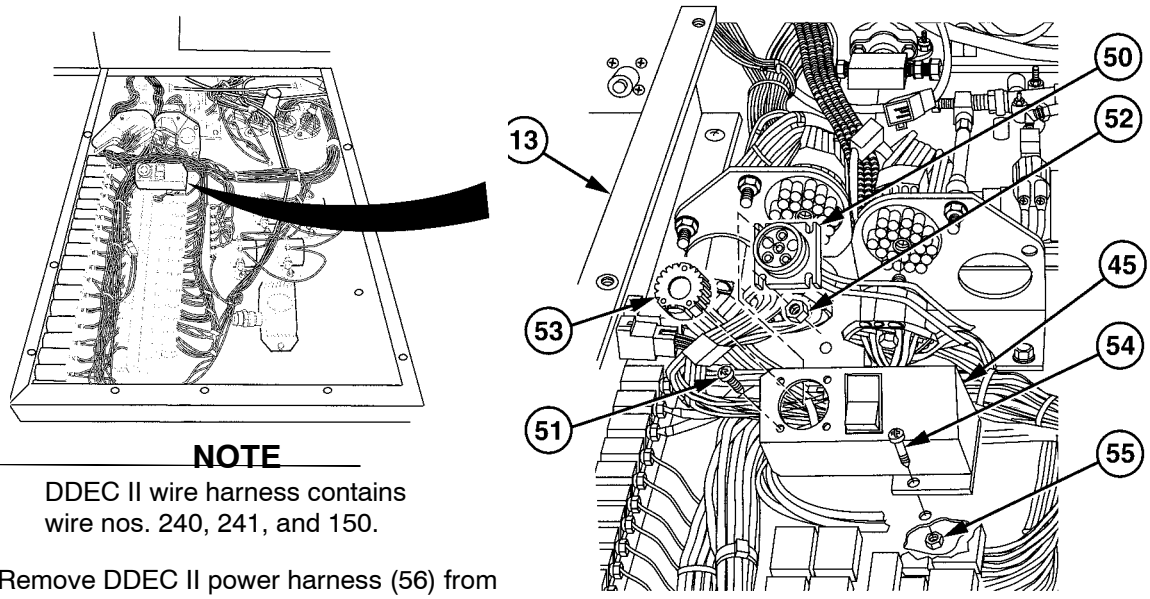
(35) Remove two screws (47), lockwashers (48), and studs (49) from electronic control box (13).



18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE (CONT)

(36) Install harness (50) on bracket (45) with four screws (51), four nuts (52), and cap (53).

(37) Install bracket (45) on electronic control box (13) with two screws (54) and two new locknuts (55).



NOTE

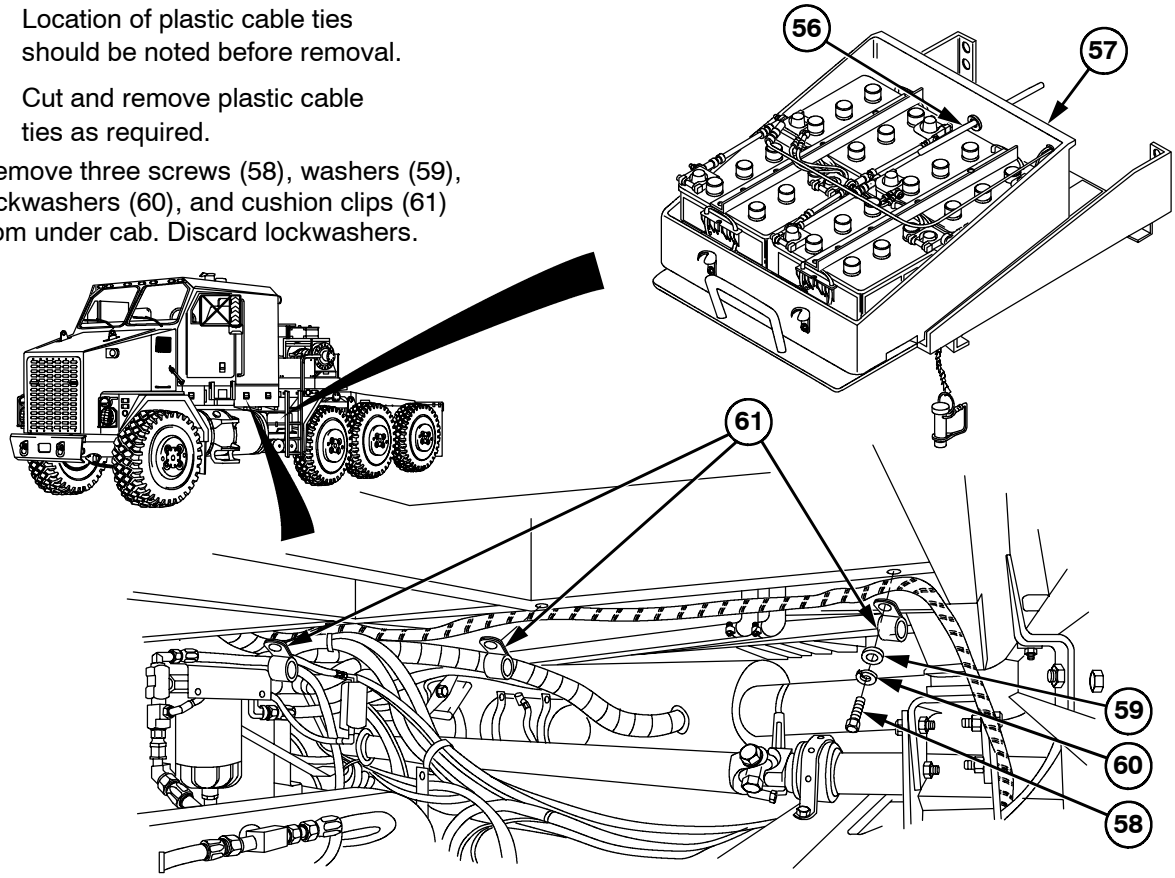
DDEC II wire harness contains wire nos. 240, 241, and 150.

(38) Remove DDEC II power harness (56) from battery box (57).

NOTE

- Location of plastic cable ties should be noted before removal.
- Cut and remove plastic cable ties as required.

(39) Remove three screws (58), washers (59), lockwashers (60), and cushion clips (61) from under cab. Discard lockwashers.



(40) Remove screw (62), lockwasher (63) and wire no. 240 (64) from circuit breaker (65).

(41) Remove screw (66), lockwasher (67), and wire no. 241 (68) from circuit breaker (69).

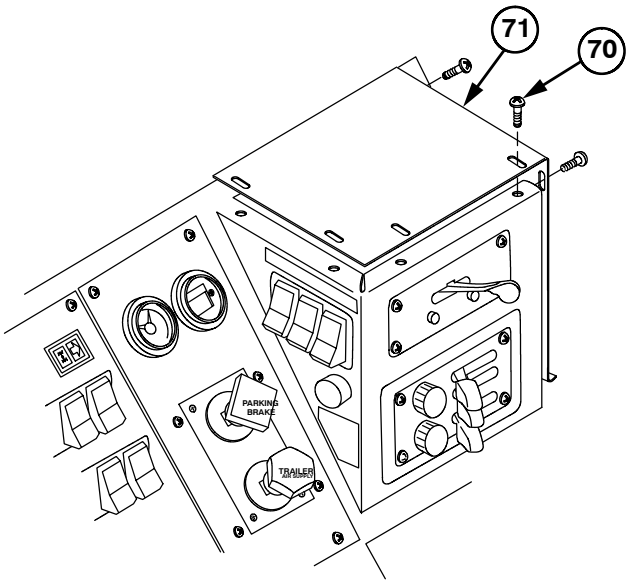
(42) Disconnect wire no. 240 (64) from DDEC circuit breaker (65).

(43) Disconnect wire no. 241 (68) from DDEC circuit breaker (69).

(44) Remove nine screws (70) and dash access panel (71).

(45) Push DDEC II power harness (56) from electronic control box (13).

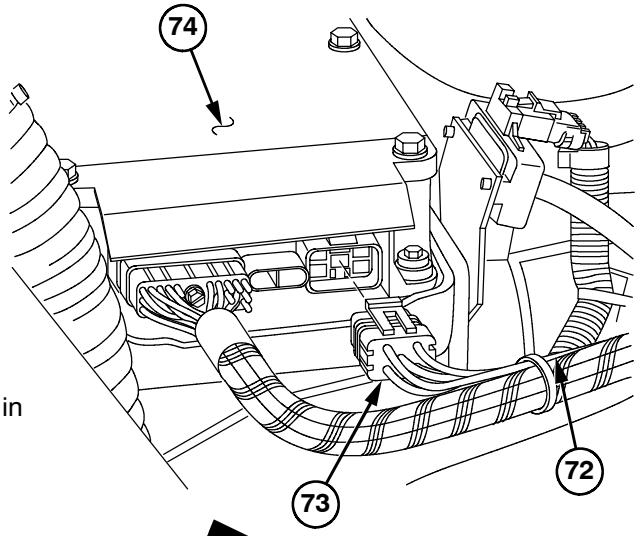
(46) Remove DDEC II power harness (56) from HET Tractor.



18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE (CONT)

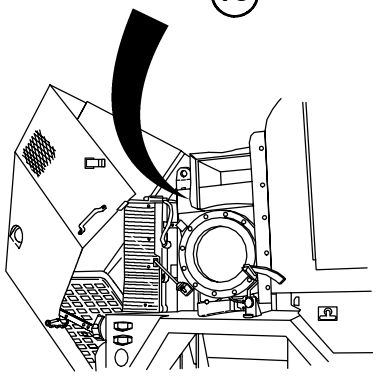
NOTE

- Evenly distribute any slack in DDEC III/IV power harness. Do not make any connections.
- The 5-part end of the harness is threaded into electronic control box through the hole in the firewall. The 3-part end goes to the center hole in the battery box.



(47) Position DDEC III/IV power harness (72) in HET Tractor with aid of an assistant.

(48) Connect DDEC III/IV power harness connector (73) to ECM (74).



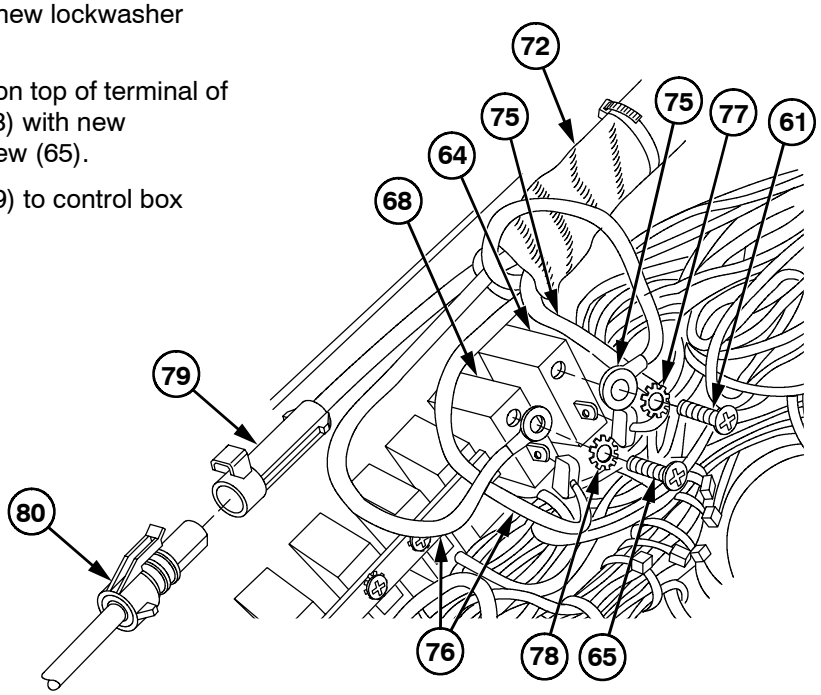
(49) Connect wire no. 240 (75) to bottom terminal of DDEC circuit breaker (64).

(50) Connect wire no. 241 (76) to bottom terminal of DDEC circuit breaker (68).

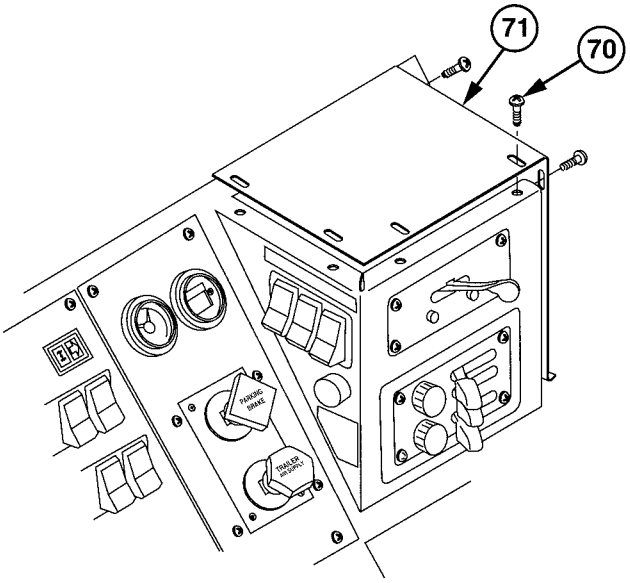
(51) Install wire no. 240 (75) on top of DDEC circuit breaker (64) with new lockwasher (77) and screw (61).

(52) Install wire no. 241 (76) on top of terminal of DDEC circuit breaker (68) with new lockwasher (78) and screw (65).

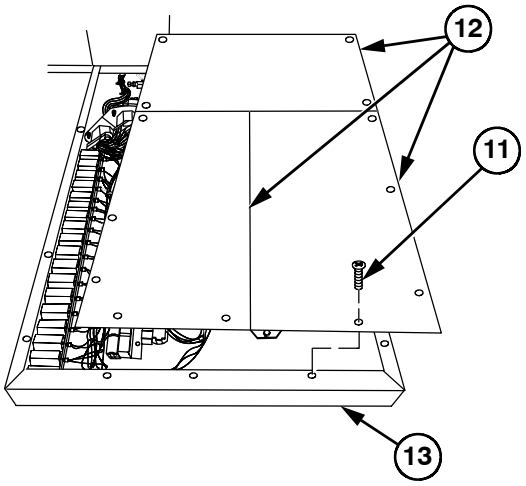
(53) Connect wire no. 953 (79) to control box harness MC59 (80).



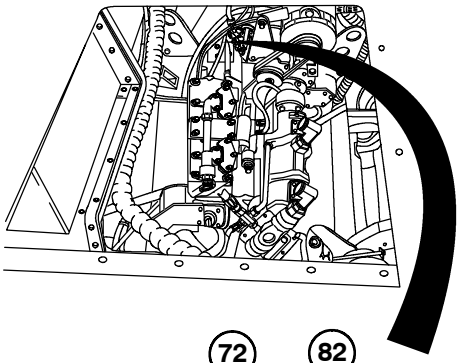
(54) Install dash access panel (71) and nine screws (70).

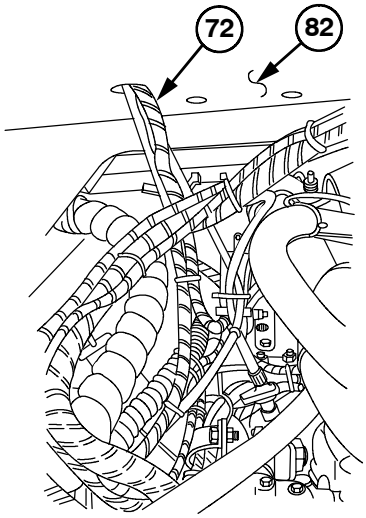


(55) Install 3 covers (12) on electronic control box (13) with 19 screws (11).



18-4. DDEC II VEHICLE CONVERSION TO ACCEPT DDEC III/IV DRESSED ENGINE (CONT)



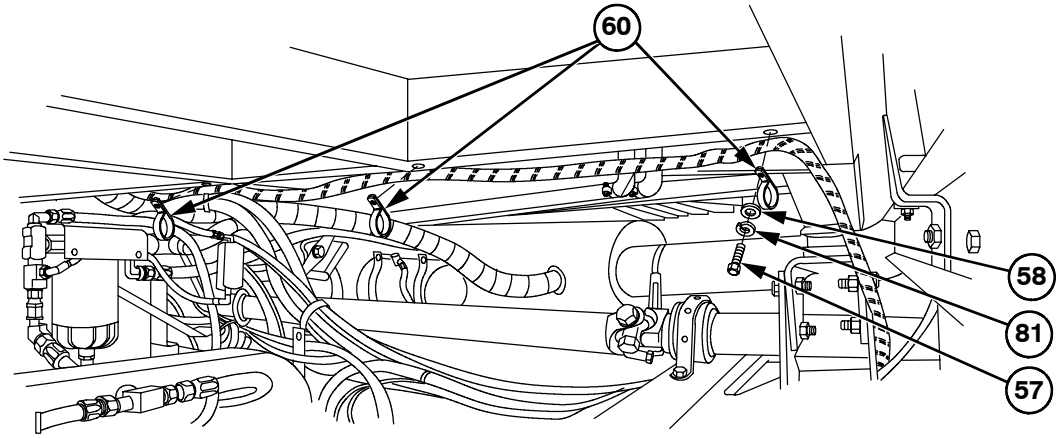


(56) Install DDEC III/IV power harness (72) on bottom of cab with three cushion clips (60), new lockwashers (81), washers (58), and screws (57).

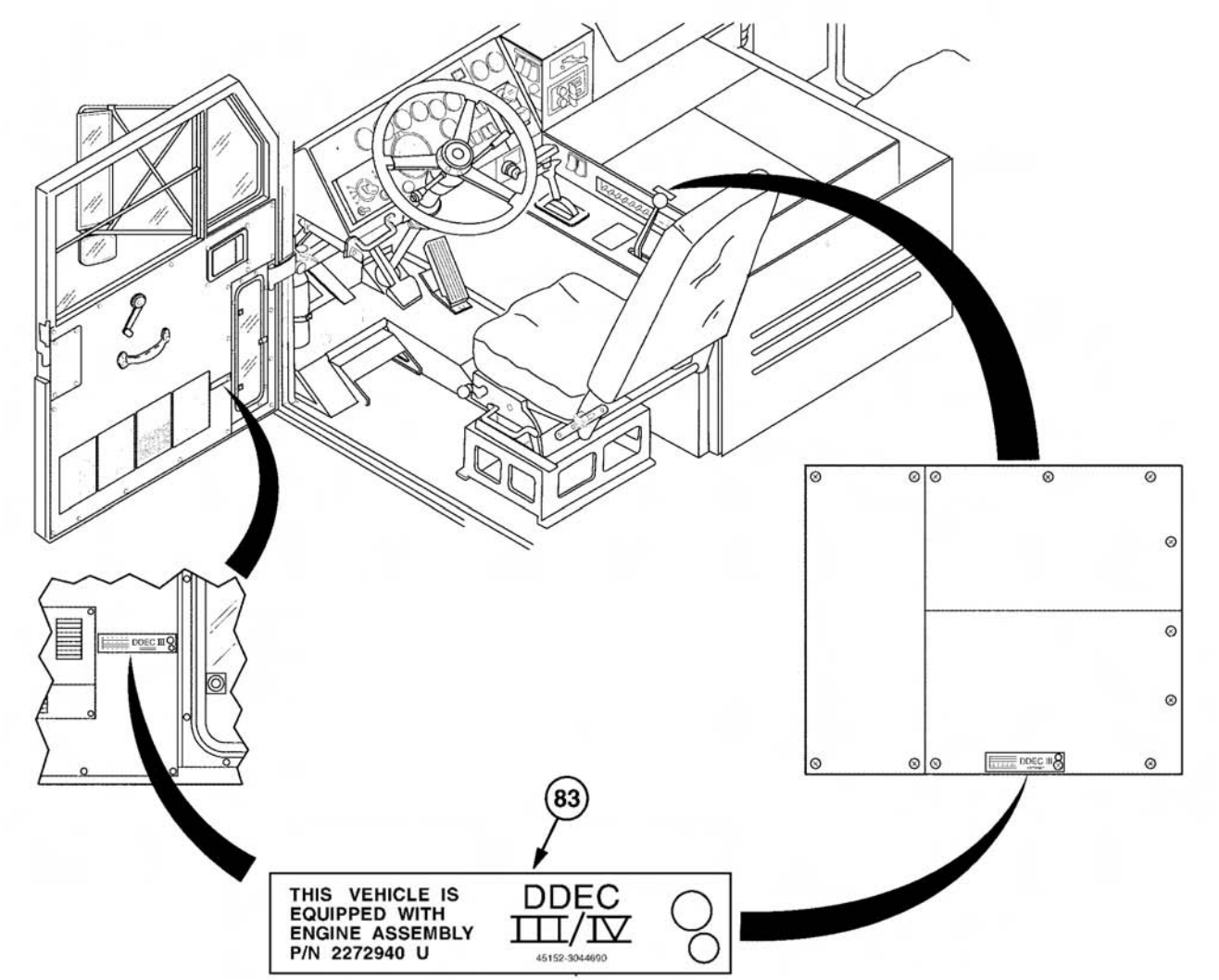
NOTE

Wires no. 240 and 241 go to the battery positive terminal. Wire nos. 150, 151, and 953 go to the negative terminal.

(57) Route DDEC III/IV power harness (72) through hole in battery box (82).



(58) Install two data plates (83) using existing hardware.



b. Follow-on Maintenance

(1) Install top doghouse insulation (TM 9-2320-360-20).

(2) Install doghouse access covers (TM 9-2320-360-20).

(3) Fill cooling system (TM 9-2320-360-20).

(4) Prime fuel system (TM 9-2320-360-10).

(5) Install stowage box (TM 9-2320-360-20).

(6) Connect batteries (TM 9-2320-360-20).

(7) Verify DDEC III/IV engine programming with Prolink or similar equipment (refer to instruction manual).

(8) Close engine hood (TM 9-2320-360-10).

APPENDIX A
REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, technical manuals, and other publications referenced in this manual.

A-2. PUBLICATIONS INDEX

The following index should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical manuals.

Consolidated Index of Army Publications and Blank Forms ..... DA Pam 25-30

A-3. FORMS

The following forms pertain to this manual. See DA Pam 25-30 for index of blank forms. See DA Pam 750-8 The Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to this material.

Field Organizations Unit Status Report ..... AR 220-1
Recommended Changes to DA Publications and Blank Forms ..... DA Form 2028
Recommended Changes to Equipment Technical Publications ..... DA Form 2028
Equipment Inspection and Maintenance Worksheet ..... DA Form 2404
Maintenance Request ..... DA Form 2407
Equipment Control Record ..... DA Form 2408-9
Quality Deficiency Report (Category II) ..... SF 368

A-4. OTHER PUBLICATIONS

The following publications contain information pertinent to the HET Tractor and associated equipment.

a. Department of Army Pamphlets

The Army Maintenance Management System (TAMMS) ..... DA Pam 750--8

b. Field Manuals

First Aid for Soldiers ..... FM 4-25.11

c. Lubrication Order

Lubrication Order for Truck, Tractor, M1070, 8 x 8,
Heavy Equipment Transporter ..... LO 9-2320-360-12
(EM 0042)

d. Technical Bulletins

Pre-Embarkation Requirements ..... TB 9-2300-281-35
Warranty Technical Bulletin for Truck, Tractor, M1070, 8 x 8,
Heavy Equipment Transporter ..... TB 9-2320-360-14
Equipment Improvement Report and Maintenance Digest: TACOM Equipment ..... TB 43-001-39
Cooling Systems: Tactical Vehicles ..... TB 750-254

A-4. OTHER PUBLICATIONS (CONT)

e. Technical Manuals

Operator's Manual for Truck, Tractor, M1070, 8 x 8, Heavy Equipment Transporter	TM 9-2320-360-10
Hand Receipt Manual for Truck, Tractor, M1070, 8 x 8, Heavy Equipment Transporter	TM 9-2320-360-10-HR
Unit Maintenance Manual for Truck, Tractor, M1070, 8 x 8, Heavy Equipment Transporter	TM 9-2320-360-20
Direct Support and General Support Repair Parts and Special Tools List for Truck, Tractor, M1070, 8 x 8, Heavy Equipment Transporter	TM 9-2320-360-34P
Equipment Improvement Report and Maintenance Summary	TM 43-1043
Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use	TM 750-244-6

APPENDIX B
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists expendable and durable items that you will need to operate and maintain the HET Tractor. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-790, Expendable/Durable Items (except medical, class V repair parts, and heraldic items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

B-2. EXPLANATION OF COLUMNS

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item, e.g., "Oil, Lubricating (Item 42, Appendix B)."

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

c. Column (3) - National Stock Number. This is the national stock number assigned to the item which you can use to requisition it.

d. Column (4) - Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number. This provides the other information you need to identify the item.

e. Column (5) - Unit of Measure. This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	8040-00-273-8717	Adhesive (81348) MMM-A-121	pt
2	O	8040-00-843-0802	Adhesive-Sealant, Silicone, RTV, General Purpose (MIL-A-46106A) (01139) 108	oz
2.1	F		Adhesive-Sealant (05972) 510	ml
3	O	5330-01-325-6993	Adhesive-Sealant (05972) 515	ml
4	F		Adhesive-Sealant (51517) 518	ml
5	O	8030-00-148-9833	Adhesive-Sealant (MIL-S-46163) (05972) 271	ml
6	O	8040-01-250-3969	Adhesive-Sealant (05972) 242	ml
7	F		Adhesive-Sealant (05972) 290	ml
7.1	H		Adhesive-Sealant (05972) 601	ml

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (CONT)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
8	F		Adhesive-Sealant (05972) 680	ml
9	F		Adhesive-Sealant, Permatex No. 1	ml
10	F		Adhesive-Sealant, Permatex No. 2	ml
10.1	F	8040-00-938-6860	Adhesive-Spray (04963) 77 17 oz. can	oz
11	C		Antifreeze, Arctic Type (MIL-A-11755) (81349)	
		6850-00-243-1992	1 gal can	gl
		6850-00-174-1806	55 gal drum	gl
12	C	6850-00-181-7940	Antifreeze, Permanent, Glycol, Inhibited (MIL-A-46153) (81349)	gl
13	F		Caps, Shipping and Sealing	
14	O		Cement, General Purpose, Synthetic Base (MIL-A-4003) (81349)	
15	C	7930-00-634-3935	Chips, Soap (81348) P-S-579	
16	F		Cloth, Crocus	
17	F		Clips, Wire (45152) 27886AX	
18	O	8030-00-597-5367	Compound, Antiseize, High Temperature (MIL-A-907) 2-1/2 lb can	lb
19	F		Compound, Gasket-Forming	
20	F	5970-00-166-5697	Compound, Insulating, Electrical, Embedding (MIL-C-47233)	
21	F		Compound, International, No. 2 (72582) 5198563	
22	F		Compound, Retaining (MIL-R-46082)	
		8030-00-181-7603	50 cc	cc
		8030-00-181-7529	250 cc	cc
22.1			Compound, Sealing (MIL-S-45180C) Type III (7A756) Permatex 3D	pt
23	F		Compound, Sealing, Lubricating, Wicking, Thread-Locking, Anaerobic, Single Component (MIL-S-46163), Type I, Grade K	

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (CONT)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
24	F		Compound, Sealing, Lubricating, Wicking, Thread-Locking, Anaerobic, Single Component (MIL-S-46163), Type I, Grade	
25	F	8030-01-104-5392	Compound, Sealing, Lubricating, Wicking, Thread-Locking, Anaerobic, Single Component (MIL-S-46163), Type II, Grade N	
26	F		Compound, Sealing, Lubricating, Wicking, Thread-Locking, Anaerobic, Single Component (MIL-S-46163), Type II, Grade O	
27	F		Compound, Sealing and Lubricating	
28	O	8030-01-166-0675	Compound, Sealing, Pipe Thread (05972) 567	
			50 ml	ml
			250 ml	ml
29	F		Connector, Electrical, Butt (34072) 04618	ea
30	F		Dye, Prussian Blue	
31	O	9150-00-223-4004	Grease, Anticorrosion (Molybdenum) (MIL-G-21164) (81349)	lb
32	C		Grease, Automotive and Artillery (GAA) (MIL-G-10924) (81349)	
		9150-00-065-0029	2-1/4 oz tube	oz
		9150-00-935-1017	14 oz cartridge	oz
		9150-00-190-0904	1 lb can	lb
		9150-00-190-0905	5 lb can	lb
		9150-00-190-0907	35 lb can	lb
33	F		Grease, Ball Bearing	
34	F	9150-01-091-9336	Grease, General Purpose, Lithium Base	
34.1	F	9150-01-145-1259	Grease, High Temperature DOD-G-85733 (81349)	qt
35	F		Jelly, Petroleum	
36	F	9505-00-191-3680	Lockwire	
37	C		Oil, Fuel, Diesel, DF-1, Winter (VV-F-800) (81348)	
		9140-00-286-5286	Bulk	gl
		9140-00-286-5287	5 gal can	gl
		9140-00-286-5288	55 gal drum, 16 gage	gl
		9140-00-286-5289	55 gal drum, 18 gage	gl

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (CONT)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
38	C		Oil, Fuel, Diesel, DF-2, Regular (VV-F-800) (81348)	
		9140-00-286-5294	Bulk	gl
		9140-00-286-5295	5 gal can	gl
		9140-00-286-5296	55 gal drum, 16 gage	gl
		9140-00-286-5297	55 gal drum, 18 gage	gl
39	F		Oil, Hydraulic	
40	C		Oil, Lubricating Gear, GO 75 (MIL-L-2105C)	
		9150-01-035-5390	1 qt can	qt
		9150-01-035-5391	5 gal drum	gl
41	C		Oil, Lubricating Gear, GO 80/90 (MIL-L-2105C)	
		9150-01-035-5392	1 qt can	qt
		9150-01-035-5393	5 gal drum	gl
		9150-01-035-5394	55 gal drum	gl
42	O		Oil, Lubricating OEA ICE, Subzero (MIL-L-46167)	
		9150-00-402-4478	1 qt can	qt
		9150-00-402-2372	5 gal drum	gl
		9150-00-491-7197	55 gal drum, 16 gage	gl
43	O		Oil, Lubricating 15W/40 (MIL-L-2104)	
		9150-01-152-4117	1 qt can	qt
		9150-01-152-4118	5 gal drum	gl
		9150-01-152-4119	55 gal drum	gl
44	C		Oil, Lubricating, OE/HDO 10 (MIL-L-2104)	
		9150-00-189-6727	1 qt can	qt
		9150-00-186-6668	5 gal drum	gl
			55 gal drum, 16 gage	gl
		9150-00-191-2772	55 gal drum, 18 gage	gl
45	F		Oil, Lubricating, OE/HDO 15 (MIL-L-2104)	
			1 qt can	qt
46	C		Oil, Lubricating, OE/HDO 30 (SAE 30) (MIL-L-2104)	
		9150-00-186-6681	1 qt can	qt
		9150-00-188-9858	5 gal drum	gl
		9150-00-265-9436	55 gal drum, 16 gage	gl
		9150-00-189-6729	55 gal drum, 18 gage	gl
47	C		Oil, Lubricating, OE/HDO 40 (MIL-L-2104)	
		9150-00-189-6730	1 qt can	qt
		9150-00-188-9862	5 gal drum	gl
		9150-00-405-2987	55 gal drum, 16 gage	gl

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (CONT)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
48	F		Oil, Lubricating, OE/HDO 50 (MIL-L-2104) 1 qt can 5 gal drum 55 gal drum, 16 gage	 qt gl gl
49	F	5350-00-186-8818	Paper, Abrasive, Garnet, P-P-121	
50	F		Plastigage	
51	O	7920-00-205-1711	Rags, Wiping, Cotton and Cotton-Synthetic (A-A-531)	lb
52	F	2090-00-372-6064	Repair Kit, Glass Reinforced Plastic Laminate	ea
53	F		Rope, 50 ft	ft
54	C	6850-01-474-2317	Solvent, Cleaning, SD (TYPE II) (MIL-PRF-680) 813 49 5 gal can	 gl
55	F		Spray, Adhesive	
56	O	8135-00-178-9200	Tags, Identification (MIL-T-12755) pk/1000	mx
57	O	5970-00-644-3167	Tape, Insulation, Electrical (MIL-T-50886)	ft
58	F		Tape, Masking, A-A-883	ft
59	F		Tape, Plastic	ft
60	O	5975-01-273-8133	Ties, Cable, Plastic (96906) MS3367 (MIL-S-29190)	

APPENDIX C
ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at the direct support and general support maintenance levels.

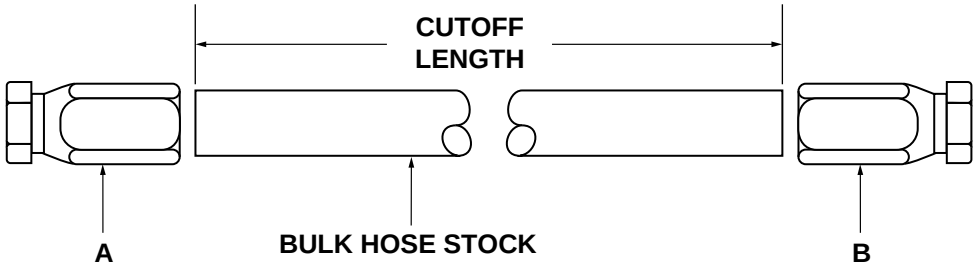
A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

Section II. MANUFACTURED ITEMS PART NUMBER INDEX

PART NO.	DESCRIPTION	FIGURE NO.
1525-6	HOSE ASSEMBLY	C-1
2BG623	REMOVER, BEARING SHELL	C-10
2BH944	EYES, LIFTING (1/2 IN.)	C-8
2HD798	YOKE HOLDER	C-15
2SK742	FIXTURE, TURBOCHARGER HOLDING	C-17
25806AX9	WIRE, SAFETY	C-2
	ADAPTER, CONSTANT VELOCITY U-JOINT BEARING CAP REMOVAL TOOL	C-19
	BEARING CONE INSTALLER, POWER DIVIDER	C-21
	CONE INSTALLER, PINION BEARING	C-20
	BLOCKS, WOODEN	C-3
	EYE, LIFTING (10 MM)	C-9
	FIXTURE, IDLER GEAR HOLDING	C-18
	GUIDE SCREWS	C-4
	HOOK, WIRE	C-6
	JET EXTRACTOR	C-11
	PLATE, STEEL, 3/16 IN.	C-12
	PLATE, STEEL, 1/16 IN.	C-13
	PLYWOOD	C-5
	PRELOAD GAGE, DIFFERENTIAL CARRIER	C-16
	SHIM	C-7
	TEMPLATE, STEERING RADIUS	C-22
	THREADED ROD (3/8 IN.)	C-14

Section III. MANUFACTURED ITEMS ILLUSTRATIONS



(1) Fabricate from bulk hose stock listed in table C-1.

(2) Using fine-toothed hacksaw, cut hose to length required in table C-1.

(2.1) Clean debris from inside hose and around hose end.

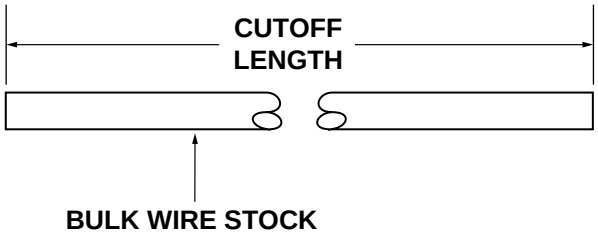
(3) Place fitting A in vise and screw hose counterclockwise until hose bottoms in fitting. Back off one-quarter turn.

(4) Place fitting B in vise and screw hose counterclockwise until hose bottoms. Back off one-quarter turn.

Figure C-1. Hose Assembly

Table C-1. Hose Assembly

HOSE ASSY PN	BULK HOSE PN	CUTOFF LENGTH IN. (CM)	FITTING A	FITTING B
1525-6	FS332-6	12 (30)	ADAPTER 5113191	ADAPTER 5113191



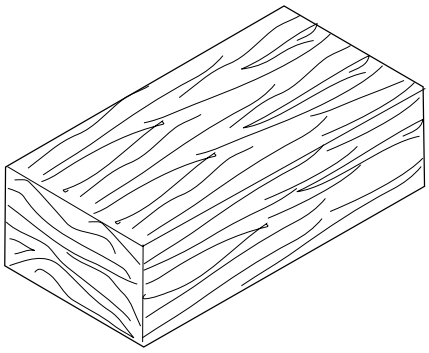
(5) Fabricate from bulk wire stock listed in table C-2.

(6) Using wire cutters, cut to required length.

Figure C-2. Safety Wire

Table C-2. Safety Wire

HARNESS ASSY PN	BULK WIRE PN	CUTOFF LENGTH IN. (MM)
25806AX9	MS20995-S41	9 (229)



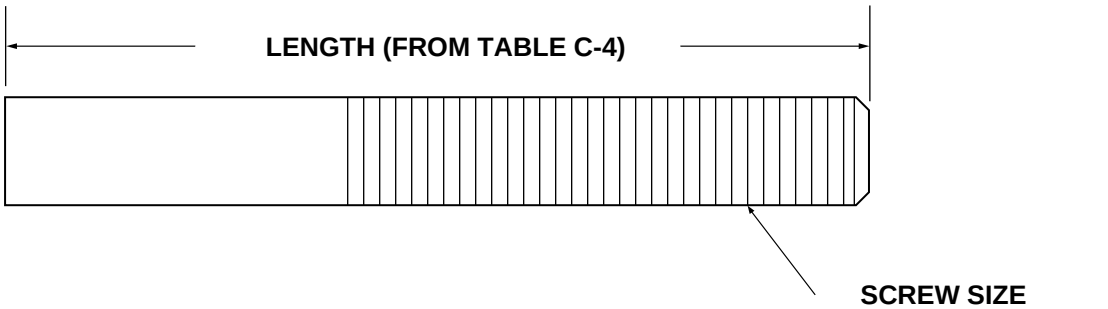
(1) Fabricate from MML751 lumber stock.

(2) Using saw and standard planing machine, cut stock to size required in table C-3.

Figure C-3. Wooden Blocks

Table C-3. Wooden Blocks

PARAGRAPH NO.	FINISHED DIMENSIONS OF BLOCK IN. (CM)
3-10, 4-4, 19-11, 20-2	1-1/2 x 1-1/2 x 12 (3.8 x 3.8 x 30)
5-6	2 x 4 x 9 (5 x 10 x 23)
14-9	4 x 4 x 24 (10 x 10 x 61)
14-11	2 x 4 x 14.5 (5 x 10 x 37)
	2 x 4 x 16.5 (5 x 10 x 42)
	2 x 4 x 21 (5 x 10 x 53)
19-7	1-1/2 x 3-1/2 x 24 (3.8 x 9 x 61)
22-17	3-1/2 x 3-1/2 x 12 (9 x 9 x 30)
25-2	1-1/2 x 3-1/2 x 12 (3.8 x 9 x 30)



(1) Fabricate from grade 5 screw of lengths shown in table C-4.

(2) Using hacksaw, cut off screw head.

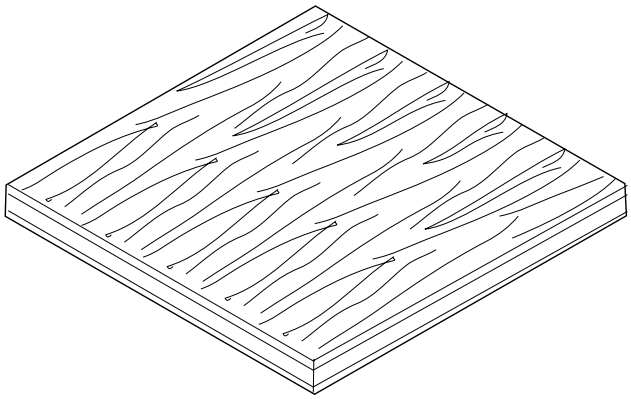
(3) Using file or grinder, remove any sharp edges.

(4) All dimensions are in inches (millimeters).

Figure C-4. Guide Screws

Table C-4. Guide Screws

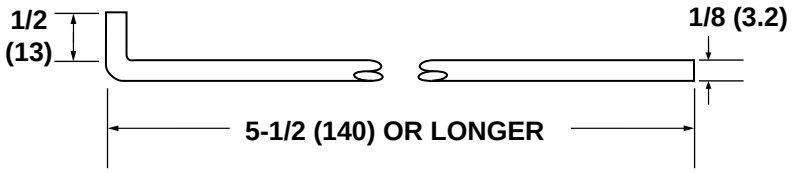
PARAGRAPH	SCREW SIZE	LENGTH IN. (MM)
3-5 and 11-6	1/2-13	2-3/8 (60)
3-5 and 13-7	1/2-13	2-1/2 (64)
7-4	1/2-20	3 (76)
28-2	3/4-10	6-1/2 (165)



(1) Fabricate from 48 x 72 x 3/4 in. exterior grade plywood.

(2) Using saw, cut to 48 x 29 x 3/4 in. (122 x 73.6 x 1.9 cm).

Figure C-5. Plywood



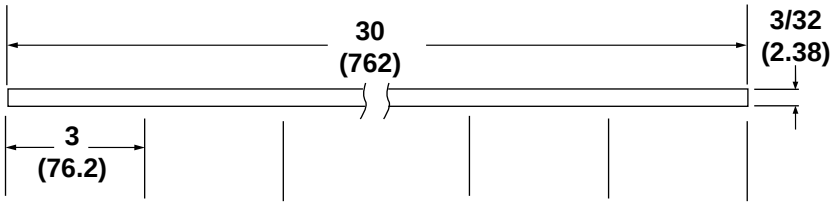
(1) Fabricate from 1/8 in. (3.2 mm) diameter steel welding rod or equivalent stiff wire.

(2) Using cutting pliers, cut welding rod to 6 in. (150 mm) length or longer.

(3) Using machinist's vise, bend 1/2 in. (13 mm) length of rod 90 degrees.

(4) All dimensions are in inches (millimeters).

Figure C-6. Wire Hook

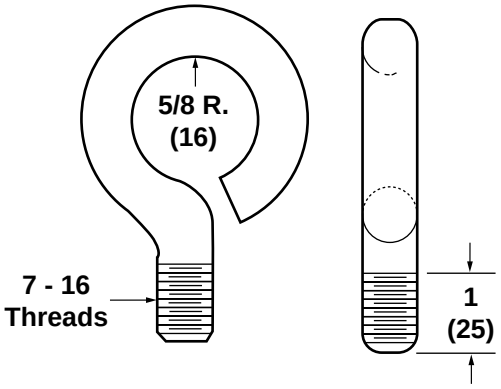


(1) Fabricate from flat shim stock 0.02 x 3/32 x 30 in. (0.5 x 2.38 x 762 mm).

(2) Cut shim stock into ten 3 in. (76.2 mm) pieces.

(3) All dimensions are in inches (millimeters).

Figure C-7. Shims



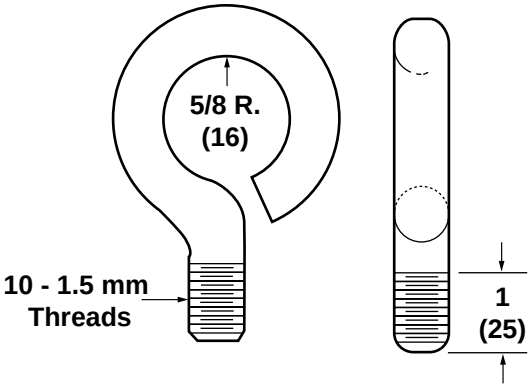
(1) Fabricate from 1/2 x 6 in. (13 x 152 mm) cold rolled steel.

(2) Thread size is 7-16 x 1 in. (25 mm) long.

(3) Heat unthreaded end and bend over 1-1/4 (32 mm) diameter rod.

(4) All dimensions are inches (millimeters).

Figure C-8. Lifting Eyes (PN 2BH944)



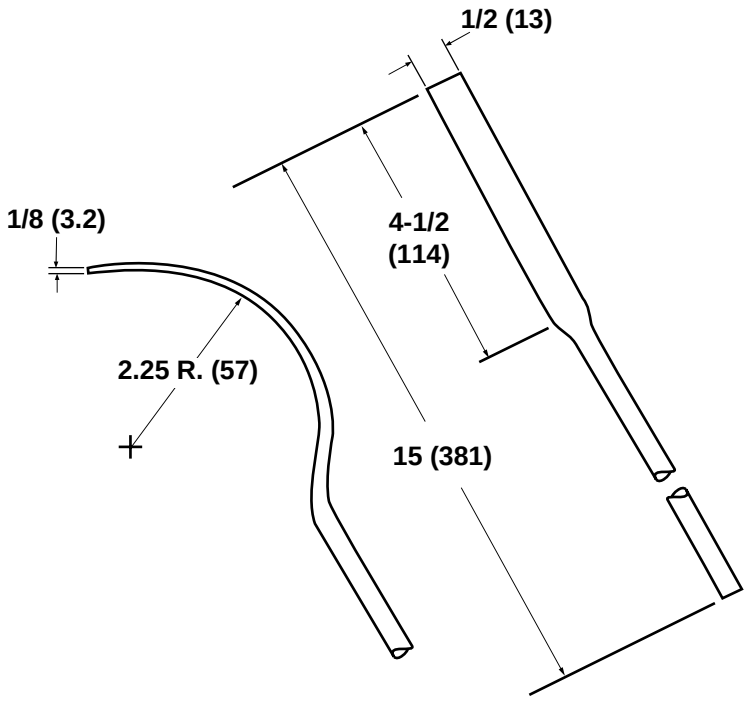
(1) Fabricate from 1/2 x 6 in. (13 x 152 mm) cold rolled steel.

(2) Thread size is 10-1.5 x 25 mm (1 in.) long.

(3) Heat unthreaded end and bend over 1-1/4 (32 mm) diameter rod.

(4) All unlabeled dimensions are inches (millimeters).

Figure C-9. Lifting Eye (10 mm)

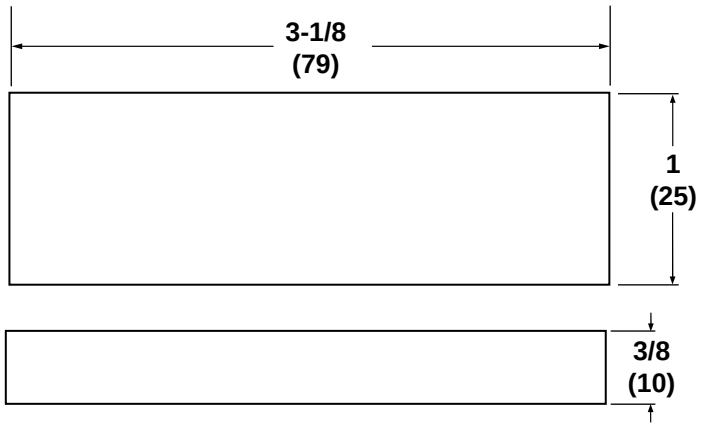


(1) Fabricate from 3/8 in. (9.5 mm) diameter cold rolled steel.

(2) Heat and flatten 4-1/2 in. (114 mm) length of round stock until end is 1/8 x 1/2 x 4-1/2 in. (3.2 x 13 x 114 mm).

(3) All dimensions are in inches (millimeters).

Figure C-10. Bearing Shell Remover (PN 2BG623)



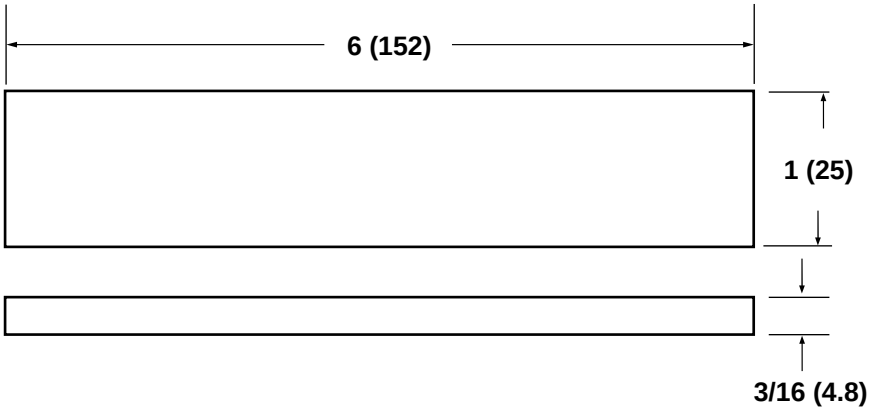
(1) Fabricate from 3/8 in. (10 mm) thick mild steel stock.

(2) Using hacksaw, cut steel stock to dimensions shown.

(3) Using file or grinder, remove any sharp edges.

(4) All dimensions are in inches (millimeters).

Figure C-11. Jet Extractor



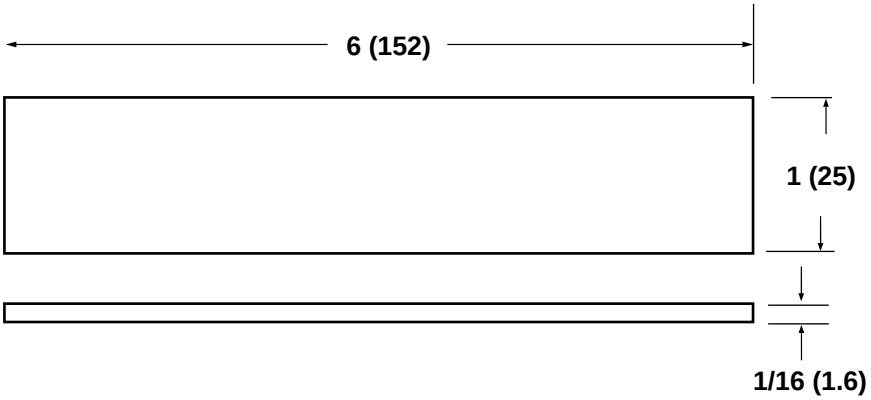
(1) Fabricate from 3/16 x 1 x 6 in. (4.8 x 25 x 152 mm) or longer flat steel stock.

(2) Using hacksaw, cut steel stock to 6 in. (152 mm) length.

(3) Using file or grinder, remove any sharp edges.

(4) All dimensions are in inches (millimeters).

Figure C-12. 3/16-Inch Steel Plate



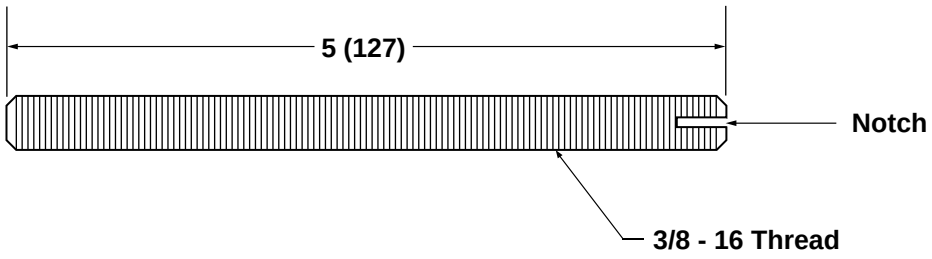
(1) Fabricate from 1/16 x 1 x 6 in. (1.6 x 25 x 152 mm) or longer flat steel stock.

(2) Using hacksaw, cut steel stock to 6 in. (152 mm) length.

(3) Using file or grinder, remove any sharp edges.

(4) All dimensions are in inches (millimeters).

Figure C-13. 1/16-Inch Steel Plate



(1) Fabricate from 3/8 in. -16 threaded steel rod.

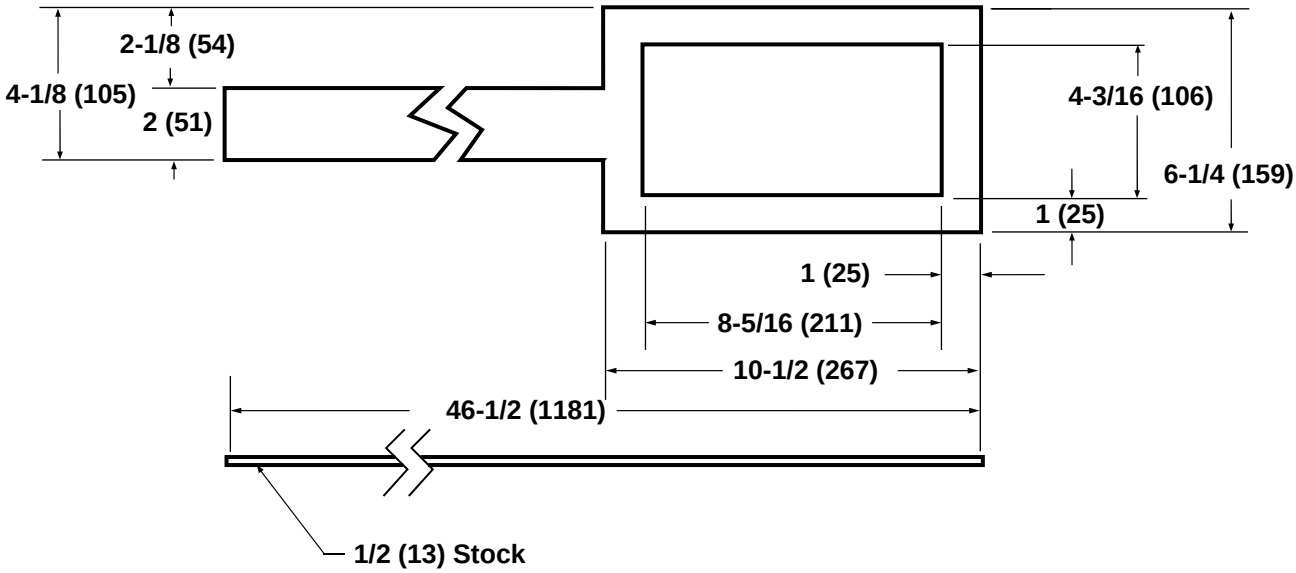
(2) Using hacksaw, cut rod to 5 in. (127 mm) length.

(3) Using file or grinder, remove any sharp edges.

(4) Using hacksaw, cut screwdriver-size notch in one end of rod.

(5) All dimensions are in inches (millimeters).

Figure C-14. Threaded Rod (3/8 inch)



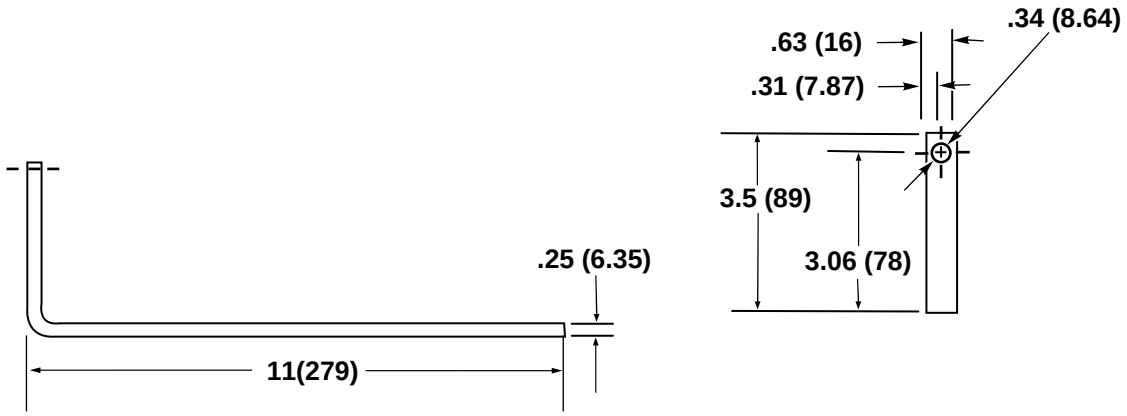
(1) Fabricate from 1/2 in. (13 mm) thick mild steel stock.

(2) Using torch, cut steel stock to dimensions shown.

(3) Using grinder, remove rough edges.

(4) All dimensions are in inches (millimeters).

Figure C-15. Yoke Holder (PN 2HD798)



(1) Fabricate from 1/4 in. (6 mm) thick, 1/2 in. (13 mm) wide, mild steel stock.

(2) Using hacksaw, cut steel stock to 14 1/2 in. (36.8 cm).

(3) Using machinist's vise, bend steel stock 90^0 where indicated.

(4) Drill .344 in. (8.73 mm) hole where indicated.

(5) Using file or grinder, remove any sharp edges.

(6) All dimensions are in inches (millimeters).

Figure C-16. Differential Carrier Preload Gage.

(1) Fabricate from 3/4 in. (19 mm) exterior grade plywood.

(2) Drill 1-1/2 in. (38 mm) diameter hole in center of base.

(3) Drill four 1/2 in. (13 mm) diameter holes in corners of base.

(4) Draw a circle with a 1-5/8 in. (41 mm) radius.

(5) Route four 1/2 x 3/4 in. (13 x 38 mm) slots in base into circle as shown.

(6) Fabricate two 1-15/16 x 2-1/2 x 1-1/4 in. (49 x 63.5 x 32 mm) fingers from plywood.

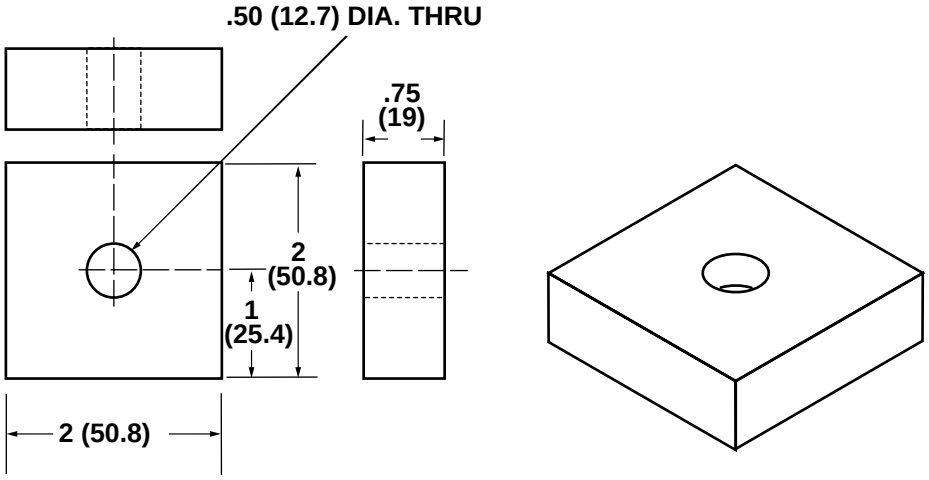
(7) Grind bottom of fingers 23/32 in. (18 mm) wide and 7/16 in. (11 mm) high. Contour front surface of fingers to fit turbine wheel blades.

(8) All dimensions are in inches (millimeters).

Figure C-17. Turbocharger Holding Fixture (PN 2SK742)

NOTE

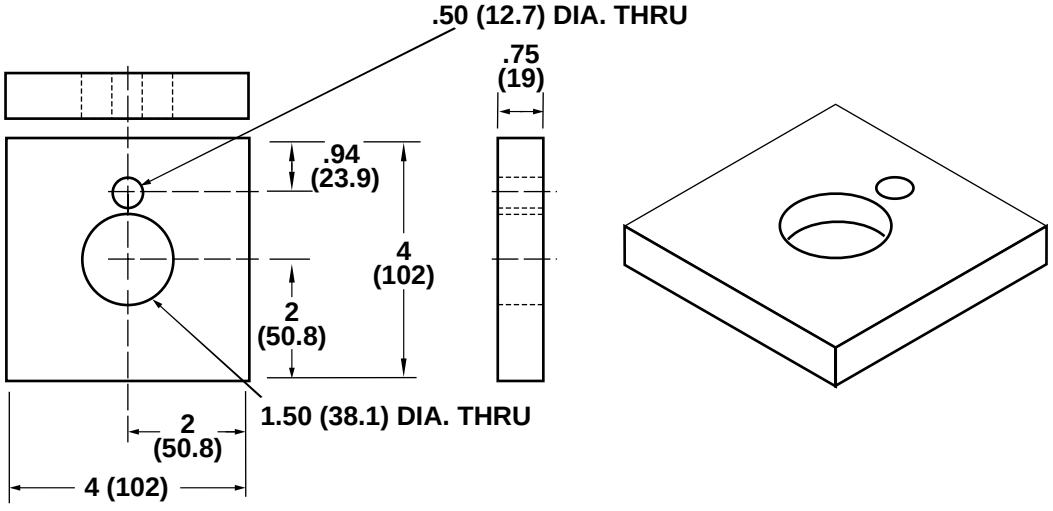
Required stock:
Mild steel plate, 0.75 x 6.13 x 4 in. (19 x 156 x 102 mm)
Mild steel plate, 0.25 x 4 x 4 in. (6.35 x 102 x 102 mm)
Nut, 3/8-16 (MS51967-8)
Bolt, 3/8-16 x 3-1/4 (MS90725-71)



(1) Cut 0.75 x 2 x 2 in. (19 x 50.8 x 50.8 mm) steel plate.

(2) Drill 0.50 in. (12.7 mm) hole through center of steel plate.

(3) All dimensions are inches (millimeters).



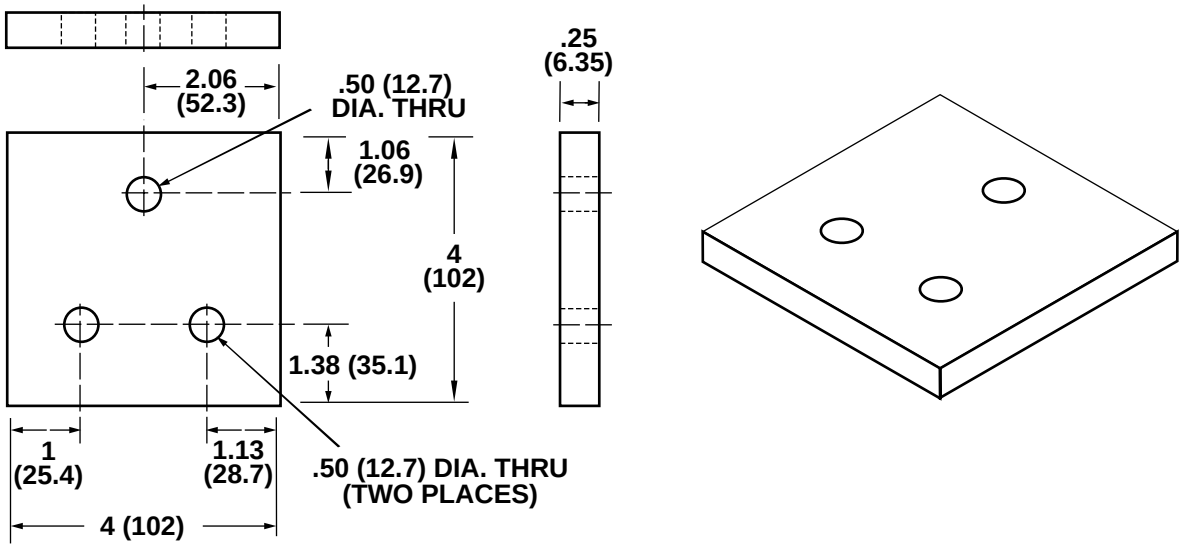
(4) Cut 0.75 x 4 x 4 in. (19 x 102 x 102 mm) steel plate.

(5) Drill 1.50 in. (38.1 mm) hole through center of steel plate.

(6) Drill 0.50 in. (12.7 mm) hole in steel plate.

(7) All dimensions are inches (millimeters).

Figure C-18. Idler Gear Holding Fixture



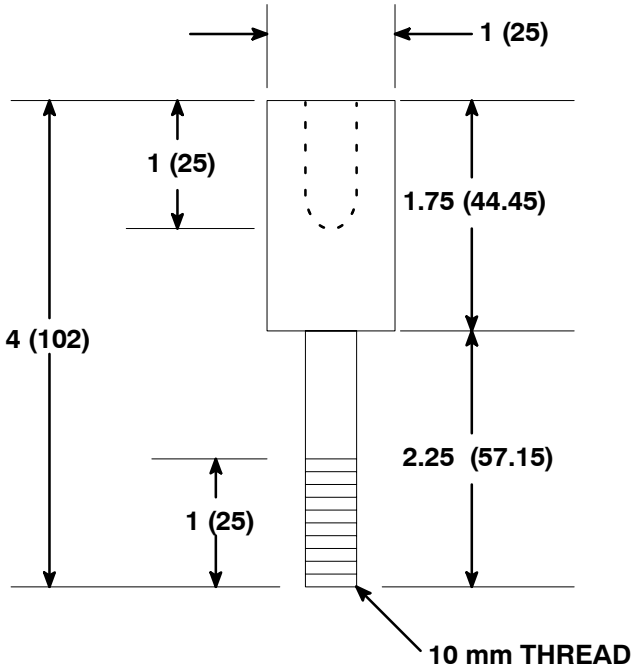
(8) Cut 0.25 x 4 x 4 in. (6.35 x 102 x 102 mm) steel plate.

(9) Drill three 0.50 in. (12.7 mm) holes through center of steel plate.

(10) All dimensions are inches (millimeters).

(11) Assemble parts using 3/8-16 x 3-1/4 in. bolt and 3/8-16 nut.

Figure C-18. Idler Gear Holding Fixture (Cont)



(1) Fabricate from 1 in. (25 mm) mild steel round stock; 4 in. (102 mm) long.

(2) Turn down 2.1/4 in. (57.15 mm) to .39 in. (10mm).

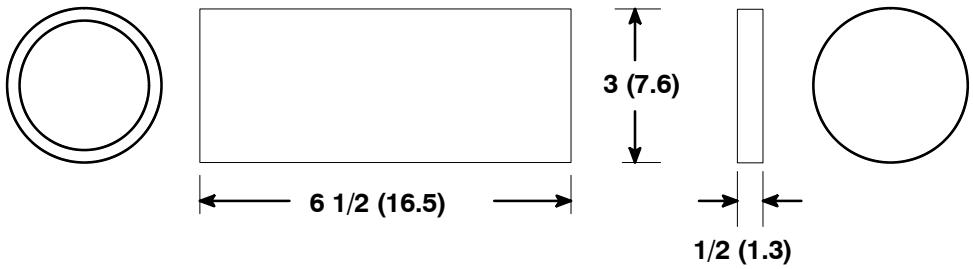
(3) Tap 1 in. (25mm) of 10 mm diameter shaft with 10 mm by 1 in. (25 mm) threads.

(4) Drill 5/8 in. (16 mm) hole 1 in. (25 mm) deep in 1 in. (25 mm) end.

(5) Tap 1 in. (25 mm) of 3/4 in. by 16 diameter hole in 1 in. (25 mm) end.

(6) All dimensions are in inches (millimeters).

Figure C-19. Adapter, Constant Velocity U-joint Bearing Cap Removal Tool



(1) Fabricate from 3 in. (7.6 cm) OD steel tube.

(2) Using hacksaw, cut tubing to 6 1/2 in. (16.5 cm) in length.

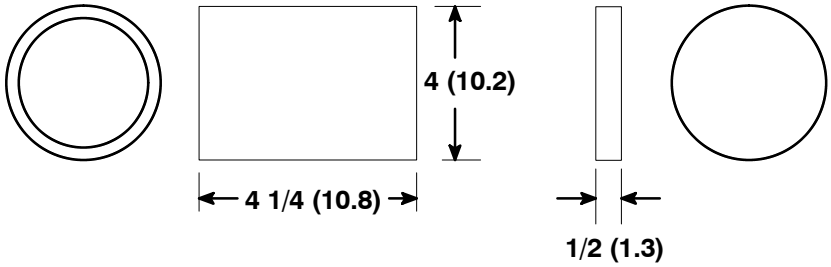
(3) Cut 3 in. (7.6 cm) diameter circle from 1/2 in. (1.3 cm) steel plate.

(4) Weld steel plate on one end of steel tube.

(5) Using file or grinder, remove any sharp edges.

(6) All dimensions are in inches (centimeters).

Figure C-20. Pinion Bearing Cone Installer (PN 2HE491)



(1) Fabricate from 4 in. (10.2 cm) OD steel tube.

(2) Using hacksaw, cut tubing to 4 1/4 in. (10.8 cm) in length.

(3) Cut 4 in. (10.2 cm) diameter circle from 1/2 in. (1.3 cm) steel plate.

(4) Weld steel plate on one end of steel tube.

(5) Using file or grinder, remove any sharp edges.

(6) All dimensions are in inches (centimeters).

Figure C-21. Power Divider Bearing Cone Installer (PN 2HE497)

(1) Fabricate from 1/8 in. (3.2 mm) aluminum plate.

(2) Cut aluminum plate to 11 X 17 in. (28 X 43 cm).

(3) Using file or grinder, remove any sharp edges.

(4) Using punch or awl, scribe a line 3/4 in. (1.9 cm) from bottom of plate.

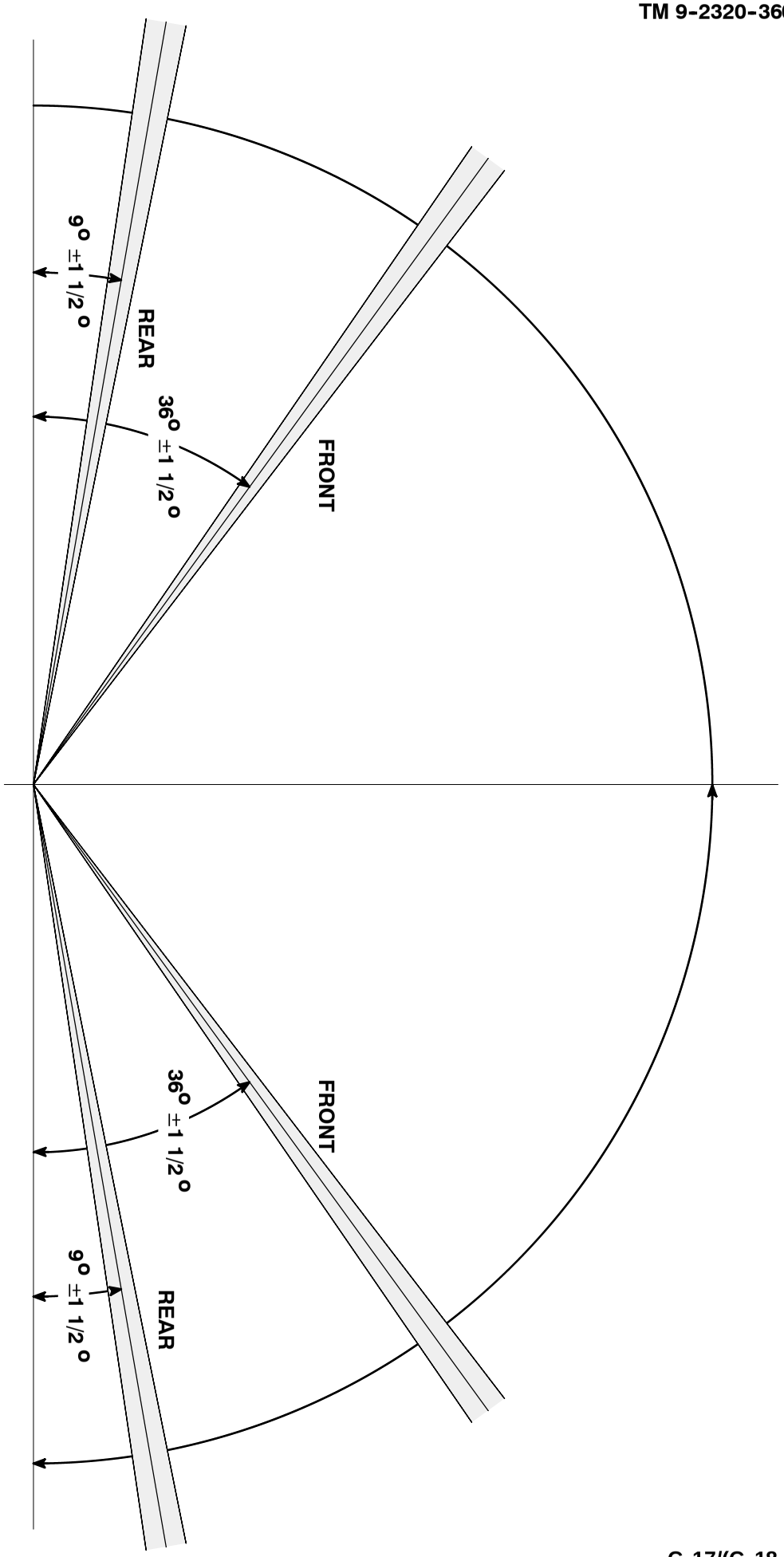
(5) Scribe second line 90 degrees from first line, 8 1/2 in. (22 cm) form edge of plate

(6) Using compass, scribe lines at 7 1/2 degrees, 10 1/2 degrees, 34 1/2 degrees and 37 1/2 degrees from line made in step (4).

(7) Repeat step (6) for other side of template.

(8) Using letter punches, identify the 34 1/2 and 37 1/2 degree lines as ”FRONT” and the 7 1/2 and 10 1/2 degree lines and ”REAR”.

Figure C-22. Steering Radius Template


9° ±1 1/2°
REAR
36° ±1 1/2°
FRONT
36° ±1 1/2°
FRONT
9° ±1 1/2°
REAR

APPENDIX D
TORQUE VALUES

D-1. GENERAL

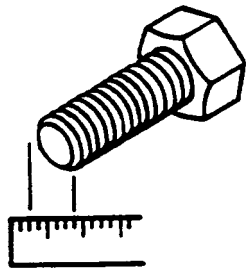
This appendix provides general torque limits for screws used on the HET Tractor. Special torque limits are shown in the maintenance procedures for applicable components. Use the general torque limits given in this appendix when specific torque limits are not given in the maintenance procedure. These general torque limits cannot be applied to screws that retain rubber components. The rubber components will be damaged before the torque limit is reached. If a special torque limit is not given in the maintenance instruction, tighten the screw or nut until it touches the metal bracket, then tighten it one more turn.

D-2. TORQUE LIMITS

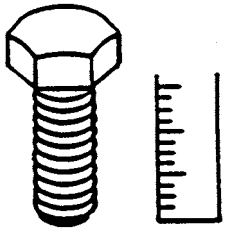
Table D-1 lists dry torque limits. Dry torque limits are used on screws that do not have lubricants applied to the threads. Table D-2 lists wet torque limits. Wet torque limits are used on screws that have high pressure lubricants applied to the threads. Table D-3 lists dry torque limits for metric screws. Table D-4 lists wet torque limits for flange nuts.

D-3. USE OF TORQUE TABLES

(1) Measure the diameter of the screw you are installing.



(2) Count the number of threads per inch.



(3) Under the heading DIAMETER look down the column until you find the diameter of the screw. (There are usually two lines beginning with the same diameter.)

NOTE

Step (4) is not required for metric screws.

(4) Under the heading THREADS PER INCH, find the number of threads per inch that matches the number you counted in step (2).

(5) To find the grade of the screw, match the markings on the head to the correct picture under CAPSCREW HEAD MARKINGS on the torque table.

(6) Look down the column under the picture your found in step (5) until you find the torque limit (lb-ft or N·m) for the diameter and threads per inch of the screw.

Table D-1. Torque Limits for Dry Fasteners



NOTE
Manufacturer's marks may vary. These are all SAE Grade 5.

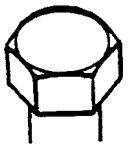
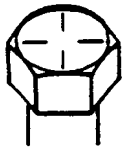
DIAMETER		THREADS PER INCH	CAPSCREW HEAD MARKINGS							
			 SAE GRADE NO. 2		 SAE GRADE NO. 5		 SAE GRADE NO. 6 OR 7		 SAE GRADE NO. 8	
			TORQUE							
IN.	MM		LB-FT	N·M	LB-FT	N·M	LB-FT	N·M	LB-FT	N·M
1/4	6.35	20	5	7	8	11	10	14	12	16
1/4	6.35	28	6	9	10	14	12	16	14	19
5/16	7.94	18	11	15	17	23	21	28	25	34
5/16	7.94	24	12	16	19	26	24	33	25	34
3/8	9.53	16	20	27	30	41	40	54	45	61
3/8	9.53	24	23	31	35	47	45	61	50	68
7/16	11.11	14	30	41	50	68	60	81	70	95
7/16		20	35	47	55	75	70	95	80	108
1/2	12.70	13	50	68	75	102	95	129	110	149
1/2		20	55	75	90	122	100	136	120	163
9/16	14.29	12	65	88	110	149	135	183	150	203
9/16		18	75	102	120	163	150	203	170	231
5/8	15.88	11	90	122	150	203	190	258	220	298
5/8		18	100	136	180	244	210	285	240	325
3/4	19.05	10	160	217	260	353	320	434	380	515
3/4		16	180	244	300	407	360	488	420	597
7/8	22.23	9	140	190	400	542	520	705	600	814
7/8		14	155	210	440	597	580	786	660	895
1	25.40	8	220	298	580	786	800	1085	900	1220
1		12	240	325	640	868	860	1166	1000	1356
1-1/8	25.58	7	300	407	800	1085	1120	1519	1280	1736
1-1/8		12	340	461	880	1193	1260	1709	1440	1953
1-1/4	31.75	7	420	570	1120	1519	1580	2142	1820	2468
1-1/4		12	460	624	1240	1681	1760	2387	2000	2712
1-3/8	34.93	6	560	759	1460	1980	2080	2820	2380	3227
1-3/8		12	640	868	1680	2278	2380	3227	2720	3688
1-1/2	38.10	6	740	1003	1940	2631	2780	3770	3160	4285
1-1/2		12	840	1139	2200	2983	3100	4204	3560	4827

Table D-2. Torque Limits for Wet Fasteners

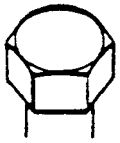
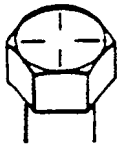
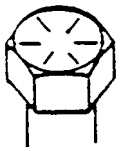
 NOTE Manufacturer's marks may vary. These are all SAE Grade 5.			CAPSCREW HEAD MARKINGS							
			 SAE GRADE NO. 2		 SAE GRADE NO. 5		 SAE GRADE NO. 6 OR 7		 SAE GRADE NO. 8	
DIAMETER		THREADS PER INCH	TORQUE							
IN.	MM		LB-FT	N·M	LB-FT	N·M	LB-FT	N·M	LB-FT	N·M
1/4	6.35	20	4	6	6	8	8	11	9	12
1/4	6.35	28	5	7	7	9	9	12	10	14
5/16	7.94	18	8	11	13	18	16	22	18	24
5/16	7.94	24	9	12	14	19	18	24	20	27
3/8	9.53	16	15	20	23	31	30	41	35	47
3/8	9.53	24	17	23	25	34	30	41	35	47
7/16	11.11	14	24	33	35	47	45	61	55	75
7/16		20	25	34	40	54	50	68	60	81
1/2	12.70	13	35	47	55	75	70	95	80	108
1/2		20	40	54	65	88	80	108	90	122
9/16	14.29	12	50	68	80	108	100	136	110	149
9/16		18	55	75	90	122	110	149	130	176
5/8	15.88	11	70	95	110	149	140	190	170	231
5/8		18	80	108	130	176	160	217	180	244
3/4	19.05	10	120	163	200	271	240	325	280	380
3/4		16	140	190	220	298	280	380	320	434
7/8	22.23	9	110	149	300	407	400	542	460	624
7/8		14	120	163	320	434	440	597	500	678
1	25.40	8	160	217	440	597	600	814	680	922
1		12	170	231	480	651	660	895	740	1003
1-1/8	25.58	7	220	298	600	814	840	1139	960	1302
1-1/8		12	260	353	660	895	940	1275	1080	1464
1-1/4	31.75	7	320	434	840	1139	1100	1492	1360	1844
1-1/4		12	360	488	920	1248	1320	1790	1500	2034
1-3/8	34.93	6	420	570	1100	1492	1560	2115	1780	2414
1-3/8		12	460	624	1260	1709	1780	2414	2040	2766
1-1/2	38.10	6	560	760	1460	1980	2080	2820	2360	3200
1-1/2		12	620	841	1640	2224	2320	3146	2660	3607

Table D-3. Torque Limits for Dry Metric Fasteners

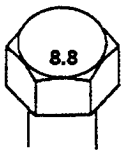
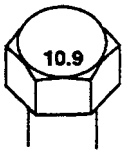
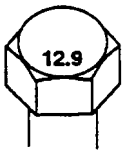
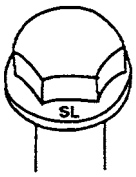
		CAPSCREW HEAD MARKINGS					
							
		METRIC GRADE 8.8		METRIC GRADE 10.9		METRIC GRADE 12.9	
DIAMETER		TORQUE					
IN.	MM	LB-FT	N·M	LB-FT	N·M	LB-FT	N·M
0.157	4	2	3	3	4	4	5
0.197	5	4	5	6	8	7	9
0.237	6	7	9	10	14	11	15
0.276	7	11	15	16	22	20	27
0.315	8	18	24	25	34	29	39
0.394	10	32	43	47	64	58	79
0.473	12	58	79	83	113	100	136
0.552	14	94	127	133	180	159	216
0.630	16	144	195	196	266	235	319
0.709	18	190	258	269	365	323	438
0.788	20	260	353	366	496	440	597
0.867	22	368	499	520	705	678	919
0.946	24	470	637	664	900	794	1077
1.064	27	707	959	996	1351	1235	1675
1.182	30	967	1311	1357	1840	1630	2210

Table D-4. Torque Limits for Wet Flange Nuts

SPIRALOCK FLANGE NUT MARKINGS GRADE 8	DIAMETER		THREADS PER INCH	TORQUE	
	IN.	MM		LB-FT	N·M
	1/4	6.35	20	15	20
	5/16	7.94	18	25	34
	3/8	9.65	16	45	61
	1/2	12.70	13	110	149
	5/8	15.75	11	210	285
	3/4	19.05	10	375	508

APPENDIX E
COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

Section I. INTRODUCTION

E-1. INTRODUCTION

This appendix lists common tools, supplements, and special tools/fixtures that are required for maintenance tasks performed at the organizational maintenance level.

E-2. EXPLANATION OF COLUMNS

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item, e.g., "Adapter Tool, Transfer Case End Play (Item 8, Appendix E)."

b. Column (2) - Item Name. This column contains the nomenclature for the item.

c. Column (3) - National Stock Number. This is the national stock number assigned to the item which you can use to requisition it.

d. Column (4) - Part Number. This provides the Government, manufacturer, or vendor part number for the item.

e. Column (5) - Reference. This column contains the shop catalog (SC), technical manual, or other publication which provides an illustration and description of the item, or lists whether the item is fabricated.

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
0.1	ADAPTER, DIFFERENTIAL MAINTENANCE STAND		J39929	TM 9-2320-360-34P
1	ADAPTER, IMPELLER, SLIP TEST	5935-01-297-2481	J33765	TM 9-2320-360-34P
2	ADAPTER, RADIATOR	4910-01-170-4929	J29003-A	TM 9-2320-360-34P
3	ADAPTER, SOCKET WRENCH, 1/2 IN. FEMALE - 3/4 IN. MALE	5120-00-144-5207		SC 4910-95-A31
4	ADAPTER, SOCKET WRENCH, 3/4 IN. FEMALE - 1/2 IN. MALE	5120-00-227-8088		
5	ADAPTER, SOCKET WRENCH, 1/2 IN. FEMALE - 3/8 IN. MALE	5120-00-240-8702		SC 4910-95-A31
6	ADAPTER, SOCKET WRENCH, 3/4 IN. FEMALE - 1 IN. MALE	5120-00-227-8104		
6.1	ADAPTER KIT, TRANSFER CASE		J39911	TM 9-2320-360-34P
7	ADAPTER PLATE, ENGINE STAND	4910-00-146-9624	J33850	TM 9-2320-360-34P
8	ADAPTER TOOL, TRANSFER CASE END PLAY		1976890U	TM 9-2320-360-34P
9	ALIGNMENT TOOL, FIFTH CLUTCH	5120-01-115-1161	J24221	TM 9-2320-360-34P
9.1	BIT SET, SCREWDRIVER	5120-01-170-4454		SC 4910-95-CL-A72
10	BOLTS, PULLER	5120-01-185-6811	J26901-A	TM 9-2320-360-34P
11	BRACKET, LIFTING	5120-01-115-1159	J24209	TM 9-2320-360-34P
12	BRACKET, LIFTING, FLYWHEEL	5120-01-116-6049	J24365	TM 9-2320-360-34P
13	BRACKET, LIFTING, MAIN SHAFT	5120-01-115-1157	J24196	
14	BRUSH, WIRE	7920-00-291-5815	8078883	SC 4910-95-A31
15	CALIPER SET, MICROMETER, 0-6 IN.	5210-00-554-7134	GGG-C-105	SC 4910-95-A63
16	CALIPER, VERNIER, 0-6 IN.	5210-01-113-1548	6240	SC 4910-95-A31
17	CAPS, VISE JAW (4 IN. BRASS OR COPPER)	5120-00-221-1506	404-4	SC 4910-95-A31
18	CLAMP SET, CYLINDER LINER HOLDDOWN	4910-01-158-3984	J24565-02	TM 9-2320-360-34P

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
19	COMPRESSOR, PISTON RING		RCL30	TM 9-2320-360-34P
20	COMPRESSOR, RING	5120-00-223-8848		SC 4910-95-A63
21	COMPRESSOR SET, CENTER SUPPORT	4310-01-247-7126	J24208-D	TM 9-2320-360-34P
22	COMPRESSOR SET, CLUTCH SPRING	5120-01-048-3129	J24204	TM 9-2320-360-34P
23	COMPRESSOR, SPRING	5120-01-048-2160	J24219	TM 9-2320-360-34P
24	COMPRESSOR UNIT, AIR	4310-00-542-4566	MIL-C-52980	SC 4910-95-CL-A31
25	COMPRESSOR, VALVE SPRING	5120-00-733-8888	J7455-A	TM 9-2320-360-34P
25.1	CONTACT TEST SET			
26	COVER, KING PIN PRELOAD		2HE225	TM 9-2320-360-34P
27	CRIMPER, TERMINAL		J35123	TM 9-2320-360-34P
28	CRIMPER, TERMINAL		J35606	TM 9-2320-360-34P
29	CRIMPER, TERMINAL		J35688	TM 9-2320-360-34P
30	CROWBAR	5120-00-224-1390		SC 4910-95-CL-A72
31	DELETED			
32	DIAL INDICATOR, MAGNETIC	5120-00-402-9619	J7872	TM 9-2320-360-34P
33	DRILL SET, TWIST, 1/16-1/2 IN. BY 64THS	5133-00-293-0983	800434	SC 4910-95-A31
34	DRILL, ELECTRIC, PORTABLE, 1/4 IN.	5130-00-889-8993	1070	SC 4910-95-A31
35	DRILL, ELECTRIC, PORTABLE, 1/2 IN.	5130-00-204-2718		SC 4910-95-CL-A02
36	DRILL, TWIST, 5/8 IN.	5133-00-228-1327	10040	SC 4910-95-A31
37	EXPANDER, SEAL	5120-00-336-0445	J4239	TM 9-2320-360-34P
38	EXTRACTOR SET, SCREW	5120-00-610-1888	A-A-283 SZ1-9	SC 4910-95-A31
39	EXTRACTOR, KING PIN		2HE226	TM 9-2320-360-34P
40	EYE, LIFTING		2BH944	Appendix C, Fig. C-4
41	FIXTURE, HOLDING, IDLER GEAR	5180-01-167-4285	2SK900	Appendix C, Fig. C-18
42	FIXTURE, LIFTING	4910-00-456-7620	J22062-01	TM 9-2320-360-34P

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
43	FIXTURE, PTO GEAR REMOVER	4910-01-158-3969	J26899	TM 9-2320-360-34P
44	FIXTURE, TEST, HEAD	4910-01-158-3985	J28454	TM 9-2320-360-34P
45	FIXTURE, TRANSMISSION HOLDING	5120-01-115-1165	J24310	TM 9-2320-360-34P
45.1	GAGE, BRAKE DRUM MICROMETER	5210-00-861-9117	8500-50	
46	GAGE, CLEARANCE	5120-01-048-2161	J24192	TM 9-2320-360-34P
47	GAGE, CYLINDER LINER DEPTH	5120-01-093-3710	J24898	TM 9-2320-360-34P
48	GAGE, DEPTH, MICROMETER	5210-00-619-4045	445BZ-6RL	SC 3470-95-CL-A02
49	GAGE, DIAL, CYLINDER BORE	5120-01-070-4543	J5347-B	TM 9-2320-360-34P
50	GAGE, FEELER	5210-00-267-3095	667	SC 4910-95-A31
51	GAGE, PISTON GROOVE	5120-01-028-1109	J24599	TM 9-2320-360-34P
52	DELETED			
53	GAGE, SEAL RING GROOVE	5120-01-133-6888	J29198-3	TM 9-2320-360-34P
54	GAGE SET, CYLINDER COMPRESSION	4910-01-148-1236	J7334-E	TM 9-2320-360-34P
55	GAGE SET, PISTON FEELER	5210-00-116-1631	J5438-01	TM 9-2320-360-34P
56	GAGE SET, TELESCOPING	5210-00-473-9350	GGG-G-17	SC 4910-95-A63
57	GOGGLES, INDUSTRIAL	4940-00-269-7912	A-A-1814	SC 4910-95-CL-A31
58	GRINDING KIT, VALVE SEAT, ELECTRIC	4910-00-473-6437	1750	SC 4910-95-CL-A63
59	GRINDING MACHINE, VALVE FACE	4910-00-540-4679	K403CM	SC 4910-95-CL-A63
60	GUIDE PIN SET		J24315	TM 9-2320-360-34P
61	GUIDE SCREWS	5120-00-629-9781	J1927-01	TM 9-2320-360-34P
62	GUIDE SLEEVE		2HE234	TM 9-2320-360-34P
63	HAMMER, HAND: NONSPARKING (SOFT-FACED)	5120-01-065-2211	57-534	SC 4910-95-A31

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
64	HAMMER, SLIDE	5120-01-355-3010	2HE227	TM 9-2320-360-34P
64.1	HAMMER, SLIDE TYPE	5120-01-112-2165	J6125-1B	TM 9-2320-360-34P
65	HANDLE, INSTALLER	5120-00-977-5578	J7079-2	TM 9-2320-360-34P
66	HANDLE, DRIVER	5120-00-677-2259	J8092	TM 9-2320-360-34P
67	HANDLE, DRIVER	5129-01-054-4048	J24202-4	TM 9-2320-360-34P
68	HEATER, GUN TYPE	4940-00-561-1002	500A	SC 4910-95-A31
69	HOIST, HAND OPERATED	1730-00-906-1352		TM 9-2320-360-10
70	HOLDER, STATOR ROLLER	5120-01-115-1185	J24218-2	TM 9-2320-360-34P
71	HOLDING FIXTURE, TURBOCHARGER		2SK742	Appendix C, Fig. C-8
72	HYDRAULIC TEST KIT		3SK867	TM 9-2320-360-34P
73	INDICATOR, DIAL	4910-00-779-7103	J8165-2	TM 9-2320-360-34P
74	INDICATOR, DIAL	5120-00-794-9178	J5959-01	SC 4910-95-CL-A31
75	INSTALLER, BEARING		J24447	TM 9-2320-360-34P
76	INSTALLER, BRIDGE GUIDE	5120-00-999-8616	J7482	TM 9-2320-360-34P
77	INSTALLER, BUSHING	4910-01-158-3986	J24201	TM 9-2320-360-34P
78	INSTALLER, FRONT SUPPORT NEEDLE BEARING	5120-01-115-1160	J24197	TM 9-2320-360-34P
79	INSTALLER, MANUAL SHAFT OIL SEAL	5120-01-115-1161	J26282	TM 9-2320-360-34P
80	INSTALLER, OIL SEAL	5120-00-937-7267	J8501	TM 9-2320-360-34P
81	INSTALLER, OIL SEAL, OUTPUT	5120-01-054-4042	J24202-1A	TM 9-2320-360-34P
82	INSTALLER, OUTPUT SHAFT BEARING	5120-01-158-3946	J25562	TM 9-2320-360-34P
83	INSTALLER, SEAL	4910-01-176-4230	J21112-B	TM 9-2320-360-34P
84	INSTALLER AND STAKING SET, COLLECTOR RING	5120-00-048-3124	J24200	TM 9-2320-360-34P
85	INSTALLER, VALVE GUIDE	5120-00-999-8617	J21520	TM 9-2320-360-34P

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
86	INSTALLER, VALVE SEAT INSERT	5120-01-048-3118	J24357	TM 9-2320-360-34P
87	INSTALLER, WATER NOZZLE	5120-01-048-3119	J24857-A	TM 9-2320-360-34P
88	INSTALLER, WATER PUMP DRIVE GEAR	5120-00-033-8902	J25257	TM 9-2320-360-34P
89	INSTALLER, WATER PUMP SEAL		J38858	TM 9-2320-360-34P
90	JACK, FLOOR (DOLLY TYPE), 10-TON	4910-00-289-7233	93660	SC 4910-95-A31
91	JACK, HYDRAULIC, 12 TON	5120-00-224-7330	5025209-111-10	SC 4910-95-A31
92	JACK KIT, HYDRAULIC HAND	5120-00-595-8387	A-A-312	SC 4910-95-A31
93	JACKSTAND, 7-TON	4910-00-251-8013	306	SC 4910-95-A31
94	LATHE, BRAKE DRUM	4910-01-028-9849	4100	SC 4910-95-A31
95	LIFT, TRANSMISSION AND DIFFERENTIAL	4910-00-585-3622	9037-20BM	SC 4910-95-A62
96	LIFTING BRACKET	5120-01-116-6048	J24195	TM 9-2320-360-34P
97	LIFTING TOOL, REAR PLANETARY		J24408-A	TM 9-2320-360-34P
98	MULTIMETER	6625-01-139-2512	T00377	SC 4910-95-A31
99	MULTIPLIER, TORQUE	5120-01-122-9393	GA185	SC 4910-95-A31
100	NUT, 1/4 IN.		MS51967-2	
100.1	NUT, 1/2 IN.		MS51967-14	
101	NUT, 5/8 IN.	5310-00-763-8920	MS51967-20	
102	PAN, OIL DRAIN	4910-00-387-9592	450	SC 4910-95-A31
103	DELETED			
104	DELETED			
105	PLIERS, RETAINING RING		J28507	TM 9-2320-360-34P
106	PLIERS, RETAINING RING	5120-00-288-9717	176L129P8	SC 4910-95-A31
107	PLIERS, RETAINING RING	5120-00-293-0046		SC 4910-95-A31

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
108	PLIERS, RETAINING RING	5120-00-293-0048	0100	SC 4910-95-A31
109	PLIERS, RETAINING RING	5120-00-293-0049		SC 4910-95-A31
110	PLIERS, RETAINING RING	5120-00-293-0186	J6843-01	SC 4910-95-A31
111	PLIERS, RETAINING RING	5120-00-595-9551	407	SC 4910-95-A31
112	PLIERS, RETAINING RING	5120-00-595-9552		SC 4910-95-A31
112.1	PLUG		FF9767-08S	
113	PLUG PIPE, 1/2 IN.	4730-01-318-6246	219P-8	TM 9-2320-360-34P
114	PLUG PIPE, 1/4 IN.	4730-01-082-1017	444693	TM 9-2320-360-34P
115	PLUG SET, RADIATOR	4910-00-273-3660	2005S-S	SC 4910-95-CL-A76
115.1	PLUMB BOB	5120-00-234-8949	GGG-P-501	
116	PRESS, HYDRAULIC, 60-TON	3444-00-449-7295	26A49	SC 4910-95-A31
117	PRESSURE TESTER, RADIATOR	4910-01-170-4928	J24460-01	TM 9-2320-360-34P
118	PROTECTOR, FORWARD CLUTCH PISTON INNER SEAL	5120-01-048-2157	J24216-01	TM 9-2320-360-34P
119	PROTECTOR, SEAL	5120-00-048-2156	J24210	TM 9-2320-360-34P
120	PULLER, 3-LEG	5120-00-740-3345	J4871	TM 9-2320-360-34P
121	PULLER ASSEMBLY, VALVE SEAT		J23479-492	TM 9-2320-360-34P
122	PULLER, BRIDGE	5120-01-143-4492	J8433-1	TM 9-2320-360-34P
123	PULLER, CAMSHAFT GEAR	5120-00-219-8397	J1902-B	TM 9-2320-360-34P
124	PULLER KIT, MECHANICAL, GEAR AND BRG	5180-00-423-1596	PE12	SC 4910-95-A31
125	PULLER KIT, MECHANICAL, SLIDE HAMMER	5180-00-313-9496	1178	SC 4910-95-A62
126	REAMER SET, SUN GEAR BUSHING	5110-01-150-9755	J 28489	TM 9-2320-360-34P
127	RECONDITIONING SET, INJECTOR TUBE	2910-01-146-9616	J22525-B	TM 9-2320-360-34P
128	RELINER, BRAKE AND CLUTCH	4910-00-173-5310	MILR13495	SC 4910-95-A31

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
129	REMOVAL TOOL, FILTER	5120-00-865-0933		SC 4910-95-CL-A72
130	REMOVER ASSEMBLY, CYLINDER LINER	4910-01-158-3892	J24563-A	TM 9-2320-360-34P
131	REMOVER, BROKEN BRIDGE GUIDE	5120-00-999-8615	J7453	TM 9-2320-360-34P
132	REMOVER/INSTALLER, CONVERTER PUMP SNAP RING	4110-01-158-3996	J26598-A	TM 9-2320-360-34P
133	REMOVER/INSTALLER, CORE PLUG	5120-01-130-8864	J23019	TM 9-2320-360-34P
134	REMOVER/INSTALLER, WATER INLET ADAPTER	5120-01-048-2180	J25275	TM 9-2320-360-34P
135	REMOVER AND INSTALLER, PISTON RING	5120-00-494-1846	7950177	TM 9-2320-360-34P
136	REMOVER, PULLEY, CAM GEAR AND WATER PUMP	5120-00-733-8890	J7932	TM 9-2320-360-34P
137	REMOVER/SETTER, STUD	5120-00-293-0050		SC 4910-95-A31
138	REMOVER/SETTER, STUD, 1/4 IN., 1/2 IN. DRIVE	5120-00-596-0980		SC 4910-95-A31
139	REMOVER SET, VALVE BRIDGE GUIDE	5120-00-999-8614	J7091-01	TM 9-2320-360-34P
140	REMOVER, TERMINAL		J35689-A	TM 9-2320-360-34P
141	REMOVER, TERMINAL		J33095	TM 9-2320-360-34P
142	REMOVER TOOL, BEARING	5120-01-117-2523	J28557	
143	REMOVER, VALVE GUIDE	5120-00-733-8880	10919987	
143.1	REMOVER, VALVE PIN	5120-01-048-3128	J24412-2	TM 9-2320-360-34P
144	RETAINER TOOL, PISTON PIN	5120-00-127-7757	J23762-A	TM 9-2320-360-34P
145	SCALE, SPRING, 0-50 LB	6670-00-254-4634	AAA-S-133	SC 4910-95-CL-A74
146	SCREW, 1/4 IN. X 3 IN.		MS90728-18	
147	SCREW, 5/16-18 X 2 IN.		MS90728-44	
148	SCREW, 5/16-18 x 2-1/4 IN.		MS90728-40	

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
148.1	SCREW, 1/2 IN. X 3-1/2 IN.		MS90728-121	
149	SCREW, 5/8 IN. X 4-1/2 IN.	5305-00-724-7264	MS90728-174	
150	SCREW, CAP, HEX, 5/8 IN. X 4 IN.	5305-00-724-7254	MS90728-172	
151	SCREW, CAP, HEX, 1/4-20 X 1-1/4 IN.	5305-00-068-0509	MS90728-10	
152	SCREW, FORCING	5305-01-142-9397	J22214-4	TM 9-2320-360-34P
153	SCREW, SHEET METAL, NO. 8 X 1 IN.		MS51850-48	
154	SEAL DRIVER, CTI		2HE232	TM 9-2320-360-34P
155	SEAL DRIVER, CTI		2HE233	TM 9-2320-360-34P
156	SEAL INSTALLER, FRONT CRANKSHAFT	5120-00-936-4377	J9783	TM 9-2320-360-34P
157	SET, CYLINDER HEAD GUIDE STUD	4910-01-162-3630	J24748	TM 9-2320-360-34P
158	SHAFT, DUMMY, TRANSFER CASE		1975300	TM 9-2320-360-34P
159	SLEEVE, PULLER	4910-01-162-3633	J25007-4	TM 9-2320-360-34P
160	SLING ASSEMBLY	3940-01-209-6008		TM 9-2320-360-10
161	SLING, ENDLESS STRAP	3940-00-675-5002		TM 9-2320-360-10
162	SOCKET, 3-1/8 IN., 1-1/2 IN. DRIVE	5130-00-234-1890	IM1005	SC 4910-95-A31
163	SOCKET, 33 MM, 3/4 IN. DRIVE		07533M	TM 9-2320-360-34P
163.1	SOCKET, 55 MM		J39938	TM 9-2320-360-34P
163.2	SOCKET, 63 MM		J39939	TM 9-2320-360-34P
164	SOCKET, DEEP WELL, 9/16 IN., 1/2 IN. DRIVE	5120-00-243-7348	A-A-1394	SC 4910-95-A31
165	SOCKET, PIPE PLUG		PPM408	TM 9-2320-360-34P
166	SOCKET, POWER STEERING		E12-V	TM 9-2320-360-34P

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
167	SOCKET SET, DEEP WELL, 12 POINT, 1/2 IN. DRIVE	5120-00-596-8622		SC 4940-95-CL-B20
168	SOCKET, SOCKETHEAD, 3/4 IN., 1/2 IN. DRIVE	5120-01-024-0168	LAW124A	TM 9-2320-360-34P
169	SOCKET, SOCKETHEAD SCREW, 1/2 IN., 1/2 IN. DRIVE	5120-00-243-1676	172396PC5	
170	SOCKET, SOCKETHEAD SCREW, 1/8 IN., 3/8 IN. DRIVE	5120-00-516-4979	4080-08	
171	SOCKET, SOCKETHEAD SCREW, 1/4 IN,, 1/2 IN. DRIVE	5120-00-596-8508		SC 4910-95-A31
172	SOCKET, SOCKETHEAD SCREW, 3/16 IN., 3/8 IN. DRIVE	5120-00-683-8597	4080-12	SC 4910-95-A31
172.1	SOCKET, SOCKETHEAD SCREW, 3/8 IN., 3/8 IN. DRIVE	5120-00-596-1199		SC 4910-95-A31
173	SOCKET, SOCKETHEAD SCREW, 14 MM, 1/2 IN. DRIVE	5120-01-079-8033	SAM14A	SC 4910-95-A31
174	SOCKET, SOCKETHEAD SCREW, 12 MM, 1/2 IN. DRIVE	5120-01-104-5346	SAM12A	SC 4910-95-A31
175	SOCKET, SOCKETHEAD SCREW, 10 MM, 1/2 IN. DRIVE	5320-01-104-5345		SC 4910-95-A31
176	SOCKET, SPANNER		2HE229	TM 9-2320-360-34P
177	SOCKET, SPANNER		2HE230	TM 9-2320-360-34P
178	SOCKET, SPANNER		2HE231	TM 9-2320-360-34P
179	SOCKET, SPANNER		2HE228	TM 9-2320-360-34P
180	SQUARE, COMBINATION, PROTRACTOR HEAD	5210-00-540-3513	GGGS656	SC 3470-95-CL-A02
181	STAND, ENGINE	4910-00-808-3372	J29109	TM 9-2320-360-34P
182	STAND, MAINTENANCE, AUTOMOTIVE AXLE	4910-00-241-3329		SC 4910-95-A63
183	DELETED			
184	STE/ICE-R	4910-01-222-6589	12259266	
185	STRAIGHT EDGE	6675-00-224-8807		SC 4910-95-A63
186	SWAGING TOOL	4910-01-158-3971	J28525	TM 9-2320-360-34P

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
187	SWAGING TOOL, SUN GEAR	4910-01-158-3970	J26997-A	TM 9-2320-360-34P
188	TAPE, MEASURING, 50 FT	5210-00-234-6745	GGG-T-106	SC 4910-95-A31
189	TAPE, MEASURING, 12 FT	5210-00-287-3335		SC 3470-95-CL-A02
190	TESTER, SPRING	6635-01-170-5001	J29196	TM 9-2320-360-34P
191	TESTER, VACUUM GAGE, LEAK DETECTOR SET	6685-01-061-4253	J-23987-B	TM 9-2320-360-34P
192	TESTING KIT, CYLINDER BLOCK PRESSURE	5180-01-252-9800	2SK737	TM 9-2320-360-34P
193	THREADING SET, SCREW, NC THREAD	5120-00-448-2362	GGG-T-330	SC 4910-95-A31
194	GAGE, INJECTOR, 1.520 IN.	5220-01-348-1638	J25502	TM 9-2320-360-34P
195	TOOL, ALIGNMENT, BLOWER SHAFT	4910-01-158-3991	J33001	TM 9-2320-360-34P
196	TOOL, ALIGNMENT, SRS/TRS	5120-01-343-1001	J34729	TM 9-2320-360-34P
196.1	TOOL, ALIGNMENT, SRS/TRS	5120-01-343-1001	J39815	TM 9-2320-360-34P
197	TOOL, CRANK POSITION TIMING		J34930-A	TM 9-2320-360-34P
198	TOOL, LIFTING	5120-01-159-1736	J33079	TM 9-2320-360-34P
199	TOOL KIT, AUTOMOTIVE FUEL AND ELECTRICAL SYSTEM REPAIR	5180-00-754-0655		SC 5180-95-CL-B08
200	TOOL KIT, BODY AND FENDER REPAIR	5180-00-754-0063		SC 5180-90-CL-N34
201	TOOL KIT, ELECTRICAL REPAIR	5180-00-876-9336	7550526	SC 4910-95-A31
202	TOOL KIT, GENERAL MECHANICS	5180-00-177-7033	SC5180-90-CL-N26	SC 5180-90-CL-N26
203	TOOL KIT, FAN CLUTCH OVERHAUL	4910-01-163-1340	3-462-902-24460	TM 9-2320-360-34P
204	TOOL SET, BLOWER SERVICE	5180-00-936-4376	J6270-G	TM 9-2320-360-34P
205	TOOL SET, FUEL PUMP	5180-00-219-8407	J1508-E	TM 9-2320-360-34P
206	V-BLOCKS	3460-00-725-5076	AA51150TY2STASZ2	SC 4910-95-A63

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
207	VISE, MACHINISTS, 4 IN. JAW, 6 IN. OPENING	5120-00-239-1439	504M2	SC 4910-95-A31
208	WASHER, FLAT, 1/4 IN.		MS23183-48	
208.1	WASHER, FLAT, 1/2 IN.		MS27183-17	
209	WASHER, FLAT, 5/8 IN.	5310-00-003-9174	MS27183-21	
210	WASHER, FLAT, 5/16 IN.	5310-00-081-4219	MS27183-12	
211	WIRE BRUSH, BRASS	5130-00-937-7281	J7944	TM 9-2320-360-34P
212	WIRE TWISTER, PLIER	5130-00-542-4171		SC 4910-95-A31
212.1	WRENCH, ADJUSTABLE, AUTOMOBILE	5120-00-264-3793	WA615	SC 4910-95-A31
213	WRENCH, COMBINATION, 1-3/8 IN.	5120-00-277-8833	1244	SC 4910-95-A31
214	WRENCH, COMBINATION, 1-1/2 IN.	5120-00-277-8834	A-A-1358	SC 4910-95-A31
215	WRENCH, COMBINATION, 1-1/4 IN.	5120-00-228-9517	1173	SC 4910-95-A31
216	WRENCH, COMBINATION, 1-5/16 IN.	5120-00-228-9518	1174	SC 4910-95-A31
217	WRENCH, COMBINATION, 2 IN.	5120-01-957-3115	CL64	TM 9-2320-360-34P
218	WRENCH, CROW'S FOOT, 9/16 IN., 3/8 IN. DRIVE	5120-00-222-7975		SC 4910-95-A31
219	WRENCH, CROW'S FOOT, 3/4 IN., 3/8 IN. DRIVE	5120-00-189-7898		SC 4910-95-A31
220	WRENCH, CROW'S FOOT, 5/8 IN., 3/8 IN. DRIVE	5120-00-224-7288	A1650-013	SC 4910-95-A31
221	WRENCH, CROW'S FOOT, 1/2 IN., 3/8 IN. DRIVE	5120-01-114-4933		SC 4910-95-A31
222	WRENCH, FUEL LINE NUT, 1/2 IN. DRIVE	5120-00-019-5232	J8932-B	TM 9-2320-360-34P
223	WRENCH, IMPACT, ELECTRIC, 1 IN.	5120-00-889-9020		SC 4910-95-A62
224	WRENCH, OPEN-END, 1-5/8 IN. & 1-13/16 IN.	5120-00-081-9099	ANSI B107.6	SC 4910-95-A31

Section II. COMMON TOOLS, SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
225	WRENCH, OPEN-END, 1-7/8 IN. & 1-11/16 IN.	5120-00-081-9100	ANSI B107.6	SC 4910-95-A31
226	WRENCH, OPEN-END, 1 IN. & 1-1/8 IN.	5120-00-187-7133		SC 4910-95-A31
227	WRENCH, OPEN-END, 15/16 IN. & 1-1/16 IN.	5120-00-277-2693		SC 4910-95-A31
228	WRENCH SET, IMPACT	5130-00-221-0607	WW650	SC 4910-95-A31
229	WRENCH SET, LINE	5120-00-985-9866		SC 4910-95-A31
230	WRENCH SET, SOCKET, 1 IN. DRIVE	5120-00-081-2309	A-A-1392	SC 4910-95-A31
231	WRENCH SET, SOCKET, 3/4 IN. DRIVE	5120-00-204-1999	GGG-W-641	SC 4910-95-A31
232	WRENCH SET, SOCKET, 3/8 IN. DRIVE	5120-00-322-6231	51200017510	SC 4910-95-A31
233	WRENCH, TORQUE, 0-600 LB-FT, 3/4 IN. DRIVE	5120-00-221-7983	TE602A	SC 4910-95-A31
234	WRENCH, TORQUE, 0-150 LB-IN., 3/8 IN. DRIVE	5120-00-230-6380	TE-12A	SC 4910-95-A31
235	WRENCH, TORQUE, 0-300 LB-IN., 1/2 IN. DRIVE	5120-00-247-2536	F3001	SC 4910-95-A31
236	WRENCH, TORQUE, 0-175 LB-FT, 1/2 IN. DRIVE	5120-00-640-6364	A-A-2411	SC 4910-95-A31
237	WRENCH, TORQUE, 0-75 LB-IN., 1/4 IN. DRIVE	5120-01-112-9532	TQSC6A	SC 4910-95-A31
238	WRENCH, TORQUE, CLICK-TYPE, 15-100 LB-FT, 3/8 IN. DRIVE		QJR2100E	TM 9-2320-360-34P
239	WRENCH, TORQUE, CLICK-TYPE, 30-250 LB-FT, 1/2 IN. DRIVE		QJR3250A	TM 9-2320-360-34P
240	WRENCH, WHEEL BEARING ADJUSTING NUT, 3-1/2 IN.	5120-01-144-5322	AS1910	SC 4910-95-CL-A74

APPENDIX F
MANDATORY REPLACEMENT PARTS

Section I. INTRODUCTION

F-1. SCOPE

This appendix lists mandatory replacement parts you will need to maintain the HET Tractor.

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 the applicable task under 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 LIST

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
1	BEARING, BALL	391 0381 040	3110-01-284-1460
2	BEARING SHELL	23501025	3120-01-336-3064
3	BOLT KIT, BEAM HANGER	A-11784	
4	BOLT KIT, BUSHING	A-5332	5306-01-344-7993
5	BUSHING	XB-02949	
6	CAP, VALVE SPRING	5111337	2815-00-529-8193
7	CLAMP	5137620	5340-01-114-5623
8	CLAMP	5143999	4730-00-080-5799
9	CONNECTOR	23500514	2990-01-298-9350
9.1	CROSS	V75750400	2520-01-352-9164
10	CYLINDER KIT	23503830	2590-01-361-8202
11	FASTENER, RATCHET	PC47516	5305-01-222-4344
12	FILTER, FUEL	25010778	2910-01-022-8183
13	FUEL PIPE, JUMPER	8928632	
14	GASKET	D346-177	5330-00-364-3550
15	GASKET	MS52000-3	5330-00-939-0666
16	GASKET	0601-38260	5330-01-352-7495

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
17	GASKET	14079550	5330-00-107-3925
18	GASKET	2DD219	
19	GASKET	23016681	5330-01-328-7635
20	GASKET	23018625	5330-01-243-5148
21	GASKET	23046658	
22	GASKET	23501587	5330-01-058-0587
23	GASKET	23502937	5330-01-353-9547
24	GASKET	244956	
25	GASKET	328951-6X	5330-00-781-7774
26	GASKET	423617	5330-01-336-8786
27	GASKET	5100404	5330-01-054-2398
28	GASKET	5100638	5330-01-058-0586
29	GASKET	5104081	5330-01-078-7186
30	GASKET	23515145	5330-01-079-9963
31	GASKET	5104507	
32	GASKET	5117242	5330-00-911-4628
33	GASKET	5117243	5330-00-735-4289
34	GASKET	5117254	5330-00-745-7831
35	GASKET	5117269	5330-00-735-4291
36	GASKET	5117332	5330-00-725-2301
37	GASKET	5117535	5330-00-844-2907
38	GASKET	5117734	5330-00-745-7776
39	GASKET	5117993	5330-00-973-1415
40	GASKET	5120224	5330-00-862-6929
41	GASKET	5121714	5330-00-745-7669
42	GASKET	5121835	5330-00-847-4967
43	GASKET	5123570	5330-00-915-2835
44	GASKET	5123638	5330-00-862-6934

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
45	GASKET	5123812	5330-00-892-1764
46	GASKET	5126499	5330-00-736-0228
47	GASKET	5136678	5330-00-198-7953
47.1	GASKET	5137221	
48	GASKET	5138659	5330-00-769-4882
49	GASKET	23520012	5330-00-915-4511
50	GASKET	5144874	5330-01-348-3331
51	GASKET	23520287	5330-01-447-1706
52	GASKET	5144901	5330-01-054-2399
53	GASKET	5145581	
54	GASKET	5148810	5330-01-058-0585
55	GASKET	5161003	5330-00-599-5577
56	GASKET	5167380	5330-00-641-4504
57	GASKET	60598	5310-00-663-7617
58	GASKET	6750186	5330-00-537-2388
59	GASKET	6839213	5330-01-049-0552
60	GASKET	79031	5330-01-078-2825
61	GASKET	8922442	8030-01-338-7640
62	GASKET	8923492	5330-01-037-4129
63	GASKET	8923512	5330-01-206-3264
64	GASKET	8923791	5330-01-088-5982
65	GASKET	8923792	5330-01-206-3265
66	GASKET	8924266	5330-01-270-1161
67	GASKET	8925778	5330-01-247-2474
68	GASKET	23511304	5330-00-758-2863
69	GASKET	97706	5330-01-078-2826
70	GASKET, FUEL PUMP TO ENGINE	5150193	5330-00-212-6290
71	GASKET/SEAL KIT	5518191	5330-01-329-2074
71.1	ISOLATOR	23512307	5342-01-414-2177
72	KEY	8928545	5315-01-304-9174

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
73	KEYWASHER	8926285	5310-01-233-1338
74	LINING, BRAKE	N2000J1466	2530-01-342-2980
75	LOCKNUT	AN365-1024A	5310-00-208-1918
76	LOCKNUT	MS21045-7	5310-00-274-9364
77	LOCKNUT	MS35691-93	5310-00-997-6903
78	LOCKNUT	MS51922-21	5310-00-959-1488
79	LOCKNUT	TLA-3410-S-GRC	5310-00-269-6340
80	LOCKNUT	TLA-3816-S-GRC	5310-01-222-9097
80.1	LOCKNUT	TLA-5811-GRC	5310-01-082-6166
81	LOCKNUT	T893R	5310-01-288-1116
82	LOCKNUT	V75502830	5310-01-344-6738
83	LOCKNUT	V75503336	5310-01-344-6740
84	LOCKNUT	XB-FW-25	5310-01-199-3419
85	LOCKNUT	XB-HNH-58-C	5310-01-199-9463
86	LOCKNUT	110310A	5310-01-159-8178
87	LOCKNUT	110311A	5310-01-111-0645
88	LOCKNUT	110312A	5310-01-150-5918
89	LOCKNUT	115307A	5310-01-151-1036
90	LOCKNUT	117212	5310-00-568-6077
91	LOCKNUT	1244954-2	5310-00-074-1387
92	LOCKNUT	1333510	5310-01-340-5671
93	LOCKNUT	1488-G	5310-01-358-3664
94	LOCKNUT	1571850	5310-01-288-5096
95	LOCKNUT	1598030	5310-01-342-8595
96	LOCKNUT	1600460	5310-01-346-9445
97	LOCKNUT	192481	5310-01-058-3353
98	LOCKNUT	26175	5310-00-429-3127
99	LOCKNUT	5149163	2835-01-015-5419
100	LOCKNUT	76985	5310-00-432-3959
101	LOCKNUT	79024	5310-01-077-9437

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
102	LOCKNUT	8925752	5310-01-268-6783
103	LOCKNUT	9004-94	
104	LOCK PLATE	57022	5340-01-127-5636
105	LOCKSTRIP	6880899	5340-01-056-0037
106	LOCKWASHER	L58	5310-00-820-6653
107	LOCKWASHER	MS27183-15	5310-00-809-4061
108	LOCKWASHER	MS27183-17	5310-00-809-5997
109	LOCKWASHER	MS27183-21	
110	LOCKWASHER	MS35333-42	
111	LOCKWASHER	MS35333-44	5310-00-194-1483
112	LOCKWASHER	MS35335-31	
113	LOCKWASHER	MS35338-100	
114	LOCKWASHER	MS35338-103	
115	LOCKWASHER	MS35338-41	5310-00-045-4007
116	LOCKWASHER	MS35338-42	5310-00-045-3299
117	LOCKWASHER	MS35338-43	5310-00-045-3296
118	LOCKWASHER	MS35338-44	5310-00-582-5965
119	LOCKWASHER	MS35338-45	5310-00-407-5966
120	LOCKWASHER	MS35338-46	5310-00-637-9541
121	LOCKWASHER	MS35338-47	5310-00-209-0965
122	LOCKWASHER	MS35338-48	5310-00-584-5272
123	LOCKWASHER	MS35338-49	5310-00-167-0860
124	LOCKWASHER	MS35338-51	5310-01-584-7888
125	LOCKWASHER	MS35338-52	5310-00-754-2005
126	LOCKWASHER	MS35338-63	5310-00-582-5965
127	LOCKWASHER	MS35338-8	5310-00-261-7340
128	LOCKWASHER	MS45904-60	5310-00-080-9786
129	LOCKWASHER	MS51848-12	5310-00-688-2195
130	LOCKWASHER	MS51848-14	5310-00-171-1735

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
131	LOCKWASHER	NWA18	5310-01-344-8254
132	LOCKWASHER	SA-1600-4	
132.1	LOCKWASHER	093078423	
132.2	LOCKWASHER	095002434	
132.3	LOCKWASHER	0400139971	
133	LOCKWASHER	1484FX	5310-01-354-9949
134	LOCKWASHER	103323	
135	LOCKWASHER	1613	
136	LOCKWASHER	237757	5305-01-133-7193
137	LOCKWASHER	2434	5310-00-775-5139
138	LOCKWASHER	2523	5310-00-775-5182
139	LOCKWASHER	3231	5310-00-032-1814
140	LOCKWASHER	5141367	5310-01-340-3936
141	LOCKWASHER	5177769	5310-00-209-1543
142	LOCKWASHER	5584	5310-00-775-5125
143	LOCKWASHER	6769636	5310-00-776-7670
144	LOCKWASHER	78328	5310-00-172-1991
145	MOUNTING PARTS KIT	328170-203X	
146	NUT	V75503561	5310-01-344-6313
147	NUT	V88350222	5310-01-345-5495
148	NUT	6772182	
149	NUT, ADJUSTING	V75502102	5310-01-344-6280
150	NUT, ADJUSTING	V88140038	5310-01-344-6279
151	NUT, NYLON	97-4196-1	
152	NUT, TRISTOP	V75503716	5310-01-357-3768
153	OVERHAUL KIT, BLOWER	23514202	2990-01-136-7514
154	OVERHAUL KIT, CYLINDER HEAD	5199674	5330-01-053-1845
155	OVERHAUL KIT, FAN CLUTCH	3-34867	2930-01-K49-9523
156	PACKING, PREFORMED	8925981	5330-01-207-7789
157	PACKING, PREFORMED	FF9446-12	5330-01-115-8226

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
158	PACKING, PREFORMED	FF9446-14	5330-01-269-8580
159	PACKING, PREFORMED	FF9446-10	
160	PACKING, PREFORMED	FF9446-16	5330-01-115-8225
160.1	PACKING, PREFORMED	FF9446-18	
161	PACKING, PREFORMED	FF9446-25	5330-01-269-6152
162	PACKING, PREFORMED	FF9449-16	5330-01-115-8225
163	PACKING, PREFORMED	FF9449-18	5310-01-092-5503
164	PACKING, PREFORMED	FF9449-21	5330-01- 269-4323
165	PACKING, PREFORMED	FF9449-25	5330-01-269-6152
165.1	PACKING, PREFORMED	M053225163	
166	PACKING, PREFORMED	V75500858	5330-01-350-6007
167	PACKING, PREFORMED	V75502787	5330-01-354-4160
167.1	PACKING, PREFORMED	XA-2265	
168	PACKING, PREFORMED	Z053095777	5330-01-304-3453
168.1	PACKING, PREFORMED	Z053074979	
168.2	PACKING, PREFORMED	Z053074980	
168.3	PACKING, PREFORMED	Z053074981	
169	PACKING, PREFORMED	154126	5330-00-123-2827
170	PACKING, PREFORMED	154130	5330-01-337-0851
171	PACKING, PREFORMED	154132	5330-00-935-6018
172	PACKING, PREFORMED	174140	5330-01-337-0850
173	PACKING, PREFORMED	2AL343	5330-01-145-4573
174	PACKING, PREFORMED	2-219N674-70	5330-00-013-7784
175	PACKING, PREFORMED	2-27153	5330-01-334-1602
176	PACKING, PREFORMED	22617-10	5330-01-040-4772
177	PACKING, PREFORMED	22617-12	5330-00-228-7196
178	PACKING, PREFORMED	22617-14	
179	PACKING, PREFORMED	22617-16	5330-01-168-0885
180	PACKING, PREFORMED	22617-2	
181	PACKING, PREFORMED	22617-20	5330-01-168-1802

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
181.1	PACKING, PREFORMED	22617-24	
182	PACKING, PREFORMED	22617-4	
182.1	PACKING, PREFORMED	22617-6	
183	PACKING, PREFORMED	22617-8	5330-01-244-2273
184	PACKING, PREFORMED	262331	
185	PACKING, PREFORMED	375422	5330-01-336-8770
186	PACKING, PREFORMED	3-924N552-90	5330-01-038-3074
187	PACKING, PREFORMED	427682	
188	PACKING, PREFORMED	5101138	5330-01-062-0942
189	PACKING, PREFORMED	5101419	5330-01-164-0344
190	PACKING, PREFORMED	5104978	5330-01-163-8179
191	PACKING, PREFORMED	6830007	5330-01-049-0547
192	PACKING, PREFORMED	71038	5330-00-633-6818
193	PACKING, PREFORMED	71040	5330-01-012-2722
194	PACKING, PREFORMED	71041	5330-00-633-6827
194.1	PACKING, PREFORMED	853181952	
195	PACKING, PREFORMED	8923959	5330-00-166-1020
196	PACKING, PREFORMED	9600-G	5330-01-351-2728
197	PACKING, PREFORMED	9605-G	5330-01-113-2084
197.1	PACKING, PREFORMED	9612	5331-01-357-0846
198	PACKING, PREFORMED	9705-G	5330-01-351-2726
199	PACKING, PREFORMED	9817-2	5330-01-351-2727
200	PACKING, PREFORMED	9964-G	5330-01-114-9226
201	PACKING, PREFORMED	9972-G	5330-01-131-7062
202	PARTS KIT	RNT-26-C	
203	PARTS KIT	RNT-26-EG	
204	PARTS KIT	RNT-26-H	
205	PARTS KIT	SN-3711-AL	
206	PARTS KIT	SN-3711-T	
207	PARTS KIT, AIR FLOW	289352	2530-01-134-1834

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
208	PARTS KIT, CLUTCH	328970X	2520-01-325-3336
209	PARTS KIT, COMPRESSOR	RNT26A	4310-01-231-2807
210	PARTS KIT, LINEAR	328971X	3040-01-221-8889
211	PIN	274889	5315-00-823-4333
212	PIN	5106909	5315-01-089-6864
213	PIN	5175641	5315-00-829-0381
214	PIN, COTTER	MS24665-291	5315-00-019-0777
215	PIN, COTTER	MS24665-267	
216	PIN, COTTER	MS24665-283	5315-00-842-3044
217	PIN, COTTER	MS24665-291	
218	PIN, COTTER	MS24665-353	5315-00-839-5822
219	PIN, COTTER	MS24665-360	5315-00-298-1499
220	PIN, COTTER	MS24665-493	5315-00-018-7988
221	PIN, COTTER	MS24665-624	5315-00-059-0217
222	PIN, COTTER	MS24665-625	5315-00-209-7273
223	PIN, COTTER	MS24665-627	5315-00-013-7308
224	PIN, COTTER	MS24665-683	5315-00-234-1673
225	PIN, RETAINING	6831774	5315-00-108-1112
226	PIN, ROLL	2451151	5315-01-162-4130
227	PIN, SPRING	456299	5315-01-297-7378
227.1	PISTON AND ROD KIT	882957	
228	PLUG	5151272	5340-00-841-9141
228.1	REPAIR KIT	0223-01251-022	
229	REPAIR KIT, GEARBOX	02-23-01260-150	3010-01-102-2040
230	REPAIR KIT, WATER PUMP	5149407	2930-01-143-1352
231	REPAIR KIT, WINCH	9426-G	5330-01-356-5147
232	REPAIR KIT, WINCH	9443-G	
233	RETAINING KIT, PITMAN ARM	1790632K	2530-01-340-4080
234	RING, RETAINING	MS16625-1175	5365-00-804-5827
235	RING, RETAINING	2-21267	5365-01-151-5087

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
236	RING, RETAINING	2-21272	5365-01-151-4985
237	RING, RETAINING	2-25578	5360-01-336-6734
238	RING, RETAINING	274613	5365-00-349-8518
239	RING, RETAINING	3359-G	5365-01-350-6035
240	RING, RETAINING	3912686063	5365-00-768-8563
241	RING, RETAINING	5149154	5365-01-015-5414
242	RING, RETAINING	5198049	5365-00-930-3257
243	RING, RETAINING	6758779	5365-00-582-2641
244	RING, RETAINING	8922407	5365-01-166-6633
245	RING, RETAINING	8922605	5365-01-173-3437
246	RING, RETAINING	9414876	5365-01-084-5352
247	RING, RETAINING	9420905	5365-01-084-5353
248	RING, SEAL	001332	5330-01-173-6825
249	RING, SEAL	23503769	5330-00-166-8396
250	RING, SEAL	23011454	5365-01-084-5258
251	RING, SEAL	23011455	2520-01-149-3273
252	RING, SEAL	23014631	5330-01-173-3413
253	RING, SEAL	23019652	5330-01-247-8519
254	RING, SEAL	23045519	5330-01-280-7491
255	RING, SEAL	3912585006	5330-01-212-2222
256	RING, SEAL	5101160	5330-01-058-0281
257	RING, SEAL	5103544	5330-01-088-6596
258	RING, SEAL	5148502	5365-01-062-0943
259	RING, SEAL	5197583	5330-00-930-3254
260	RING, SEAL	5198936	5365-01-016-0443
261	RING, SEAL	6758740	5330-00-582-0456
262	RING, SEAL	6770492	5330-00-999-3760
263	RING, SEAL	6772321	5330-00-999-3754
264	RING, SEAL	6833980	5330-01-236-1753
265	RING, SEAL	6834542	5330-01-088-5847

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
266	RING, SEAL	6836796	5330-01-336-6709
267	RING, SEAL	6836799	5330-01-145-0697
268	RING, SEAL	6836800	5330-01-336-2998
269	RING, SEAL	6880389	5330-01-141-9579
270	RING, SEAL	8922140	5330-00-764-1659
271	RING, SEAL	8927189	5330-01-054-2267
272	RING, SEAL	8928676	5330-01-346-0486
273	RING KIT, SEAL, BUTT JOINT	23014441	5330-01-087-6849
274	RING, TEFLON, PISTON	T-560-0330-001	3040-01-341-2340
274.1	ROTATING GROUP KIT	882954	
275	SCREW	MS90725-61	
276	SCREW	MS90728-172	
276.1	SCREW	Z112007092	
277	SCREW	115217A	5306-01-156-5429
277.1	SCREW	23512308	5306-01-411-6384
278	SCREW	5121466	5306-00-894-2381
279	SCREW	8927581	5305-01-242-1783
280	SCREW	9409011	5306-00-940-9011
281	SCREW, ANCHOR	23045343	5306-01-245-9837
282	SCREW, NYLON PATCH	5103534	5306-01-078-4981
283	SCREW, NYLON PATCH	8925603	5306-01-297-6987
284	SCREW, SELF-LOCKING	5101196	5306-01-120-3659
285	SCREW, SELF-LOCKING	9431456	5306-01-147-1202
286	SEAL	A11507	4330-00-846-8177
286.1	SEAL	M054097799	
287	SEAL	NA1205V1556	5330-01-344-0636
288	SEAL	N1779J1024	5330-01-345-4721
289	SEAL	V75503661	5330-01-344-0637
290	SEAL	2AG460	5330-01-328-6014
290.1	SEAL	23504641	5330-01-336-2997
291	SEAL	5102098	5330-01-058-5220

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
292	SEAL	8922045	5330-01-K49-9394
293	SEAL, CTI	V88900213	5330-01-342-7860
294	SEAL, GASKET	3912884019	5330-01-340-8159
295	SEALING KIT	V88510253	5330-01-345-0157
295.1	SEAL KIT	SK-10-2	
295.2	SEAL KIT	SK2-10V-4	
296	SEAL KIT	61267	5330-01-355-3582
296.1	SEAL KIT	882955	
297	SEAL KIT, BRAKE	9868-G	5330-01-230-3723
298	SEAL KIT, CARTRIDGE VALVE	9692-G	5330-01-169-0769
299	SEAL KIT, PLUG	70035-G	4820-01-351-5840
300	SEAL KIT, PLUG	9432-G	5340-01-344-8463
301	SEAL KIT, SOLENOID VALVE	SV08-31	4810-01-356-4018
302	SEAL KIT, VALVE CARTRIDGE	9638-G	5330-01-346-1534
303	SEAL, LIP	3912883058	5330-01-298-3042
304	SEAL, OIL	G13824	5330-00-725-1511
305	SEAL, OIL	V75503484	5330-01-344-8263
306	SEAL, OIL	V75503486	5330-01-344-8935
307	SEAL, OIL	23010610	2840-01-141-9503
308	SEAL, OIL	23016947	5330-01-245-0159
309	SEAL, OIL	415023-SSR	5330-01-340-9882
310	SEAL, OIL	415304	5330-01-033-2697
311	SEAL, OIL	471965	5330-01-336-8738
312	SEAL, OIL	23516871	
313	SEAL, OIL	5107223	5330-01-083-3063
314	SEAL, OIL	23512418	5330-00-961-9801
315	SEAL, OIL	6773311	5330-00-999-3752
316	SEAL, OIL	71246	5330-01-187-3640
317	SEAL, OIL	8929750	5330-01-324-0437
318	SEAL, POCKET	3912882086	5330-00-809-1052

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
319	SEAL, QUAD RING	2369031	5330-01-K49-9511
320	SEAL, VALVE GUIDE	8921209	5330-00-992-0695
321	SERVICE KIT	9427-G	2590-01-344-5749
321.1	SHAFT BEARING KIT	882956	
322	SHIM	5100703	5365-01-082-1972
322.1	SHIM KIT	V86010048	5310-01-345-2637
323	SNAP CLIP	H360-4-2	5340-01-151-8391
324	SNAP CLIP	H360-6-2	5340-01-224-8368
324.1	SNAP CLIP	H360-13-12	
324.2	SNAP CLIP	H360K2593	
325	SOCKET, CONTACT	1203 4051	5940-01-342-0712
326	SPACER	59808BX	5365-01-156-0026
327	SPINDLE	12267808	5315-01-091-0784
328	SPINDLE	6831679	5315-01-112-8641
329	TERMINAL	12084563	5999-01-321-1925
330	TERMINAL	12089305	5999-01-319-7394
331	U-BOLT ASSEMBLY	2-94-28X	5306-00-097-9701
332	WASHER	23013841	5310-01-245-9859
333	WASHER	6839761	5310-01-084-1768
333.1	WASHER, COPPER SEAL	23513842	
334	WASHER, COPPER	5152148	
334.1	WASHER, FIBER	Z082073500	
335	WASHER, KEY	7520854	5310-00-264-1888
336	WASHER, LOCKING	V88350241	5310-01-346-0138
337	WASHERS, PRESSURE	5125108	5310-00-785-3961
338	WASHER, RETAINING	3909063	5310-01-143-0542
338.1	WASHER, SEAL	XA-1470	
339	WASHER, THRUST	23047365	3120-01-318-2070
340	WASHER, THRUST	6835321	3120-01-084-4607
341	WASHER, THRUST	29519114	

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(1) ITEM NO.	(2) NOMENCLATURE	(3) PART NUMBER	(4) NATIONAL STOCK NUMBER
342	WASHER, THRUST	6881352	3120-01-056-2112
343	WASHER, THRUST	6881638	3120-01-053-1819
344	deleted		
345	WIRE SEAL	12010293	5975-01-226-8078
346	WIRE SEAL	12015323	5975-01-310-5011
347	YOKE BEARING KIT	923987	

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By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0702306

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ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).
	0004 00-2	4-7				Wrong POC is listed.

SAMPLE

**Reference to line numbers within the paragraph or subparagraph.*

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Your Name		Your Signature

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TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

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

WEIGHTS

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

LIQUID MEASURE

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

SQUARE MEASURE

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

CUBIC MEASURE

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

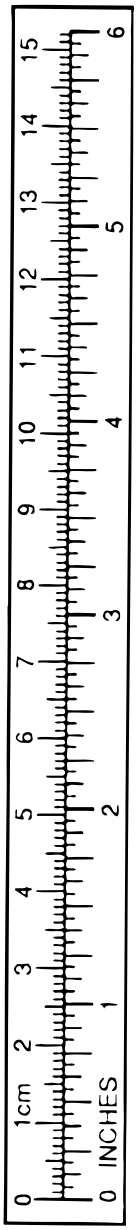
TEMPERATURE

5/9 (^oF - 32) = ^oC
212^o Fahrenheit is equivalent to 100^o Celsius
90^o Fahrenheit is equivalent to 32.2^o Celsius
32^o Fahrenheit is equivalent to 0^o Celsius
9/5 C^o + 32) = F^o

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



PIN 072610-000