TM 5-2410-237-23

TECHNICAL MANUAL

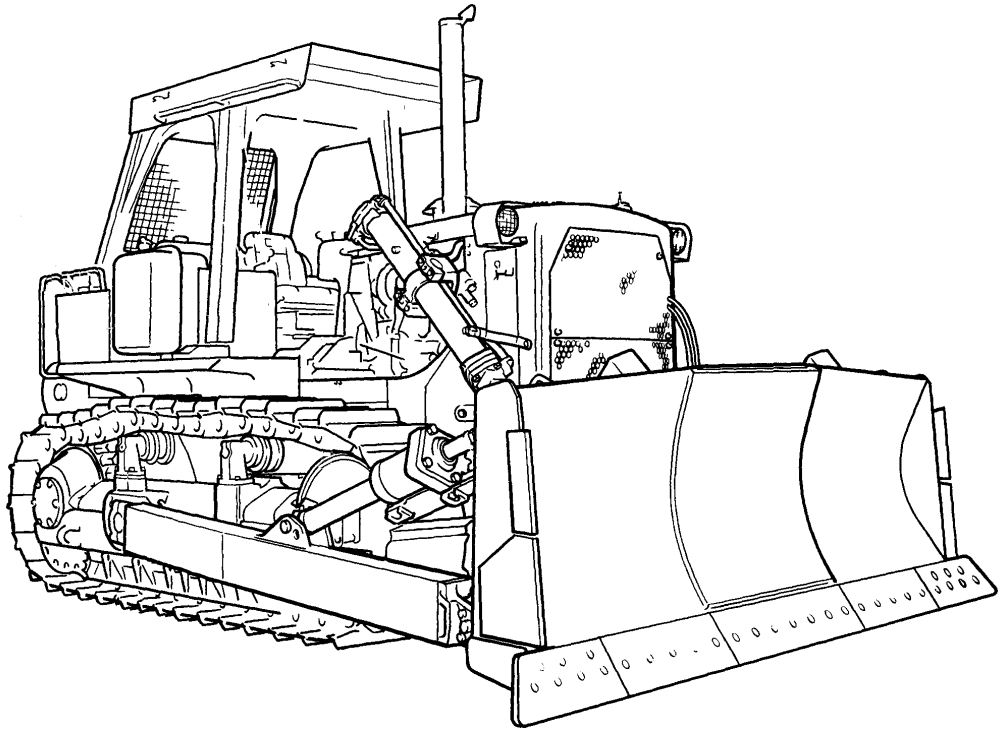
Unit and Direct Support Maintenance

FOR

TRACTOR, FULL TRACKED, LOW SPEED:

DIESEL ENGINE DRIVEN, MEDIUM DRAWBAR PULL

TRACTOR WITH RIPPER NSN 2410-01-223-0350 (EIC: EAZ)
TRACTOR WITH WINCH NSN 2410-01-223-7261 (EIC: EBM)
TRACTOR WITH RIPPER AND WINTERIZED CAB NSN 2410-01-253-2118
TRACTOR WITH WINCH AND WINTERIZED CAB NSN 2410-01-253-2117 (EIC: EBV)
CATERPILLAR MODEL D7G



SUPERSEDURE NOTICE - This manual supersedes TM 5-2410-237-20 dated 30 March 1993.

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

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 2005

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.

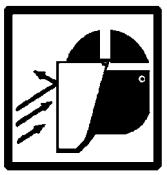
CHEMICAL - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.

EAR PROTECTION - Headphones over ears show that noise level will harm ears.

ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

EYE PROTECTION - person with goggles shows that the material will injure the eyes.

FIRE - flame shows that a material may ignite and cause burns.



FLYING PARTICLES - arrows bouncing off face with face shield shows that particles flying through the air will harm face.

HEAVY PARTS - hand with heavy object on top shows that heavy parts can crush and harm.

HOT AREA - hand over object radiating heat shows that part is hot and can burn.

HYDRAULIC FLUID PRESSURE - hydraulic fluid spraying human figure shows that fluid escaping under great pressure can cause injury or death.

RADIOACTIVE - identifies a material that emits radioactive energy and can injure human tissue or organs.

VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.

FOR INFORMATION ON FIRST AID, REFER TO FM 4-25.11.

WARNING

CARBON MONOXIDE (EXHAUST GASES) CAN KILL!

- **Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death can result from severe exposure.**
- **Carbon monoxide occurs in exhaust fumes of internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure safety of personnel when engine of tractor is operated.**

1. **DO NOT operate tractor engine in enclosed areas.**
2. **DO NOT idle tractor engine without adequate ventilation.**
3. **DO NOT drive tractor with inspection plates or cover plates removed.**
4. **BE ALERT for exhaust poisoning symptoms. They are:**
   - **Headache**
   - **Dizziness**
   - **Sleepiness**
   - **Loss of muscular control**
5. **If you see another person with exhaust poisoning symptoms:**
   - **Remove person from area.**
   - **Expose to fresh air.**
   - **Keep person warm.**
   - **Do not permit physical exercise.**
   - **Administer cardiopulmonary resuscitation (CPR), if necessary.**
   - **Notify a medic.**
6. **BE AWARE. The field protective mask for nuclear-biological-chemical (NBC) protection will not protect you from carbon monoxide poisoning.**

The Best Defense Against Carbon Monoxide Poisoning Is Good Ventilation!

WARNING

BATTERIES

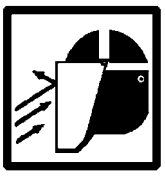
- **To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment, and injury to personnel.**
- **Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in death or serious injury to personnel.**

a. **Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.**

b. **Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required.**

c. **Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Seek medical attention immediately.**

d. **Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.**



WARNING

COMPRESSED AIR

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

WARNING

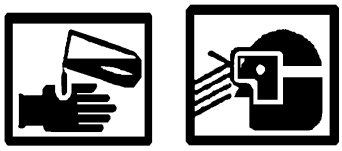
FUEL HANDLING

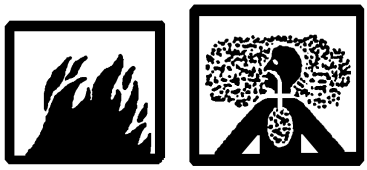
- **DO NOT smoke or permit any open flame in area of machine while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury to personnel or equipment damage.**
- **DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.**

WARNING

ELECTRICAL SYSTEM MAINTENANCE

- **Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.**
- **Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.**





WARNING

ETHER COLD START SYSTEM

Ether fuel is extremely flammable and toxic. DO NOT smoke and make sure you are in a well-ventilated area away from heat, open flames or sparks. Wear eye protection. Avoid contact with skin and eyes and avoid breathing ether fumes. If fluid enters or fumes irritate the eyes, wash immediately with large quantities of clean water for 15 minutes. Seek medical attention immediately if ether is inhaled or causes eye irritation. Failure to follow this warning may cause death or serious injury to personnel.

WARNING

EYE PROTECTION

- **Eye protection must be worn when performing maintenance where components or particles could fly out during procedure. Failure to take precautions could cause injury to personnel.**
- **Some components are under spring tension. Wear eye protection and use extreme caution when disassembling them, to avoid serious injury to personnel.**

WARNING

HAZARDOUS WASTE DISPOSAL

When servicing this machine, performing maintenance, or disposing of materials such as engine coolant, hydraulic fluid, lubricants, battery acids or batteries, and 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.

WARNING

HEARING PROTECTION

Your hearing can be PERMANENTLY DAMAGED if you are exposed to constant high noise levels of 85 DB or greater. Hearing protection is required when operating machine or when working on machine while it is operating. Failure to wear hearing protection may result in hearing loss.

WARNING

HOT COMPONENTS

Hot oil or metal parts can cause severe burns. Wear insulated gloves, long sleeves and eye protection when working with heated parts.

WARNING

HYDRAULIC SYSTEM PRESSURE

- **Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury.**

WARNING

LIFTING HEAVY PARTS

- **Lifting equipment used for lifting machine must be in good condition and of suitable load capacity. Failure to follow this warning may result in injury or death to personnel and damage to equipment.**
- **Improper use of lifting equipment and improper attachment to machine can result in serious personnel injury and equipment damage. Observe all standard rules of safety.**
- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.**

WARNING

MACHINE OPERATION

This machine must be operated only by authorized personnel who have satisfactorily completed a program of training which must include familiarity with safe operating procedures, characteristics and a knowledge of applicable codes, regulations and facilities directives. Untrained personnel subject themselves and others to the possibility of death or serious injury from the improper operation of this machine. Understand the equipment, its function and the controls before operation.

WARNING

NBC EXPOSURE

- **If NBC exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.**
- **NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.**

To order this NBC decal use:

National Stock Number (NSN) - 7690-01-114-3702
Part Number (PN) - 12296626
Commercial and Government Entity Code (CAGEC) - 19207

WARNING

PRESSURIZED COOLING SYSTEM

- **DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.**
- **DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.**
- **Wear effective eye, glove, and skin protection when handling coolants. Failure to do so may cause injury.**


WARNING

SILICONE RTV COMPOUND


- **Exposure to silicone RTV compound may be hazardous to your health. Contact with eyes can cause severe irritation and burns. Compound can be absorbed into the skin nd can cause irritation or skin sensitization. Inhalation of vapors can cause respiratory tract irritation; prolonged inhalation can result in an allergic reaction. Vapors are combustible. Do not use near open flame. Wear eye and skin protection and avoid inhalation of vapors. Use only in a well-ventilated area. Failure to follow this warning can cause injury or death.**
- **If compound gets into eyes, flush with large amounts of running water for at least 15 minutes and seek medical attention immediately. If compound gets on skin, remove as much as possible using mechanical/waterless methods, then flush with water. Seek medical attention for any burns or irritation. If inhaled, remove person to fresh air and provide oxygen if breathing is difficult, or perform cardio-pulmonary resuscitation (CPR). If injested, call physician immediately. If conscious, drink water.**


WARNING

SOLVENT CLEANING COMPOUND


- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **NOTE: P-D-680 Type II is no longer in use and has been replaced by MIL-PRF-680 Type III.**

WARNING

TESTING/ADJUSTING HYDRAULIC SYSTEM

- **When testing and adjusting hydraulic system. Always move machine away from traffic pattern and away from personnel. Allow only one person on the machine. Keep all other personnel off to one side and within view of the operator.**
- **When blade and/or ripper must be raised while tests and adjustments are being performed, ensure they are securely supported. Relieve hydraulic system pressure before disconnecting any line or fitting. Serious injury or death could result if system pressure is not relieved.**

LIST OF EFFECTIVE PAGES/WORK PACKAGES

Date of issue for original manual is:

Original 15 July 2005

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 32 AND TOTAL NUMBER OF WORK PACKAGES IS 251 CONSISTING OF THE FOLLOWING:

Page/WP No.	***Change No.**
Cover (Back Blank)	0
a to h	0
A (B Blank)	0
i to x	0
WP 0001 00 to 0254 00	0

* Zero in this column indicates an original page or work package.

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 15 July 2005

Includes Unit and Direct Support Maintenance

FOR

TRACTOR, FULL TRACKED, LOW SPEED: DIESEL ENGINE DRIVEN, MEDIUM DRAWBAR PULL

TRACTOR WITH RIPPER NSN 2410-01-223-0350 (EIC: EAZ)
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TRACTOR WITH WINCH AND WINTERIZED CAB NSN 2410-01-253-2117 (EIC: EBV)
CATERPILLAR MODEL D7G

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) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or e-mail your letter, DA Form 2028 direct to: AMSTA-LC-CI/TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The e-mail address is: TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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Table of Contents - Continued

HOW TO USE THIS MANUAL

NOTE

If at any time you are unsure how to use this manual or you cannot locate the information you need, notify your supervisor.

INTRODUCTION

1. A Service Life Extension Program (SLEP) has been implemented on selected D7G Tractors.
2. The major differences between a non-SLEP and SLEP tractor are as follows:
   a. A non-SLEP tractor is equipped with a folded core radiator and a fixed engine cooling fan.
   b. A SLEP tractor is equipped with a modular radiator and a reversible engine cooling fan.
3. Refer to WP 0002 00, *Equipment Description and Data*, for further information on how to verify which tractor you have.
4. This revised manual is designed to help you perform lubrication, troubleshooting and maintenance on both configurations of D7G Tractors.
5. This manual is written in work package format.
6. Chapters divide the manual into major categories of information (e.g., *Introductory Information with Theory of Operation, Troubleshooting Procedures, Field Maintenance Procedures,* and *Supporting Information*).
   c. Each chapter is divided into work packages, which are identified by a 6-digit number (e.g. 0001 00, 0002 00, etc.) located on the upper right-hand corner of each page. The work package page number (e.g. 0001 00-1, 0001 00-2, etc.) is located centered at the bottom of each page.
   d. If a Change Package is issued to this manual, added work packages use the 5^{th} and 6^{th} digits of their number to indicate new material. For instance, work packages inserted between WP 0001 00 and WP 0002 00 are numbered WP 0001 01, WP 0001 02, etc.
7. Read through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.
8. To ensure your safety and proper maintenance of the tractor, pay close attention to Chapter 4, General Maintenance Instructions.

CONTENTS OF THIS MANUAL

1. A *Warning Summary* is located at the beginning of this manual. Become familiar with these warnings before operating or performing troubleshooting or maintenance on the machine.
2. A *Table of Contents*, located in the front of the manual, lists all chapters and work packages in the publication.
   a. The Table of Contents also provides *Reporting Errors and Recommending Improvements* information and DA Form 2028 addresses, for the submittal of corrections to this manual.
   b. If you cannot find what you are looking for in the Table of Contents, refer to the alphabetical *Index* at the back of the manual.
3. Chapter 1, *Introductory Information with Theory of Information*, provides general information on the manual and the equipment.
4. Chapter 2 covers *Troubleshooting Procedures*. WP 0005 00 contains a *Troubleshooting Symptom Index*. If the machine malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
5. Chapter 3 deals with *Field Maintenance Procedures*: Major areas covered are *Service Upon Receipt* and *Preventive Maintenance Checks and Services (PMCS)*, and all maintenance procedures authorized by the Maintenance Allocation Chart (MAC) for this manual, organized in Functional Group Code (FGC) sequence. Refer to the *Table of Contents* for a complete listing of maintenance procedures.

6. Chapter 4 covers general maintenance information work packages. Before performing any maintenance procedure, read and understand the instructions in this chapter.
7. Chapter 5 includes *Supporting Information: References; Maintenance Allocation Chart (MAC) Introduction; Maintenance Allocation Chart (MAC)*; *Expendable and Durable Items List; Tool Identification List;* and *Warranty Information.*

FEATURES OF THIS MANUAL

1. WARNINGs, CAUTIONs, NOTEs, subject headings, and other important information are highlighted in **BOLD** print as a visual aid.

WARNING

A WARNING indicates a hazard which may result in death or serious injury.

CAUTION

A CAUTION is a reminder of safety practices or directs attention to usage practices that may result in damage to equipment.

NOTE

A NOTE is a statement containing information that will make the procedures easier to perform.

2. Statements and words of particular interest may be printed in CAPITAL LETTERS to create emphasis.
3. Within a procedural step, reference may be made to another work package in this manual or to another manual. These references indicate where you should look for more complete information.

   If you are told: “Replace engine oil filter (WP 0011 00)”, go to Work Package 0011 00 in this manual for instructions on replacing the filter.
4. Illustrations are placed after, and as close to, the procedural steps to which they apply. Callouts placed on the art may be text or numbers, or both; whichever method is easier for the soldier.
5. Numbers located at lower right corner of art (e.g. 387-001; 387-002, etc.) are art control numbers and are used for tracking purposes. Disregard these numbers.
6. Dashed leader lines used in the Lubrication Chart (WP 0009 00) indicate lubrication points that are located on both sides of the equipment.
7. Technical instructions include metric units as well as standard units. For your reference, a *Metric Conversion Chart* is located on the inside back cover of the manual.
8. The initial setup of each work package lists components necessary to perform the procedure. The number in parenthesis following the component references the callout number for the component within the work package art.

CHAPTER 1
INTRODUCTORY INFORMATION WITH THEORY OF OPERATION

GENERAL INFORMATION 0001 00

SCOPE

NOTE

- **A Service Life Extension Program (SLEP) has been implemented on selected D7G Tractors. The major differences between a non-SLEP and SLEP tractor are as follows:**
  - **a. A non-SLEP tractor is equipped with a folded core radiator and a fixed engine cooling fan.**
  - **b. A SLEP tractor is equipped with a modular radiator and a reversible engine cooling fan.**
- **Information in this manual covers both non-SLEP and SLEP tractors.**

1. **Type of Manual.** This manual is for use in performing Field Maintenance on the Model D7G Tractor.
2. **Equipment Name and Model Number.** Tractor, Full Tracked, Low Speed: Diesel Engine Driven, Medium Drawbar Pull, Caterpillar Model D7G.
   a. Tractor with Ripper NSN 2410-01-223-0350 (EIC: EAZ)
   b. Tractor with Winch NSN 2410-01-223-7261 (EIC: EBM)
   c. Tractor with Ripper and Winterized Cab NSN 2410-01-253-2118
   d. Tractor with Winch and Winterized Cab NSN 2410-01-253-2117 (EIC: EBV)
3. **Purpose of Equipment.**
   a. The D7G Tractor is used to doze soil and rocks and for clearing land of small trees and brush.
   b. Tractors equipped with rear-mounted rippers are designed for dozing and also used for ripping soil, rocks, asphalt and concrete.
   c. Tractors with rear-mounted winches are designed for dozing and are also equipped for all types of winching operations.
   d. When equipped with a Mine Clearing/Armor Protection (MCAP) Kit, the tractor is capable of clearing both surface-laid and buried anti-tank (AT) and anti-personnel (AP) land mines, to a depth of 12 in. (30.5 cm) each pass.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for the equipment will be those prescribed by DA Pam 738-750, *Functional User's Manual for the Army Maintenance Management System (TAMMS*), as contained in the Maintenance Management Update.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRS)

If your machine 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 or performance. Put it on an SF Form 368, *Product Quality Deficiency Report*. Mail it to us at: Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-AC-NML, Rock Island, Illinois 61299-7630. We'll send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

1. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.
2. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using SF Form 368, *Product Quality Deficiency Report*. Use of key words such as “corrosion,” “rust,” “deterioration,” or “cracking” will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA Pam 738-750.

OZONE DEPLETING SUBSTANCES

There are no ozone-depleting substances cited in this manual or used on the D7G Tractor.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For destruction of Army materiel to prevent enemy use, refer to TM 750-244-3, *Procedures for Destruction of Equipment to Prevent Enemy Use*.

PREPARATION FOR STORAGE OR SHIPMENT

For preparation for storage or shipment procedures, refer to WP 0244 00.

WARRANTY INFORMATION

SLEP machines are warranted by Caterpillar Inc. IAW *Warranty Information* (WP 0251 00). Record all deficiencies.

NOMENCLATURE CROSS-REFERENCE LIST

COMMON NAME	OFFICIAL NOMENCLATURE
Belly Pan	Crankcase or Transmission Guard
Dipstick	Oil Level Gage
Engine Coolant	Antifreeze, Ethylene Glycol Mixture
Rock Guard	Track Roller Frame Guard, Track Roller Guard

LIST OF ABBREVIATIONS/ACRONYM

NOTE

Refer to ASME Y14.38-1999, *Abbreviations and Acronyms*, for standard abbreviations.

ABBREVIATION/ACRONYMS	DEFINITION
AAL	Additional Authorization List
AP	Anti-Personnel
AT	Anti-Tank
BDC	Bottom Dead Center
BII	Basic Issue Items
C	Centigrade or Celsius
CID	Cubic Inch Displacement
cm	Centimeter
COEI	Components of End Item

LIST OF ABBREVIATIONS/ACRONYMS - CONTINUED

ABBREVIATION/ACRONYMS	DEFINITION
DCA	Diagnostic Connector Assembly
ECM	Electronic Control Module
GCWR	Gross Combination Weight Rating
GVWR	Gross Vehicle Weight Rating
IAW	In Accordance With
kg	Kilogram
km	Kilometer
kPa	Kilopascal
kph	Kilometers per Hour
kW	Kilowatt
L	Liter
lb-ft	Pound Foot
LC	Load Center
lg	Long
lph	Liters per Hour
MCAP	Mine Clearing/Armor Protection
MCR	Mine Clearing Rake
mm	Millimeter
NATO	North Atlantic Treaty Organization
Nm	Newton Meter
PMCS	Preventive Maintenance Checks and Services
ROPS	Rollover Protective Structure
SAE	Society of Automotive Engineers
SLEP	Service Life Extension Program
STE/ICE	Simplified Test Equipment for Internal Combustion Engines
TDC	Top Dead Center
TK	Transducer Kit
VTM	Vehicle Test Meter

END OF WORK PACKAGE

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

NOTE

- **A Service Life Extension Program (SLEP) has been implemented on selected D7G Tractors. The major differences between a non-SLEP and SLEP tractor are as follows:**
  - **a. A non-SLEP tractor is equipped with a folded core radiator and a fixed engine cooling fan.**
  - **b. A SLEP tractor is equipped with a modular radiator and a reversible engine cooling fan.**
- **To determine if you have a SLEP tractor, look for the suffix "R" stamped after the machine's serial number on its data plate.**

1. **Characteristics.**
   a. The D7G Tractor is a full-tracked, low-speed, medium drawbar pull tractor that operates over rough terrain in all types of weather.
   b. The D7G Tractor is equipped with a front-mounted bulldozer blade assembly and is designed for earth moving and construction operations.
   c. The D7G is also equipped with either a rear-mounted ripper or a rear-mounted reversible winch.
   d. When equipped with ripper, implement can penetrate and rip compacted soil, imbedded with boulders, up to a depth of 29 in. (73.7 cm).
   e. When equipped with winch, tractor can winch loads of 50,000 lb (22,700 kg) at a line speed of 80 ft (24.4 m) per minute.
   f. Tractors with winch deliver 35,000 lb (15,890 kg) of drawbar pull at 1.4 mph (2.3 kph).
   g. The D7G can be equipped with a winterized cab that allows operation in arctic conditions.
   h. A Mine Clearing/Armor Protection (MCAP) Kit is available for installation. It consists of the following:
      (1) armor protective plates that are installed around the ROPS and operator station and other crucial machine components, to protect against damage from explosive blasts; and
      (2) a mine-clearing rake (MCR) that is installed to the bulldozer blade moldboard. The MCR clears a path 12 in. deep each pass, of anti-tank (AT) and anti-personnel (AP) land mines.

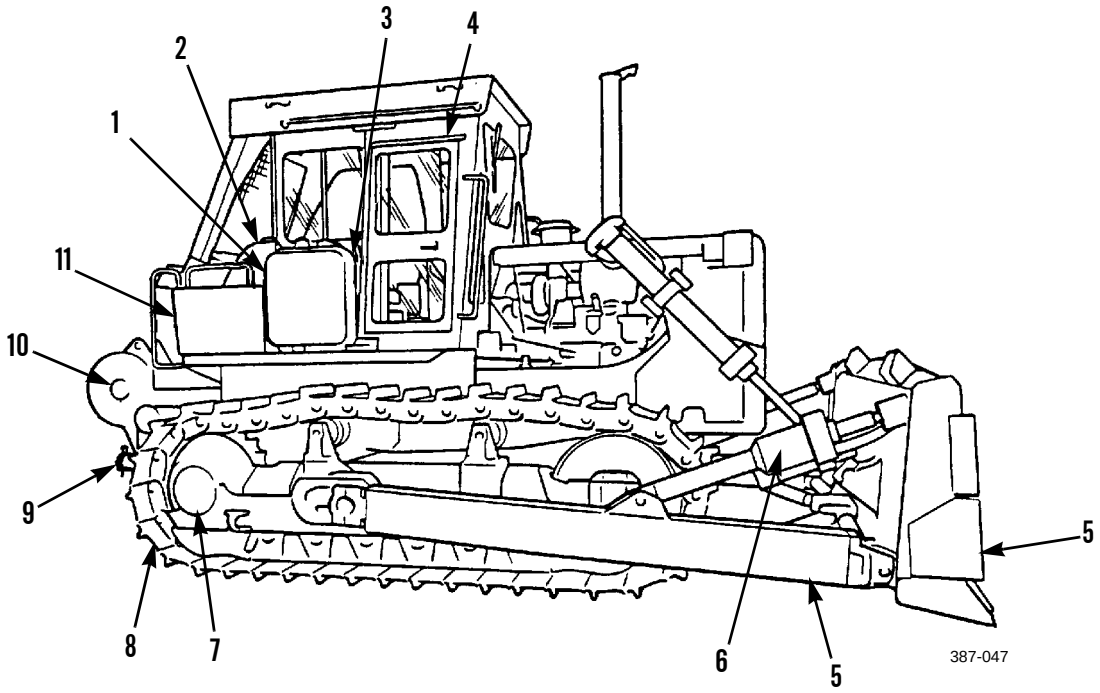
2. **Capabilities and Features.**

NOTE

- **Refer to *Equipment Data* at the end of this work package for machine dimensions, weights, fluid capacities and other miscellaneous equipment data.**
- **Refer to *Theory of Operation* in WP 0003 00 for additional information on specific machine systems.**

a. Caterpillar turbocharged, direct injection diesel engine with six in-line cylinders, generating 200 horsepower @ 2000 rpm;
b. Caterpillar powershift, manual transmission with neutral, three forward and three reverse speeds and a transmission safety lock lever;
c. operator station with adjustable seat and seat belt;
d. rollover protective structure (ROPS) canopy;
e. clutch-operated steering brakes with dual brake pedals and brake lock lever that serves as a parking brake;
f. oil sampling valves for engine, transmission and hydraulic systems;
g. fording capability up to 30 in. (76.2 cm) (as deep as the top of the final drive cover); and
h. NATO slave receptacle.

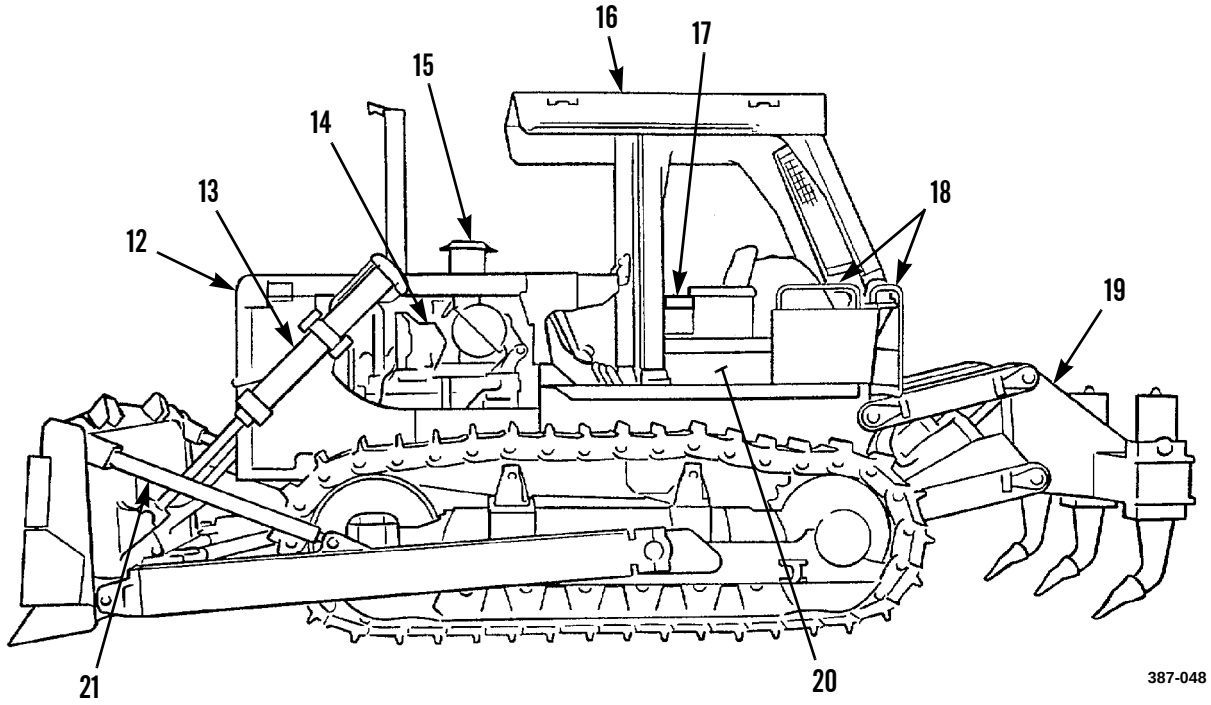
LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



TRACTOR WITH WINCH AND WINTERIZED CAB

Key	Component	Description
1	Hydraulic Tank	Stores hydraulic oil used in machine hydraulic systems.
2	Fuel Tank	Located at rear of machine. Stores fuel supply for engine operation.
3	Door Stop	Door of winterized cab can be secured to this arm to keep door in open position.
4	Winterized Cab	Allows operation in arctic conditions.
5	Bulldozer Blade Assembly	Used for earthmoving operations or as a push block. Consists of moldboard and replacable cutting edges and end bits, and blade push-arms that connect blade to the tractor. Reinforced plate in center of blade is used to push-assist scrapers. Blade assembly controls are operated from operator seat.
6	Tilt Cylinder	Located on right side. Used in conjunction with brace (on left side) to adjust angle of bulldozer blade.
7	Final Drive	Provides power to the track.
8	Track	Propels machine forward or rearward.
9	Drawbar	Used for towing compaction equipment, scrapers, etc.
10	Winch	Used for all types of winching operations. Controls operated from operator seat.
11	Tool box	Provides stowage for tools or other items required by the operator.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED



TRACTOR WITH RIPPER

Key	Component	Description
12	Radiator	Contains water and antifreeze solution which provides engine cooling.
13	Lift Cylinder	One on each side of machine raises and lowers bulldozer blade.
14	Engine Compartment	Houses the engine which powers the D7G.
15	Engine Air Precleaner	Prevents debris from entering engine air intake system.
16	ROPS	Provides rollover protection for the operator.
17	Operator Station	Enclosure contains operator seat and all controls and indicators used during operation.
18	Grabhandles	Provide a handhold for personnel climbing on machine.
19	Ripper	Used for loosening soil and for ripping through hard compacted surfaces. Equipped with three shanks.
20	Battery Box	Enclosure protects batteries from damage. Two batteries inside are easily accessible for servicing.
21	Tilt Brace	Allows for additional adjustment of blade tilt.

EQUIPMENT DATA

Dimensions and Weights:

Length

- Tractor . . . . . 13 ft 9 in. (4.2 m)
- Tractor with Blade . . . . . 17 ft 4 in. (5.3 m)
- Tractor with Blade and Winch . . . . . 18 ft 4 in. (5.6 m)
- Tractor with Blade and Ripper . . . . . 22 ft 9 in. (6.9 m)

Track Length (On Ground) . . . . . 107 in. (272 cm)

Width . . . . . .12 ft (3.7 m)

Height . . . . . .11 ft (3.4 m)

Weight:

- Tractor . . . . . 37,256 lb (16,914 kg)
- Tractor with Blade . . . . . 46,112 lb (20,935 kg)
- Tractor with Blade and Winch . . . . . 48,910 lb (22,205 kg)
- Tractor with Blade and Ripper . . . . . 51,720 lb (23,481 kg)
- Winterized Cab with ROPS . . . . . 2,489 lb (1,130 kg)

Fording Depth . . . . . .30 in. (76.2 cm)

Engine:

Manufacturer . . . . . .Caterpillar Inc.

Model 3306

Horsepower . . . . . .200 hp @ 2000 rpm

Number of Cylinders 6

Bore . . . . . .4.75 in.

Stroke . . . . . 6 in.

Displacement . . . . . 638 CID (10.5 l)

Fuel System . . . . . Direct injection

Firing Order (Injection Sequence) 1, 5, 3, 6, 2, 4

Transmission:

Manufacturer . . . . . .Caterpillar Inc.

Type . . . . . powershift, manual

Range Selection . . . . . neutral(N)/3 speeds forward and 3 speeds reverse

Speed (Forward):

- 1st . . . . . .0-2.3 mph (0-3.7 kph)
- 2nd . . . . . .0-4.0 mph (0-6.4 kph)
- 3rd . . . . . 0-6.2 mph (0-10.0 kph)

Speed (Reverse):

- 1st . . . . . .0-2.8 mph (0-4.5 kph)
- 2nd . . . . . .0-4.9 mph (7.9 kph)
- 3rd . . . . . 0-7.4 mph (0-11.9 kph)

EQUIPMENT DATA - CONTINUED

Steering and Brake System

Steering Type . . . . . hydraulically-operated clutches dual brake pedals

Brakes . . . . . band-type

Electrical System:

Starter . . . . . 24 volts

Alternator . . . . . 24 volt, 50 amp

Batteries . . . . . 24 volt system, 2 12-volt batteries

Capacities:

Fuel Tank . . . . . 115 gal. (435.3 l)

Cooling System . . . . . 12 gal. (45.4 l)

Engine Crankcase . . . . . 7.25 gal. (27.4 l)

Transmission, Bevel Gear and Steering Clutch Compartments . . . . . 18.5 gal. (70.0 l)

Final Drive (Each) . . . . . 9 gal. (34.1 l)

Hydraulic System . . . . . 21 gal. (79.5 l)

Winch Oil Sump . . . . . 16 gal. (60.6 l)

Implement Data

Bulldozer Blade Assembly:

- Type 7S
- Weight . . . . . 7,660 lb (3,478 kg)
- Height . . . . . 4 ft 2 in. (1.3 m)
- Width . . . . . 12 ft (3.7 m)

Ripper:

- Weight . . . . . 5,700 lb (2,588 kg)
- Width . . . . . 87 in. (2.2 m)

Winch:

- Model . . . . . Caterpillar Model 57
- Weight . . . . . 3,600 lb (1,634 kg)
- Wire Rope Length . . . . . 177 ft (53.9 m)
- Wire Rope Length at Rebuild . . . . . 200 ft (61.0 m) is installed at rebuild if cable is bad or less than 175 ft (53 m) long

END OF WORK PACKAGE

THEORY OF OPERATION 0003 00

INTRODUCTION

1. This work package explains how components of the D7G Tractor work together. A functional description for equipment operation is given for the following: power train, engine lubrication system, fuel system, air inlet and exhaust system, engine cooling system, steering and brake system, electrical system, machine and ripper hydraulic system, and winch hydraulic system.
2. More complete system theory of operation is located immediately preceding the work packages in Chapter 3 that deal with specific machine functional groups. See the Table of Contents.

NOTE

For information on the following systems, refer to the corresponding work package in parenthesis.

- **Hydraulic (WP 0198 00)**
- **Track (WP 0130 00)**
- **Transfer and Final Drive (WP 0123 00)**
- **Transmission (WP 0103 00)**

POWER TRAIN

1. **Engine.** The D7G is powered by an in-line six cylinder, direct injection diesel engine with scroll fuel system.

2. **Torque Divider.** The torque divider connects the engine to the planetary transmission. This connection is both a hydraulic connection and a mechanical connection. The hydraulic connection is through a torque converter. The mechanical connection is through the planetary gear set.

3. **Universal Joint.** The universal joint connects the torque divider to the transmission and transfers the power at the torque divider to the transmission.

4. **Transmission.** The transmission has three speeds FORWARD and three speeds REVERSE. Valve spools, in the transmission hydraulic controls, control the clutches in the transmission for the speed and direction of the tractor. The valve spools are connected to the transmission control lever. This is a powershift transmission.

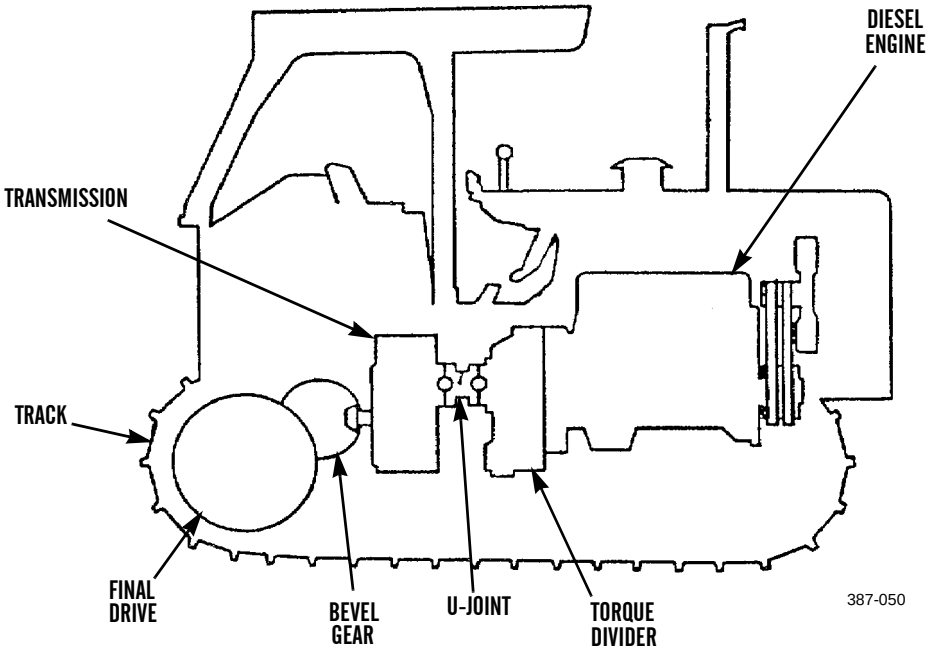
5. **Bevel Gear, Brakes and Steering Clutches.**

   a. The bevel gear transfers the power from the transmission to the steering clutches and final drives. The steering clutches are controlled from the operator's station by two levers which are connected to the hydraulic clutch valves through a series of linkages.

   b. The brakes are controlled by pedals in the operator's station. The pedals are mechanically linked to the hydraulic control valve. The brakes are also activated when the steering levers are fully extended. This permits the tractor to make a sharper turn.

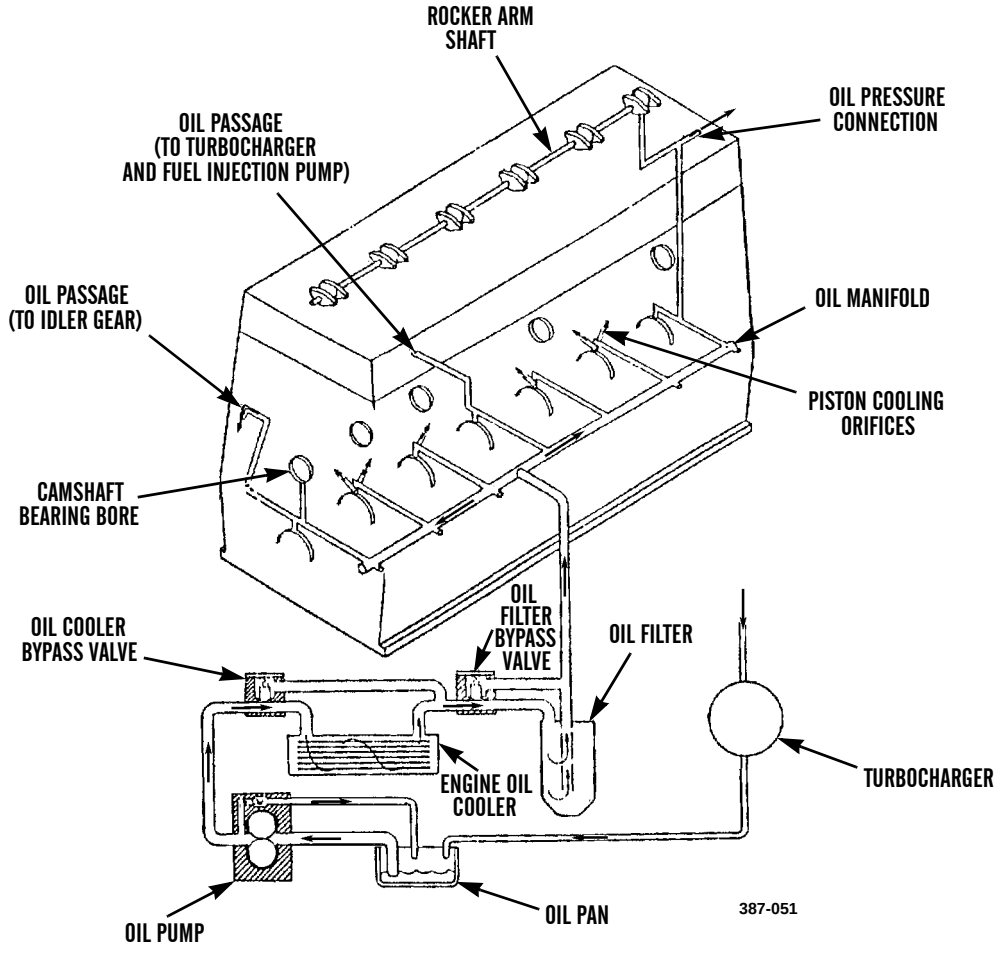
6. **Final Drives.** Driven by gears which transfer power from the steering clutches to the final drive shafts. Attached to the final drive shaft is the sprocket which turns the track.

7. **Track.** Driven by the sprocket, the track moves the tractor forward or backward.



ENGINE LUBRICATION SYSTEM

1. **Oil Lines.** Provide passage for oil through the lubrication system.
2. **Oil Cooler Bypass Valve.** Provides immediate lubrication to the engine when starting the engine cold. When the oil warms, the valve will close and the oil will pass through the oil cooler. The valve also allows the engine to be lubricated when the cooler has blockage.
3. **Oil Filter Bypass Valve.** When the engine is started cold, the valve opens and allows for immediate lubrication of the engine. The valve will also open if the oil filter has blockage.
4. **Oil Filter.** Removes harmful particles from the engine lubricating oil.
5. **Oil Cooler.** Reduces the temperature of the engine lubricating oil by transferring the heat of the oil to the engine cooling system.
6. **Oil Pump.** Gear driven by the crankshaft, the pump causes oil to circulate through the engine lubricating system.
7. **Oil Pan.** Provides containment for the engine lubricating oil. Also seals the bottom of the engine.

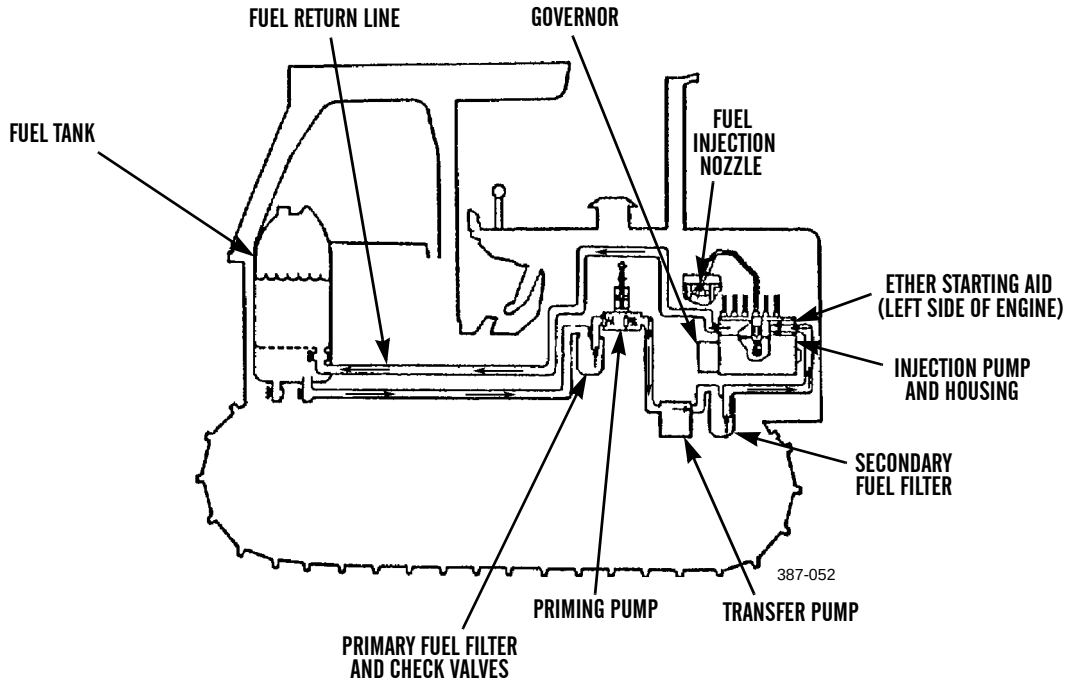


FUEL SYSTEM

NOTE

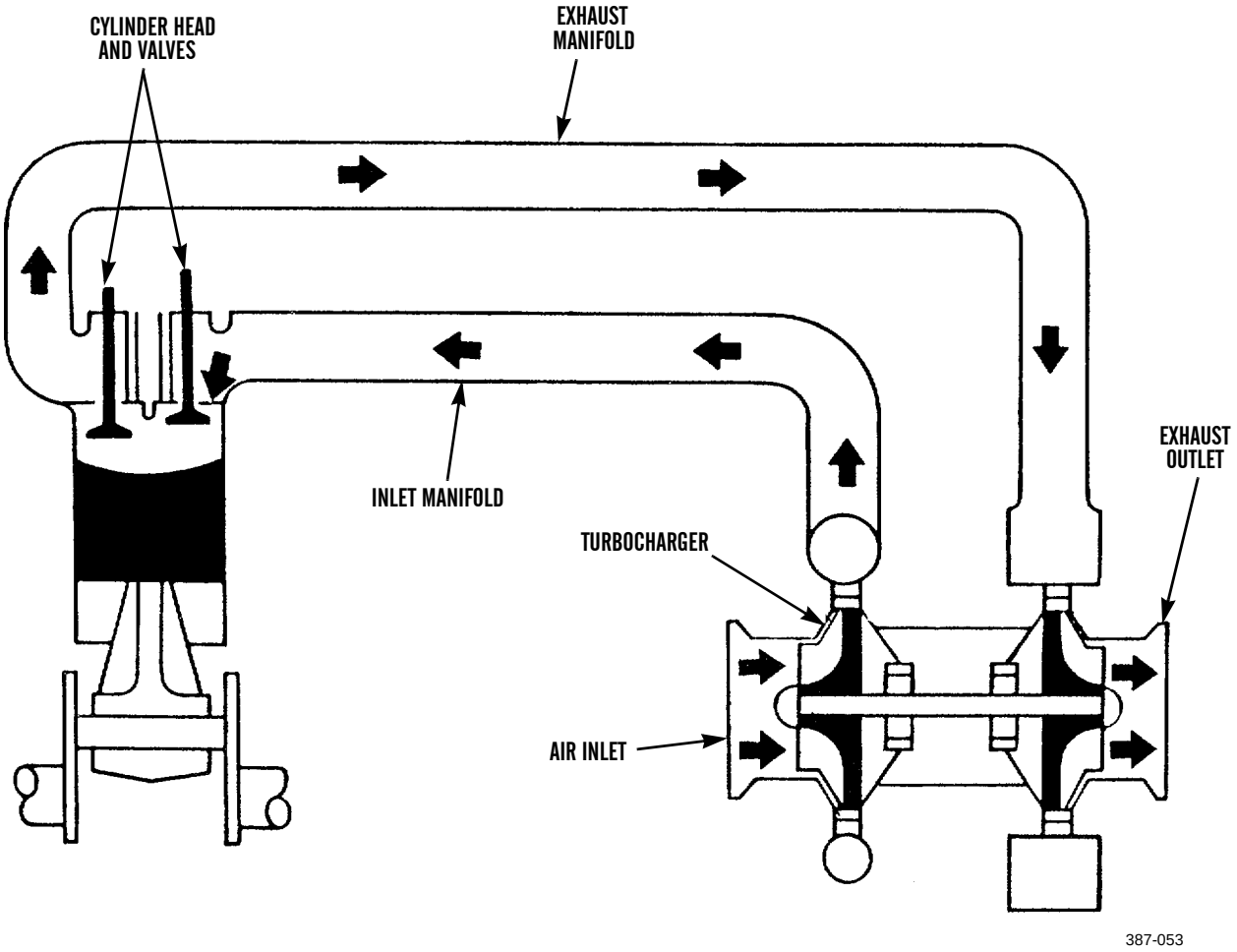
Refer to WP 0039 00 for more detailed fuel system theory of operation information.

1. **Fuel Tank.** Provides containment for fuel. It is located at the rear of the tractor.
2. **Fuel Return Line.** Provides a return route to the fuel tank for unused fuel. By allowing fuel to make a continual flow through the system, the fuel is kept cool and free of air.
3. **Priming Pump.** Used to manually prime the fuel system. The fuel system must be primed whenever there is an interruption in the fuel supply.
4. **Fuel Injection Nozzle.** The nozzle goes through the cylinder head into the combustion chamber. Fuel is sent with high pressure to the nozzle where the fuel is made into a fine spray for good combustion.
5. **Fuel Injection Pump.** Increases the pressure of the fuel, and sends an exact amount of fuel to the fuel injection nozzle. There is one fuel injection pump for each cylinder of the engine.
6. **Primary Fuel Filter.** Filters all fuel coming from the fuel tank before the fuel enters the transfer pump.
7. **Check Valves.** Controls the flow of the fuel at the primary fuel filter. Also works in conjunction with the priming pump to rid the system of air.
8. **Fuel Transfer Pump.** Pulls fuel from the fuel tank and pushes it through the system to the fuel manifold in the injection pump housing.
9. **Secondary Fuel Filter.** Filters fuel a second time before it reaches the injection pump manifold.
10. **Fuel Injection Pump Housing.** Contains the fuel manifold and the injection pumps. The governor attaches to the housing.
11. **Governor.** Controls the amount of fuel needed by the engine to maintain a desired rpm.
12. **Ether Starting Aid.** Delivers a measured amount of ether into the inlet manifold to make cold weather starting easier. The ether is stored under pressure in a cylinder. It is electrically activated from a button in the operator compartment.



AIR INLET AND EXHAUST SYSTEM

1. **Exhaust Manifold.** Carries the exhaust gases from the cylinders to the turbocharger.
2. **Inlet Manifold.** Diverts compressed air into the engine cylinders where it is mixed with fuel for combustion.
3. **Cylinder Head and Valves.** The valves which are contained in the cylinder heads control the flow of inlet air into and exhaust gases out of the cylinder during engine operation.
4. **Turbocharger.** Pulls in clean air from the air filter and compresses it. The compressed air is pushed to the inlet manifold of the engine. The turbocharger is driven by engine exhaust gases which turn the turbine wheel and the compressor wheel.
5. **Air Inlet.** The side of the turbocharger which draws air from the air filter.
6. **Exhaust Outlet.** Sends exhaust gases through the exhaust pipe and out the muffler.

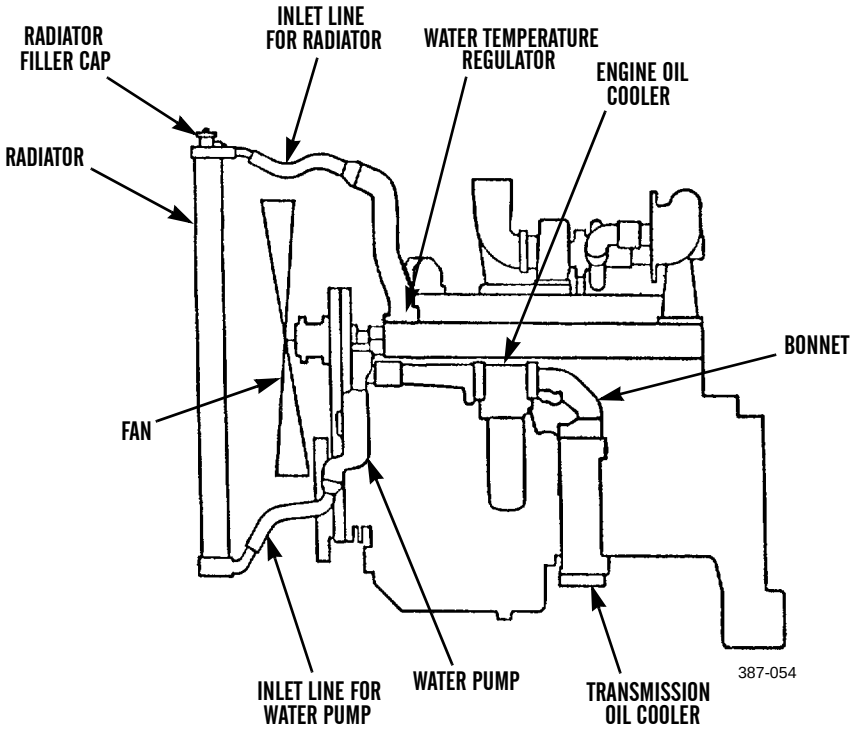


ENGINE COOLING SYSTEM

NOTE

Refer to WP 0064 00 for more detailed Cooling System theory of operation information.

1. **Radiator Filler Cap.** The filler cap allows access to service cooling system. A pressure relief valve on top of the radiator controls pressure in the cooling system.
2. **Radiator.** A sealed pressure type in which coolant flows through the inside of the core. The coolant is cooled in the core by the action of air flowing around the radiator fins.
3. **Inlet Line for Radiator.** Provides a passage for the coolant to return to the radiator to be cooled.
4. **Water Temperature Regulator.** Controls the temperature of the coolant by restricting the amount of coolant flow to the radiator. When the engine is cold, the regulator will stop the flow of coolant to the radiator and allow the coolant to recirculate in the cylinder block until it is warm. When the coolant warms, the regulator will open and allow the coolant to flow through the radiator. This process helps maintain a steady engine temperature.
5. **Engine Oil Cooler.** Coolant flows through one chamber and lubricating oil through another. The coolant lowers the lubricating oil temperature.
6. **Inlet Line for Water Pump.** Provides passage for the coolant from the radiator to the water pump.
7. **Water Pump.** Pushes the coolant through the cooling system.
8. **Bonnet.** Provides a passage for coolant between the engine oil cooler and the transmission oil cooler.
9. **Transmission Oil Cooler.** Reduces the temperature of the transmission oil by transferring the heat of the oil to the engine cooling system.
10. **Fan.** Driven by two V-belts from a pulley on the crankshaft. The fan forces air to circulate around the radiator cooling fins. This action helps reduce the temperature of the coolant.

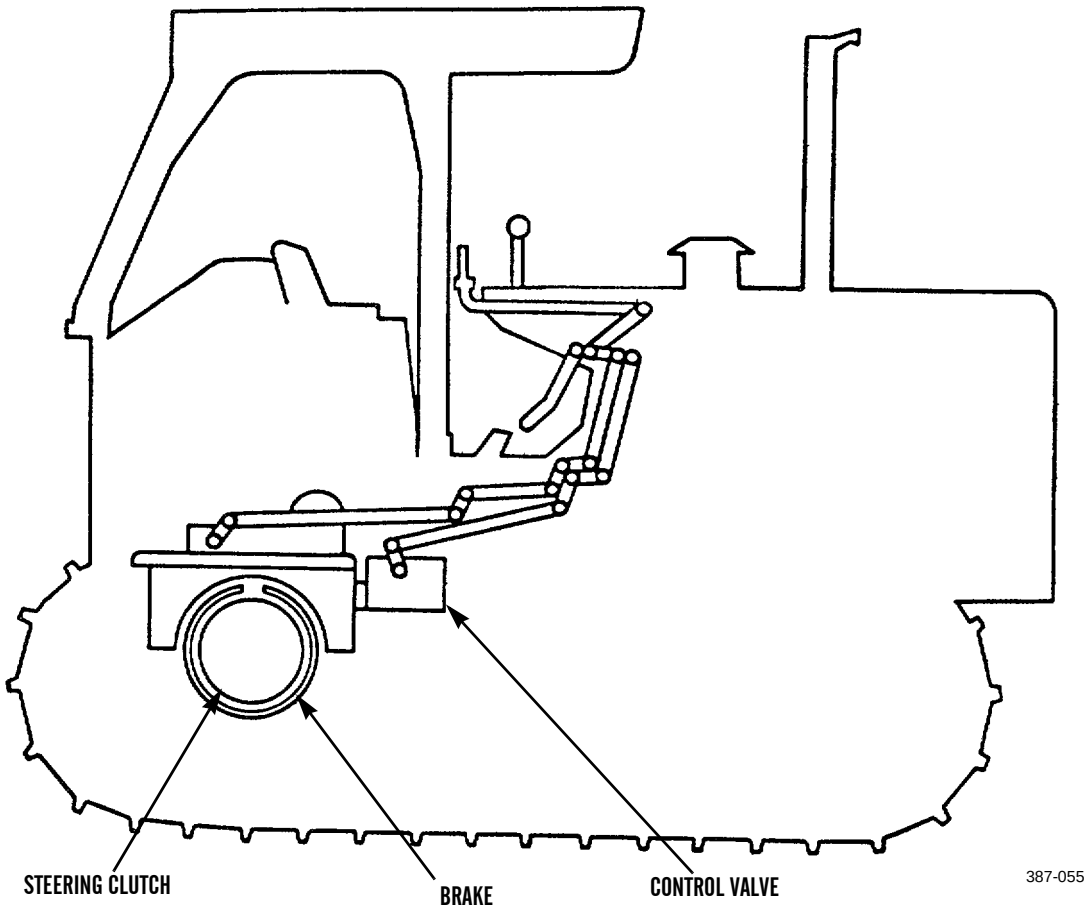


STEERING AND BRAKE SYSTEM

NOTE

Refer to WP 0144 00 for more detailed steering and brake system theory of operation information.

1. **Control Valve.** The valve is connected mechanically to the steering control levers. The valve directs the flow of pressurized oil in response to the movement of the control levers.
2. **Steering Clutch.** One for each track, it controls the steering of the tractor. Hydraulically operated, it is controlled by the steering lever in the operator station. When turning left, the left clutch is released. This causes the left track to stop moving and act as a pivot for the tractor to turn on. The reverse happens when turning right.
3. **Brakes.** The tractor has two band-type brakes (one on each steering clutch drum) which are used to stop the movement of the tractor and to assist with the steering of the tractor. When the steering levers are pulled completely out, or the brake pedals are depressed, the bands tighten around the steering clutch drum.



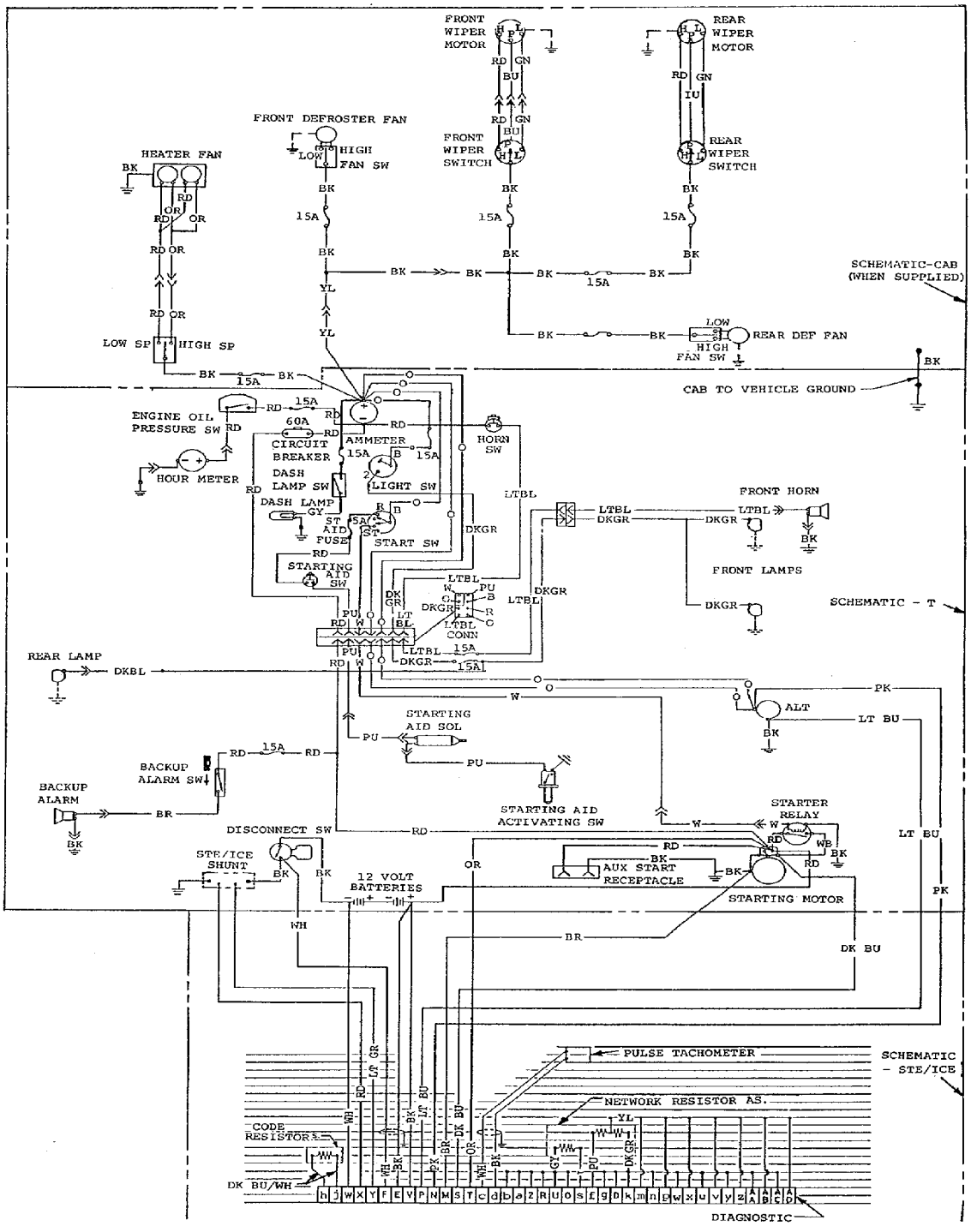
ELECTRICAL SYSTEM

NOTE

Refer to WP 0075 00 for more detailed electrical system theory of operation information.

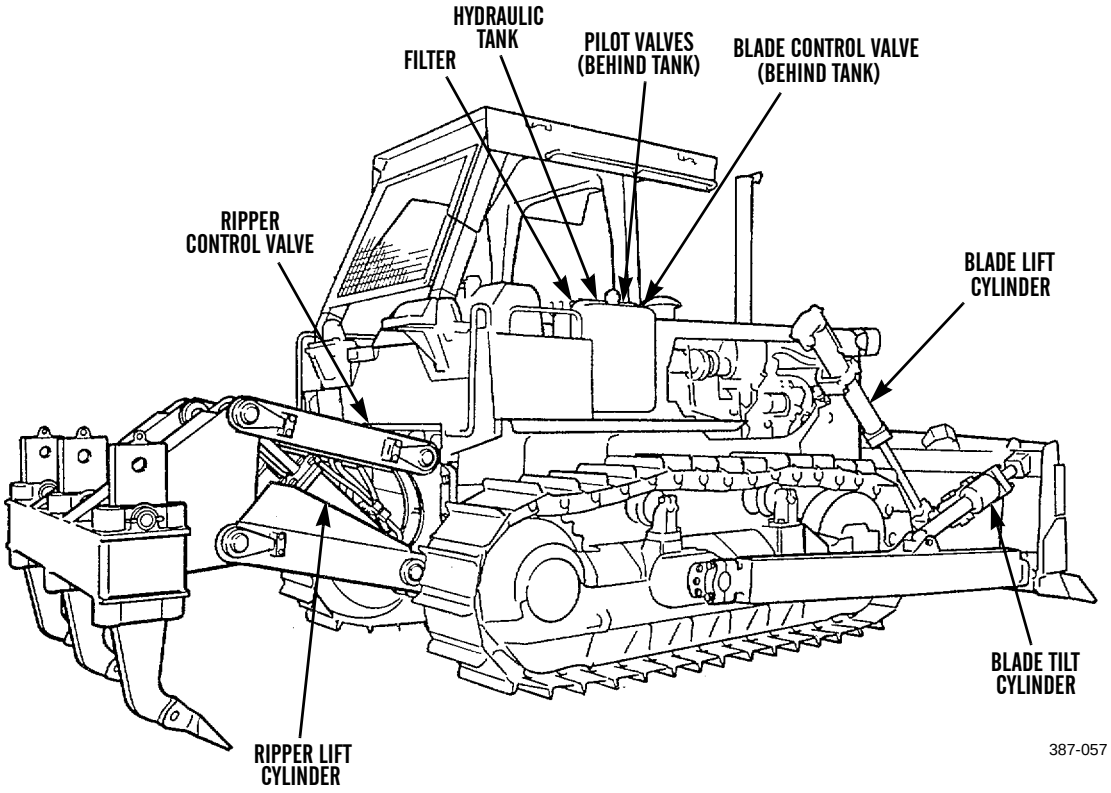
1. **General**. The electrical system has three separate circuits: the charging circuit, starting circuit and lighting circuit. Some electrical system components are used in more than one circuit. The batteries, battery disconnect switch, circuit breaker, cables and wires from the batteries are common in each of the circuits. The lighting circuit and charging circuit are both connected through the ammeter. The starting circuit is not connected through the ammeter.
2. **Starting Circuit.** When the starter switch is turned to the START position, the starter relay is closed and current is delivered to the starter solenoid. The solenoid engages the drive clutch and the starter rotates the flywheel, starting the engine.
3. **Charging Circuit.** The charging circuit is in operation when the engine is running. The alternator makes electricity for the charging circuit. A voltage regulator in the circuit controls the electrical output to keep the battery at full charge.
4. **Batteries.** Two 12-volt batteries are used on the tractor. The batteries are contained in a battery box at the rear of the tractor. Batteries are connected in series to provide 24-volt starting power for the tractor. A 24-volt, 50-amp alternator provides current when the engine is running and charges the batteries.
5. **Battery Disconnect Switch.** A disconnect switch connects or disconnects the batteries from the tractor electrical system. The starting circuit can operate only after the battery disconnect switch is in the ON position.
6. **Lighting.** The lighting system consists of two headlights mounted to the hood, one floodlight at the rear of the machine and a dash light. Control of the lights is by the dash light switch and the exterior light switch. The lighting circuits are protected by fuses located on the instrument panel.
7. **Horns.** The electrical horn button provides warning of the tractor's approach when pressed by the operator. A backup warning alarm sounds whenever the transmission selector lever is in REVERSE.
8. **Winterized Cab Electrical System.**
   a. **Heater Control Switch.** The winterized cab heater uses a three-position toggle switch. The heater's electrical circuits are protected by a fuse on the instrument panel.
   b. **Front and Rear Defroster Control Switches.** The winterized cab uses two, three-position toggle switches to control the front and rear defroster fans. The defroster electrical circuits are protected by a fuse on the instrument panel.
   c. **Window Wiper Switches.** Electrical window wipers on the winterized cab are controlled by two switches at the rear of the cab. Each window wiper circuit is protected by a fuse.

ELECTRICAL SYSTEM - CONTINUED



MACHINE AND RIPPER HYDRAULIC SYSTEM

1. **Hydraulic Tank.** Provides containment for the oil which flows through the pilot and main hydraulic systems.
2. **Filter.** Removes harmful particles from the hydraulic oil before they can enter the system. It is located in the hydraulic tank.
3. **Blade Pilot Valve.** Actuates the blade control valve for blade tilt. The blade pilot valve is actuated mechanically by the blade tilt control lever and linkages.
4. **Ripper Pilot Valve.** Actuates the ripper control valve for ripper lift. The ripper pilot valve is actuated mechanically by the ripper lift control lever and linkages.
5. **Blade Control Valve.** Controls oil going to cylinders for blade tilt and lift. Blade tilt is hydraulically actuated by the blade pilot valve, and blade lift is mechanically activated by the blade lift control lever and linkages.
6. **Ripper Control Valve.** Controls oil going to cylinders for ripper lift. Ripper lift is hydraulically actuated by the ripper pilot valve.
7. **Blade Tilt Cylinder.** Activated when the blade tilt control lever actuates the pilot valve and sends pressure oil through the control valve to the tilt cylinder.
8. **Blade Lift Cylinder.** Activated when the blade control lever actuates the control valve and sends pressurized oil to the lift cylinders.
9. **Ripper Lift Cylinder.** Activated when the ripper control lever actuates the pilot valve and sends pressurized oil through the ripper control valve to the lift cylinders.

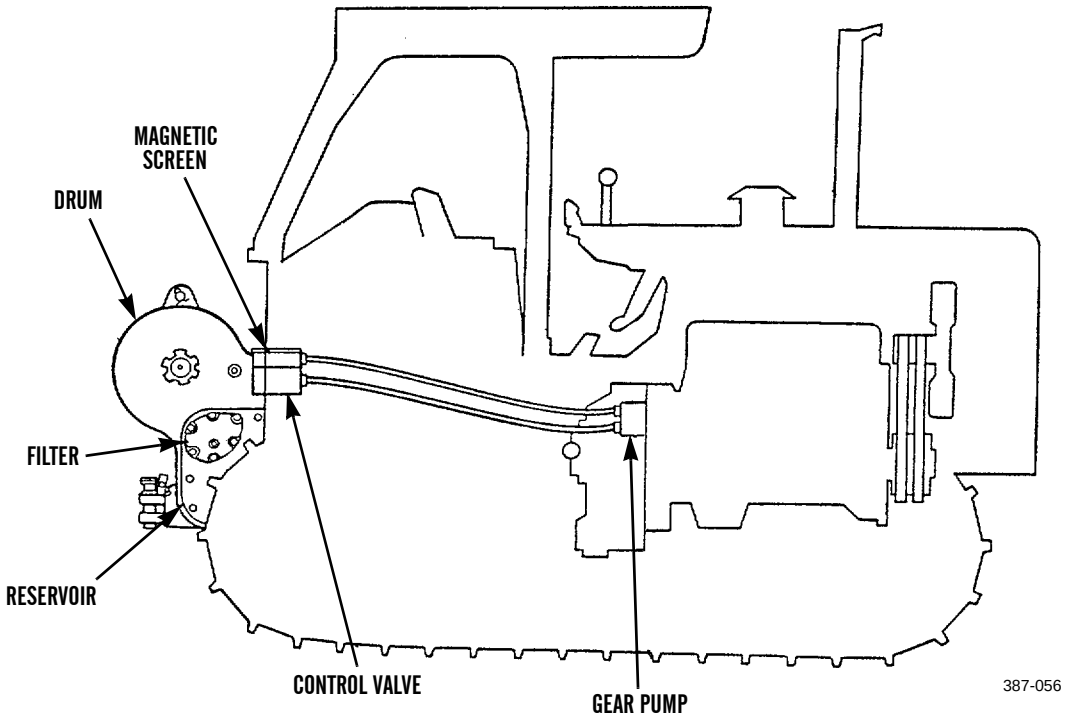


WINCH HYDRAULIC SYSTEM

NOTE

Refer to WP 0178 00 for more detailed winch theory of operation information.

1. **Reservoir.** Located in the bottom of the winch case, the reservoir provides oil for the hydraulic control and lubrication system.
2. **Magnetic Screen.** Removes metal particles and other harmful debris from the oil before it reaches the pump.
3. **Gear Pump.** Pulls oil from the reservoir and pushes it through the system.
4. **Control Valve.** Connected mechanically by a series of linkages to the control lever in the operator station. It controls oil pressure to the input and directional clutches.
5. **Filter.** All oil flow from the pump outlet not used for clutch engagement or disengagement, or for lubrication of the winch components, goes through the filter before returning to the reservoir.
6. **Drum.** A wire rope attaches to the right side of the drum and is used to perform all types of winching operations.



END OF WORK PACKAGE

CHAPTER 2
FIELD TROUBLESHOOTING PROCEDURES

TROUBLESHOOTING INTRODUCTION 0004 00

INTRODUCTION

1. Troubleshooting procedures in this chapter contain information you need to fault locate malfunctions on the D7G Tractor and its components.
2. Troubleshooting procedures are located as follows:
   a. Tables 1 through 5 in WP 0006 00 contain mechanical troubleshooting procedures.
   b. Table 6 in WP 0006 00 contains electrical troubleshooting procedures.
   c. Simplified Test Equipment for Internal Combustion Engines (STE-ICE) troubleshooting is located in WP 0007 00.
3. A *Troubleshooting Symptom Index* in WP 0005 00 is provided to aid in locating a malfunction or symptom and directs you to the appropriate troubleshooting procedure in WP 0006 00 or WP 0007 00.
4. Troubleshooting procedures in this manual cannot provide all the answers or correct all malfunctions encountered. However, these procedures are an organized step-by-step approach to a problem, that directs tests and inspections toward the source of the problem and its successful resolution.
5. If a malfunction is not listed in the *Troubleshooting Symptom Index* in WP 0005 00, or stated tests or inspections and corrective actions do not correct the problem, notify your supervisor.
6. Before performing troubleshooting, read and follow all safety instructions found in the Warning Summary at the front of this manual.

PRELIMINARY TROUBLESHOOTING PROCEDURES

1. Before starting any specific troubleshooting procedures, perform the following:

NOTE

Fluid leaks are classified as either Class I, Class II or Class III.

Class I: Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

Class II: Leakage of fluid great enough to form drops, but not enough to cause drops to drip from item being checked/inspected.

Class III: Leakage of fluid great enough to form drops that fall from item being checked/inspected.

   a. Visually check for ruptured fluid hoses or tubes and for Class II or Class III leaks.
   b. Check for mechanical jamming or binding caused by rocks or other foreign matter.
   c. Check fluid levels in subject area and service as required (TM 5-2410-237-10 or WP 0009 00 and WP 0010 00 in this manual).
2. Ensure all applicable Operator Troubleshooting has been performed before proceeding.

EXPLANATION OF TROUBLESHOOTING TABLE COLUMNS

The columns in troubleshooting Tables 1 through 6 in WP 0006 00 are defined as follows:

1. **MALFUNCTION.** Indicates fault that has occurred in system/equipment.
2. **TEST OR INSPECTION.** Indicates test or inspection to be performed to isolate probable cause for fault symptom.
3. **CORRECTIVE ACTION.** Indicates procedure to correct the problem.

ELECTRICAL TROUBLESHOOTING - GENERAL INFORMATION

NOTE

Refer to *Electrical General Maintenance Instructions* (WP 0242 00) for instructions on using a multimeter to check for continuity or shorts and to perform voltage checks.

1. Analyze the symptoms and conditions and determine the most likely cause for the problem, then troubleshoot that circuit first. The more information you have concerning the problem, the easier it will be to troubleshoot.
2. Isolate to the subsystem level (in cases where more than one subsystem is involved); next isolate the problem to a single circuit within the subsystem; then, isolate the problem to the faulty component using the *Troubleshooting Symptom Index* (WP 0005 00).
3. Frayed, broken, loose or corroded wiring is a common source of problems in any electrical circuit. Always make visual inspection before starting detail troubleshooting. Observe in particular contacts to ground. Components with case grounds are especially troublesome.

CAUTION

When making continuity checks, ensure the test equipment is isolated from power source.

4. Most of checks made are voltage checks. Pay particular attention to voltages being checked in procedures. This equipment is a 24 volt system. Instructions prior to the step instruct to disconnect at test point from the potential malfunctioning component. Once the check has been made, either repair the component or go to the referenced step. If going to another step, reconnect connection or do as otherwise instructed, such as install jumper wires using jumper wire kit. When ready to make the prescribed check, apply power to the circuit (if required). A helper may be required if the switch or power source is out of reach. Release the power function prior to going on, to avoid damage to equipment.

END OF WORK PACKAGE

TROUBLESHOOTING SYMPTOM INDEX 0005 00

NOTE

The following indices are included in this work package:

- **Electrical Troubleshooting Symptom Index;**
- **Mechanical Troubleshooting Symptom Index;**
- **STE-ICE Troubleshooting Index.**

ELECTRICAL TROUBLESHOOTING SYMPTOM INDEX

MECHANICAL TROUBLESHOOTING SYMPTOM INDEX

MECHANICAL TROUBLESHOOTING SYMPTOM INDEX - CONTINUED

STEERING SYSTEM

TRANSMISSION

WINCH

STE-ICE TROUBLESHOOTING INDEX

END OF WORK PACKAGE

Table 1. Engine Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ENGINE	
1. Engine Fails to Crank.	1. See *Electrical Troubleshooting*, Table 6.	
	2. Check engine for seizure:	
	a. With fuel injection nozzles removed, Try to turn crankshaft manually (WP 0040 00).	
	b. If crankshaft will not rotate, engine has internal damage.	Replace engine assembly (WP 0021 00).
	c. If crankshaft turns and liquid is discharged from nozzle holes, check if liquid is coolant or fuel.	If liquid is coolant, replace cylinder head (WP 0025 00).
		If liquid is fuel, test fuel injection nozzles. Replace defective nozzle(s) (WP 0040 00).
2. Engine Cranks But Fails to Start.	1. Verify with operator that correct fuel was used.	If incorrect fuel was used:
		a. Drain fuel system.
		b. Replace fuel filters (WP 0059 00 or WP 0060 00).
		c. Fill fuel tank with correct fuel (TM 5-2410-237-10).
		d. Prime fuel system (WP 0041 00).
	2. Check fuel for water or contamination.	
	a. Open draincock (WP 0052 00) and drain into clean glass container. If container is 1/4 full of water, or if dirt is evident, fuel is contaminated.	1. Drain fuel tank (WP 0052 00) completely
		2. Replace fuel filters (WP 0059 00 or WP 0060 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. Engine Cranks But Fails to Start - Continued.		3. Fill fuel tank with correct grade of clean fuel (TM 5-2410-237-10).
		4. Prime fuel system (WP 0041 00).
	b. Disconnect fuel lines between tank shutoff valve and primary fuel filter (WP 0059 00) and check for obstruction.	1. Clean lines with compressed air or sturdy wire and reconnect (WP 0053 00).
		2. Replace fuel filters (WP 0059 00 or WP 0060 00).
		3. Prime fuel system (WP 0041 00).
	3. Check fuel pressure gauge.	If indicator is in the red, replace fuel filters (WP 0059 00 or WP 0060 00).
	4. Inspect fuel lines and connections for leaks, obstructions and damage.	1. If a leak is at a connection, tighten.
		2. If a leak results from cracked, split or damaged tubing, replace tubing (WP 0053 00).
	5. Check governor setting (WP 0057 00).	Adjust governor low or high idle (WP 0057 00).
	6. Check fuel injection timing (WP 0057 00).	Adjust fuel injection timing (WP 0057 00).
	7. Perform cylinder cutout test (WP 0043 00).	Replace fuel injection nozzle(s) for suspect cylinder (WP 0040 00).
	8. Check for slipping fuel injection pump drive. Remove fuel transfer pump (WP 0042 00). Crank engine and look through fuel transfer pump mounting openings to see if shaft rotates.	If shaft does not rotate, remove small cover from timing gear cover and tighten accessory drive gear retaining nut. If tightening corrects slipping condition, time fuel injection pump (WP 0057 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. Engine Cranks Slowly, Hard to Start.	1. In cold weather, make sure proper engine oil is being used (WP 0009 00).	Replace oil (WP 0011 00).
	2. Check starting circuits. Refer to *Electrical Trouble-shooting.*	
4. Engine Starting Motor Operates, Does Not Engage Flywheel Ring Gear.	Check for broken or damaged flywheel teeth or starter driver	
	a. Remove starting motor (WP 0078 00) and inspect starter drive for damages teeth.	Replace defective starter (WP 0078 00).
	b. Manually turn engine and inspect flywheel ring gear teeth through starting motor opening in flywheel housing.	Replace defective fly-wheel assembly (WP 0030 00).
5. Engine Misfires or Runs Rough.	1. Check air cleaner for air restriction.	Inspect air cleaner for restrictions. Clean air inlet and service air cleaner filter elements (WP 0045 00).
	a. Open draincock (WP 0052 00) and drain into clean glass container. If container is 1/4 full of water, or if dirt is evident, fuel is contaminated.	1. Drain fuel tank (WP 0052 00) completely
		2. Replace fuel filters (WP 0059 00or WP 0060 00).
		3. Fill fuel tank with correct grade of clean fuel (TM 5-2410-237-10).
		4. Prime fuel system (WP 0041 00).
	b. Disconnect fuel lines between tank shutoff valve and primary fuel filter (WP 0059 00) and check for obstruction.	1. Clean lines with compressed air or sturdy wire and reconnect (WP 0053 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Engine Misfires or Runs Rough - Continued.		2. Replace fuel filters (WP 0059 00 or WP 0060 00).
		3. Prime fuel system (WP 0041 00).
	2. Check fuel pressure gauge.	If indicator is in the red, replace fuel filters (WP 0059 00 or WP 0060 00).
	3. Inspect fuel lines and connections for leaks, obstructions and damage.	1. If a leak is at a connection, tighten.
		2. If a leak results from cracked, split or damaged tubing, replace tubing (WP 0053 00).
	4. Check fuel injection lines for air.	Bleed air from fuel injection lines (WP 0041 00).
	5. Check valve clearance.	Adjust valve clearance (WP 0018 00).
	6. Check fuel injection timing (WP 0057 00).	Adjust timing (WP 0057 00).
	7. Perform cylinder cutout test (WP 0043 00).	1. If fuel pressure at suspect cylinder fuel injection nozzle appears to be equal to pressure at all other fuel injection nozzles, replace fuel injection pump as necessary (WP 0055 00).
		2. If pressures are not equal, remove blockage from nozzle-to-pump fuel line or replace nozzle for suspect cylinder (WP 0040 00).
	8. Check for worn, bent or broken push rod (WP 0018 00).	Replace push rod (WP 0018 00).
	9. Remove cylinder head and inspect valve lifters (WP 0032 00).	Replace damaged valve lifters (WP 0032 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Engine Starts But Fails to Keep Running.	1. Check air cleaner for air restriction.	Clean air inlet and service air cleaner filter elements (WP 0045 00).
	2. Check fuel for contamination.	
	a. Open draincock (WP 0052 00) and drain into clean glass container. If container is 1/4 full of water, or if dirt is evident, fuel is contaminated.	1. Drain fuel tank (WP 0052 00) completely
		2. Replace fuel filters (WP 0059 00 or WP 0060 00).
		3. Fill fuel tank with correct grade of clean fuel (TM 5-2410-237-10).
		4. Prime fuel system (WP 0041 00).
	b. Disconnect fuel lines between tank shutoff valve and primary fuel filter (WP 0059 00) and check for obstruction.	1. Clean lines with compressed air or sturdy wire and reconnect (WP 0053 00). 2. Replace fuel filters (WP 0059 00 or WP 0060 00).
		3. Prime fuel system (WP 0041 00).
	3. Inspect fuel lines and connections for leaks, obstructions and damage.	1. If a leak is at a connection, tighten.
		2. If a leak results from cracked, split or damaged tubing, replace tubing (WP 0053 00).
	4. Check fuel pressure at gage on filter base. Fuel transfer pump should supply enough pressure so that gage reads in green zone at high. If not, replace gage and check for 25 psi (172 kPa) minimum at full load and 30 psi (207 kPa) minimum at high idle.	Repair or replace transfer pump (WP 0042 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Engine Starts But Fails to Keep Running - Continued.	5. Check engine low idle speed.	Adjust governor low idle rpm (WP 0057 00).
	6. Perform cylinder cutout test (WP 0043 00).	Replace nozzle for suspect cylinder (WP 0040 00).
	7. Check for defective or leaking fuel injection pump(s).	Replace pump(s) (WP 0055 00).
7. Poor Acceleration and/or Lack of Power.	1. Check with operator to determine if fuel tank was filled with correct fuel. If incorrect fuel was put in, perform the following tasks:	
		a. Drain fuel system (WP 0052 00).
		b. Replace fuel filters (WP 0059 00 or WP 0060 00).
		c. Fill fuel tank with correct fuel (TM 5-2410-237-10).
		d. Prime fuel system (WP 0041 00).
	2. Check air cleaner for air restriction.	Clean air inlet and service air cleaner filter elements (WP 0045 00).
	3. Remove and inspect fuel ratio line from between turbocharger and governor housing.	Clean lines with compressed or sturdy wire. Replace line if damaged (WP 0053 00).
	4. Disconnect fuel lines between tank shutoff valve and primary fuel filter (WP 0059 00) and check for obstruction.	1. Clean lines with compressed air or sturdy wire and reconnect (WP 0053 00).
		2. Replace fuel filters (WP 0059 00 or WP 0060 00).
		3. Prime fuel system (WP 0041 00).
	5. Inspect fuel lines and connections for leaks, obstructions and damage.	1. If a leak is at a connection, tighten.

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. Poor Acceleration and/or Lack of Power - Continued.		2. If a leak results from cracked, split or damaged tubing, replace tubing (WP 0053 00).
	6. Check exhaust system for restrictions.	Remove restrictions and/or replace exhaust system part(s) (WP 0062 00).
	7. Perform cylinder cutout test (WP 0043 00).	1. If fuel pressure at suspect cylinder fuel injection nozzle appears to be equal to pressure at all other fuel injection nozzles, replace fuel injection pump as necessary (WP 0055 00).
		2. If pressures are not equal, remove blockage from nozzle-to-pump fuel line or replace nozzle for suspect cylinder (WP 0040 00).
	8. Check fuel injection timing (WP 0057 00).	Adjust timing (WP 0057 00).
	9. Inspect for full governor linkage travel.	Adjust governor linkage travel (WP 0058 00).
	10. Check fuel pressure at fuel injector housing inlet. Pressure must be at least 15 psi (105 kPa).	1. If fuel pressure is below 15 psi (105 kPa), replace primary fuel filter (WP 0059 00).
		2. If fuel pressure is below 15 psi (105 kPa), replace fuel transfer pump (WP 0042 00).
	11. Check valve clearance.	1. Adjust valve clearance (WP 0018 00).
		2. If problem still exists, replace turbocharger (WP 0049 00).
8. Engine Speed Unstable or Surges at All Speeds.	1. Remove and inspect fuel ratio line from between turbocharger and governor housing.	Clean lines with compressed or sturdy wire. Replace line if damaged (WP 0053 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
8. Engine Speed Unstable or Surges at All Speeds - Continued.	2. Disconnect fuel lines between tank shutoff valve and primary fuel filter (WP 0059 00) and check for obstruction.	1. Clean lines with compressed air or sturdy wire and reconnect (WP 0053 00). 2. Replace fuel filters (WP 0059 00 or WP 0060 00). 3. Prime fuel system (WP 0041 00).
	3. Inspect fuel lines and connections for leaks, obstructions and damage.	1. If a leak is at a connection, tighten. 2. If a leak results from cracked, split or damaged tubing, replace tubing (WP 0053 00).
	4. Inspect governor linkage for proper operation and adjustment.	If linkage does not operate properly or is not correctly adjusted, make necessary adjustment (WP 0058 00).
9. Excessive Engine Vibration.	1. Perform cylinder cutout test (WP 0043 00).	1. Replace defective nozzle (WP 0040 00). 2. If nozzle is operating properly, replace fuel injection pump for that cylinder (WP 0055 00).
	2. Check for loose or damaged vibration damper.	1. Tighten vibration damper capscrews to 75 lb-ft (102 Nm). 2. Replace damaged vibration damper (WP 0029 00).
	3. Check for loose or damaged crankshaft pulley.	1. Tighten pulley capscrews to 230 lb-ft (312 Nm). 2. Replace damaged crankshaft pulley (WP 0028 00).
	4. Check fan blade balance. a. Loosen or remove V-belts (WP 0074 00).	

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. Excessive Engine Vibration - Continued.	b. Operate engine at rpm where vibration occurred.	1. If vibration is not noticeable, replace fan drive assembly (WP 0072 00). 2. If vibration is noticeable, go to step 5.
	5. Inspect for loose engine mounting supports.	1. If supports are loose because of wear or damage, replace support(s) (WP 0022 00 and WP 0023 00). 2. If mounting supports are not damaged or worn, but are loose, tighten mounting supports-to-fram capscrews to 325 lb-ft (441 Nm). Securely tighten front supports-to-engine and rear supports-to-flywheel housing capscrews.
10. Engine Knocks (Fuel Knock).	1. Check with operator to determine if fuel tank was filled with correct fuel.	If incorrect fuel was put in, perform the following tasks: a. Drain fuel system (WP 0052 00). b. Replace fuel filters (WP 0059 00 or WP 0060 00). c. Fill fuel tank with correct fuel (TM 5-2410-237-10). d. Prime fuel system (WP 0041 00).
	2. Check fuel injection lines for air.	Bleed air from fuel injection lines (WP 0041 00).
	3. Perform cylinder balance test (WP 0043 00).	1. Replace defective nozzle (WP 0040 00). 2. If nozzle is operating properly, replace fuel injection pump for that cylinder (WP 0055 00).
	4. Check fuel injection timing (WP 0057 00).	3. Adjust timing, if necessary (WP 0057 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
11. Engine Knocks (Excessive Mechanical Noise).	Engine has internal damage.	Replace engine assembly (WP 0021 00).
12. Excessive Noise From Valve Mechanism (Clicking Sound).	1. Check valve clearance.	Adjust valves (WP 0018 00).
	2. Inspect valve mechanism.	Replace damaged components (WP 0019 00).
	3. Remove valve mechanism cover (WP 0017 00). Check lubrication flow at valve mechanism. There must be strong oil flow at high engine rpm and small oil flow at low rpm.	If there is low oil flow, perform oil pressure check #14 (refer to STE-ICE troubleshooting).
	4. Check valve springs and locks. Damaged or worn locks can cause valve to fall into cylinder, resulting in serious engine damage.	If damage is noted, replace cylinder head assembly (WP 0025 00).
13. Excessive Oil Consumption.	1. Check dipstick for overfilling.	If dipstick indicates excessive oil, drain crankcase to safe operating level (WP 0011 00).
	2. Check for external oil leaks.	a. Wipe off edges of rocker arm cover, oil pan, oil filter, turbocharger, engine oil cooler and other external engine surfaces. b. Start engine and check for leaks. c. Tighten nuts, screws, lines and fittings and oil filter.
	3. Check engine oil temperature.	Clean core of engine oil cooler or replace oil cooler (WP 0020 00).
	4. Check for oil leakage at turbocharger to inlet manifold connection.	If leakage is noted, replace turbocharger (WP 0049 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Excessive Oil Consumption - Continued.	5. Remove valve mechanism cover (WP 0017 00). Check for too much oil in valve mechanism compartment. Ensure there is a plug in each end of rocker shaft (WP 0019 00).	Install plug(s) (WP 0019 00).
	6. Engine has internal damage.	Replace engine assembly (WP 0021 00).
14. Low Oil Pressure.	1. Check oil lines for cracks, splits, leaks, damage and obstructions.	1. Tighten loose fittings and connections. 2. Replace oil lines that are cracked, split or damaged (WP 0051 00). 3. Clear clogged or obstructed lines with compressed air or sturdy wire.
	2. Inspect oil filter for leaks or blockage.	1. Tighten oil filter. 2. If leaking continues, service oil filter (WP 0011 00).
	3. Check for fuel in engine oil.	Drain engine lubricating oil, install new oil filter and refill crankcase (WP 0011 00).
	4. Check for restriction at oil pump inlet.	Clean inlet screen or replace inlet pipe or strainer assembly (WP 0035 00).
	5. Check rocker arm-to-rocker arm shaft clearance (WP 0018 00).	Repair or replace valve mechanism (WP 0019 00).
	6. Inspect engine oil pump.	Replace oil pump (WP 0035 00).
15. Black or Gray Exhaust Smoke.	1. Check air cleaner for air restriction.	Clean air inlet and service air cleaner filter elements (WP 0045 00).
	2. Check for fuel in engine lubricating oil. If fuel is present test injection nozzles (WP 0040 00).	1. Replace defective nozzles (WP 0040 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
15. Black or Gray Exhaust Smoke - Continued.		2. Drain engine lubricating oil, install new oil filter and refill crankcase (WP 0011 00).
	3. Check turbocharger for proper operation.	Replace turbocharger (WP 0049 00).
	4. Check fuel injection timing (WP 0057 00).	Adjust timing (WP 0057 00).
16. White or Blue Exhaust Smoke.	1. Check for coolant in engine oil.	If coolant is present, replace cylinder head gasket (WP 0025 00).
	2. Check for dirty or contaminated engine oil.	Change engine oil and filter (WP 0011 00).
	3. If white smoke is present and engine runs rough, inspect fuel lines and connections for leaks, obstructions and damage	1. If a leak is at a connection, tighten.
		2. Replace damaged fuel lines (WP 0053 00)
	4. Check dipstick for overfilling.	If dipstick indicates excessive oil, drain crankcase to safe operating level (WP 0011 00).
	5. Check for fuel in engine oil.	Drain engine lubricating oil, install new oil filter and refill crankcase (WP 0011 00).
	6. Check for rough running.	See *Malfunction 5*.
	7. Check fuel injection timing (WP 0057 00).	Adjust timing (WP 0057 00).
	8. Inspect air inlet manifold for oil.	If oil is present, replace turbocharger (WP 0050 00).
	9. Valves may be damaged.	Replace cylinder head assembly (WP 0025 00).
	10. Piston rings may be damaged.	Replace engine assembly (WP 0021 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
17. Excessive Fuel Consumption.	1. Check air cleaner for air restriction.	Clean air inlet and service air cleaner filter elements (WP 0045 00).
	2. Inspect fuel lines and connections for leaks.	1. Tighten any loose connections. 2. Replace leaking or damaged fuel lines and connections (WP 0053 00). 3. Prime fuel system (WP 0041 00).
	3. Check for fuel in engine lubricating oil.	Drain engine lubricating oil, install new oil filter and refill crankcase (WP 0011 00).
	4. Perform cylinder cutout test (WP 0043 00).	Replace suspect nozzle(s) (WP 0040 00).
18. Coolant in Engine Lubricating Oil or Engine Lubricating Oil in Cooling System.	1. Inspect cylinder head (WP 0025 00).	1. Replace a damaged or warped cylinder head (WP 0025 00). 2. If cylinder head is not defective, install new cylinder head gasket and spacer plate (WP 0025 00).
	2. Check for a cracked cylinder block.	Replace engine assembly (WP 0021 00).
	3. Inspect engine oil cooler (WP 0020 00).	Replace engine oil cooler (WP 0020 00).
19. Engine Lubricating Oil at Exhaust.	1. There may be internal failure to turbocharger.	Replace turbocharger (WP 0049 00).
	2. There may be damage or worn valve guides.	Replace cylinder head assembly (WP 0025 00).
	3. Piston rings may be damaged.	Replace engine assembly (WP 0021 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
ETHER START SYSTEM		
20. Engine Cranks But Will Not Start in Cold Weather (Fuel System Operating Properly).	1. Check ether canister by removing from valve. Shake canister and listen for liquid splashing inside.	Replace canister if empty (WP 0061 00).
	2. Check starting aid valve for proper operation.	Refer to *Electrical Troubleshooting.*
	3. Check starting aid valve tube assembly for damage.	
	a. Disconnect both ends of tube assembly.	
	b. Inspect tube assembly for kinks, holes and damaged fittings.	1. If tube assembly is not damaged, replace starting aid valve (WP 0061 00).
		2. Replace damaged tube assembly (WP 0061 00).
EXHAUST SYSTEM		
21. Excessive Exhaust Fumes and/or Fumes in Cab.	1. Inspect muffler for wear and damage.	Replace muffler (WP 0062 00).
	2. Inspect muffler-to-turbocharger coupling for wear and damage.	Replace seal, coupling or preformed packing (WP 0062 00).
COOLING SYSTEM		
22. Engine Overheats (According to Engine Water Temperature Gage).	1. Check radiator for airflow obstructions.	Remove obstructions from radiator.
	2. Check coolant level.	If coolant is low, fill to proper level (WP 0065 00).
	3. Inspect for looseness, missing and worn V-belts.	1. Check V-belt tension and adjust as required (WP 0074 00).
		2. Replace missing or worn V-belt (WP 0074 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
23. Engine Overheats (According to Engine Water Temperature Gage) - Continued.	4. Inspect radiator, water pump, transmission oil cooler, engine oil cooler, hoses and hose connections and drain cocks for leaks.	1. Tighten hose clamps and fittings. 2. Tighten or close drain cocks. 3. Replace damaged hose(s) (WP 0068 00 and WP 0071 00). 4. Replace leaking water pump (WP 0070 00). 5. Replace leaking engine oil cooler (WP 0020 00). 6. Repair or replace leaking transmission oil cooler (WP 0109 00).
	5. Test radiator (WP 0066 00). If radiator leaks.	Repair or replace (WP 0068 00).
	6. Inspect fan for cracked or missing blades.	Replace damaged fan (WP 0073 00).
	7. Check fan operation.	If fan does not turn or turn properly after step 2 above, replace fan drive (WP 0072 00).
	8. Test cooling system.	Clean and flush cooling system (WP 0065 00).
	9. Test water temperature regulator for proper operation (WP 0069 00).	Replace water temperature regulator if defective (WP 0069 00).
	10. Check water pump for wear or damage (WP 0070 00).	Replace water pump (WP 0070 00). If problem still exists, replace water temperature gage and sending unit (WP 0084 00).

Table 1. Engine Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
23. Engine Does Not Reach Normal Operating Temperature (According to Engine Water Temperature Gage).	1. Test water temperature regulator for proper operation (WP 0069 00).	1. Replace water temperature regulator if defective (WP 0069 00). 2. Replace water temperature gage and sending unit (WP 0084 00).
24. Loss of Coolant.	1. Test radiator (WP 0066 00). If radiator leaks.	Repair or replace (WP 0068 00).
	2. Check cylinder head and spacer plate for defective gaskets. Also inspect cylinder head and spacer plate.	1. Replace cylinder head and/or spacer plate (WP 0025 00). 2. Replace cylinder head and spacer plate gaskets (WP 0025 00).
	3. Check for a cracked cylinder liners or block.	Replace engine assembly (WP 0021 00).

Table 2. Transmission Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. No Response to Transmission Selector Lever Movement.	1. Check transmission oil level.	Add oil as necessary (WP 0107 00).
	2. Check transmission control linkage.	Tighten and/or adjust linkage (WP 0104 00).
	3. Check for air leaks at inlet side of transmission oil pump.	Tighten connection or replace damaged elbow and seal (WP 0118 00).
2. Incorrect Response to Transmission Selector Lever Movement.	1. Check transmission oil level.	Add oil as necessary (WP 0107 00).
	2. Check transmission control linkage.	Tighten and/or adjust linkage (WP 0104 00).
3. Excessive Noise During Shifting.	1. Check transmission oil level.	Add or replace oil as necessary (WP 0107 00).
	2. Inspect drive shaft and universal joint bearings for looseness, wear and damage.	Tighten or replace damaged components (WP 0129 00).
4. Transmission Downshifts During Operation (No Transmission Selector Lever Movement).	Check for loss of transmission oil pressure caused by low fluid level.	Add transmission oil as necessary (WP 0107 00).
5. Transmission Overheats.	1. Check transmission oil level.	1. If overfill condition exists, drain oil to proper level (WP 0107 00). 2. If low level is indicated, add oil as necessary (WP 0107 00).
	2. Check oil cooler and lines for damage.	If necessary, replace oil cooler and/or damaged lines (WP 0108 00 and WP 0109 00).
	3. Perform transmission oil pressure test (WP 0122 00).	Replace transmission oil pump (WP 0118 00).
	4. Possible clutch discs and plates damage.	Replace transmission assembly (WP 0116 00).

Table 2. Transmission Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Low Transmission Oil Pressure.	1. Check transmission oil level.	Add oil if necessary (WP 0107 00).
	2. Check for damaged oil lines.	Replace damaged line(s) (WP 0110 00).
	3. Perform transmission oil pump pressure tests (WP 0122 00)	Replace transmission oil pump if pressures are not with in required limits (WP 0118 00).
7. Transmission Oil Leakage.	1. Inspect drain plug for leaks	Tighten drain plug.
	2. Inspect oil line connections for leaks.	Tighten oil line connections.
	3. Inspect oil lines for damage	Replace damaged oil lines (WP 0110 00).
8. Transmission Noisy.	1. Check transmission oil level.	Add oil if necessary (WP 0107 00).
	2. Possible clutch discs, plates or internal damage.	Replace transmission assembly (WP 0116 00).
9. Transmission Oil Dirty, Foamy and/or Milky.	1. Inspect oil for dirt/grit.	1. Perform transmission assembly service (WP 0107 00).
	2. Inspect for excessive foaming.	1. Tighten loose lines.
	a. Inspect all external transmission fittings for looseness.	
	b. Ensure transmission has proper oil level (WP 0107 00).	Add or remove oil as necessary (WP 0107 00).
	c. Inspect for milkiness in oil.	1. If foaming continues, remove and replace transmission oil filter (WP 0111 00).
		2. Replace transmission oil cooler (WP 0109 00).

Table 2. Transmission Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. Transmission Oil Dirty, Foamy and/or Milky - Continued.	3. Locate defective component.	1. If oil contains bronze-colored particles, replace transmission (WP 0116 00). 2. If oil contains shiny steel particles, replace transmission oil pump (WP 0118 00). 3. If oil contains rubber particles, check for hose(s) failure and replace defective hose(s). 4. If oil contains aluminum particles, replace torque divider (WP 0115 00).
10. Torque Divider Overheats (According to Converter Oil Temperature Gage).	1. Check transmission oil level.	Add oil as necessary (WP 0107 00).
	2. Check V-belts.	Adjust V-belt tension or replace V-belts (WP 0074 00).
	3. Check converter oil temperature gage for proper operation using a gage known to be good.	Replace oil temperature gage if test gage does not indicate overheating (WP 0083 00).
	4. Check line connections for leaks or damaged oil lines.	Tighten connections or replace damaged oil line(s) (WP 0110 00).
	5. Check for obstruction at system vents.	Clean or replace breathers (WP 0107 00).
	6. Check for excessive in oil in the engine flywheel housing and torque divider cover.	1. Clean torque divider screen assembly (WP 0106 00). 2. Replace torque divider scavenge pump (WP 0121 00). 3. Replace torque divider (WP 0115 00).
	7. Check for loose oil filter housing cover.	Tighten cover capscrews and/or replace O-ring (WP 0111 00).
	8. Check transmission oil cooler.	Clean or replace transmission oil cooler (WP 0109 00).

Table 2. Transmission Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
10. Torque Divider Overheats (According to Converter Oil Temperature Gage) - Continued.	9. Check water pump.	1. Replace water pump (WP 0070 00). 2. Replace torque converter outlet relief valve (WP 0120 00).
11. Loss of Torque Divider Oil.	1. Check for oil around torque divider scavenge pump cover gasket.	Replace cover gasket, if necessary (WP 0121 00).
	2. Check for oil around flywheel housing-to-torque divider cover area.	Replace flywheel housing-to-torque divider housing cover gasket (WP 0115 00).
	3. Check for oil around torque divider output shaft.	Replace output shaft seal, if necessary (WP 0114 00) or replace torque divider (WP 0115 00).
	4. Check for oil around flywheel housing-to-engine block area.	If necessary, replace flywheel housing-to-engine block gasket (WP 0031 00).

Table 3. Steering System Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Tractor Will Not Turn in One Direction.	1. Inspect steering clutches control linkage for damage.	Replace damaged linkage (WP 0148 00).
	2. Check steering clutches control linkage travel.	Adjust steering control linkage (WP 0147 00).
	3. Operate steering control lever for direction with problem and observe steering clutch control valve shaft operation.	If shaft moves, repair or replace steering clutch control valve (WP 0154 00).
	4. If problem still exists, check steering clutch piston.	Repair steering clutch, if necessary (WP 0152 00).
2. Tractor Will Not Turn in Either Direction.	1. Check steering clutches control linkage travel.	1. Adjust steering control linkage (WP 0147 00). 2. Replace damaged steering control linkage (WP 0148 00).
	2. Check steering brakes control linkage travel.	1. Adjust brakes control linkage (WP 0145 00). 2. Replace damaged brakes control linkage (WP 0146 00).
	3. Check steering clutch oil lines for leaks.	Replace damaged oil lines and/ or O-rings (WP 0151 00).
	4. Check transmission oil pump pressure (WP 0122 00).	If necessary, replace transmission oil pump (WP 0118 00).
	5. Perform steering clutch piston and brake boosters pressure checks (WP 0122 00).	1. Repair or replace steering clutch control valve (WP 0154 00). 2. Repair steering clutches (WP 0152 00).
3. Tractor Turns in Either Direction When Both Steering Control Levers are Pulled at the Same Time.	1. Check steering clutch and brake control linkages for damage.	Repair or replace linkage components (WP 0146 00 and WP 0148 00).
	2. Check steering clutches control linkage travel.	Adjust steering control linkage (WP 0147 00).
	3. Perform steering clutch piston and brake boosters pressure checks (WP 0122 00).	1. Repair or replace steering clutch control valve (WP 0154 00).

Table 3. Steering System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. Tractor Turns in Either Direction When Both Steering Control Levers are Pulled at the Same Time - Continued.		2. Repair steering clutches and/ or replace clutch hubs (WP 0152 00 and WP 0155 00).
4. Slow Response to Steering Control Lever Movement.	1. Check fluid level of bevel gear and steering clutch compartments.	Add oil if necessary (WP 0111 00).
	2. Check steering clutches control linkage travel.	1. Adjust steering control linkage (WP 0147 00). 2. Replace damaged steering control linkage (WP 0148 00)
	3. Check steering brakes control linkage travel.	1. Adjust brakes control linkage (WP 0145 00). 2. Replace damaged brakes control linkage (WP 0146 00).
	4. Check steering clutch oil lines for leaks.	Replace damaged lines and/or O-rings (WP 0152 00).
	5. Check transmission oil pump pressure (WP 0122 00).	Replace transmission oil pump (WP 0118 00).
	6. Perform steering clutch piston and brake boosters pressure checks (WP 0122 00).	1. Repair or replace steering clutch control valve (WP 0154 00).
		2. Replace steering clutch hubs (WP 0155 00).

Table 4. Hydraulic System Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Irregular Cylinder Movement (Not Smooth).	1. Check all hydraulic lines and connections for leaks, kinks or other damage.	Replace damaged lines and/or fittings (WP 0212 00 through WP 0217 00).
	2. Check hydraulic tank for correct oil level and viscosity.	Add or replace oil as necessary (WP 0225 00).
2. Hydraulic Pump Noisy.	1. Check oil level in hydraulic tank.	1. Fill to proper level (WP 0225 00).
		2. Remove air from pump lines (WP 0225 00).
		3. Repair or replace pump (WP 0199 00 and WP 0200 00).
3. Hydraulic Pump Overheats.	1. Check oil level in reservoir.	Fill to proper level (WP 0225 00).
	2. Check all hydraulic lines and connections for leaks and other damage.	Replace or tighten damaged or loose lines and/or fittings (WP 0212 00 through 0217 00).
	3. Check with tractor operator to determine if hydraulic system (blade and/or ripper circuits) was operated with a short, rapid duty cycle prior to pump overheating. This can cause damage to seals in pump.	If seal damage is a possibility, repair or replace pump assembly (WP 0199 00 and WP 0200 00).
4. Slow Cylinder Movement.	1. Check for obstruction that could hinder cylinder movement.	Remove obstruction.
	2. Check oil level in reservoir.	Fill to proper level (WP 0225 00).
	3. Check all hydraulic lines and connections for leaks, kinks and other damage.	Replace or tighten damaged or loose lines and/or fittings (WP 0212 00 through WP 0217 00).
	4. Check control linkages for free movement and full travel of control valve spools.	Replace or adjust blade control linkage (WP 0207 00) and/or ripper control linkage (WP 0208 00) or replace blade control valve (WP 0201 00) or ripper control valve (WP 0206 00).

Table 4. Hydraulic System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. Slow Cylinder Movement - Continued.	5. Check for low relief valve setting and low hydraulic pump output. Perform hydraulic system flow tests (WP 0227 00).	Adjust, repair or replace affected component IAW test results (WP 0227 00).
5. Blade Tilt Cylinder and Lift Cylinders Drift.	1. Check oil level in reservoir.	Fill to proper level (WP 0225 00).
	2. Check hydraulic lines and connections to problem cylinder for leaks, kinks and/or other damage.	Replace or tighten damaged or loose lines and/or fittings (WP 0212 00 through WP 0217 00).
	3. Check relief and/or control valves for leaks.	If leaks are found, replace control valve(s) (WP 0201 00, WP 0202 00, WP 0203 00 and WP 0206 00).
	4. Perform cylinder drift tests (WP 0227 00) for lift cylinders.	1. If drift occurs only with blade control lever in LOWER or RAISE position, replace blade control valve (WP 0201 00). 2. If drift occurs only with blade lowered or only with blade raised (control lever in any position), replace blade control valve (WP 0201 00). 3. If drift occurs with blade lowered (control in LOWER) and with blade raised (control in any position), replace or repair blade lift cylinder (WP 0220 00 or WP 0221 00). 4. If blade tilt cylinder is drifting, replace or repair tilt cylinder (WP 0209 00 or WP 0210 00). 5. If blade or ripper lift cylinder is drifting, replace or repair cylinder(s) (WP 0220 00 or WP 0221 00 and WP 0223 00 or WP 0224 00).

Table 4. Hydraulic System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Blade Tilt or Ripper Lift Circuit is Slow or Does Not Move.	1. Check hydraulic tank for correct oil level. Ensure tank is filled with correct viscosity oil.	Add or replace oil as required (WP 0225 00).
	2. Carefully check system for leakage.	Repair or replace leaking component.
	3. Check hydraulic lines, hoses and fittings for signs of leaks or damage.	Tighten or replace loose or damaged lines (WP 0214 00 through WP 0216 00).
	4. Check pilot lines for restrictions.	Repair or replace pilot line.
	5. Perform hydraulic system flow tests for circuit (WP 0227 00).	Adjust, repair or replace affected component IAW test results (WP 0227 00).
7. Ripper Moves Very Slowly/No Down Pressure in Lift Circuit (Blade Tilt Circuit OK).	1. Inspect pilot line between pilot valves and blade control valve shuttle valve for restriction.	Replace line (WP 0212 00).
	2. There may be internal damage to blade control valve.	Replace blade control valve (WP 0201 00).
8. Hydraulic Oil is Overheating (Indicated by Blown Oil Seals, Decreased Life of Components).	1. Perform hydraulic system tests (WP 0227 00).	Adjust, repair or repair affected compnent(s) as directed by test results (WP 0227 00).

Table 5. Winch Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Winch Does Not Operate.	1. Check winch reservoir for proper oil level.	Fill to proper level (WP 0179 00).
	2. Check winch system oil lines and connections for damage and leaks.	1. Tighten loose fittings.
		2. Replace damaged or leaking lines and fittings (WP 0190 00).
	3. Check winch control linkage adjustment.	Adjust if necessary (WP 0182 00).
	4. Check winch control cables for bends, kinks, breaks or if they are disconnected from control lever bellcrank or control valve.	1. Reconnect control cable (WP 0183 00).
		2. If control cable(s) is damaged, replace (WP 0183 00).
	5. Inspect winch control valve for damage and leaks.	1. Tighten loose fittings.
		2. Replace control valve (WP 0181 00).
	6. Check winch gear pump for leaks and overheating.	1. Tighten loose fittings.
		2. Replace gear pump if necessary (WP 0189 00).
	7. Check for broken winch drive shaft.	Replace drive shaft (WP 0181 00).
2. Winch Operates in One Direction Only.	1. Check for damaged, kinked, broken or disconnected winch control cables or rod end.	1. Reconnect cable (WP 0183 00).
		2. If control cable is damaged, replace (WP 0183 00).
	2. Inspect winch control valve and valve connections for damage and leaks.	1. Tighten loose fittings.
		2. Replace winch control valve (WP 0182 00).

Table 5. Winch Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. Winch Operates in One Direction Only - Continued.		3. Replace winch assembly (WP 0180 00).
3. Winch Does Not Hold Load With Control Lever in BRAKE ON Position.	1. Check winch control cable adjustment.	Adjust control linkage if necessary (WP 0182 00).
	2. Check winch control valve for leaks, damage and proper operation.	Replace defective or damaged winch control valve (WP 0181 00).
4. Torque Divider Stalls.	1. Check winch control linkage adjustment.	Adjust control linkage if necessary (WP 0182 00).
	2. There may be internal damage to winch control valve.	Replace winch control valve (WP 0181 00).
	3. There may be internal damage to winch assembly.	Replace winch assembly (WP 0180 00).
5. Oil Leak at Both or One End of Winch Drum.	There may be internal damage to winch assembly.	Replace winch assembly (WP 0180 00).

Table 6. Electrical System Troubleshooting Procedures.

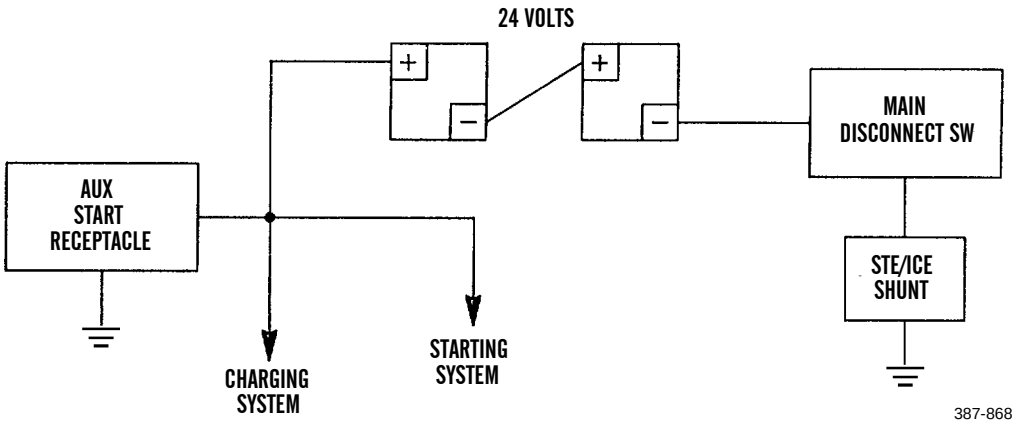
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
BATTERY SYSTEM		
		
1. Batteries are Hot, Electrolyte is Boiling or Excessive Use of Water.	NOTE **If STE/ICE is available, perform TK Mode, NG50.**	
	Check electrolyte temperature and specific gravity. Refer to TM 9-6140-200-14, *Operator's, Unit and Direct Support and General Maintenance Manual for Lead-Acid Storage Batteries.*	1. If temperature is over 120°F (49°C) and specific gravity is 1.300 or greater, batteries are being overcharged. Refer to charging system troubleshooting, *Malfunction 7.* 2. If temperature is over 120°F (49°C), but specific gravity is 1.225-1.235, recharge battery. Refer to TM 9-6140-200-14.
2. Specific Gravity Will Not Increase to 1.240 Under Charge.	NOTE **If STE/ICE is available, perform TK Mode, NG50.**	
	Check rate of charging. Place battery on charge, ensuring that cells are gassing freely. Maintain charge rate slightly below heavy gassing.	If specific gravity does not recover to 1.240 in 25 hours of charging, replace battery (WP 0100 00). Refer to TM 9-6140-200-14.

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. Engine Will Not Crank.	1. Inspect batteries.	
	a. Visually inspect batteries for cracks, leaks and corroded or broken terminal posts.	1. Replace any cracked, leaking, corroded or broken batteries or batteries with loose or broken terminal posts (WP 0100 00). Refer to TM 9-6140-200-14.
		2. Clean corroded terminal posts (TM 9-6140-200-14).
	b. Check for loose, broken or worn terminals and cables.	1. Tighten any loose terminal or cable.
		2. Replace any terminal or cable that is broken or worn (WP 0101 00).
	c. Check electrolyte level in each battery cell (TM 9-6410-200-10).	Fill each cell to fill ring with distilled water.
	d. Perform specific gravity test (TM 9-6410-200-14). Batteries must test 1.240 or greater, temperature corrected, and each cell in battery must test within 25 points of the others.	1. Charge all batteries not meeting requirements and recheck specific gravity.
		2. If 25 point variation still exists, battery is defective and must be replaced (WP 0100 00).
	WARNING **Touch terminal connections one at a time; never touch both terminals at once. Be sure not to be grounded to the machine when checking. Failure to do so may cause serious personal injury or death.**	

Table 6. Electrical System Troubleshooting Procedures - Continued.

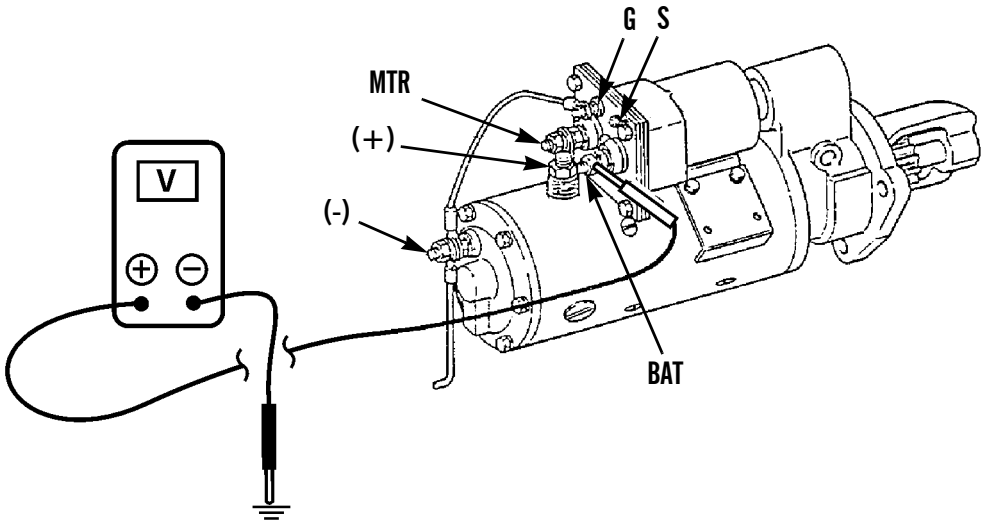
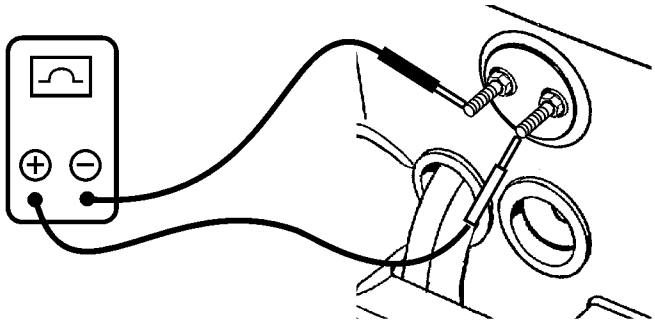
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. Engine Will Not Crank - Continued.	e. Attempt to crank engine 15 seconds. Place battery disconnect switch in OFF position and feel battery terminal connections.	1. Tighten all loose connections at batteries. 2. Tighten battery ground wire at tractor chassis ground. Tighten battery positive wire at starter solenoid. Go to Table 6, *Malfunction* 3, Test 2.
	NOTE **If STE/ICE is available, perform TK Mode NG20.**	
	2. Test batteries under load to determine adequate current capability and voltage drop during a 15 second amperage load.	
	 387-869	
	a. Set multimeter to appropriate voltage range (WP 0242 00).	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. Engine Will Not Crank - Continued.	b. Connect meter positive lead to solenoid terminal BAT and negative lead to ground strap.	
	c. Place battery disconnect switch in the ON position. Meter should read battery voltage.	
	d. With meter still connected as above, place exterior light switch to the ON position for approximately 15 seconds. Meter reading should not be below 18 volts.	1. Recharge batteries if voltage reading is low (WP 0100 00). Each cell of battery must show 1.6 volts.
	2. Test starting motor. Go to *Malfunction 5*.	
4. All Tractor Electrical Systems Inoperative.	1. Test battery disconnect switch for continuity.	
	a. Place battery disconnect switch in OFF position.	
	b. Disconnect negative battery cable from battery.	
	c. Disconnect cables from battery disconnect switch (WP 0090 00).	
	d. Set multimeter to the appropriate ohm (Ω) range (WP 0242 00).	
	e. Connect meter between battery disconnect switch terminals.	



387-875

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. All Tractor Electrical Systems Inoperative - Continued.	f. Place battery disconnect switch in ON position.	1. If continuity is not indicated, replace battery disconnect switch (WP 0090 00).
	2. Check connection of battery cables and condition of terminals. Check that battery is correctly connected to batteries, starter and chassis ground (WP 0101 00).	Clean and/or reconnect battery cables if necessary.
	3. Perform *Malfunction 3, Test 1*.	
	4. If STE/ICE is available, perform TK Mode, NG81.	

STARTING SYSTEM

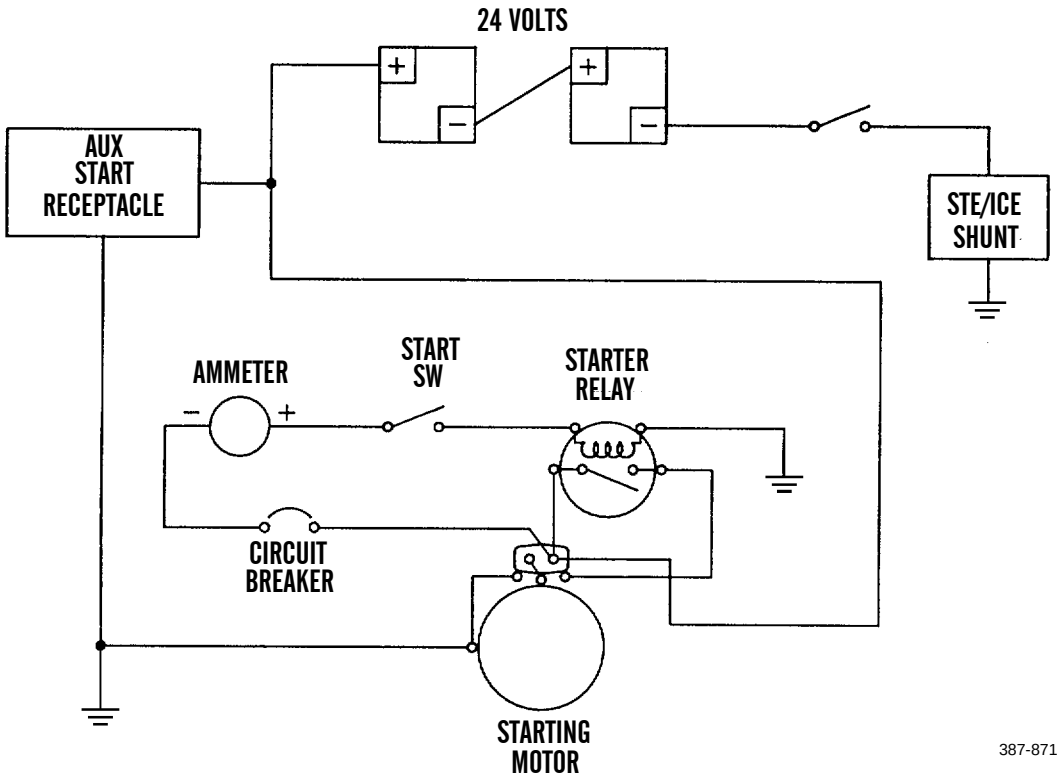


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative.	NOTE **If STE/ICE is available, perform TK Mode, NG50.**	
	1. Check circuit breakers.	Reset as necessary.
	2. Check solenoid operation.	
	a. Place battery disconnect switch to ON position. Turn start switch fully clockwise and listen for starter solenoid to energize.	1. If thump of starter solenoid energizing is heard, go to Step b.
		2. If thump of solenoid is not heard, go to *Malfunction* 5, Test 3.
	b. Place battery disconnect switch to OFF position.	
	c. Check continuity of connector between starting motor-to-solenoid connector (WP 0242 00).	1. If no continuity is indicated, repair the connection (WP 0242 00).
		2. If continuity is indicated, go to Step d.
	d. Inspect and clean ground connections on back of starter and tighten nut.	If starter is still inoperative, replace starter, go to *Malfunction* 5, Test 4.
	3. Test starter circuit source voltage.	
	a. Place battery disconnect switch in OFF position.	
	b. Place multimeter to appropriate voltage range (WP 0242 00).	
	c. Connect multimeter positive lead to “BAT” terminal on solenoid and negative lead to chassis ground.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	d. Place battery disconnect switch to ON position.	1. If battery voltage is indicated, go to *Malfunction* 5, Test 5.
	e. Check battery connections. Go to *Malfunction 4*.	Repair or replace broken wire(s) between battery and starting motor (WP 0242 00).
	f. If battery disconnect switch and connections are OK, check wiring continuity.	
	4. Check starting motor voltage.	
	a. Connect meter positive lead to solenoid terminal MTR and negative lead to chassis ground.	

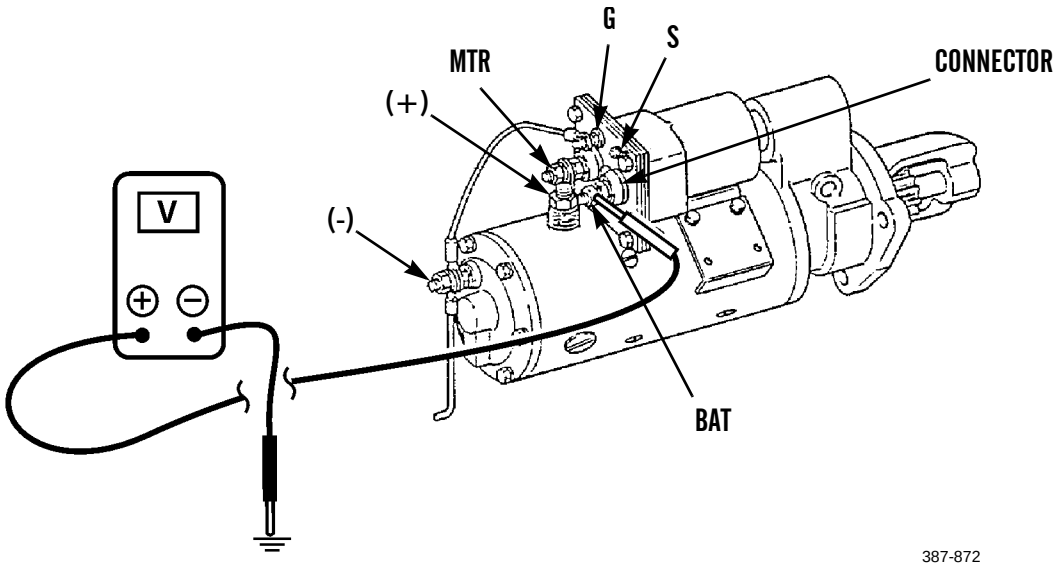


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	b. Place battery disconnect switch to ON position. c. Momentarily turn start switch fully clockwise and observe meter reading.	1. If battery voltage is indicated, replace starting motor (WP 0078 00). 2. If voltage is not indicated, replace starter solenoid (WP 0079 00).
	5. Check starter relay and solenoid. a. Place battery disconnect switch in OFF position. b. Set multimeter to appropriate voltage range. c. Connect meter positive lead to terminal S on solenoid. d. Connect meter negative lead to chassis ground.	

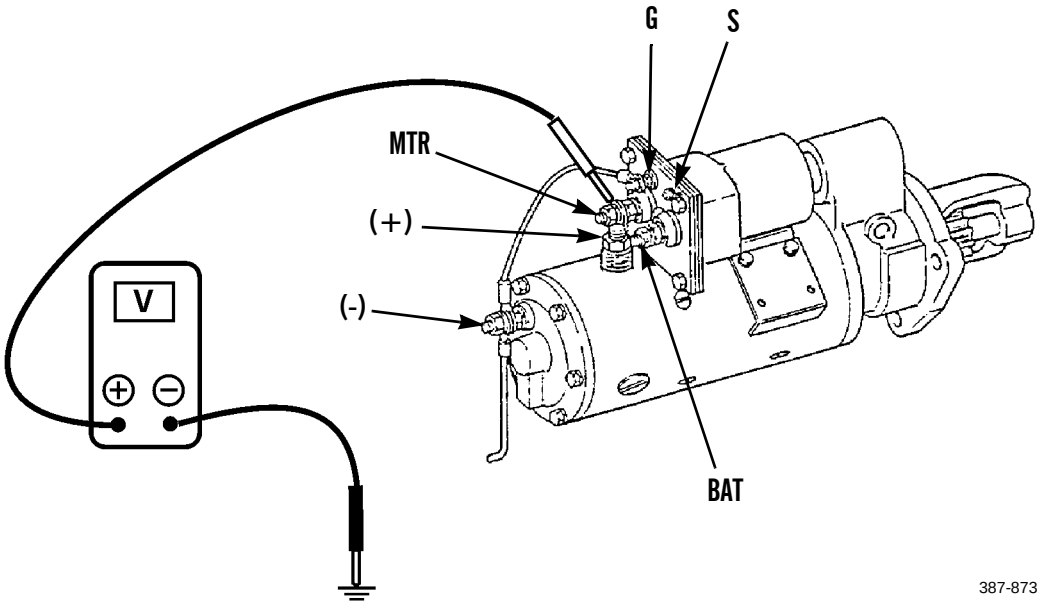


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	e. Turn battery disconnect switch to ON position.	
	f. Momentarily turn start switch fully clockwise and observe meter reading.	1. If voltage is indicated, go to Table 6, *Malfunction* 5, Test 6. 2. If voltage is not indicated, go to Table 6, *Malfunction* 5, Test 7.
	6. Test G terminal for continuity to ground. a. Place battery disconnect switch in OFF position. b. Connect meter positive lead to G terminal on solenoid.	

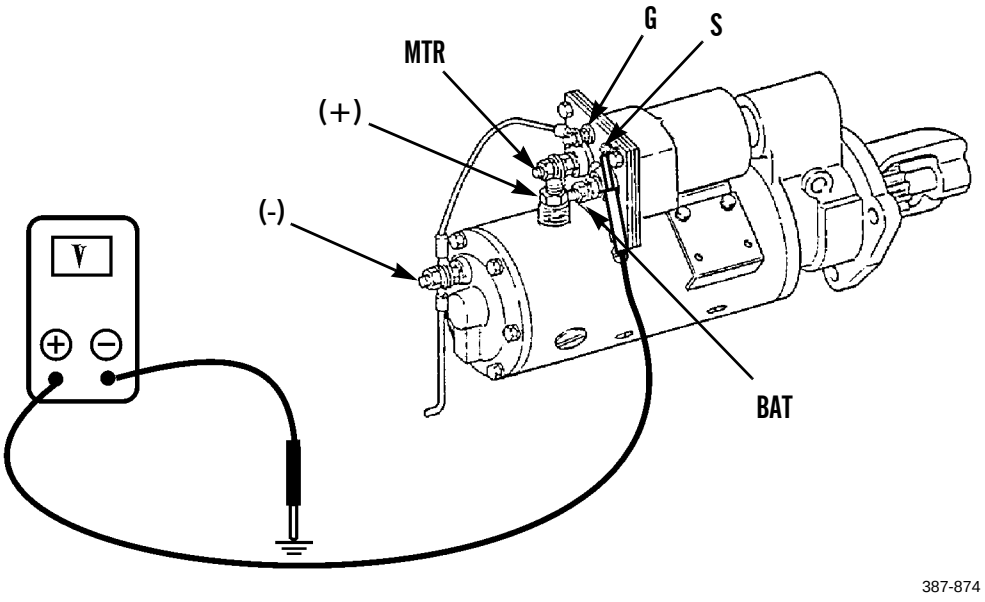
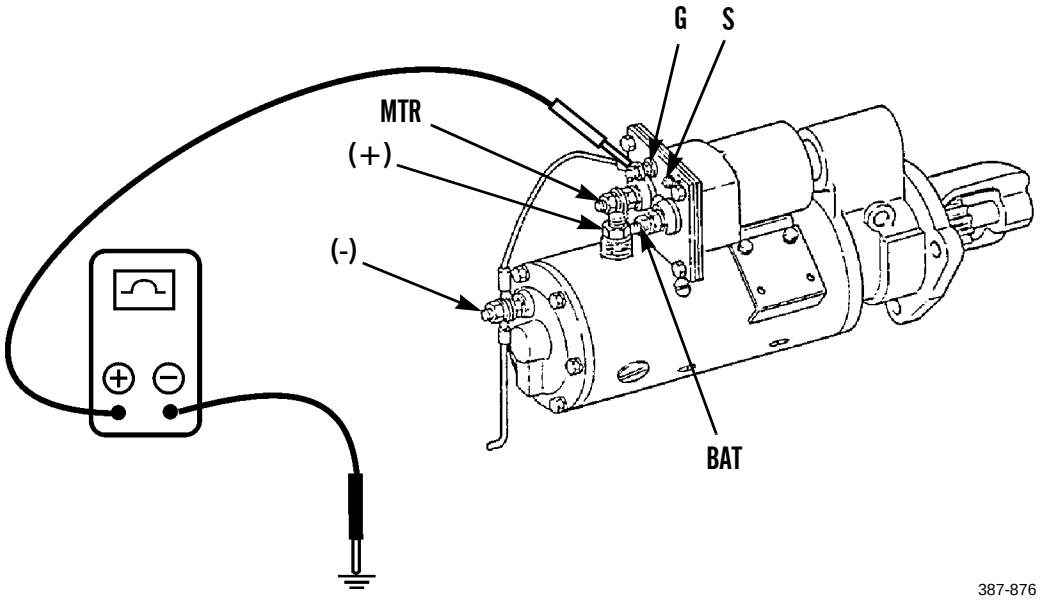


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	c. Connect meter negative lead to chassis ground and observe reading.	1. If continuity is indicated, replace solenoid (WP 0079 00). 2. If no continuity is indicated, repair the ground circuit (WP 0242 00).
	7. Test starter relay. a. Place battery disconnect switch in OFF position. b. Set multimeter to appropriate voltage range. c. Connect meter positive lead to smaller gage wire with no insulation and negative lead to chassis ground. d. Place battery disconnect switch to ON position.	



387-876

Table 6. Electrical System Troubleshooting Procedures - Continued.

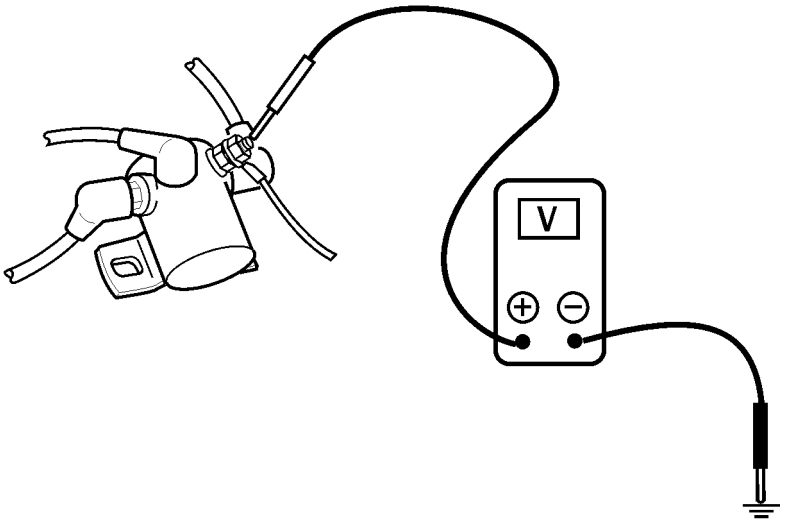
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	e. Momentarily turn start switch fully clockwise and observe meter.	1. If voltage is indicated, go to Table 6, *Malfunction* 5, Test 8. 2. If voltage is not indicated, place battery disconnect switch in OFF position, reconnect white wire and go to Table 6, *Malfunction* 5, Test 11.
	 387-877	
	8. Test for voltage between starter relay and chassis ground. a. Place battery disconnect switch in OFF position. b. Disconnect ground from starter relay. c. Connect meter positive lead to ground terminal on relay (relay side). d. Connect meter negative lead to chassis ground.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

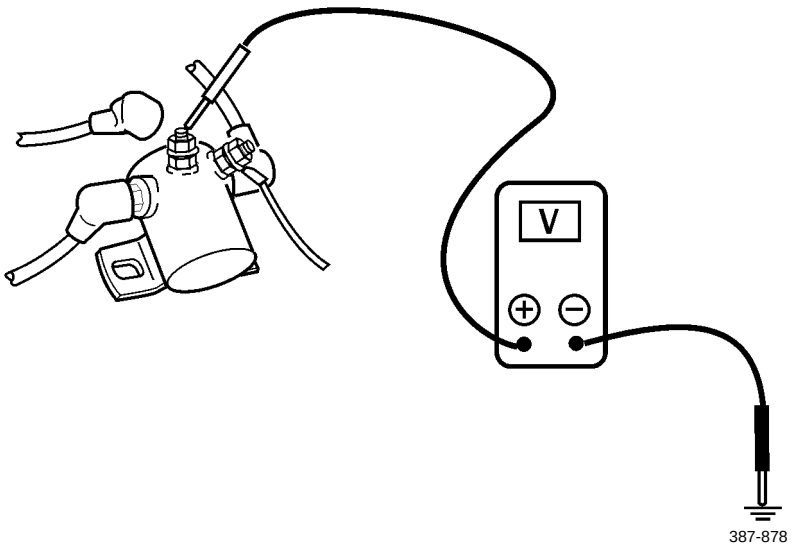
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	e. Place battery disconnect switch to ON position.	
	f. Momentarily turn start switch fully clockwise and observe meter.	1. If voltage is indicated, go to Table 6, *Malfunction* 5, Test 9. 2. If voltage is not indicated, replace relay (WP 0078 00).
		
	9. Test for continuity between starter relay ground wire and chassis ground. a. Place battery disconnect switch in OFF position. b. Connect meter positive lead to ground wire for relay (harness side).	
	c. Connect meter negative lead to chassis ground and observe reading.	1. If continuity is indicated, go to Table 6, *Malfunction* 5, Test 10. 2. If continuity is not indicated, repair the ground (WP 0242 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

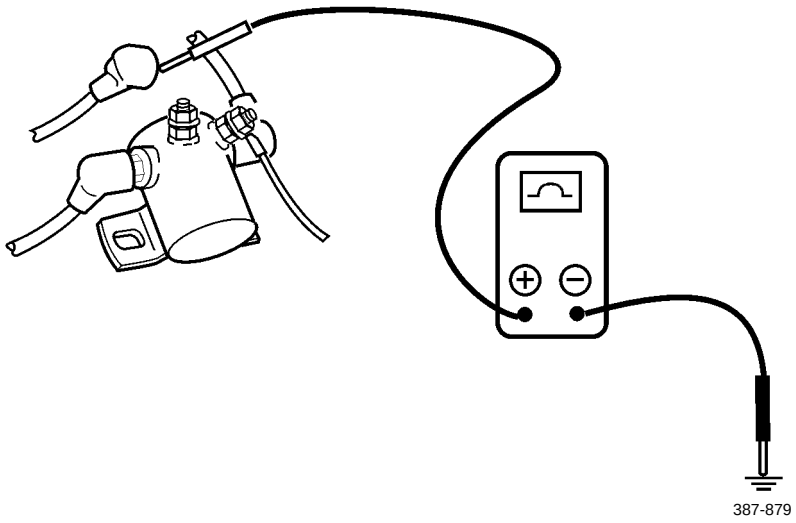
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.		
	 387-879	
	10. Test for continuity between starter relay ground and starter solenoid. a. Place battery disconnect switch in OFF position. b. Disconnect both larger gage wires from starter relay.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

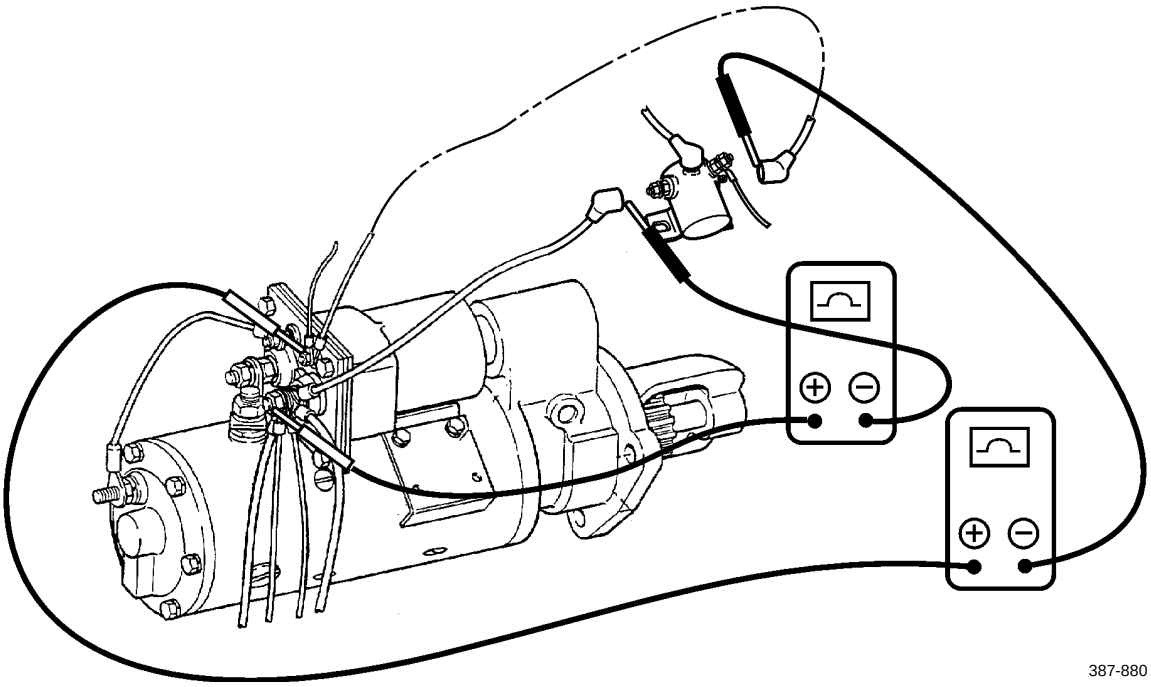
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	c. Connect meter leads as shown in the illustration below and measure continuity.	1. If continuity is indicated, replace starter relay (WP 0078 00). 2. If continuity is not indicated, repair circuit(s) in question (WP 0242 00).
	 387-880	
	11. Test voltage to start switch. a. Place battery disconnect switch in OFF position. b. Disconnect orange lead from start switch BAT terminal. c. Set multimeter to appropriate voltage range. d. Connect meter positive lead to orange lead (harness side) and negative lead to chassis ground.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

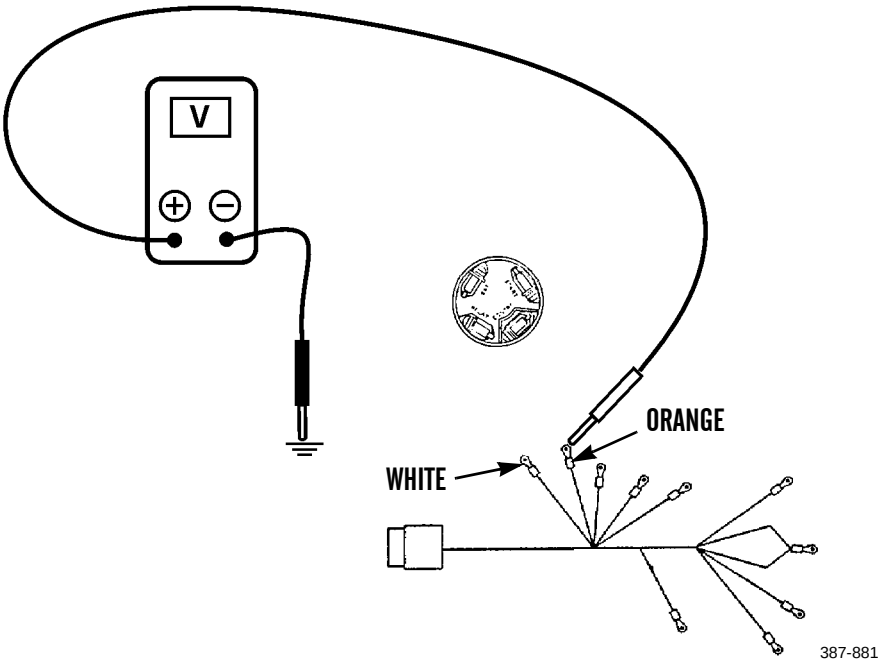
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	e. Place battery disconnect switch to ON position and observe multimeter reading.	If voltage is indicated, go to Table 6, *Malfunction* 5, Test 12.
	f. Place battery disconnect switch to OFF position and check wiring for continuity.	1. Repair or replace broken wire(s) (WP 0242 00)
		2. If wiring is OK, replace ammeter (WP 0082 00).
		
	12. Test engine start switch starter for continuity. a. Place battery disconnect switch in OFF position. b. Disconnect engine start switch.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

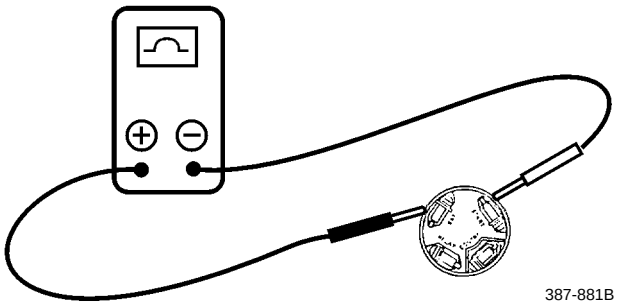
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Starting Motor Inoperative - Continued.	c. Connect meter positive lead to terminal where orange lead connects (switch side). d. Connect meter negative lead to terminal where white lead connects (switch side). e. Turn start switch fully clockwise.	1. If continuity is indicated, repair open circuit between engine start switch and starter relay. 2. If continuity is not indicated, replace engine start switch (WP 0088 00).
	 387-881B	
6. Solenoid and Starting Motor Operate; Engine Cranks Slowly.	NOTE **If STE/ICE is available, perform TK Mode, NG80.** 1. Check batteries for over-heating. a. Crank engine for 15 seconds.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Solenoid and Starting Motor Operate; Engine Cranks Slowly - Continued.	WARNING **Touch terminal connections one at a time; never touch both terminals at once. Be sure not to be grounded to the machine when checking. Failure to do so may cause serious personal injury or death.**	
	b. Feel battery terminal connections.	If battery terminal(s) are hot, clean corroded connection(s) and tighten all loose connections at batteries, ground and starter.
	2. Test specific gravity for each battery. Go to Table 6, *Malfunction 1* and perform Test 1.	
	3. Test starting motor voltage.	
	a. Set multimeter to appropriate voltage range.	
	b. Connect meter positive lead to positive terminal on starting motor and negative meter lead to chassis ground.	

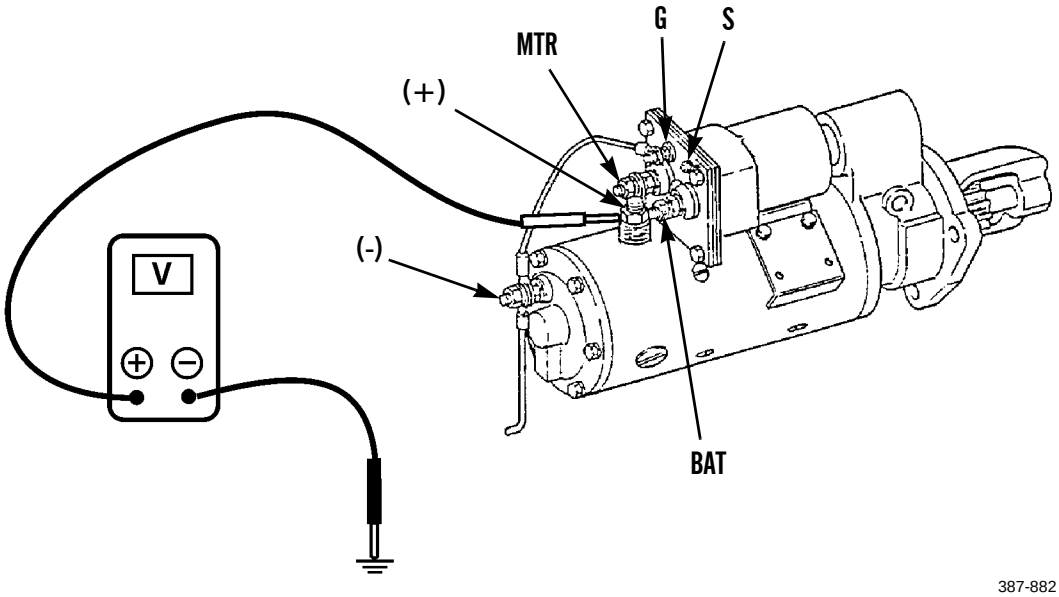


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Solenoid and Starting Motor Operate; Engine Cranks Slowly - Continued.	c. Crank engine and observe voltage reading on meter. Voltage should exceed 22 volts.	1. If voltage is low, place battery disconnect switch in OFF position and clean and tighten starting motor terminal connections. 2. If problem still exists, go to Table 6, *Malfunction* 6, Test 4.
	4. Perform voltage drop test on starting motor-to-solenoid connector (WP 0242 00). a. Connect meter negative lead to positive terminal on starting motor and meter positive lead to MTR terminal on solenoid.	
	b. Crank engine and observe meter.	If voltage reading exceeds 0.1 volt, place battery disconnect switch in OFF position and clean and tighten starting motor-to-solenoid connections. Replace if broken.

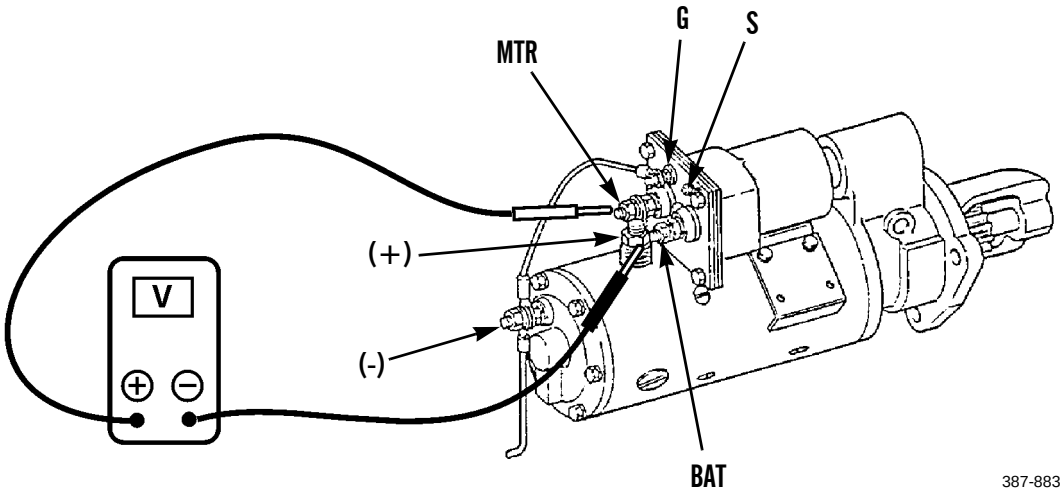


Table 6. Electrical System Troubleshooting Procedures - Continued.

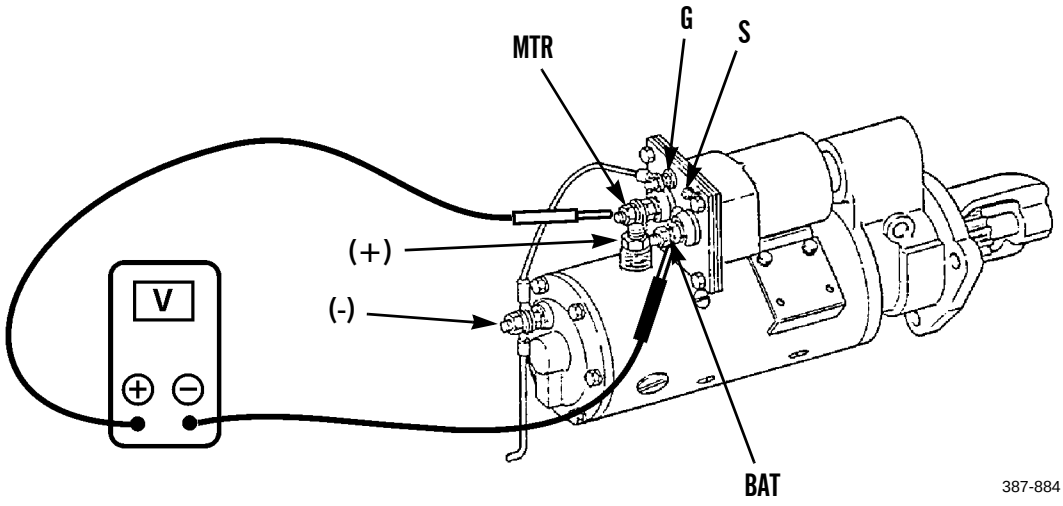
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Solenoid and Starting Motor Operate; Engine Cranks Slowly - Continued.	5. Perform voltage drop test on solenoid contactors (WP 0242 00). a. Connect meter positive lead to solenoid BAT terminal and meter negative lead to solenoid MTR terminal. b. Crank engine and observe meter.	1. If voltage reading is 0.4 volts, replace solenoid (WP 0079 00). 2. If malfunction still exists, go to Table 6, *Malfunction* 6, Tests 6, 7 and 8.
		
	6. Test negative cable voltage drop from batteries to starting motor (WP 0241 00). a. Place battery disconnect switch in OFF position.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

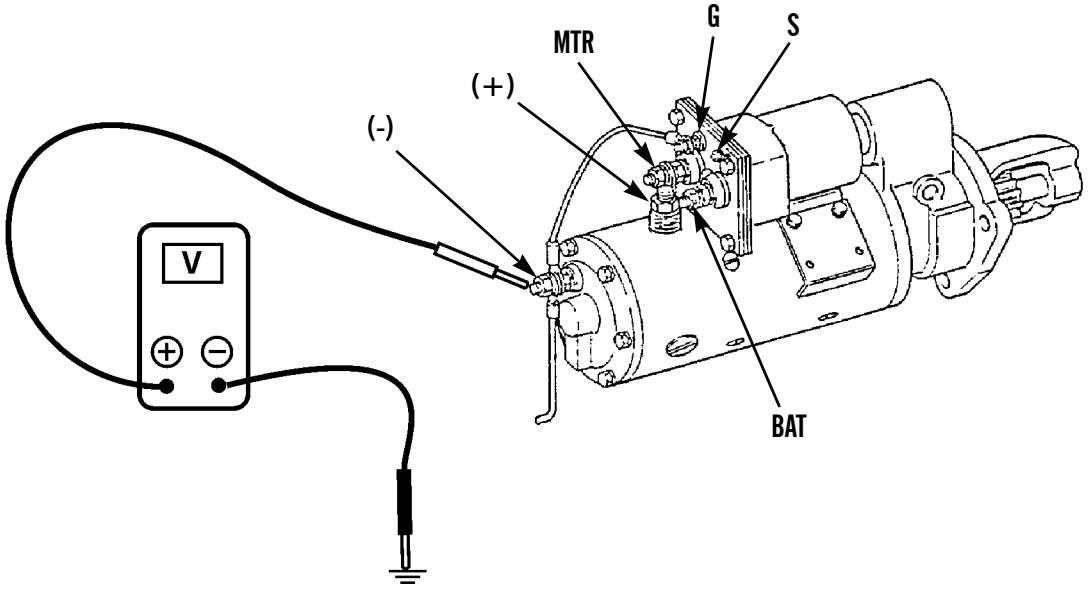
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Solenoid and Starting Motor Operate; Engine Cranks Slowly - Continued.	b. Connect meter positive lead to negative terminal on starting motor and meter negative lead to chassis ground. c. Place battery disconnect switch to ON position. d. Crank engine and observe meter.	If voltage exceeds 0.4 volts, clean and tighten cable connections at batteries, starting motor and chassis ground points.
	 387-885	
	7. Test positive cable voltage from batteries to solenoid. a. Place battery disconnect switch in OFF position.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Solenoid and Starting Motor Operate; Engine Cranks Slowly - Continued.	b. Connect meter positive lead to battery positive terminal and meter negative lead to solenoid BAT terminal. c. Place battery disconnect switch to ON position. d. Crank engine and observe meter.	If voltage exceeds 0.4 volts, clean and tighten cable connections at batteries, starting motor and chassis ground points.
	8. Test battery voltage after cranking load is applied. a. Set multimeter to appropriate voltage range.	

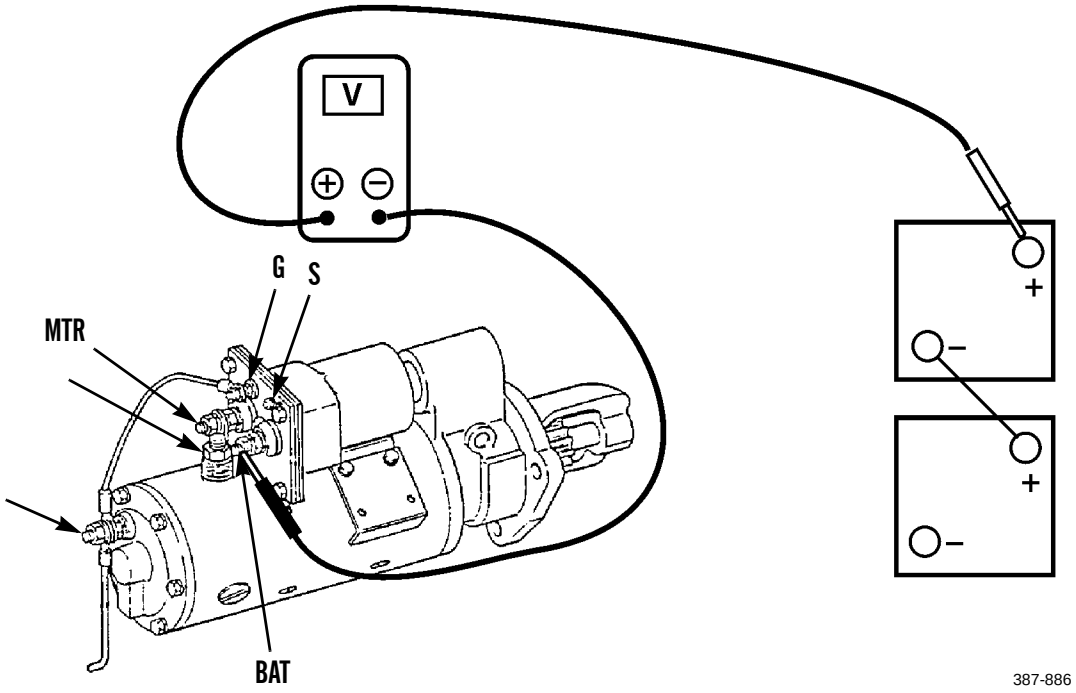
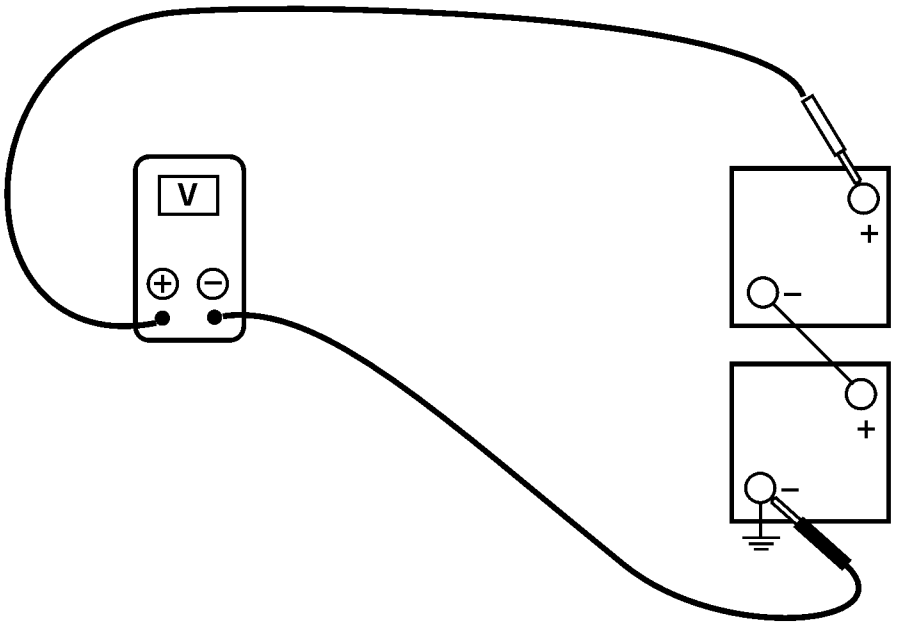


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Solenoid and Starting Motor Operate; Engine Cranks Slowly - Continued.	b. Connect meter lead directly across battery terminals as shown below.	
	c. Push governor control lever forward past detent and crank engine for approximately 30 seconds. Observe meter reading after cranking has stopped.	1. If voltage is not 20 volts or more, go to Table 6, *Malfunction 2*.
		2. If voltage is satisfactory, replace starting motor (WP 0078 00).



387-887

Table 6. Electrical System Troubleshooting Procedures - Continued.

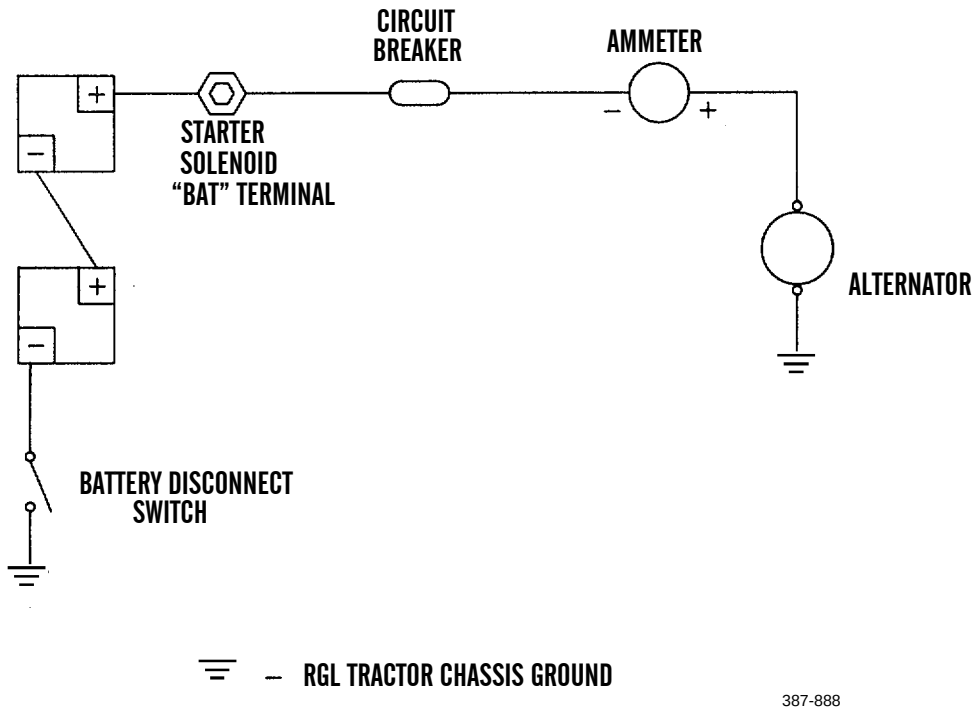
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
CHARGING SYSTEM  		
7. Batteries Hot or Boiling, Corrected Specific Gravity of All Cells is 1.240.	NOTE **If STE/ICE is available, perform MG50.** Test charging voltage. a. Set multimeter to appropriate voltage range (WP 0242 00).	

Table 6. Electrical System Troubleshooting Procedures - Continued.

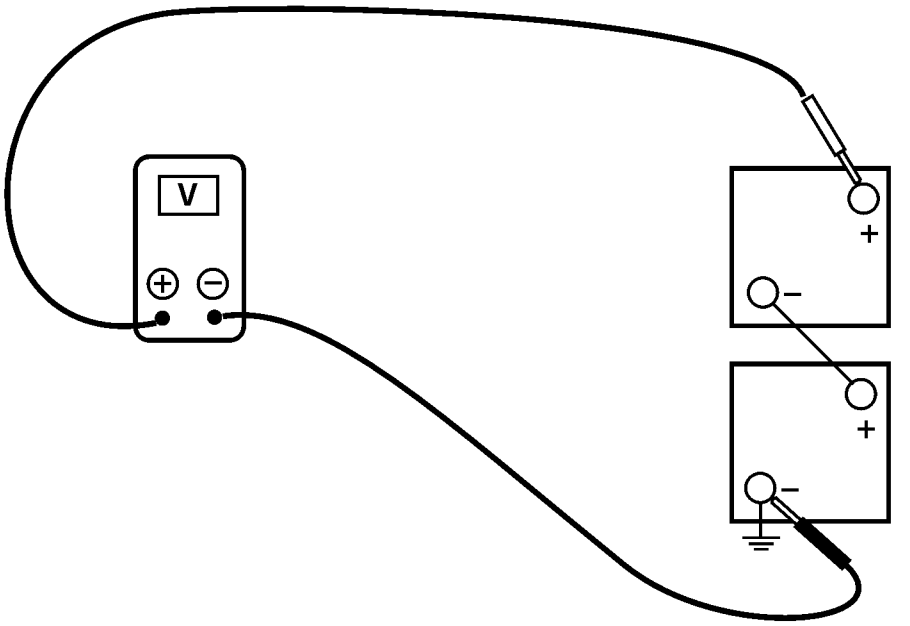
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. Batteries Hot or Boiling, Corrected Specific Gravity of All Cells is 1.240 - Continued.	b. Connect multimeter directly across battery terminals as shown.	
	c. Start engine and allow it to stabilize at 2000-2090 RPM.	If meter does not indicate 26.6-28.3 volts, replace alternator (WP 0076 00).
	 387-887	
8. Batteries Use Excessive Water.	NOTE **If STE/ICE is available, perform TK Mode, NG81.**	
	1. Visually inspect batteries for leaks.	Replace batteries as required (WP 0100 00).
	2. Test charging voltage. Go to Table 6, *Malfunction 7.*	
9. Batteries Run Down in Service.	NOTE **If STE/ICE is available, perform TK Mode, NG50.**	
	1. Check for loose, broken or missing alternator belts.	1. Adjust loose belts (WP 0074 00). 2. Replace broken or missing belts (WP 0074 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. Batteries Run Down in Service - Continued.	2. Test charging voltage. Go to Table 6, *Malfunction 7.*	
10. No Alternator Output.	NOTE **If STE/ICE is available, perform TK Mode, NG50.**	
	1. Check for loose, broken or missing alternator belts.	1. Adjust loose belts (WP 0074 00). 2. Replace broken or missing belts (WP 0074 00).
	2. Test alternator circuit voltage. a. Place battery disconnect switch in OFF position. b. Set multimeter to appropriate voltage range. c. Connect meter positive lead to orange lead disconnected from alternator positive terminal and meter negative lead to chassis ground.	

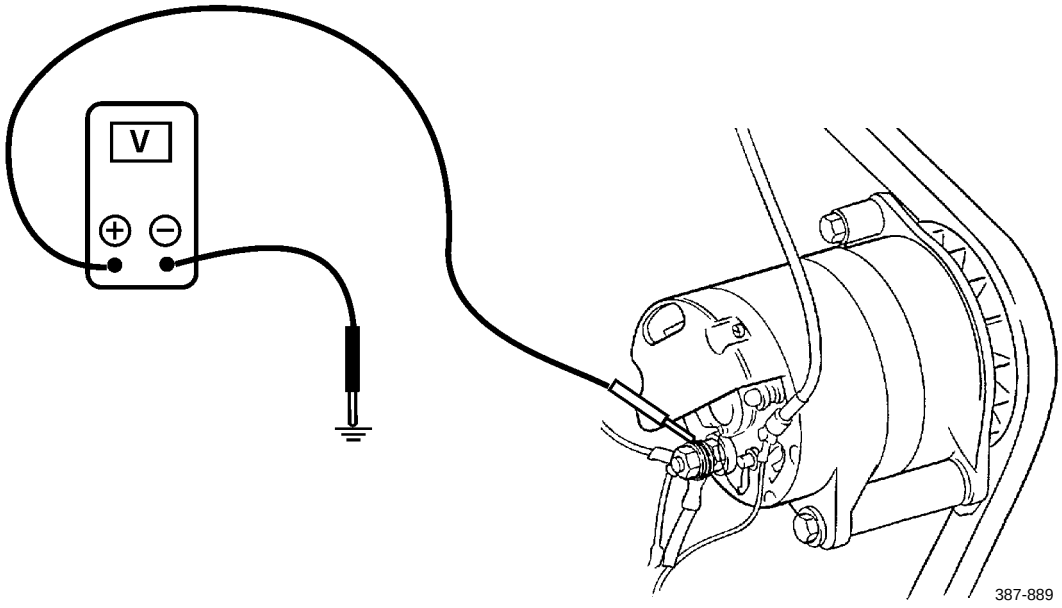


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
10. No Alternator Output - Continued.	d. Place battery disconnect switch to ON position and observe multimeter reading.	1. If battery voltage is not indicated, repair or replace alternator-to-ammeter wiring (WP 0242 00).
	e. If battery voltage is indicated, place battery disconnect switch in OFF position.	
	f. Check continuity between alternator and ground (WP 0242 00).	1. Repair or replace alternator ground (WP 0242 00).
		2. If wiring to ground is OK, replace alternator (WP 0076 00).
11. Alternator Output Low (Ammeter Reading in Red Zone).	NOTE **If STE/ICE is available, perform TK Mode, NG50.**	
	1. Check for loose, broken or missing alternator belts.	1. Adjust loose belts (WP 0074 00).
		2. Replace broken or missing belts (WP 0074 00).
	2. Test charging voltage. Go to Table 6, *Malfunction 7*.	
12. Alternator Charge Too High (Ammeter in High Green Zone).	NOTE **If STE/ICE is available, perform TK Mode, NG50.**	
	1. Test charging voltage. Go to Table 6, *Malfunction 7*.	
	2. Check alternator for overheating.	
	a. Run engine for approximately 10 minutes.	
	b. With engine off, check alternator for high temperature by holding hand near alternator.	If alternator is hot, place battery disconnect switch to OFF position and allow alternator to cool.

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
12. Alternator Charge Too High (Ammeter in High Green Zone) - Continued.	c. Start engine.	If ammeter returns to high green zone, and alternator heats up again, replace alternator (WP 0076 00).

LIGHTING SYSTEM

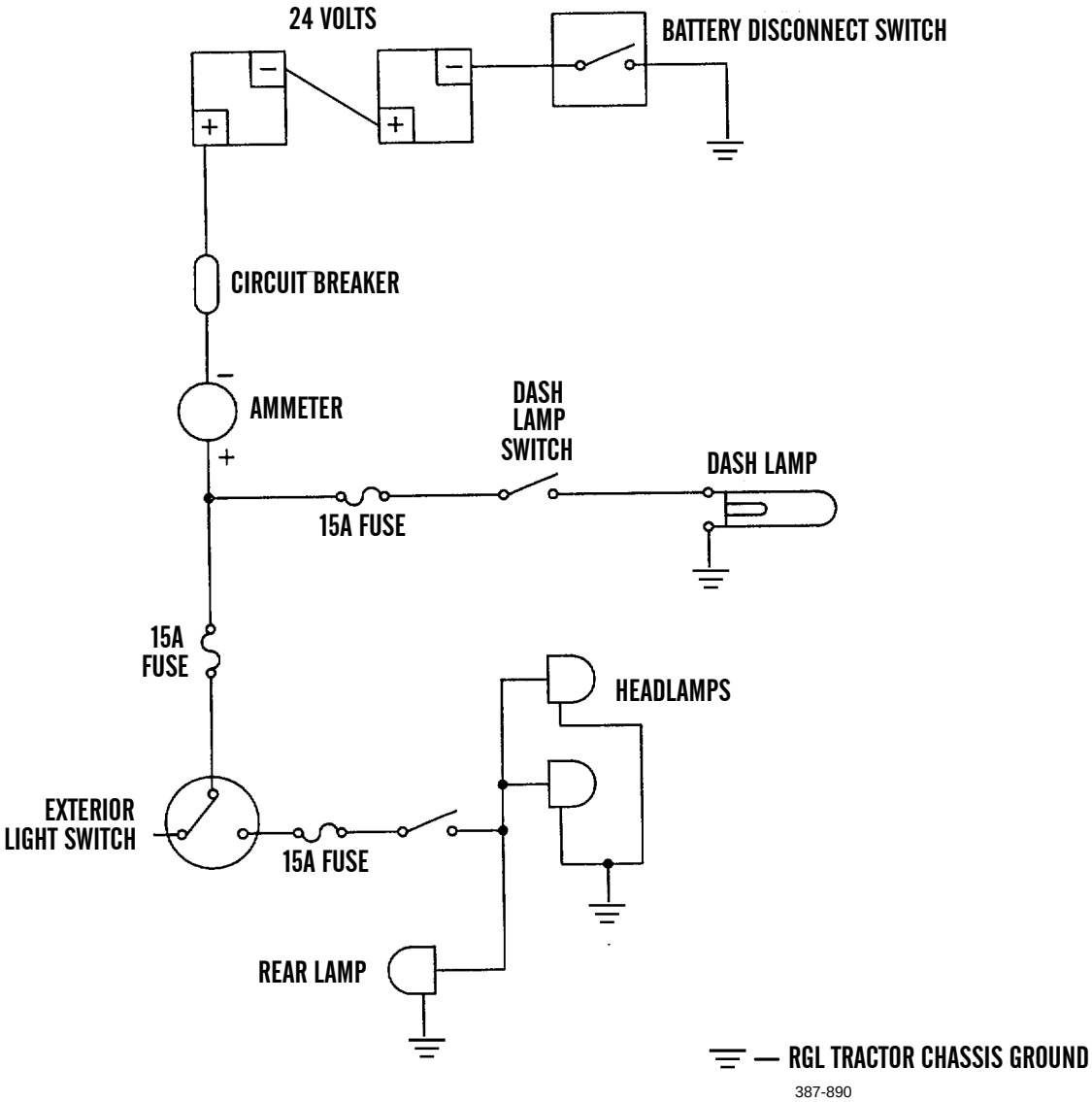


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Lamp(s) Will Not Light.	1. Check for blown fuse(s). a. Place battery disconnect switch in OFF position. b. Use multimeter to check for blown fuse in circuit with no light.	1. Replace blown fuse with same rated fuse (WP 0092 00). 2. If fuse(s) continue to blow, check for short circuit (WP 0242 00). Refer to schematic diagram.

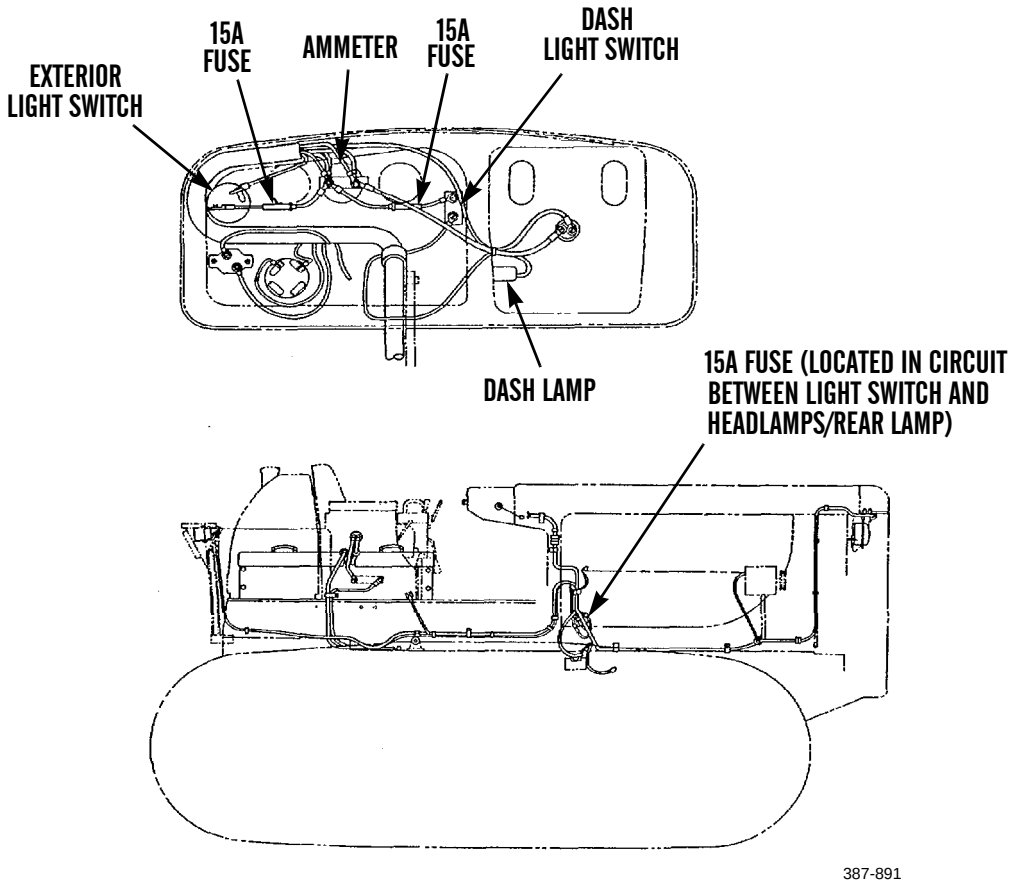


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Lamp(s) Will Not Light - Continued.	2. Check for defective lamp.	
	a. Place battery disconnect switch in OFF position.	
	b. Replace lamp with one known to be OK (WP 0080 00or WP 0093 00).	If lamp does not light, go to Table 6, *Malfunction* 13, Test 3.
	3. Place battery disconnect switch in OFF position. Check for corrosion or dirt in sockets or on terminals.	1. Clean corroded connections.
		2. Clean dirt and rust from sockets and terminals.
	4. Place battery disconnect switch in OFF position. Check lamp holders for loose connections and broken wire terminals.	1. Tighten all loose connections.
		2. Repair or replace broken wire terminals (WP 0242 00).
	NOTE **For headlamps or rear lamps, go to Table 6, *Malfunction* 13, Test 5. For dash lamps, go to Table 6, *Malfunction* 13, Test 7.**	
	5. Test headlamp/rear floodlamp circuit.	
	a. Place battery disconnect switch in OFF position.	
	NOTE **If any of the following conditions exist, replace or repair broken wire between lamp and 15 amp fuse or between lamp and ground.** • **One headlamp only will not light.** • **Both headlamps only will not light.** • **Rear floodlamp only will not light.**	
	b. If none of the exterior floodlamps light, go to step c.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

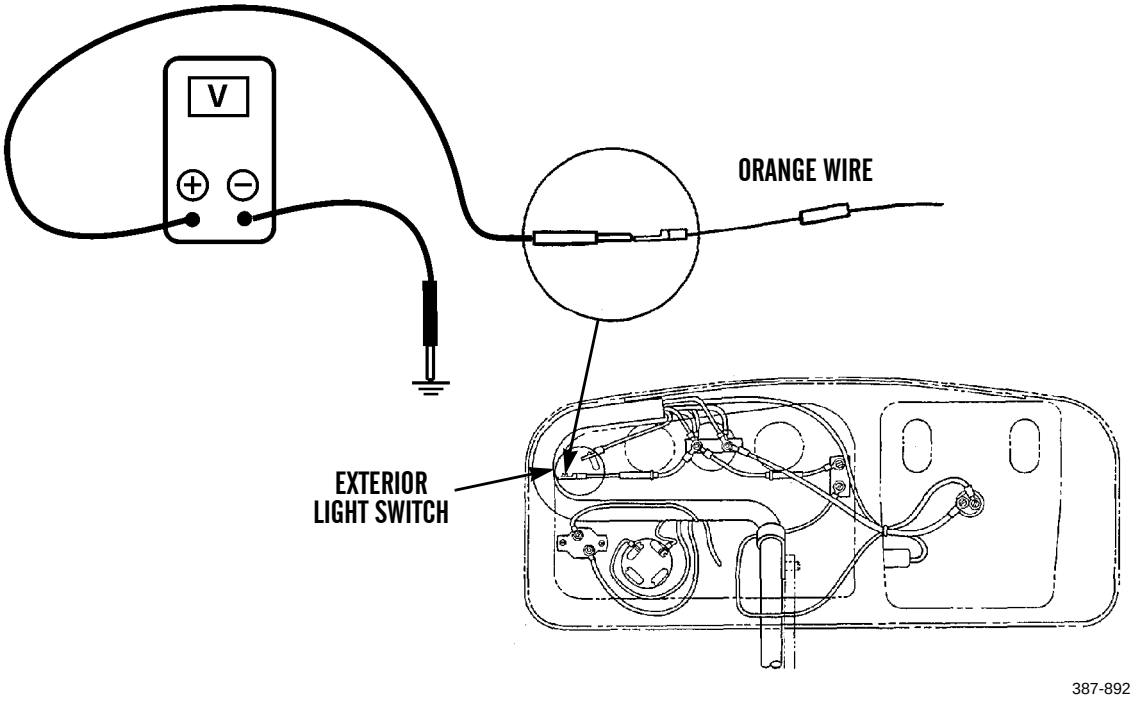
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Lamp(s) Will Not Light - Continued.	c. Disconnect orange wire from light switch terminal B. d. Set multimeter to appropriate voltage range (WP 0242 00). e. Connect meter positive lead to disconnected orange wire and negative lead to chassis ground.	
		
	f. Place battery disconnect switch in ON position and observe meter reading.	1. If voltage is indicated, go to Table 6, *Malfunction* 13, Test 6. 2. If voltage is not indicated, replace broken wire(s) to switch and/or light switch fuse (WP 0242 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

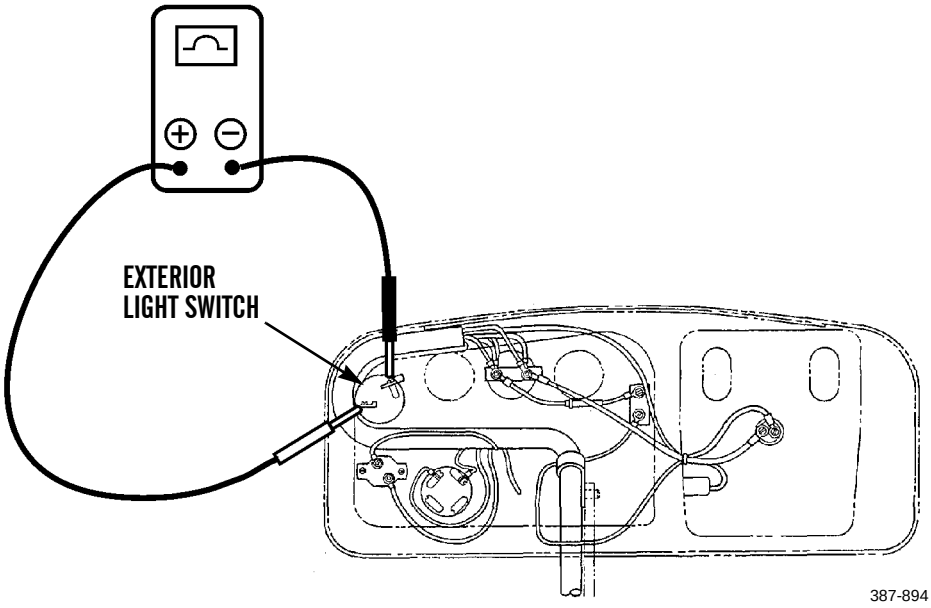
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Lamp(s) Will Not Light - Continued.	6. Test exterior light switch. a. Place battery disconnect switch in OFF position. b. Set multimeter to appropriate ohm (Ω) range. c. Disconnect dark green wire from light switch. d. Connect meter as shown to measure continuity.	
		
	e. Turn exterior light switch to ON position.	1. If continuity is indicated, repair open circuit in dark green wire (WP 0242 00). 2. If no continuity is indicated, replace exterior light switch (WP 0086 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

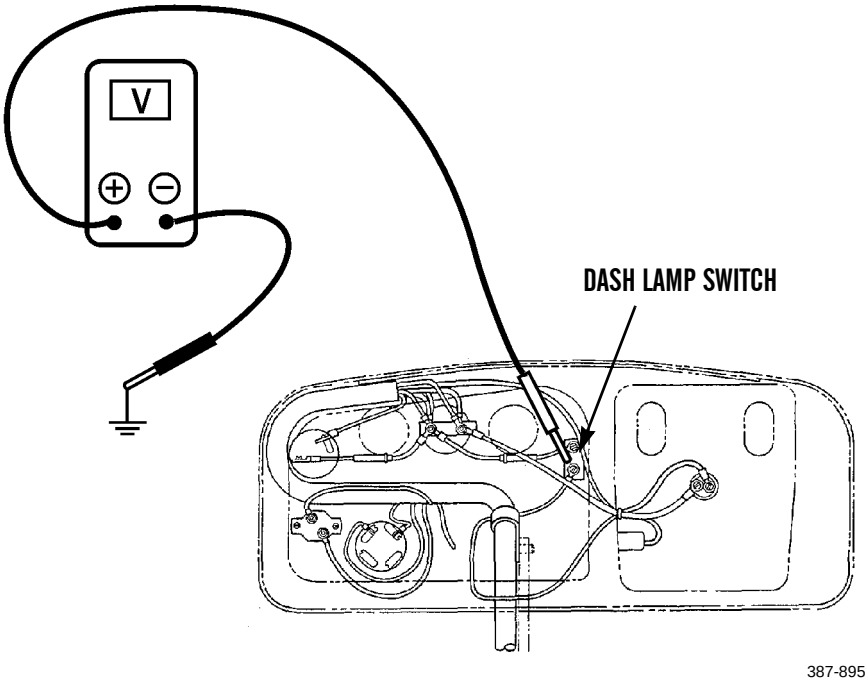
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Lamp(s) Will Not Light - Continued.	7. Test dash light circuit. a. Place battery disconnect switch in OFF position. b. Disconnect gray wire from dash lamp switch. c. Set multimeter to appropriate voltage range. d. Connect meter positive lead to switch terminal with disconnected lead and negative lead to chassis ground.	
		
	e. Place battery disconnect switch to ON position.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Lamp(s) Will Not Light - Continued.	f. Place dash light switch to ON position and observe meter. 8. Test ammeter-to-dash lamp switch wire for continuity. a. Place battery disconnect switch to OFF position. b. Set multimeter to appropriate ohm (Ω) range (WP 0242 00). c. Connect meter positive lead to orange wire terminal on switch.	1. If voltage is indicated, replace dash lamp body assembly (WP 0080 00).

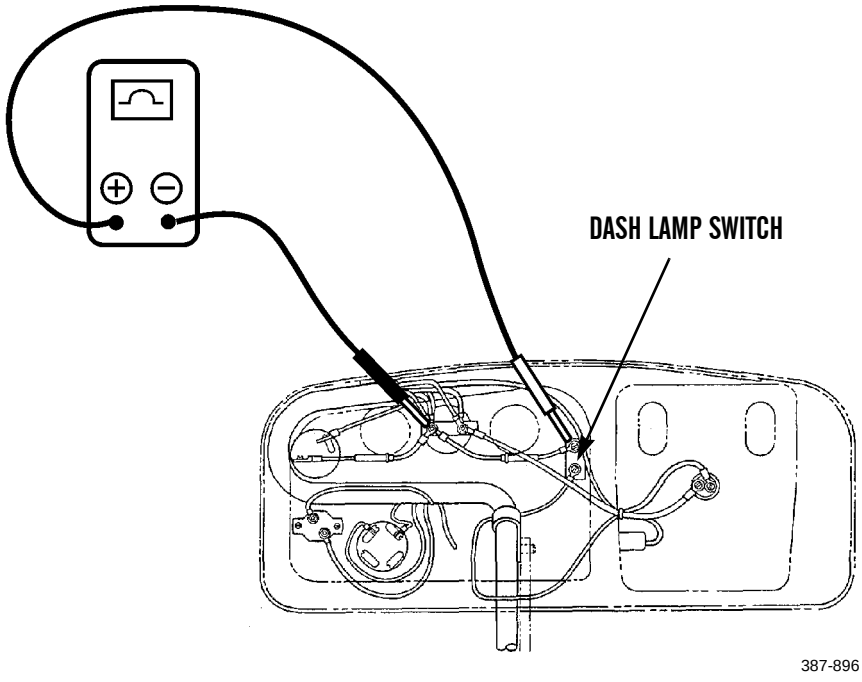


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. Lamp(s) Will Not Light - Continued.	d. Connect meter negative lead to orange wire terminal on ammeter.	1. If continuity is indicated, replace dash lamp switch (WP 0085 00). 2. If continuity is not indicated, repair open circuit in orange wire (WP 0242 00).
	9. Test dash lamp ground wire for continuity. a. Place battery disconnect switch to OFF position. b. Remove dash lamp bulb from socket. c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00). d. Connect meter positive lead to black wire terminal on socket. e. Connect meter negative lead to chassis ground.	
	f. Place battery disconnect switch in ON position.	1. If continuity is indicated, repair open circuit in gray wire (WP 0242 00). 2. If continuity is not indicated, repair open circuit in black wire (WP 0242 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

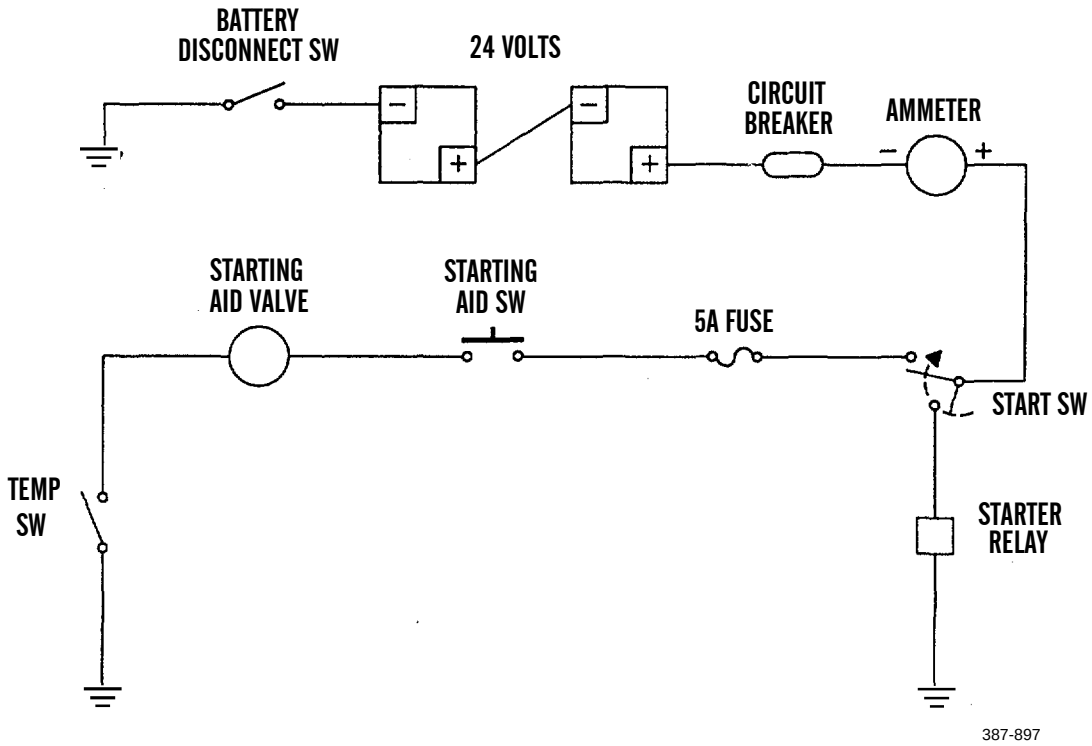
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
ETHER STARTING AID SYSTEM  		
14. Engine Cranks But Will Not Start in Cold Weather (Fuel Available).	1. Check ether canister. Remove ether canister. Shake and listen for liquid splashing inside canister. 2. Check for a blown starting aid fuse. 3. Check starting aid valve operation. a. Place battery disconnect switch in OFF position. b. Disconnect temperature switch lead from starting aid valve.	If canister is empty, replace with a full one. Replace blown fuse with same rated fuse (WP 0092 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

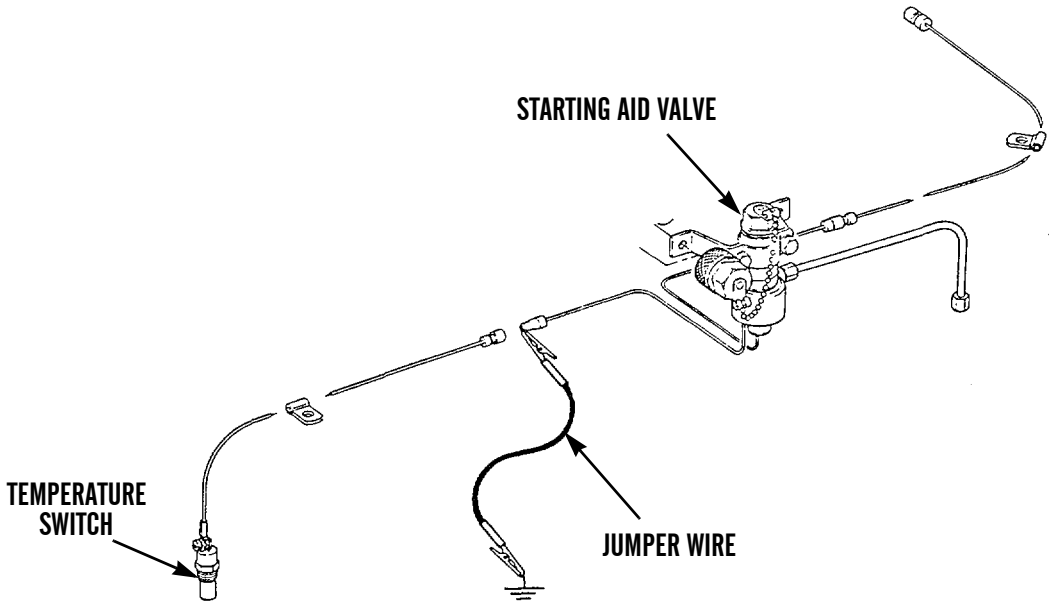
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
14. Engine Cranks But Will Not Start in Cold Weather (Fuel Available) - Continued.	c. Connect a jumper wire between purple wire on valve and chassis ground.	
	 387-898	
	d. Crank engine, press starting aid button and listen for starting aid valve operation.	1. If valve functions, go to Table 6, *Malfunction* 14, Test 4. 2. If valve does not function, place battery disconnect switch in OFF position and reconnect temperature switch lead to starting aid valve. Go to Table 6, *Malfunction* 14, Test 5.
	4. Test temperature switch wire for continuity. a. Place battery disconnect switch in OFF position. b. Disconnect wire between temperature switch and starting aid valve at both ends.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
14. Engine Cranks But Will Not Start in Cold Weather (Fuel Available) - Continued.	c. Set multimeter to appropriate ohm (Ω) range. d. Connect meter positive lead to one end of wire. e. Connect meter negative lead to other end of wire. 5. Test starting aid system voltage. a. Disconnect starting aid switch-to-valve lead at starting aid valve. b. Set multimeter to appropriate voltage range.	1. If continuity is indicated, replace temperature switch. 2. If continuity is not indicated, repair open circuit in wire (WP 0242 00).

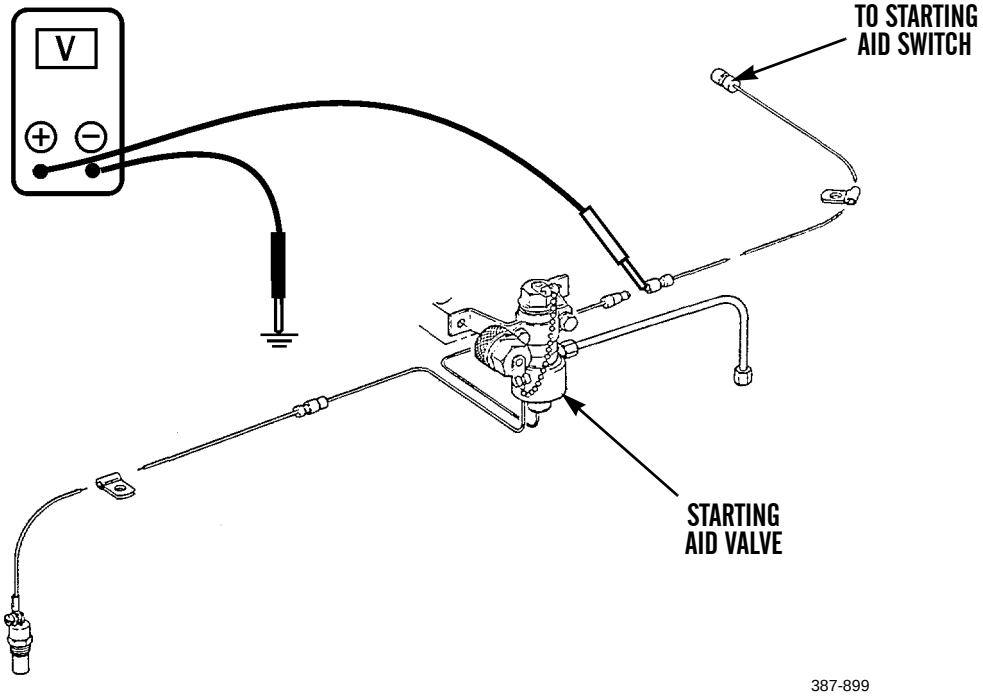


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
14. Engine Cranks But Will Not Start in Cold Weather (Fuel Available) - Continued.	c. Connect meter positive lead to purple disconnected wire and meter negative lead to chassis ground.	
	d. Crank engine, press starting aid button and observe meter.	1. If voltage is indicated, replace starting aid valve (WP 0061 00).
	6. Test temperature switch wire for continuity.	
	a. Place battery disconnect switch in OFF position.	
	b. Disconnect wire between starting aid switch and starting aid valve at both ends.	
	c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00).	
	d. Connect meter positive lead to one end of wire. Connect meter negative lead to other end of wire.	1. If continuity is indicated, replace starting aid switch (WP 0089 00).
		2. If continuity is not indicated, repair open circuit in wire (WP 0242 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
AMMETER, HOURMETER AND WARNING SYSTEM		

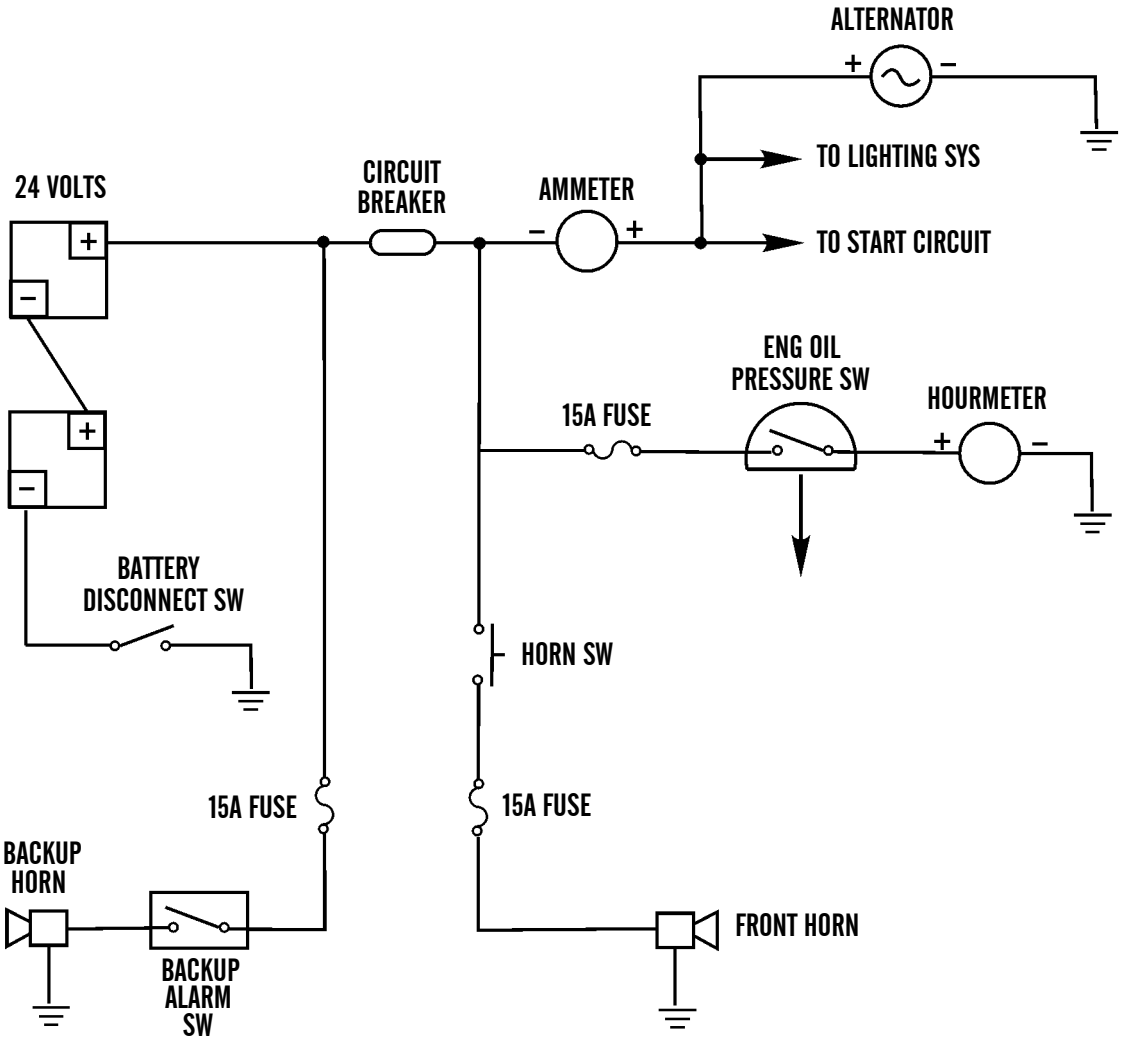


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
15. Ammeter Inoperative.	1. Test tractor electrical system Go to Table 6, *Malfunction 4*. 2. Check ammeter continuity. a. Place battery disconnect switch in OFF position. b. Set multimeter to appropriate ohm (Ω) range. c. Touch meter positive lead to ammeter case and meter negative lead to chassis ground.	1. If continuity is indicated, replace ammeter (WP 0082 00). 2. If continuity is not indicated, clean and tighten ammeter mounting points.

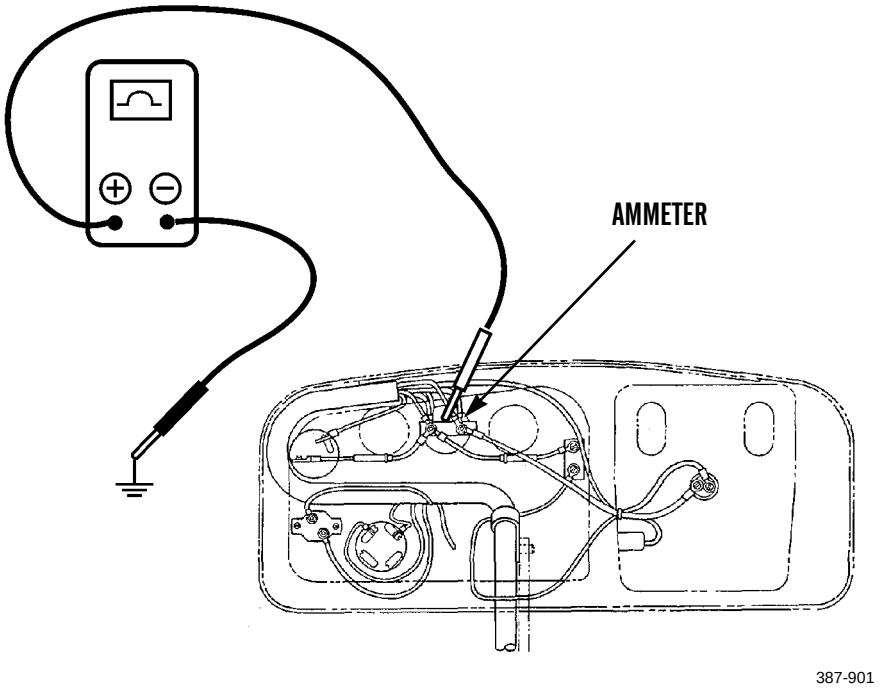


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
16. Hourmeter Inoperative.	1. Test hourmeter circuit. a. Place battery disconnect switch in OFF position. b. Check for a blown fuse. c. Disconnect engine oil pressure switch-to-hour-meter wire at switch. d. Set multimeter to appropriate voltage range. e. Connect meter positive lead to switch output terminal and meter negative lead to chassis ground.	1. Replace blown fuse with same rated fuse (WP 0092 00). 2. If fuse is not blown, proceed to step c.

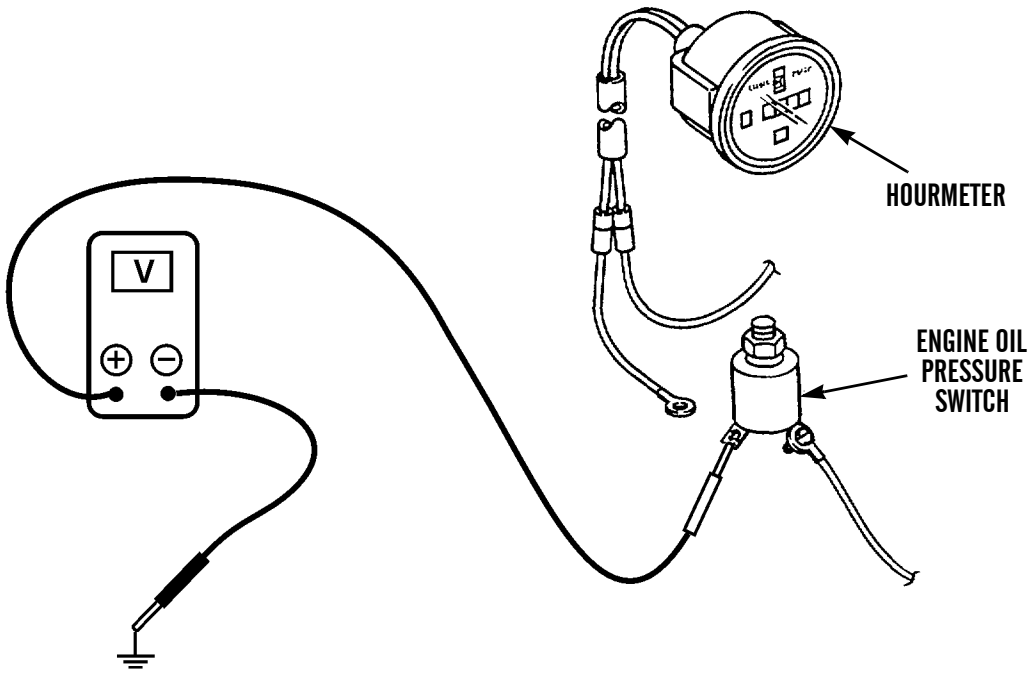


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
16. Hourmeter Inoperative - Continued.	f. Operate engine and wait until normal operating oil pressure is reached.	1. If voltage is indicated, stop engine and go to Table 6, *Malfunction 16*, Test 2. 2. If voltage is not indicated, stop engine and go to Table 6, *Malfunction 16*, Test 1, step g.
	g. Connect meter positive lead to red wire at switch and meter negative lead to chassis ground.	1. If voltage is indicated, replace the oil pressure switch (WP 0094 00). 2. If voltage is not indicated, repair open circuit between oil pressure switch and ammeter (WP 0242 00).
	2. Test temperature switch wire for continuity.	
	a. Place battery disconnect switch in OFF position.	
	b. Disconnect wire between hourmeter ground wire and oil pressure switch-to-hourmeter wire at both ends.	
	c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00).	
	d. Connect meter positive lead to one end of oil pressure switch-to-hour-meter wire.	
	e. Connect meter negative lead to other end of oil pressure switch-to-hour-meter wire. Observe meter.	1. If continuity is indicated, go to step f. 2. If continuity is not indicated, repair open circuit in wire (WP 0242 00).
	f. Connect meter positive lead to ground wire (black). Connect meter negative lead to chassis ground.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
16. Hourmeter Inoperative - Continued.	g. Place battery disconnect switch in ON position.	
	h. Observe meter.	1. If continuity is indicated, replace hourmeter (WP 0094 00). 2. If continuity is not indicated, repair open circuit in wire (WP 0242 00).
17. Front Horn Does Not Sound.	1. Test horn circuit voltage. a. Place battery disconnect switch in OFF position. b. Disconnect light blue lead from horn. c. Set multimeter to appropriate voltage range (WP 0242 00). d. Connect meter positive lead to light blue lead and meter negative lead to chassis ground.	

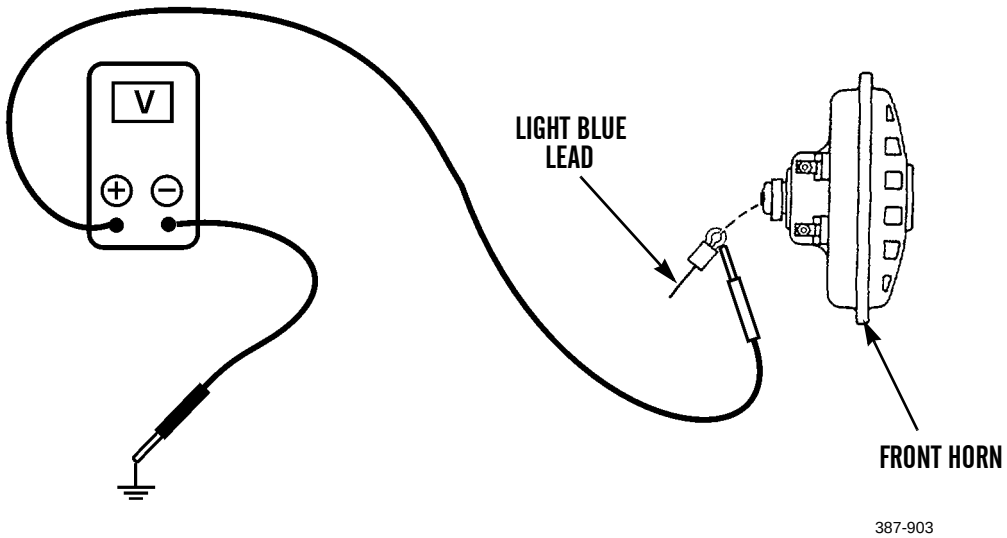


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
17. Front Horn Does Not Sound - Continued.	e. Place battery disconnect switch in ON position.	
	f. Press horn button and observe meter.	1. If voltage is indicated, go to Table 6, *Malfunction* 17, Test 4. 2. If voltage is not indicated, go to Table 6, *Malfunction* 17 Test 2.
	2. Check horn circuit continuity.	
	a. Place battery disconnect switch in OFF position.	
	b. Check for blown fuse.	1. Replace blown fuse with same rated fuse (WP 0092 00). 2. If fuse is not blown, go to Table 6, *Malfunction* 17, Test 3.

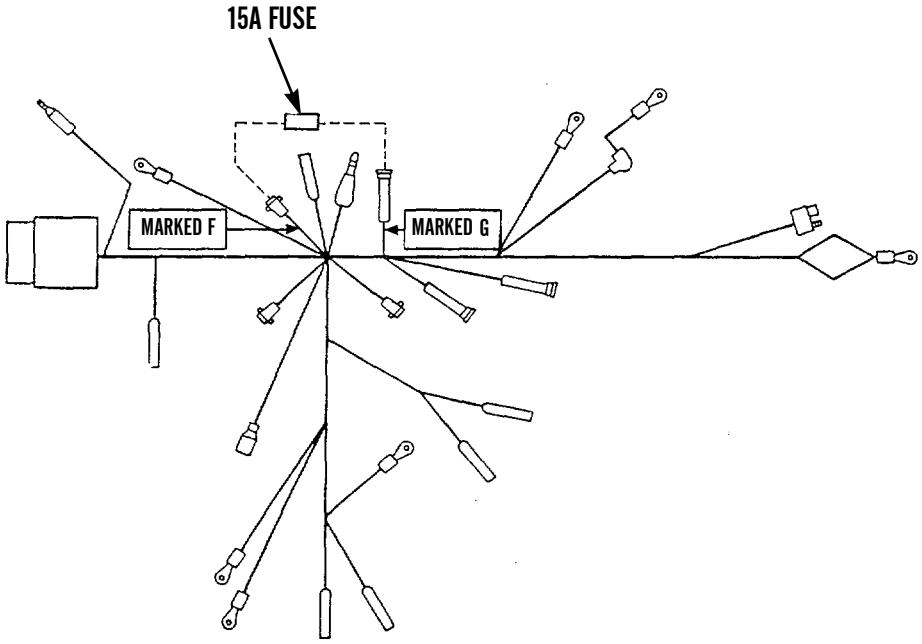


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
17. Front Horn Does Not Sound - Continued.	3. Test horn button for continuity. a. Place battery disconnect switch in OFF position. b. Completely disconnect horn button harness. c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00). d. Connect meter positive lead to horn button terminal (button side). Connect meter negative lead to other horn button terminal (button side).	
	e. Push horn button and observe meter.	1. If continuity is indicated, repair open circuit between ammeter and horn (WP 0242 00). 2. If continuity is not indicated, replace horn button (WP 0097 00).
	4. Test horn ground for continuity. a. Place battery disconnect switch in OFF position. b. Completely disconnect horn harness. c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00). d. Connect meter to positive lead to horn ground wire. Connect meter negative lead to chassis ground.	
	e. Place battery disconnect switch in ON position and observe meter.	1. If continuity is indicated, replace horn (WP 0096 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
17. Front Horn Does Not Sound - Continued.		2. If continuity is not indicated, repair open circuit in ground wire.
18. Backup Alarm Does Not Sound.	1. Test backup alarm circuit voltage. a. Place battery disconnect switch in OFF position. b. Disconnect brown wire from backup alarm. c. Set multimeter to appropriate voltage range (WP 0242 00). d. Connect meter positive lead to brown wire and meter negative lead to chassis ground.	

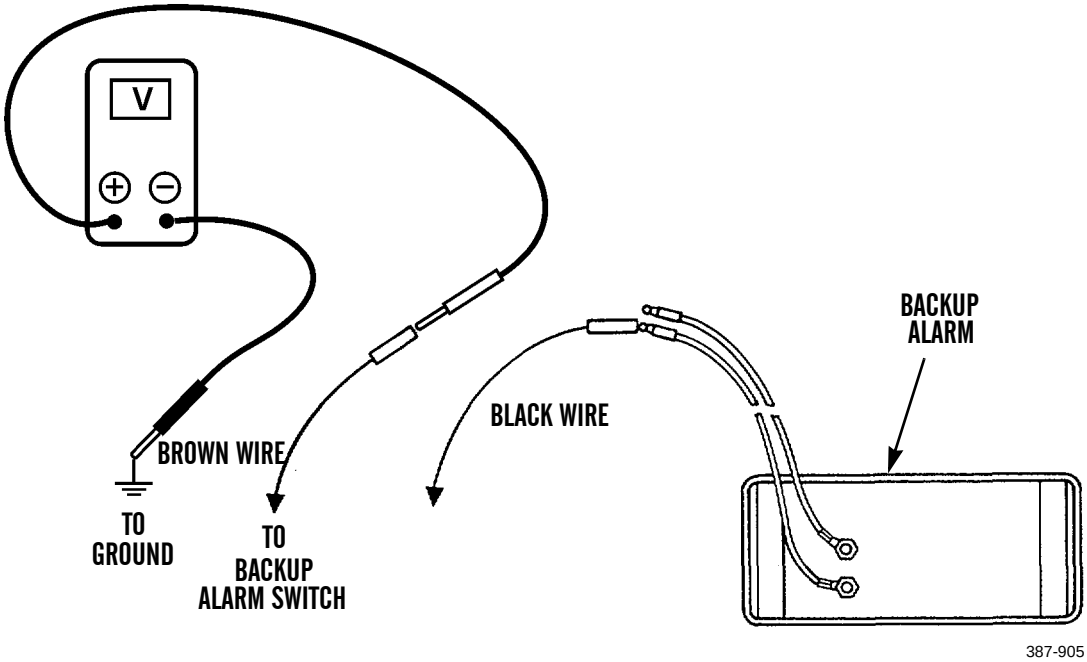


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
18. Backup Alarm Does Not Sound - Continued.	e. Place battery disconnect switch in ON position and transmission selector lever in one of the REVERSE positions. Observe meter.	1. If voltage is indicated, go to Table 6, *Malfunction* 18, Test 2. 2. If voltage is not indicated, place battery disconnect switch in OFF position and check for blown fuse. Replace blown fuse with same rated fuse (WP 0092 00).
	2. Test backup alarm ground circuit for continuity. a. Place battery disconnect switch in OFF position. b. Completely disconnect backup alarm harness. c. Set multimeter to appropriate ohm (Ω) range. d. Connect meter positive lead to alarm ground wire. Connect meter negative lead to chassis ground. e. Place battery disconnect switch in ON position and observe meter.	1. If continuity is indicated, replace backup alarm (WP 0098 00). 2. If continuity is not indicated, repair open circuit in ground wire (WP 0242 00).
	3. Test backup alarm switch for continuity. a. Place battery disconnect switch in OFF position.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
18. Backup Alarm Does Not Sound - Continued.	b. Completely disconnect backup alarm switch harness. c. Set multimeter to appropriate ohm (Ω) range. d. Connect meter positive lead to one of the backup alarm switch terminals. Connect meter negative lead to other backup alarm switch terminal. e. Place transmission selector lever in one of the REVERSE positions and observe meter.	1. If continuity is indicated, repair backup alarm circuitry (WP 0242 00). 2. If continuity is not indicated, replace backup alarm switch (WP 0099 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

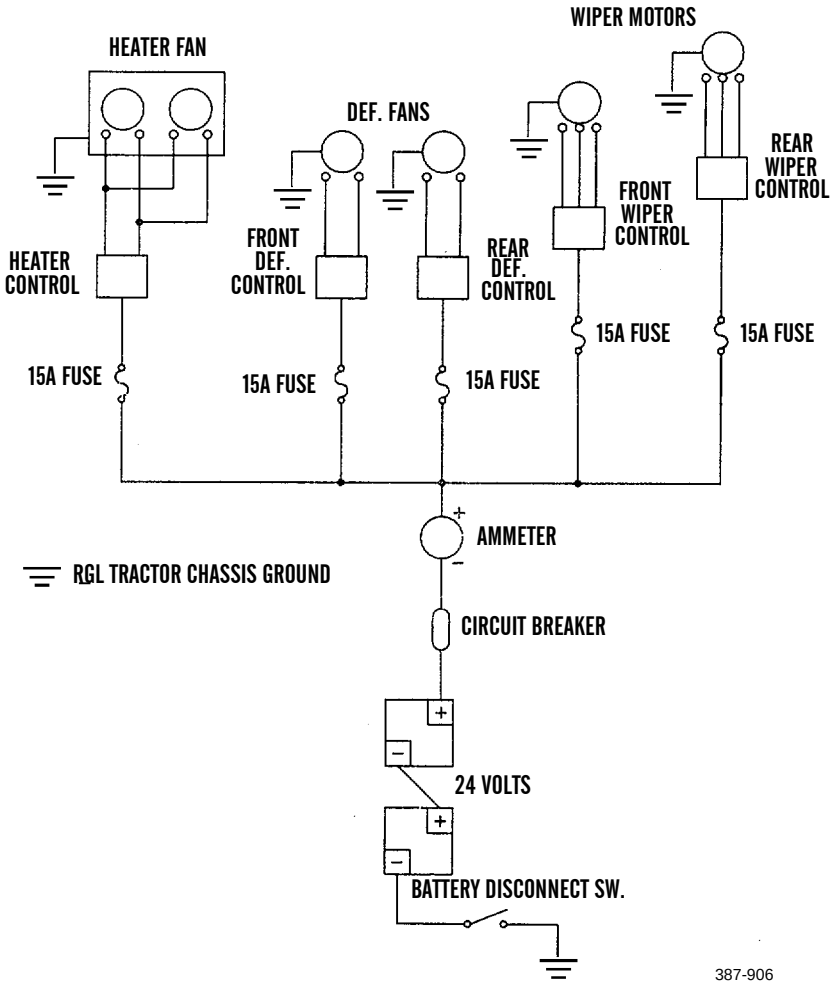
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
WINTERIZED CAB		
		
19. Heater Will Not Operate or Will Not Operate in High Speed or Low Speed Position.	1. Test heater circuit voltage. a. Place battery disconnect switch in OFF position. b. Check for blown heater circuit fuse.	1. Replace blown fuse with a fuse of the same rating (WP 0092 00). 2. If fuse is not blown, reinstall fuse and go to step c.

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
19. Heater Will Not Operate or Will Not Operate in High Speed or Low Speed Position - Continued.	c. Disconnect red and orange heater fan motors wires. d. Set multimeter to appropriate voltage range. e. Connect meter negative lead to chassis ground. f. Place battery disconnect switch in ON position. g. Place heater switch in LOW speed position and touch meter positive lead to red wires connected to switch at fan. Observe meter reading.	

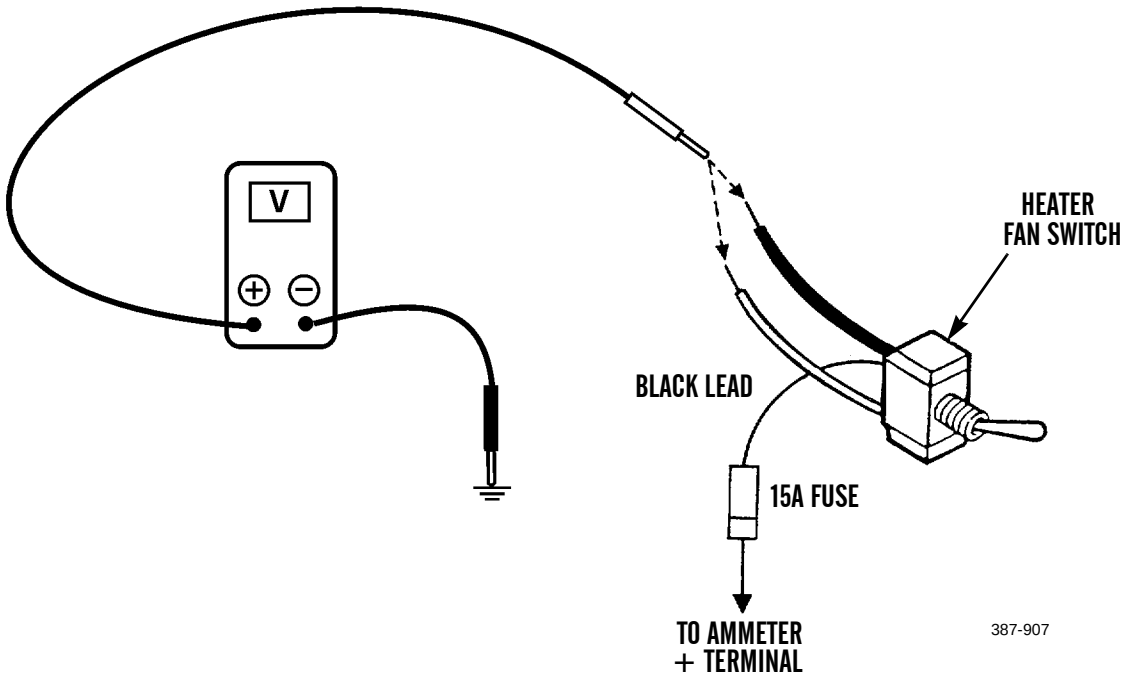


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
19. Heater Will Not Operate or Will Not Operate in High Speed or Low Speed Position - Continued.	h. Place heater switch in all HIGH speed positions and touch meter positive lead to orange wires connected to switch at fan. Observe meter reading.	1. If voltage is not indicated in *either* step g or h, replace heater switch (WP 0193 00). 2. If voltage is not indicated in *both* steps g and h, go to Table 6, *Malfunction 19* Test 2. 3. If voltage is indicated in *both* steps g and h, replace defective fan motor(s) (WP 0192 00).
	2. Test heater switch for continuity. a. Place battery disconnect switch in OFF position. b. Completely disconnect heater switch harness. c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00). d. Connect meter positive lead where black wire connects (switch side). e. Connect meter negative lead to either of the other two terminals (switch side). f. Toggle switch between all three positions and observe meter. g. Repeat steps d through f for the remaining terminal.	1. If continuity is indicated in HIGH for orange wire and LOW for red wire, but not in OFF position, repair heater circuitry (WP 0242 00). 2. If continuity is not indicated as stated above, replace heater switch (WP 0193 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
20. Defrosters Will Not Operate or Will Not Operate in High Speed or Low Speed.	NOTE **The following procedure is applicable for both front and rear defroster fans.**	
	1. Test defroster fan circuit voltage.	
	a. Place battery disconnect switch in OFF position.	
	b. Check for blown defroster fan circuit fuse.	1. Replace blown fuse with a fuse of the same rating (WP 0092 00). 2. If fuse is not blown, reinstall fuse and go to step c.
	c. Identify high speed and low speed control wires at defroster control switch with tags or similar ID technique.	
	d. Disconnect high speed and low speed control wires from defroster switch.	
	e. Set multimeter to appropriate voltage range.	
	f. Place battery disconnect switch in ON position.	
	g. Place defroster control switch to low speed position and touch meter positive lead to switch low speed terminal. Observe meter reading.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

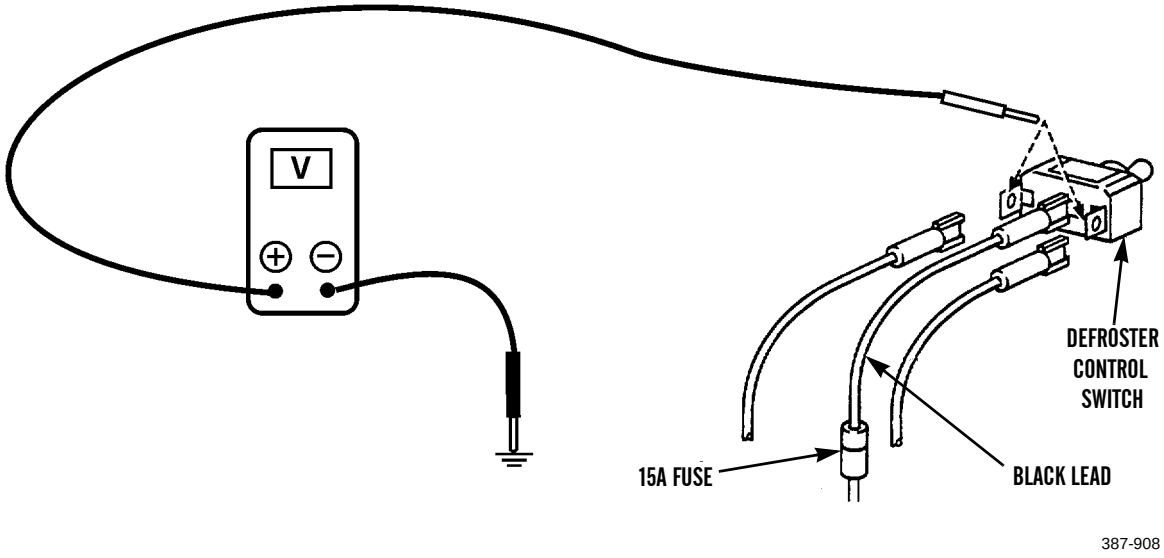
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
20. Defrosters Will Not Operate or Will Not Operate in High Speed or Low Speed - Continued.	h. Place defroster control switch to high speed position and touch meter positive lead to switch high speed terminal. Observe meter reading.	1. If voltage is not indicated in *either* step g or h, replace defroster control switch (WP 0195 00). 2. If voltage is not indicated in *both* steps g and h, go to Table 6, *Malfunction* 20, Test 2. 3. If voltage is indicated in steps *both* g and h, replace defective defroster fan motor (WP 0195 00).
		
	2. Test defroster switch for continuity. a. Place battery disconnect switch in OFF position. d. Completely disconnect defroster switch harness.	

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
20. Defrosters Will Not Operate or Will Not Operate in High Speed or Low Speed - Continued.	b. Set multimeter to appropriate ohm (Ω) range (WP 0241 00). c. Connect meter positive lead to center switch terminal (switch side). d. Connect meter negative lead to either of the other two terminals (switch side). e. Toggle switch between all three positions. Observe meter reading. f. Repeat steps c through e for remaining terminal.	1. If continuity is indicated in HIGH and LOW, but not in OFF position, repair defroster circuitry (WP 0242 00). 2. If continuity is not indicated as stated above, replace defroster switch (WP 0195 00).
21. Windshield Wiper Will Not Operate or Will Not Operate in High Speed or Low Speed Position.	NOTE **The following procedure is for both front and rear windshield wiper circuits.** 1. Test wiper motor circuit voltage. a. Place battery disconnect switch in OFF position. b. Check for blown wiper circuit fuse. c. Disconnect wiper motor wire connectors. d. Set multimeter to appropriate voltage range.	1. Replace blown fuse with a fuse of the same rating (WP 0092 00). 2. If fuse is not blown, reinstall and go to step c.

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
21. Windshield Wiper Will Not Operate or Will Not Operate in High Speed or Low Speed Position - Continued.	e. Connect meter negative lead to chassis ground. f. Place battery disconnect switch in ON position. g. Place wiper switch to low speed position and touch meter positive lead to green wire. Observe meter reading. h. Place wiper switch to high speed position and touch meter positive lead to red wire. Observe meter reading.	1. If voltage is not indicated in *either* step g or h, go to Table 6, *Malfunction 21*, Test 2. 2. If voltage is indicated in *both* steps g and h, go to Table 6, *Malfunction 21*, Test 4.

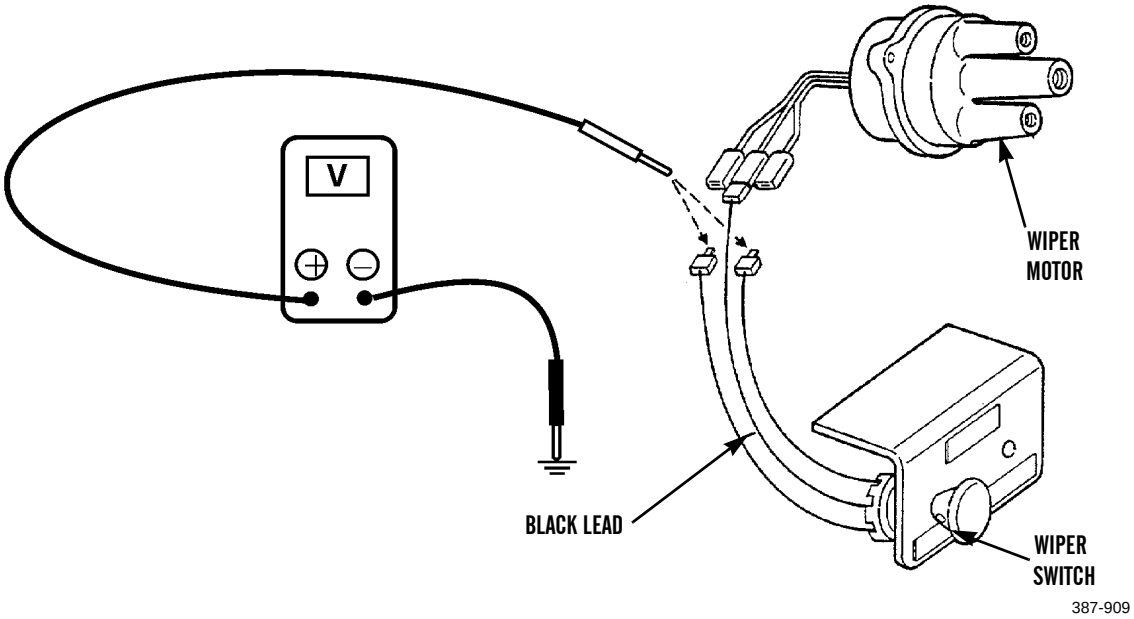


Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
21. Windshield Wiper Will Not Operate or Will Not Operate in High Speed or Low Speed Position - Continued.	2. Test wiper switch circuitry for continuity between switch and wiper motor. a. Place battery disconnect switch in OFF position. b. Completely disconnect wiper switch wiring. c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00). d. Connect meter positive lead to one end of each of the 3 wires. Connect meter negative lead to other end of each wire. Observe meter.	1. If continuity is indicated, go to Table 6, *Malfunction 21*, Test 3. 2. If continuity is not indicated, repair circuit in question (WP 0242 00).
	3. Test wiper switch source voltage. a. Place battery disconnect switch in OFF position. b. Completely disconnect wiper switch wiring. c. Set multimeter to appropriate voltage range (WP 0242 00). d. Connect meter positive lead to black wire. Connect meter negative lead chassis ground. e. Place battery disconnect switch in ON position. Observe meter reading.	1. If voltage is indicated, replace wiper switch (WP 0087 00). 2. If voltage is not indicated, repair open circuit in black wire (WP 0242 00).

Table 6. Electrical System Troubleshooting Procedures - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
21. Windshield Wiper Will Not Operate or Will Not Operate in High Speed or Low Speed Position - Continued.	4. Test wiper motor ground for continuity. a. Place battery disconnect switch in OFF position. b. Completely disconnect wiper motor wiring. c. Set multimeter to appropriate ohm (Ω) range (WP 0242 00). d. Connect meter positive lead to wiper motor ground wire. Connect meter negative lead to chassis ground. e. Place battery disconnect switch in ON position. Observe meter.	1. If continuity is indicated, replace wiper motor (WP 0194 00). 2. If continuity is not indicated, repair wiper motor ground wire (WP 0242 00).

END OF WORK PACKAGE

STE/ICE TROUBLESHOOTING PROCEDURES 0007 00

GENERAL

1. This work package contains information and tests which may be used with the STE/ICE (Simplied Test Equipment for Internal Combustion Engines) system to locate malfunctions that may develop in the vehicle. These tests can be used during troubleshooting, corrective maintenance or after parts replacement to isolate malfunctions, anticipate failures and to check that proper repairs have been made.
2. STE/ICE is used primary with the vehicle electrical system. The tests cannot cover all malfunctions which may occur. If a particular malfunction is not discussed, refer to the *The Troubleshooting Symptom Index in WP 0005 00*.
3. When a malfunction occurs, proceed to the start of the GO-Chain test sequence provided in the Vehicle Test Procedure.
4. Refer to TM 9-4910-571-12&P, *Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools List for Simplified Test Equipment for Internal Combustion Engines*, for set-up, operation and test procedures. Descriptions are given for general tests and maintenance procedures to help you keep STE/ICE working properly. See Appendix G for copies of in-vehicle test cards.

DESCRIPTION AND OPERATION

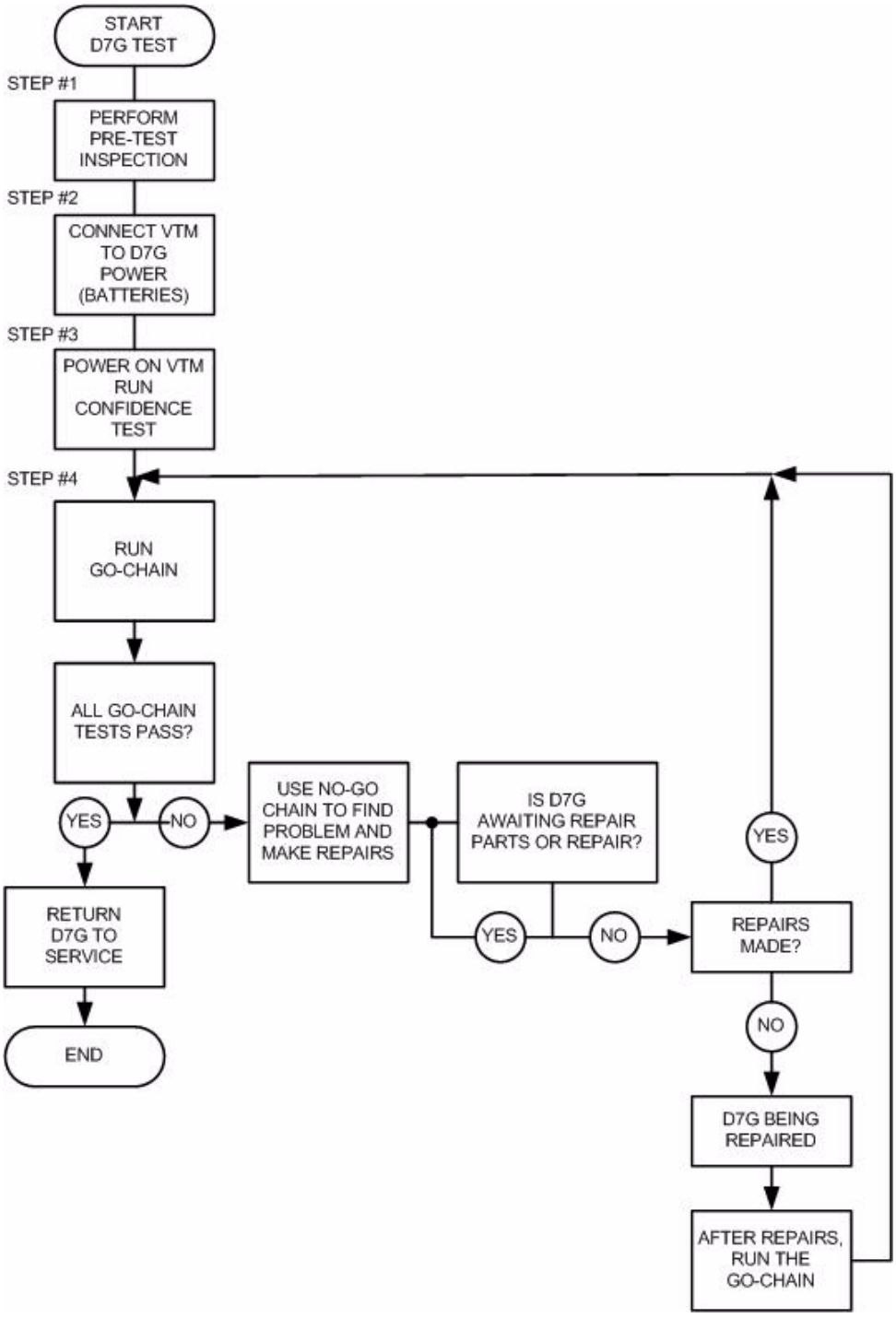
1. STE/ICE is portable and operates on the tractor's 24-volt system. It consists of a vehicle test meter (VTM), a transducer kit (TK), four electrical cables, a transit case and technical publications.
2. Refer to the manual provided with the STE/ICE for a description and operation of the VTM and the TK.

STE/ICE TESTING PROCEDURE

1. The VTM provides a method to test the D7G electrical and mechanical components. Readings are either GO/NO-GO (pass/fail) indications or digital displays in units (psi, rpm, volts, ohms, amps, etc.).
2. The diagnostic connector assembly (DCA) is mounted beneath the dashboard and provides access to the most frequently needed test points.
3. Use of the VTM through the DCA is referred to as the DCA Mode GO-Chain Tests.
4. When the VTM interfaces with the tractor through the use of the transducer kit, the use of the VTM is referred to as the TK Mode GO-Chain Tests.
5. The DCA and TK Modes can be used at the same time.

STE/ICE TROUBLESHOOTING PROCEDURES - CONTINUED **0007 00**

STE/ICE TESTING PROCEDURE - CONTINUED



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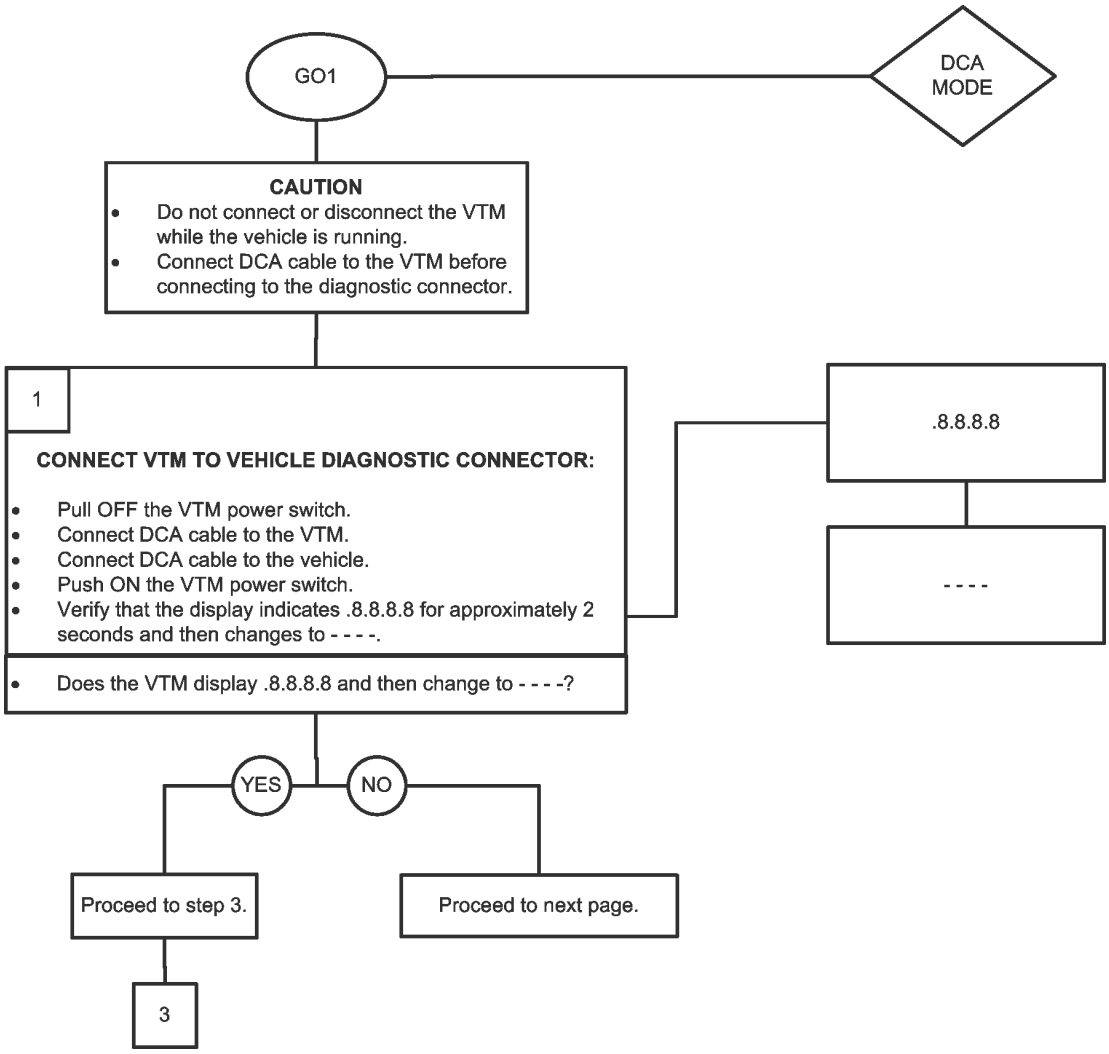

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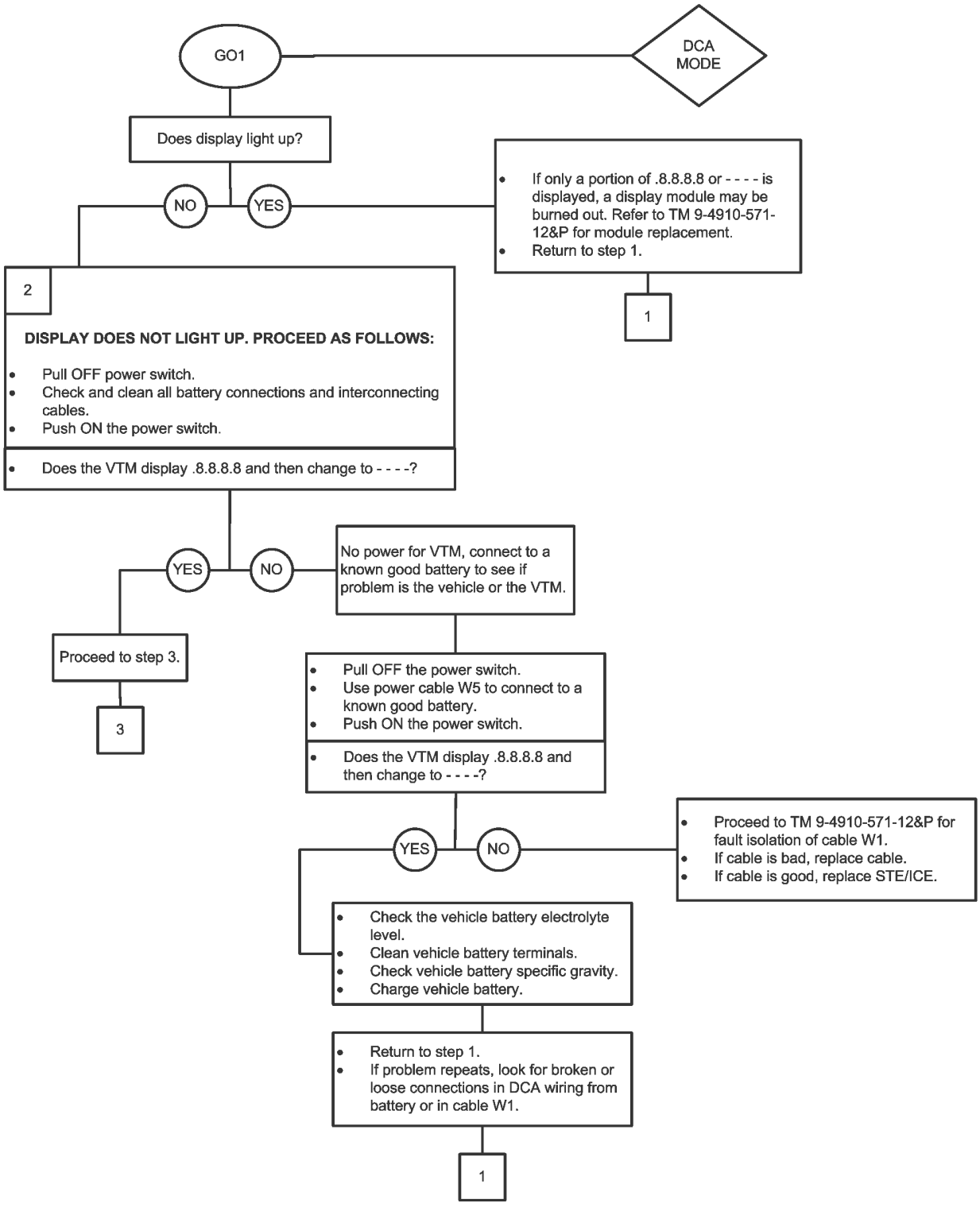

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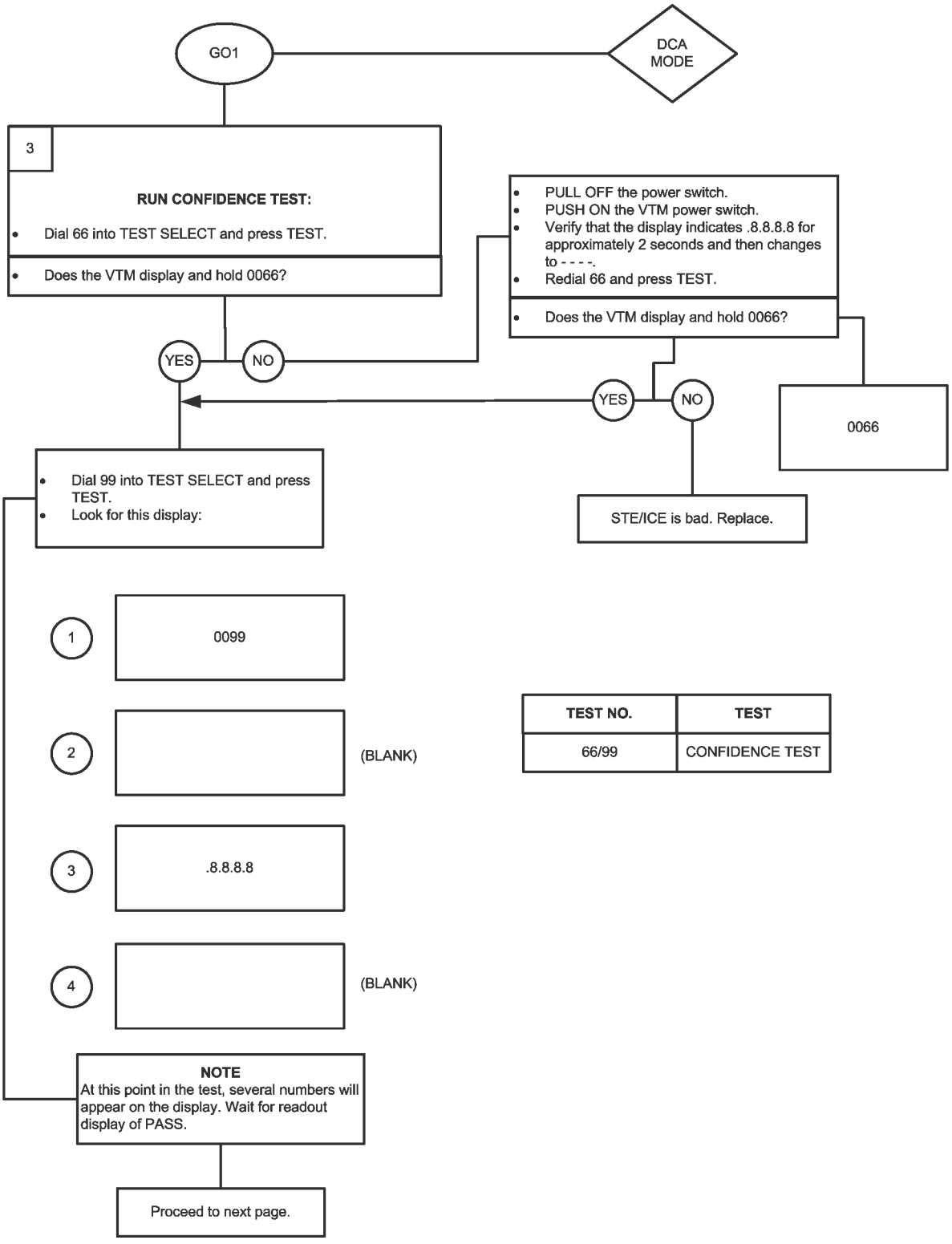

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66/99	CONFIDENCE TEST

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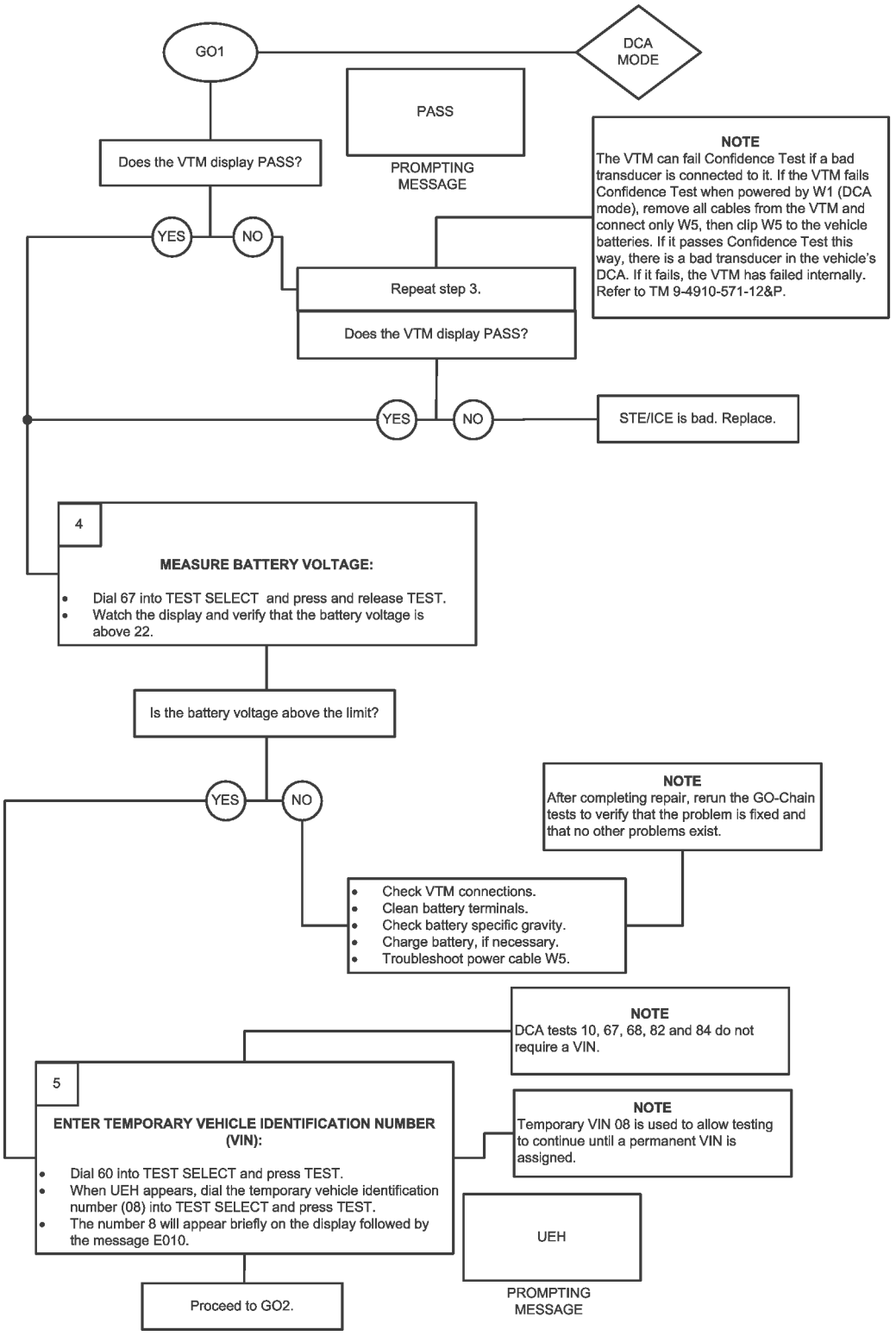

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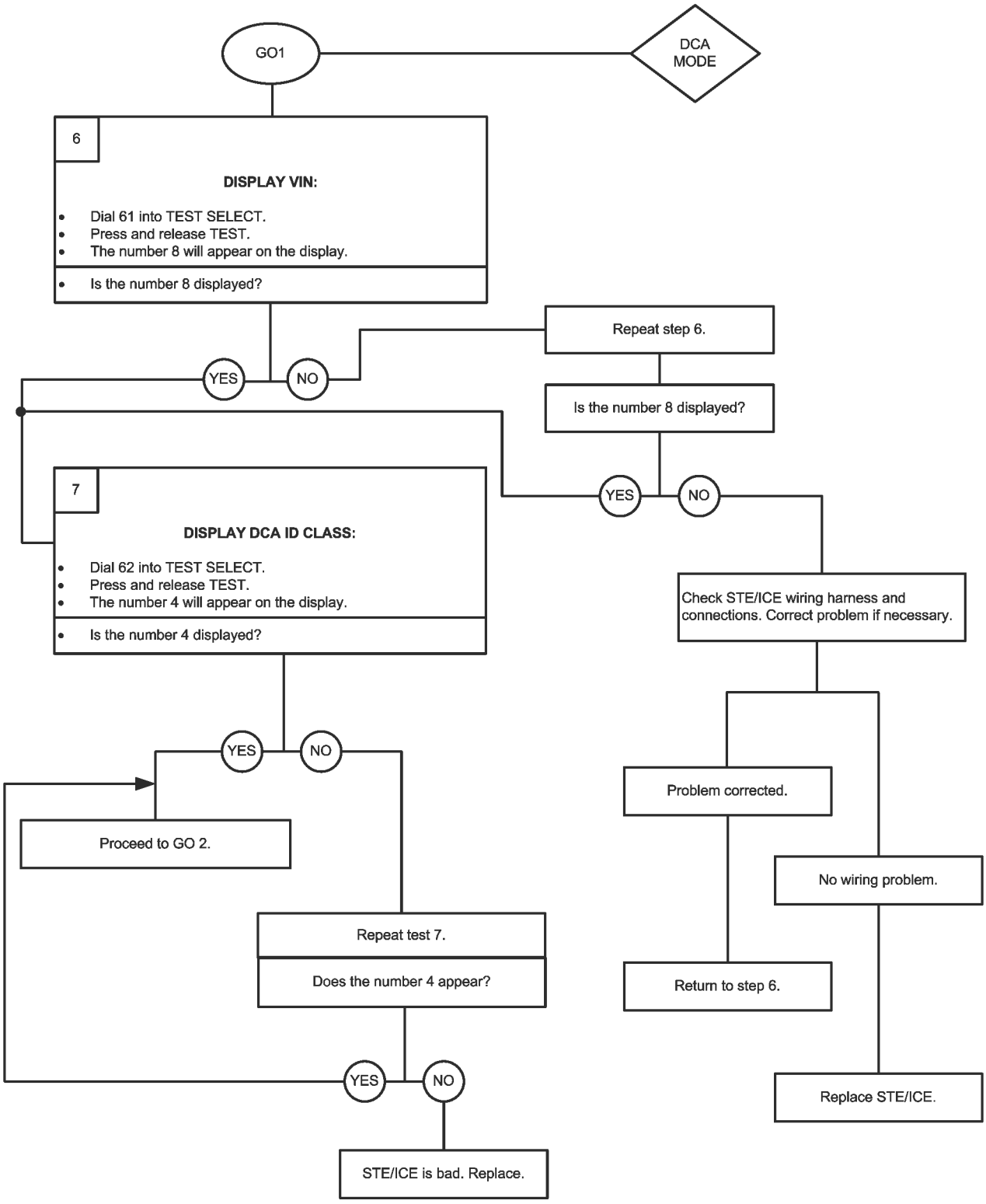

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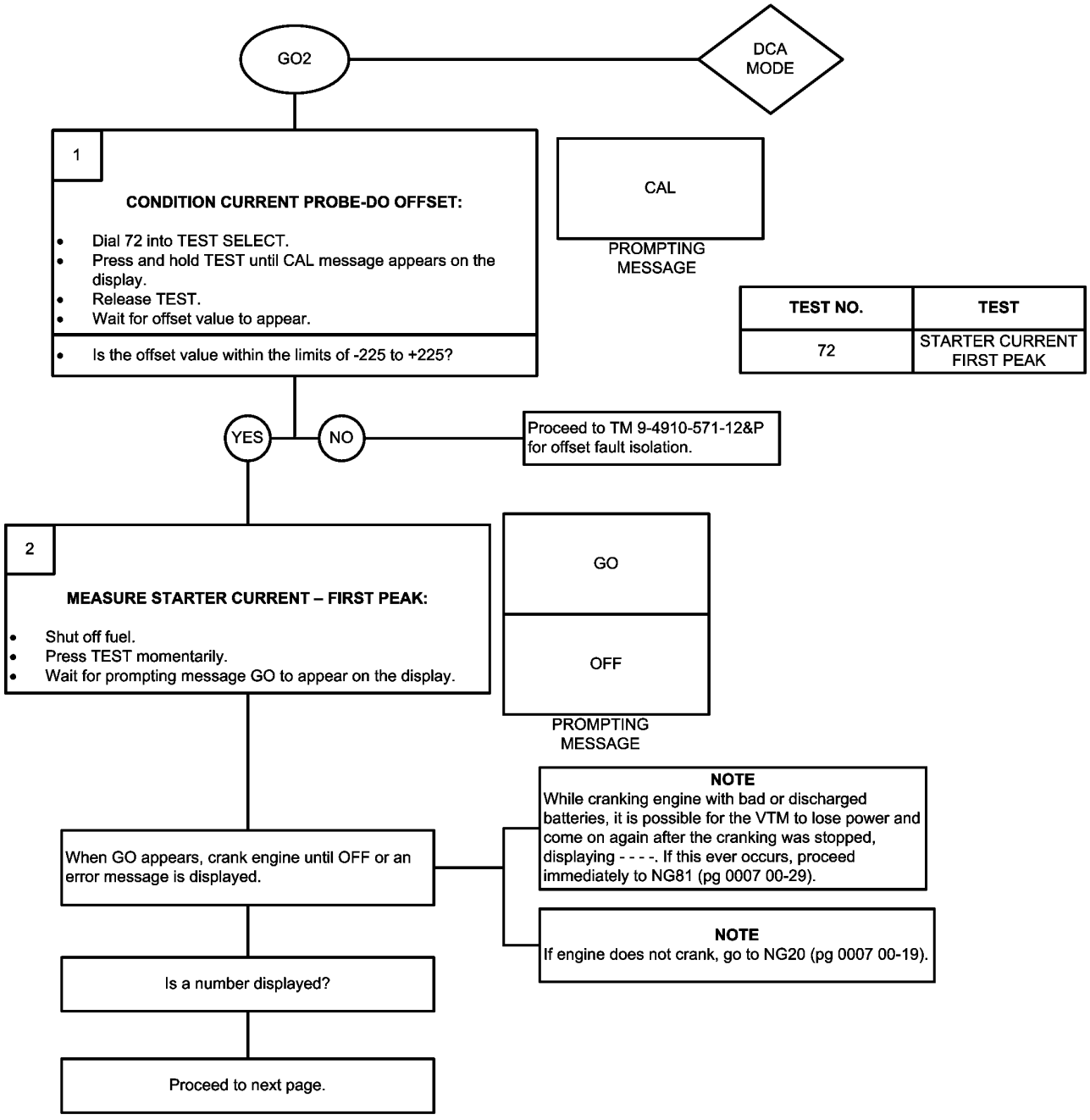

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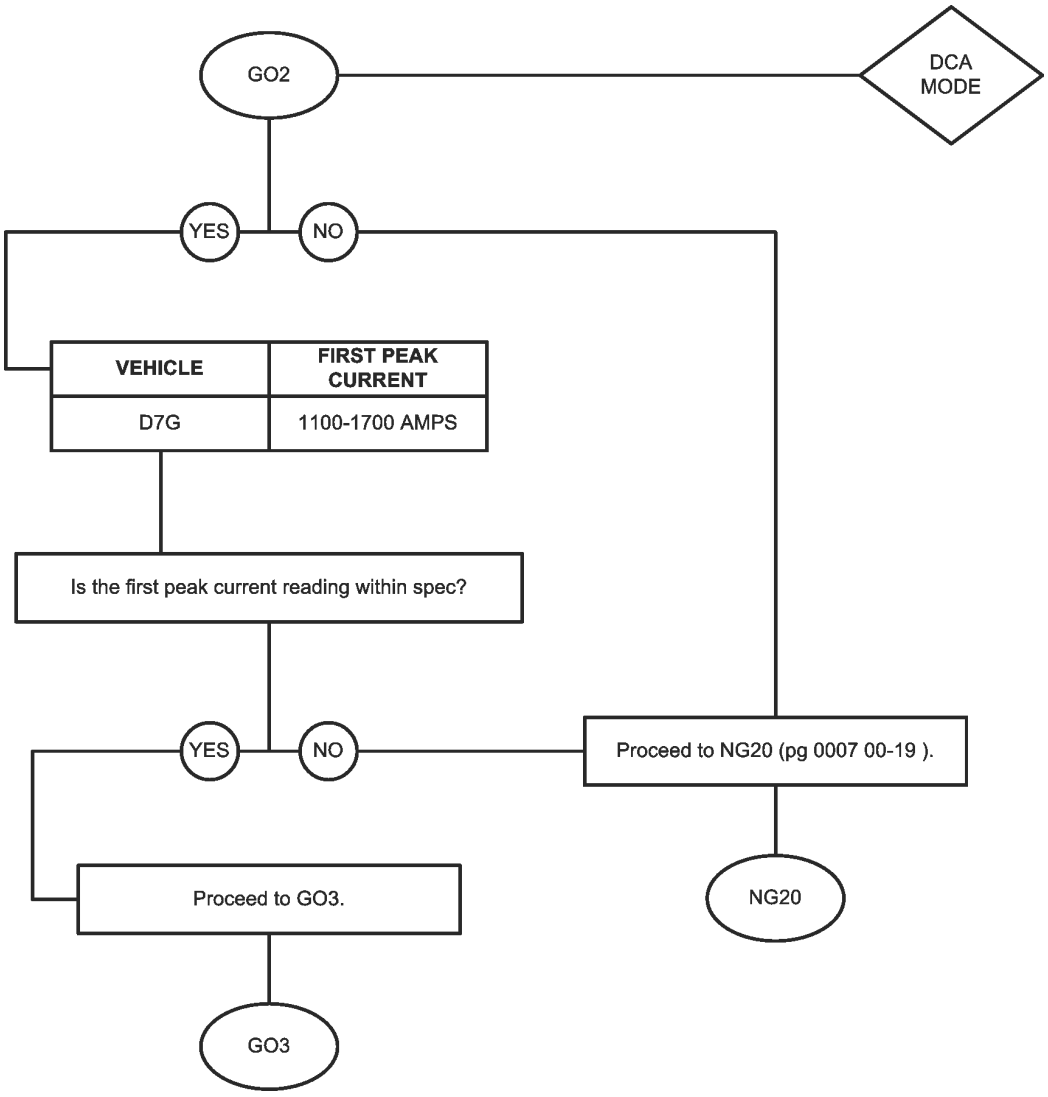

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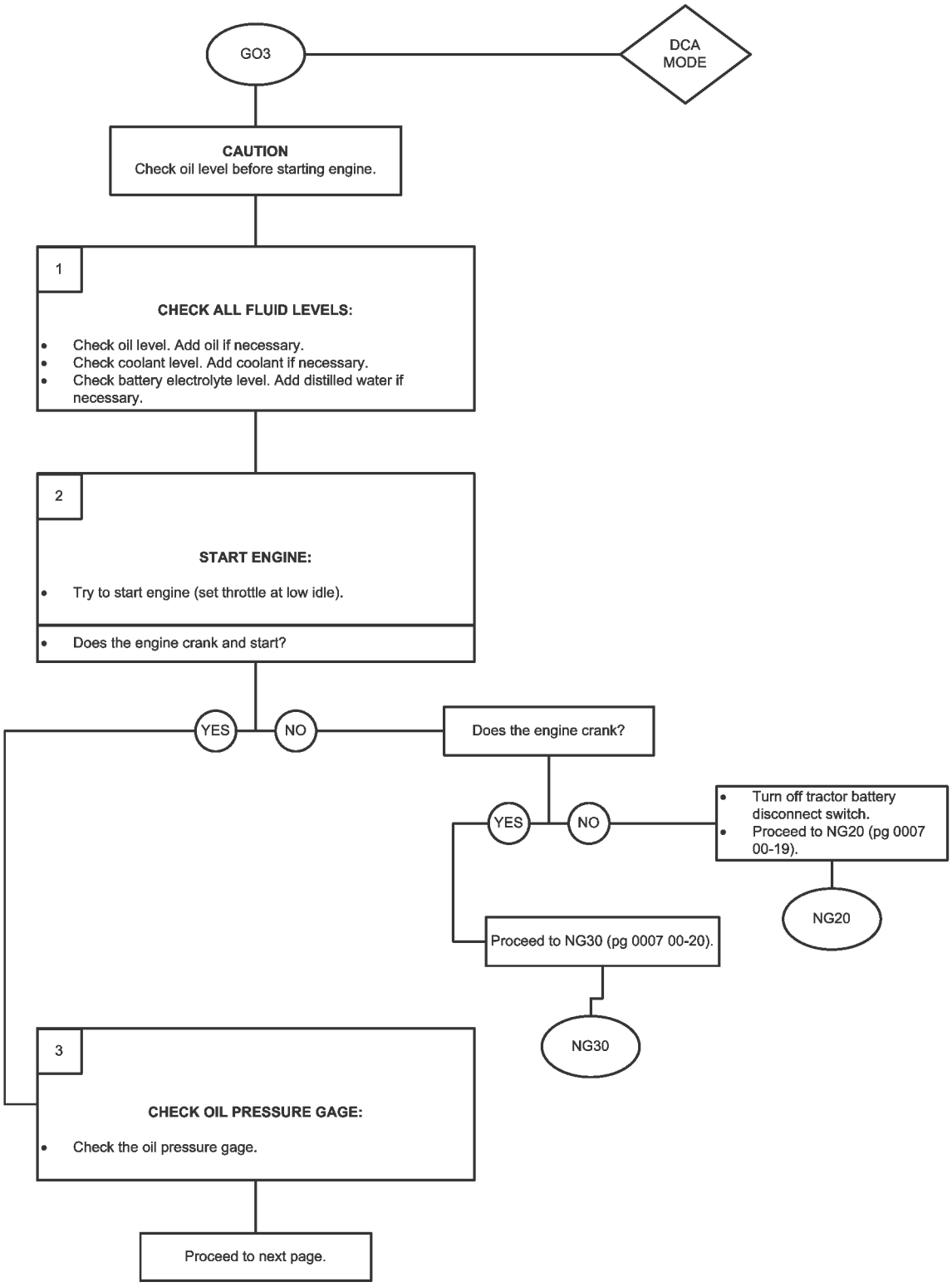

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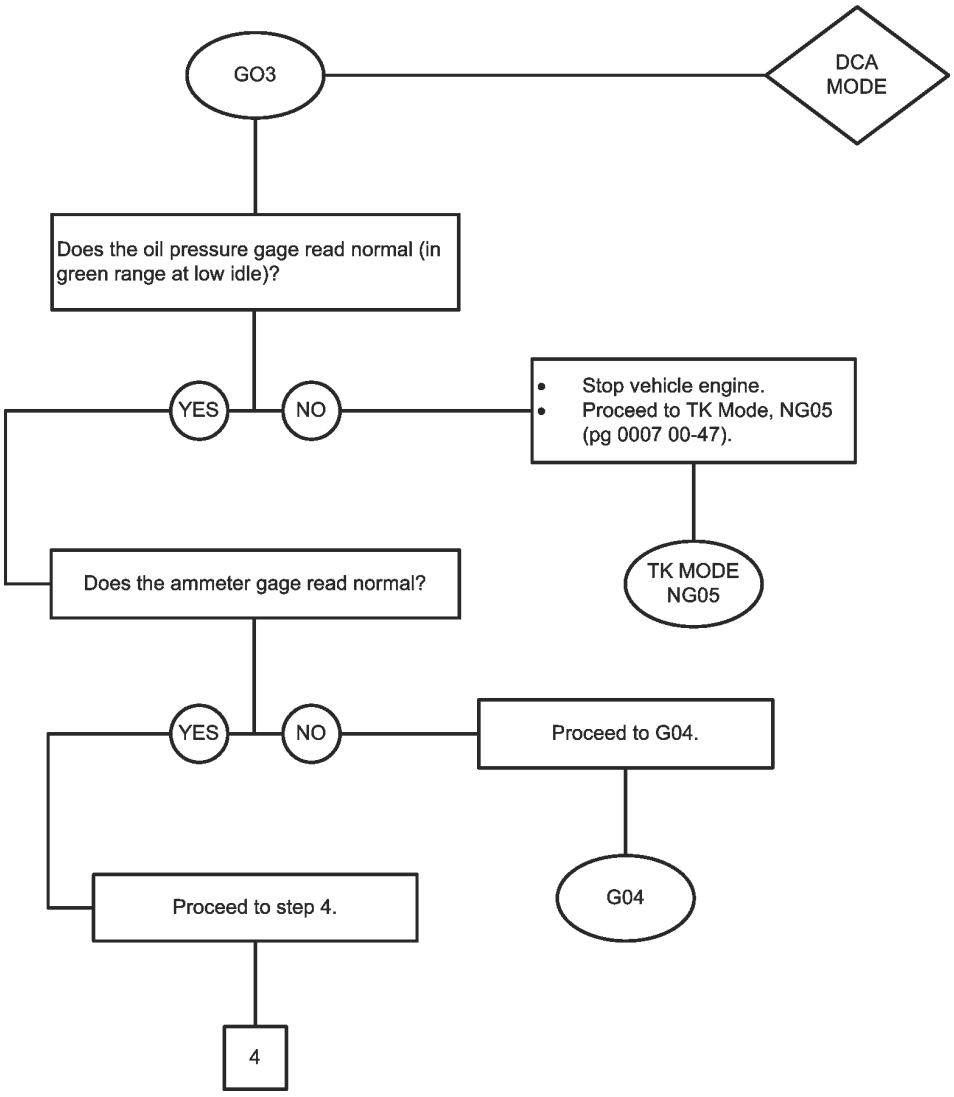

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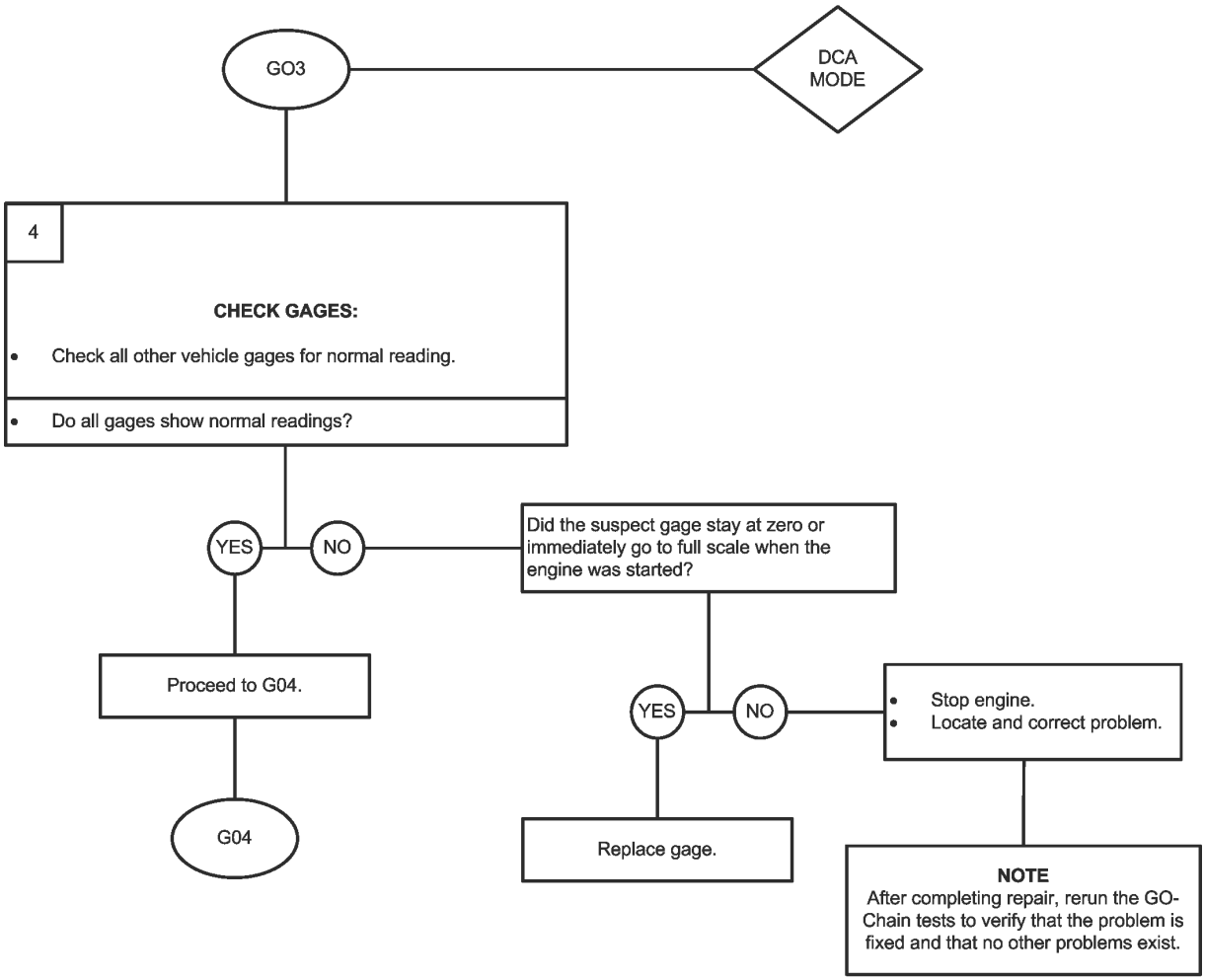

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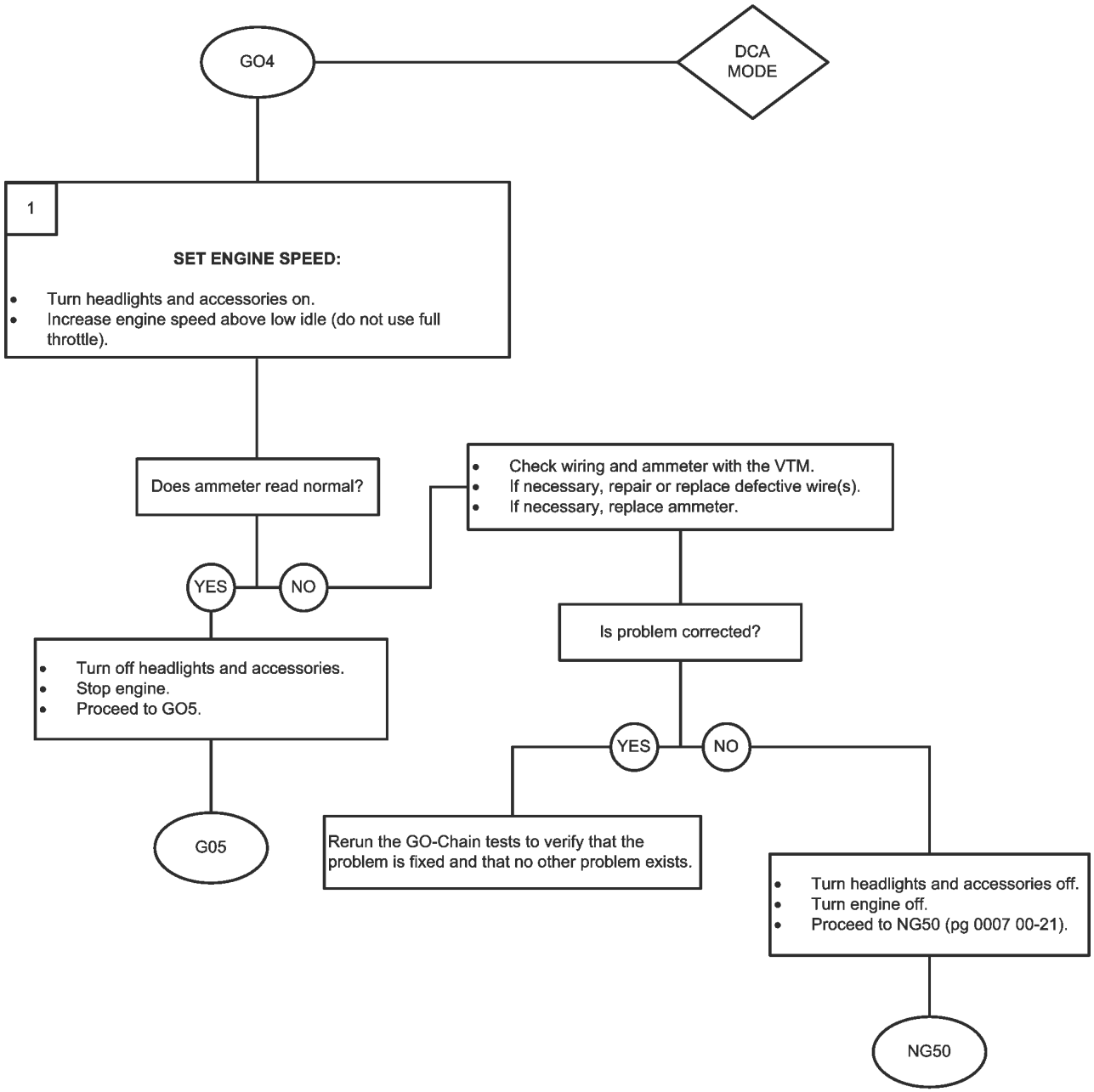

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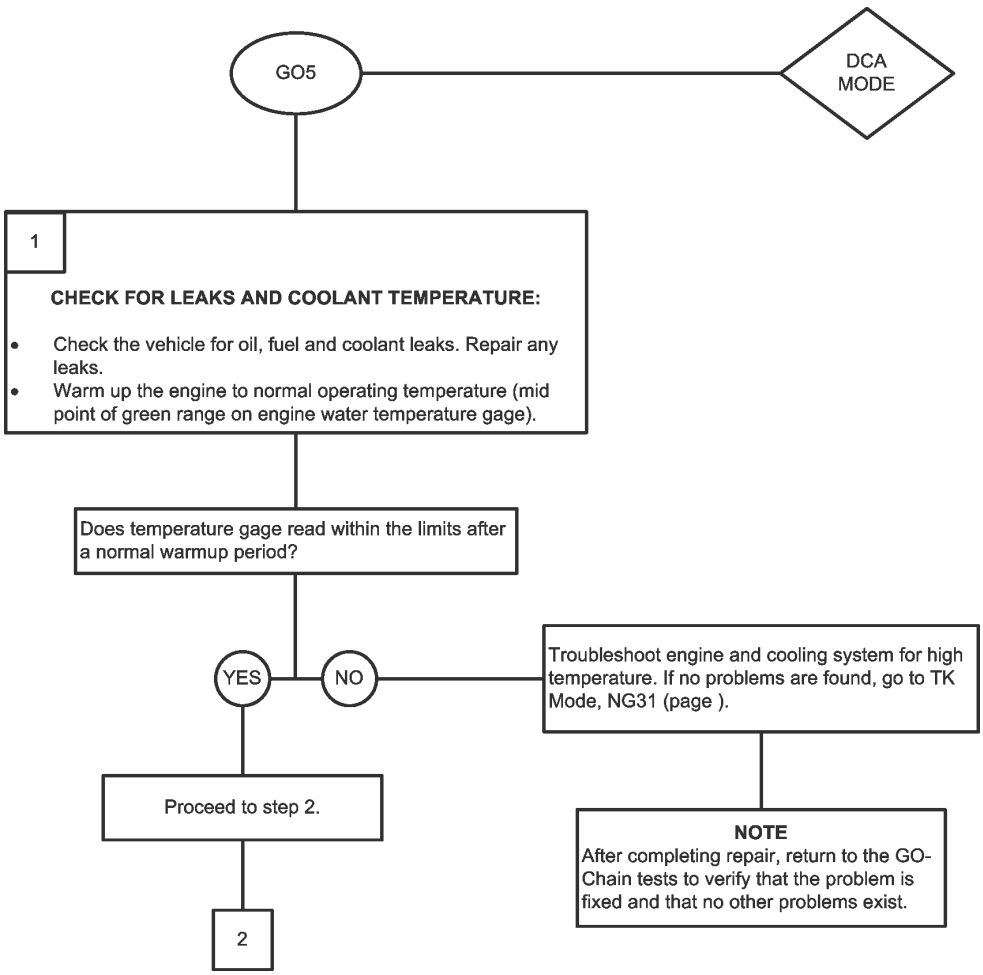

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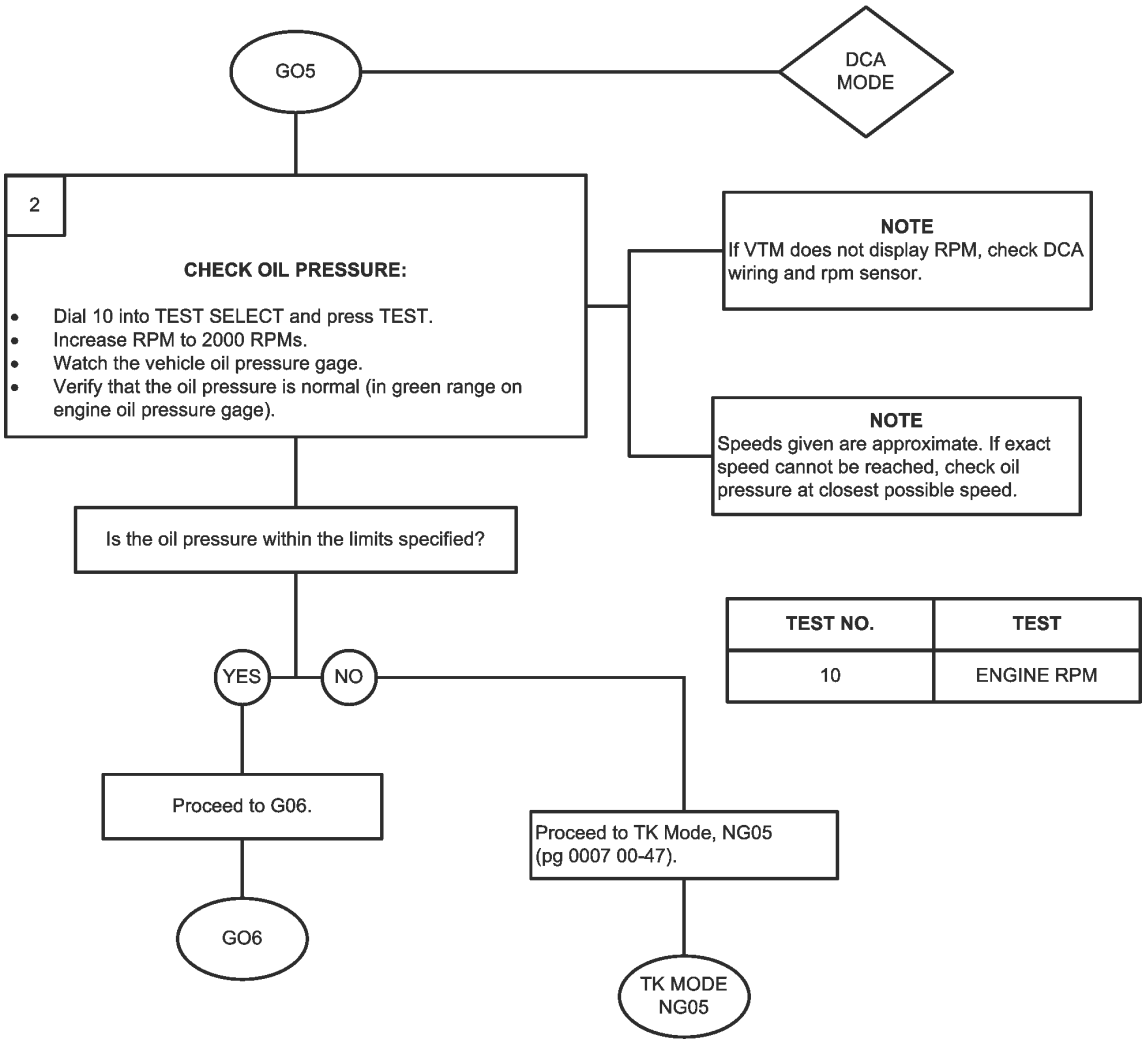

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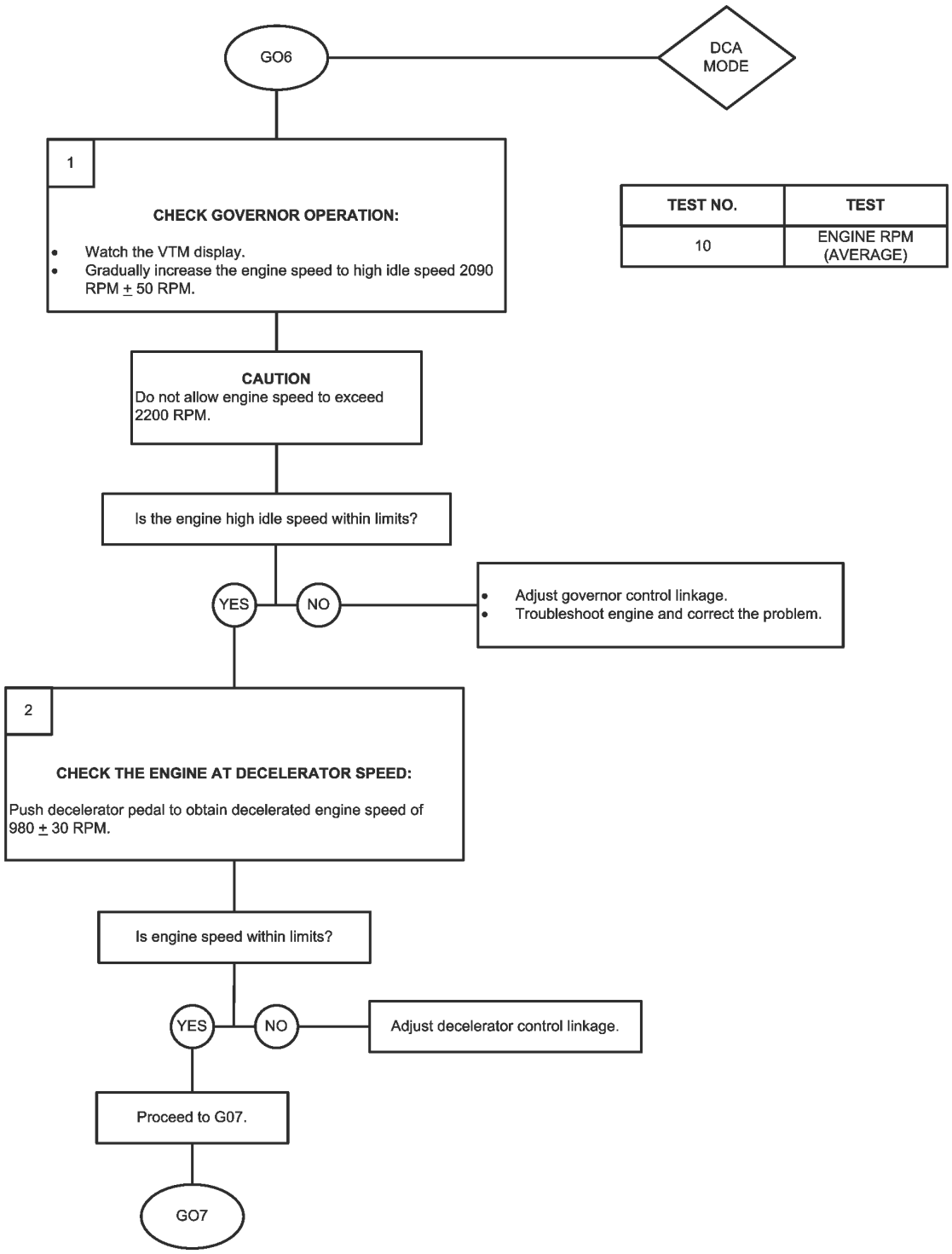

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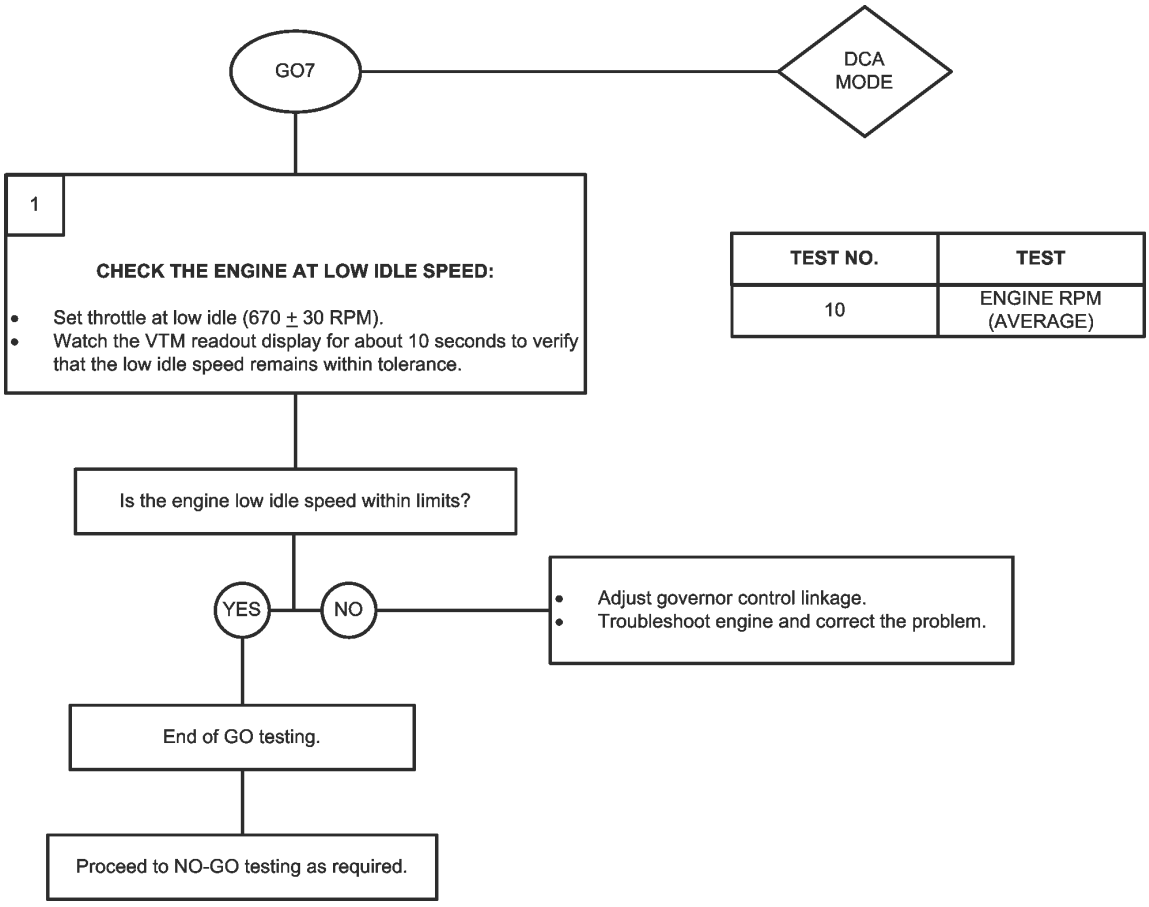

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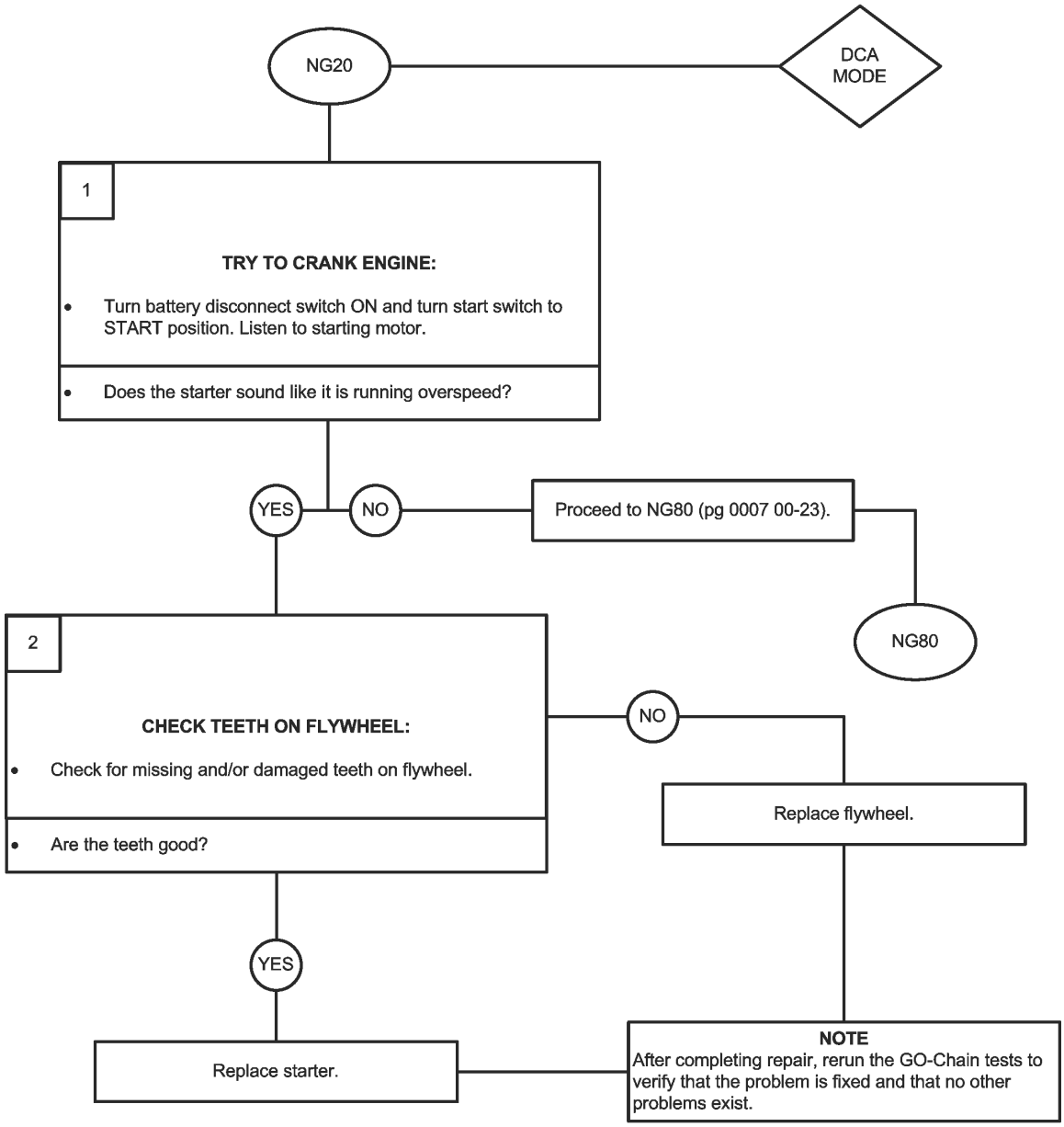

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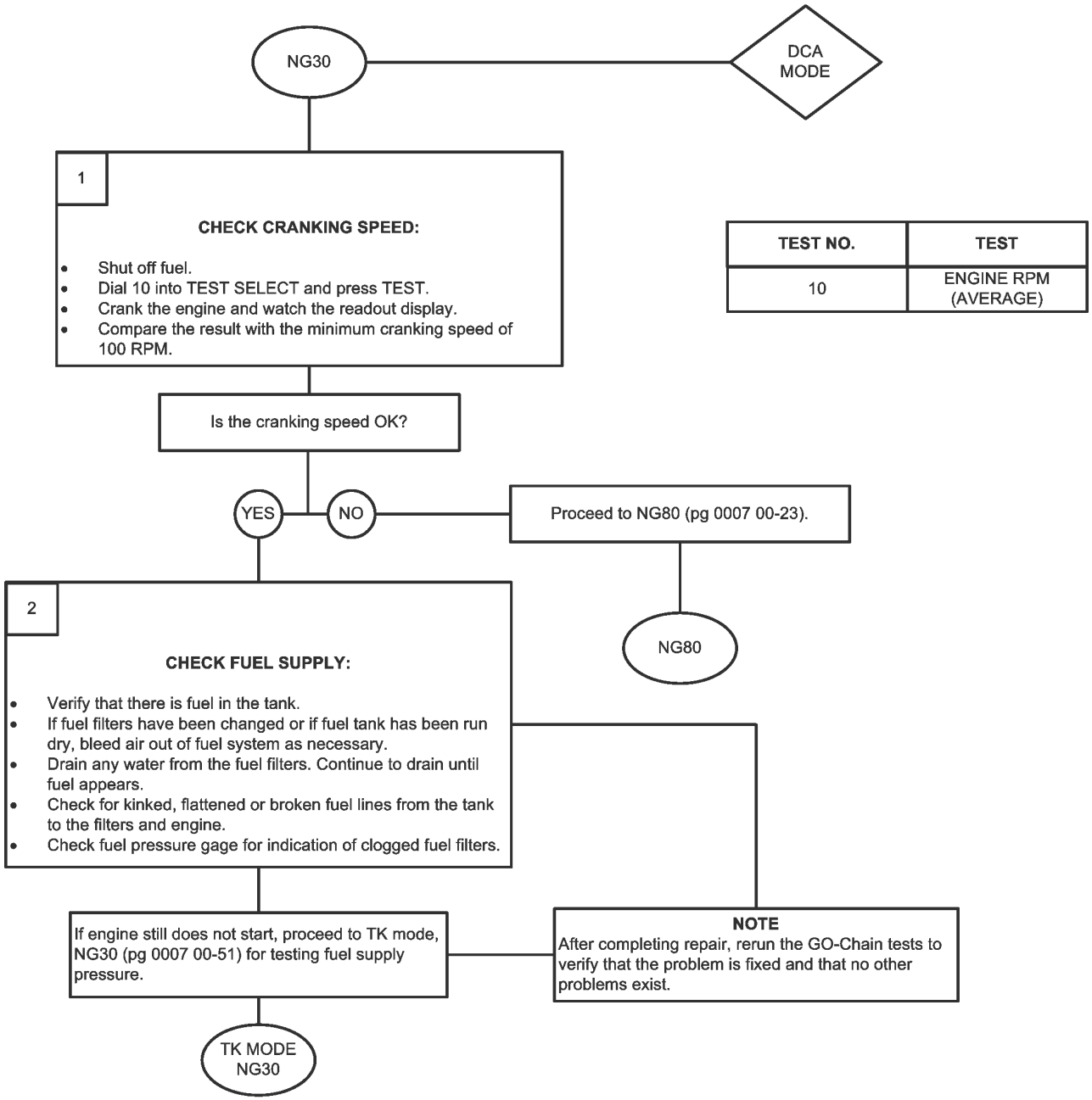

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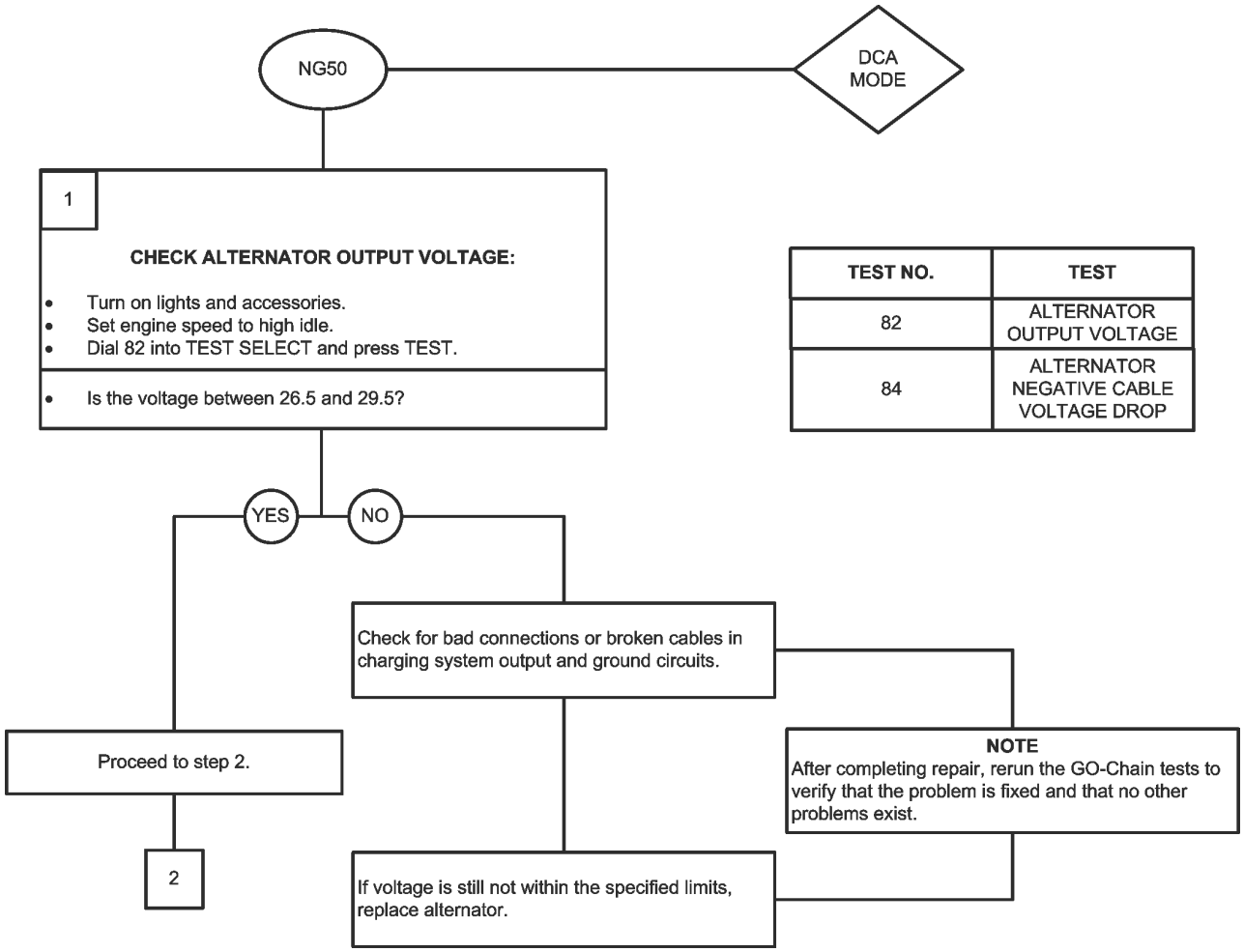

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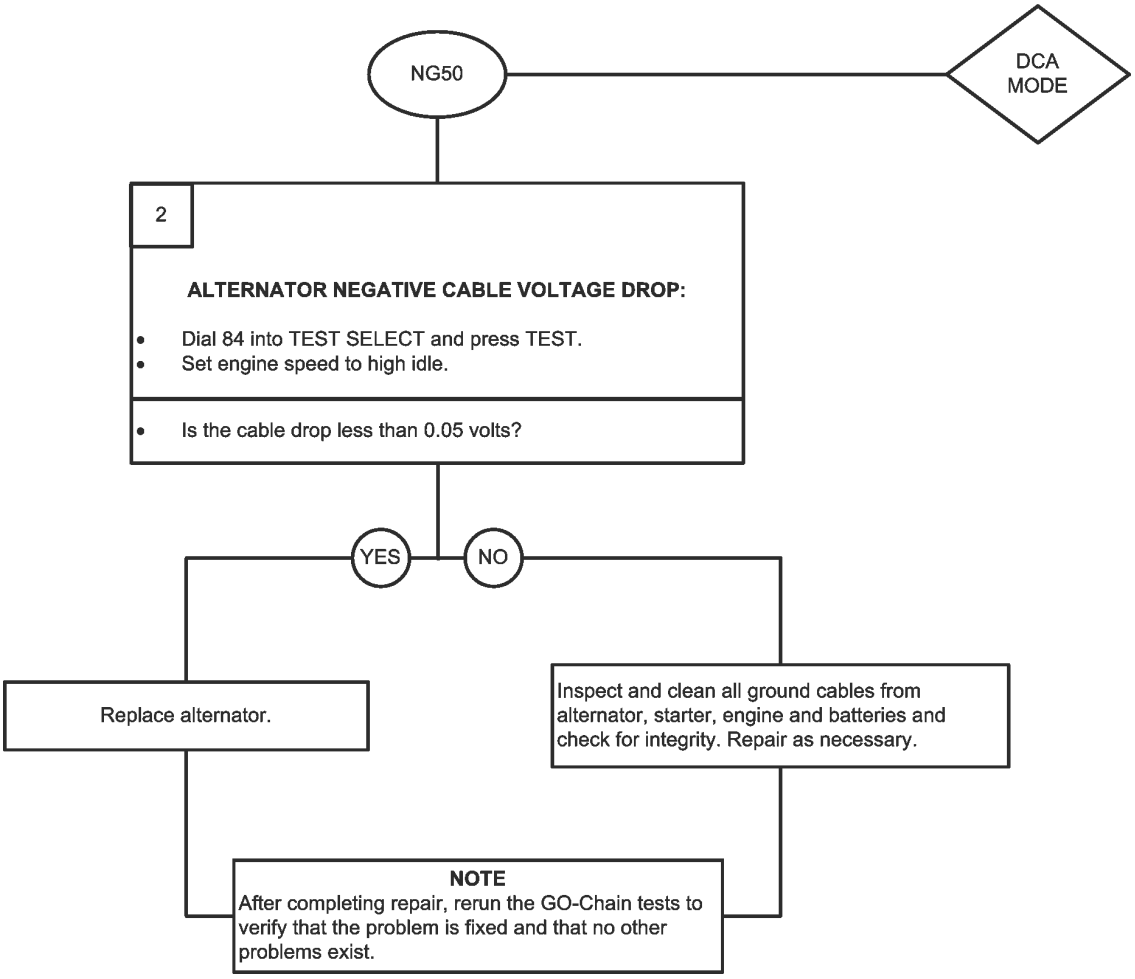

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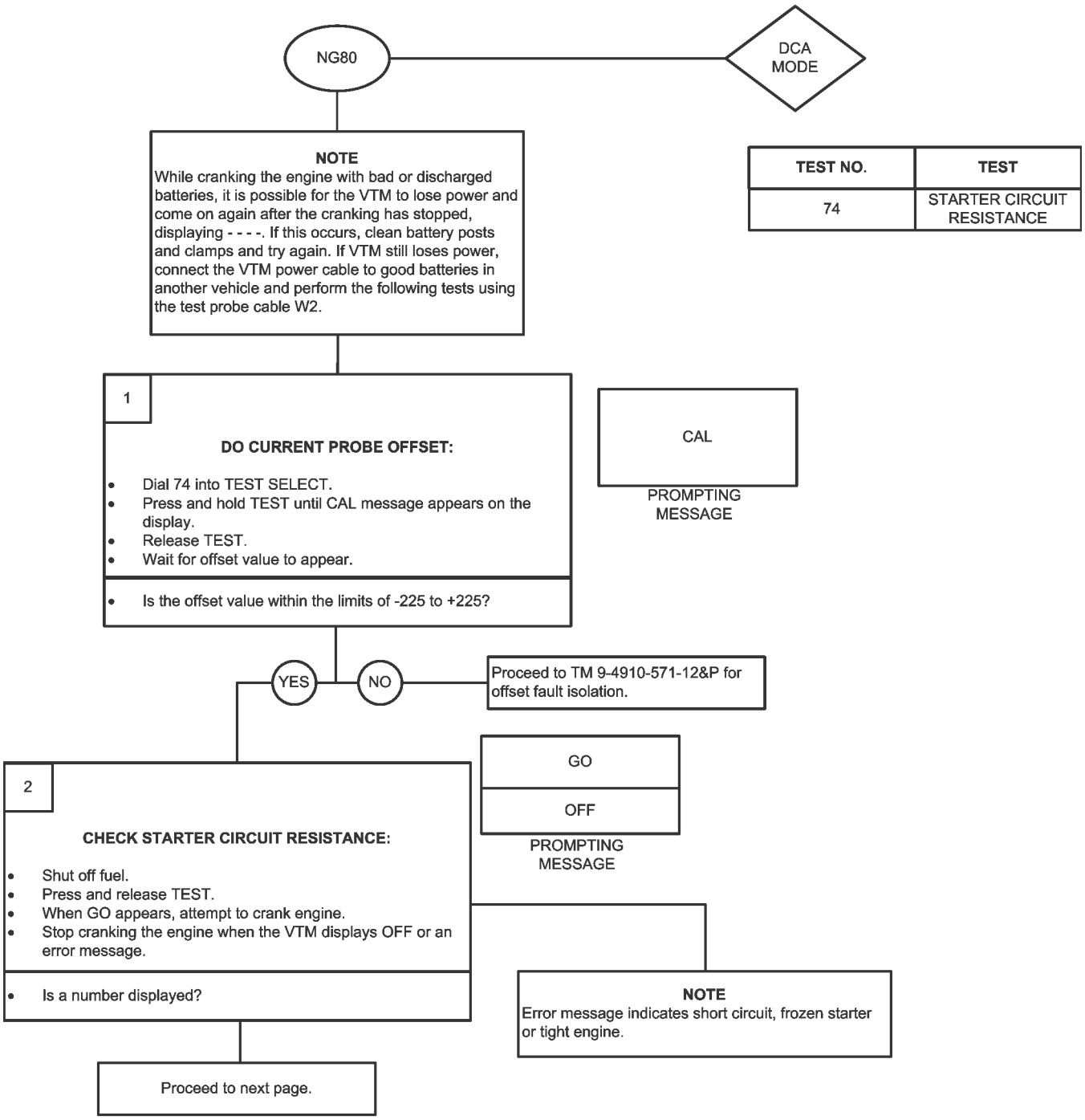

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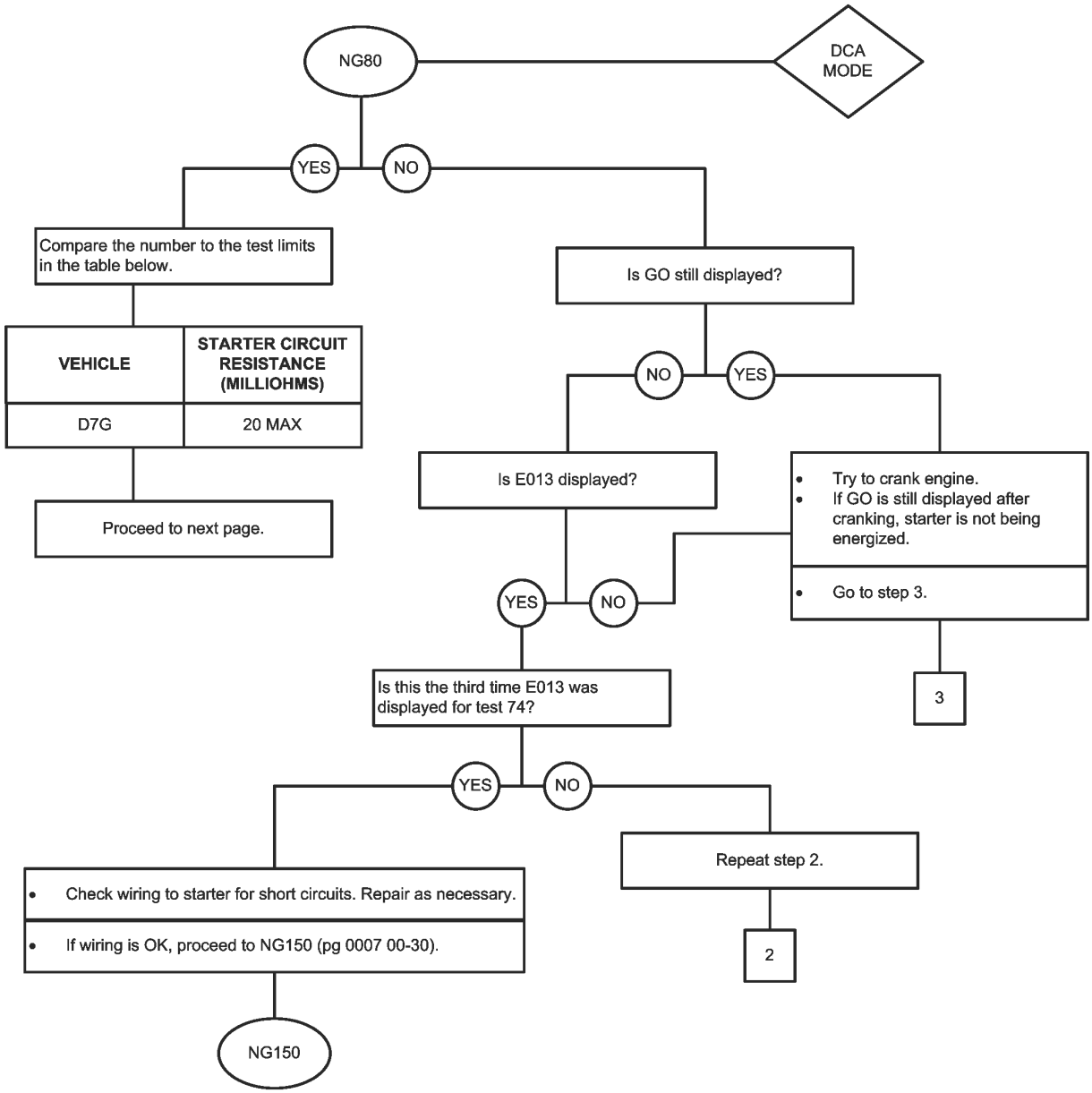

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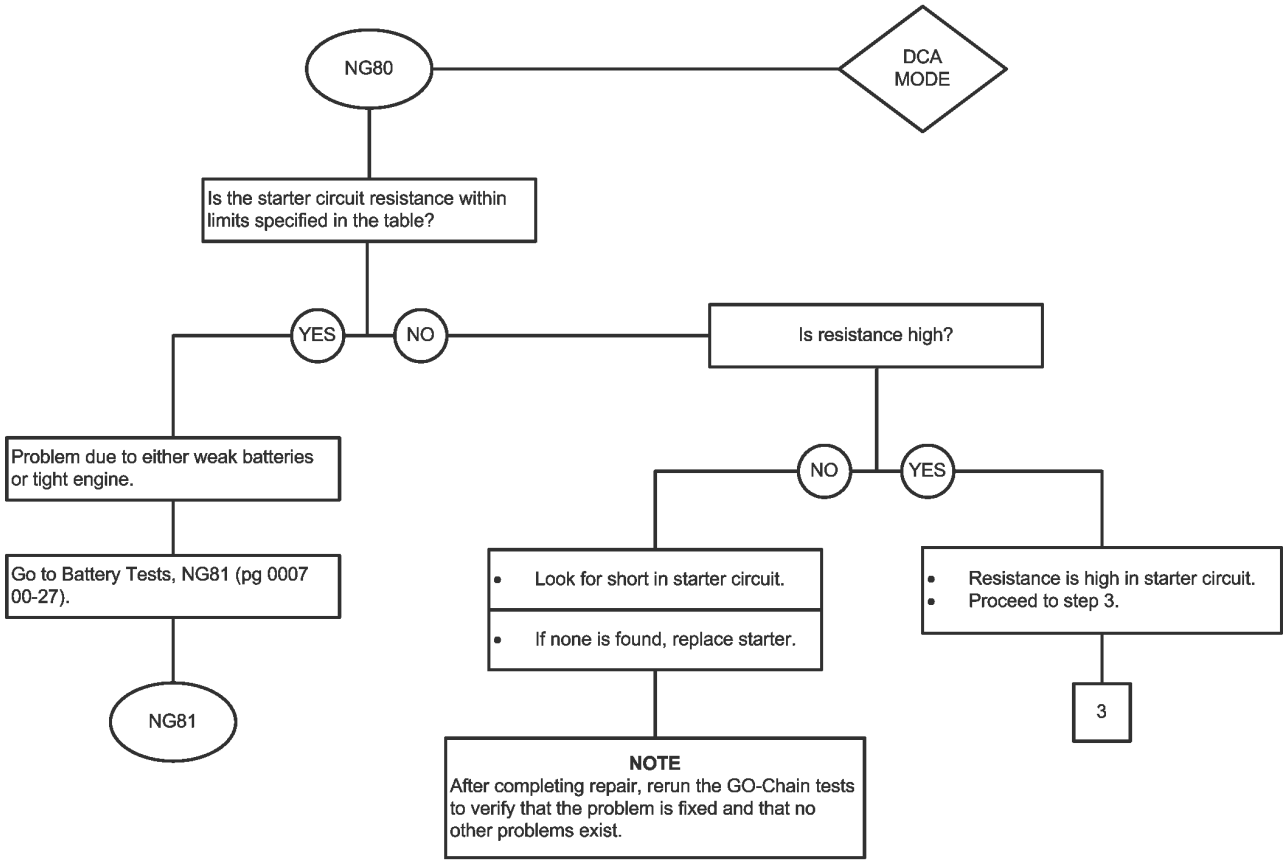

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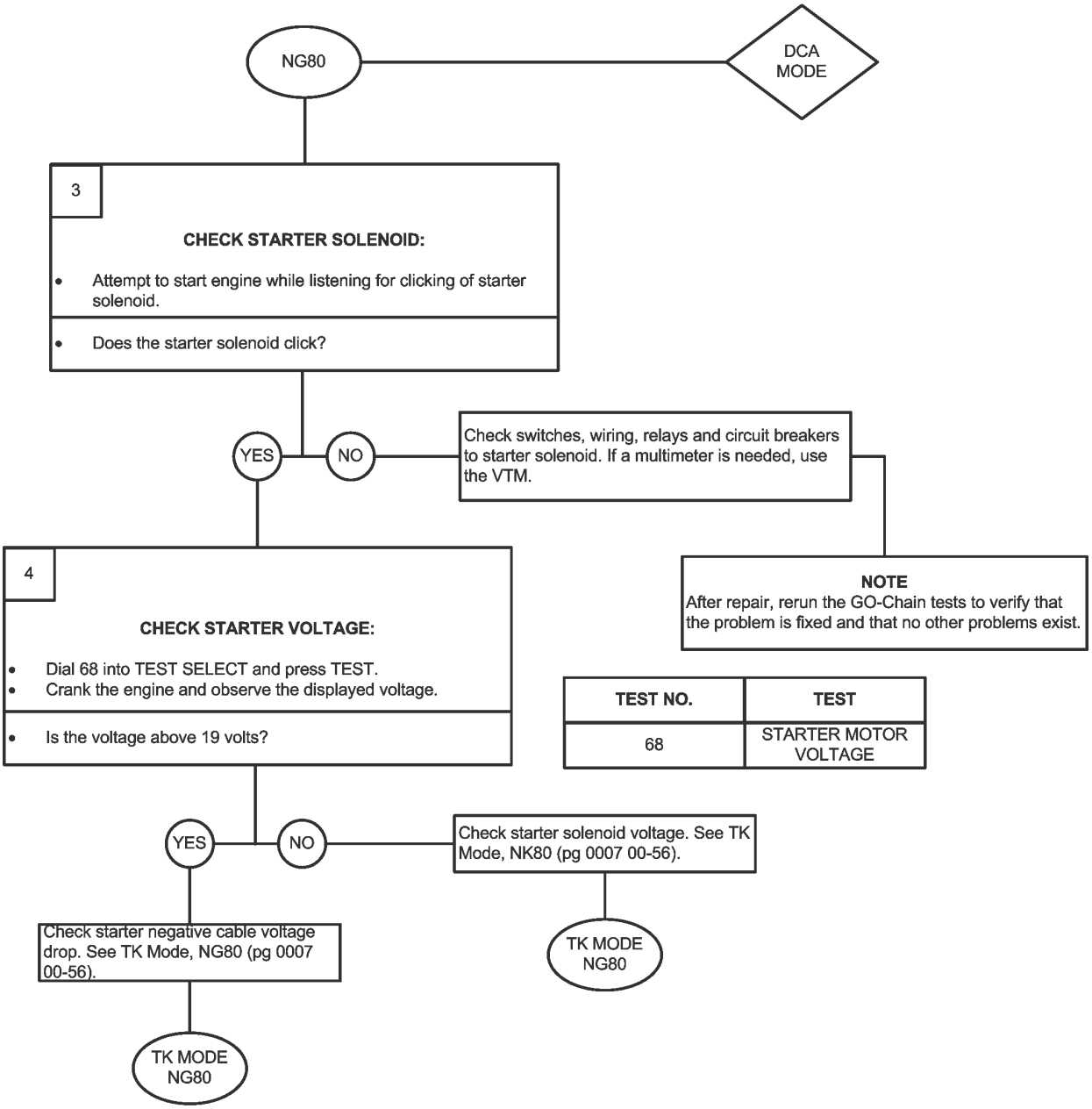

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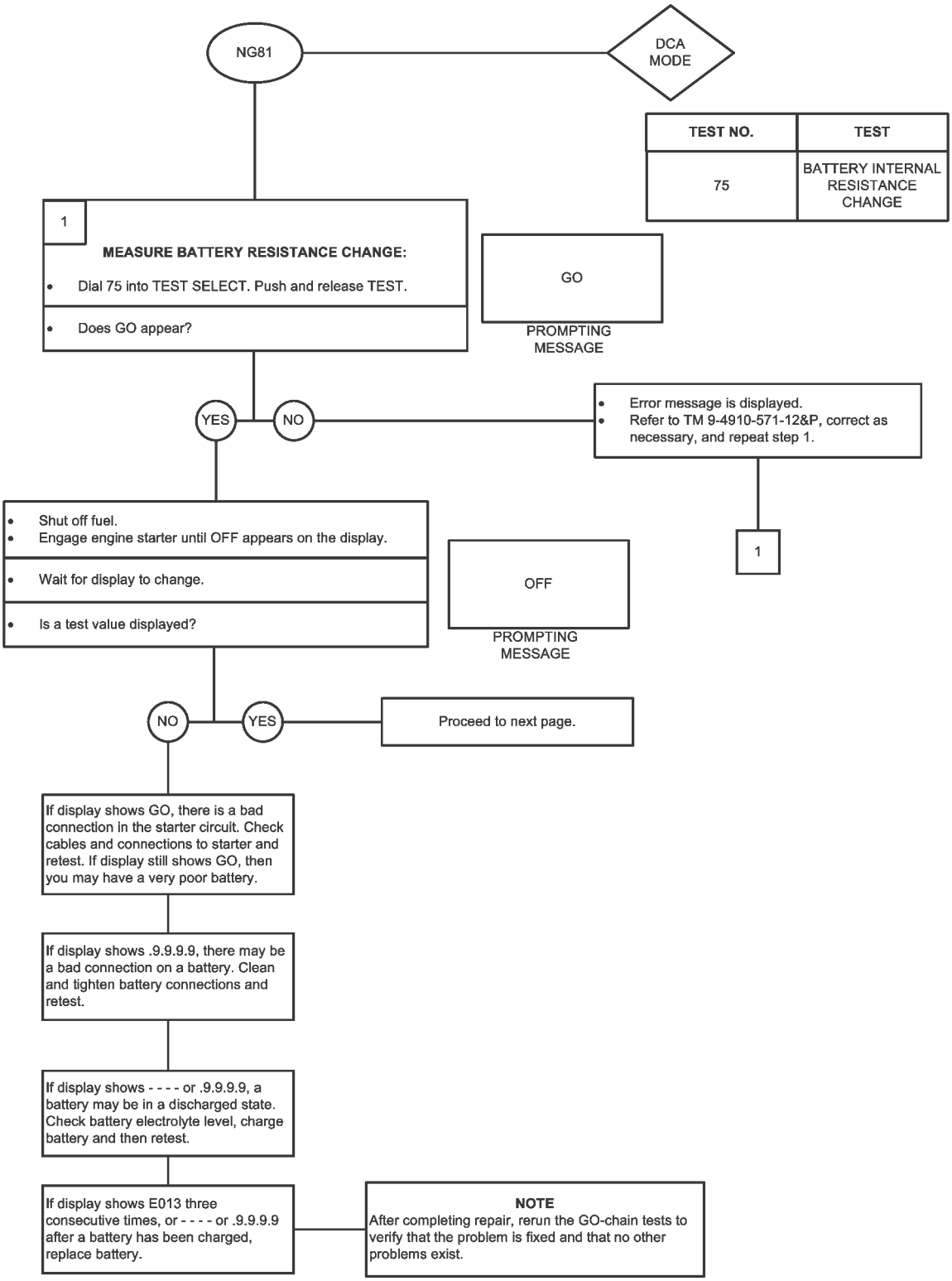

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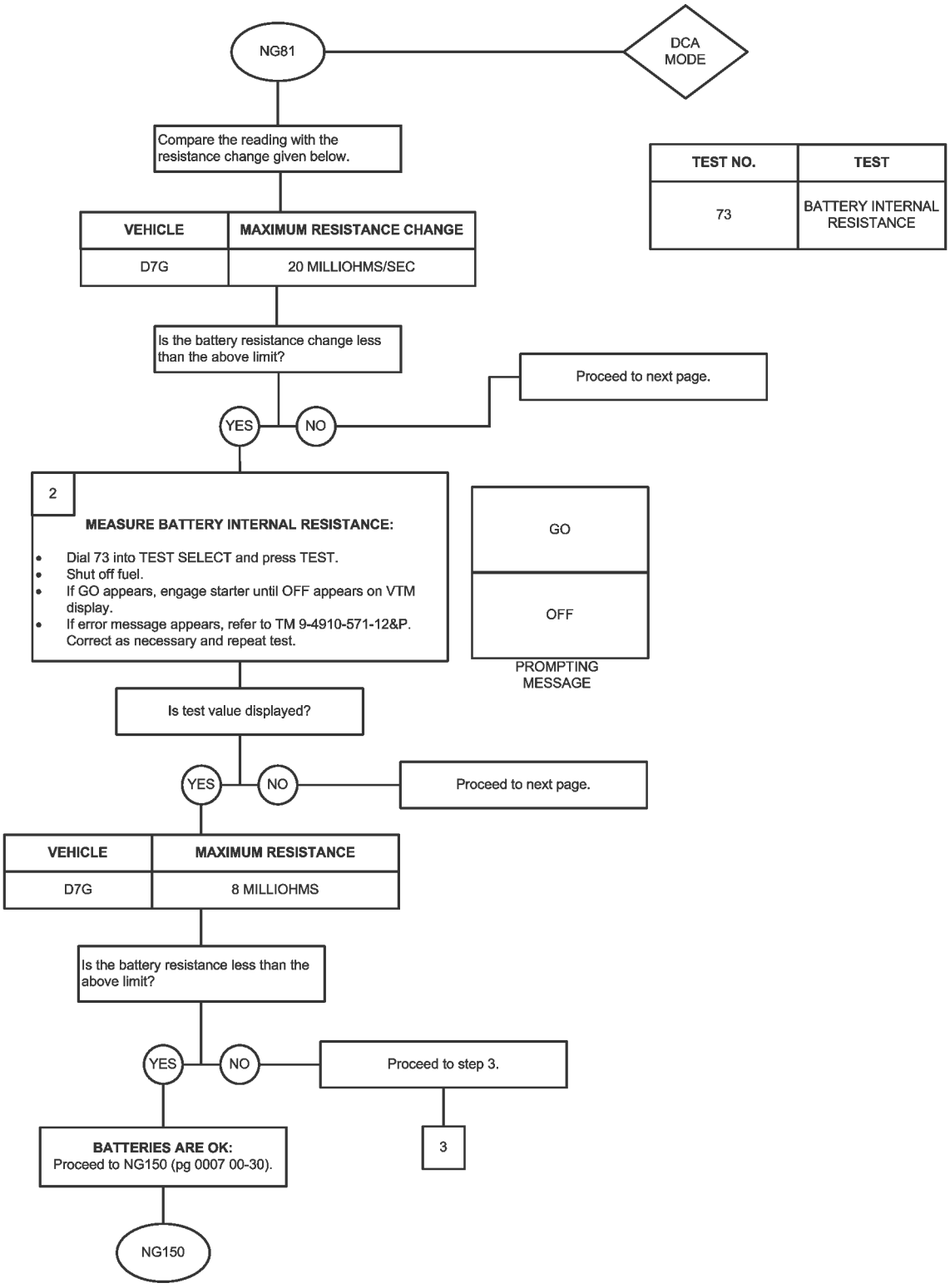

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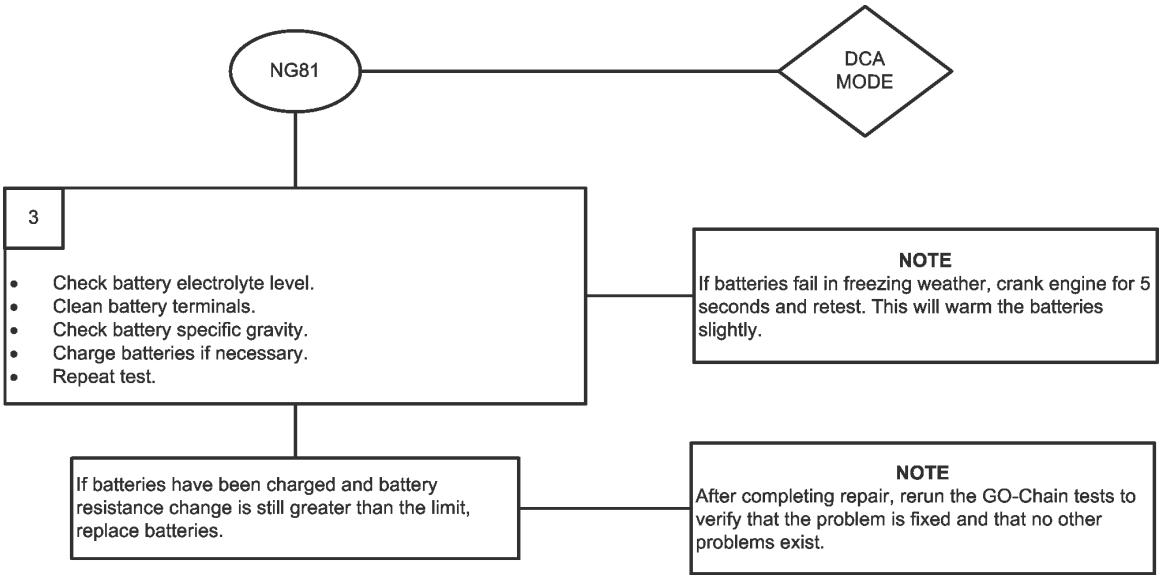

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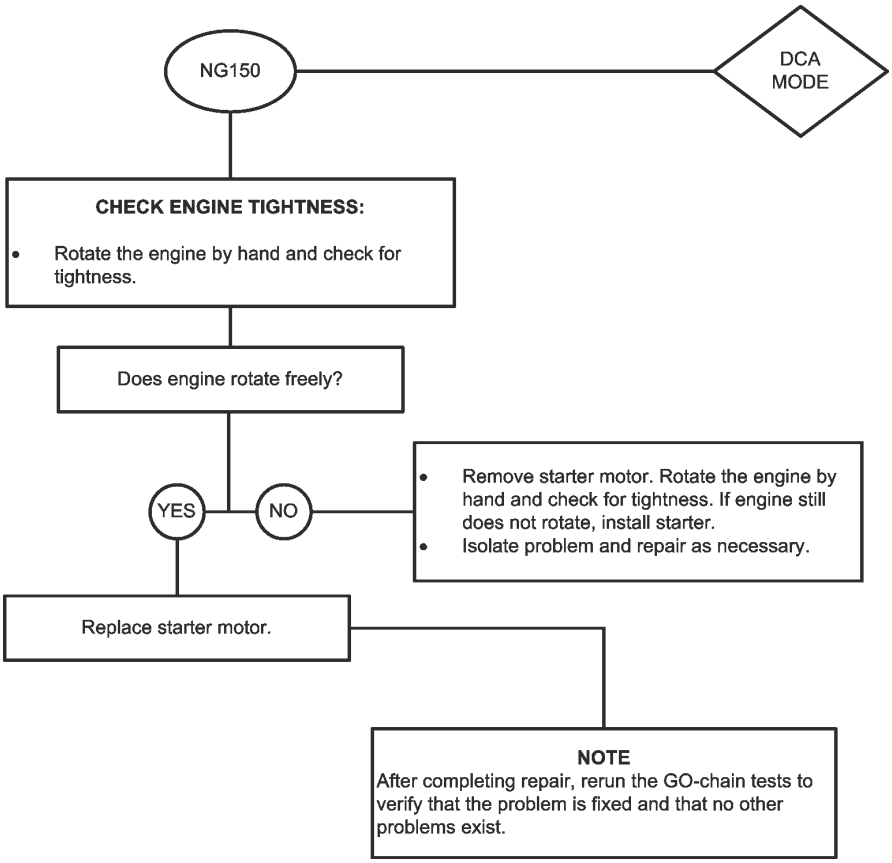

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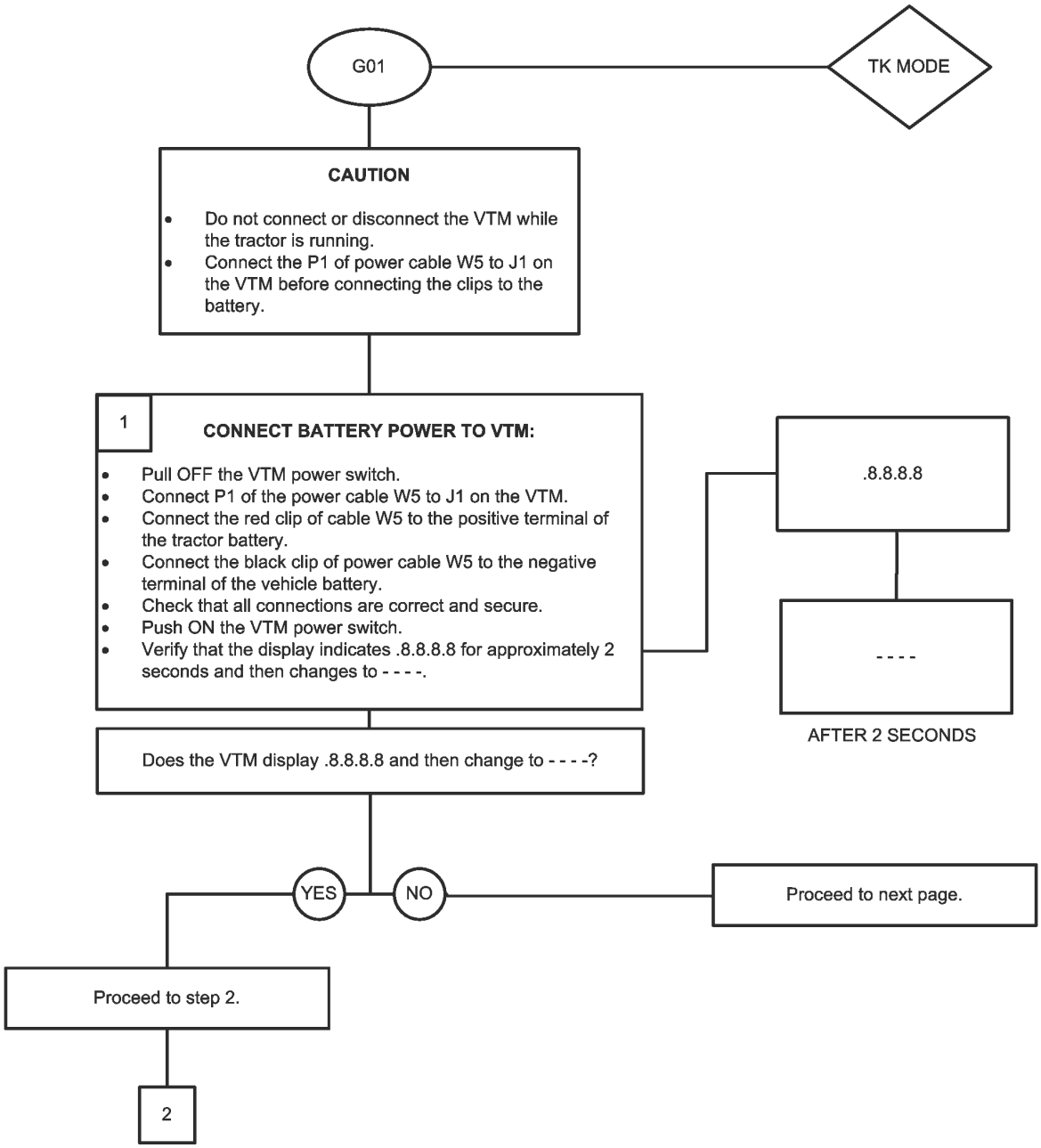

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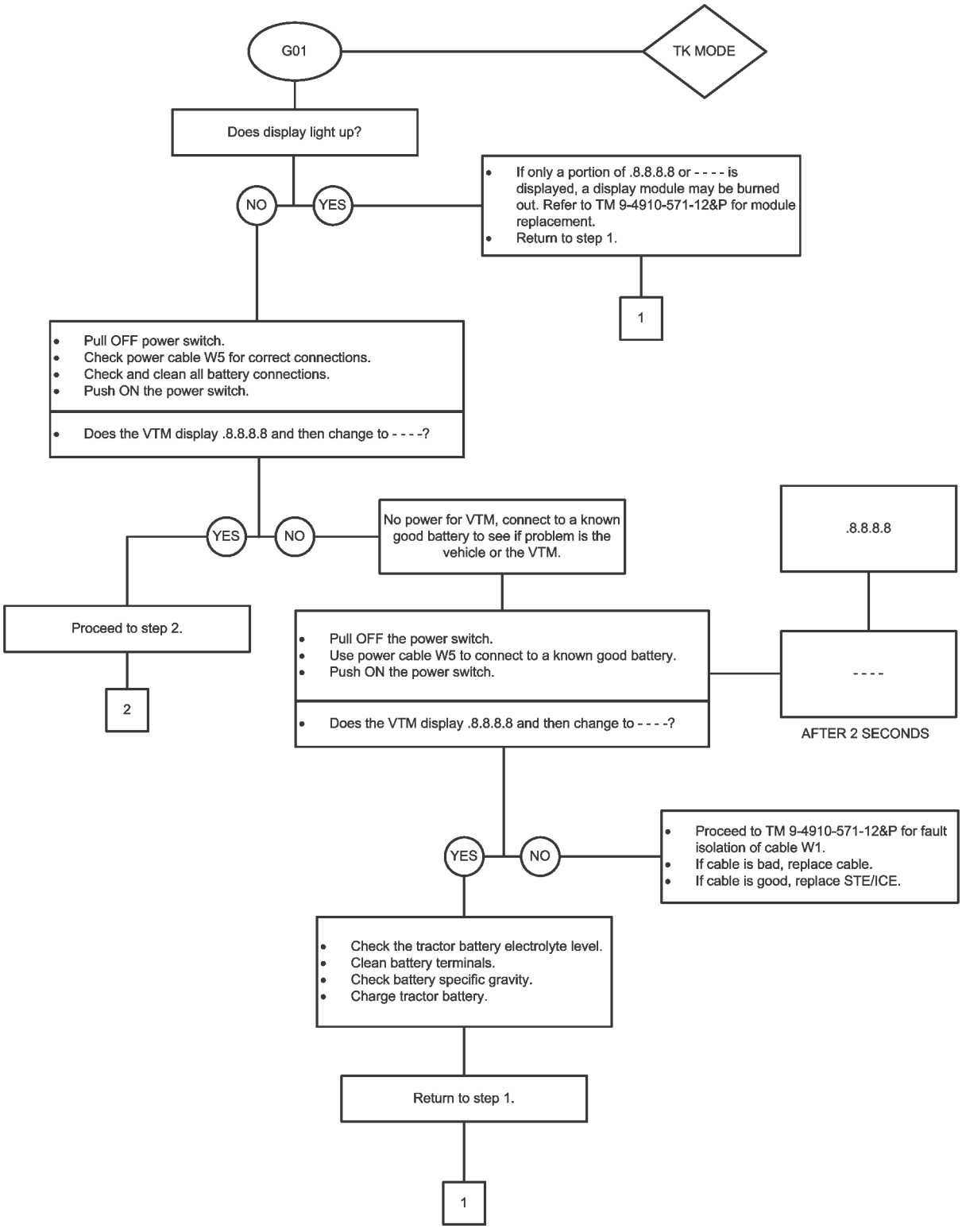

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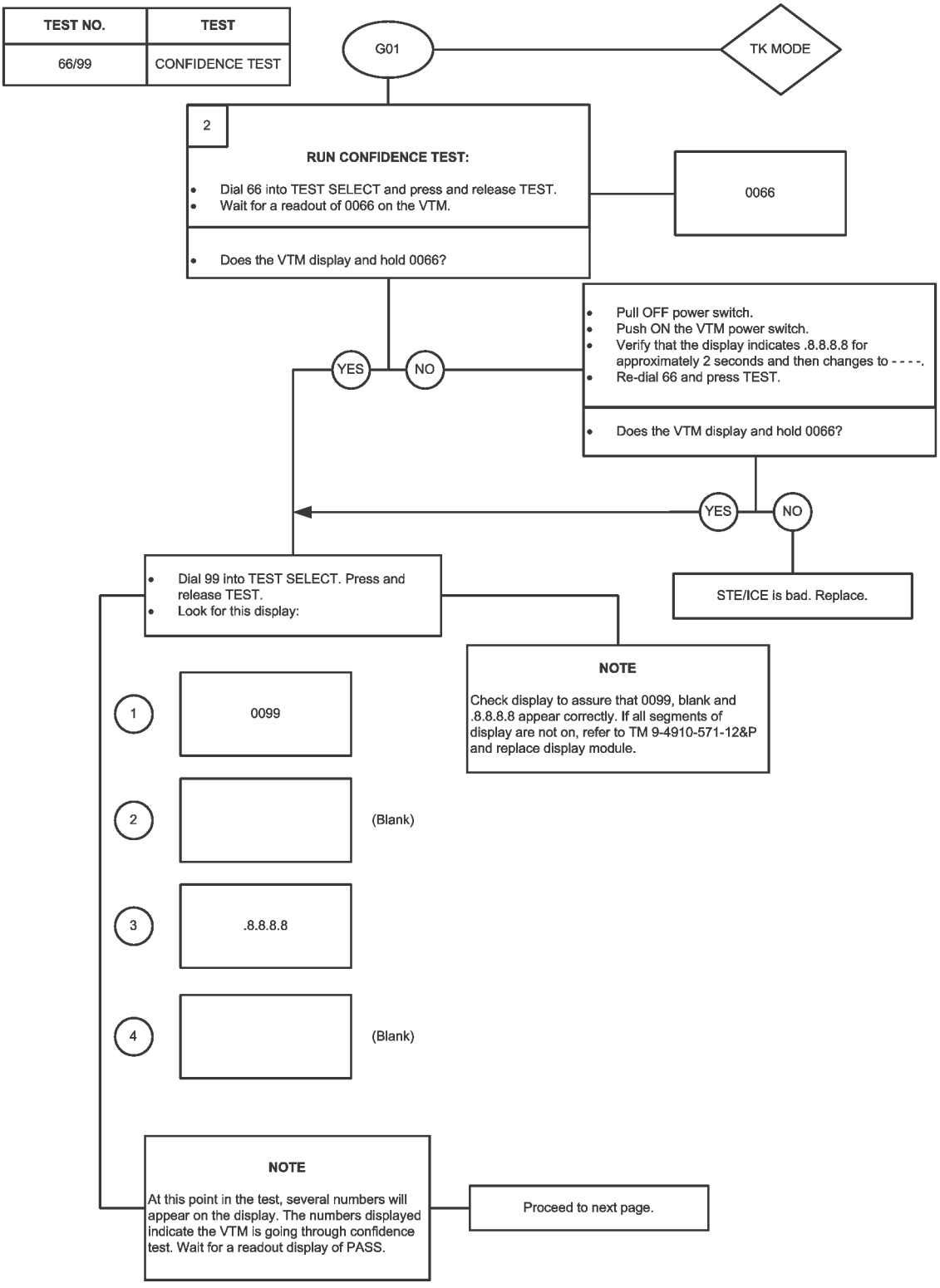

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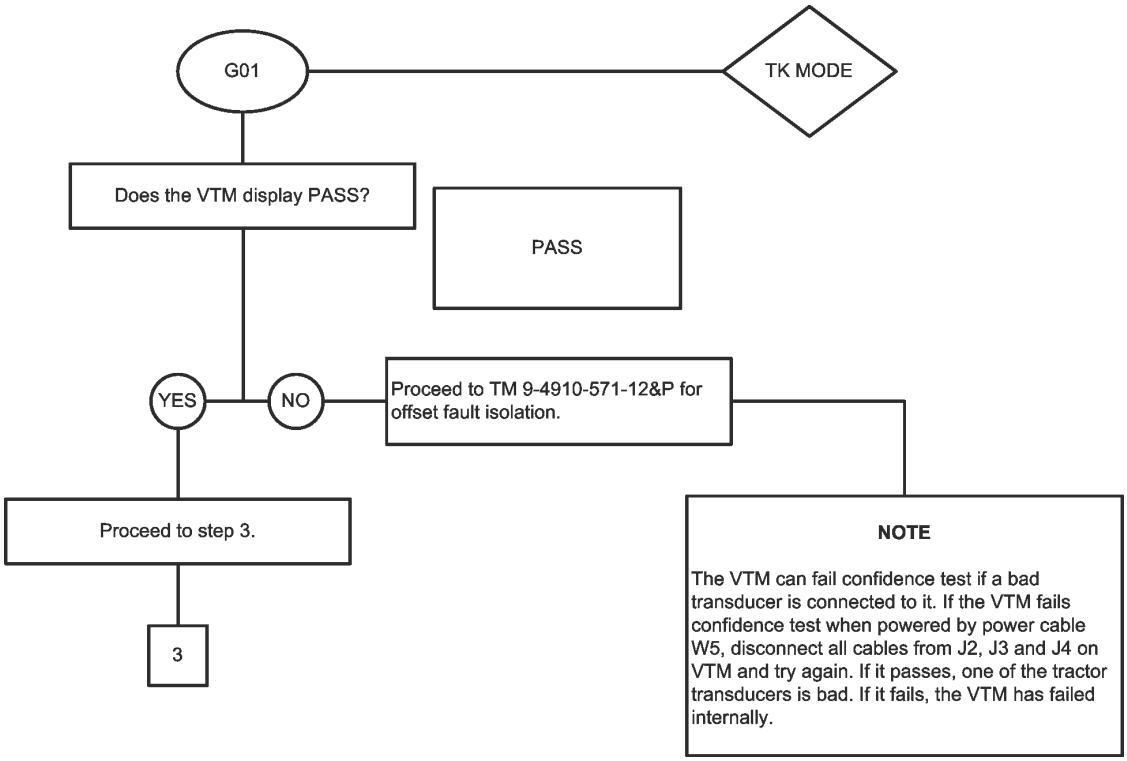

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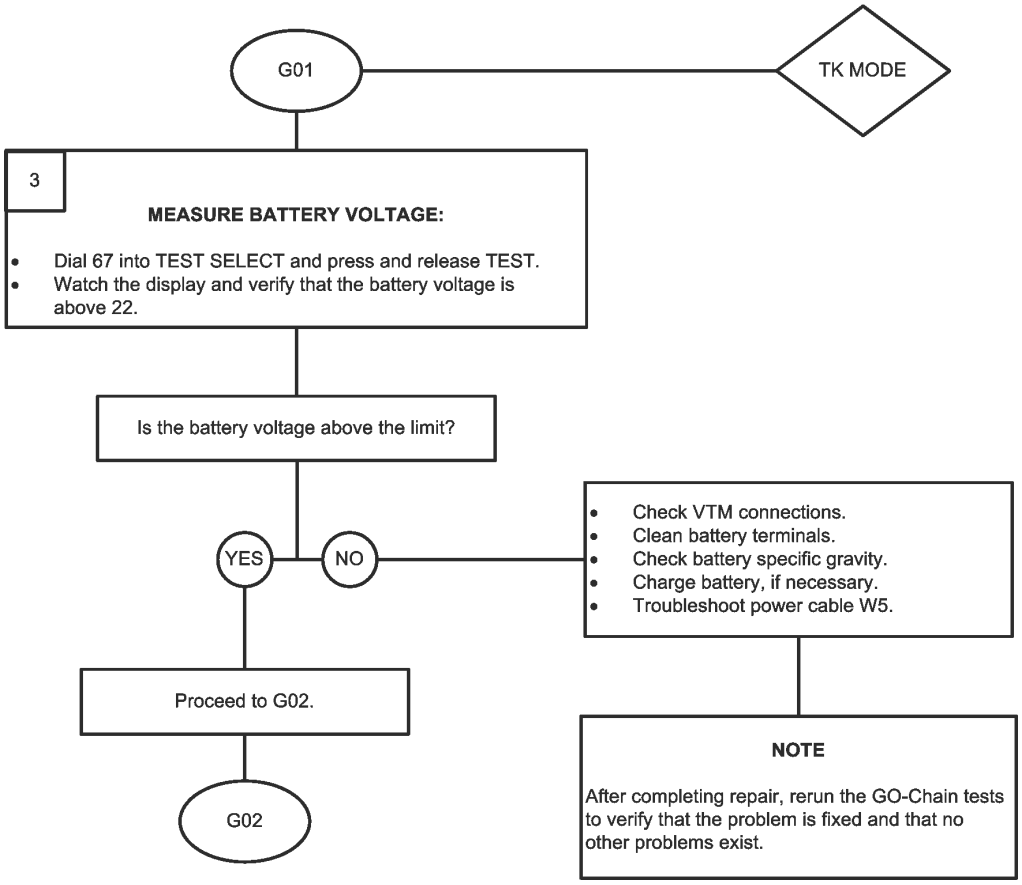

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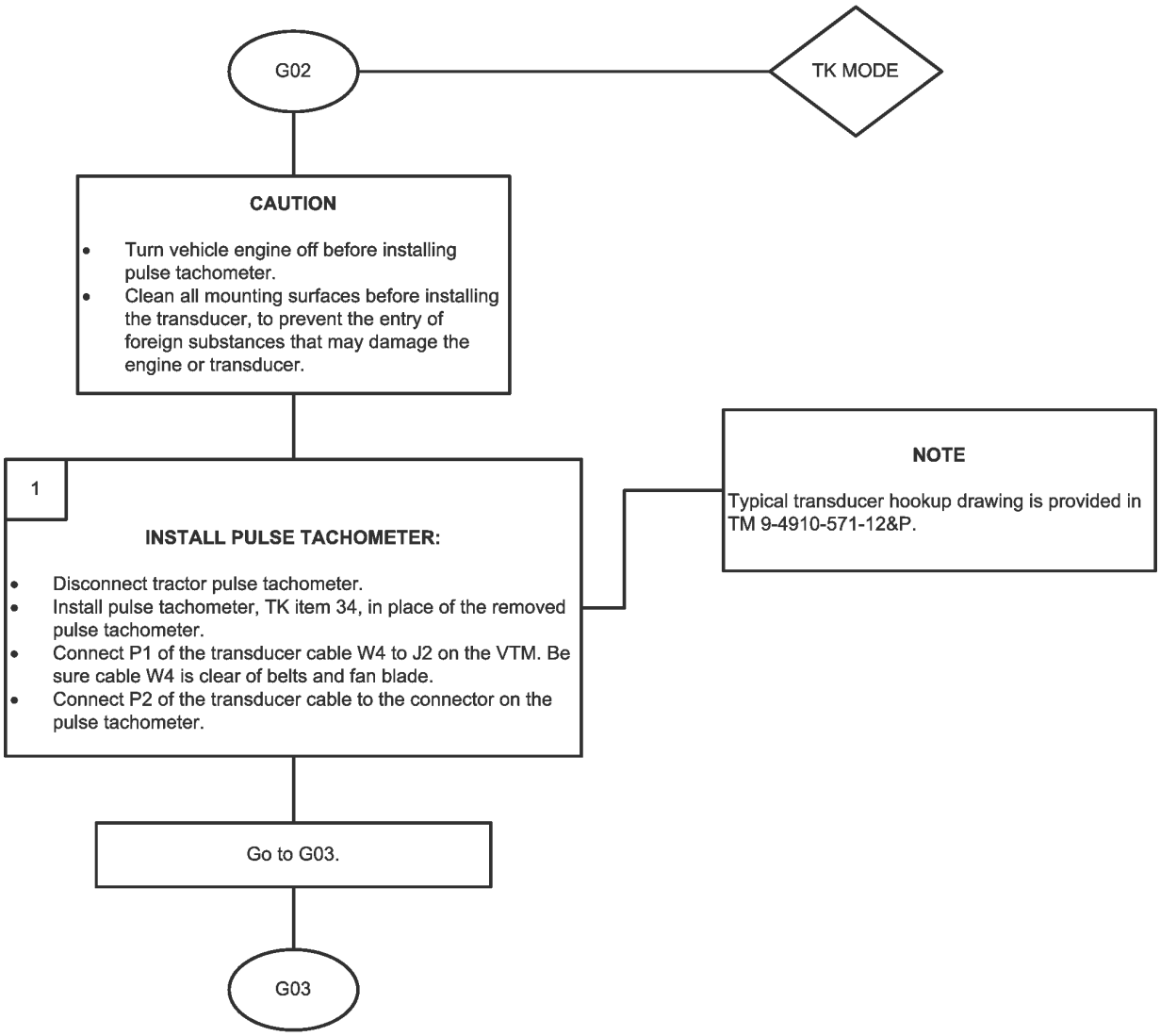

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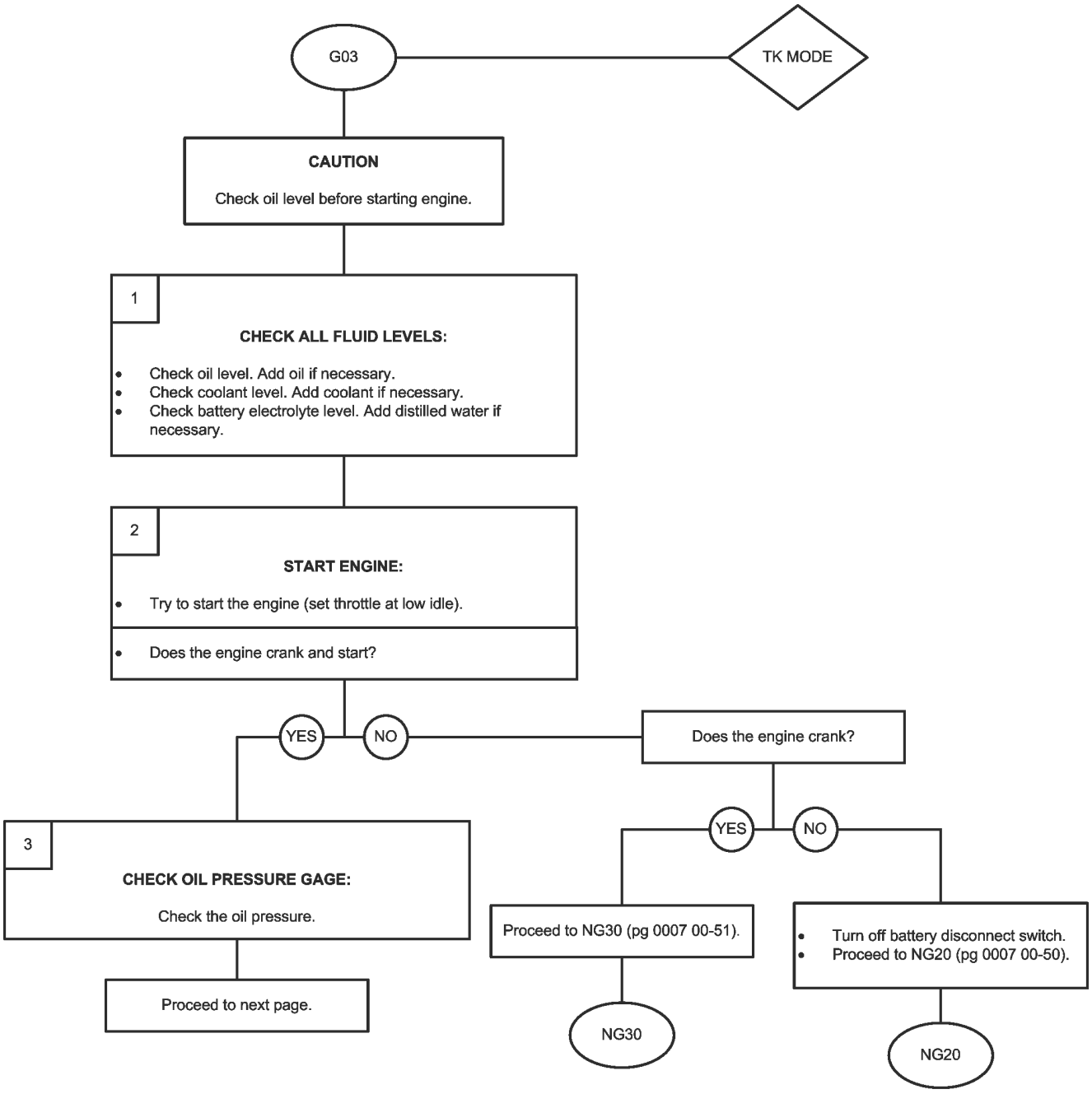

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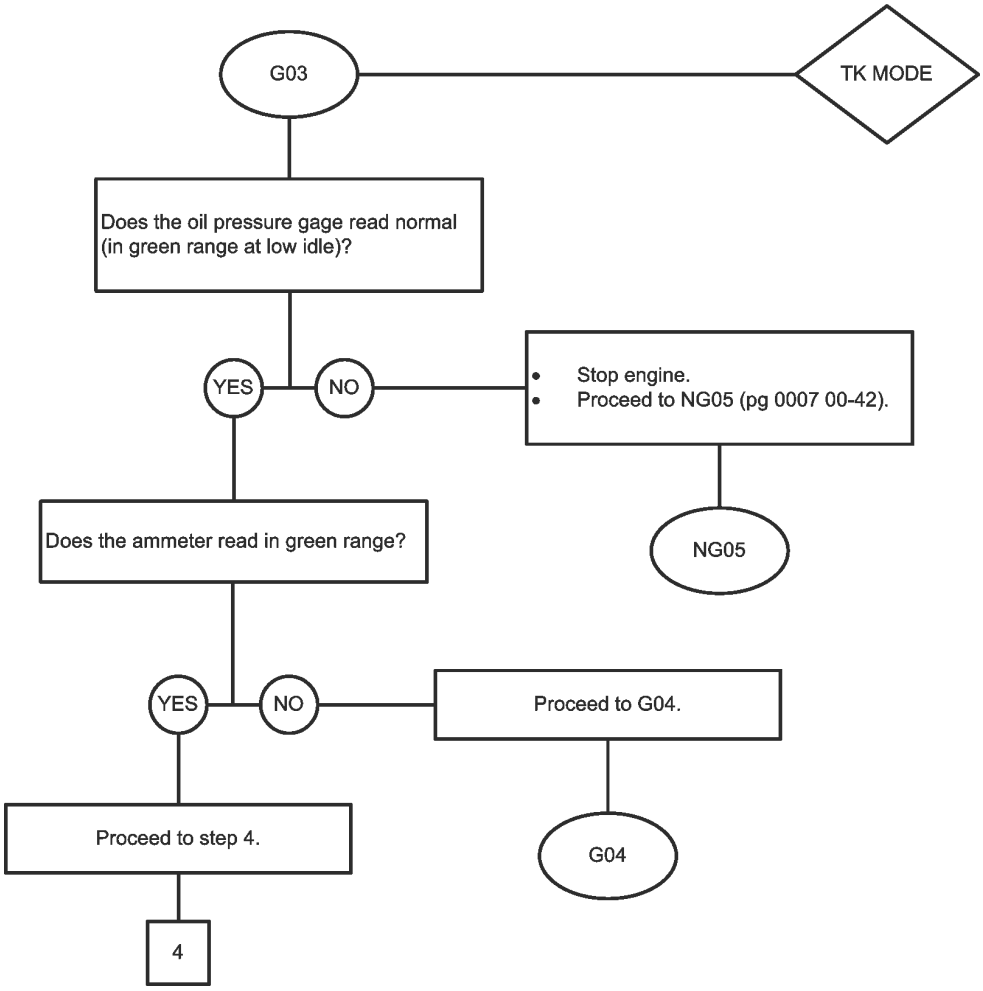

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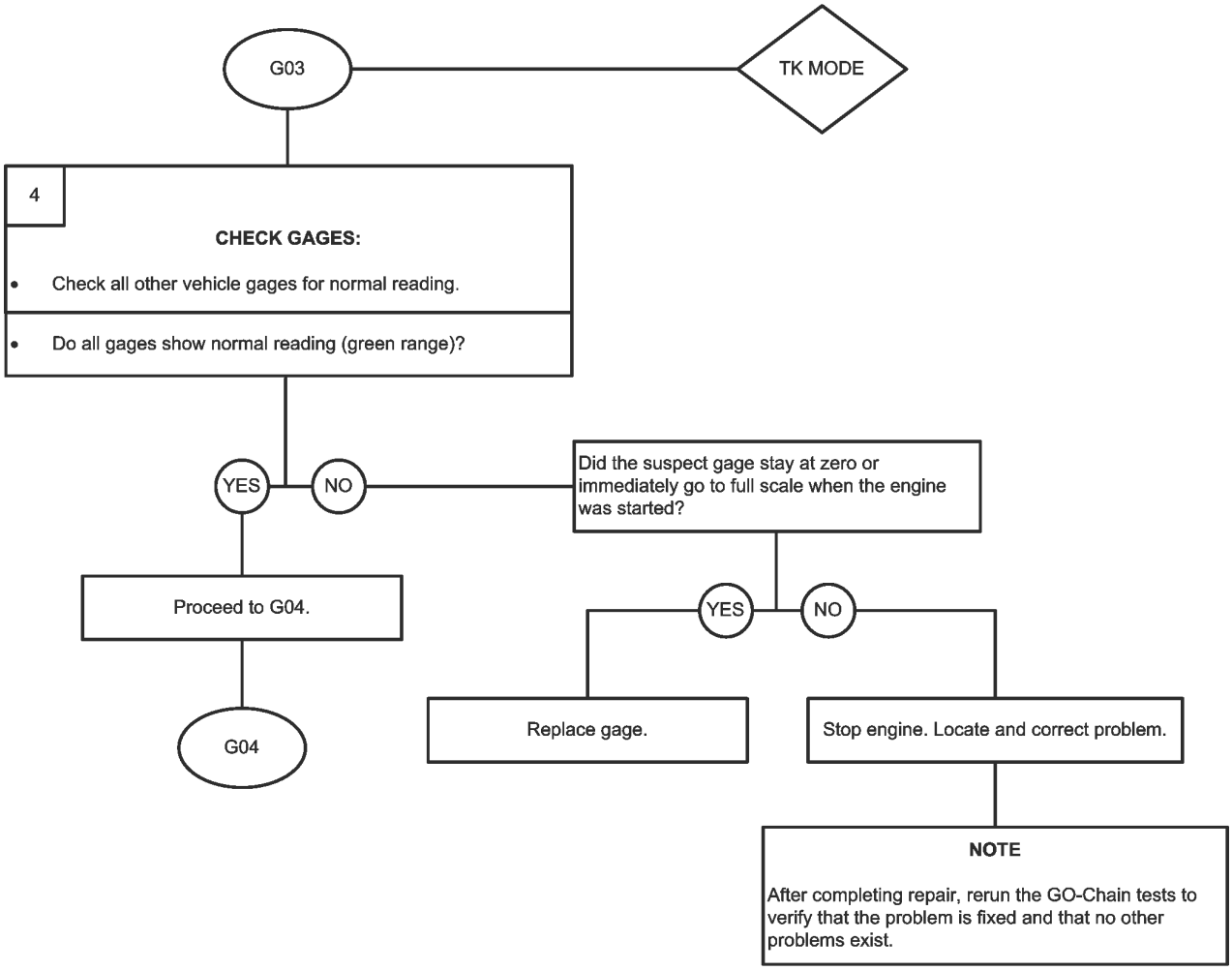

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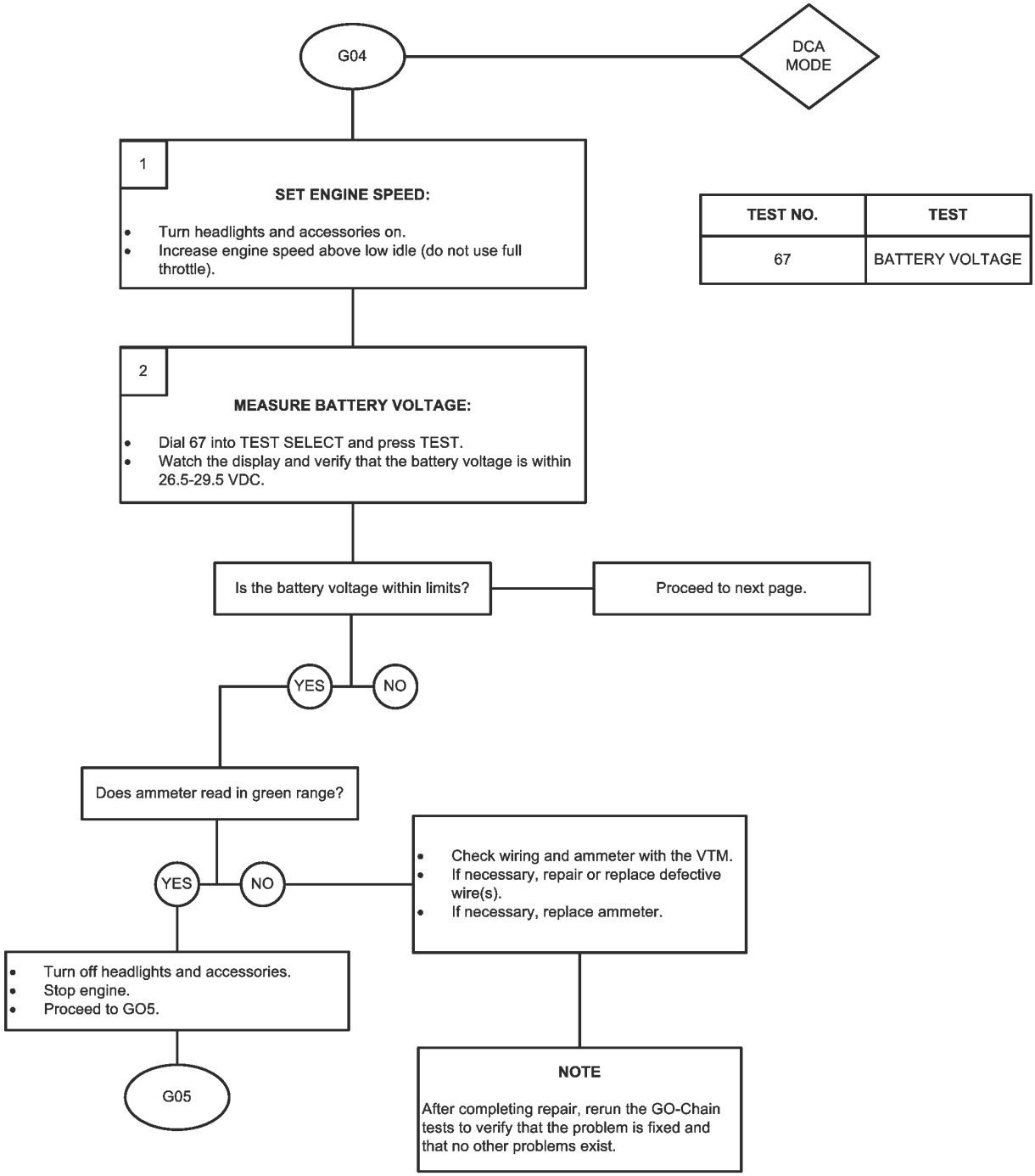

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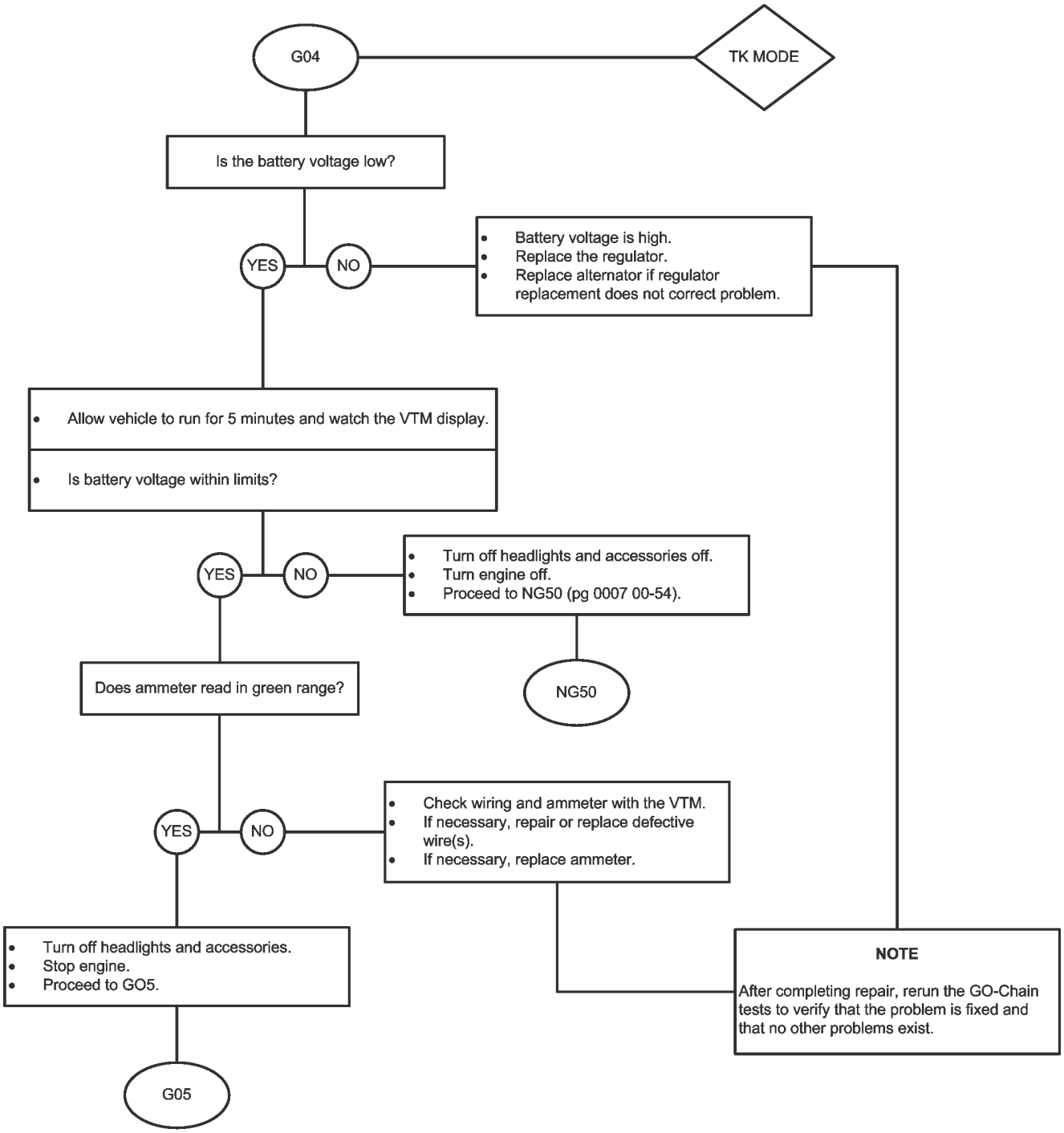

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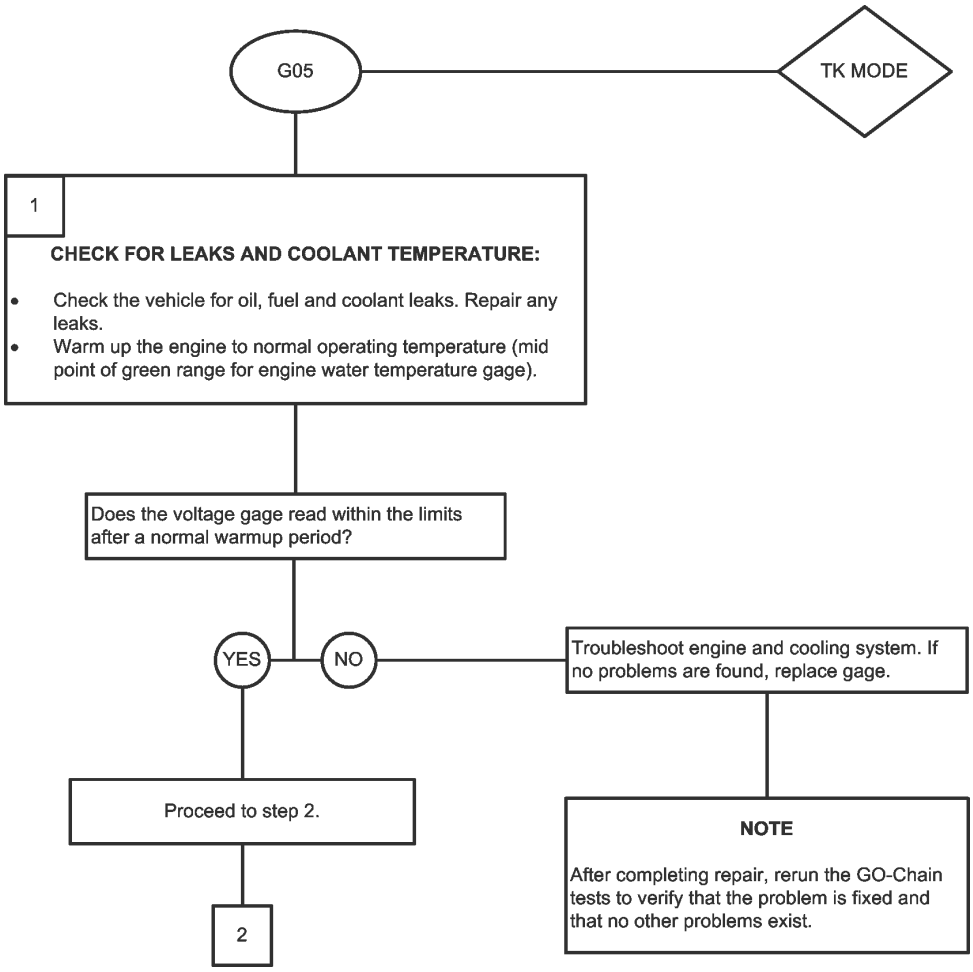

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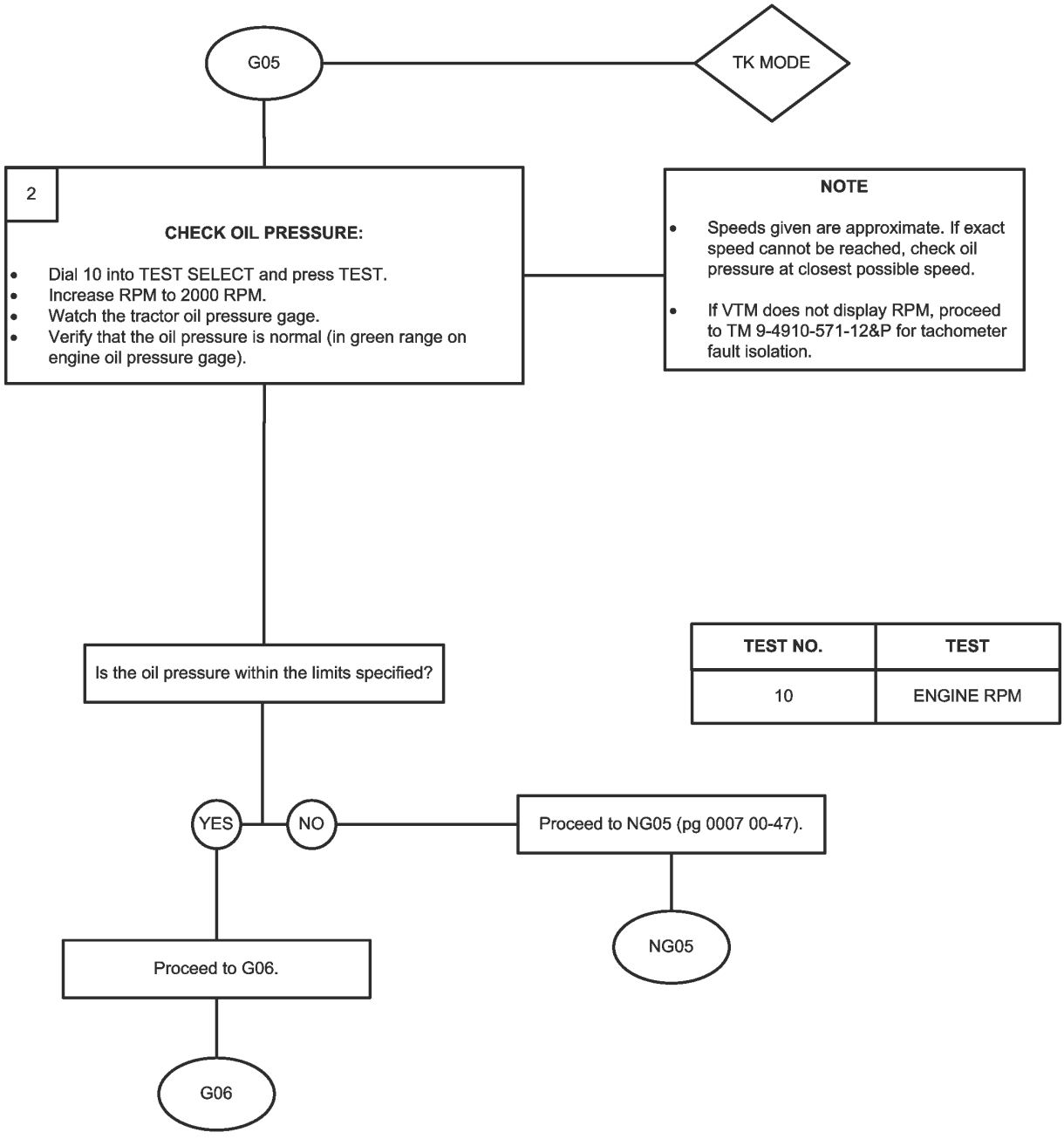

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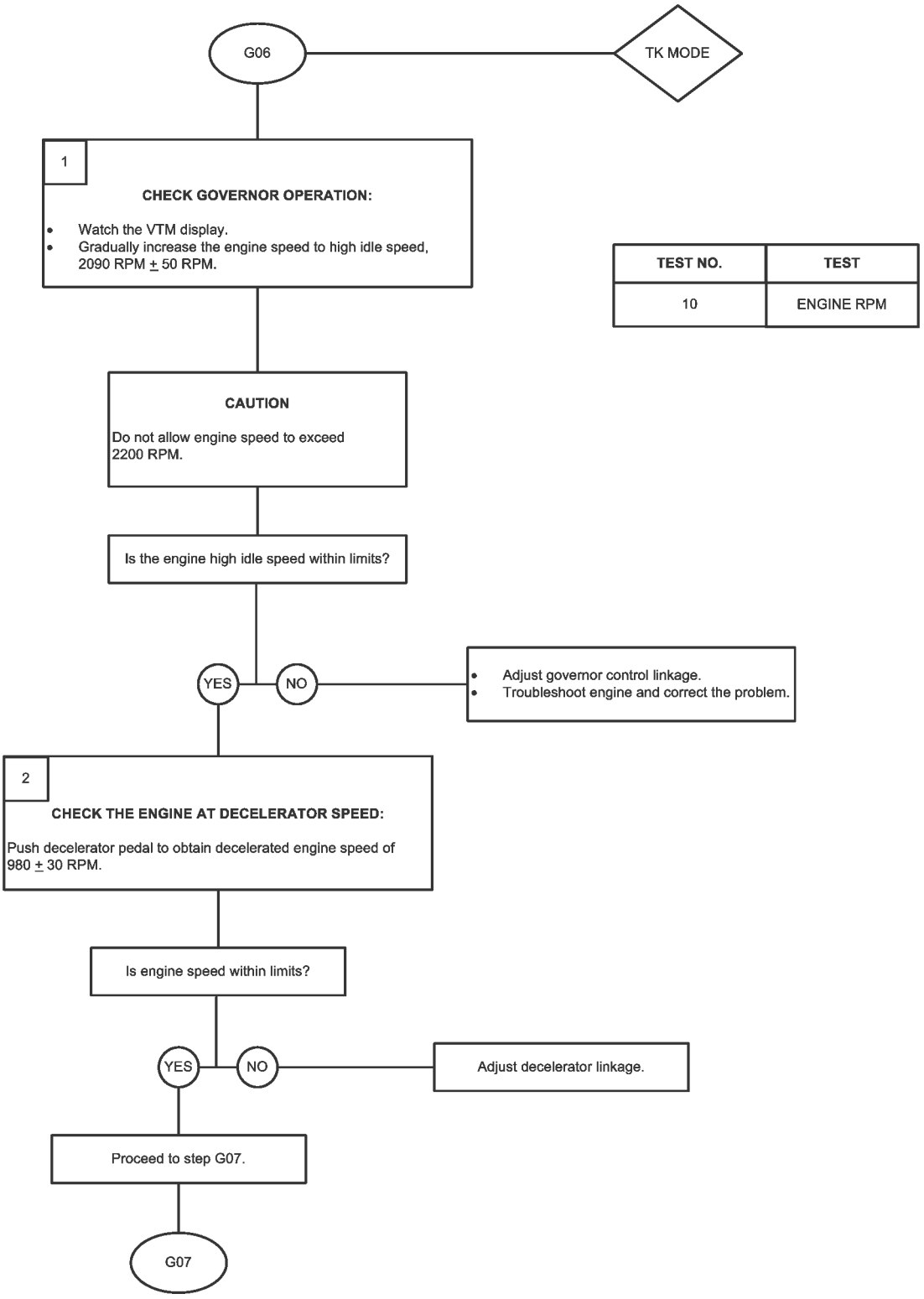

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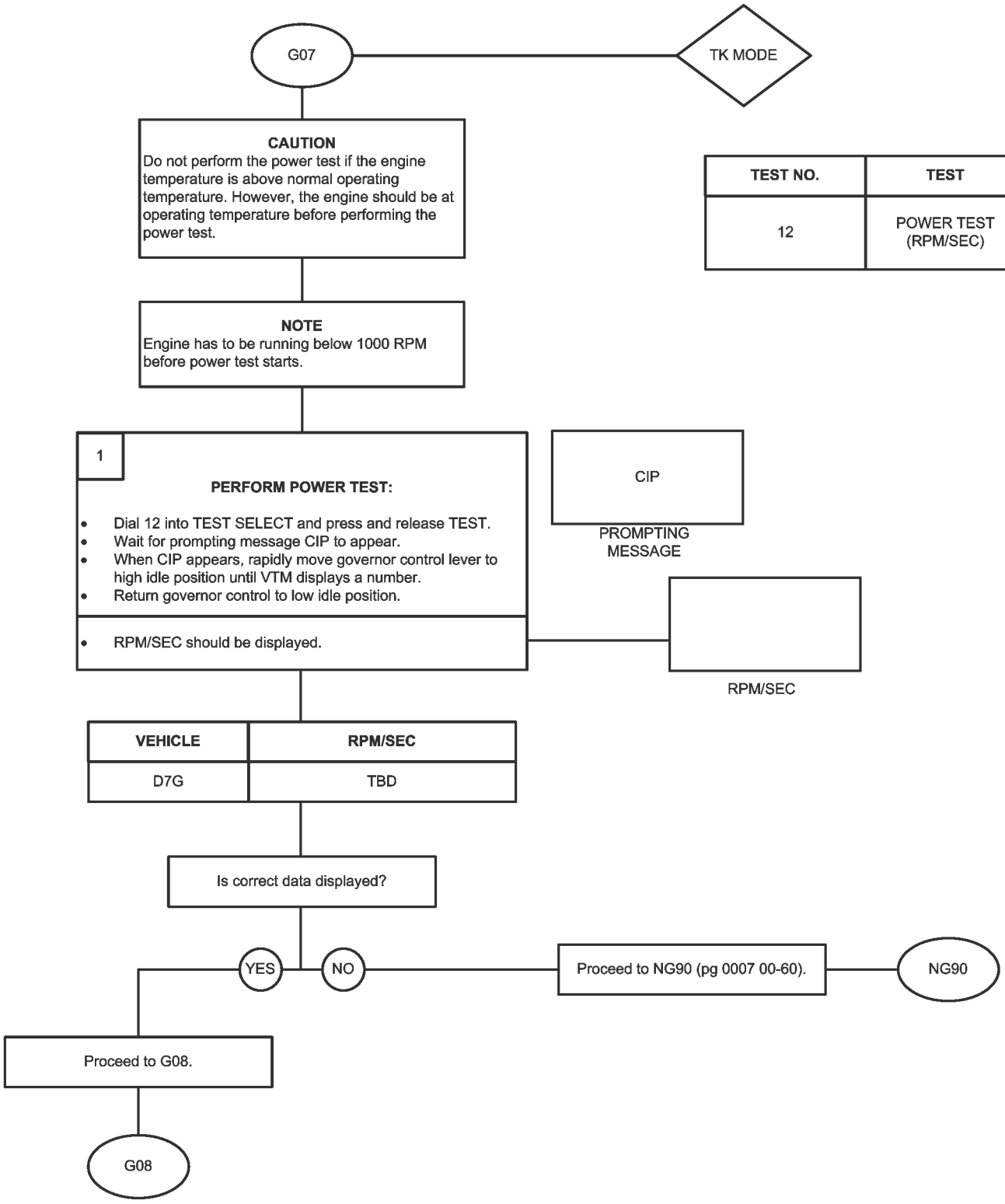

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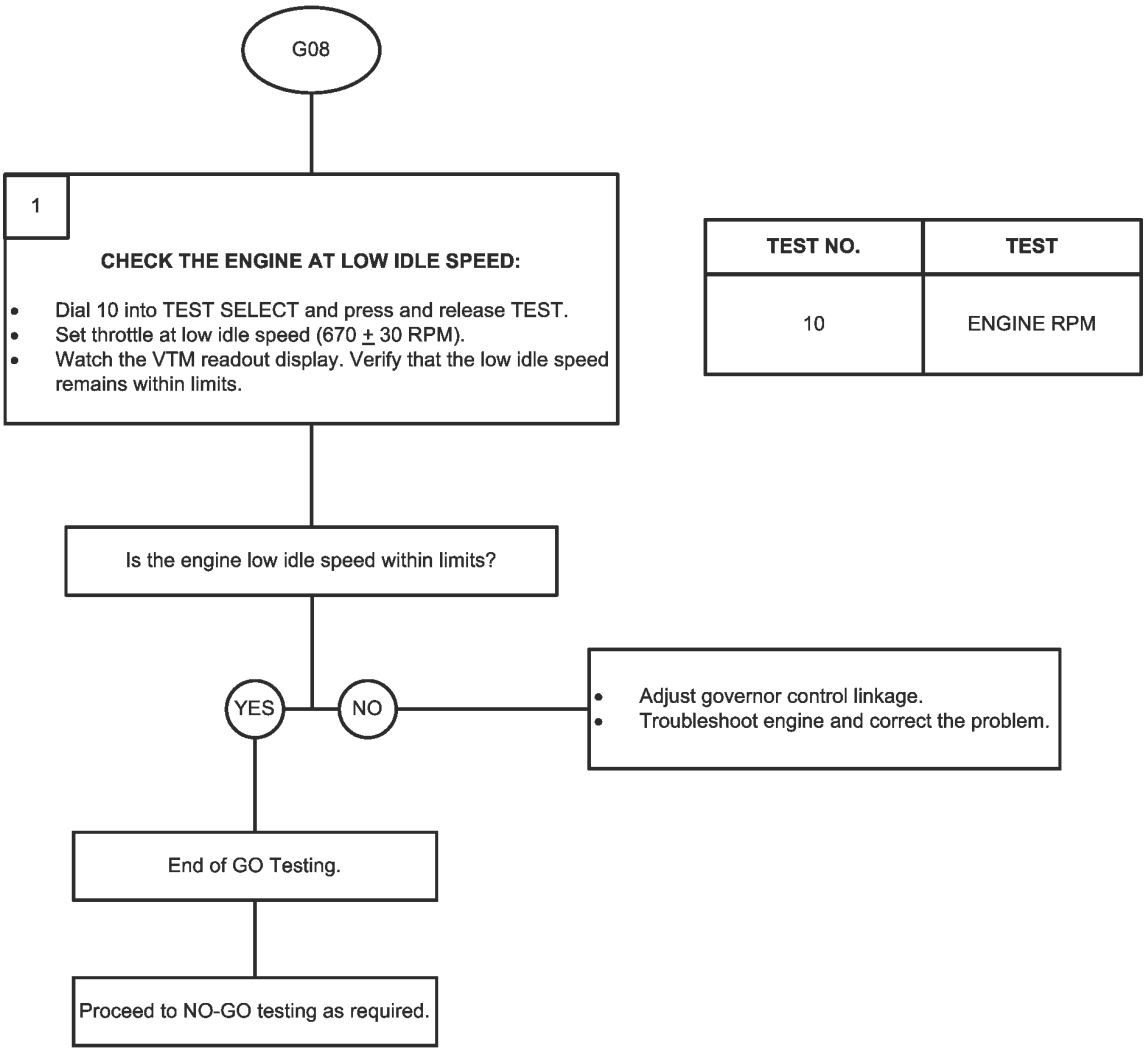
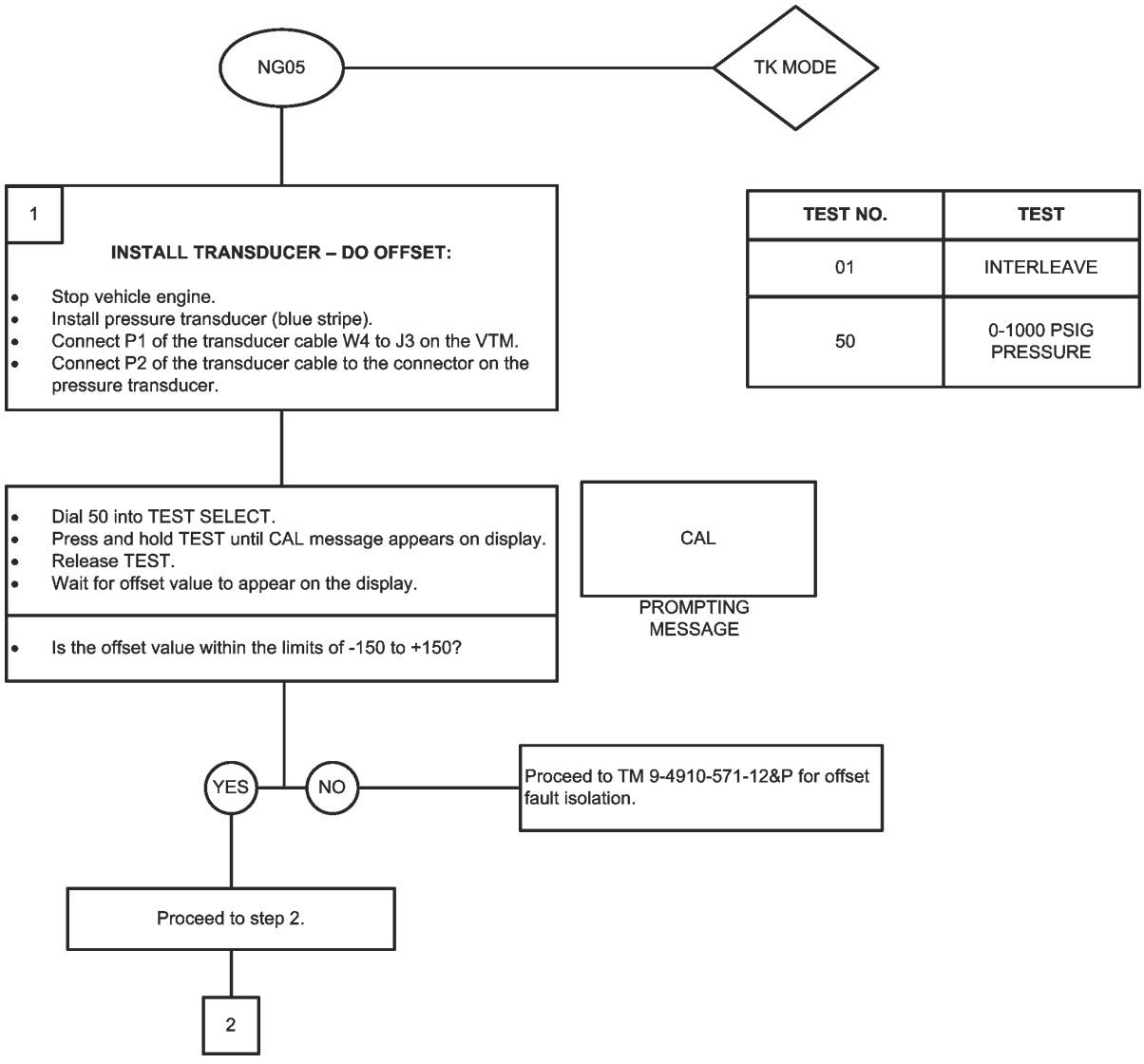


TEST NO.	TEST
10	ENGINE RPM

TK MODE NO-GO CHAIN TESTS



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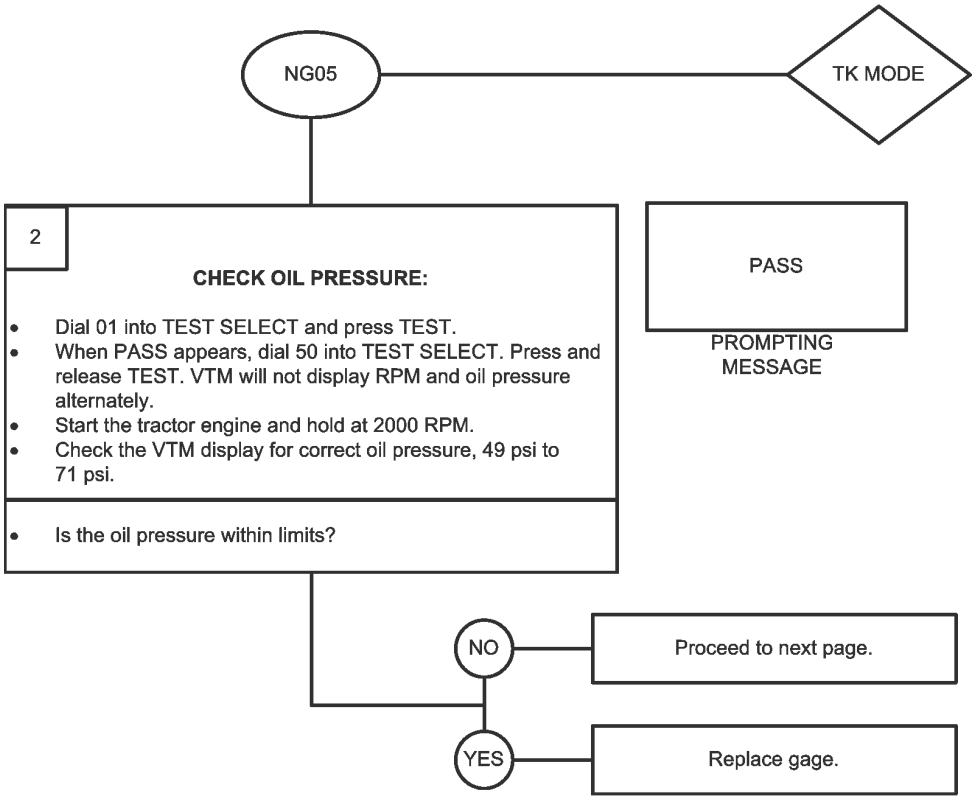

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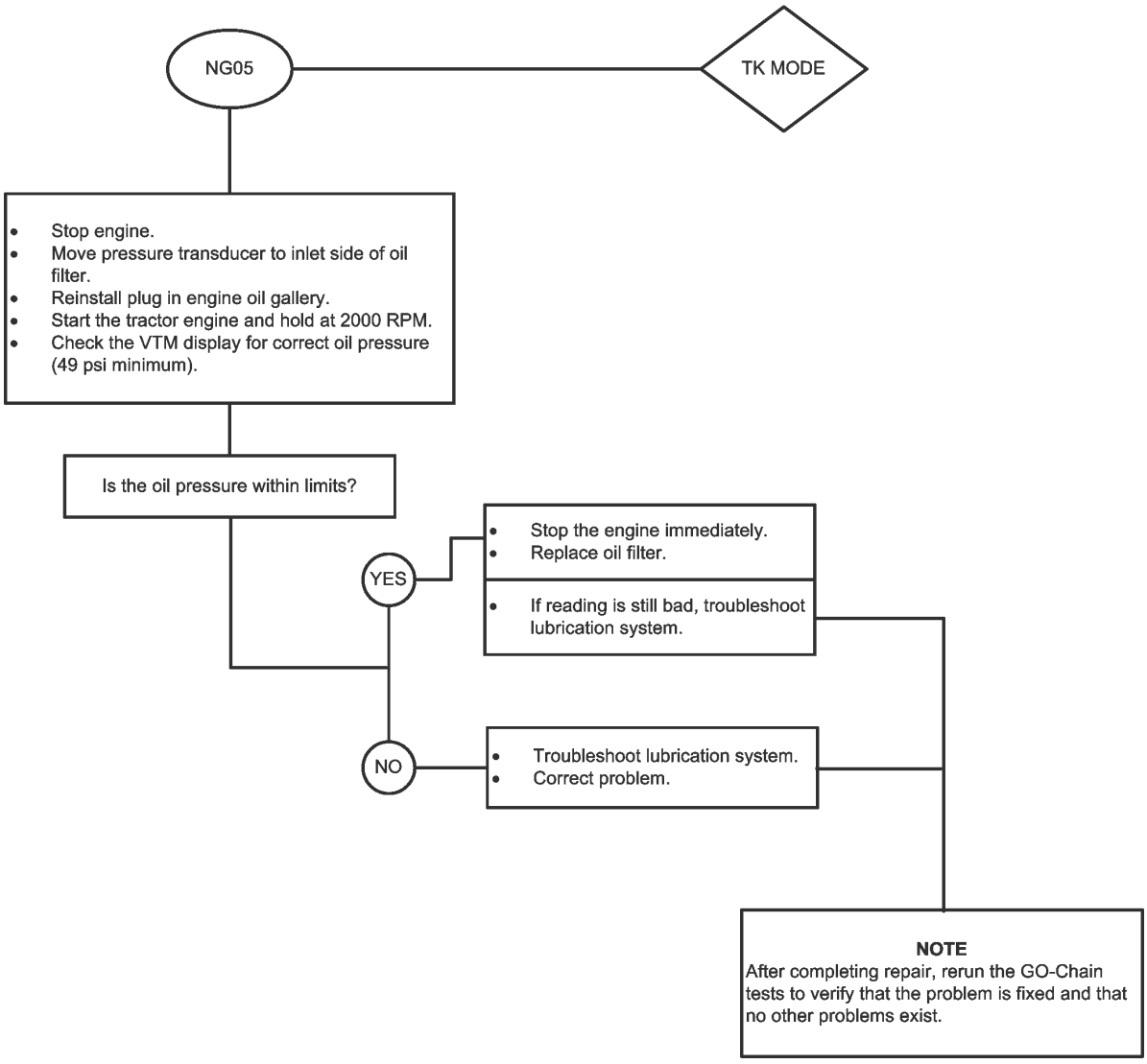

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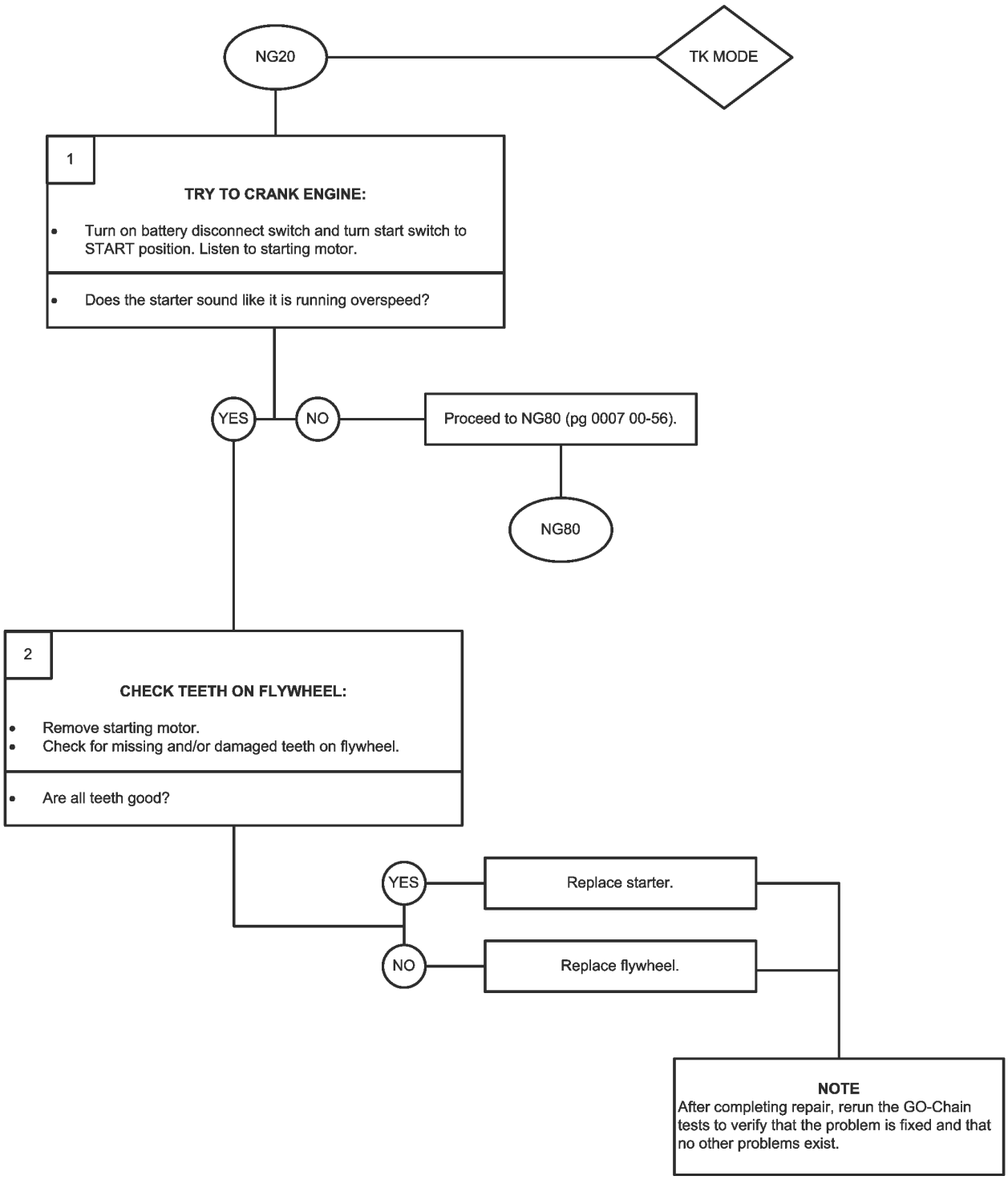

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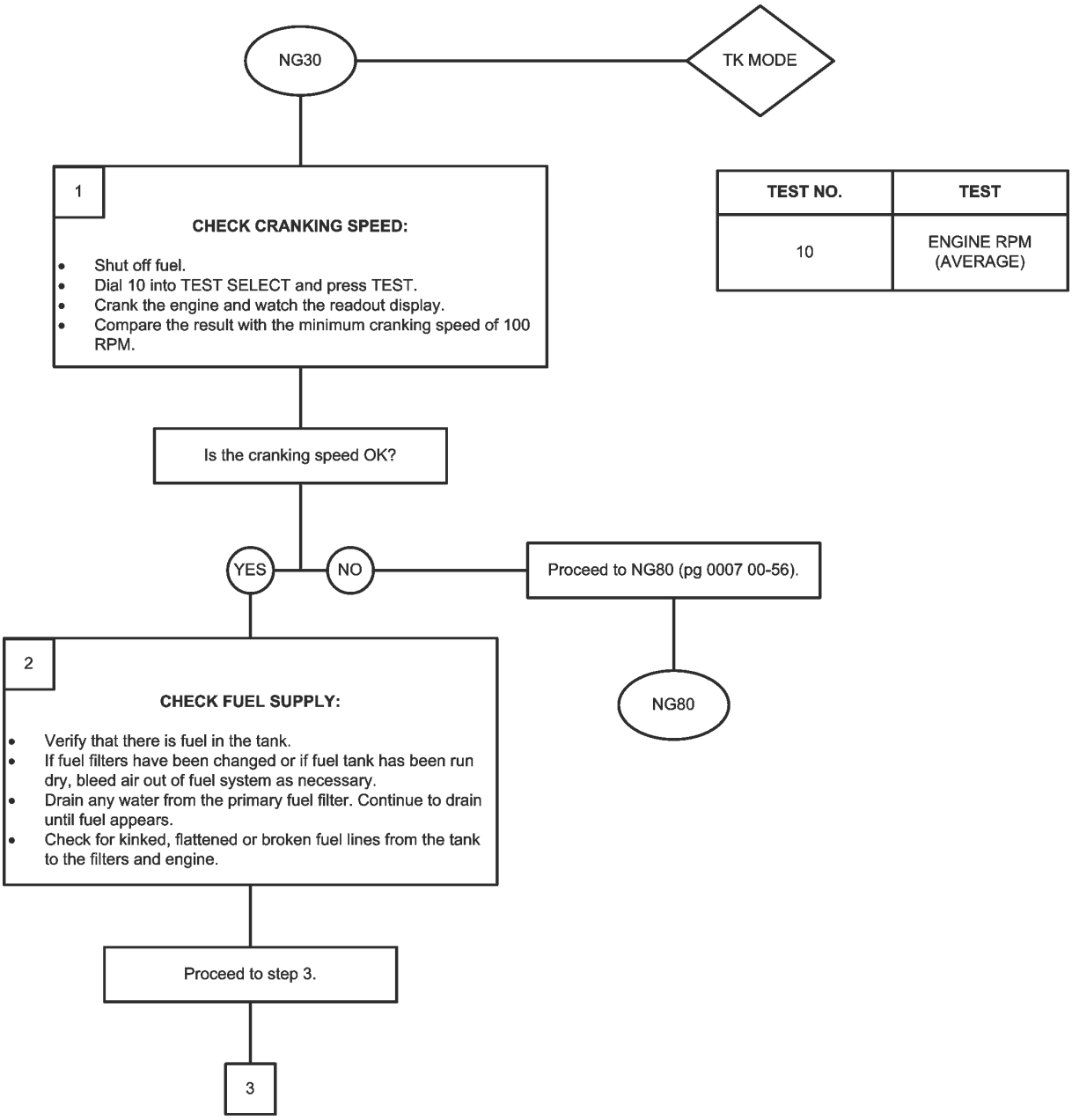

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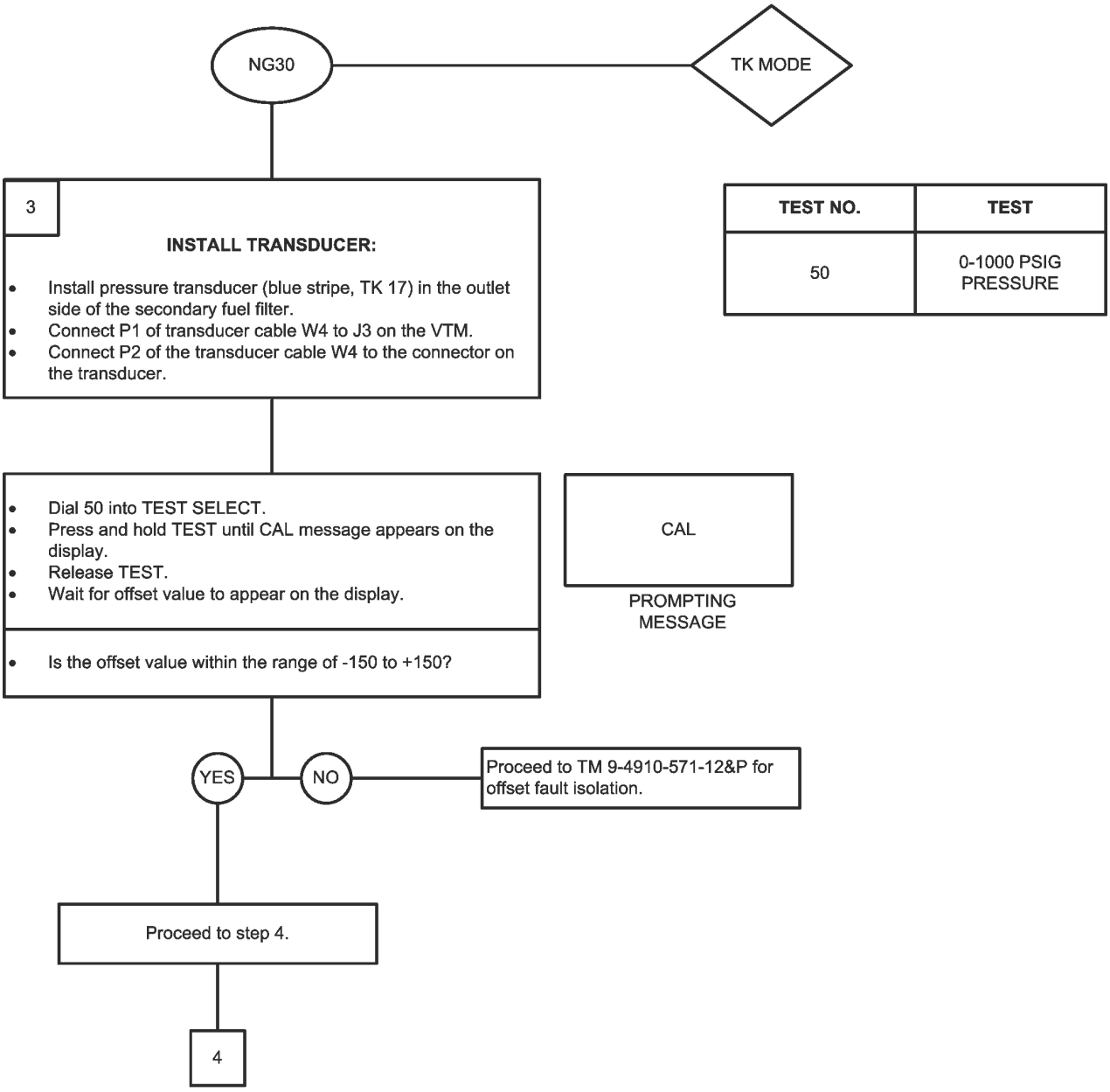

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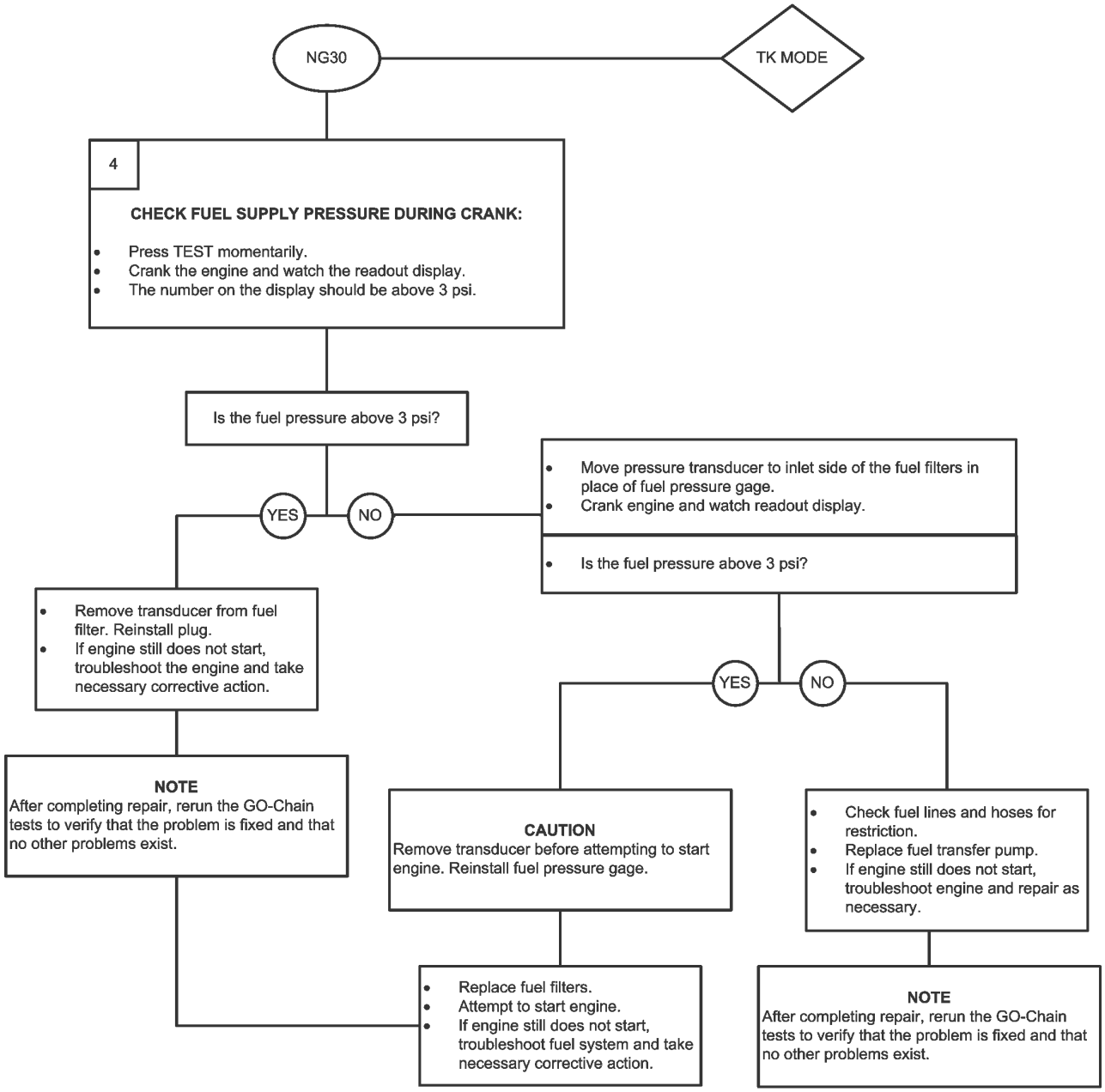

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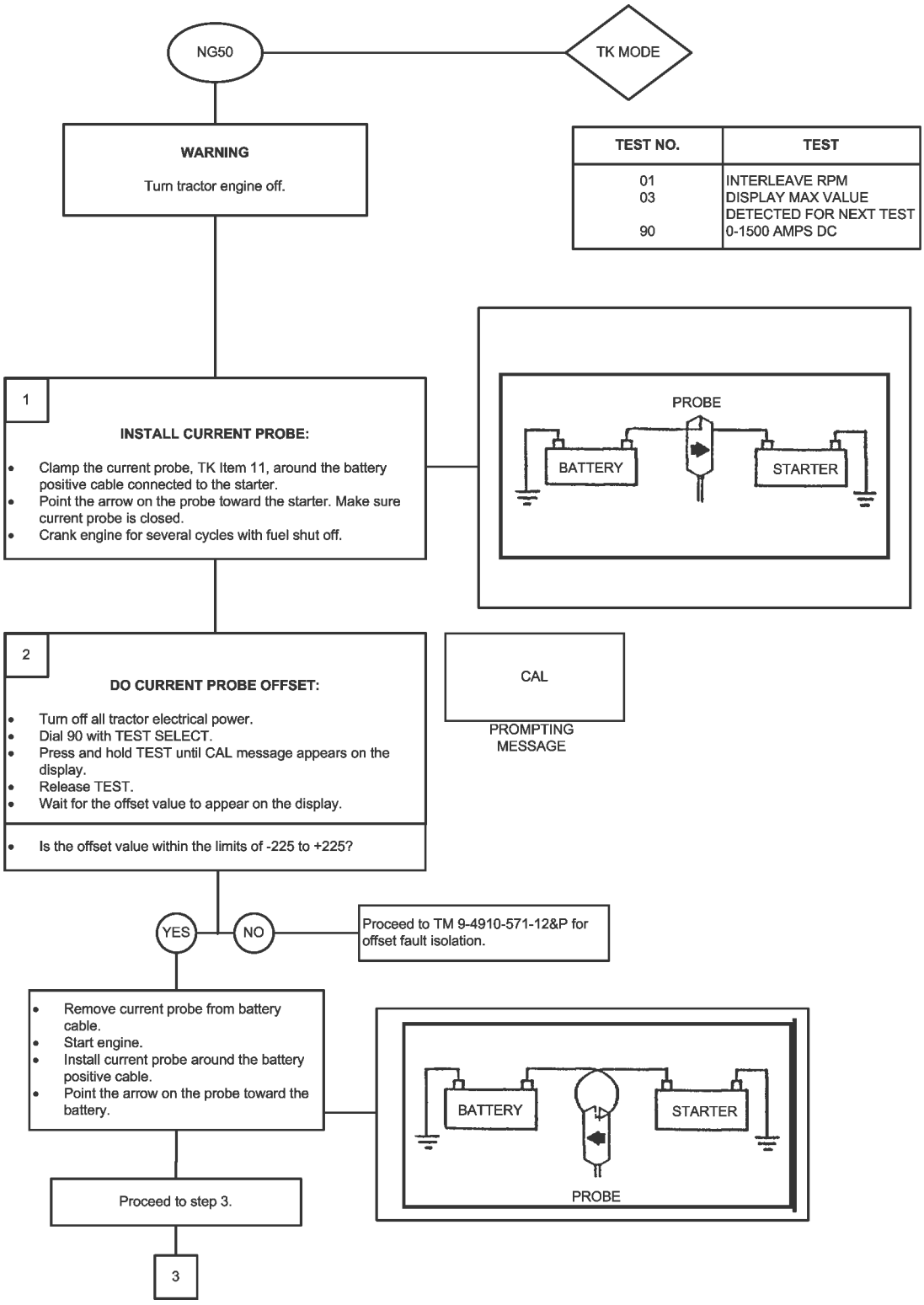

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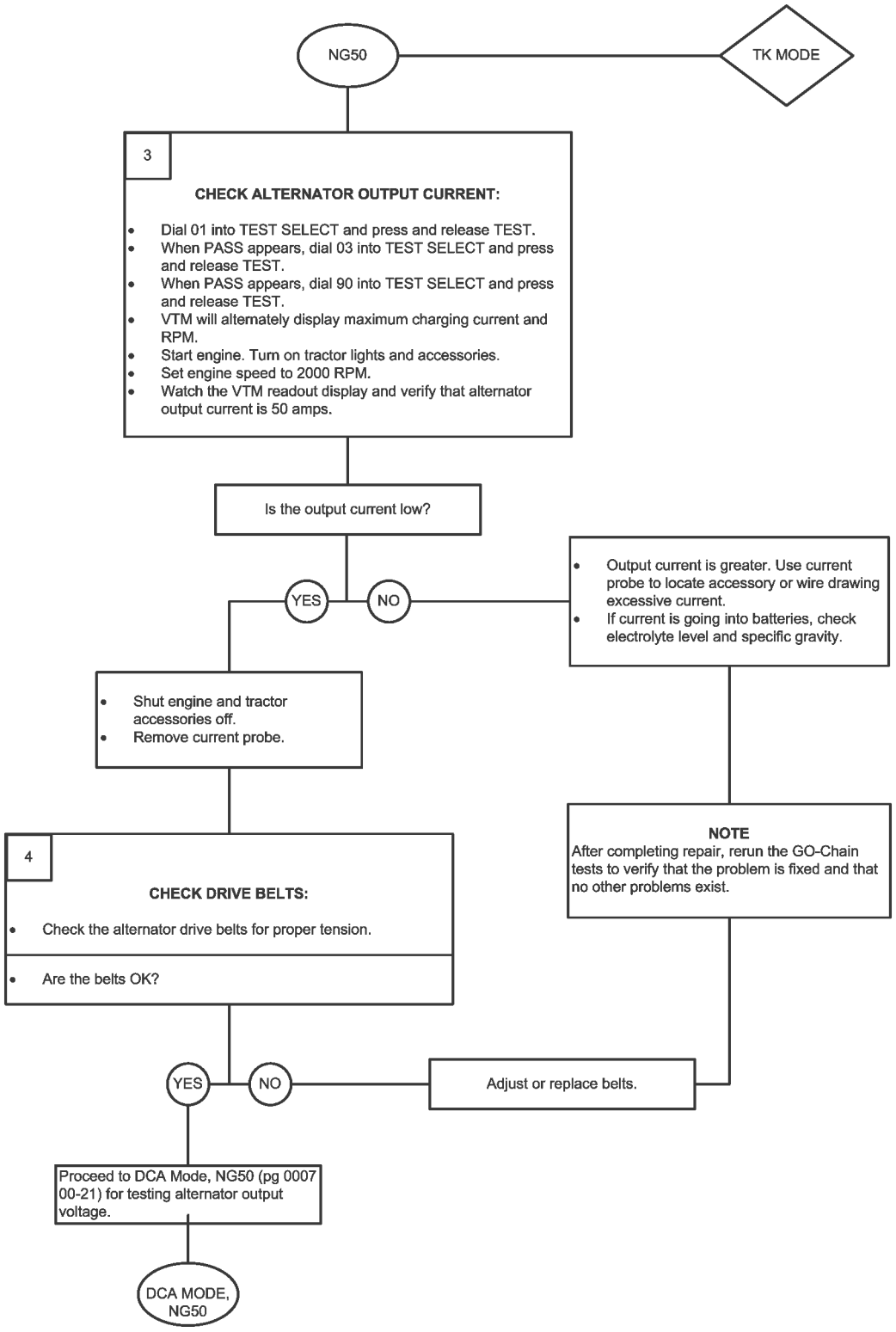

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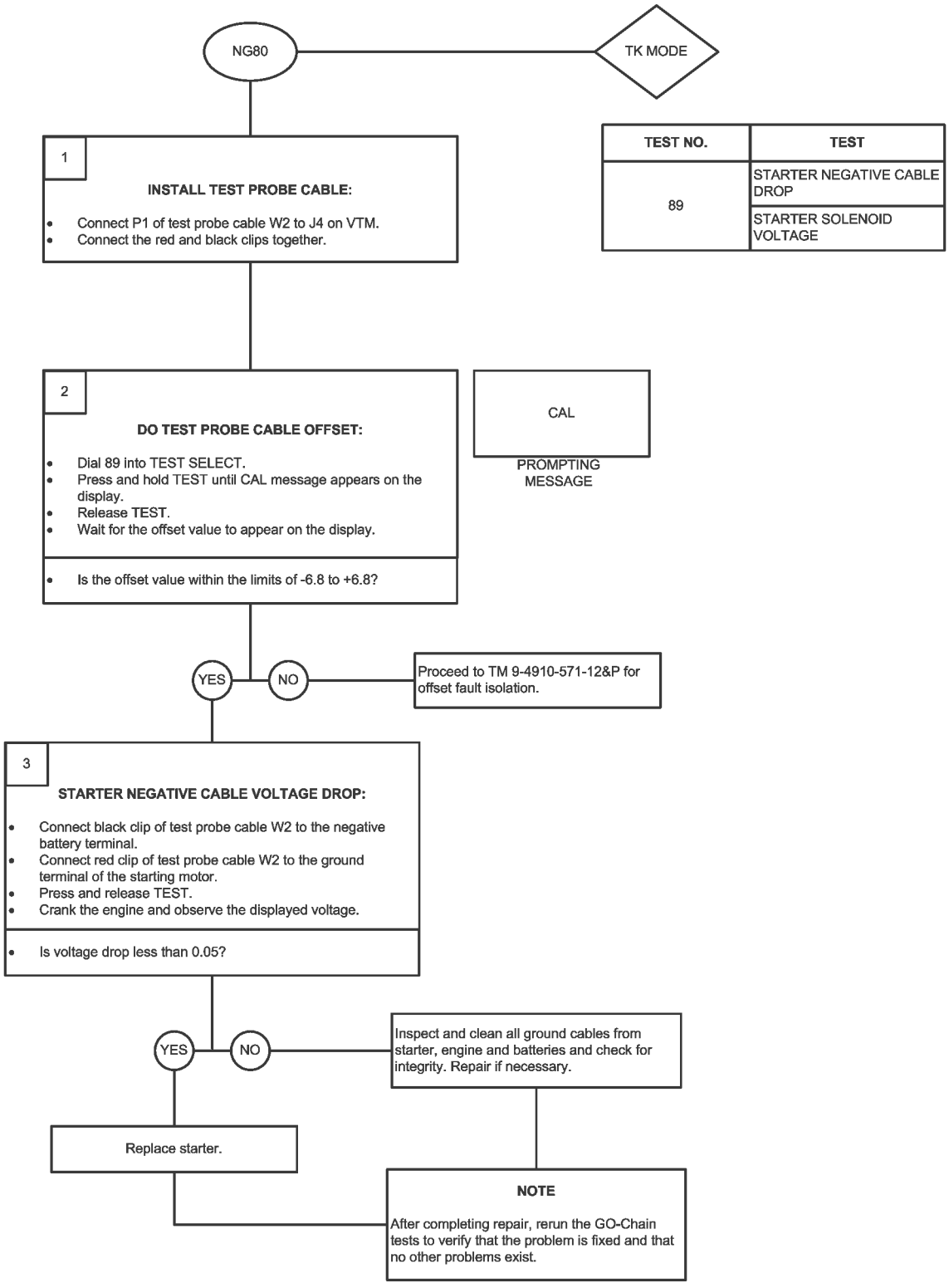

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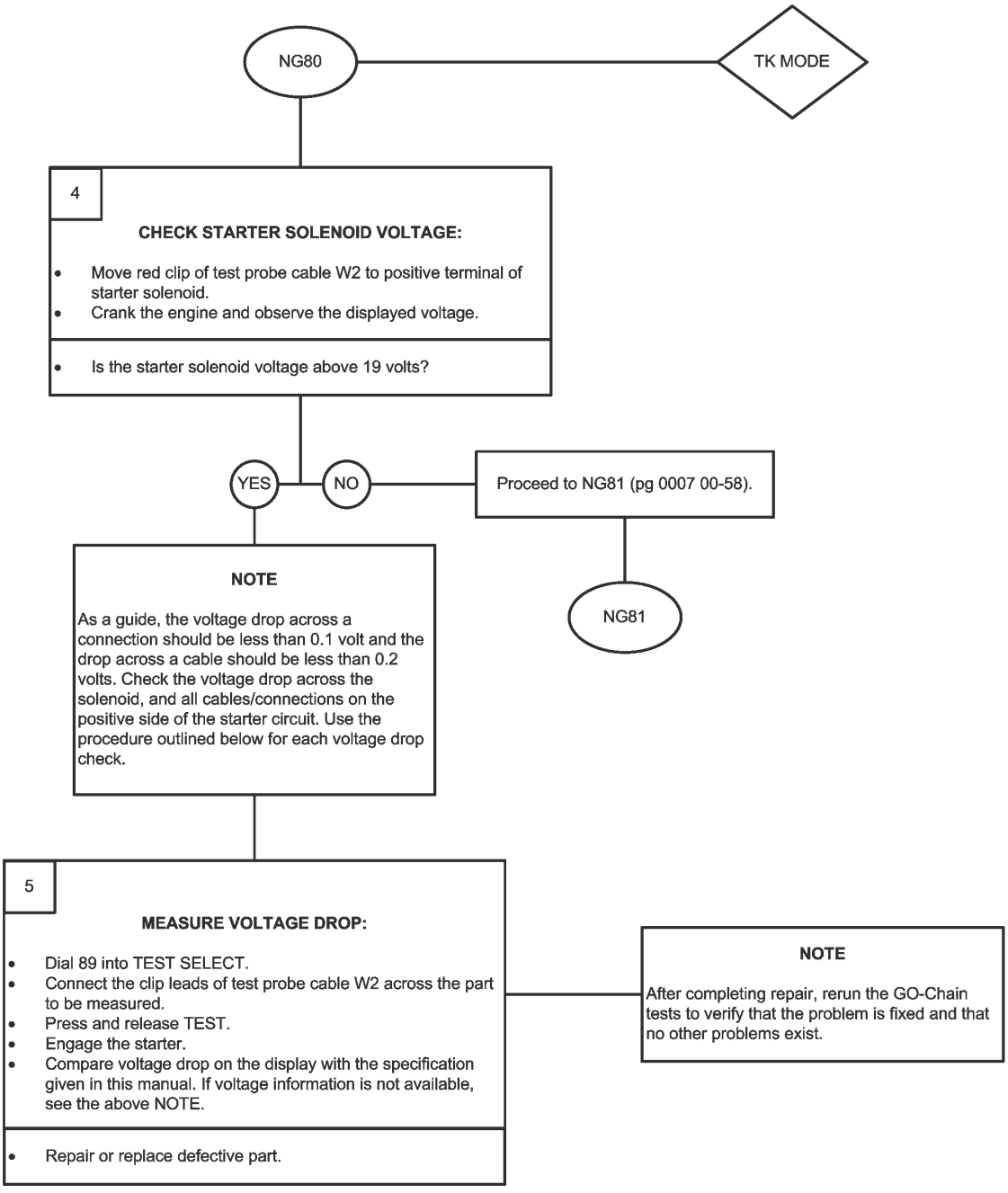

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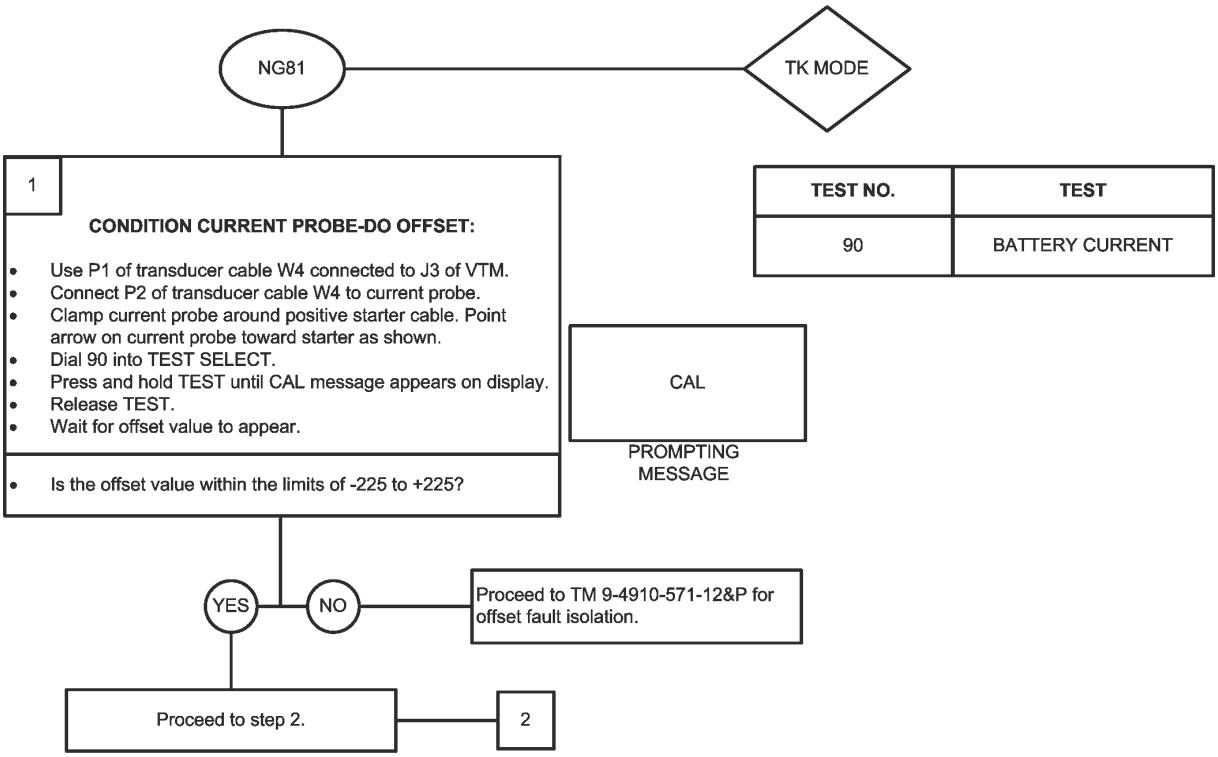

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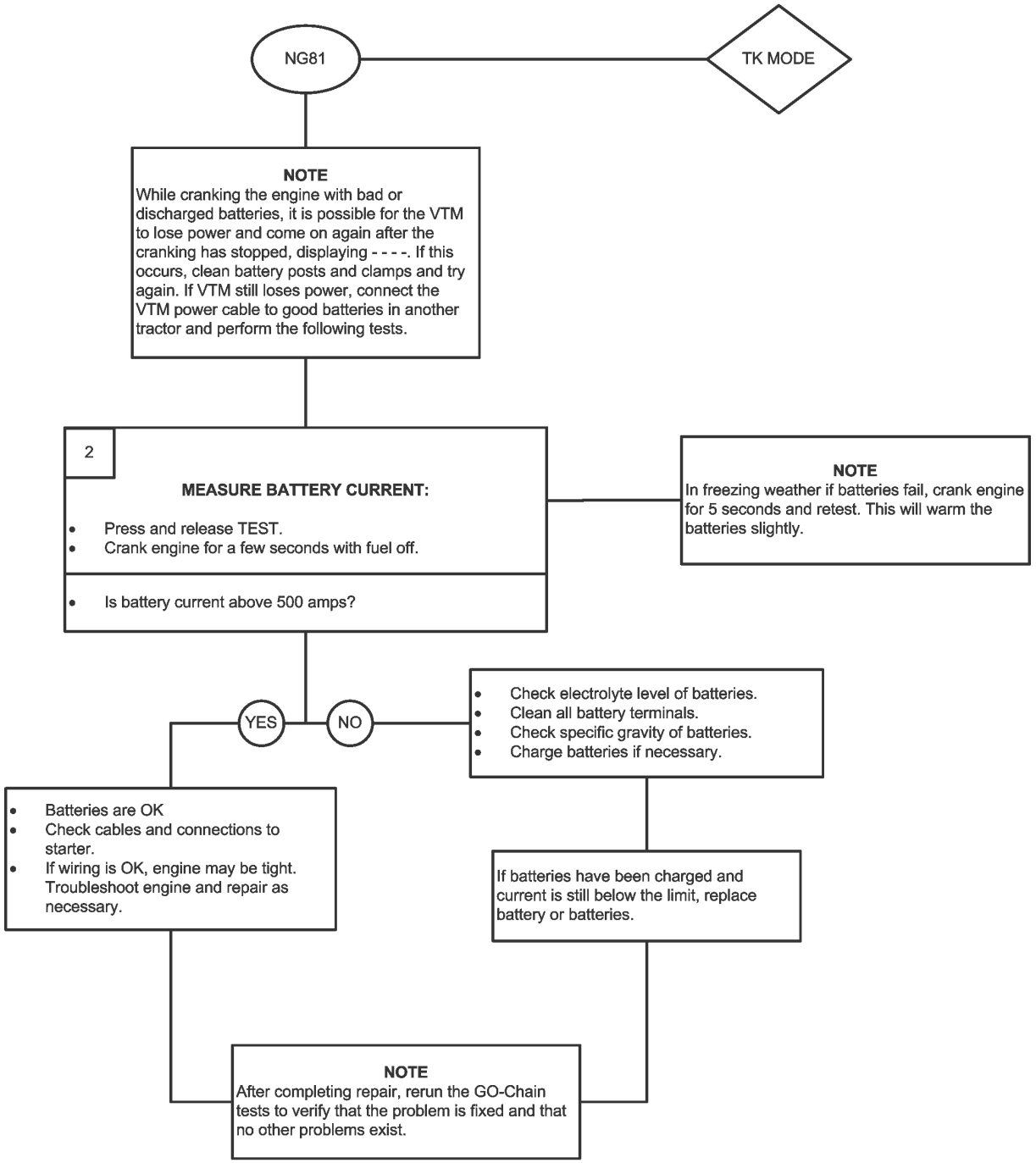

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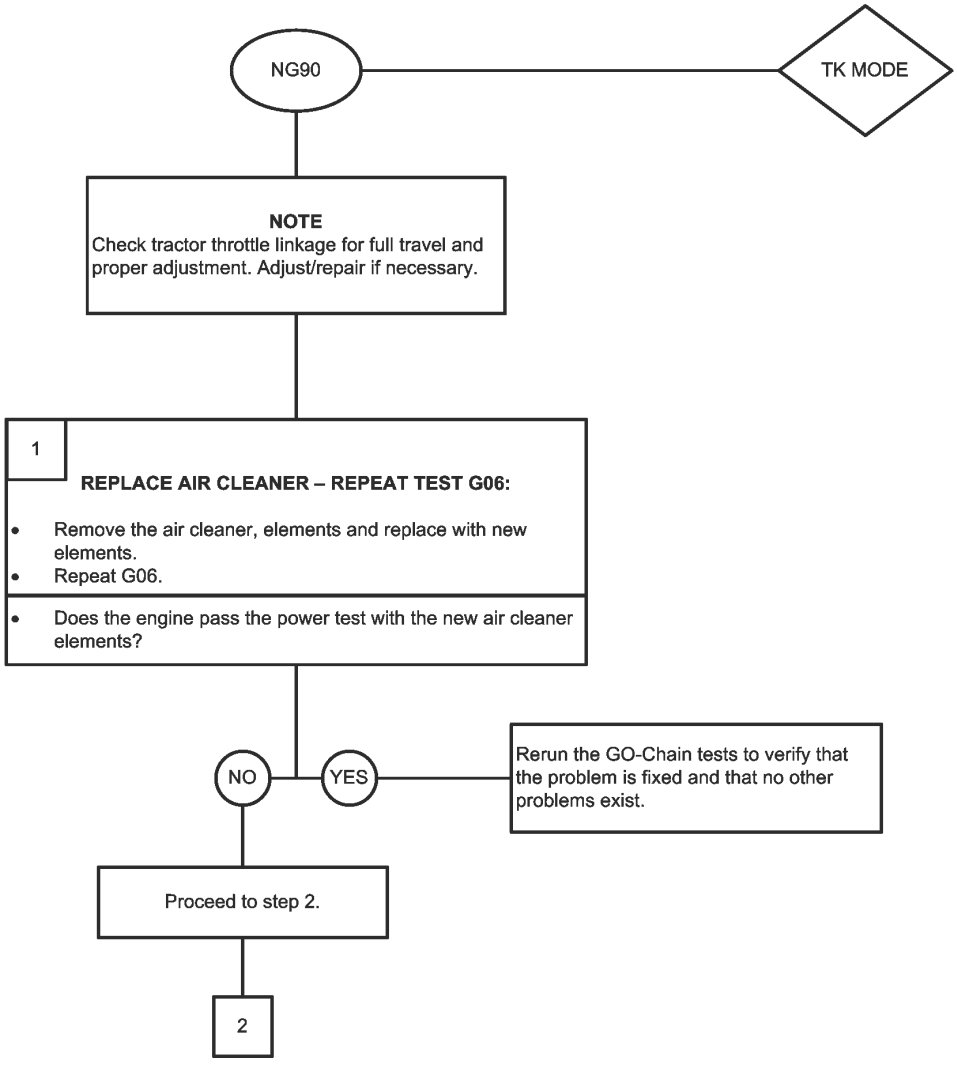

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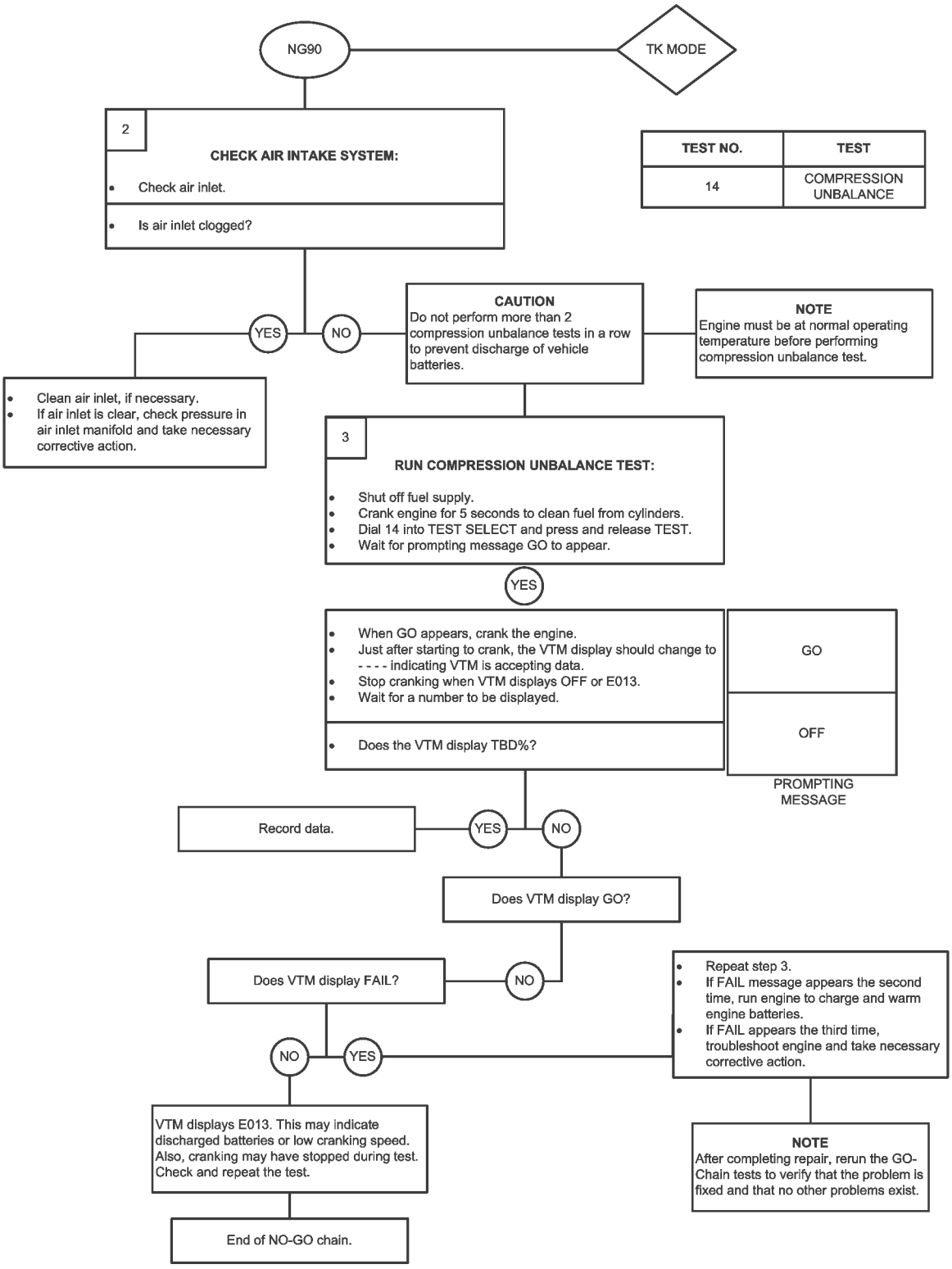


END OF WORK PACKAGE

CHAPTER 3
FIELD MAINTENANCE INSTRUCTIONS

SERVICE UPON RECEIPT 0008 00

GENERAL

1. When a used or reconditioned D7G Tractor is first received, determine whether it has been properly prepared for service and is in condition to perform its mission.
2. Follow the inspection and servicing instructions that follow.

INSPECTION INSTRUCTIONS

1. Read and follow all precautions and instructions on DD Form 1397, *Processing and Deprocessing Record for Shipment, Storage and Issue of Vehicles and Spare Engines*.
2. Remove all packing and shipping material, such as tape, tie downs, protective covers and shipping seals.

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

3. Clean any exposed metal parts coated with rust preventive compound. Use solvent cleaning compound (Item 4, WP 0249 00).
4. Inspect equipment for any damage incurred during shipment. Check if equipment has been modified.
5. Check equipment against packing slip to ensure that shipment is complete. Report any discrepancies on SF Form 368.
6. Clean all external surfaces as needed. Touch up any paint scratches.
7. Remove all Basic Issue Item (BII), Additional Authorization List (AAL), and Components of End Item (COEI) equipment and stow in accordance with TM 5-2410-237-10.
8. Install exhaust extension on muffler (WP 0063 00).
9. If equipped with ripper, install ripper shanks (WP 0240 00).

SERVICING INSTRUCTIONS

1. Service machine in accordance with PMCS instructions in TM 5-2410-237-10 and PMCS instructions in this manual (WP 0009 00 and WP 0010 00). Schedule the next PMCS on DA Form 2404 or DA Form 5988-E, *Equipment Inspection and Maintenance Worksheet*.
2. Refer to TM 5-2410-237-10 and perform functional checks of all major machine systems to ensure machine is ready for operation. Remove all warning tags.

END OF WORK PACKAGE

UNIT MAINTENANCE PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION 0009 00

GENERAL

1. To ensure that the D7G Tractor is ready for operation at all times, it must be lubricated and inspected on a regular basis so that defects may be found before they result in serious damage, equipment failure or injury to personnel.

2. The *KEY* in this work package lists the types, amounts and temperature ranges of the lubricants required for specified intervals.

3. The Lubrication Chart at the end of this work package shows all Unit Maintenance level lubrication points for the D7G Tractor.

4. Table 1 in WP 0010 00 contains systematic instructions on lubrications, inspections, adjustments and corrections to be performed by Unit Maintenance to keep the D7G Tractor in good operating condition and ready for its primary mission.

5. For information on Corrosion Prevention and Control (CPC), refer to WP 0001 00.

EXPLANATION OF TABLE ENTRIES

1. **Item Number (Item No.) Column.** Numbers in this column are for reference. When completing DA Form 2404 or DA Form 5988-E, *Equipment Inspection and Maintenance Worksheet,* include the item number for the check/service indicating a fault. Item numbers also appear in the order you must perform checks and services for the interval listed.

NOTE

If both an hours and calender interval are provided, perform check or service at whichever interval comes first.

2. **Interval Column.** This column tells you when you must perform the procedure in the procedure column. Intervals are based on calender dates or hours.

   a. *Hours* procedures must be performed at the hour interval specified.

   b. *Semiannual* procedures must be performed once every six months.

   c. *Annual* procedures must be performed once each year.

   d. *Biennial* procedures must be performed once every two years.

3. **Man-Hours Column.** This column indicates man-hours required to complete prescribed lubrication service.

4. **Item to Check/Service Column.** This column identifies the item to be checked or serviced.

NOTE

The WARNINGs and CAUTIONs appearing in your PMCS table should always be observed. WARNINGs and CAUTIONs appear before applicable procedures. These WARNINGs and CAUTIONs must be observed to prevent serious injury to yourself and others or to prevent your equipment from being damaged.

5. **Procedure Column.** This column gives the procedure you must perform to check or service the item listed in the Item to Check/Service column, to know if the equipment is ready or available for its intended mission or for operation. You must perform the procedure at the time stated in the interval column.

UNIT MAINTENANCE PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION - CONTINUED 0009 00

GENERAL LUBRICATION PROCEDURES

NOTE

- **Lubrication instructions contained in this PMCS are MANDATORY.**
- **Dashed leader lines used in illustrations of lubrication points indicate that lubrication is required on both sides of the equipment.**

1. Recommended intervals are based on normal conditions of operation, temperature, and humidity. When operating under extreme conditions, such as high or low temperatures or exposure to sand or dust, lubricants should always be changed more frequently. Lubricants that have become contaminated will be changed regardless of interval. When in doubt, notify your supervisor.

WARNING

When servicing this machine, performing maintenance or disposing of materials such as engine coolant, hydraulic fluid, lubricants, battery acids or batteries, and 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.

2. Ensure that all fluids drained as a result of lubrication or maintenance are collected in a suitable container and disposed of in accordance with local policy and ordinances. Clean up any spills immediately.

3. Keep all lubricants in a closed container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready for use.

4. Maintain a good record of all lubrication performed and report any problem noted during lubrication. Refer to DA Pam 738-750 for maintenance forms and procedures to record and report any findings.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

5. Keep all external parts of equipment not requiring lubrication free of lubricants. Before lubrication, wipe lubrication fittings with a clean rag (Item 29, WP 0249 00) and solvent cleaning compound (Item 2, WP 0249 00). After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.

6. Refer to FM 9-207, *Operations and Maintenance of Ordnance Materiel in Cold Weather*, for lubrication instructions in cold weather.

7. Refer to AR 70-12, *Fuel and Lubricant Standardization Policy for Equipment* for use of standardized fuels and lubricants.

8. For equipment under manufacturer's warranty, hardtime oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (i.e., longer-than-usual operating hours, extended idling periods or extreme dust).

GENERAL LUBRICATION PROCEDURES - CONTINUED

NOTE

The D7G is no longer enrolled in The Army Oil Analysis Program (AOAP).

9. Engine, transmission and hydraulic system oil filters shall be changed when:
   a. they are known to be contaminated or clogged; or
   b. at prescribed hardtime intervals.

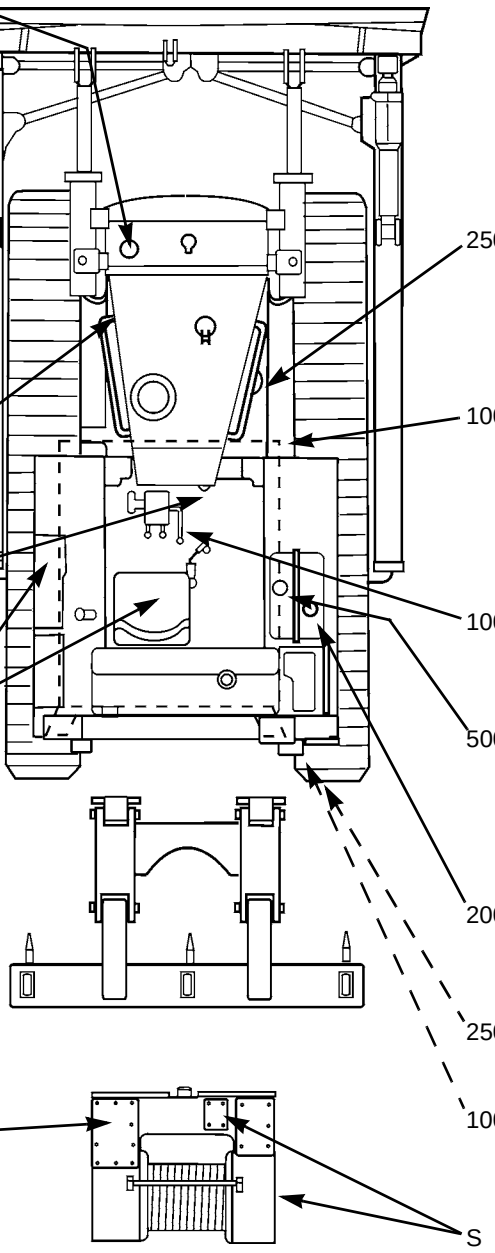
- KEY -

LUBRICANT/ COMPONENT	REFILL CAPACITY	EXPECTED TEMPERATURES*			INTERVALS
		Above +15°F (Above -9°C)	+40°F to -15°F (+4°C to -26°C)	+40°F to -65°F (+4°C to -54°C)	
OE/HDO Lubricating Oil, ICE, Tactical Service (MIL-PRF-2104)					H - Hours S - Semiannual A - Annual B - Biennial
OEA-30 Lubricating Oil, ICE, Arctic (MIL-PRF-46167)					
Engine Crankcase	7.25 gal. (27.4 L)	OE/HDO - 15/40 or OE/HDO-30 See Note	OE/HDO - 15/40 or OE/HDO-10 See Note	OEA-30	
Transmission, Bevel Gear and Steering Clutch Compartments	18.5 gal. (70.0 L)				
Towing Winch	16 gal. (60.6 L)				
Hydraulic Tank	21 gal. (79.5 L)	OE/HDO-15/40 or OE/HDO-10 See Note		OEA-30	
GO Lubricating Oil, Gear Multipurpose					
Final Drives	9 gal (each) (34.4 L) (each)	G0-75	GO-80/90	GO-85/140	
GAA Grease, Automotive and Artillery					
Driveshaft U-Joints	As Reqd	All Temperatures			
ANTIFREEZE Permanent, Ethylene Glycol, Inhibited (MILA46153)					
Cooling System	12 gal. (45.4 L)	Refer to PMCS Table			

* For arctic operation, refer to FM 9-207.

Note: Grade 15W-40 (OE/HDO-15/40) is the preferred lubricant but should only be used when temperatures are above 0°F (-18°C).

LUBRICANT •	INTERVAL		INTERVAL •	LUBRICANT	
Cooling System Drain/Refill	Anti-Freeze	2000/B	250/S	OE/HDO or OEA-30	Transmission and Steering Clutch Oil Filter Assembly Replace
Engine Crankcase OIl and Filter Replace	OE/HDO or OEA-30	250/S	1000/A	OE/HDO or OEA-30	Transmission Magnetic Strainer Remove/Clean
Torque Divider Suction Screen Remove/Clean		1000/A	1000/S	GAA	Universal Joints (2 Fittings)
Transmission Assembly Drain/Refill	OE/HDO or OEA-30	1000/A	500/S		Hydraulic System Replace Filter Element and Clean Screen
			2000/B	OE/HDO or OEA-30	Hydraulic System Drain/Refill
			250/S	GO	Final Drives Check Level/Add
Winch Drain/Refill	OE/HDO or OEA-30	B	1000/S	GO	Final Drives Drain/Refill
			S		Winch Check Level/Add Replace Filter Element and Clean Magnetic Strainer



GENERAL PMCS PROCEDURES

1. Always perform PMCS in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry. If any deficiency is discovered, perform the appropriate troubleshooting task in Chapter 2 of this manual. If any component or system is not serviceable, or if the given service does not correct the deficiency, notify your supervisor.

2. Before performing preventive maintenance, read all the checks required for the applicable interval and prepare all tools needed to make all checks. Have several clean rags (Item 29, WP 0249 00) handy. Perform ALL inspections at the applicable interval.

   a. **Keep It Clean.** Dirt, grease, oil and debris get in the way and may cover up a serious problem. Clean as you work and as needed. Use detergent (Item 11, WP 0249 00) and water when you clean.

   b. **Rust and Corrosion.** Check metal parts for rust and corrosion. If any bare metal or corrosion exists, clean and apply a light coat of lubricating oil (Item 24, WP 0249 00). Report it to your supervisor.

   c. **Bolts, Nuts and Screws.** Check bolts, nuts and screws for obvious looseness, missing, bent or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal or rust around bolt heads. If you find one you think is loose, tighten it.

   d. **Welds.** Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to your supervisor.

   e. **Electric Wires and Connectors.** Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connectors and ensure that the wires are in good condition.

   f. **Hydraulic Hoses and Lines.** Look for wear, damage, and signs of leaks. Ensure that clamps and fittings are tight. Wet spots indicate leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, correct it if authorized by the Maintenance Allocation Chart (WP 0248 00). If not authorized, notify your supervisor.

   g. **Fluid Leakage.** It is necessary for you to know how fluid leakage affects the status of your machine. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your machine. Learn and be familiar with them, and remember - when in doubt, notify your supervisor.

Leakage Definitions for PMCS

Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops, but not enough to cause drops to drip from item being checked/inspected.
Class III	Leakage of fluid great enough to form drops that fall from item being checked/inspected.

CAUTION

Operation is allowable with Class I and Class II leakage. WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR. When operating with Class I or Class II leaks, check fluid levels more frequently. Class III leaks must be reported immediately to your supervisor. Failure to do this will result in damage to vehicle and/or components.

END OF WORK PACKAGE

UNIT MAINTENANCE PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) 0010 00

INITIAL SETUP

Tools and Special Tools

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250 00)

Tool kit, general mechanics (Item 122, WP 0250 00)

Materials/Parts

Antifreeze (Item 1, WP 0249 00)

Cleaning compound, solvent (Item 4, WP 0249 00)

Cloth, abrasive, emery, fine (Item 5, WP 0249 00)

Detergent (Item 11, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil lubricating (Item 24, WP 0249 00)

Oil, lubricating (Item 25, WP 0249 00)

Oil, lubricating (Item 23, WP 0249 00)

Materials/Parts - Continued

Oil, lubricating (Item 26, WP 0249 00)

Oil, lubricating (Item 20, WP 0249 00)

Oil, lubricating, gear (Item 21, WP 0249 00)

Oil, lubricating, gear (Item 22, WP 0249 00)

Rags (Item 29, WP 0249 00)

Personnel Required

Two

Equipment Condition

Ensure machine is on level ground (TM 5-2410-237-10)

Engine OFF with engine oil warm (TM 5-2410-237-10).

Table 1. Unit Maintenance Preventive Maintenance Checks and Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
				NOTE • **Review all WARNINGs, CAUTIONs and NOTEs before performing Unit Maintenance PMCS on the D7G Tractor.** • **Unless otherwise indicated, perform all lubrication and preventive maintenance with machine parked on level ground, transmission in N (Neutral), transmission lock lever in locked position, brake lock lever engaged, implements lowered to the ground and engine shut down.** • **Perform Operator PMCS prior to or in conjunction with Unit Maintenance if:** **a. There is a delay between daily operation of the machine and Unit Maintenance PMCS.** **b. The regular operator is not assisting.**
1	**250 Hours or Semiannual**	**0.5 Hours**	**Engine Crankcase**	NOTE **Crankcase oil capacity is 7.25 gal. (27.4 l).** a. Drain oil from crankcase and replace oil filter element (WP 0011 00). b. Refill engine crankcase. Run engine and check for leaks (WP 0011 00). c. Remove crankcase breather and clean. Inspect breather seal and replace as needed. Reinstall breather (WP 0015 00).
2	**250 Hours or Semiannual**		**Engine Valve Lash**	NOTE • **Valve lash should be adjusted the <u>first</u> time engine oil is changed on a replacement engine.** • **Otherwise, valve lash should be adjusted annually.** Adjust valve clearance (WP 0018 00).
3	**250 Hours or Quarterly**		**V-Belts**	a. Check condition of V-belts. If damaged, replace V-belts as a set (WP 0074 00). b. Check tension on V-belts and adjust as needed (WP 0074 00).

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
4	250 Hours or Semiannual	0.3 Hours	Final Drives	Check oil level in each final drive. Add oil as needed (WP 0124 00).
5	250 Hours or Semiannual	0.7 Hours	Transmission Assembly	a. Replace transmission and steering clutch oil filter assembly (WP 0111 00). b. Remove, clean and reinstall oil magnetic screen assembly (WP 0112 00).
6	250 Hours or Semiannual		Brake Lock Lever and Linkage	Check that brake lock lever engages properly. If not, adjust (WP 0149 00).
7	250 Hours or Semiannual		Brake Pedals and Linkage	Check travel of brake pedals. Adjust pedal if travel has reached 5-5.5 in. (12.70-13.97 cm) (WP 0145 00).
8	500 Hours or Semiannual	0.2 Hours	Hydraulic System	Remove hydraulic filter assembly from tank, replace filter element, clean screen assembly and reinstall filter assembly in tank (WP 0218 00).
9	Semiannual	1.0 Hours	Towing Winch (If Equipped)	a. Remove winch magnetic strainer assembly, clean, inspect and reinstall (WP 0084 00). b. Change winch oil filter element (WP 0185 00).
10	Semiannual		Road Test	NOTE • **Test drive machine over varied terrain for at least 15 minutes.** • **Perform all *During* Operator PMCS checks during road test (TM 5-2410-237-10).** a. While cranking engine, listen for unusual noises and difficult cranking. b. Observe response to governor controls. Listen for unusual noises. Observe for hesitation, varying idle speed and sticking or binding of lever. c. Check for response to shifting and smoothness of operation in all speed ranges. d. Be alert for excessive vibration and the smell of fuel, oil, coolant and exhaust. e. Check all instrument and gages for proper readings (TM 5-2410-237-10).

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
10 (Con't)				f. Operate all machine implements and note response of respective control levers. g. Lightly apply brake pedals with steady force. Machine should slow down immediately and stop smoothly. h. Park machine on level ground. Place transmission in N (Neutral) with transmission lock lever in locked position. Engage brake lock lever. Lower implements to the ground and shut down engine. i. Perform a walk around inspection of machine. Check for evidence of leaks: oil, fuel and engine coolant. j. Ensure all data, caution and warning plates are present, securely mounted and legible.
11	**Semiannual**		**Engine**	a. Inspect oil lines and hoses for cracks, frays and wear that could cause leaks. b. Ensure engine oil filter assembly is securely mounted with no evidence of leaks. c. Inspect rocker arm (valve mechanism) cover for damage and leaks. d. Inspect all engine compartment wiring for frays, splits, missing insulation and poor connections. Replace any damaged wires and tighten any loose connection.
12	**Semiannual**		**Fuel System**	a. Inspect fuel filter housings for dents and cracks that could cause leaks. b. Inspect fuel transfer pump, fuel lines and fittings for damage and leaks. c. Service primary and secondary fuel filter assemblies (WP 0059 00 or WP 0060 00). d. Remove fuel filler cap and strainer. Disassemble filler cap and clean strainer and filler cap components. Assemble filler cap and reinstall strainer and filler cap (WP 0052 00).

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
13	Semiannual		Cooling System	 WARNING  • **DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.** • **DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.** • **Wear effective eye, glove, and skin protection when handling coolants. Failure to do so may cause injury.** a. Inspect hoses for splits, dry rot, wear and cracks that could cause leaks. Inspect hose clamps for tightness. Replace any damaged hose and tighten any loose hose clamps. b. Inspect radiator, water pump, engine oil cooler and transmission oil cooler for leaks and secure mounting. Tighten any loose hardware. c. Inspect radiator core for clogged or bent fins, leaks and protruding debris. Clean clogged core and remove debris. Straighten bent fins. d. Inspect fan blades for security, breaks and missing or loose capscrews. e. Inspect engine water temperature sending unit for security of mounting. Inspect wiring for frays, splits, breaks and worn or missing insulation. f. Check antifreeze solution for adequate freeze protection (TB 750-651).
14	Semiannual		Starting Motor	Inspect starting motor for security of mounting, corrosion and damaged or loose wiring. Tighten mounting capscrews and any loose connections.
15	Semiannual		Alternator	a. Inspect alternator for secure mounting.

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
15 (Con't)				b. Inspect alternator mounting bracket and attaching hardware for cracks, bends and secure mounting. Tighten any loose attaching hardware. c. Inspect alternator wiring for frays, bare wires, breaks and loose terminal connections. Tighten any loose terminal connections. d. Use a multimeter to check alternator output voltage. Voltage should read 27-29 volts (WP 0242 00).
16	**Semiannual**		**ROPS**	a. Inspect ROPS for cracks, breaks, bends or wear. Check for loose or missing mounting hardware. b. Inspect ROPS protective screen for damage, wear or loose or missing mounting hardware.
17	**Semiannual**		**Steering and Brakes**	a. Inspect steering and brake linkages for bends, cracks or wear that could cause failure. b. Inspect brake pedals for signs of looseness or wear. c. Follow routing of all hydraulic steering brake lines, hoses and tubing. Inspect for loose fittings, cracks, bends, breaks and evidence of leakage from valves, fittings or lines. d. Inspect hydraulic controls for cracks, bends and wear. Ensure controls move without binding.
18	**Semiannual**		**Batteries**	  **WARNING**  • **To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment, and injury to personnel.** • **Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in death or serious injury to personnel.**

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
18 (Con't)				**CAUTION** **• If battery compartment is corroded, it will be necessary to remove batteries and clean compartment to remove acid residues and corrosion.** **• Buildup of dirt or corrosion on batteries can lead to electrical malfunctions.** Service batteries as follows: a. Access batteries inside battery box on left side of machine. b. Check battery hold-down for looseness, corrosion or damage. Tighten if loose. c. Clean top of batteries with a rag (Item 29, WP 0249 00). d. Inspect batteries for evidence of a cracked case and electrolyte leakage. e. Disconnect battery cables (WP 0101 00). f. As required, use a solution of 1-1/2 cups (340 grams) of baking soda (Item 34, WP 0249 00) with 1 gallon (3.8 l) of clean water to remove any acid film from batteries. Rinse with clean water. g. Clean battery terminals with a fine grade of sandpaper or emery cloth (Item 5, WP 0249 00). h. Ensure all battery filler caps are present. i. Remove filler caps and check electrolyte level in each battery cell. Electrolyte level should be up to triangle in filler openings. Add distilled water as required and reinstall filler caps snugly. **CAUTION** **If battery requires charging, never exceed a charging voltage of 16 volts. Too much voltage will cause serious damage to battery.** j. Check state of charge of battery, using a digital voltmeter (TM 9-6140-200-14). A reading of 12.4 volts or more indicates battery is sufficiently charged. If reading is below 12.4 volts, recharge battery. k. Check specific gravity of electrolyte IAW TM 9-6140-200-14. l. Connect battery cables (WP 0100 00).

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

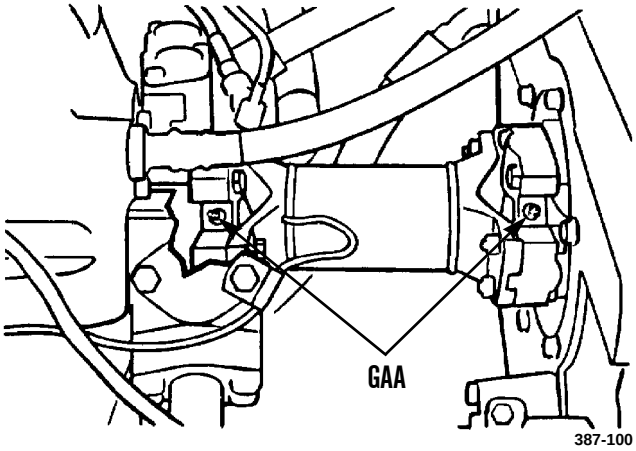
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
19	**1000 Hours or Semi-annual**	**0.5 Hours**	**Drive Shaft and U-Joints**	a. Remove floor plates to access drive shaft and U-joints (WP 0129 00). b. Inspect drive shaft for bends, cracks and twisted condition. c. Inspect U-joints for bends or cracks, play and broken or missing grease fittings. There must be no play in U-joints. d. Apply GAA grease (Item 16, WP 0249 00) to grease fitting at each U-joint.
				 387-100
20	**Semiannual**		**Undercarriage and Tracks**	a. Inspect equalizer bar for cracks, bends, breaks and loose or missing mounting hardware. b. Inspect track roller guards for cracks, bends and wear. c. Inspect the following components: track roller frame, idlers, track rollers, track carrier rollers and sprockets. Replace components that are damaged or worn beyond acceptable limits (WP 0132 00). d. Check recoil spring and track adjuster cylinder for damage or external leakage of grease. Make repairs as needed (WP 0136 00 or WP 0140 00). e. Inspect for damage or wear to track links and bushings. Inspect for cracked or missing track shoes (WP 0132 00). Replace any component that is broken, cracked, missing or worn beyond acceptable limits (WP 0132 00).

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
20 (Con't)				**NOTE** **The D7G uses two types of tracks: The Caterpillar "branded track" (identified by a Caterpillar logo) and the "classic track" (identified by a pictorial symbol of a track link). Inspection criteria and maintenance of both styles of tracks are the same. However, components of these tracks are NOT completely interchangeable. Before maintenance and requisitioning of parts, verify the type of track on the tractor and proceed accordingly.** f. Check and adjust track tension if necessary (WP 0132 00).
21	**Semiannual**		**Hydraulic System**	a. Follow routing of lines, hoses and tubing for hydraulic system. Inspect for loose fittings, cracks, bends, breaks and leaks. b. Inspect blade lift cylinders and tilt cylinder and cylinder hydraulic lines for secure mounting, loose fittings and leaks. c. If equipped with ripper, inspect ripper lift cylinders and cylinder hydraulic lines for secure mounting, loose fittings and leaks. d. If equipped with winch, inspect winch hydraulic lines for secure mounting, loose fittings and leaks.
22	**Semiannual**		**Bulldozer Blade**	**CAUTION** **If wear to cuttings edges and end bits is sufficient to cause wear to blade support, change cutting edges and install new end bits.** Inspect cutting edges and end bits for damage, wear or loose or missing mounting hardware. Change cutting edges if damaged or worn to less than 3/4 in. (19 mm). Install new end bits if worn/damaged (WP 0234 00).
23	**Semiannual**		**Dozer Push-arm Trunnions**	Inspect trunnions on both sides of machine for structural damage and missing or loose mounting hardware.
24	**Semiannual**		**Winterized Cab (If Equipped)**	a. Inspect defrosters for proper operation and evidence of damage. b. Inspect heater for proper operation and evidence of damage. c. Inspect windshield wipers for proper operation and evidence of damage.

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
25	**1000 Hours or Annual**	**1.1 Hours**	**Transmission Assembly**	a. Inspect transmission control valves for leaks, wear or cracks that could cause failure. b. Inspect transmission body for cracks or loose capscrews that could cause leaks. c. Inspect transmission shift linkage for bends, cracks and wear that could cause failure. d. Perform complete transmission assembly service (WP 0107 00): (1) Drain oil from transmission assembly. NOTE **Breather is common to transmission and steering clutches/ final drives.** (2) Replace transmission breather. (3) Replace transmission and steering clutch filter assembly. (4) Clean transmission oil magnetic screen assembly and torque divider suction screen and check for leaks. (5) Refill transmission and check for leaks.
26	**2000 Hours or Annual**		**Engine Valve Lash**	Adjust valve clearance (WP 0018 00).
27	**1000 Hours or Biennial**	**0.5 Hours**	**Final Drives**	a. Inspect final drives for evidence of oil leakage. b. Drain final drives and refill (WP 0124 00).

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE
28	**2000 Hours or Biennial**	**0.5 Hours**	**Cooling System**	 WARNING  **• DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.** **• DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.** **• Wear effective eye, glove, and skin protection when handling coolants. Failure to do so may cause injury.** Drain cooling system, change antifreeze solution and refill (WP 0065 00).
29	**2000 Hours or Biennial**	**0.7 Hours**	**Hydraulic System**	a. Inspect hydraulic tank for cracks, breaks and leaks. b. Inspect hydraulic lines and fittings at tank for looseness, damage and leaks. c. Drain oil from hydraulic tank (WP 0225 00). d. Remove, clean and reinstall filler strainer (WP 0218 00). e. Remove hydraulic filter assembly, clean screen, replace filter element and reinstall filter assembly in tank (WP 0218 00). f. Refill hydraulic tank (WP 0225 00).
30	**Biennial**	**0.8 Hours**	**Winch (If Equipped)**	a. Inspect winch for cracks, breaks and leaks. b. Inspect winch mounting hardware for looseness, missing parts or damage. c. Inspect winch control lever for proper operation and linkage for cracks, bends and missing mounting hardware. d. Reel out winch wire rope assembly completely. Inspect for kinks, frays and wear. Replace a frayed or damaged wire rope assembly. e. Drain oil from winch reservoir (WP 0179 00).

Table 1. Unit Maintenance Preventive Maintenance Checks and Services (PMCS) for the D7G Tractor - Continued.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE
30 (Con't)				f. Remove winch magnetic strainer assembly, clean, inspect and reinstall (WP 0184 00). g. Replace winch breather (WP 0186 00). h. Replace winch oil filter element (WP 0185 00). i. Refill winch reservoir (WP 0179 00).
31	**Biennial**		**Frame**	a. Inspect frame for cracks, breaks, bends, wear and corrosion. Make repairs as authorized. b. Inspect all areas of frame for missing rivets, capscrews and obstructions to other components. Move obstructions, if possible. Make repairs as required.
32	**Biennial**		**Engine Mounts and Lifting Brackets**	Inspect engine mounts and lifting brackets for security of mounting, wear, cracks, splits, broken welds and loose or missing mounting hardware.

END OF WORK PACKAGE

ENGINE OIL AND OIL FILTER ASSEMBLY MAINTENANCE 0011 00

THIS WORK PACKAGE COVERS

Changing Engine Oil, Oil Filter Replacement, Oil Filter Base: Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Filter element, fluid (12)

Gasket (18, 25 and 35)

Packing, preformed (19, 26 and 31)

Stand, jack (two required)

Materials/Parts - Continued

Tubing, rubber or plastic, 1-1/2 in. I.D. x 9 in.

References

WP 0009 00

WP 0010 00

WP 0015 00

Equipment Condition

Engine OFF (TM 5-2410-237-10)

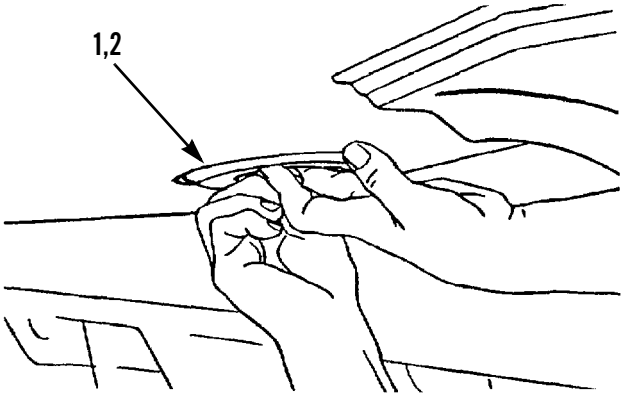
Machine parked on level ground (TM 5-2410-237-10

Transmission in neutral (N) and locked (TM 5-2410-237-10)

Engine oil warm (TM 5-2410-237-10)

CHANGING ENGINE OIL

1. Loosen capscrew (1) and remove access cover assembly (2) from crankcase guard.



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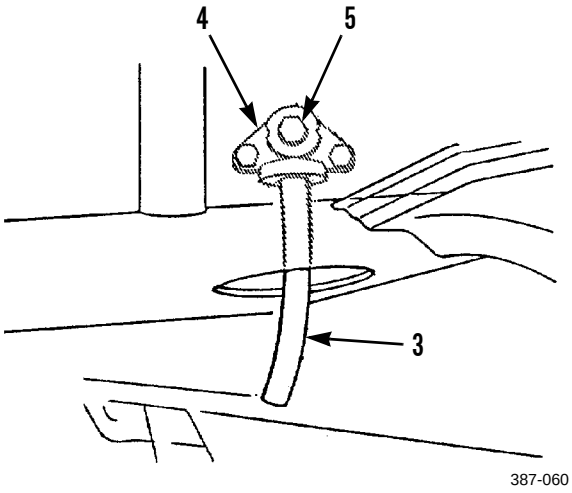
CHANGING ENGINE OIL - CONTINUED

NOTE

Crankcase capacity is 7.25 gal. (27.4 l).

2. Slide a piece of 1-1/2 in. I.D. soft rubber or plastic tubing (3) over bottom of oil drain plug adapter (4). Place a drain pan under drain opening and direct tubing into drain pan to catch oil.
3. Open, but do not remove, drain plug (5) and allow oil to drain from engine. After oil has drained from engine, close drain plug and remove tubing (3).
4. Replace oil filter as necessary. See *Oil Filter Replacement* in this work package. Refer to *PMCS* in WP 0009 00 and WP 0010 00 for interval requirement.
5. Service crankcase breather (WP 0015 00).



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6. Remove padlocks from oil dipstick (6) and oil filler tube cap (7). Remove cap from fill pipe (8).
7. Fill crankcase with new oil. See PMCS in WP 0009 00 and WP 0010 00 for oil grade and refill capacities.
8. Install cap (7) onto fill pipe (8).

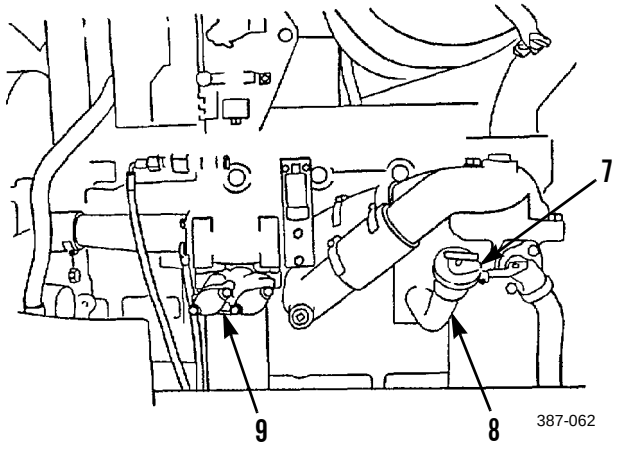
NOTE

If it is desired to check oil with engine stopped, make sure level falls within SAFE STARTING RANGE on ENGINE STOPPED side of dipstick.

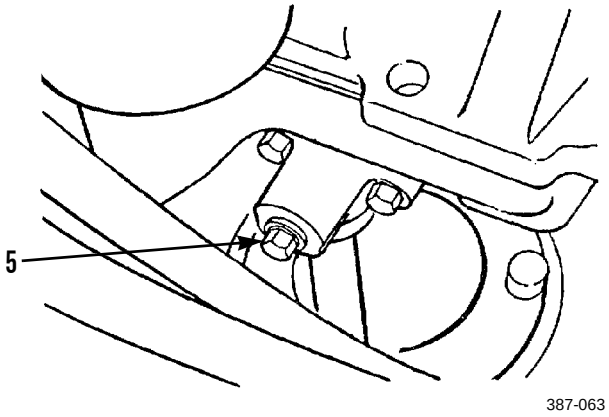
9. Start engine and run for a few minutes at low idle to fill filter housing. Check oil level by pulling dipstick (6) out with engine running and make sure oil falls between ADD and FULL marks on dipstick.

CHANGING ENGINE OIL - CONTINUED

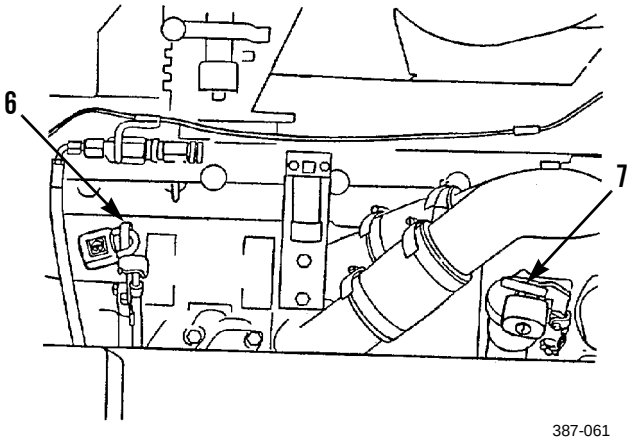
10. If necessary, remove oil filler tube cap (7) and add more oil through fill pipe (8).



11. Check oil filter base (9) and drain plug (5) for leaks.

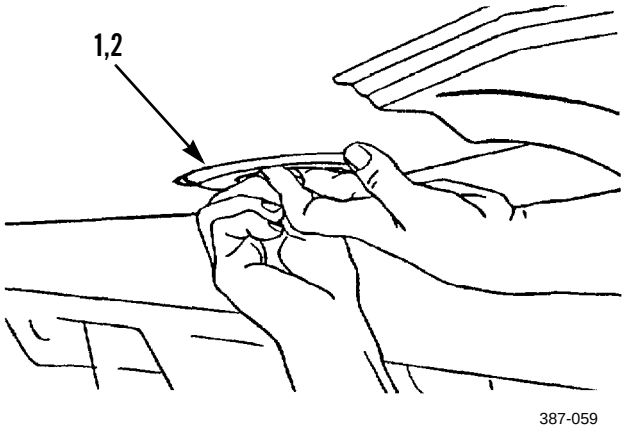


12. Install padlocks on oil filler tube cap (7) and on oil dipstick (6).



CHANGING ENGINE OIL - CONTINUED

13. Install access cover assembly (2) and tighten capscrew (1).



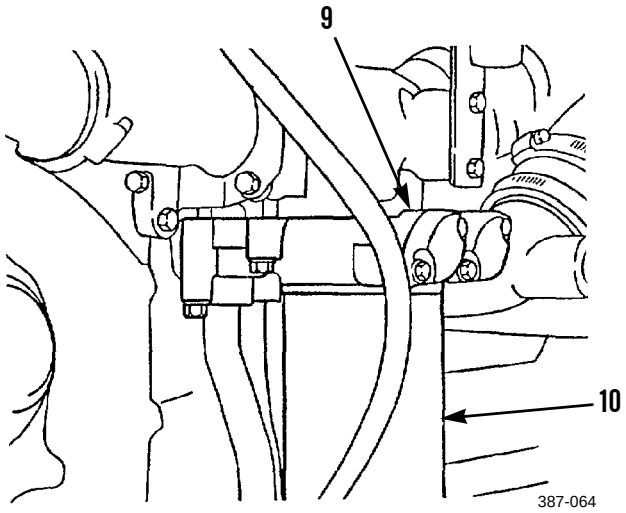
OIL FILTER REPLACEMENT

1. Drain engine oil. See *Changing Engine Oil* in this work package.

NOTE

Place a 2 quart drain pan under filter to catch any oil.

2. Use a strap wrench to remove oil filter (10). Discard filter.
3. Clean bottom of oil filter base (9) with a clean rag.
4. Apply a thin film of clean lubricating oil to gasket on base of new oil filter (10).
5. Install new oil filter (10) and tighten only until gasket on base of filter touches oil filter base (9), then tighten filter an additional 3/4 turn. Do not overtighten.
6. Fill crankcase with oil. See *Changing Engine Oil* in this work package.



OIL FILTER BASE REMOVAL

1. Drain engine oil. See *Changing Engine Oil* in this work package.
2. Remove oil filter. See *Oil Filter Replacement* in this work package.

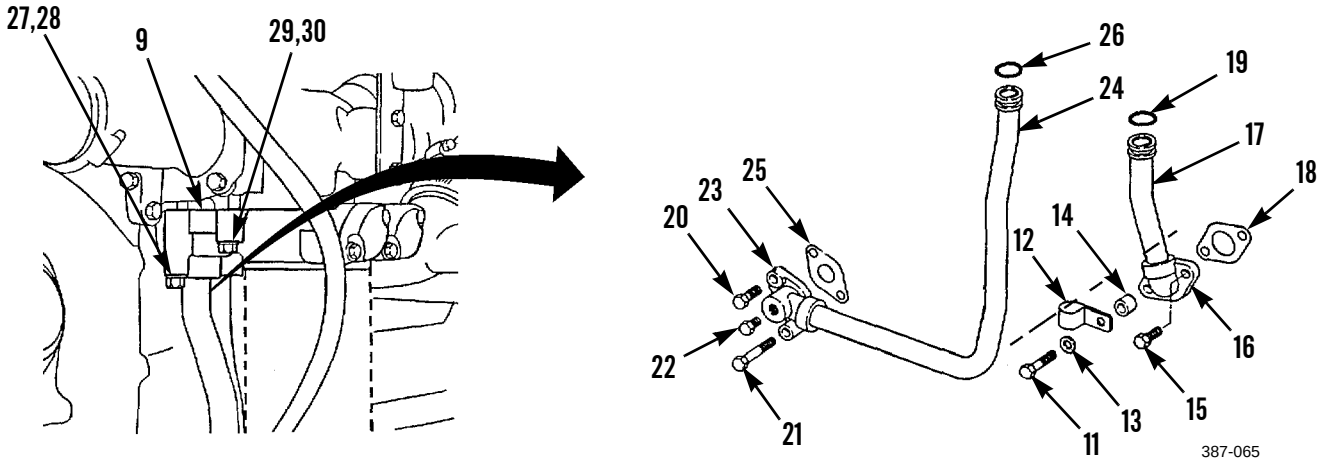
NOTE

Place drain pan under oil filter base.

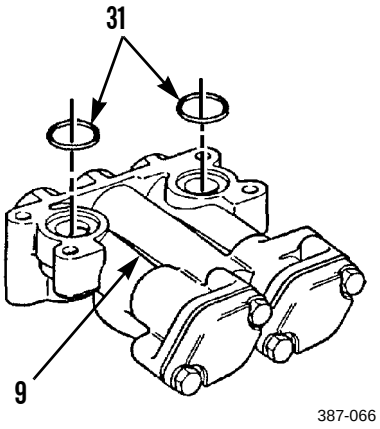
3. Remove capscrew (11) that holds clamp (12), washer (13) and spacer (14).

OIL FILTER BASE REMOVAL - CONTINUED

4. Remove capscrew (15) that holds flange (16) in place. Remove oil tube (17) by pulling it out of oil filter base (9). Remove gasket (18) and preformed packing (19). Discard gasket and preformed packing.
5. Remove two capscrews (20 and 21) and capscrew (22) from flange (23). Remove oil tube (24) by pulling it out of oil filter base (9). Remove gasket (25) and preformed packing (26). Discard gasket and preformed packing.
6. Remove capscrew (27), washer (28), three capscrews (29), washers (30) and oil filter base (9) from engine.



7. Remove preformed packings (31) from oil filter base (9). Discard preformed packings.



OIL FILTER BASE DISASSEMBLY

WARNING

Covers hold springs under compression. Use care when removing them. Failure to follow this warning may result in injury to personnel.

1. Remove four capscrews (32), washers (33), two covers (34) and gaskets (35) from oil filter base (9). Discard gaskets.
2. Remove springs (36) and plungers (37) from oil filter base (9).

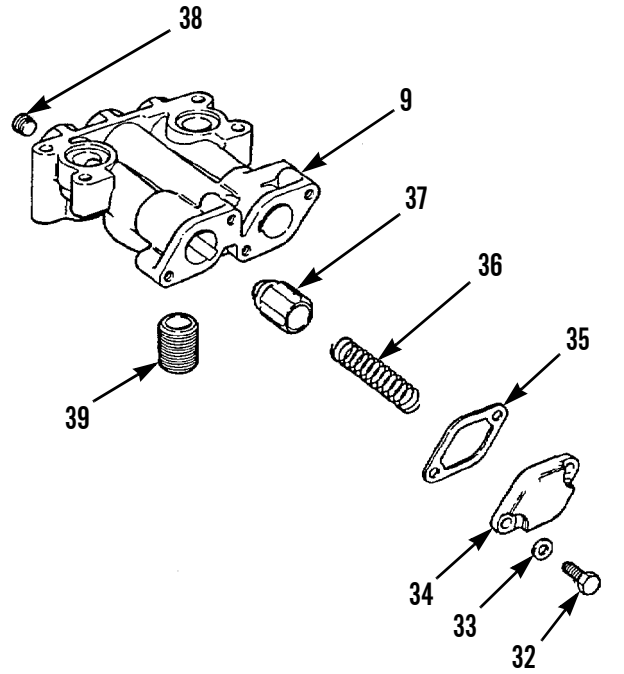
NOTE

Do not remove stud unless inspection shows need for replacement.

3. Remove plug (38). If damaged, remove stud (39) from oil filter base (9).

OIL FILTER BASE ASSEMBLY

1. Install plug (38) and, if removed, install stud (39) into oil filter base (9).
2. Install plungers (37) and springs (36) into oil filter base (9).
3. Place covers (34) with new gaskets (35) into position and install four washers (33) and capscrews (32).



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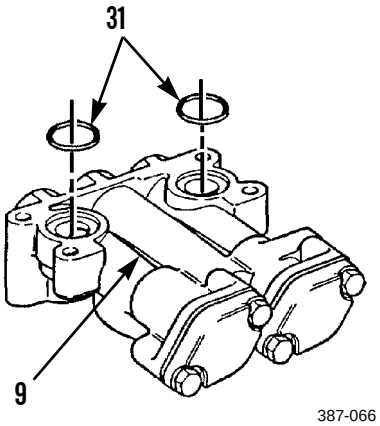
OIL FILTER BASE INSTALLATION

1. Install new preformed packings (31) into oil filter base (9).



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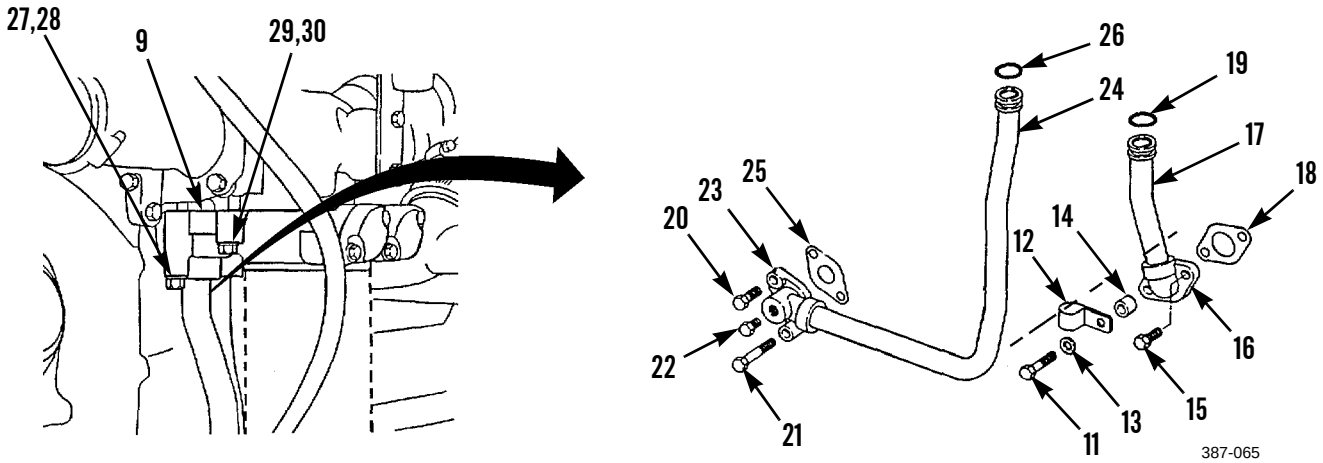
OIL FILTER BASE INSTALLATION - CONTINUED

2. Place oil filter base (9) into position on engine and install washer (28), capscrew (27), three washers (30) and capscrews (29).
3. Install new preformed packing (26) on end of oil tube (24) and install oil tube by pushing it into oil filter base (9). Place new gasket (25) and flange (23) into position. Install capscrew (22) and capscrews (20 and 21).
4. Install new preformed packing (19) on end of oil tube (17) and install oil tube by pushing it into oil filter base (9). Place new gasket (18) and flange (16) into position and install capscrew (15). Place spacer (14), clamp (12) and washer (13) into position.
5. Install capscrew (11) that holds clamp (12).
6. Install oil filter. See *Oil Filter Replacement* in this work package.
7. Fill crankcase with oil. See *Changing Engine Oil* in this work package.
8. Run engine and inspect oil filter base, filter assembly and tubing for leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

OIL LEVEL GAGE AND GAGE TUBE ASSEMBLY REPLACEMENT 0012 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

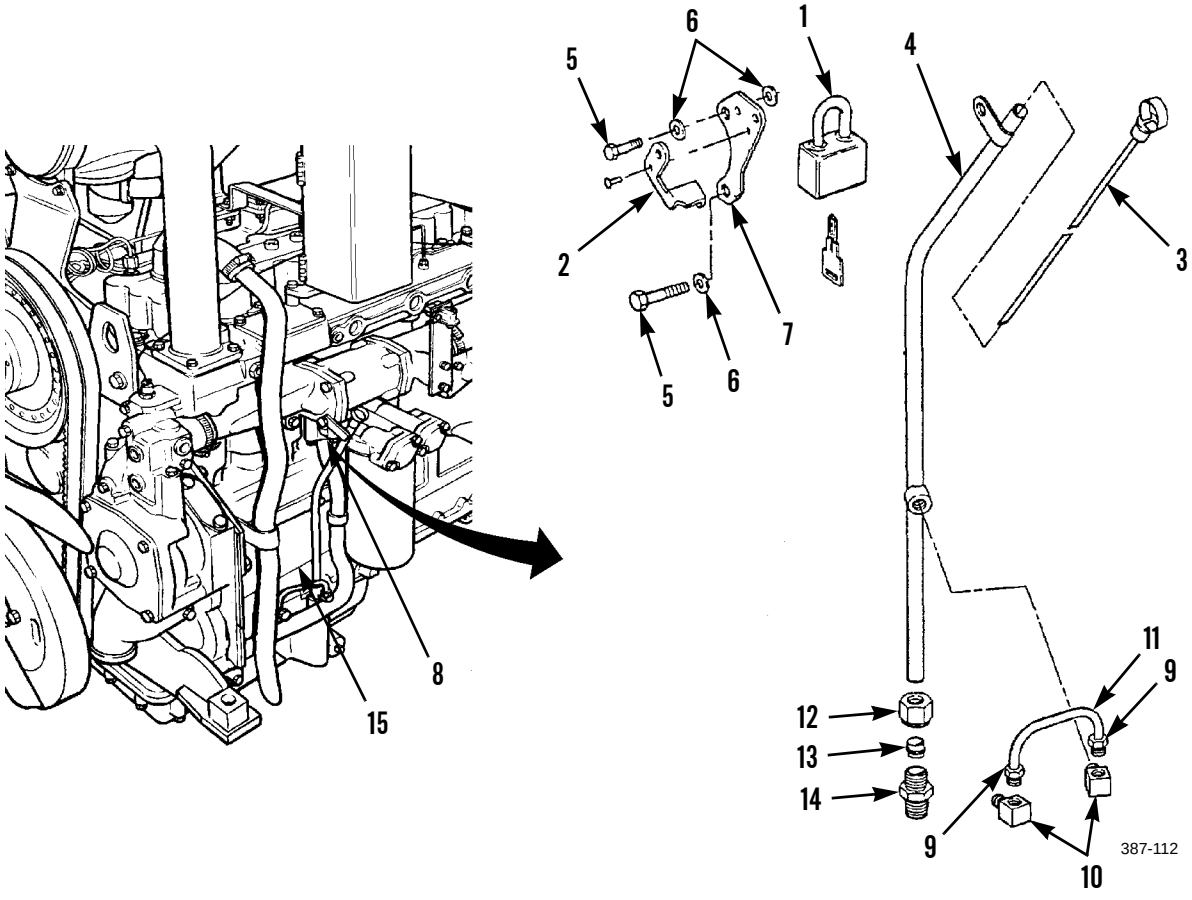
Tool kit, general mechanic's (Item 122, WP 0250 00)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

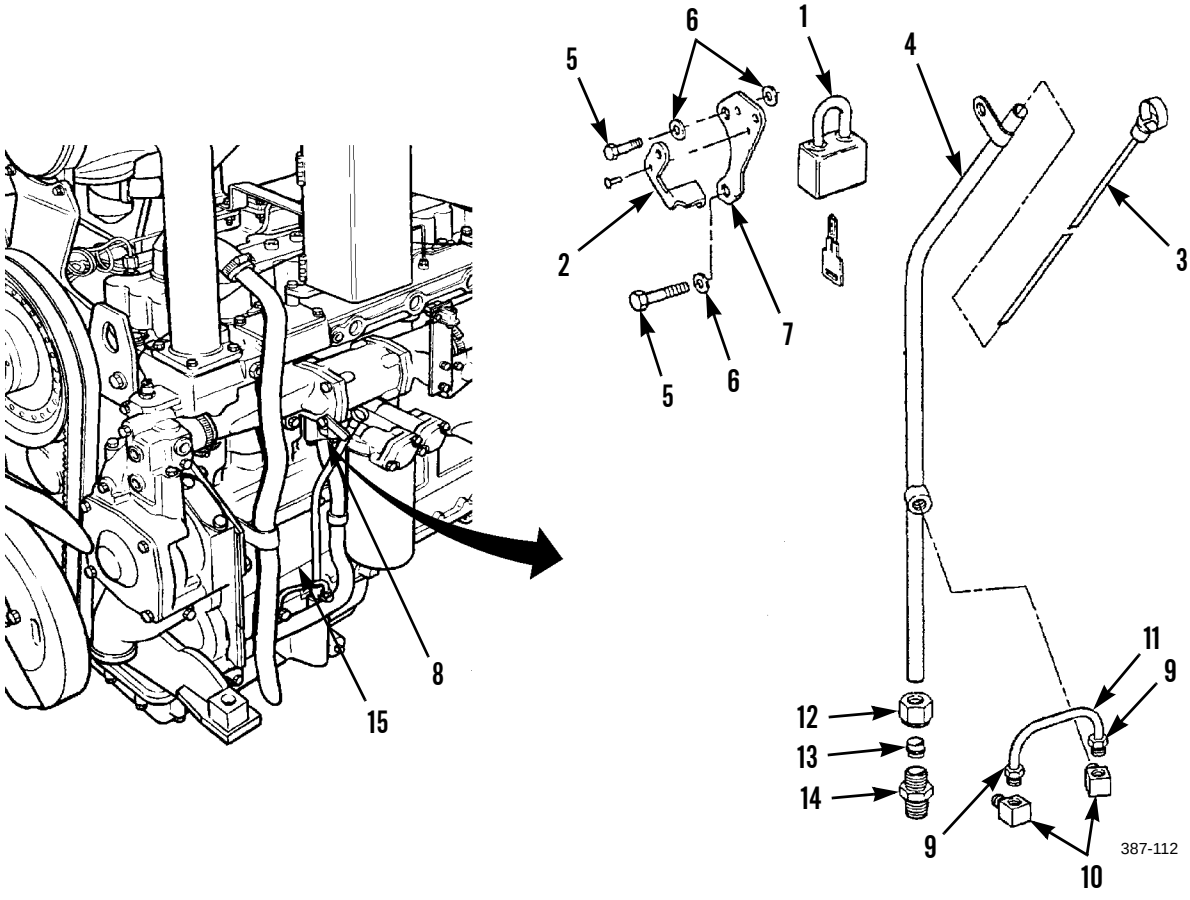
REMOVAL

1. Remove padlock (1) and slide hasp (2) upward out of way of oil level gage (3).
2. Remove oil level gage (3) from gage tube assembly (4).
3. Remove two capscrews (5), three washers (6) and bracket (7) from water pump outlet pipe (8).
4. Remove two oil relief tube compression nuts (9) from elbows (10) and remove oil relief tube (11).
5. Remove gage tube nut (12) and sleeve (13) from connector (14) and remove gage tube assembly (4).
6. Remove elbow (10) from gage tube assembly (4).
7. Remove elbow (10) from engine block (15).



INSTALLATION

1. Install elbow (10) in engine block (15).
2. Install elbow (10) in gage tube assembly (4).
3. Place nut (12) and sleeve (13) on tube (4). Position gage tube assembly (4) on connector (14) and tighten nut (12).
4. Position oil relief tube (11) on elbows (10) and tighten two oil relief tube compression nuts (9). If oil relief tube compression nuts do not fit into elbows, adjust elbows accordingly.
5. Position capscrew (5) through washer (6), bottom of bracket (7) and gage tube assembly (4), and loosely install to bottom of water pump outlet pipe (8).
6. Position capscrew (5) through washer (6), top of bracket (7) and washer (6), and loosely install to top of water pump outlet pipe (8).
7. Tighten capscrews (5).
8. Install oil level gage (3) in gage tube assembly (4).
9. Slide hasp (2) downward over oil level gage (3) and install padlock (1).



END OF WORK PACKAGE

OIL FILLER TUBE REPLACEMENT 0013 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Compound, gasket forming (Item 7, WP 0249 00)

Materials/Parts - Continued

Gasket (5)

Rivet (6)

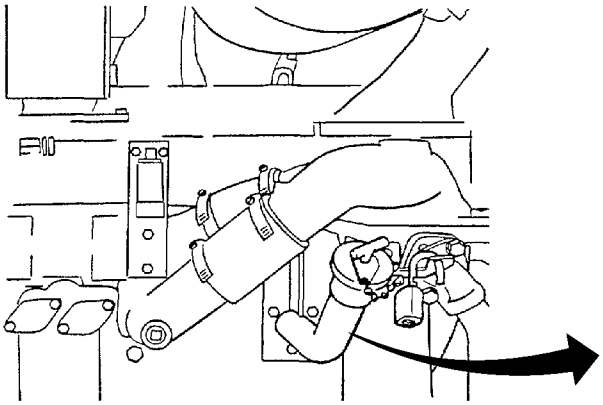
Equipment Condition

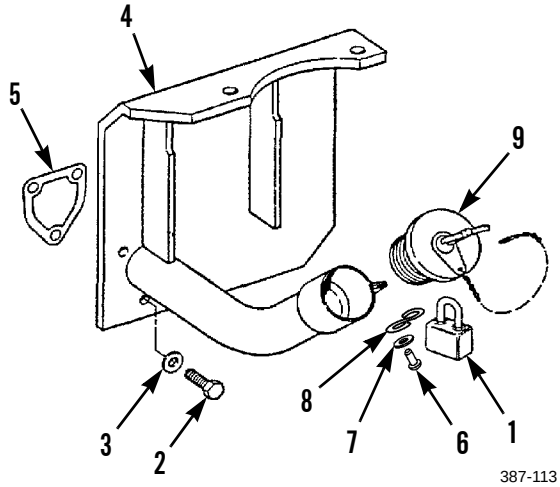
Engine OFF and cool (TM 5-2410-237-10)

Transmission oil cooler removed (WP 0109 00)

REMOVAL

1. Remove padlock (1).
2. Remove three capscrews (2) and washers (3).
3. Remove tube assembly (4) and gasket (5) from engine. Discard gasket.
4. Drill out rivet (6) and remove washer (7), hasp (8) and cap assembly (9). Discard rivet.





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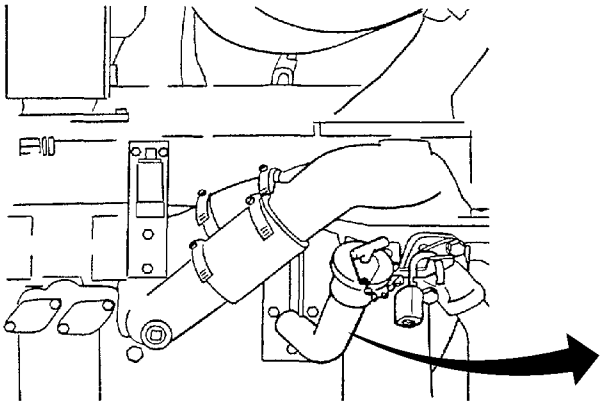
INSTALLATION

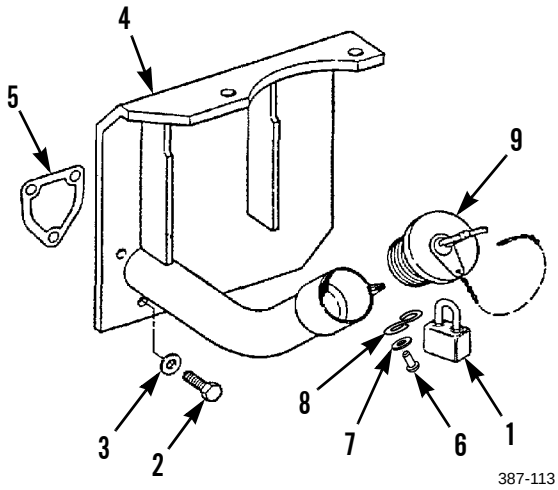
1. Put cap assembly (9) on tube assembly (4). Align chain, hasp (8) and washer (7) and install new rivet (6).
2. Clean gasket surface on tube assembly (4) and engine block.

NOTE

Evenly apply gasket forming compound on new gasket before installation.

3. Install tube assembly (4) with new gasket (5), three washers (3) and capscrews (2).
4. Install padlock (1) through hasp (8).





5. Install transmission oil cooler (WP 0109 00).
6. Run engine and check for leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

ENGINE OIL SAMPLING VALVE AND HOSE REPLACEMENT 0014 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no.1 (Item 103, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

O-ring (3)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

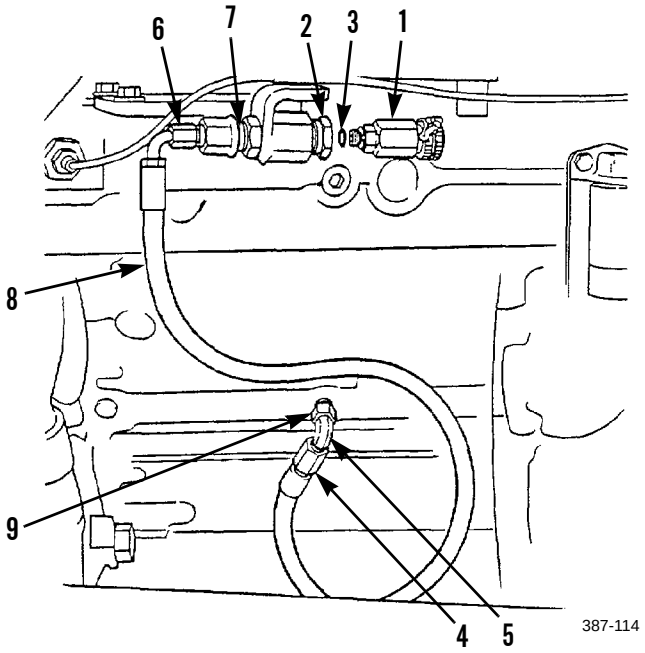
REMOVAL

1. Remove oil sampling valve (1) from adapter (2).
2. Remove O-ring (3) from valve (1). Discard O-ring.
3. Remove hose nut (4) from elbow (5) at engine block. Remove hose nut (6) from reducer (7). Remove hose (8).

CAUTION

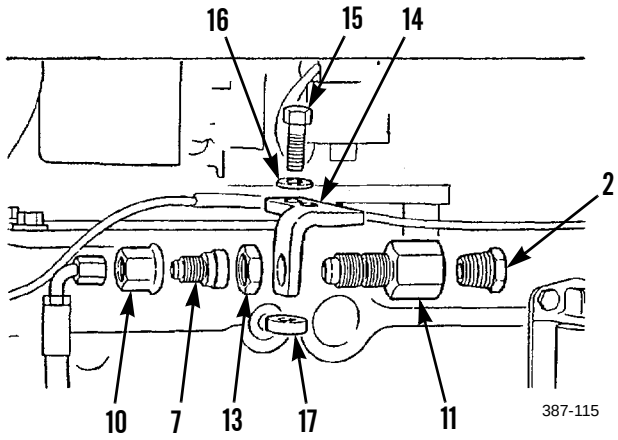
Do not remove adapter unless inspection shows need for replacement. Adapter may be damaged upon removal.

4. Remove elbow (5) from adapter (9) and remove adapter from engine block, if required.



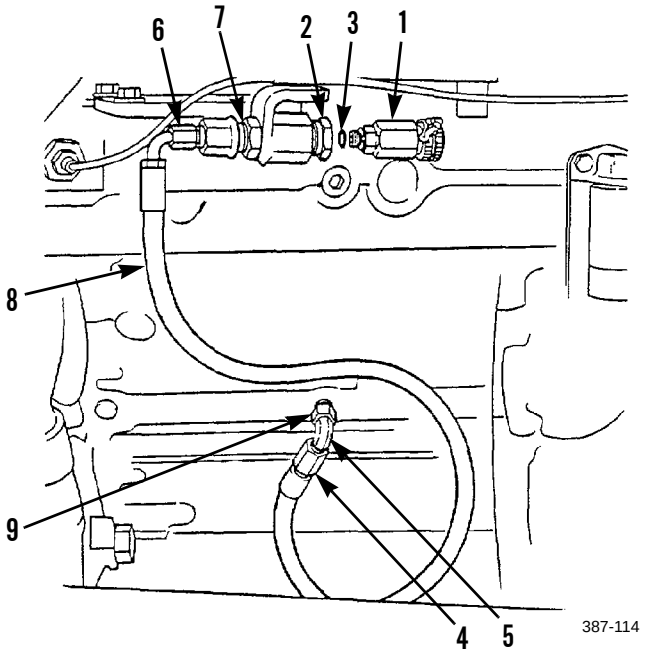
REMOVAL - CONTINUED

5. Remove nut (10) from connector (11) and remove nut and reducer (7).
6. Remove adapter (2) from connector (11).
7. Remove nut (13) from connector (11) and remove connector from bracket (14).
8. Remove two capscrews (15), washers (16) and spacers (17) from bracket (14) and remove bracket from cylinder head.



INSTALLATION

1. Place spacers (17) and bracket (14) in position on cylinder head and install two washers (16) and capscrews (15).
2. Place connector (11) in position on bracket (14). Install nut (13) to secure connector.
3. Install adapter (2) onto connector (11).
4. Place reducer (7) through nut (10) and install nut onto connector (11).
5. Install adapter (9) in engine block, if removed, and secure elbow (5) onto adapter.
6. Place hose (8) into position and install hose nut (4) onto elbow (5). Install hose nut (6) onto end of reducer (7).
7. Lightly coat with oil and install new O-ring (3) onto valve (1).
8. Install valve (1) into adapter (2) and tighten valve to 15 lb-ft (20 Nm).
9. Run engine and check for leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

CRANKCASE BREATHER REPLACEMENT 0015 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Seal (4)

References

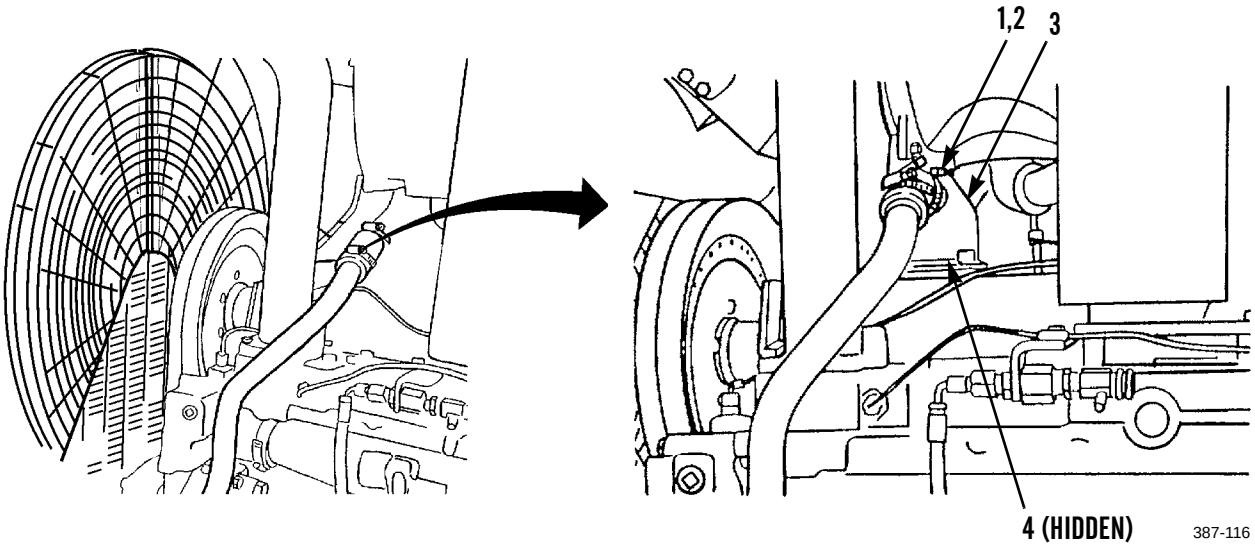
WP 0241 00

Equipment Condition

Engine fumes disposal hose removed (WP 0016 00)

REMOVAL

1. Remove capscrew (1) and washer (2) from breather (3). Remove breather.
2. Remove seal (4) from breather (3). Discard seal.



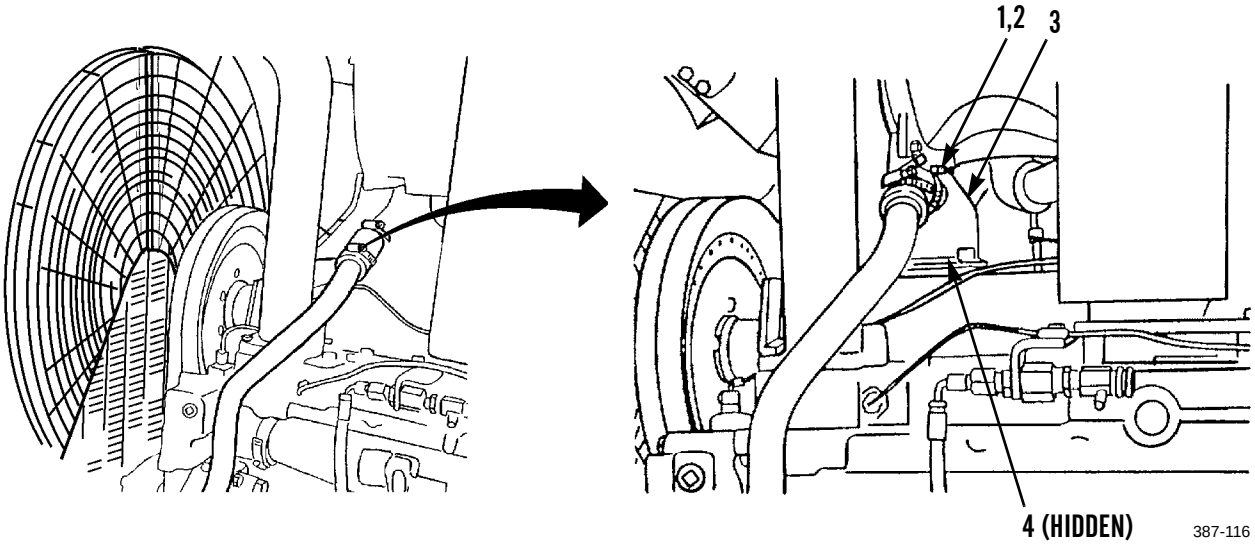
CLEANING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

Clean breather IAW *General Maintenance Instructions* (WP 0241 00).

INSTALLATION

1. Install new seal (4) onto breather (3).
2. Position breather (3) onto valve cover.
3. Insert capscrew (1) through washer (2) and breather (3) and tighten.
4. Install engine fumes disposal hose to breather (WP 0016 00).



END OF WORK PACKAGE

ENGINE FUMES DISPOSAL HOSE AND TUBE ASSEMBLY REPLACEMENT 0016 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Equipment Condition

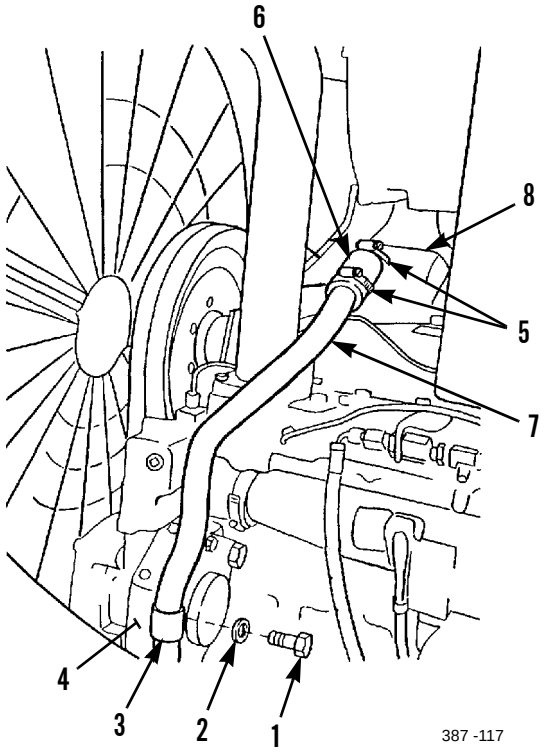
Engine OFF and cool (TM 5-2410-237-10)

REMOVAL

1. Remove capscrew (1) and washer (2) holding clip (3) to timing gear housing (4).
2. Loosen two hose clamps (5).
3. Remove hose (6), two hose clamps (5) and engine fumes disposal tube (7) from crankcase breather (8).

INSTALLATION

1. Install hose (6), two hose clamps (5) and engine fumes disposal tube (7) on crankcase breather (8).
2. Position hose clamps (5) and tighten.
3. Install clip (3) on timing gear housing (4) with washer (2) and capscrew (1).



END OF WORK PACKAGE

VALVE MECHANISM COVER REPLACEMENT 0017 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Compound, gasket shellac (Item 8, WP 0249 00)

Materials/Parts - Continued

Gasket (5)

Lockwasher (3)

Equipment Condition

Hood removed (WP 0159 00)

Ether starting aid removed (WP 0061 00)

Air cleaner removed (WP 0046 00)

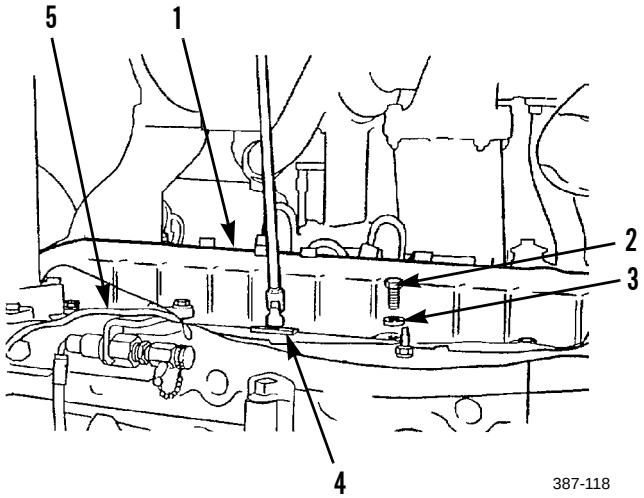
Crankcase breather removed (WP 0015 00)

REMOVAL

WARNING

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

1. Use pressurized air to clean any loose particles from valve cover (1) before removal of cover.
2. Remove three capscrews (2), lockwashers (3) and clamps (4) securing wiring harness (5). Move wiring harness out of the way of valve cover (1). Discard lockwashers.
3. Remove 12 capscrews (2), lockwashers (3) and clamps (4) that secure valve cover (1).

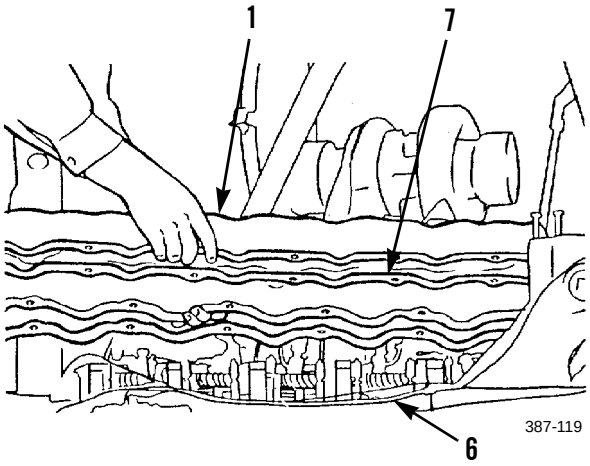


REMOVAL - CONTINUED

4. Remove valve cover (1) from cylinder head (6). Remove gasket (7) from valve cover and discard gasket.

INSTALLATION

1. Make sure that gasket surfaces are clean.
2. Apply gasket compound on face of valve cover (1) and install new gasket (5) in valve cover.
3. Install valve cover (1) onto cylinder head (4).
4. Position wiring harness (5) and install three clamps (4), new lockwashers (3) and capscrews (2) to secure wiring harness on valve cover (1). Do not tighten.
5. Install 12 clamps (4), new lockwashers (3) and capscrews (2) to secure valve cover (1). Tighten capscrews in number sequence shown to 96 lb-in. (11 Nm).



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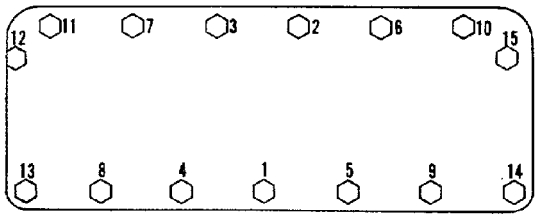
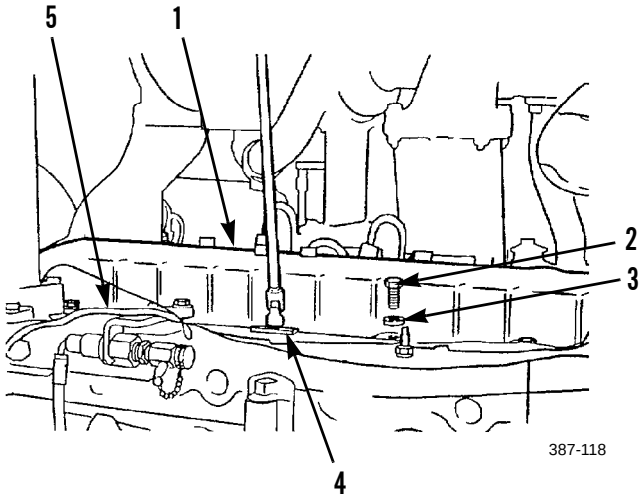


387-120

6. Install crankcase breather (WP 0015 00).
7. Install air cleaner (WP 0046 00).
8. Install ether starting aid (WP 0061 00).
9. Start engine and inspect mating surface of valve cover for oil leaks. Turn off engine.
10. Install hood (WP 0159 00).



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END OF WORK PACKAGE

VALVE MECHANISM ADJUSTMENT 0018 00

THIS WORK PACKAGE COVERS

Locating Top Dead Center (TDC) Compression Stroke for Number 1 Piston, Adjusting Valve Clearance

INITIAL SETUP:

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Bolt, timing, 3/8 in. -16NC, 2 in. long

Equipment Condition

Valve mechanism cover removed (WP 0017 00)

Crankcase guard removed (WP 0157 00)

LOCATING TOP DEAD CENTER (TDC) COMPRESSION STROKE FOR NUMBER 1 PISTON

NOTE

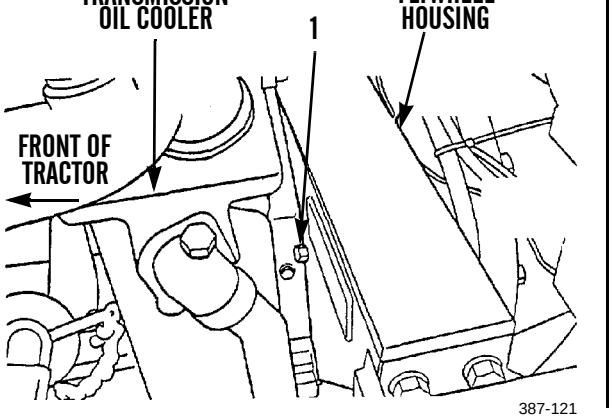
Engine is seen from vibration damper end when direction of crankshaft rotation is given.

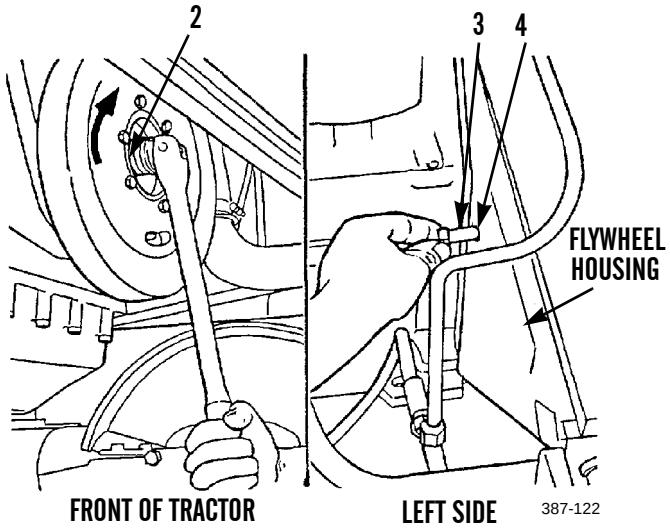
1. Remove plug (1) from flywheel housing.

NOTE

Perform the following step to remove play from timing gears when engine is set at TDC.

2. Place socket and breaker bar on mounting capscrew (2) of vibration damper. Turn vibration damper so that flywheel turns to the right. Turn flywheel until 3/8 in. -16NC bolt (3) can be installed through hole (4) of flywheel housing.



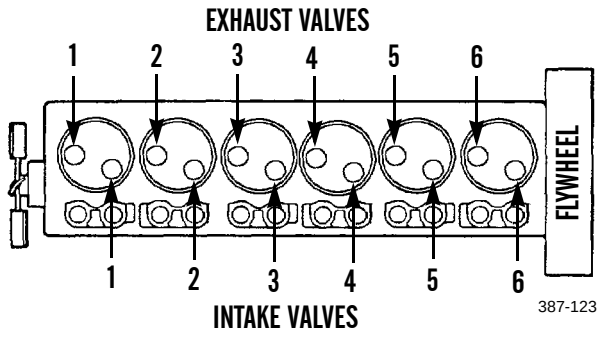


LOCATING TOP DEAD CENTER (TDC) COMPRESSION STROKE FOR NUMBER 1 PISTON - CONTINUED

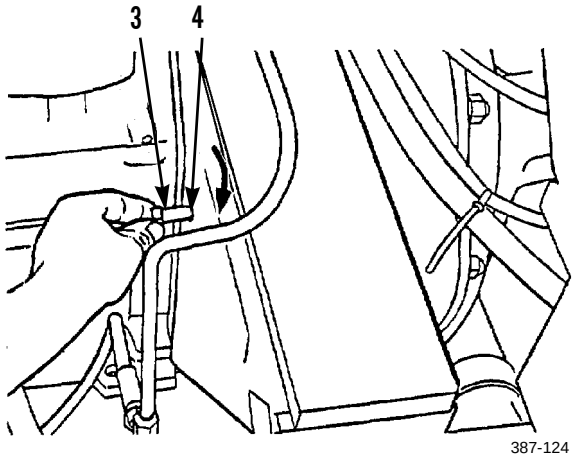
NOTE

If piston is on compression stroke, valves will be closed on number 1 cylinder.

3. Try moving rocker arms over cylinder number 1 up and down. If arms do not move, valves are open and piston is not on compression stroke. Proceed to step 4.
4. Remove bolt (3) and turn flywheel 360 degrees to the right. Return bolt to hole (4). Number 1 piston is now at TDC on compression stroke.



CYLINDER AND VALVE IDENTIFICATION

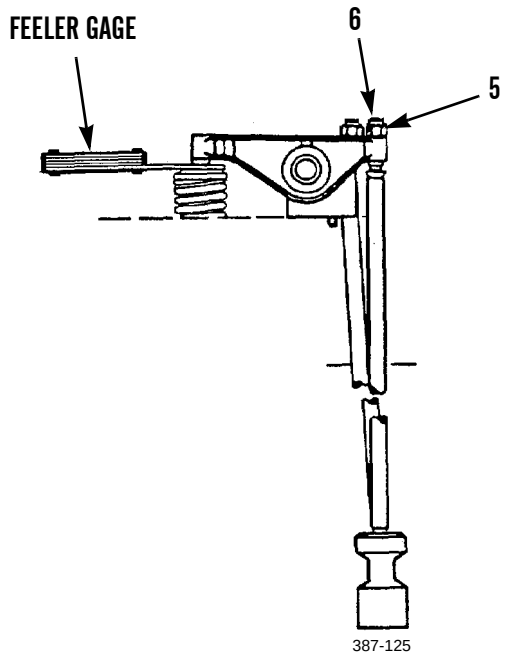


ADJUSTING VALVE CLEARANCE

NOTE

- **Ensure pushrods are not bent before performing adjustment.**
- **When valve clearance is checked using a feeler gage, it is NOT NECESSARY to adjust valves if measurement falls within 0.022-0.028 in. (0.56-0.71 mm) for exhaust and within 0.012-0.018 in. (0.30-0.46 mm) for intake.**

1. Loosen nut (5). Make adjustment to each valve by using a flat-tipped screwdriver and turning adjustment screw (6) to obtain correct reading with feeler gage.



ADJUSTING VALVE CLEARANCE - CONTINUED

2. After each adjustment has been made for a specific valve, tighten nut (5) for valve adjustment screw (6) to 22 lb-ft (30 Nm), while holding screws.

NOTE

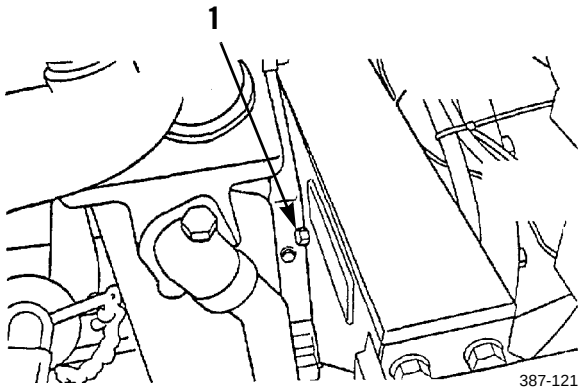
Set all valves that need adjustment to 0.025 in. (0.64 mm) for exhaust and to 0.015 in. (0.38 mm) for intake in the following manner.

3. With engine set with number 1 piston at TDC on compression stroke, make adjustments for valve clearance on intake valves for cylinders 1, 2 and 4. Make an adjustment to valve clearance on exhaust valves for cylinders 1, 3 and 5.
4. Remove bolt (3) from flywheel housing and turn flywheel 360 degrees to the right. This will put number 6 piston at TDC on compression stroke. Install bolt back into flywheel housing.
5. Make an adjustment to valve clearance on intake valves for cylinders 3, 5 and 6. Make an adjustment to valve clearance on exhaust valves for cylinders 2, 4 and 6.

CAUTION

Bolt will damage flywheel housing and flywheel if not removed and replaced by plug.

6. Remove bolt (3) and install plug (1) in flywheel housing.
7. Install valve mechanism cover (WP 0017 00).
8. Install crankcase guard (WP 0157 00).



END OF WORK PACKAGE

VALVE MECHANISM MAINTENANCE 0019 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning, Inspection, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Compound, antiseize (Item 6, WP 0249 00)

Oil, lubricating (Item 26, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

O-ring (12)

Pin (17)

Plug (18)

References

WP 0018 00

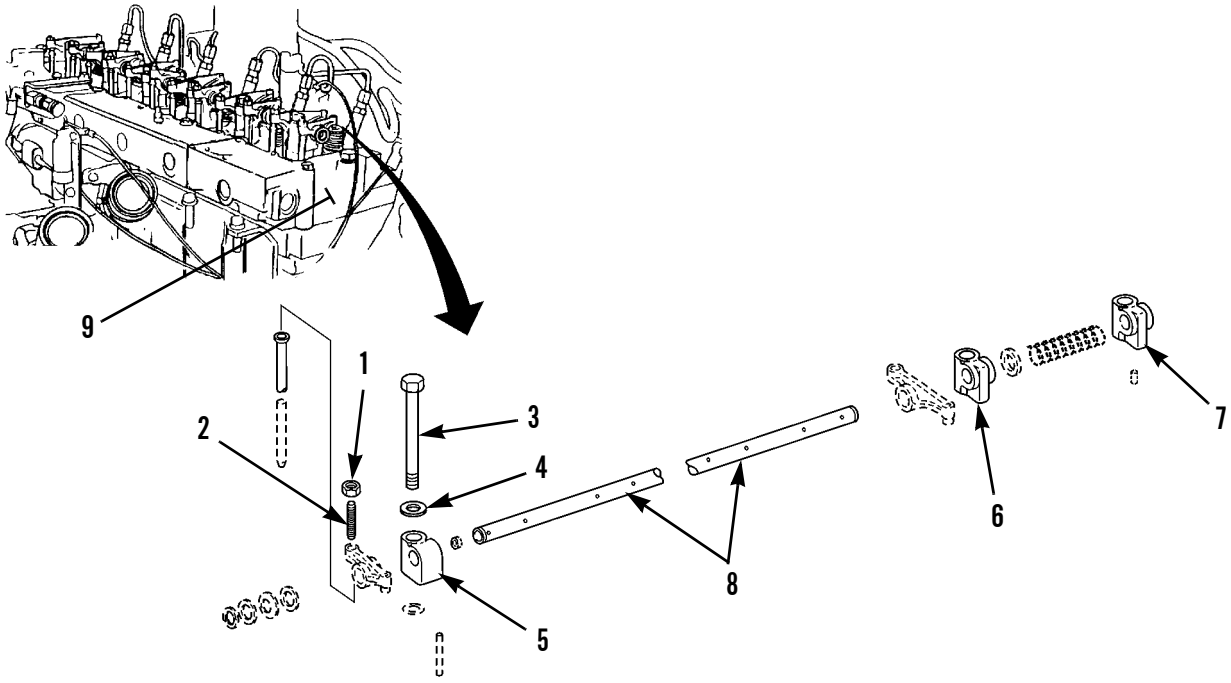
WP 0241 00

Equipment Condition

Valve mechanism cover removed (WP 0017 00)

REMOVAL

1. Loosen 12 nuts (1) and adjustment screws (2) to have maximum valve clearances.
2. Remove six capscrews (3) washers (4) from rear support bracket (5), four angle brackets (6) and eye bracket (7) that secure rocker shaft (8).
3. Remove rocker shaft (8) from cylinder head (9).



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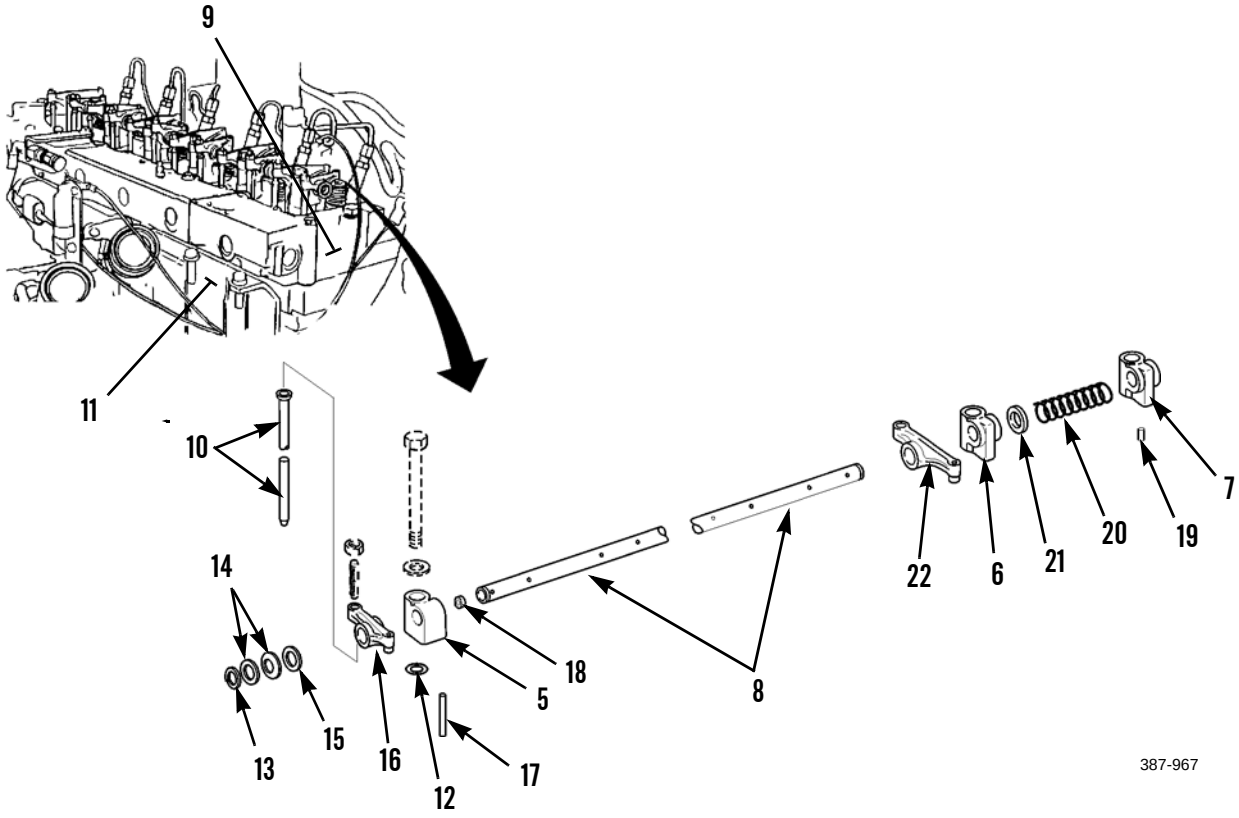
REMOVAL - CONTINUED

NOTE

Tag push rods as they are removed to ensure push rods are installed in the same location.

4. Remove 12 push rods (10) from cylinder head (9) and block assembly (11).



DISASSEMBLY

NOTE

Tag and identify all parts during disassembly and note order of sequence when removing each part.

1. Remove and discard O-ring (12) from rear support bracket (5).
2. Remove retaining ring (13), two spring tension washers (14), washer (15) and intake rocker arm (16) from rear of rocker shaft (8).
3. Remove pin (17) and rear support bracket (5) from rear of rocker shaft (8). Discard pin.
4. Remove two plugs (18) from each end of rocker shaft (8). Discard plugs.

NOTE

Smaller rocker arms are intake and larger rocker arms are exhaust.

5. Remove dowel pin (19) and eye bracket (7) from front of rocker shaft (8).
6. Remove five springs (20), twelve washers (21), angle bracket (6), six exhaust rocker arms (22) and five intake rocker arms (16) from rocker shaft (8).

CLEANING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

Thoroughly clean all parts in solvent cleaning compound and dry with low pressure air.

INSPECTION

NOTE

Refer to WP 0241 00 for general inspection instructions.

1. Inspect rocker shaft washers for distortion or other damage, and replace if necessary.
2. Inspect brackets for excessive wear, cracks or other damage, and replace if necessary.
3. Inspect rocker shaft springs for distortion, excessive wear, or other damage. Replace a damaged rocker shaft spring.
4. Inspect dowel pins for defects. Replace a bent or out-of-round pin.
5. Inspect rocker arms for any signs of excessive wear or other damage. Refer to Table 1 for rocker arm wear limits and specifications. If measurements are not within the specified limits, or if a rocker arm is damaged in any way, replace rocker arm.

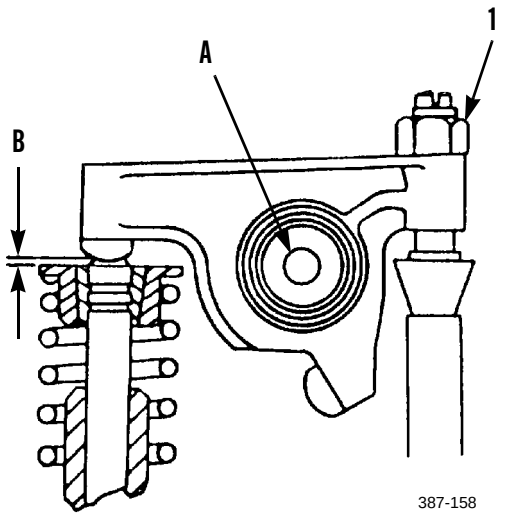


Table 1. Rocker Arm Wear Limits and Specifications.

Bore (Dimension “A”) in Bearing for Shaft (New)	0.7263 +/- 0.0005 in. (18.448 +/- 0.013 mm)
Diameter of Shaft (New)	0.7245 +/- 0.0005 in. (18.402 +/- 0.013 mm)
Maximum Permissible Clearance Between Bearing and Shaft (Worn)	0.008 in. (0.20 mm x 0.008)
Torque for Nut (1) on Valve Adjustment Screw	21 +/- 5 lb-ft (29 +/- 7 Nm)
Clearance (Dimension “B”) for Valves:	
Intake Valves	0.015 in. (0.38 mm)
Exhaust Valves	0.025 in. (0.64 mm)

INSPECTION - CONTINUED

6. Inspect push rods (10) for a bent condition, excessive wear or other damage. Replace a damaged or defective push rod.
7. Inspect rocker shaft (8) for excessive wear, bent condition or other damage. Replace a damaged or defective rocker shaft.

ASSEMBLY

CAUTION

Do NOT use old plugs, as worn or defective plugs could cause loss of oil pressure, resulting in damage to engine.

1. Install new plug (18) into each end of rocker shaft (8).

NOTE

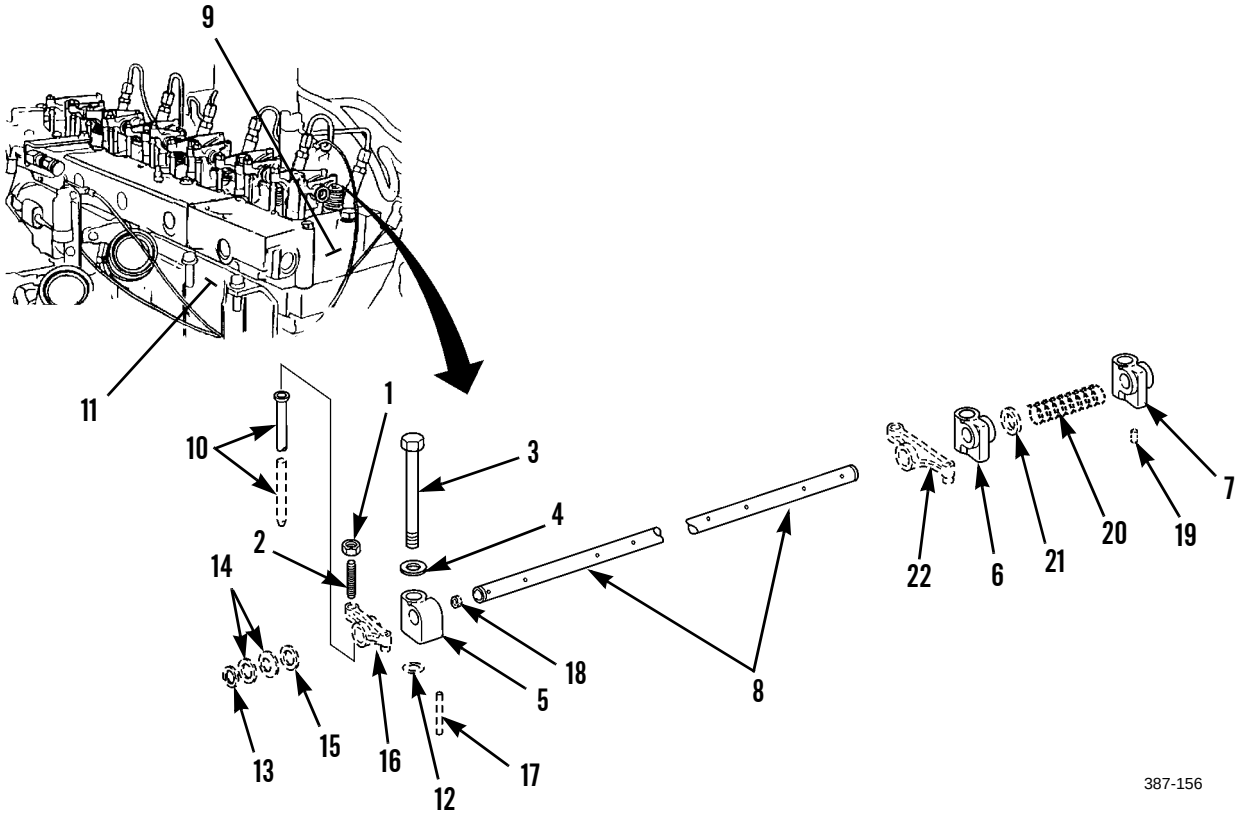
Ensure hole in rear bracket is in alignment with hole in rocker shaft during installation.

2. Install rear support bracket (5) and new pin (17) on rocker shaft (8). Pin must extend 0.378 in. (9.6 mm) above bracket.

NOTE

- **When installing one intake rocker arm in step 3, rocker arm is installed on outside of rear support bracket (5).**
- **Smaller rocker arms are intake and larger rocker arms are exhaust.**

3. Install intake rocker arm (16), washer (15), two spring tension washers (14) and retaining ring (13) on rear of rocker shaft (8).



ASSEMBLY - CONTINUED

NOTE

During assembly, pay close attention and refer to order of assembly. Ensure exhaust and intake rocker arms, springs, washers and brackets are installed in correct sequence on rocker shaft.

4. Install six exhaust rocker arms (22), five intake rocker arms (16), angle brackets (6), twelve washers (21) and five springs (20) on rocker shaft (5).
5. Align hole in bracket (7) with hole in rocker shaft (8). Install dowel pin (19) into bracket and shaft. Pin must extend 0.378 in. (9.6 mm) above bracket.
6. Apply clean lubricating oil on all rocker shaft components after assembly.

INSTALLATION

1. Install 12 push rods (10) through cylinder head (9) and into block assembly (11).

NOTE

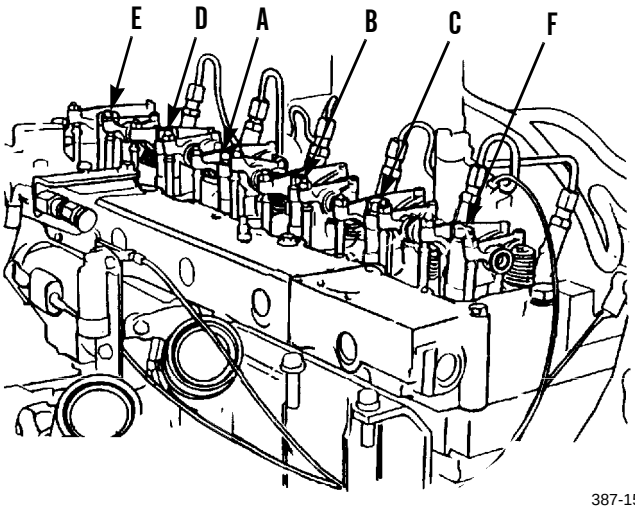
- **Each time a capscrew is removed from rear support bracket, a new O-ring must be installed.**
- **Apply clean lubricating oil to new O-ring prior to installation.**

2. Install new O-ring (12) in rear support bracket (5).
3. Place rocker shaft (8) into position on cylinder head (9).

CAUTION

Dowel pins on each end of rocker shaft and rocker arm must be in alignment with holes in cylinder head. If pins and holes are not properly aligned when rocker shaft capscrews are installed and tightened, damage to rocker shaft could occur.

4. Put antiseize compound on threads of capscrews (3) and install six washers (4) and capscrews to bracket (5, 6 and 7), to secure rocker shaft (8) to cylinder head (9).
5. Refer to illustration and tighten capscrews (3) as follows:
   a. Tighten capscrews, in letter sequence, to 115 lb-ft (156 Nm).
   b. Tighten capscrews, in letter sequence, to 185 lb-ft (251 Nm).
   c. Tighten capscrews again in letter sequence, to 185 lb-ft (251 Nm).



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6. If new rocker arms (16 or 22) were installed, install 12 new adjustment screws (2) and nuts (1).
7. Adjust valve mechanism (WP 0018 00).
8. Install valve mechanism cover (WP 0017 00).

END OF WORK PACKAGE

ENGINE OIL COOLER REPLACEMENT 0020 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Gasket (9, 14 and 17)

References

TM 5-2410-237-10

Equipment Condition

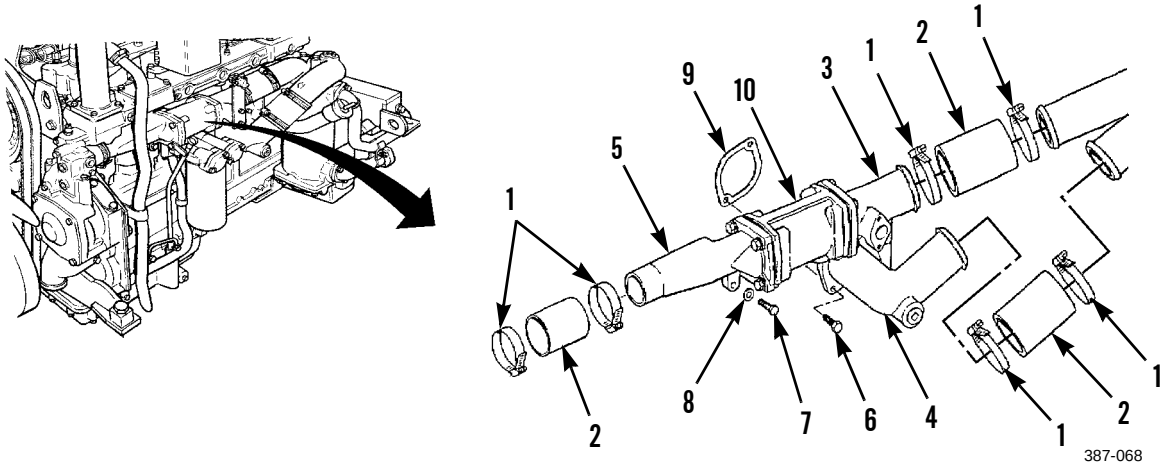
Cooling system drained (WP 0065 00)

Oil filter base removed (WP 0011 00)

Oil level gage removed (WP 0012 00)

REMOVAL

1. Loosen six clamps (1).
2. Slide three hoses (2) off outlet water flange (3), elbow flange (4) and inlet water housing (5).
3. Remove two capscrews (6).
4. Remove capscrew (7) and washer (8).
5. Remove oil cooler (10) and assembled components and gasket (9). Discard gasket.

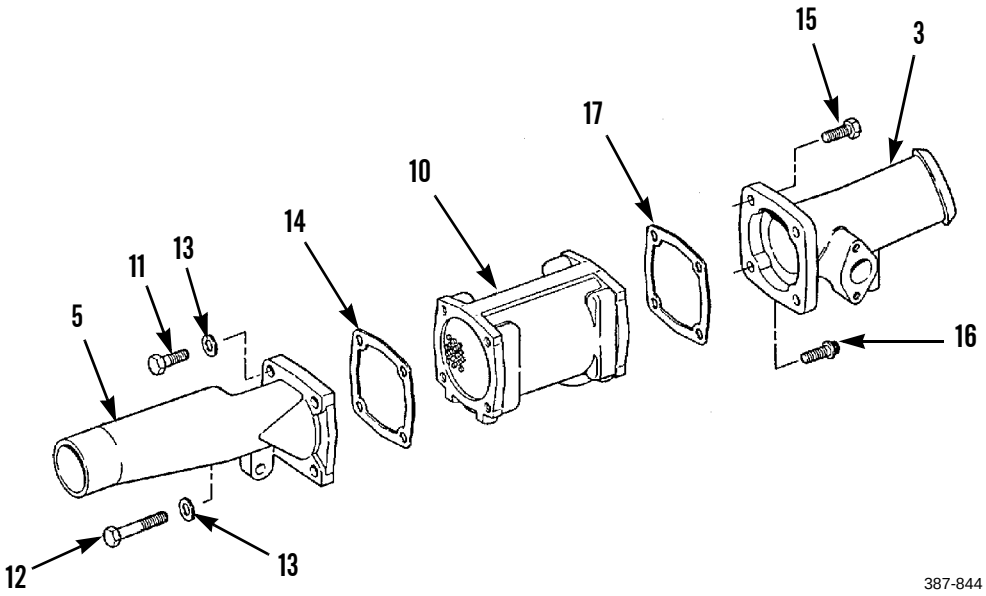


REMOVAL - CONTINUED

6. Remove three capscrews (11), capscrew (12), four washers (13), inlet water housing (5) and gasket (14) from oil cooler (10). Discard gasket.
7. Remove three capscrews (15), capscrew (16), outlet water flange (3) and gasket (17) from oil cooler (10). Discard gasket.

INSTALLATION

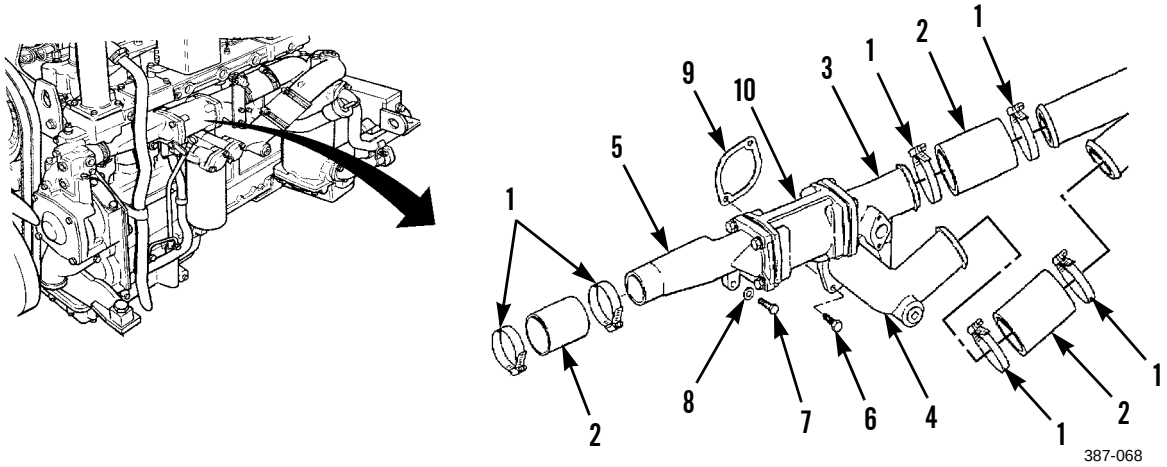
1. Position three capscrew (15) through outlet water flange (3) and install new gasket (17) on capscrews.
2. Position outlet water flange (3) to oil cooler (10) and secure with three capscrews (15) and capscrew (16). Tighten capscrews to 32 lb-ft (45 Nm).
3. Position three capscrews (11) and washers (13) through inlet water housing (5) and install new gasket (14) on capscrews.
4. Position inlet water housing (5) to oil cooler (10) and secure with three capscrews (15), washer (13) and capscrew (12), Tighten capscrews to 32 lb-ft (45 Nm).



5. Slide three hoses (2) and six hose clamps (1) on outlet water flange (3), elbow flange (4) and inlet water housing (5). Do NOT tighten clamps fully.
6. Position two capscrews (6) through elbow flange (4) and install new gasket (9) on capscrews.
7. Position oil cooler (10) and assembled components against cylinder block.
8. Install two capscrews (6), capscrew (7) and washer (8).
9. Tighten six hose clamps (1).

INSTALLATION - CONTINUED

10. Install oil level gage (WP 0012 00).
11. Install oil filter base (WP 0011 00).
12. Fill cooling system (WP 0065 00).
13. Run engine and check for proper operation and leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

ENGINE ASSEMBLY REPLACEMENT 0021 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose (Item 106, WP 0250 00)

Leveler, load, 6,000 lb capacity (Item 49, WP 0250 00)

Engine stand, 3,000 lb capacity

Lifting equipment, 3,000 lb capacity

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Strap, tiedown (Item 36, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Gasket (29)

O-ring (25, 33 and 52)

Pin, cotter (12)

References

TM 5-2410-237-10

WP 0115 00

WP 0147 00

Personnel Required

Three

Equipment Condition

Fuel shutoff valve turned OFF (WP 0041 00)

Hood removed (WP 0159 00)

Battery cables disconnected (WP 0101 00)

Radiator guard removed (WP 0158 00)

Fan guard removed (WP 0073 00)

Radiator removed (WP 0068 00)

Dash removed (WP 0160 00)

Floor plates removed (WP 0171 00)

Crankcase guards removed (WP 0157 00)

Transmission oil drained (WP 0107 00)

Transmission oil filter assembly removed (WP 0107 00)

Engine oil drained (WP 0011 00)

Drive shaft removed (WP 0129 00)

Air cleaner dust ejector removed (WP 0048 00)

NATO starting receptacle removed (WP 0102 00)

Winch pump removed (if equipped) (WP 0189 00)

Hydraulic tank drained (WP 0225 00)

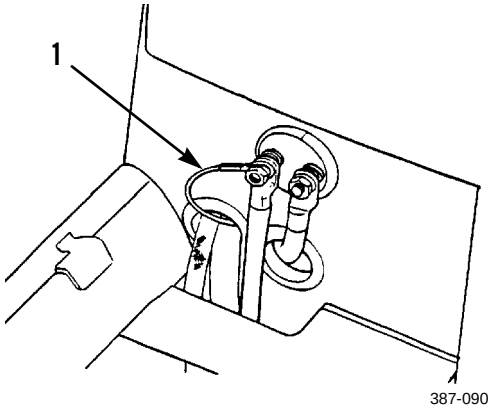
Hydraulic pump removed (WP 0199 00)

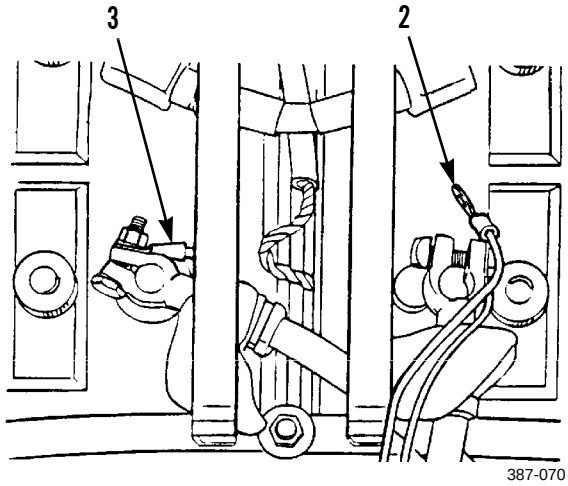
REMOVAL

NOTE

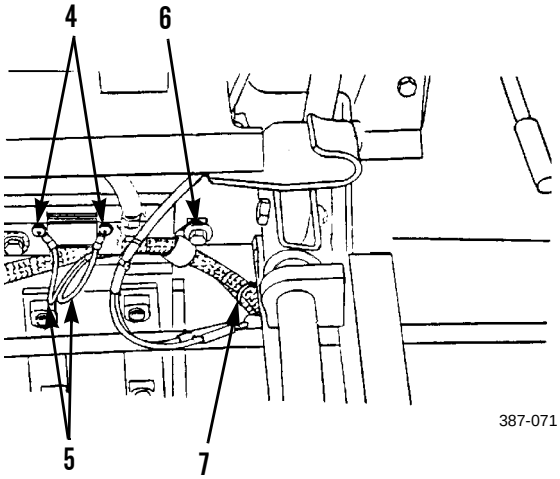
Tag wires and cables to ensure correct installation.

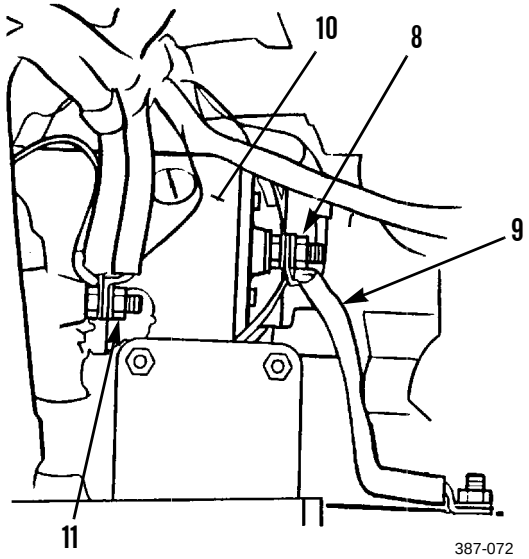
1. Tilt operator's seat forward and disconnect STE/ICE wire (1) from battery disconnect switch.
2. Remove battery cover and disconnect two cables (2) from positive post of battery and cable (3) from negative post of battery.





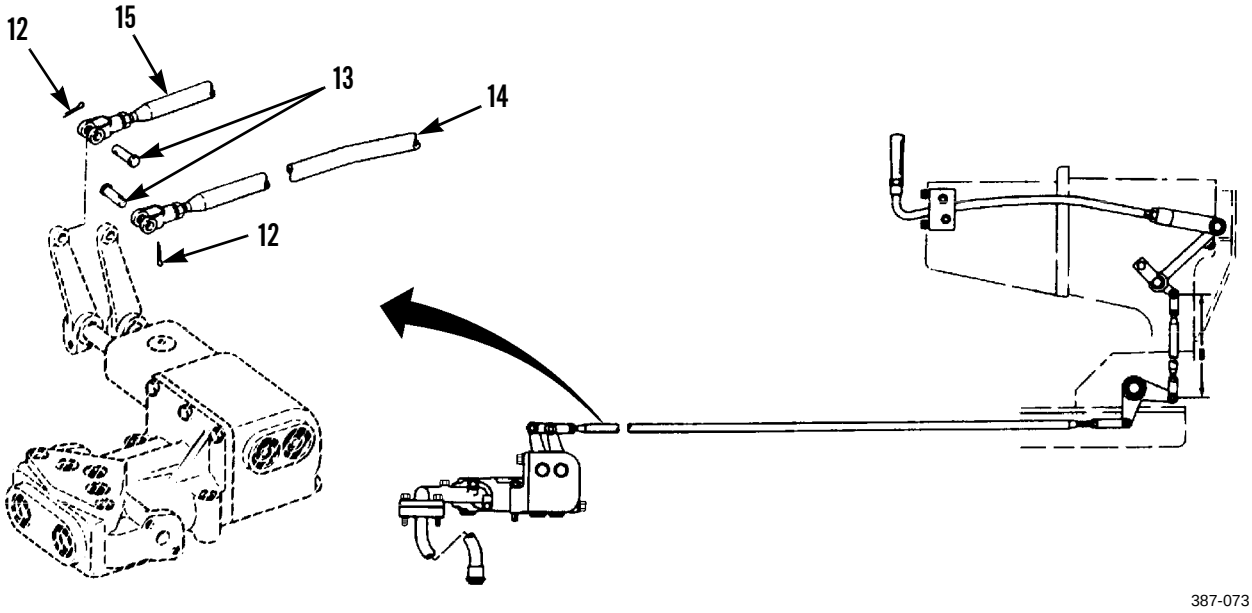
3. Remove two screws (4) that hold wires (5) to shunt and remove wires.
4. Remove clip (6) and three tiedown straps (7) that hold STE/ICE wiring harness to tractor. Pull STE/ICE wiring harness through frame and drape over engine. Discard tiedown straps.
5. Remove nut (8) that holds ground wire (9) to starter (10).
6. Remove nut (11) that holds power cable to positive post of starter (10).



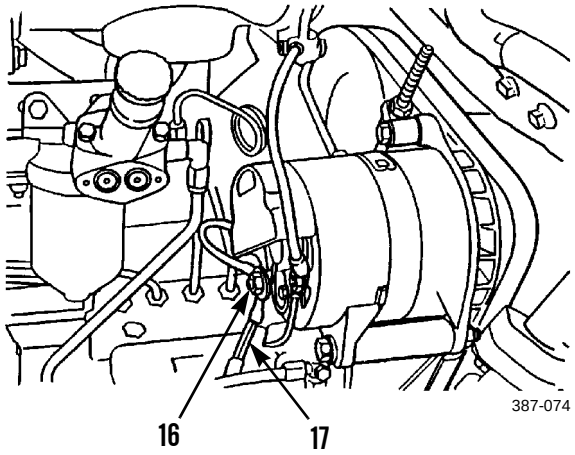


REMOVAL - CONTINUED

7. Remove two cotter pins (12) and pins (13) to remove right (14) and left (15) steering rods. Discard cotter pins.

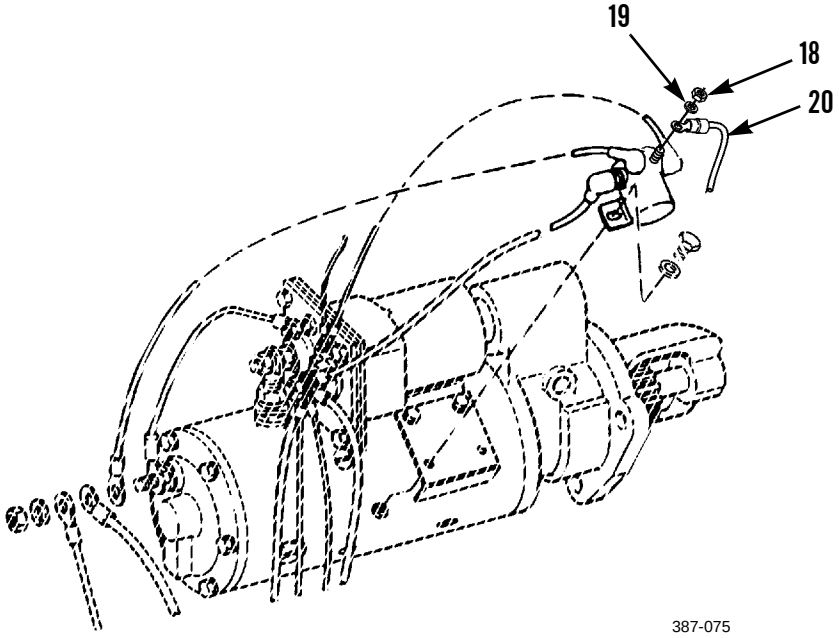


8. Remove nut (16) that holds wire harness (17) to alternator terminal.



REMOVAL - CONTINUED

9. Slide rubber boot from starter relay terminal. Remove nut (18) and washer (19) holding wire (20) to relay.



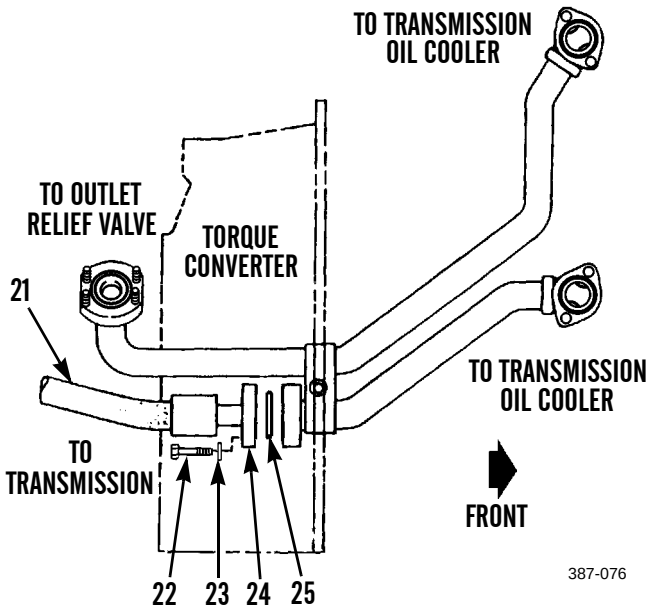
CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

NOTE

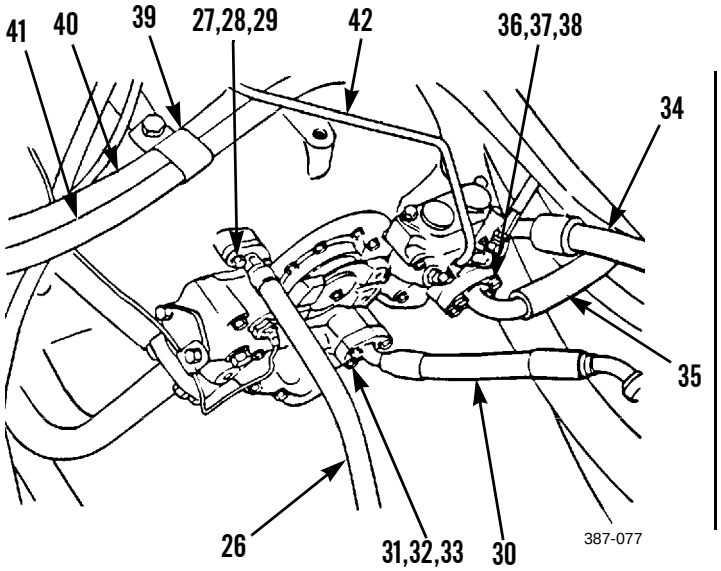
- **If more than one hydraulic line is to be removed, tag lines to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

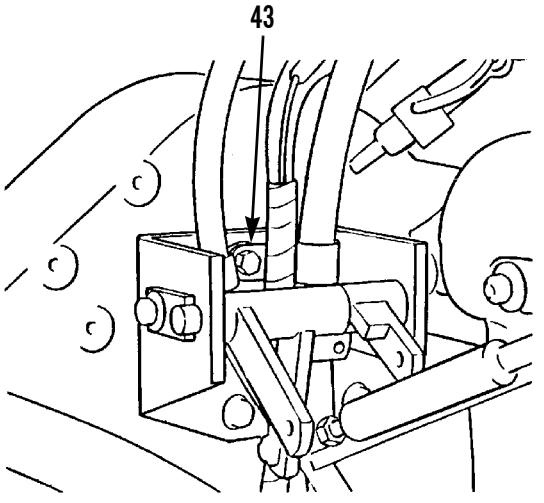
10. Disconnect hose assembly (21) by removing four capscrews (22), washers (23) and two flange halves (24) holding hose assembly to oil cooler tube assembly. Remove and discard O-ring (25).



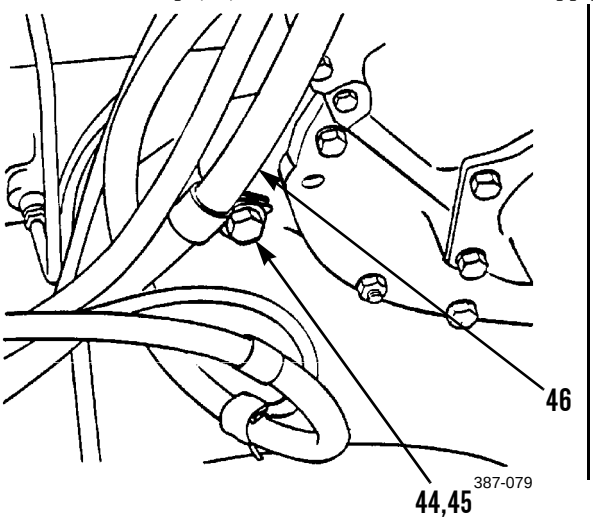
REMOVAL - CONTINUED

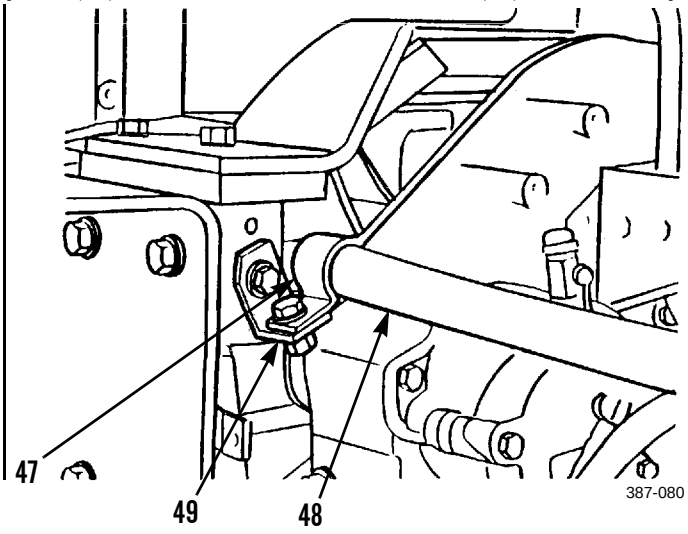
11. Disconnect vent line (26) from torque divider by removing two capscrews (27), washers (28) and gasket (29). Discard gasket.
12. Disconnect oil supply line (30) from transmission by removing two capscrews (31), washers (32) and O-ring (33). Discard O-ring.
13. Disconnect two lines (34 and 35) from transmission relief valve by removing eight capscrews (36), washers (37) and four split flanges (38).
14. Remove two clamps (39) that attach two lines (40 and 41) to torque divider.
15. Remove line (42) from transmission relief valve.
16. Remove clip (43) that holds power cable to governor control linkage bracket. Cut tiedown straps and pull wire harness from engine and lay harness over transmission. Discard tiedown straps.





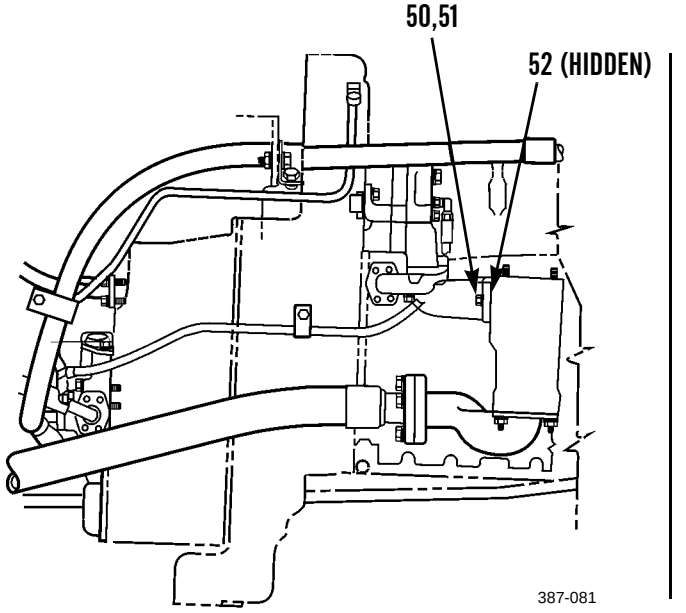
17. Remove capscrew (44) and washer (45). Remove clamp that holds battery cable (46) to flywheel housing. Move battery cable out of the way of engine.
18. Remove clamp (47) that holds transmission oil supply line (48) to fender. Move line and bracket (49) out of the way.

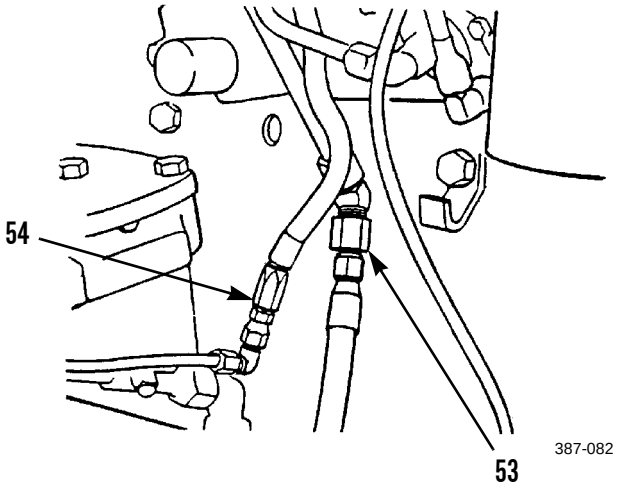




REMOVAL - CONTINUED

19. Remove two capscrews (50) and washers (51). Remove and discard O-ring (52). Lower magnetic screen assembly out of the way of engine.
20. Disconnect fuel supply line (53) from primary fuel filter.
21. Disconnect fuel return line (54) from fuel injection pump.

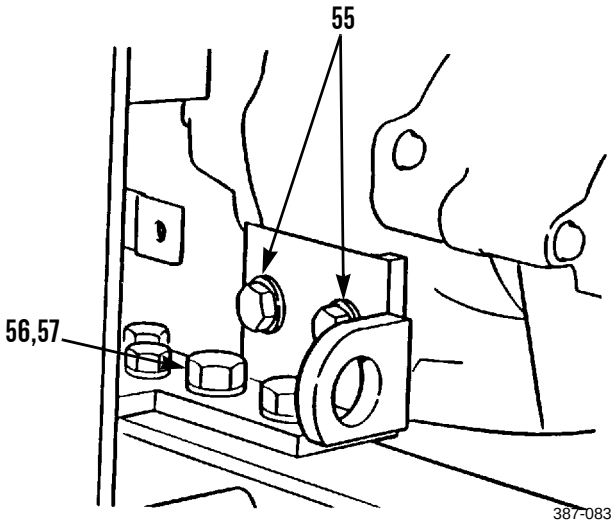




WARNING

DO NOT remove capscrews (55) on either side of the engine. Failure to follow this warning may result in injury to personnel.

22. Remove four capscrews (56) and washers (57) from rear engine mounting brackets.

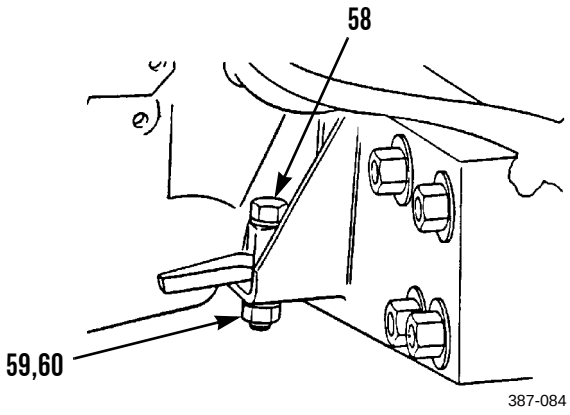


REMOVAL - CONTINUED

23. Remove two capscrews (58), nuts (59) and washers (60) from engine front support.

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.



CAUTION

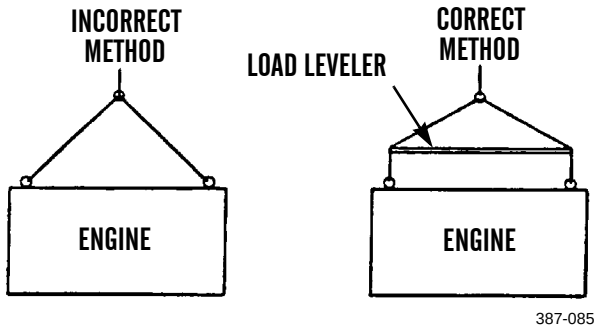
- **Always use a loader leveler while lifting engine assembly. This will keep lifting force vertical at all times, avoiding damage to lifting brackets.**
- **Engine assembly must be lifted so that crankshaft centerline is horizontal. This will prevent binding on rear engine mounts locating pins.**

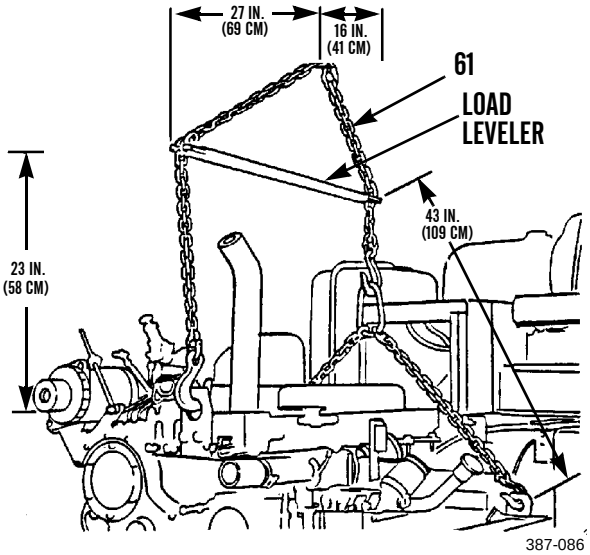
NOTE

Weight of engine and torque divider is approximately 3,000 lb (1,362 kg).

24. Attach load leveler and lifting device (61) to engine lifting brackets according to approximate dimensions shown in illustration. Lift engine from machine.

25. Lower engine to a suitable repair stand.



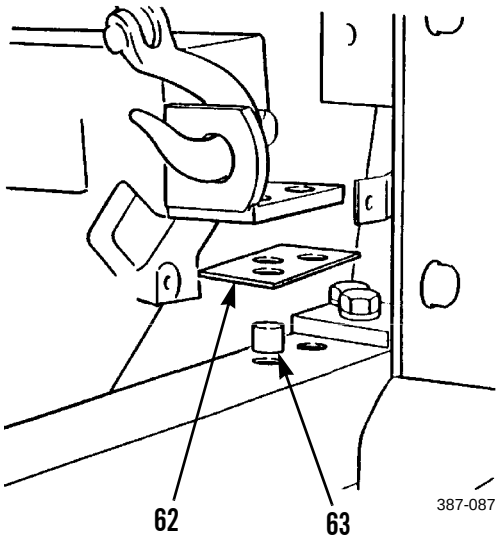


REMOVAL - CONTINUED

WARNING

Be sure engine is clear before removing shims. Failure to follow this warning may result in injury to personnel.

26. Remove shims (62) from locating pins (63) and rear mounting surface on main frame.



INSTALLATION

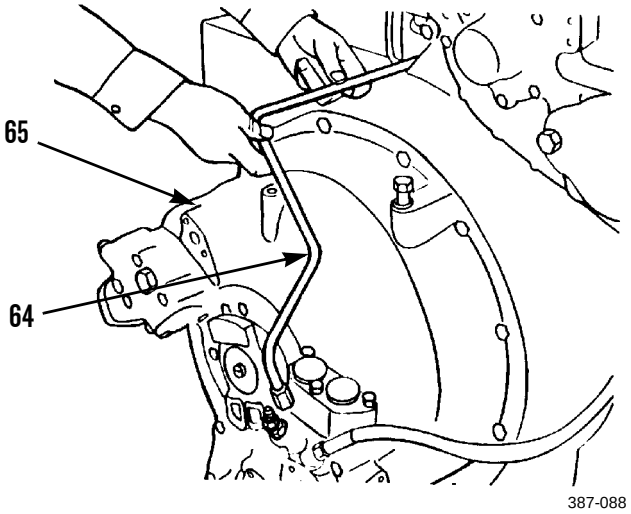
CAUTION

Remove caps from lines and remove plugs from openings as installations are made. Wipe all line ends, line fittings and mounting surfaces clean. Contamination of hydraulic system could result in premature failure.

NOTE

Apply a light film of clean oil to all new O-rings as they are installed.

1. Place replacement engine in an engine stand suitable for transferring the following accessories from damaged engine:
   a. Remove transmission oil line (64) from damaged engine.
   b. Remove torque divider (65) from damaged engine (WP 0115 00).
   c. Install torque divider (65) onto replacement engine (WP 0115 00).
   d. Install transmission oil line (64) onto replacement engine.
   e. Remove all clamps or tiedown straps that attach STE/ICE harness to engine and remove harness from starter, alternator and tach drive. Tag all cables as to their location and remove STE/ICE harness from engine.
   f. Install STE/ICE wiring harness to replacement engine and connect wires to starter, alternator, and tach drive on replacement engine. Secure harness with clamps or new tiedown straps.



2. Position shims (62) in place on rear mount surface on main frame. Be sure locating pins (63) are in position on main frame.

INSTALLATION - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

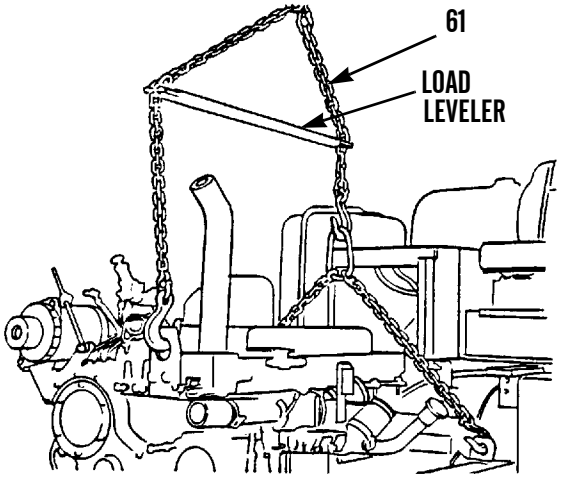
CAUTION

- **Always use a load leveler when lifting engine assembly. This will keep lifting force vertical at all times, avoiding damage to lifting brackets.**
- **Engine assembly must be lifted so that crankshaft centerline is horizontal. This will prevent binding on rear engine mounts locating pins.**

NOTE

Weight of engine and torque divider is approximately 3,000 lb (1,362 kg).

3. Attach load leveler and lifting device (61) to three brackets on replacement engine. Install engine in machine, keeping crankshaft centerline horizontal. Make sure rear engine mounts fit onto locating pins (63) in frame.
4. Install two capscrews (58), washers (60) and nuts (59) into front engine mounting bracket. Tighten capscrews to 325 lb-ft (441 Nm).



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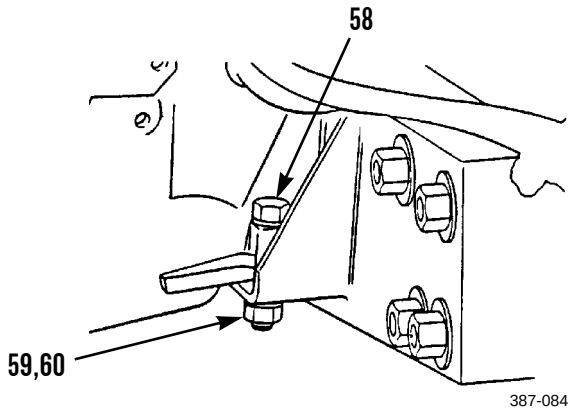

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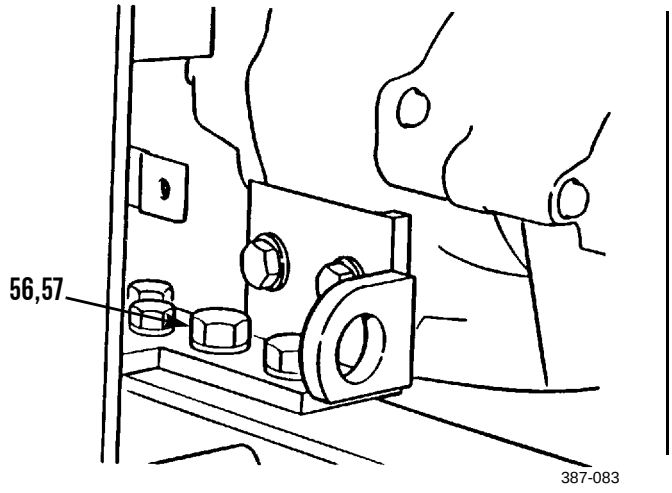
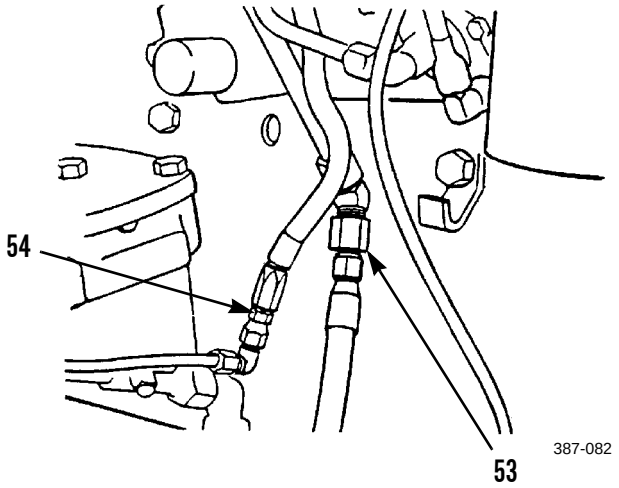
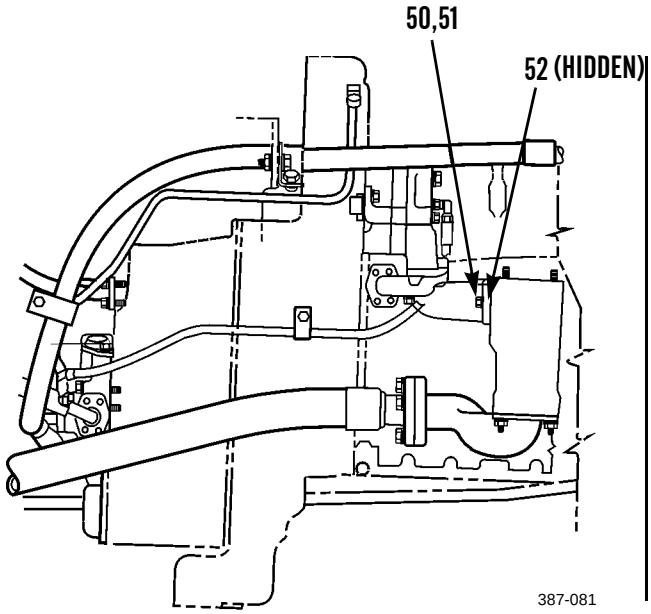
INSTALLATION - CONTINUED

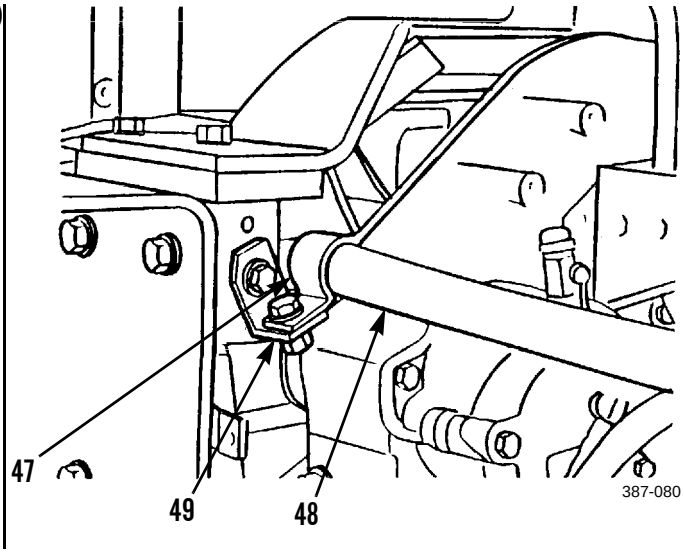
5. Install four capscrews (56) and washers (57) in rear engine mounting brackets. Tighten capscrews to 325 lb-ft (441 Nm).
6. Connect fuel return line (54) to fuel injection pump.
7. Connect fuel supply line (53) to primary fuel filter.





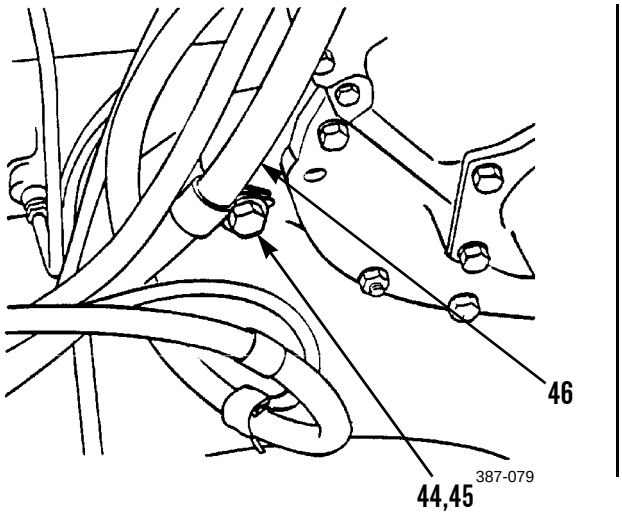
8. Lift magnetic screen assembly into position and install new O-ring (52). Install two capscrews (50) and washers (51).
9. Place transmission oil supply line (48) and bracket (49) into position. Install clamp (47) that holds line to fender.

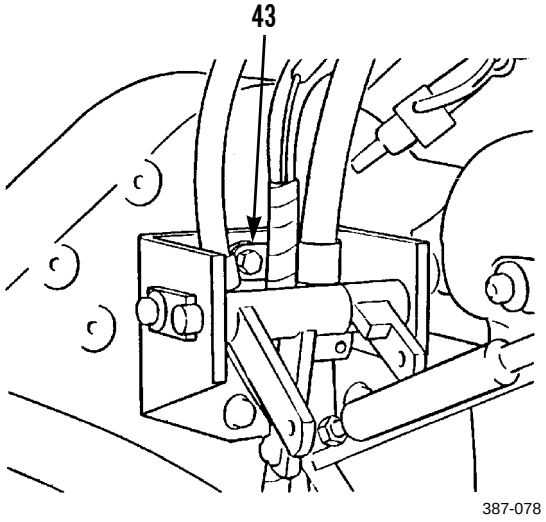




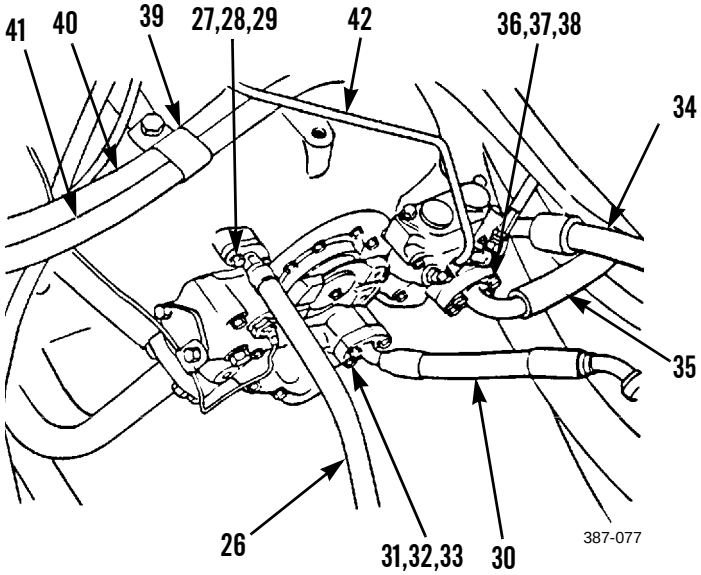
INSTALLATION - CONTINUED

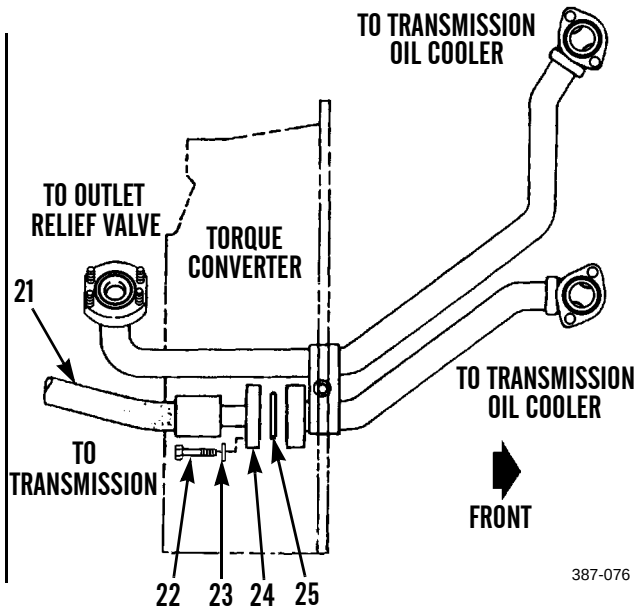
10. Position battery cable (46) over flywheel housing and attach clamp to flywheel housing with capscrew (44) and washer (45).
11. Position power cable through governor control linkage bracket and attach clip (43) holding cable to bracket.





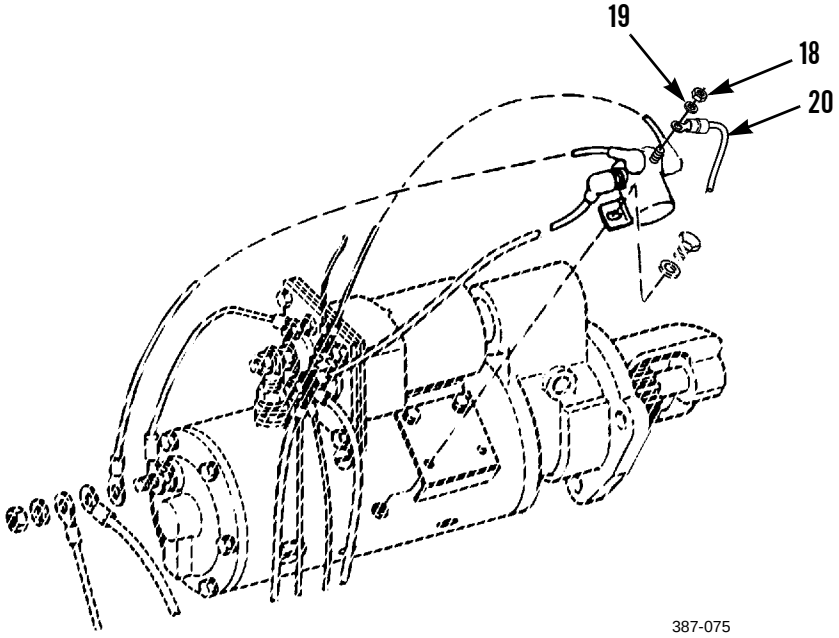
12. Install line (42) on transmission relief valve.
13. Install two clamps (39) that attach two lines (40 and 41) to torque divider.
14. Connect two lines (34 and 35) to transmission relief valve using eight capscrews (36), washers (37) and four split flanges (38).
15. Connect oil supply line (30) to transmission using two capscrews (31), washers (32) and new O-ring (33).
16. Connect vent line (26) to torque divider using two capscrews (27), washers (28) and new gasket (29).
17. Install new O-ring (25). Connect hose assembly (21) to oil cooler tube assembly using four capscrews (22), washers (23) and two flange halves (24).



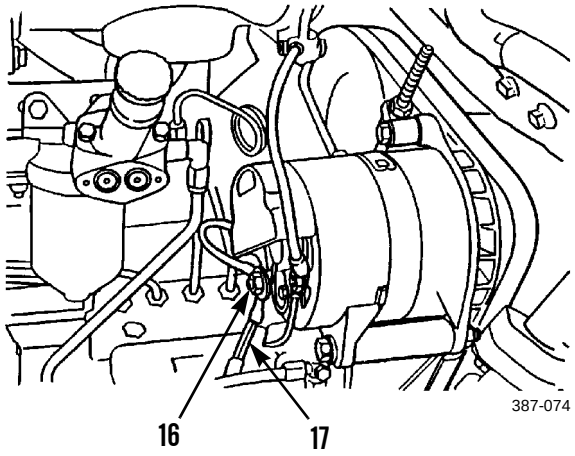


INSTALLATION - CONTINUED

18. Connect wire (20) to starter relay terminal using washer (19) and nut (18). Slide rubber boot over terminal.

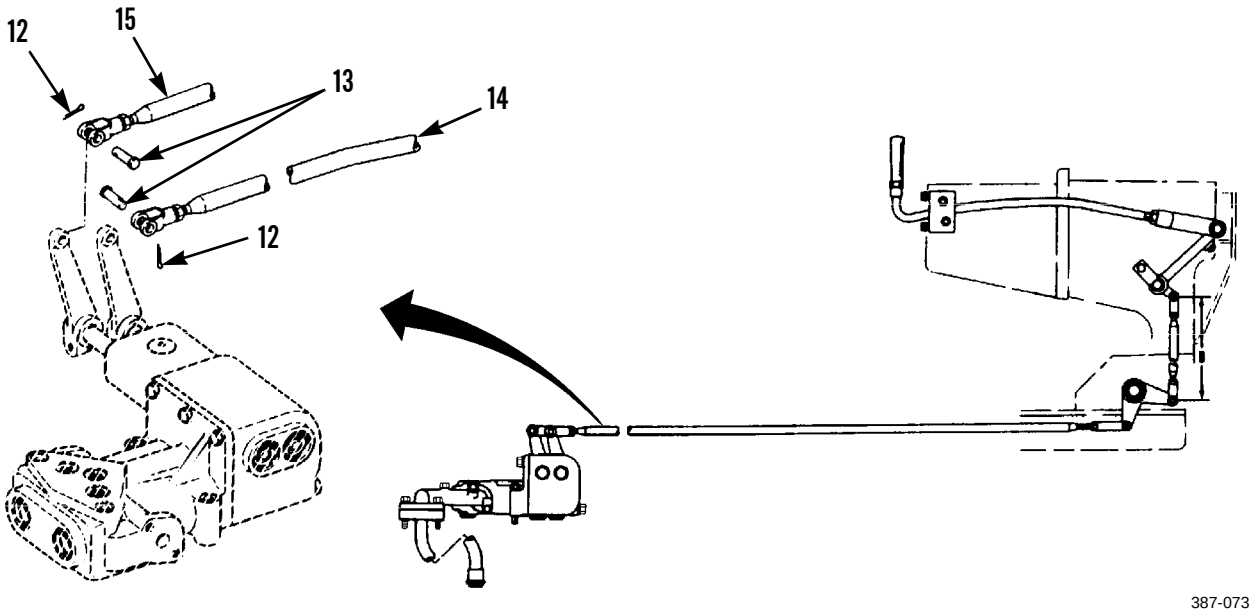


19. Connect wire harness (17) to alternator terminal using nut (16).



INSTALLATION - CONTINUED

20. Connect right (14) and left (15) steering rods to control valve using pins (13) and new cotter pins (12). Adjust steering clutch levers and linkage (WP 0147 00).

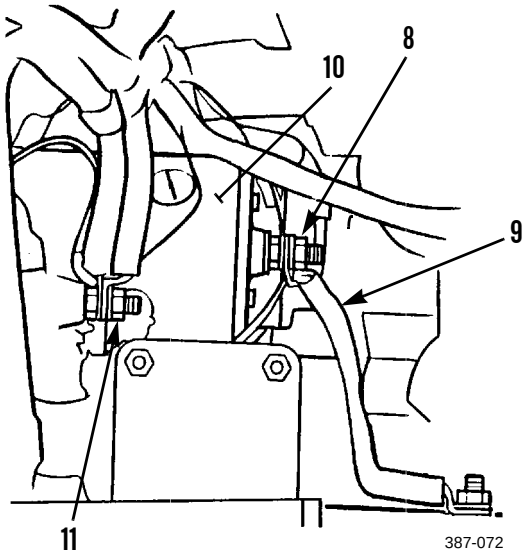


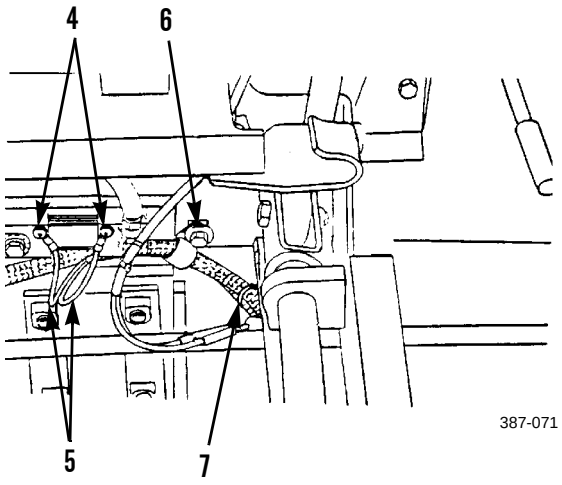
21. Install nut (11) that holds power cable to positive post of starter (10).

22. Install nut (8) that holds ground wire (9) to starter (10).

23. Pull STE/ICE wiring harness through frame. Install clip (6) and three new tiedown straps (7) to hold STE/ICE wiring harness to tractor.

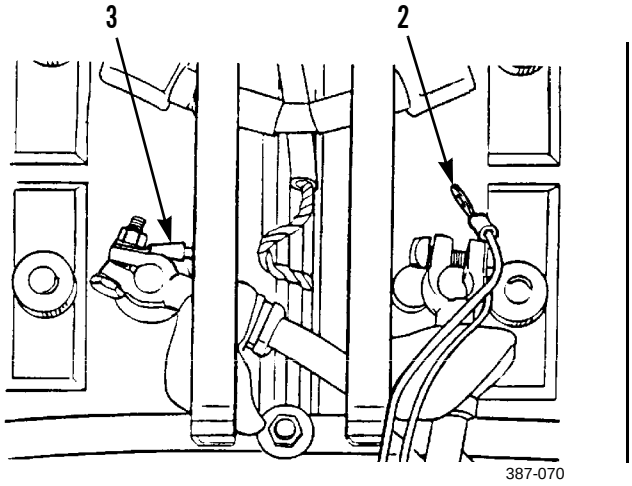
24. Place two wires (5) into position on shunt and attach with two screws (4).

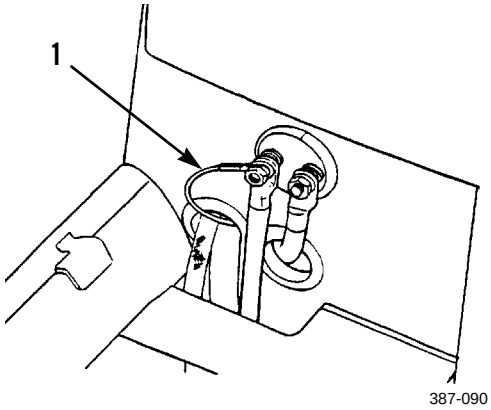




INSTALLATION - CONTINUED

25. Connect two cables (2) to positive post of battery and cable (3) to negative post of battery. Install battery cover.
26. Connect STE/ICE wire (1) to battery disconnect switch.





27. Install hydraulic pump on flywheel housing (WP 0199 00).
28. Install winch pump (if equipped) (WP 0189 00).
29. Install NATO starting receptacle (WP 0102 00).
30. Install air cleaner dust ejector (WP 0048 00).
31. Install drive shaft (WP 0129 00).
32. Install transmission oil filter assembly (WP 0107 00).
33. Install radiator guard (WP 0158 00).
34. Install floor plates (WP 0171 00).
35. Install dash (WP 0160 00).
36. Install radiator (WP 0068 00).
37. Install fan and fan guard (WP 0073 00).
38. Install hood (WP 0159 00).
39. Fill hydraulic tank (WP 0225 00).
40. Fill transmission with oil (WP 0107 00).
41. Fill engine with oil (WP 0011 00).
42. Connect battery cables (WP 0101 00).
43. Turn fuel supply valve ON.
44. Run engine and check for leaks and proper operation (TM 5-2410-237-10).
45. Install crankcase guards (WP 0157 00).

END OF WORK PACKAGE

FRONT ENGINE SUPPORT REPLACEMENT 0022 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Suitable lifting device, 4,000 lb capacity

Suitable jack stands, 4,000 lb capacity

Materials/Parts

Wood cribbing, 2 ft x 2 in. x 8 in.

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Crankcase guard removed, if required (WP 0157 00)

Crankshaft pulley removed (WP 0028 00)

Vibration damper (WP 0029 00)

REMOVAL

CAUTION

- **Wood cribbing prevents damage to oil pan and flywheel housing when engine rear support-to-flywheel housing mounting hardware is loosened.**
- **Use wood cribbing slightly larger than width of pan to prevent damage to oil pan and flywheel housing.**

1. Attach a suitable lifting device to front of engine and remove slack from lifting device.
2. Position jack stands and wood cribbing under oil pan and flywheel housing.

REMOVAL - CONTINUED

CAUTION

Do NOT remove engine rear support mounting capscrews.

3. Loosen two capscrews (1) and washers (2) that attach engine rear supports (3) at each side of flywheel housing.

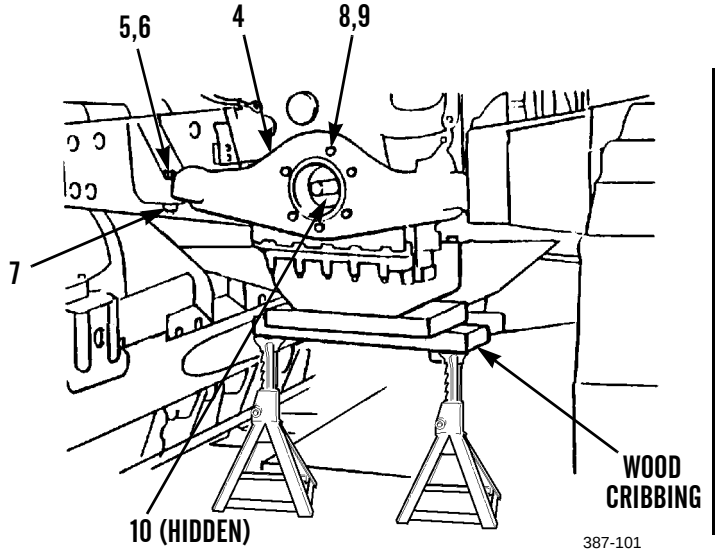
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Weight of engine assembly is approximately 3,000 lb (1,362 kg).

4. Raise front of engine enough to take weight of engine off front support (4).
5. Raise jack stands until wood cribbing is firmly against oil pan.
6. Remove two nuts (5), washers (6) and capscrews (7) from engine front support (4).
7. Ensure jack stands are firmly positioned against oil pan.
8. Remove capscrews (8) and washers (9) that attach engine front support (4) to trunnion (10).
9. Turn engine front support (4) to the right (as seen from front of engine) and remove from engine.



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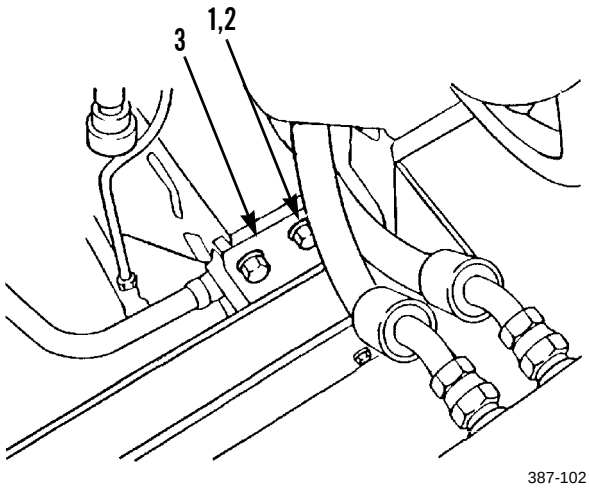

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INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

1. Install engine front support (4) in position on trunnion (10).
2. Install capscrews (8) and washers (9). Tighten capscrews to 75 lb-ft (102 Nm).
3. Lift engine slightly, remove jack stands and wood cribbing from under oil pan and flywheel housing.

NOTE

Before setting front of engine on frame, ensure front support and frame holes are aligned.

4. Lower front of engine until engine front support (4) is resting on frame.
5. Install two capscrews (7), washers (6) and nuts (5) on engine front support (4). Tighten capscrews to 150 lb-ft (203 Nm).
6. Tighten two capscrews (1) and washers (2) that attach engine rear supports (3) at each side of flywheel housing. Tighten capscrews to 150 lb-ft (203 Nm).
7. Lower fully and remove lifting device from engine.
8. Install vibration damper (WP 0029 00)
9. Crankshaft pulley (WP 0028 00).
10. If removed, install crankcase guard (WP 0157 00).
11. Run engine and check for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

REAR ENGINE MOUNTS REPLACEMENT 0023 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Lockwasher (2)

Equipment Condition

Engine assembly removed (WP 0021 00)

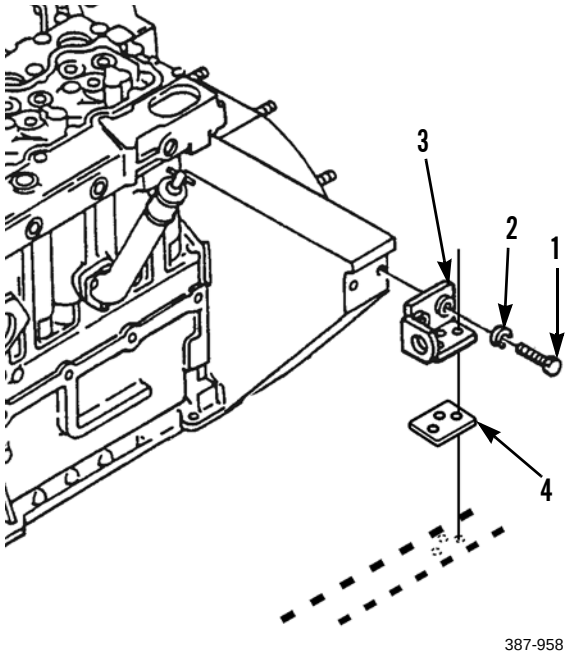
REMOVAL

1. Remove two capscrews (1) and lockwashers (2) from each rear engine mount (3). Discard lockwashers.
2. Remove rear engine mounts (3).

NOTE

- **Prior to removal of shims, mark position of shim on frame to ensure correct placement at installation.**
- **Note quantity of shims removed.**

3. Remove shims (4) from frame.



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INSTALLATION

NOTE

Place shims on frame in same position from which they were removed. If new shims are required, replace with shims of same thickness as previously removed shims.

1. Position shims (4) on frame.
2. Position rear engine mounts (3) on flywheel housing.
3. Install two capscrews (1) and new lockwashers (2) to each rear engine mount (3). Tighten capscrews to 150 lb-ft (203 Nm).
4. Install engine assembly (WP 0021 00).

END OF WORK PACKAGE

ENGINE TRUNNION REPLACEMENT 0024 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Detergent (Item 11, WP 0249 00)

O-ring (4)

Equipment Condition

Crankshaft pulley removed (WP 0028 00)

Front engine support removed (WP 0022 00)

REMOVAL

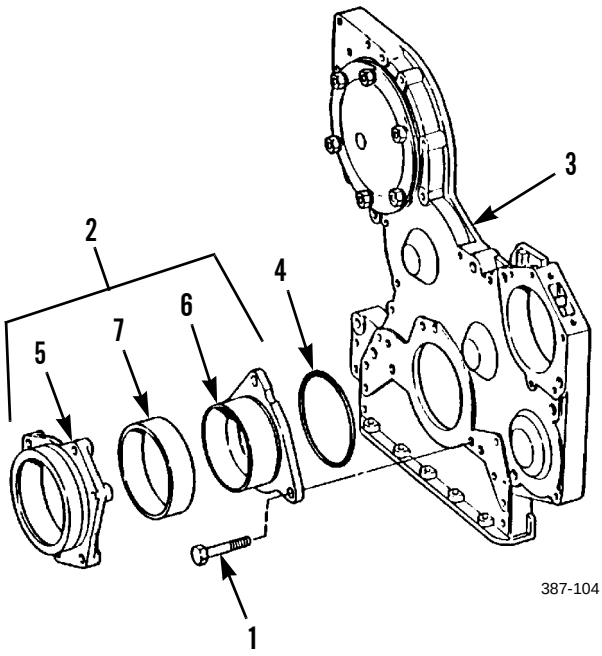
1. Remove three capscrews (1) and trunnion assembly (2) from front housing (3).
2. Remove and discard O-ring (4).
3. Separate trunnion supports (5 and 6) and sleeve (7).

INSTALLATION

NOTE

If any component of trunnion assembly is damaged, replace all components (trunnion supports and sleeve) as an assembly.

1. Install new O-ring (4) into front housing (3).
2. Install sleeve (7) into bore of support (5) dry. Install trunnion support (6) into support (5).
3. Lubricate inside diameter of sleeve (7) with 3% detergent solution.
4. Position trunnion assembly (2) on front housing (3) and install three capscrews (1).
5. Tighten capscrews (1) to 75 lb-ft (102 Nm).
6. Install front engine support (WP 0022 00).
7. Install crankshaft pulley (WP 0028 00).



END OF WORK PACKAGE

CYLINDER HEAD ASSEMBLY AND SPACER PLATE REPLACEMENT 0025 00

THIS WORK PACKAGE COVERS

Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Bracket, double angle, fan drive support (Item 17, WP 0250 00)

Link, lifting (Item 51, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 400 lb capacity

Bolt, 5/8-11 x 1 1/2 in.

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (6 and 12)

O-ring (10 and 11)

Seal (7 and 8)

References

TM 5-2410-237-10

WP 0017 00

WP 0018 00

References - Continued

WP 0050 00

WP 0072 00

WP 0241 00

Personnel Required

Two

Equipment Condition

Hood removed (WP 0159 00)

Air cleaner removed (WP 0046 00)

Muffler removed (WP 0062 00)

Turbocharger removed (WP 0049 00)

Exhaust manifold removed (WP 0036 00)

Fuel injection lines removed (WP 0044 00)

Fan drive removed (WP 0072 00)

Ether starting aid removed (WP 0061 00)

Water temperature regulator removed (WP 0069 00)

Water pump lines removed (WP 0071 00)

Oil sampling valve removed (WP 0014 00)

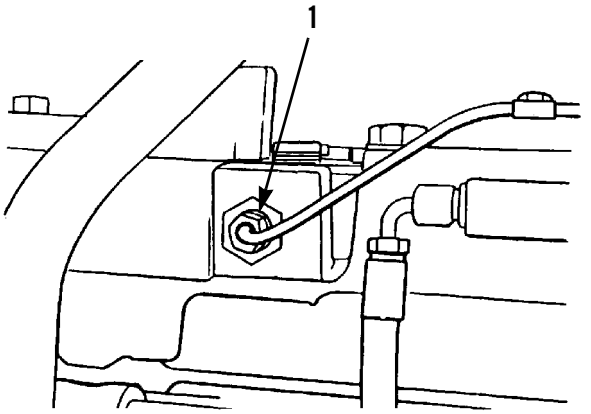
Crankcase breather removed (WP 0015 00)

Valve mechanism cover removed (WP 0017 00)

Valve mechanism removed (WP 0019 00)

REMOVAL

1. Remove clamp near water temperature sending unit (1).
2. Remove water temperature sending unit (1) from intake manifold.



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3. If engine is removed from vehicle, remove fan drive (WP 0072 00). Proceed to step 5.
4. If engine is installed in vehicle, perform the following steps:
   a. Remove four bolts that hold front muffler bracket and spacer to front of engine.
   b. Fasten lifting equipment to fan drive.
   c. Remove bolts holding fan drive support bracket to front of engine.

CAUTION

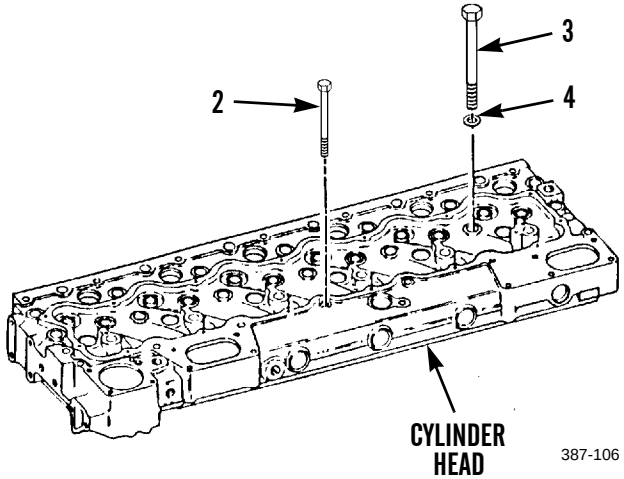
Ensure that fan does not damage radiator when installing fan drive support bracket tool.

   d. Install fan drive support bracket tool to secure fan drive to engine.
   e. Remove lifting equipment from fan and fan drive.
   f. Remove bolt, clip and hose from intake elbow. Remove intake elbow (WP 0050 00).

NOTE

It is necessary to remove engine lifting bracket from front of cylinder head to install double angle fan support bracket.

5. Remove front engine lifting bracket.
6. Remove six capscrews (2), 20 capscrews (3) and washers (4) from cylinder head.



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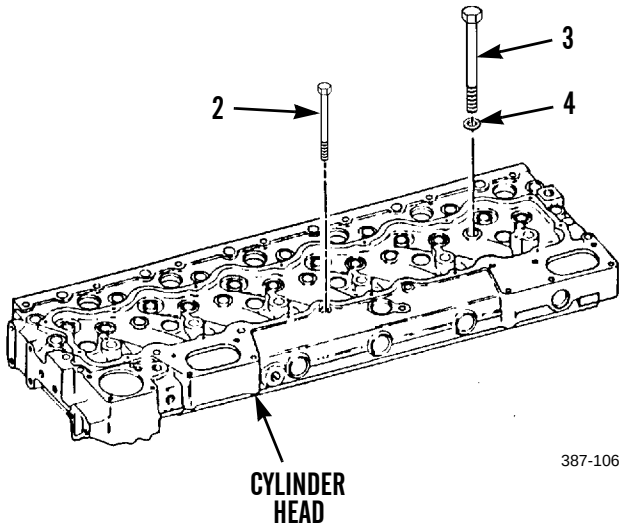
REMOVAL - CONTINUED

7. Install lifting link (5) with 5/8-11 x 1-1/2 in. bolt at front and rear of cylinder head.



NOTE

Cylinder head weighs approximately 200 lb (91 kg).

8. Attach lifting equipment to lifting points at front and rear of cylinder head.

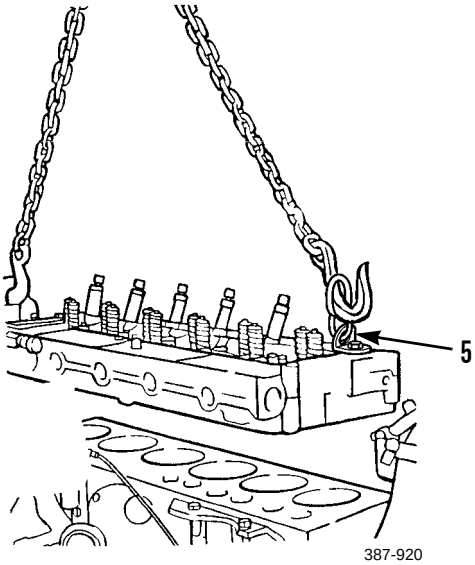
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

CAUTION

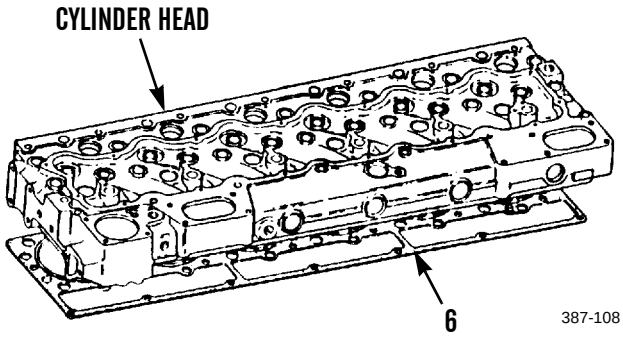
Do not lower cylinder head onto a flat surface as this could damage valves.

9. Slowly and carefully lift cylinder head from cylinder block and place it on a suitable stand or platform which will support bottom perimeter of cylinder head.

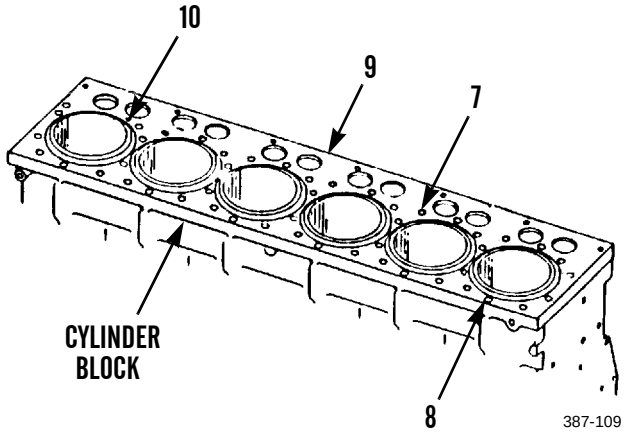


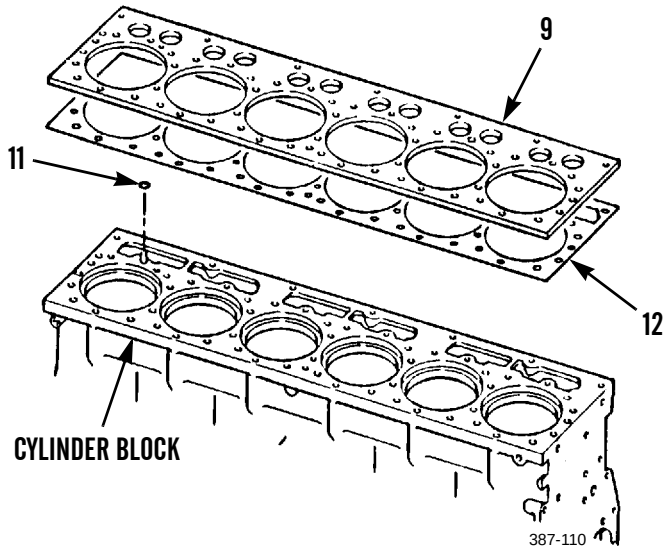
REMOVAL - CONTINUED

10. Remove and discard cylinder head gasket (6).
11. Use snap ring pliers to remove 18 water seals (7) and six water seals (8) from spacer plate (9). Discard water seals.
12. Remove O-ring (10) from dowel and discard.
13. Remove spacer plate (9) from cylinder block.
14. Remove and discard O-ring (11) from hollow dowel in cylinder block.



15. Remove and discard spacer plate gasket (12) from cylinder block.





CLEANING AND INSPECTION

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

CAUTION

Both surfaces of spacer plate, bottom surface of cylinder head, and top of cylinder block MUST be clean and dry. Do not use hard gasket scrapers or files to remove gasket material, grease or other particles from cylinder head, block or spacer plate surfaces. These tools could cause nicks or scratches which, in turn, could cause leaks or incorrect seat between cylinder head and spacer plate, and/or block and spacer plate.

CLEANING AND INSPECTION - CONTINUED

NOTE

Refer to WP 0241 00 for additional cleaning and inspection instructions.

1. Thoroughly clean cylinder head with solvent cleaning compound or other approved method of carbon removal.
2. Thoroughly clean both surfaces of spacer plate using solvent cleaning compound.
3. Visually inspect cylinder head and spacer plate for cracks, heat deterioration or other damage. Replace damaged cylinder head and/or spacer plate.
4. Check cylinder head for warpage using a straightedge and feeler gage. Replace warped cylinder head.
5. Check cylinder head for cracks. Replace cracked cylinder head.

INSTALLATION

CAUTION

To ensure there is no leakage resulting in loss of engine compression, ensure mating surfaces of cylinder block, cylinder head, spacer plate and all gaskets are clean and dry prior to installation.

1. Install new spacer plate gasket (12) on cylinder block.
2. Install new O-ring (11) on hollow dowel in cylinder block.
3. Install spacer plate (9) on cylinder block.
4. Install new O-ring (10) over dowel on spacer plate (9).
5. Install six new water seals (8) and 18 new water seals (7) in spacer plate (9).
6. Install new cylinder head gasket (6) on spacer plate.
7. Install a lifting link (5) with 5/8-11 x 1-1/2 in. bolt at rear of cylinder head. If engine is removed from vehicle, also install bearing link or 3/4 in. eyebolt at front of cylinder head.

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

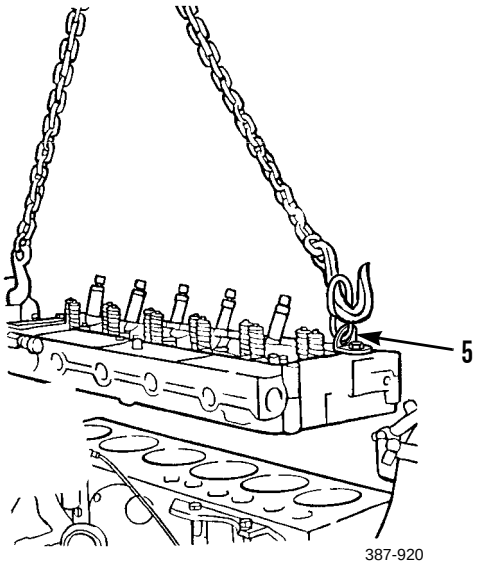
NOTE

Cylinder head weighs approximately 200 lb (91 kg).

8. Attach a nylon sling and suitable lifting device to lifting link and engine front lifting plate or lifting link (5).

INSTALLATION - CONTINUED

9. Carefully lift cylinder head and place in correct position on cylinder block.
10. Remove lifting device and lifting link (5).
11. If engine is installed in vehicle:
    a. Support fan drive with lifting equipment.
    b. Remove fan drive support bracket.
    c. Install front engine lifting bracket.
    d. Install intake elbow, hose, clip and bolt (WP 0050 00).
    e. Install valve mechanism, but do not tighten capscrews at this time (WP 0019 00).



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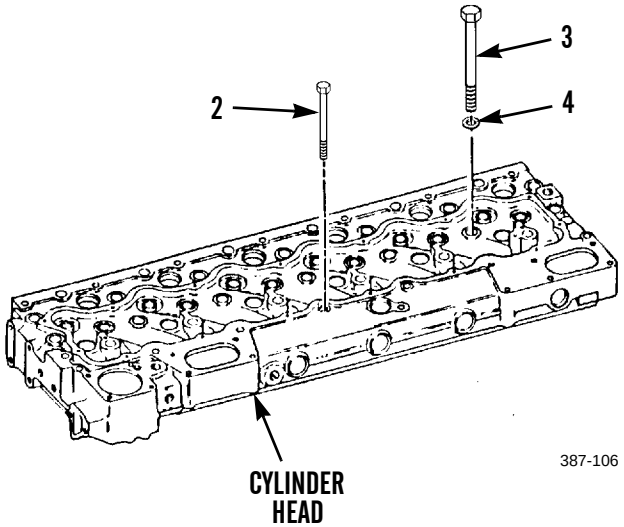
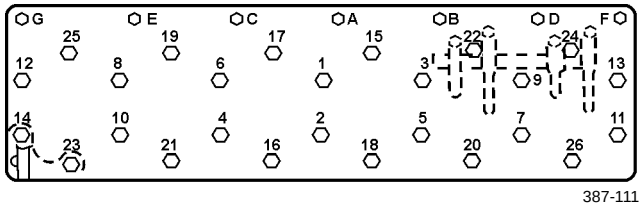
12. Apply antiseize compound to threads of cylinder head capscrews.
13. Install 20 capscrews (3), washers (4) and six capscrews (2).
14. Tighten capscrews (2 and 3) in the following sequence:
    a. Tighten all capscrews in number sequence to 115 lb-ft (156 Nm).
    b. Tighten all capscrews in number sequence to 185 lb-ft (251 Nm).
    c. Tighten all capscrews in number sequence to 185 lb-ft (251 Nm).
    d. Tighten all capscrews in letter sequence to 22 lb-ft (30 Nm).
    e. Tighten all capscrews in letter sequence to 32 lb-ft (43 Nm).
    f. Tighten all capscrews in letter sequence to 32 lb-ft (43 Nm).



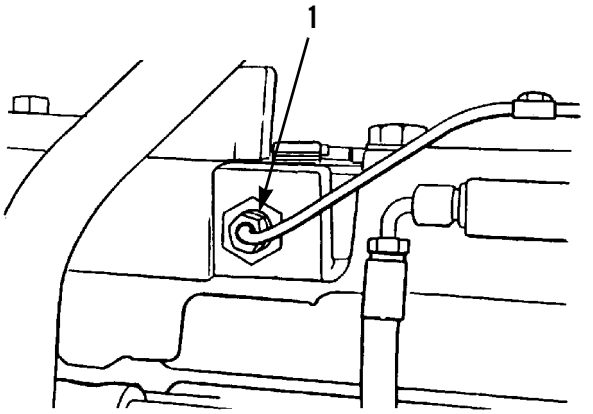
387-106



387-111

INSTALLATION - CONTINUED

15. Adjust valves (WP 0018 00).
16. Install valve mechanism cover (WP 0017 00).
17. Install crankcase breather (WP 0015 00).
18. Install oil sampling valve (WP 0014 00).
19. Install water pump lines (WP 0071 00).
20. Install water temperature regulator (WP 0069 00).
21. Install ether starting aid (WP 0061 00).
22. Install fan drive (WP 0072 00).
23. Install fuel injection lines (WP 0044 00).
24. Install exhaust manifold (WP 0036 00).
25. Install turbocharger (WP 0049 00).
26. Install muffler (WP 0062 00).
27. Install air cleaner (WP 0046 00).
28. Install water temperature sending unit (1) into cylinder head. Be careful not to overtighten.
29. Attach water temperature sending unit tube to cylinder head with clamp and capscrew.
30. Run engine and check for proper operation and leaks (TM 5-2410-237-10).
31. Install hood (WP 0159 00).



387-105

END OF WORK PACKAGE

CRANKSHAFT FRONT SEAL AND WEAR SLEEVE REPLACEMENT 0026 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)
Shop equipment, general purpose repair (Item 106, WP 0250 00)
Distorter sleeve (Item 28, WP 0250 00)
Installer (Item 45, WP 0250 00)
Puller kit, universal (Item 87, WP 0250 00)
Tool, distorter (Item 121, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 26, WP 0249 00)
Primer, coating (Item 28, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)
Sealing compound (Item 32, WP 0249 00)
Seal (1)
Sleeve, wear (4)

References

TM 5-2410-237-10

Equipment Condition

Crankshaft pulley removed (WP 0028 00)

REMOVAL

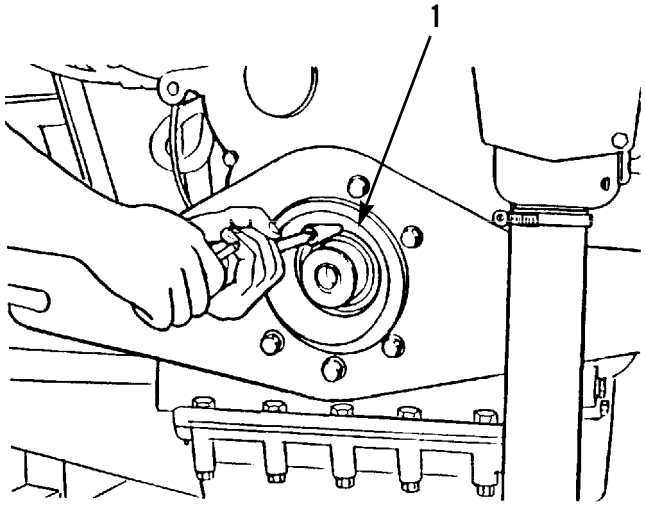
CAUTION

Use care not to damage crankshaft flange when removing seal.

NOTE

When replacing front crankshaft seal, front wear sleeve must also be replaced.

1. Drill three evenly spaced pilot holes in crankshaft front seal (1).
2. Using slide hammer puller, alternate between drilled holes to remove crankshaft front seal (1). Discard seal.

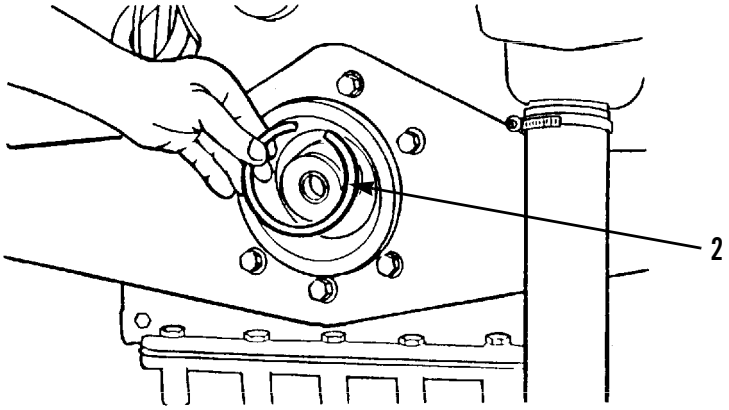


387-221

CRANKSHAFT FRONT SEAL AND WEAR SLEEVE REPLACEMENT - CONTINUED 00026 00

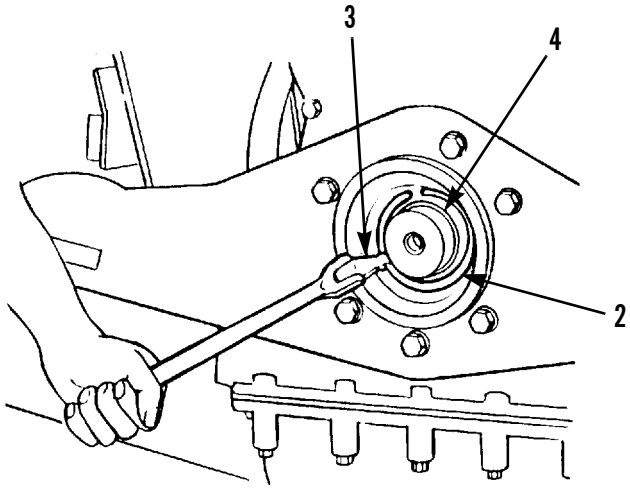
REMOVAL - CONTINUED

3. Insert distorter ring (2) into seal bore.



387-222

4. Place wear sleeve distorter (3) between distorter ring (2) and wear sleeve (4). Turn until edge of distorter makes a crease in wear sleeve. Make additional creases in wear sleeve every 90 degrees, then every 45 degrees, until wear sleeve is loose. Remove distorter ring tool and wear sleeve. Discard wear sleeve.



387-223

INSTALLATION

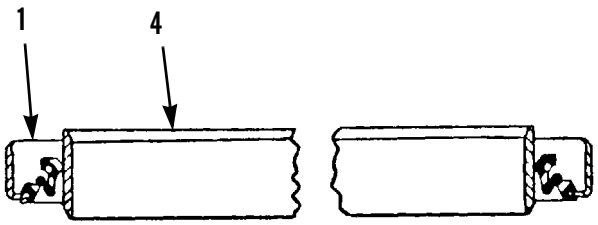
NOTE

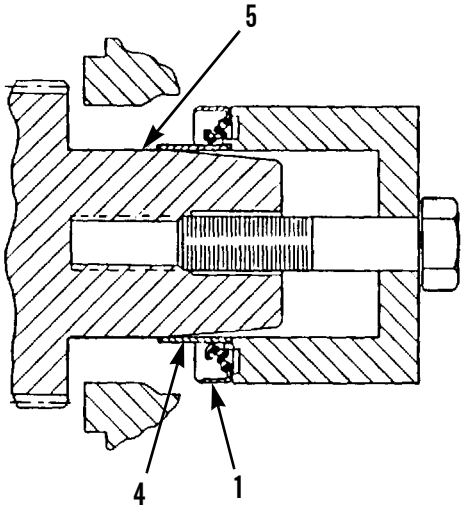
- **Wear sleeve and crankshaft front seal comes as a set.**
- **Wear sleeve and crankshaft front seal must be installed together.**

1. Apply clean lubricating oil on seal lip of new seal (1) and on outside diameter of new wear sleeve (4).
2. Install seal (1) on wear sleeve (4) as shown, with lip of seal towards side of wear sleeve that has chamfer on inside diameter.
3. Clean inside diameter of wear sleeve (4) and tapered surface of crankshaft (5) with quick cure primer coating.
4. Apply sealing compound to surfaces on inside diameter of wear sleeve (4) and on crankshaft (5).
5. Position wear sleeve (4) and seal (1) on crankshaft, with lip of seal towards engine.

INSTALLATION - CONTINUED

6. Install wear sleeve and seal installer tool. Apply a small amount of lubricating oil between capscrew and installer tool.
7. Tighten capscrew until inside surface of installer tool contacts end of crankshaft (5). Wear sleeve (4) and seal (1). Seal is fully seated when it bottoms in timing gear cover. Remove wear sleeve and seal installer tool.





8. Install crankshaft pulley (WP 0028 00).
9. Run engine and check for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

CRANKSHAFT REAR SEAL AND WEAR SLEEVE REPLACEMENT 0027 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Bolt, machine (Item 12, WP 0250 00)

Installer (Item 44, WP 0250 00)

Nut, sleeve (Item 57, WP 0250 00)

Puller kit, universal (Item 87, WP 0250 00)

Remover and replacer (Item 96, WP 0250 00)

Ring, sleeve distorter (Item 101, WP 0250 00)

Tools and Special Tools - Continued

Tool, distorter (Item 121, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 26, WP 0249 00)

Sealing compound (Item 32, WP 0249 00)

Seal (6)

Sleeve, wear (9)

References

TM 5-2410-237-10

Equipment Condition

Flywheel removed (WP 0030 00)

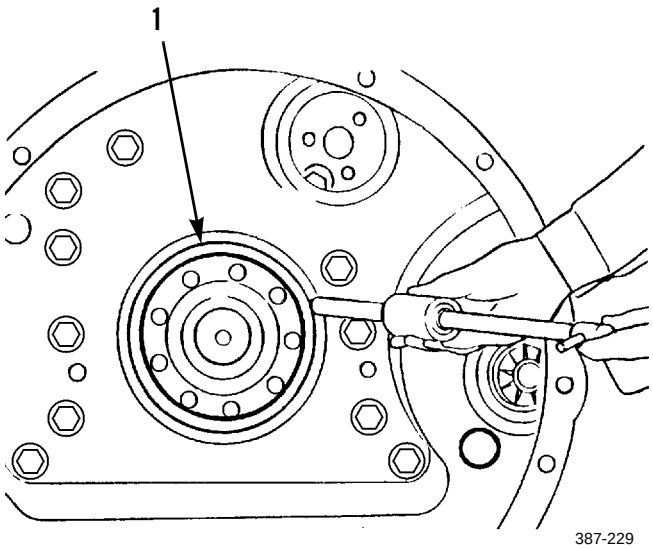
Rear accessory drive idler gear removed (WP 0037 00)

REMOVAL

CAUTION

Use care not to damage crankshaft flange when removing seal.

1. Drill three evenly spaced pilot holes in rear seal (1).
2. Using slide hammer puller, alternate between drilled holes to remove crankshaft rear seal (1). Discard rear seal.

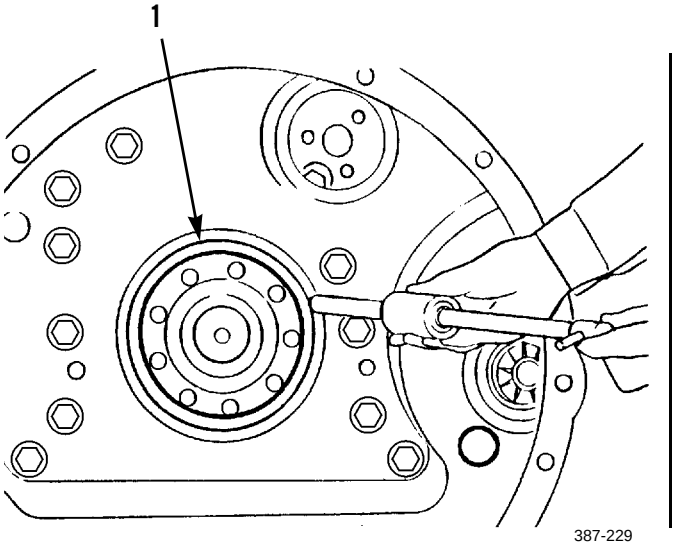


387-229

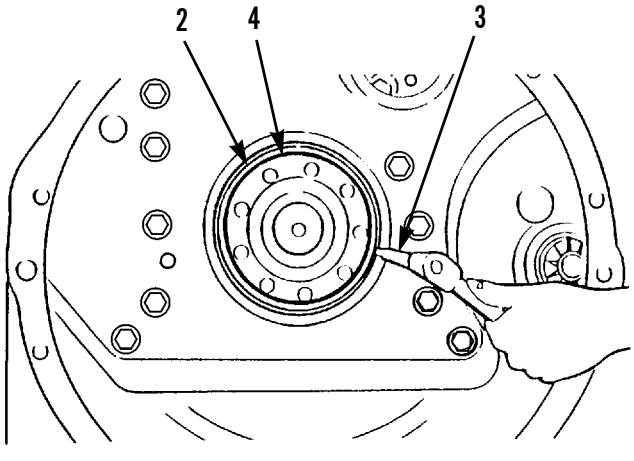
CRANKSHAFT REAR SEAL AND WEAR SLEEVE REPLACEMENT - CONTINUED 0027 00

REMOVAL - CONTINUED

3. Insert distorter ring (2) in rear seal bore.
4. Insert wear sleeve distorter (3) between distorter ring (2) and wear sleeve (4).
5. Turn distorter (3) until it makes a crease in wear sleeve (4). Make additional creases in wear sleeve, every 90 degrees, then every 45 degrees, until wear sleeve is loose.
6. Remove wear sleeve distorter (3) and wear sleeve (4). Discard wear sleeve.



387-229



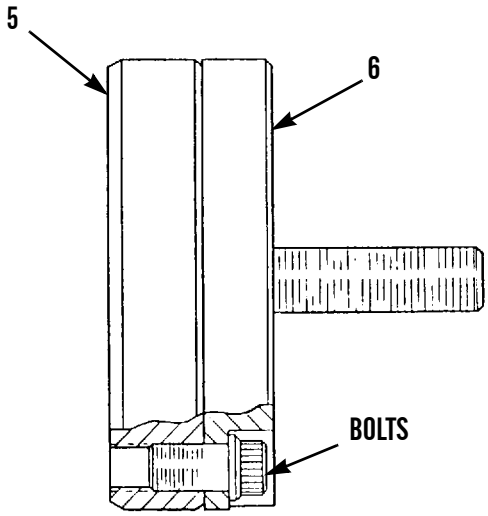
387-230

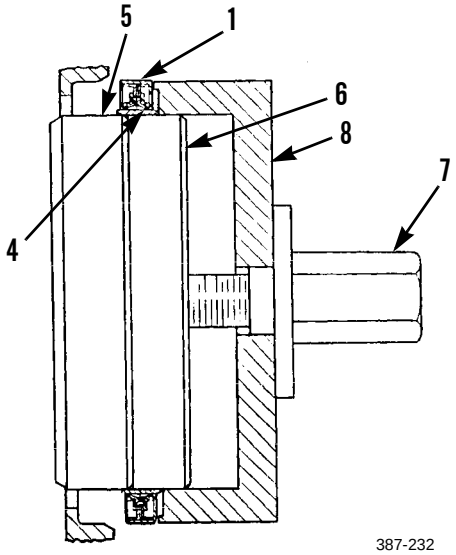
INSTALLATION

CAUTION

Do not separate rear seal and wear sleeve assembly.

1. Clean outer diameter of crankshaft flange (5) and inside diameter of new wear sleeve (4).
2. Apply sealing compound on outer diameter of crankshaft flange (5) and on inside diameter of wear sleeve (4).





387-232

INSTALLATION - CONTINUED

3. Install seal locator (6) to end of crankshaft (5) with three bolts.
4. Place new seal (1) and wear sleeve (4) assembly on locator (6) with part number on seal facing out.
5. Apply clean oil on washer face of nut (7). Place installer (8) on locator (6), then install nut.
6. Turn nut (7) until inside surface of installer (8) comes in contact with locator (6). Rear seal and wear sleeve will be in the correct location.
7. Remove nut (7), installer (8), three bolts and locator (6).
8. Install rear accessory drive idler gear (WP 0037 00).
9. Install flywheel (WP 0030 00).
10. Run engine and check for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

CRANKSHAFT PULLEY REPLACEMENT 0028 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)
Shop equipment, general purpose repair (Item 106, WP 0250 00)
Puller, crank pulley (Item 82, WP 0250 00)

Materials/Parts

Detergent (Item 11, WP 0249 00)
Oil, lubricating (Item 26, WP 0249 00)

References

TM 5-2410-237-10
WP 0074 00
WP 0241 00

Equipment Condition

Radiator removed (WP 0068 00)
Vibration damper removed (WP 0029 00)

REMOVAL

1. Loosen V-belts and remove from crankshaft pulley (WP 0074 00).

NOTE

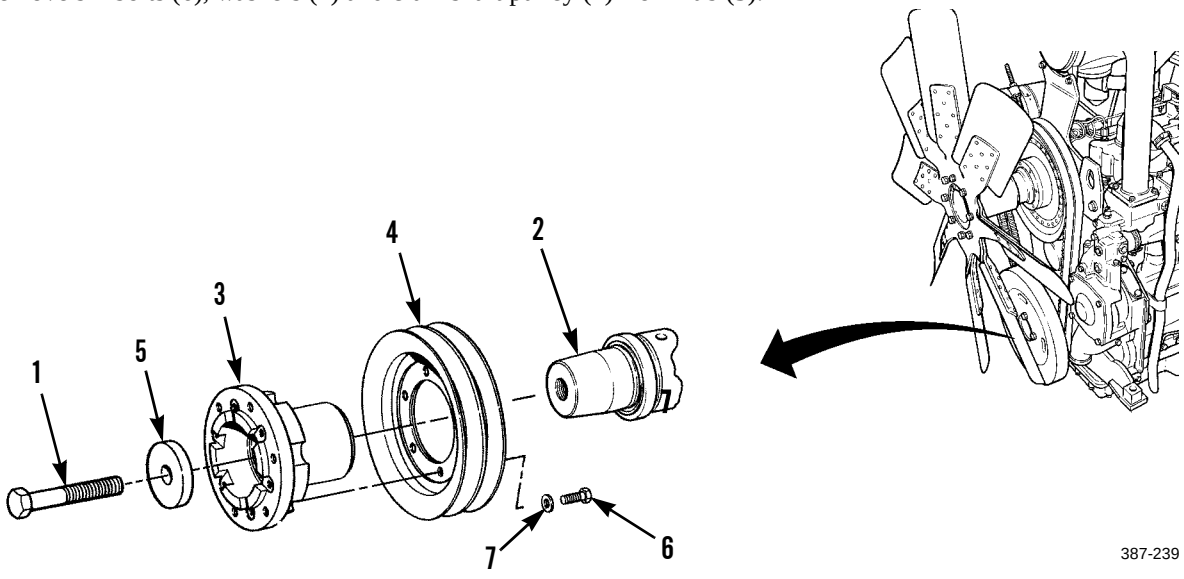
Use an impact wrench to loosen bolt so that crankshaft does not turn.

2. Loosen bolt (1) at end of crankshaft (2).

NOTE

Use an impact wrench on puller tool so that crankshaft does not turn.

3. Loosen hub (3) and crankshaft pulley (4) as an assembly using puller tool.
4. Remove bolt (1), washer (5), hub (3) and crankshaft pulley (4) assembly from crankshaft (2).
5. Remove six bolts (6), washers (7) and crankshaft pulley (4) from hub (3).



CLEANING

WARNING

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

Clean removed parts with detergent. Dry parts with compressed air.

INSPECTION

1. Inspect hub and crankshaft pulley for cracks or other damage. Replace if necessary.
2. Inspect wear of pulley grooves. Measure distance that a NEW V-belt runs above or below top of each groove. If V-belt runs more than 1/16 in. (1.6 mm) below top of groove, replace pulley.
3. Refer to WP 0241 00 for additional inspection instructions.

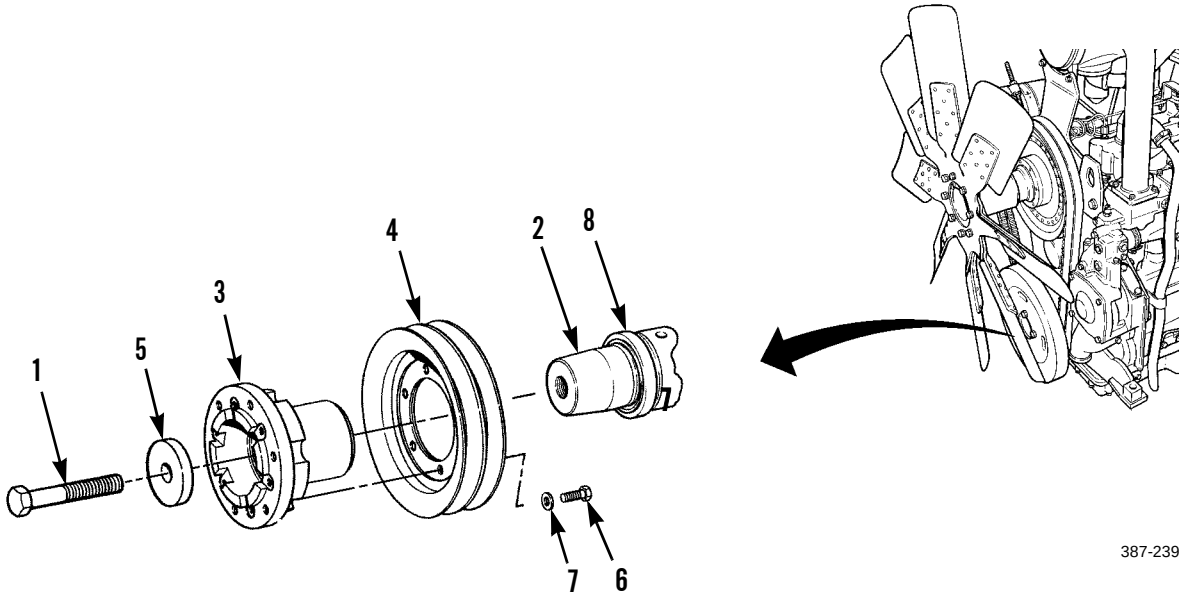
INSTALLATION

1. Install crankshaft pulley (4) to hub (3) with six washers (7) and bolts (6). Tighten bolts to 75 lb-ft (102 Nm).
2. Apply coat of lubricating oil to exposed surface of crankshaft (2), front engine oil seal (8) and tapered surface inside hub (3).

NOTE

Position washer with large flat surface toward hub.

3. Install hub (3) and crankshaft pulley (4) assembly to crankshaft (2) with washer (5) and bolt (1). Tighten bolt to 230 lb-ft (312 Nm). Tap end of bolt with a hammer and again tighten bolt to 230 lb-ft (312 Nm).



INSTALLATION - CONTINUED

4. Install vibration damper (WP 0029 00).
5. Install radiator (WP 0068 00).
6. Run engine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

VIBRATION DAMPER REPLACEMENT 0029 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

References

WP 0241 00

Equipment Condition

Crankcase guard removed (WP 0157 00)

WARNING

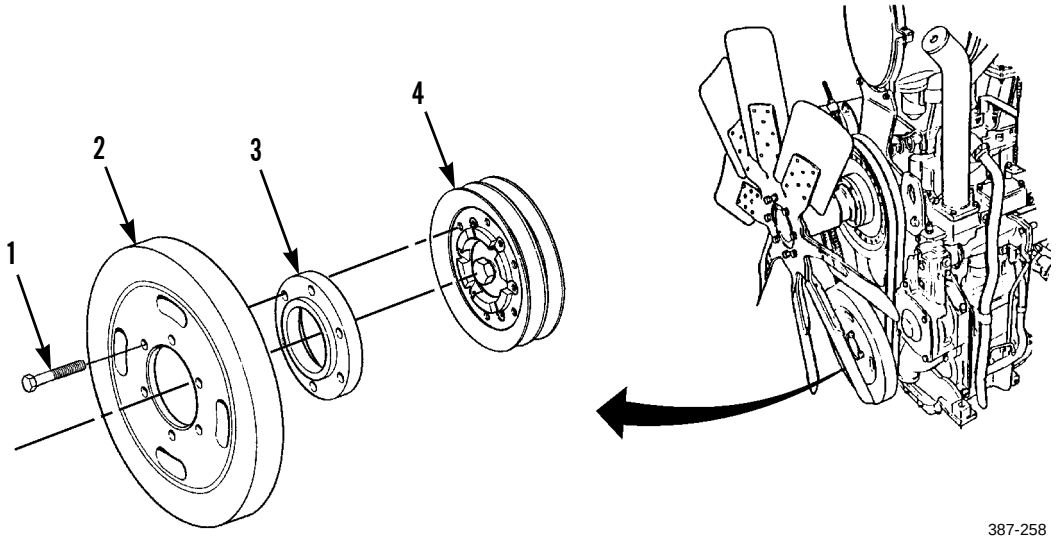
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury.

NOTE

Vibration damper weighs 44 lb (20 kg).

REMOVAL

Remove six capscrews (1), vibration damper (2) and adapter (3) from hub of crankshaft pulley (4).



CLEANING

- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.**

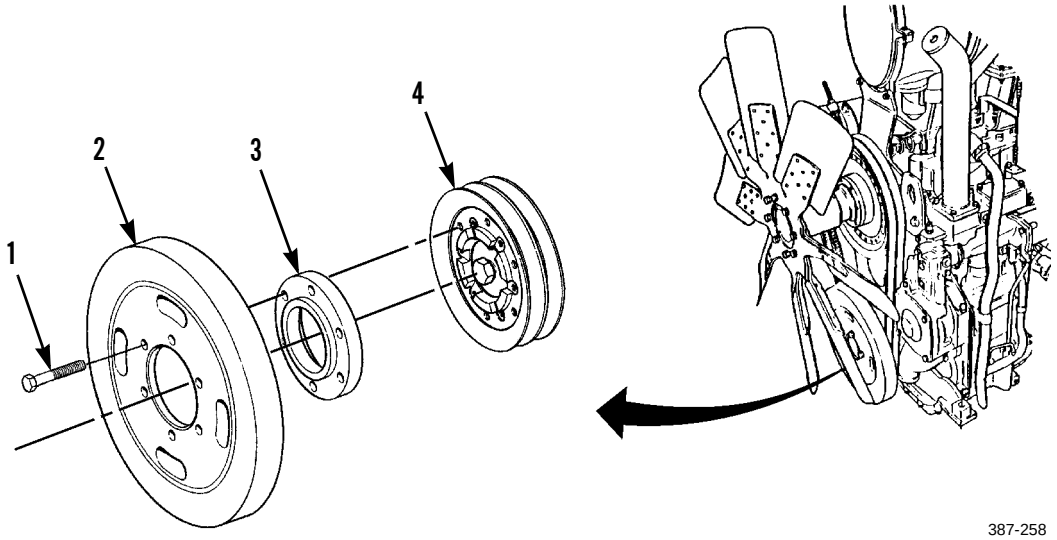
Clean removed parts with solvent cleaning compound. Dry thoroughly with compressed air.

INSPECTION

1. Inspect vibration damper and adapter for cracks or other damage. Replace if necessary.
2. Check two dash marks on perimeter of vibration damper. If marks are not aligned, replace vibration damper.

INSTALLATION

1. Position adapter (3) to hub of crankshaft pulley (4).



2. Position vibration damper (2) on adapter (3) and install six capscrews (1). Tighten capscrews to 75 lb-ft (102 Nm).
3. Install crankcase guard (WP 0157 00).

END OF WORK PACKAGE

FLYWHEEL ASSEMBLY REPLACEMENT 0030 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Lifting equipment, 200 lb capacity

Materials/Parts

Bolt, guide, 5/8 in. -18NF, 8-1/2 in. long

Materials/Parts

Bolt, guide, 5/8 in. -18NF, 8-1/2 in. long

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Torque divider removed (WP 0115 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death to personnel.

NOTE

Some flywheel assemblies come from the manufacturer without drilled and tapped holes for installing lifting equipment. If flywheel assembly to be removed or replaced is missing drilled holes, contact your local Caterpillar dealer for assistance in replacing flywheel assembly.

FLYWHEEL ASSEMBLY REPLACEMENT - CONTINUED 0030 00

REMOVAL

NOTE

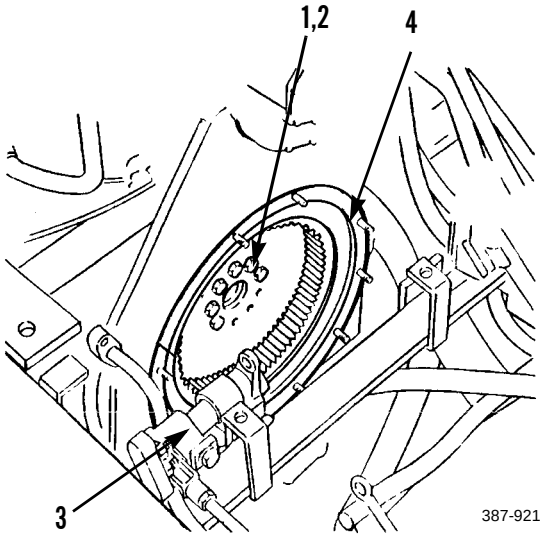
Flywheel assembly weighs 125 lb (57 kg).

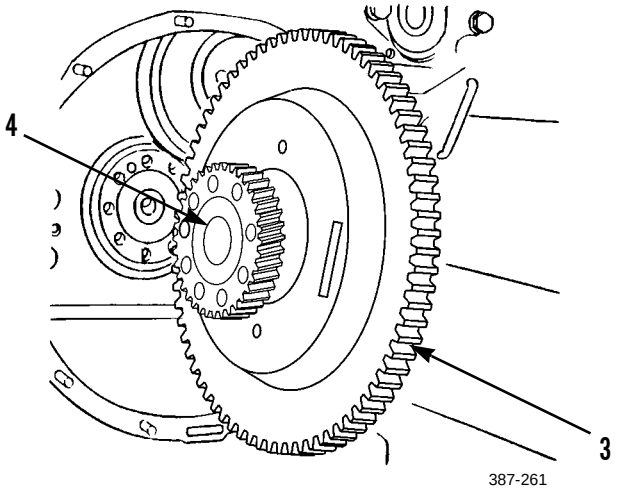
1. Remove seven capscrews (1) and washers (2) from flywheel assembly (3).
2. Install two 5/8 in. -18NF guide bolts in crankshaft.
3. Remove two remaining capscrews (1) and washers (2).
4. Slide flywheel assembly (3) out on guide bolts until flywheel is sufficiently clear to install lifting equipment.
5. Fasten lifting equipment to flywheel assembly (3).

NOTE

Keep flywheel level during removal to prevent hydraulic pump gear from falling off front of flywheel.

6. Lift flywheel assembly (3) clear and remove.
7. Apply witness marks on hydraulic pump gear (4) and flywheel assembly (3) with paint or scribe.
8. Remove hydraulic pump gear (4) from back of flywheel assembly (3).





INSTALLATION

1. Align dash marks on flywheel assembly (3) and gear (4). Install gear on flywheel assembly.

NOTE

Flywheel assembly weighs 125 lb (57 kg).

2. Fasten lifting equipment to flywheel (3).
3. Lift flywheel assembly (3) into place on two guide bolts installed into crankshaft.
4. Align dash marks on flywheel assembly (3) and crankshaft and push flywheel assembly against rear of crankshaft.
5. Install seven washers (2) and capscrews (1).
6. Remove guide bolts from crankshaft.
7. Install two remaining washers (2) and capscrews (1). Tighten nine capscrews to 150 lb-ft (203 Nm).
8. Install torque divider (WP 0115 00).
9. Run engine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

FLYWHEEL HOUSING MAINTENANCE 0031 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Lifting equipment, 500 lb capacity

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

Gasket (8 and 16)

References

TM 5-2410-237-10

WP 0037 00

Personnel Required

Two

Equipment Condition

Engine assembly removed (WP 0021 00)

Flywheel assembly removed (WP 0030 00)

Oil pan plate removed (WP 0034 00)

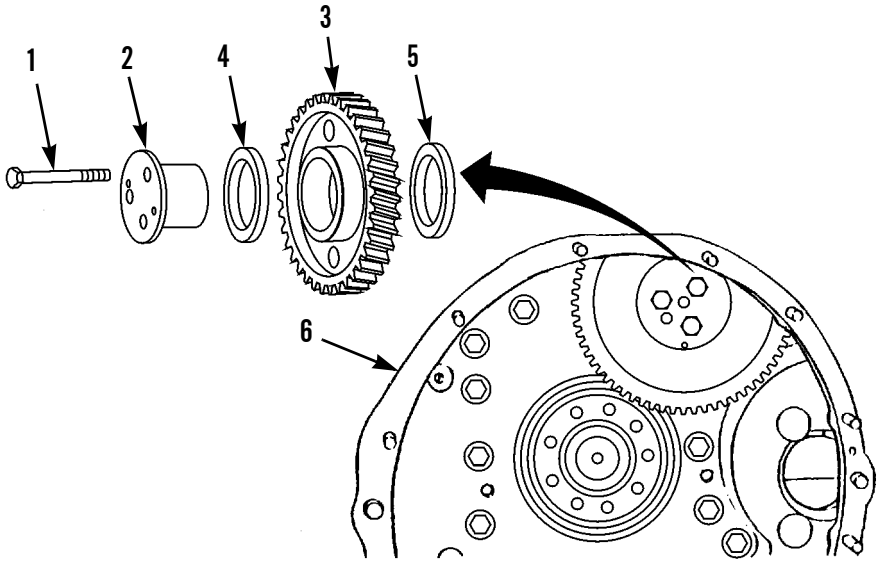
Transmission oil pump removed (WP 0118 00)

Starting motor removed (WP 0078 00)

Rear accessory drive cover removed (WP 0038 00)

REMOVAL

1. Remove three capscrews (1).
2. Remove shaft assembly (2) and gear (3). Remove washer (4) from shaft assembly (2).
3. Remove washer (5) from flywheel housing (6).



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REMOVAL - CONTINUED

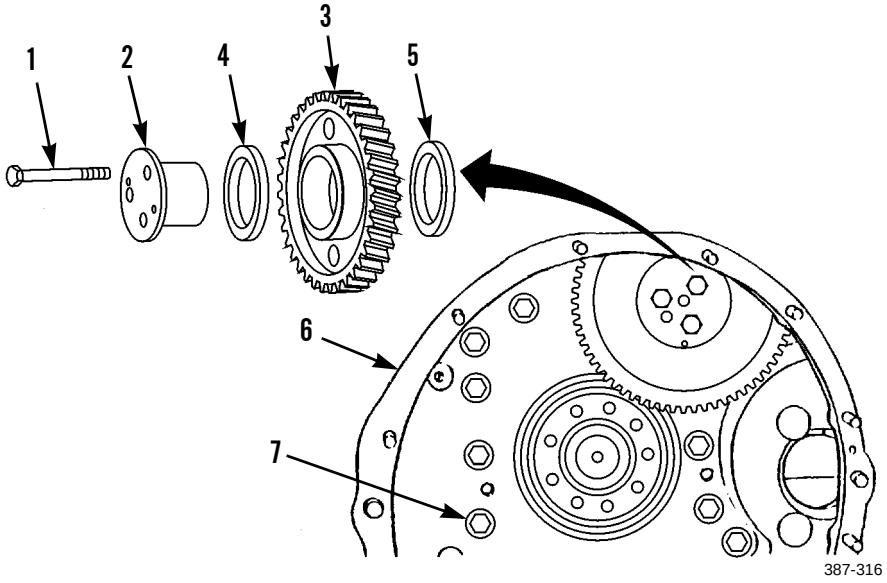
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Flywheel housing weighs approximately 350 lb (159 kg).

4. Fasten lifting equipment to flywheel housing (6).
5. Remove 13 capscrews (7) that hold flywheel housing (6) in place.



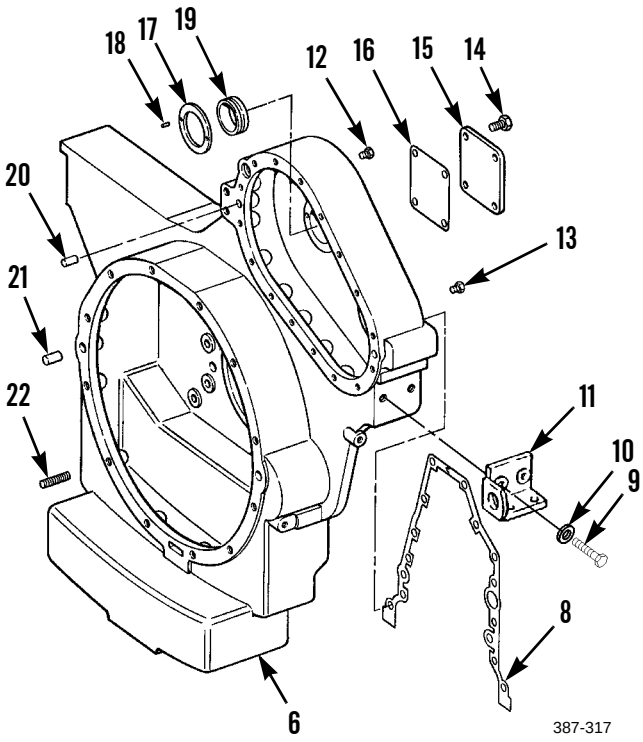
6. Remove flywheel housing (6).
7. Remove and discard gasket (8) from flywheel housing (6).

DISASSEMBLY

1. Remove rear accessory drive gears (WP 0037 00).
2. Remove four capscrews (9) and washers (10) from each side of flywheel housing (6) and remove two brackets (11).
3. Remove plug (12).
4. Remove plug (13).
5. Remove four capscrews (14), cover (15) and gasket (16). Discard gasket.
6. Remove two washers (17) and pins (18).
7. Use a bearing puller to remove two bearings (19).
8. If necessary, remove dowels (20 and 21) and stud (22) from flywheel housing (6).

ASSEMBLY

1. If removed, install dowels (20 and 21) and stud (22) into housing (6). Tighten studs to 40 lb-ft (54 Nm).
2. Use a suitable driving tool to install two bearings (19).
3. Install two washers (17) and pins (18).
4. Install cover (15) and new gasket (16) with four capscrews (14).
5. Install plug (13).
6. Install plug (12).
7. Position two brackets (11) on flywheel housing (6) and install four washers (10) and capscrews (9).
8. Install rear accessory drive gears (WP 0037 00).



INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Flywheel housing weighs approximately 350 lb (159 kg).

1. Fasten lifting equipment to flywheel housing (6).

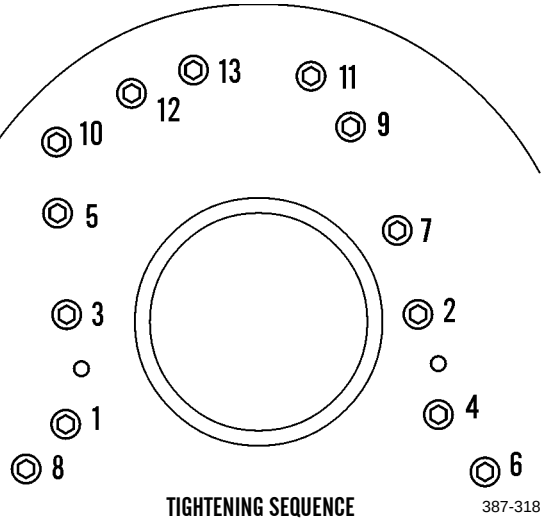
NOTE

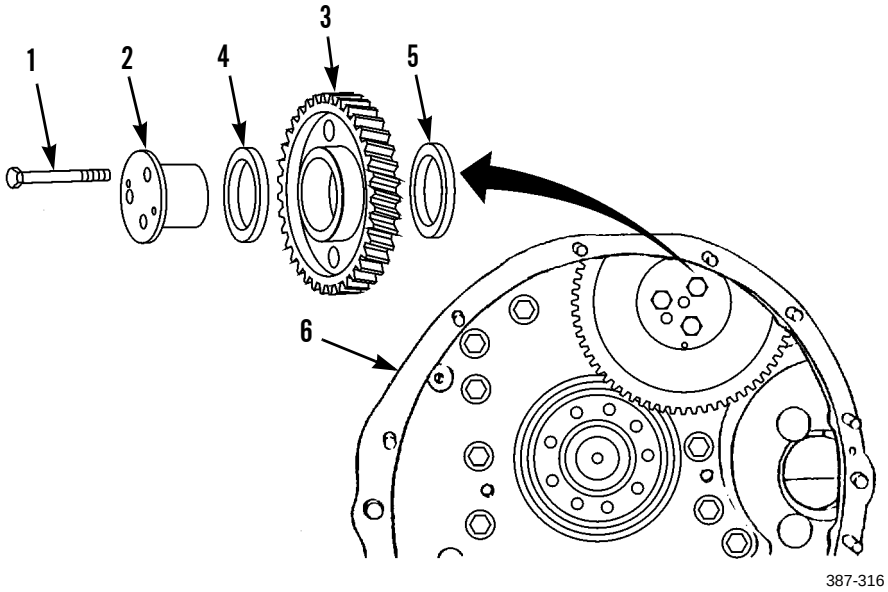
Ensure all mounting surfaces are clean and dry.

2. Install new gasket (8) on flywheel housing (6).
3. Use lifting equipment to place flywheel housing (6) in position against cylinder block.

INSTALLATION - CONTINUED

4. Install 13 capscrews (7) to hold flywheel housing (6) in place. Ensure two shorter capscrews go into positions 7 and 2.
5. Tighten 13 capscrews (7) in number sequence shown to 75 lb-ft (102 Nm).
6. Cut gasket (8) even with oil pan face of cylinder block.
7. Apply grease on washer (5) and install washer in flywheel housing (6).
8. Install washer (4) on shaft assembly (2).
9. Place gear (3) and shaft assembly (2) in flywheel housing (6).
10. Install three capscrews (1) to hold shaft assembly (2) in place.





11. Install starting motor (WP 0078 00).
12. Install transmission oil pump (WP 0118 00).
13. Install oil pan plate (WP 0034 00).
14. Install flywheel assembly (WP 0030 00).
15. Install accessory drive cover (WP 0038 00).
16. Install engine assembly (WP 0021 00).
17. Run engine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

VALVE LIFTERS REPLACEMENT 0032 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Materials/Parts - Continued

Oil, lubricating (Item 26, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

References

TM 5-2410-237-10

Equipment Condition

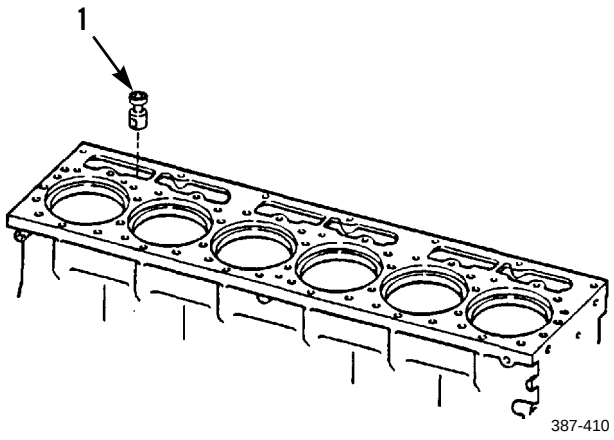
Cylinder head removed (WP 0025 00)

REMOVAL

NOTE

If original lifters are to be reinstalled, they must be placed in their original locations.

1. Identify valve lifter locations.
2. Use a magnet to remove valve lifters (1).



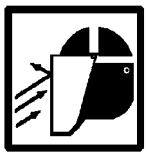
CLEANING

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Clean valve lifters and valve lifter bores in cylinder block with solvent cleaning compound.

CLEANING - CONTINUED



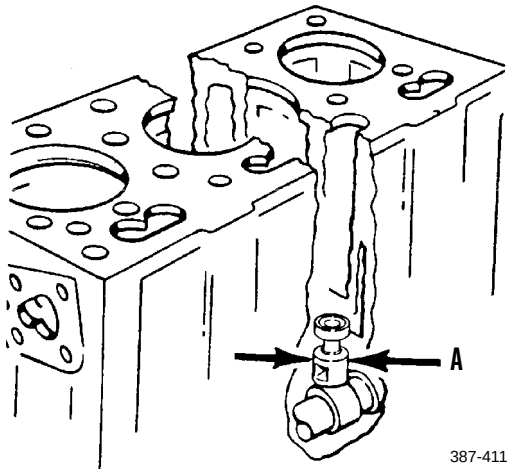
WARNING

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

2. Dry thoroughly using low pressure air.

INSPECTION

1. Inspect valve lifters for damage and corrosion. Replace valve lifters if needed.
2. Refer to Table 1 for wear limits and specifications applicable to valve lifters. If diameter of valve lifter is not within specified limits, replace valve lifter.



3. Refer to Table 1 for valve lifter bore specifications. If valve lifter bore in cylinder block is not within limits specified, engine must be rebuilt.

.

Table 1. Wear Limits and Specifications.

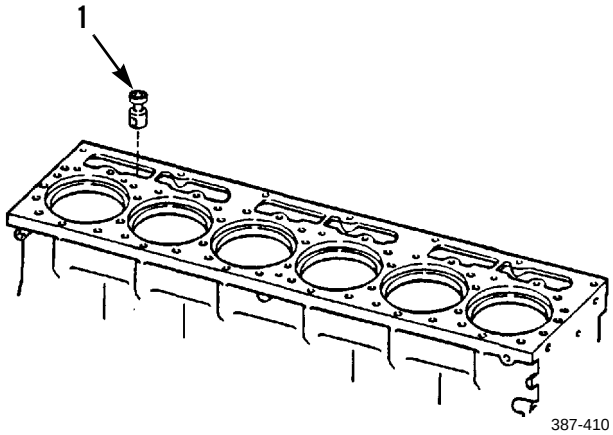
Diameter (dimension “A”) of valve lifter (new)	1.3105 in. +/- 0.0005 in. (33.287 mm +/- 0.013 mm)
Bore (dimension “A”) in block for valve lifter (new)	1.3145 in. +/- 0.0020 in. (33.388 mm +/- 0.050 mm)
Maximum permissible clearance between lifter and bore for valve lifter (worn)	0.012 in. (0.30 mm)

INSTALLATION

NOTE

- **If original valve lifters are being installed, they must be installed in their original locations.**
- **Coat valve lifters and camshaft lobes with clean oil prior to installation.**

1. Use a magnet to install valve lifters (1) into cylinder block.
2. Install cylinder head (WP 0025 00).
3. Run engine and check for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

ENGINE OIL PAN REPLACEMENT 0033 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Silicone, compound, RTV (Item 10, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Gasket (5 and 12)

Equipment Condition

Crankcase guard removed (WP 0157 00)

Engine oil drained (WP 0011 00)

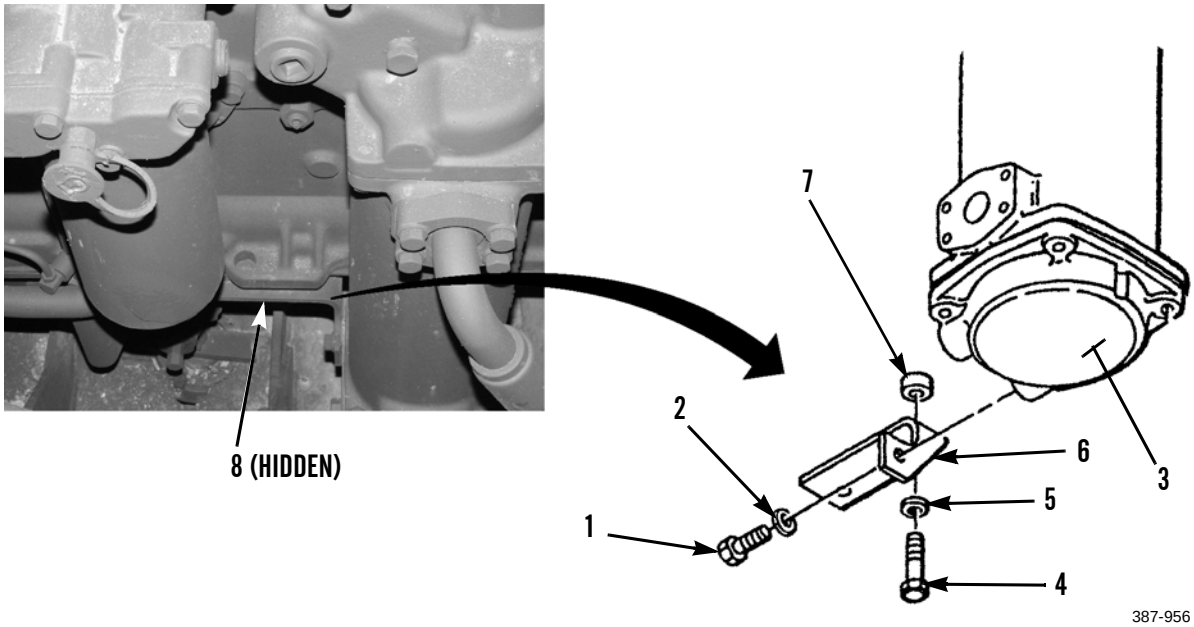
Engine oil level gage tube removed (WP 0012 00)

REMOVAL

NOTE

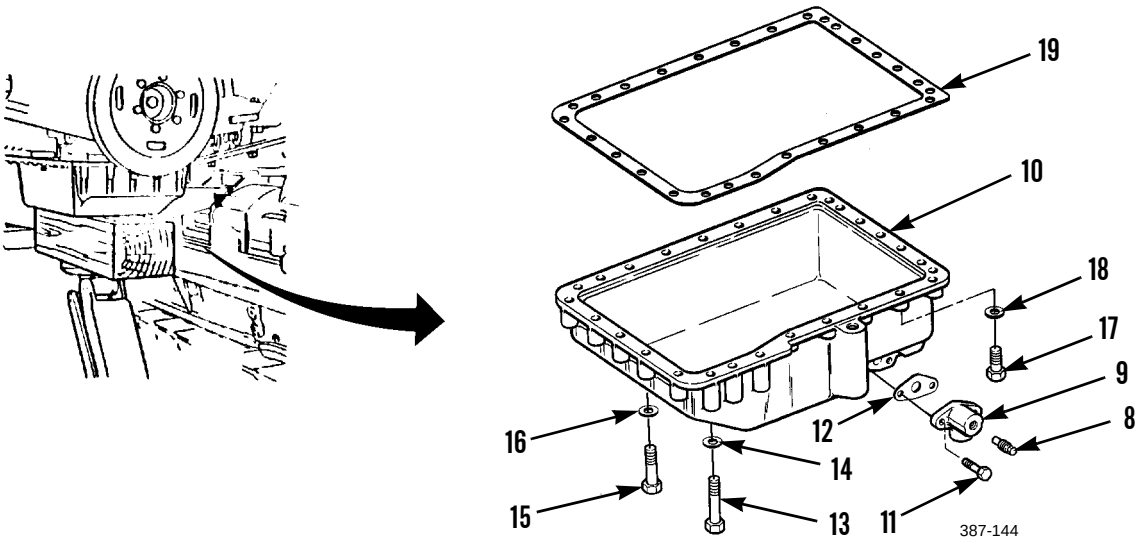
Use a suitable container to catch residual draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

1. Remove capscrew (1) and washer (2) from transmission oil cooler (3).
2. Remove two capscrews (4) washers (5), bracket (6) and spacers (7) from oil pan.



REMOVAL - CONTINUED

3. Remove plug (8) from adapter (9) on oil pan (10).
4. Remove two capscrews (11), adapter (9) and gasket (12) from oil pan (10). Discard gasket.
5. Position floor jack under oil pan (10).
6. Remove three 3-1/4 in. capscrews (13) and washers (14) from oil pan (10).
7. Remove five 2-3/4 in. capscrews (19) and washers (16) from oil pan (10).
8. Remove twenty 1-1/2 in. capscrews (17) and washers (18) from oil pan (10).
9. Lower floor jack and remove oil pan (10) and gasket (19) from engine. Discard gasket.



INSTALLATION

Exposure to silicone RTV compound may be hazardous to your health. Contact with eyes can cause severe irritation and burns. Compound can be absorbed into the skin and can cause irritation or skin sensitization. Inhalation of vapors can cause respiratory tract irritation; prolonged inhalation can result in an allergic reaction. Vapors are combustible. Do not use near open flame. Wear eye and skin protection and avoid inhalation of vapors. Use only in a well-ventilated area. Failure to follow this warning can cause injury or death.

NOTE

- **Ensure mating surface on oil pan and engine is clean.**
- **Apply a thin layer of silicone compound on oil pan to provide a seal and to keep gasket in place.**

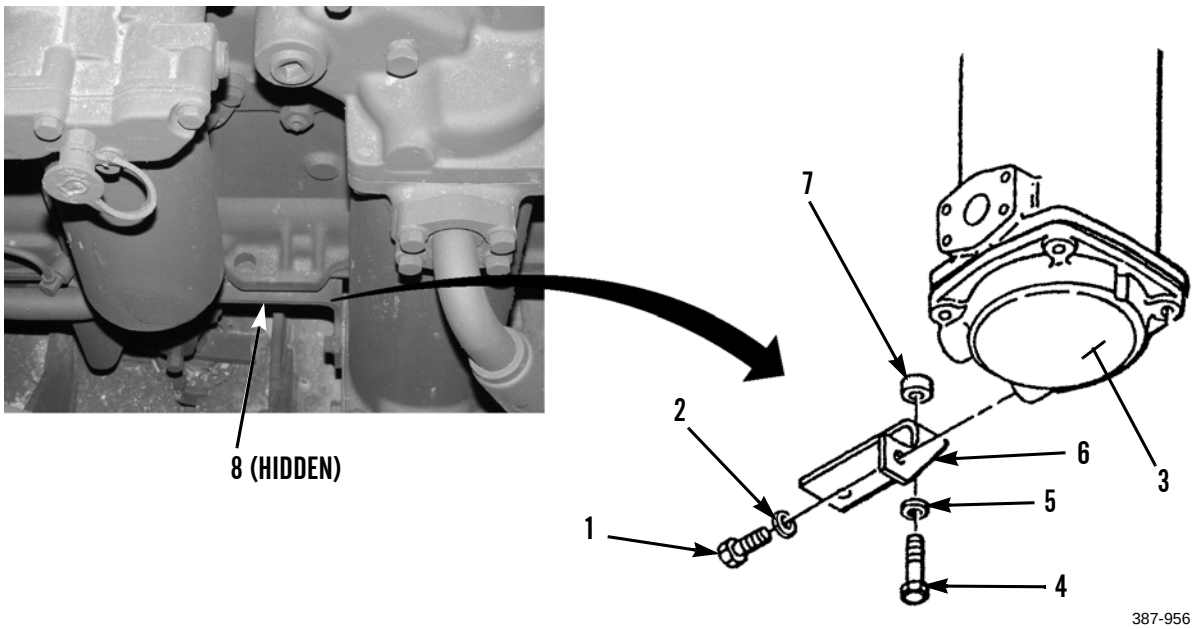
1. Position new gasket (19) on oil pan (10), then apply silicone compound to top side of gasket.
2. Use a floor jack to position oil pan (10) onto engine.

INSTALLATION - CONTINUED

NOTE

To ensure a leak-free seal, ensure capscrews are tightened evenly.

3. Install 20 1-1/2 in. capscrews (17) and washers (18) to secure oil pan (10) to engine.
4. Install five 2-3/4 in. capscrews (15) and washers (16).
5. Install three 3-1/4 in. capscrews (13) and washers (14).
6. Remove floor jack from oil pan (10).
7. Install new gasket (12) and adapter (9) to oil pan (10) with two capscrews (11).
8. Install plug (8) in adapter (9).
9. Install two spacers (7), bracket (6), washers (5) and capscrews (4) to oil pan.
10. Install washer (2) and capscrews (1) to transmission oil cooler (3).



11. Install engine oil filler tube (WP 0012 00).
12. Fill engine with oil (WP 0011 00).
13. Run engine and check for leaks and proper operation.
14. Install crankcase guard (WP 0157 00).

END OF WORK PACKAGE

OIL PAN PLATE REPLACEMENT 0034 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Compound, silicone, RTV (Item 10, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Gasket (11 and 14)

Lock (5)

Seal (18)

References

TM 5-2410-237-10

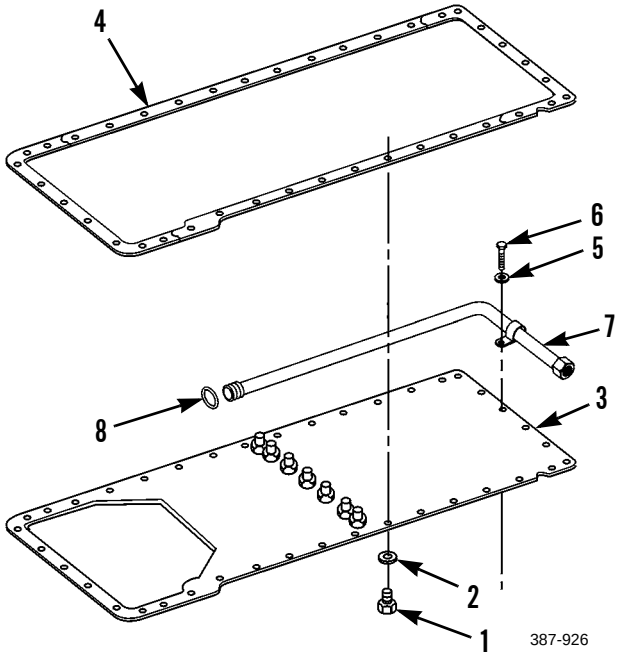
Equipment Condition

Engine oil pan removed (WP 0033 00)

Engine oil pump removed (WP 0035 00)

REMOVAL

1. Remove 18 capscrews (1) and washers (2) that hold oil pan plate (3) in place. Remove oil pan plate from engine block.
2. Remove and discard gasket (4) on oil pan plate (3).
3. Bend lock (5) down. Remove capscrew (6) which holds oil pickup tube (7) to oil pan plate (3). Discard lock.
4. Remove oil pickup tube (7) and seal (8). Discard seal.



INSTALLATION

1. Install oil pickup tube (7) and new seal (8) to oil pan plate (3).
2. Install new lock (5) and capscrew (6) to secure oil pickup tube (7) on oil pan plate (3). Bend lock up.
3. Wipe surface of oil pan plate (3) clean.

WARNING

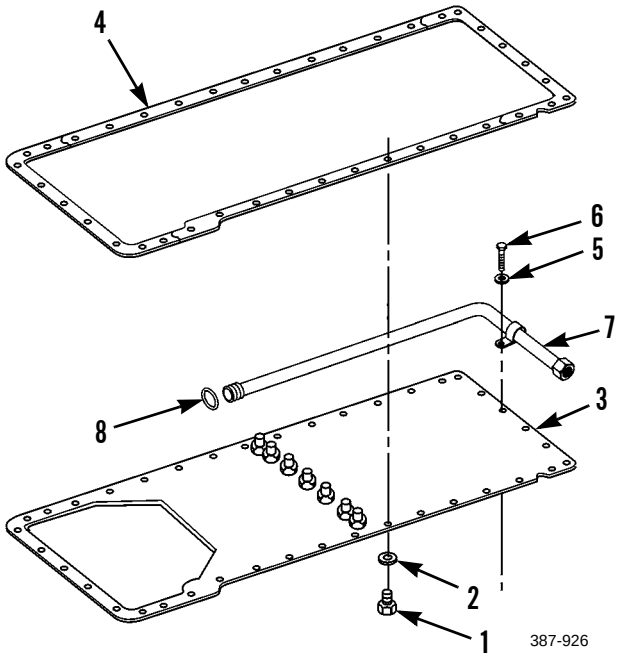
Exposure to silicone RTV compound may be hazardous to your health. Contact with eyes can cause severe irritation and burns. Compound can be absorbed into the skin and can cause irritation or skin sensitization. Inhalation of vapors can cause respiratory tract irritation; prolonged inhalation can result in an allergic reaction. Vapors are combustible. Do not use near open flame. Wear eye and skin protection and avoid inhalation of vapors. Use only in a well-ventilated area. Failure to follow this warning can cause injury or death.

4. Lightly coat both sides of new gasket (4) with silicone compound. Install gasket on oil pan plate (3).

NOTE

To ensure a leak-free seal, ensure capscrews are tightened evenly.

5. Position oil pan plate (3) on engine block with 18 capscrews (1) and washers (2).
6. Install engine oil pump (WP 0035 00).
7. Install oil pan (WP 0033 00).



END OF WORK PACKAGE

ENGINE OIL PUMP REPLACEMENT 0035 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Gasket (4 and 11)

Personnel Required

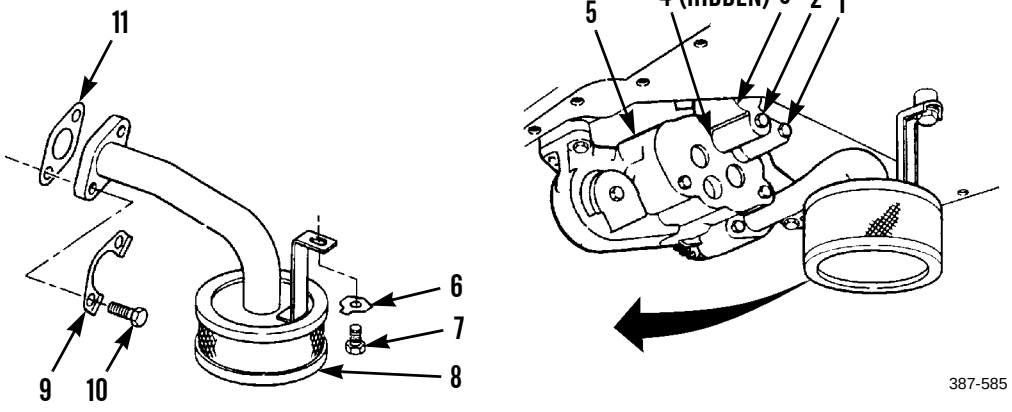
Two

Equipment Condition

Engine oil pan removed (WP 0033 00)

REMOVAL

1. Remove two capscrews (1 and 2) from elbow (3).
2. Remove elbow (3) and gasket (4) from oil pump (5) and slide elbow to the rear. Discard gasket.
3. Bend lock (6) away from capscrew (7) on strainer (8). Remove capscrew and lock.
4. Bend lock (9) away from two capscrews (10). Remove two capscrews and strainer (8) from oil pump (5). Remove and discard gasket (11).

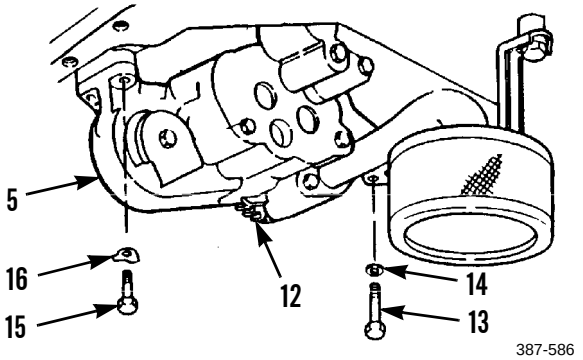


REMOVAL - CONTINUED

WARNING

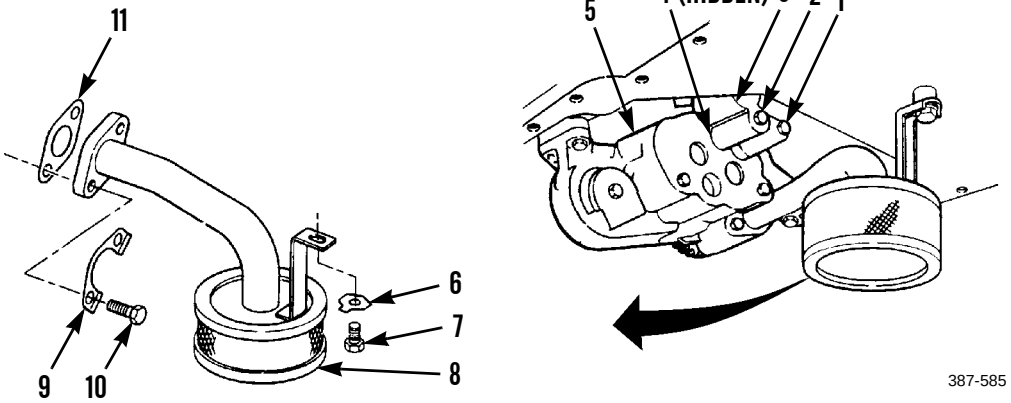
Oil pump idler gear is free to fall when oil pump is removed.

5. Have assistant hold onto oil pump (5) and idler gear (12). Remove two capscrews (13) and washers (14).
6. Bend locks (16) away from capscrews (15).
7. Remove two capscrews (15), locks (16) and oil pump (5).



INSTALLATION

1. While assistant holds oil pump (5) and idler gear (12), position oil pump on engine. Install two locks (16) and capscrews (15). Bend locks to secure capscrews.
2. Install two washers (14) and capscrews (13).
3. Position strainer (8) with new gasket (11). Install lock (9) and two capscrews (10). Bend lock to secure capscrews.
4. Install lock (6) and capscrew (7) on strainer (8). Bend lock to secure capscrew.
5. Reposition elbow (3) and install new gasket (4) and elbow to oil pump (5) with two capscrews (1 and 2).
6. Install oil pan (WP 0033 00).
7. Run engine and check for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

EXHAUST MANIFOLD REPLACEMENT 0036 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Gasket (11)

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Turbocharger removed (WP 0049 00)

Fuel injection lines removed (WP 0044 00)

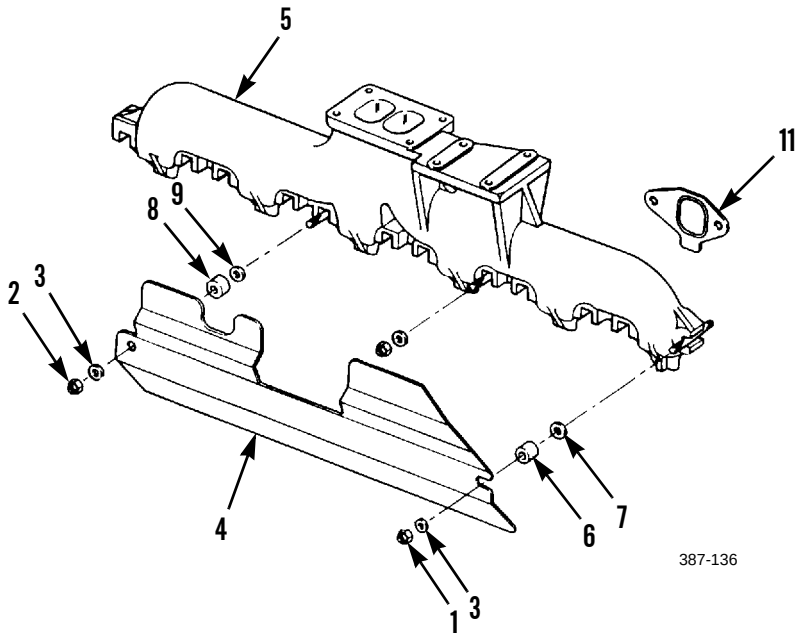
REMOVAL

1. Remove nut (1), nut (2), two washers (3) and heat shield (4) from exhaust manifold (5).

NOTE

Note position of spacers and washers in steps 2 and 3 to ensure correct installation.

2. Remove spacer (6) and washer (7).
3. Remove spacer (8) and washer (9).



REMOVAL - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury.

NOTE

Exhaust manifold weighs 37 lb (17 kg).

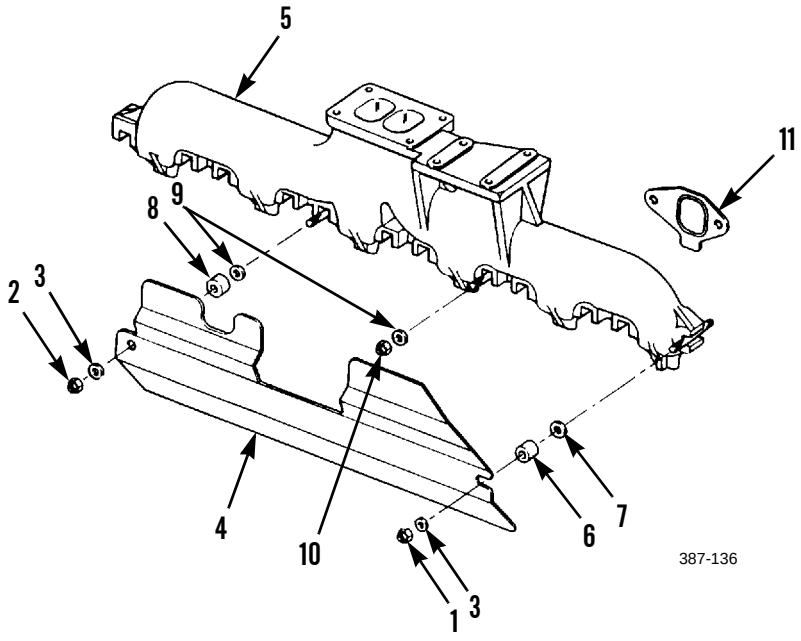
4. Remove ten nuts (10) and washers (9) that hold exhaust manifold (5) to cylinder head.
5. Remove exhaust manifold (5).
6. Remove and discard six gaskets (11).

INSTALLATION

NOTE

- **If exhaust manifold studs are loose or if new exhaust manifold studs are being used, apply antiseize compound on threads to be installed in cylinder head and tighten studs to 20 lb-ft (27 Nm).**
- **Ensure mating surfaces on exhaust manifold and cylinder head are clean and dry.**

1. Install six new gaskets (11) on cylinder head studs.
2. Apply antiseize compound on threads of exhaust manifold studs.



INSTALLATION - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury.

NOTE

Exhaust manifold weighs 37 lb (17 kg).

3. Position exhaust manifold (5) on studs and install ten washers (9) and nuts (10). Tighten nuts to 32 lb-ft (43 Nm).
4. Install washer (9) and spacer (8) in location as noted during removal.
5. Install washer (7) and spacer (6) in location as noted during removal.
6. Install heat shield (4) on exhaust manifold (5) with two washers (3) and nuts (1 and 2).
7. Install fuel injection lines (WP 0044 00).
8. Install turbocharger (WP 0049 00).
9. Run engine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

REAR ACCESSORY DRIVE GEARS REPLACEMENT 0037 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

References

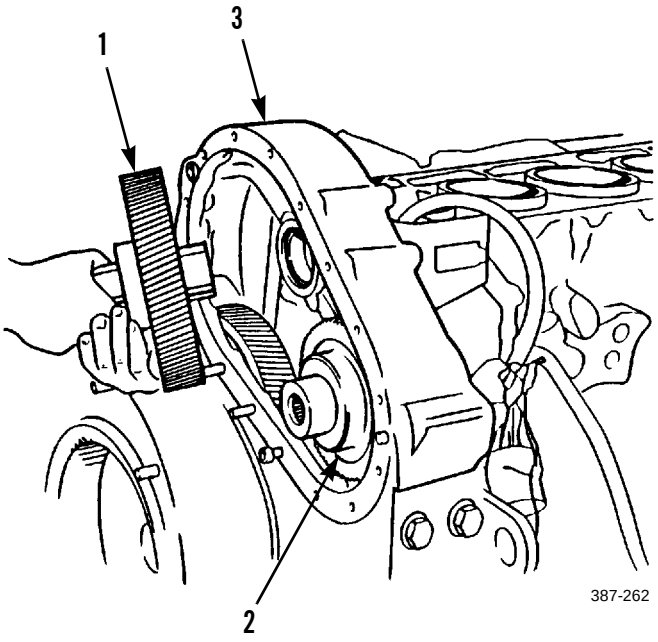
TM 5-2410-237-10

Equipment Condition

Rear accessory drive cover assembly removed (WP 0038 00)

REMOVAL

1. Remove gears (1 and 2) from flywheel housing (3).



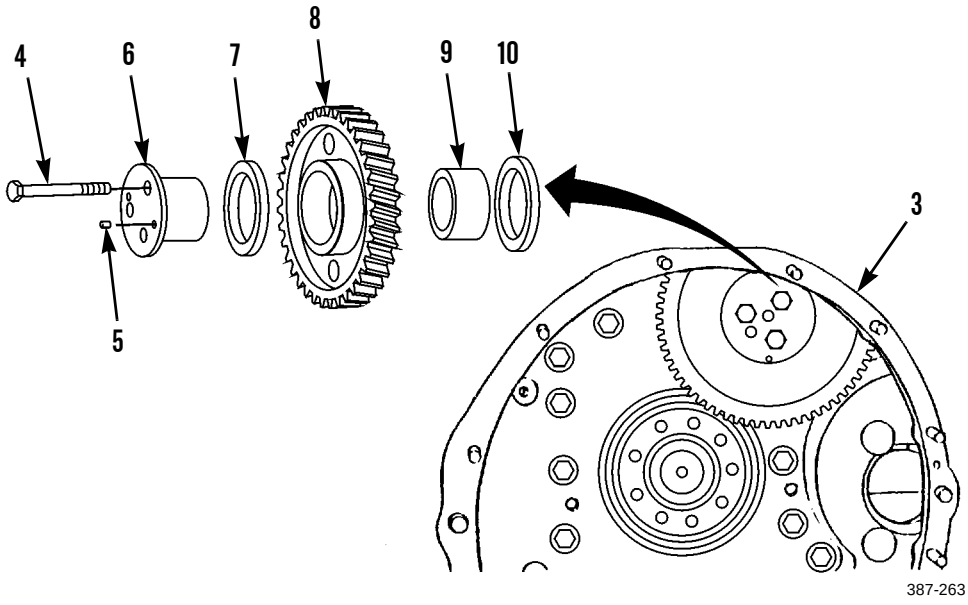
REAR ACCESSORY DRIVE GEARS REPLACEMENT - CONTINUED 0037 00

REMOVAL - CONTINUED

2. If idler gear (8) is to be removed, perform the following steps:
   a. Remove three capscrews (4), dowel (5), shaft (6), washer (7) and idler gear (8) from flywheel housing (3).
   b. If necessary, use a bearing puller to remove bearing (9) and washer (10) from flywheel housing (3).

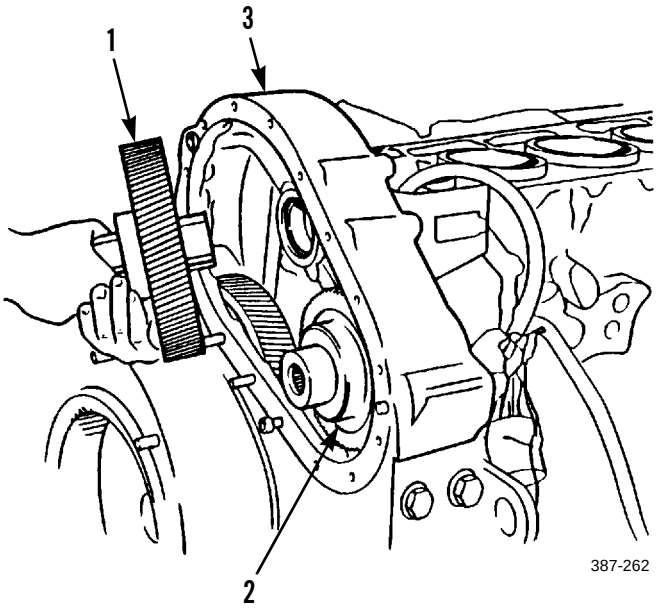
INSTALLATION

1. To install idler gear (8), perform the following steps:
   a. Use driver to install bearing (9) and washer (10) into flywheel housing (3).
   b. Place idler gear (8), washer (7), shaft (6) and dowel (5) into position. Install three capscrews (4) that secure shaft assembly to flywheel housing (3).



387-263

2. Install drive gear (2) and then drive gear (1) into flywheel housing (3).
3. Install rear accessory drive gear cover assembly (WP 0038 00).
4. Run engine and check for proper operation (TM 5-2410-237-10).



387-262

END OF WORK PACKAGE

REAR ACCESSORY DRIVE COVER ASSEMBLY REPLACEMENT 0038 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Gasket (3 and 8)

Materials/Parts - Continued

Seal (9)

References

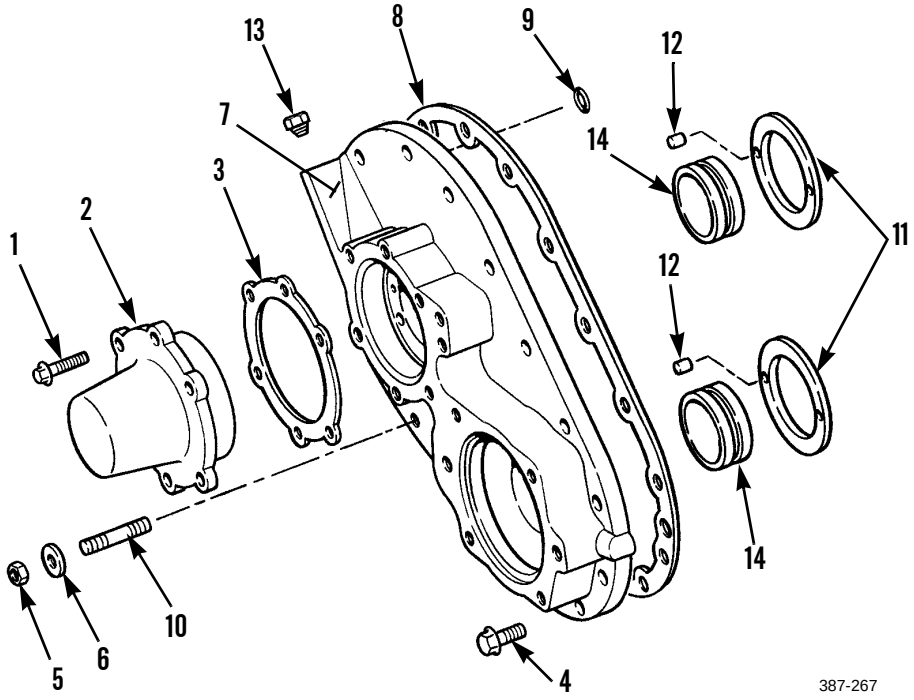
TM 5-2410-237-10

Equipment Condition

Dash assembly removed (WP 0160 00)
Hydraulic pump removed (WP 0199 00)
Winch pump removed (if equipped) (WP 0189 00)

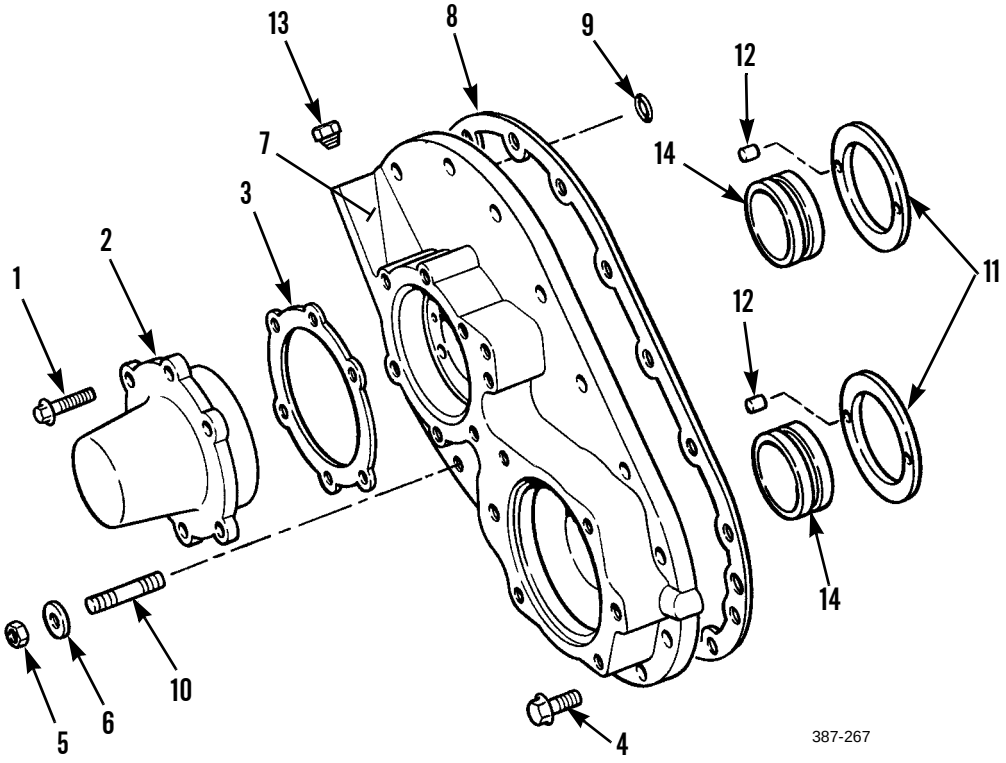
REMOVAL

1. Remove six capscrews (1) from cover (2). Remove cover and gasket (3). Discard gasket.
2. Remove 13 capscrews (4), three nuts (5) and washers (6). Remove cover (7).
3. Remove gasket (8) and seal (9). Discard gasket and seal.
4. If necessary, remove three studs (10) from flywheel housing.
5. If necessary, remove two washers (11), pins (12) and plug (13). Use a bearing puller to remove two bearings (14) from cover (7).



INSTALLATION

1. If removed, install two bearings (14) and pins (12) into cover (7) and place two washers (11) onto pins. Install plug (13).
2. If removed, insert three studs (10) into flywheel housing.
3. Install new seal (9) and new gasket (8) on cover (7).
4. Install cover (7) on three studs (10) on flywheel housing. Secure cover on studs with three washers (6) and nuts (5).
5. Install 13 capscrews (4) around cover (7).
6. Install new gasket (3) and cover (2) to cover (7) and secure with six capscrews (1).



7. Install hydraulic pump (WP 0199 00).
8. If removed, install winch pump (WP 0189 00).
9. Install dash assembly (WP 0160 00).
10. Run engine and check for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

FUEL SYSTEM THEORY OF OPERATION 0039 00

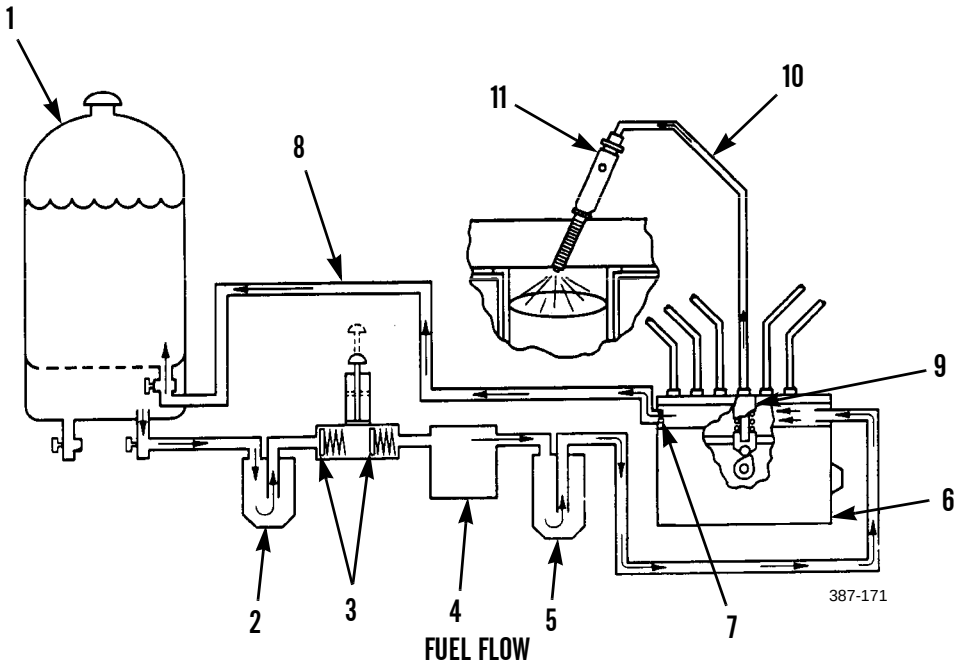
FUEL FLOW

1. Fuel is pulled from fuel tank (1) through primary fuel filter (2) and priming pump check valves (3) by fuel transfer pump (4). From the fuel transfer pump, the fuel is pushed through secondary fuel filter (5) and to the fuel manifold in fuel injection pump housing (6). The pumping spring in the fuel transfer pump keeps the fuel pressure in the system at 25-42 psi (172-290 kPa). Constant bleed orifice (7) lets a constant flow of fuel go though fuel return line (8) back to fuel tank (1). This helps keep the fuel cool and free of air.

2. Fuel injection pump (9) gets fuel from the fuel manifold and pushes fuel at very high pressure through fuel line (10) to fuel injection nozzle (11). The fuel injection nozzle has very small holes in the tip that change the flow of fuel to a very fine spray that gives good fuel combustion in the cylinder.

FUEL INJECTION PLUNGER AND BARREL

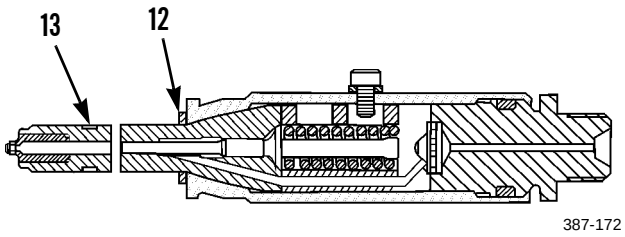
The fuel injection plunger and barrel (9) increases the pressure of the fuel and sends an exact amount of fuel to the fuel injection nozzle (11). There is one fuel injection plunger and barrel for each cylinder in the engine.



FUEL INJECTION NOZZLE

1. The fuel injection nozzle goes through the cylinder head into the combustion chamber. The fuel injection pump sends fuel with high pressure to the fuel injection nozzle where the fuel is made into a fine spray for good combustion.

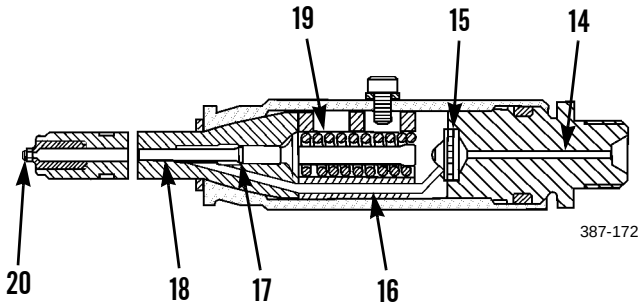
2. Seal (12) goes against the cylinder head and prevents leakage of compression from the cylinder. Carbon dam (13) keeps carbon out of the bore in the cylinder head for the nozzle.



FUEL SYSTEM THEORY OF OPERATION - CONTINUED 0039 00

FUEL INJECTION NOZZLE - CONTINUED

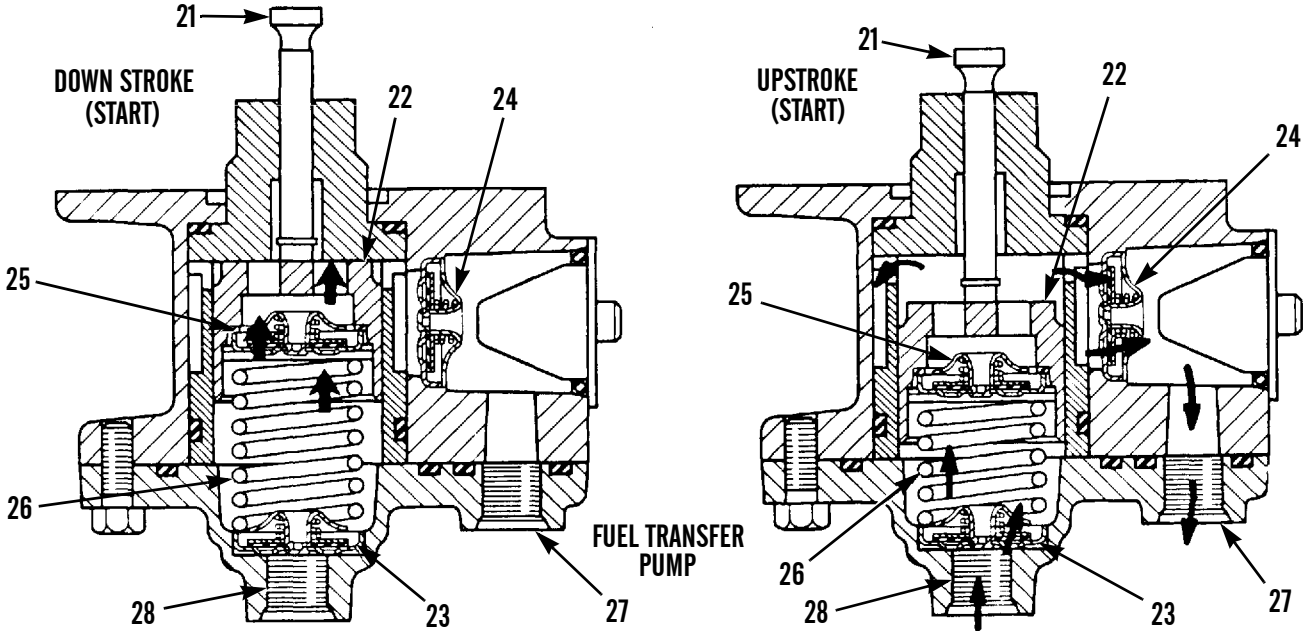
3. Fuel with high pressure from the fuel injection pump goes into inlet passage (14). Fuel then goes through filter screen (15) and into passage (16) to the area below diameter (17) of valve (18). When the pressure of the fuel that pushes against diameter (17) becomes greater than the force of spring (19), valve (18) lifts up. When valve (18) lifts, the tip of the valve comes off of the nozzle seat and the fuel will go though the nine 0.008 in. (0.203 mm) orifices (20) into the combustion chamber.
4. The injection of fuel continues until the pressure of fuel against diameter (17) becomes less than the force of spring (19). With less pressure against diameter (17), spring (19) pushes valve (18) against the nozzle seat and stops the flow of fuel to the combustion chamber.



FUEL INJECTION NOZZLE

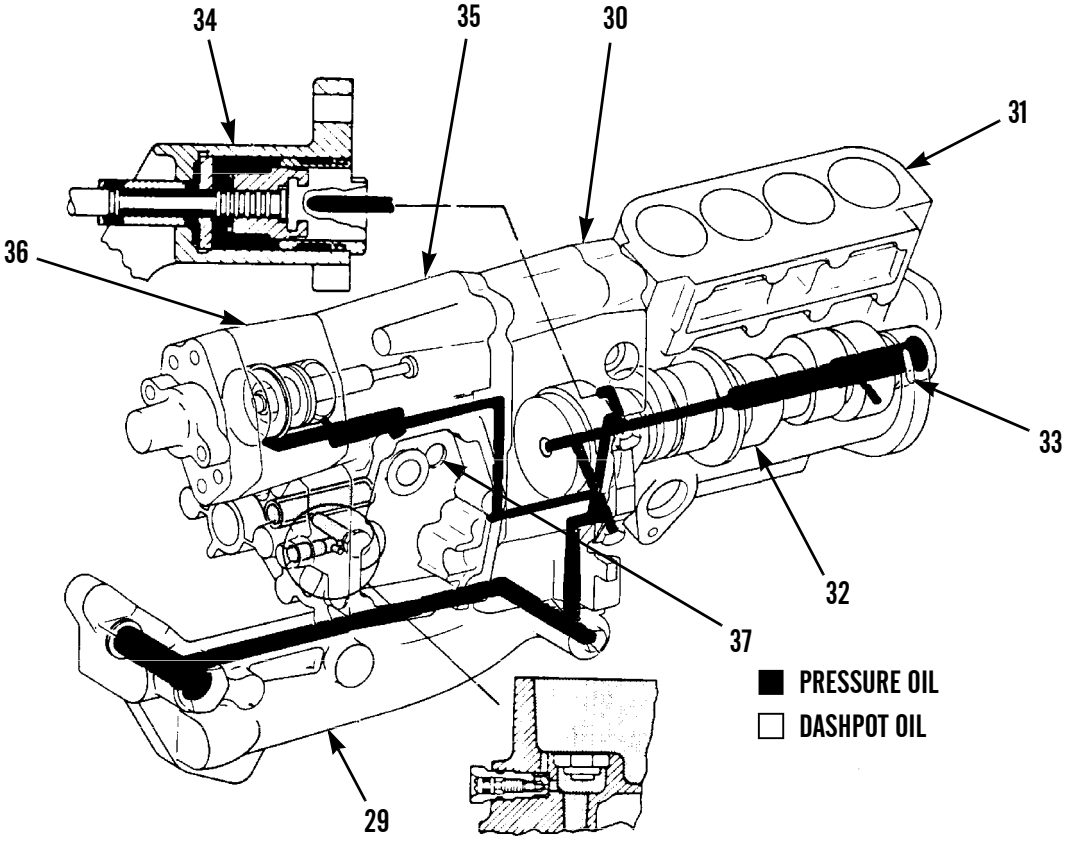
FUEL TRANSFER PUMP

1. The fuel transfer pump is a piston pump that is moved by a cam (eccentric) on the fuel injection pump camshaft. The transfer pump is located on the bottom side of the fuel injection pump housing.
2. When the fuel injection pump camshaft turns, the cam moves push rod (21) and piston (22) down. As the piston moves down, inlet check valve (23) and outlet check valve (24) close. Pumping check valve (25) opens and allows the fuel below the piston to move into the area above the piston. Pumping spring (26) is compressed as the piston is pushed down by push rod (21).
3. As the fuel injection pump camshaft continues to turn, the cam no longer puts force on push rod (21). Pumping spring (26) now moves piston (22) up. This causes pumping check valve (25) to close. Inlet check valve (23) and outlet check valve (24) will open. As the piston moves up, the fuel in the area above the piston is pushed through the outlet check valve (24) and out pump outlet port (27). Fuel also moves through pump inlet port (28) and inlet check valve (23) to fill the area below piston (22). The pump is now ready to start a new cycle.



OIL FLOW FOR FUEL INJECTION PUMP AND GOVERNOR

1. Oil from the side of the cylinder block goes to support (29) and into the bottom of front governor housing (30). The flow of oil now goes in three different directions.
   a. A part of the oil goes to the rear camshaft bearing in fuel injection pump housing (31). The bearing has a groove around the inside diameter. Oil goes through the groove and into the oil passage in the bearing surface (journal) of camshaft (32). A drilled passage through the center of the camshaft gives oil to the front camshaft bearing and to the thrust face of the camshaft drive gear. Drain hole (33) in the front of fuel injection pump housing (31) keeps the level of the oil in the housing even with the center of the camshaft. The oil returns to the oil pan through the timing gear housing.
   b. Oil also goes from the bottom of the front governor housing (30) through a passage to the fuel injection pump housing and to governor servo (34). The governor servo gives hydraulic assistance to move the fuel rack.
   c. The remainder of the oil goes through passages to the rear of rear governor housing (35), through air fuel ratio control (36) and back into another passage in the rear governor housing. Now the oil goes into the compartment for the governor controls. Drain hole (37) keeps the oil at the correct level. The oil in this compartment is used for lubrication of the governor control components and the oil is the supply for the dashpot.
2. The internal parts of the governor are lubricated by oil leakage from the servo (34) and the oil is thrown by parts in rotation. The flywheel carrier thrust bearing gets oil from the passage at the rear of the camshaft.
3. Oil from the governor returns to the oil pan through a hole in the bottom of the front governor housing (30) and through passages in the support (29) and cylinder block.



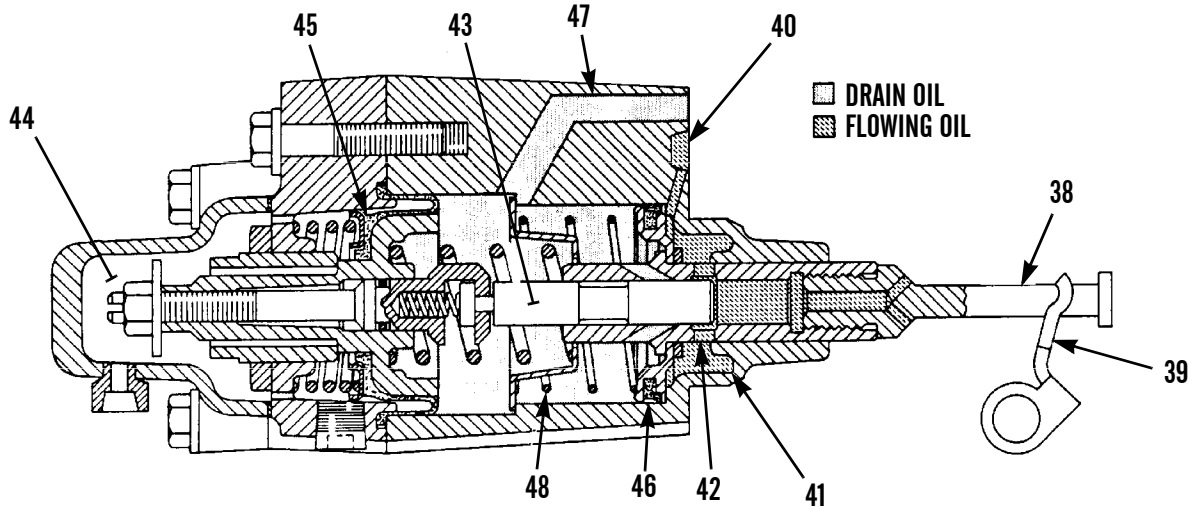
GOVERNOR AND FUEL INJECTION PUMP OIL FLOW

GOVERNOR

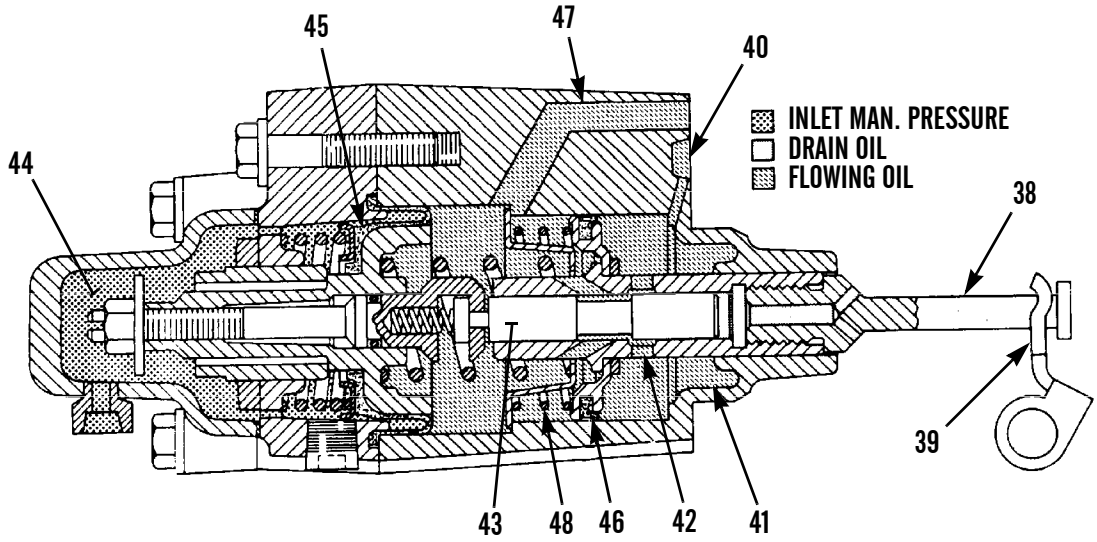
1. The governor controls the amount of fuel needed by the engine to maintain a desired rpm and controls the percent of torque rise.
2. The governor servo gives hydraulic assistance to the mechanical governor force to move the fuel rack.
3. The dashpot helps give the governor better speed control when there are sudden speed and load changes.

FUEL RATIO CONTROL

1. The air-fuel ratio control limits the amount of fuel to the cylinders during an increase of engine speed (acceleration) to reduce exhaust smoke. Stem (38) moves lever (39) which will restrict the movement of the fuel rack in the FUEL ON direction only.
2. With the engine stopped, stem (38) is in the fully extended position. The movement of the fuel rack and lever (39) is not restricted by stem (38). This gives maximum fuel to the engine for easier starts.



AIR-FUEL RATIO CONTROL-ENGINE STOPPED



AIR-FUEL RATIO CONTROL - ENGINE RUNNING

FUEL RATIO CONTROL - CONTINUED

3. After the engine is started, engine oil flows through oil inlet (40) into pressure oil chamber (41). From oil chamber (41), oil flows through oil passage (42) into internal valve (43) and out oil drain passages in stem (38).
4. Stem (38) will not move until inlet manifold pressure increases enough to move internal valve (43). A line connects the inlet manifold with inlet air chamber (44) of the air-fuel ratio control.
5. When inlet manifold pressure increases, it causes diaphragm assembly (45) to move towards the right. This also causes internal valve (43) to move to the right. When internal valve (43) moves to the right, it closes oil passage (42).
6. When oil passage (42) is closed, oil pressure increases in oil chamber (41). Oil pressure moves piston (46) and stem (38) to the left and into the operating position. The air-fuel ratio control will remain in the operating position until the engine is shut off.
7. When the governor control is moved to increase fuel to the engine, stem (38) limits the movement of lever (39) in the FUEL ON direction. The oil in oil chamber (41) acts as a restriction to the movement of stem (38) until inlet air pressure increases.
8. As the inlet air pressure increases, diaphragm assembly (45) and internal valve (43) move to the right. The internal valve opens oil passage (42), and oil in oil chamber (41) goes to oil drain passage (47). With oil pressure reduced behind piston (46), spring (48) moves the piston and stem (38) to the right. Piston and stem (46 and 38) will move until oil passage (42) is closed by internal valve (43). Lever (39) can now move to let the fuel rack go to the full fuel position. The air-fuel ratio control is designed to restrict the fuel until the air pressure in the inlet manifold is high enough for complete combustion. It prevents large amounts of exhaust smoke caused by an air-fuel mixture with too much fuel.

END OF WORK PACKAGE

FUEL INJECTION NOZZLE REPLACEMENT 0040 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Nozzle, puller group (Item 54, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Seal, carbon (4)

Washer (5)

References

TM 5-2410-237-10

WP 0041 00

Equipment Condition

Fuel injection lines disconnected (WP 0044 00)

WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel or equipment damage.

CAUTION

Use caution to ensure fuel system does not become contaminated. Keep work area clean. Install protective caps and plugs as needed. Contamination of fuel system could result in premature failure.

NOTE

Use a suitable container to catch any fuel that may drain from system. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.

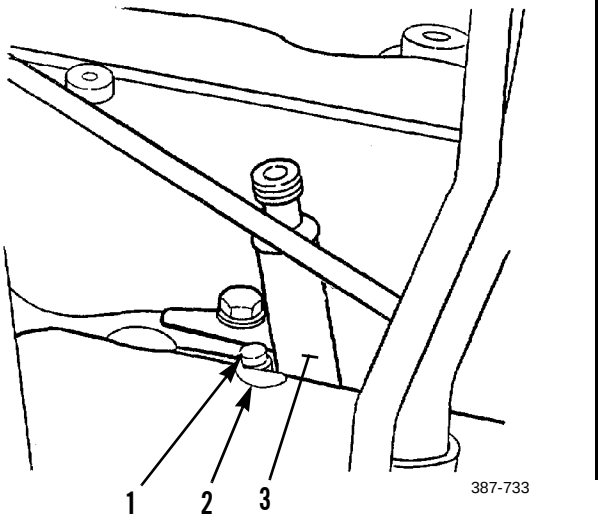
REMOVAL

1. Remove capscrew (1) and clamp (2) from fuel injection nozzle (3).

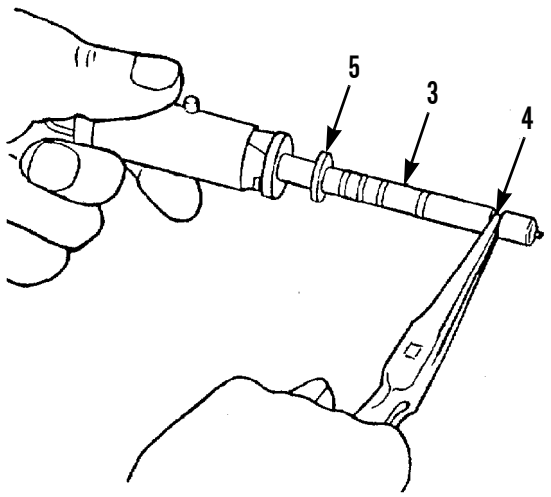
CAUTION

- **Ensure slide hammer puller tool is in alignment with fuel injection nozzle. This will prevent distortion of nozzle which can cause it to bend or break off during removal.**
- **Do not exceed 150 lb-ft (203 Nm) force on puller tool.**

2. Position puller tool on fuel injection nozzle (3) and remove nozzle from cylinder head.
3. Remove carbon seal (4) from fuel injection nozzle (3). Discard carbon seal.
4. Remove washer (5) from fuel injector nozzle (3). Discard washer.



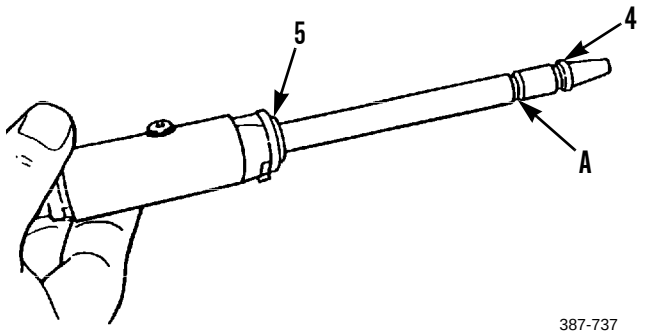
387-733



387-734

INSTALLATION

1. Install new washer (5) on fuel injection nozzle (3).
2. Install new carbon seal (4) in groove A on fuel injection nozzle (3).
3. Insert fuel injection nozzle (3) in cylinder head.
4. Install clamp (2) and capscrew (1) to secure fuel injection nozzle (3).
5. Connect fuel injection lines (WP 0044 00).
6. Bleed air from fuel system (WP 0041 00).
7. Run engine and check for leaks (TM 5-2410-237-10).



387-737

END OF WORK PACKAGE

FUEL PRIMING PUMP REPLACEMENT 0041 00

THIS WORK PACKAGE COVERS

Removal, Installation, Priming Fuel System

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Gasket (5)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

WARNING

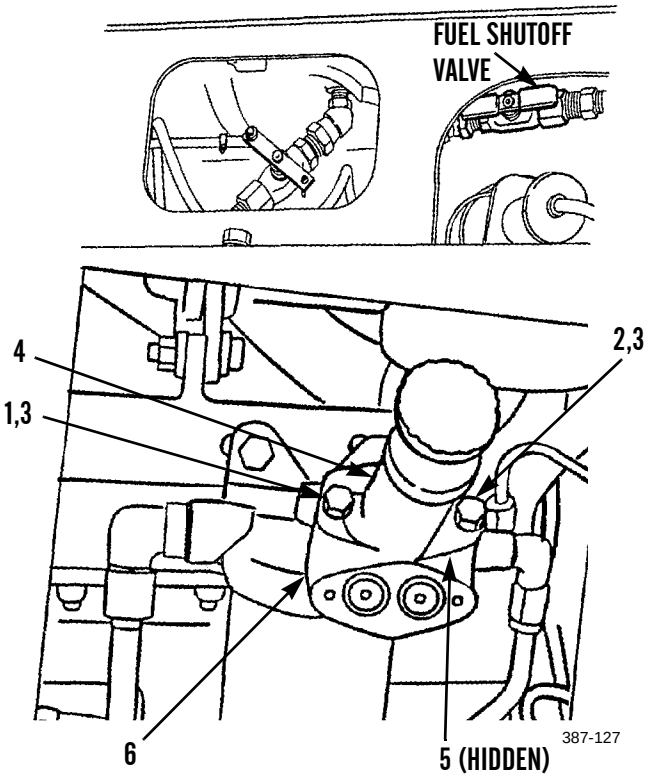
Do not perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

REMOVAL

1. Turn fuel shutoff valve at bottom of fuel tank to the OFF position.
2. Remove capscrew (1), capscrew (2) and two washers (3).
3. Remove fuel priming pump (4) and gasket (5) from primary fuel filter base (6). Discard gasket.

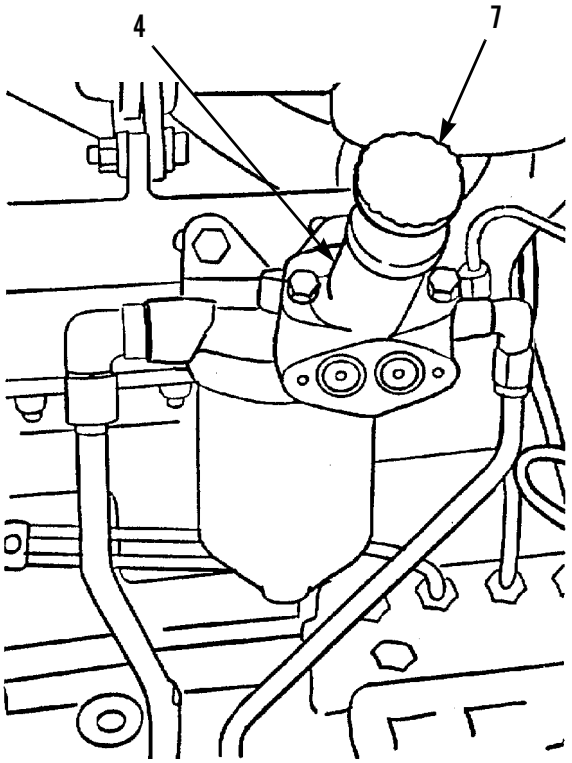
INSTALLATION

1. Position new gasket (5) and fuel priming pump (4) on primary fuel filter base (6).
2. Install capscrew (1) and washer (3).
3. Install capscrew (2) and washer (3).
4. Turn fuel shutoff valve to the ON position.
5. Prime fuel system (refer to *Priming Fuel System*).



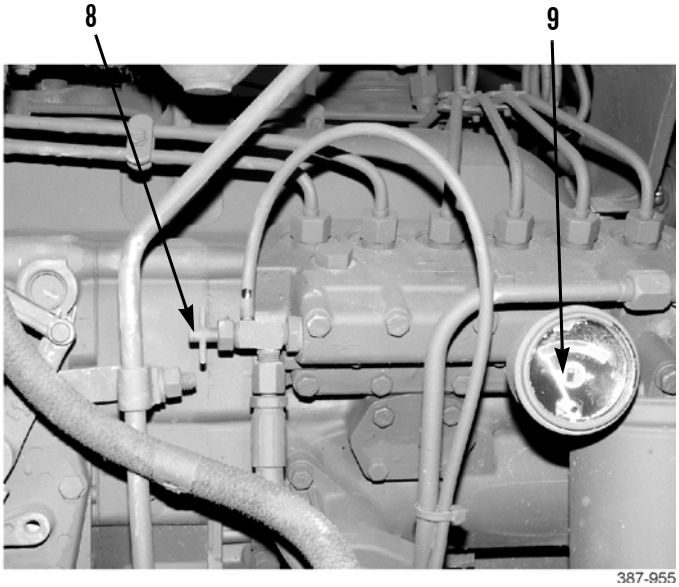
PRIMING FUEL SYSTEM

1. Unscrew knob (7) on fuel priming pump (4) until it is free to pump.



387-128

2. Place suitable container under fuel system bleed valve drain hose and open fuel system bleed valve (8).
3. Pump several times. System is primed when fuel pressure gage (9) returns to “0” immediately after pumping has stopped and fuel flows from bleed valve (8) without air bubbles. Tighten knob (7) and close bleed valve (8).
4. Run engine and check for proper operation and fuel leaks (TM 5-2410-237-10).



387-955

END OF WORK PACKAGE

FUEL TRANSFER PUMP REPLACEMENT 0042 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

O-ring (8)

Packing, preformed (3)

References

WP 0041 00

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

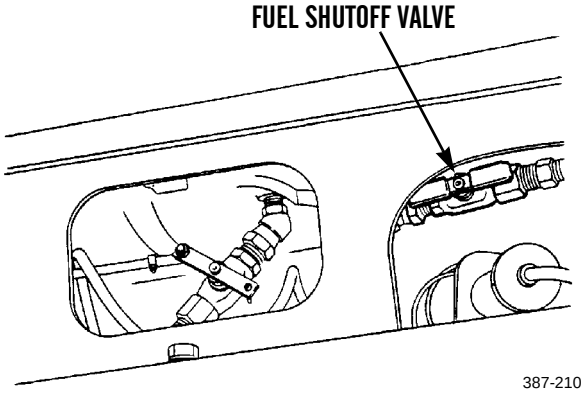
DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel or equipment damage.

CAUTION

Use caution to ensure fuel system does not become contaminated. Keep work area clean. Cap fuel lines after disconnections are made and cover all openings with a clean rag.

REMOVAL

1. Close fuel shutoff valve under fuel tank.



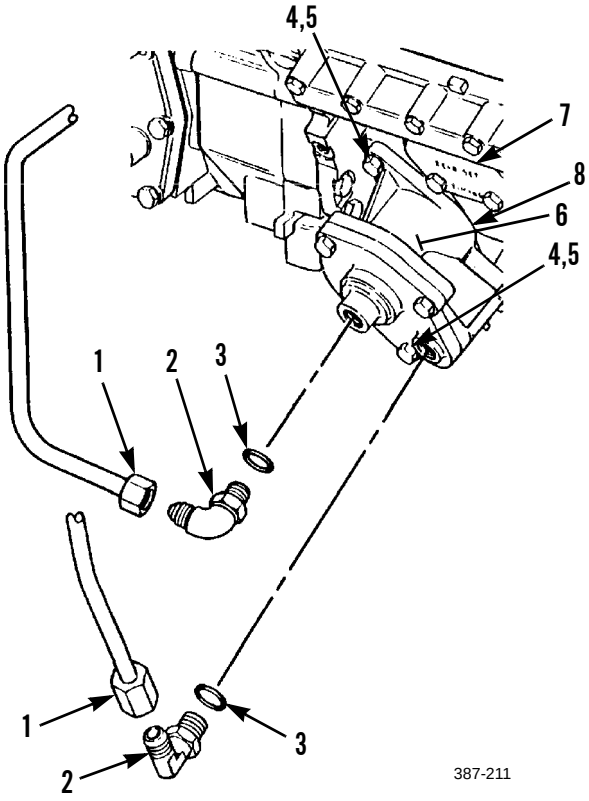
387-210

REMOVAL - CONTINUED

NOTE

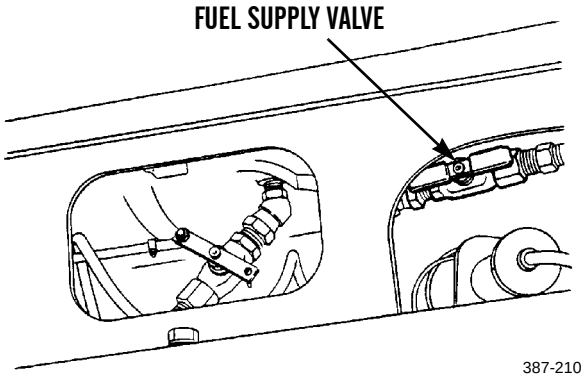
Tag fuel lines and fittings to ensure correct installation.

2. Disconnect two fuel lines (1) from elbows (2).
3. Remove two elbows (2) and preformed packings (3). Discard preformed packings.
4. Remove two capscrews (4) and washers (5) and remove fuel transfer pump (6) from fuel injection pump housing (7).
5. Remove O-ring (8) from fuel transfer pump (6). Discard O-ring.



INSTALLATION

1. Lightly coat new O-ring (8) with fuel and install on fuel transfer pump (6).
2. Position fuel transfer pump (6) on fuel injection pump housing (7). Install two washers (5) and capscrews (4).
3. Put a film of clean lubricating oil on new preformed packings (3). Install preformed packings onto elbows (2). Install elbows into fuel transfer pump (6).
4. Connect two fuel lines (1) to elbows (2).
5. Open fuel shutoff valve under fuel tank.
6. Prime fuel system (WP 0041 00).
7. Run engine and check fuel transfer pump for proper operation and fuel leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

CYLINDER CUTOUT TEST 0043 00

THIS WORK PACKAGE COVERS

Test

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

References

WP 0006 00

TEST

WARNING

- **DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel or equipment damage.**
- **Eye protection must be worn when performing this test procedure. Failure to take precautions could cause injury to personnel.**

CAUTION

- **Use caution to ensure fuel system does not become contaminated. Keep work area clean. Contamination of fuel system could result in premature failure.**
- **Utilize line wrenches for removal of injector lines to avoid damage to fittings and connectors.**

NOTE

- **Use a suitable container to catch any fuel that may drain from system. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **This on-vehicle test can be performed to find cylinder that is misfiring and causing erratic engine idle and black exhaust smoke.**

1. While running engine at an RPM that makes symptom most evident, loosen fuel line nut at a fuel injection nozzle. This will stop flow of fuel to that cylinder.
2. Listen for a change in engine idle speed or for idle to become more erratic.
   a. If change occurs, tighten fuel line and go to step 3.
   b. If no change occurs, this cylinder is misfiring.
3. Repeat step 1-2 for each injector to be tested.
4. Record results of test and return to troubleshooting, if required (WP 0006 00).

END OF WORK PACKAGE

FUEL INJECTION LINES AND FITTINGS REPLACEMENT 0044 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

References

WP 0074 00

Equipment Condition

Engine OFF and cool (TM 5-2410- 237-10)

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

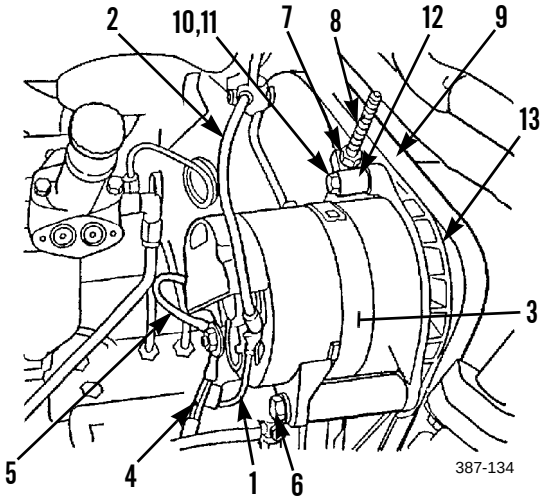
DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

REMOVAL

NOTE

- **Alternator and wiring must be moved out of the way to remove fuel lines on front part of engine.**
- **Tag all wires to ensure correct installation.**

1. Disconnect wires (1 and 2) from back of alternator (3) and move wires away from fuel lines.
2. Disconnect wires (4 and 5) from back of alternator (3) and move wires away from fuel lines.
3. Loosen capscrew (6) in pivot arm of alternator (3).
4. Loosen top and bottom nuts (7) on belt tightening rod (8) to take tension off V-belts (9).
5. Remove capscrew (10), washer (11) and block (12) with rod (8) and two nuts (7) from alternator (3).
6. Remove V-belts (9) from pulley (13) and swing alternator (3) away from fuel lines.

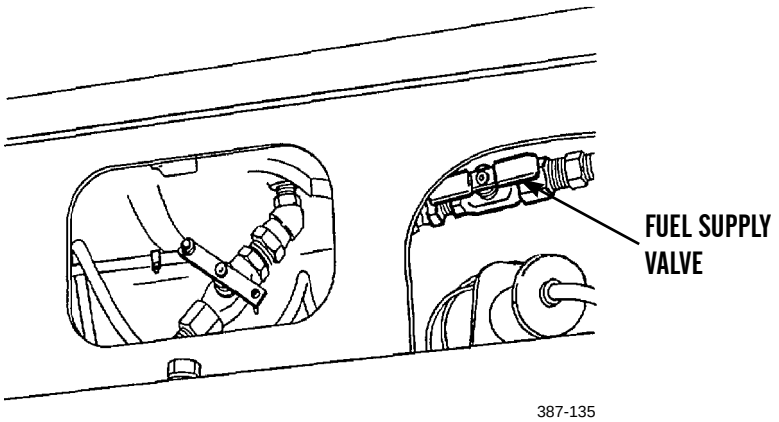


REMOVAL - CONTINUED

CAUTION

- **Cap all fuel lines and plug all fuel line openings after removal to prevent dirt from getting into fuel system. Dirt can cause serious damage to engine.**
- **Use care in removal of fuel lines to prevent twisting or bending of lines, which can affect fuel flow to engine or cause fuel leaks and possible fire.**

7. Turn fuel supply valve at bottom of fuel tank to OFF position.

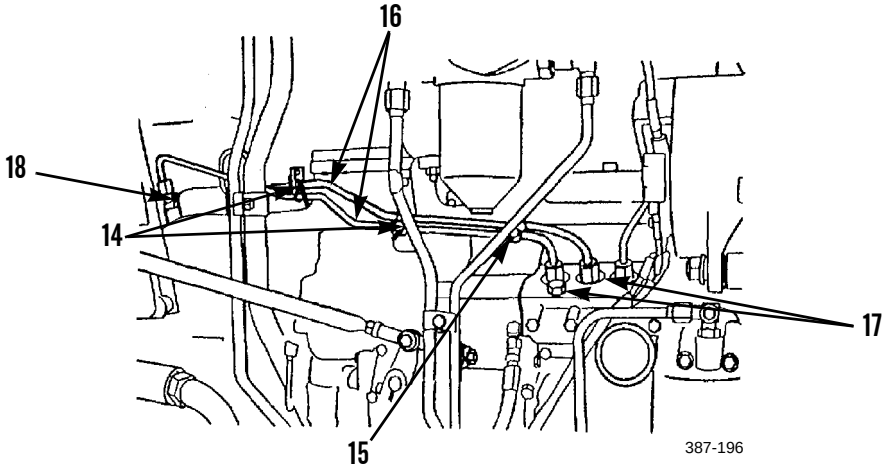


8. Remove four bolts (14) and clamps (15) from two fuel lines (16) toward back of engine.
9. Disconnect two fuel lines (16) from fuel injection pumps (17).

CAUTION

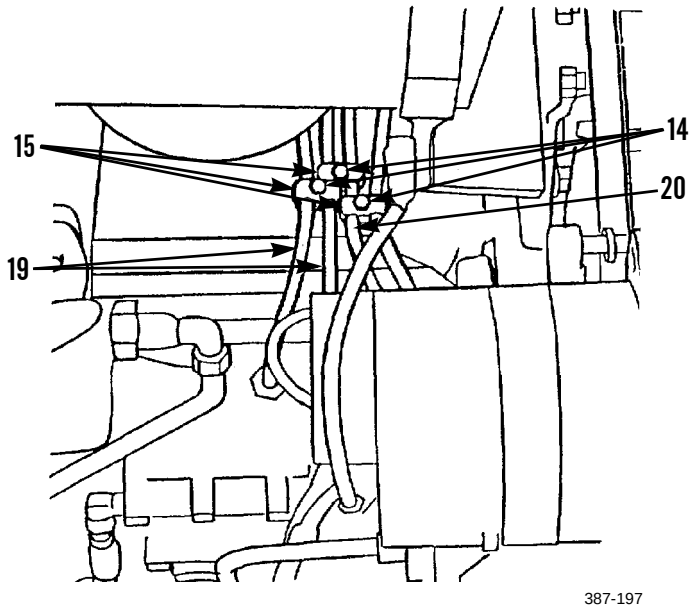
The fuel injection nozzles can be permanently damaged by twisting if only one wrench is used to loosen or tighten the fuel line nuts. Use one wrench to hold the nozzle and another to loosen the nut.

10. Remove two fuel lines (16) from two fuel injectors (18).



REMOVAL - CONTINUED

11. Remove five bolts (14) and clamps (15) from two fuel lines (19) at center of engine.
12. Repeat steps 9 and 10 for two fuel lines (19).
13. Remove three bolts (14) and clamps (15) from two fuel lines (20) at front of engine.
14. Repeat steps 9 and 10 for fuel lines (20).



387-197

INSTALLATION

CAUTION

- **Make sure fuel injection lines are clean and dry. Remove plugs and caps only as lines are installed to prevent dirt from getting into fuel system. Dirt can cause serious damage to engine.**
- **Fuel injection nozzles can be permanently damaged if only one wrench is used to tighten fuel line nuts. Use one wrench to hold nozzle and a second wrench to tighten nut.**

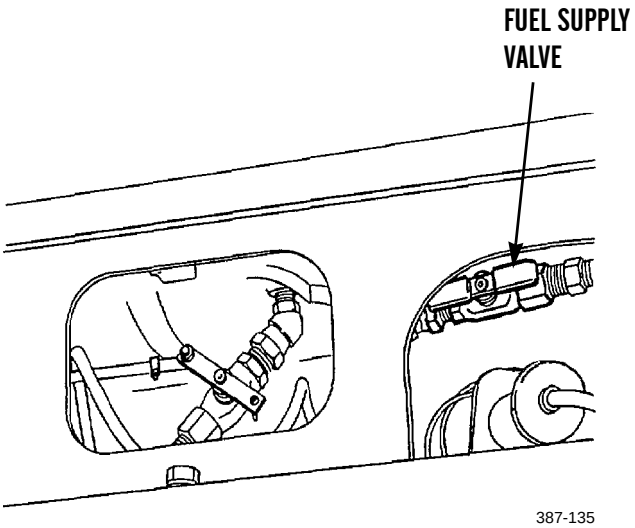
NOTE

Tighten nuts on both ends of fuel injection lines to 30 lb-ft (41 Nm).

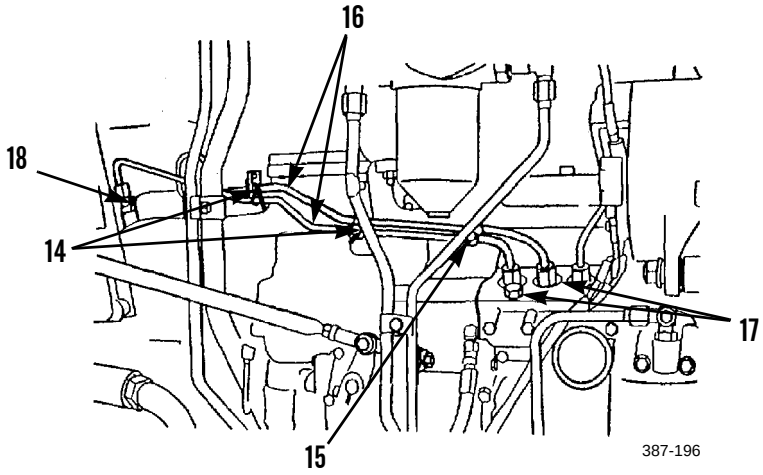
1. Install two fuel lines (20) on two injectors (18) at front of engine.
2. Install other ends of two fuel lines (20) on fuel injection pumps (17).
3. Install three clamps (15) and bolts (14) on two fuel lines (20).
4. Repeat steps 1 and 2 for two fuel lines (19) at center of engine.
5. Install five clamps (15) and bolts (14) on fuel lines (19).

INSTALLATION - CONTINUED

6. Repeat steps 1 and 2 for two fuel lines (16) at back of engine.
7. Install four clamps (15) and bolts (14) on fuel lines (16).
8. Turn fuel supply valve at bottom of fuel tank to ON position.

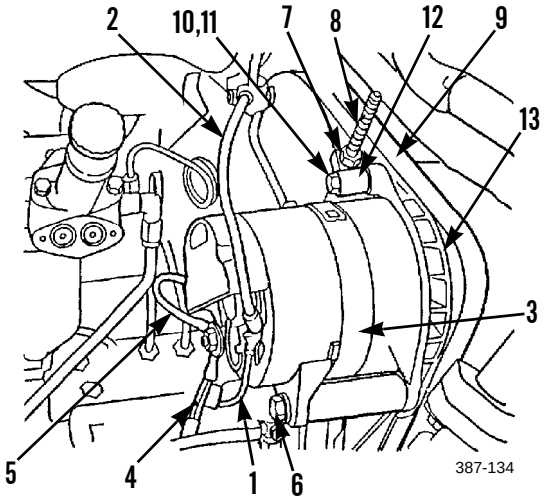


9. Bleed air from fuel system as follows:
   a. Loosen nut to fuel injector (18) on fuel line (16) to cylinder no. 6.
   b. Operate fuel priming pump until no air bubbles can be seen at injector (18).
   c. Tighten nut to fuel injector (18) to 30 lb-ft (41 Nm).
   d. Repeat steps a, b and c, working from cylinder no. 5 to cylinder no. 1.



INSTALLATION - CONTINUED

10. Swing alternator (3) into position and install V-belts (9) on pulley (13).
11. Install block (12) with rod (8) and nuts (7) on alternator (3) with capscrew (10) and washer (11).
12. Adjust tension on V-belts (9) (WP 0074 00).
13. Connect two wires (4 and 5) to back of alternator (3).
14. Connect two wires (1 and 2) to back of alternator (3).
15. Run engine and check for proper operation and fuel leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

AIR CLEANER FILTER ELEMENTS REPLACEMENT 0045 00

THIS WORK PACKAGE COVERS

Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Detergent (Item 11, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Gasket (4)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

WARNING

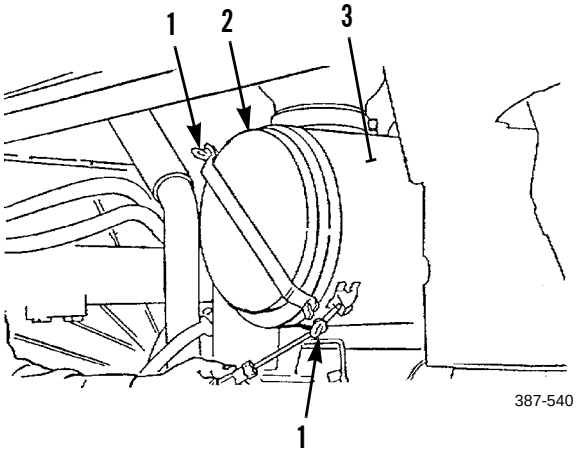
- **If NBC exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.**
- **NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.**
- **Failure to follow this warning may cause injury or death.**

REMOVAL

CAUTION

Never service air cleaner with engine running. Engine damage could result if service is performed with engine running.

1. Loosen two eye bolts (1) and remove cover (2) from filter housing (3).



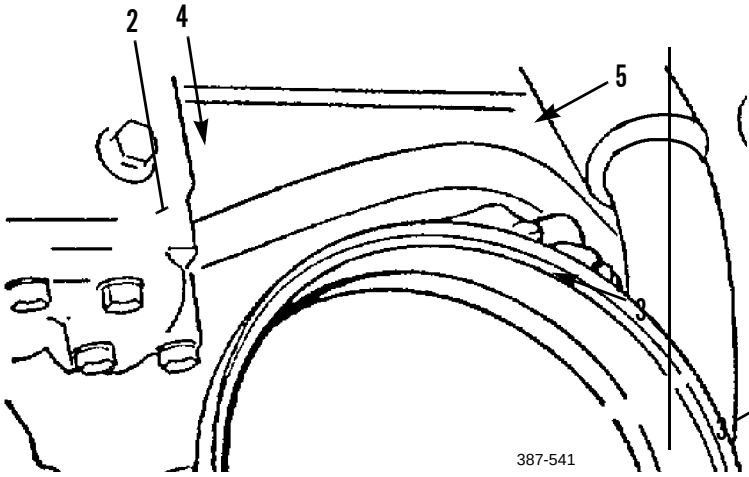
REMOVAL - CONTINUED

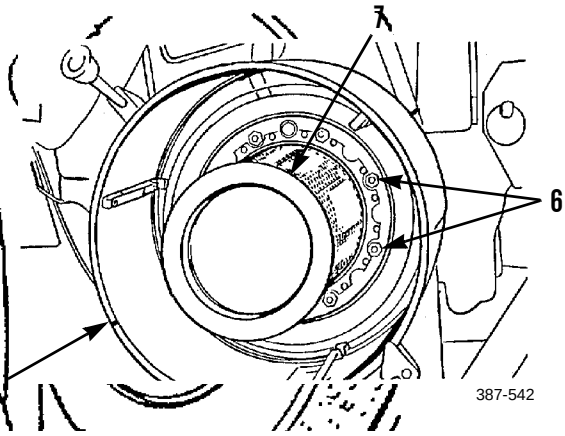
2. Inspect gasket (4) on inside of cover (2). Remove and discard only if damaged.
3. Remove primary filter element (5) from filter housing (3).
4. Use a lint-free rag to thoroughly clean inside of filter housing (3).

CAUTION

If secondary filter element is difficult to remove, gasket on bottom of secondary filter element may be sticking to filter housing. Ensure this area on filter housing is thoroughly cleaned prior to installation of secondary filter element to prevent an air leak past secondary filter.

5. Remove eight nuts (6) and secondary filter element (7) from studs inside filter housing (3).

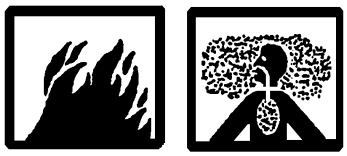




CLEANING AND INSPECTION

1. Check sealing surfaces on filter elements for dirt on the “clean” side. If this is evident, problem may be a damaged filter element, incorrect element fit or the need for cleaning and/or repair of gasketed surfaces.

WARNING



Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

CAUTION

To prevent damage, do NOT clean primary filter element by bumping or tapping.

CLEANING AND INSPECTION - CONTINUED

NOTE

- **Use a light inside primary filter element to inspect filter for tears, holes or other damage before and after each cleaning process.**
- **Discard primary filter element if any damage is evident.**

2. Direct compressed air inside primary filter element, along length of filter pleats.
3. Direct compressed air outside, along length of filter pleats.
4. Repeat step 2.

CAUTION

To prevent primary filter element damage, use a maximum of 40 psi (276 kPa) water pressure.

5. Direct water inside primary filter element, along length of filter pleats.
6. Direct water outside along length of pleats. Rinse and air dry primary filter element thoroughly.
7. Wash primary filter element in warm water and non-sudsing household detergent.
8. Rinse with clean water and air dry thoroughly.

INSTALLATION

CAUTION

DO NOT attempt to reuse secondary filter element by cleaning.

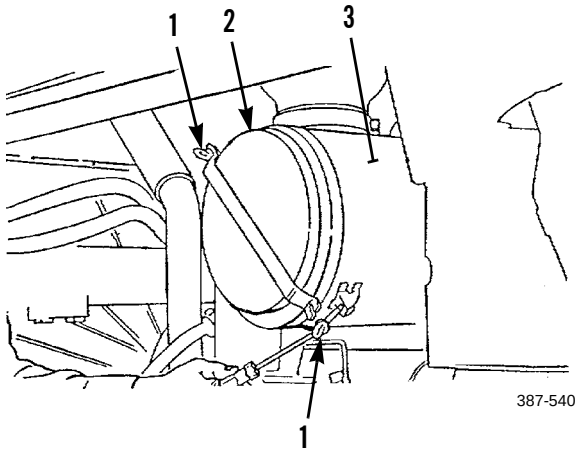
NOTE

- **Primary filter element should be replaced once each year or after being cleaned a maximum of 6 times.**
- **If indicator shows RED shortly after installation of primary filter element, which has been cleaned approximately 6 times, replace with another clean primary filter element.**
- **If indicator still shows RED shortly after installation of clean primary filter element, change secondary filter element.**
- **Replace secondary filter element if damaged or after every third primary filter element replacement.**

1. Install secondary filter element (7) on eight studs inside filter housing (3).
2. Install eight nuts (6) on studs to secure secondary filter element (7). Tighten nuts to 27 lb-ft (20 Nm).
3. Install primary filter element (5) in filter housing (3).
4. Install new gasket (4) in cover (2) and position cover on filter housing (3).

INSTALLATION - CONTINUED

5. Secure cover (2) on filter housing (3) with two eye bolts (1).
6. Reset air filter indicator by pushing button on bottom of indicator (TM 5-2410-237-10).
7. Run engine and check for proper operation (TM 5-2410-237-23).



END OF WORK PACKAGE

AIR CLEANER MAINTENANCE 0046 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Detergent (Item 11, WP 0249 00)
Rag, wiping (Item 29, WP 0249 00)
Gasket (8)
Lockwasher (5)

References

TM 5-2410-237-10

Equipment Condition

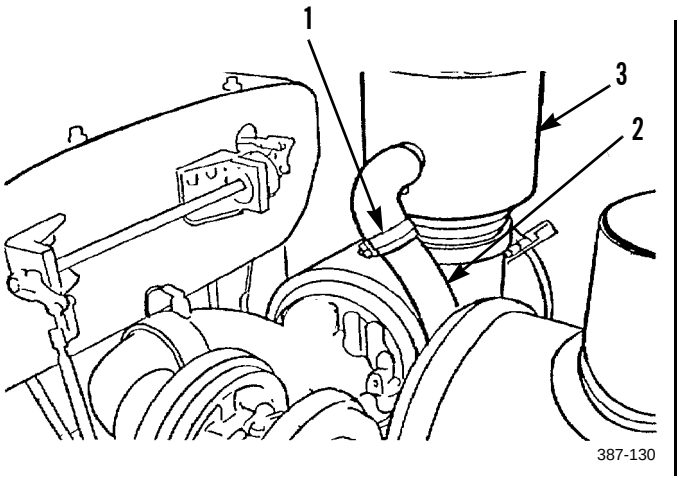
Air cleaner filter elements removed (WP 0045 00)
Hood removed (WP 0159 00)

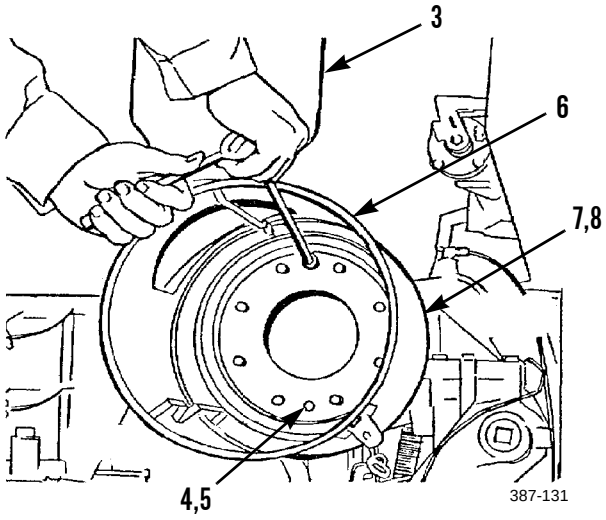
WARNING

- **If NBC exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.**
- **NBC contaminated filters must be handled using adequate precautions (FM 21-40) and must be disposed of by trained personnel. Failure to follow these instructions may cause injury or death.**

REMOVAL

1. Loosen hose clamp (1) securing dust ejector tube (2) to filter body (3). Remove hose.
2. Remove two capscrews (4) and lockwashers (5), slide filter housing (6) off studs in air cleaner outlet pipe (7) and remove from engine. Discard lockwashers.
3. Remove gasket (8) from pipe assembly (7). Discard gasket.





DISASSEMBLY

1. Loosen nut (9), capscrew (10) and clamp (11) from filter body (3) and filter housing (6).
2. Remove filter body (3) and clamp (11) from filter housing (6).

CLEANING

1. Wipe filter housing clean with a rag.

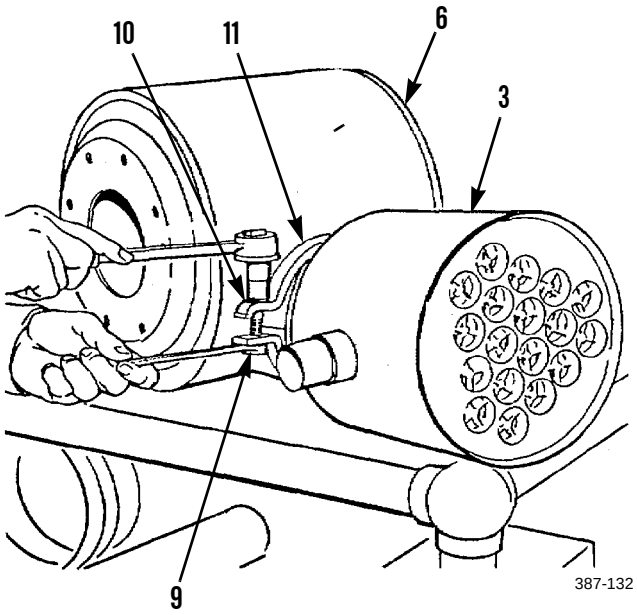
WARNING

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

2. Clean filter body with compressed air, a stiff fiber brush or wash in detergent. Dry all parts before installation.

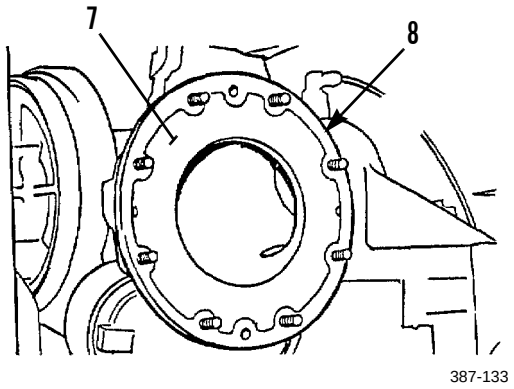
ASSEMBLY

1. Install clamp (11) on filter body (3) and assemble filter body on filter housing (6).
2. Tighten capscrew (10) and nut (9) to secure filter body (3) to filter housing (6).



INSTALLATION

1. Install new gasket (8) over studs on air cleaner outlet pipe (7).



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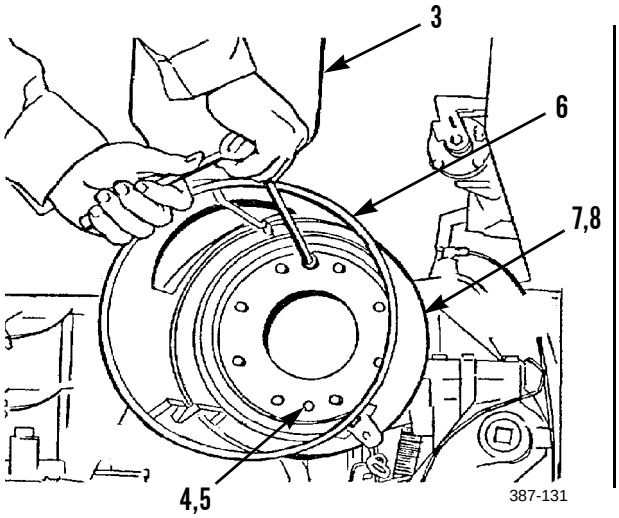
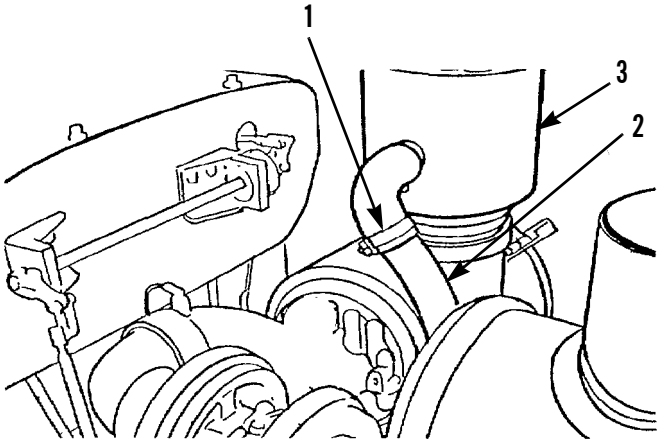
2. Position filter housing (6) with filter body (3) inserted up through opening in hood. Align eight holes in filter housing with eight studs in air cleaner outlet pipe (7) and slide housing onto studs.
3. Install two new lockwashers (5) and capscrews (4). Tighten capscrews.
4. Slide dust ejector tube (2) onto filter body (3) and tighten hose clamp (1).
5. Install air cleaner filter elements (WP 0045 00).
6. Install hood (WP 0159 00).
7. Run engine and check for proper operation (TM 5-2410-237-10).



387-131



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END OF WORK PACKAGE

ENGINE AIR PRECLEANER REPLACEMENT 0047 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Rag, wiping (Item 29, WP 0249 00)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

WARNING

- **If NBC exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.**
- **NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.**
- **Failure to follow this warning may cause injury or death.**

REMOVAL

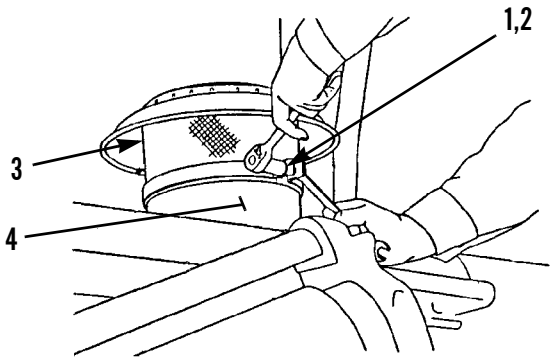
1. Loosen nut (1) and capscrew (2) securing precleaner (3) to filter body (4).
2. Remove precleaner (3) from filter body (4).

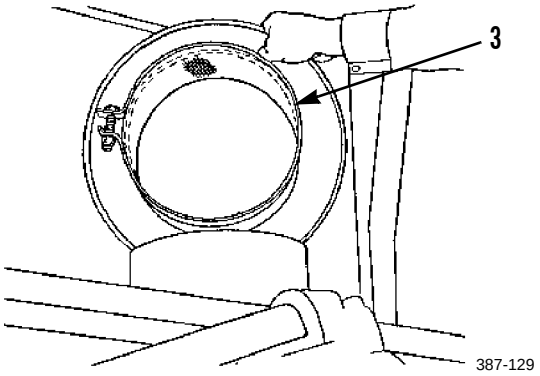
CLEANING

1. Remove all debris from precleaner (3).
2. Wipe precleaner (3) clean with a rag.

INSTALLATION

1. Position precleaner (3) onto body filter (4).
2. Tighten capscrew (2) and nut (1).





END OF WORK PACKAGE

AIR CLEANER DUST EJECTOR ASSEMBLY REPLACEMENT 0048 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Equipment Condition

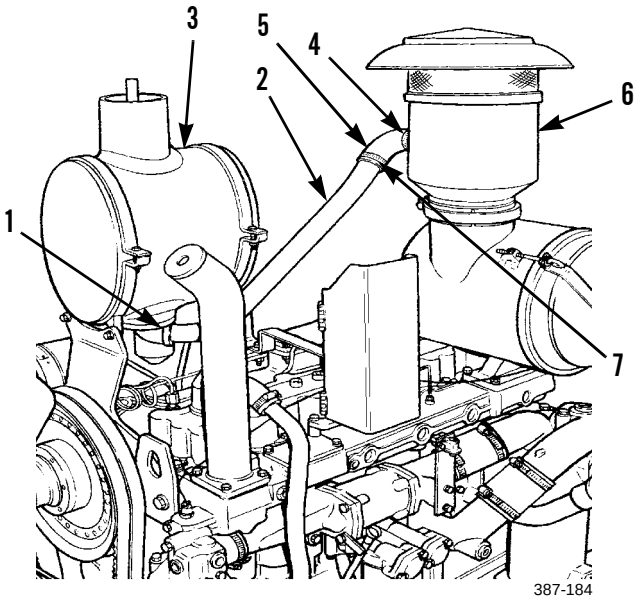
Engine OFF and cool (TM 5-2410-237-10)

WARNING

- **If NBC exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.**
- **NBC contaminated filters must be handled using adequate precautions (FM 21-40) and must be disposed of by trained personnel.**

REMOVAL

1. Remove two capscrews (1) from dust ejector tube (2) at bottom of muffler (3).
2. Loosen hose clamp (4) holding dust ejector hose (5) on precleaner body (6).
3. Remove dust ejector tube (2) from precleaner body (6) and muffler (3).
4. Loosen hose clamp (7) and separate dust ejector hose (5) and tube (2).



INSTALLATION

1. Assemble dust ejector tube (2) and hose (5) and tighten hose clamp (7).
2. Slide dust ejector hose (5) onto tube in filter body (6) and tighten clamp (4).
3. Install dust ejector tube (2) to bottom of muffler (3) with two capscrews (1).

END OF WORK PACKAGE

TURBOCHARGER ASSEMBLY REPLACEMENT 0049 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (12, 15 and 27)

Seal (4, 17 and 22)

Personnel Required

Two

References

TM 5-2410-237-10

Equipment Condition

Muffler removed (WP 0062 00)

Turbocharger oil lines removed (WP 0051 00)

Air cleaner removed (WP 0046 00)

WARNING

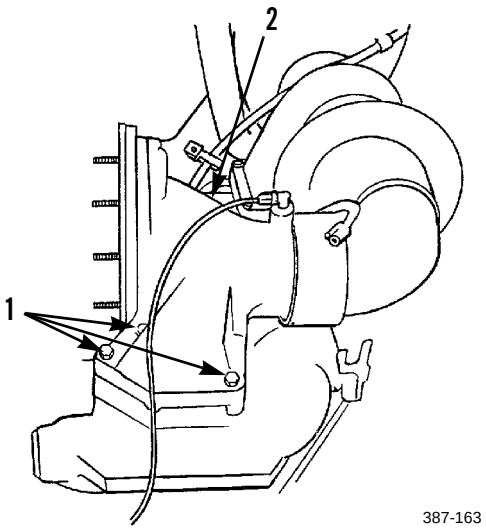
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in death or injury to personnel

NOTE

Turbocharger weighs approximately 50 lb (23 kg).

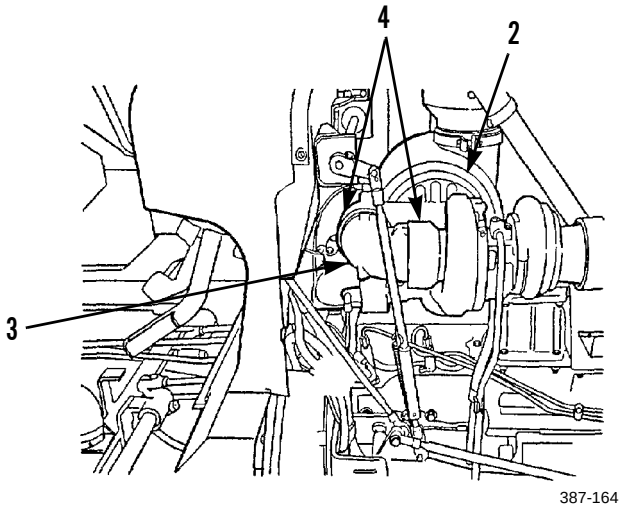
REMOVAL

1. Remove four capscrews (1) from air cleaner outlet (2).



REMOVAL - CONTINUED

2. Remove air cleaner outlet (2) and turbocharger elbow (3).
3. Remove two seals (4) from each end of elbow (3). Discard seals.
4. Remove four nuts (5) and capscrews (6) from turbocharger (7) and adapter (8).
5. Remove capscrew (9) and retainer (10) from elbow (11) and turbocharger (7).



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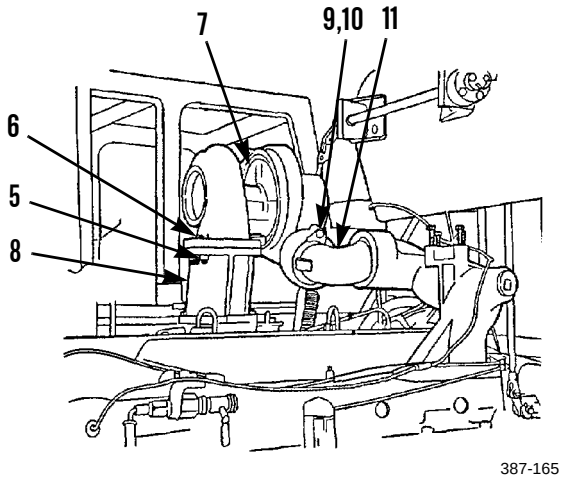

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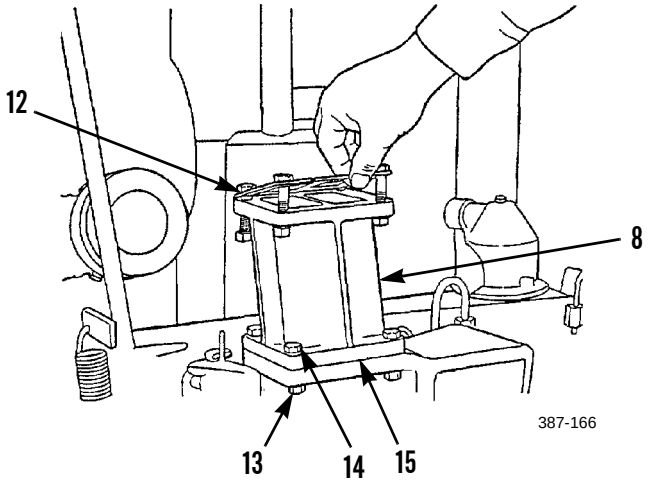
6. Carefully lift turbocharger (7) off adapter (8) and remove it from elbow (11) on output side of turbocharger (7).
7. Remove gasket (12) from adapter (8). Discard gasket.

NOTE

If it is necessary to remove adapter, use the following procedure.

8. Remove four nuts (13), capscrews (14), adapter (8) and gasket (15). Discard gasket.



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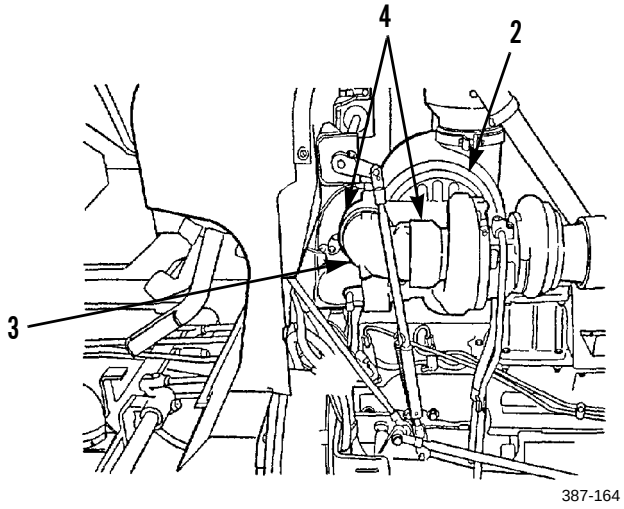
INSTALLATION

NOTE

- **If adapter has been removed, perform step 1. If it has not been removed, start installation of turbocharger at step 2.**
- **Wipe all sealing surfaces clean and dry before installing new seals and gaskets. Apply a light film of clean oil to new seals prior to installation.**

1. Install new gasket (15) and adapter (8) on exhaust manifold with four capscrews (14) and nuts (13).
2. Position new gasket (12) on adapter (8).
3. Position turbocharger (7) on adapter (8) and insert elbow (11) in output side of turbocharger.
4. Apply antiseize compound to four capscrews (6).
5. Align bolt holes in turbocharger (7), gasket (12) and adapter (8). Install four capscrews (6) and nuts (5).
6. Install capscrew (9) and retainer (10) to elbow (11) and turbocharger (7).
7. Install two new seals (4) on each end of turbocharger elbow (3) and insert one end of elbow in air cleaner outlet (2).



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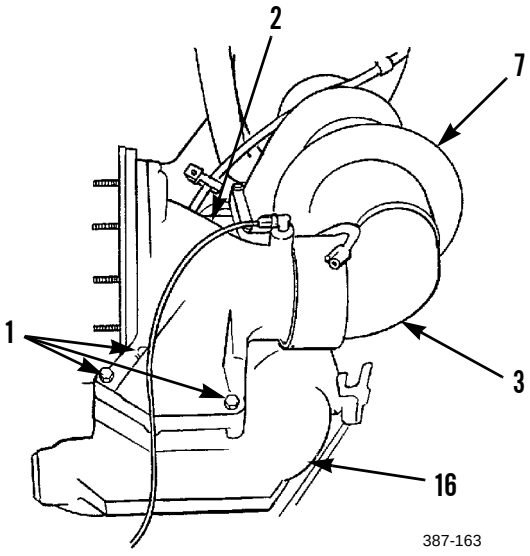
8. Insert elbow (3) in turbocharger (7) and install air cleaner outlet (2) on engine intake pipe (16) with four capscrews (1).
9. Install air cleaner (WP 0046 00).
10. Install turbocharger oil lines (WP 0051 00).
11. Install muffler (WP 0062 00)
12. Crank engine for 10 seconds before starting to prelubricate turbocharger.
13. Run engine and check for proper operation (TM 5-2410-237-10).



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END OF WORK PACKAGE

TURBOCHARGER AIR LINE REPLACEMENT 0050 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Oil, lubricating (Item 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (11)

Seal (3)

Materials/Parts - Continued

O-ring (6)

References

TM 5-2410-237-10

Equipment Condition

Muffler removed (WP 0062 00)

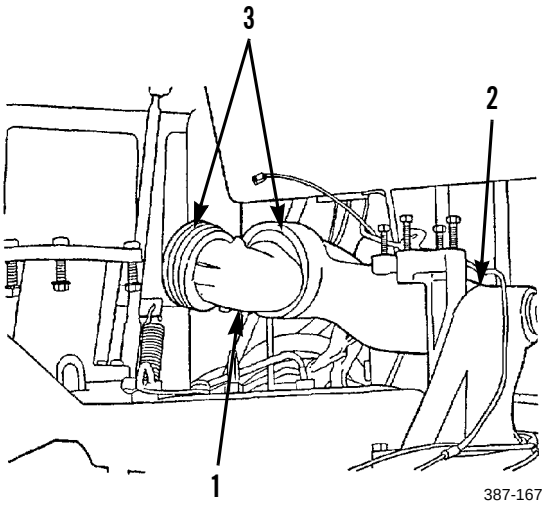
Turbocharger oil lines removed (WP 0051 00)

Turbocharger removed (WP 0049 00)

Air cleaner removed (WP 0046 00)

REMOVAL

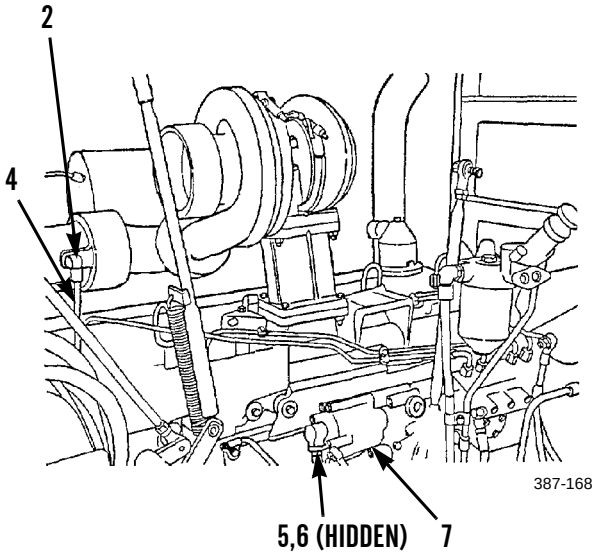
1. Remove elbow (1) from engine intake pipe (2). Remove two seals (3) from each end of elbow. Discard seals.

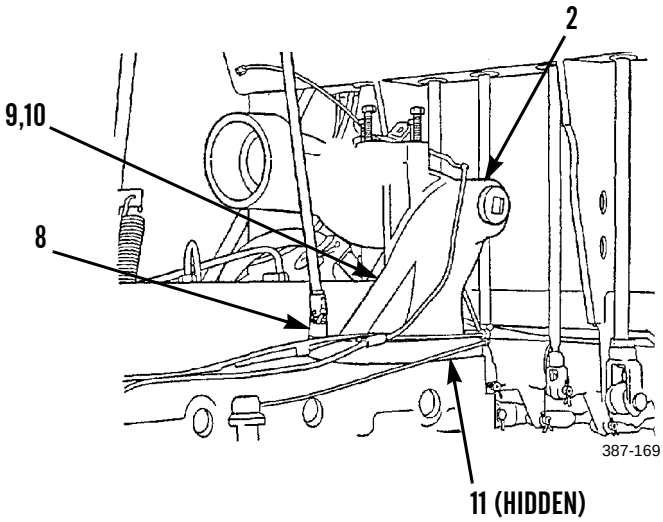


TURBOCHARGER AIR LINE REPLACEMENT - CONTINUED 0050 00

REMOVAL - CONTINUED

2. Remove upper end of tube assembly (4) from engine intake pipe (2).
3. Remove lower end of tube assembly (4), adapter (5) and O-ring (6) from governor (7). Discard O-ring.
4. Remove five short capscrews (8), long capscrew (9), washer (10), engine intake pipe (2) and gasket (11) from intake manifold. Discard gasket.





INSTALLATION

NOTE

Wipe all sealing surfaces clean and dry before installing new gasket and O-ring. Apply a light film of clean lubricating oil to new O-ring and seals before installation.

1. Install new gasket (11) and engine intake pipe (2) on intake manifold with five short capscrews (8), washer (10) and long capscrew (9).
2. Install new O-ring (6), adapter (5) and lower end of tube assembly (4) to governor (7).
3. Install upper end of tube assembly (4) to engine intake pipe (2).
4. Install two new seals (3) on each end of elbow (1) and insert one end of elbow in engine intake pipe (2).
5. Install air cleaner (WP 0046 00).
6. Install turbocharger (WP 0049 00).
7. Install turbocharger oil lines (WP 0051 00).
8. Install muffler (WP 0062 00).
9. Crank engine for 10 seconds before starting to pre-lubricate turbocharger.
10. Run engine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

TURBOCHARGER OIL LINES AND FITTINGS REPLACEMENT 0051 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 26, WP 0249 00)

Gasket (15, 16 and 17)

Materials/Parts - Continued

O-ring (22, 23 and 24)

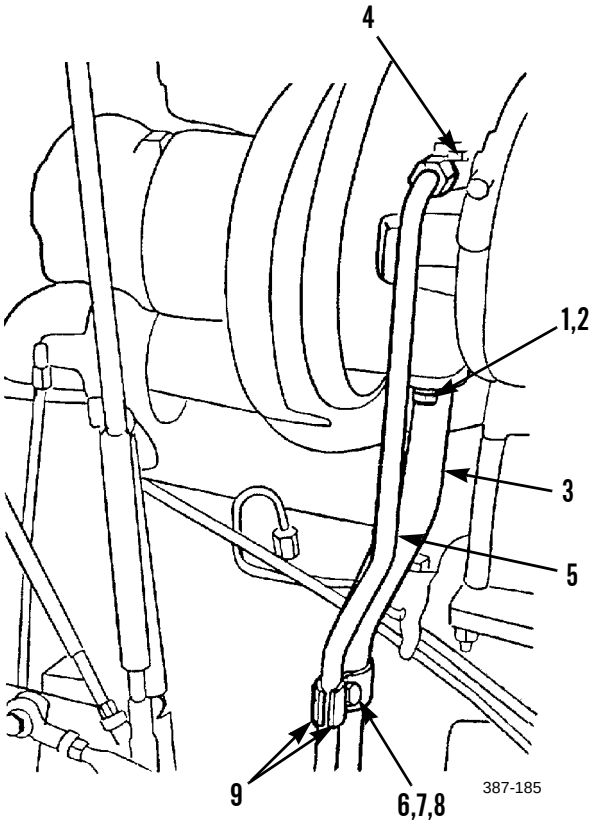
Seal (14)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

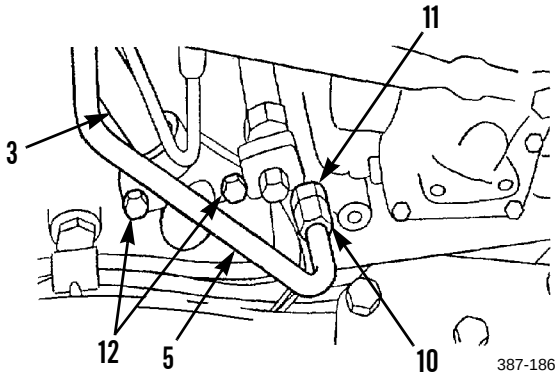
REMOVAL

1. Remove two capscrews (1) and washers (2) from oil line (3).
2. Remove two capscrews (4) from the top of oil line (5).
3. Remove nut (6), capscrew (7) and two washers (8).
4. Remove clips (9) from lines (3 and 5).

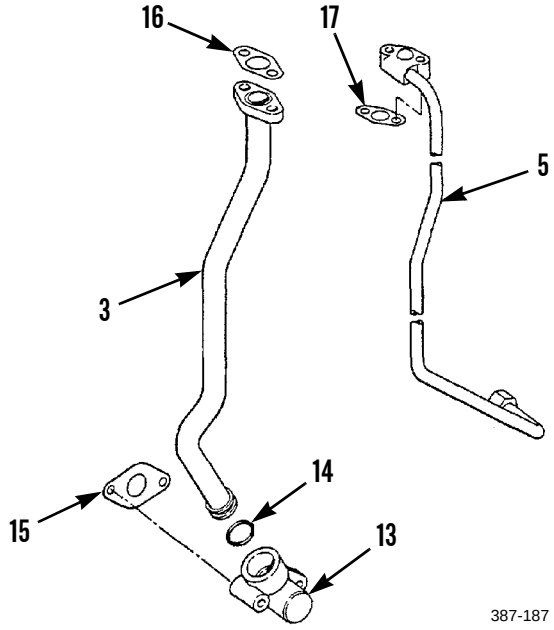


REMOVAL - CONTINUED

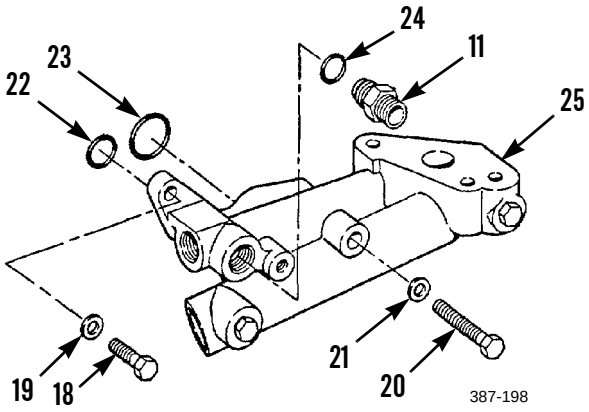
5. Unscrew nut (10) from connector (11). Remove line (5).
6. Remove two capscrews (12) from the bottom of oil line (3). Remove line.



7. Separate line (3) from adapter (13). Remove seal (14) and gasket (16) from line and gasket (15) from adapter. Discard seal and gaskets.
8. Remove gasket (17) from line (5). Discard gasket.



9. Remove two capsrews (18) and washers (19).
10. Remove capscrew (20) and washer (21). Remove support assembly (25) from engine block.
11. Remove O-rings (22 and 23) from support assembly (25). Discard O-rings.
12. Remove connector (11) and O-ring (24) from support assembly (25). Discard O-ring.

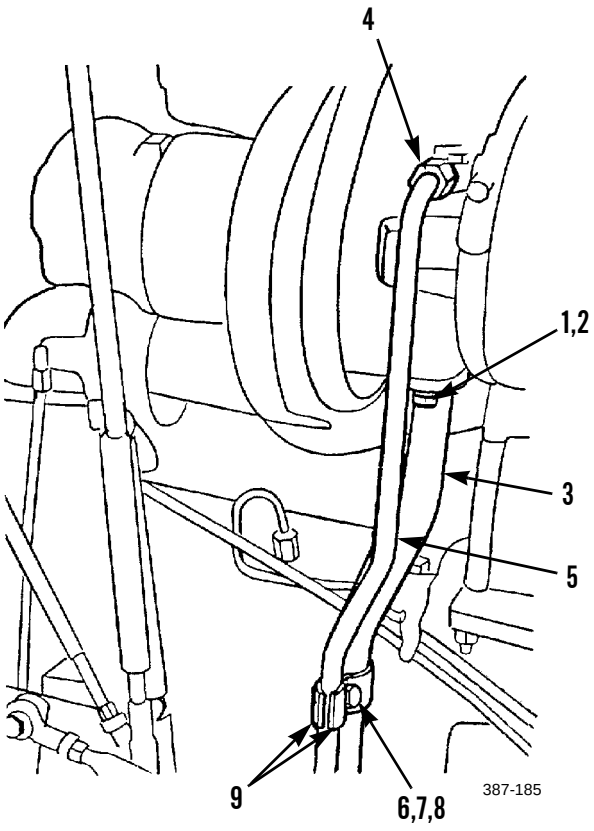


INSTALLATION

NOTE

Apply a light film of clean oil to new O-rings prior to installation.

1. Install new O-ring (24) on connector (11) and install connector on support assembly (25).
2. Install new O-rings (22 and 23) on support assembly (25).
3. Place support assembly (25) in position on engine block and install two capscrews (18) and washers (19).
4. Install capscrew (20) and washer (21).
5. Place new gasket (17) in position on line (5).
6. Place new seal (14) on line (3) and slide line into adapter (13).
7. Place new gasket (15) on adapter (13) and new gasket (16) at the top of line (3).
8. Place line (3) in position and install two capscrews (12).
9. Place line (5) in position and tighten nut (10) to connector (11).
10. Install two capscrews (4) to top of oil line (5).
11. Install two capscrews (1) and washers (2).
12. Place clips (9) in position on lines (3 and 5) and install capscrew (7), two washers (8) and nut (6).
13. Run engine and check for proper operation and oil leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

FUEL TANK MAINTENANCE 0052 00

THIS WORK PACKAGE COVERS

Filler Cap, Gage Rod and Strainer: Disassembly, Cleaning and Inspection, Assembly

Fuel Tank: Draining, Removal, Installation, Filling

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 500 lb capacity

Suitable fuel container, 115 gal. (435 l) capacity

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Fuel (Item 13, 14 or 15, WP 0249 00)

Oil, lubricating (Item 24, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Gasket (4 and 6)

O-ring (19 and 22)

References

TM 5-2410-237-10

WP 0041 00

WP 0054 00

Personnel Required

Three

Equipment Condition

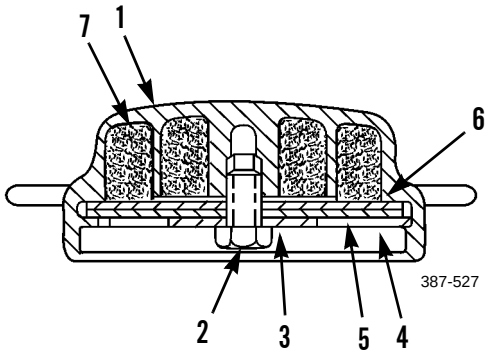
ROPS removed, if replacing fuel tank (WP 0164 00)

WARNING

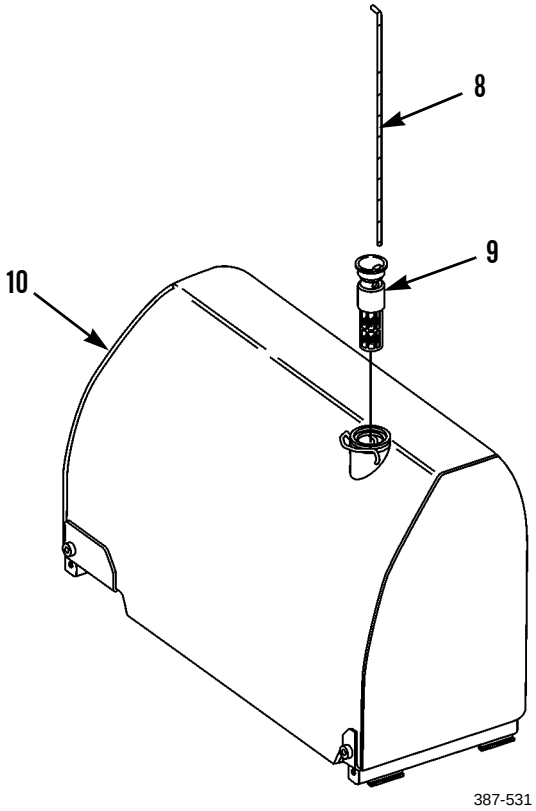
DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

FILLER CAP, GAGE ROD AND STRAINER DISASSEMBLY

1. Remove padlock from filler cap (1) and remove filler cap from fuel tank (TM 5-2410-237-10).
2. Disassemble filler cap (1) as required to clean and inspect filler cap:
   a. Remove screw (2), washer (3), gasket (4), baffle (5) and gasket (6) from filler cap (1). Discard gaskets.
   b. Remove filter element (7) from filler cap (1).



3. Remove gage rod (8) and strainer (9) from fuel tank (10).



FILLER CAP, GAGE ROD AND STRAINER CLEANING AND INSPECTION

WARNING

- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.**

1. Clean filler cap components and strainer in solvent cleaning compound.
2. Use compressed air to dry components.
3. Inspect components for cracks, corrosion, wear or other damage. Replace any damaged component.

FILLER CAP, GAGE ROD AND STRAINER ASSEMBLY

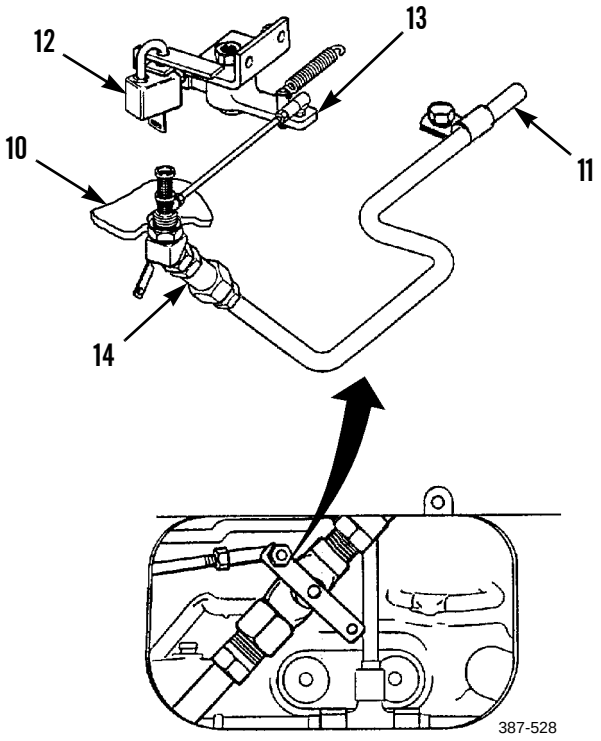
1. Install gage rod (8) and strainer (9) in fuel tank (10).
2. Assemble filler cap (1) as follows:
   a. Apply a light coat of oil to filter element (7).
   b. Install filter element (7) into filler cap (1).
   c. Install new gasket (6), baffle (5), new gasket (4), washer (3) and screw (2).
3. Install filler cap (1) and lock with padlock (TM 5-2410-237-10).

FUEL TANK DRAINING

NOTE

- **Fuel tank capacity is 114 gal. (432 l).**
- **Ensure any fuel spills are cleaned up.**

1. Place a suitable container under drain tube (11).
2. Remove padlock (12) from drain lever (13).
3. Rotate drain lever (13) counterclockwise to open drain valve (14) and drain fuel tank (10). Dispose of fuel IAW local policy and ordinances.

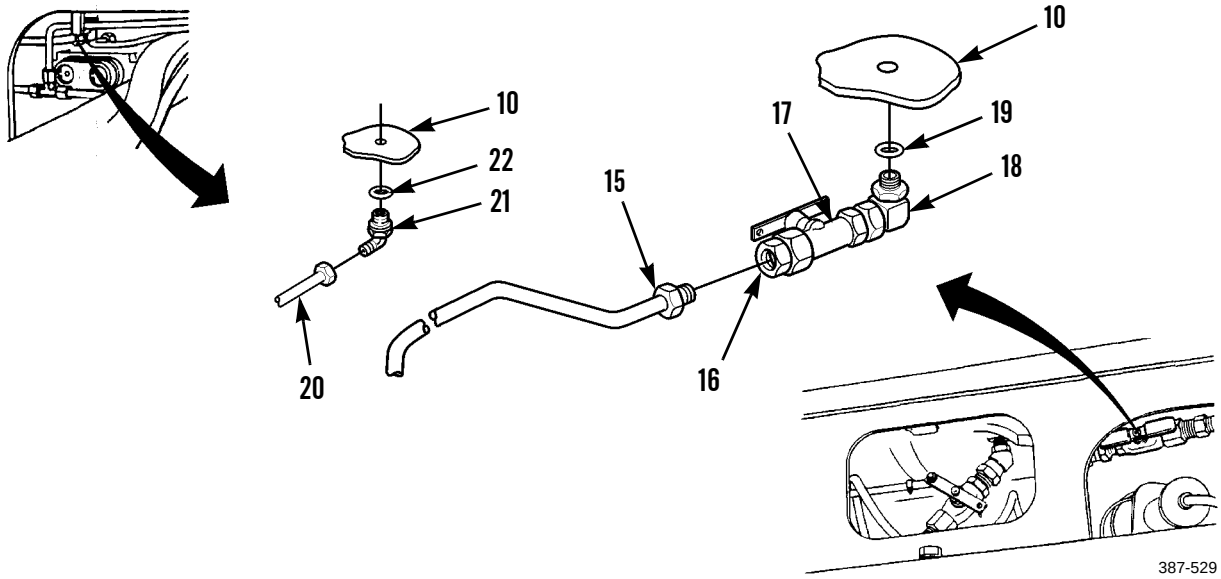


FUEL TANK REMOVAL

NOTE

Tag fuel lines to ensure correct installation.

1. Remove fuel drain line and drain mechanism (WP 0054 00).
2. Disconnect fuel supply line (15) from adapter (16) of fuel shutoff valve (17).
3. Remove adapter (16), fuel shutoff valve (17), elbow (18) and O-ring (19) from bottom of fuel tank (10). Discard O-ring.
4. Disconnect fuel return line (20) from elbow (21).
5. Remove elbow (21) and O-ring (22) from bottom of fuel tank (10). Discard O-ring.



WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Fuel tank weighs 385 lb (175 kg).

6. Attach nylon sling and suitable lifting device to fuel tank (10).
7. Remove two capscrews (23) and spacers (24) from underneath each fender. Remove fuel tank (10) from machine.

FUEL TANK INSTALLATION

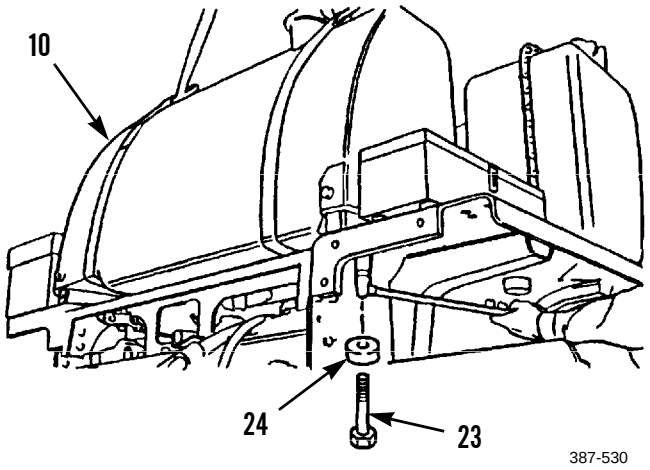
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Fuel tank weighs 385 lb (175 kg).

1. Attach nylon sling and suitable lifting device to fuel tank (10). Position fuel tank on fenders.
2. Install two spacers (24) and capcrews (23) to fuel tank (10) from underneath each fender.
3. Remove lifting device and nylon sling.



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NOTE

Apply a thin coat of clean fuel to new O-rings as they are installed.

4. Install new O-ring (22) and elbow (21) to bottom of fuel tank (10).
5. Connect fuel return line (20) to elbow (21).
6. Install new O-ring (19), elbow (18), fuel shutoff valve (17) and adapter (16) to bottom of fuel tank (10).
7. Connect fuel supply line (15) to adapter (16).
8. Install fuel drain line and drain mechanism (WP 0054 00).
9. Install ROPS (WP 0164 00).

FUEL TANK FILLING

WARNING

DO NOT smoke or permit any open flame in area of machine while you are servicing diesel fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury to personnel or equipment damage.

1. Add fuel to fuel tank (10) IAW TM 5-2410-237-10.
2. Prime fuel system (WP 0041 00).

END OF WORK PACKAGE

FUEL LINES AND FITTINGS REPLACEMENT 0053 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Fuel (Item 13, 14 or 15, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

O-ring (20, 23, 29, 34, 43, 44, 51 and 52)

References

WP 0041 00

WP 0052 00

Equipment Condition

Engine off and cool (TM 5-2410-237-10)

WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

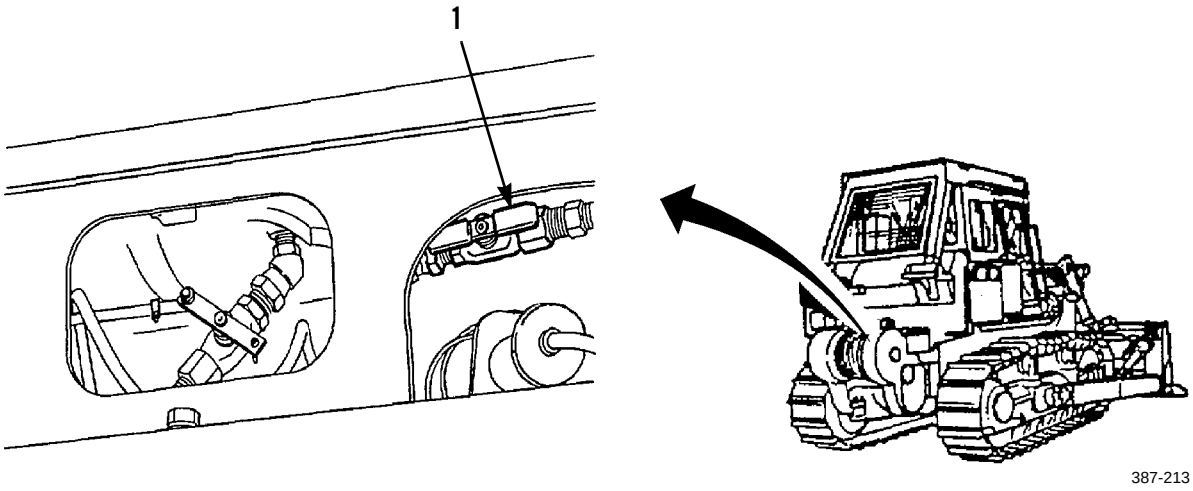
REMOVAL

NOTE

- **When removing fuel shut-off valve, fuel drain valve or fuel return lines, drain fuel tank completely (WP 0052 00). Capacity of fuel tank is 114 gal. (431 l).**
- **Use a suitable container to capture any fuel which may drain from lines. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Fuel line routing and components shown are typical.**
- **Tag fuel lines to ensure correct installation, if removing more than one line.**

REMOVAL - CONTINUED

1. Turn fuel shutoff valve (1) to OFF position.



2. Remove three bolts (2), six washers (3), clamps (4) and three nuts (5).
3. Remove three bolts (6), washers (7), small clip (8) and four large clips (9).
4. Remove nut (10), washer (7) and two large clips (9).

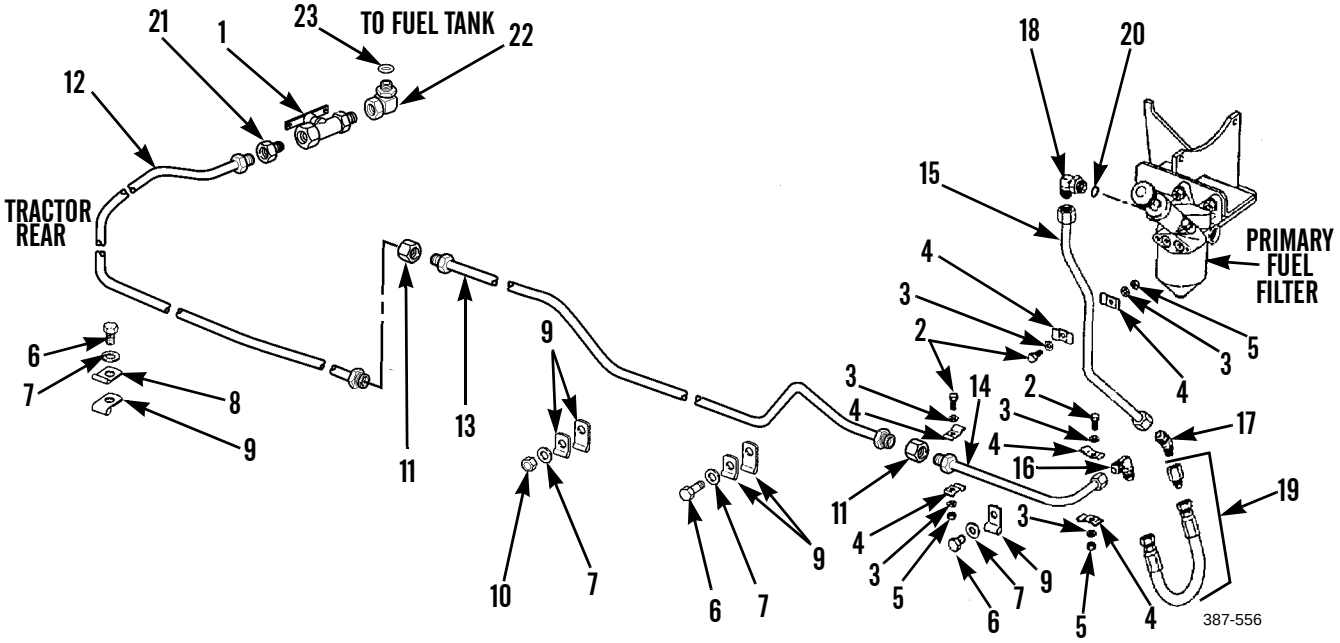
CAUTION

Wipe area clean around all fuel connections to be opened during removal. Cap lines and plug openings after removing lines. Contamination of fuel system could result in premature failure.

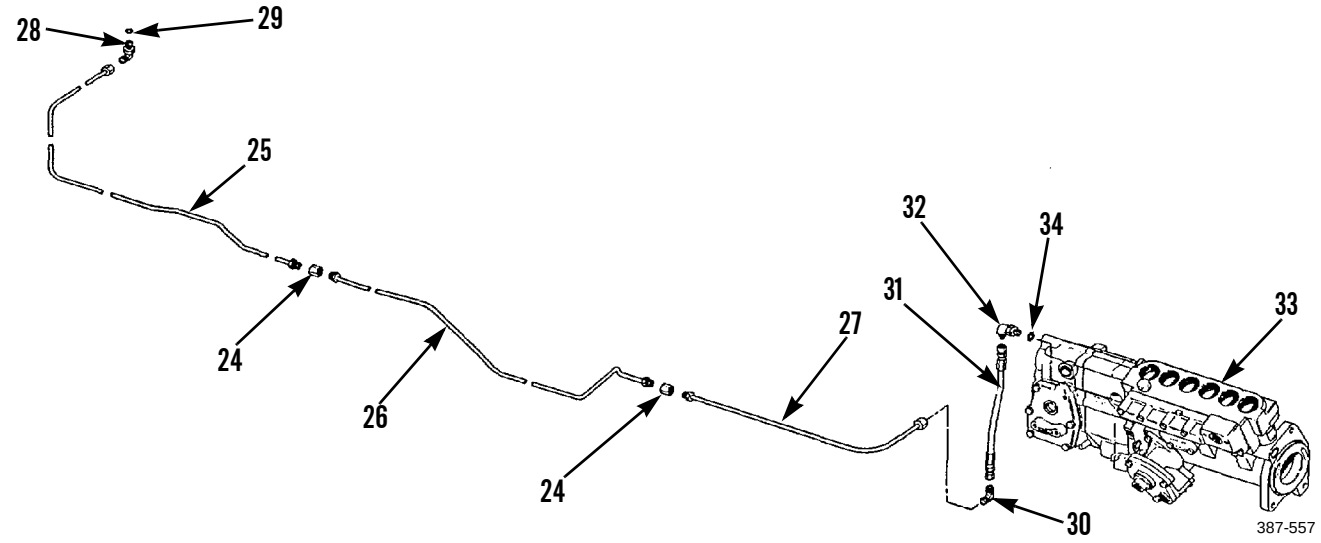
5. Disconnect unions (11) from tube assemblies (12, 13 and 14).
6. Disconnect tube assemblies (14 and 15) from elbows (16, 17 and 18).
7. Disconnect elbows (16 and 17) from hose assembly (19).
8. Remove elbow (18) from primary filter base. Remove and discard O-ring (20).
9. Disconnect tube assembly (12) from fitting (21).
10. Remove fitting (21) from fuel shut-off valve (1).
11. Remove fuel shut-off valve (1) from elbow (22).

REMOVAL - CONTINUED

12. Remove elbow (22) from fitting in bottom of fuel tank. Remove and discard O-ring (23).

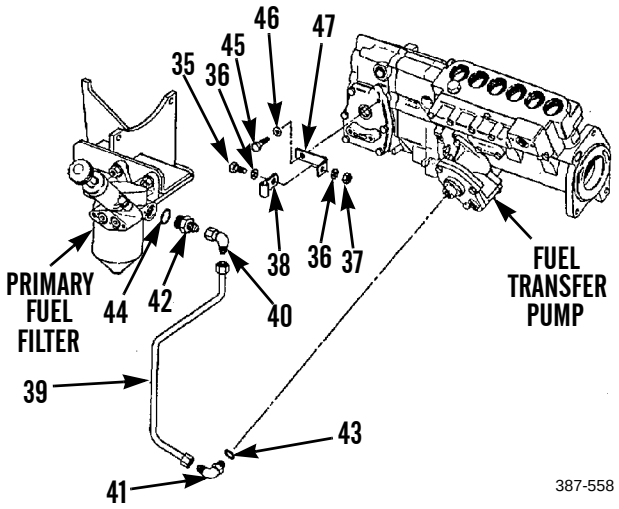


13. Disconnect two unions (24) from tube assemblies (25, 26 and 27).
14. Remove tube assembly (25) from elbow (28).
15. Remove elbow (28) from bottom of fuel tank. Remove and discard O-ring (29).
16. Remove tube assembly (27) from elbow (30).
17. Remove elbow (30) from hose assembly (31) and disconnect hose assembly from elbow (32).
18. Remove elbow (32) from fuel injection housing (33). Remove and discard O-ring (34).

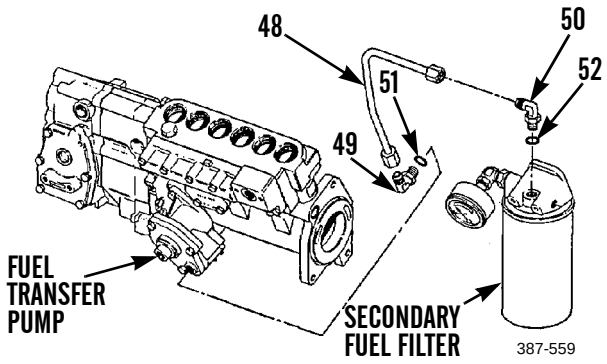


REMOVAL - CONTINUED

19. Remove bolt (35), two washers (36), nut (37) and clip (38).
20. Remove tube assembly (39) from elbows (40 and 41). Remove tube assembly.
21. Remove elbows (40 and 41) from connector (42) and fuel transfer pump. Remove and discard O-ring (43).
22. Remove connector (42) from primary fuel filter base. Remove and discard O-ring (44).



23. If required, remove bolt (45), washer (46) and bracket (47).
24. Disconnect tube assembly (48) from elbows (49 and 50).
25. Remove elbows (49 and 50). Remove and discard O-rings (51 and 52).



INSTALLATION

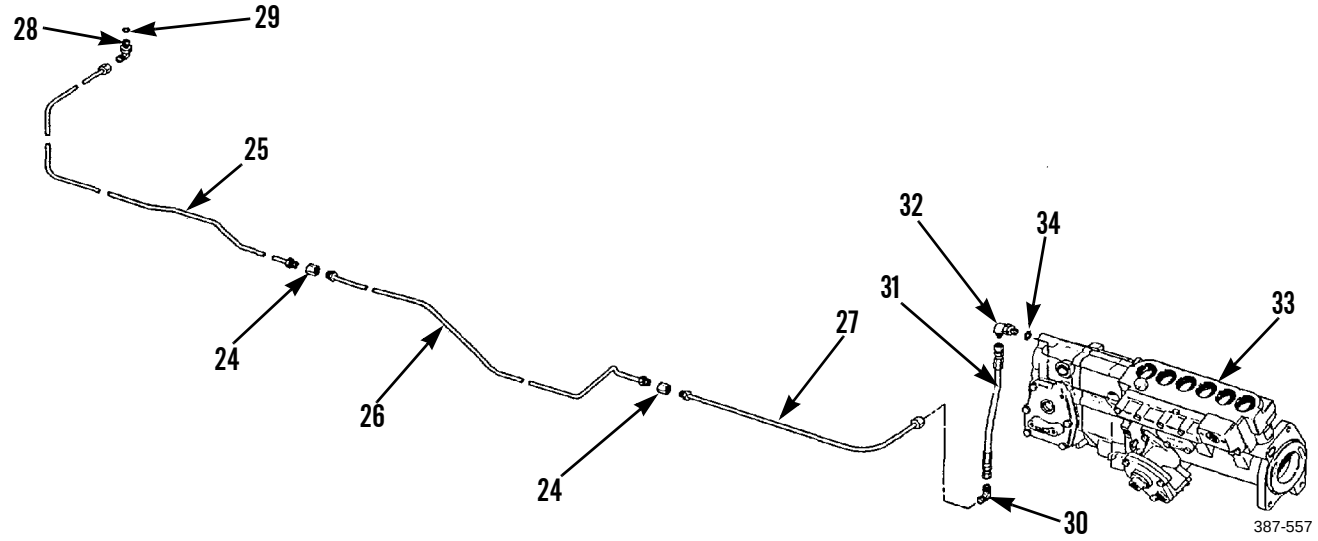
NOTE

Coat all new O-rings with clean fuel before installation.

1. Place new O-ring (51) in position on elbow (49). Install elbow on fuel transfer pump. Place new O-ring (52) in position on elbow (50). Install elbow on secondary fuel filter base.
2. Connect tube assembly (48) to elbows (49 and 50).
3. If removed, install bracket (47) with bolt (45) and washer (46).
4. Place new O-ring (44) in position on connector (42). Install connector to primary fuel filter base.
5. Install elbow (40) to connector (42).
6. Place new O-ring (43) in position on elbow (41). Install elbow to fuel transfer pump.
7. Connect tube assembly (39) to elbows (40 and 41).
8. Place clip (38) around tube assembly (39) and align clip with bracket (47). Install bolt (35), two washers (36) and nut (37).

INSTALLATION - CONTINUED

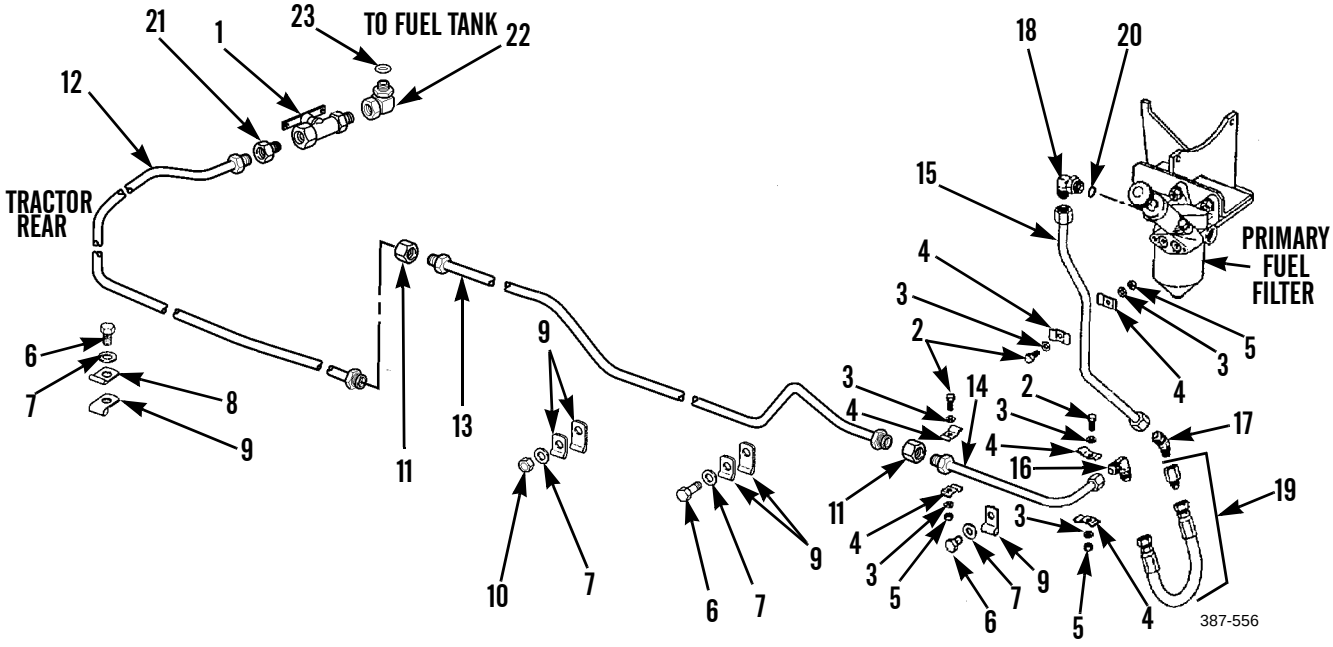
9. Place new O-ring (34) in position on elbow (32). Install elbow to fuel injection housing (33).
10. Install elbow (30) to hose assembly (31) and connect hose assembly to elbow (32).
11. Place new O-ring (29) in position on elbow (28). Install elbow in fuel tank.
12. Connect tube assemblies (27 and 25) to elbows (30 and 28).
13. Connect tube assemblies (25, 26 and 27) with two unions (24).



FUEL LINES AND FITTINGS REPLACEMENT - CONTINUED 0053 00

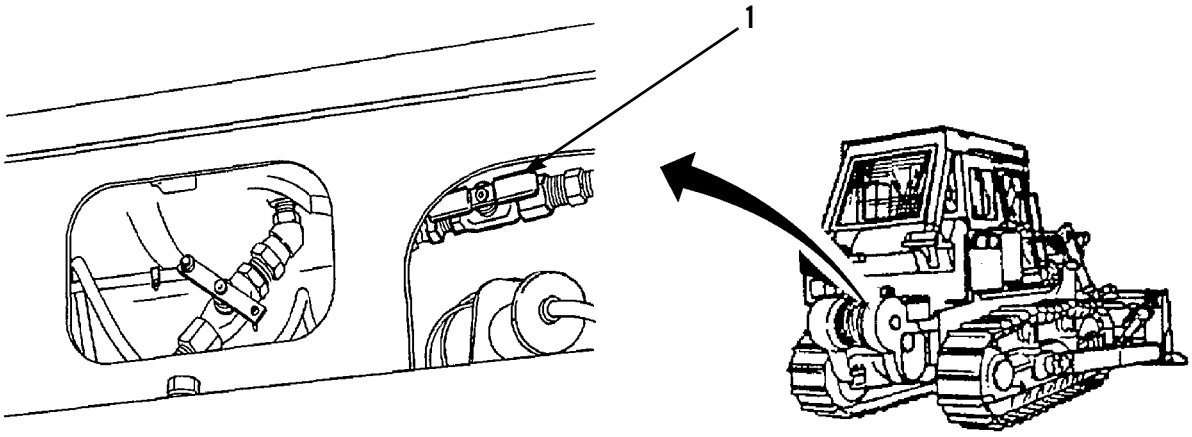
INSTALLATION - CONTINUED

14. Place new O-ring (23) in position on elbow (22). Install elbow to fuel tank fitting.
15. Install fuel shut-off valve (1) to elbow (22). Install fitting (21) to fuel shut-off valve.
16. Connect tube assembly (12) to fitting (21).
17. Connect tube assemblies (12, 13 and 14) with two unions (11).
18. Place new O-ring (20) in position on elbow (18). Install elbow in primary fuel filter.
19. Install tube assembly (15) to elbow (18). Install elbow (17) to hose assembly (19). Install elbow (16) on tube assembly (14).
20. Connect hose assembly (19) to elbows (16 and 17).
21. Install three bolts (2), six washers (3), clamps (4) and three nuts (5).
22. Install three bolts (6), washers (7), small clip (8) and four large clips (9).
23. Install nut (10), washer (7), and two large clips (9).



INSTALLATION - CONTINUED

24. Check fuel level in tank and add as needed (TM 5-2410-237-10).
25. Turn fuel shut-off valve (1) to ON position.



26. Prime fuel system (WP 0041 00).
27. Run engine and check for proper operation and fuel leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

FUEL DRAIN LINE AND DRAIN MECHANISM REPLACEMENT 0054 00

THIS WORK PACKAGE COVERS

Removal, Installation,

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Fuel (Item 13, 14 or 15, WP 0249 00)

O-ring (10)

Lockwasher (30)

References

TM 5-2410-237-10

WP 0041 00

Equipment Condition

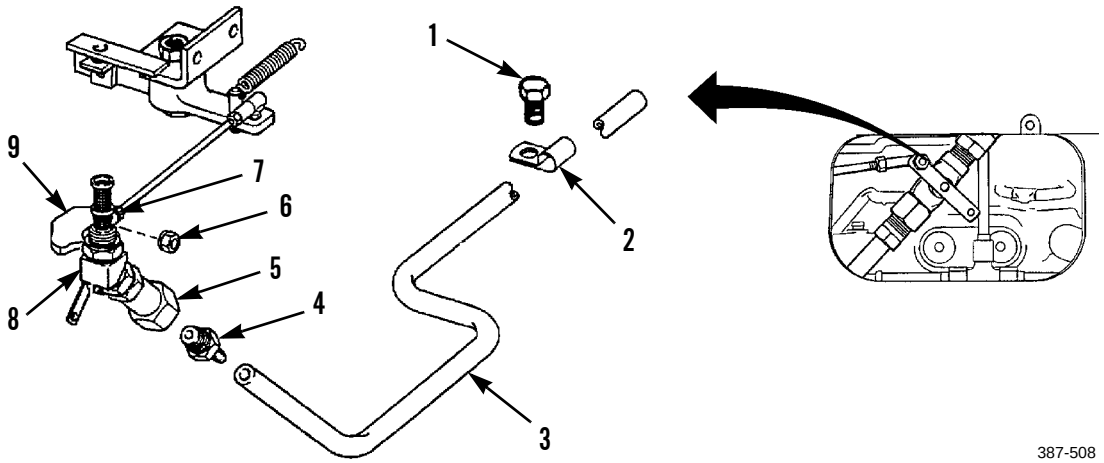
Fuel tank drained (WP 0052 00)

WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

REMOVAL

1. Remove capscrew (1) holding clip (2) to frame. Pull hose (3) from adapter (4). Remove clip from hose.
2. Remove adapter (4) from valve (5).
3. Remove nut (6) from threaded stud of ball joint (7).
4. Remove valve (5) from elbow (8) at bottom of fuel tank (9).



FUEL DRAIN LINE AND DRAIN MECHANISM REPLACEMENT - CONTINUED 00054 00

REMOVAL - CONTINUED

5. Remove elbow (8) from fuel tank (9). Remove O-ring (10) and strainer (11) from elbow. Discard O-ring.
6. Remove nut (12) from threaded stud of ball joint (13). Remove ball joint assembly from drain lever (14).

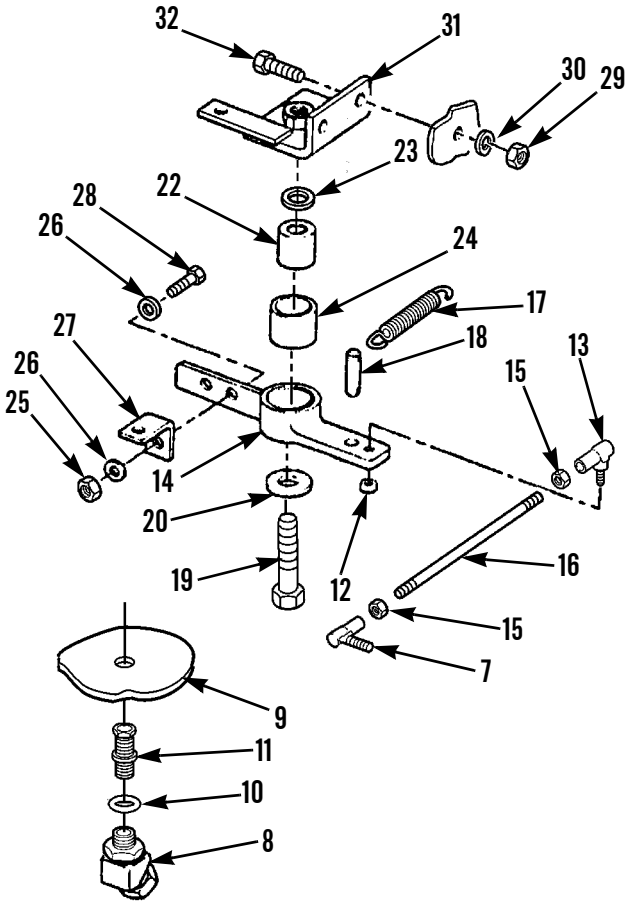
NOTE

Note position of ball joints to ensure correct installation.

7. Remove ball joints (7 and 13) and two nuts (15) from rod (16).
8. Remove spring (17) from pin (18).
9. Remove capscrew (19), washer (20), drain lever (14), spacer (22) and washer (23). Remove bushing (24) from drain lever.
10. Remove nut (25), two washers (26), bracket (27) and capscrew (28) from drain lever (14).
11. Remove two nuts (29), lockwashers (30), bracket (31) and capscrews (32). Discard lockwashers.

INSTALLATION

1. Install bracket (31) with two capscrews (32), new lockwashers (30) and nuts (29).
2. Install bracket (27) to drain lever (14) with capscrew (28), two washers (26) and nut (25).
3. Install bushing (24) in drain lever (14). Install drain lever to bracket (31) with washer (23), spacer (22), washer (20) and capscrew (19).
4. Install spring (17) to pin (18).
5. Install two nuts (15) and ball joints (7 and 13) to rod (16).
6. Place ball joint (13) in position on drain lever (14). Install nut (12).
7. Lightly coat new O-ring (10) with clean fuel and install O-ring and strainer (11) on elbow (8). Install elbow to bottom of fuel tank (9).



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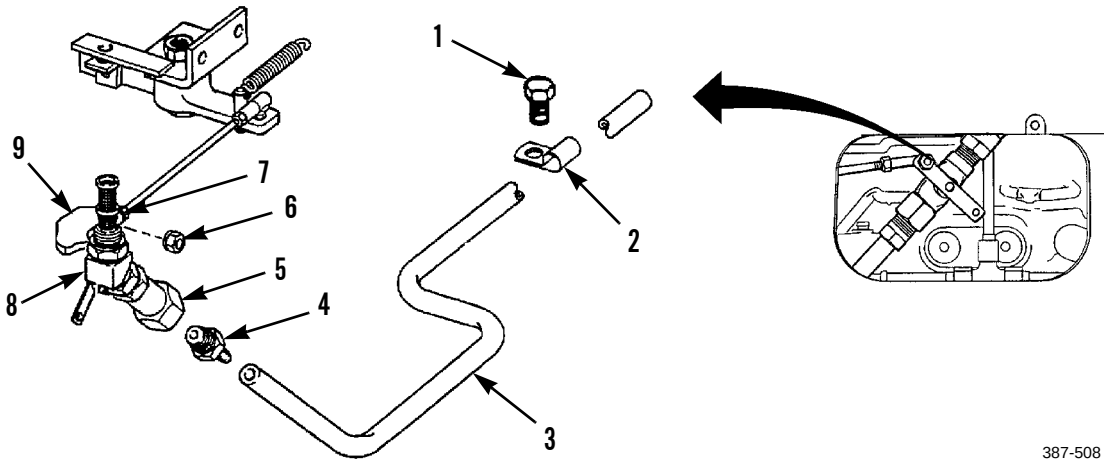
INSTALLATION - CONTINUED

8. Install valve (5) on elbow (8).
9. Connect ball joint (7) to valve (5) and install nut (6).
10. Install adapter (4) to valve (5).
11. Connect hose (3) to adapter (4). Position clip (2) on hose and install clip to frame with capscrew (1).



12. Fill fuel tank (TM 5-2410-237-10).
13. Prime fuel system (WP 0041 00).
14. Run engine and check for fuel leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

GOVERNOR AND FUEL INJECTION PUMP HOUSING REPLACEMENT 0055 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Adapter, torque wrench (Item 9, WP 0250 00)

Pin, timing (Item 66, WP 0250 00)

Puller group (Item 83, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Oil, lubricating (Item 24, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (4)

O-ring (12)

References

WP 0015 00

WP 0018 00

WP 0057 00

Personnel Required

Two

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

Hood removed (WP 0159 00)

Fuel shutoff valve under fuel tank in OFF position (WP 0042 00)

Fuel injection lines disconnected (WP 0044 00)

Governor control linkage disconnected from governor (WP 0058 00)

Fuel return line disconnected (WP 0053 00)

Alternator loosened and V-belts removed (WP 0076 00)

Primary fuel filter assembly removed (WP 0059 00)

Turbocharger drain tube removed (WP 0051 00)

Secondary fuel filter assembly removed (WP 0060 00)

Tachometer drive removed (WP 0230 00)

WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel or equipment damage.

CAUTION

Use caution to ensure fuel system does not become contaminated. Keep work area clean. Install protective caps and plugs as needed. Contamination of fuel system could result in premature failure.

NOTE

Use a suitable container to catch any fuel that may drain from system. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.

GOVERNOR AND FUEL INJECTION PUMP HOUSING REPLACEMENT - CONTINUED 00055 00

REMOVAL

1. Remove crankcase breather from valve cover to access rocker arms (WP 0015 00).
2. Perform steps 1-4 of WP 0018 00 to find top dead center (TDC) compression stroke for no. 1 piston.
3. Remove six nuts (1), washers (2), pump drive gear cover (3) and gasket (4). Discard gasket.
4. Remove capscrew (5), washer (6) and snap ring (7) from fuel injection pump camshaft (8).
5. Attach a gear puller and remove drive gear (9) from taper on fuel injection pump camshaft (8).

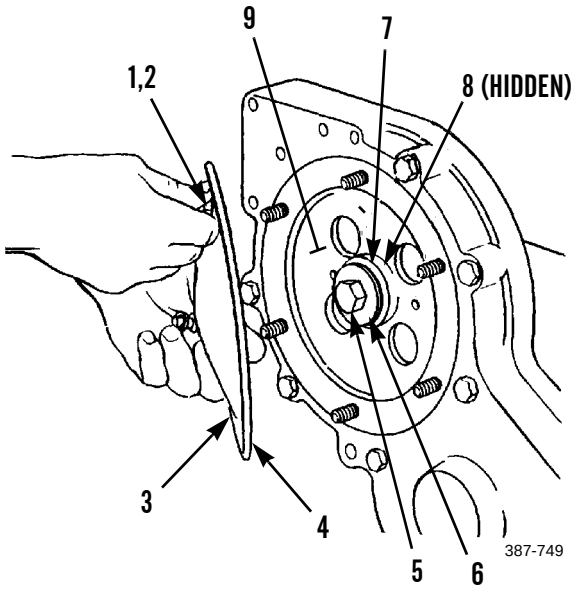
WARNING

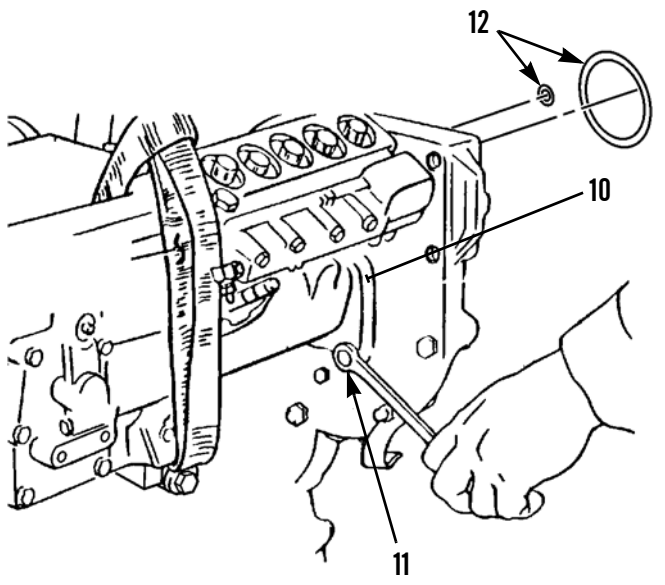
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Weight of governor and fuel injection pump housing is approximately 56 lb (25 kg).

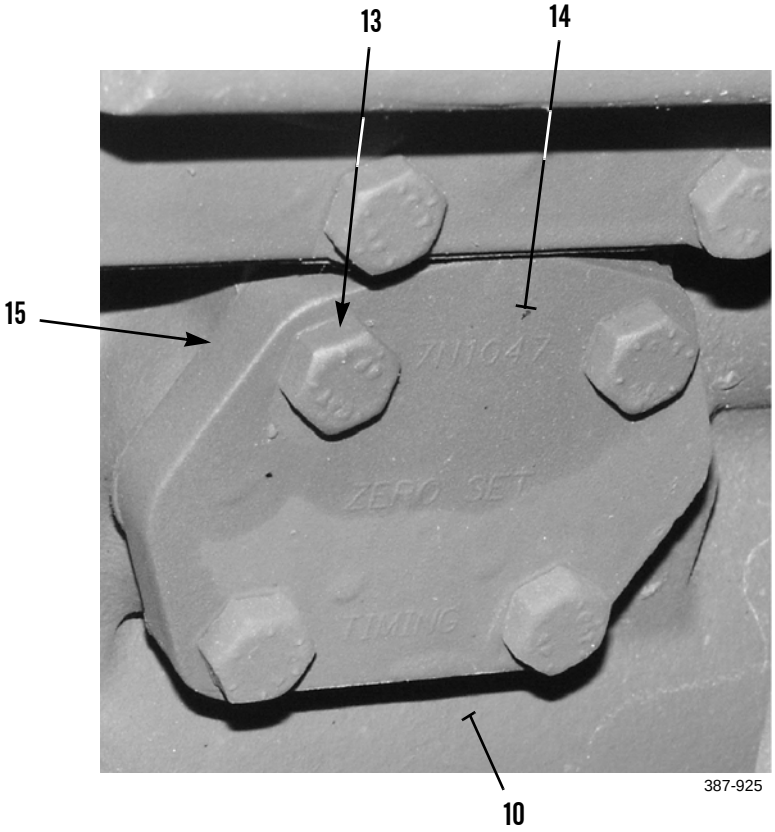
6. Fasten a nylon sling and suitable lifting device to governor and fuel injection pump housing (10).
7. Remove three nuts (11) and separate governor and fuel injection pump housing (10) from engine.
8. Remove two O-rings (12) from governor and fuel injection pump housing (10). Discard O-rings.





INSTALLATION

1. Adjust timing on bench by timing pin method:
   a. Remove four bolts (13) and timing cover (14) from governor and fuel injection pump housing (10). Remove gasket (15) and discard.
   b. Install timing pin and turn camshaft until timing pins goes in groove in fuel pump camshaft.



CAUTION

Wipe area clean around mating surface of engine and governor and fuel injection pump housing prior to installation. Contamination of fuel system could result in premature failure.

NOTE

Lightly coat new O-rings with clean oil prior to installation.

2. Install two new O-rings (12) on governor and fuel injection pump housing (10).

INSTALLATION - CONTINUED

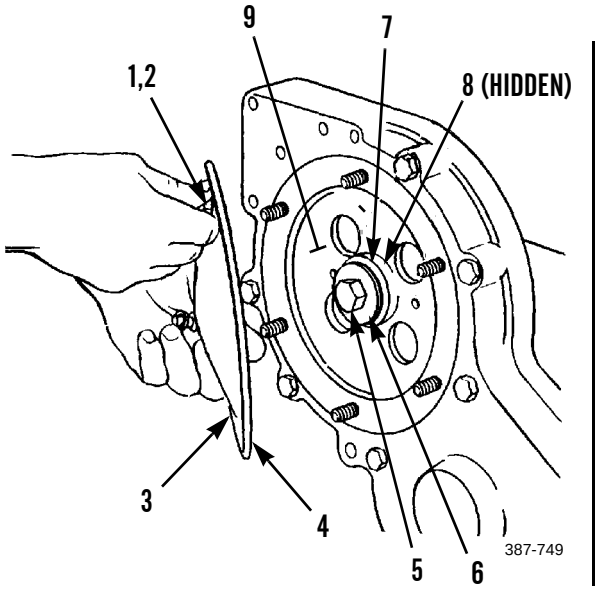
WARNING

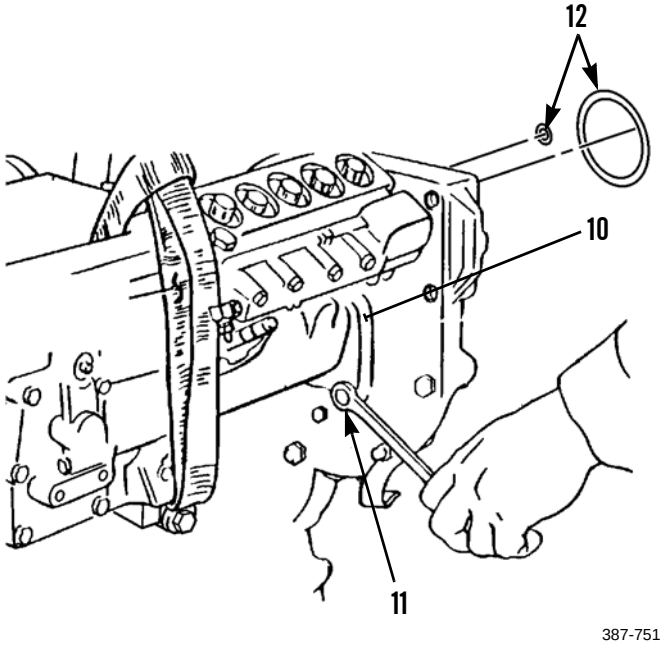
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Governor and fuel injection pump housing weighs 56 lb (25 kg).

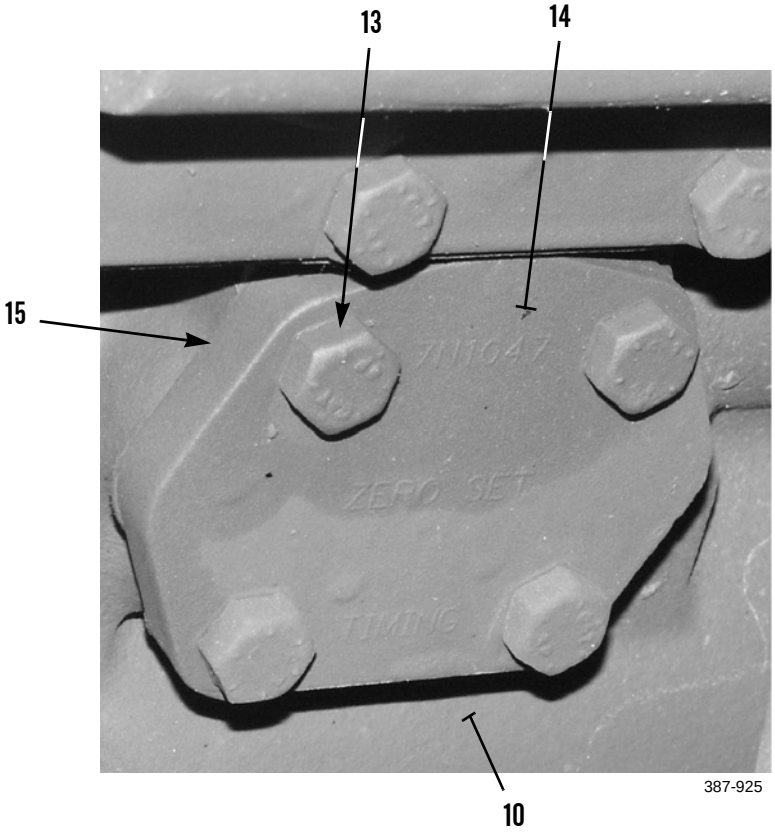
3. Fasten a nylon sling and suitable lifting device to governor and fuel injection pump housing (10) and place in position on engine.
4. Install three nuts (11) on governor and fuel injection pump housing (10) to secure to engine.
5. Install pump drive gear (9) on taper of fuel injection pump camshaft (8).
6. Install washer (6) and snap ring (7) on fuel injection pump camshaft (8).
7. Install torque wrench adapter on pump drive gear (9). Use two 3/8 in.-24NF bolts, 1 in. (25.4 mm) long, to secure adapter to puller holes in gear. Install capscrew (5). Hold torque of 45-50 lb-ft (61-68 Nm) on adapter in a rotation to the right, and tighten capscrew to 200 +/- 20 lb-ft (270 +/- 30 Nm).





INSTALLATION - CONTINUED

8. Remove timing pin and install new gasket (15) and timing cover (14) to governor and fuel injection pump housing (10) with four bolts (13).



9. Install new gasket (4), pump drive gear cover (3), six washers (2) and nuts (1).
10. Install tachometer drive (WP 0230 00).
11. Install secondary fuel filter assembly (WP 0060 00).
12. Install turbocharger drain tube (WP 0051 00).
13. Install primary fuel filter assembly (WP 0059 00).
14. Install V-belts and tighten alternator (WP 0076 00).
15. Connect fuel return line (WP 0053 00).
16. Connect governor control linkage (WP 0058 00).
17. Install fuel injection lines (WP 0044 00).
18. Turn fuel shutoff valve under fuel tank to ON position (WP 0042 00).
19. Install hood (WP 0159 00).
20. Place battery disconnect switch in ON position (TM 5-2410-237-10).
21. Operate machine and check for proper operation and fuel leaks at governor and fuel injection pump housing (10).
22. Adjust fuel injector pump and governor if necessary (WP 0057 00).
23. Operate tractor and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

GOVERNOR SHAFT SEAL REPLACEMENT 0056 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 24, WP 0249 00)

Materials/Parts - Continued

Seal (7)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

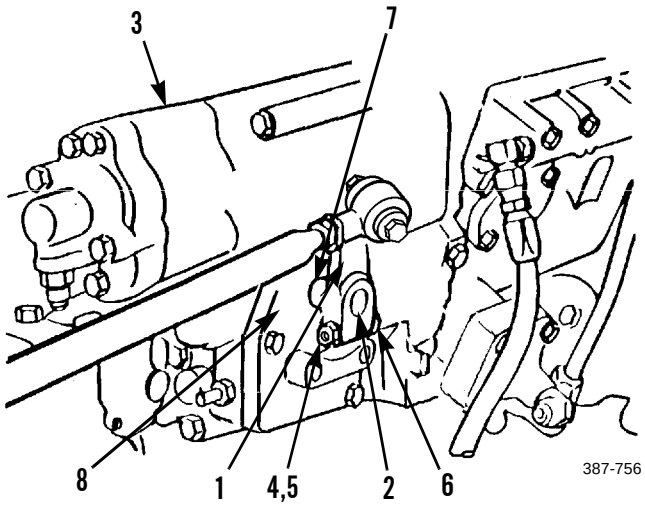
REMOVAL

1. Mark location of lever (1) on end of throttle shaft (2) of fuel injection pump governor (3).
2. Remove nut (4), two washers (5) and capscrew (6) from lever (1).

NOTE

Throttle linkage may remain attached to top of lever (1).

3. Remove lever (1) from end of throttle shaft (2) and position aside.



REMOVAL - CONTINUED

NOTE

Note position of seal in cover to ensure correct installation.

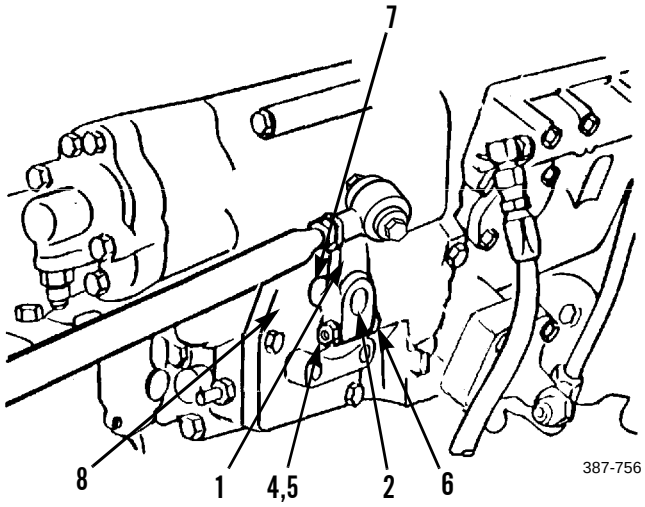
4. Remove shaft seal (7) from cover (8) and discard seal.

INSTALLATION

NOTE

Lightly coat new seal with clean oil before installation.

1. Install new shaft seal (7) into cover (8).
2. Align two marks made during removal and install lever (1) on end of throttle shaft (2).
3. Install capscrew (6), two washers (5) and nut (4) on lever (1).



END OF WORK PACKAGE

FUEL INJECTION PUMP AND GOVERNOR TIMING AND ADJUSTMENT 0057 00

THIS WORK PACKAGE COVERS

Adjust Timing by Timing Pin Method, Governor Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Adapter, torque wrench (Item 9, WP 0250 00)

Analyzer set, engine (Item 11, WP 0250 00)

Pin, timing (Item 66, WP 0250 00)

Puller group (Item 83, WP 0250 00)

Tachometer, stroboscopic (Item 119, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Bolt, 3/8 in.-16NC, 2 in. long

References

WP 0015 00

WP 0018 00

WP 0058 00

Personnel Required

Two

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel or equipment damage.

CAUTION

Use caution to ensure fuel system does not become contaminated. Keep work area clean. Install protective caps and plugs as needed. Contamination of fuel system could result in premature failure.

NOTE

Use a suitable container to catch any fuel that may drain from system. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.

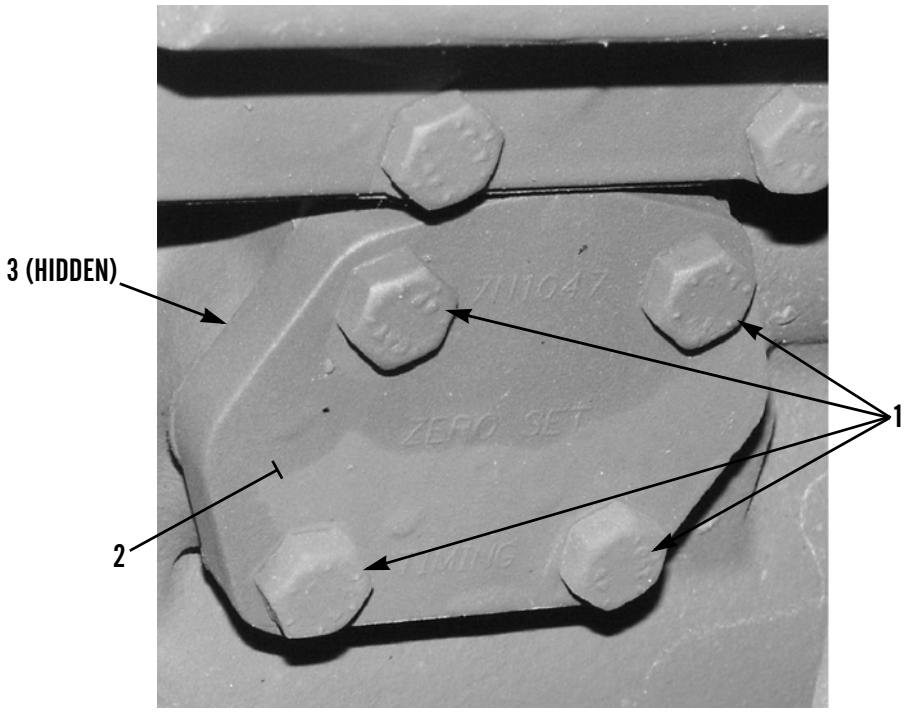
ADJUST TIMING BY TIMING PIN METHOD

1. Place battery disconnect switch in OFF position (TM 5-2410-237-10).
2. Remove crankcase breather from valve cover to access rocker arms (WP 0015 00).
3. Perform steps 1-4 of WP 0018 00 to find top dead center (TDC) compression stroke for no. 1 piston.

CAUTION

Turn flywheel slowly to avoid damage to fuel injection pump, camshaft and timing pin.

4. Rotate engine so flywheel turns approximately 30 degrees clockwise, as seen from flywheel end.
5. Remove four bolts (1) and timing cover (2) from governor and fuel injection pump housing. Remove and discard gasket (3). Install timing pin in plug hole of fuel injection pump housing.



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ADJUST TIMING BY TIMING PIN METHOD - CONTINUED

6. Rotate engine flywheel (as seen from rear of engine) slowly to the left, until timing pin goes in notch of injector pump camshaft.

7. Try to insert a 3/8 in.-16NC bolt in timing hole in flywheel housing.

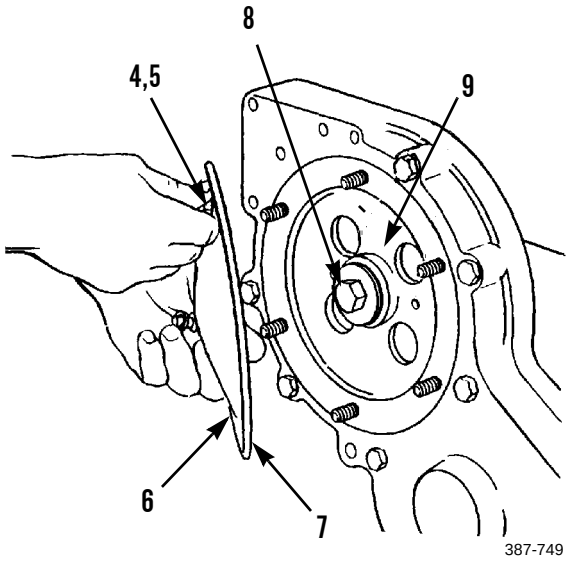
   a. If timing bolt can be installed in hole of flywheel, timing of fuel injection pump is correct. Proceed to step 8.

   b. If timing bolt cannot be installed in hole of flywheel, timing of fuel injection pump is not correct. Perform the following steps to adjust timing:

      (1) Remove six nuts (4), washers (5), pump drive gear cover (6) and gasket (7) from timing gear housing. Discard gasket.

      (2) Loosen capscrew (8) that holds drive gear (9) to fuel pump camshaft. Turn capscrew out three turns to the left.

      (3) Install gear puller and loosen drive gear (9) from fuel pump camshaft.



      (4) Rotate engine 60 degrees to the right to put no. 1 piston at top dead center.

      (5) Tighten capscrew (8) finger-tight. Ensure timing pin is in groove of fuel pump camshaft.

      (6) Slowly rotate engine to the left until timing bolt can be installed in flywheel.

      (7) Install torque wrench adapter on drive gear (9). Use two 3/8 in.-24NF bolts, 1 in. (25.4 mm) long, to secure adapter to puller holes in gear.

      (8) Hold torque of 45-50 lb-ft (61-68 Nm) on torque wrench adapter in a rotation to the right, and tighten capscrew (9) to 200 lb-ft (271 Nm).

      (9) Remove timing bolt from flywheel. Remove timing pin from fuel pump camshaft.

      (10) Rotate engine two revolutions to the left. If timing bolt can be installed in flywheel and timing pin can be installed in fuel pump camshaft, timing is correct. Continue with step 8.

      (11) If either timing pin or timing bolt cannot be installed, repeat steps 1-10.

8. Remove 3/8 in.-16NC bolt from timing hole in flywheel housing and install plug.

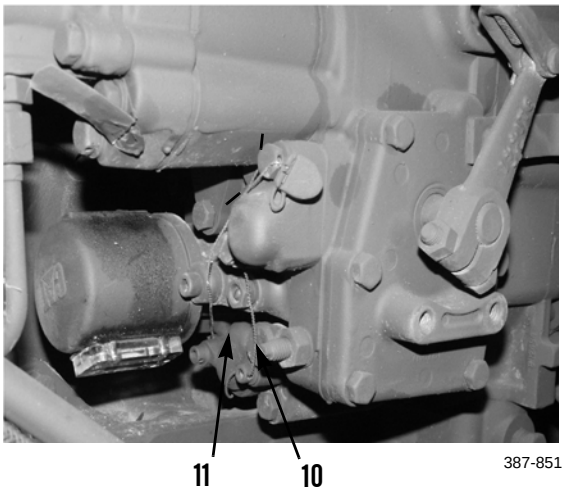
9. Remove timing pin. Install new gasket (3) and timing cover (2) to side of fuel injection pump housing with four bolts (1).

GOVERNOR ADJUSTMENT

NOTE

- **To perform these adjustments, governor and fuel injector pump housing is installed on engine and engine is at operating temperature.**
- **Engine low idle speed should be 670 +/- 30 RPM.**
- **Engine high idle speed should be 2100 +/- 30 RPM.**
- **Engine loaded rate should be 2000 +/- 10 RPM.**

1. **Governor Low Idle Adjustment.**
   a. Install photo tachometer and check engine low and high RPM on engine. Task complete if RPM is correct. If RPM fails specification, continue with governor adjustments.
   b. Disconnect governor control linkage (WP 0058 00).
   c. Adjust engine low idle RPM. Loosen locknut (10) for low idle screw (11). Turn idle screw to get correct low idle RPM.
   d. Increase engine speed and return to low idle and check low idle speed again. Hold idle screw (11) and tighten locknut (10) if low idle RPM is correct.
   e. Connect governor control linkage (WP 0058 00).
   f. Operate machine and check for proper operation (TM 5-2410-237-10).



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2. **Governor High Idle Adjustment.**

NOTE

If engine does not achieve 2100 RPM, refer to WP 0058 00 to adjust governor control linkage.

END OF WORK PACKAGE

GOVERNOR CONTROLS AND LINKAGE MAINTENANCE 0058 00

THIS WORK PACKAGE COVERS

Removal, Installation, Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (71)

Pin, cotter (6 and 28)

Materials/Parts - Continued

Seal (77 and 82)

Washer, lock (2)

Seal (77 and 82)

Washer, lock (2)

References

TM 5-2410-237-10

WP 0007 00

Equipment Condition

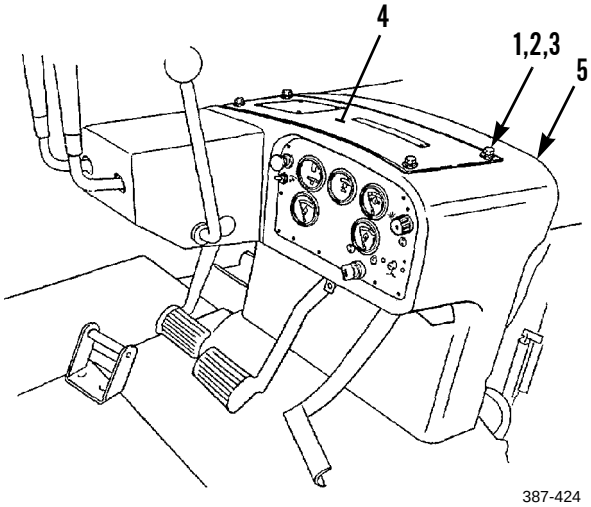
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), lockwashers (2), washers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



387-424

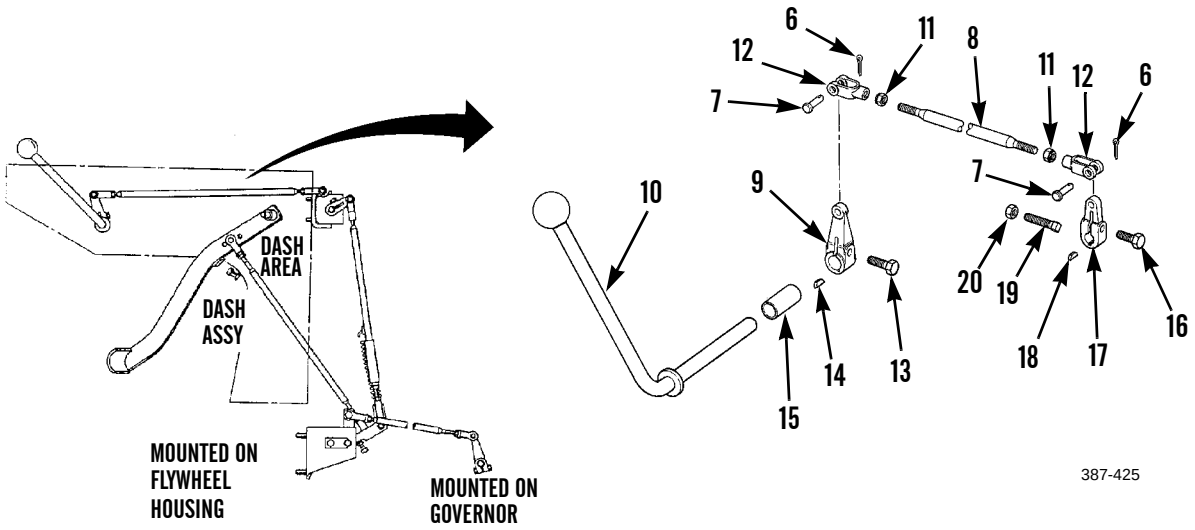
REMOVAL - CONTINUED

2. Remove cotter pin (6), pin (7) and separate end of rod (8) from lever (9) on hand lever (10). Discard cotter pin.
3. Repeat step 2 at other end of rod (8) assembly and remove rod from dash assembly (5).
4. Loosen jam nut (11) at each end of rod (8) assembly and remove rod end (12) and jam nut from each end of rod.
5. Remove capscrew (13) from lever (9) on hand lever (10).

NOTE

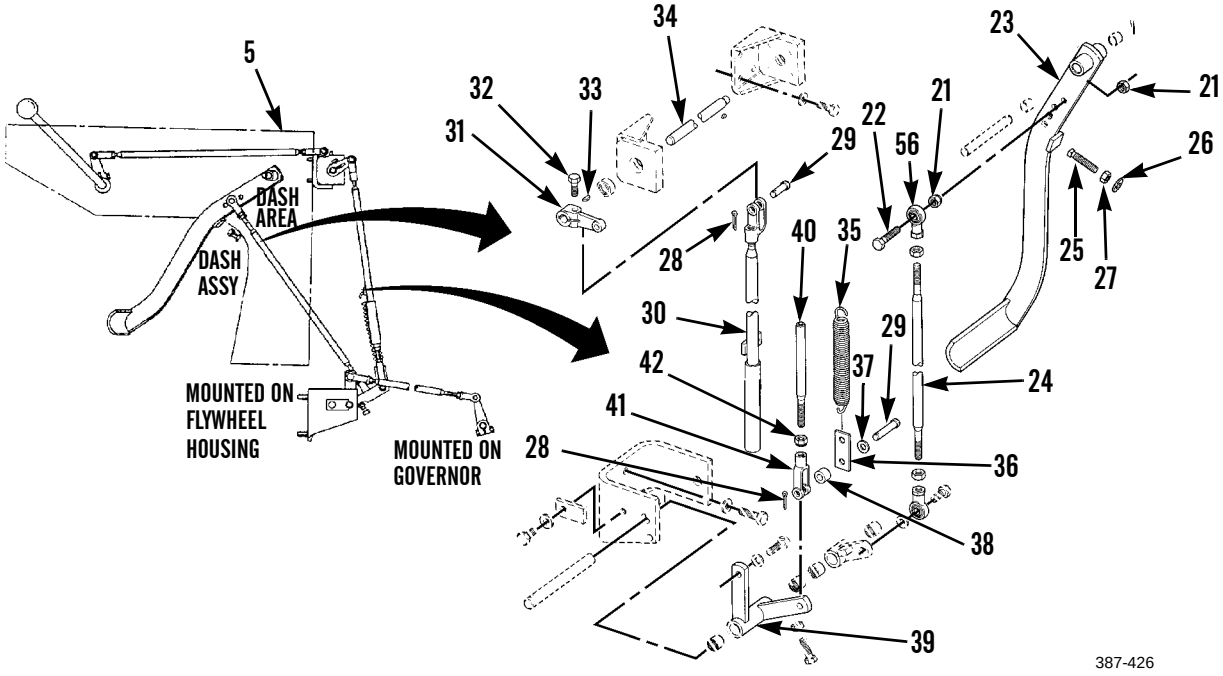
Drive small chisel into slot in levers on shafts to open them up for removal.

6. Remove lever (9), key (14) and spacer (15) from hand lever (10) and remove hand lever from side of dash assembly (5).
7. Remove capscrew (16) from lever (17) on shaft assembly at back of dash.
8. Remove lever (17) and key (18) from shaft assembly.
9. Remove capscrew (19) and nut (20) from back of dash assembly (5).



10. Remove two nuts (21) and capscrew (22) from decelerator pedal (23) and rod (24).
11. Remove stop setscrew (25), washer (26) and nut (27) from lower front of dash assembly (5).
12. Remove cotter pin (28), pin (29) and upper end of rod (30) from lever (31) at back of dash. Discard cotter pin.
13. Remove capscrew (32), lever (31) and key (33) from shaft (34).
14. Remove spring (35) from lower end of rod (30) and strip (36).
15. Remove cotter pin (28), pin (29), washer (37), strip (36), spacer (38) and rod (30) from bellcrank (39). Discard cotter pin.
16. Remove rod (40) from rod (30). Remove rod end (41) and jam nut (42) from rod (40).

REMOVAL - CONTINUED



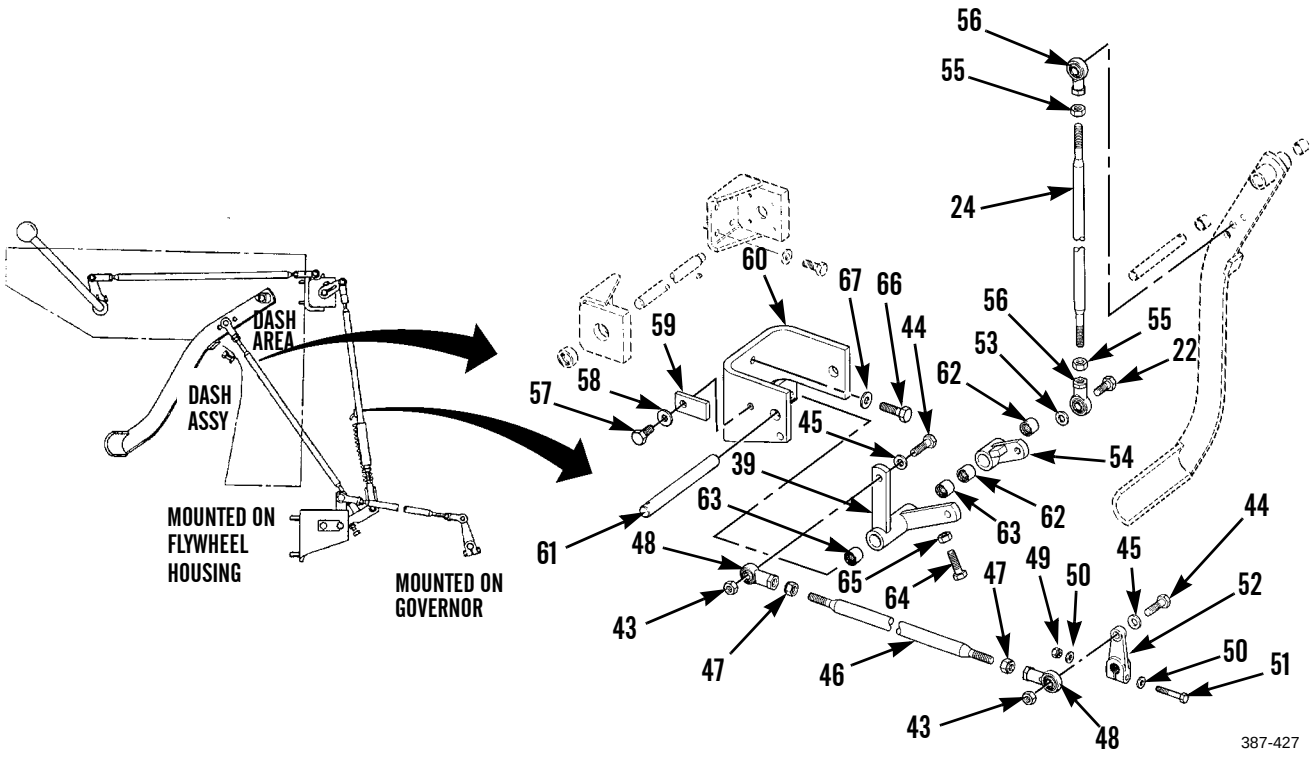
REMOVAL - CONTINUED

17. Remove nut (43), capscrew (44), two washers (45) and one end of rod (46) assembly from bellcrank (39).

NOTE

Items are removed from lever (52) when repeating step 17.

18. Repeat step 17 at other end of rod (46) assembly and remove rod.
19. Loosen jam nut (47) at each end of rod (46) assembly. Remove two rod ends (48) and jam nuts from rod.
20. Remove nut (49), two washers (50) and capscrew (51) from lever (52).
21. Remove lever (52) from shaft on governor.
22. Remove capscrew (22), lower end of rod (24) and washer (53) from bellcrank (54).
23. Loosen two jam nuts (55) and remove two rod ends (56) and jam nuts from rod (24).
24. Remove capscrew (57), washer (58) and lock (59) from side of bellcrank mounting bracket (60).
25. Remove shaft (61), bellcrank (39) and bellcrank (54) from bracket (60).
26. Remove two bearings (62) from bellcrank (54).
27. Remove two bearings (63), capscrew (64) and nut (65) from bellcrank (39).
28. Remove three capscrews (66), washers (67) and bracket (60) from flywheel housing.

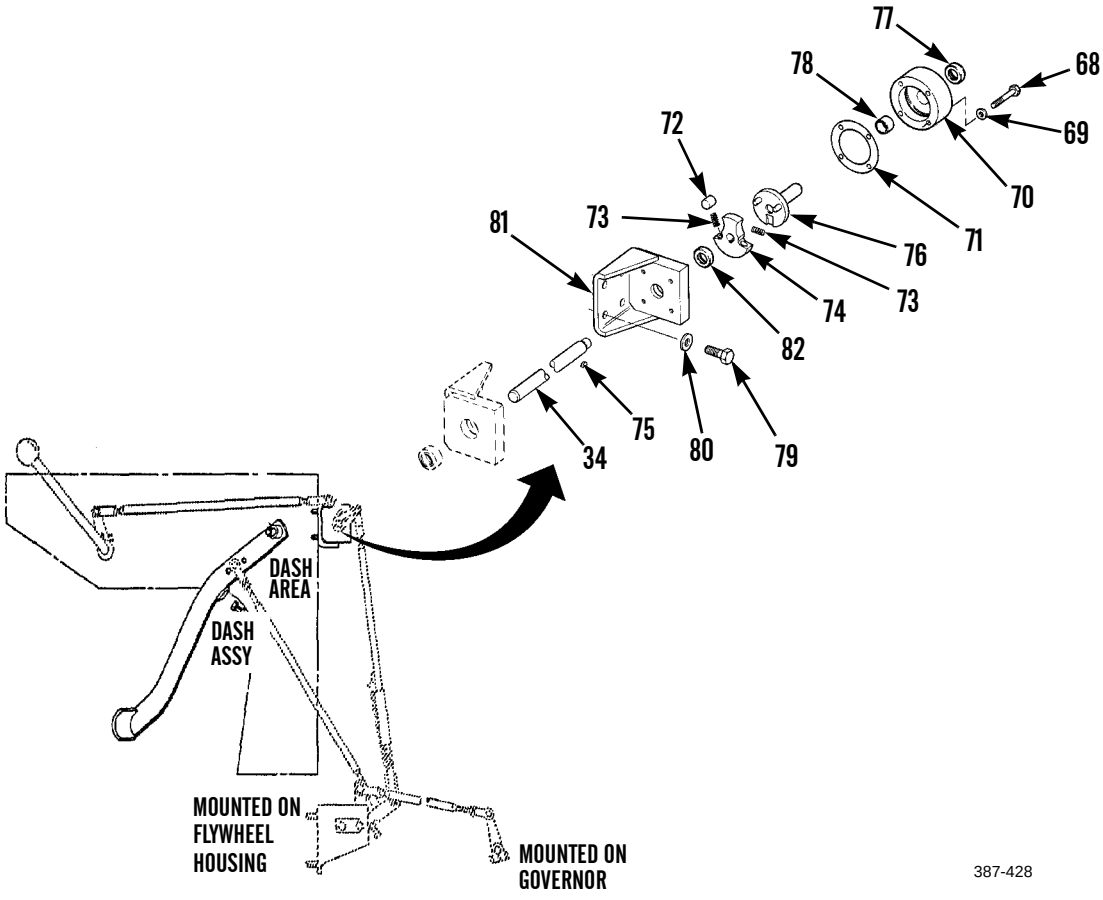


REMOVAL - CONTINUED

WARNING

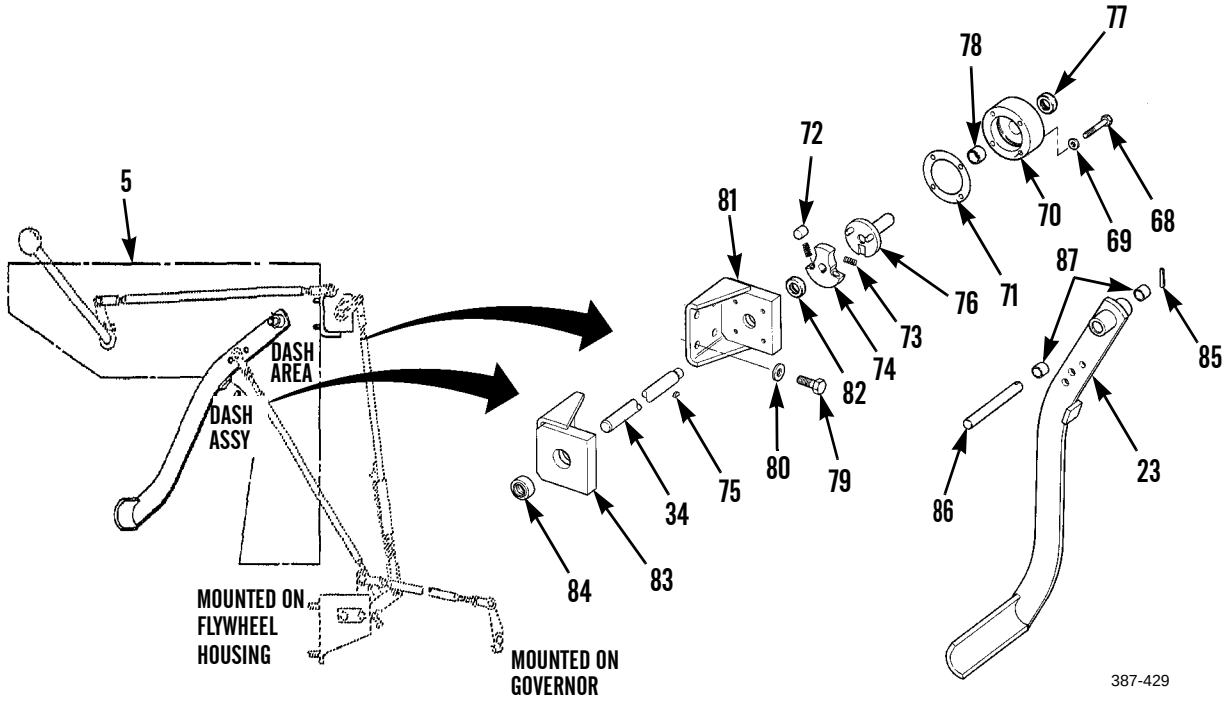
Rollers under cover assembly are spring loaded. Wear eye protection and use extreme caution when disassembling them to avoid serious injury to personnel.

29. Remove four capscrews (68) and washers (69) from cover assembly (70).
30. Push on shaft (34) and pull on cover assembly (70) to remove assembled shaft and cover assembly.
31. Remove gasket (71) and discard.
32. Slowly remove shaft (34) assembly from cover assembly (70). Keep one hand wrapped around cover assembly to catch two rollers (72) and springs (73) as shaft assembly is removed.
33. Remove plate (74) and key (75) from shaft (34).
34. Remove short shaft assembly (76) from cover assembly (70).
35. Remove seal (77) and bearing (78) from cover (70). Discard seal.
36. Remove four capscrews (79), washers (80) and support assembly (81) from back of dash assembly.
37. Remove seal (82) from support assembly (81). Discard seal.



REMOVAL - CONTINUED

38. Remove two capscrews (79), washers (80) and support assembly (83) from back of dash assembly.
39. Remove bearing (84) from support assembly (83).
40. Remove pin (85) from dowel (86). Slide decelerator pedal (23) off dowel. Remove bearings (87) from pedal.



INSTALLATION

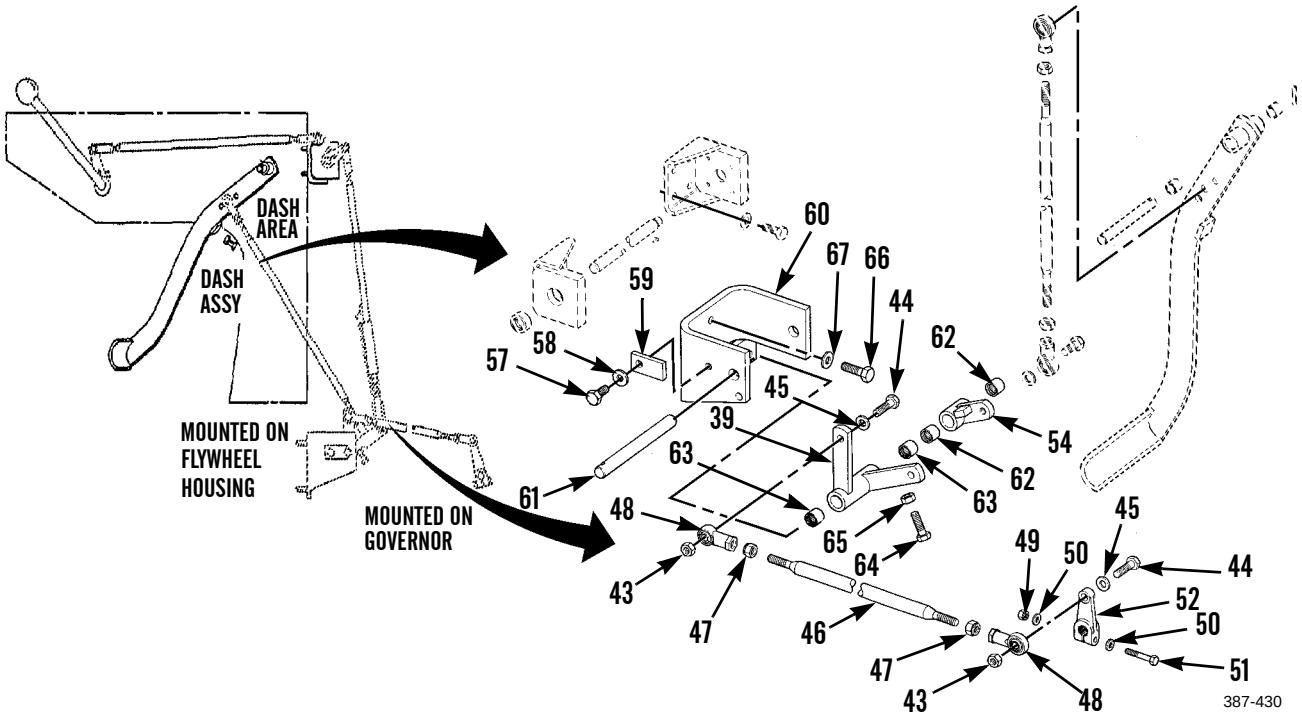
NOTE

- **Use a lint-free rag to wipe contact surfaces of all moving parts clean prior to installation.**
- **Drive small chisel into slot in levers to open them up for installation on shafts.**

1. Install bearings (87) in decelerator pedal (23). Position pedal on dowel (86) and install pin (85) to keep assembly secure.
2. Install bearing (84) in support assembly (83).
3. Install support assembly (83) on back of dash assembly (5) with two capscrews (79) and washers (80).
4. Lubricate sealing lip and install new seal (82) in support assembly (81).
5. Install support assembly (81) on back of dash assembly (5) with four capscrews (79) and washers (80).
6. Install bearing (78) in cover (70). Lubricate sealing lip and install new seal (77) in cover.
7. Install key (75) and plate (74) on shaft (34).
8. Lubricate cover (70).
9. Install short shaft (76) in cover (70).
10. Install two springs (73), rollers (72) and plate (74) end of shaft assembly in cover (70).
11. Place new gasket (71) over shaft (34) and insert shaft through support assemblies (81 and 83).
12. Align screw holes in cover (70), gasket (71) and support (81). Install four capscrews (68) and washers (69) to secure cover (70).

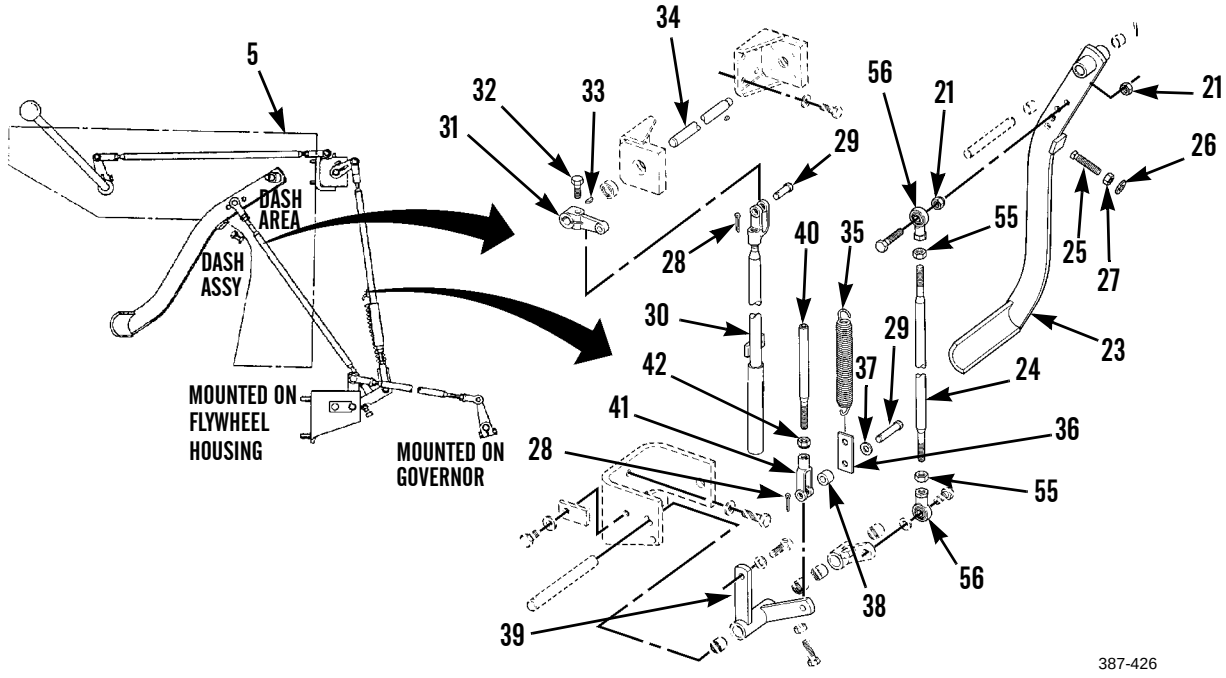
INSTALLATION - CONTINUED

13. Install bracket (60) on flywheel housing with three capscrews (66) and washers (67).
14. Install two bearings (62) in bellcrank (54).
15. Install two bearings (63), nut (65) and capscrew (64) in bellcrank (39). Do NOT tighten nut.
16. Install bellcrank (39 and 54) in bracket (60) with shaft (61).
17. Install lock (59) on side of bracket (60) with capscrew (57) and washer (58) to secure shaft (61).
18. Install lever (52) on shaft of governor with capscrew (51), two washers (50) and nut (49).
19. Install two jam nuts (47) and rod ends (48) on rod (46). Adjust rod assembly length until distance between center line of holes in rod ends is 17.24 in. (438 mm). See *Adjustment*, step 12. Tighten jam nuts against rod ends to secure.
20. Install rod end (48) on bellcrank (39) with capscrew (44), two washers (45) and nut (43).
21. Repeat step 20 for other rod end (48) on lever (52).



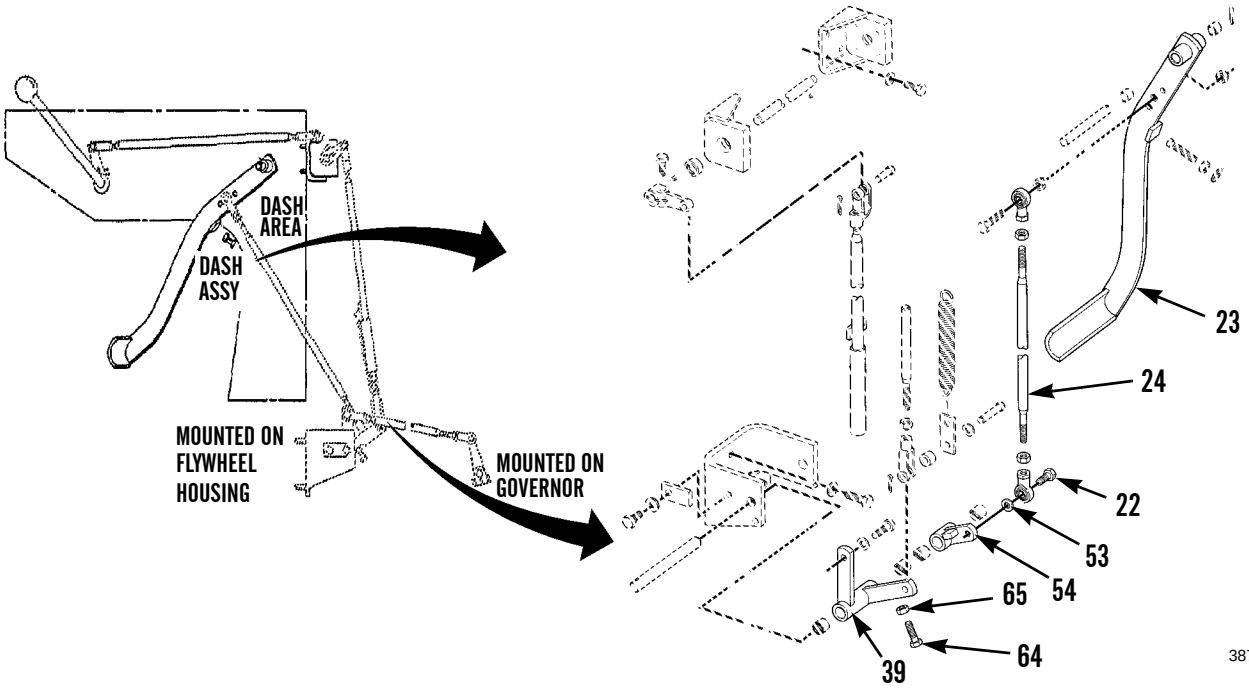
INSTALLATION - CONTINUED

22. Install jam nut (42) and rod end (41) on rod (40) and insert rod (40) in rod (30). Adjust rod length until distance between center line of holes in rod ends is 23.50 in. (597 mm). See *Adjustment*, step 6. Tighten jam nut against rod end.
23. Install pin (29), washer (37), strip (36), spacer (38) and rod end (41) on bellcrank (39) and install new cotter pin (28) in pin.
24. Install key (33) and lever (31) on shaft (34) and secure lever (31) with capscrew (32).
25. Install upper end of rod (30) on lever (31) and secure with pin (29) and new cotter pin (28).
26. Install spring (35) on strip (36) and rod (30).
27. Install washer (26), nut (27) and capscrew (25) onto lower part of dash assembly (5) finger tight.
28. Install two jam nuts (55) and rod ends (56) on rod (24). Adjust rod assembly to length of 24.01 in. (610 mm). See *Adjustment*, step 9. Tighten jam nuts against rod ends to secure.



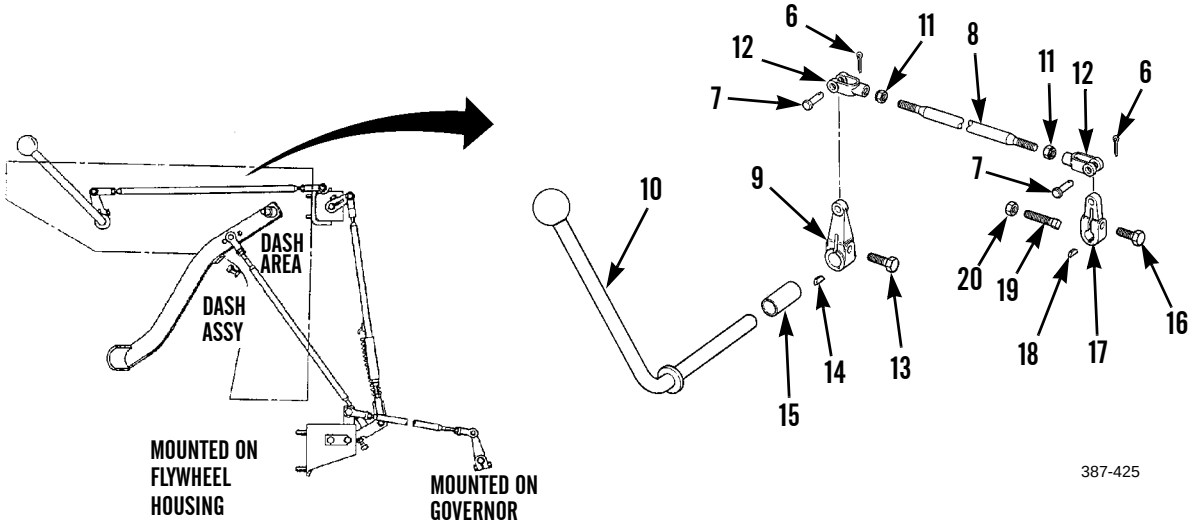
INSTALLATION - CONTINUED

29. Install upper end of rod (24) assembly on decelerator pedal (23) with capscrew (22) and two nuts (21).
30. Install lower end of rod (24) assembly on bellcrank (54) with capscrew (22) and washer (53).
31. Use capscrew (64) in bellcrank (39) to adjust decelerator lever (23) to a dimension of 3.94 in. (100 mm) from center of foot pedal to front of instrument panel. Tighten nut (65) to secure capscrew after adjustment.

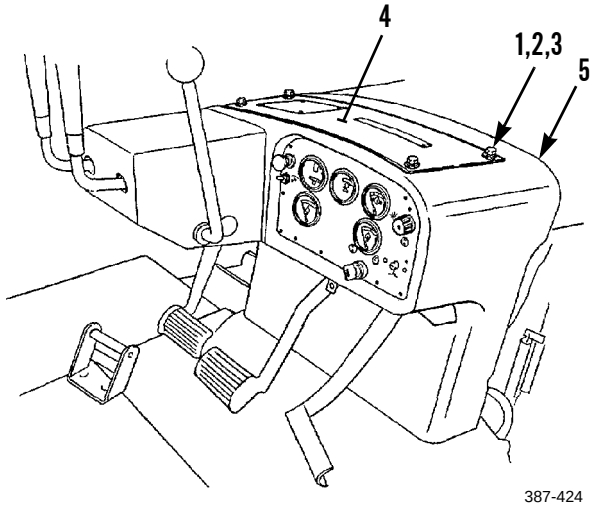


INSTALLATION - CONTINUED

32. Install key (18) and lever (17) on shaft assembly at upper rear of dash assembly (5).
33. Install capscrew (19) and nut (20) finger tight at upper rear of dash assembly (5).
34. Install capscrew (16) in lever (17) on shaft assembly on back of dash.
35. Insert hand lever (10) through side of dash housing and install spacer (15), key (14) and lever (9) on hand lever shaft.
36. Install capscrew (13) in lever (9) on hand lever (10).
37. Install two jam nuts (11) and two rod ends (12) on rod (8). Adjust rod length to 21.54 in. (547 mm). See *Adjustment*, step 3. Tighten jam nuts against rod ends to secure.
38. Install rod end (12) on lever (9) at hand lever (10) end with pin (7) and new cotter pin (6).
39. Repeat step 38 at other end of rod (8) assembly at back of dash assembly (5).

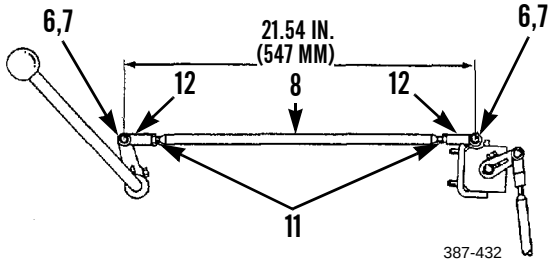


40. Make adjustments to linkages. See *Adjustment*.
41. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (2) and washers (3).
42. Connect battery cables (WP 0101 00).

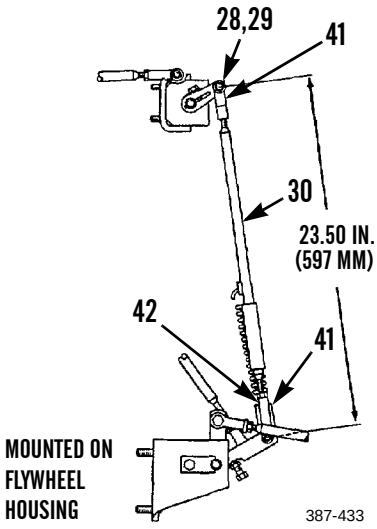


ADJUSTMENT

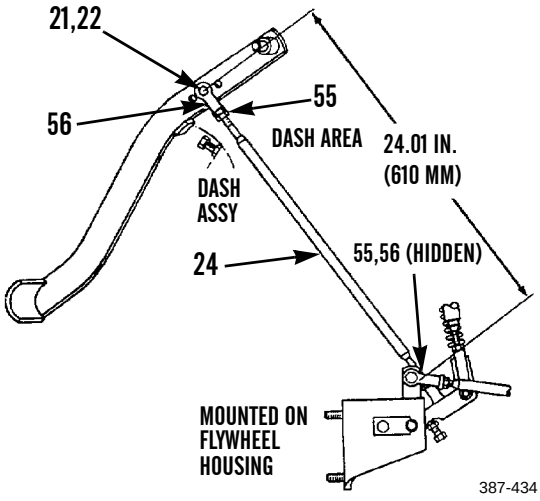
1. Remove cover from top of dash assembly. See *Removal*, step 1.
2. Loosen jam nuts (11) on rod (8) and remove cotter pin (6) and pin (7) at back end of rod assembly. Discard cotter pin.
3. Adjust rod ends (12) until distance between center line of holes in rod ends is 21.54 in. (547 mm).
4. Install rod (8) assembly with pin (7) and new cotter pin (6) and tighten jam nuts (11).



5. Loosen jam nut (42) on rod (30) and remove cotter pin (28) and pin (29) on top end of rod assembly. Discard cotter pin.
6. Adjust rod ends (41) until distance between center line of holes in rod ends is 23.50 in. (597 mm). Tighten jam nut (42).
7. Install pin (29) and new cotter pin (28).

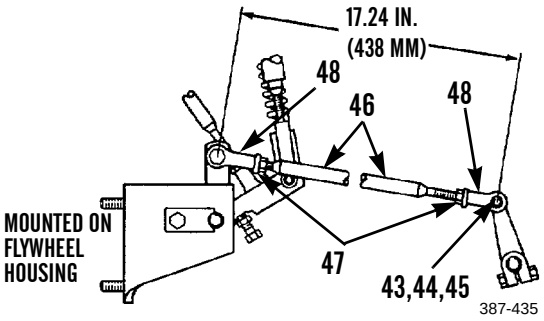


8. Loosen jam nuts (55) on rod (24) and remove capscrew (22) and two nuts (21) from rod end (56).
9. Adjust rod ends (56) until distance between center line of holes in rod ends is 24.01 in. (610 mm).
10. Install capscrew (22) and two nuts (21). Tighten jam nuts (55).

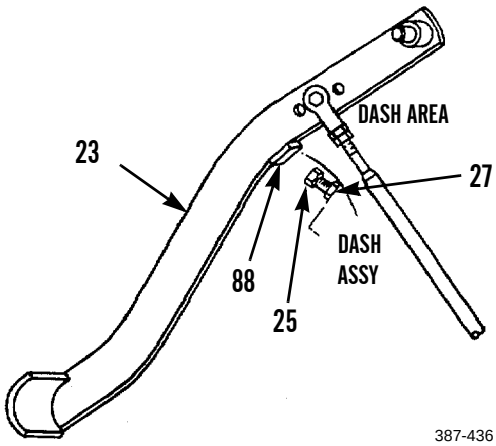


ADJUSTMENT - CONTINUED

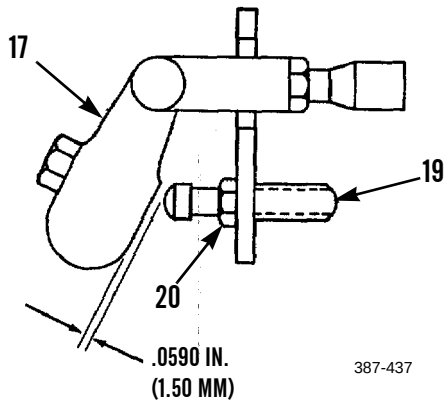
11. Loosen jam nuts (47) on rod (46). Remove capscrew (44), two washers (45) and nut (43) from rod end (48).
12. Adjust rod ends (48) until distance between center line of holes in rod ends is 17.24 in. (438 mm).
13. Install rod (46) assembly with capscrew (44), two washers (45) and nut (43). Tighten jam nuts (47).
14. Use STE/ICE to determine high idle RPM (WP 0007 00). High idle rpm should be 2130 RPM after adjustment. If it is not, a slight adjustment to length of rod (46) should be made to obtain correct high idle RPM.



15. Loosen nut (27). Start engine and depress decelerator pedal (23) until pad (88) is resting against stop setscrew (25). Turn setscrew (25) until an engine low idle RPM of 985 +50 RPM is obtained. Use STE/ICE to determine RPM (WP 0007 00). Tighten nut (27).



16. After linkage has been adjusted, set engine at high idle and adjust capscrew (19) at back of dash to 0.0590 in. (1.50 mm) dimension between capscrew and lever (17). Tighten nut (20) to secure adjustment.
17. Install cover on top of dash assembly. See installation, step 41.



18. Run and test drive machine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

PRIMARY FUEL FILTER ASSEMBLY MAINTENANCE 0059 00

THIS WORK PACKAGE COVERS

Filter Element Service

Primary Fuel Filter Assembly: Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Rag, wiping (Item 29, WP 0249 00)

Fuel (Item 13, 14 or 15, WP 0249 00)

Filter element, fluid (6)

Gasket (5)

O-ring (18)

Materials/Parts - Continued

Packing, preformed (15)

References

WP 0041 00

WP 0053 00

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

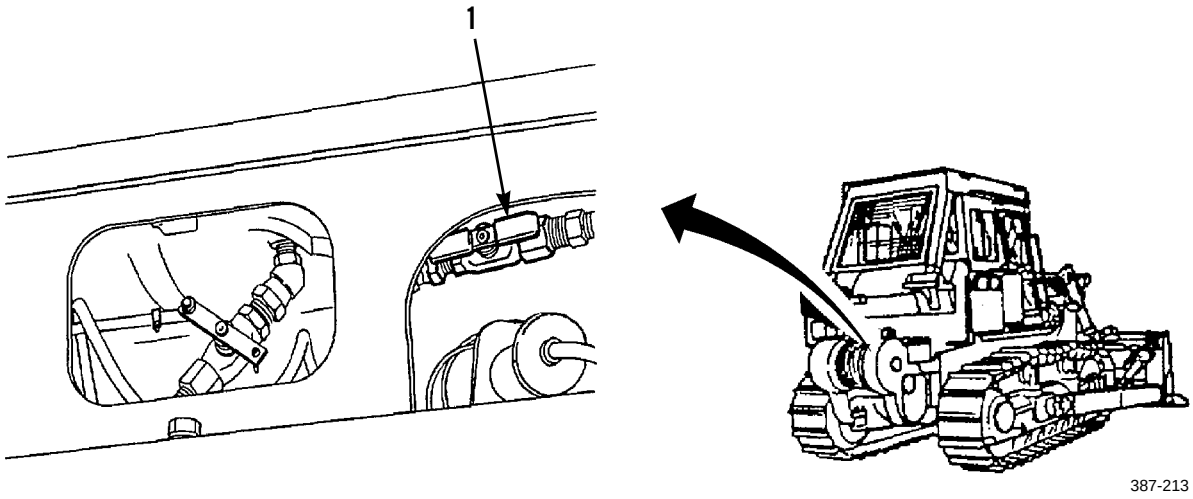
DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel or equipment damage.

CAUTION

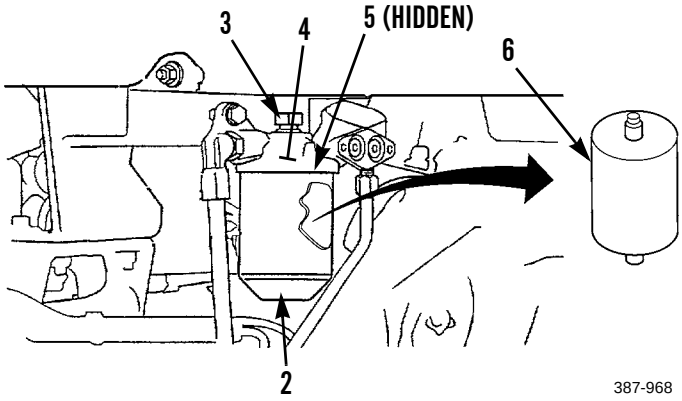
Use caution to ensure fuel system does not become contaminated. Keep work area clean. Cap fuel lines after disconnections are made and cover all openings with a clean rag.

FILTER ELEMENT SERVICE

1. Turn fuel shutoff valve (1) at bottom fuel tank to the OFF position.



2. Hold filter case (2) and loosen nut (3) from top of filter base (4).
3. Remove filter case (2) from filter base (4).
4. Remove gasket (5) and filter element (6) from filter case (2). Discard gasket.
5. Drain fuel inside filter case (2) into a suitable container.
6. Use a soft bristle brush to remove foreign particles from filter element (6).



FILTER ELEMENT SERVICE - CONTINUED

7. Inspect filter element (6) for dents, contamination, or other damage. Replace if damaged.
8. Place filter element (6) onto stud in filter case (2).
9. Coat new gasket (5) with fuel and position on filter case (2).
10. Position filter case (2) onto filter base (4) and hand tighten nut (3) until filter case is snug against filter base.

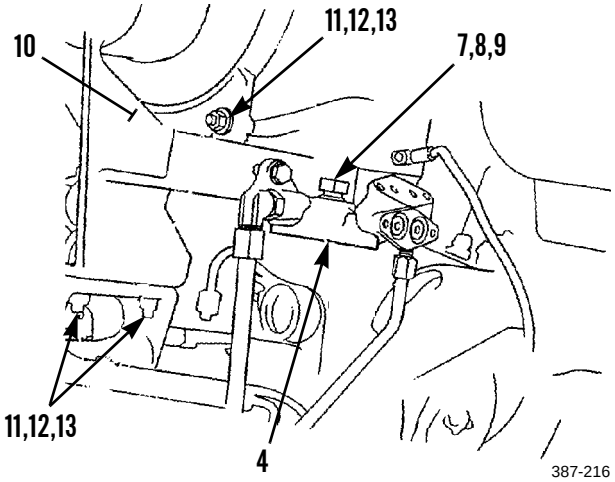
CAUTION

Do NOT overtighten or fuel leaks could result.

11. Hold filter case (2) and wrench-tighten nut (3) an additional 3/4 turn.
12. Open fuel shutoff valve (1).
13. Prime fuel system (WP 0041 00).
14. Check for any leaks by visually inspecting area.

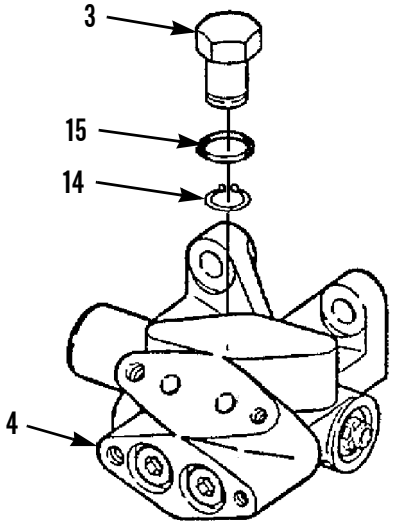
PRIMARY FUEL FILTER ASSEMBLY REMOVAL

1. Remove filter case and filter element. See *Filter Element Service* in this work package.
2. Remove fuel priming pump (WP 0041 00).
3. Disconnect fuel lines from filter base (WP 0053 00).
4. Remove two capscrews (7), four washers (8) and two nuts (9). Remove filter base (4) from support assembly (10).
5. If removal of support assembly (10) is required, remove six capscrews (11), washers (12) and nuts (13) that secure support assembly to muffler and engine.

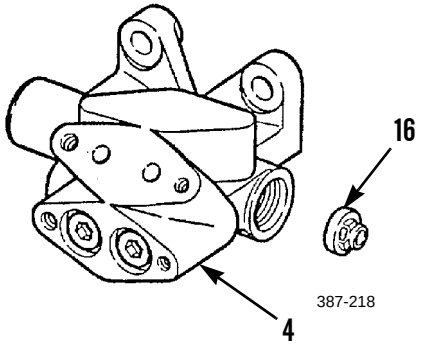


PRIMARY FUEL FILTER ASSEMBLY DISASSEMBLY

1. Remove snap ring (14) from nut (3). Remove nut (3) from filter base (4) and remove preformed packing (15) from nut (3). Discard preformed packing.
2. Remove valve assembly (16) from filter base (4).

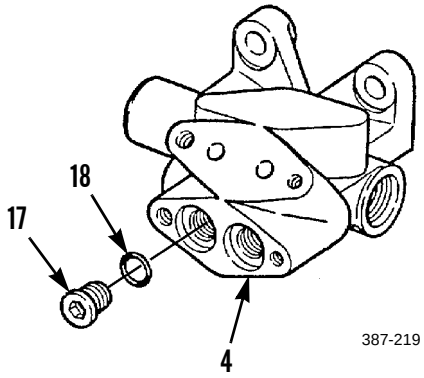


382-217

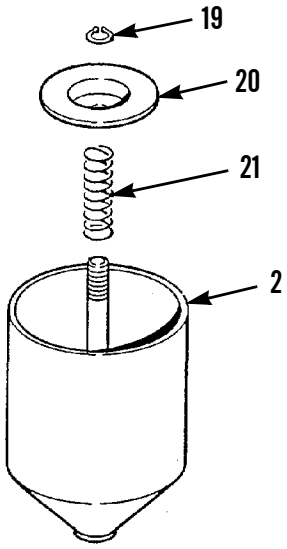


387-218

3. Remove two plugs (17) and O-rings (18) from filter base (4). Discard O-rings.
4. Remove snap ring (19) from filter case (2) and remove retainer (20) and spring (21).



387-219



387-220

PRIMARY FUEL FILTER ASSEMBLY

NOTE

- **Wipe all sealing surfaces and internal parts clean before assembly.**
- **Apply a light film of clean diesel fuel to O-rings and preformed packing before assembly.**

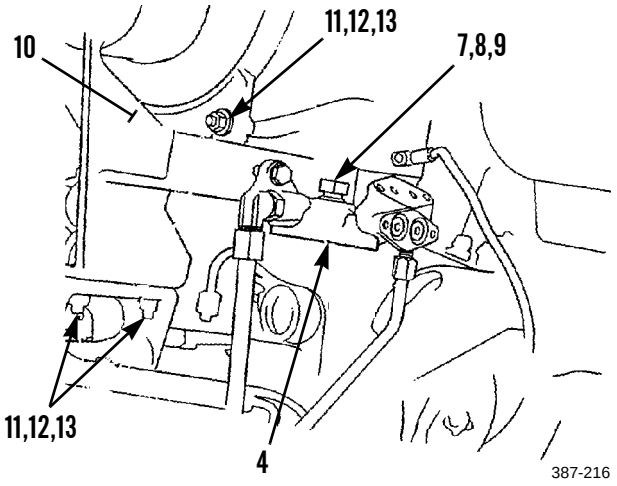
1. Place spring (21) and retainer (20) onto stud on filter case (2).
2. Install snap ring (19) to hold retainer (20) in place.

PRIMARY FUEL FILTER ASSEMBLY - CONTINUED

3. Install two plugs (17) and new O-rings (18) in filter base (4).
4. Install valve assembly (16) into filter base (4).
5. Install new preformed packing (15) onto nut (3). Place nut (3) into position and secure to filter base (4) with snap ring (14).

PRIMARY FUEL FILTER ASSEMBLY INSTALLATION

1. If support assembly (10) was removed, position support assembly and install six capscrews (11), washers (12) and nuts (13) that secure supports to muffler and engine.
2. Position filter base (4) on support assembly (10) and install two capscrews (7), four washers (8) and two nuts (9).
3. Connect fuel lines to filter base (WP 0053 00).
4. Install fuel priming pump (WP 0041 00).
5. Install filter element and filter case. See *Filter Element Service* in this work package.
6. Turn fuel shutoff valve (1) to the ON position
7. Prime fuel system (WP 0041 00).
8. Check for any leaks by visually inspecting the area.
9. Run engine and check for proper operation and fuel leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

SECONDARY FUEL FILTER ASSEMBLY MAINTENANCE 0060 00

THIS WORK PACKAGE COVERS

Filter Element Replacement

Secondary Fuel Filter Assembly: Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 106, WP 0250 00)

Materials/Parts

Fuel (Item 13, 14 or 15, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Filter element, fluid (2)

Materials/Parts - Continued

Gasket (9)

O-ring (6)

References

WP 0041 00

WP 0232 00

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

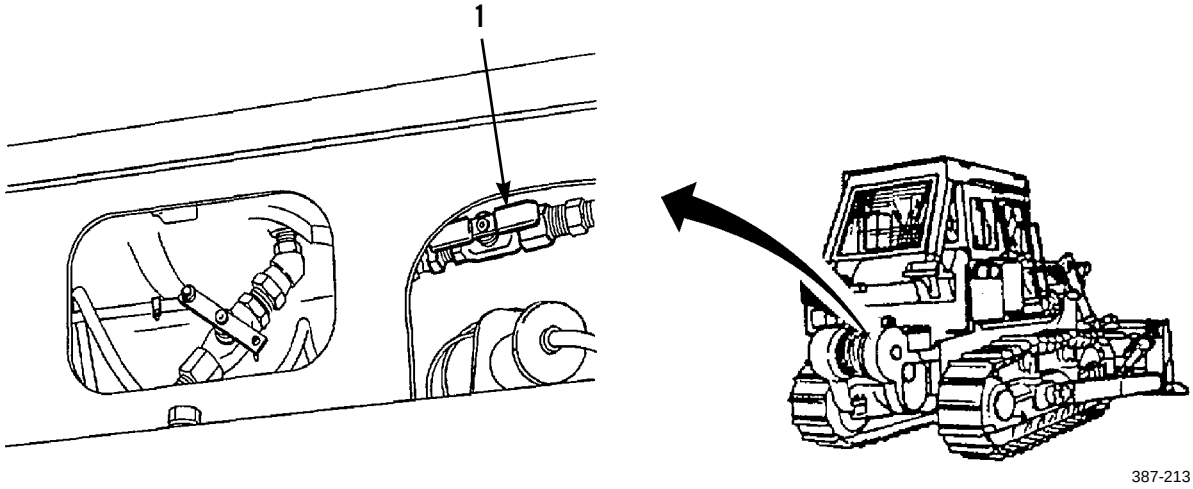
DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel or equipment damage.

CAUTION

Use caution to ensure fuel system does not become contaminated. Keep work area clean. Cap fuel lines after disconnections are made and cover all openings with a clean rag.

FILTER ELEMENT REPLACEMENT

1. Turn fuel shutoff valve (1) at bottom of fuel tank to OFF position.

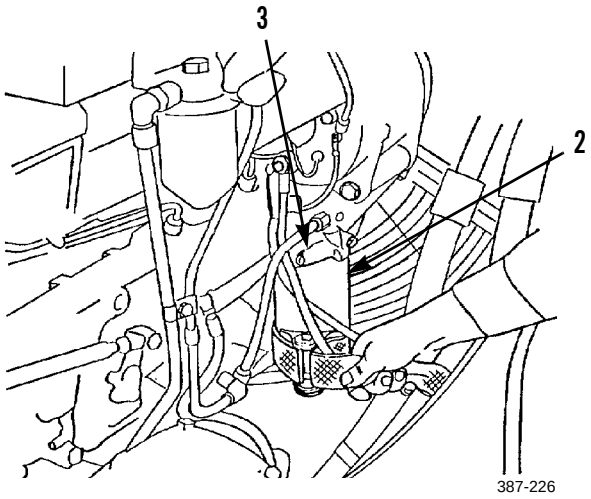


2. Remove filter element (2) and discard.
3. Wipe sealing surfaces of filter base (3) clean and dry.
4. Coat seal on new filter element (2) with clean fuel.

CAUTION

Do NOT overtighten or fuel leaks could result.

5. Install new filter element (2) by hand until seal on element contacts filter base (3). Tighten element an additional 3/4 turn.



6. Turn fuel shutoff valve (1) at bottom of fuel tank to ON position.
7. Prime fuel system (WP 0041 00).
8. Run engine and check for proper operation and fuel leaks.

SECONDARY FUEL FILTER ASSEMBLY REMOVAL

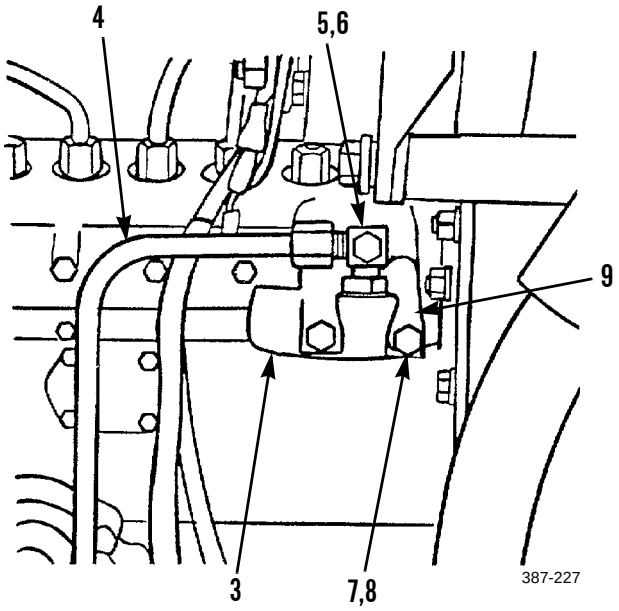
1. Remove fuel pressure gage (WP 0232 00).
2. Remove filter element. See *Filter Element Replacement* in this work package.
3. Disconnect fuel inlet line (4) from elbow (5).
4. Remove elbow (5) from filter base (3). Remove and discard O-ring (6).
5. Remove two capscrews (7) and washers (8).
6. Remove filter base (3) and gasket (9). Discard gasket.

SECONDARY FUEL FILTER ASSEMBLY INSTALLATION

NOTE

Wipe all sealing surfaces clean and dry before installation.

1. Install new gasket (9) and filter base (3) with two capscrews (7) and washers (8).
2. Coat new O-ring (6) with clean fuel and install new seal and elbow (5) to filter base (3).
3. Connect fuel inlet line (4) to elbow (5).
4. Install filter element. See *Filter Element Replacement* in this work package.
5. Install fuel pressure gage (WP 0232 00).
6. Prime fuel system (WP 0041 00).
7. Run engine and check for proper operation and fuel leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

ETHER STARTING AID MAINTENANCE 0061 00

THIS WORK PACKAGE COVERS

Service, Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Canister, ether (3)

Pin, cotter (42)

References

WP 0065 00

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Battery disconnect switch in OFF position (TM 5-2410-237-10)

SERVICE

WARNING

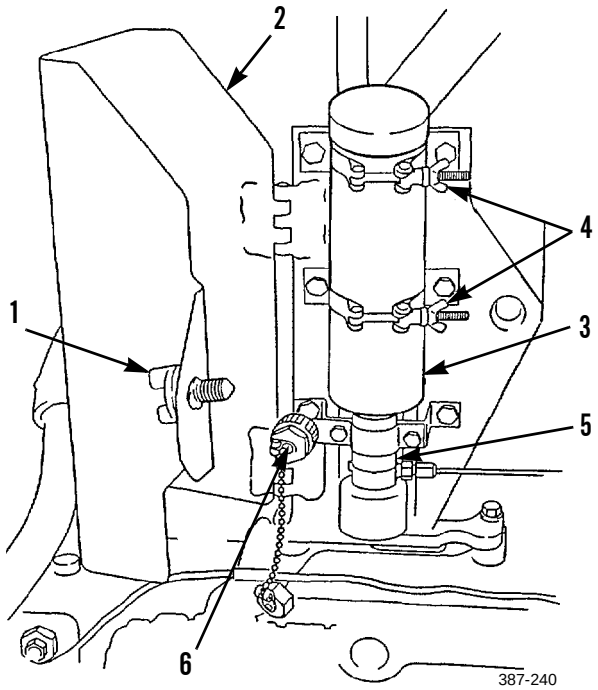
Ether fuel is extremely flammable and toxic. DO NOT smoke and make sure you are in a well-ventilated area away from heat, open flames or sparks. Wear eye protection. Avoid contact with skin and eyes and avoid breathing ether fumes. If fluid enters or fumes irritate the eyes, wash immediately with large quantities of clean water for 15 minutes. Seek medical attention immediately if ether is inhaled or causes eye irritation. Failure to follow this warning may cause death or serious injury to personnel.

1. Loosen thumbscrew (1) on cover (2).
2. Open cover (2) to expose ether canister (3).
3. Loosen two clamp assemblies (4) and remove ether canister (3) from valve (5). Dispose of ether canister IAW local policy and ordinances.

NOTE

Ether canister should be removed and not replaced when ambient temperature is above 32°F (0°C).

4. If ether canister (3) is not being installed, unscrew cap (6) from its storage position and install it in place of ether canister.
5. If ether canister (3) is being installed, screw canister into position and tighten clamp assemblies (4).
6. Close door (2) and secure with thumbscrew (1).



REMOVAL

1. Remove ether canister. See *Service* in this work package.

NOTE

Complete draining of coolant is not required.

2. Partially drain coolant (WP 0065 00).
3. Remove tube assembly (7) from valve adapter (8) and cylinder head adapter (9).
4. Remove adapter (8) and adapter (9).

CAUTION

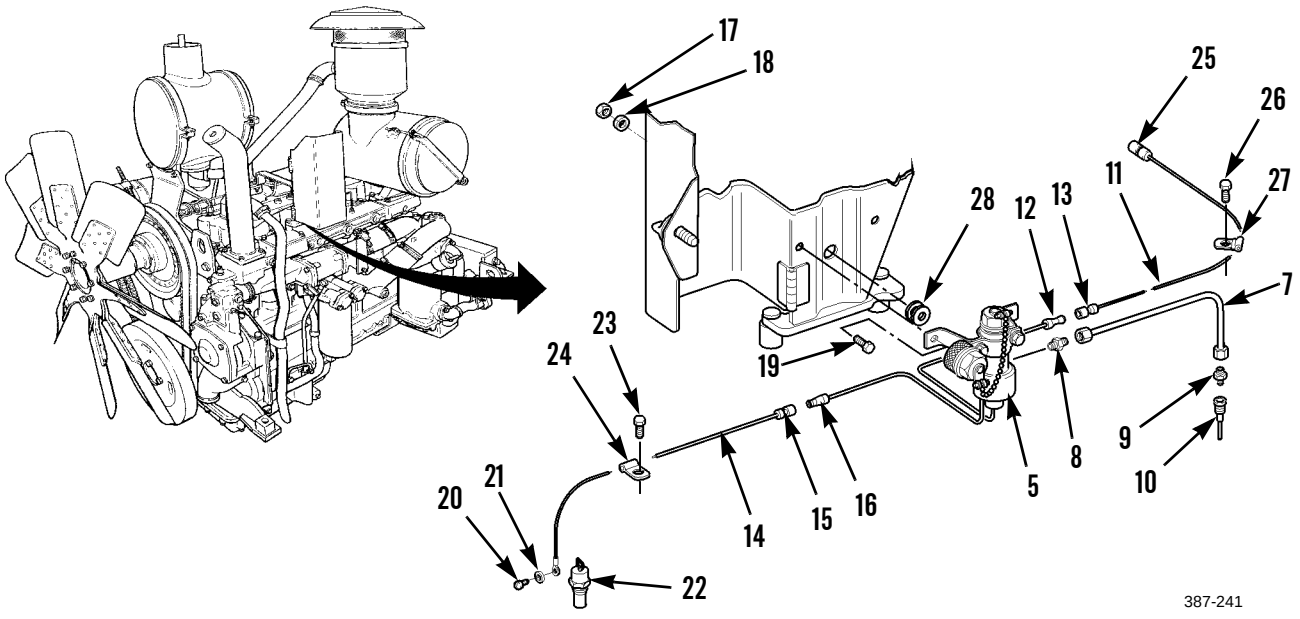
Cover or plug hole in cylinder head so that dirt cannot enter.

5. Remove nozzle (10) from cylinder head.

NOTE

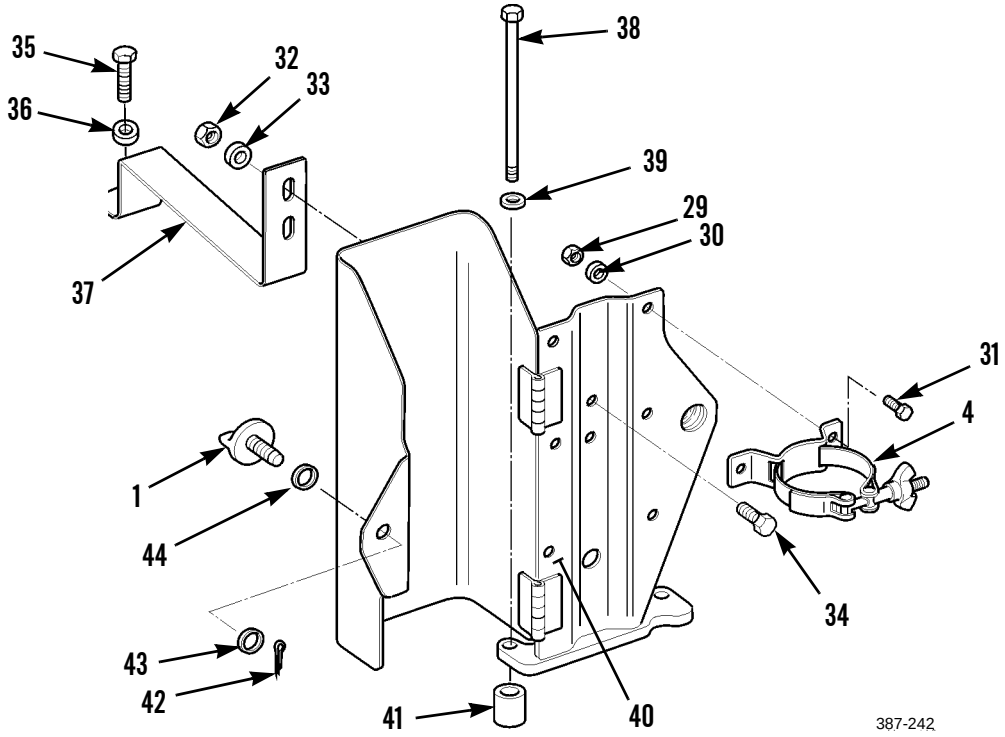
Tag wires to ensure correct installation.

6. Disconnect wire assembly (11) at connectors (12 and 13) and wire assembly (14) at connectors (15 and 16).
7. Remove two nuts (17), washers (18) and capscrews (19) and remove valve (5).
8. Remove screw (20) and washer (21) from temperature switch (22).
9. Remove temperature switch (22).
10. Remove capscrew (23) from clamp (24) and remove wire assembly (14).
11. Separate connector (25) from wiring harness.
12. Remove capscrew (26) from clamp (27) and remove wire assembly (11).
13. Remove grommet (28).



REMOVAL - CONTINUED

14. Remove four nuts (29), washers (30) capscrews (31) and remove two clamp assemblies (34).
15. Remove two nuts (32), washers (33) and capscrews (34).
16. Remove capscrew (35), washer (36) and bracket (37).
17. Remove two capscrews (38), washers (39), box assembly (40) and spacers (41) from cylinder head.
18. Remove cotter pin (42), washer (43), thumbscrew (1) and washer (44). Discard cotter pin.

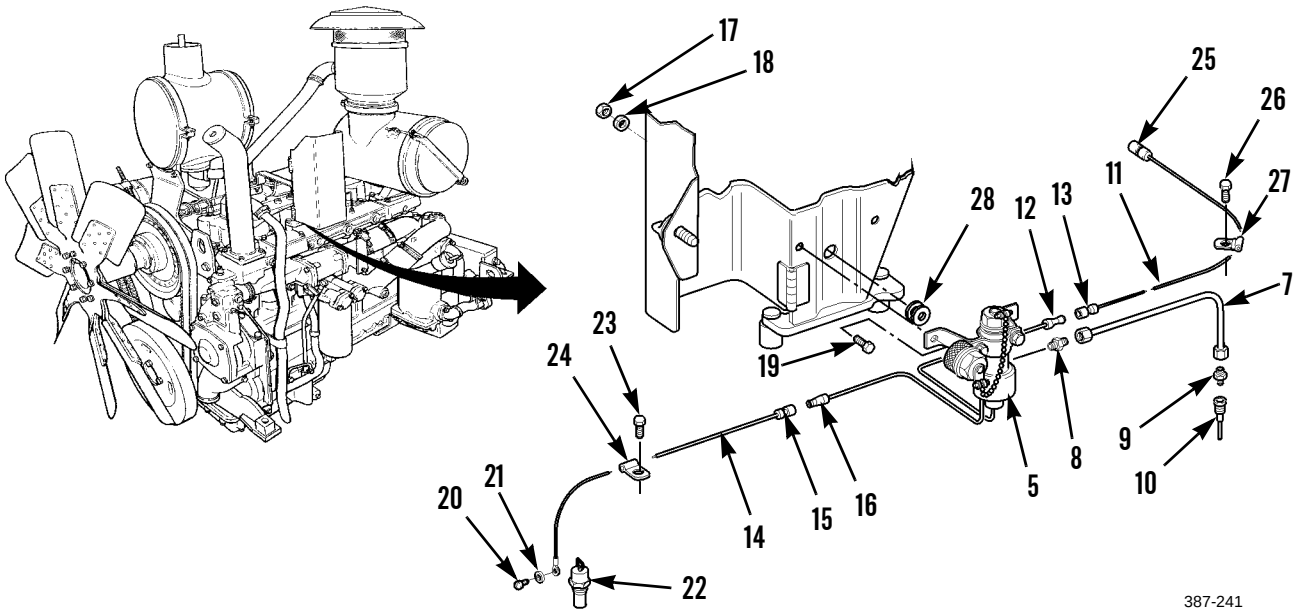


INSTALLATION

1. Install thumbscrew (1), washer (44), washer (43) and new cotter pin (42).
2. Position box assembly (40) and spacers (41) on cylinder head and install two washers (39) and capscrews (38).
3. Install bracket (37) with capscrew (35), washer (36), two washers (33), capscrews (34) and nuts (32).
4. Install two clamp assemblies (4), four capscrews (31), washers (30) and nuts (29).
5. Install grommet (28).
6. Thread valve wires through grommet and install valve (5), two capscrews (19), washers (18) and nuts (17).
7. Place wire assembly (11) in position and connect connectors (12 and 13).
8. Connect connector (25) to wiring harness.
9. Place clamp (27) around wire assembly (11) and install capscrew (26).
10. Place wire assembly (14) in position and connect connectors (15 and 16).
11. Install temperature switch (22).
12. Attach wire assembly (14), screw (20) and washer (21) to temperature switch (22).
13. Place clamp (24) around wire assembly (14) and install capscrew (23).
14. Install adapter (8) into valve (5).

INSTALLATION - CONTINUED

15. Position nozzle (10) with orifices pointing to ends of engine. Align nozzle with dash marks on nut and install nozzle into cylinder head.
16. Install adapter (9) to nozzle (10).
17. Install tube assembly (7) to adapters (8 and 9).



18. Install ether canister. See *Service* in this work package.
19. Fill cooling system (WP 0065 00).
20. Run engine and check for proper operation (TM 5-2410-237-10). Be alert for odor of leaking ether.

END OF WORK PACKAGE

MUFFLER REPLACEMENT 0062 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Exhaust extension removed (WP 0063 00)

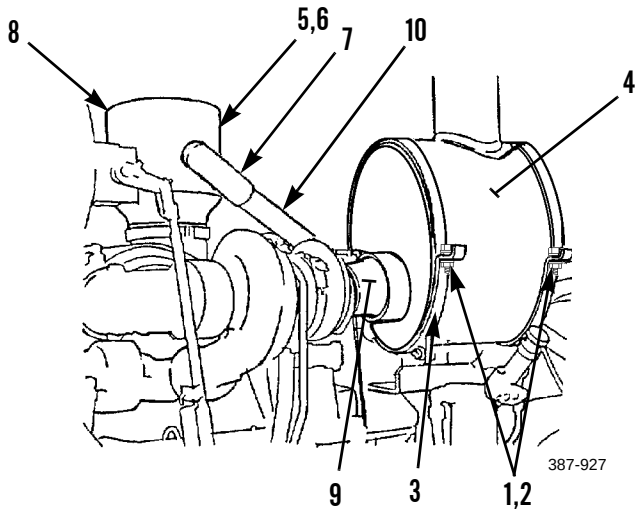
Hood removed (WP 0159 00)

WARNING

- **Ensure muffler is cool before beginning task. Failure to do so could result in serious burns.**
- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may cause injury.**

REMOVAL

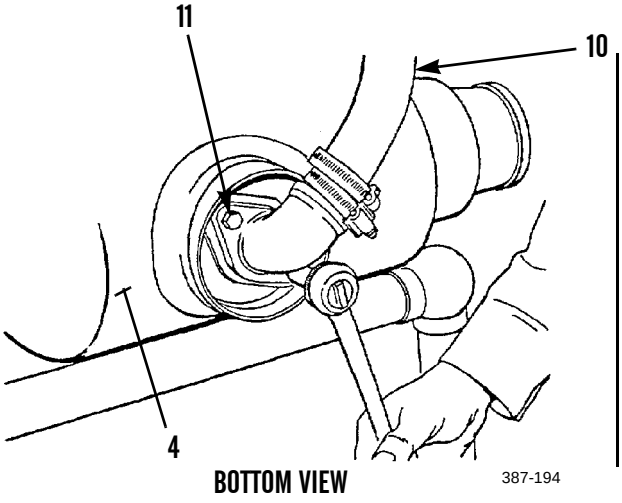
1. Remove four capscrews (1) and nuts (2) from top and bottom clamp halves (3). Remove top clamp halves from muffler (4).
2. Loosen screw (5) on hose clamp (6). Separate dust ejector hose (7) from precleaner body (8).
3. Slide muffler (4) away from turbocharger coupling (9). Lift muffler with dust ejector pipe (10) from engine assembly.

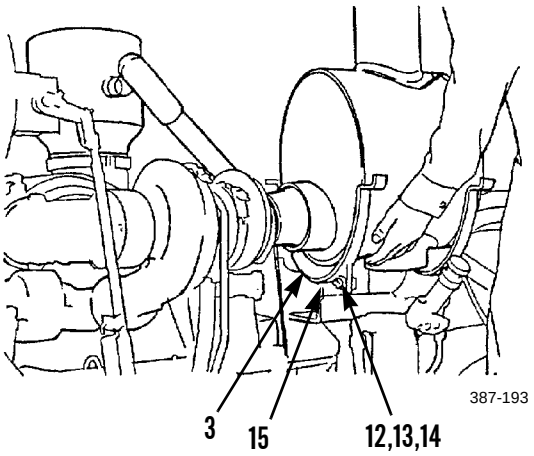


MUFFLER REPLACEMENT - CONTINUED 00062 00

REMOVAL - CONTINUED

4. Remove two capscrews (11) and separate dust ejector pipe (10) from bottom of muffler (4).
5. To remove bottom clamp halves (3), remove four capscrews (12), nuts (13) and eight washers (14).





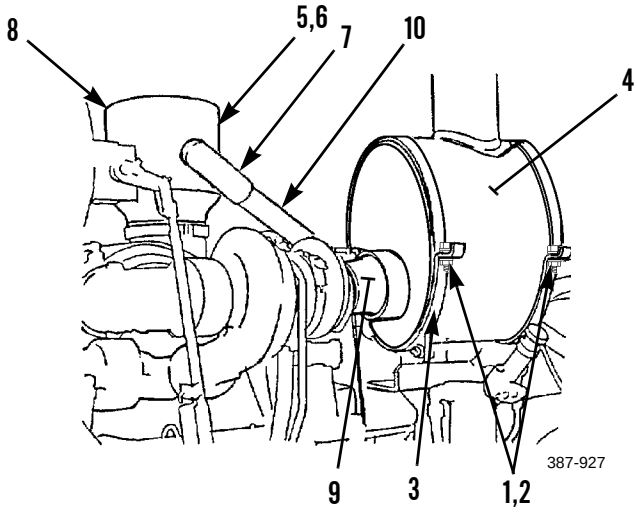
INSTALLATION

1. Position bottom clamp halves (3) on bracket (15) and install four capscrews (12), nuts (13) and eight washers (14).
2. Position dust ejector pipe (10) on bottom of muffler (4). Install two capscrews (11).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may cause injury.

3. With assistance, place muffler (4) in position and slide onto turbocharger coupling (9).
4. Line up dust ejector hose (7) with precleaner body (8). Tighten screw (5) on hose clamp (6).
5. Install top clamp halves (3) on muffler (4) with four capscrews (1) and nuts (2).
6. Install hood (WP 0159 00).
7. Install exhaust extension (WP 0063 00).
8. Run engine and check muffler for evidence of leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

EXHAUST EXTENSION REPLACEMENT 0063 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

WARNING

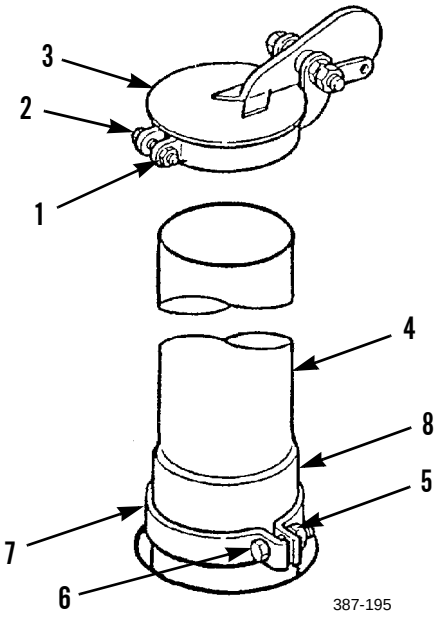
Ensure exhaust extension is cool before beginning task. Failure to do so could result in serious burns.

REMOVAL

1. Remove nut (1), capscrew (2) and cap assembly (3) from exhaust pipe (4).
2. Remove nut (5) and capscrew (6) from clamp (7).
3. Remove exhaust pipe (4) from muffler (8).

INSTALLATION

1. Place exhaust pipe (4) on muffler (8).
2. Position clamp (7) and secure with capscrew (6) and nut (5). Tighten nut to 19-25 lb-ft (26-34 Nm).
3. Place cap assembly (3) on pipe exhaust (4). Secure by installing capscrew (2) and nut (1).
4. Run engine and check exhaust extension for evidence of leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

COOLING SYSTEM THEORY OF OPERATION 0064 00

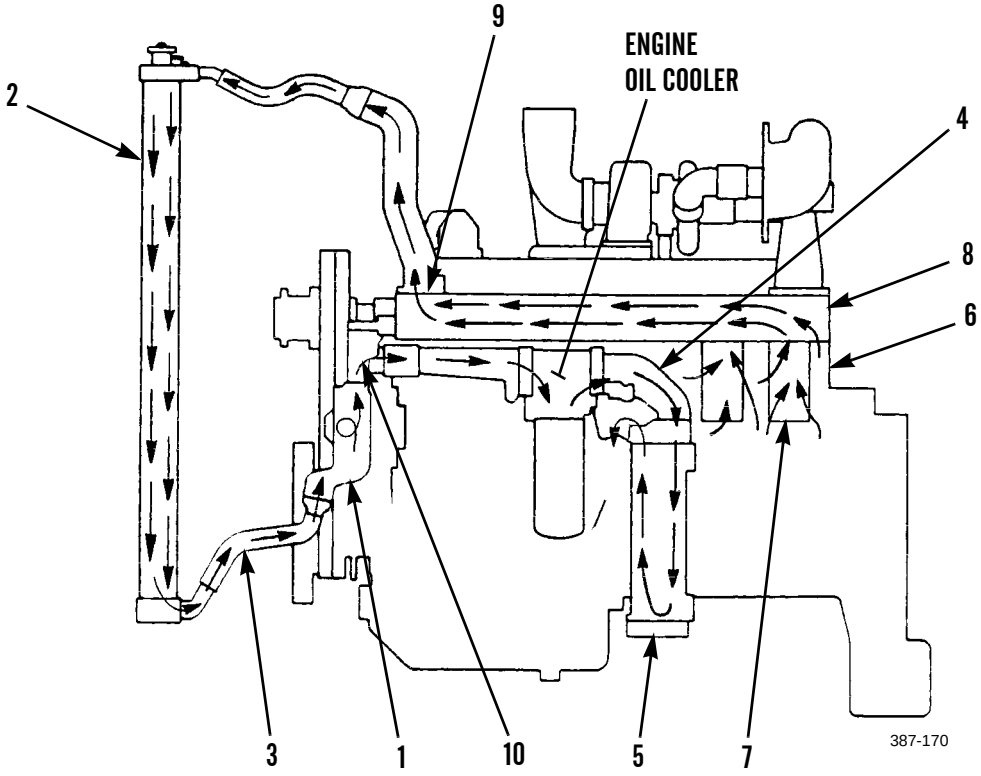
COOLING SYSTEM OPERATION

1. The water pump (1) is on the left front side of the engine. It is gear-driven by the timing gears. Coolant from the bottom of radiator (2) goes to water pump inlet (3). The rotation of the impeller in water pump (1) pushes coolant through the system.

2. The fluid filter head (4) sends the coolant flow through the transmission oil cooler (5) which is for the torque converter. The flow goes through one side on the way into transmission oil cooler (5). At the bottom of transmission oil cooler (5) the flow turns and goes back up through the other side and into the fluid filter head (4) again. The fluid filter head then sends the coolant into cylinder block (6).

3. Inside cylinder block (6) the coolant goes around cylinder liners (7) and up through the water directors into cylinder head (8). The water directors send the flow of coolant around the valves and the passages for exhaust gases in cylinder head (8). The coolant goes to the front of cylinder head (8). Here water temperature regulator (9) controls the direction of the flow. If the coolant temperature is less than normal for engine operation, water temperature regulator (9) is closed. The only way for the coolant to get out of cylinder head (8) is through internal bypass (10). The coolant from this line goes into water pump (1) which pushes it through the cooling system again. The coolant from internal bypass (10) also works to prevent cavitation (air bubbles) in the coolant. When the coolant gets to the correct temperature, water temperature regulator (9) opens and coolant flow is divided. Most of the coolant goes through the radiator (2) for cooling. The remainder goes through internal bypass (10) to water pump (1). The amount of the two flows is controlled by water temperature regulator (9).

4. Radiator (2) has a pressure relief cap and a filler cap. The pressure relief cap keeps the pressure in the cooling system from getting too high when the engine is running. It also lets air come into the system when the pressure in the system is less than atmospheric.



COOLING SYSTEM COMPONENTS

1. **Water Pump.**
   a. The centrifugal-type water pump has two seals. One prevents leakage of water and the other prevents leakage of lubricant.
   b. An opening in the bottom of the pump housing which is plugged by foam allows any leakage, at the water seal or the rear bearing oil seal, to be detected by the mechanic.
2. **Fan.** The fan is driven by two V-belts, from a pulley on the crankshaft. Belt tension is adjusted by adjusting the alternator group.
3. **Coolant Flow Switch.** The coolant flow switch is installed in the outlet side of the engine oil cooler. It is part of the engine warning system. When the force of the coolant against the paddle of the switch gets too low, the switch closes and activates the system.

END OF WORK PACKAGE

COOLING SYSTEM SERVICE 0065 00

THIS WORK PACKAGE COVERS

Draining, Flushing, Filling

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Antifreeze (Item 1, WP 0249 00)

Cleaning compound, engine cooling system (Item 3, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

References

TB 750-651

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

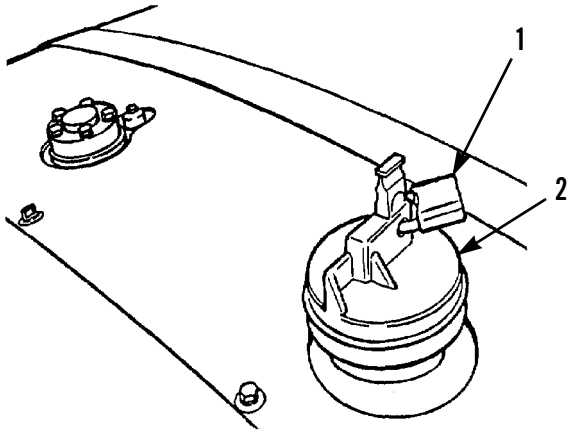
Crankcase guard opened (WP 0157 00)


WARNING


- **DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.**
- **DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.**
- **Wear effective eye, glove and skin protection when handling coolants. Failure to do so may cause injury.**

NOTE

- **Cooling system capacity is 12 gal. (45.4 l).**
- **If machine is to be stored in or shipped to an area with below freezing temperatures, cooling system must be protected to lowest expected ambient temperature.**



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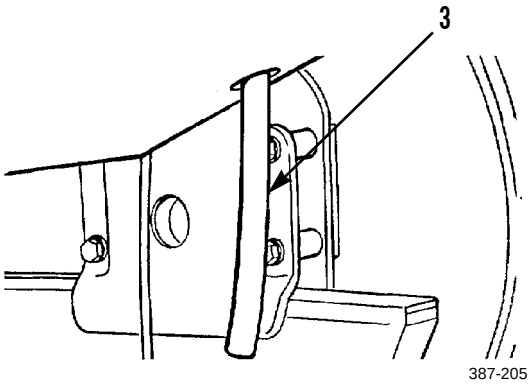
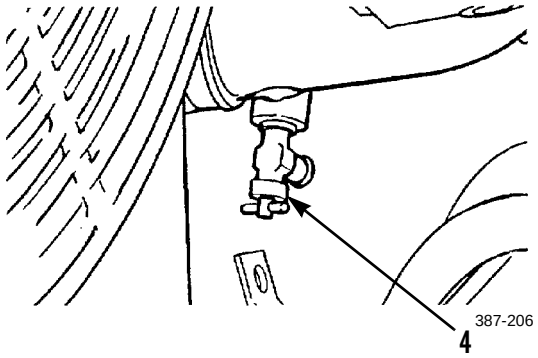
DRAINING

1. Open padlock (1) and slowly loosen the filler cap (2) to relieve pressure from the radiator. Remove filler cap.

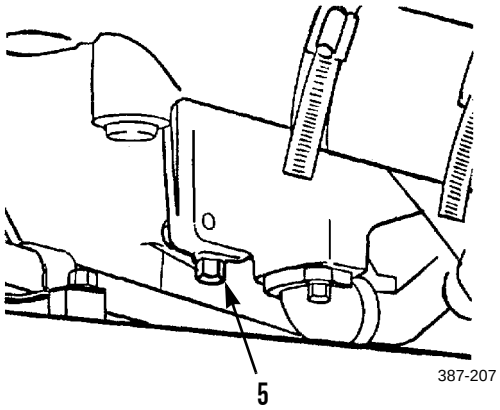
DRAINING - CONTINUED

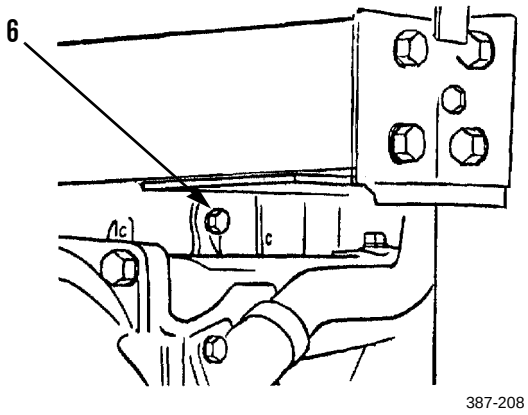
2. Install radiator drain tube (3) on drain valve (4).
3. Place a suitable container beneath drain tube (3) and open radiator drain valve (4).





4. Place a suitable container under transmission oil cooler and remove transmission oil cooler drain plug (5). Allow all coolant solution to drain.
5. Place a suitable container under engine block and remove drain plug (6). Allow all coolant solution to drain.





FLUSHING

1. Flush system with clean water. DO NOT run engine while flushing.

NOTE

Refer to TB 750-651 for use of engine cooling system cleaning compound.

2. Use engine cooling system cleaning compound when necessary to clean heavily rusted or partially clogged cooling system, to neutralize residual acids and to coat interior with silicate.
3. Repeat flushing until draining water is clear.

FILLING

1. Close radiator drain valve (4).
2. Install transmission oil cooler drain plug (5).

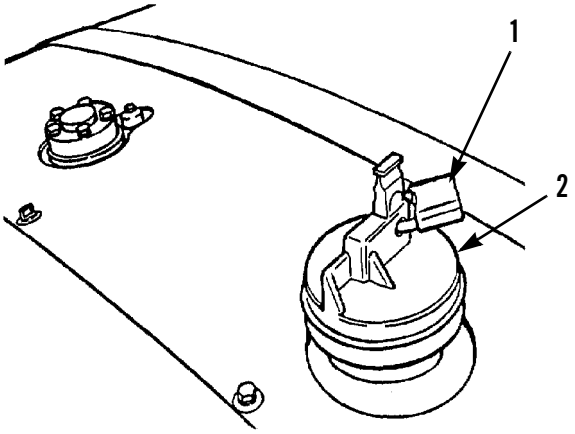
FILLING - CONTINUED

3. Install engine block drain plug (6).

CAUTION

Antifreeze should never exceed 60% by volume. Failure of cooling system can occur.

4. Mix 12 gal. (45.4 l) of antifreeze solution to provide protection to the lowest expected ambient temperature.
5. Add coolant slowly, 5 gal. (19 l) per minute or less, until level of coolant is within 1/2 in. (13 mm) of bottom of fill pipe.
6. With filler cap (2) removed, start engine and run for 15 minutes. Check for coolant leaks. Stop engine and recheck coolant level. Add coolant as needed.
7. Install filler cap (2). Secure with padlock (1).
8. Close crankcase guard (WP 0157 00).



END OF WORK PACKAGE

RADIATOR PRESSURE TESTING 0066 00

THIS WORK PACKAGE COVERS

Pressure Testing

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

References

WP 0065 00

WP 0067 00

Equipment Condition

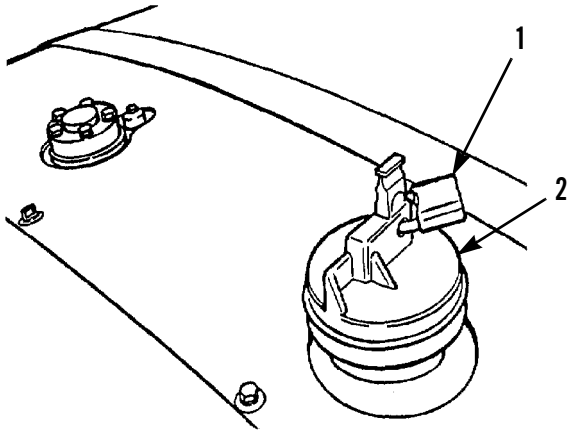
Engine OFF and cool (TM 5-2410-237-10)

WARNING

- **DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.**
- **DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.**
- **Wear effective eye, glove and skin protection when handling coolants. Failure to do so may cause injury.**

PRESSURIZED TESTING

1. Open padlock (1) and slowly loosen filler cap (2) to relieve pressure from radiator.



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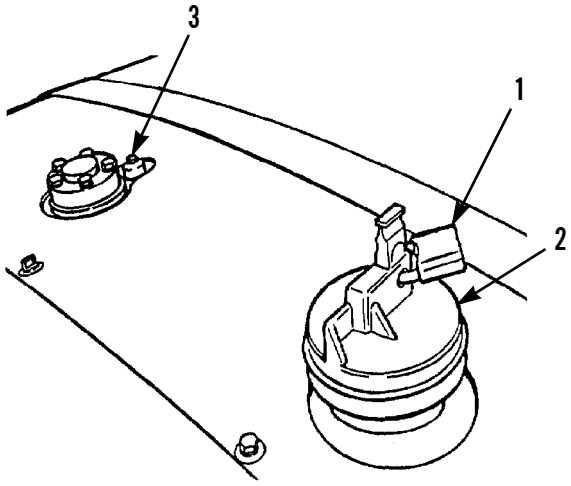
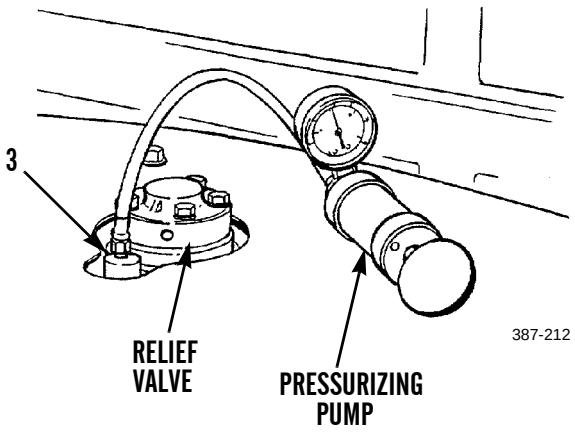
PRESSURIZED TESTING - CONTINUED

2. Remove filler cap (2) to inspect coolant level. Ensure that coolant level is within 1/2 in. (13 mm) of bottom of fill pipe. Add coolant as needed (WP 0065 00).
3. Install filler cap (2) and tighten.
4. Remove plug (3) from top of radiator.



5. Mount a pressurizing pump at location where plug (3) was removed.
6. Inspect radiator for outside leakage. Check all cooling system connections and hoses to ensure there is no external leakage.
7. Pump air into radiator until pressure reading on gage reads 14 psi (97 kPa).



8. If no external leakage is evident and pressure reading on gage remains constant for five minutes, there is no internal leakage in system.
9. If no external leakage is evident and pressure reading on gage falls, there is internal leakage. Repair engine as needed.
10. If no leakage or external leakage is found, pump more air into radiator. Relief valve must open between 15-18 psi (103-124 kPa). If not, replace valve (WP 0067 00).
11. When test is completed, open bleed valve on pump to release pressure in radiator.
12. Remove pressurizing pump from radiator and install plug (3). Tighten plug.
13. Fill cooling system, if required (WP 0065).

END OF WORK PACKAGE

RADIATOR FILLER CAP AND RELIEF VALVE REPLACEMENT 0067 00

THIS WORK PACKAGE COVERS

Radiator Filler Cap: Replacement

Relief Valve: Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Gasket (7)

References

WP 0066 00

Equipment Condition

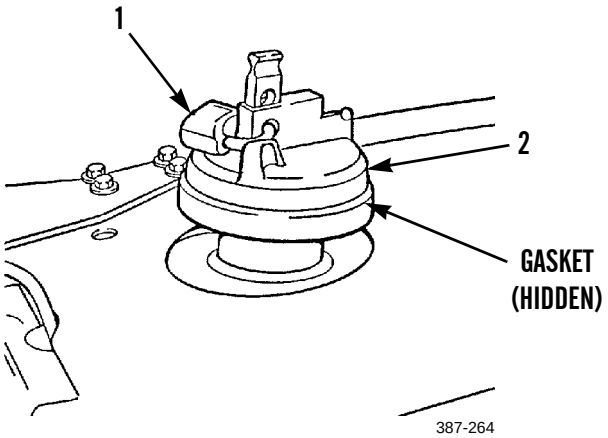
Engine OFF and cool (TM 5-2410-237-10)

WARNING

- **DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.**
- **DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.**
- **Wear effective eye, glove and skin protection when handling coolants. Failure to do so may cause injury.**

RADIATOR FILLER CAP REPLACEMENT

1. Open and remove padlock (1) securing filler cap (2).
2. Loosen filler cap (2) slowly to relieve pressure and remove filler cap.
3. Inspect gasket in filler cap (2). If gasket is damaged, replace.
4. Install filler cap (2) on radiator and tighten securely.
5. Install padlock (1) through filler cap and close lock securely.
6. Start engine and check filler cap (2) for coolant leaks.
7. Pressure test radiator as needed to verify cooling system does not leak (WP 0066 00).

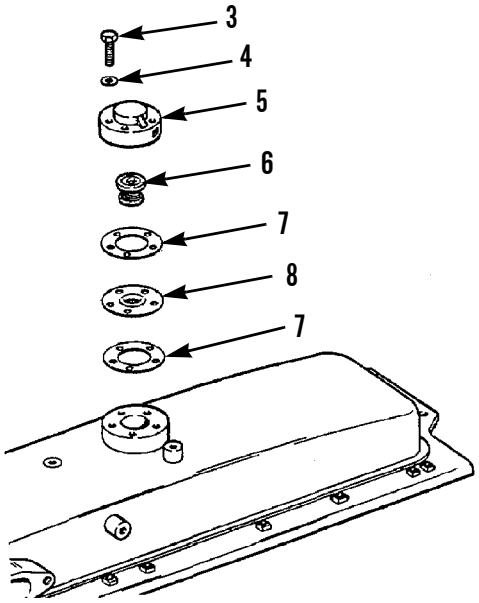


RELIEF VALVE REMOVAL

1. Remove five capscrews (3) and washers (4).
2. Remove access cover (5).
3. Remove flow control thermostat (6).
4. Remove two gaskets (7) with plate (8). Discard gaskets.

RELIEF VALVE INSTALLATION

1. Install two new gaskets (7) with plate (8).
2. Install flow control thermostat (6).
3. Install access cover (5).
4. Install five washers (4) and capscrews (3).
5. Pressure test radiator as needed to verify cooling system has no leaks and to verify operation of relief valve (WP 0066 00).
6. Start engine and check for coolant leaks (TM 5-2410-237-10).



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END OF WORK PACKAGE

RADIATOR MAINTENANCE 0068 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Link, lifting (Item 50, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 500 lb capacity

Wood cribbing

Bolt, 1/2-13 x 1 1/2 in.

Materials/Parts

Antifreeze (Item 1, WP 0249 00)

Detergent (Item 11, WP 0249 00)

Core, radiator (49)

Materials/Parts - Continued

Gasket (12)

Lockwasher (20 and 25)

Seal (48 and 55)

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Hood removed (WP 0159 00)

Headlamp protective guard removed (WP 0093 00)

Cooling system drained (WP 0065 00)

Fan guard removed (WP 0073 00)

WARNING

- **DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.**
- **DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.**
- **Wear effective eye, glove and skin protection when handling coolants. Failure to do so may cause injury.**

REMOVAL

Radiator grilles are heavy and awkward to handle. Use extreme caution and assistance when removing to prevent injury to personnel.

NOTE

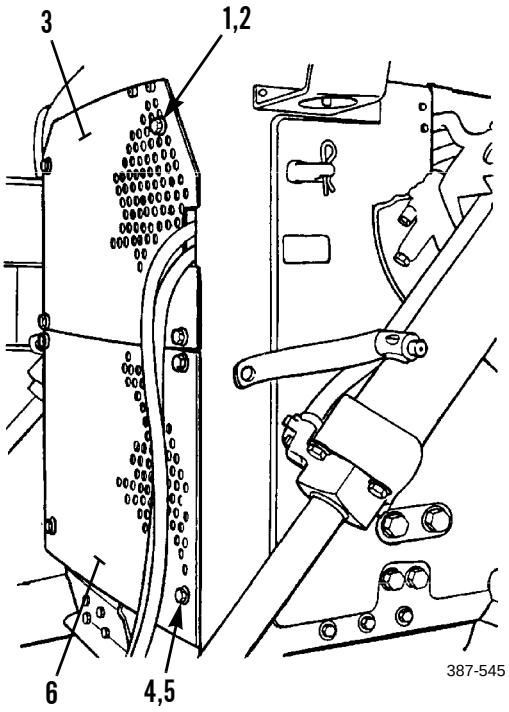
Upper and lower radiator grilles weigh 60 lb (27 kg) each.

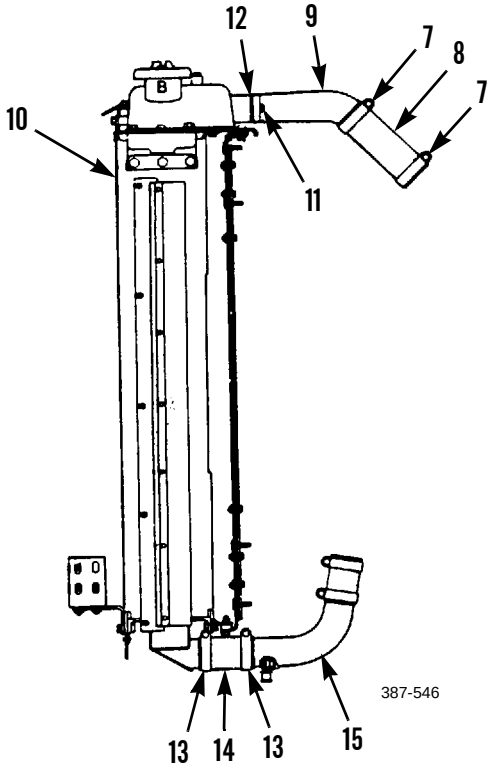
1. Remove four capscrews (1), washers (2) and upper radiator grille (3).
2. Remove four capscrews (4), washers (5) and lower radiator grille (6).

NOTE

Use a suitable container to capture any residual coolant in hoses. Dispose of coolant IAW local policy and ordinances. Ensure all spills are cleaned up.

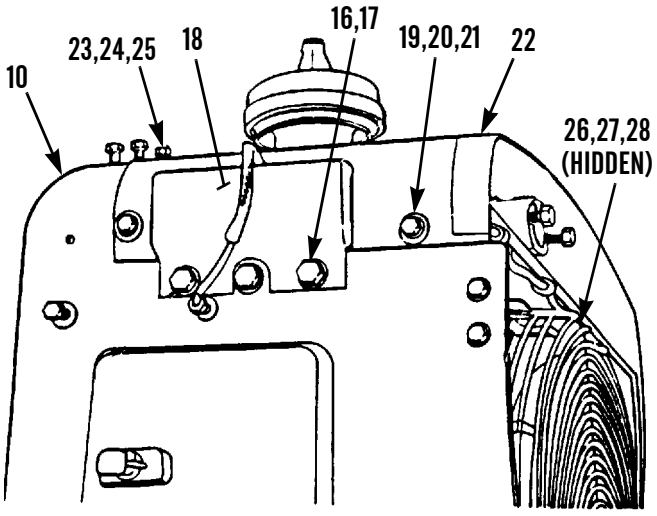
3. Loosen two clamps (7) and remove hose (8) from elbow flange (9) at top of radiator (10).
4. Remove two capscrews (11), elbow flange (9) and gasket (12) from top of radiator (10). Discard gasket.
5. Loosen two clamps (13) and remove hose (14) from elbow flange (15) at bottom of radiator (10).





REMOVAL - CONTINUED

6. Remove three capscrews (16), washers (17) and bracket (18) on one side of radiator (10).
7. Remove two capscrews (19), lockwashers (20) and washers (21) from radiator cover (22). Discard lockwashers.
8. Repeat steps 6 and 7 on other side of radiator (10).
9. Remove three capscrews (23), washers (24) and lockwashers (25) from top of radiator (10). Discard lockwashers.
10. Remove ten capscrews (26), washers (27) and shield assembly (28).
11. Remove three capscrews (29), washers (30) and bracket (31) from bottom front of radiator (10).



387-547

12. Repeat step 11 for bracket (32) on other side of radiator (10).
13. Remove three capscrews (33) and washers (34) from front bottom of radiator (10).
14. Install two lifting links (35) with 1/2-13 x 1-1/2 in. bolt in radiator top tank (36).

WARNING

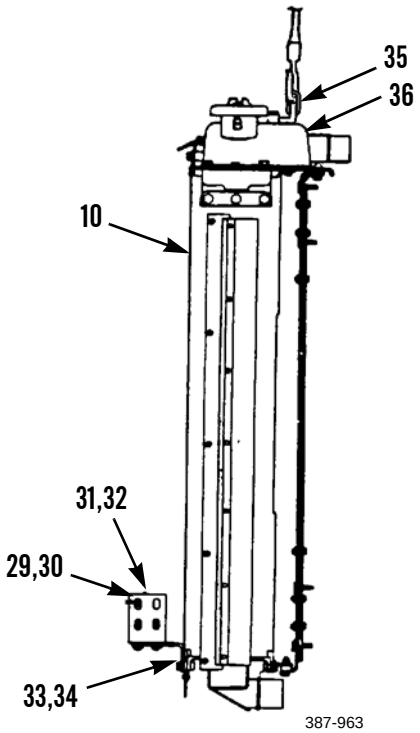
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

CAUTION

Ensure that wiring harness from horn, located between radiator and support, is clear of radiator. Lift radiator slowly and carefully to avoid damage to wiring harness.

NOTE

Radiator weighs 450 lb (204 kg).



387-963

15. Attach nylon sling and suitable lifting device to lifting links (35) and lift radiator (10) clear of machine.

DISASSEMBLY

NOTE

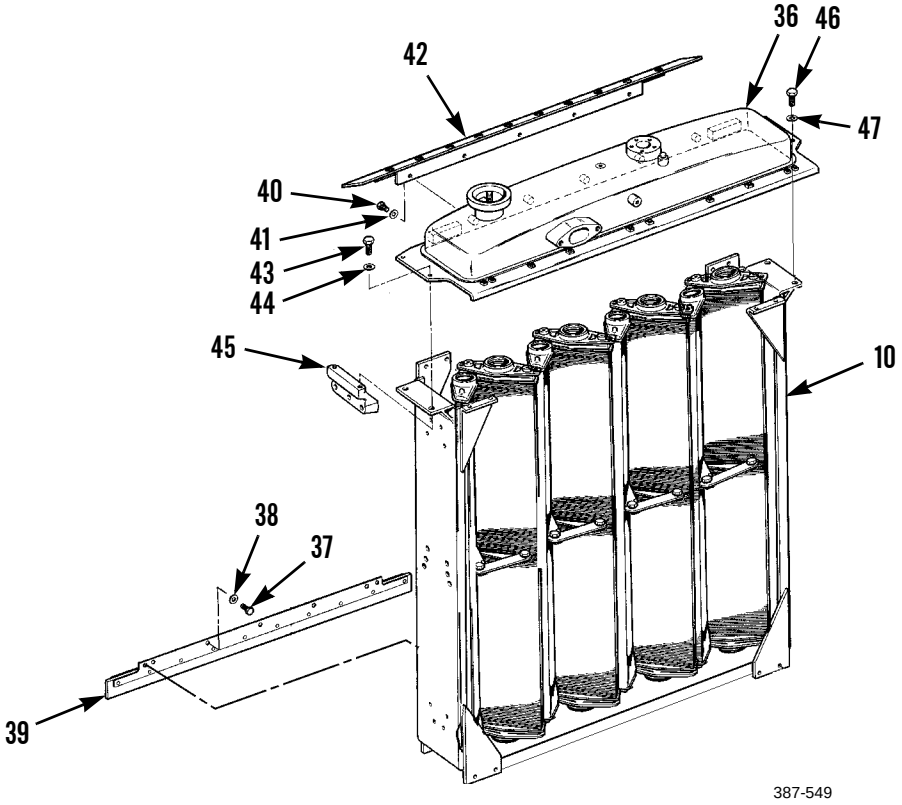
Place back side of radiator on wood blocks for steps 1 and 2.

1. Remove four capscrews (37), washers (38) and baffle (39) from bottom front of radiator (10).
2. Remove five capscrews (40), washers (41) and baffle (42) from top front of radiator (10).

NOTE

Stand radiator upright and support it securely on wood blocks.

3. Remove two capscrews (43), washers (44) and bracket (45) from one end of top tank (36).
4. Repeat step 3 for bracket (45) on other end of top tank (36).
5. Remove four capscrews (46) and washers (47) from one end of top tank (36).
6. Repeat step 5 for other end of top tank (36).
7. Remove top tank (36).



8. Remove eight seals (48) from top of cores (49). Discard seals.

NOTE

Bracket (52) is only present on non-rebuilt machines.

9. If installed, remove two capscrews (50), washers (51) and bracket (52) from side center of core (49) assembly and frame (53).

DISASSEMBLY - CONTINUED

10. If installed, repeat step 9 for bracket (52) on other side of core (49) assembly.
11. Remove six capscrews (50), washers (51) and three straps (54) from one side of core (49) assembly.
12. Remove eight capscrews (50), washers (51) and four straps (54) from other side of core (49) assembly.
13. Remove eight cores (49) and seals (55) from bottom tank (56). Discard seals and cores.
14. Remove six capscrews (57), washers (58) and frame (53) from one end of bottom tank (56).
15. Remove two capscrews (59), washers (60) and strap (61) from inside of frame (53).
16. Repeat steps 14 and 15 for frame (53) at other end of bottom tank (56).

ASSEMBLY

1. Position bottom tank (56) securely on wood blocks.

NOTE

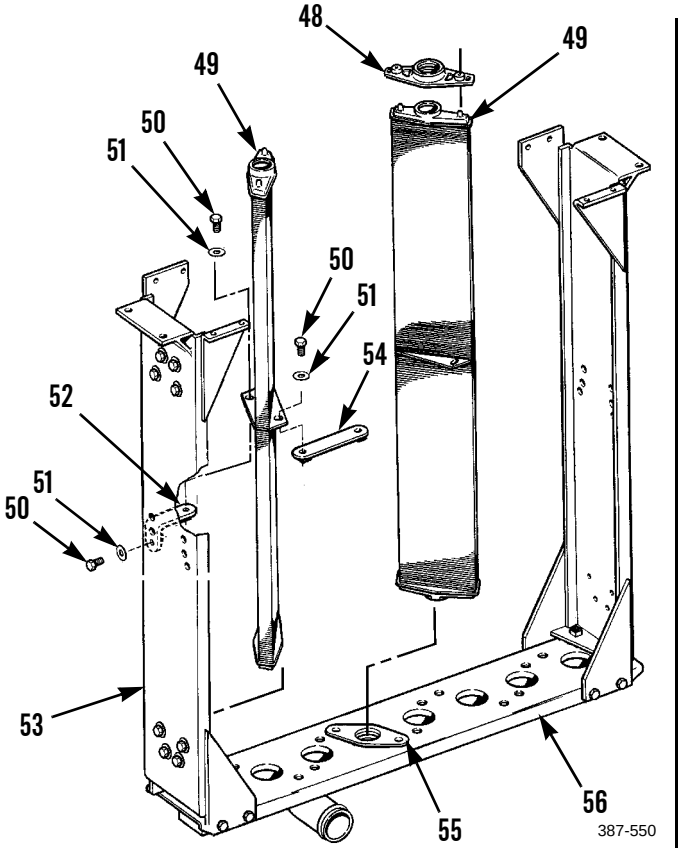
Open side of "U" bend in strap (61) must face front of radiator. Front of frame (53) is side with two straight mounting supports.

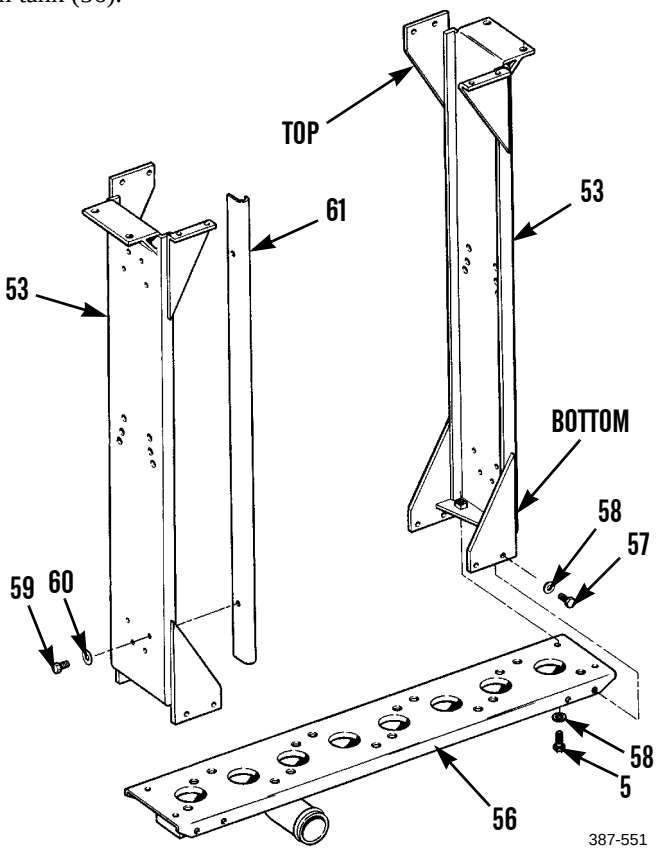
2. Install strap (61) in frame (53) with two capscrews (59) and washers (60).
3. Install frame (53) on one end of bottom tank (56) with six capscrews (57) and washers (58).

NOTE

Ensure front of frame is on side opposite outlet tube in tank.

4. Repeat steps 2 and 3 for frame (53) on other end of bottom tank (56).





ASSEMBLY - CONTINUED

NOTE

Do NOT use oil petroleum-based products or abrasive liquids on seals.

5. Ensure seal holes in bottom tank (56) are clean and serviceable. Apply liquid detergent to all sealing areas and to eight new seals (55). Install seals in bottom tank.

6. Install one end of core (49) in seal (55).

NOTE

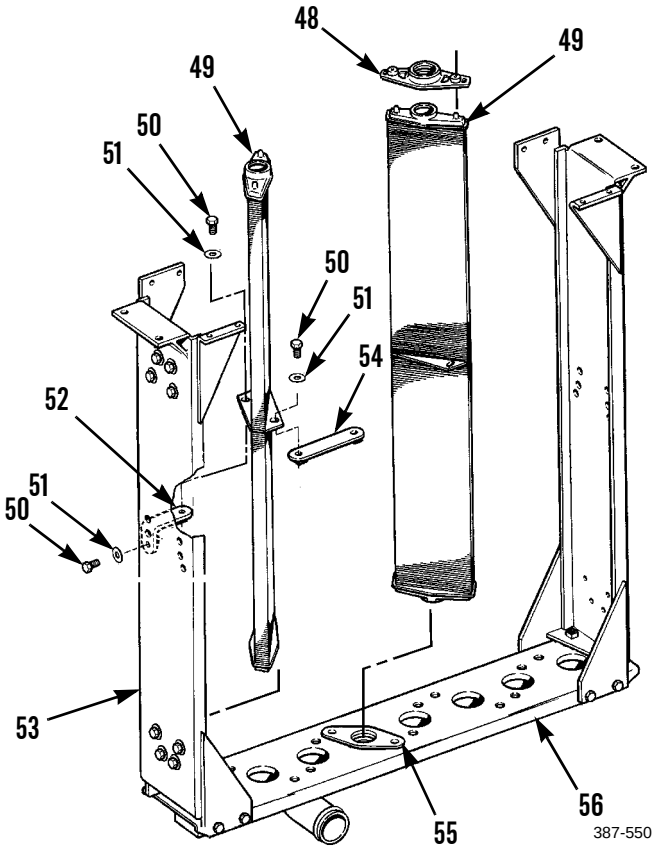
Do NOT tighten capscrews until radiator is assembled.

7. Install strap (54) at center tabs in core (49) with two capscrews (50) and washers (51).

8. If removed, install bracket (52) with two capscrews (50) and washers (51).

9. Repeat step 6 through 8 to install remaining seven cores (49).

10. Ensure seal holes in top tank (36) are clean and serviceable. Apply liquid detergent to all sealing areas and to eight new seals (48). Install seals in top tank.



11. With assistance, carefully position top tank (36) over cores (49) and line up seals (48) with core necks. Press down on top tank to seat on seals. Use a gentle rocking motion.
12. Install top tank (36) on frame (53) with four capscrews (46) and washers (47).
13. Install bracket (45) on top tank (36) with two capscrews (43) and washers (44).
14. Repeat steps 12 and 13 at other end of top tank (36).

NOTE

Ensure back of "V"s are within 1/8 in. of each other at rear by pinching together.

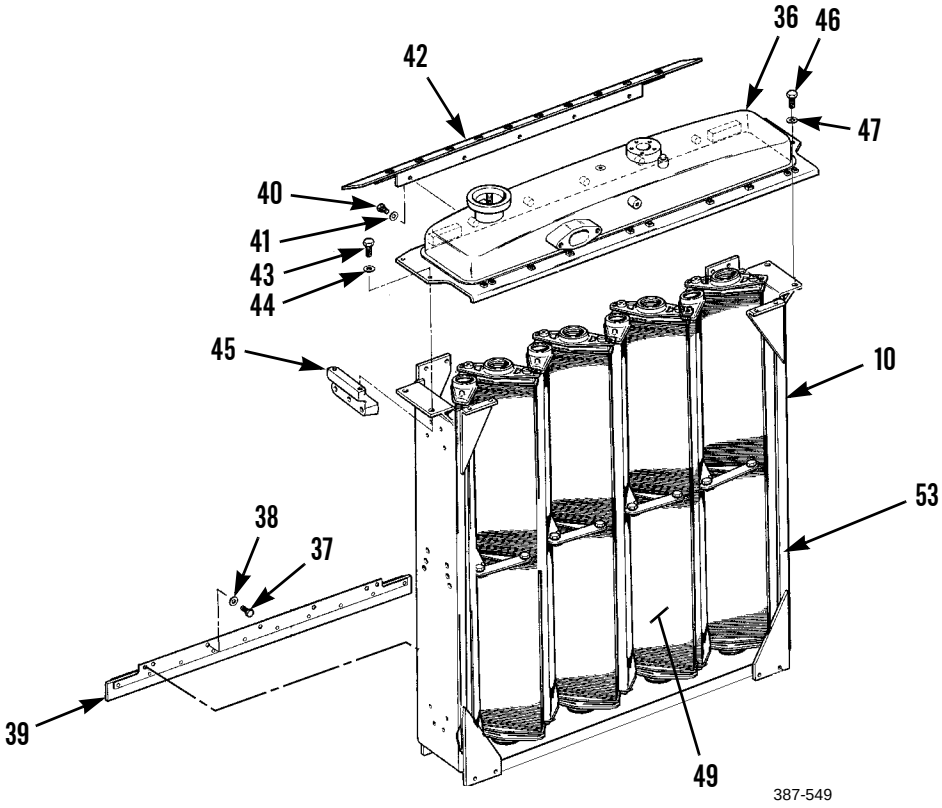
15. Adjust cores (49) to obtain a 0.25 in. (6.25 mm) gap between cores, at middle by stiffeners of "V" at front of radiator. As adjustments are made, tighten capscrews (50) on straps (54) between cores.
16. Tighten balance of capscrews (50) on radiator.

NOTE

Place back side of radiator on wood blocks for steps 17 and 18.

17. Install baffle (42) on top front of radiator with five capscrews (40) and washers (41).
18. Install baffle (39) on bottom front of radiator with four capscrews (37) and washers (38).

ASSEMBLY - CONTINUED



INSTALLATION

1. Install two lifting links (35) with bolts 1/2-13 x 1-1/2 in. in radiator top tank (36).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

CAUTION

Ensure that wiring harness from horn, located between radiator and support, is clear of radiator. Lower radiator slowly and carefully to avoid damage to wiring harness.

NOTE

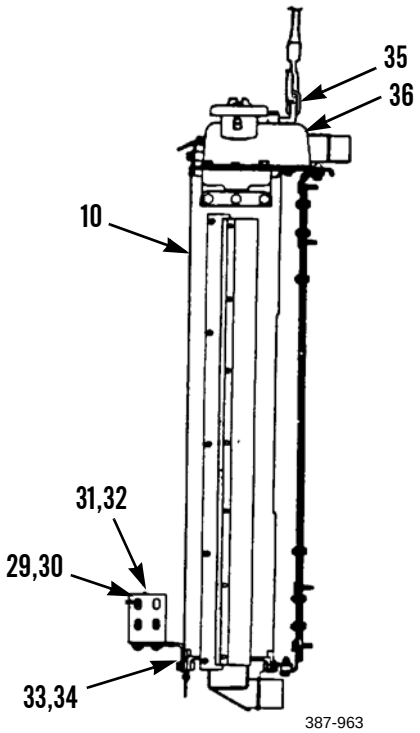
Radiator weighs 450 lb (204 kg).

2. Attach nylon sling and suitable lifting device to lifting links (35) and lift radiator (10) into radiator guard on machine.

NOTE

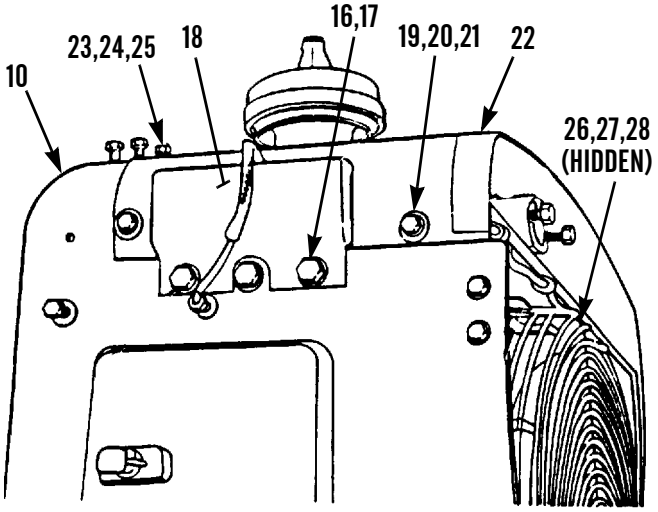
Do not tighten capscrews until all radiator mounting hardware has been installed.

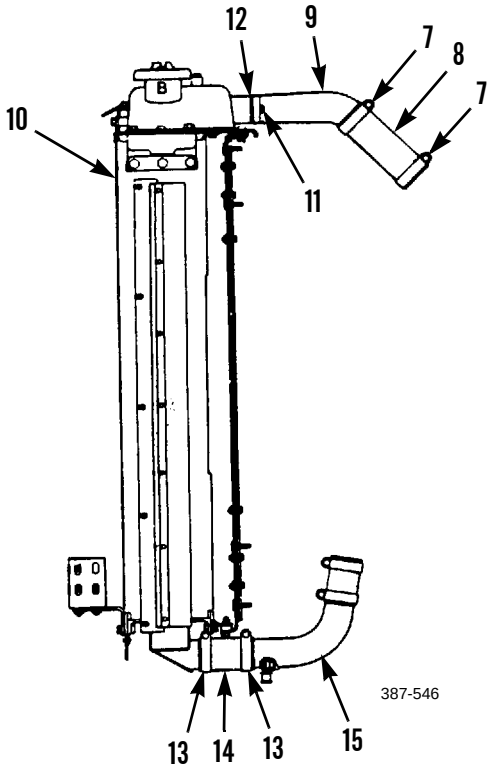
3. Install three washers (34) and capscrews (33) at front bottom of radiator (10).
4. Install bracket (31) at bottom front of radiator (10) with four washers (30) and capscrews (29).
5. Repeat step 4 for bracket (32) on other side of radiator (10).
6. Remove lifting device, bolts and two lifting links (35).



INSTALLATION - CONTINUED

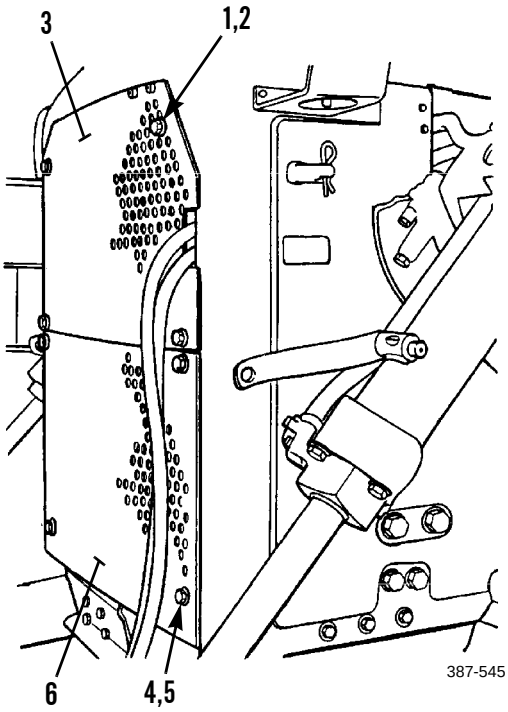
7. Install shield assembly (28) with ten washers (27) and capscrews (26).
8. Tighten all radiator mounting hardware.
9. Install radiator cover (22) with three capscrews (23), new lockwashers (25) and washers (24).
10. Install two capscrews (19), new lockwashers (20) and washers (21) on one side of radiator cover (22).
11. Install three capscrews (16), washers (17) and bracket (18) on same side of radiator (10).
12. Repeat steps 9 and 10 on other side of radiator (10).
13. Install hose (14) to bottom of radiator (10) and elbow flange (15) and tighten two hose clamps (13).
14. Install hose (8), two hose clamps (7) and elbow flange (9).
15. Install new gasket (12) and elbow flange (9) to top of radiator (10) with two capscrews (11).





INSTALLATION - CONTINUED

16. Install lower radiator grille (6) on lower radiator guard with four washers (5) and capscrews (4).
17. Install upper radiator grille (3) on upper radiator guard with four washers (2) and capscrews (1).
18. Refill cooling system (WP 0065 00).
19. Run engine and check for leaks (TM 5-2410-237-10).
20. Install fan guard (WP 0073 00).
21. Install headlamp protective guard (WP 0093 00).
22. Install hood (WP 0159 00).



END OF WORK PACKAGE

WATER TEMPERATURE REGULATOR MAINTENANCE 0069 00

THIS WORK PACKAGE COVERS

Removal, Test, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Antifreeze (Item 1, WP 0249 00)

Materials/Parts - Continued

Gasket (6)

References

TM 5-2410-237-10

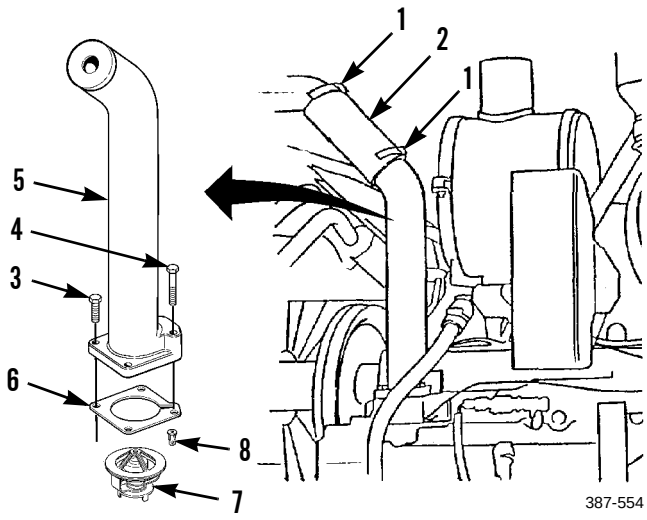
WP 0066 00

Equipment Condition

Coolant drained (WP 0065 00)

REMOVAL

1. Loosen two clamps (1) and slide hose (2) toward radiator.
2. Remove three capscrews (3), capscrew (4), elbow flange (5) and gasket (6) from cylinder head. Discard gasket.
3. Remove water temperature regulator (7) and flow control (bypass) valve (8) from cylinder head.



TEST

1. Place a thermometer in a container with water. Heat water to 175°F (79°C).
2. Submerse water temperature regulator (7) in heated water.

NOTE

Water temperature regulator should start to open at 175°F (79°C) and be fully open at 195°F (91°C) maximum.

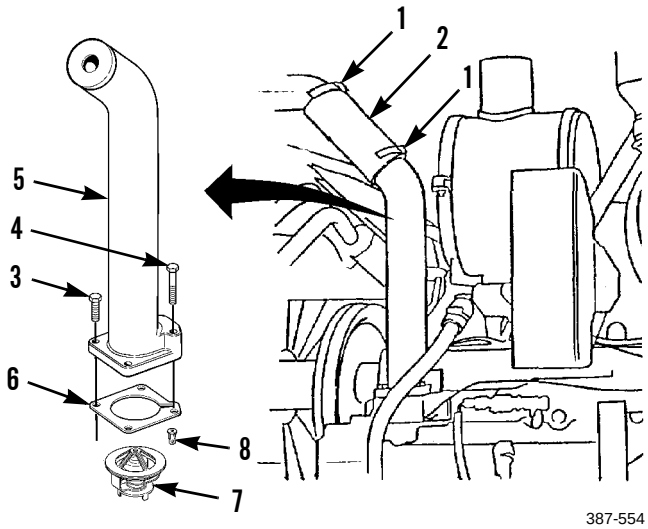
3. Read temperature on thermometer when water temperature regulator (7) starts to open.
4. Discard water temperature regulator if it is not fully open at 195°F (91°C).

INSTALLATION

CAUTION

If water temperature regulator is installed wrong, engine will overheat.

1. Install water temperature regulator (7) in cylinder head, with spring toward inside of engine. Install flow control (bypass) valve (8).
2. Install new gasket (6) and elbow flange (5) over water temperature regulator (7).
3. Install three capscrews (3) and capscrew (4).
4. Slide hose (2) in position and tighten two clamps (1).
5. Fill cooling system (WP 0065 00).
6. Run engine and check for leaks (TM 5-2410-237-10) or pressure test system (WP 0066 00).



END OF WORK PACKAGE

WATER PUMP ASSEMBLY REPLACEMENT 0070 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Antifreeze (Item 1, WP 0249 00)

Oil, lubricating (Item 26, WP 0249 00)

Packing, preformed (4)

References

TM 5-2410-237-10

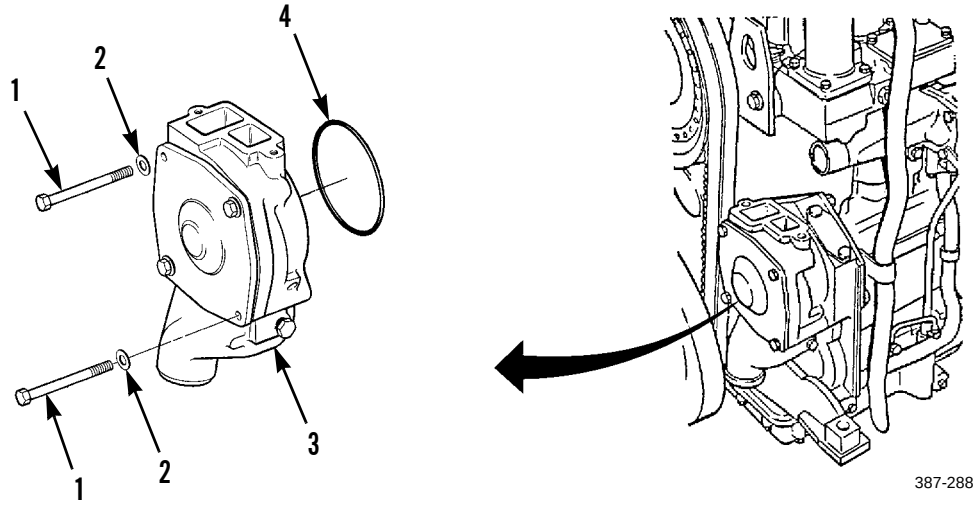
Equipment Condition

Coolant drained (WP 0065 00)

Water pump lines removed (WP 0071 00)

REMOVAL

1. Remove two capscrews (1), washers (2) and water pump (3) from timing gear cover.
2. Remove and discard preformed packing (4).



INSTALLATION

1. Lightly lubricate new preformed packing (4) with clean oil and install on water pump (3).
2. Position water pump (3) on timing gear cover and install two capscrews (1) and washers (2).
3. Install water pump lines (WP 0071 00).
4. Fill cooling system (WP 0065 00).
5. Run engine and check for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

WATER PUMP LINES AND HOSES REPLACEMENT 0071 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Antifreeze (Item 1, WP 0249 00)

Compound, gasket forming silicone (Item 7, WP 0249 00)

Materials/Parts - Continued

Gasket (13 and 14)

References

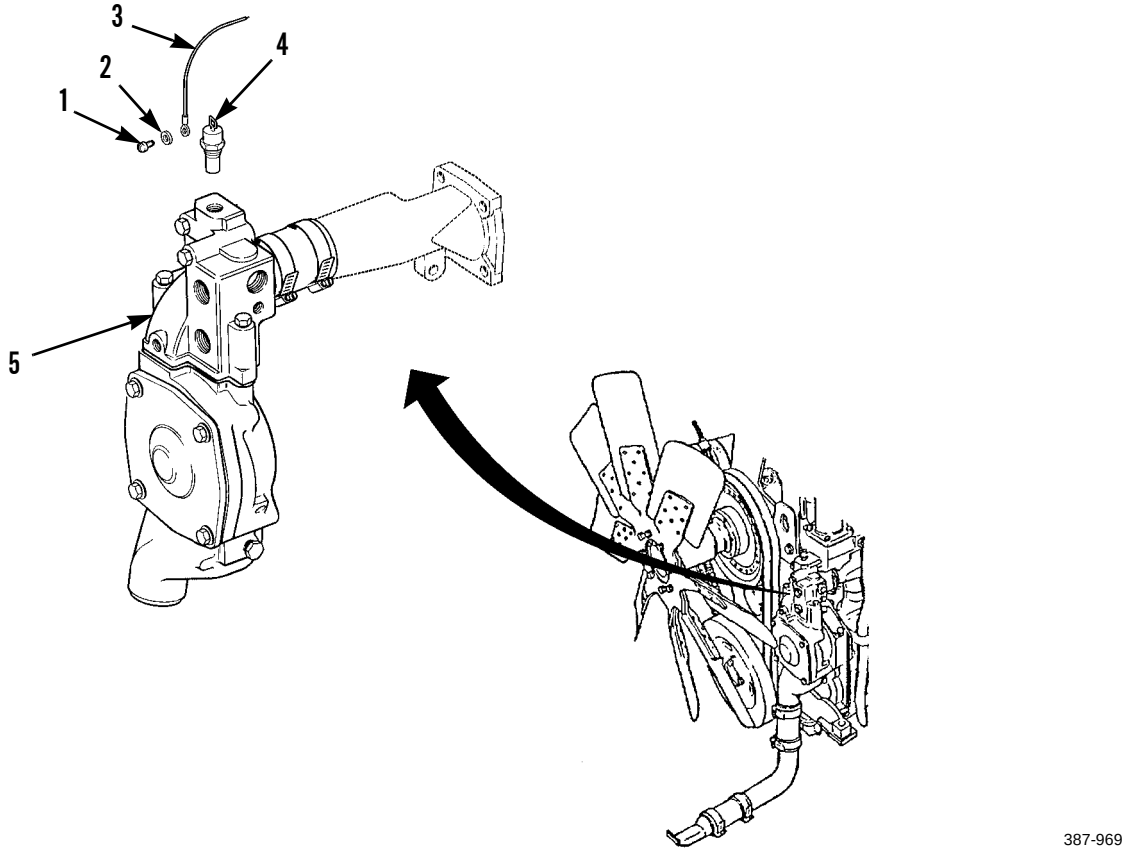
TM 5-2410-237-10

Equipment Condition

Coolant drained (WP 0065 00)

REMOVAL

1. Remove screw (1), washer (2) and wire (3) from top sending unit (4). Remove sending unit from elbow (5).



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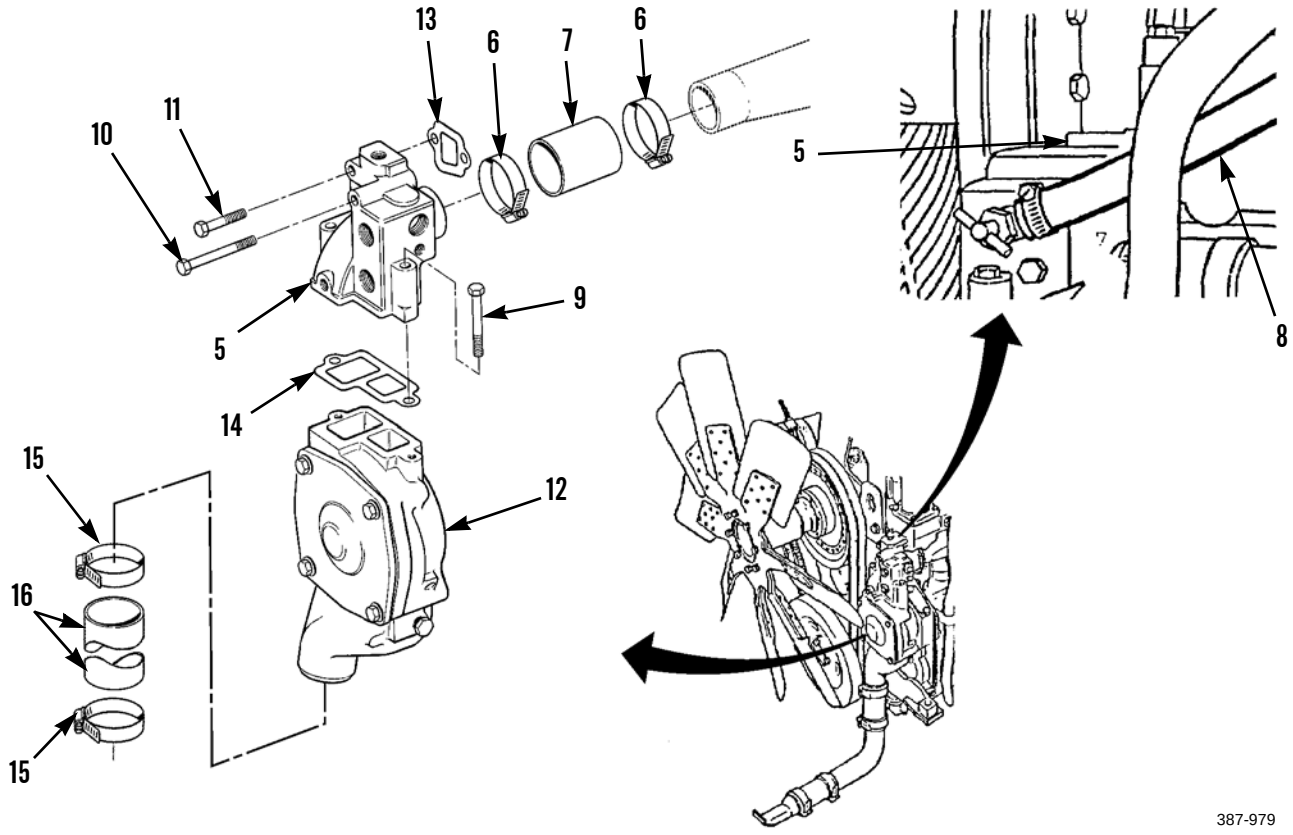
REMOVAL - CONTINUED

2. Loosen two clamps (6) from hose (7).

NOTE

Perform step 3 only if tractor is equipped with a winterized cab.

3. If equipped, disconnect heater hose (8) from elbow (5).
4. Remove two capscrews (9) and capscrews (10 and 11).
5. Carefully separate elbow (5) from engine and top of water pump (12) and remove hose (7).
6. Remove gaskets (13 and 14) from mating surfaces. Discard gaskets.
7. Loosen two clamps (15) and slide hose (16) off bottom of water pump (12).



INSTALLATION

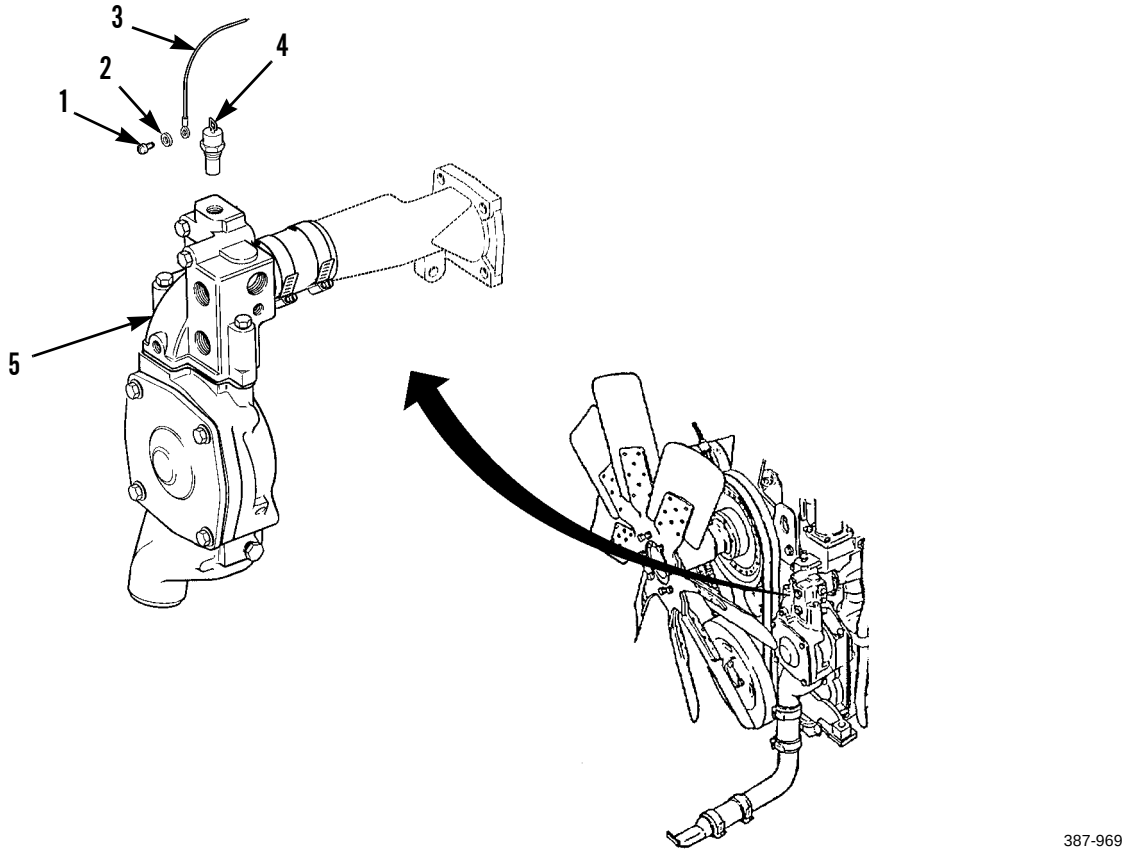
NOTE

- **Ensure mating surfaces are clean and dry.**
- **Use silicone gasket forming compound on mating surfaces to aid gasket placement and to seal between components.**

1. Position hose (16) at bottom of water pump (12) and tighten two clamps (15).
2. Install hose (7) on elbow (5).

INSTALLATION - CONTINUED

3. Position new gaskets (14 and 13) on elbow (5).
4. Position elbow (5) on engine and top of water pump (12).
5. Secure elbow (5) to water pump (12) and engine with two capscrews (9) and capscrews (11 and 10).



387-969

NOTE

Perform step 6 only if tractor is equipped with a winterized cab.

6. If equipped, connect heater hose (8) to elbow (5).
7. Position two clamps (6) and tighten.
8. Install sending unit (4) in elbow (5) and tighten.
9. Position wire (3) on top of sending unit (4) and install washer (2) and screw (1).
10. Fill cooling system (WP 0065 00).
11. Run engine and check for proper operation and coolant leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

FAN DRIVE ASSEMBLY MAINTENANCE 0072 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Bushing driver set (Item 18, WP 0250 00)

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

Bolt, self-locking (9)

Materials/Parts - Continued

O-ring (7)

Seal (15)

References

TM 5-2410-237-10

WP 0010 00

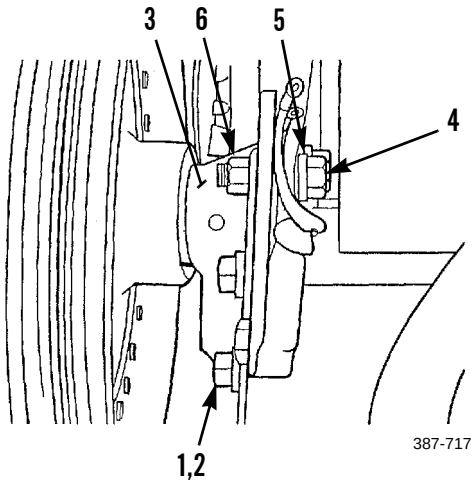
WP 0241 00

Equipment Condition

V-belts removed (WP 0074 00)

REMOVAL

1. Remove four bolts (1) and washers (2) that hold fan drive assembly (3) to engine block.
2. Remove two bolts (4), washers (5), nuts (6) and fan drive assembly (3) from bracket at top of engine.



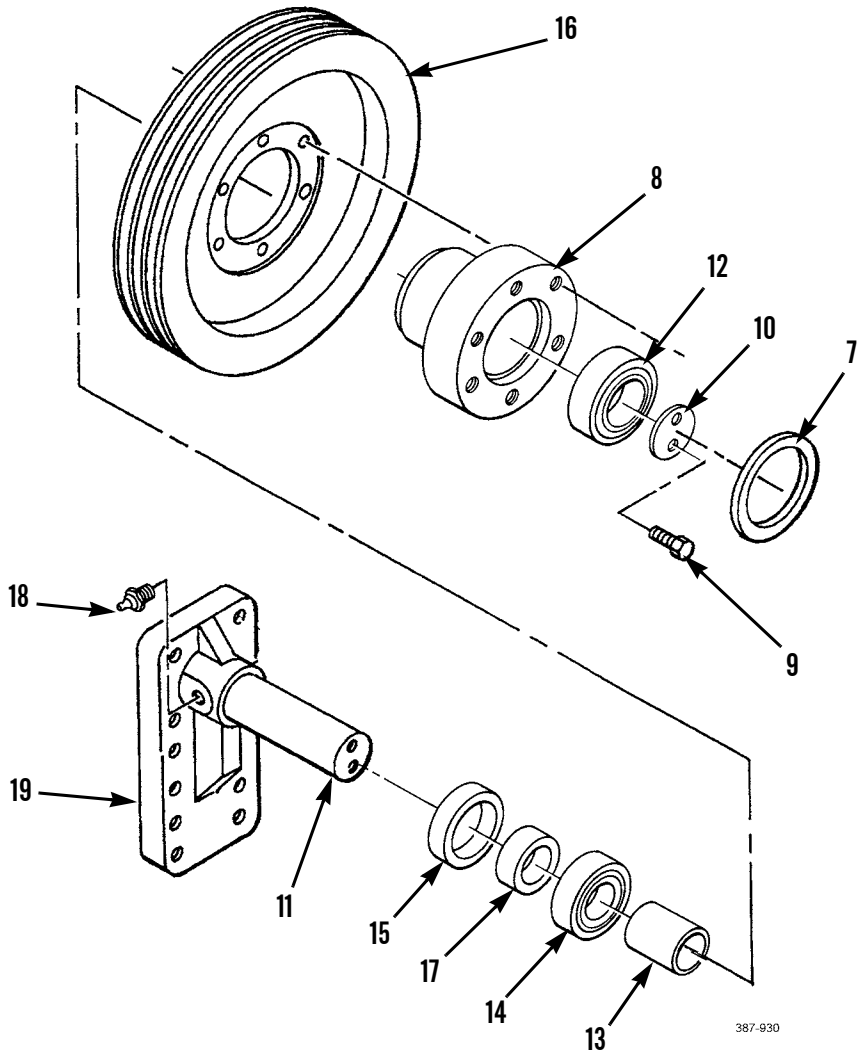
DISASSEMBLY

1. Remove O-ring (7) from hub (8). Discard O-ring.
2. Remove two self-locking bolts (9) and spacer plate (10) from end of shaft (11). Discard self-locking bolts.
3. Remove bearing (12), spacer (13) and bearing (14) from hub (8).

NOTE

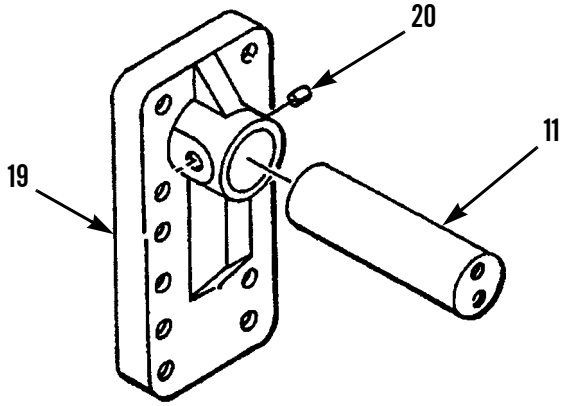
Note position of seal to ensure correct installation of a new seal.

4. Remove seal (15) from hub (8). Discard seal.
5. Remove pulley (16) from shaft (11).
6. Remove spacer (17) from shaft (11).
7. Remove grease fitting (18) from bracket (19)



DISASSEMBLY - CONTINUED

8. Remove pin (20) and separate shaft (11) from bracket (19).



387-931

CLEANING AND INSPECTION

1. Clean and inspect all components IAW WP 0241 00.
2. Replace any damaged component.

ASSEMBLY

1. Assemble shaft (11) to bracket (19) with pin (20).
2. Position pulley (16) over shaft (11) on bracket (19).
3. Install spacer (17) over shaft (11) on bracket (19).
4. Install new seal (15) to hub (8).
5. Install hub (8) over shaft (11) on bracket (19).
6. Install bearing (14) in hub (8).
7. Install spacer (13) in hub (8).

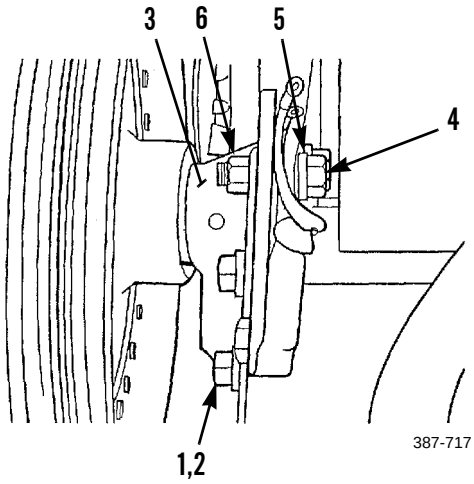
NOTE

Ensure bearing is fully seated in hub counterbore.

8. Install bearing (12) in hub (8).
9. Install spacer plate (10) to end of shaft (11) with two new self-locking bolts (9).
10. Install new O-ring (7) to hub (8).
11. Install grease fitting (18) to bracket (19).

INSTALLATION

1. Place fan drive assembly (3) in position at bracket at top of engine and install two bolts (4), washers (5) and nuts (6).
2. Install four bolts (1) and washers (2) to secure fan drive assembly (3) to engine block.
3. Install V-belts (WP 0074 00).
4. Lubricate fan drive assembly with grease (WP 0010 00).
5. Start engine and check fan for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

FAN AND FAN GUARD REPLACEMENT 0073 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Nut, self-locking (4)

Personal Required

Two

Equipment Condition

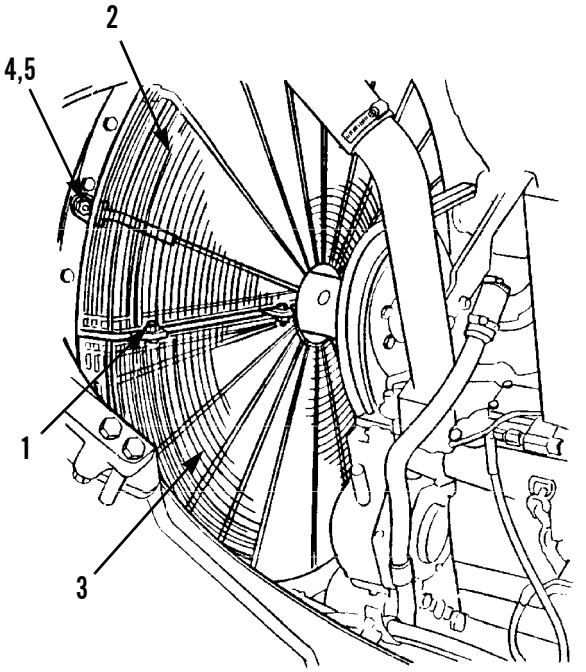
Engine OFF and cool (TM 5-2410-237-10)

Blade lift cylinder mounting tube removed, if necessary (WP 0222 00)

Radiator removed, if removing fan (WP 0068 00)

REMOVAL

1. Remove four capscrews (1) to separate upper and lower fan guards (2 and 3).
2. Remove six self-locking nuts (4), washers (5) and upper fan guard (2). Discard self-locking nuts.
3. Repeat step 2 for lower fan guard (3).
4. Swing lower fan guard (3) upward around fan and lift out.



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REMOVAL - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Fan weighs 58 lb (26 kg).**
- **Prior to removal, note position of fan blades for correct installation.**

5. Secure fan (6) with a nylon sling and suitable lifting device.
6. Remove eight capscrews (7) and washers (8).
7. Remove fan (6) from hub (9).

INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

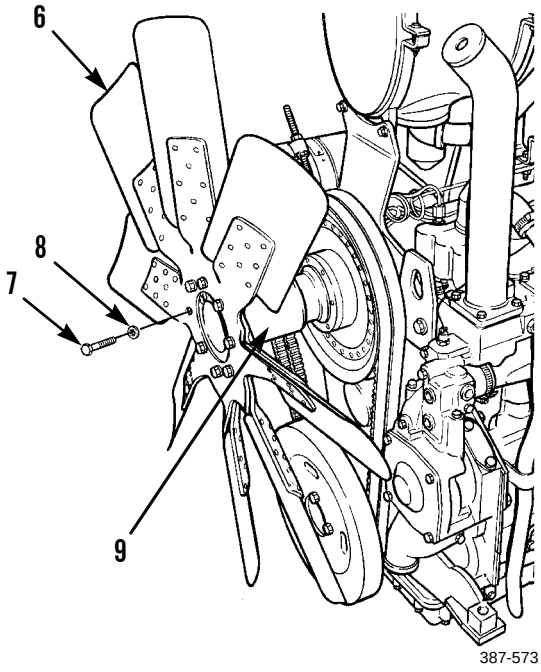
- **Fan weighs 58 lb (26 kg).**
- **Ensure fan blades are oriented the same as noted during removal.**

1. Secure fan (6) with a nylon sling and attach sling to suitable lifting device. Lower fan into position at hub (9). Install eight washers (8) and capscrews (7).
2. Swing lower fan guard (3) down around fan and position on studs.
3. Install upper fan guard (2) over fan on studs.
4. Install lower fan guard (3) with six washers (5) and new self-locking nuts (4).
5. Repeat step 4 for upper fan guard (2).
6. Install four capscrews (1) attaching upper and lower fan guards (2 and 3).
7. If removed, install radiator (WP 0068 00).

FAN AND FAN GUARD REPLACEMENT - CONTINUED 00073 00

INSTALLATION - CONTINUED

8. Install blade lift cylinder mounting tube (WP 0222 00).
9. Run engine and check for proper operation (TM 5-2410-237-10).



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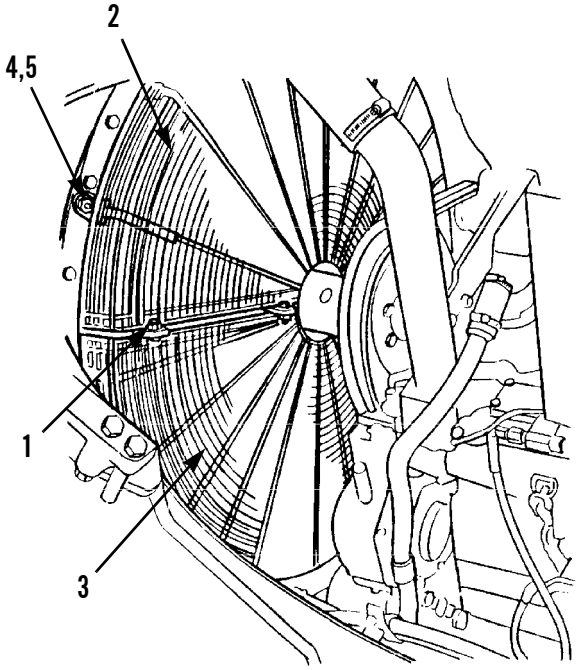

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END OF WORK PACKAGE

V-BELTS REPLACEMENT 0074 00

THIS WORK PACKAGE COVERS

Removal, Installation, Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Tools and Special Tools - Continued

Lifting equipment, 100 lb capacity

Personnel Required

Two

Equipment Condition

Hood removed (WP 0159 00)

REMOVAL

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only lifting device. Failure to follow this warning may result in injury or death.

NOTE

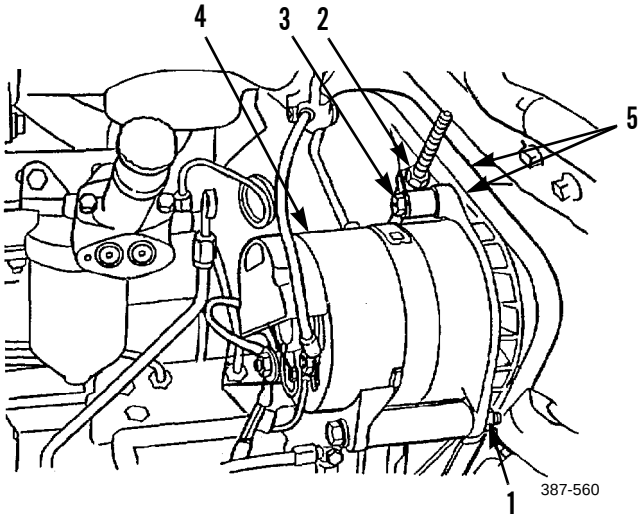
Fan and hub assembly weighs 65 lb (30 kg).

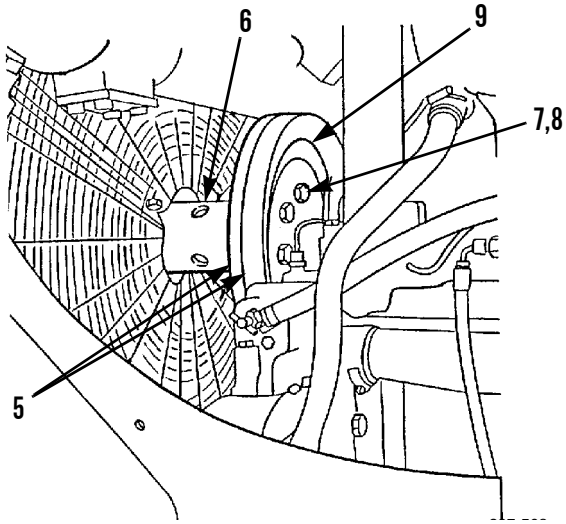
1. Loosen nuts (1, 2 and 3) and pivot alternator (4) so that two V-belts (5) are loose on pulley of alternator.
2. Secure fan hub (6) with nylon sling and suitable lifting device. Take up slack to provide support.
3. Remove six capscrews (7) and washers (8) holding fan and fan hub (6) to fan drive assembly.

CAUTION

Use care to avoid damaging radiator core when fan is placed against it.

4. Place fan and fan hub (6) assembly against radiator core and remove two V-belts (5) from fan pulley (9).



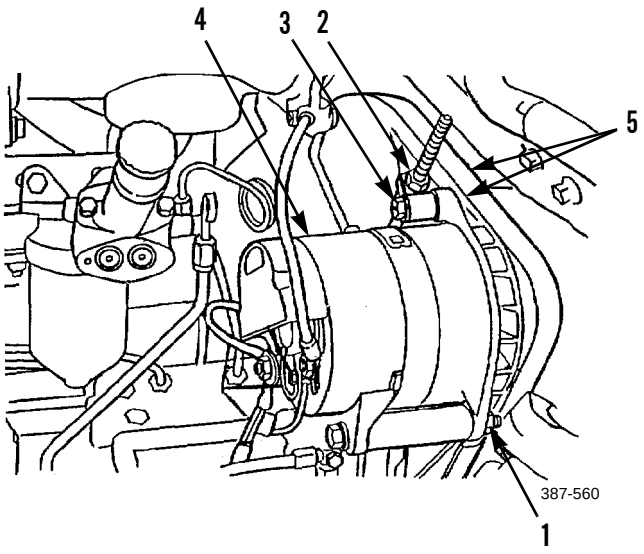


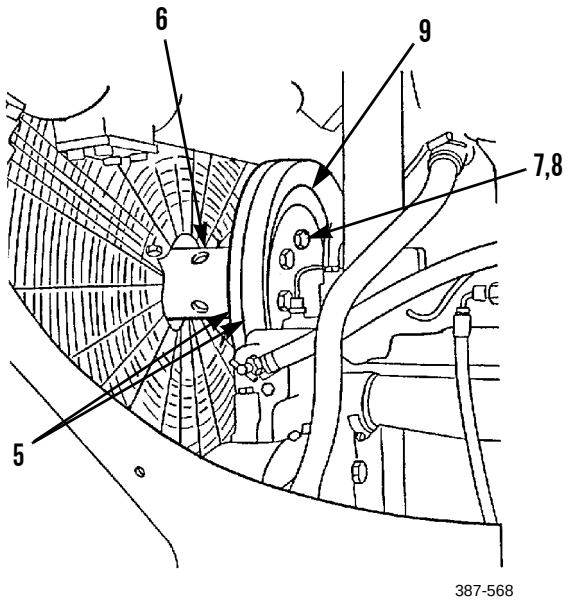
INSTALLATION

NOTE

V-belts are replaced only as a matched set. Avoid mixing new and used belts.

1. Loosely install two V-belts (5) on fan pulley (9).
2. Position fan hub (6) against fan drive.
3. Install six washers (8) and capscrews (7).
4. Remove nylon sling and lifting device from fan hub (6).





ADJUSTMENT

NOTE

- **Belt tension gage indication should be 120 lb (534 N) for new V-belts and 90 lb (400 N) for used belts.**
- **Belts are considered used if they have more than 30 minutes of operation.**

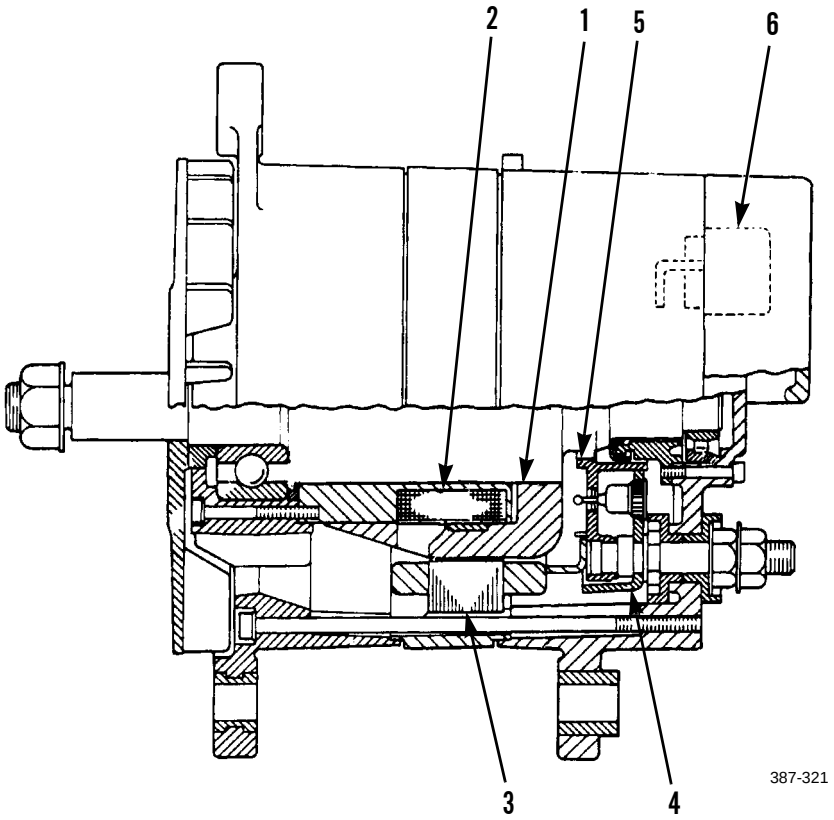
1. Turn nut (2) until correct tension on V-belts (5) is obtained.
2. When correct belt tension is obtained, tighten nuts (1 and 3).
3. Operate machine for 30 minutes and recheck belt tension. Adjust position of nut (2) as necessary.
4. Install hood (WP 0159 00).

END OF WORK PACKAGE

ELECTRICAL SYSTEM THEORY OF OPERATION 0075 00

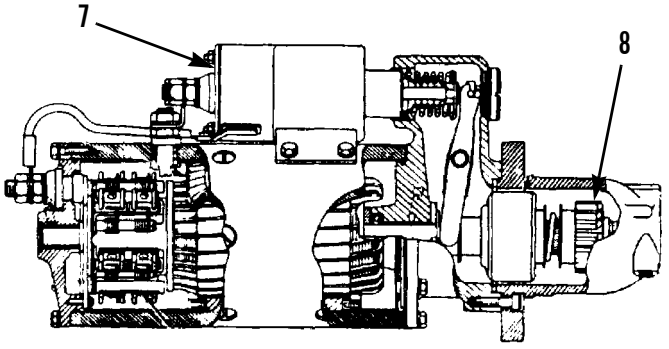
ALTERNATOR

1. The alternator is driven by three V-type belts from the crankshaft pulley. This alternator is a three phase, full-wave rectified output with an integral voltage regulator.
2. The alternator design has no need for slip rings or brushes, and the only part that has movement is the rotor assembly. All conductors that carry current are stationary. The alternator has a 50 amp output at 28 VDC.
3. The rotor assembly (1) has many magnetic poles like fingers with air space between each opposite pole. The poles have residual magnetism (like permanent magnets) that produce a small amount of magnet-like lines of force (magnetic field) between the poles. As the rotor assembly begins to turn between the field winding (2) and the stator winding (3), a small amount of alternating current (AC) is produced in the stator winding (3), from the small magnetic lines of force made by the residual magnetism of the poles. This AC current is changed to direct current (DC) when it passes through the diodes (4) of the rectifier bridge (5). Most of this current goes to charge the battery and to supply the low amperage circuit, and the remainder is sent on to the field windings (2). The DC current flow through the field winding (2) (wires around an iron core) now increases the strength of the magnetic lines of force. These stronger lines of force increase the amount of the AC current produced in the stator winding (3). The increased speed of the rotor assembly (1) also increases the current and voltage output of the alternator.
4. The voltage regulator (6) is a solid state (transistor, stationary parts) electronic switch. It feels the voltage in the system and switches on and off many times a second to control the field current (DC current to the field windings) for the alternator to make the needed voltage output.



STARTER MOTOR

1. The starter motor is used to turn the engine flywheel fast enough to get the engine running.
2. The starter motor has a solenoid (7). When the start switch is activated, electricity from the electrical system will cause the solenoid (7) to move the starter pinion (8) to engage with the ring gear on the flywheel of the engine. The starter pinion (8) will engage with the ring gear before the electric contacts in the solenoid (7) close the circuit between the battery and the starter motor. When the start switch is released, the starter pinion (8) will move away from the ring gear of the flywheel.



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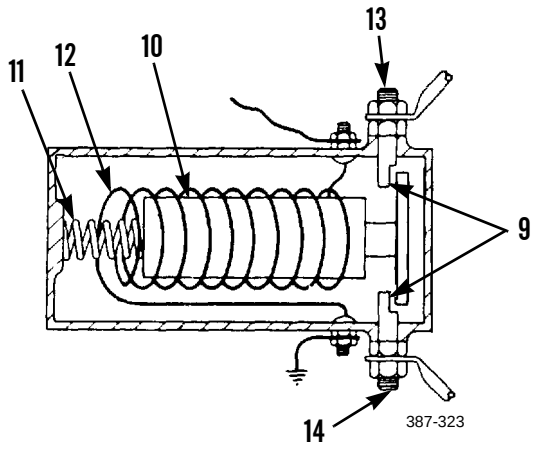
SOLENOID

1. A solenoid is a magnetic switch that uses low current to close a high current circuit. The solenoid has an electromagnet with a core which moves.
2. There are contacts (9) on the end of core (10). The contacts (9) are held in the open position by spring (11) that pushes core (10) from the magnetic center of coil (12). Low current will energize coil (12) and make a magnetic field. The magnetic field pulls core (10) to the center coil (12) and the contacts (9) close, completing the circuit between the battery terminal (13) and starter terminal (14).



387-323

END OF WORK PACKAGE

ALTERNATOR REPLACEMENT 0076 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

References

TM 5-2410-237-10

Equipment Condition

Battery cables disconnected (WP 0101 00)

V-belts removed (WP 0074 00)

WARNING

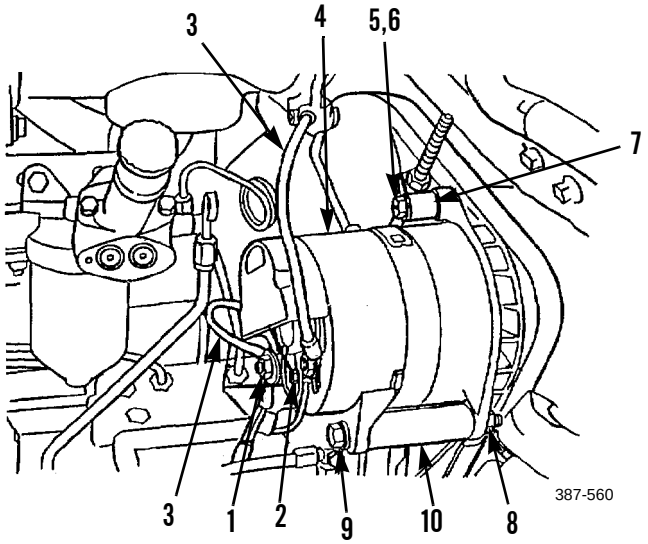
Ensure battery cables are disconnected before replacing alternator. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

NOTE

Tag wires to ensure correct installation.

1. Remove two nuts (1 and 2) and disconnect wires (3) from alternator (4).
2. Remove capscrew (5), washer (6) from alternator block (7) and alternator (4).
3. Remove nut (8) and capscrew (9).
4. Remove alternator (4) from bracket (10).

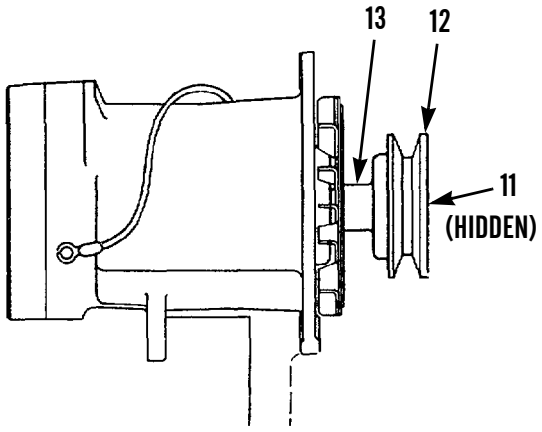


REMOVAL - CONTINUED

NOTE

If alternator requires replacement, continue to step 5.

5. Remove nut (11) and pulley (12) from alternator shaft (13).



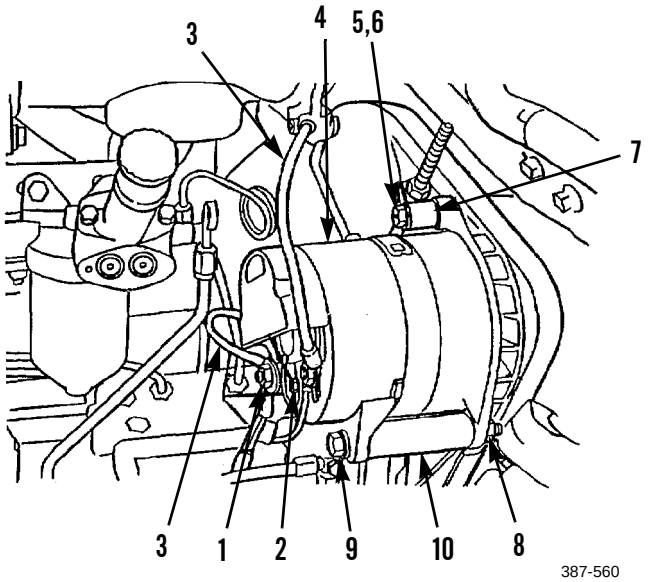
INSTALLATION

1. Install pulley (12) onto alternator shaft (13) and secure with nut (11). Tighten nut to 76 lb-ft (103 Nm).

NOTE

Do NOT tighten alternator mounting capscrews until V-belt adjustment is complete.

2. Position alternator (4) on bracket (10) and install capscrew (9) and nut (8).
3. Install washer (6) and capscrew (5) to alternator (4) and alternator block (7).
4. Connect wires (3) and install two nuts (1 and 2).
5. Connect battery cables (WP 0101 00).
6. Install and adjust V-belts (WP 0074 00).
7. Run engine and check for proper operation of charging system (TM 5-2410-237-10).



END OF WORK PACKAGE

ALTERNATOR MOUNTING BRACKET REPLACEMENT 0077 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Equipment Condition

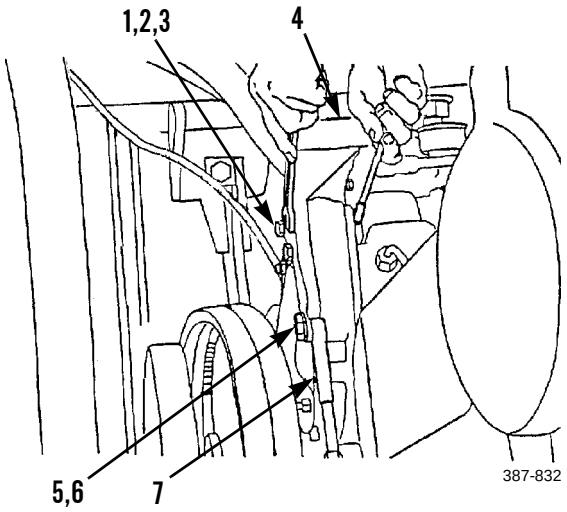
Alternator removed (WP 0076 00)

REMOVAL

1. Remove four nuts (1), washers (2), bolts (3) and alternator mounting bracket (4) from front of engine.
2. Remove bolt (5), washer (6) and threaded rod (7) from alternator mounting bracket (4).

INSTALLATION

1. Install threaded rod (7) to alternator mounting bracket (4) with washer (6) and bolt (5).
2. Install alternator mounting bracket (4) to front of engine with four bolts (3), washers (2) and nuts (1).
3. Install alternator (WP 0076 00).



END OF WORK PACKAGE

STARTING MOTOR REPLACEMENT 0078 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Gasket (21)

Lockwasher (2, 6 and 10)

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Battery cables disconnected (WP 0101 00)

NATO starting receptacle removed (WP 0102 00)

Transmission filter lines and oil magnetic screen removed (WP 0112 00)

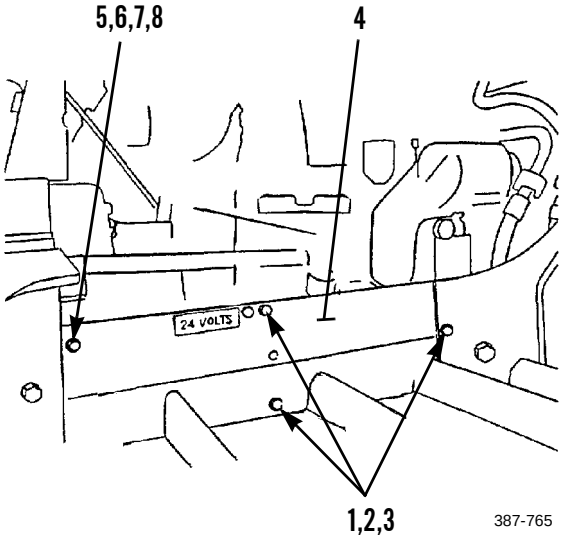
Governor control linkage removed (WP 0058 00)

WARNING

Ensure battery cables are disconnected before replacing starting motor. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), lockwashers (2) and washers (3) from guard panel (4). Discard lockwashers.
2. Remove one capscrew (5), lockwasher (6), washer (7), nut (8) and guard panel (4). Discard lockwasher.



REMOVAL - CONTINUED

NOTE

Tag wires to ensure correct installation.

3. Remove nut (9), lockwasher (10) and three wires (11) from negative terminal of starting motor (12).
4. Remove nut (13) washer (14) and four wires (15) from positive terminal of solenoid (16).
5. Remove nut (17) and two wires (18) from solenoid (16).

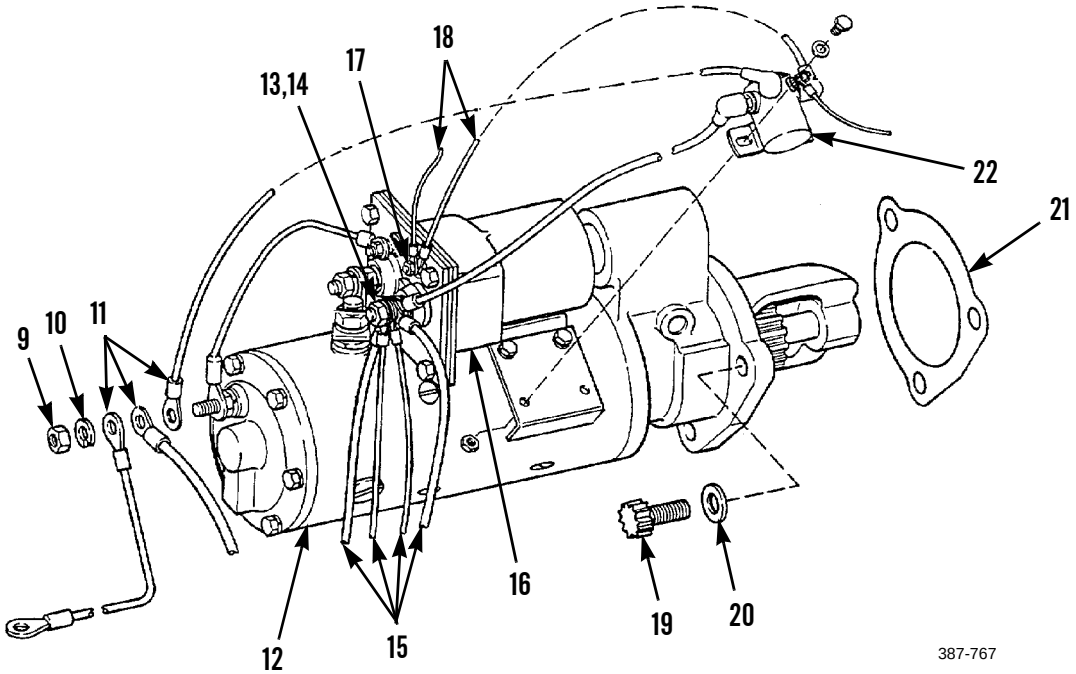
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Starting motor weighs 80 lb (36 kg).

6. Attach a nylon sling and a suitable lifting device to starting motor (12).
7. Remove three bolts (19), washers (20) and starting motor (12) from flywheel housing.
8. Remove and discard gasket (21).
9. If relay (22) is not present on new starting motor, transfer old relay to new starting motor.



INSTALLATION

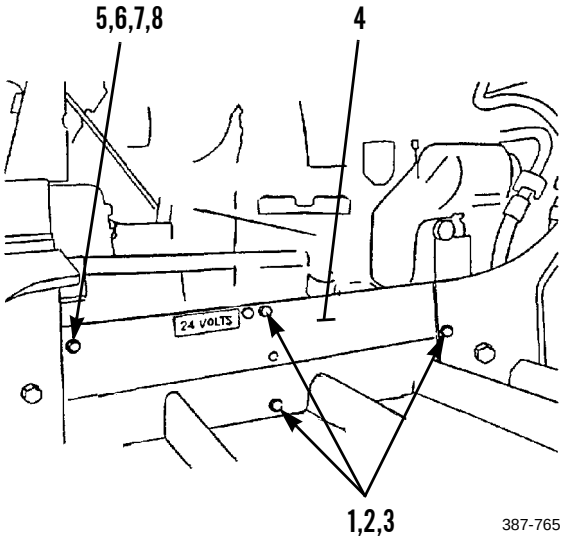
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Starting motor weighs 80 lb (36 kg).**
- **During installation of starting motor, ensure gear splines on starting motor mesh smoothly with flywheel teeth.**

1. Attach a nylon sling and a suitable lifting device to starting motor (12) and position motor at flywheel housing.
2. Install three washers (20) bolts (19) and new gasket (21) on starting motor (12) and flywheel housing. Tighten capscrews to 158 lb-ft (214 Nm).
3. Install two wires (18) and nut (17) to solenoid (16).
4. Install four wires (15) on positive terminal of solenoid (16) and secure with washer (14) and nut (13). Tighten nut to 9 lb-ft (12 Nm).
5. Install three wires (11) on negative terminal of starting motor (12) and secure with new lockwasher (10) and nut (9). Tighten nut to 21 lb-ft (28 Nm).
6. Position guard panel (4) and install one capscrew (5), new lockwasher (6), washer (7) and nut (8).
7. Install four capscrews (1), new lockwashers (2) and washers (3) to guard panel (4).
8. Install governor control linkage (WP 0058 00).
9. Install transmission filter lines and oil magnetic screen (WP 0112 00).
10. Install NATO starting receptacle (WP 0102 00).
11. Connect battery cables (WP 0101 00).
12. Place battery disconnect switch in ON position (TM 5-2410-237-10).
13. Run engine and check for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

STARTING MOTOR SOLENOID REPLACEMENT 0079 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

References

TM 5-2410-237-10

Equipment Condition

Battery cables disconnected (WP 0101 00)

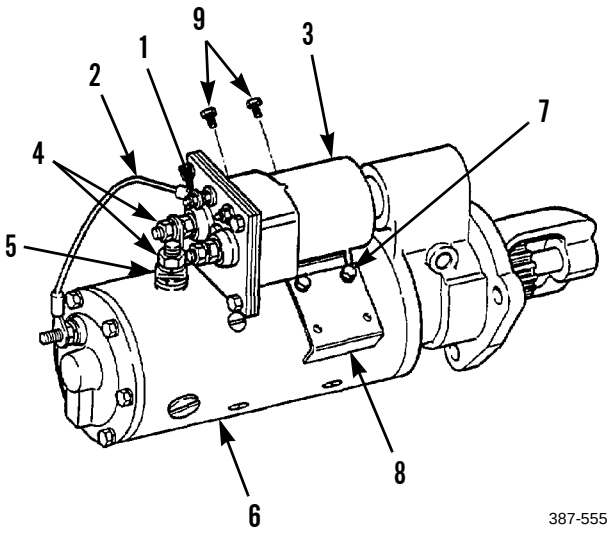
Starting motor removed (WP 0078 00)

REMOVAL

1. Remove nut (1) and wire (2) from ground terminal on solenoid (3).
2. Remove two nuts (4) and connector (5) from solenoid (3) and starting motor (6).
3. Remove two capscrews (7) and bracket (8).
4. Remove two capscrews (9) and separate solenoid (3) from starting motor (6).

INSTALLATION

1. Place solenoid (3) on starting motor (6) and install two capscrews (9).
2. Install bracket (8) with two capscrews (7).
3. Install connector (5) on terminals of starting motor (6) and solenoid (3) and secure with two nuts (4).
4. Install wire (2) on ground terminal and secure with nut (1).
5. Install starting motor (WP 0078 00).
6. Connect battery cables (WP 0101 00).
7. Start engine and check for proper operation (TM 5-2410-237-10).



387-555

END OF WORK PACKAGE

DASH PANEL LAMP REPLACEMENT 0080 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Bulb (11)

Materials/Parts - Continued

Lockwasher (3)

Equipment Condition

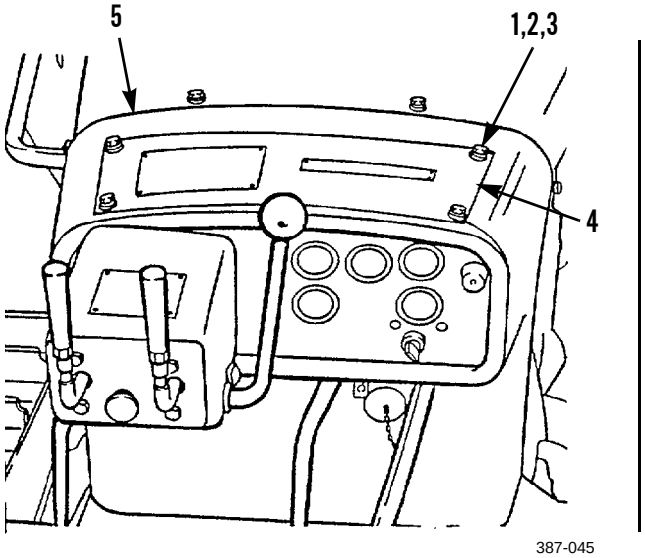
Battery cables disconnected (WP 0101 00)

WARNING

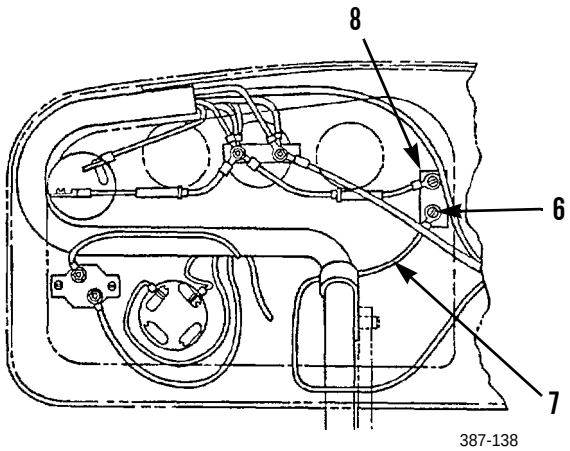
Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.
2. Remove screw (6) holding dash lamp assembly wire (7) to bottom of dash lamp switch (8).



387-045



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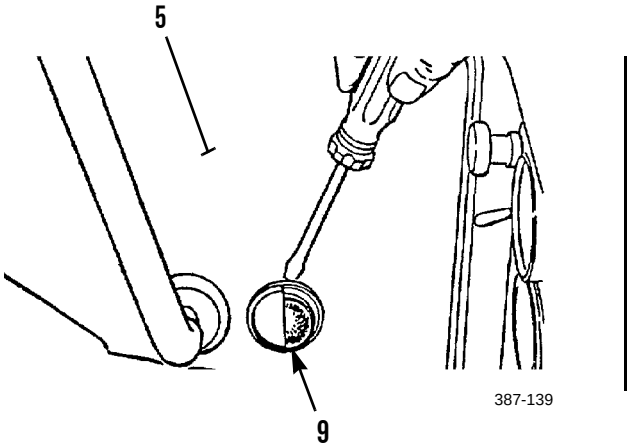
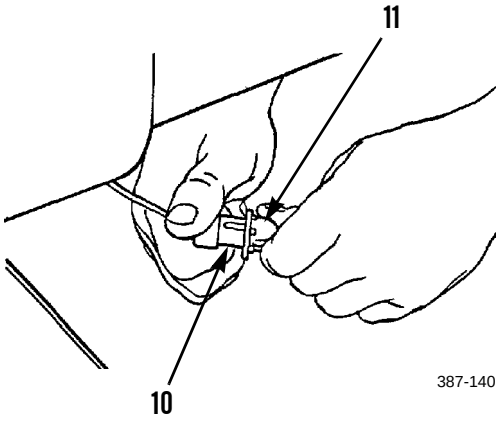
DASH PANEL LAMP REPLACEMENT 00080 00

REMOVAL - CONTINUED

3. Remove dash lamp cover (9) from side panel of dash assembly (5).



387-139

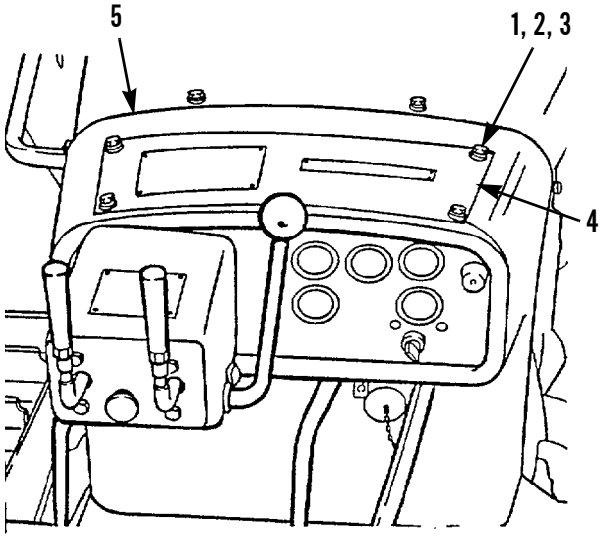


387-140

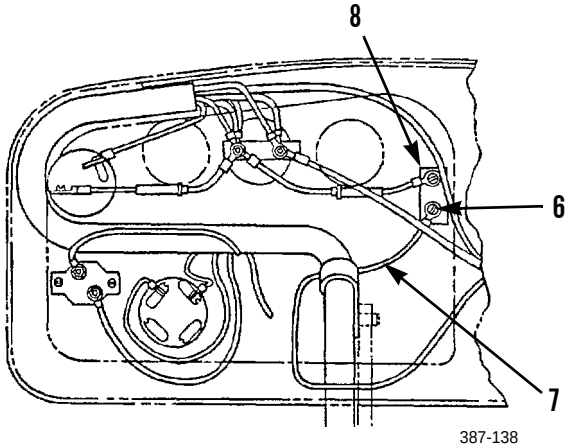
4. Remove dash lamp assembly (10) out through back side of panel to opening in bottom of dash assembly (5).
5. Remove bulb (11) from dash lamp assembly (10).

INSTALLATION

1. Install bulb (11) in dash lamp assembly (10).
2. Place dash lamp assembly (10) in position in back of side panel of dash assembly (5).
3. Install dash lamp cover (9) in side panel of dash assembly (5).
4. Route dash lamp assembly wire (7) to bottom of dash lamp switch (8) and install screw (6).
5. Install cover (4) on top of dash assembly (5) with four capscrews (1), washers (2) and new lockwashers (3).
6. Connect battery cables (WP 0101 00) and ensure dash panel lamp operates.



387-045



387-138

END OF WORK PACKAGE

HOURMETER REPLACEMENT 0081 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Lockwasher (3)

Materials/Parts - Continued

Packing, preformed (10)

Equipment Condition

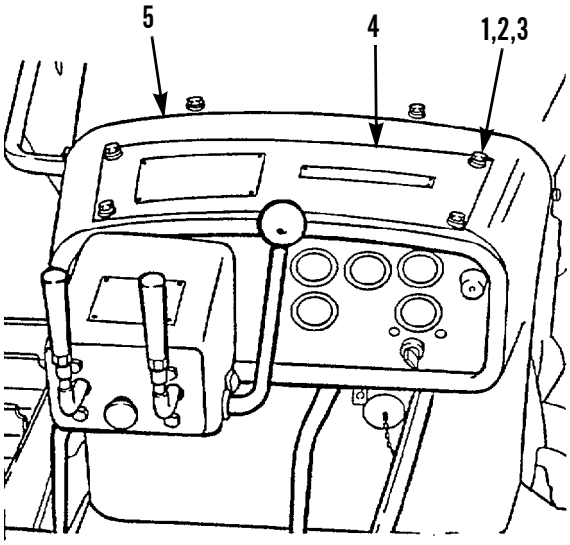
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.

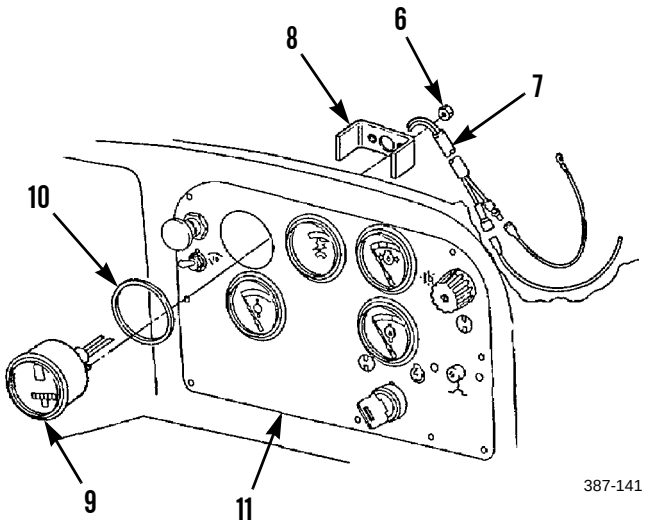


387-045

HOURMETER REPLACEMENT - CONTINUED 00081 00

REMOVAL - CONTINUED

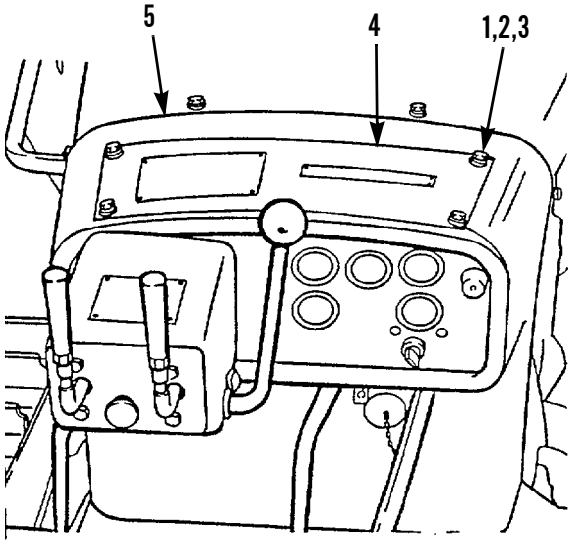
2. Remove two nuts (6), plug (7) and bracket (8) from back of hourmeter (9).
3. Remove hourmeter (9) with seal (10) out through front of dash panel (11).
4. Remove preformed packing (10) from hourmeter (9). Discard preformed packing.



387-141

INSTALLATION

1. Install new preformed packing (10) on hourmeter (9).
2. Place hourmeter (9) into position through front of dash panel (11).
3. Install bracket (8), plug (7) and two nuts (6) on back of hourmeter (9).
4. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).
5. Connect battery cables (WP 0101 00).



387-045

6. Run engine and check hourmeter for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

AMMETER REPLACEMENT 0082 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (3)

Materials/Parts - Continued

Packing, preformed (12)

References

TM 5-2410-237-10

Equipment Condition

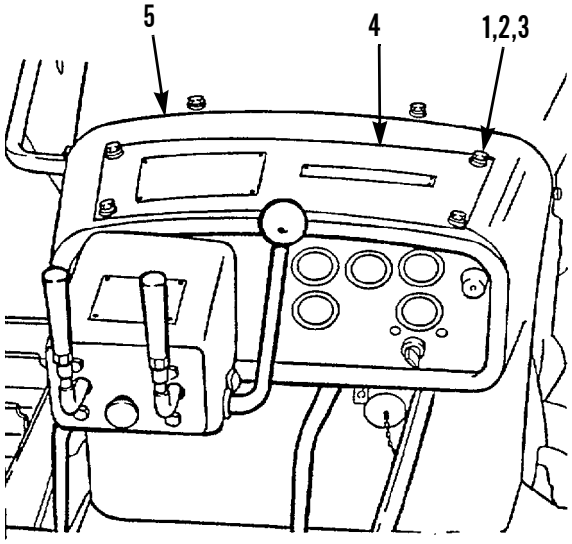
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



387-045

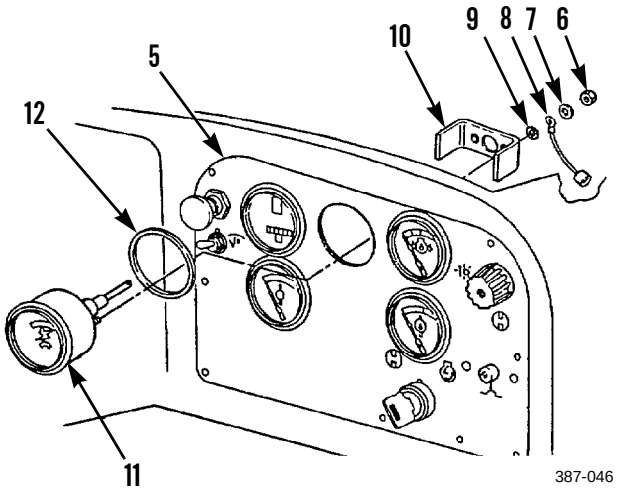
AMMETER REPLACEMENT - CONTINUED 00082 00

REMOVAL - CONTINUED

NOTE

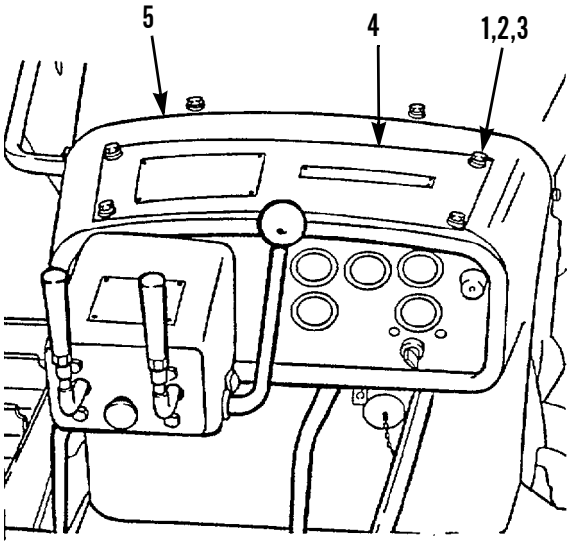
Tag wires to ensure correct operation.

2. Remove two nuts (6), washers (7), eight wires (8), two lockwashers (9) and bracket (10) from back of ammeter (11).
3. Slide ammeter with preformed packing (12) out through front of dash assembly (5).
4. Remove preformed packing (12) from ammeter. Discard preformed packing.



INSTALLATION

1. Install new preformed packing (12) on ammeter (11).
2. Insert ammeter (11) into position on dash assembly (5).
3. Install bracket (10), two new lockwashers (9), eight wires (8), two flatwashers (7) and nuts (6) on back on ammeter (11).
4. Install cover (4) on top of dash assembly (5) with four capscrews (1), washers (2) and new lockwashers (3).
5. Connect battery cables (WP 0101 00).
6. Turn battery disconnect switch to ON position (TM 5-2410-237-10).
7. Start machine and check for proper operation of ammeter (TM 5-2410-237-10).



END OF WORK PACKAGE

TORQUE CONVERTER OIL TEMPERATURE GAGE AND SENDING UNIT REPLACEMENT 0083 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Lockwasher (6)

Packing, preformed (13)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Battery cables disconnected (WP 0101 00)

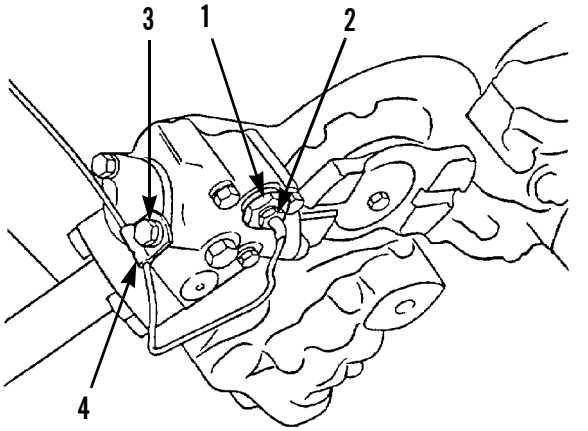
Floor plates removed (WP 0171 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Using two wrenches, hold fitting (1) and remove sending unit (2) from torque converter.
2. Remove capscrew (3) and clip (4) that secures sending unit line.

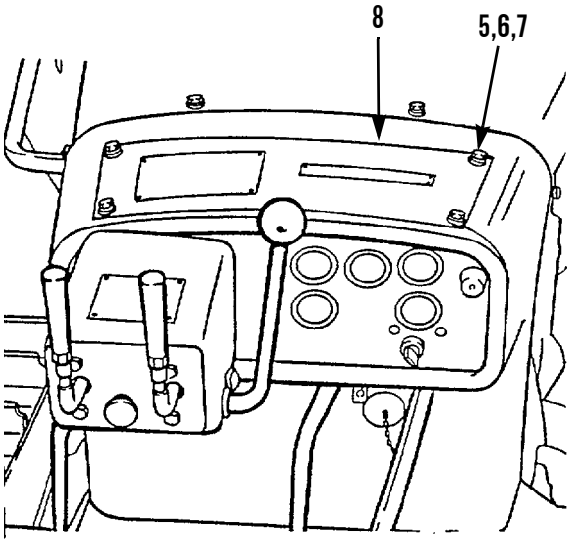


387-137

TORQUE CONVERTER OIL TEMPERATURE GAGE AND SENDING UNIT REPLACEMENT - CONTINUED 0083 00

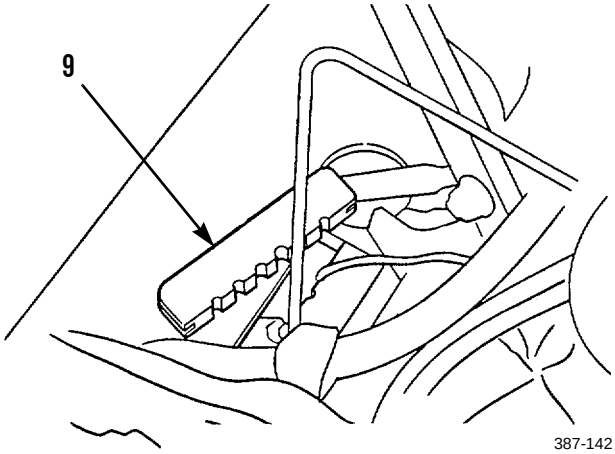
REMOVAL - CONTINUED

3. Remove four capscrews (5), washers (6), lockwashers (7) and cover (8) from top of dash assembly. Discard lockwashers.



387-045

4. Remove rubber grommet (9) from dash assembly and carefully pull sending unit (2) up through bottom of dash assembly.



387-142

5. Remove two nuts (10), washers (11) and bracket (12) that secure gage (13) to panel.

CAUTION

Torque converter oil temperature gage and sending unit are an assembly and cannot be separated.

6. Remove gage (13) with preformed packing (14) and sending unit (2) out through front of dash panel.
7. Remove preformed packing (14) from gage (13). Discard preformed packing.

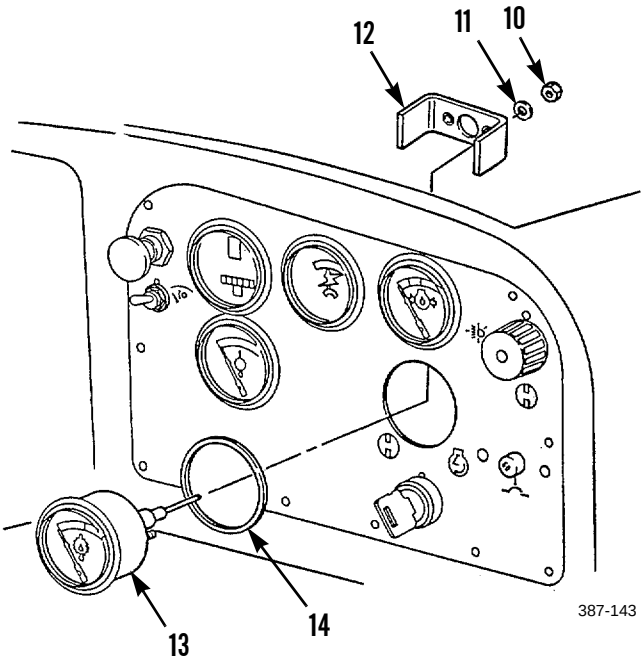
INSTALLATION

1. Install new preformed packing (14) onto gage (13).
2. Place gage (13) with preformed packing (14) and sending unit (2) into front of dash panel.

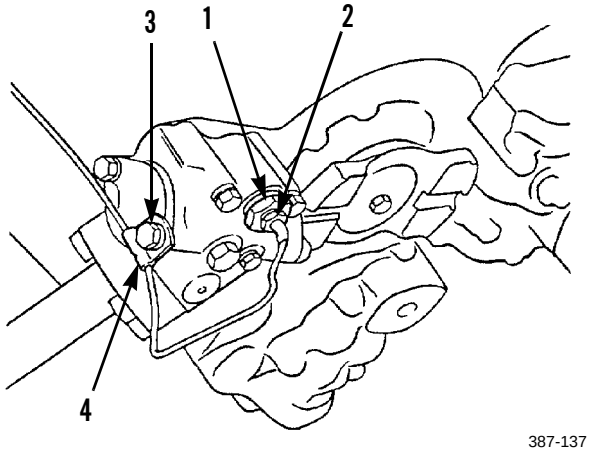
TORQUE CONVERTER OIL TEMPERATURE GAGE AND SENDING UNIT REPLACEMENT - CONTINUED 0083 00

INSTALLATION - CONTINUED

3. Install bracket (12), two washers (11) and nuts (10) to secure gage (13) to panel.



4. Carefully route sending unit (2) through bottom of dash assembly and into position. Install rubber grommet (9) into dash assembly.
5. Place cover (8) into position on top of dash assembly. Install four capscrews (5), washers (6) and new lockwashers (7).
6. Using two wrenches, hold fitting (1) and install sending unit (2) into torque converter.
7. Install capscrew (3) and clip (4) to secure sending unit line.
8. Install floor plates (WP 0171 00).
9. Connect battery cables (WP 0101 00).
10. Run engine and check gage for proper operation.



END OF WORK PACKAGE

ENGINE WATER TEMPERATURE GAGE AND SENDING UNIT REPLACEMENT 0084 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Lockwasher (3)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Packing, preformed (15)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

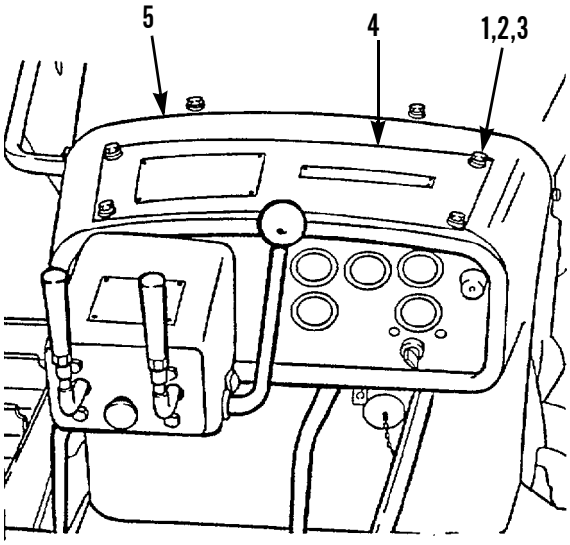
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

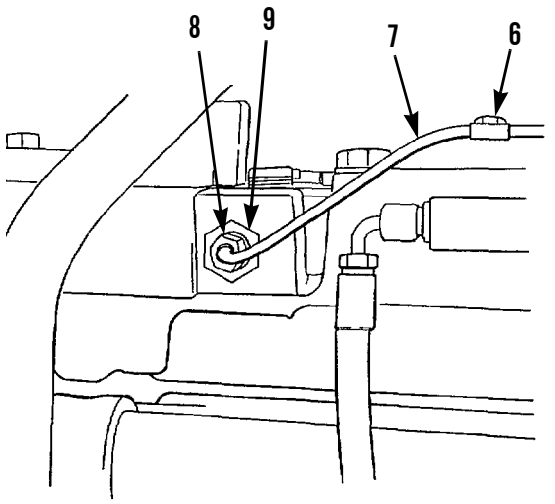
1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



387-045

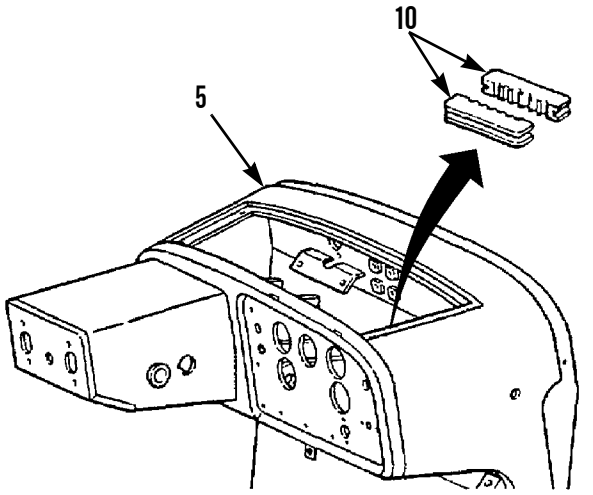
REMOVAL - CONTINUED

2. Remove three clamps (6) on sending unit line (7) to water temperature sending unit (8).
3. Using two wrenches, hold fitting (9) and remove water temperature sending unit (8) from cylinder head.



387-145

4. Remove grommet (10) from dash assembly (5).



387-146

5. Remove two nuts (11), washers (12) and bracket (13) from back of water temperature gage (14).

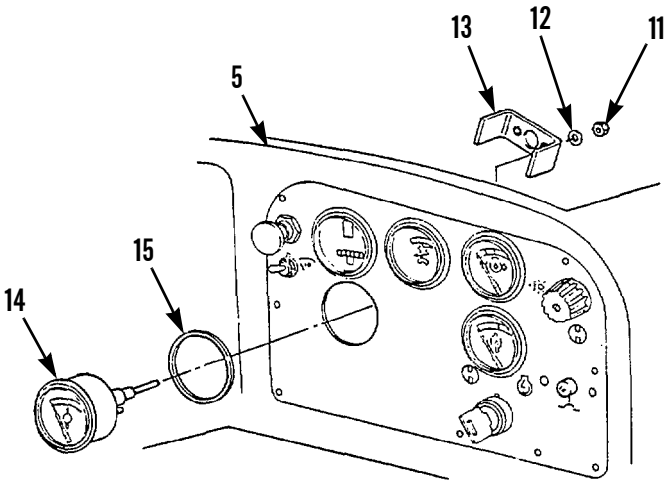
NOTE

Do not attempt to separate water temperature sending unit from gage. They must be replaced as a unit.

6. Remove water temperature gage (14) and sending unit (8) with preformed packing (15) out through front of dash assembly (5).
7. Remove preformed packing (15) from water temperature gage (14). Discard preformed packing.

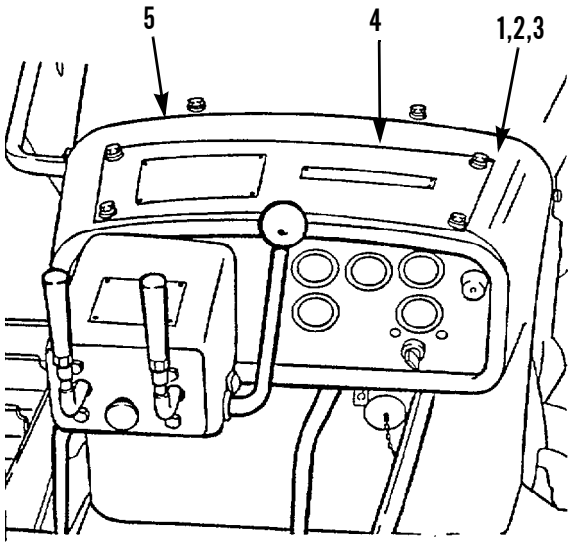
INSTALLATION

1. Install new preformed packing (15) on water temperature gage (14).
2. Place water temperature gage (14) into position through front of dash assembly (5).
3. Install bracket (13), two washers (12) and nuts (11) on back of water temperature gage (14).



387-147

4. Place water temperature sending unit (8) down through dash and install grommet (10) into dash assembly (5).
5. Install water temperature sending unit (8) into cylinder head.
6. Install three clamps along sending unit line.
7. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).
8. Check cooling system (WP 0065 00).
9. Connect battery cables (WP 0101 00).
10. Run engine and check for proper operation of gage (TM 5-2410-237-10).



387-045

END OF WORK PACKAGE

DASH LIGHT SWITCH REPLACEMENT 0085 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Lockwasher (3)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

Equipment Condition

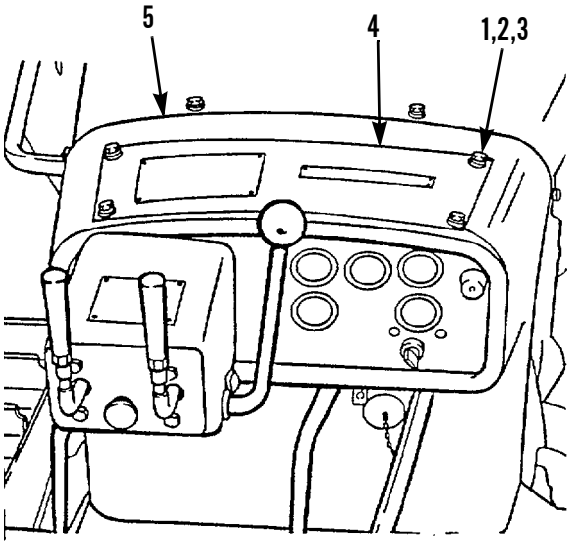
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



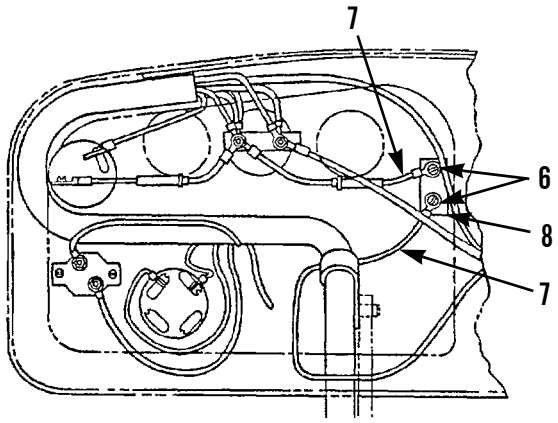
387-045

REMOVAL - CONTINUED

NOTE

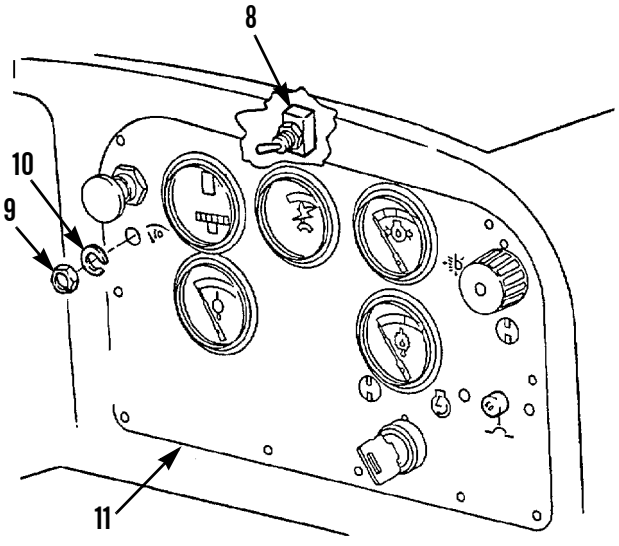
Tag wires to ensure correct installation.

2. Remove two screws (6) and wires (7) from back of dash light switch (8).



387-138

3. Remove nut (9) and retaining ring (10) from front of dash light switch (8) and remove switch through back of dash panel (11).



387-150

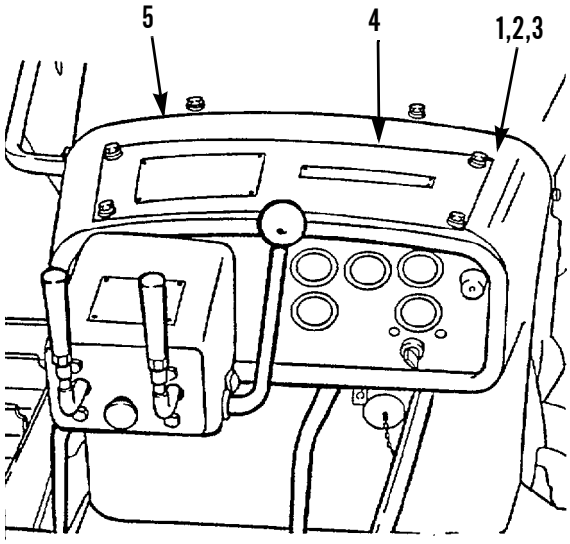
INSTALLATION

1. Insert dash light switch (8) through back of dash panel (11) and install retaining ring (10) and nut (9).
2. Install two wires (7) on back of dash light switch (8) with two screws (6).

INSTALLATION - CONTINUED

3. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).

4. Connect battery cables (WP 0101 00) and check dash light switch operation.



387-045

END OF WORK PACKAGE

EXTERIOR LIGHTS SWITCH REPLACEMENT 0086 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Lockwasher (3)

Equipment Condition

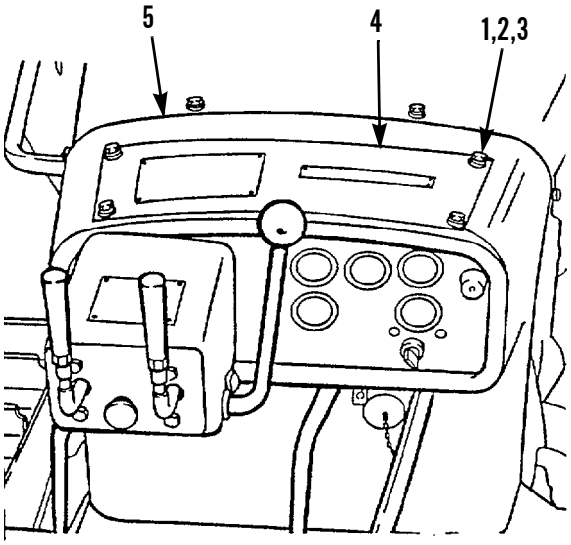
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



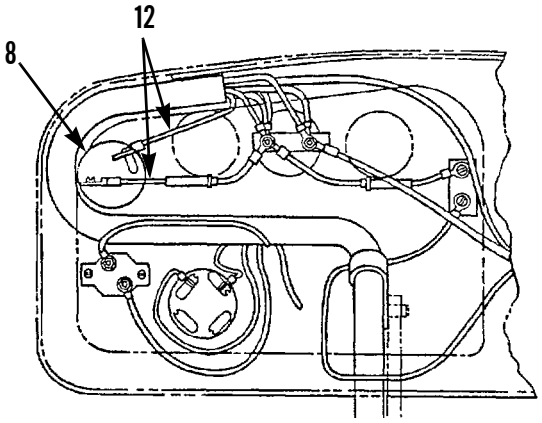
387-045

REMOVAL - CONTINUED

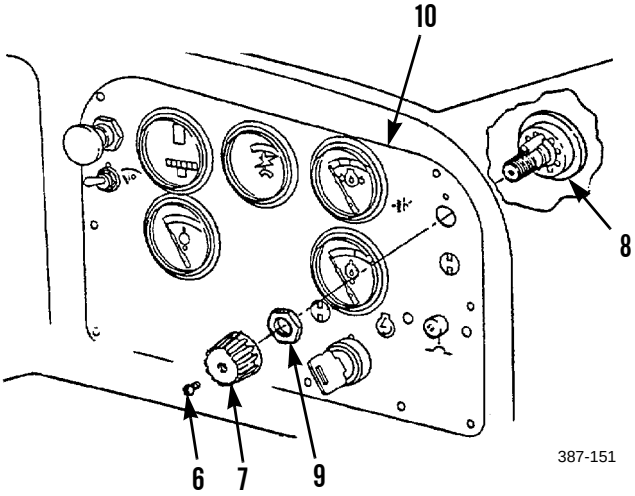
NOTE

Tag wires to ensure correct installation.

2. Remove screw (6) and knob (7) from front of light switch (8).
3. Remove locknut (9) from front of light switch (8) and remove switch through back of dash panel (10).



387-138

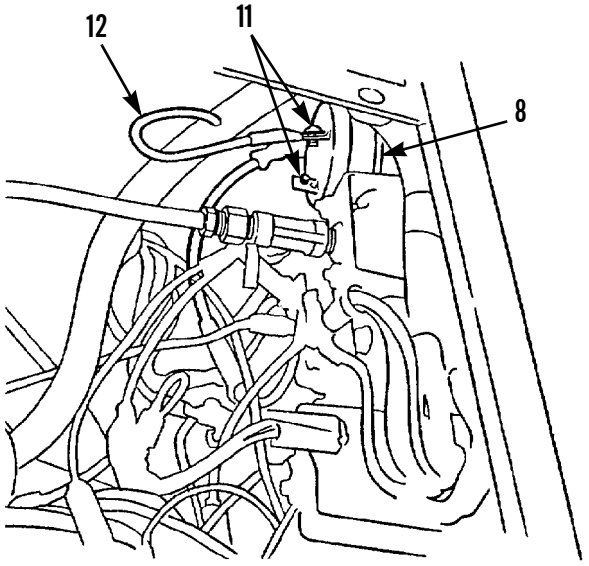


387-151

4. Remove two screws (11) and wires (12) from back of light switch (8).

INSTALLATION

1. Install two wires (12) on back of light switch (8) with two screws (11).

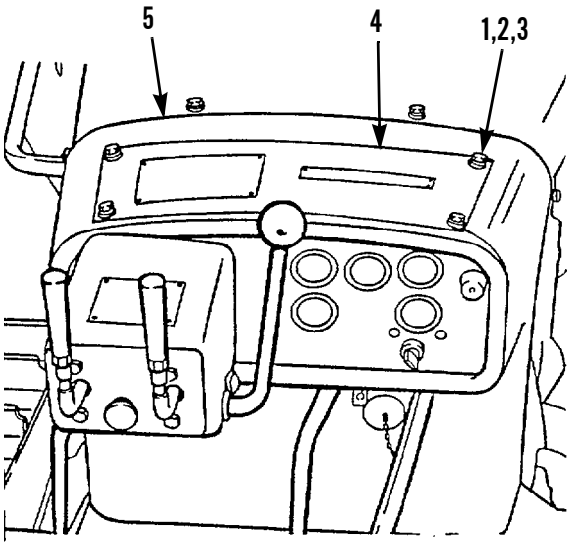


387-152

2. Insert light switch (8) through back of dash panel (10) and install locknut (9) on switch on front side of panel.
3. Install knob (7) on front of light switch (8) with screw (6).

INSTALLATION - CONTINUED

4. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).
5. Connect battery cables (WP 0101 00) and check exterior lights switch for proper operation.



387-045

END OF WORK PACKAGE

WINDSHIELD WIPER SWITCH REPLACEMENT 0087 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

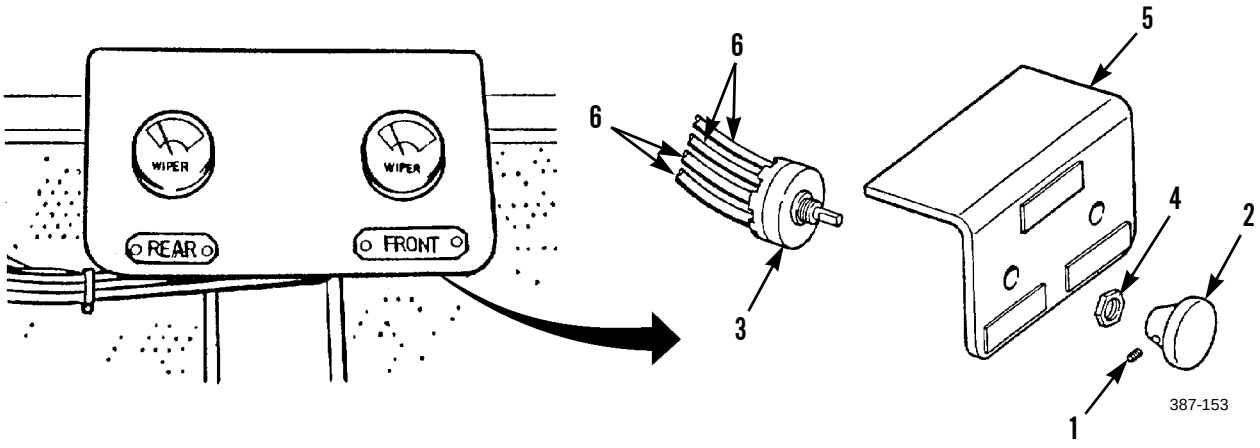
Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

NOTE

- **Use this procedure to replace either front or rear windshield wiper switch.**
- **Tag wires to ensure correct installation.**

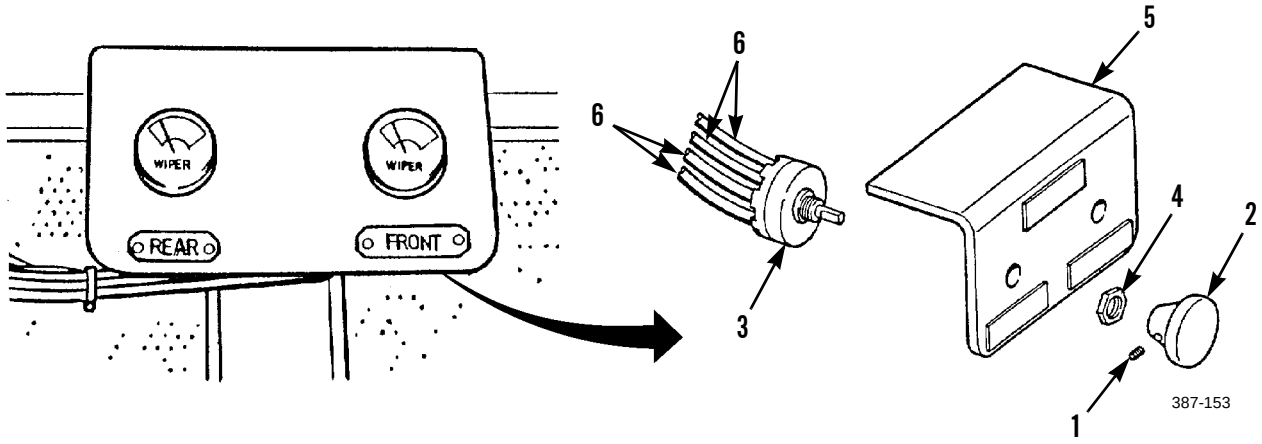
REMOVAL

1. Remove set screw (1) from switch knob (2) and remove knob from shaft of switch (3).
2. Remove locknut (4) from switch (3) and remove switch from mounting bracket (5).
3. Remove four wires (6) from back of switch (3).



INSTALLATION

1. Install four wires (6) on back of switch (3).
2. Install switch (3) in mounting bracket (5) with locknut (4).
3. Install knob (2) on switch (3) with set screw (1).



4. Turn battery disconnect switch to ON position (TM 5-2410-237-10) and check operation of windshield wiper switch.

END OF WORK PACKAGE

ENGINE START SWITCH REPLACEMENT 0088 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Lockwasher (3)

Equipment Condition

Key removed from switch (TM 5-2410-237-10)

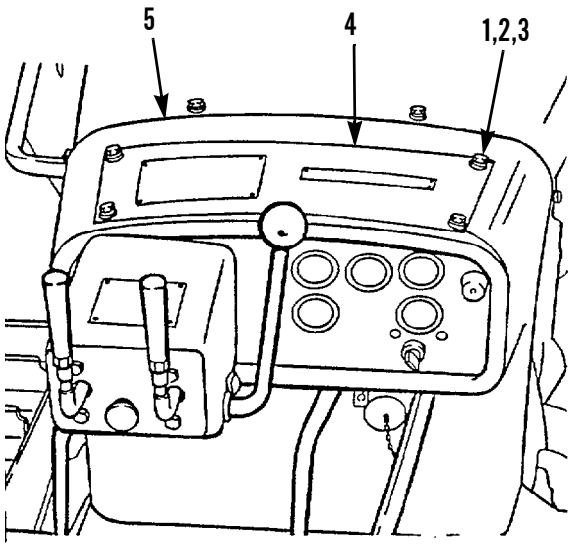
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



387-045

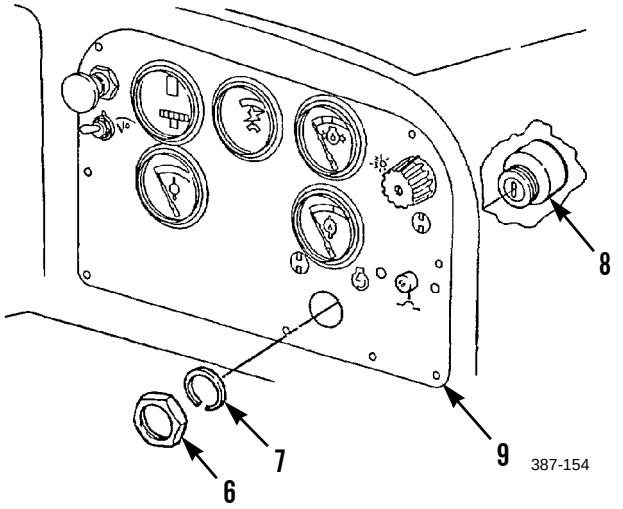
REMOVAL - CONTINUED

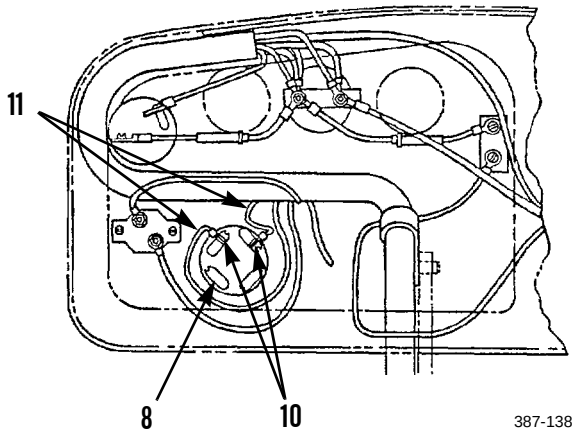
2. Remove nut (6) and retaining ring (7) from front of engine start switch (8).
3. Remove engine start switch (8) through back of dash panel (9).

NOTE

Tag wires to ensure correct installation.

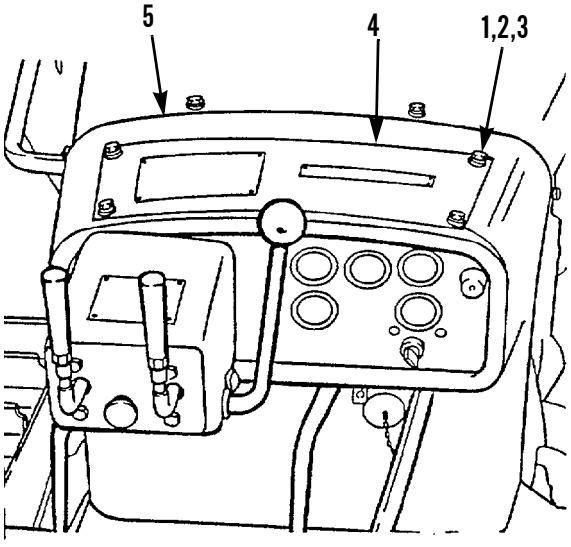
4. Remove two screws (10) and wires (11) from back of engine start switch (8).





INSTALLATION

1. Install three wires (11) on back of engine start switch (8) with two screws (10).
2. Insert engine start switch (8) through back of dash panel (9) and install retaining ring (7) and nut (6) on front of switch.
3. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).
4. Connect battery cables (WP 0101 00).
5. Start engine to check switch operation (TM 5-2410-237-10).



END OF WORK PACKAGE

ETHER STARTING AID SWITCH REPLACEMENT 0089 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Lockwasher (3)

Equipment Condition

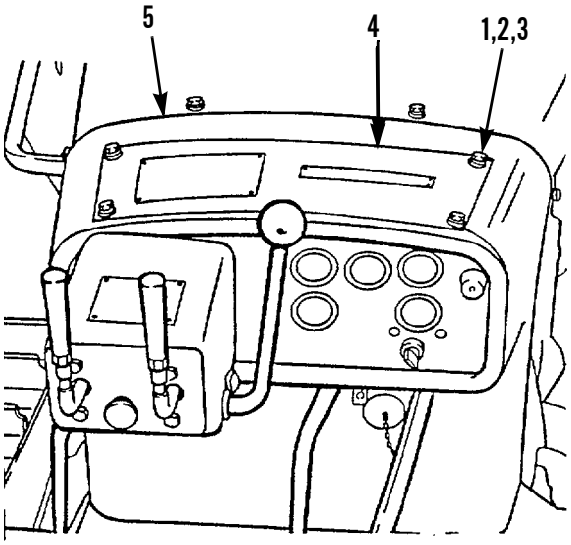
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



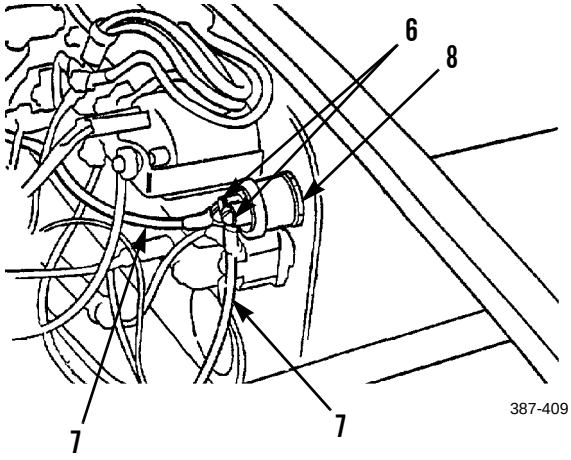
387-045

REMOVAL - CONTINUED

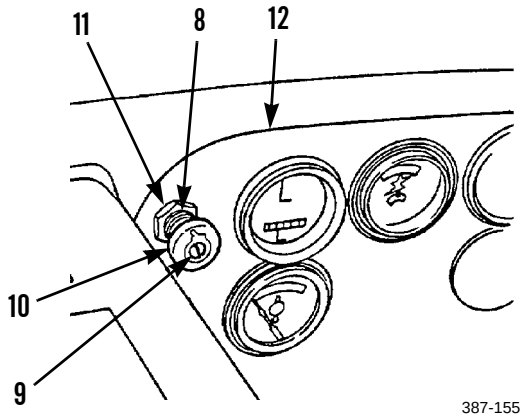
NOTE

Tag wires to ensure correct installation.

2. Remove two screws (6) and wires (7) from back of ether aid start switch (8).
3. Remove screw (9) and knob (10) from front of ether aid start switch (7).
4. Remove nut (11) from front of ether aid start switch (7) and remove switch out through back of dash panel (12).



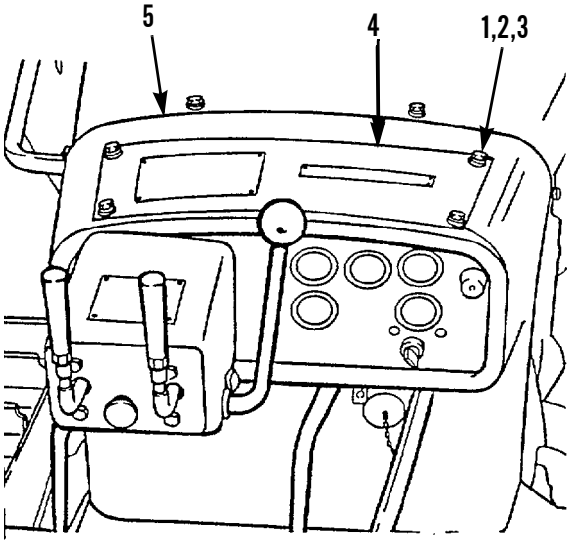
387-409



387-155

INSTALLATION

1. Insert ether aid start switch (8) through back of dash panel (12).
2. Install nut (11) on front of ether aid start switch (8).
3. Install knob (10) with screw (9).
4. Install two wires (7) to back of ether aid start switch (8) with two screws (6).
5. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).
6. Connect battery cables (WP 0101 00).
7. Check ether aid start switch for proper operation (TM 5-2410-237-10).



387-045

END OF WORK PACKAGE

BATTERY DISCONNECT SWITCH REPLACEMENT 0090 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2437-10)

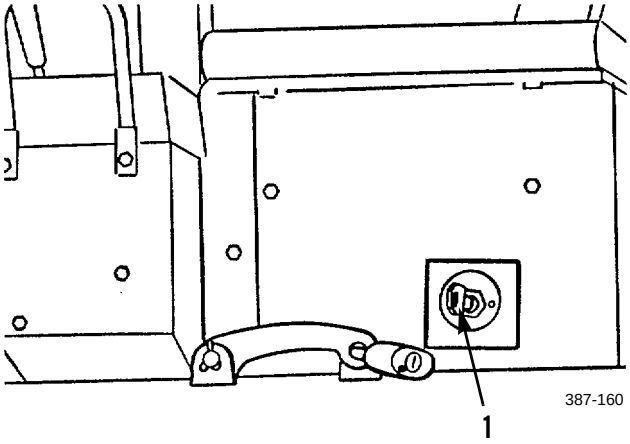
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before replacing battery disconnect switch. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove key (1).
2. Tilt seat forward.

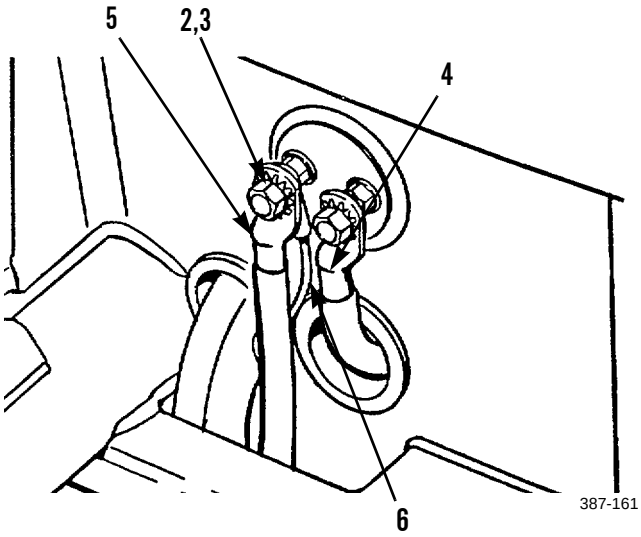


REMOVAL - CONTINUED

NOTE

Tag cables to ensure correct installation.

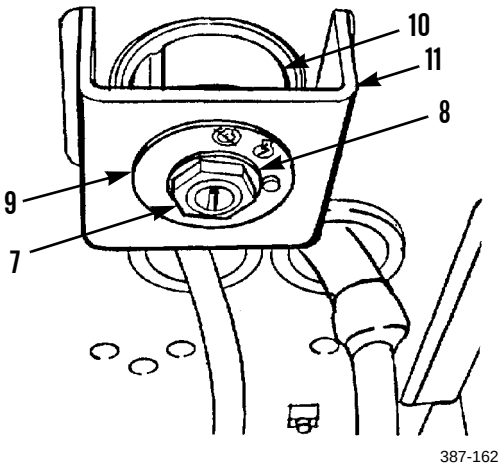
3. Remove two nuts (2) and lockwashers (3).
4. Remove cables (4 and 5) and wire (6).



5. Remove nut (7), lockwasher (8) and face plate (9) from switch mounting stud.
6. Remove switch (10) from mounting bracket (11).

INSTALLATION

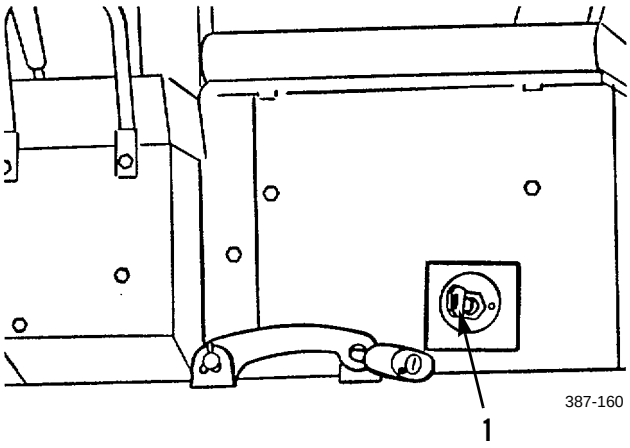
1. Position switch (10) into mounting bracket (11).
2. Install face plate (9), lockwasher (8) and nut (7) to switch mounting stud.



3. Install wire (6) and cables (4 and 5) with two lockwashers (3) and nuts (2).
4. Return seat to normal position (TM 5-2410-237-10).

INSTALLATION - CONTINUED

5. Install key (1) (TM 5-2410-237-10).
6. Connect battery cables (WP 0101 00).
7. Turn battery disconnect switch to ON position (TM 5-2410-237-10) and check operation of switch. Turn switch to OFF.



END OF WORK PACKAGE

60-AMP CIRCUIT BREAKER (STARTING/CHARGING CIRCUIT) REPLACEMENT 0091 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (3)

References

TM 5-2410-237-10

Equipment Condition

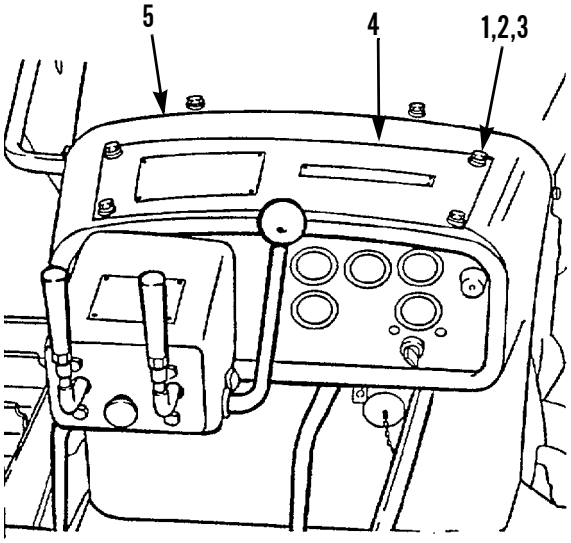
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



387-045

60-AMP CIRCUIT BREAKER (STARTING/CHARGING CIRCUIT) REPLACEMENT - CONTINUED 0091 00

REMOVAL - CONTINUED

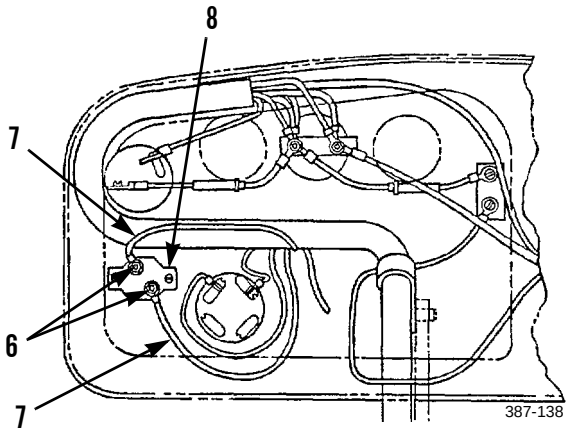
NOTE

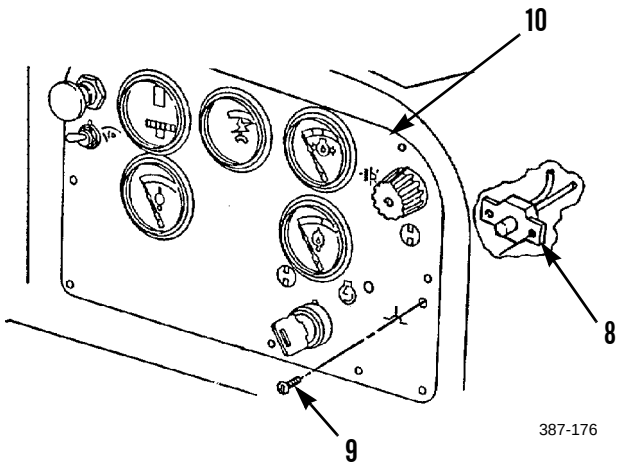
Tag wires to ensure correct installation.

2. Remove two nuts (6) and wires (7) from back of circuit breaker (8).
3. Remove two screws (9) and circuit breaker (8) from back of dash panel (10).

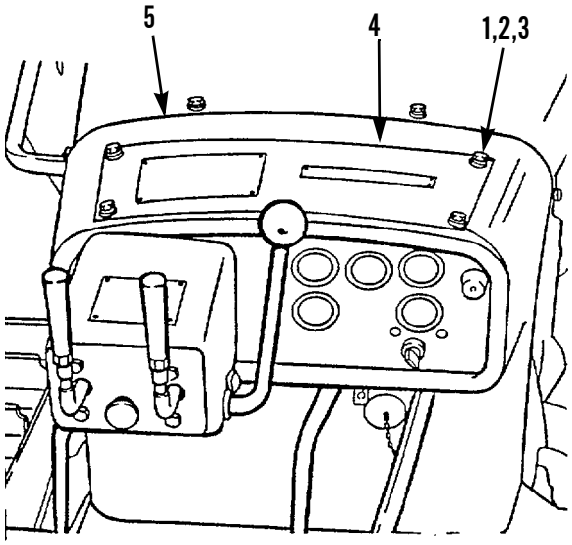
INSTALLATION

1. Install circuit breaker (8) in back of dash panel (10) with two screws (9).
2. Install two wires (7) on back of circuit breaker (8) with nuts (6).





3. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).
4. Connect battery cables (WP 0101 00).
5. Start engine. Starting/charging circuits operate properly when circuit breaker is functional (TM 5-2410-237-10).



END OF WORK PACKAGE

FUSES REPLACEMENT 0092 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Lockwasher (2)

Equipment Condition

Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

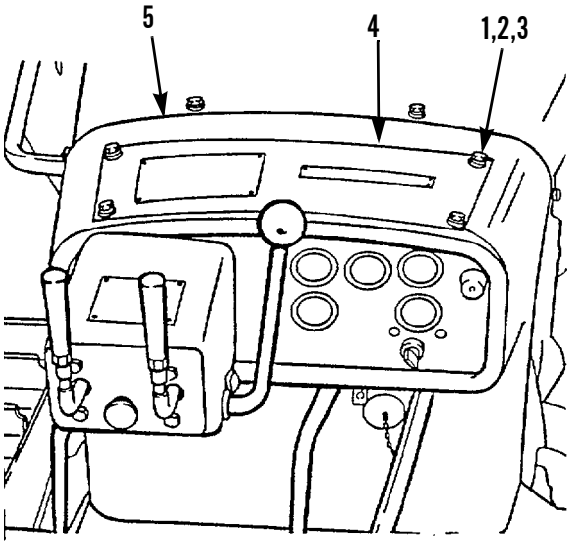
1. Refer to Table 1 for the location of fuses, the circuit each fuse protects and type of fuse required.

Table 1. D7G Fuses.

LOCATION	CIRCUIT (IF EQUIPPED)	FUSE TYPE
Cab Wiring Harness	Front Defroster Fan	AGC-15EX (15A 32V)
	Rear Defroster Fan	SFE-15 (15A 32V)
	Front Wiper Motor	SFE-15 (15A 32V)
	Rear Wiper Motor	SFE-15 (15A 32V)
Inside Dash	Heater Fan	FO2A (32V 15A)
	Ether Starting Aid	AGC-5TX (5A 32V)
	Dash Lights	AGC-15EX (15A 32V)
	Hourmeter	AGC-15EX (15A 32V)
Right/Rear of Engine	Front Horn	AGC-15EX (15A 32V)
	Exterior Lights	AGC-15EX (15A 32V)
	Backup Alarm	AGC-15EX (15A 32V)

REMOVAL - CONTINUED

2. Remove four capscrews (1), lockwashers (2), washers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



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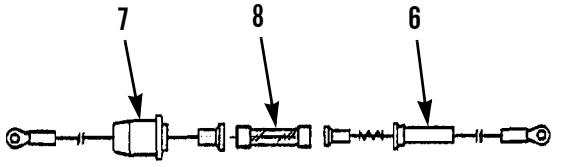
NOTE

If more than one fuse is to be replaced, tag wires to ensure correct installation.

3. Push cap (7) against body (6) of fuse holder assembly and twist cap counterclockwise to open fuse holder assembly.
4. Remove fuse (8) from body (6). Discard fuse.

INSTALLATION

1. Place new fuse (8) of same type and rating in body (6) of fuse holder assembly.
2. Place cap (7) on body (6) aligning prongs of cap with slots in body.
3. Push fuse (8) down with cap (7) and turn cap clockwise.



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4. If removed, install cover (4) on top of dash assembly (5) with four washers (3), new lockwashers (2) and capscrews (1).
5. Connect battery cables (WP 0101 00). Check operation of applicable circuit.

END OF WORK PACKAGE

HEADLAMPS, REAR FLOODLAMP AND GUARDS REPLACEMENT 0093 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Lockwasher (4, 13 and 19)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

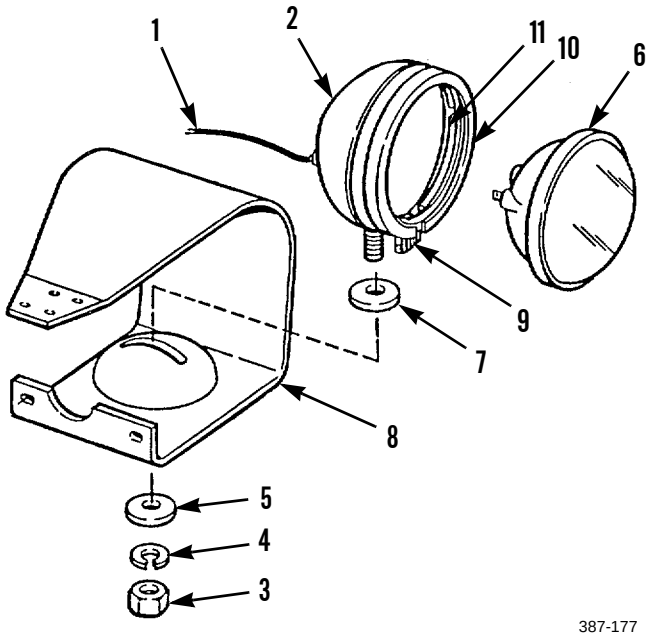
Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

NOTE

Lamp removal is similar for headlamps and rear floodlamp.

1. If removing headlamp, remove screw and disconnect wire (1) from back of body (2).
2. If removing rear floodlamp, loosen nut (3) and turn lamp to disconnect wire.
3. Remove nut (3), lockwasher (4) and washer (5) from body (2). Lift body with headlamp (6) and washer (7) from guard (8). Discard lockwasher.
4. Loosen screw (9) on outside clamp (10). Remove screw and clamp.
5. Remove headlamp (6) from rubber ring (11). Unplug headlamp and remove from body (2).
6. Remove screw to remove inside clamp from rubber ring (11).
7. If necessary, remove rubber ring (11) from body (2).



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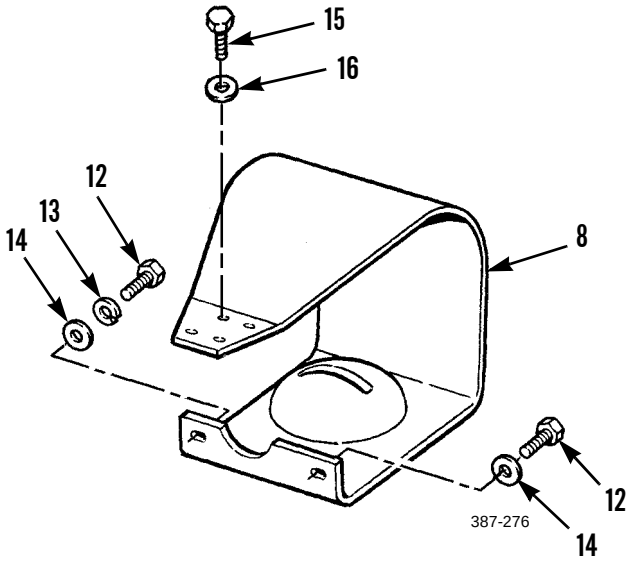
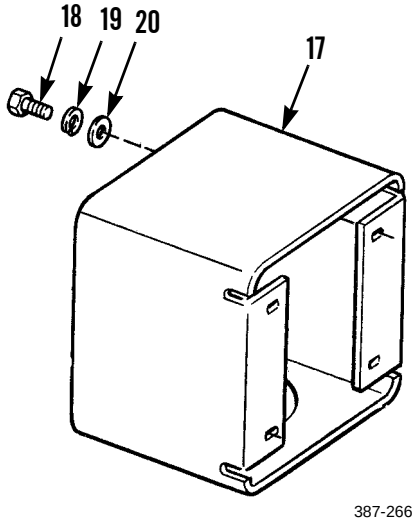
REMOVAL - CONTINUED

8. To remove headlamp guard (8) perform the following:
   a. Remove two bolts (12), lockwasher (13) and two washers (14) from lower lip of guard (8). Discard lockwasher.
   b. Remove four bolts (15), washers (16) and guard (8) from top of radiator cover.



9. To remove rear floodlamp protective cover (17), perform the following:
   a. Remove four capscrews (18), three lockwashers (19) and four washers (20) from cover (12). Discard lockwashers.
   b. Remove cover (17) from tractor.



INSTALLATION

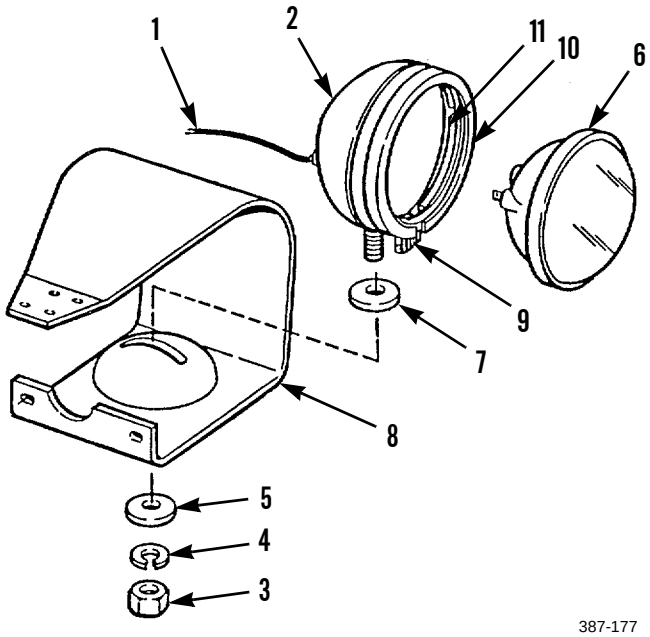
1. To install rear floodlamp protective cover (17), perform the following:
   a. Position cover (17) on tractor.
   b. Secure cover (17) with four capscrews (18). Three new lockwashers (19) and four washers (20).
2. To install headlamp guard (8), perform the following:
   a. Install top leg of guard (18) on radiator cover with four bolts (15) and washers (16).
   b. Install two bolts (12), new lockwasher (13) and two washers (14) to radiator guard.

INSTALLATION - CONTINUED

NOTE

On rear floodlamp, loosen nut and turn lamp to connect wire. Follow steps 4 through 7.

3. If removed, place rubber ring (11) in position on body (2). Place inside clamp in position over rubber ring. Secure rubber ring by installing and tightening clamp screw.
4. Plug receptacle into headlamp (6) and place headlamp in body (2).
5. Place outside clamp (10) in position on rubber ring (11) and tighten screw (9) until assembly is secure.
6. Place washer (7) and body (2) with headlamp (6) in position on guard (8).
7. Attach wire (1) to body (2) with screw.
8. Secure body (2) with headlamp (6) to guard (8) with washer (5), new lockwasher (4) and nut.
9. Turn battery disconnect switch to ON position (TM 5-2410-237-10). Turn on headlamps and floodlamp and check for proper operation.



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END OF WORK PACKAGE

OIL PRESSURE BYPASS SWITCH AND GAGE REPLACEMENT 0094 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (3)

References

TM 5-2410-237-10

Equipment Condition

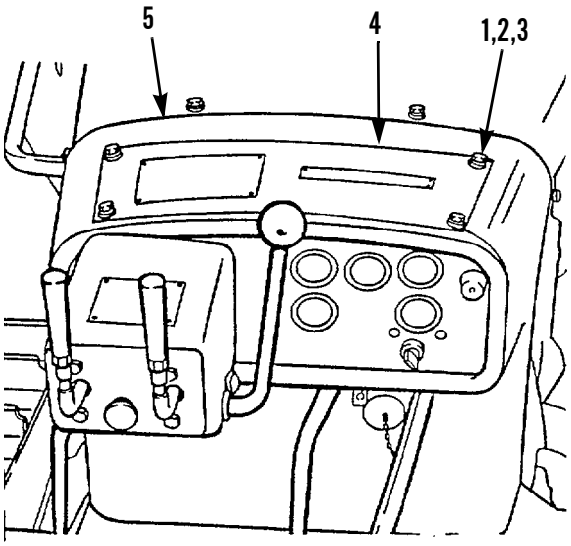
Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



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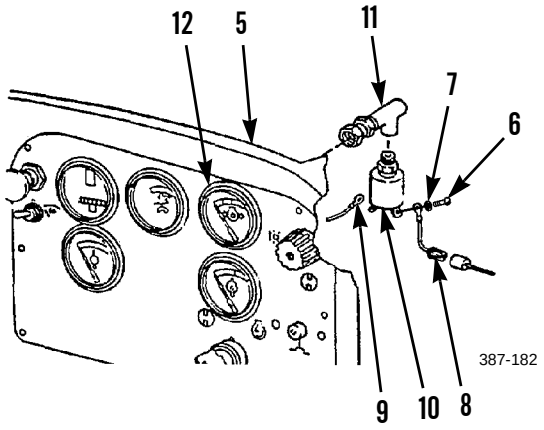
REMOVAL - CONTINUED

NOTE

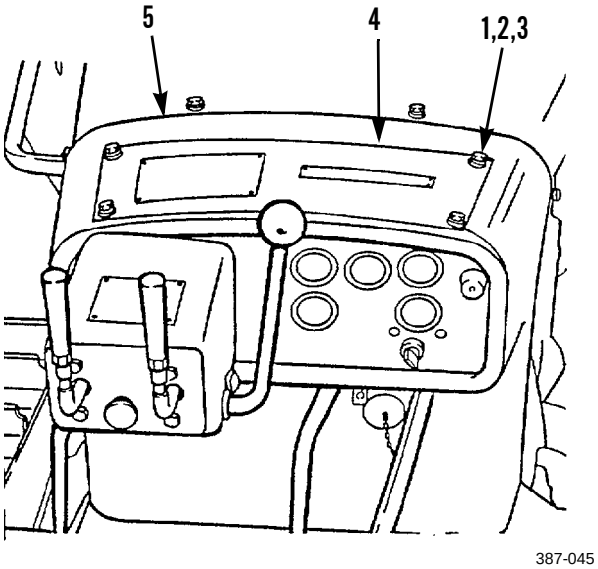
Tag wires to ensure correct installation.

2. Remove two screws (6) and washers (7) and disconnect wires (8 and 9) from switch (10).
3. Remove oil pressure bypass switch (10) from tee (11) located behind oil pressure gage (12).
4. Remove hourmeter oil pressure switch (10) from top of dash assembly (5).



INSTALLATION

1. Install oil pressure bypass switch (10) in tee (11) on back of oil pressure gage (12).
2. Connect wires (8 and 9) to switch (10) with two washers (7) and screws (6).
3. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (3) and washers (2).
4. Connect battery cables (WP 0101 00).
5. Run engine and check that hourmeter functions (TM 5-2410-237-10).



END OF WORK PACKAGE

DIAGNOSTIC (STE-ICE) WIRING MAINTENANCE 0095 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (3)

Material/Parts - Continued

Nut, self-locking (16)

References

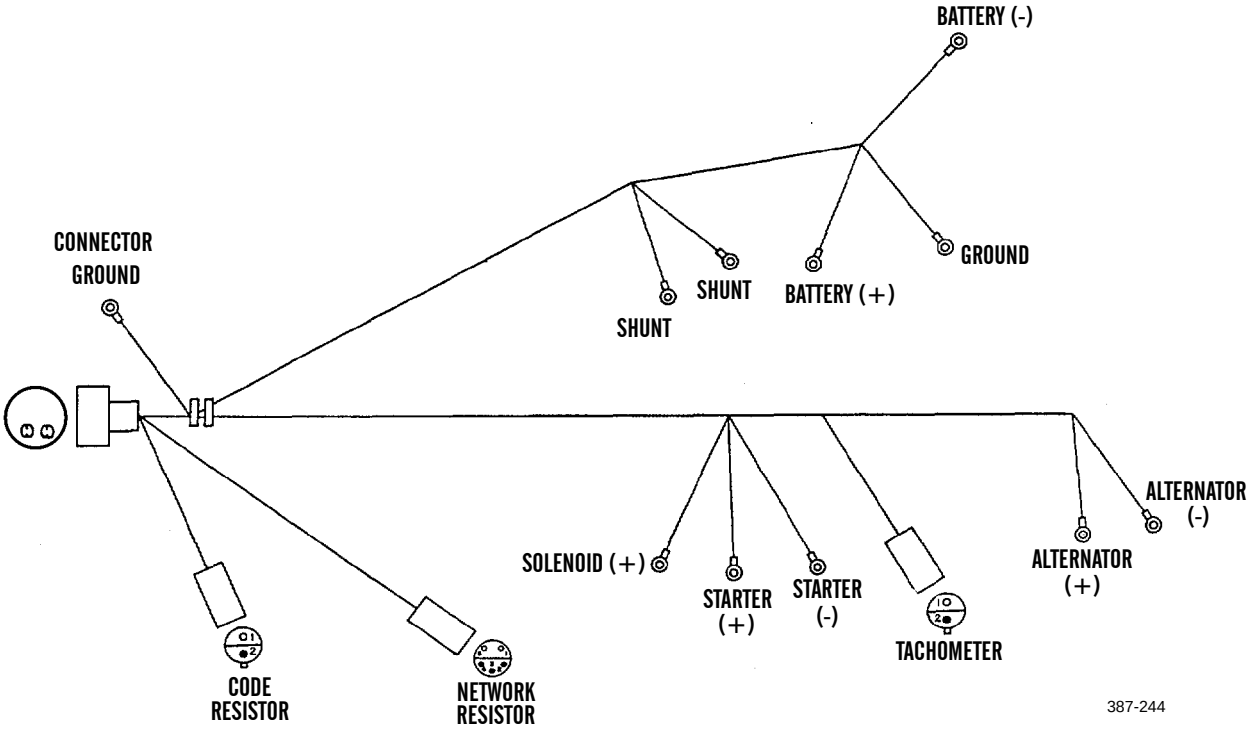
WP 0242 00

Equipment Condition

Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery is disconnected before replacing STE-ICE wiring. Failure to follow this warning could result in personal injury or damage to equipment.

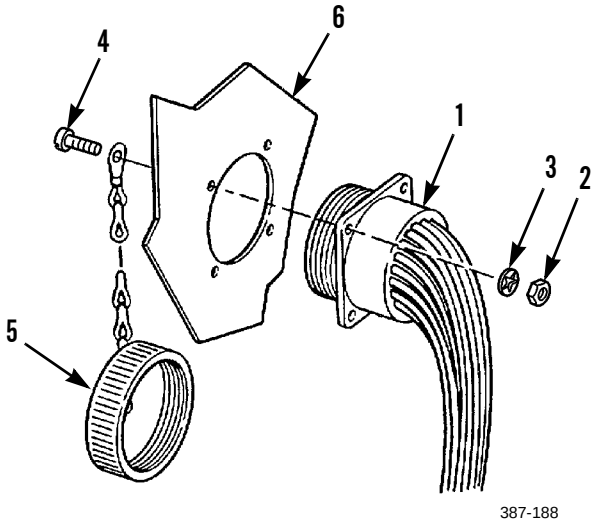


REMOVAL

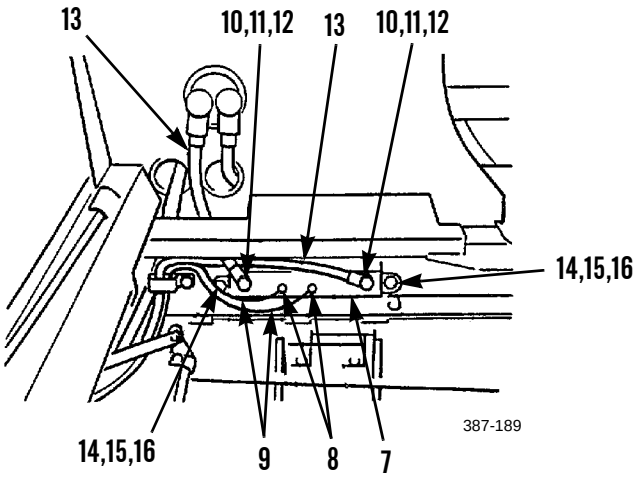
NOTE

Tag wires to ensure correct installation.

1. Locate faulty wire and trace it back to connector (1). Remove solder holding wire to connector and remove wire (WP 0242 00).
2. Remove four nuts (2), lockwashers (3), capscrews (4) and cap (5) from dash panel (6). Remove connector (1). Discard lockwashers.



3. To remove shunt (7), remove two screws (8) holding wires (9).
4. Remove two capscrews (10), lockwashers (11) and starwashers (12). Remove cables (13) from shunt (7).
5. Remove two capscrews (14), washers (15) and self-locking nuts (16). Remove shunt (7). Discard self-locking nuts.

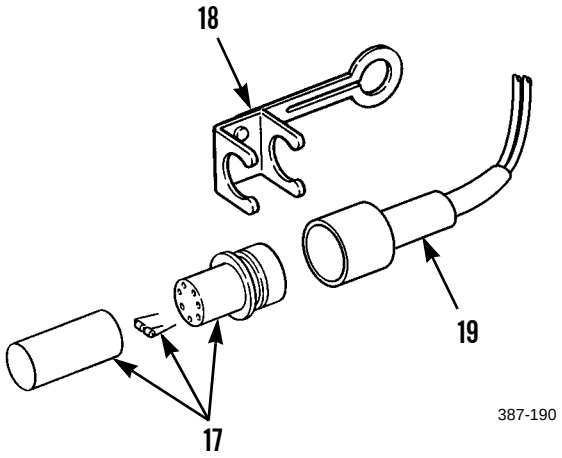


REMOVAL - CONTINUED

6. To remove network or code resistor, remove resistor assembly (17) from bracket (18).
7. Disconnect resistor assembly (17) from wires (19).

INSTALLATION

1. To install resistor assembly (17), connect resistor assembly to wires (19) and install in bracket (18).



2. To install shunt (7), position shunt and install two capscrews (14), washers (15) and new self-locking nuts (16).
3. Install cables (13) on shunt (7) with two capscrews (10), lockwashers (11) and starwashers (12).
4. Install wires (9) on shunt (7) with two screws (8).
5. Place connector (1) and cap (5) in position on dash panel (6) and install four capscrews (4), new lockwashers (3) and nuts (2).
6. Fabricate replacement wire(s) of the same gage, length and terminal type as the wire(s) removed (WP 0242 00).
7. Connect battery cables (WP 0101 00).

END OF WORK PACKAGE

HORN REPLACEMENT 0096 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (9)

Personnel Required

Two

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

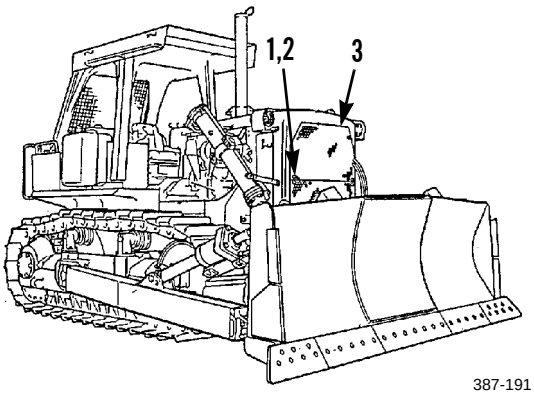
- **Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.**
- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury to personnel.**

NOTE

Radiator grille plate assembly weighs 60 lb (27 kg).

REMOVAL

1. Remove four capscrews (1), washers (2) and upper radiator grille plate assembly (3).



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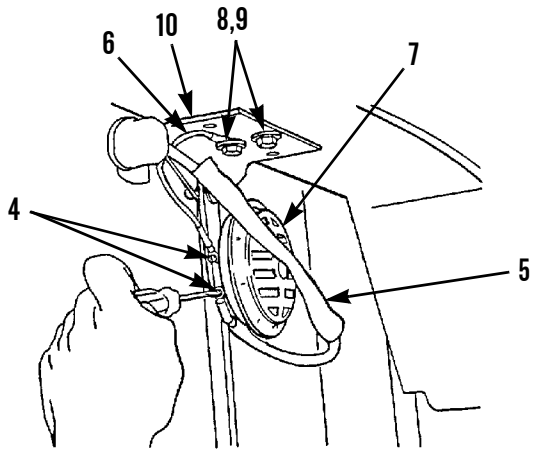
REMOVAL - CONTINUED

NOTE

Tag wires to ensure correct installation.

2. Remove two capscrews (4) and disconnect wire harness (5) and wire (6) from horn (7).
3. Remove two capscrews (8) and lockwashers (9). Remove horn bracket (10) with horn (7) from radiator guard assembly. Discard lockwashers.



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INSTALLATION

1. Position horn (7) and horn bracket (10) on radiator guard assembly. Install two new lockwashers (9) and capscrews (8).
2. Connect wire harness (5) and wire (6) to horn (7) and secure with two capscrews (4).
3. Turn battery disconnect switch to ON position (TM 5-2410-237-10) and check operation of horn.

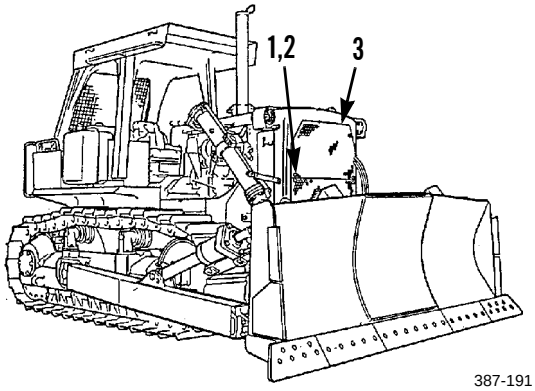
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Radiator grille plate assembly weighs 60 lb (27 kg).

4. Place upper radiator grille plate assembly (3) in position and install four washers (2) and capscrews (1).



387-191

END OF WORK PACKAGE

HORN BUTTON REPLACEMENT 0097 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (5)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

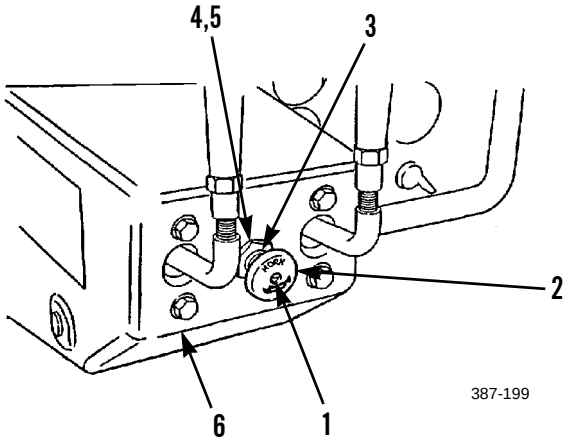
REMOVAL

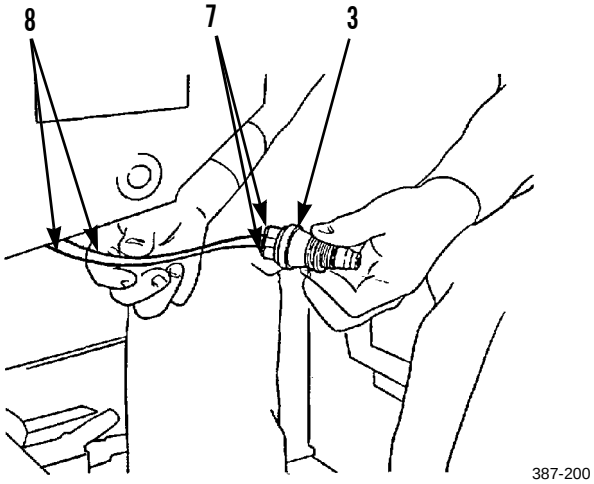
1. Remove screw (1) and button (2) from front of horn switch (3).
2. Remove nut (4) and lockwasher (5) from front of horn switch (3). Discard lockwasher.
3. Remove horn switch (3) from control panel (6).

NOTE

Tag wires to ensure correct installation.

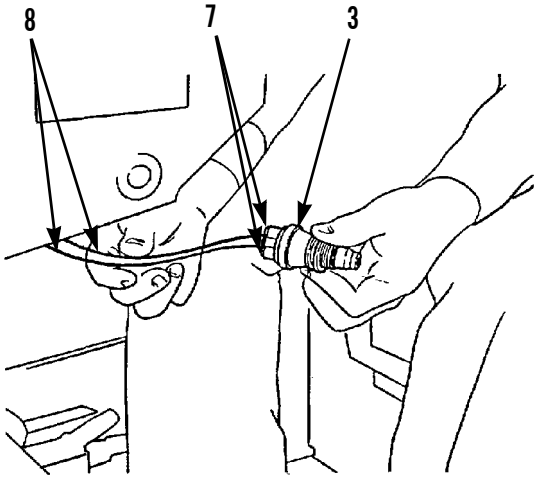
4. Remove two screws (7) and wires (8) from horn switch (3).





INSTALLATION

1. Install two wires (8) to horn switch (3) with screws (7).
2. Place horn switch (3) into position through bottom of control panel (6).
3. Install lockwasher (5) and nut (4) on front of horn switch (3).
4. Install button (2) on horn switch (3) with screw (1).



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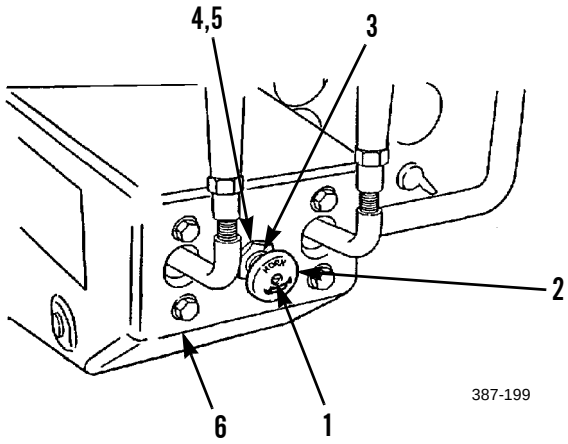

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5. Turn battery disconnect switch to ON position (TM 5-2410-237-10) and check horn for proper operation.

END OF WORK PACKAGE

BACKUP ALARM REPLACEMENT 0098 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools/Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

Turn battery disconnect switch to OFF position before replacing backup alarm. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove two capscrews (1), washers (2) and nuts (3) that hold alarm (4) to bracket (5).

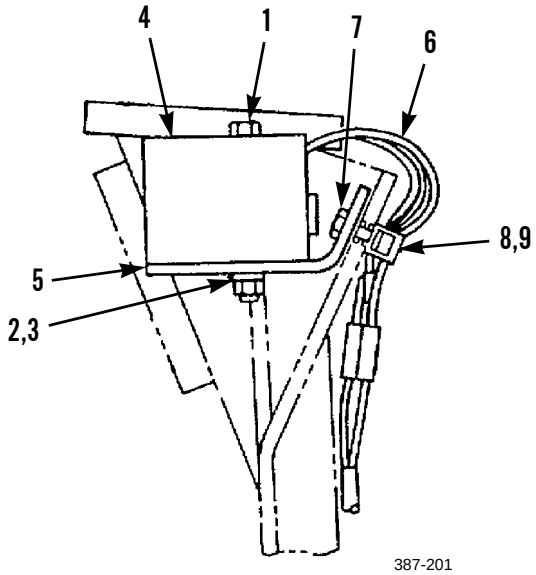
NOTE

Tag wires to ensure correct installation.

2. Remove alarm (4) from bracket (5).
3. Disconnect wires (6) from alarm (4).
4. To remove bracket (5) from ROPS rear panel, remove two capscrews (7), washers (8) and nuts (9).

INSTALLATION

1. Position bracket (5) on ROPS rear panel and install two capscrews (7), washers (8) and nuts (9).
2. Connect wires (6) to alarm (4).
3. Place alarm (4) in position on bracket (5) and install two capscrews (1), washers (2) and nuts (3).
4. Turn battery disconnect switch to ON position (TM 5-2410-237-10).
5. Check backup alarm for proper operation.



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END OF WORK PACKAGE

BACKUP ALARM SWITCH REPLACEMENT 0099 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Lockwasher (2)

Rivet (8 and 18)

Equipment Condition

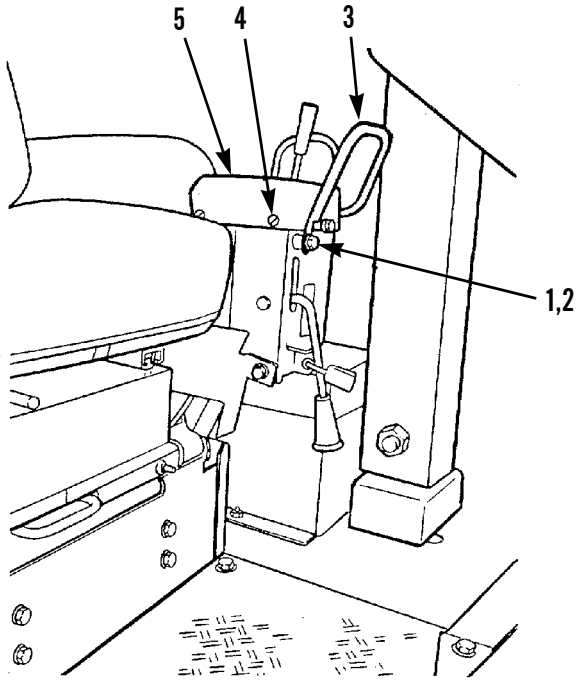
Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

Turn battery disconnect switch to OFF position before replacing backup alarm switch. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove three capscrews (1), lockwashers (2) and guard (3) from console. Discard lockwashers.
2. Remove four screws (4) and lift guide (5) from console.



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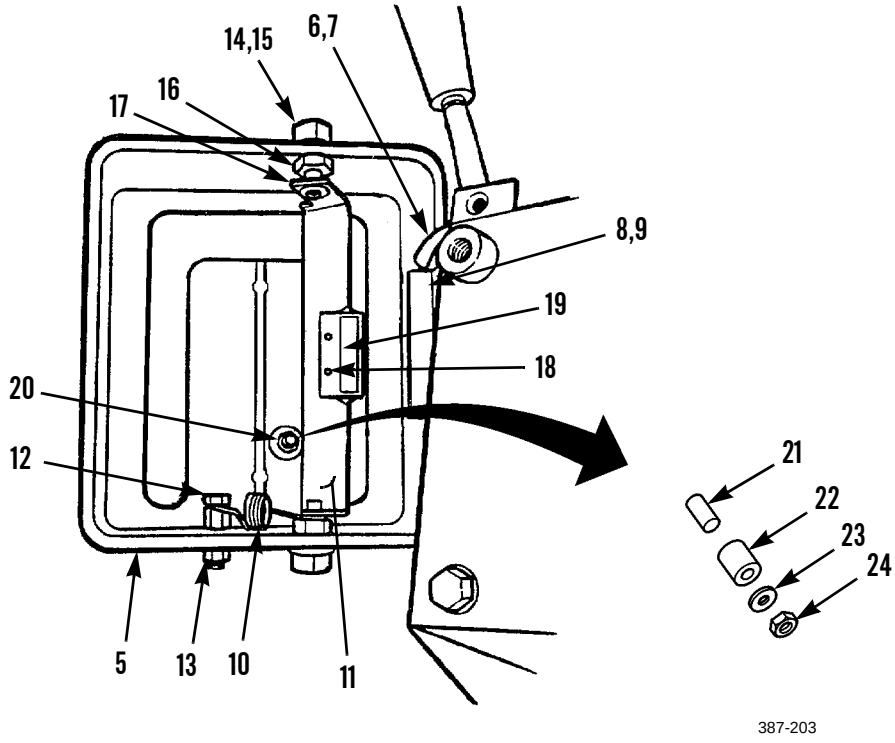
REMOVAL - CONTINUED

NOTE

Tag wires to ensure correct installation.

3. Disconnect switch connectors (6) from harness connectors (7).
4. Drill out rivets (8) and remove switch (9). Discard rivets.
5. Remove spring (10) from lever (11) and retainer (12).
6. Remove nut (13) and retainer (12).
7. Remove capscrews (14) and washers (15) and nuts (16) from both sides of guide (5). Remove bearings (17) and lever (11).
8. Drill out rivets (18) and remove actuator (19) from lever (11). Discard rivets.
9. Remove screw (20), spacer (21), bumper (22), washer (23) and nut (24) from guide (5).

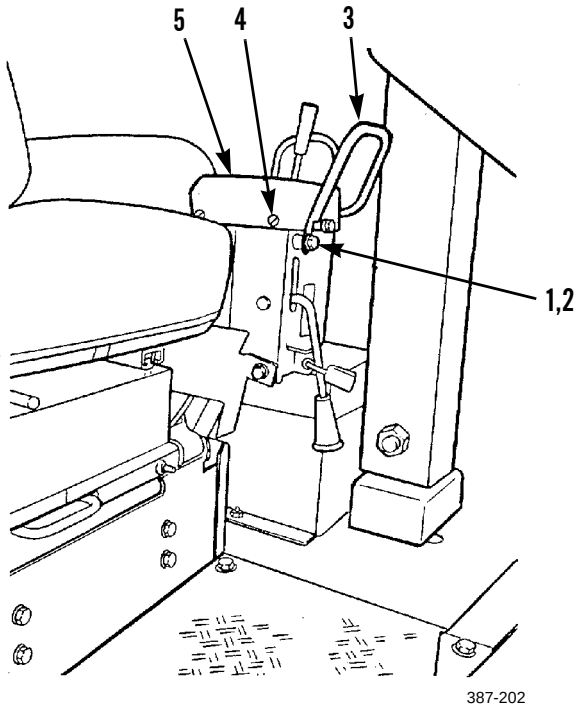


INSTALLATION

1. Place screw (20) into position on guide (5) and attach spacer (21), bumper (22), washer (23) and nut (24).
2. Install two new rivets (8) to secure switch (9) to guide (5).
3. Install two new rivets (18) to secure actuator (19) to lever (11).
4. Install retainer (12) to guide (5) with nut (13). Install spring (10) on lever (11) and retainer.
5. Place lever (11) and bearings (17) into position and install capscrews (14), washers (15) and nuts (16).
6. Connect switch connectors (6) to harness connectors (7).

INSTALLATION - CONTINUED

7. Place guide (5) into position on console and secure with four screws (4).
8. Attach guard (3) to console with three capscrews (1) and new lockwashers (2).
9. Turn battery disconnect switch to ON position (TM 5-2410-237-10) and check backup alarm switch for proper operation.



387-202

END OF WORK PACKAGE

BATTERY MAINTENANCE 0100 00

THIS WORK PACKAGE COVERS

Removal, Service, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 250 lb capacity

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Nut, self-locking (6)

References

TM 9-6140-200-14

Personnel Required

Two

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

Battery box cover removed (TM 5-2410-237-10)

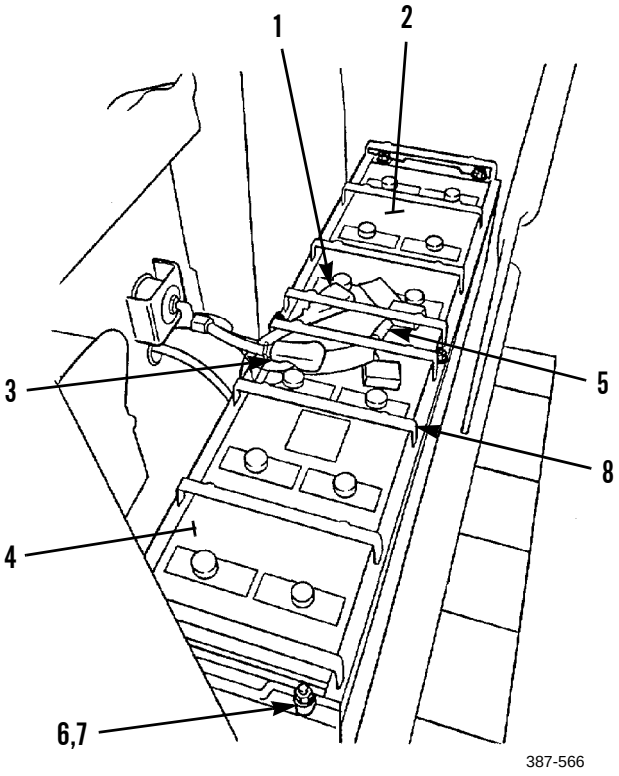
- **Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.**
- **To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment, and injury to personnel.**
- **Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in death or serious injury to personnel.**

REMOVAL

NOTE

Tag cables to ensure correct installation.

1. Lift up rubber boot and disconnect negative battery cable (1) from negative terminal of battery (2).
2. Lift up rubber boot and disconnect positive battery cable (3) from positive terminal of battery (4).
3. Lift up rubber boots and remove cable (5) from between batteries (2 and 4).
4. Remove six self-locking nuts (6), washers (7) and battery hold-down bracket (8). Discard self-locking nuts.



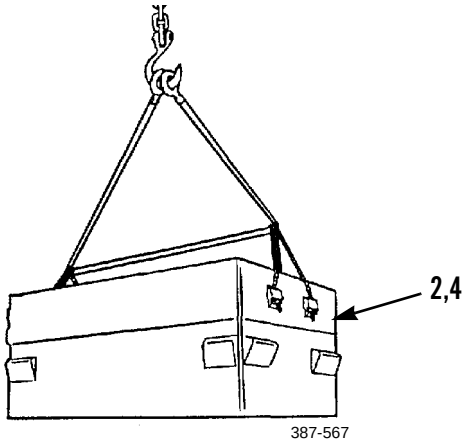
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Each battery weighs 88 lb (39 kg).

5. Attach nylon sling and suitable lifting device to handles of battery (4) and lift battery from battery box.
6. Repeat step 5 to remove battery (2).



SERVICE

Service batteries IAW TM 9-6140-200-14.

INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Each battery weighs 88 lb (39 kg).

1. Attach a nylon sling and a suitable lifting device to handles of battery (2). Use lifting device to lower battery into battery box.
2. Repeat step 1 for battery (4).
3. Place battery hold-down bracket (8) over studs of battery box. Install six washers (7) and new self-locking nuts (6).
4. Connect cable (5) between batteries (2 and 4). Position boots over terminals.
5. Connect positive battery cable (3) to positive terminal of battery (4). Position boot over terminal.
6. Connect negative battery cable (1) to negative terminal on battery (2). Position boot over terminal.
7. Install battery box cover (TM 5-2410-237-10).

END OF WORK PACKAGE

BATTERY CABLES REPLACEMENT 0101 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Rag, wiping (Item 29, WP 0249 00)

Strap, tiedown (Item 36, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Nut, self-locking (28)

References

WP 0171 00

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

Battery box cover removed (TM 5-2410-237-10)

- **Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.**
- **To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment and injury to personnel.**
- **Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in death or serious injury to personnel.**

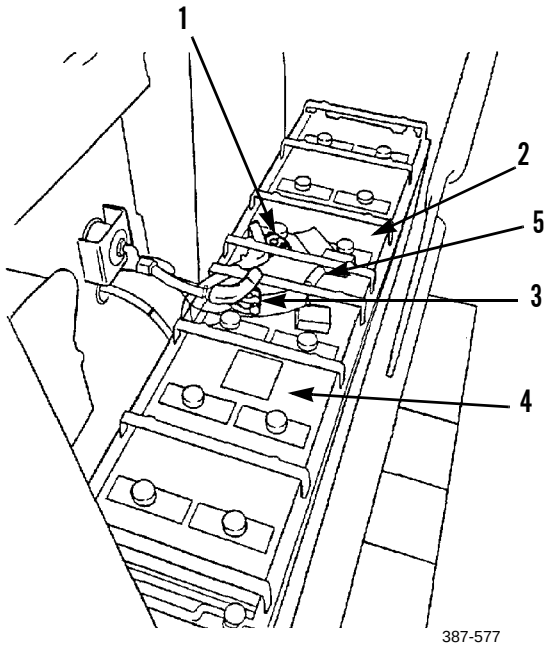
REMOVAL

1. Remove floor plates for access to remove cables (WP 0171 00).

NOTE

- Tag cables to ensure correct installation.
- Lift up rubber boots for access to cable terminals.

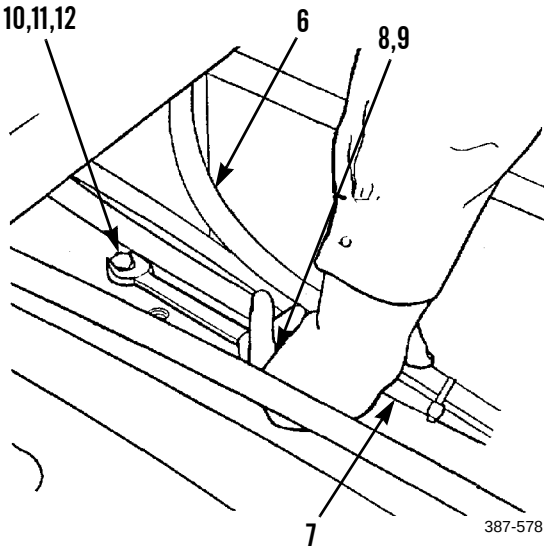
2. Loosen nut and disconnect negative battery cable (1) from negative post of battery (2).
3. Loosen nut and disconnect positive battery cable (3) from positive post of battery (4).
4. Loosen two nuts and disconnect battery cable (5) from between posts of batteries (2 and 4).



NOTE

Capscrews and clamps are located inside bell housing and on frame under seat.

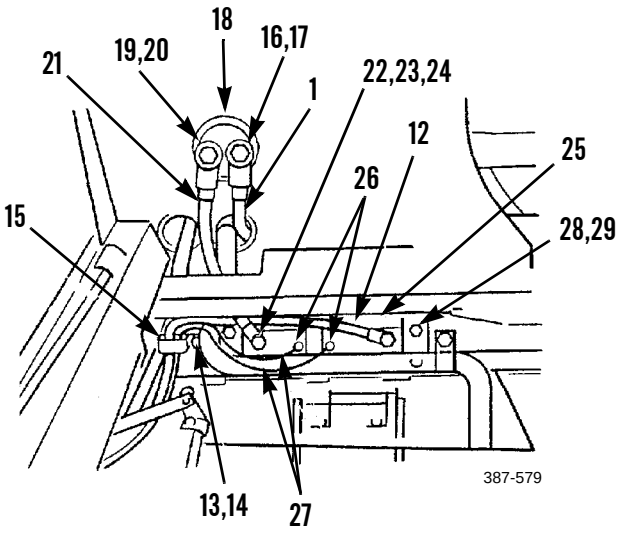
5. Remove and discard tiedown straps securing cables (6 and 7) to frame. Remove two capscrews (8) and clamps (9).
6. Remove capscrew (10) and washer (11) to disconnect cable (12) from tractor frame.

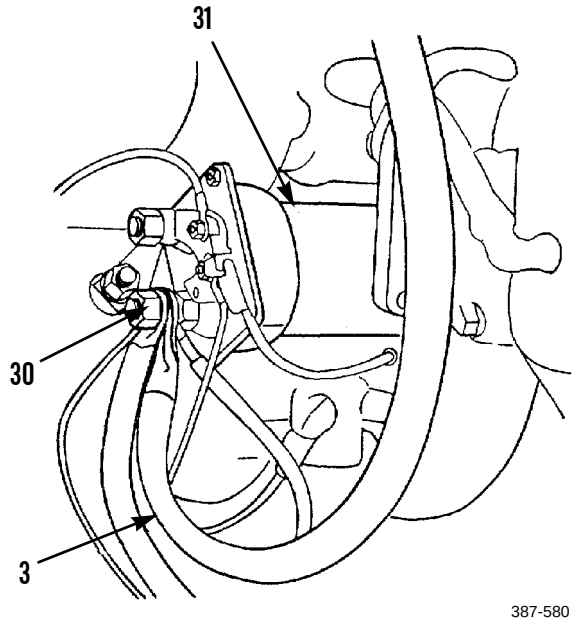


BATTERY CABLES REPLACEMENT - CONTINUED 0101 00

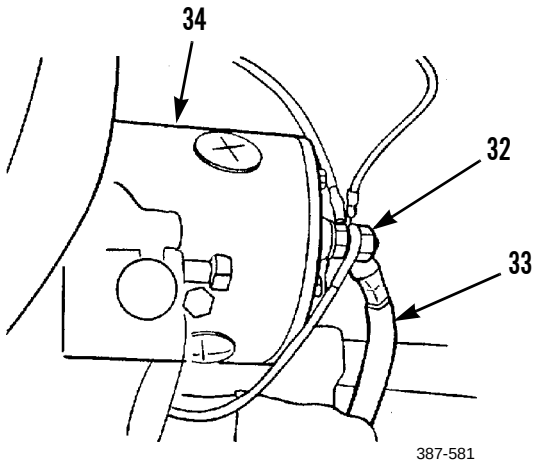
REMOVAL - CONTINUED

7. Remove three capscrews (13), washers (14) and clamps (15).
8. Remove nut (16), starwasher (17) and negative battery cable (1) from battery disconnect switch (18). Pull out cable from battery side.
9. Remove nut (19), starwasher (20) and disconnect cable (21) from negative post of battery disconnect switch (18).
10. Remove two nuts (22), washers (23), starwashers (24) and cables (12 and 21) from shunt (25).
11. Remove two screws (26) and disconnect two wires (27) from shunt (25).
12. Remove two self-locking nuts (28), capscrews (29) and shunt (25) from seat frame. Discard self-locking nuts.



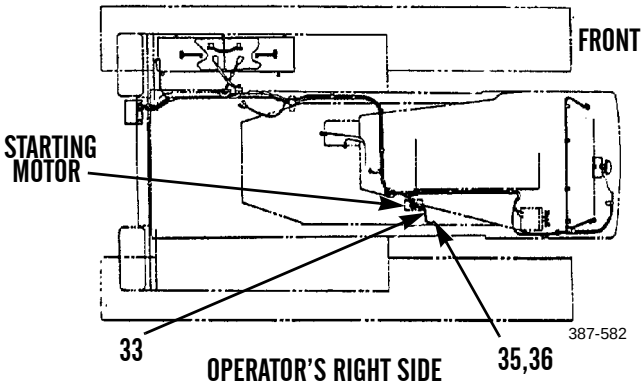


13. Remove nut (30) and remove positive battery cable (3) from starting motor solenoid (31). Pull out cable toward starting motor solenoid.
14. Remove nut (32) and disconnect negative cable (33) from starting motor (34).



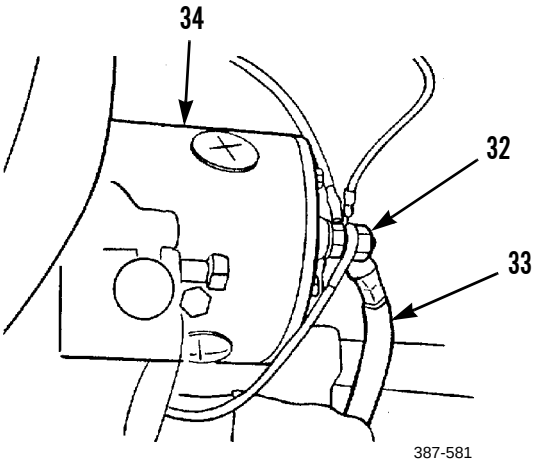
REMOVAL - CONTINUED

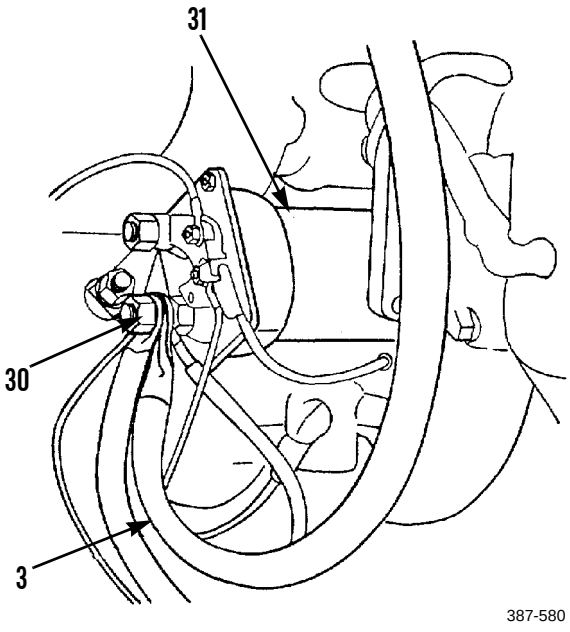
15. Remove capscrew (35), starwasher (36) and negative cable (33) from frame.



INSTALLATION

1. Install negative cable (33) to frame with capscrew (35) and starwasher (36).
2. Connect negative cable (33) to starting motor (34) with nut (32). Tighten nut to 22 lb-ft (30 Nm).

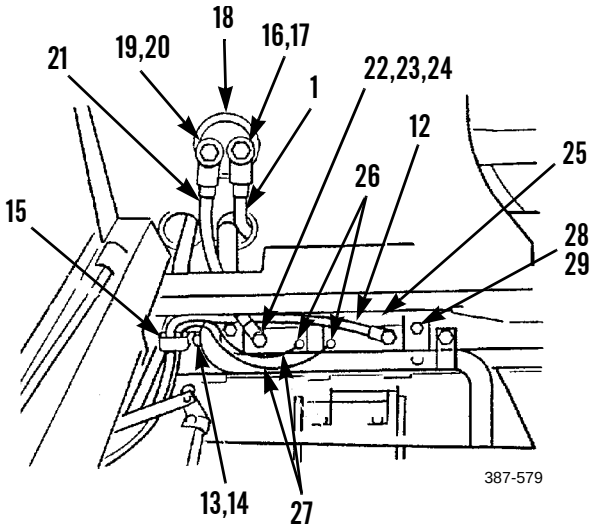




3. Connect positive battery cable (3) to starting motor solenoid (31) with nut (30). Pull out cable toward battery.

INSTALLATION - CONTINUED

4. Position shunt (25) onto seat frame. Install shunt with two capscrews (29) and new self-locking nuts (28).
5. Connect two wires (27) to shunt (25) with two screws (26).
6. Connect cables (12 and 21) to shunt (25) with two starwashers (24), washers (23) and nuts (22).
7. Connect cable (21) to negative post on battery disconnect switch (18) with starwasher (20) and nut (19).
8. Install negative battery cable (1) through battery side and connect to battery disconnect (18) with starwasher (17) and nut (16).

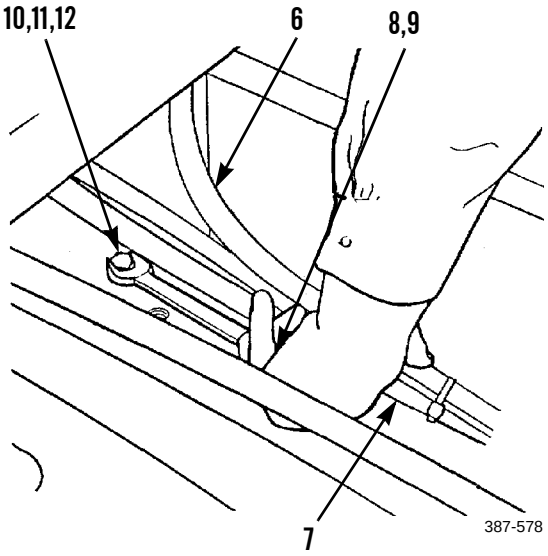


9. Install three clamps (15) with three washers (14) and capscrews (13).
10. Connect cable (12) to tractor frame with washer (11) and capscrew (10).

NOTE

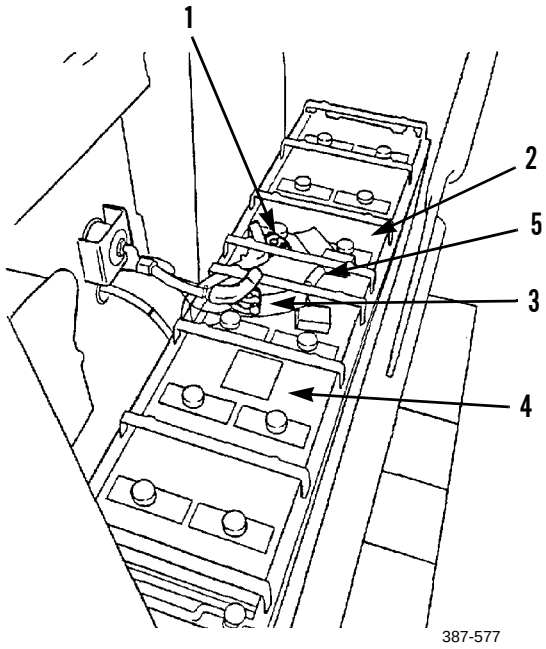
Capscrews and clamps are located inside bell housing and on frame under seat.

11. Install two clamps (9) with two capscrews (8).
12. Install new tiedown straps to secure cables (6 and 7) to frame.



INSTALLATION - CONTINUED

13. Connect battery cable (5) between posts of batteries (2 and 4) and tighten two nuts.
14. Connect positive battery cable (3) to positive post of battery (4) and tighten nut.
15. Connect negative battery cable (1) to negative post of battery (2) and tighten nut.



16. Install battery box cover (TM 5-2410-237-10).
17. Install floor plates (WP 0171 00).
18. Turn battery disconnect switch to ON position (TM5-2410-237-10).
19. Start tractor (TM 5-2410-237-10) and check for proper operation.

END OF WORK PACKAGE

NATO STARTING RECEPTACLE REPLACEMENT 0102 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tool and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Nut, self-locking (9)

Equipment Condition

Battery cables disconnected (WP 0101 00)

WARNING

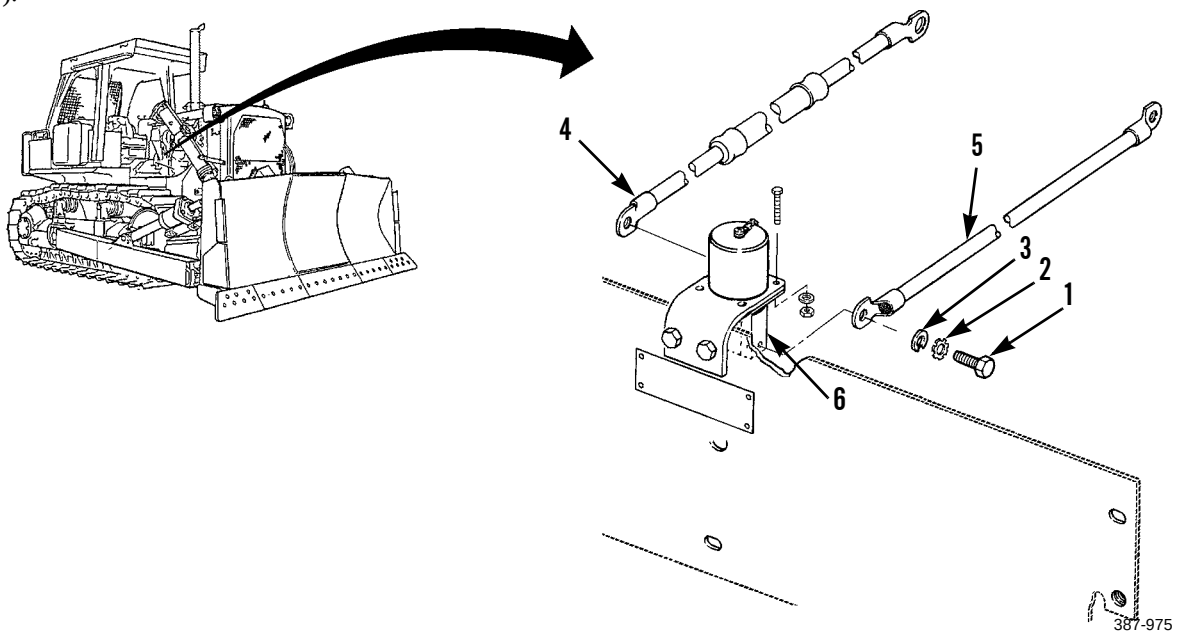
Ensure battery is disconnected before replacing NATO starting receptacle. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

NOTE

Tag cables to ensure correct installation.

1. Remove two capscrews (1), starwashers (2) and lockwashers (3). Remove cables (4 and 5) from receptacle connector (6).

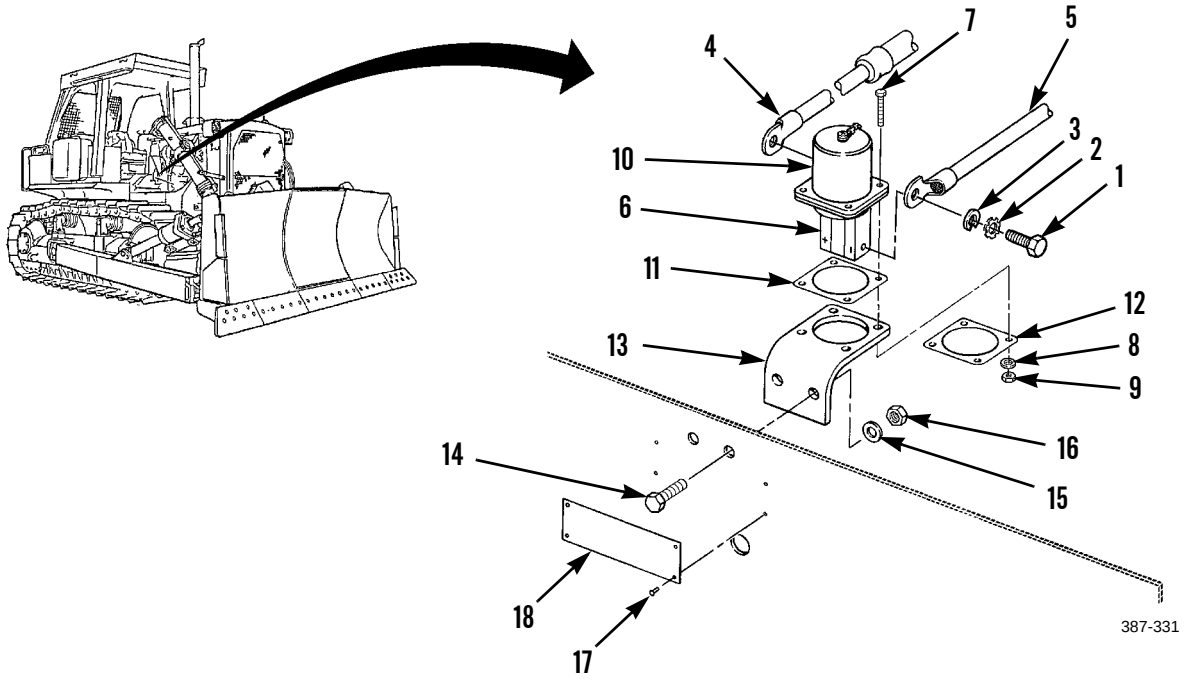


REMOVAL - CONTINUED

2. Remove four capscrews (7), washers (8) and self-locking nuts (9). Discard self-locking nuts.
3. Remove cap (10), receptacle connector (6) and insulators (11 and 12) from bracket (13).
4. If damaged, remove two capscrews (14), washers (15), nuts (16) and bracket (13) from guard.
5. If damaged, remove four screws (17) and plate (18).

INSTALLATION

1. If removed, install bracket (13) to guard with two capscrews (14), washers (15) and nuts (16).
2. Install receptacle connector (6), insulators (11 and 12) and cap (10) to bracket (13) with four capscrews (7), washers (8) and new self-locking nuts (9).
3. Connect cables (4 and 5) to receptacle connector (6) and install two capscrews (1), starwashers (2) and lockwashers (3).
4. If removed, install plate (18) with four screws (17).



5. Connect battery cables (WP 0101 00).

END OF WORK PACKAGE

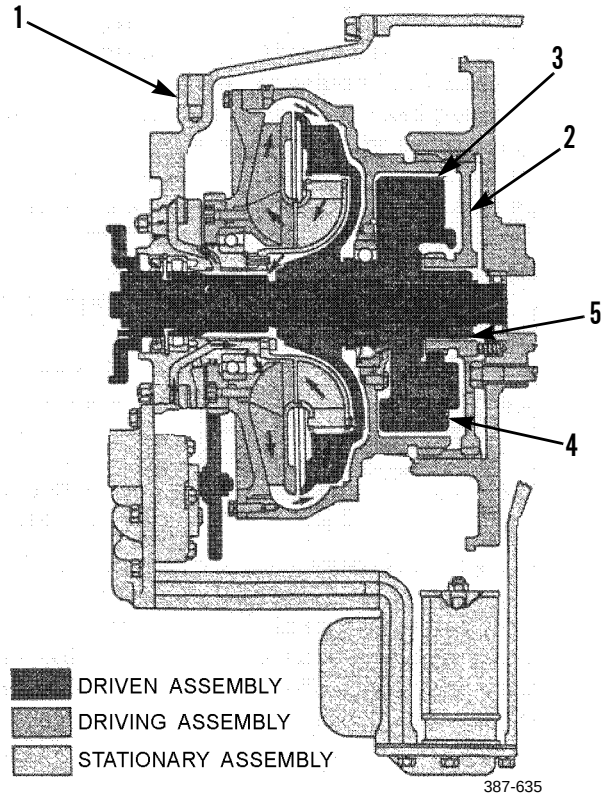
TRANSMISSION THEORY OF OPERATION 0103 00

TORQUE DIVIDER

1. The torque divider connects the engine to the planetary transmission. This connection is both a hydraulic connection and a mechanical connection. The hydraulic connection is through a torque converter. The mechanical connection is through a planetary gear set.
2. The torque converter uses oil to multiply the torque to the transmission. When the machine is working against a low load, the torque multiplication is low. When the machine is working against a high load, the torque multiplication is higher. A higher torque can then be sent to the transmission during high load conditions. The planetary gear set also multiplies the torque from the engine by making an increase gear in the mechanical advantage through it gears. This torque multiplication also makes an increase as the load on the machine becomes higher. During no load conditions, neither the torque converter nor the planetary gear set can multiply the torque from the engine.
3. Oil for the operation of the torque converter is from the transmission hydraulic controls. A relief valve for converter inlet controls the pressure of the oil to the torque converter. A relief valve for converter outlet controls the pressure of the oil in the converter.

TORQUE DIVIDER OPERATION

1. The torque converter is driven by the engine through housing (1). The planetary gear set is driven by the engine through sun gear (2). These connections let the torque output of the engine go in two separate directions. Because of the larger radius of ring gear (3), most of this torque is sent by the torque converter through the ring gear to planetary gears (4). The remainder of the torque is sent by sun gear (2) to planetary gears (4). If planetary carrier (5) has no resistance to rotation (no load), sun gear (2), planetary gears (4), planetary carrier (5) and ring gear (3) will turn at the same speed. The torque from the converter and from the planetary gear set is now through the planetary carrier to output shaft (6) and the planetary transmission. Neither the torque converter nor the planetary gear set can multiply the torque from the engine when they are turning at the same speed.



2. When the machine has a load, planetary carrier (5) has a resistance to rotation. Since sun gear (2) is turning at the rpm of the engine, this resistance to rotation causes planetary gears (4) to turn on their shafts. Their rotation is opposite the rotation of the ring gear (3). This causes a decrease in the speed of the ring gear. Since turbine (7) is connected to the ring gear, a decrease in speed will cause the torque converter to multiply the torque of the engine from housing (1). The torque multiplication is sent to planetary carrier (5) and the output shaft through the ring gear. With the decrease in the speed of the ring gear, the torque of the engine through sun gear (2) and the planetary gear set also multiplies. This torque multiplication is also sent to planetary carrier (5) and the output shaft.

TORQUE DIVIDER OPERATION - CONTINUED

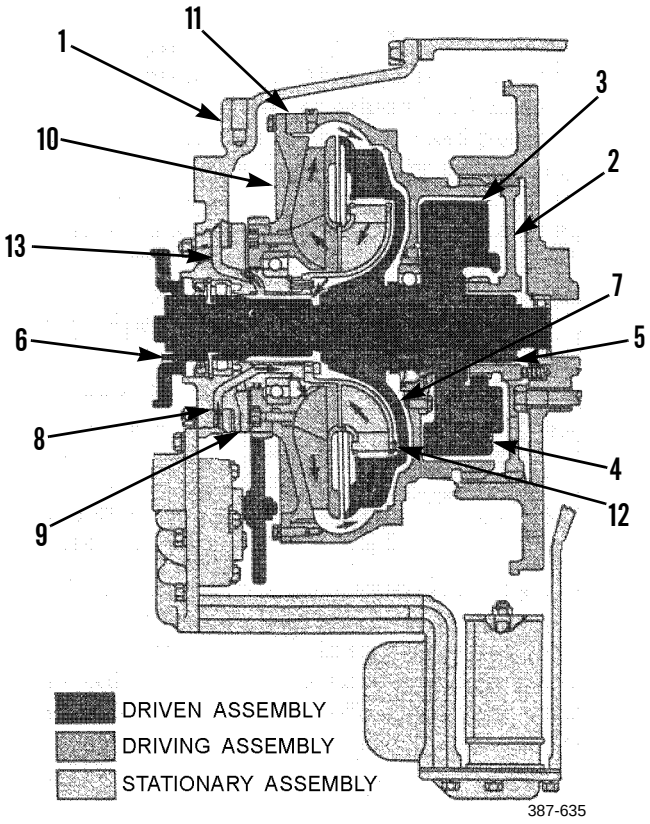
3. If the resistance to rotation of planetary carrier (5) becomes higher (more load on the machine), the speed of the ring gear (3) will decrease more. The slower speed will let the torque multiplication through both the torque converter and the sun gear (2) become higher. If the resistance to rotation of the planetary carrier becomes high enough, the ring gear will stop. During some very high load conditions, the rotation of the planetary carrier and the output shaft will also stop. This will cause the ring gear to turn slowly in the opposite direction. At this time the torque multiplication of the torque converter and the sun gear is at its maximum.

TORQUE CONVERTER OPERATION

1. Oil for the operation of the torque converter goes through inlet passage (8) in carrier (9) to impeller (10). The rotation of the impeller gives force to the oil. The impeller sends the oil toward the outside of the impeller, around the inside of the housing (11) to turbine (7). The force of oil hitting the blades of the turbine causes the turbine to turn. Since the turbine is connected to ring gear (3), torque is sent to planetary gears (4). At this point in time, the torque given to the turbine by the force of the oil from the impeller cannot be more than the torque output of the engine to the impeller.

2. As the oil goes from the turbine, it is moving in a direction opposite to the direction of impeller (10) rotation. Stator (12) causes the oil to change direction. Since the stator is connected to carrier (9) and cannot turn, most of the oil is sent back to impeller (10). The remainder of the oil goes from the stator through outlet passage (13) to the oil cooler and the transmission lubrication system.

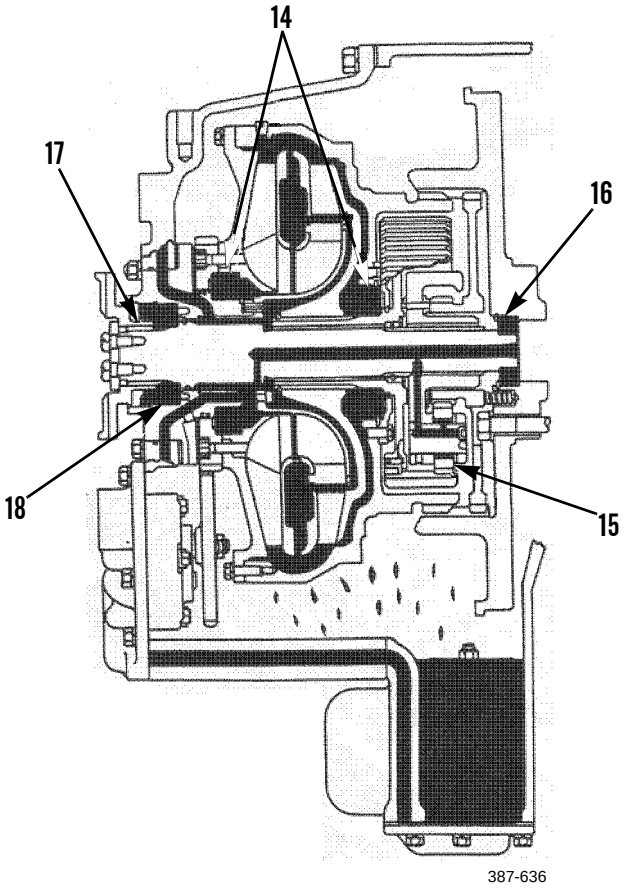
3. The force of the oil from the stator (12) can now add the torque output from the engine to impeller (10). This extra force can give an increase to the torque output of the engine to the turbine (7). The larger the difference between the speeds of the impeller and the turbine, the larger the amount of force of the oil from the stator. Since it is the load on the machine that changes the speed of the turbine, the higher the load, the larger the difference in the speeds of the impeller and the turbine. It is then the different loads on the machine that control the amount of torque multiplication that the force of the oil from the stator can add.



TORQUE DIVIDER LUBRICATION

4. Oil for lubrication of the torque divider bearings and the planetary gear set is from the supply used for the operation of the torque converter. Bearings (14) are constantly running in oil. Bearings and gears in planetary gear set (15) and pilot bearing (16) get lubrication through passages in output shaft (17). Output shaft bearing (18) gets lubrication from normal oil leakage by a piston ring-type seal.

5. Oil is pulled from the reservoir through the magnetic screen by the oil pump. The oil pump sends pressure oil to the oil filter. The oil goes through the filter; if there is too much restriction, there is a bypass valve to allow the oil to go around the filter. The oil enters the torque divider through the inlet relief valve. Leakage oil inside the torque divider is used for lubrication of the torque divider components. After lubrication of the components, the oil goes to the bottom of the torque divider housing where the scavenge pump picks up the oil and returns it to the reservoir in the transmission case.



387-636

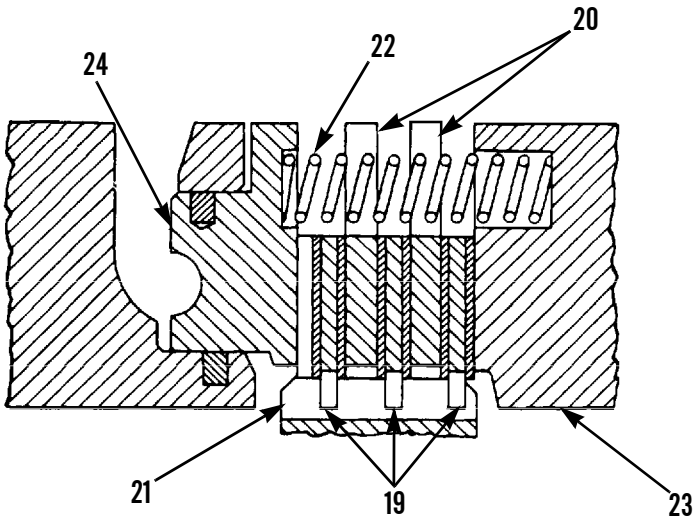
TRANSMISSION

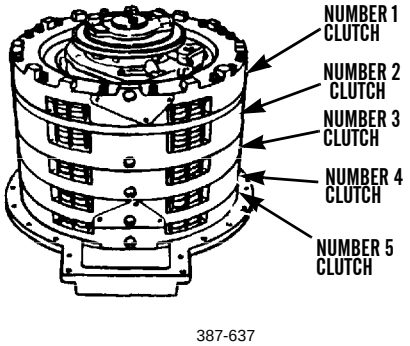
1. The transmission has three speeds forward and three speeds reverse. It has planetary gear systems and five hydraulic clutches.

2. The five transmission clutches are disc type and in separate housings. Each clutch has discs (19) and plates (20). The inside of discs (19) are engaged with the outside teeth of ring gear (21). Notches on the outside diameter of plates (20) are engaged with pins in the clutch housing. The pins keep the plates from turning.

3. The springs (22) are between clutch housing (23) and piston (24). The springs keep the clutches disengaged. The clutches are engaged when oil is sent into the area behind the piston (24). When the pressure of the oil in the area behind the piston increases, the piston moves to the right. The piston moves against the force of spring (22) and pushes discs and plates together. The clutch is now engaged. The discs keep ring gear (21) from turning. When the clutch is released, the pressure in the area behind piston (24) decreases and the spring now push the piston to the left. The discs and plates are now apart. The clutch is disengaged.

4. The two front clutches (no. 1 and no. 2) are direction clutches. The no. 1 clutch is the forward direction clutch. The no. 2 clutch is the reverse direction clutch. The three rear clutches (no. 3, no. 4 and no. 5) are speed clutches.

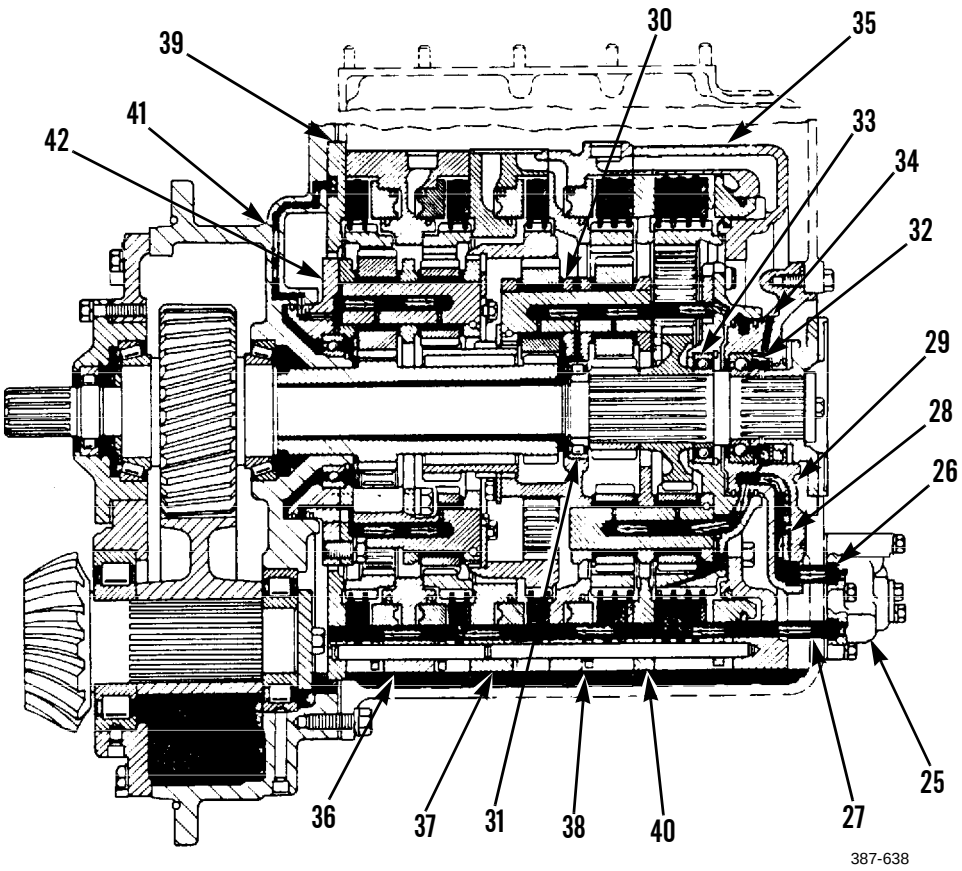




5. A speed and direction clutch must be engaged in the transmission before power goes through the transmission.

SPEED	CLUTCHES ENGAGED
First Forward	1 and 5
Second Forward	1 and 3
Third Forward	1 and 4
First Reverse	2 and 5
Second Reverse	2 and 3
Third Reverse	2 and 4

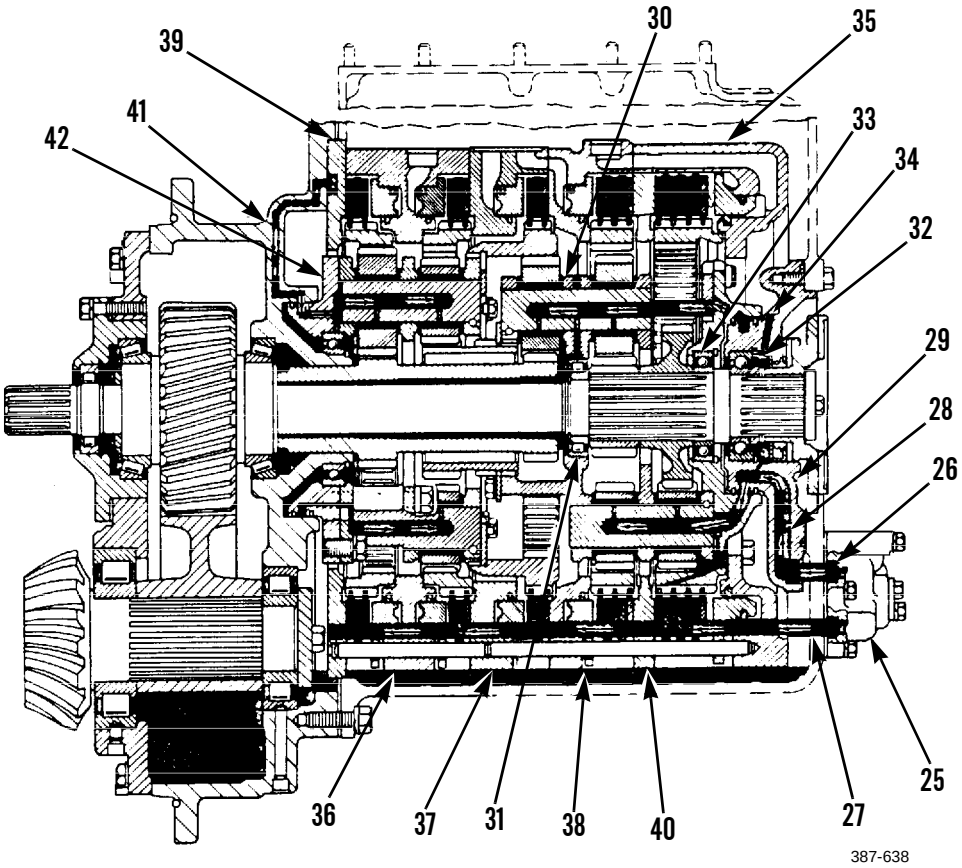
TRANSMISSION LUBRICATION



1. The oil for lubrication of the transmission comes from the transmission oil cooler.
2. From the cooler, the oil goes to manifold (25) on the front of the transmission case. The manifold divides the flow of oil. Oil is sent through tubes (26 and 27). The remainder of the oil goes out a hose to the relief valve for brake cooling and lubrication in the steering clutch compartment.
3. Oil goes through tube (26) to manifold (28) in front bearing cage (29). The manifold sends oil through a passage to the no. 1 carrier. The oil then goes through passages in the planetary gear shafts to the bearings and thrust washers of the planetary gears. Oil also goes through a passage in shaft (30) to center bearing (31) of the input shaft. A small passage in bearing cage (29) lets oil go to front bearing (32) and bearing (33). This oil then goes through passage (34) to the bottom of the transmission case.
4. A small passage in the no. 1 carrier lets oil go to the ring gear of the no. 1 clutch.
5. A small passage in the ring gear for the no. 1 clutch lets oil go to the discs and plates of the no. 1 clutch.
6. Tube (27) is installed in a hole in no. 1 clutch housing (35). Each of the clutch housings (36, 37 and 38) has a hole which is in alignment with the hole in the no. 1 clutch housing. Plates (39 and 40) also have a hole which is in alignment with the hole in the no. 1 clutch housing.
7. Oil goes through tube (27) to the no. 1 clutch housing (35). The oil goes through the holes in clutch housing (36, 37 and 38) and plate (40) to plate (39).
8. Plate (39) has a groove on the rear side of the plate. The oil from manifold (25) goes to the groove. At the groove, the flow of oil divides.

TRANSMISSION LUBRICATION - CONTINUED

9. Part of the oil goes through passage (41) in the transfer gear case. The oil goes through the passage to bearing cage (42). The oil then goes to the no. 2 carrier. The oil then goes through passages in the planetary gear shafts to the bearings and thrust washers of the planetary gears. Oil then goes to the rear bearing.



10. The remainder of the oil from the groove of plate (39) goes through two holes in the plate (39). Each of the clutch housings (35, 36, 37 and 38) and plate (40) have two holes which are in alignment with the two holes in plate (39). Oil goes through the clutch housings and plate (40) toward the front of the transmission. The oil stops in the no. 1 clutch housing.
11. The no. 1 clutch housing and plate (40) have passages which send the oil to discs and plates of the no. 1 and no. 2 clutches.
12. The components of the transfer gear get lubrication by oil thrown inside the transfer case.
13. The remainder of the components in the transmission get lubrication from oil thrown inside the transmission and oil released at points of pressure lubrication.

END OF WORK PACKAGE

TRANSMISSION SELECTOR LEVER AND LINKAGE MAINTENANCE 0104 00

THIS WORK PACKAGE COVERS

Removal, Installation, Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Nut, self-locking (39)

Washer, lock (2, 11, 15, 29, 34 and 43)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

Floor plates removed (WP 0171 00)

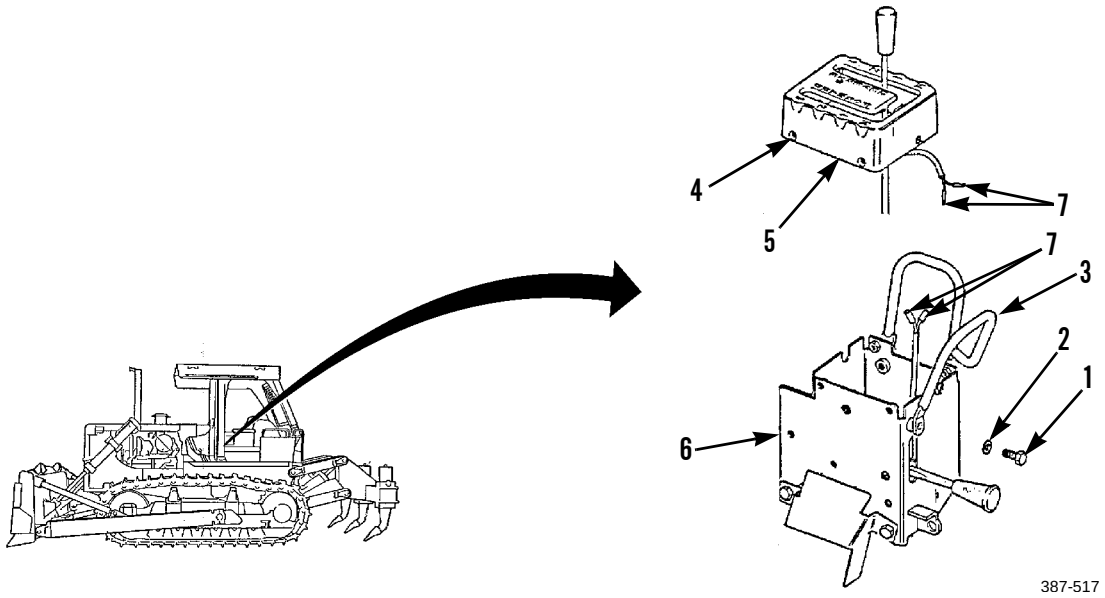
Seat with vertical adjuster removed (WP 0172 00)

WARNING

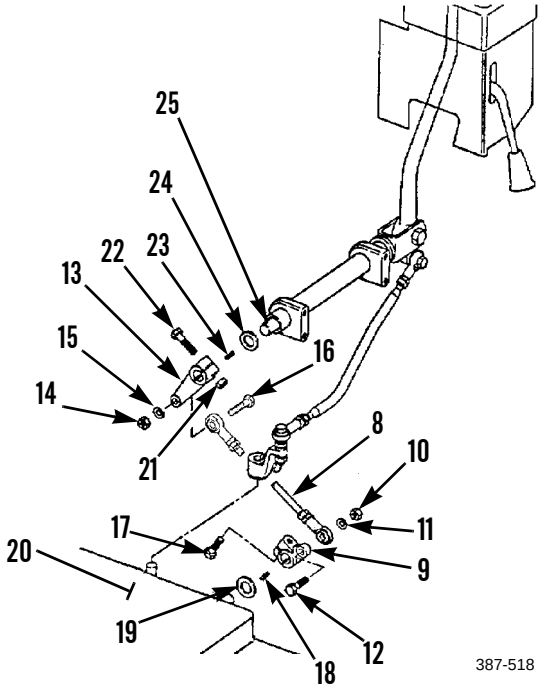
Turn battery disconnect switch to OFF before performing maintenance on transmission selector lever and linkage. Failure to follow this warning could result in injury or damage to equipment.

REMOVAL

1. Remove three capscrews (1), lockwashers (2) and guard (3). Discard lockwashers.
2. Remove knobs from transmission selector lever.
3. Remove four screws (4) and partially remove guide cover (5) from transmission control box (6).
4. Tag and disconnect two wires (7) and remove guide cover (5).

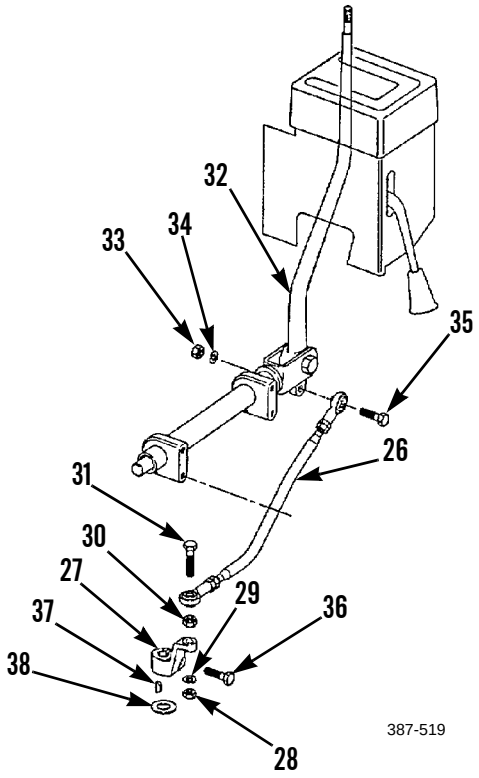


5. Disconnect one end of rod assembly (8) from lever (9) by removing nut (10), lockwasher (11) and capscrew (12). Discard lockwasher.
6. Disconnect other end of rod assembly (8) from lever (13) by removing nut (14), lockwasher (15) and capscrew (16). Discard lockwasher. Remove rod assembly.
7. Loosen capscrew (17) and remove lever (9), key (18) and washer (19) from transmission (20).
8. Remove nut (21) and capscrew (22) from lever (13) and slide lever, key (23) and spacer (24) from shaft (25).



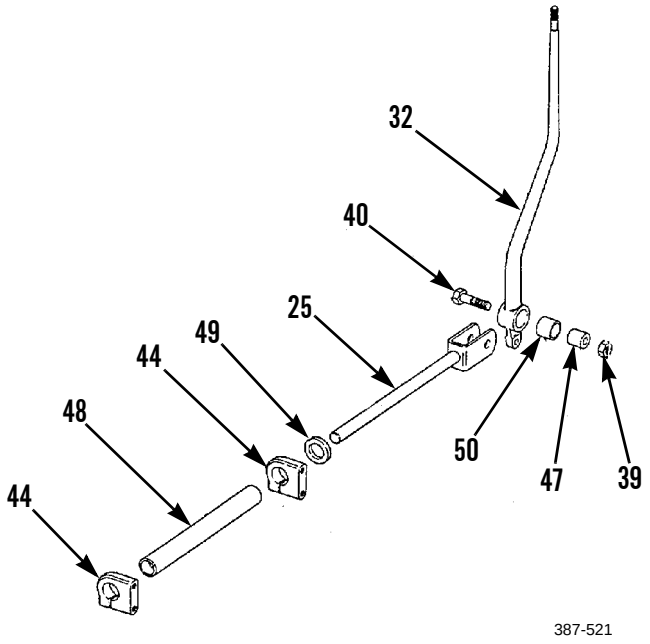
REMOVAL - CONTINUED

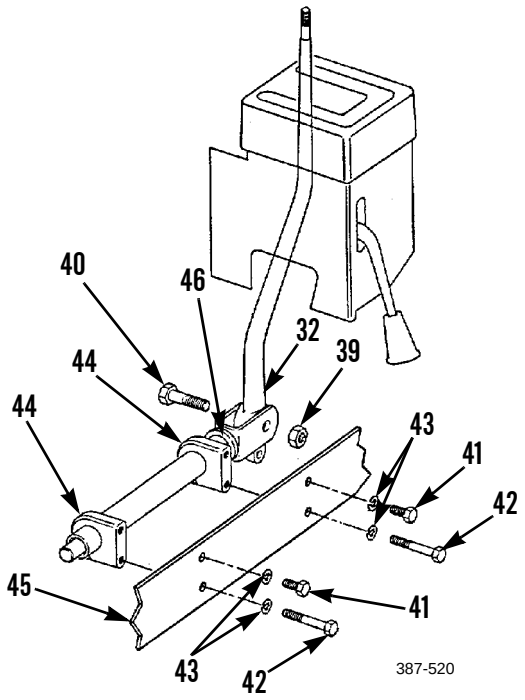
9. Disconnect one end of rod assembly (26) from lever (27) by removing nut (28), lockwasher (29), nut (30) and capscrew (31). Discard lockwasher.
10. Disconnect other end of rod assembly (26) from selector lever (32) by removing nut (33), lockwasher (34), and capscrew (35). Remove rod assembly. Discard lockwasher.
11. Loosen capscrew (36) and remove lever (27), key (37) and washer (38) from transmission (20).



REMOVAL - CONTINUED

12. Remove self-locking nut (39) from capscrew (40). Discard self-locking nut.
13. Remove two short capscrews (41), two long capscrews (42) and four lockwashers (43) from two clamps (44) and plate (45). Discard lockwashers.
14. Move shaft assembly (46) from selector lever (32) and remove capscrew (40) and spacer (47).
15. Slide support (48) and spacer (49) from shaft (25).
16. Remove clamps (44) from support (48).
17. If damaged, press bushing (50) from selector lever (32).





INSTALLATION

1. If removed, press bushing (50) into selector lever (32).
2. Position two clamps (44) on support (48).
3. Install spacer (49) and support (48) on shaft (25).
4. Hold shaft assembly (46) and selector lever (32) in place and install capscrew (40) and spacer (47).
5. Hold shaft assembly (46) in position and align holes in clamps (44) with holes in plate (45).

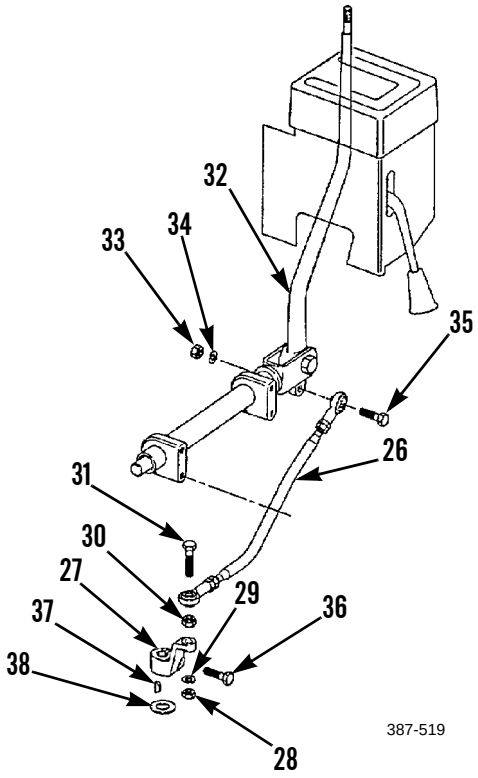
NOTE

Short capscrews must be installed in top holes of clamp and long capscrews in bottom holes of clamp.

6. Install clamps (44) to plate (45) with four new lockwashers (43), two short capscrews (41) and two long capscrews (42).
7. Install new self-locking nut (39) on capscrew (40).

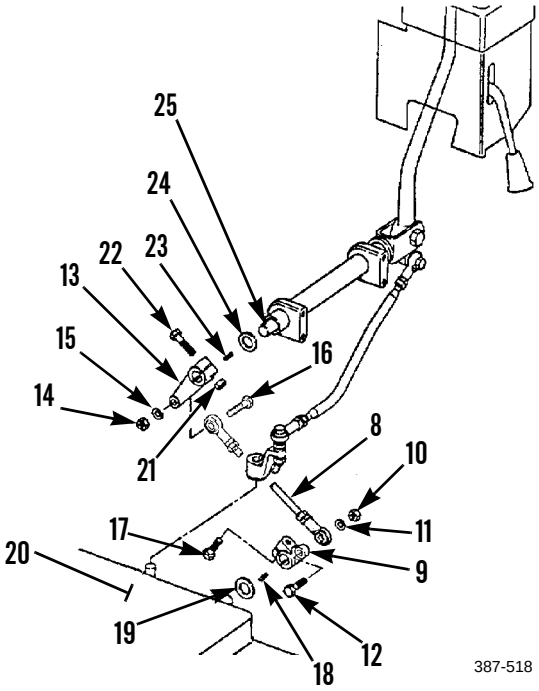
INSTALLATION - CONTINUED

8. Position washer (38), lever (27) and key (37) on transmission (20) and tighten capscrew (36).
9. Install one end of rod assembly (26) to selector lever (32) with capscrew (35), new lockwasher (34) and nut (33).
10. Install other end of rod assembly (26) to lever (27) with capscrew (31), nut (30), new lockwasher (29) and nut (28).

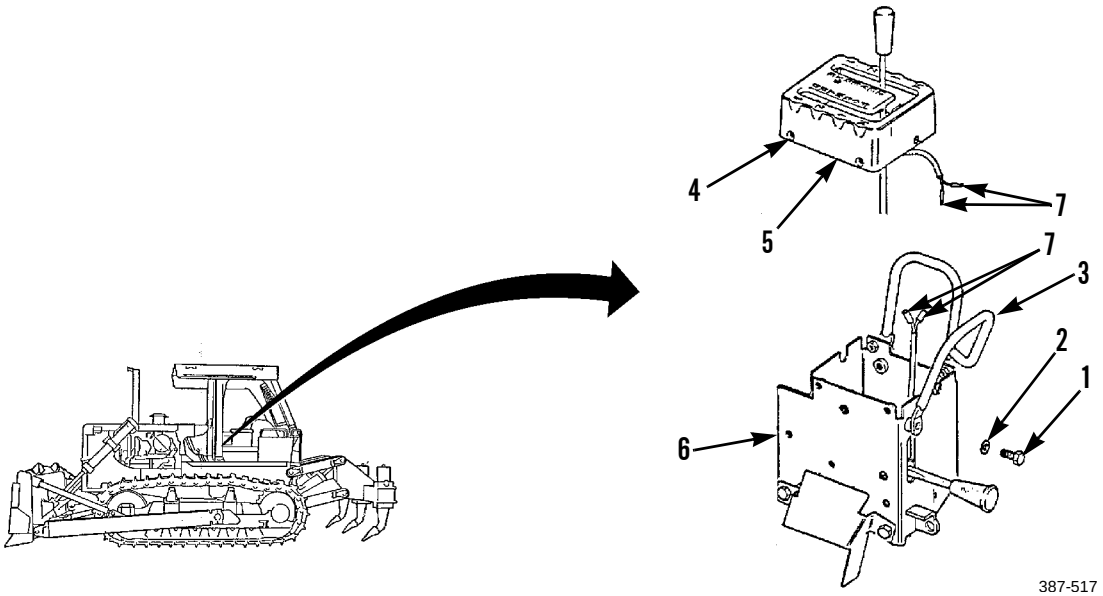


INSTALLATION - CONTINUED

11. Install spacer (24), lever (13) and key (23) on shaft (25) with capscrew (22) and nut (21).
12. Position washer (19), lever (9) and key (18) on transmission (20) and tighten capscrew (17).
13. Install one end of rod assembly (8) to lever (13) with capscrew (16), new lockwasher (15) and nut (14).
14. Install other end of rod assembly (8) to lever (9) with capscrew (12), new lockwasher (11) and nut (10).



15. Connect two wires (7) and position guide cover (5) on transmission control box (6).
16. Install four screws (4).
17. Install knob on transmission selector lever.
18. Install guard (3) with three new lockwashers (2) and capscrews (1).

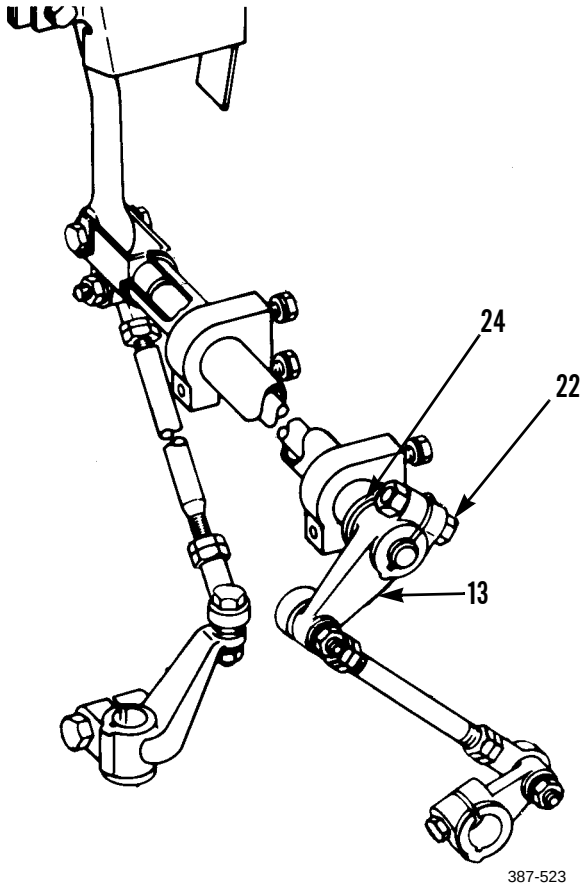


ADJUSTMENT

NOTE

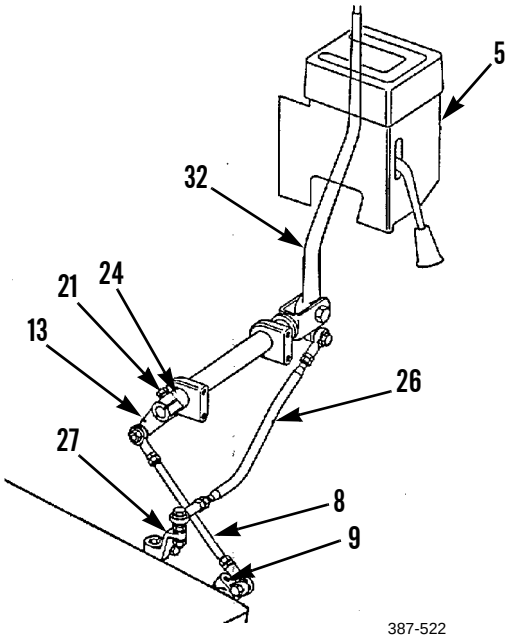
- **Engine must be OFF to perform adjustment.**
- **Ensure all linkage mounting bolts are tight before performing adjustment.**

1. Loosen capscrew (22) on lever (13). Place a 0.012 in. (0.30 mm) thickness feeler gage between spacer (24) and lever.
2. Make necessary adjustment to lever (13) and tighten capscrew (22).

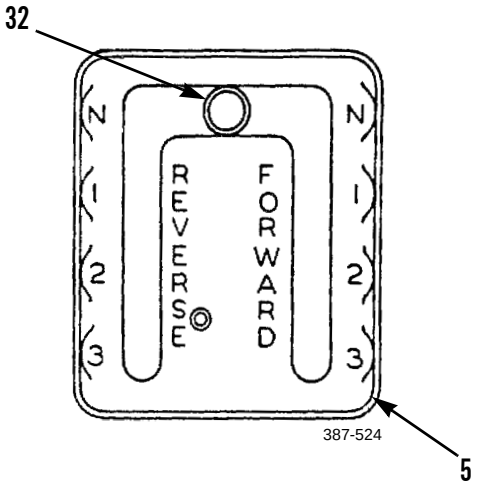


ADJUSTMENT - CONTINUED

3. Disconnect rod assembly (26) from lever (27) and selector lever (32). See *Removal*, steps 8 and 9.
4. Put lever (27) in FORWARD "F" detent.
5. Disconnect rod assembly (8) from levers (9 and 13). See *Removal*, steps 4 and 5.
6. Put lever (9) in NEUTRAL "N" detent.



7. Put selector lever (32) in center of NEUTRAL opening of guide cover (5).

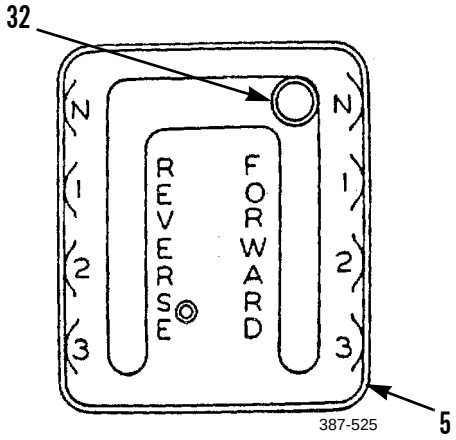


8. Adjust rod ends of rod assembly (8) until rod assembly can be installed between levers (9 and 13).
9. Connect rod assembly (8) to levers (9 and 13). See *Installation*, steps 13 and 14.

ADJUSTMENT - CONTINUED

10. Put selector lever (32) in front of FORWARD slot of NEUTRAL opening of guide cover (5).

11. Adjust rod ends of rod assembly (26) until rod assembly can be installed between lever (27) and selector lever (32).



12. Connect rod assembly (26) to lever (27) and selector lever (32). See *Installation*, steps 9 and 10.
13. Install seat with vertical adjuster (WP 0172 00).
14. Install floor plates (WP 0171 00).
15. Turn battery disconnect switch to ON position (TM 5-2410-237-10).
16. Test drive tractor in all speeds.

END OF WORK PACKAGE

TRANSMISSION SAFETY LOCK LEVER REPLACEMENT 0105 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (2, 10, and 19)

Pin, cotter (15 and 23)

References

WP 0104 00

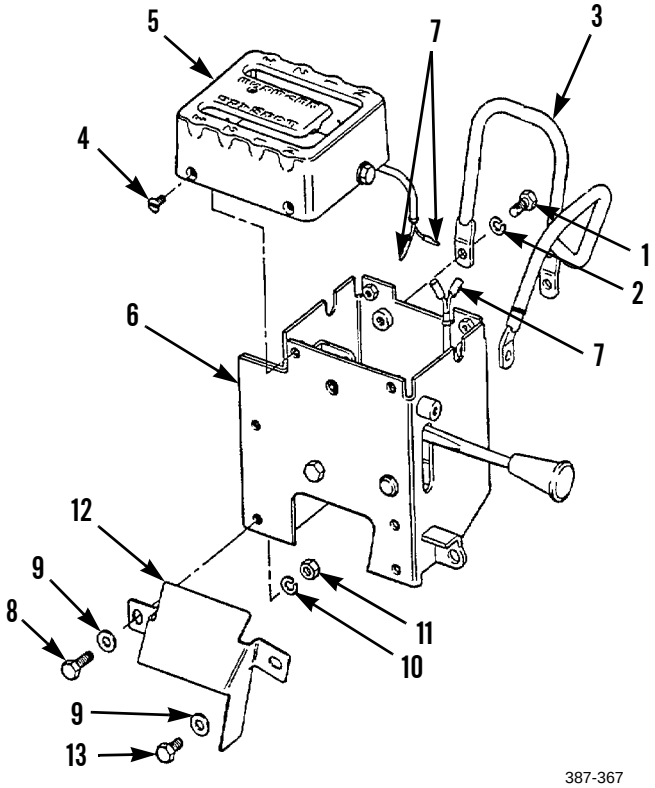
Equipment Condition

Engine OFF (TM 5-2410-237-10)

Machine parked on level ground (TM 5-2410-237-10)

REMOVAL

1. Remove three capscrews (1), lockwashers (2) and guard (3). Discard lockwashers.
2. Remove knob from transmission selector lever.
3. Remove four screws (4) and partially remove guide cover (5) from transmission control box (6).
4. Tag and disconnect two wires (7) and remove guide cover (5) completely.
5. Remove transmission selector lever (WP 0104 00).
6. Remove capscrew (8), washer (9), lockwasher (10) and nut (11) from one side of shield (12). Discard lockwasher.
7. Remove capscrew (13), washer (9), lockwasher (10) and nut (11) from other side of shield (12) and remove shield (12). Discard lockwasher.



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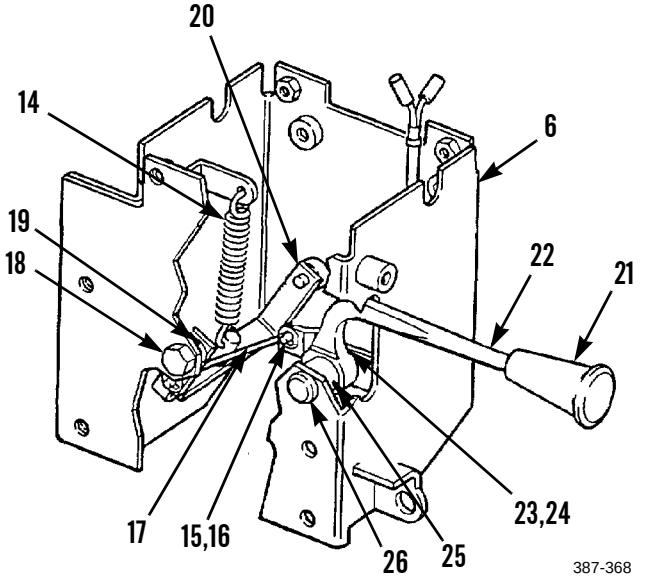
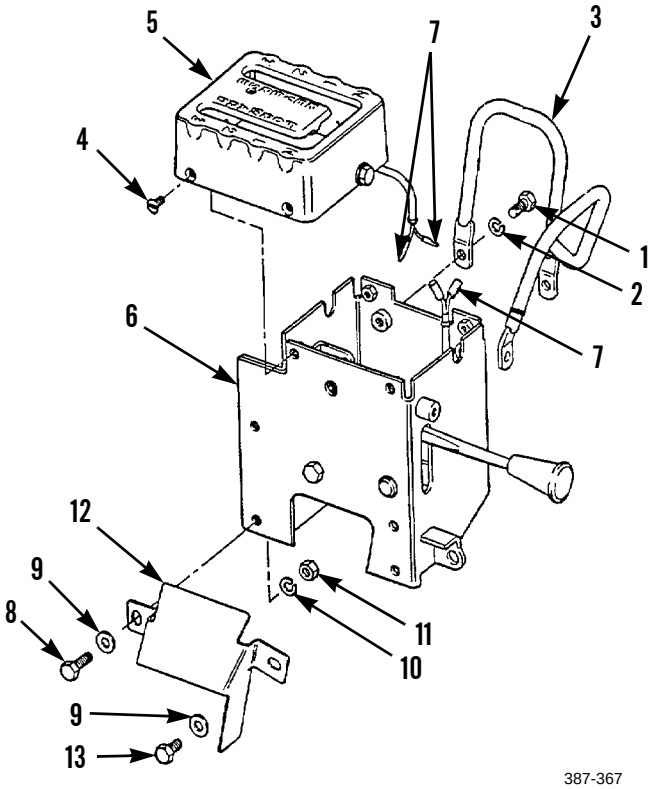
REMOVAL - CONTINUED

8. Remove spring (14).
9. Remove two cotter pins (15), washers (16) and rod (17). Discard cotter pins.
10. Remove two capscrews (18), lockwashers (19) and lever (20) from transmission control box (6). Discard lockwashers.
11. Remove knob (21) from lever (22).
12. Remove cotter pin (23), washer (24), lever (22), spacer (25) and pin (26) from transmission control box (6). Discard cotter pin.



INSTALLATION

1. Position pin (26) and spacer (25) in transmission control box (6) and install lever (22), washer (24) and new cotter pin (23).
2. Install knob (21) onto lever (22).
3. Install lever (20) in transmission control box (6) with two new lockwashers (19) and capscrews (18).
4. Install rod (17) with two washers (16) and new cotter pins (15).
5. Install spring (14).
6. Position shield (12) on transmission control box (6) and install capscrew (13), washer (9), new lockwasher (10) and nut (11) on one side shield.
7. Install capscrew (8), washer (9), new lockwasher (10) and nut (11) on other side of shield (12).
8. Install transmission selector lever (WP 0104 00).
9. Connect two wires (7) and position guide cover (5) on transmission control box (6).
10. Secure guide cover (5) with four screws (4).
11. Install knob on transmission selector lever.
12. Install guard (3) with three new lockwashers (2) and capscrews (1).
13. Check transmission safety lock lever for proper operation.



END OF WORK PACKAGE

TORQUE DIVIDER SUCTION SCREEN REPLACEMENT 0106 00

THIS WORK PACKAGE COVERS

Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Compound, sealing (Item 9, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Gasket (9)

Nut, self-locking (5)

Washer, lock (3)

References

WP 0107 00

WP 0241 00

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Crankcase guard removed (WP 0157 00)

NOTE

Clean suction screen whenever common oil compartment is drained for repairs on brakes, transmission or torque divider.

REMOVAL

NOTE

Use a suitable container to capture residual draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

REMOVAL - CONTINUED

1. Remove drain plug (1) and drain oil into a suitable container.

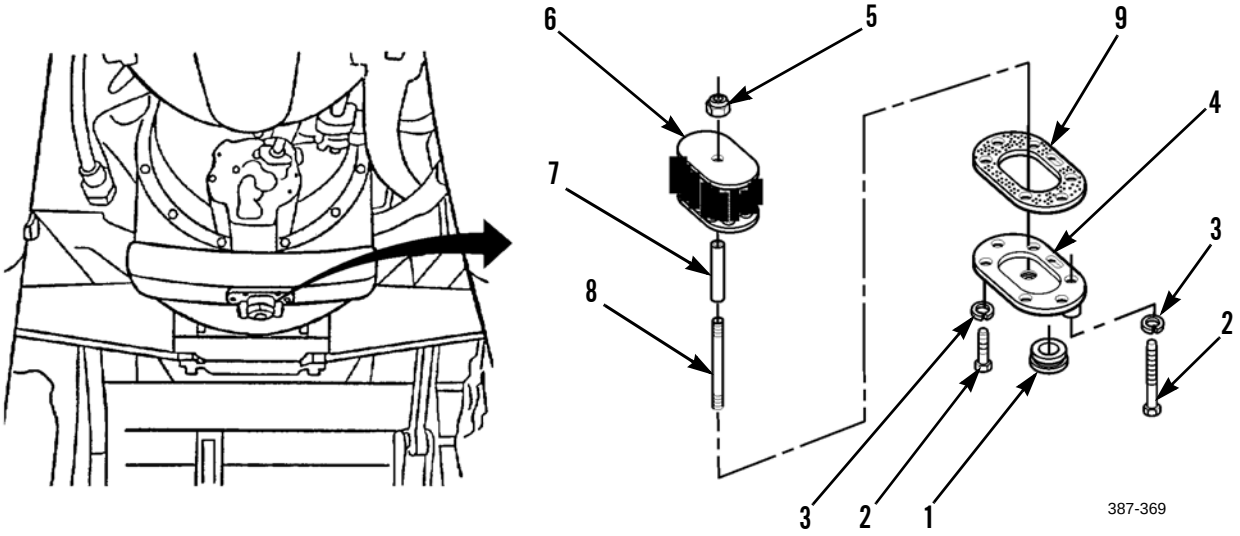
NOTE

Bolts must be installed in same locations from which they were removed. Tag each bolt and its corresponding mounting locations, to ensure correct installation.

2. Remove six bolts (2), lockwashers (3) and cover (4), with assembled parts, from flywheel housing. Discard lockwashers.

3. Remove self-locking nut (5) and disassemble suction screen assembly (6) from spacer (7) and stud (8). Discard self-locking nut.

4. Remove gasket (9) from flywheel housing or cover (4). Discard gasket.



CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Clean suction screen in solvent cleaning compound IAW WP 0241 00.

2. Inspect suction assembly for damage IAW WP 0241 00.

3. Replace any damaged part.

INSTALLATION

1. Install new gasket (9) on cover (4).
2. Assemble spacer (7) and suction screen (6) onto stud (8). Install new self-locking nut (5).

NOTE

Ensure bolts are installed in same locations from which they were removed.

3. Install cover (4), with assembled parts, on underside of flywheel housing with six new lockwashers (3) and bolts (2).
4. Apply sealing compound to threads of drain plug (1). Install plug and tighten.
5. Check level of oil in transmission and add as needed (WP 0107 00).
6. Start engine and check for leaks.
7. Install crankcase guard (WP 0157 00).

END OF WORK PACKAGE

TRANSMISSION ASSEMBLY SERVICE 0107 00

THIS WORK PACKAGE COVERS

Service

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

References

WP 0009 00

References - Continued

WP 0106 00

WP 0109 00

WP 0111 00

WP 0112 00

WP 0115 00

Equipment Condition

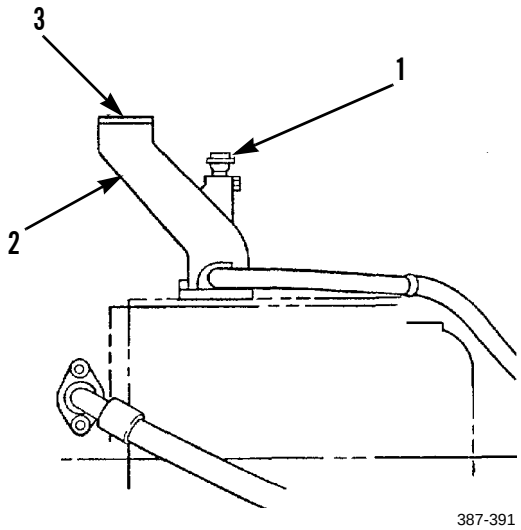
Machine parked on level surface (TM 5-2410-237-10)

Transmission warm, in N (Neutral) and locked (TM 5-2410-237-10)

Front crankcase guard removed (WP 0157 00)

SERVICE

1. Tilt seat forward (TM 5-2410-237-10) to access transmission breather (1) and fill tube (2). Remove fill tube cap (3).



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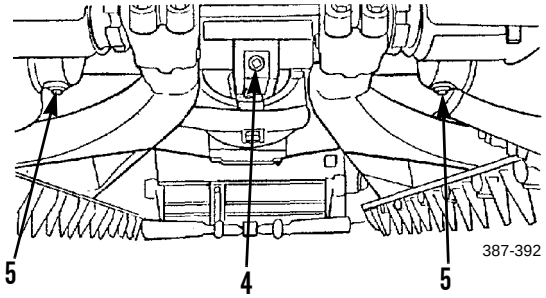
SERVICE - CONTINUED

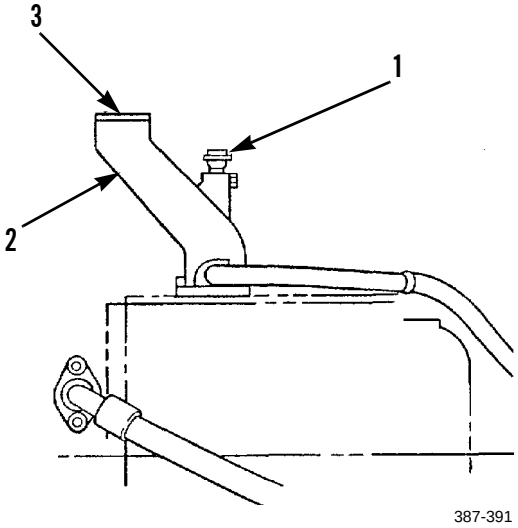
NOTE

Use a suitable container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

2. Remove bevel gear drain plug (4) and steering clutch drain plugs (5) and allow transmission to drain.
3. Remove breather (1) and clean.



4. Install breather (1) and tighten.
5. Drain transmission oil cooler (WP 0109 00).
6. Remove plug from flywheel housing and drain oil (WP 0106 00).
7. Replace transmission and steering clutch oil filter assembly (WP 0111 00).
8. Remove, clean and reinstall transmission oil magnetic screen assembly (WP 0112 00).
9. Remove, clean and reinstall torque divider suction screen (WP 0115 00).
10. Install bevel gear drain plug (4) and steering clutch drain plugs (5).



NOTE

Refer to KEY in *PMCS Introduction* (WP 0009 00) for appropriate oil to add based on temperature range of operation expected.

11. Fill transmission with oil through fill tube (2).
12. Install fill tube cap (3).
13. Start engine and allow to warm up.
14. Check for transmission oil leaks.
15. Remove dipstick and check level. Oil should be at FULL mark on dipstick. Add oil as needed. Shut down engine.
16. Install crankcase guard (WP 0157 00).

END OF WORK PACKAGE

TRANSMISSION OIL COOLER LINES REPLACEMENT 0108 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Lockwasher (2, 8, 17, 27 and 31)

O-ring (9, 10, 18, 19, 24, 25, 29 and 32)

Equipment Condition

Floor plates removed (WP 0171 00)

Transmission oil drained (WP 0107 00)

Seat with vertical adjuster removed (WP 0172 00)

REMOVAL

1. Loosen capscrew (1), lockwasher (2), nut (3) and clamp set (4).

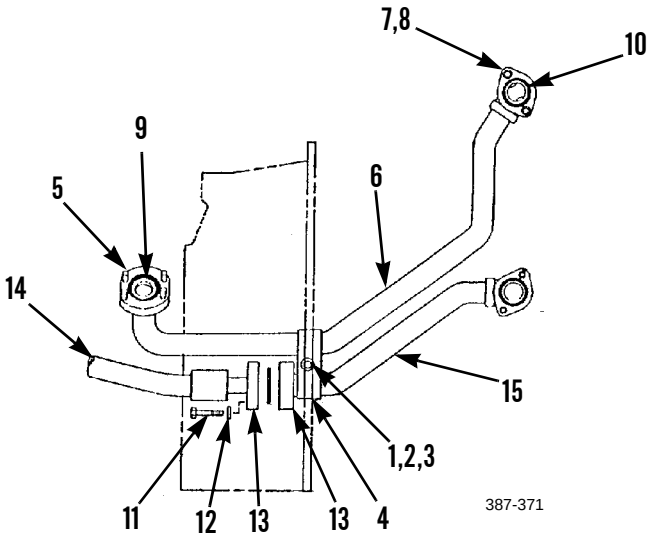
CAUTION

Place protective caps on all transmission system openings to prevent foreign materials from contaminating system.

NOTE

Use a suitable container to capture residual draining oil when disconnecting oil cooler lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

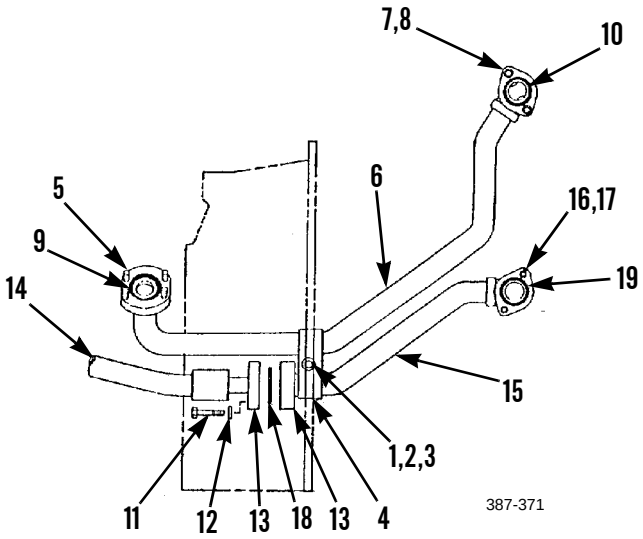
2. Remove four capscrews (5) holding tube assembly (6) to torque converter outlet relief valve.
3. Remove two capscrews (7) and lockwashers (8) holding tube assembly (6) to oil cooler inlet. Separate tube assembly from outlet relief valve and oil cooler inlet. Lift out tube assembly. Remove O-rings (9 and 10) from ends of tube assembly. Discard lockwashers and O-rings.
4. Remove four capscrews (11), washers (12) and two flange halves (13) holding hose assembly (14) to cooler line tube assembly (15).



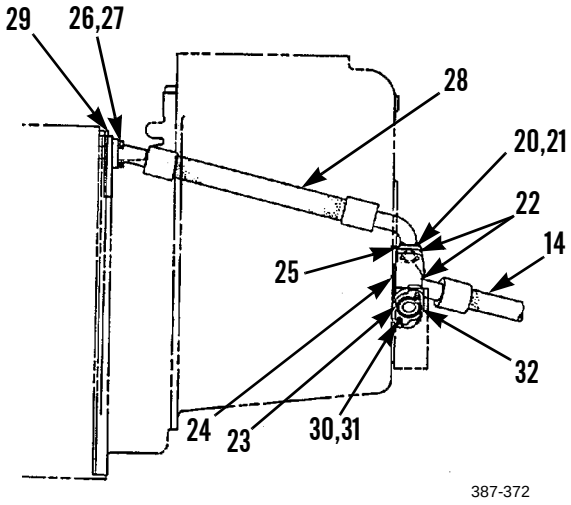
TRANSMISSION OIL COOLER LINES REPLACEMENT - CONTINUED 0108 00

REMOVAL - CONTINUED

5. Remove two capscrews (16) and lockwashers (17) that hold tube assembly (15) to oil cooler outlet. Separate connections and lift out tube assembly. Discard lockwashers.
6. Remove capscrew (1), lockwasher (2), nut (3) and clamp (4) from tube assembly (15). Discard lockwasher. Remove O-rings (18 and 19) from tube assembly ends and discard.



7. Remove eight capscrews (20), washers (21) and four flange halves (22). Disconnect fittings from diverter manifold (23). Remove O-rings (24 and 25) and discard.
8. Remove two capscrews (26) and lockwashers (27). Remove hose assembly (28). Remove O-ring (29) and discard. Discard lockwashers.
9. If required, remove two bolts (30), lockwashers (31) and diverter manifold (23). Remove O-ring (32) and discard.



INSTALLATION

CAUTION

Wipe clean all components, lines and fittings as connections are made to prevent contamination from entering transmission.

NOTE

Lightly coat new O-rings with clean oil before installation.

1. If diverter manifold (23) was removed, position new O-ring (32) on transmission manifold. Place diverter manifold in position and secure with two new lockwashers (31) and bolts (30).
2. Position new O-ring (29) and hose assembly (28). Install two new lockwashers (27) and capscrews (26). Do NOT fully tighten capscrews.
3. Position new O-ring (25), hose assembly (28) and two flange halves (22) on diverter manifold (23). Secure with four capscrews (20) and washers (21).
4. Position new O-ring (24) and hose assembly (14) in position on diverter manifold (23). Secure with four capscrews (20) and washers (21) and tighten.
5. Position new O-ring (19) and tube assembly (15) on oil cooler outlet. Secure with two capscrews (16) and new lockwashers (17).
6. Position new O-ring (18), hose assembly (14) and flange halves (13) to tube assembly (15). Secure with four capscrews (11) and washers (12).
7. Position new O-ring (10) and tube assembly (6) at oil cooler inlet. Secure with two capscrews (7) and new lockwashers (8).
8. Position clamp set (4) around tube assemblies (6 and 15) and secure loosely with capscrew (1), new lockwasher (2) and nut (3).
9. Position new O-ring (9) and tube assembly (6) at torque converter outlet relief valve. Secure with four capscrews (5).
10. Fully tighten capscrew (1) and nut (3).
11. Refill transmission oil (WP 0107 00).
12. Run engine and check for proper operation and leaks.
13. Install floor plates (WP 0171 00).
14. Install seat with vertical adjuster (WP 0174 00).

END OF WORK PACKAGE

TRANSMISSION OIL COOLER REPLACEMENT 0109 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Gasket (25 and 30)

Lockwasher (14)

O-ring (17)

Personnel Required

Two

Equipment Condition

Crankcase guard removed (WP 0157 00)

Engine coolant drained (WP 0065 00)

Transmission oil drained (WP 0107 00)

REMOVAL

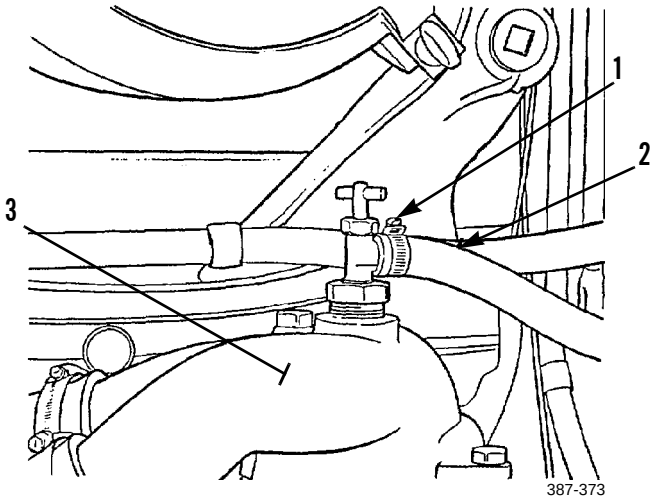
WARNING

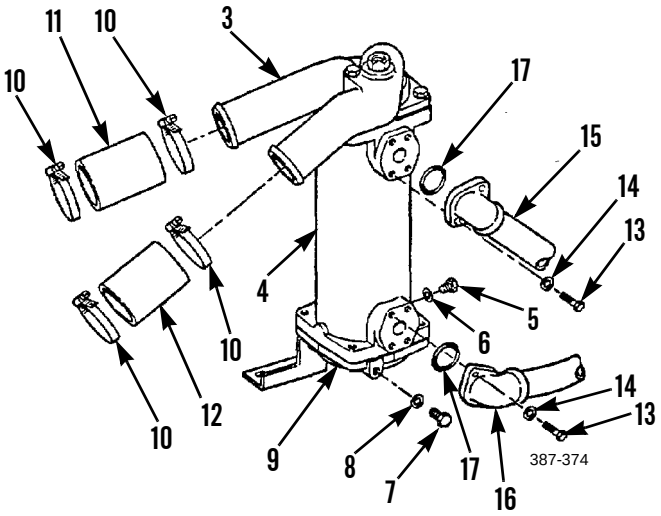
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Use a suitable container to capture residual draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Step 1 is for winterized cab model only.**

1. Loosen clamp (1) and disconnect heater hose (2) from valve on top of head (3).





2. Place a drain pan under oil cooler (4) to catch transmission oil.
3. Remove drain plug (5) and washer (6) from oil cooler (4).
4. Remove drain plug (7) and washer (8) from access cover (9).
5. Loosen four clamps (10) and slide hoses (11 and 12) away from head (3).

CAUTION

Place protective caps or plugs on all transmission system openings to prevent foreign matter from contaminating system.

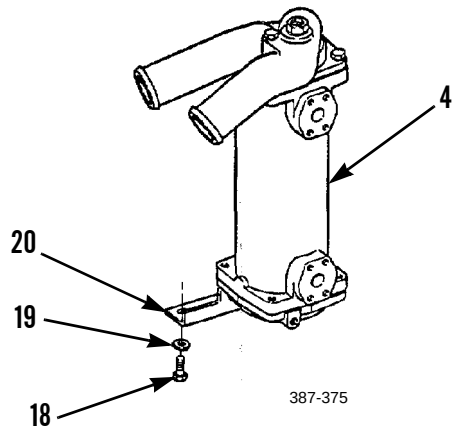
6. Remove four capscrews (13) and lockwashers (14) and slide tubes (15 and 16) away from oil cooler (4). Remove and discard O-rings (17) and lockwashers.

REMOVAL - CONTINUED

NOTE

Oil cooler assembly weighs 72 lb (33 kg).

7. Attach a nylon sling and a suitable lifting device to support oil cooler (4) with assembled parts.
8. Remove two capscrews (18) and washers (19) from bracket (20) and cylinder block.
9. Lift oil cooler (4) from machine. Remove sling and lifting device from oil cooler.

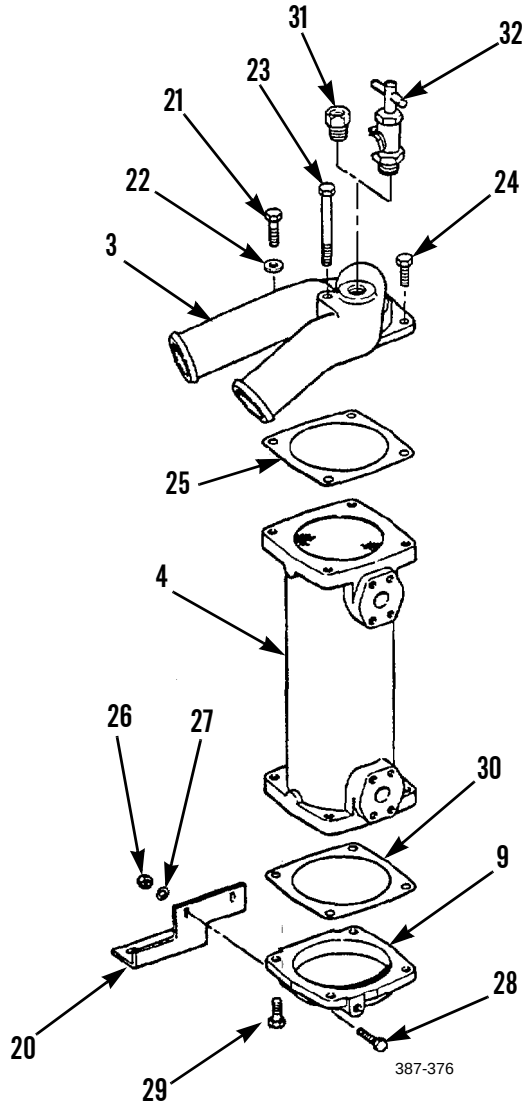


REMOVAL - CONTINUED

NOTE

Perform steps 10-14 as needed to separate head and access cover from oil cooler.

10. Remove two capscrews (21), washers (22), capscrew (23) and capscrew (24).
11. Separate head (3) from oil cooler (4). Remove gasket (25) and discard.
12. Remove two nuts (26), washers (27), capscrews (28) and bracket (20) from access cover (9).
13. Remove four bolts (29) and separate access cover (9) from oil cooler (4). Remove and discard gasket (30).
14. Remove plug (31) (without winterized cab) or valve (32) (with winterized cab) from head (3).



INSTALLATION

NOTE

Perform steps 1-4 as needed to assemble head and access cover to oil cooler.

1. Install plug (31) (without winterized cab) or valve (32) (with winterized cab) into head (3).
2. Position new gasket (30) and access cover (9) on oil cooler (4) and install four bolts (29).
3. Install bracket (20) to bonnet (9) with two capscrews (28), washers (27) and nuts (26).
4. Position new gasket (25) and head (3) on oil cooler (4) and install two capscrews (21), washers (22), capscrew (23) and capscrew (24).

WARNING

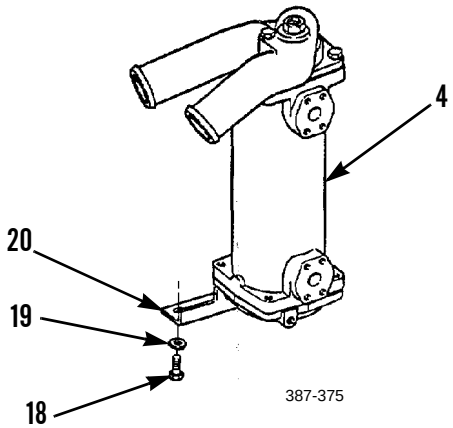
INSTALLATION - CONTINUED

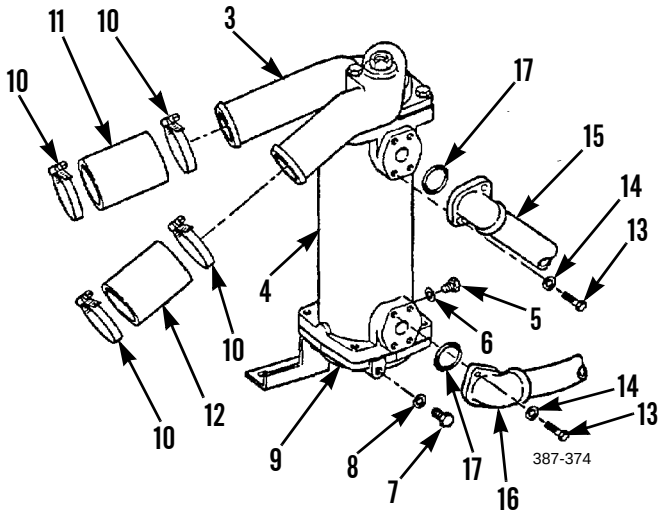
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Oil cooler assembly weighs 72 lb (33 kg).

5. Use a nylon sling and a suitable lifting device to lower oil cooler (4) into position.
6. Install two capscrews (18) and washers (19) to secure bracket (20) to cylinder block.





7. Remove nylon sling and lifting device from oil cooler (4).

CAUTION

Wipe clean all lines and fittings as connections are made to prevent contamination from entering transmission.

NOTE

Lightly coat new O-rings with clean oil before installation.

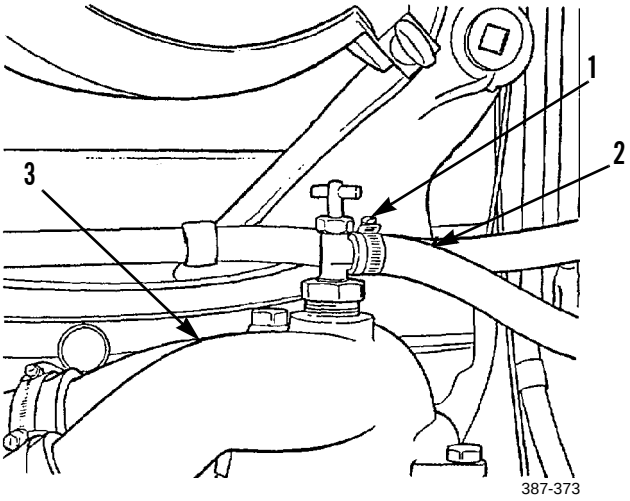
8. Install two new O-rings (17) and tubes (15 and 16) to oil cooler (4) with four new lockwashers (14) and capscrews (13).
9. Slide hoses (11 and 12) into position on head (3).
10. Tighten four clamps (10).
11. Install drain plug (7) and washer (8) to access cover (9).
12. Install drain plug (5) and washer (6) to oil cooler (4).

INSTALLATION - CONTINUED

NOTE

Step 13 is for winterized cab model only.

13. Slide heater hose (2) onto valve on top of head (3) and tighten clamp (1).



14. Refill transmission (WP 0107 00).
15. Refill cooling system (WP 0065 00).
16. Run engine and check for proper operation and leaks.
17. Install crankcase guard (WP 0157 00).

END OF WORK PACKAGE

TRANSMISSION OIL LINES REPLACEMENT 0110 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

O-ring (as required)

Equipment Condition

Floor plates removed (WP 0171 00)

Transmission oil drained, as required (WP 0107 00)

Seat tilted forward, if required for access (TM 5-2410-237-10)

REMOVAL

NOTE

This procedure provides general instructions for replacement of transmission oil lines. The replacement of a specific line should vary only slightly.

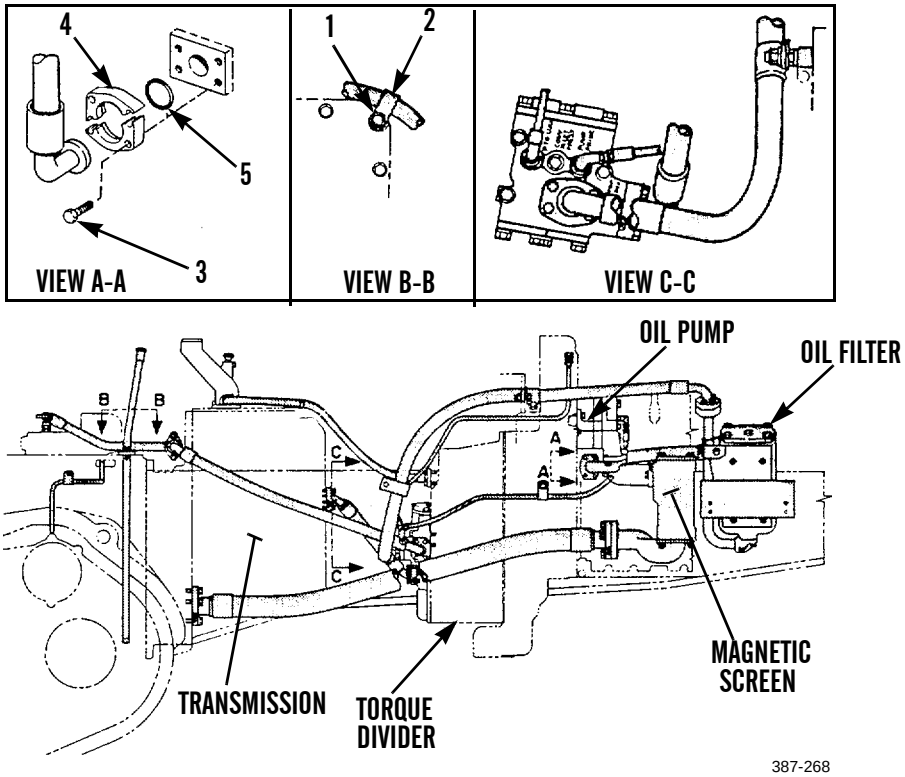
CAUTION

Always cap lines and hoses and/or plug openings when removing transmission oil lines. Contaminants may enter system and cause premature failure.

NOTE

- **Use a suitable container to capture residual draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Tag lines before removal to ensure correct installation.**
- **Hose clamp mounting hardware differs depending on location of clamp.**

1. Remove bolts (1) from hose clamps (2) along entire length of line.
2. Remove capscrews (3) and flanges (4) from each end of line.
3. Remove and discard O-ring (5) from each end of line.
4. Remove oil line from machine.



INSTALLATION

CAUTION

Remove caps and/or plugs from lines and openings and wipe lines and fittings clean as connections are made, to prevent contamination.

1. Route line along its proper path.
2. Install new O-ring (5) onto each end of line.
3. Place flanges (4) into position and install capscrews (3).

NOTE

Hose clamp mounting hardware differs depending on locating of clamp.

4. Install hose clamps (2) and bolts (1) into their previous locations.
6. Add oil to transmission as required (WP 0107 00).
7. Operate machine and check for leaks.
8. Install floor plates (WP 0171 00).

END OF WORK PACKAGE

TRANSMISSION AND STEERING CLUTCH OIL FILTER ASSEMBLY MAINTENANCE 0111 00

THIS WORK PACKAGE COVERS

Service, Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Element, filter (5)

Materials/Parts - Continued

Gasket (19)

O-ring (4, 10, 15 and 22)

References

WP 0107 00

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

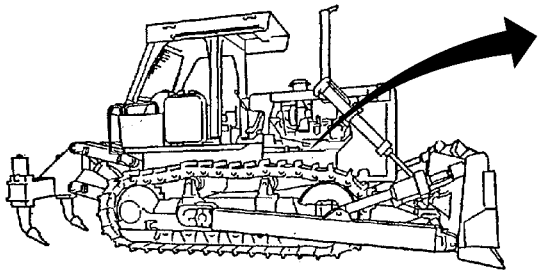
Machine parked on level ground (TM 5-2410-237-10)

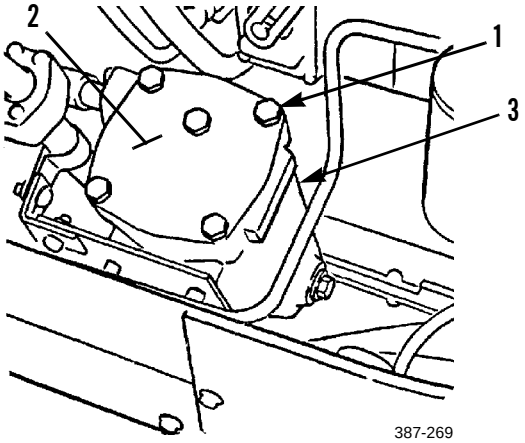
SERVICE

NOTE

Use a suitable container to capture any residual draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned.

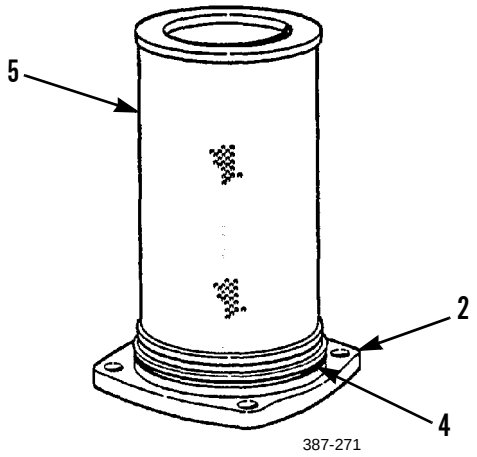
1. Remove four bolts (1) from cover (2) and filter housing (3).





SERVICE - CONTINUED

2. Remove cover (2). Remove O-ring (4) from cover. Discard O-ring. Wipe cover clean with a rag.
3. Remove filter element (5) from filter housing (3). Discard filter element.
4. Siphon transmission oil from filter housing (3). Wipe housing clean with a rag.
5. Install new filter element (5) into filter housing (3).

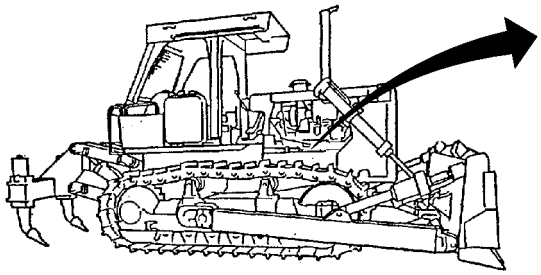


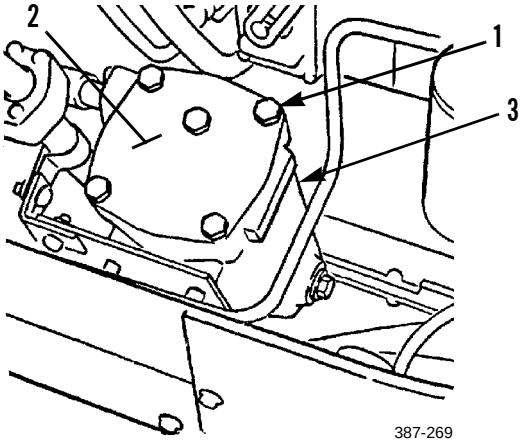
387-271

NOTE

- **Ensure O-ring groove is clean before installation.**
- **Lightly coat new O-ring with clean oil before installation.**

6. Install new O-ring (4) onto cover (2).
7. Install cover (2) to filter housing (3) with four bolts (1).



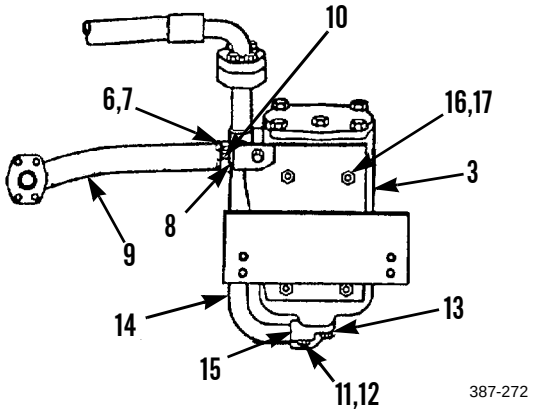


387-269

8. Check transmission oil level and add as needed (WP 0107 00).

REMOVAL

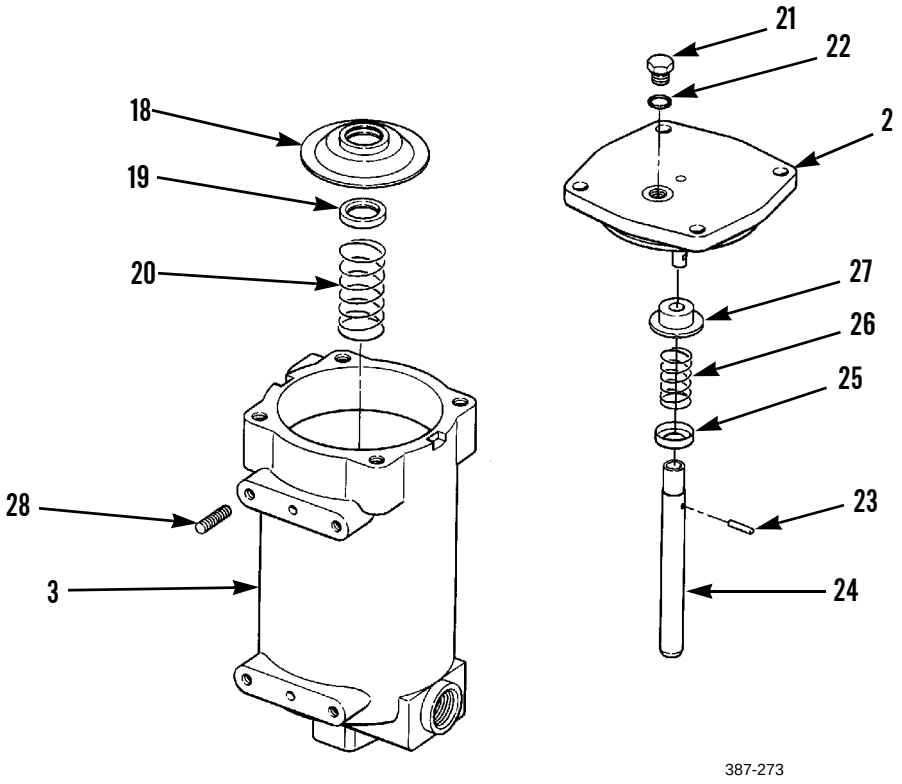
1. Perform *Service* steps 1 through 6.
2. Remove four bolts (6), washers (7), two flanges (8) and hose assembly (9). Remove O-ring (10) from hose assembly and discard.
3. Remove four capscrews (11), washers (12) split flange (13) and tube assembly (14). Remove O-ring (15) from tube assembly and discard.
4. Remove four nuts (16), washers (17) and filter housing (3) from machine.



387-272

DISASSEMBLY

1. Remove retainer (18), gasket (19) and spring (20) from inside of filter housing (3). Discard gasket.
2. Remove plug (21) and O-ring (22) from cover (2). Discard O-ring.
3. Use a hammer and punch to remove pin (23) from tube (24). Remove tube, retainer (25), spring (26) and retainer (27) from cover (2).
4. If necessary, remove four studs (28) from filter housing (3).



ASSEMBLY

1. If removed, install four studs (28) into filter housing (3).

NOTE

Ensure pin is not damaged. If damaged, it must be replaced.

2. Install retainer (27), spring (26), retainer (25) and tube (24) onto cover (2) and install pin (23) into tube.
3. Lubricate new O-ring (22) with clean oil. Install plug (21) and O-ring into cover (2).
4. Install spring (20), new gasket (19) and retainer (18) into filter housing (3).

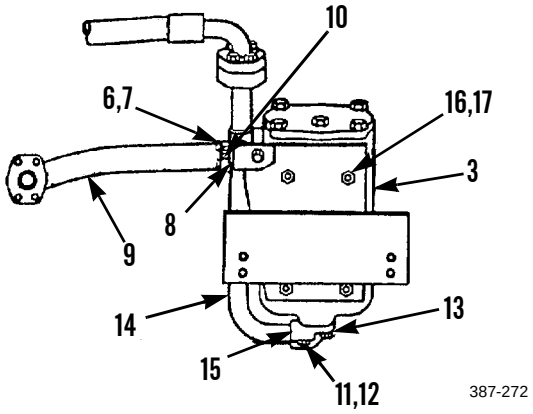
INSTALLATION

1. Place filter housing (3) into position on machine and install four washers (17) and nuts (16).

NOTE

- **Ensure O-ring grooves are clean before installation.**
- **Lightly coat new O-rings with clean oil before installation.**

2. Install new O-ring (15) in tube assembly (14).
3. Install four capscrews (11), washers (12) split flanges (13) and tube assembly (14) to base of filter housing (3).
4. Install new O-ring (10) in hose assembly (9).
5. Install eight capscrews (6), washers (7) two split flanges (8) and hose assembly (9) to filter housing (3).
6. Perform *Service*, steps 5 through 7.
7. Operate machine and check for leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

TRANSMISSION OIL MAGNETIC SCREEN ASSEMBLY MAINTENANCE 0112 00

THIS WORK PACKAGE COVERS

Cleaning Magnetic Screen, Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Materials/Parts - Continued

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

O-ring (6, 13 and 17)

References

WP 0107 00

Equipment Condition

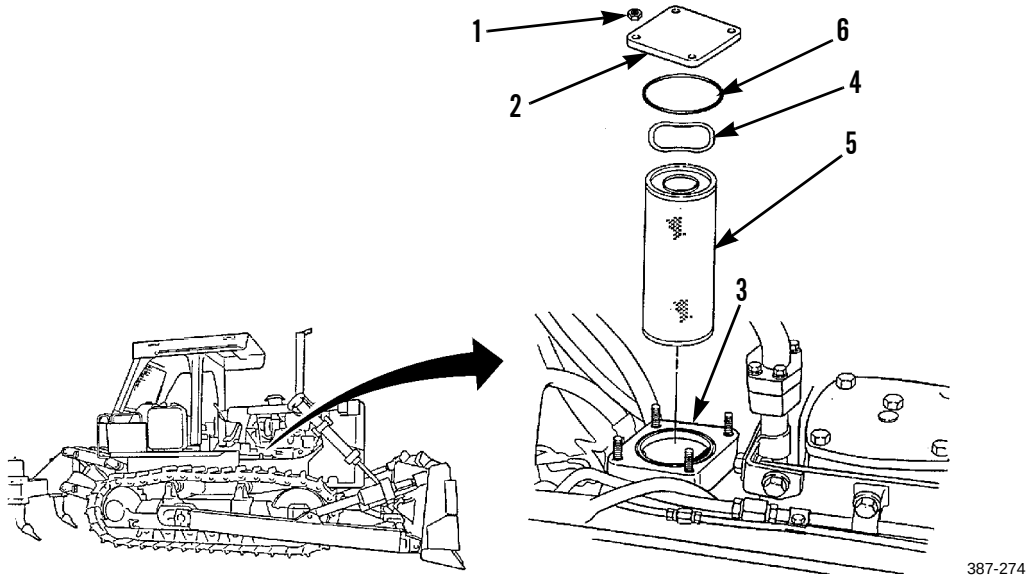
Engine OFF and cool (TM 5-2410-237-10)

CLEANING MAGNETIC SCREEN

NOTE

Use a suitable container to capture any residual draining oil. Dispose of oil, IAW local policy and ordinances.

1. Remove four nuts (1) and cover (2) from housing (3).
2. Remove spring washer (4) from top of magnetic screen assembly (5).
3. Remove O-ring (6) from housing (3) and discard.
4. Remove magnetic screen assembly (5) from housing (3).
5. Siphon transmission oil from magnetic screen housing (3). Wipe housing clean with rag.

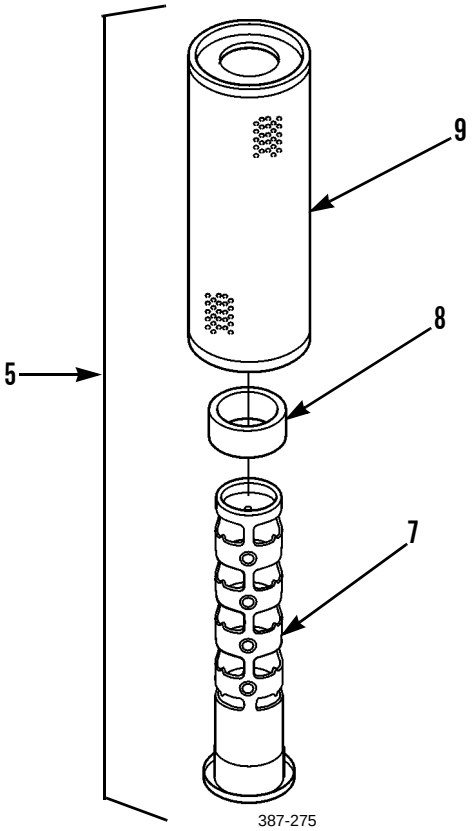


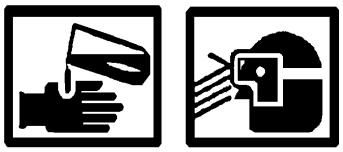
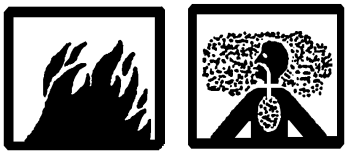
CLEANING MAGNETIC SCREEN - CONTINUED

NOTE

Dropping a magnet may result in demagnetization. Do not drop magnets.

6. Disassemble magnetic screen assembly (5) by removing tube (7) and four magnets (8) from screen (9).
7. Inspect magnetic screen assembly (5) for damage.
8. Inspect tube (7) and magnets (8) for metal shavings, particles and damage. If metal shavings are found, contact Direct Support Maintenance.



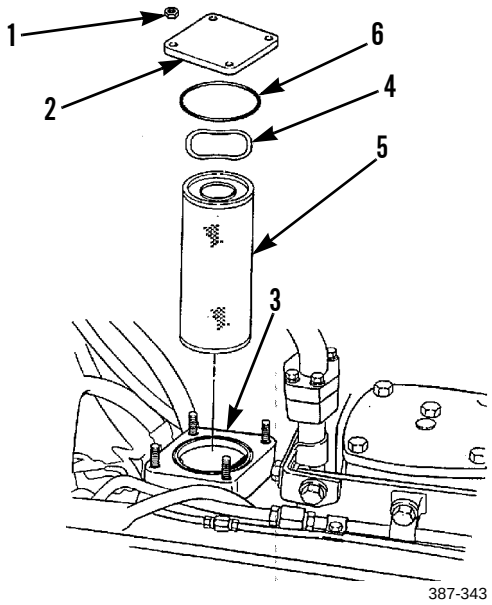

WARNING


- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.**

9. Clean components with solvent cleaning compound and dry using pressurized air.

CLEANING MAGNETIC SCREEN - CONTINUED

10. Place screen (9) over magnets (8) and tube (7) with “THIS SIDE OUT” notice on screen toward top.
11. Install magnetic screen assembly (5) into housing (3).



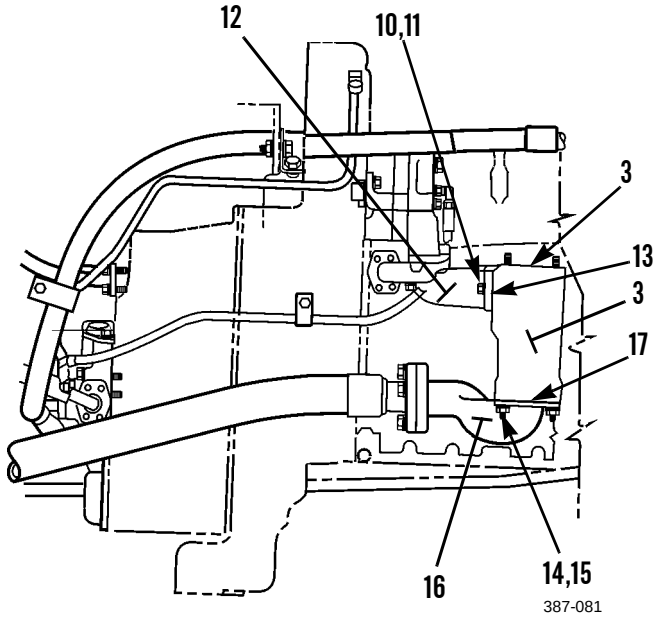
NOTE

Lightly coat new O-ring with clean oil before installation.

12. Install new O-ring (6) in housing (3).
13. Install spring washer (4) on top of magnetic screen assembly (5).
14. Place cover (2) on housing (3) and install four nuts (1).

REMOVAL

1. Perform *Cleaning Magnetic Screen*, steps 1 through 5.
2. Remove two capscrews (10) and washers (11) from elbow (12) and housing (3). Remove and discard O-ring (13).
3. Remove four nuts (14) and washers (15) from base (16) and housing (3).
4. Remove housing (3) from machine.
5. Remove O-ring (17) from base (16) and discard.



NOTE

Lightly coat new O-rings with clean oil before installation.

INSTALLATION

1. Install new O-ring (17) to base (16).
2. Place housing (3) on base (16) and install four washers (15) and nuts (14).
3. Install new O-ring (13) to elbow (12).
4. Install elbow (12) to housing (3) with two capscrews (10) and washers (11).
5. Perform *Cleaning Magnetic Screen*, steps 6 through 14.
6. Check transmission oil level and add as needed (WP 0107 00).
7. Operate machine and check for leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

TRANSMISSION OIL SAMPLING VALVE REPLACEMENT 0113 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24 or 25 WP 0250 00)

Materials/Parts - Continued

O-ring (2)

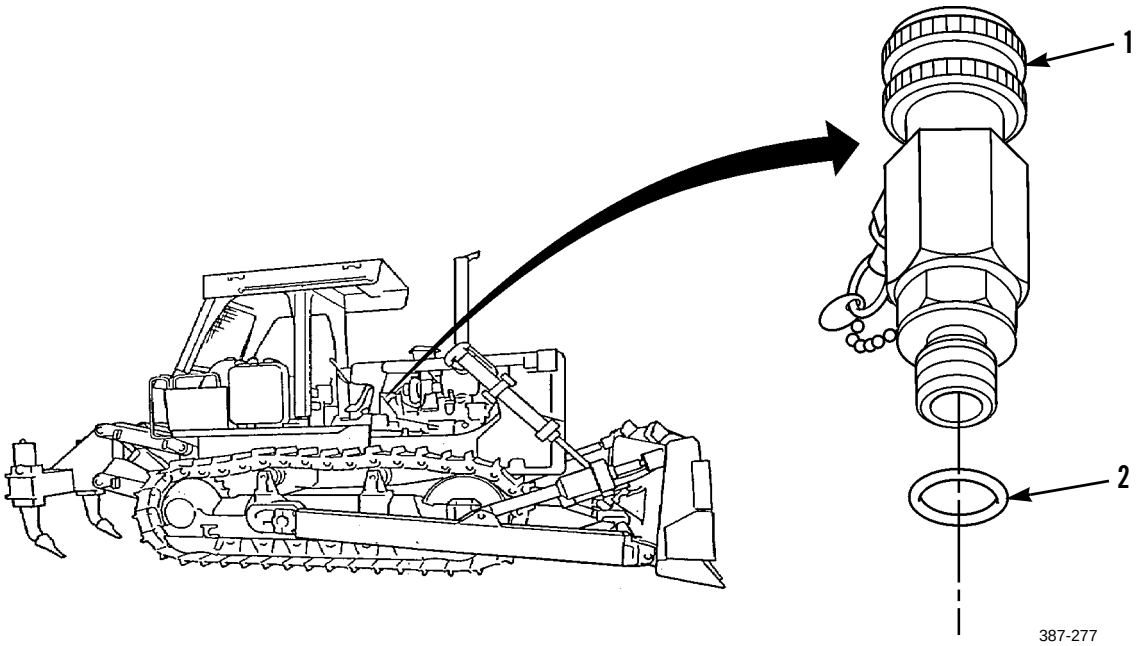
Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Transmission cool (TM 5-2410-237-10)

REMOVAL

1. Remove oil sampling valve (1) from top of transmission oil pump on right side of engine compartment.
2. Discard O-ring (2).



INSTALLATION

NOTE

Lightly coat new O-ring with clean oil before installation.

1. Install new O-ring (2) on oil sampling valve (1).
2. Install oil sampling valve (1) onto transmission oil pump on right side of engine compartment.
3. Check oil sampling valve for proper operation and leaks.

END OF WORK PACKAGE

TORQUE DIVIDER OUTPUT SHAFT SEAL REPLACEMENT 0114 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Compound, silicone, RTV (Item 10, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Seal (5)

References

WP 0107 00

WP 0171 00

Equipment Condition

Driveshaft removed (WP 0129 00)

REMOVAL

CAUTION

Wipe area clean around output shaft flange. Debris falling into torque divider could result in premature failure.

NOTE

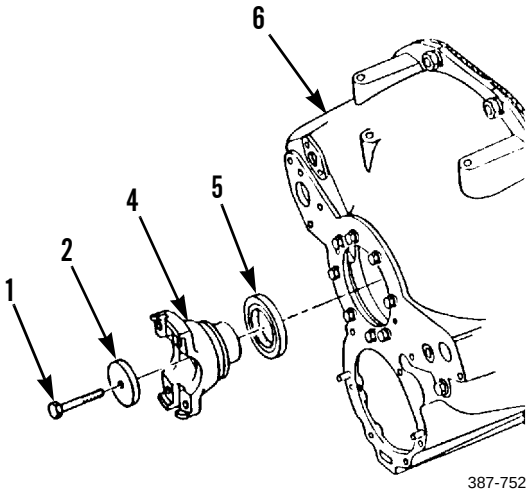
Use a suitable container to catch any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

1. Remove capscrew (1) and washer (2) from output shaft (3)

NOTE

Retain output shaft to ensure it does not fall out.

2. Remove flange (4) from output shaft (3).
3. Remove seal (5) from torque divider housing (6). Discard seal.



INSTALLATION

NOTE

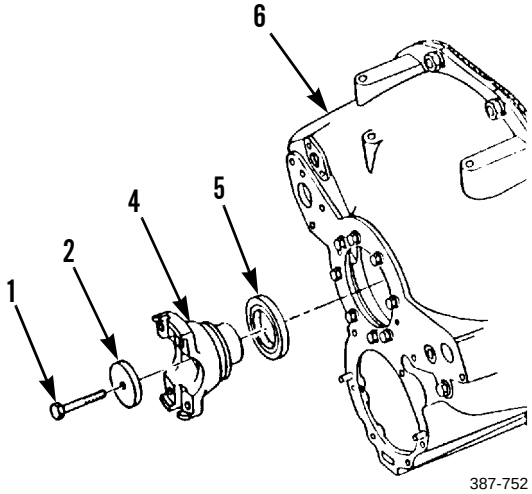
- **Apply clean grease to new seal prior to installation.**
- **Ensure flat side of seal faces transmission when installing.**

1. Install new seal (5) into torque divider housing (6).
2. Install flange (4) onto output shaft (3) until fully seated.

WARNING

Exposure to silicone RTV compound may be hazardous to your health. Contact with eyes can cause severe irritation and burns. Compound can be absorbed into the skin and can cause irritation or skin sensitization. Inhalation of vapors can cause respiratory tract irritation; prolonged inhalation can result in an allergic reaction. Vapors are combustible. Do not use near open flame. Wear eye and skin protection and avoid inhalation of vapors. Use only in a well-ventilated area. Failure to follow this warning can cause injury or death.

3. Apply silicone RTV compound to underside of washer (2). Install washer and capscrew (1). Tighten capscrew to 40 lb-ft (54 Nm).
4. Install drive shaft (WP 0129 00). Do NOT install floor plates.
5. Check level of oil in transmission and add as needed (WP 0107 00).
6. Test drive and check torque divider for proper operation and leaks.
7. Install floor plates (WP 0171 00).



387-752

END OF WORK PACKAGE

TORQUE DIVIDER REPLACEMENT 0115 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Link, lifting (Item 51, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 400 lb capacity

Bolt, 5/8-11 x 1-1/2 in

Materials/Parts

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Wire, nonelectrical (Item 40, WP 0249 00)

Gasket (15)

Screw, forcing, 3/8 in. - 16NC (5)

Lockwasher (4)

Personnel Required

Two

Equipment Condition

ROPS removed (WP 0164 00)

Floor plates removed (WP 0171 00)

Dash assembly removed (WP 0160 00)

Equipment Condition - Continued

Seat and seat base assembly removed (WP 0172 00)

Brake pedal assembly removed (WP 0146 00)

Driveshaft removed (WP 0129 00)

Transmission guard removed (WP 0157 00)

Steering clutch linkage that crosses over torque divider disconnected (WP 0148 00)

Brake lock linkage that crosses over torque divider disconnected (WP 0149 00)

Torque divider (WP 0106 00) and transmission oil drained (WP 0107 00)

Transmission oil lines disconnected from torque divider (WP 0110 00)

Transmission oil cooler lines disconnected from torque divider (WP 0108 00)

Torque converter outlet relief valve removed (WP 0120 00)

Transmission relief valve removed (WP 0119 00)

Torque divider scavenge pump removed (WP 0121 00)

REMOVAL

1. Fasten two lifting links (1) with 5/8-11 x 1-1/2 in bolts to holes on top of torque divider (2).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

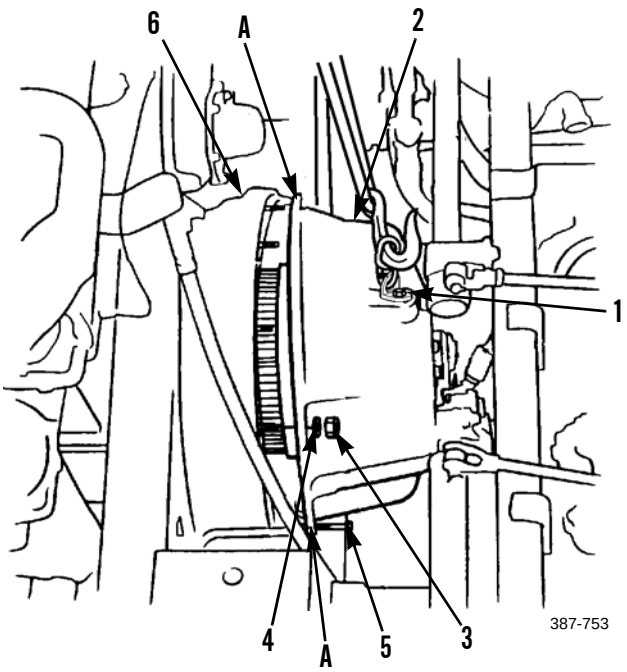
- **Torque divider weighs 300 lb (136 kg).**
- **Use a suitable container to catch any oil that may drain from torque divider. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

2. Fasten a nylon sling and a suitable lifting device to lifting links (1).
3. Remove 12 nuts (3) and lockwashers (4). Discard lockwashers.
4. Install two 3/8 in. -16NC forcing screws (5) into torque divider (2) at locations A.
5. Slowly turn forcing screws (5) in until enough pressure is applied to separate torque divider (2) from flywheel housing (6).

NOTE

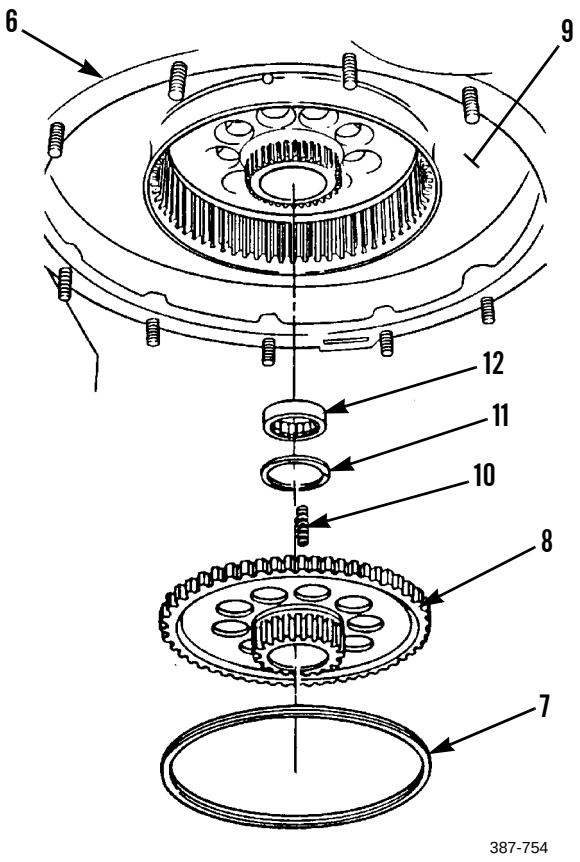
Do NOT remove torque divider at this point.

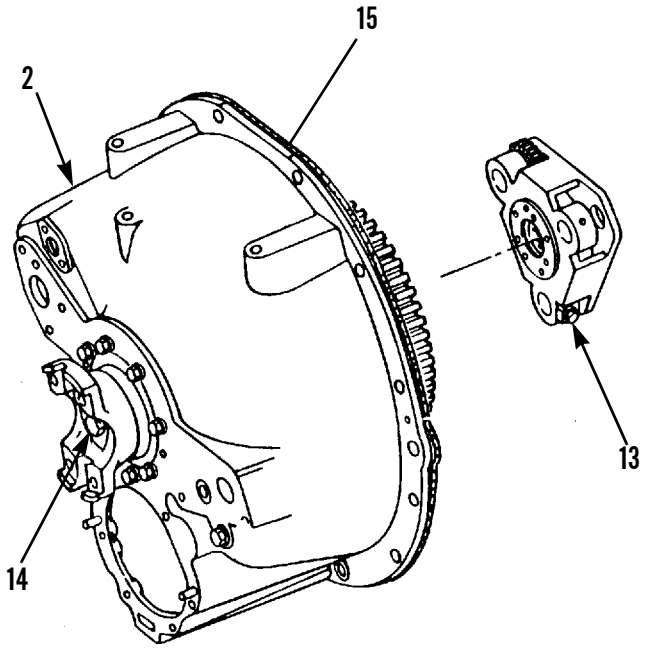
6. Back torque divider (2) away from flywheel housing (6) just enough to slide a piece of wire around planetary carrier. Connect each end of wire to forcing screws (5). This will ensure that planetary carrier assembly does not fall when torque divider is removed.
7. Slowly back torque divider (2) away from flywheel housing (6) and lift out torque divider. Remove forcing screws (5) from torque divider.



REMOVAL - CONTINUED

8. Remove ring (7) and gear (8) from flywheel (9).
9. Remove three springs (10) from behind gear (8).
10. Remove retaining ring (11) from flywheel (9).
11. Remove bearing (12) from flywheel (9).
12. Remove wire from around torque divider (2) and carefully slide planetary carrier assembly (13) off of output shaft (14).
13. Remove gasket (15) from torque divider (2) or flywheel housing (6). Discard gasket.





INSTALLATION

1. Install bearing (12) into flywheel (9).
2. Install retaining ring (11) and three springs (10) into flywheel (9).
3. Install gear (8) and ring (7) into flywheel (9). Be sure to align marks between ring and flywheel.
4. Slide planetary carrier assembly (13) onto output shaft (14) and wrap a wire around torque divider (2) and planetary carrier assembly to prevent assembly from sliding off shaft during installation.

NOTE

Ensure mating surfaces on flywheel housing (6) and torque divider (2) are clean prior to installing new gasket.

5. Install two lifting links (1) with 5/8-11 x 1-1/2 in bolts into housing of torque divider (2). Place new gasket (15) on flywheel housing (6).

INSTALLATION - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

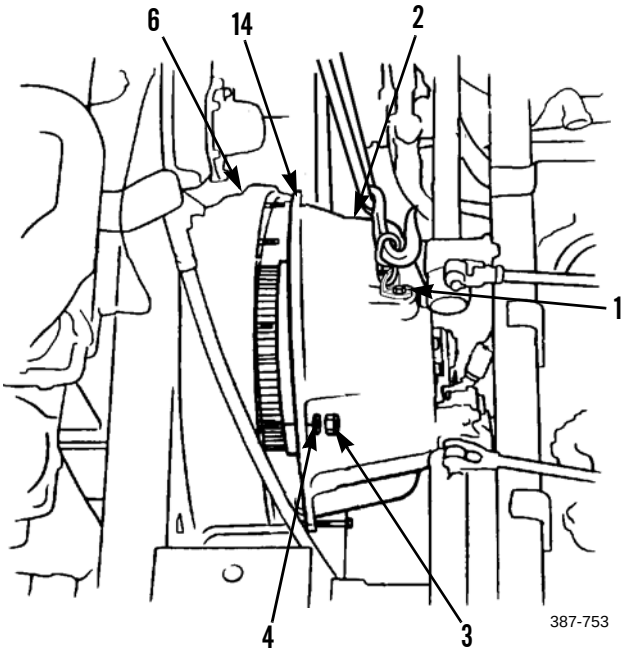
Torque divider weighs 300 lb (136 kg).

6. Fasten a nylon sling and a suitable lifting device to lifting links (1) and carefully lift torque divider (2) into position.
7. Slide torque divider (2) onto studs on flywheel housing (6). Remove wire.

NOTE

Carefully maneuver torque divider onto flywheel housing so that planetary gears engage with flywheel.

8. Install 12 new lockwashers (4) and nuts (3). Tighten nuts to 75 lb-ft (102 Nm).
9. Remove lifting equipment, two bolts and lifting links (1) from top of torque divider (2).
10. Install torque divider scavenge pump (WP 0121 00).
11. Install transmission relief valve (WP 0119 00).
12. Install torque converter outlet relief valve (WP 0120 00).
13. Connect transmission oil lines to torque divider (WP 0110 00).
14. Connect transmission oil cooler lines to torque divider (WP 0108 00).
15. Connect brake lock linkage (WP 0149 00).
16. Connect steering clutch linkage (WP 0148 00).
17. Install driveshaft (WP 0129 00).
18. Install brake pedal assembly (WP 0146 00).
19. Install seat and seat base assembly (WP 0172 00).
20. Install dash assembly (WP 0160 00).
21. Install floor plates (WP 0171 00).
22. Install ROPS (WP 0164 00).
23. Install transmission guard (WP 0157 00).
24. Refill torque divider (WP 0106 00) and transmission (WP 0107 00).
25. Run engine and test drive in all speeds.



END OF WORK PACKAGE

TRANSMISSION ASSEMBLY REPLACEMENT 0116 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Link, lifting (Item 51, WP 0250 00)

Stand, transmission (Item 117, WP 0250 00)

Lifting equipment, 2,000 lb capacity

Bolt, 5/8-11 x 1-1/2 in

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Compound, silicone, RTV (Item 10, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Gasket (7)

Lockwasher (6)

References

WP 0110 00

WP 0146 00

WP 0153 00

WP 0154 00

References - Continued

WP 0110 00

WP 0189 00

WP 0203 00

Personnel Required

Three

Equipment Condition

Machine parked on level surface (TM 5-2410-237-10)

Disconnect battery cables (WP 0101 00)

Floor plates removed (WP 0171 00)

Transmission system oil drained (WP 0107 00)

Transmission guard removed (WP 0157 00)

Driveshaft and U-joint removed (WP 0129 00)

ROPS removed (WP 0164 00)

Winterized cab removed, if equipped (WP 0168 00)

Seat and seat base assembly removed (WP 0172 00)

Transmission selector linkage removed (WP 0104 00)

Hydraulic tank mounting brackets and plates removed (WP 0156 00)

Steering clutch levers and linkage removed (WP 0148 00)

REMOVAL

CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of transmission could result in premature failure.

NOTE

- **Tag wires and lines as needed, to ensure correct installation.**
- **Use a suitable container to catch any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **For tractors with ripper, ensure divertor manifold is clear of transmission.**

1. Disconnect vent tube (1) from torque divider case.
2. Disconnect two rods from steering brake at beam (WP 0146 00).
3. Remove two control rods from steering clutch control valve (WP 0154 00).
4. Disconnect hose from hydraulic pressure control valve (WP 0203 00).
5. Disconnect oil lines from transmission and manifold (WP 0110 00).
6. For machines equipped with winch, disconnect hose from gear pump (WP 0189 00).
7. Install four lifting links (2) with 5/8-11 x 1-1/2 in. bolts to bosses on transmission assembly (3).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Transmission assembly weighs 1,150 lb (522 kg).

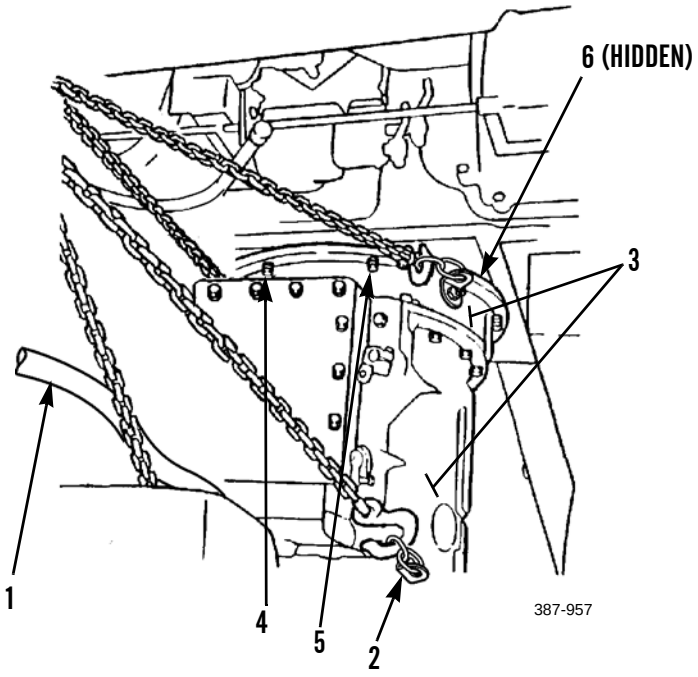
8. Attach a suitable lifting device to lifting links (2) on transmission assembly (3) and take up slack.
9. Disconnect hose from steering clutch relief valve (WP 0153 00).

CAUTION

Transmission assembly must be lifted so that locator studs are level. This prevents binding and damage to bottom locator studs.

10. Remove ten nuts (4) and lockwashers (5) from transmission assembly (3) and bevel gear case studs. Discard lockwashers.
11. Remove transmission assembly (3) from machine. Place assembly on transmission stand or suitable cribbing.
12. Remove gasket (6) from bevel gear case studs. Discard gasket.

REMOVAL - CONTINUED



INSTALLATION

1. Install four lifting links (2) with 5/8-11 x 1-1/2 in. bolts to bosses on transmission assembly (3).

Exposure to silicone RTV compound may be hazardous to your health. Contact with eyes can cause severe irritation and burns. Compound can be absorbed into the skin and can cause irritation or skin sensitization. Inhalation of vapors can cause respiratory tract irritation; prolonged inhalation can result in an allergic reaction. Vapors are combustible. Do not use near open flame. Wear eye and skin protection and avoid inhalation of vapors. Use only in a well-ventilated area. Failure to follow this warning can cause injury or death.

2. Apply silicone RTV compound to both sides of new gasket (6).
3. Place new gasket (6) on bevel gear case studs.

INSTALLATION - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

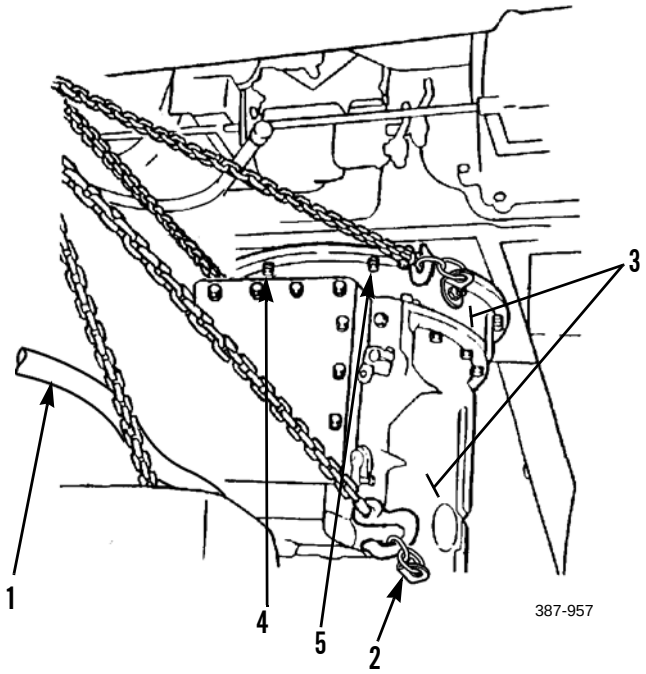
CAUTION

Transmission assembly must be lifted so that locator studs are level. This prevents binding and damage to bottom locator studs.

NOTE

Transmission and transfer gears assembly weighs 1,150 lb (522 kg).

4. Attach a suitable lifting device to lifting links (2) on transmission assembly (3).
5. Install six new lockwashers (5) and nuts (4) to secure transmission assembly (3) to bevel gear case.
6. Connect hose to steering clutch relief valve (WP 0154 00).
7. Remove lifting device, four bolts and lifting links (2).
8. For tractors equipped with a winch, connect hose to gear pump. (WP 0189 00).
9. Connect oil lines to transmission and manifold (WP 0110 00).



INSTALLATION - CONTINUED

10. Connect hose to hydraulic pressure control valve (WP 0203 00).
11. Install two control rods to steering clutch control valve (WP 0154 00).
12. Connect vent tube (1) to torque divider case.
13. Connect two rods to steering brake at crossbeam (WP 0146 00).
14. Connect steering clutch levers and linkage (WP 0148 00).
15. Install hydraulic tank mounting brackets and plates (WP 0156 00).
16. Install transmission selector linkage (WP 0104 00).
17. Connect battery cables (WP 0101 00).
18. Install seat base and assembly (WP 0172 00).
19. If removed, install winterized cab (WP 0168 00).
20. Install ROPS (WP 0164 00).
21. Install driveshaft and U-joint (WP 0129 00).
22. Install transmission guard (WP 0157 00).
23. Fill transmission assembly and bevel gear case (WP 0107 00).
24. Run engine and test drive transmission assembly in all speeds. Check for leaks.
25. Install floor plates (WP 0171 00).

END OF WORK PACKAGE

TRANSMISSION CONTROL VALVES REPLACEMENT 0117 00

THIS WORK PACKAGE COVERS

Removal, Installation, Relief Valve Setting Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (8 and 21)

Materials/Parts - Continued

Lockwasher (2, 7, 10, 14 and 19)

O-ring (25, 26, 31, 32, 34, 37 and 56)

References

WP 0122 00

Equipment Condition

Floor plates removed (WP 0171 00)

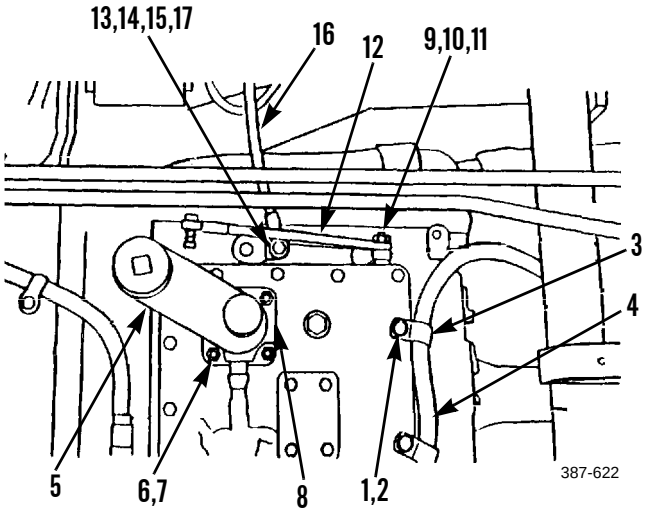
Seat and seat base assembly removed (WP 0172 00)

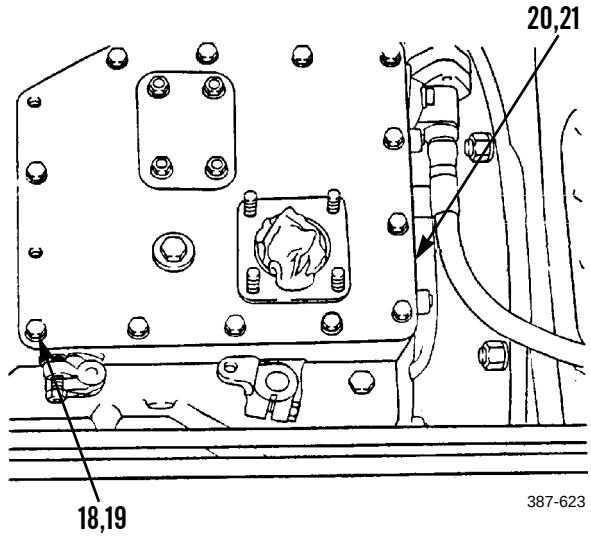
REMOVAL

CAUTION

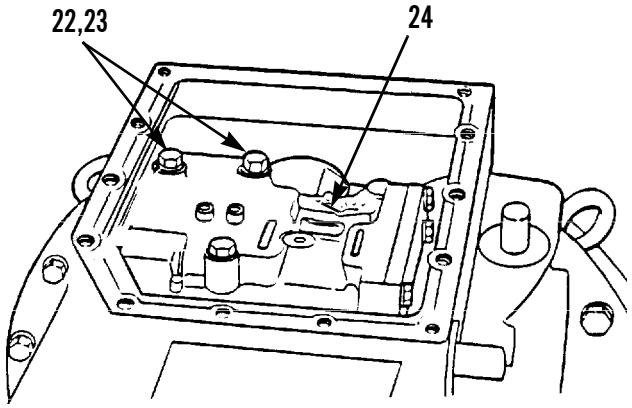
Wipe area clean around all transmission components before removal. Cap oil lines and plug openings after removing lines. Contamination of transmission could result in premature failure.

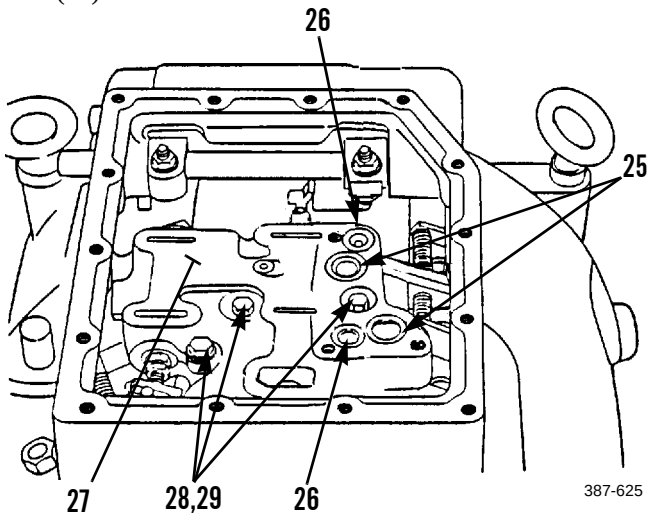
1. Remove two capscrews (1), lockwashers (2) and clips (3). Discard lockwashers.
2. Disconnect hose assembly (4) from spout (5). Plug end of hose assembly.
3. Remove four nuts (6), lockwashers (7) and spout (5). Discard lockwashers. Remove and discard gasket (8).
4. Remove nut (9), lockwasher (10) and capscrew (11) and disconnect rod (12) from transmission. Discard lockwasher.
5. Remove nut (13), lockwasher (14) and capscrew (15) and disconnect rod (16) from transmission. Discard lockwasher. Remove nut (17).
6. Remove 14 capscrews (18), lockwashers (19) and cover (20). Discard lockwashers. Remove and discard gasket (21).





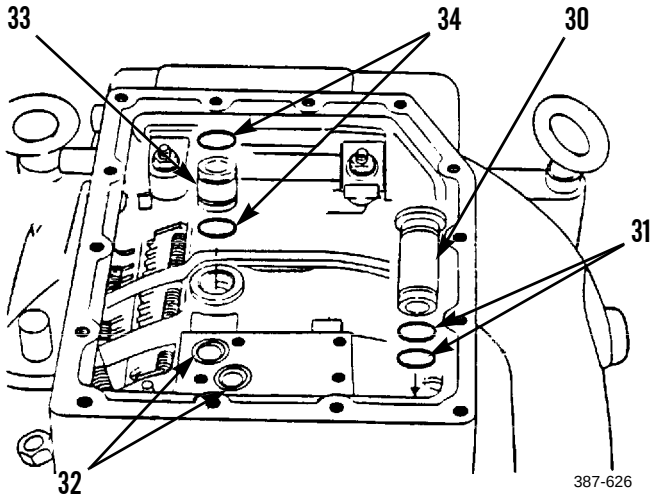
7. Remove three capscrews (22), washers (23) and pressure control valve (24) from transmission.
8. Remove four O-rings (25 and 26) from top of selector valve (27). Discard O-rings.
9. Remove three capscrews (28), washers (29) and selector valve (27) from transmission.





REMOVAL - CONTINUED

10. Remove sleeve (30) from transmission. Remove two O-rings (31) from sleeve. Discard O-rings.
11. Remove two O-rings (32) and discard.
12. Remove three sleeves (33). Remove two O-rings (34) from each sleeve. Discard O-rings.



INSTALLATION

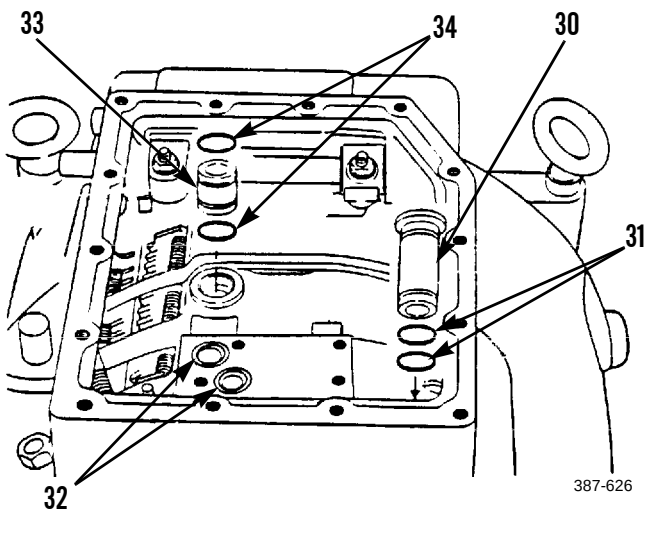
CAUTION

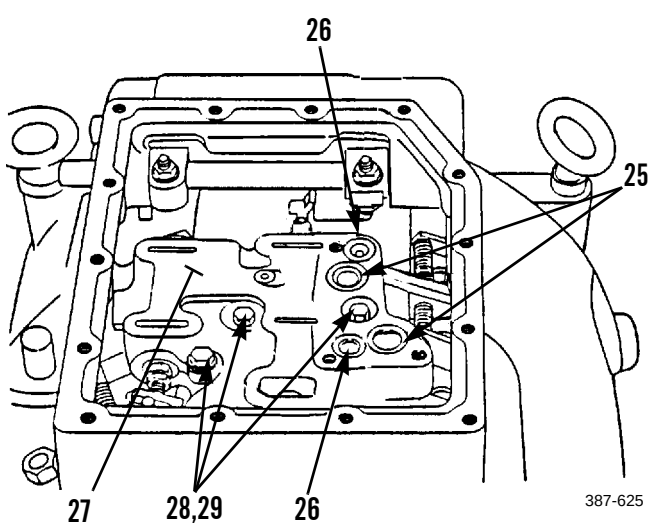
Ensure all components are clean before installation. Perform installation in a clean work environment. Contamination of transmission system could result in premature failure.

NOTE

Lightly coat all components with clean oil before installation.

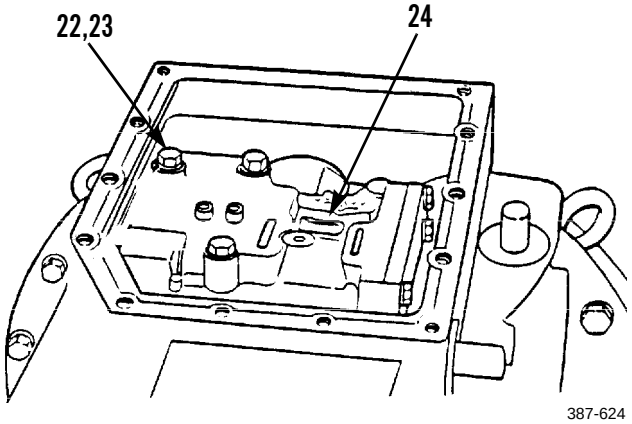
1. Install two new O-rings (34) onto each sleeve (33). Install three sleeves into transmission.
2. Install two new O-rings (32).
3. Install two new O-rings (31) onto sleeve (30). Install sleeve in transmission.
4. Position selector valve (27) in transmission. Ensure that sleeves (30 and 33) align with holes in selector valve and that links on ends of valve spools are in position on control levers.
5. Secure selector valve (27) with three washers (29) and capscrews (28). Tighten capscrews to 35 lb-ft (47 Nm).
6. Install four new O-rings (25 and 26) into top of selector valve (27).

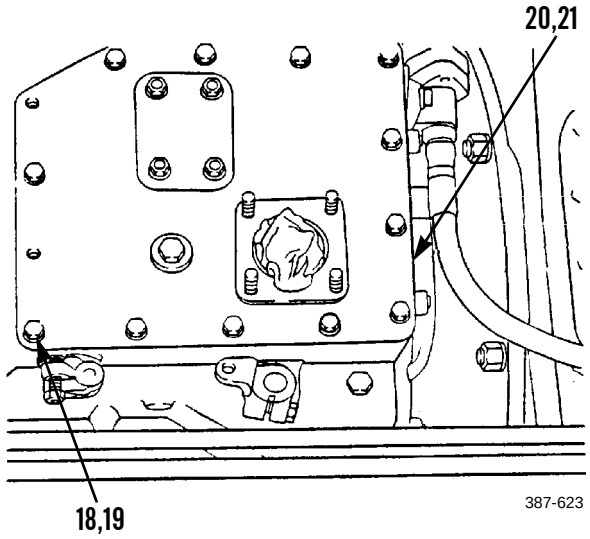




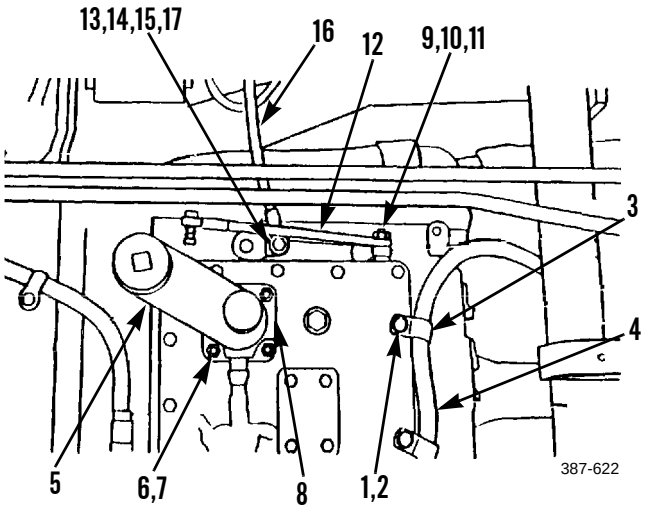
INSTALLATION - CONTINUED

7. Position pressure control valve (24) on top of selector valve (27). Secure to transmission with three washers (23) and capscrews (22). Tighten capscrews to 35 lb-ft (47 Nm).
8. Install new gasket (21) and cover (20) to transmission with 14 new lockwashers (19) and capscrews (18).





9. Install nut (17) and rod (16). Install capscrew (15), new lockwasher (14) and nut (13).
10. Install rod (12) onto transmission with capscrew (11), new lockwasher (10) and nut (9).
11. Adjust rods (12 and 16) as required.
12. Install new gasket (8) and spout (5) with four new lockwashers (7) and nuts (6).
13. Remove plug from end of hose assembly (4). Connect hose assembly to spout (5).
14. Secure hose assembly (4) to transmission with two clips (3), new lockwashers (2) and capscrews (1).



INSTALLATION - CONTINUED

15. Check and adjust relief valve setting. Refer to *Relief Valve Setting Adjustment* below.
16. Install seat and seat base assembly (WP 0172 00).
17. Install floor plates (WP 0171 00).

RELIEF VALVE SETTING ADJUSTMENT

1. Perform direction clutch test (primary setting) (WP 0122 00).
   a. Each 0.035 in. (0.90 mm) spacer will change setting by 10.9 psi (75 kPa).
   b. Each 0.010 in. (0.25 mm) spacer will change setting by 2.9 psi (20 kPa).

CAUTION

Wipe valve body clean prior to disassembly. Perform disassembly in a clean work environment. Contamination of transmission could result in premature failure.

NOTE

Disassembly of pressure control valve is authorized to add or remove spacers in order to adjust relief valve setting.

2. Add or remove spacers in pressure control valve if required to adjust relief valve setting:
   a. Remove four capscrews (35) and cover (36) from pressure control valve body (37).

NOTE

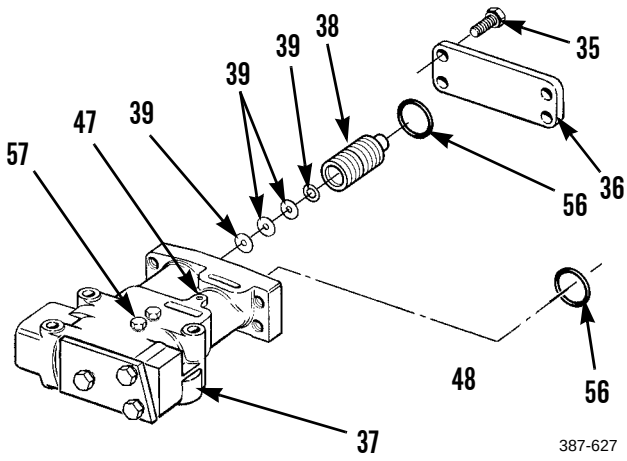
Note quantity and size of spacers.

   b. Remove piston (38) and spacers (39) from valve body (37).
   c. Remove and discard two O-rings (40).
   d. Add or remove spacers (39) to achieve correct relief valve setting.

NOTE

Lightly coat new O-rings with clean oil before installation.

   e. Install piston (38) and two new O-rings (40).
   f. Install cover (36) with four capscrews (35).



PRESSURE CONTROL VALVE

3. Operate machine and check transmission for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

TRANSMISSION OIL PUMP REPLACEMENT 0118 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Lockwasher (5 and 11)

O-ring (18 and 22)

References

WP 0107 00

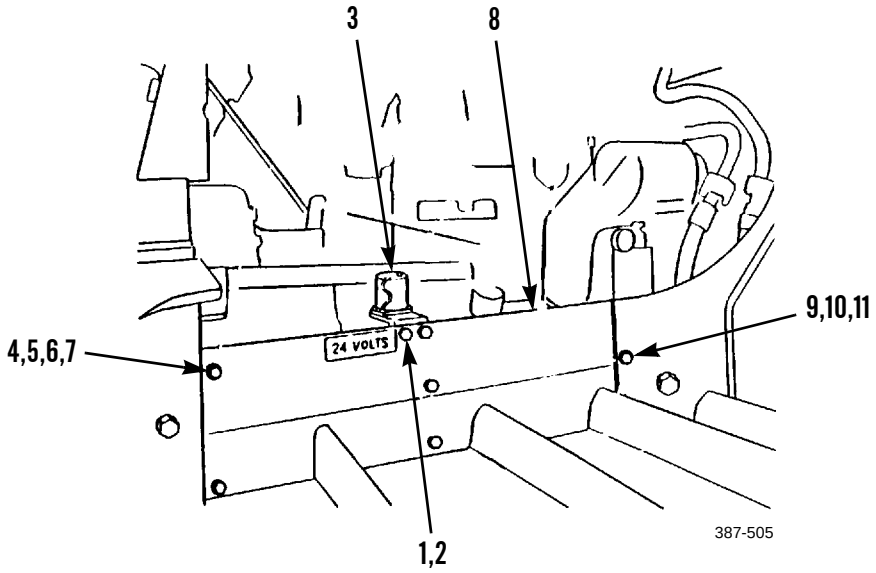
Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

Transmission oil sampling valve removed (WP 0113 00)

REMOVAL

1. Remove two nuts (1), four washers (2) and move NATO starting receptacle (3) aside.
2. Remove two nuts (4), lockwashers (5), washers (6) and capscrews (7) from R.H. guard assembly (8). Discard lockwashers.
3. Remove three capscrews (9), washers (10) and lockwashers (11) from R.H. guard assembly (8). Remove guard assembly. Discard lockwashers.



REMOVAL - CONTINUED

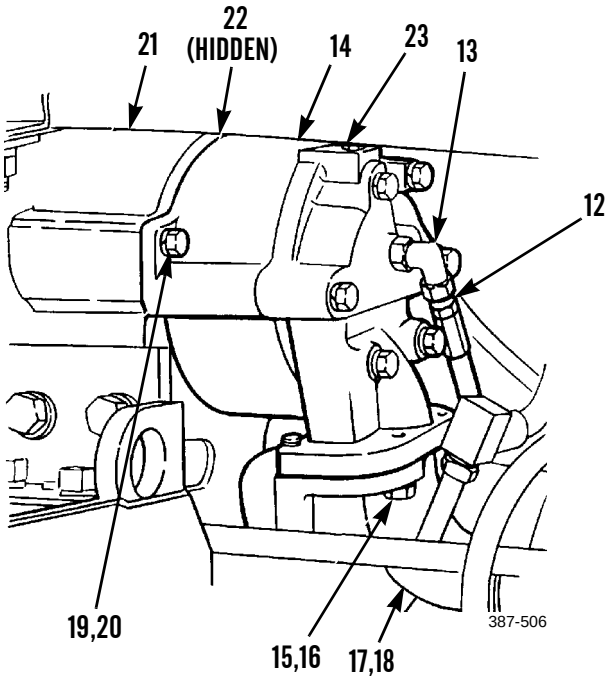
CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap lines and plug openings after removing lines. Contamination of transmission could result in premature failure.

NOTE

- **Use a suitable container to capture any residual oil in lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Tag lines to ensure correct installation.**

4. Disconnect vent line (12) from elbow (13) on pump (14). Remove elbow.
5. Remove four capscrews (15), washers (16), elbow (17) and O-ring (18) from pump (14). Discard O-ring.
6. Remove remaining elbows from pump (14).
7. Remove two capscrews (19) and washers (20) from pump (14).
8. Remove pump (14) from flywheel housing (21). Remove O-ring (22) and discard.



INSTALLATION

NOTE

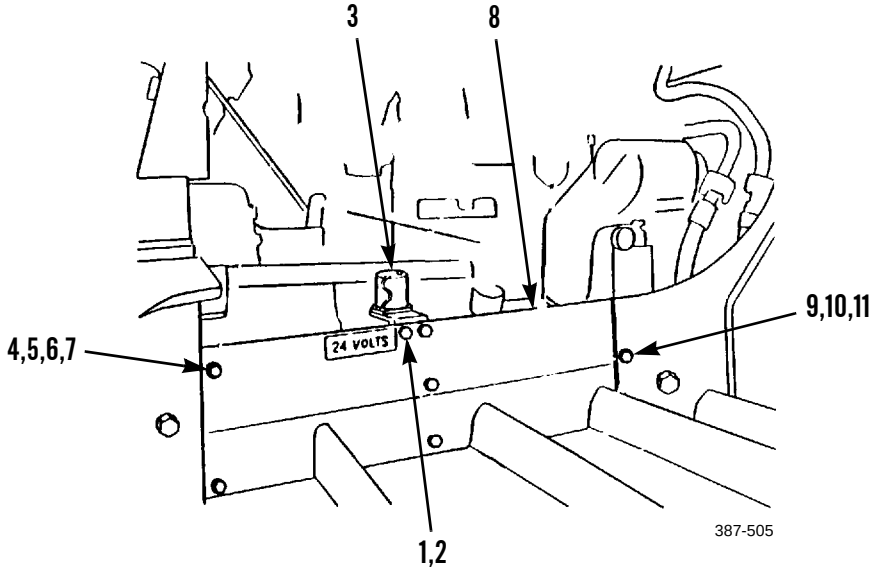
- **Ensure all mating surfaces on pump and flywheel housing are clean and dry before installation.**
- **Ensure splines on drive gear of oil pump are free of burrs.**
- **Mesh splines on drive gear of oil pump with flywheel teeth. Ensure they mesh together smoothly.**
- **Lightly coat new O-rings with clean oil before installation.**

1. Install new O-ring (22) and pump (14) on flywheel housing (21) with two washers (20) and capscrews (19).
2. Install new O-ring (18) and elbow (17) to pump (14) with four washers (16) and capscrews (15).

TRANSMISSION OIL PUMP REPLACEMENT - CONTINUED **0118 00**

INSTALLATION - CONTINUED

3. Install remaining elbows on pump (14).
4. Install elbow (13) on transmission oil pump (14).
5. Connect vent line (12) to elbow (13).
6. Install R.H. guard assembly (8) with three new lockwashers (11), washers (10) and capscrews (9).
7. Install two new lockwashers (5), washers (6), capscrews (7) and nuts (4) to R.H. guard assembly (8).
8. Position NATO starting receptacle (3) and secure with four washers (2) and two nuts (1).
9. Install transmission oil sampling valve (WP 0113 00).
10. Check transmission oil level and add as required (WP 0107 00).



END OF WORK PACKAGE

TRANSMISSION RELIEF VALVE REPLACEMENT 0119 00

THIS WORK PACKAGE COVERS

Removal, Installation, Relief Valve Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

Lockwasher (22)

O-ring (6, 11, 14, 17, 20 and 24)

References

WP 0107 00

WP 0122 00

Equipment Condition

Floor plates removed (WP 0171 00)

REMOVAL

CAUTION

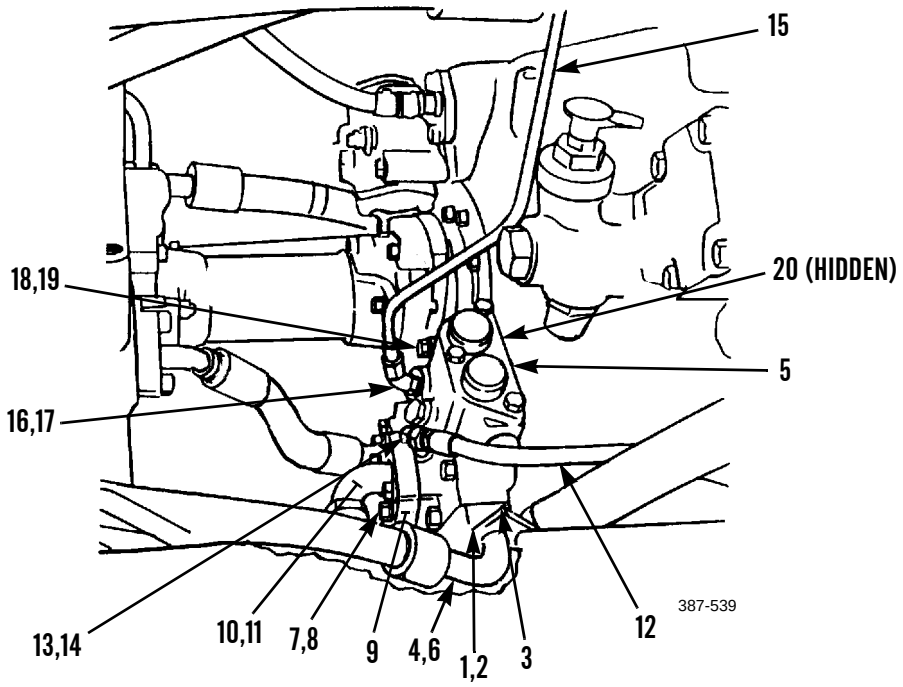
Wipe area clean around all connections to be opened during removal. Cap hoses and plug openings after removing lines. Contamination of transmission could result in premature failure.

NOTE

- **Use a suitable container to capture any residual oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Tag lines to ensure correct installation.**

REMOVAL - CONTINUED

1. Remove four capscrews (1), washers (2), two flanges (3) and hose assembly (4) from relief valve (5). Remove and discard O-ring (6).
2. Remove four capscrews (7), washers (8), two flanges (9) and hose assembly (10) from relief valve (5). Remove and discard O-ring (11).
3. Disconnect hose assembly (12) from elbow (13). Remove elbow and O-ring (14) from relief valve (5). Discard O-ring.
4. Disconnect tube assembly (15) from elbow (16). Remove elbow and O-ring (17) from relief valve (5). Discard O-ring.
5. Remove three capscrews (18), washers (19) and relief valve (5) from torque divider.
6. Remove two O-rings (20) from relief valve (5) located between relief valve and torque divider. Discard O-rings.



INSTALLATION

CAUTION

Care should be taken not to contaminate transmission oil system during installation of relief valve and hydraulic lines. Contamination of transmission can result in premature failure.

NOTE

- **Wipe area clean around torque converter, relief valve and all lines before installation.**
- **Lightly coat new O-rings with clean oil before installation.**

1. Install two new O-rings (20) in relief valve (5) and position relief valve on torque divider.
2. Secure relief valve (5) to torque divider with three washers (19) and capscrews (18).
3. Install new O-ring (17) and elbow (16) in relief valve (5).
4. Connect tube assembly (15) elbow (16).
5. Install new O-ring (14) and elbow (13) in relief valve (5).
6. Connect hose assembly (12) to elbow (13).

INSTALLATION - CONTINUED

7. Install hose assembly (10) to relief valve (5) with two flanges (9), four washers (8) and capscrews (7).
8. Install new O-ring (6) in hose assembly (4). Install hose assembly to relief valve (5) with two flanges (3), four washers (2) and capscrews (1).
9. Check transmission oil level and add as needed (WP 0107 00).
10. As required, check relief valve setting by performing power train hydraulic system tests (WP 0122 00). Perform *Relief Valve Adjustment* below as required.
11. Run engine and test drive in all speeds.
12. Install floor plates (WP 0171 00).

RELIEF VALVE ADJUSTMENT

NOTE

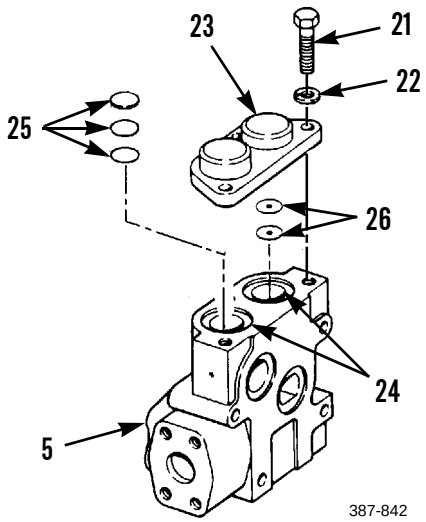
Adjustment can be performed without removing valve from torque divider.

1. Remove two capscrews (21), lockwashers (22), cover (23) and two O-rings (24) from relief valve (5). Discard O-rings and lockwashers.
2. Add spacers (25) to increase relief valve setting or remove spacers to decrease setting:
   a. Each 0.010 in. (0.25 mm) spacer will change relief pressure by 4.2 psi (29 kPa).
   b. Each 0.036 in. (0.91 mm) spacer will change relief pressure by 15.1 psi (104 kPa).
   c. Each 0.062 in. (1.57 mm) spacer will change relief pressure by 26.4 psi (182 kPa).
3. Add spacers (26) to increase relief valve setting or remove spacers to decrease setting:
   a. Each 0.010 in. (0.25 mm) spacer will change relief pressure by 1.3 psi (9 kPa).
   b. Each 0.036 in. (0.91 mm) spacer will change relief pressure by 4.7 psi (33 kPa).

NOTE

Lightly coat new O-rings with clean oil before installation.

4. When adjustments are correct, install two new O-rings (24), cover (23), two new lockwashers (22) and capscrews (21). Tighten capscrews to 18 lb-ft (24 Nm).



END OF WORK PACKAGE

TORQUE CONVERTER OUTLET RELIEF VALVE REPLACEMENT 0120 00

THIS WORK PACKAGE COVERS

Removal, Installation, Relief Valve Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Lockwasher (10 and 14)

O-ring (8, 11, 12 and 16)

References

WP 0107 00

WP 0122 00

Equipment Condition

Floor plates removed (WP 0171 00)

REMOVAL

CAUTION

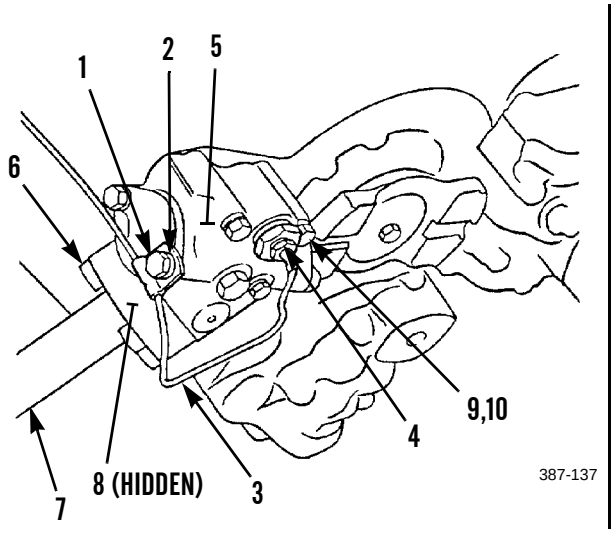
Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of transmission could result in premature failure.

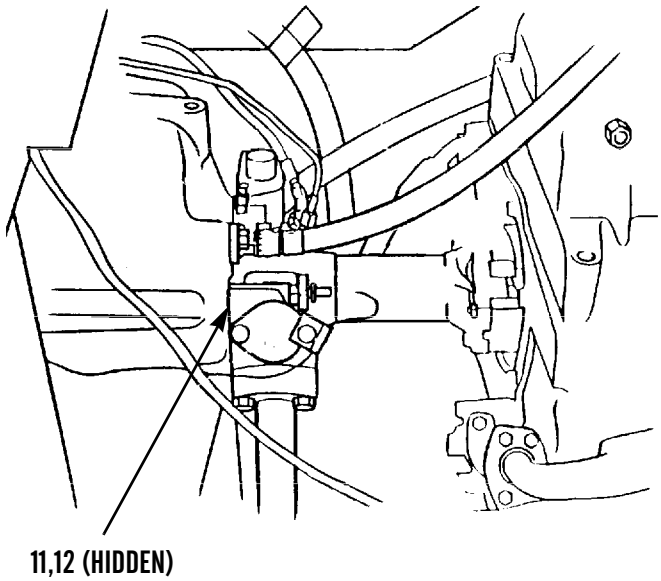
NOTE

Use a suitable container to capture any residual oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

REMOVAL - CONTINUED

1. Remove capscrew (1) and clip (2) from oil temperature sending unit line (3).
2. Remove oil temperature sending unit (4) from relief valve (5).
3. Remove four capscrews (6) and outlet tube (7) from relief valve (5). Remove O-ring (8) and discard.
4. Remove three capscrews (9), lockwashers (10) and relief valve (5) from torque divider. Discard lockwashers.
5. Remove two O-rings (11 and 12) from relief valve (5). Discard O-rings.





INSTALLATION

CAUTION

Care should be taken not to contaminate transmission oil system during installation of lines. Transmission contamination can result in premature failure.

NOTE

- **Wipe area clean around torque divider, relief valve and all lines before installation.**
- **Lightly coat new O-rings with clean oil before installation.**

1. Install two new O-rings (11 and 12) on relief valve (5).
2. Position relief valve (5) on torque divider and install three new lockwashers (10) and capscrews (9).
3. Install new O-ring (8) in outlet tube (7).
4. Install outlet tube (7) to relief valve (5) with four capscrews (6).
5. Install oil temperature sending unit (4) in relief valve (5).
6. Secure oil temperature sending unit line (3) to relief valve (5) with clip (2) and capscrew (1).
7. Check transmission oil level and add as needed (WP 0107 00).

INSTALLATION - CONTINUED

8. Perform power train hydraulic system tests (WP 0122 00). Perform *Relief Valve Adjustment* below as required.
9. Run engine and test drive in all speeds.
10. Install floor plates (WP 0171 00).

RELIEF VALVE ADJUSTMENT

NOTE

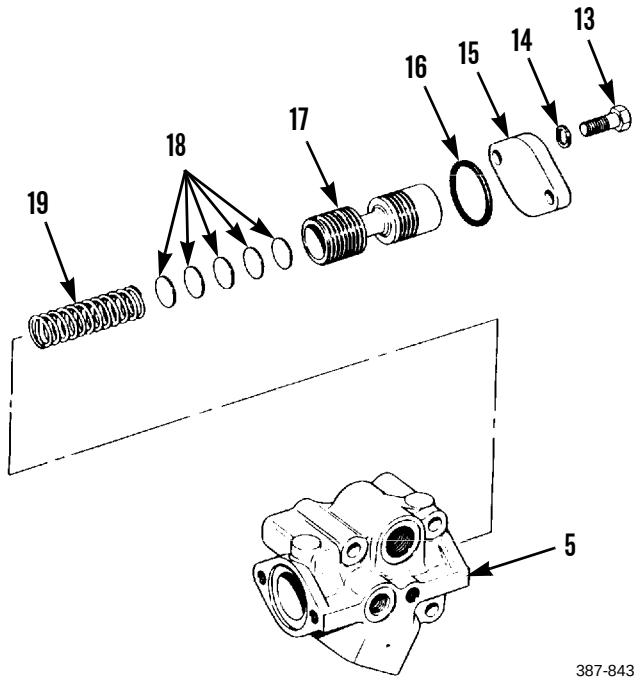
Adjustment can be performed without removing valve from torque divider.

1. Remove two capscrews (13), lockwashers (14), cover (15) and O-ring (16) from relief valve (5). Discard O-ring and lockwashers.
2. Remove valve (17), five spacers (18) and spring (19).
3. Add spacers (18) to increase relief valve setting. Remove spacers to decrease setting. Each 0.035 in. (90 mm) spacer will change pressure by 2.9 psi (20 kPa).
4. Install spring (19), required quantity of spacers (18) and valve (17).

NOTE

Lightly coat new O-ring with clean oil before installation.

5. Position new O-ring (16) in relief valve (5) and install cover (15) with two new lockwashers (14) and capscrews (13). Tighten capscrews to 18 lb-ft (24 Nm).



END OF WORK PACKAGE

TORQUE DIVIDER SCAVENGE PUMP REPLACEMENT 0121 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Compound, silicone RTV (Item 10, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Gasket (8)

Lockwasher (7)

Screw, forcing, 3/8 in. x 3 in. -16NC

Equipment Condition

Transmission guard removed (WP 0157 00)

Transmission oil drained from flywheel housing (WP 0107 00)

REMOVAL

CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of transmission could result in premature failure.

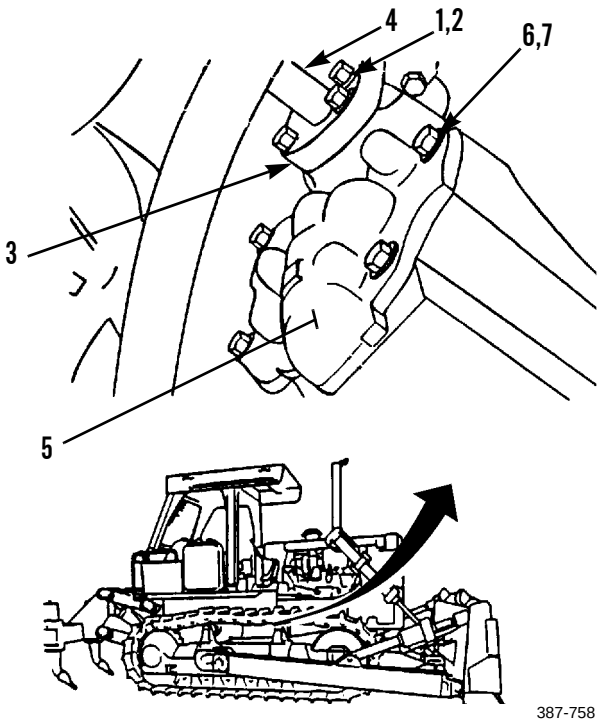
TORQUE DIVIDER SCAVENGE PUMP REPLACEMENT - CONTINUED 0121 00

REMOVAL - CONTINUED

NOTE

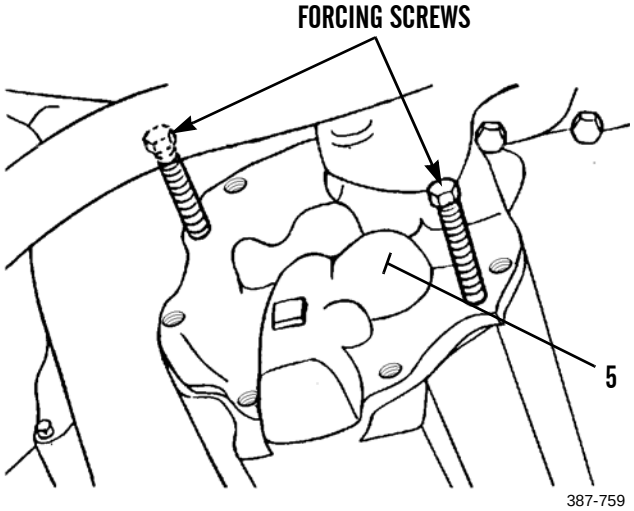
Use a suitable container to capture any draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

1. Remove four capscrews (1), washers (2) and split-type flange (3).
2. Remove oil line (4) from scavenge pump (5).
3. Remove six capscrews (6) and lockwashers (7) that hold scavenge pump (5) to flywheel housing. Discard lockwashers.



387-758

4. Install two 3/8 in. -16NC forcing screws into scavenge pump (5).
5. Slowly and evenly turn forcing screws until scavenge pump (5) pulls free from flywheel housing.



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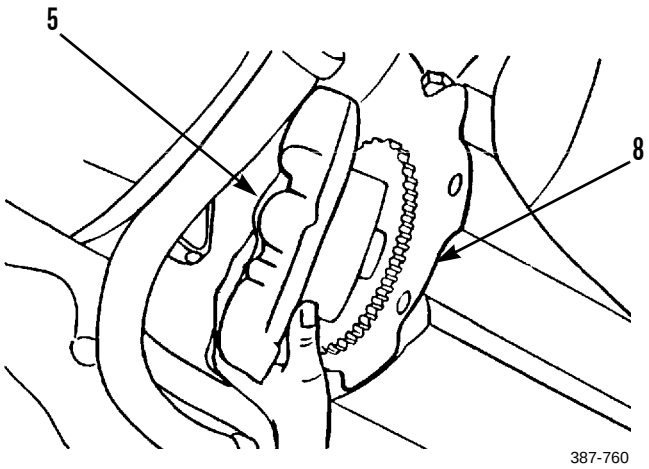
REMOVAL - CONTINUED

6. Remove scavenge pump (5) from flywheel housing. Remove and discard gasket (8).



INSTALLATION

Exposure to silicone RTV compound may be hazardous to your health. Contact with eyes can cause severe irritation and burns. Compound can be absorbed into the skin and can cause irritation or skin sensitization. Inhalation of vapors can cause respiratory tract irritation; prolonged inhalation can result in an allergic reaction. Vapors are combustible. Do not use near open flame. Wear eye and skin protection and avoid inhalation of vapors. Use only in a well-ventilated area. Failure to follow this warning can cause injury or death.

CAUTION

Wipe area clean around mating surfaces of flywheel housing and scavenge pump before installation. Contamination of transmission could result in premature failure.

1. Apply silicone RTV compound to both sides of new gasket (8). Position new gasket on flywheel housing.
2. Position scavenge pump (5) on flywheel housing. Ensure gear on scavenge pump is in alignment with drive gear in torque divider.
3. Install six new lockwashers (7) and capscrews (6).
4. Install oil line (4) on scavenge pump (5) with split-type flange (3), four washers (2) and capscrews (1).
5. Check transmission oil level and add as needed (WP 0107 00).
6. Run engine and check scavenge pump for leaks.
7. Install transmission guard (WP 0157 00).

END OF WORK PACKAGE

POWER TRAIN HYDRAULIC SYSTEM TESTS 0122 00

THIS WORK PACKAGE COVERS

General Information, Visual Checks, Pressure Tests

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Tool outfit, hydraulic system test and repair (Item 124, WP 0250 00)

References

TM 5-2410-237-10

WP 0119 00

WP 0120 00

Personnel Required

Two

Equipment Condition

Transmission oil level correct (WP 0107 00)

Floor plates removed (WP 0171 00)

Transmission, brake and steering control linkage adjustments correct (WP 0105 00, WP 0145 00 and WP 0147 00)

Seat and seat base assembly removed (WP 0172 00)

GENERAL INFORMATION

1. Correct oil flow and pressure are necessary for any hydraulic system operation. Output from pump (pump flow) increases with an increase in engine RPM and decreases when RPM is decreased. Oil pressure is caused by resistance to oil flow.
2. Visual checks should be done before performing pressure tests.

VISUAL CHECKS

1. Perform visual inspection of power train hydraulic system with engine OFF and all implements lowered to the ground.
2. Inspect all lines and connections for damage and/or leaks. Repair as needed.
3. Inspect control linkages for bent, broken or damaged components. Repair as needed.
4. Verify that transmission oil level is correct before proceeding to pressure tests.

PRESSURE TESTS

WARNING

ONLY authorized personnel are allowed on tractor during pressure tests. Do NOT perform pressure tests on power train unless tractor is secured against movement, with brake lock engaged, all implements lowered to ground and tracks blocked. Failure to follow this warning may result in serious injury or death.

NOTE

Ensure all linkage adjustments and transmission oil level are correct before proceeding.

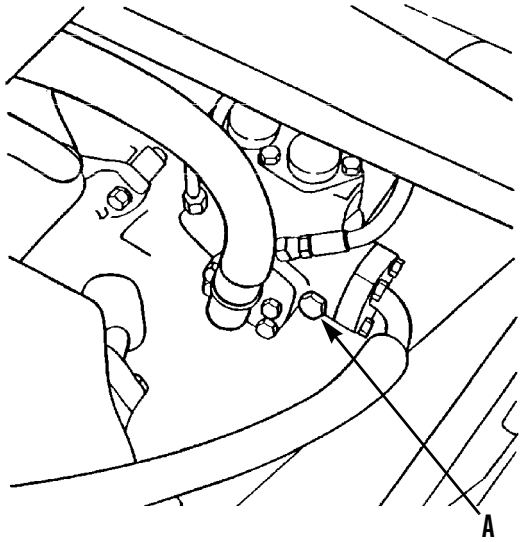
1. Engage brake lock lever (TM 5-2410-237-10).
2. Place transmission selector lever in appropriate position for test to be performed (TM 5-2410-237-10).
3. Lower all implements to the ground (TM 5-2410-237-10).
4. Block tracks.
5. Run machine until power train is at operating temperature.

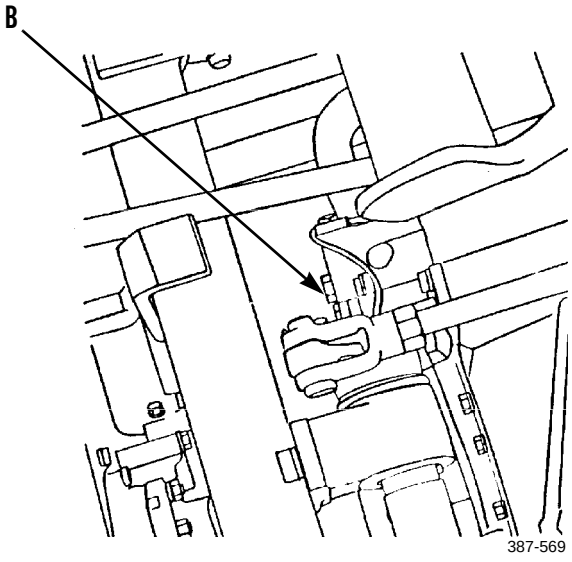
PRESSURE TESTS - CONTINUED

6. Refer to Table 1 to perform power train pressure tests.

Power Train Pressure Tests.

PRESSURE AT	PRESSURE TAP LOCATION	PRESSURE MEASURED WITH GOVERNOR CONTROL LEVER AT:		ADJUSTMENT
		LOW IDLE SETTING	HIGH IDLE SETTING	
Pump (Pressure Relief Valve)	Sequence Relief Valve Port (A)	380 psi (2620 kPa) minimum (transmission selector lever in NEUTRAL)	415-455 psi (2861-3137 kPa) (transmission selector lever in NEUTRAL)	Add or remove spacers to adjust transmission relief valve (WP 0119 00).
Torque Converter Outlet	Torque Converter Outlet Relief Valve Port (B)		*37-47 psi (255-324 kPa) (transmission selector lever in THIRD FORWARD and brakes activated with converter in stall condition)	Add or remove spacers to adjust torque converter outlet relief valve (WP 0120 00).



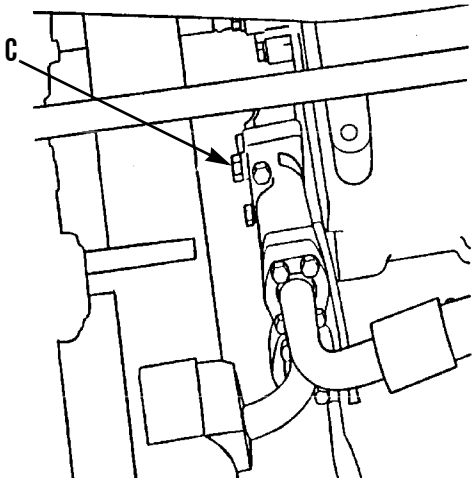


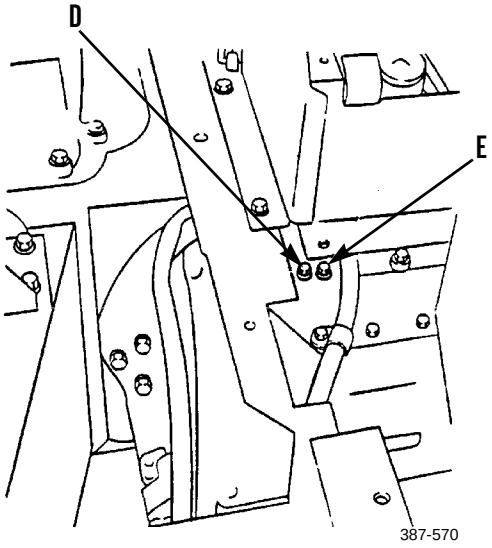
* Transmission selection THIRD FORWARD = clutches 1 and 4 engaged in transmission.

PRESSURE TESTS - CONTINUED

Power Train Pressure Tests - Continued.

PRESSURE AT	PRESSURE TAP LOCATION	PRESSURE MEASURED AT GOVERNOR CONTROL LEVER AT:		CORRECTIVE ADJUSTMENT
		LOW IDLE SETTING	HIGH IDLE SETTING	
Transmission Lubrication Oil	Transmission Oil Cooler Manifold Port (C)	1-7 psi (7-48 kPa) (transmission selector lever in NEUTRAL)	28-42 psi (193-290 kPa) (transmission selector lever in NEUTRAL)	NONE.
NOTE **To access ports D and E, it is necessary to remove four nuts, lockwashers, cover and gasket from transmission case.**				
Speed Clutch	Pressure Control Valve Port (D)	380 psi (2620 kPa) minimum (transmission selector lever in NEUTRAL)	415-455 psi (2861-3137 kPa) (transmission selector lever in NEUTRAL)	NONE.
Direction Clutch (Primary Setting)	Pressure Control Valve Port (E)	43-46 psi (296-317 kPa) with check valve held open, using a brass rod through plug hole in transmission cover (transmission selector lever in NEUTRAL)		NONE. Note: Adjustment is controlled by modulating relief valve (inside pressure control valve).

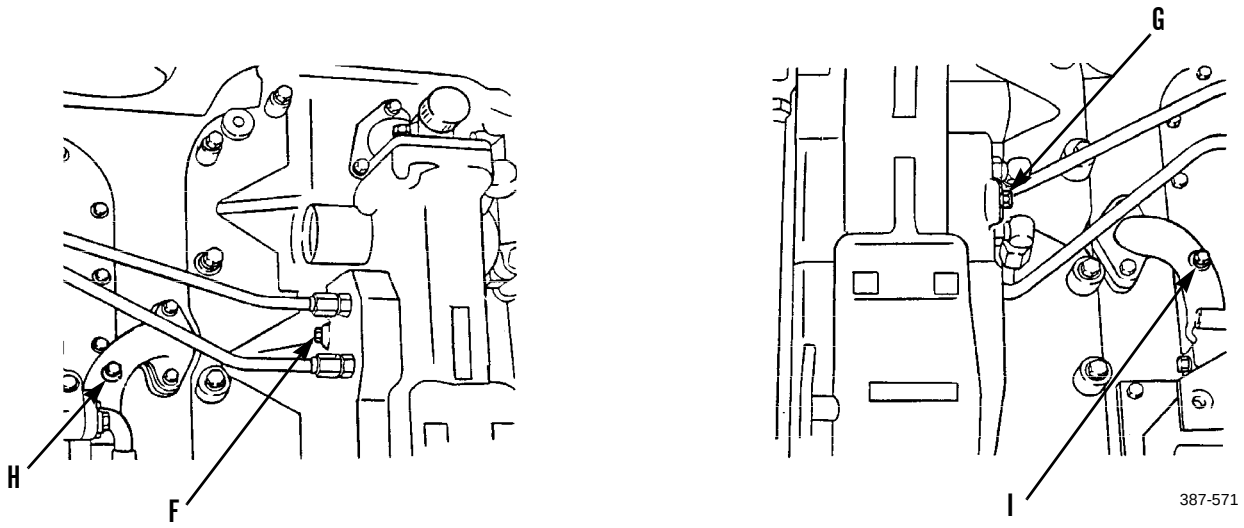




PRESSURE TESTS - CONTINUED

Power Train Pressure Tests - Continued.

PRESSURE AT	PRESSURE TAP LOCATION	PRESSURE MEASURED AT GOVERNOR CONTROL LEVER		CORRECTIVE ADJUSTMENT
		LOW IDLE SETTING	HIGH IDLE SETTING	
Brake Boosters	Left Booster (F) and Right Booster (G)	345 psi (2379 kPa) minimum (brakes activated by brake pedals)	380 psi (2620 kPa) minimum (brakes activated by brake pedals)	NONE.
Brake Boosters	Left Booster (F) and Right Booster (G)	330 psi (2275 kPa) minimum (brakes activated by steering control levers)	370 psi (2551 kPa) minimum (brakes activated by steering control levers)	NONE.
Piston for Steering Clutches	Left Steering Clutch (H) and Right Steering Clutch (I)	330 psi (2275 kPa) minimum (steering clutches released)	370 psi (2551 kPa) minimum (steering clutches released)	NONE.

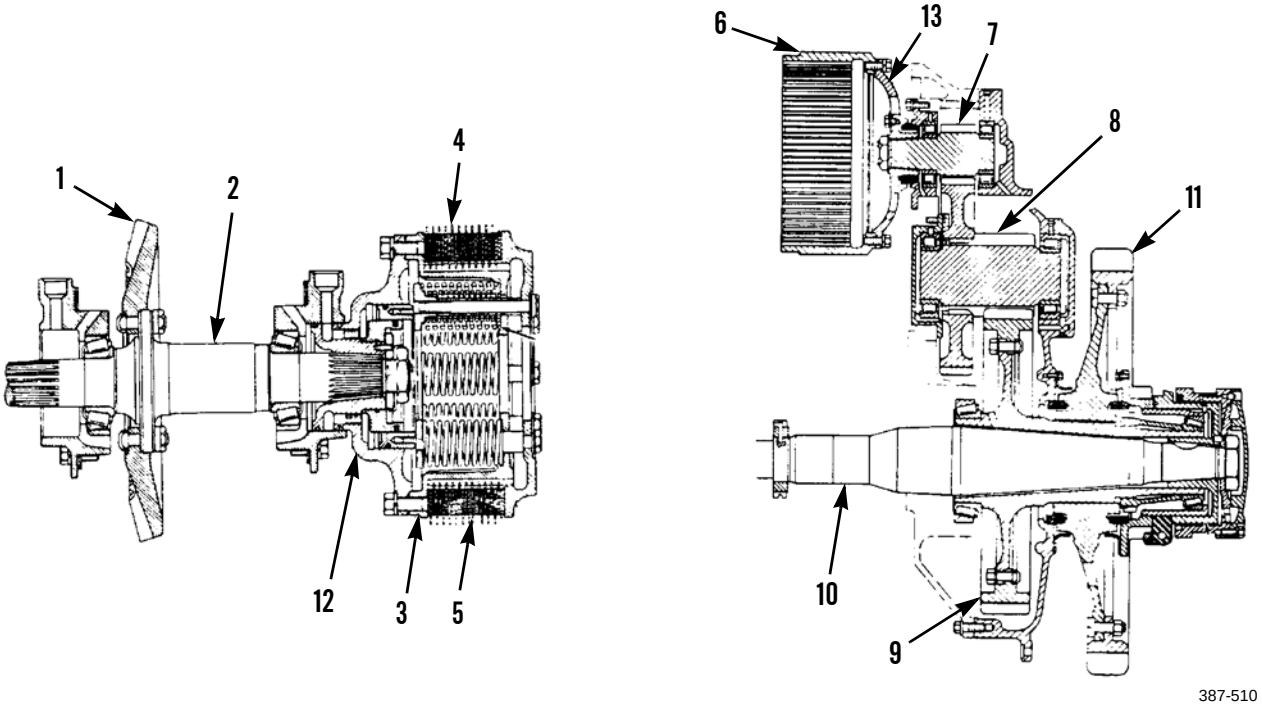


7. Install seat and seat base assembly (WP 0172 00).
8. Install floor plates (WP 0171 00).
9. Remove track blocks.
10. Test drive and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

TRANSFER AND FINAL DRIVE THEORY OF OPERATION 0123 00

1. The main components of the final drives are: bevel gear (1), bevel gear shaft (2), steering clutch inner drum (3), disc assemblies (4), steel discs (5), steering clutch outer drum (6) (also the brake drum), final drive pinion (7), idler pinion (8), final drive gear (9), sprocket shaft (10) and sprocket (11).
2. The bevel gear and steering clutches are in the bevel gear and steering clutch case. The bevel gear and steering clutch case is the reservoir for the transmission and steering hydraulic systems. As the bevel gear turns, lubricant is thrown on the bevel gear, bevel pinion and steering clutches for lubrication. The bearings for the bevel gear shaft get lubrication from the control valve for the steering clutches.
3. The final drive cases are fastened to the bevel gear and steering clutch case. The final drive cases are reservoirs for oil for the final drives.
4. With a steering clutch engaged, power goes from the inner drum (3), through the discs (4), to the outer drum (6). The steering clutches are normally engaged.
5. With a steering clutch released, power cannot go from the inner drum to the outer drum.
6. Splines connect both ends of bevel gear shaft (2) to the drive hub (12). The drive hubs are fastened to inner drums (3) of the steering clutches. Teeth connect steel discs (5) to the inner drums (3). Teeth connect disc assemblies (4) to outer drum (6). The outer drum is fastened to the drive hub (13) of pinion (7). Pinion (7) is engaged with idler gear (8). The idler gear is engaged with the final drive gear (9). Splines connect sprocket (11) to the final drive gear. The teeth of the sprocket are engaged with the track pins.
7. When a steering clutch is engaged, the flow of power is: from the bevel gear (1) through bevel gear shaft to inner drum (3). The inner drum turns steel discs (5). The steel discs turn disc assemblies (4). The disc assemblies turn outer drum (6). The outer drum turns final drive pinion (7). The final drive pinion turns idler gear (8). The idler gear turns final drive gear (9). The gear turns sprocket (11). The sprocket turns the track.
8. When a steering clutch is not engaged, the connection between bevel gear (1) and final drive pinion (7) is broken. Power does not go through the final drive to the track.



END OF WORK PACKAGE

FINAL DRIVE SERVICE 0124 00

THIS WORK PACKAGE COVERS

Service

INITIAL SETUP

Tools and Special Tools

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Gasket (2)

References

WP 0009 00

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

NOTE

Perform this service on both sides of tractor.

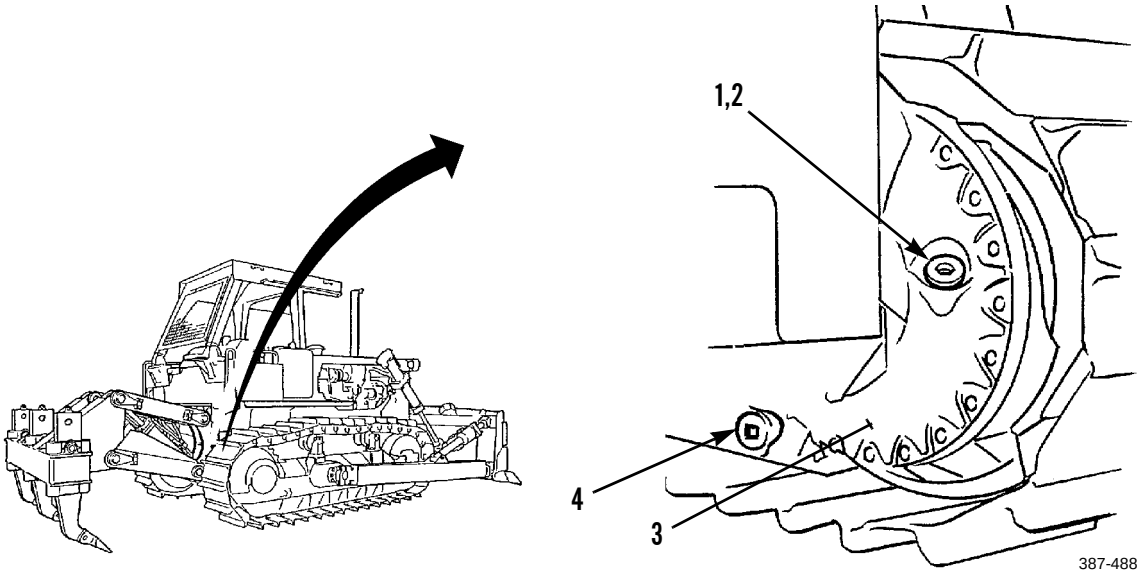
SERVICE

1. Remove fill plug (1) and gasket (2) from final drive housing (3). Discard gasket.

NOTE

Capacity of each final drive is 9 gal. (34.1 l).

2. Place a drain pan underneath final drive housing (3).
3. Remove drain plug (4) from final drive housing (3) and allow oil to drain. Dispose of oil IAW local policy and ordinances.

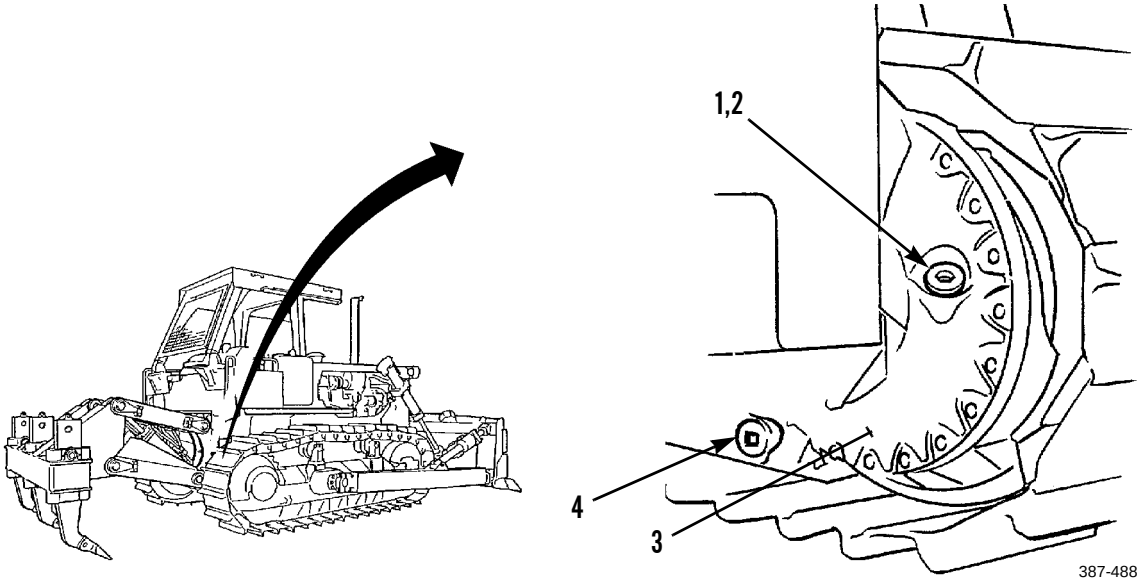


SERVICE - CONTINUED

4. Wipe drain plug (4) clean and install in final drive housing (3).
5. Fill final drive housing (3) through fill plug (1) opening until level is up to fill plug opening. For correct oil grade refer to KEY in *PMCS Introduction* (WP 0009 00).
6. Install new gasket (2) and fill plug (1) in final drive housing (3).

NOTE

Final drives and transmission share a common breather..



END OF WORK PACKAGE

FINAL DRIVE CASE, GEARS, IDLER PINION, AND BEARINGS REPLACEMENT 0125 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Link, lifting (Item 51, WP 0250 00)

Link, lifting (Item 134, WP 0250 00)

Pin, shoulder (Item 63, WP 0250 00)

Press, arbor (Item 74, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 400 lb capacity

Bolt, 5/8-11 x 2 in.

Bolt, 3/8-16 x 1-1/2 in.

Materials/Parts

Compound, gasket, shellac (Item 8, WP 0249 00)

Grease, GAA (Item 22, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Wire, nonelectrical (Item 40, WP 0249 00)

Capscrew, forcing, 1/2 in.-13NC (5)

Capscrew, 1/4 in.-20NC

Materials/Parts - Continued

Lock (18 and 25)

Pin, guide, 5/8 in. -11NC

Plug (9)

Retainer (23)

Screw, #10-32

Wood blocks, 4 in. x 4 in. x 3 ft long

References

TM 5-2410-237-10

WP 0107 00

WP 0241 00

Personnel Required

Two

Equipment Condition

Track drive sprocket removed (WP 0141 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

REMOVAL

NOTE

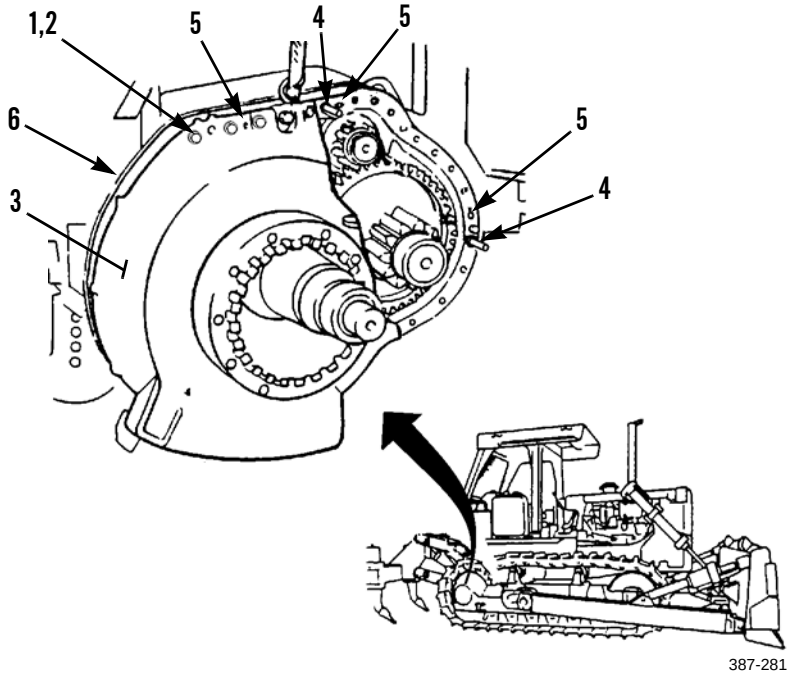
This procedure applies to either R.H. or L.H. final drive assembly.

1. Remove two capscrews (1) and washers (2) from final drive case (3).

WARNING

Guide pins must be installed as instructed in step 2 to avoid personal injury.

2. Install two 5/8 in. -11NC guide pins (4) and three 1/2 in. -13NC forcing screws (5) in final drive case (3).
3. Remove 29 remaining capscrews (1) and washers (2) from final drive case (3).
4. Tighten forcing screws (5) evenly until final drive case (3) is approximately 0.25 in. (6.3 mm) away from steering clutch case (6).



CAUTION

Use a piece of wire to keep idler pinion in position so it will not fall from steering clutch case when final drive case is removed.

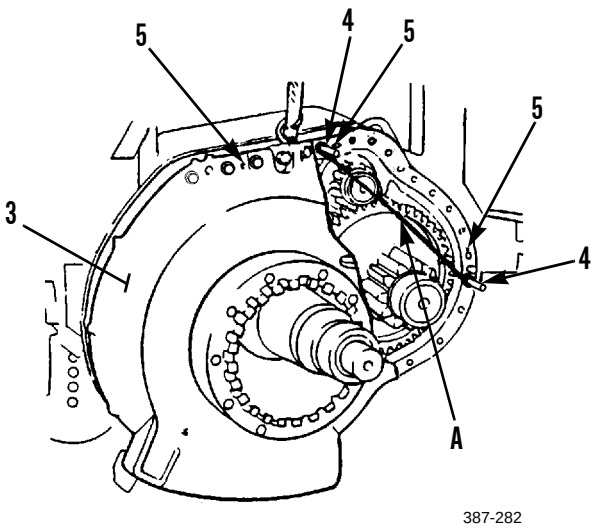
5. Install a piece of wire (A) around two guide pins (4) and across face of idler pinion to hold idler pinion in place.

REMOVAL - CONTINUED

NOTE

Weight of final drive case (3) is 280 lb (127 kg).

6. Tighten three forcing screws (5) until two lifting links can be attached to final drive case (3). Attach two lifting links with 5/8-11 x 2 in. bolts, nuts and washers to final drive case (3).
7. Attach suitable lifting device to lifting links and remove final drive case. Remove forcing screws.



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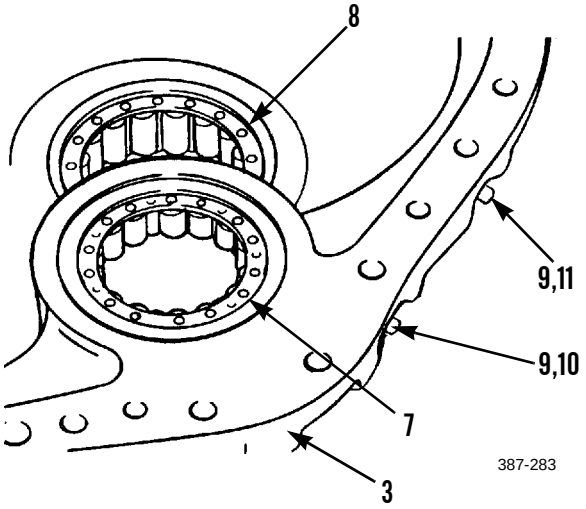
NOTE

Plugs are destroyed during removal.

8. If necessary to remove race and roller bearing assemblies (7 and 8), remove two plugs (9) from dowel holes in final drive case (3) with a slide puller. Discard plugs.
9. Use a #10-32 screw to remove dowel (10), holding race and roller assembly (7), from final drive case (3). Remove screw from dowel.
10. Use a 1/4 in. -20 NC capscrew to remove dowel (11), holding race and roller assembly (8), from final drive case (3). Remove capscrew from dowel.
11. Pull race and roller assemblies (7 and 8) from final drive case (3).



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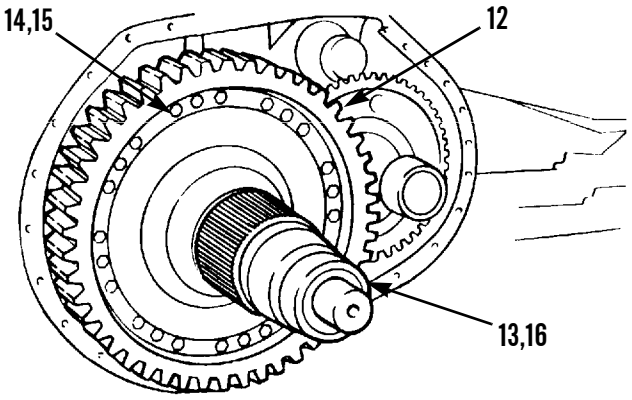
REMOVAL - CONTINUED

NOTE

Weight of gear (12) and hub (13) is 350 lb (159 kg).

12. Pull out on gear (12) and hub (13) enough for access. Remove one nut (14) and bolt (15). Install lifting link with 5/8-11 x 2 in. bolt, nut and washer in hole in gear.
13. Attach a nylon sling and a suitable lifting device to lifting link. Remove gear (12), hub (13) and key (16) as an assembly from sprocket shaft.
14. Place gear (12) and hub (13) on wood cribbing with hub pointing down. Remove nylon sling and lifting device.



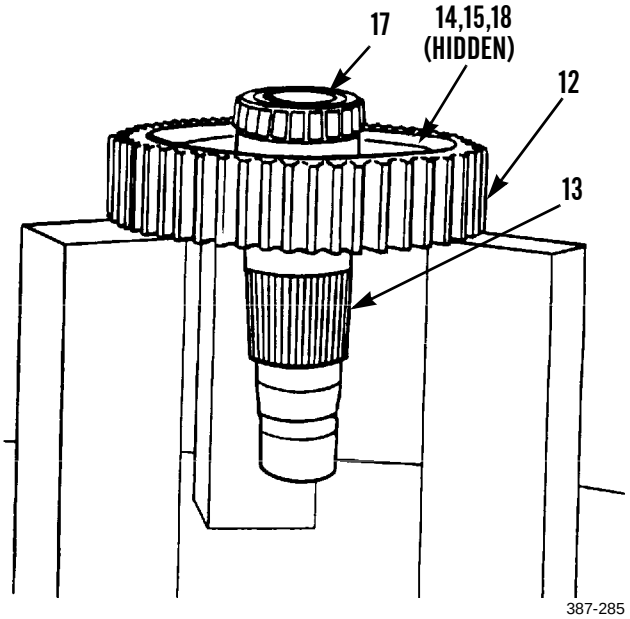
387-284

15. Pull bearing cone (17) from hub (13).
16. Flatten eight locks (18) for removal from hub (13).
17. Remove 15 remaining nuts (14) and eight locks (18) from 15 bolts (15). Remove bolts from hub (13). Discard locks.

NOTE

- **Weight of hub is 218 lb (99 kg).**
- **Use a nylon strap and a pin or capscrew that is longer than bottom end of hub width, to attach lifting device to hub.**

18. Remove hub (13) from gear (12).



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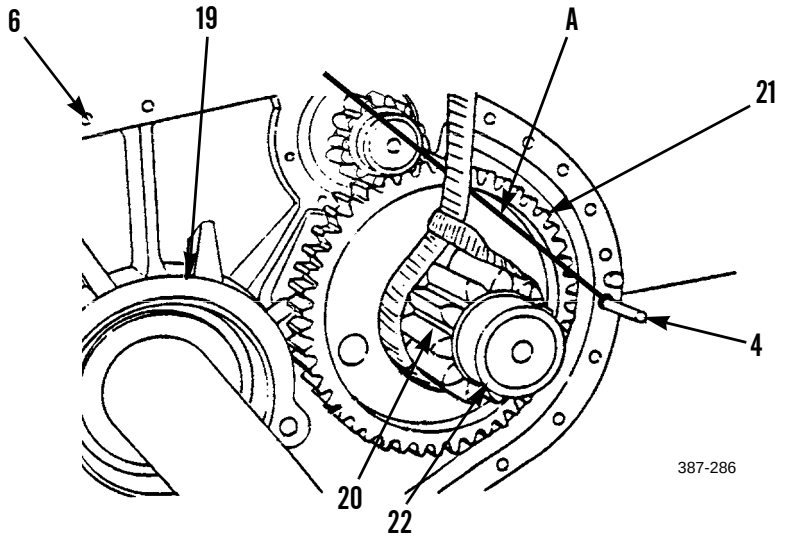
REMOVAL - CONTINUED

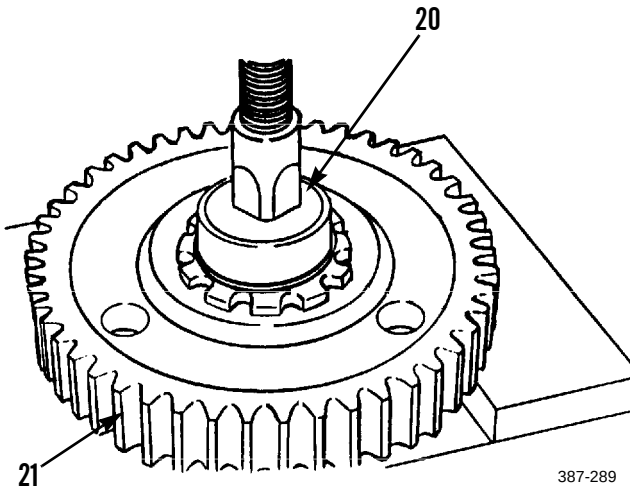
19. If necessary, pull bearing cup (19) from steering clutch case (6).
20. Attach a nylon sling and lifting device to idler pinion (20). Remove wire (A) installed in Step 5 from guide pins (4) that hold idler pinion and gear (21) in place. Remove gear and idler pinion from steering clutch case (6).
21. Pull bearing race (22) from one end of idler pinion (20) shaft.



CAUTION

Too much pressure on idler pinion shaft can cause damage to gear.

22. Place gear (21) and idler pinion (20) in a press. Apply a small amount of pressure on idler pinion shaft with press.

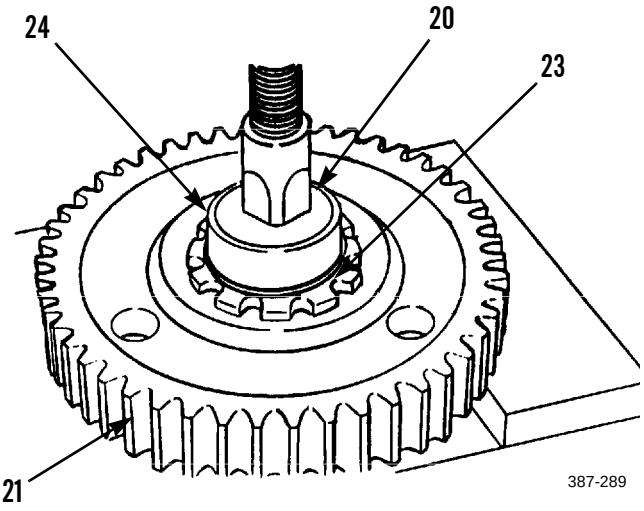


REMOVAL - CONTINUED

NOTE

Weight of idler pinion (20) is 85 lb (39 kg).

23. Push retainer (23) in groove on shaft of idler pinion (20). Retainer will stay in groove because of pressure on idler pinion shaft. When retainer is completely in groove, idler pinion shaft will slide out of gear (21). Discard retainer.
24. Pull bearing race (24) from other end of idler pinion (20) shaft.



25. Drain oil from bevel gear case and applicable steering clutch compartment (WP 0107 00).
26. Bend four locks (25) down. Remove eight capscrews (26) and four locks from bearing cage (27). Discard locks.

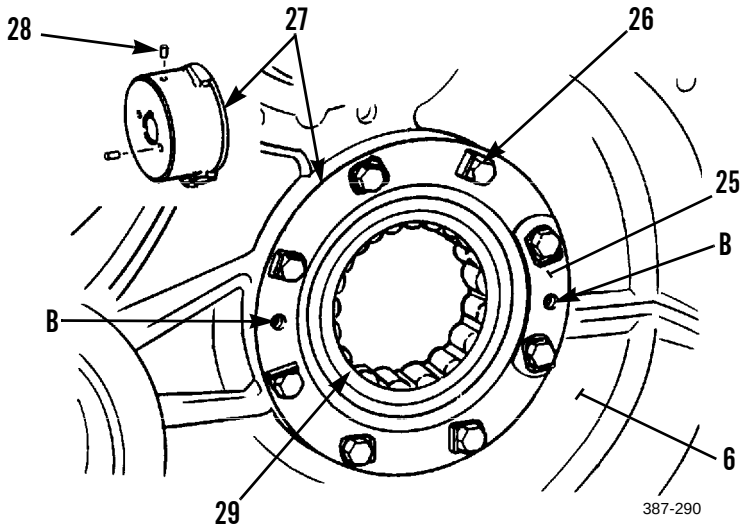
REMOVAL - CONTINUED

27. Install two 1/2 in. -13NC forcing screws in bearing cage (27) at tapped holes (B). Tighten forcing screws evenly and remove bearing cage from steering clutch case (6). Remove forcing screws from bearing cage.

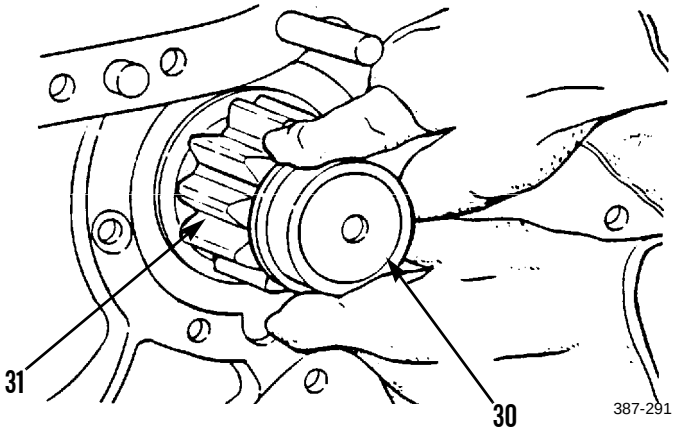
NOTE

Dowel is located behind flange of bearing cage.

28. Use a 1/4 in. -20NC capscrew to remove dowel (28) from bearing cage (27). Remove capscrew from dowels.
29. Pull race and roller assembly (29) from bearing cage (27).



30. If necessary, pull bearing race (30) from pinion shaft (31).



CLEANING

1. Wipe clean and dry all bearing mounting surfaces in openings and on shafts.
2. Wipe all gears clean.
3. Clean all gasket sealing surfaces before installation of new gasket compound.

INSPECTION

See WP 0241 00 for general inspection instructions.

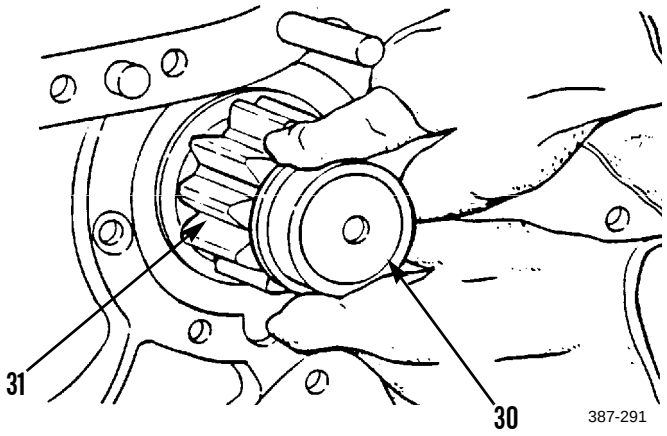
INSTALLATION

- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.**
- **Wear hand protection when handling both hot and cold components to prevent injury.**

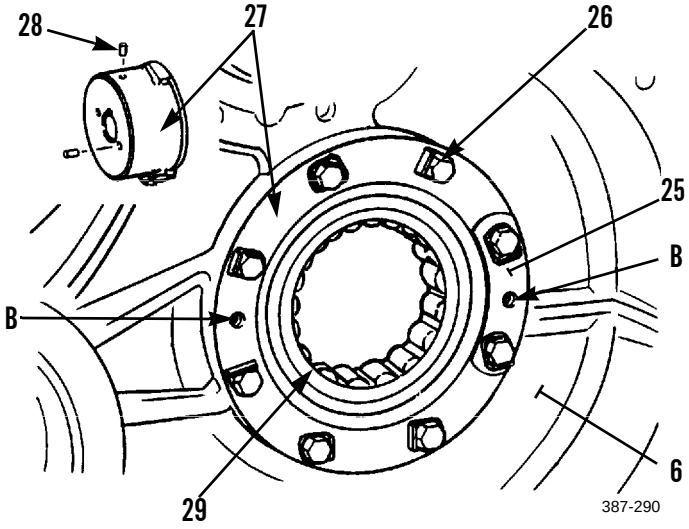
NOTE

This procedure applies to either R.H. or L.H. final drive assembly.

1. Heat bearing race (30) evenly to a maximum temperature of 275°F (135°C). Install bearing race on pinion shaft (31).



2. Lower temperature of race and roller assembly (29). Align hole in race and roller assembly with hole in bearing cage (27) and install race and roller assembly in cage.
3. Use a 1/4 in. -20NC capscrew to install dowel (28) in bearing cage (27). Remove capscrew.
4. Apply gasket compound on contact surfaces of bearing cage (27) and steering clutch case (6). Install bearing cage in steering clutch case with oil groove next to race and roller assembly (29) at bottom of hole.
5. Install four new locks (25) and eight capscrews (26) to secure bearing cage (27) to steering clutch case (6). Bend locks up against flats of capscrew heads.



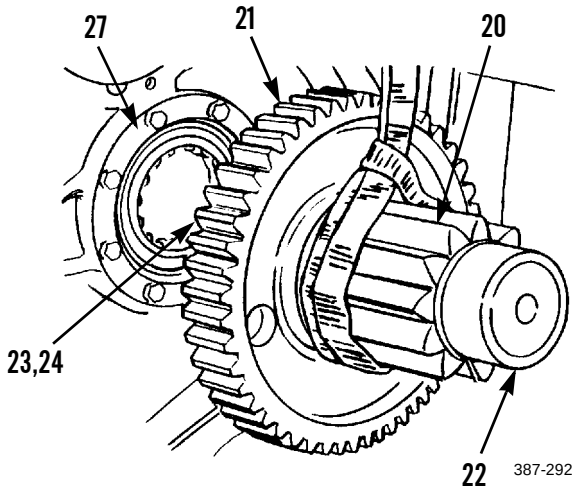
INSTALLATION - CONTINUED

6. Install new retainer (23) in idler pinion (20). Install gear (21) over idler pinion so that deep chamfer puts retainer under compression. Retainer must be engaged in groove of gear.

WARNING

Wear hand protection when handling hot components to prevent burns.

7. Heat two bearing races (22 and 24) to a maximum temperature of 275°F (135°C) and install them on each end of idler pinion (20).



NOTE

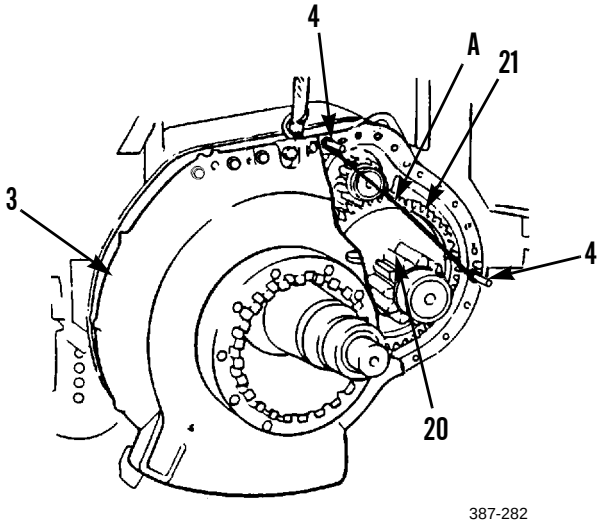
- **Apply gear lubricating oil in all race and roller assemblies to hold rollers in position for installation of inner races.**
- **Weight of gear and idler pinion assembly is 120 lb (55 kg).**

8. Attach a nylon sling and a suitable lifting device to gear (21) and idler pinion (20) assembly and install assembly in roller assembly (29) in cage assembly (27).

NOTE

Wire will hold gear and idler pinion in position until final drive case is installed.

9. Fasten wire (A) around guide pins (4) to hold gear (21) and idler pinion (20) in place.



INSTALLATION - CONTINUED

NOTE

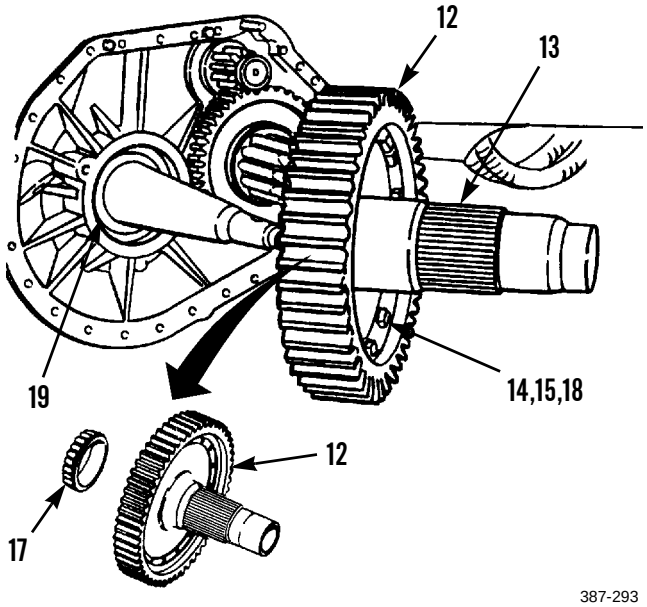
Weight of hub is 218 lb. (99 kg).

10. Attach lifting device to hub (13) and put it in position in gear (12) with long neck side of hub up.
11. Install 15 bolts (15) through hub (13) and gear (12) and secure with eight new locks (18) and 15 nuts (14). Bend locks up against flats of bolt heads.
12. Attach a lifting link to hole in gear (12). Attach a nylon sling to lifting link and to a suitable lifting device. Turn assembly over and position it on blocks with long neck side of hub (13) down.

WARNING

Wear hand protection when handling hot components to prevent burns.

13. Heat bearing cone (17) to a maximum temperature of 275°F (135°C). Install bearing cone on hub (13).
14. If removed, install bearing cup (19).



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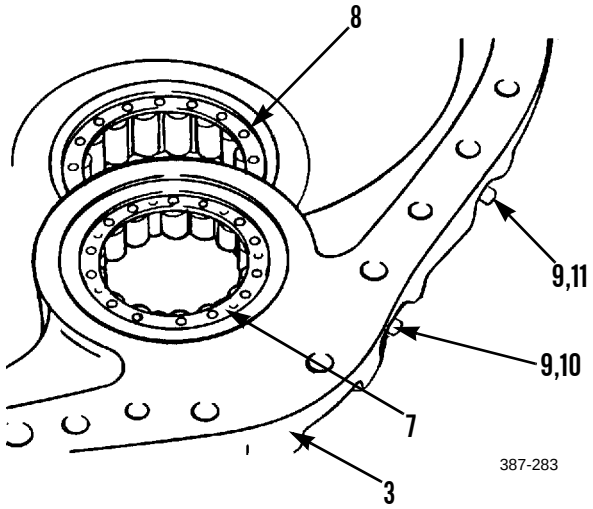
NOTE

Weight of gear (12) and hub (13) is approximately 350 lb (159 kg).

15. Install key (16). Use lifting link, nylon strap and lifting device to put gear (12) and hub (13) part way onto sprocket shaft. Remove lifting link, nylon sling and lifting device.
16. Install one remaining bolt (15) and nut (14). Bend remaining tab of one lock (18) against bolt head.
17. Push gear (12) and hub (13) fully onto sprocket shaft.
18. Lower temperature of race and roller assemblies (7 and 8). Install race and roller assemblies in final drive case (3) with dowel hole in race and roller assemblies in line with dowel hole in final drive case.
19. Use a 1/4 in. -20NC capscrew to install dowel (11) for race and roller assembly (8). Remove capscrew.
20. Use a #10 - 32 screw to install dowel (10) for race and roller assembly (7). Remove screw.
21. Install two new plugs (9) in dowel holes in drive case (3).
22. Apply gasket compound on contact surfaces of steering clutch case and final drive case (3).



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INSTALLATION - CONTINUED

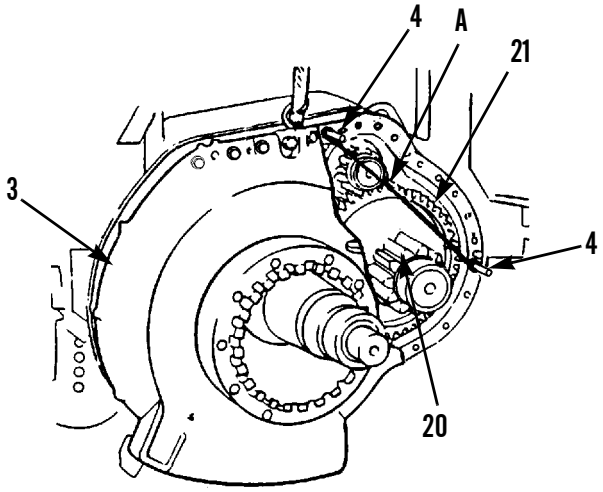
NOTE

Weight of final drive case is 280 lb (127 kg).

23. Attach two lifting links with 3/8-16 x 1-1/2 in. bolts to forcing screw holes on final drive case (3). Attach lifting device to lifting links and position final drive case on guide pins (4). Remove wire (A) used to hold gear (21) and idler pinion (20).

24. Push final drive case (3) against steering clutch case (6). Install 29 capscrews (1) and washers (2). Remove two guide pins (4) and install two remaining capscrews and washers. Tighten all capscrews to 200 lb-ft (271 Nm).

25. Remove lifting device and lifting links from final drive case (3).



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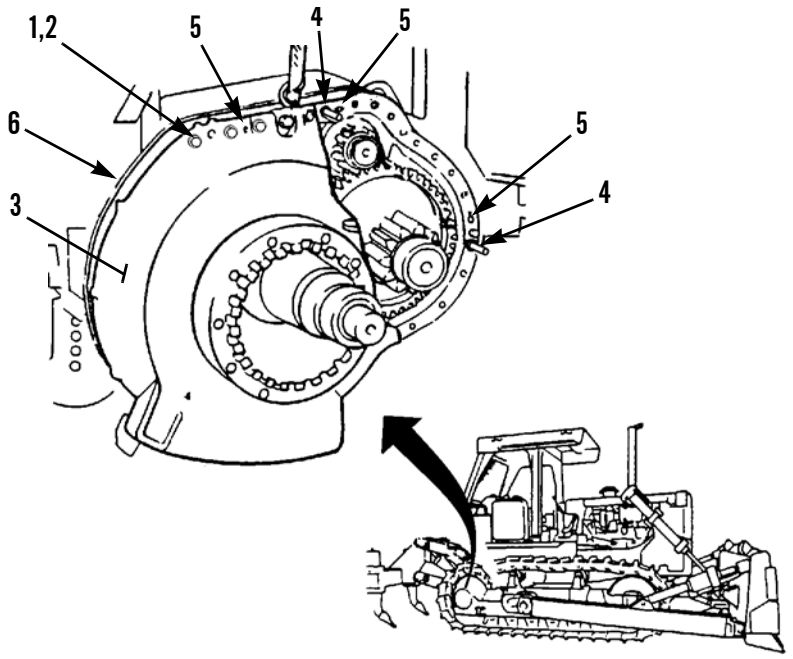

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26. Install sprocket assembly (WP 0141 00).
27. Refill transmission (WP 0107 00).
28. Run engine and test drive.

END OF WORK PACKAGE

FINAL DRIVE PINIONS AND FLANGES MAINTENANCE 0126 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Shop equipment, general purpose repair (Item 106, WP 0250 00)
Adapter (Item 1, WP 0250 00)
Adapter, coupling (Item 5, WP 0250 00)
Adapter, socket wrench (Item 7, WP 0250 00)
Adjusting tool, bearing (Item 10, WP 0250 00)
Bolt, machine (Item 13, WP 0250 00)
Bushing driver set (Item 18, WP 0250 00)
Clip, retaining (Item 20, WP 0250 00)
Collar, shaft (Item 21, WP 0250 00)
Coupling tool (Item 25, WP 0250 00)
Cylinder assembly, actuating, linear (Item 27, WP 0250 00)
Head, socket install (Item 36, WP 0250 00)
Hose assembly, (Item 37, WP 0250 00)
Inserter, seal (Item 41, WP 0250 00)
Inserter, seal (Item 42, WP 0250 00)
Inserter, seal (Item 43, WP 0250 00)
Leg, mechanical puller (Item 47, WP 0250 00)
Leg, mechanical puller (Item 48, WP 0250 00)
Lifting equipment, 100 lb capacity
Link, pin (Item 52, WP 0250 00)
Pin, lock (Item 62, WP 0250 00)
Pin, shoulder, headless (Item 63, WP 0250 00)
Puller attachment, mechanical (Item 78, WP 0250 00)
Puller attachment, mechanical (Item 79, WP 0250 00)
Puller attachment, mechanical (Item 80, WP 0250 00)
Puller attachment, mechanical (Item 81, WP 0250 00)
Puller, crank pulley (Item 82, WP 0250 00)
Puller, hydraulic (Item 84, WP 0250 00)
Puller, hydraulic (Item 85, WP 0250 00)

Tools and Special Tools - Continued

Puller, mechanical (Item 88, WP 0250 00)
Pump, hydraulic ram, hand driven (Item 92, WP 0250 00)
Pumping unit, hydraulic, power driven (Item 94, WP 0250 00)
Pusher, rollover (Item 95, WP 0250 00)
Repair tool, special purpose (Item 100, WP 0250 00)
Sling, nylon (Item 109, WP 0250 00)
Socket, socket wrench (Item 110, WP 0250 00)
Spacer (Item 111, WP 0250 00)
Spacer, sleeve (Item 113, WP 0250 00)
Stand assembly (Item 114, WP 0250 00)
Stand, lifting (Item 115, WP 0250 00)
Step plate, mechanical puller (Item 118, WP 0250 00)
Tool, special (Item 126, WP 0250 00)
Washer, flat (Item 129, WP 0250 00)
Wrench, ratchet (Item 130, WP 0250 00)
Wrench, torque: 1 in. square drive (Item 132, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)
Compound, gasket forming, silicone (Item 7, WP 0249 00)
Rag, wiping (Item 29, WP 0249 00)
Block of wood, 2 in. x 8 in. x 2 ft long
Screw, #10-32
Screw, forcing, 3/8 in. - 16 NC
Gasket (9)
Packing, preformed (11)
Seal, duo-cone (10)

References

TM 9-214
WP 0241 00

Personnel Required

Two

Equipment Condition

Steering clutches removed (WP 0152 00)

REMOVAL

NOTE

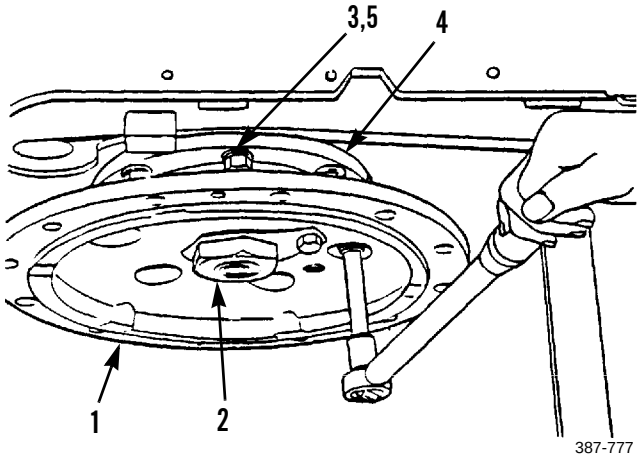
If final drive pinion and flange are to be disassembled, nut must be loosened.

1. Wedge block of wood behind final drive flange (1) to prevent it from turning. Loosen nut (2).
2. Attach lifting equipment to track and pull track slightly forward to align holes in final drive flange (1) with capscrews (3) in bearing cage (4).

NOTE

Final drive flange may have to be rotated slightly to gain access to some capscrews.

3. Remove seven capscrews (3) and washers (5) from bearing cage (4).



4. Rotate flange (1) enough to align holes in flange with forcing screw holes in bearing cage (4) and install two 3/8 -16NC forcing screws in bearing cage.
5. Turn forcing screws evenly until bearing cage (4) is free of bevel gear case.

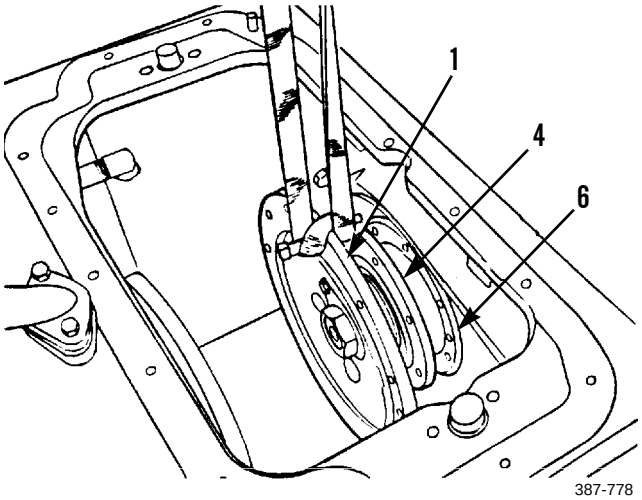
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury to personnel.

NOTE

Weight of final drive pinion (6) and flange (1) as a unit is 80 lb (36 kg).

6. Attach a nylon sling and a suitable lifting device to final drive pinion (6) and flange (1) as a unit and remove from gear case.



DISASSEMBLY

1. Remove nut (2) from shaft of final drive pinion (6).
2. Remove capscrew (7) and lock (8) from flange (1).

WARNING

Because flange is installed on shaft of final drive pinion with a force of 35-40 tons, nut will prevent flange from coming off and causing personal injury.

3. Reinstall nut (2) on shaft of final drive pinion (6), with a distance of 0.125 in. (3.2 mm) between nut and flange (1).

WARNING

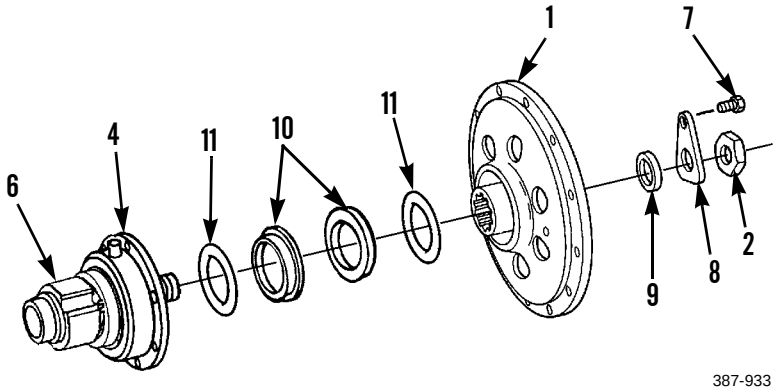
Keep hands clear of puller when removing flange. Failure to do so could cause injury.

4. Install puller on flange (1) and apply pressure to break flange loose from shaft of final drive pinion (6).
5. Remove puller, nut (2) and flange (1) from shaft of final drive pinion (6).
6. Remove gasket (9) from hub of flange (1). Discard gasket.

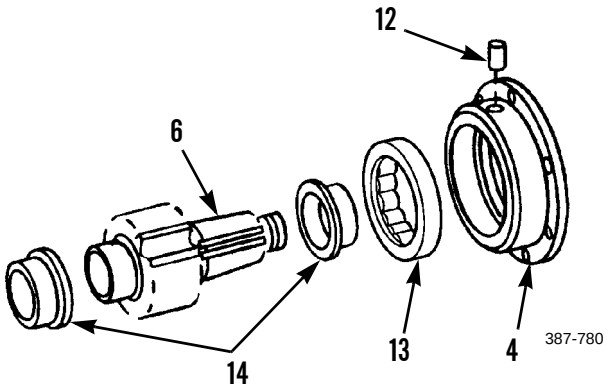
NOTE

Duo-cone seal (10) assembly is a two-piece seal. One half of seal is in flange (1); the other half is in bearing cage (4).

7. Remove duo-cone seal (10) with preformed packing (11) from flange (1). Remove duo-cone seal (10) with preformed packing (11) from bearing cage (4).
8. Discard two pre-formed packings (11) and duo-cone seal (10).
9. Remove bearing cage (4) from shaft of final drive pinion (6).



DISASSEMBLY - CONTINUED



10. Install #10-32 screw in dowel (12) and pull on screw to remove dowel from bearing cage (4). Remove screw from dowel.
11. Remove race and roller assembly (13) from bearing cage (4).
12. Remove bearing race (14) from one end of final drive pinion (6) shaft.
13. Repeat step 12 at other end of final drive pinion (6) shaft.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use of protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Clean all parts with solvent cleaning compound.
2. Refer to WP 0241 00 for general inspection instructions.
3. Refer to TM 9-214 for inspection of roller bearing.
4. Replace damaged parts as necessary.
5. Remove gasket material and clean all mating surfaces before assembly or installation.

ASSEMBLY

WARNING

Wear hand protection when handling hot components to prevent serious burns.

1. Heat two bearing races (14) to a maximum temperature of 275°F (135°C) and install one race at each end of final drive pinion (6) shaft. Races must contact shoulders on final drive pinion shaft.
2. Allow bearing races (14) to cool and install roller assembly (13) in bearing cage (4) with hole in outer race in line with dowel hole in cage.
3. Use a #10-32 screw to install dowel (12) in bearing cage (4), to secure bearing race (14) and roller assembly (13). Remove screw from dowel.
4. Install bearing cage (4) on spline end of final drive pinion (6) shaft with flange toward splines.

ASSEMBLY - CONTINUED

CAUTION

Duo-cone seal assembly is a two-piece seal. It must be used as a matched pair or failure will result. Do not separate.

NOTE

After installation, apply clean oil to contact surfaces of metal seals.

5. Install two new preformed packings (11) on duo-cone seal (10).

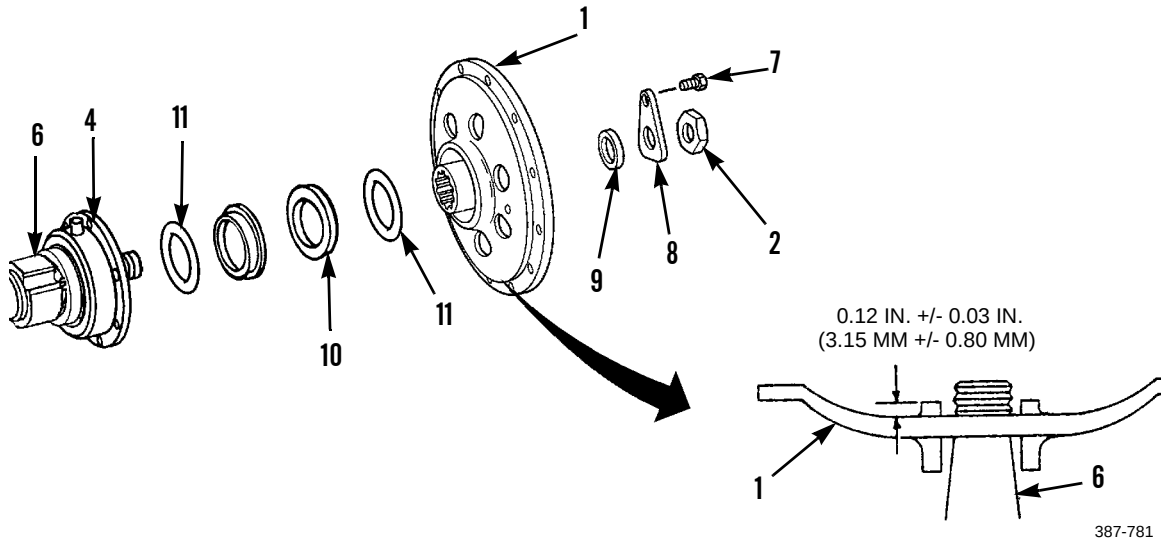
CAUTION

Seals and seal contact surfaces must be kept clean. Do not touch after being cleaned or leaks can result.

NOTE

Do not apply oil to preformed packings.

6. Install duo-cone seal (10) with preformed packing (11) in bearing cage (4). Clean metal contact surface of seal, then apply a thin film of clean oil to metal contact surface.
7. Install duo-cone seal (10) with preformed packing (11) in flange (1). Clean metal contact surface of seal, then apply a thin film of clean oil to metal contact surface.
8. Clean and dry splines on shaft of final drive pinion (6).



ASSEMBLY - CONTINUED

WARNING

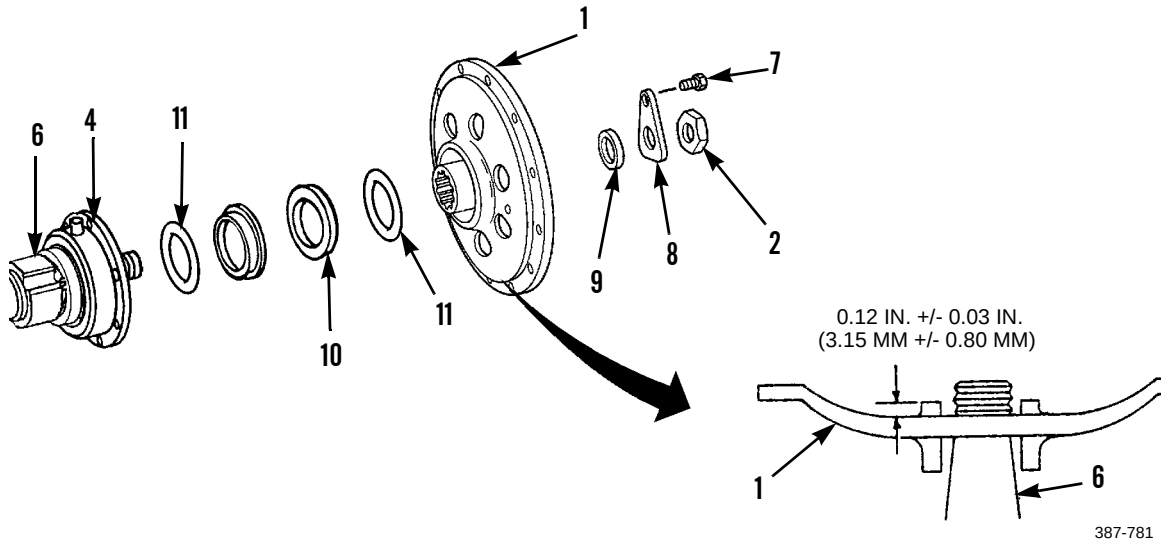
Keep hands clear of puller when installing flange. Failure to do so could cause personal injury.

9. Position flange (1) on splines of final drive pinion (6) shaft, install puller, and press flange on final drive pinion shaft with a force of 35-40 tons. Remove puller.
10. Measure distance from shoulder on final drive pinion (6) shaft to hub face in center of flange (1). This distance must be 0.12 in. +/- 0.03 in. (3.15 mm +/- 0.80 mm).
11. If distance in step 10 is less than 0.09 in. (2.29 mm), replace flange (1) and final drive pinion (4). If distance exceeds 0.15 in. (3.81 mm), remove flange and clean final drive pinion and shaft splines. Reinstall flange.
12. Install new gasket (9) in hub of flange (1).
13. Install lock (8) on flange (1) with capscrew (7).

NOTE

Nut (2) is tightened and lock (8) is bent to secure nut after final drive pinion and flange assembly is installed in bevel gear case.

14. Install nut (2) on shaft of final drive pinion (6) finger tight.



INSTALLATION

1. Apply silicone gasket forming compound on flange of bearing cage (4) and cage mounting surface on bevel gear case.

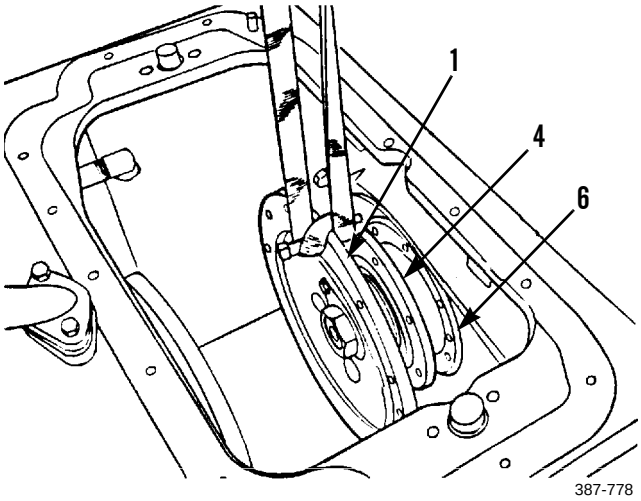
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury to personnel.

NOTE

Weight of final drive pinion (6) and flange (1) as a unit is 80 lb (36 kg).

2. Use a nylon sling and a suitable lifting device to install final drive pinion (6) and flange (1) as a unit on bevel gear case. Ensure unit is positioned as follows:
   a. Engage unit with teeth on final drive gear inside bevel gear case.
   b. Seat final drive pinion bearing race (14) in bearing inside bevel gear case.
   c. Position bearing cage (4) flange with dowel hole up, oil hole down and capscrew holes aligned with holes in bevel gear case.
3. Attach lifting equipment to track and move track to align holes in flange (1) with holes in bearing cage (4).



NOTE

Flange may have to be rotated slightly to gain access to some capscrews.

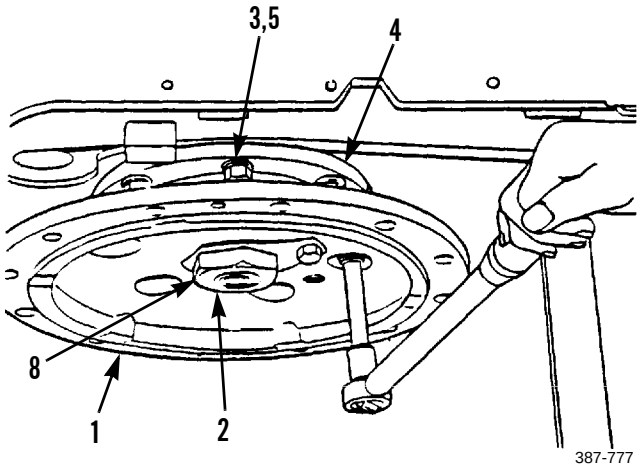
4. Install seven washers (5) and capscrews (3) to secure bearing cage (4). Tighten capscrews to 100 lb-ft (140 Nm).

NOTE

If final drive pinion and flange were NOT disassembled, skip step 5.

INSTALLATION - CONTINUED

5. Tighten nut (2) on shaft of final drive pinion (6) to 700 lb-ft (949 Nm).
6. Bend lock (8) against nut (2).
7. Install steering clutches (WP 0152 00).
8. Run engine and test drive in all speeds (TM 5-2410-237-10).



END OF WORK PACKAGE

BEVEL GEAR AND SHAFT REPLACEMENT 0127 00

THIS PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Bushing driver set (Item 18, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Pigment, paint products (Item 27, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Sealing compound (Item 33, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Bar stock, 1/4 in. x 1 in. x 8 in. long

Capscrew, 1/2 in. - 13NC

Materials/Parts - Continued

Lockwasher (6 and 8)

Nut

Wood, block 2 in. x 4 in. x 2 ft long

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Steering clutch control valve removed (WP 0154 00)

Steering clutch hubs removed (WP 0155 00)

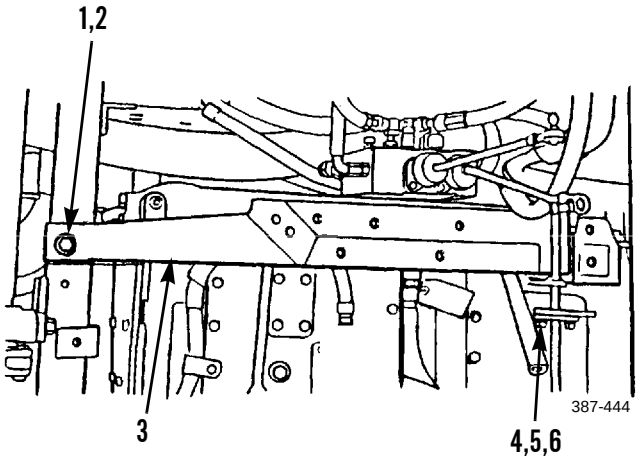
Hydraulic tank mounting brackets and plates removed (WP 0156 00)

WARNING

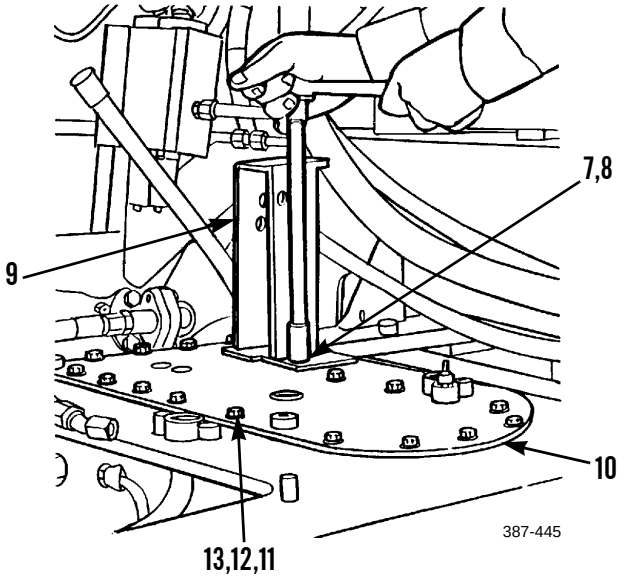
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death to personnel.

REMOVAL

1. Remove capscrew (1) and washer (2) from end of support assembly (3) at gear case.
2. Remove two capscrews (4), nuts (5) and lockwashers (6) from other end of support assembly (3) and remove support assembly. Discard lockwashers.



3. Remove four capscrews (7), lockwashers (8) and bracket assembly (9) from top of gear case cover (10). Discard lockwashers.
4. Remove 19 capscrews (11), washers (12), three spacers (13) and cover (10) from bevel gear case.
5. Remove oil lines from two bearing cages (14 and 15).



6. Use a piece of bar stock between teeth in bevel gear (16) and bottom of gear case to hold gear while removing 10 nuts (17) and washers (18).

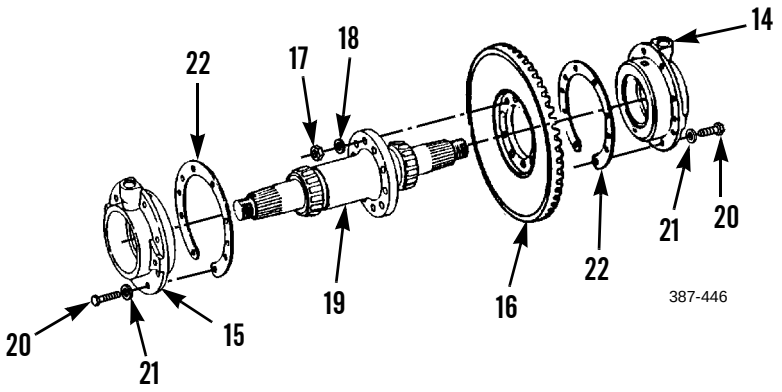
NOTE

Weight of bevel gear shaft is 46 lb (21 kg).

7. Attach a nylon sling and a suitable lifting device to bevel gear shaft (19) for support.
8. Remove eight capscrews (20) and washers (21) from bearing cage (14) at bevel gear end of bevel gear shaft (19).
9. Install two 1/2 in. -13NC forcing screws in bearing cage (14) and turn screws evenly to remove cage. Remove forcing screws from bearing cage.
10. Remove shims (22) from bearing cage (14).

REMOVAL - CONTINUED

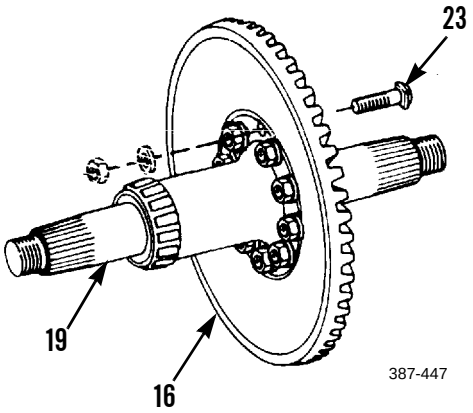
11. Repeat steps 8 through 10 for bearing cage (15) at steering clutch end of bevel gear shaft (19).



CAUTION

Install large nut on each end of bevel gear shaft to protect threads from damage.

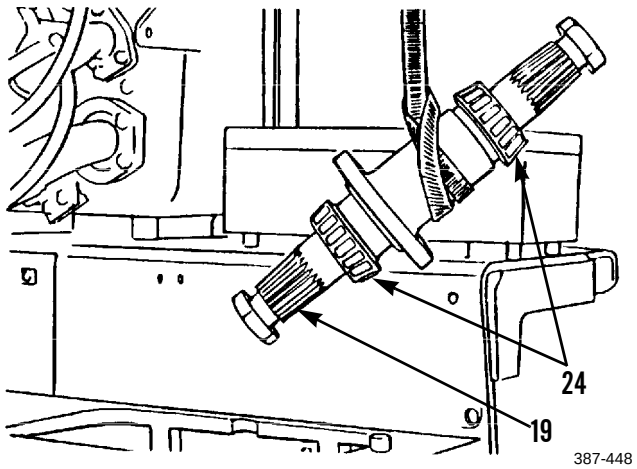
12. Slide bevel gear shaft (19) 3/4 in. toward clutch compartment and remove 10 capscrews (23) from bevel gear (16).



NOTE

Put wood block under bevel gear during removal of gear shaft.

13. Use lifting device to slowly remove bevel gear shaft (19) through steering clutch compartment.
14. Remove large nut from each end of bevel gear shaft (19) and use a puller to remove two bearings (24).

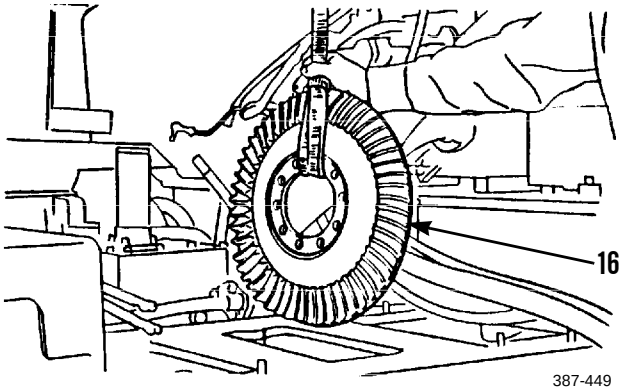


REMOVAL - CONTINUED

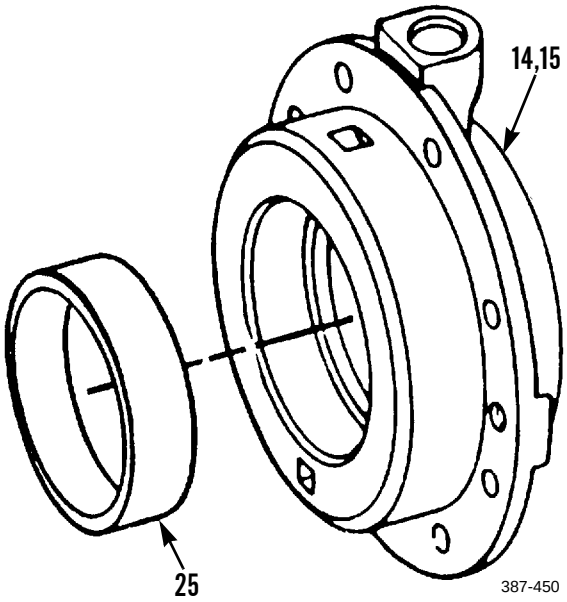
NOTE

Weight of bevel gear is 54 lb (24 kg).

15. Use lifting device to remove bevel gear (16) from gear case.



16. Use a puller to remove bearing races (25) from bearing cages (14 and 15).



INSTALLATION

1. Lower temperature of two bearing races (25) and use a bearing installation tool to install in bearing cage (14 and 15).

INSTALLATION - CONTINUED

WARNING

Wear hand protection when handling hot components to prevent serious burns.

2. Heat two bearings (24) to maximum temperature of 275°F (135°C) and install one on each end of bevel gear shaft (19).

CAUTION

Install large nut on each end of bevel gear shaft to protect threads from damage.

NOTE

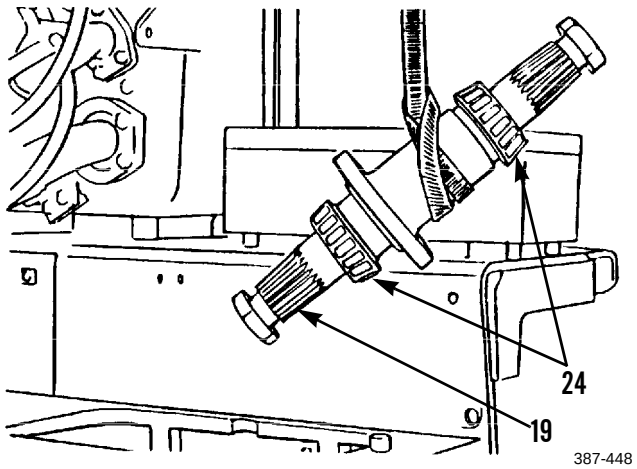
- **If transmission is in tractor, install bevel gear shaft without bevel gear and follow installation procedure starting at step 3.**
- **If transmission is not in tractor, install bevel gear shaft with bevel gear and follow installation procedure starting at step 5.**
- **Weight of bevel gear shaft is 46 lb (21 kg).**

3. Use a suitable lifting device to position bevel gear shaft (19) in bevel gear case.

NOTE

Leave lifting device attached to bevel gear shaft for support during bearing adjustment procedure.

4. Adjust bearings (24) on bevel gear shaft (19) as follows:



387-448

INSTALLATION - CONTINUED

NOTE

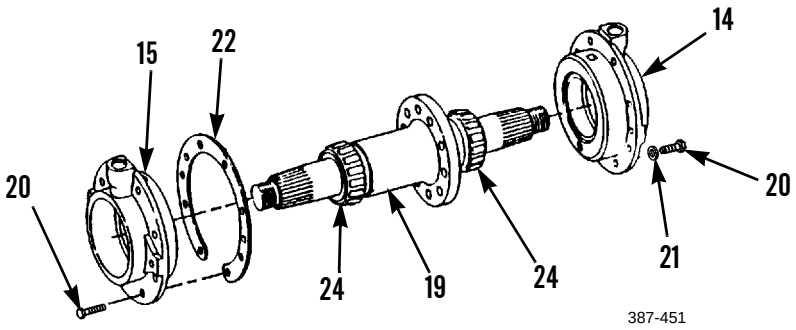
Thickness of full shim pack is 0.119-0.125 in. (3.02-3.18 mm).

a. Install bearing cage (15) at steering clutch end of shaft with full package of shims (22) and eight capscrews (20). Do NOT install washers. Tighten capscrews evenly.
b. Install other bearing cage (14) at bevel gear end of shaft with eight capscrews (20) and washers (21). Do NOT install shims at this time.

CAUTION

Torque value is for new bearings.

c. Tighten capscrews (20) evenly while turning bevel gear shaft (19) with torque wrench, until torque reading is 70-85 lb-in. (7.9-9.6 Nm)
d. With feeler gage, measure gap between flange of bearing cage (14) and face of bevel gear case at each capscrew (20). Gap must be the same around entire flange.
e. Remove bearing cage (14) and install shims (22) on cage equal to feeler gage measurement from previous step.

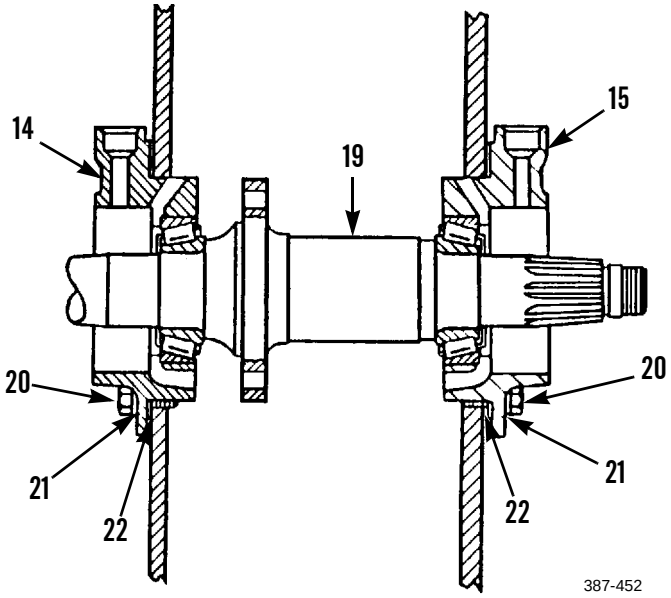


INSTALLATION - CONTINUED

f. Reinstall bearing cage (14) and shims (22) on bevel gear shaft (19) with eight capscrews (20) and washers (21). Tighten capscrews evenly to 100 lb-ft (136 Nm).

g. Remove eight capscrews (20) from bearing cage (15) at steering clutch end of bevel gear shaft (19). Reinstall capscrews with eight washers (21) and tighten capscrews to 100 lb-ft (136 Nm).

h. Check torque on steering clutch end of bevel gear shaft (19). Torque must be 70-85 lb-in. (7.9-9.6 Nm). If necessary, remove or add shims (22) under bearing cage (14) until torque is correct.



INSTALLATION - CONTINUED

5. Install bevel gear (16) on bevel gear shaft (19) as follows:

   a. Attach lifting device to bevel gear shaft (19) to take weight off bearings (24).

   b. Remove eight capscrews (20), washers (21), shims (22) and bearing cage (15) at clutch end of shaft (19). Identify shims and bearing cage for assembly.

   c. Repeat step b for bearing cage (14) at other end of shaft (19).

   d. Use lifting device to remove bevel gear shaft (19) from gear case.

NOTE

Weight of bevel gear is 54 lb (24 kg).

   e. Use lifting device to position bevel gear (16) in gear case with hole centered at bearing cage hole. Block gear in position until bevel gear shaft (19) is installed.

   f. Use lifting device to position bevel gear shaft (19) in gear case with hub end of shaft through bevel gear (16). Leave lifting device attached.

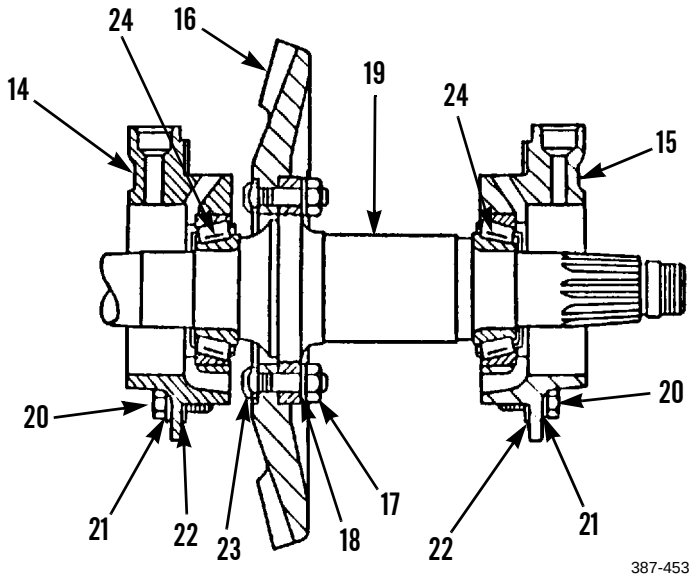
   g. Install bevel gear (16) on shaft (19) with 10 capscrews (23), washers (18) and nuts (17) finger tight.

   h. Install bearing cage (14) at gear end of shaft (19) with eight capscrews (20), washers (21) and shims (22). Tighten capscrews finger tight and use lifting device to keep weight of shaft off bearings (24).

   i. Repeat step h for bearing cage (15) at other end of bevel gear shaft (19).

   j. Tighten eight capscrews (20) on bearing cages (14 and 15) evenly to 100 lb-ft (136 Nm).

   k. Use a wrench and bar or block to hold bevel gear (16) in position. Tighten 10 nuts (17) to secure gear to shaft (19). Remove lifting device.



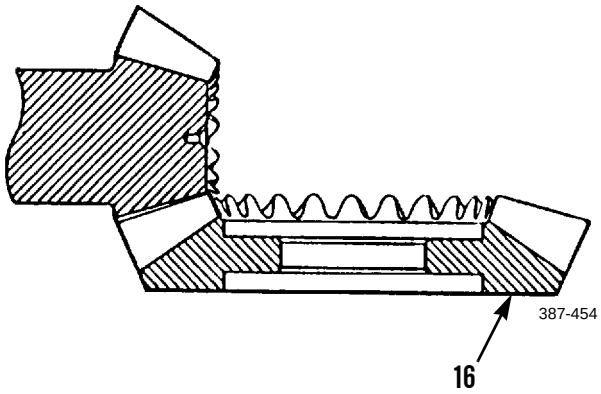
INSTALLATION - CONTINUED

6. Make adjustments to bevel gear position for correct gear clearance (backlash) between bevel gear (16) and bevel pinion (from transmission) as follows:
   a. Position magnetic based dial indicator so indicator tip contacts a tooth on bevel pinion.
   b. Wedge block of wood between bevel gear (16) and case so bevel gear will not turn.

NOTE

Ensure bevel pinion (from transmission) is held as far as possible toward front of machine when gear clearance (backlash) is measured. Correct backlash is 0.015 in. + 0.004 in. or - 0.003 in. (0.38 mm + 0.10 mm or - 0.08 mm).

   c. Push bevel pinion toward front of machine as far as possible. Move bevel pinion clockwise and then counterclockwise. The free movement (backlash) will be the difference in values read on dial indicator.
   d. Repeat steps b and c at three more points around bevel gear (16) to find point of smallest gear clearance (backlash).



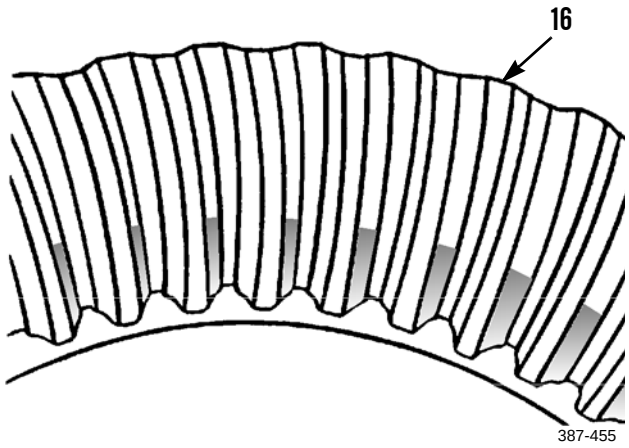
NOTE

Adjustment of bearings for bevel gear shaft (19) will not change by movement of shims from one bearing cage to other bearing cage as long as total thickness of shims is the same.

   e. If measurement of smallest gear clearance (backlash) is too large, remove some of shims (22) from behind bearing cage (14). Install shims (that were removed) behind bearing cage (15).
   f. If measurement of smallest gear clearance (backlash) is too small, remove some of shims (22) from behind bearing cage (15). Install shims (that were removed) behind bearing cage (14).
7. After bevel gear bearing preload and gear clearance (backlash) adjustments have been made, check tooth contact setting between bevel gear (16) and bevel pinion shaft as follows:
   a. Apply thin coat of prussian blue on bevel gear teeth. Turn bevel pinion shaft and check marks made on bevel gear teeth.

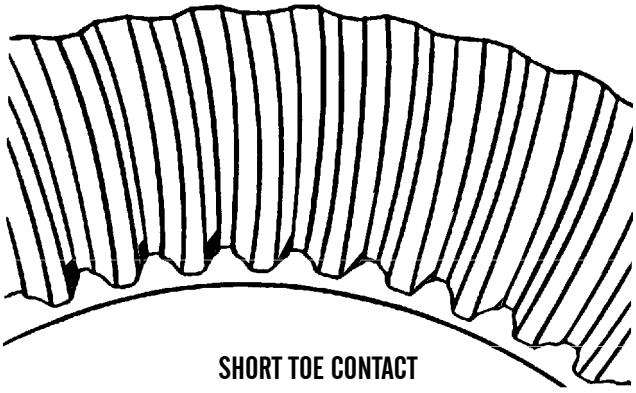
INSTALLATION - CONTINUED

b. With no load, correct tooth setting will be as shown. The area of contact starts near toe of gear and goes 30% up length of tooth. With this setting, when load is put on gear it will be over correct area of teeth.



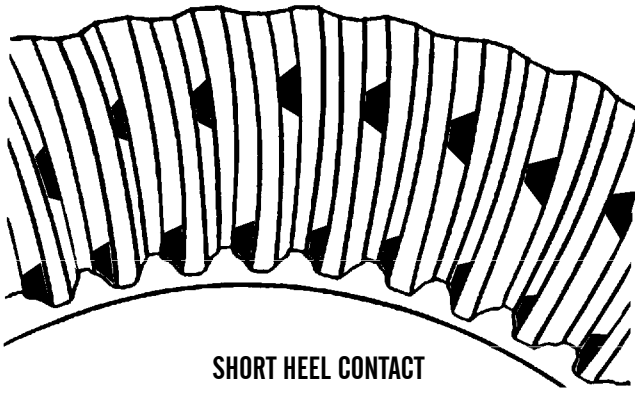
387-455

c. If bevel pinion shaft is too far away from bevel gear, short toe contact will be the result as shown. The teeth of bevel pinion shaft will be in contact with toe ends of convex faces (part that makes a curve toward outside), and top edge of heel end of concave faces (part that makes a curve toward inside). To correct this, add shims between bevel pinion shaft and bearing cage of transmission. Check gear clearance (backlash) and tooth contact again.



387-456

d. If bevel pinion shaft is too near to center of bevel gear, short heel contact will be the result as shown. The teeth of bevel pinion shaft will be in contact with toe ends of concave faces (part that makes a curve towards the inside) and the heel ends of convex faces (part that makes a curve toward the outside). To correct this, move pinion shaft away from bevel gear by removal of shims between bearing cage of transmission and bevel pinion shaft. After doing this, check gear clearance (backlash) and tooth contact again.



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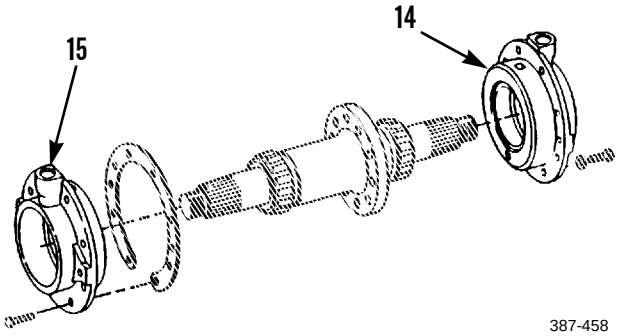
INSTALLATION - CONTINUED

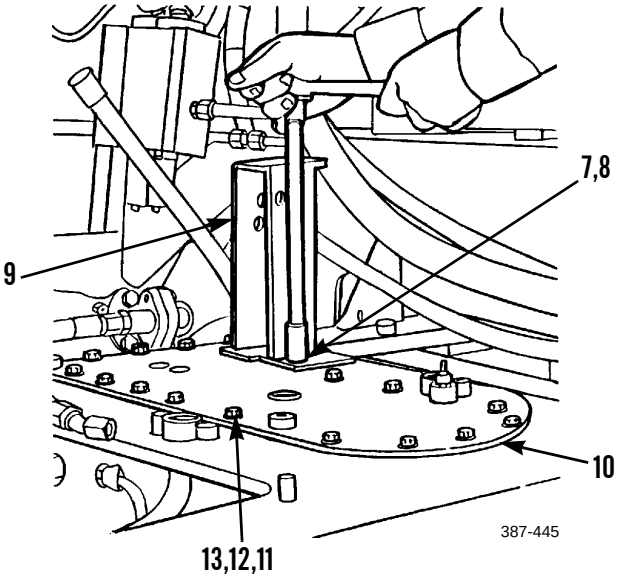
NOTE

Several adjustments must be made for correct tooth contact setting. If gear clearance (backlash) is changed, tooth contact setting will change.

8. Install oil lines in bearing cages (14 and 15).

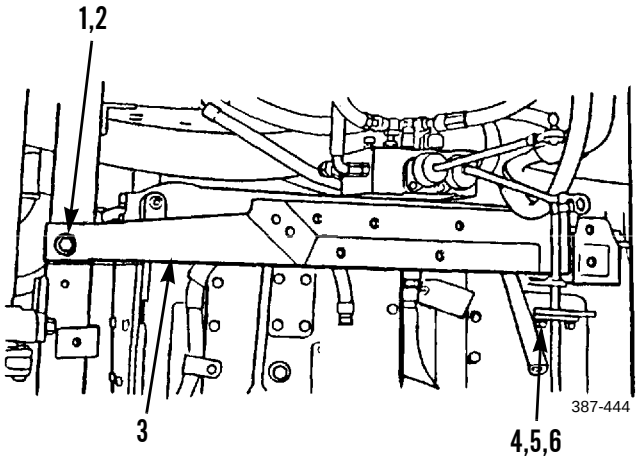


9. Place a bead of sealing compound on cover (10). Install cover on bevel gear case with 19 capscrews (11), washers (12) and three spacers (13).
10. Install bracket (9) on gear case cover (10) with four capscrews (7) and new lockwashers (8).



INSTALLATION - CONTINUED

11. Position support assembly (3) and install one end of support assembly with two capscrews (4), new lockwashers (6) and nuts (5).
12. Install other end of support assembly (3) with capscrew (1) and washer (2).



13. Install hydraulic tank mounting brackets and plates (WP 0156 00).
14. Install steering clutch hubs (WP 0155 00).
15. Install steering clutch control valve (WP 0154 00).
16. Run engine and test drive in all speeds (TM 5-2410-237-10).

END OF WORK PACKAGE

FINAL DRIVE BEARINGS ADJUSTMENT 0128 00

THIS WORK PACKAGE COVERS

Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Adjusting tool, bearing (Item 10, WP 0250 00)

Materials/Parts

Compound, silicone, RTV (Item 10, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 20, 21 or 22, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Gasket (7)

Washer, lock (5)

References

WP 0010 00

WP 0132 00

WP 0243 00

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

ADJUSTMENT

NOTE

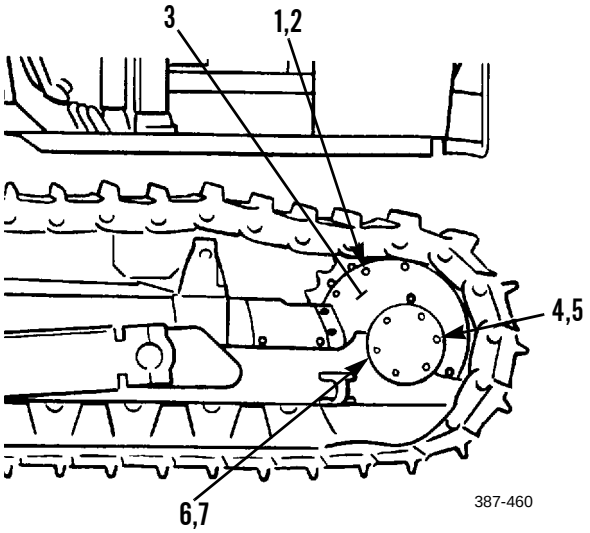
When adjusting bearings, track must be loosened, not removed.

1. Perform steps to loosen track (WP 0132 00).
2. Lift machine off ground (WP 0243 00).

NOTE

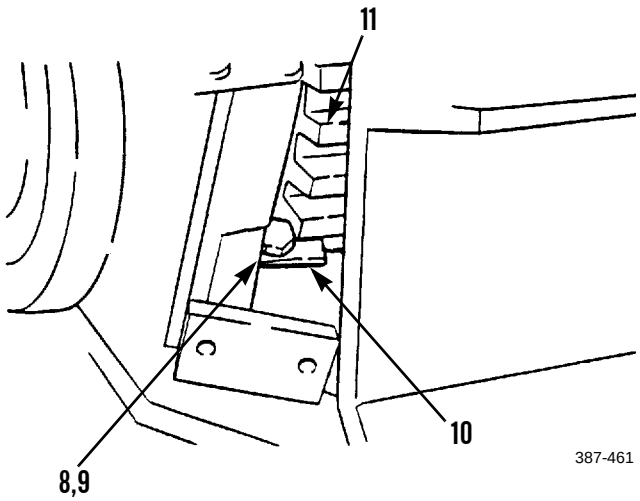
Sprocket assembly must turn while adjustment to final drive bearing is made.

3. Remove six capscrews (1), washers (2) and guard (3) from track roller frame.
4. Remove six capscrews (4), lockwashers (5) and cap (6) from support. Discard lockwashers.
5. Remove and discard gasket (7).



ADJUSTMENT - CONTINUED

6. Remove capscrew (8), nut (9) and lock (10) from adjusting nut (11).

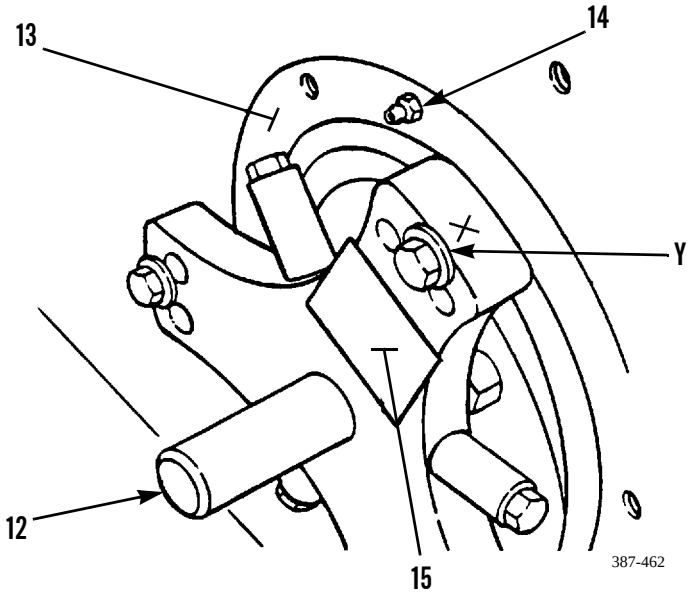


NOTE

All parts must be clean. Bearings must have lubricating oil on them. Adjusting nut must turn freely on threads and bearing cage must move freely in holder.

7. Install stand, bearing adjusting tool, washers and capscrews as follows:

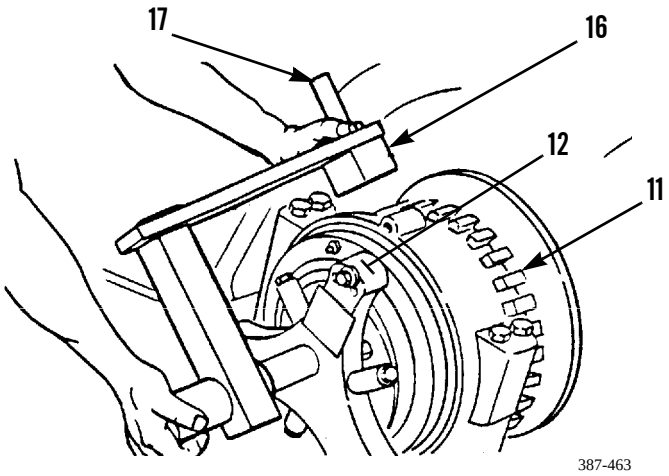
   a. Install trunnion group (12) on track roller frame support assembly (13) using holes marked “Y”. Trunnion arm with identification “X” must be fastened to first hole with threads located to the right from grease fitting (14). See instructions on decal (15).



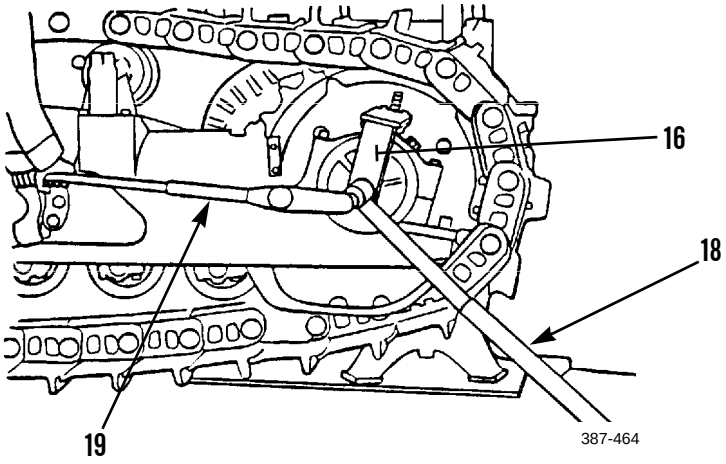
FINAL DRIVE BEARINGS ADJUSTMENT - CONTINUED 0128 00

ADJUSTMENT - CONTINUED

b. Install driver group (16) on trunnion group (12). Pin (17) must be in retracted position as shown.
c. Push pin (17) down between two lugs on adjusting nut (11).



8. Install torque multiplier (18) and torque wrench (19) over driver group (16). Start machine and turn sprocket slowly while adjusting nut (11) is turned to the left to tighten to 2500 lb-ft (3390 Nm).



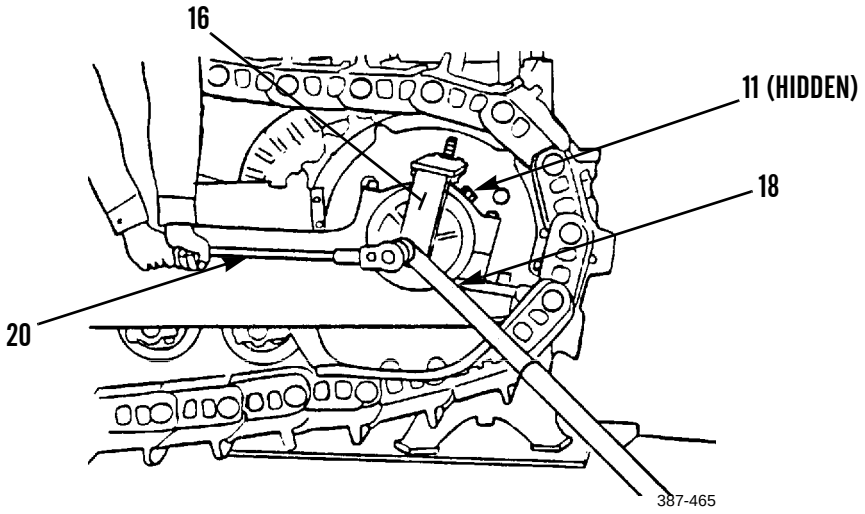
ADJUSTMENT - CONTINUED

9. Remove torque wrench (19) and install ratchet wrench (20). Turn adjusting nut (11) to the right (six to ten lugs) to lower torque to less than 350 lb-ft (475 Nm).

NOTE

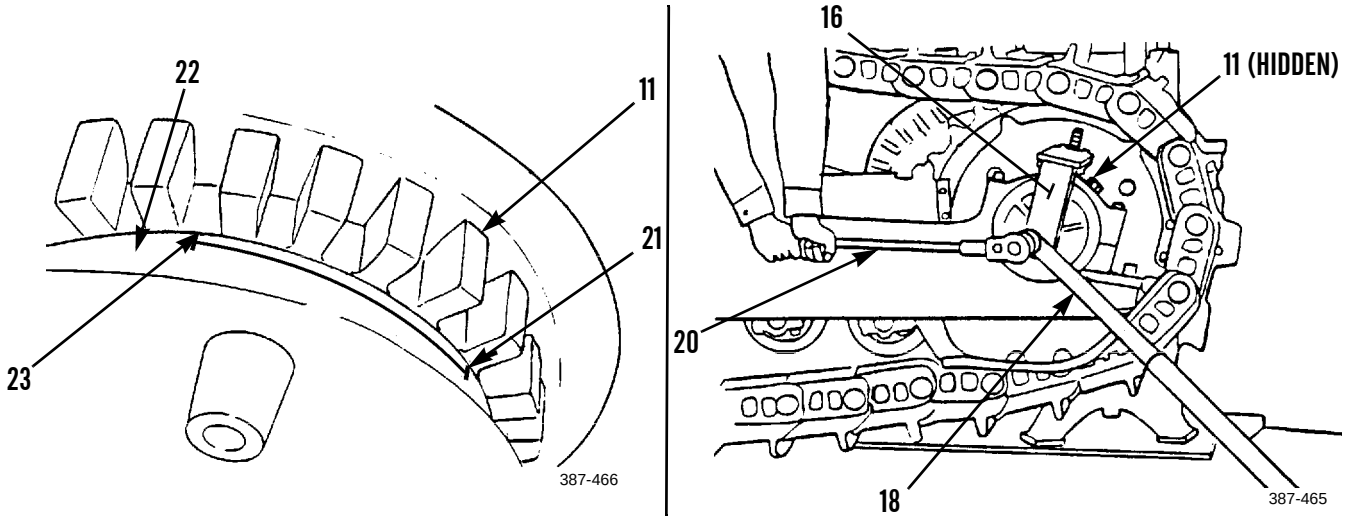
If it is not possible to get a torque below 350 lb-ft (475 Nm) after adjusting nut is loosened, a separation of tracks must be made (WP 0132 00) to make adjustment of bearings.

10. Remove torque multiplier (18) and install torque wrench (19) and adapter. Tighten adjusting nut (11) to 350 lb-ft (475 Nm).



11. Move driver group (16) out of the way and put a mark (21) on adjusting nut (11) and holder assembly (22) in alignment with each other. Mark (23) on holder assembly (22) should be placed to the left from mark (21) and 5.84 in. +/- 0.06 in. (148.3 mm +/- 1.5 mm) (distance “Z”) from mark (21).

12. Install driver group (16) on shaft of trunnion group.



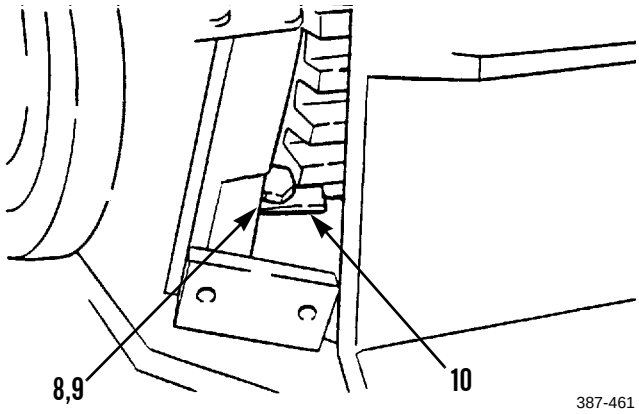
13. Install torque multiplier (18) and tighten adjusting nut (11) until marks (21 and 23) are in alignment.

ADJUSTMENT - CONTINUED

NOTE

If necessary, tighten adjusting nut to install lock in one adjusting nut.

14. Install lock (10) with capscrew (8) and nut (9).



15. Remove the following tools: capscrews, washers, bearing adjusting tool and stand.

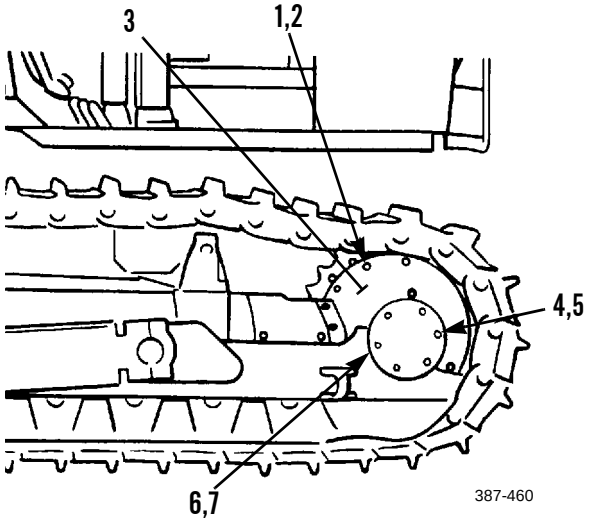
WARNING

Exposure to silicone RTV compound may be hazardous to your health. Contact with eyes can cause sever irritation and burns. Compound can be absorbed into the skin and can cause irritation or skin sensitization. Inhalation of vapors can cause respiratory tract irritation; prolonged inhalation can result in al allergic reaction. Vapors are combustible. Do not use near open flame. Wear eye and skin protection and avoid inhalation of vapors. Use only in a well-ventilated area. FAilure to follow this warning can cause injury or death.

NOTE

Coat both sides of new gasket with silicone RTV compound.

16. Position new gasket (7) and cap (6) and install six capscrews (4) and new washers (5).
17. Install guard (3) with six capscrews (1) and new lockwashers (2).
18. Lubricate track roller frame outer bearings by filling retainer cavity with grease (WP 0010 00).
19. Lower machine to ground (WP 0243 00).
20. Adjust track (WP 0132 00).



END OF WORK PACKAGE

DRIVESHAFT AND U-JOINT REPLACEMENT 0129 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

Personnel Required

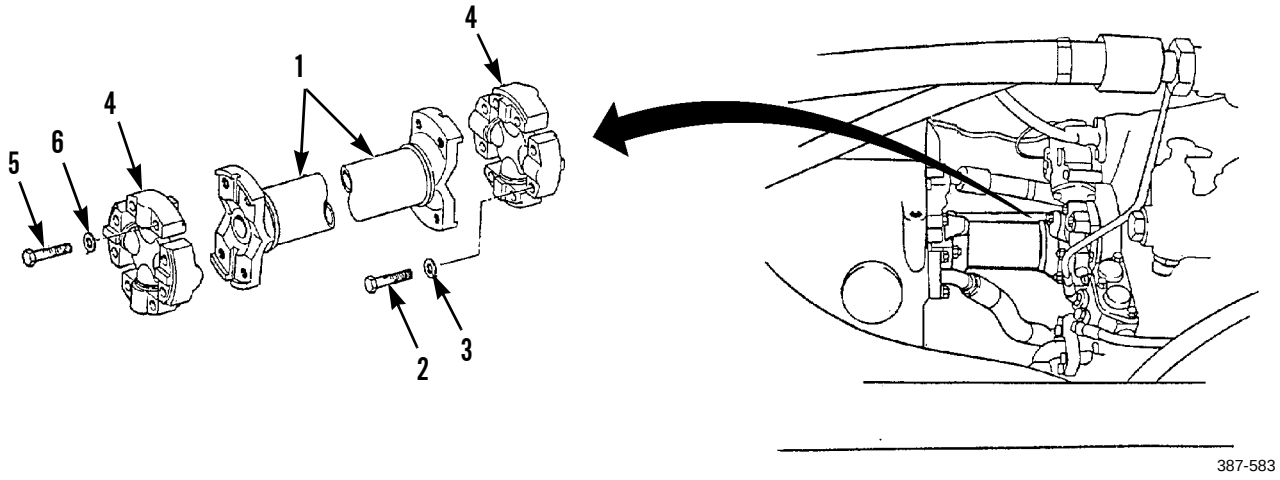
Two

Equipment Condition

Floor plates removed (WP 0171 00)

REMOVAL

1. Use a nylon sling to support driveshaft (1) and remove eight bolts (2) and washers (3) from U-joints (4), transmission and torque divider. Remove driveshaft.
2. Remove four bolts (5), washers (6) and U-joint (4) from each end of driveshaft (1).



INSTALLATION

1. Install U-joint (4) to each end of driveshaft (1) with four washers (6) and bolts (5). Tighten bolts to 40 lb-ft (54 Nm).
2. Use a nylon sling to support driveshaft (1) with u-joints (4). Secure to transmission and torque divider with eight washers (3) and bolts (2).
3. As needed, apply grease to each U-joint grease fitting.
4. Install floor plates (WP 0171 00).

END OF WORK PACKAGE

TRACK THEORY OF OPERATION 0130 00

UNDERCARRIAGE

1. The undercarriage connects to the body and final drives. Two track assemblies are kept in parallel adjustment by the diagonal braces of the track roller frames. Each track assembly can move up and down by itself.

2. The components of the undercarriage are: equalizer bar, track rollers, track carrier rollers, tracks, front idlers, track roller frames, track adjusters and recoil springs.

3. The front idlers, track rollers and track carrier rollers use seals to prevent the loss of lubricant and to keep out foreign material.

TRACK ROLLER FRAMES

1. The track roller frames are fastened to the final drive bearing cage and to the steering clutch and bevel gear case.

2. The track rollers, track carrier rollers, front idlers, track adjusters and recoil springs are fastened to the track roller frames.

3. The alignment of the track roller frames and final drives is controlled by the shim adjustment of the final drives.

TRACK CARRIER ROLLERS

1. The track carrier rollers give support to the track between the sprocket and the front idler. The shaft of the track carrier roller is fastened to a support bracket by a clamp. The support bracket is fastened to the track roller frame.

2. The track carrier rollers must be in alignment with the sprocket and the front idler. The alignment is done by the movement of the roller shaft inside the support bracket. The carrier rollers turn on two tapered roller bearings.

TRACK ROLLERS

1. The track rollers are fastened to the track roller frames. The track rollers are in contact with the inside surfaces of the track links. Flanges on the track rollers prevent the movement of the track from side to side. The inside surfaces of the track links cause an equal distribution of the weight of the machine along the track.

2. Each track roller frame has six track rollers, three single flange and three double flange.

3. The flange at the center of shaft gets the side load on the roller. Bearings also get the side load on the roller. The amount of side movement or end clearance of the shaft cannot be adjusted.

FRONT IDLERS

1. The front idlers put the tracks in position in front of the track rollers. They also keep the tracks in alignment with the sprockets.

2. The adjustment of the tracks is done by the movement of the front idlers. The track adjusters move the front idlers and hold them in position.

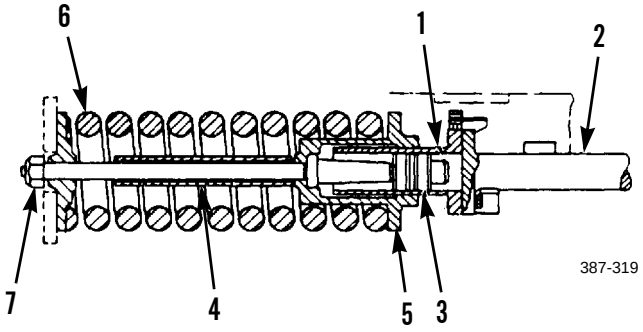
3. The position of the front idlers is controlled by shims. The front idlers must have correct alignment with the track roller frames.

RECOIL SPRINGS AND TRACK ADJUSTER

1. The recoil springs are normally in compression. They are held between brackets and stops on the track roller frames. Normally, the force of the springs is not against the tracks. The force against the track for the correct setting of track curve (sag) is controlled by the track adjuster.

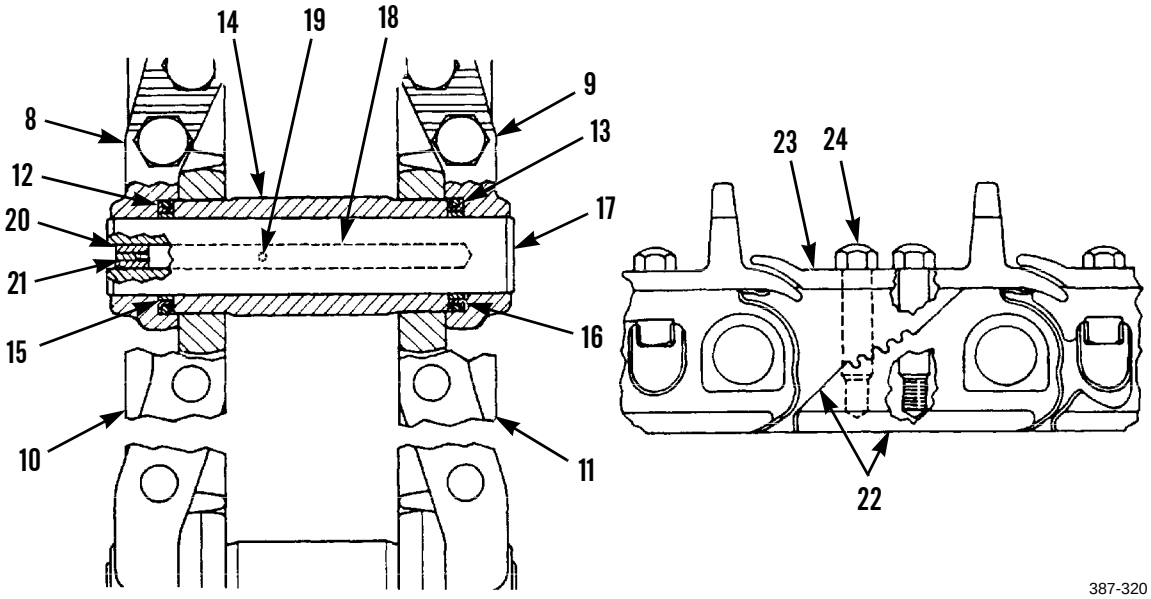
RECOIL SPRINGS AND TRACK ADJUSTER - CONTINUED

2. Track adjustment is made by adding to cavity (1) through a fill valve. This moves recoil rod (2) and the front idler toward the front of the machine. The movement of the recoil rod and front idler tightens the track. The tension on the track is released by a relief valve.
3. If rocks or debris get between the track and the rollers, idler or sprocket, recoil rod (2) moves toward the rear of the machine. The movement of the recoil rod tightens the track. Since the grease in cavity (1) cannot be compressed, piston (3) and bolt (4) move toward the rear of the machine. Bolt (4) pushes pilot (5) toward the rear of the machine. Pilot (5) pushes on spring (6). This puts spring (6) in compression. The movement of pilot (5) and the compression of spring (6) prevent too much tension on the track.
4. Nut (7) is used to keep recoil spring in compression when it is installed in the machine.



TRACK

1. The machine has sealed and lubricated track. Each track assembly has links, pins, bushings, thrust rings, polyurethane seal assemblies, rubber stoppers and polyurethane plugs.
2. Each of the track links (8 and 9) makes a fit over the track links in front of them. Link (8) makes a fit over link (10). Link (9) makes a fit over link (11). The connection of the track links makes the track assembly.
3. Each link has a counterbore in the end which makes a fit with the link in front of it. Seal assemblies (12 and 13) are installed in the counterbores of the links. Each seal assembly has a load ring and a seal ring. The load ring pushes the seal ring against the end of bushing (14) and the link counterbore.



TRACK - CONTINUED

4. The seal ring gives a positive seal between the bushing and the link counterbore. The edge of the seal ring is against the end of the bushing. The thrust rings (15 and 16) are installed on the pin (17). The thrust rings give a specific amount of compression to the seal assemblies and control the end play (free movement) of the joint. The arrangement of the seal assemblies and thrust rings keeps foreign materials out of the joint and oil in the joint.
5. The pin (17) has a hole (18) almost the full length of the pin. Hole (19) is drilled radially in the pin near the center of the pin. The radial hole (19) lets oil go to the surface between the pin (17) and the bushing (14) and to the lip of the seal rings. The oil gives lubrication to the pin and bushing and also makes the lip of the seal ring wet. The lip of the seal ring must be kept wet to prevent wear of the lip of the seal ring. Oil is kept in the pin by a stopper (20) and a plug (21). The oil is installed in the pin through a hole in the center of the stopper (20). When the chambers in the pin are filled, the plug (21) is installed in the stopper (20).
6. Each pin and bushing assembly is sealed and has its own lubrication; the result is no internal wear on the joint. The interval for the turning of the track pins and bushings is much longer because the only wear will be on the outside of the bushings and the links.
7. The two-piece master links (22) and master shoe (23) are held together with capscrews (24).

END OF WORK PACKAGE

TRACK DRIVE SPROCKET SEGMENTS REPLACEMENT 0131 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Oil, lubricating (Item 24, WP 0249 00)

Personnel Required

Two

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Tractor parked on level ground (TM 5-2410-237-10)

WARNING

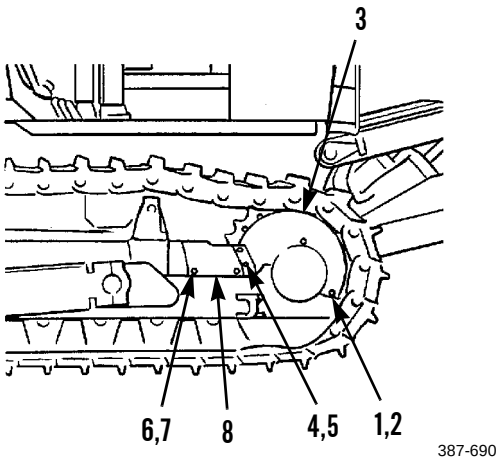
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in serious injury to personnel.

NOTE

Use this procedure for either side of track.

REMOVAL

1. Remove three bolts (1) and washers (2) from guard (3).
2. Remove two bolts (4), washers (5) and guard (3).
3. Remove four bolts (6), washers (7) and guard (8).

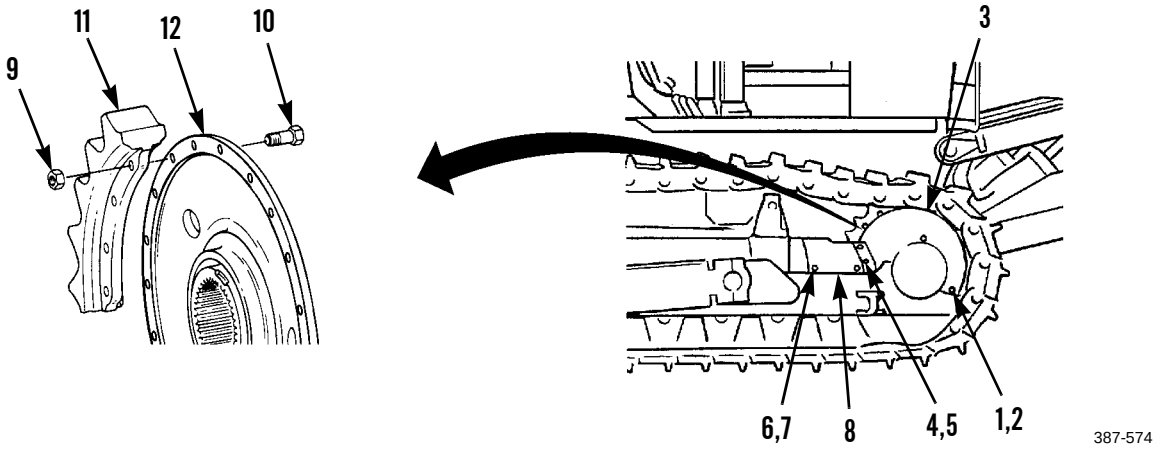


REMOVAL - CONTINUED

NOTE

Move tractor at intervals and inspect five sprocket segments per track for cracked or broken teeth and loose or missing nuts and capscrews.

4. Remove four nuts (9), bolts (10) and sprocket segment (11) from hub (12).



INSTALLATION

NOTE

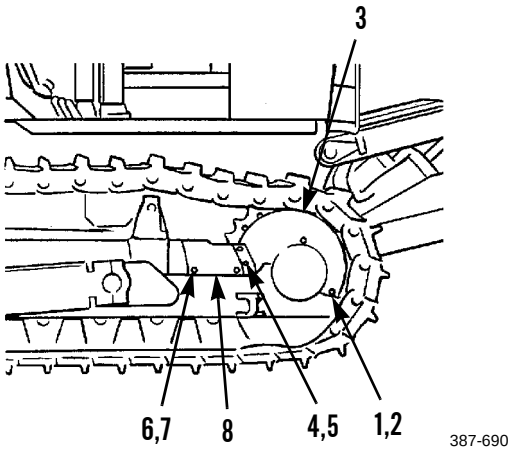
- **Ensure mounting surfaces are clean.**
- **Lightly coat bolt thread, with oil before installation.**

1. Install sprocket segment (11) to hub (12) with four bolts (10) and nuts (9). Tighten nuts to a wet torque of 220 lb-ft (298 Nm), then tighten 1/3 turn more.

NOTE

Apply antiseize compound to all mounting bolts before installation.

2. Install guard (8), four washers (7) and bolts (6).
3. Install guard (3), two washers (5) and bolts (4).
4. Install three washers (2) and bolts (1) securing guard (3).



5. Test drive and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

TRACK ASSEMBLY INSPECTION AND ADJUSTMENT 0132 00

THIS WORK PACKAGE COVERS

Inspection, Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Gage, sprocket wear (Item 31, WP 0250 00)

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Drawbar pin (TM 5-2410-237-10)

References

WP 0131 00
WP 0134 00
WP 0137 00
WP 0138 00
WP 0143 00
WP 0162 00

Personnel Required

Two

Equipment Condition

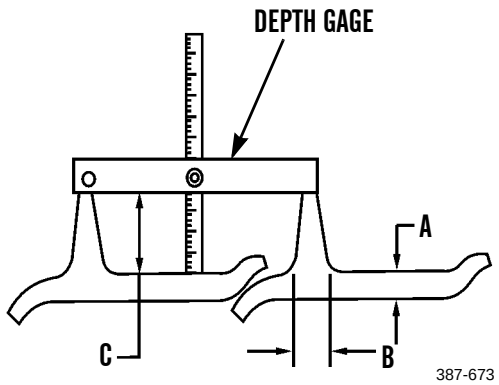
All implements in fully raised position (TM 5-2410-237-10)

INSPECTION

NOTE

- **Inspection includes all moving parts and guides of undercarriage because of their functional relationship. Wear of one item directly affects other items. Inspection should include all listed items.**
- **Undercarriage components are considered rebuildable if in range of 80-100% worn condition. Components at 120% worn condition are considered beyond repair and must be replaced.**

1. **Track Shoes.** Measure track shoe grouser height and refer to Table 1. Replace track assembly as necessary (WP 0143 00).



INSPECTION - CONTINUED

Table 1. Track Shoe Dimensions.

SHOE	GROUSER DIMENSIONS (NEW)			GROUSER HEIGHT WEAR		
Shoe Type	A (Thickness)	B (Width)	C (Height)	80%	100%	120%
Standard Single Grouser	0.56 in. (14.2 mm)	1.04 in. (26.4 mm)	2.76 in. (70.1 mm)	1.36 in. (34.6 mm)	1.00 in. (25.4 mm)	0.64 in. (16.2 mm)

2. **Track Chain.**

NOTE

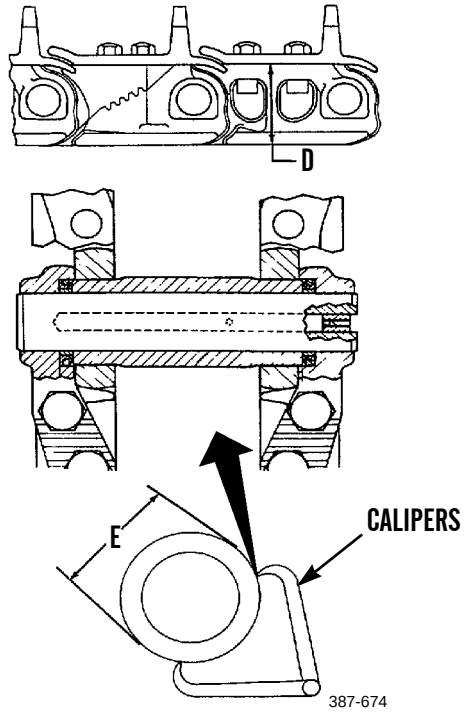
Tractor uses a sealed lubricated track chain which means there is virtually no wear on track pins as long as seals retain lubricating oil in bushing.

a. Measure link rail height (dimension D) and refer to Table 2. Replace track assembly as necessary (WP 0143 00).

NOTE

Check for "dry" track pin and bushing joints by feeling bushings or link pin bosses for higher temperatures compared to other joints of chain.

b. Measure bushing external diameter (dimension E) and refer to Table 2. If bushings are between 80 and 100% worn dimension, replace track assembly (WP 0143 00).



Track Chain Dimensions.

MEASUREMENT	NEW	80%	100%	120%
Chain Link Rail Height D	4.94 in. (125.5 mm)	4.62 in. (117.3 mm)	4.50 in. (114.3 mm)	4.30 in. (109.2 mm)
Chain Bushing External Diameter E	2.94 in. (74.7 mm)	2.80 in. (71.1 mm)	2.74 in. (69.6 mm)	2.67 in. (67.8 mm)

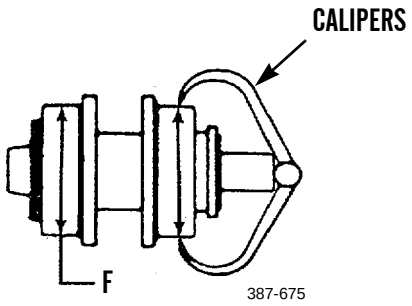
INSPECTION - CONTINUED

3. **Track Carrier Rollers.**

NOTE

Front and rear carrier rollers can be switched to balance tread wear between front and rear rollers.

Measure carrier roller tread diameter (dimension F) and refer to Table 3. Replace carrier roller (WP 0137 00) as necessary.



Carrier Roller Dimensions.

MEASUREMENT	NEW	80%	100%	120%
Carrier Roller Tread Diameter F	7.50 in. (190.5 mm)	6.91 in. (175.5 mm)	6.75 in. (171.4 mm)	6.46 in. (164 mm)

4. **Track Rollers.**

NOTE

Front and rear track rollers wear faster. Switch front and rear rollers with intermediate rollers to balance tread wear and prolong roller wear.

Measure track roller tread diameter (dimension G) and refer to Table 4. Replace track roller (WP 0134 00) as necessary.

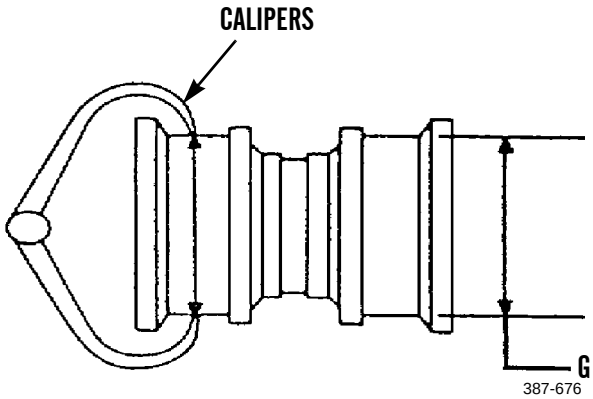
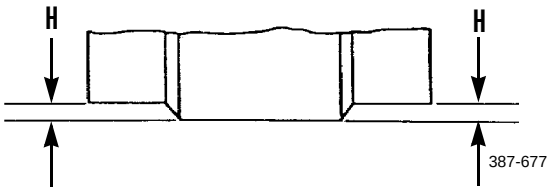


Table 4. Track Roller Dimensions.

MEASUREMENT	NEW	80%	100%	120%
Track Roller Tread Diameter G	8.75 in. (222.3 mm)	8.11 in. (205.1 mm)	7.87 in. (199.9 mm)	7.48 in. (189.1 mm)

INSPECTION - CONTINUED

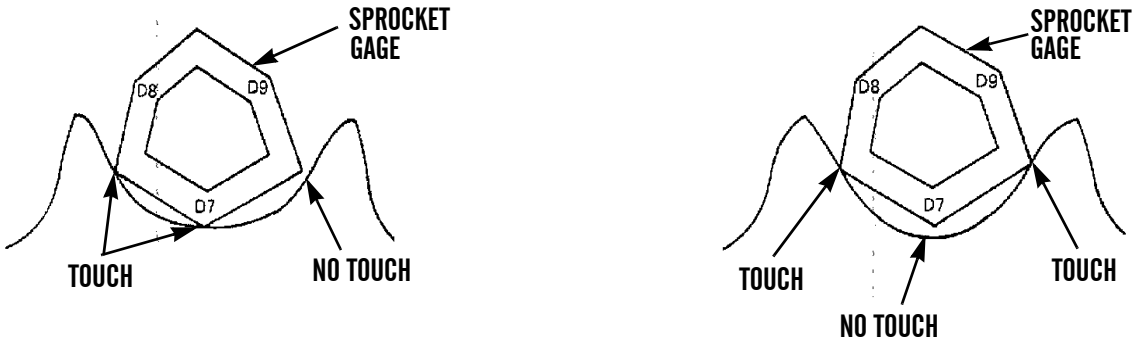
5. **Track Idler.** Measure track idler tread wear (dimension H) and refer to Table 5. Replace track idler (WP 0138 00) as necessary.



Track Idler Dimensions.

MEASUREMENT	NEW	80%	100%	120%
Track Idler Tread Wear H	0.86 in. (21.9 mm)	1.04 in. (26.4 mm)	1.24 in. (31.5 mm)	1.44 in. (36.6 mm)

6. **Track Drive Sprocket.**
   a. Measure drive sprocket wear using sprocket wear gage.
   b. If sprocket does not touch on one of two outer points of gage, sprocket segment must be replaced (WP 0131 00).
   c. If sprocket touches outer two points and not center point of gage, sprocket can be used with a new track (WP 0143 00).



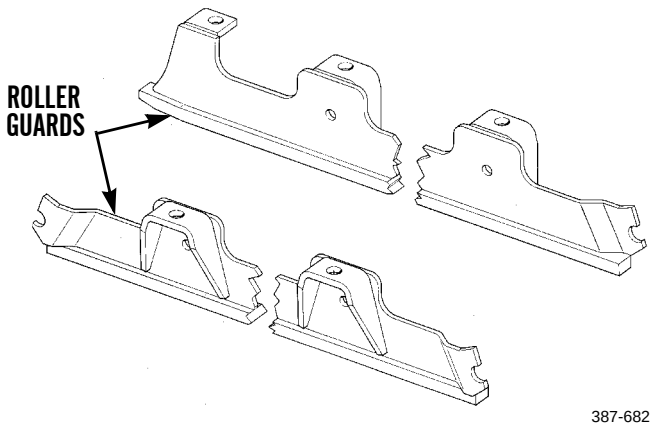
INSPECTION - CONTINUED

7. **Track Roller Guards.**

NOTE

Track roller guards provide some guiding effect. They serve mainly to keep foreign debris from entering roller areas. In some instances, track roller guards can increase wear on chain and pin ends.

Replace roller guards if cracked, bent or worn (WP 0162 00).



387-682

ADJUSTMENT

NOTE

- **Track adjustment should be performed on level ground and on same surface conditions on which machine is operated.**
- **Packed dirt should not be removed from track, if packing conditions exist on the job.**

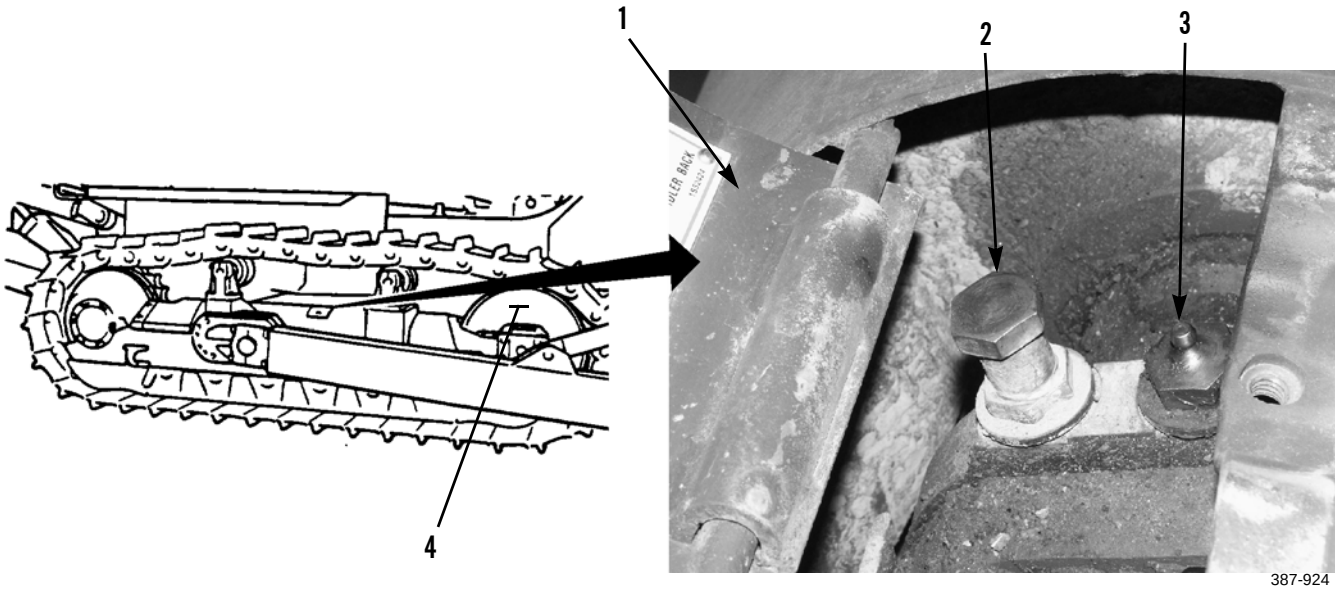
1. Move machine forward a distance of at least twice its length. Allow machine to coast to a stop. Do NOT apply brakes. Shut down engine.
2. Loosen bolt and open recoil mechanism access cover (1).
3. Wipe clean relief valve (2).

ADJUSTMENT - CONTINUED

WARNING

Wear eye protection and keep face clear when venting grease from relief valve during track adjustment. NEVER visually inspect relief valve to see if grease is escaping. Always observe track to verify it has loosened. Failure to follow this warning could cause eye injury or blindness.

4. Open relief valve (2) and allow grease to escape and track tension to release.
5. Close relief valve (2). Clean area around relief valve and fill valve (3)
6. Connect grease fun to fill valve (3). Pump grease into fill valve until track idler (4) moves forward toward front of tractor. STOP pumping when track idler stops moving.



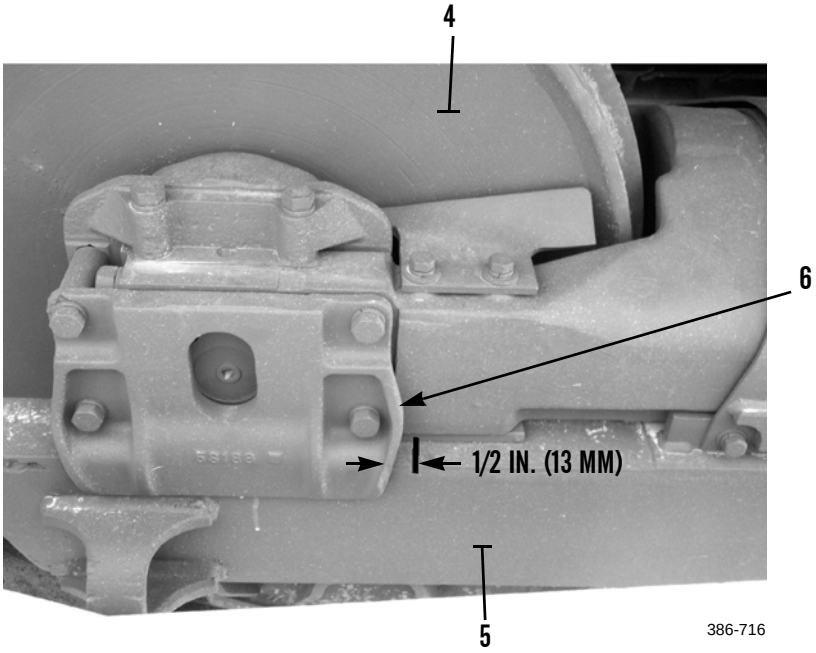
7. Mark a line on track roller frame (5) 1/2 in. (13 mm) from rear face of idler bearing support (6).

ADJUSTMENT - CONTINUED

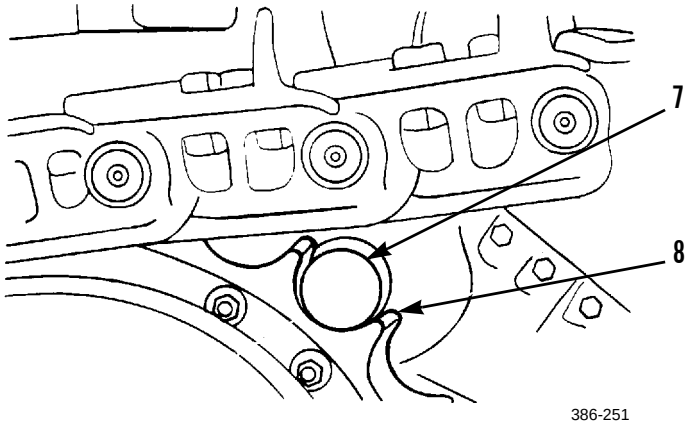
WARNING

Wear eye protection and keep face clear when venting grease from relief valve during track adjustment. NEVER visually inspect relief valve to see if grease is escaping. Always observe track to verify it has loosened. Failure to follow this warning could cause eye injury or blindness.

8. Open relief valve (2) no more than one turn and allow grease to escape and idler to move back.



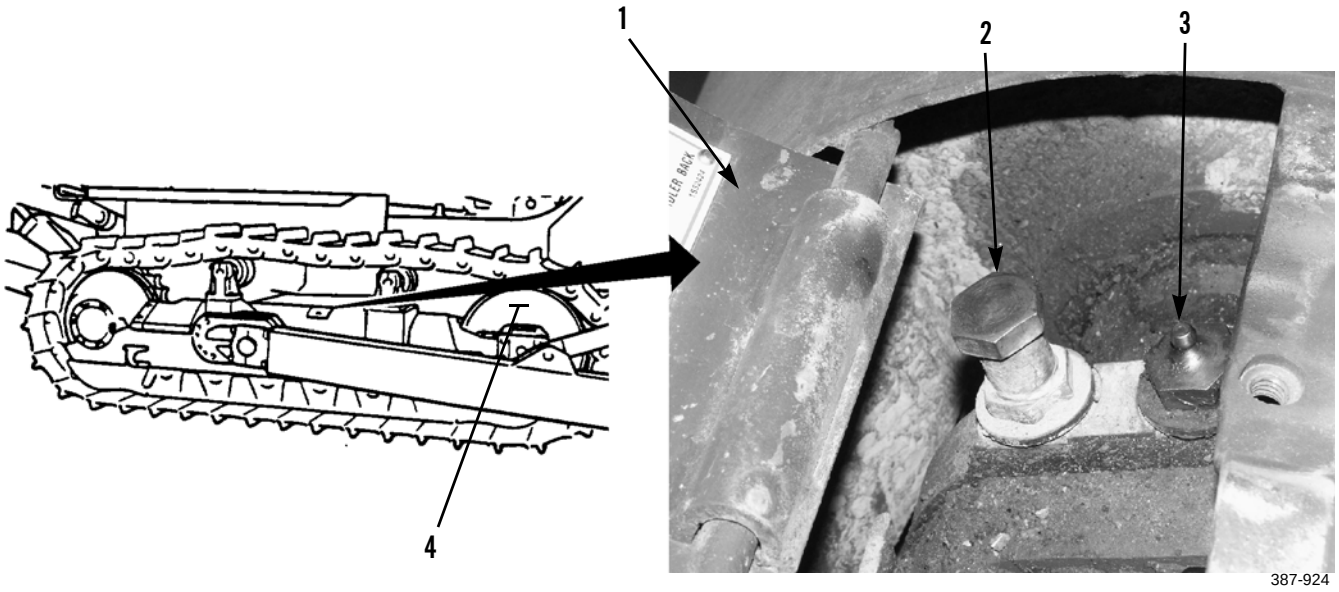
9. Put a drawbar pin (7), or a length of steel pipe, between teeth at top of track drive sprocket (8) near track link.



TRACK ASSEMBLY INSPECTION AND ADJUSTMENT - CONTINUED 0132 00

ADJUSTMENT - CONTINUED

10. Start engine and move machine in reverse until rear face of idler bearing support (6) moves past mark made on track roller frame (5).
11. Move machine forward until pin (7) is free of sprocket (8). Shut down engine and remove pin.
12. Connect grease gun to fill valve (3). Close relief valve (2).
13. Pump grease into fill valve (3) until rear face of idler bearing support (6) lines up with mark made on track roller frame (5).
14. Close recoil mechanism access cover (1) and tighten bolt.



387-924

15. Test drive and check track for proper operation.

END OF WORK PACKAGE

EQUALIZER BAR ASSEMBLY REPLACEMENT 0133 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Washer, lock (2 and 7)

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Right-front track carrier roller removed (WP 0137 00)

Two frontmost track roller frame guards removed (WP 0163 00)

Crankcase and transmission guards removed (WP 0157 00)

Tractor raised (WP 0243 00)

WARNING

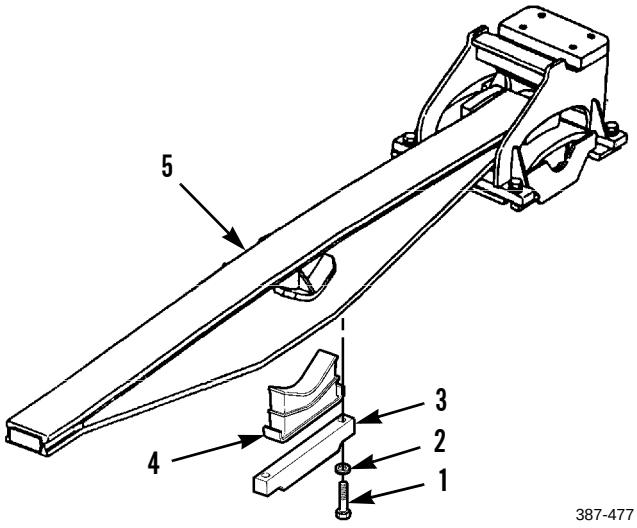
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Equalizer bar weighs 300 lb (136 kg).

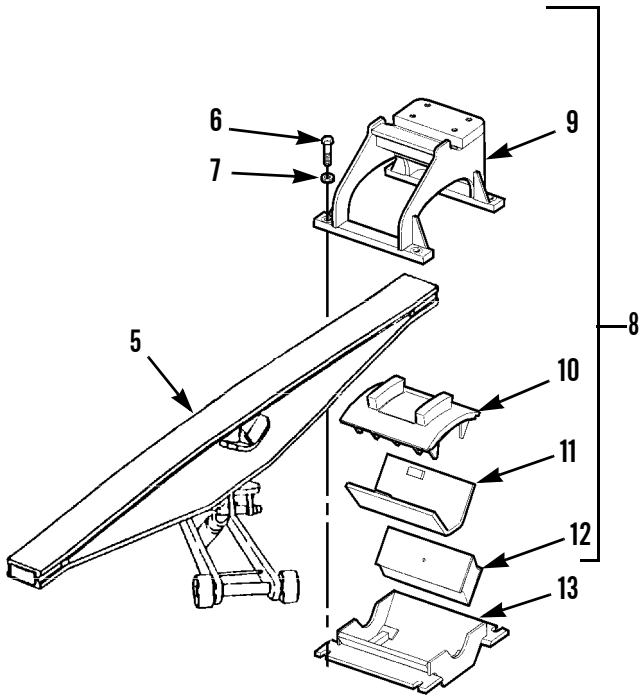
REMOVAL

1. Remove four bolts (1), lockwashers (2), two plates (3) and pads (4) from equalizer bar (5). Discard lockwashers.
2. From rear of tractor, position hydraulic floor jack under equalizer bar (5). Raise jack until it contacts equalizer bar.



REMOVAL - CONTINUED

3. Remove four bolts (6) and lockwashers (7) from right support assembly (8) on right track roller frame. Discard lockwashers.
4. Use hydraulic floor jack to lift equalizer bar (5) enough to remove right support (9).
5. Carefully remove equalizer bar (5) by rotating bar and pulling floor jack towards rear of tractor. Lower equalizer bar as soon as bar clears track roller frames.
6. Use a suitable lifting device to remove equalizer bar (5) from floor jack.
7. If necessary, remove remaining right support assembly (8) from right track roller frame as follows:
   a. Remove upper plate (10).
   b. Remove lower plate (11).
   c. Remove pad (12).
   d. Remove lower suspension (13).
8. If necessary, remove left front track carrier roller (WP 0137 00) and repeat step 3 to remove left support assembly.
9. Repeat step 7, a through d, for left support assembly, if necessary.



387-482

INSTALLATION


WARNING


Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Equalizer bar weighs 300 lbs (136 kg).

EQUALIZER BAR ASSEMBLY REPLACEMENT - CONTINUED 0133 00

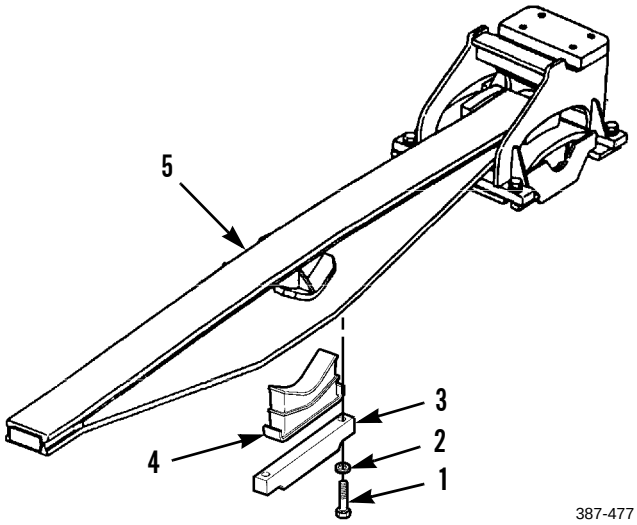
INSTALLATION - CONTINUED

1. Install right support assembly (8) as follows:
   a. Install lower suspension (13).
   b. Install pad (12).
   c. Install lower plate (11).
   d. Install upper plate (10).
2. If removed, repeat step 1, a through d, for left support assembly (8).
3. Install left support (9) with four new lockwashers (7) and bolts (6). Tighten bolts to 350 lb-ft (475 Nm).
4. Use a suitable lifting device to place equalizer bar (5) on hydraulic floor jack.
5. Push floor jack with equalizer bar (5) between tracks at rear of tractor. Rotate bar to align one end with left support assembly (8).
6. Move floor jack forward to position other end of equalizer bar in line with right upper plate (10).
7. Install right support (9) over end of equalizer bar (5) and on track roller frame.

NOTE

Make sure equalizer bar is centered on upper plate assembly.

8. Lower hydraulic jack until weight of equalizer bar is on right upper plate assembly (10).
9. Install four new lockwashers (7) and bolts (6) on right support (9). Tighten capscrews to 350 lb-ft (475 Nm).
10. Install two pads (4), plates (3), four new lockwashers (2) and bolts (1) on equalizer bar (5).
11. Tighten bolts (1) to 350 lb-ft (475 Nm).
12. Lower tractor to ground (WP 0243 00).
13. Install crankcase and transmission guards (WP 0157 00).
14. Install track roller frame guards (WP 0163 00).
15. Install right-front carrier roller. If removed, install left-front carrier roller (WP 0137 00).
16. Operate tractor and check for proper operation (TM 5-2410-237-10).



387-477

END OF WORK PACKAGE

TRACK ROLLERS REPLACEMENT 0134 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, machine shop (Item 107, WP 0250 00)

Lifting equipment, 200 lb capacity

References

WP 0243 00

Personnel Required

Two

Equipment Condition

Track roller guards removed (WP 0162 00)

Track loosened (WP 0132 00)

Machine raised off ground (WP 0243 00)

REMOVAL

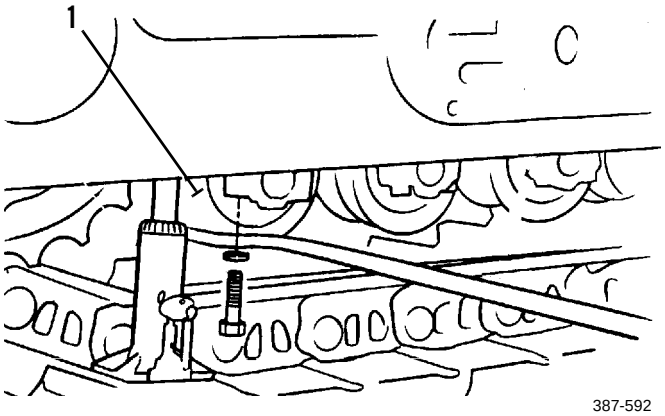
NOTE

If tractor has less than 1000 hours on it, you may have to separate track to remove track rollers.

1. Place a suitable jack under track and raise track off track roller (1).

WARNING

- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.**



387-592

- **Use assistance and extreme caution when using a chain and tanker bar to stabilize track roller. Ensure track roller is securely supported prior to loosening mounting hardware.**

REMOVAL - CONTINUED

NOTE

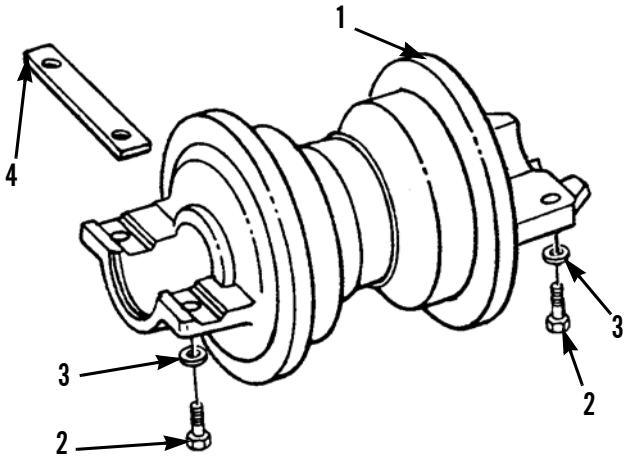
- **Weight of a single-flanged roller is 155 lb (70 kg). Weight of a double-flanged roller is 170 lb (77 kg).**
- **To remove an end roller, it may be necessary to remove roller next to it for clearance.**

2. Attach a suitable lifting device to chain and pry bar under track roller (1) to hold roller in position.

NOTE

A single-flanged roller is illustrated. Location of capscrews is the same for both single-flanged and double-flanged rollers.

3. Remove four capscrews (2) and washers (3) that secure track roller (1) in place.
4. Remove lock collar (4) and track roller (1).



INSTALLATION

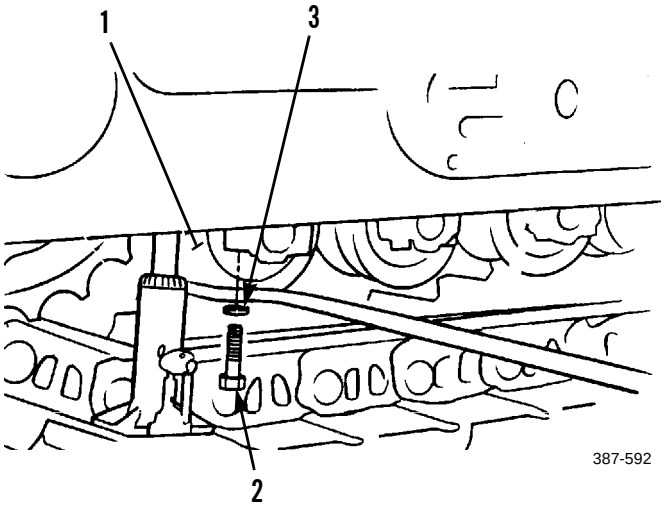
WARNING

- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.**
- **Use assistance and extreme caution when using a chain and tanker bar to stabilize track roller. Ensure track roller is securely supported.**

NOTE

Weight of a single-flanged roller is 155 lb (70 kg). Weight of a double-flanged roller is 170 lb (77 kg).

1. Attach a suitable lifting device to chain and pry bar under track roller (1) to hold roller in position.
2. Install lock collar (4) in track roller (1).
3. Install four washers (3) and capscrews (2) to secure track roller (1). Tighten capscrews to 550 lb-ft (746 Nm).
4. Lower track onto track roller (1) and remove hydraulic jack.
5. Lower machine to the ground (WP 0243 00).
6. Tighten and adjust track (WP 0132 00).
7. Install track roller guards (WP 0162 00).
8. Test drive and check track for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

TRACK ROLLER FRAME ASSEMBLY REPLACEMENT 0135 00

THIS WORK PACKAGE COVERS

Removal, Installation, Alignment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Link, lifting (Item 51, WP 0250 00)

Puller, ratchet lever, cable type (Item 90, WP 0250 00)

Lifting equipment, 4,000 lb capacity

Bolt, 3/4-10 x 1-1/2 in.

Materials/Parts

Washer, lock (7, 13 and 16)

Wood block, 4 in. x 4 in. x 12 in.

References

TM 5-2410-237-10

WP 0132 00

WP 0141 00

WP 0243 00

Personnel Required

Three

Equipment Condition

Track removed (WP 0143 00)

Track roller frame guard covers removed (WP 0163 00)

REMOVAL

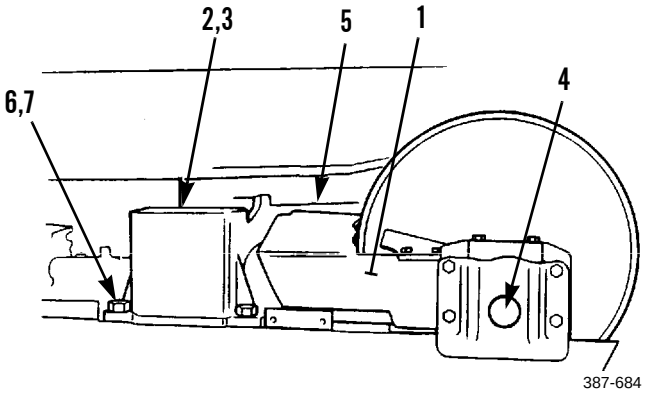
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Weight of an assembled track roller frame is 3,900 lb (1,769 kg).

1. Attach ratchet puller to front of track roller frame (1).
2. Install two lifting links (2) with 3/4 -10 x 1 1-1/2 in. bolts and attach a suitable lifting device to front support assembly (3) and point (4) on front of track roller frame (1).
3. Insert a block of wood between equalizer bar and frame.
4. Attach ratchet puller to lifting device at point (4).
5. Lift track roller frame (1) and use ratchet puller to raise evenly to remove tension on equalizer bar (5).
6. Remove four capscrews (6) and lockwashers (7) that secure front support assembly (3) to track roller frame (1). Discard lockwashers.

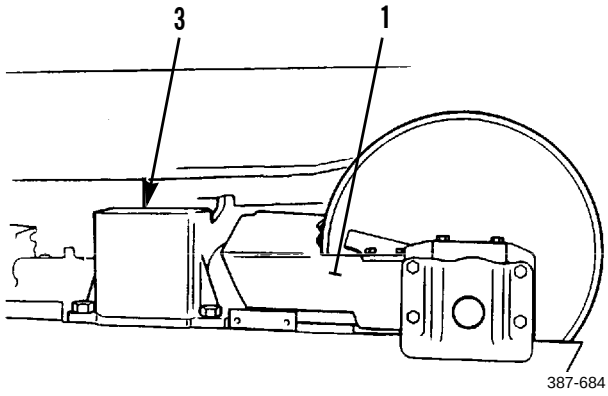


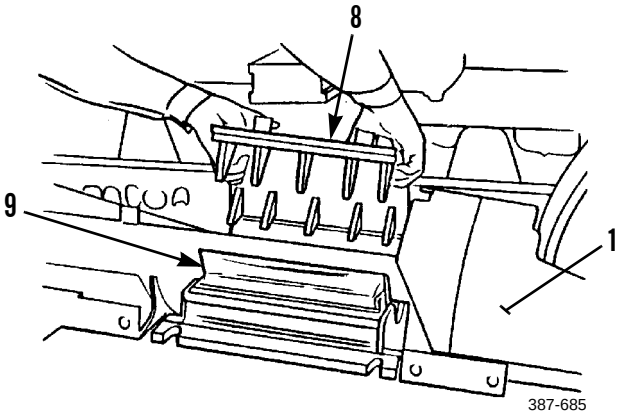
REMOVAL - CONTINUED

NOTE

Weight of front support assembly is approximately 70 lb (32 kg).

7. Lower front of track roller frame (1) onto track and remove front support assembly (3).
8. Remove plate (8) and pads (9) from track roller frame (1).

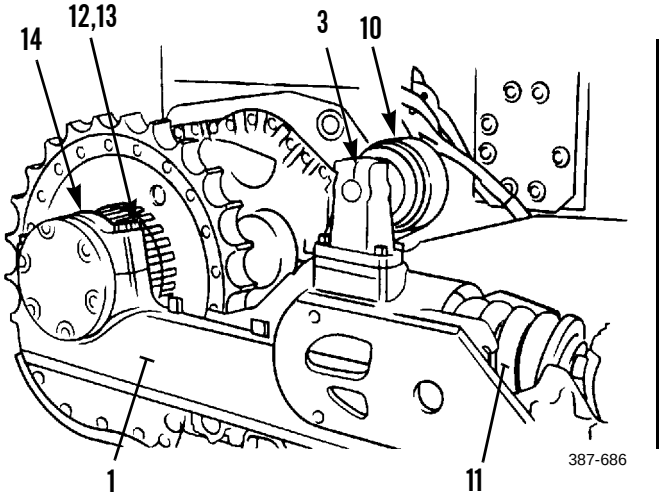


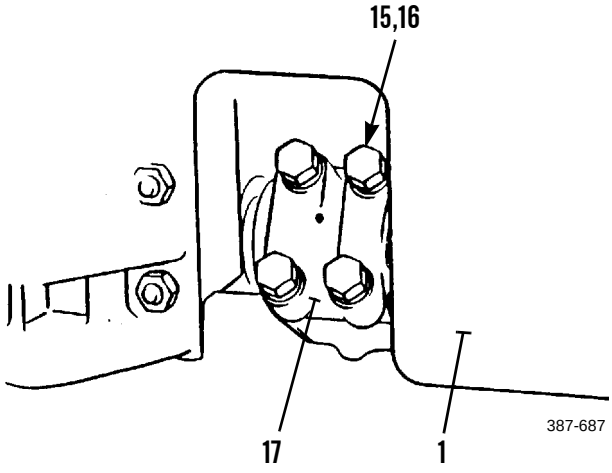


WARNING

Ratchet puller must be attached to track roller frame in a manner to evenly distribute weight of frame. Failure to do so may cause frame to tip, causing personal injury or death.

9. Attach lifting device to rear track carrier roller (10) and ratchet puller to lifting device and to recoil spring (11).
10. Adjust ratchet puller so rear track carrier roller (10), rear support assembly (3) and recoil spring (11) are level and balanced.
11. Remove four capscrews (12), lockwashers (13) and remove cap (14) from track roller frame (1). Discard lockwashers.
12. Remove four capscrews (15), lockwashers (16) and remove cap (17) from rear of track roller frame (1). Discard lockwashers.





REMOVAL - CONTINUED

13. Lower track roller frame (1) onto track.
14. Remove track roller frame (1) from track.

INSTALLATION

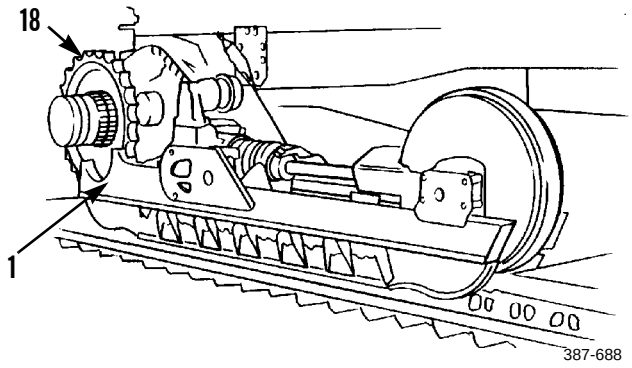
WARNING

- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.**
- **Ratchet puller must be attached to track roller frame in a manner to evenly distribute weight of frame. Failure to do so may cause frame to tip, causing personal injury or death.**

NOTE

Weight of an assembled track roller frame is 3,900 lb (1,771 kg).

1. Attach lifting device to rear of track roller frame (1).
2. Place track roller frame (1) in position on track.
3. Lift rear of track roller frame (1) in position on final drive sprocket (18) outer hub.



Ratchet puller must be attached to track roller frame in a manner to evenly distribute weight of frame. Failure to do so may cause frame to tip, causing personal injury or death.

4. Attach lifting device to rear track carrier roller (10) and ratchet puller to lifting device and to recoil spring (11).
5. Adjust ratchet puller so rear track carrier roller (10), rear support assembly (3) and recoil spring (11) are level and balanced.
6. Install cap (14) to track roller frame (1) with four new lockwashers (13) and capscrews (12). Tighten capscrews to 375 lb-ft (508 Nm).
7. Install cap (17) to track roller frame (1) with four new lockwashers (16) and capscrews (15). Tighten capscrews to 375 lb-ft (508 Nm).

INSTALLATION - CONTINUED

8. Install pads (9) and plate (8) in position on track roller frame (1).

WARNING

- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that nay lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.**

NOTE

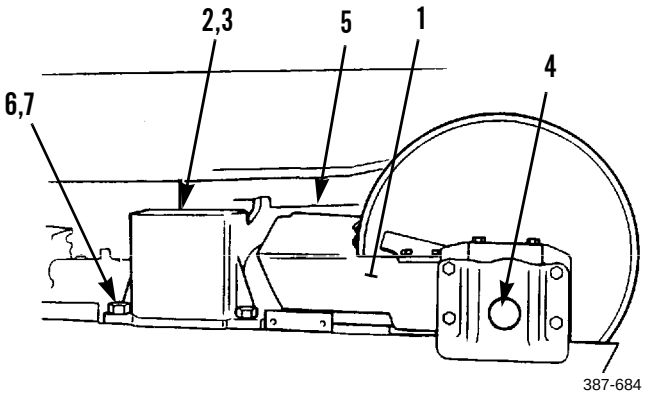
Weight of front support assembly is approximately 70 lb (32 kg).

9. Attach lifting device to lifting links (2) and to front support assembly (3) and point (4) on front of track roller frame (1).
10. Attach ratchet puller to front of track roller frame (1) and point (4).

NOTE

Do not hit front support assembly (3) when track roller frame is put into position under equalizer bar (5).

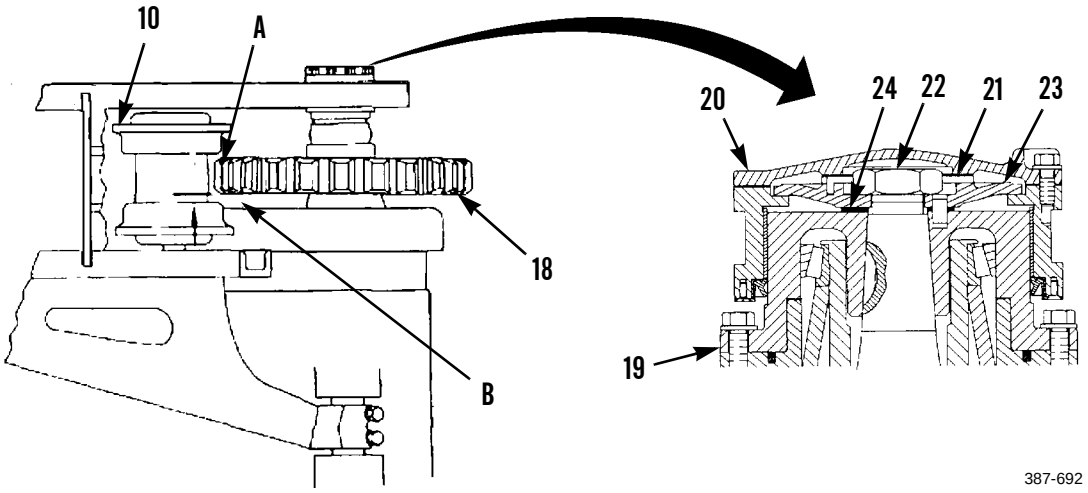
11. Lift track roller frame (1) into position on equalizer bar (5).
12. Lift track roller frame (1) and use ratchet puller to raise evenly until capscrew holes in front support assembly (3) are aligned with capscrew holes in track roller frame.
13. Install front support assembly (3) to track roller frame (1) with four new lockwashers (7) and capscrews (6). Tighten capscrews to 350 lb-ft (475 Nm).
14. Lower track roller frame (1) until weight is on equalizer bar (5). Remove lifting device, bolts, lifting links and ratchet puller.
15. Install track roller frame guard covers (WP 0163 00).
16. Install track (WP 0143 00).



ALIGNMENT

1. Place machine on flat and level surface.
2. Measure and mark centerline of sprocket (18) and centerline of rear track carrier roller (10). Centerlines should be lined up with each other. Distance A should equal distance B.
3. If centerline of sprocket (18) is more than 0.06 in. (1.5 mm) from centerline of rear track carrier roller (10), perform steps 4-12 to align track roller frame.

ALIGNMENT - CONTINUED



WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

4. Raise machine IAW (WP 0243 00) until both tracks are off ground.
5. Release tension from tracks (WP 0143 00).

NOTE

Refer to WP 0141 00 for assistance in performing steps 6-9.

6. Remove holder assembly (19).
7. Remove cap (20), lock (21), nut (22), retainer assembly (23) and shims (24).

NOTE

- **Thickness of one shim is 0.036 in. (0.91 mm). Use the least amount of shims and do NOT use more than seven shims on either side of machine.**
- **The following steps must be completed on each side of machine.**

8. Change alignment of rear track carrier roller (10) in relation to final drive sprocket (18) by installing or removing shim(s) (24) from final drive support.
   a. Install shim(s) (24) between retainer assembly (23) and holder (19) of final drive to move track roller frame out to make distance A more.
   b. Remove shim(s) (24) between retainer assembly (23) and holder (19) of final drive to move track roller frame in to make distance A less.
9. Install retainer assembly (23), nut (22), lock (21), and cap (20).

ALIGNMENT - CONTINUED

10. Lower machine to ground and remove lifting devices (WP 0243 00).
11. Adjust track (WP 0132 00).
12. Run machine and check track for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

RECOIL SPRING REPLACEMENT 0136 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Press, arbor (Item 74, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 350 lb capacity

Materials/Parts

Lockwasher (8)

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Track roller frame guards removed (WP 0163 00)

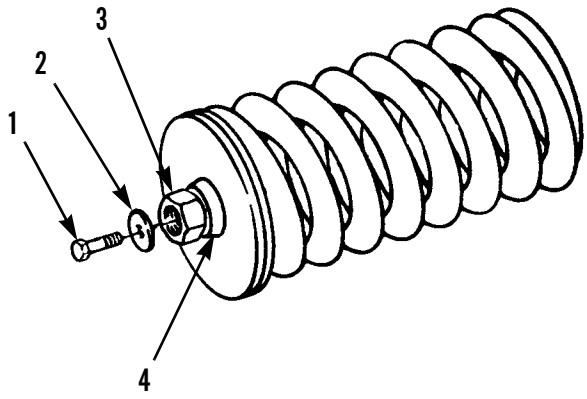
Track adjuster cylinder removed (WP 0140 00)

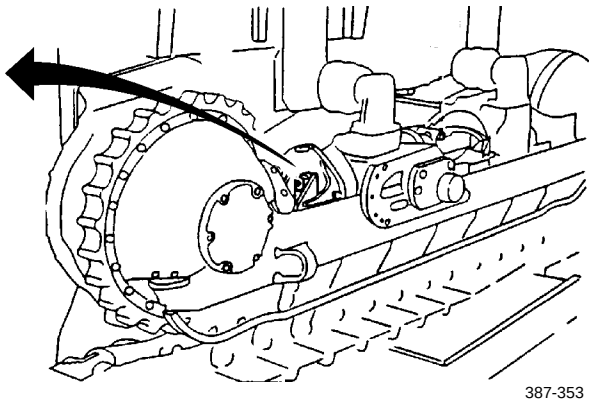
REMOVAL

WARNING

- **Recoil spring is under spring tension. Use extreme caution when disassembling to avoid injury or death.**
- **Ensure there is no spring pressure on two front stops. Do NOT remove recoil spring from track roller frame until pressure is released from two front spring stops to avoid injury or death.**

1. Remove bolt (1) and washer (2).
2. Tighten nut (3) against recoil spring rear pilot (4) to relieve pressure against recoil spring stop (5).





REMOVAL - CONTINUED

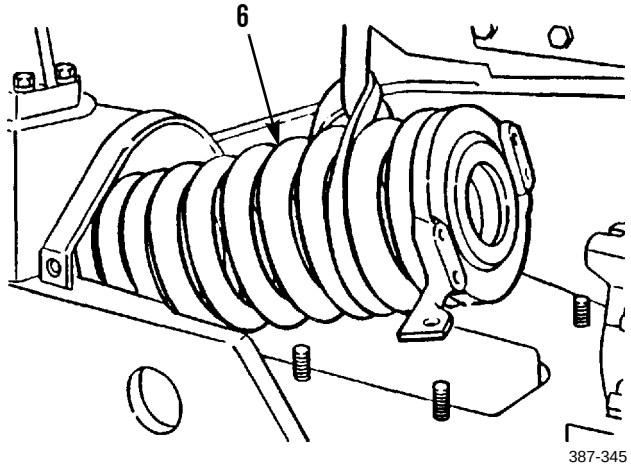
WARNING

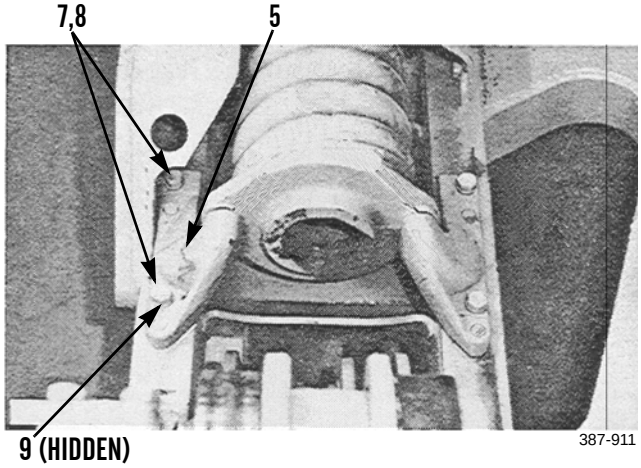
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Recoil spring weighs 300 lb (136 kg).

3. Attach nylon sling and a suitable lifting device to recoil spring (6).
4. Remove four capscrews (7), lockwashers (8) and spacers (9) from two stops (5). Discard lockwashers.
5. Remove two front stops (5) and recoil spring (6) from track roller frame.





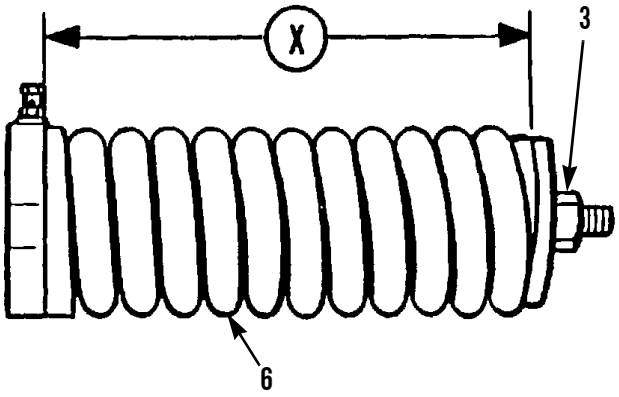
INSTALLATION

WARNING

- **Recoil spring is under spring tension. Use extreme caution when assembling, to avoid injury or death.**
- **Ensure press is equipped with guards to hold spring assembly in position while it is under compression.**

1. If recoil spring (6) is to be replaced, put recoil spring in a press and put spring under compression.
   a. Remove nut (3) and slowly release spring. Spring is under compression until length of spring is 31.61 in. (80.29 cm).
   b. Put new spring in position and put spring under compression until distance (X) is 24.75 in. (62.87 cm). Tighten nut (3) to hold spring and retainers.

INSTALLATION - CONTINUED



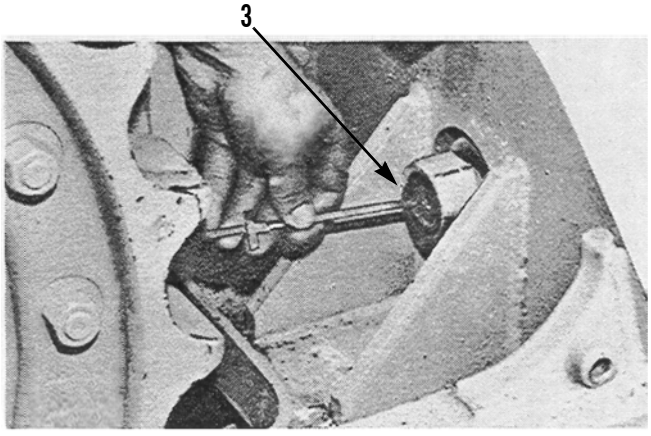
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

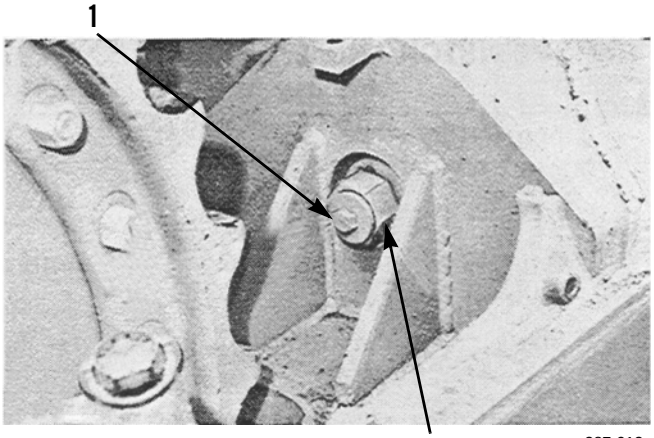
NOTE

Recoil spring weighs 300 lb (136 kg).

2. Attach a nylon sling and a suitable lifting device and position recoil spring (6) in track roller frame.
3. Install spacers (9) and recoil front stops (5) in position.
4. Install four new lockwashers (8), and capscrews (7) securing two front stops (5). Tighten capscrews to 200 lb-ft (271 Nm).
5. Install washer (2) and bolt (1).
6. Loosen recoil spring compression nut (3) until it extends 0.06 in. (1.5 mm) past end of bolt.



387-912



387-913

INSTALLATION - CONTINUED

7. Install track adjuster cylinder (WP 0140 00).
8. Install track roller frame guard (WP 0163 00).
9. Test drive and check recoil spring for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

TRACK CARRIER ROLLERS REPLACEMENT 0137 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 200 lb capacity

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Lockwasher (4 and 7)

Materials/Parts - Continued

Wood block, 4 in. x 4 in. x 12 in.

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Track loosened (WP 0132 00)

REMOVAL

WARNING

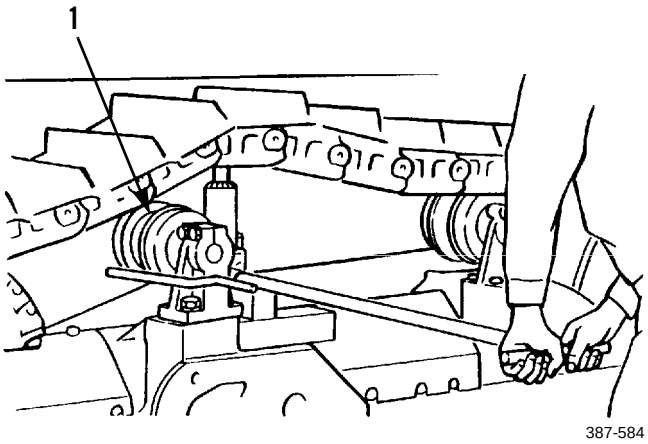
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Carrier roller assembly weighs 120 lb (55 kg).

REMOVAL - CONTINUED

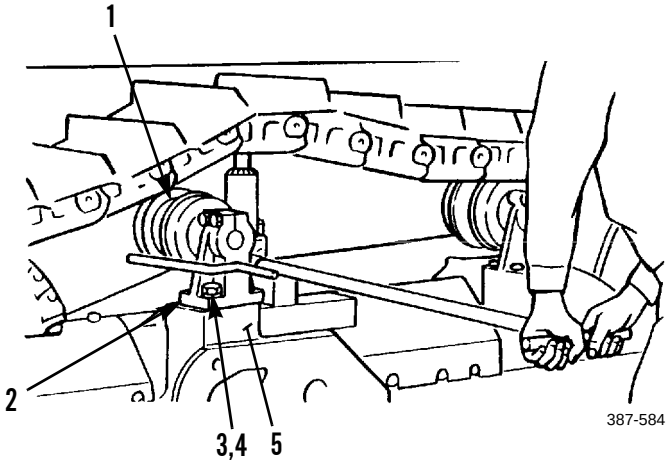
1. Place a wood block and hydraulic jack under track, near carrier roller (1) and lift track up and away from carrier roller.
2. Fasten a nylon sling and suitable lifting device to carrier roller (1) and bracket (2).
3. Remove four capscrews (3) and lockwashers (4) that secure bracket (2) to track roller frame (5). Discard lockwashers.
4. Remove carrier roller (1) and bracket (2) as a unit from track roller frame (5).

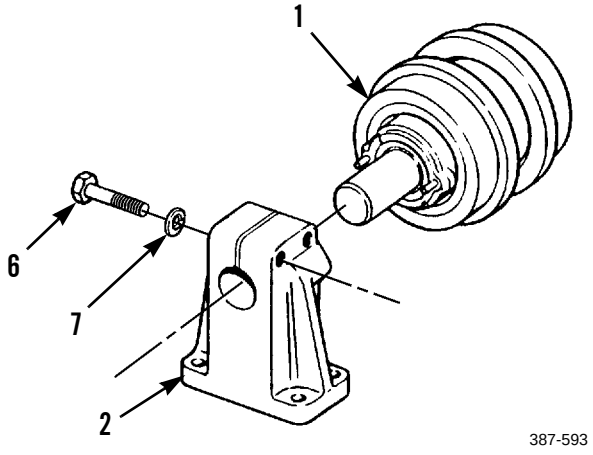


NOTE

Secure bracket in vise to permit removal of capscrews.

5. Remove two capscrews (6) and lockwashers (7). Discard lockwashers.
6. Separate bracket (2) from carrier roller (1).





INSTALLATION

NOTE

- **Secure bracket in vise to permit installation of carrier roller to bracket.**
- **Apply antiseize compound to all capscrews before installation.**

1. Install carrier roller (1) on bracket (2).
2. Install two new lockwashers (7) and capscrews (6).

INSTALLATION - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Carrier roller assembly weighs 120 lb (55 kg).

1. Fasten a nylon sling and a suitable lifting device and position carrier roller (1) and bracket (2) as a unit on track roller frame (5).
2. Secure bracket (2) to track roller frame (5) with four new lockwashers (4) and capscrews (3).
3. Use a block and hydraulic jack and lower track into carrier roller (1).
4. Adjust track (WP 0132 00).
5. Test drive and check track for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

TRACK IDLER REPLACEMENT 0138 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 1,000 lb capacity

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Materials/Parts - Continued

Lockwasher (3, 13 and 17)

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Track separated (WP 0143 00)

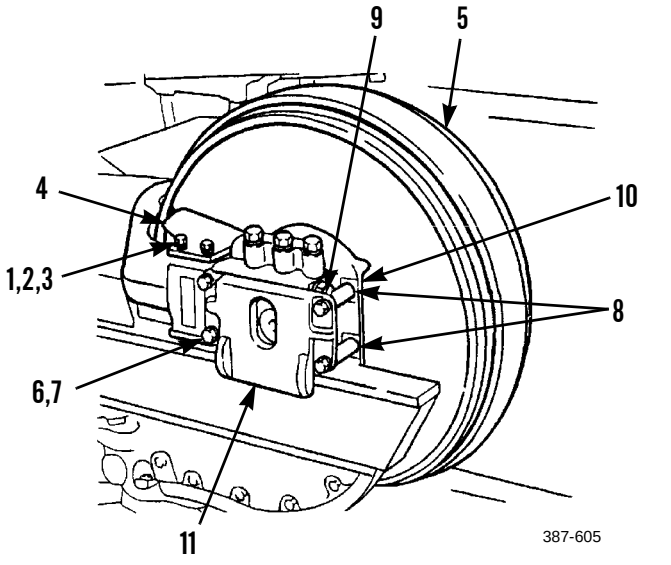
REMOVAL

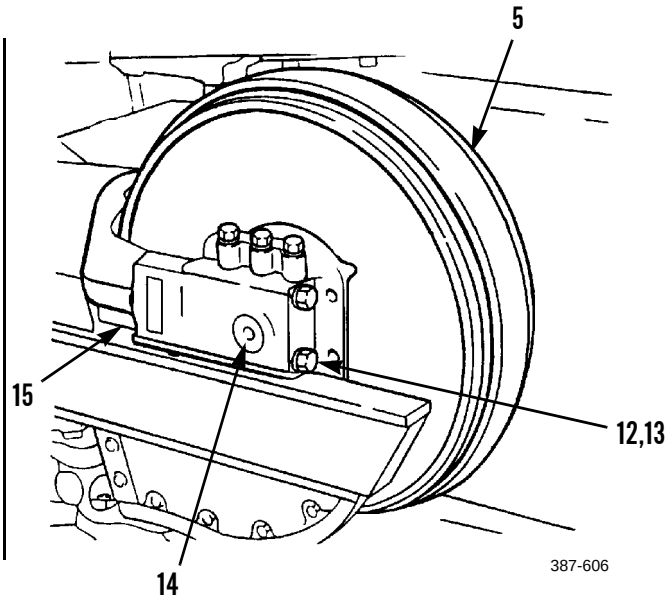
1. Remove two capscrews (1), washers (2), lockwashers (3) and guard (4) from both sides of idler (5). Discard lockwashers.

NOTE

Keep shims with respective plates for installation.

2. Remove four capscrews (6), washers (7), two spacers (8), shims (9), strip (10) and plate (11) from both sides of idler (5).
3. Remove two capscrews (12) and lockwashers (13) from bearing (14) and yoke (15) on both sides of idler (5). Discard lockwashers.





REMOVAL - CONTINUED

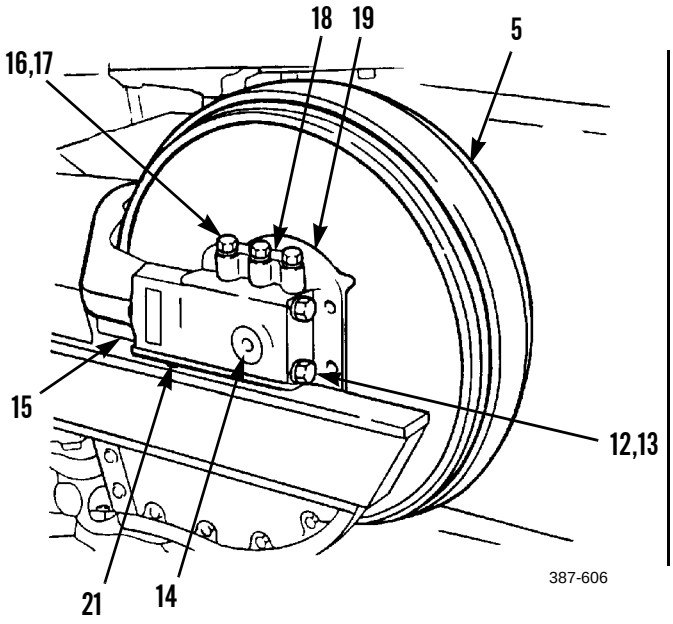
WARNING

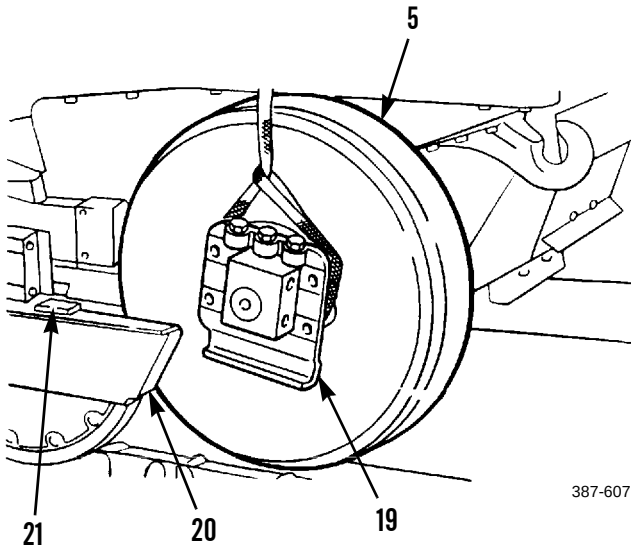
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Idler weighs 500 lb (227 kg).

4. Attach a nylon sling and a suitable lifting device to each side of idler (5) and support.
5. Remove three capscrews (16), lockwashers (17) and shims (18) at top of collar assembly (19), at yoke (15) end only, on both sides of idler (5). Discard lockwashers.
6. Move idler (5) forward until collar assembly (19) clears end of track roller frame (20).
7. Remove idler (5).





INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Idler weighs 500 lb (227 kg).**
- **Apply antiseize compound to all capscrews before installation.**

1. Attach a suitable lifting device to both sides of idler (5). Lift idler into position on track roller frame (20).
2. Install two new lockwashers (13) and capscrews (12) through bearing (14) into yoke (15) on each side of idler (5).

NOTE

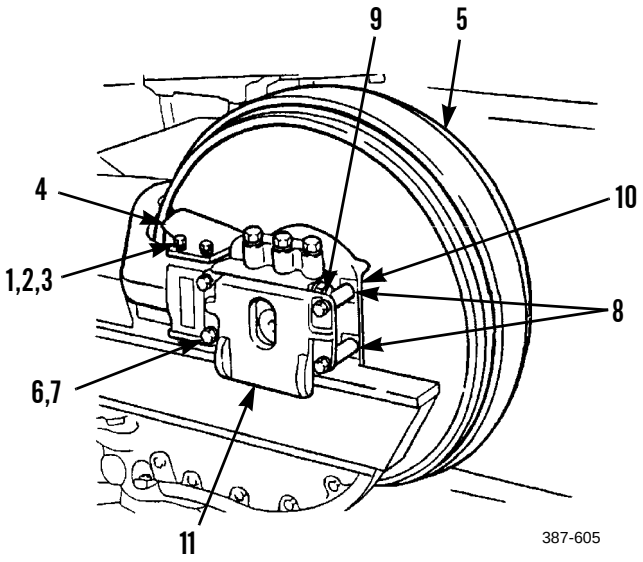
Minimum clearance must be 0.030-0.075 in. (0.76-1.91 mm) between yoke (15) and plate assembly (21). Add or remove shim(s) (18) as necessary.

3. Install shims (18), three new lockwashers (17) and capscrews (16) at top of collar (19) and bearing (14) on each side of idler (5).
4. Install plate (11), two spacers (8), four new lockwashers (7), capscrews (6) and two strips (10) to both sides of idler (5). Leave capscrews loose for shimming.

NOTE

Add or remove shims (9) as needed to provide a clearance of 0.030 in. +/- 0.020 in. (0.76 mm +/- 0.51 mm) between plate (11) and track roller frame (20).

5. Remove two capscrews (6) and lockwashers (7) and install shims (9) between plate (11) and spacers (8) on each side of idler (5).
6. Reinstall capscrews (6) and lockwashers (7). Tighten capscrews to 200 lb-ft (271 Nm).
7. Install guard (4) with two capscrews (1), new lockwashers (3) and washers (2) on each side of idler (5).
8. Connect track (WP 0143 00).
9. Test drive and check track for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

TRACK IDLER YOKE REPLACEMENT 0139 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 200 lb capacity

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Lockwasher (3)

Personnel Required

Two

Equipment Condition

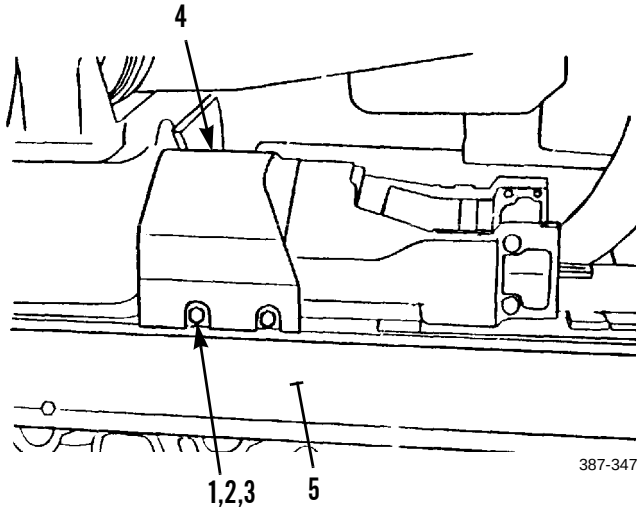
Front track idler removed (WP 0138 00)

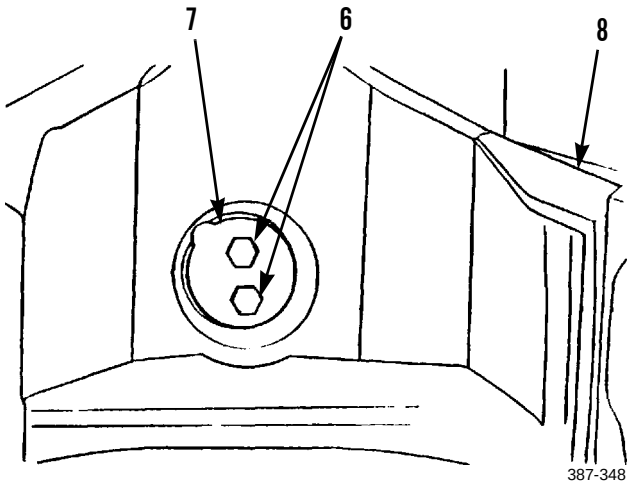
REMOVAL

NOTE

Guard weighs 23 lb (10 kg).

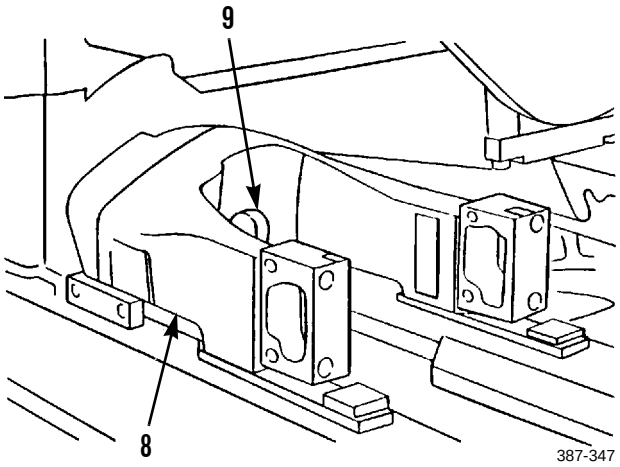
1. Remove five bolts (1), washers (2), lockwashers (3) and guard (4) from track roller frame (5).
2. Remove two bolts (6) and plate (7) from center of yoke (8).





REMOVAL - CONTINUED

3. Strike rod (9) inside center of yoke (8) to break rod taper loose and free yoke. Pull yoke away from rod.



NOTE

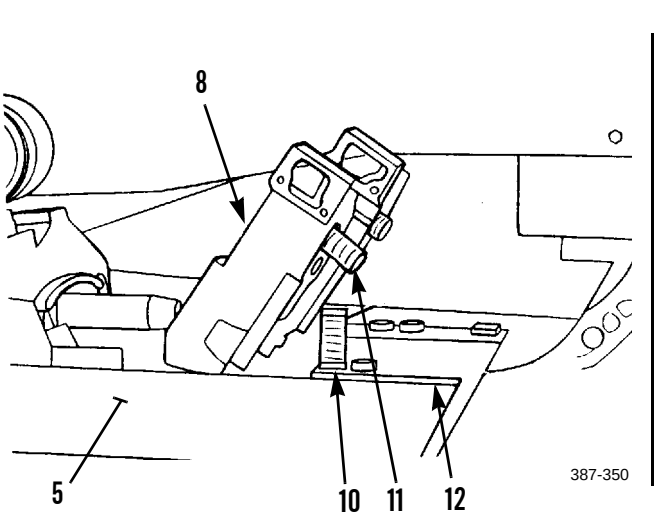
Yoke weighs 110 lb (50 kg).

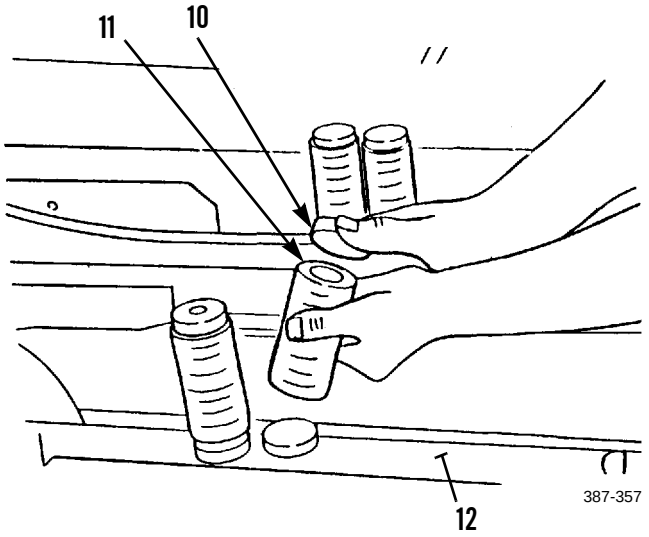
4. Use a nylon sling and a suitable lifting device to raise open end of yoke (8) and remove four plates (10), springs (11) and two plate assemblies (12).
5. Remove yoke (8) with lifting device.

INSTALLATION

1. Position two plate assemblies (12) on track roller frame (5).
2. Install two springs (11) and plates (10) on each plate assembly (12).

INSTALLATION - CONTINUED

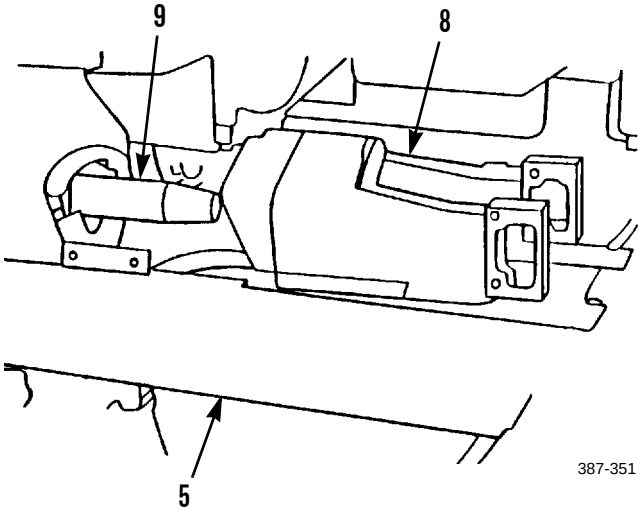




NOTE

Yoke weighs 110 lb (50 kg).

3. Use a nylon sling and a suitable lifting device to lift yoke (8) into position on track roller frame (5) and lower yoke over plates (10) and springs (11).
4. Push yoke (8) forward onto end of rod (9).

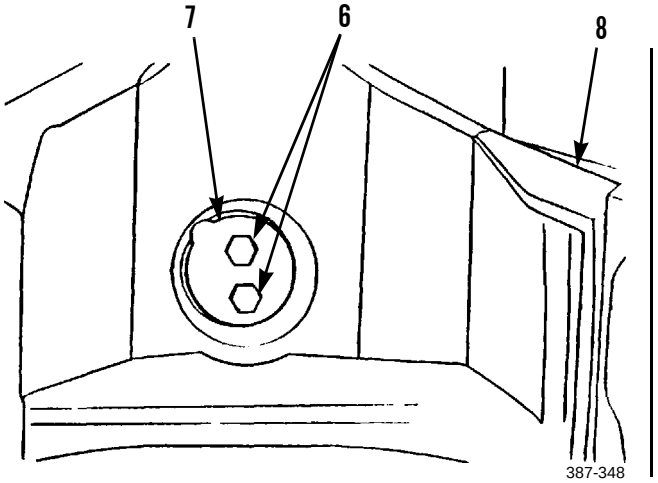


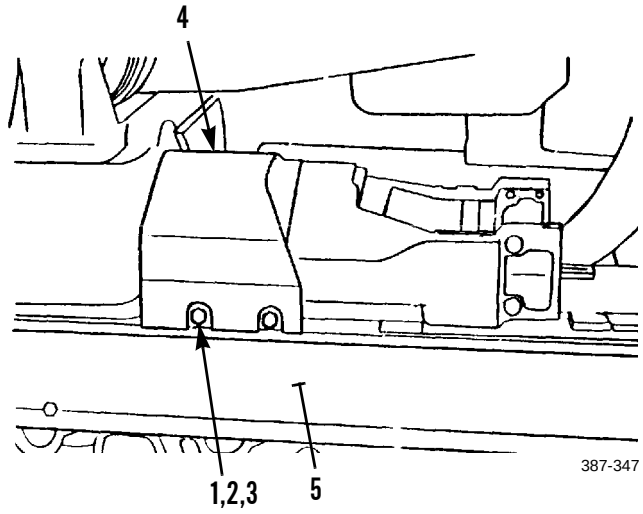
INSTALLATION - CONTINUED

NOTE

Apply antiseize compound to all bolts before installation.

5. Install plate (7) and two capscrews (6) over end of rod (9).
6. Install guard (4) on track roller frame (5) with five washers (2), new lockwashers (3) and bolts (1).





7. Install front track idler (WP 0138 00).
8. Test drive and check track for proper operation.

END OF WORK PACKAGE

TRACK ADJUSTER CYLINDER MAINTENANCE 0140 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 26, WP 0249 00)

Materials/Parts - Continued

Lockwasher (2)

Seal (9, 10 and 18)

Washer (16)

References

TM 5-2410-237-10

Equipment Condition

Track separated (WP 0132 00)

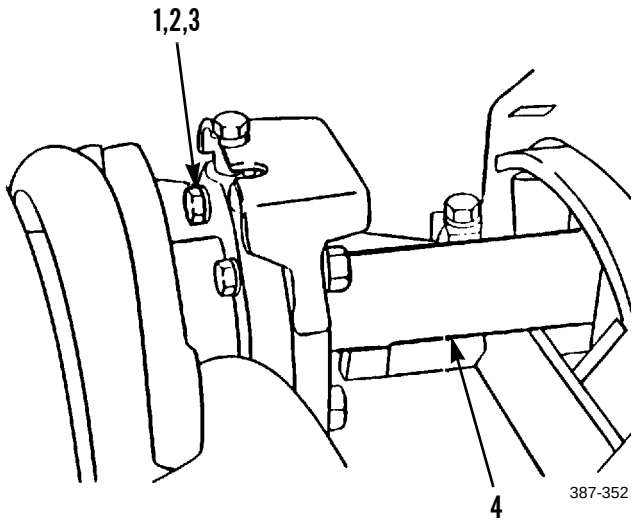
Track roller frame guards removed (WP 0163 00)

REMOVAL

WARNING

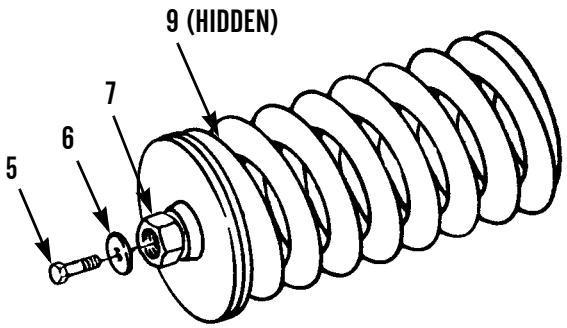
Ensure hydraulic pressure in track adjusting mechanism is completely released before removing hydraulic track adjuster. Failure to follow this warning may result in injury.

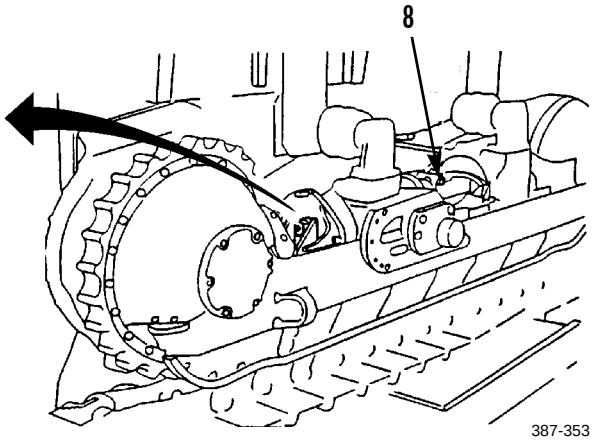
1. Remove five nuts (1), lockwashers (2) and bolts (3) that hold cylinder to yoke (4). Discard lockwashers.
2. Pull front idler and yoke (4) forward on track roller frame.



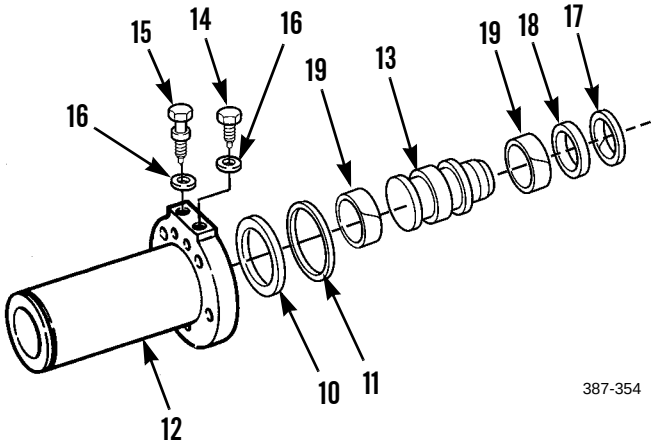
REMOVAL - CONTINUED

3. Remove capscrew (5) and washer (6) from shaft of recoil spring and tighten nut (7) against rear pilot of recoil spring until pressure against front stops (8) is released.
4. Remove hydraulic track adjuster from front pilot of recoil spring.
5. Remove seal (9) from front pilot of recoil spring. Discard seal.





6. Remove seal (10) and ring (11) from cylinder (12). Discard seal.
7. Remove piston (13) assembly from cylinder (12).
8. Remove fill valve (14), relief valve (15) and two washers (16) from cylinder (12). Discard washers.
9. Remove ring (17) and seal (18) from piston (13). Discard seal.
10. Remove two rings (19) from piston (13).



INSTALLATION

1. Install fill valve (14) and washer (16) in cylinder (12). Install relief valve (15) and washer (16) in cylinder. Tighten both valves to 25 lb-ft (34 Nm).
2. Install two rings (19) on piston (13). Install new seal (18) on piston with sealing lip toward ring (17) that holds seal in position. Install ring to secure seal.
3. Install piston (13) assembly in cylinder (12).

NOTE

Lubricate new seal with a thin coating of clean oil prior to installation.

4. Install new seal (10) in cylinder (12). Install ring (11) next to seal with chamfer toward cylinder.
5. Install new seal (9) in front pilot of recoil spring. Put grease on seal.
6. Install hydraulic track adjuster assembly in position in front pilot of recoil spring.

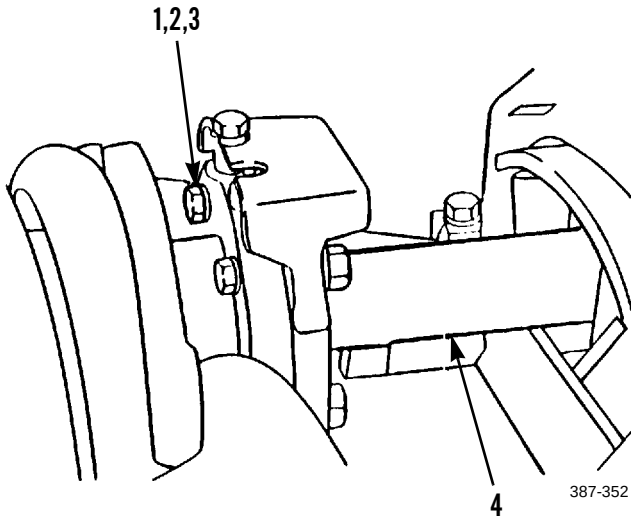
INSTALLATION - CONTINUED

7. Move front idler and yoke (4) toward hydraulic track adjuster. Ensure hydraulic track adjuster is against yoke.

NOTE

Apply antiseize compound to bolts before installation.

8. Install five bolts (3), new lockwashers (2) and nuts (1) that hold hydraulic track adjuster to yoke (4).
9. Loosen nut (7) on shaft of recoil spring until nut is extended beyond end of shaft 0.06 in. +/- 0.03 in. (1.52 mm +/- 0.76 mm). Install washer (6) and capscrew (5) in end of shaft.
10. Install track roller frame (WP 0163 00).
11. Connect track (WP 0132 00).
12. Test drive and check track for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

TRACK DRIVE SPROCKET/HUB REPLACEMENT 0141 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Adapter (Item 3, WP 0250 00)

Adapter (Item 4, WP 0250 00)

Adapter, coupling (Item 5, WP 0250 00)

Adapter, sprocket installation (Item 8, WP 0250 00)

Bolt, forcing, 1-1/2 in. x 12

Clip, retaining (Item 20, WP 0250 00)

Forcing screw, mechanical puller (Item 29, WP 0250 00)

Head (Item 35, WP 0250 00)

Inserter, seal (Item 41, WP 0250 00)

Nut, plain, round (Item 55, WP 0250 00)

Nut, plain, round (Item 56, WP 0250 00)

Pin (Item 59, WP 0250 00)

Pin (Item 60, WP 0250 00)

Pin (Item 61, WP 0250 00)

Pin, straight, headless (Item 64, WP 0250 00)

Plate, intermediate, friction clutch (Item 67, WP 0250 00)

Plate assembly (Item 68, WP 0250 00)

Puller assembly (Item 77, WP 0250 00)

Puller attachment, mechanical (Item 78, WP 0250 00)

Puller attachment, mechanical (Item 79, WP 0250 00)

Puller, hydraulic (Item 84, WP 0250 00)

Puller, mechanical (Item 88, WP 0250 00)

Puller, sprocket arm (Item 91, WP 0250 00)

Pump, hydraulic ram, hand driven (Item 92, WP 0250 00)

Tools and Special Tools - Continued

Remover, bearing and bushing (Item 99, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Socket, socket wrench (Item 110, WP 0250 00)

Spacer, sleeve (Item 113, WP 0250 00)

Step plate, mechanical puller (Item 118, WP 0250 00)

Wrench, spanner (Item 131, WP 0250 00)

Yoke (Item 133, WP 0250 00)

Lifting equipment, 1,000 lb capacity

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (4 and 22)

Lock, retainer (28)

Lockwasher (2 and 14)

Packing, preformed (21, 26, 43 and 45)

Seal (11)

Seal assembly (20, 25, 42 and 44)

References

TM 5-2410-237-10

WP 0124 00

WP 0128 00

WP 0142 00

WP 0143 00

WP 0241 00

Personnel Required

Two

Equipment Condition

Track roller frame removed (WP 0135 00)

Final drive drained (WP 0124 00)

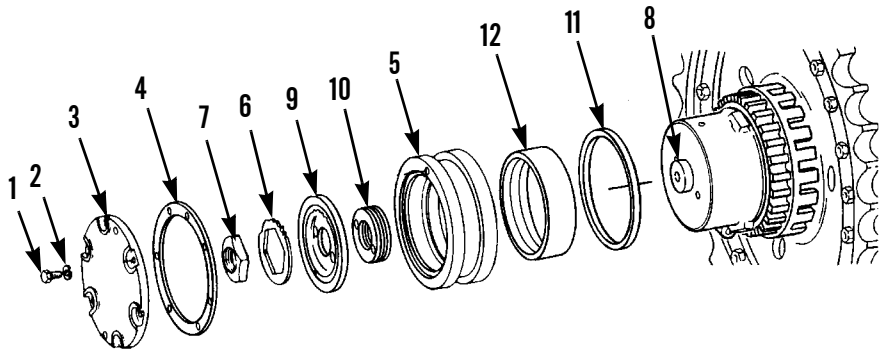
REMOVAL

1. Remove six capscrews (1), lockwashers (2), plate (3) and gasket (4) from support (5). Discard lockwashers and gasket.
2. Remove retainer (6) and nut (7) from sprocket shaft (8).

NOTE

Note arrangement and quantity of shims.

3. Remove retainer packing (9), shims (10) and support (5).
4. Remove seal (11) and bearing sleeve (12) from support (5). Discard seal.



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5. Remove nut (13), lockwasher (14), capscrew (15) and retainer (16) from holder (17). Discard lockwasher.

NOTE

Do not use more than 50 tons of pressure to loosen holder.

6. Install hydraulic pump on holder (17) and loosen holder from taper on sprocket shaft (8).
7. Remove hydraulic puller from holder (17).

REMOVAL - CONTINUED

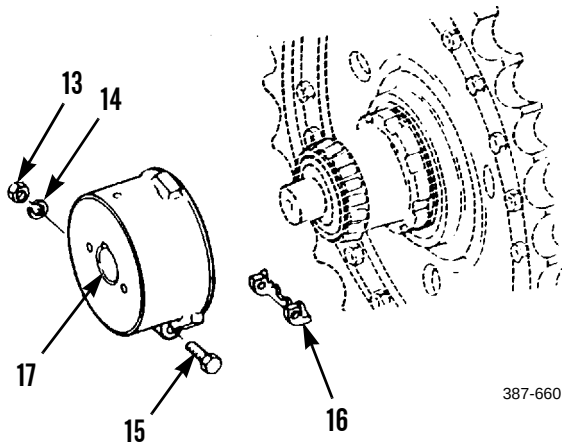
WARNING

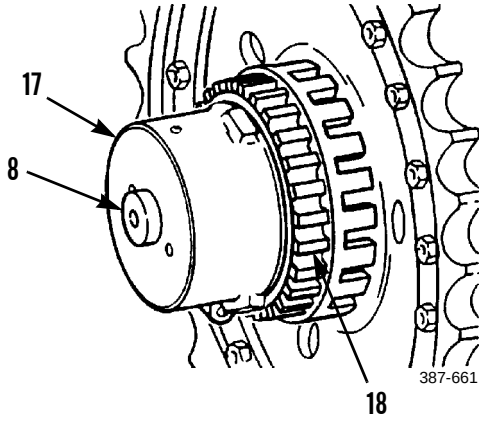
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Weight of holder and adjusting nut as a unit is approximately 93 lb (42 kg).

8. Use a nylon sling and a suitable lifting device to remove holder (17) and adjusting nut (18) as a unit.

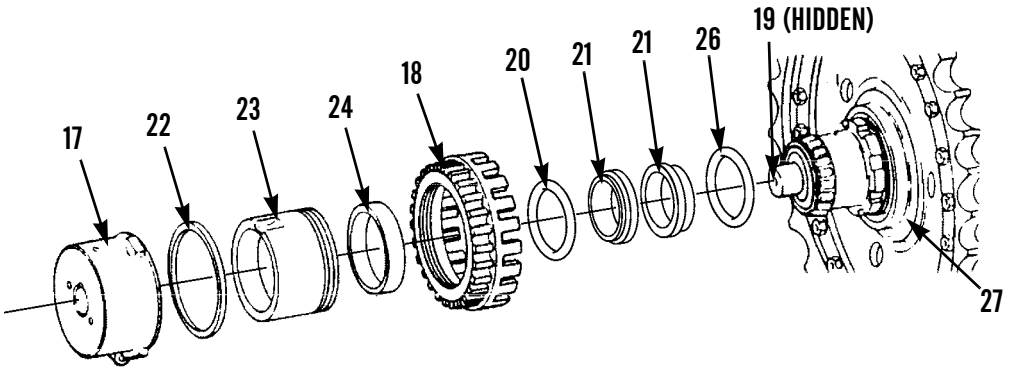




9. Remove woodruff key (19) from sprocket shaft (8).
10. Remove seal assembly (20) and preformed packing (21) from inside adjusting nut (18). Discard seal assembly and preformed packing.
11. Remove adjusting nut (18) from holder (17).
12. Remove gasket (22) from holder (17). Discard gasket.
13. Remove cage (23) from holder (17).
14. Remove bearing cup (24) from cage (23).

REMOVAL - CONTINUED

15. Remove seal assembly (25) and preformed packing (26) from sprocket (27). Discard seal assembly and preformed packing.

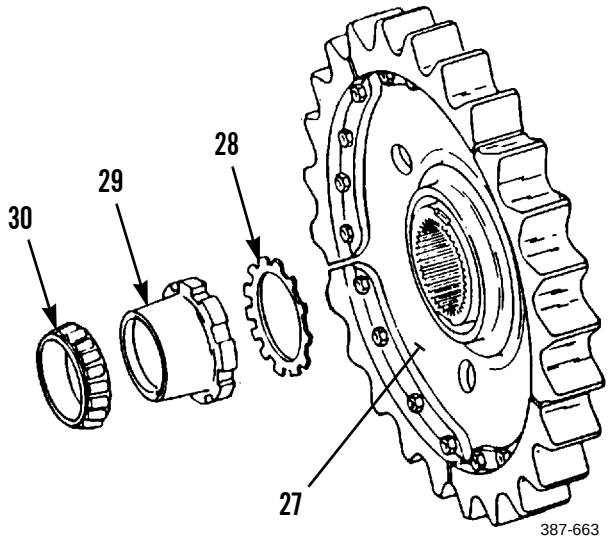


16. Unbend tabs of retainer lock (28).
17. Loosen nut (29) until there is a 1 in. (25.4 mm) gap between nut and sprocket (27).
18. Turn nut (29) toward sprocket (27) until remover tool can be inserted between nut and bearing (30).

CAUTION

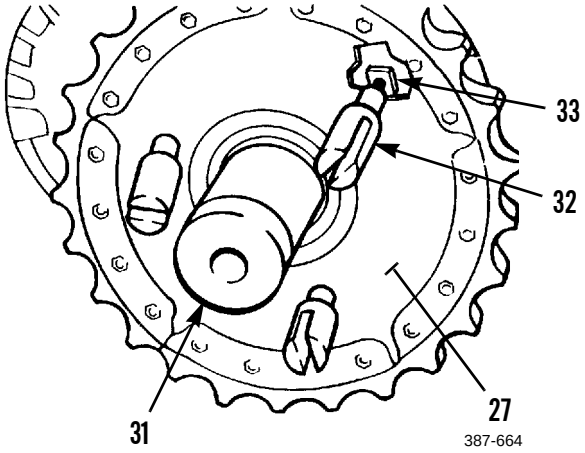
Use care when removing bearing and nut. Haste or improper choice of removal tool will damage parts.

19. Turn nut (29) away from sprocket (27) and remove bearing (30).
20. Remove removal tool, nut (29) and retainer lock (28). Discard retainer lock.

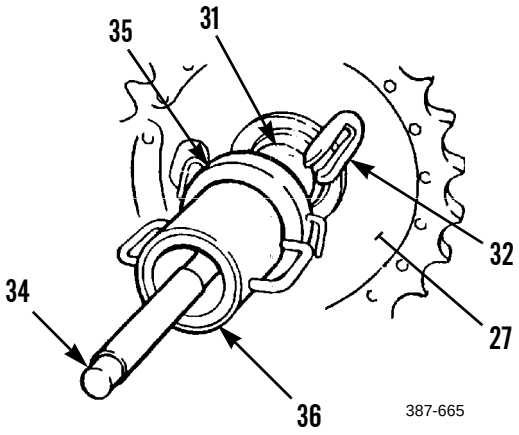


REMOVAL - CONTINUED

21. Install an adapter (31) on drive hub and turn to within 0.25 in. (6.3 mm) of sprocket (27).
22. Install three adapters (32) in three puller holes in sprocket (27).
23. Install three nuts (33) on adapters (32) with angle side toward sprocket (27) and flat side even with threaded end of adapter (31). Position drill point on nut toward outer edge of sprocket.

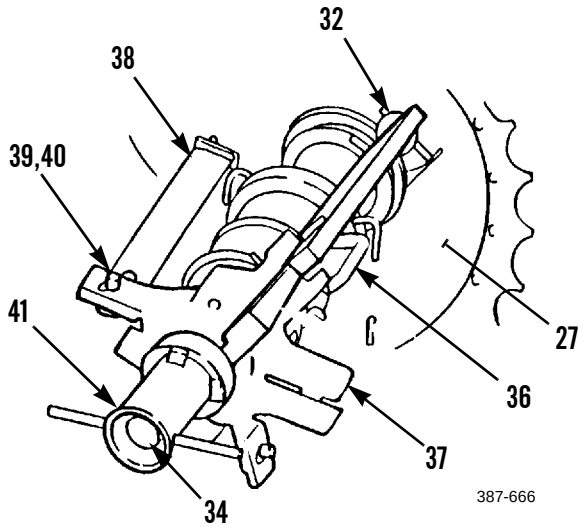


24. Install stud (34) in adapter (31).
25. Install plate (35) and cylinder (36) on stud (34) and against adapter (31). Piston end of cylinder should face away from sprocket (27).



REMOVAL - CONTINUED

26. Install head (37) on stud (34) with flat side against cylinder (36).
27. Install three arms (38) to connect head (37) with adapters (32) in sprocket (27) and secure arms with pins (39) and lock pins (40) at each end.
28. Install nut (41) on stud (34) within 1 in. (25.4 mm) from head (37).



WARNING

Sprocket is installed with 60-65 tons of force and requires considerable force to loosen. Stand clear of sprocket during loosening procedure to avoid personal injury.

29. Connect hydraulic pump to cylinder (36) and apply pressure to break sprocket (27) loose. Remove hydraulic pump.

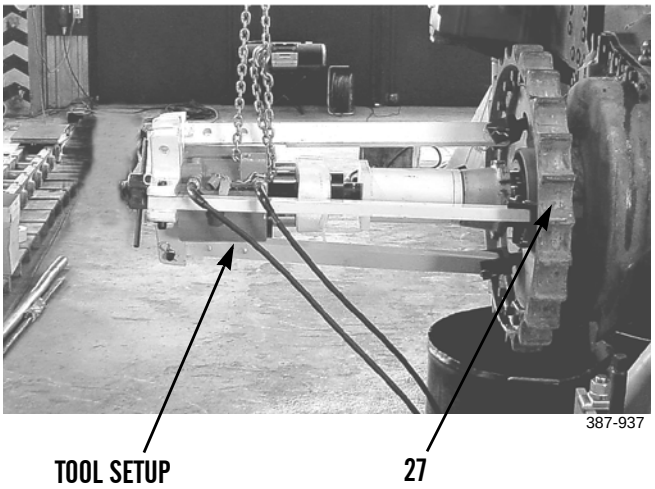
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Sprocket weighs 400 lb (181 kg).

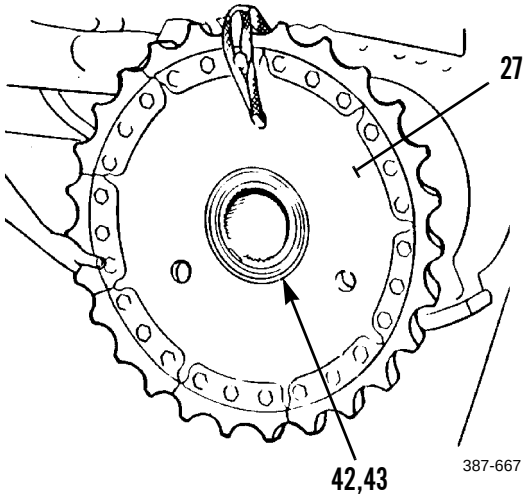
30. Use a nylon sling and a suitable lifting device to carefully remove sprocket (27) from hub.

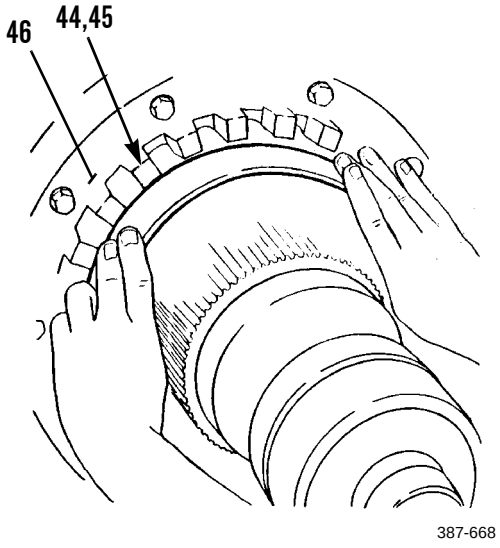


REMOVAL - CONTINUED

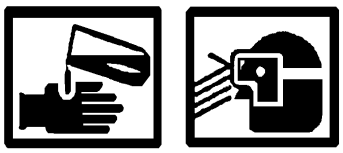
31. Remove seal assembly (42) and preformed packing (43) from hub of sprocket (27). Discard seal assembly and preformed packing.

32. Remove seal assembly (44) and preformed packing (45) from final drive (46). Discard seal assembly and preformed packing.

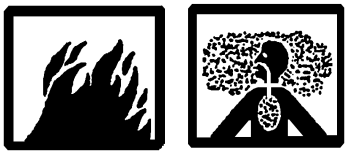




CLEANING



WARNING



- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.**

1. Clean all removed components with solvent cleaning compound.
2. Thoroughly dry components with compressed air or clean rags.
3. Ensure mating surfaces in final drive are clean.

INSPECTION

1. Inspect all removed components IAW WP 0241 00.
2. Ensure mating surfaces in final drive are free of damage.

INSTALLATION

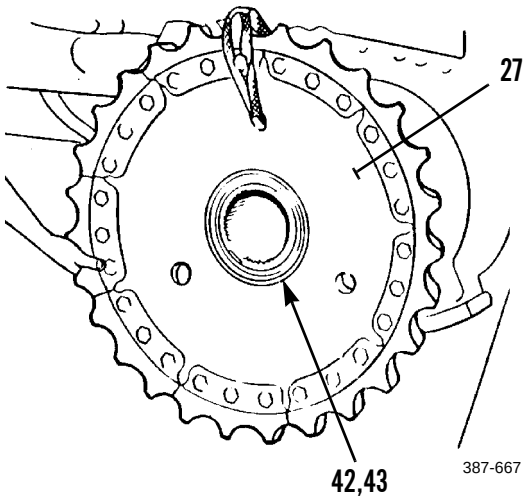
CAUTION

- **New seal assemblies and new preformed packings must be used as matched pairs or failure will result. Do not separate.**
- **Seal and seal contact surfaces must be kept clean. Do not touch after being cleaned or leaks can result.**

NOTE

Do not apply oil to preformed packings.

1. Install new seal assembly (44) and new preformed packing (44) on final drive (46). Clean metal contact surface of seal assembly, then apply a thin film of clean oil to metal contact surface.
2. Install new seal assembly (42) and new preformed packing (43) in hub of sprocket (27). Clean metal contact surface of seal assembly, then apply a thin film of clean oil to metal contact surface.



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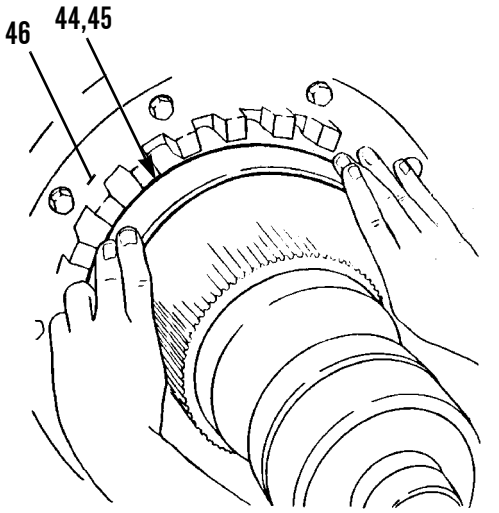


387-668

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

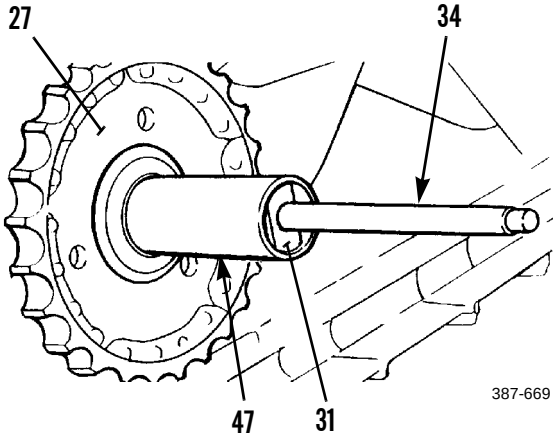
NOTE

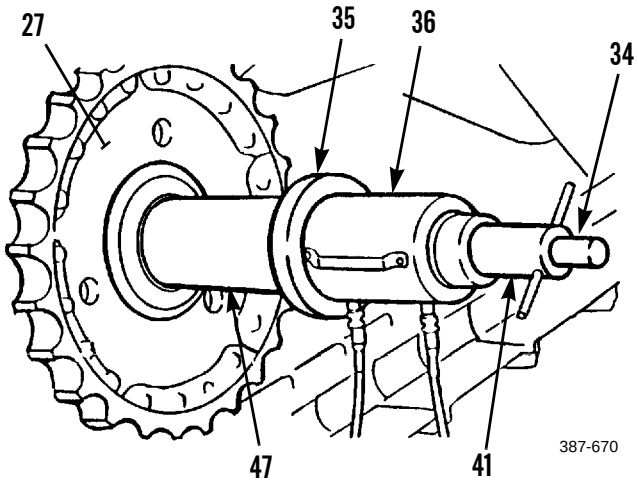
Sprocket weighs 400 lb (181 kg).

3. Use a nylon sling and a suitable lifting device to lift sprocket (27) into position at end of drive hub. Align splines carefully and push sprocket onto drive hub as far as possible by hand.
4. Install adapter (31) on drive hub and turn adapter until it is fully on drive hub.
5. Install stud (34) in adapter (31).

INSTALLATION - CONTINUED

6. Install sleeve (47) over stud (34) and adapter (31) until it makes contact with sprocket (27).
7. Install plate (35) on stud (34) until it makes contact with sleeve (47).
8. Install retracted cylinder (36) on stud (34) until it makes contact with plate (35). Piston end of cylinder should face away from sprocket (27).
9. Install nut (41) on stud (34) to within 1 in. (2.54 cm) of cylinder (36).
10. Connect hydraulic pump to cylinder (36) and apply 60-65 tons of pressure to force sprocket (27) fully onto drive hub.

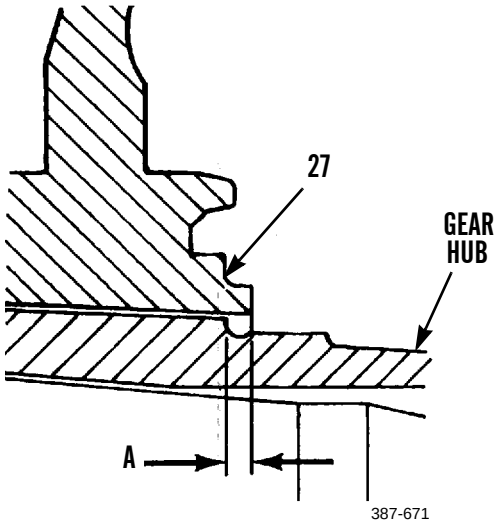




WARNING

Make sure pressure is off cylinder of sprocket installation tool before trying to remove tooling. Failure to follow this precaution could result in serious personal injury.

11. Remove sprocket installation tooling.
12. Check distance from hub face of sprocket (27) to spline shoulder on final drive gear hub. Dimension (A) must be 0.500 +/- 0.060 in. (12.7 +/- 1.52 mm).
13. If distance measured in step 12 is less than 0.44 in. (11.18 mm), replace sprocket (27) and final drive gear hub. If distance exceeds 0.560 in. (14.22 mm), remove sprocket, clean hub splines and reinstall sprocket.



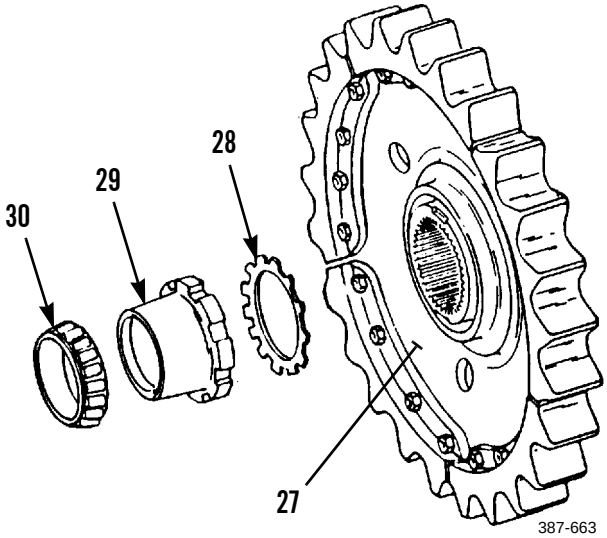
INSTALLATION - CONTINUED

14. Install new retainer lock (28) and nut (29).
15. Bend one tab of retainer lock (28) in notch of nut (29) and one tab in notch of sprocket (27) hub.

WARNING

Use insulated gloves for handling hot parts to avoid personal injury.

16. Heat bearing (30) to 275°F (135°C) maximum. Install bearing on final drive hub against nut (29).



17. Lower temperature of bearing (30) and install bearing cup (24) in cage (23).
18. Align slot in cage (23) over dowel in holder (17) and install cage in holder.
19. Install new gasket (22) in groove in holder (17).
20. Apply clean grease to threads of adjusting nut (18) and on face of nut that contacts gasket (22) in holder (17).
21. Install adjusting nut (18) on holder (17) and tighten completely to end of thread travel.

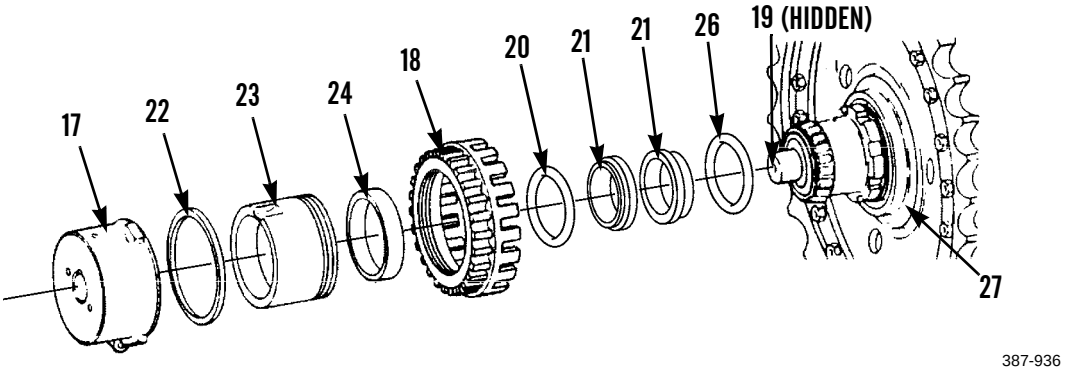
CAUTION

- **New seal assemblies and new preformed packings must be used as matched pairs or failure will result. Do not separate.**
- **Seal and seal contact surfaces must be kept clean. Do not touch after being cleaned or leaks can result.**

NOTE

Do not apply oil to preformed packings.

22. Install new seal assemblies (20) and new preformed packing (21) inside adjusting nut (18). Clean metal contact surface of seal assembly, then apply a thin film of clean oil to metal contact surface.
23. Install new seal assembly (25) and new preformed packing (26) in hub of sprocket (27). Clean metal contact surface of seal assembly, then apply a thin film of clean oil to metal contact surface.
24. Install woodruff key (19) in sprocket shaft (8).



INSTALLATION - CONTINUED

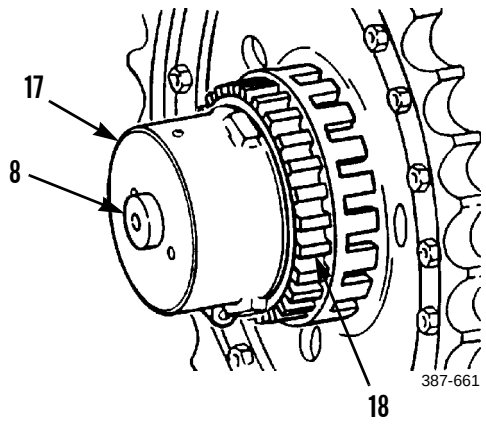
WARNING

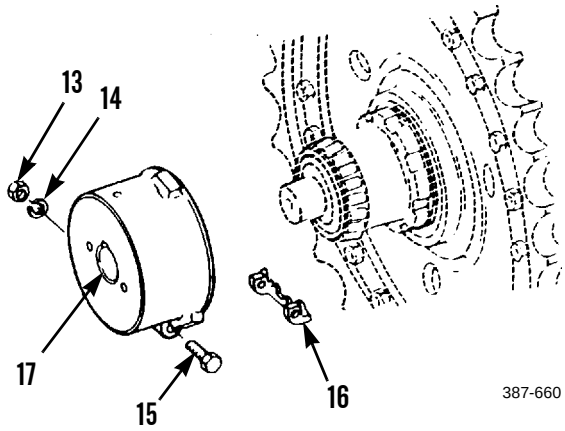
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

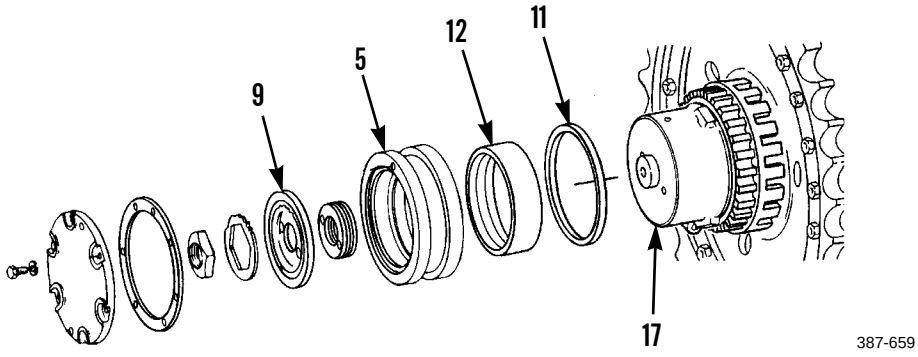
Weight of holder and adjusting nut as a unit is approximately 93 lb (42 kg).

25. Use a nylon sling and a suitable lifting device to position holder (17) and adjusting nut (18) on sprocket shaft (8), being careful to align keyway in holder with woodruff key in shaft. Do NOT install retainer (16) on holder at this time, to allow for bearing adjustment.



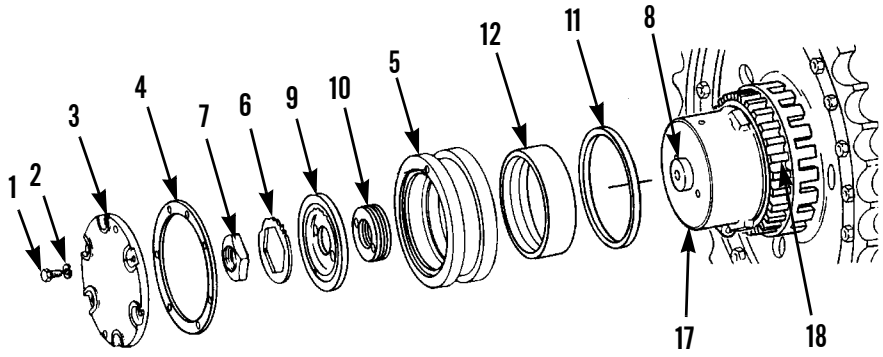


26. Install bearing sleeve (12) in support (5).
27. Install new seal (11) in support (5) with lip of seal toward and even with outside edge of support. Apply clean oil to lip of seal.
28. Apply clean grease on inside diameter of support (5) and install support over holder (17).
29. Refer to WP 0142 00 for shimming procedure and specifications on sprocket shaft, for correct alignment of sprocket and track roller frame.
30. Fill inside of retainer packing (9) with clean grease and install retainer packing on dowels in holder (17).



INSTALLATION - CONTINUED

31. Install nut (7) on sprocket shaft (8). Tighten nut to 1100-1200 lb-ft (1492-1627 Nm).
32. Tighten adjusting nut (18) until snug. Final tightening will occur during adjustment.
33. Install retainer (6) over nut (7) on sprocket shaft (8). Do NOT install new gasket (4) or plate (3) at this time. These components need to be removed to perform bearing adjustment.
34. Adjust final drive bearings (WP 0128 00).
35. Install track roller frame (WP 0135 00).
36. Fill final drive (WP 0124 00).
37. Connect track (WP 0143 00).
38. Test drive and check track for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

DRIVE SPROCKET SHAFT REPLACEMENT 0142 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Adapter (Item 2, WP 0250 00)

Adapter, coupling (Item 5, WP 0250 00)

Adapter, pin (Item 6, WP 0250 00)

Clip, retaining (Item 20, WP 0250 00)

Forcing screw, mechanical puller (Item 29, WP 0250 00)

Head, socket install (Item 36, WP 0250 00)

Link, pin (Item 52, WP 0250 00)

Nut, plain, round (Item 56, WP 0250 00)

Pin (Item 61, WP 0250 00)

Pin, lock (Item 62, WP 0250 00)

Pin, straight, headless (Item 64, WP 0250 00)

Tools and Special Tools - Continued

Puller, hydraulic (Item 84, WP 0250 00)

Puller, hydraulic (Item 85, WP 0250 00)

Puller, mechanical (Item 88, WP 0250 00)

Pump, hydraulic ram (Item 92, WP 0250 00)

Spacer, sleeve (Item 113, WP 0250 00)

Wrench, spanner (Item 131, WP 0250 00)

Lifting equipment, 400 lb capacity

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Track roller frame removed (WP 0135 00)

Sprocket assembly removed (WP 0141 00)

Final drive case, gears, idler pinions and bearings removed (WP 0125 00)

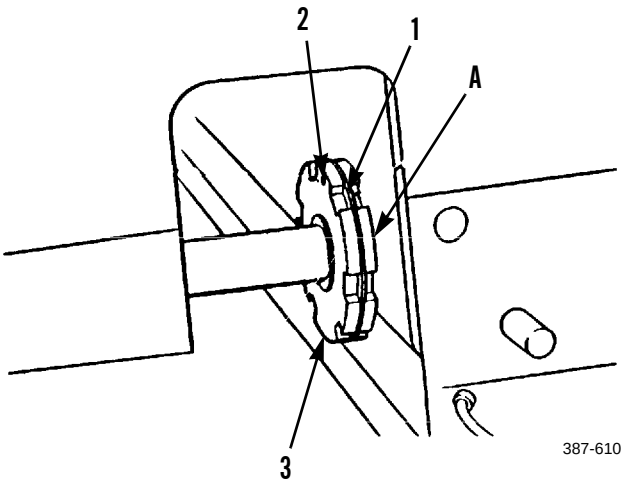
REMOVAL

1. Remove ring (1) and pin (2) from nut (3) at steering clutch case.

CAUTION

DO NOT remove nut (3) from threaded portion of sprocket shaft. Failure to follow this caution could result in thread damage on shaft and in steering clutch case.

2. Loosen nut (3) on steering clutch case until there is a 0.125 in. (3.2 mm) gap (A) between nut and steering clutch case.



REMOVAL - CONTINUED

3. Install threaded adapter (4) on sprocket shaft (5) and turn until all threads are engaged.
4. Install and turn stud extension (6) completely into adapter (4).

NOTE

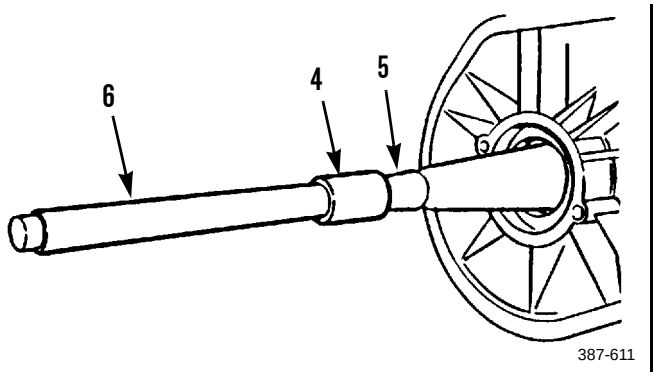
When installing protective sleeve (7), ensure slot opening is away from bevel gear case.

5. Install protective sleeve (7) over stud extension (6) until sleeve contacts bevel gear case (8).
6. Install head (9) into protective sleeve (7).
7. Install cylinder (10) on stud extension (6) and against head (9) and secure with nut (11).
8. Connect hydraulic pump to cylinder (10) and hold protective sleeve (7) and head (9) in alignment.
9. Apply pressure to sprocket shaft (5) to loosen from taper.

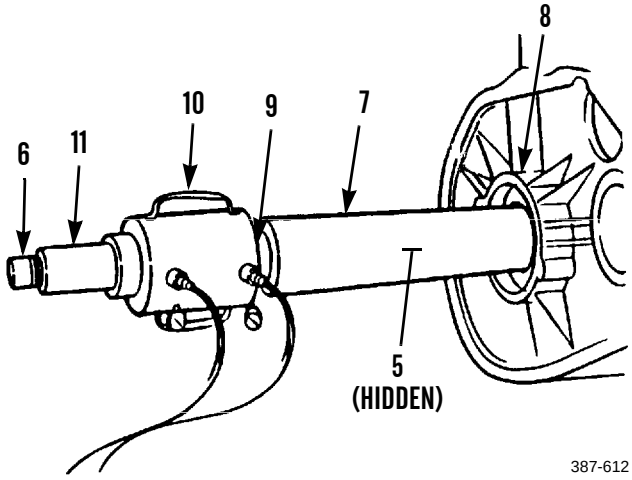
WARNING

Ensure piston of cylinder (10) is retracted and pressure is off prior to removal of tools. Failure to follow this warning could result in personal injury.

10. Remove tooling from sprocket shaft (5).



387-611



387-612

REMOVAL - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

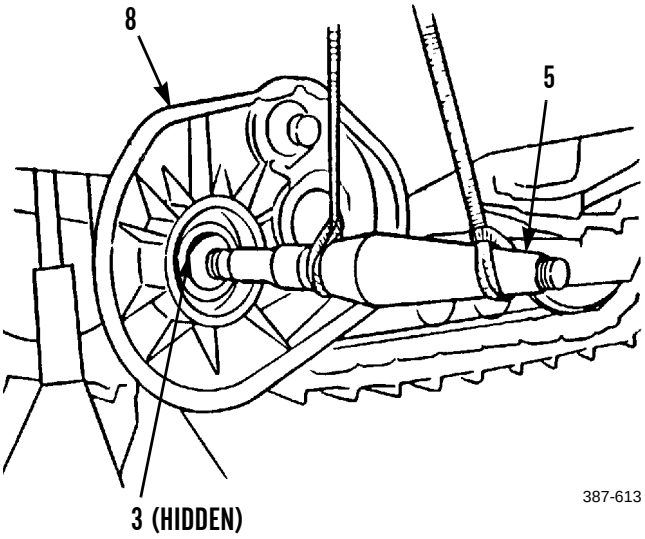
Sprocket shaft (5) weighs approximately 185 lb (84 kg).

11. Attach a suitable lifting device to sprocket shaft (5) close to bevel gear case (8) and raise lifting device to take weight off shaft.
12. Remove nut (3) from opposite end of sprocket shaft (5).

CAUTION

Use caution and proper handling of equipment and remove slowly and carefully to avoid damage to threads on shaft and in gear case.

13. With assistance, remove sprocket shaft (5) from bevel gear case (8).



INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Sprocket shaft (5) weighs approximately 185 lb (84 kg).

CAUTION

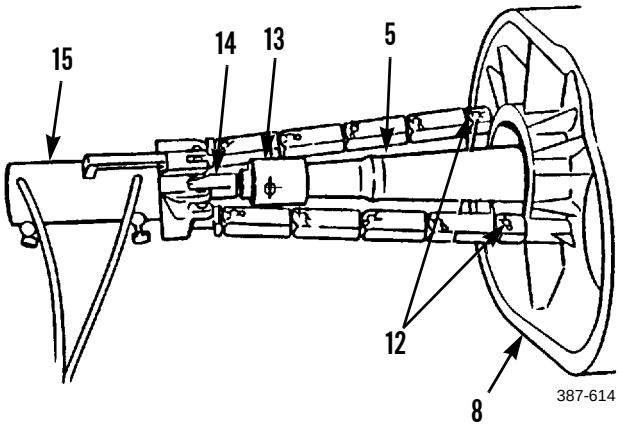
Use caution and proper handling of equipment and install slowly and carefully to avoid damage to threads on shaft and in gear case.

1. Use a suitable lifting device and position sprocket shaft (5) on bevel gear case (8).
2. Push sprocket shaft (5) into bevel gear case (8) as far as possible using only hand pressure.
3. Attach hydraulic pump for installation of sprocket shaft (5).

CAUTION

To avoid damage to bevel gear case threads, ensure adapters are installed in bevel gear case so that shoulder of adapter is against bevel gear case. After shoulder of adapter comes in contact with bevel gear case, adapters can be tightened a maximum of 1/8 turn or loosened a maximum of 3/8 turn to put adapter in correct position so that remainder of tooling can be installed. When remainder of tooling is installed, do not let weight of tooling or lifting device put a load on adapters. Keep all tooling level.

4. Install two adapters (12) into large threaded holes in bevel gear case (8).
5. Install adapter (13) on end of sprocket shaft (5) and connect rod (14) to adapter.
6. Connect hydraulic cylinder (15) to adapters (12) in bevel gear case (8).



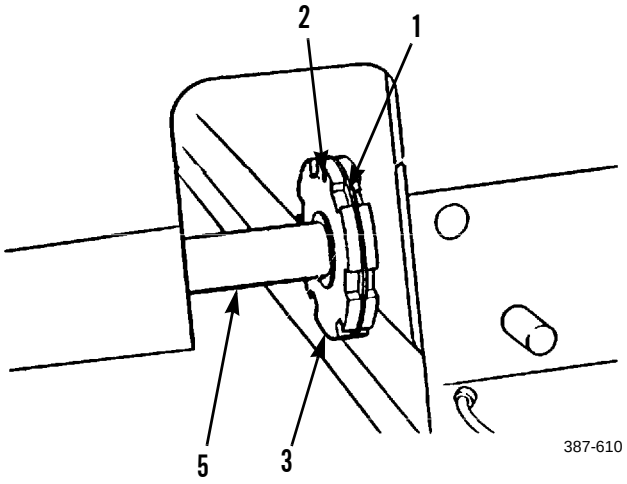
NOTE

Maintain force on sprocket shaft (5) while installing and applying torque to nut (3).

7. Attach hydraulic pump to hydraulic cylinder (15). Apply 55-60 tons (490-535 kn) of force to push sprocket shaft (5) into position,

INSTALLATION - CONTINUED

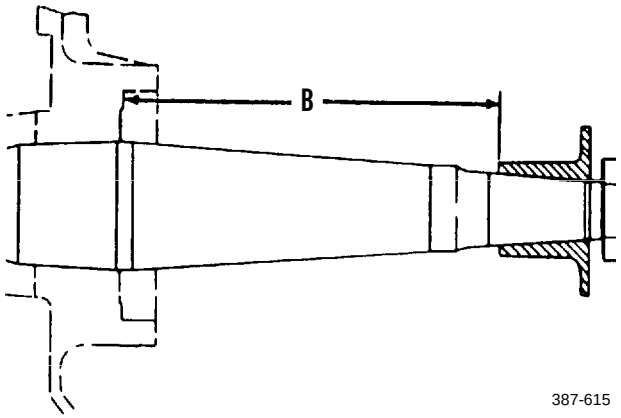
8. Install nut (3) on end of sprocket shaft (5). Tighten nut to 750 lb-ft (1020 Nm).
9. Release pressure on hydraulic cylinder (15).



WARNING

Ensure pressure is off cylinder before attempting to remove hydraulic pump. Failure to follow this warning could result in personal injury and damage to equipment.

10. Remove tooling from sprocket shaft (5) and gear case (8).
11. Measure distance (B) from inner edge of holder assembly to bottom of counterbore for inner bearing cup in gear case (8). Distance should be 17.258 +/- 0.062 in. (43.84 +/- 0.16 cm).



NOTE

If original nut (3) and sprocket shaft (5) are used and holes for pin installation line up, proceed to step 13.

12. Drill a 0.368 in. (0.935 cm) hole in one of the grooves through nut (3) perpendicular to centerline of sprocket shaft (5) and 0.56 in. deep into shaft.
13. Install pin (2) into sprocket shaft (5) through hole in nut (3).
14. Install ring (1) in groove in nut (3) to secure pin (2).
15. Install final drive cases, gears, idler pinions and bearings (WP 0125 00).
16. Install sprocket assembly (WP 0141 00).
17. Install track roller frame (WP 0135 00).
18. Test drive and check drive sprocket shaft for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

TRACK ASSEMBLY REPLACEMENT 0143 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Tool set, track repair (Item 125, WP 0250 00)

Drawbar pin (TM 5-2410-237-10)

Lifting equipment, 4,000 lb capacity

Wood block, 4 in. x 4 in. x 8 in.

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

References

WP 0132 00

Personnel Required

Two

Equipment Condition

Machine parked on level ground

REMOVAL

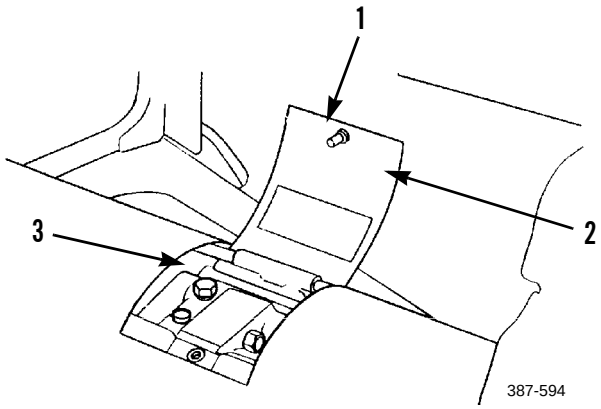
1. Remove all dirt and debris that may prevent retraction of the idler.

WARNING

- **Adjuster cylinder for track is under high pressure. Use the following procedure to relieve this pressure and observe relaxing of tension on track.**
- **Wear eye protection and use extreme caution. Do NOT observe grease coming from relief valve.**
- **Do NOT, under any circumstances, attempt to relieve pressure by excessive loosening or removal of relief valve (3). Failure to follow these precautions could result in serious personal injury.**

2. Loosen bolt (1) and open track adjuster access panel (2).

3. Turn relief valve (3) one turn counterclockwise to release grease from vent hole below relief valve.



REMOVAL - CONTINUED

NOTE

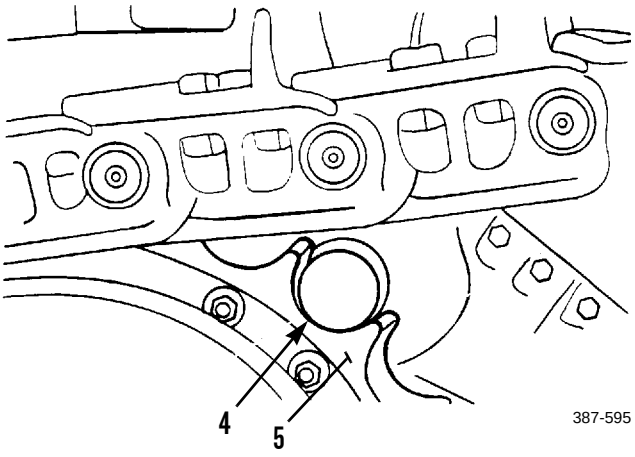
- **Drawbar pin (4) must have contact with track bushing when sprocket (5) is turned in reverse.**
- **Position drawbar pin evenly.**

4. Install drawbar pin (4) between teeth of sprocket (5).
5. Start machine and move track forward and backward to loosen track. If track does not loosen, proceed to step 6.

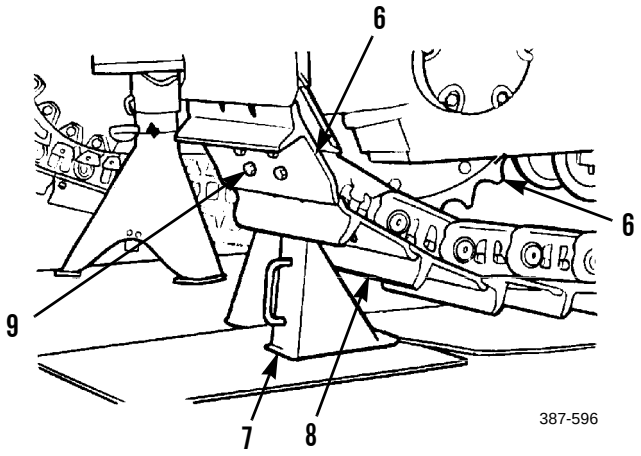
WARNING

Keep all personnel clear of front and rear of machine. Track moves fast and uncontrolled if separation occurs. At least 20 ft of clearance is required in front. Failure to follow these precautions could result in serious injury or death.

6. Move machine to the rear until slug (4) is in 9 o'clock position (3 o'clock position for left-hand track) to put tension to the rear against force of recoil spring and push grease out of vent holes.
7. Move machine forward to release tension on track.
8. Remove slug (4) from teeth of sprocket (5).



9. Move track until master link (6) is in 8 o'clock position (4 o'clock position for left-hand track) on sprocket (5).
10. Install track block (7) under track shoe (8) next to master link (6) and move track until track shoe makes contact with track block.

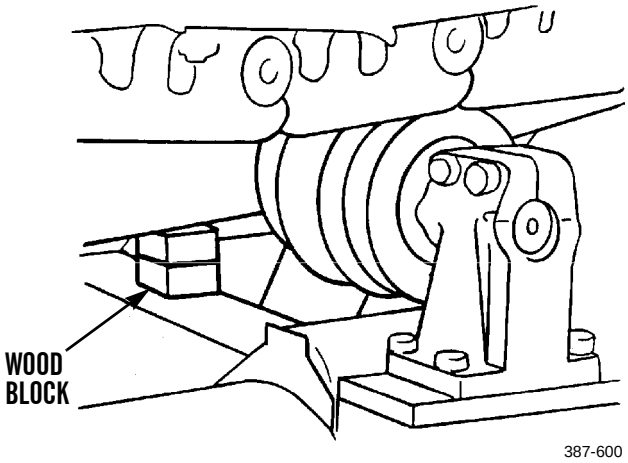


REMOVAL - CONTINUED

WARNING

To compensate for weight imbalance when removing one track, a metal block must be placed between frame and equalizer bar on same side from which track is to be removed. Failure to follow this precaution can result in equipment damage and serious personal injury.

11. Install wood block, between frame and equalizer bar.



387-600

12. Remove four capscrews (9) and master link (6) from track.

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

13. Use a suitable lifting device to lift track and remove track block (7) from under track. Ensure that track still makes contact with sprocket.
14. Slowly move machine to separate and remove track from roller frame.

INSTALLATION

1. Position machine, with master link (6) one link past bottom center line of sprocket (5).

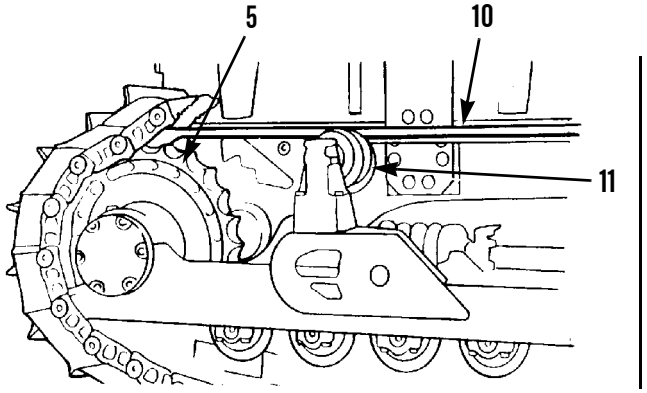
WARNING

Keep all personnel clear of front and rear of machine during positioning and connection of track ends. At least 20 ft of clearance is required in front. Stand at side of track when installing master link and bolts. Failure to follow these precautions could result in serious injury or death.

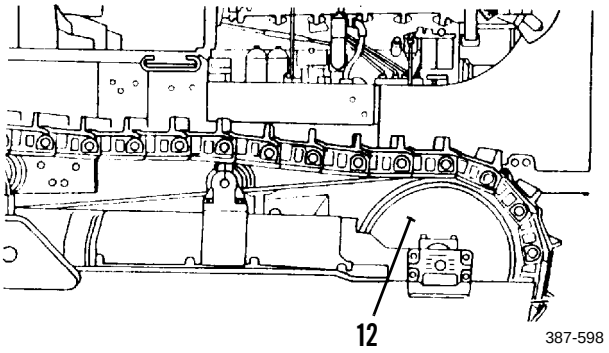
NOTE

Use tanker bar to keep track taut during installation.

2. Slowly move machine rearward until track is pulled at least one link past top center line of sprocket.
3. Position a long bar (10) across track carrier roller (11) and between track and sprocket (5).
4. Slowly move machine rearward and slowly feed track over front idler (12) and two carrier rollers (11). Use bar (10) to guide track and move bar along with track. Stop rotation when the first link reaches the 4 o'clock position (8 o'clock position on left-hand track) on front idler.

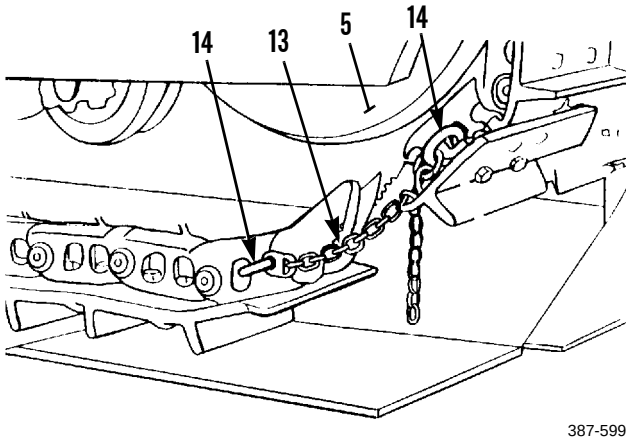


387-597



387-598

5. Install chain (13) and links (14) between track links in ends of track. Leave about 4 in. (10.2 cm) clearance between chain and track pins.
6. Move machine rearward until bottom link is below a horizontal line through center of sprocket (5).



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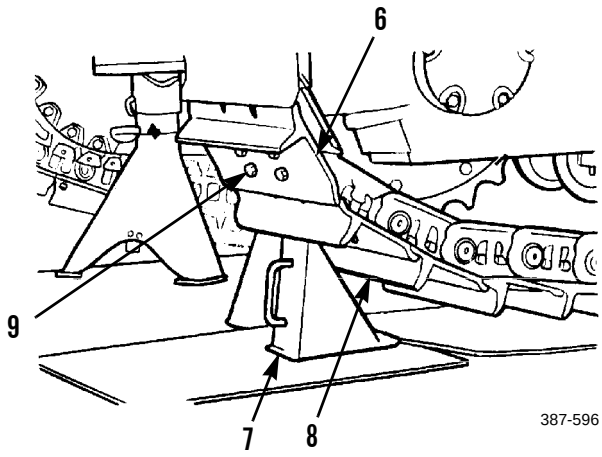
INSTALLATION - CONTINUED

7. Put track block (7) in position under track. Remove chain (13) and link (14).

NOTE

Some adjustment of master link angle will be needed to engage teeth.

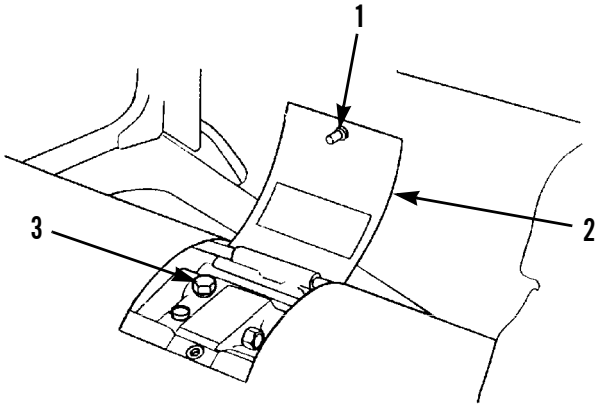
8. Move machine rearward until upper end of master link (6) is in alignment with lower end of master link. Make sure teeth of both ends of master link are engaged. Check for hole alignment with a capscrew (9) and adjust if necessary.



NOTE

Prior to installation, apply antiseize compound to capscrews.

9. Install four capscrews (9) on master link (6). Tighten capscrews to 220 lb-ft (300 Nm). Turn capscrews an additional 180° (1/2 turn).
10. Move machine forward and remove track block (7).
11. Remove metal block from between frame and equalizer bar.
12. Tighten relief valve (3) to 25 lb-ft (35 Nm).
13. Adjust track (WP 0132 00).
14. Close track adjuster access panel (2) and tighten bolt (1).
15. Test drive and check track for proper operation.

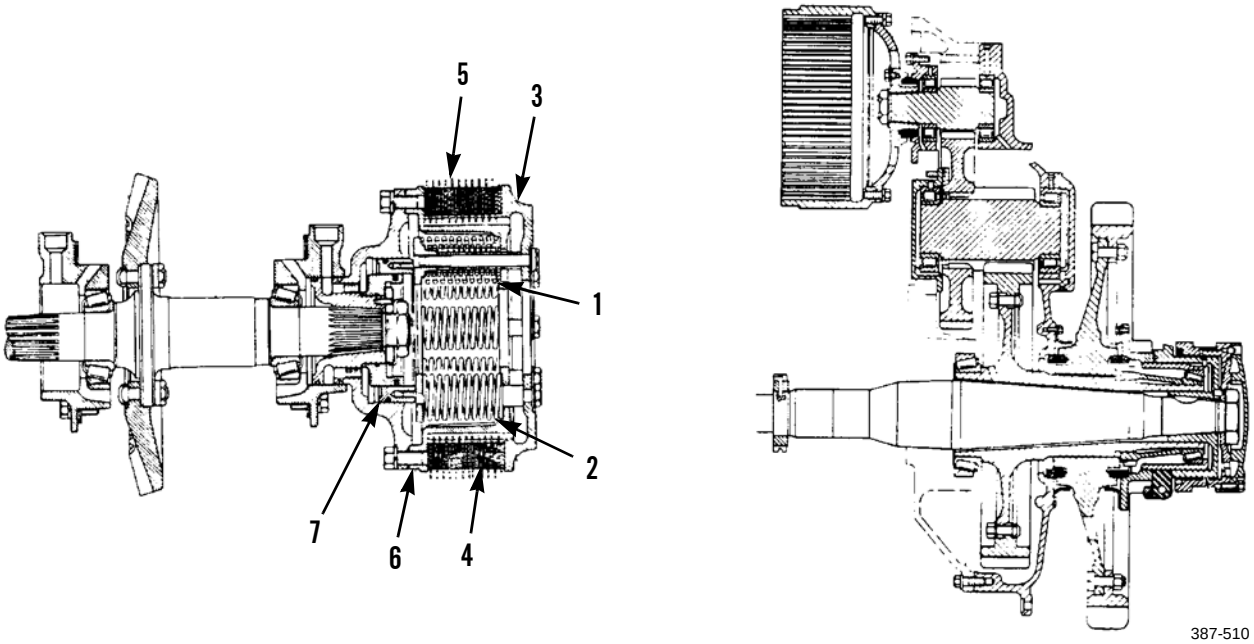


END OF WORK PACKAGE

STEERING CLUTCH

1. With a steering clutch engaged, the force of springs (1 and 2) keeps pressure plate (3), steel discs (4) and disc assemblies (5) against inner drum (6). Power goes from the inner drum, through the discs, to the outer drum (brake drum). The steering clutches are normally engaged.

2. With a steering clutch released, pressure oil from the hydraulic controls for the steering clutches moves piston (7) toward the outside of the machine. The piston pushes on the spring retainer. The spring retainer pushes on springs (1 and 2) and puts them in compression. At the same time, the spring retainer pushes pressure plate (3) toward the outside of the machine. The pressure plate is now not in contact with steel discs (4) and disc assemblies (5). The disc and disc assemblies are not held together. Power cannot go from the inner drum to the outer drum.



HYDRAULIC CONTROL VALVE FOR STEERING CLUTCHES

Pressure oil is sent to the hydraulic control valve by the transmission oil pump. When the control levers are pulled, levers move plungers to the left. The plungers move spring-tensioned valve spools. The movement of the valve spools lets oil go to the steering clutch pistons. The oil pushes against the pistons. The pistons push against the springs and move the pressure plates away from the disc assemblies which releases the steering clutches.

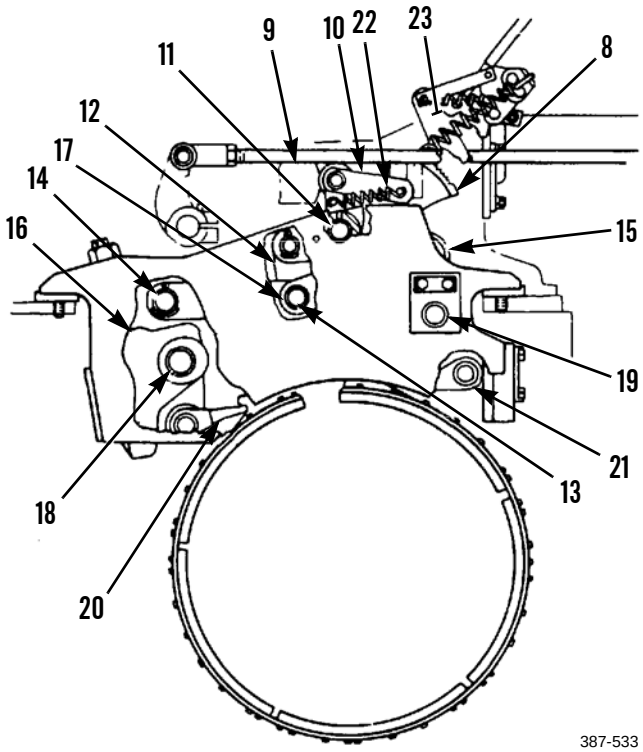
BRAKES

1. Two band-type brakes, one on each steering clutch drum, stop the movement of the machine. The brakes also give assistance to the steering clutches to turn the machine. The operation of each brake gets assistance from a hydraulic control mechanism. The operation of each brake is separate from the other. Both brakes can be held in the “ON” position by pawl (8) on the brake linkage.

2. The operation of both brakes is the same. When a brake pedal is pushed toward the front of the machine, mechanical linkage moves piston (9) in the hydraulic control mechanism. The piston pushes against the roller on bellcrank (10). The bellcrank turns on the shaft (11) and moves the link (12) toward the top. This moves pin (13) toward the top and pins (14 and 15) away from each other. Levers (16 and 17) then turn on shafts (18 and 19). Levers (16 and 17) move struts (20 and 21) toward each other. As the struts move toward each other, they push on the ends of the brake band. This causes the brake to make contact with the brake drum, stopping or slowing the machine.

BRAKES - CONTINUED

3. When the brake pedal is released, spring (22) and springs inside the hydraulic control mechanism move the mechanical linkage and brake pedal. The struts move away from each other. The brake band is not in contact with the steering clutch drum. Now, the brakes are in the “OFF” position.
4. Both brakes can be held in the “ON” position. Push both brake pedals toward the front of the machine. At the same time, push the parking brake lever forward and down. The parking brake lever is at the right side of the seat. The movement of the pawl (8) moves rod (23) and engages the teeth of the pawl (8) with the teeth of the ratchet. The brakes are held in the “ON” position by the link. The links push against the bellcrank (10). To release the brakes, push on the brake pedals and pull the parking brake lever up and backwards.
5. An oil line sends pressure oil to each brake band. This oil is for lubrication and cooling of the brake bands.



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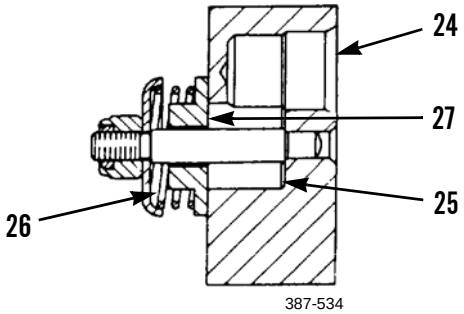
RELIEF VALVE FOR BRAKE COOLING AND LUBRICATION

The relief valve for brake cooling and lubrication is in the compartment for the left steering clutch. It lets oil at a specific pressure go to the brake bands. Cool oil goes in the valve through opening (24) and fills chamber (25). The oil comes from the oil cooler and goes through the lubrication manifold on the transmission case. Chamber (25) has two openings. A hose is connected to each of the openings. One hose goes to the right brake band and the other hose goes to the left brake band. The oil goes from chamber (25) through the two hoses to the brake bands. The oil pressure to the brake bands is controlled by spring (26) and valve (27). When the pressure of the oil in chamber (25) goes above 50 psi +/- 5 psi (345 kPa +/- 34 kPa), valve (27) moves and lets the extra oil go to the compartment for the left steering clutch.



387-534

END OF WORK PACKAGE

STEERING BRAKE PEDALS AND LINKAGE ADJUSTMENT 0145 00

THIS WORK PACKAGE COVERS

Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Gasket (4)

Pin, cotter (8)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

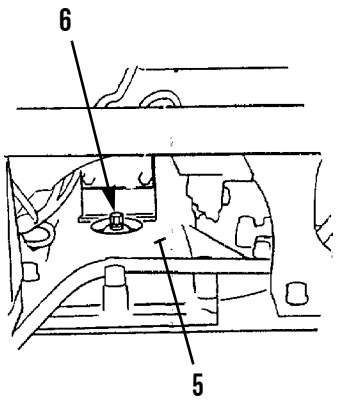
Floor plates removed (WP 0171 00)

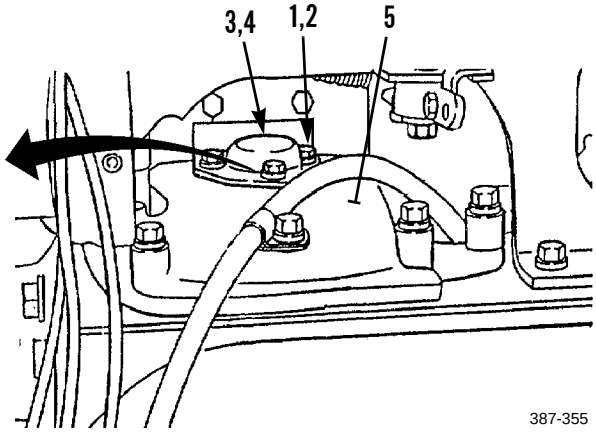
ADJUSTMENT

NOTE

The following procedure is for R.H. linkage. Repeat procedure for L.H. linkage.

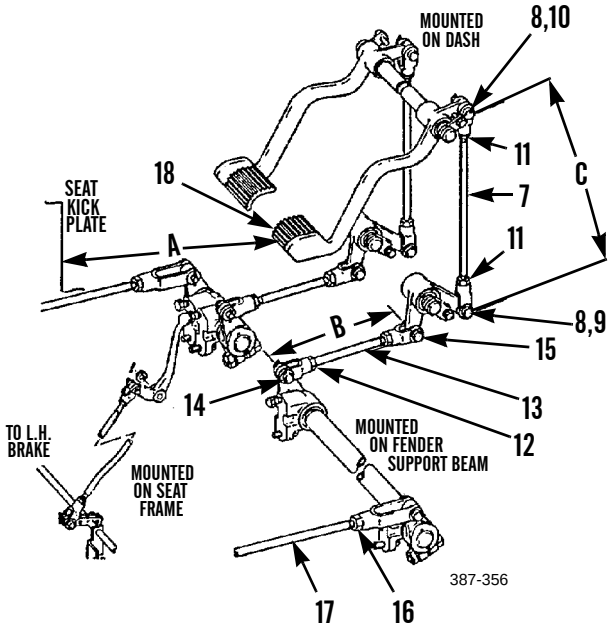
1. Remove three capscrews (1) and washers (2) from cover (3).
2. Remove cover (3) and gasket (4) from top of final drive case (5) to gain access to brake band adjusting screw (6). Discard gasket.
3. Turn brake band adjusting screw (6) clockwise until band is tight, then loosen 1-1/2 turns (9 clicks) counterclockwise.



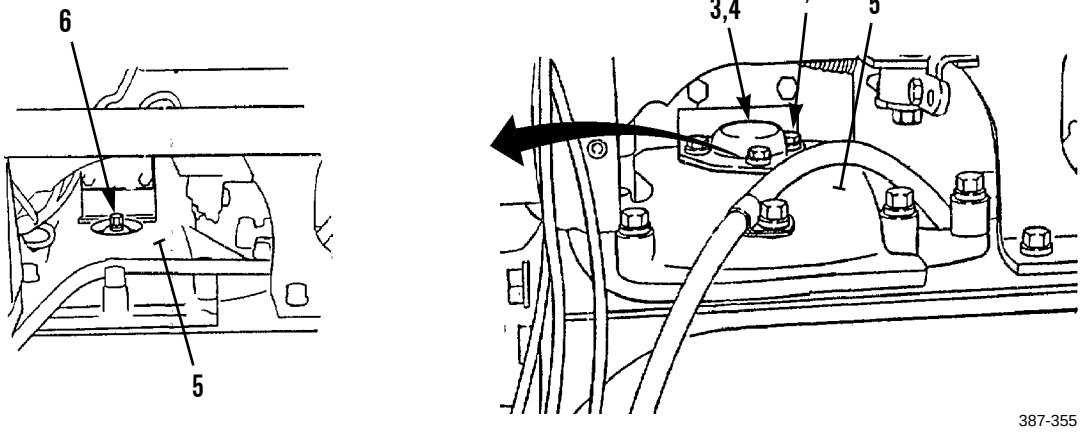


ADJUSTMENT - CONTINUED

4. Remove rod (7) by removing two cotter pins (8) and pins (9 and 10). Discard cotter pins.
5. Loosen nut (11) at both ends of rod (7) and turn rod until distance between center line of pins (9 and 10) is 19.25 in. +/- 0.02 in. (48.90 cm +/- 0.05 cm) dimension C.
6. Tighten nuts (11).
7. Install rod (7) and secure with pins (9 and 10) and new cotter pins (8).
8. Loosen nut (12) on rod (13) and turn rod until distance between center lines of pins (14 and 15) is 12.88 in. (32.7 cm) dimension B.
9. Tighten nut (12).
10. Loosen nut (16) on rod (17) and turn rod end to adjust length of rod so distance between front of right brake pedal (18) and seat kick plate is 18.53 in. +/- 0.12 in. (47.07 cm +/- 0.30 cm) dimension A.



11. Tighten nut (16).
12. Install new gasket (4) and cover (3) with three washers (2) and capscrews (1).
13. Repeat steps 1 through 12 for left side.
14. Install floor plates (WP 0171 00).
15. Turn battery disconnect switch to ON position (TM 5-2410-237-10).
16. Test drive and check for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

STEERING BRAKE PEDALS AND LINKAGE MAINTENANCE 0146 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no.1 (Item 103, WP 0250 00)

Materials /Parts

Key (34)

Lockwasher (2, 15, 20 and 28)

Pin, cotter (6, 11 and 23)

References

TM 5-2410-237-10

WP 0145 00

Equipment Condition

Battery cables disconnected (WP 0101 00)

Floor plates removed (WP 0171 00)

Seat and seat base removed, if replacing rearmost linkage at brake actuating mechanism (WP 0172 00)

Fuel tank removed, if replacing rearmost linkage at brake actuating mechanism (WP 0052 00)

REMOVAL

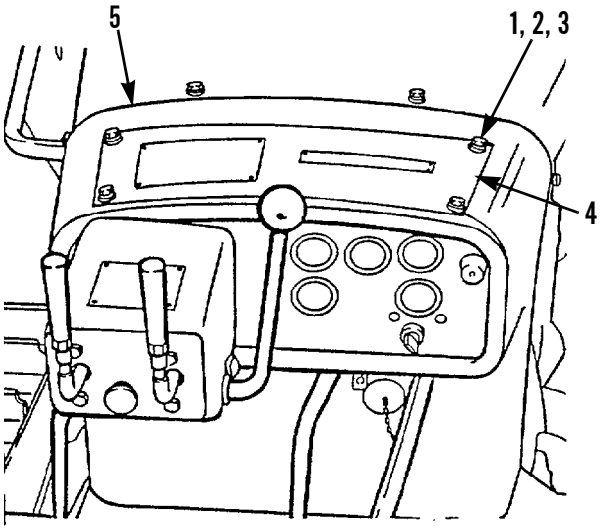
WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in injury or damage to equipment.

NOTE

This procedure to be used for R.H. or L.H. brake linkages.

1. Remove four capscrews (1), lockwashers (2), washers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



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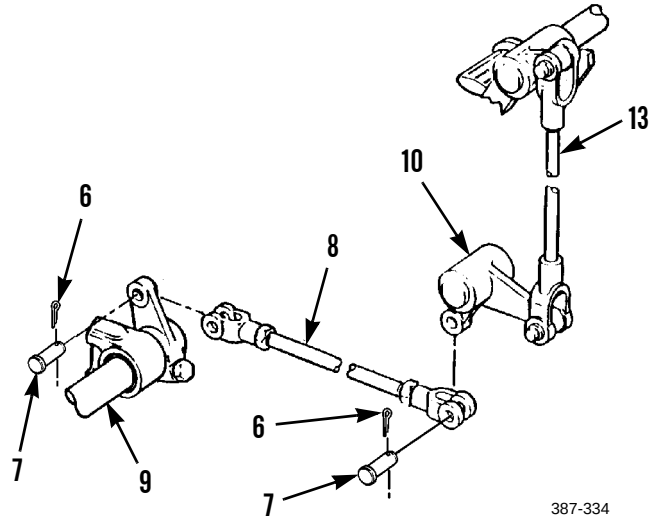
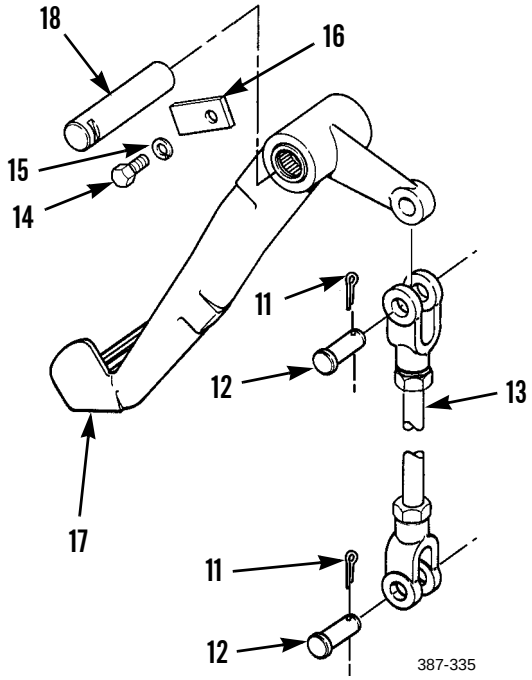
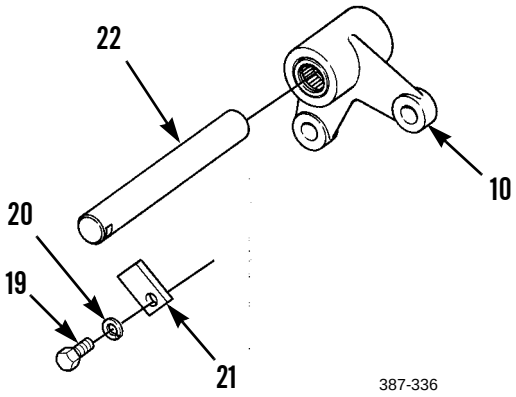
REMOVAL - CONTINUED

2. Remove cotter pin (6) and pin (7) from rod assembly (8) at shaft (9) under floor. Discard cotter pin.
3. Repeat step 2 for other end of rod assembly (8) at bellcrank (10) located at bottom rear of dash assembly and remove rod assembly (8).
4. Remove cotter pin (11) and pin (12) from top end of rod assembly (13) at foot pedal support. Discard cotter pin.
5. Repeat step 4 for bottom of rod assembly (13) at bellcrank (10) and remove rod assembly.
6. Remove capscrew (14), lockwasher (15) and lock (16) from pedal (17) and support bracket in dash assembly. Discard lockwasher.
7. Remove shaft (18) and pedal (17) from dash assembly.



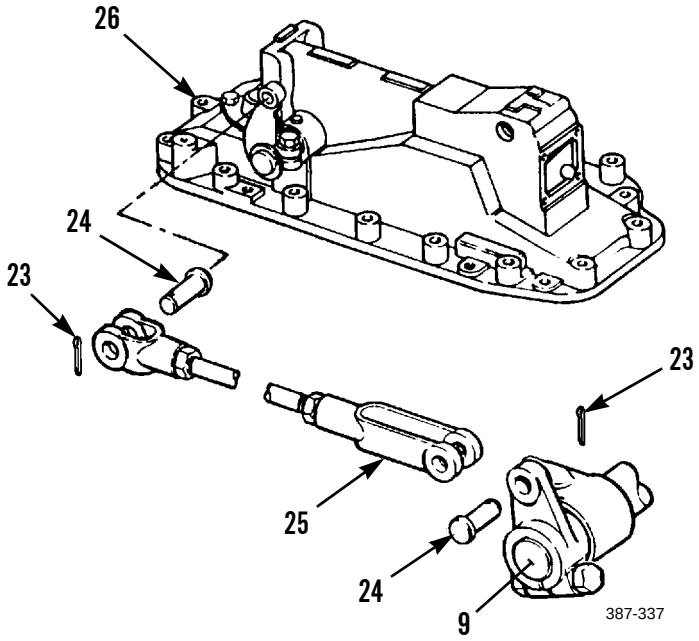


8. Remove capscrew (19), lockwasher (20) and lock (21) from bellcrank (10) and mounting bracket at bottom rear of dash assembly.
9. Remove shaft (22) from steering clutch bellcrank and brake bellcrank (10). Remove brake bellcrank and reinsert shaft (22) through clutch bellcrank and support bracket.

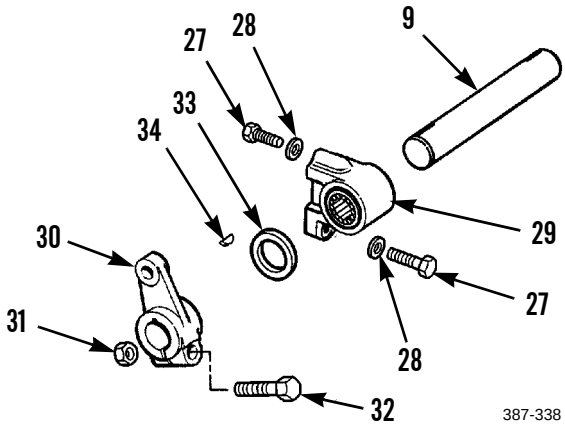


REMOVAL - CONTINUED

10. Remove cotter pin (23) and pin (24) from rod assembly (25) at end of shaft (9) under floor. Discard cotter pin.
11. Repeat step 10 for other end of rod assembly (25) at brake actuating mechanism (26) and remove rod assembly.
12. Remove four capscrews (27), lockwashers (28) and two brackets (29) with shaft (9) and levers (30) from crossbeam in floor. Discard lockwashers.
13. Remove nut (31), capscrew (32), lever (30), washer (33) and key (34) from one end of shaft (9). Discard key.
14. Repeat step 13 for lever (30) at other end of shaft (9).
15. Remove two brackets (29) from shaft (9).



387-337



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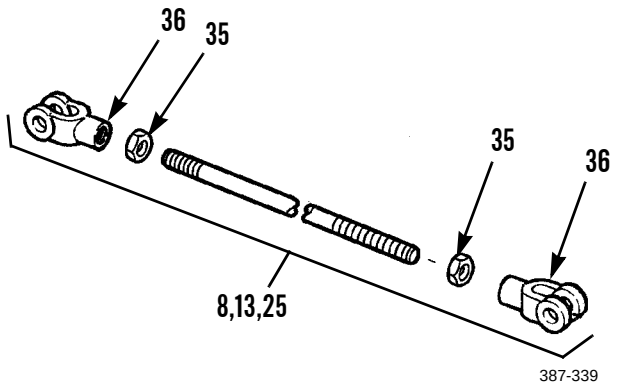
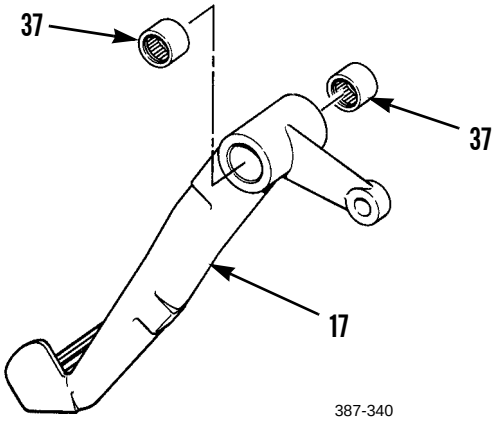
DISASSEMBLY

1. Loosen nut (35) at each end of rod assembly (8). Remove two rod ends (36) and two nuts (35).
2. Repeat step 1 for rod assembly (13).
3. Repeat step 1 for rod assembly (25).
4. Remove two bearings (37) from foot pedal (17).



387-339



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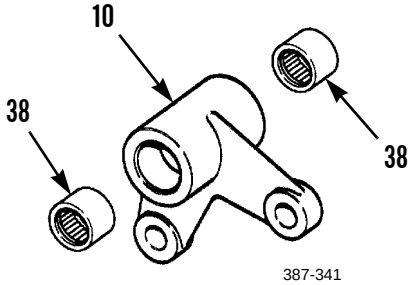
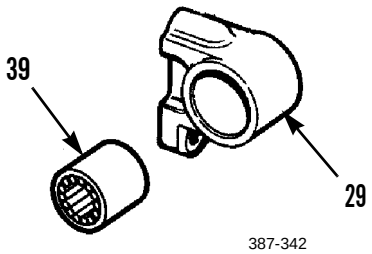
DISASSEMBLY - CONTINUED

5. Remove two bearings (38) from bellcrank (10).
6. Remove bearings (39) from shaft mounting bracket (29).
7. Repeat step 6 for other bracket (29).



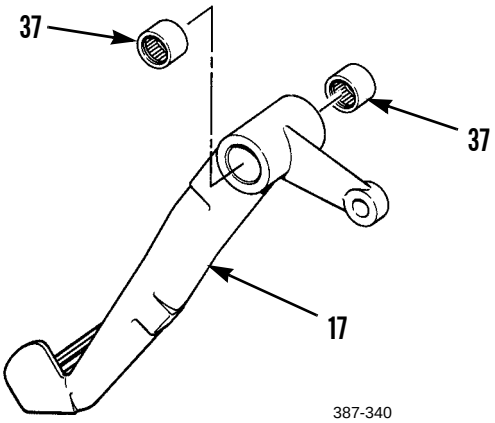
387-341



387-342

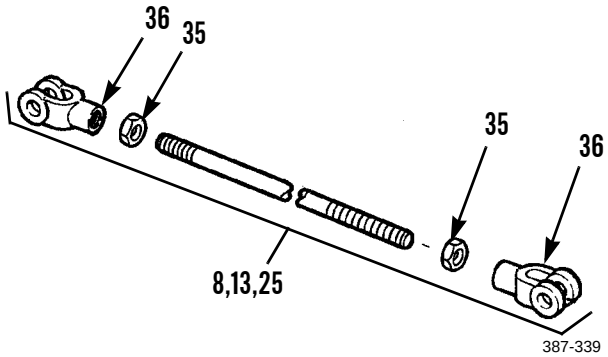
ASSEMBLY

1. Install bearing (39) in shaft mounting bracket (29).
2. Repeat step 1 for other bracket (29).
3. Install two bearings (38) in bellcrank (10).
4. Install two bearings (37) in foot pedal (17).



387-340

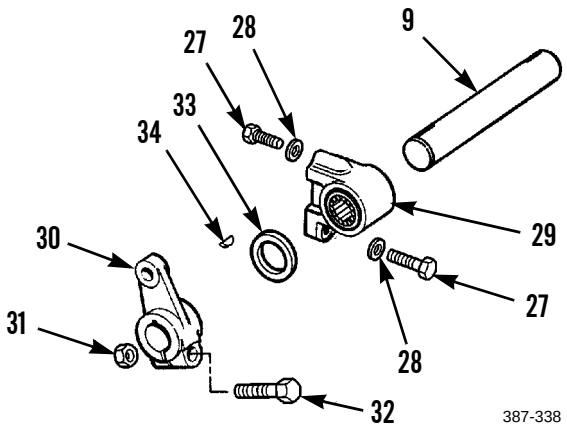
5. Install nut (35) on each end of rod (13).
6. Install rod end (36) on each end of rod (13). Adjust rod ends to a distance of 19.25 in. +/- 0.02 in. (48.90 cm +/- 0.51 cm) between center lines of holes in rod ends.
7. Tighten nuts (35) against rod ends (36) to 75 lb-ft (102 Nm).
8. Repeat steps 5 through 7 for rod assembly (8). Ensure that distance between center lines is 12.88 in. (32.72 cm).
9. Install nut (35) and rod end (36) on each end of rod (25). Do NOT tighten nuts at this time.

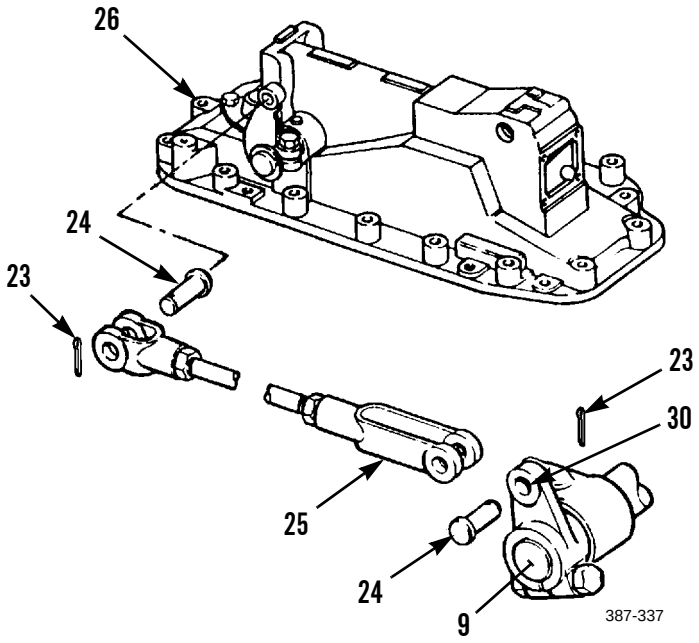


387-339

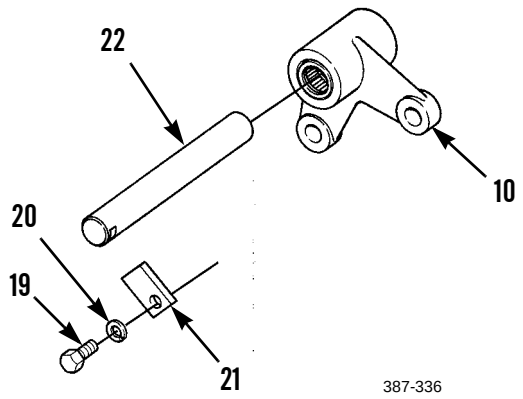
INSTALLATION

1. Install two brackets (29) on shaft (9).
2. Install washer (33), new key (34) and lever (30) on end of shaft (9).
3. Install capscrew (32) and nut (31) in lever (30) to secure lever to shaft (9).
4. Repeat steps 2 and 3 for lever (30) at other end of shaft (9).
5. Install two brackets (29) with shaft (9) and levers (30) on crossbeam in floor using four capscrews (27) and new lockwashers (28).
6. Install one end of rod assembly (25) on brake actuating mechanism (26) with pin (24) and new cotter pin (23). Do NOT tighten rod assembly nut at this time.
7. Repeat step 6 for other end of rod assembly (25) on lever (30) at end of shaft (9). Do NOT tighten rod assembly nut at this time.



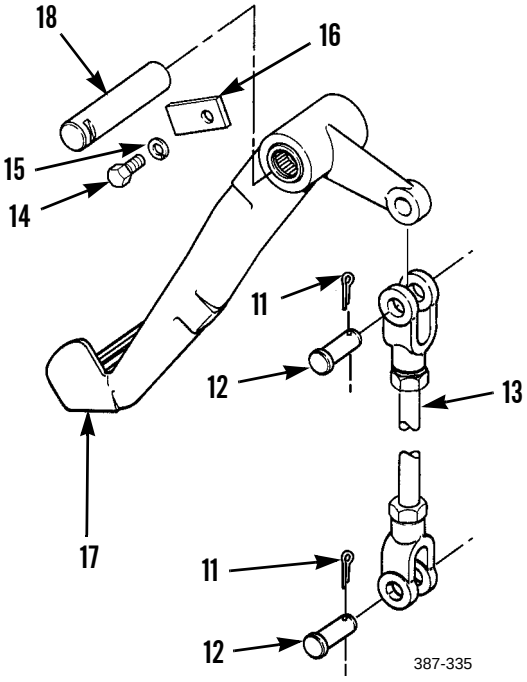


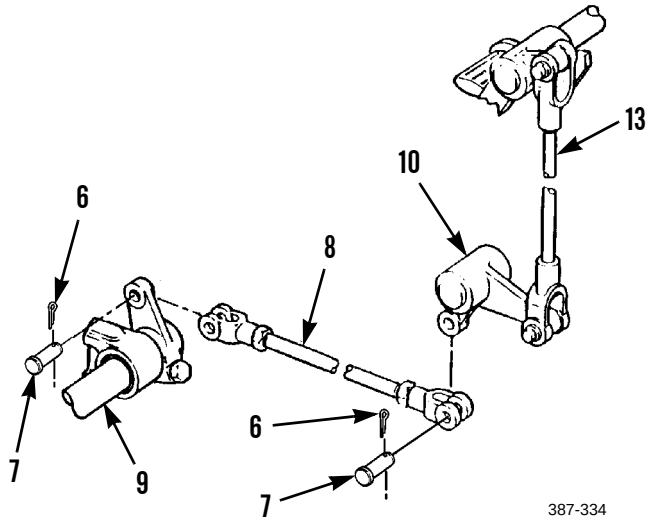
8. Remove shaft (22) from steering clutch bellcrank. Position brake bellcrank (10) and reinsert shaft through both bellcranks and support bracket.
9. Install lock (21) on bellcrank support bracket with capscrew (19) and new lockwasher (20).



INSTALLATION - CONTINUED

10. Install pedal (17) in dash assembly with shaft (18).
11. Install lock (16) on pedal support bracket with capscrew (14) and new lockwasher (15).
12. Install end of rod assembly (13) on pedal (17) lever with pin (12) and new cotter pin (11).
13. Repeat step 12 at bellcrank (10) end of rod assembly (13).
14. Install rod assembly (8) at shaft (9) with pin (7) and new cotter pin (6).
15. Repeat step 14 for other end of rod assembly (8) at bellcrank (10).





16. Adjust linkages (WP 0145 00).
17. Install cover (4) on dash assembly (5) with four capscrews (1), four new lockwashers (2) and four washers (3).
18. If removed, install fuel tank (WP 0052 00).
19. If removed, install seat and seat base (WP 0172 00).
20. Install floor plates (WP 0171 00).
21. Connect battery cables (WP 0101 00)
22. Test drive and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

STEERING CLUTCH LEVERS AND LINKAGE ADJUSTMENT 0147 00

THIS WORK PACKAGE COVERS

Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Lockwasher (2)

Materials/Parts - Continued

Pin, cotter (6 and 14)

References

TM 5-2410-237-10

Equipment Condition

Battery cables disconnected (WP 0101 00)

Floor plates removed (WP 0171 00)

WARNING

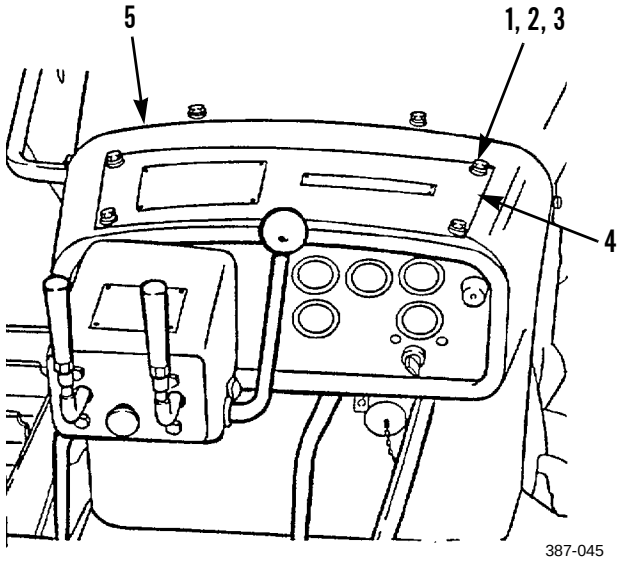
Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in injury or damage to equipment.

ADJUSTMENT

NOTE

- **Ensure all linkage mounting bolts are tight before performing adjustment.**
- **Adjustment of one steering clutch lever and linkage is described. Both are adjusted the same way.**
- **When either side is adjusted, adjustment of other side should be performed.**

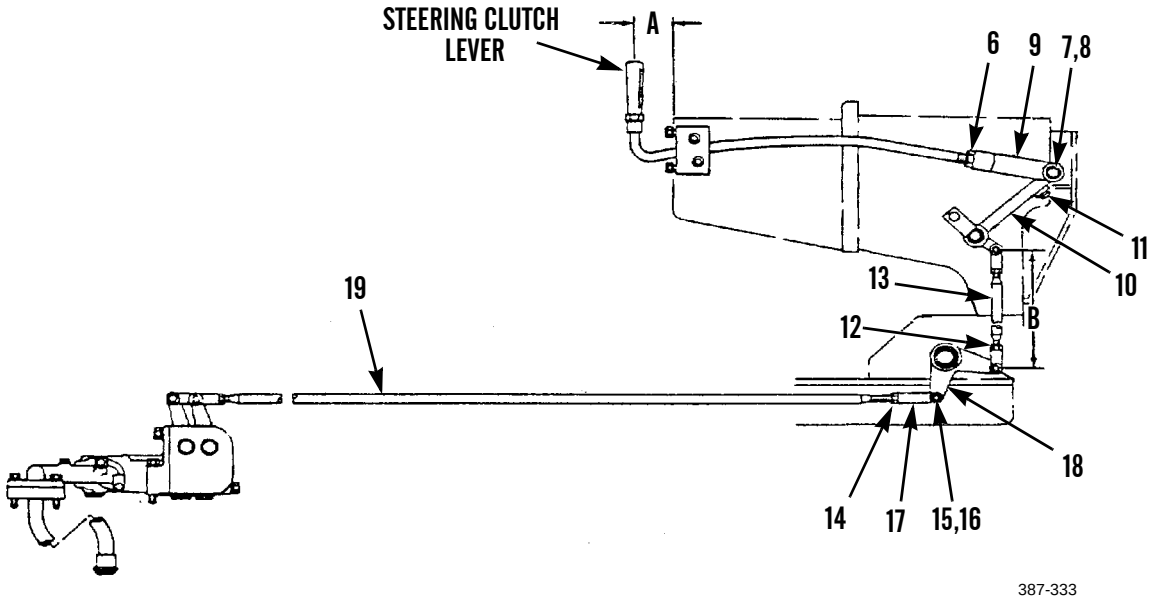
1. Remove four capscrews (1), lockwashers (2), washers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



STEERING CLUTCH LEVERS AND LINKAGE ADJUSTMENT - CONTINUED 0147 00

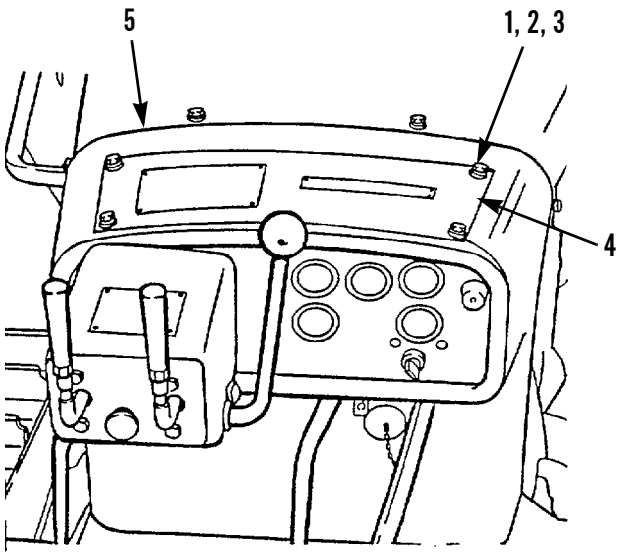
ADJUSTMENT - CONTINUED

2. Loosen nut (6) and remove cotter pin (7) and pin (8) that connects rod end (9) to lever (10). Discard cotter pin.
3. Push lever (10) all the way toward front of machine against bumper (11).
4. Turn rod end (9) so that distance (A) between center line of steering clutch lever and face of dash is 2.50 in. +/- 0.12 in. (6.35 cm +/- 0.30 cm)
5. Install pin (8) and new cotter pin (7) to connect rod end (9) to lever (10).
6. Tighten nut (6).
7. Loosen nut (12) and turn rod (13) so that distance (B) between center line of pins is 18.50 in. +/- 0.02 in. (46.99 cm +/- 0.05 cm).
8. Tighten nut (12).
9. Loosen nut (14) and remove cotter pin (15) and pin (16) that connects rod end (17) to lever (18). Discard cotter pin.
10. Pull rod (19) towards front of machine until a resistance is felt.
11. Make adjustment to rod end (17) so that pin (16) can be installed through rod end into lever (18).
12. Turn rod end (17) 1/2 turn so that length of rod (19) is made shorter.
13. Put rod end (17) in position on lever (18) and install pin (16) and new cotter pin (15).
14. Tighten nut (14).



ADJUSTMENT - CONTINUED

15. Install cover (4) on dash assembly (5) with four washers (3), new lockwashers (2) and capscrews (1).
16. Install floor plates (WP 0171 00).
17. Connect battery cables (WP 0101 00).
18. Test drive and check for proper operation (TM 5-2410-237-10).



387-045

END OF WORK PACKAGE

STEERING CLUTCH LEVERS AND LINKAGE MAINTENANCE 0148 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Key (26)

Lockwasher (2, 13, 28 and 37)

Pin, cotter (6, 15, 20, 30 and 40)

References

TM 5-2410-237-10

WP 0147 00

Equipment Condition

Battery cables disconnected (WP 0101 00)

Floor plates removed (WP 0171 00)

WARNING

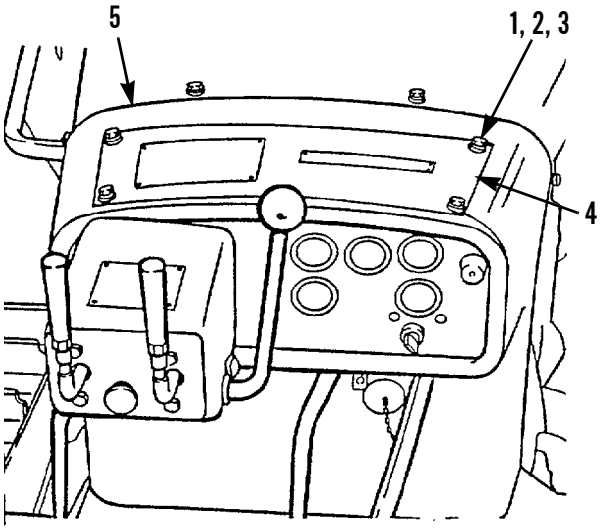
Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in injury or damage to equipment.

NOTE

This procedure to be used for either R.H. or L.H. steering clutch control.

REMOVAL

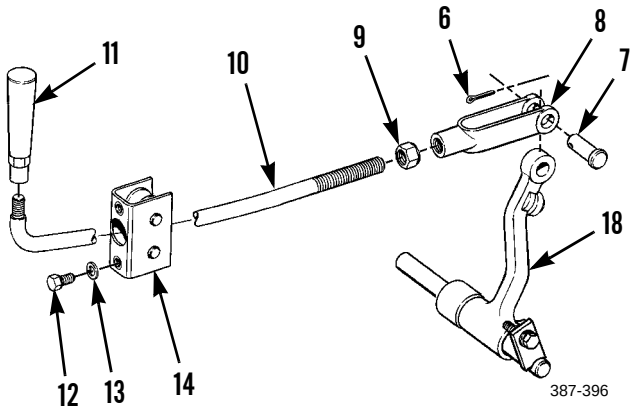
1. Remove four capscrews (1), lockwashers (2), washers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.



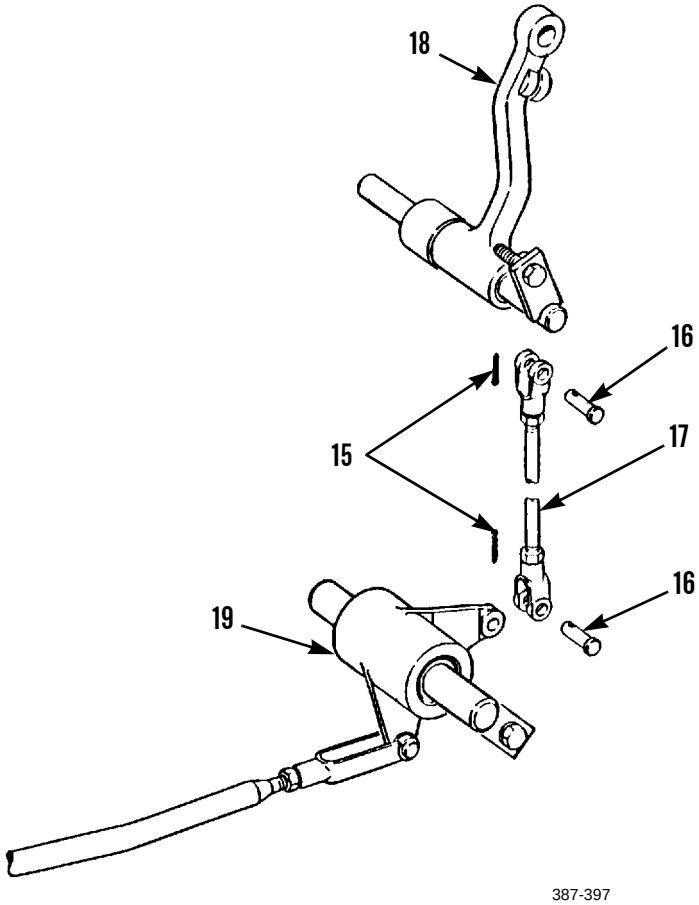
387-045

REMOVAL - CONTINUED

2. Remove cotter pin (6) and pin (7) from rod end (8) inside dash assembly. Discard cotter pin.
3. Loosen nut (9) and remove rod end (8) and nut from end of rod assembly (10).
4. Remove handle (11) from rod (10) and remove rod from dash assembly.
5. Remove two capscrews (12), lockwashers (13) and bracket (14) assembly from dash assembly. Discard lockwashers.

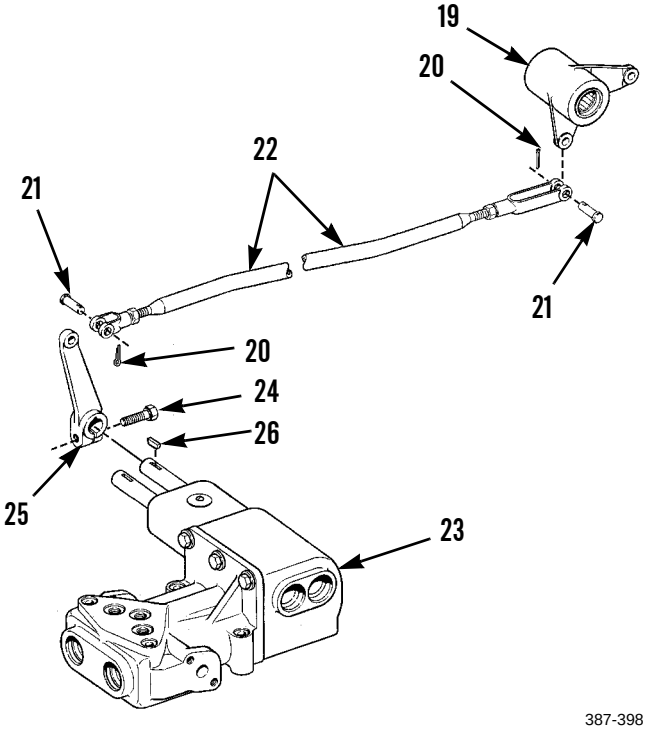


6. Remove cotter pin (15) and pin (16) from top end of rod (17) at lever (18). Discard cotter pin.
7. Repeat step 6 for bottom end of rod (17) at bellcrank (19).



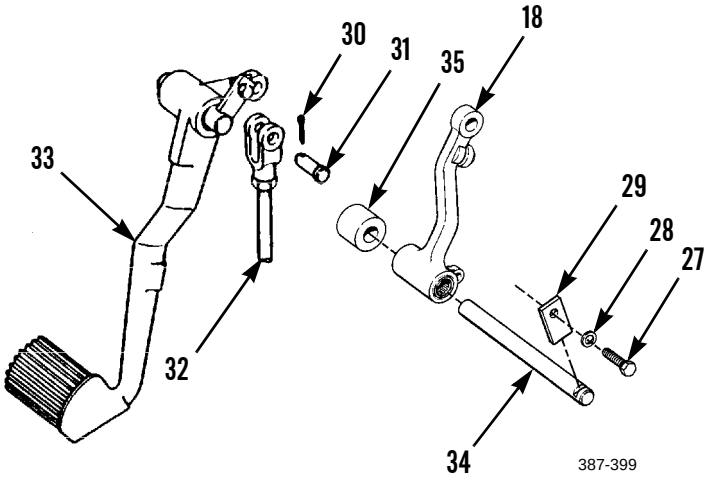
REMOVAL - CONTINUED

8. Remove cotter pin (20) and pin (21) from end of rod (22) at bellcrank (19). Discard cotter pin.
9. Repeat step 8 for other end of rod (22) at control valve (23) and remove rod.
10. Remove capscrew (24), lever (25) and key (26) from control valve (23). Discard key.



387-398

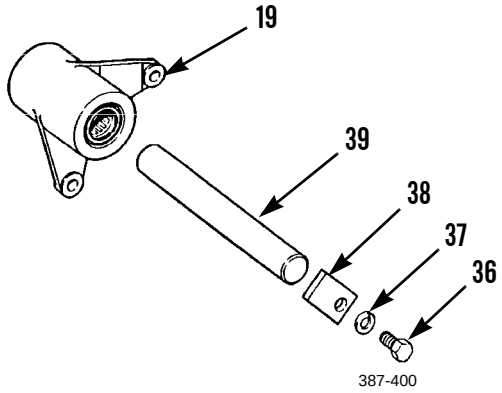
11. Remove capscrew (27), lockwasher (28) and lock (29) from lever mounting bracket. Discard lockwasher.
12. Remove cotter pin (30), pin (31) and end of rod (32) from brake foot pedal (33). Discard cotter pin.
13. Raise brake foot pedal (33) as high as possible and remove shaft (34), spacer (35) and lever (18) from dash assembly.



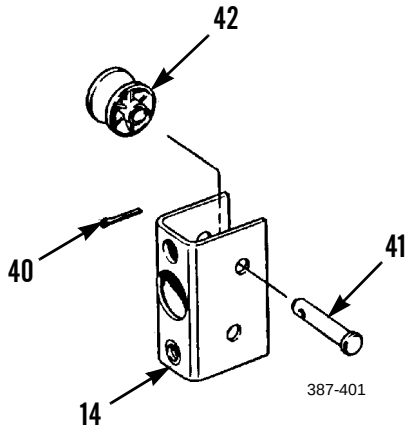
387-399

REMOVAL - CONTINUED

14. Remove capscrew (36), lockwasher (37) and lock (38) from bellcrank shaft support bracket. Discard lockwasher.
15. Pull shaft (39) out far enough to remove clutch linkage bellcrank (19) and reinsert shaft (39) into support bracket to secure brake linkage bellcrank.



387-400



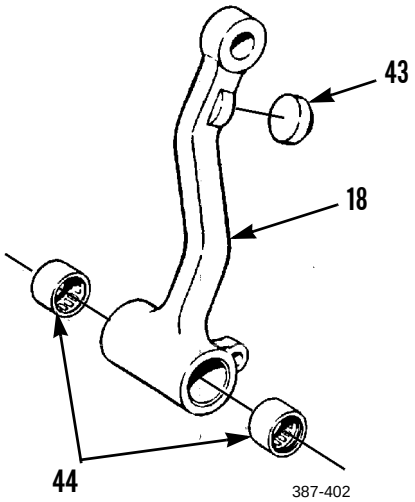
387-401

DISASSEMBLY

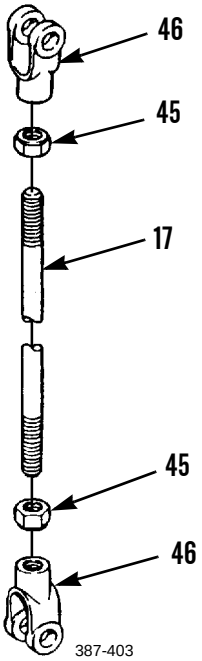
NOTE

Disassemble only as needed to replace damaged components.

1. Remove cotter pin (40), pin (41) and roller (42) from bracket (14). Discard cotter pin.
2. Repeat step 1 for other roller (42) in bracket (14).
3. Remove bumper (43) and two bearings (44) from lever (18).
4. Loosen two nuts (45) on rod (17) and remove two rod ends (46) and nuts.



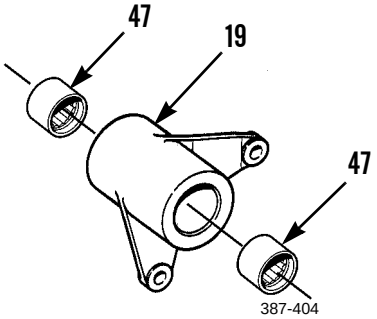
387-402

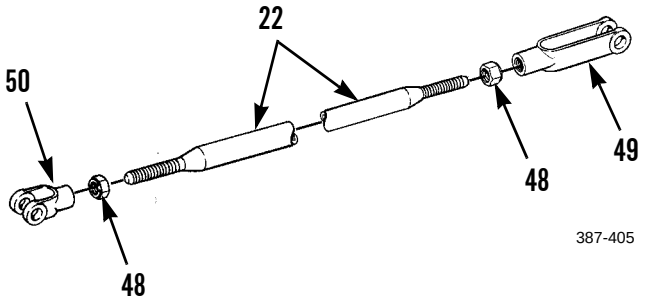


387-403

DISASSEMBLY - CONTINUED

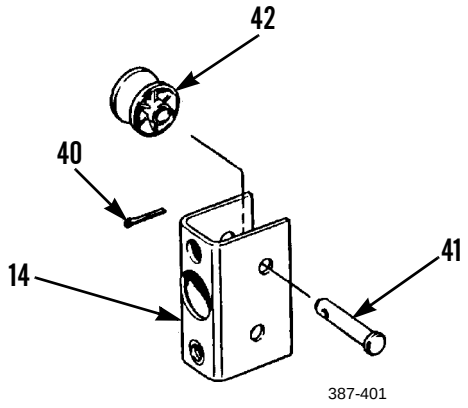
5. Remove two bearings (47) from bellcrank (19).
6. Loosen two nuts (48) on rod (22) and remove rod ends (49 and 50) and nuts.

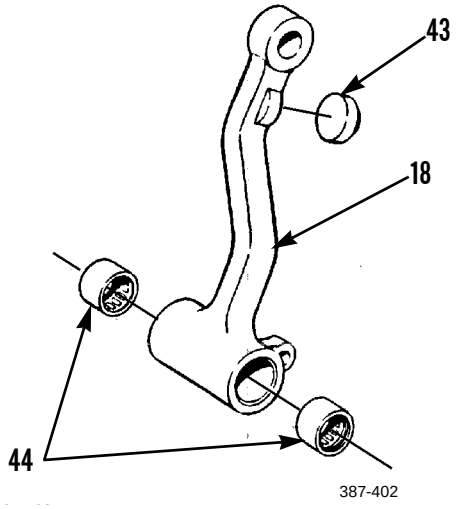




ASSEMBLY

1. Install roller (42) and pin (41) in bracket (14) and install new cotter pin (40) in pin.
2. Repeat step 1 for other roller (42) in other bracket (14).
3. Install two bearings (44) and bumper (43) in lever (18).





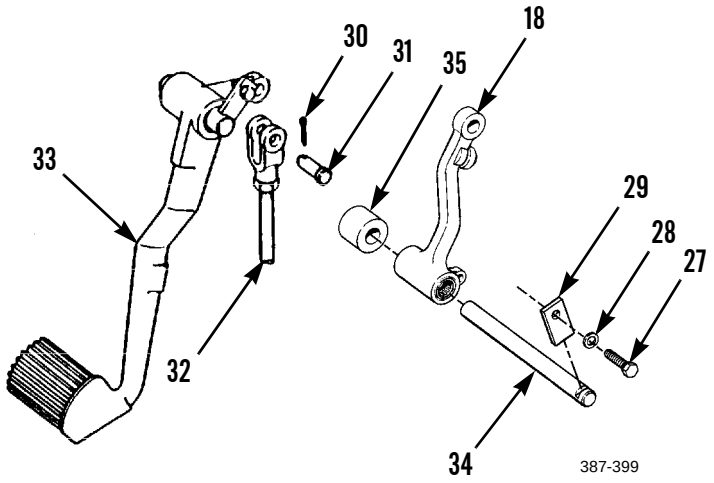
4. Install two nuts (45) and rod ends (46) on rod (17). Adjust rod ends to 18.50 in. +/- 0.02 in. (46.99 cm +/- 0.05 cm) between center lines of holes in rod ends.
5. Tighten two nuts (45) against rod ends (46).
6. Install two bearings (47) in bellcrank (19).
7. Install two nuts (48) and rod ends (49 and 50) on rod (22). Do not tighten nuts at this time.

INSTALLATION

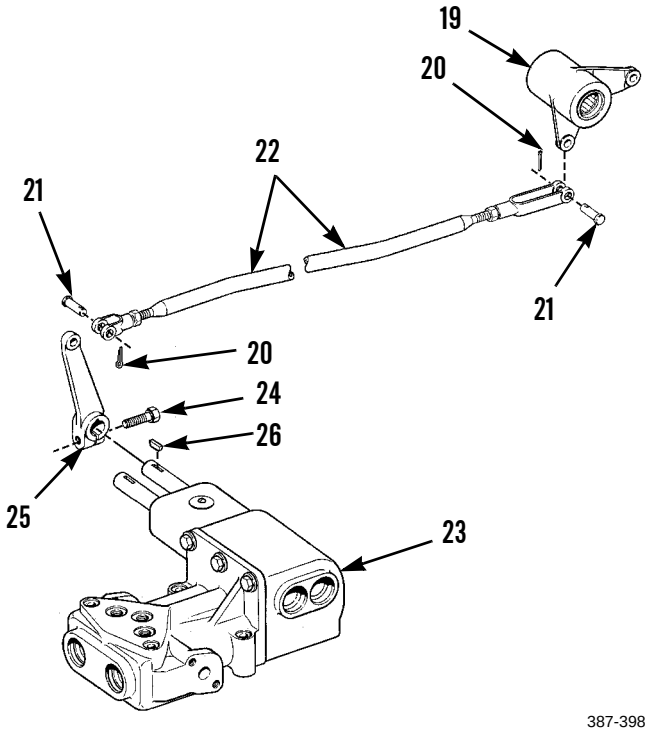
1. Pull shaft (39) out far enough to install clutch linkage bellcrank (19) on shaft (39) and reinsert shaft into support bracket.
2. Install lock (38) with capscrew (36) and new lockwasher (37) to secure shaft (39).

INSTALLATION - CONTINUED

3. Raise brake foot pedal (33) as high as possible. Position lever (18) and spacer (35) between mounting bracket and other clutch linkage lever.

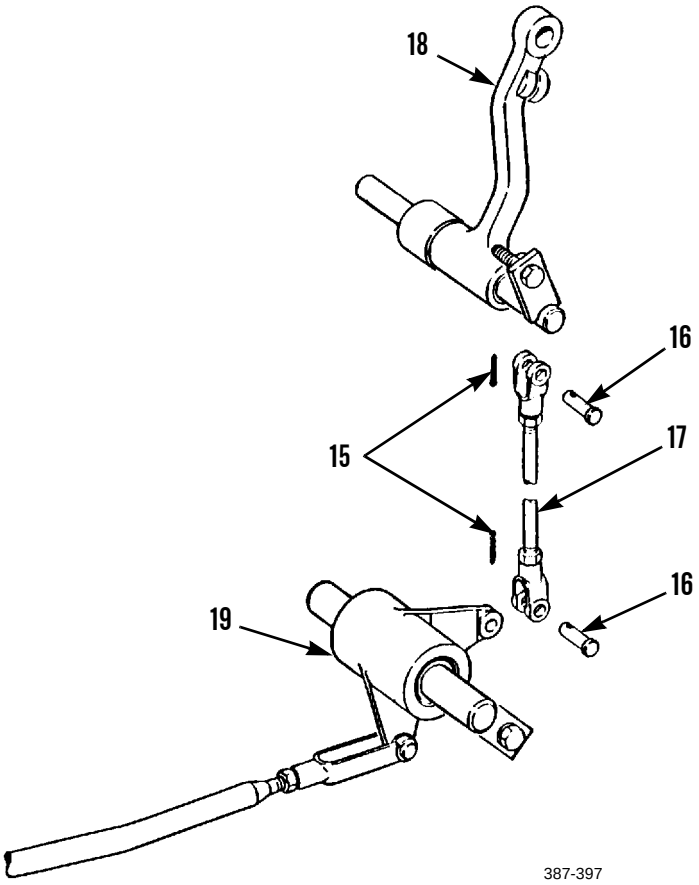


4. Insert shaft (34) through mounting bracket, lever (18), spacer (35) and other lever and mounting bracket.
5. Install lock (29) with capscrew (27) and new lockwasher (28) to secure shaft (34).
6. Install end of rod (32) on brake foot pedal (33) with pin (31) and new cotter pin (30).
7. Install lever (25) on control valve (23) with new key (26) and capscrew (24).
8. Install one end of rod (22) on lever (25) with pin (21) and new cotter pin (20).
9. Repeat step 8 for other end of rod (22) at bellcrank (19).

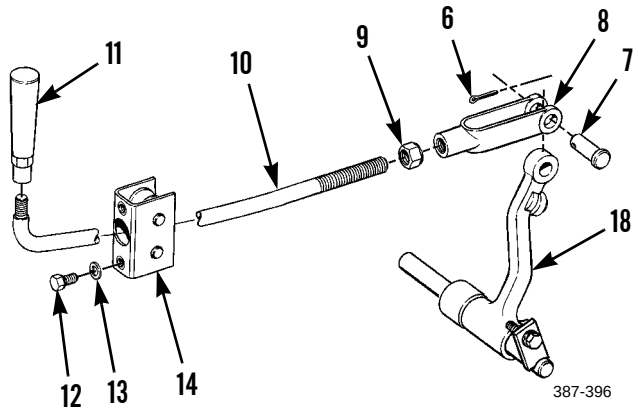


INSTALLATION - CONTINUED

10. Install one end of rod (17) on bellcrank (19) with pin (16) and new cotter pin (15).
11. Repeat step 10 for other end of rod (17) at lever (18).



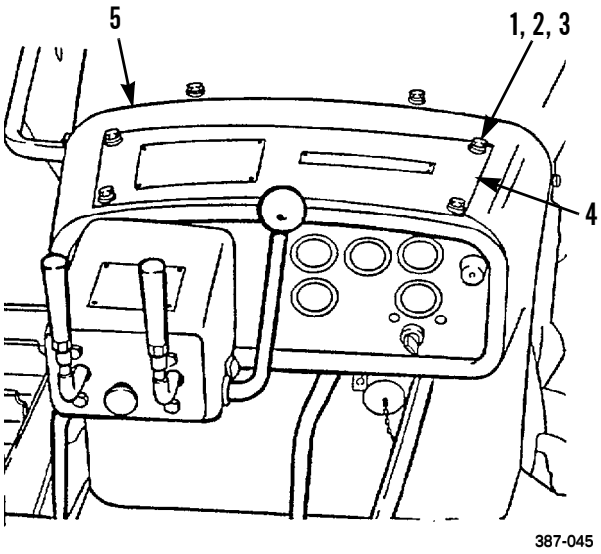
12. Install bracket (14) assembly in dash assembly with two capscrews (12) and new lockwashers (13).
13. Insert rod (10) through rollers in bracket (14) assembly and install handle (11) on rod.
14. Loosely install nut (9) and rod end (8) on rod (10).
15. Install rod end (8) on lever (18) with pin (7) and new cotter pin (6).
16. Tighten nut (9) against rod end (8).



INSTALLATION - CONTINUED

17. Adjust linkage (WP 0147 00).
18. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (2) and washers (3).
19. Install floor plates (WP 0171 00).
20. Connect battery cables (WP 0101 00).
21. Test drive and check steering for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE



STEERING BRAKE LOCK LEVER AND LINKAGE REPLACEMENT 0149 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Pin, cotter (1, 5 and 9)

Equipment Condition

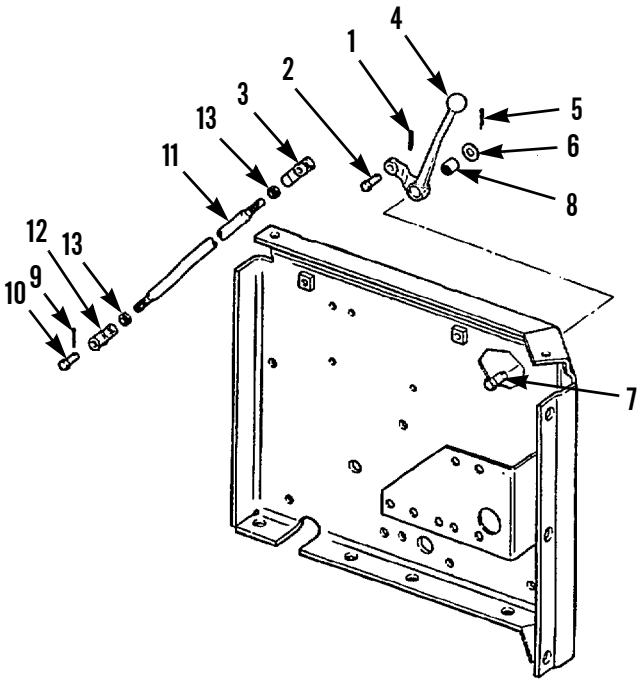
Seat removed (WP 0172 00)

REMOVAL

1. Remove cotter pin (1) and pin (2) that connects rod end (3) to lever (4). Discard cotter pin.
2. Remove cotter pin (5), washer (6) and slide lever (4) from welded pin (7). Discard cotter pin.
3. Remove bearing (8) from lever (4).
4. Remove cotter pin (9) and pin (10) and remove rod (11) from tractor. Discard cotter pin.
5. Remove rod ends (3 and 12) and nuts (13) from rod (11).

INSTALLATION

1. Install rod ends (3 and 12) and nuts (13) onto rod (11).
2. Place rod (11) into position and install pin (10) and new cotter pin (9).
3. Install bearing (8) into lever (4).
4. Slide lever (4) onto welded pin (7) and install washer (6) and new cotter pin (5).
5. Connect rod end (3) to lever (4) with pin (2) and new cotter pin (1).
6. Check steering brake lock for proper operation.
7. Install seat (WP 0172 00).



387-358

END OF WORK PACKAGE

STEERING BRAKE ACTUATING MECHANISM MAINTENANCE 0150 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 200 lb capacity

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Lockwasher (6 and 55)

Materials/Parts - Continued

Pin, cotter (10, 26 and 47)

Pin, spring (15, 17 and 24)

Wood blocks, 6 in. x 4 in. x 4 in.

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

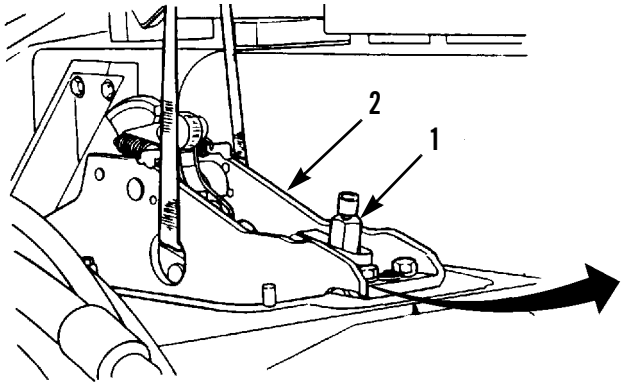
Steering brake hydraulic control assembly removed (WP 0151 00)

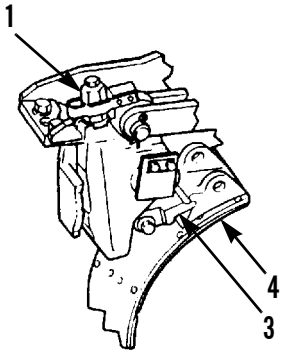
NOTE

R.H. and L.H. steering brake actuating mechanism are the same. This procedure covers one side.

REMOVAL

1. Loosen socket (1) in actuating mechanism (2) to disengage struts (3) from brake band (4).





REMOVAL - CONTINUED

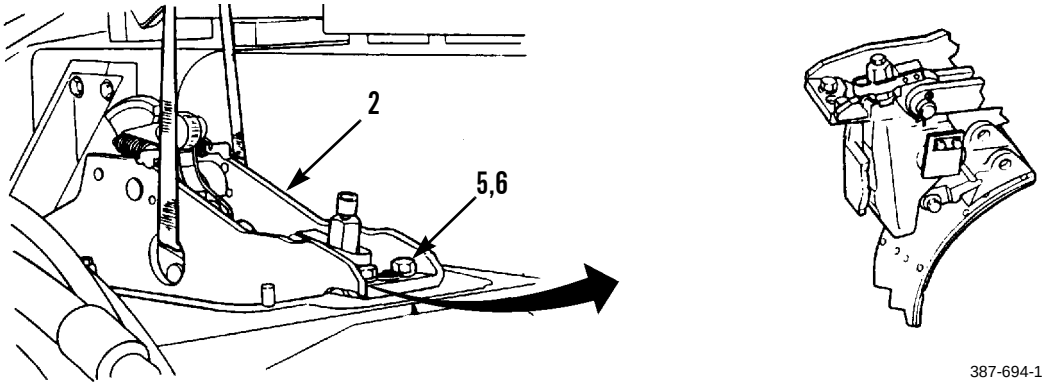
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

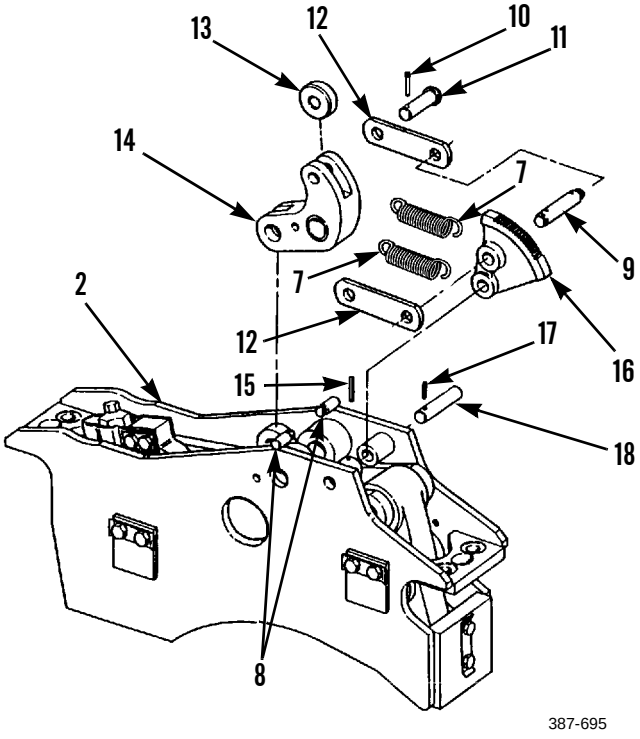
Steering brake actuating mechanism weighs 100 lb (45 kg).

2. Attach a nylon sling and suitable lifting device to actuating mechanism (2) and take up slack in lifting device.
3. Remove four bolts (5) and lockwashers (6) from actuating mechanism (2). Discard lockwashers.
4. Use lifting device and, if necessary, a pry bar to lift actuating mechanism (2) from gear case.



DISASSEMBLY

1. Place actuating mechanism (2) on work bench and support 4-6 in. (10-15 cm) off work surface on two wood blocks.
2. Remove two springs (7) from welded pins (8) and from both sides of pin (9).
3. Remove cotter pin (10), pin (11), two links (12) and roller (13) from bellcrank (14). Discard cotter pin.
4. Remove spring pin (15), pin (9) and two links (12) from ratchet (16). Discard spring pin.
5. Remove spring pin (17), shaft (18) and ratchet (16). Discard spring pin.



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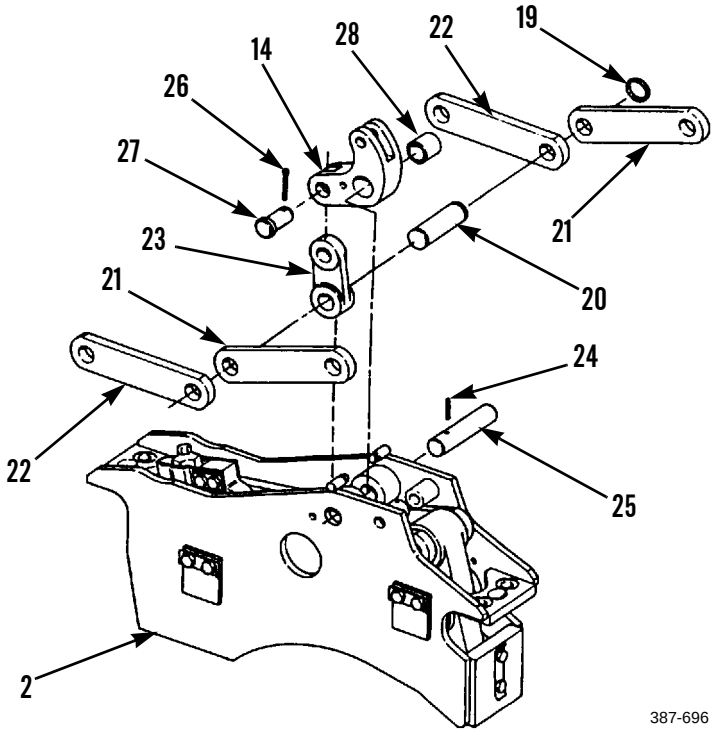
DISASSEMBLY - CONTINUED

6. At large hole in side of actuating mechanism (2), remove retaining ring (19) and pin (20) that connects two links (21), links (22) and lever (23). If necessary, remove other retaining ring from pin.
7. Remove spring pin (24), shaft (25) and bellcrank (14) from actuating mechanism (2). Discard spring pin.
8. Remove cotter pin (26), pin (27) and lever (23) from bellcrank (14). Discard cotter pin.
9. Remove bearing (28) from bellcrank (14).

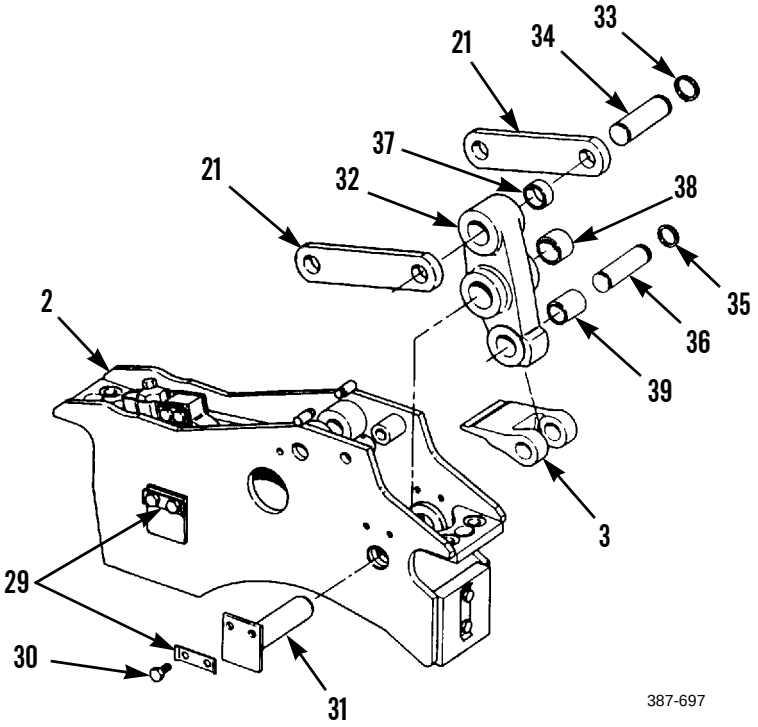


NOTE

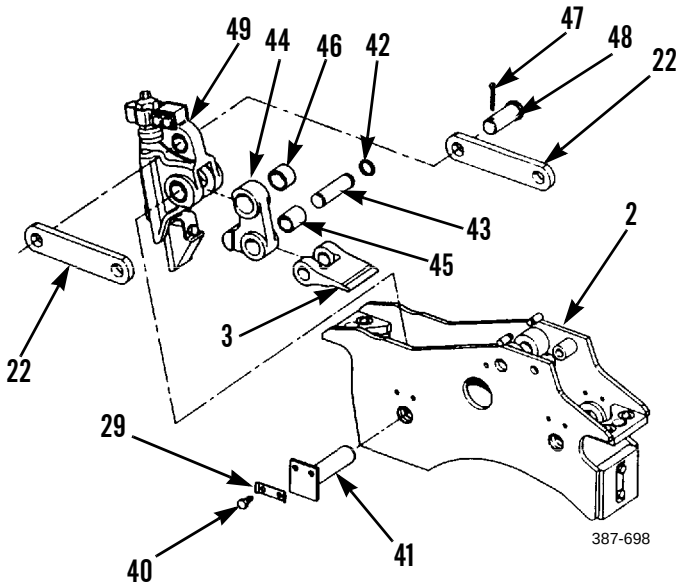
Turn actuating mechanism over on its side, with capscrews facing up, to complete disassembly.

10. Flatten two locks (29) and remove two capscrews (30), one lock, shaft (31) and lever (32) from actuating mechanism (2).
11. Remove retaining ring (33), pin (34) and two links (21) from one end of lever (32). If necessary, remove other retaining ring from pin.
12. Remove retaining ring (35), pin (36) and strut (3) from other end of lever (32). If necessary, remove other retaining ring from pin.
13. Remove bearings (37, 38 and 39) from lever (32).

DISASSEMBLY - CONTINUED

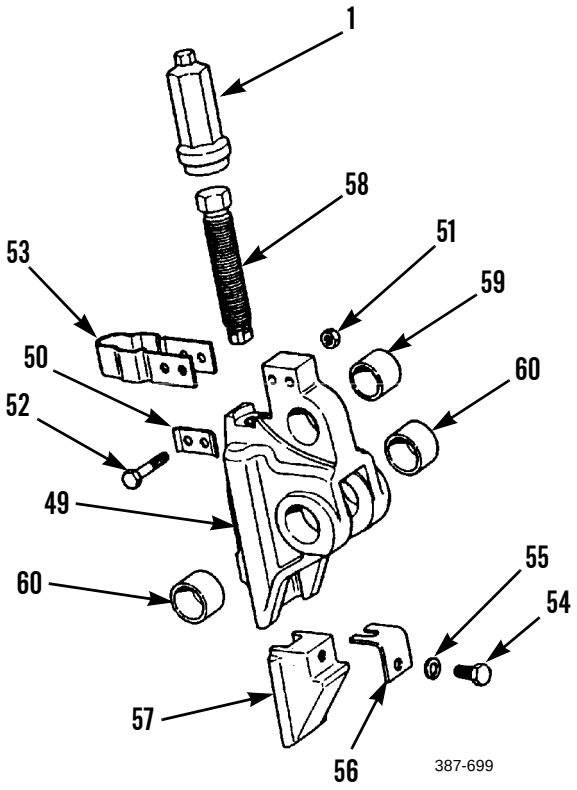


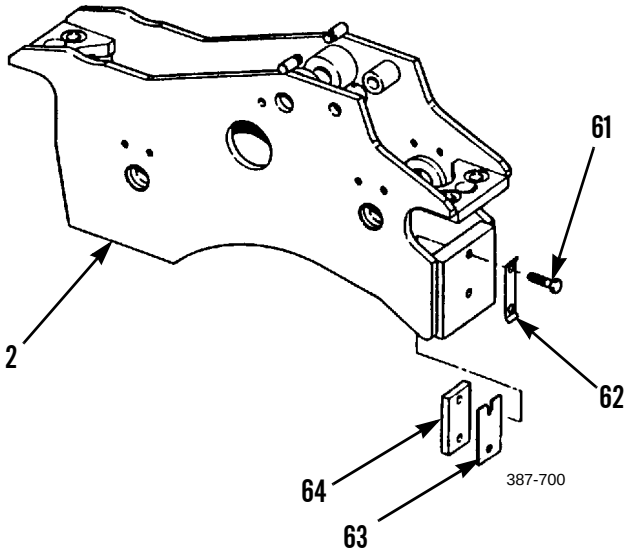
14. Remove two capscrews (40), lock (29), shaft (41) and two lever assemblies from other end of actuating mechanism (2).
15. Remove retaining ring (42), pin (43) and strut (3) from lever (44). If necessary, remove other retaining ring from pin.
16. Remove small bearing (45) and larger bearing (46) from lever (44).
17. Remove cotter pin (47), pin (48) and two links (22) from lever (49). Discard cotter pin.



DISASSEMBLY - CONTINUED

18. Flatten lock (50) and remove two nuts (51), capscrews (52), lock, spring (53) and socket (1) from lever (49).
19. Remove capscrew (54), lockwasher (55), spring (56) and wedge (57) from lever (49). Discard lockwasher.
20. Remove adjusting screw (58) from lever (49).
21. Remove small bearing (59) and two larger bearings (60) from lever (49).
22. Remove two capscrews (61), lockplate (62), shims (63) and plate (64) from end of actuating mechanism (2).





CLEANING AND INSPECTION

Dry cleaning solvent MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Clean all removed components in solvent cleaning compound.
2. Wipe components clean with a rag.
3. Inspect for bends, breaks, cracks, corrosion or other damage.
4. Replace any damaged component.

ASSEMBLY

NOTE

For ease of assembly, position actuating mechanism securely on wood blocks 4-6 in. (10-15 cm) above work surface.

1. Install shims (63), plate (64), lockplate (62) and two capscrews (61) on end of actuating mechanism (2). Bend lockplate.

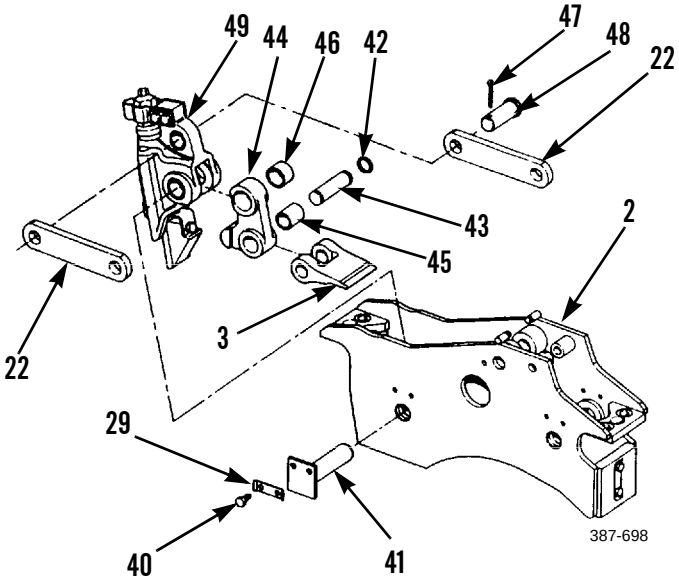
NOTE

All bearings must be centered from side to side in bearing holes.

2. Install two larger bearings (60) and smaller bearing (59) in lever (49).
3. Install adjusting screw (58) through top of lever (49) and install wedge (57) in bottom of lever until it contacts end of adjusting screw.
4. Install spring (56) with new lockwasher (55) and capscrew (54) in wedge (57), with open end of spring in groove at end of adjusting screw (58).
5. Install socket (1) over adjusting screw (58). Secure socket with spring (53), two capscrews (52), lock (50) and two nuts (51).

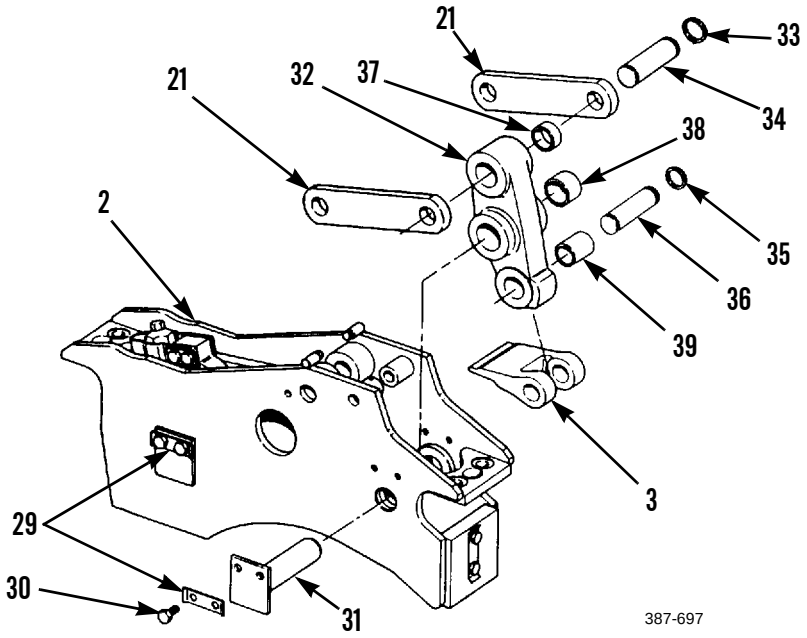
ASSEMBLY - CONTINUED

6. Install two links (22) on lever (49) with pin (48) and new cotter pin (47).
7. Install smaller bearing (45) and larger bearing (46) in lever (44).
8. Install strut (3) on lever (44) with pin (43) and retaining ring (42). If removed install other retaining ring on pin.
9. Position lever (49) with assembled components in actuating mechanism (2). Line up holes and partially insert shaft (41) into one side of lever.
10. Position lever (44) with strut (3) in lever (49). Line up holes and insert shaft (41) through both levers (44 and 49) and actuating mechanism (2).
11. Install lock (29) and two capscrews (40) to secure shaft (41). Bend lock.

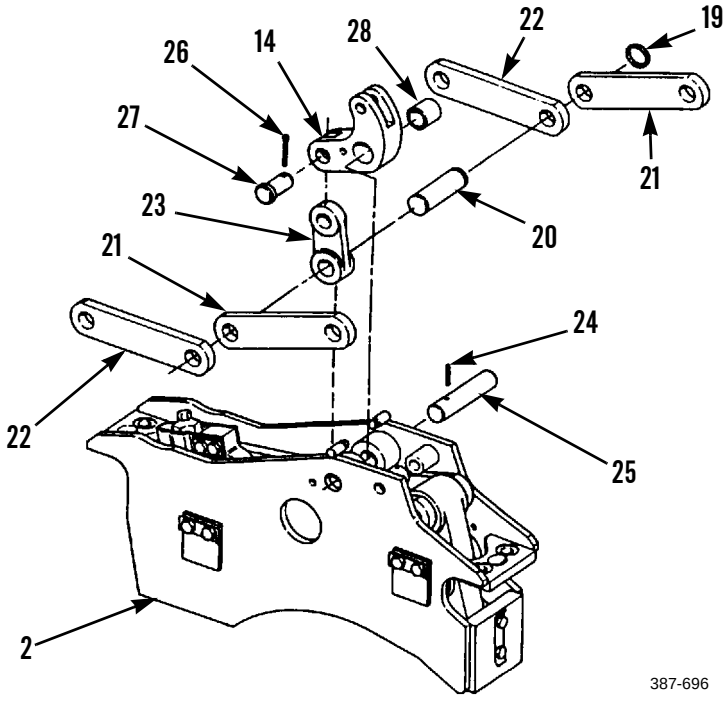


12. Install bearings (37, 38 and 39) in lever (32).
13. Install strut (3) on lever (32) with pin (36) and retaining ring (35). If removed, install other retaining ring in pin.
14. Install two links (21) on other end of lever (32) with pin (34) and retaining ring (33). If removed, install other retaining ring in pin.
15. Position lever (32) and strut (3) in actuating mechanism (2). Line up holes and insert shaft (31) through actuating mechanism and lever.
16. Install lock (29) and two capscrews (30) to secure shaft (31). Bend lock.

ASSEMBLY - CONTINUED

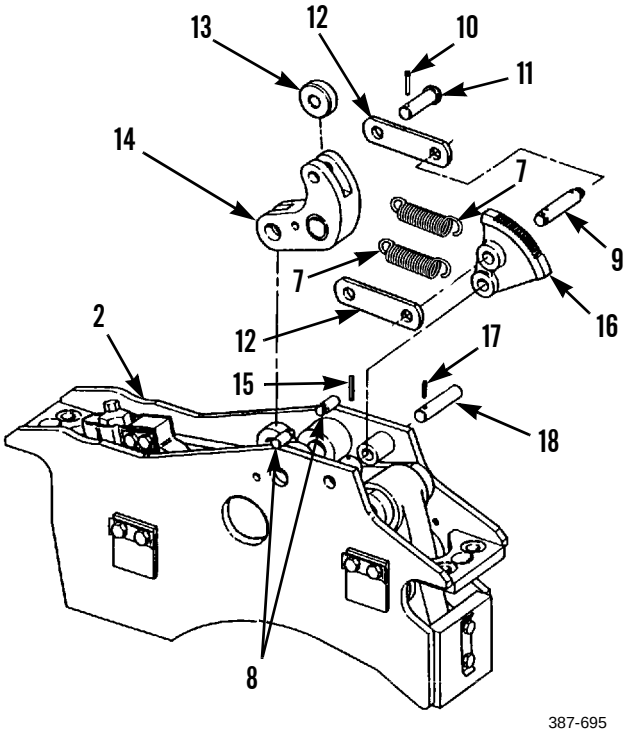


17. Install bearing (28) in bellcrank (14).
18. Install lever (23) in bellcrank (14) with pin (27) and new cotter pin (26).
19. Install bellcrank (14) between two large bosses in actuating mechanism (2) with pin (25) and new spring pin (24).
20. Line up bottom hole in lever (23) with holes in two links (21) and links (22), at large center hole in actuating mechanism (2), and insert pin (20) through four links and lever.
21. Secure pin (20) with retaining ring (19). If removed, install other retaining ring in pin.

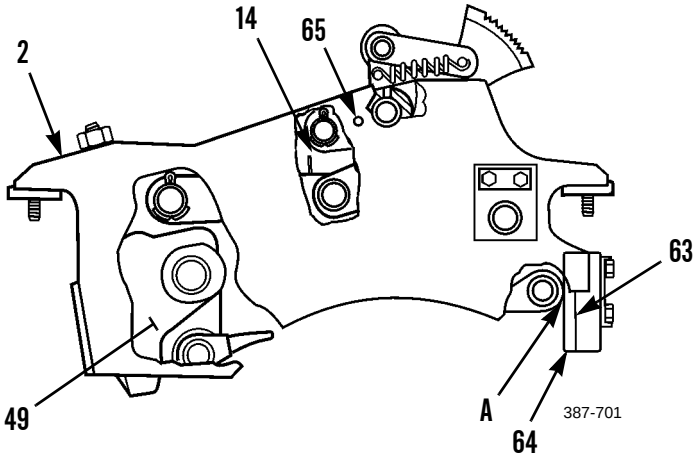


ASSEMBLY - CONTINUED

22. Install ratchet (16) between two small bosses in actuating mechanism (2) with shaft (18) and new spring pin (17).
23. Install pin (9) in ratchet (16) with new spring pin (15).
24. Install two links (12) on pin (9) in ratchet (16).
25. Install other end of two links (12) and roller (13) in bellcrank (14) with pin (11) and new cotter pin (10).
26. Install two springs (7) on both sides of pin (9) and on welded pins (8) on actuating mechanism (2).



27. Adjust actuating mechanism (2) as follows:
    a. Install one 3/8 in. (9.53 mm) rod (65) through holes in actuating mechanism (2) and bellcrank (14).
    b. Hold lever (49) against back plate of actuating mechanism (2).
    c. Separate struts (3) in order to remove slack in linkage.
    d. Measure distance A between strut (3) and plate (64) with a feeler gage. Correct distance is 0.010 +/- 0.005 in. (0.25 +/- 0.13 mm).
    e. Add or remove shims (63) as needed to adjust distance A.\



INSTALLATION

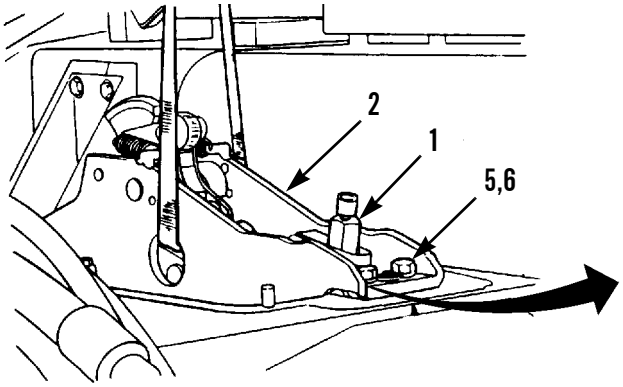
WARNING

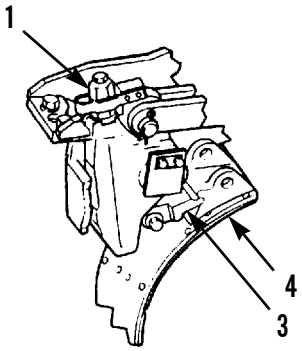
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Steering brake actuating mechanism weighs 100 lb (45 kg).

1. Attach a nylon sling and suitable lifting device to actuating mechanism (2) and lift actuating mechanism into position in gear case.
2. Adjust socket (1) to allow struts (3) to engage brake band (4).
3. Install four new lockwashers (6) and bolts (5) to secure actuating mechanism (2).
4. Install steering brake hydraulic control assembly (WP 0151 00).
5. Test drive and check for proper operation (TM 5-2410-237-10).





387-694-1

END OF WORK PACKAGE

STEERING BRAKE HYDRAULIC CONTROL ASSEMBLY MAINTENANCE 0151 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning, Inspection, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Took kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Link, lifting (Item 50, WP 0250 00)

Lifting equipment, 100 lb capacity

Bolt, 1/2-13 x 1-1/2 in.

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Cleaning compound, solvent (Item 4, WP 0249 00)

Compound, gasket forming, silicone (Item 7, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Gasket (23 and 101)

Lockwasher (2, 5, 21, 68 and 69)

Materials/Parts - Continued

O-ring (39 and 60)

Pin, cotter (9, 16, 73 and 87)

Plug (71 and 94)

Screw, forcing, 1/2 in. -13 NC x 4 in. long (51)

Seal (95 and 97)

References

TM 5-2410-237-10

WP 0107 00

WP 0241 00

Personnel Required

Two

Equipment Condition

Fuel tank removed (WP 0052 00)

Seat and seat base assembly removed (WP 0172 00)

Floor plates removed (WP 0171 00)

ROPS removed (WP 0164 00)

Brake lock lever removed (WP 0149 00)

Hydraulic tank mounting brackets removed (WP 0156 00)

REMOVAL

CAUTION

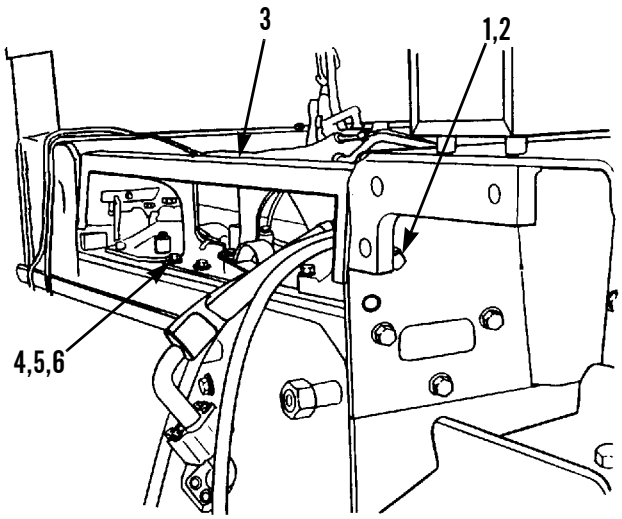
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil lines and plug openings after removing lines. Contamination of steering brake system could result in premature failure.

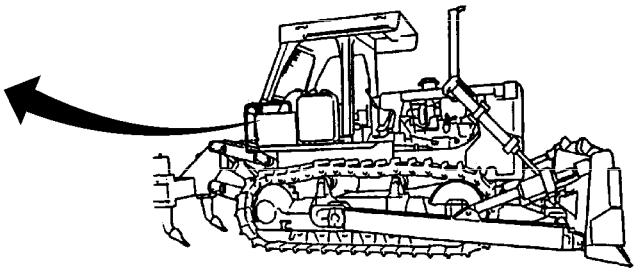
NOTE

- **This procedure is to be used for either R.H. or L.H. steering brake hydraulic control assembly.**
- **Tag hydraulic lines, fuel lines and other components as needed to ensure correct installation.**

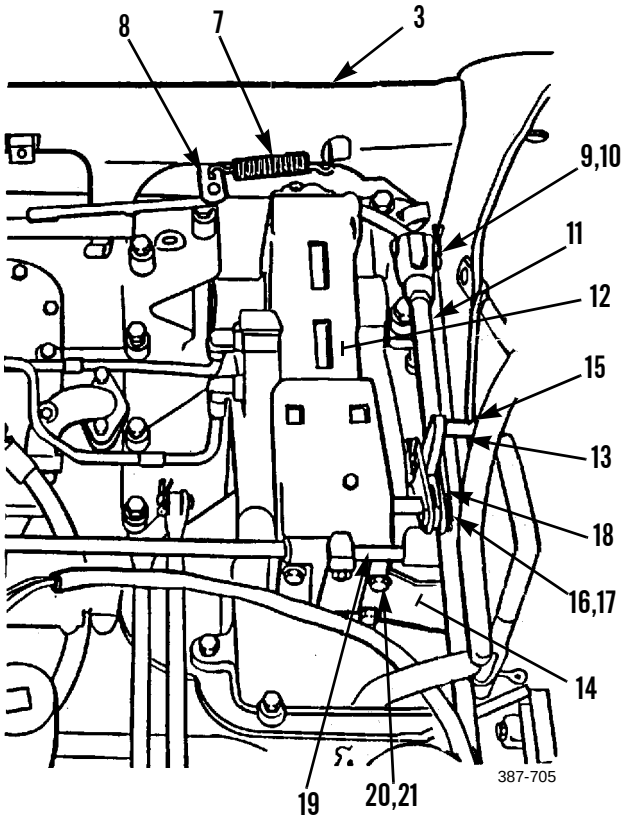
REMOVAL - CONTINUED

1. Remove three capscrews (1) and lockwashers (2) from one end of fender brace (3). Discard lockwashers.
2. Repeat step 1 for other end of fender brace (3).
3. Remove three capscrews (4), lockwashers (5) and washers (6) from center of fender brace (3). Discard lockwashers.



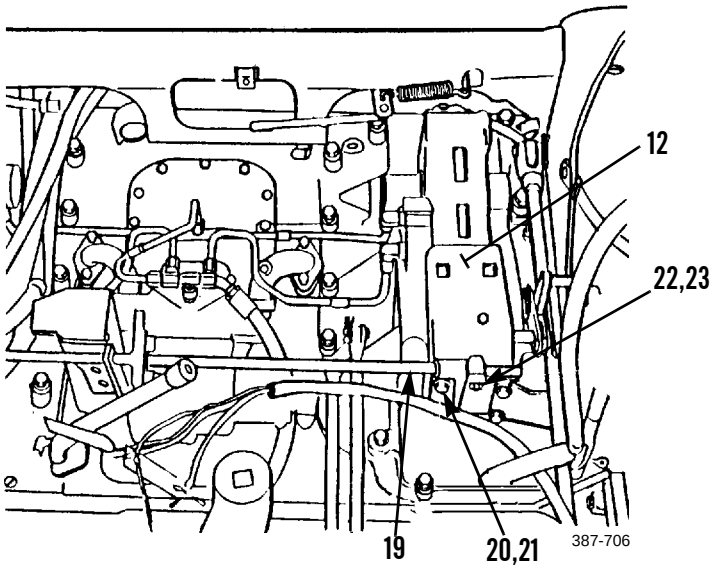


4. Remove spring (7) from fender brace (3) and fuel shut-off lever (8).
5. Tap fender brace (3) on underside to break it loose and remove fender brace.
6. Remove cotter pin (9), pin (10) and end of brake control rod (11) from lever on hydraulic control (12). Discard cotter pin.
7. Repeat step 6 at other end of brake control rod (11) and remove rod.
8. Remove spring (13) from bracket (14) and lever (15).
9. Remove cotter pin (16), pin (17) and two links (18) from lever on end of shaft assembly (19). Discard cotter pin.
10. Repeat steps 8 and 9 on other end of shaft assembly (19).
11. Remove two capscrews (20), lockwashers (21) and bracket (14) from front of hydraulic control (12). Discard lockwashers.



REMOVAL - CONTINUED

12. Remove other two capscrews (20), lockwashers (21) and bracket of shaft assembly (19) from front of hydraulic control (12). Discard lockwashers.
13. Repeat step 12 at other end of shaft assembly (19) and remove shaft assembly.
14. Remove cover (22) and gasket (23) from hydraulic control (12). Discard gasket.

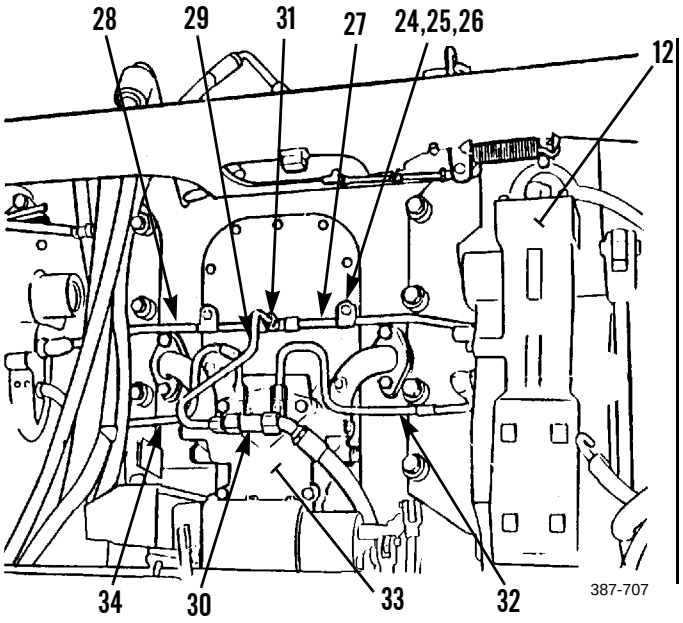


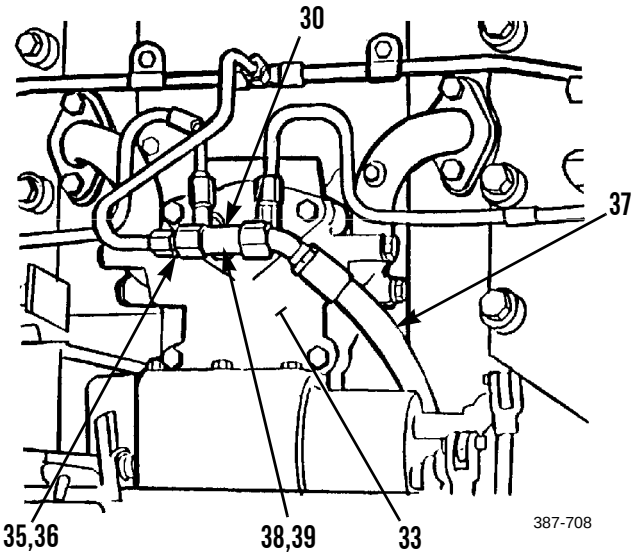
REMOVAL - CONTINUED

NOTE

On tractors equipped with ripper, move ripper hydraulic lines away from brake fluid lines connecting two brake control housings.

15. Remove two capscrews (24), spacers (25) and clips (26) holding tube assemblies (27 and 28) on frame.
16. Disconnect and remove tube assembly (29) from tees (30 and 31).
17. Disconnect and remove tube assembly (27) between hydraulic control (12) and tee (31).
18. Repeat step 17 for tube assembly (28) from other hydraulic control and tee (31).
19. Disconnect and remove tube assembly (32) between hydraulic control (12) and elbow on top of steering clutch control valve (33).
20. Repeat step 19 for tube assembly (34) from other hydraulic control to steering clutch control valve (33).
21. Remove nut (35) and adapter (36) from one side of tee (30) on steering clutch control valve (33).
22. Remove hose assembly (37) from other side of tee (30).
23. Remove tee (30) and adapter (38) from top of steering clutch control valve (33).
24. Remove O-ring (39) from adapter (38). Discard O-ring.





REMOVAL - CONTINUED

WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

NOTE

- **If R.H. hydraulic control is being removed, fuel lines must first be removed at side of housing. Perform steps 25 through 27.**
- **If L.H. hydraulic control is being removed, proceed to step 29.**

25. Remove capscrew (40), washer (41), clip (42) and two tube assemblies (43 and 44) from right side of hydraulic control (12).

26. Disconnect tube assembly (43) from smaller fuel line below hydraulic tank.

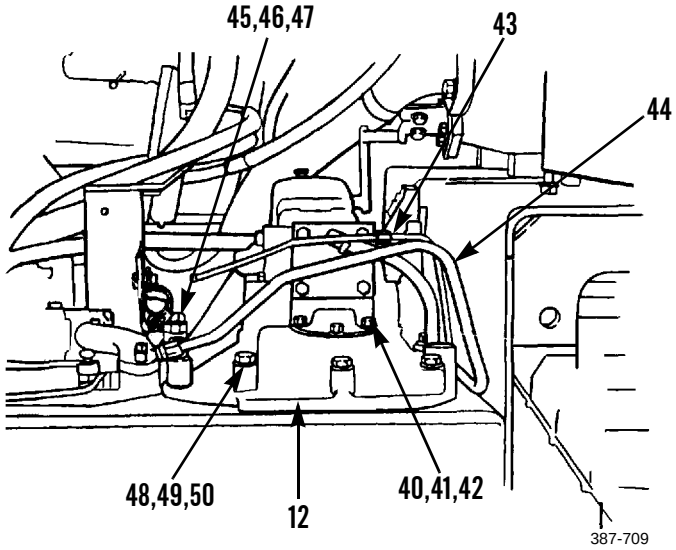
27. Disconnect tube assembly (44) from larger fuel line below hydraulic tank.

NOTE

If tractor has ripper attachment and R.H. hydraulic control is being removed, perform step 28 to remove hydraulic hose to ripper from clamp at left side of R.H. hydraulic control and move all hoses away from hydraulic control.

28. Remove capscrew (45), washer (46) and clamp (47) from ripper hydraulic hose.

29. Remove 16 capscrews (48), washers (49) and two spacers (50) from edge of hydraulic control (12).



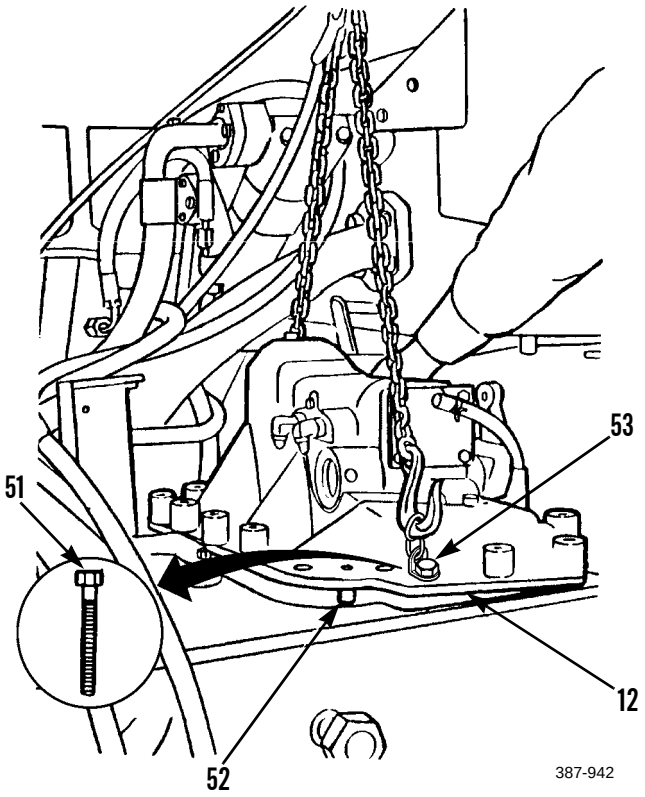
REMOVAL - CONTINUED

30. Install two (1/2 -13NC x 4 in. long) forcing screws (51), one at each end of hydraulic control (12).
31. Turn forcing screws (51) evenly until hydraulic control (12) is raised off locating pins (52) on top of gear case.
32. Remove two forcing screws (51) and install two lifting links (53) with 1/2-13 x 1-1/2 in. bolts, one at each end of hydraulic control (12).

WARNING

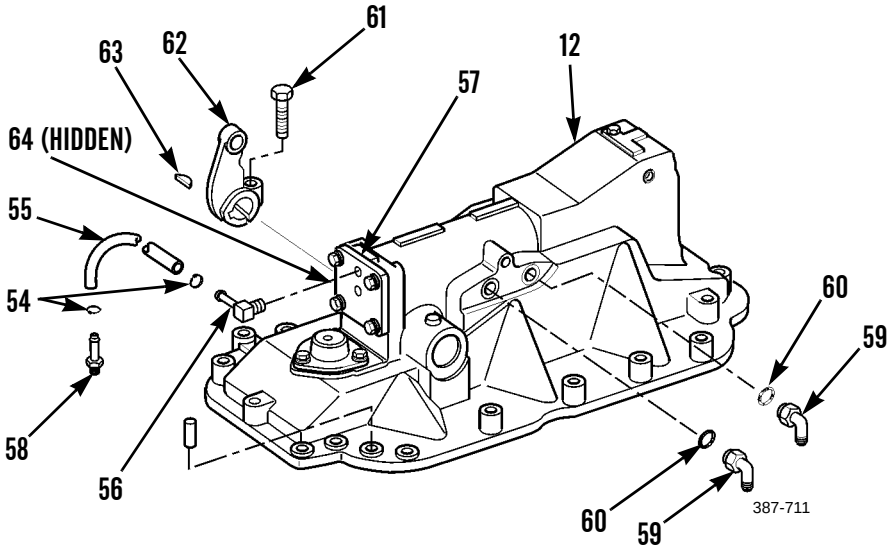
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

33. Attach a suitable lifting device to lifting links (53) and remove hydraulic control (12) from tractor.
34. Position hydraulic control (12) on work surface and remove lifting links (53).



DISASSEMBLY

1. Remove two hose clamps (54) and hose (55) from elbow (56) at cover (57), on end of hydraulic control (12).
2. Remove elbow (56) from cover (57). Remove hose fitting (58) from hydraulic control (12).
3. Remove two elbows (59) and O-rings (60) from side of hydraulic control (12). Discard O-rings.
4. Remove capscrew (61) from lever (62) at side of hydraulic control (12).
5. Remove lever (62) and key (63) from shaft (64). Inspect key for damage. If damaged, discard key.
6. Turn hydraulic control (12) upside down.

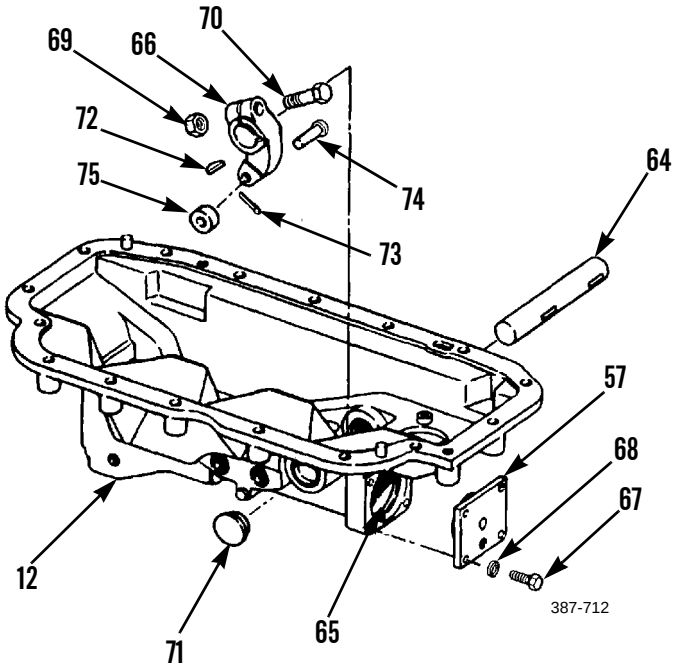


DISASSEMBLY - CONTINUED

WARNING

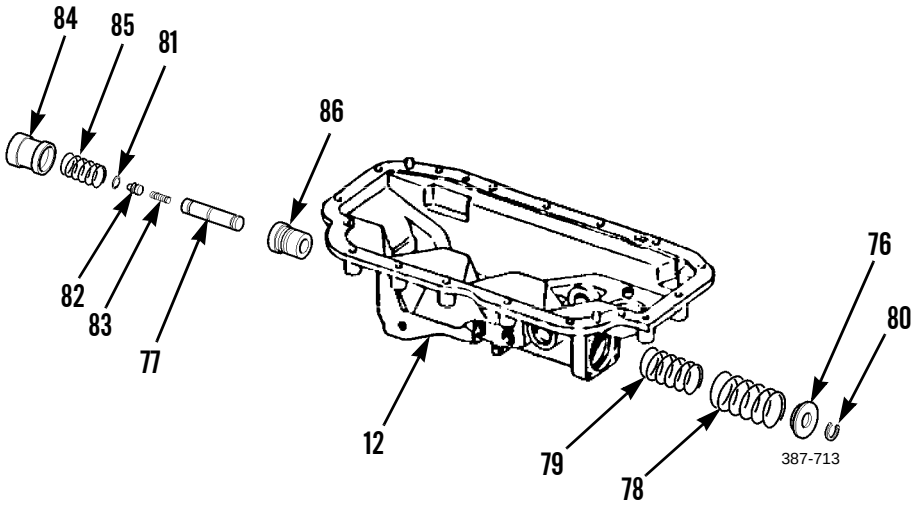
- **Plunger assembly (65), lever (66) and cover (57) are under spring pressure. Use caution when removing these parts to prevent personal injury or damaged or lost parts.**
- **To prevent injury or lost parts, remove cover (57) and install it backwards with two capscrews and leave in place until ready to remove plunger assembly (65).**

7. Use a large screwdriver to compress plunger assembly (65) and place capscrew between plunger assembly and mounting lip of cover (57) inside hydraulic control (12), to keep pressure off lever (66).
8. Remove four capscrews (67), lockwashers (68) and cover (57) from end of hydraulic control (12). Use two capscrews (67) to reinstall cover backwards over opening to prevent plunger assembly (65) from flying out. Discard lockwashers.
9. Remove nut (69) and capscrew (70) from lever (66).
10. Loosen lever (66) on shaft (64).
11. Drive shaft (64) far enough to remove plug (71) and to expose key (72). Remove key. Discard plug.
12. Drive shaft (64) out of hydraulic control (12) and remove lever (66).
13. Remove cotter pin (73), pin (74) and roller (75) from lever (66). Discard cotter pin.
14. Hold cover (57) to prevent plunger assembly (65) from flying out. Slowly remove two capscrews (67) and cover.
15. Use a large screwdriver to apply pressure on plunger assembly (65). While applying pressure, remove capscrew jamming plunger assembly. Slowly release plunger assembly until all spring pressure is relieved.

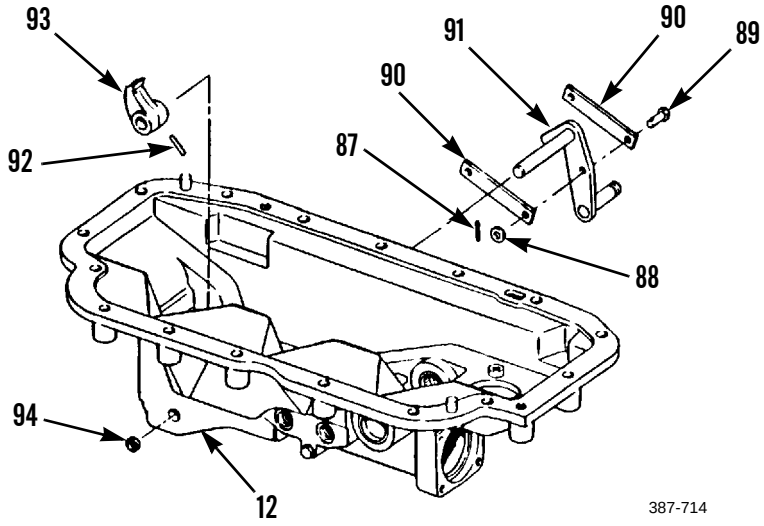


DISASSEMBLY - CONTINUED

16. Remove retainer (76), plunger (77), outer spring (78) and inner spring (79) through end of hydraulic control (12).
17. Remove retaining ring (80) from plunger (77).
18. Remove retaining ring (81), valve (82) and valve spring (83) from other end of plunger (77).
19. Remove piston (84) and spring (85) from hydraulic control (12).
20. Remove sleeve (86) from hydraulic control (12).

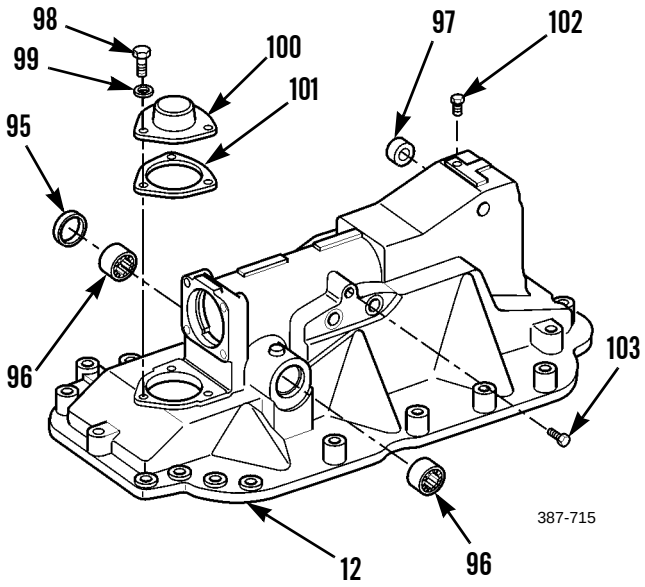


21. Remove cotter pin (87), washer (88), pin (89) and two links (90) from parking brake lever assembly (91). Discard cotter pin.
22. Remove pin (92) from pawl (93) and shaft of parking brake lever assembly (91).
23. Tap shaft of parking brake lever assembly (91) to knock plug (94) out hydraulic control (12). Remove parking brake lever assembly and pawl (93). Discard plug.



DISASSEMBLY - CONTINUED

24. Remove seal (95) and two bearings (96) from shaft mounting holes in hydraulic control (12). Discard seal.
25. Turn hydraulic control (12) to open side down.
26. Remove seal (97) from parking brake lever assembly hole in hydraulic control (12). Discard seal.
27. Remove three capscrews (98), lockwashers (99), cover (100) and gasket (101) from end of hydraulic control (12). Discard lockwashers and gasket.
28. Remove plug (102) from top of hydraulic control (12).
29. Remove plug (103) from side of hydraulic control (12).



CLEANING

- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.**

1. Clean all removed components with solvent cleaning compound.
2. Thoroughly dry components with compressed air or clean rags.
3. Remove all old gasket material from mounting flange of hydraulic control and mounting surface on top of gear case.

INSPECTION

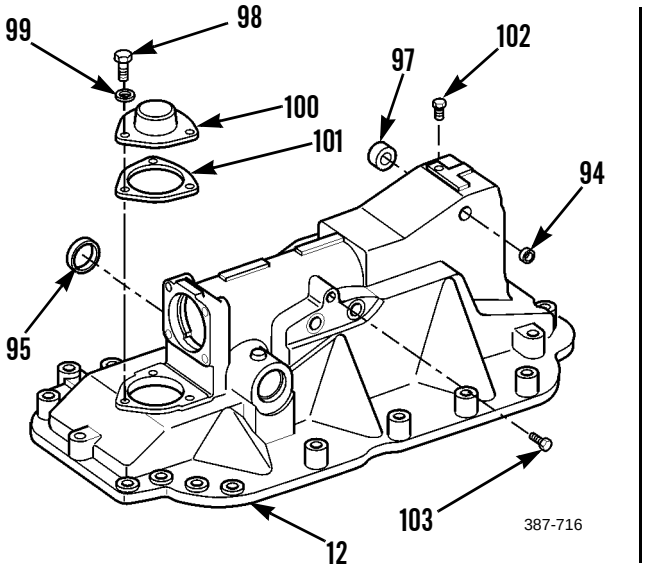
1. Inspect all removed components IAW (WP 0241 00).
2. Replace any component found to be damaged.

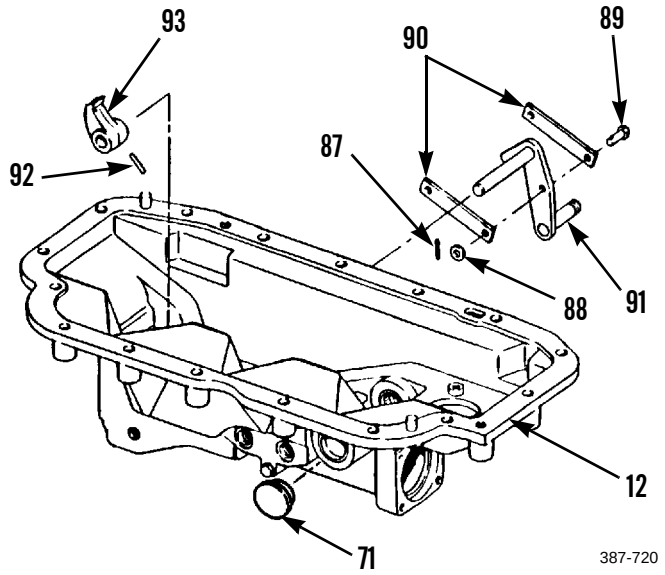
ASSEMBLY

CAUTION

Care should be taken not to contaminate steering brake system during assembly of hydraulic control. Dirt and foreign substances should be removed from surrounding area.

1. Install plug (103) on side of hydraulic control (12).
2. Install plug (102) in top of hydraulic control (12).
3. Wipe gasket surface on cover (100) and hydraulic control (12) clean. Install new gasket (101) and cover on hydraulic control with three new lockwashers (99) and capscrews (98).
4. Apply a light film of clean lubricating oil to lip of new seal (97). Insert seal, lip first, into hole for parking brake lever shaft. Ensure seal in fully seated in hole.
5. Install new plug (94) in lever shaft hole on opposite side of hydraulic control (12).
6. Repeat steps 4 and 5 to install new seal (95) and new plug (71) for large shaft holes in hydraulic control (12).
7. Turn hydraulic control (12) to open side up.





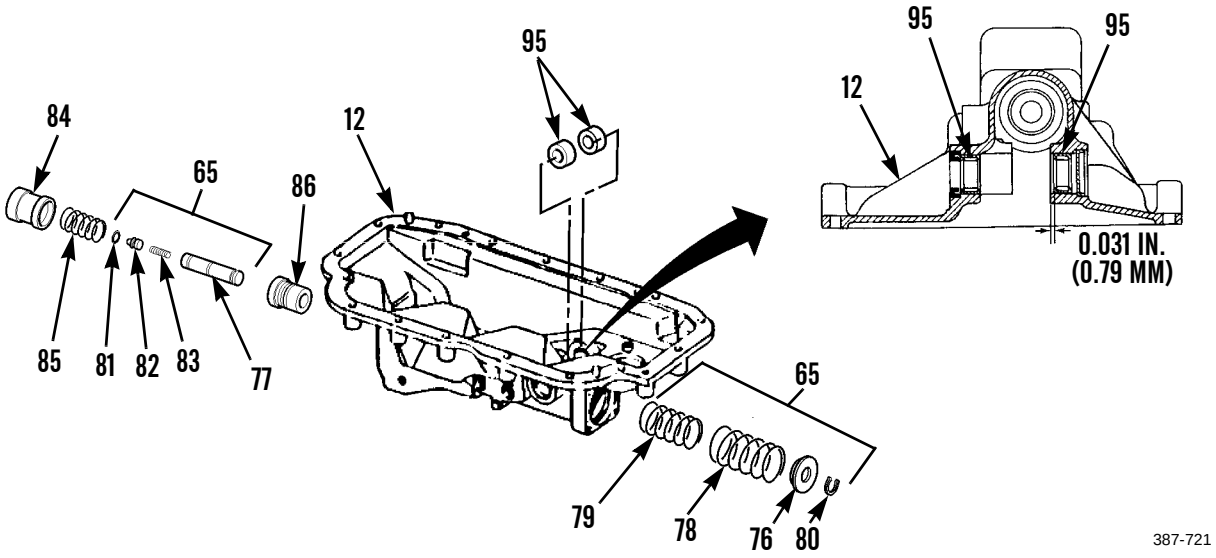
8. Insert shaft of parking brake lever assembly (91) through seal (97) in hydraulic control (12) and through pawl (93) into hole in opposite side of hydraulic control.
9. Line up hole in pawl (93) with hole in parking brake lever assembly (91) and install pin (92).
10. Install two links (90) to parking brake lever assembly (91) with pin (89), washer (88) and new cotter pin (87).

ASSEMBLY - CONTINUED

NOTE

Install two shaft bearings with identification lettering facing center of hydraulic control, so that lettering can be seen after installation.

11. Install two bearings (95) in brake control shaft hole on inside of hydraulic control (12). Lettered edge of bearings must be installed until they are 0.031 in. (0.79 mm) below edge of hole in hydraulic control.
12. Install sleeve (86) in counterbore inside hydraulic control (12). Sleeve must bottom in counterbore.
13. Insert spring (85) in piston (84) and install piston in counterbore and make contact with sleeve (86).
14. Install valve spring (83) and valve (82) in plunger (77) and secure with retaining ring (81).
15. Install retainer (76) on other end of plunger (77) and secure with retaining ring (80).
16. Install inner spring (79) and outer spring (78) over plunger (77) and seat on retainer (76).
17. Install plunger assembly (65) with plunger (77) through sleeve (86), and inner spring (79) and outer spring (78) over sleeve (86).
18. Use a large screwdriver to apply pressure to retainer (76) to compress springs. Insert a capscrew between retainer and inside of hydraulic control (12).



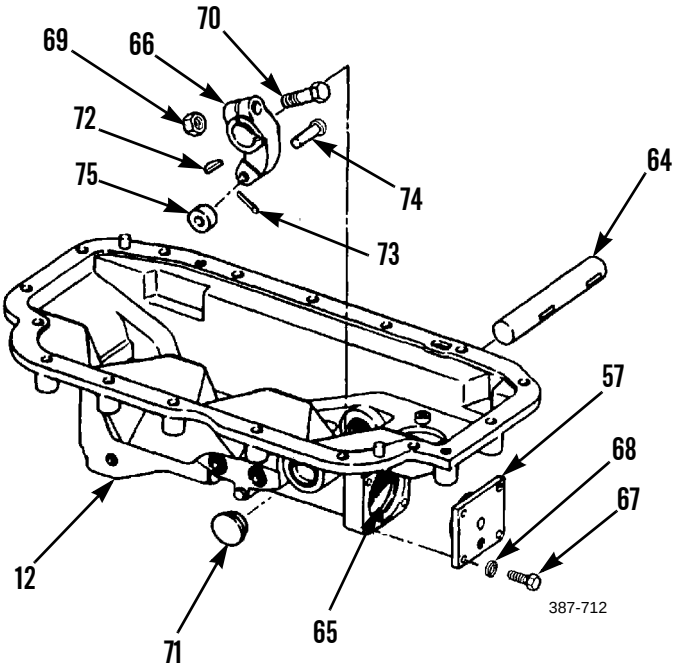
WARNING

Do not disturb capscrew holding plunger assembly until lever (66) and cover (57) assemblies are in place. Spring pressure behind plunger assembly could cause injury or lost parts.

19. Install roller (75) in lever (66) with pin (74) and new cotter pin (73).
20. Force lever (66) open for assembly.
21. Insert shaft (64) through seal (94), bearing (95), one side of hydraulic control (12), lever (66) and into other side of hydraulic control.
22. Insert key (72) in shaft (64). Align key with slot in lever (66) and slide lever onto key as far as possible.
23. Drive shaft (64) to center lever (66) on key (72) and center shaft in hydraulic control (12). Remove tool from lever.

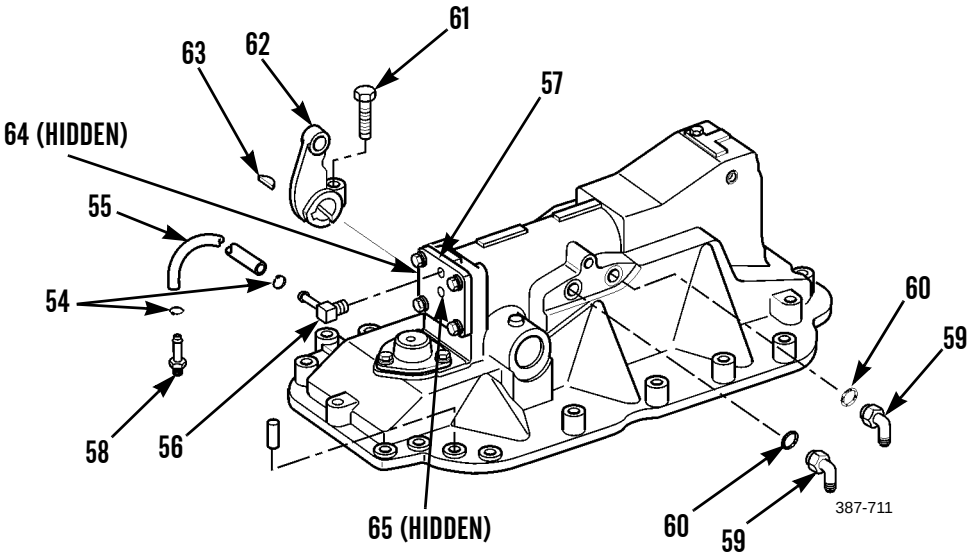
ASSEMBLY - CONTINUED

24. Secure lever (66) to shaft (64) inside hydraulic control (12) with capscrew (70) and nut (69).
25. Turn hydraulic control (12) over to open side down.
26. Stake plug (71) at shaft (64) in three places.
27. Install cover (57) on end of hydraulic control (12) with four new lockwashers (68) and capscrews (67).



ASSEMBLY - CONTINUED

28. Force lever (62) open for assembly.
29. Install key (63) in shaft (64).
30. Align slot in lever (62) with key (63), slide lever on key and shaft (64), centering lever over key. Remove tool from lever.
31. Install capscrew (61) in lever (62).
32. Push on lever (62) to put pressure on springs inside hydraulic control (12) and remove capscrew wedged between plunger assembly (65) and housing. Slowly release pressure on lever until plunger assembly bottoms on roller (75) and cover (57).
33. Apply a light film of clean lubricating oil to two new O-rings (60) and install O-rings on elbows (59).
34. Install two elbows (59) in side of hydraulic control (12).
35. Install hose fitting (58) in hydraulic control (12) and elbow (56) in cover (57).
36. Install hose (55) on elbow (56) and hose fitting (58) and secure with two hose clamps (54).



INSTALLATION

CAUTION

Care should be taken not to contaminate steering brake system during installation of hydraulic lines. Dirt and foreign substances should be removed from surrounding area before lines are installed.

NOTE

This procedure is to be used for either R.H. or L.H. steering brake hydraulic control assembly.

1. Install two lifting links (53) with 1/2-13 x 1-1/2 in. bolts, one at each end of hydraulic control (12).

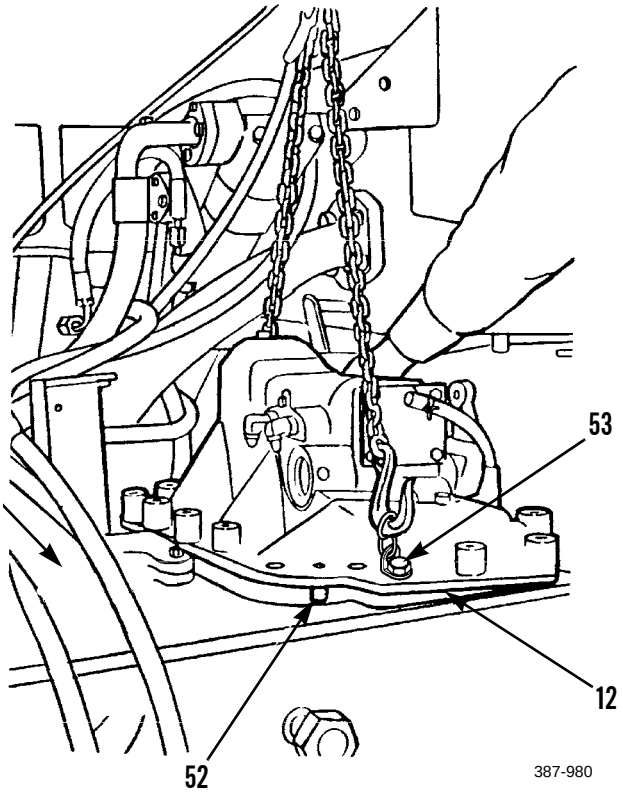
INSTALLATION - CONTINUED

2. Ensure mounting flange of hydraulic control (12) and mounting surface on top of gear case at back of tractor are clean and dry.
3. Apply gasket forming compound on mounting flange of hydraulic control (12) and on tractor mounting surface.

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

4. Attach a suitable lifting device to lifting links (53) and position hydraulic control (12) on two locating pins (52) on top of gear case. Remove lifting links (53).



INSTALLATION - CONTINUED

5. Install 16 capscrews (48), washers (49) and two spacers (50) around edge of hydraulic control (12). Tighten capscrews to 100 lb-ft (136 Nm).

NOTE

If tractor has ripper attachment and R.H. hydraulic control is being installed, perform step 6 to install clamp with hydraulic hose at left side of R.H. hydraulic control.

6. Secure ripper hydraulic hose with clamp (47), washer (46) and capscrew (45).

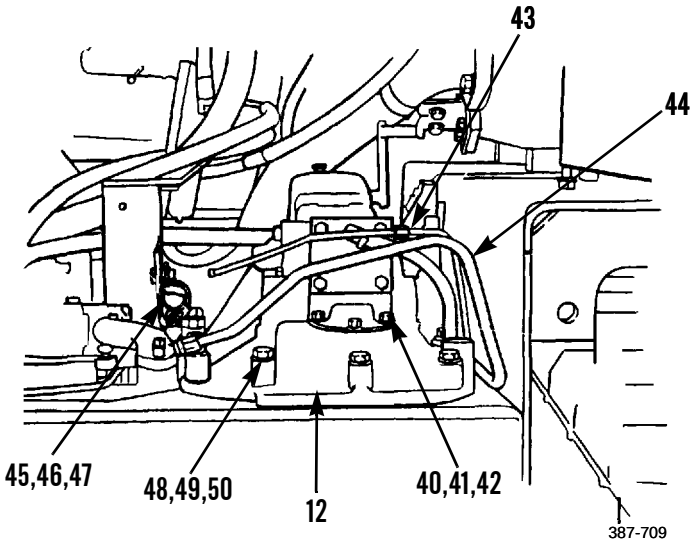
WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

NOTE

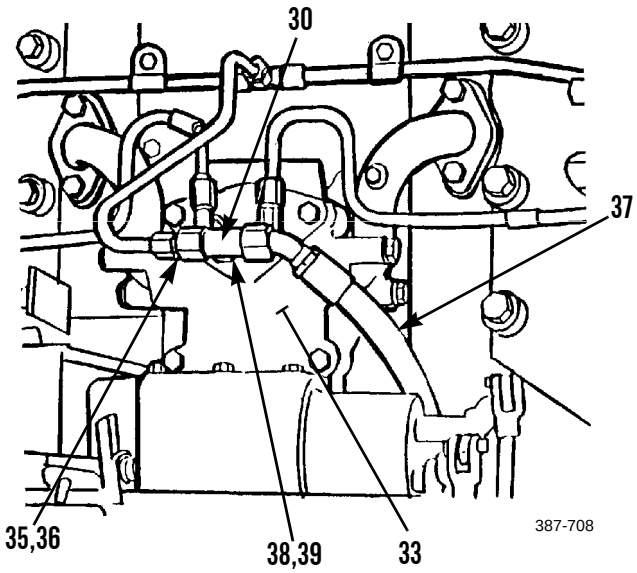
- **If R.H. hydraulic control is being installed, perform steps 7 through 9 to install fuel lines.**
- **If L.H. hydraulic control is being installed, proceed to step 10.**

7. Connect tube assembly (44) to larger fuel line below hydraulic tank.
8. Connect tube assembly (43) to smaller fuel line below hydraulic tank.
9. Secure two fuel lines (43 and 44) to right side of hydraulic control (12) with clip (42), washer (41) and capscrew (40).

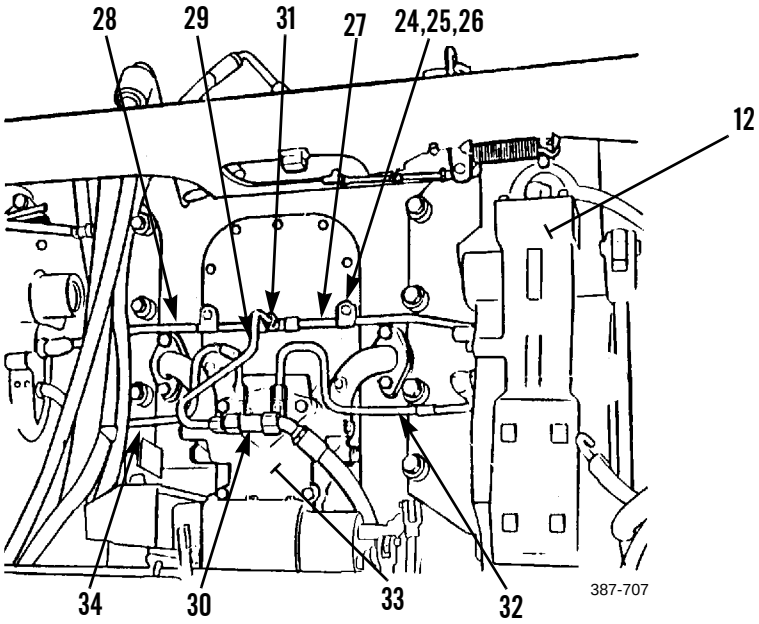


INSTALLATION - CONTINUED

10. Apply a light film of clean lubricating oil to new O-ring (39) and install O-ring on adapter (38).
11. Install adapter (38) and tee (30) in top of steering clutch control valve (33).
12. Install hose assembly (37) on one side of tee (30).
13. Install adapter (36) and nut (35) on other side of tee (30).

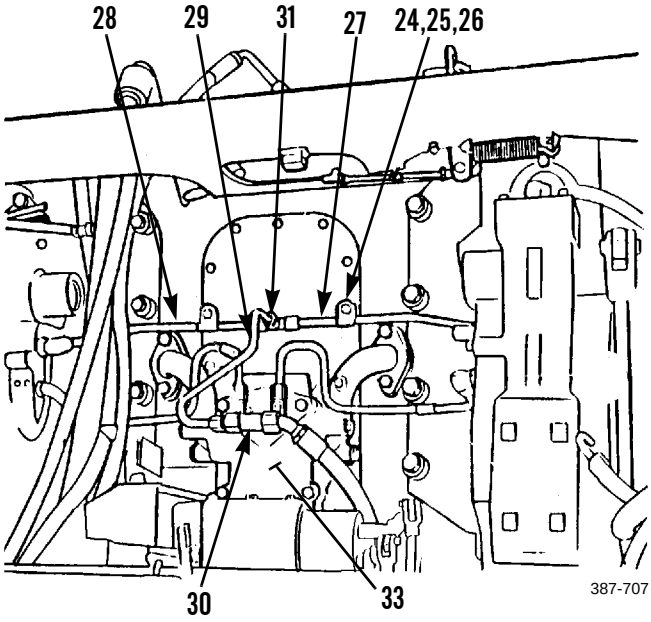


14. Install tube assembly (32) between hydraulic control (12) and elbow on top of steering clutch control valve (33).
15. Repeat step 14 for tube assembly (34) to other hydraulic control.
16. Install one end of tube assembly (27) on tee (31).
17. Repeat step 16 to install one end of tube assembly (28) on tee (31).
18. Position tube assemblies (27 and 28) and tee (31) to hydraulic control (12) and install end of tube assembly (27) on hydraulic control.
19. Repeat step 18 to install end of tube assembly (28) on other hydraulic control.

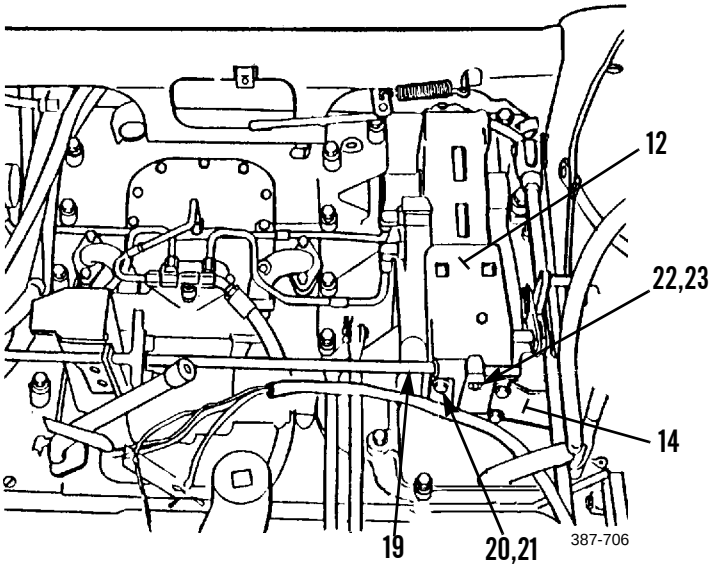


INSTALLATION - CONTINUED

20. Install tube assembly (29) between lower tee (31) and upper tee (30) on steering clutch control valve (33).
21. Secure tube assemblies (27 and 28) on frame with two clips (26), spacers (25) and capscrews (24).

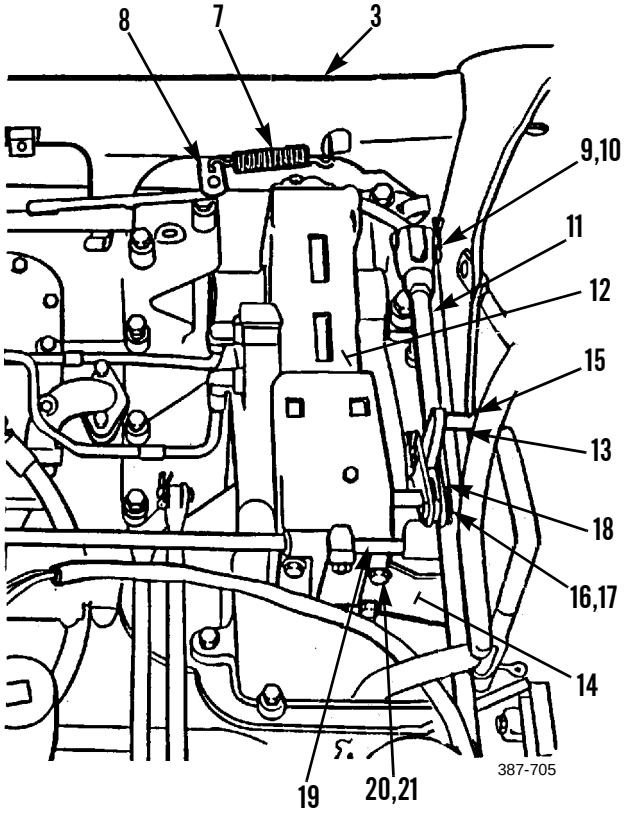


22. Install new gasket (23), cover (22) and bracket (14) to front of hydraulic control (12) with two new lockwashers (21) and capscrews (20). Do not tighten capscrews.
23. Install bracket of shaft assembly (19) on front of hydraulic control (12) over cover (22) with other two new lockwashers (21) and capscrews (20). Do not tighten capscrews.
24. Repeat step 23 for other end of shaft assembly (19).
25. Tighten capscrews (20).

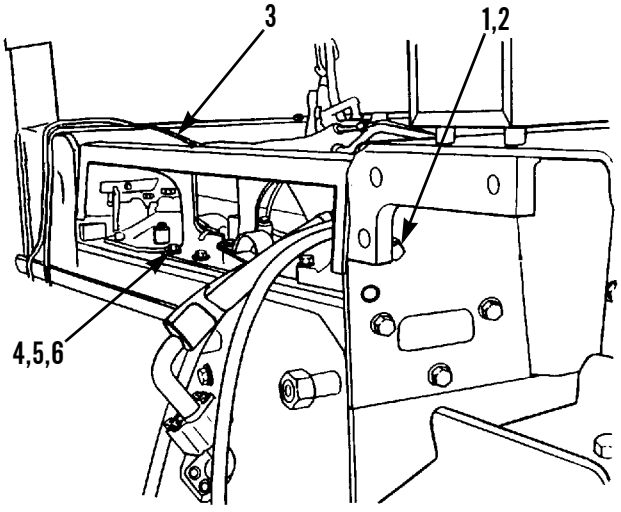


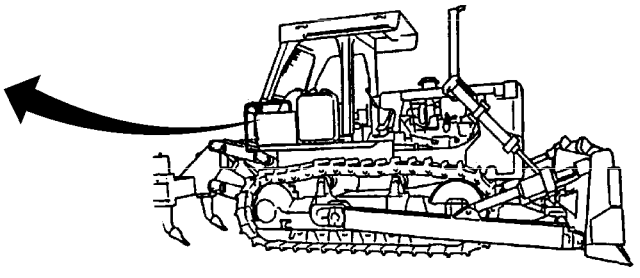
INSTALLATION - CONTINUED

26. Install two links (18) to shaft assembly (19) with pin (17) and new cotter pin (16).
27. Install spring (13) between bracket (14) and lever (15) on shaft assembly (19).
28. Repeat steps 26 and 27 at other end of shaft assembly (19).
29. Install one end of brake control rod (11) on lever on hydraulic control (12) with pin (10) and new cotter pin (9).
30. Repeat step 29 at other end of brake control rod (11).



31. Position fender brace (3) between fenders.
32. Secure center of fender brace (3) to frame with three washers (6), new lockwashers (5) and capscrews (4).
33. Secure one end of fender brace (3) to fender with three new lockwashers (2) and capscrews (1).
34. Repeat step 33 at other end of fender brace (2).
35. Install spring (7) on fender brace (3) and fuel shut-off lever (8).





INSTALLATION - CONTINUED

36. Install brake lock lever (WP 0149 00).
37. Install seat and seat base assembly (WP 0172 00).
38. Install floor plates (WP 0171 00).
39. Install fuel tank (WP 0052 00).
40. Install ROPS (WP 0164 00).
41. Install hydraulic tank mounting brackets (WP 0156 00).
42. Check level of oil in transmission and add as necessary (WP 0107 00).
43. Test drive and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

STEERING CLUTCH ASSEMBLY MAINTENANCE 0152 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Lifting equipment, 200 lb capacity

Link, lifting (Item 50, WP 0250 00)

Plate, assembly (Item 68, WP 0250 00)

Plate, compressor, steering (Item 69, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Stand, steering clutch (Item 116, WP 0250 00)

Bolt, 1/2-13 x 1-1/2 in.

Capscrew, 3/8 in. - 16NC x 4 in.

Nut, hex, 3/8 in. -16NC

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Capscrew, 5/8 in. x 8 in.

References

TM 5-2410-237-10

WP 0145 00

WP 0152 00

Personnel Required

Two

Equipment Condition

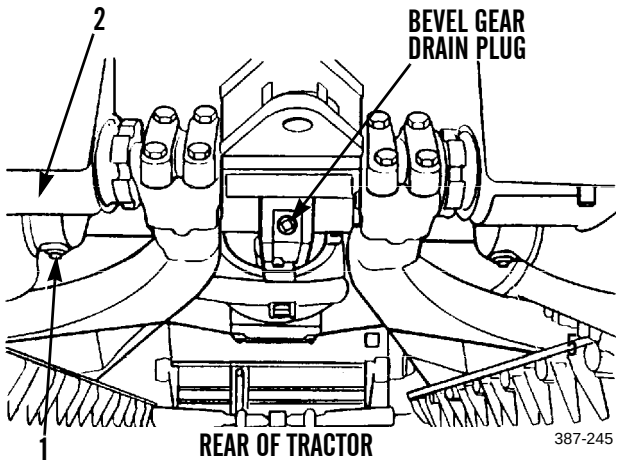
Steering brake actuating mechanism removed (WP 0150 00)

REMOVAL

NOTE

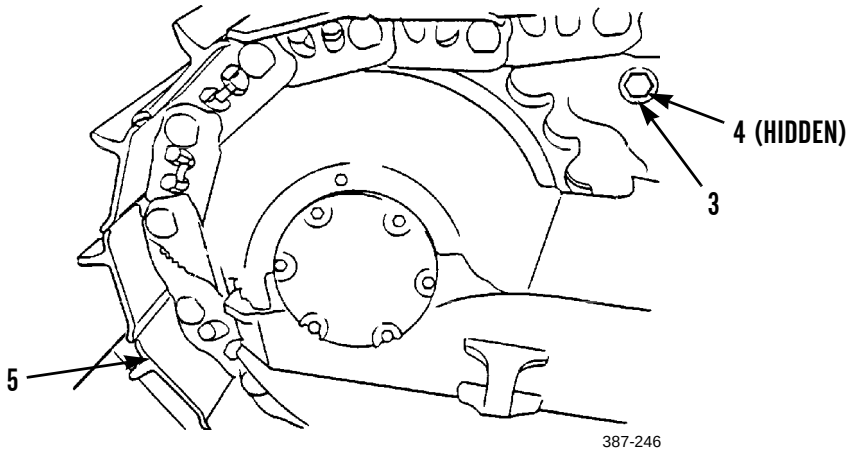
Use a suitable container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

1. Remove drain plug (1) at bottom of steering clutch case (2) and at bevel gear.



REMOVAL - CONTINUED

2. Remove plug (3) at side of steering clutch case to gain access to capscrews (4).
3. Position jack under tooth of track shoe (5).
4. Align capscrews (4) with hole at plug (3).



5. Remove hose assembly (6) from oil line (7) in clutch case.
6. Remove two nuts (8), washers (9) and hose assembly (6) from brake band (10).

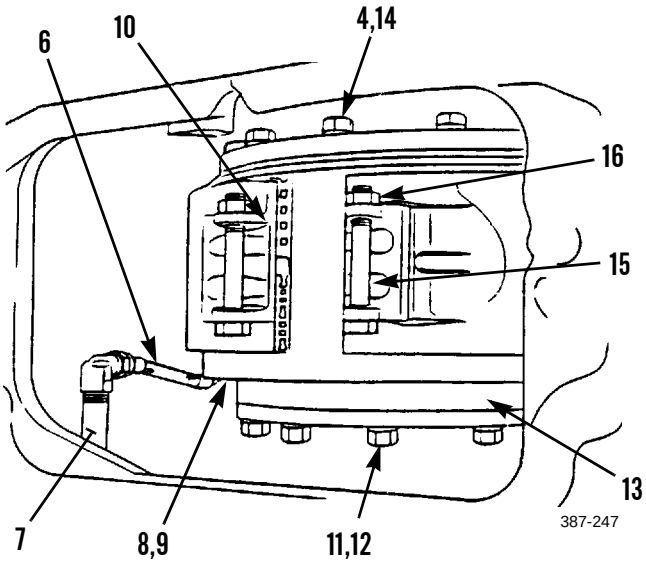
WARNING

Do not remove all capscrews. Leave one capscrew on each side of clutch. If clutch drops before sling is attached, personal injury and equipment damage will result.

NOTE

Steering clutch must be turned to line up capscrews (4) with plug (3) hole by using a jack to push on grouser of track shoe (5).

7. Remove eleven capscrews (11) and washers (12) from hub on one side of steering clutch (13).
8. Remove eight capscrews (4) and washers (14) on flange side of steering clutch (13) through plug (3) hole in side of gear case.
9. Install two 3/8 in. -16NC x 4 in. long capscrews (15) through brake band (10) clamp and secure capscrews with two 3/8 in. hex nuts (16).



REMOVAL - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Steering clutch assembly weighs approximately 175 lb (79 kg).

10. Attach a nylon sling and suitable lifting device to capscrews (15) in brake band (10) clamp and raise lifting equipment to take up slack.

NOTE

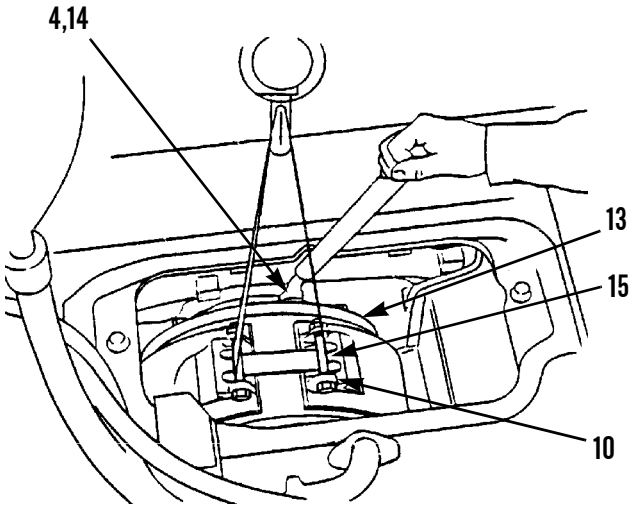
Tractor must be moved, using jack, to position clutch for removal of last capscrew on each side of steering clutch.

11. Remove remaining two capscrews (4) and washers (14) from one side of steering clutch (13) and capscrew (11) and washer (12) from other side.

NOTE

- **Keep steering clutch assembly level while lifting. Clutch is free to slide out of outer drum.**
- **It may be necessary to pry inner drum away from shoulder of the hub.**

12. Lift steering clutch (13) from clutch case.



DISASSEMBLY

WARNING

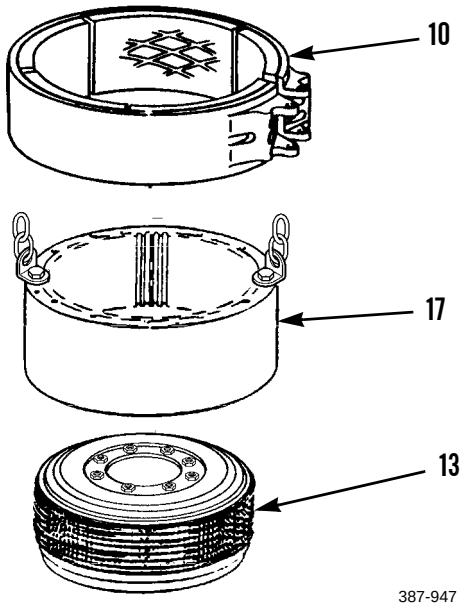
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

1. Use a nylon sling and suitable lifting device to position steering clutch (13) on bench with capscrew side up.
2. Remove lifting equipment and brake band (10) from steering clutch (13).
3. Install two lifting links with 1/2-13 x 1-1/2 in. bolts in outer drum (17) 180° apart.

NOTE

Outer drum weighs 110 lb (50 kg).

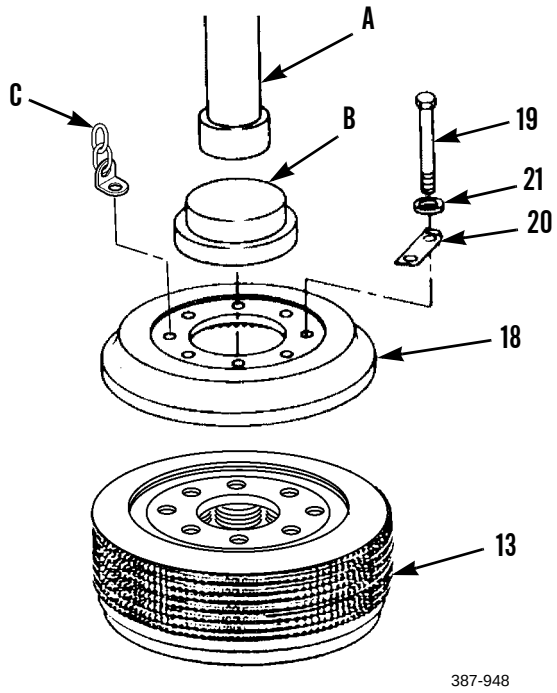
4. Use nylon sling and suitable lifting device to remove outer drum (17) from steering clutch (13).



5. Use lifting equipment to position steering clutch (13) on hydraulic arbor press (A) over round block (B) with capscrew side of clutch facing up.
6. Position round block (B) on top pressure plate (18) inside circle of capscrews (19). Apply pressure to plate (18) with press to take pressure off capscrews (19).
7. Flatten four locks (20).
8. Remove eight capscrews (19), washers (21) and four locks (20).
9. Release pressure on plate (18) and remove round block (B).

DISASSEMBLY - CONTINUED

10. Install two lifting links with 1/2-13 x 1-1/2 in. bolts in pressure plate (18) 180 degrees apart.
11. Use nylon sling and a suitable lifting device to remove pressure plate (18) from steering clutch (13).

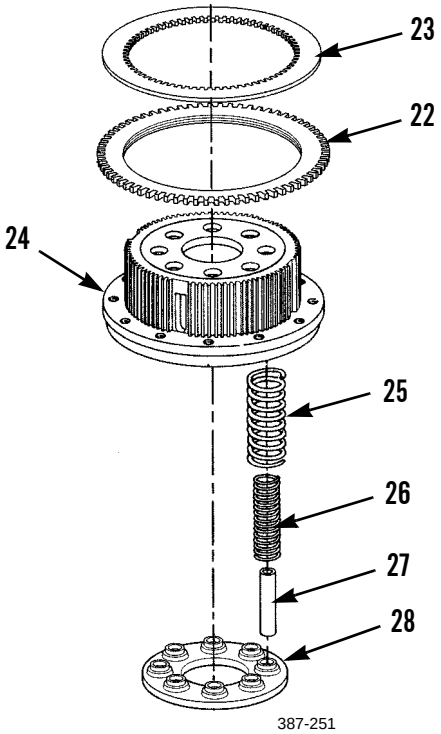


12. Measure height of disc stack. Compare height with dimension of new stack: 2.012-2.222 in. (51.1-56.4 mm). Disc stack height must be a minimum of 1.877 in. (47.7 mm). Replace discs or stack as necessary.

NOTE

Tag discs and disc assemblies for assembly sequencing as they are removed.

13. Remove eight disc assemblies (22) and seven discs (23) from inner hub (24).
14. Remove inner hub (24) from clutch assembly.
15. Remove eight outer springs (25), inner springs (26) and sleeves (27) from retainer (28).
16. Remove retainer (28) from round block.

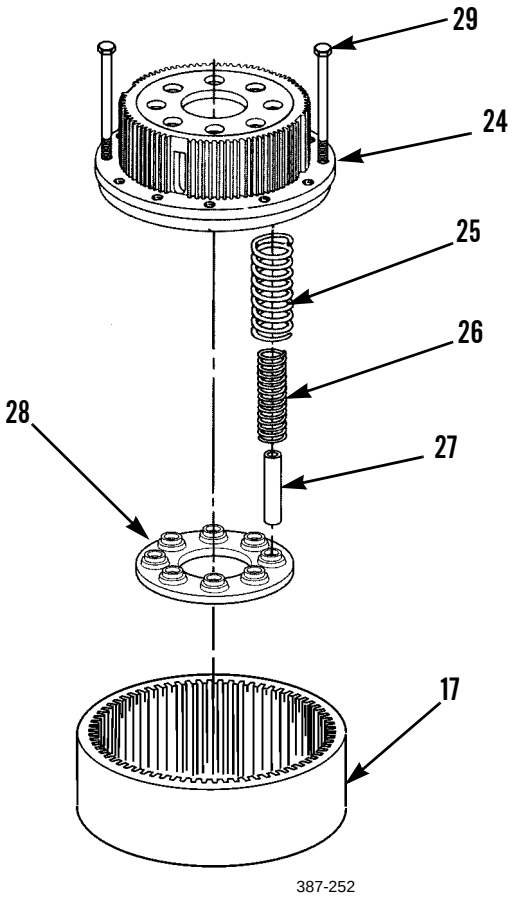


ASSEMBLY

NOTE

Assemble steering clutch on bed of hydraulic arbor press. Compression of stack is required in order to assemble steering clutch. Assemble steering clutch inside of outer drum (17) to ensure correct spline assignment for discs (23) and disc assemblies (22).

1. Position outer drum (17), with threaded bores facing down, on bed of hydraulic press.
2. Center round block inside outer drum (17) and place retainer (28), with boss side up, on block.
3. Install eight sleeves (27) in bosses on retainer (28).
4. Install eight inner springs (26) and outer springs (25) over sleeves (27) and bosses on retainer (28).
5. Install two 8 in. long capscrews (29) in inner hub (24) 180° apart.
6. Use two long capscrews (29) as handles to lift inner hub (24) into position over springs (25 and 26) and retainer (28). Align threaded bores in inner hub with sleeves (27) inside springs. Remove two capscrews.



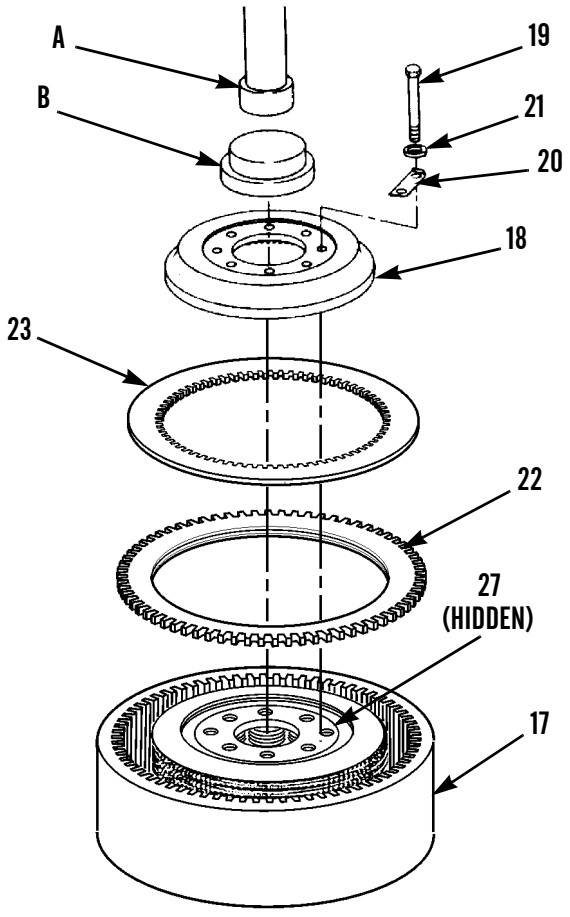
387-252

ASSEMBLY - CONTINUED

NOTE

For better wear distribution, install discs and disc assemblies in reverse order of disassembly. For example, top is now installed on bottom.

7. Install eight disc assemblies (22) on seven discs (23) in alternating sequence, starting with a disc assembly (22). Center disc assemblies in outer drum (17).
8. Install pressure plate (18) on top of stack and align threaded bores with sleeves (27).
9. Position round block (B) on pressure plate (18) inside circle of threaded bores and apply only enough pressure with press (A) to get capscrews started.
10. Apply antiseize compound on threads of eight capscrews (19).
11. Install eight capscrews (19), washers (21) and four locks (20) to secure pressure plate (18) to retainer (28). Tighten capscrews to 150 lb-ft (203 Nm).
12. Release pressure and remove block (B).



ASSEMBLY - CONTINUED

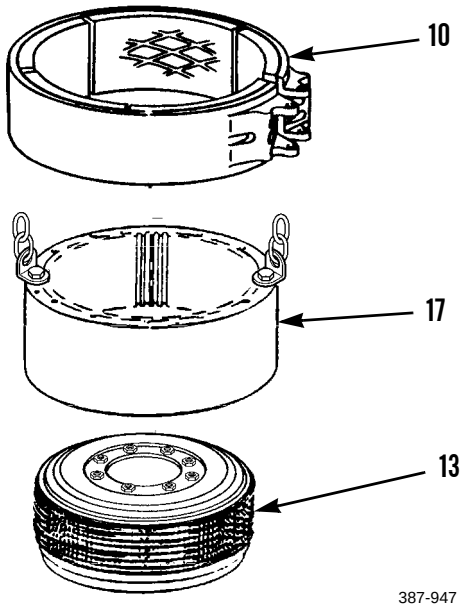
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Steering clutch assembly weighs approximately 175 lb (79 kg).

13. Use a suitable lifting device to lift steering clutch (13) and outer drum (17) off press and position assembly on bench.



14. Use a nylon sling and suitable lifting device to position assembly with threaded bores in outer drum (17) facing up. Install two lifting links with bolts 1/2-13 x 1-1/2 in. bolts in outer drum 180 degrees apart.

NOTE

Outer drum weighs 110 lb (50 kg).

15. Use a suitable lifting device to remove outer drum (17) from steering clutch (13) and set drum aside. Leave lifting links in place.
16. Use a suitable lifting device to turn steering clutch (13) over on bench (capscrew side up).
17. Use a suitable lifting device to install outer drum (17) on steering clutch (13). Remove lifting links.
18. Install brake band (10) on outer drum (17).

INSTALLATION

1. Install two 3/8 in. -16 x 4 in. long capscrews (15) through brake band (10) clamps and secure capscrews with two 3/8 in. -16 hex nuts (16).

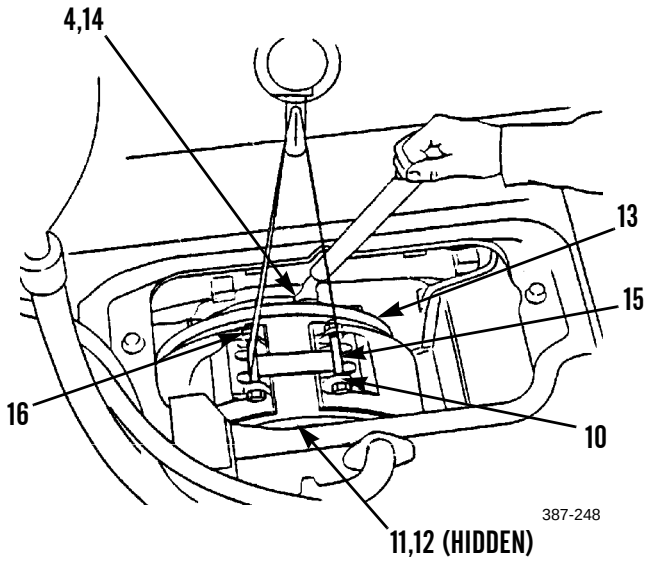
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Steering clutch assembly weighs approximately 175 lb (79 kg).**
- **Ensure steering clutch stays level so that clutch does not come apart.**

2. Attach a nylon sling and suitable lifting device to capscrews (15) and lift steering clutch (13) into clutch case between hub and flange.
3. Put antiseize compound on threads of all capscrews (4 and 11).
4. Install one capscrew (4) and washer (14) on hub side of steering clutch (13). Tighten capscrew to 200 lb-ft (271 Nm).
5. Install one capscrew (11) and washer (12) on flange side of steering clutch (13). Tighten capscrew to 200 lb-ft (271 Nm).



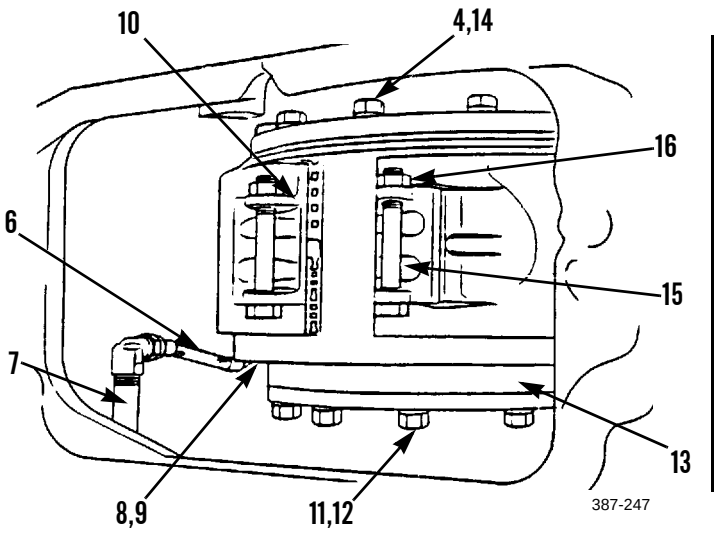
INSTALLATION - CONTINUED

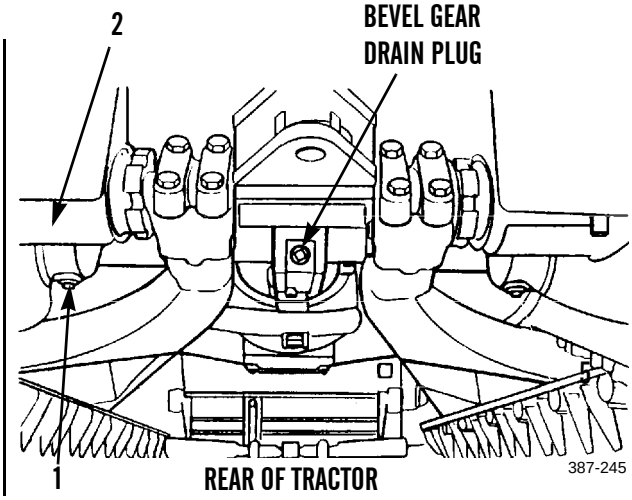
6. Remove lifting device, two nuts (16) and capscrews (15).

NOTE

Tractor must be moved, using jack, to position clutch for installation of remaining capscrews and washers.

7. Install eight capscrews (4) and washers (14) on flange side of steering clutch (13) through plug opening in clutch case.
8. Install eleven capscrews (11) and washers (12) on hub side of steering clutch (13).
9. Install one end of hose assembly (6) on brake band (10) with two washers (9) and nuts (8).
10. Install other end of hose assembly (6) on oil line (7) in clutch case.
11. Install drain plug (1) in bottom of steering clutch case (2) and at bevel gear.
12. Install steering brake actuating mechanism (WP 0150 00).
13. Fill steering clutch case with oil in accordance with expected temperature range (WP 0152 00).
14. Adjust brakes (WP 0145 00).
15. Test drive and check steering for proper operation (TM 5-2410-237-10).





END OF WORK PACKAGE

STEERING BRAKE RELIEF VALVE REPLACEMENT 0153 00

THIS WORK PACKAGE COVERS

Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

References

TM 5-2410-237-10

WP 0241 00

Equipment Condition

L.H. brake hydraulic control assembly removed (WP 0151 00)

REMOVAL

NOTE

This valve is located next to brake actuating mechanism on left side of machine only.

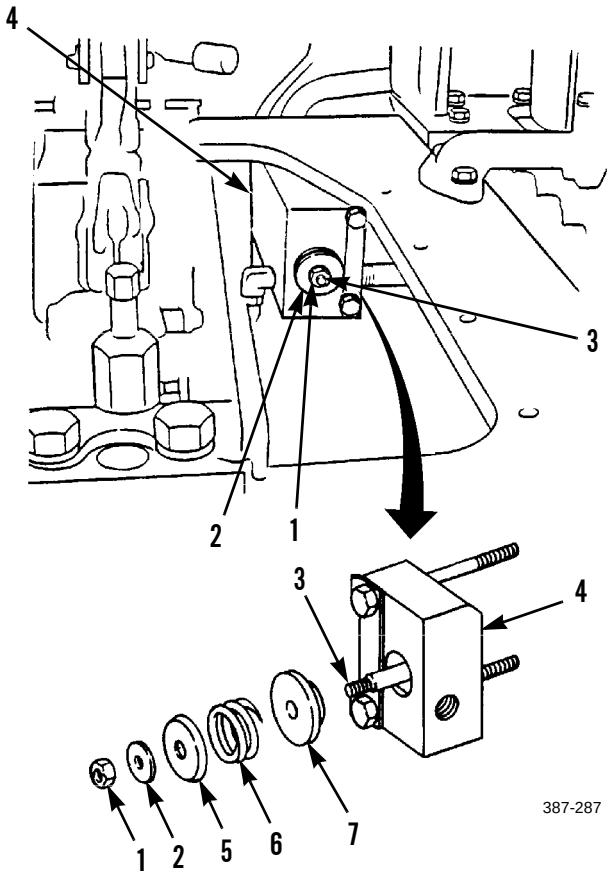
1. Remove nut (1) and washer (2) from pin (3) in block assembly (4).
2. Remove spring retainer (5), spring (6) and valve (7) from block assembly (4).

CLEANING AND INSPECTION

1. Wipe all parts clean and dry IAW instructions in WP 0241 00.
2. Inspect parts for wear and replace if necessary.

INSTALLATION

1. Apply a film of clean lubricating oil on valve (7) and install valve in block assembly (4) over pin (3).
2. Install spring (6) and spring retainer (5) on valve (7) over pin (3).
3. Install washer (2) and nut (1) on pin (3).
4. Install L.H. brake hydraulic control assembly (WP 0151 00).
5. Test drive and check steering for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

STEERING CLUTCH CONTROL VALVE MAINTENANCE 0154 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Cleaning compound, solvent (Item 4, WP 0249 00)

Compound, gasket forming, silicone (Item 7, WP 0249 00)

Oil, lubricating (Item 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Capscrew, course thread, 3/8 in.

Gasket (35)

Lockwasher (19, 22, 27 and 39)

O-ring (12, 14, 24, 25, 28 and 53)

Pin, cotter (15 and 67)

Seal (65)

References

TM 5-2410-237-10

WP 0107 00

Equipment Condition

Fuel tank removed (WP 0052 00)

REMOVAL

CAUTION

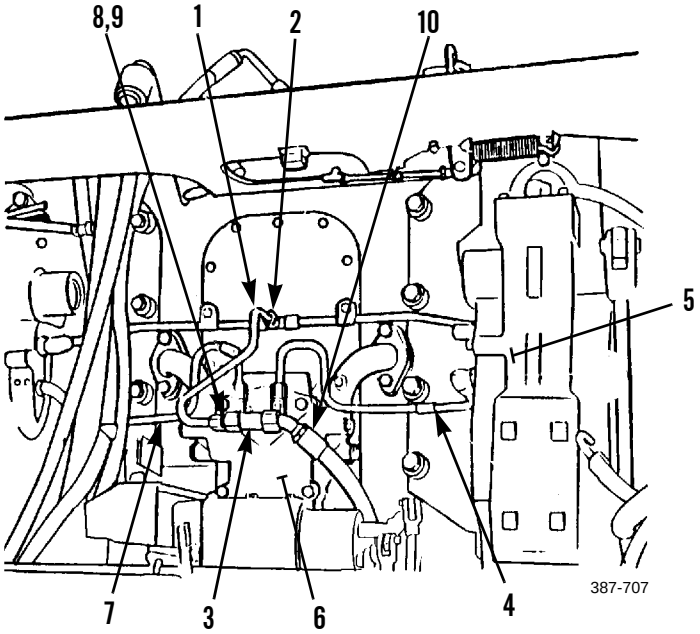
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

NOTE

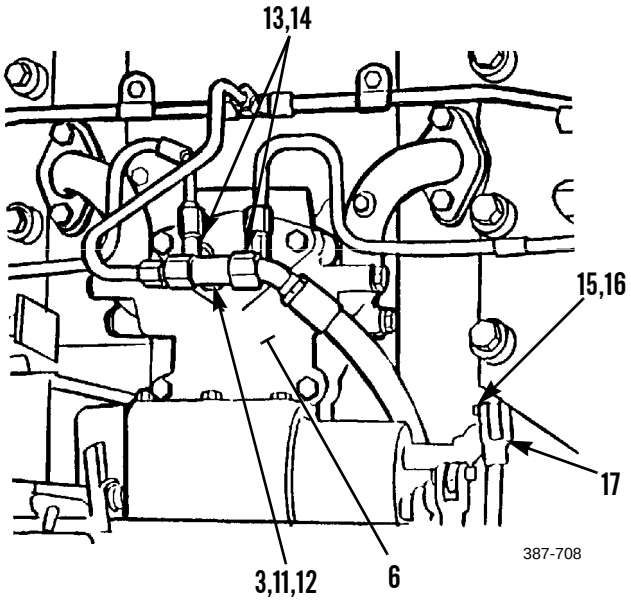
- **Tag hydraulic lines as needed to ensure correct installation.**
- **Use a suitable container to capture any draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

REMOVAL - CONTINUED

1. Disconnect and remove tube assembly (1) from tee (2) and tee (3) at center of tubing assembly.
2. Disconnect and remove tube assembly (4) between hydraulic control (5) and elbow on top of control valve (6).
3. Repeat step 2 for tube assembly (7) from other hydraulic control to control valve (6).
4. Remove nut (8) and adapter (9) from one side of tee (3).
5. Remove hose assembly (10) from other side of tee (3).

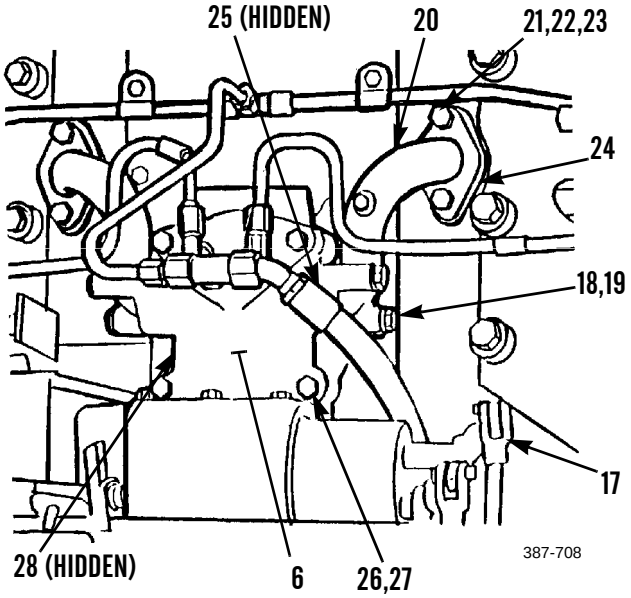


6. Remove tee (3) and adapter (11) from top of control valve (6).
7. Remove O-ring (12) from adapter (11). Discard O-ring.
8. Remove two elbows (13) and O-rings (14) from top of control valve (6). Discard O-rings.
9. Remove cotter pin (15), pin (16) and end of clutch control rod (17) from control valve (6). Discard cotter pin.
10. Repeat step 9 for other control rod.



REMOVAL - CONTINUED

11. Remove two capscrews (18) and lockwashers (19) from elbow (20) mounted on side of control valve (6). Discard lockwashers.
12. Remove two capscrews (21), lockwashers (22) and washers (23) at other end of elbow (20) and remove elbow. Discard lockwashers.
13. Remove O-ring (24) from one end of elbow (20) and O-ring (25) from other end. Discard O-rings.
14. Repeat steps 11 through 13 for elbow on other side of control valve (6).
15. Remove four capscrews (26), lockwashers (27) and control valve (6) from top of gear case. Discard lockwashers.
16. Remove three O-rings (28) from gear case. Discard O-rings.



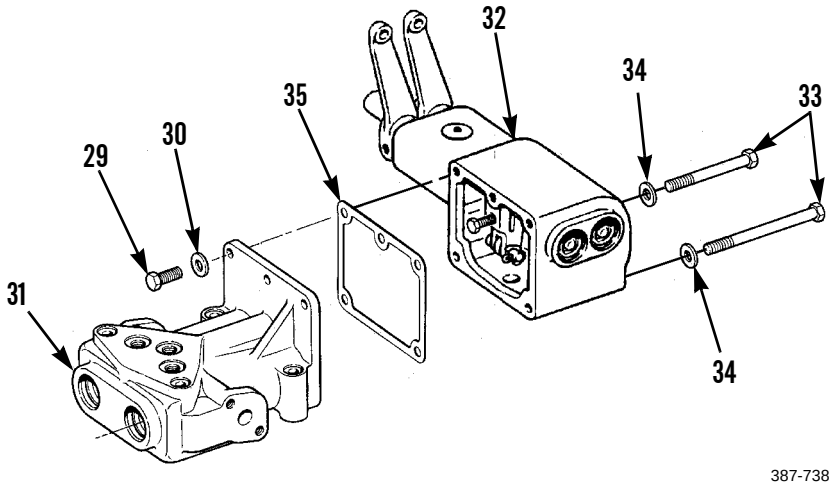
DISASSEMBLY

1. Remove three capscrews (29) and washers (30) from spool housing (31) and lever housing (32).

WARNING

Spool and lever housings are spring-loaded. Separate housings carefully to prevent personal injury or part damage.

2. Remove two capscrews (33) and washers (34) from other side of lever housing (32) and separate spool housing (31).
3. Remove gasket (35) and discard.



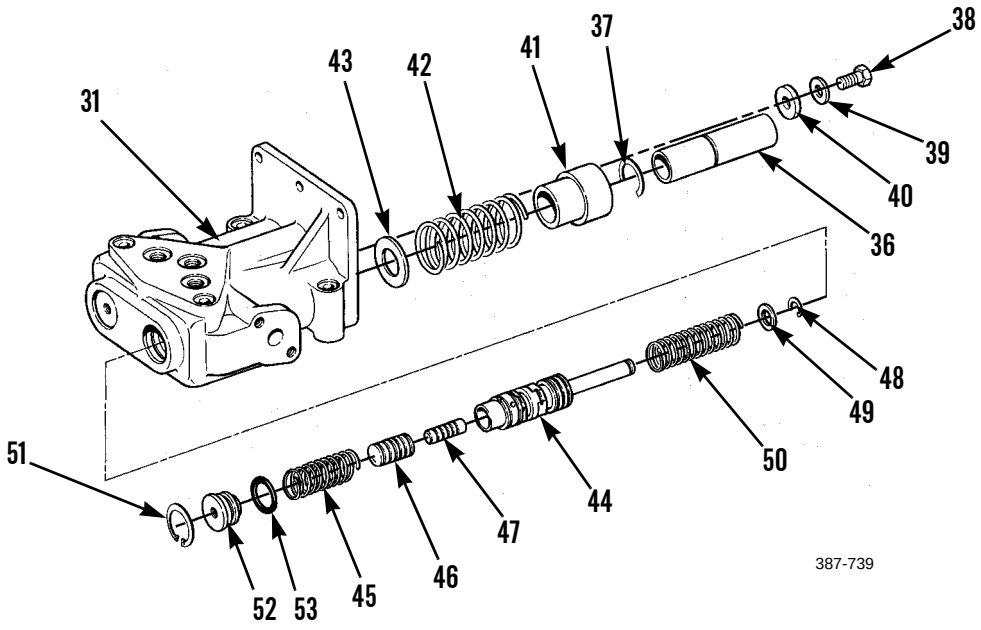
DISASSEMBLY - CONTINUED

4. Remove two plungers (36) with retaining rings (37) from spool housing (31). If necessary, remove retaining rings from plungers.

WARNING

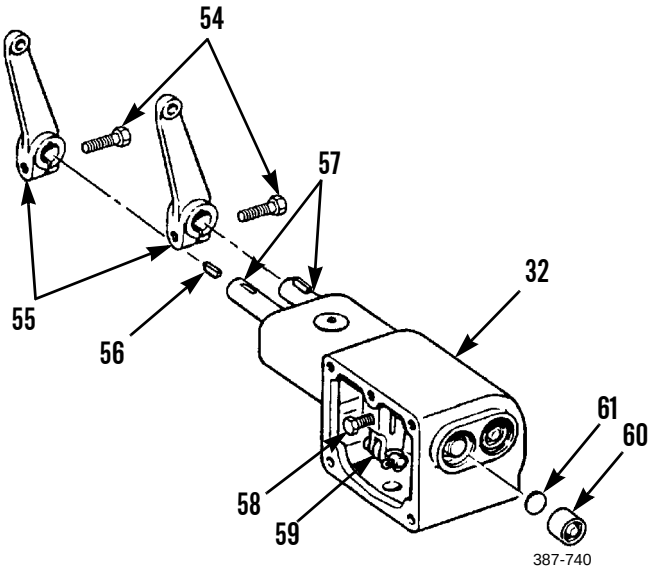
Capscrew (38), lockwasher (39) and washer (40) are under spring pressure. Remove carefully to prevent personal injury or parts damage.

5. Remove capscrew (38), lockwasher (39) and washer (40) from spool housing (31). Discard lockwasher.
6. Remove bushing (41), outer spring (42), washer (43), spool valve (44) and spring (45) from one port in spool housing (31).
7. Remove slug (46) and piston (47) from end of spool valve (44).
8. Remove retaining ring (48), washer (49) and spring (50) on other end of spool valve (44).
9. Repeat steps 6 through 8 for other spool valve assembly.
10. Remove two retaining rings (51). Use 3/8 in. course thread capscrew to remove two plugs (52) from end of spool housing (31).
11. Remove O-ring (53) from each plug (52). Discard O-rings.

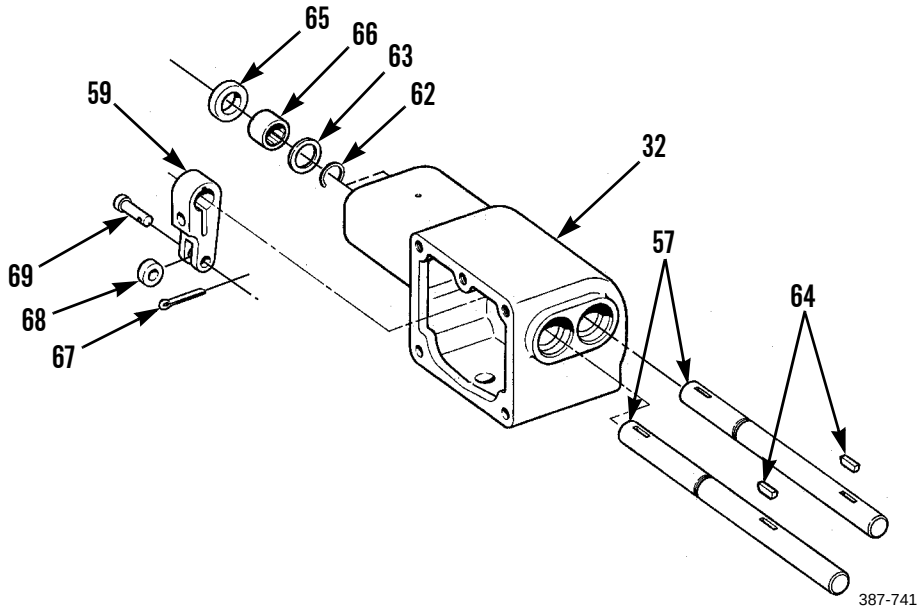


DISASSEMBLY - CONTINUED

12. Remove capscrew (54), lever (55) and remove key (56) from shaft (57) in lever housing (32).
13. Repeat step 12 on other shaft (57).
14. Loosen two capscrews (58) in levers (59) inside lever housing (32).
15. Tap end of shaft (57) with soft hammer to remove bearing (60) and spacer (61) from lever housing (32) at opposite end of shaft.



16. Remove retaining ring (62) from shaft (57).
17. Remove shaft (57), washer (63), key (64) and lever (59) from lever housing (32).
18. Repeat steps 15 through 17 for other shaft (57).
19. Remove two seals (65) and bearings (66) from shaft openings in lever housing (32). Discard seals.
20. Remove cotter pin (67), roller (68) and pin (69) from lever (59). Discard cotter pin.
21. Repeat step 20 for other lever (59).



CLEANING AND INSPECTION

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Clean all sealing surfaces, mating surfaces and tube assembly connections with solvent cleaning compound and allow to dry.
2. Inspect internal casing and internal parts of control valve for cracks, wear, scoring and damage. If components and parts are damaged, replace as necessary.

ASSEMBLY

NOTE

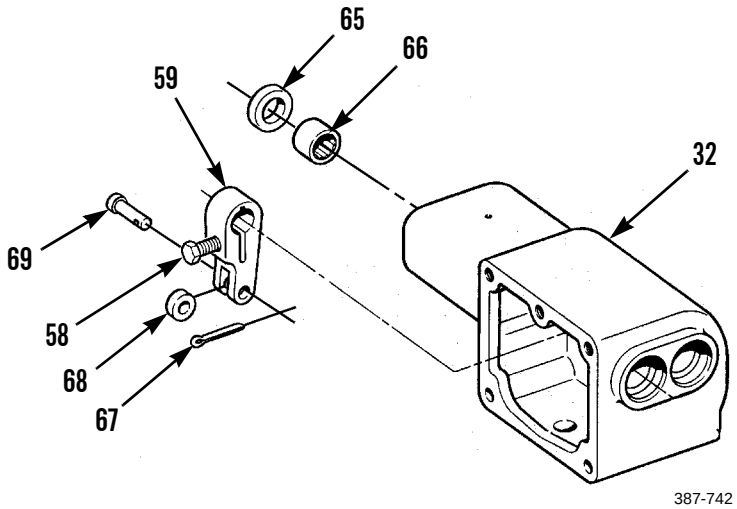
Apply a light coat of clean oil to all parts before assembly.

1. Install two bearings (66) in shaft openings in lever housing (32).

NOTE

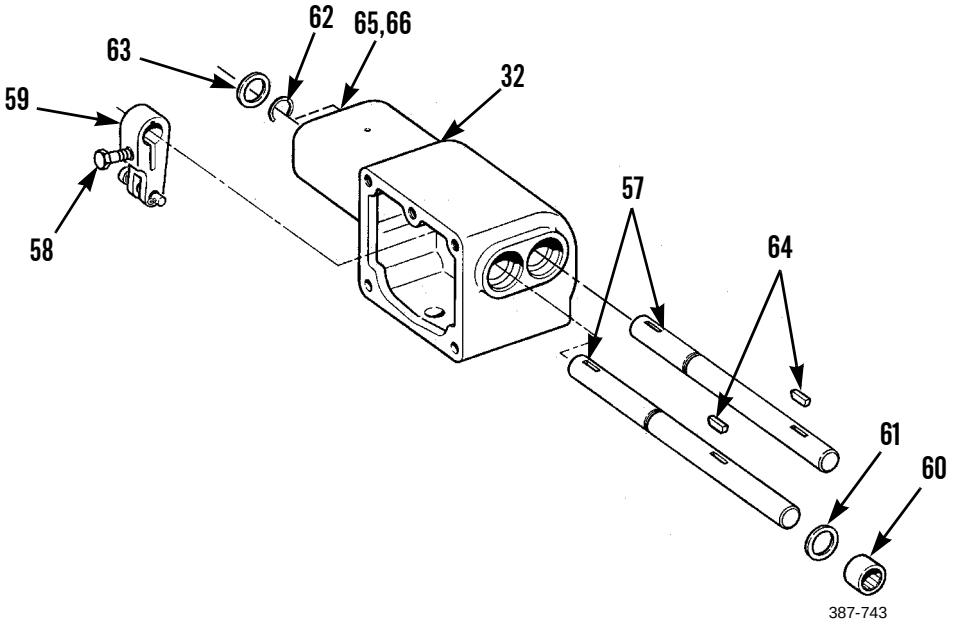
Before installing new seals (65), apply silicone gasket forming compound to seal seat in lever housing and allow to dry.

2. Install two new seals (65) in shaft openings in lever housing (32).
3. Install roller (68) in lever (59) with pin (69) and new cotter pin (67).
4. Repeat step 3 for other lever (59).

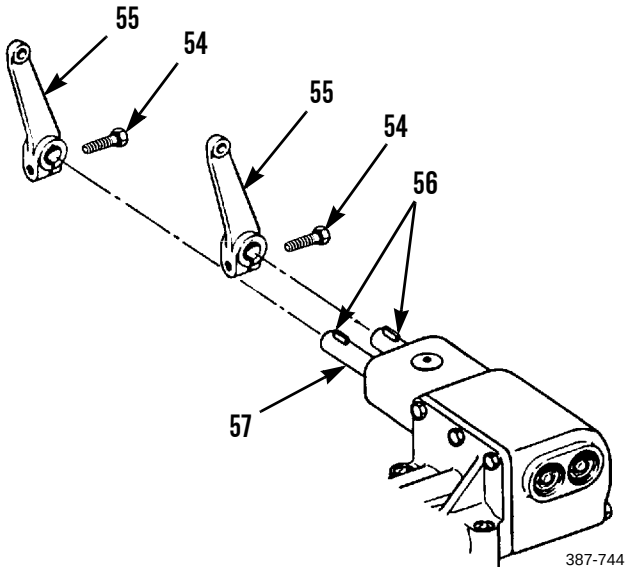


ASSEMBLY - CONTINUED

5. Insert shaft (57) through end of lever housing (32) and install lever (59), washer (63), key (64) and retaining ring (62) on shaft. Push shaft through bearing (66) and seal (65) in other end of housing.
6. Install spacer (61) and bearing (60) in lever housing (32) at other end of shaft (57).
7. Align slot in lever (59) with key (64) in shaft (57). Slide lever over key and center lever with plunger opening in side of lever housing (32). Tighten capscrew (58) in lever.



8. Install capscrew (54) in lever (55), but do not tighten.
9. Install key (56) in key slot in end of shaft (57).
10. Install lever (55) on shaft (57) over key (56) and tighten capscrew (54).
11. Repeat steps 5-10 for other shaft (57).



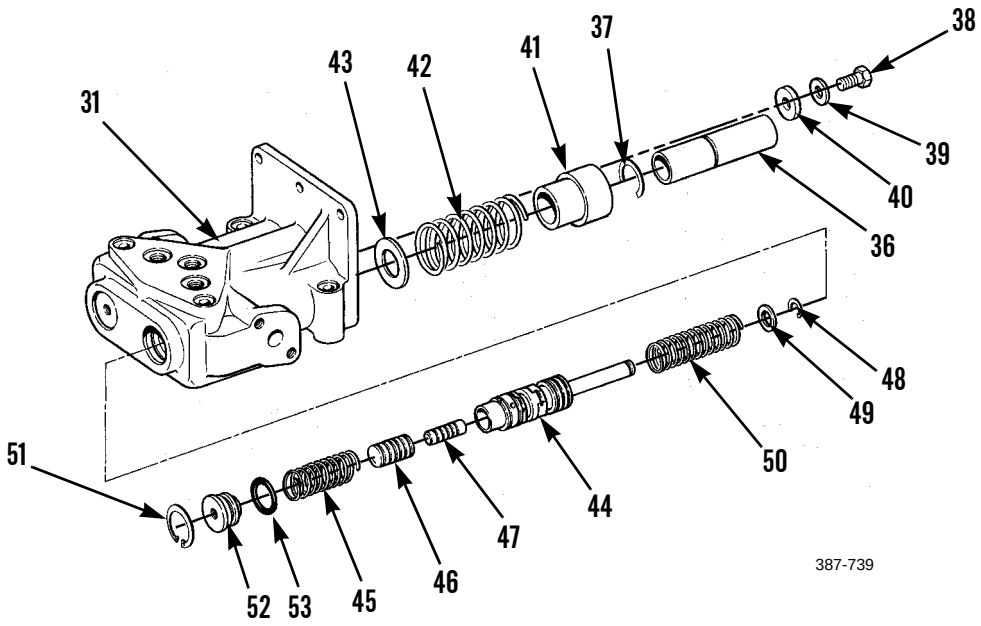
ASSEMBLY - CONTINUED

12. Apply a light film of clean oil to new O-ring (53) and install O-ring on plug (52).
13. Use a 3/8 in. capscrew to install plug (52) in end of spool housing (31).
14. Install retaining ring (51) to secure plug (52).
15. Repeat steps 12-14 for other plug (52).
16. Install spring (50), washer (49) and retaining ring (48) on one end of spool valve (44).
17. Install piston (47) and slug (46) in other end of spool valve (44).
18. Apply a light film of clean oil to spool valve (44) and install spool valve and spring (45) in spool housing (31).
19. Install washer (43), spring (42) and bushing (41) over spool valve (44).
20. Repeat steps 16 through 19 for other spool valve (44).

WARNING

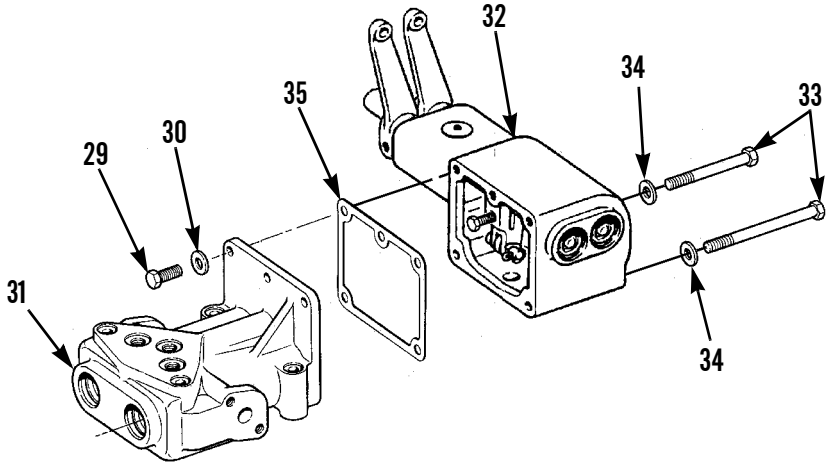
Spool and lever housings are spring-loaded. Assemble housings carefully to prevent personal injury or part damage.

21. Apply pressure to two bushings (41) and install washer (40), new lockwasher (39) and capscrew (38) in spool housing (31) to secure both spool valve assemblies.
22. Install two retaining rings (37) on plungers (36) and insert plungers into spool housing (31) over end of spools.



ASSEMBLY - CONTINUED

23. Position new gasket (35) on mating surface of spool housing (31) and position spool housing to lever housing (32).
24. Install two washers (34) and capscrews (33) through lever housing (32) into spool housing (31).
25. Install three washers (30) and capscrews (29) to secure two housings.



INSTALLATION

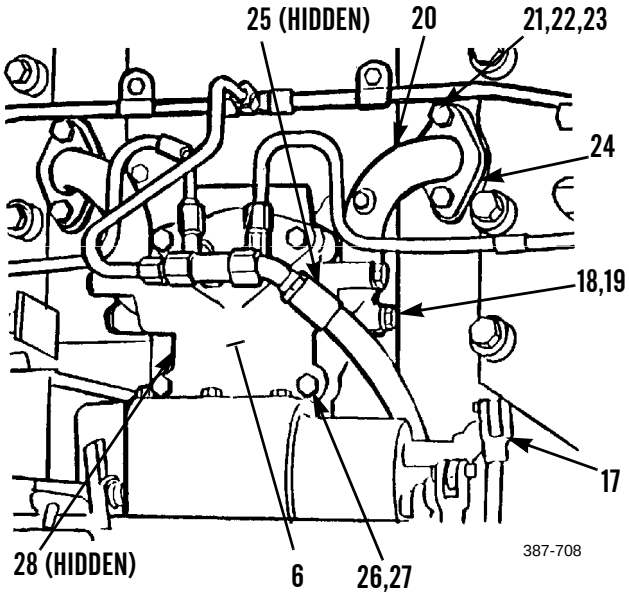
CAUTION

Care should be taken not to contaminate hydraulic system during installation of hydraulic lines. Dirt and foreign substances should be removed from surrounding area before lines are installed.

NOTE

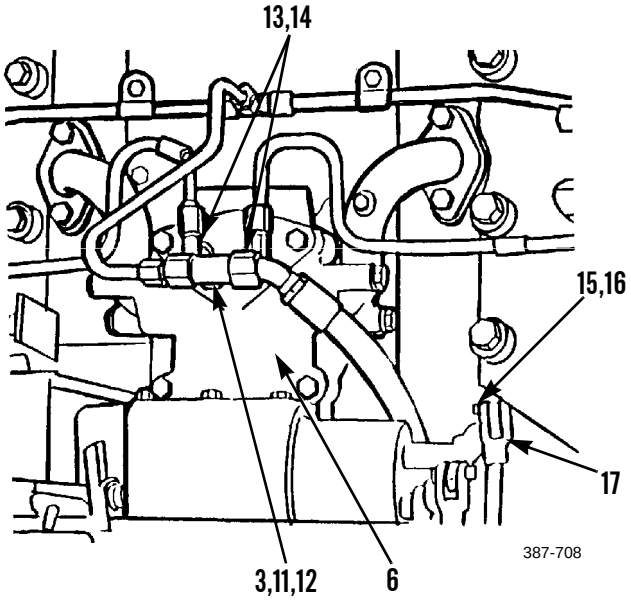
Apply a light film of clean oil to new O-rings prior to installation.

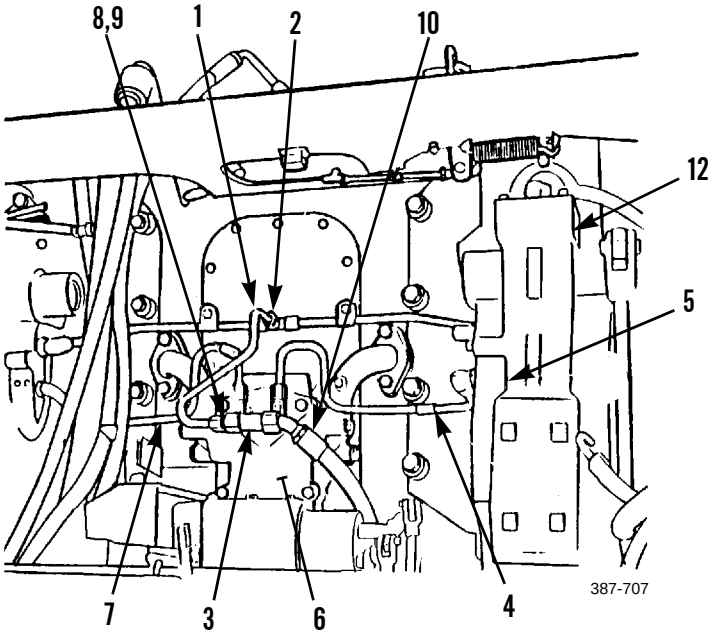
1. Position three new O-rings (28) on bevel of gear case.
2. Position control valve (6) on gear case. Ensure O-rings (28) are properly seated.
3. Install four new lockwashers (27) and capscrews (26) to secure control valve (6) to gear case.
4. Install new O-rings (24 and 25) in flange at each end of elbow (20).
5. Install one end of elbow (20) on control valve (6) with two new lockwashers (19) and capscrews (18).
6. Install other end of elbow (20) with two washers (23), new lockwashers (22) and capscrews (21).
7. Repeat steps 4-6 for elbow on other side of control valve (6).



INSTALLATION - CONTINUED

8. Install end of clutch control rod (17) on control valve (6) with pin (16) and new cotter pin (15).
9. Repeat step 8 for other control rod.
10. Install two new O-rings (14) on elbows (13).
11. Install two elbows (13) and O-rings (14) on top of control valve (6).
12. Install new O-ring (12) on adapter (11).
13. Install adapter (11) and tee (3) on top of control valve (6).
14. Install adapter (9) and nut (8) on one side of tee (3) on control valve (6).
15. Install hose assembly (10) on other side of tee (3).
16. Install tube assembly (4) between hydraulic control (5) and elbow (13) on top of control valve (6).
17. Repeat step 16 for tube assembly (7) from other hydraulic control to control valve (6).
18. Connect tube assembly (1) to tee (2) and tee (3).
19. Install fuel tank (WP 0052 00).
20. Check level of oil in transmission and add as needed (WP 0107 00).
21. Test drive and check steering clutch for proper operation (TM 5-2410-237-10).





END OF WORK PACKAGE

STEERING CLUTCH HUB REPLACEMENT 0155 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Adapter (Item 1, WP 0250 00)

Bolt, machine (Item 14, WP 0250 00)

Bolt, machine (Item 15, WP 0250 00)

Bolt, machine (Item 16, WP 0250 00)

Leg (Item 46, WP 0250 00)

Puller (Item 76, WP 0250 00)

Puller attachment, mechanical (Item 80, WP 0250 00)

Puller, hydraulic (Item 86, WP 0250 00)

Puller, mechanical (Item 89, WP 0250 00)

Pump, hydraulic ram, hand driven (Item 93, WP 0250 00)

Screw, cap, hexagon head (Item 102, WP 0250 00)

Tools and Special Tools - Continued

Spacer (Item 111, WP 0250 00)

Washer (Item 128, WP 0250 00)

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Screw, anchor (1), 3/8 in. -16NC, 3 in. long (two required)

Packing, preformed (13)

Retainer (5)

Ring (4, 10 and 11)

Reference

TM 5-2410-237-10

Equipment Condition

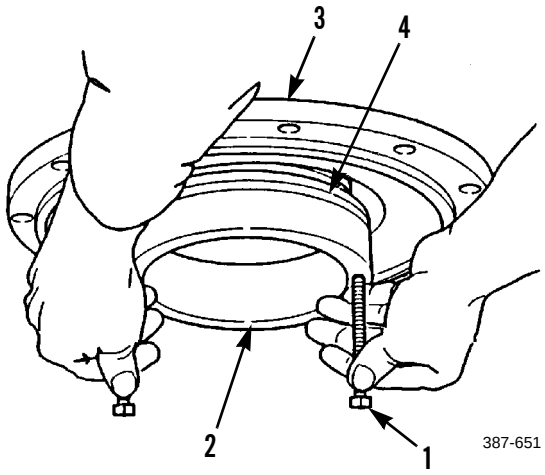
Steering clutch removed (WP 0152 00)

REMOVAL

NOTE

- **This procedure applies to R.H. or L.H. steering clutch hub.**
- **Ensure anchor screws are turned evenly during removal.**

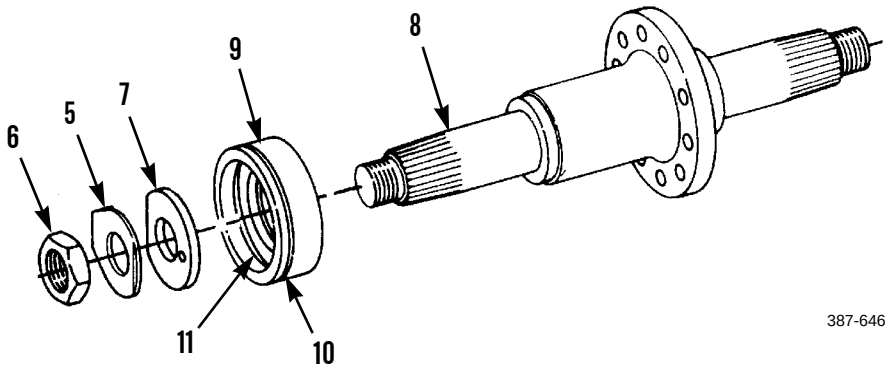
1. Install two 3/8 in. anchor screws (1) and remove piston (2) from steering clutch hub (3).
2. Remove ring (4) from piston (2). Discard ring.



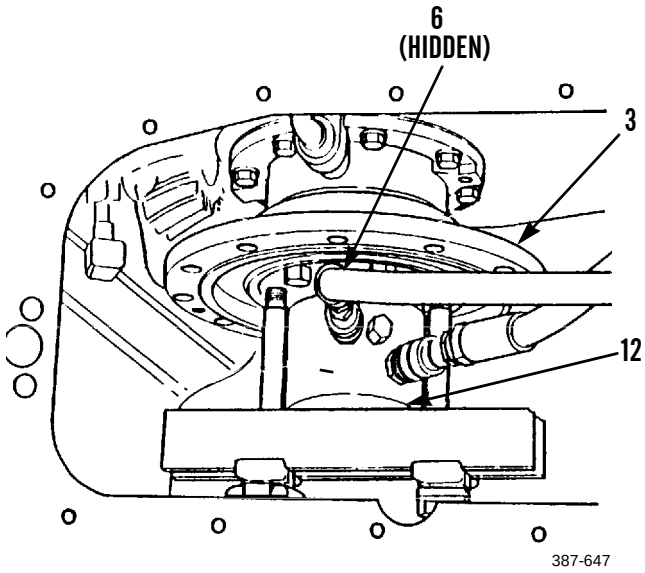
STEERING CLUTCH HUB REPLACEMENT - CONTINUED 0155 00

REMOVAL - CONTINUED

3. Bend retainer (5) straight from under nut (6).
4. Remove nut (6), retainer (5) and washer (7) from bevel gear shaft (8). Discard retainer.
5. Remove clutch retainer (9) from bevel gear shaft (8).
6. Remove ring (10) from outside and ring (11) from inside of clutch retainer (9). Discard rings.

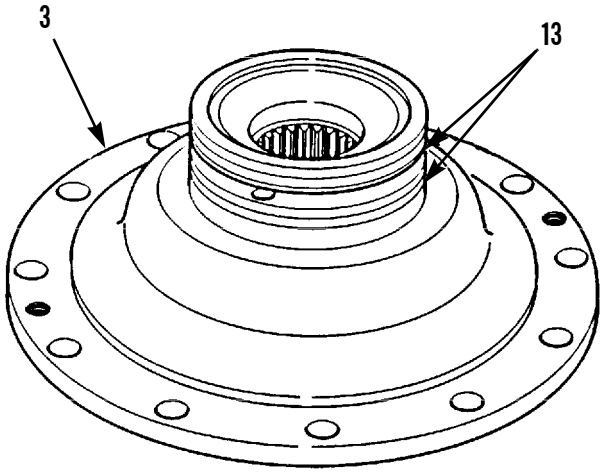


7. Install nut (6) on bevel gear shaft (8), with clearance of 0.375 in. (9.52 mm) between nut and steering clutch hub (3).
8. Install hydraulic puller (12) on steering clutch hub (3) and break steering clutch hub loose from bevel gear shaft (8).
9. Remove nut (6) from bevel gear shaft (8) and hydraulic puller (12) from steering clutch hub (3).
10. Remove steering clutch hub (3) from bevel gear shaft (8).



REMOVAL - CONTINUED

11. Remove two preformed packings (13) from steering clutch hub (3). Discard preformed packings.



387-648

CLEANING

1. Wipe splines on bevel gear shaft and steering clutch hub clean and dry.
2. Wipe ring grooves on steering clutch hub, piston and clutch retainer clean and dry.

INSTALLATION

NOTE

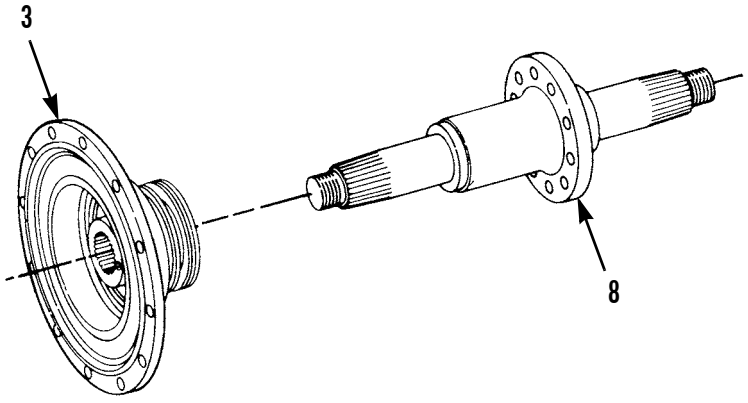
Lightly coat new preformed packings with clean oil before installation.

1. Install two new preformed packings (13) on steering clutch hub (3).

NOTE

Apply a light film of clean grease on splines before installation.

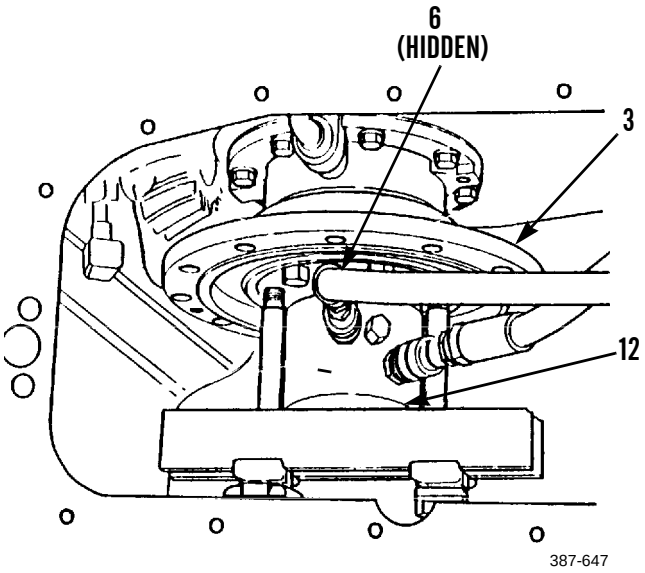
2. Position steering clutch hub (3) on bevel gear shaft (8), align splines and slide hub on bevel gear shaft as far as possible.



387-949

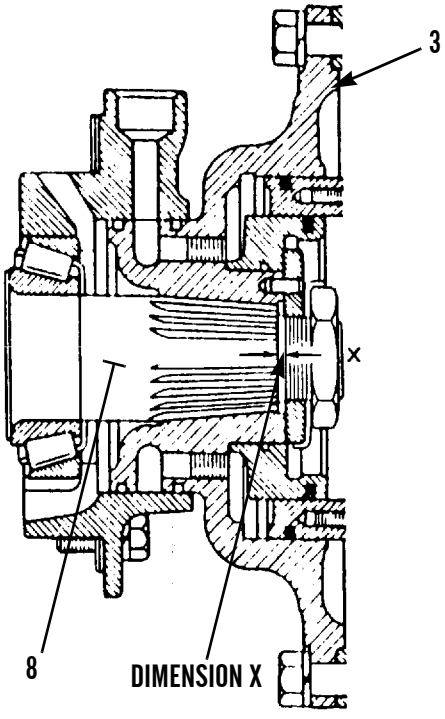
INSTALLATION - CONTINUED

3. Install nut (6) and hydraulic puller (12) on bevel gear shaft (8). Apply a force of 35-40 tons to seat steering clutch hub (3).
4. Remove nut (6) and hydraulic puller (12).



387-647

5. Measure distance between face of steering clutch hub (3) and shoulder of bevel gear shaft (8). Dimension X must be 0.12 in. +/- 0.03 in. (3.05 mm +/- 0.76 mm).



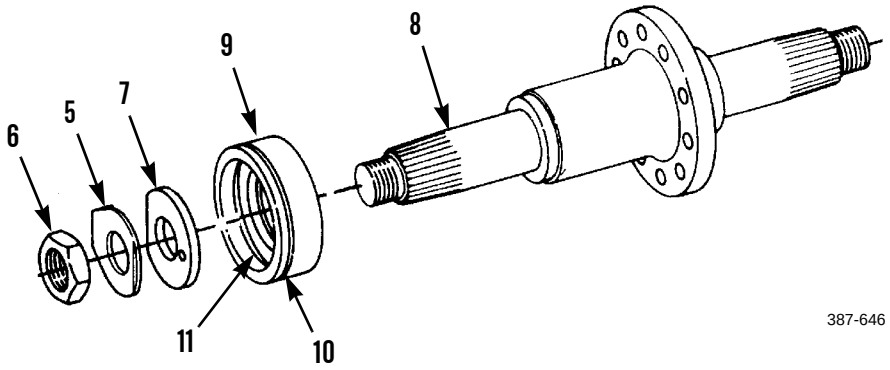
387-650

INSTALLATION - CONTINUED

NOTE

Lightly coat new rings with clean oil before installation.

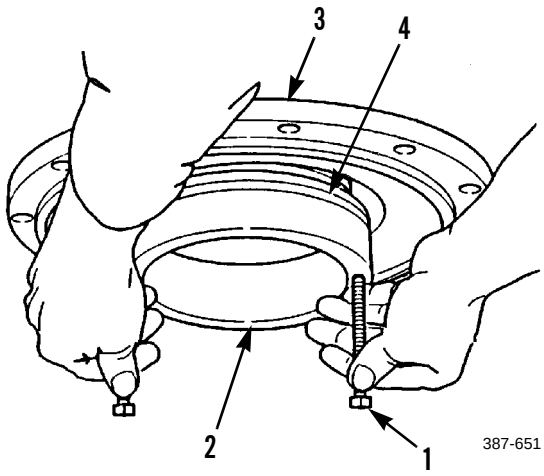
6. Install new ring (11) on inside and new ring (10) on outside of clutch retainer (9).
7. Install clutch retainer (9), washer (7), new retainer (5) and nut (6) on bevel gear shaft (8).
8. Tighten nut (6) to 700 lb-ft (949 Nm).
9. Bend retainer (5) on nut (6) to secure.



NOTE

Lightly coat new ring with clean oil before installation.

10. Install new ring (4) on piston (2).
11. Install piston (2) in steering clutch hub (3) as far as possible.
12. Install two 3/8 in. anchor screws (1) in outer circle of threaded bores in steering clutch hub (3).
13. Install hydraulic puller over piston (2) and press piston into steering clutch hub (3).
14. Remove hydraulic puller and anchor screws (1).
15. Install steering clutch (WP 0152 00).



16. Operate machine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

HYDRAULIC TANK MOUNTING BRACKETS AND PLATES REPLACEMENT 0156 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

References

WP 0225 00

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

Seat and seat base assembly removed (WP 0172 00)

Steering brake lock lever and linkage removed (WP 0149 00)

Blade control lever and linkage removed (WP 0207 00)

If equipped, ripper control lever and linkage removed (WP 0208 00)

If equipped, winch control lever and linkage removed (WP 0183 00)

If equipped, sound suppression panels removed (WP 0196 00)

HYDRAULIC TANK MOUNTING BRACKETS AND PLATES REPLACEMENT - CONTINUED 0156 00

REMOVAL

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,238 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

1. Remove four capscrews (1), washers (2) and bracket (3) from plate assembly (4).

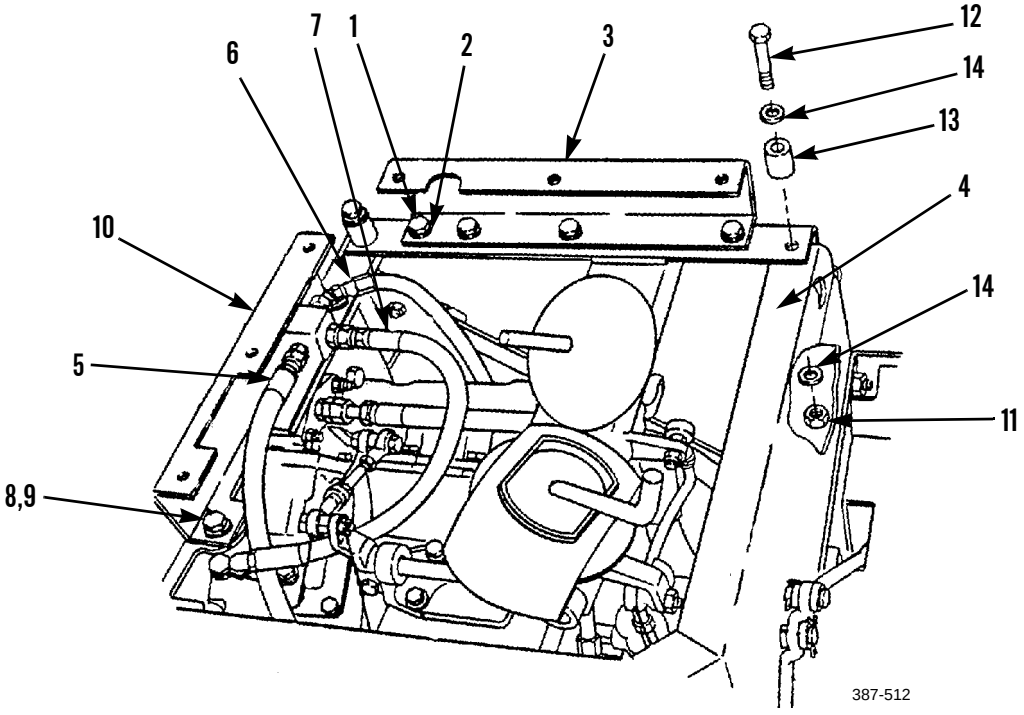
CAUTION

Install protective caps and plug openings after removal of hydraulic hoses, to ensure contamination does not enter hydraulic system.

NOTE

- **Use a suitable container to capture any residual oil that may drain from hoses as they are disconnected. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Tag hoses as they are removed to ensure correct installation.**

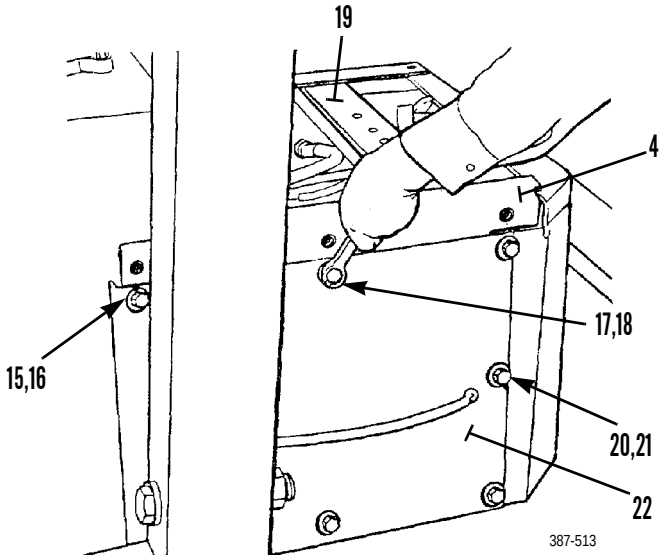
2. Disconnect hydraulic hoses (5, 6 and 7).
3. Remove two capscrews (8), washers (9) and bracket (10).
4. Remove four nuts (11), capscrews (12), spacers (13) and eight washers (14) from plate assembly (4).



HYDRAULIC TANK MOUNTING BRACKETS AND PLATES REPLACEMENT - CONTINUED 0156 00

REMOVAL - CONTINUED

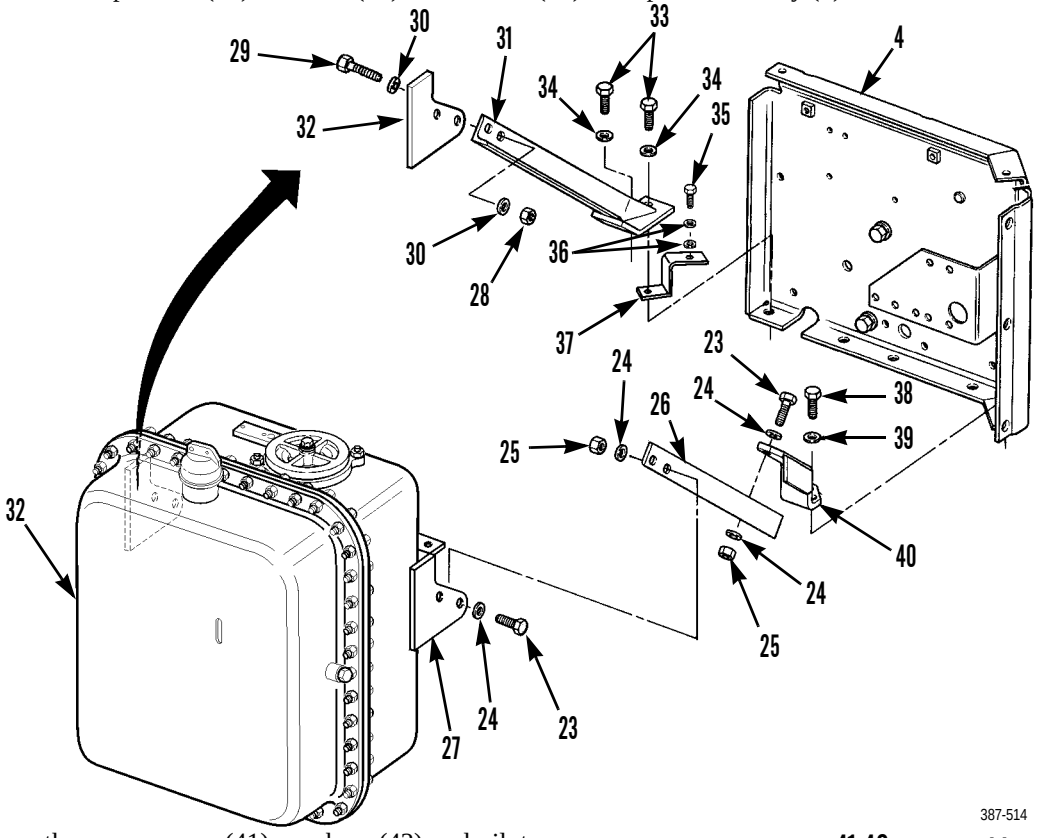
5. Remove capscrew (15) and washer (16).
6. Remove two capscrews (17), washers (18) and bracket assembly (19) from plate assembly (4).
7. Remove three capscrews (20), washers (21) and panel (22) from plate assembly (4).



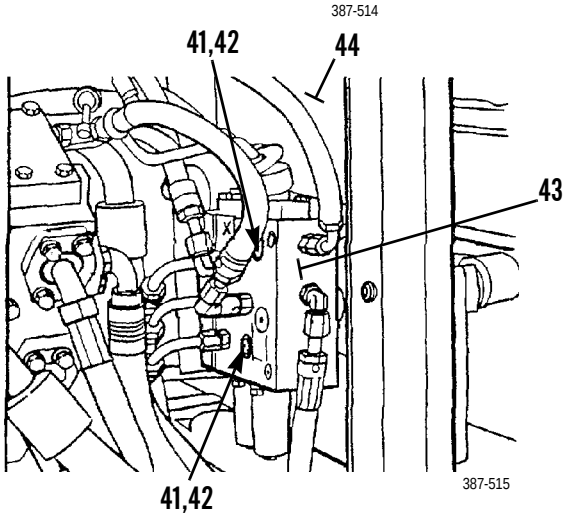
HYDRAULIC TANK MOUNTING BRACKETS AND PLATES REPLACEMENT - CONTINUED 0156 00

REMOVAL - CONTINUED

8. Remove four capscrews (23), eight washers (24), four nuts (25) and brace (26) from plate assembly (4) and hydraulic tank bracket (27).
9. Remove two nuts (28), capscrews (29) and four washers (30) securing upper end of brace (31) to hydraulic tank (32).
10. Remove two capscrews (33), washers (34) and brace (31) from plate assembly (4).
11. Remove capscrew (35), two washers (36) and bracket (37).
12. Remove two capscrews (38), washers (39) and bracket (40) from plate assembly (4).

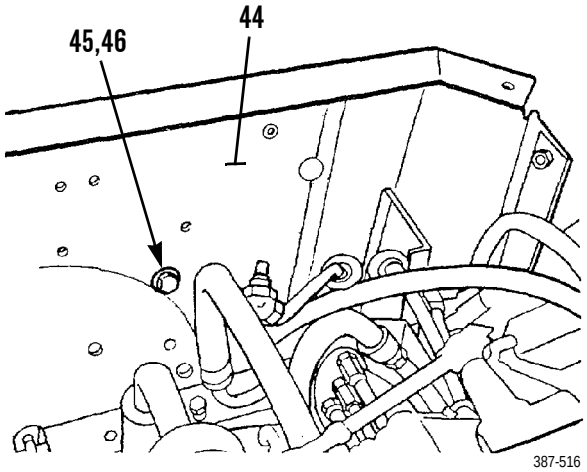


13. Remove three capscrews (41), washers (42) and pilot valve (43) from side panel (44).



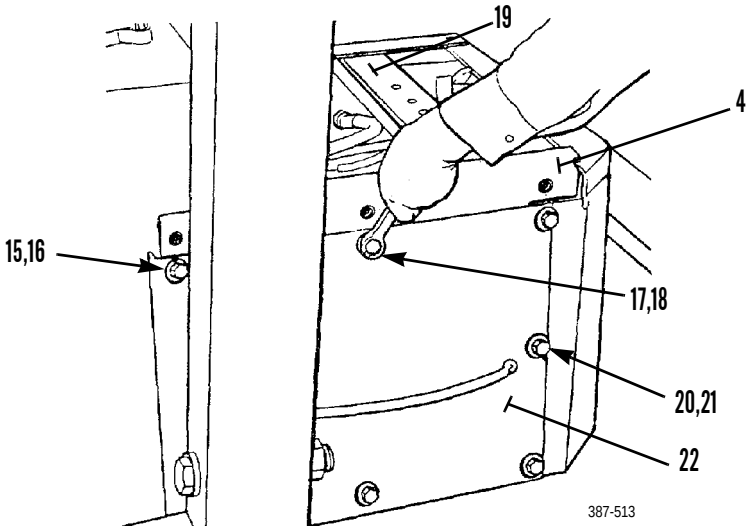
REMOVAL - CONTINUED

14. Remove eight capscrews (45), washers (46) and side panel (44).



INSTALLATION

1. Install side panel (44) with eight washers (46) and capscrews (45).
2. Install pilot valve (43) to side panel (44) with three washers (42) and capscrews (41).
3. Install bracket (40) to plate assembly (4) with two washers (39) and capscrews (38).
4. Position bracket (37) and brace (31). Install capscrew (35), two capscrews (33), and four washers (36 and 34) to secure lower end of brace to plate assembly (4).
5. Secure upper end of brace (31) to hydraulic tank (32) with two capscrews (29), four washers (30) and two nuts (28).
6. Install brace (26) to hydraulic tank bracket (27) and plate assembly (4) with four capscrews (23), eight washers (24) and four nuts (25).
7. Install panel (22) to plate assembly (4) with three washers (21) and capscrews (20).
8. Install bracket assembly (19) to plate assembly (4) with two washers (18) and capscrews (17).
9. Install washer (16) and capscrew (15).



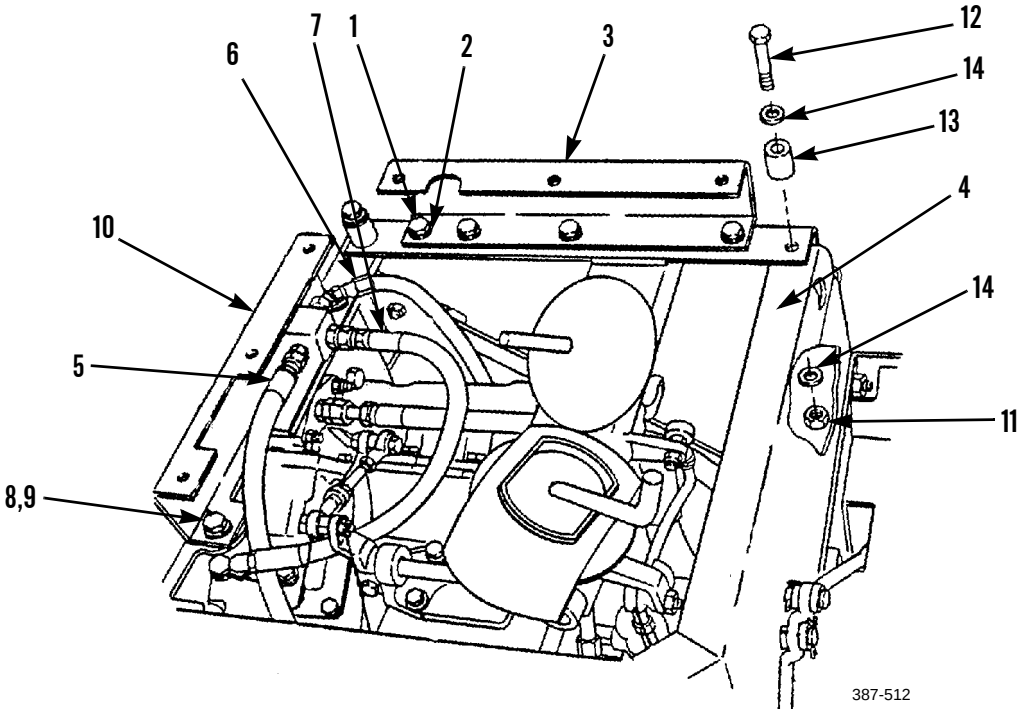
INSTALLATION - CONTINUED

10. Install four capscrews (12), spacers (13), eight washers (14) and four nuts (11) to plate assembly (4).
11. Install bracket (10) with two washers (9) and capscrews (8).

CAUTION

Clean all hydraulic hose connectors before installation to prevent contamination from entering hydraulic system.

12. Connect hydraulic hoses (5, 6 and 7).
13. Install bracket (3) to plate assembly (4) with four washers (2) and capscrews (1).



14. If equipped, install sound suppression panels (WP 0196 00).
15. If equipped, install winch control lever and linkage (WP 0183 00).
16. If equipped, install ripper control lever and linkage (WP 0208 00).
17. Install blade control lever and linkage (WP 0207 00).
18. Install steering brake lock lever and linkage (WP 0149 00).
19. Install seat and seat base assembly (WP 0172 00).
20. Check level of oil in hydraulic tank and add oil, if needed (WP 0225 00).

END OF WORK PACKAGE

TRANSMISSION AND CRANKCASE GUARDS REPLACEMENT 0157 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Compound, anti-seize (Item 6, WP 0249 00)

Wood block, 2 in. x 4 in. x 18 in. long

Personnel Required

Two

Equipment Condition

Tractor parked on level ground (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

WARNING

- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death to personnel.**
- **Dirt and rocks under guards can significantly add to their weight.**

NOTE

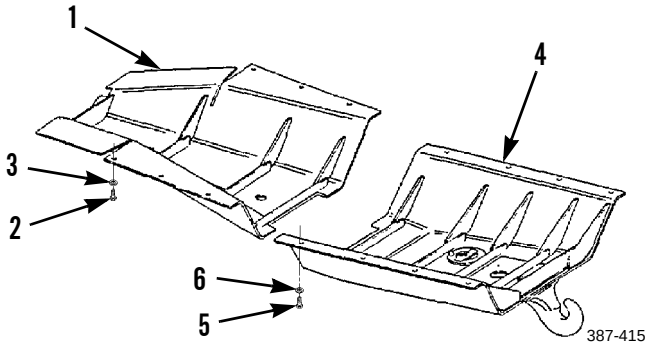
- **Transmission guard weighs 350 lb (159 kg).**
- **Crankcase guard weighs 335 lb (152 kg).**

REMOVAL

NOTE

An 18 in. (46 cm) piece of 2 x 4 wood block should be placed on jack to facilitate removal of transmission and crankcase guards.

1. Apply light pressure to transmission guard (1) with hydraulic floor jack.
2. Remove six bolts (2) and washers (3).
3. Lower hydraulic floor jack and remove transmission guard (1) from tractor.
4. Repeat step 2 for crankcase guard (4).
5. Remove eight bolts (5) and washers (6).
6. Lower hydraulic floor jack and remove crankcase guard (4).



INSTALLATION

NOTE

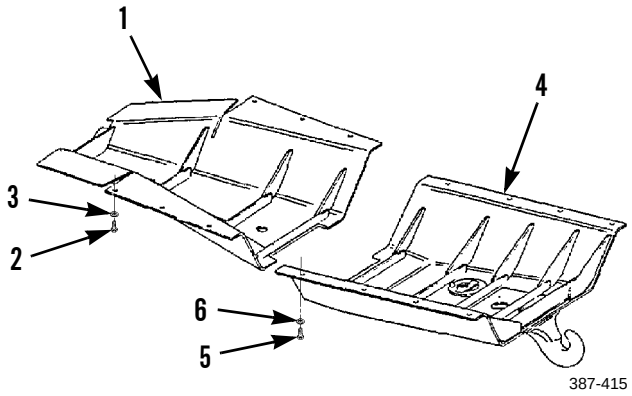
An 18 in. (46 cm) piece of 2 x 4 wood block should be placed on jack to facilitate installation of transmission and crankcase guards.

1. Place crankcase guard (4) on hydraulic floor jack and raise into position under tractor. Apply light pressure to hold in position.

NOTE

- **Apply anti-seize compound to threads of mounting bolts.**
- **Do not tighten bolts until all bolts have been installed.**

2. Install eight washers (6) and bolts (5).
3. Repeat step 1 for transmission guard (1).
4. Install six washers (3) and bolts (2).



END OF WORK PACKAGE

RADIATOR GUARD REPLACEMENT 0158 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 2,000 lb capacity

References

TM 5-2410-237-10

Personnel Required

Three

Equipment Condition

Upper and lower radiator grilles removed (WP 0068 00)

Blade tilt cylinder lines removed from guard (WP 0214 00)

Blade lift cylinder mounting tube removed (WP 0222 00)

RADIATOR GUARD REPLACEMENT - CONTINUED 000158 00

REMOVAL

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

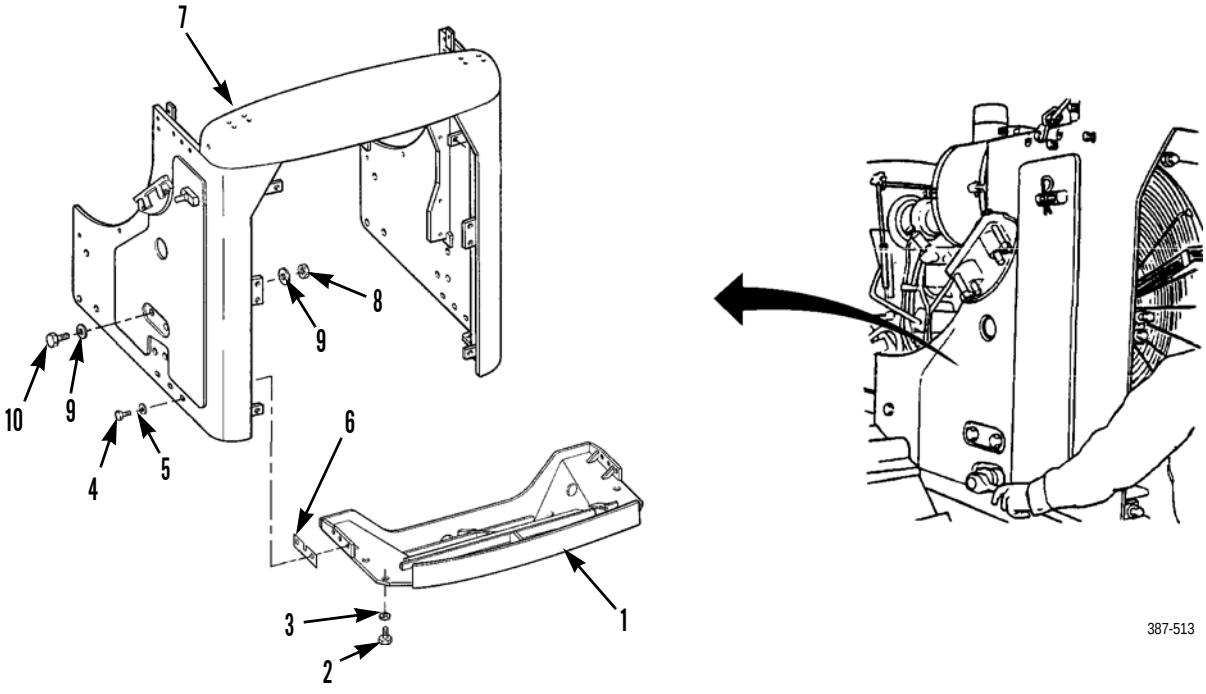
Guard weighs 157 lb (71 kg).

1. Position hydraulic floor jack underneath guard (1) and raise jack to support guard.
2. Remove four capscrews (2) and washers (3) from underneath guard (1).
3. Remove six capscrews (4), washers (5) and shims (6), if used. Lower hydraulic floor jack to remove guard (1) from guard (7).

NOTE

Guard weighs 790 lb (359 kg).

4. Attach a nylon sling and a suitable lifting device to guard (7).
5. Remove seven nuts (8), 14 washers (9) and seven capscrews (10) from one side of guard (7).
6. Repeat step 5 on other side of guard (7).
7. Use lifting device to carefully lift guard (7) off tractor.



INSTALLATION

NOTE

Guard weighs 790 lb (359 kg).

1. Attach a nylon sling and a suitable lifting device to guard (7). Carefully lift guard into position on tractor.
2. Install seven capscrews (10), 14 washers (90) and seven nuts (8) into one side of guard (7).
3. Repeat step 2 on other side of guard (7).

NOTE

Guard weighs 157 lb (71 kg).

4. Use hydraulic floor jack to install guard (1) into position on guard (7).
5. Install six capscrews (4), washers (5) and shims (6), if used, to secure guard (1) to guard (7).
6. Install four capscrews (2) and washers (3) underneath each side of guard (1).
7. Install blade lift cylinder mounting tube (WP 0222 00).
8. Install blade tilt cylinder lines to guard (WP 0214 00).
9. Install upper and lower radiator grilles (WP 0068 00).
10. Operate machine and check for leaks and proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

HOOD REPLACEMENT 0159 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Shop equipment, welding (Item 108, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Gasket (6)

Materials/Parts - Continued

Lockwasher (2, 9 and 15)

Pin, cotter (12)

Personnel Required

Two

Equipment Condition

Exhaust extension removed (WP 0063 00)

Engine air cleaner precleaner removed (WP 0047 00)

WARNING

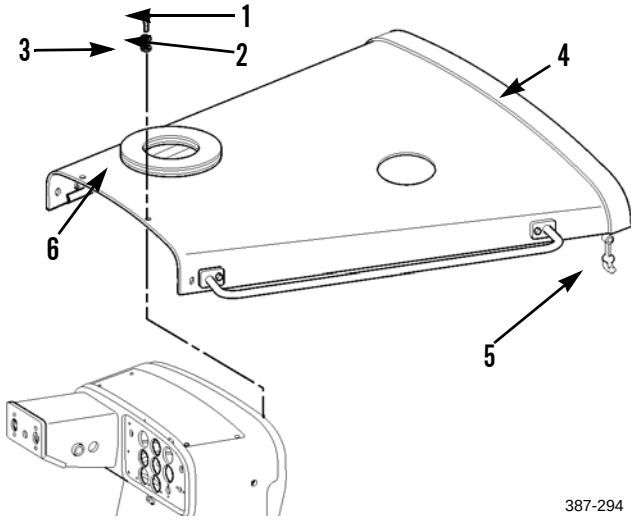
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Hood weighs 60 lb (27 kg).

REMOVAL

1. Remove four capscrews (1), lockwashers (2) and washers (3) at cab end of hood (4). Discard lockwashers.
2. Release two latches (5) at radiator end of hood (4).
3. Attach a nylon sling and a suitable lifting device to hood (4). Remove hood from tractor.
4. Remove and discard gasket (6).



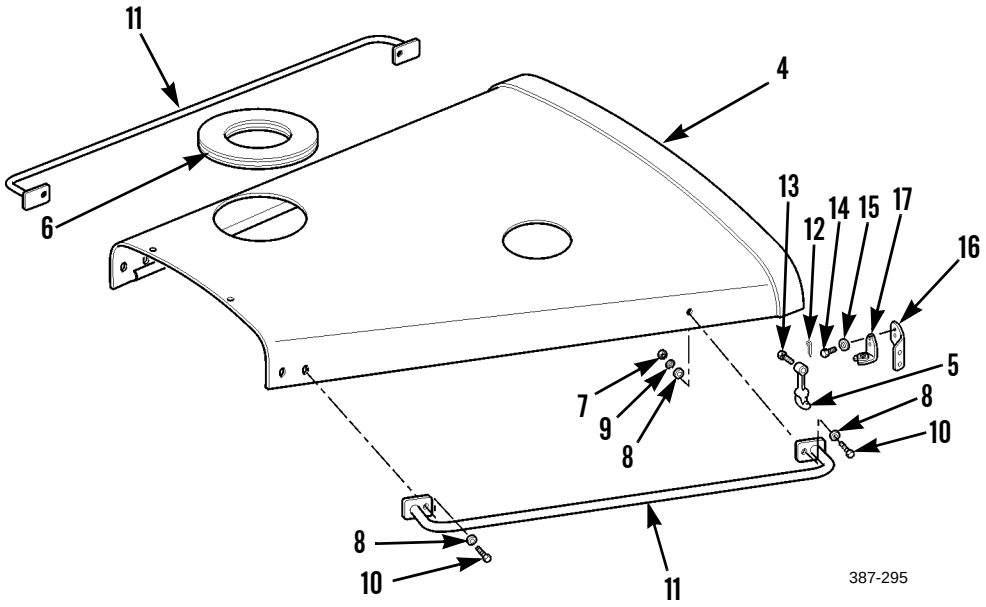
REMOVAL - CONTINUED

5. Use a lifting device to place hood (4) upside down on work surface.

NOTE

Perform steps 6-10 as needed to removed components from hood.

6. Remove two nuts (7), four washers (8), two lockwashers (9), capscrews (10) and grabhandle (11) from one side of hood (4). Discard lockwashers.
7. Remove cotter pin (12), pin (13) and latch (5) on same side of hood (4). Discard cotter pin.
8. Repeat steps 6 and 7 on other side of hood (4).
9. Remove two capscrews (14), lockwashers (15) and brackets (16 and 17). Discard lockwashers.
10. Repeat step 9 on other side of hood (4).



INSTALLATION

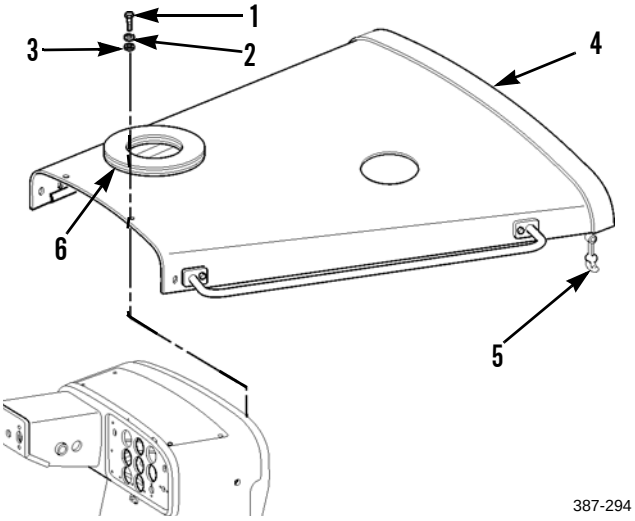
NOTE

Perform steps 1-5 as needed to install components that were removed from hood.

1. Install brackets (16 and 17) with two new lockwashers (15) and capscrews (14).
2. Repeat step 1 on other side of hood (4).
3. Install latch (5) on one side of hood (4) with pin (13) and new cotter pin (12).
4. Install grabhandle (11) on same side of hood (4) with two capscrews (10), new lockwashers (9), four washers (8) and two nuts (7).
5. Repeat steps 3 and 4 on other side of hood (4).

INSTALLATION - CONTINUED

6. Attach a nylon sling and a suitable lifting device to hood (4). Turn hood right side up and position on tractor.
7. Install four washers (3), new lockwashers (2) and capscrews (1) at cab end of hood (4). Remove nylon sling and lifting device.
8. Latch two latches (5) at radiator end of hood (4).
9. Install new gasket (6).
10. Install engine cleaner air precleaner (WP 0047 00).
11. Install exhaust extension (WP 0063 00).



END OF WORK PACKAGE

DASH ASSEMBLY REPLACEMENT 0160 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Link, lifting (Item 134, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 300 lb capacity

Bolt, 3/8-16 x 1-1/2 in.

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Lockwasher (17, 29, 38, 43 and 45)

Pin, cotter (9 and 24)

Personnel Required

Three

References

TM 5-2410-237-10

WP 0058 00

WP 0146 00

WP 0148 00

WP 0193 00

WP 0231 00

Equipment Condition

Battery cables disconnected (WP 0101 00)

Hood removed (WP 0159 00)

Winterized cab removed, if equipped (WP 0168 00)

Cooling system drained (WP 0065 00)

REMOVAL

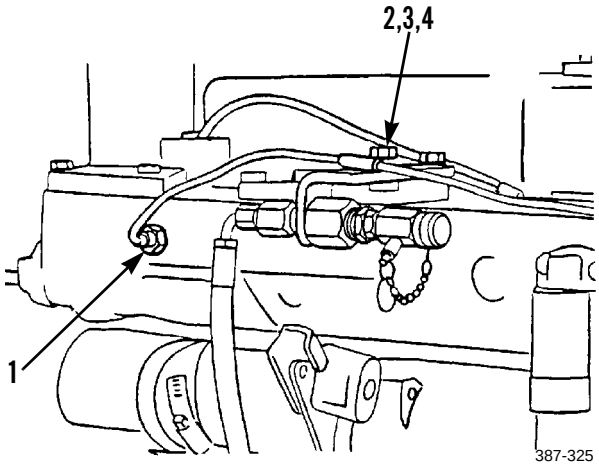
WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in personal injury or damage to equipment.

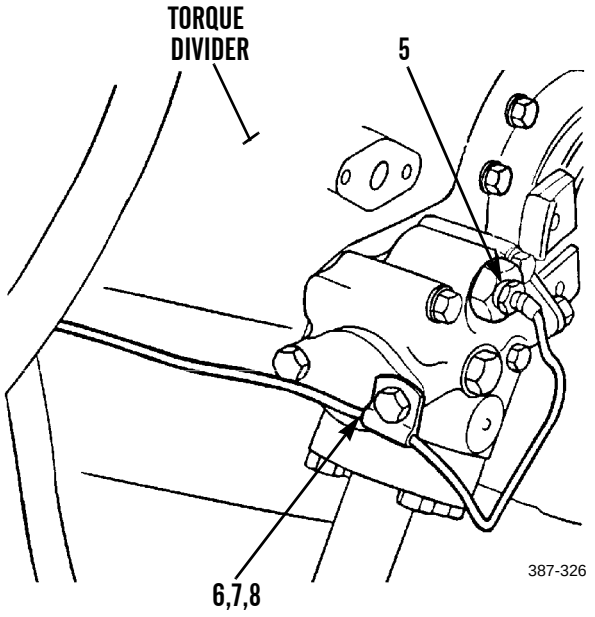
NOTE

Tag all wires to ensure correct installation.

1. Remove engine temperature sensor (1). Remove three capscrews (2), washers (3) and clips (4). Roll up sensor tubing and fasten to dash.



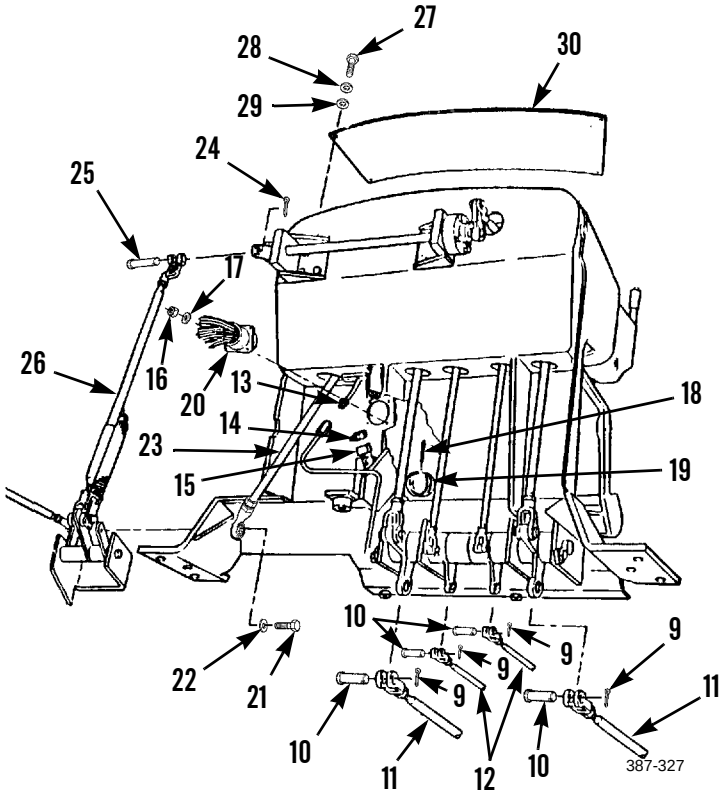
2. Remove torque converter oil temperature sensor (5) and plug opening. Remove capscrew (6), washer (7) and clip (8). Roll up sensor tubing and fasten to dash.



DASH ASSEMBLY REPLACEMENT - CONTINUED 0160 00

REMOVAL - CONTINUED

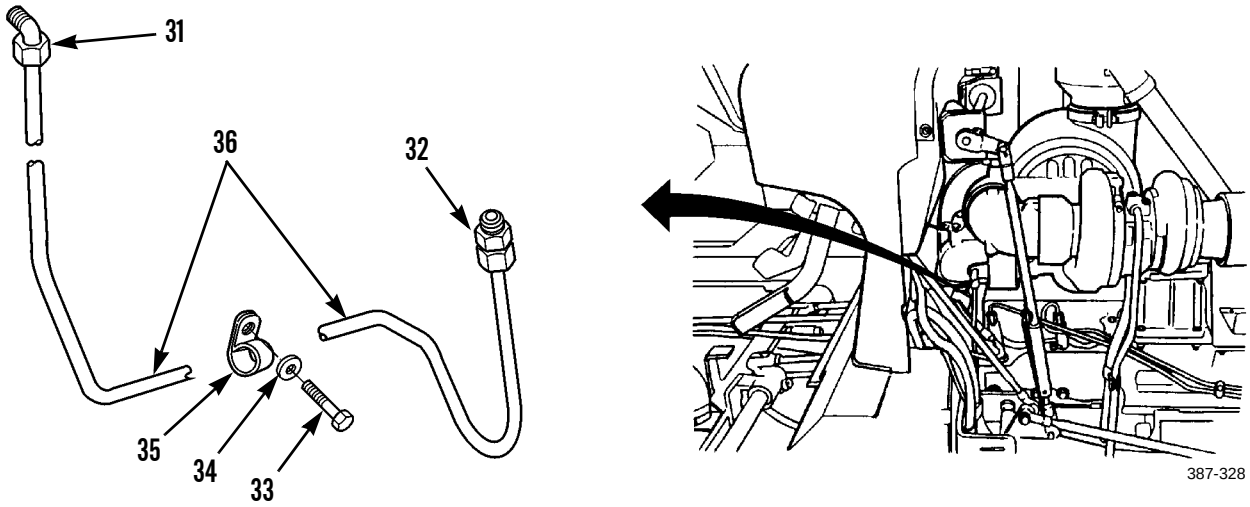
3. Remove four cotter pins (9) and pins (10) and disconnect two steering rods (11) and two brake rods (12). Discard cotter pins.
4. Disconnect engine oil pressure line (13).
5. Loosen clamp (14) and disconnect chassis wiring harness (15).
6. Remove four nuts (16), four lockwashers (17), slotted screws (18) and cover (19) and remove STE/ICE wiring harness (20) from dash. Discard lockwashers.
7. Remove capscrew (21) and washer (22) and disconnect decelerator control rod (23).
8. Remove cotter pin (24) and pin (25) and remove throttle control rod (26). Discard cotter pin.
9. Remove four capscrews (27), washers (28) and lockwashers (29) and remove cover (30). Discard lockwashers.



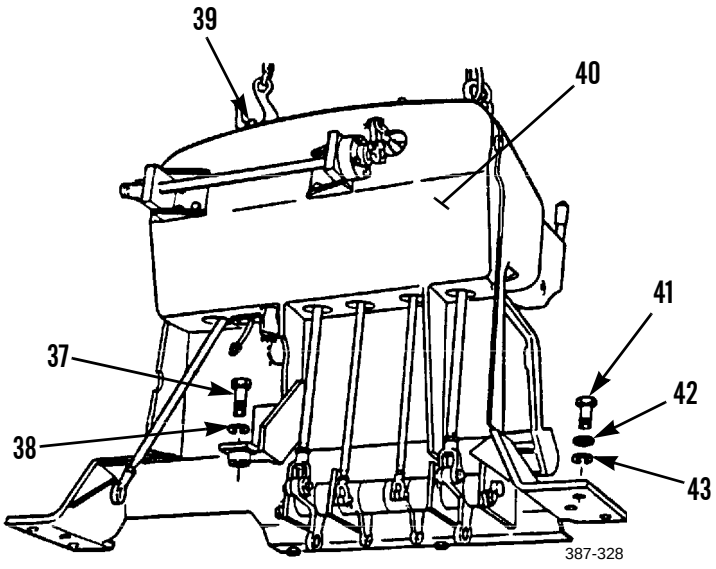
DASH ASSEMBLY REPLACEMENT - CONTINUED 0160 00

REMOVAL - CONTINUED

10. Loosen fittings (31 and 32). Remove two capscrews (33), washers (34) and clips (35). Remove tube assembly (36).



11. Remove capscrew (37) and lockwasher (38). Discard lockwasher.



REMOVAL - CONTINUED

WARNING

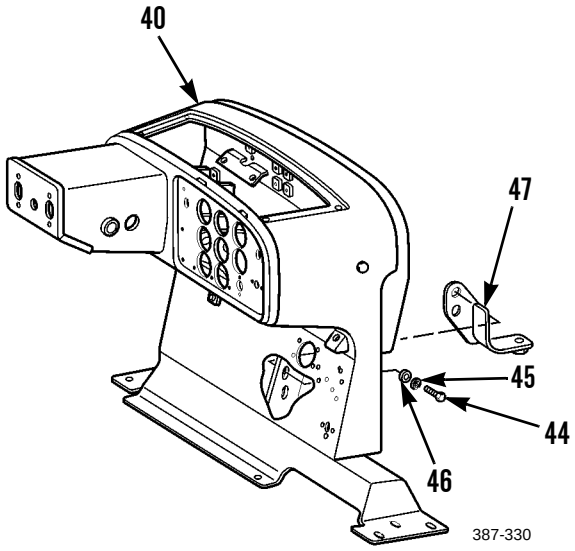
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

12. Install two lifting links (39) with 3/8-16 x 1-1/2 in. bolts in top of dash assembly (40) and fasten a nylon sling and a suitable lifting device to lifting links.
13. Remove six capscrews (41), washers (42) and lockwashers (43). Discard lockwashers.
14. Remove dash assembly (40) using lifting device.

NOTE

Perform steps 15-21 as required to remove remaining components from dash.

15. Remove electrical gages (WP 0081 00 thru WP 0084 00).
16. Remove heater switch, if equipped with winterization kit (WP 0193 00).
17. Remove engine oil pressure gage (WP 0231 00).
18. Remove governor linkage (WP 0058 00).
19. Remove steering clutch levers and linkage (WP 0148 00).
20. Remove steering brake pedals and linkage (WP 0146 00).
21. Remove capscrew (44), lockwasher (45) and washer (46) and remove support assembly (47) from dash assembly (40). Discard lockwasher.

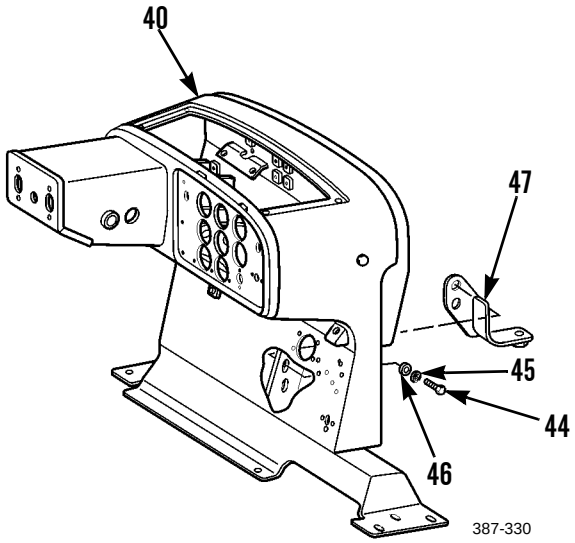


INSTALLATION

NOTE

Perform steps 1-7 as required to install components to dash.

1. Position support assembly (47) to dash assembly (40) and secure with washer (46), new lockwasher (45) and capscrew (44).



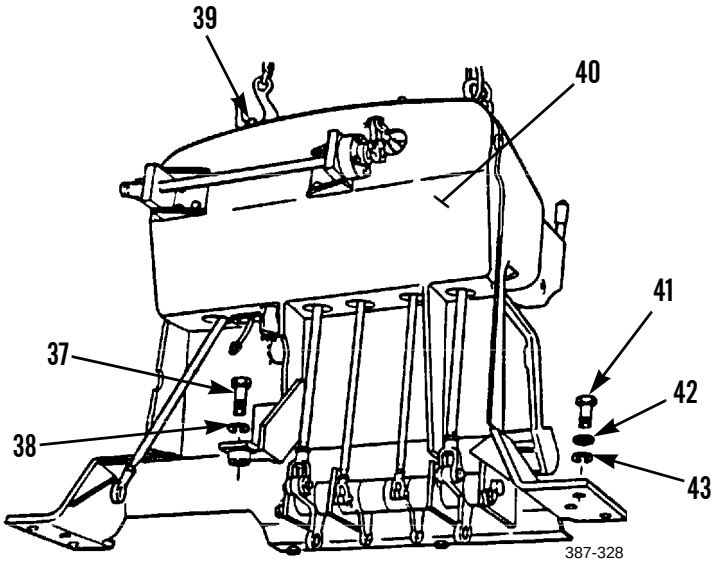
2. Install steering brake pedals and linkage (WP 0146 00).
3. Install steering clutch levers and linkage (WP 0148 00).
4. Install governor linkage (WP 0058 00).
5. Install engine oil pressure gage (WP 0231 00).
6. Install heater switch, if equipped with winterization kit (WP 0193 00).
7. Install electrical gages (WP 0081 thru WP 0084 00).

INSTALLATION - CONTINUED

WARNING

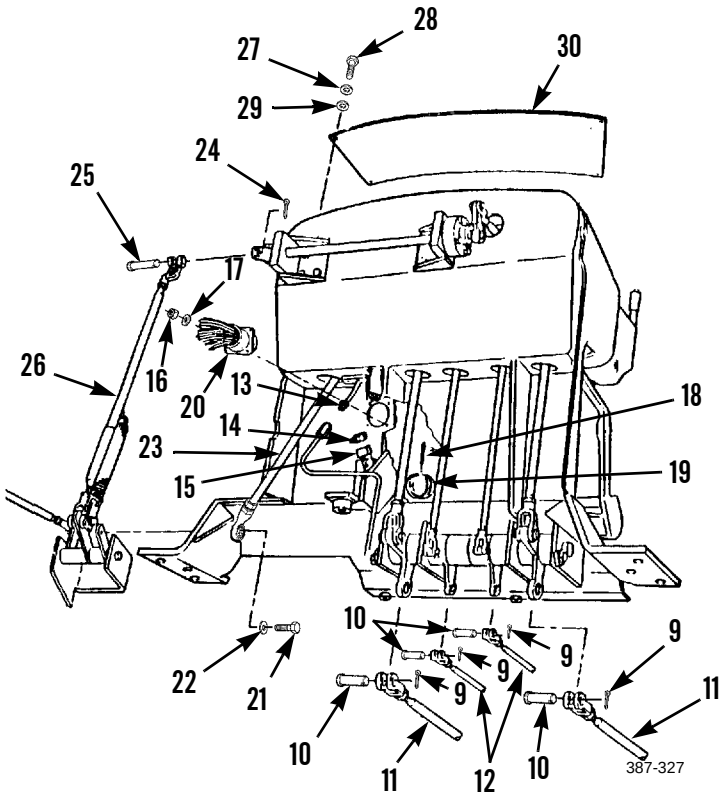
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

8. Use a nylon sling attached to two lifting links (39) and a suitable lifting device to position dash assembly (40) on frame. Install six new lockwashers (43), washers (42) and capscrews (41).
9. Remove lifting link, nylon sling and two lifting links (39) from dash assembly (40).
10. Install new lockwasher (38) and capscrew (37).



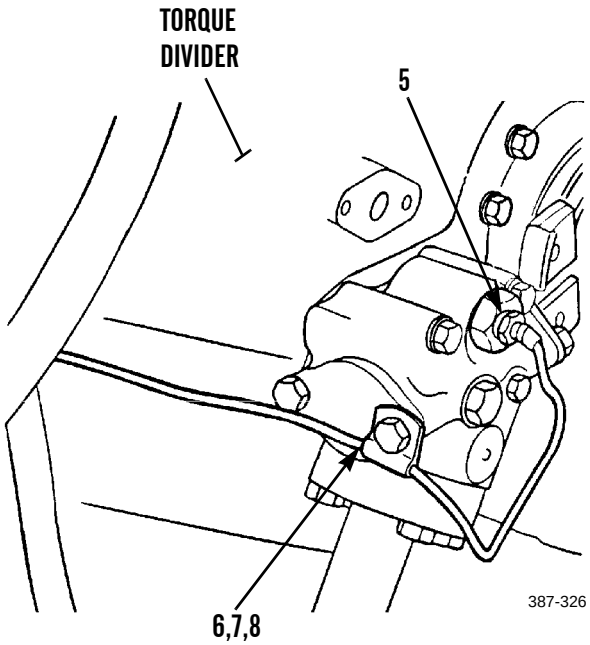
INSTALLATION - CONTINUED

11. Install cover (30) on dash assembly with four new lockwashers (29), washers (28) and capscrews (27).
12. Position throttle control rod (26) and install pin (25) and new cotter pin (24).
13. Position decelerator control rod (23) and install washer (22) and capscrew (21).
14. Reconnect chassis wiring harness (15) and tighten clamp (14).
15. Position STE/ICE wiring harness (20) on dash and install cover (19), four slotted screws (18), new lockwashers (17) and nuts (16).
16. Connect engine oil pressure line (13).
17. Position two brake rods (12) and two steering rods (11) and install four pins (10) and new cotter pins (9).

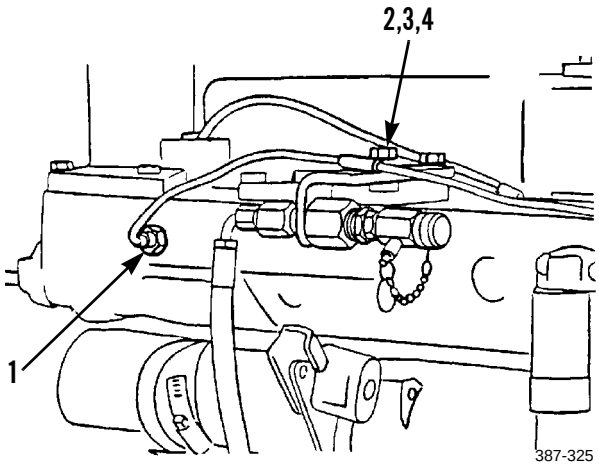


INSTALLATION - CONTINUED

18. Remove plug from opening and install torque converter oil temperature sensor (5). Install washer (7), capscrew (6) and clip (8) to secure sensor tubing.

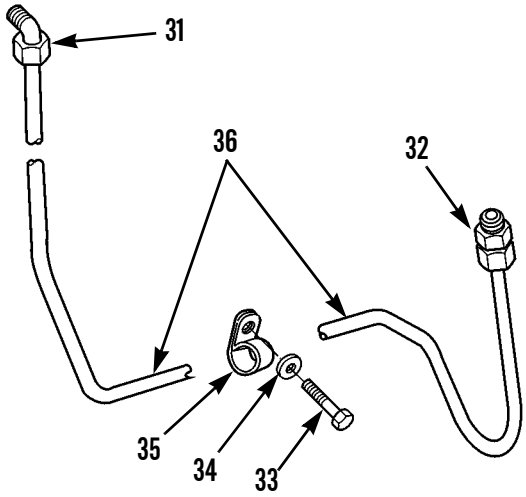


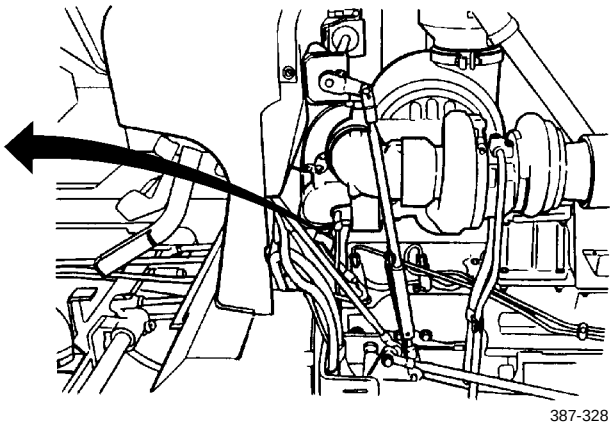
19. Install engine temperature sensor (1). Install three washers (3), capscrews (2) and clips (4) to secure sensor tubing.



INSTALLATION - CONTINUED

20. Position tube assembly (36) and secure with two clips (35), washers (34) and capscrews (33). Tighten fittings (31 and 32).





21. Install winterized cab, if equipped (WP 0168 00).
22. Install hood (WP 0159 00).
23. Refill cooling system (WP 0065 00).
24. Connect battery cables (WP 0101 00).
25. Operate machine and ensure all dash switches/gages work. Check for leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

BATTERY BOX REPLACEMENT 0161 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

References

WP 0197 00

Equipment Condition

Batteries removed (WP 0100 00)

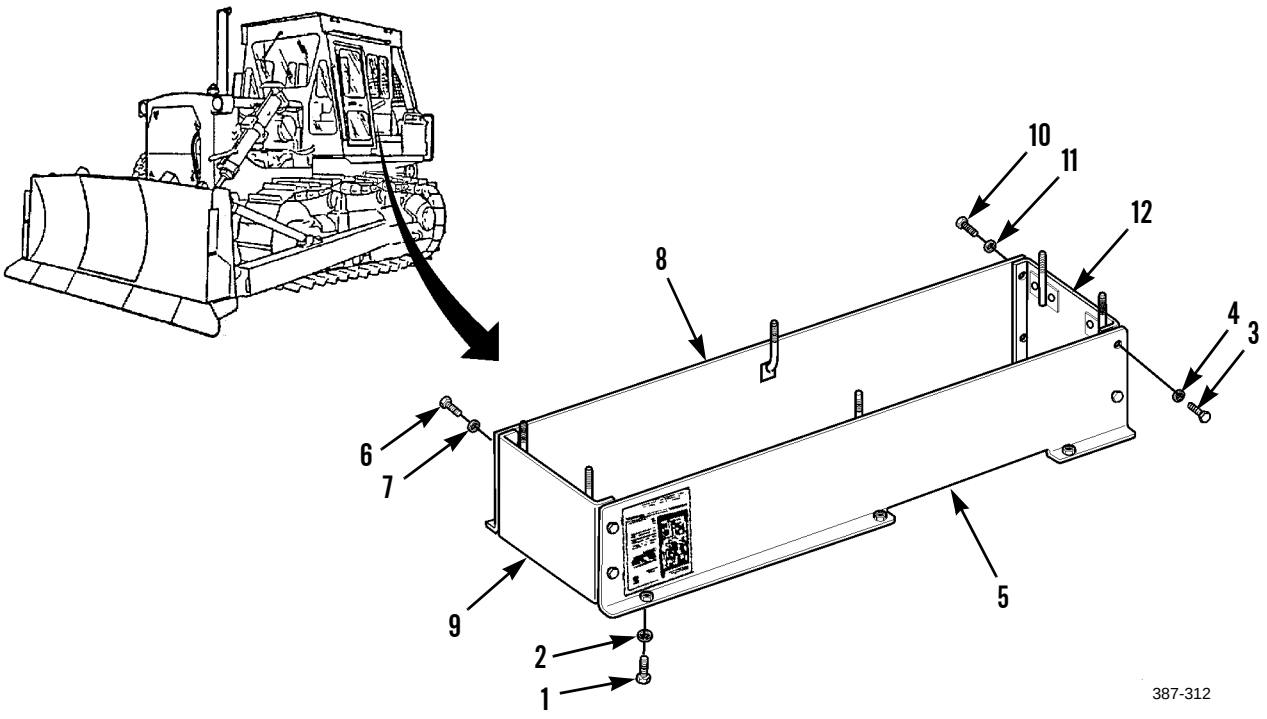
REMOVAL

1. Remove six capscrews (1) and washers (2) located underneath fender.

NOTE

Remove and save data plates (WP 0197 00) only when removing front panel for replacement.

2. Remove four capscrews (3) and washers (4) from panel (5). Lift panel (5) from tractor.
3. Remove two capscrews (6) and washers (7) from panel (8). Lift panel (9) from tractor.
4. Remove two capscrews (10) and washers (11) from panel (8). Lift panel (12) from tractor and then remove panel (8).



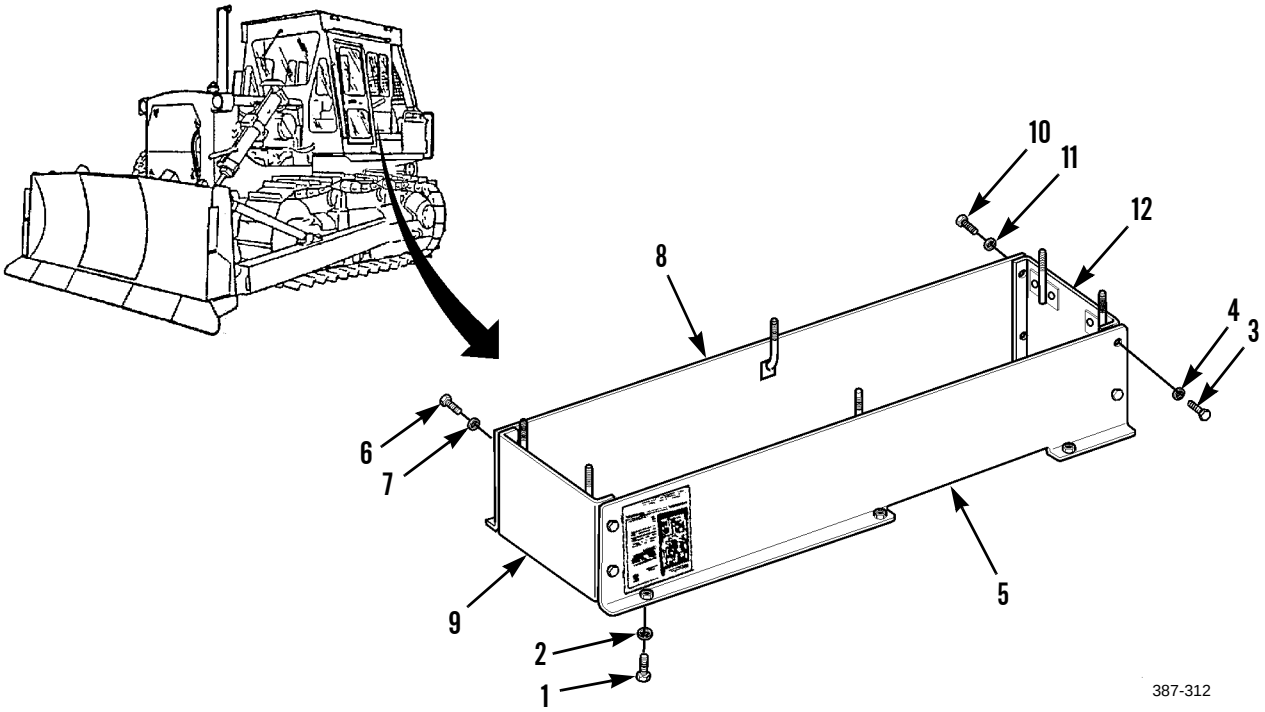
INSTALLATION

1. Place panel (8) in position on tractor. Place panel (12) in position and install two capscrews (10) and washers (11).
2. Place panel (9) in position and install two capscrews (7) and washers (6).

NOTE

Before installing new panel, mount data plates in appropriate location (WP 0197 00).

3. Place panel (5) in position and install four capscrews (3) and washers (4).
4. Install six capscrews (1) and washers (2) from underneath fender.



5. Install batteries (WP 0100 00).

END OF WORK PACKAGE

TRACK ROLLER GUARDS REPLACEMENT 0162 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Materials/Parts - Continued

Lockwasher (2, 6 and 12)

Two wood blocks, 4 in. x 4 in. x 20 in. long

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

TRACK ROLLER GUARDS REPLACEMENT - CONTINUED 0162 00

REMOVAL

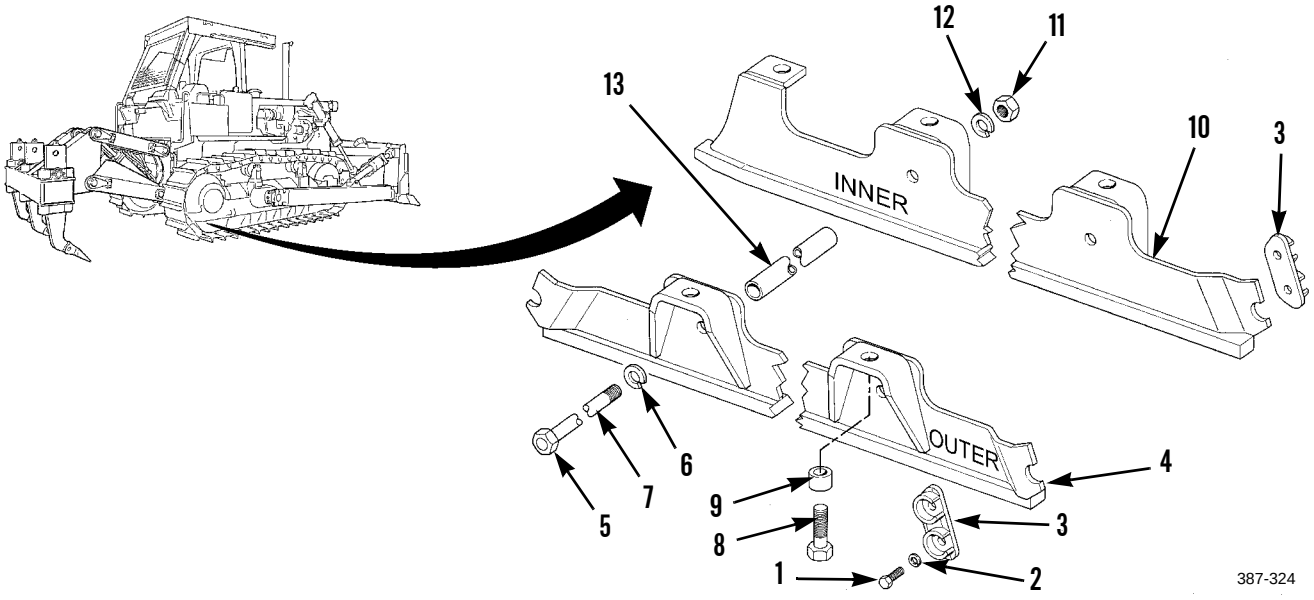
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury or death to personnel.

NOTE

- **Outer guards weigh 88 lb (40 kg) each.**
- **R.H. inner guard weighs 98 lb (44 kg).**
- **L.H. inner guard weighs 120 lb (54 kg).**
- **Right-side inner and outer track roller guards are shown. Left-side inner and outer track roller guards are replaced the same way.**

1. Remove two bolts (1), lockwashers (2) and retainer (3) from each end of the outer guard (4). Discard lockwashers.
2. Remove five nuts (5) and lockwashers (6). Push five rods (7) through outer guard (4). Discard lockwashers.
3. Place wooden blocks between track assembly and outer guard (4) at each end.
4. Remove five capscrews (8) and spacers (9) that hold outer guard (4) to track roller frame. Use capscrews to lower outer guard onto wooden blocks. Remove outer guard.
5. Remove five rods (7) from inner guard (10). If required, remove nut (11) and lockwasher (12) from each of five rods. Remove five spacers (13) from inner guard. Discard lockwashers.
6. Place wooden blocks between track assembly and inner guard (10) at each end.
7. Remove two bolts (1), lockwashers (2) and retainer (3) at forward end of inner guard (10) to track roller frame. Discard lockwashers.
8. Remove six capscrews (8) and spacers (9) that hold inner guard (10) to track roller frame. Use capscrews to lower inner guard onto wooden blocks. Remove inner guard.



INSTALLATION

NOTE

Apply antiseize components to all guard mounting bolts and capscrews before installation.

1. Position inner guard (10) on track roller frame and loosely install six capscrews (8) and spacers (9).
2. Insert five rods (7) through inner guard (10) with nut (11) and new lockwasher (12) loosely installed on each rod.
3. Place spacers (13) over rods (7).
4. Position outer guard (4) on track roller frame and loosely install five capscrews (8) and spacers (9).
5. Feed rods (7) through outer guard (4).
6. Loosely install five new lockwashers (6) and nuts (5) on rods (7) on outer guard side.
7. Tighten capscrews (8) on both outer and inner guards (4 and 10) to 500 lb-ft (678 Nm).
8. Tighten nuts (5 and 11) on rods (7) to 265 lb-ft (359 Nm).
9. Install retainer (3) at forward end of inner guard (10) with two bolts (1) and new lockwashers (2).
10. Install retainer (3) at each end of outer guard (4) with two bolts (1) and new lockwashers (2).

END OF WORK PACKAGE

TRACK ROLLER FRAME GUARDS REPLACEMENT 0163 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury to personnel.

REMOVAL

NOTE

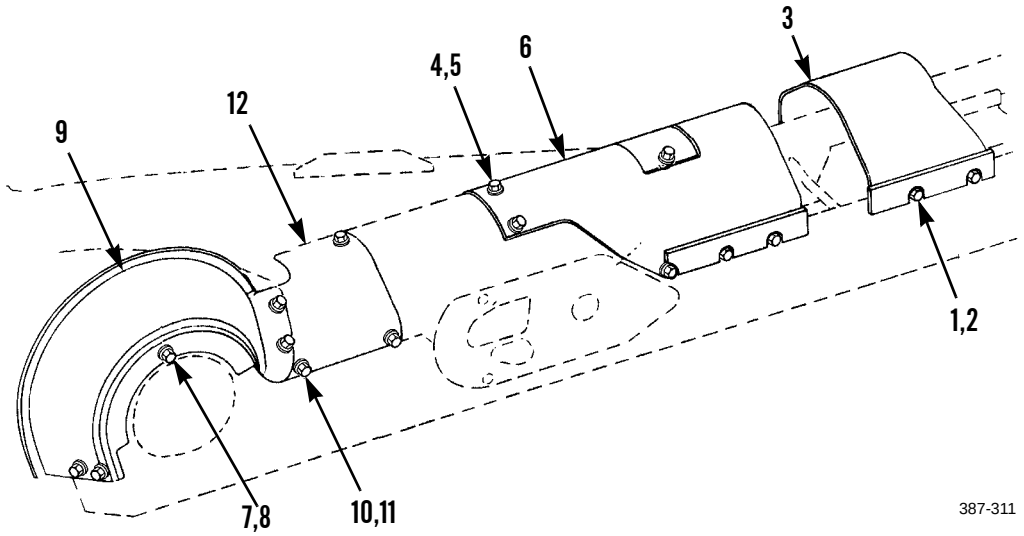
Guard (3) weighs 24 lb (11 kg).

1. Remove four bolts (1), washers (2) and guard (3) from front end of track roller frame.

NOTE

Guard (6) weighs 52 lb (24 kg). All other guards weigh 20 lb (9 kg) or less.

2. Remove nine bolts (4), washers (5) and guard (6) from center of track roller frame.
3. Remove five bolts (7), washers (8) and guard (9) from rear of track roller frame.
4. Remove four bolts (10), washers (11) and (12) from rear of track roller frame.



INSTALLATION

NOTE

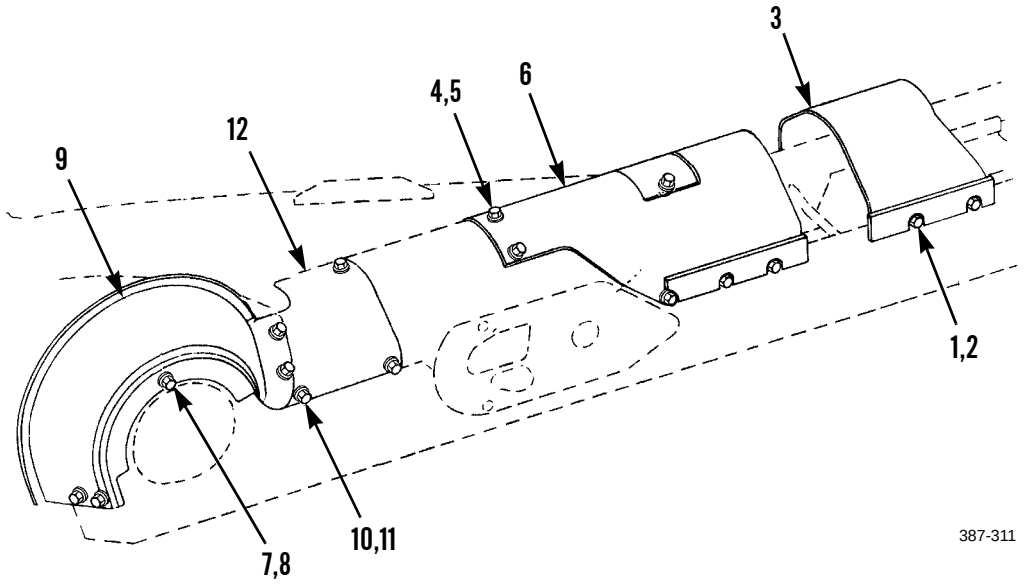
- **Guards (9 and 12) weigh 20 lb (9 kg) or less.**
- **Apply antiseize compound to all guard mounting bolts before installation.**

1. Install guard (12) with four washers (11) and bolts (10).
2. Install guard (9) with five washers (8) and bolts (7).

NOTE

Guard (6) weighs 52 lb (24 kg). Guard (3) weighs 24 lb (11 kg).

3. Install guard (6) with nine washers (5) and bolts (4).
4. Install guard (3) with four washers (2) and bolts (1).



END OF WORK PACKAGE

ROLLOVER PROTECTIVE STRUCTURE (ROPS) REPLACEMENT 0164 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250 00)

Lifting equipment, 4,000 lb capacity

References

WP 0165 00

WP 0166 00

Personnel Required

Three

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Protective screen removed from ROPS, if equipped with screen (WP 0167 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

ROPS weighs approximately 1,500 lb (681 kg).

REMOVAL

1. Attach suitable lifting device to ROPS.

NOTE

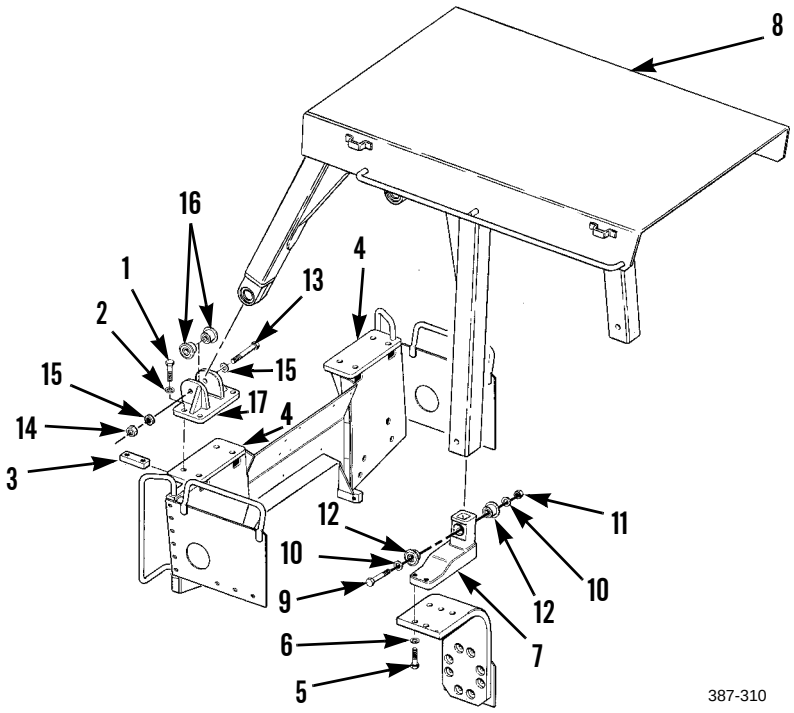
Capscrew heads are located underneath fenders.

2. Remove four capscrews (1), washers (2) and two nut strips (3) from each side of rear mounting pads (4) on tractor.
3. Remove three bolts (5) and washers (6) on each side of tractor from front mounting pad (7) and ROPS (8).
4. Using suitable lifting device, lift ROPS (8) with mounting pads (7) from tractor.

NOTE

Steps 4 and 5 apply to both right and left pads.

5. Remove bolt (9), two washers (10), nut (11), two bushings (12) and front mounting pad (7) from front leg of ROPS (8).
6. Remove bolt (13), nut (14), two washers (15), bushings (16) and rear mounting pad (17) from rear leg of ROPS (8).



INSTALLATION

NOTE

- **If ROPS has been replaced, notify Direct Support Maintenance to install protective screen angle mounted brackets by welding (WP 0166 00).**
- **Apply antiseize compound to all mounting bolts and capscrews before installation.**
- **Steps 1 and 2 apply to both right and left hand pads.**

1. Install rear mounting pad (17) and two bushings (16) to rear leg of ROPS (8) with bolt (13), two washers (15) and nut (14).
2. Install front mounting pad (7) and two bushings (12) to front leg of ROPS (8) with bolt (9), two washers (10) and nut (11).
3. Attach a suitable lifting device to ROPS (8) and lift ROPS into position on tractor.
4. Install three bolts (5) and washers (6) on each side of tractor to front mounting pad (7) and ROPS (8).
5. Install four capscrews (1), washers (2) and two nut strips (3) to each side of rear mounting pads (4) on tractor and ROPS (8).
6. Evenly tighten capscrews (1 and 13) and bolts (5 and 14) to 900 lb-ft (1220 Nm).
7. If equipped, install protective screen (WP 0167 00).

END OF WORK PACKAGE

ROPS MOUNTING BRACKETS AND PLATES REPLACEMENT 0165 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 1000 lb capacity

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Lockwasher (19)

References

WP 0245 00

Personnel Required

Two

Equipment Condition

ROPS removed (WP 0164 00)

Rear floodlamp removed (WP 0093 00)

Backup alarm removed (WP 0098 00)

WARNING

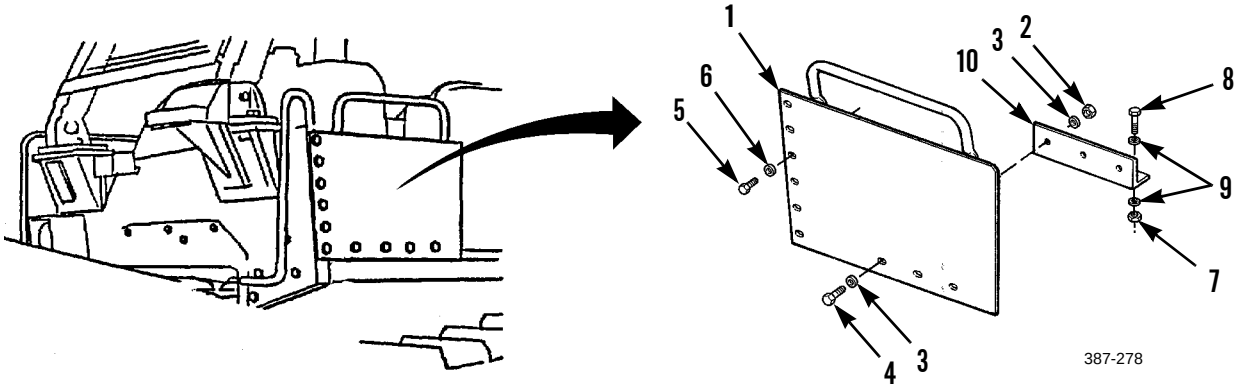
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

REMOVAL

NOTE

R.H. plate weighs 51 lb (23 kg).

1. Attach a nylon sling and a suitable lifting device to R.H. plate (1).
2. Remove three nuts (2), six washers (3) and three capscrews (4) from bottom edge of R.H. plate (1).
3. Remove six capscrews (5), washers (6) and R.H. plate (1).
4. Remove two nuts (7), capscrews (8), four washers (9) and angle (10) from right rear of machine.

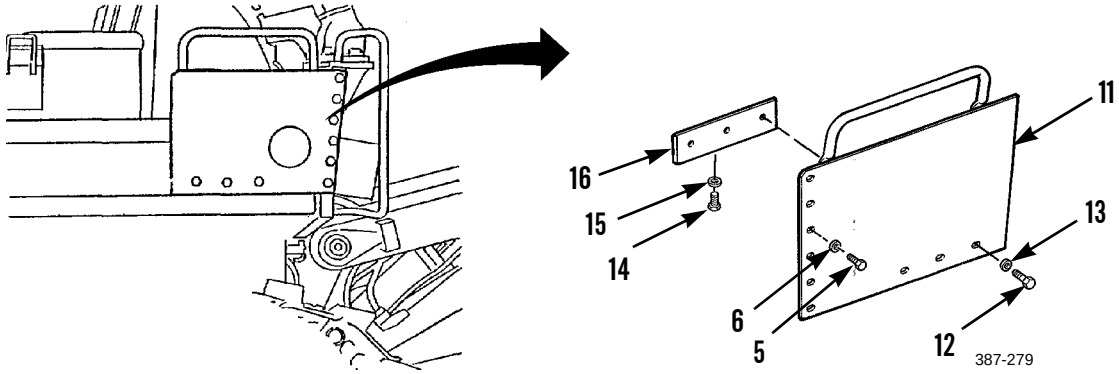


REMOVAL - CONTINUED

NOTE

L.H. plate weighs 48 lb (22 kg).

5. Attach a nylon sling and a suitable lifting device to L.H. plate (11).
6. Remove three capscrews (12) and washers (13) from bottom edge of L.H. plate (11).
7. Remove six capscrews (5), washers (6) and L.H. plate (11).
8. Remove three capscrews (14), washers (15) and block (16) from left rear of machine.



NOTE

Cover weighs 17 lb (8 kg).

9. Remove five capscrews (17), washers (18), lockwashers (19) and cover (20) from back of machine. Discard lockwashers.
10. Remove four capscrews (21), washers (22) and gas can support bracket (23) from support assembly (24).

NOTE

Support assembly weighs 453 lb (206 kg).

11. Attach a nylon sling and a suitable lifting device to support assembly (24).
12. Remove three capscrews (25), six washers (26) and three nuts (27) from one side of support assembly (24).
13. Remove capscrew (28), washer (29) and shims (30) on same side of support assembly (24).
14. Repeat steps 12 and 13 on other side and remove support assembly (24) from machine.

INSTALLATION

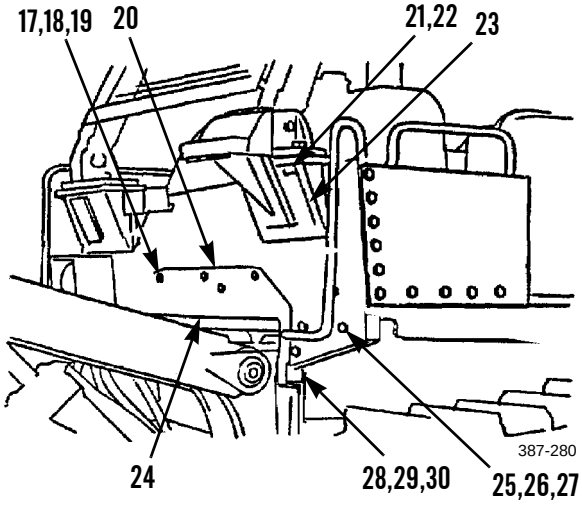
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **If ROPS is replaced, new ROPS will not come with welded on angle brackets to mount protective screen. Perform this task to weld angle brackets on new ROPS.**
- **Support assembly weighs 453 lb (206 kg).**
- **Apply antiseize compound to all mounting capscews before installation.**
- **Ensure all mounting bracket and plate mounting hardware is tightened IAW torque limits (WP 0245 00).**

1. Use a nylon sling and a suitable lifting device to position support assembly (24) at rear of machine.
2. Install capscrew (28), washer (29) and shims (30) on one side of support assembly (24). Do NOT tighten capscrew.
3. Install three capscrews (25), six washers (26) and three nuts (27) on same side of support assembly (24). Do NOT tighten capscrews.
4. Repeat steps 2 and 3 on other side of support assembly (24).
5. Tighten all capscrews (25 and 28). Remove nylon sling lifting device.
6. Install gas can support bracket (23) on support assembly (24) with four capscrews (21) and washers (22).



NOTE

Cover weighs 17 lb (8 kg).

7. Install cover (20) on support assembly (24) with five capscrews (17), washers (18) and new lockwashers (19).
8. Install block (16) at left rear of machine with three capscrews (14) and washers (15).

INSTALLATION - CONTINUED

NOTE

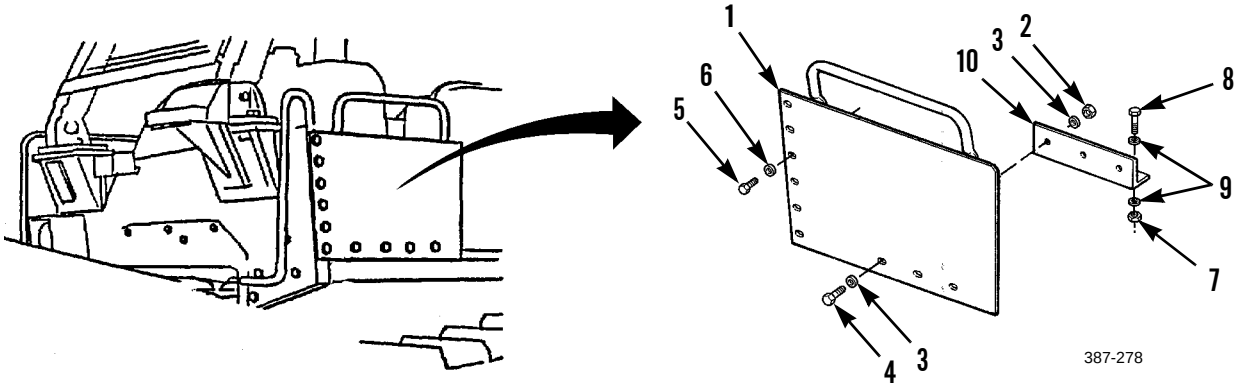
L.H. plate weighs 48 lb (22 kg).

9. Use a nylon sling and a suitable lifting device to position L.H. plate (11) to left rear side of machine.
10. Install L.H. plate (11) on block (16) with three capscrews (12) and washers (13). Do NOT tighten capscrews.
11. Install L.H. plate (11) with six capscrews (5) and washers (6).
12. Tighten nine capscrews (5 and 12).
13. Install angle (10) to right rear of machine with two capscrews (8), four washers (9) and two nuts (7).

NOTE

R.H. plate weighs 51 lb (23 kg).

14. Use a nylon sling and a suitable lifting device to position R.H. plate (1) to right rear of machine.
15. Install R.H. plate (1) on angle (10) with three capscrews (4), six washers (3) and three nuts (2). Do NOT tighten capscrews.
16. Install six capscrews (5) and washers (6).
17. Tighten nine capscrews (4 and 5).



18. Install backup alarm (WP 0098 00).
19. Install rear floodlamp (WP 0093 00).
20. Install ROPS (WP 0164 00).

END OF WORK PACKAGE

WELDING PROCEDURE TO INSTALL PROTECTIVE SCREEN ANGLE BRACKETS 00166 00

THIS WORK PACKAGE COVERS

Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, welding (Item 108, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

References

TC 9-237

Personnel Required

Two

Equipment Condition

Protective screen removed (WP 0167 00)

NOTE

- **If ROPS is replaced, new ROPS will not come with welded-on angle brackets to mount protective screen. Perform this task to weld angle brackets on new ROPS.**
- **ROPS certification will not be affected if welding is done IAW instructions in this work package.**
- **A certified welder is required.**

INSTALLATION

1. Install four angle brackets to protective screen (WP 0167 00).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death to personnel.

NOTE

Protective screen weighs 60 lb (27 kg).

2. Attach a nylon sling and a suitable lifting device to protective screen.
3. Lift protective screen into position at ROPS.
4. Mark outline of angle brackets on ROPS to indicate bracket location.
5. Lower protection screen to the ground and remove the four angle brackets.
6. Weld each angle bracket to ROPS IAW TC 9-237, *Operator's Circular for Welding Theory and Application*.

END OF WORK PACKAGE

PROTECTIVE SCREEN REPLACEMENT 0167 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

References

WP 0166 00

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

REMOVAL

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Screen weighs 60 lb (27 kg).**
- **Screen mounting hardware may vary from one machine to another.**

1. Attach a nylon sling and a suitable lifting device to screen (1). Take up all slack in sling.
2. Remove two bolts (2) and washers (3) at top of screen (1).
3. Remove two bolts (4) and washers (5) at bottom of screen (1) and remove screen from four angle brackets that are welded to ROPS (6).

NOTE

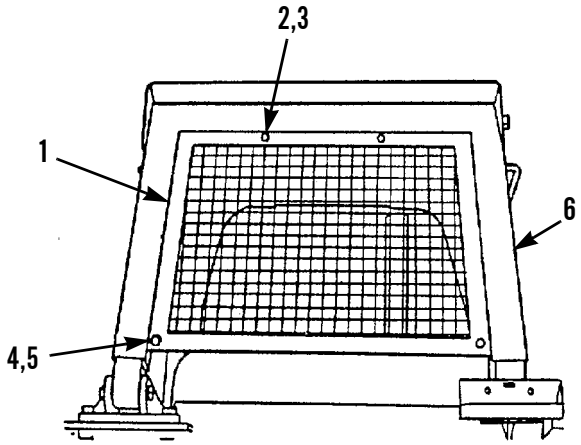
If angle brackets are damaged, they may be replaced by Direct Support Maintenance IAW welding instructions in WP 0166 00.

INSTALLATION

NOTE

Apply antiseize compound to mounting bolts before installation.

1. Attach a nylon sling and suitable lifting device to screen (1) and position screen on ROPS (6). Install two bolts (4) and washers (5) at bottom of screen.
2. Install two bolts (2) and washers (3) at top of screen (1).



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END OF WORK PACKAGE

WINTERIZED CAB MAINTENANCE 0168 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 200 lb capacity

Materials/Parts

Compound, silicone, RTV (Item 10, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Wood cribbing, 4 in. x 4 in. x 2 ft.

Gasket (42, 49 and 61)

Personnel Required

Three

References

WP 0087 00

WP 0164 00

WP 0169 00

WP 0192 00

WP 0194 00

WP 0195 00

WP 0196 00

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

REMOVAL

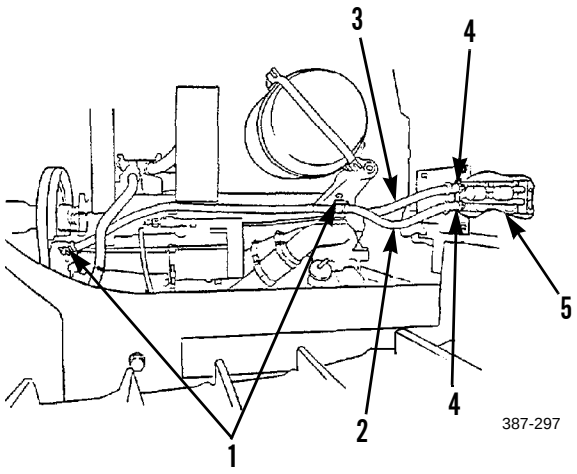
NOTE

Perform steps 1-5 only as required for disassembly.

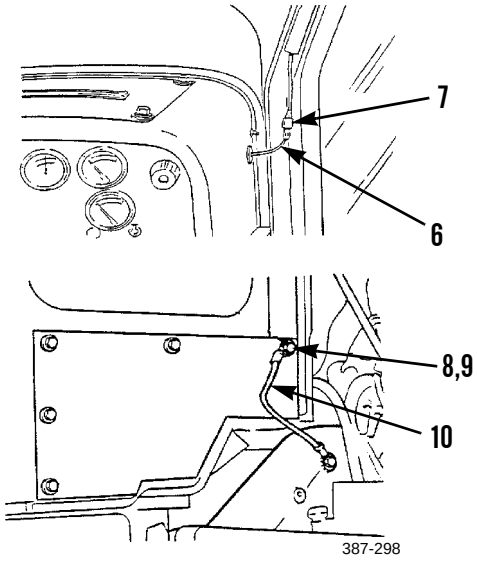
1. Remove defroster fans (WP 0195 00).
2. Remove heater (WP 0192 00).
3. Remove windshield wipers (WP 0194 00).
4. Remove windshield wiper switches (WP 0087 00).
5. Remove sound suppression panels (WP 0196 00).

REMOVAL - CONTINUED

6. Close two petcocks (1) on heater hoses in engine compartment.
7. Tag hoses (2 and 3), loosen two hose clamps (4) and disconnect hoses from heater (5). Pull hoses out of cab.



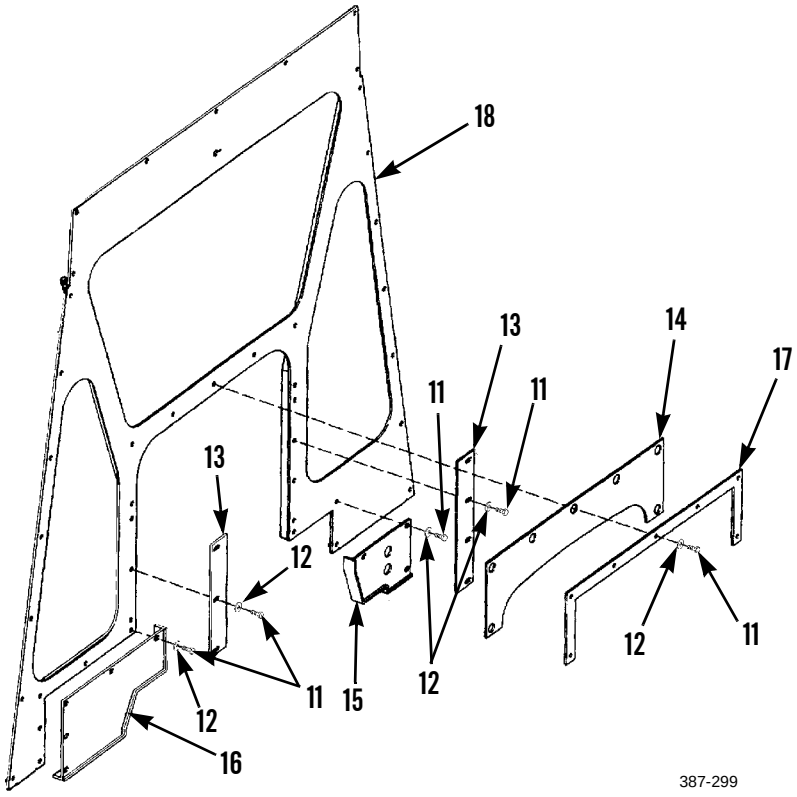
8. Disconnect power wire (6) at connector (7) to right of dash panel.
9. Remove capscrew (8), washer (9) and ground wire (10) from right front cab panel. Move wire away from cab and reinstall capscrew and washer.



10. Slide a flat knife or similar tool between foam and tractor mating surface to break seal.

REMOVAL - CONTINUED

11. Loosen but do NOT remove, 22 capscrews (11) and washers (12) from braces (13 and 14) and panels (15, 16, and 17) attached to front panel (18).



WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

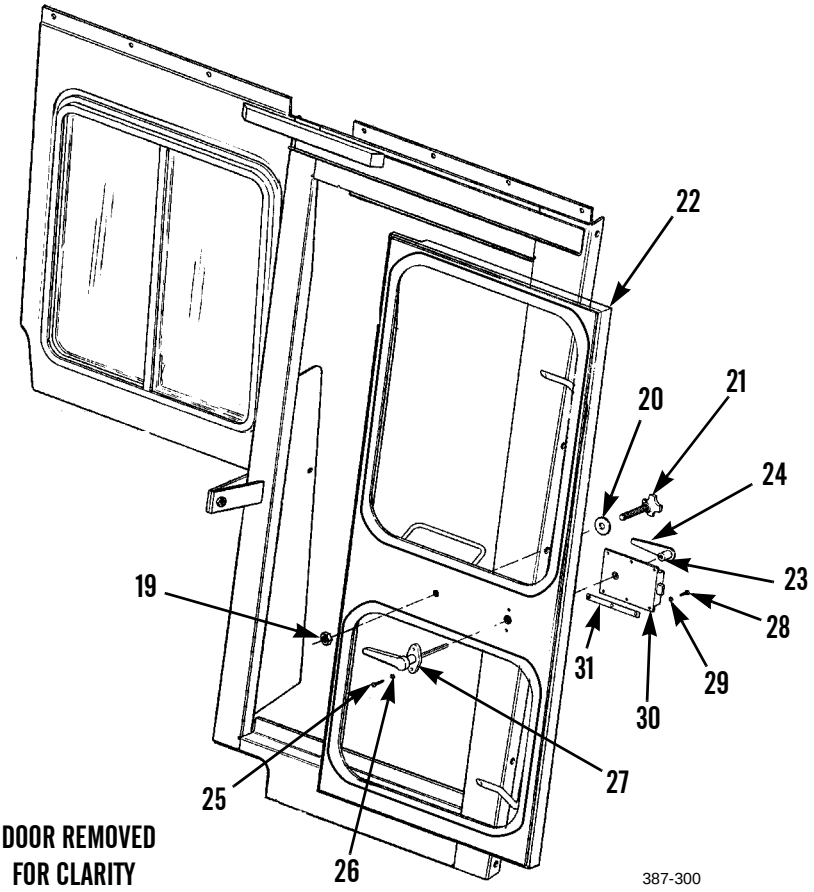
- **Weight of cab with ROPS is 3,000 lb (1,362 kg).**
- **Support rear feet with wood cribbing to level ROPS canopy when resting winterized cab on ground.**

12. Follow instructions for removing ROPS to remove winterized cab (WP 0164 00).

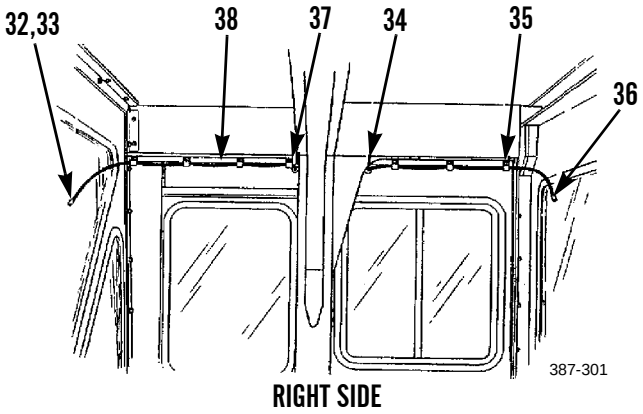
13. Remove all gaskets from mating surfaces.

DISASSEMBLY

1. Remove glass from all panels (WP 0169 00).
2. Remove nut (19), washer (20) and knob (21) from door (22).
3. Loosen setscrew (23) on inside handle (24) and remove handle.
4. Remove two screws (25), washers (26) and outside handle (27).
5. Remove six screws (28), washers (29), latch assembly (30) and shims (31) from door (22).

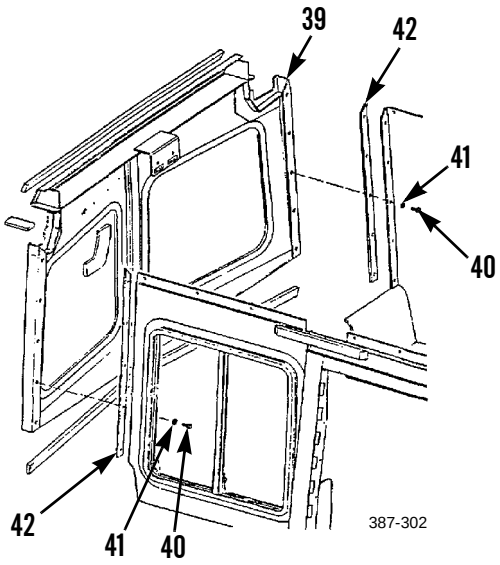


6. Remove all capscrews (32) and clamps (33) holding wiring harness to cab.
7. Pry out grommet (34).
8. Disconnect four connectors (35) and remove rear wiring harness half (36).
9. Pry out grommet (37).
10. Take front wiring harness half (38) out towards front of cab.



DISASSEMBLY - CONTINUED

11. Hold rear panel (39) and remove five capscrews (40) and washers (41) from rear panel and side panel. Repeat this procedure on other side.
12. Lower rear panel (39) onto a pallet. Remove gaskets (42). Discard gaskets.

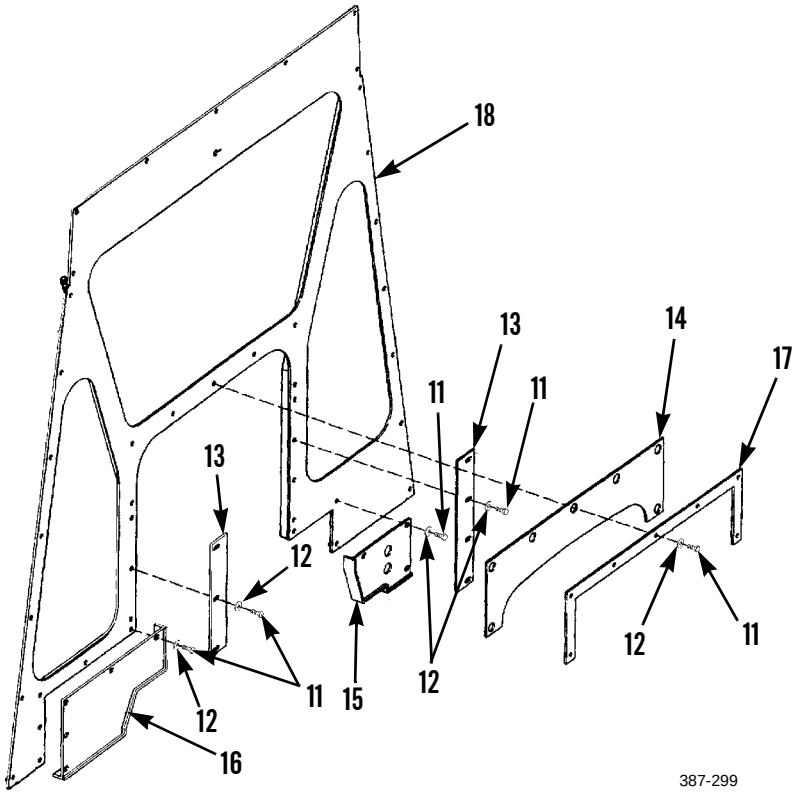


DISASSEMBLY - CONTINUED

NOTE

Panels (15, 16, and 17) and braces (13 and 14) were loosened during removal.

13. Remove five capscrews (11), washers (12) and panel (17) from front panel (18).
14. Remove three capscrews (11), washers (12) and panel (16) from front panel (18).
15. Remove seven capscrews (11), washers (12) and braces (13) from front panel (18).
16. Remove seven capscrews (11), washers (12), brace (14) and panel (15) from front panel (18).



WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Weight of cab with ROPS is 3,000 lb (1,362 kg).**
- **Support rear feet with wood cribbing to level ROPS canopy when resting winterized cab on ground.**

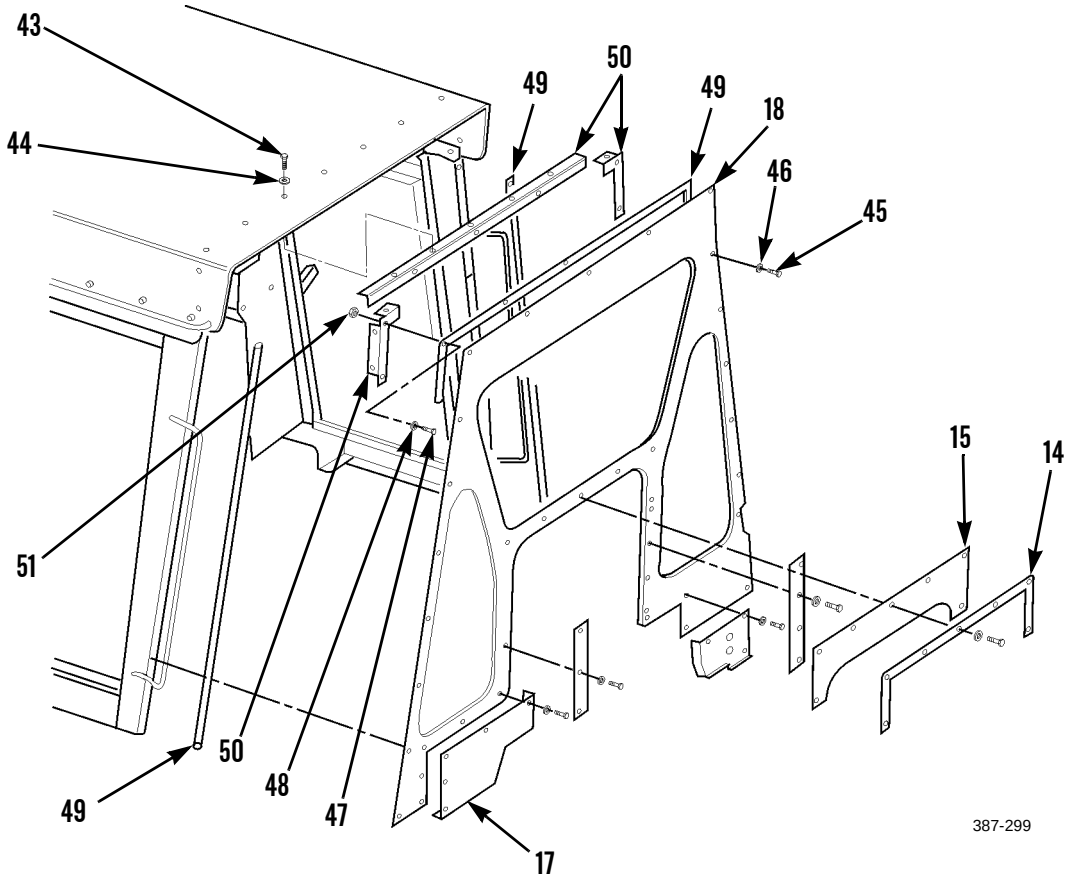
DISASSEMBLY - CONTINUED

17. Attach a nylon sling and a suitable lifting device to front panel (18).
18. Remove 11 capscrews (43) and washers (44) from ROPS canopy.
19. Remove 14 capscrews (45) and washers (46) from side of front panel (18).

WARNING

Front panel will be unsteady. Use extreme caution when removing from ROPS.

20. Use nylon sling and lifting device to separate front panel (18) from side panels and ROPS. Lay panel on pallet.
21. Remove seven capscrews (47), washers (48), gaskets (49), brackets (50) and seven nuts (51). Discard gaskets.



DISASSEMBLY - CONTINUED

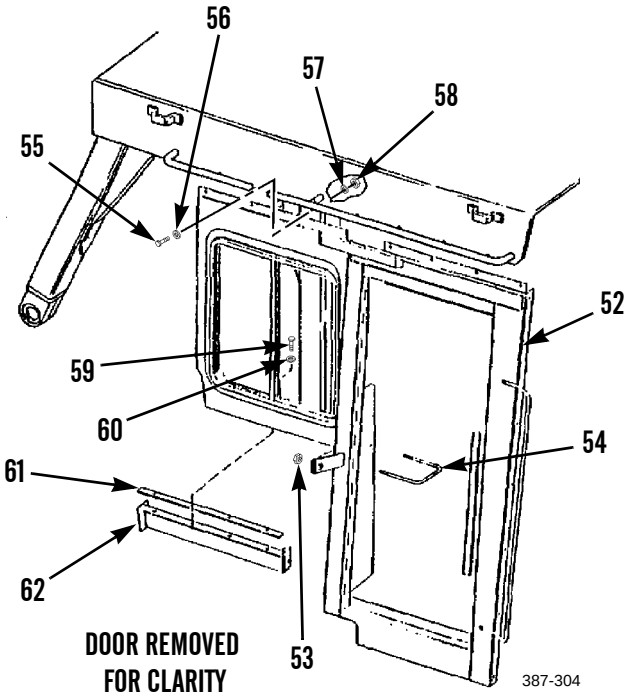
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

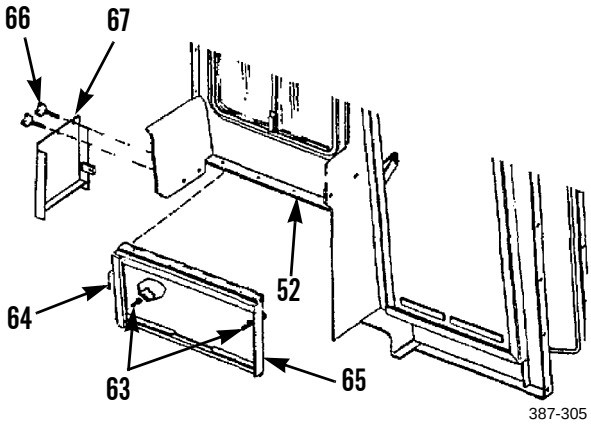
- **Weight of cab with ROPS is 3,000 lb (1,362 kg).**
- **Support rear feet with wood cribbing to level ROPS canopy when resting winterized cab on ground.**
- **Follow steps 22 through 25 for removal of either R.H. or L.H. side panel (52).**

22. Attach nylon sling and lifting device to side panel (52). Remove nuts (53) and U-bolts (54) from side panel and ROPS support leg.
23. Remove seven capscrews (55), washers (56), washers (57) and nuts (58).
24. Use nylon sling and lifting device to move side panel (52) away from ROPS.
25. On R.H. side panel (52), remove four capscrews (59) and washers (60). Remove gasket (61) and plate (62). Discard gasket.



DISASSEMBLY - CONTINUED

26. On L.H. side panel (52) loosen knobs (63).
27. Remove four capscrews (64) and panel (65) from L.H. side panel (52).
28. Loosen knobs (66) and remove panel (67) from L.H. side panel (52).



ASSEMBLY

NOTE

Use silicone-based sealant on all mating surfaces.

1. Place panel (67) in position on L.H. side panel (52). Tighten knobs (66).
2. Install panel (65) with four capscrews (64) to L.H. side panel (52). Tighten knobs (63).
3. On R.H. side panel (52), install new gasket (61) and plate (62) with four capscrews (59) and washers (60).

WARNING

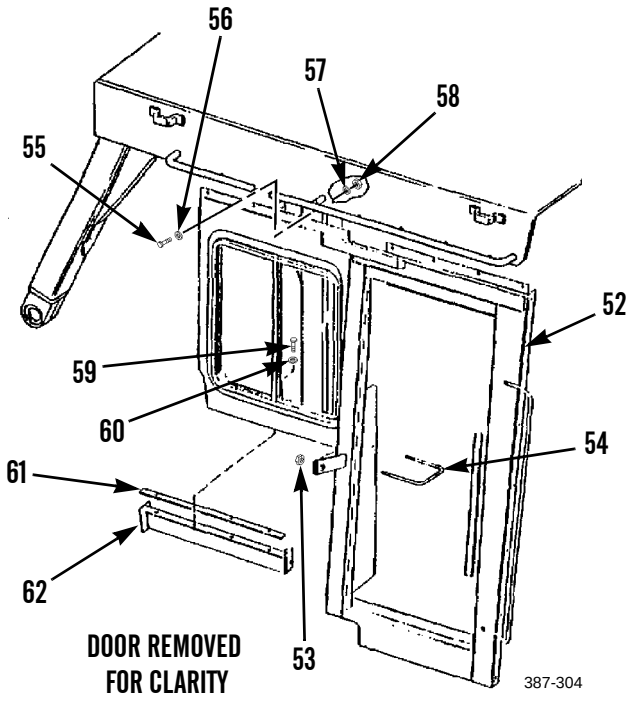
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Weight of cab with ROPS is 3,000 lb (1,362 kg).**
- **Support rear feet with wood cribbing to level ROPS canopy when resting winterized cab on ground.**
- **Follow steps 4 through 6 for installation of either L.H. or R.H. side panel (52).**

ASSEMBLY - CONTINUED

4. Attach a nylon sling and a suitable lifting device to side panel (52) and position panel on ROPS.
5. Install seven capscrews (55), washers (56), washers (57) and nuts (58).
6. Install U-bolts (54) and nuts (53) to side panel (52) and ROPS support leg.



ASSEMBLY - CONTINUED

7. Install seven capscrews (47), washers (48), brackets (50) and nuts (51).

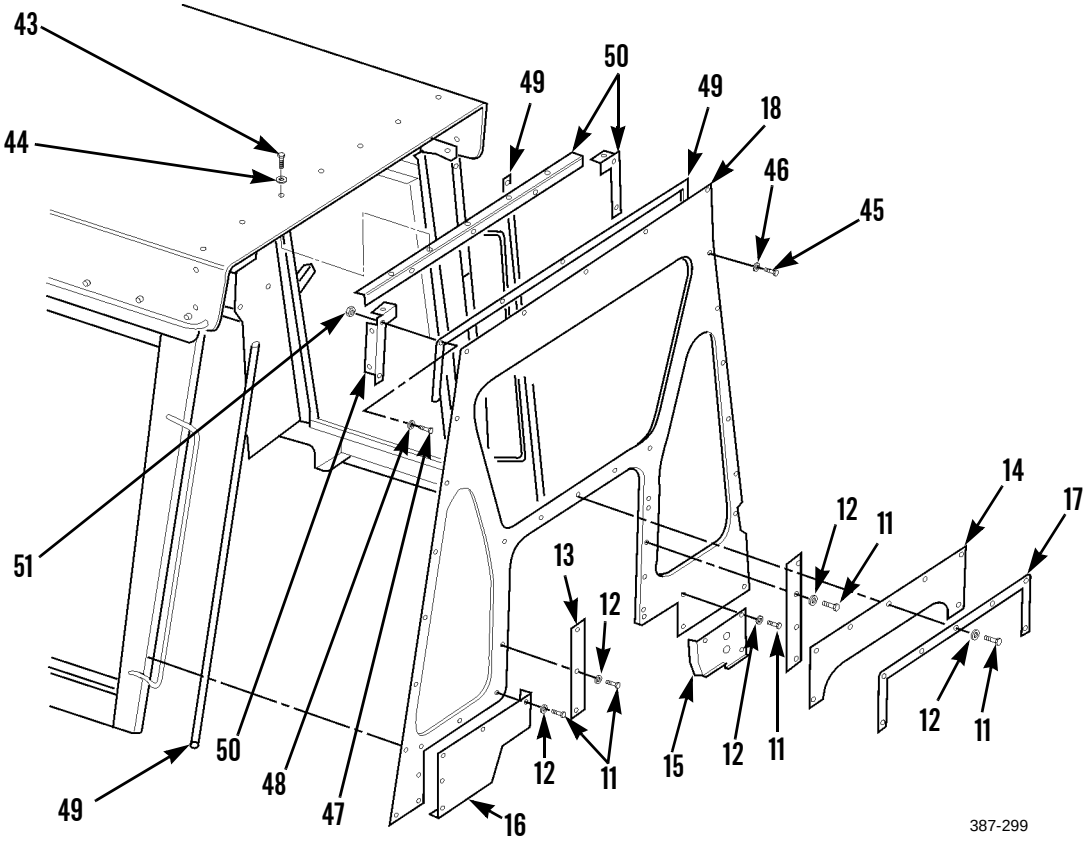
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

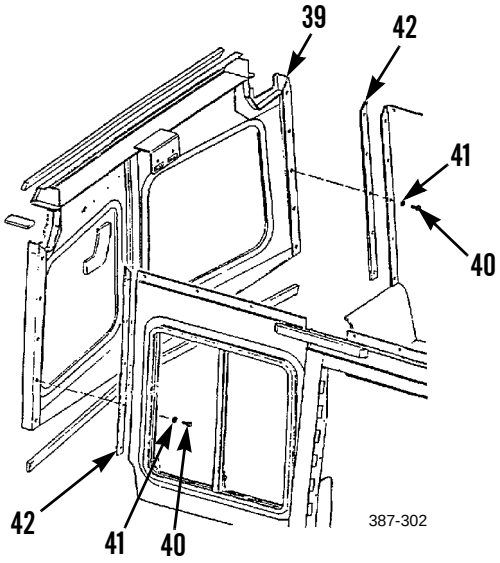
- **Weight of cab with ROPS is 3,000 lb (1,362 kg).**
- **Support rear feet with wood cribbing to level ROPS canopy when resting winterized cab on ground.**
- **Follow steps 4 through 6 for installation of either L.H. or R.H. side panel (52).**

8. Attach nylon sling and lifting device to front panel (18) and position panel on side panels.
9. Place new straight gaskets (49) in position and install 14 capscrews (45) and washers (46) from side of front panel (18).
10. Install 11 capscrews (43) and washers (44) on ROPS canopy.
11. Install seven capscrews (11), washers (12), brace (14) and panel (15) to front panel (18).
12. Install seven capscrews (11), washers (12) and braces (13) to front panel (18).
13. Install three capscrews (11), washers (12) and panel (16) to front panel (18).
14. Install five capscrews (11), washers (12) and panel (17) to front panel (18).

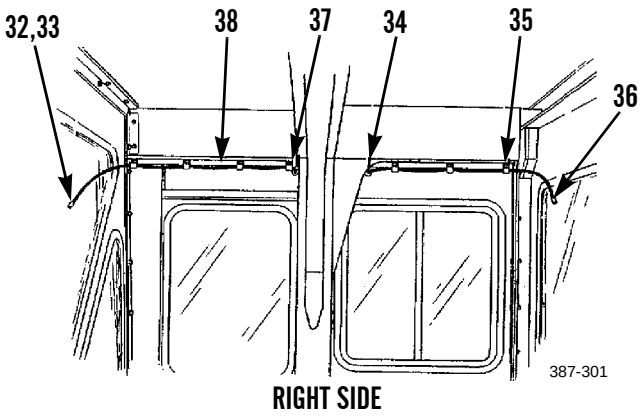


ASSEMBLY - CONTINUED

15. Place new gaskets (42) in position on side panels and position rear panel (39) on side panels.
16. Install five capscrews (40) and washers (41) on each side panel.

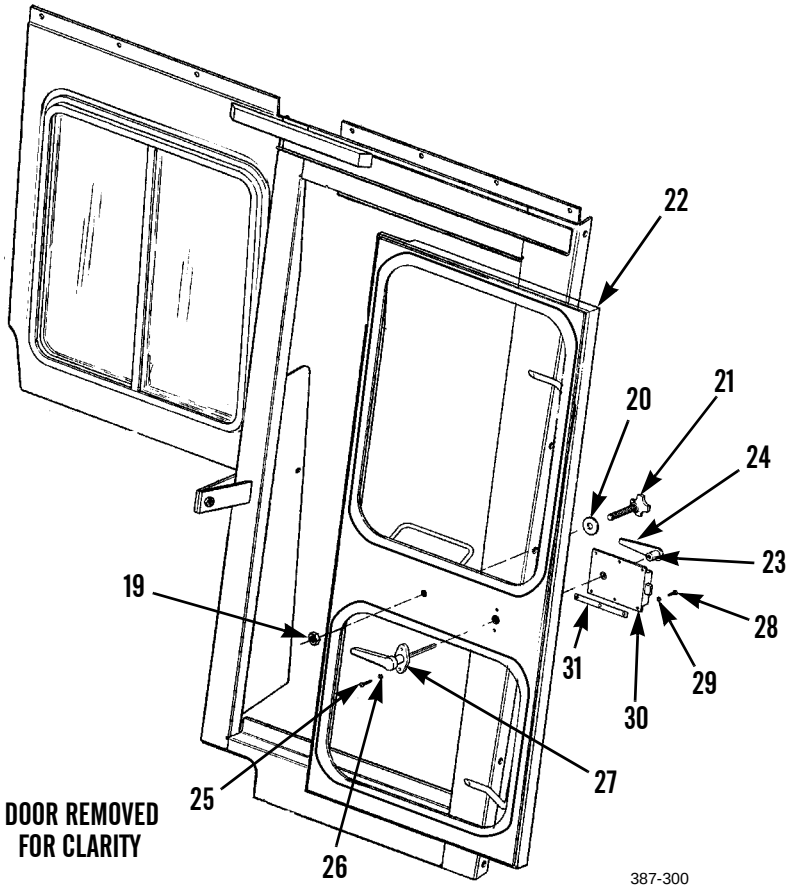


17. Install grommets (37) and (34) inside winterized cab.
18. Pull front wiring harness half (38) in through front of cab and feed through grommets (37 and 34).
19. Pull rear wiring harness half (36) in through back of cab.
20. Connect four connectors (35).
21. Install clamps (33) and capscrews (32) to secure wiring harness to cab.



ASSEMBLY - CONTINUED

22. Install six screws (28), washers (29), latch assembly (30) and shims (31) to door (22).
23. Install two screws (25), washers (26) and outside handle (27) to door (22).
24. Place inside handle (24) in position and tighten setscrew (23).
25. Place knob (21) and washer (20) in door (22) and install nut (19).



26. Install glass in all panels (WP 0169 00).

INSTALLATION

1. Cement all foam gaskets on mating surfaces of cab using RTV silicone compound.

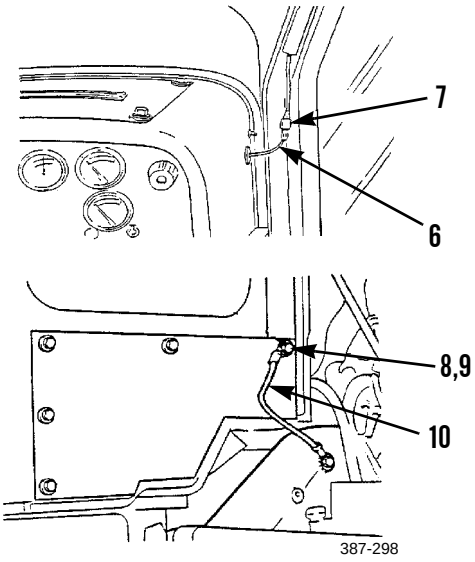
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Weight of cab with ROPS is 3,000 lb (1,362 kg).

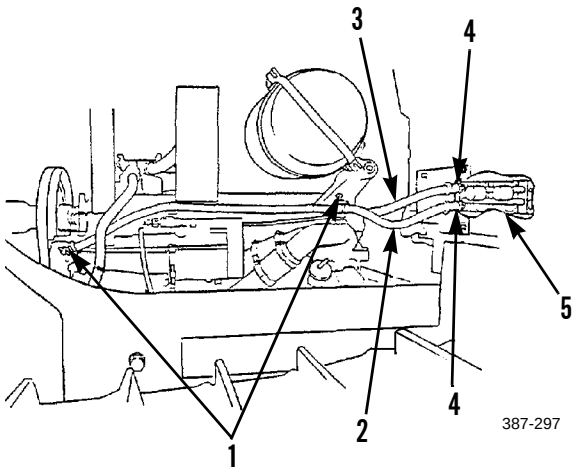
2. Follow instructions for installing ROPS to install winterized cab (WP 0164 00).
3. Install ground wire (10), washer (9) and capscrew (8).
4. Connect power wire (6) to connector (7) located at the right of dash panel.



5. Install heater (WP 0192 00).

INSTALLATION - CONTINUED

6. Feed hoses (2 and 3) into cab. Connect hoses to heater (5) and tighten clamps (4).
7. Open petcocks (1).



8. Install sound suppression panels (WP 0196 00)
9. Install windshield wiper switches (WP 0087 00).
10. Install windshield wipers (WP 0194 00).
11. Install defroster fans (WP 0195 00).

END OF WORK PACKAGE

WINDSHIELD GLASS REPLACEMENT 0169 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Materials/Parts

Detergent (Item 11, WP 0249 00)

Seal (2)

Personnel Required

Two

WARNING

Wear eye protection when handling glass to protect against possible injury to eyes.

NOTE

This procedure is written as a example of windshield glass replacement. All cab window glass is replaced in the similar manner.

REMOVAL

WARNING

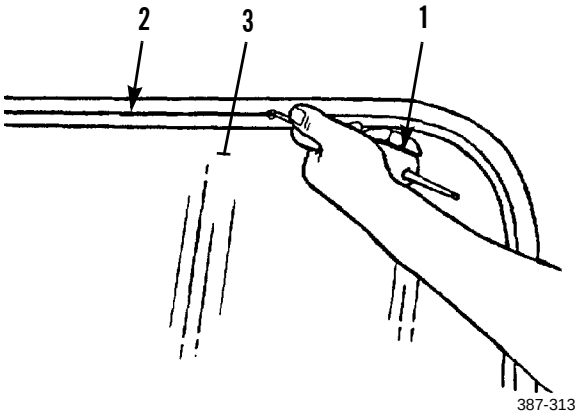
If it is necessary to remove damaged glass, use thick gloves to avoid injury.

1. Put seal installer (1) between two lips of seal (2).

WARNING

Use care when removing seal to prevent glass from causing personal injury.

2. Move seal installer (1) along seal (2) to pull locking lip out away from cab. Move seal installer completely around circumference of glass (3).
3. Remove glass (3) and discard seal (2).



INSTALLATION

WARNING

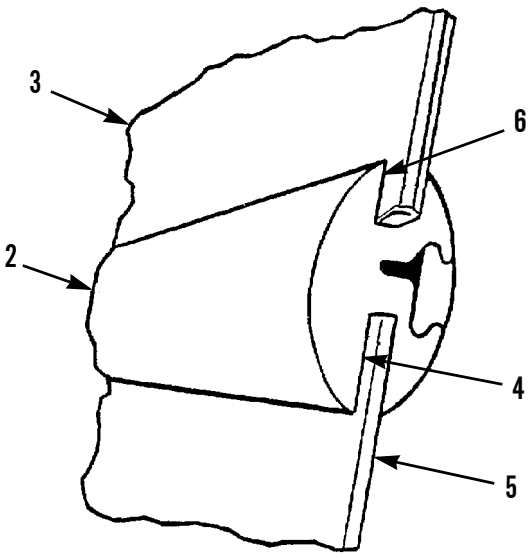
Wear gloves and handle glass carefully to avoid personal injury.

1. Install new seal (2) around circumference of window opening. Start along side of window panel. Install edge (4) of seal over panel (5) with locking lip toward outside of cab.
2. Cut seal (2) to extend past starting point by 1/8 in. (3.2 mm) per foot of window opening circumference.
3. Push ends of seal (2) together and push them over panel (5) to make a tight, smooth joint.

NOTE

When glass is installed, edge (6) must be over glass (3).

4. Put lower corner of glass (3) in channel of seal (2) as far as possible. Do not use too much force.
5. Moving in both directions from starting point, lift glass channel lip and glass will slip into place.
6. Put a solution of soap and water on locking lip of seal (2).
7. Install curved end of seal installer (1) between locking lip and its groove at any point away from seal (2) joint.
8. Move seal installer (1) along groove completely around circumference of seal (2). Rubber lip will lock into position around circumference of glass (3).



387-314

END OF WORK PACKAGE

FENDERS AND FENDER MOUNTING REPLACEMENT 0170 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Lifting equipment, 400 lb capacity

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Compound, antiseize (Item 6, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26 WP 0249 00)

Lockwasher (11, 15, 19, 24, 27, 29, 31, 33, 36, 43 and 46)

O-ring (4 and 7)

Reference

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

For Either Fender Removal:

ROPS mounting brackets and plates removed (WP 0165 00)

Fuel tank removed (WP 0052 00)

Steering clutch levers and linkage removed (WP 0148 00)

Steering brake pedals and linkage removed (WP 0146 00)

Blade (lift and tilt) control valve removed (WP 0201 00)

Additional Conditions for R.H. Fender:

Toolbox removed (WP 0177 00)

Hydraulic tank removed (WP 0226 00)

Additional Conditions for L.H. Fender:

Battery box removed (WP 0161 00)

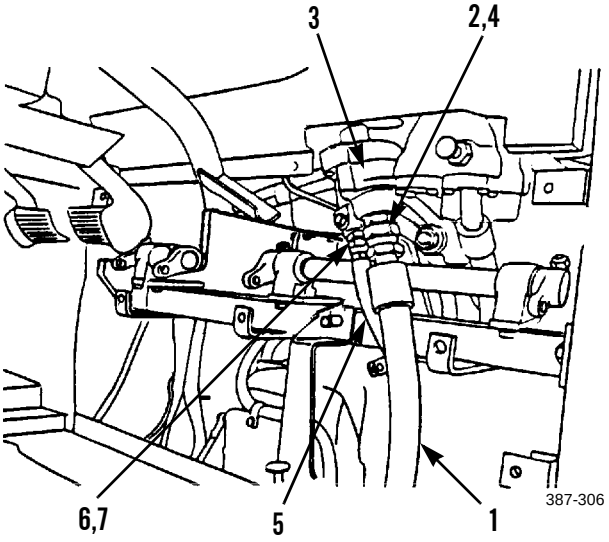
Seat and seat base assembly removed (WP 0172 00)

REMOVAL

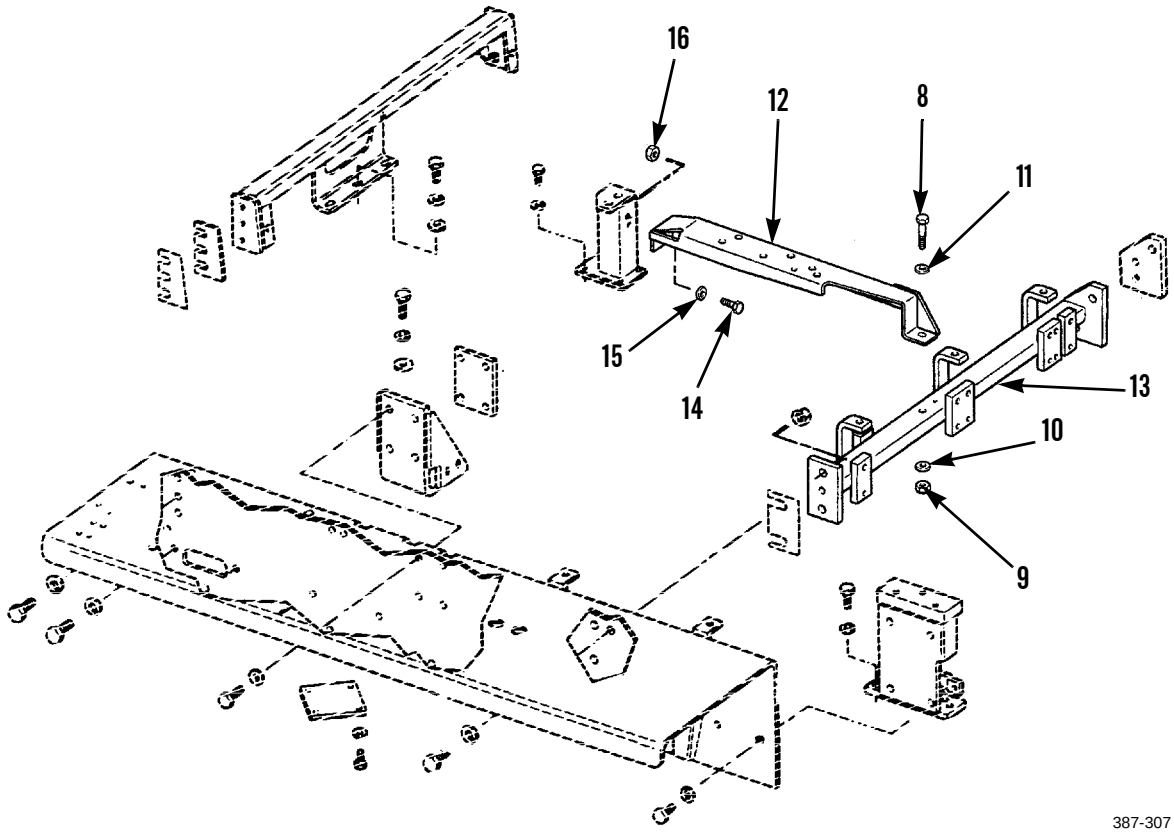
CAUTION

Use caution to ensure contamination does not enter winch system. Plug hoses as soon as disconnections are made.

1. If equipped with winch, disconnect hose (1) from connector (2) on winch gear pump (3). Remove and discard O-ring (4) from end of hose.
2. Disconnect hose (5) from connector (6) on winch gear pump (3). Remove and discard O-ring (7) from end of hose.



3. Remove capscrew (8), nut (9), washer (10) and lockwasher (11) from one end of support assembly (12) and beam assembly (13). Discard lockwasher.
4. Remove two capscrews (14), lockwashers (15), nuts (16) and support assembly (12) from beam assembly (13). Discard lockwashers.



REMOVAL - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

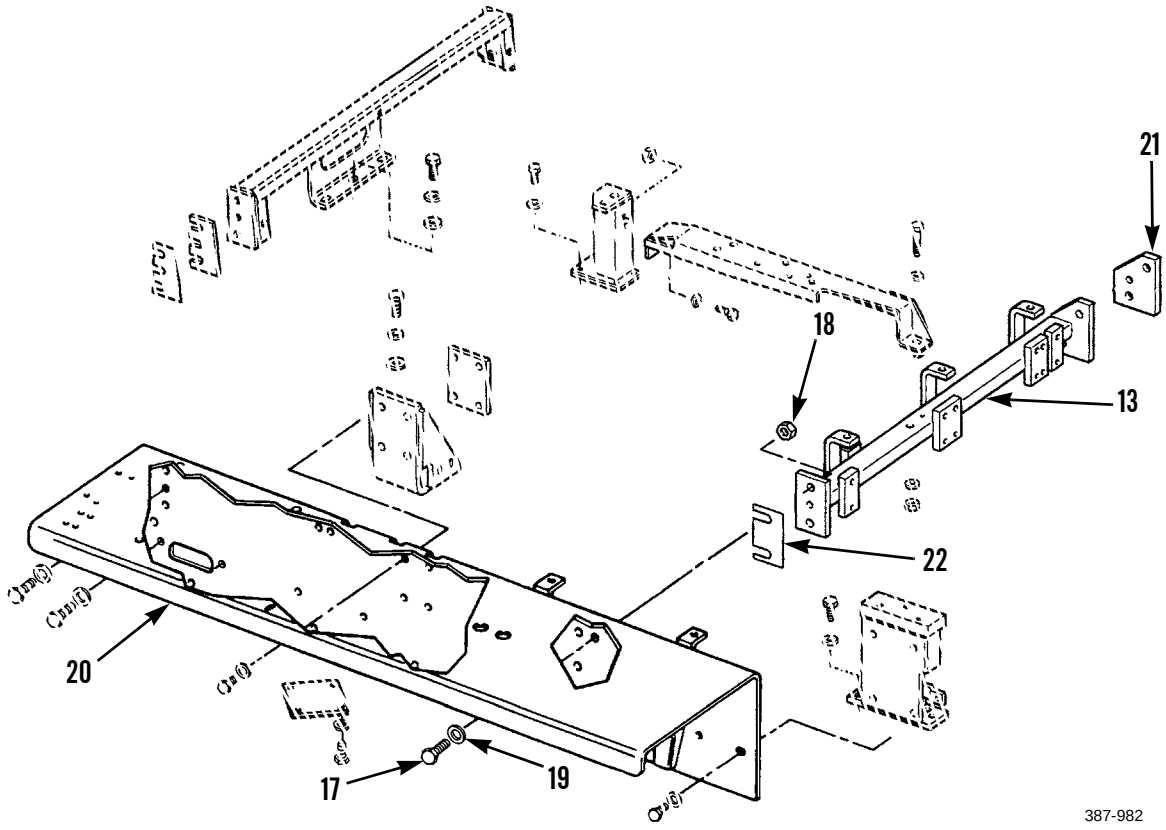
Beam assembly weighs 36 lb (16 kg).

5. Attach a nylon sling and a suitable lifting device to beam assembly (13). Remove four capscrews (17), nuts (18) and lockwashers (19) from beam assembly and fenders (20). Remove beam assembly (13). Discard lockwashers.
6. Remove one spacer plate (21) and shims (22). Keep shims together.

NOTE

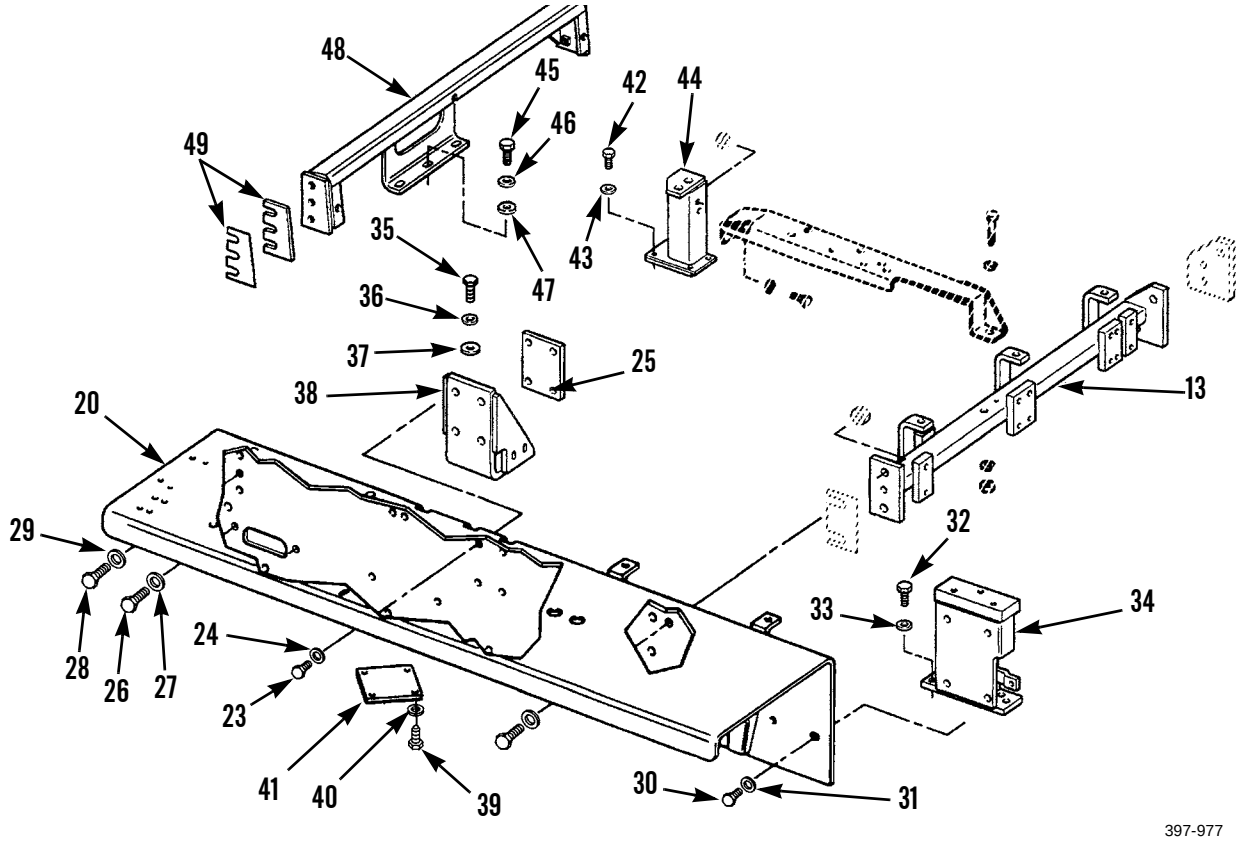
Fenders weigh approximately 340 lb (154 kg).

7. Attach a nylon sling and a suitable lifting device to R.H. fender (20) and take up slack in sling.



REMOVAL - CONTINUED

8. Remove four capscrews (23), lockwashers (24) and plate (25) from center of R.H. fender (20) mounting. Discard lockwashers.
9. Remove seven capscrews (26) and lockwashers (27) from along rear bottom section of fender (20). Discard lockwashers.
10. Remove three capscrews (28) and lockwashers (29) from rear fender (20) mounting. Discard lockwashers.
11. Remove four capscrews (30) and lockwashers (31) from front fender (20) mounting and remove fender. Discard lockwashers.
12. If necessary, remove four capscrews (32) and lockwashers (33) from bracket assembly (34). Remove bracket assembly. Discard lockwashers.
13. If necessary, remove four capscrews (35), lockwashers (36) and washers (37) from bracket assembly (38). Remove bracket assembly. Discard lockwashers.
14. Repeat steps 7 through 13 if L.H. fender is to be removed.
15. If necessary, remove four capscrews (39), washers (40) and cover (41) from R.H. fender (20).
16. If necessary, remove four capscrews (42), lockwashers (43) and bracket assembly (44). Discard lockwashers.
17. If necessary, remove three capscrews (45), lockwashers (46), washers (47), support assembly (48) and shims (49). Keep shims together. Discard lockwashers.



INSTALLATION

1. If removed, install support assembly (48), shims (49), three washers (47), new lockwashers (46) and capscrews (45).
2. If removed, install bracket assembly (44), four new lockwashers (43) and capscrews (42).
3. If removed, install cover (41), four washers (40) and capscrews (39) to R.H. fender (20).
4. If removed, install bracket assembly (38), four washers (37), new lockwashers (36) and capscrews (35).
5. If removed, install bracket assembly (34), four new lockwashers (33) and capscrews (32).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Fenders weigh approximately 340 lb (154 kg).**
- **Apply antiseize compound to fender mounting hardware before installation.**
- **Do NOT tighten fender mounting capscrews until all of them have been installed. This will aid in hole line-up and hardware installation.**

6. Attach a nylon sling and a suitable lifting device to R.H. fender (20) and lift into position.
7. Install four capscrews (30) and new lockwashers (31) at front fender (20) mounting.
8. Install three capscrews (28) and new lockwashers (29) at rear fender (20) mounting.
9. Install seven capscrews (26) and new lockwashers (27) along rear bottom section of fender (20).
10. Install four capscrews (23), new lockwashers (24) and plate (25) to center of R.H. fender (20) mounting.
11. Repeat steps 4 through 10 to install L.H. fender, if removal was necessary.

INSTALLATION - CONTINUED

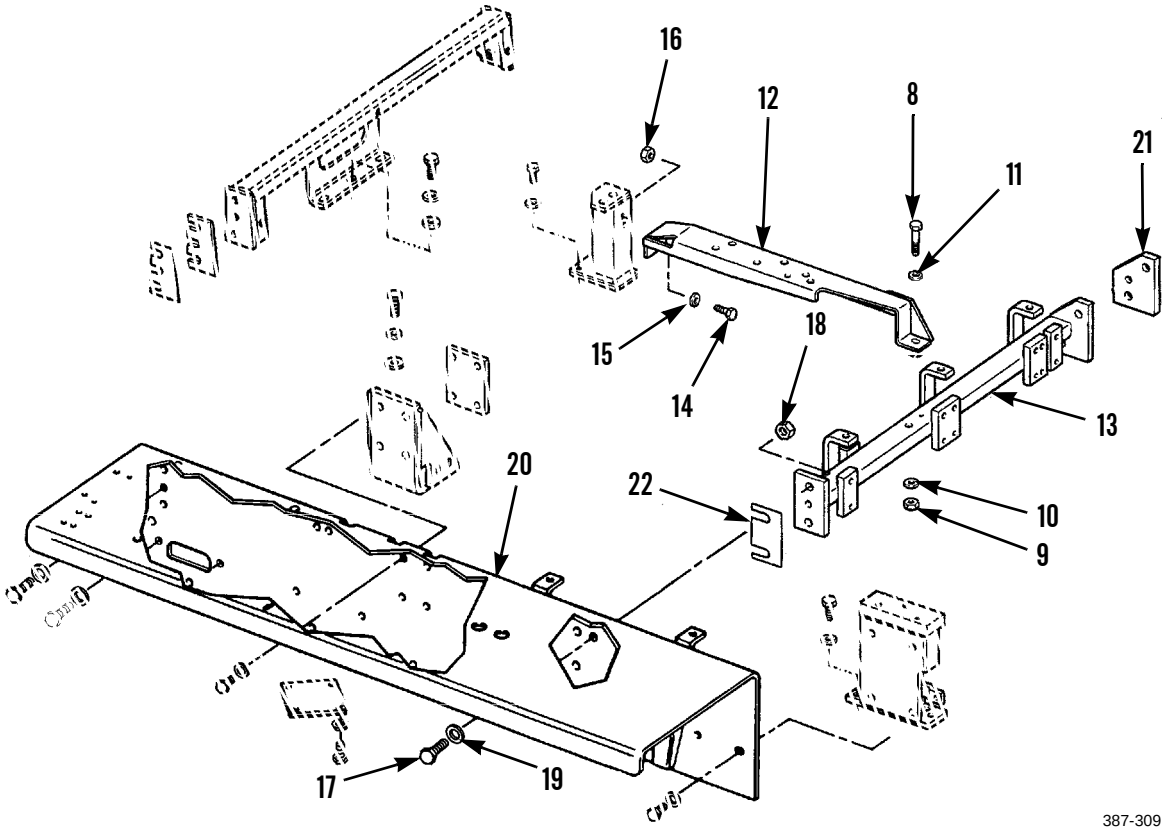
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Beam assembly weighs 36 lb (16 kg).

12. Attach nylon sling and lifting device to beam assembly (13) and install beam assembly. Install shims (22) on R.H. side of beam (13) and spacer plate (21) on L.H. side of beam assembly (13).
13. Install four capscrews (17), new lockwashers (19) and nuts (18) to secure beam assembly (13) to fenders (20).
14. Tighten all capscrews and remove nylon sling and lifting device.
15. Position support assembly (12). Install two capscrews (14), new lockwashers (15) and nuts (16) to secure one end of support assembly.
16. Install capscrew (8), new lockwasher (11), washer (10) and nut (9) to secure other end of support assembly (12) to beam assembly (13).

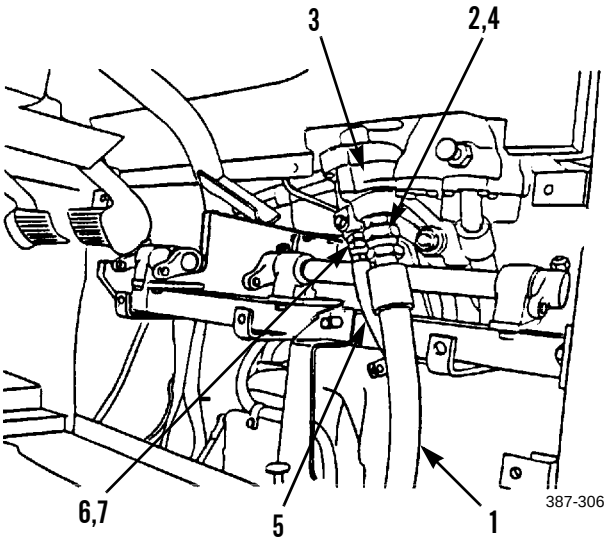


INSTALLATION - CONTINUED

NOTE

Lightly coat new O-rings with clean oil before installation.

17. If equipped with winch, install new O-ring (7) in hose (5). Connect hose to connector (6) on winch gear pump (3).
18. Install new O-ring (4) in hose (1). Connect hose to connector (2) on winch gear pump (3).



19. Install the following:
    a. Blade (lift and tilt) control valve (WP 0201 00).
    b. Steering brake pedals and linkage (WP 0146 00).
    c. Steering clutch levers and linkage (WP 0148 00).
    d. Fuel tank (WP 0052 00).
    e. ROPS mounting brackets and plates (WP 0165 00).
20. If R.H. fender was removed, install:
    a. Hydraulic tank (WP 0226 00).
    b. Toolbox (WP 0177 00).
21. If L.H. fender was removed, install:
    a. Seat and seat base assembly (WP 0172 00).
    b. Battery box (WP 0161 00).
22. Operate machine and check for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

FLOOR PLATES REPLACEMENT 0171 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

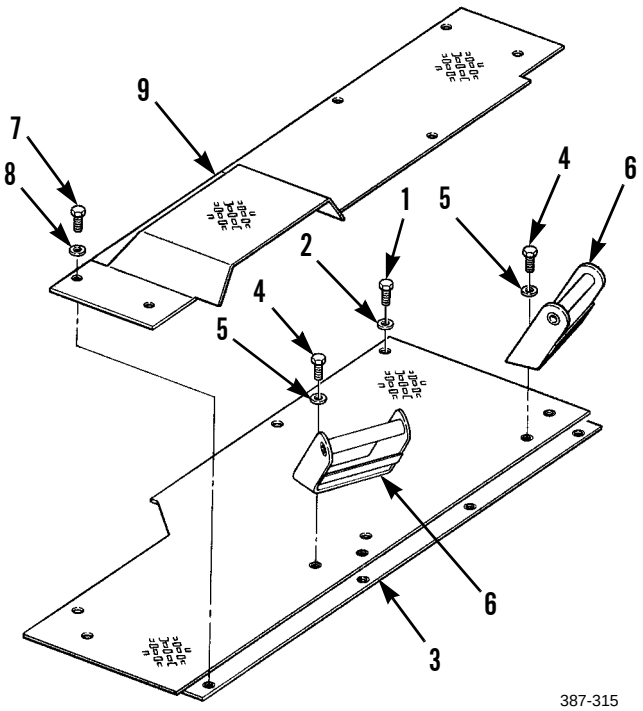
Compound, antiseize (Item 6, WP 0249 00)

Equipment Condition

Heater removed (tractor with winterized cab) (WP 0192 00)

REMOVAL

1. If equipped, remove floor mat from winterized cab.
2. Remove five bolts (1) and washers (2) from rear floor plate (3).
3. Remove four bolts (4), washers (5) and two footrests (6) from rear floor plate (3).
4. Remove eight bolts (7) and washers (8) from front floor plate (9).
5. Remove floor plates (3 and 9) from tractor.



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INSTALLATION

NOTE

Apply antiseize compound to all mounting bolts before installation.

1. Position front floor plate (9) in tractor.
2. Position rear floor plate (3) in tractor.
3. Install two footrests (6) to rear floor plate (3) with four bolts (4) and washers (5).
4. Install eight bolts (7) and washers (8) in front floor plate (9). Do NOT tighten bolts.
5. Install five bolts (1) and washers (2) in rear floor plate (3).
6. Tighten all bolts (1 and 7) in floor plates (3 and 9).
7. If equipped, replace floor mat in winterized cab.
8. If equipped, install heater in winterized cab (WP 0192 00).

END OF WORK PACKAGE

SEAT, SEAT BASE ASSEMBLY AND SEAT BELT REPLACEMENT 0172 00

THIS WORK PACKAGE COVERS

Seat and Seat Base Assembly: Removal, Installation, Seat Adjustment

Seat Belt: Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 200 lb capacity

Materials/Parts

Tag marker (Item 37, WP 0249 00)

Lockwasher (22, 26, 30, 43, 44 and 49)

Nut, self-locking (37 and 57)

Personnel Required

Two

Equipment Condition

Winterized cab removed (if equipped) (WP 0168 00)

ROPS removed (WP 0164 00)

Battery disconnect switch removed (WP 0090 00)

Floor plates removed (WP 0171 00)

Battery cables removed (WP 0101 00)

SEAT AND SEAT BASE ASSEMBLY REMOVAL

1. Pull rod assembly (1) at front of seat vertical adjuster (2) forward to release seat lock.

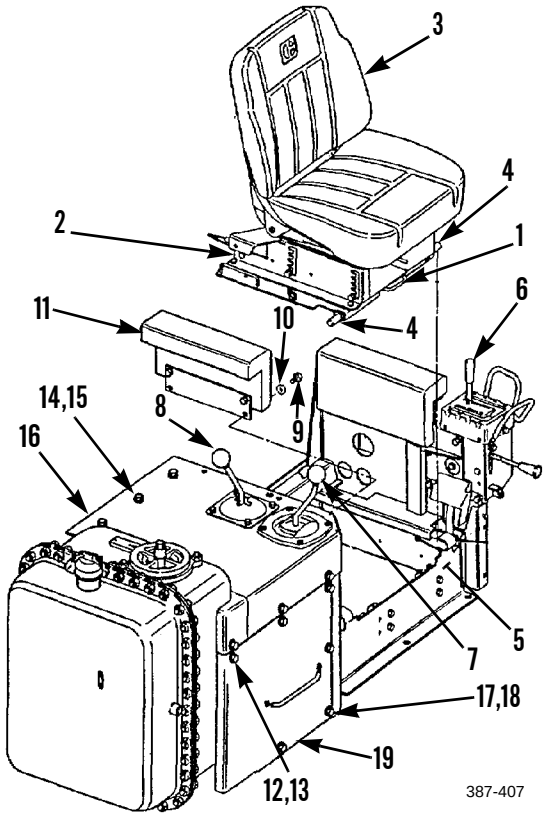
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Seat with vertical adjuster weighs 70 lb (32 kg).

2. Attach nylon sling and suitable lifting device to back of seat (3).
3. Slide seat (3) back and straight up so hinge pins (4) slide out of seat base assembly (5). Remove seat with vehicle adjuster (2) from tractor.
4. Remove transmission selector lever knobs (6), blade control lever knob (7) and winch/ripper control lever knob (8).
5. Remove two capscrews (9), washers (10) and armrest assembly (11).
6. Remove two capscrews (12) and washers (13).
7. Remove eight capscrews (14), washers (15) and cover (16).
8. Remove five capscrews (17), washers (18) and plate (19).

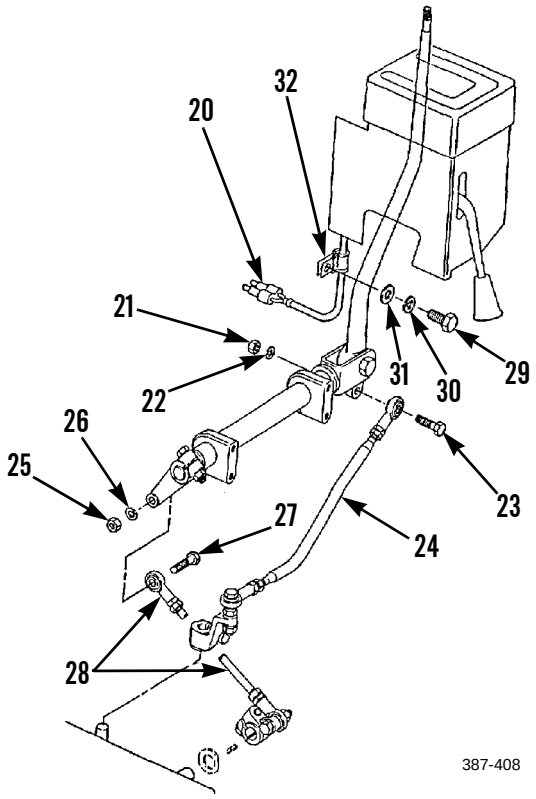


SEAT AND SEAT BASE ASSEMBLY REMOVAL - CONTINUED

NOTE

Tag wires to ensure correct installation.

9. Disconnect two backup alarm wires (20) from wiring harness.
10. Remove nut (21), lockwasher (22) and capscrew (23) that secure transmission direction linkage rod (24). Discard lockwasher.
11. Remove nut (25), lockwasher (26) and capscrew (27) that secure transmission gear selection linkage rod (28). Discard lockwasher.
12. Remove capscrew (29), lockwasher (30), washer (31) and clamp (32). Discard lockwasher.



SEAT AND SEAT BASE ASSEMBLY REMOVAL - CONTINUED

13. Remove six capscrews (33) and washers (34) from right side of seat base assembly (5).

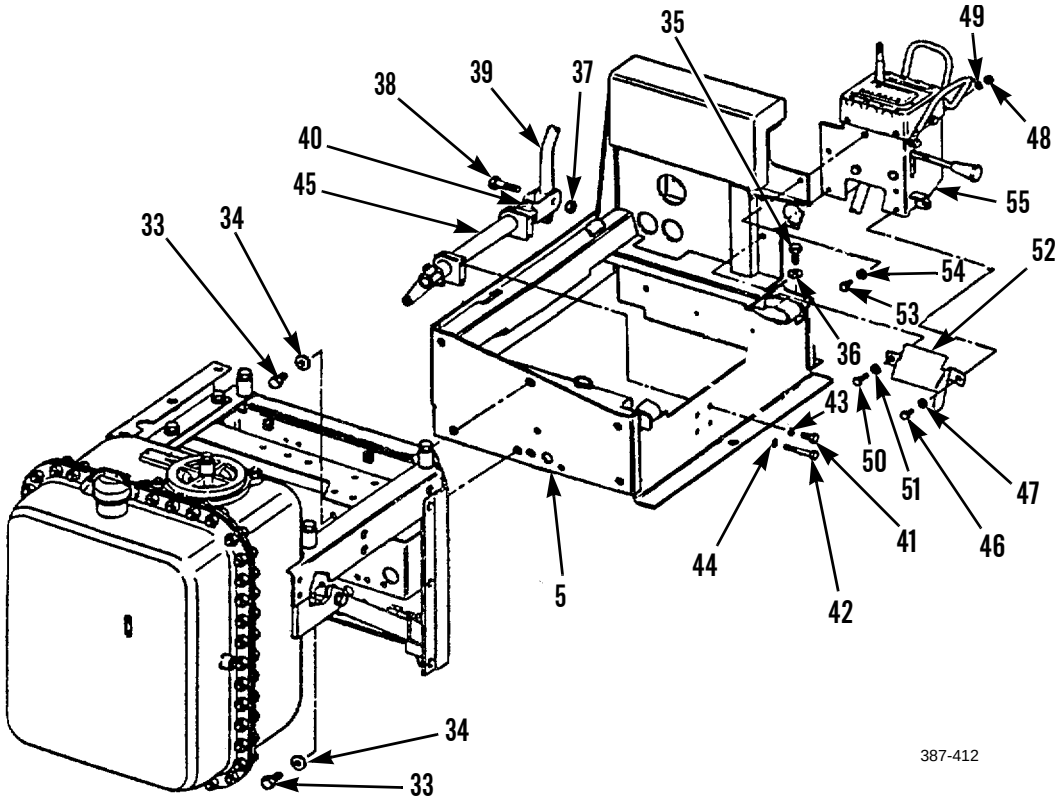
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Seat base assembly weighs 72 lb (33 kg).

14. Attach nylon slings and a suitable lifting device to seat base assembly (5).
15. Remove three capscrews (35) and washers (36) from left side of seat base assembly (5).
16. Lift seat base assembly (5) from tractor.
17. Remove self-locking nut (37) and capscrew (38) and disconnect selector lever (39) from fork (40). Disconnect self-locking nut.
18. Remove two capscrews (41), capscrews (42), four lockwashers (43 and 44) and linkage assembly (45) from seat base assembly (5). Discard lockwashers.
19. Remove capscrew (46), washer (47), nut (48), lockwasher (49), capscrew (50), washer (51) and shield (52). Discard lockwasher.
20. Remove capscrew (53), washer (54) and transmission control box assembly (55) from seat base assembly (5).



SEAT AND SEAT BASE ASSEMBLY INSTALLATION

1. Position transmission control box assembly (55) on left side of seat base assembly (5) and install capscrew (53) and washer (54).
2. Position shield (52) in position and install capscrew (46), washer (47), new lockwasher (49) and nut (48). Install capscrew (50) and washer (51).
3. Position linkage assembly (45) on seat base assembly (5) and install four capscrews (41 and 42) and new lockwashers (43 and 44).
4. Align holes in selector lever (39) and fork (40) and install capscrew (38) and new self-locking nut (37).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

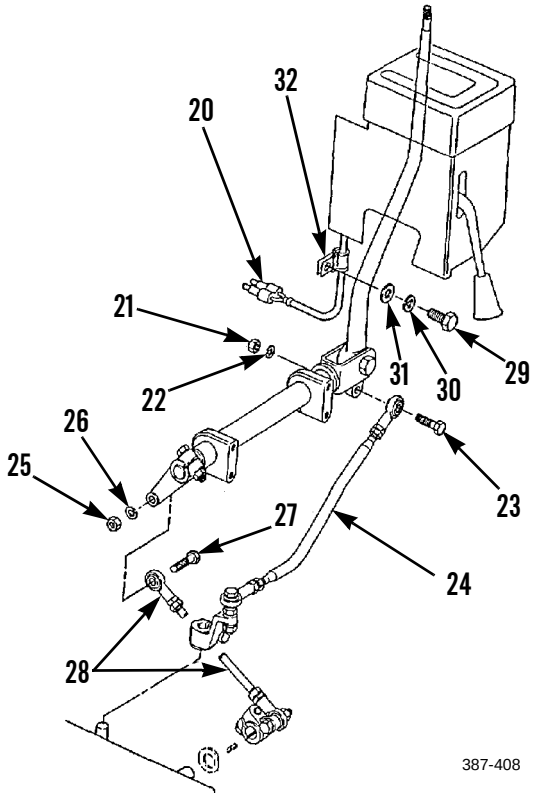
Seat base assembly weighs 72 lb (33 kg).

5. Attach nylon slings and suitable lifting device and lift seat base assembly (5) into position on tractor. Leave lifting equipment attached.

NOTE

Do NOT tighten seat base mounting capscrews until all have been installed.

6. Secure seat base assembly (5) on left side with three capscrews (35) and washers (36).
7. Install six capscrews (33) and washers (34) through right side of seat base assembly (5).
8. Tighten nine mounting capscrews (33 and 35).
9. Install capscrew (23), new lockwasher (26) and nut (25) to secure transmission gear selection linkage rod (28).
10. Install capscrew (23), new lockwasher (22) and nut (21) to secure transmission direction linkage rod (24).
11. Connect two backup alarm wires (20) to wiring harness.
12. Install clamp (32) on wiring with capscrew (29), new lockwasher (30) and washer (31).



SEAT AND SEAT BASE ASSEMBLY INSTALLATION - CONTINUED

13. Position plate (19) and install five capscrews (17) and washers (18).
14. Position cover (16) and install eight capscrews (14) and washers (15).
15. Install two capscrews (12) and washers (13).
16. Position armrest assembly (11) and install two capscrews (9) and washers (10).

NOTE

Carefully guide blade control lever and winch/ripper control lever through dust covers in cover (16).

17. Install transmission selector lever handle (6), blade control lever knob (7) and winch/ripper control lever knobs (8).

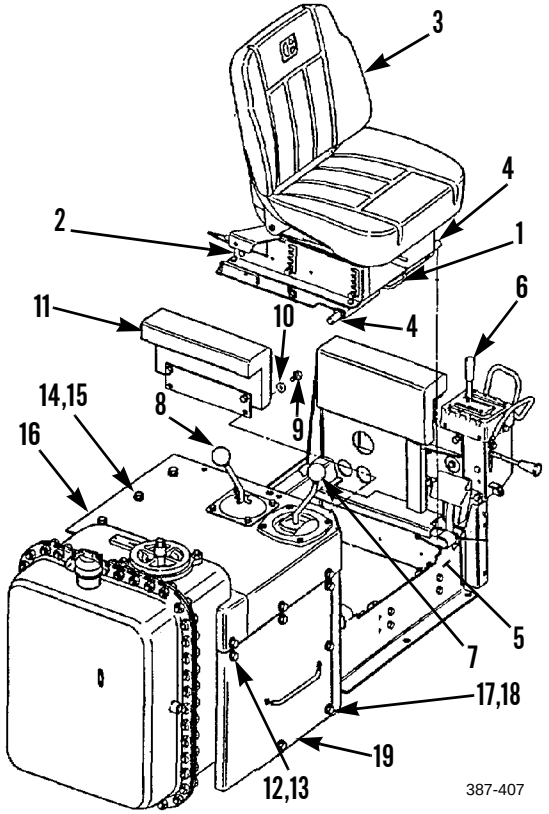
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Seat with vertical adjuster weighs 70 lb (32 kg).

18. Attach nylon sling and suitable lifting device to back of seat (3) and position seat with vertical adjuster (2) in seat base assembly (5).
19. Tilt seat (3) forward then slide seat forward and place hinge pins (4) into hooks in seat base assembly (5).
20. Push back of seat (3) down until locks snap into position.



SEAT AND SEAT BASE ASSEMBLY INSTALLATION- CONTINUED

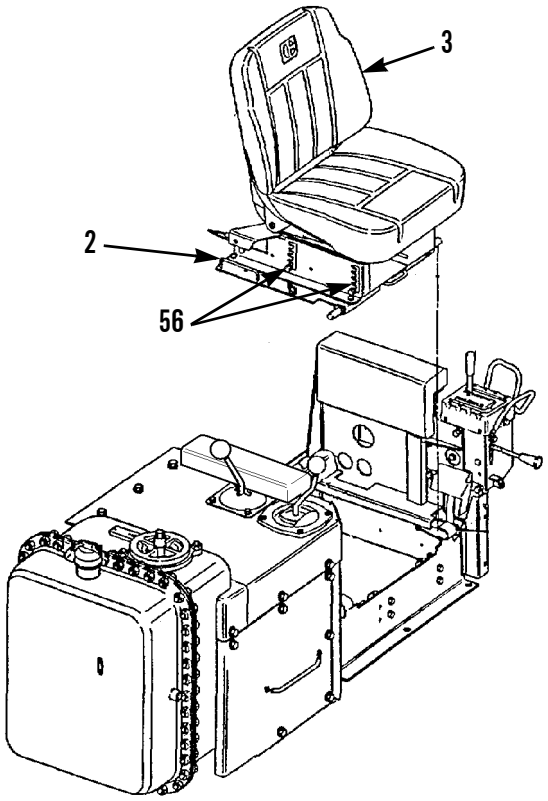
21. Install battery cables (WP 0101 00).
22. Install floor plates (WP 0171 00).
23. Install battery disconnect switch (WP 0090 00).
24. Install winterized cab (if equipped) (WP 0168 00).
25. Install ROPS (WP 0164 00).
26. Perform *Adjustment*.

SEAT ADJUSTMENT

WARNING

Seat is properly adjusted when operator can fully depress brake pedals. All controls must be at proper operating distance from operator. An unsafe condition exists when controls cannot be reached. Failure to make proper adjustments may result in serious personal injury or death.

1. Loosen two capscrews (56) on each side of seat vertical adjuster (2) three full turns each.
2. With assistance, slide seat (3) back and then up or down as needed. Slide seat forward again after reaching desired height.
3. Tighten two capscrews (56) on each side of vertical adjuster (2).



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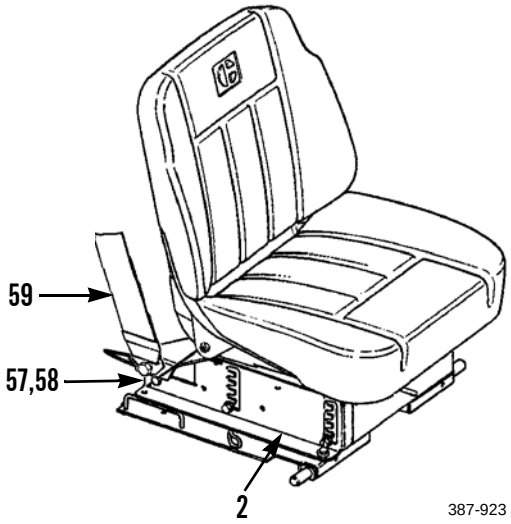
SEAT BELT REMOVAL

1. Perform step 1 of *Seat and Seat Base Assembly Removal* to tip seat (3) forward and access seat belt.
2. Remove self-locking nut (57), eyebolt (58) and seat belt (59) from one side of vertical adjuster (2). Discard self-locking nut.
3. Repeat step 2 to remove seat belt (59) from other side of vertical adjuster (2).

SEAT BELT INSTALLATION

1. Install seat belt (59) to one side of vertical adjuster (2) with eyebolt (58) and new self-locking nut (57). Torque nut to 52 lb.-ft. (71 Nm).
2. Repeat step 1 to install seat belt (59) to other side of vertical adjuster (2).
3. Return seat (3) to its original (operating) position.



END OF WORK PACKAGE

SEAT HINGE MAINTENANCE 0173 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Nut, self-locking (17)

Materials/Parts - Continued

Pin, cotter (6)

Equipment Condition

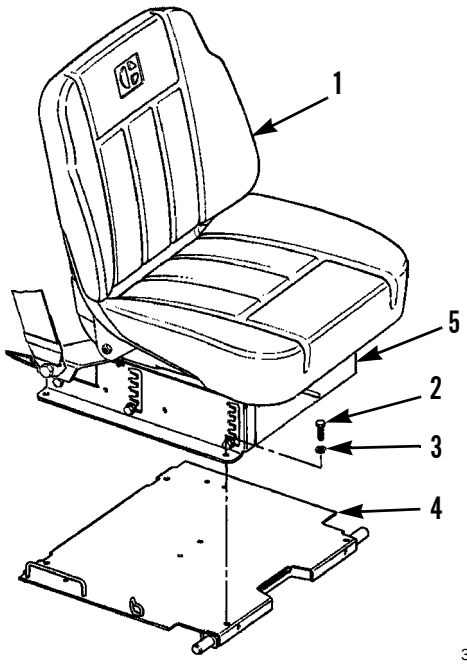
Seat and seat base removed (WP 0172 00)

REMOVAL

NOTE

Seat weighs 26 lb (12 kg).

1. Place seat (1) on work bench and tip it on its front.
2. Remove four capscrews (2) washers (3) and hinge assembly (4) from vertical adjuster (5).



387-364

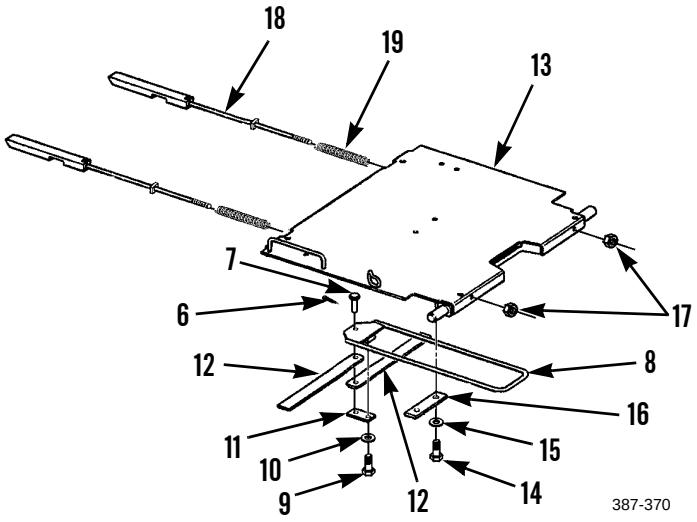
DISASSEMBLY

1. Remove cotter pin (6) and pin (7) from back end of rod assembly (8). Discard cotter pin.
2. Remove capscrew (9), washer (10) and plate (11) from back end of rod assembly (8).
3. Remove two plates (12) from rod assembly (8) and hinge plate (13).
4. Remove two capscrews (14), washers (15), plate (16) and rod assembly (8) from hinge plate (13).

NOTE

Perform steps 5-7 for each latch assembly.

5. Remove self-locking nut (17) at front end of latch assembly (18). Discard self-locking nut.
6. Remove latch assembly (18) through back end of hinge plate (13).
7. Remove spring (19) from latch assembly (18).



ASSEMBLY

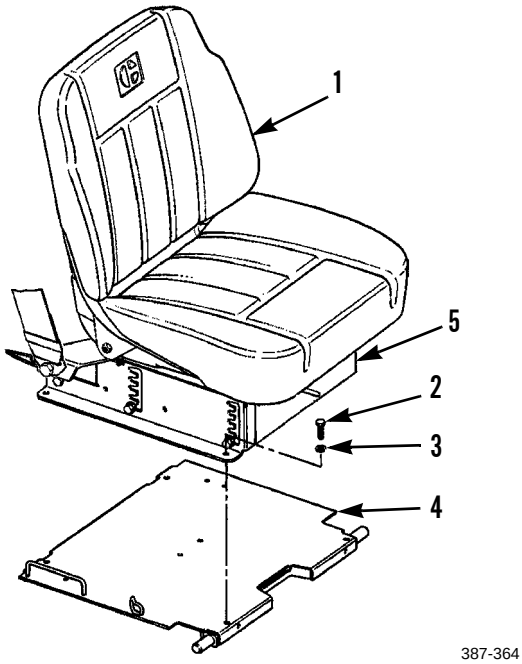
NOTE

Perform steps 1-4 for each latch assembly.

1. Install spring (19) on latch assembly (18).
2. Insert latch assembly (18) into back of hinge plate (13) with threaded rod through hole in front of hinge plate.
3. Install new self-locking nut (17) on front end of latch assembly (18).
4. Adjust self-locking nuts (17) on latch assembly (18) so that latch assembly extends 0.8 in. (20.3 mm) beyond hinge plate (13).
5. Install rod assembly (8) in hinge plate (13) with plate (16), two capscrews (14) and washers (15).
6. Install pin (7) in rod assembly (8).
7. Install two plates (12) in hinge plate (13) and on pin (7) of rod assembly (8).
8. Install plate (11), washer (10) and capscrew (9) on rod assembly (8).
9. Install new cotter pin (6) in pin (7).

INSTALLATION

1. Position hinge assembly (4) on vertical adjuster (5) and install four capscrews (2) and washers (3).



2. Install seat and seat base (WP 0172 00).

END OF WORK PACKAGE

SEAT VERTICAL ADJUSTER MAINTENANCE 0174 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

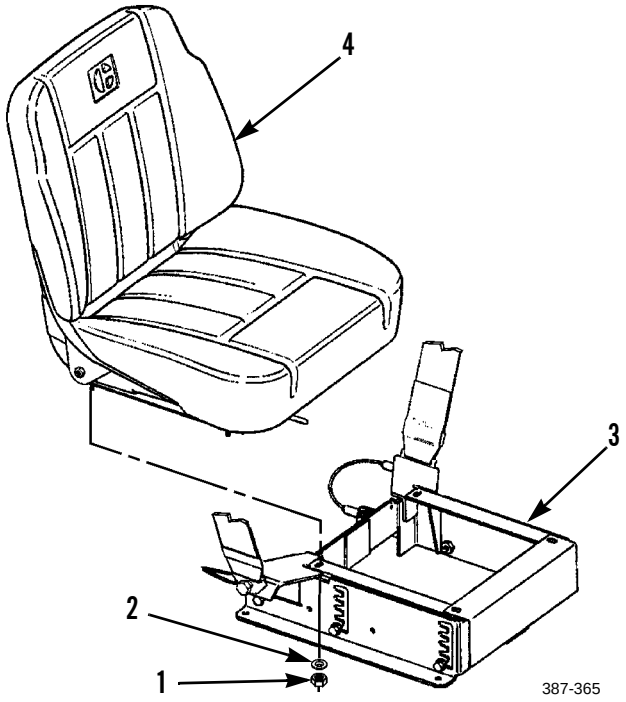
Nut, self-locking (7 and 11)

Equipment Condition

Seat hinge removed from vertical adjuster (WP 0173 00)

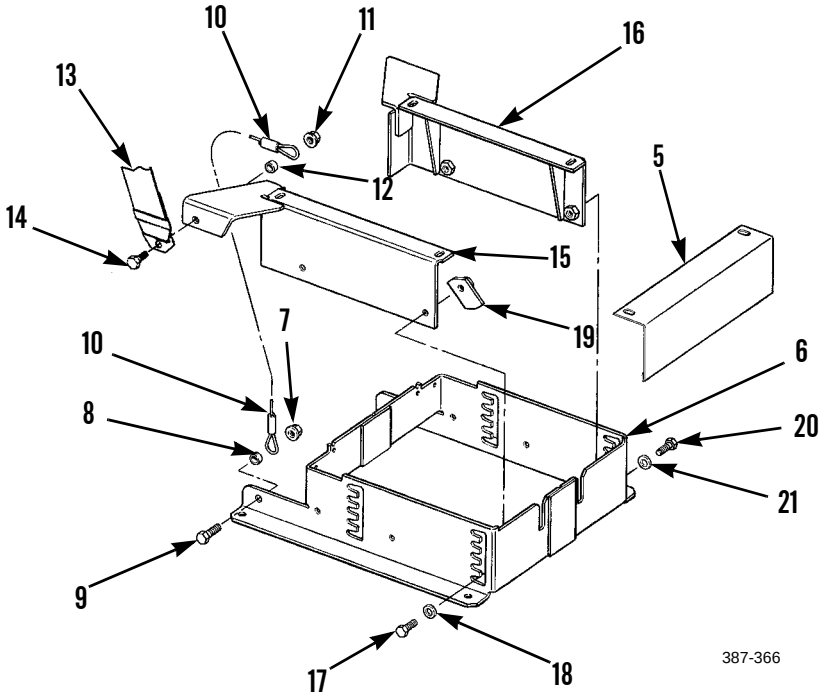
REMOVAL

1. Remove four nuts (1) and washers (2) from vertical adjuster (3) and seat (4).
2. Remove vertical adjuster (3) from seat (4).



DISASSEMBLY

1. Remove sheet (5) from front of base (6).
2. Remove self-locking nut (7), spacer (8), capscrew (9) and end of cable (10) from back of base (6). Discard self-locking nut.
3. Remove self-locking nut (11), other end of cable (10), spacer (12), seat belt (13) and eyebolt (14) from R.H. support (15). Discard self-locking nut.
4. Repeat steps 2 and 3 for cable (10) and seat belt (13) on L.H. support (16).
5. Remove two capscrews (17), washers (18), plate (19) and R.H. support (15) from base (6).
6. Remove two capscrews (20), washers (21) and L.H. support (16) from base (6).
7. Carefully inspect seat belt (13) for wear. Discard seat belt if wear is evident or if belt is 3 years old, as indicated on belt.



ASSEMBLY

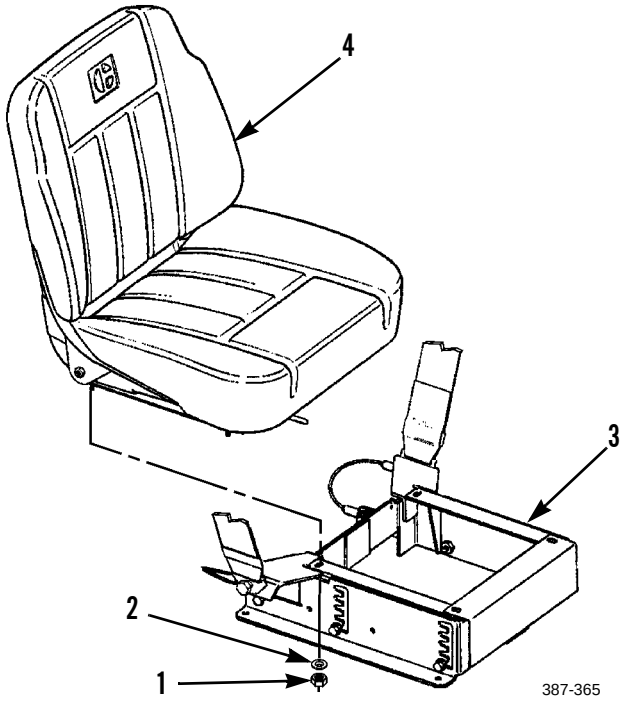
NOTE

Always position L.H. and R.H. supports in lowest slots in base, unless directed otherwise.

1. Position L.H. support (16) on base (6) and install two capscrews (20) and washers (21).
2. Position R.H. support (15) on base (6) and install two capscrews (17), washers (18) and plate (19).
3. Install seat belt (13) and one end of cable (10) on R.H. support (15) with eyebolt (14), spacer (12) and new self-locking nut (11). Torque nut to 52 lb-ft (71 Nm).
4. Install other end of cable (10) on back of base (6) with capscrew (9), spacer (8) and new self-locking nut (7). Torque nut to 90 lb.-ft. (122 Nm).
5. Repeat steps 3 and 4 for cable (10) and seat belt (13) on L.H. support (16).
6. Install sheet (5) on front of base (6).

INSTALLATION

1. Position vertical adjuster (3) on seat (4) with four washers (2) and nuts (1). Torque nut to 90 lb-ft (122 Nm).



2. Install seat hinge to vertical adjuster (WP 0173 00).

END OF WORK PACKAGE

SEAT REPAIR 0175 00

THIS WORK PACKAGE COVERS

Disassembly, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Clips (15)

Rivets (12 and 14)

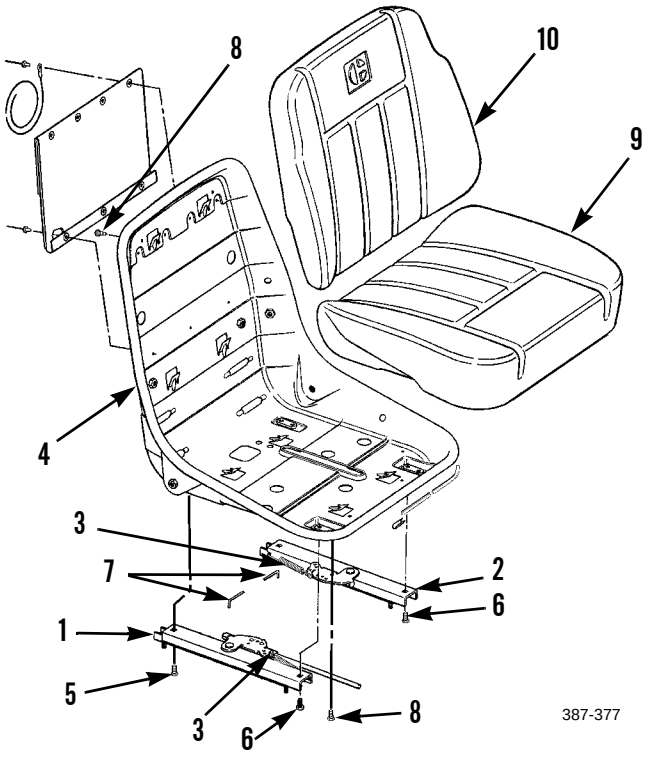
Seal (16)

Equipment Condition

Vertical adjuster removed from seat (WP 0174 00)

DISASSEMBLY

1. Lay seat on its back.
2. Operate lever on slide adjuster (1) to remove spring tension from slide adjusters (1 and 2).
3. Remove two springs (3) and slide adjusters (1 and 2) to front end of seat frame (4).
4. Remove two bolts (5) and slide adjusters (1 and 2) to rear end of seat frame (4).
5. Remove two bolts (6) and slide adjusters (1 and 2).
6. Remove connecting link (7) from slide adjusters (1 and 2).
7. Remove four capscrews (8), seat cushion (9) and back cushion (10) from seat frame (4) by lifting up and out.

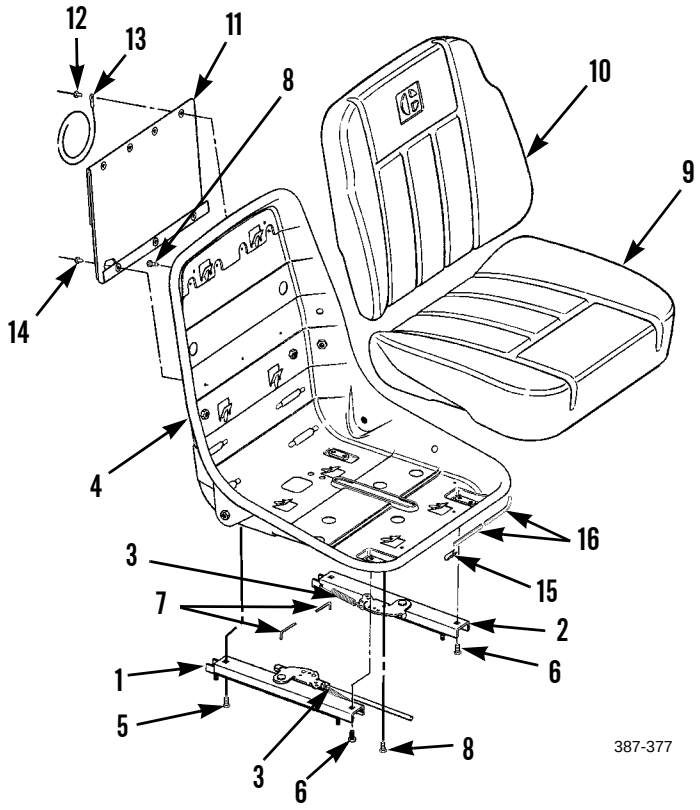


DISASSEMBLY - CONTINUED

8. Open holder (11) and remove four top rivets (12) and lanyard (13). Discard rivets.
9. Allow holder (11) to fold down and remove three bottom rivets (14) and holder. Discard rivets.
10. Remove clip (15) and seal (16) from seat frame (4). Discard seal and clip.

ASSEMBLY

1. Install new seal (16) on seat frame (4). Start seal at bottom center of seat frame. Secure ends of seal with new clip (15).
2. Position bottom edge of holder (11) on back of seat frame (4), so that top of holder is hanging down. Secure bottom edge with three new rivets (14).
3. Position holder (11) up with flap open and install three new rivets (12) on R.H. side.
4. Position lanyard (13) over L.H. hole and install new rivet (12).
5. Install seat cushion (9) and back cushion (10) in seat frame (4) with four capscrews (8).
6. Install connecting (7) between slide adjusters (1 and 2).
7. Position slide adjusters (1 and 2) on bottom of seat frame (4) and install two bolts (5), bolts (6) and springs (3).



8. Install vertical adjuster to seat (WP 0174 00).

END OF WORK PACKAGE

SEAT BASE REPAIR 0176 00

THIS WORK PACKAGE COVERS

Disassembly, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Pin, cotter (1)

Equipment Condition

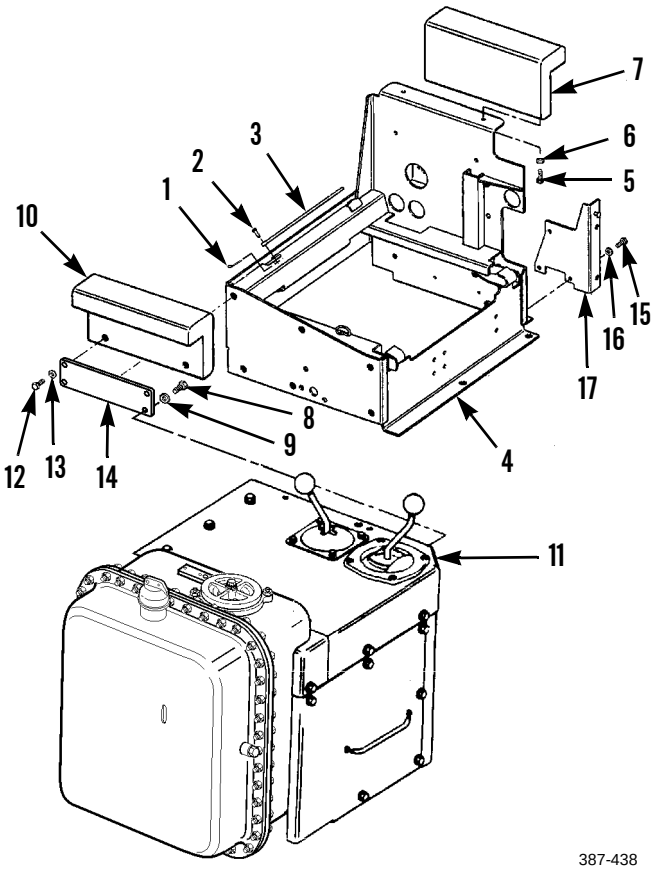
Seat with vertical adjuster removed (WP 0174 00)

NOTE

Seat base need not be removed from tractor unless it is damaged. Replacement of other parts may be done by just removing seat with vertical adjuster.

DISASSEMBLY

1. Remove cotter pin (1), pin (2) and rod (3) from back of seat base (4). Discard cotter pin.
2. Remove four capscrews (5), washers (6) and L.H. armrest (7) from left side of seat base (4).
3. Remove two capscrews (8), washers (9) and R.H. armrest (10) from hydraulic control cover (11).
4. Remove two capscrews (12), washers (13) and bracket (14) from armrest (10).
5. Remove three capscrews (15), washers (16) and plate (17) from seat base (4).



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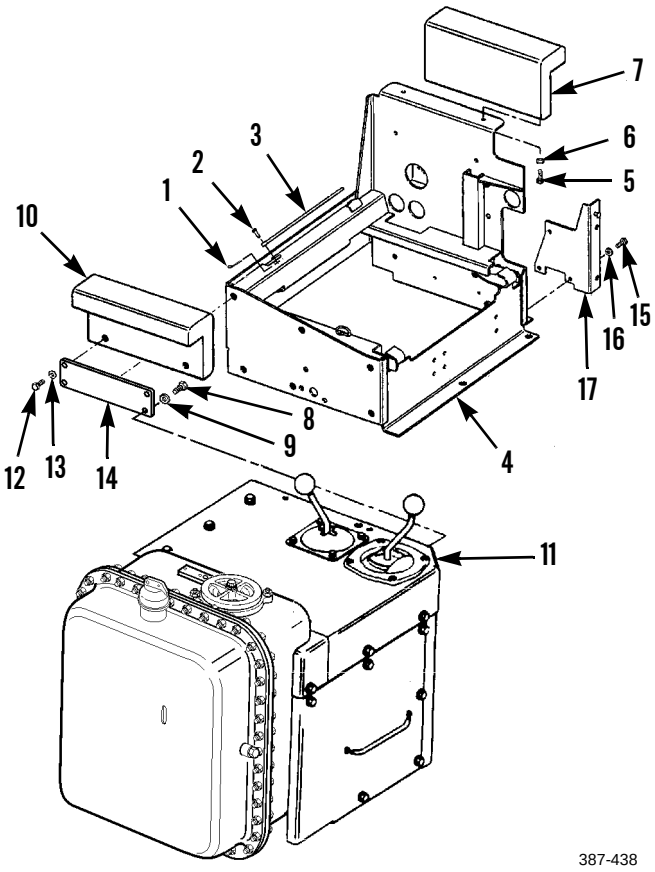
ASSEMBLY

1. Install plate (17) to seat base (4) with three capscrews (15) and washers (16).
2. Install bracket (14) to R.H. armrest (10) with two capscrews (12) and washers (13).
3. Install R.H. armrest (10) on hydraulic control cover (11) with two capscrews (8) and washers (9).
4. Install L.H. left armrest (7) on other side of seat base (4) with four capscrews (5) and washers (6).
5. Install rod (3) at back of seat base (4) with pin (2) and new cotter pin (1).
6. Install seat with vertical adjuster (WP 0174 00).



END OF WORK PACKAGE

TOOLBOX REPLACEMENT 0177 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Washer, lock (2)

Personnel Required

Two

Equipment Condition

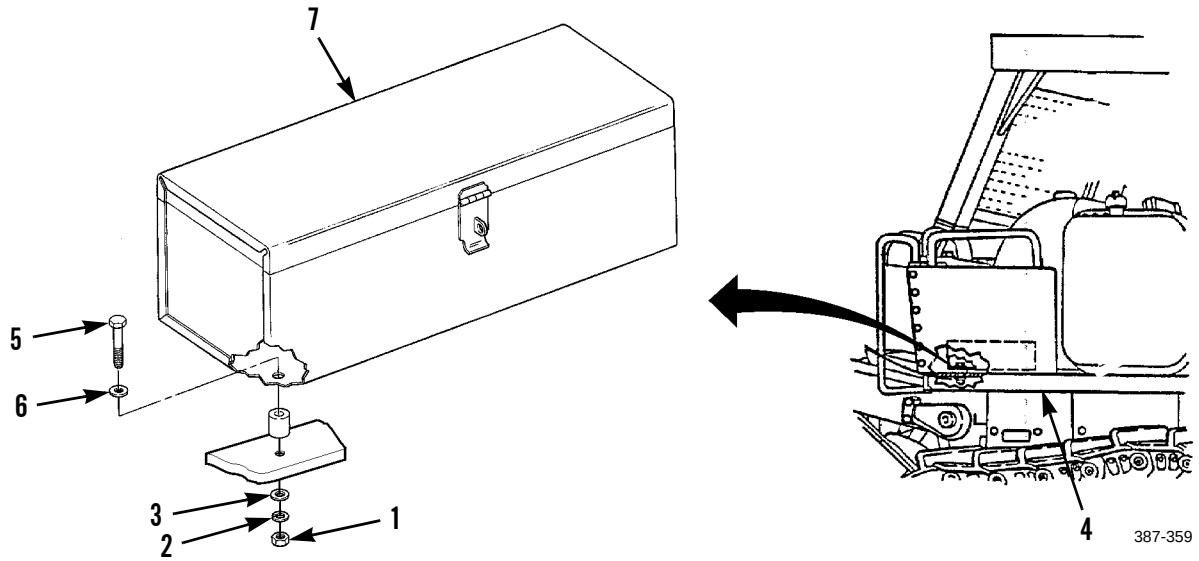
Machine parked on level ground (TM 5-2410-237-10)

REMOVAL

NOTE

One person is required to hold wrench on bolt heads in toolbox while other person removes nuts and washers under fender.

1. Remove four nuts (1), lockwashers (2) and washers (3) from toolbox mounting on underside of fender (4). Discard lockwashers.
2. Remove four bolts (5) and washers (6) from inside toolbox (7) on top side of fender (4).
3. Remove toolbox (7) from fender (4).



TOOLBOX REPLACEMENT - CONTINUED 0177 00

REMOVAL - CONTINUED

4. Remove four spacers (8) from fender (4).

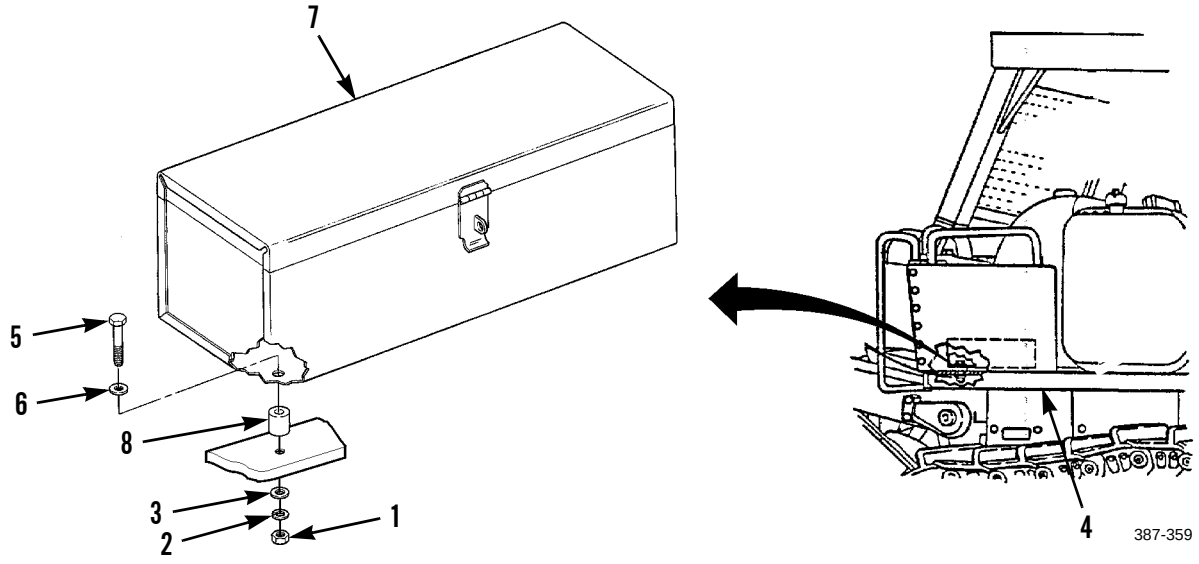
INSTALLATION

1. Position four spacers (8) over toolbox mounting holes in fender (4).
2. Position toolbox (7) on spacers (8) and align holes.
3. Install four washers (6) on bolts (5) and insert bolts through holes in toolbox (7), spacer (8) and fender (4).

NOTE

One person is required to hold wrench on capscrews inside toolbox while a second person installs nuts and washers under fender.

4. Install four washers (3), new lockwashers (2) and nuts (1) on bolts (5) on underside of fender (4).

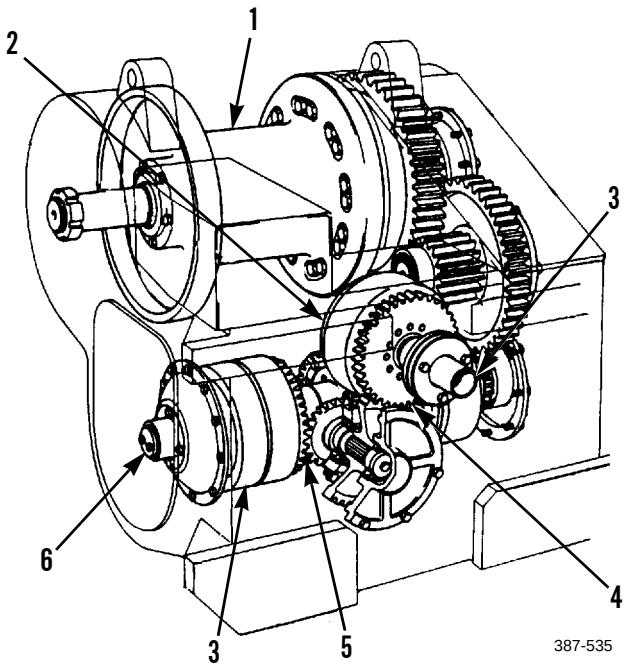


END OF WORK PACKAGE

WINCH THEORY OF OPERATION 0178 00

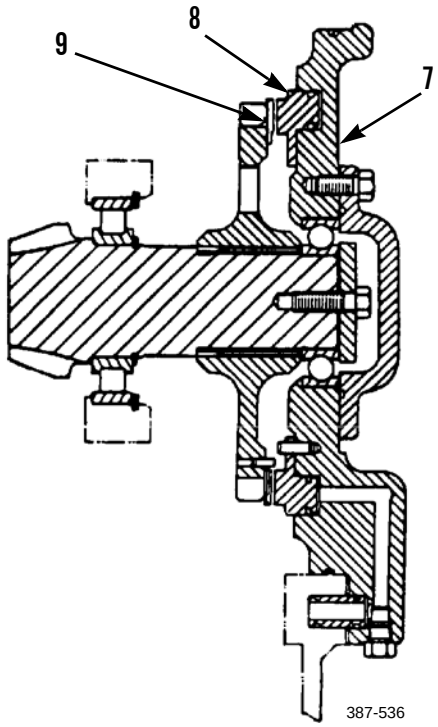
WINCH MECHANICAL DESCRIPTION

1. The winch is bolted directly to the tractor main frame. The splined winch input shaft plugs directly into tractor power take-off (PTO) shaft.
2. All winch functions are hydraulically actuated by means of a hydraulic control unit located inside the winch case. The control unit is connected to the operator's winch hand control lever by means of linkage. System hydraulic flow is provided by an engine-mounted gear pump.
3. The winch case is fabricated steel with an integral drawbar. Access covers allow service to components without removing the winch from the tractor.
4. The tractor's transmission center shaft is the power source for the winch. It is essentially an extension of the tractor's main drive shaft driven by the output portion of the transfer case. The end of center shaft is splined and acts as the tractor's PTO. The winch input shaft is splined to plug directly into the tractor's PTO.
5. A high load on the winch will cause an increase in torque output and cable pull on winch drum (1). The hydraulic control valve controls input clutch (2) and directional clutches (3).
6. Input clutch (2) is a hydraulically activated disc-type oil clutch. There is no connection between the input shaft of the clutch and the output gear (4) until oil pressure causes a solid connection between clutch plates and clutch discs (engaged clutch). The operator moves a hand control lever to direct oil to the clutch to engage the clutch. Input clutch (2) can be modulated to provide inching control in the reel-in mode. In order to handle the engagement and disengagement modulation, the winch uses four disc assemblies and four plates in the input clutch. When the input clutch is engaged, power goes through gears (4) to bevel gear and pinion (5).
7. A connection between bevel gear and pinion (5) and center shaft (6) is made by the directional clutches (3). The connection in clutches (3) is made by springs holding the discs against the plates (clutches engaged). Both clutches (3) are engaged until oil pressure of the hydraulic control system moves the piston of one clutch or the pistons of both clutches. This causes the discs and plates to move apart (clutch disengaged).
8. Directional clutches (3) are so named because they change the direction that the cable moves. Directional clutches turn in opposite directions. When both are engaged, the winch drum cannot turn. When the input clutch is engaged, one directional clutch must be disengaged. Disengagement of one clutch will cause the winch to REEL IN. Disengagement of the other clutch will cause the winch to REEL OUT.



WINCH MECHANICAL DESCRIPTION - CONTINUED

9. When the winch control lever is in the BRAKE ON position, the viscous drag brake stops the winch from spooling the cable in. A portion of the lube oil, which is 32 psi (221 kPa) at low idle, is sent through manifold (7) to piston (8). The force of the oil moves piston (8) to the left against disc (9) which is pinned to gear. The friction between the piston and disc is great enough to prevent the viscous drag of the input clutch from turning the bevel gear and shaft assembly.



WINCH HYDRAULIC SYSTEM

1. The winch hydraulic system consists of a pump, a filter, a directional control valve, a pressure control valve and piping. The system reservoir is located in the bottom of the winch case. The same hydraulic oil is used as lubricating oil for the gearing, bearings and other moving parts of the winch.
2. The winch control valve allows the winch to be placed in any of four conditions: 1) HOLD (Brake On); 2) REEL IN; 3) REEL OUT; or 4) BRAKE OFF.
   a. In the HOLD condition, both directional clutches are engaged. The input clutch is disengaged, disconnecting the winch from the PTO. Engaging the two spring-applied directional clutches “locks up” the winch drive shaft and keeps the winch from turning. In this condition, a load can be towed using the winch cable.
   b. For either REEL IN or REEL OUT, the input clutch must be engaged and the appropriate directional clutch must be disengaged. The opposite directional clutch remains engaged. Torque from the PTO shaft can then be transmitted through the input clutch, transfer gearing, housing of the disengaged directional clutch, winch shaft, planetary gearing and winch drive gears to the winch drum. Selecting the opposite direction of winch rotation, with the control valve, will cause the disengaged directional clutch to re-engage and the other directional clutch to disengage. The input clutch remains engaged.
   c. Placing the control valve in the BRAKE OFF position will establish an oil flow such that both directional clutches are disengaged while the input clutch remains disengaged. In this condition, cable can be spooled off the winch drum either by pulling the cable or by attaching the cable to an object and driving the tractor forward.

WINCH HYDRAULIC SYSTEM - CONTINUED

3. Winch HOLD Position. In the hold position, the pump draws oil from the reservoir, through a strainer, and discharges the oil to an inlet port on the pressure control valve. Porting within the pressure control valve and the directional valve directs the oil flow, under low pressure, to the lubrication circuit. No pressure is applied to any of the clutches.
4. REEL OUT Position. In the reel out position, the winch drum will be rotated, under power, in the direction necessary to unspool cable from the drum. To do this, the input clutch must be engaged and the right directional clutch must be disengaged. A sequence valve (17), built into the pressure control valve (2), ensures that the input clutch will be fully engaged before the directional clutch is allowed to disengage.

NOTE

The lag between input clutch engagement and directional clutch disengagement is of *very* short duration, by necessity. Allowing the input clutch to be engaged for any appreciable length of time while the winch shaft is locked up would stall the engine. In the following description, it is assumed that the control lever is moved briskly and fully into the REEL OUT position.

a. Spool (16) moves out of valve body (6) and coupling (11) is moved into valve body (2), as the control lever is moved into the REEL OUT position. Inward movement of coupling (11) compresses spring (12) and also shifts spool (14) to the right. Spool (14) ports pump flow through oil passage (15) to chamber (24) and through oil passage (20) to sequence valve (17). Chamber (24) is connected to the right directional clutch. When pressure in the chamber below the sequence valve reaches 80 psi (552 kPa), the sequence valve will unseat. Oil then flows around the sequence valve and through oil passage (13) to load piston (7). The load piston will move spool (8) to the right, closing off pump flow to the chamber of spool (14) and opening oil passage (5) to pump flow. Oil flows through oil passage (5) and chamber (22) to the input clutch.
b. The pressure buildup in chamber (22) is reflected back to the slug chamber of spool (8). This pressure, which is the input clutch operating pressure, builds quickly. At 300 psi +/- 15 psi (2069 kPa +/- 103 kPa), pressure in the slug chamber, when combined with the force of the spool return spring, will overcome the force imposed by load piston (7) and will shift spool (8) to the left.
c. The pressure in right directional clutch chamber (24) [presently at 80 psi (552 kPa)] will now build quickly toward its maximum of 275 psi +/- 15 psi (1896 kPa +/- 103 kPa). At a pressure of 180 psi (1241 kPa), the directional clutch begins to release; at 275 psi (1896 kPa) it is fully released. Spool (14) will be shifted to the left by the combined force of the system pressure felt in the slug chamber and the spool return spring.
d. So long as the control lever is held in the REEL OUT position, spools (8 and 14) will regulate the respective clutch operating pressures. In the case of the input clutch, operating pressure of 300 psi +/- 15 psi (2069 kPa +/- 103 kPa) is determined by the force of the load piston spring.
e. The operating pressure of the directional clutch is determined by the compression of spring (12), which can be varied by the amount that coupling (11) is moved into the valve body by the control lever. The design of spring (12) allows the directional clutch operating pressure to be regulated in a range of 180 - 275 psi (1241 - 1896 kPa), thereby varying winch drum speed

WINCH HYDRAULIC SYSTEM - CONTINUED.

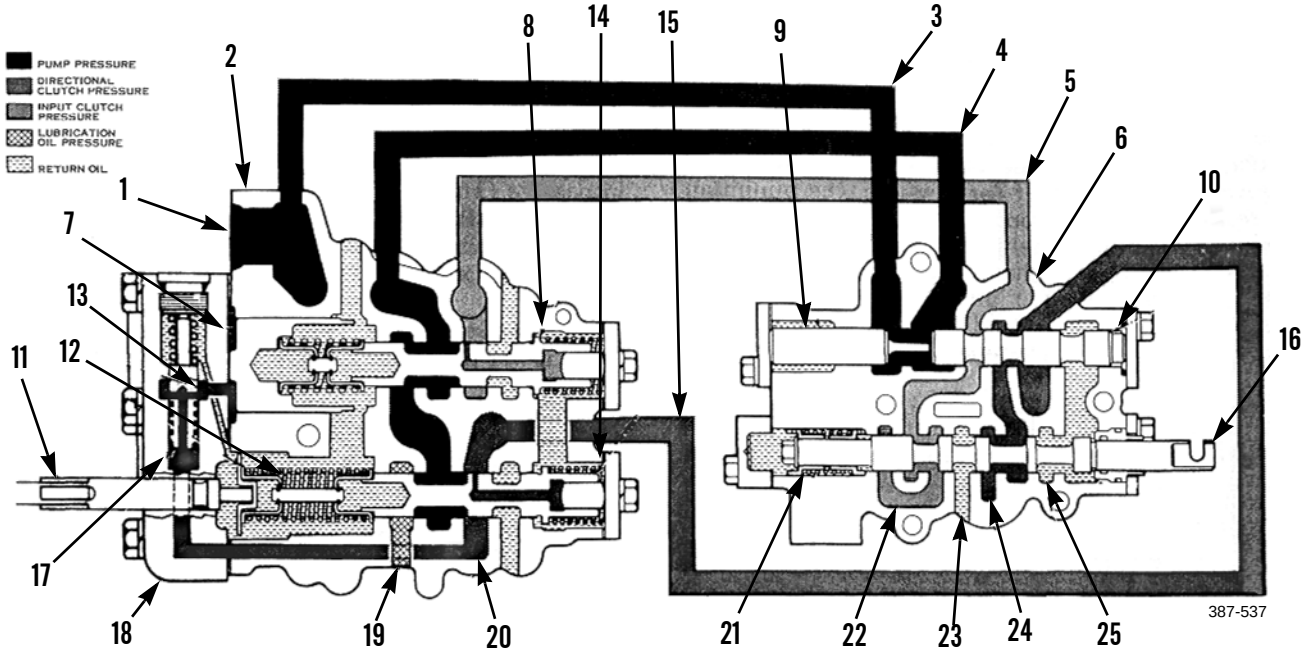


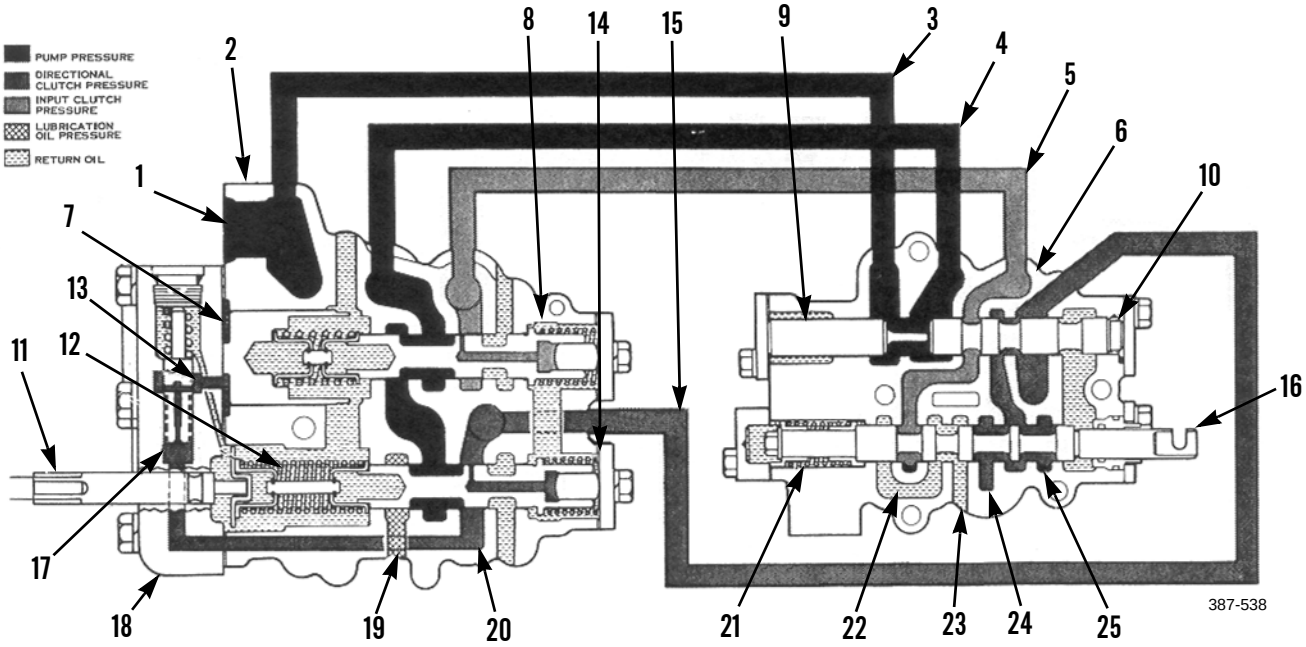
Table 1. Control System Oil Flow Schematic (REEL OUT Position).

Key	COMPONENT	key	COMPONENT
1	Supply Port	14	Spool
2	Body of Pressure Control Valve	15	Oil Passage
3	Oil Passage	16	Spool
4	Oil Passage	17	Sequence Valve
5	Oil Passage	18	Cover
6	Body of Valve for Selection of Direction	19	Oil Line
7	Load Piston	20	Oil Passage
8	Spool	21	Centering Spring
9	Stop	22	Fill Chamber for Input Clutch
10	Spool	23	Drain
11	Coupling	24	Fill Chamber for Right Side Directional Clutch
12	Spring Assembly	25	Fill Chamber for Left Side Directional Clutch
13	Oil Passage		

5. REEL IN Position. The sequence of operation for REEL IN is identical to that for REEL OUT. The only difference is in control lever throw, which results in spool (16) being moved into valve body (6). Chamber (25) fills instead of chamber (24). Chamber (25) is connected to the left directional clutch and winch drum rotation will reverse.

WINCH HYDRAULIC SYSTEM - CONTINUED

6. BRAKE OFF Position. In this position, the winch drum is free to rotate in either direction because both directional clutches will be disengaged. The input clutch will also be disengaged. When in BRAKE OFF position, spool (16) is centered in valve body (6), connecting both chambers (24 and 25) to oil passage (15). The outlet from chamber (22) to the input clutch is blocked by spool (16). Coupling (11) is moved into valve body (2) in the same manner as described for REEL OUT operation. The shifting of spools (8 and 14) and the function of sequence valve (17) is also the same oil passage (15) and chambers (24 and 25) will remain pressurized, keeping both directional clutches disengaged, until the control lever is returned to the HOLD position.



Control System Oil Flow Schematic (BRAKE OFF Position).

Key	COMPONENT	key	COMPONENT
1	Supply Port	14	Spool
2	Body of Pressure Control Valve	15	Oil Passage
3	Oil Passage	16	Spool
4	Oil Passage	17	Sequence Valve
5	Oil Passage	18	Cover
6	Body of Valve for Selection of Direction	19	Oil Line
7	Load Piston	20	Oil Passage
8	Spool	21	Centering Spring
9	Stop	22	Fill Chamber for Input Clutch
10	Spool	23	Drain
11	Coupling	24	Fill Chamber for Right Side Directional Clutch
12	Spring Assembly	25	Fill Chamber for Left Side Directional Clutch
13	Oil Passage		

END OF WORK PACKAGE

CHANGING WINCH ASSEMBLY OIL 0179 00

THIS WORK PACKAGE COVERS

Draining Oil, Refilling Oil

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (2 and 4)

References

WP 0009 00

WP 0184 00

WP 0185 00

Equipment Condition

Tractor parked on level ground (TM 5-2410-237-10)

Winch oil warm (winch operated for about 5 minutes) (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

DRAINING OIL

CAUTION

Wipe area clean around plugs before they are removed to prevent contamination of winch oil.

NOTE

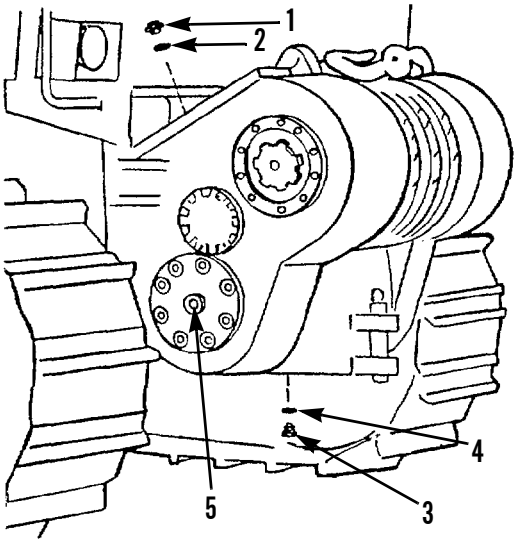
- **Place a suitable container under winch drain plug to collect drained oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Capacity is approximately 16 gal. (60.6 l).**

1. Remove fill plug (1) and gasket (2). Discard gasket.
2. Remove drain plug (3) and gasket (4). Allow oil to drain completely. Discard gasket.

NOTE

If noticeable amounts of metal particles are present in winch oil, replacement of winch may be required.

3. Wipe clean and inspect drain plug (3). Install drain plug with new gasket (4).
4. Perform related winch maintenance.
   a. Clean magnetic strainer assembly. Replace magnetic strainer filter (WP 0184 00).
   b. Replace winch oil filter (WP 0185 00).



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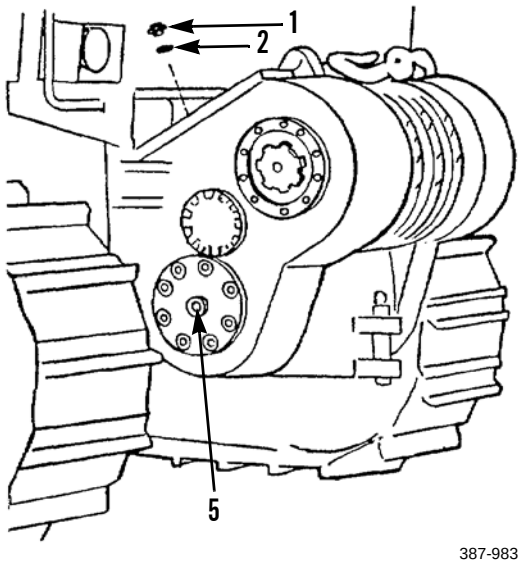
REFILLING OIL

1. Fill winch with oil at fill plug opening until oil can be seen through sight gage (5). Refer to WP 0009 00, PMCS Introduction, for proper grade of oil to use IAW expected temperature range of operation.
2. Wipe clean and inspect fill plug (1). Install fill plug with new gasket (2).
3. Operate winch and recheck oil level. Oil must be visible in sight gage (5). Add oil if necessary.



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END OF WORK PACKAGE

WINCH ASSEMBLY REPLACEMENT 0180 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250)

Link, lifting (Item 51, WP 0250 00)

Lifting equipment, 2 ton capacity

Wood cribbing, 4 ft x 4 in. x 4 in.

Bolt, 3/4-10 x 1-1/2 in.

Materials/Parts

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Wire, nonelectrical (Item 40, WP 0249 00)

Gasket (9)

Materials/Parts - Continued

Lockwasher (4 and 6)

Nut, self-locking (11 and 15)

O-ring (10, 23, 30 and 32)

Personnel Required

Three

References

TM 5-2410-237-10

TM 5-2410-237-23P

WP 0181 00

WP 0184 00

WP 0189 00

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Winch wire rope assembly removed, as required (WP 0188 00)

Winch oil drained (WP 0179 00)

REMOVAL

1. Clean external surfaces of winch to remove accumulated grease and dirt.

NOTE

- **Tag hoses before removed to ensure correct installation.**
- **Use a suitable container to catch any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Use two wrenches when disconnecting hose connections.**
- **Tractor will be immobilized when winch is removed. If tractor must be moved, perform the following step to isolate winch gear pump.**

2. Remove winch gear pump from rear of engine auxiliary drive (WP 0189 00). Cover opening where pump was removed with plate that is listed and illustrated in TM 5-2410-237-23P.
3. Remove winch control valve (WP 0181 00).
4. Remove winch magnetic strainer assembly (WP 0184 00). Wire magnetic strainer assembly up and out of the way.

REMOVAL - CONTINUED

NOTE

Use a tap to chase and clean threaded holes in bosses to which chain end links are attached.

5. Attach lifting link with 3/4-10 x 1-1/2 in. bolt in threaded boss (1) on each side of winch (2).
6. Remove two capscrews (3) and lockwashers (4). Discard lockwashers.
7. Remove seven remaining capscrews (5) and lockwashers (6) from cover (7) and cable access opening (8). Discard lockwashers.
8. Remove gasket (9) and O-ring (10) from cover (7). Discard gasket and O-ring.
9. Remove two self-locking nuts (11) and washers (12) from two top inner studs (13). Discard self-locking nuts.

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Winch assembly weighs approximately 3600 lb (1634 kg).

10. Attach a suitable three-point lifting device to each lifting link and to bar (14).
11. Remove six self-locking nuts (15) and washers (16) from studs (17). Discard self-locking nuts.

CAUTION

- **Remove winch slowly and carefully to prevent damage to mounting studs, transmission and drive shaft.**
- **Adjust lifting device as necessary to remove load from mounting studs.**

12. Use lifting device to move winch (2) straight back until drive shaft (18) is clear of tractor.
13. Place winch (2) on wood cribbing to prevent tipping.

CAUTION

Cover and gasket must be installed to prevent dirt and other damaging contaminants from entering final drive case.

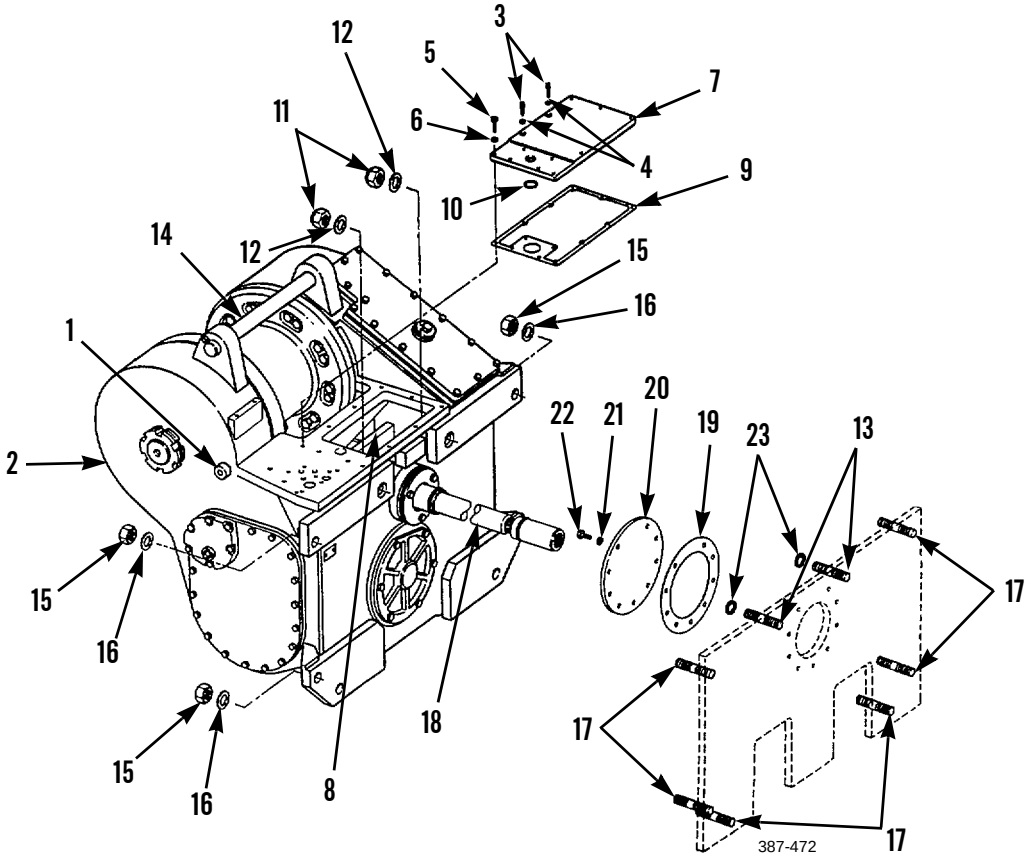
NOTE

Round cover, gasket and mounting hardware are COEI items listed in TM 5-2410-237-10.

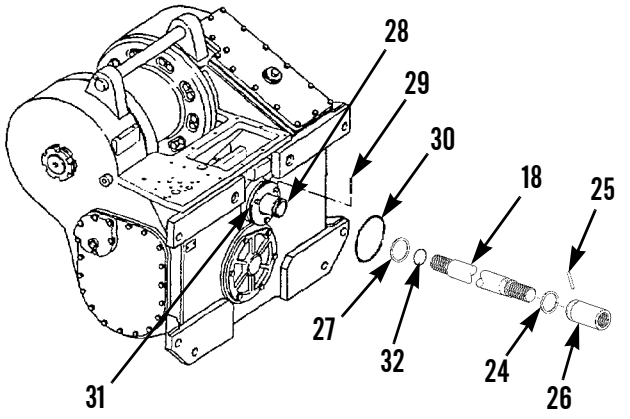
14. Install gasket (19) and round cover (20) over opening in final drive case at rear of tractor. Secure with nine lockwashers (21) and capscrews (22).

REMOVAL - CONTINUED

15. Remove two O-rings (23) from top inner studs (13). Discard O-rings.



16. Remove retaining ring (24), pin (25) and coupling (26) from transmission end of drive shaft (18).
17. Remove retaining ring (27) from winch coupling (28).
18. Remove pin (29) and drive shaft (18) from winch coupling (28).
19. Remove O-ring (30) from coupling flange (31). Discard O-ring.
20. Remove O-ring (32) from drive shaft (18). Discard O-ring.

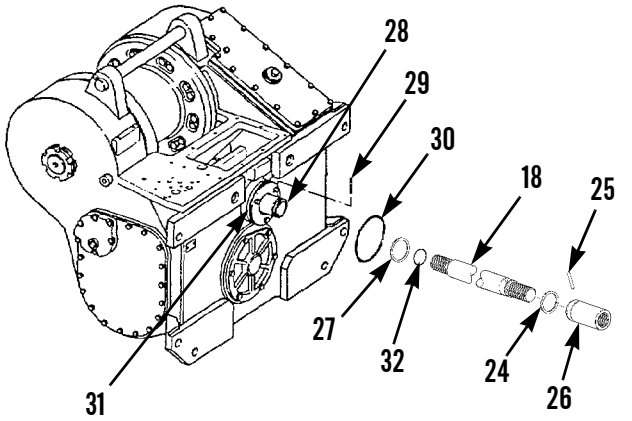


INSTALLATION

NOTE

- **Prior to installation, ensure all traces of paint or rust have been removed from mounting surfaces of winch and tractor and from mounting studs.**
- **Wipe clean all retaining ring and O-ring grooves in components.**
- **Lightly coat all new O-rings with clean oil before installation.**

1. Install new O-ring (32) on drive shaft (18).
2. Install new O-ring (30) on coupling flange (31).
3. Temporarily install retaining ring (27) onto end of winch coupling (28) and rotate coupling with hole straight up. Keep bottom of retaining ring to hold pin (29) in position.
4. Insert drive shaft (18) into winch coupling (28), align holes and install pin (29). Retain pin by sliding retaining ring (27) into groove in winch coupling (28).
5. Lightly lubricate, then temporarily install retaining ring (24) on groove end of coupling (26). Do NOT install retaining ring in groove at this time.
6. Install coupling (26) on drive shaft (18), align holes and install pin (25). Retain pin by sliding retaining ring (24) into groove in coupling (26).



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NOTE

Use a tap to chase and clean threaded holes in bosses to which chain end links are attached.

7. Attach lifting link with 3/4-10 x 1-1/2 in. bolt in threaded boss (1) on each side of winch (2).
8. Remove nine capscrews (22), lockwashers (21), round cover (20) and gasket (19) from opening in final drive case at rear of tractor. Discard gasket and lockwashers.
9. Install two new O-rings (23) on top inner studs (13).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Winch assembly weighs approximately 3600 lb (1634 kg).

10. Attach a suitable three-point lifting device to lifting link on each side of winch (2) and to bar (14).

INSTALLATION - CONTINUED

CAUTION

Ensure winch is steady when aligning drive shaft to drive shaft opening at rear of tractor. Install winch slowly and carefully. Failure to maintain control of winch while it is inserted could cause damage to mounting studs, drive shaft and transmission.

NOTE

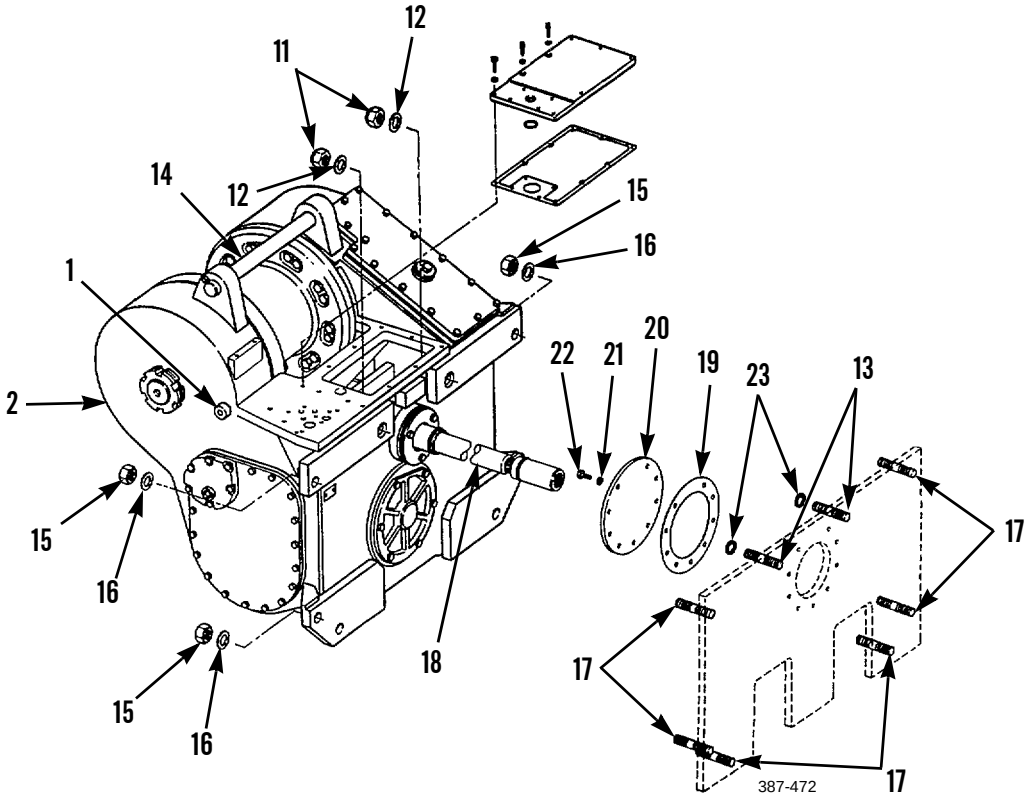
- **Assistance is required to align winch drive shaft with transmission coupling and output shaft.**
- **Adjust lifting device as needed until correct alignment is achieved.**

11. Align winch drive shaft (18) with opening in back of tractor. Rotate winch drive shaft to ensure that splines of transmission coupling and output shaft line up.

NOTE

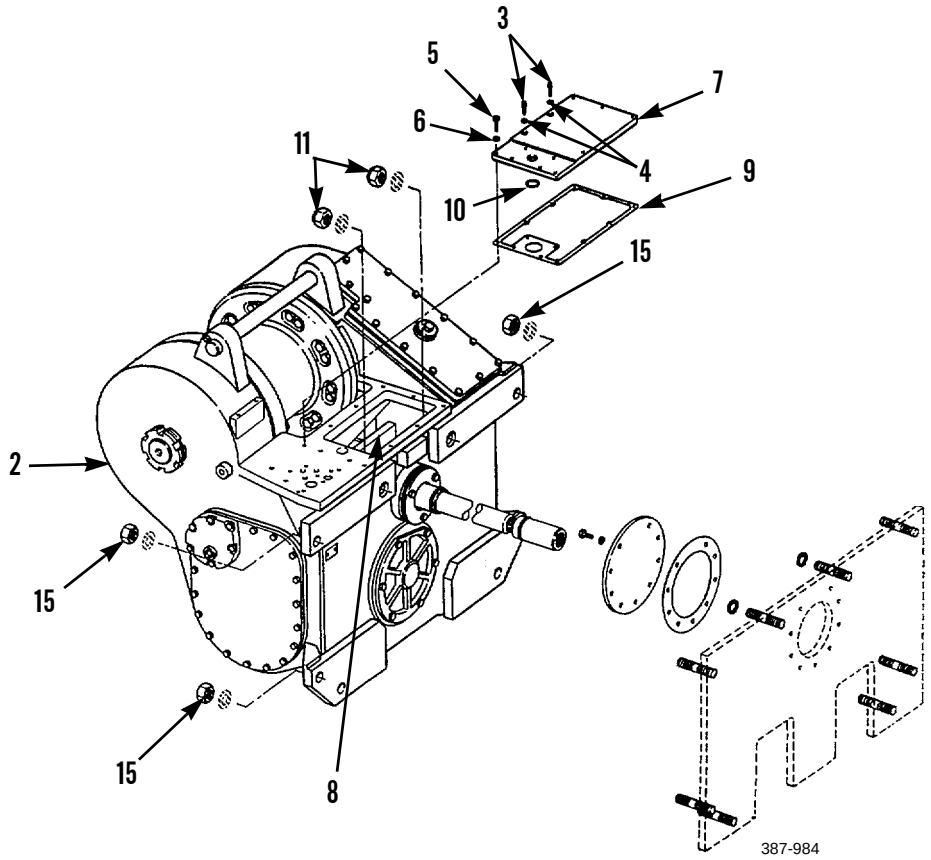
Winch is correctly aligned and installed when winch case is flush against rear of tractor.

12. Slowly move winch (2) toward tractor until coupling on drive shaft (18) is seated in transmission and winch is mounted on studs (13 and 17).
13. Install six washers (16) and new self-locking nuts (15) on studs (17).
14. Install two washers (12) and new self-locking nuts (11) on top inner studs (13).



INSTALLATION - CONTINUED

15. Tighten self-locking nuts (11 and 15) to 1200 lb-ft (1627 Nm).
16. Remove lifting device and lifting links from winch (2).
17. Install new O-ring (10), new gasket (9) and cover (7) on cable access opening (8).
18. Install seven new lockwashers (6) and capscrews (5) to cover (7). Install two new lockwashers (4) and capscrews (3).



19. Install winch magnetic strainer assembly (WP 0184 00).
20. Install winch control valve (WP 0181 00).
21. Install winch wire rope assembly, as required (WP 0188 00).

NOTE

As required, perform the following step to install winch gear pump, if it was removed prior to removing winch.

22. Remove plate and install winch gear pump (WP 0189 00).
23. Refill winch with oil (WP 0179 00).
24. Check winch for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

WINCH CONTROL VALVE REPLACEMENT 0181 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (24)

Materials/Parts - Continued

Lockwasher (3)

Nut, self-locking (10)

O-ring (23)

References

WP 0182 00

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

CAUTION

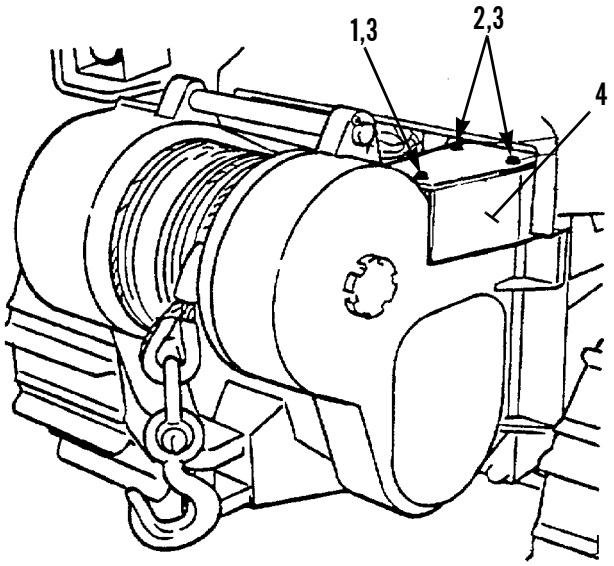
Wipe area clean around all connections to be opened during procedure. Plug hydraulic hose and all ports in control valve and mating surface on winch, to prevent dirt from contaminating winch.

NOTE

- Use a suitable container to catch any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.
- Use two wrenches when disconnecting and connecting connections.

REMOVAL

1. Remove two capscrews (1), capscrews (2) and four lockwashers (3) from cover (4). Remove cover. Discard lockwashers.



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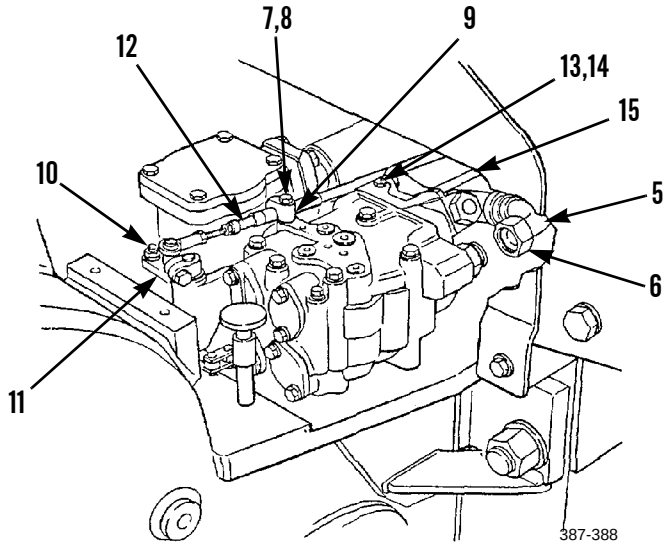
REMOVAL - CONTINUED

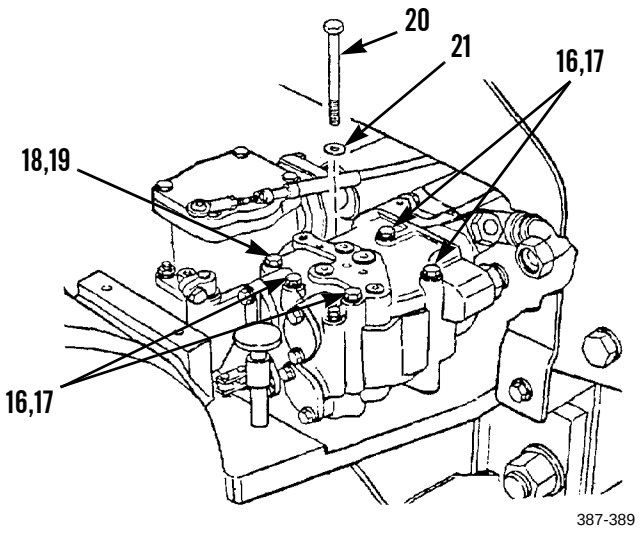
2. Disconnect hose (5) by unscrewing fitting (6).
3. Remove capscrew (7), washer (8) and clamp (9).
4. Remove self-locking nut (10) and capscrew (11). Lay cable (12) to the side. Discard self-locking nut.
5. Remove capscrew (13) and washer (14). Pull cable (15) from control valve.

NOTE

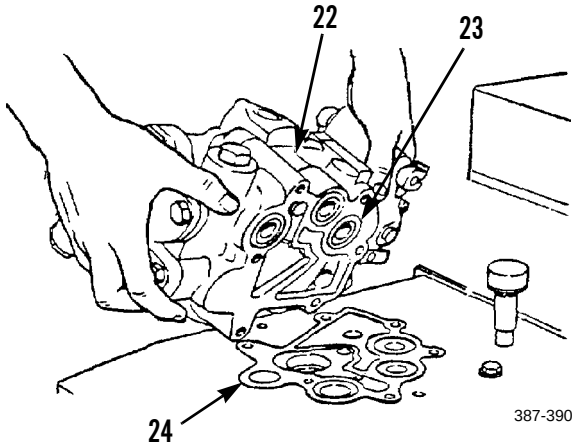
Note size of capscrews and their mounting location to ensure correct installation.

6. Remove four 5-3/4 in. long capscrews (16) and washers (17).
7. Remove 5-1/4 in. long capscrew (18) and washer (19).
8. Remove 4 in. long capscrew (20) and washer (21).





9. Remove control valve (22) from winch. Remove and discard three O-rings (23) and gasket (24).

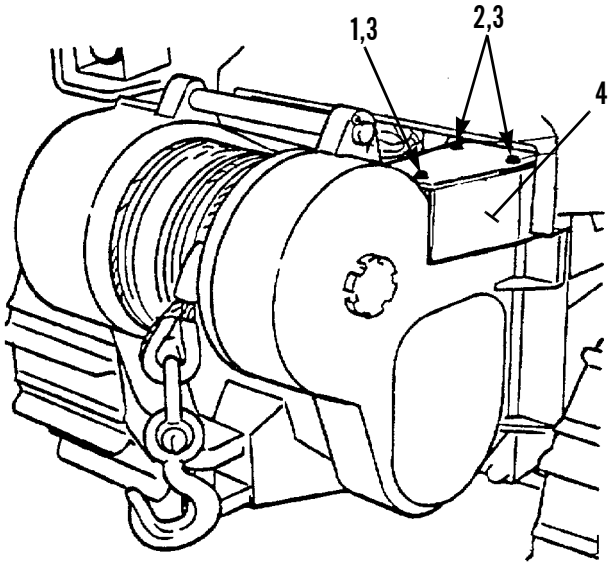


INSTALLATION

NOTE

Lightly coat new O-rings with clean oil before installation.

1. Place three new O-rings (23) on control valve (22). Place new gasket (24) on mating surface of winch. Position control valve on winch.
2. Install four 5-3/4 in. long capscrews (16) and washers (17).
3. Install 5-1/4 in. long capscrew (18) and washer (19).
4. Install 4 in. long capscrew (20) and washer (21).
5. Install cable (15) in control valve with capscrew (13) and washer (14).
6. Install cable (12) in control valve with capscrew (11) and new self-locking nut (10).
7. Align cable (12) and install clamp (9) with capscrew (7) and washer (8).
8. Adjust cables (2) (WP 0182 00).
9. Connect hose (5) to control valve and tighten fitting (6).
10. Check winch for proper operation and leaks.
11. Install cover (4) with two capscrews (1), capscrews (2) and four new lockwashers (3).



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END OF WORK PACKAGE

WINCH CONTROL LEVER AND LINKAGE ADJUSTMENT 0182 00

THIS WORK PACKAGE COVERS

Adjustment

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Gage, pressure, dial indicating, 0-600 psi (Item 30, WP 0250 00)

Materials/Parts

Lockwasher (3 and 14)

Materials/Parts - Continued

Nut, self-locking (6 and 18)

Pin, spring

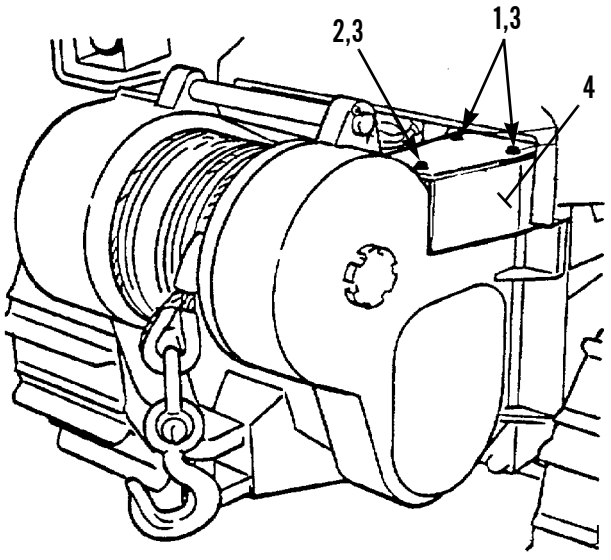
Equipment Condition

Tractor parked on level ground (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

ADJUSTMENT

1. Remove two capscrews (1), capscrews (2) and four lockwashers (3) from cover (4). Remove cover. Discard lockwashers.
2. Remove capscrew (5) and self-locking nut (6) from rod end (7) and lever at winch control valve (8). Discard self-locking nut.
3. Adjust control cable (9) so that distance between rod end (7) and end of threads on control cable is 0.50 in. (12.7 mm).
4. Install rod end (7) on lever and secure with capscrew (5) and new self-locking nut (6). Tighten nut securely against rod end.



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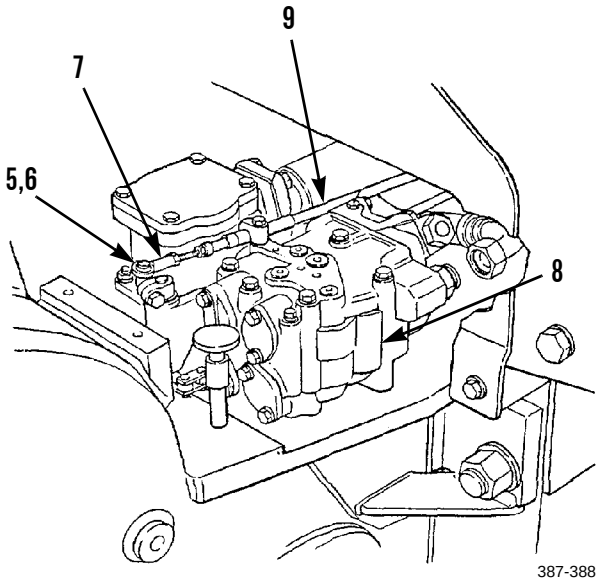

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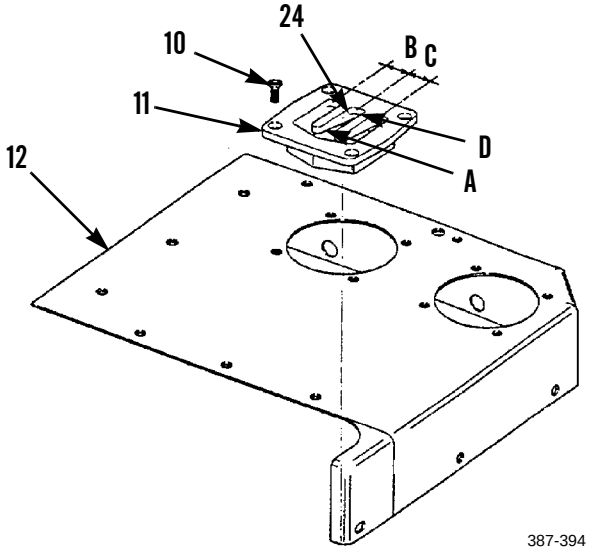
ADJUSTMENT - CONTINUED

5. Remove four capscrews (10) and guide (11) from cover (12).
6. Put control lever (13) in BRAKE ON position (A).
7. Remove spring pin, lockwasher (14) and rod end (15) of control cable (9) from control lever (13). Discard lockwasher and spring pin.
8. Loosen nut (16) and adjust rod end (15) until dimensions (B and C) are same when control lever (13) is in BRAKE ON position (A).
9. Install new lockwasher (14) and rod end (15) on control lever (13) with new spring pin.
10. Tighten nut (16) securely.
11. Remove capscrew (17), self-locking nut (18) and rod end (19) of control cable (20) from bellcrank (21).
12. Loosen nut (22). Move control lever (13) to BRAKE OFF position (D).



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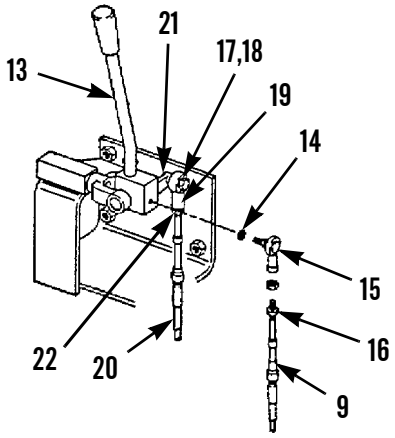

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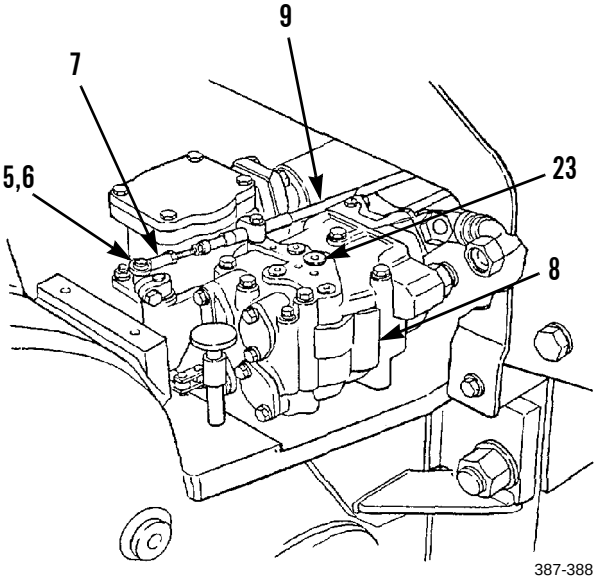
13. Install pressure gage in brake pressure tap (23) in control valve (8).



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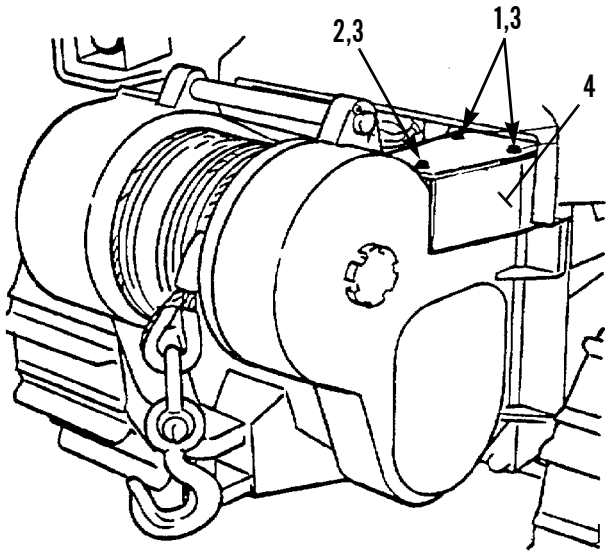
WINCH CONTROL LEVER AND LINKAGE ADJUSTMENT - CONTINUED 0182 00

ADJUSTMENT - CONTINUED

14. Start engine. Adjust control cable (20) until pressure at brake tap is 185 +/- 5 psi (1270 +/- 35 kPa).
15. Move control lever (13) into clip (24). If control lever is not held by clip, adjust control cable (20) until control lever is held. At this time, pressure at brake pressure tap must be not less than 160 psi (1100 kPa).
16. Tighten nut (22) securely against rod end (19).
17. Install rod end (19) on bellcrank (21) with capscrew (17) and new self-locking nut (18).
18. Do not tighten bellcrank mounting nut. Install on threads until there is a minimum amount of free movement in bellcrank (21) and bellcrank is free to turn.
19. Move control lever (13) to all positions. Ensure that threads on control cables (9 and 20) do not come in contact with rubber seals. If threads come in contact with rubber seals, adjust cables again.
20. Install guide (11) to cover (12) with four capscrews (10).
21. Remove pressure gage from brake pressure tap (23).
22. Install cover (4) with two capscrews (1), capscrews (2) and four new lockwashers (3).
23. Operate winch and check for proper operation (TM 5-2410-237-10).



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END OF WORK PACKAGE

WINCH CONTROL LEVER AND LINKAGE REPLACEMENT 0183 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (23, 37 and 40)

Nut, self-locking (22 and 46)

Materials/Parts - Continued

Pin, spring (28)

References

WP 0182 00

WP 0196 00

Equipment Condition

Tractor parked on level ground (TM 5-2410-237-10)

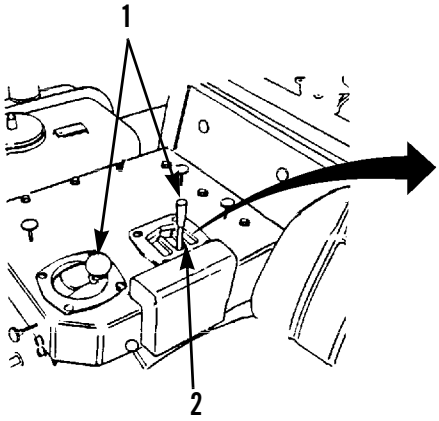
Engine OFF and cool (TM 5-2410-237-10)

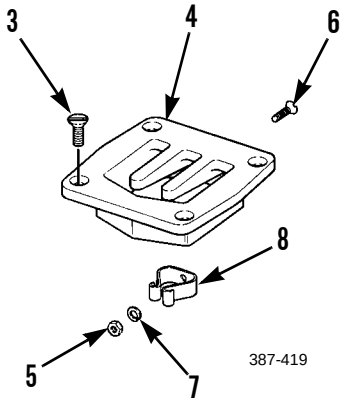
REMOVAL

NOTE

If tractor is equipped with winterized cab, remove sound suppression panels from control console (WP 0196 00).

1. Remove knobs (1) from winch control lever (2) and blade control lever.
2. Remove four screws (3) from control lever guide (4). Remove guide.
3. Remove nut (5), screw (6), washer (7) and clip (8) from guide (4).

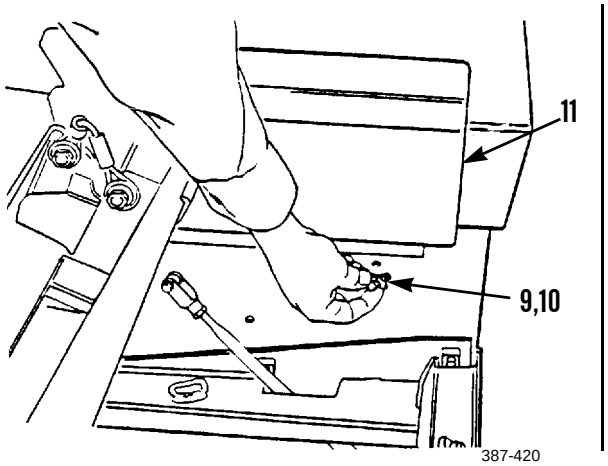


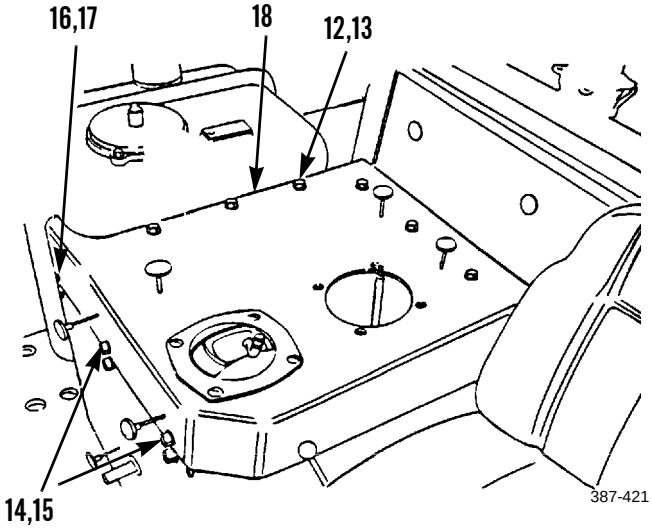


REMOVAL - CONTINUED

4. Lift seat and remove two capscrews (9), washers (10) and armrest (11) from control console.

5. Remove six capscrews (12) and washers (13), two capscrews (14) and washers (15) and capscrew (16) and washer (17) that secure cover (18) to control console. Remove cover.





NOTE

Tag control cables to ensure proper installation.

6. Remove capscrew (21) and self-locking nut (22) from control cable (19). Discard self-locking nut.

7. Unscrew control cable (20) and remove lockwasher (23). Discard lockwasher.

8. Remove nut (24) and washer (25) from bellcrank (26).

9. Remove bellcrank (26) with lever (2) from bracket (27).

CAUTION

Drive spring pin through backside of block on lever to avoid damaging threads at front end of hole.

10. Remove spring pin (28) from bellcrank (26). Discard spring pin.

11. Remove shaft (29) and lever (2) from bellcrank (26).

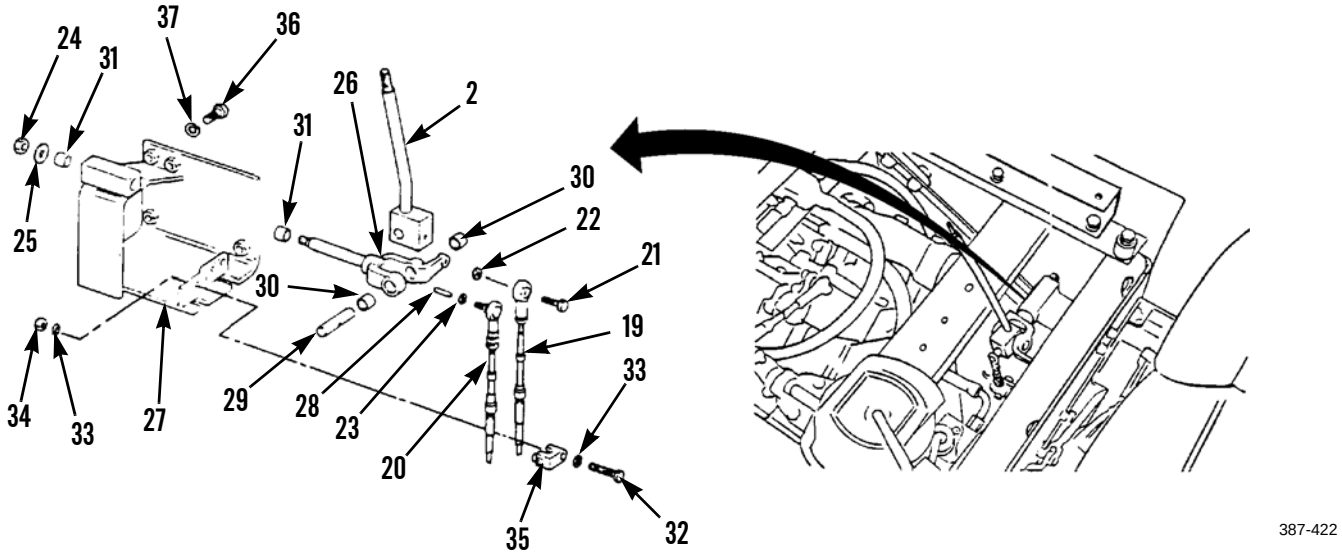
12. Remove two bushings (30) from bellcrank (26).

13. Remove two bushings (31) from bracket (27).

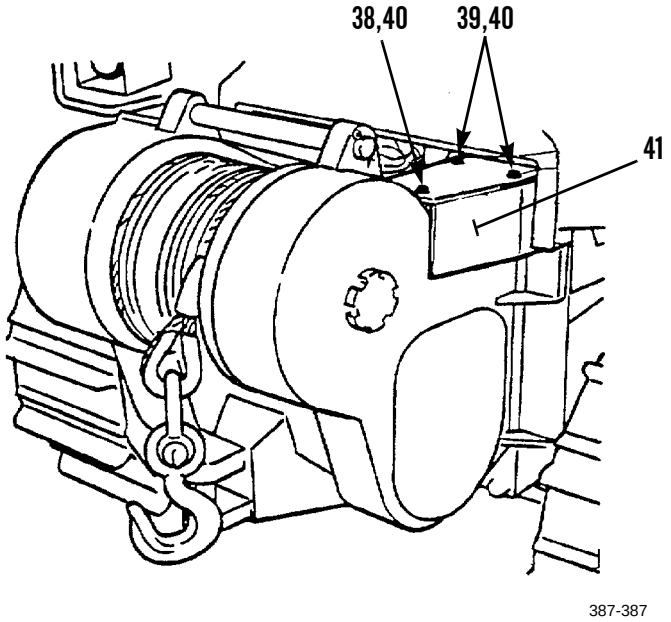
14. Remove bolt (32), two washers (33), nut (34) and two clamps (35) from control cables (19 and 20) and bracket (27).

15. Remove four capscrews (36), lockwashers (37) and bracket (27). Discard lockwashers.

REMOVAL - CONTINUED



16. Remove two capscrews (38), capscrews (39), four lockwashers (40) and cover (41) from winch control valve. Discard lockwashers.

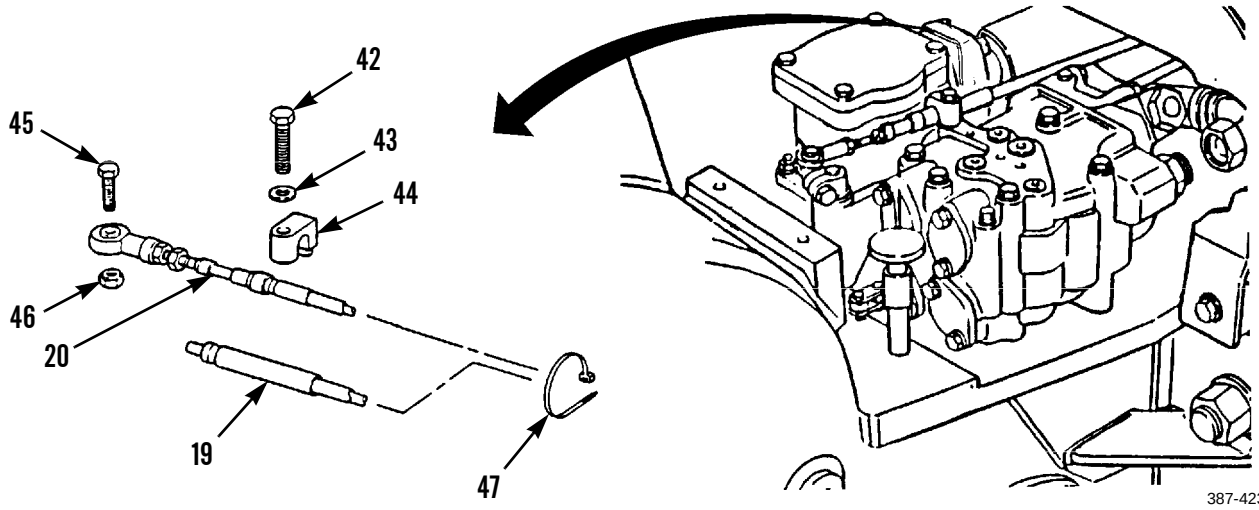


REMOVAL - CONTINUED

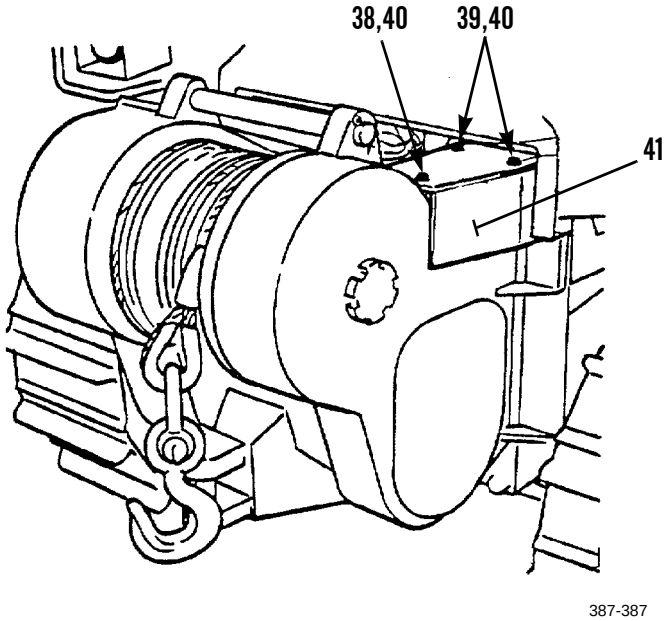
17. Remove capscrew (42), washer (43) and clamp (44) from control cable (20).
18. Remove capscrew (45) and self-locking nut (46) from control cable (20). Remove control cable (19) from control valve. Discard self-locking nut.
19. Remove control cables (19 and 20) from machine. Remove straps (47) as necessary.

INSTALLATION

1. Install control cables (19 and 20) to machine. Install straps (47) as necessary.
2. Install control cable (19) to control valve. Install control cable (20) with capscrew (45) and new self-locking nut (46).
3. Install capscrew (42), washer (43) and clamp (44) to control cable (20).

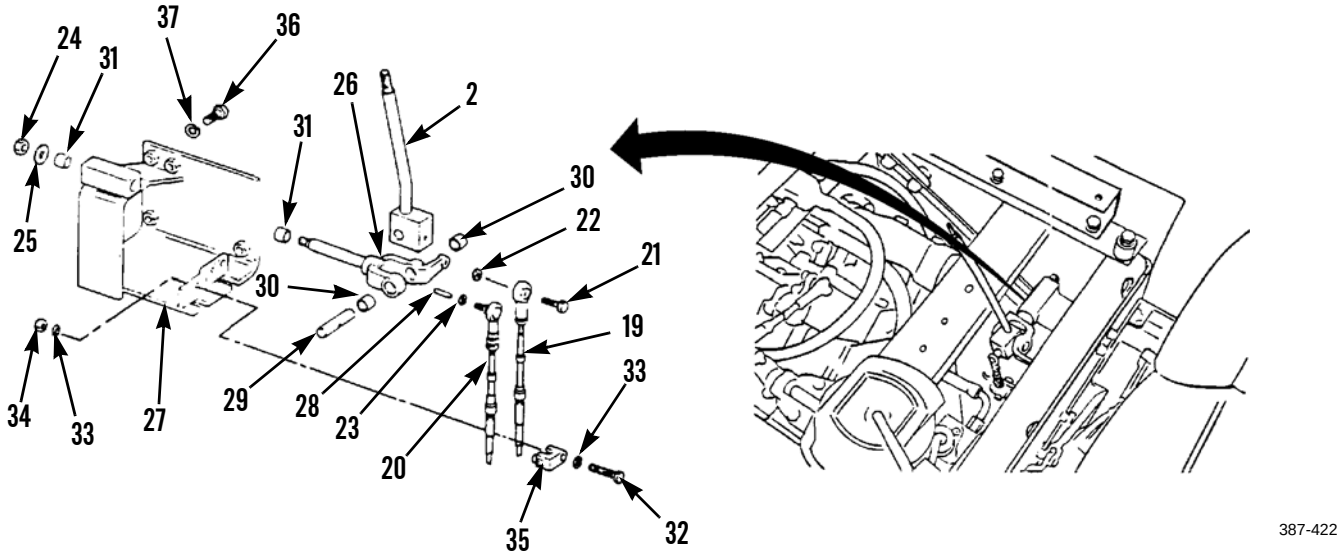


4. Install cover (41) on winch control valve with two capscrews (38), capscrews (39) and four new lockwashers (40).

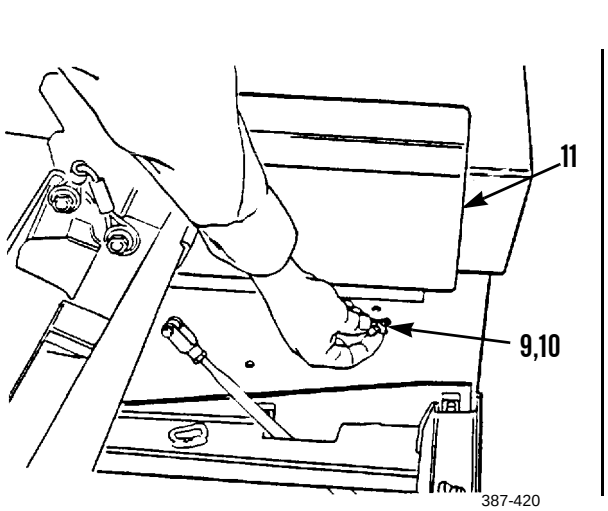


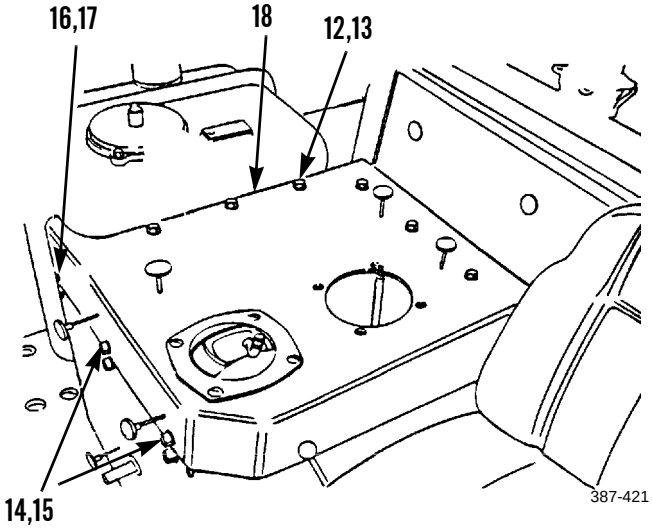
INSTALLATION - CONTINUED

5. Install bracket (27) with four capscrews (36) and new lockwashers (37).
6. Secure control cables (19 and 20) to bracket (27) with two clamps (35), bolt (32), two washers (33) and nut (34).
7. Install two bushings (31) in bracket (27).
8. Install two bushings (30) in bellcrank (26).
9. Install shaft (29) and lever (2) to bellcrank (26) with new spring pin (28).
10. Install bellcrank (26) with lever (2) to bracket (27) with washer (25) and nut (24).
11. Install capscrew (21) and new self-locking nut (22) to secure control cable (19) to bellcrank (26). Install new lockwasher (23) and control cable (20).



12. Position cover (18) on control console. Install six capscrews (12) and washers (13), two capscrews (14) and washers (15) and capscrew (16) and washer (17).
13. Install armrest (11) on control console with two capscrews (9) and washers (10).





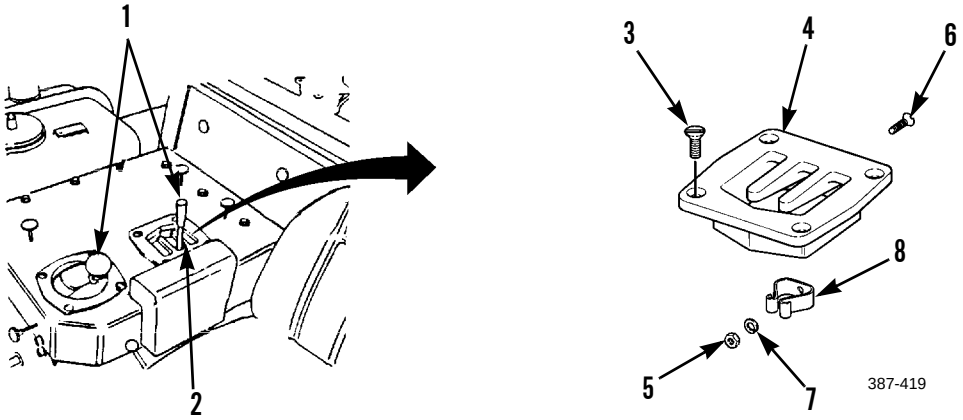
INSTALLATION - CONTINUED

14. Install screw (6), nut (5), washer (7) and clip (8) onto control lever guide (4).
15. Install guide (4) to console with four screws (3).
16. Install knobs (1) to winch control lever (2) and blade control lever.

NOTE

If tractor is equipped with winterized cab, install sound suppression panels to control console (WP 0201 00).

17. Adjust control lever and linkage (WP 0182 00).
18. Check winch for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

WINCH MAGNETIC STRAINER ASSEMBLY REPLACEMENT 0184 00

THIS WORK PACKAGE COVERS

Service, Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

O-ring (6, 11 and 17)

References

WP 0179 00

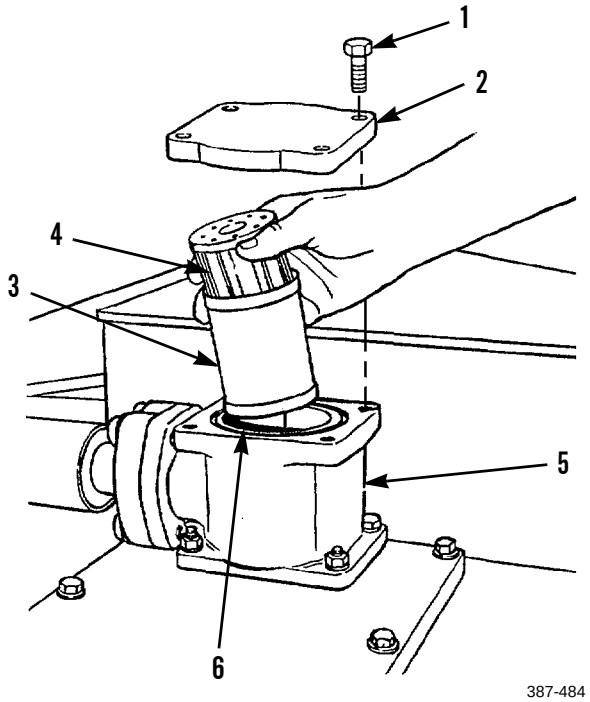
Equipment Condition

Tractor parked on level ground (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

SERVICE

1. Remove four bolts (1) from cover (2). Remove cover.
2. Remove strainer (3) and filter (4) from housing (5).
3. Remove and discard O-ring (6) from housing (5).



387-484

SERVICE - CONTINUED

WARNING

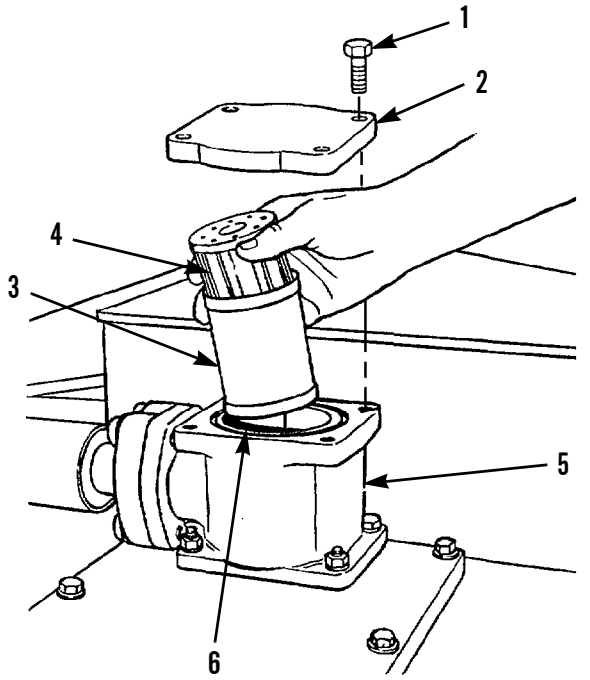
Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

4. Clean strainer (3) and filter (4) in solvent cleaning compound.

NOTE

Replace filter at the same interval winch oil is changed (biennially).

5. Inspect strainer (3) and filter (4) for damage. Replace if damaged.
6. Install strainer (3) and filter (4) in housing (5).
7. Put clean oil on new O-ring (6) and install in housing (5).
8. Install cover (2) on housing (5) with four bolts (1).



387-484

REMOVAL

CAUTION

Plug hose to prevent dirt from entering winch.

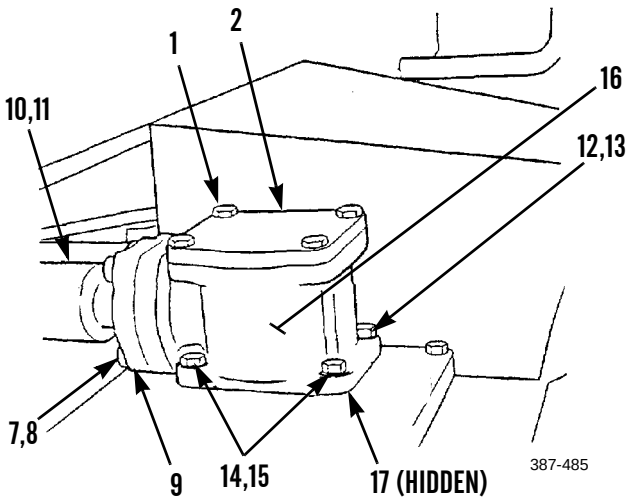
1. Remove four bolts (7) and washers (8) from two split flanges (9). Remove flanges and disconnect hose (10). Remove and discard O-ring (11).
2. Remove two bolts (12) and washers (13).
3. Remove two nuts (14) and washers (15).
4. Remove magnetic strainer assembly (16) and O-ring (17) from winch cover. Discard O-ring.

INSTALLATION

NOTE

- **Lightly coat new O-rings with clean oil before installation.**
- **Ensure mating surfaces are clean.**

1. Install new O-ring (17) on base of magnetic strainer assembly (16).
2. Position magnetic strainer assembly (16) on winch cover. Install two washers (15) and nuts (14). Install two washers (13) and bolts (12). Tighten nuts and bolts to 40 lb-ft (54 Nm).
3. Install new O-ring (11), hose (10) and two split flanges (9) on magnetic strainer assembly (16) with four washers (8) and bolts (7).
4. Run engine at low idle. Ensure oil is visible in sight gage. Add oil if necessary (WP 0179 00).
5. Check winch for leaks and proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

WINCH OIL FILTER ASSEMBLY MAINTENANCE 0185 00

THIS WORK PACKAGE COVERS

Changing Oil Filter Element

Oil Filer Assembly: Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Filter element, fluid (7)

Materials/Parts - Continued

Gasket (13)

Lockwasher (4 and 11)

O-ring (9 and 20)

Retainer, packing (8)

Seal (2)

References

WP 0179 00

Equipment Condition

Tractor parked on level ground (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

CAUTION

Wipe area clean around all connections to be opened during procedure. Cap oil lines and plug openings to prevent contamination of winch, which could result in premature failure.

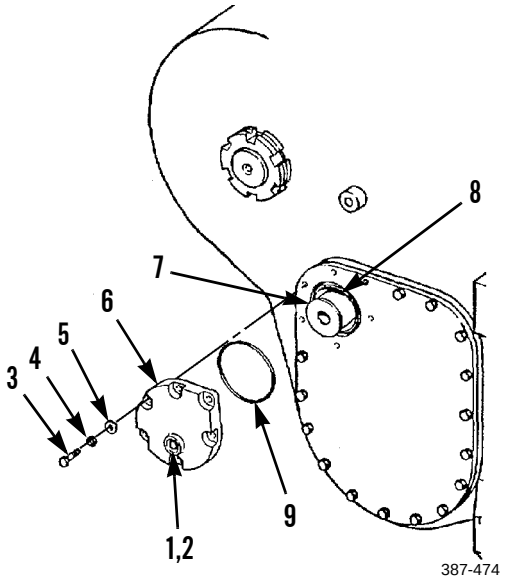
CHANGING OIL FILTER ELEMENT

NOTE

Use a suitable container to catch draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

CHANGING OIL FILTER ELEMENT - CONTINUED

1. Remove plug (1) and seal (2) and let oil drain into a suitable container. Discard seal. Install plug with new seal after oil has drained.
2. Remove six capscrews (3), lockwashers (4) and washers (5) from filter cover (6). Discard lockwashers.
3. Remove filter cover (6) and filter element (7) with packing retainer (8). Discard filter element and packing retainer.
4. Remove O-ring (9) from filter cover (6). Discard O-ring.



387-474

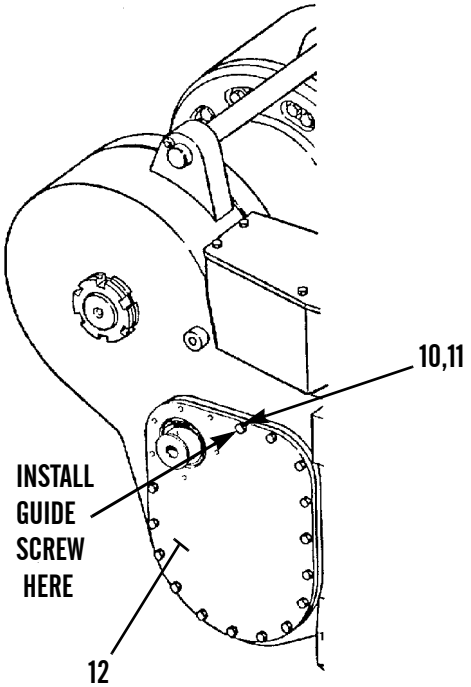
NOTE

Lightly coat new packing retainer and new O-ring with clean oil before installation.

5. Put clean oil on new packing retainer (8). Install new filter element (7) and new packing retainer (8).
6. Install new O-ring (9) in groove on filter cover (6).
7. Position filter cover (6) and align capscrew holes.
8. Install six capscrews (3), new lockwashers (4) and washers (5) to filter cover (6).
9. Start engine and run at low idle. Check level of oil in winch sight gage. Add oil if oil is not visible in sight gage (WP 0179 00).
10. Check winch for proper operation and leaks (TM 5-2410-237-10).

OIL FILTER ASSEMBLY REMOVAL

1. Remove oil filter element. Refer to *Changing Oil Filter Element*.
2. Remove one capscrew (10) and lockwasher (11) near top of access cover (12). Discard lockwasher. Install a guide screw in place of capscrew.
3. Remove remaining 14 capscrews (10) and lockwashers (11) from access cover (12). Discard lockwashers.
4. Lift access cover (12) and gasket (13) from guide screw. Discard gasket.
5. Remove capscrew (14) and lock (15).
6. Remove two capscrews (16) and washers (17) from filter head (18).
7. Lower filter head (18) and pipe (19) to remove from winch case.
8. Separate pipe (19) from filter head (18).
9. Remove and discard two O-rings (20).



387-475

OIL FILTER ASSEMBLY INSTALLATION

NOTE

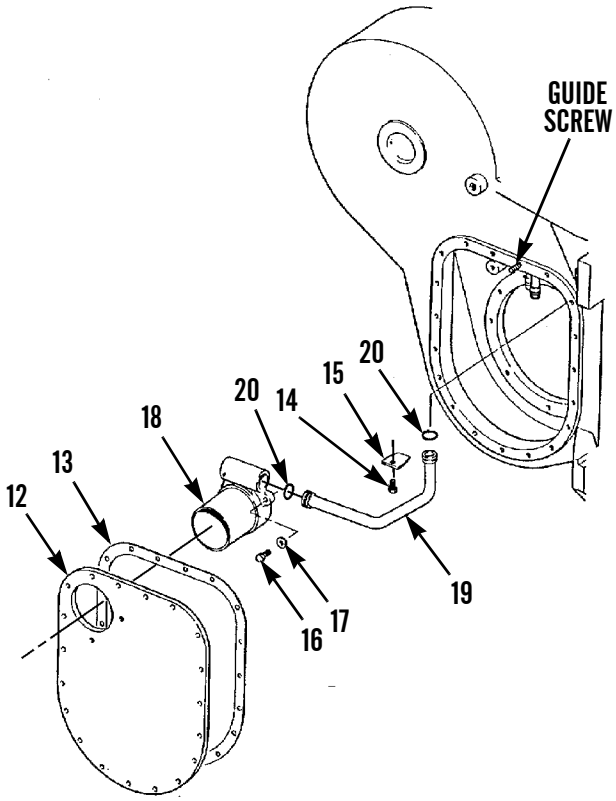
Lightly coat new O-rings with clean oil before installation.

1. Install two new O-rings (20) on pipe (19).
2. Push pipe (19) into filter head (18).
3. Position filter head (18) and pipe (19) inside winch case. Install two capscrews (16) and washers (17) to secure filter head to winch case.
4. Secure top of pipe (19) with lock (15) and capscrew (14).
5. Place new gasket (13) on access cover (12).

NOTE

Use guide screw installed as shown in winch case to help with installation of access cover.

6. Position access cover (12) and install 14 new lockwashers (11) and capscrews (10).
7. Remove guide screw and install remaining new lockwasher (11) and capscrew (10).
8. Install oil filter element. Refer to *Changing Oil Filter Element.*
9. Start engine and run at low idle. Check level of oil in winch sight gage. Add oil if oil is not visible in gage (WP 0179 00).
10. Check winch for proper operation and leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

WINCH BREATHER REPLACEMENT 0186 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Equipment Condition

Winch control valve cover removed (WP 0181 00)

CAUTION

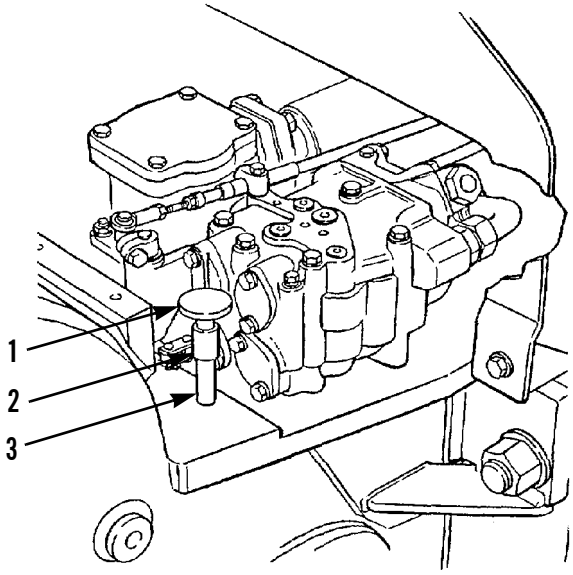
Ensure opening in winch is covered when breather is removed, to prevent dirt from contaminating winch.

REMOVAL

1. Remove breather (1) from coupling (2).
2. Remove coupling (2) from nipple (3).
3. Remove nipple (3) from winch.
4. Plug breather hole in winch.

INSTALLATION

1. Remove plug from breather hole.
2. Wipe breather hole clean.
3. Install nipple (3).
4. Install coupling (2) to nipple (3).
5. Install breather (1) to coupling (2). Hand tighten breather.
6. Install winch control valve cover (WP 0181 00).



387-360

END OF WORK PACKAGE

DRAWBAR PIN AND LATCH REPLACEMENT 0187 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Pin, cotter (5)

Equipment Condition

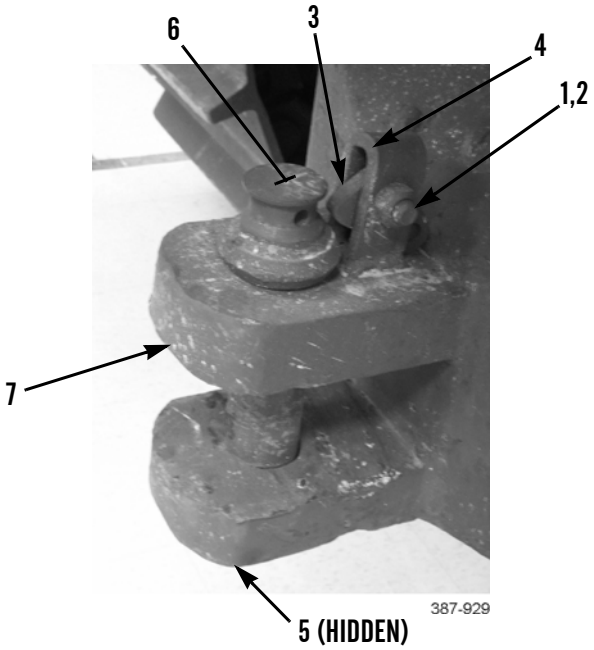
Machine parked on level ground (TM 5-2410-237-10)

REMOVAL

1. Remove nut (1), bolt (2) and latch (3) from weldment (4).
2. Remove cotter pin (5) and drawbar pin (6) from bracket (7). Discard cotter pin.
3. Remove capscrew (4), nut (5) and latch (1).

INSTALLATION

4. Install latch (3) to weldment (4) with bolt (2) and nut (1).
5. Install drawbar pin (6) in bracket (7).
6. Install new cotter pin (5) in drawbar pin (6).
7. Ensure latch (3) moves freely. Loosen or tighten nut (1) as needed.



END OF WORK PACKAGE

WINCH WIRE ROPE ASSEMBLY MAINTENANCE 0188 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Lockwasher (2)

References

FM 5-125

Personnel Required

Two

Equipment Condition

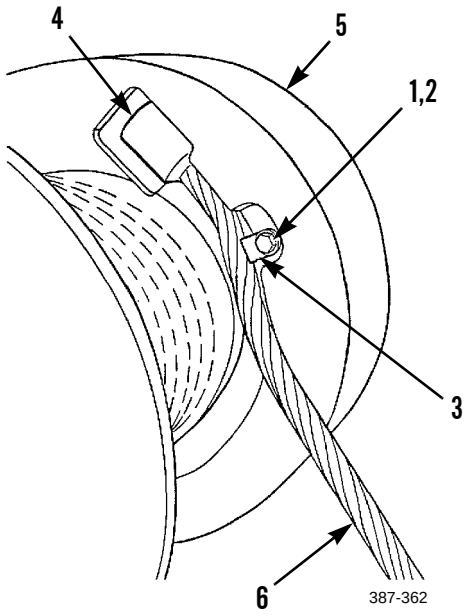
Winch wire rope reeled out (TM 5-2410-237-10)

WARNING

Wear heavy gloves when handling wire rope to protect hands against injury.

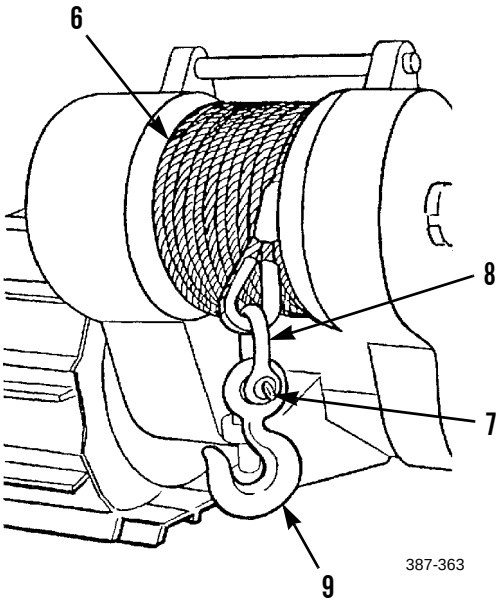
REMOVAL

1. Remove capscrew (1), lockwasher (2) and clamp (3). Discard lockwasher.
2. Pull ferrule (4) from winch drum (5) and remove wire rope (6).



DISASSEMBLY

1. Remove pin (7) from clevis (8) and remove hook (9).
2. Remove clevis (8) from wire rope (6).



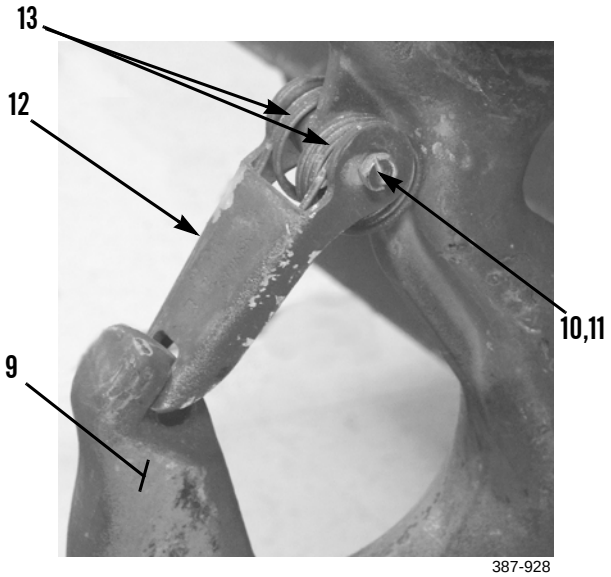
WARNING

Wear eye protection when disassembling latch to prevent injury.

NOTE

Note location of two springs and how they are installed to ensure correct assembly.

3. Remove nut (10) and screw (11) from latch (12) and hook (9).
4. Remove latch (12) and two springs (13) from hook (9).



CLEANING AND INSPECTION

WARNING

- **Wear eye protection when using wire brush to protect against injury.**
- **Failure to replace a damaged wire rope assembly could result in injury or death in the event wire rope breaks when loaded.**

NOTE

Refer to FM 5-125, Rigging Techniques, Procedures, and Applications for further information.

1. Clean entire length of wire rope with a wire brush.
2. Inspect entire length of wire rope for flat spots, fraying, kinks and evidence of rusting.
3. Replace wire rope if any frays or any kinks are evident, or if any flat spot is more than 1/2 the diameter of wire rope.

ASSEMBLY

WARNING

Wear eye protection when assembling latch to prevent injury.

1. Position latch (12) and two springs (13) to hook (9).
2. Install screw (11) through hook (9), springs (13) and latch (12) and secure with nut (10).
3. Position clevis (8) in loop at end of wire rope (6).
4. Position eye of hook (9) in clevis (8) and install pin (7).

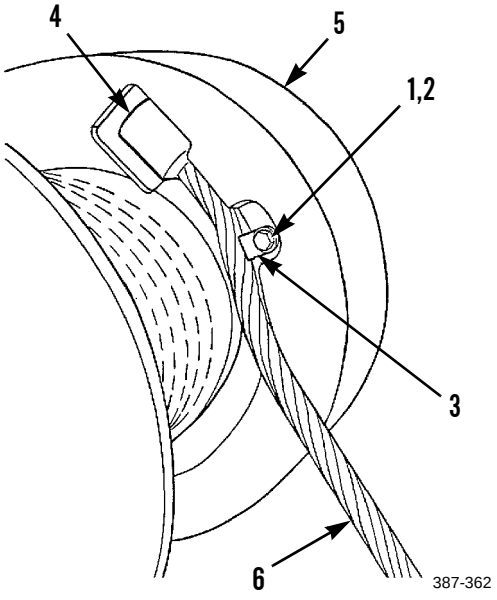
INSTALLATION

1. Lay wire rope (6) out in a straight line behind tractor.

NOTE

When installing wire rope for standard speed winch, ensure wire rope is wound over top of winch drum.

2. Install cable ferrule (4) in groove on winch drum (5).
3. Install clamp (3) with new lockwasher (2) and capscrew (1).
4. Start engine and wind wire rope on drum (TM 5-2410-237-10).



END OF WORK PACKAGE

WINCH GEAR PUMP REPLACEMENT 0189 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Gasket (15)

Lockwasher (8 and 14)

O-ring (5, 6, and 10)

References

WP 0179 00

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

Floor plates removed (WP 0171 00)

REMOVAL

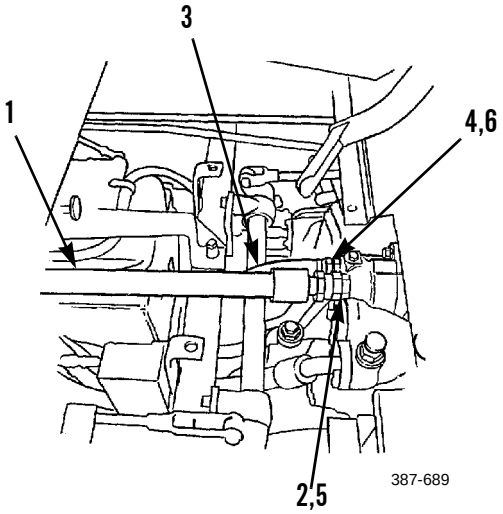
CAUTION

Wipe area clean around all connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of winch could result in premature failure.

NOTE

- **Use a suitable container to capture any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. Disconnect hose (1) from connector (2). Disconnect hose (3) from connector (4). Remove and discard two O-rings (5 and 6) from hoses.



REMOVAL - CONTINUED

2. Remove two bolts (7) and lockwashers (8) from pump (9). Discard lockwashers.
3. Remove pump (9) and O-ring (10) from adapter. Discard O-ring.

NOTE

Perform steps 4-6 only if pump mounting adapter requires replacement.

4. Remove coupling (12) from adapter (11).
5. Remove six bolts (13) and lockwashers (14) from adapter (11). Discard lockwashers.
6. Remove adapter (11) and gasket (15) from engine. Discard gasket.

INSTALLATION

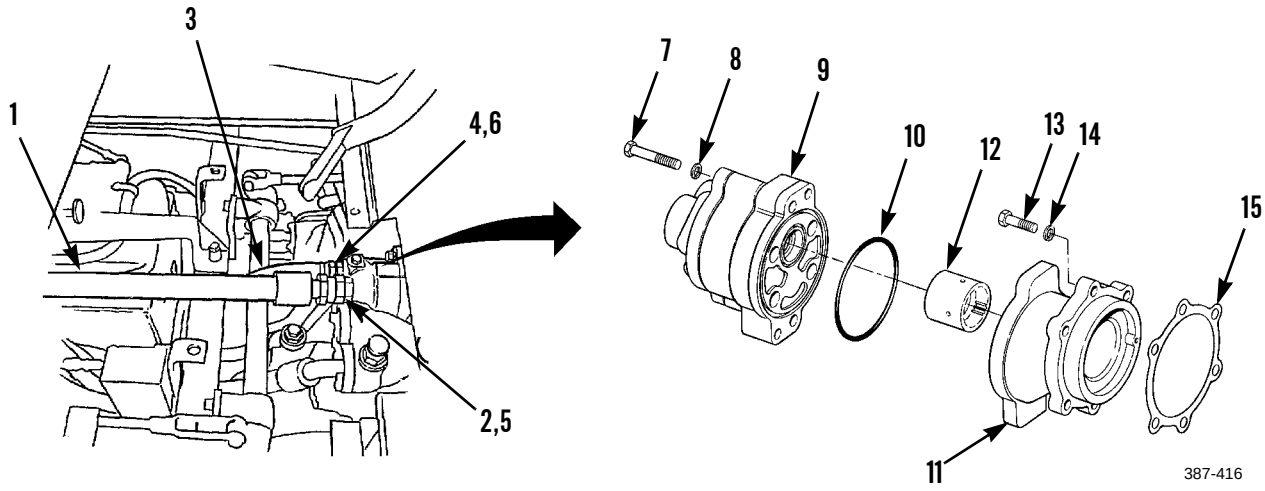
CAUTION

Ensure mounting surfaces are clean before installation. Failure to provide clean mounting surfaces may cause contamination of winch.

NOTE

- **Perform steps 1-3 only if pump mounting adapter was removed.**
- **Lightly coat new O-rings with clean oil before installation.**

1. Install new gasket (15) on adapter assembly (11).
2. Install adapter (11) on engine with six new lockwashers (14) and bolts (13).
3. Install coupling (12) in adapter (11).
4. Install new O-ring (10) on pump (9).
5. Install pump (9) on adapter (11) with two new lockwashers (8) and bolts (7).
6. Install new O-ring (6) on hose (3) and install hose to connector (4) on pump (9).
7. Install new O-ring (5) on hose (1) and install hose to connector (2) on pump (9).
8. Check winch oil level and add oil as needed (WP 0179 00).
9. Start engine and run at low idle. Check winch for proper operation and leaks.
10. Install floor plates (WP 0171 00).



END OF WORK PACKAGE

WINCH LINES AND FITTINGS REPLACEMENT 0190 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winch

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, 25 or 26, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

Lockwasher (14)

O-ring (3, 6, 8 and 12)

Strap (21)

References

WP 0179 00

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Floor plates removed (WP 0171 00)

WARNING

At operating temperature winch oil is hot. Allow oil to cool before disconnecting any lines. Failure to do so could result in injury.

REMOVAL

CAUTION

Wipe area clean around all connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of winch could result in premature failure.

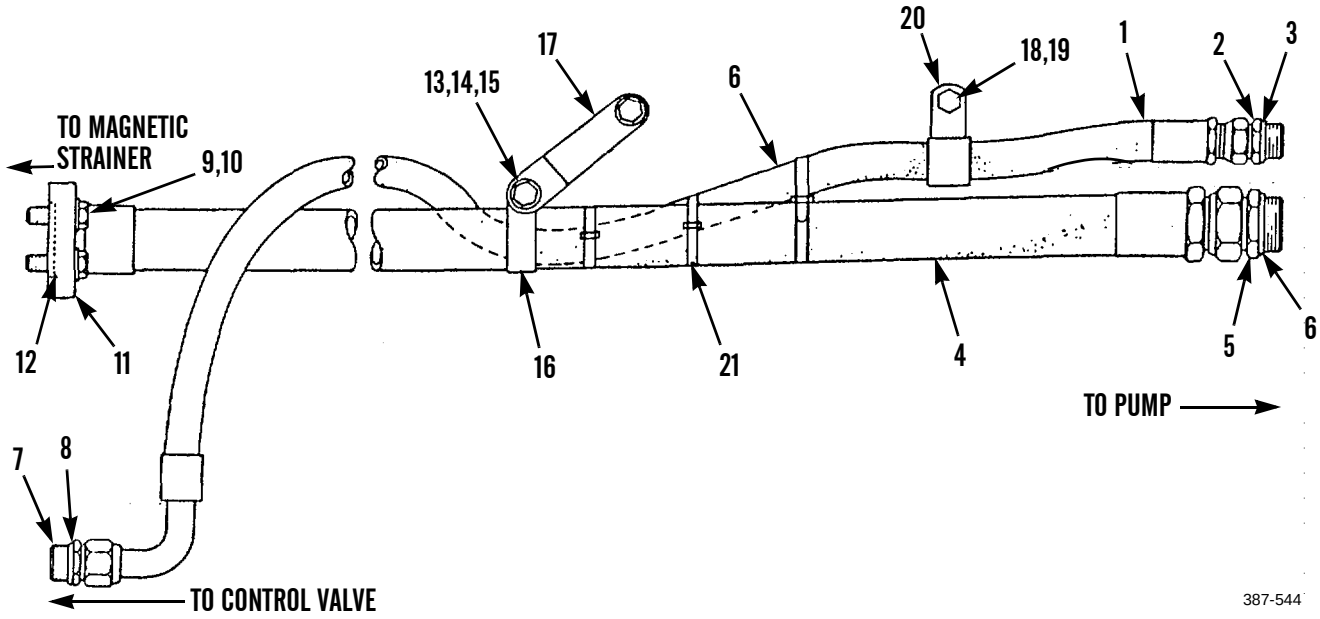
1. Remove fill plug from winch (WP 0179 00).

REMOVAL - CONTINUED

NOTE

- Use a suitable container to capture any oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.
- Tag lines to ensure correct installation.

2. Disconnect hose (1) from connector (2) at winch gear pump. Remove connector. Remove and discard O-ring (3) from connector.
3. Disconnect hose (4) from connector (5) at winch gear pump. Remove connector. Remove and discard O-ring (6) from connector.
4. Disconnect hose (1) from connector (7) located at winch control valve. Remove connector. Remove and discard O-ring (8) from connector.
5. Remove four bolts (9), washers (10) and two split flanges (11) to disconnect hose (4) from winch magnetic strainer assembly housing. Remove and discard O-ring (12) from end of hose.
6. Remove capscrew (13), lockwasher (14), nut (15) and clip (16) with hose (4) from bracket (17). Discard lockwasher.
7. Remove capscrew (18), spacer (19) and clip (20) from hose (1).
8. Remove hoses (1 and 4) from machine. Cut three straps (21) from hoses. Discard straps.



INSTALLATION

CAUTION

Remove caps and/or plugs and wipe components clean to prevent contamination of winch.

NOTE

Lightly coat new O-rings with clean oil before installation.

1. Position hoses (1 and 4) between connection points on machine.
2. Install connector (2) with new O-ring (3) into winch gear pump.
3. Connect hose (1) to connector (2).
4. Install connector (5) with new O-ring (6) into winch gear pump.
5. Connect hose (4) to connector (5).

INSTALLATION - CONTINUED

6. Install connector (7) with new O-ring (8) into winch control valve.
7. Connect hose (1) to connector (7).
8. Install new O-ring (12) in end of hose (4). Install hose to magnetic strainer assembly housing with two split flanges (11), four washers (10) and bolts (9).
9. Secure hose (4) to bracket (17) with clip (16), capscrew (13), new lockwasher (14) and nut (15).
10. Secure hose (1) with clip (20), spacer (19) and capscrew (18).
11. Tie hoses (1 and 4) together with three new straps (21).
12. Install floor plates (WP 0171 00).
13. Check level of oil in winch sight gage and add oil as needed (WP 0179 00).
14. Start engine and run at low idle. Ensure that oil is visible in sight gage. Add oil if necessary (WP 0179 00).
15. Check winch for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

MIRROR ASSEMBLY REPLACEMENT 0191 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Equipment Condition

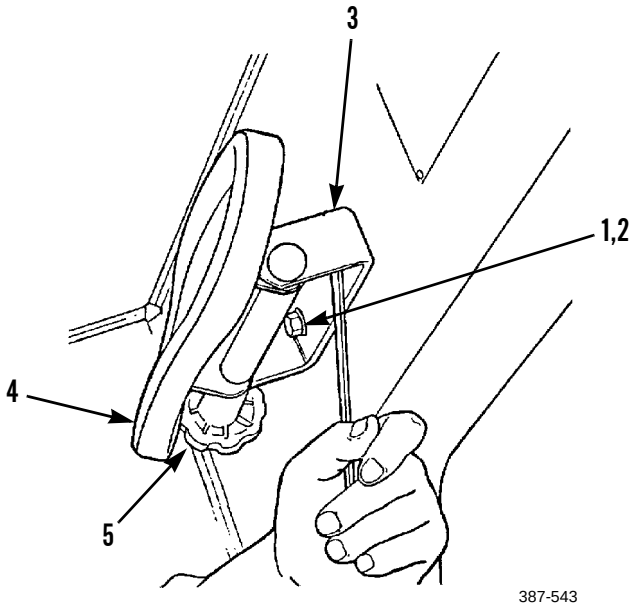
Machine parked on level ground (TM 5-2410-237-10)

REMOVAL

1. Remove two capscrews (1) and washers (2) from mounting bracket (3).
2. Remove mounting bracket (3) with mirror head (4) from tractor.

INSTALLATION

1. Place mirror head (4) with mounting brackets (3) in position on tractor.
2. Install two washers (2) and capscrews (1) to secure mounting bracket (3) on tractor.
3. To adjust orientation of mirror head (4), loosen knob (5), move mirror head to achieve proper visibility, then tighten knob.



END OF WORK PACKAGE

PERSONNEL HEATER MAINTENANCE 0192 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Rag, wiping (Item 29, WP 0249 00)

Strap, tiedown (Item 36, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

References

WP 0065 00

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

Engine OFF and cool (TM 5-2410-237-10)

WARNING

Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

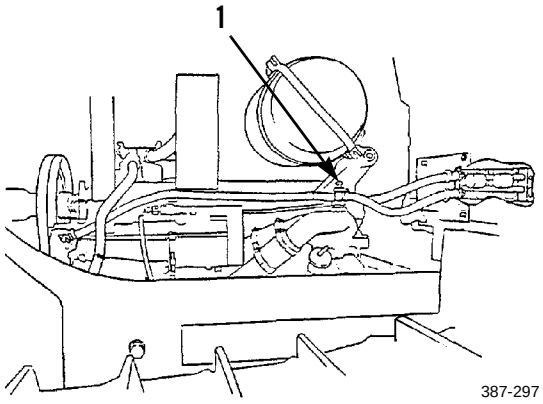
REMOVAL

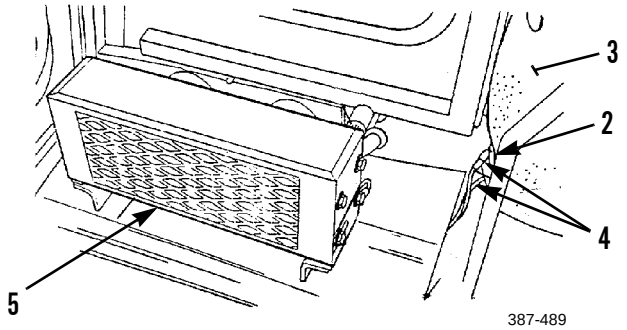
1. Close two water shut-off petcocks (1) on heater hoses in engine compartment.
2. Unscrew button (2) at lower left corner of front insulation panel (3) and pull back panel.

NOTE

Tag wires and coolant hoses to ensure correct installation.

3. Disconnect two fan motor wires (4) from heater (5).



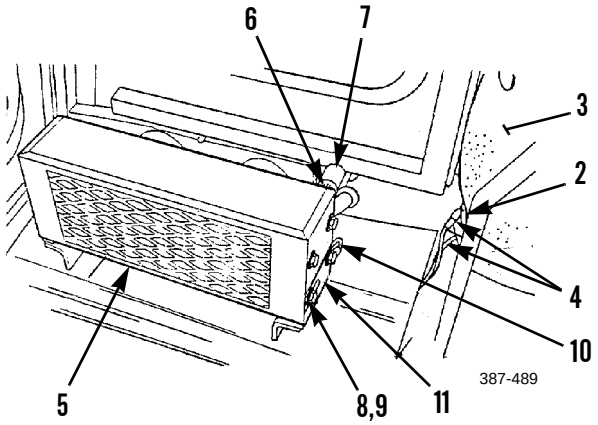


REMOVAL - CONTINUED

NOTE

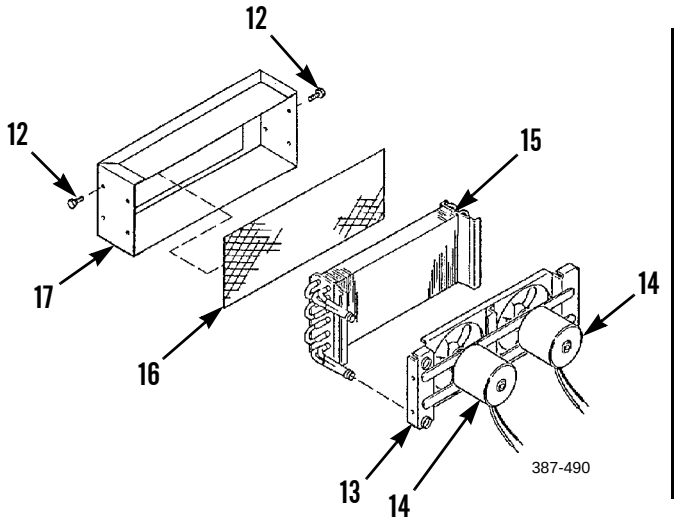
Use a suitable container to capture any residual coolant in hoses. Dispose of coolant IAW local policy and ordinances. Ensure all spills are cleaned up.

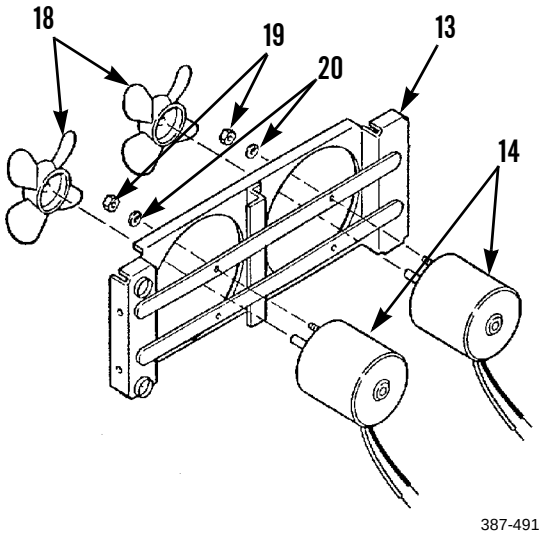
4. Loosen two hose clamps (6) and remove hoses (7) from back of heater (5).
5. Remove capscrew (8), washer (9) and ground wire (10) from lower rear corner of heater (5).
6. Remove three capscrews (8), washers (9) and heater (5) from mounting brackets (11).



DISASSEMBLY

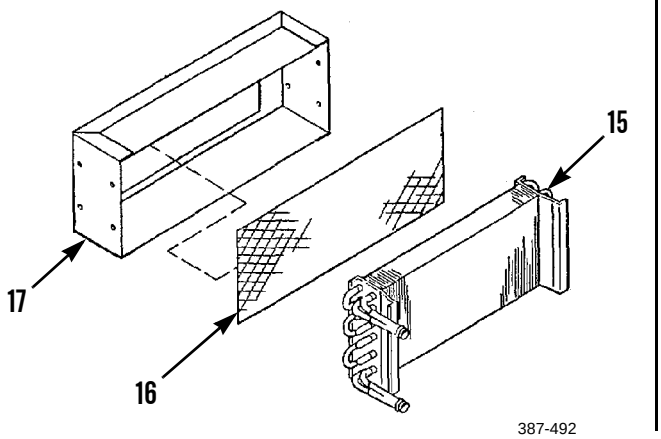
1. Remove capscrew (12) from each side of heater. Remove support panel (13) with fan motors (14).
2. Lift heater core (15) and screen (16) out of heater cover (17).
3. Remove fan blades (18) from fan motors (14) by sliding off motor shafts. Cut tiedown strap on motor wires. Discard tiedown strap.
4. Remove four nuts (19), washers (20) and two fan motors (14) from support panel (13).



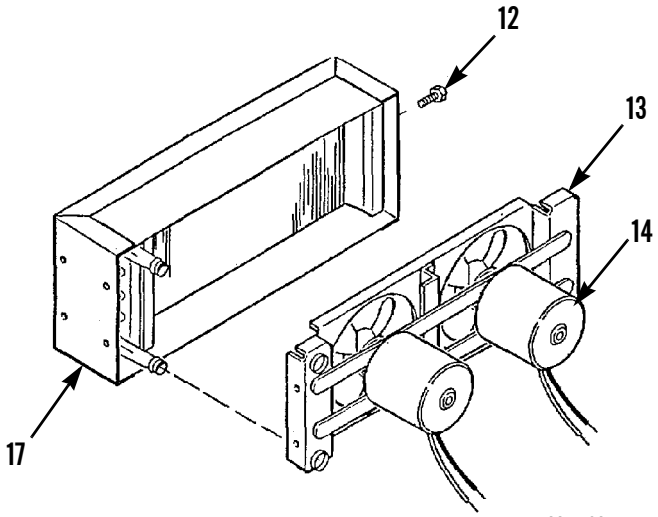


ASSEMBLY

1. Install screen (16) into heater cover (17).
2. Place heater core (15) into heater cover (17).
3. Place fan motors (14) on support panel (13) and secure with four washers (20) and nuts (19). Install new tiedown strap on motor wires.
4. Slide fan blades (18) onto fan motor (14) shafts.
5. Place support panel (13) in position in heater cover (17). Install two capscrews (12) at top rear of cover to hold panel in position.



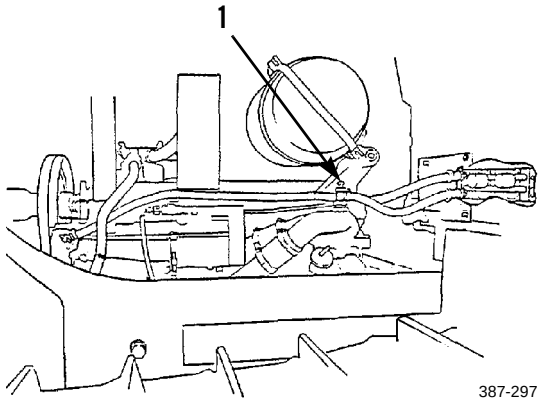
387-492



387-493

INSTALLATION

1. Position heater (5) on mounting brackets (11) on floor and install ground wire (10) in lower rear corner of heater with capscrew (8) and washer (9).
2. Install remaining three capscrews (8) and washers (9) to heater (5) and mounting brackets (11).
3. Install two hoses (7) and tighten hose clamps (6).
4. Connect two fan motor wires (4). Push insulation panel (3) back into position and fasten with button (2).
5. Open two water shut-off petcocks (1) on heater hoses in engine compartment.
6. Place battery disconnect switch in ON position (TM 5-2410-237-10).



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7. Start engine and check level of coolant in radiator. Add coolant as needed (WP 0065 00).
8. Check personnel heater for proper operation and leaks.
9. Shut down engine (TM 5-2410-237-23).

END OF WORK PACKAGE

HEATER SWITCH REPLACEMENT 0193 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Lockwasher (2)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

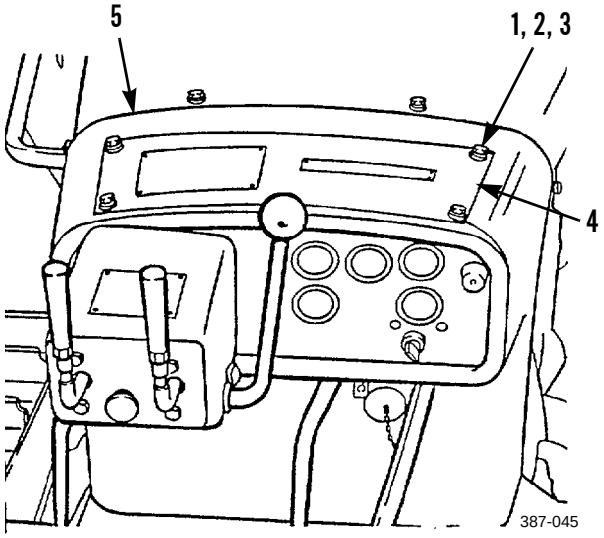
REMOVAL

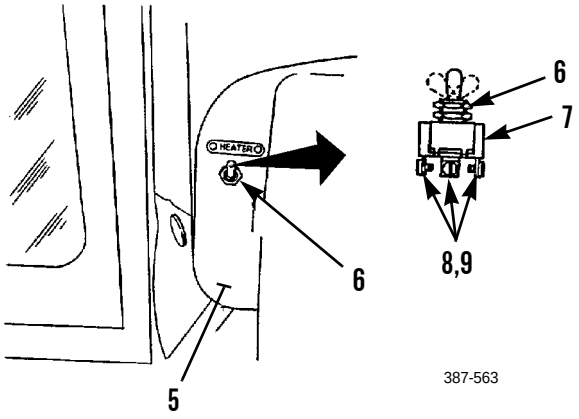
1. Remove four capscrews (1), lockwashers (2), washers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.
2. Remove nut (6) from front of heater switch (7) and remove switch through back of dash assembly (5).

NOTE

Tag wires to ensure correct installation.

3. Remove three screws (8) and wires (9) from heater switch (7).

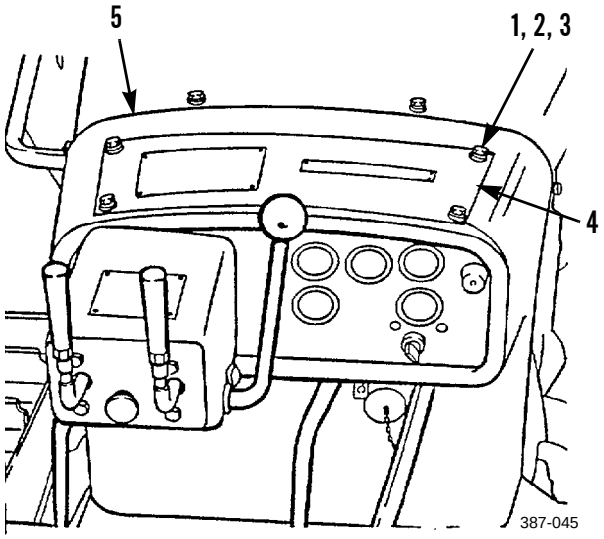


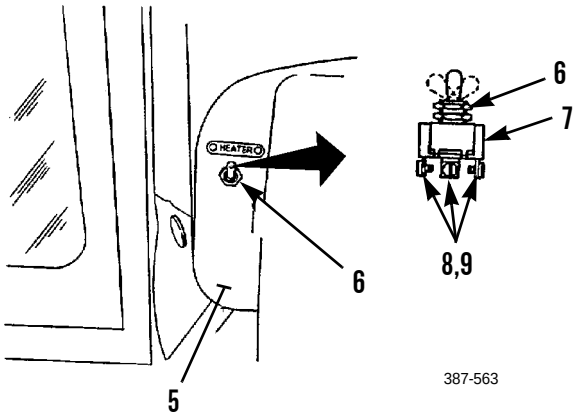


HEATER SWITCH REPLACEMENT - CONTINUED 0193 00

INSTALLATION

1. Position three wires (9) on back of heater switch (7) and secure with three screws (8).
2. Insert heater switch (7) through back of dash assembly (5) and install nut (6) on front of switch.
3. Install cover (4) on top of dash assembly (5) with four capscrews (1), new lockwashers (2) and washers (3).





4. Turn battery disconnect switch to ON position (TM5-2410-237-10).
5. Start engine (TM 5-2410-237-10), and check heater switch for proper operation.

END OF WORK PACKAGE

WINDSHIELD WIPER ASSEMBLY MAINTENANCE 0194 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Personnel Required

Two

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Gasket (17)

Lockwasher (3)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

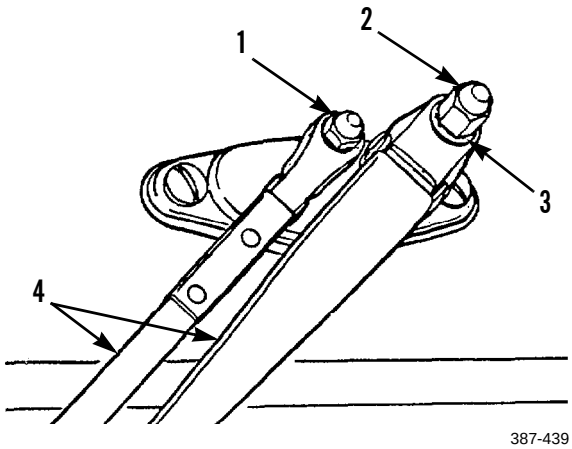
Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

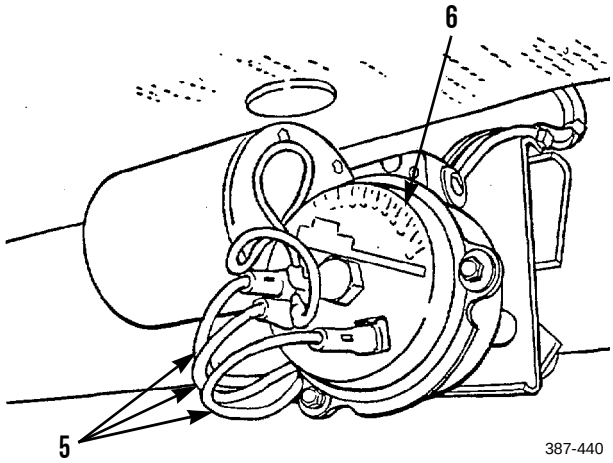
NOTE

This paragraph is for maintenance of front or rear windshield wiper assembly.

REMOVAL

1. Remove nuts (1 and 2), lockwasher (3) and wiper arms (4) from pivot shafts. Discard lockwasher.
2. Disconnect and tag three wires (5) from wiper motor (6).





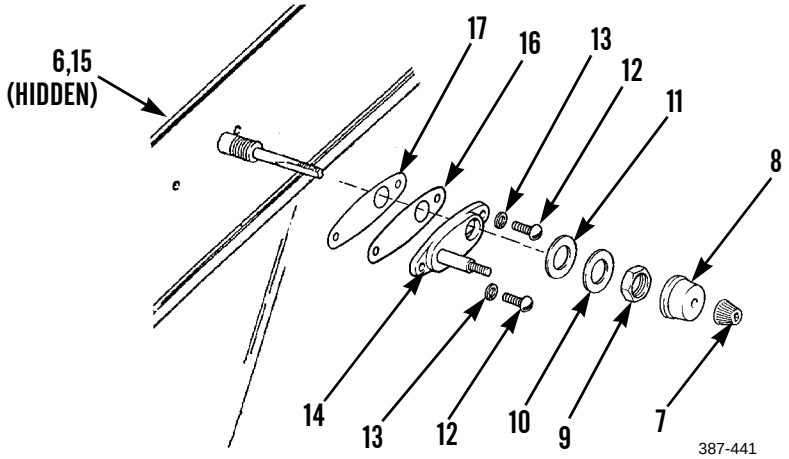
REMOVAL - CONTINUED

3. Remove bushing (7) and boot (8) by pulling straight off.
4. Remove nut (8), washer (10) and washer (11). Discard gasket.

NOTE

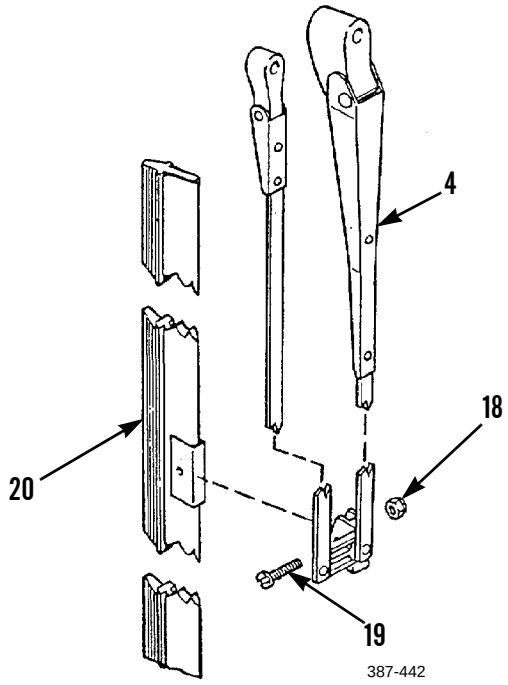
Before removing screws, have assistant hold wiper motor and bracket assembly on inside of cab.

5. Remove two screws (12) and starwashers (13) securing adapter (14), wiper motor (6) and bracket (15) to cab.
6. Remove adapter (14), spacer (16) and gasket (17) from outside of cab. Discard gasket.
7. Remove wiper motor (6) and bracket (15) as an assembly from inside of cab.



DISASSEMBLY

1. Remove nut (18) and screw (19) from wiper blade bracket and remove wiper blade (20) from wiper arm (4).



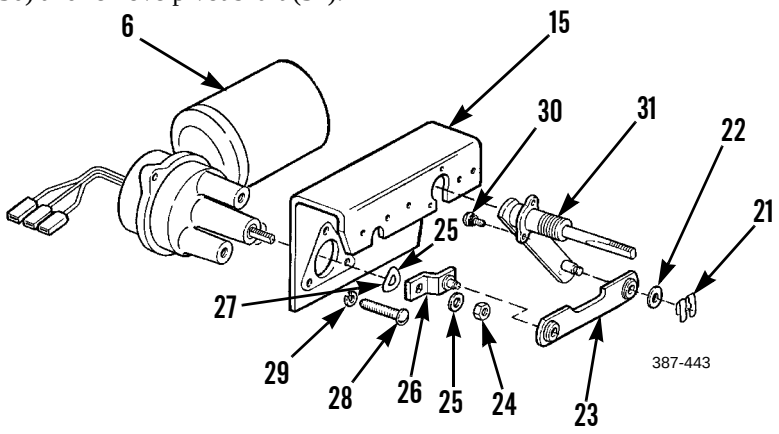
DISASSEMBLY - CONTINUED

2. Remove two clips (21), washers (22) and link arm (23).
3. Remove nut (24), washer (25), arm (26) and spring tension washer (27).
4. Remove three screws (28), washers (29) and wiper motor (6) to bracket (15).

NOTE

Save shims on stud of pivot shaft for assembly.

5. Remove two screws (30) and remove pivot shaft (31).

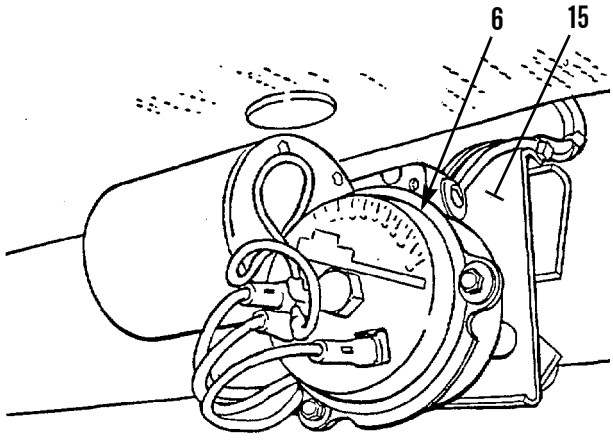


ASSEMBLY

1. Install pivot shaft (31) to bracket (15) with two screws (30). Place shims on pivot shaft.
2. Position wiper motor (6) onto back of bracket (15) and install three screws (28) and washers (29).
3. Install spring tension washer (27), arm (26), and washer (25) and nut (24) onto wiper motor shaft.
4. Assemble link arm (23) onto pins on pivot shaft (31) and arm (26) and install two washers (22) and clips (21).
5. Install wiper blade (20) on wiper arm (4) with screw (19) and nut (18).

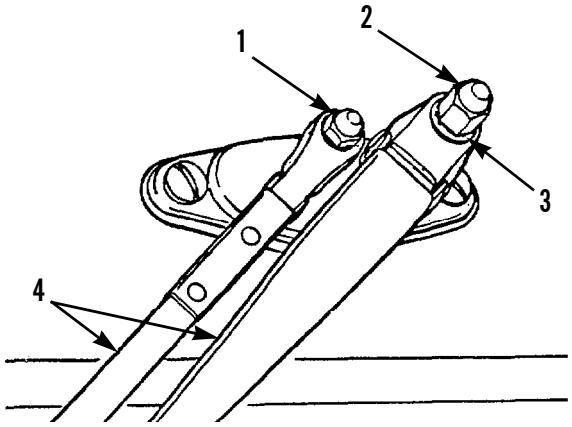
INSTALLATION

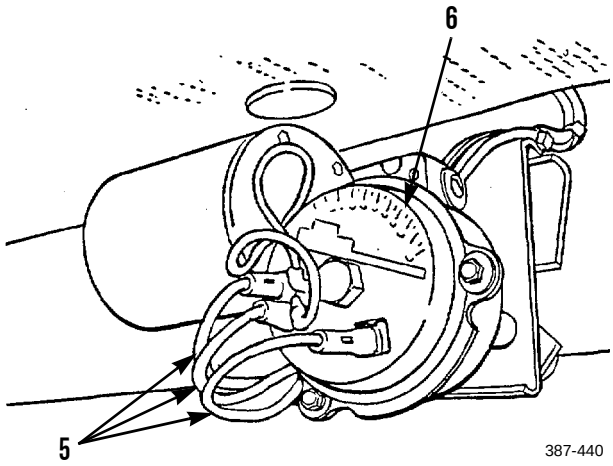
1. From inside cab, have assistant hold wiper motor (6) and bracket (15) assembly in position.
2. From outside of cab, install new gasket (17), spacer (16) and adapter (14) on pivot shaft (31) protruding through cab.
3. Install two screws (12) and starwashers (13) to secure adapter (14), wiper motor (6) and bracket (15) to cab.
4. Install washer (11), washer (10) and nut (9).
5. Slide boot (8) and bushing (7) on pivot shaft (31).



INSTALLATION - CONTINUED

6. Install wiper arms (4) on pivot shafts and install new lockwasher (3) and nuts (1 and 2).
7. Connect three wires (5) to wiper motor (6).





8. Turn battery disconnect switch to ON position (TM 5-2410-237-10).
9. Check windshield wipers for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

DEFROSTER FAN MAINTENANCE 0195 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Tag, marker (Item 37, WP 0249 00)

Nut, self-locking (12, 17 and 26)

Equipment Condition

Battery disconnect switch in OFF position (TM 5-2410-237-10)

WARNING

Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

NOTE

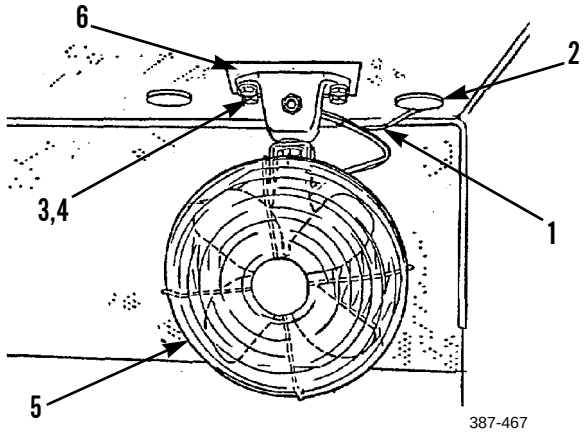
This procedure applies to either front or rear defroster fan.

REMOVAL

NOTE

Tag wire to ensure correct installation.

1. Disconnect wire (1) from fuse holder (2).
2. Remove four capscrews (3), washers (4) and defroster fan (5) from bracket (6) in cab roof.



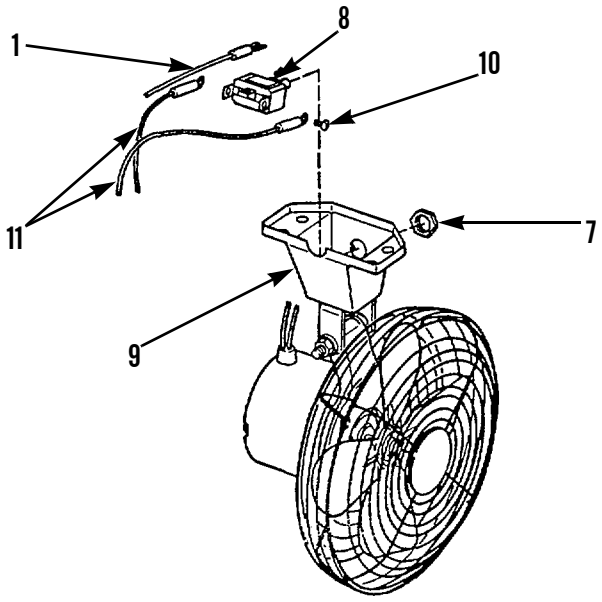
DISASSEMBLY

1. Remove locknut (7) and switch (8) from mounting base (9).

NOTE

Tag wires to ensure correct assembly.

2. Remove three screws (10), wire (1) and two wires (11) from switch (8).



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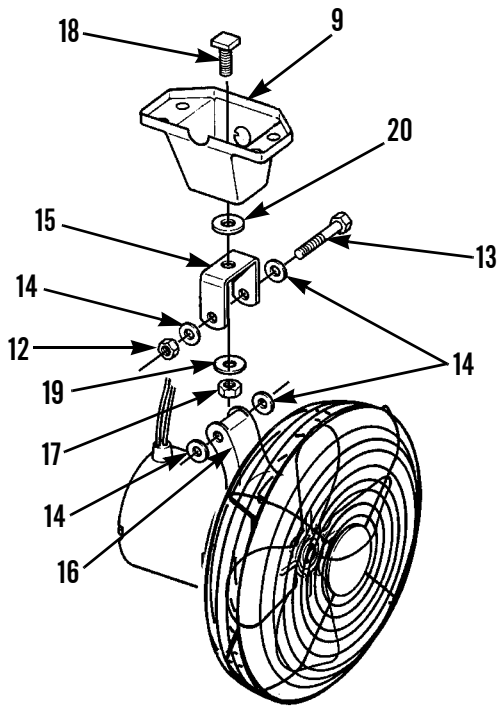
3. Remove self-locking nut (12), capscrew (13) and four washers (14) securing angle bracket (15) to mounting bracket (16). Discard self-locking nut.
4. Remove self-locking nut (17), bolt (18), washer (19), spacer (20) and angle bracket (15) from mounting base (9). Discard self-locking nut.



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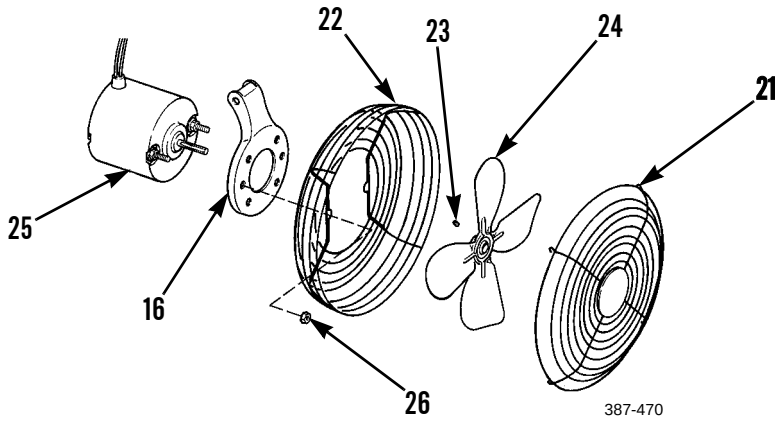
DISASSEMBLY - CONTINUED

5. Remove front fan guard (21) from rear fan guard (22).
6. Remove setscrew (23) and fan blade (24) from shaft of motor (25).
7. Remove two self-locking nuts (26), rear fan guard (22) and mounting bracket (16) from motor (25). Discard self-locking nuts.



ASSEMBLY

1. Install mounting bracket (16) and rear fan guard (22) on motor (25) with two new self-locking nuts (26).
2. Install setscrew (23) part way into hub of fan blade (24).
3. Install fan blade (24) on shaft of motor (25) and tighten setscrew (23).
4. Install front fan guard (21) on rear fan guard (22).
5. Install bolt (18) through mounting bracket (9) and install spacer (20), angle bracket (15), washer (19) and new self-locking nut (17) on bolt.
6. Position mounting bracket (16) with two washers (14) into angle bracket (15) and install capscrew (13), two washers (14) and new self-locking nut (12).
7. Connect wire (1) and two wires (11) to switch (8) with three screws (10).

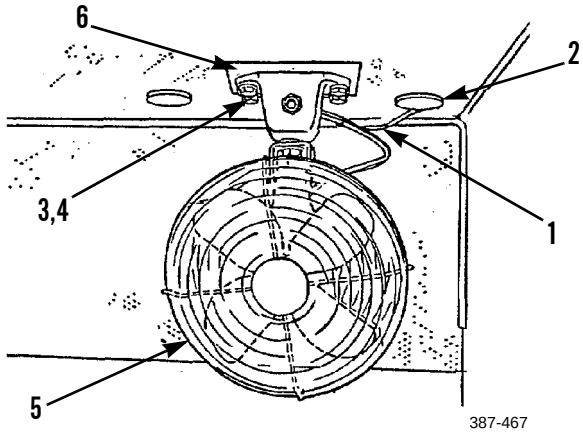
NOTE

Replacement switch comes with new mounting locknut.

8. Place switch (8) in mounting base (9) and install locknut (7) on switch.

INSTALLATION

1. Install defroster fan (5) on bracket (6) with four capscrews (3) and washers (4).
2. Connect wire (1) to fuse holder (2).



3. Turn battery disconnect switch to ON position (TM 5-2410-237-10).
4. Check defroster fan for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

SOUND SUPPRESSION PANELS REPLACEMENT 0196 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with winterized cab

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

NOTE

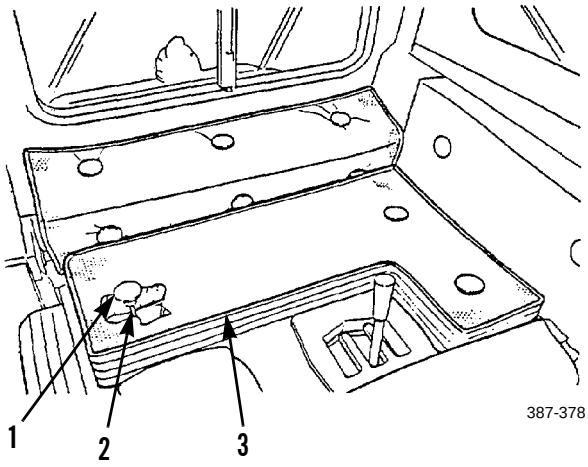
This procedure is typical for all panels which are secured to walls and roof of operator's station.

REMOVAL

1. Turn button (1) counterclockwise to remove from mounting stud (2). Repeat for all buttons.
2. Lift panel (3) over mounting studs to remove.

INSTALLATION

1. Place panel (3) in position over mounting studs (2).
2. Install button (1) on mounting stud (2) to secure panel. Repeat for all buttons.



END OF WORK PACKAGE

DATA PLATES REPLACEMENT 0197 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Screw, drive (1)

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

NOTE

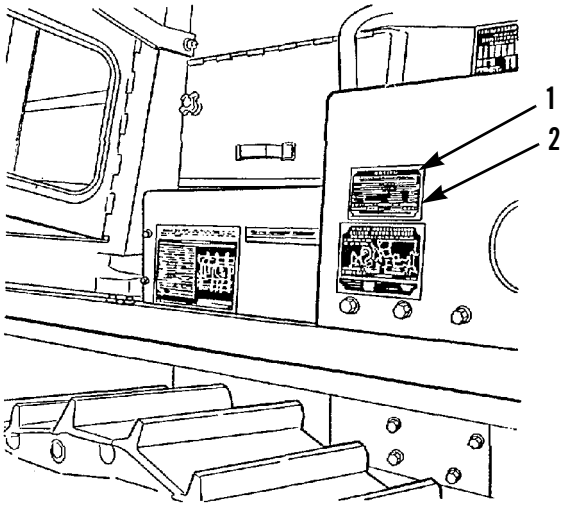
This is a general procedure that applies to all data plates on tractor.

REMOVAL

1. Use a drill bit to remove drive screws (1). Discard drive screws.
2. Remove data plate (2) from tractor.

INSTALLATION

1. Position data plate (2) on tractor.
2. Install new drive screws (1).



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END OF WORK PACKAGE

HYDRAULIC SYSTEM THEORY OF OPERATION 0198 00

SYSTEM DESCRIPTION

1. The hydraulic system supplies a controlled flow of filtered hydraulic oil for operation of the bulldozer blade and ripper.
2. Principle components of the hydraulic system are: pilot valves (1 and 2), pumps (3 and 4), pressure control valve (5), ripper control valve (9), quick drop valves (13), blade lift cylinders (14), blade control valve (lift and tilt) (17), blade tilt cylinder (18), ripper lift cylinders (22), filter (25) and hydraulic tank (26).
3. A two-section vane pump (3 and 4) draws oil from the hydraulic tank (26) whenever the engine is running. The small section of pump (4) supplies oil for the pilot system and operation of the blade tilt cylinders (18). The large section of pump (3) supplies oil to operate the blade lift cylinders (14) and the ripper lift cylinders (22). If the cylinder is not being operated, oil flow from both sections of the pump is combined within the blade control valve (17) to supply the blade lift cylinders (14).
4. Pilot oil flows from the small section of the pump to the pressure control valve (5). This oil flow moves a valve spool against concentric springs. The force of these springs produces a back pressure of 115 psi (758 kPa) on the small section of the pump, and also provides operating pressure for pilot valves (1 and 2).
5. The blade tilt and ripper lift functions are controlled by pilot valves (1 and 2). The respective control levers connect to the spools of the pilot valves. The blade lift control lever directly controls the spool (36) of the blade lift control valve; no pilot valve is involved.
6. Return oil from all circuits is passed through a filter (25) before entering the tank. The filter has a bypass feature, which operates a visual indicator that shows when bypassing is occurring.

BULLDOZER BLADE LIFT SYSTEM

1. The blade control valve (17) has four operating positions: RAISE, HOLD, LOWER and FLOAT. The lift valve spool is moved to the desired operating position by fore and aft movement of the blade control lever.
2. The RAISE and LOWER positions raise or lower the blade. In the HOLD position, the spool is centered and oil flow to and from the lift cylinders is blocked. The FLOAT position (lever fully forward) has detents to hold the valve spool in position. In the FLOAT position, both ends of the blade lift cylinders are at “tank” pressure; thus, the blade can be moved up or down by outside forces.
3. With the blade control lever in the HOLD position and the engine running, oil flow from both pump sections combines in passage (28) of the control valve. When pressure in passage (28) exceeds the 80 psi (552 kPa) pressure exerted by spring (29), dump valve (30) will unseat and the oil flow from both pump sections will return to the tank via oil return line (24).
4. With the blade control lever in the RAISE position, blade lift valve spool (36) is moved into the valve body. Pressure buildup in the valve unseats load check valve (37). Oil then flows under pressure through quick drop valves (13) to the rod ends of the blade lift cylinders (14). Cylinder movement raises the bulldozer blade. Exhaust oil from the head ends of the cylinders returns to the tank through passages in the control valve (17).
5. Moving the blade lift control lever to the LOWER position directs pressurized flow to the head ends of the blade lift cylinders (14). Return oil from the rod ends of the blade lift cylinders can either pass to the tank through the control valve (17) or it can be added to the flow going to the head ends through the makeup valve (38) in the control valve.
6. If working pressure of the lift cylinders is greater than the setting of relief valve (32), the relief valve will unseat. Dump valve (30) will then open, allowing overflow to momentarily return to the tank. The relief valve (32) will reseat when cylinder working pressure drops below relief setting. The relief setting is adjusted by adding or removing shims.

BULLDOZER BLADE TILT SYSTEM

1. The blade tilt control spool and related valves are located in the upper portion of the blade control valve (17).
2. Pilot oil to operate the blade tilt control spool and supply oil for the tilt cylinder (18) is provided by the small section of the pump (4). All flow from the small section of the pump goes into pressure control valve (5). As mentioned previously, spring force within the pressure control valve sets a minimum pump operating pressure of 115 psi (758 kPa).

BULLDOZER BLADE TILT SYSTEM - CONTINUED

3. To tilt the blade to the right, the tilt control lever is moved to the right. This will move the blade tilt pilot valve (2) spool into the valve body, allowing flow to be ported through the pilot valve (2) to one end of the tilt control spool (39) in the blade control valve (17). As the tilt control spool moves, the tilt system oil chamber (40) in the blade control valve will be sealed off from the lift system chamber (28) and pressure will build up quickly in chamber (40). Oil then flows under pressure to the head end of the cylinder and the blade tilts to the right (up). Exhaust oil from the rod end of the cylinder returns through the blade control valve to the tank.

4. To tilt the blade to the left (left side up), the tilt control lever is moved left, reversing the pilot valve spool movement and changing the porting through the blade control valve. Oil then flows under pressure to the rod end of the cylinder.

5. Components of the blade tilt system are protected against overpressure by a pilot-operated relief valve (34) which is built into the blade control valve (17). Cylinder working pressure in chamber (40) is applied against relief valve (34) through orifice (41). If cylinder working pressure rises above the setting of valve (34), the poppet will unseat and vent chamber (42) to the tank via return line (24) and the pressure in chamber (42) will drop. The pressure in chamber (40) will remain relatively high because of the restriction caused by orifice (41), and dump valve (31) will move upward against its spring. Upward movement of dump valve will open chamber (40) to line (24) and the overpressure will be “dumped” to tank. When the pressure returns to normal, dump valve (31) and relief valve (34) will both reseat.

RIPPER LIFT SYSTEM

1. When the ripper lift control lever is moved to the right, the spool of ripper lift pilot valve (1) moves out of the valve body, allowing pilot pressure through line (10) to the upper end of the ripper lift control valve (9) spool. Pilot pressure causes the spool to shift, allowing system oil to flow to the head ends of the ripper lift cylinders (22).

2. As pressurized oil forces the cylinder pistons outward, exhaust oil from the rod ends returns to the ripper control valve (9). Within the valve, exhaust oil can either be returned to the tank or, when necessary, sent through the makeup valve (44) and combined with main system flow going to the head ends of the cylinders.

3. To lower the ripper, the ripper lift pilot valve (1) directs pilot oil to the lower end of the ripper control valve (9). Main system flow is then directed to the rod ends of the ripper lift cylinders (22). Again, exhaust oil from the cylinders can be used as makeup oil when demanded.

4. During both the raising and lowering operations, pilot oil from the ripper lift pilot valve (1) is directed, via line (27), to the shuttle valve (33) in the blade control valve (17). The shuttle valve shifts to open a passage (28) for main system oil to flow into the chamber between dump valve (30) and blade lift relief valve (32). This chamber is then at system pressure. If an excessive pressure builds up, the relief valve will unseat and open passage (28) to oil return line (24). When system pressure drops back to normal, the relief valve reseats and flow back to the tank is cut off.

LOWERING RIPPER WITH ENGINE OFF

1. The design of the pressure control valve (5) allows the ripper to be lowered while the engine is not running. Oil pressure to accomplish this is created in the head ends of the ripper lift cylinders (22) by the weight of the ripper acting on the cylinder pistons.

2. With the ripper control lever in HOLD, oil pressure in the head ends of the cylinders is transmitted to a port on the ripper lift pilot valve (1) via line (23), internal passages in the pressure control valve (5), and through line (7). This pressure also exists in a chamber in the ripper lift control valve (9). Moving the ripper lift control lever to the LOWER position allows the cylinder pressure to be applied to the spool in the ripper lift control valve (9) just as in normal lowering operation. All the exhaust oil not needed for pilot flow is routed through the makeup valve (43) of the ripper control valve to the head ends of the cylinders as makeup oil.

LOWERING RIPPER WITH ENGINE OFF - CONTINUED

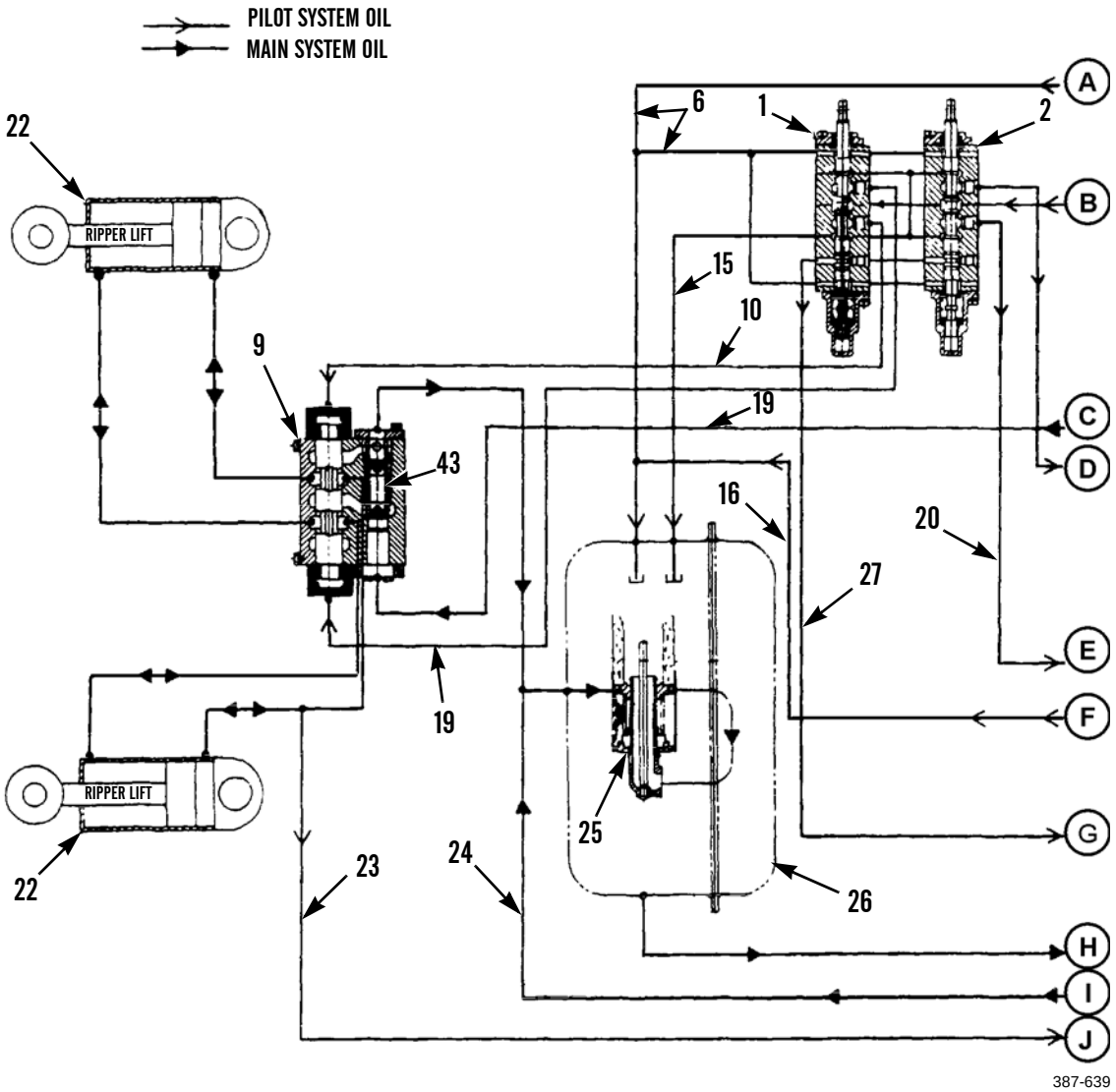


Figure 1. Bulldozer Blade and Ripper Hydraulic System Components.

LOWERING RIPPER WITH ENGINE OFF - CONTINUED

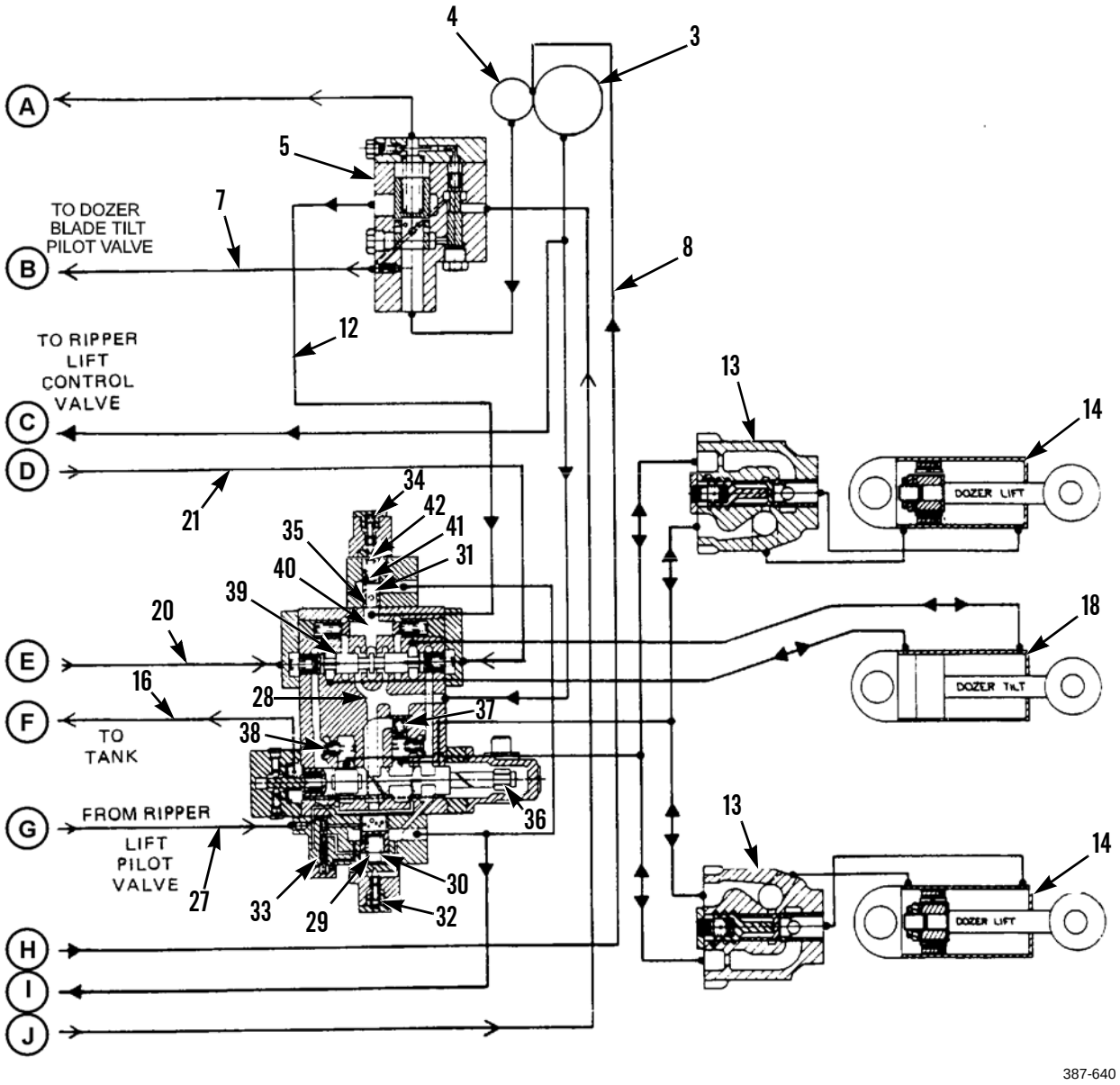


Figure 2. Blade Control Valve Components.

LOWERING RIPPER WITH ENGINE OFF - CONTINUED

ITEM NO.	COMPONENT	ITEM NO.	COMPONENT
1	Ripper Lift Pilot Valve	23	Ripper Cylinder-to-Pressure Control Valve Pressure Line (Ripper with Engine Off)
2	Blade Tilt Pilot Valve	24	Oil Return Line
3	Large Section of Oil Pump	25	Oil Filter
4	Small Section of Oil Pump	26	Hydraulic Tank
5	Pressure Control Valve	27	Shuttle Valve Pilot Line
6	Pilot Valves Return Lines	28	Passage
7	Pilot Valves Supply Lines	29	Dump Valve Spring
8	Pump Supply Line	30	Main System Dump Valve
9	Ripper Control Valve	31	Dump Valve
10	Ripper Control Valve Pilot Line (Raise)	32	Blade Lift Relief Valve
11	Oil Return Lines	33.	Shuttle Valve
12	Tilt Control Valve Supply Line	34	Blade Tilt Relief Valve
13	Quick Drop Valves	35	Dump Valve (Small Pump Section)
14	Blade Lift Cylinders	36	Blade Lift Control Valve Spool
15	Pilot System Return Lines	37	Load Check Valve
16	Oil Return Line	38	Makeup Valve (For Head End of Lift Cylinders)
17	Blade Control Valve (Lift and Tilt)	39	Tilt Control Spool
18	Blade Tilt Cylinder	40	Oil Chamber
19	Ripper Control Valve Pilot Line (Lower)	41	Orifice
20	Blade Tilt Pilot Line (Head End)	42	Chamber (Ripper Control Valve Component)
21	Blade Tilt Pilot Line (Rod End)	43	Makeup Valve
22	Ripper Lift Cylinders		

END OF WORK PACKAGE

HYDRAULIC PUMP REPLACEMENT 0199 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 100 lb capacity

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

O-ring (6, 12 and 18)

References

TM 5-2410-237-10

Personnel Required

Two

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

Hydraulic tank drained (WP 0225 00)

Floor plates removed (WP 0171 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

REMOVAL

CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

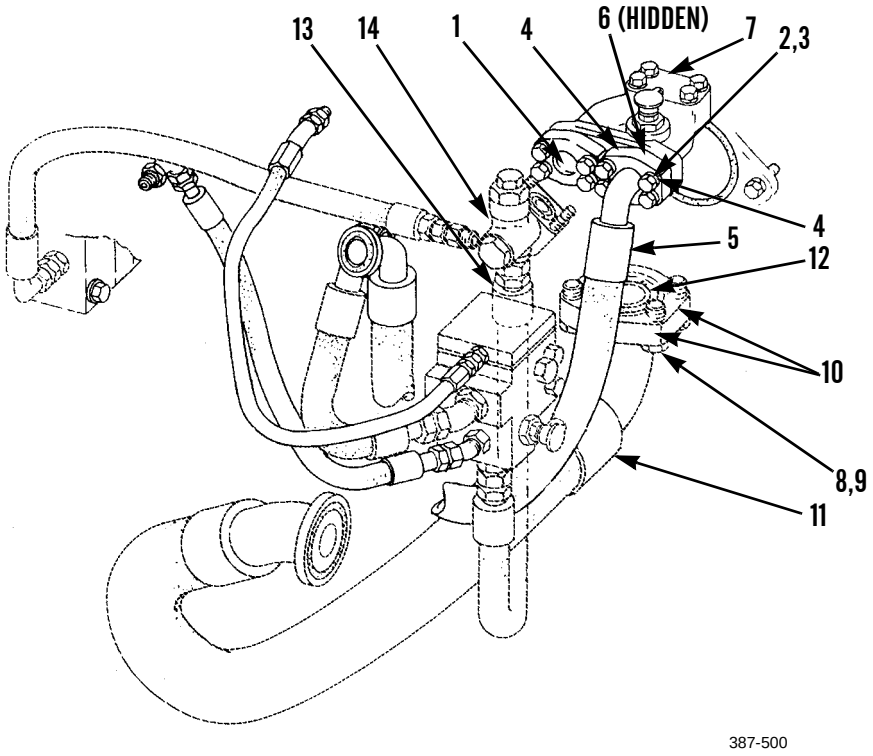
HYDRAULIC PUMP REPLACEMENT - CONTINUED 0199 00

REMOVAL - CONTINUED

NOTE

- **Tag hydraulic hoses to ensure correct installation.**
- **Use suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **On tractors with ripper attachment, a second hose is connected to hydraulic pump manifold in place of cover (1). If equipped, repeat step 1 to remove ripper hose.**

1. Remove four capscrews (2), flatwashers (3) and split flange (4). Separate hose (5) and O-ring (6) from manifold (7). Discard O-ring.
2. Remove four capscrews (8), flatwashers (9) and split flange (10). Separate large hose (11) and O-ring (12) from bottom of hydraulic pump. Discard O-ring.
3. Disconnect hose (13) from underside of elbow (14) on hydraulic pump.



387-500

REMOVAL - CONTINUED

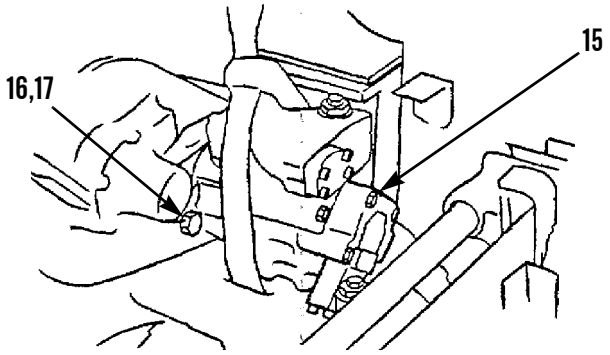
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

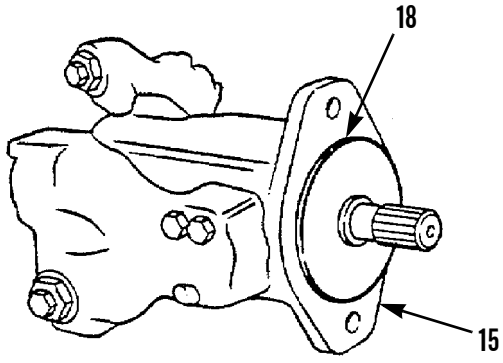
Hydraulic pump weighs 50 lb (23 kg).

4. Attach a nylon sling and a suitable lifting device to hydraulic pump (15).
5. Remove two capscrews (16) and flatwashers (17) from hydraulic pump (15). Lift pump free of engine auxiliary drive cover.



387-501

6. Remove O-ring (18) from hydraulic pump (15). Discard O-ring.



387-502

INSTALLATION

CAUTION

Wipe all sealing surfaces and hose connections clean and dry prior to installation. Contamination of hydraulic system could result in premature failure.

NOTE

Lightly coat new O-rings with clean oil before installation.

1. Install new O-ring (18) on hydraulic pump (15).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

CAUTION

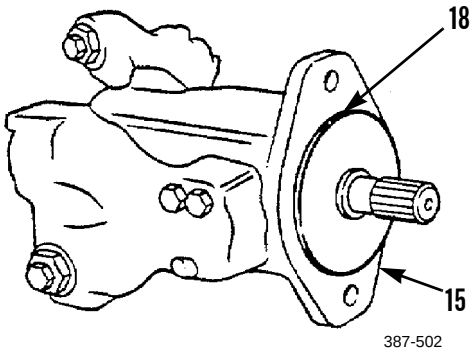
Ensure splines on pump shaft are aligned with internal splines on engine auxiliary drive gear.

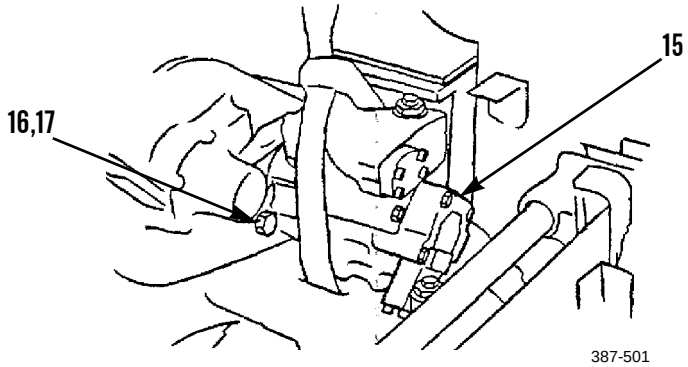
NOTE

Hydraulic pump weighs 50 lb (23 kg).

2. Attach a nylon sling and a suitable lifting device to hydraulic pump (15) and lift assembly into position on engine auxiliary drive cover.

3. Secure hydraulic pump (15) on engine auxiliary drive cover with two flatwashers (17) and capscrews (16).





4. Connect hose (13) on underside of elbow (14) on hydraulic pump.

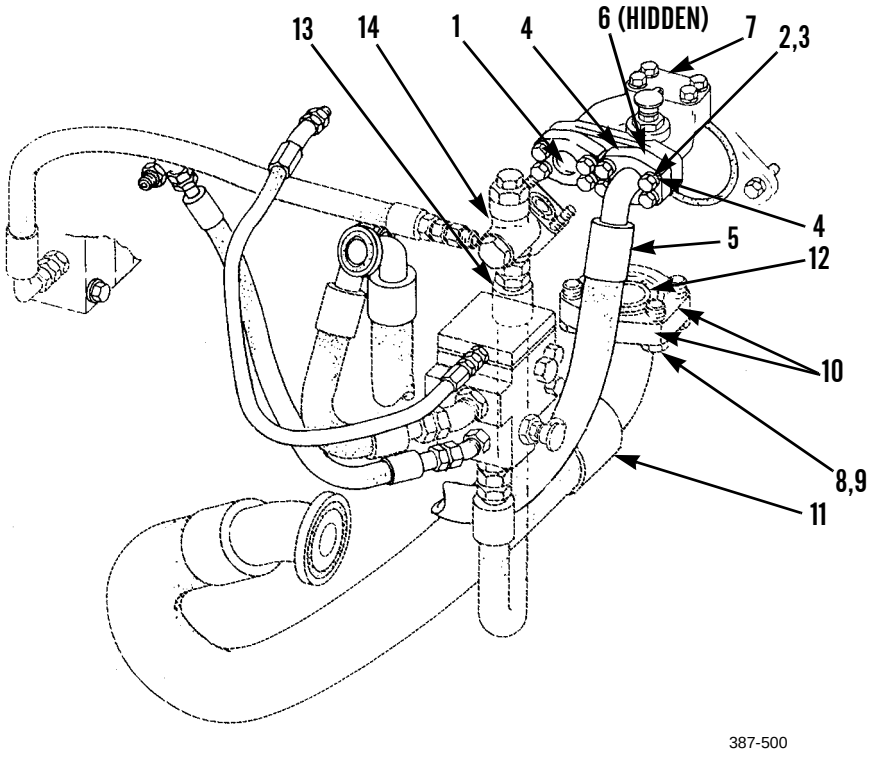
5. Install new O-ring (12) and large hose (11) on bottom of hydraulic pump with split flange (10), four capscrews (8) and flatwashers (9).

INSTALLATION - CONTINUED

NOTE

On tractors with ripper attachment, a second hose is connected to hydraulic pump manifold in place of cover (1). If equipped, repeat step 6 to install ripper hose.

6. Install new O-ring (6) and hose (5) on manifold (7) with split flange (4), four capscrews (2) and flatwashers (3).



7. Refill hydraulic tank and bleed air from system (WP 0225 00).
8. Check hydraulic pump for leaks and proper operation (TM 5-2410-237-10).
9. Install floor plates (WP 0171 00).

END OF WORK PACKAGE

HYDRAULIC PUMP REPAIR 0200 00

THIS WORK PACKAGE COVERS

Disassembly, Cleaning and Inspection, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Oil, lubricating oil (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

O-ring (8, 10, 12, 14, 18, 21, 26, 27, 37 and 40)

Packing (24)

Materials/Parts - Continued

Packing, preformed (39)

Pipe, 1 in. diameter x 8 in. long

Seal (28, 32, 34, 36, 44, 46, 52 and 53)

References

WP 0227 00

WP 0241 00

Equipment Condition

Hydraulic pump removed (WP 0199 00)

DISASSEMBLY

CAUTION

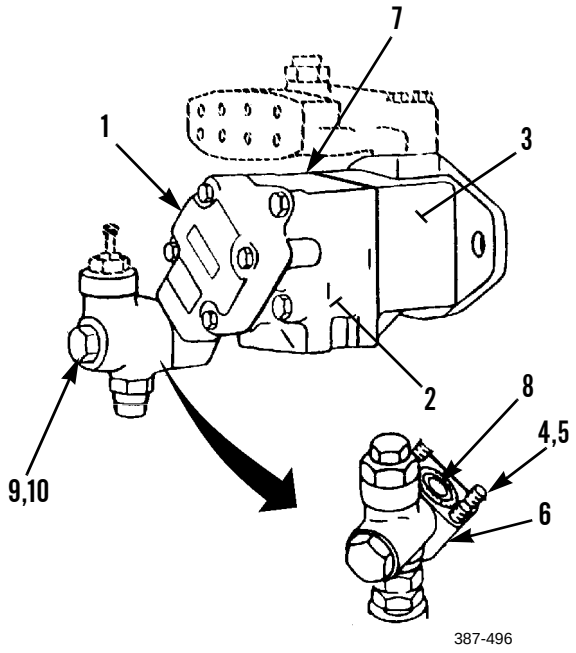
To prevent contamination from entering hydraulic system, ensure components are kept clean during disassembly.

1. Wipe clean outside of pump body and cover.

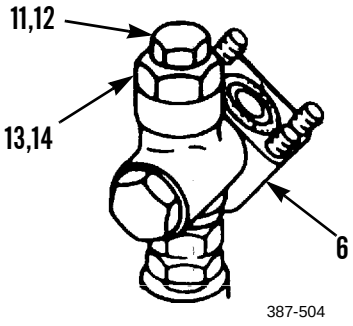
NOTE

Reference marks will ensure correct assembly of pump.

2. Put reference marks between end cover (1) and center cover (2) and between center cover and pump body (3).
3. Remove four capscrews (4), washers (5) and elbow (6) from pump (7). Remove and discard O-ring (8).
4. Remove plug (9) and O-ring (10) from elbow (6). Discard O-ring.

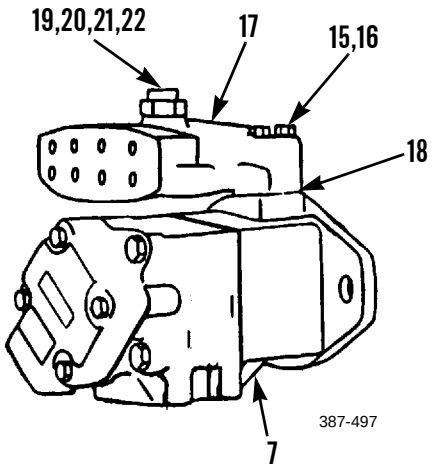


5. Remove plug (11) and O-ring (12) from elbow (6). Discard O-ring.
6. Remove adapter (13) and O-ring (14) from elbow (6). Discard O-ring.



DISASSEMBLY - CONTINUED

7. Remove four capscrews (15), washers (16), manifold (17) and O-ring (18) from pump (7). Discard O-ring.
8. Remove nipple assembly (19), dust cap (20) and O-ring (21) from adapter (22). Discard O-ring.
9. Remove adapter (22) from manifold (17).

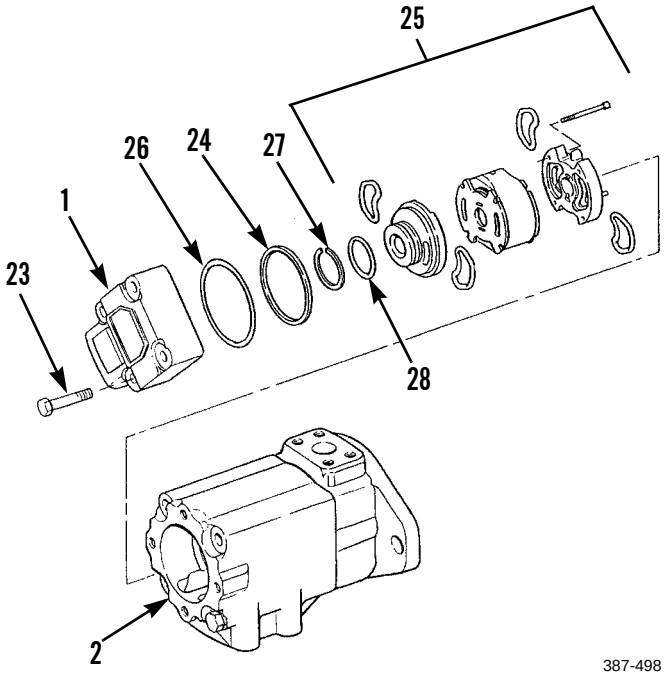


10. Remove four bolts (23) and end cover (1) from center cover (2).

NOTE

Note orientation of components during disassembly to ensure correct assembly.

11. Remove packing (24), sub-assembly (25) and O-ring (26) from end cover (1). Discard packing and O-ring.
12. Remove O-ring (27) and seal (28) from sub-assembly (25). Discard O-ring and seal.

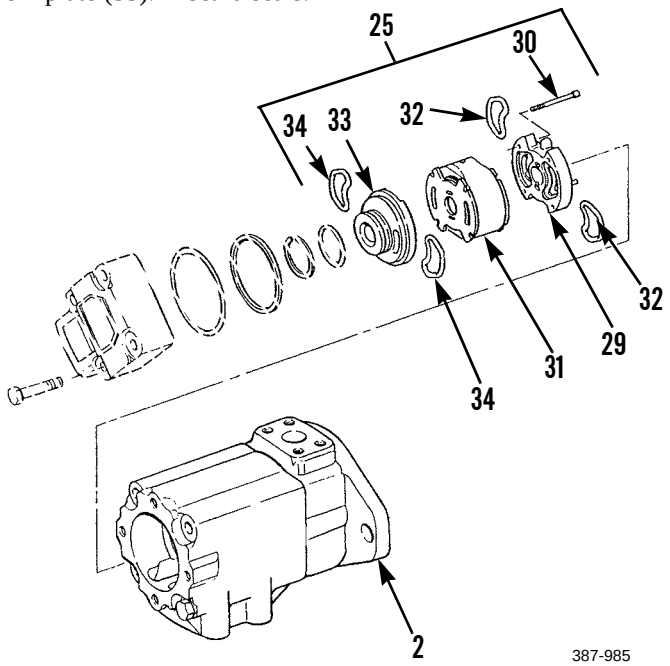


DISSASSEMBLY - CONTINUED

NOTE

- **Put an alignment mark across components of sub-assembly to ensure correct assembly.**
- **Note directions of arrows on plate (29) and location of capscrews (30) to ensure correct assembly. Arrows show rotation direction of pump. Capscrews are installed in holes next to arrows.**

13. Remove four capscrews (30) from sub-assembly (25).
14. Remove plate (29) from plate (31).
15. Remove two seals (32) from plate (29). Discard seals.
16. Remove plate (33) from plate (31).
17. Remove two seals (34) from plate (33). Discard seals.



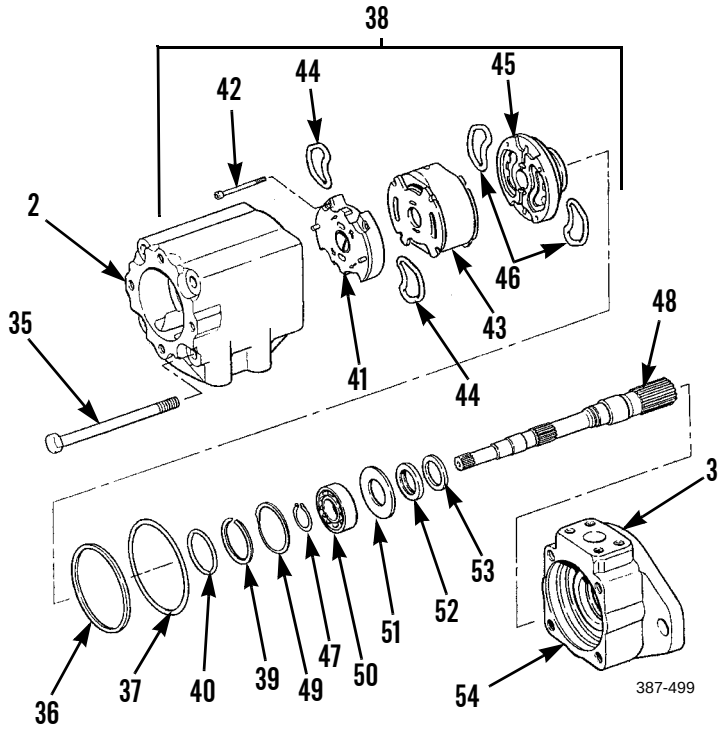
18. Remove four capscrews (35), center cover (2) and seal (36). Discard seal.
19. Remove O-ring (37) and sub-assembly (38) from pump body (3). Discard O-ring.
20. Remove preformed packing (39) and O-ring (40) from sub-assembly (38). Discard preformed packing and O-ring.

DISSASSEMBLY - CONTINUED

NOTE

- **Put an alignment mark across components of sub-assembly to ensure correct assembly.**
- **Note directions of arrows on plate (41) and location of capscrews (42) to ensure correct assembly. Arrows show rotation direction of pump. Capscrews are installed in holes next to arrows.**

21. Remove four capscrews (42) and separate plate (41) from plate (43).
22. Remove two seals (44) from plate (41). Discard seals.
23. Remove plate (45) from plate (43).
24. Remove two seals (46) from plate (45). Discard seals.
25. Remove retaining ring (47) from shaft (48).
26. Press shaft (48) from pump body (3).
27. Remove retaining ring (49), bearing (50) and washer (51) from pump body (3).
28. Remove two seals (52 and 53) from pump body (3). Discard seals.
29. Remove plug (54) from pump body (3).



CLEANING AND INSPECTION

- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in serious injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.**

1. Thoroughly clean all parts in solvent cleaning compound.
2. Dry parts thoroughly with compressed air.

NOTE

If any component of sub-assemblies, with the exception of seals, is damaged, replace complete sub-assembly.

3. Inspect all components for damage or wear IAW instructions in WP 0250 00. Replace defective components.

ASSEMBLY

CAUTION

Ensure all components are kept clean during assembly. Failure to follow this caution could cause contamination of hydraulic system.

NOTE

- **Prior to assembly, lightly coat all sub-assembly components and all new seals, new packings and new O-rings with clean oil.**
- **During assembly, all components must be installed in correct direction of pump rotation. Pump rotation as seen from splined end of shaft is to the left.**

1. Install plug (54) in pump body (3).
2. Install new outer seal (53) in pump body (3), with spring-loaded lip toward pump bearing.
3. Turn pump body (3) over and install new inner seal (52) in pump body, with spring-loaded lip toward pump bearing.
4. Install washer (51), bearing (50) and retaining ring (49) in pump body (3).
5. Put a piece of 1 in. diameter pipe that is 8 in. long in position against inner race of bearing (50). Use a driver tool, pipe and a press to install shaft (48).
6. Install retaining ring (47) on shaft (48).

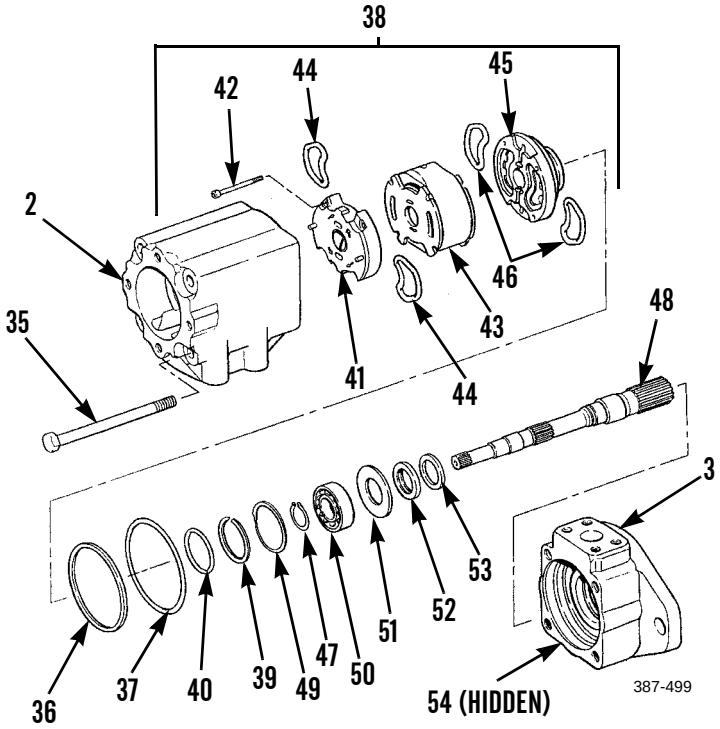
ASSEMBLY - CONTINUED

7. Install new O-ring (37) in pump body (3).

NOTE

Seals (44 and 46) are two-piece seals. Ensure that preformed packing seal is in plastic seal before seals are installed.

8. Install two new seals (46) with preformed packing in contact with end plate (45).
9. Install two new seals (44) with preformed packing in contact with plate (41).
10. Position plates (41 and 45) on plate (43) and loosely install four capscrews (42) in holes nearest arrows that are the same direction as arrow on plate (41). These arrows show direction of pump rotation and must be assembled with arrows in same direction.
11. Install new O-ring (40) and new preformed packing (39) on sub-assembly (38), with O-ring installed toward pressure source.
12. Install sub-assembly (38) on pump body (3), with sub-assembly positioned so pins in plate (41) are in alignment with mounting holes of center cover (2).
13. Tighten four capscrews (42).
14. Install new seal (36).
15. Align pins in plate of sub-assembly (38) with holes in center cover (2). Install pump body (3) and sub-assembly in center cover according to markings made at disassembly.
16. Install four capscrews (35) and tighten capscrews to 70 lb-ft (95 Nm).

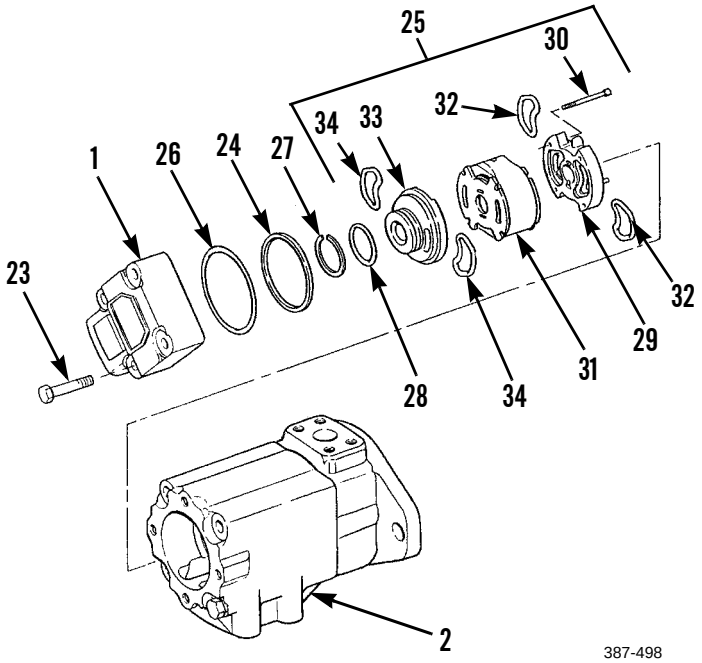


ASSEMBLY - CONTINUED

NOTE

Seals (32 and 34) are two-piece seals. Ensure that preformed packing seal is in plastic seal before seals are installed.

17. Install two new seals (32) with preformed packing in contact with plate (29).
18. Install two new seals (34) with preformed packing in contact with plate (33).
19. Position plates (33 and 29) on plate (31) and install four capscrews (30) in holes nearest arrows that are in the same direction as arrow on plate (29). These arrows show direction of pump rotation and must be assembled with arrows in the same direction.
20. Install new seal (28) and new O-ring (27) on sub-assembly (25), with seal installed toward pressure source.
21. Install new O-ring (26) in end cover (1).
22. Install sub-assembly (25) on end cover (1), with sub-assembly positioned so pins in plate (29) are in alignment with mounting holes in center cover (2).
23. Install new packing (24) on end cover (1).
24. Install four bolts (23) and tighten bolts to 45 lb-ft (61 Nm).

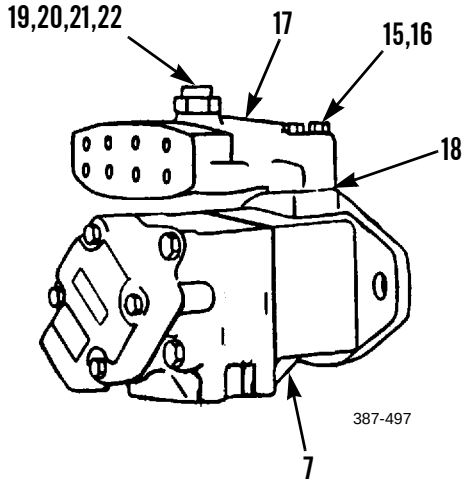


ASSEMBLY - CONTINUED

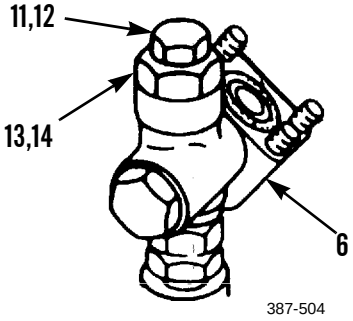
NOTE

After assembly of pump, pump shaft must turn by hand.

25. Verify that pump shaft turns by hand. If not, pump must be disassembled and assembled again.
26. Install adapter (22) in manifold (17).
27. Install new O-ring (21), dust cap (20) and nipple assembly (19) in adapter (22).
28. Install new O-ring (18) in manifold (17). Install manifold on pump (7) and with four washers (16) and capscrews (15).

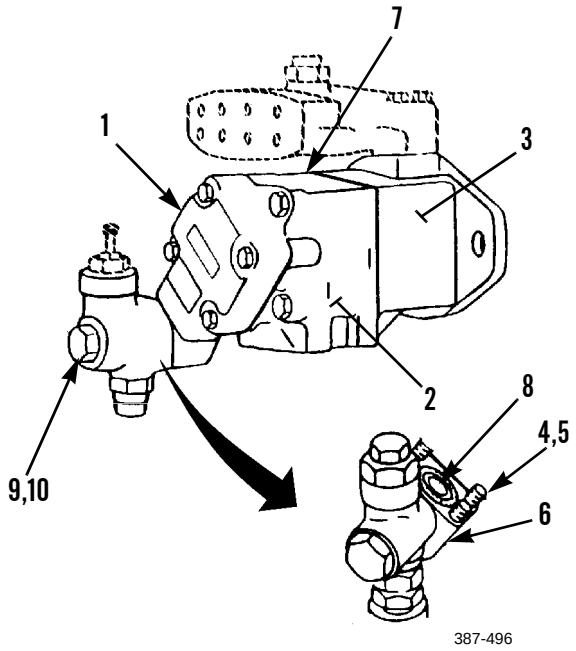


29. Install new O-ring (14) and adapter (13) in elbow (6).
30. Install new O-ring (12) and plug (11) in elbow (6).



ASSEMBLY - CONTINUED

31. Install new O-ring (10) and plug (9) in elbow (6).
32. Install new O-ring (8) and elbow (6) on pump (7) with four washers (5) and capscrews (4).



33. Install hydraulic pump (WP 0199 00).
34. Before returning machine to service, perform pump tests to ensure pump operation is correct (WP 0227 00).

END OF WORK PACKAGE

BLADE CONTROL VALVE (LIFT AND TILT) REPLACEMENT 0201 00

THIS WORK PACKAGE COVERS

Removal, Installation, Relief Valve Setting Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 300 lb capacity

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Sealing compound (Item 31, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

O-ring (7, 10, 23, 25 and 28)

Personnel Required

Two

References

WP 0227 00

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

Hydraulic tank drained (WP 0225 00)

Hydraulic tank mounting brackets and plates removed (WP 0156 00)

Blade and ripper pilot valves removed (WP 0204 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

REMOVAL

CAUTION

WARNING

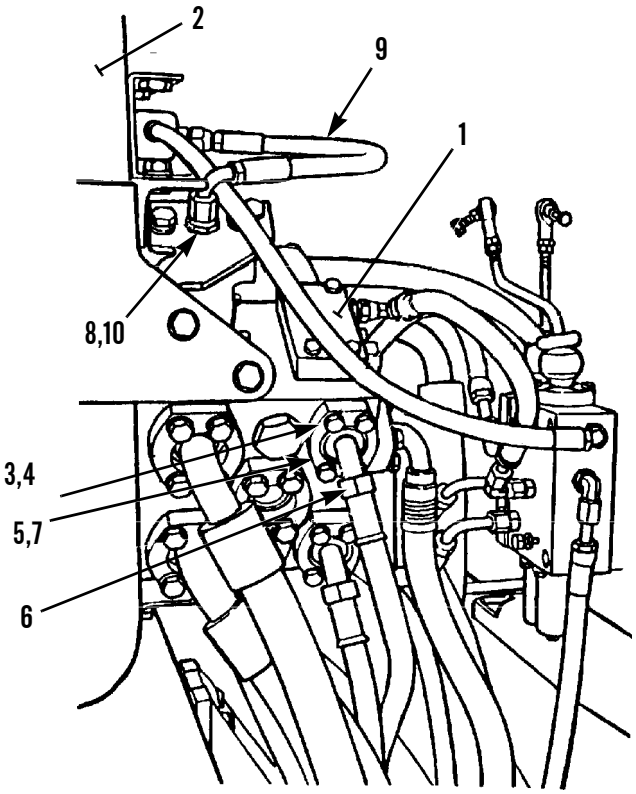
Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

REMOVAL - CONTINUED

NOTE

- **Tag hydraulic lines to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. Remove all hydraulic lines from blade control valve (1) and hydraulic tank (2), using the following procedures:
   a. For hydraulic lines with flange fittings: Remove four capscrews (3), washers (4), two split flanges (5), line (6) and O-ring (7) from blade control valve. Discard O-ring.
   b. For hydraulic lines with connector fittings: Loosen connector (8) and remove line (9) from fitting. Remove O-ring (10) from connector and discard. Remove fitting from blade control lever valve (1).



387-588

2. Remove four capscrews (11) and manifold (12) from hydraulic tank (2).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

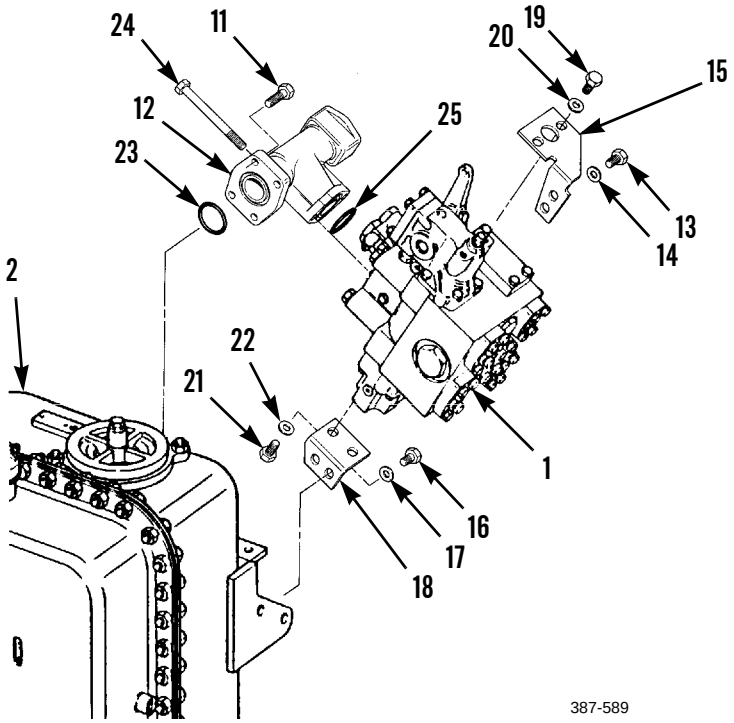
Blade control valve assembly weighs approximately 150 lb (68 kg).

3. Attach a nylon sling and a suitable lifting device to blade control valve (1) to take weight off capscrews during removal.
4. Remove two capscrews (13) and washers (14) from upper bracket (15) and hydraulic tank (2).
5. Remove two capscrews (16) and washers (17) from lower bracket (18) and hydraulic tank (2).
6. Use lifting device to remove blade control valve (1) from hydraulic tank (2).

REMOVAL - CONTINUED

7. Remove two capscrews (19), washers (20) and upper bracket (15) from blade control valve (1).
8. Remove two capscrews (21), washers (22) and lower bracket (18) from blade control valve (1).
9. Remove O-ring (23) from manifold (12) and discard O-ring.
10. Remove two capscrews (24), manifold (12) and O-ring (25) from blade control valve (1). Discard O-ring.

INSTALLATION



CAUTION

Wipe all connectors and sealing surfaces on hydraulic tank and control valve clean and dry before installation, to prevent contamination from entering hydraulic system.

NOTE

- **Lightly coat new O-rings with clean oil before installation.**
- **Apply sealing compound to pipe threads.**

1. Install new O-ring (25) and manifold (12) to blade control valve (1) with two capscrews (24).
2. Install new O-ring (23) in manifold (12).
3. Install lower bracket (18) to blade control valve (1) with two capscrews (21) and washers (22).
4. Install upper bracket (15) to blade control valve (1) with two capscrews (19) and washers (20).

INSTALLATION

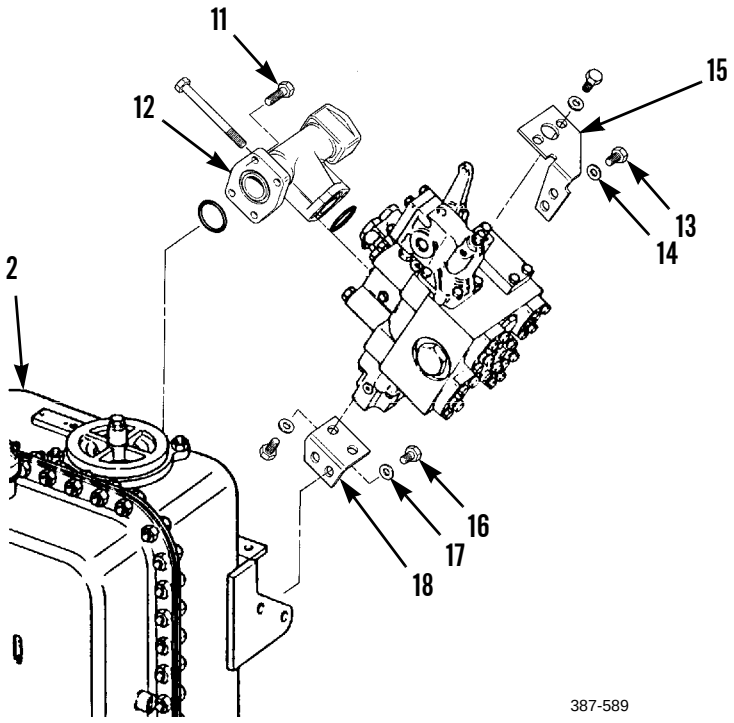
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

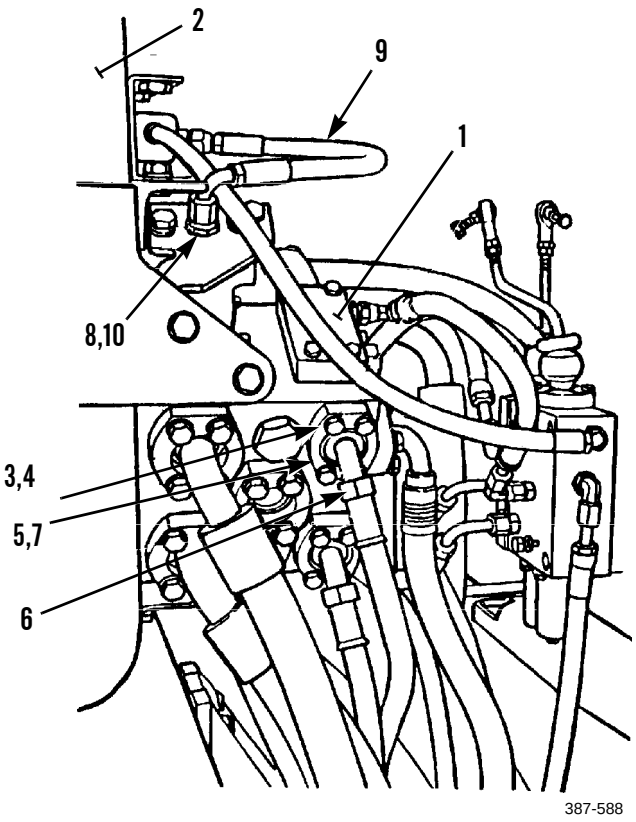
Blade control valve assembly weighs approximately 150 lb (68 kg).

5. Attach nylon sling and suitable lifting device to blade control valve (1). Use lifting device to position blade control valve to hydraulic tank (2).
6. Install lower bracket (18) on hydraulic tank (2) with two capscrews (16) and washers (17).
7. Install upper bracket (15) to hydraulic tank (2) with two capscrews (13) and washers (14).
8. Install manifold (12) to hydraulic tank (2) with four capscrews (11).



INSTALLATION - CONTINUED

9. Install all hydraulic lines on blade control valve (1) and tank (2) using one of the following procedures:
   a. For hydraulic lines with flange fittings: Install line (6) and new O-ring (7) to blade control valve (1)with two split flanges (5), four capscrews (3) and four washers (4).
   b. For hydraulic lines with connector fittings: Install fitting and new O-ring (10) to blade control valve (1). Install end of line (9) to proper location and tighten connector (8).



10. Install blade and ripper pilot valves (WP 0204 00).
11. Install hydraulic tank mounting brackets and plates (WP 0156 00).
12. Refill hydraulic tank and bleed air from system (WP 0225 00).
13. Operate machine and check for proper operation with blade control levers in all operating positions. Check for leaks.
14. Perform hydraulic system tests to ensure valve is operating properly (WP 0227 00).
15. If tests indicate incorrect relief valve setting, adjust IAW *Relief Valve Setting Adjustment* in this work package.

RELIEF VALVE SETTING ADJUSTMENT

WARNING

- **Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before removing any component. Failure to do so could result in injury.**

1. Relieve hydraulic system pressure (WP 0241 00).

WARNING

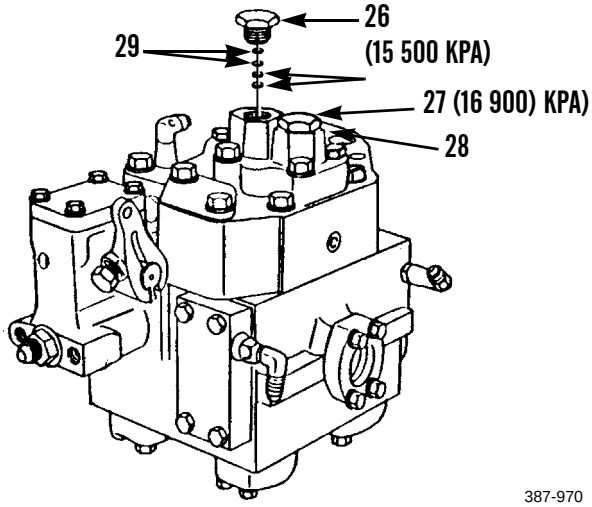
WARNING

Personal injury can result when relief valve plugs are removed. Remove plugs slowly to release spring tension.

NOTE

- **Plug (26) for bulldozer blade lift and ripper lift is stamped "15 500 KPA". Plug (27) for blade tilt is stamped "16 900 KPA."**
- **If tests indicate one or both relief valves need adjustment, perform the following.**

2. Slowly remove plug(s) (26 and 27). Remove O-rings (28) from plugs and discard.
3. Add shims (29) to increase relief valve setting or remove shims to decrease setting:
   a. One 0.005 in. shim will change relief pressure by 35 psi (240 kPa).
   b. One 0.048 in. shim will change relief pressure by 335 psi (2310 kPa).
4. Install new O-rings (28) and plug(s) (26 and 27). Tighten to 80 lb-ft (108 Nm).
5. Repeat hydraulic system tests to ensure settings are correct (WP 0227 00).



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END OF WORK PACKAGE

BLADE QUICK DROP VALVE MAINTENANCE 0202 00

THIS WORK PACKAGE COVERS

Removal, Disassembly, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Lockwasher (Item 2, 9, 14, 19 and 21)

O-ring (4, 22, 23 and 24)

References

WP 0225 00

Personal Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Hydraulic system pressure relieved (WP 0241 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

REMOVAL

WARNING

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

REMOVAL - CONTINUED

NOTE

- **Tag hydraulic lines to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. Remove two bolts (1) and lockwashers (2), tube assembly (3) and O-ring (4). Discard lockwashers and O-ring.
2. Remove bolt (5), washer (6) and clamp (7).
3. Remove eight bolts (8), lockwashers (9) and four half flanges (10) securing lift cylinder lines (11 and 12). Discard lockwashers. Remove and discard O-rings from lines.

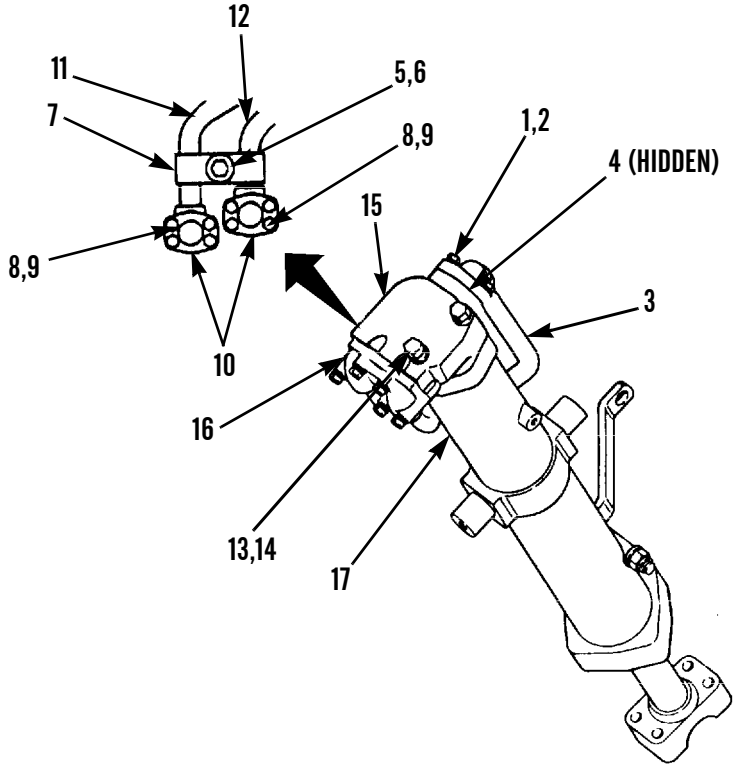
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury.

NOTE

Quick drop valve and tube assembly weighs 38 lb (17 kg).

4. Remove two bolts (13) and lockwashers (14) and lift quick drop valve (15) with tube assembly (16) from lift cylinder (17). Discard lockwashers.



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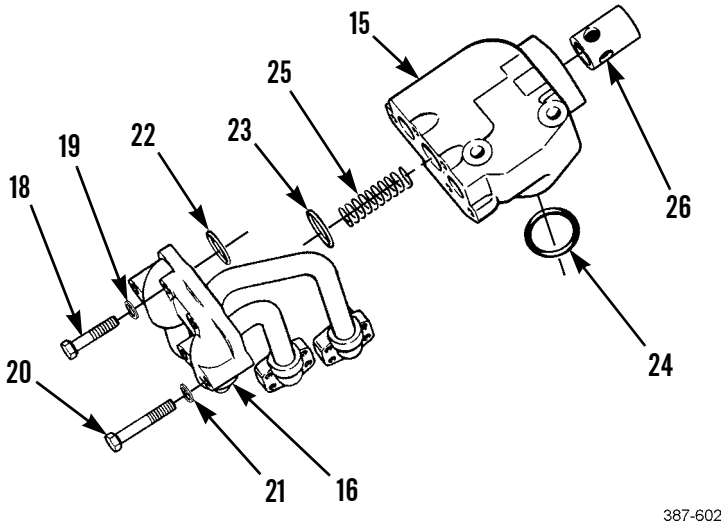
DISASSEMBLY

1. Remove two short bolts (18), lockwashers (19), three long bolts (20), lockwashers (21) and tube assembly (16) from quick drop valve (15). Discard lockwashers.
2. Remove and discard O-rings (22 and 23).
3. Remove and discard O-ring (24).
4. Remove spring (25) and sleeve (26) from quick drop valve (15).



ASSEMBLY

NOTE

Lightly coat spring, sleeve and new O-rings with clean oil before assembly.

1. Install sleeve (26) and spring (25) into quick drop valve (15).
2. Install new O-rings (22, 23, and 24).
3. Install tube assembly (16) to quick drop valve (15) with three new lockwashers (21) and long bolts (20) and two new lockwashers (19) and short bolts (18). Tighten bolts to 60 lb-ft (81 Nm).

INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury.

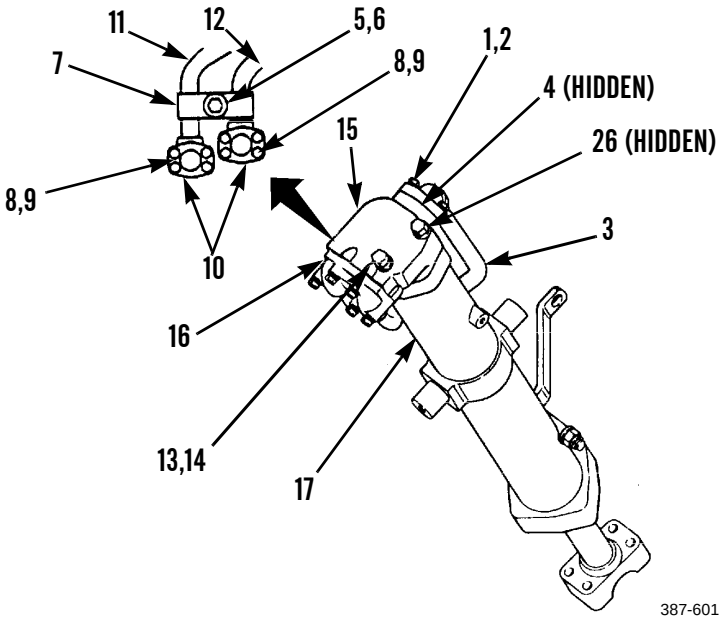
NOTE

Quick drop valve and tube assembly weighs 38 lb (17 kg).

WARNING

Wipe all connectors and sealing surfaces clean and dry before installation, to prevent contamination from entering hydraulic system.

1. Position quick drop valve (15) and tube assembly (16) on lift cylinder (17) and install two new lockwashers (14) and bolts (13). Tighten bolts to 118 lb-ft (160 Nm).
2. Check sleeve (26) to ensure it moves freely.
3. Connect lift cylinder lines (11 and 12) with new O-rings using four half flanges (10), eight new lockwashers (9) and bolts (8).
4. Place clamp (7) in position and install washer (6) and bolt (5).
5. Install new O-ring (4) and tube assembly (3) with two new lockwasher (2) and bolts (1). Tighten bolts to 60 lb-ft (81 Nm).



6. Check level of oil in hydraulic tank. Add oil as needed and bleed air from system (WP 0225 00).
7. Operate tractor and check for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

HYDRAULIC PRESSURE CONTROL VALVE REPLACEMENT 0203 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Compound, antiseize (Item 6, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

O-ring (3, 5, 7, 9 and 15)

References

WP 0225 00

Personnel Required

Two

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

Floor plates removed (WP 0171 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

REMOVAL

CAUTION

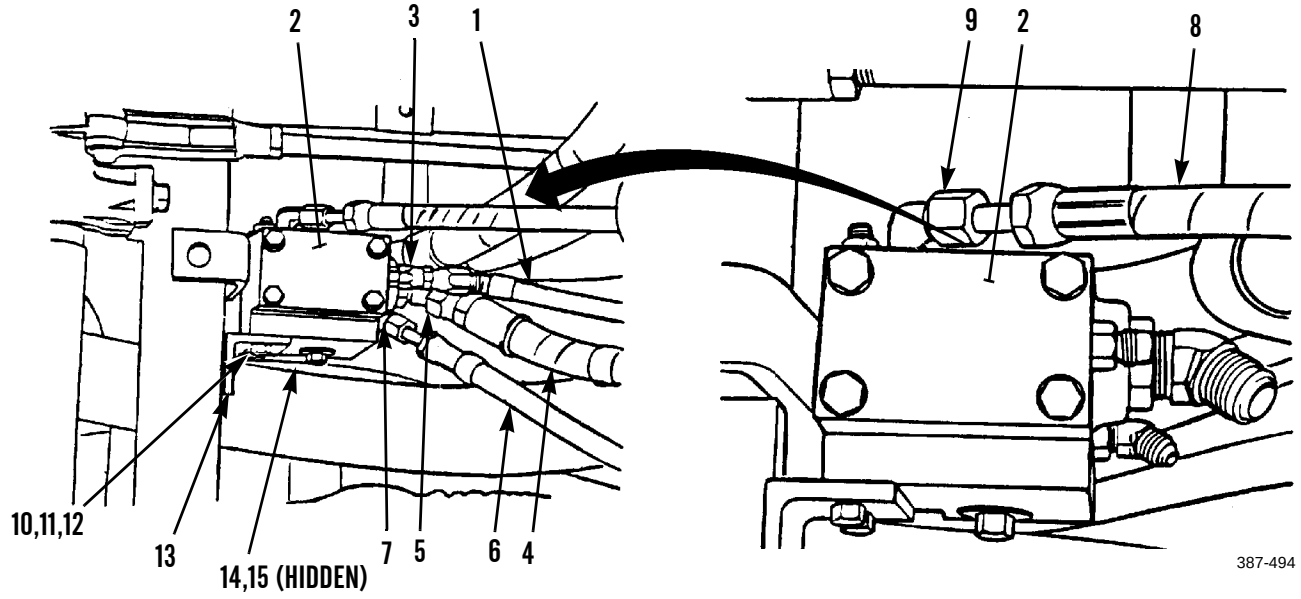
Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug opening after removing lines. Contamination of hydraulic system could result in premature failure.

REMOVAL - CONTINUED

NOTE

- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Tag hoses before removal to ensure correct installation.**

1. Disconnect hose (1) from front face of hydraulic control valve (2).
2. Remove O-ring (3) from end of hose (1). Discard O-ring.
3. Disconnect hose (4) from front face of hydraulic control valve (2).
4. Remove O-ring (5) from end of hose (4). Discard O-ring.
5. Disconnect hose (6) from front face of hydraulic control valve (2).
6. Remove O-ring (7) from end of hose (6). Discard O-ring.
7. If equipped with ripper, disconnect hose (8) from side of hydraulic control valve (2).
8. Remove O-ring (9) from end of hose (8). Discard O-ring.
9. Remove two nuts (10), washers (11), capscrews (12) and hydraulic control valve (2) from fender brace assembly (13). Support hydraulic control valve until disconnection of hose (14).
10. Disconnect hose (14) from underside of hydraulic control valve (2).
11. Remove O-ring (15) from end of hose (14). Discard O-ring.



INSTALLATION

CAUTION

Clean hose fittings and ends of all hoses before installation to prevent contamination of hydraulic system.

NOTE

- **If replacing hydraulic control valve, transfer all fittings from old valve to new. Before installation of hoses, apply antiseize compound on male threads of fittings.**
- **Lightly coat new O-rings with clean oil before installation.**

1. Install new O-ring (15) in end of hose (14) and connect hose to bottom of hydraulic control valve (2).
2. Position hydraulic control valve (2) to fender brace assembly (13) and install two capscrews (12), washers (11) and nuts (10).
3. Install new O-ring (9) on hose (8) and connect hose to side of hydraulic control valve (2).
4. Install new O-ring (7) on hose (6) and connect hose to front face of hydraulic control valve (2).
5. Install new O-ring (5) on hose (4) and connect hose to front face of hydraulic control valve (2).
6. Install new O-ring (3) on hose (1) and connect hose to front face of hydraulic control valve (2).
7. Check oil level in hydraulic tank. Refill system tank and bleed air from system, as required (WP 0225 00).
8. Operate machine and ensure hydraulic system is operating properly and no leaks are evident.
9. Install floor plates (WP 0171 00).

END OF WORK PACKAGE

BLADE TILT AND RIPPER PILOT VALVE ASSEMBLY REPLACEMENT 0204 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

O-ring (8, 11,14, and 16)

References

TM 5-2410-237-10

WP 0225 00

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

Blade control linkage disconnected from blade tilt pilot valve (WP 0207 00)

Ripper control linkage disconnected from ripper pilot valve, if equipped with ripper (WP 0208 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

REMOVAL

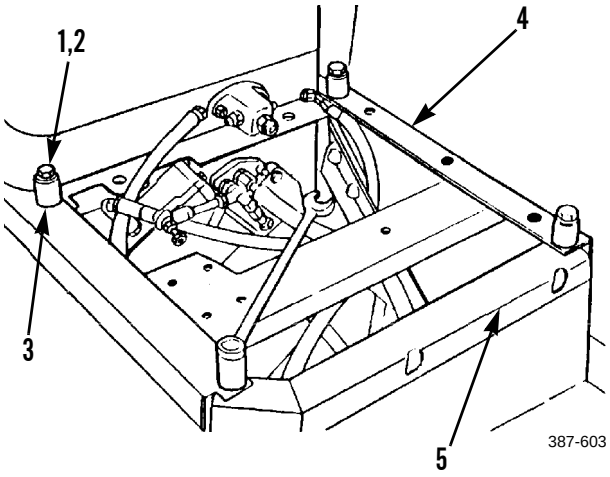
WARNING

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

NOTE

- **Tag hydraulic lines to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. Remove four capscrews (1), washers (2), spacers (3) and frame (4) from control housing (5).



2. Disconnect two hoses (6) at front side of pilot valve assembly (7).
3. Remove O-rings (8) from each hose (6) and discard.
4. Disconnect two hoses (9) from blade tilt pilot valve (10) of pilot valve assembly (7).

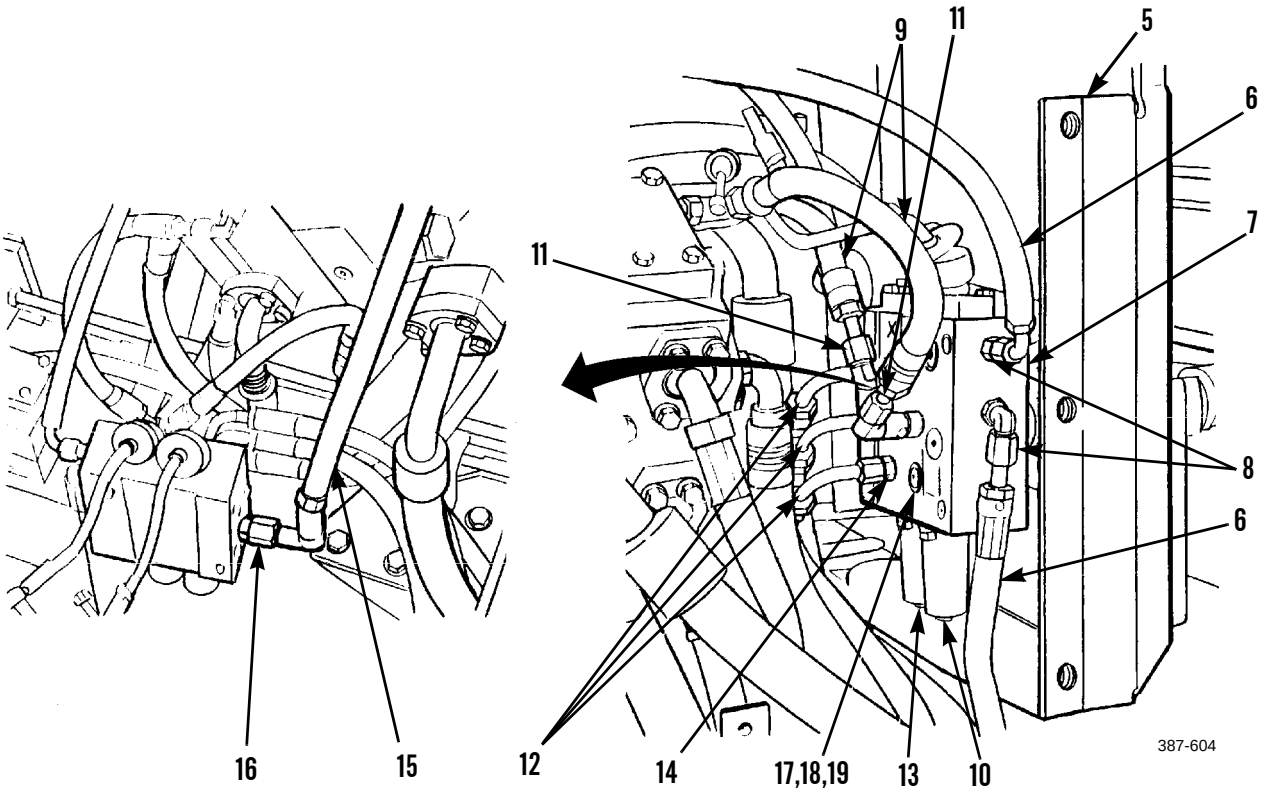
REMOVAL - CONTINUED

5. Remove O-rings (11) from each hose (9) and discard O-rings.
6. Disconnect three hoses (12) from ripper pilot valve (13) of pilot valve assembly (7).
7. Remove O-rings (14) from each hose (12) and discard.
8. Disconnect hose (15) from back side of pilot valve assembly (7).
9. Remove O-ring (16) from hose (15) and discard.

WARNING

If equipped with ripper, pilot valve assembly weighs 24 lb (11 kg). Otherwise, pilot valve assembly weighs 17 lb (8 kg).

10. Remove three nuts (17), capscrews (18), washers (19) and pilot valve assembly (7) from side of control housing (5).



INSTALLATION

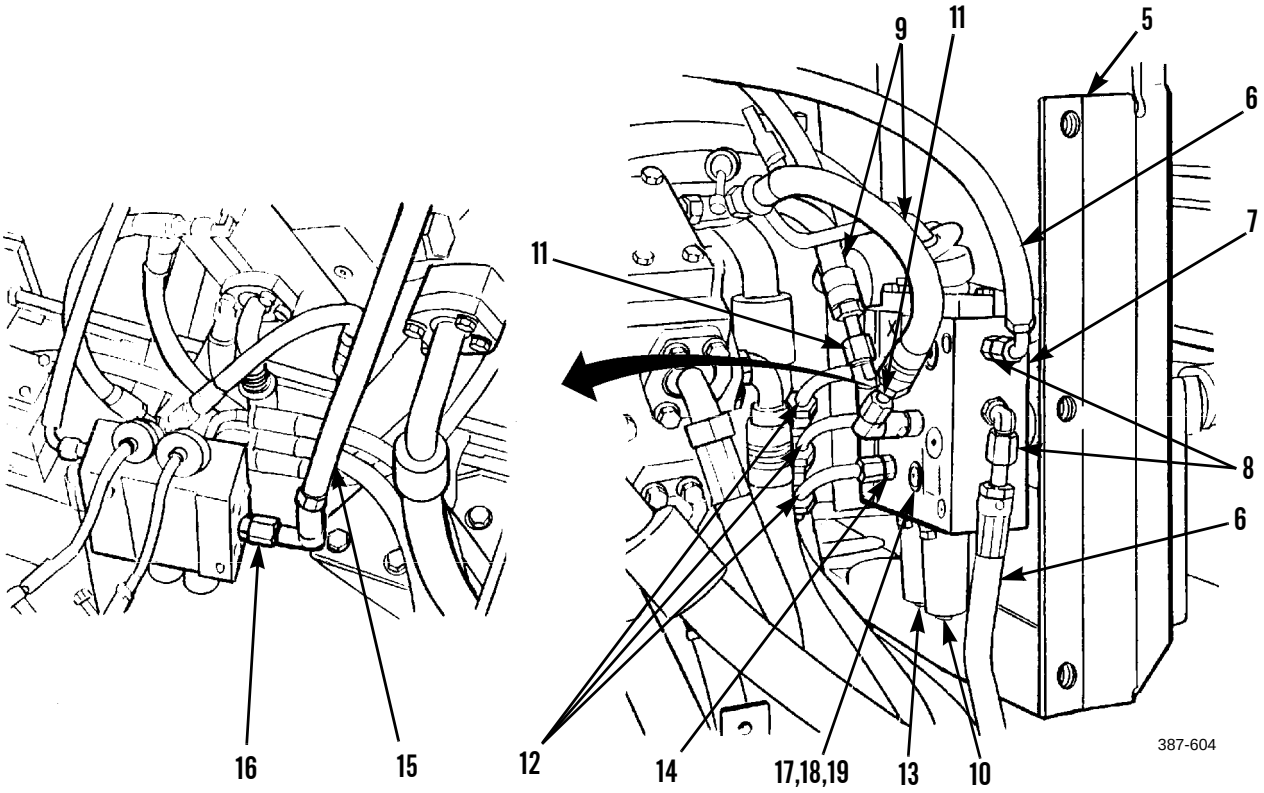
WARNING

Wipe all sealing surfaces on hoses and valve clean and dry before installation to prevent contamination of hydraulic system.

NOTE

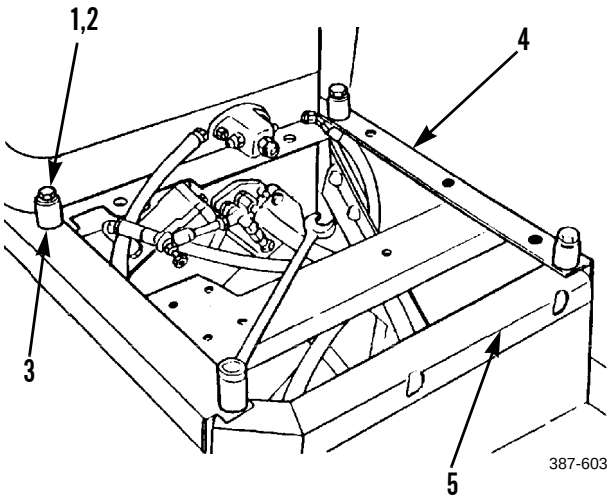
- **Lightly coat new O-rings with clean oil before installation.**
- **If equipped with ripper, pilot valve assembly weighs 24 lb (11 kg). Otherwise, pilot valve assembly weighs 17 lb (8 kg).**

1. Use two wrenches to install pilot valve assembly (7) on side of control housing (5) with three capscrews (18), washers (19) and nuts (17).
2. Install new O-ring (16) on hose (15) and connect hose to back side of pilot valve assembly (7).
3. Install new O-rings (14) on three hoses (12) and connect hoses to ripper pilot valve (13) of pilot valve assembly (7).
4. Install new O-rings (11) on two hoses (9) and connect hoses to blade tilt pilot valve (10) of pilot valve assembly (7).
5. Install new O-rings (8) on two hoses (6) and connect hoses to front side of pilot valve assembly (7).



INSTALLATION - CONTINUED

6. Install frame (4) to control housing (5) with four capscrews (1), washers (2) and spacers (3).



7. Connect blade control linkage to blade tilt pilot valve (WP 0207 00).
8. If equipped with ripper, connect ripper control linkage to ripper pilot valve (WP 0208 00).
9. Check machine oil level in hydraulic tank. Refill tank and bleed air from system, as required (WP 0241 00).
10. Operate machine and check blade and ripper for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

BLADE TILT AND RIPPER PILOT VALVE ASSEMBLY REPAIR 0205 00

THIS WORK PACKAGE COVERS

Disassembly, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Materials/Parts

Compound, antiseize (Item 6, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

O-ring (3, 4, 12, 13, and 14)

Equipment Condition

Blade and ripper pilot valve assembly removed (WP 0205 00)

CAUTION

Ensure work area is kept clean to prevent contamination of hydraulic system.

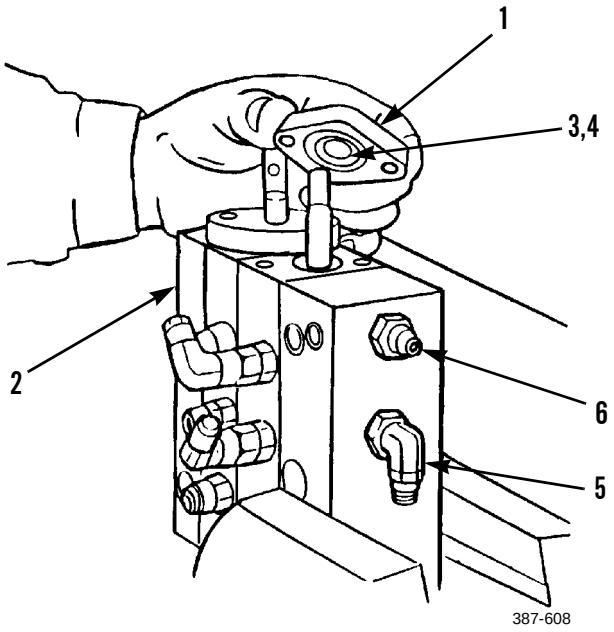
NOTE

- **Repair of pilot valve assembly, if machine is equipped with ripper, is similar to repair of pilot valve assembly, if machine is not equipped with ripper. Machine without ripper will have no ripper pilot valve. This work package describes and illustrates a machine equipped with ripper.**
- **Capscrews and washers used for holding housings on two pilot valves were removed when ripper and blade control levers were removed. Keep these parts with proper pilot valve for installation.**
- **Tag pilot valves and manifolds to ensure correct assembly.**

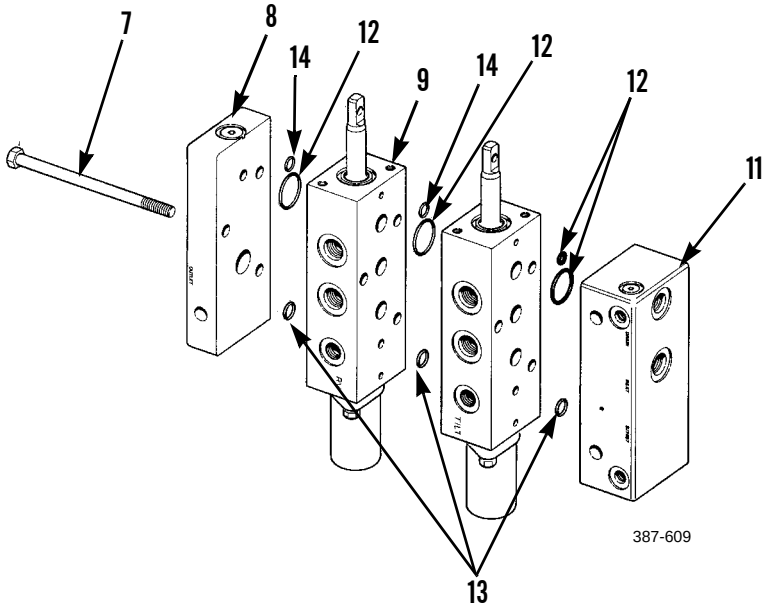
BLADE TILT AND RIPPER PILOT VALVE ASSEMBLY REPAIR - CONTINUED 0205 00

DISASSEMBLY - CONTINUED

1. Remove two housings (1) from top of pilot valve assembly (2). Remove housing O-ring (3) and shaft O-ring (4) from both housings. Discard O-rings.
2. Remove three elbows (5) from pilot valve assembly (2).
3. Remove eight adapters (6) from pilot valve assembly (2).



4. Remove three capscrews (7) and separate outlet manifold (8), ripper pilot valve (9), blade tilt pilot valve (10) and inlet manifold (11).
5. Remove three O-rings (12) from large valve ports, O-ring (13) from smaller port and two small O-rings (14) from smallest ports in inlet manifold (11). Discard O-rings.
6. Repeat step 5 for blade tilt pilot valve (10).
7. Repeat step 5 for ripper pilot valve (9).



ASSEMBLY

NOTE

Lightly coat new O-rings with clean oil before assembly.

1. Install three new O-rings (12) at large valve ports, new O-ring (13) at smaller port and two new small O-rings (14) at smallest ports in inlet manifold (11).
2. Repeat step 1 for ripper pilot valve (9).
3. Repeat step 1 for blade tilt pilot valve (10).

CAUTION

Ensure all O-rings are properly seated when assembling manifolds and pilot valves, to avoid pinching or cutting O-rings, which could cause leaks and system malfunctions.

4. Position and carefully align inlet manifold (11), blade tilt pilot valve (10), ripper pilot valve (9) and outlet manifold (8) together.
5. Install three capscrews (7) to secure manifolds (8 and 11) and pilot valves (9 and 10).
6. Apply six antiseize compound to pipe threads of adapters (6) and install adapters in pilot valve assembly (2).
7. Apply antiseize compound to pipe threads of three elbows (5) and install elbows in pilot valve assembly (2).
8. Install new shaft O-ring (4) and housing O-ring (3) in housing (1). Position housing over stem of ripper pilot valve (9).
9. Install two washers and capscrews (removed when linkage was disconnected from pilot valve) finger tight to hold housing (1) on ripper pilot valve (9).
10. Repeat steps 8 and 9 for blade tilt pilot valve (10).
11. Install blade and ripper pilot valve assembly (WP 0205 00).

END OF WORK PACKAGE

RIPPER CONTROL VALVE REPLACEMENT 0206 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with ripper

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 200 lb capacity

Material/Parts

Cap set, protective (Item 2, WP 0250 00)

Oil, lubricating (Item 23, 24 or 25, WP 0250 00)

Material/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0250 00)

O-ring (11, 12, 19, 20, 21, 27, 28, 32, 37 and 46)

Washer, lock (2)

References

WP 0225 00

Personnel Required

Two

Equipment Condition

Ripper resting on ground (TM 5-2410-237-10)

Hydraulic system pressure relieved (WP 0241 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

WARNING

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

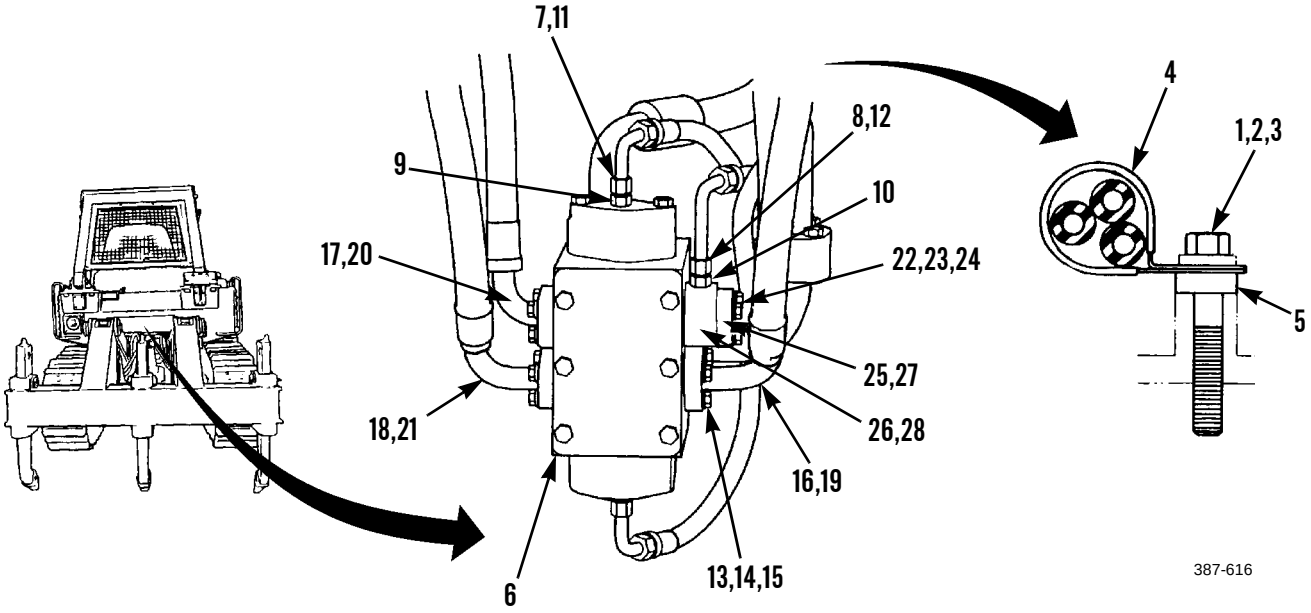
NOTE

- **Tag hydraulic lines to ensure correct installation.**
- **Use a suitable container to catch any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

RIPPER CONTROL VALVE REPLACEMENT - CONTINUED 0206 00

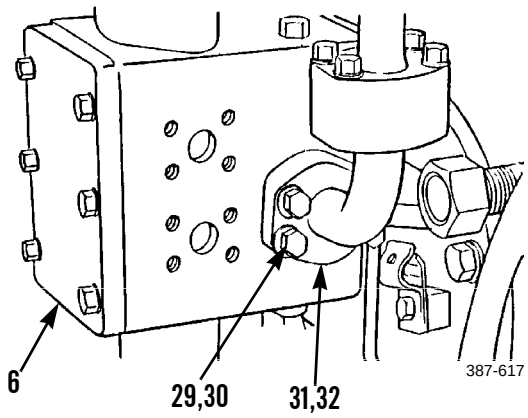
REMOVAL

1. Remove capscrew (1), lockwasher (2), washer (3), clamp (4) and spacer (5) to release three oil lines from final drive case above ripper control valve (6). Discard lockwasher.
2. Disconnect two oil lines (7 and 8) from two adapters (9 and 10). Remove two O-rings (11 and 12) from lines. Discard O-rings.
3. Remove two adapters (9 and 10) from ripper control valve (6).
4. Remove four capscrews (13), washers (14) and two split flanges (15) from each of three lines (16, 17 and 18). Disconnect lines from ripper control valve (6).
5. Remove O-rings (19, 20 and 21) from each line (16, 17 and 18). Discard O-rings.
6. Remove four capscrews (22), washers (23), two split flanges (24) and disconnect line (25) from adapter (26). Remove O-ring (27) from line. Discard O-ring.
7. Remove adapter (26) and O-ring (28) from ripper control valve (6). Discard O-ring.

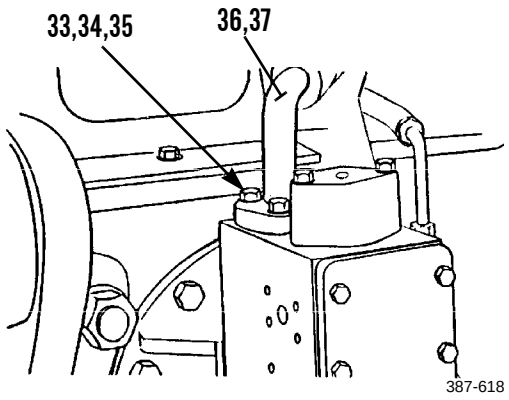


REMOVAL - CONTINUED

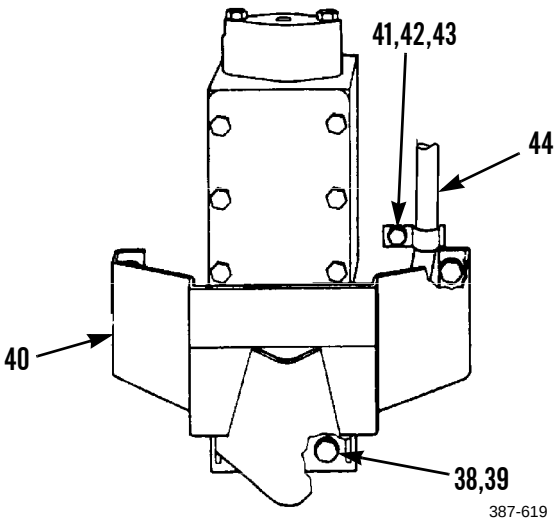
8. Remove four capscrews (29), washers (30) and elbow (31) from side of ripper control valve (6).
9. Remove O-ring (32) from elbow (31). Discard O-ring.



10. Remove four capscrews (33), washers (34), two split flanges (35) and disconnect line (36) from top of ripper control valve (6).
11. Remove O-ring (37) from line (36). Discard O-ring.



12. Remove four capscrews (38), washers (39) and guard (40) from tractor.
13. Remove capscrew (41), washer (42) and clamp (43) holding pilot oil line (44) to tractor.



REMOVAL - CONTINUED

14. Disconnect pilot oil line (44) from adapter (45) at bottom of ripper control valve (6). Remove O-ring (46) from line. Discard O-ring.
15. Remove adapter (45) from ripper control valve (6).

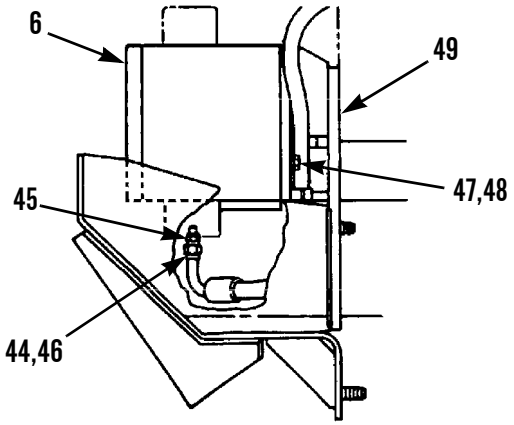
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Ripper control valve weighs 55 lb (25 kg).

16. Attach a nylon sling and a suitable lifting device to ripper control valve (6) to take weight off capscrews (47) during removal.
17. Remove four capscrews (47), washers (48) and ripper control valve (6) from mounting bracket (49).



387-620

INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

WARNING

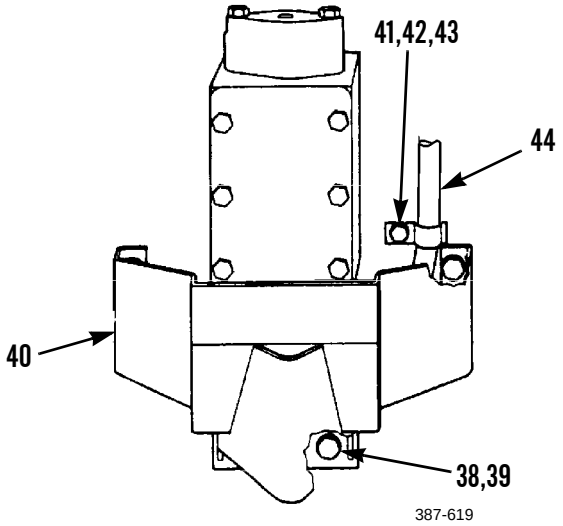
Ensure all sealing surfaces on valve and hoses are clean and dry before installation. Contamination of hydraulic system could result in premature failure.

INSTALLATION - CONTINUED

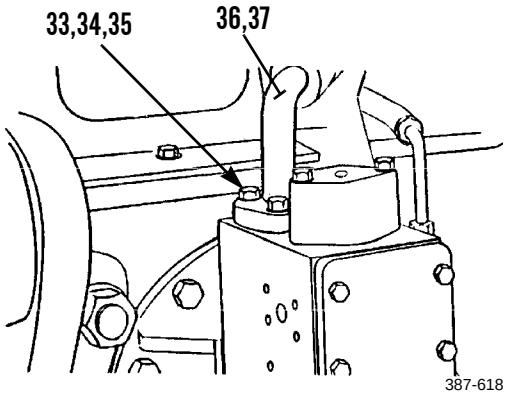
NOTE

- **Ripper control valve weighs 55 lb (25 kg).**
- **Lightly coat new O-rings with clean oil before installation.**

1. Use a nylon sling and a suitable lifting device to position ripper control valve (6) to mounting bracket (49). Install valve to mounting bracket with four washers (48) and capscrews (47).
2. Install adapter (45) to bottom of ripper control valve (6).
3. Install new O-ring (46) to pilot oil line (44) and connect pilot oil line to adapter (45).
4. Install clamp (43) to pilot oil line (44) with washer (42) and capscrew (41).
5. Install guard (40) to tractor with four washers (39) and capscrews (38).

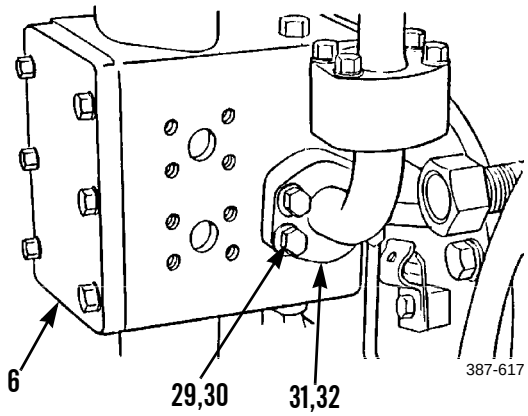


6. Install new O-ring (37) to line (36). Connect line to ripper control valve (6) with two split flanges (35), four washers (34) and capscrews (33).

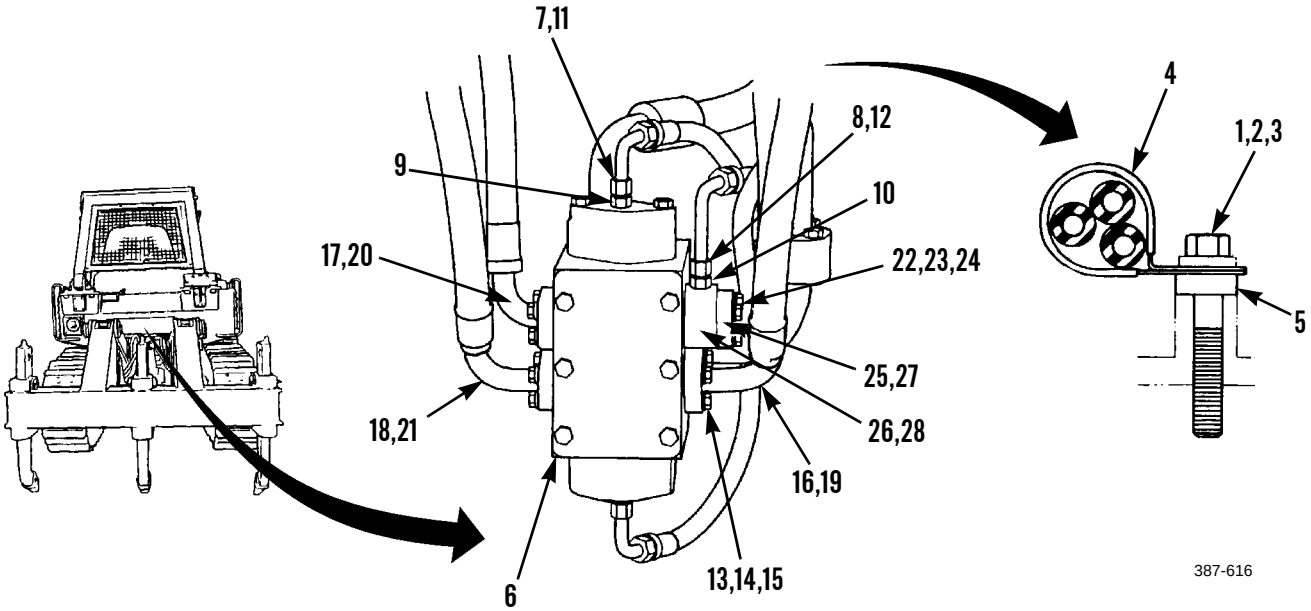


INSTALLATION - CONTINUED

7. Install new O-ring (32) to elbow (31). Install elbow to ripper control valve (6) with four washers (30) and capscrews (29).



8. Install new O-ring (28) to adapter (26).
9. Install new O-ring (27) to line (25). Install line and adapter (26) to ripper control valve (6) with two split flanges (24), four washers (23) and capscrews (22).
10. Install new O-ring (19, 20 and 21) to each of three lines (16, 17 and 18). Connect each line to ripper control valve (6) with two split flanges (15), four washers (14) and capscrews (13).
11. Install two adapters (9 and 10) to ripper control valve (6).
12. Install new O-rings (11 and 12) in each of two lines (7 and 8) and connect oil lines to adapters (9 and 10).
13. Connect three oil lines to final drive case with spacer (5), clamp (4), washer (3), new lockwasher (2) and capscrew (1).



14. Check level of oil in hydraulic tank. Refill tank and bleed air from system, as required (WP 0225 00).
15. Operate machine and check ripper for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

BLADE CONTROL LEVER AND LINKAGE REPLACEMENT 0207 00

THIS WORK PACKAGE COVERS

Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Nut, self-locking (20)

Pin, cotter (27)

References

TM 5-2410-237-10

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

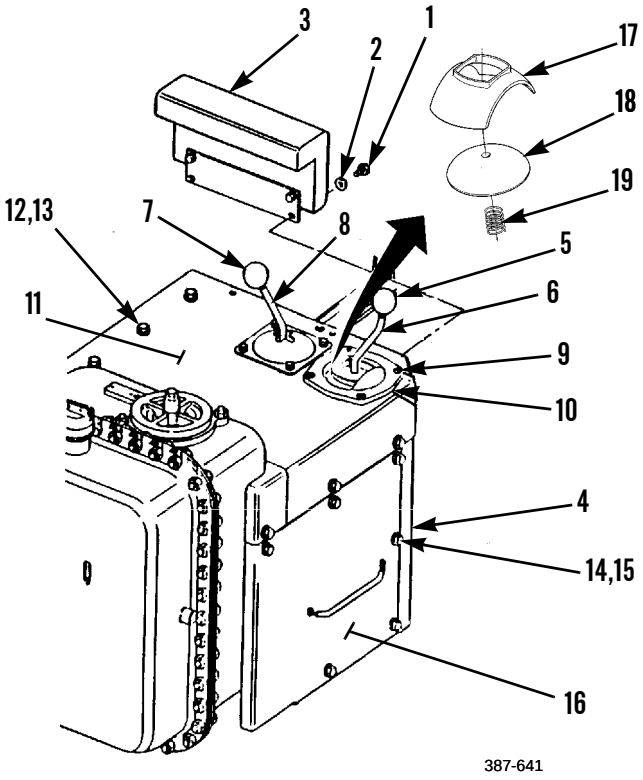
Steering brake lock lever removed (WP 0149 00)

REMOVAL

WARNING

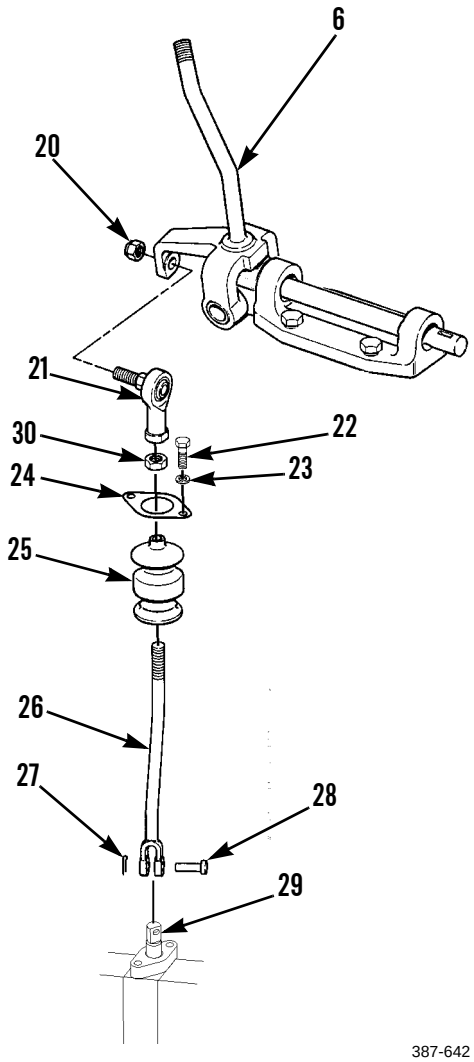
Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

1. Remove two capscrews (1), washers (2) and armrest (3) from control console (4).
2. Remove knob (5) from blade control lever (6).
3. Remove knob (7) from ripper or winch control lever (8) (whichever applies).
4. Remove four screws (9) and cover (10) from cover (11).
5. Remove nine capscrews (12), washers (13) and cover (11) from control console (4).
6. Remove six capscrews (14), washers (15) and plate (16) from front of control console (4).
7. Remove guide (17), dome (18) and spring (19) from blade control lever (6).



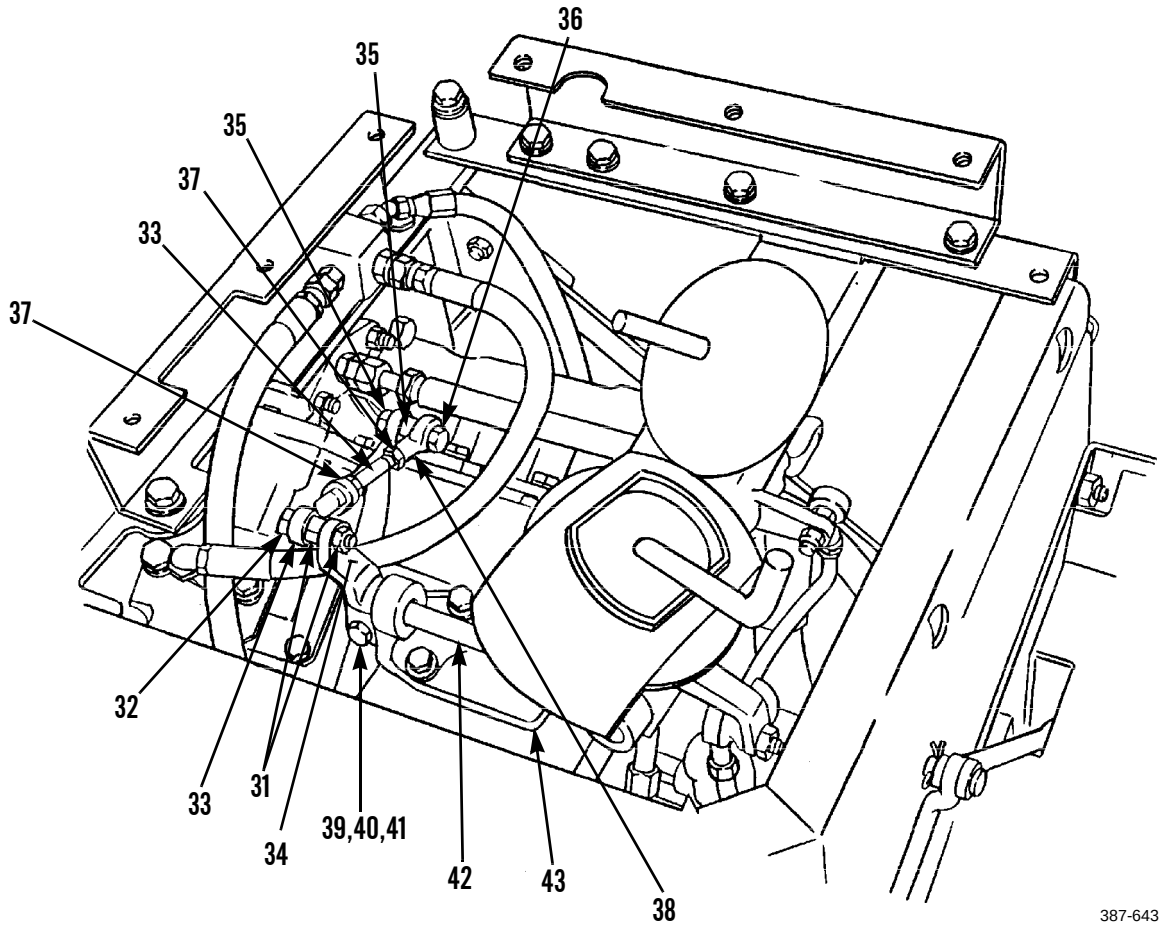
REMOVAL - CONTINUED

8. Remove self-locking nut (20) and rod end (21) from blade control lever (6). Discard self-locking nut.
9. Remove two capscrews (22) and washers (23) from boot flange (24) and slide boot (25) and boot flange partially up rod (26).
10. Remove cotter pin (27), pin (28) and disconnect rod (26) from blade tilt pilot valve (29). Discard cotter pin.
11. Loosen nut (30), remove rod end (21), nut, boot (25) and boot flange (24) from rod (26).



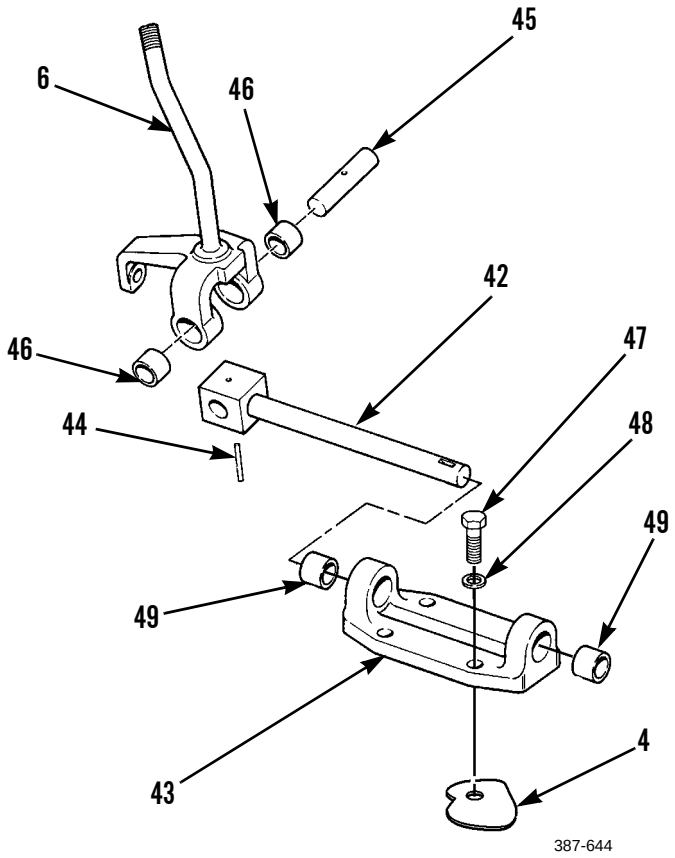
REMOVAL - CONTINUED

12. Remove two nuts (31), bolt (32) and top end of rod (33) assembly from lever (34).
13. Remove two nuts (35), bolt (36) and lower end of rod (33) assembly from lever at blade control valve.
14. Loosen nut (37), remove rod end (38) and nut from one end of rod (33).
15. Repeat step 14 at other end of rod (33).
16. Remove nut (39), capscrew (40), lever (34) and key (41) from shaft (42).
17. Remove shaft (42) from bracket (43).



18. Remove pin (44) from shaft (42) and shaft (45).
19. Remove shaft (45) and blade control lever (6) from shaft (42).
20. Remove two bearings (46) from blade control lever (6).
21. Remove four bolts (47), washers (48) and bracket (43) from control console (4).
22. Remove two bearings (49) from bracket (43).

REMOVAL - CONTINUED



CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

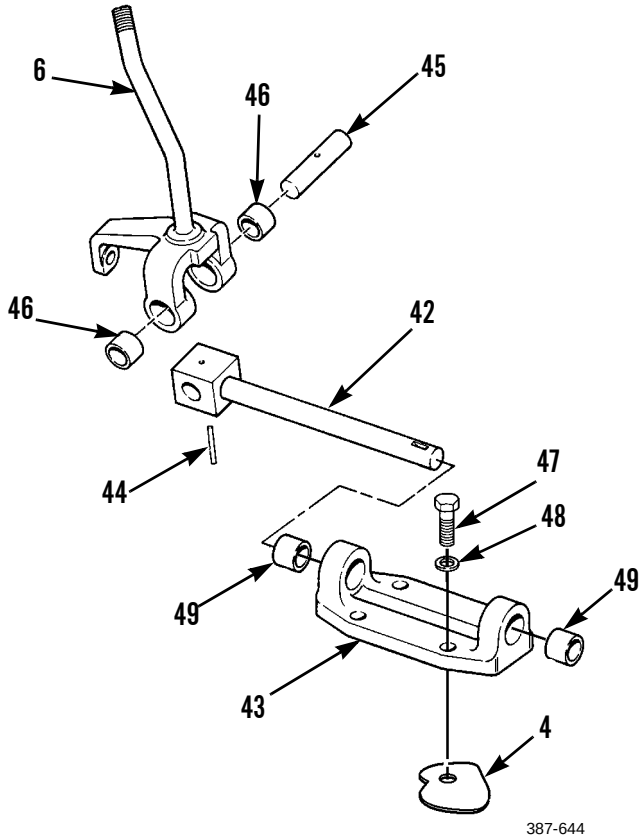
1. Clean all parts of control linkages with solvent cleaning compound and dry rags.
2. Inspect components for damage. Replace if damaged.

INSTALLATION

WARNING

Lightly coat bearings and pivot points with GAA grease before installation. After installation, remove excess grease with rag.

1. Install two bearings (49) in bracket (43).
2. Install bracket (43) to control console (4) with four washers (48) and bolts (47).
3. Install two bearings (46) in blade control lever (6).
4. Position blade control lever (6) over block end of shaft (42) and insert shaft (45) through lever and shaft (42).
5. Align hole in shaft (45) with shaft (42) and install pin (44).
6. Install shaft (42) in bracket (43).

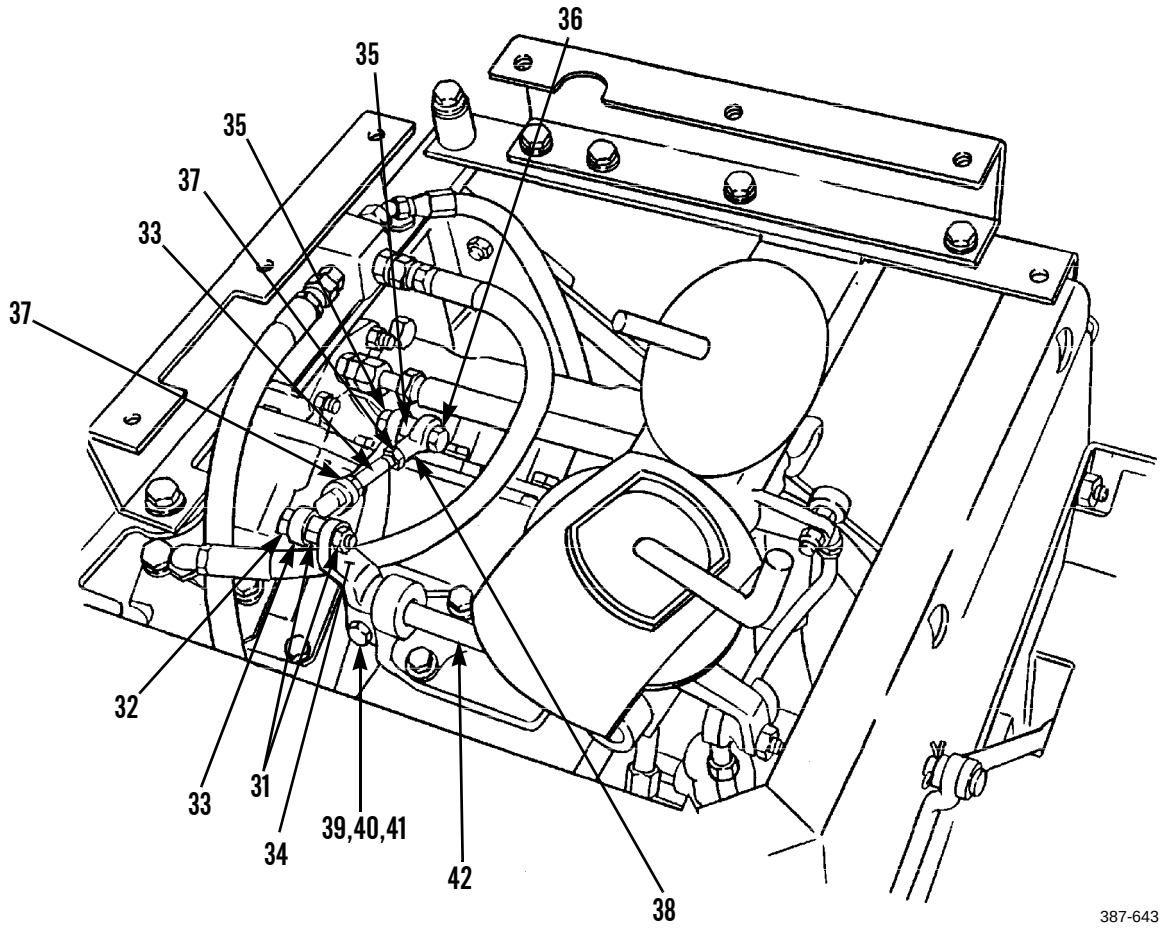


7. Install key (41) and lever (34) on shaft (42).
8. Install capscrew (40) and nut (39) in lever (34).

BLADE CONTROL LEVER AND LINKAGE REPLACEMENT - CONTINUED 0207 00

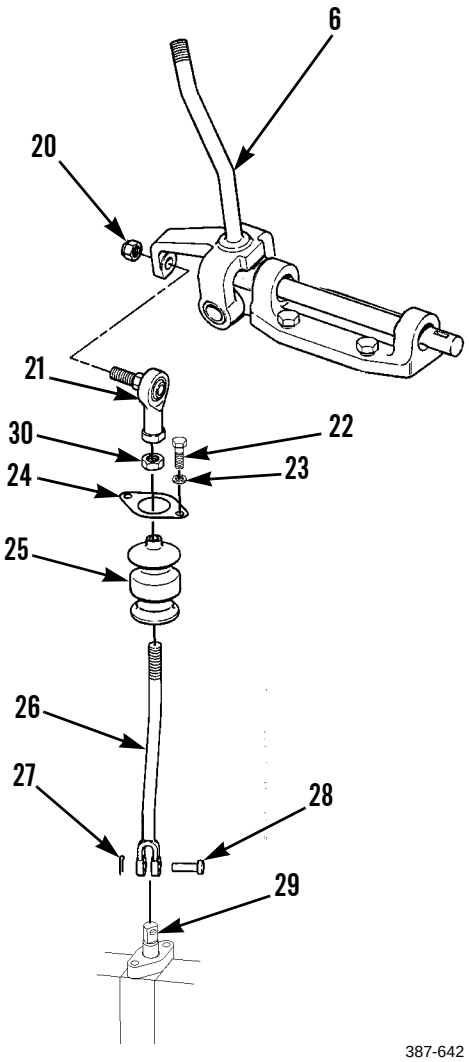
INSTALLATION - CONTINUED

9. Install nut (37) and rod end (38) on each end of rod (33). Do NOT tighten nuts at this time.
10. Install lower end of rod (33) assembly to lever at blade control valve with bolt (36) and two nuts (35).
11. Install top end of rod (33) assembly in lever (34) with bolt (32) and two nuts (31). Do NOT tighten nuts at this time.



INSTALLATION - CONTINUED

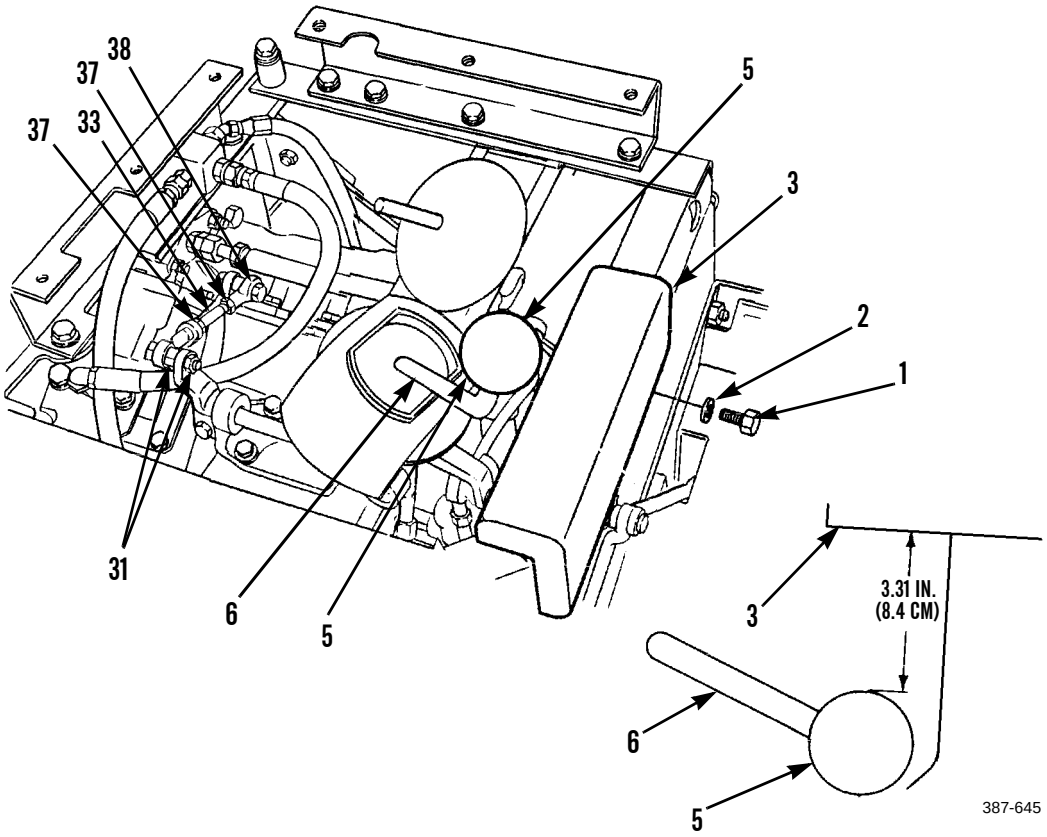
12. Install boot flange (24) on boot (25) and slide boot about halfway down on rod (26).
13. Install nut (30) and rod end (21) on rod (26). Do NOT Tighten nut at this time.
14. Install bottom end of rod (26) on blade tilt pilot valve (29) with pin (28) and new cotter pin (27).
15. Slide boot (25) over rod (26) end and secure boot flange (24) to pilot valve (29) with two washers (23) and capscrews (22).
16. Adjust rod end (21) on rod (26) and with blade control lever (6) in vertical position. Install rod end in lever with new self-locking nut (20). Tighten nut (20) and nut (30).



BLADE CONTROL LEVER AND LINKAGE REPLACEMENT - CONTINUED 0207 00

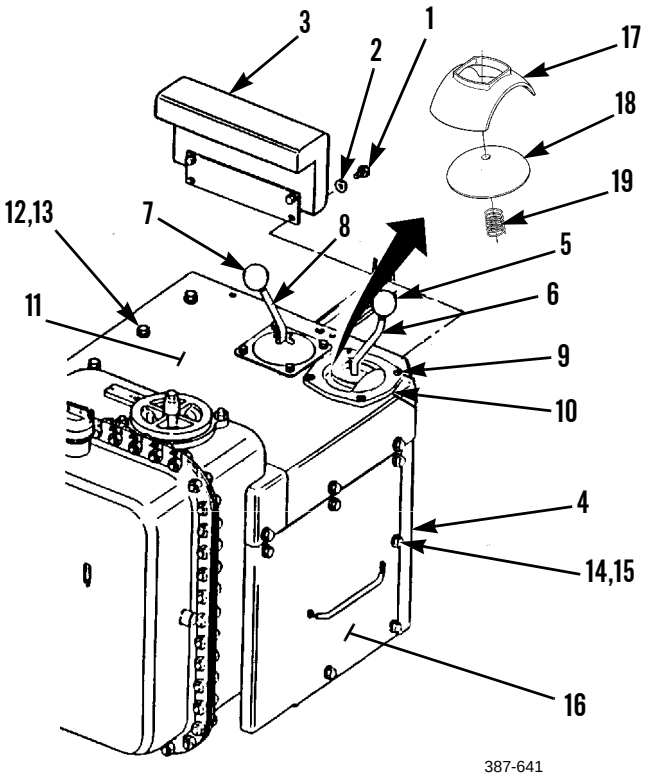
INSTALLATION - CONTINUED

17. To adjust blade control lever (6) for proper neutral position, temporarily install armrest (3) with two capscrews (1) and washers (2) finger tight. Install knob (5) on blade control lever.
18. Adjust length of rod (33) assembly to obtain a distance of 3.31 in. (8.4 cm) between surface of knob and front edge of armrest (3).
19. Remove two capscrews (1), washers (2), armrest (3) and knob (5).
20. Tighten two nuts (31) on end of rod (33) assembly. Tighten nut (37) at each end of rod assembly against rod ends (38).



INSTALLATION - CONTINUED

21. Place spring (19), dome (18) and guide (17) on blade control lever (6).
22. Install plate (16) to control console (4) with six washers (15) and capscrews (14).
23. Install cover (11) to control console (4) with nine washers (13) and capscrews (12).
24. Place cover (10) over blade control lever (6). Position guide (17) in cover and install cover to cover (11) with four screws (9).
25. Install knob (5) on blade control lever (6) and knob (7) on ripper or winch control lever (8) (whichever applies).
26. Install armrest (3) to control console (4) with two washers (2) and capscrews (1).
27. Install steering brake lock lever (WP 0149 00).



28. Operate machine and check blade control lever for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

RIPPER CONTROL LEVER AND LINKAGE REPLACEMENT 0208 00

THIS WORK PACKAGE COVERS

Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Applicable Configuration

Tractor with ripper

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Nut, self-locking (27)

Pin, cotter (21)

References

TM 5-2410-237-10

Equipment Condition

Seat removed (WP 0172 00)

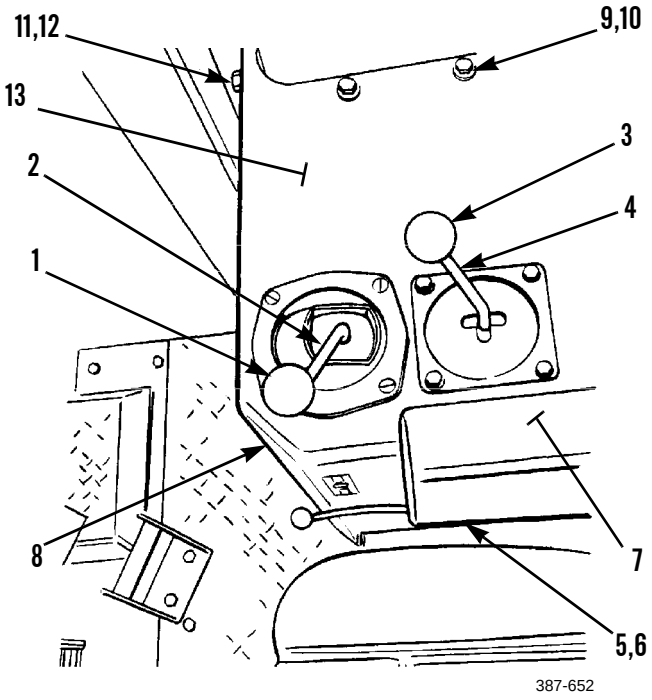
Hydraulic system pressure relieved (WP 0241 00)

REMOVAL

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

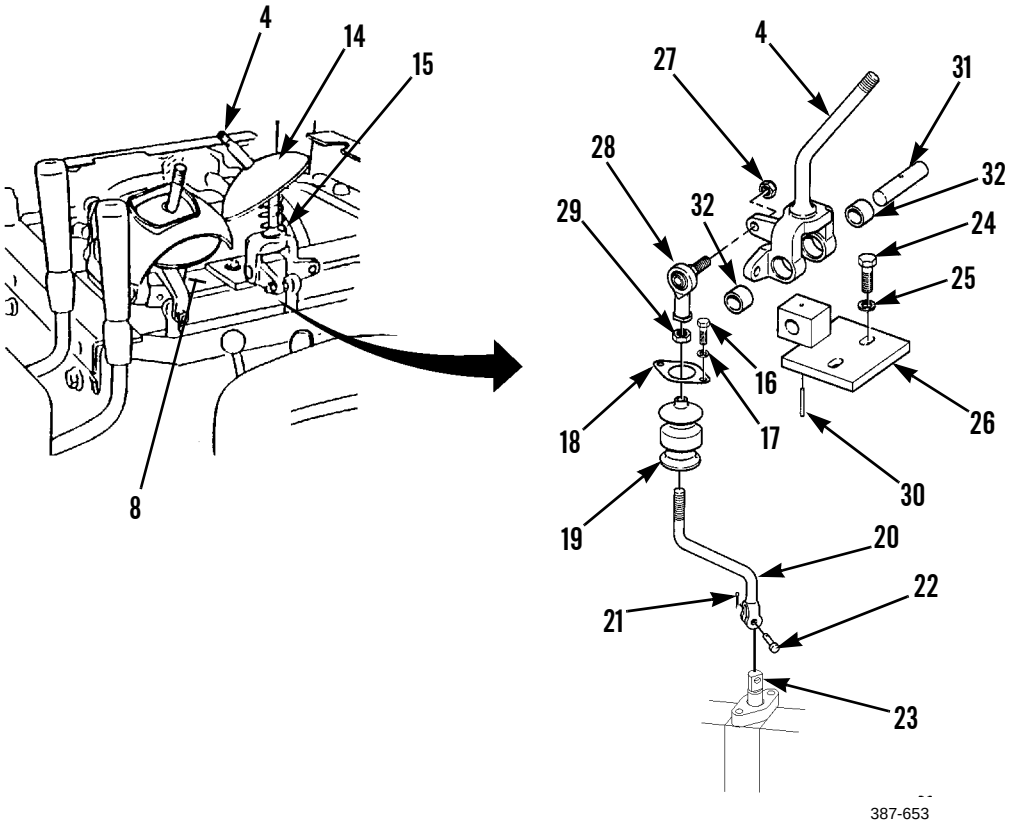
1. Remove knob (1) from blade control lever (2).
2. Remove knob (3) from ripper control lever (4).
3. Remove two capscrews (5), washers (6) and armrest (7) from side of control console (8).
4. Remove eight capscrews (9), washers (10), capscrew (11) and washer (12) from cover (13).
5. Remove cover (13) from control console (8).



6. Remove dome (14) and spring (15) from ripper control lever (4).
7. Remove two capscrews (16) and washers (17) from boot flange (18) at bottom of control linkage.
8. Slide boot (19) and boot flange (18) partially up lower rod (20).
9. Remove cotter pin (21) and pin (22) to disconnect lower rod (20) from ripper pilot valve (23). Discard cotter pin.
10. Remove two capscrews (24) and washers (25) from bracket (26) assembly and remove bracket assembly from control console (8).

REMOVAL - CONTINUED

11. Remove self-locking nut (27) from rod end (28) and remove lower rod (20) from ripper control lever (4). Discard self-locking nut.
12. Loosen nut (29) and remove rod end (28) from lower rod (20).
13. Remove nut (29), boot (19) and boot flange (18) from lower rod (20).
14. Secure bracket (26) assembly in vise and remove pin (30) from bracket.
15. Remove shaft (31) and ripper control lever (4) from bracket (26).
16. Remove two bearings (32) from ripper control lever (4).



CLEANING AND INSPECTION

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

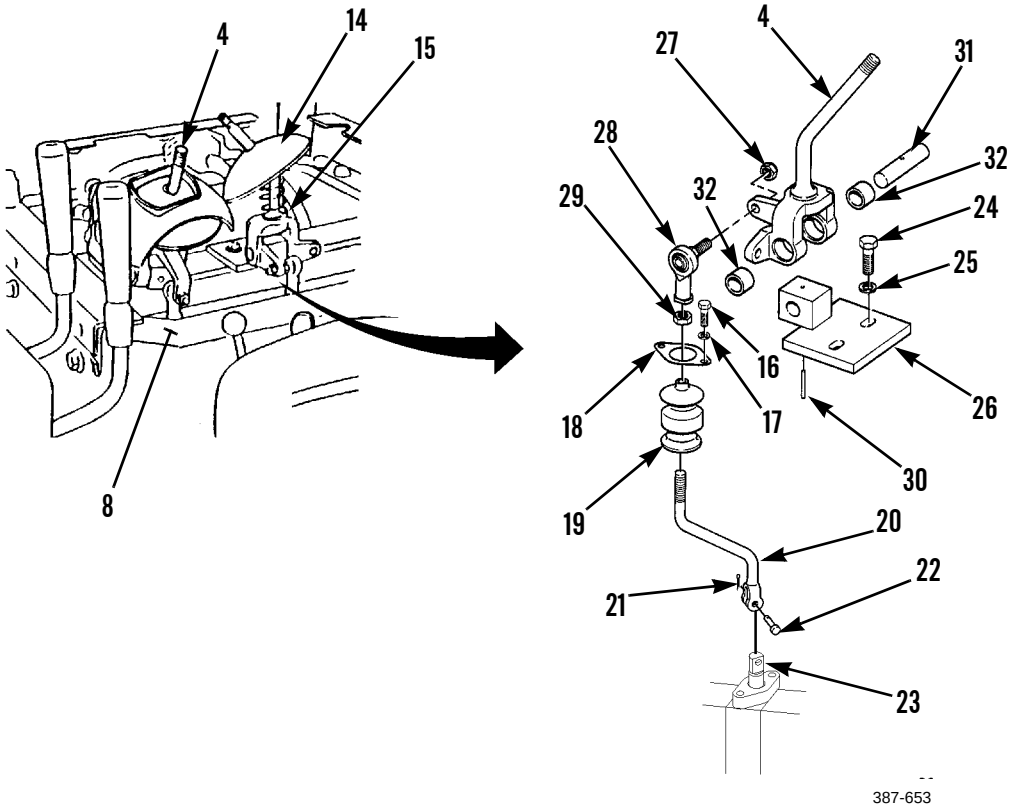
1. Clean all parts of control linkage with solvent cleaning compound and dry rags.
2. Inspect components for damage. Replace if damaged.

INSTALLATION

NOTE

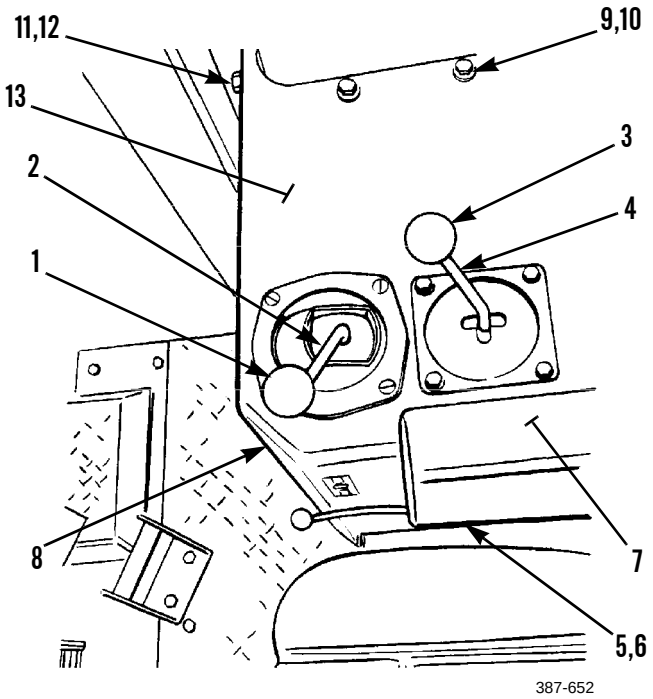
Lightly coat bearings and pivot points with GAA grease before installation. After installation, remove excess grease with a rag.

1. Install two bearings (32) in ripper control lever (4).
2. Secure bracket (26) in vise. Install ripper control lever (4) to bracket with shaft (31).
3. Align hole in shaft (31) with hole in bracket (26) and install pin (30).
4. Install boot flange (18) on boot (19) and slide both onto lower rod (20).
5. Install nut (29) and rod end (28) on lower rod (20). Do NOT tighten nut.
6. Adjust rod end (28) and install rod end in ripper control lever (4) with new self-locking nut (27).
7. Position bracket (26) to control console (8) and install with two washers (25) and capscrews (24).
8. Connect lower rod (20) to ripper pilot valve (23) with pin (22) and new cotter pin (21). Tighten nut (29).
9. Slide boot (19) down over end of lower rod (20).
10. Install boot flange (18) with two washers (17) and capscrews (16).
11. Install spring (15) and dome (14) on ripper control lever (4).



INSTALLATION - CONTINUED

12. Position cover (13) on control console (8).
13. Install eight washers (10), capscrews (9), washer (12) and capscrew (11).
14. Install armrest (7) to control console (8) with two washers (6) and capscrews (5).
15. Install knob (3) on ripper control lever (4).
16. Install knob (1) on blade control lever (2).



17. Install seat (WP 0172 00).
18. Operate machine and check ripper for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

BLADE TILT CYLINDER REPLACEMENT 0209 00

THIS WORK PACKAGE COVERS

Removal, Installation, Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 1,000 lb capacity (minimum)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25 WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

Lockwasher (2)

O-ring (9)

Pin, cotter (14)

References

WP 0226 00

Personnel Required

Three

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Hydraulic system pressure relieved (WP 0241 00)

WARNING

Do NOT remove hydraulic tank filler cap, disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin causing serious injury or death.

REMOVAL

CAUTION

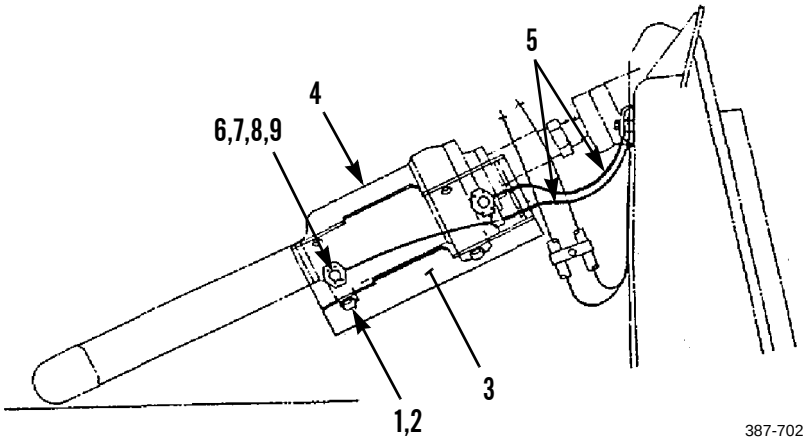
Wipe area clean around all hydraulic connections to be opened during removal. Cap lines and plug openings after removing hydraulic lines. Contamination of hydraulic system could result in premature failure.

NOTE

- **Tag hydraulic hoses to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from hoses or system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

REMOVAL - CONTINUED

1. Remove four capscrews (1), lockwashers (2) and hose guard (3) from tilt cylinder (4) on right side of machine. Discard lockwashers.
2. Tag two hoses (5).
3. Remove four capscrews (6), flatwashers (7), two flanges (8), O-ring (9) and one hose (5). Discard O-ring.
4. Repeat step 3 for other hose (5).



WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

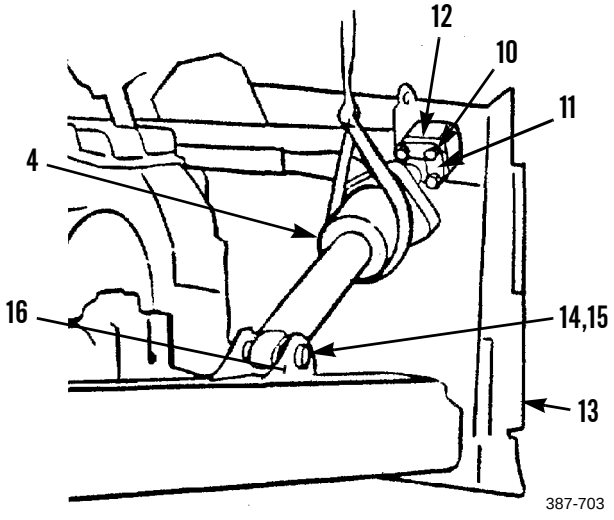
Tilt cylinder weighs 248 lb (112 kg).

5. Attach a nylon sling and a suitable lifting device to center of tilt cylinder (4).

NOTE

Ball joint socket stays with tilt cylinder. It can only be removed by disassembling cylinder.

6. Remove four bolts (10), ball joint socket (11) and shims (11) from bulldozer blade (13).
7. Remove cotter pin (14) and slide pin (15) out of pusharm (16). Remove tilt cylinder (4) from bulldoze blade (13) and pusharm. Discard cotter pin.



INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Tilt cylinder weighs 248 lb (112 kg).

1. Attach a nylon sling and a suitable lifting device and sling to center of tilt cylinder (4).
2. Position tilt cylinder (4) to bulldozer blade (13) and pusharm (16).
3. Install ball joint socket (11) and tilt cylinder (4) to blade (13) with four bolts (10). Do NOT install shims (12).

NOTE

Push or pull tilt cylinder as needed to line up cylinder with pusharm.

4. Position tilt cylinder (4) on pusharm (16) and install pin (15) and new cotter pin (14).
5. Perform *Adjustment* steps 1-3 to install shims (12) and adjust as required. After performing *Adjustment* steps 1-3, return to *Installation*, step 6.

CAUTION

Wipe all sealing surfaces and hose connections clean and dry before installation. Contamination of hydraulic system could result in premature failure.

NOTE

Lightly coat new O-rings with clean oil before installation.

6. Install hose (5) with new O-ring (9), two flanges (8), four flatwashers (7) and capscrews (6).
7. Repeat step 6 for other hose (5).
8. Install hose guard (3) on tilt cylinder (4) with four new lockwashers (2) and capscrews (1).
9. Ensure there is enough slack in hoses to permit rod extension.
10. Check oil level in hydraulic tank. Refill hydraulic tank and bleed air from system, as required (WP 0226 00).
11. Apply GAA grease to grease fitting on ball joint socket (11).
12. Start engine and check blade tilt cylinder for correct operation and leaks.

ADJUSTMENT

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

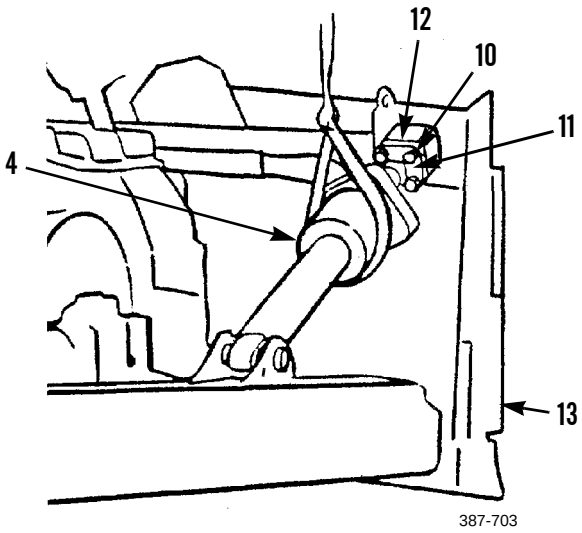
Tilt cylinder weighs 248 lb (112 kg).

1. Use a nylon sling and a suitable lifting device to hold tilt cylinder (4) during adjustment.

NOTE

All shims must be removed before adjustment is made. Refer to *Removal* above.

2. Measure gap between ball joint socket (11) and bulldozer blade (12) without shims (12).
3. Remove bolts (10). Install shims (12) equal in thickness to measured gap plus ONE shim. Reinstall bolts.
4. Check blade tilt cylinder for proper operation and leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

BLADE TILT CYLINDER REPAIR 0210 00

THIS WORK PACKAGE COVERS

Disassembly, Cleaning and Inspection, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 103, WP 0250 00)

Guide, seal (Item 33, WP 0250 00)

Inserter, seal (Item 40, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Cleaning compound, solvent (Item 4, WP 0249 00)

Cloth, abrasive, emery (Item 5, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Sealant, repair kit (Item 30, WP 0249 00)

Materials/Parts - Continued

Nut, self-locking (8)

O-ring (13)

Ring, backup (14)

Ring, piston (17)

Seal (10, 11, 12 and 16)

Personnel Required

Two

Equipment Condition

Blade tilt cylinder removed (WP 0209 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

CAUTION

Wipe area clean around all hydraulic connections to be opened during disassembly. Install protective caps and plugs as needed. Contamination of hydraulic system could result in premature failure.

NOTE

- **Use a suitable container to catch any hydraulic oil that may drain from cylinder. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Tilt cylinder weighs 248 lb (112 kg).**

DISASSEMBLY

NOTE

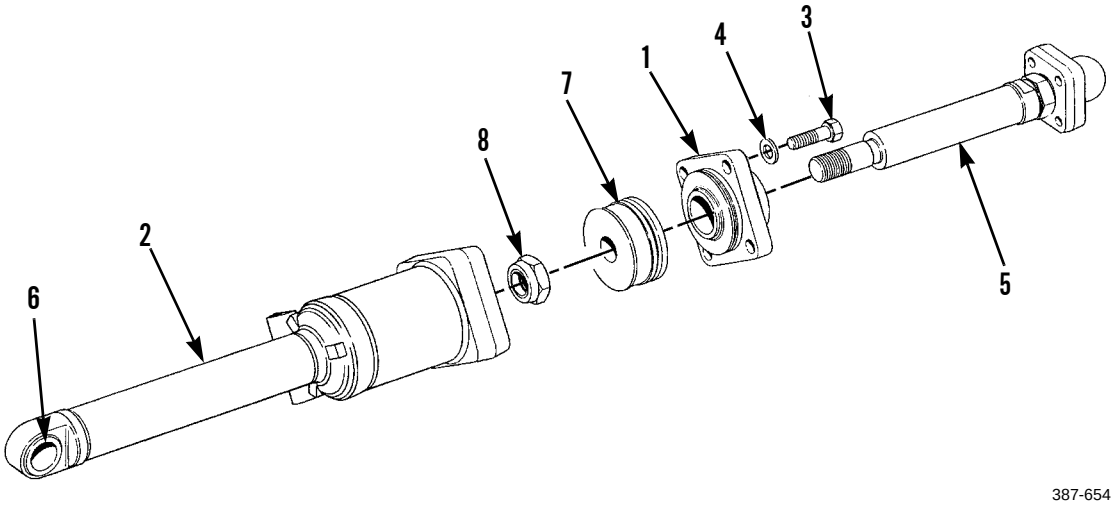
Prior to disassembly of tilt cylinder, inspect external casing of tilt cylinder for serviceability (cracks and damage). If not serviceable, replace tilt cylinder.

1. Scribe a mark on head (1) and cylinder housing (2) for correct alignment at assembly.
2. Remove four bolts (3) and washers (4) from head (1).
3. Pull piston rod (5) and piston assembly slowly from cylinder housing (2) to allow oil to escape.
4. Inspect bearing sleeve (6) for serviceability. Replace tilt cylinder if not serviceable.

CAUTION

Protect piston rod and use care when placing into vise.

5. Place piston rod (5) in vise and remove self-locking nut (8) from piston rod. Discard self-locking nut.
6. Remove piston (7) from piston rod (5).



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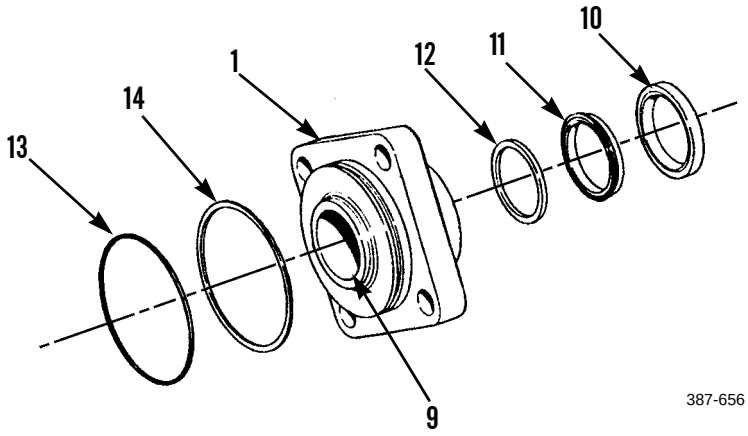
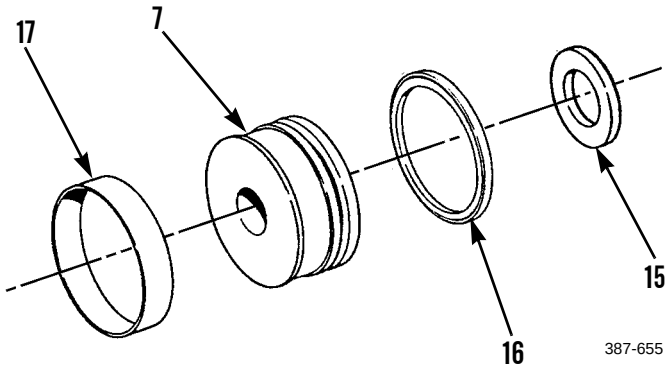
DISASSEMBLY - CONTINUED

7. Inspect bearing sleeve (9) for serviceability. If not serviceable, replace tilt cylinder.
8. Remove three seals (10, 11 and 12) from head (1). Discard seals.
9. Remove O-ring (13) and backup ring (14) from inner groove of head (1). Discard O-ring and backup ring.



10. Remove washer (15), seal (16) and piston ring (17) from piston (7). Discard seal and piston ring.



CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

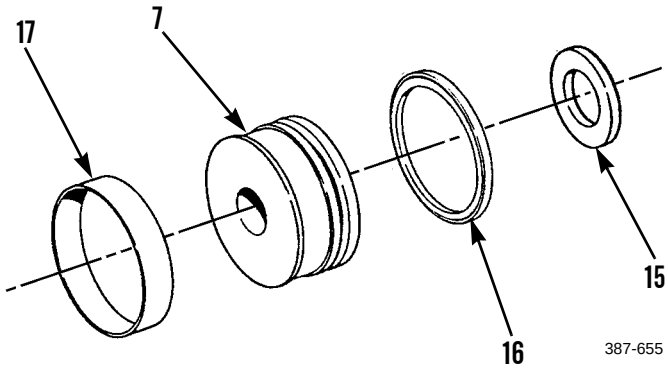
1. Clean all sealing surfaces and tube assembly connections with solvent cleaning compound and allow to dry.
2. Inspect internal casing of cylinder and internal parts of cylinder for cracks, wear, scoring or other damage. If components are not serviceable, replace tilt cylinder.
3. Ensure mating surfaces for bearing sleeves are clean and not damaged.

ASSEMBLY

NOTE

- **Lightly coat bearing sleeves, new O-ring, new backup ring, new piston ring and new seals with clean oil before assembly.**
- **Ensure new seal faces toward cylinder housing when installed.**

1. Install new piston ring (17), new seal (16) and washer (15) on piston (7).



ASSEMBLY - CONTINUED

2. Install new backup ring (14) and new O-ring (13) in inner groove of head (1).
3. Install new seals (11 and 12) in head (1).
4. Use sandpaper or emery cloth to scuff surfaces of counterbore in head (1) and outside diameter of new seal (10). Clean counterbore in head and scruffed surface of seal thoroughly with quick-cure primer, until neither component discolors a clean white towel. After cleaning, do NOT touch cleaned surfaces. Handle seal by lip only.

NOTE

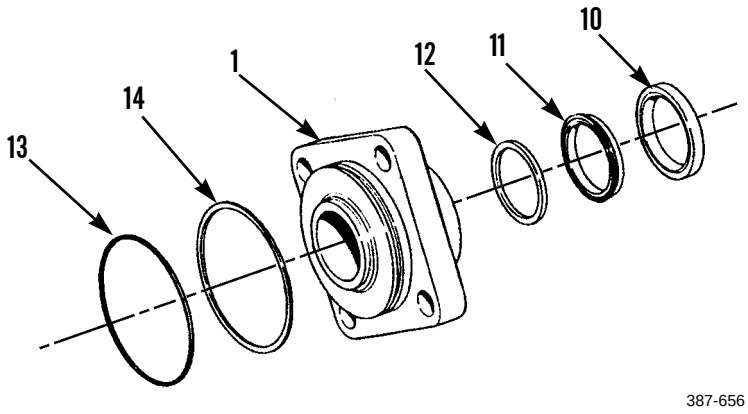
Quick-cure primer will dry in approximately 30 seconds.

5. Apply quick-cure primer to counterbore of head (1) and to metal shell of seal (10) and allow to dry.

NOTE

Do NOT allow bearing mount compound to contact sealing lip.

6. Apply bearing mount compound evenly but not excessively to counterbore of head (1) and to metal shell of seal (10).
7. Install seal (10) into counterbore of head (1), with sealing lip facing inward. Seat seal firmly against bottom of counterbore. Wipe away excess bearing mount compound. Allow compound 15 minutes to dry.



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ASSEMBLY - CONTINUED

8. Place head (1) on cylinder housing (2) and install two bolts (3) to hold head in place.

CAUTION

Piston rod must be supported and kept level at all times to avoid damaging seals in head.

9. Place seal guide on piston end of piston rod (5). Push piston rod into head (1) as far as possible.

10. Remove two bolts (3) and separate head (1) and piston rod (5) as a unit from cylinder housing (2).

CAUTION

Protect piston rod and use care when placing in vise.

NOTE

- **Lightly coat threads on piston rod and piston with clean oil before assembly.**
- **Ensure seal guide is installed on end of piston rod before assembly.**

11. Install piston (7) on piston rod (5).

12. Install new self-locking nut (8) on piston rod (5) and tighten to 1600 lb-ft (2169 Nm).

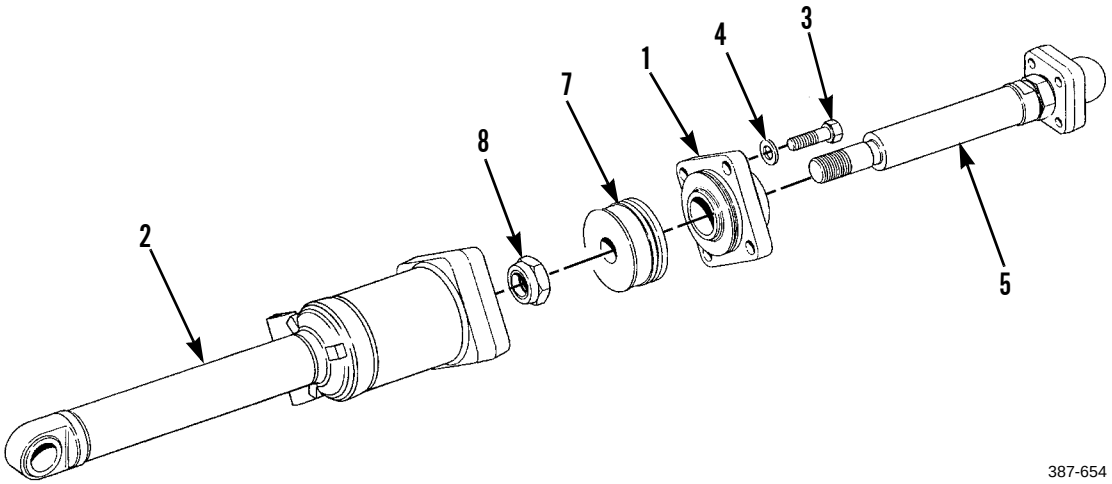
NOTE

To ensure proper alignment and fit, ensure scribe marks on head and cylinder housing are in alignment.

13. Install head (1) and piston rod (5) into cylinder housing (2).

NOTE

- **Tighten bolts evenly to draw head all the way on cylinder housing.**
- **Piston rod must be fully extended when bolts are tightened for correct alignment of cylinder housing and head.**



ASSEMBLY - CONTINUED

14. Install four washers (4) and bolts (3) on head (1) and tighten to 265 lb-ft (359 Nm).
15. Install blade tilt cylinder (WP 0209 00).

END OF WORK PACKAGE

BLADE TILT ADJUSTABLE BRACE REPLACEMENT 0211 00

THIS WORK PACKAGE COVERS

Removal, Cleaning, Installation and Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 500 lb capacity

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Materials/Parts - Continued

Grease, GAA (Item 16, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Pin, cotter (5)

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

REMOVAL

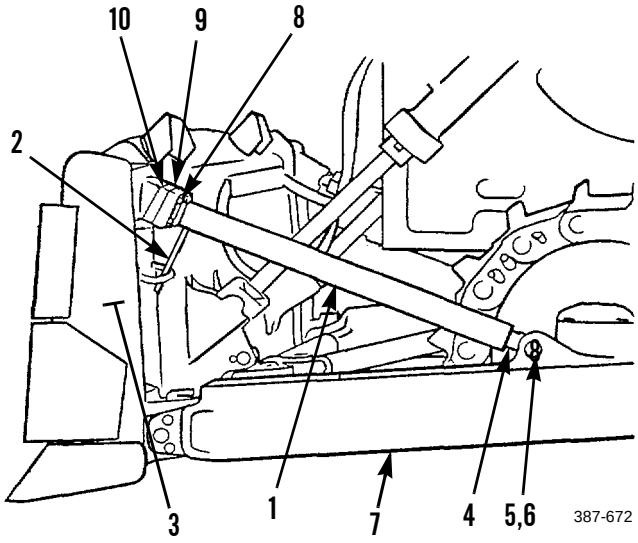
1. Turn brace (1) using brace handle (2) so that brace handle is centered in loop at rear of bulldozer blade (3).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Blade tilt adjustable brace weighs 115 lb (52 kg).



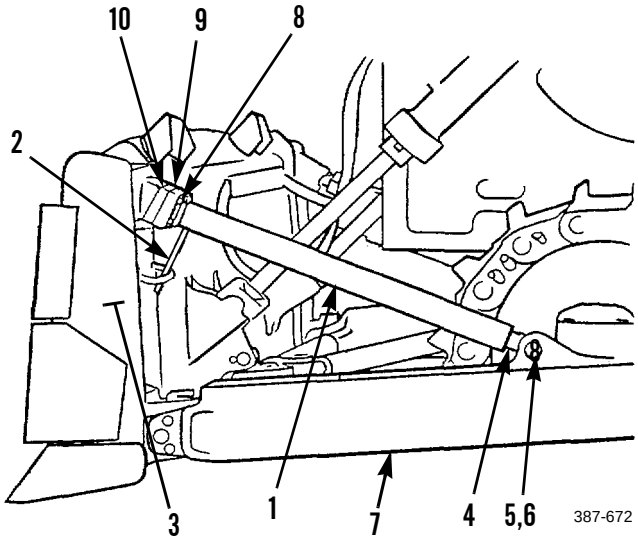
2. Attach nylon sling and suitable lifting device to rear of brace (1) at eye bolt (4). Take up slack.
3. Remove cotter pin (5) and pin (6) from eye bolt (4) and pusharm (7). Discard cotter pin.
4. Lower brace (1) and move nylon sling and lifting device to front of brace just behind brace handle (2). Take up slack.

REMOVAL - CONTINUED

NOTE

Ball joint socket stays with brace. It can only be removed by disassembling brace.

5. Remove four bolts (8), ball joint socket (9) and shims (10) from bulldozer blade (3).

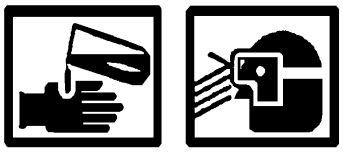


CAUTION

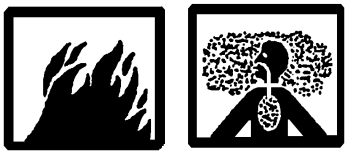
Use care to avoid damage to brace handle as brace is removed from tractor.

6. Remove brace (1) from machine.

CLEANING



WARNING



Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

Use solvent cleaning compound to clean grease from ball joint socket, shims and socket of bulldozer blade.

INSTALLATION AND ADJUSTMENT

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Blade tilt adjustable brace weighs 115 lb (52 kg).

1. Use nylon sling and suitable lifting device to position brace (1) at pusharm (7). Install eye bolt (4) with pin (6) and new cotter pin (5).
2. Lengthen brace (1) as needed and adjust lifting device.
3. Install ball joint socket (9) to bulldozer blade (3) with four bolts (8). Do NOT install shims (10). Tighten bolts evenly.
4. Measure gap between ball joint socket (9) and bulldozer blade (3) without shims (10).
5. Remove four bolts (8) and shorten brace (1). Install shims (10) equal in thickness of measured gap plus add ONE shim.
6. Lenghten brace (1) and install four bolts (8).
7. Apply GAA grease to ball and socket (9) grease fitting.
8. Check bulldozer blade for proper operation.

END OF WORK PACKAGE

RIPPER HYDRAULIC LINES AND FITTINGS REPLACEMENT 0212 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with ripper

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap, set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

O-ring (6 and 8)

References

WP 0225 00

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

WARNING

- **Do NOT remove hydraulic tank filler cap, disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury to personnel.**
- **Eye protection must be worn when replacing lines and fittings. Failure to take precautions could result in injury to personnel.**

REMOVAL

CAUTION

- **Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for removal to avoid damage to fittings and connectors.**

REMOVAL - CONTINUED

NOTE

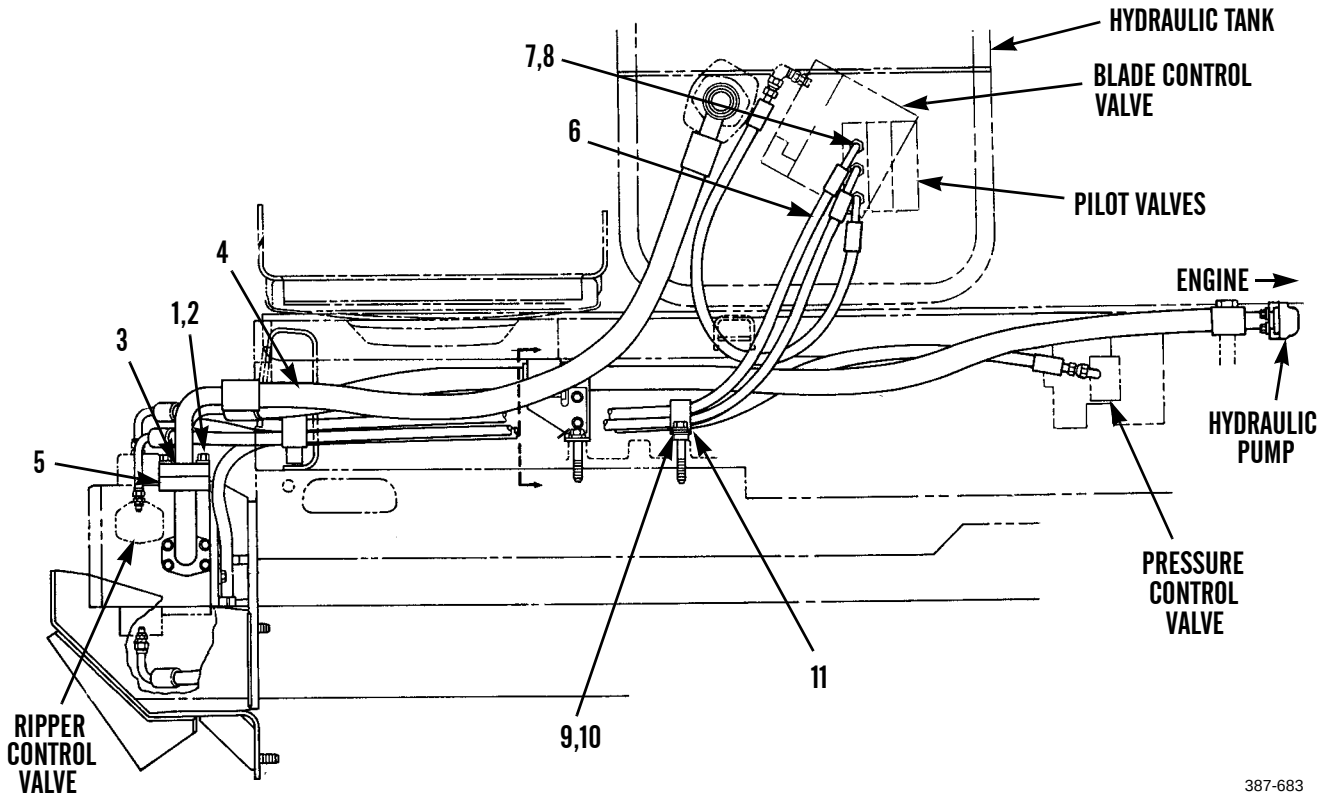
- **Tag hydraulic lines to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. For hydraulic lines with split or regular flange fittings, remove four capscrews (1), washers (2), two split flanges or regular flange (3), line (4) and O-ring (5). Discard O-ring.
2. For hydraulic lines with connector fittings, disconnect line (6) from fitting (7). Remove O-ring (8) from fitting and discard O-ring. Remove fitting.

NOTE

Mounting hardware for clamps may vary depending on type and location of clamp.

3. For lines held in position with clamps, remove capscrew (9), washer (10) and clamp (11) from lines.



INSTALLATION

CAUTION

- **Wipe all line ends, line fittings and mounting surfaces clean and dry before installation, to prevent contamination of hydraulic system.**
- **Utilize line wrenches for installation to avoid damage to fittings and connectors.**

NOTE

Lightly coat new O-rings with clean oil before installation.

1. For hydraulic lines with connector fittings, install fitting (7). Install new O-ring (8) to fitting (7) and connect line (6) to fitting.
2. For hydraulic lines with split or regular flange fittings, install new O-ring (5) to end of line (4). Install line with two split flanges or regular flange (3), four washers (2) and capscrews (1).

NOTE

Mounting hardware for clamps may vary depending on type and location of clamp.

3. For lines held in position with clamps, install clamp (11) on line or lines with washer (10) and capscrew (9).
4. Check level in hydraulic tank. Refill tank as needed and bleed air from system (WP 0225 00).
5. Cycle cylinders and check for proper operation and leaks. Stop engine and reposition fittings if hydraulic lines pull tight.
6. Ensure that oil is still visible in sight gage on hydraulic tank. Add oil as needed. (WP 0225 00).

END OF WORK PACKAGE

BLADE HYDRAULIC LINES AND FITTINGS REPLACEMENT 0213 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

Lockwasher (8 and 17)

O-ring (5 and 13)

References

WP 0225 00

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

WARNING

- **Do NOT remove hydraulic tank filler cap, disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury to personnel.**
- **Eye protection must be worn when replacing lines and fittings. Failure to take precautions could result in injury to personnel.**

REMOVAL

CAUTION

- **Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for removal to avoid damage to fittings and connectors.**

REMOVAL - CONTINUED

NOTE

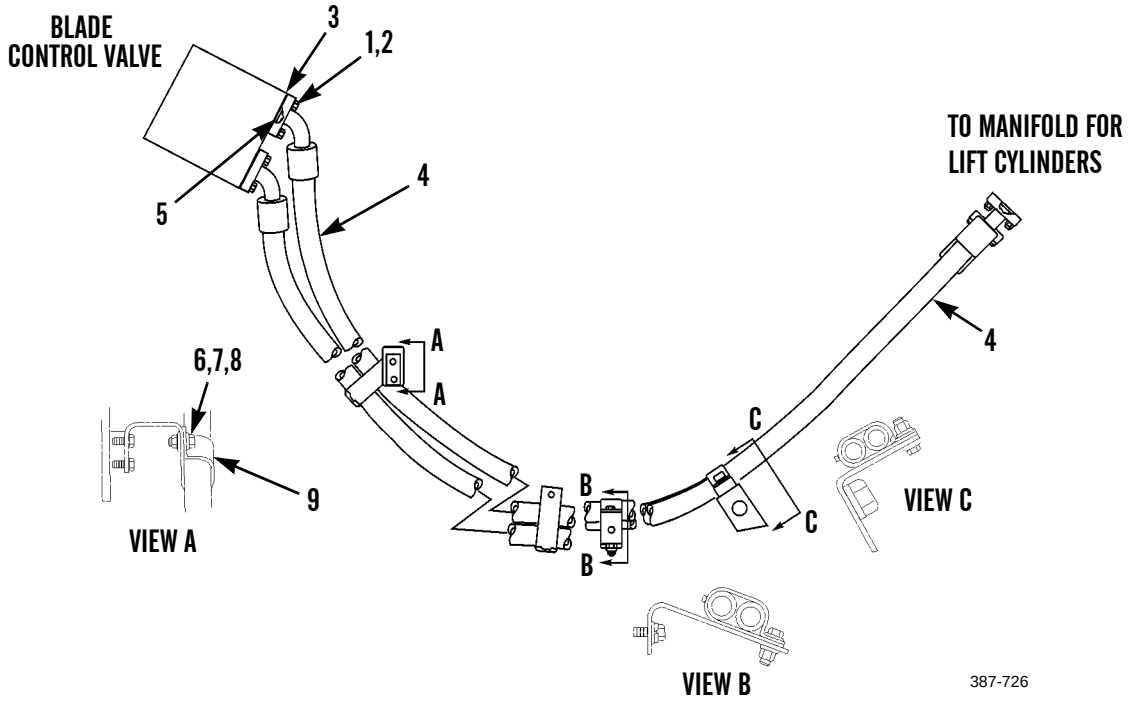
- **Tag hydraulic hoses to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. Remove four capscrews (1), washers (2), two split flanges or regular flange (3), hydraulic hose (4) and O-ring (5). Discard O-ring.

NOTE

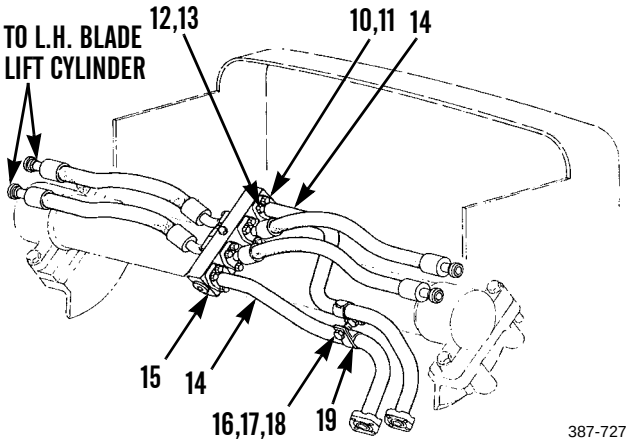
Mounting hardware for retaining straps may vary depending on type and location of strap.

2. For hydraulic hoses held in position with retaining straps, remove capscrew (6), washer (7), lockwasher (8) and retaining strap (9). Discard lockwasher.



REMOVAL - CONTINUED

3. Remove four capscrews (10), washers (11), two split flanges or regular flange (12), O-ring (13) and hydraulic hose (14) from manifold (15) above lift cylinder mounting tube. Discard O-ring.
4. Remove capscrew (16), lockwasher (17), washer (18) and retaining strap (19) from hydraulic hose (14). Discard lockwasher.



INSTALLATION

CAUTION

- **Wipe all sealing surfaces and hose connections clean and dry prior to installation. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for installation to avoid damage to fittings and connectors.**

NOTE

- **Lightly coat new O-rings with clean oil before installation.**
- **Mounting hardware for retaining straps may vary depending on type and location of strap.**

1. Secure hydraulic hose (14) with retaining strap (19), washer (18), new lockwasher (17) and capscrew (16).
2. Install end of hydraulic hose (14) on manifold (15) with new O-ring (13), two split flanges or regular flange (12), four washers (11) and capscrews (10).
3. For hydraulic hoses held in position with retaining straps, install retaining strap (9) on hydraulic hose or hoses with capscrew (6), washer (7) and new lockwasher (8).
4. Install end of hydraulic hose (4) with new O-ring (5), two split flanges or regular flange (3), four washers (2) and capscrews (1).
5. Check oil level in hydraulic tank. Refill tank and bleed air from system, as required (WP 0225 00).
6. Cycle cylinders and check for proper operation and leaks. Stop engine and reposition fittings if hydraulic hoses pull tight.
7. Ensure that oil level is still visible in sight gage on hydraulic tank. Add oil as needed (WP 0225 00).

END OF WORK PACKAGE

BLADE TILT CYLINDER HYDRAULIC LINES AND FITTINGS 0214 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

O-ring (6 and 9)

References

WP 0225 00

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

Radiator grilles removed (WP 0068 00)



WARNING

- **Do NOT remove hydraulic tank filler cap, disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury to personnel.**
- **Eye protection must be worn when replacing lines and fittings. Failure to take precautions could result in injury to personnel.**

REMOVAL

CAUTION

- **Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for removal to avoid damage to fittings and connectors.**

REMOVAL - CONTINUED

NOTE

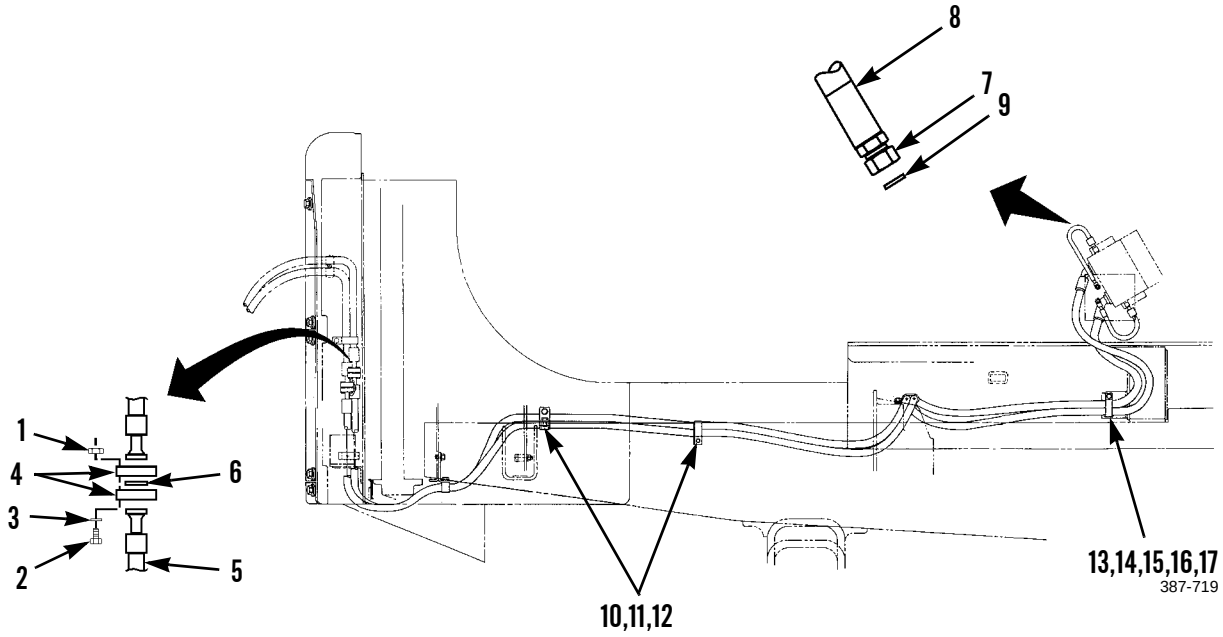
- **Tag hydraulic lines to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. Remove four nuts (1), capscrews (2), washers (3), two split flanges or regular flange (4), hydraulic line (5) and O-ring (6). Discard O-ring.
2. Loosen connector (7) and remove hydraulic line (8) from connection.
3. Remove O-ring (9) from connector (7). Discard O-ring.

NOTE

Mounting hardware for clamps and retaining straps may vary depending on their type and location.

4. Remove capscrew (10), washer (11) and clamp (12) from hydraulic lines.
5. Remove nut (13), capscrew (14), washer (15), retaining strap (16) and clamp (17) from hydraulic lines.



INSTALLATION

CAUTION

- **Wipe all sealing surfaces and hose connections clean and dry prior to installation. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for installation to avoid damage to fittings and connectors.**

INSTALLATION - CONTINUED

NOTE

Lightly coat new O-rings with clean oil before installation.

1. Install new O-ring (6), hydraulic line (5), two split flanges or regular flange (4), four capscrews (2), washers (3) and nuts (1).
2. Install new O-ring (9) on connector (7) and install connector on end of hydraulic line (8).

NOTE

Mounting hardware for clamps and retaining straps may vary depending on their type and location.

3. Install clamp (12) on hydraulic line or lines with washer (11) and capscrew (10).
4. Install clamp (17) and retaining strap (16) to hydraulic lines with capscrew (14), washer (15) and nut (13).
5. Check oil level in hydraulic tank. Refill tank and bleed air from system, as required (WP 0225 00).
6. Cycle cylinders and check for proper operation and leaks. Stop engine and reposition fittings if lines pull tight.
7. Ensure that oil level is still visible in sight gage on hydraulic tank. Add oil as needed (WP 0225 00).
8. Install radiator grilles (WP 0068 00).

END OF WORK PACKAGE

HYDRAULIC PUMP LINES AND FITTINGS REPLACEMENT 0215 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil Lubricating (Item 23, 24 or 25, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

O-ring (5 and 8)

References

TM 5-2410-237-10

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

Hydraulic tank drained (WP 0225 00)



WARNING

- **Do NOT remove hydraulic tank filler cap, disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury to personnel.**
- **Eye protection must be worn when replacing lines and fittings. Failure to take precautions could result in injury to personnel.**

REMOVAL

CAUTION

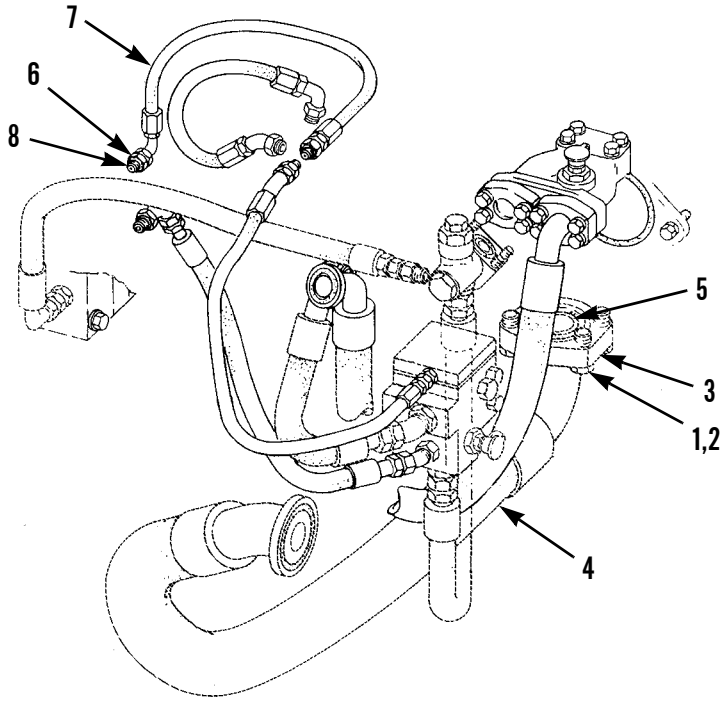
- **Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for removal to avoid damaging fittings and connectors.**

NOTE

- **Tag lines to ensure correct installation.**
- **Use a suitable container to catch any hydraulic oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

REMOVAL - CONTINUED

1. For hydraulic lines with split or regular flange fittings, remove four capscrews (1), washers (2), two split flanges or regular flange (3), line (4) and O-ring (5). Discard O-ring.
2. For hydraulic lines with connector fittings, loosen connector (6) and remove line (7) from connection. Remove O-ring (8) from connector and discard.



387-486

INSTALLATION

CAUTION

- **Wipe all sealing surfaces and line connections clean and dry before installation. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for installation to avoid damage to fittings and connectors.**

NOTE

Lightly coat new O-rings with clean oil before installation.

1. For hydraulic lines with flange fittings, install end of line (4) with new O-ring, (5), two split flanges or regular flange (3), four capscrews (1) and washers (2).
2. For hydraulic lines with connector fittings, install new O-ring (8) on connector (6) and install end of line (7).
3. Check oil level in hydraulic tank. Refill hydraulic tank and bleed air from system, as required (WP 0225 00).
4. Check hydraulic system for proper operation and leaks (TM 5-2410-237-10).
5. Ensure that oil level is still visible in sight gage on hydraulic tank. Add oil as needed (WP 0225 00).

END OF WORK PACKAGE

HYDRAULIC SYSTEM LINES AND FITTINGS REPAIR 0216 00

THIS WORK PACKAGE COVERS

Introduction, Disassembly, Cleaning and Inspection, Repair, Fabrication of Hose Assembly

INITIAL SETUP

Tools and Special Tools

Tool outfit, hydraulic system test and repair (HSTRU) (Item 124, WP 0250 00)

Press, hydraulic, portable (Item 75, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24, or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Couplings (as required)

Hose (as required)

References

TM 9-4940-468-13

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Hydraulic system

Pressure relieved (WP 0241 00)

INTRODUCTION

1. This work package and referenced technical manual (TM 9-4940-468-13) for the Hydraulic System Test and Repair, (HSTRU) provides all the required WARNINGs, CAUTIONs, NOTEs and procedures for the maintenance of hydraulic hose assemblies.
2. Before attempting to disassemble, repair, or fabricate any hydraulic hose(s) utilizing the HSTRU, read and understand all WARNINGs, CAUTIONs and NOTEs in this work package and in TM 9-4940-468-13.

WARNING

- **Do NOT remove or disconnect any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury.**

INTRODUCTION - CONTINUED

WARNING

- **Eye protection must be worn when performing maintenance on hose assemblies. Failure to take precautions could cause injury to personnel.**
- **Before installation of a coupling that has been used before, inside diameter of stem must be returned to original specifications. Ensure that reconditioning has been performed correctly and completely. Do NOT use damaged or defective couplings. Failure to do so may cause hose failure. Personal injury could result.**

CAUTION

Keep work area clean. Wipe area clean around all hydraulic hose fittings and couplings. Cap openings to prevent contamination of hydraulic system, which could result in premature failure.

NOTE

Use ONLY XT-3 couplings and XT-3 sleeves with XT-3 hoses. All XT-3 couplings and sleeves have a triangular identification mark.

DISASSEMBLY

Refer to TM 9-4940-468-13.

CLEANING AND INSPECTION

Refer to TM 9-4940-468-13.

REPAIR

Refer to TM 9-4940-468-13.

FABRICATION OF HOSE ASSEMBLY

Refer to TM 9-4940-468-13.

END OF WORK PACKAGE

HYDRAULIC SYSTEM OIL SAMPLING VALVE AND HOSE ASSEMBLY REPLACEMENT 0217 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

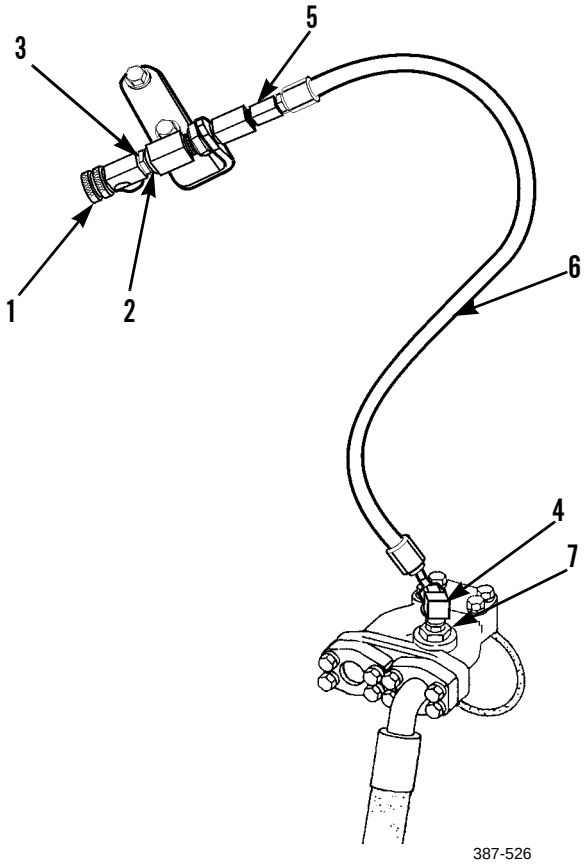
O-ring (3 and 8)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

REMOVAL

1. Remove oil sampling valve (1) from adapter (2).
2. Remove O-ring (3) from oil sampling valve (1). Discard O-ring.
3. Loosen hose nut from elbow (4) at hydraulic manifold. Loosen hose nut from reducer (5) and remove hose assembly (6).
4. Remove elbow (4) from adapter (7).



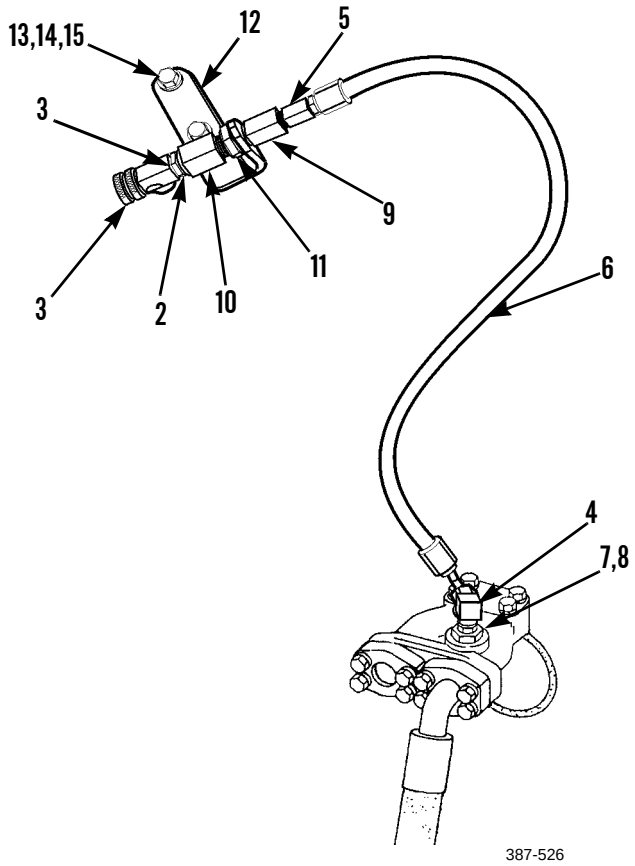
HYDRAULIC SYSTEM OIL SAMPLING VALVE AND HOSE ASSEMBLY REPLACEMENT - CONTINUED 0217 00

REMOVAL - CONTINUED

CAUTION

Do not remove adapter unless inspection shows need for replacement. Adapter may be damaged upon removal.

5. Remove adapter (7) and O-ring (8) from hydraulic manifold. Discard O-ring.
6. Remove reducer (5) from fitting (9).
7. Remove adapter (2) from adapter (10).
8. Remove adapter (10) from fitting (9).
9. Remove nut (11) and fitting (9) from angle bracket (12).
10. Remove two capscrews (13), washers (14), spacers (15) and angle bracket (12).



INSTALLATION

NOTE

Lightly coat new O-rings with clean oil before installation.

1. Install two spacers (15) and angle bracket (12) with two washers (14) and capscrews (13).
2. Install fitting (9) on angle bracket (12) and secure with nut (11).
3. Install adapter (10) and adapter (2).
4. Install reducer (5) to fitting (9).
5. If removed, install new O-ring (8) and adapter (7) in hydraulic manifold.
6. Install elbow (4) to adapter (7).
7. Connect hose assembly (6) to elbow (4) and tighten hose nut. Connect other end of hose assembly to reducer (5) and tighten hose nut.
8. Install new O-ring (3) onto oil sampling valve (1).
9. Install oil sampling valve (1) into adapter (2) and hand tighten valve.
10. Run engine and check for leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

HYDRAULIC FILTER ASSEMBLY AND FILLER STRAINER REPLACEMENT 0218 00

THIS WORK PACKAGE COVERS

Filter Assembly: Removal, Cleaning and Inspection, Installation

Filler Strainer: Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

O-ring (7 and 8)

Filter element, fluid (5)

References

WP 0009 00

WP 0219 00

Equipment Condition

Hydraulic system pressure relieved (WP 0241 00)

WARNING

- **Do NOT remove hydraulic tank filler cap, disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before beginning this task. Failure to do so could result in injury to personnel.**
- **Eye protection must be worn when replacing lines and fittings. Failure to take precautions could result in injury to personnel.**

CAUTION

Cover openings into hydraulic tank to ensure dirt or debris do not fall into tank and contaminate hydraulic system.

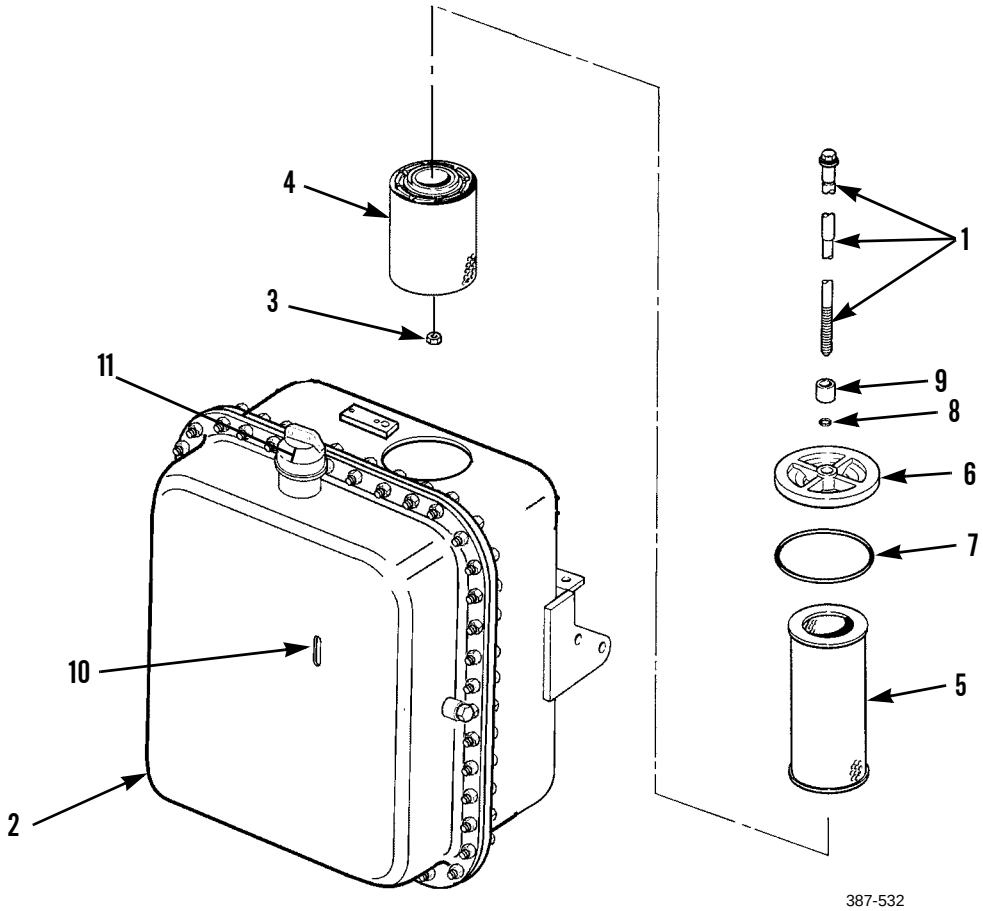
FILTER ASSEMBLY REMOVAL

1. Loosen bolt (1) and remove filter assembly from hydraulic tank (2).
2. Remove nut (3) from bolt (1).

WARNING

Do NOT attempt to disassemble screen assembly without proper tools. Screen assembly is assembled under high spring tension. Disassembly using improper tools may cause severe injury.

3. Remove screen assembly (4) from bolt (1). To disassemble and clean screen assembly, use tools and procedures in WP 0219 00.
4. Separate filter element (5) from cover (6). Discard filter element.
5. Slide cover (6) off bolt (1).
6. Remove O-ring (7) from cover (6). Discard O-ring.
7. Remove O-ring (8) and spacer (9) from bolt (1). Discard O-ring.



387-532

FILTER ASSEMBLY CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Use solvent cleaning compound to clean filter assembly components.
2. Inspect components for damage. Replace any damaged component.

FILTER ASSEMBLY INSTALLATION

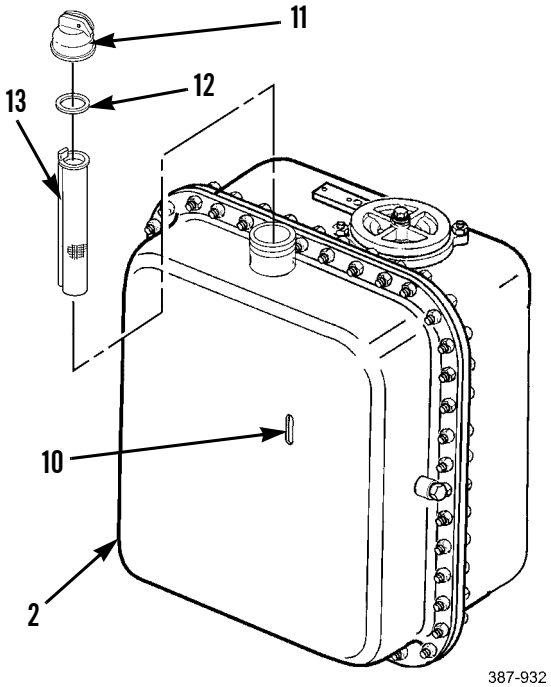
NOTE

Lightly coat new O-rings with clean oil before installation.

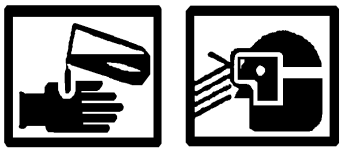
1. Install spacer (9) and new O-ring (8) on bolt (1).
2. Install new O-ring (7) on cover (6).
3. Install cover (6) on bolt (1).
4. Slide new filter element (5) over bolt (1) to mate with cover (6).
5. Install screen assembly (4) on bolt (1).
6. Install nut (3) on bolt (1).
7. Install filter assembly in hydraulic tank (2) and tighten bolt (1).
8. Check oil level in sight gage (10) on hydraulic tank (2). Add oil as needed until level is visible in sight gage. Refer to *PMCS Introduction* (WP 0009 00) to determine grade of oil to be used IAW expected temperature range of operation.
9. If loose, tighten filler cap (11) on hydraulic tank (2).

FILLER STRAINER REMOVAL

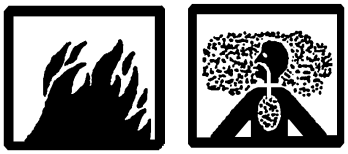
1. Remove filler cap (11) from hydraulic tank (2).
2. Remove retaining ring (12) from filler neck.
3. Remove filler strainer (13) from hydraulic tank (12).



FILLER STRAINER CLEANING AND INSPECTION



WARNING



Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Use solvent cleaning compound to clean filler strainer.
2. Inspect filler strainer and retaining ring for damage. Replace if damaged.

FILLER STRAINER INSTALLATION

1. Install filler strainer (13) into filler neck of hydraulic tank (2).
2. Install retaining (12) to secure filler strainer (13) in filler neck.
3. Check oil level in sight gage (10) on hydraulic tank (2). Add oil as needed until level is visible in sight gage. Refer to PMCS Introduction (WP 0009 00) to determine grade of oil IAW expected temperature range of operation.
4. Install filler cap (11) and tighten.

END OF WORK PACKAGE

HYDRAULIC FILTER SCREEN ASSEMBLY REPAIR 0219 00

THIS WORK PACKAGE COVERS

Disassembly, Cleaning and Inspection, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Compressor, ring (Item 22, WP 0250 00)

Plate, mechanical puller (Item 70, WP 0250 00)

Press, hydraulic, portable (Item 75, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

References

WP 0241 00

Equipment Condition

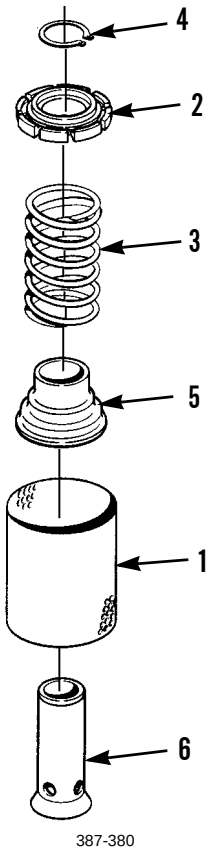
Hydraulic filter assembly and filler strainer removed (WP 0218 00)

DISASSEMBLY

WARNING

Eye protection is required when using press to compress spring. Failure to follow this warning may cause injury.

1. Put screen (1) assembly in press and place ring compressor in position on spacer (2).
2. Place puller plate on top of ring compressor and compress spring (3) until spacer (2) is below ring (4). Remove ring.
3. Slowly release force on spacer (2).
4. Remove spacer (2), valve (5), tube (6) and spring (3) from screen (1).



387-380

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

1. Wash screen in clean solvent cleaning compound IAW instructions in WP 0241 00.
2. Inspect screen assembly components IAW instructions WP 0241 00.

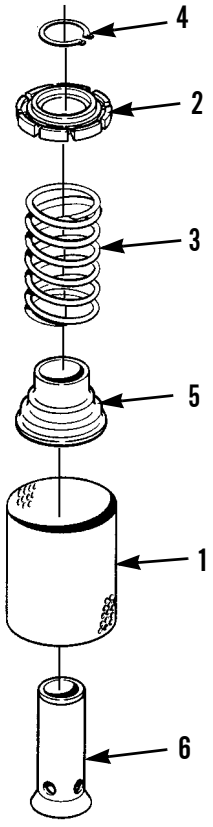
ASSEMBLY

1. Install tube (6) in bottom of screen (1).
2. Install valve (5), spring (3) and spacer (2) in top of screen (1) on tube (6).

WARNING

Eye protection is required when using press to compress spring.

3. Use press to hold screen (1) assembly and compress spring (3). Install ring (4).
4. Install hydraulic filter assembly and filler strainer (WP 0218 00).



387-380

END OF WORK PACKAGE

BLADE LIFT CYLINDER REPLACEMENT 0220 00

THIS WORK PACKAGE COVERS

Removal, Installation, Adjustment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 1,000 lb capacity

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Lockwasher (9)

O-ring (4)

References

WP 0225 00

Personnel Required

Three

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Hydraulic system cool (TM 5-2410-237-10)

Hydraulic system pressure relieved (WP 0241 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

REMOVAL

CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

REMOVAL - CONTINUED

NOTE

- **Tag all hydraulic hoses to ensure correct installation.**
- **Use a suitable container to capture any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

1. Remove four capscrews (1), flatwashers (2), split flange (3), O-ring (4) and hose (5) from tube assembly (6) of lift cylinder (7). Discard O-ring.
2. Repeat step 1 for other hose (5).

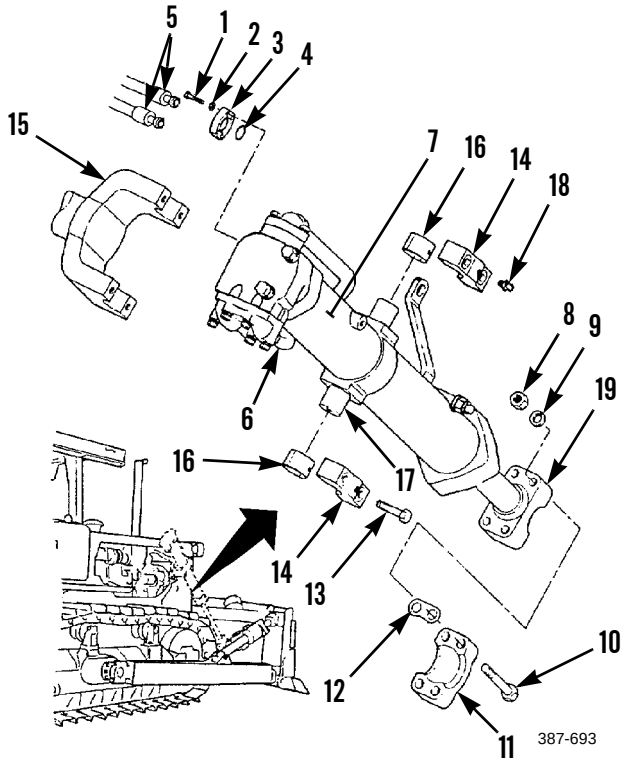
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Lift cylinder with quick drop valve weighs approximately 275 lb (125 kg).

3. Attach a nylon sling and a suitable lifting device to upper part of lift cylinder (7).
4. Remove four nuts (8), lockwashers (9), capscrews (10), cap (11) and two spacers (12) from bulldozer blade end of lift cylinder (7). Retract lift cylinder. Retain lockwashers.
5. Remove four capscrews (13), two caps (14) and lift cylinder (7) from lift cylinder mounting tube yoke (15). Raise lift cylinder (7) clear and remove from machine.
6. If not serviceable, remove two bearings (16) from pivots (17) on lift cylinder (7).



INSTALLATION

NOTE

- **Before installation of bearings, lubricate bearings with clean GAA grease.**
- **Ensure mating surfaces for bearings are clean and not damaged.**

1. If removed, install two bearings (16) on pivots (17) of lift cylinder (7).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Lift cylinder with quick drop valve weighs approximately 275 (125 kg).**
- **Ensure mating surfaces for bearings are clean.**

1. Attach a nylon sling and a suitable lifting device to upper part of lift cylinder (7) and position lift cylinder pivots (17) to lift cylinder mounting tube yoke (15).
2. Install two caps (14) with four capscrews (13) to secure lift cylinder (7) to lift cylinder mounting tube yoke (15).
3. Extend lift cylinder (7) until contact is made with blade mounting bracket and install cap (11), four capscrews (10), original lockwashers (9) and nuts (8). Do NOT install spacers (12).

CAUTION

Wipe all sealing surfaces and hose connections clean and dry before installation. Contamination of hydraulic system could result in premature failure.

NOTE

Lightly coat new O-rings with clean oil before installation.

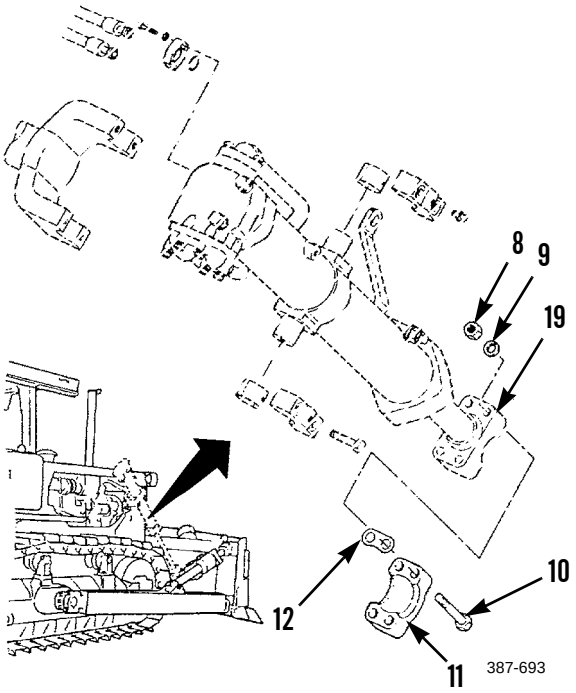
4. Install new O-ring (4) and hose (5) on tube assembly (6) with split flange (3), four flatwashers (2) and capscrews (1).
5. Repeat step 4 for other hose (5).

ADJUSTMENT

NOTE

All spacers must be removed before adjustment. Refer to *Removal,* step 4.

1. Measure gap between cap (11) and cylinder rod end cap (19) without spacers (12).
2. Remove four nuts (8), lockwashers (9), capscrews (10) and cap (11). Discard lockwashers.
3. Install spacers (12) equal to measured gap, plus ONE spacer.
4. Reinstall cap (11) with four capscrews (10), new lockwashers (9) and nuts (8).
5. Perform steps 7-9 of *Installation*.
6. Apply GAA grease to grease fitting (18) on each cap (14).
7. Check oil level in hydraulic tank. Refill tank and bleed air from system if necessary (WP 0225 00).
8. Check for proper operation and leaks.



END OF WORK PACKAGE

BLADE LIFT CYLINDER REPAIR 0221 00

THIS WORK PACKAGE COVERS

Disassembly, Cleaning and Inspection, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Guide, seal (Item 34, WP 0250 00)

Inserter, seal (Item 38, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Cleaning compound, solvent (Item 4, WP 0249 00)

Cloth, abrasive, emery (Item 5, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Sealant, repair kit (Item 30, WP 0249 00)

Materials/Parts - Continued

Gasket (12)

Nut, self-locking (7)

O-ring (13 and 14)

Packing, preformed (11)

Packing, retainer (15)

Ring, piston (16)

Seal (10)

Personnel Required

Two

Equipment Condition

Blade lift cylinder removed (WP 0220 00)

Quick drop valve removed (WP 0202 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

CAUTION

Wipe area clean around all hydraulic connections to be opened during disassembly. Install protective caps and plugs as needed. Contamination of hydraulic system could result in premature failure.

NOTE

- **Use a suitable container to catch any hydraulic oil that may drain from cylinder. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Lift cylinder weighs approximately 240 lb (109 kg).**

DISASSEMBLY

NOTE

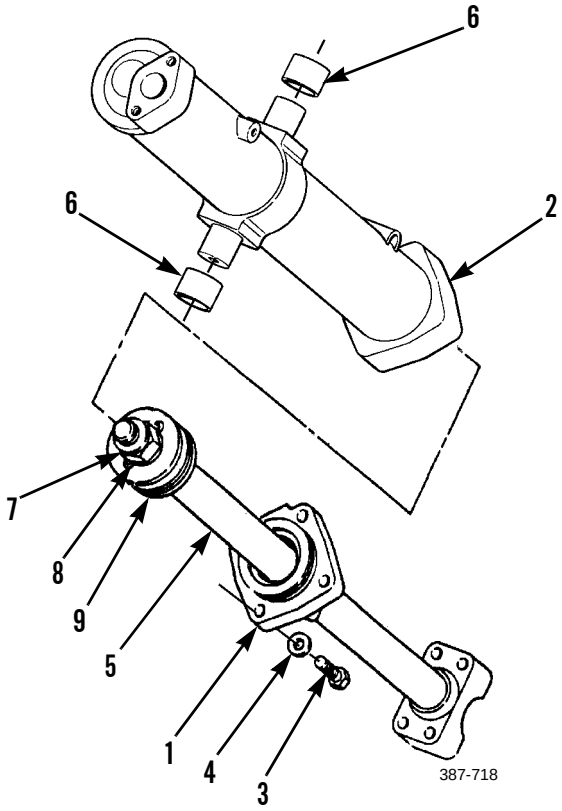
Prior to disassembly of lift cylinder, inspect external casing of lift cylinder for serviceability (cracks and other damage). If not serviceable, replace lift cylinder.

1. Scribe a mark on head (1) and cylinder housing (2) for correct alignment at assembly.
2. Remove four bolts (3) and washers (4) from head (1).
3. Pull piston rod (5) with piston assembly slowly from cylinder housing (2) to allow oil to escape.
4. Inspect two bearing sleeves (6) for serviceability. Bearing sleeves lift cylinder if not serviceable.

CAUTION

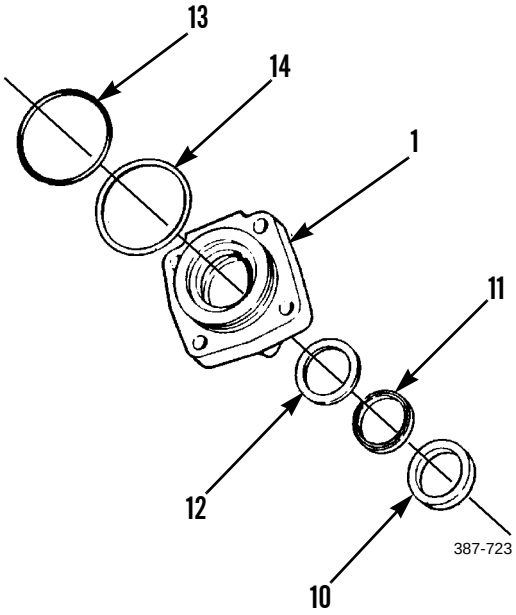
Protect piston rod and use care when placing into vise.

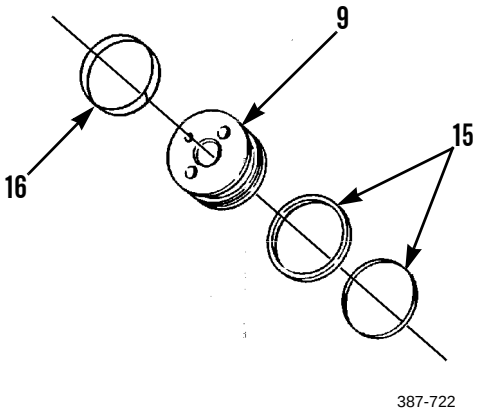
5. Place piston rod (5) into vise and remove self-locking nut (7) and washer (8) from piston rod. Discard self-locking nut.
6. Remove piston (9) from piston rod (5).



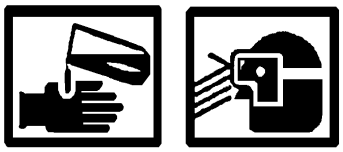
DISASSEMBLY - CONTINUED

7. Remove seal (10), preformed packing (11) and gasket (12) from head (1). Discard seal, preformed packing and gasket.
8. Remove O-rings (13 and 14) from inner groove on head (1). Discard O-rings.
9. Remove two retainer packings (15) and ring spacer (16) from piston (9). Discard retainer packings and ring spacer.





CLEANING AND INSPECTION



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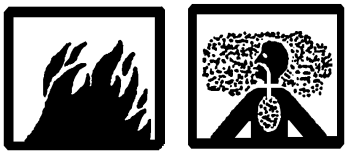


Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

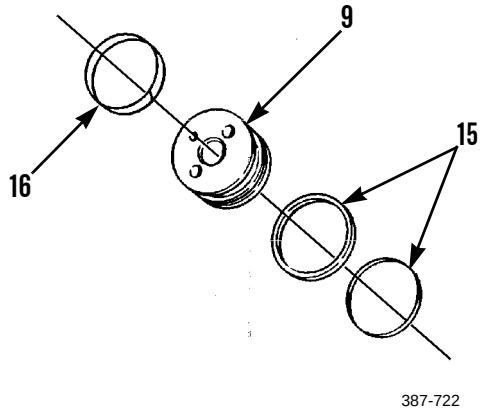
1. Clean all sealing surfaces and tube assembly connections with solvent cleaning compound and allow to dry.
2. Inspect internal casing of cylinder and internal parts of cylinder for cracks, wear, scoring and damage. If components and parts are not serviceable, replace lift cylinder.
3. Ensure mating surfaces for bearing sleeves are clean and not damaged.

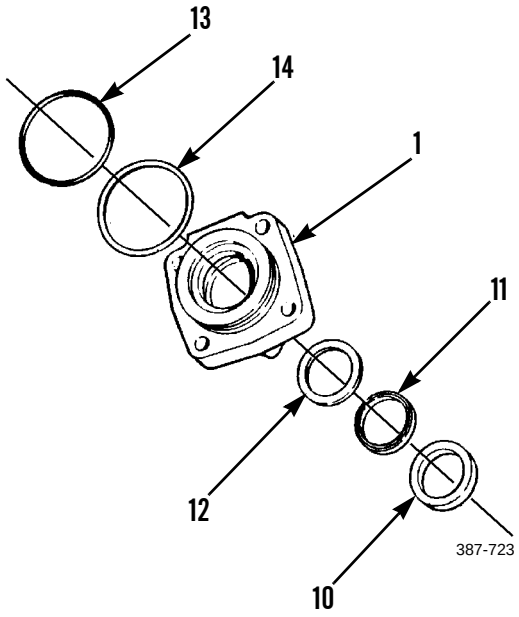
ASSEMBLY

NOTE

- **Lightly coat bearing sleeves, new ring spacer, new retainer packings, new O-rings, new seal, new gasket and preformed packings before assembly.**
- **Ensure retainer packings face toward cylinder housing when installed.**

1. Install new ring spacer (16) and new retainer packings (15) on piston (9).
2. Install new O-rings (13 and 14) into inner groove on head (1).
3. Install new gasket (12) and new preformed packing (11) in head (1).





4. Use sandpaper or emery cloth to scuff surfaces of counterbore in head (1) and outside diameter of new seal (10). Clean counterbore in head and scuffed surface of seal thoroughly with quick-cure sealant, until neither component discolors a clean white towel. After cleaning, do NOT touch cleaned surfaces. Handle seal by lip only.

NOTE

Quick-cure sealant will dry in approximately 30 seconds.

5. Apply quick-cure sealant to counterbore of head (1) and to metal shell of seal (10) and allow to dry.

NOTE

Do NOT allow bearing mount compound to contact sealing lip.

6. Apply bearing mount compound evenly but not excessively to counterbore of head (1) and to metal shell of seal (10).
7. Install seal into counterbore of head (1), with sealing lip facing inward. Seat seal firmly against bottom of counterbore. Wipe away excess bearing mount compound. Allow compound 15 minutes to dry.
8. Place head (1) on cylinder housing (2) and install two bolts (3) to hold head in place.

ASSEMBLY - CONTINUED

CAUTION

Piston rod must be supported and kept level at all times to avoid damaging seals in head.

9. Place seal guide onto piston end of piston rod (5).
10. Push piston rod into head (1) as far as possible.
11. Remove two bolts (3) and separate head (1) and piston rod (5) as a unit from cylinder housing (2).

CAUTION

Protect piston rod and use care when placing in vise.

NOTE

- **Apply clean lubricating oil on threads on piston rod and piston before assembly.**
- **Ensure seal guide is installed on end of piston rod before assembly.**

12. Install piston (9) on piston rod (5).
13. Install washer (8) and new self-locking nut (7) on piston rod (5) and tighten to 1180 lb-ft (1600 Nm).

NOTE

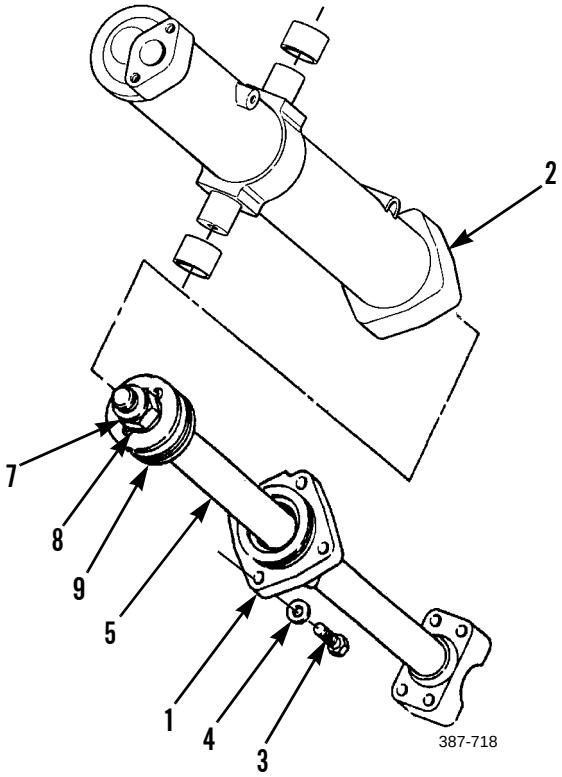
To ensure proper alignment and fit, ensure scribe marks on head and cylinder housing are in alignment.

14. Install head (1) and piston rod (5) into cylinder housing (2).

NOTE

- **Tighten bolts evenly to draw head all the way on cylinder housing.**
- **Piston rod must be fully extended when bolts are tightened for correct alignment of cylinder housing and head.**

15. Install four washers (4) and bolts (3) on head (1) and tighten to 465 lb-ft (631 Nm).



ASSEMBLY - CONTINUED

16. Install quick drop valve (WP 0202 00).
17. Install blade lift cylinder (WP 0220 00).

END OF WORK PACKAGE

BLADE LIFT CYLINDER MOUNTING TUBE REPLACEMENT 0222 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 500 lb capacity

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

References

WP 0213 00

Personnel Required

Two

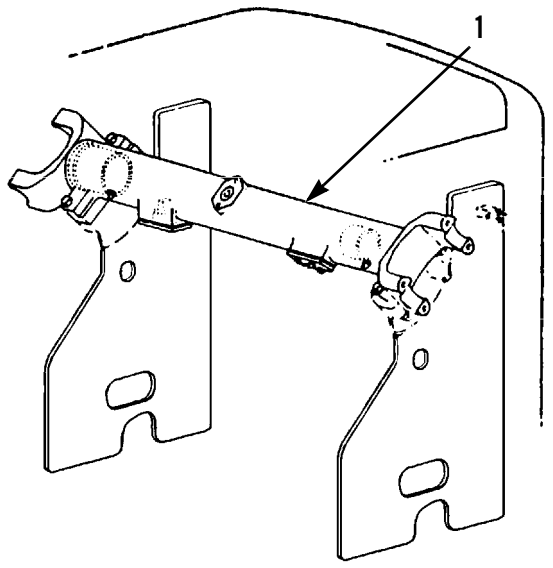
Equipment Condition

Blade lift cylinder removed (WP 0220 00)

Hood removed (WP 0159 00)

REMOVAL

1. Remove blade hydraulic lines and fittings that are routed above tube (1) (WP 0213 00).



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REMOVAL - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

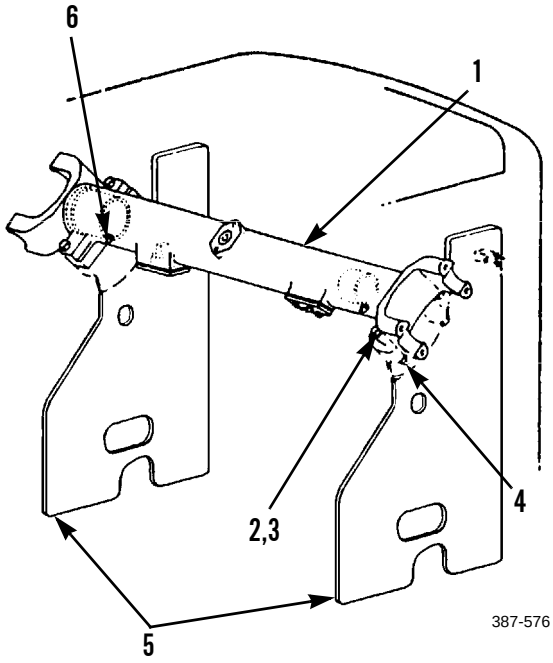
Blade lift cylinder mounting tube weighs approximately 426 lb (193 kg).

2. Attach a nylon sling and a suitable lifting device to tube (1). Take up all slack in sling.
3. Remove two nuts (2) and bolts (3) from each end of tube (1).
4. Remove two bolts (4) from underside of tube mounting on each end of tube (1).

CAUTION

Use caution not to damage fan guard and radiator as tube is lifted clear of radiator guard.

5. Remove tube (1) from radiator guard (5).
6. If damaged, remove grease fitting (6) from each end of tube (1).



INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

CAUTION

Use caution not do damage fan guard and radiator as tube is lifted clear of radiator guard.

NOTE

Blade lift cylinder mounting tube weighs approximately 426 lb (193 kg).

1. Attach a nylon sling and a suitable lifting device to tube (1).

CAUTION

Use caution not to damage fan guard and radiator as tube is positioned at radiator guard.

2. Lift tube (1) into position on radiator guard (5).
3. Install two bolts (4) to underside of tube mounting at each end of tube (11).
4. Install two bolts (3) and nuts (2) to each end of tube (1).
5. If removed, install grease fitting (6) to each end of tube (1).
6. Apply GAA grease, as needed, to grease fittings (6) on tube (1).
7. If damaged remove grease fitting (6) from each end of tube (1).
8. Install hydraulic lines and fittings that are routed above tube (1) (WP 0213 00).
9. Install blade lift cylinders (WP 0220 00).
10. Install hood (WP 0159 00).

END OF WORK PACKAGE

RIPPER LIFT CYLINDER REPLACEMENT 0223 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with ripper

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 1,000 lb capacity

Wood blocks (2)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Tag marker (Item 37, WP 0249 00)

O-ring (4)

Personnel Required

Three

References

WP 0225 00

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Hydraulic system pressure relieved (WP 0241 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic oil under pressure can penetrate the skin, causing serious injury or death.

CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap lines and plug openings after removing hydraulic lines. Contamination of hydraulic system could result in premature failure.

NOTE

- **Tag all hydraulic lines to ensure correct installation.**
- **Use a suitable container to capture any oil leakage. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **This procedure replaces right ripper lift cylinder. Procedure for the left ripper lift cylinder is the same.**

RIPPER LIFT CYLINDER REPLACEMENT - CONTINUED 0223 00

REMOVAL

1. Remove four capscrews (1), washers (2), two flanges (3) and disconnect hose assembly (4) from tube assembly (5) on lift cylinder (6).
2. Remove O-ring (7) from hose assembly (4). Discard O-ring.
3. Repeat steps 1 and 2 to disconnect other hose assembly (4).
4. Place wood block (8) under lift cylinder (6) and connecting link (9).

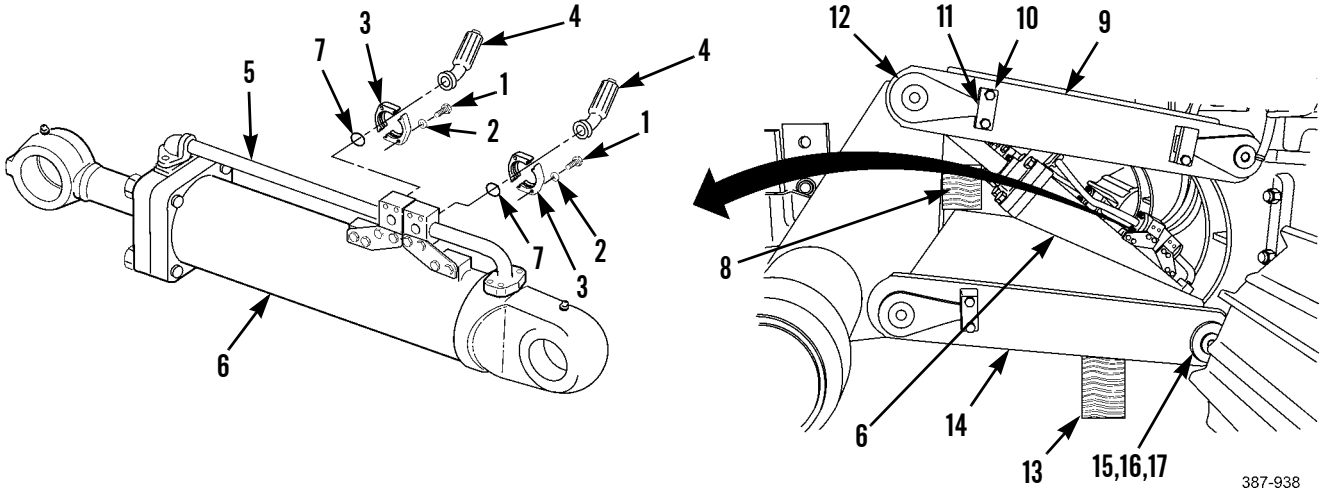
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death.

NOTE

- **Ripper lift cylinder weighs 195 lb (89 kg).**
- **Connecting link weighs 227 lb (126 kg).**

5. Attach a nylon sling and a suitable lifting device to lift cylinder (6) and connecting link (9).
6. Remove two bolts (10), plate (11) and pin assembly (12).
7. Lower lift cylinder (6) and connecting link (9) onto wood block (8).
8. Remove nylon sling and lifting device from lift cylinder (6) and connecting link (9).
9. Attach nylon sling and lifting device to lift cylinder (6).
10. Place wood block (13) under frame assembly (14).
11. Remove two bolts (15), plate (16) and pin assembly (17) from lift cylinder (6) and frame assembly (14).
12. Remove lift cylinder (6).
13. Remove nylon sling and lifting device from lift cylinder (6).



INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death.

NOTE

- **Ripper lift cylinder weighs 195 lb (89 kg).**
- **Connecting link weighs 227 lb (126 kg).**

1. Attach a nylon sling and a suitable lifting device to lift cylinder (6) and move cylinder into position at frame assembly (14).
2. Instal pin assembly (17), plate (16) and two bolts (15).
3. Lower lift cylinder (6) to wood block (8).
4. Remove nylon sling and lifting device from lift cylinder (6).
5. Attach nylon sling and lifting device to connecting link (9) and lift cylinder (6).
6. Align hole in connecting link (9) with hole in lift cylinder (6) and install pin assembly (12), plate (11) and two bolts (10).
7. Remove nylon sling and lifting device from connecting link (9) and lift cylinder (6).
8. Remove wood blocks (8 and 13).

CAUTION

Wipe all sealing surfaces and hose connections clean and dry before installation. Contamination of hydraulic system could result in premature failure.

NOTE

Lightly coat new O-rings with clean oil before installation.

9. Install new O-ring (7) in hose assembly (4).
10. Connect hose assembly (4) to tube assembly (5) on lift cylinder (6) with two flanges (3), four washers (2) and capscrews (1).
11. Repeat steps 9 and 10 to connect other hose assembly (4).
12. Apply GAA grease to grease fittings at lift cylinder, connecting link and frame assembly.
13. Refill hydraulic tank and bleed air from system, if necessary (WP 0225 00).
14. Start engine, operate ripper lift cylinder and check for proper operation and leaks (TM 5-2410-237-10).

END OF WORK PACKAGE

RIPPER LIFT CYLINDER REPAIR 0224 00

THIS WORK PACKAGE COVERS

Disassembly, Cleaning and Inspection, Assembly

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Guide, seal (Item 32, WP 0250 00)

Inserter, seal (Item 39, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Cleaning compound, solvent (Item 4, WP 0249 00)

Cloth, abrasive, emery (Item 5, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Sealant, repair kit (Item 30, WP 0249 00)

Gasket (21)

Materials/Parts - Continued

Nut, self-locking (16)

O-ring (10 and 22)

Packing, preformed (20)

Ring (25)

Ring, backup (23)

Ring, piston (26)

Seal (19 and 24)

Personnel Required

Two

Equipment Condition

Ripper lift cylinder removed (WP 0223 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

CAUTION

Wipe area clean around all hydraulic connections to be opened during disassembly. Install protective caps and plugs as needed. Contamination of hydraulic system could result in premature failure.

NOTE

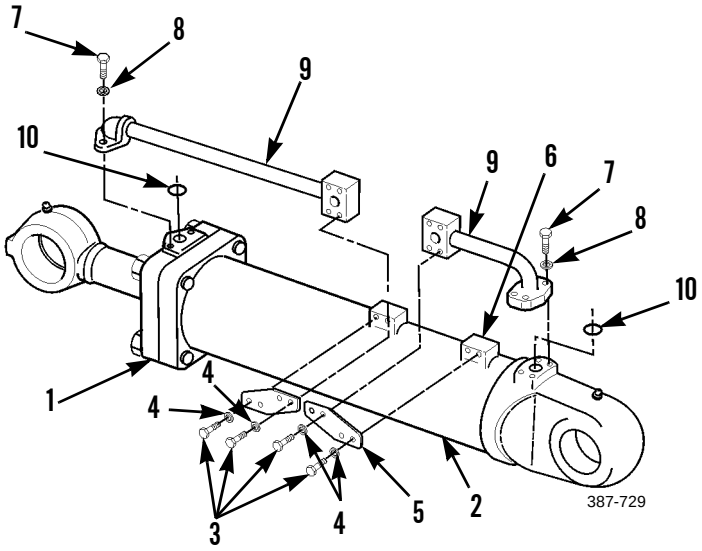
- **Use a suitable container to catch any hydraulic oil that may drain from cylinder. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Ripper lift cylinder weighs 195 lb (89 kg).**

DISASSEMBLY

NOTE

Prior to disassembly of lift cylinder, inspect external casing of lift cylinder for serviceability (cracks and damage). If not serviceable, replace lift cylinder.

1. Scribe a mark on head (1) and cylinder housing (2) for correct alignment at assembly.
2. Remove eight bolts (3) and washers (4) holding two plates (5) to bosses (6) on cylinder housing (2).
3. Remove six bolts (7), washers (8), two tube assemblies (9) and O-rings (10) from head (1) and cylinder housing (2). Discard O-rings.



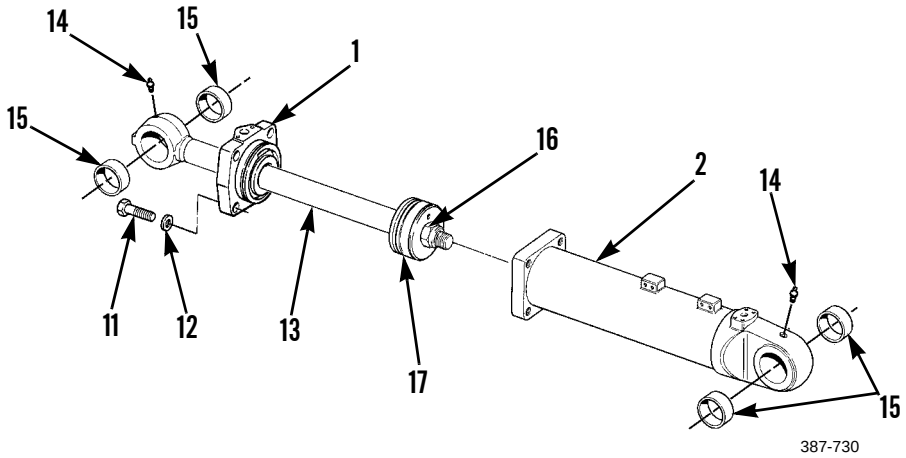
4. Remove four bolts (11) and washers (12) from head (1).
5. Pull piston rod (13) and piston assembly slowly from cylinder housing (2) to allow oil to escape.
6. If required, remove two grease fittings (14) from cylinder housing (2) and piston rod (13).
7. Inspect four bearing sleeves (15) for serviceability. Replace lift cylinder if not serviceable.

CAUTION

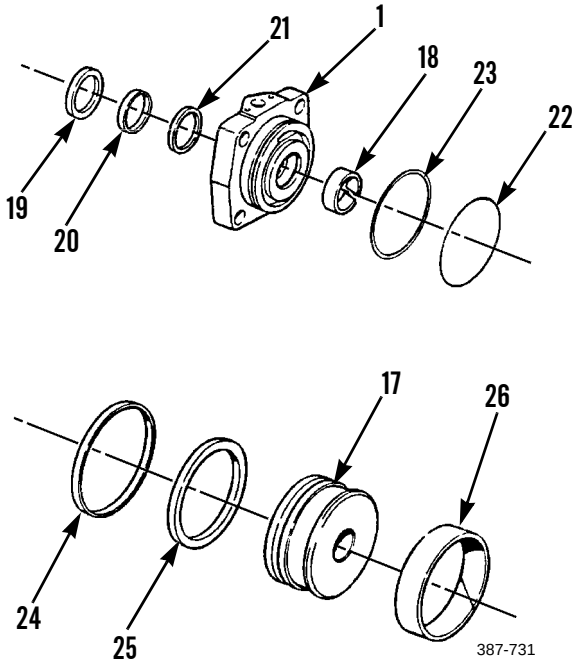
Protect piston rod and use care when placing in vise.

8. Place piston rod (13) in vise and remove self-locking nut (16) from piston rod. Discard self-locking nut.
9. Remove piston (17) from piston rod (13).

DISASSEMBLY - CONTINUED



10. Inspect bearing sleeve (18) for damage. If damaged, remove.
11. Remove seal (19), preformed packing (20) and gasket (21) from head (1). Discard seal, preformed packing and gasket.
12. Remove O-ring (22) and backup ring (23) from inner groove of head (1). Discard O-ring and backup ring.
13. Remove seal (24), ring (25) and piston ring (26) from piston (17). Discard seal, ring and piston ring.



CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

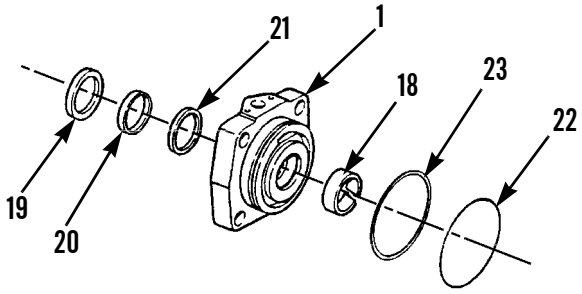
1. Clean all sealing surfaces and tube assembly connections with solvent cleaning compound and allow to dry.
2. Inspect internal casing of cylinder and internal parts of cylinder for cracks, wear, scoring and damage. If components and parts are not serviceable, replace lift cylinder.
3. Ensure mating surfaces for bearing sleeves are clean and not damaged.

ASSEMBLY

NOTE

Lightly coat bearing sleeves, new O-rings, new preformed packing, new ring, new backup ring, new piston ring, and new seals with clean oil before assembly.

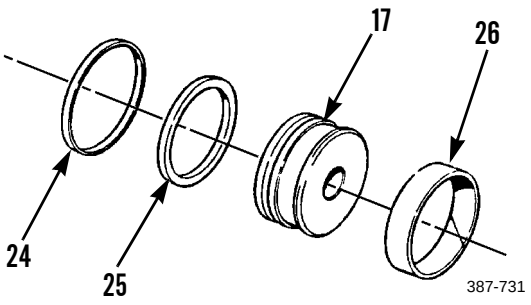
1. Install new piston ring (26), new ring (25) and new seal (24) on piston (17).
2. Install new backup ring (23) and new O-ring (22) into inner groove on head (1).
3. Install new gasket (21) and new preformed packing (20) in head (1).
4. Use sandpaper or emery cloth to scuff surfaces of counterbore inside of head (1) and outside diameter of new seal (19). Clean counterbore in head and scuffed surface of seal thoroughly with quick-cure sealant, until neither component discolors a clean white towel. After cleaning, do NOT touch cleaned surfaces. Handle seal by lip only.



NOTE

Quick-cure sealant will dry in approximately 30 seconds.

5. Apply quick-cure sealant to counterbore of head (1) and to metal shell of seal (19) and allow to dry.



ASSEMBLY - CONTINUED

NOTE

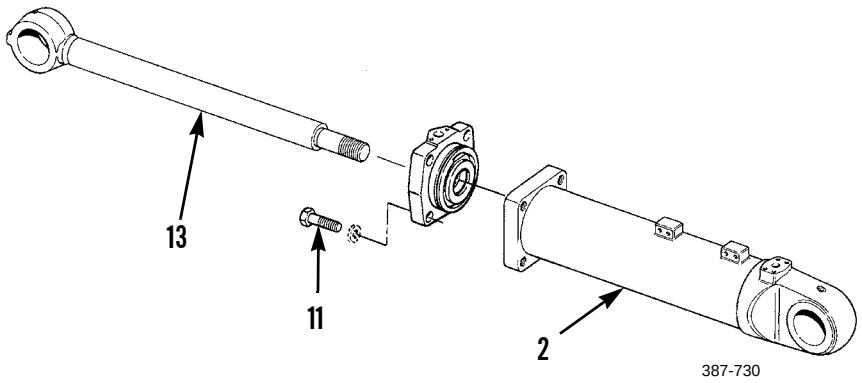
Do NOT allow bearing mount compound to contact sealing lip.

6. Apply bearing mount compound evenly but not excessively to counterbore of head (1) and to metal shell of seal (19).
7. Install seal (19) into counterbore of head (1), with sealing lip facing inward. Seat seal firmly against bottom of counterbore. Wipe away excess bearing mount compound. Allow compound 15 minutes to dry.
8. If removed, install bearing sleeve (18) in head (1).
9. Place head (1) on cylinder housing (2) and install two bolts (11) to hold head in place.

CAUTION

Piston rod must be supported and kept level at all times to avoid damaging seals in head.

10. Place seal guide on piston end of piston rod (13). Push piston rod into head (1) as far as possible.
11. Remove two bolts (11) and separate head (1) and piston rod (13) as a unit from cylinder housing (2).



ASSEMBLY - CONTINUED

12. If removed, install grease fitting (14) on piston rod (13) and cylinder housing (2).

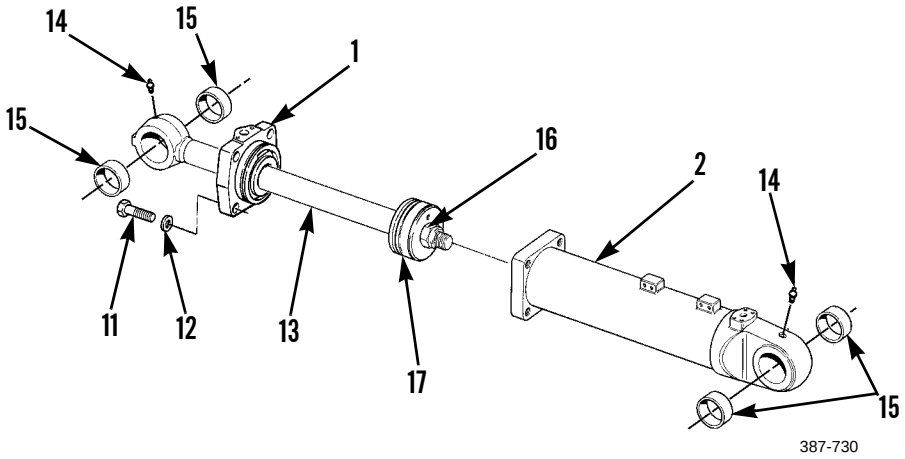
CAUTION

Protect piston rod and use care when placing in vise.

NOTE

- **Lightly coat threads on piston rod and piston with clean oil before assembly.**
- **Ensure seal guide is installed on end of piston rod prior to assembly.**

13. Install piston (17) on piston rod (13).
14. Install new self-locking nut (16) on piston rod (13) and tighten to 1620 lb-ft (2197 Nm).



NOTE

To ensure proper alignment and fit, ensure scribe marks on head and cylinder housing are in alignment.

15. Install head (1) and piston rod (13) into cylinder housing (2).

NOTE

- **Tighten bolts evenly to draw head all the way on cylinder housing.**
- **Piston rod must be fully extended when bolts are tightened for correct alignment of cylinder housing and head.**

16. Install four washers (12) and bolts (11) on head (1) and tighten to 465 lb-ft (631 Nm).

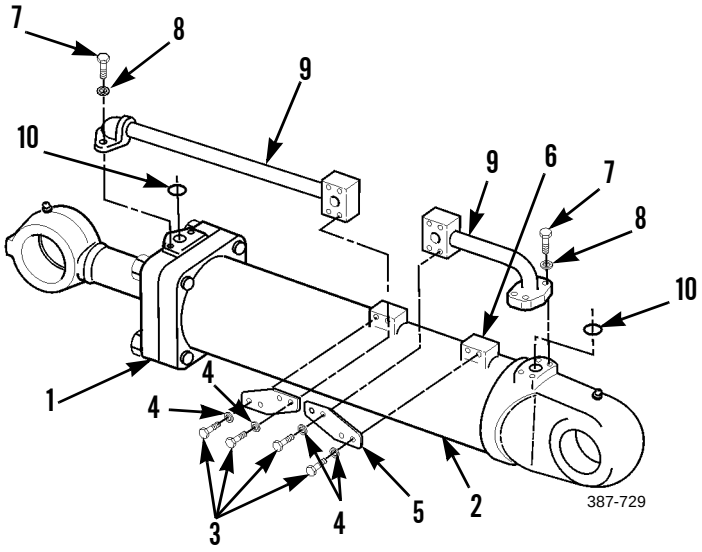
ASSEMBLY - CONTINUED

17. Install two plates (5) to bosses (6) on cylinder housing (2) and secure with eight washers (4) and bolts (3).

NOTE

Insert all washers and bolts to tube assemblies and hand tighten first, then fully tighten.

18. Install two new O-rings (10) and tube assemblies (9) to cylinder housing (2) and head (1) and secure with six washers (8) and bolts (7).



19. Install ripper lift cylinder (WP 0223 00).

END OF WORK PACKAGE

CHANGING HYDRAULIC SYSTEM OIL 0225 00

THIS WORK PACKAGE COVERS

Draining, Filling, Bleeding

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cleaning compound, solvent (Item 4, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Gasket (8)

Materials/Parts - Continued

Pipe nipple, 1 in. NPT x 6 in. long

References

WP 0009 00

WP 0218 00

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Hydraulic system warm (TM 5-2410-237-10)

Engine OFF (TM 5-2410-237-10)

Floor plates removed (WP 0171 00)

DRAINING

WARNING

- **Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **To effectively drain hydraulic system, oil must be warm. Use caution when draining oil to avoid burns.**

1. Remove filler cap (1) from hydraulic tank (2).
2. Remove four capscrews (3), flatwashers (4) and cover (5) located under fender (6).

NOTE

Capacity of hydraulic tank is 21 gal. (79.5 l).

3. Position a suitable container under hydraulic tank (2) and remove drain plug (7) and gasket (8) from bottom of tank. Discard gasket.
4. Drain hydraulic oil from hydraulic tank (2). Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

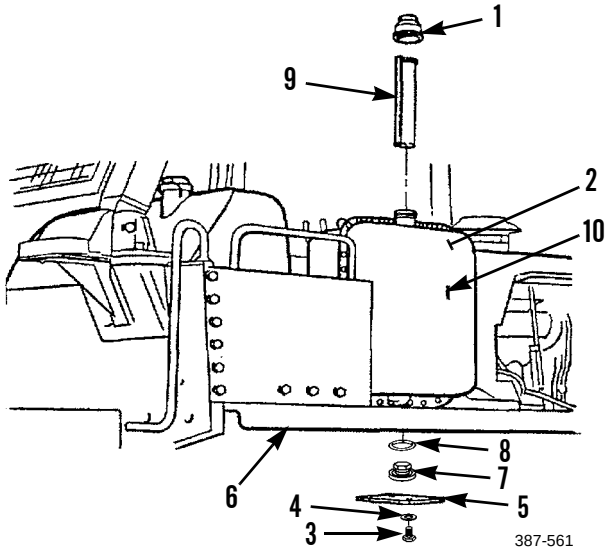
FILLING

1. Remove, clean and reinstall filler strainer (9) (WP 0218 00).
2. Remove pipe nipple and install new gasket (8) and drain plug (7).
3. Change hydraulic filter assembly (WP 0218 00).
4. Install cover (5) under fender (6) with four washers (4) and capscrews (3).

NOTE

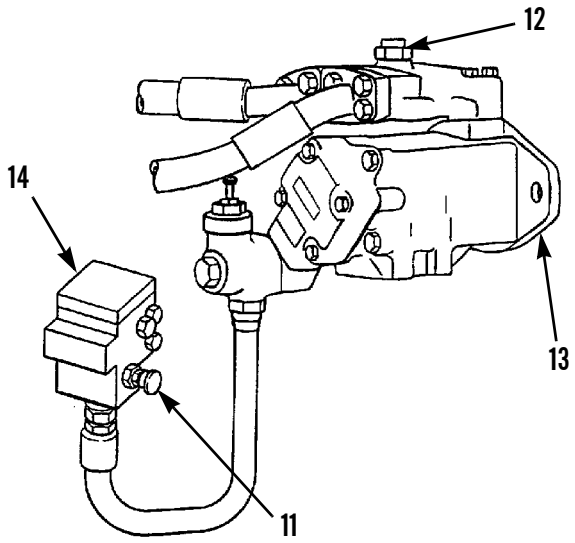
Refer to KEY in *PMCS Introduction* (WP 0009 00) for correct grade of oil for expected temperature range of operation.

5. Add oil to hydraulic tank (2) until oil is visible in sight gage (10).



BLEEDING

1. Start engine and run at idle.
2. Loosen plugs (11 and 12) from tee test taps on pump (13) and pressure control valve (14).
3. Let air escape and tighten plugs (11 and 12) as soon as oil starts to run out.



NOTE

4. Check and fill hydraulic tank (2), as required.
5. Install filler cap (1) on hydraulic tank (2).
6. Operate machine and check for leaks and proper operation (TM 5-2410-237-10).
7. Install floor plates (WP 0171 00).

END OF WORK PACKAGE

HYDRAULIC TANK REPLACEMENT 0226 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Link, lifting (Item 134, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 500 lb capacity

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

Nut, self-locking (8)

O-ring (6)

References

WP 0218 00

Personnel Required

Two

Equipment Condition

Blade control valve removed (WP 0201 00)

REMOVAL

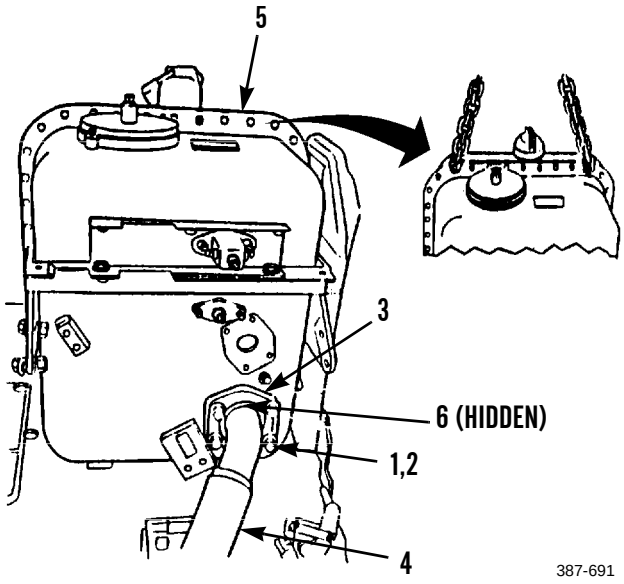
CAUTION

Install protective caps and plug openings in tank and hoses after removal of hydraulic hoses, to ensure contamination does not enter hydraulic system.

NOTE

- **Use a suitable container to capture any residual oil that may drain from hoses as they are disconnected. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**
- **Tag hoses as they are removed to ensure correct installation.**

1. Remove four capscrews (1), washers (2), flange halves (3) and hydraulic pump hose (4) from side of tank (5).
2. Remove O-ring (6) from hydraulic pump hose (4). Discard O-ring.
3. Remove remaining hydraulic hoses from tank (5). Discard all hose connection O-rings.



REMOVAL - CONTINUED

4. Remove two self-locking nuts (7) and capscrews (8) from top corners of tank (5). Do NOT discard self-locking nuts.

5. Secure two lifting links (9) to tank (5) and reinstall capscrews (8) and self-locking nuts (7).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Hydraulic tank weighs 248 lb (113 kg).

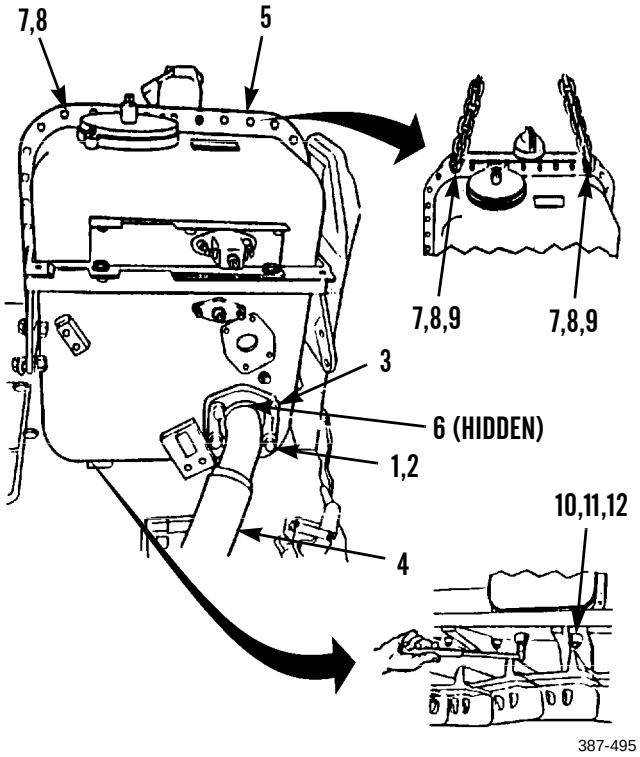
6. Attach a nylon sling and a suitable lifting device to lifting links (9) to support tank (5).

7. Remove two capscrews (10), spacers (11) and washers (12) from tank (5) on underside of fender.

8. Use nylon sling and lifting device to remove tank (5) from fender.

9. Remove two self-locking nuts (7), capscrews (8), and lifting links (9) from tank (5), if a new tank is to be installed.

10. Remove filter assembly and filler strainer from tank (5) if a new tank is to be installed (WP 0218 00).



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INSTALLATION

CAUTION

Wipe area clean around openings in tank and hydraulic hoses before installation, to ensure contamination does not enter hydraulic system.

1. If removed, install filter assembly and filler strainer to tank (5) (WP 0218 00).

2. If installing a new tank (5), remove two self-locking nuts (7) and capscrews (8) from top corners of new tank. Do NOT discard self-locking nuts.

3. Secure two lifting links (9) to tank (5) and reinstall two capscrews (8) and self-locking nuts (7).

INSTALLATION - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

Hydraulic tank weighs is 248 lb (113 kg).

4. Attach a nylon sling and a suitable lifting device to lifting links (9) to support tank (5).
5. Use nylon sling and lifting device to position tank (5) on fender, with mounting holes in tank aligned with holes in fender.

NOTE

Mounting hardware is installed from underside of fender.

6. Install tank (5) on fender with two washers (12), spacers (11) and capscrews (10).
7. Remove two self-locking nuts (7), capscrews (8) and lifting links (9) from top of tank (5). Discard self-locking nuts.
8. Reinstall two capscrews (8) and new self-locking nuts (7) to tank (5).

NOTE

Lightly coat new O-rings in hose connections with clean oil before installation.

9. Install new O-ring (6) and hydraulic pump hose (4) on tank (5) with flange halves (3), four washers (2) and capscrews (1).
10. Install remaining hydraulic hoses to tank (5), using new O-rings at hose connections.
11. Install blade control valve (WP 0201 00).

END OF WORK PACKAGE

HYDRAULIC SYSTEM TESTS 0227 00

THIS WORK PACKAGE COVERS

Preliminary Checks, Test Setup and Operational Checks, Tilt, Lift and Ripper Circuit Speed Tests, Hydraulic System Test Procedures, Pressure Relief Valve Tests, Pump Efficiency Test (On Machine), Restoring Equipment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, general purpose repair (Item 106, WP 0250 00)

Tool outfit, hydraulic system test and repair (HSTRU) (Item 124, WP 0250 00)

Cover, access (Item 26, WP 0250 00)

O-ring (Item 58, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

References

WP 0009 00

WP 0010 00

WP 0201 00

WP 0218 00

WP 0220 00

WP 0225 00

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Floor plates removed (WP 0171 00)

WARNING

- **Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **At operating, temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury.**

CAUTION

Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure

NOTE

- **Hydraulic system tests are performed when required by troubleshooting to confirm a problem or identify a faulty component within the system. These tests can also be performed after repair operations to ensure faults have been corrected and performance is within specifications.**
- **Hydraulic system tests consist of operating checks and analysis of test results to indicate if corrective action is needed.**
- **Perform PMCS for hydraulic system as outlined in WP 0009 00 and WP 0010 00 before performing tests.**

PRELIMINARY CHECKS

1. A visual inspection of the system with the engine stopped should be the first step when performing hydraulic system tests.
2. With the blade and ripper (if equipped) resting on the ground and oil cool, perform the following inspections:
   a. Check oil level in hydraulic tank and add oil as needed (WP 0225 00).
   b. Remove filter element and filler strainer and check for foreign matter. Clean strainer and replace filter element as needed (WP 0218 00).
   c. Inspect all lines, fittings and cylinders for damage or leakage. Make repairs as needed.
   d. Inspect all control linkages for bent, damaged or broken components. Make repairs as needed.

TEST SETUP AND OPERATIONAL CHECKS

WARNING

When testing and adjusting hydraulic system, always move machine away from traffic pattern and away from personnel. Allow only one person on the machine. Keep all other personnel off to one side and within view of the operator.

1. Park machine in a safe location to perform tests.
2. Start engine and lower blade.
3. Warm up hydraulic system.

NOTE

An operational check of the hydraulic system is useful in detecting possible internal leakage, faulty valves or a faulty pump.

4. Perform the following operational checks:
   a. Raise, lower and tilt blade several times. If equipped with ripper, raise and lower ripper several times.
      (1) Watch cylinders as they extend and retract. Movement must be smooth and regular.
      (2) Listen for pump noise.
   b. Test and check adjustment of any area if a problem is found.
5. Verify high idle is 2100 RPM +/- 60 RPM.
6. Perform *Tilt, Lift and Ripper Circuit Speed Tests* below.

TILT, LIFT AND RIPPER CIRCUIT SPEED TESTS

1. Hydraulic filter elements should be changed, if dirty, before performing the following speed tests.
2. Oil must be of recommended viscosity and at normal operating temperature of 145°-155° F (63°-68° C) to ensure accurate test results.
3. Speed tests are made with engine at high idle.
4. Speeds in Table 1 are those of a machine equipped with a tilt, lift and ripper circuit.
5. System speeds similar to speeds given in table 1 indicate that circuits are operating normally. However, relief valves should be tested to ensure they are set at proper settings.
6. If only lift circuit or only tilt circuit has slow speeds, check slow circuit for excessive drifting.

Table 1. Tilt, Lift and Ripper Circuit Speed Tests.

CIRCUIT SPEED TEST	TRAVEL TIME SPEED IN SECONDS
Tilt Circuit Time needed to move tilt cylinder rod from fully retracted to fully extend position.	2.2
Time needed to move tilt cylinder rod from fully extended to fully retract position.	1.7
Lift Circuit Time needed to raise blade from ground level to maximum height.	3.0
Ripper Time needed to raise ripper from fully extended to fully retracted position.	4.8

7. If all circuits are slow, check for pump malfunctioning. Also check main pressure relief valve for leakage or low pressure settings. Refer to *Pump Efficiency Tests* (*On Machine*) and *Pressure Relief Valve Tests* in this work package.

HYDRAULIC SYSTEM TEST PROCEDURES

1. **Introduction.**
   a. Check relief valve setting at low idle. Refer to *Pressure Relief Valve Tests* in this work package. If relief valve pressure can be obtained at low idle, pump is working correctly.
   b. If machine is equipped with a tilt and/or ripper circuit, put a tap into these circuits and check for relief valve pressure at low idle. If relief pressure cannot be read on gage in all circuits, pump or relief valve is probably bad. If pressure cannot be read in only one circuit, refer to drift tests for that circuit for further testing.

HYDRAULIC SYSTEM TEST PROCEDURES

NOTE

If test results are not as indicated, refer to Troubleshooting for correctitve action.

2. **Blade Lift Circuit Drift Tests.** Refer to Table 2 for correct test results for the following checks. Refer to Table 3 to interpret test results.

   a. **Test No. 1.** Raise front of tractor off ground by lowering level blade. Put blade control lever in HOLD position. Shut off engine. Measure lift cylinder rod movement.

   b. **Test No. 2.** Raise front of tractor off ground by lowering level blade. Shut off engine and hold blade control lever in LOWER position. Measure lift cylinder rod movement.

   c. **Test No. 3.** Raise blade off ground. Hold blade control lever in HOLD position. Shut off engine. Measure lift cylinder rod movement.

   d. **Test No. 4.** Raise blade off ground and shut off engine. Hold blade control lever in RAISE position. Measure lift cylinder rod movement.

Table 2. Blade Lift Circuit Drift Tests.

MAXIMUM CYLINDER MOVEMENT	DURATION OF TEST	OIL TEMPERATURE
1.5 in. (38.1 mm)	5 min.	100°F (38°C)
1.5 in. (38.1 mm)	2.7 min.	135°F (57°C)
1.5 in. (38.1 mm)	1.7 min.	175°F (79°C)

Table 3. Interpretation of Blade Lift Circuit Drift Tests.

TEST RESULTS	MOST PROBABLE CAUSES
Drifting occurs in Tests No. 1 and No. 2	Lift circuit make-up valve (head ends) leaking.
Drifting occurs in Test No. 3 and No. 4	Lift circuit make-up valve (rod ends) leaking.
Drifting occurs in Tests No. 2, No. 3 and No. 4	Leakage between pistons and cylinders. Bad piston valves in cylinders.
Drifting occurs in Tests No. 2 and No. 4	Lift circuit check valve leaking. Leakage between valve and seat and/or seat and body.
NOTE: Remember that an O-ring seal failure in circuit will have same effect as a major component failure.	

HYDRAULIC SYSTEM TEST PROCEDURES - CONTINUED

3. **Blade Tilt Circuit Drift Tests.** Refer to Table 4 for correct test results for the following checks. Refer to Table 5 to interpret test results.

   a. **Test No. 1.** Lower blade flat on ground. Raise front of tractor off ground by lowering right side of blade (tilt right). Place tilt circuit in HOLD position. Shut off engine and measure tilt cylinder rod movement.

   b. **Test No. 2.** Lower blade flat on ground. Raise front of tractor off ground by lowering left side of blade (tilt left). Place tilt circuit in HOLD position. Shut off engine and measure tilt cylinder rod movement.

Table 4. Blade Tilt Circuit Drift Tests.

MAXIMUM CYLINDER MOVEMENT	DURATION OF TEST	OIL TEMPERATURE
0.44 in. (11.2 mm)	5 min.	100°F (38°C)
0.44 in. (11.2 mm)	2.7 min.	135°F (57°C)
0.44 in. (11.2 mm)	1.7 min.	175°F (79°C)

Table 5. Interpretation of Blade Tilt Circuit Drift Tests.

TEST RESULTS	MOST PROBABLE CAUSES
Drifting occurs in Tests No. 1 and No. 2	1. Leakage between piston and cylinder. 2. Leakage between tilt circuit valve spool and body.
NOTE: Remember that an O-ring seal failure in circuit will have same effect as a major component failure.	

4. **Ripper Lift Circuit Drift Tests.** Refer to Table 6 for correct results for the following checks. Refer to Table 7 to interpret test results.

   a. **Test No. 1.** Raise rear of tractor off ground by lowering ripper. Place ripper control lever in HOLD position. Shut off engine and measure ripper cylinder rod movement.

   b. **Test No. 2.** Raise ripper off ground. Place ripper control lever in HOLD position. Shut off engine and measure ripper cylinder rod movement.

Table 6. Ripper Lift Circuit Drift Tests.

MAXIMUM CYLINDER MOVEMENT	DURATION OF TEST	OIL TEMPERATURE
0.38 in. (9.7 mm)	5 min.	100°F (38°C)
0.38 in. (9.7 mm)	2.7 min.	135°F (57°C)
0.38 in. (9.7 mm)	1.7 min.	175°F (79°C)

HYDRAULIC SYSTEM TEST PROCEDURES - CONTINUED

Table 7. Interpretation of Ripper Lift Circuit Drift Tests.

TEST RESULTS	MOST PROBABLE CAUSES
Drifting occurs in Tests No. 1 and No. 3	1. Leakage between piston and cylinder. 2. Leakage between ripper circuit valve spool and body. 3. Leakage in restrictor valve.
NOTE: Remember that an O-ring seal failure in circuit will have same effect as a major component failure.	

PRESSURE RELIEF VALVE TESTS

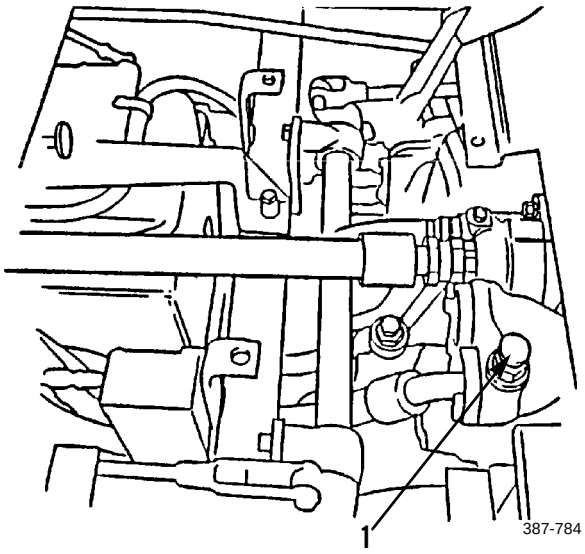
WARNING

- **Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury.**

1. **<u>Main Relief Valve</u>.**

   a. Operate machine until hydraulic system is at operating temperature. Lower implements to the ground and bulldozer blade level. Shut down engine. Move all hydraulic control levers to all positions to relieve pressure in lines. Return all control levers to HOLD position.

   b. Install a 0-4000 psi (0-27,579 kPa) gage in pressure tap (1) of main hydraulic pump.



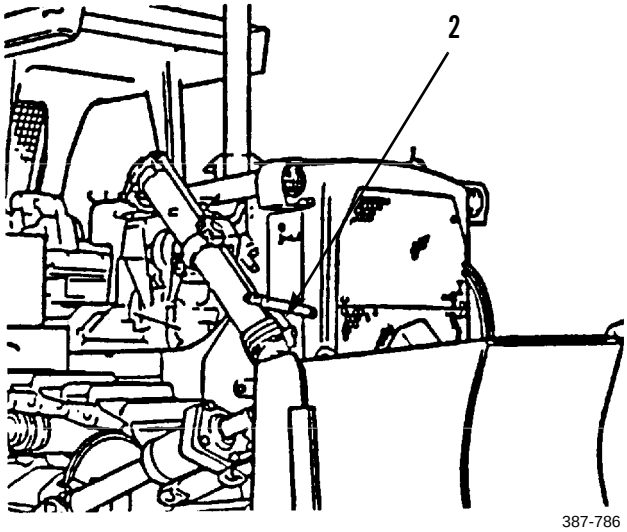
PRESSURE RELIEF VALVE TESTS - CONTINUED

c. If equipped with a ripper, run engine at low idle and raise ripper until lift cylinders bottom out. Main relief valve should open 2250 + 50 or 0 psi (15,513 + 344 or 0.0 kPa).

d. Block hose (2) at both blade lift cylinders.

(1) Disconnect hose (2) at lift cylinder head (WP 0220 00).

(2) Install O-ring and cover and reconnect hose (2).



e. With engine at low idle, operate blade control lever to extend lift cylinders. Main relief valve should open at 2250 +/- 50 or 0 psi (15,513 +/- 344 or 0.0 kPa).

f. Shut down engine. Move all hydraulic control levers to all positions to relieve pressure in lines. Return all control levers to HOLD position.

g. Remove block in line to blade lift cylinders.

(1) Disconnect hose (2) (WP 0220 00).

(2) Remove O-ring and cover and reconnect hose (2).

NOTE

- **One 0.005 in. shim will change relief pressure by 35 psi (240 kPa).**
- **One 0.048 in. shim will change relief pressure by 335 psi (2310 kPa).**

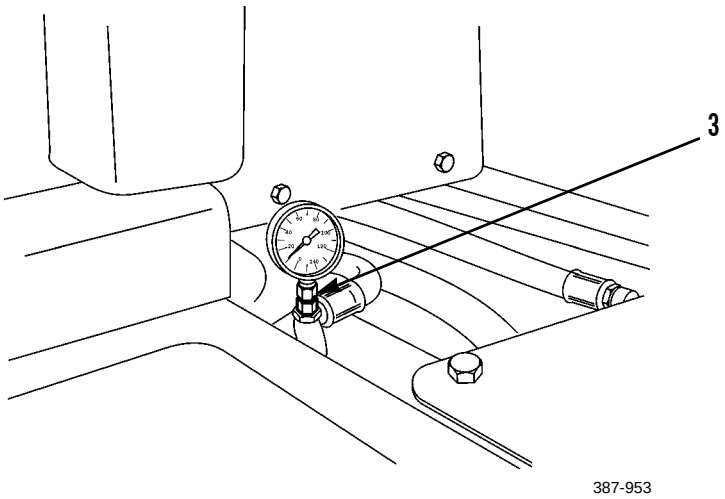
h. To adjust main relief valve setting, perform *Relief Valve Setting Adjustment* in WP 0201 00.

PRESSURE RELIEF VALVE TESTS - CONTINUED

2. **Tilt Relief Valve.**

   a. Operate machine until hydraulic system is at operating temperature. Lower implements to the ground and bulldozer blade level. Shut down engine. Move all hydraulic control levers to all positions to relieve pressure in lines. Return all control levers to HOLD position.

   b. Install a 0-4000 psi (0-27,579 kPa) gage in pressure tap (3).



   c. Raise blade high enough to allow for maximum tilt in either direction.

   d. With engine at low idle, extend or retract tilt cylinder to full extent of travel. Observe gage reading. Maximum gage reading should be 2450 psi ± 25 psi (16,892 ± 172 kPa).

   e. Return blade to level position and lower to the ground.

NOTE

- **One 0.005 in. shim will change relief pressure by 35 psi (240 kPa).**
- **One 0.048 in. shim will change relief pressure by 335 psi (2310 kPa).**

   f. To adjust tilt relief valve setting, remove tilt control valve and perform *Relief Valve Setting Adjustment* (WP 0201 00).

PUMP EFFICIENCY TEST (ON MACHINE)

1. Install flow meter.
2. Start engine and run at 2000 RPM.
3. Measure pump flow at 100 psi (7.0 kg/cm^2) with engine at 2000 RPM.
4. Measure pump flow at 1000 psi (70.3 kg/cm^2) with engine at 2000 RPM.
5. Calculate percentage of flow loss using the following formula:

$$\left(\frac{\text{gpm @ 100 psi - gpm @ 1000 psi}}{\text{gpm @ 100 psi}}\right) \times 100 = \text{Percentage of flow loss}$$

6. If percentage of flow loss is more than 10%, pump performance is not sufficient.

RESTORING EQUIPMENT

1. Remove all test equipment and install any removed plugs.
2. Check oil level in hydraulic tank. Add oil as needed. Bleed air from system (WP 0225 00).
3. Operate tilt, lift and ripper (if equipped) circuits and check for proper operation (TM 5-2410-237-10).
4. Shut off engine and check for oil leaks.
5. Recheck oil level in hydraulic tank (WP 0225 00).
6. Install floor plates (WP 0171 00).

END OF WORK PACKAGE

INSTALLATION OF ARMOR PACKAGE 0228 00

THIS WORK PACKAGE COVERS

General Information, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Tool, lifting (Item 123, WP 0250 00)

Materials/Parts

Compound, sealing (Item 9, WP 0249 00)

1991, 1996, or 2004 MCAP Armor Kit

References

TM 5-2410-237-10

TM 5-2410-237-23P

Personnel Required

Three

Equipment Condition

Radiator guard removed (WP 0158 00)

Backup alarm removed (WP 0098 00)

Rear floodlamp removed (WP 0093 00)

Transmission guard removed (WP 0157 00)

Hood grabhandles removed (WP 0159 00)

Protective screen removed (WP 0167 00)

Left and right lift cylinder travel lock bracket removed (WP 0220 00)

Winterized cab removed, if equipped (WP 0168 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

GENERAL INFORMATION

NOTE

- **This work package contains installation instructions for 1991, 1996 and 2004 MCAP Armor Kits.**
- **Differences between kits are noted in the procedure.**

1. **General Information.**

   a. While installing cab armor, due to tolerance stackup and/or prior rework or repair to tractor, armor kit may interfere with tractor parts. If this occurs, rework tractor parts rather than armor kit, if possible.

   b. DO NOT weld, burn, grind or drill on ROPS structure or support members.

   c. Loosely install armor kit components. To ensure all components fit correctly, do NOT tighten mounting bolts until all adjacent and connecting armor parts have been installed.

GENERAL INFORMATION - CONTINUED

2. **Applying Sealing Compound and Torquing Instructions.**

NOTE

Do NOT let bolts with sealing compound set for more than one hour before torquing.

a. With all armor plates installed and adjusted for proper fit, tighten enough bolts in all panels to hold secure.

b. One panel at a time, remove remaining nuts and bolts (if in threaded hole) and add sealing compound. Reinstall and tighten nuts and bolts.

c. Remove previously tightened nuts and bolts and add sealing compound.

d. Tighten all bolts as individual panels are completed.

e. Tighten by bolt size should be as follows:

(1) 1/4 in. bolts: 9 lb-ft (12 Nm).

(2) 3/8 in. bolts: 5 lb-ft (45 Nm).

(3) 1/2 in. bolts: 75 lb-ft (100 Nm).

(4) 1/2 in. bolts for aluminum window frames: 50 lb-ft (70 Nm).

(5) 5/8 in. bolts: 150 lb-ft (200 Nm).

(6) 3/4 in. bolts: 270 lb-ft (360 Nm).

INSTALLATION

1. **Installation of Radiator Guards.**

NOTE

Use a suitable lifting device when installing the following components:

- **Side guard weighs approximately 85 lb (39 kg).**
- **Radiator guard weighs approximately 230 lb (105 kg).**

a. Install left and right side guard mounting brackets (1 and 2) to radiator with eight bolts (3) (5/8 x 2.00 in.) and washers (4).

NOTE

L.H. rear light bracket mounting bolts and six lower radiator shield bolts will be reinstalled later along with engine side guards.

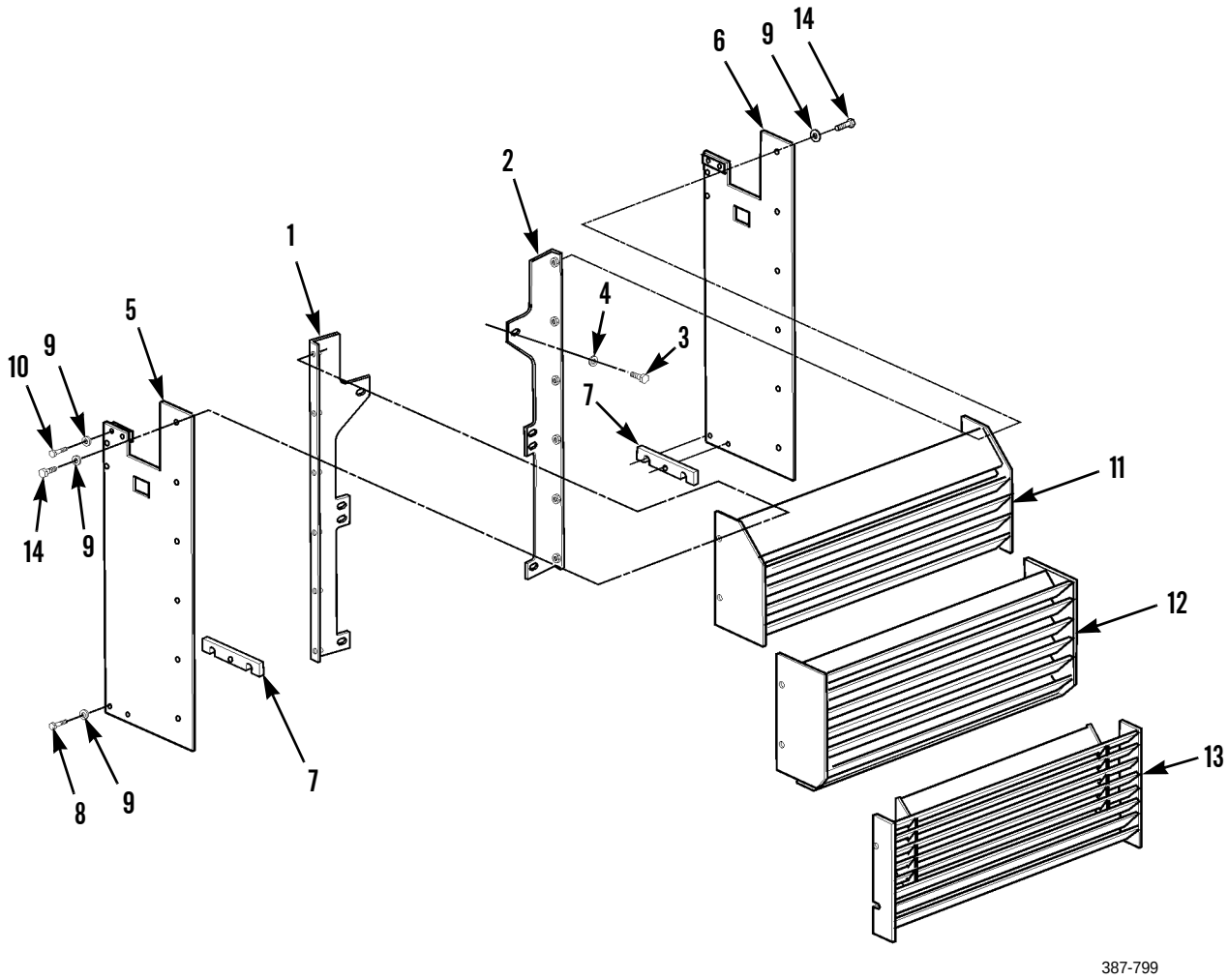
b. Remove two light bracket mounting bolts on L.H. side of radiator shield and three bolts at bottom of each side of radiator shield. Retain shield bolts for reinstallation.

c. Position left and right side guard assemblies (5 and 6) with spacers (7) placed behind and at bottom of each guard. Install four bolts (8) (5/8 x 2.00 in.) and washers (9). Install four bolts (10) (1/2 x 2-1/2 in.) and washers (9).

d. Install three radiator guards (11, 12 and 13) with 12 bolts (14) and washers (9), six on each side.

INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED



INSTALLATION - CONTINUED

2. **Installation of Top and Rear Cab Plates.**

NOTE

Use a suitable lifting device when installing the following components:

- **Top rear plate weighs approximately 185 lb (84 kg).**
- **Lower rear plate weighs approximately 235 lb (107 kg).**
- **Top front plate weighs approximately 121 lb (55 kg).**
- **Top rear plate weighs approximately 180 lb (82 kg).**
- **Front mounting bracket weighs approximately 51 lb (23 kg).**

a. Install top rear plate (15) with two existing bolts and four washers.

b. Install lower rear plate (16) with two bolts (17) (1/2 x 1-1/2 in.) and washers (18).

c. Install grommet (19) in lower plate (16).

d. Install four bolts (17) and washers (18) to secure plates (15 and 16) together.

e. Install left and right guard strips (20 and 21) with six bolts (22) (1/2 x 1.00 in.) and washers (23) on each side.

f. Check dimension between left-top side plate rearmost mounting hole and top mounting bolt of left side guard strip (20). Dimension must be 16.06-16.56 in. (40.8-42.1 cm). If measurement is correct, install remaining mounting bolts and washers to secure rear top and lower plates (15 and 16). If measurement is not correct, it may be necessary to loosen mounting bolts and relocate plates, retighten, and recheck measurement.

g. Install left and right top side plates (24 and 25) with four bolts (17) to temporarily hold plates in place.

h. Position cab top plates (26 and 27) on top of cab.

i. Install six bolts (17), twelve washers (23) and six nuts (28) per side to secure cab top plates (26 and 27) to left and right top side plates (24 and 25).

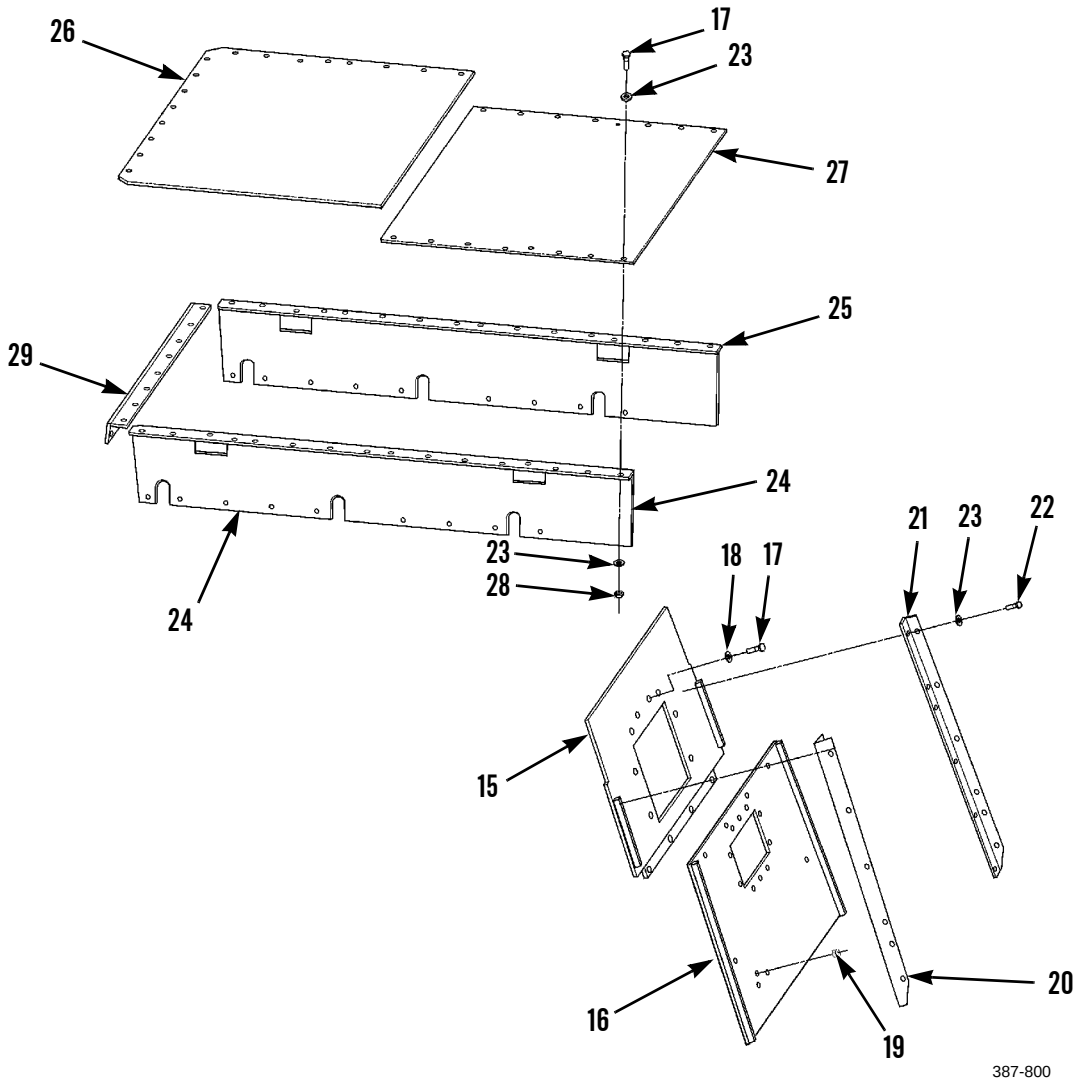
j. Remove four bolts (17) (previously installed in step g) from each side plate (24 and 25).

k. Install remaining four bolts (17), eight washers (23) and four nuts (28) to secure top plates (26 and 27).

l. Install top front mounting bracket (29) with eight bolts (17), sixteen washers (23) and eight nuts (28).

INSTALLATION OF ARMOR PACKAGE - CONTINUED **0228 00**

INSTALLATION - CONTINUED



INSTALLATION - CONTINUED

3. **Installation of Cab Front Plates.**

NOTE

Use a suitable lifting device when installing the following components:

- **Cab left and right front plates weigh approximately 150 lb (68 kg) each.**
- **Cab center plate weighs approximately 115 lb (52 kg).**

a. Remove two existing bolts from left and right side of forward end of cab floor.

b. Install left and right front shield mounting brackets (30 and 31) with four bolts (32) (1/2 x 2.00 in.) and washers (33).

NOTE

On 2004 MCAP Kit, left and right front shields have larger windows openings.

c. Install left and right front shields (34 and 35) with two bolts (32) (1/2 x 2.00 in.), four washers (33) and two nuts (36).

d. Loosely attach tops of left and right front shields (34 and 35) to top front mounting bracket (29) with six bolts (32), twelve washers (33) and six nuts (36).

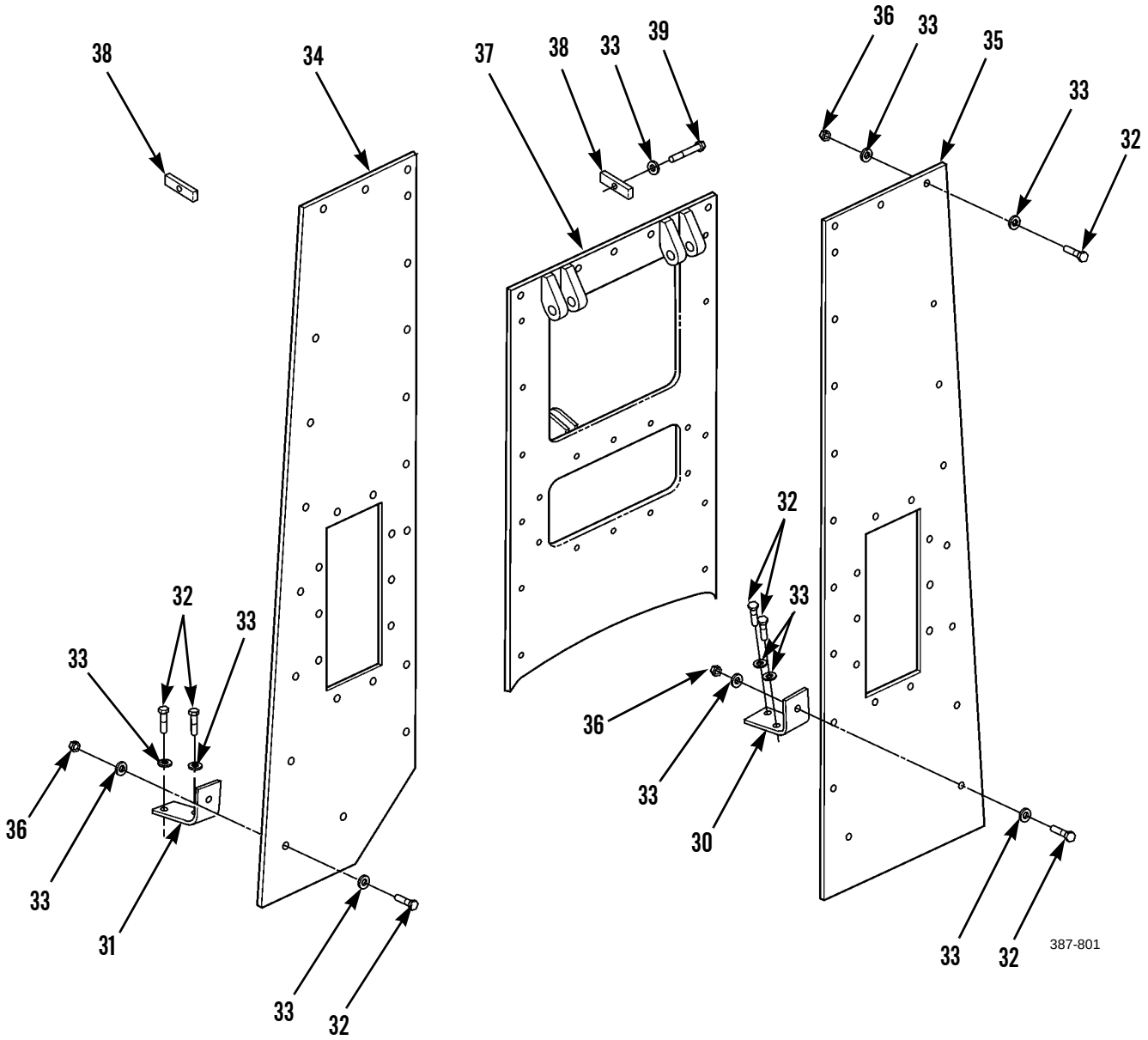
e. Loosely attach bottoms of left and right front shields (34 and 35) to floor mounted brackets (30 and 31) with two bolts (32), four washers (33) and nuts (36).

f. Align left and right front shields (34 and 35) with cab top and ROPS supports, maintaining 1/4 in. (6.35 mm) tolerance around all sides. Tighten all mounting bolts.

g. Install center cab plate (37) with five bolts (32) (1/2 x 2.0 in.), ten washers (33) and five nuts (36).

h. Install four top plate retainers (38), two on each side of cab, to top side plates (24 and 25) with four bolts (39) (1/2 x 3-1/2 in.) and washers (33).

INSTALLATION - CONTINUED

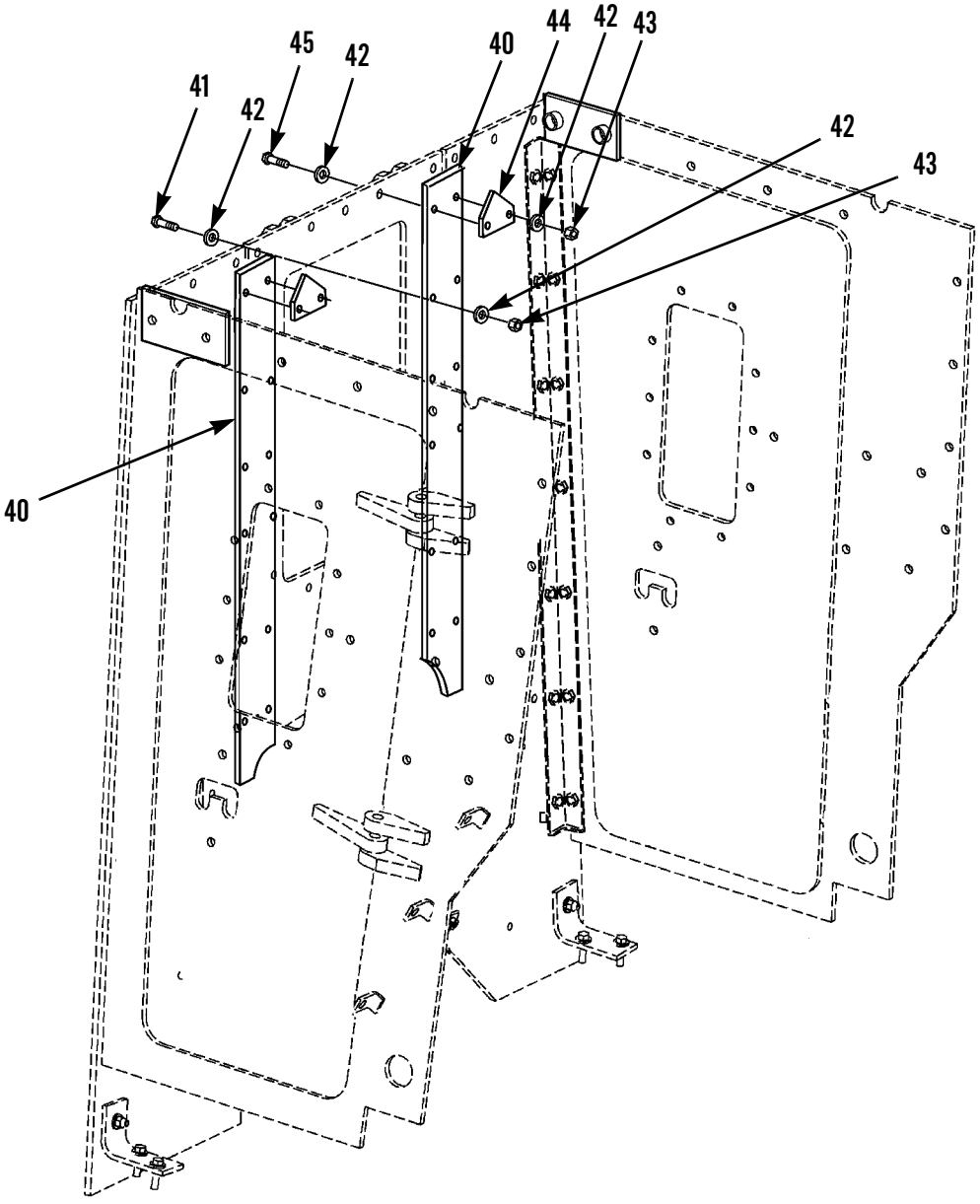


INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED

i. From inside cab, install two backup strips (40) with ten bolts (41), 20 washers (42) and ten nuts (43).

j. From inside cab, install two mounting plates (44) with four bolts (45) (1/2 x 2-1/2 in.), washers (42) nuts (43).



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INSTALLATION - CONTINUED

4. **Installation of Cab Upper Left/Right Side Plates.**

NOTE

Use a suitable lifting device when installing the following components:

- **Door frame assemblies weigh approximately 150 lb (68 kg).**
- **Left and right side plates weigh approximately 201 lb (91 kg).**
- **Left and right door assembly weigh approximately 200 lb (91 kg).**

a. Install left side cab door frame assembly (46) with five bolts (47) (1/2 x 2.00 in.), ten washers (48) and five nuts (49).

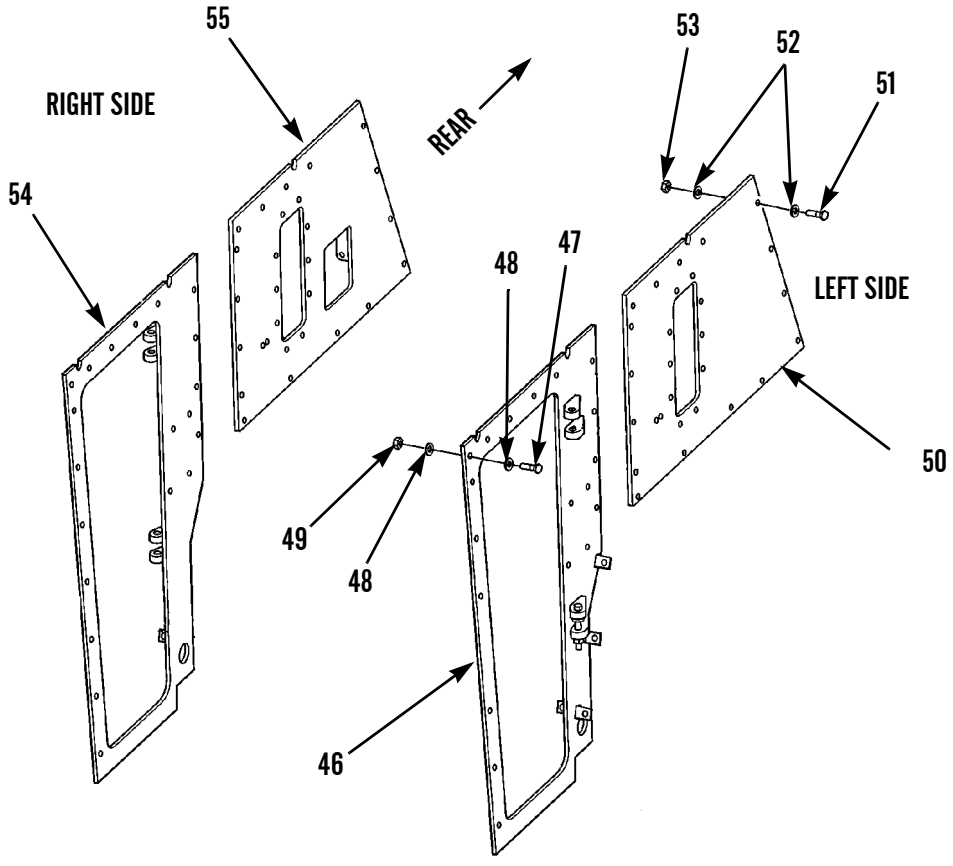
NOTE

On 2004 MCAP Armor Kit, left and right side upper plates have larger windows openings.

b. Install left side upper plate (50) with eight bolts (51), sixteen washers (52) and eight nuts (53) on top and rear of plate.

c. Install right side cab door frame assembly (54) with five bolts (47), ten washers (48) and five nuts (49).

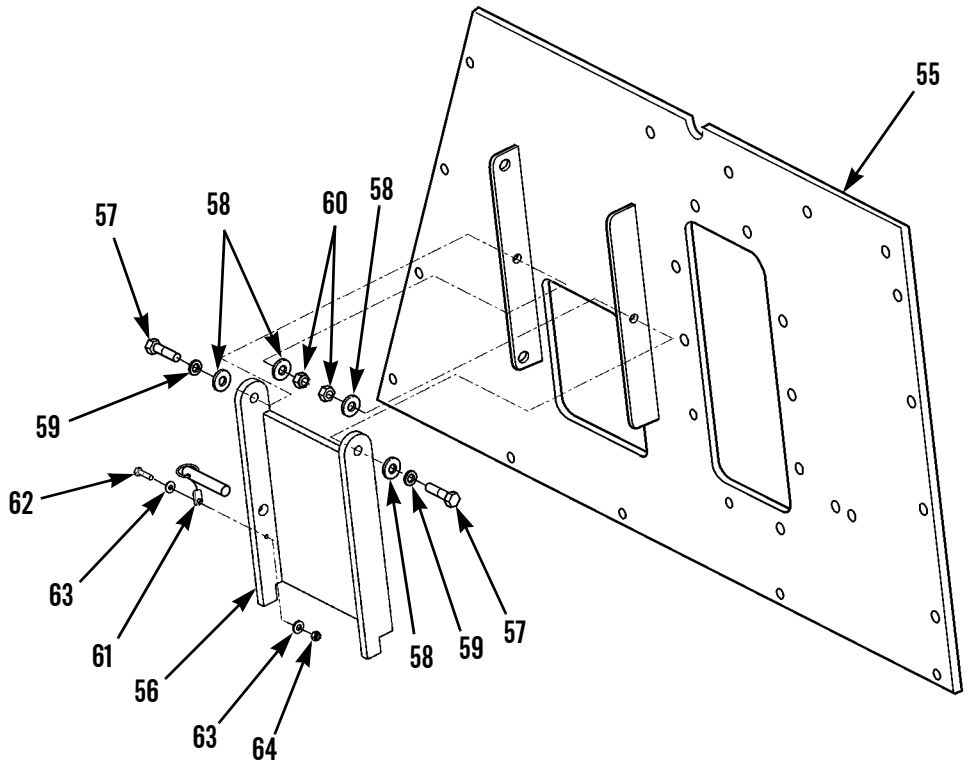
d. Install right side upper plate (55) with eight bolts (51), sixteen washers (52) and eight nuts (53) on top and rear of plate.



INSTALLATION - CONTINUED

e. Install fuel access cover assembly (56) on right side upper plate (55) with two bolts (57), four washers (used as spacers) (58), two washers (59) and two locknuts (60).

f. Install fuel access cover locking pin (61) with screw (62) (10 x 1.00 in.), two washers (63) and locknut (64).



RIGHT SIDE OF CAB (FUEL COVER) 387-804

NOTE

To properly shim door assemblies, place two washers on top and three washers on bottom of each door hinge.

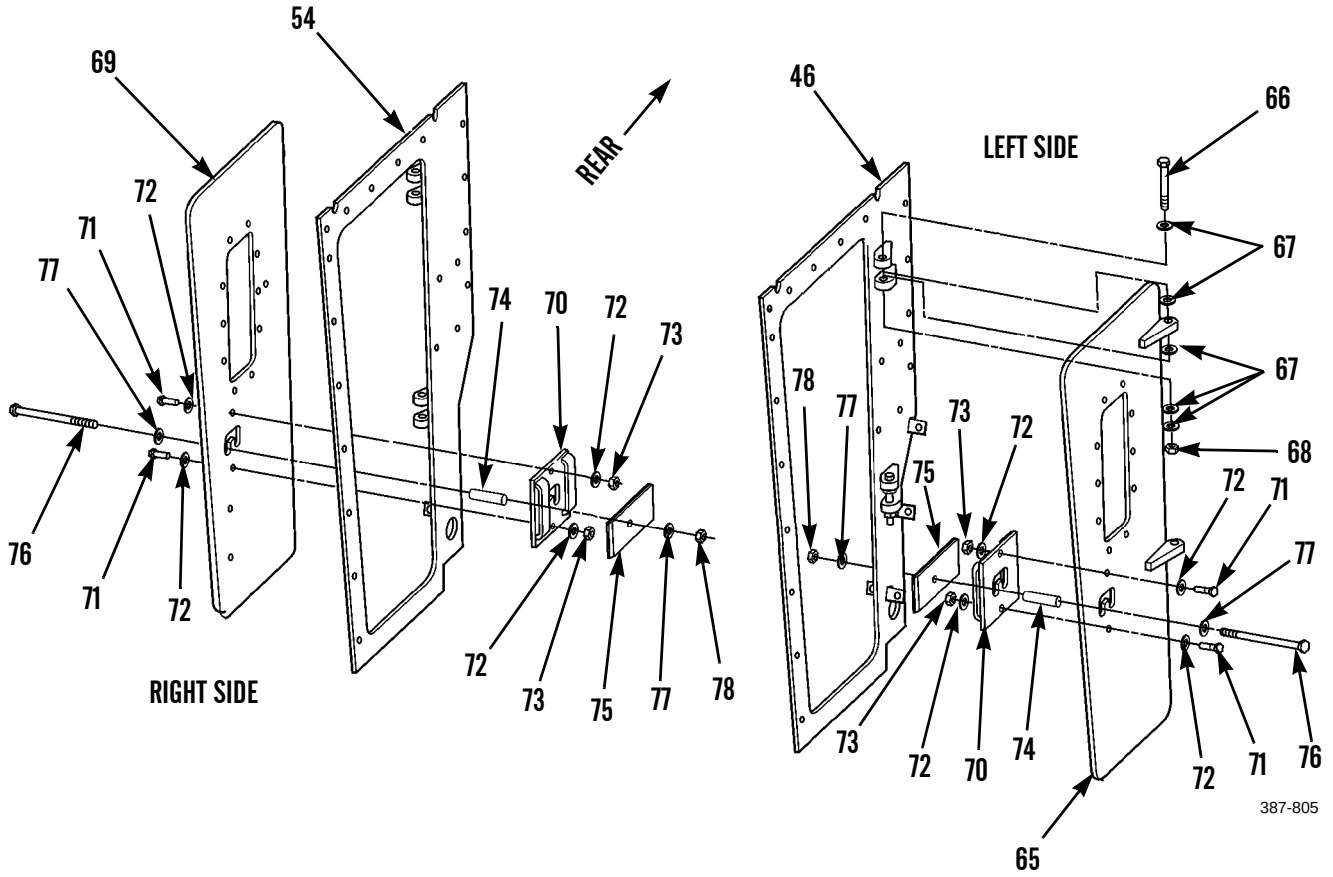
g. Install left side cab door (65) with two bolts (66) (3/4 x 5.00 in.), ten washers (67) and two nuts (68).

h. Install right side cab door (69) with two bolts (66), ten washers (67) and two nuts (68).

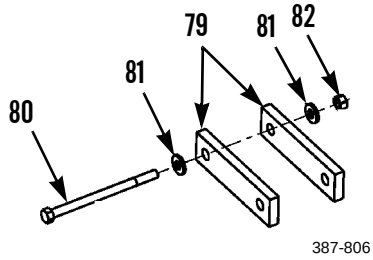
i. Install door (dead bolt) bracket (70) on left and right side doors with two bolts (71) (5/8 x 2.00 in.), four washers (72) and two nuts (73).

j. Install door latch (74) and plate (75) on left and right doors with bolt (76) (3/4 x 9 in.), two washers (77) and nut (78).

INSTALLATION - CONTINUED



k. Install four ROPS-to-cab brackets (79). Position one bracket on inside side of ROPS post and one between post and cab door frame. Secure each bracket with two bolts (80) (1/2 x 7-1/2 in.), four washers (81) and two nuts (82).



INSTALLATION - CONTINUED

5. **Installation of Cab Lower Left Side and Rear Plates.**

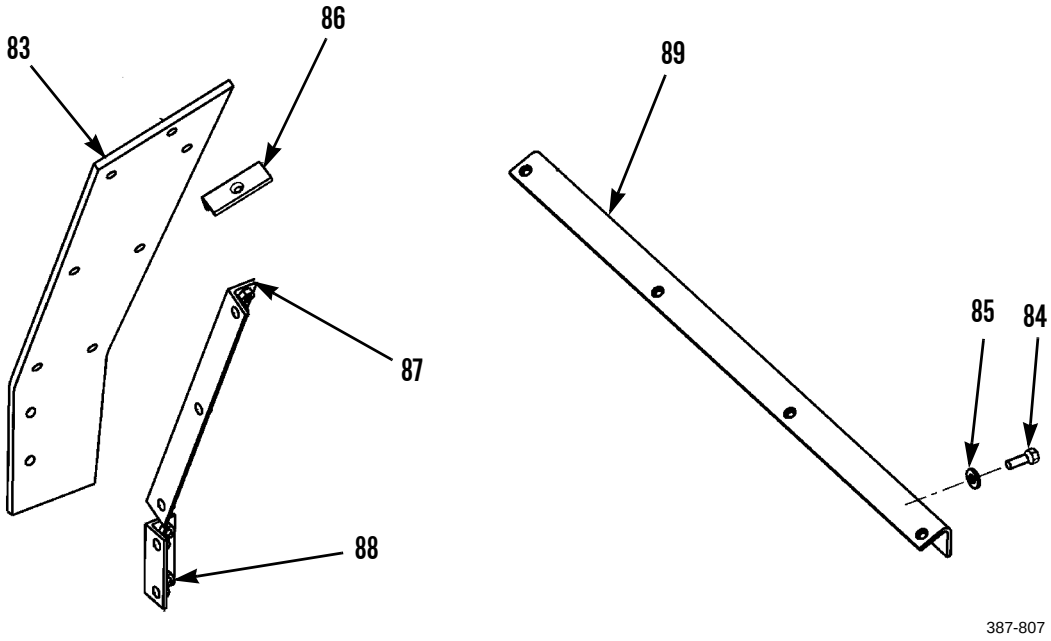
NOTE

Use a suitable lifting device when installing the following components:

- **Cab rear top plate weighs approximately 161 lb (73 kg).**
- **Cab rear bottom plate weighs approximately 161 lb (73 kg).**
- **Battery box side cover weighs approximately 322 lb (146 kg).**
- **Battery box top cover weighs approximately 75 lb (34 kg).**

a. Install battery box front cover plate (83) with three bolts (84) (1/2 x 1-1/2 in.) and washers (85).

b. Install battery box cover brackets (86, 87, 88 and 89) with ten bolts (84) and washers (85).



c. Install cab lower rear upper plate (90) with four bolts (91) (3/4 x 1-1/2 in.) and washers (92).

d. Install lower rear plate mounting bracket (93) under lip of upper plate (90) with three bolts (94) (1/2 x 1-1/2 in.) and washers (95) located in center holes.

e. Install bottom plate (96) to bracket (93) with three bolts (94) and washers (95).

f. Install electrical lead grommet (97) in bottom plate (96).

g. Install backup mounting brackets (98) to each end of upper plate (90) with two bolts (94), two bolts (99) (1/2 x 2 in.) and four washers (95).

h. Install backup mounting brackets (100) to each end of bottom plate (96) with three bolts (94), bolt (99) and four washers (95).

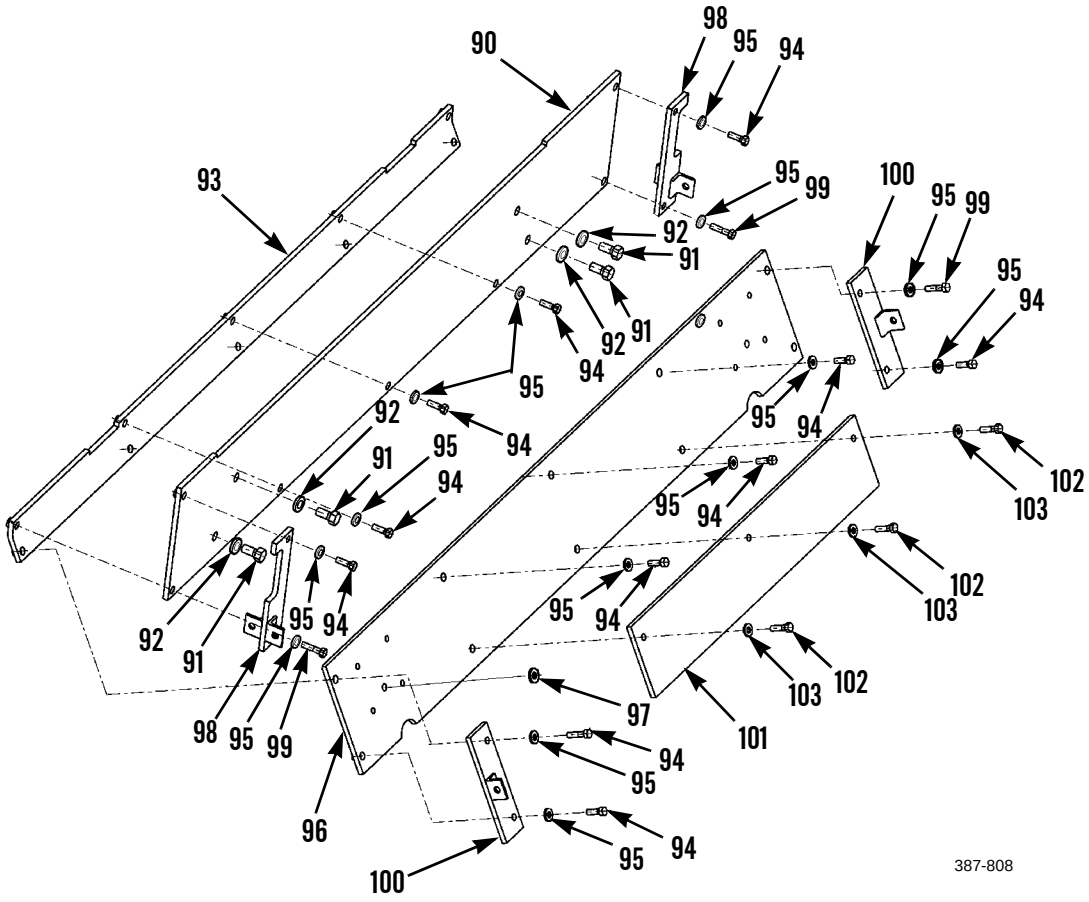
INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED

NOTE

Winch access cover plate (101) should be installed over bottom plate (96) if winch assembly is installed on machine. If ripper is installed on machine, rotate plate 180 degrees to cover access area.

i. Install cover plate (101) over bottom plate (96) with three bolts (102) (1 x 1-3/4 in.) and washers (103).



INSTALLATION - CONTINUED

6. **Installation of Battery Box Covers.**

NOTE

Use a suitable lifting device when installing the following components:

- **Battery box side cover weighs approximately 322 lb (146 kg).**
- **Battery box top cover weighs approximately 75 lb (34 kg).**

a. Install battery box side cover (104) with seven bolts (105) (1/2 x 1-1/2 in.), washers (106) and nuts (107).

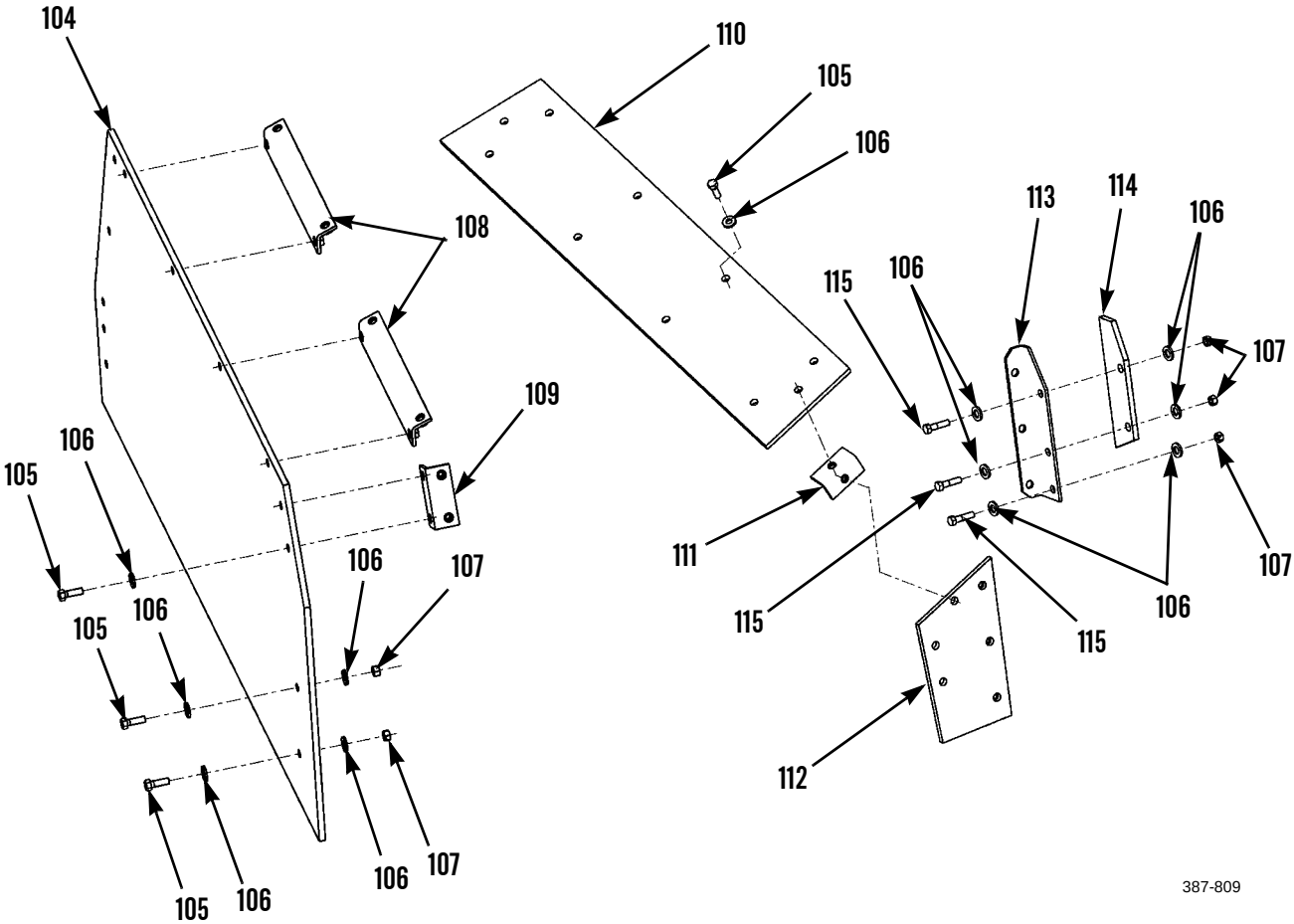
b. Install battery box top cover angle brackets (108 and 109) with two bolts (105) and washers (106) each angle bracket.

c. Install battery box top cover (110) with bolts (105) and washers (106).

d. Install battery box rear cover mounting bracket (111) with bolt (105) and washer (106).

e. Install battery box rear cover plate (112) with three bolts (105) and washers (106).

f. Install angle brackets (113 and 114) at rear of battery box with five bolts (115), five washers (106) and three nuts (107).



INSTALLATION - CONTINUED

7. **Installation of Cab Right Side Hydraulic Tank Covers.**

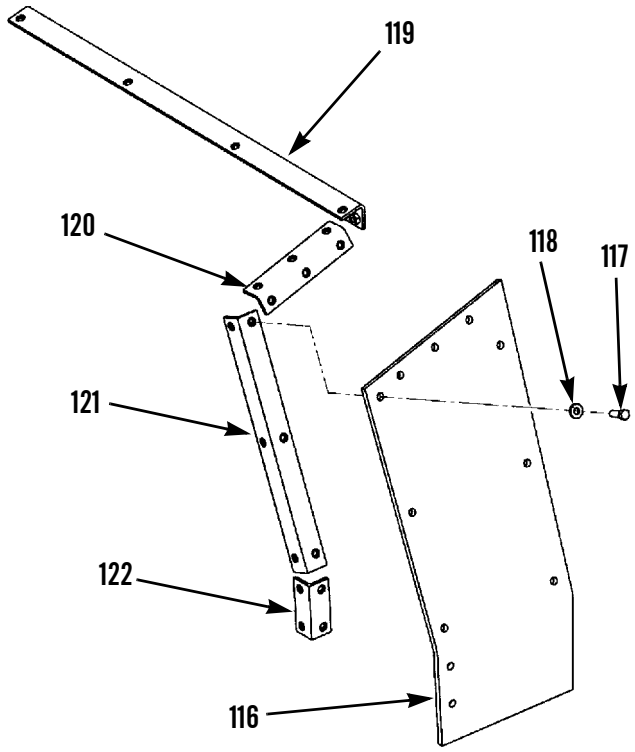
NOTE

Use a suitable lifting device when installing the following components:

- **Hydraulic tank front cover weighs approximately 75 lb (34 kg).**
- **Hydraulic tank side cover weighs approximately 196 lb (89 kg).**
- **Hydraulic tank louvered panel weighs approximately 141 lb (64 kg).**
- **Hydraulic tank louvers cover weighs approximately 60 lb (27 kg).**
- **Hydraulic tank top cover weighs approximately 121 lb (55 kg).**

a. Install hydraulic tank front cover (116) with three bolts (117) (1/2 x 1-1/2 in.) and washers (118).

b. Install hydraulic tank covers mounting brackets (119, 120, 121 and 122) with 12 bolts (117) and washers (118).



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INSTALLATION OF ARMOR PACKAGE - CONTINUED **0228 00**

INSTALLATION - CONTINUED

c. Install hydraulic tank side cover plate (123) with seven bolts (117), washers (118), and two nuts (124).

d. Install hydraulic tank sight gage cover (125) with two bolts (117) and washers (118).

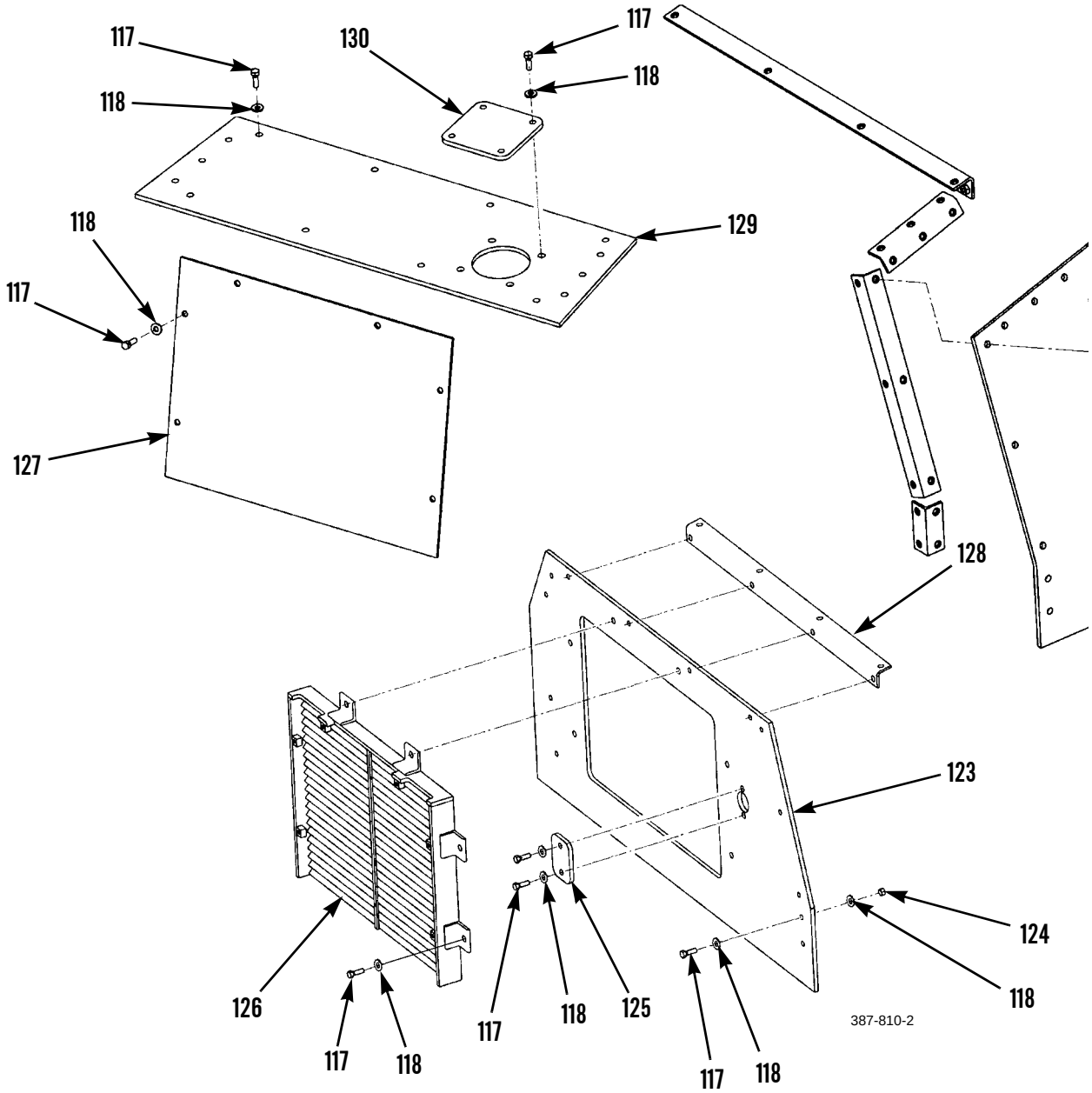
e. Install hydraulic tank louvered panel (126) with six bolts (117) and washers (118).

f. Install hydraulic tank panel cover (127) with six bolts (117) and washers (118).

g. Install hydraulic tank side cover top bracket (128) with four bolts (117) and washers (118).

h. Install hydraulic tank top cover (129) with 11 bolts (117) and washers (118).

i. Install hydraulic tank fill cap access cover (130) with four bolts (117) and washers (118).

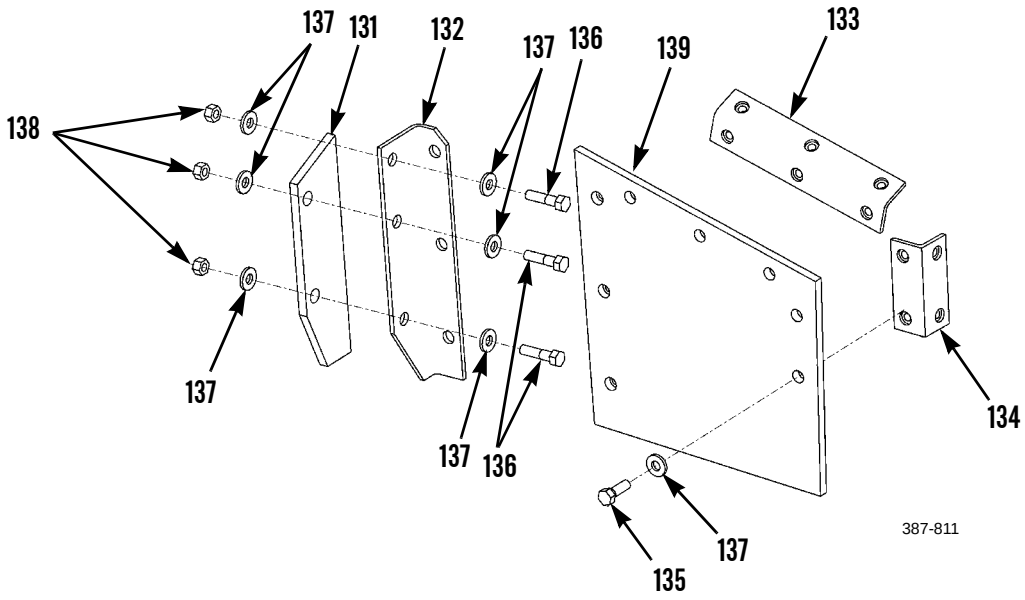


INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED

j. Install hydraulic tank rear cover mounting brackets (131, 132, 133 and 134) with five bolts (135), three bolts (136), eleven washers (137) and three nuts (138).

k. Install hydraulic tank rear cover (139) with eight bolts (135) and washers (137).

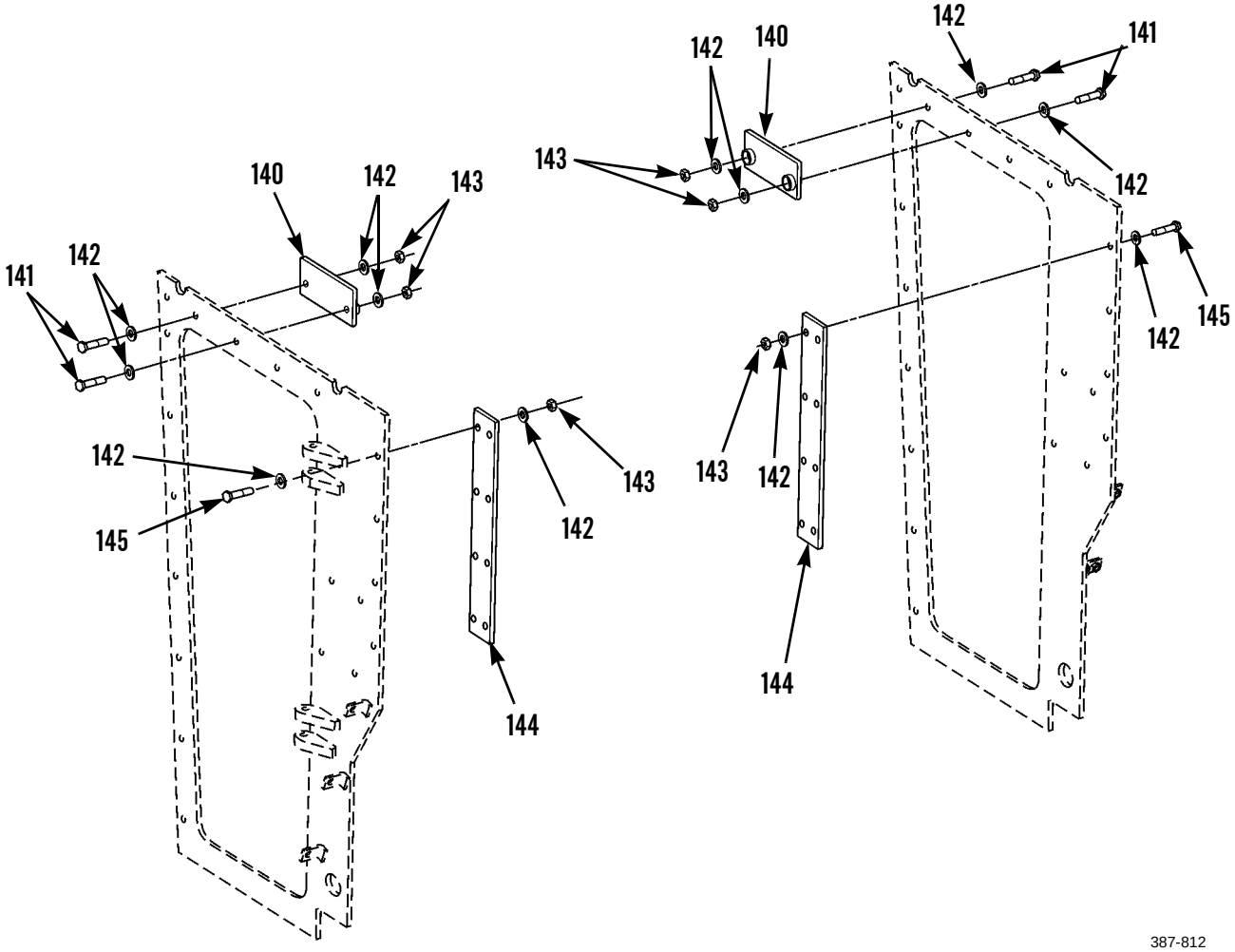


INSTALLATION - CONTINUED

8. **Installation of Inside Cab Door Frame Support Brackets.**

   a. Install left and right top door brackets (140) with two bolts (141), four washers (142) and two nuts (143) each bracket.

   b. Install left and right side door frame brackets (144) with eight bolts (145), 16 washers (142) and eight nuts (143) each bracket.



9. **Installation of Right Side Engine Covers and Guards.**

NOTE

Use a suitable lifting device when installing the following components:

- **Engine lower guard plate weighs approximately 141 lb (65 kg).**
- **Engine guard door frame plate weighs approximately 101 lb (46 kg).**
- **Engine guard door assembly weighs approximately 75 lb (34 kg).**

Refer to TM 5-2410-237-23P for 1991 MCAP-unique items.

a. Install right side engine guard plate (146) with one bolt (147) (3/8 x 2.0 in.), washer (148), two bolts (149) (5/8 x 2.0 in.) and washers (150).

INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

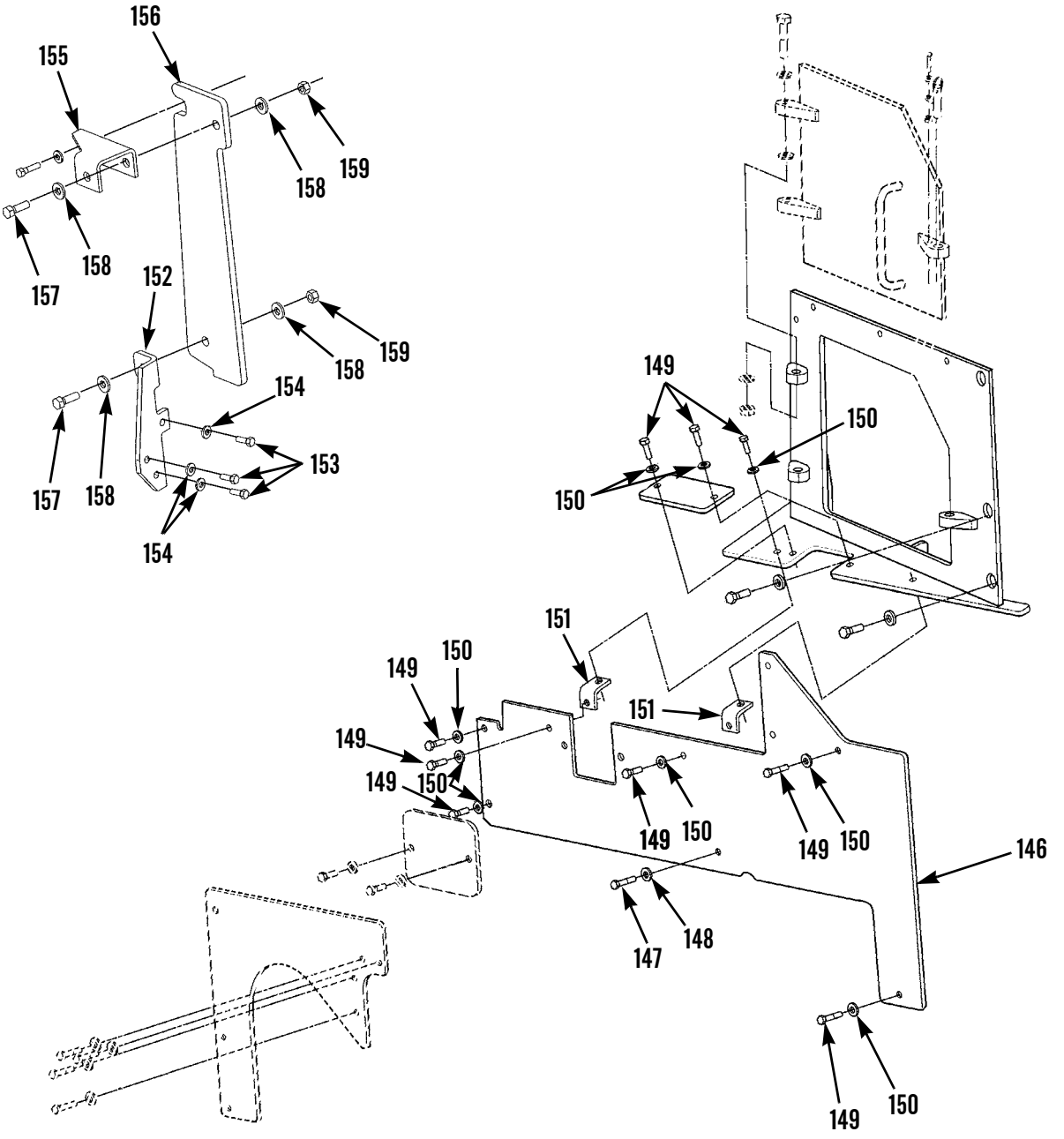
INSTALLATION - CONTINUED

b. Install two brackets (151) on right side engine guard plate (146) with one bolt (149) and washer (150) each bracket.

c. Install right rear guard mounting bracket (152) with three bolts (153) (3/8 x 1.0 in.) and washers (154).

d. Attach bracket (155) to rear guard plate (156) with bolt (157) (1/2 x 1-1/2 in.), two washers (158) and nut (159).

e. Install rear guard plate (156) with bracket (155) to bracket (152) with bolt (157) (1/2 x 1-1/2 in.), two washers (158) and nut (159).



INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED

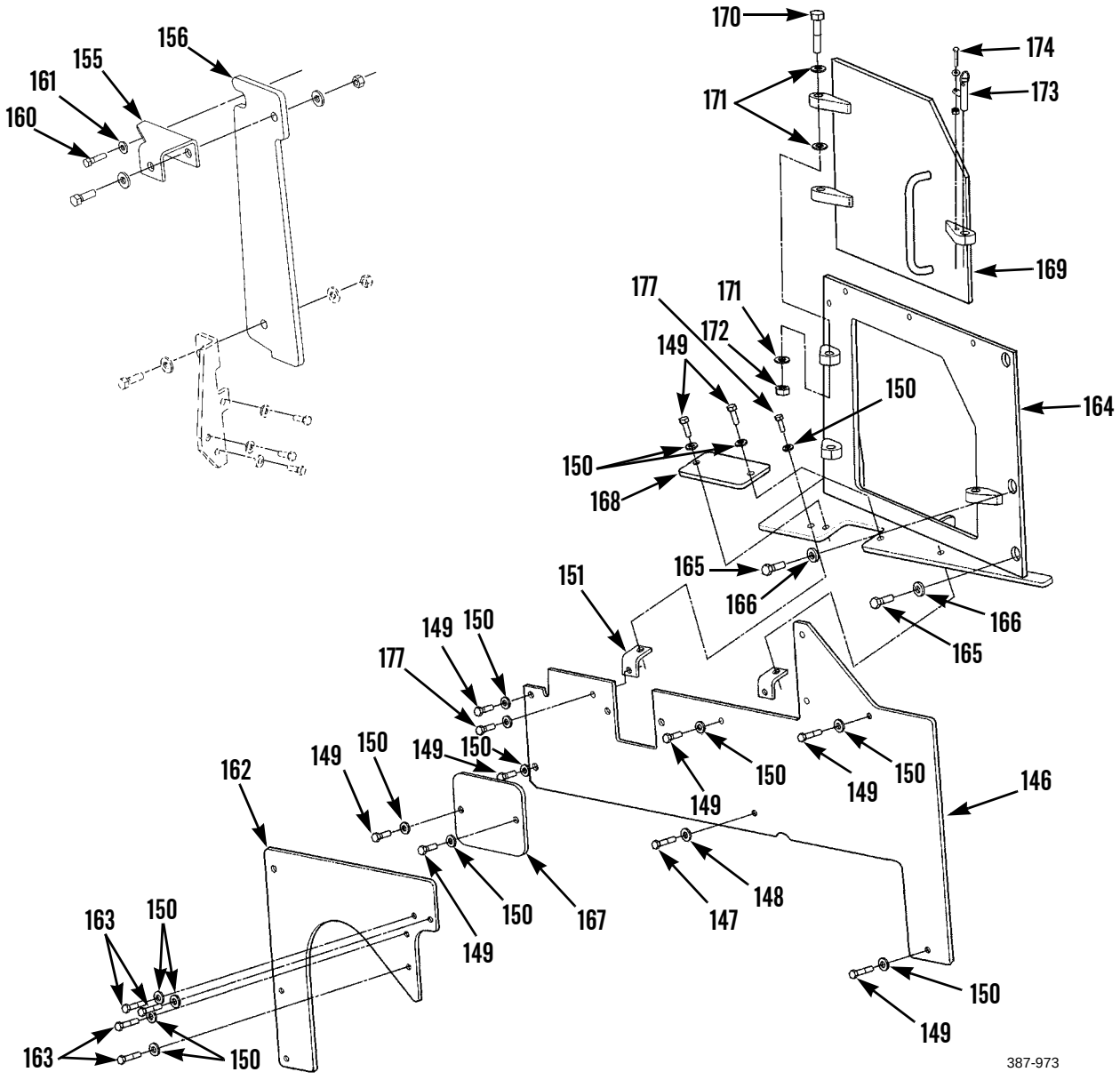
f. Attach bracket (155) to machine with bolt (160) (3/8 x 1-1/2 in.) and washer (161).

g. Install guard plate (162) with three bolts (163) (1/2 x 2-1/2 in.) and washers (150).

h. Install right engine door frame (164) with two bolts (165) (5/8 x 2.0 in.) and washers (166), and six bolts (149) and washers (150).

i. Reinstall light bracket removed in step 1b of *Installation of Radiator Guards*.

j. Install side plate access covers (167 and 168) with two bolts (149) and washers (150) each access cover.



INSTALLATION - CONTINUED

k. Install right side door assembly (169) with two bolts (170) (3/4 x 3-1/2 in.), washers (171) and nuts (172).

l. Install door locking pin (173) with bolt (174) (1/4 x 1-3/4 in.), washer (175) and nut (176).

m. Attach two brackets (151) to guard plate (146) and right engine door frame (164) with bolts (177) (1/2 x 1-1/2 in.) and washers (150).

10. **Installation of Left Side Engine Covers and Guards.**

NOTE

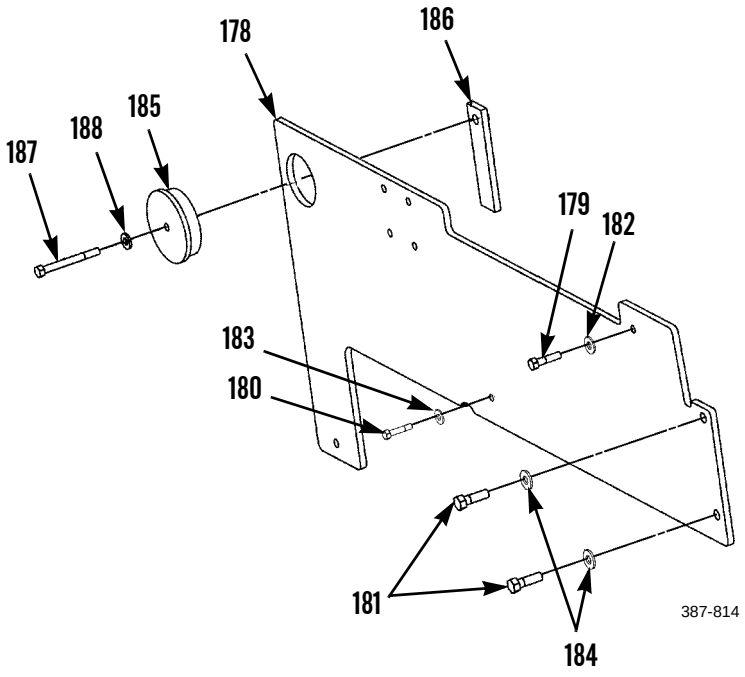
Use a suitable lifting device when installing the following components:

- **Engine lower guard plate weighs approximately 141 lb (65 kg).**
- **Engine guard door frame plate weighs approximately 101 lb (46 kg).**
- **Engine guard door assembly weighs approximately 90 lb (41 kg).**

Refer to TM 5-2410-237-23P for 1991 MCAP-unique items.

a. Install left side lower guard plate (178) with one bolt (179) (1/2 x 2.0 in.), one bolt (180) (3/8 x 2.0 in.), two bolts (181) (5/8 x 2.0 in.) and washers (182, 183 and 184).

b. Install retainer plate assembly (185) and mounting plate (186) in lower guard plate (178) with bolt (187) (1/2 x 4-3/4 in.) and washer (188).

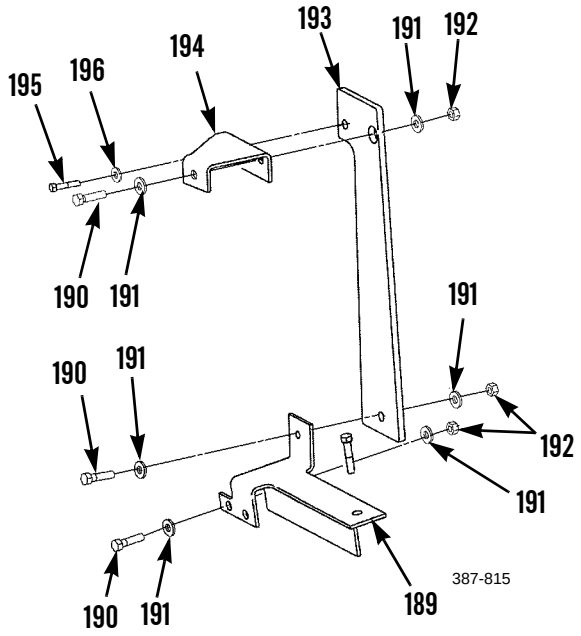


INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED

c. Install left rear engine guard mounting bracket (189) with three bolts (190) (1/2 x 2.0 in.), six washers (191) and three nuts (192).

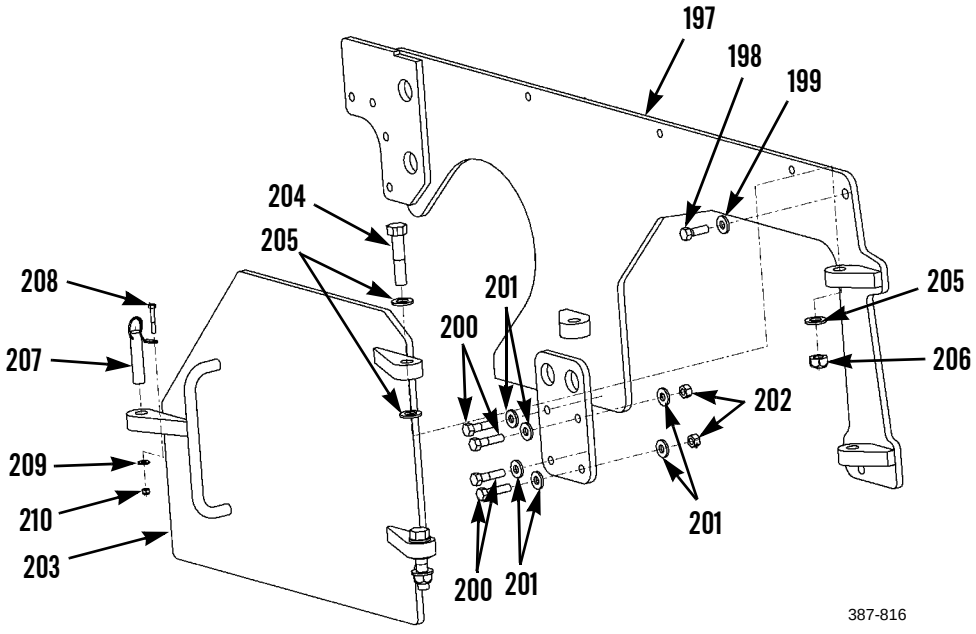
d. Install guard (193) and bracket (194) with two bolts (190), four washers (191) and nuts (192) and one bolt (195) and washer (196).



e. Install left side door frame plate (197) with four bolts (198) (1/2 x 1-1/2 in.) and washers (199), and four bolts (200) (1/2 x 1.0 in.), eight washers (201) and nuts (202).

f. Install engine guard left door (203) with two bolts (204) (3/4 x 3-1/2 in.), six washers (205) and two nuts (206).

g. Install door locking pin (207) with bolt (208) (1/4 x 1-3/4 in.), washer (209) and nut (210).



INSTALLATION - CONTINUED

11. **Installation of Left/Right Blade Lift Cylinder Guards.**

NOTE

Use a suitable lifting device when installing blade lift cylinder guards. Guards weigh approximately 201 lb (91 kg) each.

a. Install two brackets (211) and cylinder guard (212) on right side blade lift cylinder with four washers (213) and nuts (214).

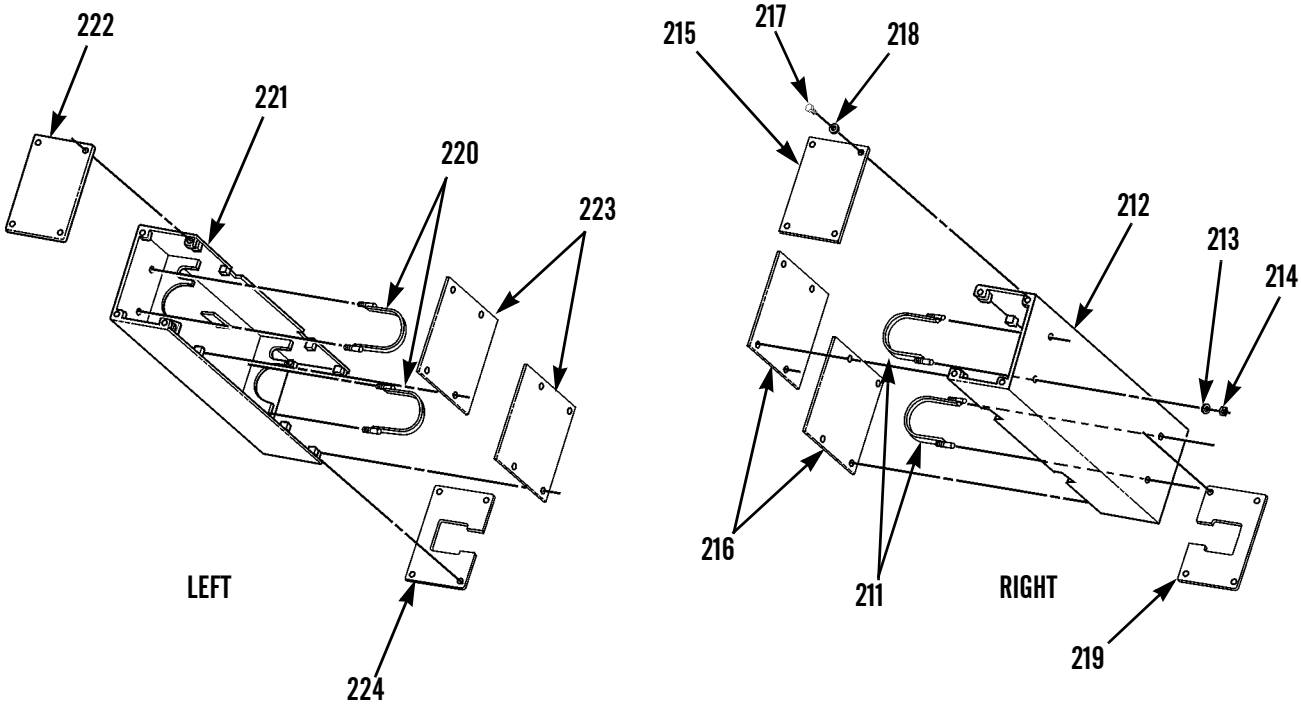
b. Install right cylinder guard top plate (215) and inner plates (216) with 12 bolts (217) (1/2 x 1-1/2 in.) and washers (218).

c. Install right cylinder guard bottom plate (219) with four bolts (217) and washers (218).

d. Install two brackets (220) and cylinder guard (221) on left side blade lift cylinder with four washers (213) and nuts (214).

e. Install left cylinder guard top plate (222) and inner plates (223) with eleven bolts (217) (1/2 x 1-1/2 in.) and washers (218).

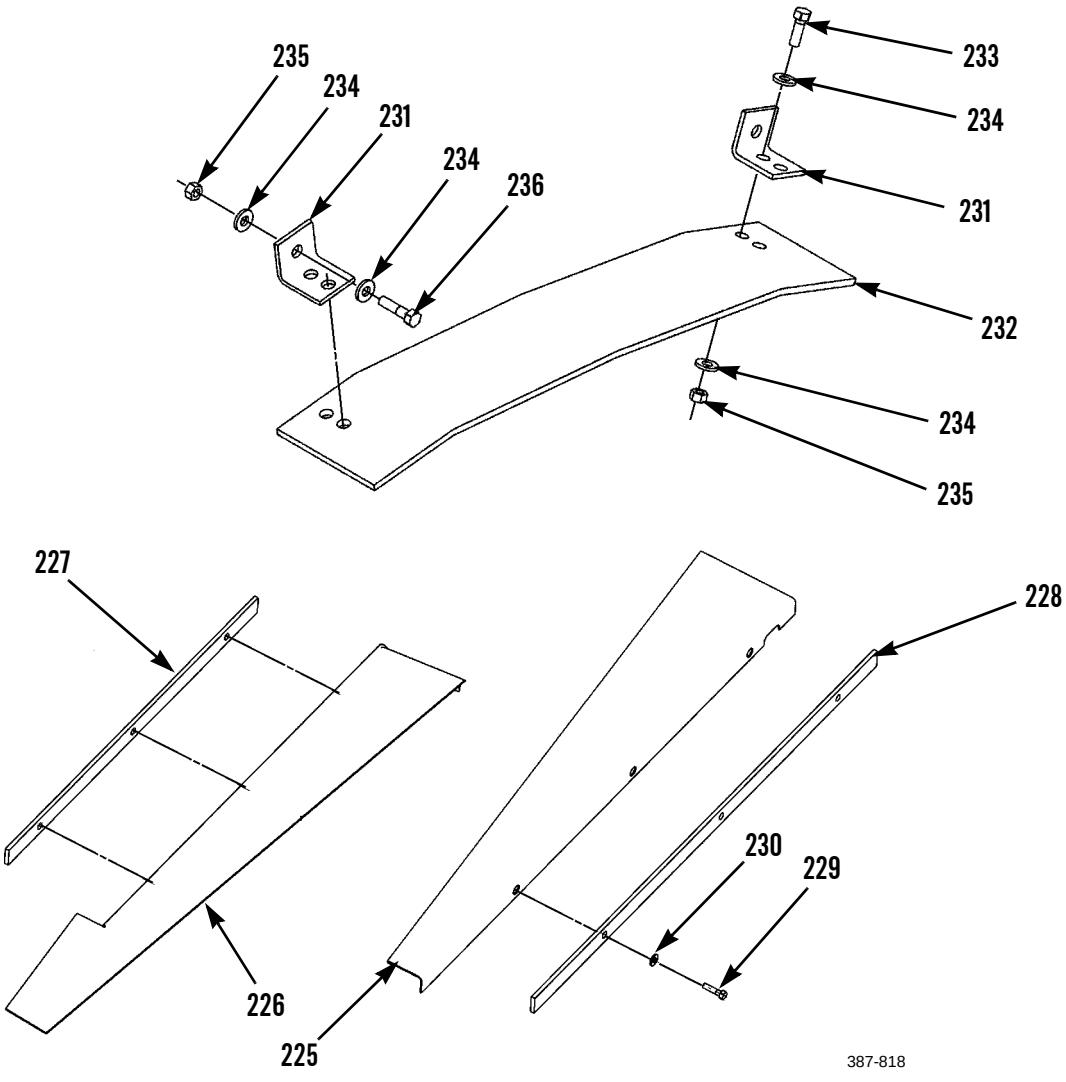
f. Install left cylinder guard bottom plate (224) with four bolts (217) and washers (218).



INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED

12. **Installation of Hood Screens and Guard.**
    a. Install left and right engine hood screens (225 and 226) and plates (227 and 228) with three bolts (229) and washers (230) on each side.
    b. Attach two brackets (231) to guard (232) with four bolts (233) (1/2 x 1-1/2 in.), eight washers (234) and four nuts (235).
    c. Install assembled guard (232) on engine hood with two bolts (236) (1/2 x 2.0 in.), four washers (234) and two nuts (235).



INSTALLATION - CONTINUED

13. **Installation of Cab Front Vent Cover and Locking Handle.**

NOTE

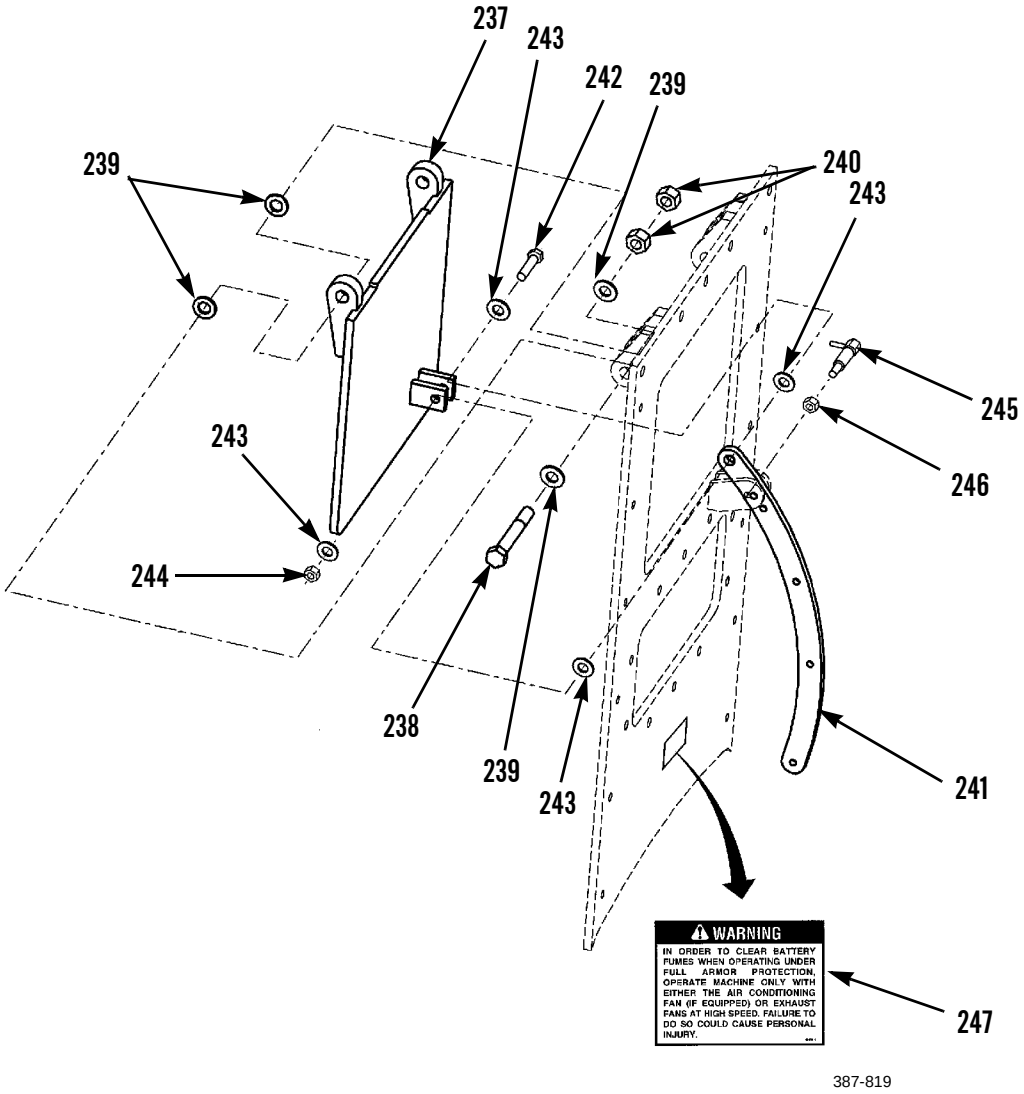
Hinge bolts require double nuts.

a. Install front vent cover (237) on outside of cab front with two hinge bolts (238) (3/4 x 5-3/4 in.), four washers (239) and four nuts (240).

b. Attach locking handle (241) to vent cover (237) with bolt (242), four washers (243) and nut (244).

c. Connect locking handle (241) to locking bracket inside cab with locking plunger detente (245) and nut (246).

d. Attach warning decal (247) inside cab below vent cover opening.



387-819

INSTALLATION - CONTINUED

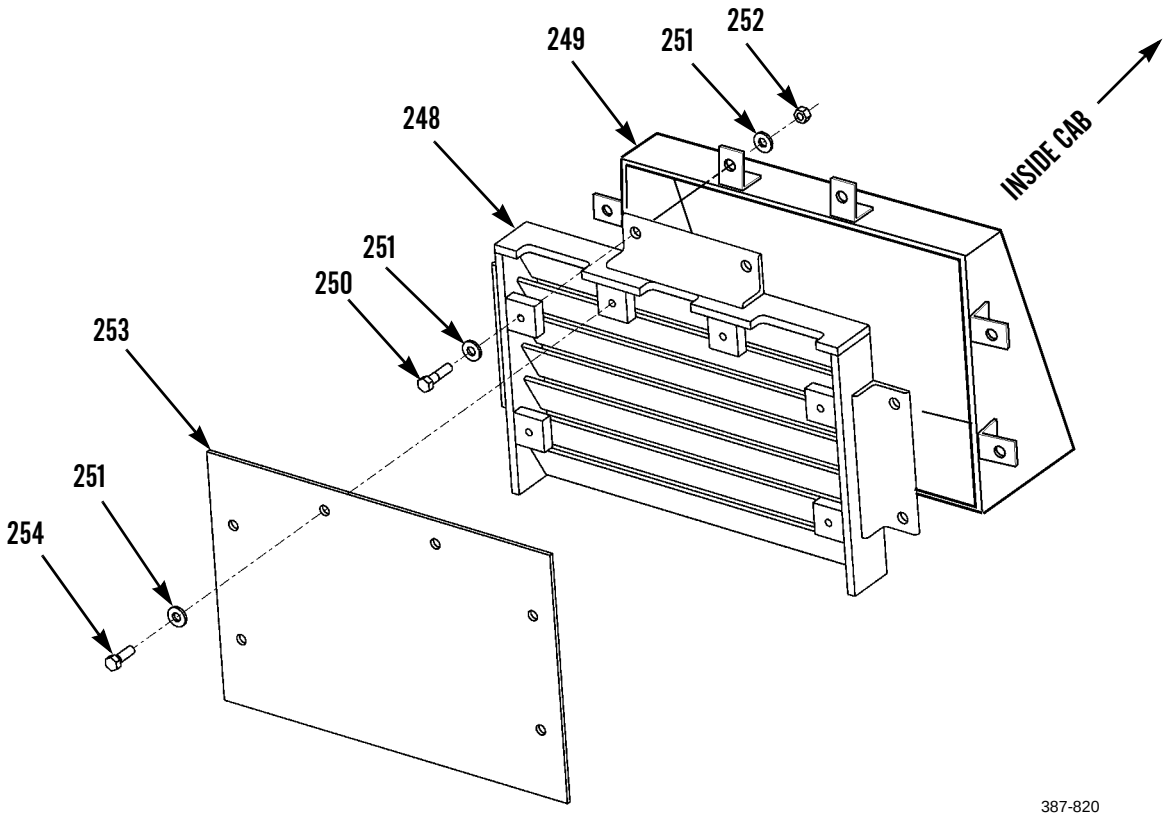
14. **Installation of Cab Rear Louver Assembly.**

NOTE

Use a suitable lifting device when installing cab rear louver assembly. Louver assembly weighs approximately 71 lb (32 kg).

a. Install rear louver (248) and fan case assembly (249) to inside rear wall of cab with six bolts (250) (1/2 x 2.0 in.), 12 washers (251) and six nuts (252).

b. Install rear louver cover (253) from outside of cab to louver assembly with six bolts (254) (1/2 x 1-1/2 in.) and washers (251).



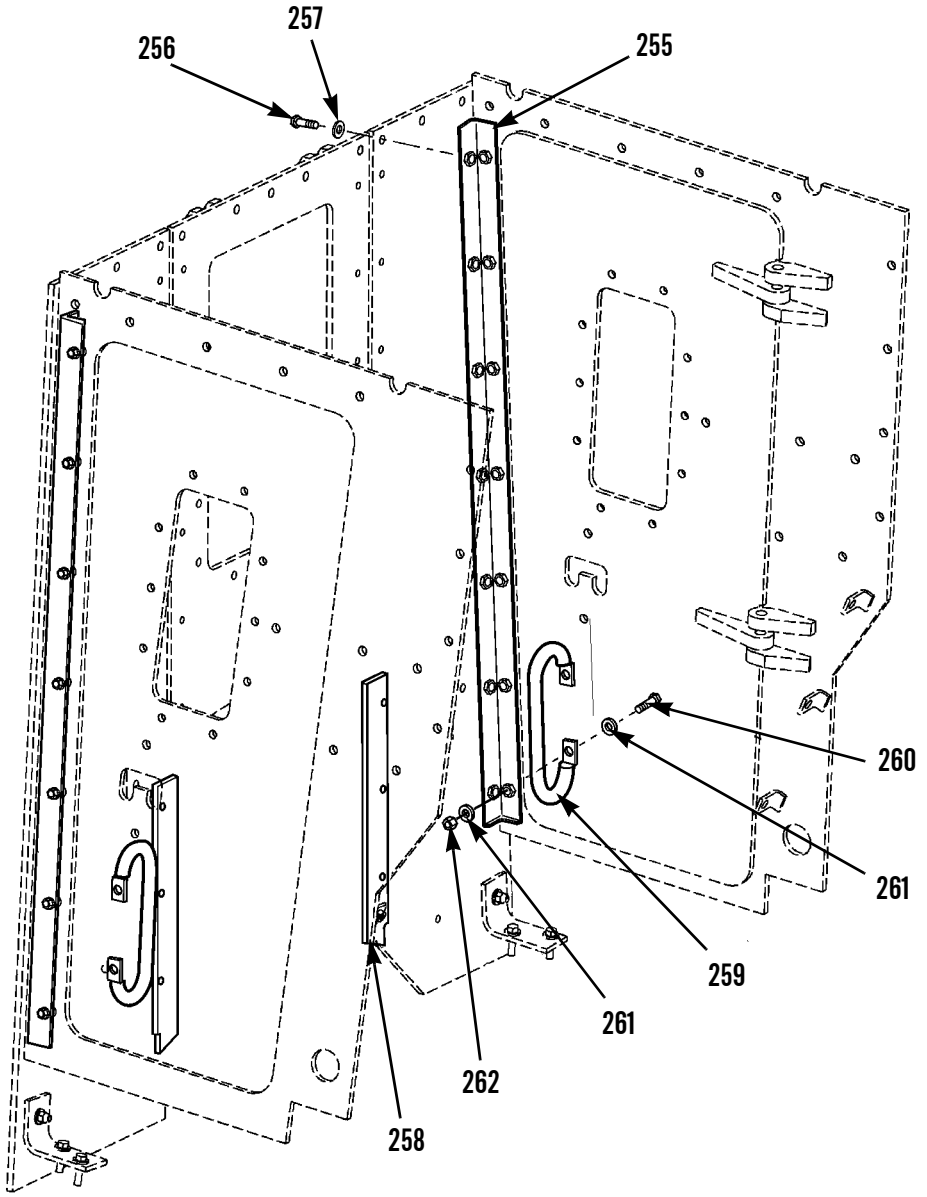
INSTALLATION - CONTINUED

15. **Installation of Interior and Exterior Brackets and Handles.**

    a. Install front left and right interior corner brackets (255) with 28 bolts (256) (1/2 x 1-1/2 in.) and washers (257).

    b. Remove dash panel upper cover and set aside. Install two back strips (258), one on each side of dash, with six bolts (256) and washers (257).

    c. Install left/right interior and exterior door handles (259) with four bolts (260), eight washers (261) and four nuts (262).



387-821

INSTALLATION OF ARMOR PACKAGE - CONTINUED 0228 00

INSTALLATION - CONTINUED

16. **Installation of Left and Right Door Latch.**

    a. Install bracket (263) to outside cab wall with two bolts (264) (1/2 x 1-1/2 in.), four washers (265) and two nuts (266).

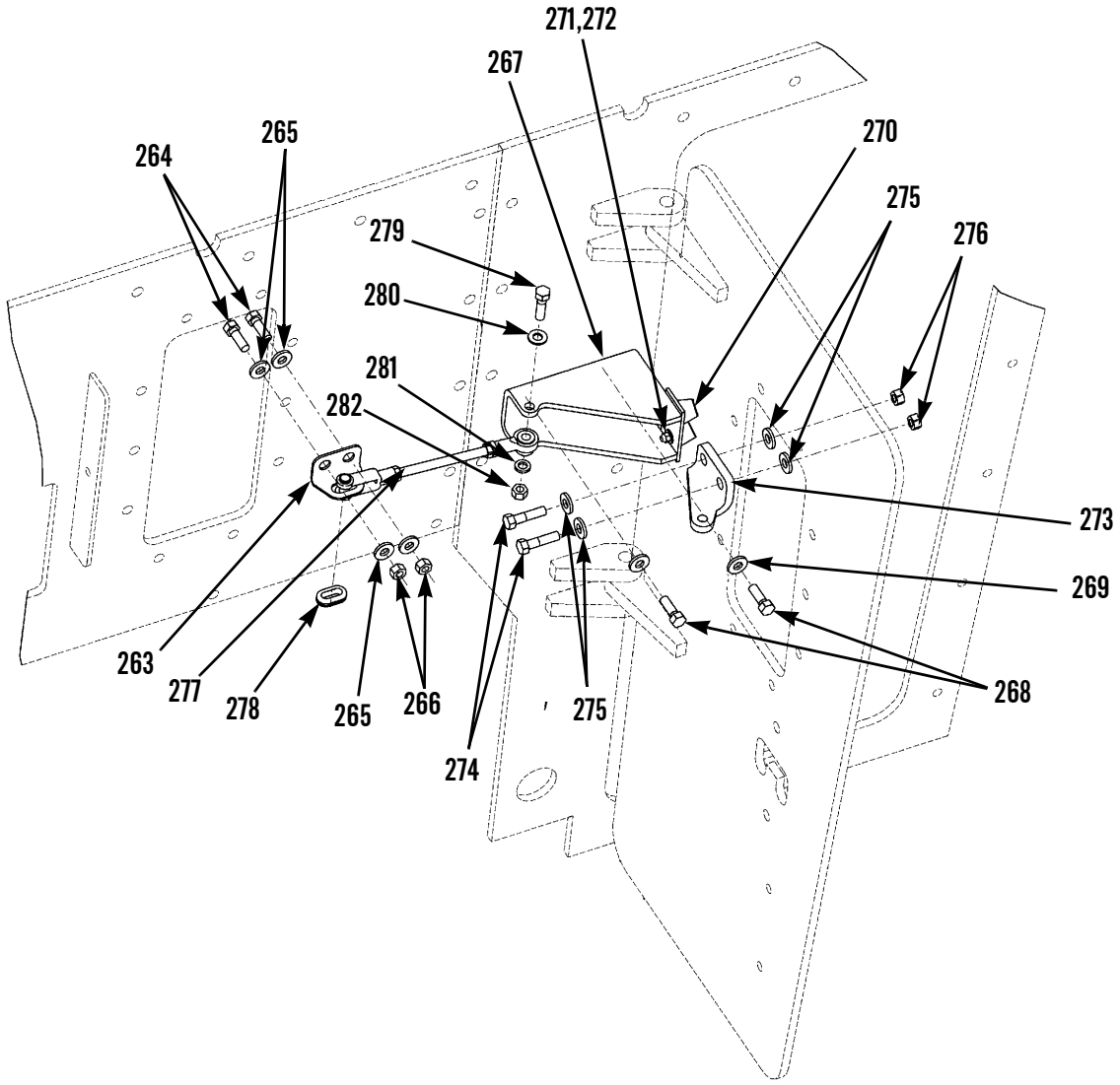
    b. Install door stop bracket (267) to outside of cab wall with two bolts (268) (1/2 x 1-1/2 in.) and washers (269).

    c. Install door bumper (270) on stop bracket (267) with two washers (271) and nuts (272).

    d. Install door hold open bracket (273) with two bolts (274) (1/2 x 2.0 in.), four washers (275) and two nuts (276).

    e. Install assembled door hold open rod (277) between cab mounted bracket (263) with grommet (278) and bolt (279) (1/2 x 3/4 in.), flatwasher (280), lockwasher (281) and nut (282).

    f. Adjust door hold open rod (277) as required to secure door(s) open position.



387-822

INSTALLATION - CONTINUED

17. **Installation of Cab Windows.**

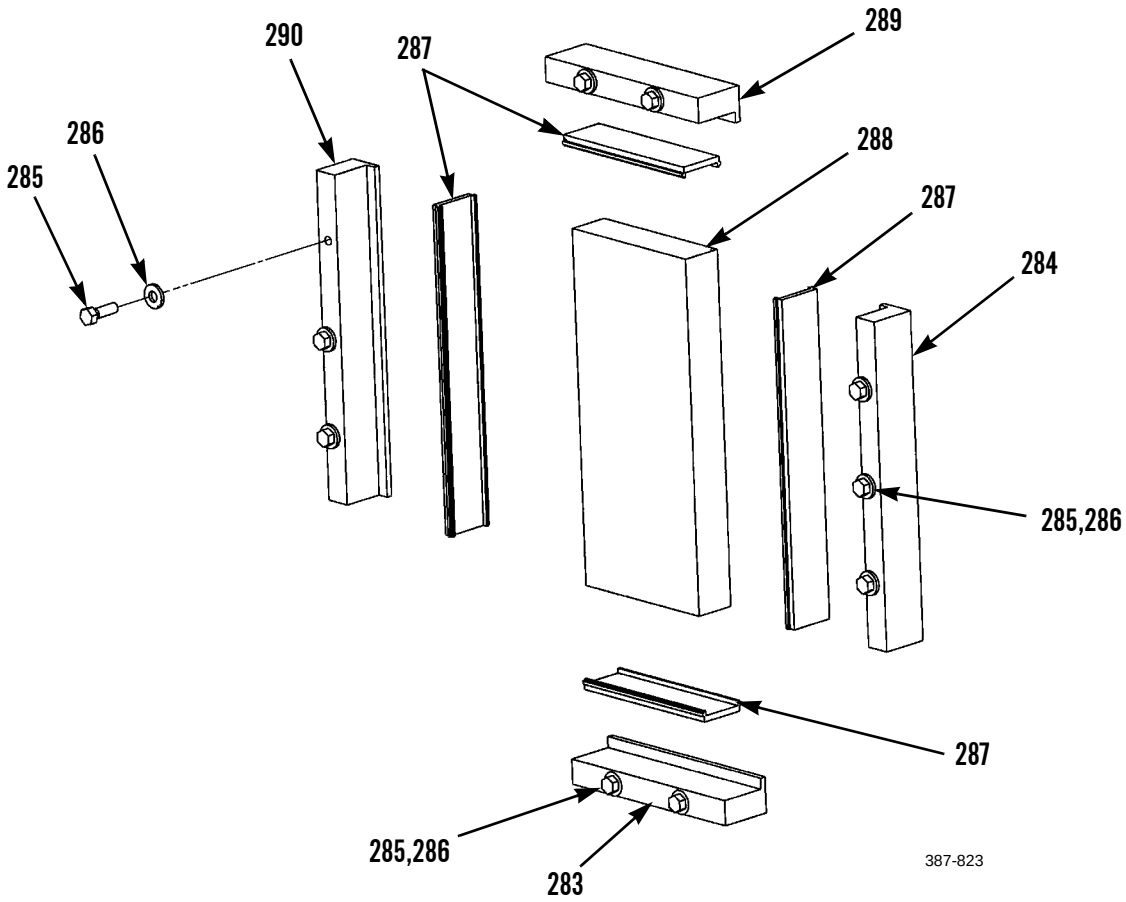
NOTE

- **2004 MCAP Armor Kit has larger front and side windows that require four each side frames and twelve bolts and washers.**
- **Threat side of glass must face to outside of operator area. If glass panel is not labeled, threat side has a thinner outer panel.**
- **Thread lock sealing compound may be applied to mounting bolts during installation. Bolts will be torqued at completion of this step.**
- **Window frames must be installed loosely and then tightened corner to corner and side to side to allow glass panels to center within frame work.**
- **After installation of glass panels and frames, tighten mounting bolts to 50 lb-ft (68 Nm).**

a. Install lower window frame (283) and side frames (284) with five bolts (285) and washers (286).

b. Place molding (287) around glass (288) and install in place.

c. Install upper window frame (289) and side frames (290) with five bolts (285) and washers (286).



INSTALLATION - CONTINUED

18. **Installation of Cab Recirculating Fan and Cab Fresh Air Intake Fan (1991 and 1996 MCAP Kits).**

WARNING

Turn battery disconnect switch to OFF before working on any electrical system component. Failure to follow this warning could result in personal injury or damage to equipment.

a. Ensure battery disconnect switch is in OFF position (TM 5-2410-237-10).

b. Install recirculating fan assembly (291) to cab mounted bracket with four bolts (292) (1/2 x 2-1/2 in.), washers (293) and nuts (294).

c. Install cab light (295) to cab mounted bracket with two nuts (296) and washers (297).

d. Install assembled wiring harness (298) (dash-to-fan) from dash panel, up and over right side door to right rear window. Secure harness in place with clips (299) and existing nuts. Evenly space clips to secure harness in place. Install grommet (300) on harness at dash panel end.

e. Install fresh air intake fan assembly (301) on fan case assembly (249) with six bolts (302) and washers (303). Install fan harness bracket (304) at upper left corner mounting bolt.

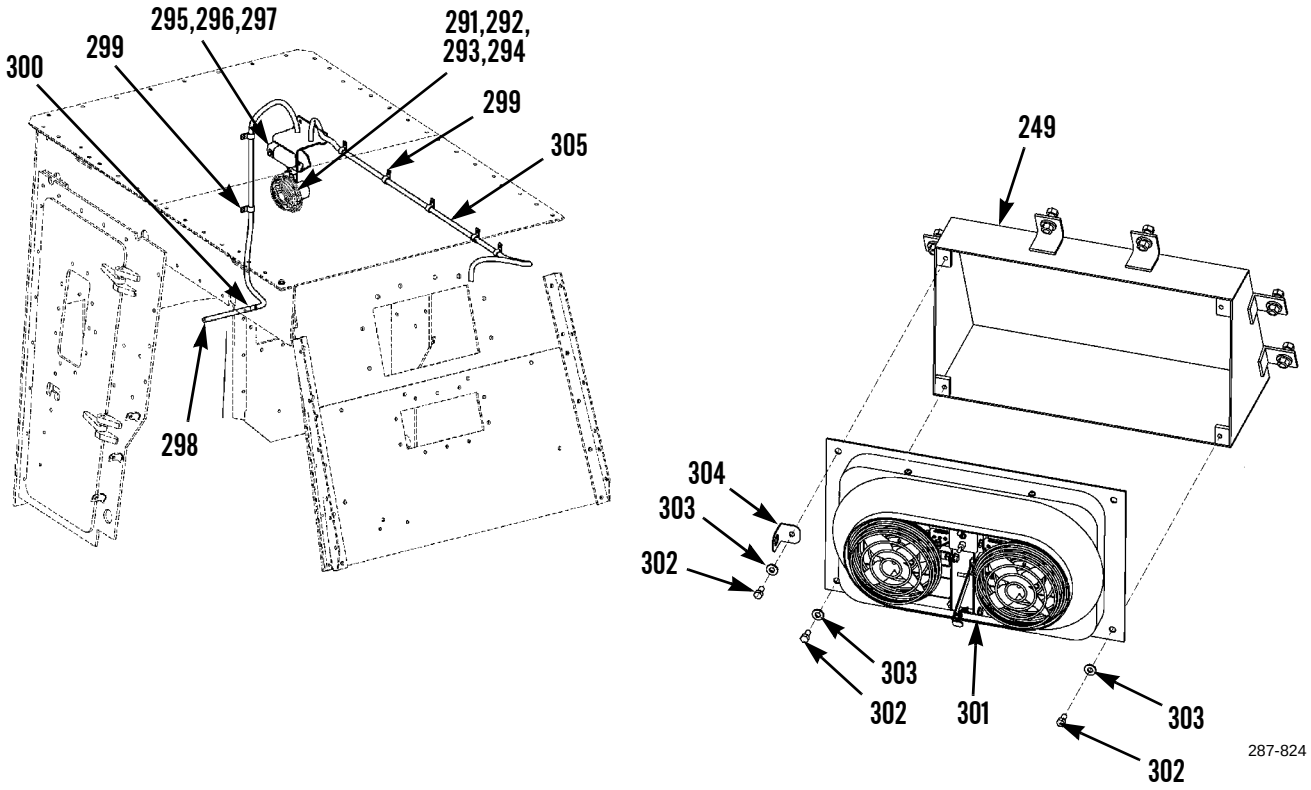
f. Install assembled wiring harness (305) (recirculating fan-to-fresh air intake fan) from fan around to rear of cab above rear window. Secure harness in place with clips (299) and existing nuts. Evenly space clips to secure harness in place.

g. Connect harness (305) to electrical connector on fresh air intake fan assembly (301).

h. Connect harness (298) electrical connectors to recirculating fan assembly (291) and cab light (295).

i. Connect BLACK wire of harness (298) to a good ground at dash panel. Connect RED wire to POSTIVE post of ammeter. Reinstall dash panel upper cover with bolts and washers removed in step 15b, *Installation of Interior and Exterior Brackets and Handles*.

INSTALLATION - CONTINUED



INSTALLATION - CONTINUED

19. **Assembly and Installation of Fresh Air Intake Fan Group (2004 MCAP Kit).**

a. Assemble Fresh Air Fan Group.

(1) Connect fan harness (306) to fan (307).

NOTE

Note color and position of each connector blade.

(2) Install three-bladed connector (308) on harness (306).

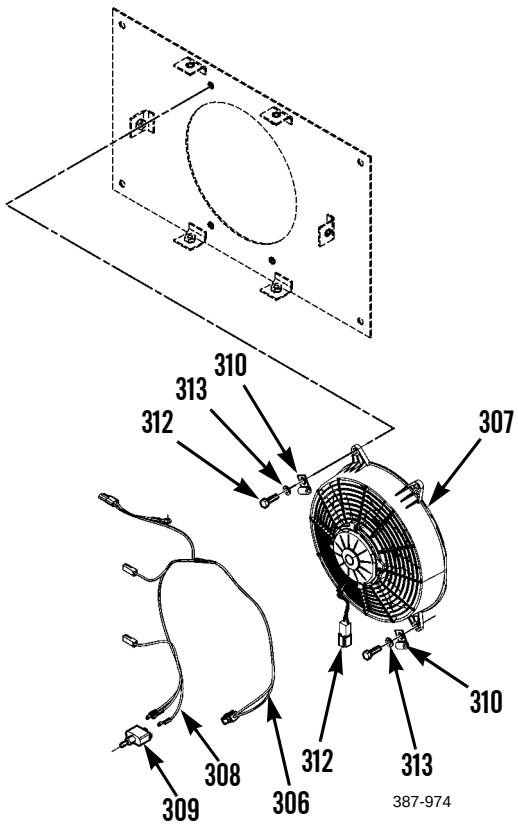
(3) Install fan motor switch (309) on harness connector (308) with three screws provided with switch. Ensure wire colors and switch match.

(4) Install three clips (310) on fan harness (306), position harness with clips and fan (307) at two top threaded mounting holes. Secure fan, harness, and clips in place on mounting plate (311) with two bolts (312) and washers (313).

(5) Install bolt (312), washer (313), and clip (310) in lower right side threaded mounting hole, to secure fan (307) and harness (306) to mounting plate (311).

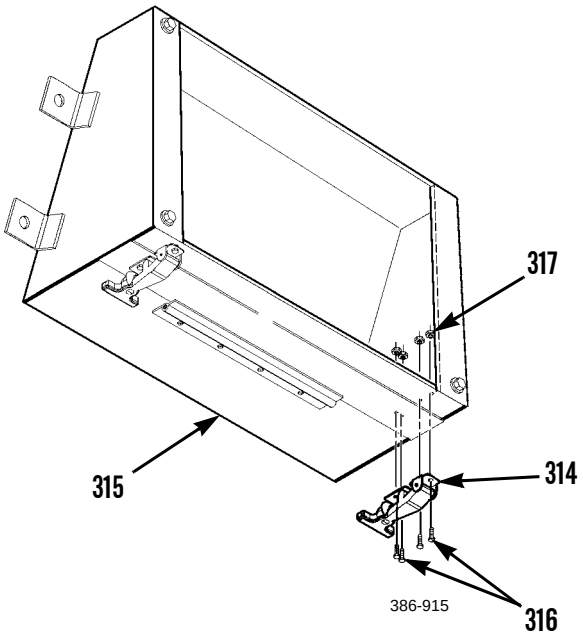
(6) Install bolt (312) and washer (313) in remaining mounting hole to secure fan (307) to mounting plate (311).

(7) Tighten four bolts (312) to 48 lb-in. (5 Nm).



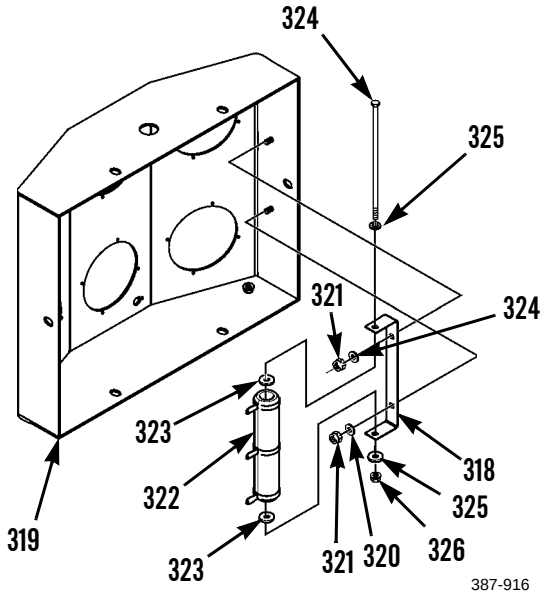
INSTALLATION - CONTINUED

(8) Install two latches (314) on case assembly (315) with eight screws (316) and washers (317).



(9) Install resistor bracket (318) on inside of shroud (319) with two washers (320) and locknuts (321).

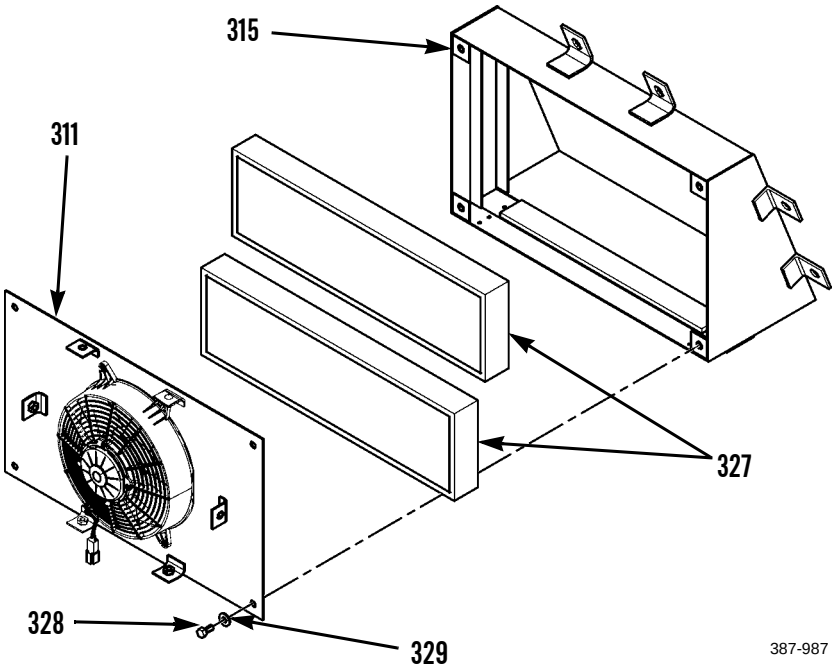
(10) Install resistor (322) on bracket (318) with two rubber washers (323), bolt (324), two washers (325), and nut (326). Tighten bolt and nut until resistor is secure between rubber washers.



INSTALLATION - CONTINUED

(11) Install two filters (327) in case assembly (315).

(12) Install mounting plate (311) with fan (307) on case assembly (315) with four bolts (328) and washers (329). Tighten bolts to 35 lb-ft. (47 Nm).



(13) Place shroud (319) close enough to case assembly (315) to make harness connections.

(14) Connect fan harness (306) resistor connectors to upper and lower resistor (322) connectors blades.

(15) Route fan harness (306) power lead and ground lead through center hole in top of shroud (319).

(16) Route fan harness (306) ON/OFF switch (330) through hole in front of shroud (319). Adjust position and secure switch with jam nuts and lockwashers provided with switch.

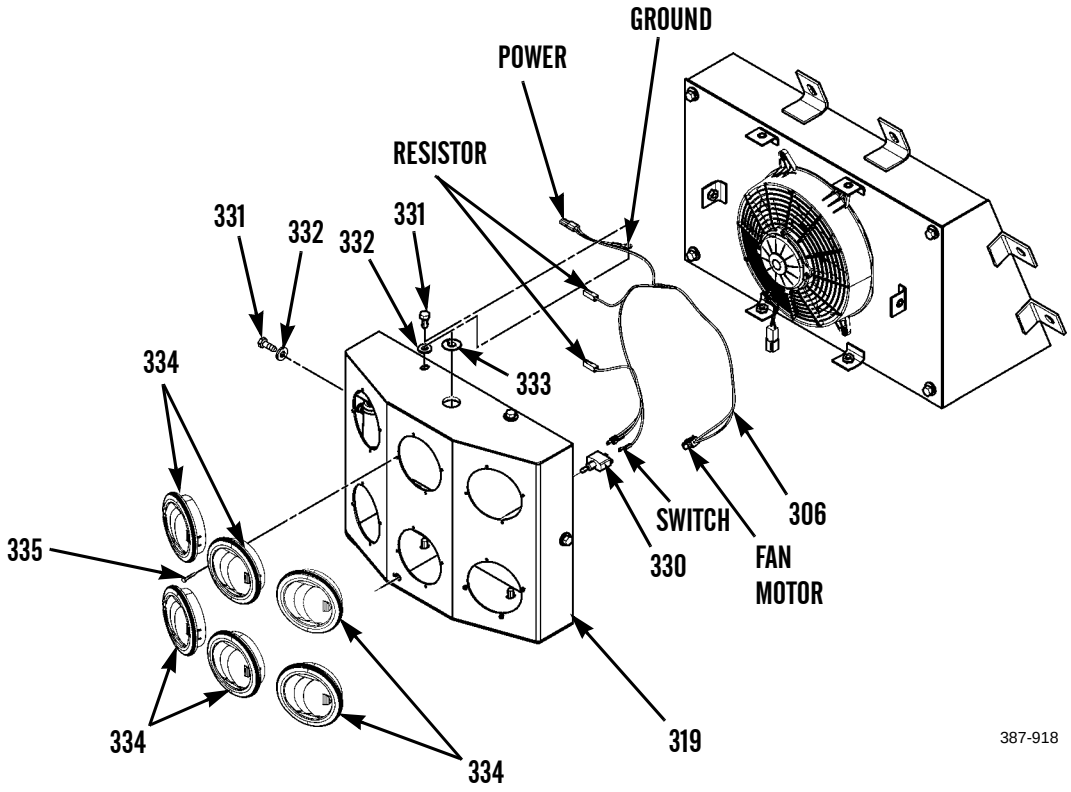
(17) Attach shroud (319) to case assembly (315) with six bolts (331) and washers (332). Attach fan harness (306) ground lead to mounting bolt located at top left of case assembly.

(18) Tighten bolts (331) to 35 lb-ft. (47 Nm).

(19) Install grommet (333) on fan harness (306) at top of shroud (319).

(20) Install six louvers (334) in shroud (319) with four screws (335) each louver.

INSTALLATION - CONTINUED



b. Installation of Fresh Air Fan Group.

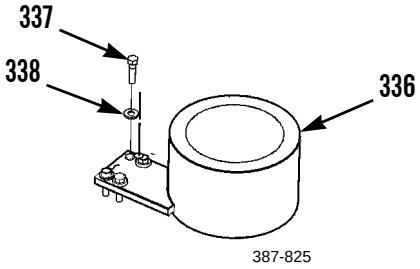
(1) Install fresh air fan group to inside rear wall of cab (Installation step 14, *Installation of Cab Rear Louver Assembly*).

(2) Connect fan harness (306) power connector to cab harness (305).

20. **Installation of Radiator Cap Guard and Front Grabhandles.**

a. Install radiator cap guard (336) with four bolts (337) (3/8 x 1-1/2 in.) and washers (338).

b. Reinstall grabhandles previously removed from hood on cab front (WP 0159 00).



21. **Installation of Backup Alarm and Rear Lights.**

a. Reinstall backup alarm (WP 0098 00).

b. Reinstall and connect rear light (WP 0093 00).

INSTALLATION - CONTINUED

22. **Rear Bottom Guard Installation.**

WARNING

Ensure rear bottom guard is securely attached to hydraulic floor jack before attempting to install. If not secured, rear bottom guard can fall from floor jack and cause injury.

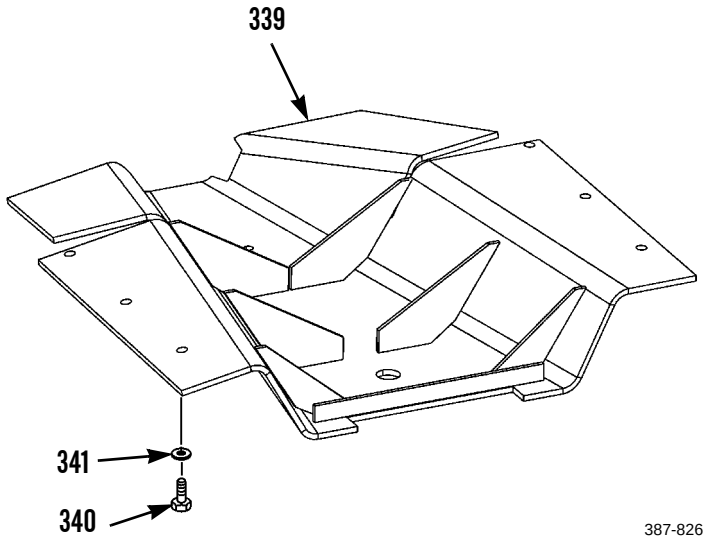
NOTE

- **Rear bottom guard weighs approximately 350 lb (159 kg).**
- **Apply sealing compound to all six bolts before installation.**

a. With rear bottom guard (339) positioned on hydraulic floor jack, raise guard into place and secure with six bolts (340) and washers (341).

b. Tighten rear bottom guard mounting bolts to 350 lb-ft (475 Nm).

c. Remove floor jack from under machine.



END OF WORK PACKAGE

INSTALLATION OF MINE CLEARING RAKE (MCR) EAR TO BULLDOZER BLADE MOLDBOARD 0229 00

THIS WORK PACKAGE COVERS

Introduction, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, welding (Item 108, WP 0250 00)

Lifting equipment, 5,000 lb capacity

Materials/Parts

Wood cribbing, 10-in.

References

TC 9-237

TM 43-0139

WP 0211 00

Personnel Required

Three

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.**
- **Ground guide assistance is required when positioning machine to rake assembly, to prevent injury to personnel or damage to equipment.**

NOTE

- **Required lifting capacity for rake assembly is 5,000 lb (2270 kg).**
- **A certified welder is required.**

INTRODUCTION

1. **Positioning of Bulldozer Blade Moldboard.**
   a. Blade tilt adjustable brace on left pusharm should be at midrange. Length of brace should be 52.6 in. (133.6 cm) (WP 0211 00).
   b. Tilt cylinder on right side pusharm should be in rearmost pin mounting position.
2. **Positioning of Rake Assembly.**
   a. Remove rake assembly from its transport or storage configuration.
   b. Unfold rake assembly and install all retaining pins, bolts, and self-locking nuts.
   c. Lift rear of rake assembly and place one 10 in. (25.4 cm) high block under each hook mounting bracket. Lower rake onto blocks.

INSTALLATION OF MINE CLEARING RAKE (MCR) EAR TO BULLDOZER BLADE MOLDBOARD - CONTINUED

0229 00

INTRODUCTION - CONTINUED

3. **Suitable Welding Processes.**

NOTE

Refer to TC 9-237, *Operators Circular for Welding Theory and Applications* for further welding instructions.

a. Use low-hydrogen process with minimum yield strength of 60,000 psi (413,700 kPa) and 0.5 in. (12 mm) all around weld.

b. For Manual Metal Arc Welding, use AWS 7018 electrode.

c. For Shielded Metal Arc Welding, use AWS ER70 S1, S2 or S3 electrodes.

INSTALLATION

1. **Aligning Machine to Rake Assembly.**

a. Place rake locking hooks (1) in open position, by removing retaining bolts (2). Rotate hook to open position. Reinstall bolts to prevent loss.

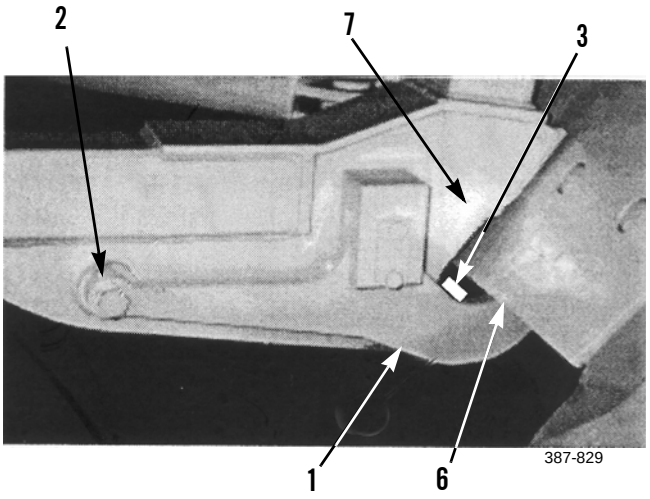
b. Place a 0.25 in. (6 mm) spacer (3) on each locking hook (1) and temporarily secure spacer with tape.

c. With assistance of a ground guide, move machine slowly toward rear of rake assembly.

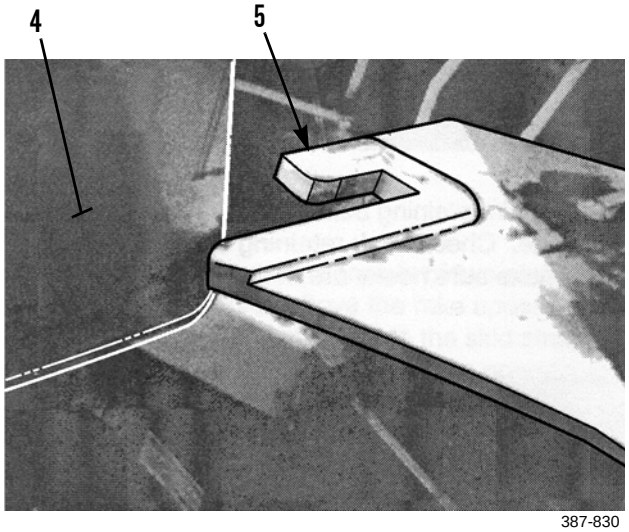
d. Align right hand side of moldboard end plate (4) with slotted guide plate (5) on rake. Keep moving until cutting edge (6) contacts rake push pad (7).

e. Remove hook retaining bolts (2) and rotate hooks (1) to closed position. Reinstall hook retaining bolts.

f. Slowly lower blade until cutting edge (6) contacts spacers (3). Maintain contact with both spacers until fit-up process is completed.



387-829



387-830

2. **Measuring and Fitting Mounting Ears to Machine.**

a. Install mounting ear (8) to each side of rake assembly with retaining pin (10), bolt (11) and locknut (12).

b. Inspect both mounting ears (8). Measure and record the greater stand-off distance (if any) between mounting ear and face of moldboard (9).

INSTALLATION OF MINE CLEARING RAKE (MCR) EAR TO BULLDOZER BLADE MOLDBOARD - CONTINUED 0229 00

INSTALLATION - CONTINUED

c. Remove mounting ear (8) with the least stand-off, by removing locknut (12), bolt (11) and retaining pin (10).

d. Reposition rake assembly and/or machine to close gap between mounting ear (8) and moldboard (9).

NOTE

It may be necessary to lift or lower rear of rake assembly to properly install mounting ear retaining pins.

e. Trim removed mounting ear (8), as required, by grinding.

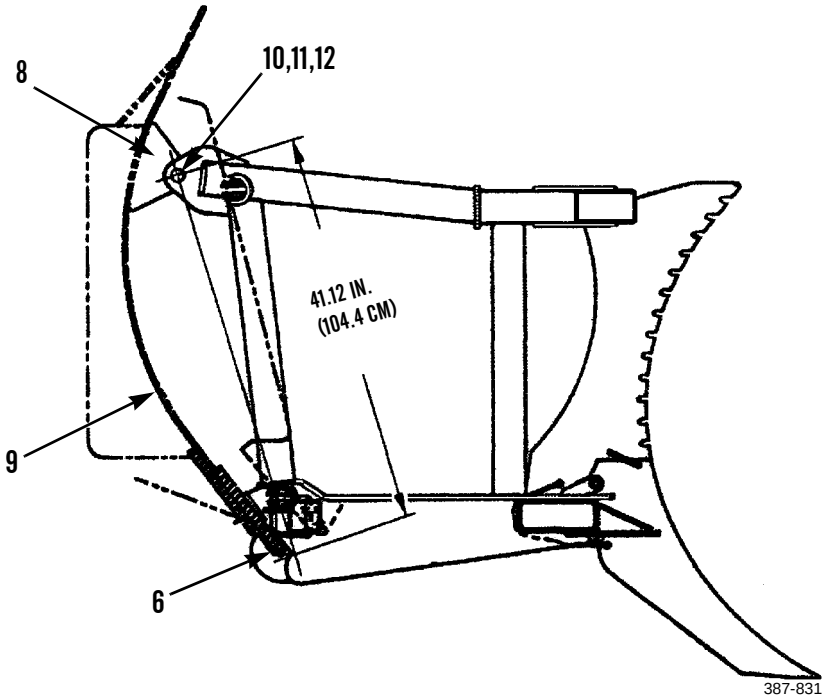
f. Reinstall mounting ear (8) with retaining pin (10), bolt (11) and locknut (12).

g. With rake mounting ears (8) and retaining pins (10) installed, and before welding, recheck contact points between mounting ears and moldboard (9). Also check cutting edge (6) and locking hook (1) alignment. Adjust and reposition as required.

h. Measure distance between cutting edge (6) and center of mounting ear pin (12). This dimension should be 41.12 in. (104.4 cm).

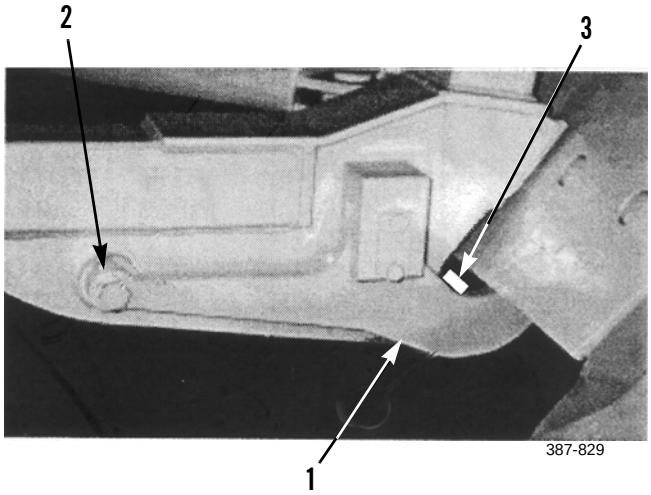
i. When positioning and measurements are correct, clean weld area and tack weld connecting ears (8) to moldboard (9).

j. Disconnect rake assembly from moldboard (9) by removing mounting ear locknuts (12), bolts (11) and retaining pins (10).



INSTALLATION - CONTINUED

k. Remove retaining bolts (2) and rotate rake locking hooks (1) to open position. Reinstall bolts to prevent loss.



3. **Welding Mounting Ears to Moldboard.**

NOTE

- **Refer to TC 9-237 for welding instructions.**
- **Refer to TM 43-0139, *Painting Instructors for Army Material*, for painting instructions.**

a. Completely clean area around mounting ears before welding.

b. Weld each mounting ear in place.

c. Clean welds and apply paint.

d. Remove spacers (3) from locking hooks.

END OF WORK PACKAGE

TACHOMETER DRIVE REPLACEMENT 0230 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Lockwasher (6)

O-ring (10)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

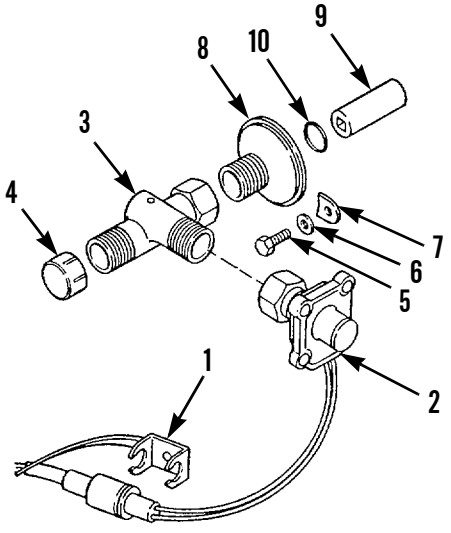
Battery disconnect switch in OFF position (TM 5-2410-237-10)

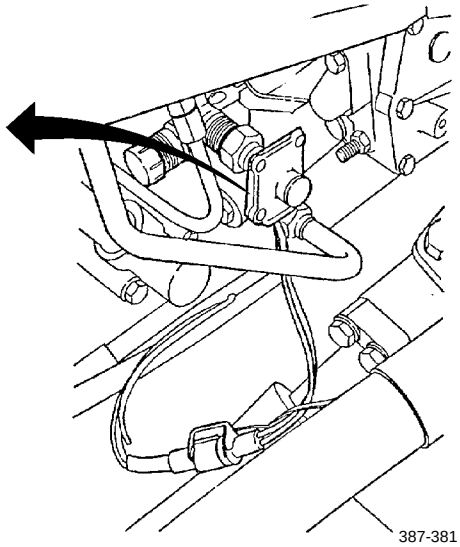
WARNING

Turn battery disconnect switch to OFF position before working on any electrical system component. Failure to follow this warning could result in injury or damage to equipment.

REMOVAL

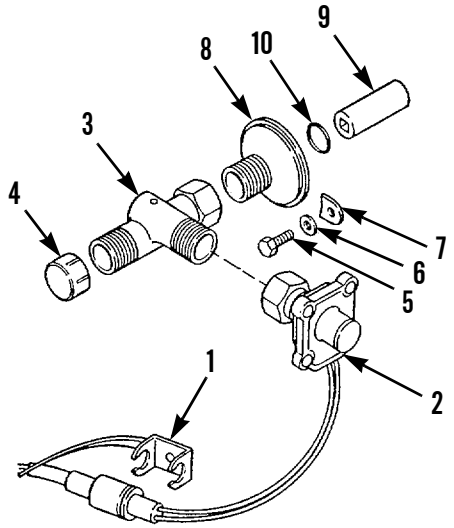
1. Remove clip (1) from STE-ICE connection. Disconnect connector of tachometer (2) from STE-ICE connector. Remove tachometer.
2. Remove tachometer adapter (3). If required, remove protective cap (4) from tachometer adapter.
3. Remove two bolts (5), lockwashers (6) and clamps (7) that hold adapter assembly (8) to governor. Slide adapter assembly off sleeve (9) and remove O-ring (10) from adapter assembly. Discard lockwashers and O-ring.
4. Slide sleeve (9) off cable from governor.

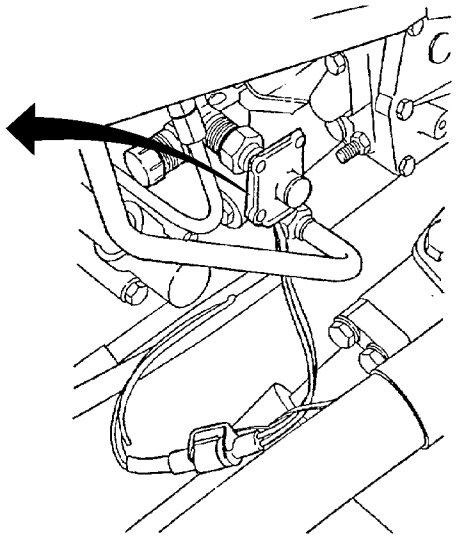




INSTALLATION

1. Slide sleeve (9) on cable at governor.
2. Install new O-ring (10) on adapter assembly (8). Slide adapter assembly over sleeve (9) and install two clamps (7), new lockwashers (6) and bolts (5).
3. If removed, install protective cap (4) on tachometer adapter (3). Install tachometer adapter.
4. Install tachometer (2) to angle drive end of tachometer adapter (3).
5. Connect tachometer (2) connector to STE-ICE connector. Secure connection with clip (1).
6. Turn battery disconnect switch to ON position (TM 5-2410-237-10).
7. Check tachometer for proper operation (TM 5-2410-237-10)





387-381

END OF WORK PACKAGE

ENGINE OIL PRESSURE GAGE REPLACEMENT 0231 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Materials/Parts - Continued

Tape, antiseizing (Item 38, WP 0249 00)

Lockwasher (3)

Packing, preformed (15)

References

TM 5-2410-237-10

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Battery cables disconnected (WP 0101 00)

WARNING

Ensure battery cables are disconnected before performing maintenance inside dash assembly. Failure to follow this warning could result in injury or damage to equipment.

CAUTION

Clean area to remove dirt before disconnecting oil lines and removing gage and fittings. Cap or plug openings to prevent contamination.

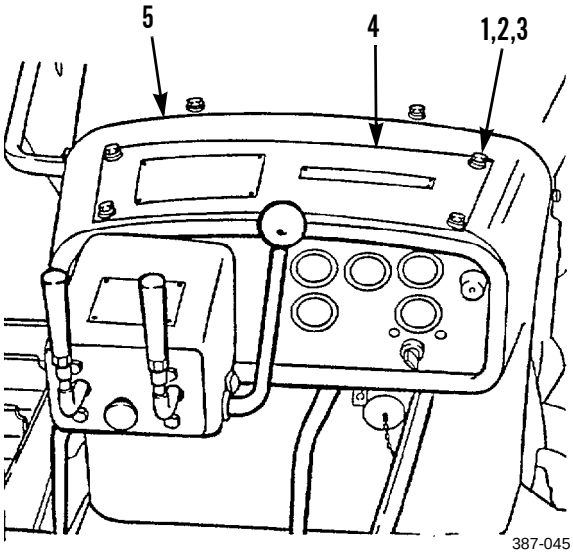
REMOVAL

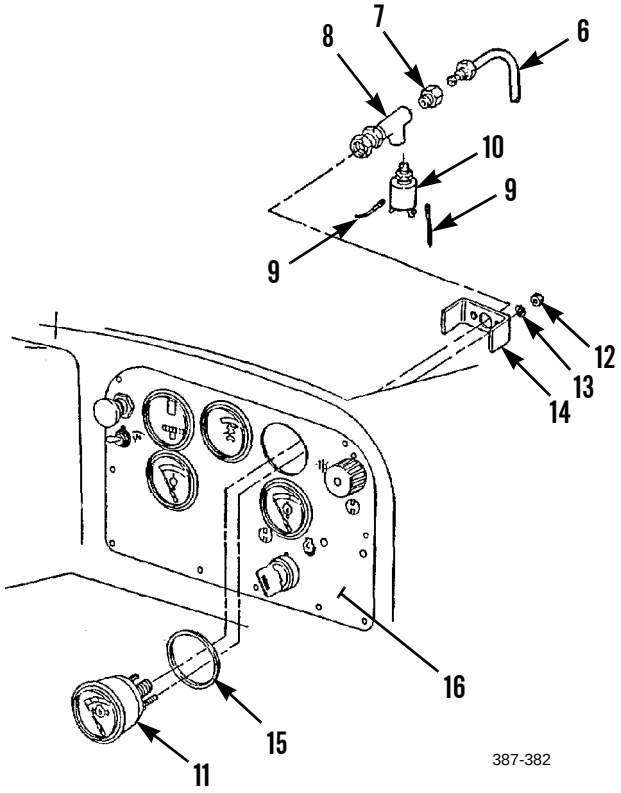
1. Remove four capscrews (1), washers (2), lockwashers (3) and cover (4) from top of dash assembly (5). Discard lockwashers.
2. Disconnect oil line (6) from connector (7) on back of tee (8). Cap oil line to keep line clean.
3. Remove connector (7) from tee (8).

NOTE

Tag wires to ensure correct installation.

4. Disconnect wires (9) and remove hourmeter switch (10) from tee (8).
5. Remove tee (8) from back of oil pressure gage (11). Cap tee to keep clean.
6. Remove two nuts (12), starwashers (13) and bracket (14).
7. Slide oil pressure gage (11) with preformed packing (15) out through front of dash panel (16).
8. Remove preformed packing (15) from oil pressure gage (11). Discard preformed packing.





INSTALLATION

1. Install new preformed packing (15) on oil pressure gage (11).
2. Insert oil pressure gage (11) into position on dash panel (16).
3. Install bracket (14), two starwashers (13) and nuts (12) on back of gage (11).
4. Wrap nipple on back of oil pressure gage (11) with antiseizing tape.
5. Install tee (8) on oil pressure gage (11).

INSTALLATION - CONTINUED

6. Wrap nipple on hourmeter switch (10) with antiseizing tape.
7. Install hourmeter switch (10) to tee (8).
8. Connect wires (9) to hourmeter switch (10).
9. Install connector (7) on tee (8).
10. Connect oil line (6) to connector (7).
11. Install cover (4) on top of dash assembly (5) with capscrews (1), washers (2) and new lockwashers (3).
12. Connect battery cables (WP 0101 00).
13. Start engine and ensure and check engine oil pressure gage for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

FUEL PRESSURE GAGE REPLACEMENT 0232 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Fuel (Item 13, 14 or 15, WP 0249 00)

Materials/Parts - Continued

Rag, wiping (Item 29, WP 0249 00)

Packing, preformed (4)

Equipment Condition

Engine OFF and cool (TM 5-2410-237-10)

Fuel shutoff valve closed (TM 5-2410-237-10)

REMOVAL

WARNING

DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel.

CAUTION

Clean area to remove dirt before removing gage and fittings. Plug opening in filter base to prevent contamination of fuel system.

NOTE

Some fuel may drain when removing pressure gage. Use a suitable container to capture any fuel. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.

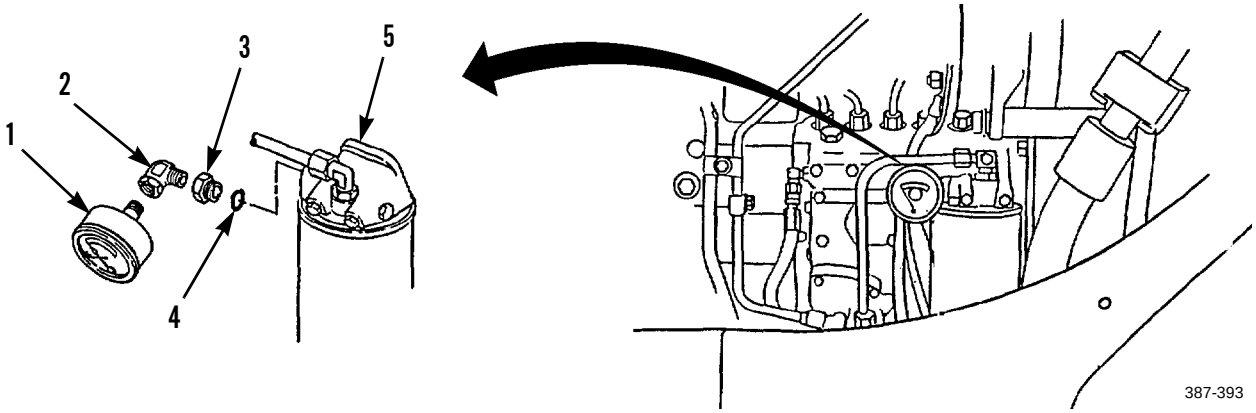
1. Remove fuel pressure gage (1) from elbow (2).
2. Remove elbow (2) from nut (3).
3. Remove nut (3) and preformed packing (4) from secondary fuel filter base (5). Discard preformed packing.

INSTALLATION

NOTE

Lightly coat new preformed packing with clean fuel before installation.

1. Install new preformed packing (4) and nut (3) to secondary fuel filter base (5).
2. Install elbow (2) to nut (3).
3. Install fuel pressure gage (1) to elbow (2).
4. Open fuel shutoff valve.
5. Start engine and check fuel pressure gage for proper operation and leaks (TM 5-2410-237-10).



END OF WORK PACKAGE

AIR FILTER INDICATOR REPLACEMENT 0233 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Nut, self-locking (8)

Equipment Condition

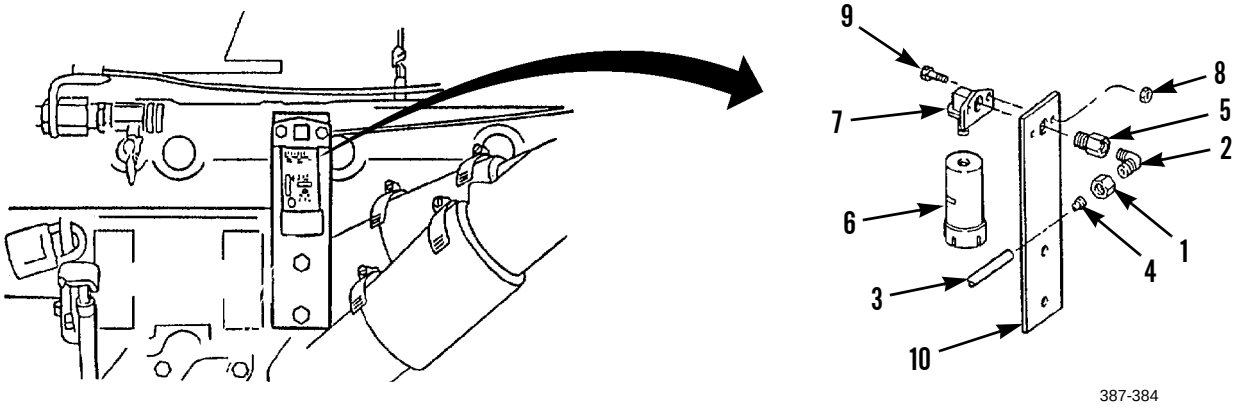
Engine OFF and cool

References

TM 5-2410-237-10

REMOVAL

1. Remove nut (1) from elbow (2).
2. Separate tubing (3) from elbow (2). Take care not to lose insert (4).
3. Remove fitting (5) and elbow (2).
4. Remove air filter indicator (6) from adapter (7).
5. Remove two self-locking nuts (8), bolts (9) and adapter (7) from bracket (10). Discard self-locking nuts.



INSTALLATION

1. Install adapter (7) to bracket (10) with two bolts (9) and new self-locking nuts (8).
2. Install air filter indicator (6) into adapter (7).
3. Install fitting (5) and elbow (2).
4. Connect tubing (3) to elbow (2). Make sure insert (4) is placed in tubing (3).
5. Install nut (1) on elbow (2).
6. Check air filter indicator for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

BLADE CUTTING EDGES AND END BITS REPLACEMENT 0234 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Wood cribbing, 4 in. x 4 in. x 12 in. long

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

WARNING

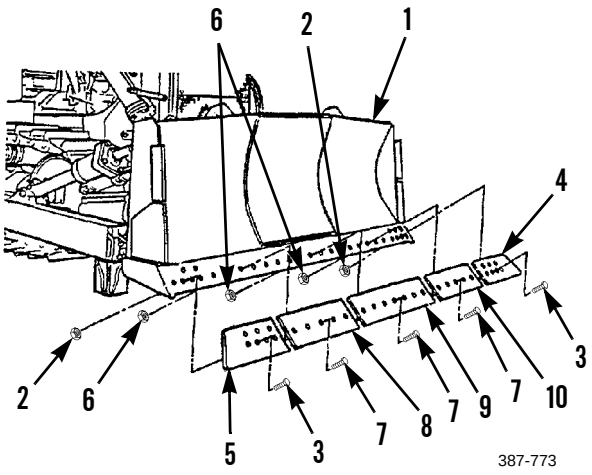
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may cause injury.

NOTE

- **Left and right end bits weigh 47 lb (21 kg) and 45 lb (20 kg) respectively.**
- **Outermost cutting edges weigh 60 lb (27 kg) each.**
- **Middle cutting edge weighs 83 lb (38 kg).**

REMOVAL

1. Raise blade (1) approximately 12 in. (30.5 cm) and block right and left pusharms securely at blade end.
2. Shut off engine.
3. Remove nuts (2), bolts (3) and end bits (4 and 5) as needed.
4. Remove nuts (6), bolts (7) and cutting edges (8, 9 and 10) as needed.



INSTALLATION

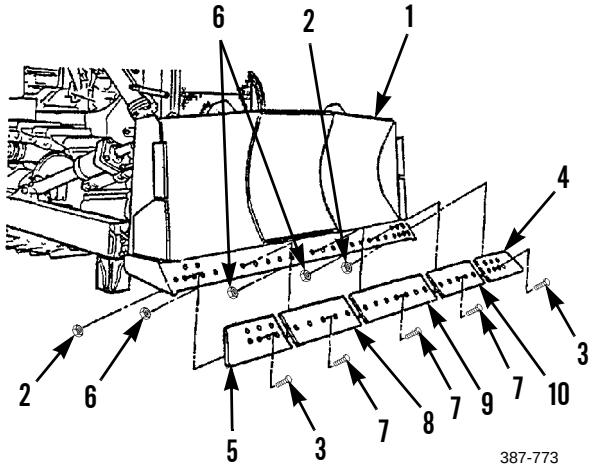
CAUTION

If opposite edge of cutting edge section is not worn, rotate this section. If both edges of cutting edge sections are worn, replace worn section(s) to prevent wear on blade support.

NOTE

Cutting edges and end bits worn to less than 3/4 in. (19 mm) from edge of blade support are not serviceable.

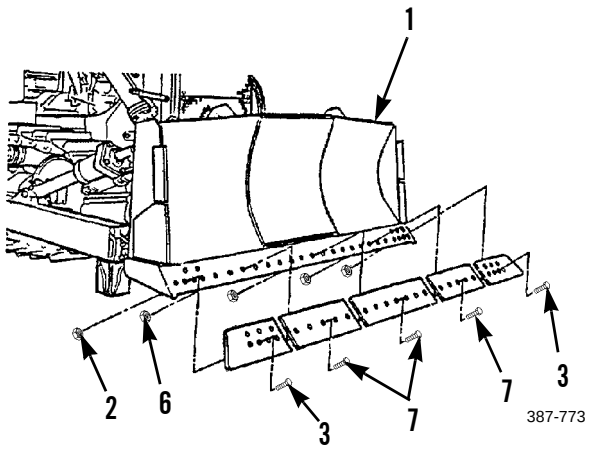
1. Thoroughly clean mounting surface of blade (1), cutting edges (8, 9 and 10) and end bits (4 and 5).
2. Install cutting edges (8, 9 and 10) with bolts (7) and nuts (6).
3. Tighten nuts (6) to 350 lb-ft (474 Nm).
4. Install two end bits (4 and 5) with bolts (3) and nuts (2).
5. Tighten nuts (2) to 350 lb-ft (474 Nm).



WARNING

Wear safety glasses whenever striking metal objects with a hammer. Failure to follow this warning may result in injury to personnel.

6. Seat all bolt (3 and 7) heads firmly in countersink with heavy hammer.
7. Tighten nuts (2 and 6) again to 350 lb-ft (474 Nm).
8. Raise blade (1) and remove blocking from under push-arms.
9. Check blade for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

BLADE AND PUSHARM ASSEMBLY REPLACEMENT 0235 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250 00)

Lifting equipment, 1,000 lb capacity

Materials/Parts

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

Lockwasher (32)

Wood cribbing, 4 in. x 4 in. x 12 in. long

Wire, 1/16 in. dia x 24 in. long

References

WP 0220 00

WP 0225 00

WP 0245 00

Personnel Required

Three

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Implements fully lowered to ground (TM 5-2410-237-10)

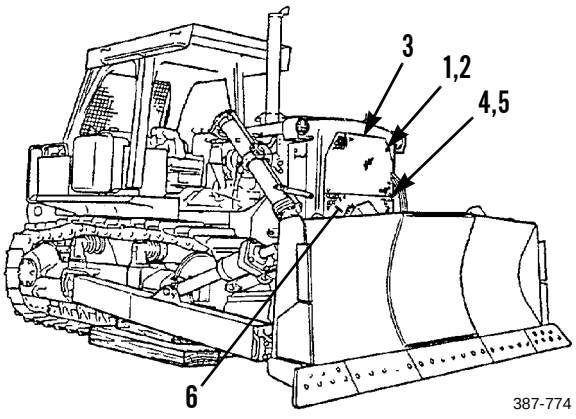
Hydraulic system pressure relieved (WP 0241 00)

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,238 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

REMOVAL

1. Place wood cribbing under pusharms of tractor.
2. Remove four capscrews (1), washers (2) and upper radiator grille (3).
3. Remove four capscrews (4), washers (5) and lower radiator grille (6).
4. Remove capscrew (7) and clamp (8) from tilt cylinder hoses (9 and 10) and radiator guard.
5. Remove capscrew (11) and clamp (12) from tilt cylinder hoses (9 and 10) and radiator guard.
6. Remove two capscrews (13), washers (14), nuts (15) and clamp (16) from radiator guard. Open clamp and separate hoses (17 and 18).



CAUTION

Before disconnecting hydraulic lines and fittings, clean area to prevent contamination and premature failure of the hydraulic system.

NOTE

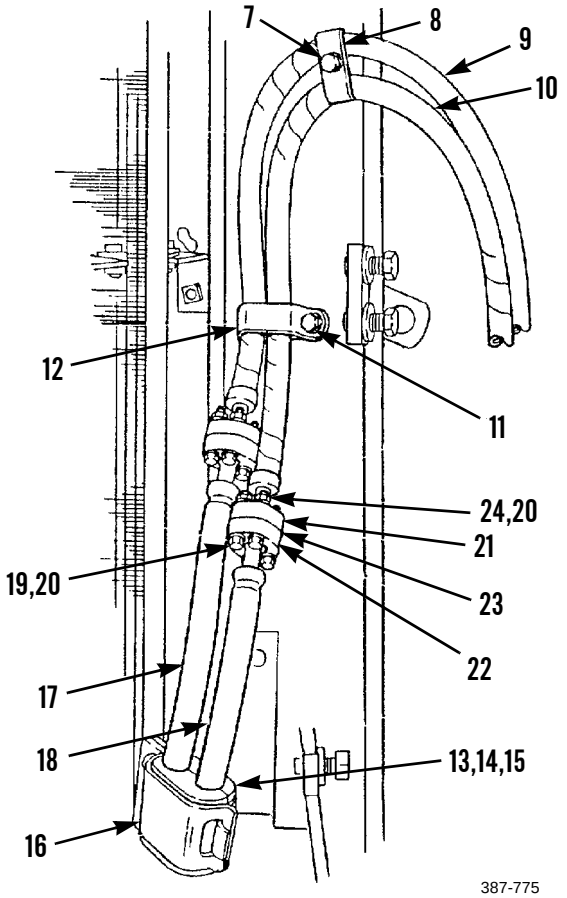
- **Tag hydraulic hoses to ensure correct installation.**
- **Use a suitable container to catch any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

7. Remove four capscrews (19), eight washers (20), split flanges (21 and 22), plate (23) and four nuts (24). Separate hoses (10 and 18).
8. To separate hoses (9 and 17) repeat step 7.

NOTE

Forming a loop will close the system and prevent dirt and moisture contamination.

9. Connect hose (9) to hose (10) with split flanges (21 and 22) and plate (23). Install eight washers (20), four capscrews (19) and nuts (24).
10. Connect hoses (17 and 18) by following procedure in step 9.
11. Disconnect both lift cylinders (25) from blade (26) (WP 0220 00).



REMOVAL - CONTINUED

CAUTION

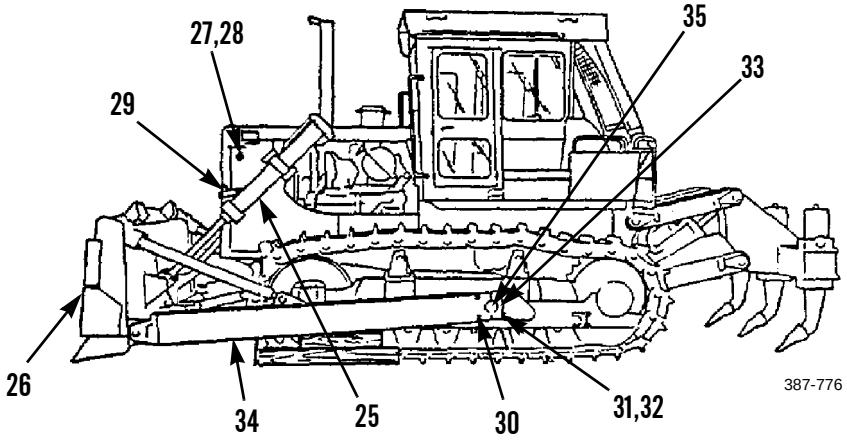
When retracting cylinders, have an assistant guide rod to prevent damage to rod from contact with track or other parts of tractor.

12. Retract both lift cylinders (25).
13. Remove pin (27) from post (28). Line up bracket (29) on cylinder with post. Install bracket on post and secure with pin.
14. Repeat step 13 for other cylinder, and secure both cylinder rods in position with wire.
15. Remove two nuts (30), bolts (31), lockwashers (32) and cap (33) from pusharm (34). Discard lockwashers.
16. Repeat step 15 on other pusharm (34).

WARNING

Use extreme caution and ground guide assistance to prevent injury or death.

17. Carefully back tractor away from pusharm and blade assembly.



INSTALLATION

WARNING

Use extreme caution and ground guide assistance to prevent injury or death.

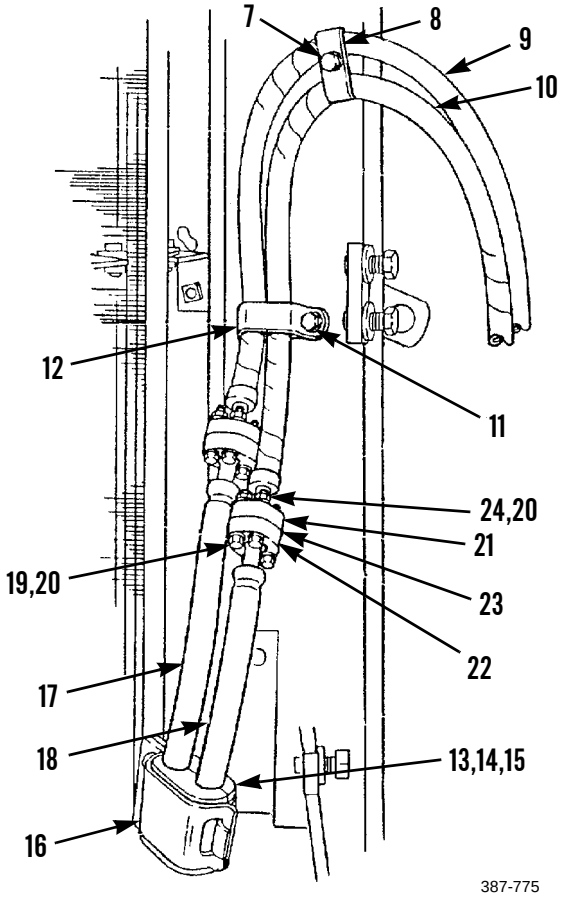
1. Drive tractor up to blade and pusharm assembly. Have assistant guide tractor into position (TM 5-2410-237-10).
2. Place cap (33) in position on trunnion (35) and install two bolts (31). New lockwashers (32), and nuts (30). Tighten nuts IAW torque limits (WP 0245 00). Repeat step for other pusharm (34).
3. Remove wires securing rods to lift cylinders (25). Remove pins (27) from posts (28). Remove lift cylinders and brackets (29) from posts. Reinstall pins in posts.
4. Connect lift cylinders (25) to blade (26) (WP 0220 00).

INSTALLATION - CONTINUED

WARNING

Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,238 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.

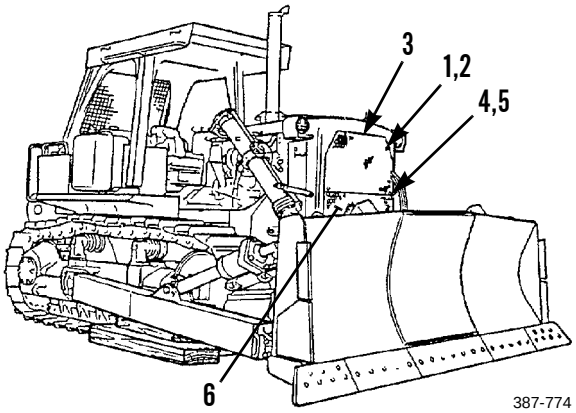
5. Relieve hydraulic system pressure (WP 0241 00).
6. Remove four nuts (24), eight washers (20), four capscrews (19), split flanges (21 and 22) and plate (23) to disconnect hose (9) from (10). Repeat to remove hose (17) from (18).
7. Connect hose (10), plate (23) and hose (18). Secure with split flanges (21 and 22), four capscrews (19), eight washers (20) and nuts (24). Repeat to connect hose (9), plate (23) and hose (17).
8. Place clamp (16) around hoses (17 and 18). Place hoses and clamp in position on radiator guard and install two washers (14), capscrews (13) and nuts (15).
9. Place clamp (12) around tilt cylinder hoses (9 and 10) and install capscrew (11) and clamp to radiator guard.
10. Place clamp (8) around tilt cylinder hoses (9 and 10) and install capscrew (7) and clamp to radiator guard.



BLADE AND PUSHARM ASSEMBLY REPLACEMENT - CONTINUED 0235 00

INSTALLATION - CONTINUED

11. Install lower radiator grille (6) with four washers (5) and capscrews (4).
12. Install upper radiator grille (3) with four washers (2) and capscrews (1).
13. Raise blade and remove wood cribbing from under pusharms.
14. Check level of oil in hydraulic tank. Add oil and bleed system as needed (WP 0225 00).
15. Check blade and pusharm for proper operation (TM 5-2410-237-10).



END OF WORK PACKAGE

BLADE DIAGONAL BRACES AND STRUT ASSEMBLY REPLACEMENT 0236 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Lifting equipment, 500 lb capacity

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Lockwasher (10)

Pin, cotter (3, 6, 15, 17 and 20)

Personnel Required

Two

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Blade lowered to the ground (TM 5-2410-237-10)

REMOVAL

WARNING

- **Use extreme caution to prevent heavy parts from falling or tipping. Use a suitable lifting device to lift heavy parts. Failure to follow these precautions could result in serious injury.**
- **Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.**

NOTE

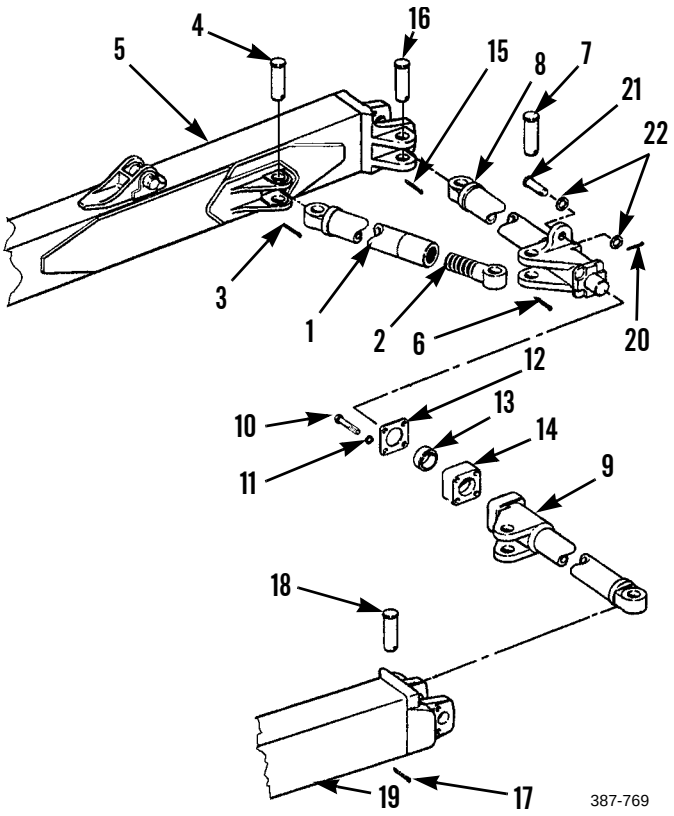
Blade diagonal brace weighs 91 lb (41 kg).

1. Attach a nylon sling and a suitable lifting device to brace (1) and eyebolt (2) assembly.
2. Remove cotter pin (3) and pin (4) from brace (1) and pusharm (5). Discard cotter pin.
3. Remove cotter pin (6) and pin (7) from eyebolt (2) and strut (8). Use nylon sling and lifting device to remove brace (1) and eyebolt (2) assembly. Discard cotter pin.
4. As required remove eyebolt (2) from brace (1).
5. Repeat steps 1-4 to remove other brace (1) and eyebolt (2) assembly.

NOTE

Strut assembly weighs approximately 250 lb (114 kg).

6. Attach a nylon sling and a suitable lifting device to strut assembly which consists of strut (8), strut (9), four bolts (10), lockwashers (11), plate (12), bearing (13) and cage (14).
7. Remove cotter pin (15) and pin (16) from strut (8) and pusharm (5). Discard cotter pin.
8. Remove cotter pin (17) and pin (18) from strut (9) and pusharm (19). Discard cotter pin.
9. Remove cotter pin (20), pin (21), two washers (22) and release strut (8) from attachment to bulldozer blade. Discard cotter pin.
10. Use nylon sling and lifting device to remove strut assembly.
11. Remove strut (8) from strut (9).
12. Remove four bolts (10), lockwashers (11), plate (12), bearing (13) and cage (14) as a unit from strut (9). Discard lockwashers.
13. Remove bearing (13) from cage (14).



INSTALLATION

1. Apply GAA grease to bearing (13) and install bearing into cage (14).
2. Install four bolts (10), new lockwashers (11), plate (12) and cage (14) to strut (9).
3. Install strut (9) to strut (8).

- **Use extreme caution to prevent heavy parts from falling or tipping. Use a suitable lifting device to lift heavy parts. Failure to follow these precautions could result in serious injury.**
- **Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.**

NOTE

Strut assembly weighs approximately 250 lb (114 kg).

4. Use a nylon sling and a suitable lifting device to install strut assembly into position between pusharms (5 and 19).
5. Install pin (18) and new cotter pin (17) to connect strut (9) to pusharm (19).
6. Install pin (16) and new cotter pin (15) to connect strut (8) to pusharm (5).
7. Install pin (21) two washers (22) and new cotter pin (20) to secure strut (8) to bulldozer blade.
8. If removed, install eyebolt (2) to brace (1).

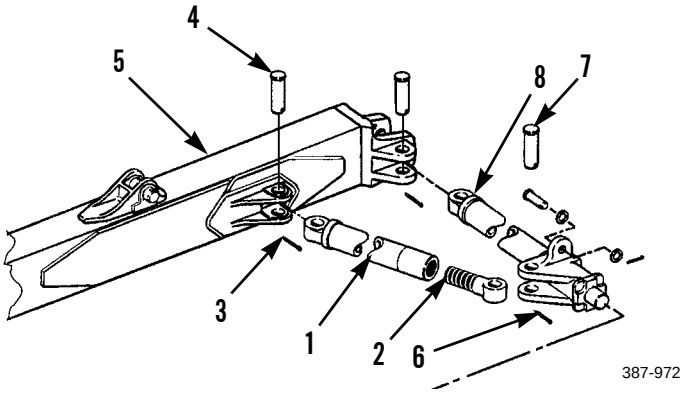
NOTE

Blade diagonal brace weighs 91 lb (41 kg).

9. Attach a nylon sling and a suitable lifting device to brace (1) and eyebolt (2) assembly.

INSTALLATION - CONTINUED

10. Use sling and lifting device to position brace (1) and eyebolt (2) assembly between pusharm (5) and strut (8).
11. Install pin (4) and new cotter pin (3) to connect brace (1) to pusharm (5).
12. Install pin (7) and new cotter pin (6) to connect eyebolt (2) to strut (8) assembly.



13. Repeat steps 18-12 to install other brace (1) and eyebolt (2) assembly.

END OF WORK PACKAGE

BLADE PUSHARM TRUNNION REPLACEMENT 0237 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250 00)

Materials/Parts

Rag, wiping (Item 29, WP 0249 00)

Lockwasher (2)

References

WP 0245 00

Personnel Required

Two

Equipment Condition

Blade and pusharm assembly removed (WP 0235 00)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury or death to personnel.

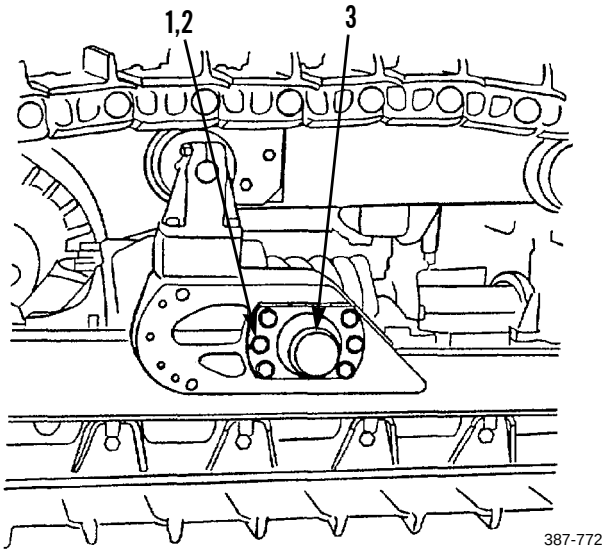
REMOVAL

1. Remove two bolts (1) and lockwashers (2) from each side of trunnion (3). Discard lockwashers.

NOTE

Trunnion weighs 52 lb (24 kg).

2. Support trunnion (3) and remove remaining bolt (1) and lockwasher (2) from each side. Remove trunnion. Discard lockwashers.



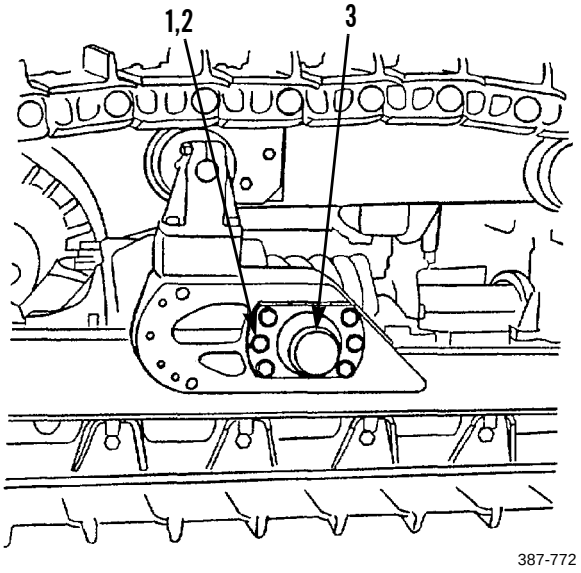
INSTALLATION

1. Wipe trunnion mounting surfaces clean before installation.

WARNING

Ensure trunnion is properly supported to ensure it does not fall and cause injury to personnel.

2. Position trunnion (3) and line up bolt holes.
3. Install trunnion (3) with six new lockwashers (2) and bolts (1). Torque bolts to 850 lb-ft +/- 150 lb-ft (1150 Nm +/- 200 Nm).
4. Install blade and pusharm assembly (WP 0235 00).



387-772

END OF WORK PACKAGE

RIPPER ASSEMBLY MAINTENANCE 0238 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with ripper

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Sling, nylon (Item 109, WP 0250 00)

Lifting equipment, 3,000 lb capacity

Bar, 30 in. long x 1 in. diameter.

Cribbing, 2 ft x 8 in. x 8 in.

Materials/Parts

Cap set, protective (Item 2, WP 0249 00)

Grease, GAA (Item 16, WP 0249 00)

Oil, lubricating (Item 23, 24 or 25, WP 0249 00)

Rag, wiping (Item 29, WP 0249 00)

Materials/Parts - Continued

Tag, marker (Item 37, WP 0249 00)

O-ring (14)

References

WP 0225 00

Personnel Required

Three

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

Hydraulic system pressure relieved (WP 0241 00)

Ripper control valve removed (WP 0206 00)

Ripper shanks removed (WP 0240 00)

WARNING

- **Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,238 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **At operating temperature hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury.**
- **Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.**

REMOVAL

NOTE

- **Beam weighs 2,000 lb (908 kg).**
- **Frame assembly weighs 990 lb (449 kg).**
- **Connecting links weighs 227 lb (126 kg).**
- **Ripper lift cylinder weighs 195 lb (89 kg).**

1. Place cribbing underneath beam (1) and frame assembly (2).
2. Cut locking wire and remove four bolts (3) and two plates (4) from connecting link (5).
3. Attach a nylon sling and a suitable lifting device to connecting link (5).
4. Place a bar between lift cylinder (6) and frame assembly (2), to prevent damage and movement of lift cylinder during removal of two pin assemblies (7).

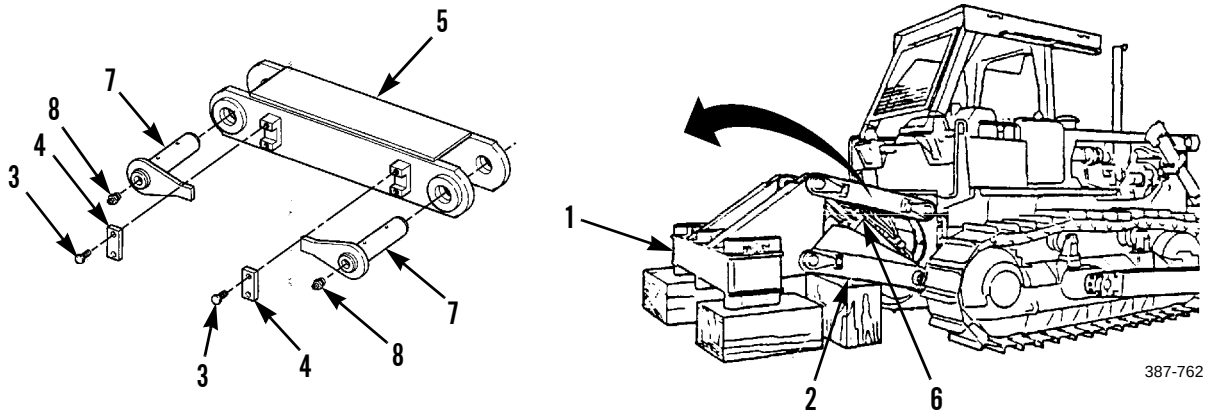
CAUTION

Be careful not to damage lift cylinder or valve hoses and fittings while removing pin assemblies.

NOTE

- **Mark all pin assemblies for installation.**
- **Mark connecting link to indicate sides, front, rear, up and down.**

5. Remove two pin assemblies (7) from connecting link (5).
6. Remove grease fitting (8) from end of each pin assembly (7), if required.
7. Lift and remove connecting link (5) from machine. Remove nylon sling and lifting device from connecting link.
8. Repeat steps 2-7 for connecting link (5) on other side of ripper.



REMOVAL - CONTINUED

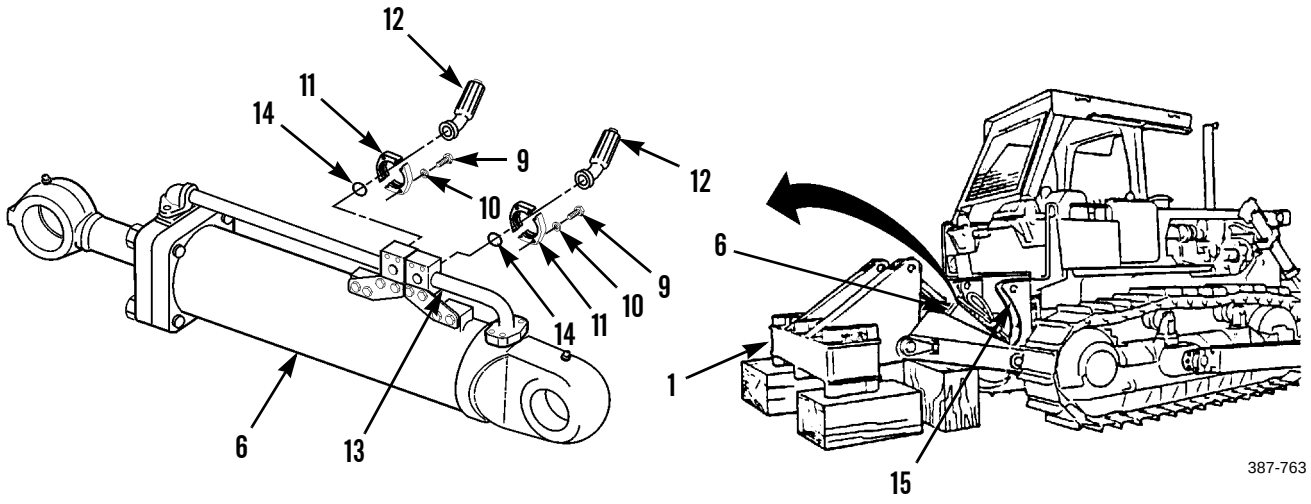
CAUTION

- **Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings to lift cylinders after removing lines. Contamination of hydraulic system could result in premature failure.**
- **Utilize line wrenches for removal to avoid damage to fittings.**

NOTE

- **Tag hydraulic lines and connections to ensure correct installation.**
- **Use a suitable container to catch any oil that may drain from system. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.**

9. Remove four capscrews (9), washers (10), two flanges (11) and disconnect each of two hose assemblies (12) from tube assemblies (13) on lift cylinder (6).
10. Remove two O-rings (14) from hose assemblies (12). Discard O-rings.
11. Repeat steps 9 and 10 for lift cylinder (6) on other side of ripper.
12. Attach a nylon sling and a suitable lifting device to lift cylinder (6) and lift cylinder up and toward mounting bracket (15). Use chains to secure cylinder to mounting bracket.
13. Repeat step 12 for lift cylinder (6) on other side of ripper.



REMOVAL - CONTINUED

14. Install a bar through front pin holes (16) of beam (1).
15. Attach a suitable lifting device on bar between two points (17) on beam (1).
16. Remove two bolts (18) and plate (19) from pin assembly (20) securing frame assembly (2) to beam (1).
17. Repeat step 16 to remove pin assembly (20) on other side of frame assembly (2) and beam (1).
18. Remove grease fitting (21) from end of each pin assembly (20), if required.

NOTE

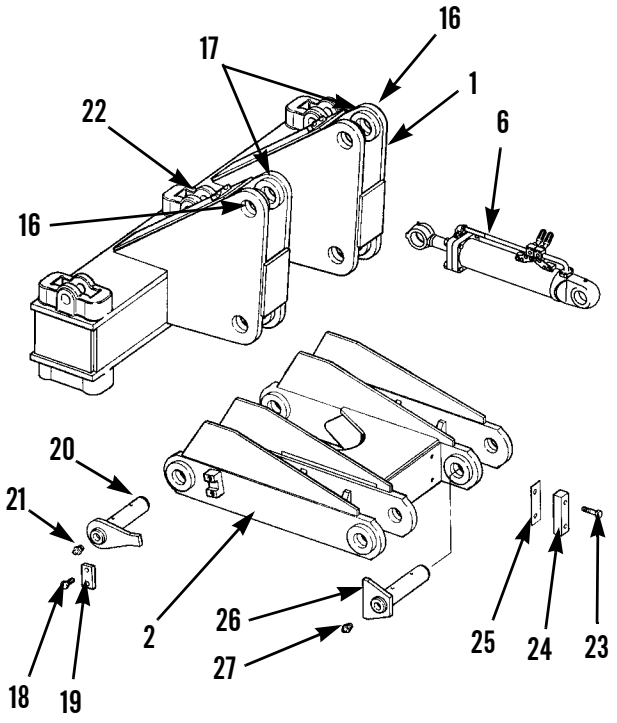
Put slack in slings before attaching chains.

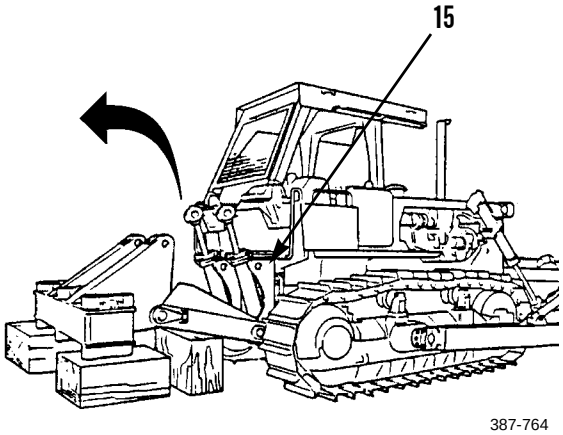
19. Install a bar through bore (22) and, with a suitable three-point lifting device, remove beam (1) from frame assembly (2).
20. Attach a suitable lifting device to frame assembly (2) and lift frame so it is level with tractor. Place blocks underneath frame assembly.

NOTE

Prior to removal, tag lift cylinders as left and right to identify for assembly.

21. With a nylon sling and a suitable lifting device attached, release lift cylinder (6) from mounting bracket (15). Remove two bolts (23), plate (24) and spacers (25) from each side of frame assembly (2).
22. Remove pin assembly (26) from frame assembly (2) that attaches lift cylinder (6) to mounting bracket (15).
23. Remove grease fitting (27) from pin assembly (26), if required.
24. Remove lift cylinder (6) from frame assembly (2).
25. Repeat steps 21-24 for other lift cylinder (6).





REMOVAL - CONTINUED

26. Use a suitable lifting device to remove frame assembly (2) from back of tractor.

INSTALLATION

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

NOTE

- **Beam weighs 2,000 lb (908 kg).**
- **Frame assembly weighs 990 lb (449 kg).**
- **Connecting links weighs 227 lb (126 kg).**
- **Ripper lift cylinder weighs 195 lb (89 kg).**
- **Clean all parts, pins and bores thoroughly before installation.**
- **It may be necessary to temporarily install lower pins to achieve proper alignment of frame assembly and mounting brackets.**
- **Lightly coat pin assemblies with clean grease before installation.**

1. Attach a suitable lifting device to frame assembly (2) and align frame assembly to mounting brackets (15) on back of tractor. Place blocks underneath frame assembly. Remove lifting equipment.

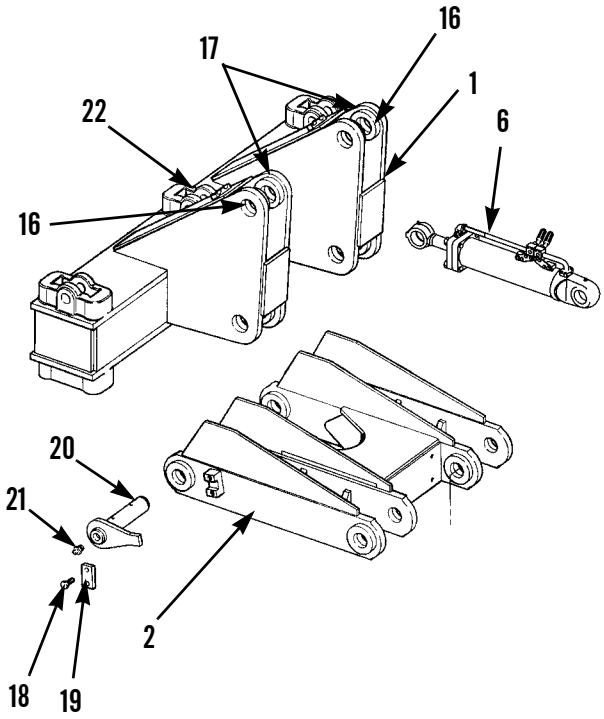
NOTE

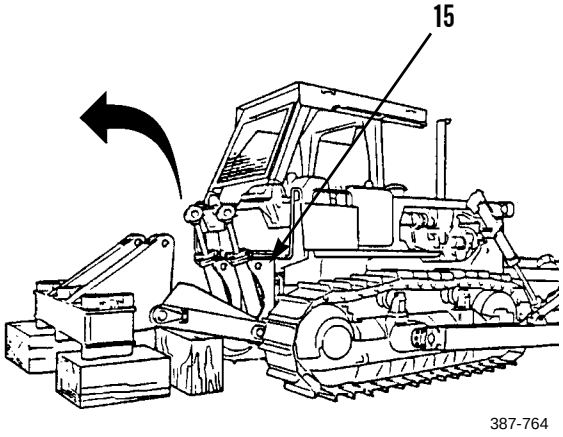
Install lift cylinder with cylinder eye toward machine and port tubing up.

2. Use a nylon sling and a suitable lifting device to position and align lift cylinder (6) in frame assembly (2).
3. Install pin assembly (26) through inside of frame assembly (2) and mounting bracket (15) to secure lower portion of lift cylinder (6). Place a block underneath cylinder and lower lift cylinder on block.
4. If removed, install grease fitting (27) in pin assembly (26).
5. Install two spacers (25), plate (24) and two bolts (23) to each side of frame assembly (2).
6. Repeat steps 2 through 5 for other lift cylinder (6).

INSTALLATION - CONTINUED

7. Use nylon sling and lifting device to raise lift cylinder (6) up and toward mounting bracket (15). Use chains to secure cylinder to mounting bracket.
8. Repeat step 7 for other lift cylinder (6).
9. Install a bar through front pin holes (16) of beam (1). Install a bar through bore (22).
10. Attach a suitable three-point lifting device to two lift points (17) on beam (1) and to bar through bore (22). Align beam with frame assembly (2).
11. Install pin assembly (20) in outside of frame assembly (2) and through beam (1).
12. If removed, install grease fitting (21) in pin assembly (20).
13. Install plate (19) and two bolts (18) over pin assembly (20).
14. Repeat steps 11 through 13 to install pin assembly (20) on other side.





INSTALLATION - CONTINUED

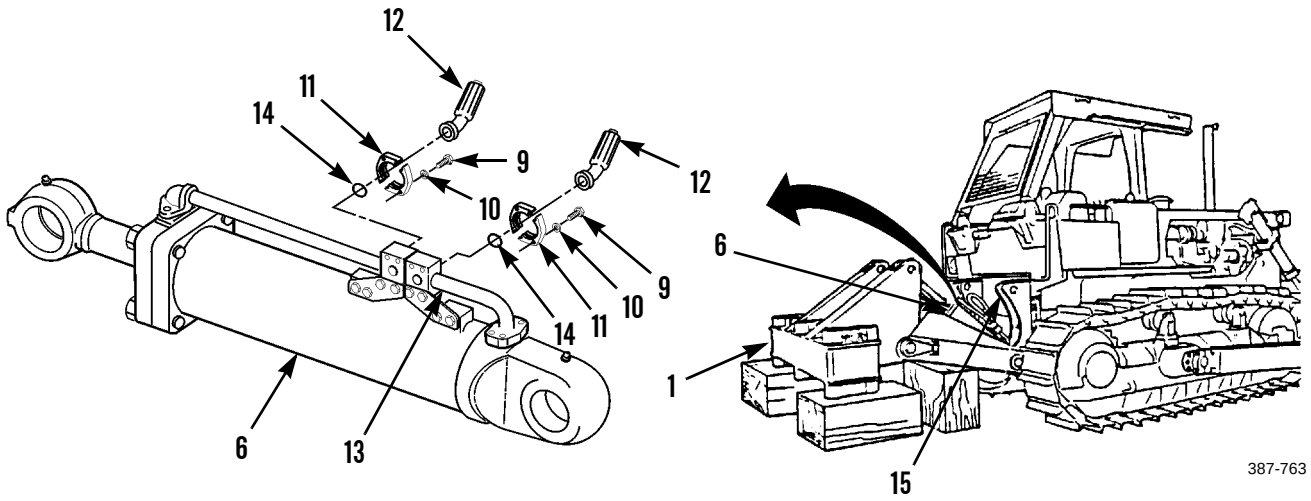
CAUTION

- **Wipe area clean around hydraulic hose assemblies and fittings before they are installed, to prevent contamination and premature failure of hydraulic system.**
- **Utilize line wrenches for installation to avoid damage to fittings.**

NOTE

Lightly coat new O-rings with clean oil before installation.

15. Install two new O-rings (14) on hose assemblies (12).
16. Connect each of two hose assemblies (12) to tube assemblies (13) on lift cylinder (6) with two flanges (11), four washers (10) and capscrews (9). Repeat for other lift cylinder.

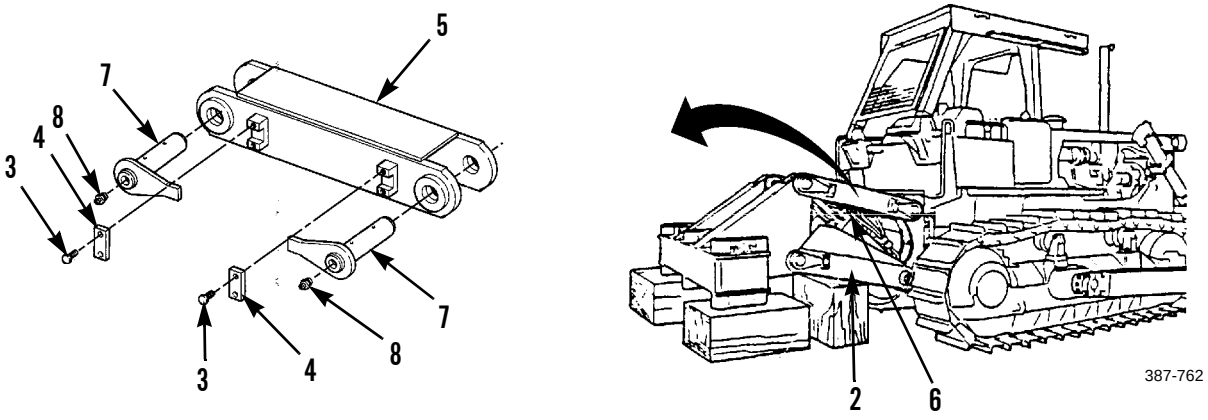


INSTALLATION - CONTINUED

CAUTION

- **Be careful not to damage cylinder or valve hoses and fittings while installing pin assemblies.**
- **Ensure markings of sides, front, rear, up and down are facing correctly before installation of connecting link.**

17. Attach a nylon sling and a suitable lifting device to connecting link (5).
18. Place a bar between lift cylinder (6) and frame assembly (2), to prevent damage and movement of lift cylinder during installation of two pin assemblies (7).
19. Position connecting link (5).
20. Install two pin assemblies (7) through connecting link (5).
21. If removed, install grease fitting (8) to each end of pin assembly (7).
22. Install plate (4) at each end of connecting link (5) with two bolts (3).
23. Repeat steps 17-22 for connecting link (5) on other side of ripper.



24. Install ripper control valve (WP 0206 00).
25. Fill hydraulic tank and bleed system as needed (WP 0225 00).
26. Install ripper shanks (WP 0240 00).
27. Apply GAA grease to 20 ripper assembly grease fittings (TM 5-2410-237-10).
28. Check ripper for proper operation (TM 5-2410-237-10).

END OF WORK PACKAGE

RIPPER TOOTH REPLACEMENT 0239 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with ripper

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Blocks, 4 in. x 4 in.

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury or death to personnel.

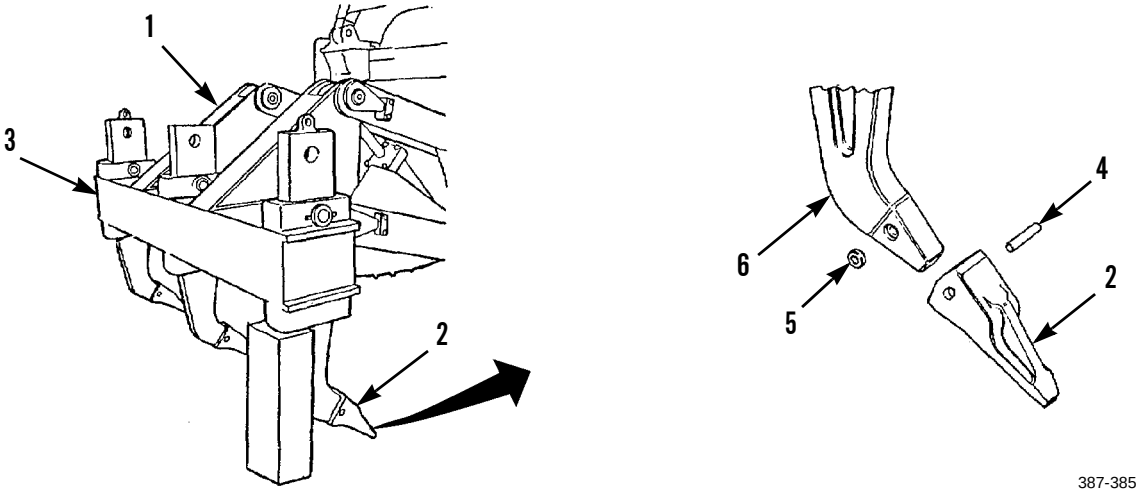
REMOVAL

1. Raise ripper assembly (1) until teeth (2) are approximately 6 in. (15.2 cm) off ground.
2. Place blocks under ripper beam (3). Shut down engine.

NOTE

Ripper tooth weighs 24 lb (11 kg).

3. While facing rear of tractor, drive pin (4) from R.H. side of tooth (2).
4. Remove tooth (2) and retainer (5) from shank (6).
5. Repeat steps 3 and 4 for other two teeth.



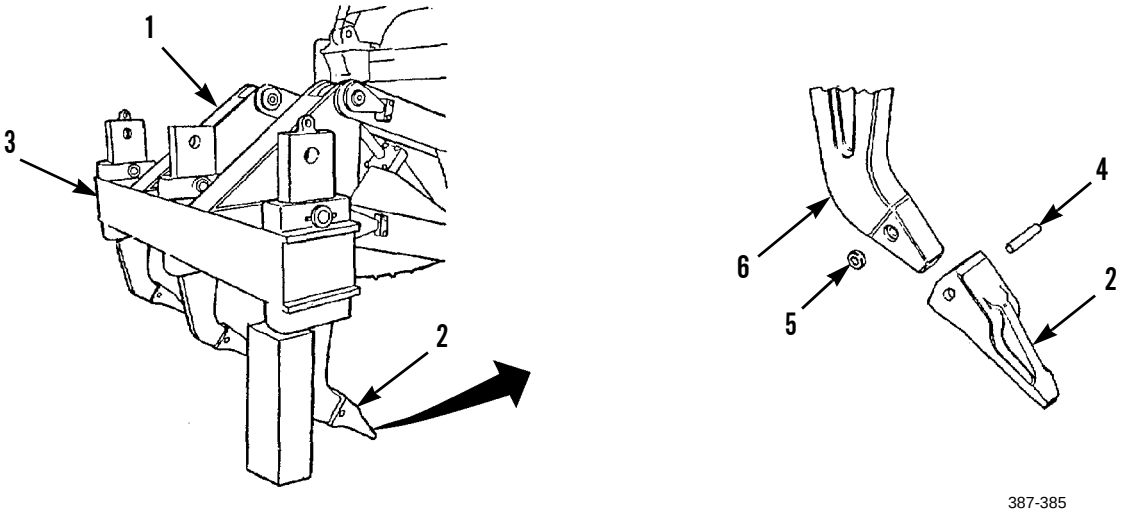
INSTALLATION

1. Install retainer (5) in recess on R.H. side of shank (6).

NOTE

Ripper tooth weighs 24 lb (11 kg).

2. Slide tooth (2) over end of shank (6) and retainer (5). Insert pin (4) in tooth and shank, grooved end first.
3. From L.H. side of tooth (2), drive pin (4) through retainer (5) until flush on both sides of tooth.



4. Repeat steps 1-3 for other two teeth.
5. Start engine, raise ripper, remove blocks, lower ripper and turn off engine (TM 5-2410-237-10).

END OF WORK PACKAGE

RIPPER SHANK REPLACEMENT 0240 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Applicable Configuration

Tractor with ripper

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Lifting equipment, 1,000 lb capacity

Materials/Parts

Blocks, 8 in. x 8 in. x 5 ft long

Pin, cotter (5)

References

WP 0239 00

Personnel Required

Three

Equipment Condition

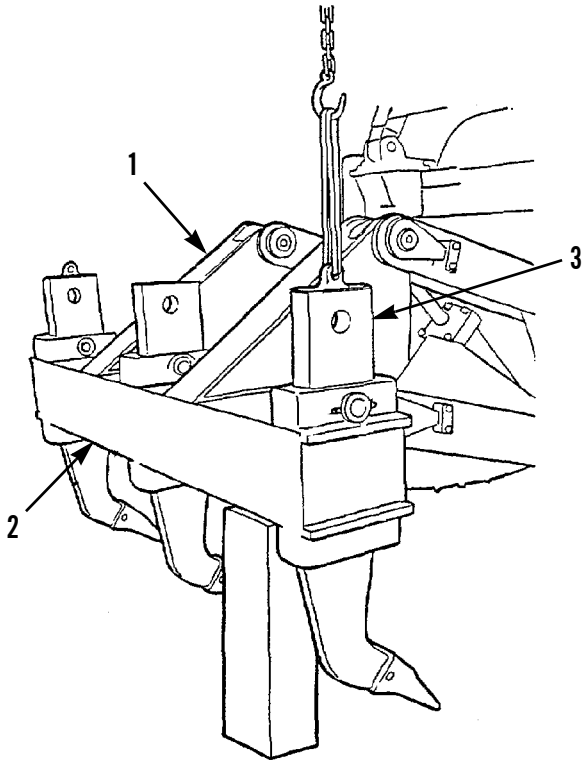
Machine parked on level ground (TM 5-2410-237-10)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in death or injury to personnel.

REMOVAL

1. Raise ripper (1) to its maximum raised position.
2. Place suitable block(s) under beam (2) and shut down engine.
3. Attach a nylon sling and a suitable lifting device to shank (3). Remove slack in lifting device.



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REMOVAL - CONTINUED

NOTE

- **Use lifting device to take pressure off pin.**
- **When removing center shank, remove cotter pins and retainers from both ends of pin. Push pin to the right so that end of pin enters hole in ripper beam brace.**

4. Remove cotter pin (4) and retainer (5) from one end of pin (6). Discard cotter pins.
5. Drive pin (6) from beam (2) and shank (3).
6. Lower lifting equipment until shank (3) is resting on ground.

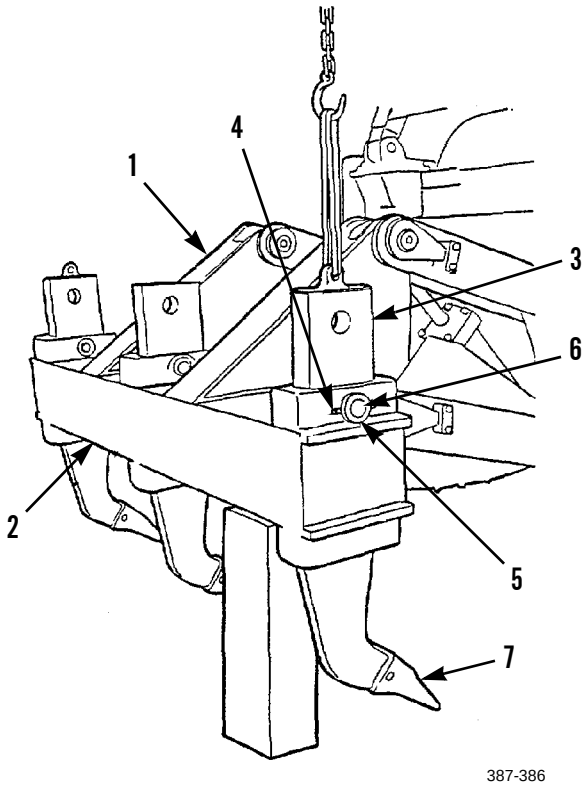
INSTALLATION

1. Position shank (3) under beam (2).

NOTE

If installing on a hard surface, remove tooth (7) for clearance (WP 0239 00). If installing on a soft surface, a small hole about 10 in. (25.4 cm) deep can be dug to provide enough clearance.

2. Attach a nylon sling and a suitable lifting device to lifting eye in shank (3). Feed sling through hole in bottom of beam (2).
3. Lift shank (3) into position and insert pin (6). Drive pin through beam (2) and shank (3).
4. Install retainers (5) on both ends of pin (6). Align holes in retainers and pin, and install new cotter pin (4) at each end of pin.
5. Start engine, raise ripper and remove block(s).
6. Remove nylon sling and lifting device from shank (3).
7. Check ripper for proper operation.
8. Lower ripper and shut down engine (TM 5-2410-237-10).



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END OF WORK PACKAGE

CHAPTER 4
GENERAL MAINTENANCE INSTRUCTIONS

NOTE

Refer to WP 0242 00 for *Electrical General Maintenance Instructions*.

SCOPE

These general maintenance instructions contain general shop practices and specific methods you must be familiar with to properly maintain the D7G Tractor. You should read and understand these practices and methods before starting maintenance tasks on the machine.

WORK SAFETY

1. Before starting a task, think about the risks and hazards to your safety as well as others. Wear protective gear such as safety goggles or lenses, safety shoes, rubber apron or gloves. Protect yourself against injury.
2. Observe all WARNINGs and CAUTIONs.
3. When lifting heavy parts, have someone help you. Make sure that lifting equipment is working properly, that it is suitable for the task assigned, of sufficient load capacity and is secured against slipping.
4. Always use power tools carefully.
5. Before beginning a procedure, ensure that the following conditions have been observed, unless otherwise specified:
   a. Machine must be parked on level ground with implements lowered to the ground.
   b. Transmission must be in N (Neutral) with transmission lock lever in locked position.
   c. Brake lock lever must be engaged and tracks blocked.
   d. Engine must be off.
   e. Components which are hot at operating temperatures (i.e., cooling, exhaust and hydraulic systems) must cool down before they are removed.
   f. Components must, however, be at operating temperature to be tested.
   g. Battery disconnect switch must be in OFF position and/or batteries disconnected when performing electrical system maintenance.
   h. Hydraulic system pressure must be relieved before disconnecting any hydraulic system line or fitting. Refer to *Relieving Hydraulic System Pressure* below.

RELIEVING HYDRAULIC SYSTEM PRESSURE

WARNING

- **Do NOT remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2500 psi (17,237 kPa), even with engine and pump OFF. To relieve pressure, lower all hydraulic attachments to the ground and shut down engine. Move control levers through all operating positions, then SLOWLY loosen hydraulic tank filler cap. After maintenance, tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing serious injury or death.**
- **At operating temperature, hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulics. Failure to do so could result in injury.**

1. Lower all machine implements to the ground.
2. Shut down engine.

RELIEVING HYDRAULIC SYSTEM PRESSURE - CONTINUED

3. Move all control levers through all operating positions. Return levers to HOLD position.
4. Slowly loosen hydraulic tank filler cap and allow any pressure to escape.

GENERAL INFORMATION

1. Before beginning a task, find out how much repair, modification or replacement is needed to fix the equipment as described in this manual. Sometimes the reason for equipment failure can be seen right away and complete teardown is not necessary. Disassemble the equipment only as far as necessary to repair or replace damaged or broken parts.
2. All tags and forms attached to the equipment must be checked to learn the reason for removal from service. Check all Modification Work Orders (MWOs) and Technical Bulletins (TBs) for equipment changes and updates.
3. In some cases a part may be damaged by removal. If the part appears to be good, and other parts behind it are not defective, leave it on and continue the procedure. Here are a few simple rules:
   a. Do not remove dowel pins or studs unless loose, bent, broken or otherwise damaged.
   b. Do not pull bearings or bushings unless damaged. If you must get at parts behind them, pull out bearings or bushings carefully.
   c. Replace all gaskets, seals, preformed packings, O-rings, cotter pins, spring pins, self-locking nuts, and lockwashers.

CLEANING INSTRUCTIONS

- **Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, It may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.**
- **Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment. Refer to TM 9-247, *Materials used for Cleaning, Perserving, Abrading and Cementing Ordinance Materiel and Related Materiels including Chemicals*, for correct information.**
- **Fire extinguishers should be placed nearby when using solvent cleaning compound.**
- **Cloths or rags saturated with solvent cleaning compound must be disposed of IAW authorized facilities' procedures.**
- **Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury.**
- **Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.**

1. **General.**
   a. Cleaning instructions are the same for the majority of parts and components of the D7G Tractor.
   b. The importance of cleaning must be thoroughly understood by maintenance personnel. Great care and effort are required in cleaning. Dirt and foreign material are a constant threat to satisfactory maintenance. The following should apply to all cleaning, inspection, repair and assembly operations.

CLEANING INSTRUCTIONS - CONTINUED

(1) Clean all parts before inspection, after repair and before assembly.

(2) To prevent contamination, hands should be kept free of accumulation of grease, which can collect dust, dirt or grit.

(3) After cleaning, all parts should be covered or wrapped to protect them from dust and dirt. Parts that are subject to rust should be lightly oiled.

2. **External Engine Cleaning.**

   a. Protect all electrical equipment that could be damaged by the steam or moisture before steam cleaning.

   b. Cover all openings before steam cleaning.

   c. After cleaning, dry and apply a light coat of oil (Item 24, WP 0249 00) to all parts subject to rust.

   d. Clear out all tapped (threaded) holes with compressed air to remove dirt and cleaning fluid.

3. **Cleaning Disassembled Parts.**

   a. Place all disassembled parts in wire baskets for cleaning.

   b. Dry and cover all cleaned parts.

   c. Place parts on or in “racks” and hold for inspection or repair.

   d. All parts subject to rusting must be lightly oiled and wrapped.

   e. Keep all related parts and components together. Do not mix parts.

4. **Castings.**

   a. Clean inner and outer surfaces of castings and all areas subject to grease and oil with solvent cleaning compound (Item 4, WP 0249 00).

   b. Use a stiff brush to remove sludge and gum deposits.

   c. Clear out all tapped (threaded) holes with compressed air to remove dirt and cleaning solvent.

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

   a. Clean passages with wire probes to break up any sludge or gum deposits.

   b. Wash passages by flushing with solvent cleaning compound (Item 4, WP 0249 00).

   c. Dry passages with compressed air.

6. **Oil Seals, Electrical Cables and Flexible Hoses.**

CAUTION

Washing oil seals, electrical cables and flexible hoses with dry cleaning solvents or mineral spirits will cause serious damage or destroy the material.

   a. Wash electrical cables and flexible hoses with a mild solution of detergent (Item 11, WP 0249 00) and water and wipe dry.

   b. Oil seals are generally damaged during removal; cleaning will not be necessary since new seals will be used in assembly.

7. **Bearings.** Refer to TM 9-214 (WP 0246 00) for complete instructions.

8. **Machined Surfaces.**

   a. Clean machined surfaces with solvent cleaning compound (Item 4, WP 0249 00).

   b. Dry surfaces with compressed air.

CLEANING INSTRUCTIONS - CONTINUED

9. **Mated Surfaces.**
   a. Remove old gasket and/or sealing compound using a wire brush and solvent cleaning compound (Item 4, WP 0249 00).
   b. Lightly coat with oil (Item 24, WP 0249 00) and wrap all parts subject to rust before storing.
10. **Rusted Surfaces.** Clean all rusted surfaces using wire brush and crocus cloth.
11. **Oil-Bathed Internal Parts.** Wipe oil-bathed internal parts clean with a lint-free cloth.
12. **Air-Actuated Internal Parts.** Wash air-actuated internal parts clean with a lint-free cloth.
13. **Externally Exposed Parts.** Wash externally exposed parts with detergent (Item 11, WP 0249 00) and water. Rinse thoroughly and air dry.

INSPECTION INSTRUCTIONS

1. **General.** All components and parts must be carefully checked to determine if they are serviceable for reuse, if they can be repaired or if they must be scrapped.
2. **Drilled and Tapped (Threaded) Holes.**
   a. Inspect for wear, distortion (stretching), cracks or any other damage in or around holes.
   b. Inspect threaded areas for wear, distortion or evidence of cross-threading.
   c. Mark all damaged areas for repair or replacement.
3. **Metal Lines, Flexible Lines (Hoses) and Fittings.**
   a. Inspect lines for sharp kinks, cracks, bends or dents.
   b. Inspect flexible lines for fraying, evidence of leakage or loose fittings or connectors.
   c. Check all fittings and connectors for thread damage. Check for hex heads that are worn or rounded by poorly fitting wrenches.
   d. Mark all damaged material for repair or replacement.
4. **Castings.**
   a. Inspect all ferrous and nonferrous castings for cracks using a magnifying glass and strong light.
   b. Particularly check areas around studs, pipe plugs, threaded inserts and sharp corners. Replace all cracked castings.
   c. Inspect machined surfaces for nicks, burrs or raised metal. Mark damaged areas for repair or replacement.
   d. Inspect all pipe plugs, pipe plug openings, screws and screw openings for damaged or stripped threads.
   e. Check all gasket mating surfaces, flanges on housings and supports for warpage with a straightedge or surface plate. Inspect mating flanges for discoloration that may indicate persistent oil leakage.
5. **Bearings.** Refer to TM 9-214 (WP 0246 00) for inspection of bearings. Damaged bearings must be replaced.
6. **Studs, Bolts and Screws.** Replace if threads are damaged, bent, loose or stretched.
7. **Gears.**

NOTE

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

   a. Inspect all gears for cracks using a magnifying glass and strong light. No cracks are permissible.
   b. Inspect gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces.
   c. Check keyway slots for wear or damage. If keyways are worn, damaged or elongated, replace gear.

INSPECTION INSTRUCTIONS - CONTINUED

8. **Bushing and Bushing Type Bearings.**

   a. Check all bushings and bushing type bearings for secure fit, evidence of overheating, wear, burrs, nicks and out-of-round condition. Replace as necessary.

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

9. **Oil Seals.** Oil seals are mandatory replacement items.

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

11. **Machine-Tooled Parts.** Inspect for cracks, breaks, elongated holes, wear and chips. Replace any damaged parts.

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

13. **Mating Surfaces.** Inspect for remains of old gasket, seal, secure fit, pitting and evidence of leakage.

14. **Rusted Surfaces.** Inspect for pitting, holes and severe damage.

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

16. **Internal Parts.** Inspect for cracks, nicks, burrs, evidence of overheating and wear.

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

18. **Springs.** Inspect for broken, collapsed and twisted coils.

REPAIR INSTRUCTIONS

1. **General.**

   a. Any repair procedure peculiar to a specific part or component is covered in the work package relating to that item.

CAUTION

Repaired items must be thoroughly cleaned to remove metal chips and abrasives, to prevent these from entering working parts of the machine.

   b. After repair, clean all parts thoroughly to prevent dirt, metal chips or other foreign material from entering any working parts.

2. **Castings.**

   a. Only minor repairs to machined surfaces, flanges and gasket mating surfaces are permitted. Remove minor nicks, burrs and scratches with:

      (1) Fine mill file.

      (2) Crocus cloth dipped in cleaning solvent.

      (3) Lapping across a surface plate.

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

   c. Repair damaged threaded pipe plug or screw threads with a tap. Repair oversize holes with threaded inserts.

REPAIR INSTRUCTIONS - CONTINUED

3. **Studs.**
   a. Repair minor thread damage with a thread die.
   b. Replace studs having stripped or damaged threads as outlined below:
      (1) Remove using a stud remover. Back studs out slowly to avoid heat buildup and seizure that can cause stud to break off.

CAUTION

Refer to TC 9-237 (WP 0246 00) to avoid damage to castings if welding method is used.

      (2) If studs break off too short to use a stud remover, use a stud extractor to remove or use "welding method": weld bar stock or a nut to stud and remove with a wrench.
      (3) Install replacement stud slowly to prevent heat buildup and snapping off.
4. **Gears.**
   a. Remove gears using pullers.
   b. Only minor repairs to gears are permitted. Remove minor nicks, burrs or scratches on gear teeth with:
      (1) Fine mill file.
      (2) Crocus cloth dipped in solvent cleaning compound (Item 4, WP 0249 00).
5. **Bushings and Bushing Type Bearings.** When bushings and bushing type bearings seize to a shaft and spin in the bore, associated parts must also be replaced.
6. **Oil Seals.**
   a. Remove oil seals by pressing or prying out, being careful not to damage casting or adapter bore.
   b. Always install new seal in bore using proper seal installation tool.
7. **Painting.** Upon installation, restored parts must be painted IAW TB 43-0209 (WP 0246 00).

LUBRICATION INSTRUCTIONS

NOTE

Refer to TM 5-2410-237-10 and to Unit Maintenance PMCS (WP 0009 00 and WP 0010 00) for detailed, illustrated instructions on proper lubrication. The following are some general practices to remember:

1. Use the correct lubricant.
2. Keep lubricants clean.
3. Clean all fittings and area around fill and drain points before lubrication.
4. Lubricate clean disassembled and new parts to prevent rust.

STANDARD TOOL REQUIREMENTS

1. The following are general practices regarding the use of tools:
   a. Always use the proper tool kit and tools for the procedure being performed.
   b. Ensure that tools are clean and lubricated to reduce wear and to prevent rust.
   c. Keep track of tools. Do not be careless with them.
   d. Return tools to toolbox when finished with repair or maintenance.
   e. Return toolboxes and tools to tool storage when not in use.

STANDARD TOOL REQUIREMENTS - CONTINUED

f. Inventory tools before and after each use.

2. Some maintenance tasks may require special or fabricated tools. The “Initial Setup” of the procedure will specify any special or fabricated tools needed to perform that procedure. Use these special tools only for the maintenance procedures for which they are designed or called out. If you are unfamiliar with a required tool, see your supervisor.

APPLYING TORQUE

1. When tightening fasteners, use torque value as specified in *Torque Limits*, WP 0245 00.

2. If a unique torque value is required, it will be provided in the procedural step of the task.

TAGGING INSTRUCTIONS

1. Use marker tags (Item 37, WP 0249 00) to identify all electrical wires, fuel, oil, coolant, and hydraulic lines, and any other parts which may be hard to identify or replace later. Fasten tags to parts during removal by wrapping wire fasteners around or through parts and twisting ends together. Position tags to be out of the way during cleaning, inspection, and repair. Mark tags with a pencil, pen or marker.

2. Whenever possible, identify electrical wires with the number of the terminal or wire to which it connects. If no markings can be found, tag both wires or wire and terminal, and use the same identifying mark for both. If you cannot tag a wire because it must fit through a small hole or you cannot reach it, write down the description of the wire and the point to which it connects or draw a simple diagram on paper. Be sure to write down enough information so you will be able to properly connect the wires during assembly. If you need to identify a loose wire, look for identifying number near end of the wire, stamped on a permanent metal tag. Compare the number to wire numbers on the appropriate electrical schematic.

3. Identify fuel, oil, coolant, and hydraulic lines when you are taking off more than one line at the same time. Mark tags with points to which lines and hoses must be connected. If it is not obvious which end of a line goes where, tag each end of the line.

4. Identify and tag other parts as required by name and installed location.

LINES AND PORTS

To keep dirt from contaminating fluid systems when removing and installing fuel, oil, coolant, and hydraulic lines, perform the following steps:

a. Clean fittings and surrounding area before disconnecting lines.

b. Cover, cap, plug (Item 2, WP 0249 00) or tape lines and ports after disconnecting lines. When these are not available, use plastic bags and rubber bands, clean rags (Item 29, WP 0249 00), duct tape (Item 39, WP 0249 00) or other similar materials to prevent dirt from entering system.

c. Ensure that new and used parts are clean before installing.

d. Replace all removed tiedown straps.

e. Wait to remove cover, cap, plug or tape from lines and ports until just before installing lines.

FLUID DISPOSAL

WARNING

When servicing this vehicle, performing maintenance, or disposing of materials such as engine coolant, hydraulic fluid, lubricants, battery acids or batteries, 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.

Dispose of contaminated drained fluids in IAW the Standard Operating Procedures (SOP) of your unit.

END OF WORK PACKAGE

ELECTRICAL GENERAL MAINTENANCE INSTRUCTIONS 0242 00

THIS WORK PACKAGE COVERS

Receptacle Connector Repair
Waterproof Connector Repair
Military Connector Repair
Ring Terminal Repair
Splicing Wires
Electrical Ground Points
Multimeter Usage
Relay Inspection and Test

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 1 (Item 103, WP 0250 00)

Materials/Parts

Cloth, abrasive (Item 5, WP 0249 00)

Detergent (Item 11, WP 0249 00)

Flux, soldering (Item 12, WP 0249 00)

Materials/Parts - Continued

Grease, electrically conductive (Item 17, WP 0249 00)

Insulating sleeving (Item 18, WP 0249 00)

Insulating varnish, electrical (Item 19, WP 0249 00)

Solder, lead-tin alloy (Item 35, WP 0249 00)

Tag, marker (Item 37, WP 0249 00)

NOTE

- **Use electrically conductive grease on unprotected (exposed to weather) electrical connectors before connections are made.**
- **Use electrical insulating varnish on all electrical connections that are mounted outside of machine and are exposed to harsh weather and/or spray from the ground.**
- **Tag and mark position of wires in electrical connector to ensure correct installation.**

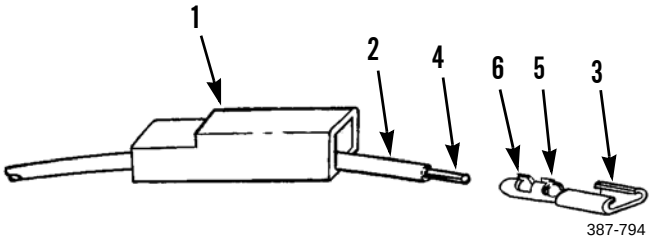
RECEPTACLE CONNECTOR REPAIR

1. While releasing locking tab through front of connector (1), push wire (2) and receptacle (3) through front of connector.
2. If defective, remove receptacle (3) from wire (2) by cutting through wire just behind receptacle. Discard receptacle.

NOTE

Perform steps 3 through 6 only if receptacle was removed.

3. Slide connector (1) back on wire (2).
4. Strip insulation of wire (2) to expose ¼ in. (6 mm) length of metal strands (4).
5. Securely crimp tabs (5) of new receptacle (3) over metal strands (4).
6. Crimp tabs (6) of receptacle (3) over insulation of wire (2).
7. Slide connector (1) forward over receptacle (3) until locking tab of receptacle snaps into place.



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WATERPROOF CONNECTOR REPAIR

1. Remove end cover (7) and gasket (8) from front of connector (9).
2. Remove seal (10) from rear of connector (9) and slide seal back on wire (11).

NOTE

Perform the following steps for each wire of connector.

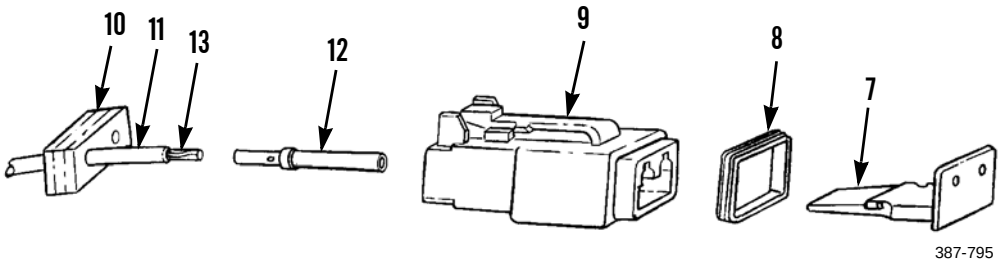
3. While releasing locking tab through front of connector (9), remove wire (11) and pin (12) through rear of connector.
4. If defective, remove pin (12) from wire (11) by cutting just behind pin. Discard pin.

NOTE

Perform steps 5 through 8 only if pin was removed.

5. Strip insulation of wire (11) to expose ¼ in. (6 mm) length of metal strands (13).
6. Insert metal strands (13) of wire (11) fully into rear of new pin (12).
7. Securely crimp pin (12) to metal strands (13) of wire (11).
8. Push pin (12) into rear of connector (9) until fully seated.
9. Install seal (10) on rear of connector (9).
10. Install gasket (8) and end cover (7) on front of connector (9).

WATERPROOF CONNECTOR REPAIR - CONTINUED



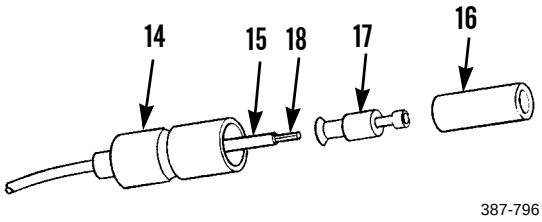
MILITARY CONNECTOR REPAIR

1. Slide shell (14) back on wire (15) to expose sleeve (16).
2. Remove sleeve (16) from terminal (17) by pulling sleeve forward.
3. If defective, remove terminal (17) from wire (15) by cutting through wire just behind terminal. Discard terminal.

NOTE

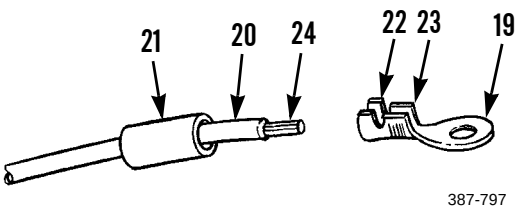
Perform steps 4 through 6 only if terminal was removed.

4. Strip insulation of wire (15) to expose length of metal strands (18) equal to depth of new terminal (17).
5. Securely crimp new terminal (17) to metal strands (18) of wire (15).
6. Install sleeve (16) to terminal (17) by pushing sleeve over front of terminal until fully seated.
7. Slide shell (14) up wire (15) and over sleeve (16).



RING TERMINAL REPAIR

1. Remove ring terminal (19) from wire (20) by cutting through wire just behind heat shrink tubing (21). Discard terminal.
2. Cut new heat shrink tubing (21) to length sufficient to cover tabs (22 and 23) of ring terminal (19) and ¼ in. (6 mm) of wire (20).
3. Slide heat shrink tubing (21) back on wire (20).
4. Strip insulation of wire (20) to expose proper length of metal strands (24).
5. Securely crimp tabs (23) of new ring terminal (19) over metal strands (24).
6. Crimp tabs (22) of ring terminal (19) over insulation of wire (20).
7. Slide heat shrink tubing (21) over tabs (22 and 23) of ring terminal (19).
8. Using heat gun, apply heat to heat shrink tubing (21) until tubing snugly conforms to ring terminal (19) and insulation of wire (20).



SPLICING WIRES

NOTE

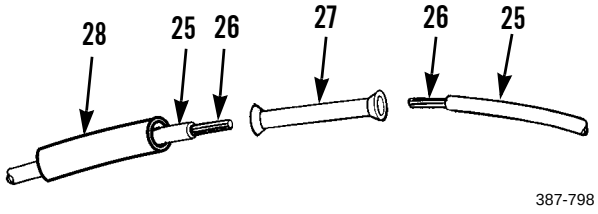
The selection of crimping tool and type of splice connectors is optional.

1. Inspect each end of wire (25). Trim insulation and metal strands (26) of wire back, as necessary, to ensure integrity of wire.
2. Strip each end of wire (25) to expose length of metal strands (26) to suit type of splice connector (27) used.

NOTE

Perform steps 3 and 4 at each end of splice connector.

3. Insert metal strands (26) of wire (25) fully into splice connector (27).
4. Cut length of insulation sleeving (28) at least 3/4 in. (19 mm) longer than length of splice connector (27) and slide insulation sleeving over one wire (25).
5. Securely crimp splice connector (27) to metal strands (26) of wire (25).
6. Center insulation sleeving (28) over splice connector (27) and use heat gun to shrink insulation sleeving.



ELECTRICAL GROUND POINTS

Many electrical problems are the result of poor ground connections. Ensure that ground connections are good by performing the following steps:

WARNING

Although battery disconnect switch must be ON to test electrical circuit voltage, turn battery disconnect switch to OFF before performing resistance tests or replacing parts. Failure to follow this warning may result in injury to personnel and damage to parts or equipment.

a. Remove screw, lockwasher, nut, etc. connecting ground wire terminal to machine ground point.
b. If necessary, clean mounting hardware, wire terminal, and ground point with detergent and a scrub brush.
c. Remove any rust or corrosion from ground point with a wire brush and abrasive cloth.
d. Replace defective mounting hardware and wire terminal as necessary.
e. Install wire terminal to ground point with screw, lockwasher, nut, etc. and tighten securely.

MULTIMETER USAGE

1. **General.** A multimeter is used to troubleshoot the electrical system of the machine. The multimeter ohms scale is used to test for continuity, shorts and resistance. The multimeter voltmeter scale is used to test voltage levels in the electrical system.
2. **Continuity Tests.** Continuity tests are performed to check for breaks in a circuit (such as a fuse, switch, light bulb connector or electrical wiring).

MULTIMETER USAGE - CONTINUED

NOTE

If readout will not zero properly, replace batteries and repeat zeroing procedure. If readout will not zero after batteries have been replaced, notify your supervisor.

a. **Zero Multimeter.**

(1) Set multimeter to ON.

(2) Select OHMS.

(3) Select LOWEST VOLTAGE/OHMS scale.

(4) Touch black and red probes together and check for a zero indication on digital readout.

CAUTION

Before performing a continuity test, always place battery disconnect switch in OFF position and disconnect circuit to be tested. Failure to follow this caution may damage multimeter.

b. **Testing for Continuity.**

(1) Zero multimeter.

(2) Connect black and red probes to both terminals of circuit being tested.

(3) Observe readout and interpret results as follows:

(a) If readout indicates any numeric value, circuit has continuity.

(b) If readout does not indicate any numeric value, or value is over the limits of the meter, circuit is open.

CAUTION

Before performing a continuity test, always place battery disconnect switch in OFF position and disconnect circuit to be tested. Failure to follow this caution may damage multimeter.

c. **Testing for Shorts.** A short (or short circuit) occurs when two circuits that should not be connected have continuity with each other. A short also occurs when a circuit that should not touch ground has continuity with ground.

(1) Zero multimeter.

(2) Connect black probe to one pin and red probe to either ground or another pin.

(3) Observe readout and interpret results as follows:

(a) If readout indicates any numeric value above 0 (zero) but less than the meter's limits, circuits are shorted or circuit is grounded, if testing to ground.

(b) If readout does not indicate a numeric value or value does not change when connected to circuit(s) in question, circuits are not shorted.

(c) If readout jumps or flickers, circuits are shorted or grounded intermittently.

CAUTION

Before performing a continuity test, always place battery disconnect switch in OFF position and disconnect circuit to be tested. Failure to follow this caution may damage multimeter.

d. **Testing for Resistance.** Allowable resistance readings depend on circuit being tested. Refer to the particular section dealing with that circuit or component for allowable readings.

(1) Zero multimeter.

MULTIMETER USAGE - CONTINUED

(2) Select OHMS.

(3) Select lowest VOLTAGE/OHMS range. If test specifies ohms range, select required range.

(4) Connect black and red probes across circuit to be tested.

(5) Observe readout and interpret results as circuit resistance.

3. **Voltage Tests.**

a. **Measuring DC Voltage.**

(1) Set multimeter to ON.

(2) Select lowest possible DC VOLTAGE range that is still higher than voltage to be measured.

(3) Connect red probe to positive (+) pin and black probe to negative (-) pin.

(4) Observe readout and interpret results as DC voltage in circuit being tested.

b. **Measuring DC Voltage Drop.**

NOTE

Voltage drop is defined as the amount of voltage loss that occurs through all or part of a circuit due to resistance.

(1) Set multimeter to ON.

(2) Select lower possible DC VOLTAGE range that is still higher than voltage to be measured.

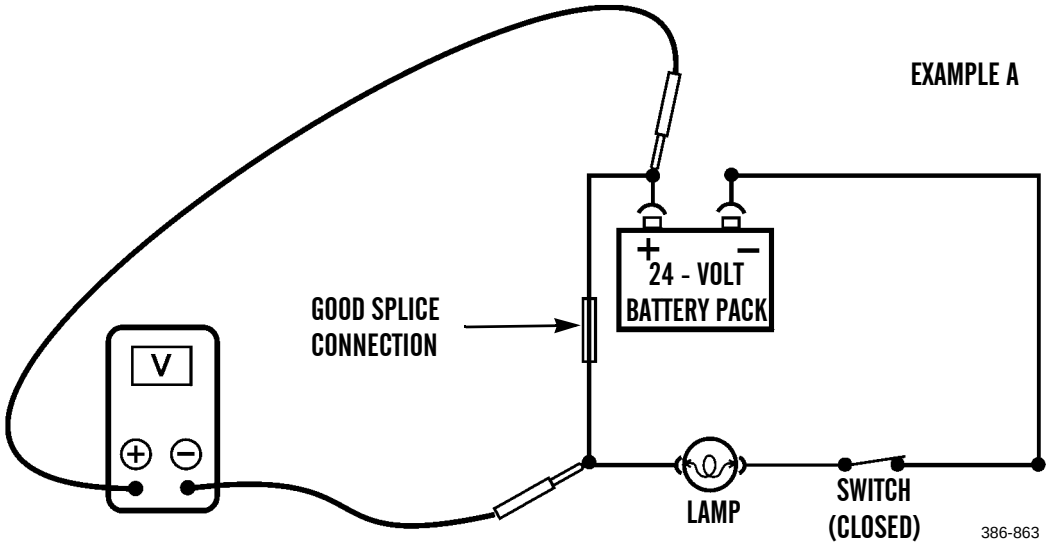
(3) Connect red probe to test location closest to positive (+) side. Connect probe to test location closest to ground.

(4) Observe readout and interpret results as DC voltage in circuit being tested.

c. **DC Voltage Drop Examples.**

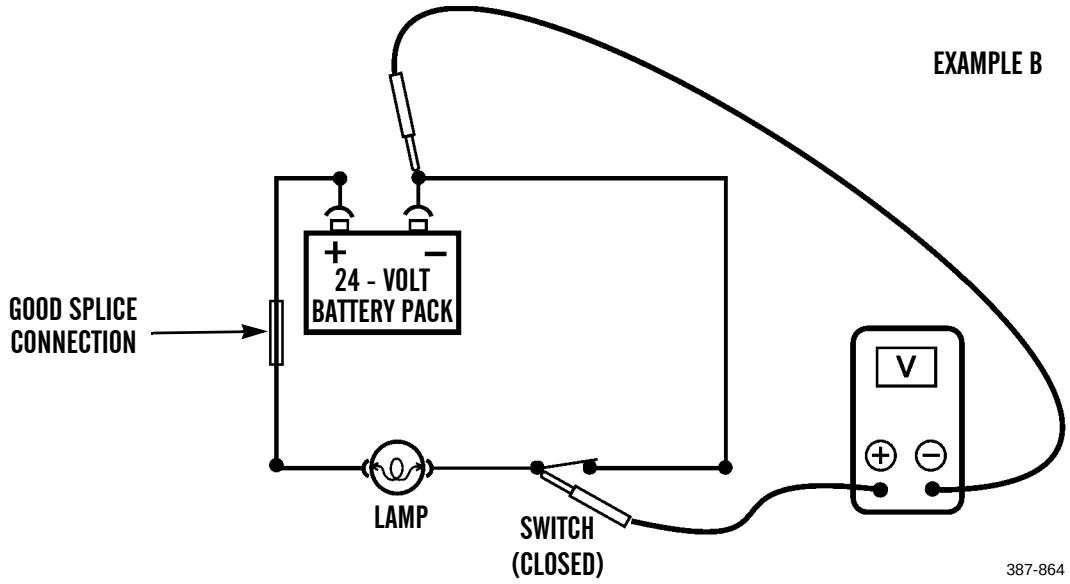
(1) Good Voltage Drop.

(a) Example A shows how to measure voltage drop across a good splice connection. Voltage reading at multimeter should be low (about 0.1 volt). This means that resistance across this splice is low, resulting in low voltage drop.

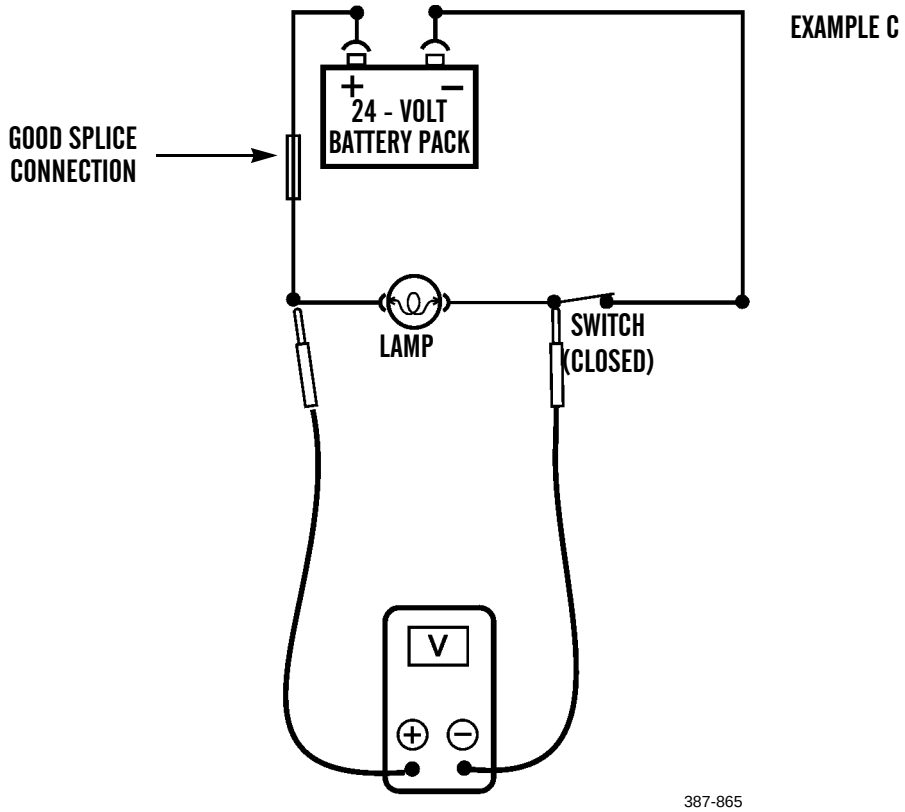


(b) Example B shows how to measure voltage drop across a closed switch. Voltage reading at multimeter also should be low (about 0.1 volt). This means that resistance across this switch is low, resulting in low voltage drop.

MULTIMETER USAGE - CONTINUED



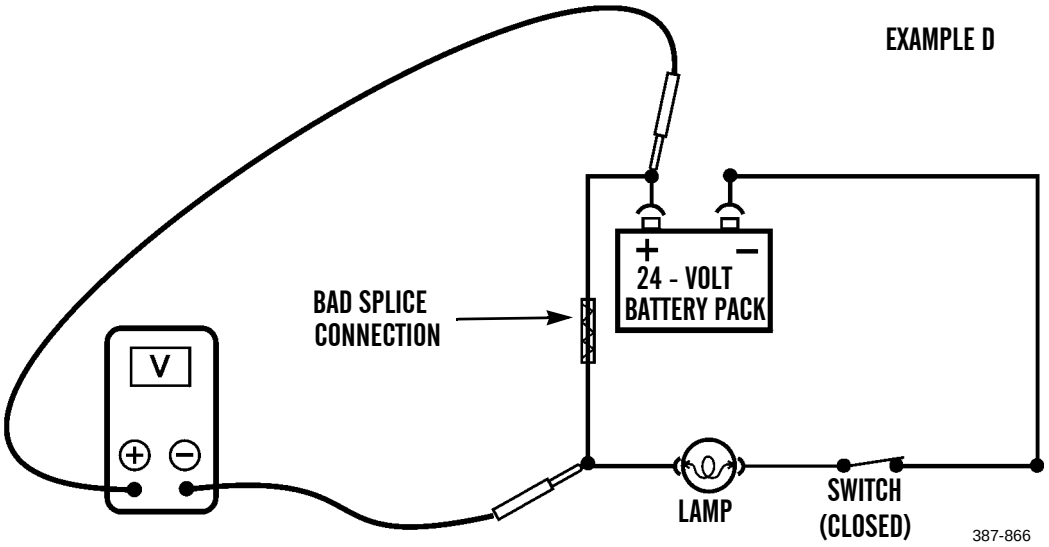
(c) Example C shows how to measure voltage drop across a load, in this case a lamp. If voltages in Examples A and B are 0.1 volt each, voltage reading at multimeter in Example C will equal 23.8 volts. This is because the sum of all voltage drops in a circuit is equal to the source voltage.



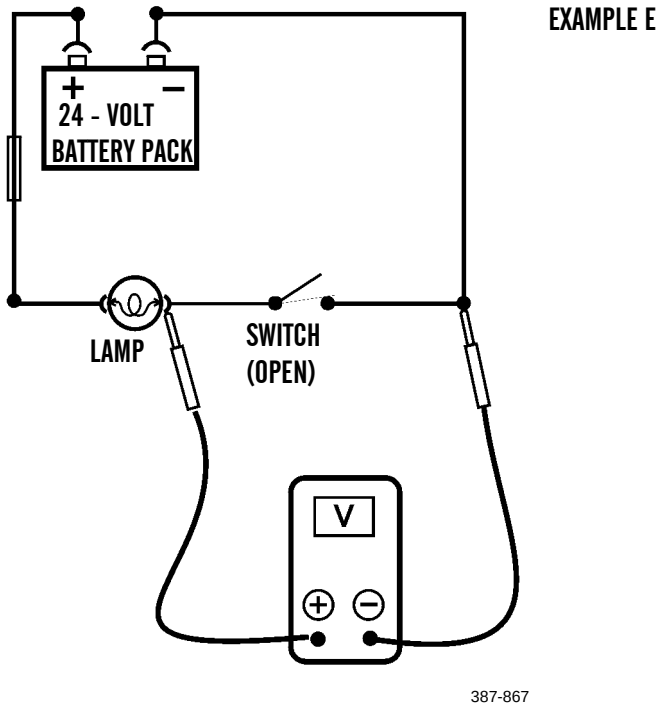
MULTIMETER USAGE - CONTINUED

(2) Bad Voltage Drop.

(a) Example D shows how to measure voltage drop across a bad splice connection. The voltage reading at multimeter is high (for example 7 volts). This means the resistance across this splice is high, resulting in high voltage drop. This would cause lamp to be dimly lit when switch is closed.



(b) Example E shows how to measure voltage drop across an open circuit, in this case an open switch. This could also be used to demonstrate the reading in a circuit with a broken wire. The voltage reading at multimeter will be approximately 24 volts. This means that an open circuit or an open switch has infinite resistance, causing all voltage to be lost.



RELAY INSPECTION AND TEST

1. **Inspecting Relays.**
   a. Check for bent or damaged pins.
   b. Check for burned or damaged relay case.
2. **Testing Relays.**

NOTE

When testing relays, always refer to circuit diagram printed or stamped on relay case.

   a. Using a multimeter, check for continuity across relay coil.
   b. Using a multimeter, check open or closed contacts within relay.

END OF WORK PACKAGE

GROUND HANDLING PROCEDURES 0243 00

THIS WORK PACKAGE COVERS

Operating/Adjusting Hydraulic Jack Stands, Raising Tractor off Ground, Lowering Tractor to Ground

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Shop equipment, common no. 2 (Item 104, WP 0250 00)

Cap, protective, dust (Item 19, WP 0250 00)

Collar, shaft (Item 21, WP 0250 00)

Coupling assembly (Item 23, WP 0250 00)

Coupling half, quick (Item 24, WP 0250 00)

Cylinder assembly, actuating (Item 27, WP 0250 00)

Hose assembly (Item 37, WP 0250 00)

Nipple, pipe (Item 53, WP 0250 00)

Pin, shoulder (Item 63, WP 0250 00)

Plug, pipe (Item 72, WP 0250 00)

Plug, protective, dust (Item 73, WP 0250 00)

Pumping unit, hydraulic (Item 94, WP 0250 00)

Reducer, pipe (Item 97, WP 0250 00)

Reducer, pipe (Item 98, WP 0250 00)

Repair tool, special purpose (Item 100, WP 0250 00)

Tools and Special Tools - Continued

Stand assembly (Item 114, WP 0250 00)

Stand, lifting (Item 115, WP 0250 00)

Tee, pipe (Item 120, WP 0250 00)

Tool, special (Item 126, WP 0250 00)

Valve, needle (Item 127, WP 0250 00)

Materials/Parts

Wood blocks, 8 in. x 8 in. x 18 in. long

References

WP 0132 00

Personnel Required

Two

Equipment Condition

Blade and pusharm assembly removed (WP 0235 00)

Rear implement removed (WP 0238 00 for ripper or WP 0180 00 for winch)

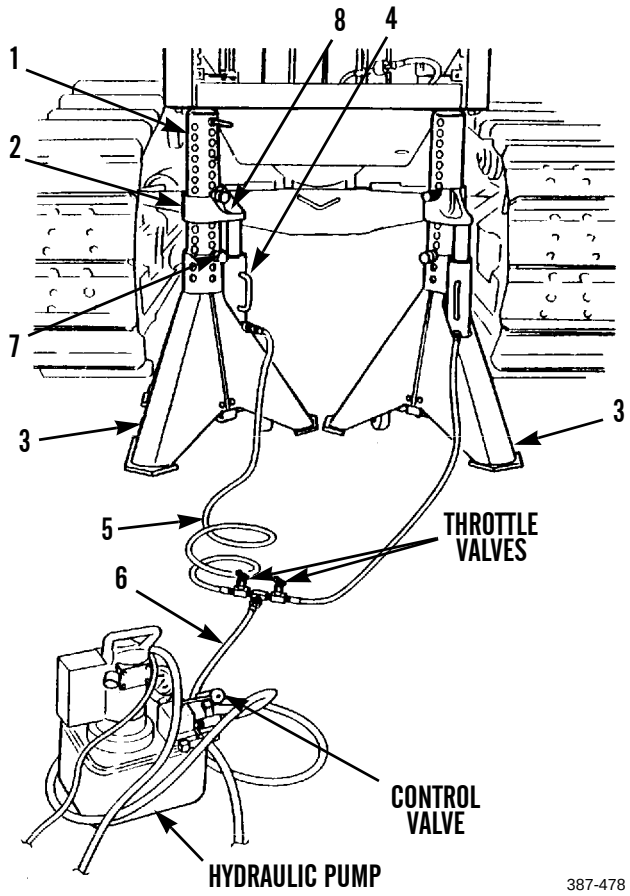
Track tension released, if required (WP 0143 00)

WARNING

- **This task must be performed on a flat, level concrete surface. Hydraulic jack stands can become unstable if used on any other surface. Instability could cause tractor to fall, causing personal injury or death.**
- **All damage or leaks to hydraulic jack stands must be repaired before use. Failure to make repairs can cause injury or death.**
- **Always use handle any time extension tube on hydraulic jack stand is manually extended or retracted. Failure to follow this warning may cause injury.**

OPERATING/ADJUSTING HYDRAULIC JACK STANDS

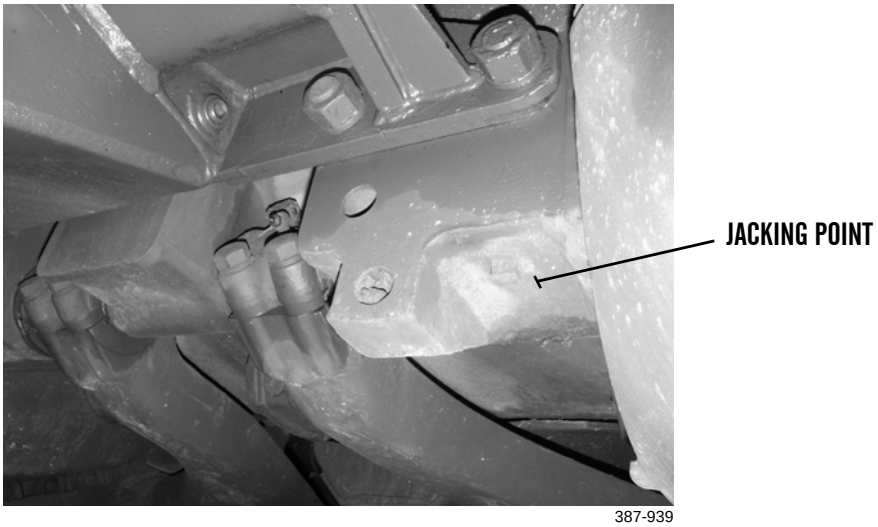
1. Assemble hydraulic jack stands as follows:
   a. Install extension tube (1) and collar (2) on jack stand (3).
   b. Install hydraulic cylinder (4) in jack stand (3) and under tab of collar (2).
   c. Repeat steps a and b for other jack stand (3).
   d. Connect hydraulic lines (5) from throttle valves to each hydraulic cylinder (4).
   e. Connect hose (6) from valve tee to hydraulic pump.
   f. Open both throttle valves and control valve on hydraulic pump and ensure cylinders (4) are fully retracted. If necessary, push down on extension tube (1).



WARNING

Ensure all jack stands and blocking are properly placed and secure, to prevent movement of item to be lifted. Failure to follow this precaution could result in serious injury or death.

2. Put jack stand under area to be lifted. Ensure lifting point is sturdy.



JACKING POINT AT RIGHT-REAR OF TRACTOR. LEFT SIDE IS THE SAME.

OPERATING/ADJUSTING HYDRAULIC JACK STANDS - CONTINUED

3. Lift item using the following procedure:

   a. Close control valve on hydraulic pump.

CAUTION

Extension tube may bind in stand when tube is lifted by hydraulic cylinder. Observe jack stands carefully during lifting procedure. Tapping with hammer may free binding.

   b. Operate hydraulic pump to raise jack stands.

WARNING

Ensure jack stands raise evenly to provide a balanced lift. Failure to raise evenly could cause an unstable condition. Serious injury or death could result.

   c. If jack stands do not raise evenly, partially close throttle valve connected to higher jack stand. While pumping, close valve until jack stands raise evenly when operating hydraulic pump.

WARNING

Extension tube can only be raised until bottom hole of extension tube is aligned with top hole of jack stand. Hydraulic jack stands become unstable if raised higher. Instability can allow item to fall, causing personal injury or death.

   d. If hydraulic cylinders (4) are fully extended, but item is not lifted enough, install pin (7) through each jack stand and extension tube (1). This will keep jack stand raised while cylinders are retracted. If jack stands are high enough, go to step j.

   e. Open control valve on hydraulic pump and remove pin (8) above each collar (2).

   f. Retract hydraulic cylinder (4) and lower collar (2).

   g. Install pin (8) in first hole above collar (2).

   h. Close control valve on hydraulic pump and operate pump to raise jack stands.

   i. Repeat steps d through h only until item is lifted high enough or bottom hole of extension tube (1) is aligned with top hole of jack stand.

   j. Install pin (7) through each jack stand and extension tube (1) to secure jack stand in raised position. Remove hydraulic pressure by opening control valve on hydraulic pump.

4. Slowly lower item, using the following procedure:

CAUTION

Extension tube may bind in jack stand when extension tube is lowered by retracting hydraulic cylinder. Observe jack stands carefully during lowering procedure. Tapping tube with a hammer may free binding.

   a. Slowly open control valve on hydraulic pump. Allow hydraulic cylinders to retract completely.

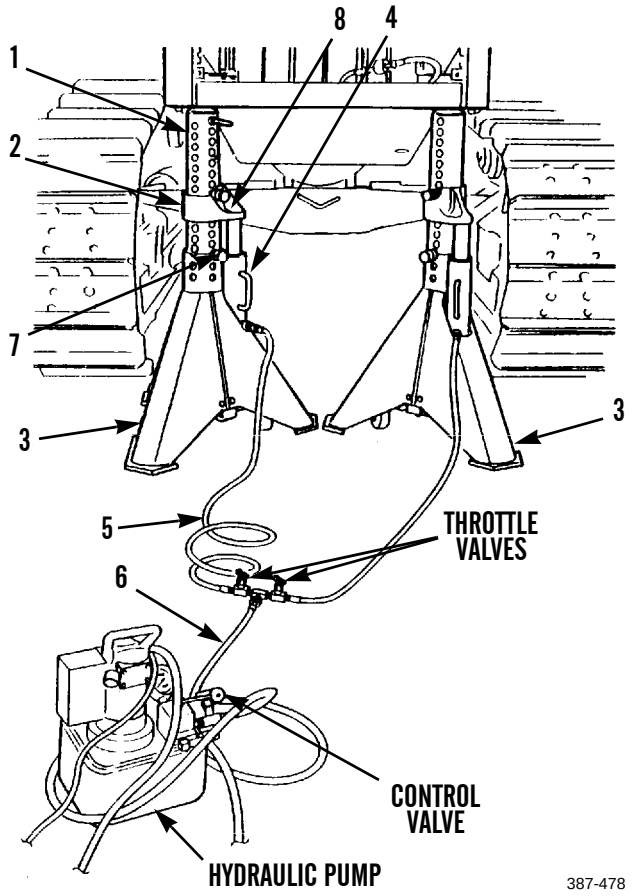
OPERATING/ADJUSTING HYDRAULIC JACK STANDS - CONTINUED

b. If hydraulic cylinders (4) are fully retracted, but item is not lowered completely, close control valve on hydraulic pump.

c. Operate hydraulic pump until a hole in extension tube (1) and jack stand are in alignment. Install pin (7) in this hole for each jack stand.

d. Open control valve on hydraulic pump to retract hydraulic cylinders (4). Remove pin (8) from above each collar (2).

e. Close control valve on hydraulic pump. Operate pump to extend hydraulic cylinders (4) and raise collars (2). Do not extend cylinders completely. Cylinders must be extended to remove weight from lower pins (7).



f. Install pins (8) in first hole above collars (2).

g. Operate hydraulic pump to lift item so lower pins (7) can be removed.

h. Repeat steps a through g until weight of item is completely off jack stands.

i. Remove hydraulic jack stands.

RAISING TRACTOR OFF GROUND

WARNING

Ground guide assistance is required to position tracks of tractor on wood blocks. All other personnel must stand clear, to prevent serious injury or death.

1. Put four wood blocks in front of each track. Drive tractor up on wood blocks so that both front and rear of tractor are totally supported by blocks.

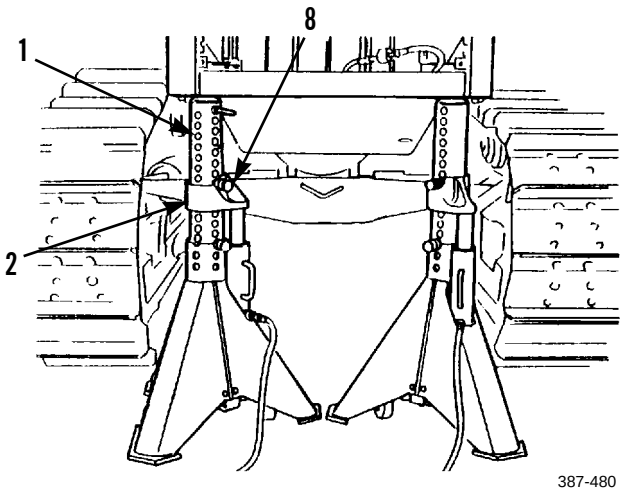
WARNING

Tracks must be securely blocked so that tractor will not move backwards when front of tractor is lifted with hydraulic jack stands.

2. Engage parking brake. Put wood blocks behind tracks at rear of tractor.

RAISING TRACTOR OFF GROUND - CONTINUED

3. Move transmission gear selector to neutral and shut down engine.
4. Assemble hydraulic jack stands IAW step 1 of *Operating/Adjusting Hydraulic Jack Stands*.
5. Place hydraulic jack stands under main frame at front of tractor, IAW step 2 of *Operating/Adjusting Hydraulic Jack Stands*.
6. Move extension tube (1) of hydraulic jack stands up to bottom of main frame. Install pin (8) in first hole above collar (2). Ensure pin fits into groove of collar.
7. Lift front of tractor using hydraulic jack stands, IAW step 3 of *Operating/Adjusting Hydraulic Jack Stands*.



387-480

WARNING

Keep tractor level when tractor is elevated on jack stands to maintain stability and safety.

8. Repeat steps 4-7, to place hydraulic jack stands underneath steering clutch cases and raise rear of tractor.

387-939

JACKING POINT AT RIGHT-REAR OF TRACTOR. LEFT SIDE IS THE SAME.

RAISING TRACTOR OFF GROUND - CONTINUED

WARNING

Tractor must be kept level and lowest track grouser must be 2 in. (5 cm) off floor when tractor is elevated. DO NOT lift tractor any higher than necessary. Stability and safety will then be maintained.

9. Continue to raise front and rear of tractor evenly, until lowest track grouser is 2 in. (5 cm) off floor and tractor is level.

WARNING

Ensure all jack stands and blocking are properly placed and secure to prevent movement of tractor. Use extreme care when operating tractor in elevated position.

10. If tractor operation is necessary with tractor in raised position, use extreme care and slow engine speed ONLY.

LOWERING TRACTOR TO GROUND

WARNING

Parking brake must be engaged to prevent tractor from moving backwards when rear of tractor is lowered to the ground.

1. Ensure parking brake is engaged.

NOTE

- **Wood blocks must be installed under tracks to allow for clearance to remove hydraulic jack stands after tractor is lowered.**
- **Tractor may have to be raised to install wood blocks.**

2. Put wood blocks under front and rear of both tracks.

WARNING

Tracks must be securely blocked so that tractor will not move backwards when rear of tractor is lowered with hydraulic jack stands.

3. Slowly lower rear of tractor onto wood blocks IAW step 4 in *Operating/Adjusting Hydraulic Jack Stands*. Install two more blocks behind tracks at rear of tractor to prevent it from moving. Remove hydraulic jack stands from rear.
4. Slowly lower front of tractor IAW step 4 in *Operating/Adjusting Hydraulic Jack Stands*, until weight of tractor is completely off hydraulic jack stands. Remove hydraulic jack stands from front.
5. Start engine and apply brakes.
6. Remove blocks from behind tracks at rear of tractor.

WARNING

Ground guide assistance is required when driving tractor off wood blocks. All other personnel must stand clear, to prevent serious injury or death.

7. Release parking brake. Slowly drive tractor off wood blocks.
8. Make track adjustments, if required (WP 0132 00).
9. Install blade and pusharm assembly (WP 0235 00).
10. Install rear implement: ripper (WP 0238 00) or winch (WP 0180 00).

END OF WORK PACKAGE

PREPARATION FOR STORAGE AND SHIPMENT 0244 00

THIS WORK PACKAGE COVERS

Preparation for Storage

Preparation for Shipment

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 122, WP 0250 00)

Materials/Parts

Grease, GAA (Item 16, WP 0249 00)

Tape (Item 39, WP 0249 00)

References

WP 0008 00

WP 0009 00

Equipment Condition

Machine parked on level ground (TM 5-2410-237-10)

PREPARATION FOR STORAGE

1. Perform Operator Preventive Maintenance Checks and Services (PMCS) contained in TM 5-2410-237-10.
2. Perform Unit Maintenance Preventive Maintenance Checks and Services (PMCS) contained in WP 0009 00 and WP 0010 00.
3. Schedule the next PMCS on DD Form 814, *Preventive Maintenance Schedule and Record*.
4. Store tractor with blade (and ripper if equipped) lowered. Cycle controls after engine shutdown to relieve any pressure in circuits.
5. Seal exhaust stack opening and engine air cleaner precleaner opening with tape.
6. Coat exposed metal portions of blade (and ripper if equipped) cylinder rods with rust preventive compound.
7. Cover seat, armrests and dash with protective plastic wrap.
8. Fill fuel tank completely.
9. Ensure that fuel drain valve handle, battery box, engine oil filler tube, fuel tank cap, engine oil level gage, hydraulic tank cover, dash cover, seat assembly and radiator cover are protected.
10. On models with winterized cab, ensure all windows are closed and lock cab door.
11. Ensure that tractor is fully equipped. Refer to TM 5-2410-237-10HR.
12. Fill in DD Form 1397 completely and attach to a conspicuous part of the tractor.

PREPARATION FOR SHIPMENT

1. Perform Operator Preventive Maintenance Checks and Services (PMCS) contained in TM 5-2410-237-10.
2. Perform Unit Maintenance Preventive Maintenance Checks and Services (PMCS) contained in WP 0009 00 and WP 0010 00.
3. Schedule the next PMCS on DD Form 814, *Preventive Maintenance Schedule and Record*.
4. Seal exhaust stack opening and engine air cleaner precleaner opening with tape.
5. Consult for shipping and transportation data on data plate (TM 5-2410-237-10).

END OF WORK PACKAGE

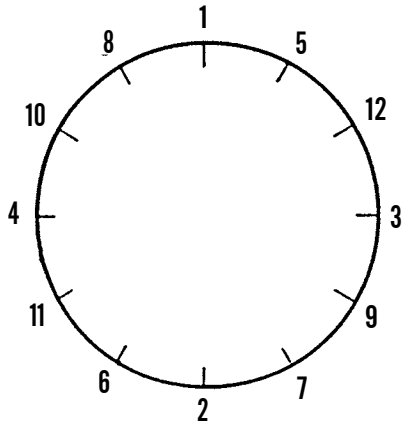
TORQUE LIMITS 0245 00

SCOPE

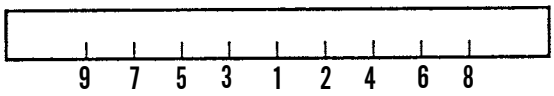
This work package lists standard torque values and provides general information for applying torque. Special torque values and tightening sequences are indicated in the maintenance procedures for applicable components.

GENERAL

1. Always use torque values listed in Tables 1 and 2 when a maintenance procedure does not give a specific torque value.
   a. Table 1 provides torque limits for SAE standard fasteners.
   b. Table 2 provides torque limits for metric fasteners.
2. Unless otherwise indicated, standard torque tolerance shall be ± 10%.
3. Torque values listed are based on clean, dry threads. Reduce torque by 10% when engine oil is used as a lubricant. Reduce torque by 20% if new plated capscrews are used.
4. If the maintenance procedures do not specify a tightening order, use the following guides:
   a. Unless otherwise specified, lubricate threads of fasteners with oil (OE/HDO-10 or OEA-30).
   b. When tightening fasteners above 30 lb-ft (41 Nm), use the torque pattern but only tighten to 70% of final value (multiply final value by 0.7). Repeat pattern until final value is reached.
   c. Tighten circular patterns using circular torque pattern and tighten straight patterns using straight torque pattern.



CIRCLULAR TORQUE PATTERN



STRAIGHT TORQUE PATTERN

CAUTION

If replacement capscrews are of higher grade than originally supplied, use torque specifications for the original. This will prevent equipment damage due to overtorquing.

Table 1. Torque Limits - SAE Standard Fasteners.

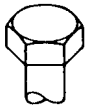
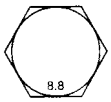
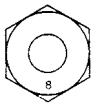
CURRENT USAGE	MUCH USED	MUCH USED	USED AT TIMES	USED AT TIMES
QUALITY OF MATERIAL	INDETERMINATE	MINIMUM COMMERCIAL	MEDIUM COMMERCIAL	BEST COMMERCIAL
SAE Grade Number	1 or 2	5	6 or 7	8
Cap Screw Head Markings Manufacturer's marks may vary These are all SAE Grade 5 (3 line)				
CAP SCREW BODY SIZE IN. - THREAD	TORQUE LB-FT (NM)	TORQUE LB-FT (NM)	TORQUE LB-FT (NM)	TORQUE LB-FT (NM)
1/4 20	5 (7)	8 (11)	10 (14)	12 (16)
28	6 (8)	10 (14)		14 (19)
5/16 18	11 (15)	17 (23)	19 (26)	24 (33)
24	13 (18)	19 (26)		27 (37)
3/8 16	18 (24)	31 (42)	34 (46)	44 (60)
24	20 (27)	35 (47)		49 (66)
7/16 14	28 (38)	49 (66)	55 (75)	70 (95)
20	30 (41)	55 (75)		78 (106)
1/2 13	39 (53)	75 (102)	85 (115)	105 (142)
20	41 (56)	85 (115)		120 (163)
9/16 12	51 (69)	110 (149)	120 (163)	155 (210)
18	55 (75)	120 (163)		170 (231)
5/8 11	83 (113)	150 (203)	167 (226)	210 (285)
18	95 (129)	170 (231)		240 (325)
3/4 10	105 (142)	270 (366)	280 (380)	375 (508)
16	115 (156)	295 (400)		420 (569)
7/8 9	160 (217)	395 (536)	440 (597)	605 (820)
14	175 (237)	435 (590)		675 (915)
1 8	235 (319)	590 (800)	660 (895)	910 (1234)
14	250 (339)	660 (895)		990 (1342)

Table 2. Torque Limits - Metric Fasteners.

TORQUE VALUES FOR METRIC THREAD FASTENERS WITH LUBRICATED* OR PLATED THREADS†				
Thread Diameter-Pitch	 **Class 8.8 Bolt**	 **Class 8 Nut**	 **Class 10.9 Bolt**	 **Class 10 Nut**
	Torque: lb-ft (Nm)		**Torque: lb-ft (Nm)**	
M6	5 (7)		7 (9)	
M8	12 (16)		17 (23)	
M8 x 1	13 (18)		18 (24)	
M10	24 (33)		34 (46)	
M10 x 1.25	27 (37)		38 (52)	
M12	42 (57)		60 (81)	
M12 x 1.5	43 (58)		62 (84)	
M14	66 (89)		95 (129)	
M14 x 1.5	72 (98)		103 (140)	
M16	103 (140)		148 (201)	
M16 x 1.5	110 (149)		157 (213)	
M18	147 (199)		203 (275)	
M18 x 1.5	165 (224)		229 (310)	
M20	208 (282)		288 (390)	
M20 x 1.5	213 (313)		320 (434)	
M22	283 (384)		392 (531)	
M22 x 1.5	315 (427)		431 (584)	
M24	360 (488)		498 (675)	
M24 x 2	392 (531)		542 (735)	
M27	527 (715)		729 (988)	
M27 x 2	569 (771)		788 (1068)	
M30	715 (969)		990 (1342)	
M30 x 2	792 (1074)		1096 (1486)	

* All plated and unplated fasteners should be coated with oil before installation.

† Use these torque values if either the bolt or nut is lubricated or plated (zinc-phosphate conversion-coated, cadmium-plated, or waxed).

END OF WORK PACKAGE

CHAPTER 5
SUPPORTING INFORMATION

REFERENCES 0246 00

SCOPE

This work package lists all forms, field manuals, technical bulletins, technical manuals and other publications referenced in this manual and which apply to maintenance of the D7G Tractor.

PUBLICATION INDEXES

NOTE

The following indexes should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical manual.

Consolidated Army Publications and Forms Index. . . . . .DA Pam 25-30

Functional User's Manual for the Army Maintenance Management System. . . . . .DA Pam 738-750

FORMS

Refer to DA Pam 738-750, *The Army Maintenance Management System (TAMMS)*, for instructions on the use of maintenance forms.

Equipment Inspection and Maintenance Worksheet. . . . . DA Form 2404, DA Form 5988-E

Preventive Maintenance Schedule and Record. . . . . DD Form 314

Processing and Deprocessing Record for Shipment, Storage and Issue of Vehicles and Spare Engines . . . . . DD Form 1397

Product Quality Deficiency Report. . . . . SF Form 368

Recommended Changes to Publications and Blank Forms. . . . . DA Form 2028

FIELD MANUALS

Operations and Maintenance of Ordinance Materiel in Cold Weather. . . . . .FM 9-207

TECHNICAL MANUALS

Inspection, Care and Maintenance of Antifriction Bearings. . . . . TM 9-214

Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and Related Materiels Including Chemicals. . . . . TM 9-247

Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools List for Simplified Test Equipment for Internal Combustion Engines (NSN 4910-00-124-2554) . . . . . TM 9-4910-571-12&P

Operator's Manual for D7G Tractor . . . . . TM 5-2410-237-10

Operator's, Unit, and Direct Support Maintenance Manual for Tool Outfit, Hydraulic Systems Test and Repair Unit (HSTRU) (NSN 4940-01-036-5784) (EIC:2DD) . . . . . TM 9-4940-468-13

Operator's, Unit, Direct Support and General Support Maintenance Manual for Lead-Acid Storage Batteries. . . . . TM 9-6140-200-14

Painting Instructions for Army Materiel. . . . . TM 43-0139

Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) . . . . . .TM 750-244-3

Transportability Guidance, Tractor, Low-Speed DED, Medium Drawbar Pull . . . . . TM 55-2410-237-14

Unit, Direct Support and General Support Including Depot Maintenance RPSTL for D7G Tractor. . . . . TM 5-2410-237-23P

OTHER PUBLICATIONS

Abbreviations and Acronyms . . . . . ASME Y14.38-1999

Army Medical Department Expendable/Durable Items . . . . . .CTA 8-100

Expendable/Durable Items (Except Medical, Class V, Repair Parts and Heraldic Items) . . . . . .CTA 50-970

Fuels and Lubricants Standardization for Equipment. . . . . .AR 70-12

Operator's Circular for Welding Theory and Application . . . . . TC 9-237

END OF WORK PACKAGE

MAINTENANCE ALLOCATION CHART (MAC) INTRODUCTION 0247 00

THE ARMY MAINTENANCE SYSTEM MAC

1. This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.
2. The MAC immediately following this introduction designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown in the MAC (WP 0248 00) in column (4) as:

   Field - includes subcolumns:

   C - Operator/Crew
   O - Unit
   D - Direct Support

   Sustainmant - includes subcolumns:

   H - General Support
   D - Depot
3. The tools and test equipment requirements (immediately following the MAC) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.
4. The remarks (immediately following the tools and test equipment requirements) contain supplemental instructions and explanatory notes for a particular maintenance function.

MAINTENANCE FUNCTIONS

Maintenance functions are limited to and defined as follows:

1. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound or feel).
2. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.
3. **Service.** Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint or to replenish fuel, lubricants, chemical fluids or gases.
4. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position or by setting the operating characteristics to specified parameters.
5. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.
6. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. **Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
8. **Replace.** To remove an unserviceable item and install a serviceable counterpart in its place. “Replace” is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.
9. **Repair.** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction or failure in a part, subassembly, module (component or assembly), end item or system.

MAINTENANCE FUNCTIONS - CONTINUED

NOTE

The following definitions are applicable to the "repair" maintenance function:

- **Services - Inspect, test, service, adjust, align, calibrate and/or replace.**
- **Fault location/troubleshooting - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).**
- **Disassembly/assembly - The step-by-step breakdown (taking apart) of a spare/functional group coded item and to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).**
- **Actions - Welding, grinding, riveting, straightening, facing, machining and/or resurfacing.**

10. **Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

11. **Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

EXPLANATION OF COLUMNS IN THE MAC, TABLE 1

1. **Column (1) - Group Number.** Column (1) lists Group numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies and modules with the Next Higher Assembly (NHA).

2. **Column (2) - Component/Assembly.** Column (2) contains the item names of components, assemblies, subassemblies and modules for which maintenance is authorized.

3. **Column (3) - Maintenance Function.** Column (3) lists the functions to be performed on the item listed in Column (2). (For a detailed explanation of these functions refer to "Maintenance Functions" outlined above).

4. **Column (4) - Maintenance Level.** Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field:

C - Operator/Crew Maintenance
O - Unit Maintenance
D - Direct Support Maintenance

Sustainment:

H - General Support Maintenance
D - Depot Maintenance

MAINTENANCE FUNCTIONS - CONTINUED

NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by a work time figure in the "H" column of column (4), and an associated reference code is used in the REMARKS CODE column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

5. **Column (5) - Tools and Equipment Reference Code.** Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.
6. **Column (6) - Remarks Code.** When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries (Table 3).

EXPLANATION OF COLUMNS IN THE TOOLS AND TEST EQUIPMENT REQUIREMENTS, TABLE 2

1. **Column (1) - Tool or Test Equipment Reference Code.** The tool and test equipment reference code correlates with a code used in column (5) of the MAC.
2. **Column (2) - Maintenance Level.** The lowest level of maintenance authorized to use the tool or test equipment.
3. **Column (3) - Nomenclature.** Name or identification of the tool or test equipment.
4. **Column (4) - National Stock Number (NSN).** The NSN of the tool or test equipment.
5. **Column (5) - Tool Number.** The manufacturer's part number, model number, or type number.

EXPLANATION OF COLUMNS IN THE REMARKS, TABLE 3

1. **Column (1) - Remarks Code.** The code recorded in column (6) of the MAC.
2. **Column (2) - Remarks.** This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

END OF WORK PACKAGE

Table 1. MAC for the D7G Tractor.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
01	**ENGINE**								
0100	Engine Assembly:	Inspect	0.2						A
		Test		1.5				12,144	B
		Service		0.5				123,144	C
		Replace			16.4			56,59,126,144	
		Repair			46	80		96,126,127,144, 147	
	Front Engine Support	Replace			3			126,144	
	Trunnion	Replace			1			126,144	
	Rear Engine Mounts	Replace			4.3			126,144	
0101	Crankcase, Block, Cylinder Head:								
	Cylinder Head	Replace			2			18,60,126,129, 144	
		Repair				4		22,34,126,127, 153	
	Block, Cylinder	Replace				40		60,126,144	
		Repair				16		126,144	
0102	Crankshaft:								
	Crankshaft	Replace				24		126,127,144	
	Assembly	Repair				8		126,144	
	Front Seal and Wear Sleeve	Replace			4			32,54,63,104, 126,143,144	
	Rear Seal and Wear Sleeve	Replace			4			13,55,63,69, 104,118,121, 126,143,144	
	Crankshaft Pulley	Replace			1			126,144	
	Vibration Damper	Replace			3			126,144	
0103	Flywheel Assembly:								
	Flywheel	Replace			4.3			60,126,144	
	Flywheel Housing	Replace			10			60,126,144	
0104	Pistons, Connecting Rods:								
	Pistons, Connecting Rods	Replace				10		126,127,144	
0105	Valves, Camshafts and Timing Systems:								

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
01	**ENGINE - Continued**								
	Covers, Front Housing	Replace				12		126,127,144	
	Cover, Valve Mechanism	Replace		1.5				123,144	
	Valve Mechanism	Adjust		1.5				123,144	D
		Replace			1.9			126,144	
		Repair			2			126,144	
	Lifters, Valve	Replace			5.4			126,144	
	Camshaft and Camshaft Bearings	Replace				19		126,144	
	Timing Gears, Bearings and Timing Gear Plate	Replace				16		126,144	
0106	Engine Lubrication System:								
	Pump, Oil	Replace			2.6			126,144	E
		Repair				2		126,144	
	Pan, Oil	Replace			2.3			126,144	
	Plate, Oil Pan	Replace			2.6			126,144	
	Valve, Oil Sampling	Replace		0.2				123,144	
	Filter Assembly, Oil	Service		0.4				123,144	
		Replace		0.8				123,144	
	Gage, Oil Level	Replace		1				144	
	Filler Tube, Oil	Replace		0.5				123,144	
	Breather, Crankcase	Service		0.2				144	F
		Replace		0.6				144	
	Hose, Fumes Disposal	Replace		0.5				144	
	Cooler, Engine Oil	Replace		0.7				123,144	
0108	Manifolds:								
	Manifold, Exhaust	Replace			3.8			126,144	
0109	Accessory Driving Mechanisms:								
	Rear Drive Gears	Replace			6			126,144	
	Cover Assembly	Replace			2			126,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT	
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	REF CODE	REMARKS CODE
03	**FUEL SYSTEM**								
0301	Fuel Injection:								
	Fuel Injection Nozzles	Test			0.5			126,144	
		Replace			1			66,126,144	
0302	Fuel Pumps:								
	Pump, Transfer	Replace			0.5			126,144	
	Pump, Priming	Replace		0.3				123,144	G
	Pump, Injection	Replace				2		126,144	
		Repair				1.5		126	
	Lines and Fittings, Fuel Injection	Replace		0.5				123,144	
	Fuel Injection Pump and Governor Assembly	Test			1			126,144	H
		Adjust			0.5			10,80,85,99, 126,141,144	H,I,J
		Replace			2			10,80,99, 126,129,144	I
		Repair				4		71,76,80,85, 113,126,144	
	Governor Shaft Seal	Replace		0.5				144	
0304	Air Cleaner:	Replace		1				144	
		Repair		0.5				144	
	Elements	Service	0.2	0.2				123,144	
		Replace		0.5				123,144	
	Preclean	Service		0.2				144	
		Replace		0.5				144	
	Dust Ejector	Replace		0.2				144	
0305	Turbocharger:								
	Turbocharger	Replace		3				144	K
		Repair				2		36,126,144	
	Air Lines	Replace		1				144	
	Oil Lines	Replace		1				144	
0306	Tanks, Lines, Fittings:								
	Tank, Fuel	Service		0.1				123,144	
		Replace		1.2				123,129,144	
	Lines and Fittings, Fuel	Replace		1.5				123,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND	
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	EQUIPMENT REF CODE	REMARKS CODE
03	**FUEL SYSTEM - Continued**								
	Drain Lines and Drain Valve Mechanism	Replace		1.5				144	
0308	Engine Speed Governor and Controls:								
	Governor Controls and Linkage	Adjust		0.5				123,144	
		Replace		2.2				123,144	
0309	Fuel Filters:								
	Filter Assembly, Primary Fuel	Service		0.4				144	
		Replace		0.5				144	
	Filter Assembly, Secondary Fuel	Service		0.2				123,144	
		Replace		0.5				123,144	
0311	Ether Starting Aids:								
	Ether Starting Aid	Service		0.2				144	
		Replace		2				144	
04	**EXHAUST SYSTEM**								
0401	Muffler and Pipes:								
	Muffler	Replace		0.7				144	
	Exhaust Extension	Replace		0.2				144	
05	**COOLING SYSTEM**								
0501	Radiator:								
	Radiator	Inspect	0.5						L
		Test		1				123,144	
		Service		0.5				123,144	
		Replace		3.2				60,123,129,144	
		Repair			4.4			88,115,116,123, 128	
	Radiator Cap and Relief Valve	Replace		0.1				123,144	
0503	Water Manifold, Headers, Thermostat's and Housing Gaskets:								
	Water Temperature Regulator	Test		1				123,144	
		Replace		0.5				123,144	
0504	Water Pump:								
	Pump Assembly	Replace		2.5				144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT	
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	REF CODE	REMARKS CODE
05	**COOLING SYSTEM - Continued**								
	Water Lines	Replace		1				144	
0505	Fan Assembly:								
	Fan Drive Assembly	Replace		1.5				123,144	
		Repair		1				19,123,144	
	Fan and Fan Guard	Replace		0.3				123,129,144	
	Belts, V-belts	Adjust		0.2				123,144	
		Replace		0.5				123,129,144	
06	**ELECTRICAL SYSTEM**								
0601	Alternator, Generator:								
	Alternator	Test			0.5			12,126	
		Replace		1.3				123,144	
	Brackets, Alternator Mounting	Replace		1				123,144	
0603	Starting Motor:	Test			0.5			12,126	
		Replace		2				123,129,144	
	Solenoid, Starting Motor	Replace		0.3				144	
0607	Instruments or Engine Control Panel:								
	Instruments	Inspect	0.1						
		Replace		0.5				144	
	Hourmeter	Inspect	0.1						
		Replace		0.5				144	
	Ammeter	Inspect	0.1						
		Replace		0.5				144	
	Water Temperature, Engine	Inspect	0.1						
		Replace		0.5				144	
	Oil Temperature, Torque Converter	Inspect	0.1						
		Replace		0.5				144	
0608	Miscellaneous Items								
	Switches:								
	Dash Light	Replace		0.5				144	
	Exterior Lights	Replace		0.5				144	
	Start, Engine	Replace		0.5				144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
06	**ELECTRICAL SYSTEM - Continued**								
	Start, Ether Aid	Replace		0.5				144	
	Battery Disconnect	Replace		0.5				144	
	Reset, Circuit Breaker	Replace		0.5				144	
	Fuses	Replace		0.3				144	
0609	Lights:								
	Headlamps and Rear Floodlamp	Replace		0.5				144	
	Protective Covers, Headlamps and Rear Floodlamp	Replace		0.3				144	
0610	Sending Units:								
	Oil Pressure Bypass Switch	Replace		0.5				144	
	Diagnostic (STE/ ICE) Wiring	Replace Repair		1 0.5				144 123,144	
0611	Horn:	Replace		1				144	
	Horn Button	Replace		0.5				144	
	Backup Alarm	Inspect	0.1						
		Replace		0.5				144	
	Switch, Backup Alarm	Test	0.1						
		Replace		1				123,144	
0612	Batteries, Storage:	Test		0.5				123	
		Service		0.4				123,144	M
		Replace		1				123,144	
	Cables and Terminals	Service Replace		0.2 0.4				123,144 123,144	
0613	Chassis Wiring Harnesses:	Replace Repair		2.5 0.5				144 123,144	
	NATO Starting Receptacle	Replace		0.5				144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
07	**TRANSMISSION**								
0705	Transmission Shifting Components:								
	Lever and Linkage, Transmission	Adjust		1				144	
		Replace		3				144	
	Safety Lock Lever, Transmission	Replace		1				144	
0708	Torque Converter or Fluid Coupling:								
	Torque Divider	Service		0.2				123,144	N
		Replace			6			60,126,129,144	
		Repair				10.5		126,144	
	Output Seal	Replace			3			126,144	
0710	Transmission Assembly:	Inspect	0.2						O
		Test			1			126,144,146	P
		Service		0.2				123,144	
		Replace			3.6			61,89,126,139, 144	
		Repair				40		126,144	
	Input Seal	Replace			2			126,144	
	Hydraulic Control Valves	Adjust			1			126,144	Q
		Replace			2.5			126,144	
0721	Coolers, Pumps, Motors:								
	Transmission Oil Cooler Lines	Replace		1				123,144	
	Pump, Oil	Test			1.5			126,144,146	
		Replace			0.2			126,144	
	Oil Lines, Transmission	Replace		1				123,144	
	Oil Filter Assembly	Service		0.2				123,144	
		Replace		0.7				123,144	
		Repair		0.4				123,144	
	Relief Valve, Transmission	Adjust			1.5			126,144	Q
		Replace			0.6			126,144	
	Oil Cooler, Transmission	Replace		0.7				123,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
08	**TRANSFER AND FINAL DRIVE ASSEMBLIES**								
	Outlet Relief Valve, Torque Converter	Adjust			2			126,144	Q
		Replace			1			126,144	
	Scavenge Pump, Torque Divider	Replace			1			126,144	
	Magnetic Screen Assembly	Service		0.5				123,144	R
		Replace		0.5				123,144	
	Oil Sampling Valve, Transmission	Replace		0.5				144	
0801	Power Transfer and Final Drive Assemblies:								
	Final Drive	Service		0.5				123,144	
		Adjust			3			11,126,144	S
	Final Drive Cases, Gears, Idler, Pinions and Bearings	Replace			20			60,77,90,126, 129,144	
	Bevel Gear and Shaft	Replace			6			20,126,129,144	
	Final Drive Pinions and Flanges	Replace			1			126,129,144	
		Repair			1			1,5,7,8,11,14, 20,23,24,26,27, 29,31,46,47,51, 52,53,57,58,60, 61,62,75,77,94, 95,96,97,98, 101,102,106, 110,111,112, 114,120,125, 126,129,130, 131,134,136, 137,140,149, 152,154,158	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
08	**TRANSFER AND FINAL DRIVE ASSEMBLIES - Continued**								
	Track Drive Sprockets/Hubs	Replace			4			3,4,5,9,23,35, 45,51,67,68,72, 73,74,78,81,82, 93,94,100,106, 109,110,111, 119,125,126, 129,130,134, 140,144,156, 159	
	Sprocket Segments	Inspect	0.5						T
		Replace		1				123,144	
	Shaft, Drive Sprocket	Replace			4			2,5,23,25,35,39, 46,62,65,68,75, 76,79,100,101, 105,106,110, 111,126,134, 144,156	Z
09	**PROPELLER AND PROPELLER SHAFTS**								
0900	Propeller Shafts:								
	Drive Shafts and Universal Joints	Service		0.5				144	U
		Replace		1.5				123,144	
13	**WHEELS AND TRACKS**								
1301	Suspension Assembly:								
	Equalizer Bar Assembly	Replace			1.5			126,144,157	V
	Track Rollers	Replace			1			127,144,157	V
	Frame Assembly, Track Roller	Replace			4			61,108,126,144, 157	V
	Recoil Spring	Replace			2.8			90,126,129,144	
1302	Track Support Rollers and Brackets:								
	Track Carrier Rollers	Replace			0.5			126,129,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT	
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	REF CODE	REMARKS CODE
13	**WHEELS AND TRACKS - Continued**								
1303	Track Idlers and Brackets:								
	Track Idlers	Replace			1.7			126,129,144	
	Track Idler Yokes	Replace			0.5			126,129,144	
	Track Adjuster	Replace			3.2			126,144	
1305	Track Assembly:								
	Track Assembly	Inspect		0.2				40,123,144	
		Adjust	0.5	0.5				144	
		Replace		4				123,144,148	
14	**STEERING**								
1403	Steering Brakes:								
	Steering Brakes	Test	0.5						
	Actuating Mechanism, Steering Brakes	Replace			6			126,129,144	
		Repair			6			126,144	
	Hydraulic Control Assembly, Steering Brakes	Replace			1			60,126,144	
		Repair			1.5			126,144	
	Pedals and Linkage, Steering Brakes	Adjust		0.5				123,144	
		Replace		3.6				123,144	
		Repair		2				123,144	
	Brake Lock Lever, Steering	Replace		1				144	
	Steering Clutch	Replace			4			126,129,144	
		Repair			10			60,82,83,126, 138,144	
	Steering Clutch Hubs	Replace			1			1,15,16,17,56, 86,87,92,96, 102,107,110, 122,126,132, 144,150,151	
	Steering Clutch Levers and Linkage	Adjust		0.5				123,144	
		Replace		1.6				144	
		Repair		3				144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT	
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	REF CODE	REMARKS CODE
14	**STEERING - Continued**								
1414	Steering System Valves:								
	Relief Valve, Steering Brake	Replace			0.5			126,144	
	Control Valve, Steering Clutch	Replace Repair			4.2 3			126,144 126,144	
15	**FRAME,TOWING ATTACHMENTS AND DRAWBARS**								
1501	Frame Assembly:								
	Frame and Case Assembly	Repair			2	12		126,128,144	W
18	**BODY, CAB, HOOD AND HULL**								
1801	Body, Cab, Hood and Hull Assemblies:								
	Hydraulic Tank Mounting Brackets and Plates	Replace		1				144	
	Crankcase and Transmission Guards	Inspect Replace	0.1	1				123,144	X
	Radiator Guard	Inspect	0.1						
		Replace		0.5				124,129,144	
	Hood	Replace		0.2				123,129,144	
	Dash	Replace		1				60,123,129,144	
	Battery Box	Replace		1				123,144	
	Track Roller Guard	Inspect	0.1						X
		Replace		1				124,144	
	Track Roller Frame Guard	Inspect Replace	0.1	1				144	X
	Rollover Protective Structure (ROPS)	Replace		0.7				124,144	
	ROPS Mounting Brackets and Plates	Replace		0.5				123,129,144	
	Protective Screen	Replace		0.2				129,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT	
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	REF CODE	REMARKS CODE
18	**BODY, CAB, HOOD AND HULL - Continued**								
	Winterized Cab	Replace		3				124,129	
		Repair		6				123,144	Y
	Windshield Glass	Replace		2				123,144	
1802	Fenders, Running Boards and Related Items:								
	Fenders	Replace			1			126,144	
1805	Floors, Subfloors and Related Components:								
	Floor Plates	Replace		0.4				144	
1806	Upholstery, Seats and Carpets:								
	Seat and Seat Base	Replace		1				123,129,144	
	Assembly	Repair		4				123,144	
1808	Storage Racks, Boxes, Straps and Carrying Cases:								
	Toolbox	Replace		1				144	
20	**HOIST, WINCH, CAPSTAN, WINDLASS, POWER CONTROL UNIT AND POWER TAKE-OFF**								
2001	Hoist, Capstan, Windlass, Crane or Winch Assembly:								
	Winch Assembly	Inspect	0.2						Z
		Service		0.3				123,144	R,AA
		Replace		8				61,124,144	
		Repair				36		126,144	
	Winch Control Valve	Replace		0.7				123,144	
		Repair				2		38,126,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
			C	O	F	H	D		
20	**HOIST, WINCH, CAPSTAN, WINDLASS, POWER CONTROL UNIT AND POWER TAKE-OFF - Continued**								
	Winch Control Lever and Linkage	Adjust		0.2				37,144	
		Replace		0.8				144	
	Winch Magnetic Strainer Assembly	Service		0.5				123,144	BB
		Replace		0.5				123,144	
	Winch Oil Filter Assembly	Service		0.5				123,144	CC
		Replace		0.5				123,144	
	Winch Breather	Replace		0.2				144	
	Drawbar Pin	Replace		0.5				144	
	Wire Rope Assembly	Replace		1.5				123,144	
		Repair		2				123,144	
	Gear Pump	Replace		2				123,144	
	Winch Lines	Replace		0.5		1		123,144	DD
22	**BODY, CHASSIS AND HULL ACCESSORY ITEMS**								
2202	Accessory Items:								
	Mirrors	Replace		0.5				144	
2207	Winterization Equipment:								
	Personnel Heater	Replace		1.5				123,144	
		Repair		2				144	
	Heater Switch	Replace		0.5				144	
	Windshield Wiper Assembly, Front and Rear	Replace		1				144	
	Defroster Fans	Replace		1				144	
	Sound Suppression Panels	Replace		1				144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
			C	O	F	H	D		
22	**BODY, CHASSIS AND HULL ACCESSORY ITEMS - Continued**								
2210	Data Plates and Instruction Holders:								
	Data Plates	Replace		1				123,144	
24	**HYDRAULIC AND FLUID SYSTEMS**	Inspect	0.2						EE
		Test			4			30,70,126,144, 146	
2401	Pump and Motor:								
	Pump	Test			1.3			30,70,126,144, 146	
		Replace		1				123,129,144	
		Repair			1			126,144	
2402	Manifold and/or Control Valves:								
	Blade (Left and Tilt) Control Valve	Adjust			1			126,144	Q
		Replace			3			126,129,144	
	Blade Quick Drop Valve	Replace		1				123,144	
		Repair			0.5			126,144	
	Pressure Control Valve	Replace		1				123,144	
	Pilot Valves	Replace		1				123,144	
		Repair			1.5			126,144	
	Ripper Control Valve	Replace			1			126,129,144	
2403	Hydraulics Controls and/or Manual Controls:								
	Blade Control Lever and Linkage	Adjust		1				144	
		Replace		1.5				144	
	Ripper Control Lever and Linkage	Replace		1.1				144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT	
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	REF CODE	REMARKS CODE
24	**HYDRAULIC AND FLUID SYSTEMS - Continued**								
2404	Tilt Cylinders and Tilt Crank:								
	Cylinder Hydraulic, Blade Tilt	Adjust		0.6				123,129,144	
		Replace		0.6				123,129,144	
		Repair			1			42,50,126,144	FF
2406	Strainers, Filters, Lines and Fittings, Etc.:								
	Ripper Lines	Replace		1				123,144	
		Repair			0.5			91,146	GG
	Blade Lines	Replace		1				123,146	
		Repair			0.5			91,146	GG
	Tilt Cylinder Lines, Blade	Replace		1				123,144	
		Repair			0.5			91,146	GG
	Pump Lines, Hydraulic	Replace		1				123,144	
		Repair			0.5			91,146	GG
	Hydraulic Filter Assembly	Service		0.2				123,144	
		Replace		0.5				123,144	
	Hydraulic Filter Screen Assembly	Repair			0.5			26,84,91,126, 144	
2407	Hydraulic Cylinders:								
	Blade Lift Cylinder	Adjust		0.5				123,129,144	
		Replace		0.6				123,144	
		Repair			1			20,33,43,44,48, 126,144,155	FF
	Ripper Lift Cylinder	Replace		1				123,129,144	
		Repair			1			20,41,49,126, 144,155	FF
	Blade Lift Cylinder Mounting Tube	Replace		1				123,129,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
24	**HYDRAULIC AND FLUID SYSTEMS - Continued**								
2408	Liquid Tanks or Reservoirs:								
	Hydraulic Tank	Inspect	0.2						
		Service		0.5				123,144	HH
		Replace			1.2			61,126,129,144	
		Repair			4			126,128,144	W
33	**SPECIAL PURPOSE KITS**								
3307	Special Purpose Kits:								
	Mine Clearing	Install		8.0				60,123,144,145	
	Armor Protection (MCAP) Armor Kit	Repair		2.0				60,123,144,145	
	Mine Clearing Rake	Install	0.5					128,144	
		Repair		1.0				128,144	
	Fan Assembly, Fresh Air Intake	Replace		0.5				123,144	
		Repair		1.0				123,144	
47	**GAGES (NON-ELECTRICAL)**								
4701	Instruments:								
	Tachometer Drive	Replace		0.8				144	
4702	Gages and Indicators:								
	Fuel Pressure	Inspect	0.1						
		Replace		0.5				123,144	
	Oil Pressure, Engine	Inspect	0.1						
		Replace		0.5				123,144	
	Air Filter Indicator	Inspect	0.1						
		Replace		0.5				144	
74	**EARTH MOVING EQUIPMENT COMPONENTS**								
7435	Moldboard Assembly:								
	Moldboard Assembly	Inspect	0.2						II
	Cutting Edge	Replace		1.5				123,144	

Table 1. MAC for the D7G Tractor - Continued.

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT	TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D		
74	**EARTH MOVING EQUIPMENT COMPONENTS - Continued**								
	End Bit	Replace		1				123,144	
7436	Lift Arms and Pivot Assemblies:								
	Blade and Pusharm Assembly	Replace		2.5				124,144	
	Blade Diagonal Brace	Replace		1				123,129,144	
	Strut Assembly	Replace		1.5				123,129,144	
	Adjustable Brace, Blade Tilt	Adjust Replace		0.6 1				123,129,144 123,129,144	
	Trunnion	Replace		0.5				124,144	
7465	Rooters, Rippers, Plows, Harrows and Rotary Tillers:								
	Ripper Assembly	Inspect	0.2						JJ
		Replace		4				123,129,144	
		Repair		6				123,129,144	
	Ripper Tooth	Replace		0.2				144	
	Ripper Shank	Replace		0.2				124,144	

Table 2. Tools and Test Equipment Requirements for the D7G Tractor.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
1	F	Adapter		6V3094 (11083)
2	F	Adapter	5120-01-119-1716	1P3054
3	F	Adapter		6V3123 (11083)
4	F	Adapter	5120-01-119-1764	7M9773
5	F	Adapter, Coupling	5120-01-119-1765	7M9774
6	F	Adapter, Pin	5120-01-119-1715	1P3053
7	H	Adapter, Sleeve	5365-01-506-1837	5P5215
8	F	Adapter, Socket Wrench	5120-01-508-9182	2P8261
9	F	Adapter, Sprocket Installation	5120-01-512-7168	5P6222
10	F	Adapter, Torque Wrench	5120-01-359-2644	6V6175
11	F	Adjusting Tool, Bearing	5120-01-272-4055	6V0082
12	O,F	Analyzer Set, Engine	4910-00-124-2554	2389409
13	F	Bolt, Machine	5306-01-026-9992	9S8890
14	F	Bolt, Machine	5306-00-426-3080	1A5822
15	F	Bolt, Machine	5306-00-426-3209	1B4367
16	F	Bolt, Machine	5306-00-263-8982	6F7024
17	F	Bolt, Special	5306-00-008-5972	1D4624
18	F	Bracket, Double Angle, Fan Drive Support	5340-01-270-1290	5P1762
19	F	Bushing Driver Set	5120-01-030-1626	1P0510
20	F	Bushing Driver Set	5120-01-039-4811	1P0520
21	F	Cap, Protective, Dust	5340-01-292-1734	1P7437
22	H	Clamp	5120-01-484-9390	6V2163
23	F	Clip, Retaining	5340-00-377-8758	7B2499
24	F	Collar, Shaft	3040-01-295-2500	8S7625
25	H	Collet, Threading Die	5136-01-512-8937	9U6954
26	F	Compressor, Ring		1U6684 (11083)
27	F	Coupling Assembly, Quick Disconnect	4730-01-275-0057	1108
28	O	Coupling Half, Quick	4730-01-295-3790	1P2375
29	O	Coupling Tool		1P7402 (11083)
30	F	Cover, Access	5340-01-169-2140	5H4020

Table 2. Tools and Test Equipment Requirements for the D7G Tractor - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
31	F	Cylinder Assembly, Actuating, Linear	3040-01-264-9538	8S7650
32	F	Distorter, Sleeve	5120-01-119-1750	5P7315
33	H	Extension Handle, Wrench	5120-01-512-9821	5P8675
34	H	Extractor, Group Val	4910-01-296-3862	1667441
35	F	Forcing Screw, Mechanical Puller	5120-01-513-9583	5P5207
36	H	Gage Set, Inspection	5280-01-505-8509	6V7926
37	O,F	Gage, Pressure, Dial Indicating, 0-600 PSI	6685-01-338-2513	8T0856
38	H	Gage, Pressure, Dial Indicating, 10-60 PSI	6685-01-338-2512	8T0846
39	H	Gage, Pressure, Dial Indicating	6620-01486-7681	8T0820
40	O	Gage, Sprocket Wear	5210-01-225-1132	5P8617
41	F	Guide, Seal		2P8301 (11083)
42	F	Guide, Seal		5P6156 (11083)
43	F	Guide, Seal		5P8565 (11083)
44	H	Handle, Extension, Wrench	5120-01-512-9821	5P8675
45	F	Head		6V4000 (11083)
46	F	Head, Socket Install	5120-00-972-0345	9H3992
47	F	Hose Assembly	3442-00-876-6522	8F0024
48	F	Inserter, Seal	5120-01-289-0637	4S9450
49	F	Inserter, Seal	5120-01-289-0635	4S9453
50	F	Inserter, Seal	5120-01-289-0636	4S9454
51	F	Inserter, Seal	5120-01-119-1736	5M2162
52	F	Inserter, Seal	5120-01-286-4205	8M9395
53	F	Inserter, Seal		1U8842 (11083)
54	F	Installer	5120-01-426-1411	4C8982
55	F	Installer	5120-01-349-0341	6V7876
56	F	Leg		1P7461 (11083)
57	F, H	Leg, Mechanical Puller	5120-00-227-0633	1107
58	F	Leg, Mechanical Puller	5120-00-633-5075	1110

Table 2. Tools and Test Equipment Requirements for the D7G Tractor - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
59	O	Leveler, Load: 6,000 lb capacity	3950-01-263-9513	60842
60	O, F	Link, Bearing (Lifting)	5340-01-476-1734	1387574
61	O	Link, Chain, End	4010-01-268-9869	5P9736
62	F	Link, Pin	5120-01-119-1714	1P3052
63	H	Locator, Seal	5120-01-030-3575	9S8871
64	H	Multiplier, Torque Wrench	5120-01-296-4235	6V6080
65	O	Nipple, Pipe	4730-01-162-0102	5P8998
66	F	Nozzle Puller Group	2910-01-250-1608	6V6980
67	F	Nut, Plain, Round	5310-01-507-2374	6V3124
68	F	Nut, Plain, Round	5310-01-507-2390	5P5208
69	F	Nut, Sleeve	5310-01-038-8318	9S8858
70	F	O-ring	5331-00-741-0674	5F1678
71	H	Parts Kit, Diesel Engine Governor	2990-01-343-0876	5P6577
72	F	Pin	5315-01-119-1754	6H4158
73	F	Pin	5315-01-265-0418	5F9892
74	F	Pin	5315-01-270-5495	7S7112
75	F	Pin, Lock	5315-00-931-8963	3J1770
76	H	Pin, Shoulder, Headless	5315-01-285-3476	3P1544
77	F	Pin, Shoulder, Headless	5315-01-270-2832	8S7615
78	F	Pin, Straight, Headless	5315-01-506-5030	6V3126
79	F	Pin, Straight, Headless	5315-00-922-2595	7M9772
80	F	Pin, Timing	2815-01-268-2194	6V4186
81	F	Plate	2520-01-408-9279	1P492
82	F	Plate Assembly		5P5212 (11083)
83	F	Plate, Compressor, Steering	5120-00-371-9610	5F5034
84	F	Plate, Mechanical Puller	5120-01-338-7733	1P2393
85	F	Plate, Timing	5120-00-512-0697	8S5417-00
86	H	Pliers		1P1855 (11083)
87	H	Pliers		1P1860 (11083)
88	O	Plug, Pipe	4730-00-089-2515	5M6213

Table 2. Tools and Test Equipment Requirements for the D7G Tractor - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
89	O	Plug, Protective, Dust	5340-01-371-2357	1P2377
90	F	Press, Arbor, Hand Operated	3444-00-449-7295	AA59384
91	F	Press, Hydraulic, Portable	4940-01-272-2839	2159672
92	F	Puller	5130-01-289-0100	8M9011
93	F	Puller Assembly		1U6415 (11083)
94	F	Puller Attachment, Mechanical	5120-01-512-7167	1H3112
95	F	Puller Attachment, Mechanical	5120-00-288-6756	8B7551
96	F, H	Puller Attachment, Mechanical	5120-00-293-1430	8B7554
97	F	Puller Attachment, Mechanical	5120-00-288-6756	8B7551
98	F	Puller, Crank Pulley	5120-01-124-1732	1P0820
99	F,H	Puller Group	5120-01-128-0725	8S2264
100	F	Puller, Hydraulic	5130-01-288-2786	9S8900
101	F	Puller, Hydraulic	5130-01-480-6682	5P-5201
102	F	Puller, Hydraulic	5130-01-294-0717	6V3170
103	H	Puller Kit, Cylinder Sleeve, Hydraulic	5130-01-513-1143	9U6630
104	F	Puller Kit, Universal	5180-01-124-1903	1P3075
105	H	Puller, Mechanical		5S1430 (11083)
106	F	Puller, Mechanical	5120-00-633-5074	939
107	F	Puller, Mechanical	5120-00-633-5085	GGG-P-781
108	F	Puller, Ratchet Lever, Cable Type	5120-01-275-2286	8S9906
109	F	Puller, Sprocket Arm	5120-00-971-5507	5F9306
110	F	Pump, Hydraulic Ram, Hand Driven	4320-01-271-9831	304401
111	F	Pump, Hydraulic Ram, Hand Driven	4320-00-374-1403	4C4865
112	O	Pumping Unit, Hydraulic, Power Driven	4320-01-068-6009	3S6224
113	H	Punch Driver	5120-01-484-9392	6V4818
114	F	Pusher, Rollover	5120-01-119-1773	8S9903
115	O	Reducer, Pipe	4730-00-726-1103	5S2403
116	O	Reducer, Pipe	4730-01-373-5625	5B6009

Table 2. Tools and Test Equipment Requirements for the D7G Tractor - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
117	H	Reducer, Pipe	4730-00-726-1103	5404-6-4
118	F	Remover and Replacer	5120-01-030-3575	9S8871
119	F	Remover, Bearing and Bushing	5120-01-393-3420	3P2248
120	O	Repair Tool, Special Purpose	4910-01-264-4778	8S7621
121	F	Ring, Sleeve Distorter	5120-01-119-1749	5P7313
122	F	Screw, Cap, Hexagon Head	5305-01-271-2044	8F1156
123	O	Shop Equipment, Automotive Maintenance and Repair: Common No. 1, Less Power, SC4910-95-CL-A74	4910-00-754-0654	SC4910-95CLA74
124	O	Shop Equipment, Automotive Maintenance and Repair: Common No. 2, Less Power, SC4910-95-CL-A72	4910-00-754-0650	SC4910-95CLA72
125	O, F	Shop Equipment, Contact Maintenance: Truck Mounted, SC4040-95-CL-B04	4940-00-294-9518	MILS45855
126	F	Shop Equipment, General Purpose Repair: Semitrailer Mounted, SC4940-95-CL-B02	4940-00-287-4894	MILS45538
127	F	Shop Equipment, Machine Shop: Field Maintenance, Basic, SC3470-95-CL-A02	3470-00-754-0708	SC3470-95CLA02
128	F	Shop Equipment, Welding, SC3470-95-CL-A08	4940-00-357-7268	SC3470-95CLA08
129	O	Sling, Nylon	2835-01-078-2081	4X8FTX2IN
130	F	Socket, Socket Wrench	5120-01-233-0320	5S6087
131	F	Spacer	5365-01-119-1769	8M9008
132	F	Spacer, Sleeve	5365-01-300-2674	0L1774
133	H	Spacer, Sleeve	5365-01-270-2772	5P8634
134	F	Spacer, Sleeve	5365-01-506-1820	5P6220
135	H	Stand Assembly	4910-01-264-4034	8S7630
136	F	Stand Assembly	4910-01-264-4777	8S7640
137	F	Stand, Lifting	5120-01-343-8085	4C6486

Table 2. Tools and Test Equipment Requirements for the D7G Tractor - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
138	F	Stand, Steering Clutch		FT0610 (11083)
139	H	Stand, Transmission	4910-01-265-2624	1P2420
140	F	Step Plate, Mechanical Puller	5120-00-473-6921	8B7560
141	F	Tachometer, Stroboscopic	6680-01-355-7805	1U6602
142	O	Tee, Pipe	4370-00-119-9861	MS14303-2R06
143	F	Tool, Distorter	5120-01-119-1748	5P7312
144	O, F	Tool Kit, General Mechanic's: Automotive, SC5180-90-CL-N05	5180-00-699-5273	SC5180-90-CL-N05
145	O	Tool, Lifting: MCAP Installation	3940-01-515-7742	4R9712 (11083)
146	F	Tool Outfit, Hydraulic System Test and Repair (HSTRU), SC3470-95-CL-B07	4940-01-036-5784	13221E6850
147	H	Tool Set, Off-Engine Lifter Setting	5180-01-358-3781	6V4180
148	F	Tool Set, Track Repair	5120-00-513-1788	5P2379
149	F	Tool, Special	4910-01-265-0428	8S7611
150	O	Valve, Needle	4810-01-127-5377	1S8937
151	F	Washer		3H467 (11083)
152	F	Washer, Flat	5310-00-308-2227	4B5273
153	H	Wrench, Bonnet, Injector Pump Removal	5120-01-266-7433	8T5287
154	F	Wrench, Ratchet	5120-01-123-5881	8H0684
155	H	Wrench Spanner	5120-01-512-8936	5P3520
156	F	Wrench, Spanner	5120-01-119-1902	7F9306
157	H	Wrench, Torque: 3/4 in. Square Drive		9S7351 (11083)
158	F	Wrench, Torque: 1 in. Square Drive	5120-01-507-6929	5P3508
159	F	Yoke	5120-00-426-3787	2B2003
160	F	Link, Bearing (Lifting)	4940-01-268-2201	1387573 (11083)

Table 3. Remarks for the D7G Tractor.

(1) REFERENCE CODE	(2) REMARKS
A	Inspect by checking lubricating oil level and checking for leaks.
B	Engine tests conducted using STE/ICE diagnostic equipment.
C	Service by changing oil.
D	Valve mechanism adjustment consists of measuring clearance between rocker arm and valve turning adjustment screw. Procedure also indicates how to locate Top Dead Center (TDC) compression stroke for no. 1 piston.
E	Includes removal of suction bell.
F	Service by cleaning.
G	Includes priming fuel system.
H	Fuel injection pump timing checks can be performed with engine installed or removed.
I	Checking timing by timing pin method.
J	Setting idle speed.
K	Replacement includes removal of air cleaner air lines.
L	Inspect by checking coolant level and by checking for leaks.
M	Battery maintenance instructions are provided in TM 9-6140-200-14.
N	Service consists of removing and cleaning suction screen.
O	Inspect by checking transmission oil level and checking for leaks.
P	Test consists of pressure tests and performance tests.
Q	Adjustment consists of limited disassembly to add or remove shims.
R	Service by cleaning screen.
S	Adjust final drive bearings.
T	Check for excessive wear and missing or broken segments.
U	Service by lubrication.
V	Ground handling task is required.
W	Limited repair authorized (minor welding).
X	Check for damage and missing or loose bolts.
Y	Includes the removal of insulation panels.
Z	Inspect by checking oil level and condition of wire rope, hook and safety latch.
AA	Service by changing winch oil.
BB	Service by cleaning magnetic strainer.
CC	Service by replacing filter element.
DD	Accessible lines are replaced by Unit Maintenance; internal lines by Sustainment Maintenance.
EE	Inspect by checking oil level and checking for leaks and excessive wear or damage to lines.
FF	Limited repair authorized to replace seals, gaskets, wipers and rings.
GG	Hose assemblies may be replaced by manufactured hoses with reusable couplings.
HH	Service by changing hydraulic system oil.

Table 3. Remarks for the D7G Tractor - Continued.

(1) REFERENCE CODE	(2) REMARKS
II	Check cutting edges and end bits for excessive wear and damage (wear tolerance).
JJ	Check for missing or damaged teeth and shanks.

END OF WORK PACKAGE

EXPENDABLE AND DURABLE ITEMS LIST 0249 00

SCOPE

This work package lists expendable and durable items you will need to maintain the D7G Tractor. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, *Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items),* or CTA 8-100, *Army Medical Department Expendable/Durable Items*.

EXPLANATION OF COLUMNS

1. **Column (1) - Item Number.** This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item [e.g., Use antifreeze (Item 1, WP 0249 00)].
2. **Column (2) - Level.** This column identifies the lowest level of Field Maintenance that requires the listed item.

   C - Operator/Crew

   O - Unit Maintenance

   F - Direct Support Maintenance
3. **Column (3) - National Stock Number (NSN).** This is the NSN assigned to the item which you can use to requisition it.
4. **Column (4) - Description, Item Name, Commercial and Government Entity Code (CAGEC), and Part Number (P/N).** This provides the other information you need to identify the item.
5. **Column (5) - Unit of Measure (U/M).** This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List.

ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
1	C		ANTIFREEZE: Permanent, Ethylene Glycol, Inhibited (81349) MILA46153	
		6850-00-181-7929	1 Gallon Bottle	GAL
		6850-00-181-7933	5 Gallon Can	GAL
		6850-00-181-7940	55 Gallon Drum	GAL
2	O	5340-00-450-5718	CAP SET, PROTECTIVE: Dust and Moisture Seal (19207) 10935405	EA
3	O	6850-00-598-7328	CLEANING COMPOUND: Engine Cooling System (81349) MIL-C-10597	KIT
4	C		CLEANING COMPOUND: Solvent, Type III (81349) MIL-PRF-680	
		6850-01-474-2318	1 Gallon Can	GAL
		6850-01-474-2320	5 Gallon Can	GAL
		6850-01-474-2321	55 Gallon Drum	GAL
5	O		CLOTH: Abrasive, Emery, Fine (80204) ANSI B74.18	
		5350-00-584-4654	50 Sheet Package	EA
6	O		COMPOUND: Antiseize (05972) 76764	
		8030-00-251-3980	1 Pound Can	LB
7	O		COMPOUND: Gasket Forming, Silicone (05972) 77C	
			13 Ounce Cartridge	OZ
8	O		COMPOUND: Gasket Shellac (62377) INDIAN HEAD	
		8040-00-664-4134	1 Pint Bottle	PT
9	C	8030-01-509-1597	COMPOUND: Sealing (11083) 9S3263	OZ

Table 1. Expendable and Durable Items List - Continued.

ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
10	O		COMPOUND: Silicone, RTV (7X677) 12346193	
		6850-01-159-4844	10 1/7 Ounce Tube	OZ
11	C		DETERGENT: General Purpose, Liquid (83421) 7930-00-282-9699	
		7930-00-282-9699	1 Gallon Can	GAL
12	O		FLUX: Soldering (58536) A-A-51145TY1 FORM A	
		3439-00-255-9935	1 Pound Can	LB
13	C		FUEL: Diesel, DF-1 Grade, Winter (81346) ASTM D 975	
		9140-00-286-5286	Bulk	GAL
		9140-00-286-5287	5 Gallon Can	GAL
		9140-00-286-5288	55 Gallon Drum	GAL
14	C		FUEL: Diesel, DF-2 Grade (81346) ASTM D 975	
		9140-00-286-5294	Bulk	GAL
		9140-00-286-5295	5 Gallon Can	GAL
		9140-00-286-5296	55 Gallon Drum	GAL
15	C	9130-01-031-5816	FUEL, TURBINE: Aviation (81349) MILT83133 GR JP8	GAL
16	C		GREASE: Automotive and Artillery, GAA	
		9150-01-197-7688	(81349) M-10924-A 2-1/4 Ounce Tube	OZ
		9150-01-197-7690	(81349) M-10924-C 1-3/4 Pound Can	LB
		9150-01-197-7692	(81349) M-10924-E 35 Pound Can	LB
		9150-01-197-7693	(81349) M-10924-B 14 Ounce Cartridge	OZ
17	O	9150-01-361-8919	GREASE: Electrically Conductive (53711) 5190179	OZ

Table 1. Expendable and Durable Items List - Continued.

ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
18	O		INSULATING SLEEVING: Electrical (81343) M23053/5-106-0	
		5970-00-815-1295	250 Foot Spool	FT
19	O		INSULATING VARNISH: Electrical, Dielectric (75037) 1602	
		5970-00-815-1295	250 Foot Spool	FT
20	O		OIL: Lubricating, GO-75 (81349) MIL-PRF-2105	
		9150-01-035-5390	1 Quart Can	QT
		9150-01-035-5391	5 Gallon Can	GAL
21	O		OIL: Lubricating, GO-80/90 (81349) MIL-PRF-2105	
		9150-01-035-5392	1 Quart Can	QT
		9150-00-001-9395	5 Gallon Can	GAL
		9150-01-035-5394	55 Gallon Drum	GAL
22	O		OIL: Lubricating, GO-85/140 (81349) MIL-PRF-2105	
		9150-01-048-4591	1 Quart Can	QT
		9150-01-035-5395	5 Gallon Can	GAL
		9150-01-035-5396	55 Gallon Drum	GAL
23	C		OIL: Lubricating, OEA-30, Arctic	
		9150-00-402-4478	(81349) MIL-L-46167 1 Quart Can	QT
		9150-00-402-2372	(81349) MIL-PRF-46167 5 Gallon Can	GAL
		9150-00-491-7197	(81349) MIL-PRF-46167 55 Gallon Drum	GAL

Table 1. Expendable and Durable Items List - Continued.

ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
24	C		OIL: Lubricating, OE/HDO-10 (81349) MIL-PRF-2104	
		9150-00-189-6727	1 Quart Can	QT
		9150-00-186-6668	5 Gallon Can	GAL
		9150-00-191-2772	55 Gallon Drum	GAL
25	C		OIL: Lubricating, OE/HDO-15/40 (81349) MIL-PRF-2104	
		9150-01-152-4117	1 Quart Can	QT
		9150-01-152-4118	5 Gallon Can	GAL
		9150-01-152-4119	55 Gallon Drum	GAL
26	C		OIL: Lubricating, OE/HDO-30 (81349) MIL-PRF-2104	
		9150-00-186-6681	1 Quart Can	QT
		9150-00-188-9858	5 Gallon Can	GAL
27	O		PIGMENT, PAINT PRODUCTS: Prussian Blue (58536) AA3108-2A-001Q	
		8010-00-664-1414	1 Quart Can	QT
28	O		PRIMER COATING (81348) TTP1757-1CG-001P	
			1 Pint Can	PT
29	C		RAG: Wiping (64067) 7920-00-205-1711	
		7290-00-205-1711	50 Pound Bale	LB
30	F		SEALANT, Quick-cure: Repair Kit (11083) 173-0531	KIT
31	O		SEALING COMPOUND (81349) MIL-S-15204	
		8030-00-246-0931	5 Ounce Tube	OZ
32			SEALING COMPOUND (05972) 26241	
		8030-01-142-3131	250 CC Bottle	CC

Table 1. Expendable and Durable Items List - Continued.

ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
33			SEALING COMPOUND (61603) 392430	
		8030-01-155-3238	Box of 6 Tubes, 50 ML Each	ML
34			SODIUM BICARBONATE: Technical (58539) AA374-2	
		6810-00-264-6618	1 Pound Box	LB
35	O		SOLDER: Lead-Tin Alloy, Rosin Core (81348) QQ-S-571	
		3439-00-555-4629	1 Pound Spool	LB
36	O		STRAP: Tiedown, Electrical Components	
		5975-00-903-2284	(96906) MS3367-4-0 4 Inch Length, Black Package of 100	EA
		5975-00-984-6582	(96906) MS3367-1-0 6 Inch Length, Black Package of 100	EA
		5975-00-935-5946	(96906) MS3367-2-1 13.35 Inch Minimum Length, Brown Package of 100	EA
37	O		TAG: Marker (64067) 9905-00-537-8954	
		9905-00-537-8954	Pack of 50	EA
38	O		TAPE: Antiseizing (52152) 6195	
		8030-00-889-3535	260 Inch Roll	IN.
39			TAPE: Duct, 2 Inches Wide (39482) 1791K70	
		5640-00-103-2254	60 Yard Roll	YD
		5970-00-815-1295	250 Foot Spool	FT
40	O		WIRE: Nonelectrical (81346) ASTM A641	
		9905-00-596-0191	5 Pound Coil	LB

END OF WORK PACKAGE

TOOL IDENTIFICATION LIST 0250 00

SCOPE

This work package lists all common tools and supplements and special tools/fixtures needed to maintain the D7G Tractor.

EXPLANATION OF COLUMNS IN THE TOOL IDENTIFICATION LIST

1. **Column (1) - Item Number (No.).** This number is assigned to the entry in the list and is referenced in the initial setup to identify the item (e.g., Tool kit, general mechanic's, Item 122, WP 0250 00).
2. **Column (2) - Item Name.** This column lists the item by noun nomenclature and other descriptive features (e.g., Cutter, tube).
3. **Column (3) - National Stock Number.** This is the National Stock Number (NSN) assigned to the item; use it to requisition the item.
4. **Column (4) - Part Number/CAGEC.** Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity) which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. The manufacturer's Commercial and Government Entity Code (CAGEC) is also included.
5. **Column (5) - Reference.** This column identifies the authorizing supply catalog or RPSTL for selected tool.

Table 1. Tool Identification List.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER/ CAGEC	(5) REFERENCE
1	Adapter		6V3094 (11083)	TM 5-2410-237-23P
2	Adapter	5120-01-119-1713	1P3054 (11083)	TM 5-2410-237-23P
3	Adapter		6V3123 (11083)	TM 5-2410-237-23P
4	Adapter	5120-01-119-1764	7M9773 (11083)	TM 5-2410-237-23P
5	Adapter, Coupling	5120-01-119-1765	7M9774 (11083)	TM 5-2410-237-23P
6	Adapter, Pin	5120-01-119-1715	1P3053 (11083)	TM 5-2410-237-23P
7	Adapter, Socket Wrench	5120-01-508-9182	2P8261 (11083)	TM 5-2410-237-23P
8	Adapter, Sprocket Installation	5120-01-512-7168	5P6222 (11083)	TM 5-2410-237-23P
9	Adapter, Torque Wrench	5120-01-359-2644	6V6175 (11083)	TM 5-2410-237-23P
10	Adjusting Tool, Bearing	5120-01-272-4055	6V0082 (11083)	TM 5-2410-237-23P
11	Analyzer, Set, Engine	4910-00-124-2554	2389409 (16331)	TM 5-2410-237-23P
12	Bolt, Machine	5306-01-026-9992	9S8890 (11083)	TM 5-2410-237-23P
13	Bolt, Machine	5306-00-426-3080	1A5822 (11083)	TM 5-2410-237-23P
14	Bolt, Machine	5306-00-426-3209	1B4367 (11083)	TM 5-2410-237-23P
15	Bolt, Machine	5306-00-263-8982	6F7024 (11083)	TM 5-2410-237-23P
16	Bolt, Machine	5306-00-008-5972	1D4624 (11083)	TM 5-2410-237-23P
17	Bracket, Double Angle, Fan Drive Support	5340-01-270-1290	5P1762 (11083)	TM 5-2410-237-23P
18	Bushing Driver Set	5120-01-039-4811	1P0520 (11083)	TM 5-2410-237-23P
19	Cap, Protective, Dust	5340-01-292-1734	1P7437 (11083)	TM 5-2410-237-23P
20	Clip, Retaining	5340-00-377-8758	7B2499 (11083)	TM 5-2410-237-23P
21	Collar, Shaft	3040-01-295-2500	8S7625 (11083)	TM 5-2410-237-23P
22	Compressor, Ring		1U6684 (11083)	TM 5-2410-237-23P
23	Coupling Assembly, Quick Disconnect	4730-01-275-0057	1108 (97111)	TM 5-2410-237-23P
24	Coupling, Half, Quick	4730-01-295-3790	1P2375 (11083)	TM 5-2410-237-23P
25	Coupling Tool		1P7402 (11083)	TM 5-2410-237-23P
26	Cover, Access	5340-01-169-2140	5H4020 (11083)	TM 5-2410-237-23P
27	Cylinder Assembly, Actuating, Linear	3040-01-264-9538	8S7650 (11083)	TM 5-2410-237-23P
28	Distorter, Sleeve	5120-01-119-1750	5P7315 (11083)	TM 5-2410-237-23P
29	Forcing Screw, Mechanical Puller	5120-01-513-9583	5P5207 (11083)	TM 5-2410-237-23P
30	Gage, Pressure, Dial Indicating: 0-600 psi	6685-01-338-2513	8T0856 (11083)	TM 5-2410-237-23P

Table 1. Tool Identification List - Continued.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER/ CAGEC	(5) REFERENCE
31	Gage, Sprocket Wear	5210-01-225-1132	5P8617 (11083)	TM 5-2410-237-23P
32	Guide, Seal		2P8301 (11083)	TM 5-2410-237-23P
33	Guide, Seal		5P6156 (11083)	TM 5-2410-237-23P
34	Guide, Seal		5P8565 (11083)	TM 5-2410-237-23P
35	Head		6V4000 (11083)	TM 5-2410-237-23P
36	Head, Socket Install	5120-00-972-0345	9H3992 (11083)	TM 5-2410-237-23P
37	Hose Assembly	3442-00-876-6522	8F0024 (11083)	TM 5-2410-237-23P
38	Inserter, Seal	5120-01-289-0637	4S9450 (11083)	TM 5-2410-237-23P
39	Inserter, Seal	5120-01-289-0635	4S9453 (11083)	TM 5-2410-237-23P
40	Inserter, Seal	5120-01-289-0636	4S9454 (11083)	TM 5-2410-237-23P
41	Inserter, Seal	5120-01-119-1736	5M2162 (11083)	TM 5-2410-237-23P
42	Inserter, Seal	5120-01-286-4205	8M9395 (11083)	TM 5-2410-237-23P
43	Inserter, Seal		1U8842 (11083)	TM 5-2410-237-23P
44	Installer	5120-01-349-0341	6V7876 (11083)	TM 5-2410-237-23P
45	Installer	5120-01-426-1411	4C8982 (11083)	TM 5-2410-237-23P
46	Leg		1P7461 (11083)	TM 5-2410-237-23P
47	Leg, Mechanical Puller	5120-00-227-0633	1107 (45225)	TM 5-2410-237-23P
48	Leg, Mechanical Puller	5120-00-633-5075	1110 (45225)	TM 5-2410-237-23P
49	Leveler, Load: 6,000 lb Capacity	3950-01-263-9513	60842 (45225)	TM 5-2410-237-23P
50	Link, Bearing (Lifting)	5120-01-451-1401	1387575 (11083)	TM 5-2410-237-23P
51	Link, Bearing (Lifting)	5340-01-476-1734	1387574 (11083)	TM 5-2410-237-23P
52	Link, Pin	5120-01-119-1714	1P3052 (11083)	TM 5-2410-237-23P
53	Nipple, Pipe	4730-01-162-0102	5P8998 (11083)	TM 5-2410-237-23P
54	Nozzle Puller Group	2910-01-250-1608	6V6980 (11083)	TM 5-2410-237-23P
55	Nut, Plain, Round	5310-01-507-2374	6V3124 (11083)	TM 5-2410-237-23P
56	Nut, Plain, Round	5310-01-507-2390	5P5208 (11083)	TM 5-2410-237-23P
57	Nut, Sleeve	5310-01-038-8318	9S8858-00 (11083)	TM 5-2410-237-23P
58	O-ring	5331-00-741-0674	5F1678 (11083)	TM 5-2410-237-23P
59	Pin	5315-01-119-1754	6H4158 (11083)	TM 5-2410-237-23P
60	Pin	5315-01-265-0418	5F9892 (11083)	TM 5-2410-237-23P
61	Pin	5315-01-270-5495	7S7112 (11083)	TM 5-2410-237-23P
62	Pin, Lock	5315-00-931-8963	3J1770 (11083)	TM 5-2410-237-23P
63	Pin, Shoulder, Headless	5315-01-270-2832	8S7615 (11083)	TM 5-2410-237-23P
64	Pin, Straight, Headless	5315-01-506-5030	6V3126 (11083)	TM 5-2410-237-23P

Table 1. Tool Identification List - Continued.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER/ CAGEC	(5) REFERENCE
65	Pin, Straight, Headless	5315-00-922-2595	7M9772 (11083)	TM 5-2410-237-23P
66	Pin, Timing	2815-01-268-2194	6V4186 (11083)	TM 5-2410-237-23P
67	Plate, Intermediate, Friction Clutch	2520-01-408-9279	1P492 (11083)	TM 5-2410-237-23P
68	Plate Assembly		5P5212 (11083)	TM 5-2410-237-23P
69	Plate, Compressor, Steering	5120-00-371-9610	5F5034 (11083)	TM 5-2410-237-23P
70	Plate, Mechanical Puller	5120-01-338-7733	1P2393 (11083)	TM 5-2410-237-23P
71	Plate, Timing	5120-00-512-0697	8S5417-00 (58312)	TM 5-2410-237-23P
72	Plug, Pipe	4730-00-089-2515	5M6213 (11083)	TM 5-2410-237-23P
73	Plug, Protective, Dust	5340-01-371-2357	1P2377 (11083)	TM 5-2410-237-23P
74	Press, Arbor, Hand Operated	3444-00-449-7295	AA59384 (58536)	TM 5-2410-237-23P
75	Press, Hydraulic, Portable	4940-01-272-2839	2159672 (11083)	TM 5-2410-237-23P
76	Puller	5130-01-289-0100	8M9011 (11083)	TM 5-2410-237-23P
77	Puller Assembly		1U6415 (11083)	TM 5-2410-237-23P
78	Puller Attachment, Mechanical	5120-00-293-1430	8B7554 (11083)	TM 5-2410-237-23P
79	Puller Attachment, Mechanical	5120-01-512-7167	1H3112 (11083)	TM 5-2410-237-23P
80	Puller Attachment, Mechanical	5120-00-288-6756	8B7551 (11083)	TM 5-2410-237-23P
81	Puller Attachment, Mechanical	5120-00-288-6756	8B7551 (11083)	TM 5-2410-237-23P
82	Puller, Crank Pulley	5120-01-124-1732	1P0820 (11083)	TM 5-2410-237-23P
83	Puller Group	5120-01-128-0725	8S2264 (11083)	TM 5-2410-237-23P
84	Puller, Hydraulic	5130-01-288-2786	9S8900 (11083)	TM 5-2410-237-23P
85	Puller, Hydraulic	5130-01-480-6682	5P-5201 (11083)	TM 5-2410-237-23P
86	Puller, Hydraulic	5130-01-294-0717	6V3170 (11083)	TM 5-2410-237-23P
87	Puller Kit, Universal	5180-01-124-1903	1P3075 (11083)	TM 5-2410-237-23P
88	Puller, Mechanical	5120-00-633-5074	939 (45225)	TM 5-2410-237-23P
89	Puller, Mechanical	5120-00-633-5085	GGG-P-781 (81348)	TM 5-2410-237-23P
90	Puller, Ratchet Lever, Cable Type	5120-01-275-2286	8S9906 (11083)	TM 5-2410-237-23P
91	Puller, Sprocket Arm	5120-00-971-5507	5F9306 (11083)	TM 5-2410-237-23P
92	Pump, Hydraulic Ram, Hand Driven	4320-01-271-9831	304401 (45225)	TM 5-2410-237-23P
93	Pump, Hydraulic Ram, Hand Driven	4320-00-374-1403	4C4865 (11083)	TM 5-2410-237-23P
94	Pumping Unit, Hydraulic, Power Driven	4320-01-068-6009	3S6224 (11083)	TM 5-2410-237-23P
95	Pusher, Rollover	5120-01-119-1773	8S9903 (11083)	TM 5-2410-237-23P
96	Remover and Replacer	5120-01-030-3575	9S8871 (11083)	TM 5-2410-237-23P
97	Reducer, Pipe	4730-00-726-1103	5S2403 (11083)	TM 5-2410-237-23P

Table 1. Tool Identification List - Continued.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER/ CAGEC	(5) REFERENCE
98	Reducer, Pipe	4730-01-373-5625	5B6009 (11083)	TM 5-2410-237-23P
99	Remover, Bearing and Bushing	5120-01-393-3420	3P2248 (11083)	TM 5-2410-237-23P
100	Repair Tool, Special Purpose	4910-01-264-4778	8S7621 (11083)	TM 5-2410-237-23P
101	Ring, Sleeve Distorter	5120-01-119-1749	5P7313 (11083)	TM 5-2410-237-23P
102	Screw, Cap, Hexagon Head	5305-01-271-2044	8F1156 (11083)	TM 5-2410-237-23P
103	Shop Equipment, Automotive Maintenance and Repair: Common No. 1, Less Power, SC4910-95-CL-A74	4910-00-754-0654	SC4910-95CLA74 (19204)	
104	Shop Equipment, Automotive Maintenance and Repair: Common No. 2, Less Power, SC4910-95-CL-A72	4910-00-754-0650	SC4910-95CLA72 (19204)	
105	Shop Equipment, Contact Maintenance: Truck Mounted, SC4040-95-CL-B04	4940-00-294-9518	MILS45855 (81349)	
106	Shop Equipment, General Purpose Repair: Semitrailer Mounted, SC4940-95-CL-B02	4940-00-287-4894	MILS45538 (81349)	
107	Shop Equipment, Machine Shop: Field Maintenance, Basic, SC3470-95-CL-A02	3470-00-754-0708	SC3470-95CLA02 (19204)	
108	Shop Equipment, Welding, SC3470-95-CL-A08	4940-00-357-7268	SC3470-95CLA08 (19204)	
109	Sling, Nylon	2835-01-078-2081	4X8FTX2IN (91796)	TM 5-2410-237-23P
110	Socket, Socket Wrench	5120-01-233-0320	5S6087 (11083)	TM 5-2410-237-23P
111	Spacer	5365-01-119-1769	8M9008 (11083)	TM 5-2410-237-23P
112	Spacer, Sleeve	5365-01-300-2674	0L1774 (11083)	TM 5-2410-237-23P
113	Spacer, Sleeve	5365-01-506-1820	5P6220 (11083)	TM 5-2410-237-23P
114	Stand Assembly	4910-01-264-4777	8S7640 (11083)	TM 5-2410-237-23P
115	Stand, Lifting	5120-01-343-8085	4C6486 (11083)	TM 5-2410-237-23P
116	Stand, Steering Clutch		FT0610 (11083)	TM 5-2410-237-23P
117	Stand, Transmission	4910-01-265-2624	1P2420 (11083)	TM 5-2410-237-23P
118	Step Plate, Mechanical Puller	5120-00473-6921	8B7560 (11083)	TM 5-2410-237-23P
119	Tachometer, Stroboscopic	6680-01-355-7805	1U6602 (11083)	TM 5-2410-237-23P
120	Tee, Pipe	4370-00-119-9861	MS14303-2R06 (96906)	TM 5-2410-237-23P

Table 1. Tool Identification List - Continued.

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER/ CAGEC	(5) REFERENCE
121	Tool, Distorter	5120-01-119-1748	5P7312 (11083)	TM 5-2410-237-23P
122	Tool Kit, General Mechanic's: Automotive, SC5180-90-CL-N05	5180-00-699-5273	SC5180-90-CL-N05 (50980)	
123	Tool, Lifting: MCAP Installation	3940-01-515-7742	4R9712 (11083)	TM 5-2410-237-23P
124	Tool Outfit, Hydraulic System Test and Repair (HSTRU), SC3470-95-CL-B07	4940-01-036-5784	13221E6850 (97403)	
125	Tool Set, Track Repair	5120-00-513-1788	5P2379 (11083)	TM 5-2410-237-23P
126	Tool, Special	4910-01-265-0428	8S7611 (11083)	TM 5-2410-237-23P
127	Valve, Needle	4810-01-127-5377	1S8937 (11083)	TM 5-2410-237-23P
128	Washer		3H467 (11083)	TM 5-2410-237-23P
129	Washer, Flat	5310-00-308-2227	4B5273 (11083)	TM 5-2410-237-23P
130	Wrench, Ratchet	5120-01-123-5881	8H0684 (11083)	TM 5-2410-237-23P
131	Wrench, Spanner	5120-01-119-1902	7F9306 (11083)	TM 5-2410-237-23P
132	Wrench, Torque: 1 in. Square Drive	5120-01-507-6929	5P3508 (11083)	TM 5-2410-237-23P
133	Yoke	5120-00-426-3787	2B2003 (11083)	TM 5-2410-237-23P
134	Link, Bearing (Lifting)	4940-01-268-2201	1387573 (11083)	TM 5-2410-237-23P

END OF WORK PACKAGE

Effective with sales to the first user on or after July 1, 2000

CATERPILLAR BATTERY LIMITED WARRANTY

USA and Canada

Caterpillar Inc. or any of its subsidiaries ("Caterpillar") warrants new batteries sold by it and used within the geographic area serviced by authorized USA and Canadian Caterpillar dealers, to be free from defects in material and workmanship.

In other areas, different warranties may apply. Copies of applicable warranties may be obtained by writing to Caterpillar, Inc., 100 N.E. Adams St., Peoria, IL USA 61629.

This warranty is subject to the following:

1. The warranty period is as follows, starting from the date of battery sale or product delivery to the first user.

Application	Battery Type & Warranty Period	
	Premium, High Output	General Service Line
On-Highway vehicles up to 680 kilograms (3/4 ton) capacity with charging systems in a personal, family or household use application.	72 Months	72 Months
On-Highway vehicles up to 680 kilograms (3/4 ton) capacity with charging systems in other than a personal, family or household use application.	36 Months	36 Months
All on-highway vehicles over 680 kilograms (3/4 ton) capacity with charging systems.	36 Months	30 Months
Earthmoving, construction, materials handling, paving and off-highway equipment, agricultural, industrial engine, electric power generation and marine products with charging systems.	36 Months	24 Months
For deep cycle applications or applications without constant battery charging systems (i.e. auxiliary batteries for marine pleasure craft or recreational vehicles; electric trolling motor or golf cart applications which use batteries as their motive power; lawn garden applications, etc.).	3 Months	(See Note)

Note: For "General Service Line" batteries in deep cycle applications or applications without constant battery charging systems, the warranty period is as follows:

BCI group sizes U-1R, U-1, 8V, and GC-2: 18 Months
BCI group sizes 24 M and 27M: 30 Months
The warranty period for all other batteries is 3 Months.

2. Within the periods stated in Item 1, Caterpillar will replace a battery which it finds to be defective in material or workmanship with a new battery at the following cost to the user:

For the first 18 months from date of sale or delivery for PHO group 31 batteries used in on-highway applications, 12 months for Cat PHO batteries not used in the aforementioned on-highway applications and 3 months for "General Service Line" category batteries, or batteries in deep cycle applications or applications without constant battery charging systems, there is no charge to the user. After this time period, user cost is determined by the following formula:

$$\frac{\text{Current Consumer's Battery Price} \times \text{Months of Service}}{\text{Months in Warranty Period}} = \text{User Cost}$$

3. This warranty will be honored upon return of the battery, during normal working hours, to a Caterpillar dealer or other source approved by Caterpillar.

4. Taxes, installation, or transportation costs, which may result from replacement, are not included in this warranty.

(continued on reverse side...)

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS WHICH IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN. CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION (CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS) IS EXCLUDED IN ITS ENTIRETY.

For personal or family use batteries used in the USA, its territories and possessions, some states do not allow limitations on how long an implied warranty may last nor allow the exclusion or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary by jurisdiction. To find the location of the nearest Caterpillar dealer or authorized repair facility, call (877) 228-9900. If you have questions concerning this warranty or its application, call or write: NACD Business Operations, Caterpillar Inc., 100 N. E. Adams St., Peoria, IL 61629-1250 Telephone:(309)675-4037.

Effective with sales to the first user on or after September 1, 1999

CATERPILLAR WARRANTY

Ground Engaging Tools
Worldwide
(excluding the commonwealth of Independent States)

Caterpillar Inc. or any of its subsidiaries ("Caterpillar") warrants the following Ground Engaging Tools (and every major component thereof) sold by it, and used outside the Commonwealth of Independent States (formerly USSR), against breakage. This warranty is applicable after the expiration of any standard machine or parts warranty to:

- Tips and adapters used on buckets, rippers and scrapers
- End bits and router bits
- Side cutters and sidebar protectors
- Uni-tooth components
- Modulok and HD Mining System components
- MEGS (Mining Edge Guard System) components
- Mechanically-attached adapter systems and wear plates
- Lip Protection System components
- Base edge assemblies, bolt-on flat plate or half arrow segments and cutting edges (except high carbon motor grader cutting edges)
- Ripper shank protectors and multi-piece ripper protectors
- Scarifier tips
- Compactor feet
- Landfill compactor tips and chopper blades (an additional warranty applies to Long Life Plus Tips)
- Bolt-on wear plates and sole plates
- Loader bucket cutting edge corner components
- Grader Bit and Mining Bit adapters
- Grader Bit, Mining Bit assemblies and tungsten carbide motor grader cutting edges (except for carbide element)
- Percussive drill products

This warranty also covers the parent material of the Ground Engaging Tools covered if Caterpillar-sourced Abrasion-Resistant Material (ARM) has been applied by a Caterpillar dealer.

This warranty is subject to the following:

Warranty Period
The warranty period is not limited by time and is applicable throughout the *useful life* of the Ground Engaging Tools covered.

Caterpillar Responsibilities
If a breakage occurs during normal operation, Caterpillar will, during normal working hours and at a place of business of a Caterpillar dealer or other source approved by Caterpillar:

- Provide (at Caterpillar's choice) new or Caterpillar-approved repaired parts or assembled components needed to correct the defect.

Note: Items replaced under this warranty become the property of Caterpillar.

User Responsibilities
The user is responsible for:

- Labor (including welding) and hardware costs associated with removal and installation.
- Parts shipping charges in excess of those which are usual and customary.
- Local taxes, if applicable.
- Giving timely notice of a warrantable failure and promptly making the product available for repair.

Limitations
Caterpillar is not responsible for failures resulting from:

- Any use or installation which Caterpillar judges improper.
- Breakage of Ground Engaging Tools due to worn mating components or those that have been hardfaced or improperly welded.
- Attachments of competitive parts to Caterpillar components.
- Cracks in the ARM weld and chipping of hard particles out of the weld. This is not considered "breakage" under the terms of this warranty.
- Abuse, neglect and/or improper repair.

A different warranty statement applies to Ground Engaging Tools used in the Commonwealth of Independent States. Copies of this warranty may be obtained by writing Caterpillar Inc., 100 N.E. Adams St., Peoria, IL USA 61629.

For products operating outside of Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS WHICH IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN. CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION (CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS) IS EXCLUDED IN ITS ENTIRETY.

For products operating in Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

THIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED OR MODIFIED ("MANDATORY RIGHTS"). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED.

NEITHER THIS WARRANTY NOR ANY OTHER CONDITION OR WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED (SUBJECT ONLY TO THE MANDATORY RIGHTS), IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS WHICH IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

TO THE EXTENT PERMITTED UNDER THE MANDATORY RIGHTS, IF CATERPILLAR IS THE SUPPLIER TO THE USER, CATERPILLAR'S LIABILITY SHALL BE LIMITED AT ITS OPTION TO (a) IN THE CASE OF SERVICES, THE SUPPLY OF THE SERVICES AGAIN OR THE PAYMENT OF THE COST OF HAVING THE SERVICES SUPPLIED AGAIN, AND (b) IN THE CASE OF GOODS, THE REPAIR OR REPLACEMENT OF THE GOODS, THE SUPPLY OF EQUIVALENT GOODS, THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT GOODS.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPOSED UNDER MANDATORY RIGHTS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION (CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS) IS EXCLUDED IN ITS ENTIRETY.

Claims under this warranty should be submitted to a place of business of a Caterpillar dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 100 N. E. Adams St., Peoria, IL USA 61629.

SELF5281-02

Effective with sales to the first user on or after June 1, 2001

CATERPILLAR WARRANTY

Earthmoving, Construction, and Material Handling Machines Rebuilt As Part Of The Service Life Extension Program

Caterpillar warrants products rebuilt to be free from defects in material and workmanship.

This warranty is subject to the following:

Warranty Period

For rebuilt machines and attachments, the warranty period is 18 months or 500 operating hours, whichever occurs first, starting from date of delivery to the user.

An additional warranty against breakage is applicable to certain Caterpillar brand Ground Engaging Tools. Refer to the applicable warranty statement for coverage detail.

An additional prorated warranty applies to Caterpillar brand batteries after the 18-month or 500 hours. Refer to applicable warranty statement for coverage detail.

Caterpillar Responsibilities
If a defect in material or workmanship is found during the warranty period, Caterpillar will, during normal working hours and at a place of business of a Caterpillar dealer or other source approved by Caterpillar:

- Provide (at Caterpillar's choice) new, remanufactured, or Caterpillar-approved repaired parts or assembled components needed to correct the defect.
- Provide reasonable and customary labor needed to correct the defect.
- The costs associated with transporting the product, or reasonable travel by dealer mechanic.

User Responsibilities

The user is responsible for:

- Providing proof of the delivery date to the user.
- Labor costs, except as stated under "Caterpillar Responsibilities".
- Local taxes, if applicable.
- Parts shipping charges in excess of those which are usual and customary.
- Costs to investigate complaints, unless the problem is caused by a defect in Caterpillar material or workmanship.
- Giving timely notice of a warrantable failure and promptly making the product available for repair.
- Performance of the required maintenance (including use of proper fuel, oil, lubricants and coolant) and replacement of items due to normal wear and tear.
- Allowing Caterpillar access to all electronically stored data.

Limitations

Caterpillar is not responsible for failures resulting from:

- Any use or installation which Caterpillar judges improper.
- Attachments, accessory items and parts not sold or approved by Caterpillar.
- Abuse, neglect and/or improper repair.
- User's delay in making the product available after being notified of a potential product problem.
- Unauthorized repair or adjustments, and unauthorized fuel setting changes.

NEITHER THE FOREGOING EXPRESS WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS WHICH IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT CATERPILLAR EMISSION-RELATED COMPONENTS WARRANTIES FOR NEW ENGINES, WHERE APPLICABLE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN. CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

As used in this warranty, the term "Caterpillar" means Caterpillar, Inc., or one of its subsidiaries, except Caterpillar Oversea s S.A., Caterpillar France S.A., Caterpillar (U.K.) Limited, or Caterpillar Belgium S.A., whichever last sold the product involved.

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By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

SANDRA R. RILEY
Administrative Assistant to the
Secretary of the Army
0515902

DISTRIBUTION: To be distributed in accordance with the initial distribution requirements for IDN: 255972, requirements for TM 5-2410-237-23.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 1 July 2005
TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-CI/TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	FROM: *(Activity and location) (Include ZIP Code)* 125th Transportation Company ATTN: Motor SGT (SGT Wilson) Ft. Riley, KA 78665-4000	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 5-2410-237-23	15 March 2005	Field Maintenance Manual for Tractor, Full Tracked, Low Speed: Diesel Engine Driven, Medium Drawbar Pull, T-9

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON
	0007 00-1					Symptom Index Missing Title/Page references.

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
Johnny Wilson, E-5, MOTOR SGT	DSN 867-7967	

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARK *(Use this part for any explanatory remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

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 Pounds
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 = 0.0386 Sq Miles

Cubic Measure

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

Temperature

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° +32 = F°

APPROXIMATE CONVERSION FACTORS

To Change	To	Multiply By
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Sq Inches	Sq Centimeters	6.451
Sq Feet	Sq Meters	0.093
Sq Yards	Sq Meters	0.836
Sq Miles	Sq Kilometers	2.590
Acres	Sq 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 Sq 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
Sq Centimeters	Sq Inches	0.155
Sq Meters	Sq Feet	10.764
Sq Meters	Sq Yards	1.196
Sq Kilometers	Sq Miles	0.386
Sq 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 Sq Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

PIN: 082533-000