

# TM 5-3805-248-23-2

---

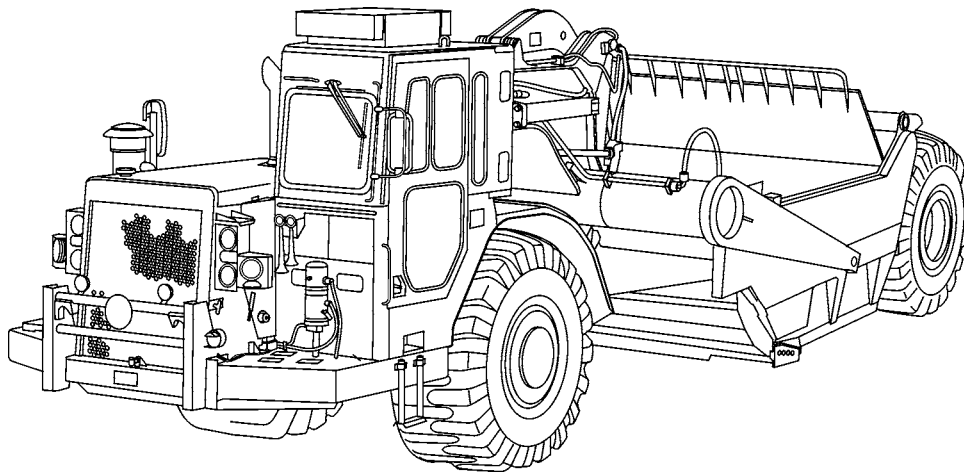
## TECHNICAL MANUAL

### Unit and Direct Support Maintenance

FOR

### SCRAPER, EARTH MOVING, MOTORIZED, DIESEL ENGINE DRIVEN

MODEL 621B  
(NSN 3805-01-153-1854) (EIC: EH3)



**SUPERSEDURE NOTICE** - This manual supersedes TM 5-3805-248-14&P-2 and TM 3805-248-14&P-3, dated 19 August 1985

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

---

**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**FEBRUARY 2006**



## 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.



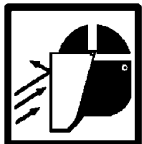
**ELECTRICAL** - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.



**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.



HEAVY OBJECT - human figure stooping over heavy object shows physical injury potential from improper lifting technique.



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



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 to personnel.



POISON - skull and crossbones shows material is poisonous or is a danger to life.



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



SLICK FLOOR - wavy line on floor with legs prone shows that slick floor presents a danger from falling.



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



**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 engine in enclosed areas.
  2. DO NOT idle engine without adequate ventilation.
  3. DO NOT drive 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!***



- 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.



Compressed air used for cleaning or drying purposes, or for clearing restrictions, should never exceed 30 psi (207 kPa). Use protective equipment and exercise caution to avoid injury to personnel.



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.



**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**

***FUEL HANDLING***

- 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.
- 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.
- Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.



**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***

Hearing protection is required when operating machine or when within 23 feet of machine when it is operating. Failure to wear hearing protection may result in hearing loss.

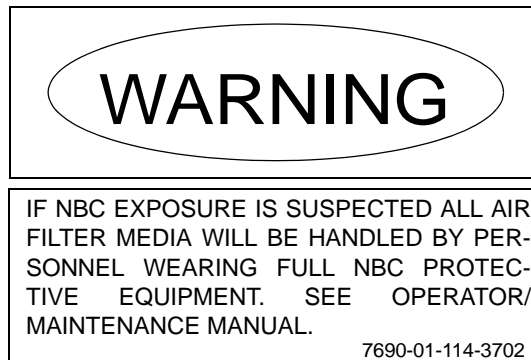


**WARNING**

***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**

***OPERATION SAFETY***

- Use caution and maintain three-point contact at all times when mounting and dismounting machine, to avoid injury to personnel.
- DO NOT allow riders on machine. Failure to follow this warning may result in serious injury or death to personnel.
- DO NOT operate machine unless seat belt has been fastened. Failure to follow this warning may result in serious injury or death, in the event of an accident.
- BE ALERT for personnel in the area while operating machine. Always check to ensure area is clear of personnel and obstructions before starting engine, moving machine or lowering or raising scraper bowl. Failure to follow this warning may result in serious injury or death to personnel or damage to equipment.
- Never leave the operator's position without applying the parking brake. Failure to follow this warning may result in death to injury to personnel or damage to equipment.
- Never use starting fluid or spray to aid in starting the engine, other than the on-board ether cold start system. Failure to follow this warning may result in death or injury to personnel or damage to equipment.
- Always use a ground guide when driving machine up or down ramps in preparation for highway or marine. Failure to use a ground guide may result in death or injury to personnel or damage to equipment.
- When loaded and traveling across a hillside, reduce speed significantly BEFORE turning uphill. Failure to do so may cause machine to roll over, resulting in injury or death to personnel.

Do NOT operate machine if parking brake was applied due to a malfunction of airbrake system or parking brake. Correct any problem before attempting to operate machine. Personal injury or death can result from a brake malfunction.



**WARNING**

***PREPARATION FOR TRANSPORT***

- 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 lift capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause death or injury to personnel.
- Always use a ground guide when moving machine during preparation for transport procedures (driving up and down ramps or onto rail flatcars). Failure to use a ground guide may result in death or injury to personnel or damage to equipment.
- Use assistance and handle windshield with caution to ensure it does not become damaged. Failure to do so may damage windshield or cause personnel injury from cut glass if windshield breaks.
- Use extreme caution when climbing on ladder. Failure to exercise caution may result in a fall, causing injury to personnel.



**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. 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**

*SLAVE STARTING*

- When slave starting tractor, use NATO slave cable that DOES NOT have loose or missing insulation.
- DO NOT proceed if suitable cable is not available.
- DO NOT use civilian-type jumper cables.
- DO NOT allow disabled and booster machines to come in contact with each other at any time during slave starting.

**WARNING**

*TIRES*

- Operating machine with underinflated or defective tire may lead to tire failure and loss of traction or control. Damage to equipment or injury to personnel may result.
- If tire pressure is 0 psi (0 kPa) do NOT inflate. Notify Unit Maintenance.
- Use a self-inflating chuck and stand at a distance behind tire when inflating tire. Failure to do so could result in injury or death to personnel.

**WARNING**

*WORK SAFETY*



- Lifting cables, chains, hooks, and slings used for lifting machine must be in good condition and of suitable 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 of cables to machine can result in serious personnel injury and equipment damage. Observe all standard rules of safety.
- Ensure engine compartment access door is securely supported in open position. Failure to do so could cause door to slam shut, causing serious injury to personnel.



- Hitch and steering movement can reduce clearances suddenly and cause personnel injury. Always stop engine BEFORE working in area of hitch link.
- Configuration changes to cutting edge should NEVER be attempted without first securing the bowl by blocking it so that it is firmly supported. Failure to follow this warning may cause injury to personnel.



- 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.

**LIST OF EFFECTIVE PAGES/WORK PACKAGES**

Date of issue for original manual is:

Original            15 February 2006

**TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 42 AND TOTAL NUMBER OF WORK PACKAGES IS 130 CONSISTING OF THE FOLLOWING:**

<b>Page/WP No.</b>	<b>*Change No.</b>
Cover/(Back Blank)	0
a to h	0
A/(B Blank)	0
i to vi	0
WP 0257 00 to 387 00	0
Index-1 to Index-9/(Index-10 Blank)	0

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

**A/B Blank**





**MAINTENANCE MANUAL  
Unit and Direct Support Maintenance**

FOR

**SCRAPER, EARTH MOVING,  
MOTORIZED, DIESEL ENGINE DRIVEN  
MODEL 621B  
(NSN 3805-01-153-1854) (EIC: EH3)**

**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 <https://aeeps.ria.army.mil/>. The DA Form 2028 is located under the Public Applications section in the AEPS Public Home Page. 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 or DA Form 2028 direct to: AMSTA-LC-LPIT/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.

**SUPERSEDURE NOTICE** - This manual supersedes TM 5-3805-248-14&P-2 and TM 3805-248-14&P-3, dated 19 August 1985

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

## Table of Contents

	<b>Page Number</b>
<b>VOLUME II</b>	
Warning Summary . . . . .	a
How To Use This Manual . . . . .	vii
<b>CHAPTER 4 DIRECT SUPPORT FIELD MAINTENANCE</b>	
<i>Engine</i>	
WP 0257 00 Engine Assembly Replacement . . . . .	0257 00-1
WP 0258 00 Engine Mounts Replacement . . . . .	0258 00-1
WP 0259 00 Cylinder Head Assembly Maintenance . . . . .	0259 00-1
WP 0260 00 Crankshaft Pulley and Damper Replacement . . . . .	0260 00-1
WP 0261 00 Flywheel Replacement . . . . .	0261 00-1
WP 0262 00 Flywheel Housing Replacement . . . . .	0262 00-1
WP 0263 00 Valves and Springs Maintenance . . . . .	0263 00-1
WP 0264 00 Valve Lifters Replacement . . . . .	0264 00-1
WP 0265 00 Push Rods and Arms Replacement . . . . .	0265 00-1
WP 0266 00 Valve Bridges Maintenance . . . . .	0266 00-1
WP 0267 00 Lubrication Oil Pump Replacement . . . . .	0267 00-1
WP 0268 00 Oil Pan Maintenance . . . . .	0268 00-1

## Table of Contents - Continued

	<b>Page Number</b>
<i>Engine - Continued</i>	
WP 0269 00 Engine Oil Cooler Replacement . . . . .	0269 00-1
WP 0270 00 Exhaust Manifold Replacement . . . . .	0270 00-1
WP 0271 00 Accessory Drive Group Replacement . . . . .	0271 00-1
<i>Fuel System Maintenance</i>	
WP 0272 00 Injector Valve and Nozzle Maintenance . . . . .	0272 00-1
WP 0273 00 Fuel Injection Pump Housing and Governor Assembly Replacement . . . . .	0273 00-1
WP 0274 00 Fuel Injection Pump Housing and Governor Adjustment . . . . .	0274 00-1
WP 0275 00 Fuel Transfer Pump Maintenance . . . . .	0275 00-1
WP 0276 00 Turbocharger Replacement . . . . .	0276 00-1
WP 0277 00 Aftercooler Replacement . . . . .	0277 00-1
WP 0278 00 Automatic Timing Advance Unit Maintenance . . . . .	0278 00-1
WP 0279 00 Fuel Pump Drive Replacement . . . . .	0279 00-1
WP 0280 00 Governor Control Maintenance . . . . .	0280 00-1
<i>Cooling System</i>	
WP 0281 00 Water Pump Repair . . . . .	0281 00-1
WP 0282 00 Fan and Fan Drive Maintenance . . . . .	0282 00-1
<i>Transmission</i>	
WP 0283 00 Linkage Adjustment . . . . .	0283 00-1
WP 0284 00 Control Group Pressure Test . . . . .	0284 00-1
WP 0285 00 Shift Point Adjustment . . . . .	0285 00-1
WP 0286 00 Transmission Replacement . . . . .	0286 00-1
WP 0287 00 Transmission Filler Replacement . . . . .	0287 00-1
WP 0288 00 Flywheel Scavenge Retarder Pump Maintenance . . . . .	0288 00-1
WP 0289 00 Hydraulic Retarder Maintenance . . . . .	0289 00-1
WP 0290 00 Retarder Coolant Lines Replacement . . . . .	0290 00-1
WP 0291 00 Retarder Oil Cooler Assembly Replacement . . . . .	0291 00-1
WP 0292 00 Retarder Control Valve Maintenance . . . . .	0292 00-1
<i>Transfer and Final Drive Assemblies</i>	
WP 0293 00 Driveshaft Replacement . . . . .	0293 00-1
WP 0294 00 Front Axle Housing Replacement . . . . .	0294 00-1
WP 0295 00 Differential and Bevel Gear Assembly Replacement . . . . .	0295 00-1
WP 0296 00 Differential Filler Replacement . . . . .	0296 00-1
WP 0297 00 Differential Filler Hose Replacement . . . . .	0297 00-1
WP 0298 00 Rear Axle Housing Replacement . . . . .	0298 00-1
<i>Brake System</i>	
WP 0299 00 Brake Control Valve Repair . . . . .	0299 00-1
WP 0300 00 Double Check Valve Repair . . . . .	0300 00-1
WP 0301 00 Air Dryer Repair . . . . .	0301 00-1
WP 0302 00 Tractor Wheel and Tire Maintenance . . . . .	0302 00-1
WP 0303 00 Scraper Wheel and Tire Replacement . . . . .	0303 00-1
WP 0304 00 Brake Drums Replacement . . . . .	0304 00-1
WP 0305 00 Tire Replacement . . . . .	0305 00-1

## Table of Contents - Continued

Page  
Number

### *Steering System*

WP 0306 00	Steering Flow Meter Tee Test Procedures . . . . .	0306 00-1
WP 0307 00	Supplemental Steering Pump Replacement . . . . .	0307 00-1
WP 0308 00	Steering Cylinder Repair . . . . .	0308 00-1
WP 0309 00	Hydraulic Steering Servo-Sender Cylinder Repair . . . . .	0309 00-1
WP 0310 00	Hydraulic Steering Servo-Receiver Cylinder Repair . . . . .	0310 00-1
WP 0311 00	Hydraulic Steering Servo-Receiver Cylinder Replacement . . . . .	0311 00-1
WP 0312 00	Steering Control Valve Maintenance . . . . .	0312 00-1

### *Body, Cab, Hood and Hull*

WP 0313 00	Hitch Links Maintenance . . . . .	0313 00-1
WP 0314 00	Draft Frame Assembly Shoes Maintenance . . . . .	0314 00-1
WP 0315 00	Operator Compartment Replacement . . . . .	0315 00-1
WP 0316 00	Seat Suspension Replacement . . . . .	0316 00-1
WP 0317 00	Seat Suspension Assembly Repair . . . . .	0317 00-1
WP 0318 00	Heater Assembly, Plenum, Housing and Coil Replacement . . . . .	0318 00-1
WP 0319 00	Heater Assembly, Motor, Blower Assemblies and Case Repair . . . . .	0319 00-1
WP 0320 00	Heater Motor Assembly Repair . . . . .	0320 00-1
WP 0321 00	Hydraulic System Flow Meter Tee Test and Maintenance . . . . .	0321 00-1
WP 0322 00	Hydraulic Implement Pump Replacement . . . . .	0322 00-1

### *Hydraulic System*

WP 0323 00	Scraper Control Valve Replacement . . . . .	0323 00-1
WP 0324 00	Bowl Lift Check Valves Repair . . . . .	0324 00-1
WP 0325 00	Control Lever Linkage Replacement . . . . .	0325 00-1
WP 0326 00	Hydraulic Tank Filter By-Pass Valve Repair . . . . .	0326 00-1
WP 0327 00	Breaker Relief Valve Repair . . . . .	0327 00-1
WP 0328 00	Ejector Assembly Replacement . . . . .	0328 00-1
WP 0329 00	Lower Rear Ejector Roller Replacement . . . . .	0329 00-1
WP 0330 00	Lower Front Ejector Roller Maintenance . . . . .	0330 00-1
WP 0331 00	Ejector Guide Roller Maintenance . . . . .	0331 00-1
WP 0332 00	Tachometer Drive Replacement . . . . .	0332 00-1

## CHAPTER 5 SUPPORTING INFORMATION

WP 0333 00	Preparation for Storage and Shipment . . . . .	0333 00-1
WP 0334 00	Illustrated List of Manufactured Items . . . . .	0334 00-1
WP 0335 00	Torque Limits . . . . .	0335 00-1
WP 0336 00	References . . . . .	0336 00-1
WP 0337 00	Maintenance Allocation Chart (MAC) Introduction . . . . .	0337 00-1
WP 0338 00	Maintenance Allocation Chart (MAC) . . . . .	0338 00-1
WP 0339 00	Expendable and Durable Items List . . . . .	0339 00-1

## CHAPTER 6 GENERAL SUPPORT/DEPOT OR SUSTAINMENT MAINTENANCE

### *Engine*

WP 0340 00	Engine Front Cover Replacement . . . . .	0340 00-1
WP 0341 00	Engine Front Cover Plate Replacement . . . . .	0341 00-1
WP 0342 00	Cylinder Block Repair . . . . .	0342 00-1
WP 0343 00	Head Assembly Overhaul . . . . .	0343 00-1

## Table of Contents - Continued

	<b>Page Number</b>
<i>Engine - Continued</i>	
WP 0344 00 Crankshaft Front Seals Replacement . . . . .	0344 00-1
WP 0345 00 Crankshaft Rear Seals Replacement . . . . .	0345 00-1
WP 0346 00 Crankshaft Replacement . . . . .	0346 00-1
WP 0347 00 Crankshaft Main Bearings Maintenance . . . . .	0347 00-1
WP 0348 00 Piston and Connecting Rod Maintenance . . . . .	0348 00-1
WP 0349 00 Rocker Arms Repair . . . . .	0349 00-1
WP 0350 00 Camshaft Maintenance . . . . .	0350 00-1
WP 0351 00 Camshaft Bearings Replacement . . . . .	0351 00-1
<i>Fuel System Maintenance</i>	
WP 0352 00 Idler Gear Replacement . . . . .	0352 00-1
WP 0353 00 Fuel Injection Pump Repair . . . . .	0353 00-1
WP 0354 00 Governor Assembly Repair . . . . .	0354 00-1
WP 0355 00 Air-Fuel Ratio Control Maintenance . . . . .	0355 00-1
WP 0356 00 Turbocharger Repair . . . . .	0356 00-1
<i>Cooling System</i>	
WP 0357 00 Radiator Repair . . . . .	0357 00-1
<i>Electrical System</i>	
WP 0358 00 Alternator (Delco) Repair . . . . .	0358 00-1
WP 0359 00 Alternator (Bosch) Repair . . . . .	0359 00-1
WP 0360 00 Starting Motor Solenoid Replacement . . . . .	0360 00-1
WP 0361 00 Starting Motor (Delco-Remy) Repair . . . . .	0361 00-1
WP 0362 00 Starting Motor (Prestolite) Repair . . . . .	0362 00-1
WP 0363 00 Starting Motor Solenoid (Prestolite) Repair . . . . .	0363 00-1
<i>Transmission</i>	
WP 0364 00 Pressure and Selector Valve Assembly Replacement . . . . .	0364 00-1
WP 0365 00 Governor Cutoff Valve Repair . . . . .	0365 00-1
WP 0366 00 Automatic Selector Valve Repair . . . . .	0366 00-1
WP 0367 00 Shift Pressure Valve Repair . . . . .	0367 00-1
<i>Transmission - Continued</i>	
WP 0368 00 Pressure Control Valve Repair . . . . .	0368 00-1
WP 0369 00 Manual Selector Valve Repair . . . . .	0369 00-1
WP 0370 00 Governor and Automatic Shift Drive Maintenance . . . . .	0370 00-1
WP 0371 00 Torque Converter Maintenance . . . . .	0371 00-1
WP 0372 00 Transmission Case Assembly Maintenance . . . . .	0372 00-1
WP 0373 00 Transmission Planetary Repair . . . . .	0373 00-1
WP 0374 00 Transfer Gears Repair . . . . .	0374 00-1
<i>Transfer and Final Drive Assemblies</i>	
WP 0375 00 Scavenge Oil Pump, Manifold and Transmission Oil Pump Replacement . . . . .	0375 00-1
WP 0376 00 Differential and Bevel Gear Repair . . . . .	0376 00-1
<i>Brake System</i>	
WP 0377 00 Air Compressor Repair . . . . .	0377 00-1
WP 0378 00 Air Compressor Governor Assembly Repair . . . . .	0378 00-1

## Table of Contents - Continued

	<b>Page Number</b>
<i>Steering System</i>	
WP 0379 00 Supplemental Steering Pump Repair . . . . .	0379 00-1
<i>Hydraulic System</i>	
WP 0380 00 Hydraulic Implement Pump Repair . . . . .	0380 00-1
WP 0381 00 Scraper Control Valve Repair . . . . .	0381 00-1
WP 0382 00 Sequence Valve Repair . . . . .	0382 00-1
WP 0383 00 Bowl Lift Cylinders Repair . . . . .	0383 00-1
WP 0384 00 Ejector Cylinder Repair . . . . .	0384 00-1
WP 0385 00 Apron Cylinder Repair . . . . .	0385 00-1
WP 0386 00 Apron Assembly Replacement . . . . .	0386 00-1
WP 0387 00 Apron Lift Mechanism Maintenance . . . . .	0387 00-1
Index . . . . .	Index-1



# HOW TO USE THIS MANUAL

## INTRODUCTION

1. This manual is designed to help you operate the scraper and perform operator troubleshooting and maintenance on the equipment.
2. This manual is written in work package format:
  - a. Chapters divide the manual into major categories of information.
  - b. 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.
  - c. If a Change Package is issued to this manual, added work packages use the 5<sup>th</sup> and 6<sup>th</sup> 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.
3. Due to the size of this manual, it is separated into two volumes:
  - a. The first volume (TM 5-3805-248-23-1) consists of Chapters 1 through 3 (through WP 0256 00).
  - b. The second volume (TM 5-3805-248-23-2) contains Chapters 4 through 6.
  - c. Both volumes will have Chapter 5, *Supporting Information*, for reference purposes.
4. Scan through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.

## 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 operator troubleshooting or maintenance on the scraper.
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, *Troubleshooting Procedures*. WP 0008 00 is 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 *Unit Field Maintenance*: Major areas covered are *Preventive Maintenance Checks and Services (PMCS)* and operator level maintenance tasks.
6. Chapter 4, consists of *Direct Support Field Maintenance*.
7. Chapter 5 includes *Supporting Information: Illustrated List of Manufactured Items; Torque Limits; References; Maintenance Allocation Chart (MAC) Introduction; Maintenance Allocation Chart (MAC); and Expendable and Durable Items List*.
8. Chapter 6 consists of *General Support/Depot or Sustainment Maintenance*.

## **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 that may result in death or serious injury.

### **CAUTION**

A CAUTION is a reminder of safety practices or directs attention to 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 for 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: "If red band is showing, service air cleaner as soon as possible (WP 0015 00)", go to Work Package 0015 00 in this manual for instructions on servicing the air cleaner.
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. 394-001; 394-002, etc.) are art control numbers and are used for tracking purposes. Disregard these numbers.
6. 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.

### **NOTE**

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



**CHAPTER 4**  
**DIRECT SUPPORT FIELD MAINTENANCE**



**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

Lifting device, 4,000 lb minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Detergent (Item 13, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (2)

Seal

**References**

WP 0113 00

**Personnel Required**

Three

**Equipment Condition**

Air pressure vented (TM 5-3805-248-10)

Crankcase oil drained (WP 0022 00)

Oil filter removed (WP 0022 00)

Air cleaner removed (WP 0031 00)

Fuel lines removed (WP 0035 000)

Muffler and piping removed (WP 0041 00)

Radiator and support assembly removed (WP 0044 00)

Temperature by-pass removed (WP 0136 00)

Engine compartment shields removed (WP 0191 00)

Crankcase guards removed (WP 0201 00)

Retarder control valve assembly removed (WP 0292 00)

Driveshaft removed (WP 0293 00)

**REMOVAL**

**NOTE**

Tag wiring harnesses prior to removal to ensure correct installation.

1. Remove alternator ground wire connector (WP 0113 00).

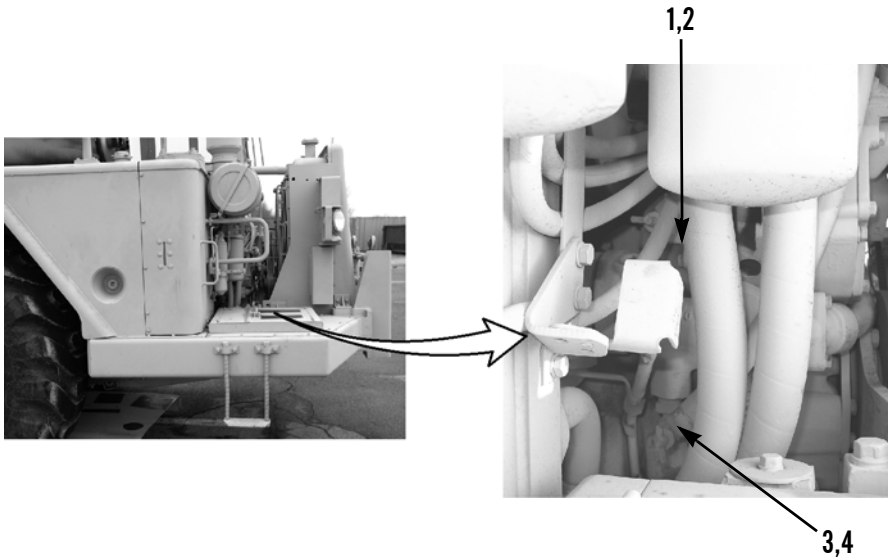
**CAUTION**

Wipe area clean around all connections prior to removal. Cap coolant hoses and plug openings after removal. Contamination of coolant system could result in premature failure.

**REMOVAL - CONTINUED**

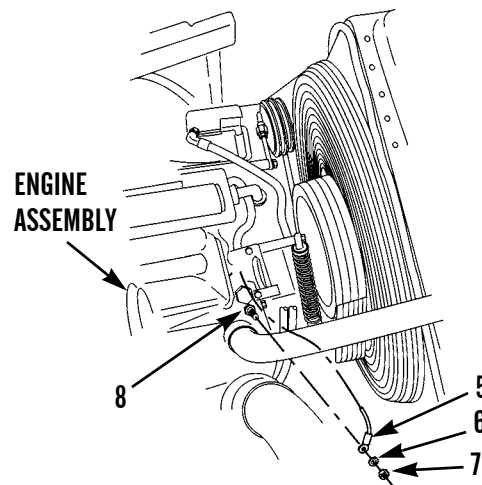
**NOTE**

- Tag hose and tube assemblies prior to removal to ensure correct installation.
  - Note location of all retaining hardware to ensure correct installation.
2. Loosen clamps (1 and 3) on front right side of engine assembly.
  3. Disconnect two hoses (2 and 4).
  4. Remove clamps (1 and 3).
  5. Trace routing of hoses (2 and 4) and remove all retaining hardware.



394-514

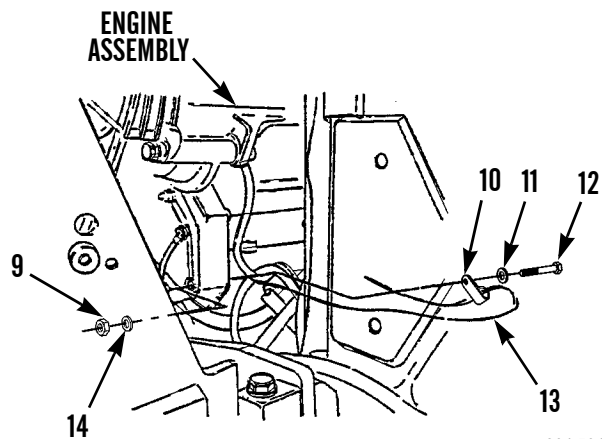
6. Remove nut (7) and washer (6) from coolant temperature sending switch from top front of engine assembly.
7. Disconnect wire connector (5) from coolant temperature sender (8).



394-593

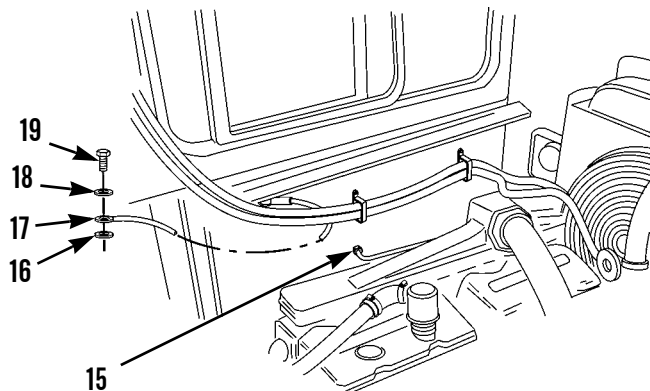
**REMOVAL - CONTINUED**

8. Remove nut (9), bolt (12), washers (11 and 14) and clamp (10) to remove wiring harness (13) from timing gear housing at lower left side of engine assembly.



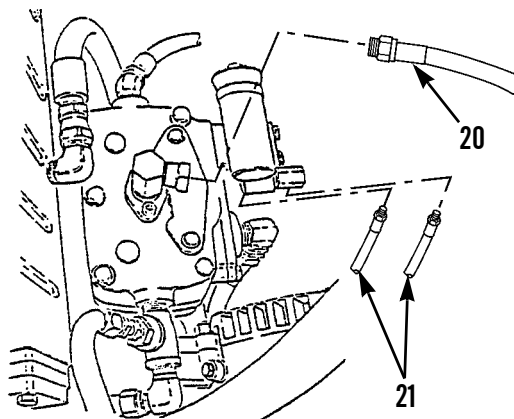
394-594

9. Disconnect tube assembly (15) from tube assembly mounted on left side of aftercooler.
10. Remove bolt (19) and washers (16 and 18) from top rear of aftercooler.
11. Disconnect wire connector (17).



394-595

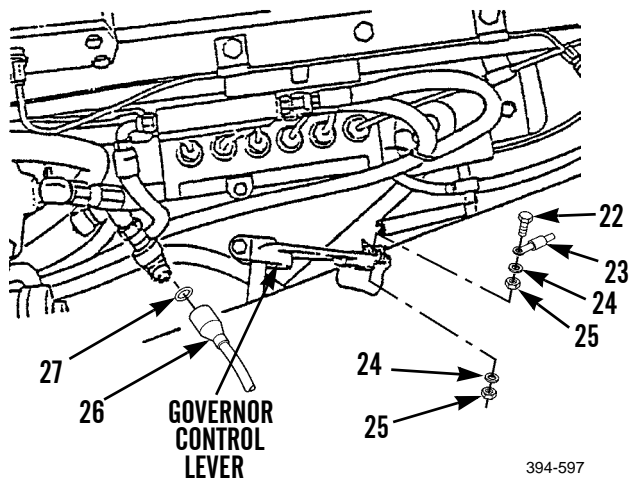
12. Disconnect hose assembly (20) from elbow on top of air compressor.
13. Disconnect two hose assemblies (21) from air compressor governor.



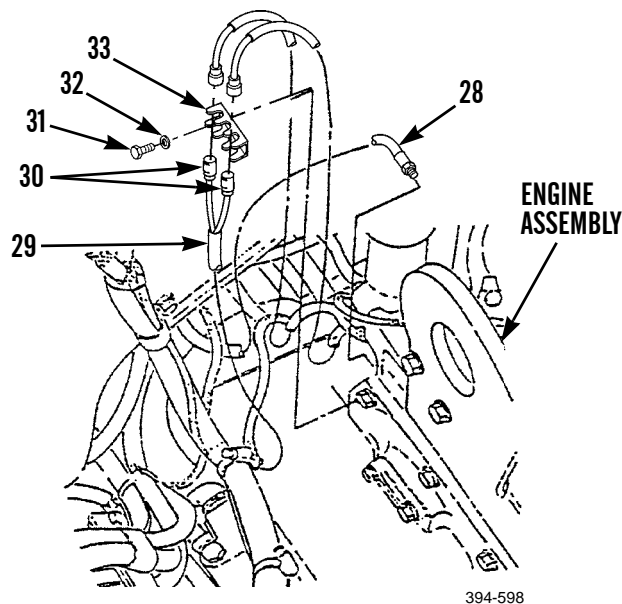
394-596

**REMOVAL - CONTINUED**

14. Disconnect tachometer drive cable (26) from tachometer drive adapter on lower left side of engine.
15. Remove and discard seal (27).
16. Remove bolt (22), two washers (24) and nuts (25) from governor control lever.
17. Separate rod assembly (23) from governor control lever.

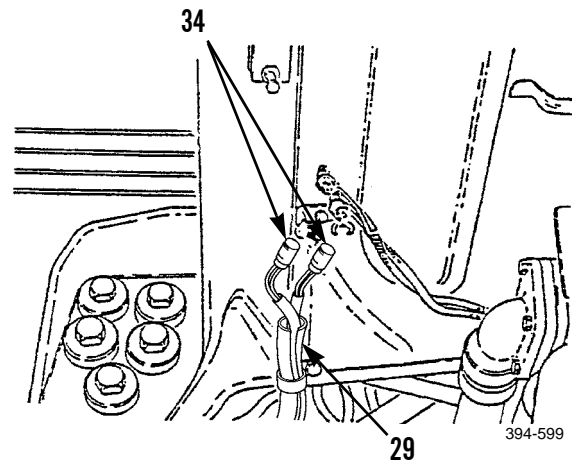


18. Disconnect hose assembly (28) from cylinder head on rear left side of engine assembly.
19. Remove bolt (31), washer (32) and clamp (33) from mounting for wiring harness (29) on front left flywheel housing.
20. Disconnect two wire connectors (30) of wiring harness (29) from front left flywheel housing.

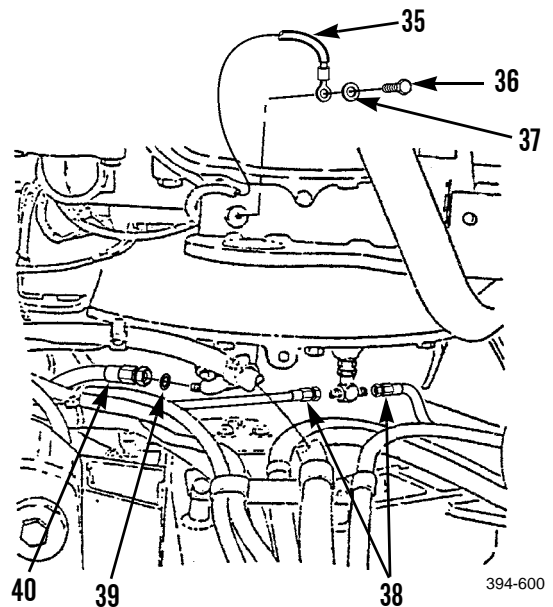


**REMOVAL - CONTINUED**

21. Disconnect and remove two wire connectors (34) of wiring harness (29) from mounting clip on left rear of engine assembly.

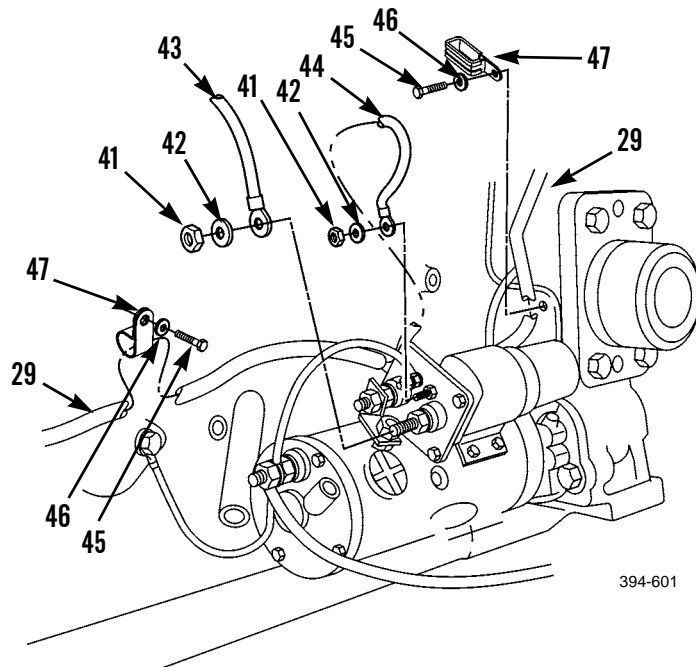


22. Remove screw (36) and lockwasher (37) from ether aid temperature switch on rear, top of engine assembly.
23. Disconnect wire connector (35).
24. Disconnect two hose assemblies (38) from tee on top of flywheel housing.
25. Disconnect hose assembly (40) from elbow at top of retarder.
26. Remove and discard preformed packing (39).

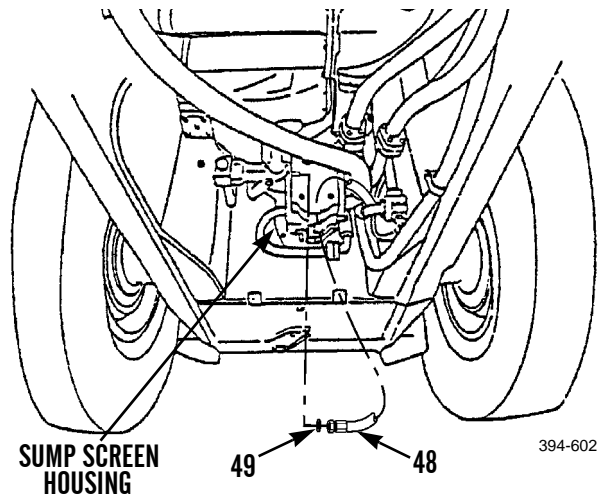


**REMOVAL - CONTINUED**

27. Remove two nuts (41) and washers (42) from starting motor solenoid.
28. Disconnect two wire connectors (43 and 44).
29. Remove two bolts (45), washers (46) and clamps (47) from mounting of wiring harness (29) on lower left side of engine block.



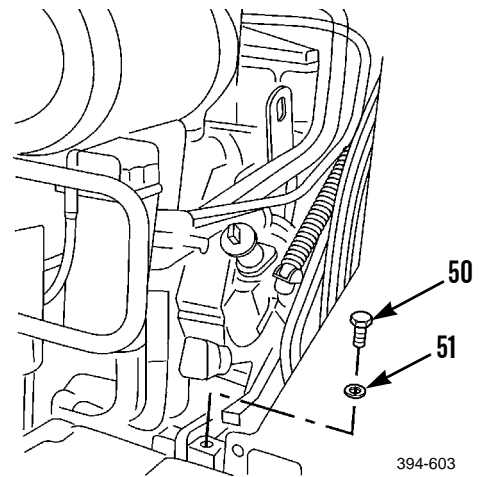
30. Disconnect hose assembly (48) from sump screen housing under flywheel housing.
31. Remove and discard preformed packing (49).



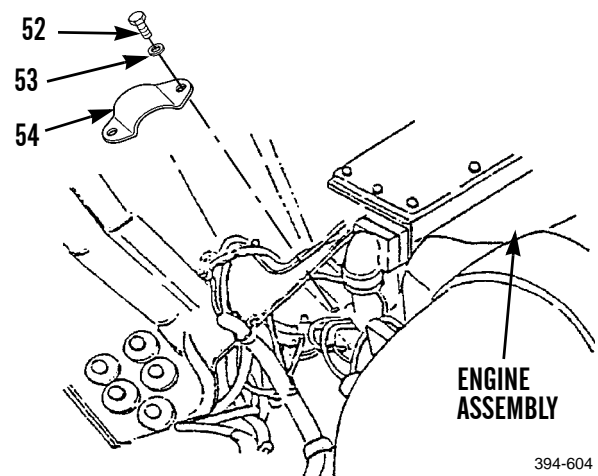


**REMOVAL - CONTINUED**

32. Remove four bolts (50) and washers (51) from front mounting of engine assembly.



33. Remove four bolts (52), washers (53) and two caps (54) from rear mounting of engine assembly.



34. Install lifting device to lifting eyes mounted on each end of cylinder head on engine assembly.

**REMOVAL - CONTINUED****WARNING**

Use caution when handling heavy parts. Provide adequate support and use two assistants 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.

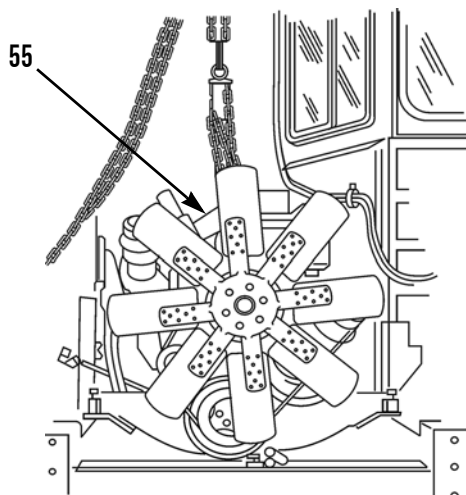
**CAUTION**

Use care not to damage surrounding hoses, harnesses and components.

**NOTE**

Weight of engine assembly is 3,150 lb (1,429 kg).

35. Use hoist and sling to lift engine assembly (55) high enough to clear frame.
36. Pull engine assembly forward and remove from machine. Place on engine stand.



394-1619

**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 eye protection.

1. Clean all metal parts with solvent and rubber parts with detergent.
2. Dry all metal parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION****WARNING**

Use caution when handling heavy parts. Provide adequate support and use two assistants 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.

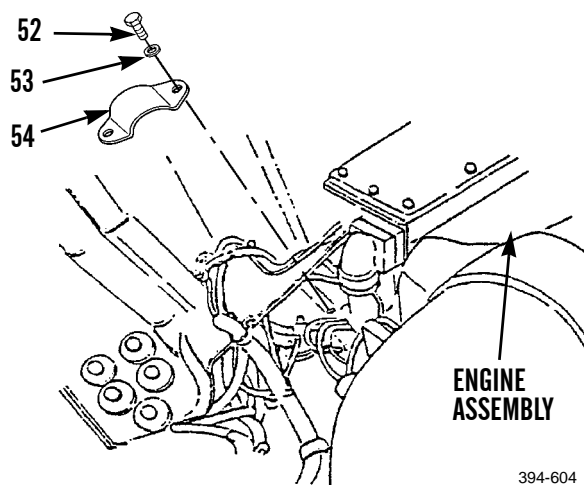
**CAUTION**

Use care not to damage surrounding hoses, harnesses and components.

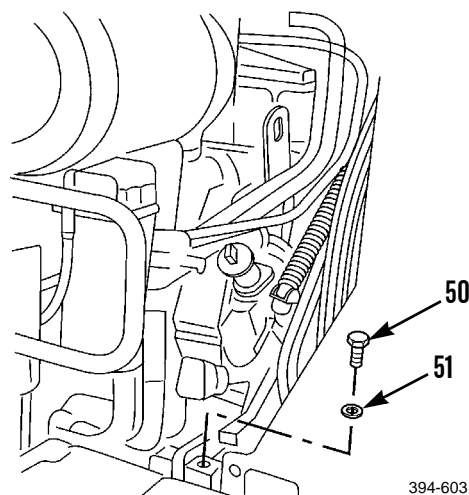
**NOTE**

Weight of engine assembly is 3,150 lb (1,429 kg).

1. Use lifting device to lift engine assembly and install in engine compartment. Use pry bar to align front and rear mounts.
2. Install two caps (54), four washers (53) and bolts (52) on rear mounting of engine assembly. Torque bolts to 185 lb-ft (84 Nm).
3. Install four washers (51) and bolts (50) to front mounting on engine assembly.



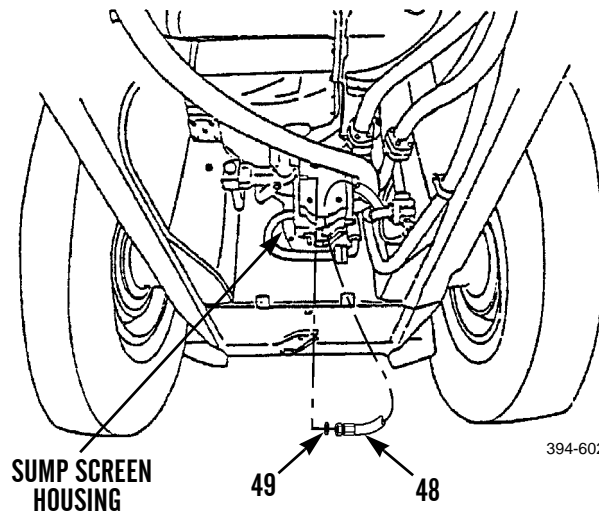
394-604



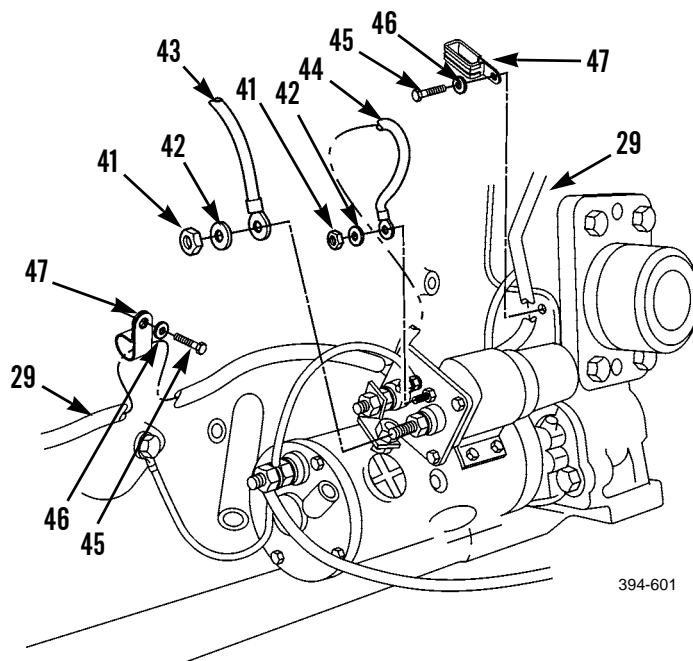
394-603

**INSTALLATION - CONTINUED**

4. Install new preformed packing (49) in sump screen housing under flywheel housing.
5. Connect hose assembly (48).

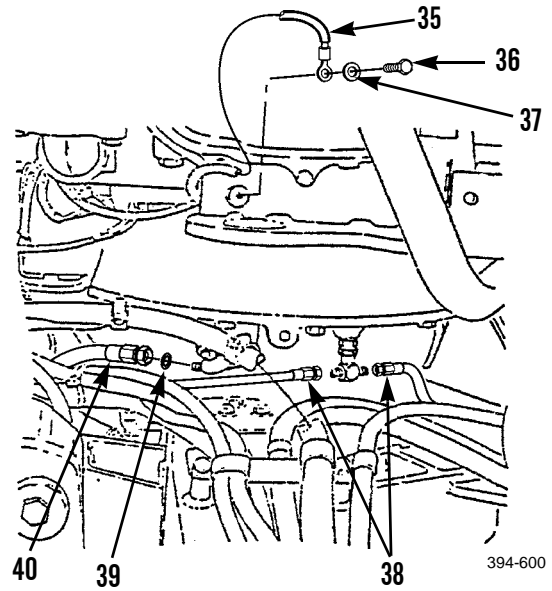


6. Install two clamps (47), washers (46) and bolts (45) to secure wiring harness (29) to lower left side of engine block.
7. Connect wire connector (43) on battery side of solenoid on starting motor.
8. Install one of two washers (42) and nuts (41).
9. Connect wire connector (44) on "S" side of solenoid.
10. Install remaining one of two washers (42) and nuts (41).

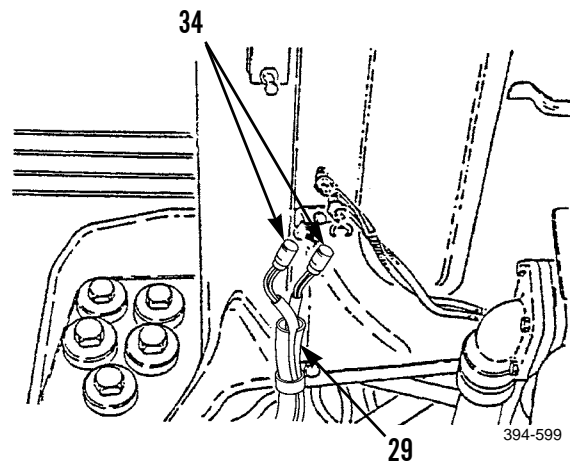


**INSTALLATION - CONTINUED**

11. Install new preformed packing (39) on elbow at top of retarder.
12. Connect hose assembly (40).
13. Connect two hose assemblies (38) to tee at top of fly-wheel housing.
14. Connect wire connector (35) to ether aid temperature switch on top rear of engine.
15. Install lockwasher (37) and screw (36).

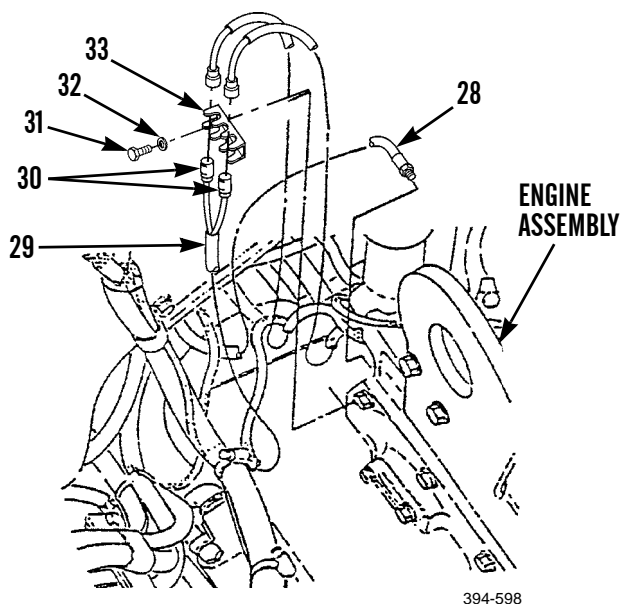


16. Connect two wire connectors (34) of wiring harness (29) and install in mounting clip on rear left side of engine assembly.

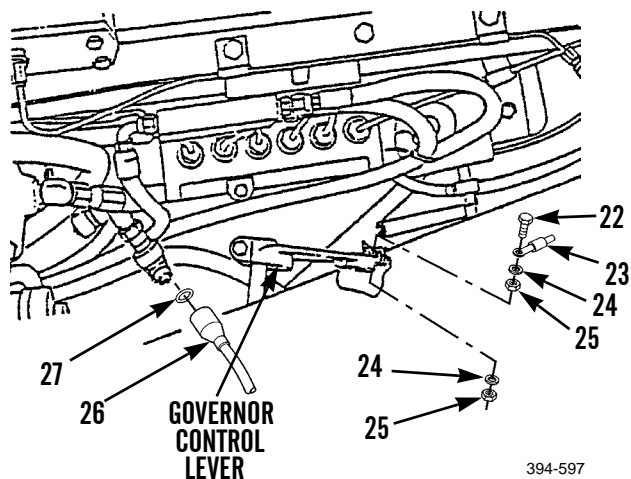


**INSTALLATION - CONTINUED**

17. Connect two wire connectors (30) of wire harness (29) at front left flywheel housing.
18. Install clamp (33), washer (32) and bolt (31) to secure wiring harness (29) to engine assembly.
19. Connect hose assembly (28) to fitting on cylinder head on rear left side of engine assembly.

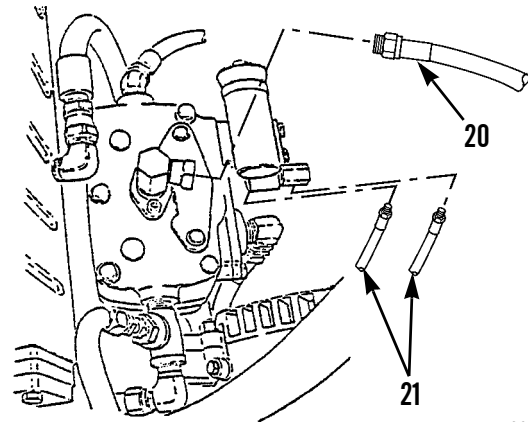


20. Position rod assembly (23) on governor control lever on lower left side of engine assembly.
21. Install two nuts (25), washers (24) and bolt (22).
22. Install new seal (27) in tachometer drive adapter.
23. Connect tachometer drive cable (26).



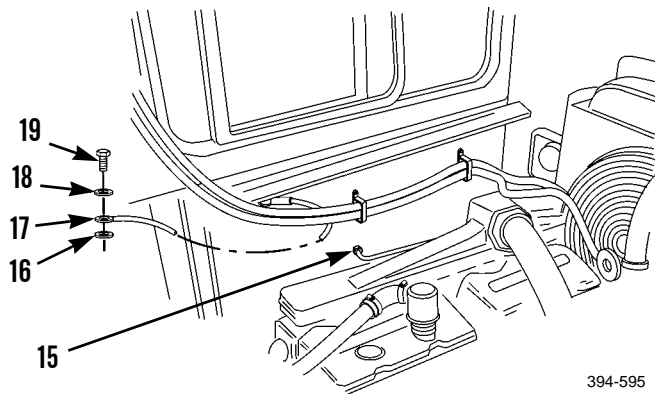
**INSTALLATION - CONTINUED**

- 24. Connect two hose assemblies (21) under air compressor governor.
- 25. Connect hose assembly (20) to elbow on top of air compressor.



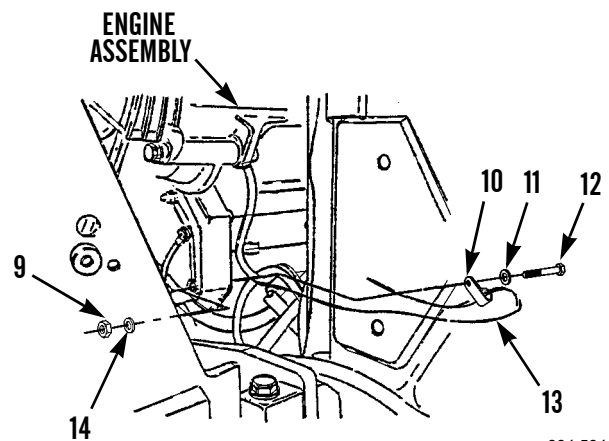
394-596

- 26. Connect wire connector (17) to top rear of aftercooler.
- 27. Install two washers (16 and 18) and bolt (19).
- 28. Connect tube assembly (15) to ether aid tube mounted to left side of aftercooler.



394-595

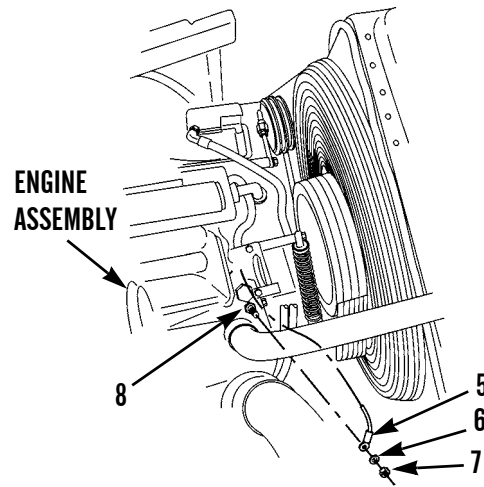
- 29. Install wiring harness (13) in clamp (10), washers (11 and 14), bolt (12) and nut (9).



394-594

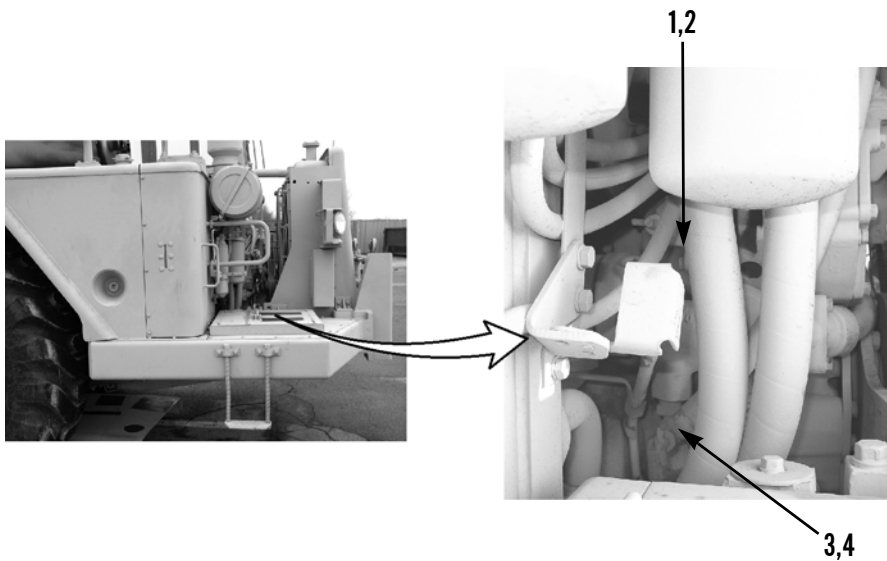
**INSTALLATION - CONTINUED**

30. Connect wire connector (5) to coolant temperature sending switch (8).
31. Install washer (6) and nut (7).



394-593

32. Position two clamps (2 and 4) on hoses (1 and 3).
33. Install two hoses (1 and 3) on front right side of engine.
34. Tighten two clamps (2 and 4).



394-514

35. Install alternator ground wire connector (WP 0113 00).
36. Install oil filter and fill crankcase with oil (WP 0035 00).
37. Install fuel lines (WP 0044 00).
38. Install air cleaner (WP 0031 00).
39. Install muffler and piping (WP 0041 00).
40. Install radiator and support assembly (WP 0044 00).



***INSTALLATION - CONTINUED***

41. Install temperature by-pass (WP 0136 00).
42. Install engine compartment shields (WP 0191 00).
43. Install crankcase guards (WP 0201 00).
44. Install retarder valve assembly (WP 0292 00).
45. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**ENGINE MOUNTS REPLACEMENT**

**0258 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 100 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Tag, marker (Item 42, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

Engine removed (WP 0257 00)

Crankshaft pulley and damper removed (WP 0260 00)

---

**REMOVAL**

1. Remove bolt (6) and washer (5).

**NOTE**

Tag wire connectors, cable and harness assemblies prior to removal to ensure correct installation.

2. Disconnect wire (1).

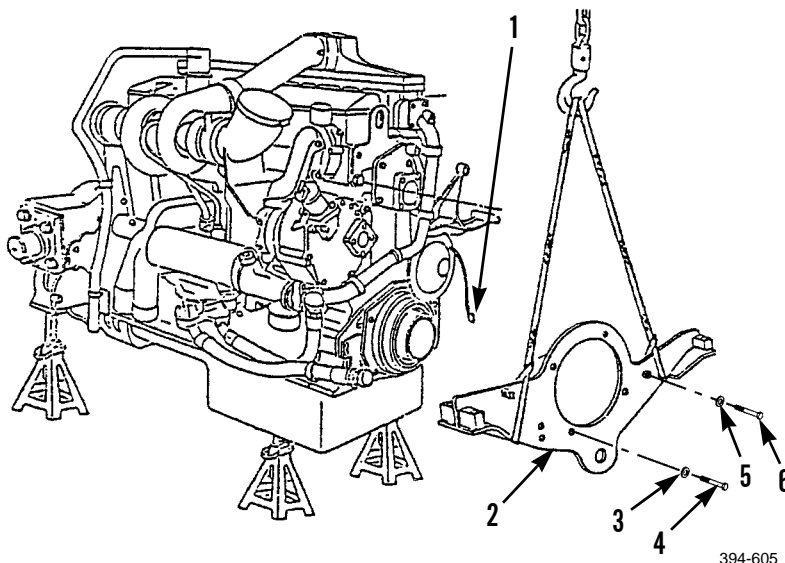
**WARNING**

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 death or injury.

**NOTE**

Weight of support is 60 lb (27 kg).

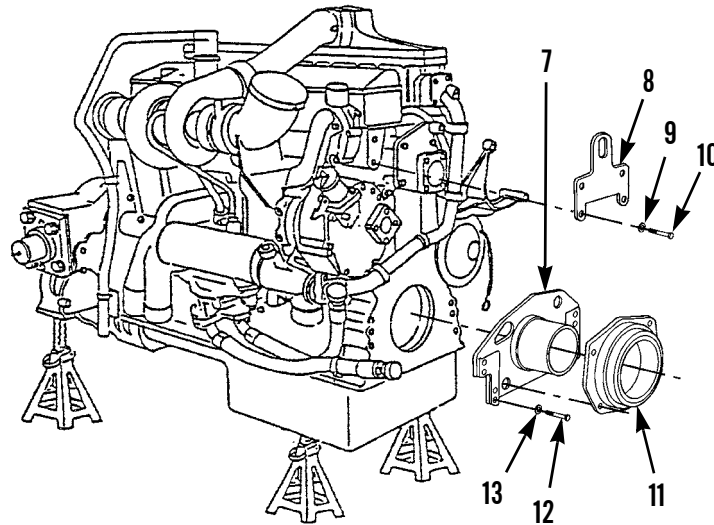
3. Install lifting device to support (2).
4. Remove four bolts (4) and washers (3).
5. Remove support (2) from engine.
6. Remove lifting device from support (2).



394-605

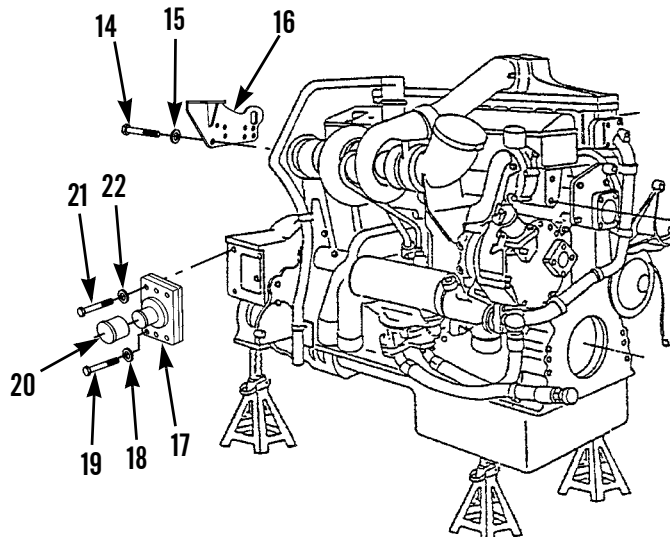
**REMOVAL - CONTINUED**

7. Remove bushing (11) from adapter (7).
8. Remove eight bolts (12) and washers (13).
9. Remove adapter (7).
10. Remove four bolts (10), washers (9) and eye (8).



394-606

11. Remove two mounts (20).
12. Remove eight bolts (21) and washers (22).
13. Remove two bolts (19) and washers (18).
14. Remove rear support (17).
15. Remove eight bolts (14), washers (15) and support (16).



394-607

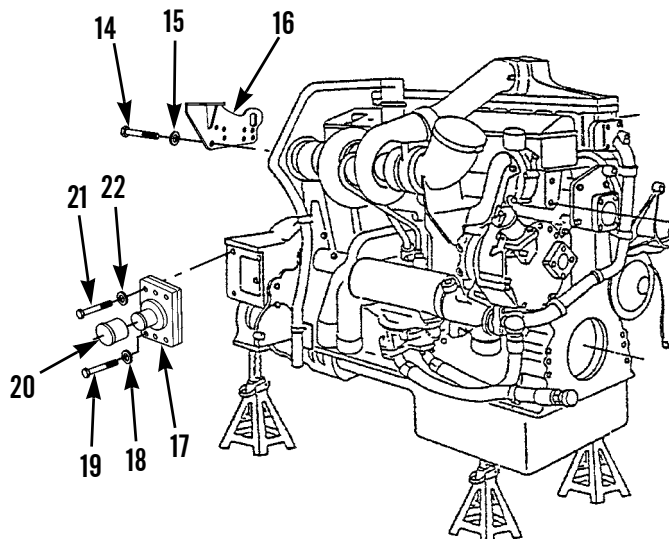
**CLEANING AND INSPECTION****WARNING**

- 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 all parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

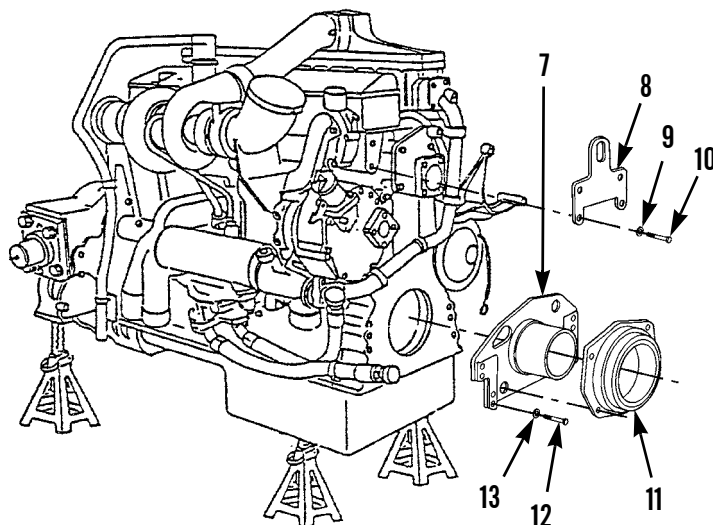
1. Install support (16), eight washers (15) and bolts (14).
2. Install rear support (17).
3. Install two washers (18) and bolts (19).
4. Install eight washers (22) and bolts (21).
5. Install two mounts (20).



394-607

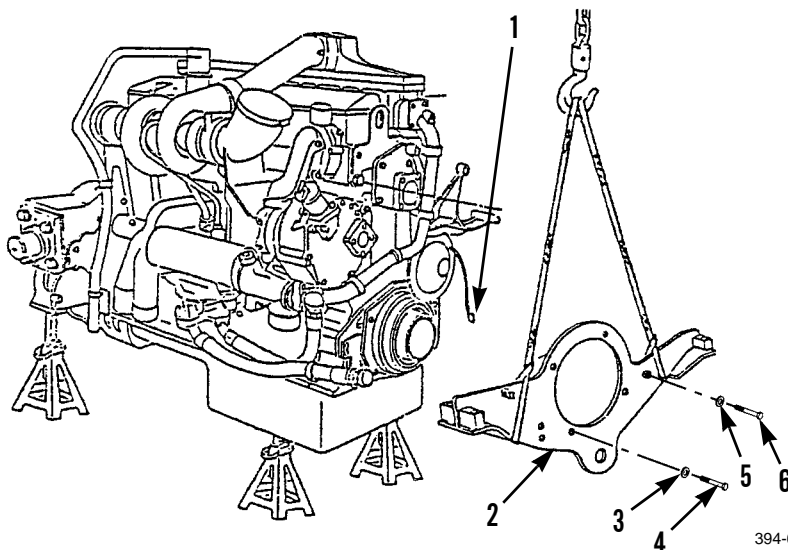
**INSTALLATION - CONTINUED**

6. Install eye (8), four washers (9) and bolts (10).
7. Install adapter (7).
8. Install eight washers (13) and bolts (12).
9. Install bushing (11).



394-606

10. Install lifting device to support (2).
11. Use lifting device to install support (2) on engine.
12. Install four washers (3) and bolts (4) on support (2).
13. Remove lifting device.
14. Connect wire (1).
15. Install washer (5) and bolt (6).



394-605

---

**ENGINE MOUNTS REPLACEMENT - CONTINUED**

---

**0258 00**

***INSTALLATION - CONTINUED***

16. Install engine (WP 0257 00).
17. Install crankshaft pulley and damper (WP 0260 00).
18. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**CYLINDER HEAD ASSEMBLY MAINTENANCE**

---

**0259 00****THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, common no. 2 (Item 102, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bushing, sleeve (Item 13, WP 0338 00)

Extractor, group valve (Item 22, WP 0338 00)

Gage, GP valve (Item 30, WP 0338 00)

Honing kit, valve guide (Item 38, WP 0338 00)

Ice

Inserter and remover, stud (Item 41, WP 0338 00)

Lifting device, 400 lb minimum capacity

Screws, forcing, 3/8 -16 NC

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Cloth, abrasive, emery (Item 9, WP 0339 00)

**Materials/Parts - Continued**

Compound, sealing (Item 10, WP 0339 00)

Detergent, general purpose (Item 13, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket (2)

Packing, preformed (4)

Prussian blue

Seal (24)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

WP 0263 00

**Equipment Condition**

Thermostat removed (WP 0046 00)

Water temperature sender removed (WP 0092 00)

Ether start sender switch removed (WP 0098 00)

Push rods and arms removed (WP 0265 00)

Valve bridges removed (WP 0266 00)

Exhaust manifold removed (WP 0270 00)

Injector valve and nozzle removed (WP 0272 00)

Aftercooler removed (WP 0277 00)

---

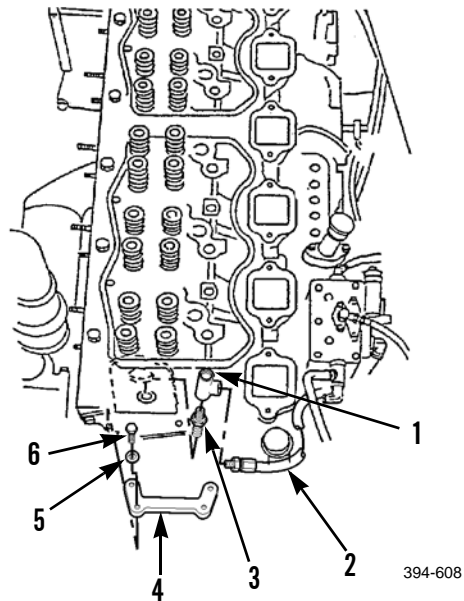
**REMOVAL****CAUTION**

Wipe area clean around all connections prior to removal. Cap lines and plug openings after removal. Contamination of system could result in premature failure.

**NOTE**

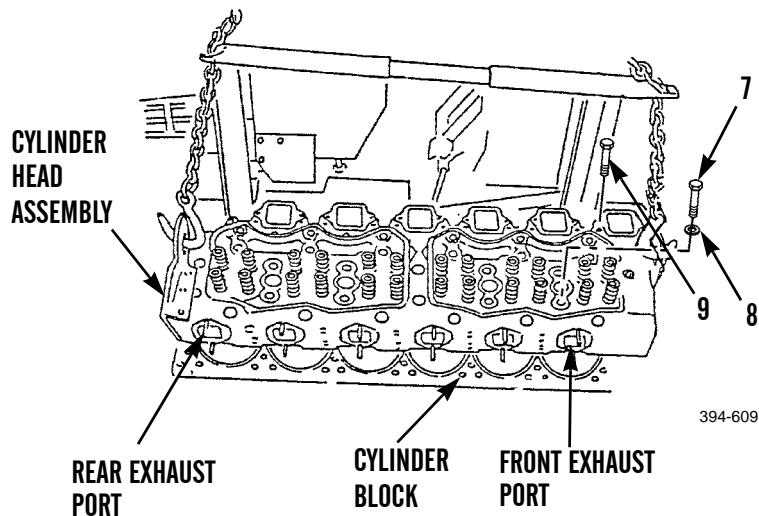
Tag hose and tube assemblies prior to removal to ensure correct installation.

1. Disconnect hose assembly (2) at front of engine.
2. Remove tee (1) and nipple (3).
3. Remove four bolts (6), washers (5) and plate (4).



**REMOVAL - CONTINUED**

4. Remove 12 bolts (9) from top left of cylinder head assembly.
5. Remove 20 bolts (7) and washers (8) from top of cylinder head assembly.

**WARNING**

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**

Weight of cylinder head assembly is 300 lb (136 kg).

6. Install lifting device to cylinder head assembly.

**CAUTION**

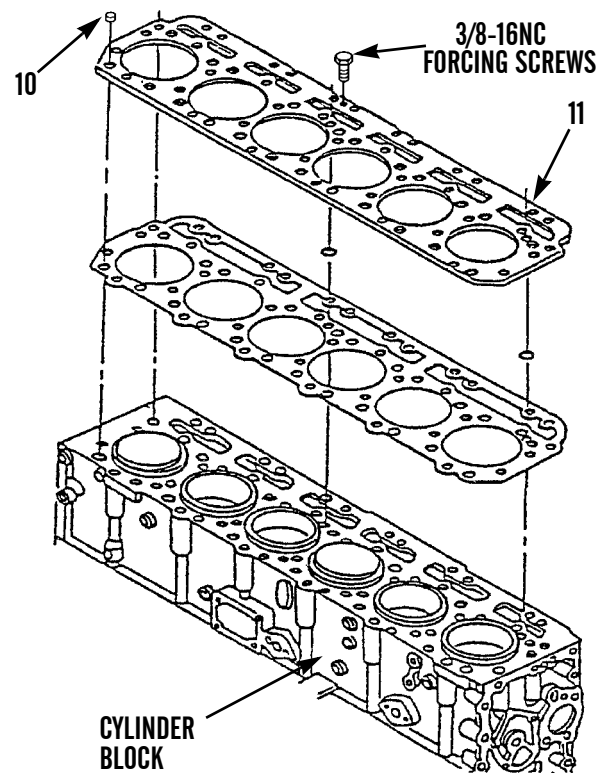
Do not scratch or distort machined surfaces of cylinder head assembly.

7. Separate cylinder head assembly from cylinder block. Use a prybar to insert into front and rear exhaust ports located on right of cylinder head assembly. Lift upwards just enough to separate cylinder head assembly from cylinder block.
8. Use lifting device to remove cylinder head assembly.

**REMOVAL - CONTINUED****CAUTION**

Machined surfaces of cylinder head must be protected. Do not allow contact with metal or concrete surfaces.

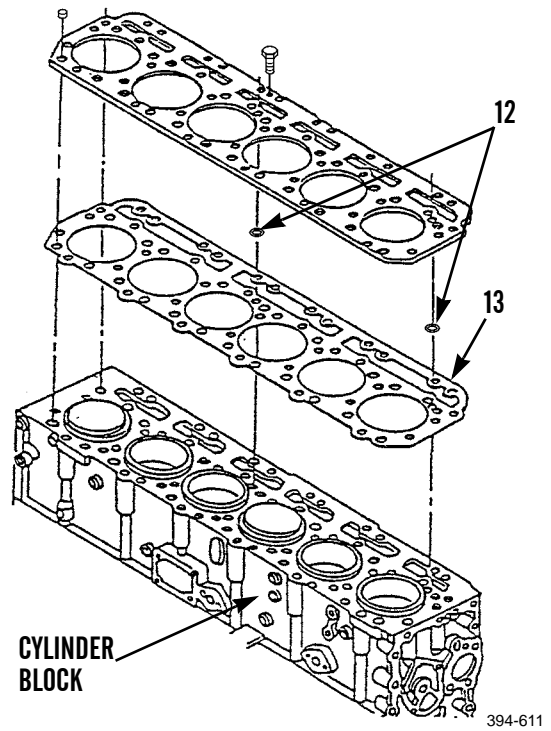
9. Place cylinder head assembly on or between padded surface or wood blocks for disassembly.
10. Remove lifting device.
11. Remove and discard 24 seals (10).
12. Install seven forcing screws in block plate (11).
13. Using seven forcing screws, remove block plate (11).
14. Remove seven forcing screws from block plate (11).



394-610

**REMOVAL - CONTINUED**

15. Remove and discard two preformed packings (12) and gasket (13).



**DISASSEMBLY****NOTE**

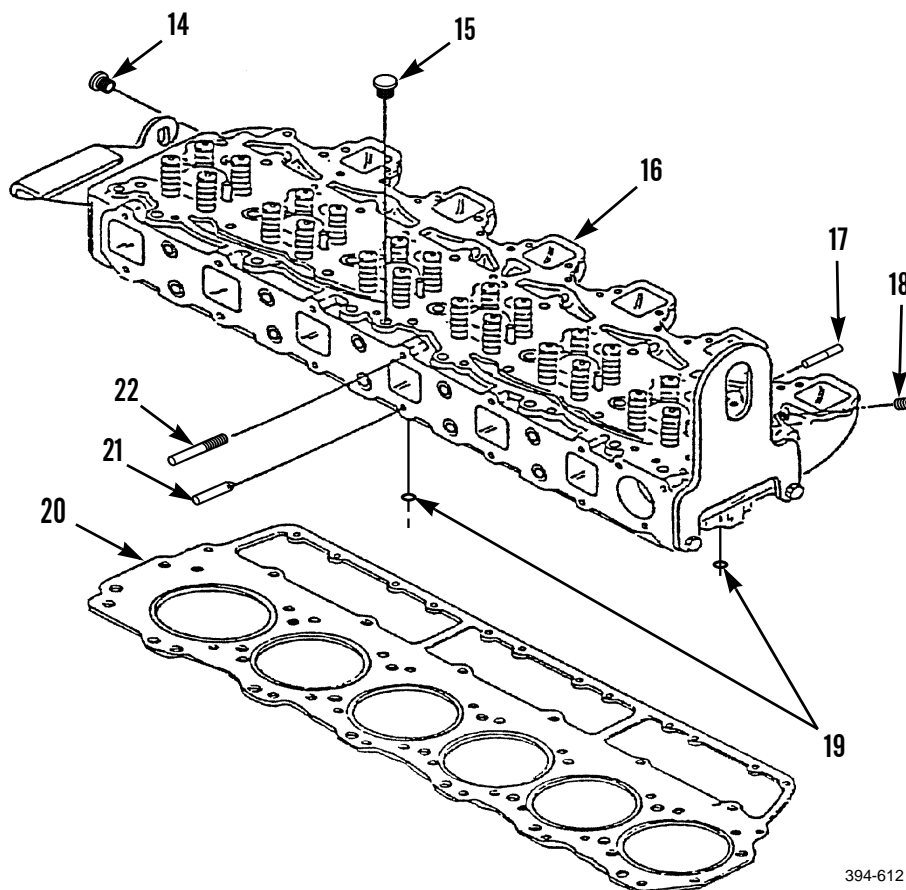
Cover cylinder block with clean rags to protect cylinders and machined surfaces.

1. Remove and discard gasket (20) and two preformed packings (19).
2. If damaged, remove and discard stud (21) and 11 studs (22).
3. Remove two plugs (15) from top of cylinder head (16).
4. Remove three plugs (14) from top and rear left and right of cylinder head (16).
5. Remove plug (18) from front, left of cylinder head (16).
6. If damaged, remove and discard six studs (17) from left of cylinder head (16).

**NOTE**

Each valve must be tagged with location of the valve port from which originally removed.

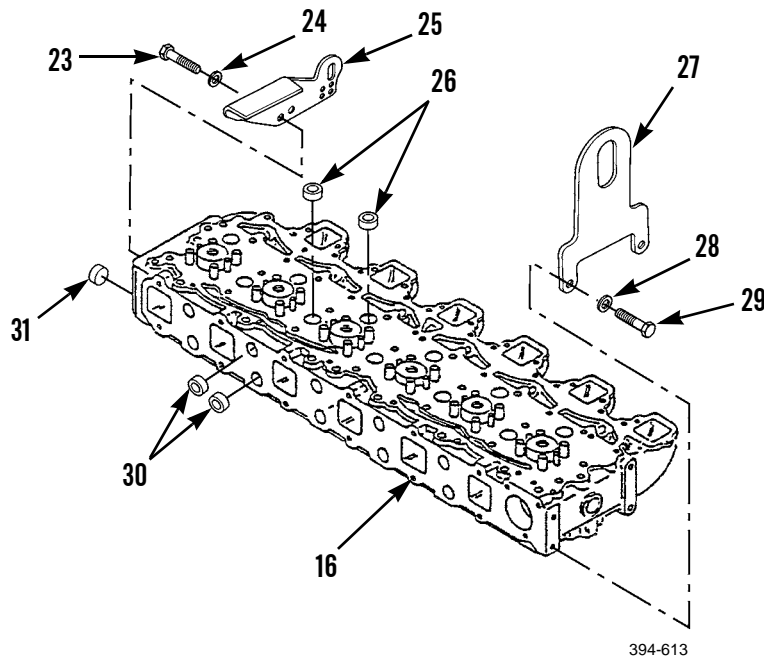
7. Remove valves and springs (WP 0263 00).



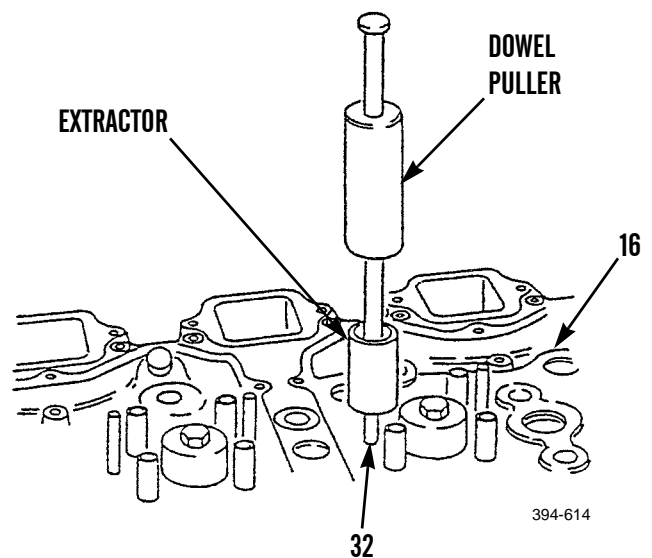
394-612

**DISASSEMBLY - CONTINUED**

8. Remove four bolts (29), washers (28) and eye (27) from front of cylinder head (16).
9. Remove two bolts (23), washers (24) and support (25) from rear of cylinder head (16).
10. If damaged, remove and discard 12 expansion plugs (26) from top of cylinder head (16). Drill and pry out.
11. If damaged, remove and discard ten expansion plugs (30) from right of cylinder head (16). Drill and pry out.
12. If damaged, remove and discard expansion plug (31) from rear of cylinder head (16). Drill and pry out.



13. Inspect 12 dowels (32) on top of cylinder head (16). Replace if cracked, broken, worn, bent or scored. Contact general support if dowel bore in cylinder head (16) is worn.
14. Using dowel puller and extractor, remove and discard 12 dowels (32) if inspection proves necessary.



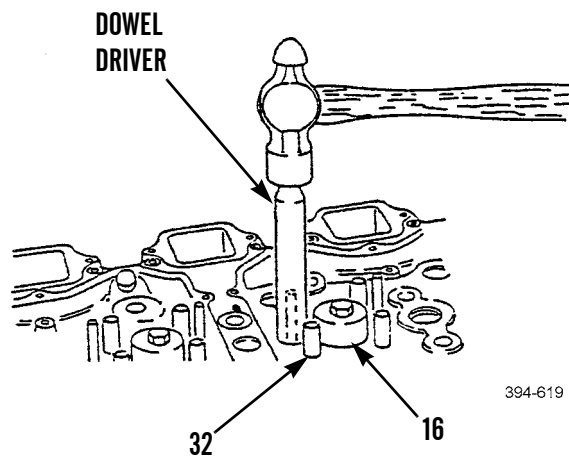
**CLEANING AND INSPECTION****WARNING**

- 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. Remove all gasket and preformed packing material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

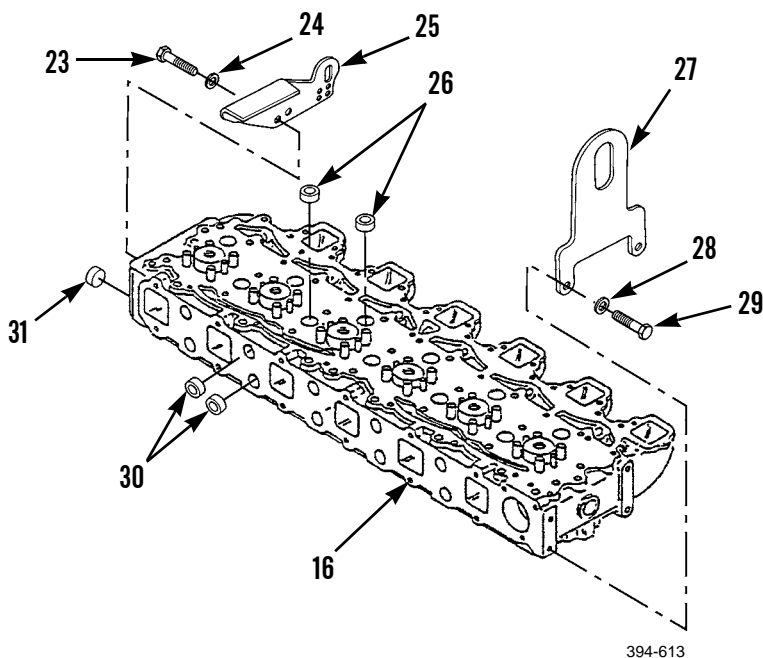
1. Use dowel driver and hammer to install 12 new dowels (32), if removed, in top of cylinder head (16). Correct assembled dowel height is 2.080 to 2.120 in. (52.83 to 53.85 mm).





**ASSEMBLY - CONTINUED**

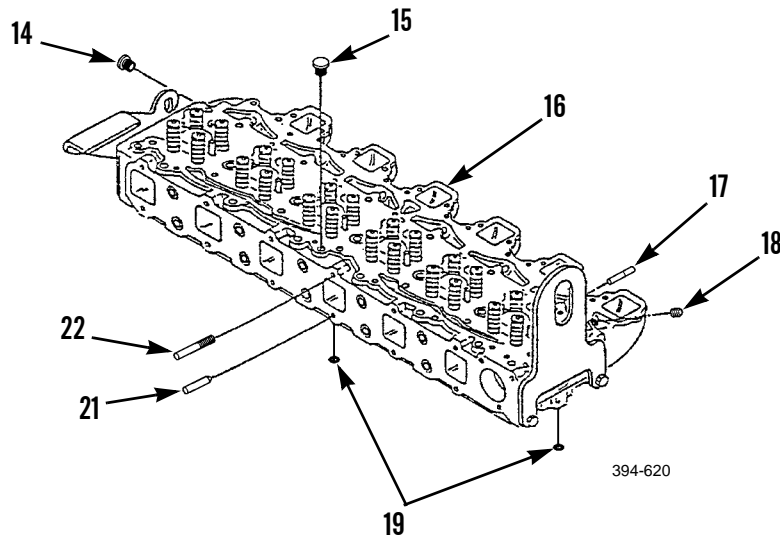
2. If removed, lower temperature of new expansion plug (31).
3. If removed, install new expansion plug (31) in rear, right side of cylinder head (16).
4. If removed, lower temperature of ten new expansion plugs (30).
5. If removed, install ten new expansion plugs (30) to a depth of 0.790 in. (20.07 mm) in right side of cylinder head (16).
6. If removed, lower temperature of six of 12 new expansion plugs (26).
7. If removed, install six of 12 new expansion plugs (26) to a depth of 1.77 in. (44.96 mm) in outer top, left row of cylinder head (16).
8. If removed, lower temperature of remaining six of 12 new expansion plugs (26).
9. If removed, install remaining six of 12 new expansion plugs (26) to a depth of 0.790 in. (20.07 mm) in top, center row of cylinder head (16).
10. Install support (25), two washers (24) and bolts (23) to rear of cylinder head (16).
11. Install eye (27), four washers (28) and bolts (29) to front of cylinder head (16).



**ASSEMBLY - CONTINUED****NOTE**

Valves must be installed in cylinder head to valve seats from which they were matched with during repair procedure.

12. Install valves and springs in cylinder head (WP 0263 00).
13. If removed, install six new studs (17) to left side of cylinder head (16).
14. Install plug (18) to front, left side of cylinder head (16).
15. Install three plugs (14) to top and rear, left and right corners of cylinder head (16).
16. Install two plugs (15) to top of cylinder head (16).
17. If removed, install 11 new studs (22) and new stud (21) to right side of cylinder head (16).
18. Install two new preformed packings (19).



**INSTALLATION**

- Using clean oil, lubricate cylinder liner walls.

**NOTE**

Do not use any gasket sealants or adhesives. Keep cylinder head mounting surfaces clean and dry.

- Install new gasket (13) to top of cylinder block.
- Install two new preformed packings (12) and block plate (11).

**CAUTION**

Petroleum products can damage spacer plate water seals resulting in premature failure.

- Install 24 new seals (10) in water ports.
- Install new gasket (20) to top of block plate (11).

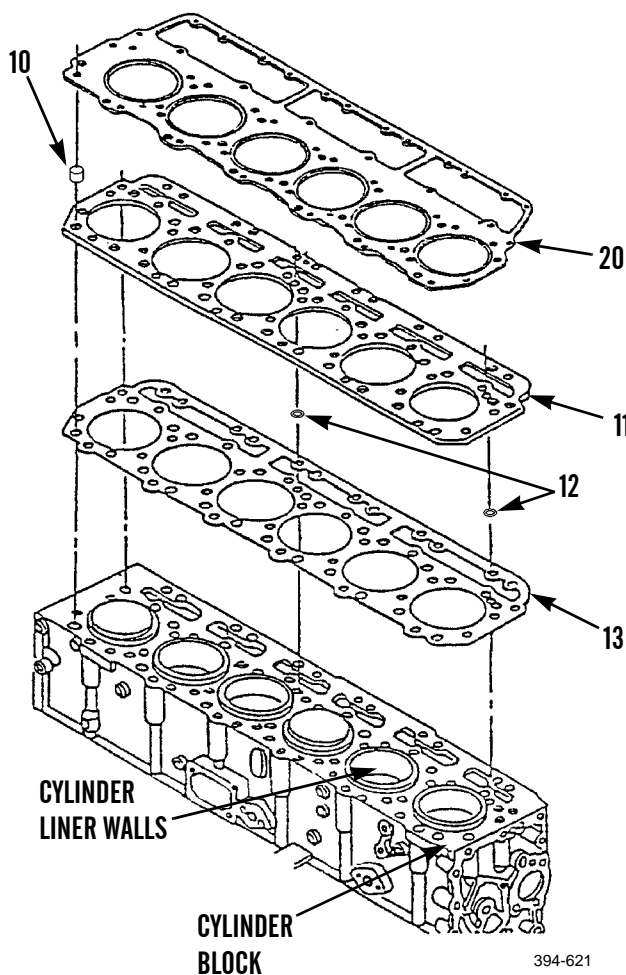
**WARNING**

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**

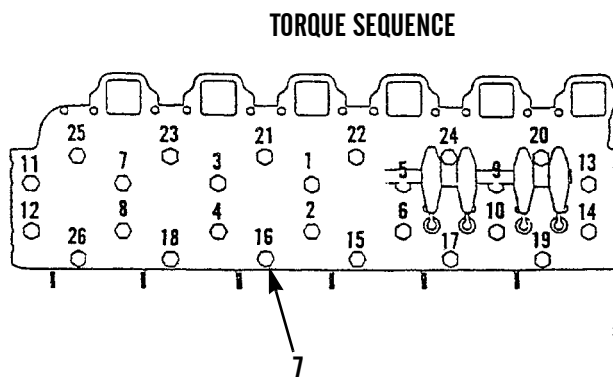
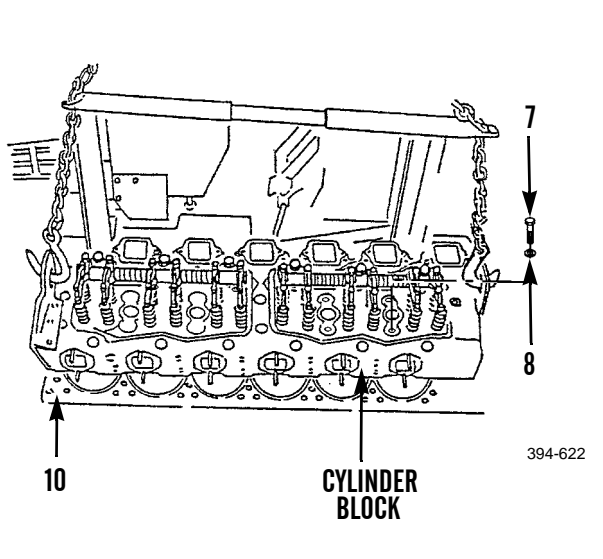
Weight of cylinder head assembly is 300 lb (136 kg).

- Install lifting device to cylinder head assembly.
- Use lifting device to install cylinder head assembly on cylinder block.
- Slowly lower cylinder head assembly, checking 24 new seals (10) for proper seating.

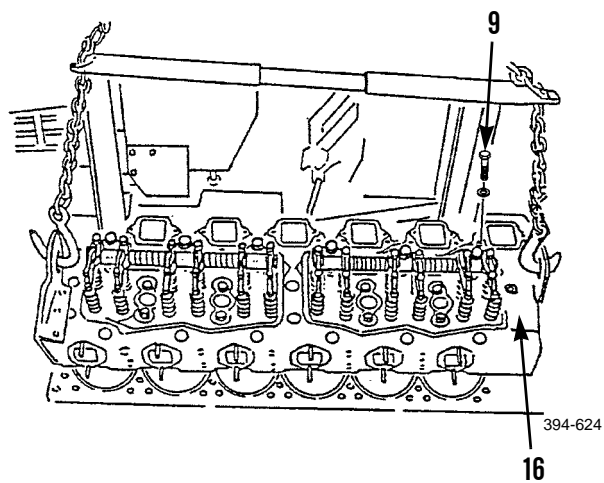


**INSTALLATION - CONTINUED**

9. Apply clean oil to 20 washers (8) and bolts (7).
10. Install 20 washers (8) and bolts (7).
11. Torque 20 bolts (7) 1 through 20 in sequence in three steps. Torque to 200 lb-ft (271 Nm), 330 lb-ft (447 Nm), then repeat 330 lb-ft (447 Nm) torque sequence.
12. Install push rods and arms (WP 0265 00).
13. Torque six bolts (7) 21 through 26 in sequence in three steps. Torque to 200 lb-ft (271 Nm), 330 lb-ft (447 Nm), then repeat 330 lb-ft (447 Nm) torque sequence.

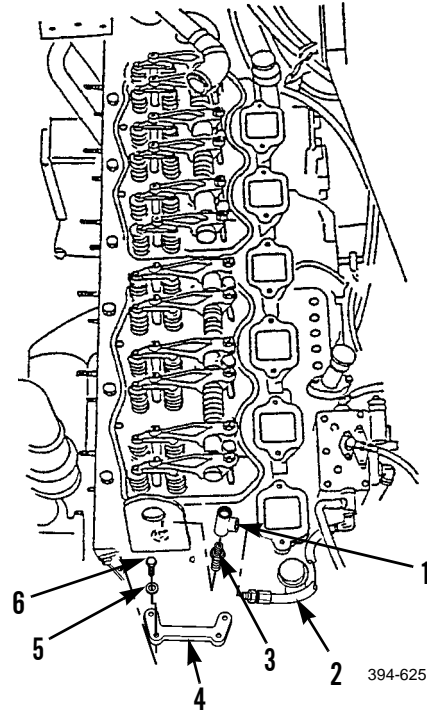


14. Install 12 bolts (9) in top, left cylinder head (16). Torque bolts to 33 lb-ft (45 Nm).
15. Remove lifting device from cylinder head assembly.



**INSTALLATION - CONTINUED**

16. Install plate (4).
17. Install four washers (5) and bolts (6).
18. Using sealing compound, coat nipple (3), tee (1) and hose assembly (2).
19. Install nipple (3) and tee (1).
20. Connect hose assembly (2).



21. Install thermostat (WP 0046 00).
22. Install water temperature sender (WP 0092 00).
23. Install ether start sender switch (WP 0098 00).
24. Install push rods and arms (WP 0265 00).
25. Install valve bridges (WP 0266 00).
26. Install exhaust manifold (WP 0270 00).
27. Install injector valve and nozzle (WP 0272 00).
28. Install aftercooler (WP 0277 00).
29. Operate machine to verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**CRANKSHAFT PULLEY AND DAMPER REPLACEMENT**

---

0260 00

**HIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

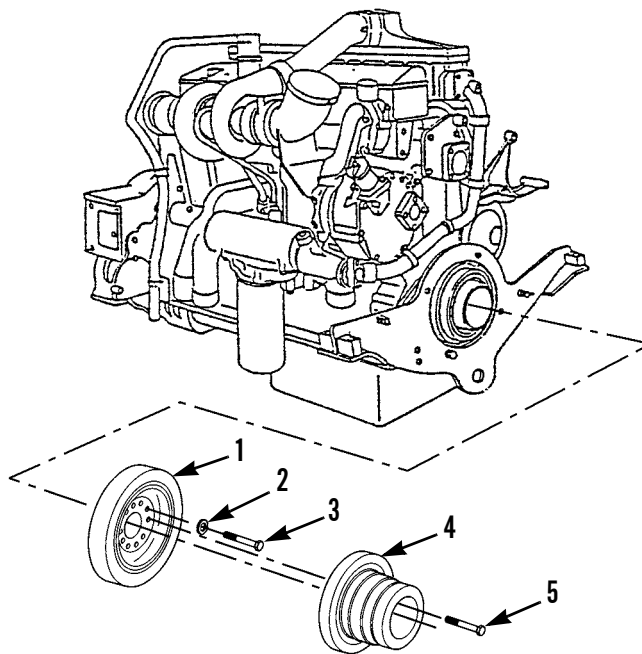
Radiator and support removed (WP 0044 00)

Fan and fan drive removed (WP 0282 00)

---

**REMOVAL**

1. Remove four bolts (5) from front of engine.
2. Remove pulley (4).
3. Remove six bolts (3) and washers (2).
4. Remove damper (1).



394-1753

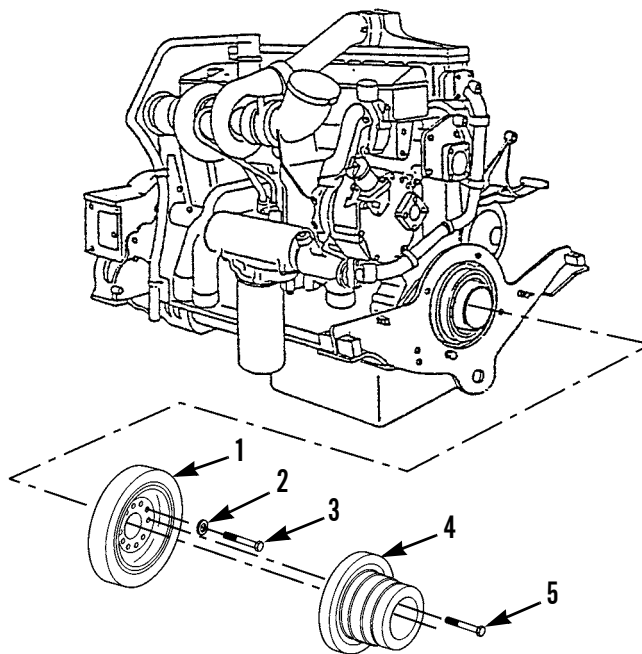
**CLEANING AND INSPECTION****WARNING**

- Solvent 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.
- 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 parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install damper (1).
2. Lubricate six washers (2) and bolts (3) with clean oil.
3. Install six washers (2) and bolts (3).
4. Install pulley (4).
5. Install four bolts (5).



394-1753

6. Install radiator and support (WP 0044 00).
7. Install fan and fan drive (WP 0282 00).
8. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**FLYWHEEL REPLACEMENT**

0261 00

**THIS WORK PACKAGE COVERS**

Removal, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

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

Lifting device, 200 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Engine removed (WP 0257 00)

Hydraulic retarder removed (WP 0289 00)

**REMOVAL****WARNING**

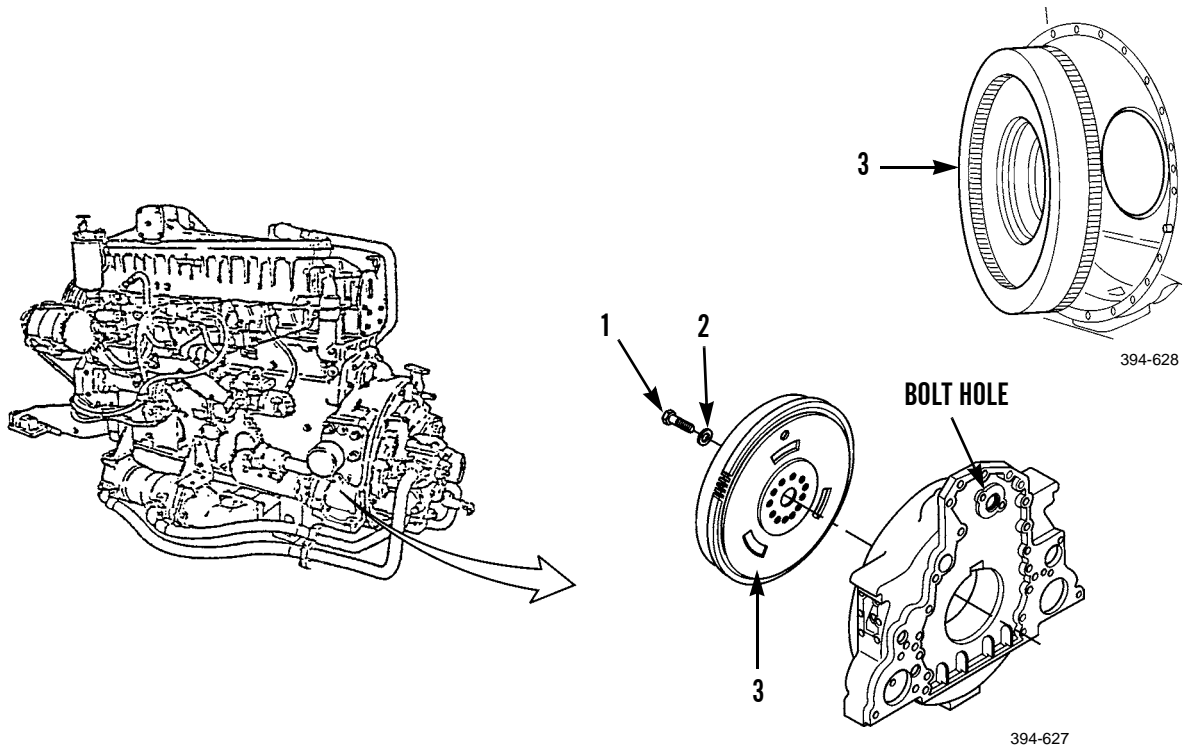
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

**NOTE**

Weight of flywheel is 150 lb (68 kg).

**FLYWHEEL REPLACEMENT - CONTINUED****0261 00****REMOVAL - CONTINUED**

1. Install link bracket and 5/8-11 NC bolt on flywheel.
2. Install lifting device to link bracket.
3. Remove 12 bolts (1) and washers (2).
4. Remove flywheel assembly (3) with bracket and place on a work bench.

**INSTALLATION**

1. Install lifting device to bracket link and position on flywheel assembly (3).
2. Install bolt.
3. Use lifting device to install flywheel (3).
4. Install 12 washers (2).
5. Use clean oil to lubricate 12 bolts (1).
6. Install 12 bolts (1) and torque to 210 lb-ft (285 Nm).
7. Remove bolt.
8. Remove lifting device and link bracket.
9. Install hydraulic retarder (WP 0289 00).
10. Install engine (WP 0257 00).
11. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**FLYWHEEL HOUSING REPLACEMENT**

**0262 00**

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

Lifting device, 200 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Sealant, silicone, RTV blue (Item 36, WP 0339 00)

Gasket (3)

**References**

TM 5-3805-248-10

**Equipment Condition**

Flywheel removed (WP 0261 00)

Oil pan removed (WP 0268 00)

Starting motor removed (WP 0057 00)

Rear crankshaft seal removed (WP 0345 00)

**REMOVAL**



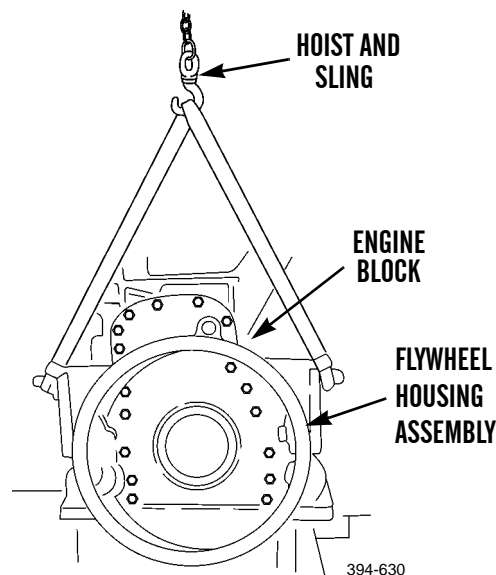
**WARNING**

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**

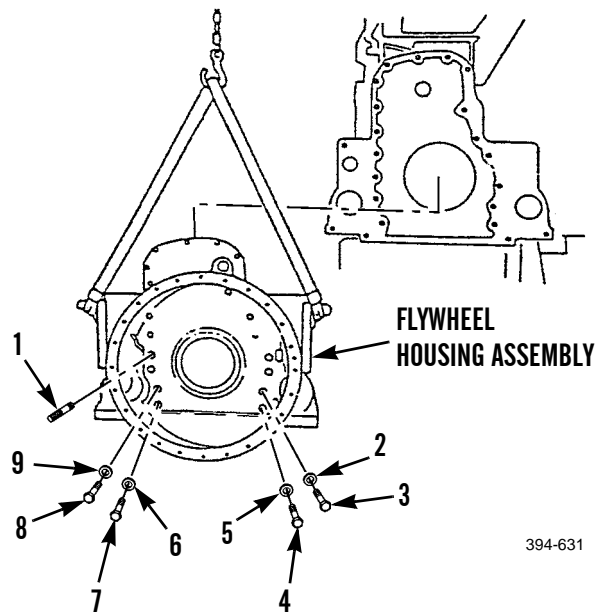
Weight of flywheel housing assembly is 126 lb (57 kg).

1. Install lifting device to flywheel housing assembly on rear of engine.



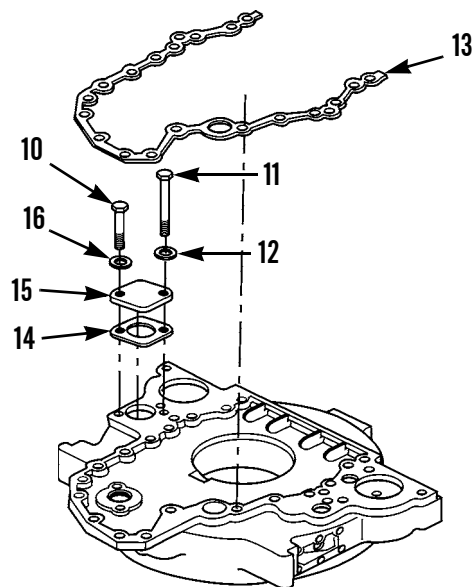
**REMOVAL - CONTINUED**

2. Remove nine bolts (4) and washers (5) from flywheel housing assembly.
3. Remove five bolts (7) and washers (6).
4. Remove bolt (8) and washer (9).
5. Remove four bolts (3) and washers (2).
6. Remove two studs (1).
7. Use lifting device to remove flywheel housing assembly.



394-631

8. Position on clean flat surface with gasket (13) facing up.
9. Remove lifting device from flywheel housing assembly.
10. Remove and discard gasket (13).
11. Remove bolt (11), washer (12), bolt (10) and washer (16).
12. Remove cover (15) and gasket (14). Discard gasket.



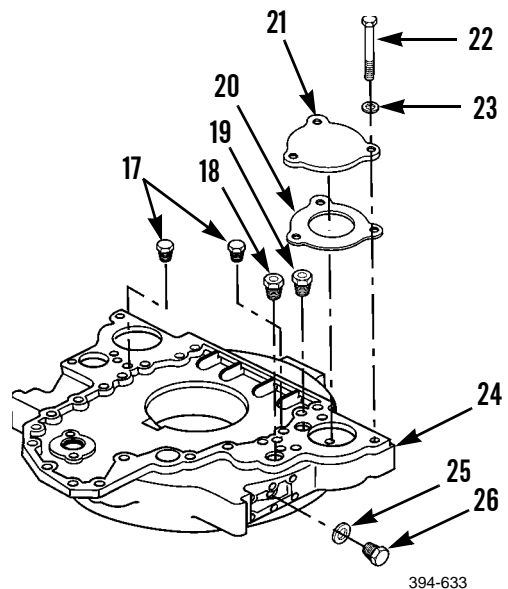
394-632

## FLYWHEEL HOUSING REPLACEMENT - CONTINUED

0262 00

**REMOVAL - CONTINUED**

13. Remove three bolts (22) and washers (23) from flywheel housing assembly (24).
14. Remove cover (21) and gasket (20). Discard gasket.
15. Remove two plugs (17).
16. Remove plugs (18 and 19) from flywheel housing assembly.
17. Remove plug (26) and washer (25) from flywheel housing (24).

**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 cause 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.

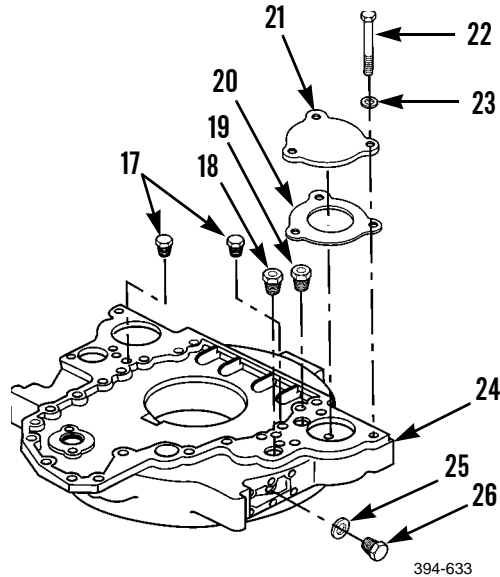
1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

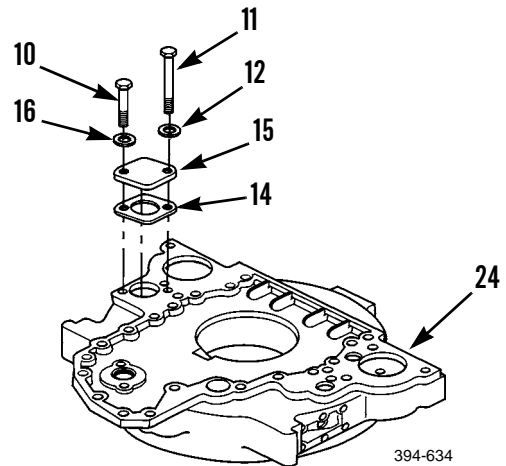
**NOTE**

All mating surfaces of housing, housing gasket and rear of engine block must be free of oil, fuel, water, gasket adhesive and other contaminants during assembly.

1. Install washer (25) and plug (26) in flywheel housing (24). Torque plug to 40 lb-ft (54 Nm).
2. Install plugs (18 and 19).
3. Install plug (19) flush with surface of flywheel housing (24).
4. Install two plugs (17).
5. Install new gasket (20) and cover (21).
6. Install three washers (23) and bolts (22).



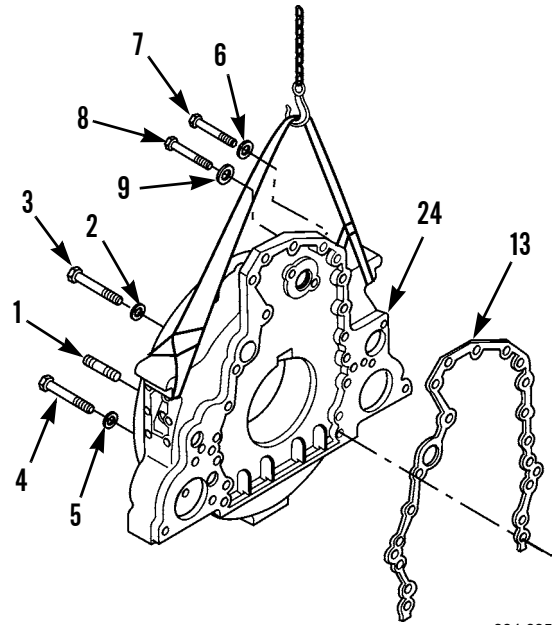
7. Install new gasket (14) and cover (15).
8. Install washer (16) and bolt (10).
9. Install washer (12) and bolt (11).



10. Install lifting device to flywheel housing assembly (24).
11. Use lifting device to position flywheel housing assembly (24) on end on flat surface.

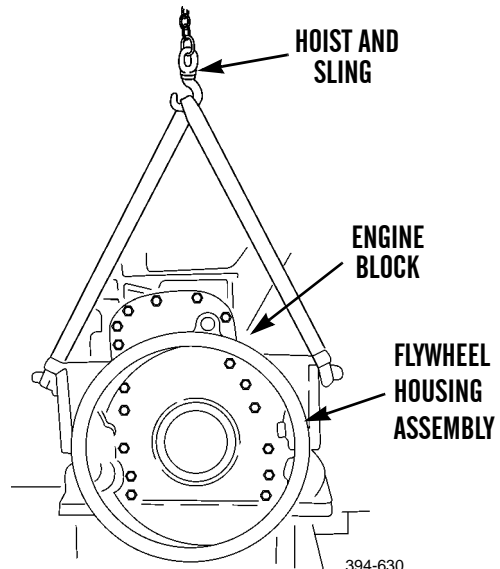
**INSTALLATION - CONTINUED**

12. Install two studs (1).
13. Install four washers (2) and bolts (3).
14. Install washer (9) and bolt (8).
15. Install five washers (6) and bolts (7).
16. Install nine washers (5) and bolts (4).
17. Apply bead of silicone sealant to bottom left and right edges of flywheel housing (24) mating surface.
18. Install new gasket (13) on bolts (3, 4, 7 and 8).
19. Inspect gasket (13) for correct position.
20. Apply another bead of silicone sealant to bottom left and right edges of new gasket surface.



394-635

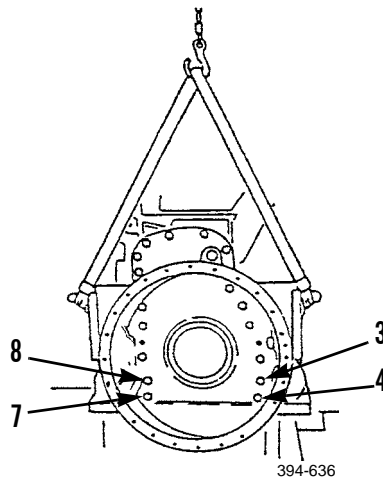
21. Use lifting device to position flywheel housing assembly (24) on engine.



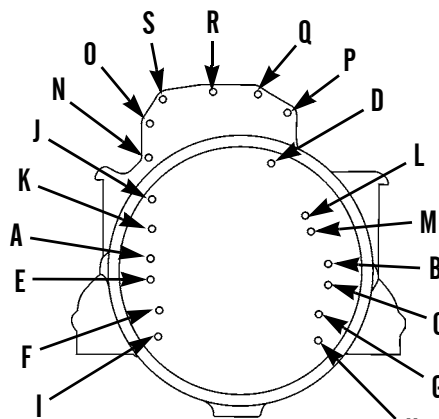
394-630

**INSTALLATION - CONTINUED**

22. Tighten 19 bolts (3, 4, 7 and 8).



23. Torque bolts (A through I) sequentially to 100 lb-ft (136 Nm).
24. Torque bolts (J through S) sequentially to 40 lb-ft (54 Nm).
25. Torque bolts (A through I) sequentially to 100 lb-ft (136 Nm).
26. Torque bolts (J through S) sequentially to 40 lb-ft (54 Nm).



**NOTE**

Do not use finger or towel to remove excess silicone sealant. Use flat straight edge tool, such as a putty knife.

27. Using flat straight edge tool, remove excess silicone sealant.
28. Remove lifting device.
29. Install new rear crankshaft seal (WP 0345 00).
30. Install flywheel (WP 0261 00).
31. Install oil pan (WP 0268 00).
32. Install starting motor (WP 0057 00).

**END OF WORK PACKAGE**



**VALVES AND SPRINGS MAINTENANCE**

0263 00

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Repair, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**Equipment Condition**

Cylinder head removed (WP 0259 00)

**REMOVAL****WARNING**

Always wear safety glasses when removing or installing parts retaining compressed springs. Remove retaining parts slowly to relieve spring pressure. Injury may result if you do not follow this procedure.

**NOTE**

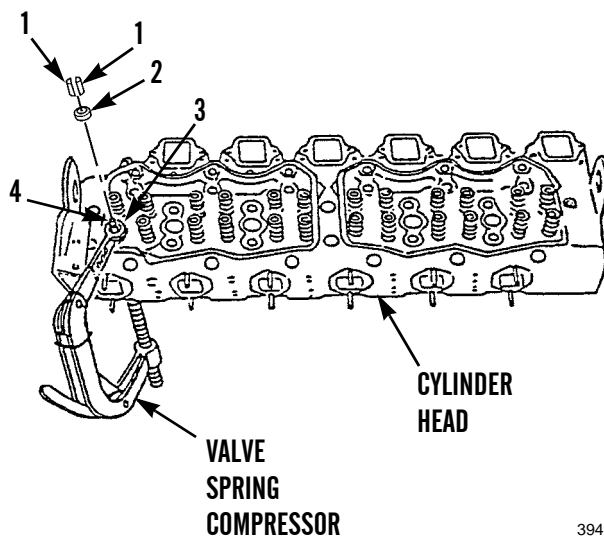
The following is a maintenance procedure for one valve. The maintenance procedures for the remaining valves are identical.

1. Position valve spring compressor on valve spring (3) and bottom of valve on cylinder head.
2. Compress valve spring (3).

**WARNING**

Use extreme caution when removing locks and rotors. Wear safety glasses. Accidental release of the valve spring may cause injury.

3. Remove two locks (1) and rotor (2) from valve stem (4).
4. Slowly release valve spring compressor and remove.
5. Remove valve spring (3) and valve stem (4) from cylinder head.



394-638

**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 cause 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 parts with solvent cleaning compound.
  2. Dry all parts with compressed air.
  3. Inspect and replace retainers and rotors if cracked, broken or worn.
  4. Use a spring tester to inspect and replace springs if cracked, broken, distorted or spring pressure is less than 71 lb (32 kg) when spring is compressed to a height of 2.165 in. (55 mm).
  5. Inspect and replace intake and exhaust valves if cracked, broken, scored, grooved, warped, burned, pitted or valve head dished.
  6. Use micrometer to measure diameter of valve stems. Measure stems in three places. Replace valve if stem diameter is less than 0.3704 in. (9.4 mm).
  7. Use vee block holder and dial indicator to measure valve face and stem runout. Replace valve if runout exceeds 0.0006 in. (0.015 mm).
  8. Measure valve head diameter. Replace if intake valve diameter is less than 1.771 in. (45 mm) and exhaust valve is less than 1.646 in. (42 mm).
  9. Measure valve lip margin. Replace intake valve if less than 0.099 in. (2.5 mm) and exhaust valve if less than 0.080 in. (2.0 mm).
  10. Inspect and replace valves if retainer grooves or stem tip is worn.

**REPAIR**

1. Use grinding machine, grind intake valves lightly. Grind at 29 degree angle.
2. Using grinding machine, grind exhaust valves lightly. Grind at 44 degree angle.

**CAUTION**

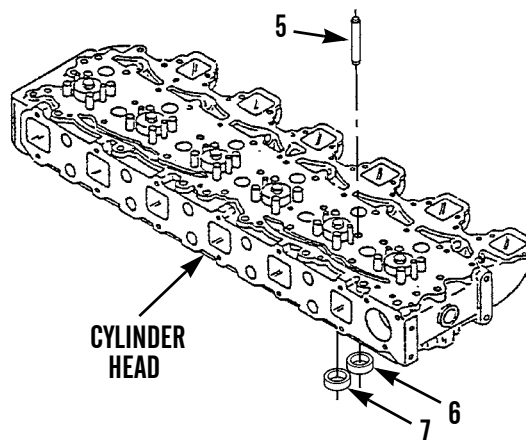
Removal of guide from cylinder head will cause destruction of guide. Remove guide only if inspection proves necessary.

3. Inspect 24 guides (5) inside bore of cylinder head. Replace if cracked, broken, out of round or scored.
4. Use valve guide gage to measure guide bore in three places. Replace guide (5) if measurement exceeds 0.3755 in. (9.53 mm).
5. Use bushing and driver and hammer to remove and discard guide(s) (5) by driving from bottom of cylinder head.

**WARNING**

Use gloves or tongs to handle extremely cold parts, such as those which have been chilled in ice. Contact between cold parts and your skin may cause frostbite and other injury.

6. Use ice to lower temperature of new guide(s) (5).
7. Use bushing and driver and hammer to install new guide(s) (5), if removed. Drive new guide(s) in from top of cylinder head. Height from top of new guide(s) to cylinder head must be between 1.24 and 1.30 in. (31 to 33 mm).
8. Use honing group to hone new guide(s) (5) to a smooth finish.



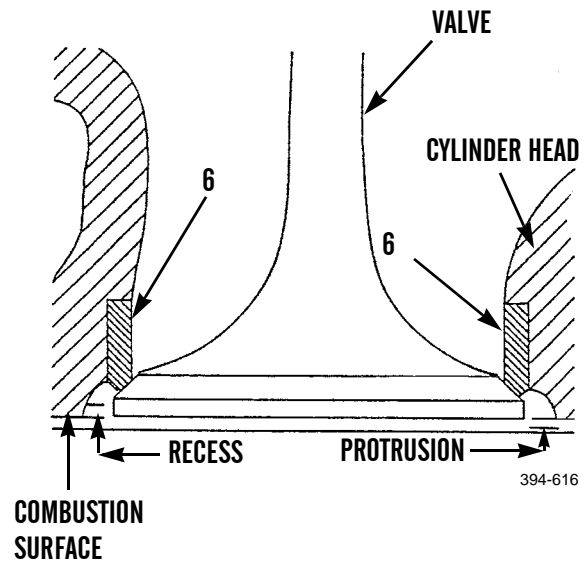
394-615

9. Measure inside diameter of new guide(s) (5). Inside diameter should be between 0.3725 and 0.3745 in. (9.46 to 9.51 mm) after installation of new guide(s).
10. Inspect 12 intake valve seats (6) and 12 exhaust valve seats (7) on bottom of cylinder head. Replace if cracked, broken, scored or burned.

**REPAIR - CONTINUED****NOTE**

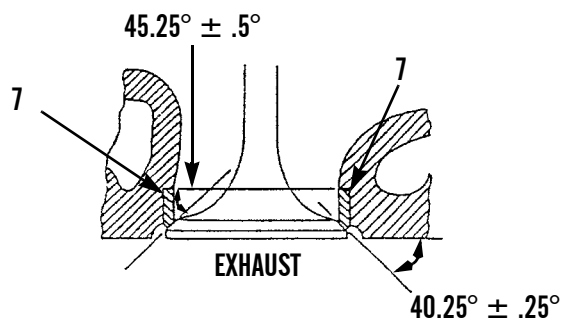
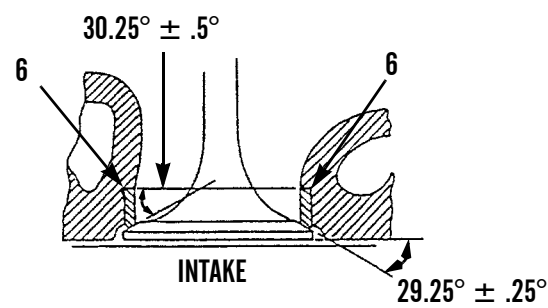
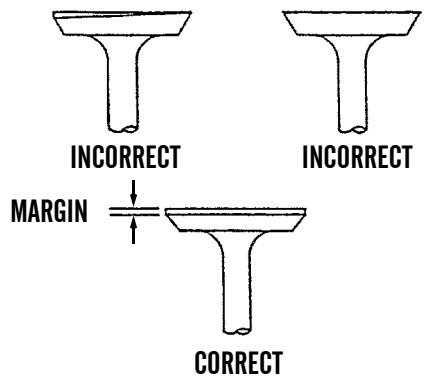
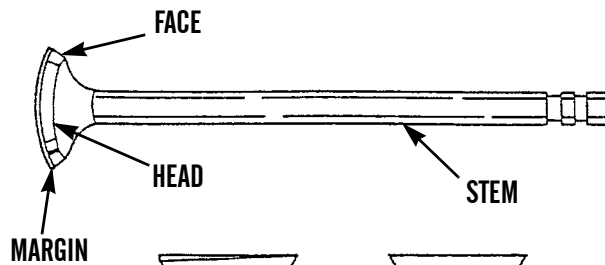
- The following is a maintenance procedure for one valve seat. The maintenance procedure for the remaining valve seats is identical except where noted.
- Valves must be matched to corresponding valve seat when making measurements.

11. Install valve through cylinder head against valve seat (6).
12. Use dial indicating depth gage to measure valve recess or protrusion. Valve must not recess more than 0.048 in. (1.22 mm) below or project more than 0.008 in. (0.20 mm) above combustion surface of cylinder head.
13. Remove valve from cylinder head.



**REPAIR - CONTINUED**

14. Resurface intake valve face and exhaust face angles, as necessary. Maintain valve face margin and angles, as shown. A minimum margin must be maintained of 0.099 in. (2.51 mm) for intake valves and 0.080 in. (2.03 mm) for exhaust valves.
15. Resurface intake valve seat (6) and exhaust valve seat (7) angles, as necessary. Maintain intake valve seat (6) and exhaust valve seat (7) angles as shown.
16. Use Prussian blue to apply bluing to valve face.



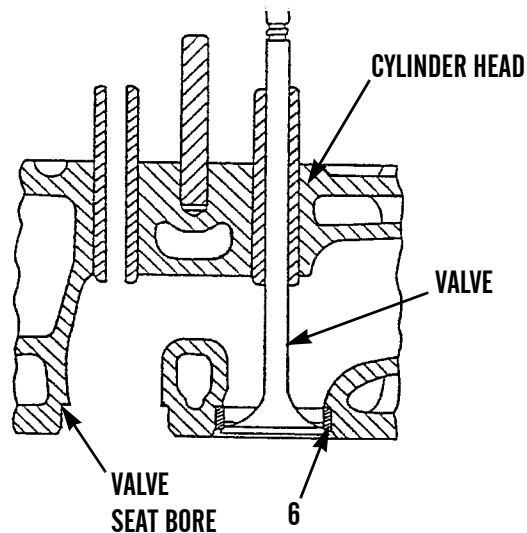
**REPAIR - CONTINUED**

17. Install valve in cylinder head and turn lightly. Allow valve face to ride on valve seat (6).
18. Remove valve.
19. Inspect valve. If blue is transferred to center of valve face, contact is good. If blue is transferred to top of valve face, grind valve seat (6). If blue is transferred to bottom edge of valve face, grind valve.

**NOTE**

- Installation of a new valve may bring valve recess within specifications. Replace valve seat if resurfacing of valve seat and replacement of valve does not bring recess or protrusion within specification.
- Steps 18 through 29 cover valve seat replacement and are only necessary if resurfacing cannot bring old valve seat within specification.

20. Using valve seat extractor tool group, grind a groove around the inner bore of valve seat (6).
21. Install collet from valve seat extractor tool group and expand in groove.
22. Attach proper extractor from valve seat extractor tool group to collet.
23. Remove valve seat (6), as necessary, from cylinder head.
24. Remove tooling from valve seat (6).
25. Remove burrs from valve seat bore in cylinder head.
26. Use ice to lower temperature of new valve seat (6).



394-618

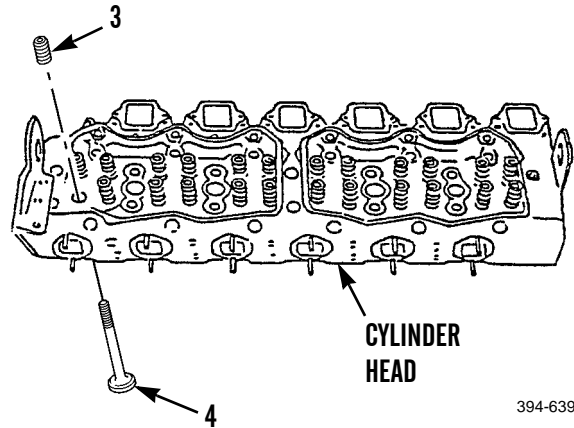
**CAUTION**

When installing new valve seats, never expand the diameter of collet.

27. Use valve seat extractor tool group to install new valve seat (6) in bottom of cylinder head.
28. Drive new valve seat (6) into place, if necessary.
29. Remove valve seat extractor tool group from new valve seat (6).
30. Repeat steps 13 through 17.
31. Repeat steps 10 through 17 until valve and valve seat (6) are within specification.

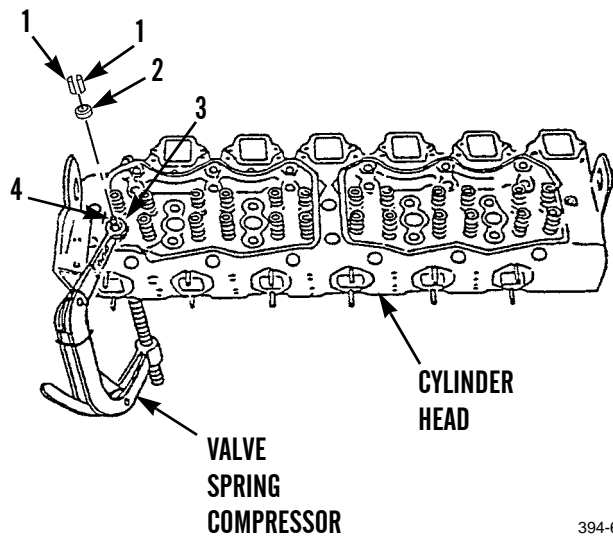
**INSTALLATION**

1. Install valve (4).
2. Check valve recess and protrusion (WP 0259 00).
3. Position spring (3).



394-639

4. Use valve spring compressor to compress spring (3).
5. Install rotor (2) and two locks (1) in valve stem grooves with large end of locks (1) facing up.
6. Remove valve spring compressor carefully from cylinder head.
7. Use soft-faced hammer to tap valve (4) to insure two locks (1) are properly seated.



394-638

8. Install cylinder head (WP 0259 00).

**END OF WORK PACKAGE**





**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Tool, valve lifter (Item 120, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Lifter spring guide (12)

**References**

TM 5-3805-248-10

**Equipment Condition**

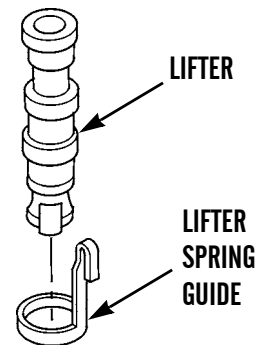
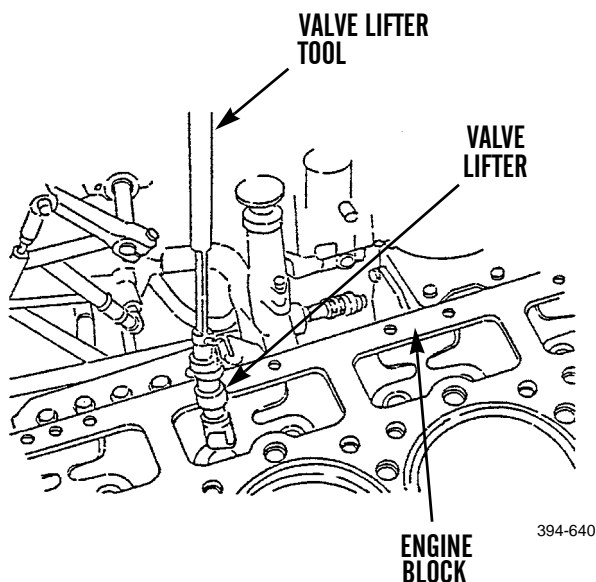
Cylinder head removed (WP 0259 00)

Push rods and arms removed (WP 0265 00)

Valve bridges removed (WP 0266 00)

**REMOVAL**

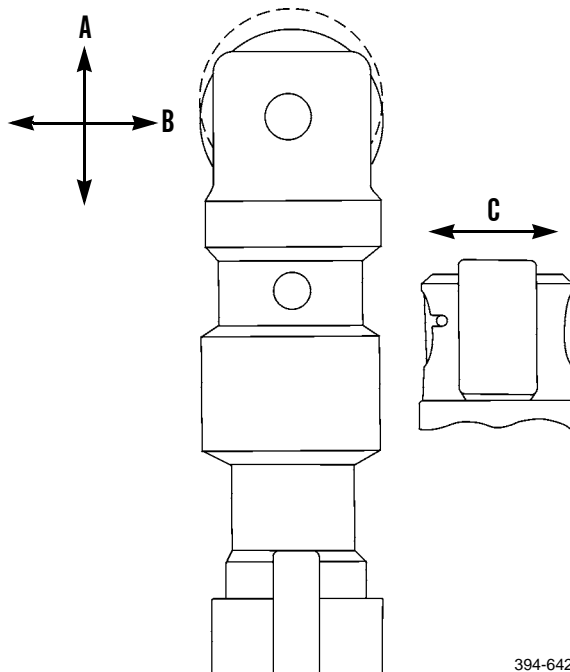
1. Use valve lifter tool to remove 12 valve lifters from top of engine block.
2. Remove and discard 12 lifter spring guides from valve lifters.



**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 cause 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 parts with solvent cleaning compound.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.
4. Use a dial indicator to measure valve lifter roller movement in direction A. Replace valve lifter if measurement is greater than 0.007 in. (0.178 mm).
5. Use a dial indicator to measure valve lifter roller movement in direction B. Replace valve lifter if measurement is greater than 0.007 in. (0.178 mm).
6. Use a dial indicator to measure valve lifter roller movement in direction C. Replace valve lifter if measurement is greater than 0.020 in. (0.508 mm).

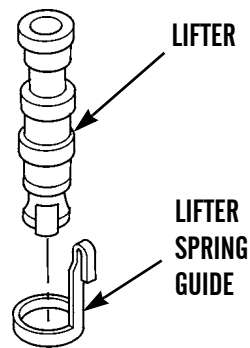


394-642

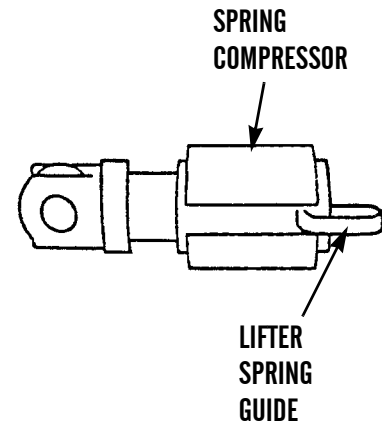
**INSTALLATION****CAUTION**

New spring guides must be installed when valve lifter is removed from engine. Failure to follow this procedure could result in damage to equipment.

1. Install 12 new lifter spring guides on valve lifters.
2. Coat 12 valve lifters with clean oil.



394-641



394-643

**WARNING**

Always wear safety glasses when removing or installing parts containing compressed springs. Remove retaining parts slowly to relieve spring pressure. Failure to follow this instruction may cause injury to personnel.

3. Use valve spring compressor to compress 12 new lifter spring guides.
4. Use valve lifter tool to install 12 valve lifters and push into position.
5. Install cylinder head (WP 0259 00).
6. Install push rods and arms (WP 0265 00).
7. Install valve bridges (WP 0266 00).

**END OF WORK PACKAGE**



**PUSH RODS AND ARMS REPLACEMENT****0265 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation, Valve Lash Adjustment

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag marker (Item 42, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

Fuel injection lines removed (WP 0030 00)

Valve covers removed (WP 0021 00)

Hood removed (WP 0189 00)

**REMOVAL****NOTE**

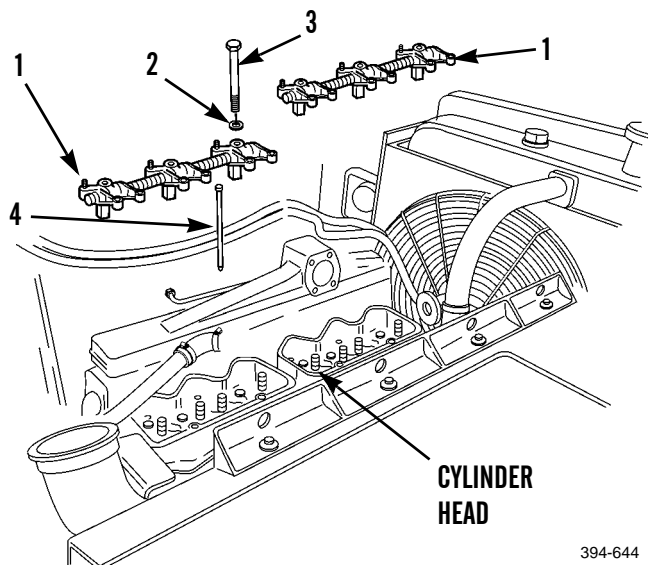
The following is a maintenance procedure for front bank push rods. The maintenance procedure for the rear bank push rods is identical.

1. Remove three bolts (3) and washers (2).
2. Remove rocker shaft assembly (1) from cylinder head.

**NOTE**

Each push rod must be numbered during removal so push rods can be installed in the same location.

3. Use tags to number six push rods (4) and remove.



394-644

**CLEANING AND INSPECTION****WARNING**

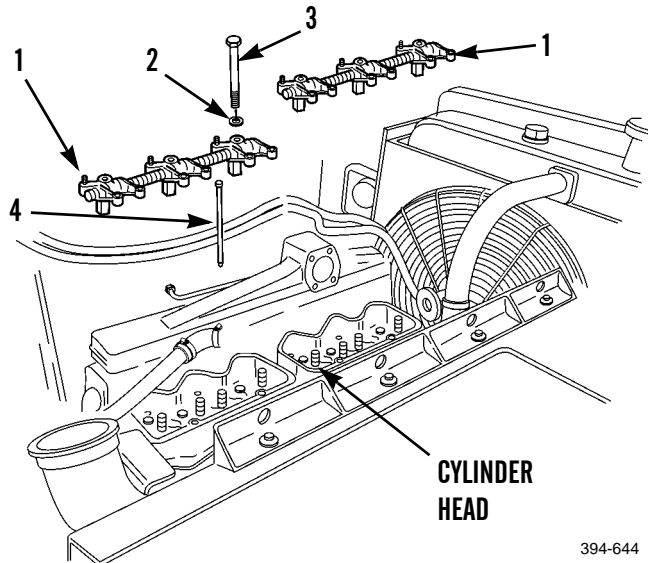
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 all parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION****NOTE**

Use numbers made during removal to install all push rods in original position.

1. Install six push rods (4).
2. Position rocker shaft assembly (1) on cylinder head.
3. Use lubricating oil to lubricate three washers (2) and threads of bolts (3).
4. Install three washers (2) and bolts (3) on rocker shaft assembly (1). Starting with center bolt, torque all three bolts (3) to 200 lb-ft (271 Nm). Torque all three bolts (3) again to 330 lb-ft (447 Nm).

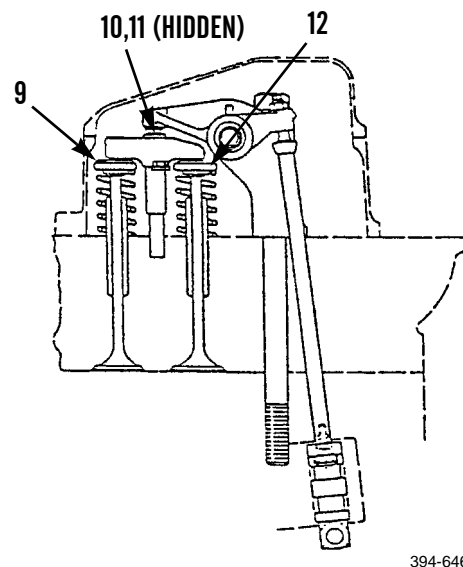
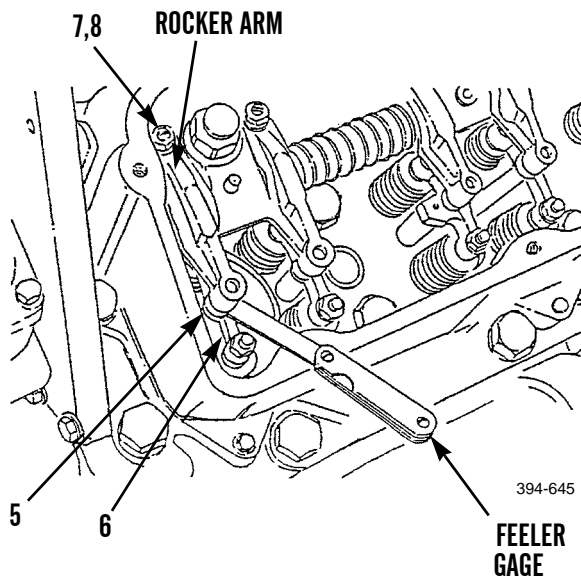


394-644

**VALVE LASH ADJUSTMENT****NOTE**

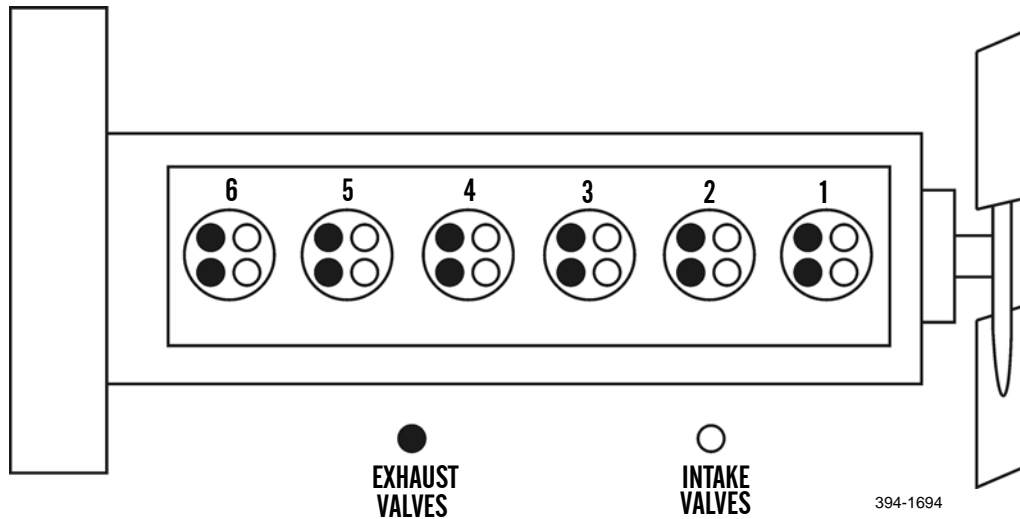
The crankshaft must be rotated in the direction of engine rotation until the valve being adjusted closes and the push rod is at its lowest point.

1. Place piston #1 at top dead center on compression stroke. Refer to WP 0028 00 for barring engine over.
2. Loosen nut (7).
3. Loosen adjusting screw (8).
4. Adjust rocker arm. Apply hand pressure on bridge assembly (6). Insert feeler gage between rocker arm and bridge assembly wear seat (5). Turn adjusting screw (8) until bridge assembly wear seat touches gage.
5. Torque nut (7) to 22 lb-ft (30 Nm).
6. Loosen nut (10).
7. Loosen bridge adjusting screw (11).
8. Adjust exhaust valve (9) and inlet valve (12). Insert feeler gage between exhaust valve and bottom of bridge adjusting screw (11). Clearance must be 0.027-0.033 in. (0.7-0.84 mm). Insert feeler gage between inlet valve (12) and bridge assembly (6). Clearance must be 0.012-0.018 in. (0.3-0.46 mm).
9. Torque nut (10) to 22 lb-ft (30 Nm).



**VALVE LASH ADJUSTMENT - CONTINUED**

10. Repeat steps 1 through 8 for intake valves 1, 2 and 4 and exhaust valves 1, 3 and 5. Refer to WP 0028 00 for barring engine over.
11. Turn engine 360 degrees to place piston #6 at top dead center on compression stroke.
12. Repeat steps 1 through 8 for intake valves 3, 5 and 6 and exhaust valves 2, 4 and 6.



13. Install fuel injection lines (WP 0030 00).
14. Install valve covers (WP 0021 00).
15. Install hood (WP 0189 00).

**END OF WORK PACKAGE**



**VALVE BRIDGES MAINTENANCE****0266 00****THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Adjustment

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Shop Equipment, field maintenance (Item 104, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

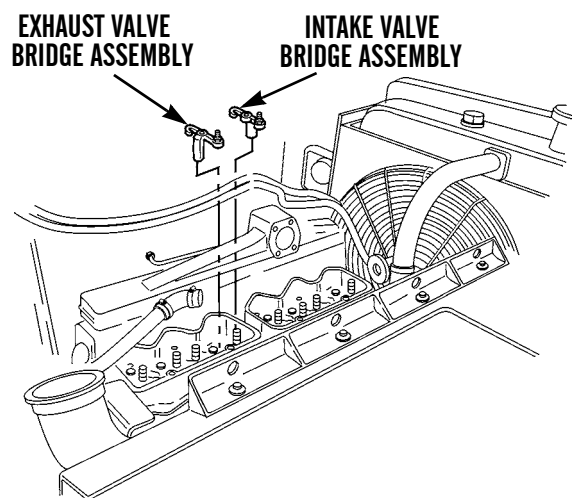
Tag, marker (Item 42, WP 0339 00)

**Equipment Condition**

Push rods and arms removed (WP 0265 00)

**REMOVAL****NOTE**

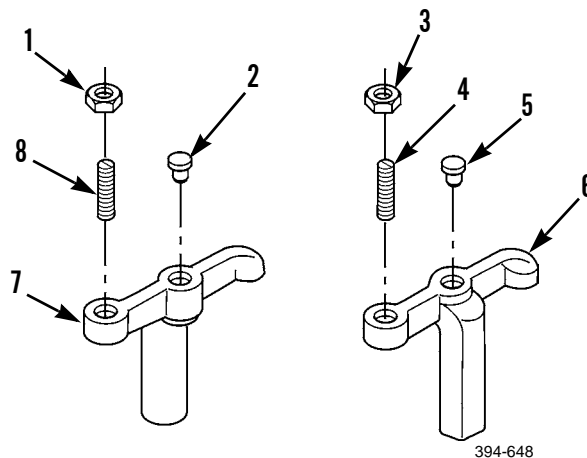
- Tag all intake and exhaust bridge assemblies to their respected cylinders to insure exact placement during installation.
  - The following is a maintenance procedure for an exhaust valve bridge assembly and an intake valve bridge assembly. The maintenance procedure for the remaining bridge assemblies is identical.
1. Remove exhaust valve bridge assembly.
  2. Remove intake valve bridge assembly.



394-647

**DISASSEMBLY**

1. Use vise jaw caps to position intake valve bridge assembly in vise.
2. Hold screw (4).
3. Loosen nut (3).
4. Remove nut (3) and screw (4).
5. Remove wear seat (5) and intake bridge (6).
6. Use vise jaw caps to position exhaust valve bridge assembly in vise.
7. Hold screw (8).
8. Loosen nut (1).
9. Remove nut (1) and screw (8).
10. Remove wear seat (2) and exhaust bridge (7).

**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 cause 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 parts with solvent cleaning compound.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Use vise jaw caps to position exhaust bridge (7) in vise.
2. Install wear seat (2). Use hammer to evenly tap wear seat (2) into top, center hole of exhaust bridge (7).
3. Install screw (8) and nut (1) loosely.
4. Use vise jaw caps to position intake bridge (6) in vise.
5. Install wear seat (5). Use hammer to evenly tap wear seat (5) into top, center hole of intake bridge (6).
6. Install screw (4) and nut (3) loosely.

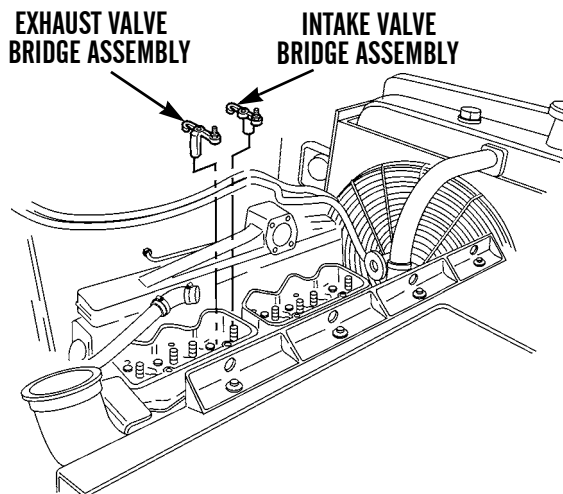
**INSTALLATION**

1. Use clean oil to lubricate bridge mounting dowel.
2. Use clean oil to lubricate exhaust valve bridge assembly and intake valve bridge assembly.

**NOTE**

Adjustment screw on bridges face toward exhaust manifold.

3. Install exhaust valve bridge assembly and intake valve bridge assembly.



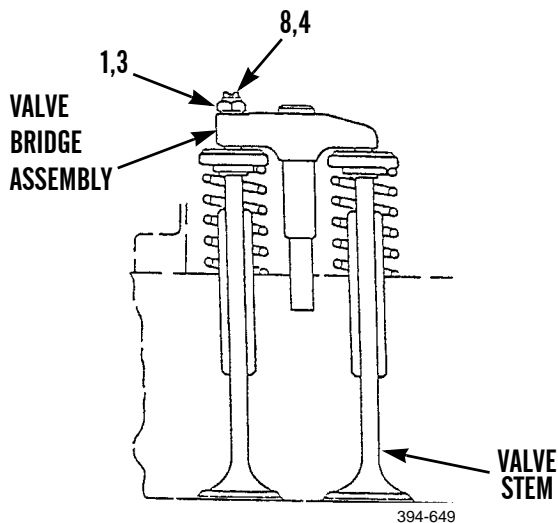
394-647

**ADJUSTMENT**

**NOTE**

Valves must be fully closed before bridge assembly adjustment can be performed.

1. Seat exhaust valve bridge assembly and intake valve bridge assembly. Apply downward force with finger to make contact with valve stem opposite adjustment screw end.
2. Turn screws (4 and 8) clockwise until screws (4 and 8) make contact with valve stems. Turn screws (4 and 8) an additional 1/3 clockwise turn. Hold.
3. Tighten nuts (3 and 1) to 22 lb-ft (30 Nm).



394-649

4. Install push rods and arms (WP 0265 00).

**END OF WORK PACKAGE**



---

**LUBRICATION OIL PUMP REPLACEMENT**

---

**0267 00****THIS WORK PACKAGE COVERS**Remove, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, common no. 2 (Item 102, WP 0338 00)

Bushing driver set (Item 11, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed (2)

**Equipment Condition**Oil pan removed (WP 0268 00)

---

**REMOVAL****WARNING**

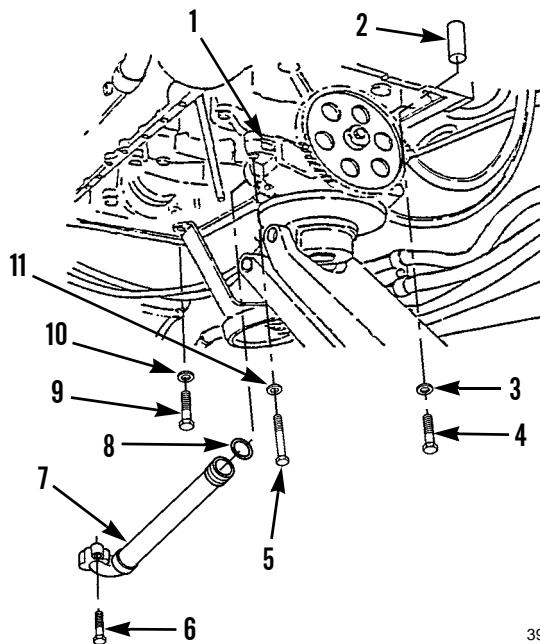
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

**NOTE**

Weight of lubrication oil pump assembly is 73 lb (33 kg).

**REMOVAL - CONTINUED**

1. Use hydraulic floor jack to support oil pump body (1).
2. Remove bolt (5), washer (11), two bolts (4) and washers (3).
3. Remove three sleeves (2).
4. Remove two bolts (9) and washers (10).
5. Remove two bolts (6), discharge tube (7) and pre-formed packing (8). Discard preformed packing.
6. Use hydraulic floor jack to lower oil pump body (1).



394-650

**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 cause 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 parts with solvent cleaning compound.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

***INSTALLATION***

1. Install new preformed packing (8) and discharge tube (7).
2. Position oil pump body (1) on hydraulic floor jack.
3. Position oil pump body (1) under vehicle and raise hydraulic floor jack.
4. Install two bolts (6).
5. Install two washers (10) and bolts (9).
6. Install two rings (2).
7. Install two washers (3), bolts (4), washer (11) and bolt (5).
8. Lower hydraulic floor jack and remove.
9. Install oil pan (WP 0268 00).

**END OF WORK PACKAGE**





---

**OIL PAN MAINTENANCE**

---

0268 00

**THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, common no. 2 (Item 102, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Gasket (4)

**References**

TM 5-3805-248-10

**Equipment Condition**

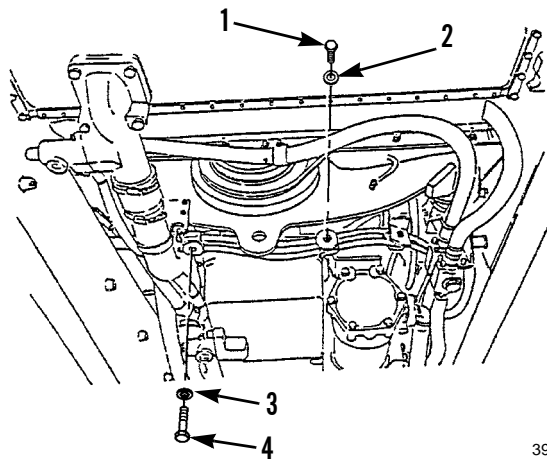
Engine oil drained (WP 0022 00)

Front and rear crankcase guards removed (WP 0201 00)

---

**REMOVAL**

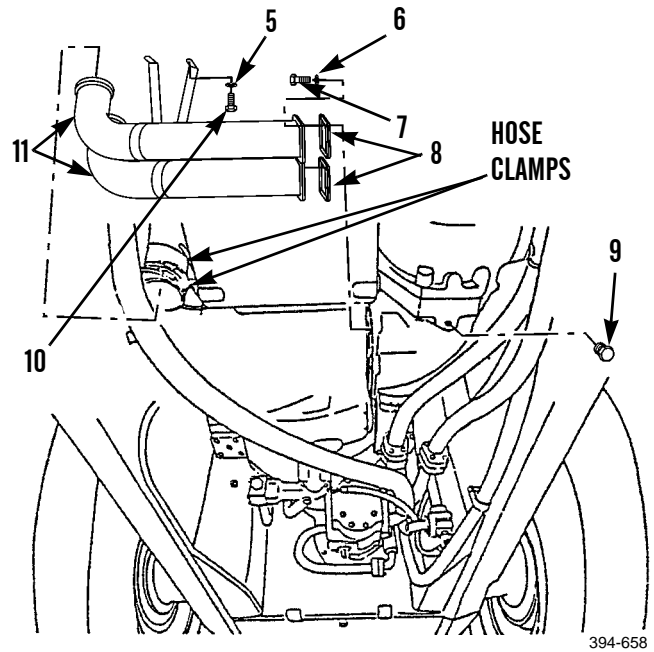
1. Remove two bolts (1) and washers (2).
2. Remove two bolts (4) and washers (3).



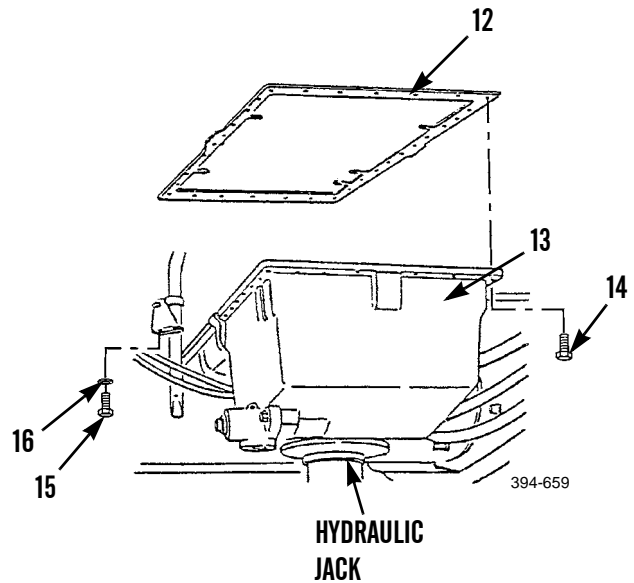
394-657

**REMOVAL - CONTINUED**

3. Remove plug (9) from under engine. Drain engine coolant into container.
4. Remove eight bolts (7) and washers (6).
5. Remove two bolts (10) and washers (5).
6. Loosen four hose clamps.
7. Remove two coolant tubes (11) and gaskets (8). Discard two gaskets.

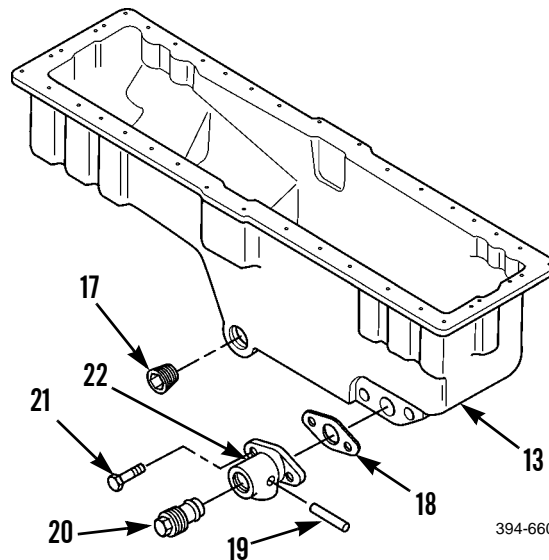


8. Remove two bolts (15) and washers (16).
9. Use hydraulic floor jack to support oil pan (13).
10. Remove 32 bolts (14).
11. Lower oil pan (13) and gasket (12) from engine. Discard gasket.



**DISASSEMBLY**

1. Remove plug (17) from oil pan (13).
2. Remove drain plug (20).
3. Remove two bolts (21).
4. Remove adapter (22) and gasket (18) from oil pan (13). Discard gasket.
5. Remove pin (19) from adapter (22).

**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.

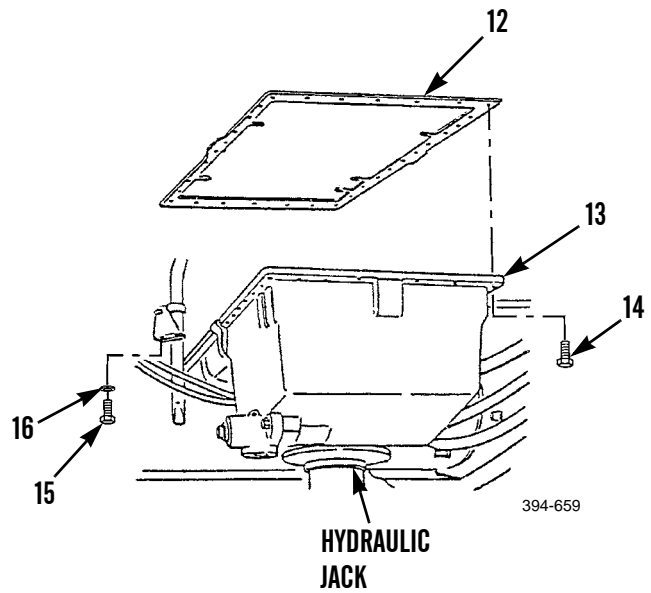
1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

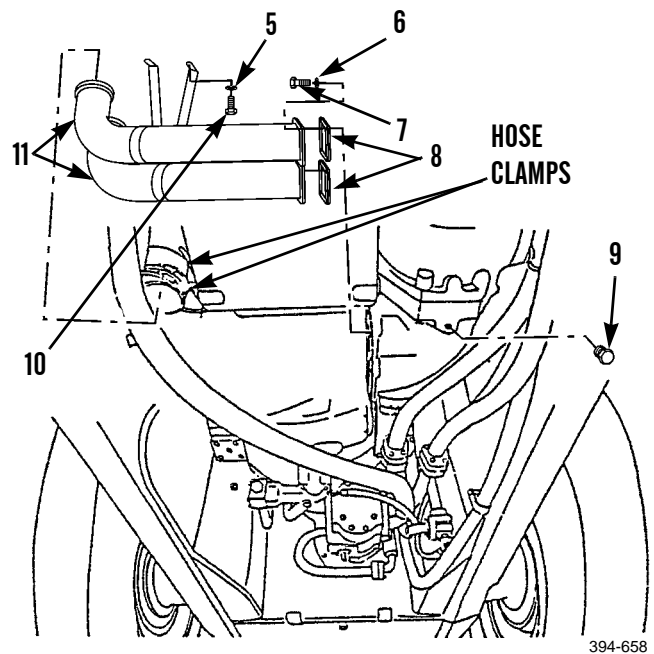
1. Install spring pin (19) in adapter (22).
2. Position adapter (22) and new gasket (18) on oil pan (13).
3. Install two bolts (21).
4. Install drain plug (20).
5. Install plug (17).

**INSTALLATION**

1. Position new gasket (12) and oil pan (13) under engine.
2. Support oil pan (13) with hydraulic floor jack.
3. Install 32 bolts (14) finger tight
4. Tighten bolts (14) in criss-cross pattern.
5. Remove hydraulic floor jack.
6. Install two washers (16) and bolts (15).

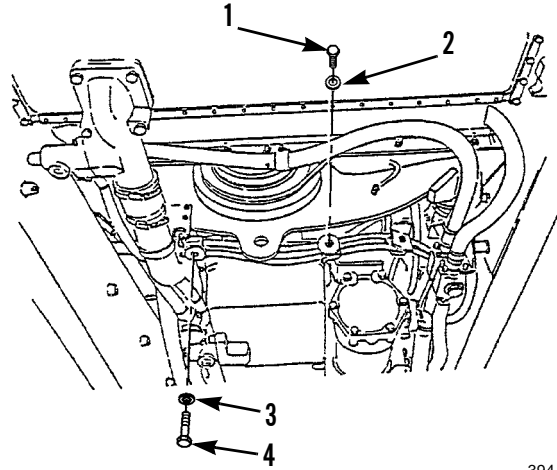


7. Position two new gaskets (8).
8. Position two coolant tubes (11).
9. Install two washers (5) and bolts (10).
10. Install eight washers (6) and bolts (7).
11. Position two hose clamps on coolant tubes (11) and tighten.
12. Install plug (9).



**INSTALLATION - CONTINUED**

13. Install two washes (2) and bolts (1).
14. Install two washers (3) and bolts (4).



394-657

15. Fill coolant to correct level (TM 5-3805-248-10).
16. Fill engine oil to correct level (WP 0022 00).
17. Operate engine (TM 5-3805-248-10).
18. Inspect oil pan and coolant tubes for leaks (TM 5-3805-248-10).
19. Shut down engine (TM 5-3805-248-10).
20. Install front and rear crankcase guards (WP 0201 00).

**END OF WORK PACKAGE**



---

**ENGINE OIL COOLER REPLACEMENT**

**0269 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Device, lifting 100 lb minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**Materials/Parts - Continued**

Packing, preformed (2)

Gasket (3)

Seal (2)

**Personal Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Oil filter base removed (WP 0026 00)

Engine removed (WP 0257 00)

---

**REMOVAL**

1. Remove two bolts (1 and 2) and gasket (3). Discard gasket.
2. Remove clamp (4).

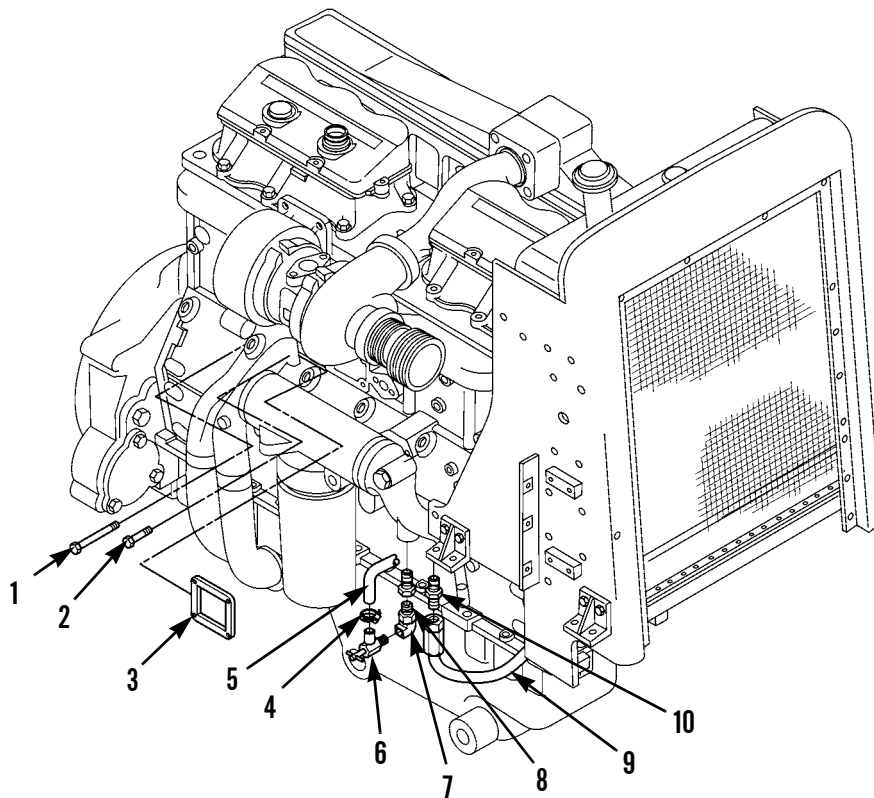
**CAUTION**

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

**NOTE**

Tag hose and tube assemblies prior to removal to ensure correct installation.

3. Disconnect hose assembly (5) from cock (6).
4. Remove cock (6), elbow (7) and bushing (8).
5. Disconnect hose assembly (9) from connector (10).
6. Remove connector (10).



394-661



REMOVAL - CONTINUED



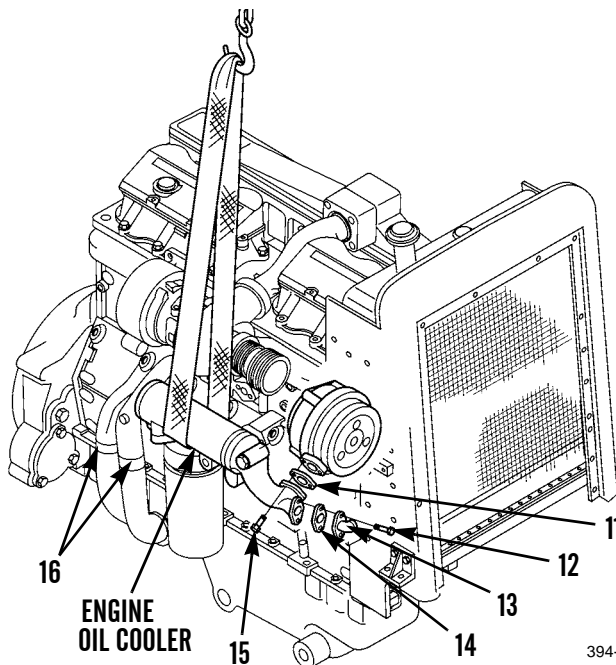
**WARNING**

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**

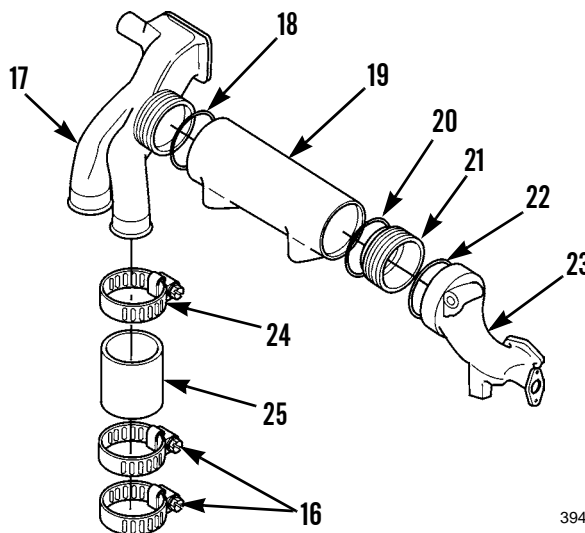
Weight of the oil cooler assembly is 52 lb (24 kg).

7. Attach lifting device to engine oil cooler assembly.
8. Remove two bolts (15) and gasket (11). Discard gasket.
9. Remove two bolts (12), elbow (13) and gasket (14). Discard gasket.
10. Loosen four clamps (16).
11. Use hoist and sling to remove engine oil cooler assembly.



394-662

12. Remove lifting device.
13. Remove four clamps (16).
14. Remove two clamps (24).
15. Disconnect two hoses (25) from bonnet (17).
16. Remove bonnet (17) from core assembly (19).
17. Remove and discard seal (18).
18. Remove bonnet (23) and preformed packing (22) from adapter (21). Discard preformed packing.
19. Remove adapter (21) and seal (20) from core assembly (19). Discard seal.



394-663

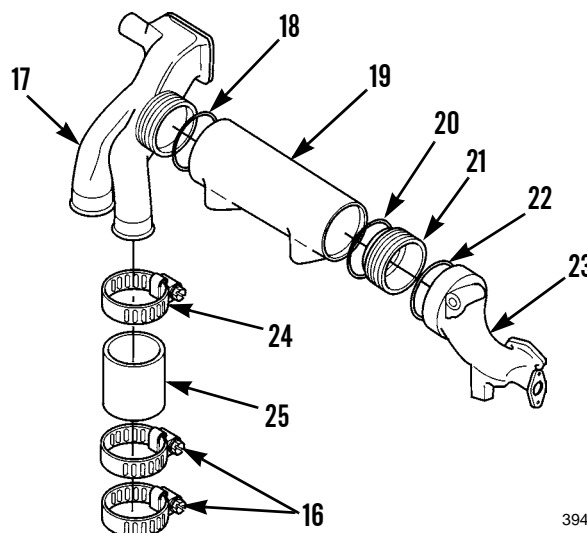
**CLEANING AND INSPECTION****WARNING**

- 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. Remove all gasket and preformed packing material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

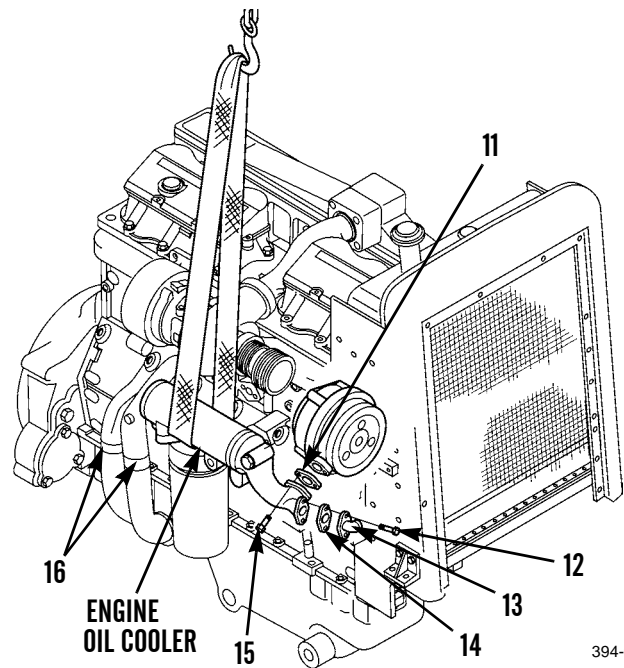
1. Install new seal (20) and adapter (21) on core assembly (19).
2. Install new preformed packing (22) and bonnet (23) on adapter (21).
3. Install new seal (18) and bonnet (17) on core assembly (19).
4. Install two hoses (25) on bonnet (17).
5. Install two clamps (24).
6. Loosely install four clamps (16) on two hoses (25).
7. Attach lifting device to engine oil cooler assembly.
8. Use lifting device to install engine oil cooler assembly.
9. Tighten four clamps (16).



394-663

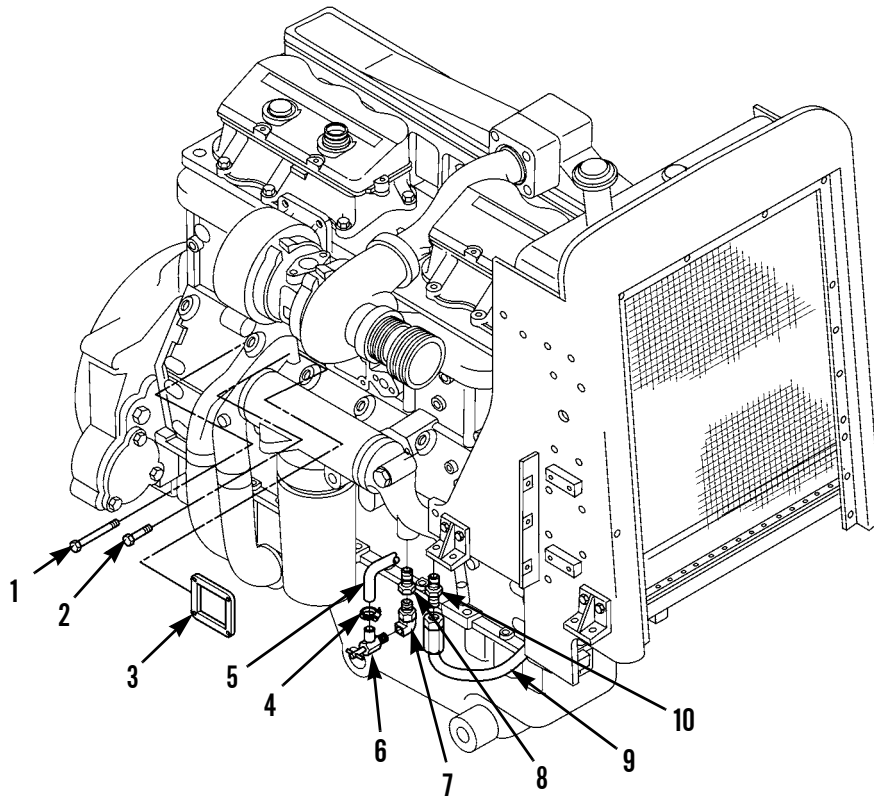
**INSTALLATION - CONTINUED**

10. Install new gasket (14), elbow (13) and two bolts (12).
11. Install new gasket (11) and two bolts (15).
12. Remove lifting device.



**ENGINE OIL COOLER REPLACEMENT - CONTINUED****0269 00****INSTALLATION - CONTINUED**

13. Install connector (10).
14. Connect hose assembly (9) to connector (10).
15. Install bushing (8), elbow (7) and cock (6).
16. Connect hose assembly (5) to cock (6) and install clamp (4).
17. Install new gasket (3) and two bolts (1 and 2).



394-661

18. Install oil filter base (WP 0026 00).
19. Install engine (WP 0257 00).

**END OF WORK PACKAGE**

---

**EXHAUST MANIFOLD REPLACEMENT**

---

0270 00

**THIS WORK PACKAGE COVERS**

Remove, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, anti-seize (Item 11, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Locknut (12)

Gasket (6)

**References**

TM 5-3805-248-10

**Equipment Condition**

Turbocharger removed (WP 0276 00)

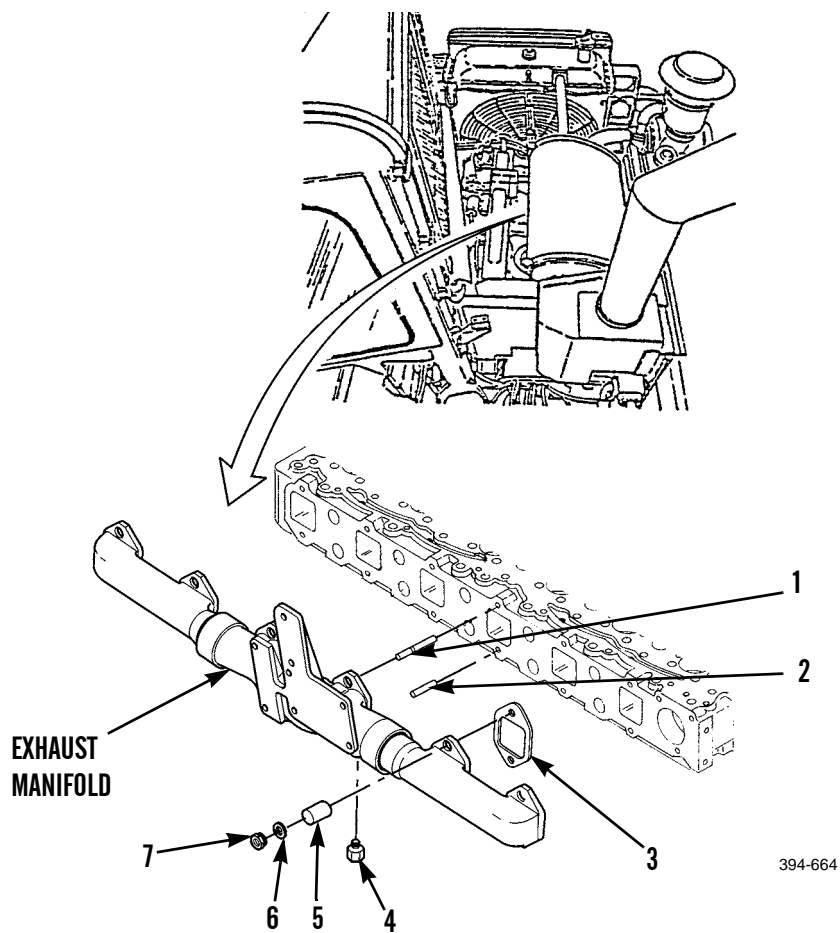
---

**EXHAUST MANIFOLD REPLACEMENT - CONTINUED**

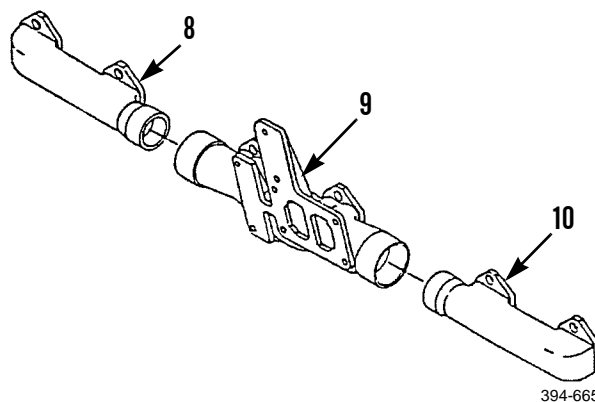
0270 00

**REMOVAL**

1. Remove 12 locknuts (7), washers (6) and spacers (5) from studs (1) on right side of engine. Discard locknuts.
2. Remove exhaust manifold assembly and six gaskets (3) from cylinder head. Discard six gaskets.
3. Remove two plugs (4).
4. If damaged, remove stud (1) and 11 studs (2) from right side of cylinder head.



5. Remove exhaust manifolds (8 and 10) from exhaust manifold (9).



**CLEANING AND INSPECTION**



**WARNING**

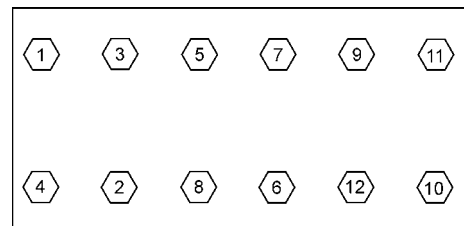


- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.
5. Inspect exhaust manifolds for warpage.

**INSTALLATION**

1. Install exhaust manifolds (8 and 10) in exhaust manifold (9). Flanged ends must be properly seated.
2. If removed, apply antiseize compound to threads on 11 new studs (2) and new stud (1) on right side of cylinder head.
3. If removed, install 11 new studs (2) and new stud (1) in cylinder head.
4. Using anti-seize compound, coat threads on two plugs (4).
5. Install two plugs (4).
6. Install six new gaskets (3) and exhaust manifold assembly on studs.
7. Install 12 spacers (5), washers (6) and new locknuts (7) on studs.
8. Tighten 12 new locknuts (7), in sequence, to 38 lb-ft (49 Nm).



394-666

9. Install turbocharger (WP 0276 00).
10. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**





**ACCESSORY DRIVE GROUP REPLACEMENT**

**0271 00**

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Gasket

**References**

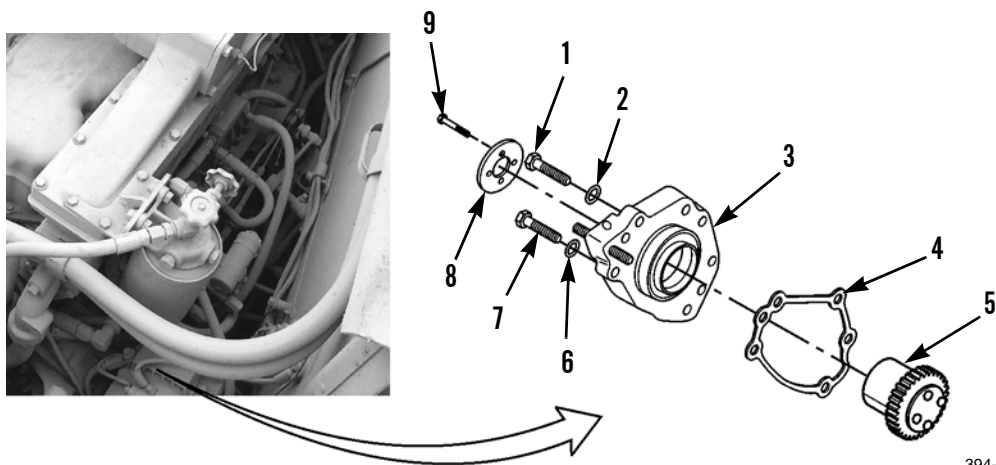
TM 5-3805-248-10

**Equipment Condition**

Air compressor removed (WP 0167 00)

**REMOVAL**

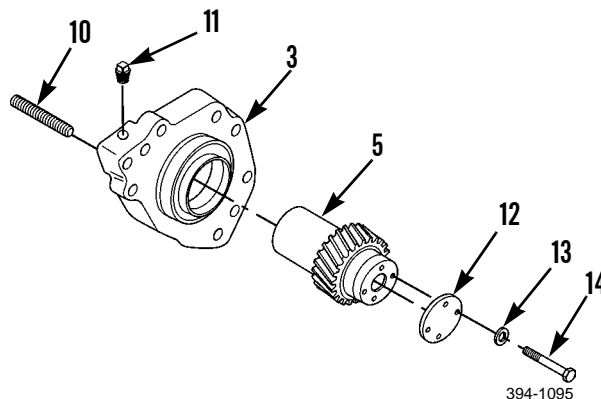
1. Remove two bolts (1), washers (2), bolts (7), washers (6) and drive bearing (3) from front left side of engine.
2. Remove and discard gasket (4) from drive bearing (3).
3. Remove four bolts (9), plate (8) and drive gear (5) from drive bearing (3).



394-1094

**REMOVAL - CONTINUED**

4. Remove four bolts (14), washers (13) and cover (12) from drive gear (5).
5. Remove plug (11) from drive bearing (3).
6. Remove two studs (10) from drive bearing (3).

**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. The use of 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 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.

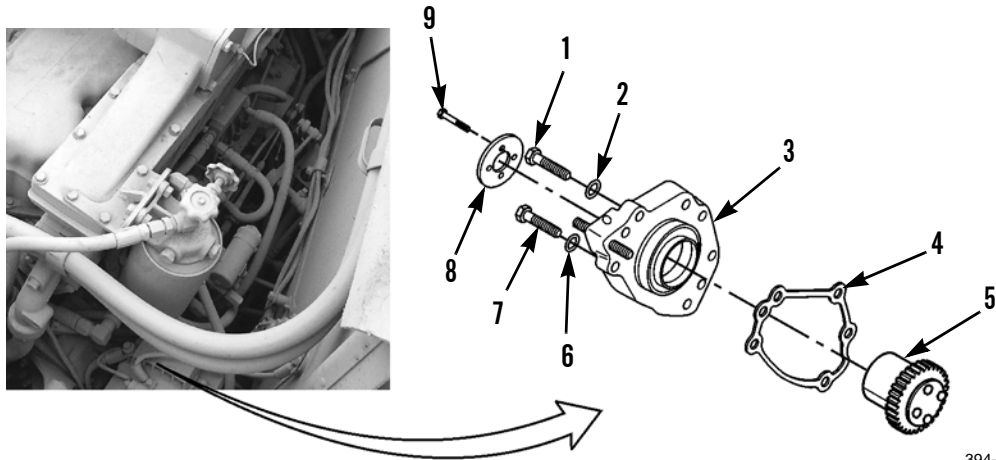
1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent and ensure that they are free of seal material, dirt and oil.
3. Visually inspect parts for cracks, heat deterioration or other damage. Replace damaged parts as necessary.
4. Dry parts with compressed air.

**INSTALLATION**

1. Install two studs (10) and plug (11) to front left side of engine.
2. Install cover (12), four washers (13) and bolts (14) to drive gear (5).

**INSTALLATION - CONTINUED**

3. Install drive gear (5), plate (8) and four bolts (9) to drive bearing (3).
4. Install new gasket (4) to drive bearing (3).
5. Install drive bearing (3), two washers (6), bolts (7), washers (2) and bolts (1) to front left side of engine.



6. Install air compressor (WP 0167 00).
7. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**INJECTOR VALVE AND NOZZLE MAINTENANCE**

---

**0272 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Testing, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Extractor adapter, fuel nozzle (Item 21, WP 0338 00)

Guide, seal (Item 33, WP 0338 00)

Nut, plain, hexagon (Item 60, WP 0338 00)

Puller kit, universal (Item 83, WP 0338 00)

Pumping unit, hydraulic, hand driven (Item 92, WP 0338 00)

**Tools and Special Tools - Continued**

Tube assembly, metal (Item 121, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Fuel, diesel (Items 14 and 15, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Seal

**Equipment Condition**

Valve cover and housing removed (WP 0021 00)

Fuel injector lines removed (WP 0030 00)

Engine hood removed (WP 0189 00)

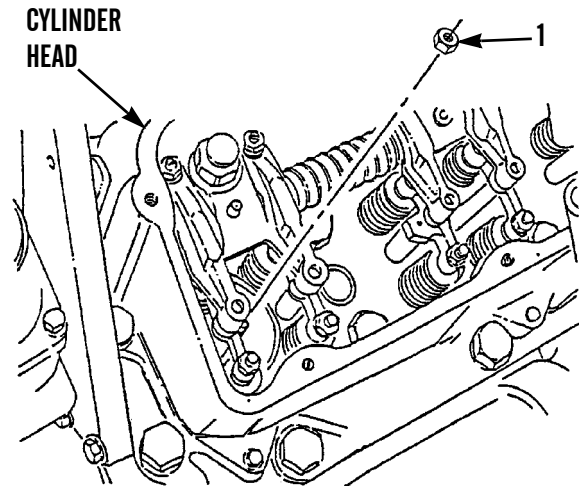
---

**NOTE**

The following is a maintenance procedure for one fuel injector valve. The maintenance procedure for the remaining five fuel injector valves is identical.

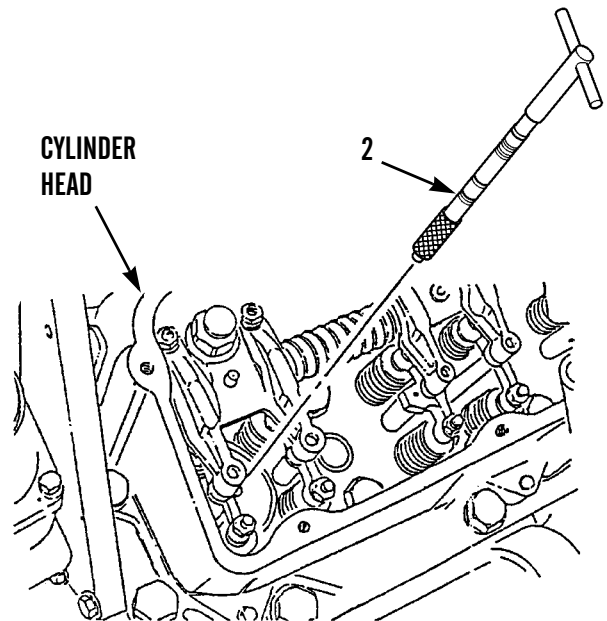
**REMOVAL**

1. Remove nut (1) from cylinder head.



394-476

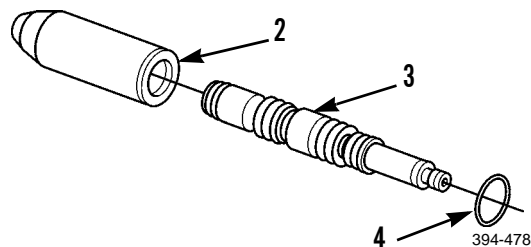
2. Lift nozzle assembly (2) out of cylinder head and remove.



394-477

**REMOVAL - CONTINUED**

3. Remove nozzle (2) from valve body assembly (3).
4. Remove and discard seal (4) from valve body assembly (3).

**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 cause 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 parts with solvent cleaning compound.
2. Visually inspect parts for damage and replace as necessary.
3. Dry parts with compressed air.

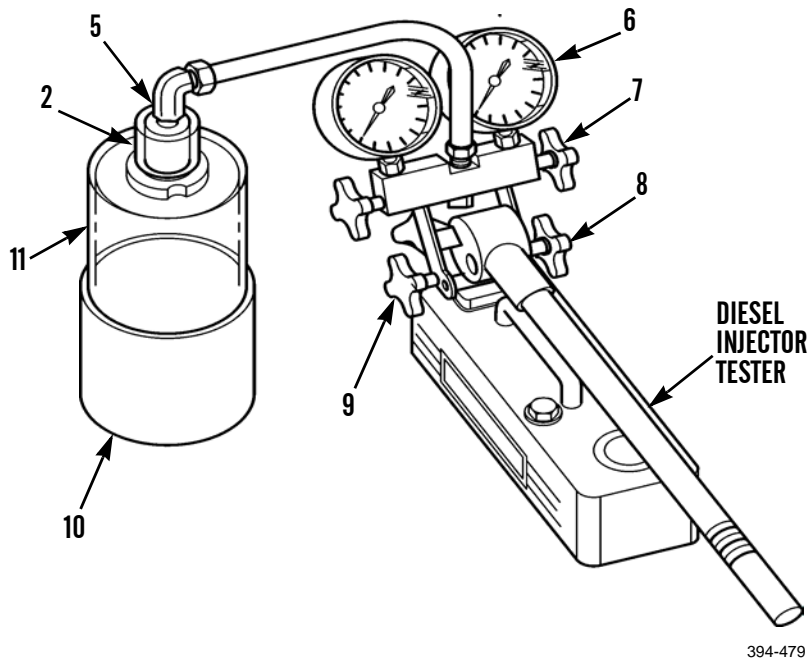
**TESTING****WARNING**

When testing fuel injectors, always direct tip of nozzle assembly away from you. Fuel from orifices can penetrate clothing and skin causing serious injury. Be sure top of nozzle assembly is enclosed in a receptacle to contain spray.

**CAUTION**

Do not use drill or reamer in orifices of nozzle assembly. Do not use steel brush or wire wheel to clean tip of nozzle assembly. The orifices of nozzle assembly and valve body assembly can be damaged easily.

1. Install adapter (5) on diesel injector tester, loosely.
2. Install nozzle (2) in bottom of adapter (5). Tighten adapter (5).
3. Install extension (11) and fuel collector (10) on diesel injector tester.





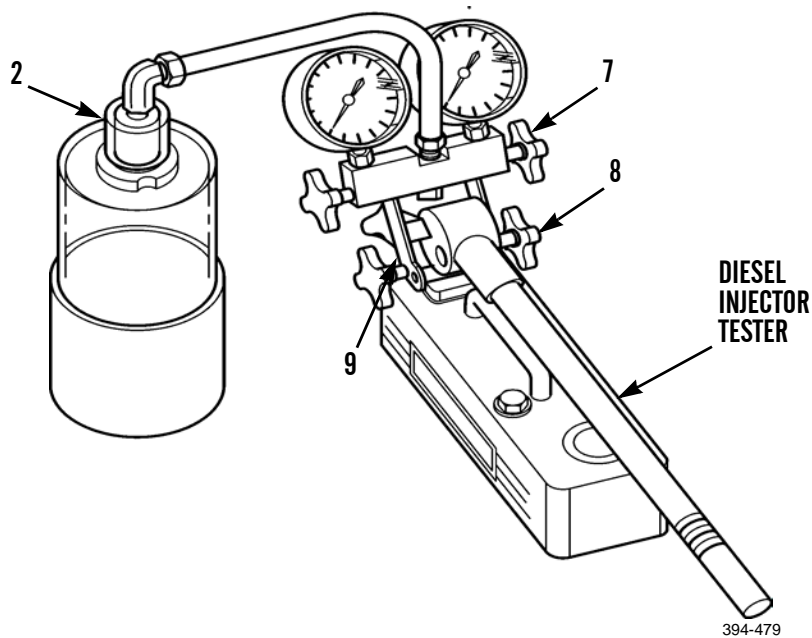
**TESTING - CONTINUED****NOTE**

Pressure may start to increase before there is any indication of clear test fluid. To correct this condition, tighten adapter.

4. Close on-off valve (8).
5. Open gage protector valve (7) and pump isolator valve (9) one-half turn each.
6. Bleed air from diesel injector tester. Loosen bottom of adapter (5). Operate pump until air bubbles are removed and clear test fluid flows past threads at top of adapter (5).
7. Test nozzle assembly (2) for pressure loss.
8. Open gage protector valve (7).
9. Close pump isolator valve (9).
10. Adjust gage protector valve (7) until pressure returns to 2,200 psi (15,168 kPa).
11. Read gage (6) after 30 seconds. Minimum pressure loss is 200 psi (1,379 kPa). Maximum pressure loss is 1,800 psi (12,411 kPa).
12. Replace nozzle assembly (2) if test indicates pressure loss outside 200 psi (1,379 kPa) and 1800 psi (12,411 kPa) limits. Continue testing only if pressure loss is within 200 psi (1,379 kPa) and 1,800 psi (12,411 kPa).
13. Test valve opening pressure.
14. Open pump isolator valve (9). Slowly increase pressure until test fluid flows through tip of nozzle assembly (2).
15. Read gage (6). Minimum valve opening pressure is 2,400 psi (16,547 kPa). Maximum valve opening pressure is 3,100 psi (21,374 kPa).
16. Replace nozzle assembly (2) if test indicates valve opening pressure outside 2,400 psi (16,547 kPa) and 3,100 psi (21,374 kPa) limits. Continue testing only if valve opening pressure is within 2,400 psi (16,547 kPa) and 3,100 psi (21,374 kPa).
17. Flush with test fluid.
18. Close gage protector valve (7) and on-off valve (8).
19. Open pump isolator valve (9). Operate pump three full strokes.
20. Clean nozzle assembly (2) and adapter (5). Wipe all test fluid off with clean cloth. Dry thoroughly.
21. Test tip leakage on nozzle assembly (2).

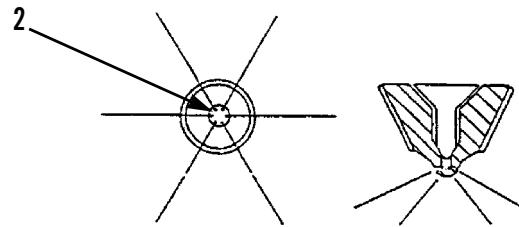
**TESTING - CONTINUED**

22. Open gage protector valve (7). Slowly increase pressure to 2,200 psi (1,517 kPa). A drop of test fluid may form but must not fall from tip of nozzle assembly (2).
23. Replace nozzle assembly (2) if test indicates more than one drop of fluid or if drop falls from tip of nozzle assembly (2). Continue testing only if tip leakage is within limits.
24. Test orifice restriction.
25. Close gage protector valve (7) and on-off valve (8).
26. Open pump isolator valve (9). Slowly increase pressure.

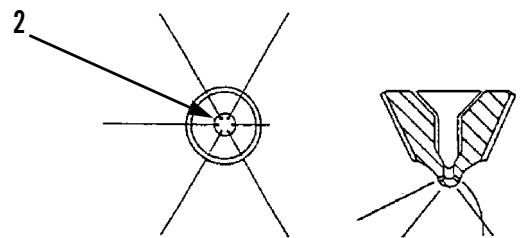


**TESTING - CONTINUED**

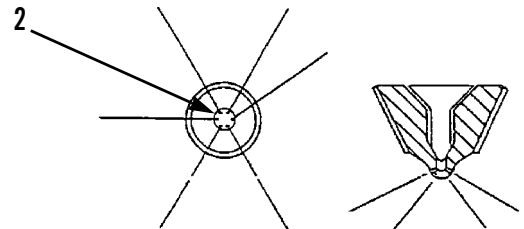
27. Observe discharge pattern of test fluid. Test fluid flow must be the same from all six orifices of tip of nozzle assembly (2).
28. Clean nozzle assembly (2) with test fluid. Remove any loose carbon.
29. Test orifice restriction.
30. If test indicates irregular test fluid flow after cleaning, replace.



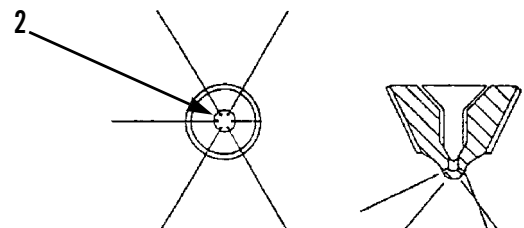
**GOOD NOZZLE  
(USE AGAIN)**



**TYPICAL DISCHARGE PATTERN FOR ORIFICE  
WITH A RESTRICTION  
(REPLACEMENT NECESSARY)**



**TYPICAL DISCHARGE PATTERN WITH  
HORIZONTAL DISTORTION  
(REPLACEMENT NECESSARY)**

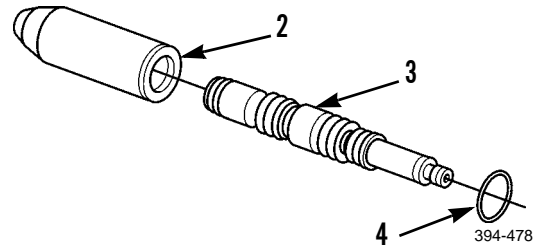


**TYPICAL DISCHARGE PATTERN WITH  
VERTICAL DISTORTION  
(REPLACEMENT NECESSARY)**

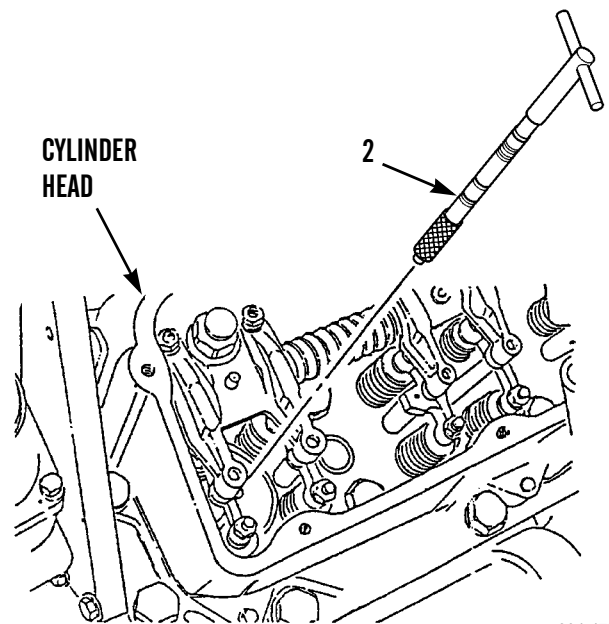
394-480

**INSTALLATION**

1. Use seal guide to install new seal (4) on valve body assembly (3).
2. Use clean diesel fuel to lubricate new seal (4).
3. Install nozzle (2) on valve body assembly (3). Hand tighten.



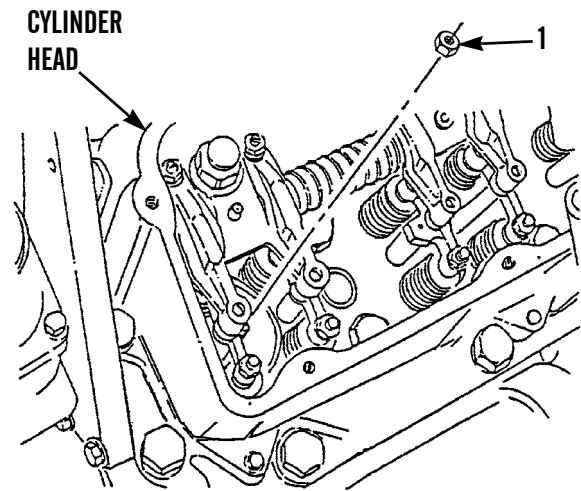
4. Install nozzle (2) assembly in cylinder head.



394-477

**INSTALLATION - CONTINUED**

5. Install nut (1) and tighten to 55 lb-ft (75 Nm).



394-476

6. Install valve cover and housing (WP 0021 00).
7. Install fuel injector lines (WP 0030 00).
8. Install engine hood (WP 0189 00).

**END OF WORK PACKAGE**



**FUEL INJECTION PUMP HOUSING AND GOVERNOR ASSEMBLY REPLACEMENT****0273 00****THIS WORK PACKAGE COVERS**

Removal, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 150 lb minimum capacity

**Materials/Parts**

Rag, wiping (Item 35, WP 0339 00)

Oil, Lubricating (Item 32, WP 0339 00)

Gasket

Packing, preformed (2)

**References**

WP 0030 00

WP 0036 00

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Crankcase guard removed (WP 0201 00)

Hood removed (WP 0180 00)

**REMOVAL****WARNING**

- 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.
- Wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.
- 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.

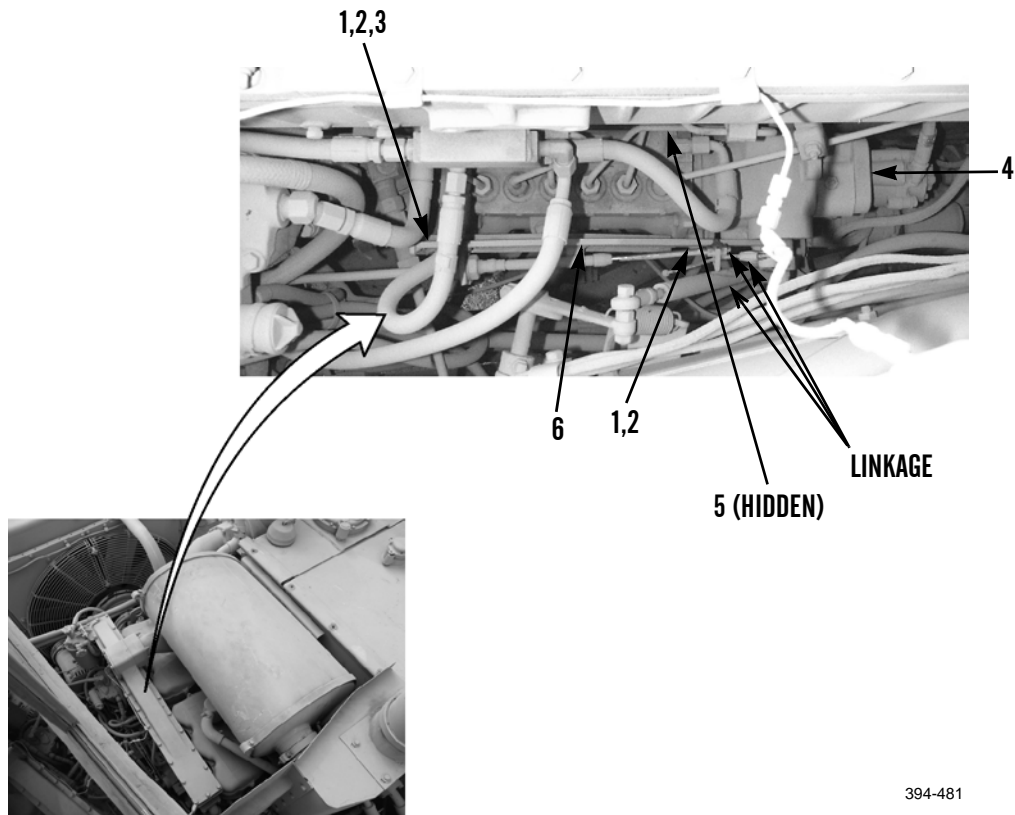
**NOTE**

Fuel injection pump and governor assembly weighs 55 lb (25 kg).

1. Disconnect fuel injection lines from housing (WP 0030 00).
2. Disconnect linkage from governor (WP 0036 00).

**REMOVAL - CONTINUED**

3. Attach lifting device to fuel injection pump housing and governor assembly (4).
4. Remove four bolts (1), washers (2), washer (3) and bracket (6) from pump housing and governor assembly (4).
5. Loosen bolt (5).

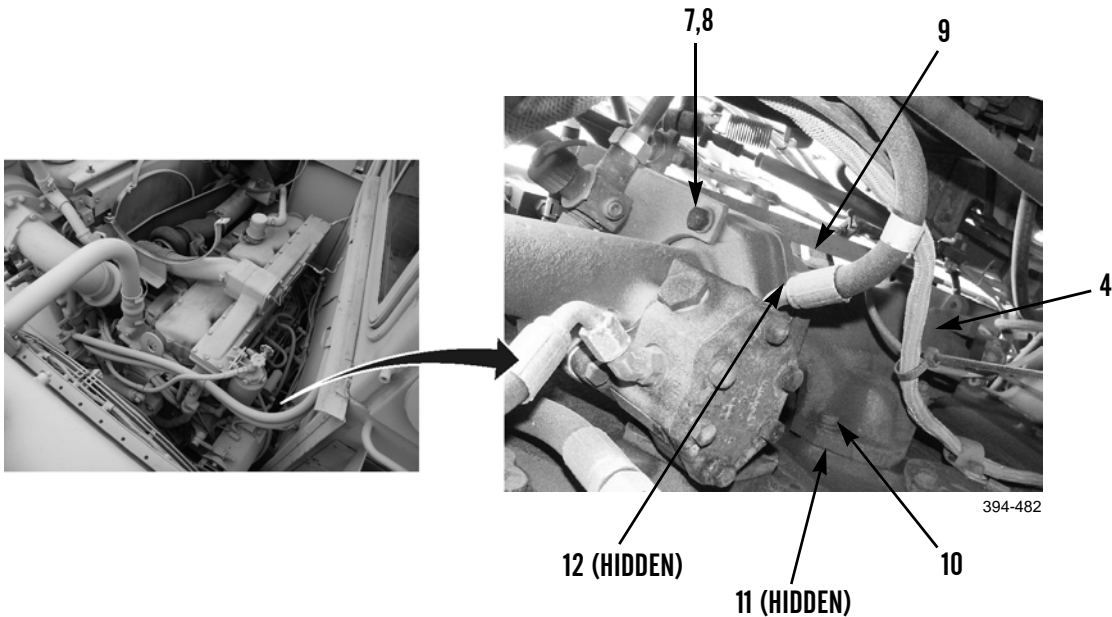


394-481



**REMOVAL - CONTINUED**

6. Remove five bolts (9) from pump housing and governor assembly (4).
7. Remove two bolts (10), preformed packing (11) and gasket (12) from governor drive. Discard gasket and preformed packings.
8. Remove bolt (5) which was loosened in step 5.
9. Remove fuel injection pump housing and governor assembly (4) from machine.

**INSTALLATION**

1. Attach lifting device to fuel injection pump housing and governor assembly (4).
2. Install new gasket (12), two new preformed packings (11), fuel injection pump housing and governor assembly (4) and two bolts (10) on machine.
3. Install five bolts (9) in pump housing and governor assembly (4).
4. Install washer (3), bracket (6), washers (2), four bolts (1) and bolt (5) on pump housing and governor assembly (4).
5. Connect linkage on governor (WP 0036 00).
6. Connect fuel injection lines on housing (WP 0030 00).
7. Start machine and verify normal operation of fuel system (TM 5-3805-248-10).
8. Shut down engine (TM 5-3805-248-10).
9. Inspect for fuel system leaks.
10. Install crankcase guards (WP 0201 00).
11. Install hood (WP 0180 00).

**END OF WORK PACKAGE**



---

**FUEL INJECTION PUMP HOUSING AND GOVERNOR ADJUSTMENT**

---

**0274 00****THIS WORK PACKAGE COVERS**Removal, Setting, Cleaning and Inspection, Installation, Testing, Adjustment

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Group, pickup (Item 34 WP 0338 00)

Pin, timing (Item 65, WP 0338 00)

Pinion turning tool (Item 67, WP 0338 00)

Prod, test (Item 80, WP 0338 00)

Tachometer, photo (Item 111, WP 0338 00)

Plate, steel 1/2 in. x 10 in. x 10 in.

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Gasket

**References**

WP 0021 00

WP 0031 00

WP 0041 00

WP 0104 00

WP 0189 00

WP 0201 00

WP 0273 00

WP 0278 00

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Hood and side panel removed (WP 0189 00)

Front valve cover removed (WP 0021 00)

Crankcase guard removed (WP 0201 00)

Muffler removed (WP 0041 00)

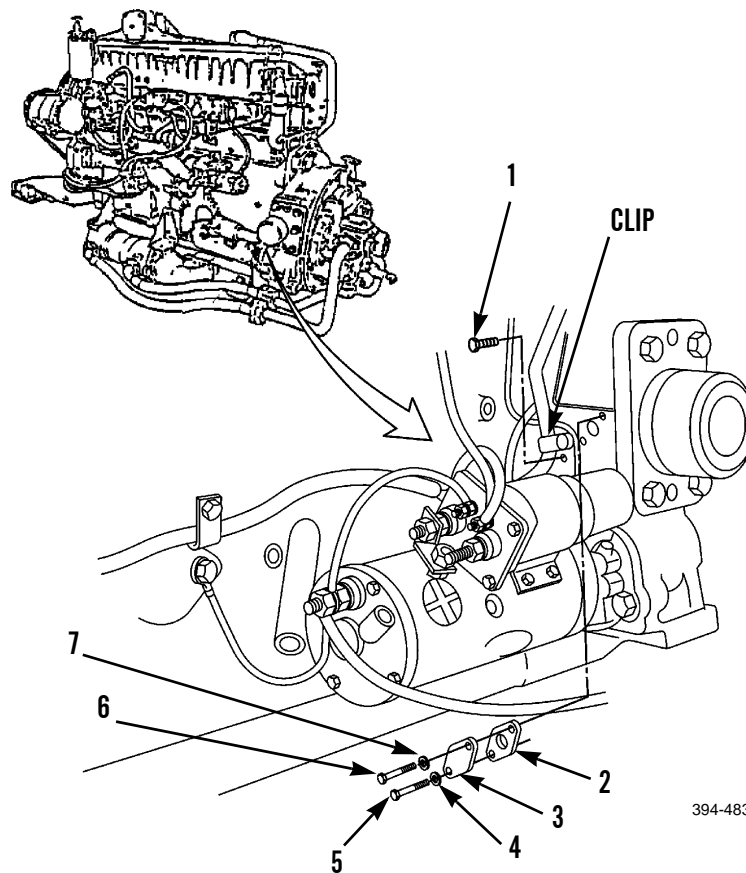
Automatic timing advance unit removed (WP 0278 00)

Wheels chocked

---

**REMOVAL**

1. Remove timing bolt (5), washer (4) and clip from left side of flywheel housing. Leave clip attached to harness.
2. Remove bolt (6), washer (7), cover (3) and gasket (2). Discard gasket.
3. Remove plug (1).

**SETTING**

1. Install engine turning tool through left side of flywheel housing until shoulder of engine turning tool is against flywheel housing. Engine pinion turning tool engages ring gear on flywheel housing.
2. Insert 1/2 in. (13 mm) ratchet in engine turning tool.
3. Position timing bolt (8) and locate against flywheel housing.

**NOTE**

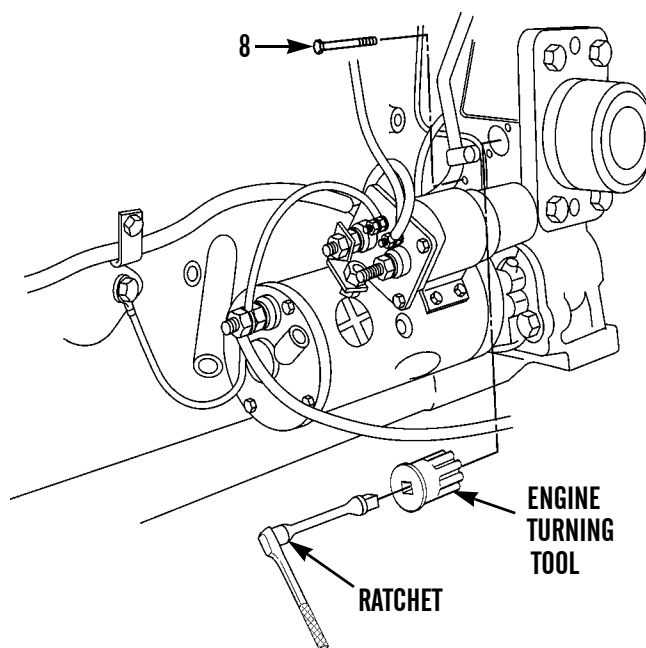
When direction of engine rotation is specified, engine is viewed from rear.

4. Rotate 1/2 in. (13 mm) ratchet on engine counterclockwise while holding timing bolt (8) in position and hand tighten. Stop turning when timing bolt (8) can be threaded into hole in flywheel housing.

## SETTING - CONTINUED

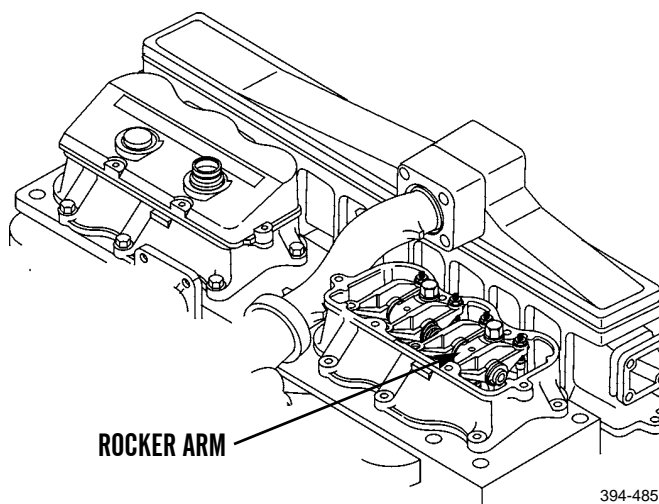
**NOTE**

If engine is turned past timing hole, rotate it clockwise 30 degrees, then repeat step 4.



394-484

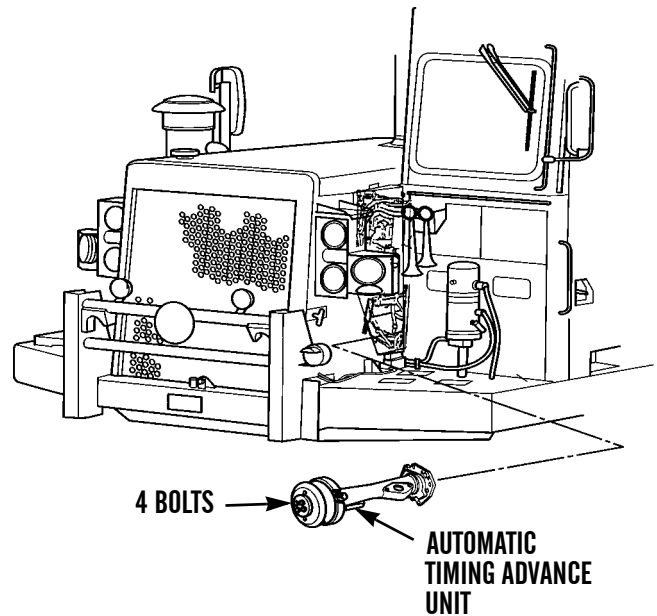
5. Pivot number 1 rocker arm up and down on shaft by hand. If number 1 rocker arm can be moved by hand, engine is in position for fuel injection pump timing (top center, number 1 piston compression stroke). Proceed to step 10. Complete step 9 if number 1 rocker arm cannot be moved by hand.
6. Remove timing bolt (8), then repeat steps 5 through 8.



394-485

**SETTING - CONTINUED**

7. Loosen four bolts on automatic timing advance unit and rotate counterclockwise two turns.

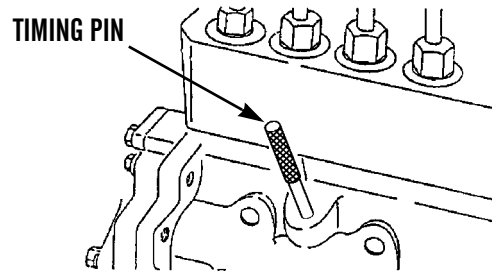


394-486

**NOTE**

If timing pin cannot be installed completely, turn automatic timing advance unit with bar until timing pin can be installed in fuel injection pump camshaft through hole in fuel injection pump housing.

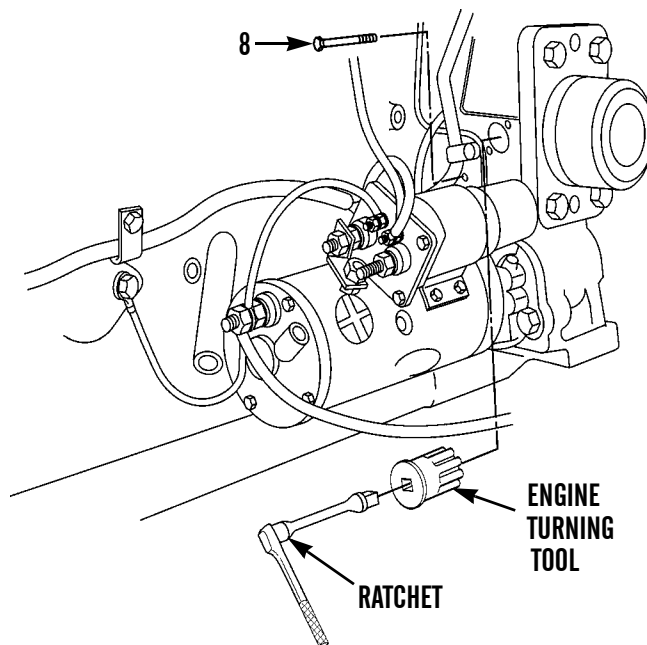
8. Install timing pin.
9. Remove timing bolt (8) from right side of flywheel housing.
10. Rotate 1/2 in. (13 mm) ratchet on engine turning tool clockwise approximately 60 degrees.
11. Hand tighten four bolts on automatic timing advance unit.
12. Rotate 1/2 in. (13 mm) ratchet on engine flywheel housing 60 degrees counterclockwise to top, center compression stroke, number 1 piston. Do not turn past timing hole alignment.
13. Install timing bolt (8).
14. Torque four bolts on automatic timing advance unit to 25 lb-ft (34 Nm).
15. Remove timing pin from fuel injection pump.



394-487

**SETTING - CONTINUED**

16. Torque four bolts on automatic timing advance unit once more to 50 lb-ft (68 Nm).
17. Remove timing bolt (8) from flywheel housing.
18. Rotate engine counterclockwise two complete revolutions.
19. Install timing bolt (8).
20. Install timing pin in notch of camshaft on fuel injection pump. If timing pin cannot be installed, repeat steps 10 through 20.
21. Remove timing pin.
22. Remove timing bolt (8) and engine turning tool from flywheel housing.



394-484

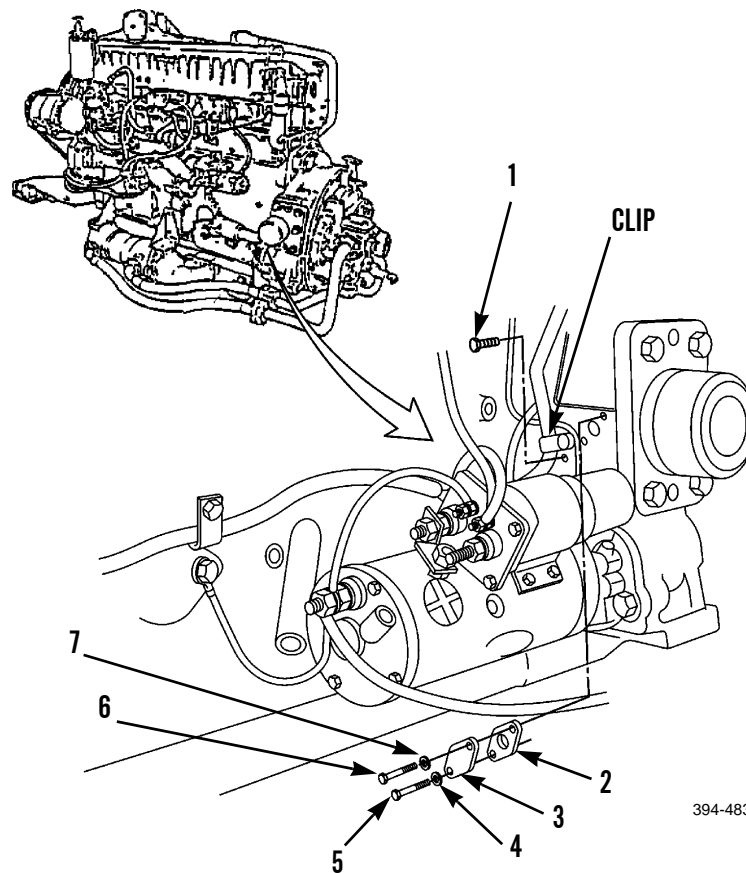
**CLEANING AND INSPECTION****WARNING**

- 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 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. Remove all gasket material from mounting surface.
2. Clean all parts with solvent cleaning compound.
3. Visually inspect parts for damage. Replace damaged parts as necessary.
4. Dry parts with compressed air.

**INSTALLATION**

1. Install front valve cover (WP 0021 00).
2. Install automatic timing advance unit (WP 0278 00).
3. Install plug (1) in flywheel housing.
4. Position new gasket (2) and cover (3) on flywheel housing.
5. Install washer (7) and bolt (6).
6. Install clip, washer (4) and timing bolt (5).
7. Remove bolt (6), washer (7), cover (3) and gasket (2). Discard gasket.
8. Remove plug (1).





**TESTING****CAUTION**

If any of the fuel injection pumps are installed wrong, the engine may over-speed (run out of control) when started. Adjustment steps 1 through 19 must be followed to check for over-speed condition. Failure to follow this procedure could result in damage to equipment.

1. Remove air cleaner pipe from air cleaner (WP 0031 00).
2. Attach injection line speed pickup group to fuel line from fuel injection pump following manufacturer's instructions.
3. Connect to multitach.
4. Connect battery negative ground cable to battery box (WP 0104 00).

**WARNING**

A thick steel plate placed over the turbocharger intake will stop engine if an over-speed condition exists. Due to excessive suction at intake, the plate will be pulled quickly toward the intake. Exercise care to make sure fingers are not crushed between plate and turbocharger intake. Failure to follow this procedure may cause injury.

5. Start engine (TM 5-3805-248-10).
6. With assistance, observe operation of turbocharger intake on engine. If engine accelerates out of control, place steel plate over turbocharger intake to stop engine.

**NOTE**

If over-speed condition is present, notify general support maintenance. If engine operates normally, proceed with step 7.

7. Stop engine (TM 5-3805-248-10).
8. Disconnect battery negative ground (WP 0104 00).
9. Install pipe on air cleaner (WP 0031 00).
10. Operate engine and verify correct operation of fuel system (TM 5-3805-248-10).

**ADJUSTMENT**

1. Connect battery negative ground to battery box (WP 0104 00).
2. With assistance, start and keep engine running until normal operating temperature is reached (TM 5-3805-248-10).

**WARNING**

Exercise care when working on engine while engine is running. Stay clear of all hot and moving parts. Instruct assistant not to engage transmission or hydraulic equipment and not to articulate vehicle. Failure to follow this procedure may cause injury. If you are injured, seek medical aid immediately.

**NOTE**

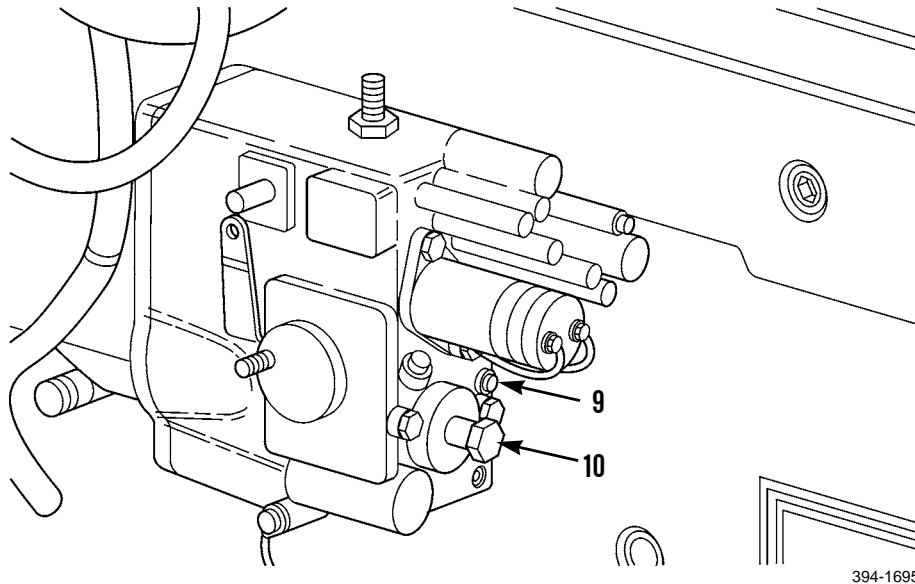
Engine speed is indicated on multitach.

3. Adjust low idle adjustment screw on governor assembly to an idle speed of 745 RPM to 905 RPM. Rotate clockwise to increase RPM.

**ADJUSTMENT - CONTINUED****NOTE**

Do not use the vehicle tachometer unless its accuracy is known to be within  $\pm 1$  RPM.

4. Connect a tachometer to the tachometer drive.

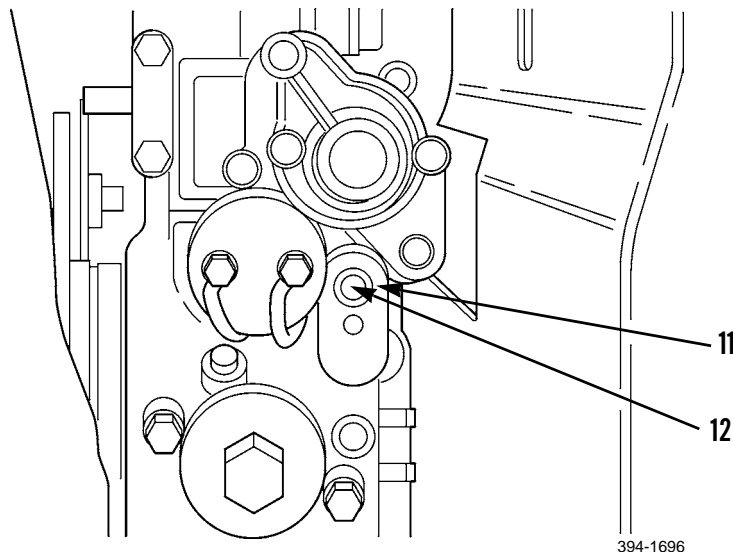


5. Connect the clip end of the circuit tester to the brass terminal screw (10) on the governor housing. Connect the other end of the tester to a good ground connection.

**WARNING**

Work carefully around an engine that is running. Engine parts that are hot, or parts that are moving. Wear eye protection when performing this tasks. Failure to follow this warning may result in injury or death.

6. Start engine (TM 5-3805-248-10).
7. With the engine at normal operating conditions, run the engine at high idle.
8. Record the speed of the engine at high idle.
9. Add load on engine slowly until circuit tester light just comes on (minimum light output). This is the set point.
10. Record the engine speed.
11. Shut down engine (TM 5-3805-248-10).
12. The set point should be 1910-1930 RPM and high idle RPM recorded previously should be 2259-2369 RPM. If these are in specification, no adjustment is needed. If the RPM recorded are out of specification in either case, repeat the following adjustment steps until both are in specification.
13. Remove cover (9).

**ADJUSTMENT - CONTINUED**

14. While engine is running at high idle, loosen locknut (11) and turn adjustment screw (12) to adjust the engine speed to 2300 RPM. If set is out of range, turn the screw in to raise it and out to lower it.
15. Repeat steps 5 through 12 to recheck set point. When the set point is correct, check the high idle RPM. The high idle RPM must not be more than 2360.
16. If the high idle RPM is more 2360, replace the injection pump housing and governor (WP 0273 00).
17. Shut down engine.
18. Disconnect battery negative ground from battery box (WP 0104 00).
19. Remove multitach and injection line speed pickup group from engine.

**CAUTION**

Follow manufacturer's instructions for removal of test equipment and repainting of fuel injector lines. Failure to follow this procedure may cause damage to equipment.

20. Install hood (WP 0189 00).
21. Install rear crankcase guard (WP 0201 00).
22. Install muffler (WP 0041 00).

**END OF WORK PACKAGE**



**FUEL TRANSFER PUMP MAINTENANCE**

0275 00

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance level**

Direct support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Tool, pump assembly, fuel transfer (Item 117, WP 0338 00)

Tool, pump assembly, fuel transfer (Item 118, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Gasket (2)

Packing, preformed (3)

Seal (2)

**References**

TM 5-3805-248-10

**Equipment Condition**

Fuel tank drained (WP 0034 00)

Hood removed (WP 0189 00)

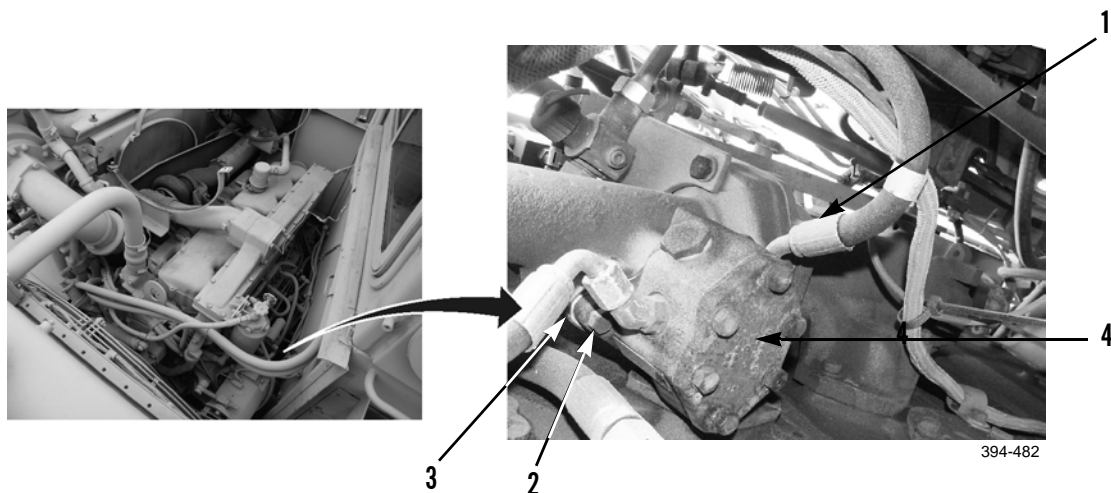
**WARNING**

- 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.
- Wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.

**REMOVAL****NOTE**

- Tag lines prior to removal to ensure correct installation.
- Use container to capture draining fuel. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.

1. Disconnect two lines (1) from fuel transfer pump (4).
2. Remove two bolts (2), securing fuel transfer pump (4) to fuel injection pump housing.
3. Remove fuel transfer pump (4).
4. Remove gasket (3) from fuel transfer pump (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.
- 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 cause 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. Remove all gasket material from mounting surface.
2. Clean all parts with solvent cleaning compound.
3. Visually inspect parts for damage. Replace damaged parts as necessary.
4. Dry parts with compressed air.

***INSTALLATION***

1. Position new gasket (3) on fuel transfer pump (4).
2. Position fuel transfer pump (4) on fuel injection pump housing.
3. Install two bolts (2) to secure fuel transfer pump (4) to fuel injector pump housing.
4. Connect two lines (1) to fuel injection pump housing.
5. Fill fuel tank to correct level (WP 0034 00).
6. Prime fuel system (TM 5-3805-248-10).
7. Install hood (WP 0189 00).
8. Operate machine, check for leaks and verify proper operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**





---

**TURBOCHARGER REPLACEMENT**

---

0276 00

**THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, anti-seize (Item 11, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket (3)

Packing, preformed (3)

**References**

TM 5-3805-248-10

**Equipment Condition**Turbocharger air piping removed (WP 0033 00)

---

**REMOVAL****CAUTION**

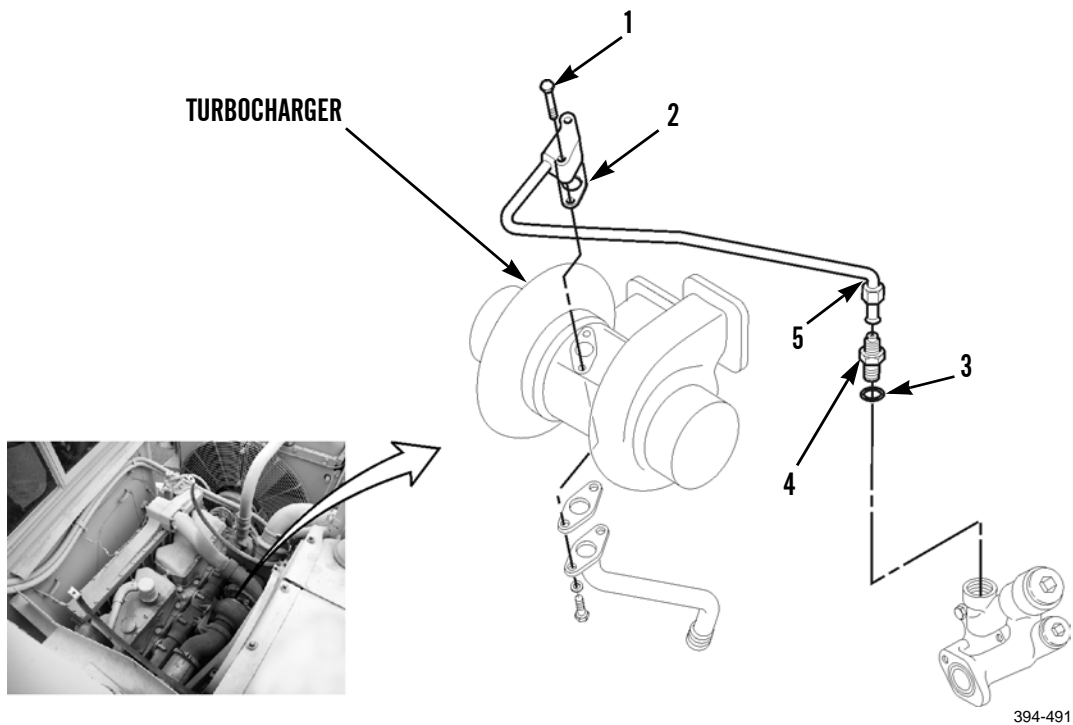
Wipe area clean around all connections to be opened during removal and disassembly. Cap oil lines and plug openings after removing lines. Contamination of engine lubrication system could result in premature failure.

**NOTE**

- Tag lines prior to removal to ensure correct installation.
- Use a container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

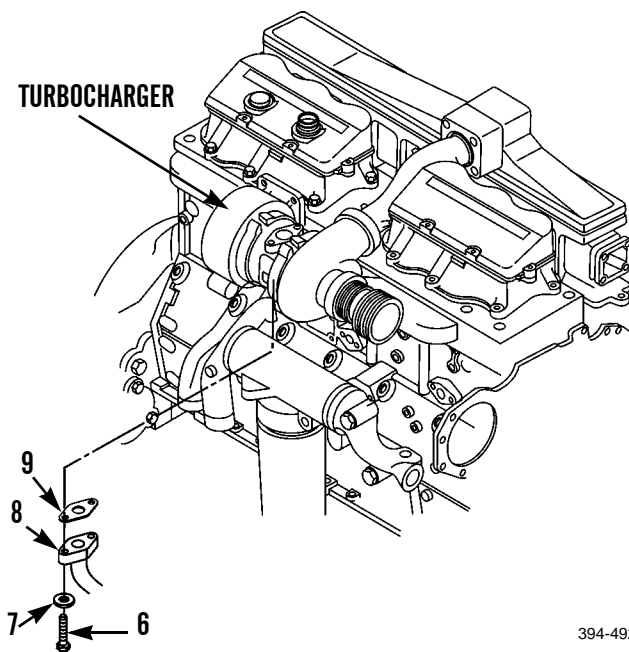
**REMOVAL - CONTINUED**

1. Remove two bolts (1) from top of turbocharger.
2. Disconnect tube assembly (5) from connector (4).
3. Remove and discard gasket (2) from turbocharger.
4. Remove tube assembly (5) from engine oil filter base adapter.
5. Remove connector (4) and preformed packing (3). Discard preformed packing.



**REMOVAL - CONTINUED**

6. Remove two bolts (6) and washers (7) from tube assembly (8) under turbocharger.
7. Disconnect tube assembly (8) from turbocharger.
8. Remove gasket (9). Discard gasket.



9. Remove bolt (14) and washer (15) from turbocharger.
10. Remove four nuts (11) from right side of engine.
11. Support turbocharger.



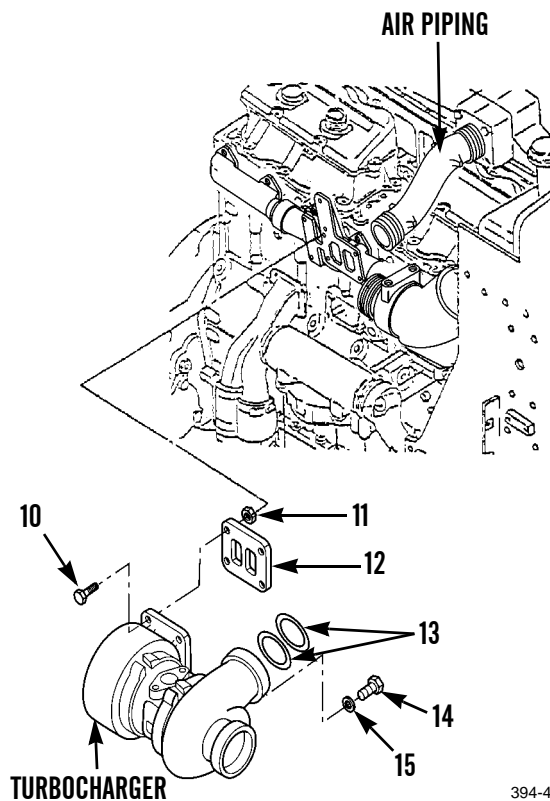
**WARNING**

Lifting cables, chains, hooks, and slings used for lifting machine must be in good condition and of suitable capacity. Failure to follow this warning may result in injury or death to personnel and damage to equipment.

**NOTE**

The weight of the turbocharger is 40 lb (18 kg).

12. Remove four bolts (10) and turbocharger.
13. Remove gasket (12) and two preformed packings (13). Discard gasket and preformed packings.



**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 cause 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. Remove all gasket material from mounting surfaces.
  2. Clean all parts with solvent cleaning compound.
  3. Dry all parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

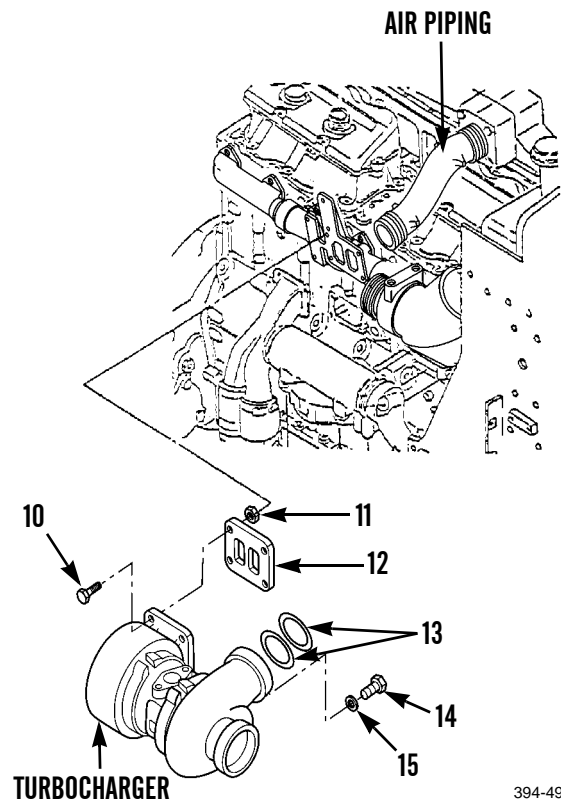
**INSTALLATION****NOTE**

Make sure that oil can flow freely through the oil supply and oil drain lines. There should be no kinks, obstructions or clogs in the line.

1. Use clean oil to lubricate bore on turbocharger.
2. Install two new preformed packings (13) on air piping.
3. Install new gasket (12) and turbocharger. Slide turbocharger onto air piping.
4. Use anti-seize compound to lubricate four bolts (10) and nuts (11) and install loosely.
5. Install washer (15) and bolt (14) to turbocharger.

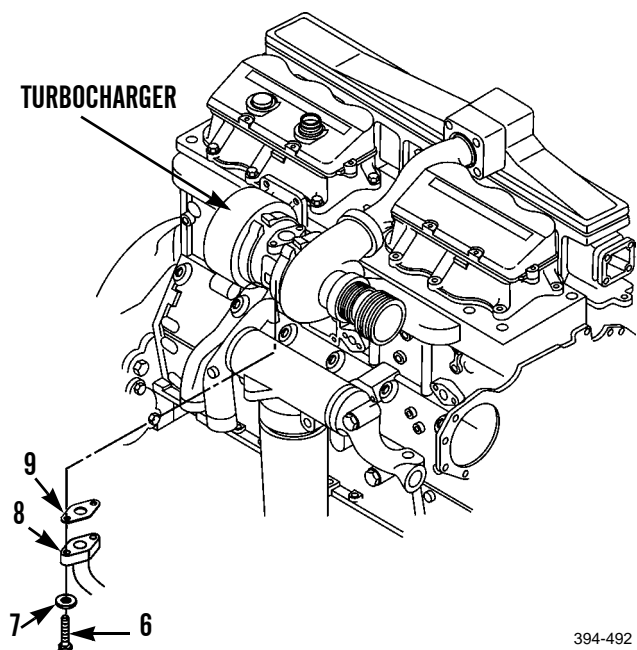
**INSTALLATION - CONTINUED**

6. Tighten four bolts (10) and nuts (11).



394-493

7. Install new gasket (9) on bottom of turbocharger.
8. Connect tube assembly (8) to turbocharger.
9. Install two washers (7) and bolts (6).

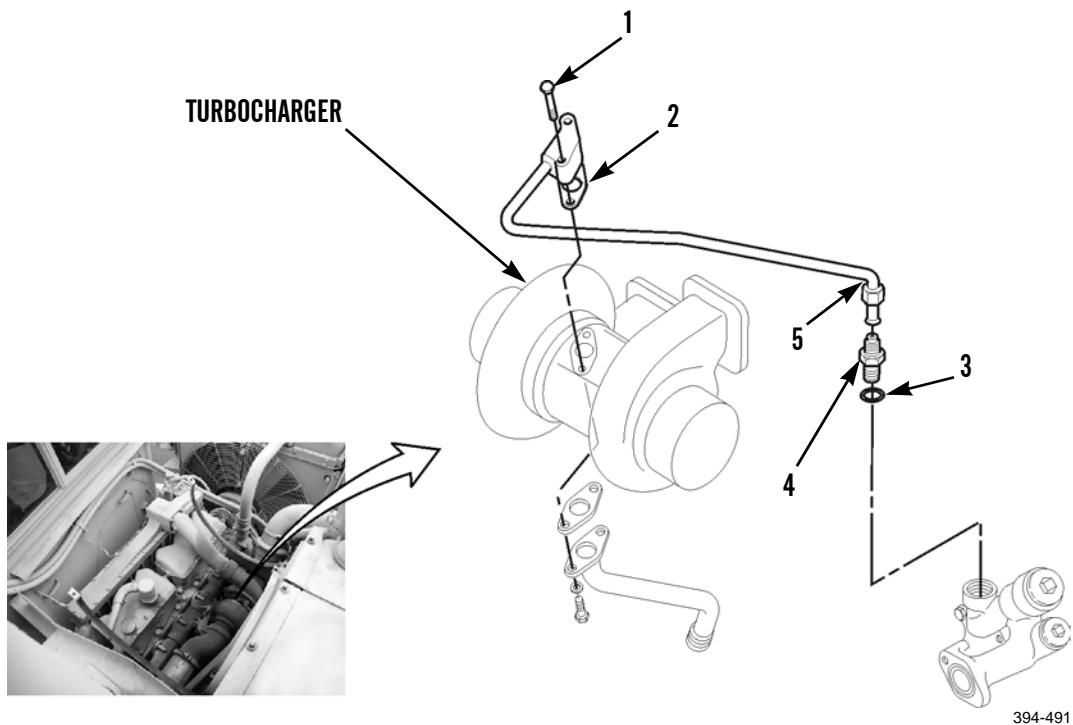


394-492

**INSTALLATION - CONTINUED****CAUTION**

Step 4 helps prevent dry operation of turbocharger. Failure to perform step 4 may cause damage to equipment.

10. Pour clean oil into oil inlet opening. Spin turbocharger by hand and refill inlet port.
11. Install new preformed packing (3) and connector (4) in engine oil filter base adapter.
12. Install tube assembly (5) loosely.
13. Install new gasket (2) on top of turbocharger.
14. Connect tube assembly (5) to turbocharger.
15. Install two bolts (1) to turbocharger.
16. Tighten tube assembly nut on connector (4) at engine oil filter base adapter.



17. Install turbocharger air piping (WP 0033 00).
18. Operate engine for four minutes and verify correct operation of turbocharger (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**AFTERCOOLER REPLACEMENT****0277 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 150 lb (68 kg) minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, sealing (Item 10, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Tag, marker (Item 42, WP 0339 00)

Gasket (8)

**References**

WP 0047 00

TM 5-3805-248-10

**Equipment Condition**

Coolant drained (WP 0042 00)

Coolant filter and brackets removed (WP 0051 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.

**CAUTION**

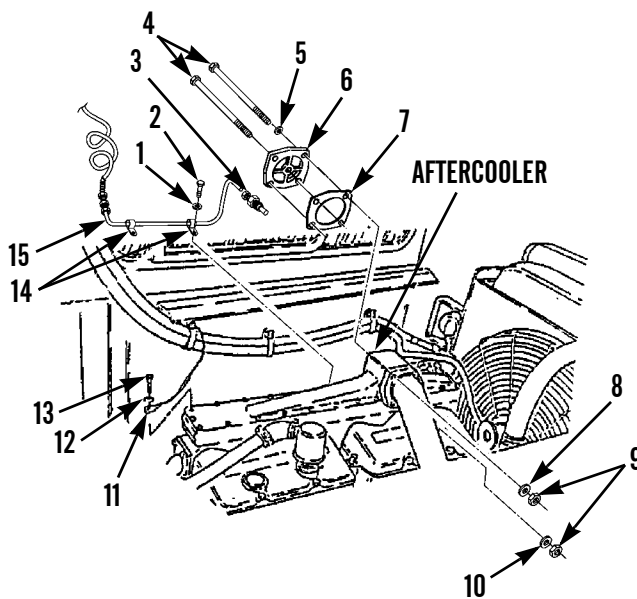
Wipe area clean around all connections to be opened during removal and disassembly. Cap oil lines and plug openings after removing lines. Contamination of engine lubrication system could result in premature failure.

**NOTE**

- Aftercooler weighs 95 lb (43 kg).
- Tag lines prior to removal to ensure correct installation.
- Use container to capture draining fluids. Dispose of fluids IAW local policy and ordinances. Ensure all spills are cleaned up.

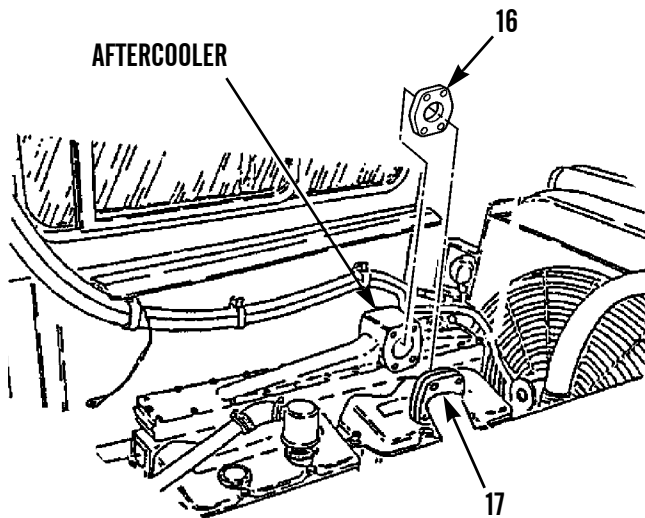
**REMOVAL - CONTINUED**

1. Remove bolt (13) and washer (12) from rear left side of aftercooler.
2. Disconnect wire connector (11) from aftercooler.
3. Remove two bolts (2) and washers (1) from tube assembly (15) and mounting clips (14).
4. Disconnect tube assembly (15) from atomizer (3).
5. Remove atomizer (3) from aftercooler.
6. Remove four nuts (9), three washers (10), washer (8), four bolts (4) and washers (5) from top, right side of aftercooler.
7. Use soft-face hammer to loosen and remove cover (6) and gasket (7). Discard gasket.



394-494

8. Disconnect aftercooler water line (WP 0047 00) from aftercooler.
9. Use soft-face hammer and loosen adapter (17) from aftercooler.
10. Remove adapter (17) and gasket (16). Discard gasket.

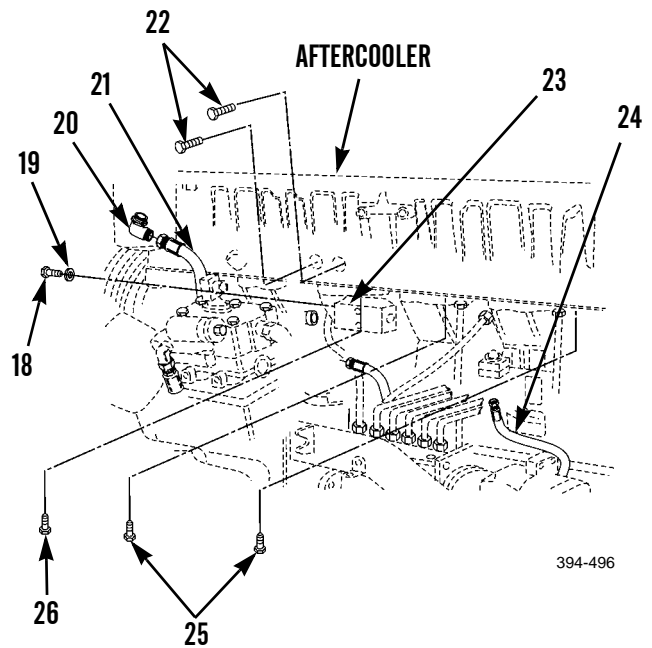


394-495



**REMOVAL - CONTINUED**

11. Disconnect hose assembly (21) from elbow (20).
12. Remove elbow (20) from aftercooler.
13. Remove two plugs (22) on left side of aftercooler and drain.
14. Remove two bolts (18) and washers (19) from under center left side of block and hose assembly (23).
15. Disconnect block and hose assembly (23) and position away from aftercooler. Hose assemblies can remain connected to block.
16. Disconnect hose assembly (24) from under rear left side of aftercooler.
17. Remove bolt (26) and nine bolts (25) from mounting ports of cylinder head under left side of aftercooler.



394-496

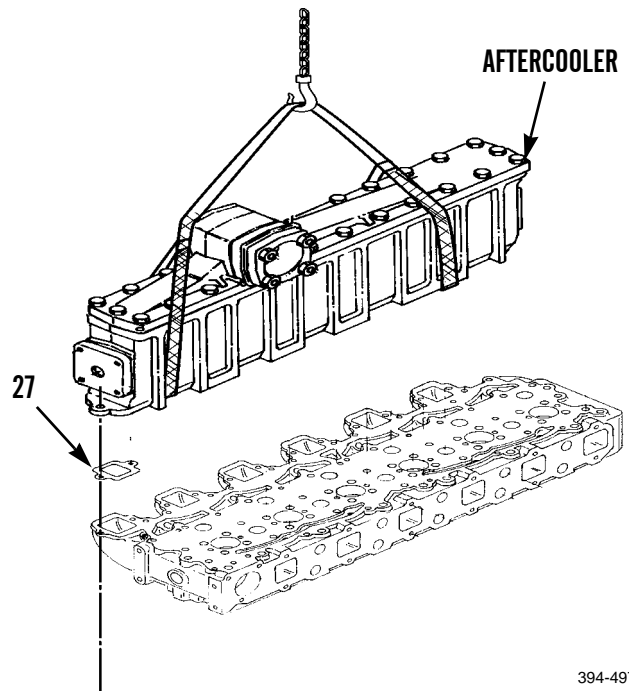
**REMOVAL - CONTINUED****WARNING**

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 aftercooler assembly is 95 lb (43 kg).

18. Install lifting device to aftercooler.
19. Remove aftercooler. Do not lay machined surfaces on unprotected surface.
20. Remove and discard six gaskets (27).



394-497

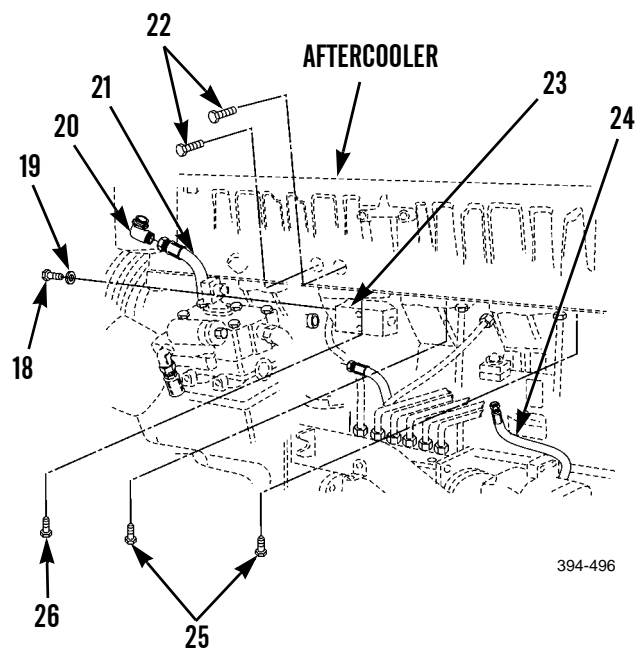
**CLEANING AND INSPECTION****WARNING**

- 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 cause 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. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.
5. Ensure aftercooler is completely free of solvent to prevent engine over speed at start-up.

**INSTALLATION**

1. Position six new gaskets (27) on left side of cylinder head.
2. Use lifting device to position aftercooler on machine.
3. Remove lifting device.
4. Apply sealing compound to nine bolts (25) and bolt (26) and install.
5. Connect hose assembly (24) under rear left side of aftercooler.
6. Position block and hose assembly (23) under left side of aftercooler.
7. Install two washers (19) and bolts (18) to block and hose assembly (23).
8. Install two plugs (22) on aftercooler.
9. Install elbow (20) on aftercooler.



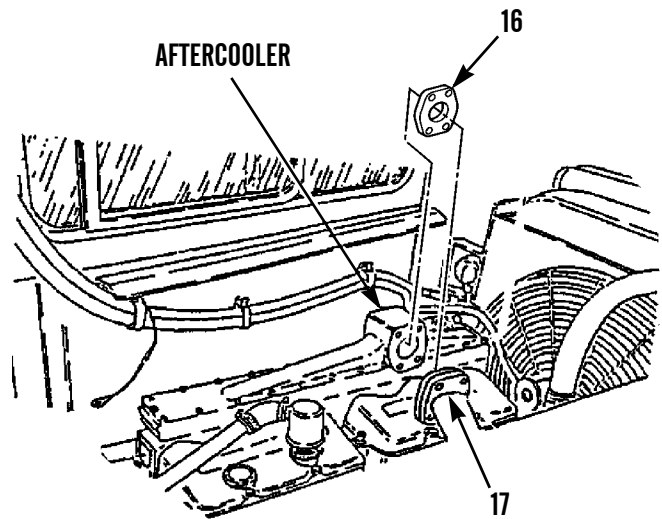
394-496

**AFTERCOOLER REPLACEMENT - CONTINUED**

0277 00

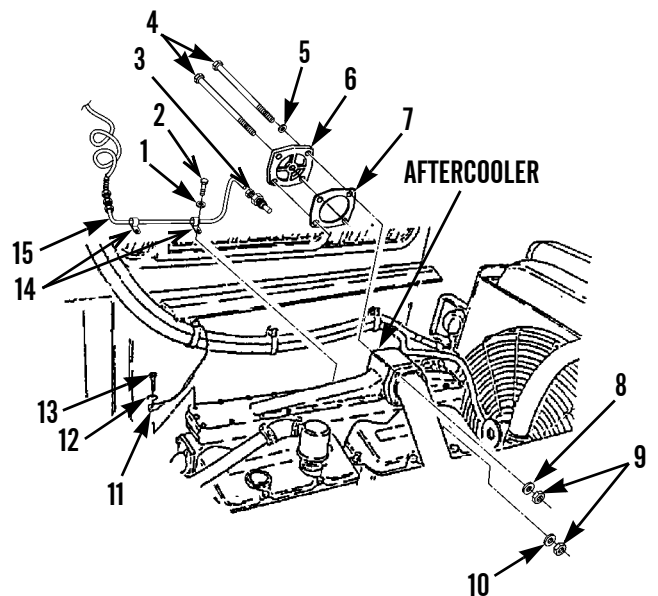
**INSTALLATION - CONTINUED**

10. Install new gasket (16) and adapter (17) on aftercooler.
11. Connect aftercooler water lines (WP 0047 00).



394-495

12. Install new gasket (7) and cover (6) on aftercooler.
13. Install four washers (5) and bolts (4) to cover (6) and adapter (17).
14. Install washer (8), three washers (10) and four nuts (9) on top right side of aftercooler.
15. Install atomizer (3) in cover (6).
16. Connect tube assembly (15) on atomizer (3).
17. Position two mounting clips (14) on tube assembly (15) and aftercooler.
18. Install two washers (1) and bolts (2) on tube assembly (15) and aftercooler.



394-494

***INSTALLATION - CONTINUED***

19. Connect wire connector (11).
20. Install washer (12) and bolt (13) to top rear left side of aftercooler.
21. Install coolant filter and brackets (WP 0051 00).
22. Refill radiator to correct level (WP 0042 00).
23. Inspect all hose connections and mounting for leaks.
24. Start machine and verify normal operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**AUTOMATIC TIMING ADVANCE UNIT MAINTENANCE**

---

**0278 00****THIS WORK PACKAGE COVERS**Setting, Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Pin, timing (Item 65, WP 0338 00)

Pinion turning tool (Item 67, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Sealing compound (Item 39, WP 0339 00)

Gasket

**References**

WP 0010 00

WP 0201 00

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

Engine shut down (TM 5-3805-248-10)

Bowl lowered to the ground (TM 5-3805-248-10)

Battery disconnect switch in OFF position (TM 5-3805-248-10)

Hood removed (WP 0189 00)

---

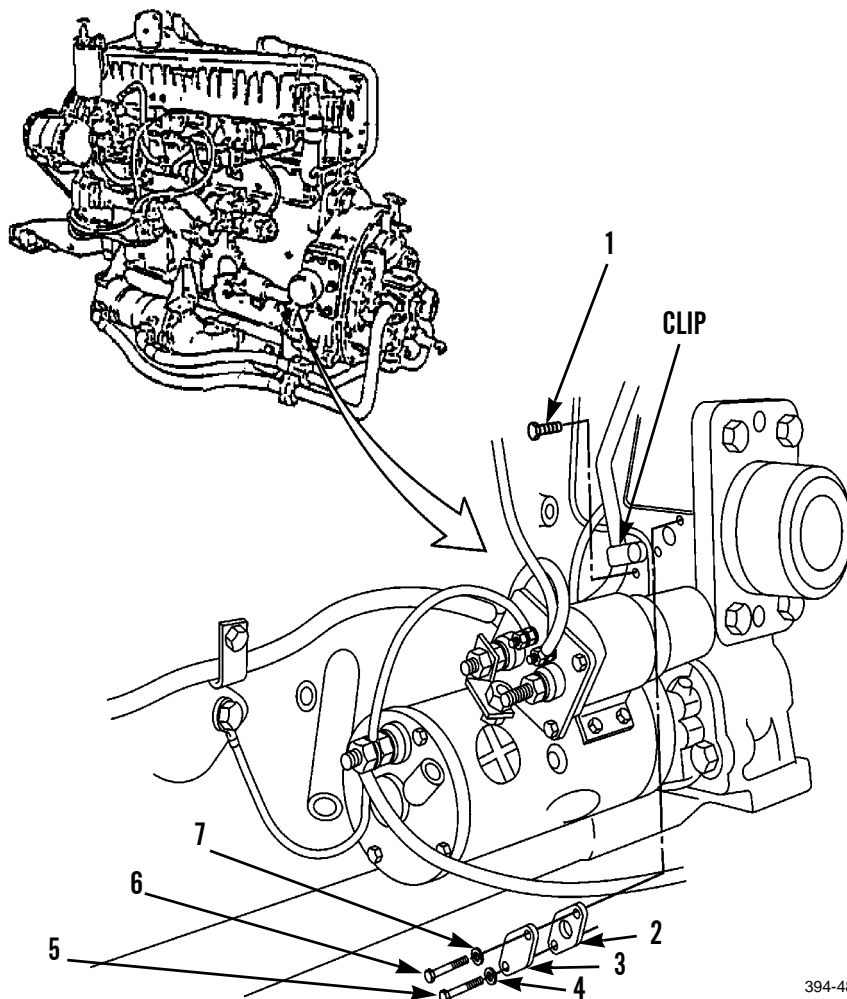
**SETTING**

1. Remove crankcase guard (WP 0201 00).
2. Set number one piston in top, center compression position.

**NOTE**

The following is a procedure for installing timing bolt in left side of engine to set number one piston in top, center compression position. Timing bolt may also be installed in right side of engine. Two threaded timing bolt holes in flywheel housing are at different distances from center and will only align with correct hole in flywheel housing.

3. Remove timing bolt (5), washer (4) and clip from left side of flywheel housing. Leave clip attached to harness.
4. Remove bolt (6), washer (7), cover (3) and gasket (2). Discard gasket.
5. Remove plug (1) from flywheel housing.
6. Install engine turning tool in left side of flywheel housing until shoulder of engine is against flywheel housing.
7. Attach 1/2 in. (13 mm) ratchet to engine turning tool.



394-483

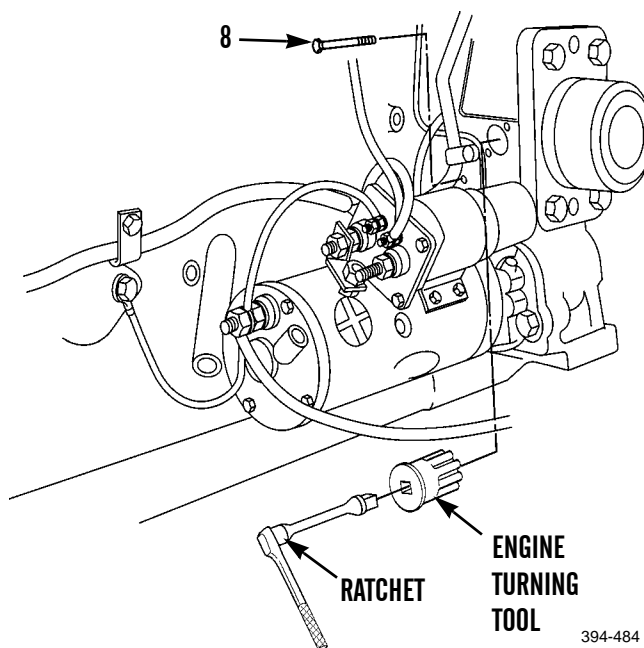


## SETTING - CONTINUED

**NOTE**

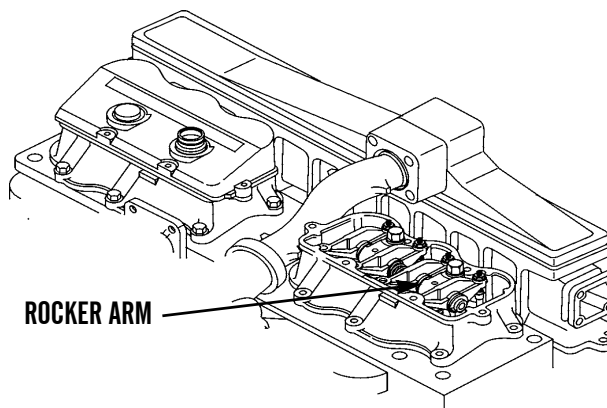
Normal engine rotation is counterclockwise. If flywheel housing is not turned in direction of normal engine rotation, or if it is turned past threaded timing bolt hole, rotate flywheel housing clockwise approximately 30 degrees. This is to remove any play in timing gears when engine is put on top center.

8. Position timing bolt (8) and locate against flywheel housing where plug (1) was removed.
9. Rotate 1/2 in. (13 mm) ratchet on engine counterclockwise while holding timing bolt (8) in position and hand tighten. Stop turning when timing bolt (8) can be threaded into hole in flywheel housing.
10. Install timing bolt (8).
11. Check number one piston setting. Number one piston should be at top center of compression stroke.



394-484

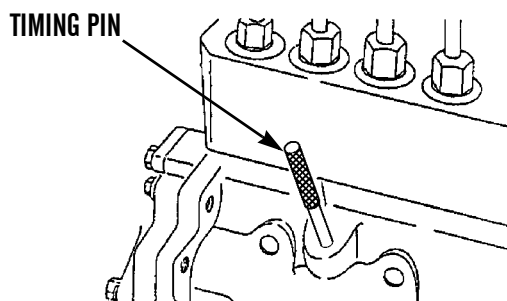
12. Remove front valve cover (WP 0010 00).
13. Check number one cylinder. If number one cylinder is on the compression stroke, valves will be closed.
14. Test rocker arm. With valves closed, rocker arm can be moved by hand. If rocker arm cannot be moved, rotate flywheel housing 360 degrees and repeat steps 9 and 11.



394-485

**SETTING - CONTINUED**

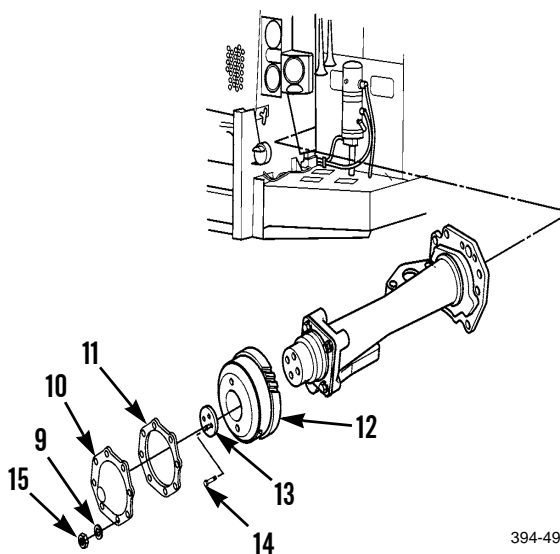
15. Install timing pin through hole in fuel injection pump housing and slot in camshaft.



394-487

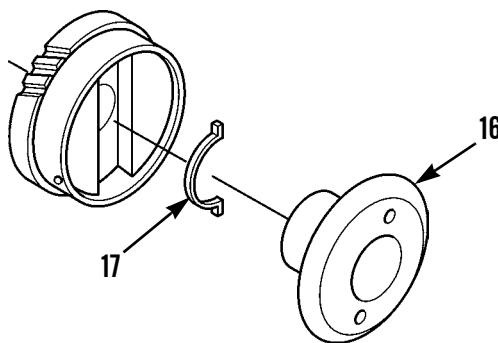
**REMOVAL**

1. Remove eight nuts (15) and washers (9) from left side of engine.
2. Remove cover (10) from engine.
3. Remove and discard gasket (11).
4. Remove four bolts (14) and retainer (13) from tap gear assembly (12).
5. Use a soft-faced hammer to loosen tap gear assembly (12), then remove.



394-498

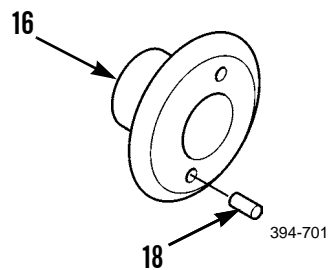
6. Remove ring (17) and flange assembly (16).



394-499

**REMOVAL - CONTINUED**

7. Remove two dowels (18) from flange (16).



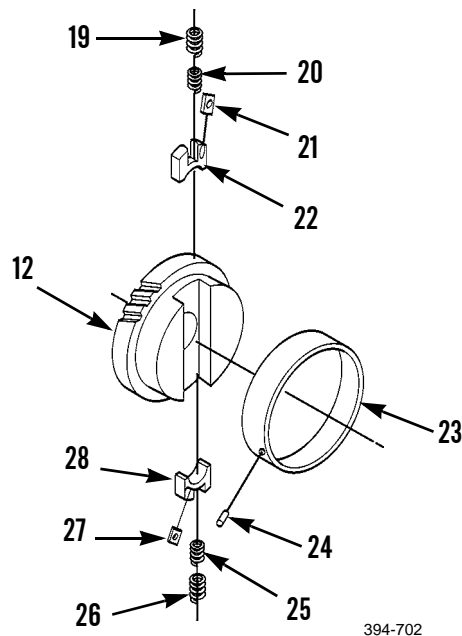
8. Remove dowel (24) from ring (23).
9. Remove ring (23) from tap gear (12).



**WARNING**

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

10. Remove outer spring (19) and inner spring (20) from tap gear assembly (12).
11. Remove weight (22) and slide (21) from tap gear assembly (12).
12. Remove outer spring (26) and inner spring (25) from tap gear assembly (12).
13. Remove weight (28) and slide (27) from tap gear assembly (12).





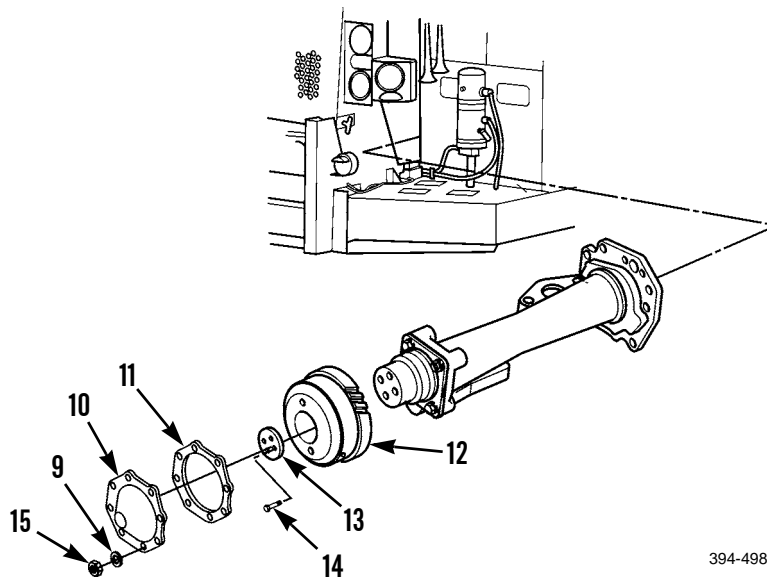
**INSTALLATION - CONTINUED**

7. Install inner spring (20) and outer spring (19).
8. Install ring (23) and dowel (24) on flange (16).
9. Install gear (12) on flange (16).
10. Install ring (17) on tap gear assembly (12).
11. Position gear (12) assembly on governor and fuel pump drive housing, aligning bolt holes.
12. Install retainer (13) from tap gear assembly (12).

**NOTE**

Coat threads of bolts with sealing compound.

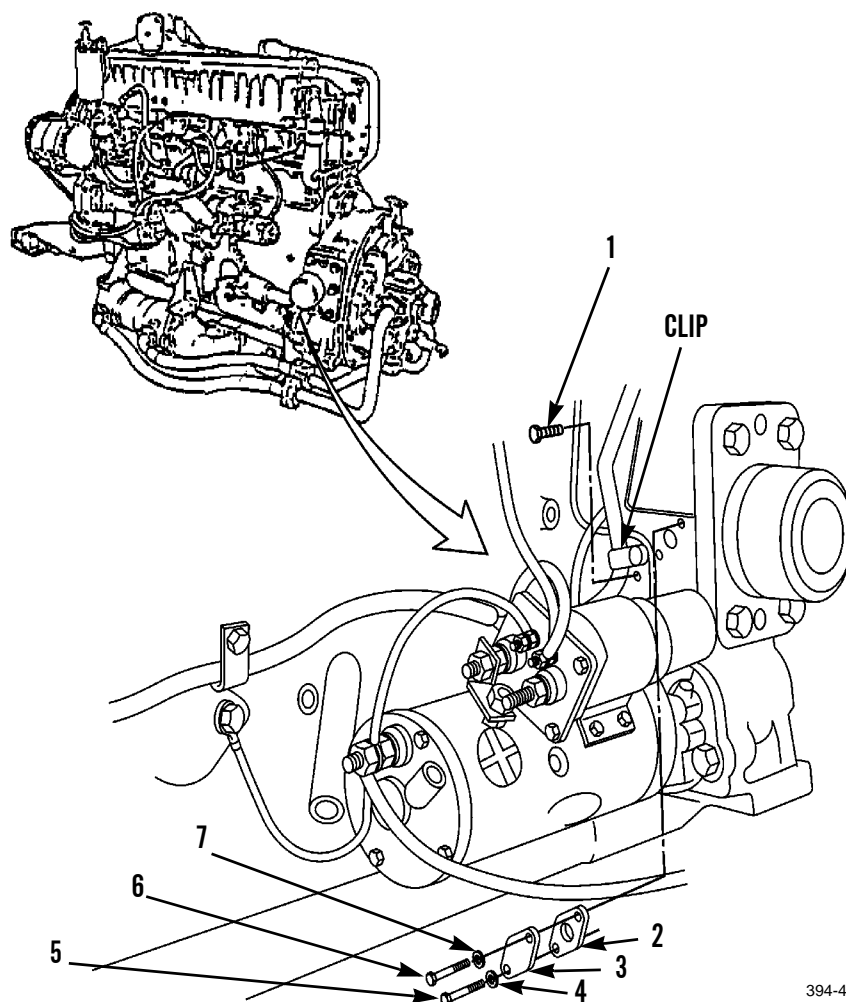
13. Install four bolts (14) on retainer (13) and tighten to 25 lb-ft (34 Nm).
14. Remove timing pin from fuel injection pump housing.
15. Tighten four bolts (14) evenly to 50 lb-ft (68 Nm) and then to 100 lb-ft (136 Nm).
16. Install new gasket (11) and cover (10) to engine.
17. Install eight washers (9) and nuts (15) to cover (10).



394-498

**INSTALLATION - CONTINUED**

18. Remove timing bolt (8) from flywheel housing.
19. Install plug (1) to flywheel housing.
20. Install new gasket (2) and cover (3).
21. Install washer (4) and timing bolt (5).
22. Install clip, washer (7) and bolt (6).
23. Install valve cover (WP 0010 00).



394-483

24. Operate engine and verify correct operation (TM 5-3805-248-10).
25. Shut down engine (TM 5-3805-248-10).
26. Install hood (WP 0189 00).
27. Install engine compartment shields (WP 0201 00).

**END OF WORK PACKAGE**

---

**FUEL PUMP DRIVE REPLACEMENT**

**0279 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed

Gasket (4)

**References**

TM 5-3805-248-10

**Equipment Condition**

Tachometer drive removed (WP 0332 00)

Fuel injector pump housing and governor removed (WP 0273 00)

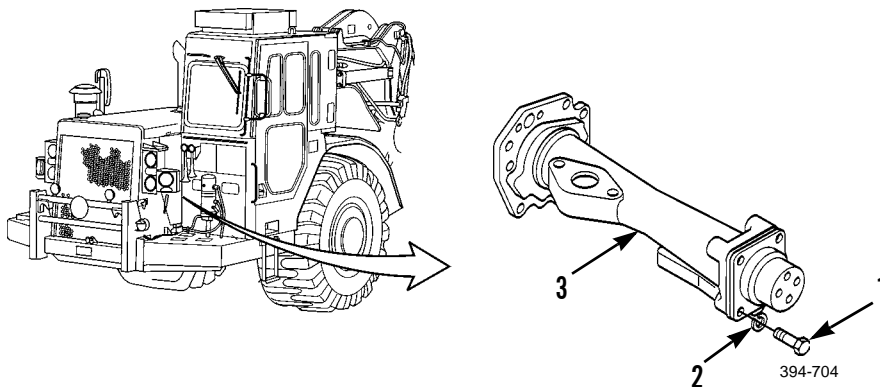
Fuel transfer pump removed (WP 0275 00)

Automatic timing advance unit removed (WP 0278 00)

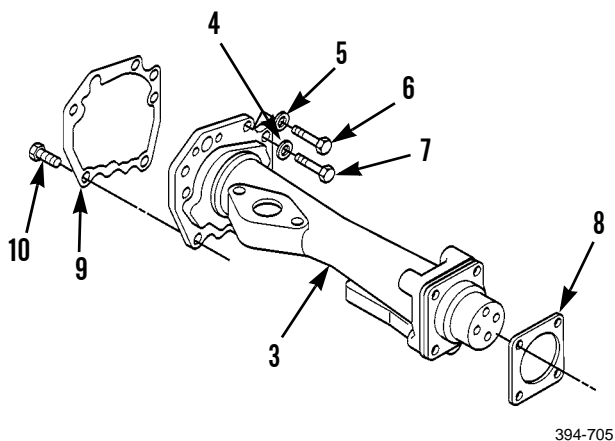
---

**REMOVAL**

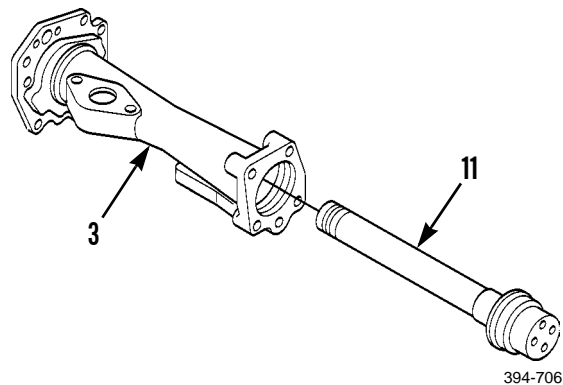
1. Remove four bolts (1), washers (2) and housing (3) assembly from front right side of engine.



2. Remove two bolts (6) and washers (5) from housing assembly (3).
3. Remove bolt (7) and washer (4) from housing assembly (3).
4. Remove two bolts (10) and gasket (9) from housing assembly (3). Discard gasket.
5. Remove retainer (8) from housing assembly (3).
6. Remove housing (3) assembly from machine.



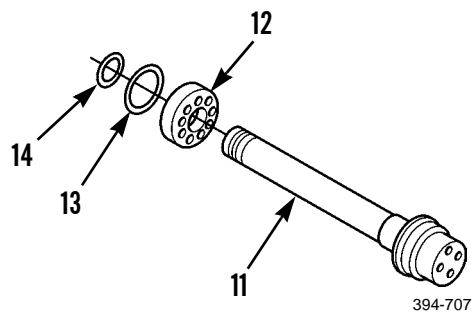
7. Remove shaft (11) assembly from housing (3) assembly.



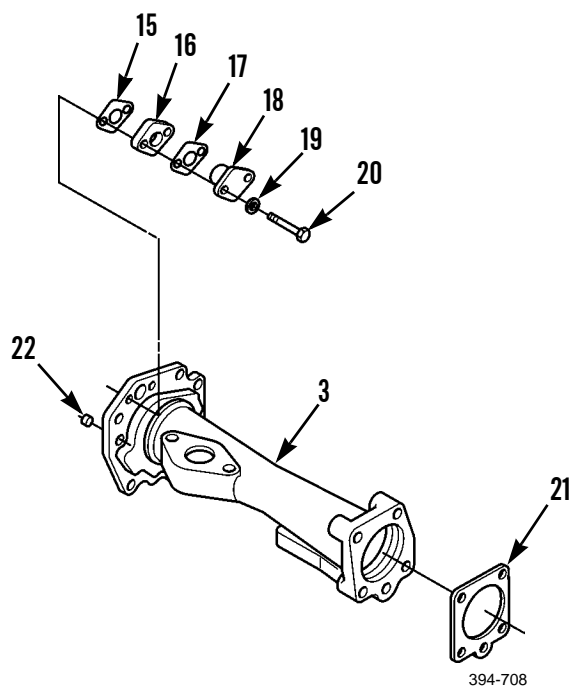


**REMOVAL - CONTINUED**

8. Remove preformed packing (14), ring (13) and bearing (12) from shaft (11). Discard preformed packing.



9. Remove and discard gasket (21).
10. Remove two bolts (20) and washers (19) from housing assembly (3).
11. Remove stop (18), gasket (17), spacer (16) and gasket (15) from housing assembly (3). Discard gaskets.
12. Remove two dowels (22) from housing assembly (3).

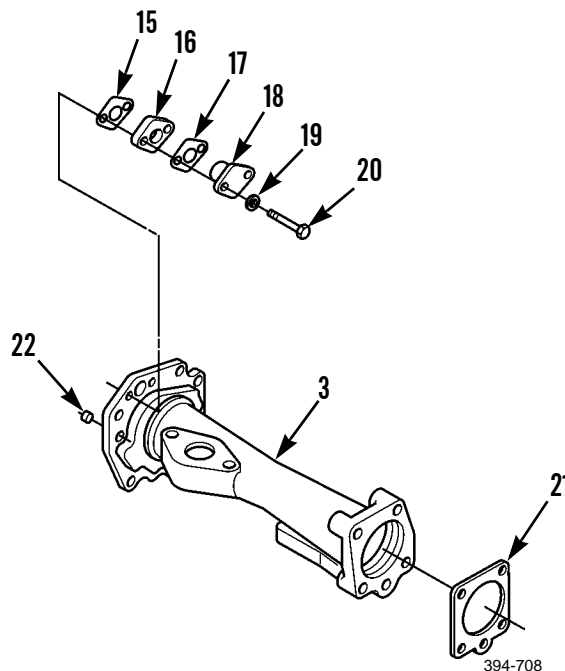


**CLEANING AND INSPECTION****WARNING**

- 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 cause 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. Remove all gasket material from mounting surface.
  2. Clean all parts with solvent cleaning compound.
  3. Visually inspect parts for damage. Replace damaged parts as necessary.
  4. Dry parts with compressed air.

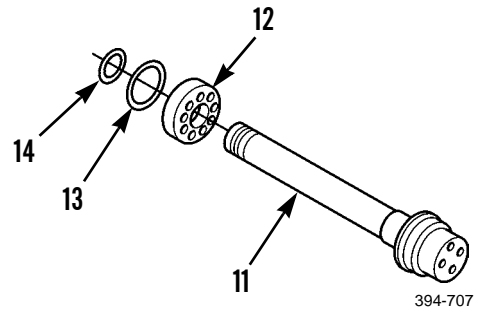
**INSTALLATION**

1. Install two dowels (22) in housing (3) on housing assembly.
2. Install new gasket (15) and spacer (16) on housing assembly (3).
3. Install new gasket (17) and stop (18) on housing assembly (3).
4. Install two washers (19), bolts (20) and gasket (21) on housing assembly (3).

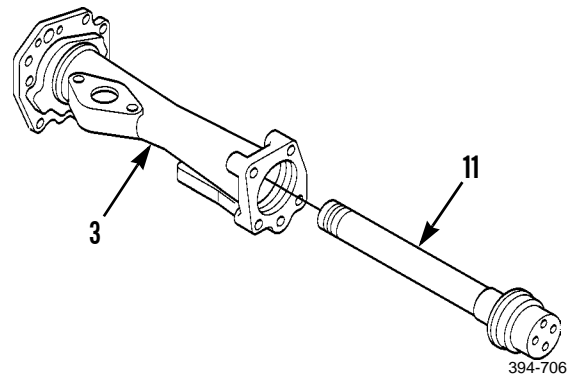


**INSTALLATION - CONTINUED**

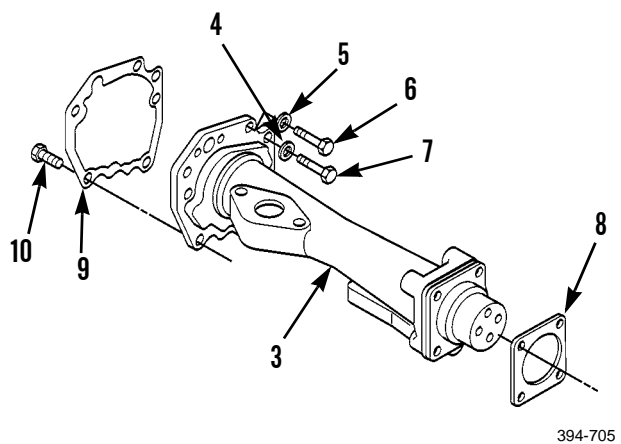
5. Install bearing (12), ring (13) and new preformed packing (14) on shaft (11).



6. Install shaft (11) assembly in housing (3) assembly.

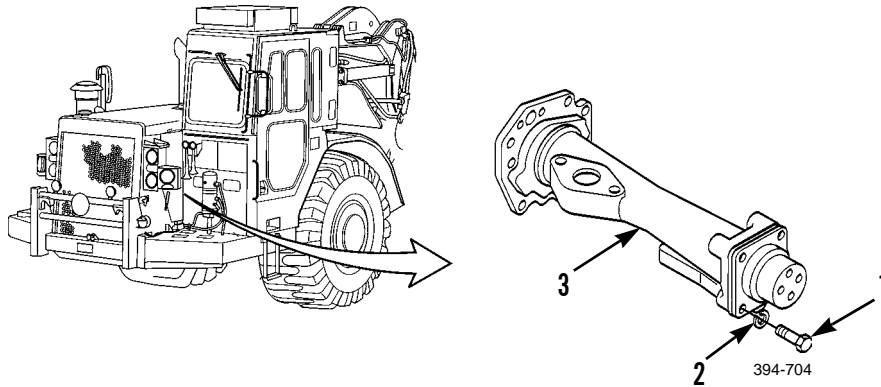


7. Install retainer (8) on housing (3) assembly.
8. Install new gasket (9) and two bolts (10) on housing assembly (3).
9. Install washer (4) and bolt (7) on housing assembly (3).
10. Install two washers (5) and bolts (6) on housing assembly (3).



**FUEL PUMP DRIVE REPLACEMENT - CONTINUED****0279 00****INSTALLATION - CONTINUED**

11. Position housing (3) assembly on machine.
12. Install four washers (2) and bolts (1) on housing assembly (3) and engine.
13. Install tachometer drive (WP 0332 00).



14. Install fuel injector pump housing and governor (WP 0273 00).
15. Install fuel transfer pump (WP 0275 00).
16. Install automatic timing advance unit (WP 0278 00).
17. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

---

**GOVERNOR CONTROL MAINTENANCE**

---

**0280 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation, Adjustment

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Lubricating oil, general purpose (Item 26, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Tag, marker (Item 42, WP 0339 00)

Gasket

**References**

TM 5-3805-248-10

**Personnel Required**

Two

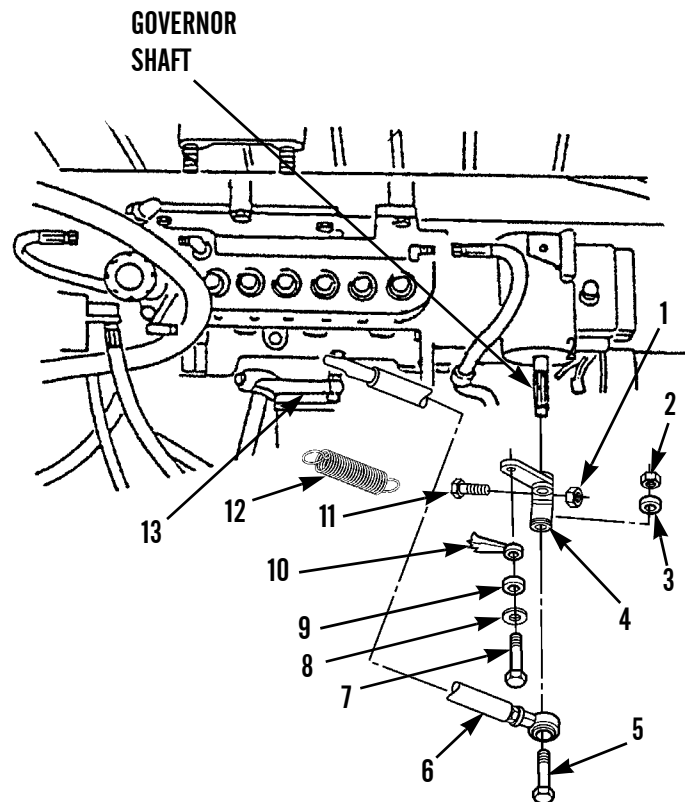
**Equipment Condition**Hood removed (WP 0189 00)

---

**REMOVAL****WARNING**

- Eye protection must be worn when performing maintenance where components or particles could fly out during procedure. Failure to follow this instruction may cause injury.
- Some components are under spring tension. Wear eye protection and use extreme caution when disassembling them to avoid injury.

1. Press lever (13) on left side of engine to relieve tension on spring (12).
2. Remove spring (12), nut (1) and bolt (11) from lever (4).
3. Remove nut (2), washer (3) and bolt (5) from lever (4).
4. Remove bolt (7), washer (8) and spacer (9) from lever (4).

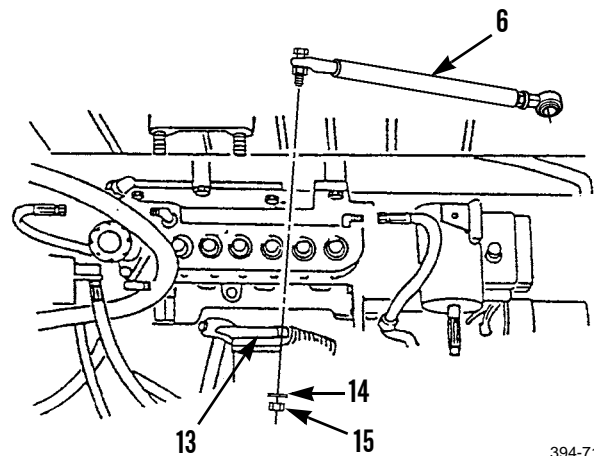


394-709

**REMOVAL - CONTINUED****NOTE**

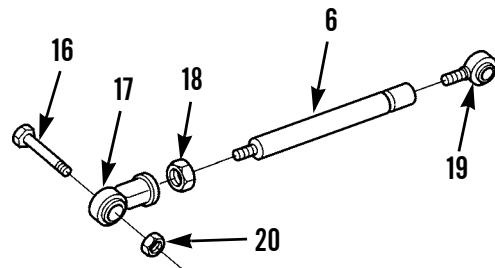
Tag wire connectors, cable and harness assemblies before disconnecting to ensure correct installation.

5. Disconnect cable (10) from lever (4).
6. Separate spring link (6) assembly from lever (4).
7. Mark lever (4) and governor shaft to aid in installation.
8. Remove lever (4) from governor shaft.
9. Press lever (13) on left side of engine to relieve tension on spring (12).



394-710

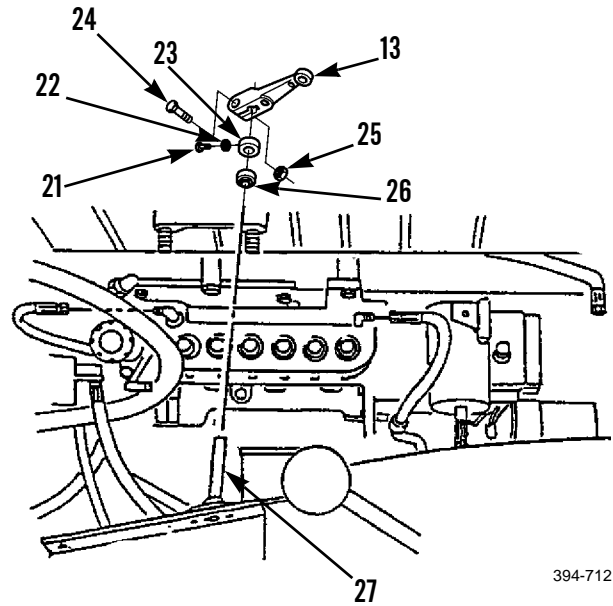
10. Remove nut (20), bolt (16), rod end bearings (17) and (19) and nut (18) from spring link (6).



394-711

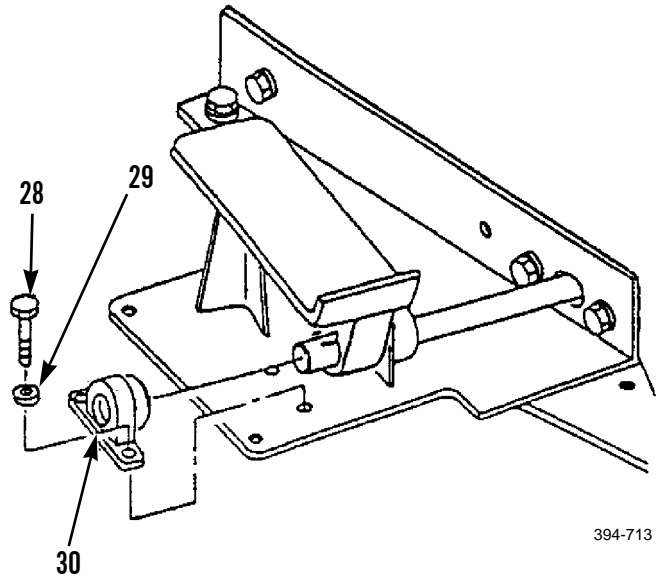
**REMOVAL - CONTINUED**

11. Remove nut (25) and bolt (24) from lever (13).
12. Remove lever (13) from shaft (27).
13. Remove key (23) from collar (26).
14. Remove setscrew (21) and washer (22) from collar (26).
15. Remove collar (26) from shaft (27).



394-712

16. Remove two bolts (28), washers (29) and bracket (30) assembly from operator compartment floor.

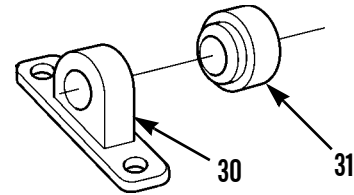


394-713



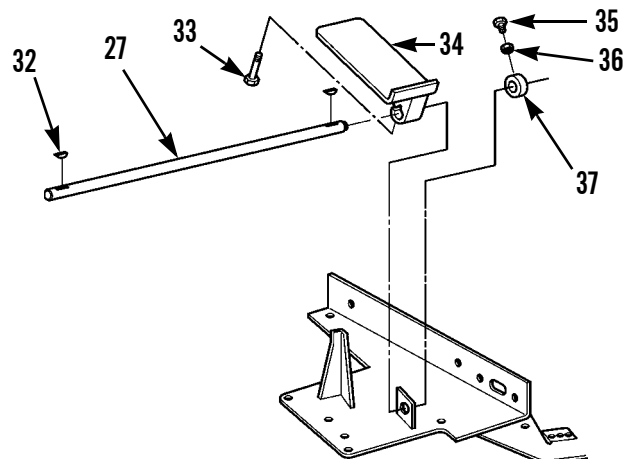
**REMOVAL - CONTINUED**

17. Use brass rod and hammer to remove bearing (31) from bracket (30).



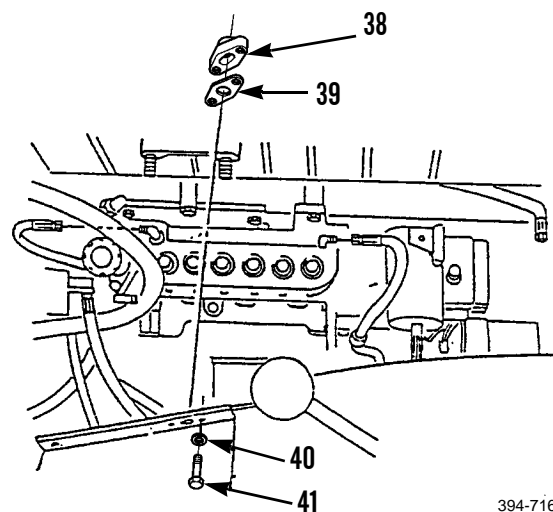
394-714

18. Remove bolt (33) from pedal (34).
19. Remove setscrew (35) and washer (36) from collar (37).
20. Remove pedal (34) from machine.
21. Remove key (32) from shaft (27).
22. Remove shaft (27) from machine.
23. Remove collar (37) from machine.



394-715

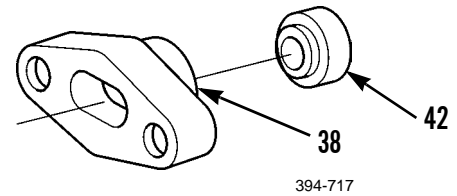
24. With assistance, support bracket (38) and remove two bolts (41) and washers (40) from operator compartment floor.
25. Remove bracket (38) assembly from engine compartment.
26. Remove and discard gasket (39). Remove all gasket material from mounting surfaces.



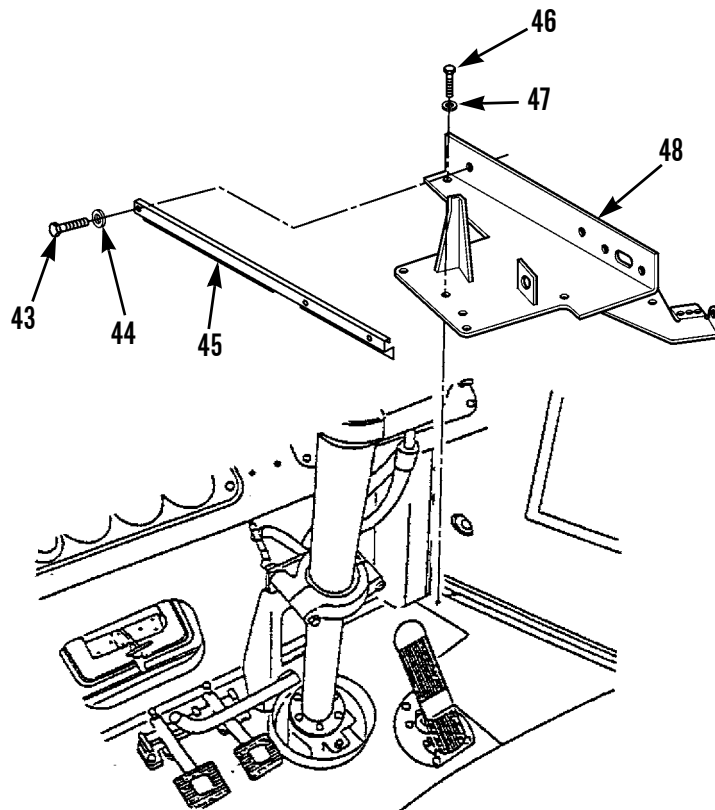
394-716

**REMOVAL - CONTINUED**

27. Use brass rod and hammer to remove bearing (42) from bracket (38).



28. Remove three bolts (43), washers (44) and support (45) from operator compartment floor.
29. Remove four bolts (46) and washers (47) from plate (48).
30. Remove plate (48) from operator compartment floor.



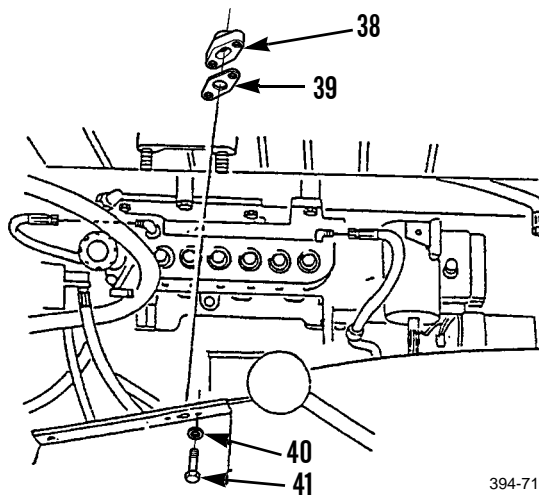
394-718

**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 cause 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. Remove all gasket material from mounting surface.
  2. Clean all parts with solvent cleaning compound.
  3. Visually inspect parts for damage. Replace damaged parts as necessary.
  4. Dry parts with compressed air.

**INSTALLATION**

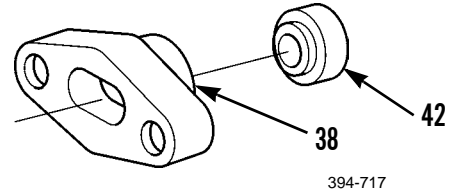
1. Install plate (48) on operator compartment floor.
2. Install four washers (47) and bolts (46) to plate (48).
3. Install support (45), three washers (44) and bolts (43) on operator compartment floor.
4. Install new gasket (39) on bracket (38).
5. Install bracket (38) on operator compartment floor.
6. With assistance, while supporting bracket (38), install two washers (40) and bolts (41) on bracket (38).



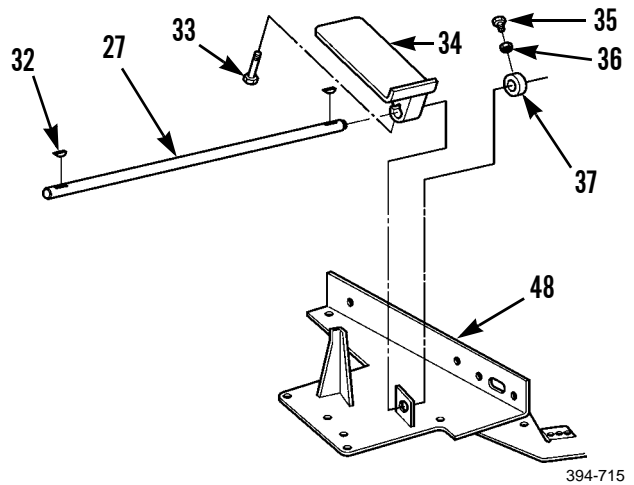
394-716

**INSTALLATION - CONTINUED**

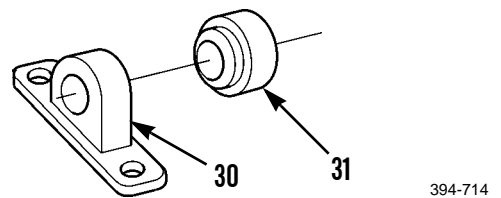
7. Use clean oil to lubricate bearing (42).
8. Use a brass rod and hammer to install bearing (42) in bracket (38).



9. Position collar (37) on plate (48).
10. Install shaft (27) through support on plate (48) and collar (37).
11. Install key (32) in shaft (27).
12. Install pedal (34) on operator compartment floor.
13. Install washer (36) and setscrew (35) in collar (37).
14. Install bolt (33) in pedal (34).

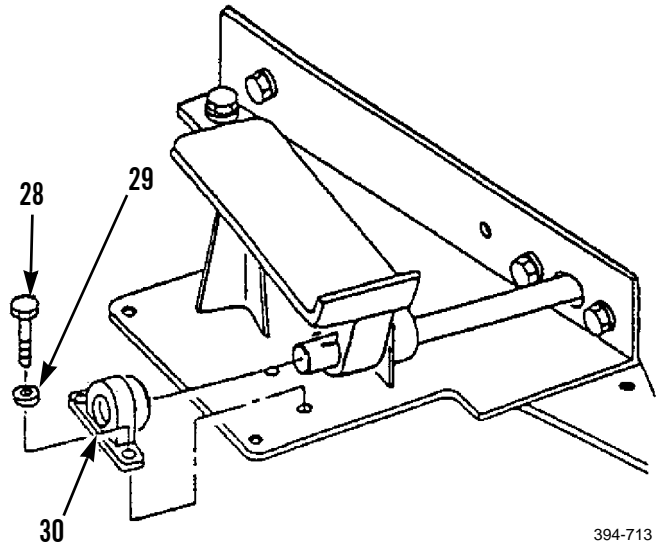


15. Use clean oil to lubricate bearing (31).
16. Use a brass rod and hammer to install bearing (31) in bracket (30).



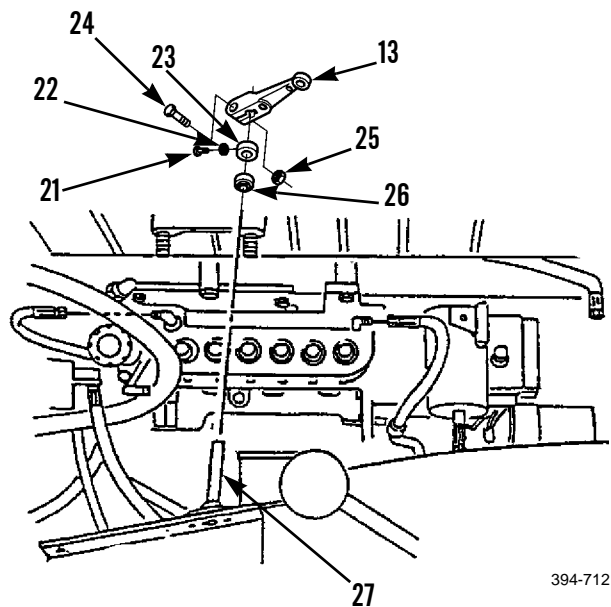
**INSTALLATION - CONTINUED**

17. Install bracket (30) assembly, two washers (29) and bolts (28) on operator compartment floor.



394-713

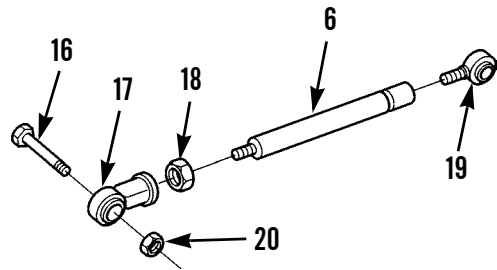
18. Install collar (26), washer (22) and setscrew (21).
19. Install key (23) and lever (13) on collar (26).
20. Install bolt (24) and nut (25) on lever (13).



394-712

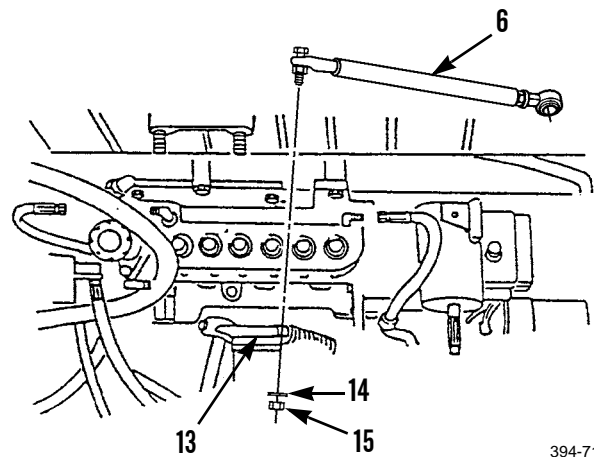
**INSTALLATION - CONTINUED**

21. Use clean oil to lubricate rod end bearing (17 and 19).
22. Install nut (18) and rod end bearings (17 and 19) on spring link (6).
23. Install bolt (16) and nut (20) in rod end bearing (16).



394-711

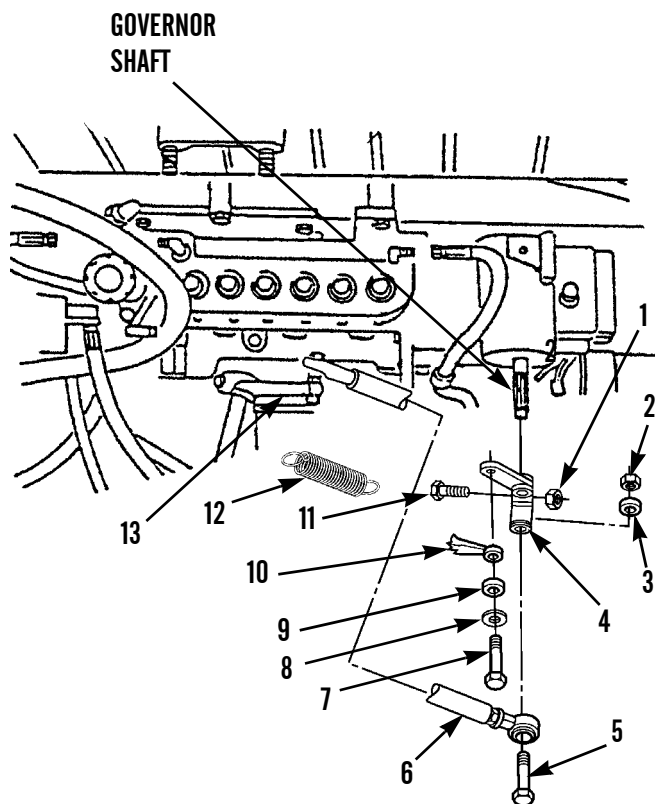
24. Install spring link (6) assembly on lever (13).
25. Install washer (14) and nut (15) on spring link (6).



394-710

**INSTALLATION - CONTINUED**

26. Use marks made at removal to align lever (4) on governor shaft.
27. Install lever (4) on governor shaft.
28. Connect cable (10).
29. Install spacer (9), washer (8) and bolt (7) on lever (4).
30. Position spring link (6) assembly on lever (4).
31. Install bolt (5), washer (3) and nut (2) on lever (4).
32. Install bolt (11), nut (1) and spring (12) on lever (4).

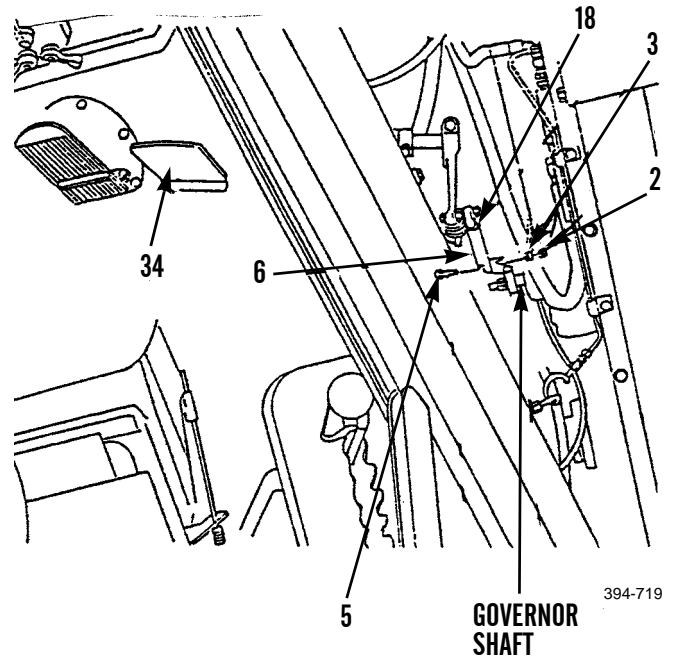


394-709

**ADJUSTMENT****NOTE**

The following procedure is for the adjustment of the spring link. This procedure does not affect high or low idle speeds. Use an assistant to press pedal while checking governor shaft.

1. Press pedal (34).
2. Check governor shaft. Spring link (6) is adjusted correctly if governor shaft is against stop.
3. Loosen nut (18).
4. Remove nut (2), washer (3) and bolt (5).
5. Rotate spring link (6) clockwise to shorten spring link; counterclockwise to lengthen spring link.
6. Install bolt (5), washer (3) and nut (2).
7. Tighten nut (18).



8. Operate engine and verify correct operation of governor (TM 5-3805-248-10).
9. Install hood (WP 0189 00).

**END OF WORK PACKAGE**



---

**WATER PUMP REPAIR**

**0281 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, common no. 1 (Item 101, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 30, WP 0339 00)

Packing, preformed (5)

Seal

Spring

**References**

TM 5-3805-248-10

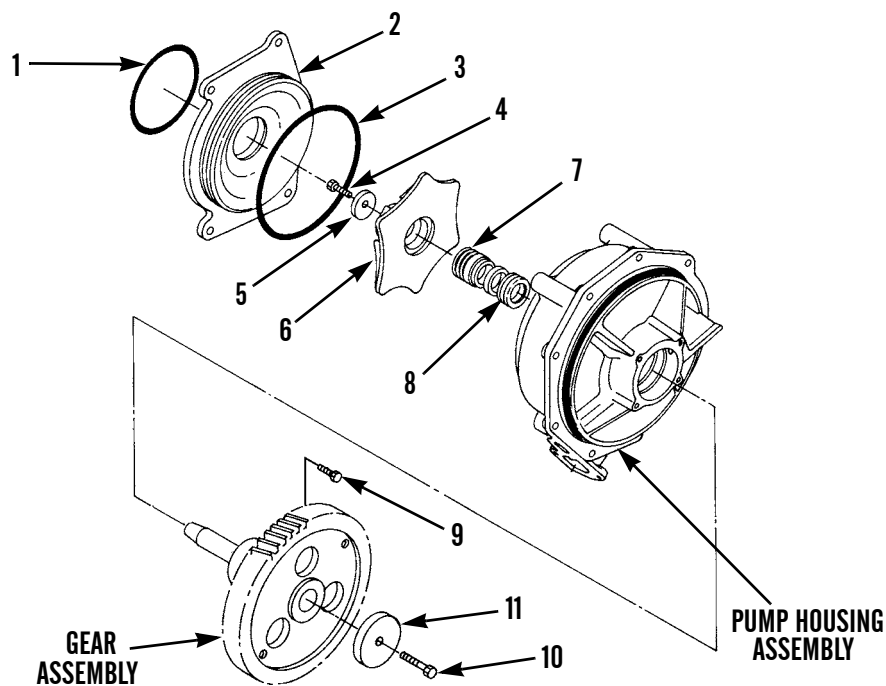
**Equipment Condition**

Water pump removed (WP 0052 00)

---

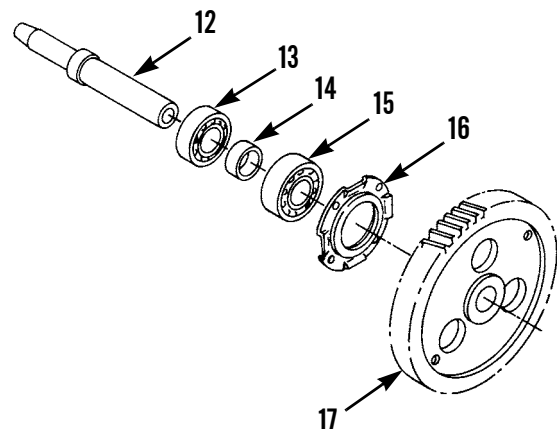
**DISASSEMBLY**

1. Remove preformed packing (1), adapter (2) and preformed packing (3) from pump housing assembly. Discard preformed packings.
2. Remove capscrew (4) and washer (5) from pump housing assembly.
3. Using puller, remove impeller (6) from pump housing assembly.
4. Remove spring (7) and preformed packing (8) and discard.
5. Remove four bolts (9) from gear assembly.
6. Remove capscrew (10) and washer from gear assembly (11).
7. Remove gear assembly from pump housing assembly.



394-671

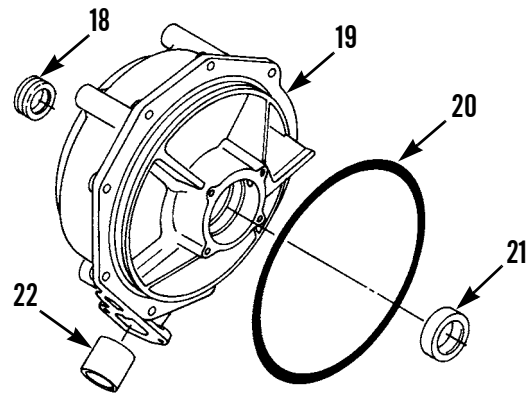
8. Use gear puller to remove gear (17) from gear assembly.
9. Remove retainer (16), bearing (15), spacer (14) and bearing (13) from shaft (12).



394-672

**DISASSEMBLY - CONTINUED**

10. Remove preformed packing (20) from pump housing assembly (19) and discard.
11. Use driver and hammer to remove seal (21) from pump housing assembly (19) and discard.
12. Use driver and hammer to remove preformed packing (18) from pump housing assembly and discard.
13. Remove filter (22) from pump housing assembly (19).



394-673

**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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

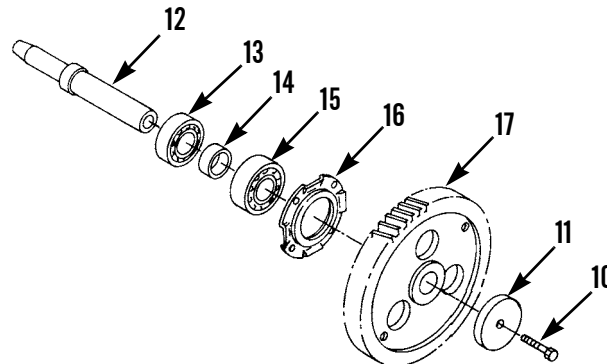
1. Remove all preformed packing and seal material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install filter (22) in pump housing assembly (19).
2. Use driver and hand pressure to install new preformed packing (18) on pump housing assembly (19).
3. Use driver and hammer, install new seal (21) on pump housing assembly (19) with lip facing up.
4. Use clean oil to lubricate lip of new seal (21).
5. Install new preformed packing (20) on pump housing assembly (19).
6. Use clean oil to lubricate bearings (15 and 13).

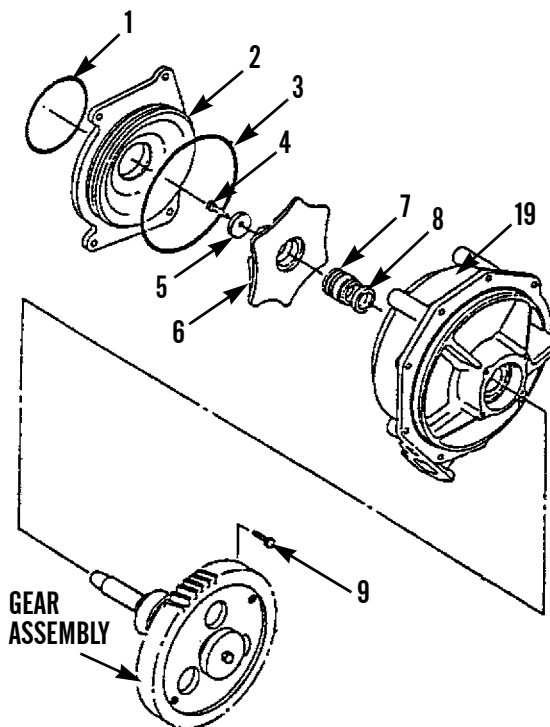
**ASSEMBLY - CONTINUED**

7. Install bearing (13), spacer (14), bearing (15), retainer (16), gear (17), washer (11) and capscrew (10) on shaft (12) on gear assembly.



394-674

8. Install gear assembly in pump housing assembly (19).
9. Install four bolts (9) on gear assembly.
10. Use driver and hand pressure to install new preformed packing (8) with smooth face toward inside of pump housing assembly (19) until light contact is made.
11. Install new spring (7) on pump housing assembly (19).
12. Install impeller (6), washer (5), capscrew (4), new preformed packing (3), adapter (2) and new preformed packing (1) on pump housing assembly (19). Tighten capscrew (4) to 28 lb-ft (38 Nm), tap with hammer, and retighten to 28 lb-ft (38 Nm).



394-675

13. Install water pump (WP 0052 00).

**END OF WORK PACKAGE**

---

**FAN AND FAN DRIVE MAINTENANCE**

---

0282 00

**THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 200 lb. minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Grease, GAA (Item 20, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Compound, sealing (Item 10, WP 0339 00)

Packing, preformed

Seal

**References**

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Radiator and support assembly removed (WP 0044 00)

Fan belts removed (WP 0053 00)

Fan belts tensioner removed (WP 0054 00)

---

**REMOVAL****CAUTION**

Wipe area clean around all connections prior to removal. Cap hoses and plug openings after removal. Contamination of system could result in premature failure.

**REMOVAL - CONTINUED**

1. Disconnect hose (2) from bracket (3).

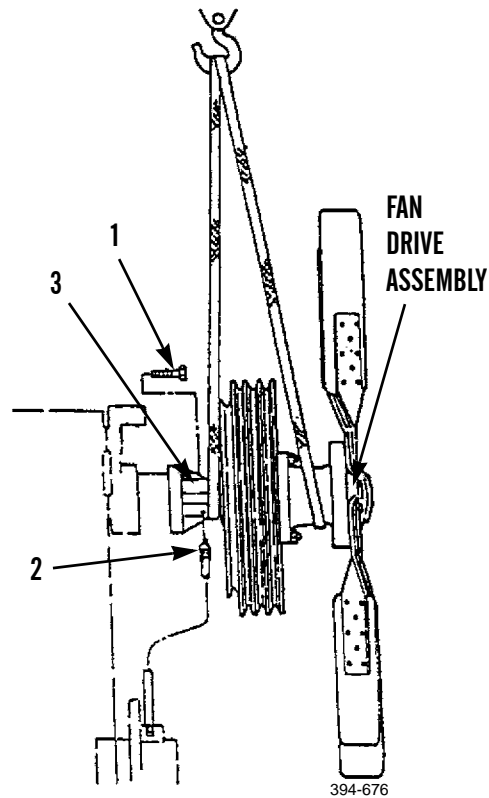
**WARNING**

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 death or injury.

**NOTE**

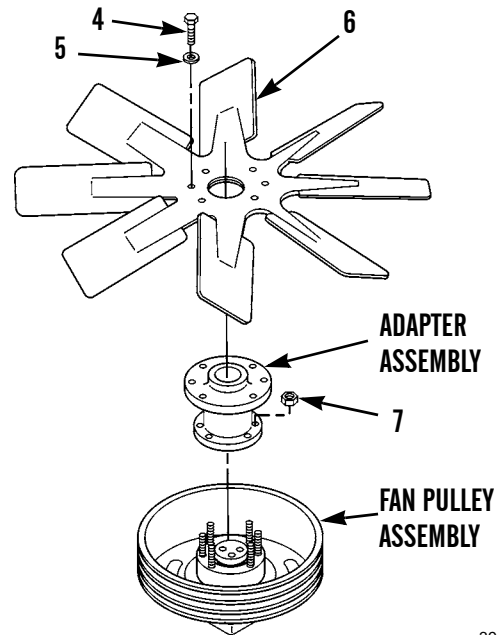
Weight of fan and fan drive is 124 lb (56 kg).

2. Attach lifting device to fan drive assembly.
3. Remove four capscrews (1).
4. Use lifting device to remove fan drive assembly from machine.
5. Remove lifting device from fan drive assembly.



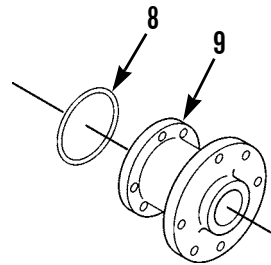
**DISASSEMBLY**

1. Remove six capscrews (4) and washers (5) from spider assembly (6).
2. Remove spider assembly (6) from adapter assembly.
3. Remove six nuts (7) from adapter assembly.
4. Remove adapter assembly from fan pulley assembly.



394-677

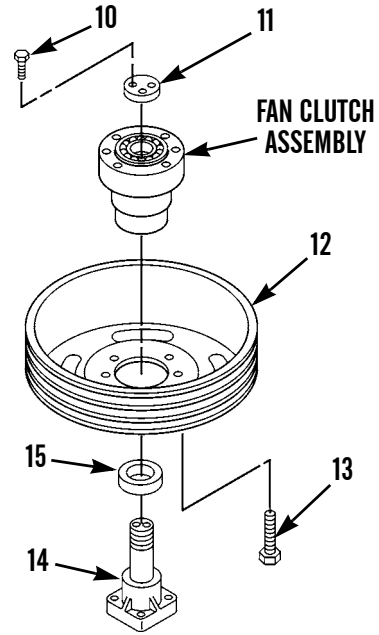
5. Remove preformed packing (8) from adapter (9) and discard.



394-678

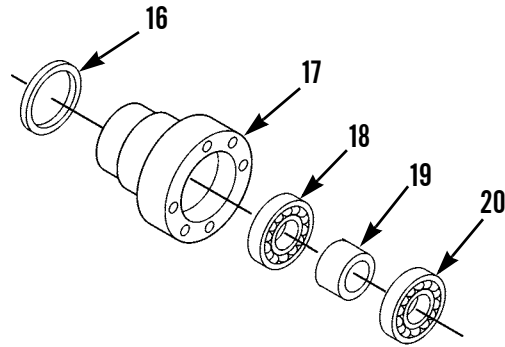
**DISASSEMBLY - CONTINUED**

6. Remove six bolts (13).
7. Remove two capscrews (10) and washer (11).
8. Remove bracket (14) and spacer (15).
9. Remove fan clutch assembly from pulley (12).



394-679

10. Remove seal (16), bearing (20), spacer (19) and bearing (18) from fan clutch hub (17). Discard seal.



394-680



**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 eye protection.

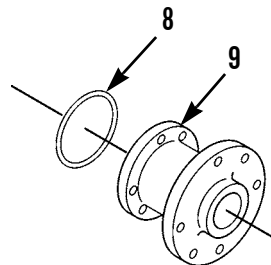
1. Remove all preformed packing and seal material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Fill fan clutch hub (17) with grease.
2. Install bearing (18), spacer (19) and bearing (20) in fan clutch hub (17).
3. Use driver and hammer to install new seal (16) with lip toward outside. Lubricate lip of new seal (16) lightly with grease.
4. Install fan clutch assembly in pulley (12).
5. Install spacer (15) and bracket (14).
6. Apply sealant to threads of two capscrews (10).
7. Install washer (11) and two capscrews (10).
8. Install six bolts (13).

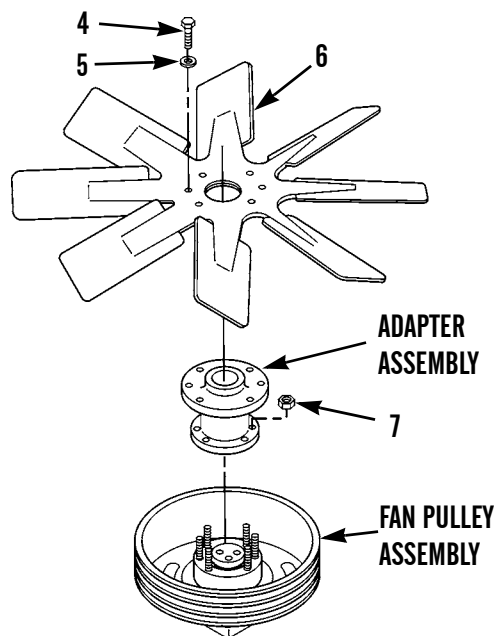
**ASSEMBLY - CONTINUED**

9. Install new preformed packing (8) on adapter (9).



394-678

10. Install adapter assembly on fan pulley assembly.
11. Install six nuts (7) on adapter assembly.
12. Position spider assembly (6) on adapter assembly.
13. Install six washers (5) and capscrews (4) on spider assembly (6).



394-677

**INSTALLATION**



**WARNING**

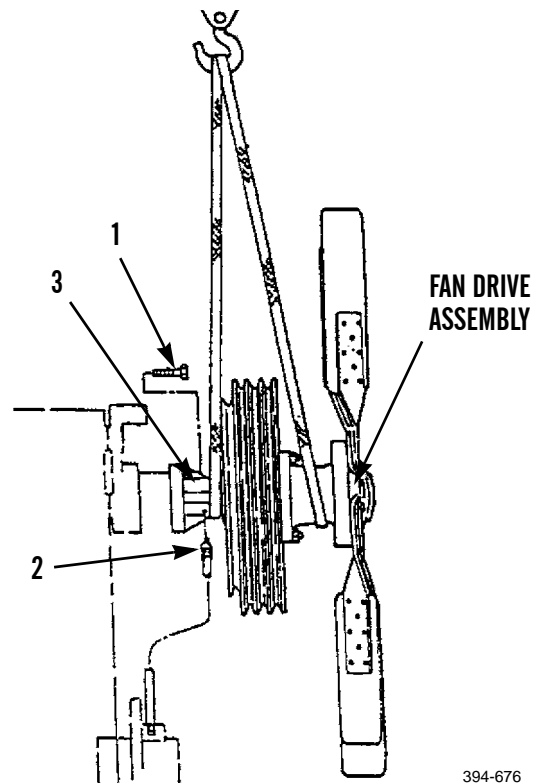
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause death or injury.

**NOTE**

Weight of fan and fan drive is 124 lb (56 kg).

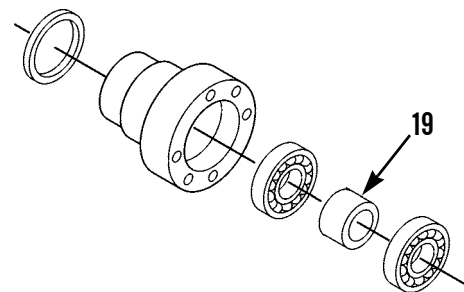
**INSTALLATION - CONTINUED**

1. Attach lifting device to fan drive assembly.
2. Position fan drive assembly on machine.
3. Install four capscrews (1).



394-676

4. Remove lifting device from fan drive assembly (19).



394-680

5. Connect hose (2) to bracket (3).
6. Install fan belt tensioner (WP 0054 00).
7. Install fan belts (WP 0053 00).
8. Install radiator and support assembly (WP 0044 00).

**END OF WORK PACKAGE**



**LINKAGE ADJUSTMENT**

**0283 00**

**THIS WORK PACKAGE COVERS**

Adjustment

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Rag, wiping (Item 35, WP 0339 00)

**References**

WP 0285 00

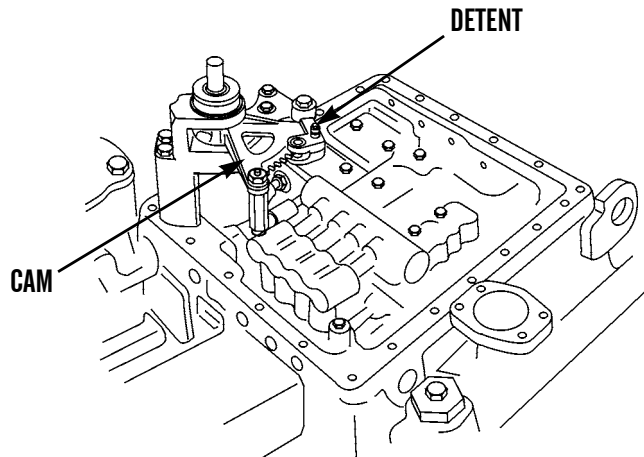
**Equipment Condition**

Linkage housing and transmission cover removed (WP 0364 00)

Linkage housing and transmission cover removal (WP 0171 00).

**ADJUSTMENT**

1. Inspect the position of the detent on the manual shift cam. Correct position of detent for FIRST speed is notch on cam marked 1. If detent is not in correct position, complete steps 2 through 4. Otherwise proceed to step 5.

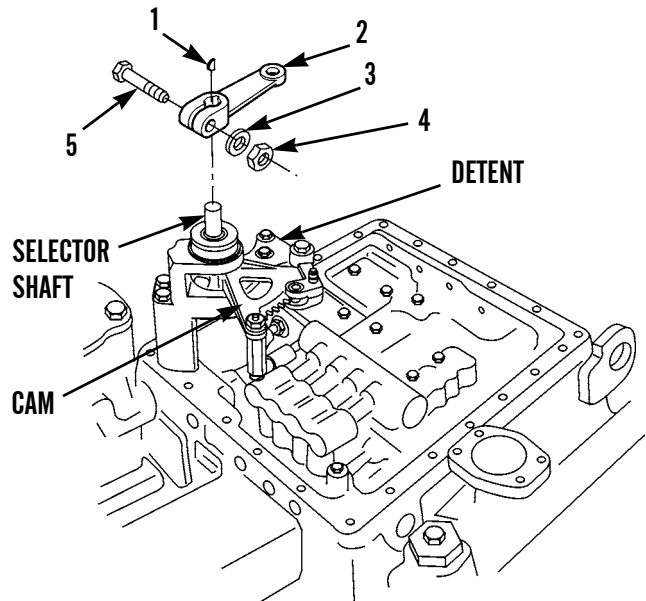


394-814

**ADJUSTMENT - CONTINUED****NOTE**

Perform steps 2 through 4 only if inspection indicates detent is not in position 1 on manual shift cam.

2. Install woodruff key (1), lever (2), bolt (5), washer (3) and nut (4) on selector shaft.
3. Manually move lever (2) until detent is in third notch of manual shift cam marked 1.



394-815

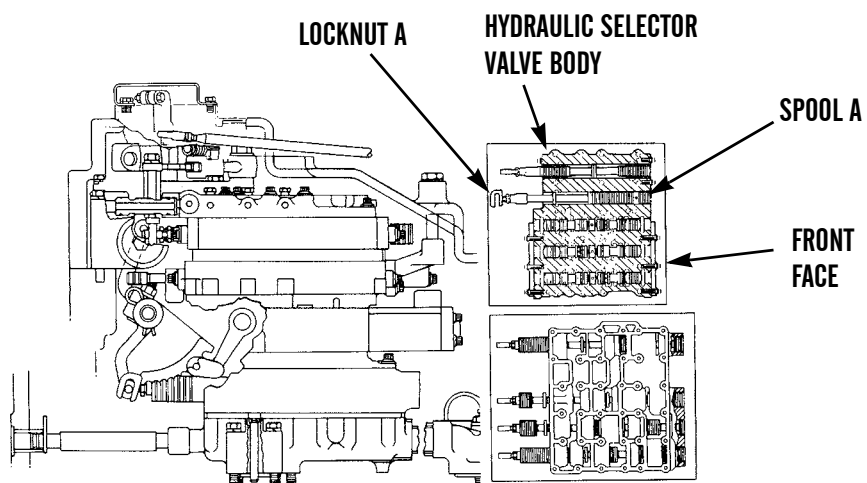
4. Inspect the position of spool A in hydraulic selector valve body. Forward edge of spool A must be flush with face of hydraulic selector valve body. If spool A is not in correct position, perform steps 5 through 7. Otherwise proceed to step 8.

**NOTE**

Perform steps 5 through 7 only if inspection indicates spool A is not in correct position.

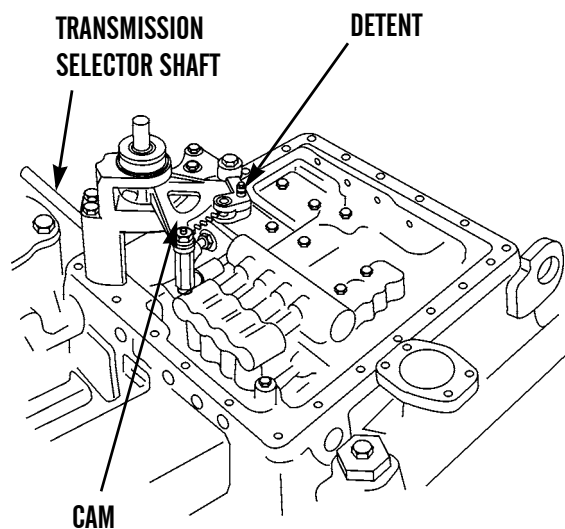
5. Use a wrench, loosen locknut A and turn spool A until its forward edge is flush with front face of hydraulic selector valve body.
6. Holding spool A to prevent it from turning, tighten locknut A to 25 lb-ft (34 Nm).

ADJUSTMENT - CONTINUED



394-816

7. Using locking pliers, rotate transmission selector shaft until the detent is at the FOURTH speed (sixth notch) indicator on the hydraulic shift cam.



394-817

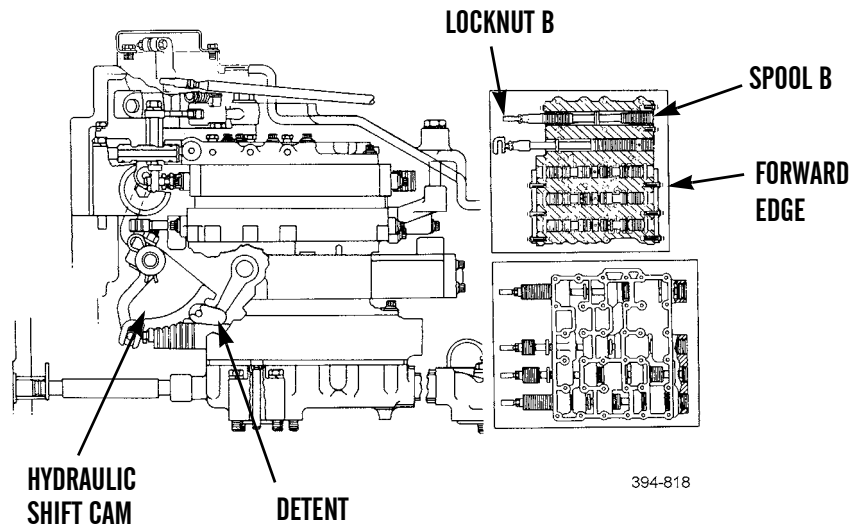
**ADJUSTMENT - CONTINUED**

8. Inspect the position of spool B in hydraulic selector valve body. Forward edge of spool B must be flush with face of hydraulic selector valve body. If spool B is not in correct position, perform steps 9 and 10.

**NOTE**

Perform steps 9 and 10 only if inspection indicates spool B is not in correct position.

9. Using a wrench, loosen locknut B and turn spool B until its forward edge is flush with front face of hydraulic selector valve body.



10. Holding spool B to prevent it from turning, tighten locknut B to 15 lb-ft (20 Nm).
11. Using locking pliers, rotate transmission selector shaft until detent is at position 1 (third notch) on hydraulic shift cam.

**NOTE**

Valve assemblies may need to be partially removed (WP 0280 00).

12. Inspect the position of four spools C in selection valve body. Forward edge of each of four spools C must be flush with front face of selection valve body. If four spools C are not in correct positions, perform steps 13 and 14.

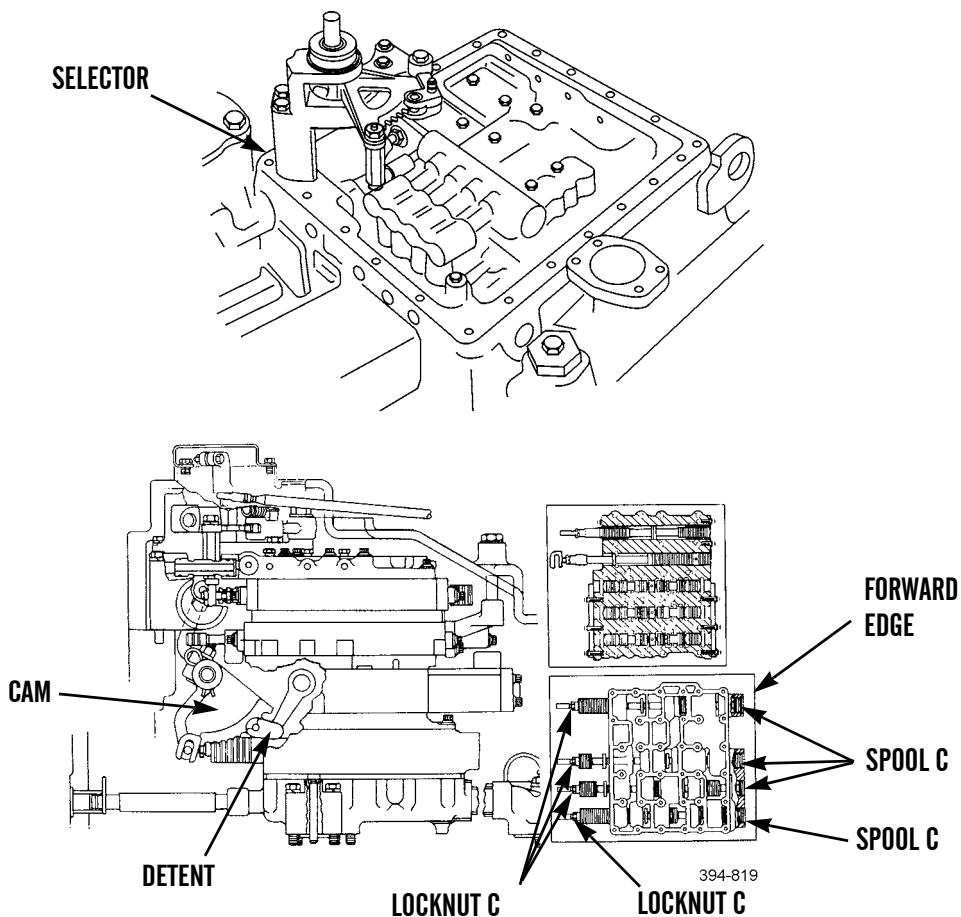


ADJUSTMENT - CONTINUED

**NOTE**

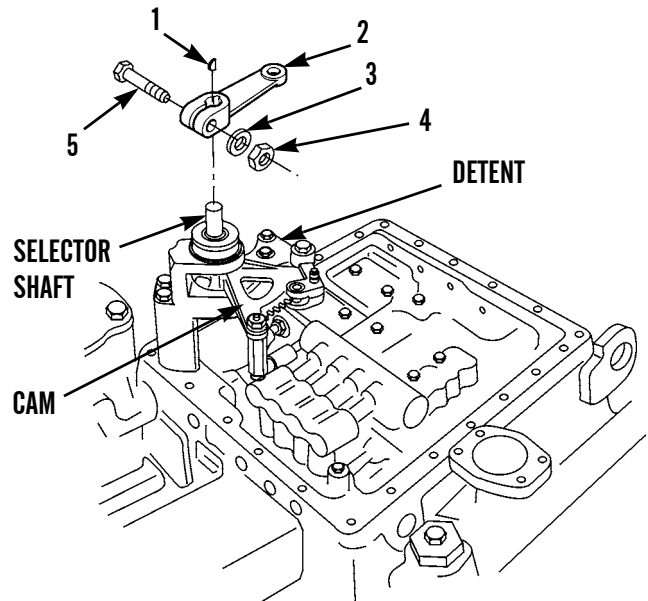
Perform steps 13 and 14 only if inspection indicates four spools C are not in correct positions.

13. Loosen each of four locknuts C as necessary and turn each of four spools C as necessary until its forward edge is flush with face of selector valve body.
14. While holding spool C to prevent it from turning, tighten each locknut C to 15 lb-ft (20 Nm).



**ADJUSTMENT - CONTINUED**

15. Remove nut (4), washer (3), bolt (5), lever (2) and woodruff key (1) from selector shaft.



394-815

**NOTE**

If transmission fails to operate properly after steps 1 through 14 have been performed as necessary, perform shift point adjustment (WP 0285 00).

16. Install transmission cover and linkage housing (WP 0364 00).

**END OF WORK PACKAGE**

---

**CONTROL GROUP PRESSURE TEST**

---

0284 00

**THIS WORK PACKAGE COVERS**Installation, Testing, Cleaning and Inspection, Removal

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Control, throttle kit (Item 16, WP 0338 00)

Gage, pressure kit (Item 31, WP 0338 00)

Gage, pressure kit adapter (Item 32, WP 0338 00)

Lifting device, 150 lb minimum capacity

**References**

WP 0104 00

WP 0139 00

WP 0174 00

WP 0292 00

WP 0367 00

WP 0368 00

WP 0371 00

WP 0375 00

TM 5-3805-248-10

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket (2)

Lockwasher (25)

**Equipment Condition**

Front axle removed (WP 0141 00)

Steering linkage disconnected (WP 0179 00)

Hood removed (WP 0189 00)

Step assembly removed (WP 0200 00)

---

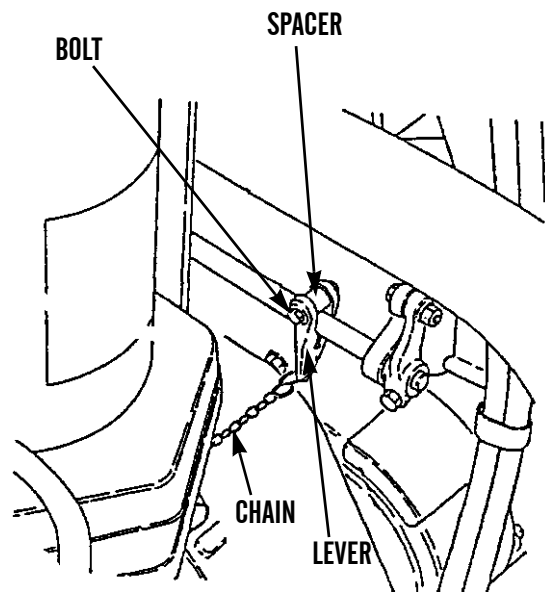
**INSTALLATION****WARNING**

Both axles must be removed and steering linkage must be disconnected before attempting this procedure. Failure to follow this procedure may cause injury.

**NOTE**

If lever is not available for installation, locking pliers may be substituted.

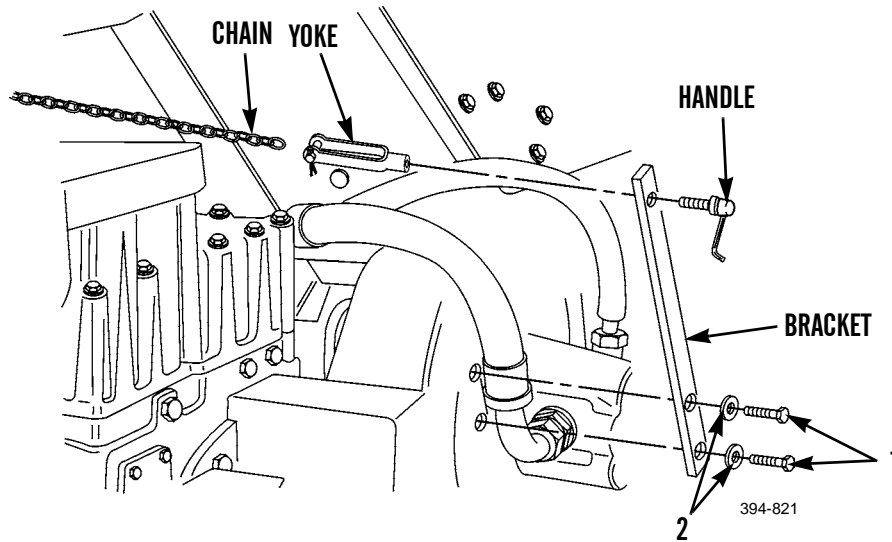
1. Install lever, spacer and bolt from throttle control kit on governor linkage located on left side of engine. Position lever so when it is pulled it will give maximum travel of governor linkage.
2. Connect chain to lever and route as straight as possible through open areas to rear of vehicle.



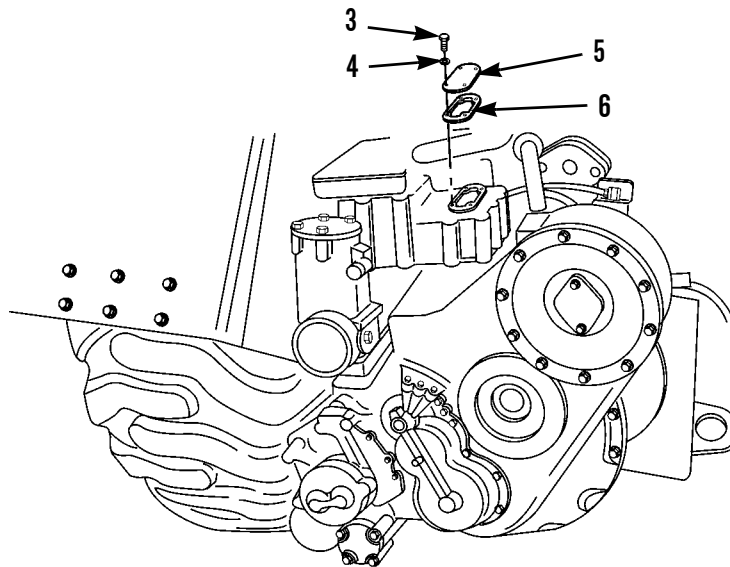
394-820

3. Remove two bolts (1) and washers (2) from transmission case.
4. Install bracket and two bolts (1).
5. Install handle through top of bracket.
6. Adjust chain on yoke so length is just long enough to thread end of yoke on handle and install.
7. Turn handle clockwise and observe if governor linkage is moving. If not, adjust length of chain.

INSTALLATION - CONTINUED



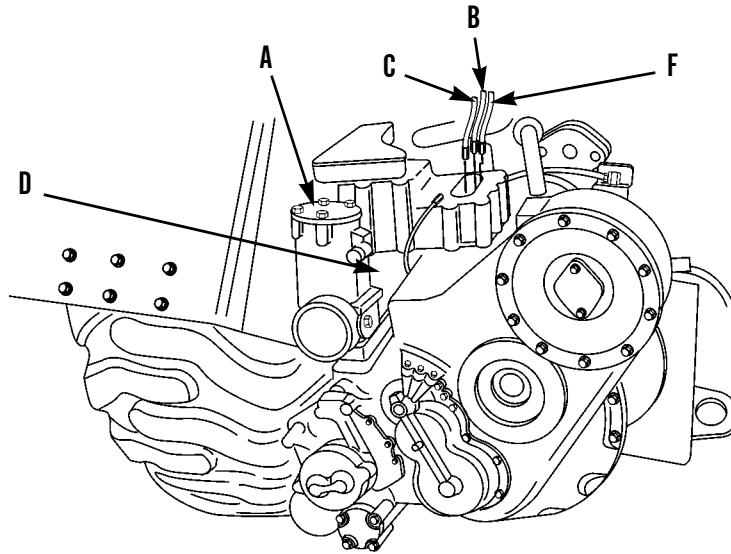
8. Remove four bolts (3), lockwashers (4), cover (5) and gasket (6). Discard gasket and lockwashers.



394-822

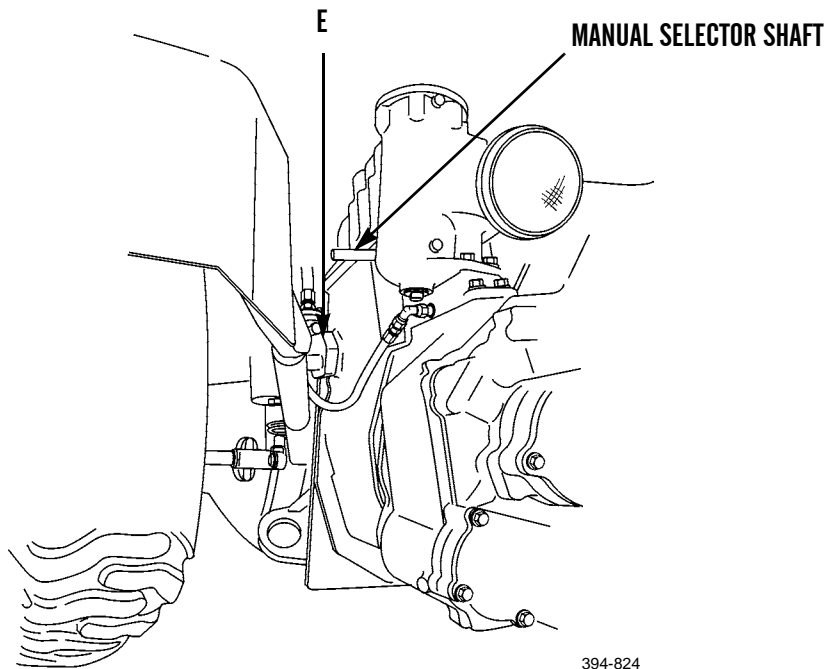
**INSTALLATION - CONTINUED**

9. Install transmission hydraulic test set taps A, B, C, D and F in accordance with instructions contained in set.



394-823

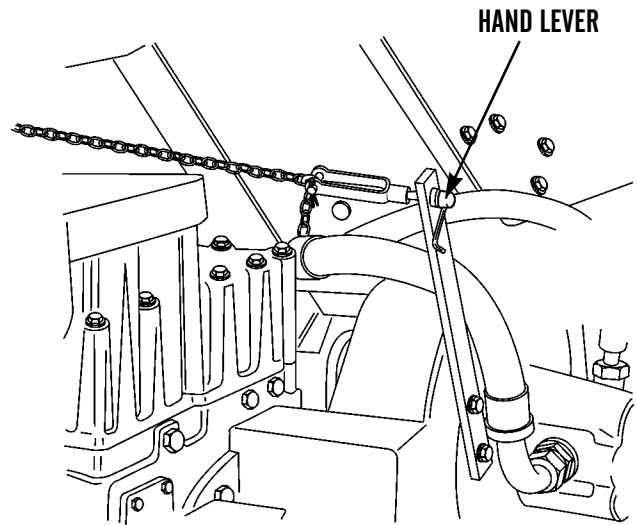
10. Install tap E.
11. Position transmission speed select lever in operator compartment in REVERSE.



394-824

**CONTROL GROUP PRESSURE TEST - CONTINUED****0284 00****TESTING**

1. Connect battery negative ground (WP 0104 00).
2. Operate engine (TM 5-3805-248-10).
3. Allow engine to reach operating temperature.
4. Turn hand lever until tachometer on transmission hydraulic test set reads 750 RPM.

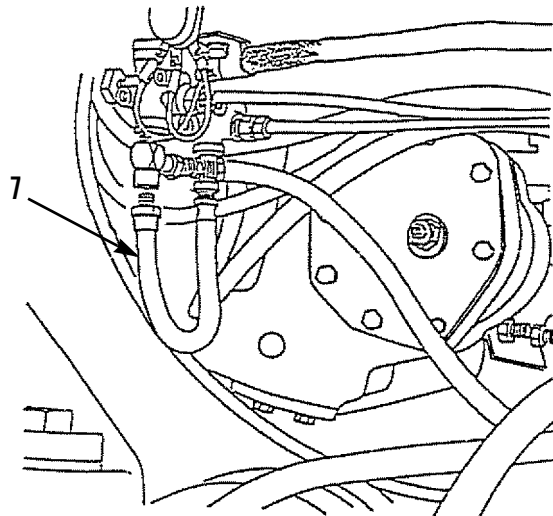


394-825

**NOTE**

All pressures recorded will be used in later steps. Engine RPM, transmission speed and tap designation (A, B, C, D, E and F) should also be recorded for later reference purposes.

5. Record pressure gage readings for taps A, B and C, engine RPM and transmission speed.
6. Position transmission speed select lever in NEUTRAL.
7. Record pressure gage readings for taps A, B and C, engine RPM and transmission speed.
8. Turn hand lever until tachometer on transmission hydraulic test set reads 900 RPM.
9. Shut down engine (TM 5-3805-248-10).
10. Vent air tank (TM 5-3805-248-10).
11. Disconnect air line (7) from transmission hold valve under operator compartment floor.
12. Install 0-100 psi air pressure gage in transmission control valve.
13. Connect air line (7).
14. Operate engine (TM 5-3805-248-10).
15. Observe 0-100 psi air pressure gage reading. If reading is less than 65 psi, transmission control valve may need replacement or repair (WP 0174 00).
16. Shut down engine (TM 5-3805-248-10).
17. Disconnect air line (7).
18. Remove 0-100 psi air pressure gage.
19. Connect air line (7).



394-826

**TESTING - CONTINUED**

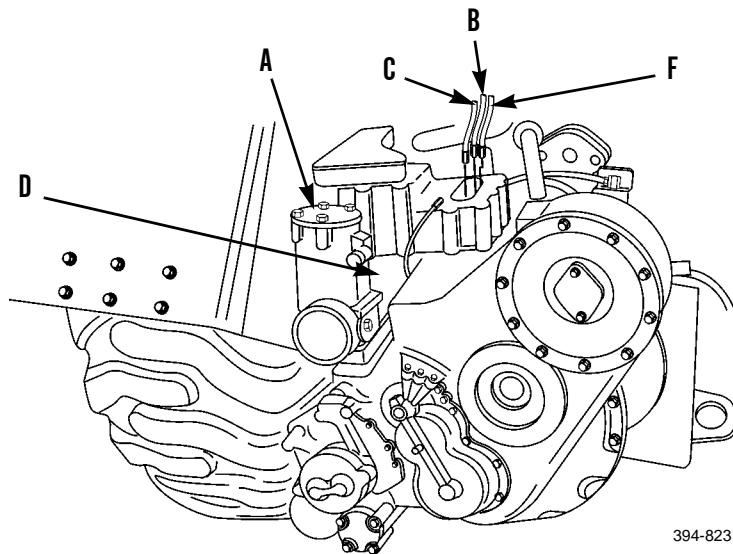
20. With assistance, depress and hold the transmission control valve and operate engine.
21. Position transmission speed select lever in EIGHTH speed.
22. Depress accelerator pedal and hold until transmission shifts into EIGHTH speed.
23. Release accelerator pedal and slowly move transmission selector lever through each speed to NEUTRAL.

**NOTE**

If transmission downshifts out of EIGHTH speed with transmission hold pedal depressed, transmission hold valve is not operating (WP 0139 00).

24. Release transmission hold valve pedal.
25. Install locking pliers on manual selector shaft at left rear of transmission case.
26. Depress and hold transmission hold valve pedal.
27. Turn hand lever until engine rpm shown on transmission hydraulic test set tachometer reads 2,250 RPM.
28. Use locking pliers on manual selector shaft to slowly shift transmission to REVERSE, FIRST speed and SECOND speed. Record pressure gage readings to taps B and C, engine RPM and transmission speed.
29. Use locking pliers on manual selector shaft to slowly shift transmission to THIRD speed through EIGHTH speed. Record pressure gage readings for taps B and C, engine RPM and transmission speed.
30. Release transmission hold valve pedal.
31. Use locking pliers to shift manual selector shaft to NEUTRAL, and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
32. Use locking pliers to shift manual selector shaft into REVERSE, and record pressure gage readings for tap D, engine RPM and transmission speed.
33. Use locking pliers to shift manual selector shaft into FIRST speed, and record pressure gage readings for tap D, engine RPM and transmission speed.
34. Use locking pliers to shift manual selector shaft into NEUTRAL, and record pressure gage readings for tap D, engine RPM and transmission speed.
35. Use locking pliers to shift manual selector shaft into SECOND speed, and record pressure gage readings for tap D, engine RPM and transmission speed.



**TESTING - CONTINUED**

394-823

**NOTE**

In step 36, all shifts start from THIRD speed.

36. Use locking pliers to shift manual selector shaft from THIRD speed to FOURTH speed; from FOURTH speed to FIFTH speed; from FIFTH speed to SIXTH speed; from SIXTH speed to SEVENTH speed; and from SEVENTH speed to EIGHTH speed. Record pressure gage readings for tap D, engine rpm and transmission speed.
37. Turn hand lever until tachometer on transmission hydraulic test set reads 750 RPM.
38. Use locking pliers to shift manual selector shaft into FIRST speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
39. Use locking pliers to shift manual selector shaft into SECOND speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
40. Use locking pliers to shift manual selector shaft into REVERSE and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
41. Use locking pliers to shift manual selector shaft into THIRD speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
42. Use locking pliers to shift manual selector shaft into FOURTH speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
43. Use locking plier to shift manual selector shaft into FIFTH speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
44. Use locking pliers to shift manual selector shaft into SIXTH speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
45. Use locking pliers to shift manual selector shaft into SEVENTH speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
46. Use locking pliers to shift manual selector shaft into EIGHTH speed and record pressure gage readings for taps B, C and D, engine RPM and transmission speed.
47. Stop engine.
48. Compare recorded pressures with Table 1, Transmission Control Pressure Chart. If all pressures are satisfactory, transmission control group is operating properly.

TESTING - CONTINUED

**NOTE**

- If all pressures are satisfactory, EXCEPT pressures recorded at tap B, the torque converter may need service or replacement (WP 0371 00).
- If the torque converter is operating, the retarder control valve may need service or replacement (WP 0292 00).
- If all pressures are satisfactory, EXCEPT pressures recorded at tap D, the transmission oil pump may need service or replacement (WP 0375 00).

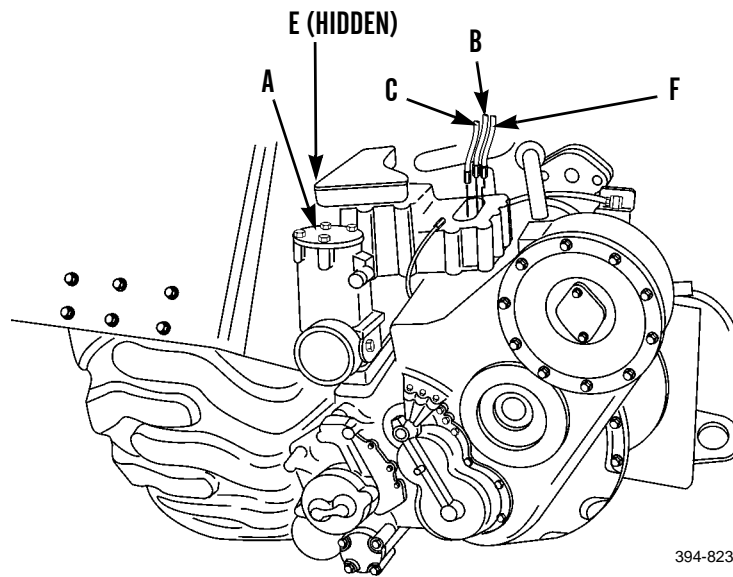
**Table 2. Transmission Control Pressure Chart (psi).**

Pressure Tap	Engine RPM	Reverse	Transmission Neutral	Speeds 1 and 2	Speeds 3 through 8	Effect of Changing Spacers
A - Transmission Oil Pump	750 2,250	390 min 445-460	285 min 345-360	390 min 445-460	285 min 345-360	Pressures at taps A, B and C change if spacers are changed. See spacer chart, Table 3, in this work package.
B - System Pressure No. 1	750 2,250	380 min 400-420	275 min 285-305	380 min 400-420	275 min 285-305	
C - System Pressure No. 2	750 2,250	380 min 400-420	275 min 285-305	380 min 400-420	275 min 285-305	
D - Lubrication Pressure	750 2,250	1 min 16-22	1 min 16-22	1 min 16-22	1 min 16-22	Pressures at taps D, E and F do not change if spacers are changed. See spacer chart, Table 3, in this work package.
E - Torque Conv. Inlet Pressure	750 2,250	1 min 55-70		1 min 55-70		
F - Torque Conv. Outlet Pressure	1765 to 1,895			34-44		

**TESTING - CONTINUED****NOTE**

Unsatisfactory pressures at pressure taps A, C, E or F require investigation and correction of the problem. Perform the following steps to check the initial pressures of the transmission control group.

49. Position transmission speed indicator lever in FIRST speed.
50. Position transmission speed indicator lever in FIFTH speed.
51. Remove taps B, C and F.



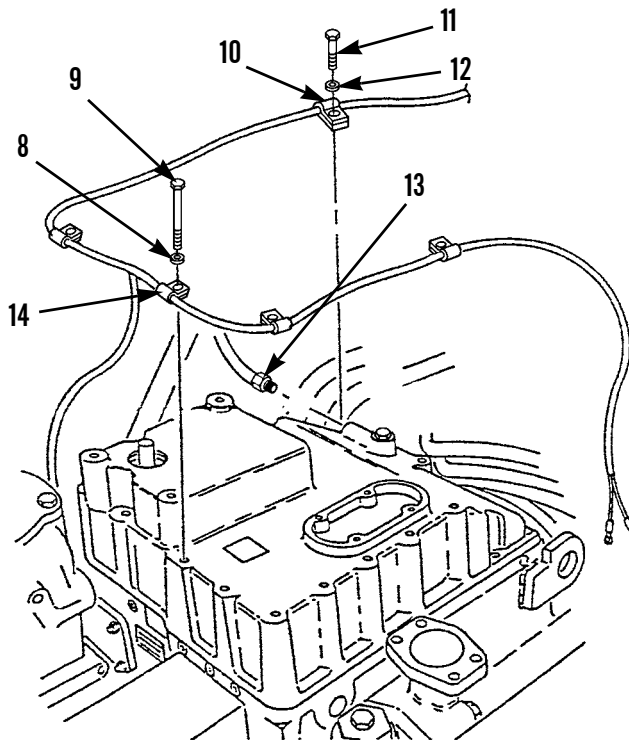
**TESTING - CONTINUED**

52. Remove 12 bolts (9), lockwashers (8) and four clips (14). Discard lockwashers.
53. Remove nine bolts (11), lockwashers (12) and three clips (10). Discard lockwashers.

**NOTE**

Tag hose and tube assemblies prior to removal to ensure correct installation.

54. Disconnect hose assembly (13).



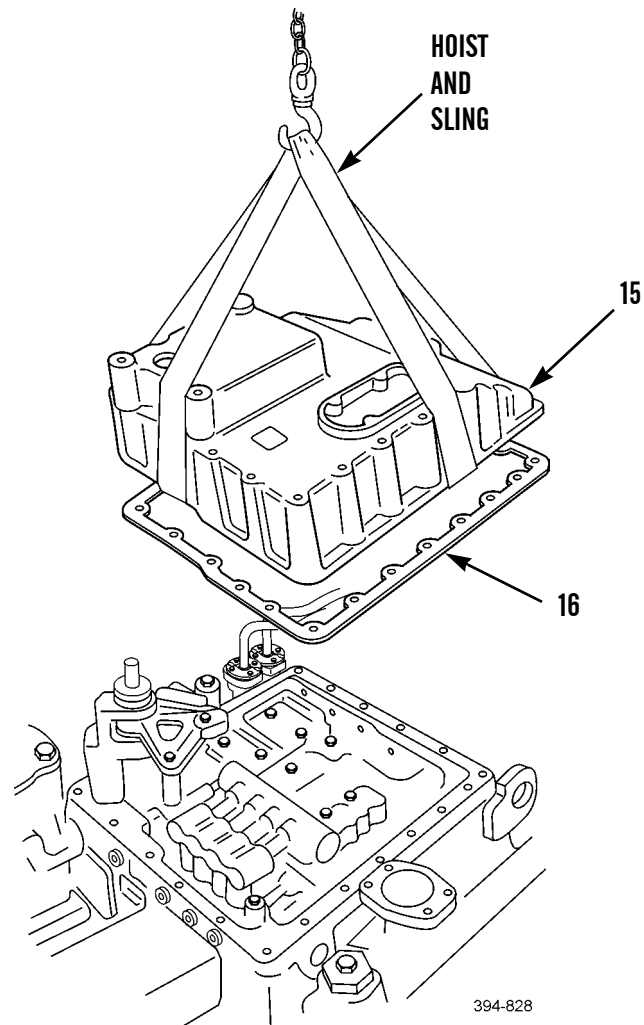
394-827

**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**

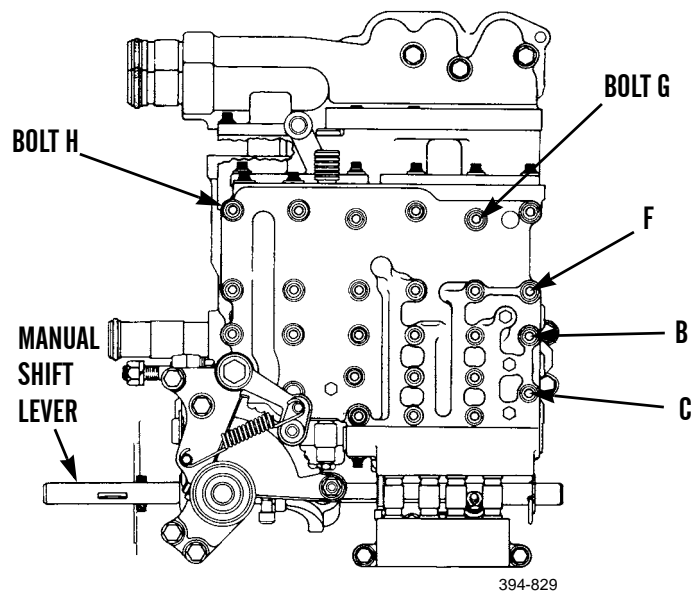
Weight of cover assembly is 70 lbs (32 kg).

**TESTING - CONTINUED**

55. Use lifting device to remove cover (15) and gasket (16). Discard gasket.
56. Remove lifting device.
57. Operate engine. Allow transmission oil to reach operating temperature (TM 5-3805-248-10).

**TESTING - CONTINUED**

58. Stop engine.
59. Install transmission hydraulic test set.
60. Connect 0-200 psi pressure gage to tap A.
61. Use locking pliers to shift manual selector shaft into REVERSE.
62. Rotate hand lever to increase engine speed on transmission hydraulic test, set tachometer to 750 RPM and record pressure reading on pressure gage for tap A.
63. Remove bolt G.
64. Connect 0-150 psi pressure gage to pressure tap C.
65. Use locking pliers to shift manual selector shaft into NEUTRAL and record pressure reading on pressure gage for tap C.
66. Install bolt G.
67. Remove bolt H.
68. Connect 0-600 psi pressure gage to pressure tap B and record pressure reading on pressure gage for tap B.

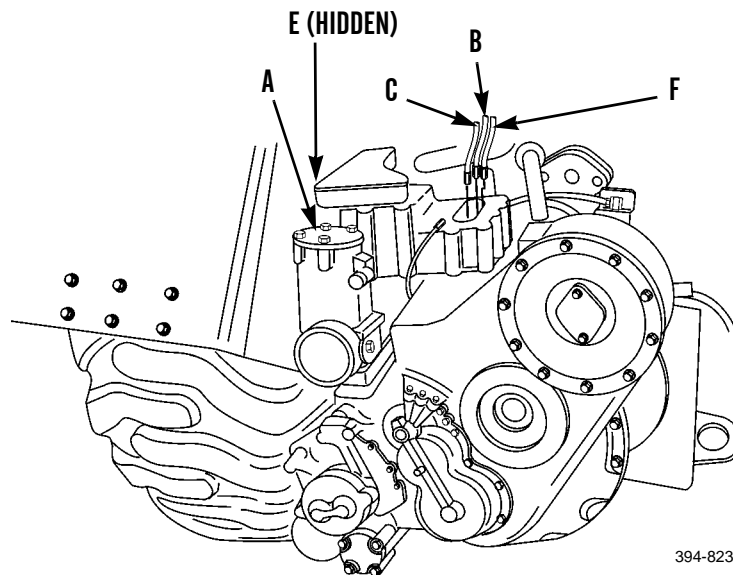


394-829

**TESTING - CONTINUED****NOTE**

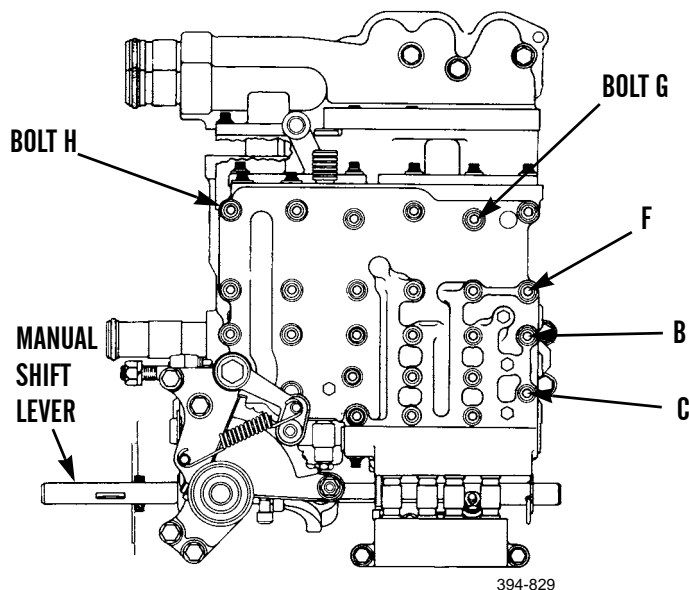
The following oil pressures are initialed. Refer to Table 2, Initial Pressure Chart, in this work package.

69. Shut down engine (TM 5-3805-248-10).
70. Install transmission hydraulic test set.
71. Connect 0-200 psi pressure gage to tap A.
72. Use locking pliers to shift manual selector shaft into REVERSE.



73. Rotate hand lever to increase engine speed on transmission hydraulic test set tachometer to 750 RPM, and record pressure reading on pressure gage for tap A.
74. Remove bolt G.
75. Connect 0-150 psi pressure gage to pressure tap C.
76. Use locking pliers to shift manual selector into NEUTRAL, and record pressure reading on pressure gage for tap C.
77. Install bolt G.
78. Remove bolt H.
79. Connect 0-600 psi pressure gage to pressure tap B and record pressure reading on pressure gage for tap B.
80. Rotate hand lever to increase engine speed on transmission hydraulic test set tachometer to 2,250 RPM, and record pressure reading on pressure gage for tap B.

TESTING - CONTINUED



81. Rotate hand lever to increase engine speed on transmission hydraulic test set tachometer to 750 RPM.
82. Stop engine.
83. Compare pressures recorded in steps 62 through 69 to specifications in Table 2, Initial Pressure Chart.

Table 2. Initial Pressure Chart.

Pressure Tap	Engine RPM	Initial Pressure	Remarks
C	750	57-63	Bolt G removed
B	750	42-48	Bolt H removed
B	2,250	295-305	
<p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• If the pressures are satisfactory, proceed to step 79.</li> <li>• If tap A pressure is not satisfactory, refer to step 73.</li> <li>• If tap B pressure (750 RPM) is not satisfactory, refer to step 75.</li> <li>• If tap B pressure (2,250 RPM) is not satisfactory, refer to step 77.</li> <li>• If tap C pressure is not satisfactory, refer to step 78.</li> </ul>			

84. Determine pressure change required by subtracting tap A pressure reading from 120 psi.

**NOTE**

The procedure for changing spacers is in the repair procedure for each individual control valve assembly.



**TESTING - CONTINUED**

- 85. Determine spacer thickness change to tap A pressure. Refer to Table 3, Spacer Chart. Change spacers in shift pressure valve if necessary (WP 0367 00).
- 86. If pressure reading is too low, add tap A pressure reading at 750 RPM to 45 psi. This figure is pressure change required. If pressure reading is too high, subtract tap B pressure reading at 750 RPM from 45 psi. This figure is pressure change required.
- 87. Determine thickness change for tap B pressure. Refer to Table 3 Spacer Chart. Change spacers in shift pressure valve if necessary (WP 0367 00).
- 88. If pressure reading is too low, add tap B pressure reading at 2,250 RPM to 300 psi. This figure is the pressure change required. If pressure reading is too high, subtract tap B pressure reading at 2,250 RPM from 60 psi. This figure is the pressure change required.
- 89. Determine thickness change for tap C pressure. Refer to Table 3. Change spacers in pressure control valve if necessary (WP 0368 00).

**Table 3. Spacer Chart.**

Pressure Tap	Spacer Part Number	Thickness	Pressure Change	Spacer Location
A	7M1397	0.036	9.0	Shift Pressure Valve
B (750 RPM)	8S6214	0.016	4.5	Shift Pressure Valve
	8S6215	0.036	10.0	Shift Pressure Valve
B (2,250 RPM)	2S674	0.016	8.0	Shift Pressure Valve
	2S675	0.036	18.2	Shift Pressure Valve
C	8S6214	0.016	2.5	Pressure Control Valve
	8S6215	0.036	5.6	Pressure Control Valve

**CAUTION**

Changing spacers to get satisfactory initial pressures will cause some change in transmission control pressures. Spacer thickness selections may have to be changed in order to retain satisfactory transmission control pressure. Failure to follow this procedure could cause damage to equipment.

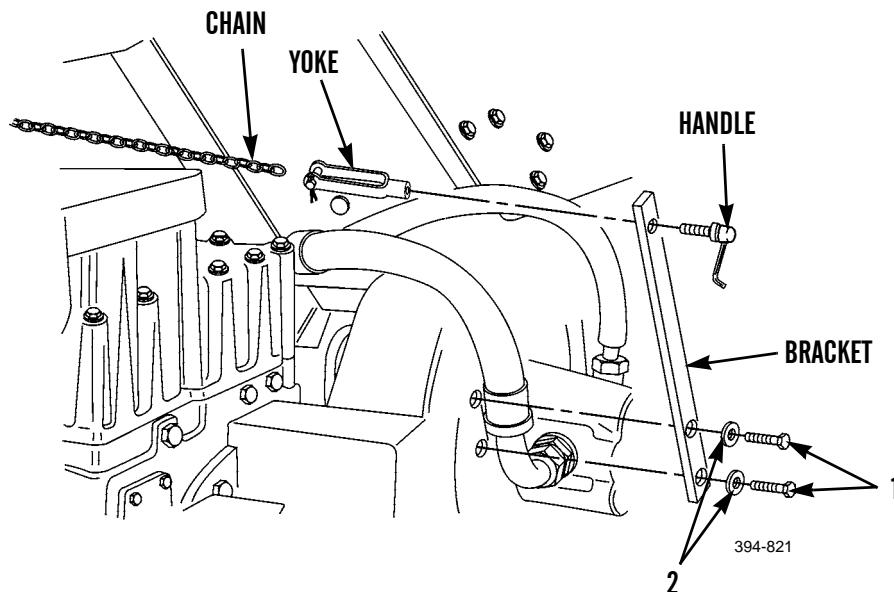
- 90. Compare Table 1, Transmission Control Pressure Chart, specifications with required pressures for taps A, B and C. Make sure spacer change for initial pressure requirements does not cause out-of-tolerance transmission control pressures. Modify spacer thickness as required.

**CLEANING AND INSPECTION****WARNING**

- 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.
  - 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 eye protection.
1. Remove all gasket material from mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry parts with compressed air.
  4. Visually inspect parts for damage. Replace damaged parts as necessary.

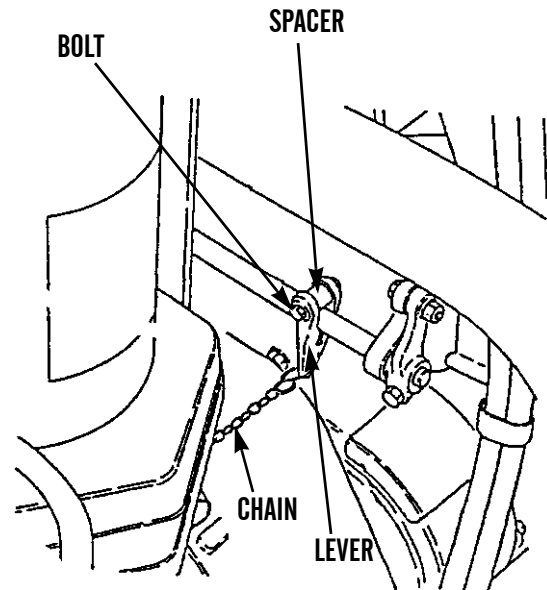
**REMOVAL**

1. Remove transmission hydraulic test set from rear of vehicle.
2. Disconnect chain from yoke.



**REMOVAL - CONTINUED**

3. Remove handle, yoke, two bolts (1) and bracket.
4. Install two washers (2) and bolts (1).
5. Remove chain, bolt, spacer and lever from governor linkage.



394-820

**REMOVAL - CONTINUED**

6. Install new gasket (16).

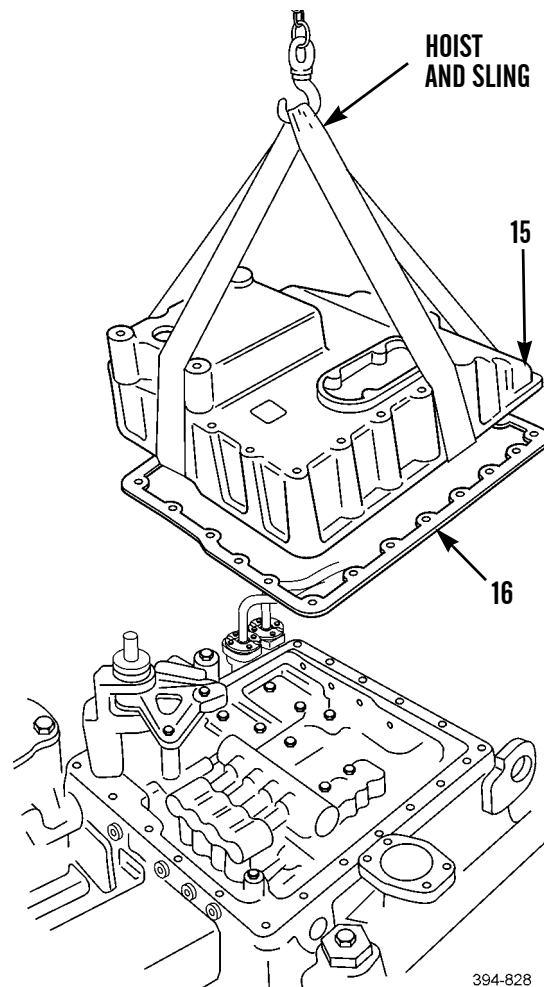
**WARNING**

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**

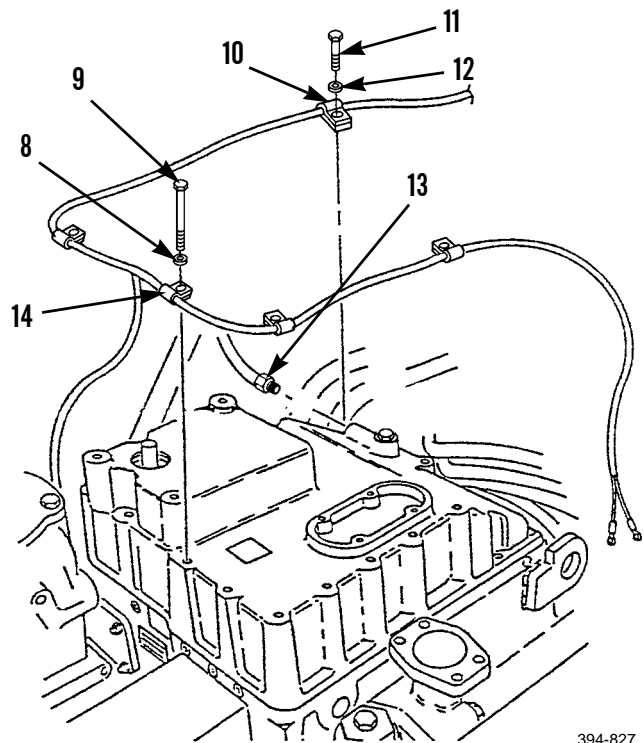
Weight of cover assembly is 70 lb (32 kg).

7. Install lifting device on cover (15).
8. Use lifting device to install cover (15).
9. Remove lifting device from cover (15).



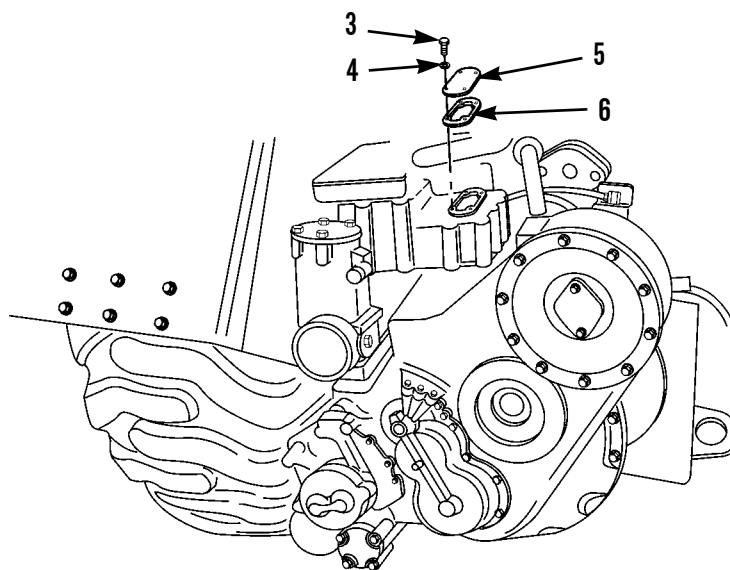
**REMOVAL - CONTINUED**

10. Install three clips (10), nine new lockwashers (12) and bolts (11).
11. Install four clips (14), 12 new lockwashers (8) and bolts (9).
12. Connect hose assembly (13).



394-827

13. Install new gasket (6), cover (5), four new lockwashers (4) and bolts (3).



394-822

---

**CONTROL GROUP PRESSURE TEST - CONTINUED**

---

**0284 00**

***REMOVAL - CONTINUED***

14. Install front axles (WP 0141 00).
15. Install steering linkage (WP 0179 00).
16. Operate machine and verify correct operation of transmission (TM 5-3805-248-10).
17. Install hood (WP 0189 00).
18. Install step assembly (WP 0200 00).

**END OF WORK PACKAGE**

---

**SHIFT POINT ADJUSTMENT**

---

0285 00

**THIS WORK PACKAGE COVERS**Adjustment

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Control, throttle kit (Item 16, WP 0338 00)

Gage, pressure kit (Item 31, WP 0338 00)

Gage, pressure kit adapter (Item 32, WP 0338 00)

**Materials/Parts**

Rag, wiping (Item 35, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

Front axles removed (WP 0141 00)

Steering linkage disconnected (WP 0179 00)

Hood removed (WP 0189 00)

---

**ADJUSTMENT****WARNING**

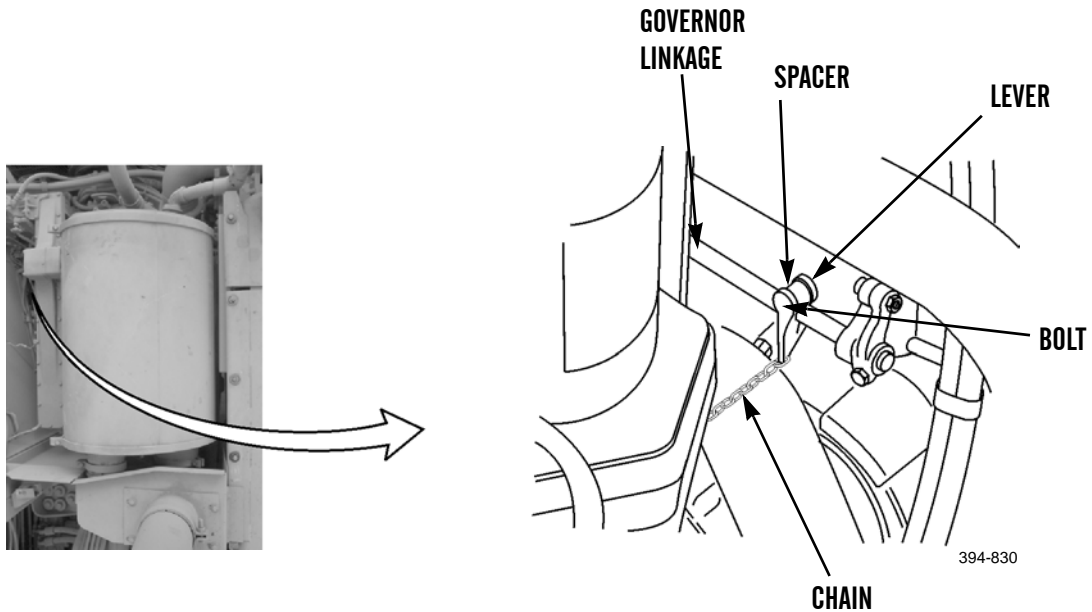
Both axles must be removed and steering linkage must be disconnected before attempting this procedure. Failure to follow this procedure could result in injury.

**NOTE**

If lever is not available for installation, locking pliers may be substituted.

**ADJUSTMENT - CONTINUED**

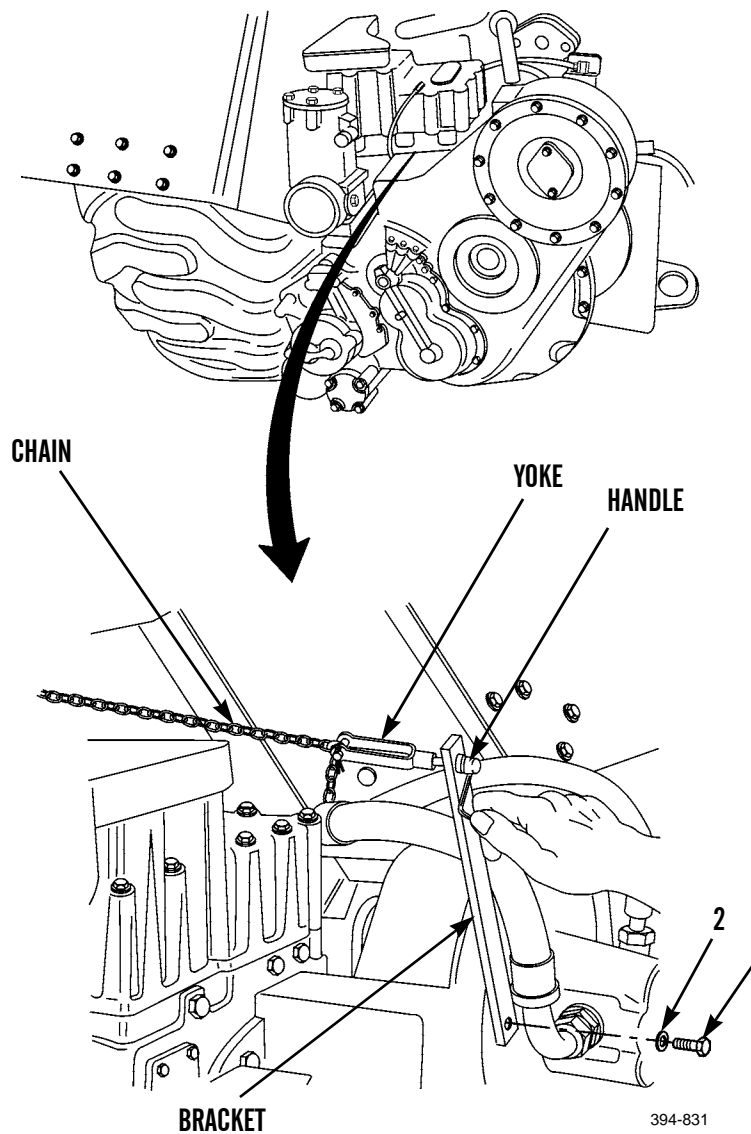
1. Install lever, spacer and bolt from engine speed control adapter group on governor linkage located on left side of engine. Position lever so when it is pulled, it will give maximum travel of governor linkage.
2. Connect chain assembly to lever and route chain as straight as possible through open areas to rear of vehicle.





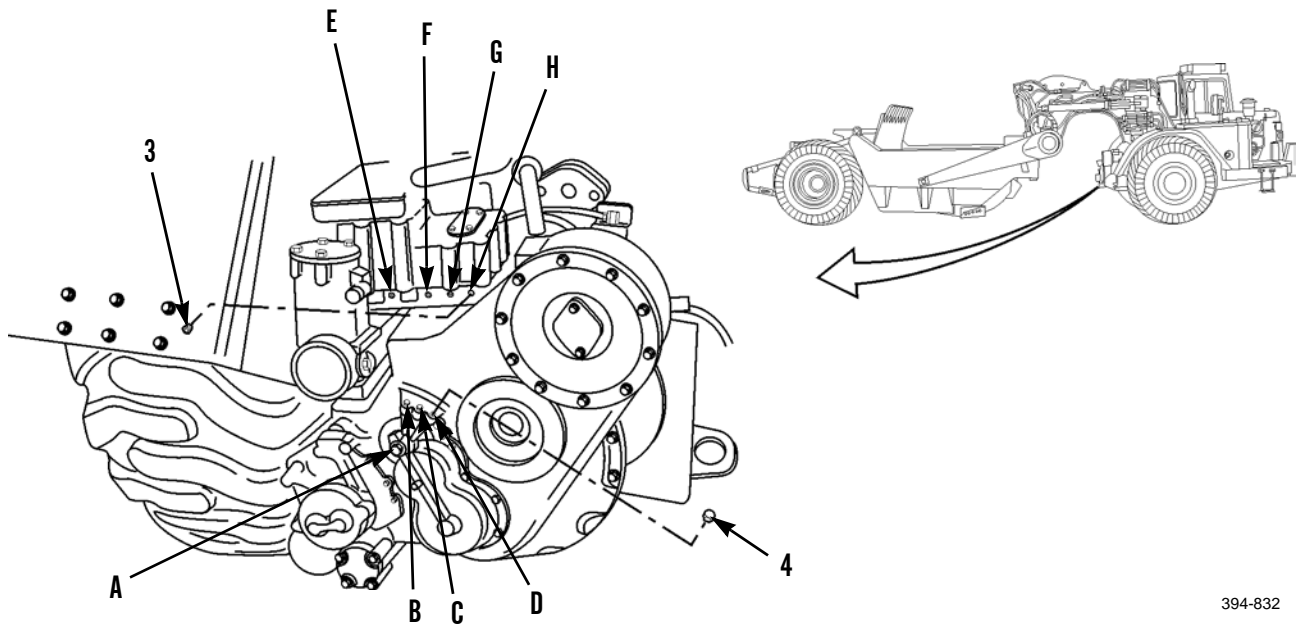
**ADJUSTMENT - CONTINUED**

3. Remove two bolts (1) and washers (2) from transmission case.
4. Install bracket and two bolts (1).
5. Install handle through top of bracket.
6. Adjust chain on yoke so length is just long enough to thread end of yoke on handle and install.
7. Turn handle clockwise and observe if governor linkage is moving. If not, adjust length or chain.



**ADJUSTMENT - CONTINUED**

8. Remove four plugs (4) at taps A, B, C and D.
9. Install transmission hydraulic test group at taps A, B, C and D.
10. Remove four plugs (3) at taps E, F, G and H.
11. Operate engine and let transmission oil get to normal operating temperature (TM 5-3805-248-10).
12. Put transmission selector lever, at operator console, in 2nd speed position and run engine at 1,500 RPM.
13. Check supply oil to governor at test location A. Pressure should be 85-94 psi.
14. If supply pressure for governor is not in tolerance, turn adjustment screw (E) to get correct pressure.



394-832

**ADJUSTMENT - CONTINUED****NOTE**

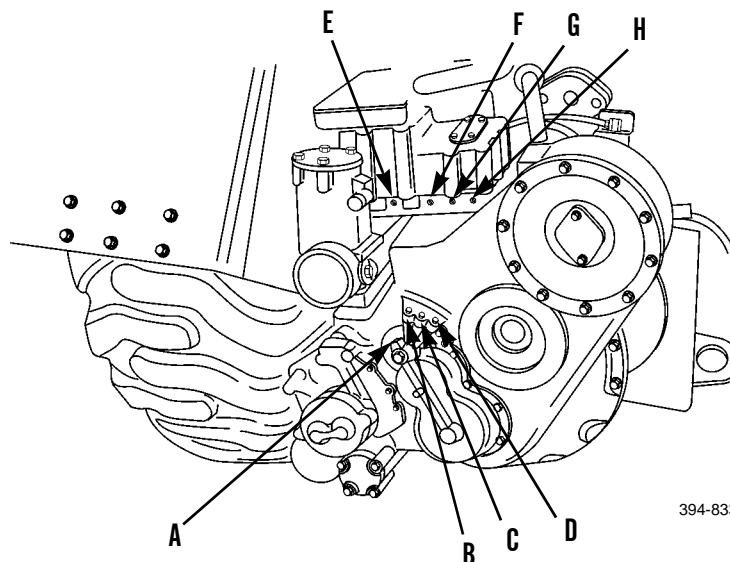
Supply pressure for governor is changed when an adjustment is made to a downshift point.

15. Put transmission selector lever in 3rd speed position and increase engine RPM to get a 2nd to 3rd speed upshift.
16. Put transmission selector lever in 4th speed position and run engine at 1,900 RPM.
17. Slowly increase engine RPM and turn screw (G), as necessary, to get a 3rd or 4th speed upshift when engine is running  $2,055 \pm 30$  RPM.
18. Slowly decrease engine RPM and turn screw (E), as necessary, to get a 4th to 3rd speed downshift when engine is running at  $1,440 \pm 30$  RPM.
19. Slowly decrease engine RPM and turn screw (E), as necessary, to get a 3rd to 2nd speed downshift when engine is running at  $1,262 \pm 30$  RPM.

**NOTE**

To make adjustment of 3rd to 2nd speed downshift, it may be necessary to also turn screw (F).

20. Put transmission selector lever in 5th speed position and run engine at 1,900 RPM.
21. Slowly increase engine RPM and turn screw (H), as necessary, to get a 4th to 5th speed upshift when engine is running  $2055 \pm 30$  RPM.
22. Put transmission selector lever in 5th speed position and run engine until transmission shifts to 5th speed.
23. Put transmission selector lever in 6th speed position and run engine at 1,900 RPM.
24. Slowly increase engine RPM and turn screw (G), as necessary to get a 5th to 6th speed upshift when engine is running at  $2,055 \pm 30$  RPM.
25. Put transmission selector lever in 7th speed position and run engine at 1,900 RPM.
26. Slowly increase engine RPM and turn screw (H), as necessary to get a 6th to 7th speed upshift when engine is running at  $2066 \pm 30$  RPM.



394-833

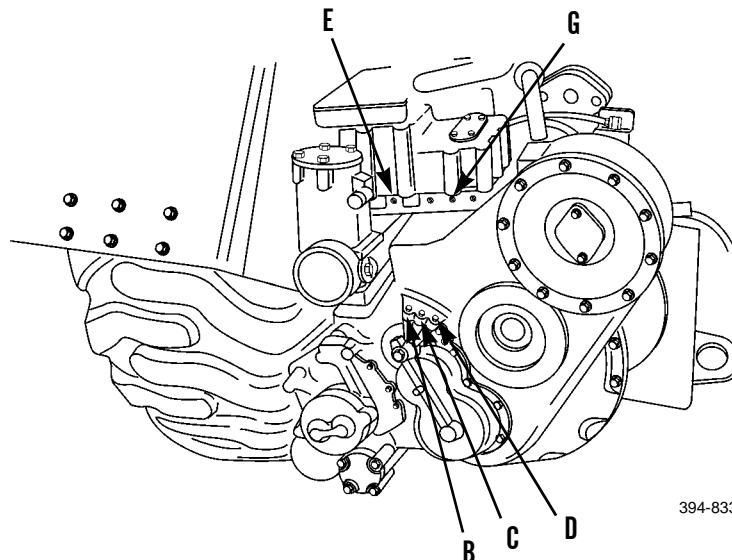
**ADJUSTMENT - CONTINUED**

- 27. Put transmission selector lever in 8th speed position and run engine at 1,900 RPM.
- 28. Slowly increase engine RPM and turn screw (G), as necessary, to get a 7th to 8th speed upshift when engine is running at  $2,056 \pm 30$  RPM.

**Table 1. Shift Point Chart.**

Shift	Engine Speed	Screw
3 to 2	$1262 \pm 30$	E
3 to 4 4 to 3	$2055 \pm 30$ $1440 \pm 30$	G E
4 to 5 5 to 4	$2055 \pm 30$ $1449 \pm 30$	H E
5 to 6 6 to 5	$2055 \pm 30$ $1440 \pm 30$	G E
6 to 7 7 to 6	$2066 \pm 30$ $1449 \pm 30$	H E
7 to 8 8 to 7	$2055 \pm 30$ $1440 \pm 30$	G E

- 29. To make adjustment of downshift point:
  - a. Put transmission selector lever in position of next lower speed.
  - b. Slowly decrease engine RPM and turn screw (E), as necessary, to get a downshift when engine is running at RPM shown in Table 1, Shift Point Chart.
- 30. Make check of all upshift and downshift points and make sure all points are in tolerance.



394-833

**ADJUSTMENT - CONTINUED**

31. If adjustment cannot be made to shift points or a shift point, make a check of operation of governor as follows:
  - a. Install a 0-150 psi pressure gage in each pressure tap (B), (C) and (D).
  - b. Refer to Table 2, Governor Performance Chart for approximate pressure of governor at each shift point.
  - c. Repeat steps 11 through 31 and check pressures of governor.
  - d. If pressures of governor are not correct, clean or install a new governor.

**Table 2. Governor Performance Chart.**

Selection Shaft Speed Position	Shift Point	Engine RPM	Pressure Tap	Approximate Pressure psi
3rd	3 to 2 * *	1262±30	C	25
3rd	3 to 4 *	2055±30		74 * * *
4th	4 to 3 *	1440±30		67
4th	4 to 5 * *	2055±30	D	41
5th	5 to 4	1449±30		37
5th	5 to 6	2055±30		74 * * *
6th	6 to 5	1440±30	B	67
6th	6 to 7	2066±30		41
7th	7 to 6	1449±30		37
7th	7 to 8	2055±30		74 * * *
8th	8 to 7	1440±30		67
* Make an adjustment to these shift points first. ** Make an adjustment to these shift points second. *** The pressures of these shift points must be within 0.5 psi of each other. The engine speed of these shift points must be within 5 RPM of each other. If these conditions can be obtained, the governor is operating correctly.				

32. Install front axles (WP 0141 00).
33. Install steering linkage (WP 0179 00).
34. Operate machine to verify correct operation of transmission (TM 5-3805-248-10).
35. Install hood (WP 0189 00).

**END OF WORK PACKAGE**



---

**TRANSMISSION REPLACEMENT**

**0286 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

Lifting device, 6,800 lb minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket (3)

Packing, preformed (3)

**References**

WP 0125 00

WP 0295 00

WP 0322 00

**Personal Required**

Two

**Equipment Condition**

Cutting edge worklight removed (WP 0086 00)

Cutting edge worklight harness removed from transmission (WP 0122 00)

Axles removed (WP 0141 00)

Transmission drained (WP 0128 00)

Driveshaft removed (WP 0293 00)

Supplemental steering pump removed (WP 0307 00)

Air pressure vented (TM 5-3805-248-10)

---

**REMOVAL****CAUTION**

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

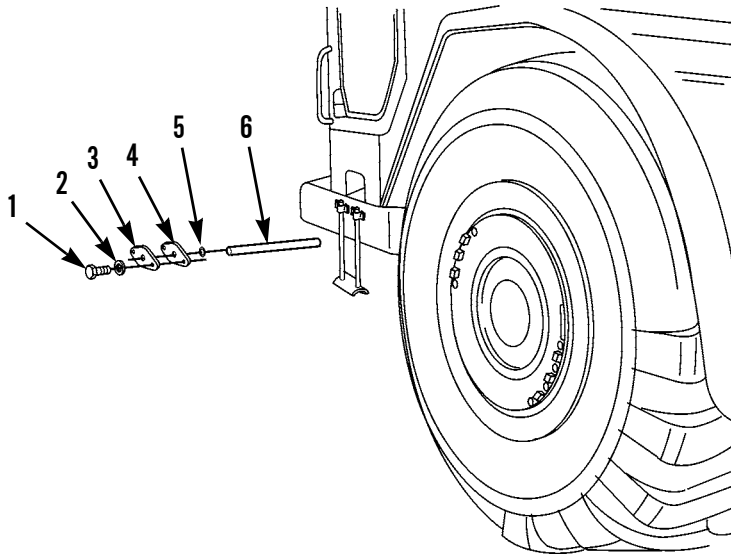
**NOTE**

- Tag all hose and tube assemblies prior to disconnecting to ensure correct installation.
- Use a container to capture any oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

**NOTE**

Steps 1 through 4 are for the removal of shaft from the left wheel. Removal of shaft from the right wheel is identical.

1. Remove two bolts (1) and washers (2) from inner wheel well.
2. Remove cover (3), shim (4) and preformed packing (5). Discard preformed packing.
3. Remove pin (6).

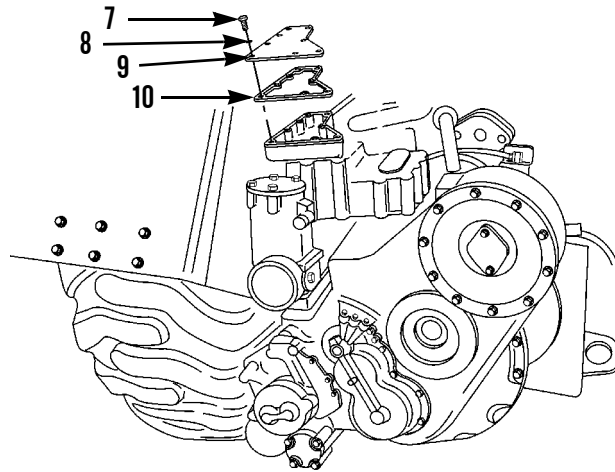


394-769



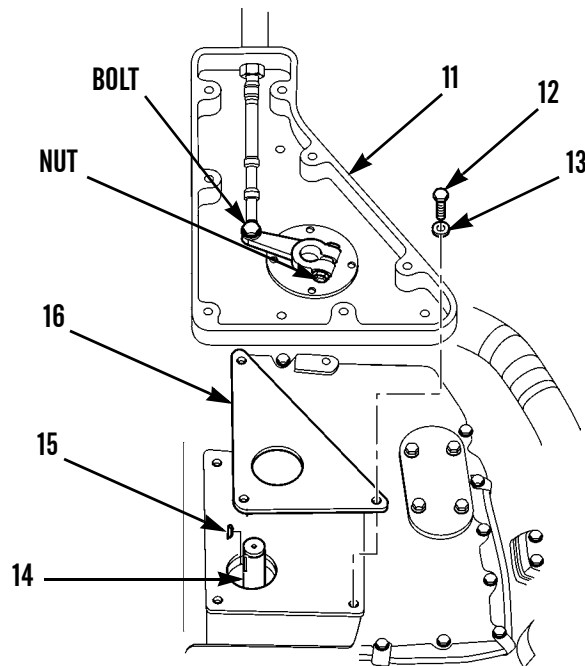
**REMOVAL - CONTINUED**

4. Remove seven bolts (7) and washers (8).
5. Remove cover (9) and gasket (10). Discard gasket.



394-770

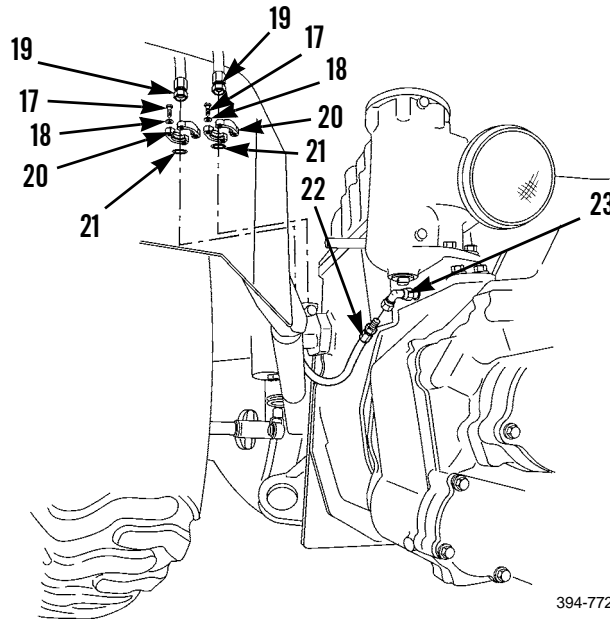
6. Loosen bolt and nut.
7. Remove three bolts (12) and washers (13).
8. Remove housing (11) from shaft (14) and move housing (11) out of the way.
9. Remove woodruff key (15) and gasket (16). Discard gasket.



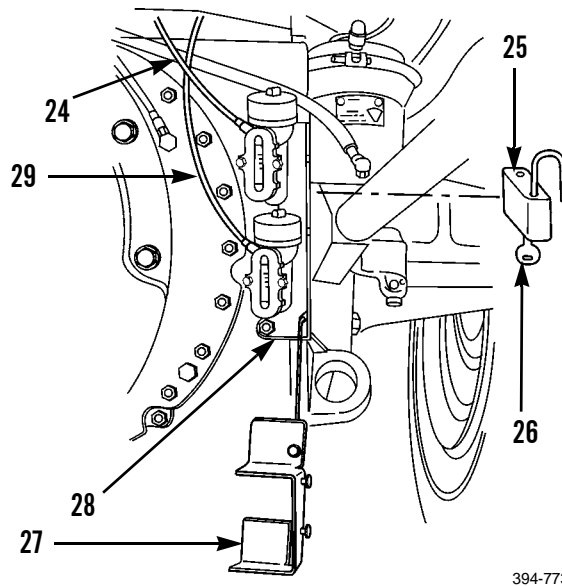
394-771

**REMOVAL - CONTINUED**

10. Disconnect hose assembly (22) and elbow (23).
11. Remove eight bolts (17) and washers (18).
12. Remove four flange halves (20).
13. Disconnect two hose assemblies (19) and remove two preformed packings (21). Discard preformed packings.

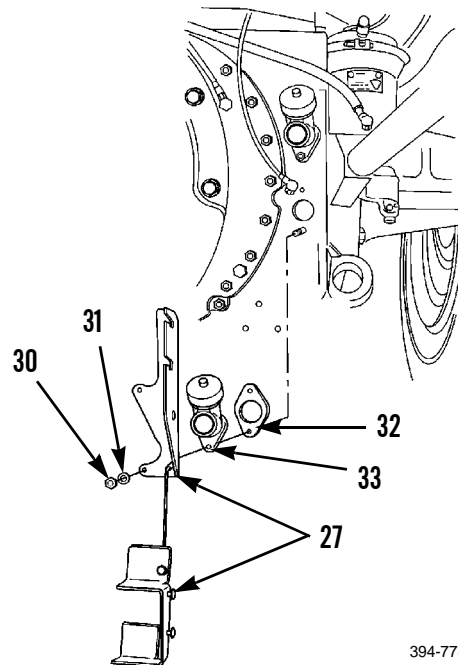


14. Use key (26) to unlock lock (25), and remove lock and key.
15. Disconnect cover plate (27) from back plate (28).
16. Disconnect hose assemblies (24 and 29).



**REMOVAL - CONTINUED**

17. Remove two nuts (30) and washers (31).
18. Remove cover plate (27) assembly.
19. Remove differential filler (33) and gasket (32). Discard gasket.
20. Disconnect hydraulic implement pump (WP 0322 00).



21. Install link bracket into top of transfer case.

**WARNING**

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.

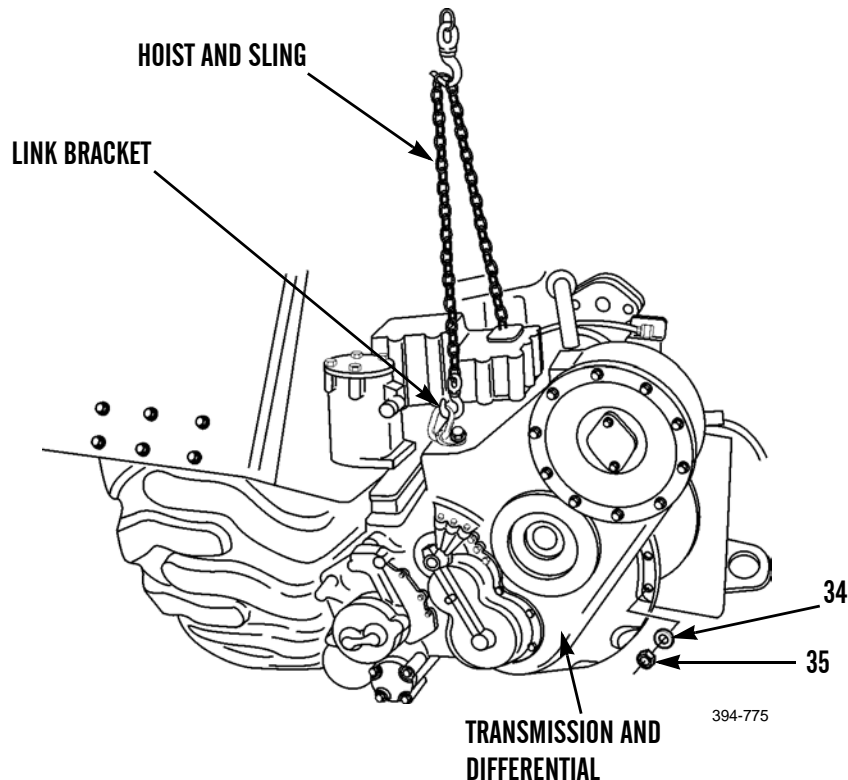
**NOTE**

- Weight of retarder transmission is 4,500 lb (2,041 kg).
  - Place hydraulic floor jack under retarder oil cooler assembly for support.
22. Attach lifting device to 3/4-10NC link bracket and to front lifting eye.

**REMOVAL - CONTINUED****NOTE**

Do not remove the four bolts that secure the differential to the transmission.

23. Remove 20 nuts (35) and washers (34).
24. Remove transmission and differential as an assembly.



25. Remove differential assembly (WP 0300 00).

**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 cause 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.

**CLEANING AND INSPECTION - CONTINUED**

1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Remove all gasket material from mounting surfaces.
2. Attach differential assembly to transmission assembly (WP 0295 00).
3. Install 3/4-10NC link bracket into top of transfer case.

**WARNING**

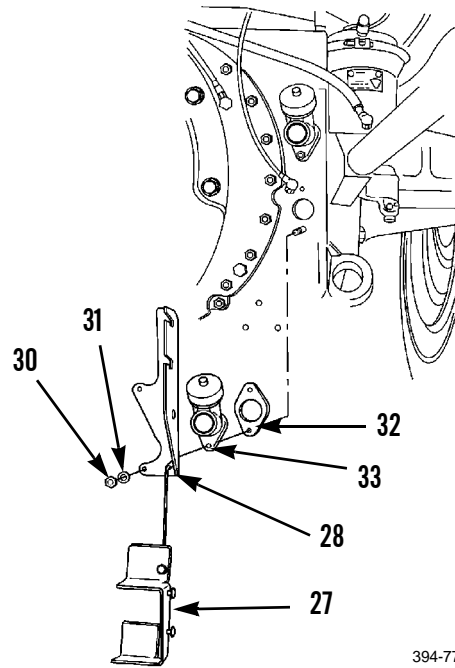
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

**NOTE**

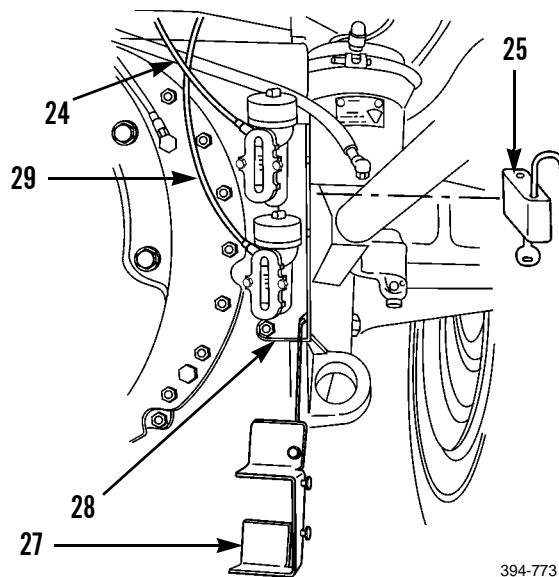
- Weight of retarder transmission is 4,500 lb (2,041 kg).
  - Place hydraulic floor jack under retarder oil cooler assembly for support.
4. Attach lifting device to link bracket and to front lifting eye.
  5. Install transmission and differential on mounting studs.
  6. Install four washers (34) and nuts (35) on studs opposite each other.
  7. Tighten the four nuts (35) until transmission is flush against the differential case.
  8. Install 16 washers (34) and nuts (35).
  9. Remove link bracket and lifting device.

**INSTALLATION - CONTINUED**

10. Connect hydraulic implement pump (WP 0322 00).
11. Install new gasket (32), differential filler (33), cover plate (27) assembly, two washers (31) and nuts (30).

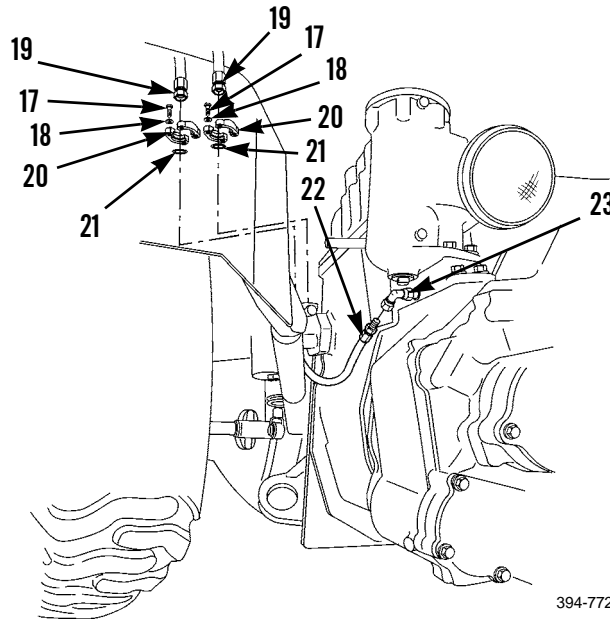


12. Connect hose assemblies (24 and 29).
13. Connect cover plate (27) to back plate (28).
14. If equipped, install padlock (25).



**INSTALLATION - CONTINUED**

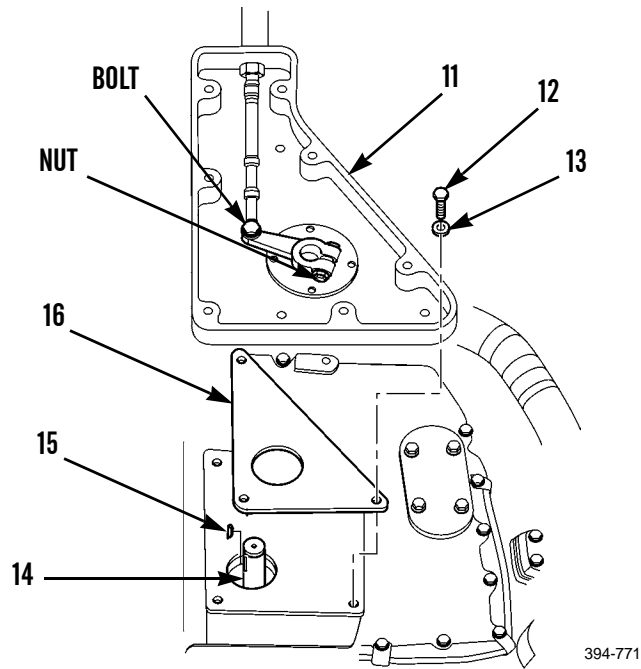
15. Install two new preformed packings (21).
16. Connect two hose assemblies (19).
17. Install four flange halves (20), eight washers (18) and bolts (17).
18. Connect hose assembly (22) and elbow (23).



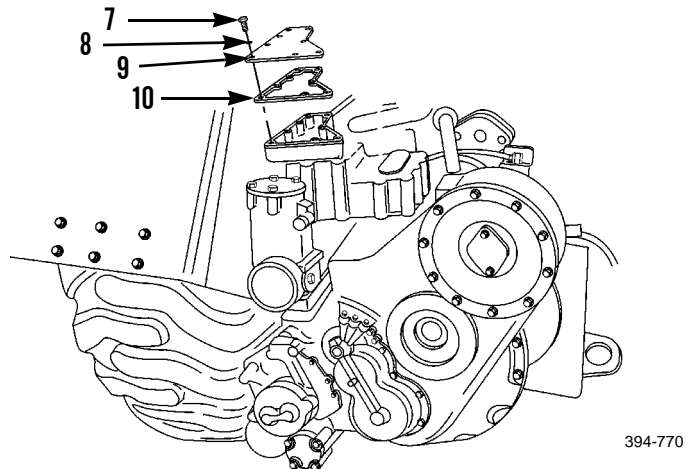
394-772

**INSTALLATION - CONTINUED**

19. Install new gasket (16) and key (15) on shaft (14).
20. Install housing (11).
21. Install three washers (13) and bolts (12).
22. Adjust transmission shift control cable (WP 0114 00).
23. Tighten nut and bolt.



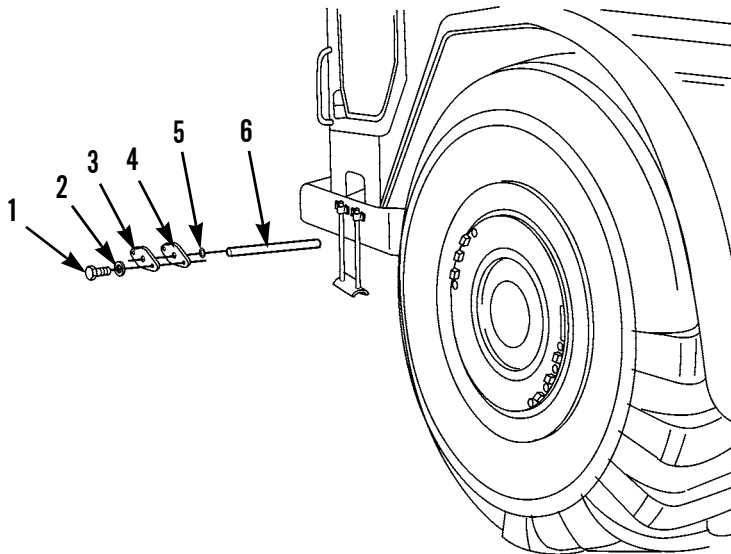
24. Install new gasket (10).
25. Install cover (9) and seven washers (8) and bolts (7).





**INSTALLATION - CONTINUED**

26. Install pin (6) in bore in inner-left wheel wall until pin (6) seats on differential.
27. Measure the amount of pin sticking out beyond the mounting face.
28. Install shim(s) (4) to equal the measured thickness minus 0.002 in. (0.051 mm) and remove shim(s) (4) and pin (6).
29. Install pin (6) and new preformed packing (5).
30. Install shim(s) (4) to the measured thickness noted in step 27.
31. Install cover (3), two washers (2) and bolts (1).



394-769

32. Install axles (WP 0141 00).
33. Install cutting edge worklight and harness (WP 0086 00 and WP 0122 00).
34. Install driveshaft (WP 0293 00).
35. Install supplemental steering pump (WP 0307 00).
36. Refill transmission to correct level (WP 0128 00).
37. Operate machine and verify correct operation of transmission (TM 5-3805-248-10).
38. Shut down engine (TM 5-3805-248-10).
39. Check for transmission, final drive or hydraulic leaks.

**END OF WORK PACKAGE**



---

**TRANSMISSION FILLER REPLACEMENT**

**0287 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance level**

Direct support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Gasket

Seal (2)

**References**

TM 5-3805-248-10

**Equipment Condition**

Transmission fluid drained (WP 0128 00)

---

**REMOVAL**

1. Remove padlock (4) if equipped.
2. Disconnect plate (5) and let hang by cable.

**CAUTION**

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

**NOTE**

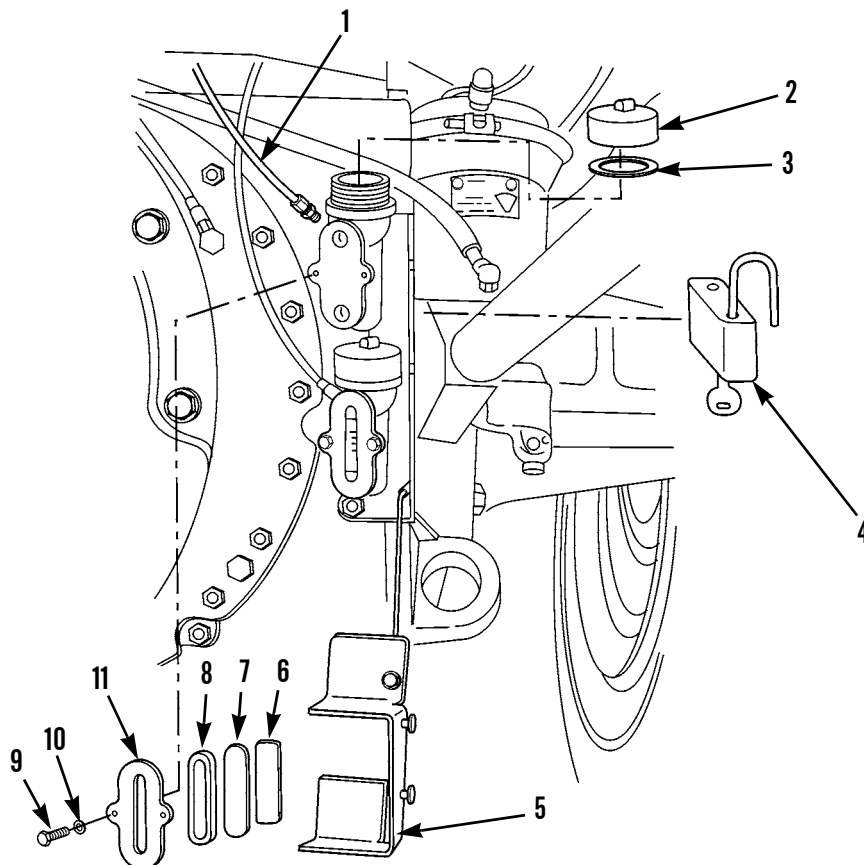
Use a container to capture any oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

3. Disconnect hose assembly (1).
4. Remove cap (2) and seal (3). Discard seal.

**NOTE**

If equipped with round sight glass, proceed to step 6. Do not attempt to disassemble sight gage.

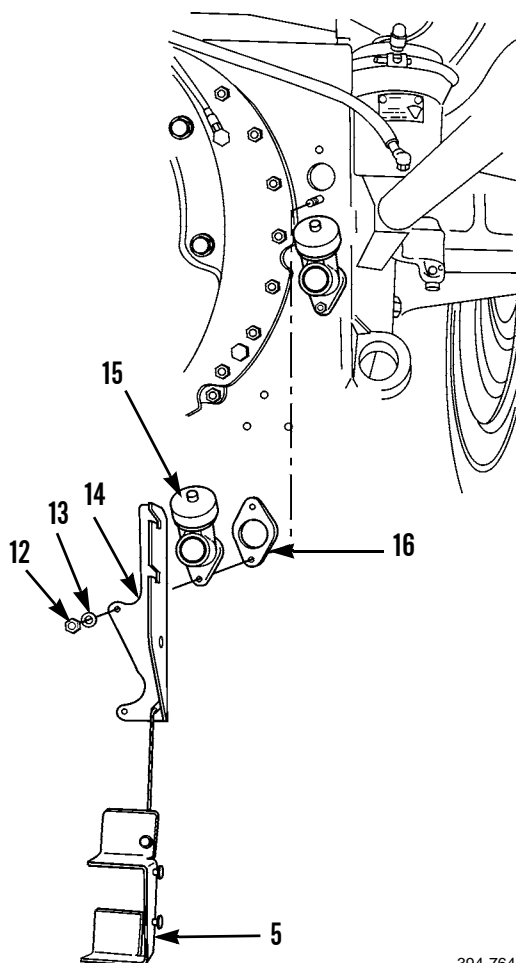
5. Remove two bolts (9), washers (10), retainer (11), seal (8), lens (7) and plate (6). Discard seal.



394-763

**REMOVAL- CONTINUED**

6. Remove two nuts (12), washers (13) and plate (14) with plate (5) attached.
7. Remove elbow (15) and gasket (16). Discard gasket.



394-764

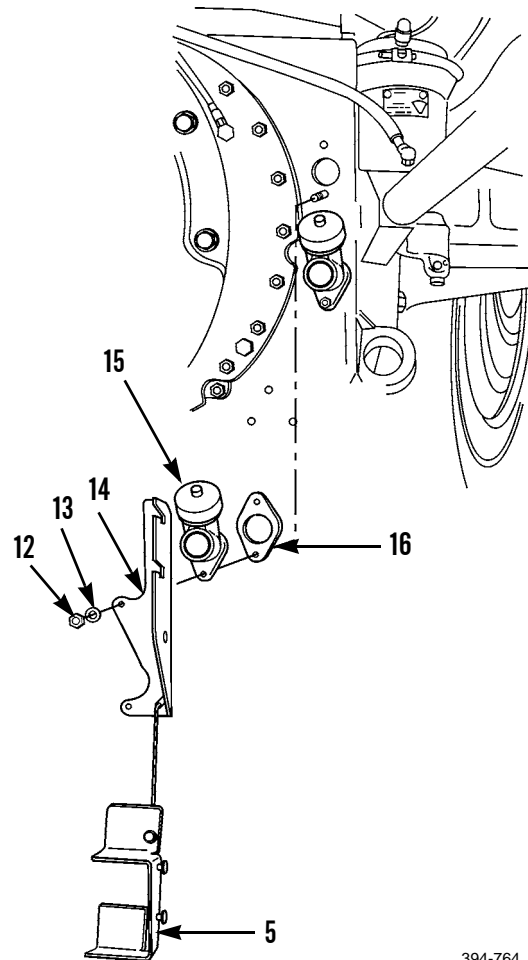
**CLEANING AND INSPECTION****WARNING**

- 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 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 eye protection.

1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install new gasket (16), and elbow (15).
2. Install plate (14) with plate (5) attached, two washers (13) and nuts (12).



394-764

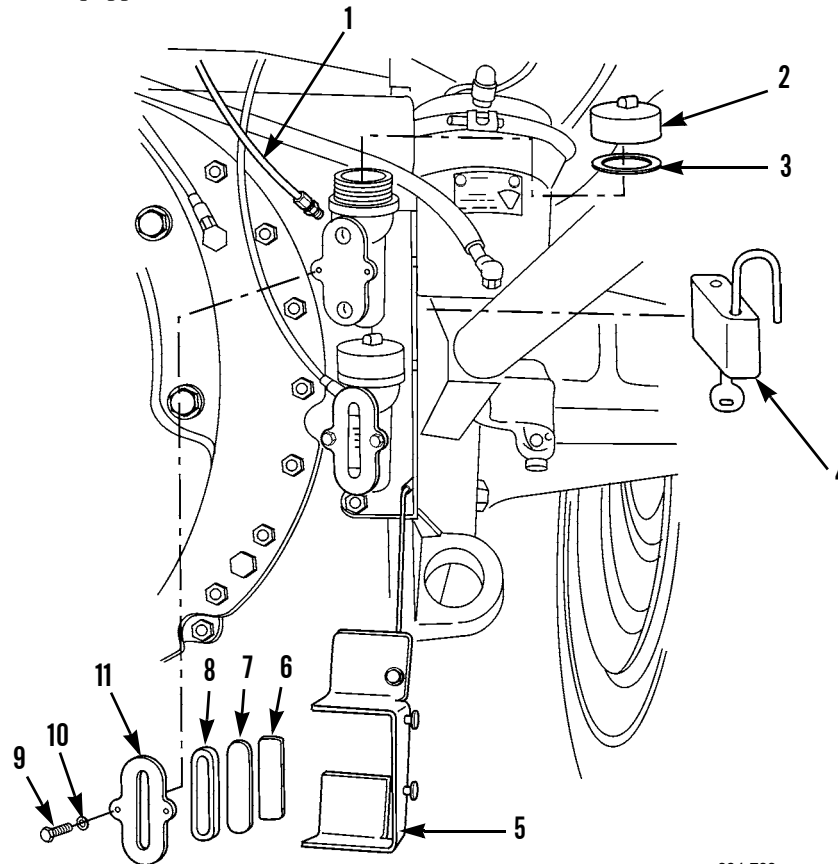
**NOTE**

If equipped with round sight glass, proceed to step 5.

3. Install plate (6), lens (7) and new seal (8).
4. Install retainer (11), two washers (10) and bolts (9).
5. Install new seal (3) and cap (2).
6. Connect hose assembly (1).
7. Install plate (5).

**INSTALLATION - CONTINUED**

8. Install padlock (4) if equipped.



394-763

9. Refill transmission (WP 0128 00)
10. Operate machine (TM 5-3805-248-10)
11. Shut down engine (TM 5-3805-248-10).
12. Check for leaks around sight glass and hoses.

**END OF WORK PACKAGE**





---

**FLYWHEEL SCAVENGE RETARDER PUMP MAINTENANCE**

---

**0288 00****THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Tag, marker (Item 42, WP 0339 00)

Filter

Gasket

Packing, preformed (5)

Seal (5)

**References**

TM 5-3805-248-20

**Equipment Condition**Crankcase guards removed (WP 201 00)

---

**REMOVAL****CAUTION**

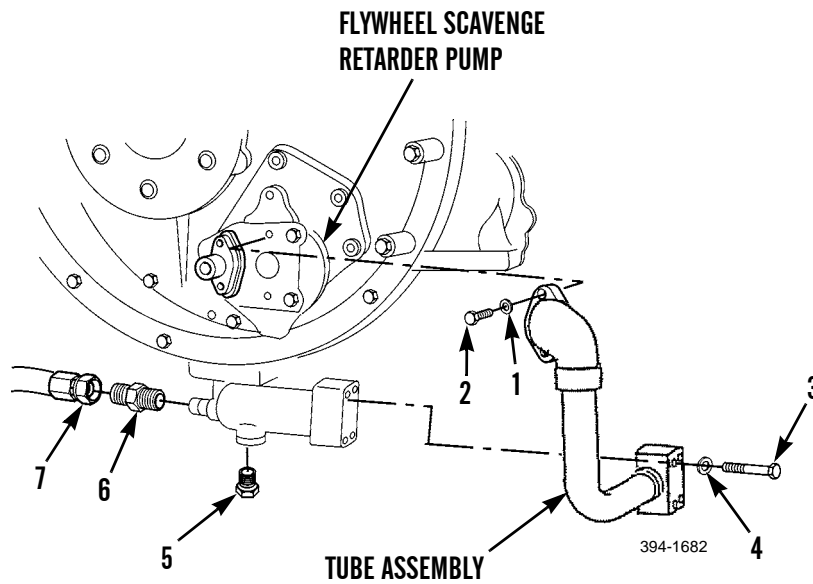
Wipe area clean around all connections to be opened during removal and disassembly. Cap lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

**NOTE**

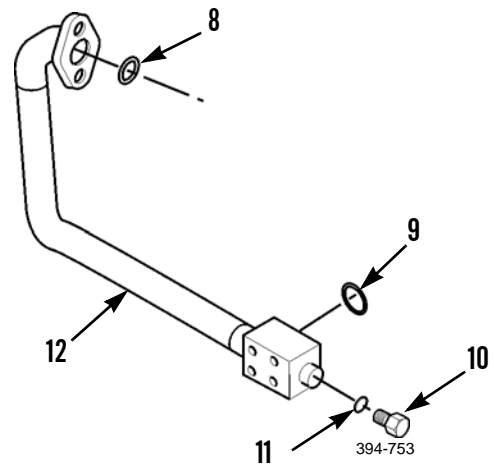
- Tag all hose and tube assemblies prior to disconnecting to ensure correct installation.
- Use a container to capture any oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

**REMOVAL - CONTINUED**

1. Remove plug (5) and drain oil into container.
2. Disconnect hose assembly (7).
3. Remove connector (6).
4. Remove two bolts (2) and washers (1).
5. Remove four bolts (3), washers (4) and tube assembly from flywheel scavenge retarder pump.

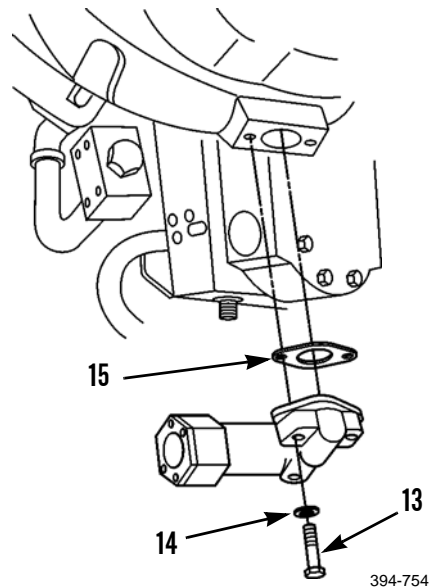


6. Remove preformed packing (8), seal (9), plug (10) and preformed packing (11) from tube assembly (12). Discard preformed packings and seal.

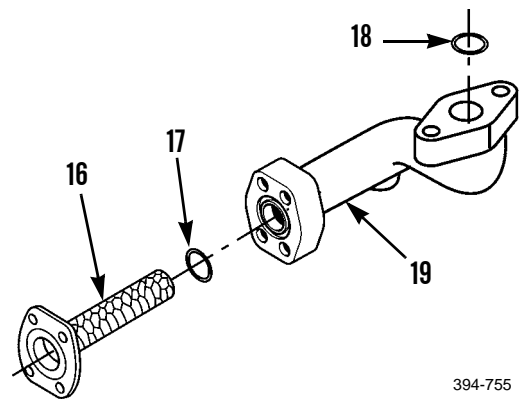


**REMOVAL - CONTINUED**

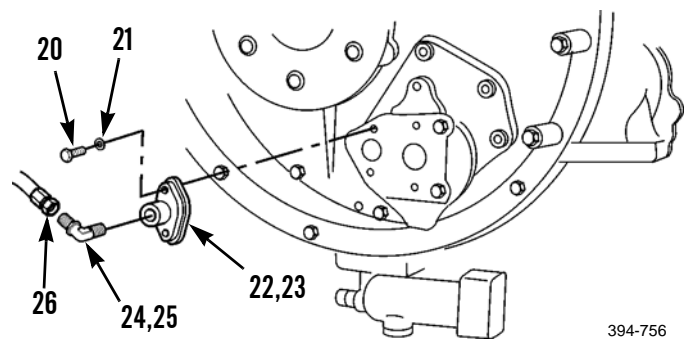
7. Remove two bolts (13), washers (14), elbow assembly and gasket (15). Discard gasket.



8. Remove and discard filter (16), seal (17) and preformed packing (18) from elbow (19).
9. Cover holes in elbow (19) to prevent contamination.

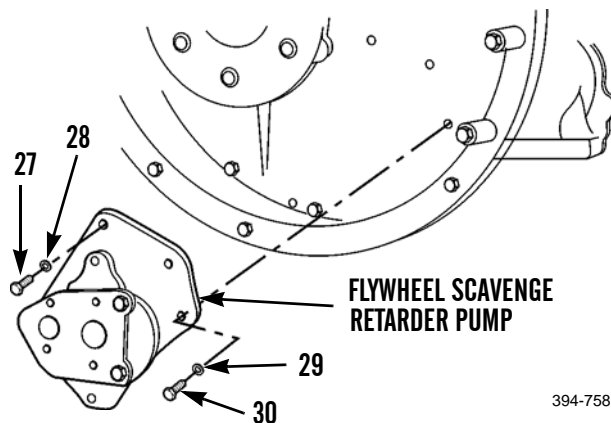


10. Disconnect hose assembly (26).
11. Remove adapter (25), two bolts (20), washers (21) and elbow (23) from flywheel scavenger retarder pump.
12. Remove and discard preformed packing (24) from adapter (25).
13. Remove and discard preformed packing (22) from elbow (23).



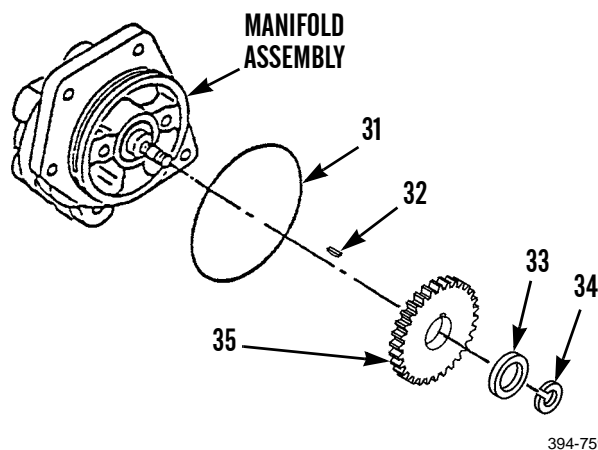
**REMOVAL - CONTINUED**

14. Support flywheel scavenge retarder pump and remove three bolts (30), lockwashers (29), bolt (27) and lock-washer (28).

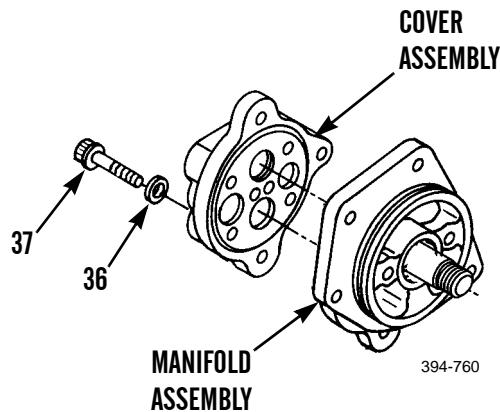


**DISASSEMBLY**

1. Use retaining ring pliers to remove retaining ring (34).
2. Remove thrust washer (33), gear (35), key (32) and seal (31) from manifold assembly. Discard seal.

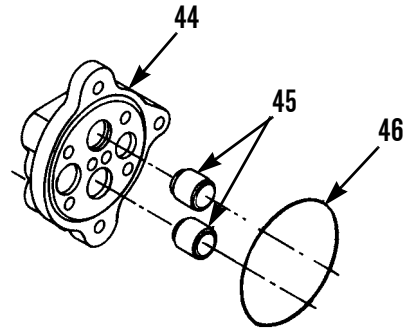


3. Remove four bolts (37), washers (36) and cover assembly from manifold assembly.



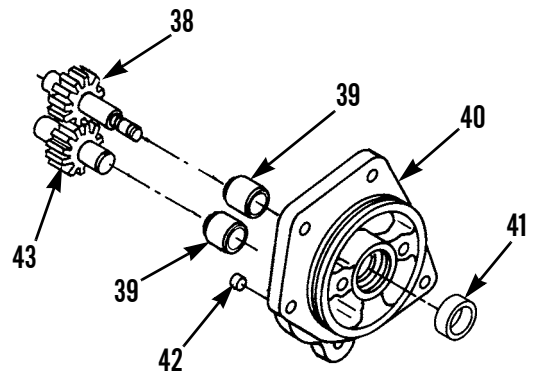
**DISASSEMBLY - CONTINUED**

4. Remove and discard seal (46) from cover (44).
5. Use brass driver and hammer to remove two sleeve bearings (45) from cover (44).



394-762

6. Remove gears (38 and 43).
7. Use brass driver and hammer to remove two sleeve bearings (39) and seal (41) from manifold (40). Discard seal.
8. Use dowel puller to remove two dowels (42).



394-761

**CLEANING AND INSPECTION**



**WARNING**



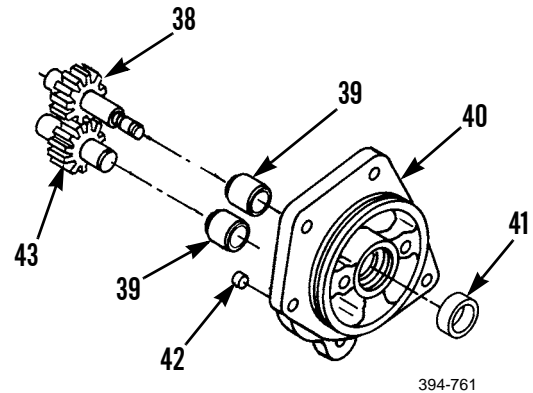
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

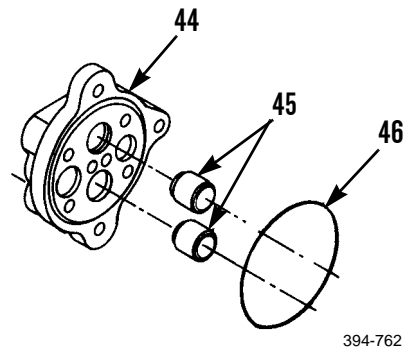
**ASSEMBLY****NOTE**

Sleeve bearings must be fitted to 0.062 in. (1.575 mm) below inside surface of parts in which they are installed.

1. Use brass driver and hammer to install two sleeve bearings (39) not more than 0.062 in. (1.575 mm) in manifold (40).
2. Install two dowels (42).
3. Use clean oil to lubricate lip of new seal (41).
4. Use brass driver and hammer to install new seal (41).
5. Install gears (38 and 43) in manifold (40).

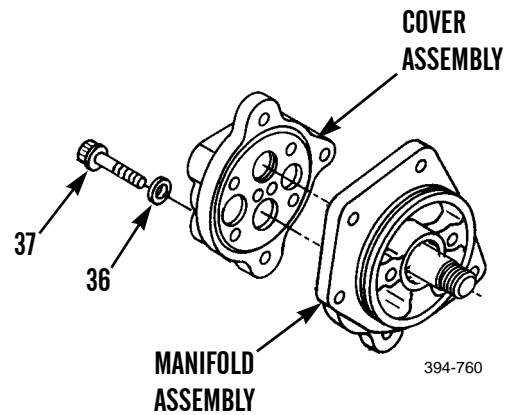


6. Use brass driver and hammer to install two sleeve bearings (45) not more than 0.062 in. (1.575 mm) in cover (44).
7. Install new seal (46) on cover (44).

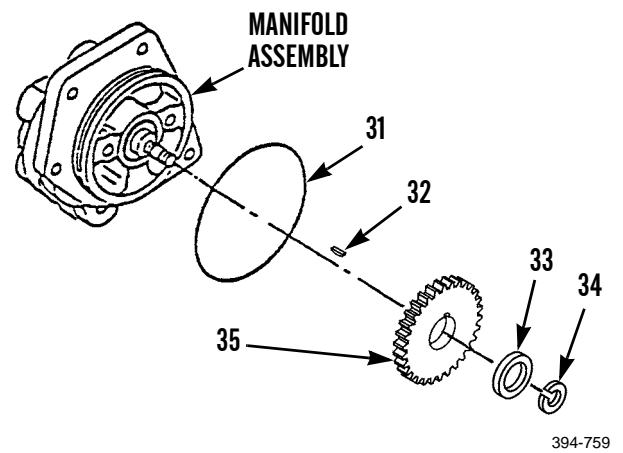


**ASSEMBLY - CONTINUED**

8. Install cover assembly, four washers (36) and bolts (37) on manifold assembly.

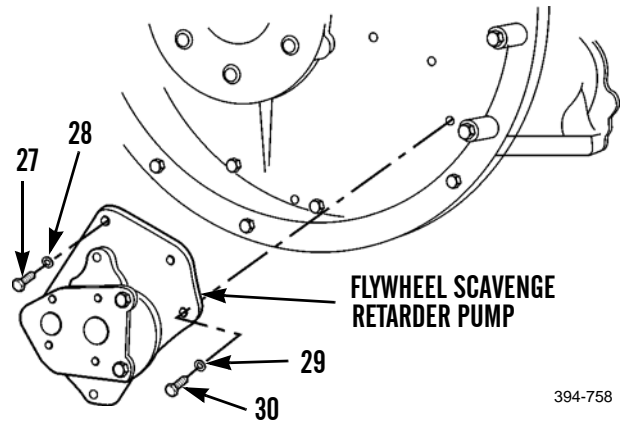


9. Install new seal (31).
10. Install key (32) in shaft groove of gear (45).
11. Install gear (35) and thrust washer (33).
12. Use retaining ring pliers to install retaining ring (34).
13. Rotate gear (35) by hand to ensure it turns freely.

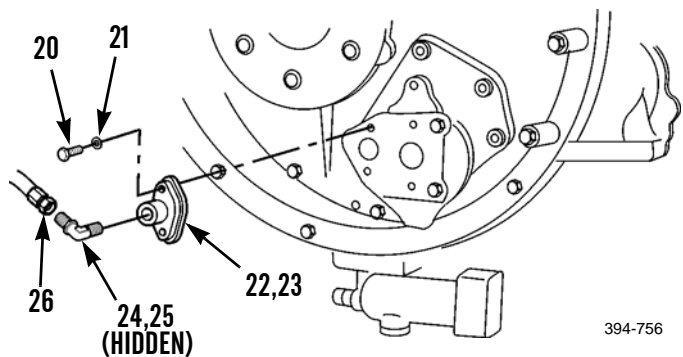


**INSTALLATION**

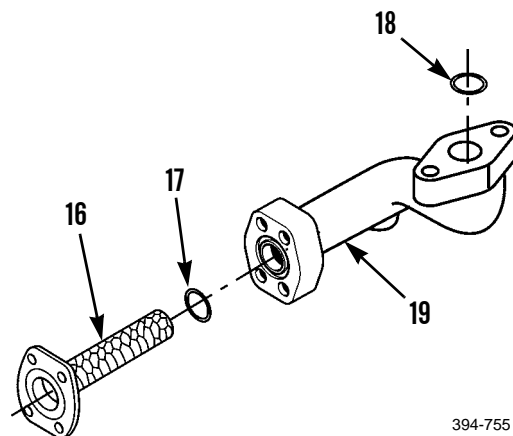
1. Position flywheel scavenge retarder pump on flywheel housing and install lockwasher (28) and bolt (27).
2. Install three lockwashers (29) and bolts (30).
3. Using pump-type oil can, fill flywheel scavenge retarder pump chamber with clean hydraulic fluid.



4. Install new preformed packing (22) in elbow (23).
5. Install new preformed packing (24) on adapter (25).
6. Install elbow (23), two washers (21) and bolts (20).
7. Install adapter (25).
8. Connect hose assembly (26).



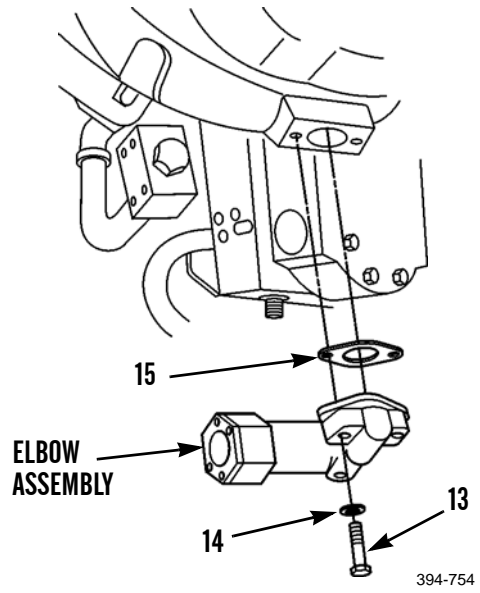
9. Remove tape and plastic from elbow (19).
10. Install new preformed packing (18), new seal (17) and new filter (16) in elbow (19).



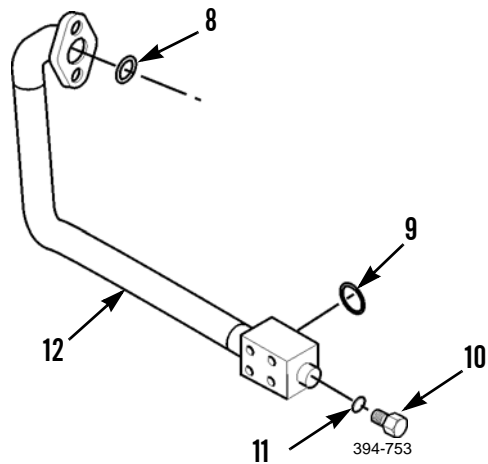


**INSTALLATION - CONTINUED**

11. Install new gasket (15), elbow assembly, two washers (14) and bolts (13).

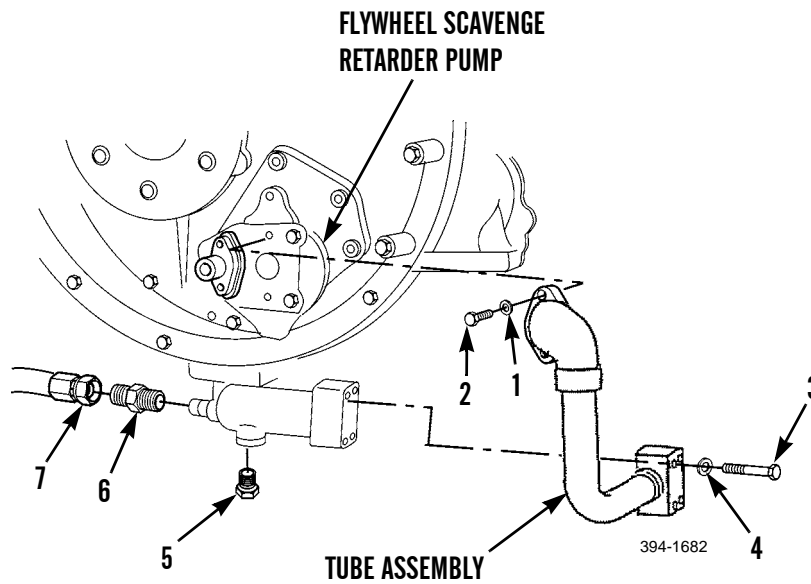


12. Install new preformed packing (11), plug (10), new seal (9) and new preformed packing (8) in tube assembly (12).



**INSTALLATION - CONTINUED**

13. Install tube assembly and two washers (1) and bolts (2) on flywheel scavenge retarder pump.
14. Install four washers (4) and bolts (3).
15. Install connector (6).
16. Connect hose assembly (7).
17. Install plug (5).



18. Operate machine and verify correct operation of retarder (TM 5-3805-248-10)
19. Shut down engine (TM 5-3805-248-10).
20. Check for hydraulic leaks around scavenge pump and hoses.
21. Install crankcase guards (WP 0201 00).

**END OF WORK PACKAGE**

---

**HYDRAULIC RETARDER MAINTENANCE**

---

**0289 00****THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

Bushing driver set (Item 12, WP 0338 00)

Link, bearing (Item 51, WP 0338 00)

Puller attachment, mechanical (Item 81, WP 0338 00)

Puller attachment, mechanical (FD) (Item 82, WP 0338 00)

Tool, alignment (Item 115, WP 0338 00)

Bolt 5/8-112B THD

Lifting device, 350 lb minimum capacity

Screw, forcing 7/16-14NC

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, sealing (Item 10, WP 0339 00)

Oil, lubricating (Item 30, 31 and 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (6)

Seal

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Hood removed (WP 0189 00)

Supplemental steering pump removed (WP 0307 00)

Flywheel scavenge pump removed (WP 0288 00)

Retarder control valve removed (WP 0292 00)

---

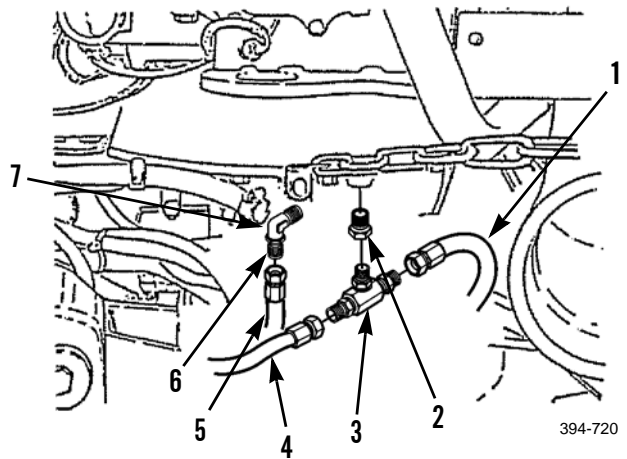
**REMOVAL****CAUTION**

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

**NOTE**

- Tag all hose and tube assemblies prior to disconnecting to ensure correct installation.
- Use a container to capture any oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

1. Disconnect hose assemblies (1 and 4) from hydraulic retarder assembly.
2. Remove tee (3) and connector (2).
3. Disconnect hose assembly (5).
4. Remove elbow (7) and preformed packing (6). Discard preformed packing.



REMOVAL - CONTINUED



WARNING

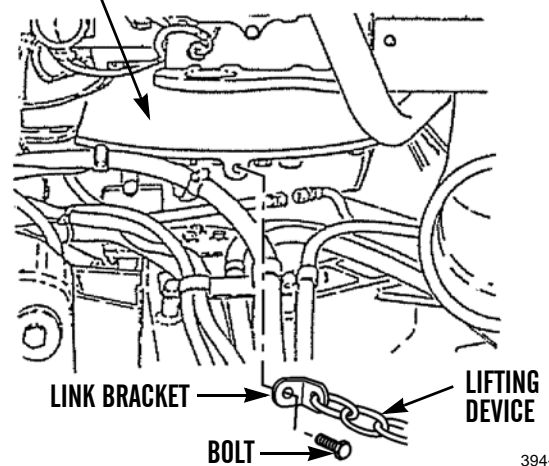
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

NOTE

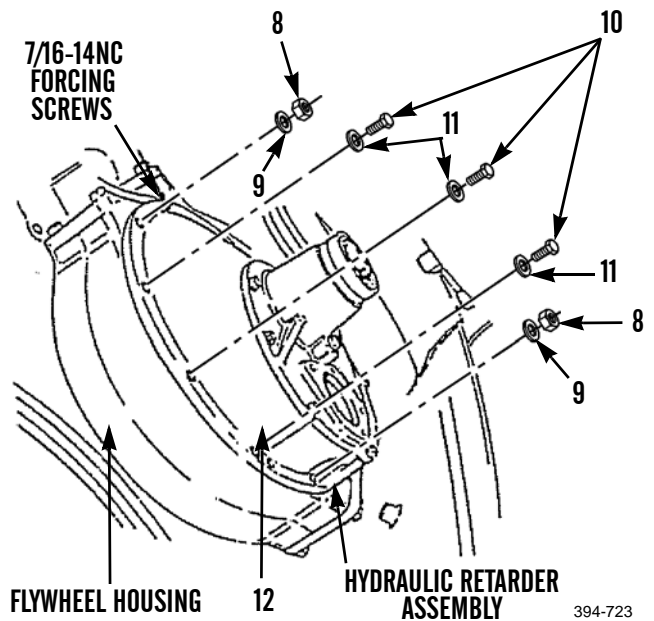
Weight of retarder assembly is 210 lb (95 kg).

5. Install link bracket, 5/8-112B THD bolt and lifting device on hydraulic retarder. Remove slack from lifting device.

HYDRAULIC RETARDER



6. Remove two nuts (8), washers (9), nine bolts (10) and washers (11).
7. Install three 7/16-14NC forcing screws on cover (12).
8. Tighten three 7/16-14NC forcing screws gradually and in succession, and separate hydraulic retarder assembly from flywheel housing.



**REMOVAL - CONTINUED**

9. Use lifting device to lower hydraulic retarder assembly onto suitable dolly.
10. Remove lifting device.
11. Remove hydraulic retarder assembly from under machine.

**DISASSEMBLY****WARNING**

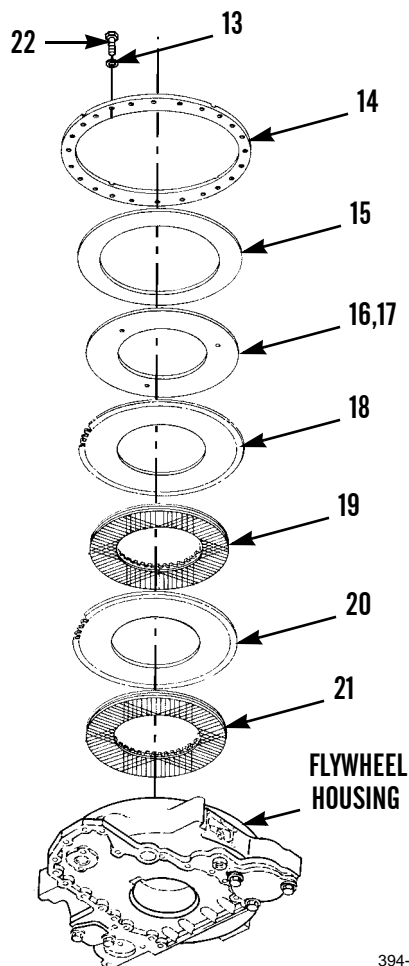
- Eye protection must be worn when performing maintenance where components or particles could fly out during procedure. Failure to take precautions may cause injury.
- Some components are under spring tension. Wear eye protection and use extreme caution when disassembling them to avoid injury.

1. Loosen 24 bolts (22) gradually and in succession on flywheel housing to ease tension on spring (15).

**NOTE**

Remove friction discs only if inspection indicates replacement is necessary.

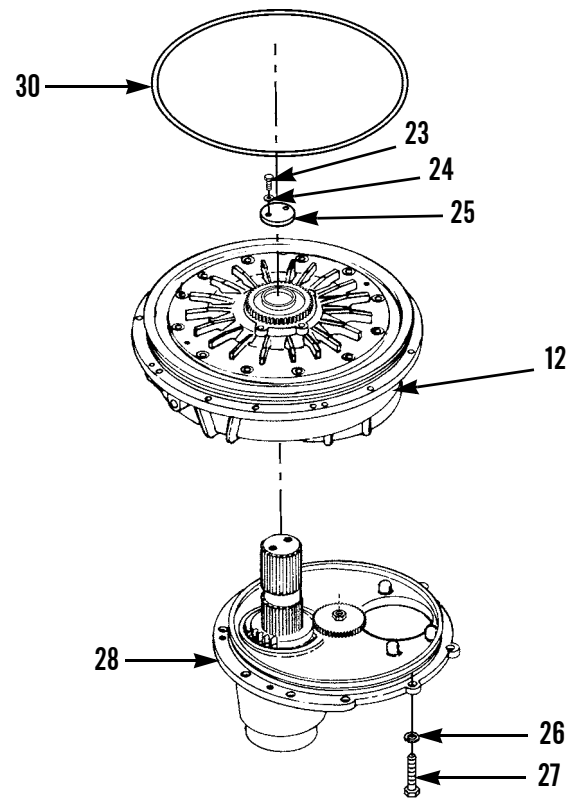
2. Support retainer (14) by hand, remove 24 bolts (22), washers (13), retainer (14), spring (15), items (16 and 17) as an assembly, disc (18), friction disc (19), disc (20) and friction disc (21). Discard friction discs (19 and 21), if necessary.
3. Remove three pins (16) from plate (17).



394-724

**DISASSEMBLY - CONTINUED**

4. Remove and discard preformed packing (30).
5. Remove two bolts (23), washers (24) and retainer (25).
6. Remove nine bolts (27), washers (26) and cover (28) assembly from housing (12) assembly.



394-725

**DISASSEMBLY - CONTINUED**

7. Remove gear (35), shaft (29) assembly, locknut (33), retainer (32) and gear (31) assembly.

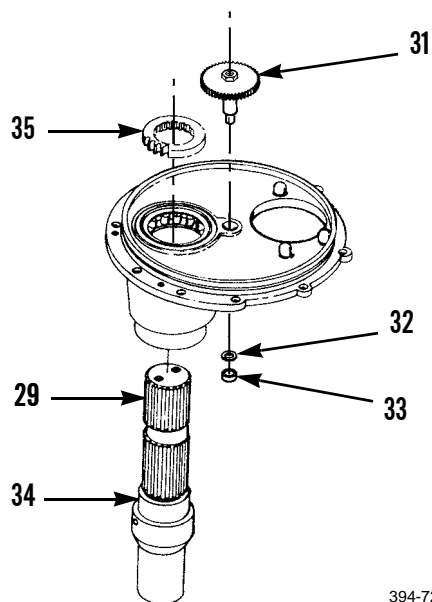


**WARNING**



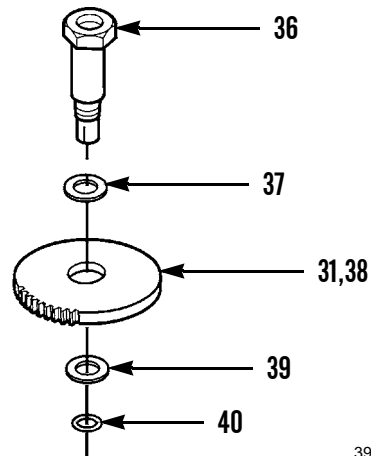
Hot oil or metal parts can cause severe burns. Wear insulated gloves, long sleeves and eye protection when working with heated parts.

8. Use oil bath to heat race (34) to a maximum temperature of 275°F (135°C) and remove from shaft (29).



394-726

9. Remove preformed packing (40), washer (39), gear (31) assembly and washer (37) from shaft (36). Discard preformed packing.
10. Use an arbor press to remove bearing (38) from gear (31).

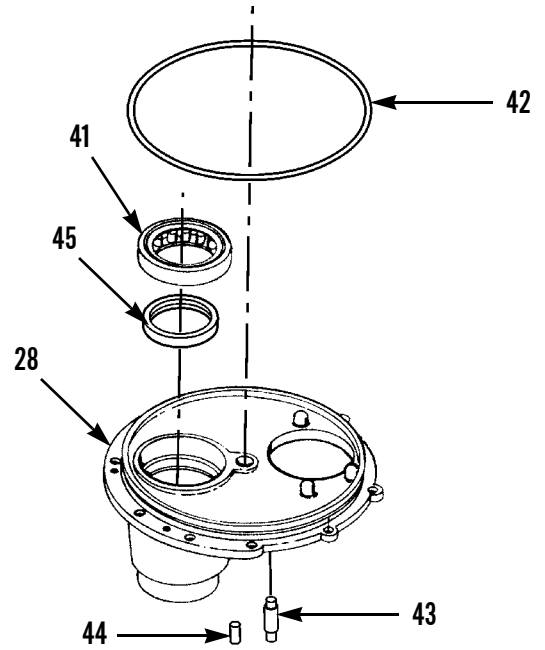


394-728



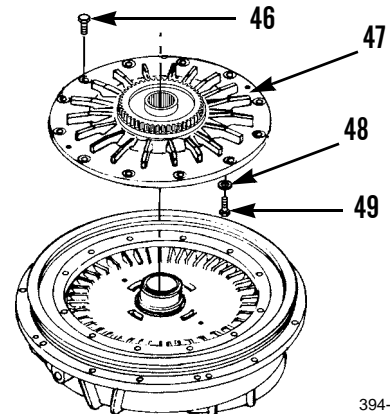
**DISASSEMBLY - CONTINUED**

11. Use push-puller, forcing screw legs and bearing cup puller attachment to remove bearing (41).
12. Remove and discard seal (45).
13. Remove pin (43), stud (44) and preformed packing (42) from cover (28). Discard preformed packing.



394-729

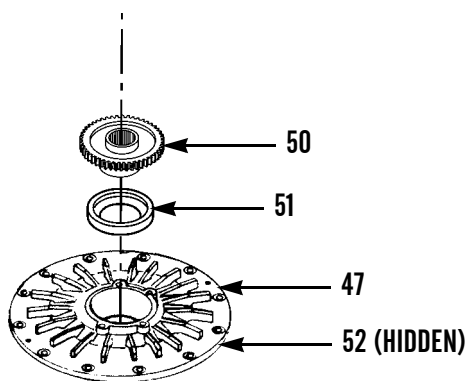
14. Remove 12 bolts (46), four bolts (49), washers (48) and stator (47) assembly.



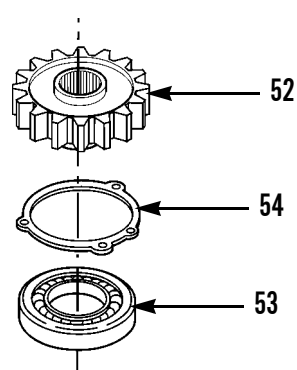
394-730

**DISASSEMBLY - CONTINUED**

15. Remove deflector (51) and gear (50) assembly from stator (47) assembly.
16. Use driver and bearing puller attachment to remove bearing (53).
17. Remove gear (52) from stator (47).
18. Remove retainer (54) from gear (52).

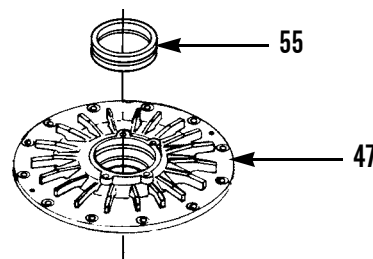


394-731



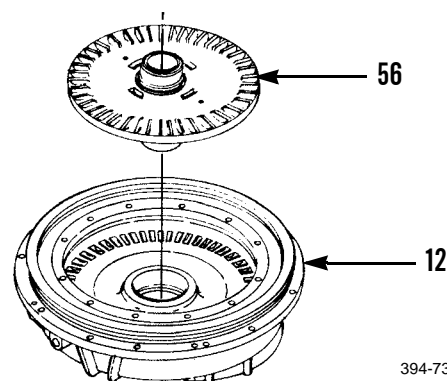
394-732

19. Use driver and press to remove race (55) from stator (47).



394-733

20. Remove rotor (56) assembly from housing (12) assembly.



394-734

**DISASSEMBLY - CONTINUED**

21. Unhook ring ends and remove ring (60), two rings (61) and ring (57).



**WARNING**

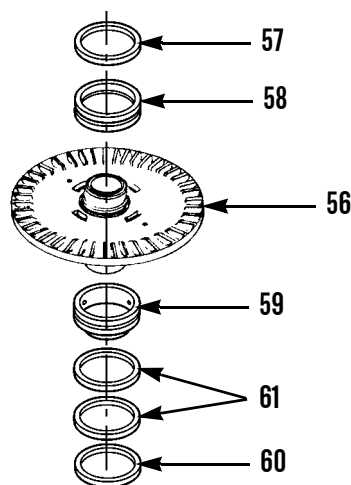


Hot oil or metal parts can cause severe burns. Wear insulated gloves, long sleeves and eye protection when working with heated parts.

**CAUTION**

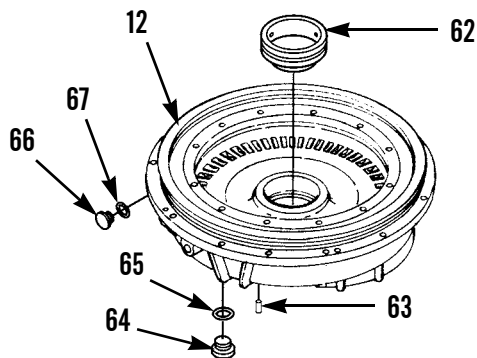
Carriers will be damaged if removed from rotor. Perform step 21 only if inspection of carriers indicates removal is necessary.

22. Use oil bath to heat carriers (58 and 59) to 275°F (135°C) and remove from rotor (56), if necessary.



394-735

23. Remove dowel (63).
24. Remove race (62), plug (66), preformed packing (67), plug (64) and preformed packing (65) from housing (12). Discard preformed packings.



394-736

**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 cause 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. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

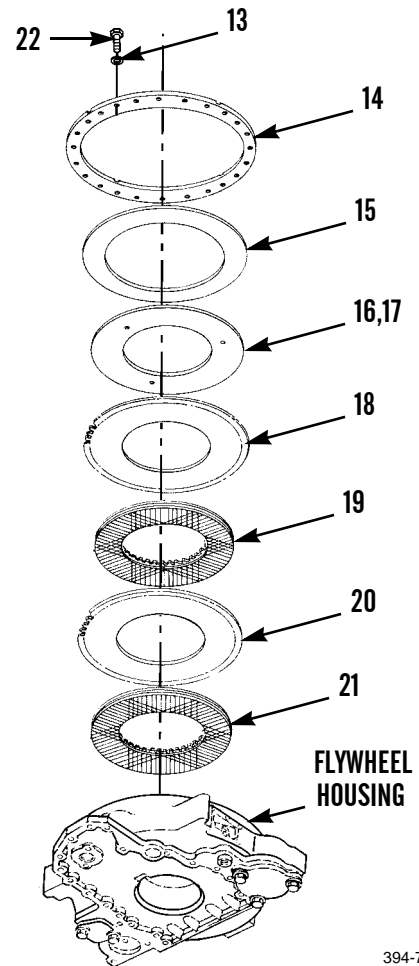
1. Install three pins (16) in plate (17).
2. Use clean lubricating oil and soak new friction discs (19 and 21), if removed, for one hour prior to installation.

**NOTE**

Friction discs, plate, spring and retainer must be held in place by hand while installing.

**ASSEMBLY - CONTINUED**

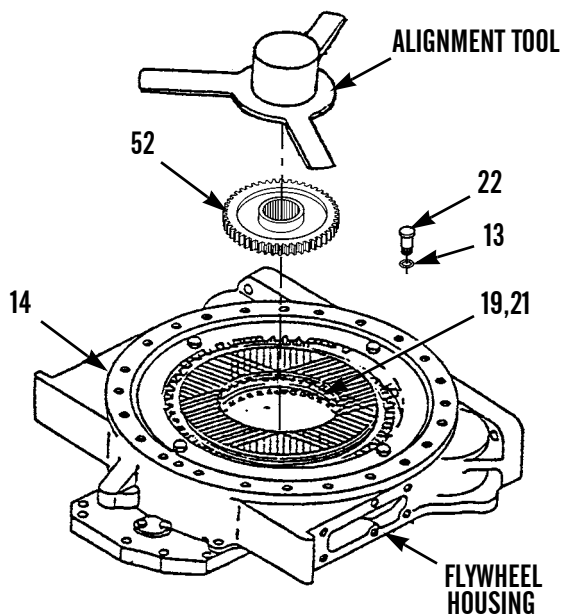
3. Install new friction disc (21), disc (20), new friction disc (19) and disc (18) in flywheel housing.
4. Install plate (17) assembly with pins (16) towards rear of machine.
5. Install spring (15) and retainer (14).
6. Install three washers (13) and bolts (22) loosely and equally spaced around retainer (14).



394-724

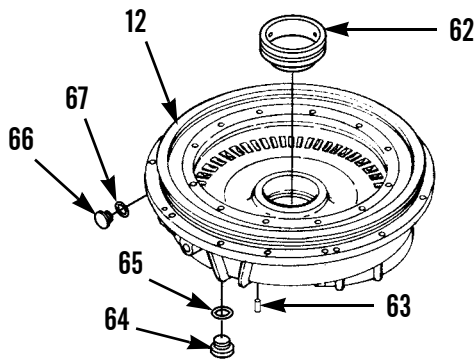
**ASSEMBLY - CONTINUED**

7. Position gear (52) in the flywheel housing and align splines in gear with splines in friction discs (19 and 21).
8. Position alignment tool in gear (52) and flywheel housing to center gear (52) and discs (19) and (21) in flywheel housing.
9. Install remaining 21 of 24 washers (13) and bolts (22) in retainer (14). Torque 24 bolts (22) to 42 lb-ft (57 Nm).
10. Remove alignment tool and gear (52).



394-737

11. Install new preformed packing (65), plug (64), new preformed packing (67) and plug (66) in housing (12).
12. Install race (62) in housing (12) until seated on lip of counterbore and lubricate with clean oil.
13. Install dowel (63) in housing (12).

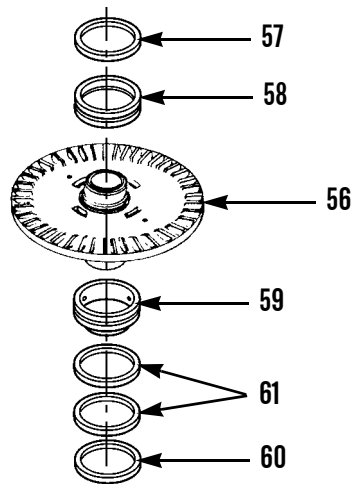


394-736

**ASSEMBLY - CONTINUED****WARNING**

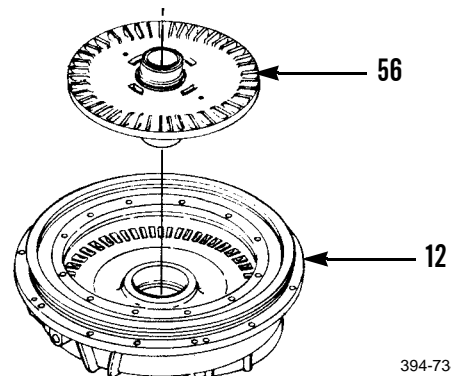
Hot oil or metal parts can cause severe burns. Wear insulated gloves, long sleeves and eye protection when working with heated parts.

14. If removed, use oil bath to heat new carriers (58 and 59) to a maximum temperature of 275°F and install in rotor (56).
15. Install ring (57) in groove of carrier (58). Hook ends of ring (57) together, ensuring ends are properly engaged with one another.
16. Install two rings (61) and ring (60) on carrier (59). Hook ends of rings (60 and 61) together, ensuring ends are properly engaged with each other.



394-735

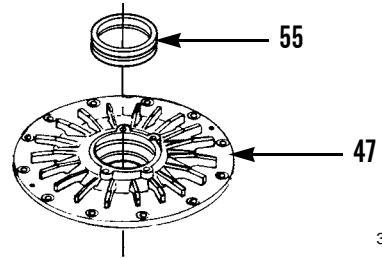
17. Install rotor (56) assembly in front of housing (12).



394-734

**ASSEMBLY - CONTINUED**

18. Use driver group and press to install race (55) in stator (47) until race (55) seats with counterbore.
19. Use clean oil to lubricate race (55).



394-733

20. Position retainer (54) on gear (52) with flat side of retainer facing gear.

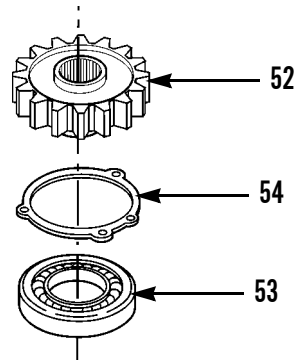


**WARNING**



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

21. Use bath oil to heat bearing (53) to a maximum temperature of 275°F (135°C) and install on gear.



394-732

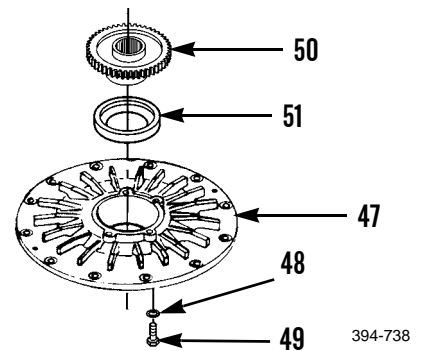


**ASSEMBLY - CONTINUED**

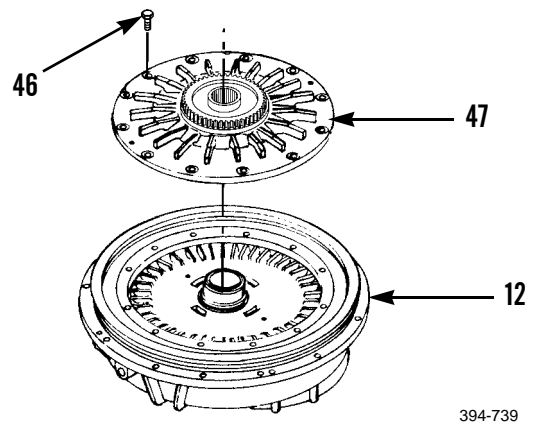
22. Install four washers (48) and bolts (49) through rear of stator (47) assembly.
23. Position deflector (51) and gear (50) assembly on four bolts (49) on front face of stator (47). Align four bolts (49) and tighten bolts to 36 lb-ft (49 Nm).

**NOTE**

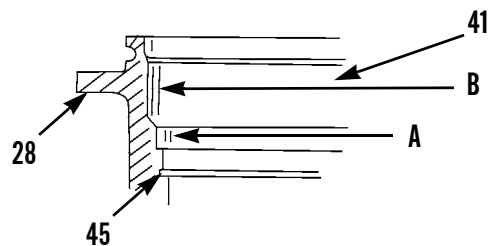
Ensure gear turns freely in stator and that ends of rings installed on carriers are properly engaged before assembling stator and rotor assemblies.



24. Position stator (47) assembly on housing (12) assembly and install 12 bolts (46). Torque 12 bolts to 36 lb-ft (49 Nm).

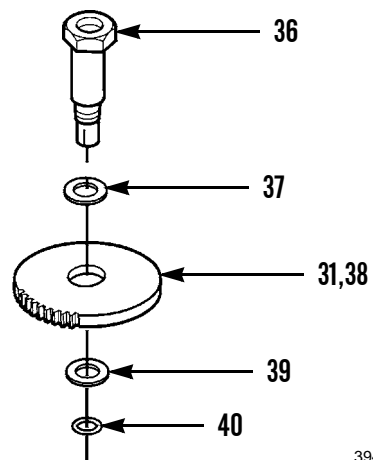


25. Install cover (28) in soft-jawed vise, with front of cover facing up.
26. Use driver group and hammer to install new seal (45), with lip side down and the opposite face of seal flush with point A of cover (28).
27. Use clean lubricating oil to lubricate seal (45) lip.
28. Install bearing (41) until it is seated at point B.



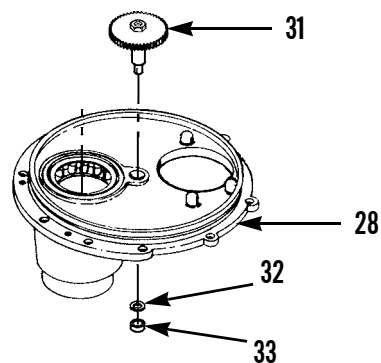
**ASSEMBLY - CONTINUED**

29. Install bearing (38) in gear (31).
30. Install washer (37), gear (31) assembly, washer (39) and new preformed packing (40) on shaft (36). Be sure new preformed packing (40) is seated in groove on shaft (36).



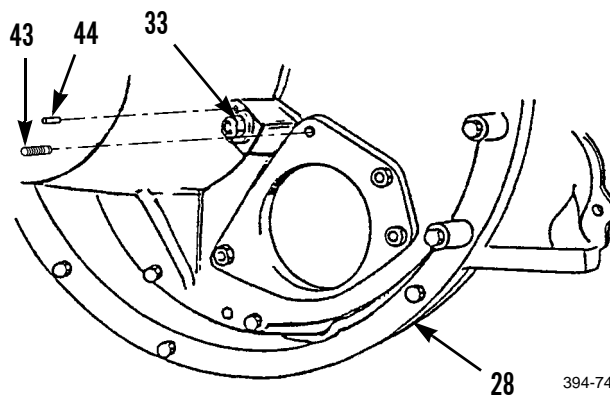
394-728

31. Install gear (31) assembly in cover (28).
32. Install retainer (32) and locknut (33) on shaft (36) and hand tighten.



394-741

33. Remove cover (28) assembly from soft-jawed vise and invert.
34. Torque locknut (33) to 37 lb-ft (50 Nm).
35. Install pin (44).
36. Apply thread sealant to short threaded end of stud (43) and install.



394-742

**ASSEMBLY - CONTINUED**

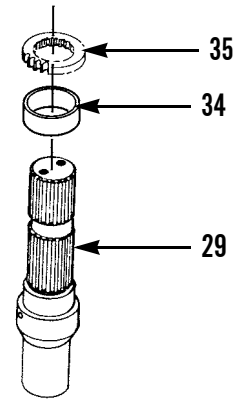


**WARNING**



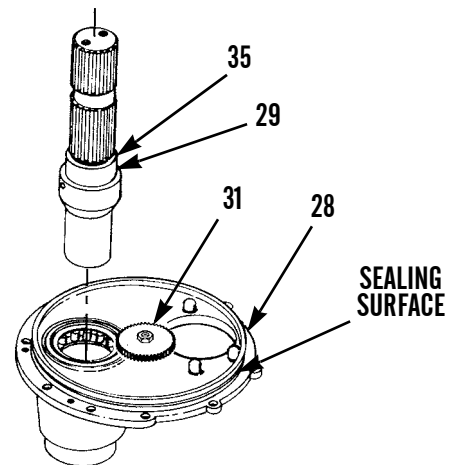
Hot oil or metal parts can cause severe burns. Wear insulated gloves, long sleeves and eye protection when working with heated parts.

37. Use oil bath to heat race (34) to a maximum temperature of 275°F (135°C).
38. Install race (34) on shaft (29) until contact with shoulder of shaft is made.
39. Use clean lubricating oil to lubricate outer surface of race (34).
40. Use a soft-face hammer to install gear (35).



394-743

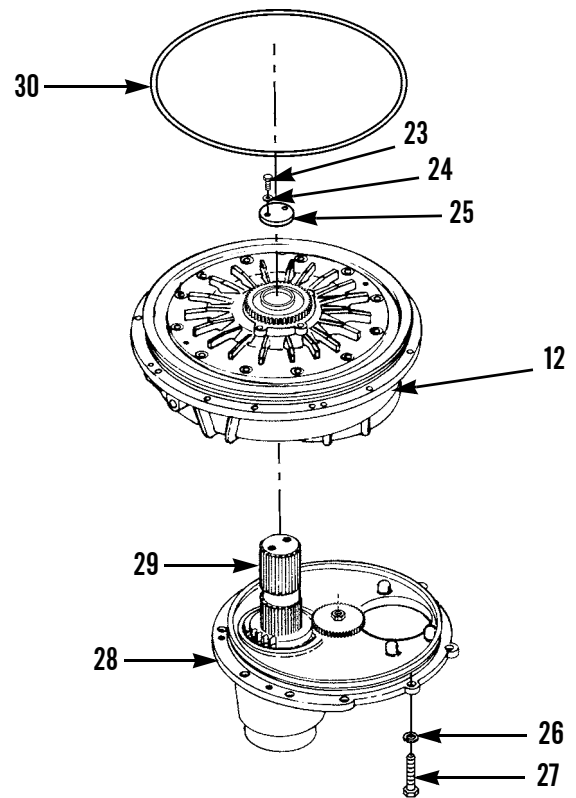
41. Install shaft (29) assembly in cover (28) assembly. Be sure gears (31 and 35) are aligned.



394-744

**ASSEMBLY - CONTINUED**

42. Use clean lubricating oil to lubricate cover (28) sealing surface.
43. Position cover (28) assembly on housing (12) assembly. Align splines on shaft (29) with internal splines of rotor and gear.
44. Install nine washers (26) and bolts (27).
45. Install retainer (25), two washers (24) and bolts (23) in end of shaft (29).
46. Install new preformed packing (30).



394-725

**INSTALLATION**

1. Use clean lubricating oil to lightly coat inner bore of housing (12) sealing surfaces.
2. Attach link bracket with a 5/8-112B THD bolt to hydraulic retarder assembly.

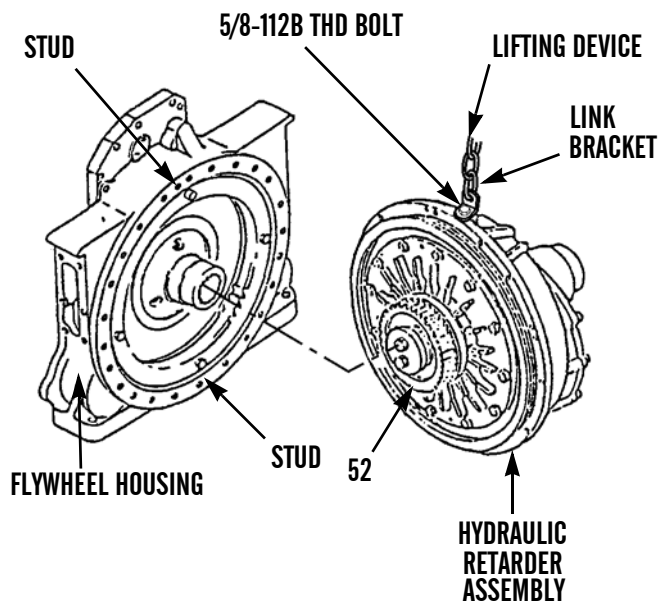
**WARNING**

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**

Weight of retarder assembly is 210 lb (95 kg).

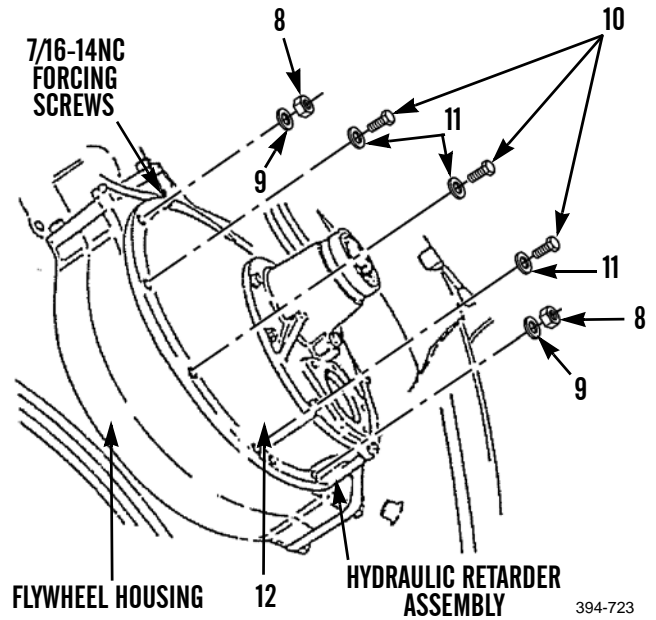
3. Use a dolly to position hydraulic retarder assembly under machine.
4. Attach lifting device to link bracket on hydraulic retarder assembly.
5. Use lifting device to position hydraulic retarder assembly on two studs on flywheel assembly.



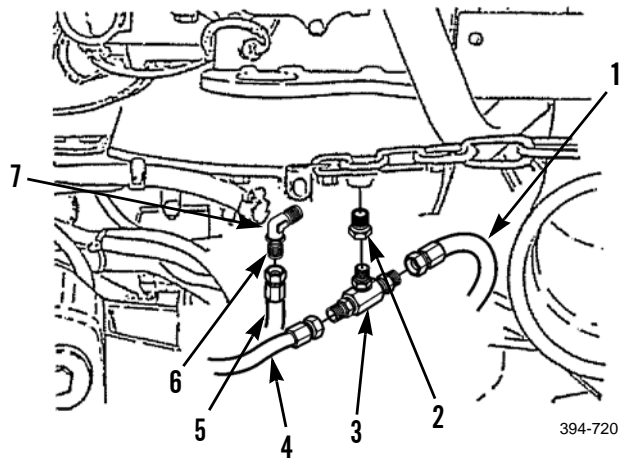
394-745

**INSTALLATION - CONTINUED**

6. Install two washers (9), nuts (8), nine washers (11) and nine bolts (10) in housing (12).
7. Remove lifting device.



8. Install new preformed packing (6) and elbow (7).
9. Connect hose assembly (5).
10. Install connector (2) and tee (3).
11. Connect hose assemblies (1 and 4) to hydraulic retarder assembly.



12. Install supplemental steering pump (WP 0307 00).
13. Install flywheel scavenge pump (WP 0288 00).
14. Install retarder control valve (WP 0292 00).
15. Operate machine and verify correct operation of retarder (TM 5-3805-248-10).
16. Shut down engine (TM 5-3805-248-10).
17. Check for hydraulic leaks around retarder and hoses.
18. Install hood (WP 0189 00).

**END OF WORK PACKAGE**

---

**RETARDER COOLANT LINES REPLACEMENT**

---

**0290 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Unit

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Strap, tiedown (Item 41, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket

**Equipment Condition**

Transmission oil drained (WP 0128 00)

Retarder oil cooler assembly removed (WP 0289 00)

Crankcase guards removed (WP 0201 00)

---

**REMOVAL****CAUTION**

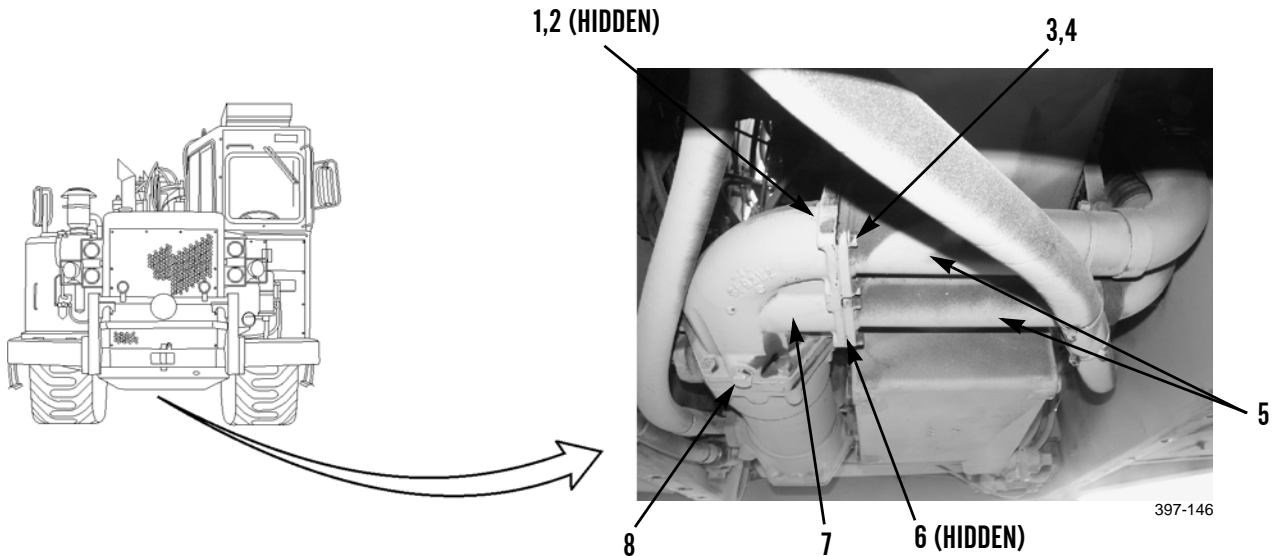
Wipe area clean around all connections to be opened during removal and disassembly. Cap oil lines and plug openings after removing lines. Contamination of engine lubrication system could result in premature failure.

**NOTE**

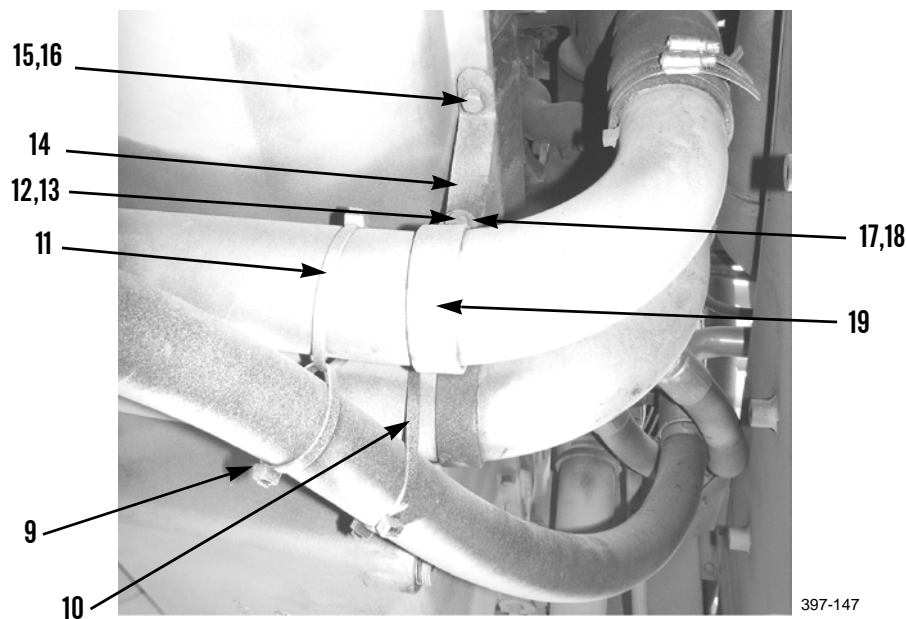
- Tag lines prior to removal to ensure correct installation.
- Use a container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

**REMOVAL - CONTINUED**

1. Remove plug (8) and allow oil to drain
2. Remove two capscrews (1) and washers (2) that support manifold (7) from engine.
3. Remove eight capscrews (3) and washers (4).
4. Remove manifold (7) and two gaskets (6) from two tube assemblies (5). Discard two gaskets.



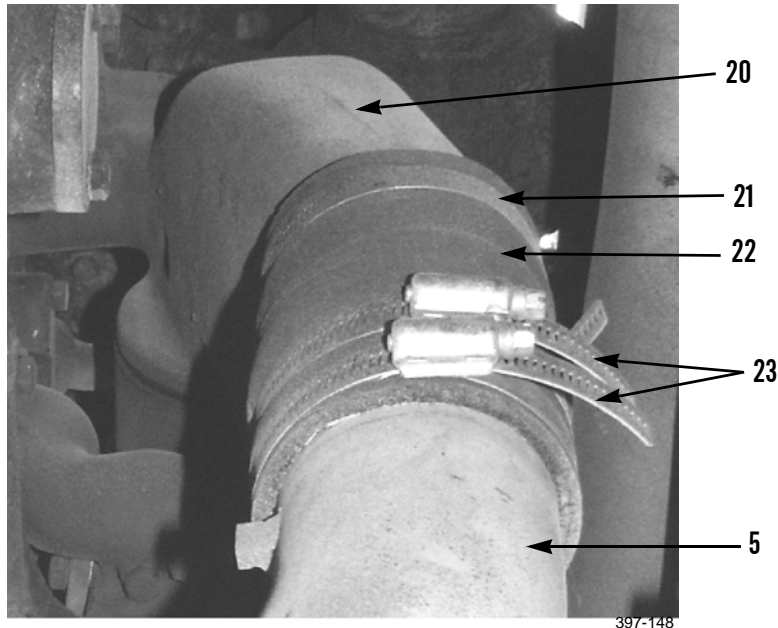
5. Cut tie straps (9 through 11) and discard.
6. Remove two capscrews (12), washers (13), nuts (18), washers (17) and clamps (19) from retaining bracket (14).
7. If necessary, remove two capscrews (16), washers (15) and retaining bracket (14).





**REMOVAL - CONTINUED**

8. Loosen two clamps (21).
9. Loosen four clamps (23).
10. Remove two tube assemblies (5) from machine.
11. Remove two tube assembly (22) from tube assemblies (20) and (5).

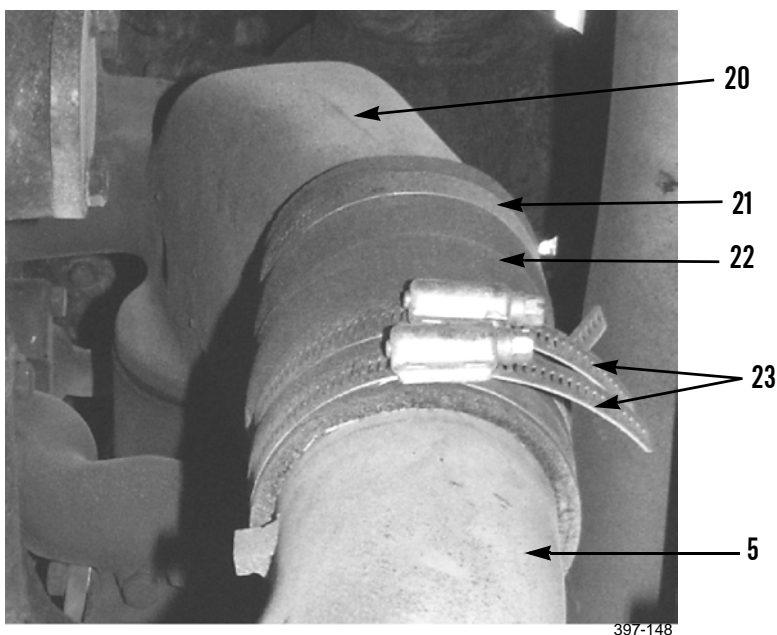
**CLEANING AND INSPECTION****WARNING**

- 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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

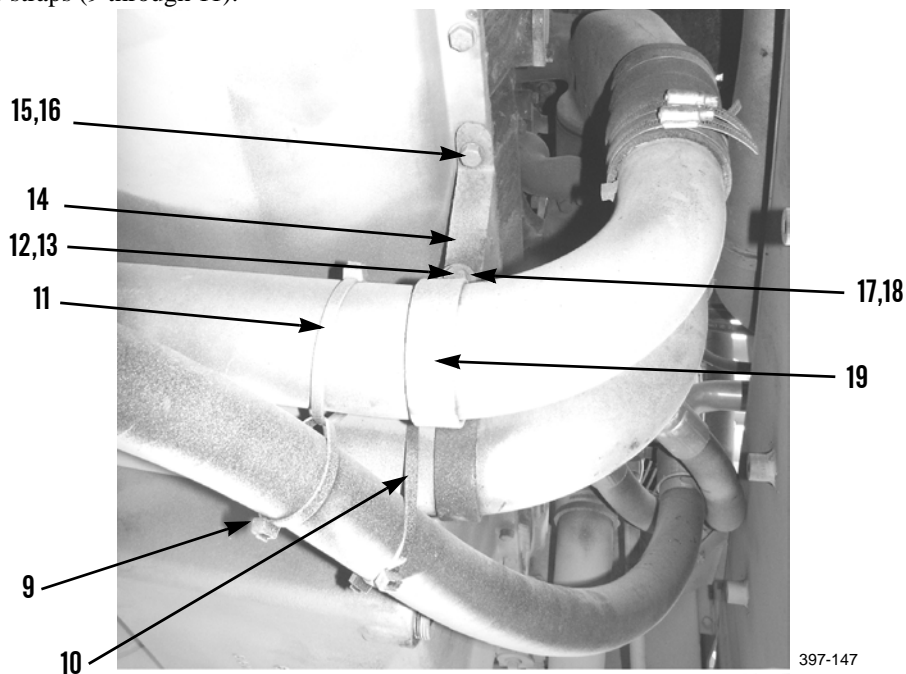
1. Remove all gasket material from all mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install two tubes assembly (22) on tubes (20).
2. Loosely install two clamps (21) and four clamps (23).
3. Install two tube assemblies (5) on tubes (22).



4. Install bracket (14), two washers (15) and capscrews (16).
5. Install two clamps (19), washers (17), nuts (18), washers (13) and capscrews (12) on bracket (14).
6. Install new tie straps (9 through 11).

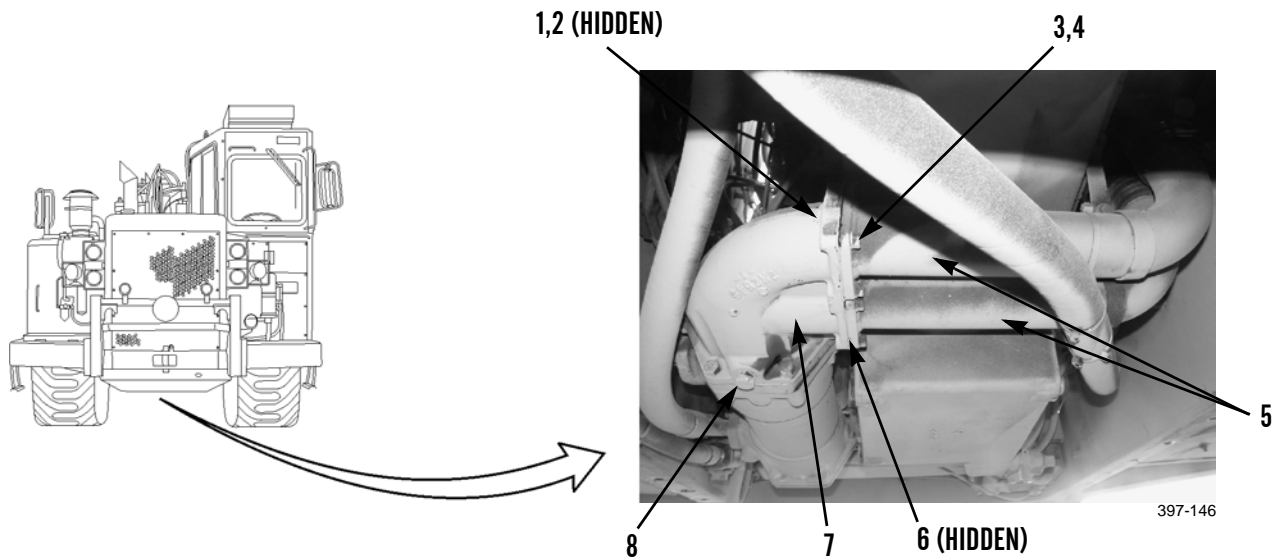


**RETARDER COOLANT LINES REPLACEMENT - CONTINUED**

0290 00

**INSTALLATION - CONTINUED**

7. Install two new gaskets (6) on manifold (7).
8. Connect two tube assemblies (5).
9. Install manifold (7), eight washers (4) and capscrews (3).
10. Install two washers (2) and capscrews (1) that support manifold (7) on engine. Torque two capscrews to 40 lb-ft (54 Nm).
11. Tighten all clamps (21 and 23).



12. Refill transmission (WP 0128 00).
13. Install retarder oil cooler assembly (WP 0289 00).
14. Install crankcase guards (WP 0201 00).

**END OF WORK PACKAGE**



**RETARDER OIL COOLER ASSEMBLY REPLACEMENT****0291 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance level**

Direct support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance and repair: field maintenance, (Item 103, WP 0338 00)

Lifting device 150 lb min. capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket

Packing, preformed (4)

**References**

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Transmission oil drained (WP 0128 00)

Radiator coolant drained (WP 0042 00)

Crankcase guards removed (WP 0201 00)

**REMOVAL****WARNING**

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 result in injury or death to personnel.

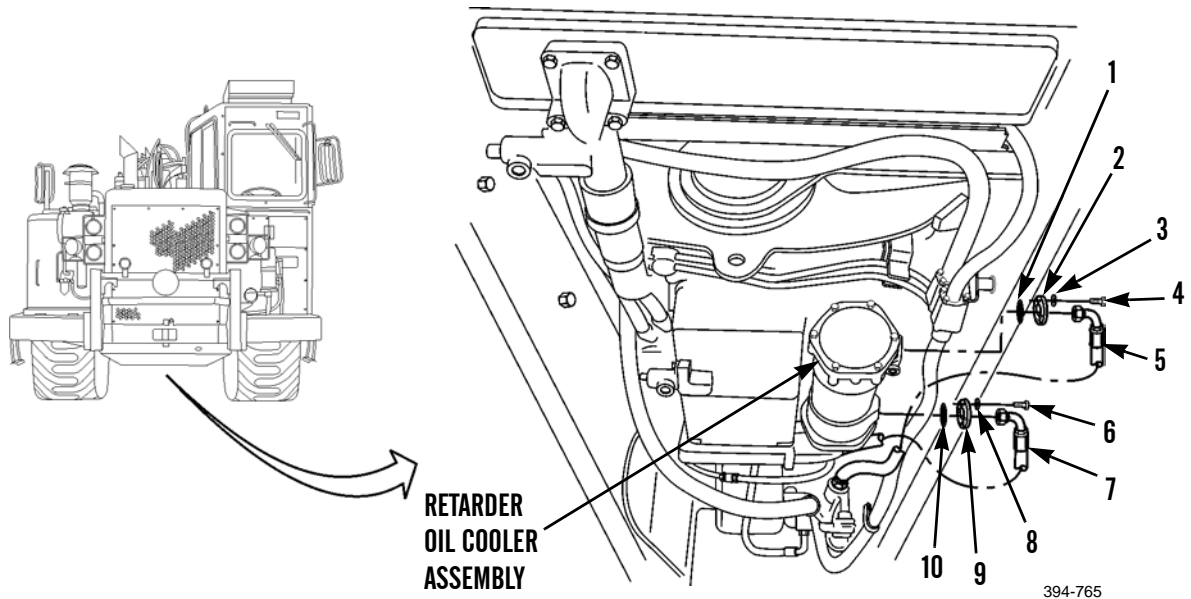
**CAUTION**

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

**REMOVAL - CONTINUED**

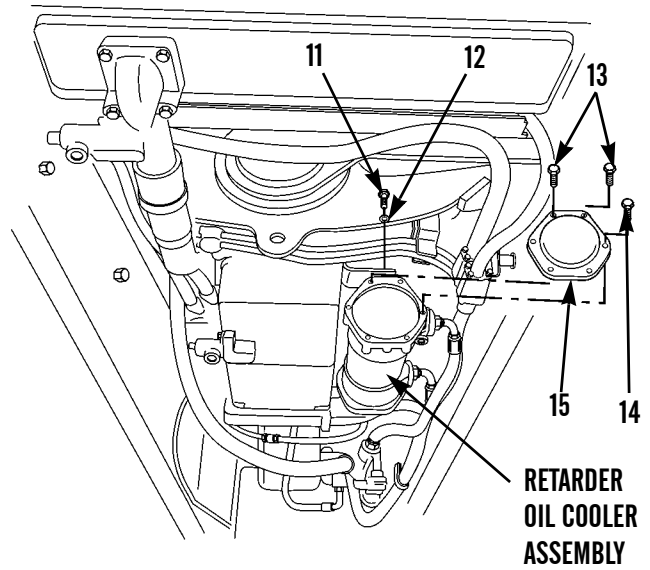
**NOTE**

- Tag all hose and tube assemblies prior to disconnecting to ensure correct installation.
  - Use a container to capture any oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.
  - Weight of retarder oil cooler assembly is 100 lb (46 kg).
1. Place hydraulic floor jack under retarder oil cooler assembly for support.
  2. Remove four bolts (4), washers (3), two flange halves (2) and preformed packing (1) from retarder oil cooler assembly under left side of vehicle. Discard preformed packing.
  3. Disconnect hose assembly (5).
  4. Remove four bolts (6), washers (8), two flange halves (9) and preformed packing (10) from retarder oil cooler assembly. Discard preformed packing.
  5. Disconnect hose assembly (7).



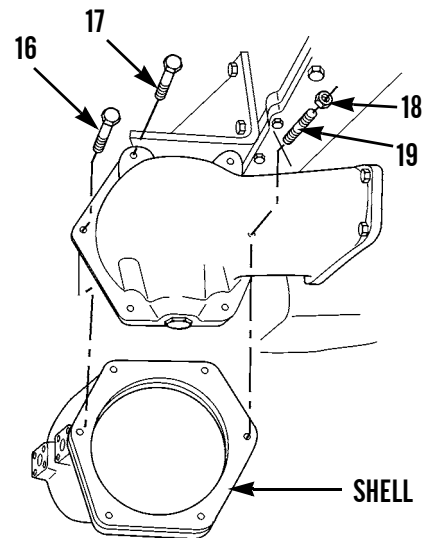
**REMOVAL - CONTINUED**

6. Remove two bolts (11), washers (12), bolts (13), four bolts (14) and bonnet (15) from retarder oil cooler assembly.



394-766

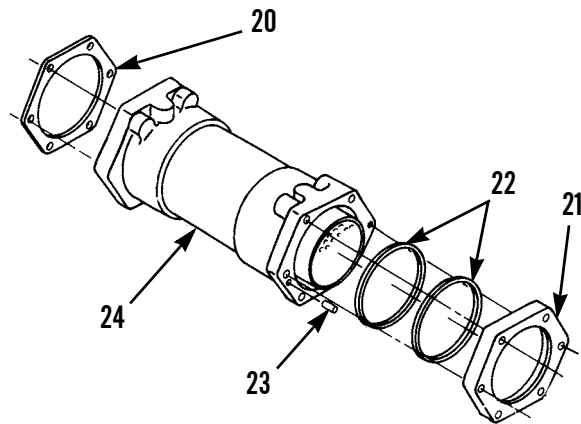
7. Remove two bolts (17), four bolts (16), nut (18) and stud (19) from retarder oil cooler assembly.
8. Use hydraulic floor jack to lower and remove shell assembly from machine.
9. Remove hydraulic floor jack.



394-767

**REMOVAL - CONTINUED**

10. Remove and discard gasket (20) from shell (24).
11. Remove adapter (21), two preformed packings (22) and pin (23) from shell (24). Discard preformed packings (22).



394-768

**CLEANING AND INSPECTION****WARNING**

- 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.
- 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 eye protection.

1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install pin (23), two new preformed packings (22) and adapter (21) in shell (24).
2. Install new gasket (20) on shell (24).



**INSTALLATION - CONTINUED**



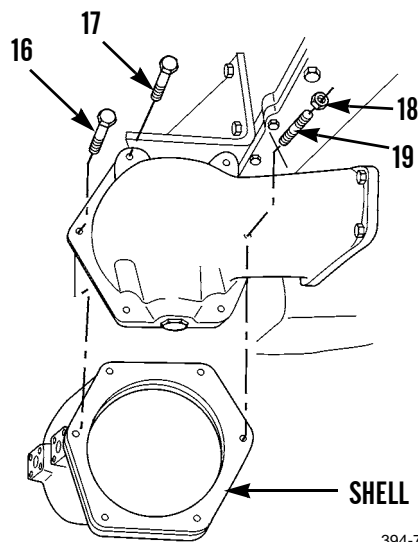
**WARNING**

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 result in injury or death to personnel.

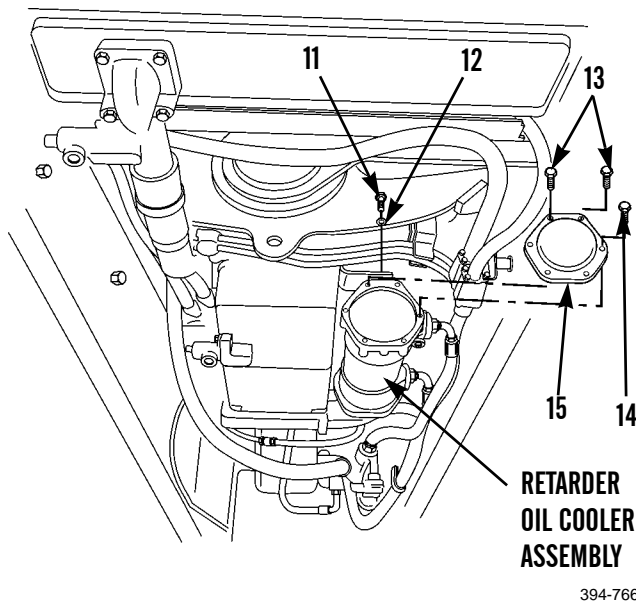
**NOTE**

Weight of retarder oil cooler assembly is 100 lb (46 kg).

3. Use hydraulic floor jack to raise shell assembly into position and install.
4. Install stud (19), nut (18), four bolts (16) and two bolts (17).

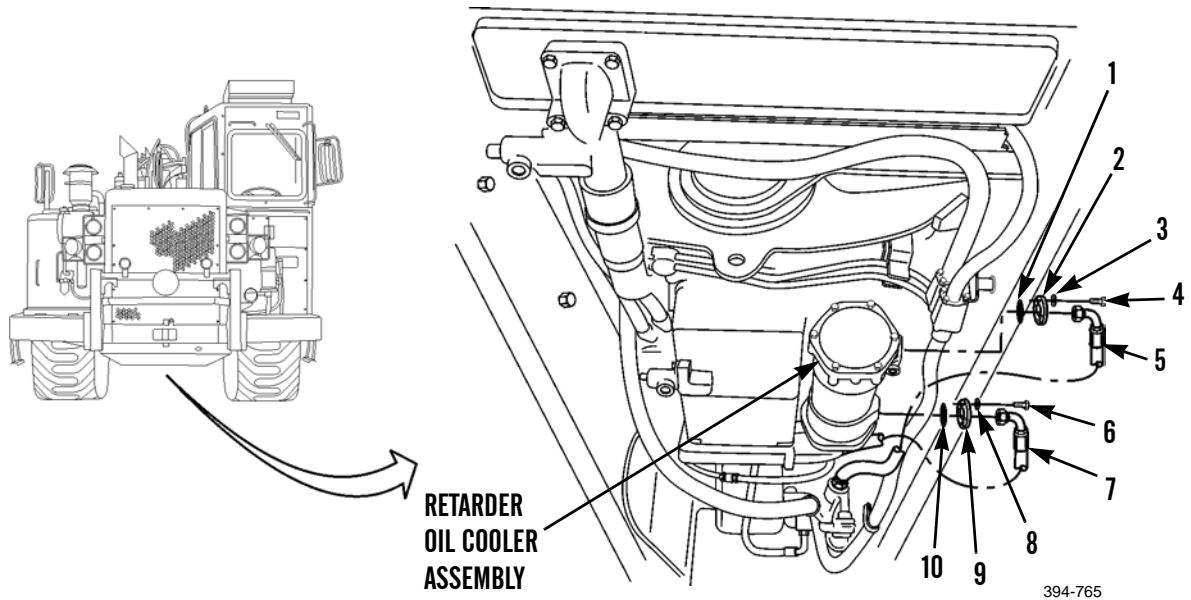


5. Install bonnet (15), four bolts (14), two bolts (13), washers (12) and bolts (11) on retarder oil cooler assembly.



**INSTALLATION - CONTINUED**

6. Connect hose assembly (7).
7. Install new preformed packing (10), two flange halves (9), four washers (8) and bolts (6).
8. Connect hose assembly (5).
9. Install new preformed packing (1), two flange halves (2), four washers (3) and bolts (4).



10. Remove hydraulic floor jack.
11. Refill transmission (WP 0128 00).
12. Refill radiator coolant (WP 0042 00).
13. Install crankcase guards (WP 0201 00).

**END OF WORK PACKAGE**

---

**RETARDER CONTROL VALVE MAINTENANCE**

---

0292 00

**THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance level**

Direct support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (9)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Supplemental steering pump removed (WP 0307 00)

---

**REMOVAL****CAUTION**

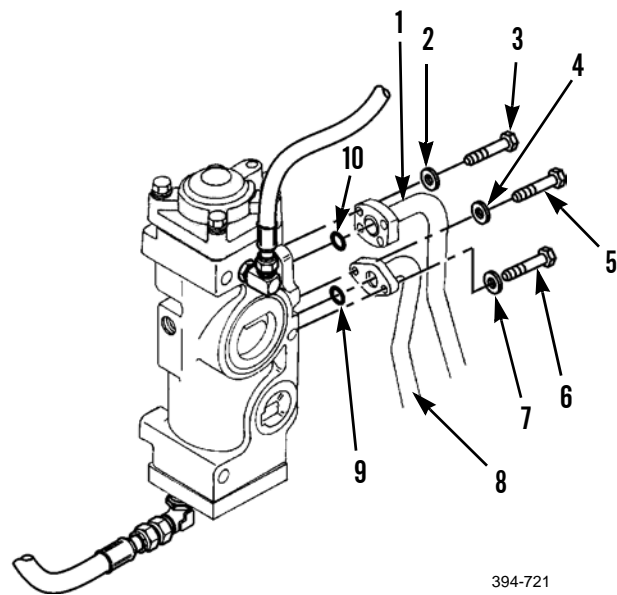
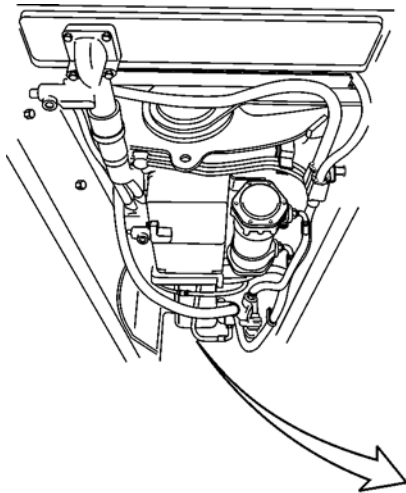
Wipe area clean around all connections to be opened during removal and disassembly. Cap lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure.

**NOTE**

- Tag all hose and tube assemblies prior to disconnecting to ensure correct installation.
- Use a container to capture any oil that may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

**REMOVAL - CONTINUED**

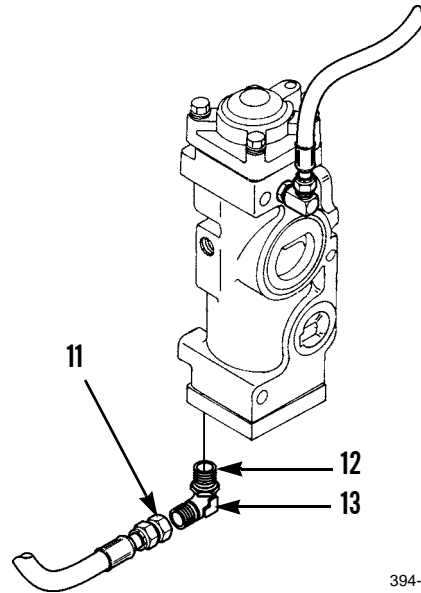
1. Remove bolt (6), washer (7), bolt (5) and washer (4).
2. Disconnect tube assembly (8).
3. Remove and discard preformed packing (9).
4. Remove four bolts (3) and washers (2).
5. Disconnect tube assembly (1).
6. Remove and discard preformed packing (10).



394-721

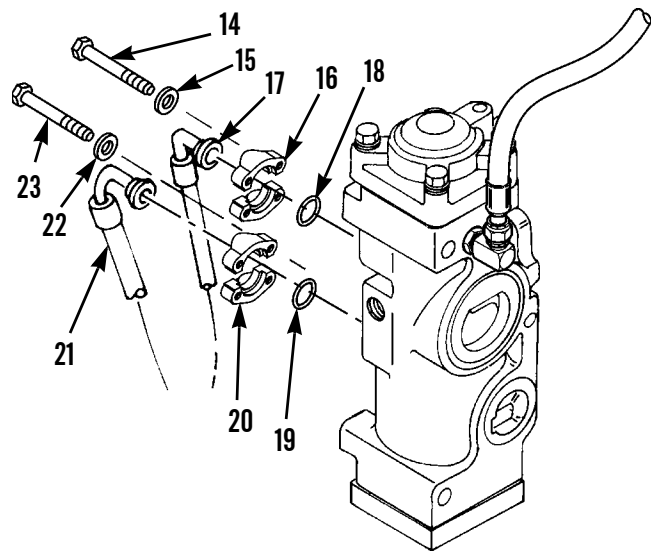
**REMOVAL - CONTINUED**

7. Disconnect hose assembly (11).
8. Remove elbow (12) and preformed packing (13). Discard preformed packing.



394-727

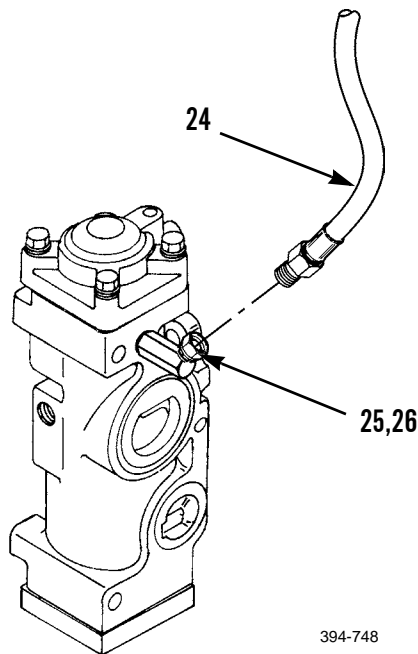
9. Remove four bolts (14), washers (15) and two flange halves (16).
10. Disconnect hose assembly (17).
11. Remove and discard preformed packing (18).
12. Remove four bolts (23), washers (22) and two flange halves (20).
13. Disconnect tube assembly (21).
14. Remove and discard preformed packing (19).



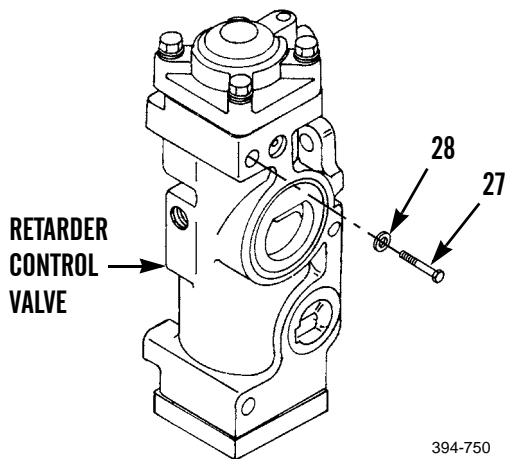
394-747

**REMOVAL - CONTINUED**

15. Disconnect hose assembly (24).
16. Remove elbow (26).
17. Remove and discard preformed packing (25) from elbow (26).



18. With assistance remove four bolts (27), washers (28) and retarder control valve assembly from machine.



**DISASSEMBLY**

1. Remove and discard preformed packings (29 and 30).

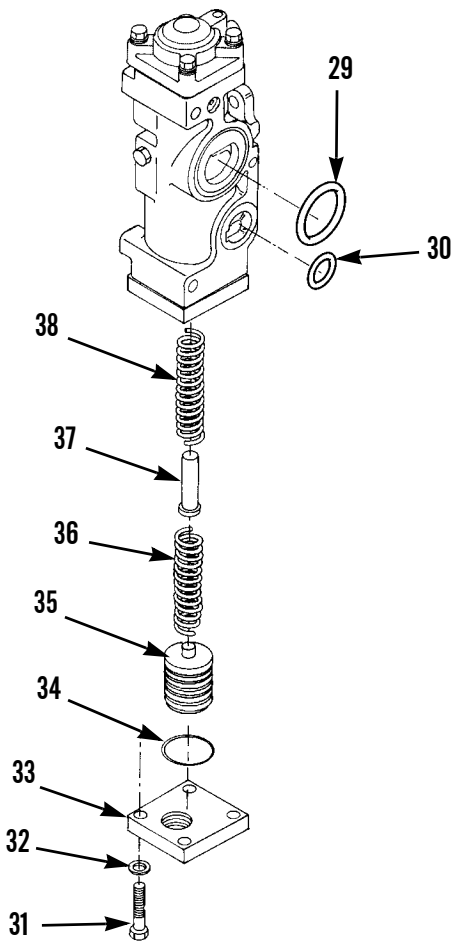


**WARNING**

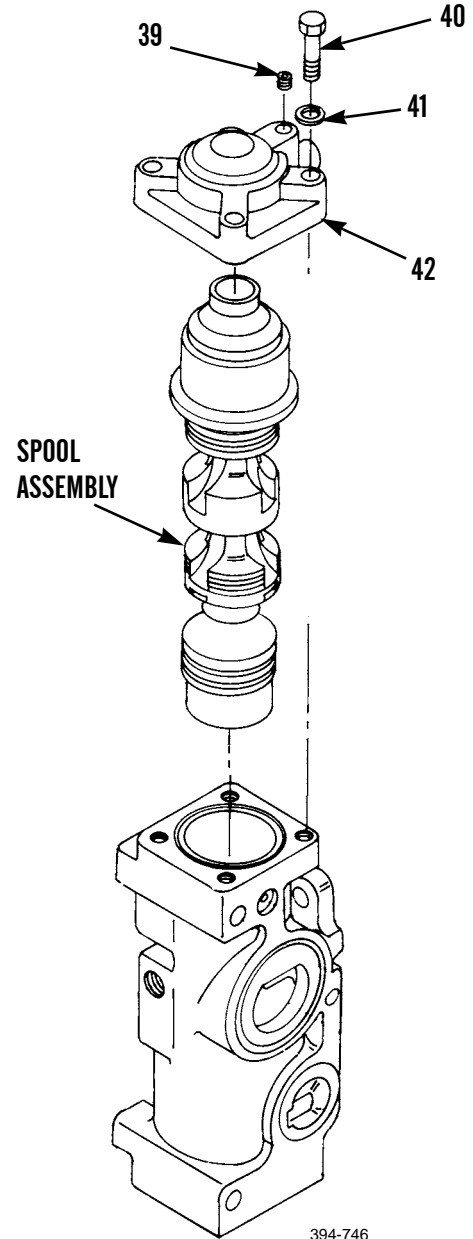
- Eye protection must be worn when performing maintenance where components or particles could fly out during procedure. Failure to take precautions may cause injury.
  - Some components are under spring tension. Wear eye protection and use extreme caution when disassembling them to avoid injury.
2. Remove four bolts (31), washers (32), cover (33), preformed packing (34), slug (35), spring (36), stop (37) and spring (38). Discard preformed packing.

**DISASSEMBLY - CONTINUED**

3. Remove plug (39), four bolts (40), washers (41), cover (42) and spool assembly.



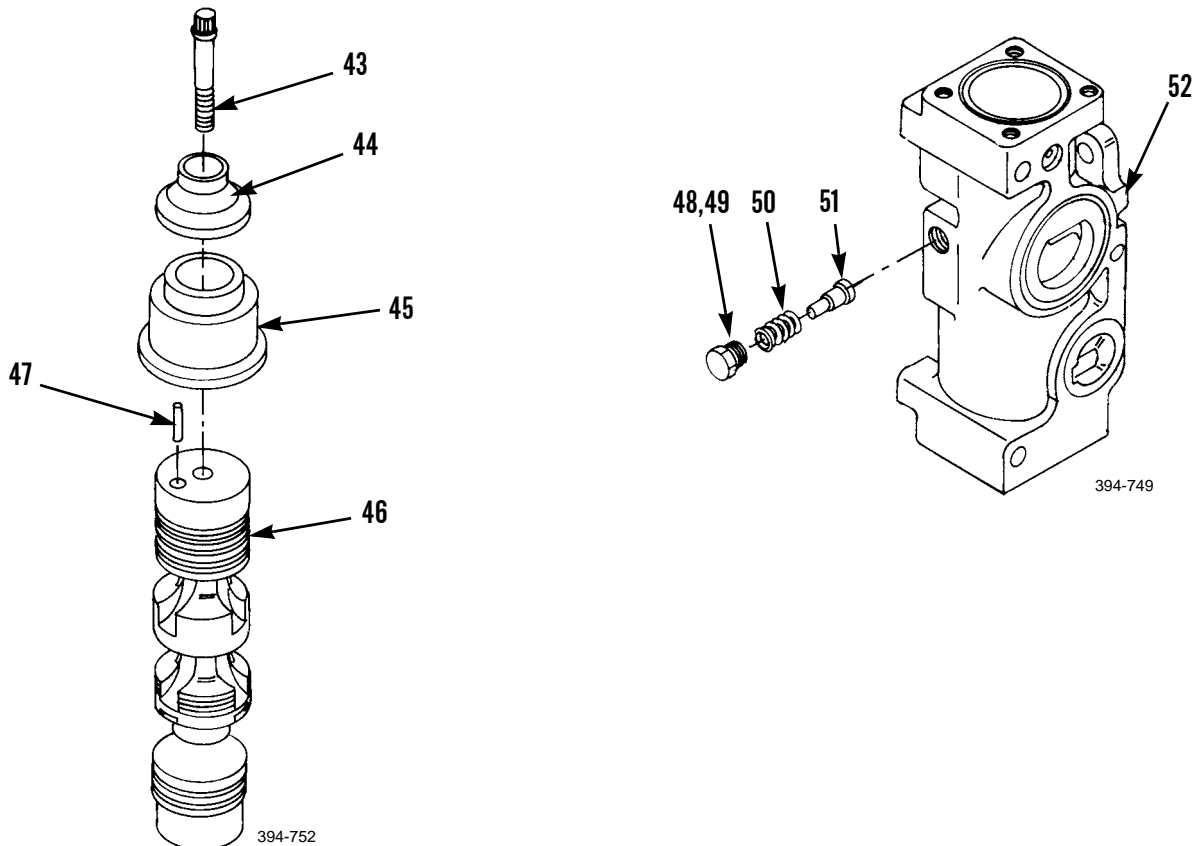
394-751



394-746

**DISASSEMBLY - CONTINUED**

4. Remove bolt (43), stop (44), diaphragm (45), pin (47) and spool (46).
5. Remove plug (49) assembly, spring (50) and plunger (51) from body (52).
6. Remove and discard preformed packing (48) from plug (49).

**CLEANING AND INSPECTION****WARNING**

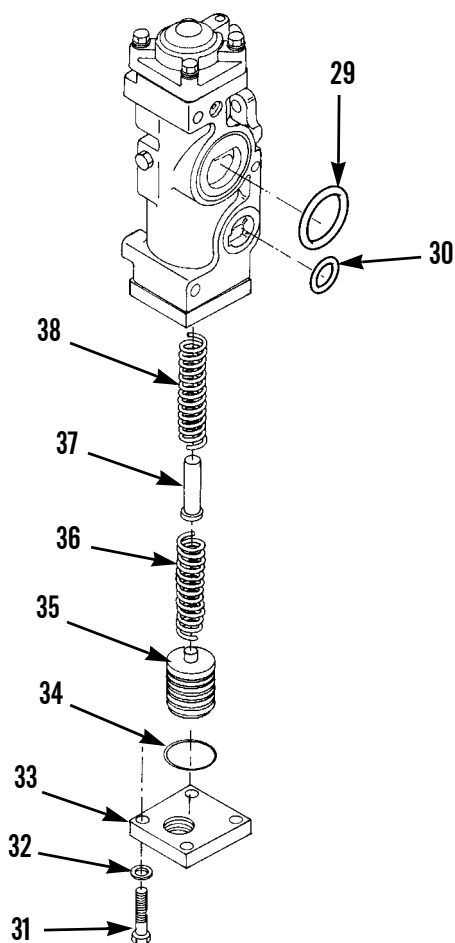
- Dry cleaning solvent MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by compressed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

1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

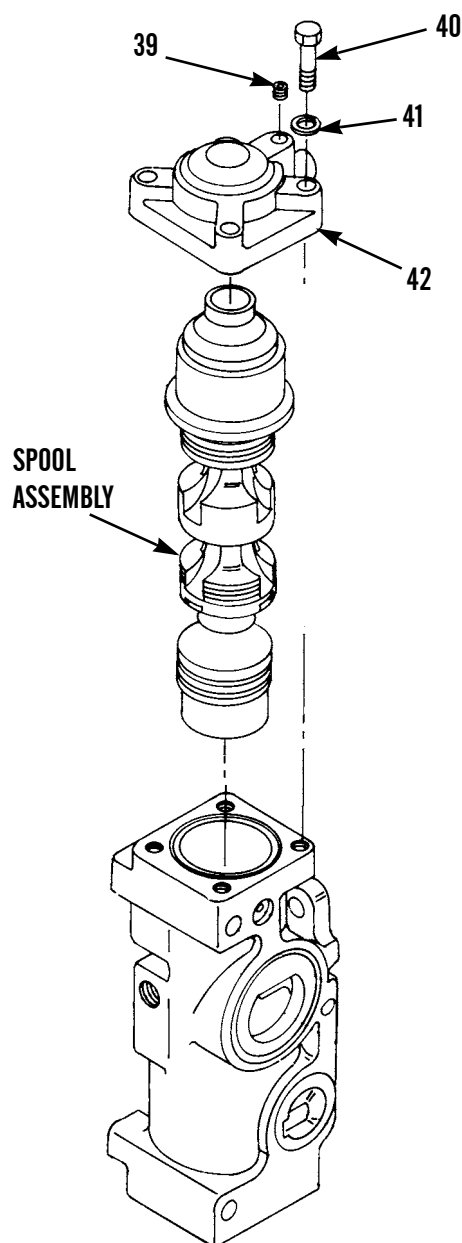


**ASSEMBLY**

1. Install new preformed packing (48) on plug (49).
2. Install plunger (51), spring (50) and plug (49) assembly on body (52).
3. Install pin (47), diaphragm (45), stop (44) and bolt (43) in spool (46).
4. Install spool assembly, cover (42), four washers (41), bolts (40) and plug (39). Turn lip of diaphragm (45) back to engage with groove in body (52).
5. Install spring (38), stop (37), spring (36), slug (35), new preformed packing (34), cover (33), four washers (32), bolts (31) and new preformed packings (29 and 30).



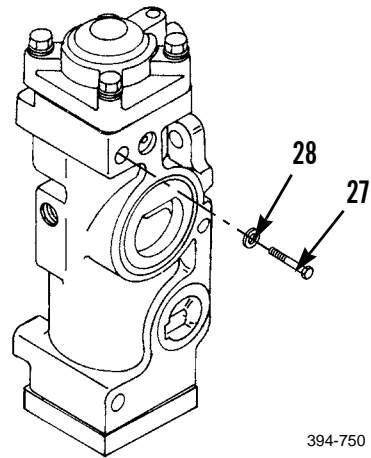
394-751



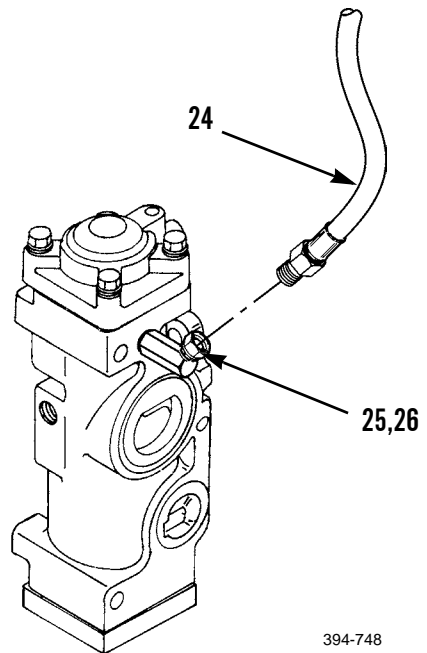
394-746

**INSTALLATION**

1. With assistance, position retarder control valve assembly on machine and install four washers (28) and bolts (27).

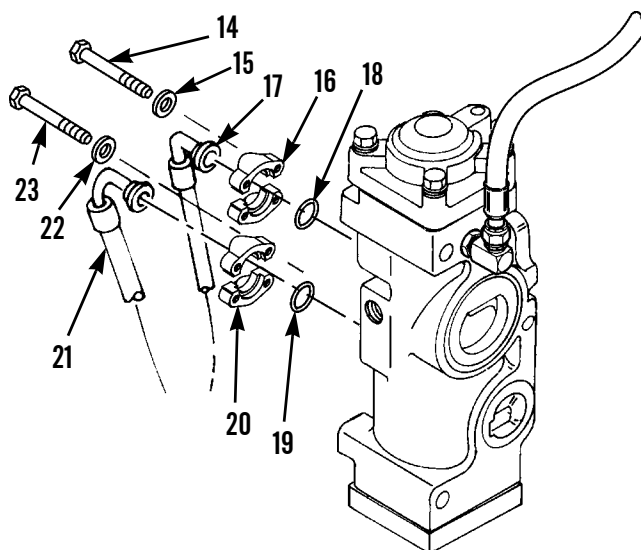


2. Install new preformed packing (25) and elbow (26).
3. Connect hose assembly (24).



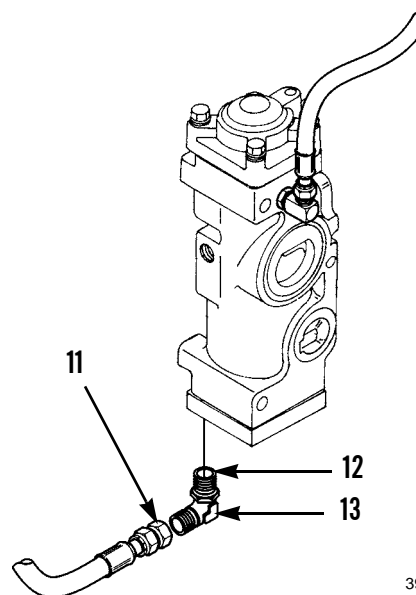
**INSTALLATION - CONTINUED**

4. Install new preformed packing (19).
5. Connect tube assembly (21).
6. Install two flange halves (20), washers (22) and four bolts (23).
7. Install new preformed packing (18).
8. Connect hose assembly (17).
9. Install two flange halves (16), washers (15) and four bolts (14).



394-747

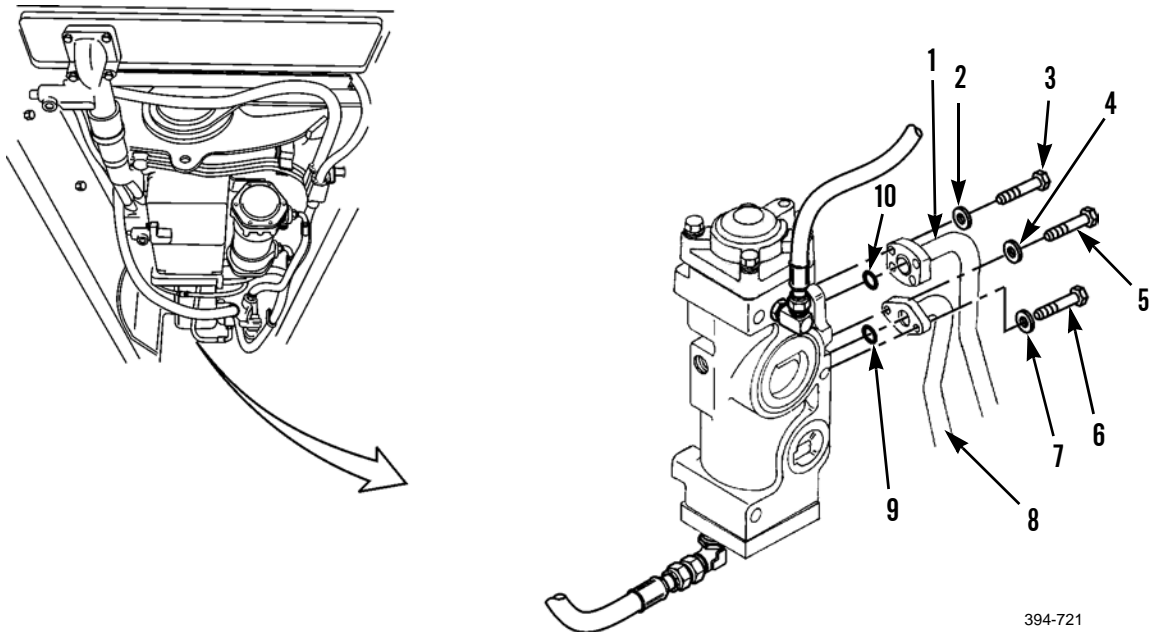
10. Install new preformed packing (12) and elbow (13).
11. Connect hose assembly (11).



394-727

**INSTALLATION - CONTINUED**

12. Install new preformed packing (10).
13. Connect tube assembly (1). Install four bolts (3) and washers (2).
14. Install new preformed packing (9).
15. Connect tube assembly (8).
16. Install washer (4), bolt (5), washer (7) and bolt (6).
- 17.



394-721

18. Install supplemental steering pump (WP 0307 00)
19. Operate machine and verify correct operation of retarder (TM 5-3805-248-10).
20. Shut down engine (TM 5-3805-248-10).
21. Check for hydraulic leaks around hoses and control valve.

**END OF WORK PACKAGE**

---

**DRIVESHAFT REPLACEMENT**

**0293 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive less power (Item 103, WP 0338 00)

Pinion turning tool (Item 67, WP 0338 00)

Tool, drive (Item 116, WP 0338 00)

3/8-16NC eyebolt

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Gasket

O-ring (2)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

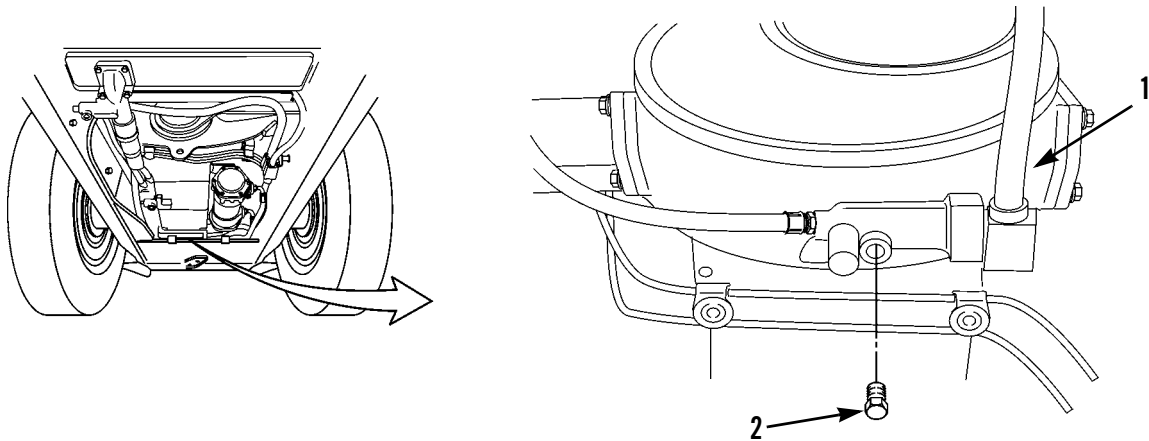
Hydraulic fluid drained (WP 0229 00)

---

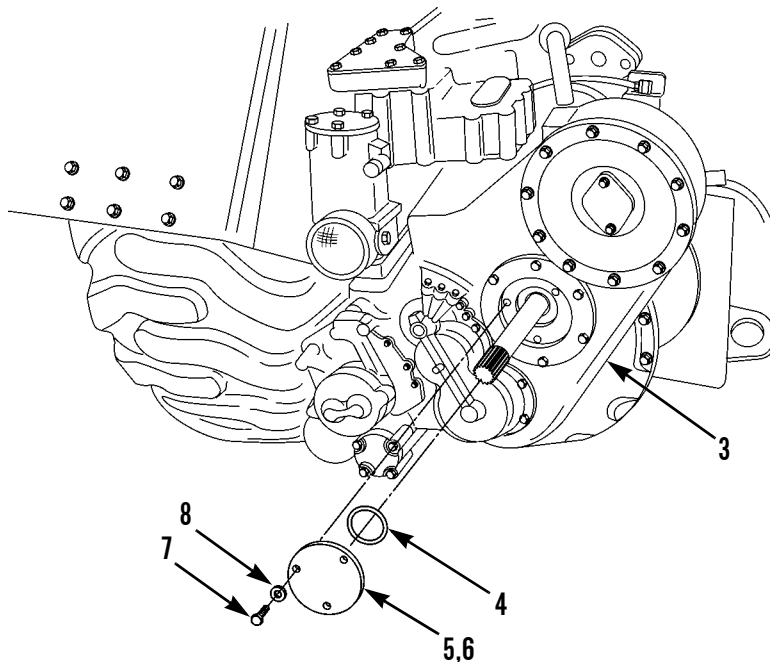
**REMOVAL****NOTE**

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

1. Place container under flywheel housing (1) and remove plug (2). Allow fluid to drain.



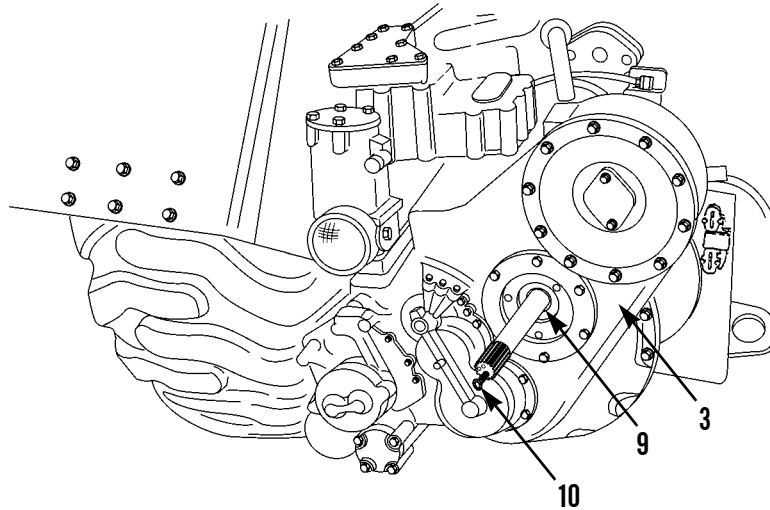
2. Remove three bolts (7), washers (8), cover (5) and ring (4) from transmission (3).
3. Remove and discard O-ring (6) from cover (5).



394-777

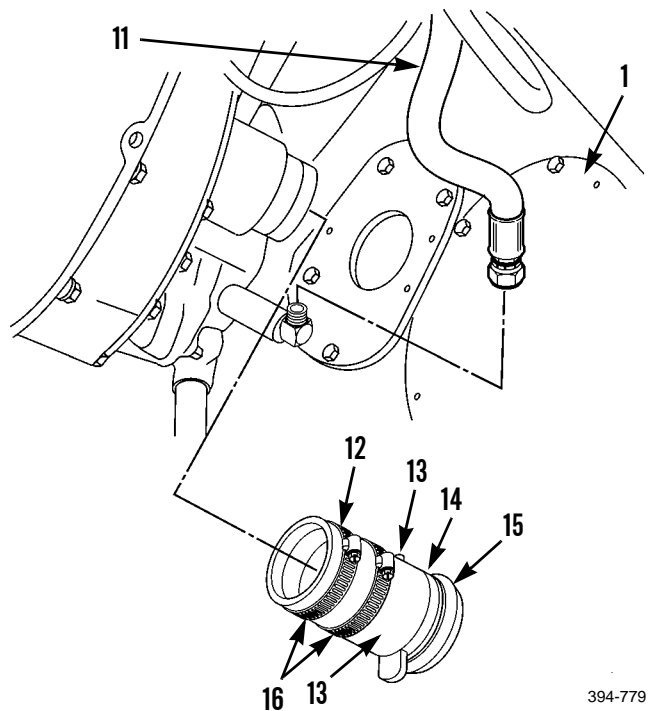
**REMOVAL - CONTINUED**

4. Install 3/4-16NC eyebolt (10) in one of three holes in driveshaft (9).
5. Pull driveshaft (9) by 3/4-16NC eyebolt (10) until 2 ft (0.6 m) of driveshaft extends from transmission (3).



394-778

6. Disconnect hose assembly (11) from machine, forward of flywheel housing (1).
7. Loosen two clamps (16) on hose (12).
8. Place pry bar between pry tabs (13) on tube (14) and flywheel housing (1) and remove tube (14) assembly.
9. Remove two clamps (16), hose (12) and O-ring (15) from tube (14). Discard O-ring.



394-779

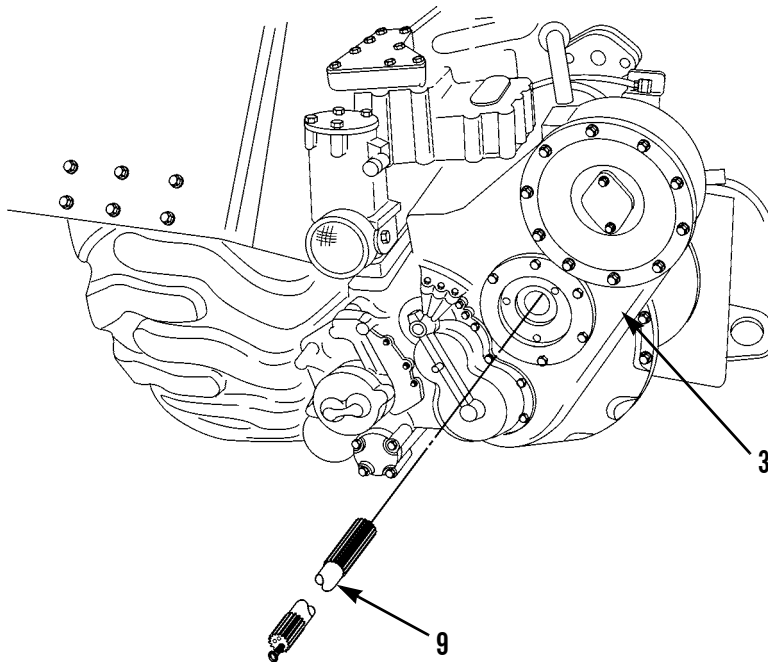
**REMOVAL - CONTINUED****WARNING**

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 cause injury or death.

**NOTE**

Driveshaft weighs 72 lb (33 kg) and is 6 ft (2 m) long.

10. With assistance, remove driveshaft (9) from transmission (3).



394-780



**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 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 parts with solvent cleaning compound and dry with compressed air. Ensure all gasket material is removed from mounting surfaces.
  2. Inspect all parts for damage and replace as necessary.

**INSTALLATION****WARNING**

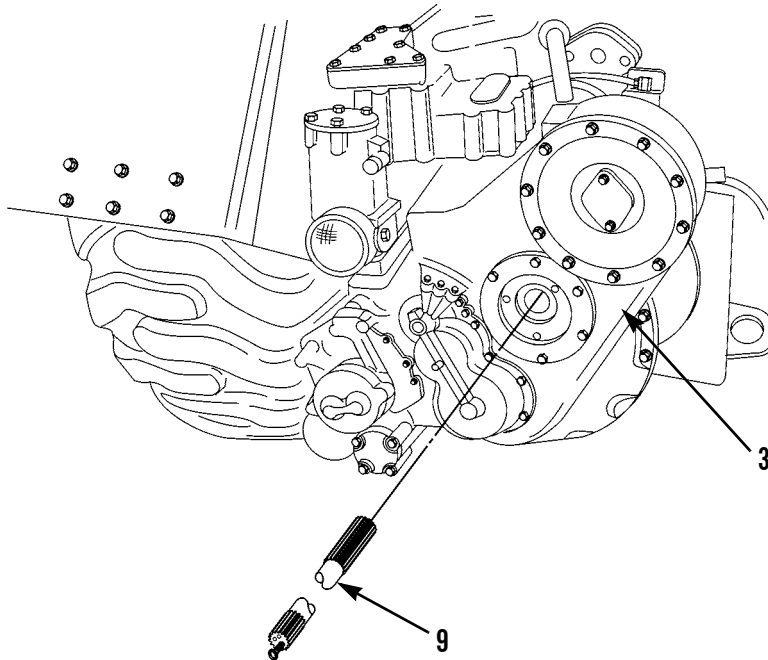
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury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

**NOTE**

Driveshaft weighs 72 lb (33 kg) and is 6 ft (2 m) long.

**INSTALLATION - CONTINUED**

1. Align splines on driveshaft (9) with splines in transmission (3) and position driveshaft in transmission.



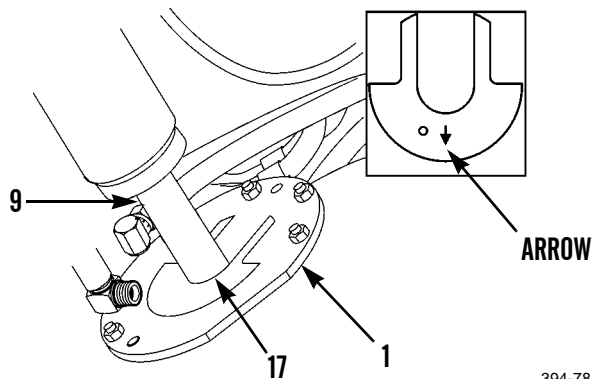
394-780

2. Install alignment tool (17) in bore of flywheel housing (1).

**CAUTION**

Engine and transmission must be aligned before installing driveshaft. Failure to follow this caution may result in damage to equipment.

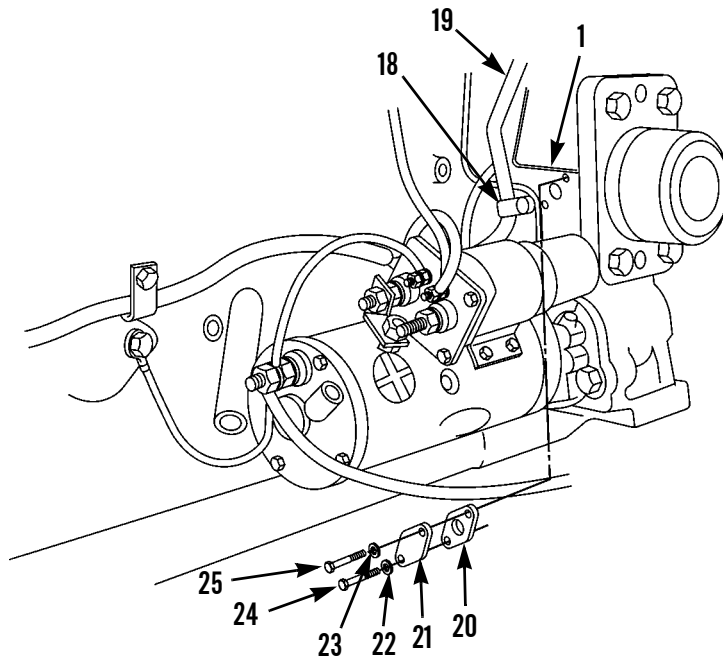
3. Rotate alignment tool (17) 360 degrees clockwise and counterclockwise. If alignment tool turns freely, go to step 13.
4. Position alignment tool (17) equal distance between two points where resistance is felt. Arrow on alignment tool indicates direction engine must be turned to align engine and driveshaft (9).



394-781

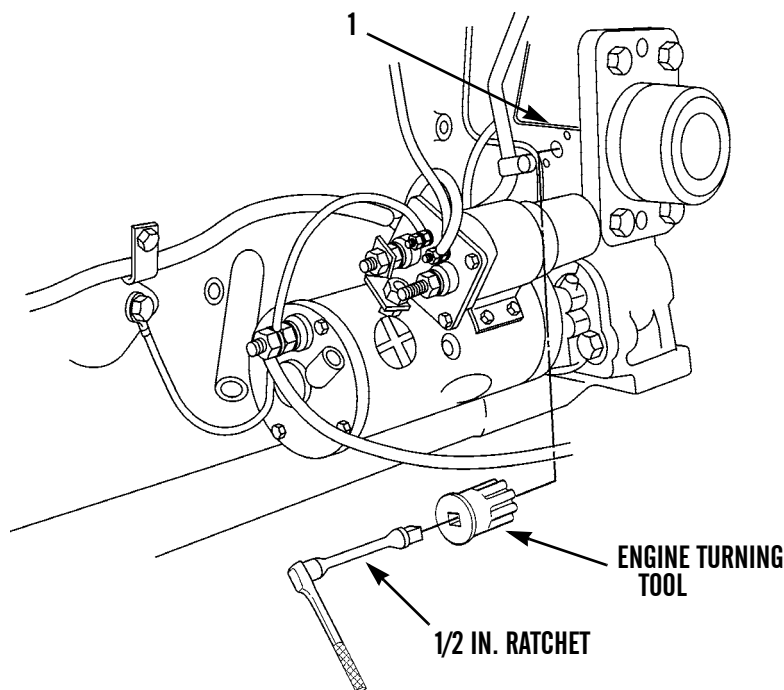
**INSTALLATION - CONTINUED**

5. Remove bolt (24) and washer (22) from cover (21).
6. Loosen clip (18), but do not remove from wiring harness (19).
7. Remove timing bolt (25), washer (23), cover (21) and gasket (20) from flywheel housing (1). Discard gasket.



394-782

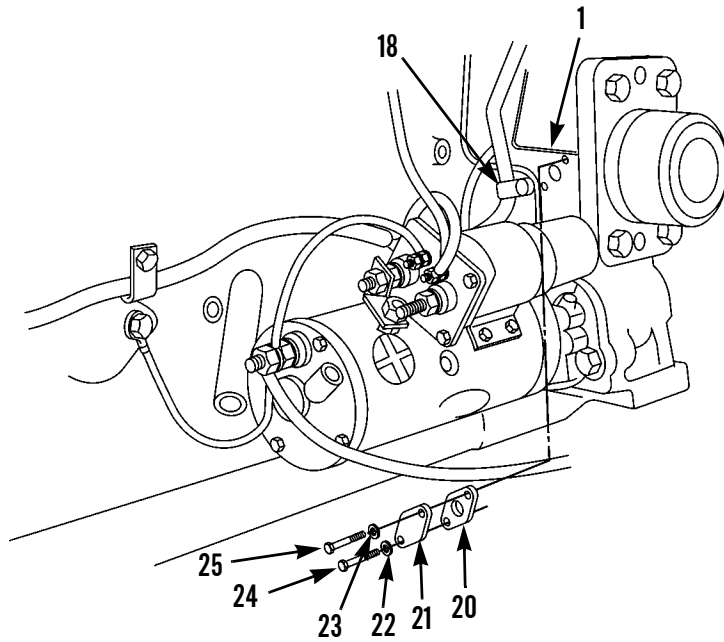
8. Install engine turning tool in flywheel housing (1) until shoulder of engine turning tool is against flywheel housing.
9. Attach 1/2 in. (12.7 mm) ratchet on engine turning tool and turn engine in small increments until alignment tool turns freely through 360 degrees. Remove 1/2 in. (12.7 mm) ratchet and engine turning tool.



394-783

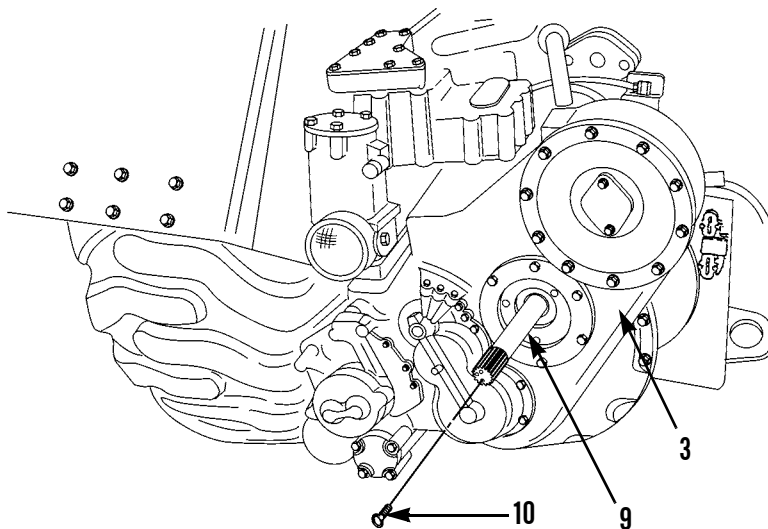
**INSTALLATION - CONTINUED**

10. Install new gasket (20) and cover (21) on flywheel housing (1) with washer (23) and timing bolt (25).
11. Install washer (24) and bolt (22) on cover (21) and clip (18).



394-782

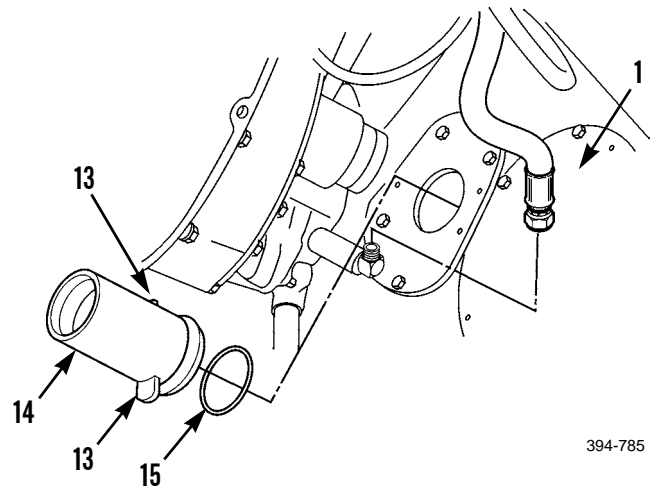
12. Using 3/4-16NC eyebolt (10), pull on driveshaft (9) until driveshaft protrudes 2 ft (0.6 m) from transmission case (3).



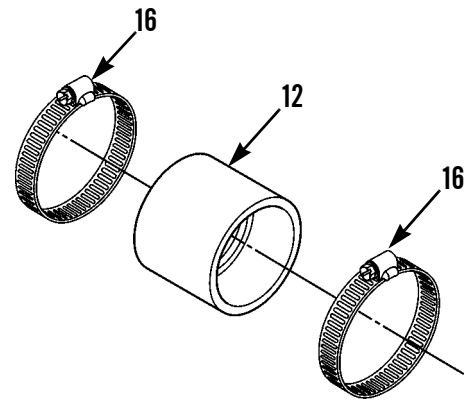
394-784

**INSTALLATION - CONTINUED**

13. Install new O-ring (15) and tube (14) on flywheel housing (1). Tap two pry tabs (13) lightly to seat tube.



14. Install two clamps (16) on hose (12).

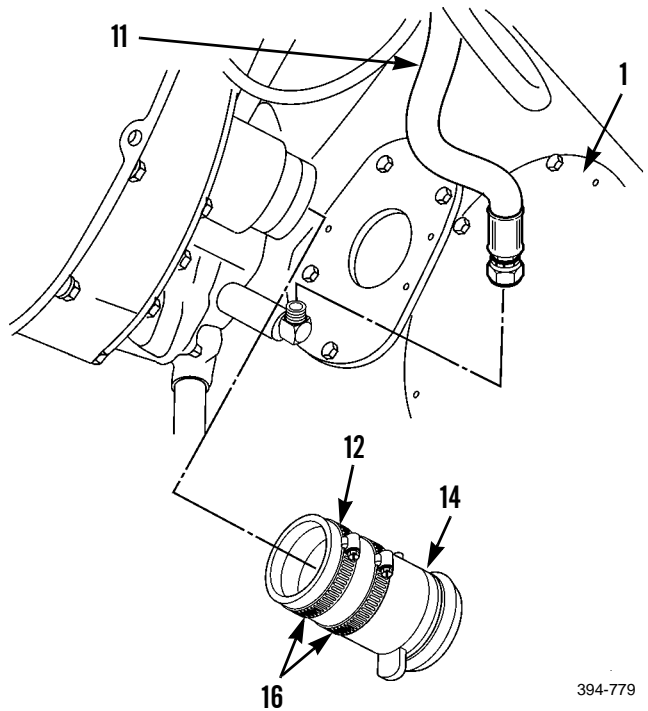


394-785

394-786

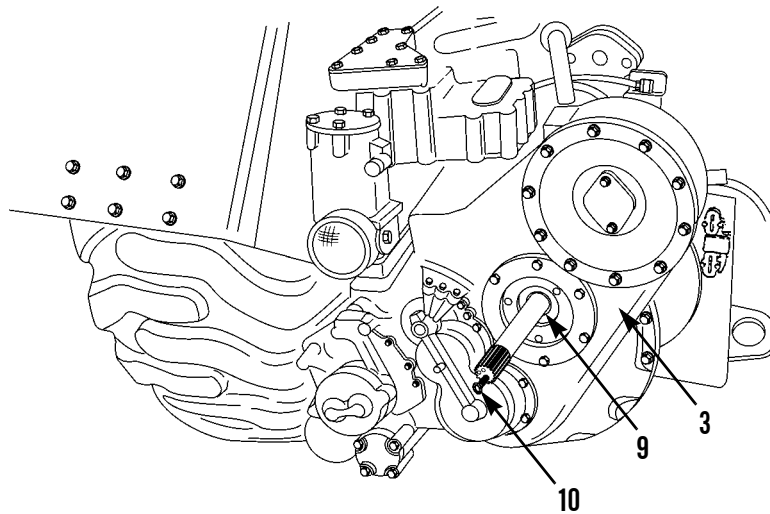
**INSTALLATION - CONTINUED**

15. Position hose (12) on tube (14) and tighten two clamps (16).
16. Connect hose assembly (11) to machine, forward of flywheel housing (1).



394-779

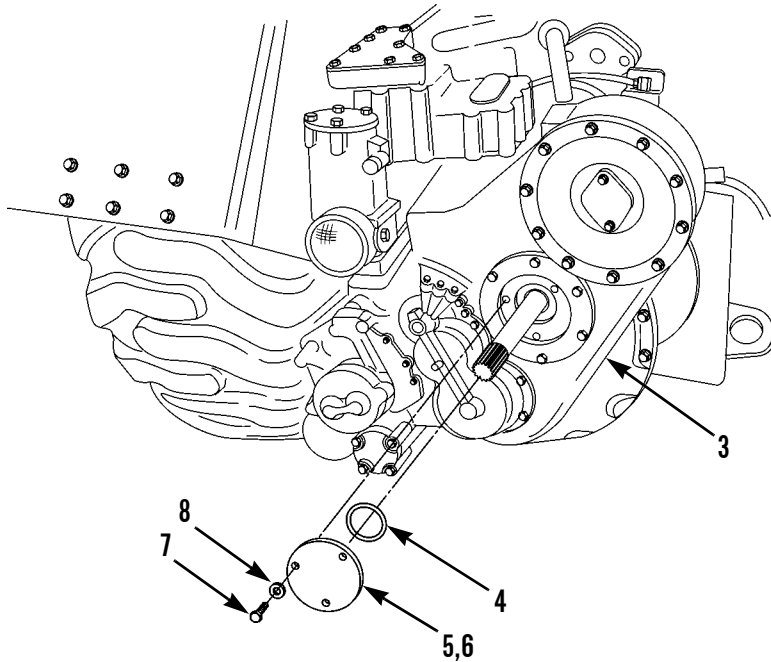
17. Fully install driveshaft (9) in transmission (3) and remove 3/4-16NC eyebolt (10).



394-778

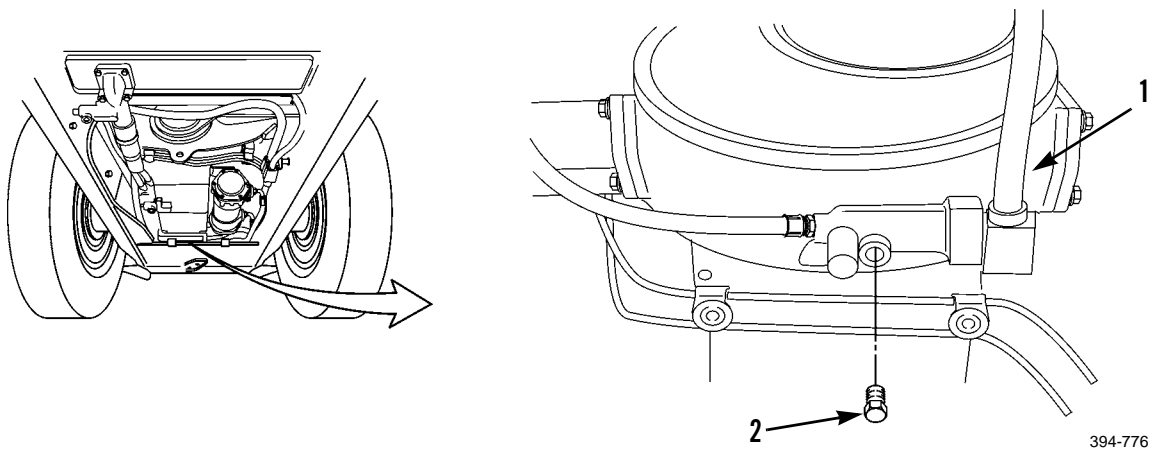
**INSTALLATION - CONTINUED**

18. Install new O-ring (6) on cover (5).
19. Install ring (4) and cover (5) on transmission (3) with three washers (8) and bolts (7).



394-777

20. Install plug (2) on flywheel housing (1).



394-776

21. Fill hydraulic tank to correct level (WP 0229 00).
22. Operate machine and verify proper operation (TM 5-3805-248-10).
23. Shut down engine (TM 5-3805-248-10).
24. Check for leaks around driveshaft cover (TM 5-3805-248-10).

**END OF WORK PACKAGE**





**FRONT AXLE HOUSING REPLACEMENT****0294 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 500 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, anti-seize (Item 11, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed

**References**

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Final drive removed (WP 0144 00)

Wheel and tire removed (WP 0302 00)

Shoe assembly removed (WP 0150 00)

Front brake camshaft and slack adjuster removed (WP 0147 00)

**REMOVAL****WARNING**

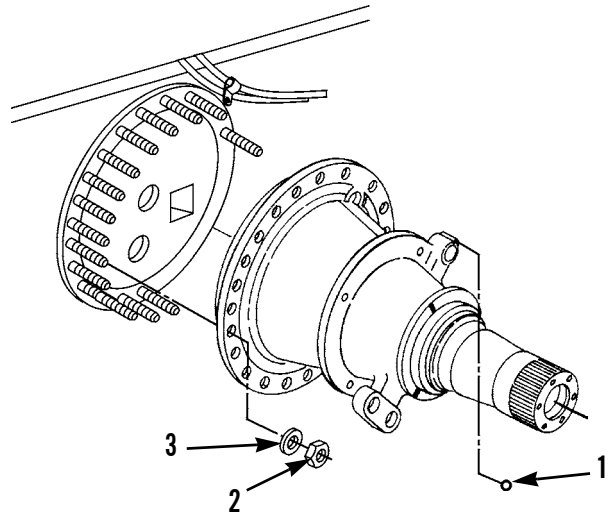
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

**NOTE**

- Weight of front axle housing is 455 lb (206 kg).
- This task is for removal of the right tractor axle housing. The procedure for removal of the left tractor axle housing is identical.

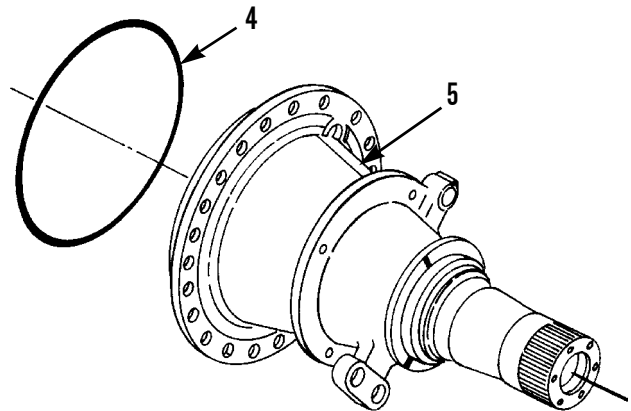
**REMOVAL - CONTINUED**

1. Attach lifting device to right front axle housing.
2. Remove 22 nuts (2) and washers (3).
3. Remove ball (1) if necessary.
4. Use lifting device to remove front axle housing from machine and place on flat surface.
5. Remove lifting device.



394-1698

6. Remove and discard preformed packing (4) from axle housing (5).



394-898

**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 cause 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. Remove all preformed packing material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry parts with compressed air.
4. Inspect all parts and replace if damaged.

**INSTALLATION**

1. Install new preformed packing (4) on front axle housing (5).
2. Install ball (1) if removed.

**WARNING**

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**

Weight of front axle housing is 455 lb (206 kg).

3. Attach lifting device to front axle housing (5).
4. Use lifting device to position front axle housing (5) on studs.
5. Apply anti-seize compound to threads of stud.
6. Install 22 washers (3) and nuts (2). Tighten nuts to 220 lb-ft (398 Nm).
7. Remove lifting device.
8. Install front brake camshaft and slack adjuster (WP 0147 00).
9. Install shoe assembly (WP 0150 00).
10. Install wheel with tire (WP 0302 00).
11. Install final drive (WP 0144 00).
12. Operate machine to verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**DIFFERENTIAL AND BEVEL GEAR ASSEMBLY REPLACEMENT****0295 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

Bolt and washer, 3/8-16NC 23 THD

Lifting device 1,400 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 6, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed

**References**

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Transmission removed (WP 0286 00)

**REMOVAL****WARNING**

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.

**REMOVAL - CONTINUED****NOTE**

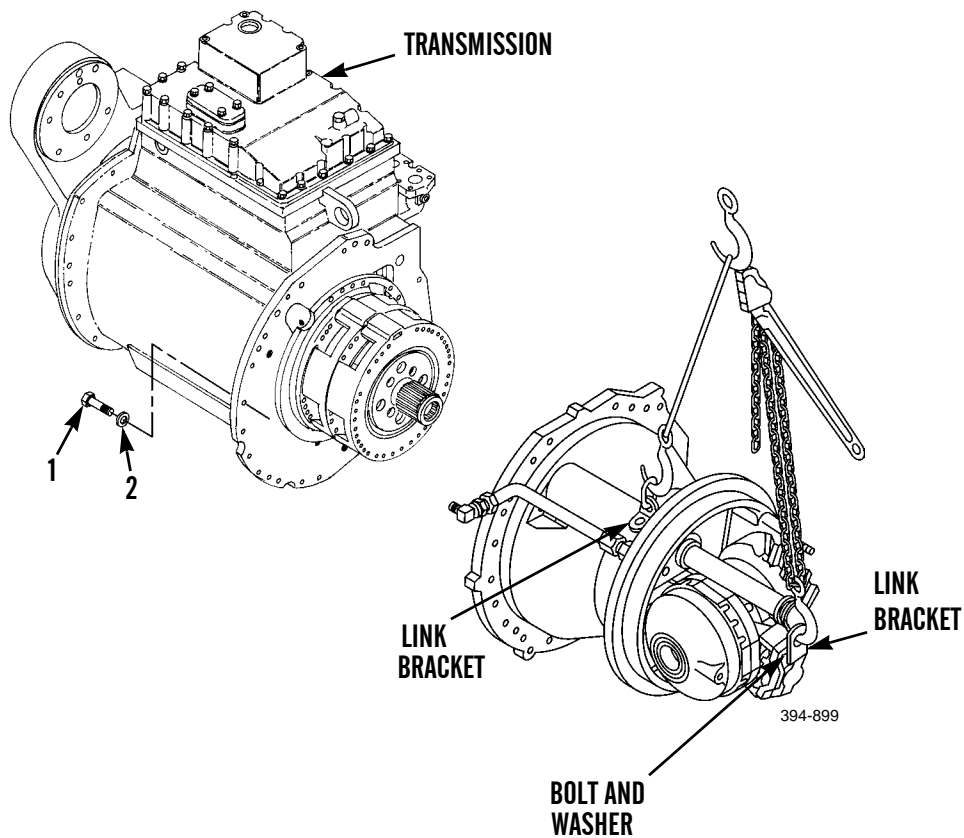
Weight of differential and bevel gear assembly is 900 lb (408 kg).

1. Install link bracket in top of differential housing.
2. Install link bracket, washer and bolt.
3. Install lifting device to link brackets.

**CAUTION**

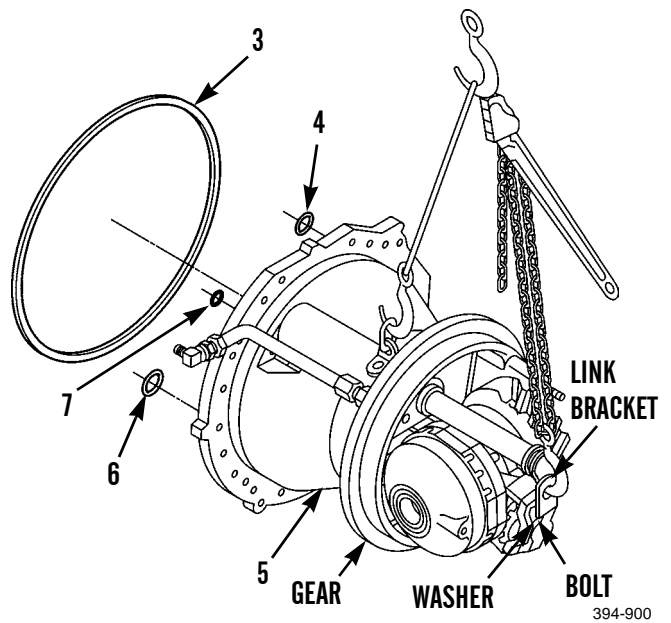
Lifting device must be taut to support differential assembly.

4. Remove four bolts (1) and washers (2).

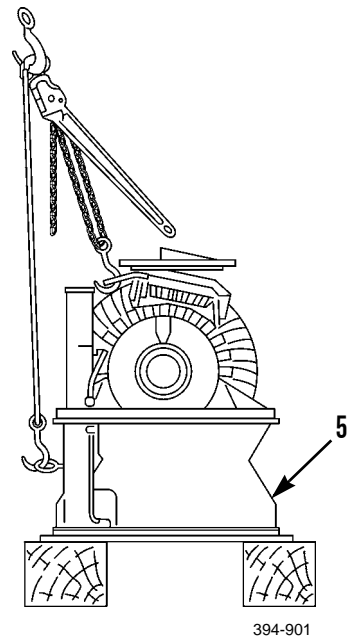


**REMOVAL - CONTINUED**

5. Use lifting device to remove bevel gear assembly and differential (5) from transmission.
6. Remove and discard preformed packings (3, 4, 6 and 7) from bevel gear assembly (5).



7. Use lifting device to take up slack until rear of differential and bevel gear assembly (5) is facing upward.
8. Use lifting device to lower differential and bevel gear assembly (5) on wood blocks.
9. Remove lifting device.



**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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.
1. Remove all preformed packing material from mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry parts with compressed air.
  4. Inspect all parts and replace if damaged.

**INSTALLATION****WARNING**

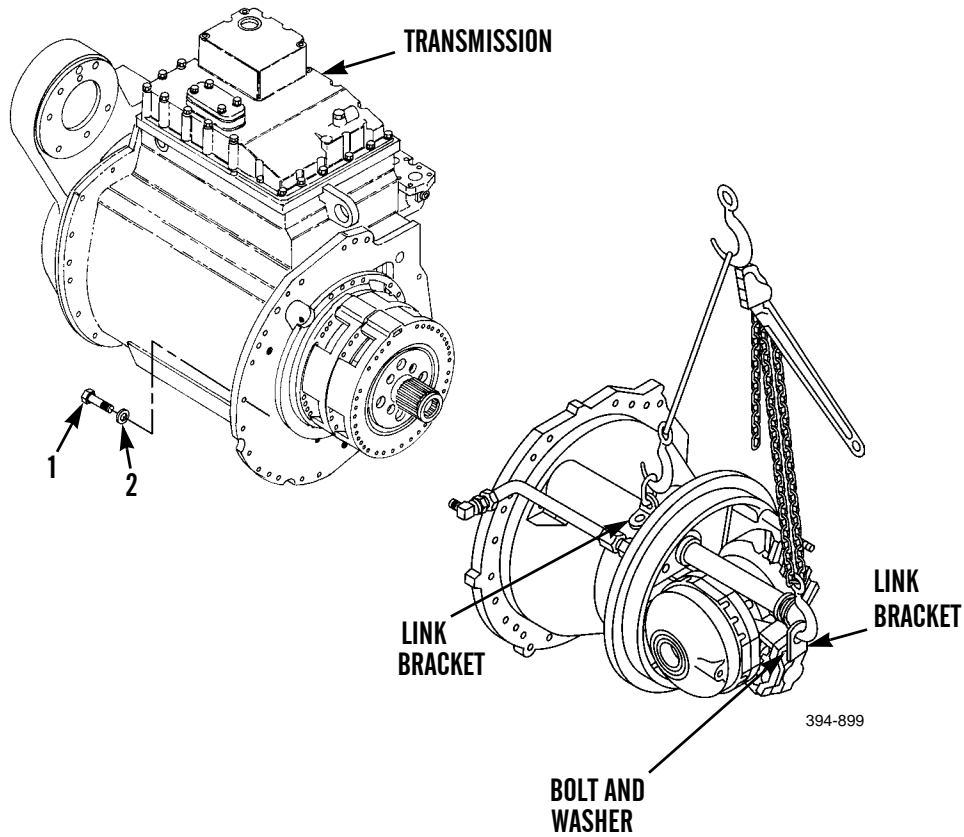
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

1. Attach lifting device to differential and bevel gear assembly (5) and remove from wood blocks.
2. Install new preformed packings (3, 4, 6 and 7) on bevel gear assembly (5).
3. Install differential and bevel gear assembly (5) on transmission. Splines on transmission output shaft and internal splines of differential assembly can be aligned by turning the large visible gear on the rear of the differential.



**INSTALLATION - CONTINUED**

4. Install four washers (2) and bolts (1).
5. Remove lifting device, bolt, washer and link brackets.



6. Install transmission (WP 0286 00).
7. Operate machine to verify proper operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**DIFFERENTIAL FILLER REPLACEMENT**

0296 00

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance and repair (Item 103, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 30, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Gasket

Seal (2)

**References**

TM 5-3805-248-10

**Equipment Condition**

Final drive oil drained to level below sight gage (WP 0144 00)

**REMOVAL**

1. Remove padlock (4) if equipped.
2. Disconnect plate (5) and let hang by cable.

**CAUTION**

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

**NOTE**

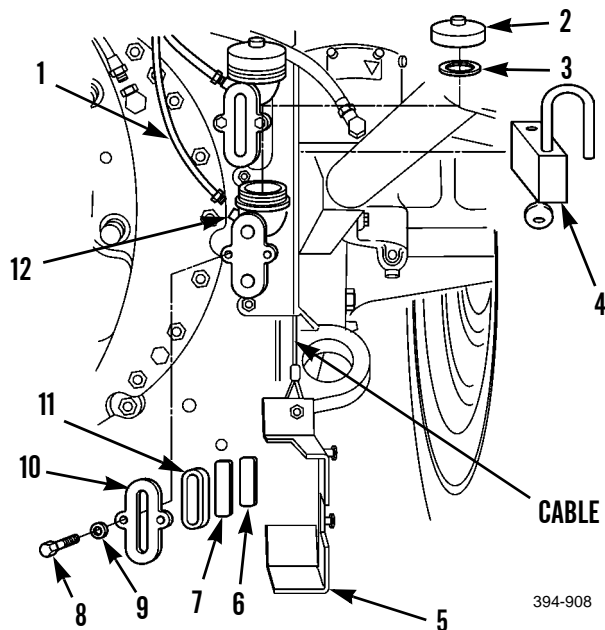
Use container to capture any oil which may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

3. Disconnect hose assembly (1) from elbow (12).
4. Remove cap (2) and seal (3) from elbow (12). Discard seal.

**NOTE**

If equipped with round sight glass, proceed to step 6. Do not attempt to disassemble sight gage.

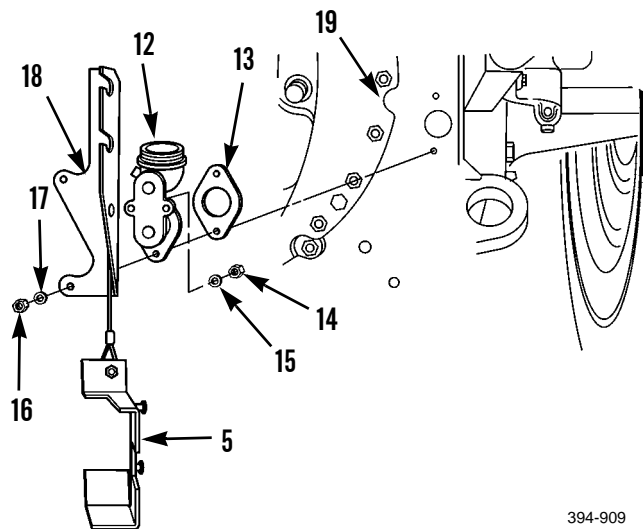
5. Remove two bolts (8), washers (9), retainer (10), seal (11), lens (7) and plate (6). Discard seal.



394-908

**REMOVAL - CONTINUED**

6. Remove two nuts (16), washers (17) and plate (18) with plate (5) attached.
7. Remove nut (14) and washer (15).
8. Remove elbow (12) and gasket (13). Discard gasket.



394-909

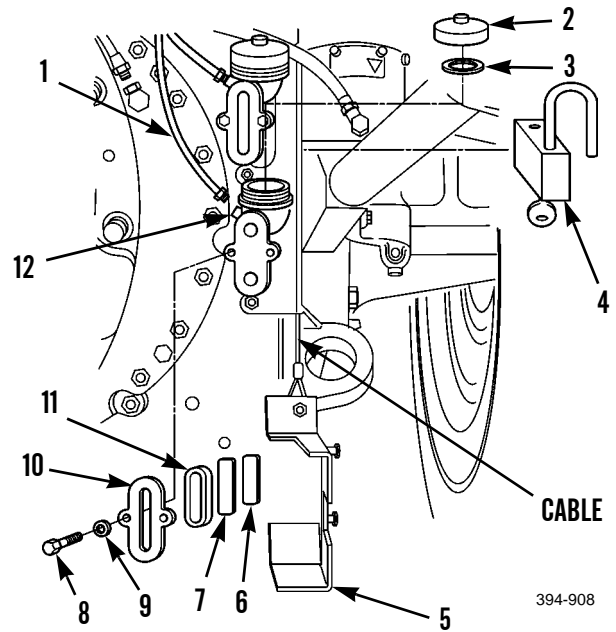
**CLEANING AND INSPECTION****WARNING**

- 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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

1. Remove all seal and gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install new gasket (13), elbow (12), washer (15) and nut (14) on differential (19).
2. Install plate (18) with plate (5) attached, two washers (17) and nuts (16).
3. Install plate (6), lens (7) and new seal (11) on elbow (12).
4. Install retainer (10), two washers (9) and bolts (8).
5. Install new seal (3) and cap (2).
6. Connect hose assembly (1).
7. Connect plate (5).
8. If removed, install padlock (4).



9. Fill differential with lubricating oil (TM 5-3805-248-10).
10. Operate machine and verify proper operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**DIFFERENTIAL FILLER HOSE REPLACEMENT**

0297 00

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance and repair (Item 103, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

**Materials/Parts - Continued**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

Transmission removed (WP 0286 00)

**REMOVAL**

1. Loosen clamps (1), (2), (4) and (5).

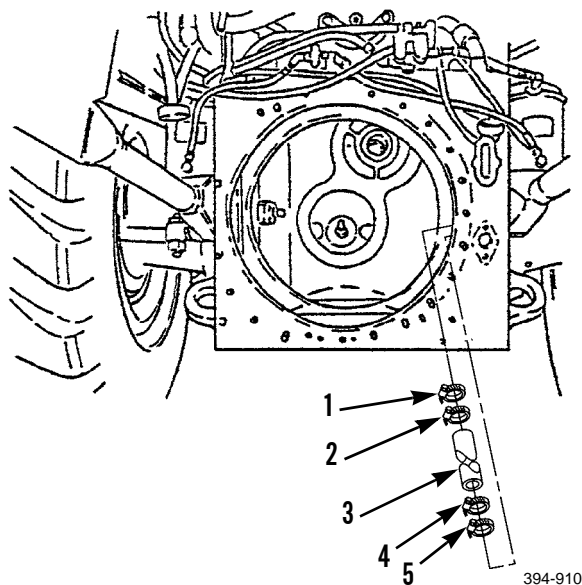
**CAUTION**

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

**NOTE**

Use container to capture any oil which may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

2. Disconnect hose (3) from differential filler.
3. Remove clamps (1), (2), (4) and (5) from hose (3).



394-910

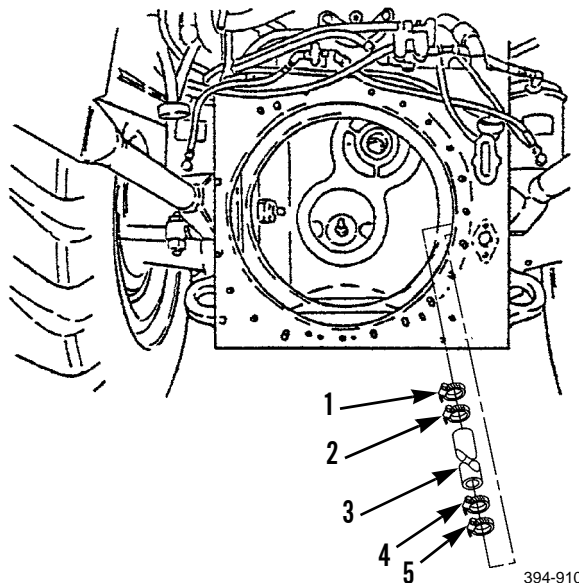
**CLEANING AND INSPECTION****WARNING**

- 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 eye protection.

1. Clean all parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Position clamps (1), (2), (4) and (5) on hose (3).
2. Connect hose (3) to differential filler.
3. Tighten clamps (1), (2), (4) and (5).



4. Install transmission (WP 0286 00).
5. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**REAR AXLE HOUSING REPLACEMENT**

---

**0298 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

Lifting device, 525 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Compound, anti-seize (Item 11, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Personnel Required**

Two

**References**

TM 5-3805-248-20

**Equipment Condition**

Tire and wheel removed (WP 0303 00)

Brake adjusters and camshafts removed (WP 0147 00)

Brake shoes removed (WP 0150 00)

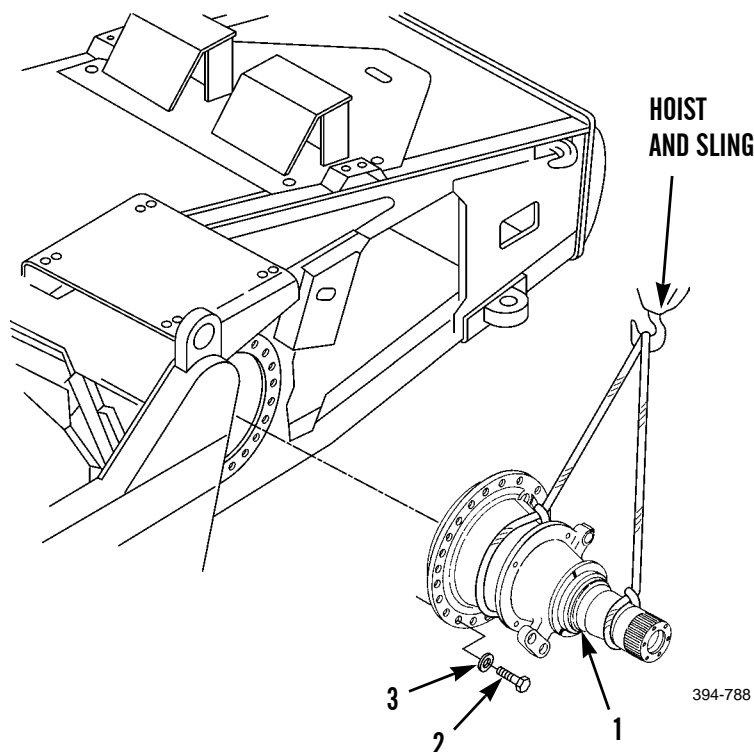
---

**REMOVAL****NOTE**

- This task is for removal of the left rear axle housing. The procedure for removal of the right axle housing is the same.
- Use a suitable container to capture any oil which may drain from lines. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

**REMOVAL - CONTINUED**

1. Attach lifting device to axle housing (1).
2. Remove 22 bolts (2) and washers (3).

**WARNING**

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 result in death or injury to personnel.

**NOTE**

Weight of axle housing is 340 lb (154 kg).

3. With assistance, use lifting device to remove axle housing (1) from machine.

**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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.
1. Remove all gasket material from mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry all parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Apply anti-seize compound to coat 22 washers (3) and bolts (2).
2. Attach lifting device to axle housing (1).

**WARNING**

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 result in injury or death.

**NOTE**

Weight of axle housing is 340 lb (154 kg).

3. With assistance, use lifting device, position axle housing (1) against machine.
4. Install 22 washers (3) and bolts (2). Torque 22 bolts (2) to 200 lb-ft (271 Nm).
5. Install tire and wheel (WP 0303 00).
6. Install brake adjusters and camshafts (WP 0147 00).
7. Install brake shoes (WP 0150 00).
8. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Gasket

Packing, preformed (3)

**References**

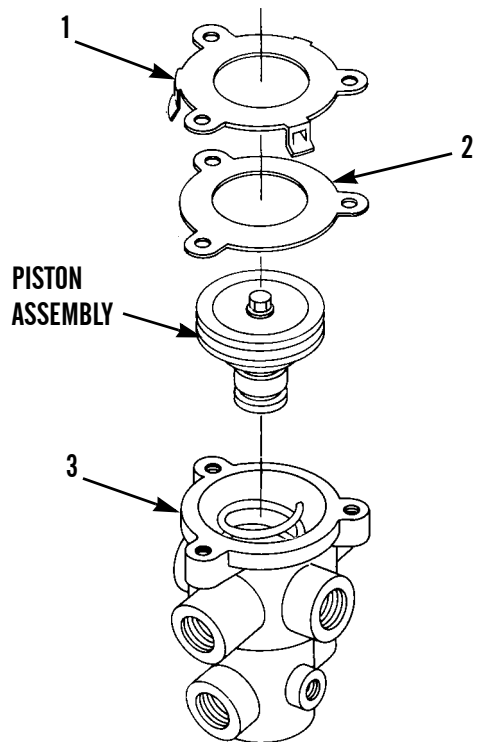
TM 5-3805-248-10

**Equipment Condition**

Brake control valve removed (WP 0155 00)

**DISASSEMBLY**

1. Remove retainer (1) from top of valve body (3).
2. Remove and discard gasket (2).
3. Remove piston assembly from valve body (3).



394-789

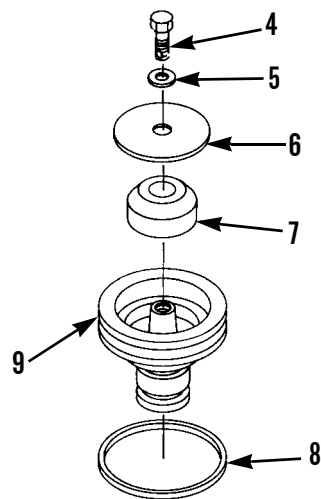
**DISASSEMBLY - CONTINUED**



**WARNING**

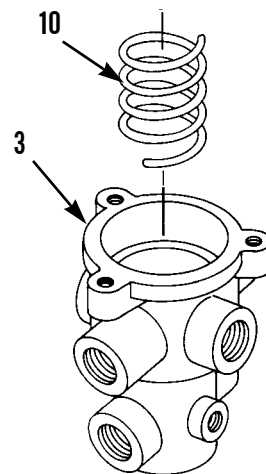
- Eye protection must be worn when performing maintenance where components or particles could fly out during procedures. Failure to take precautions could cause injury to personnel.
- Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

4. Remove bolt (4), washer (5), seat (6) and mount (7) from piston (9).
5. Remove and discard preformed packing (8).



394-790

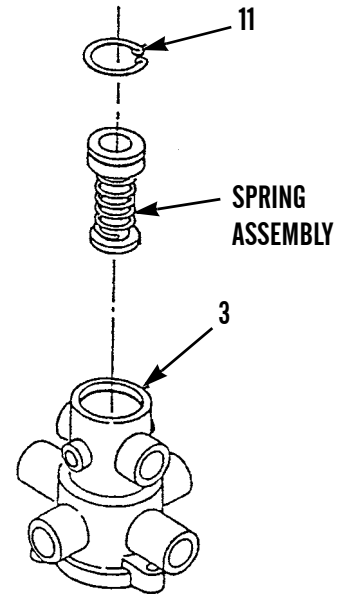
6. Remove spring (10) from valve body (3).
7. Invert valve body (3).



394-791

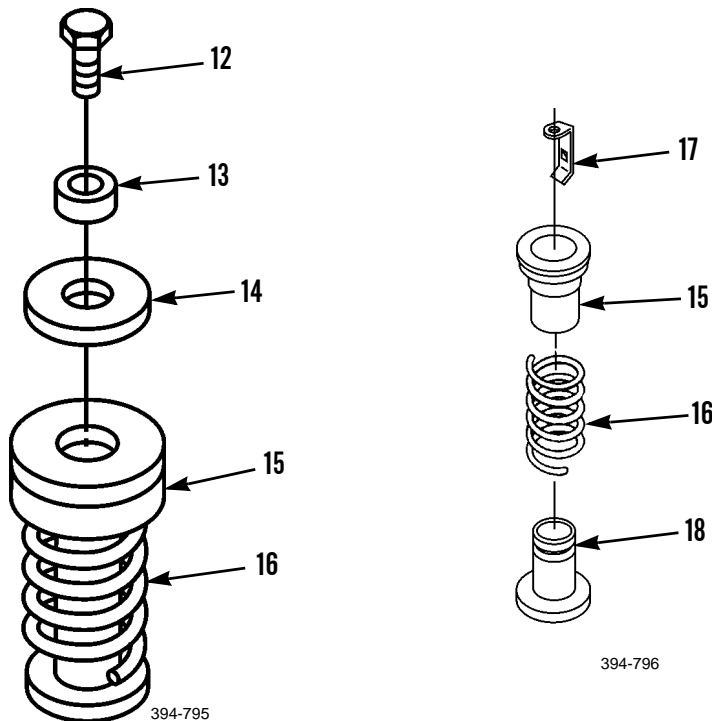
**DISASSEMBLY - CONTINUED**

8. Use snap ring pliers to remove ring (11).
9. Remove spring assembly from valve body (3).



394-792

10. Remove screw (12), washer (13) and diaphragm (14) from seat (15).
11. Remove seat (15), springs (16 and 17) and valve (18).
12. Compress spring (16), remove spring (17) and disassemble components.

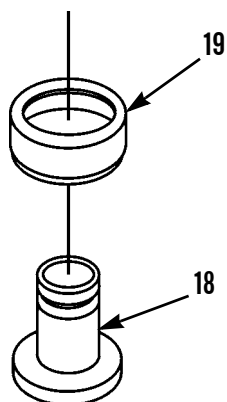


394-796

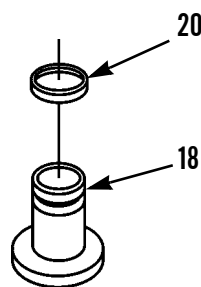
394-795

**DISASSEMBLY - CONTINUED**

13. Remove retainer (19) from valve (18).
14. Remove and discard preformed packing (20) from valve (18).

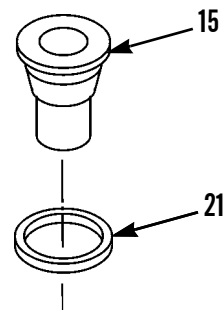


394-797



394-798

15. Remove and discard preformed packing (21) from seat (15) groove.



394-794

**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 eye protection.



**CLEANING AND INSPECTION - CONTINUED**

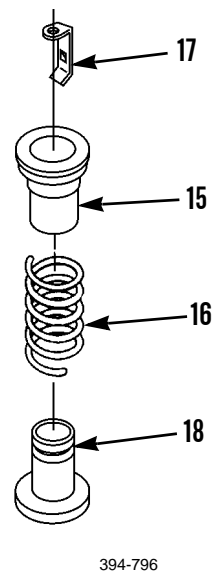
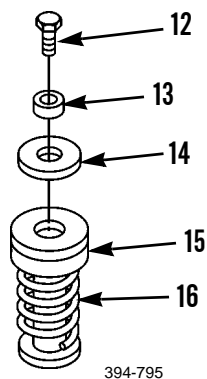
1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install new preformed packing (20) on valve (18).
2. Install retainer (19) on valve (18).

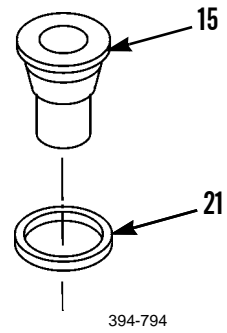
**WARNING**

- Eye protection must be worn when performing maintenance where components or particles could fly out during procedures. Failure to take precautions could cause injury to personnel.
  - Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.
3. Install valve (18), springs (16) and (17) and seat (15). Compress spring (16), valve (18), seat (15) and insert spring (17) to hold components together.
  4. Position and install diaphragm (14), washer (13) and screw (12) on seat (15).

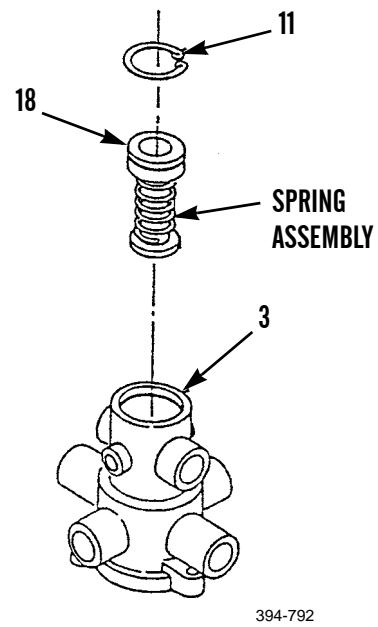


**ASSEMBLY - CONTINUED**

5. Install new preformed packing (21) on groove of seat (15).

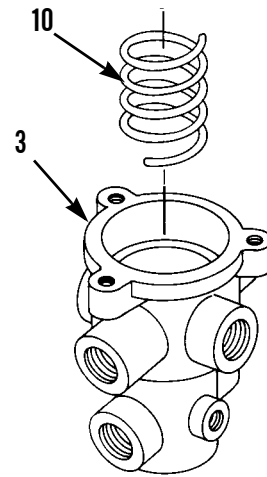


6. Install spring assembly in valve body (3) with valve (18) toward top of valve body (3).
7. Use snap ring pliers to install ring (11).



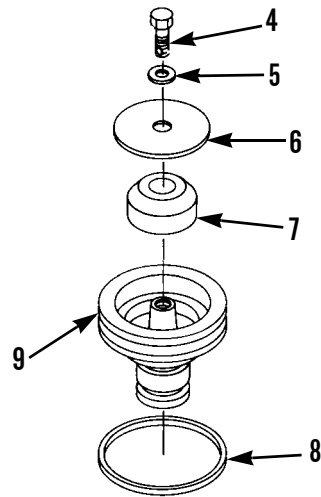
**ASSEMBLY - CONTINUED**

8. Invert valve body (3).
9. Install spring (10) in valve body (3).



394-791

10. Position and install mount (7), seat (6), washer (5) and bolt (4) on piston (9).
11. Install new preformed packing (8).

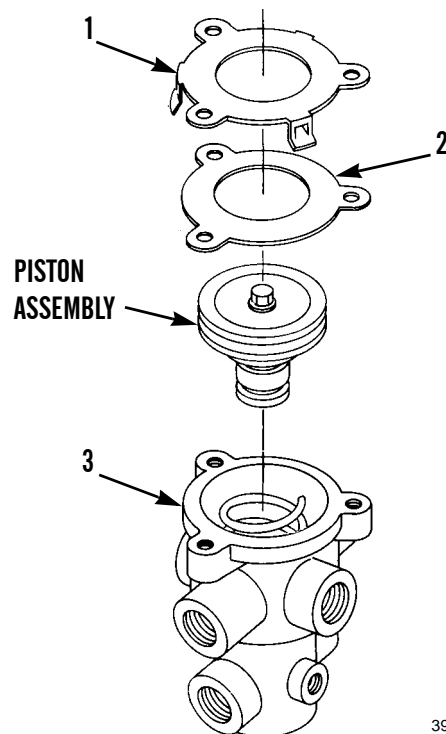


394-790

**ASSEMBLY - CONTINUED****WARNING**

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

12. Install piston assembly in valve body (3).
13. Install new gasket (2) and retainer (1).



394-789

14. Install brake control valve (WP 0155 00).
15. Operate machine and verify correct operation of brakes (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 6, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed

**References**

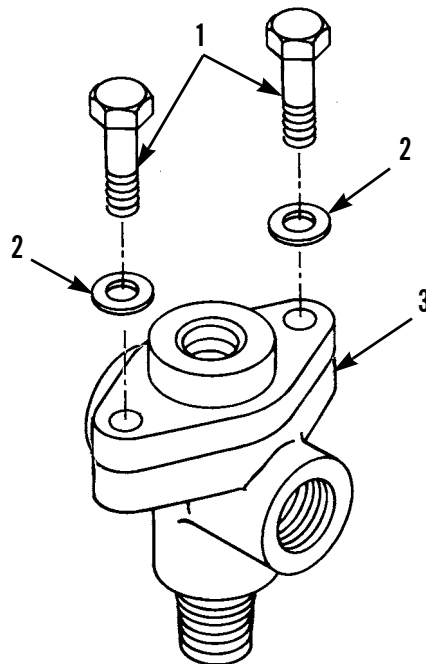
TM 5-3805-248-10

**Equipment Condition**

Double check valve removed (WP 0158 00)

**DISASSEMBLY**

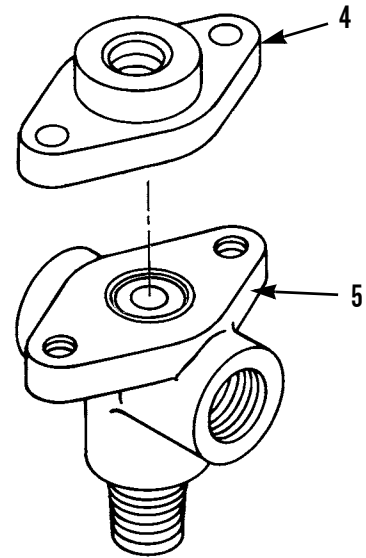
1. Remove two bolts (1) and washers (2) from double check valve assembly (3).



394-793

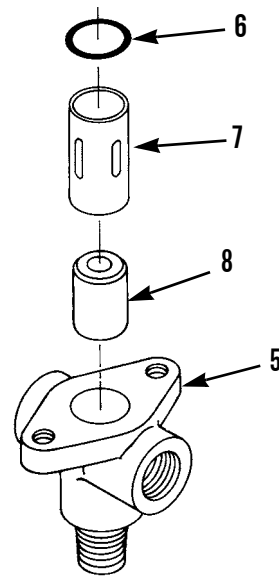
**DISASSEMBLY - CONTINUED**

2. Remove cap (4) from double check valve body (5).



394-799

3. Remove shuttle (8), guide (7) and preformed packing (6) from double check valve body (5). Discard preformed packing.



394-800

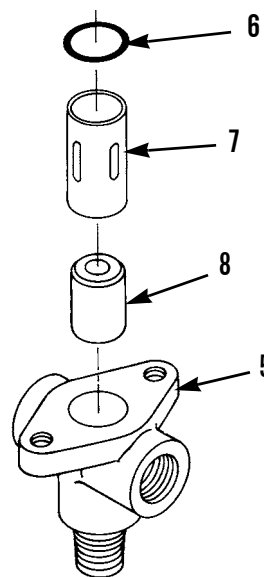
**CLEANING AND INSPECTION****WARNING**

- 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. 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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

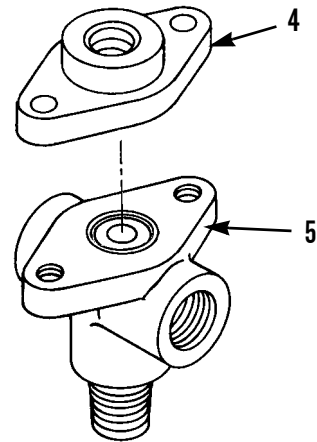
1. Install new preformed packing (6), guide (7) and shuttle (8) in double check valve body (5).



394-800

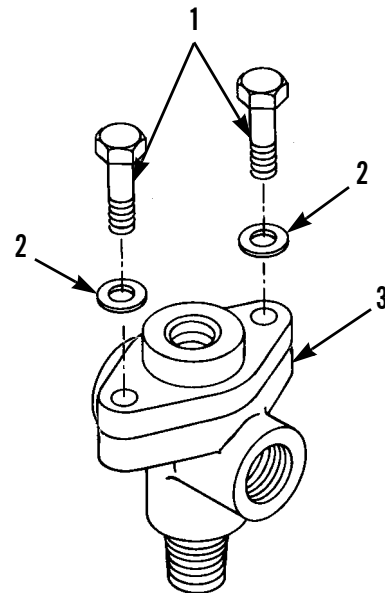
**ASSEMBLY - CONTINUED**

2. Position cap (4) on double check valve body (5).



394-799

3. Install two washers (2) and bolts (1) onto double check valve assembly (3).



394-793

4. Install double check valve (WP 0158 00).
5. Operate machine and verify correct operation of brakes (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tape, anti-seizing (Item 43, WP 0339 00)

**Materials/Parts - Continued**

Cartridge replacement kit

Check valve kit

Desiccant parts kit

Purge valve kit

**References**

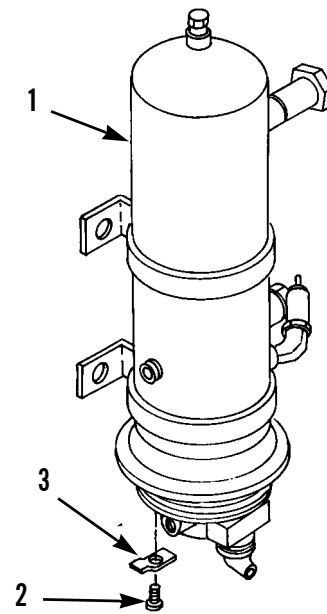
TM 5-3805-248-10

**Equipment Condition**

Air dryer removed (WP 0152 00)

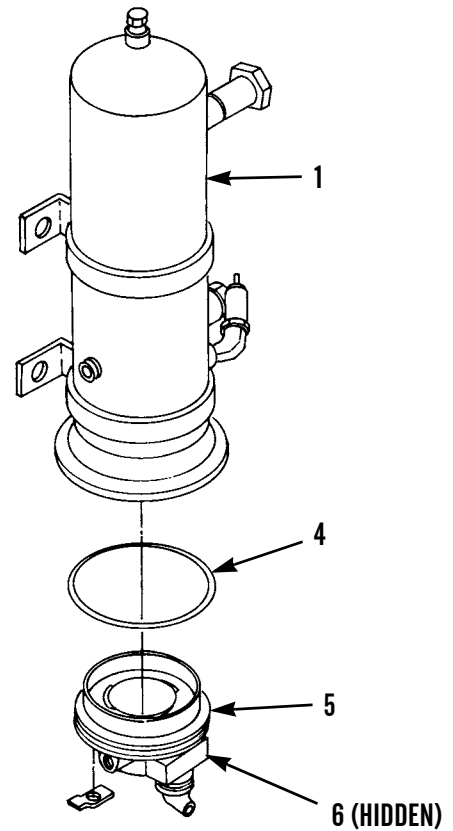
**DISASSEMBLY**

1. Loosen three bolts (2) from bottom of air dryer tank (1).
2. Rotate three clamps (3), one-quarter turn in either direction, and remove.



**DISASSEMBLY - CONTINUED**

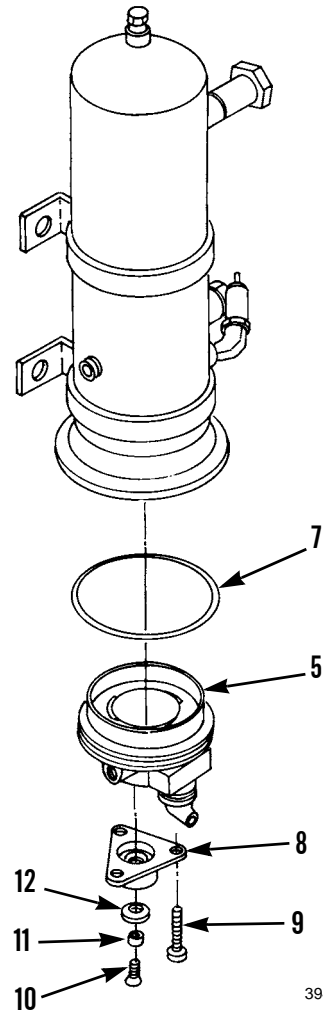
3. Press spring (6) in end cover (5) inside air dryer tank (1).
4. Insert screwdriver into notch in rim of air dryer tank (1).
5. Remove and discard retaining ring (4) by applying pressure with screwdriver.
6. Remove end cover (5).



394-1009

**DISASSEMBLY - CONTINUED**

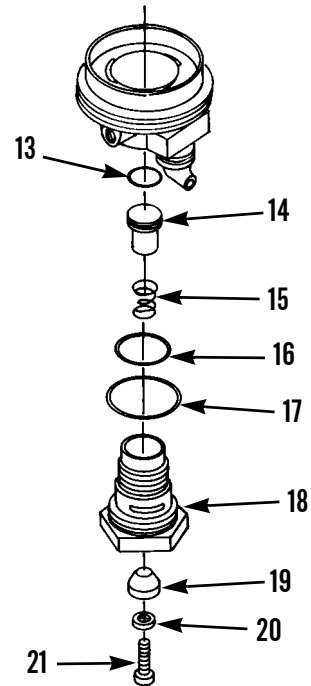
7. Remove and discard preformed packing (7).
8. Remove screw (10), washer (11), and diaphragm (12).  
Discard diaphragm.
9. Remove three screws (9) and exhaust cover (8).



394-1010

**DISASSEMBLY - CONTINUED**

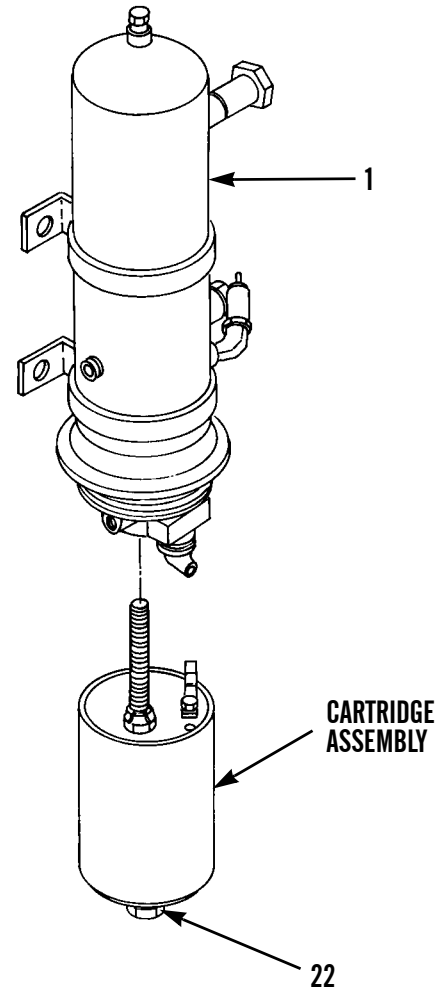
10. Remove cap (18).
11. Insert screwdriver in slot of purge valve piston (14) to keep cap (18) from turning.
12. Loosen bolt (21) from cap (18).
13. Remove bolt (21) from cap (18).
14. Remove lockwasher (20), purge valve (19), purge valve piston (14) and spring (15). Discard purge valve and spring.
15. Remove and discard preformed packings (16) and (17).
16. Remove and discard preformed packing (13).



394-1011

**DISASSEMBLY - CONTINUED**

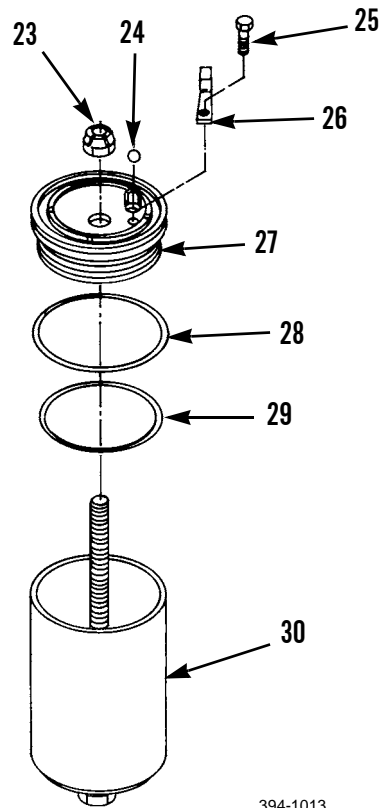
17. Loosen bolt (22). Rotate counterclockwise until cartridge assembly is free of air dryer tank (1).
18. Remove cartridge assembly.



394-1012

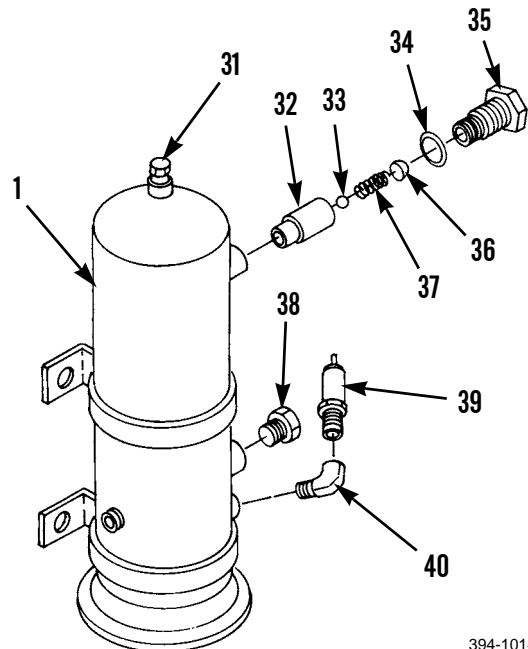
**DISASSEMBLY - CONTINUED**

19. Remove nut (23) and sealing plate (27) from cartridge (30). Discard cartridge and nut.
20. Remove and discard preformed packings (28 and 29).
21. Remove bolt (25), clip (26) and ball (24). Discard ball.



394-1013

22. Remove bolt (35).
23. Remove check valve body (32) from bolt (35).
24. Remove ball (33), spring (37), seal washer (36) and preformed packing (34) from check valve body (32). Discard ball, spring and preformed packing.
25. Remove check valve (39) from air dryer tank (1).
26. Remove elbow (40).
27. Remove plugs (31) and (38).



394-1014

**DISASSEMBLY - CONTINUED**

**NOTE**

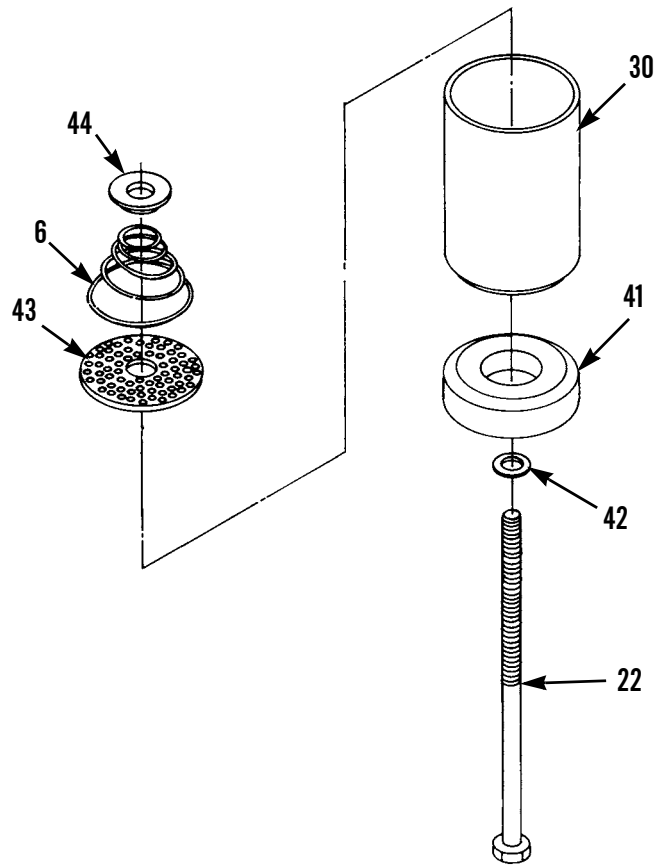
Perform steps 28 and 29 to disassemble desiccant cartridge only if desiccant is being replaced and cartridge is being reused.

28. Remove seat (44), spring (6), plate (43), filter (41) and washer (42) from bolt (22). Discard plate and filter.

**NOTE**

Dispose of desiccant IAW local policies and ordinances.

29. Remove desiccant material from cartridge (30).



394-1015

**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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

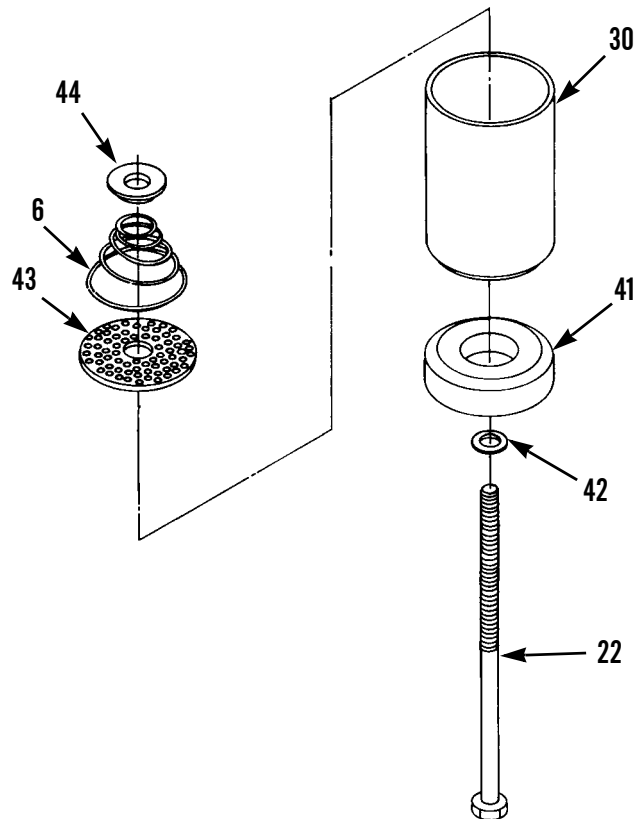
1. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

**NOTE**

All parts furnished in kits are used during assembly.

1. Install washer (42) and new filter (41) on bolt (22), with cloth side of filter (41) toward cartridge (30).
2. Insert bolt (22) into cartridge (30).
3. Pour entire package of new desiccant material into cartridge (30).
4. Install new plate (43) on bolt (22), with cloth side of plate (43) toward desiccant material.
5. Tap plate (43) with soft-face hammer to settle desiccant material into cartridge (30). Plate (43) must fit into cartridge (30) below shoulder of bolt (22).
6. Install spring (6) and seat (44) on bolt (22).



394-1015

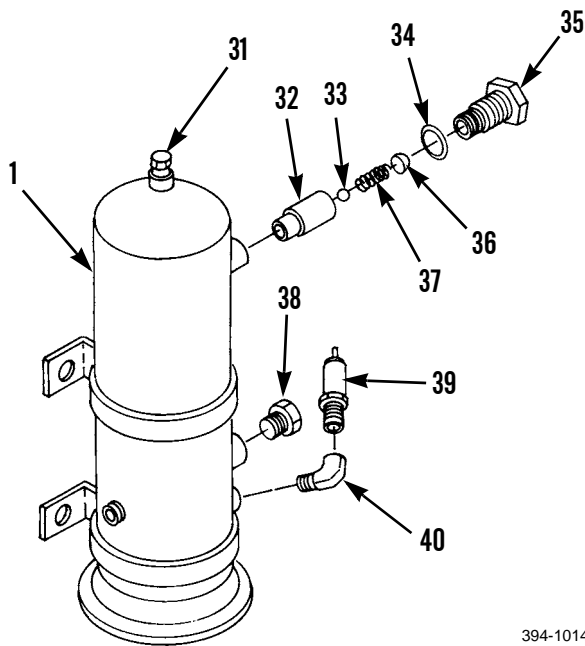


ASSEMBLY - CONTINUED

**NOTE**

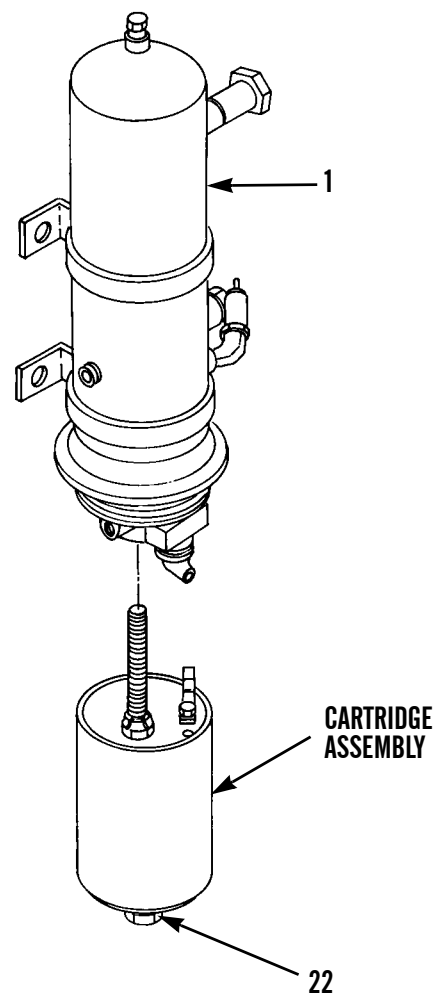
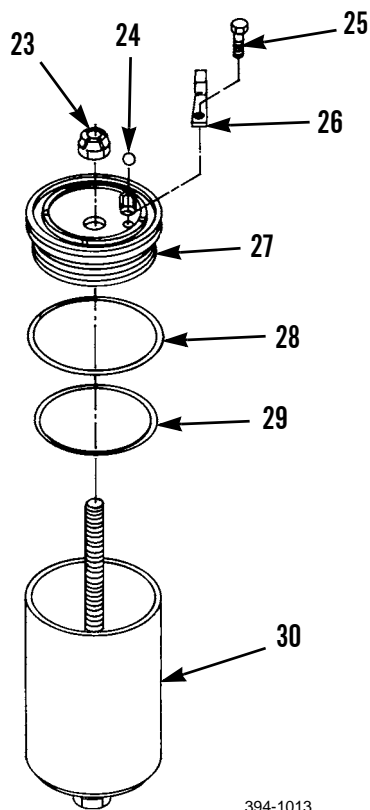
Wrap threads of all air fittings with anti-seizing tape prior to installation to prevent leaks.

7. Install plugs (31 and 38) in air dryer tank (1).
8. Install elbow (40).
9. Install check valve (39) in elbow (40).
10. Apply lubricant from repair kit to new ball (33), new spring (37) and seal washer (36).
11. Install new ball (33), new spring (37) and seal washer (36) in check valve body (32).
12. Apply lubricant from repair kit to new preformed packing (34).
13. Install new preformed packing (34) on bolt (35).
14. Install bolt (35) in check valve body (32). Torque bolt and check valve body to 18 lb-ft (24 Nm).



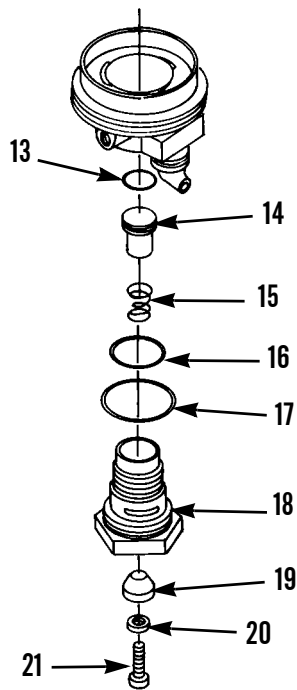
**ASSEMBLY - CONTINUED**

15. Apply lubricant from repair kit to new preformed packings (28) and (29).
16. Install new preformed packings (28) and (29) on sealing plate (27).
17. Install new ball (24), clip (26), and bolt (25) on sealing plate (27).
18. Remove nut (23) from new cartridge (30).
19. Install sealing plate assembly (27) on new cartridge (30).
20. Install new nut (23) on bolt (22).
21. Rotate nut (23) clockwise several turns to draw sealing plate (27) toward opening of cartridge (30).
22. Apply lubricant from kit to new preformed packing (29) previously installed on sealing plate (27).
23. Tighten nut (23) until sealing plate (27) is seated in cartridge (30).
24. Apply lubricant from kit to new preformed packing (28) previously installed on sealing plate (27).
25. Install cartridge assembly inside air dryer tank (1). Torque bolt (22) to 32 lb-ft (43 Nm).

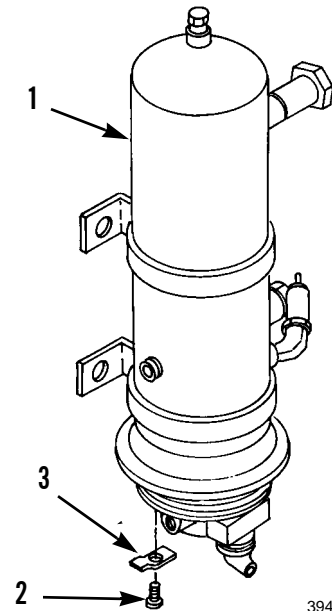


**ASSEMBLY - CONTINUED**

26. Apply lubricant from kit to new preformed packings (16 and 17).
27. Install new preformed packings (16 and 17) on cap (18).
28. Apply lubricant from kit to new preformed packing (13).
29. Install new preformed packing (3) on purge valve piston (14).
30. Apply lubricant from kit to new purge valve (19).
31. Install purge valve piston (14), new spring (15) and new purge valve (19) in cap (18).
32. Install lockwasher (20) and bolt (21) in cap (18). Hold purge valve piston (14) with screw driver in slot. Tighten bolt (21) to 50 lb-in. (68 Nm).
33. Apply lubricant from kit to threads of cap (18).



394-1011



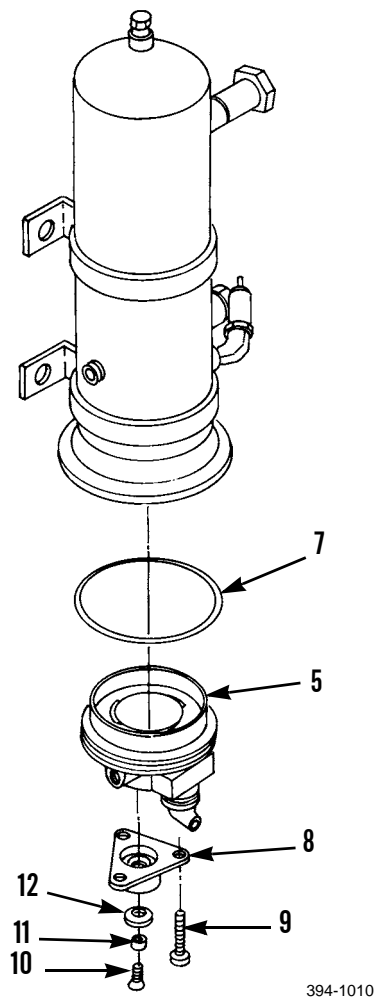
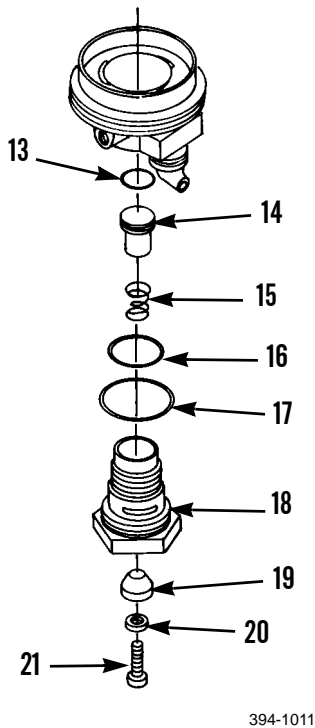
394-1008

**ASSEMBLY - CONTINUED**

34. Apply lubricant from kit to bore end cover (5).
35. Install cap (18) in end cover (5). Torque cap to 215 lb-in. (24 Nm).
36. Apply lubricant from kit to new preformed packing (7).
37. Install new preformed packing (7) on end cover (5) groove.
38. Install exhaust cover (8) and three screws (9).

**NOTE**

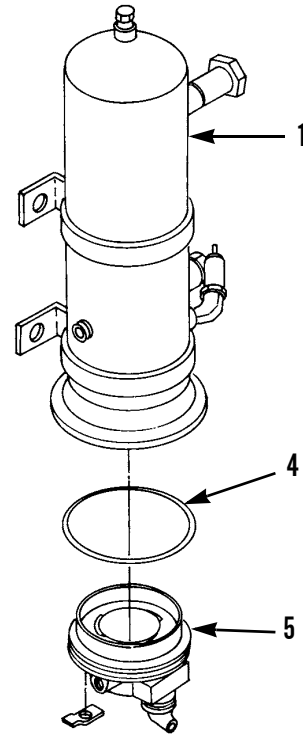
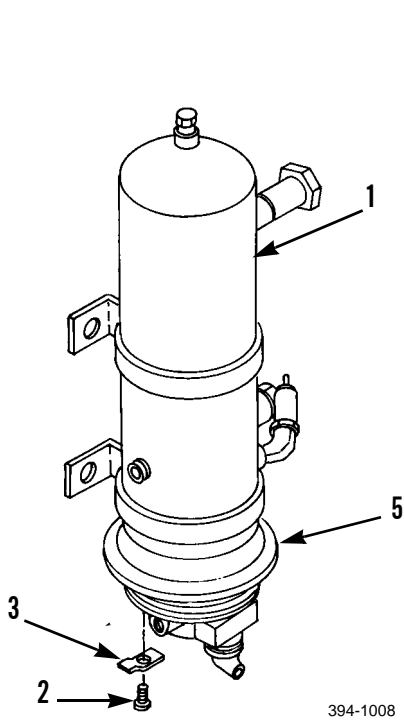
Do not perform steps 39 through 42 if desiccant cartridge assembly is being replaced as a unit. Steps 39 through 42 are the procedures to fill cartridge with new desiccant material and reassemble the desiccant cartridge.



39. Install new diaphragm (12), washer (11), and screw (10) on exhaust cover (8).

**ASSEMBLY - CONTINUED**

40. Position end cover (5) assembly in air dryer tank (1). Press in to clear retaining ring (4) groove inside air dryer tank (1).
41. Install retaining ring (4) in groove to secure end cover (5).
42. Install three clamps (3). Position clamps to hold end cover (5), then tighten bolts (2).



43. Install air dryer (WP 0152 00).
44. Operate machine and verify correct brake operation (TM 5-3805-248-10).
45. Shut down engine (TM 5-3805-248-10).
46. Check for air leaks.

**END OF WORK PACKAGE**



---

**TRACTOR WHEEL AND TIRE MAINTENANCE**

---

**0302 00****THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Assembly, base (Item 2, WP 0338 00)

Cylinder assembly, actuating, linear (Item 17, WP 0338 00)

Installer, seal (Item 47, WP 0338 00)

Link, bracket (Item 124, WP 0338 00)

Pin, shoulder, headless (Item 63, WP 0338 00)

Repair tool, special purpose (Item 96, WP 0338 00)

Stand assembly (Item 107, WP 0338 00)

Stand, lifting (Item 108, WP 0338 00)

Tool, special (Item 119, WP 0338 00)

Lifting device, 3,300 lb minimum capacity

Lifting device, 300 lb minimum capacity

Wood block (4 in. x 4 in. x 12 in.)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Items 27, 28 or 29 WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Seal (2)

**References**

WP 0149 00

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Final drive removed (WP 0144 00)

Brake actuator rod disconnected from slack adjuster (WP 0151 00)

---

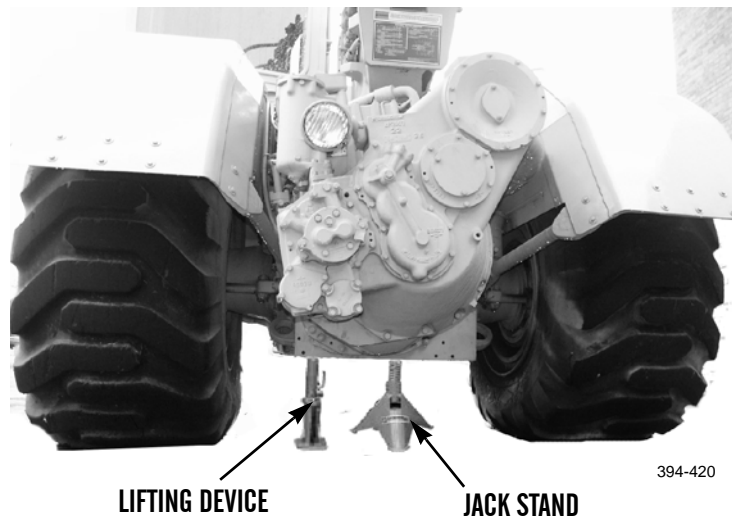
**REMOVAL****NOTE**

The following maintenance procedure is for the tractor left tire and wheel assembly. The maintenance procedure for the right tractor tire and wheel assembly is identical.

1. Position wheel blocks on rear wheels and left-front wheel of tractor.

**WARNING**

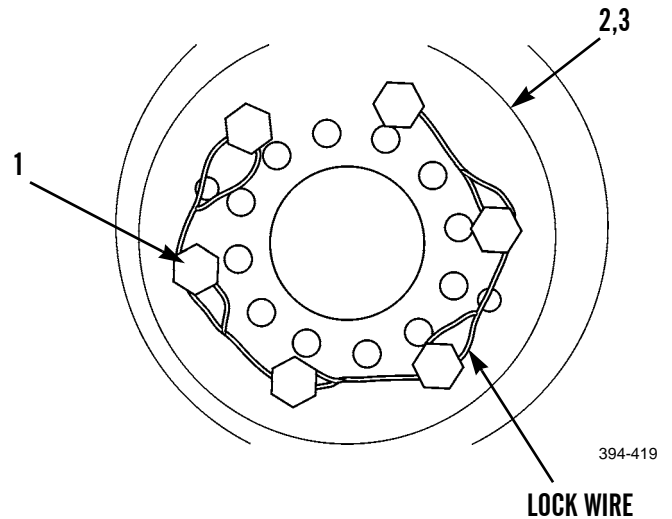
- Ensure lifting device, wood blocks and jack stand placement are secure and will not slip, shift or roll. Failure to follow these instructions may cause injury.
  - Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used 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.
2. Position lifting device under differential frame at left tractor wheel.
  3. Position jack stand under differential frame to support right tractor wheel.
  4. Lower tractor so that all weight is supported by jack stand.





**REMOVAL - CONTINUED**

5. Remove six bolts (1) and lock wire.
6. Remove ring (2) and shim(s) (3). Tie shim(s) (3) together and tag for identification.

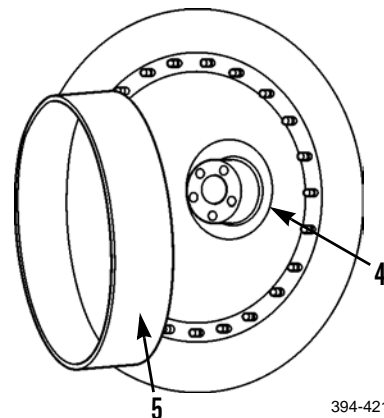
**WARNING**

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**

Gear and internal gear assembly weighs 200 lb (91 kg).

7. Position link bracket on inside of gear (5) assembly.
8. Use lifting device to remove gear and internal gear (5) assembly from tire and wheel assembly.
9. Place gear and internal gear (5) in a work area and remove lifting bracket.
10. Remove cone bearing (4) from tire and wheel assembly.



**REMOVAL - CONTINUED**



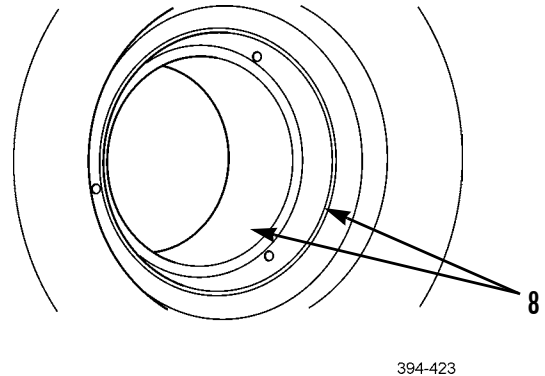
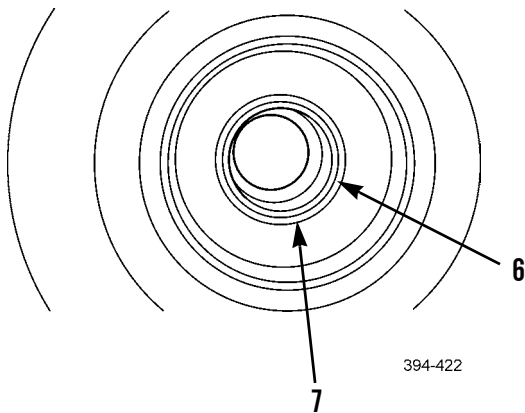
**WARNING**

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**

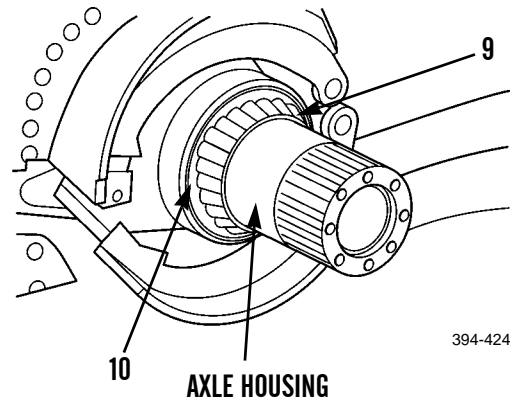
Tire and wheel assembly weighs 2,200 lb (1,000 kg).

11. Use lifting device to remove tire and wheel assembly from machine.
12. Remove seal (6), ring (7) and cups (8) from tire and wheel assembly.



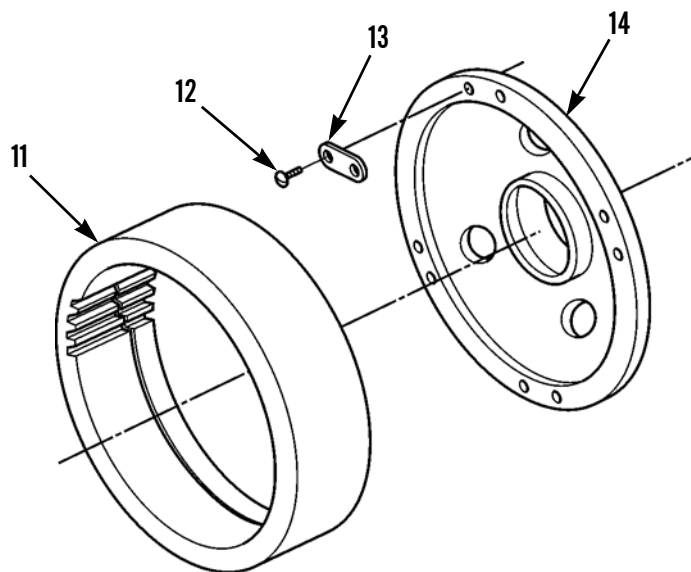
**REMOVAL - CONTINUED**

13. Remove cone bearing (9) and seal (10) from axle housing.



**DISASSEMBLY**

- Remove eight bolts (12), four retainers (13) and gear (11) from hub (14).

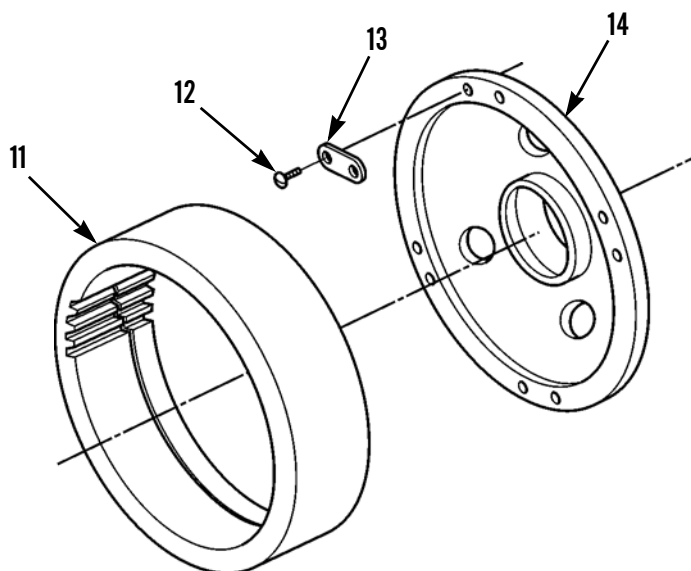


**CLEANING AND INSPECTION****WARNING**

- 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 cause injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.
1. Clean all parts with solvent cleaning compound.
  2. Dry parts with compressed air.
  3. Inspect all parts for damage and replace damaged parts as necessary.

**ASSEMBLY**

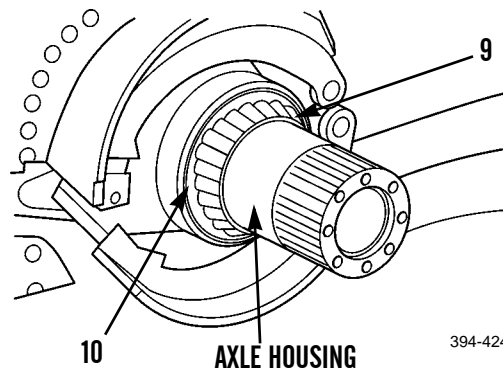
1. Install gear (11) on hub (14).
2. Install four retainers (13) and eight bolts (12).



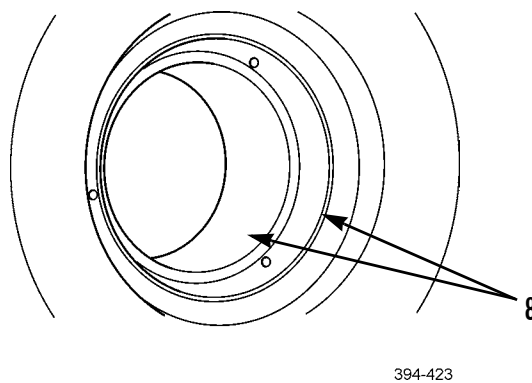
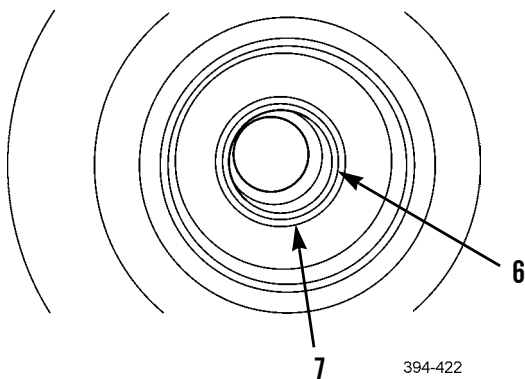
394-425

**INSTALLATION**

1. Lightly coat axle housing with clean lubricating oil.
2. Install new seal (10) on axle housing.
3. Heat cone bearing (9) in lubricating oil at 275°F (135°C) for 30 minutes and install in axle housing.



4. Install cups (8) on tire and wheel assembly.
5. Install ring (7) and new seal (6) on tire and wheel assembly.



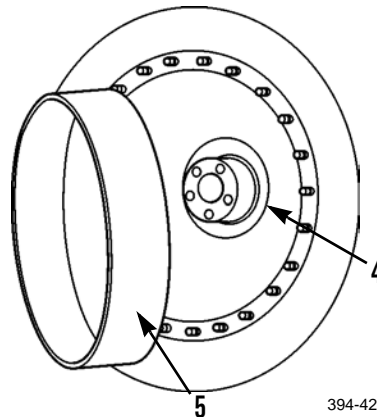
**WARNING**

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**

Tire and wheel assembly weighs 2,200 lb (1,000 kg).

6. Attach lifting device to tire and wheel assembly.
7. Install tire and wheel assembly on axle housing.
8. Install cone bearing (4) on tire and wheel assembly.
9. Position link bracket on gear and internal gear (5) assembly.
10. Install gear and internal gear (5) assembly on tire and wheel assembly.
11. Remove link bracket.



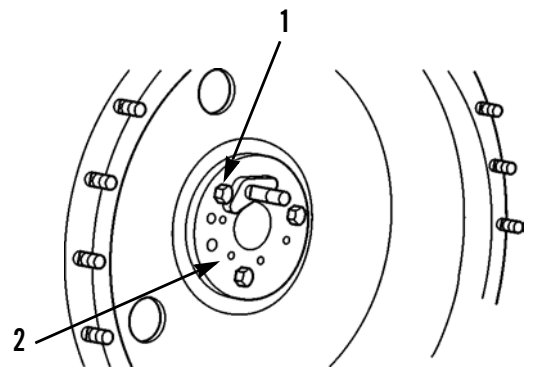
**INSTALLATION - CONTINUED**

12. Install ring (2) and three bolts (1), one in every third hole.
13. Torque three bolts (1) to 25 lb-ft (34 Nm). Torque three bolts (1) again to 50 lb-ft (68 Nm).
14. Install depth micrometer in threaded bolt holes in ring (2).
15. Measure average depth to end of axle housing.
16. Position outside micrometer on ring (2). Measure average thickness of ring (2) at threaded bolt holes.

**NOTE**

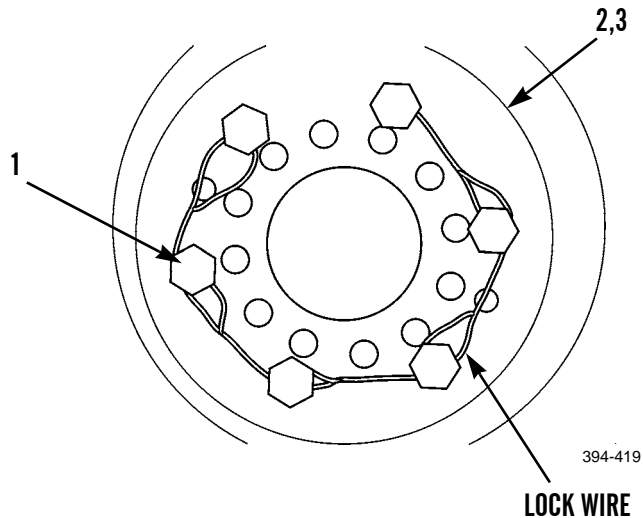
Measured gap is the difference between the average depth measurement and average thickness of ring.

17. Remove three bolts (1) and ring (2).



394-426

18. Install shim(s) (3).
19. Adjust measured gap to 0.012 in. (0.3 mm) more than the measured gap. Add or remove shim(s) (3) to adjust.
20. Install ring (2) and six bolts (1). Torque bolts to 100 lb-ft (136 Nm).
21. Install lock wire.



394-419

**LOCK WIRE**

***INSTALLATION - CONTINUED***

22. Install final drive (WP 0144 00).
23. Lift machine and remove jack stand.
24. Lower machine to ground and remove lifting device.
25. Connect brake actuator rod (WP 0181 00) to slack adjuster.
26. Adjust brakes (WP 0149 00).
27. Operate machine and verify correct operation of brakes (TM 5-3805-248-10).

**END OF WORK PACKAGE**





---

**SCRAPER WHEEL AND TIRE REPLACEMENT**

---

0303 00

**THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Assembly, base (Item 2, WP 0338 00)

Cylinder assembly, actuating, linear (Item 17, WP 0338 00)

Installer, seal (Item 47, WP 0338 00)

Pin, shoulder, headless (Item 63, WP 0338 00)

Pump, hydraulic ram, hand driven (Item 91, WP 0338 00)

Saddle assembly, lifting block (Item 97, WP 0338 00)

Stand, lifting (Item 108, WP 0338 00)

Tool, special (Item 118, WP 0338 00)

**Tools and Special Tools - Continued**

Lifting device, 3,300 lb minimum capacity

Nuts (1/2-13NC x 3)

Screws, forcing (1/2-13NC x 3)

Wood block (4 in. x 4 in. x 12 in.)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Items 27, 28 or 29, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (3)

Seal (2)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**Brake actuator rod disconnected from slack adjuster (WP 0151 00)

---

**WARNING**

Lifting of the machine for wheel and tire assembly service is a step-by-step procedure. Failure to follow this procedure may cause injury.

**NOTE**

The following replacement procedure is for the front-right wheel and tire assembly. The replacement procedure for the tractor front-left tire and wheel assembly is identical.

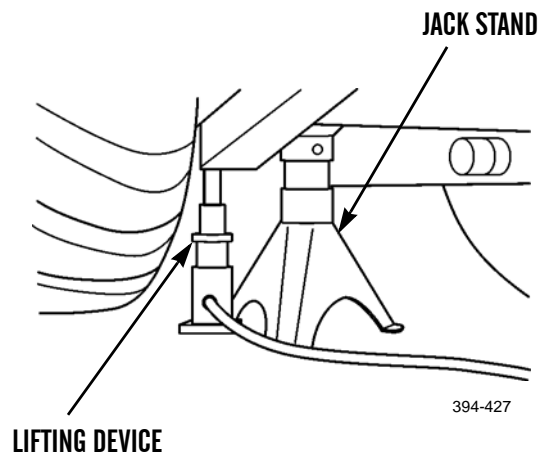
**REMOVAL**

1. Position wheel blocks under front and rear of wheel and tire assemblies not being removed.

**WARNING**

Ensure machine will not roll or shift before jacking it or placing it on jack stands. Use chock blocks to prevent machine from rolling. Failure to follow this procedure may cause injury or death due to machine turning or slipping off jacks or jack stands.

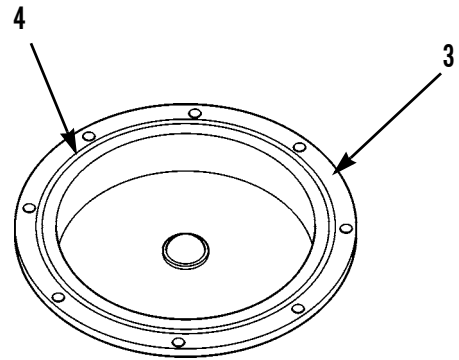
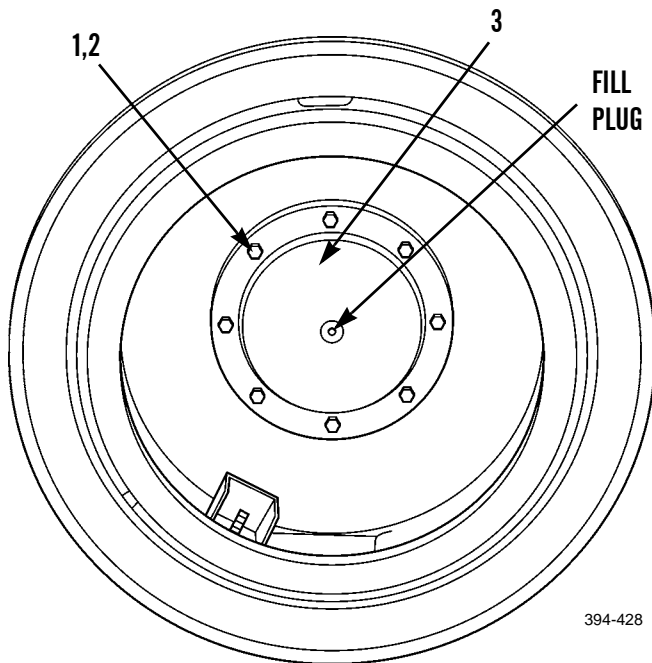
2. Position lifting device under frame at right scraper wheel.
3. Lift machine until tire is off ground.
4. Position jack stand under scraper.
5. Lower machine slowly onto jack stand, making sure machine is safely supported.



**REMOVAL - CONTINUED****NOTE**

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

6. Remove fill plug.
7. Place container under scraper wheel.
8. Loosen eight bolts (1) a small amount. Do not remove nuts. Pull cap (3) away from the wheel to drain the oil from the wheel assembly.
9. Remove eight bolts (1), washers (2) and cap (3).
10. Remove and discard preformed packing (4).



**REMOVAL - CONTINUED**



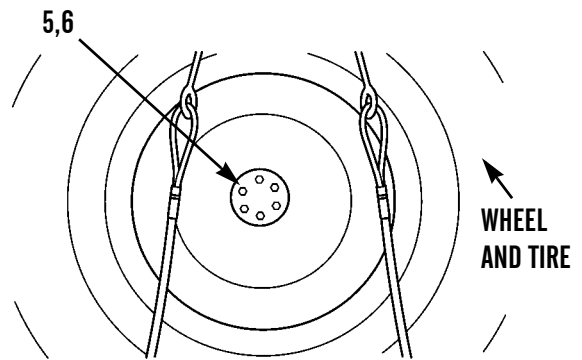
**WARNING**

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**

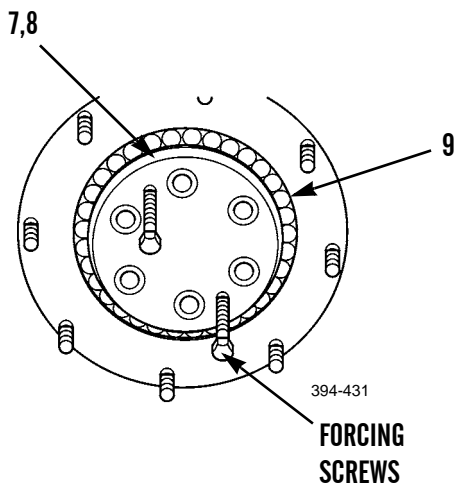
Wheel and tire assembly weighs 2,500 lb (1,134 kg).

11. Attach lifting device to wheel and tire assembly.
12. Remove six bolts (5) and spacers (6).

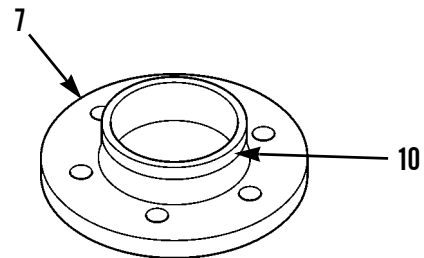


394-430

13. Install two 1/2-13NC x 3 forcing screws equally spaced on retainer (7).
14. Tighten two forcing screws until retainer (7) breaks loose from wheel and tire assembly.
15. Remove retainer (7), shim(s) (8) and preformed packing (10). Tie shim(s) together and tag for identification. Discard preformed packing.
16. Work wheel and tire assembly outward to free bearing (9). Remove bearing.



394-431



394-432

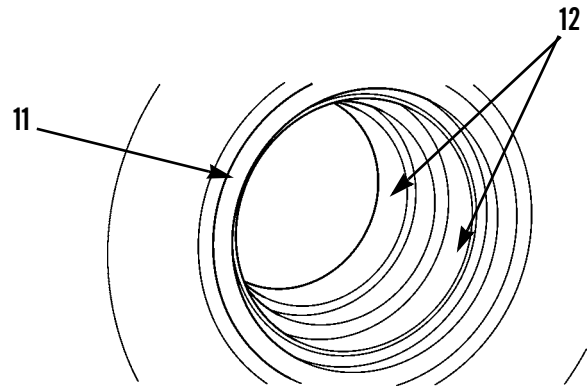
**REMOVAL - CONTINUED**

17. Remove wheel and tire assembly.
18. Remove lifting device.

**CAUTION**

Exercise care when removing seal. Failure to follow this procedure could cause damage to equipment.

19. Remove seal (11) and two bearing cups (12) from wheel and tire assembly. Discard seal.



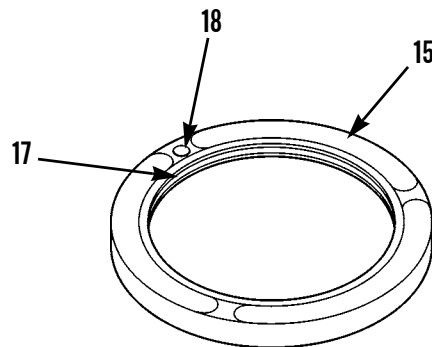
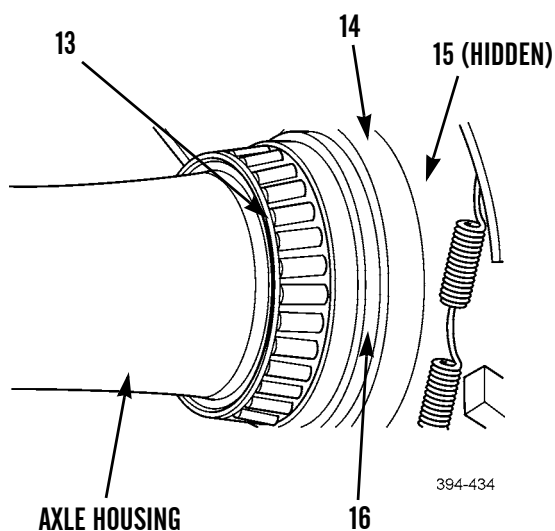
394-433

20. Remove bearing (13) and spacer (16).

**CAUTION**

Use caution when removing seal and ring. Failure to follow this procedure could cause damage to equipment.

21. Remove seal (14) and retainer (15). Discard seal.
22. Remove three pins (18) and preformed packing (17). Discard preformed packing.



394-435

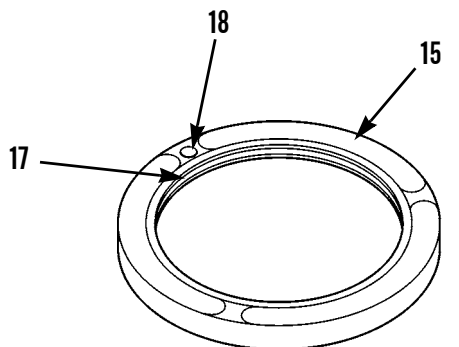
**CLEANING AND INSPECTION****WARNING**

- Solvent dry cleaning 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 cause injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.
1. Clean all parts with solvent dry cleaning.
  2. Dry parts with compressed air.
  3. Inspect all parts for damage and replace damaged parts as necessary.

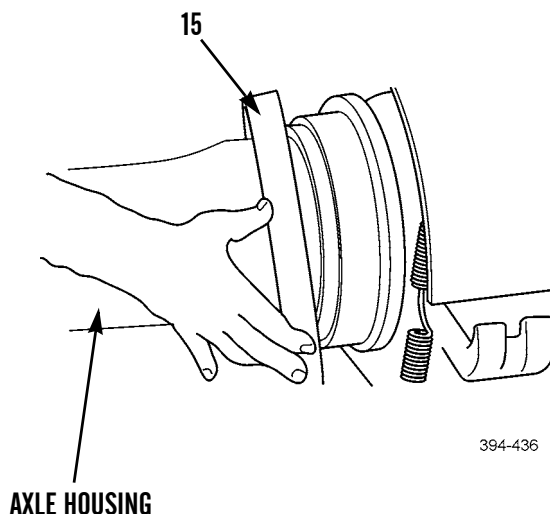
**INSTALLATION****NOTE**

Do not allow gear lubricant to get on ring, seal or mounting surface of axle housing before they are in their final assembled position. Make sure the metal surfaces that the seals make contact with are clean and dry. Apply a light coat of lubricating oil to the contact surface of the metal seal after it is installed.

1. Install new preformed packing (17) and three pins (18) on retainer (15).
2. Install retainer (15) assembly on axle housing.



394-435



394-436

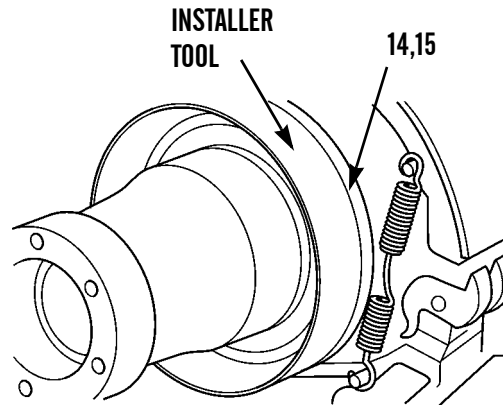
**AXLE HOUSING**

**INSTALLATION - CONTINUED**

**NOTE**

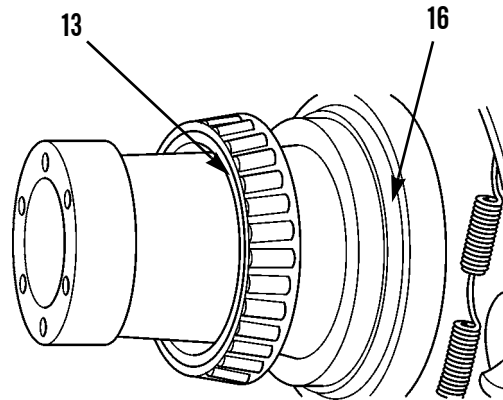
Use seal installer to ensure seal is properly seated on bottom of seal ring ramp and against retaining lip. Ensure ring of seal is not twisted and seal is clean and dry.

3. Use installer tool to install new seal (14) in retainer (15).



394-437

4. Install spacer (16) on rear axle housing.
5. Lubricate bearing (13) with gear lubricant and heat at 275°F (135°C) for 30 minutes.
6. Install bearing (13) on rear axle housing.



394-438

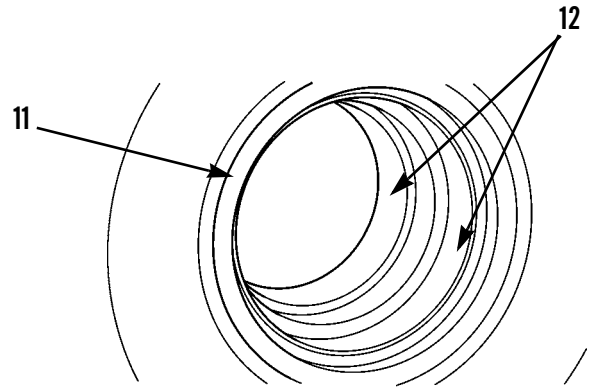
**INSTALLATION - CONTINUED**



**WARNING**

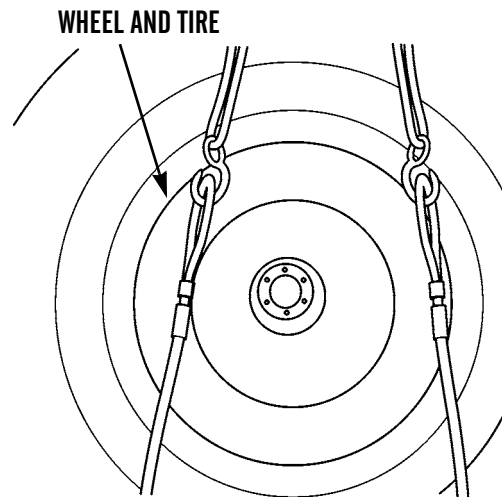
Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death.

7. Install two bearing cups (12) and new seal (11) on scraper wheel and tire assembly.



394-433

8. Attach lifting device to wheel and tire assembly.
9. Use lifting device to install wheel and tire assembly on machine.

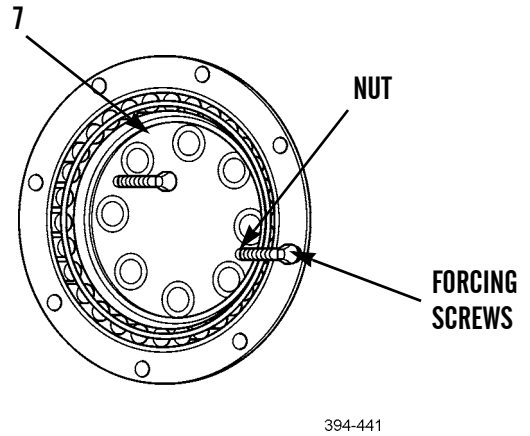
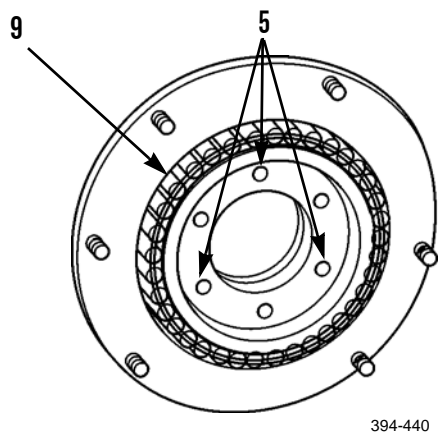


394-439

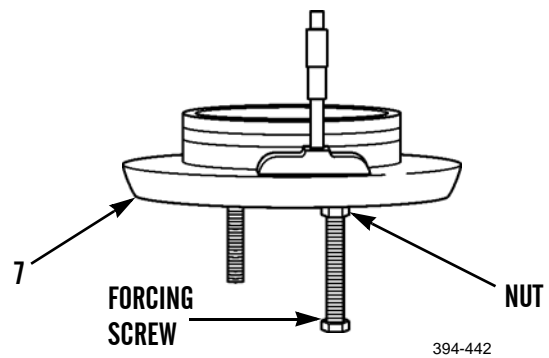


**INSTALLATION - CONTINUED**

10. Install bearing (9), retainer (7) and three bolts (5) equally spaced. Torque bolts to 50 lb-ft (68 Nm).
11. Thread one nut onto each forcing screw. Install two forcing screws and nuts equally spaced in retainer (7). Tighten two forcing screws by hand until contact is made with end of rear axle housing. Tighten two nuts to hold two forcing screws in place.
12. Remove three bolts (5) and retainer (7). Do not remove forcing screws from retainer.

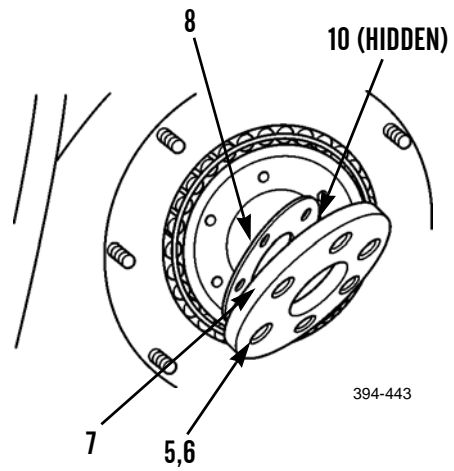


13. Measure and record depth from end of each of forcing screw to machined surface of retainer (7).

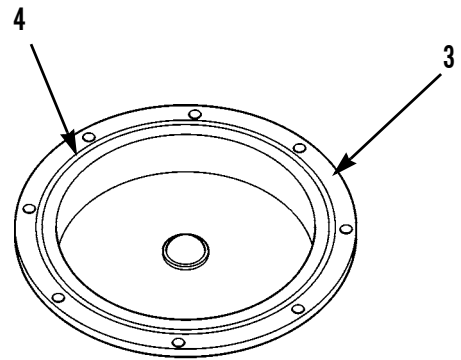


**INSTALLATION - CONTINUED**

14. Install new preformed packing (10) in retainer (7).
15. Install shim(s) (8) to thickness measured in step 13 plus 0.012 in. (0.30 mm).
16. Install retainer (7), six spacers (6) and bolts (5).  
Torque bolts to 100 lb-ft (136 Nm).

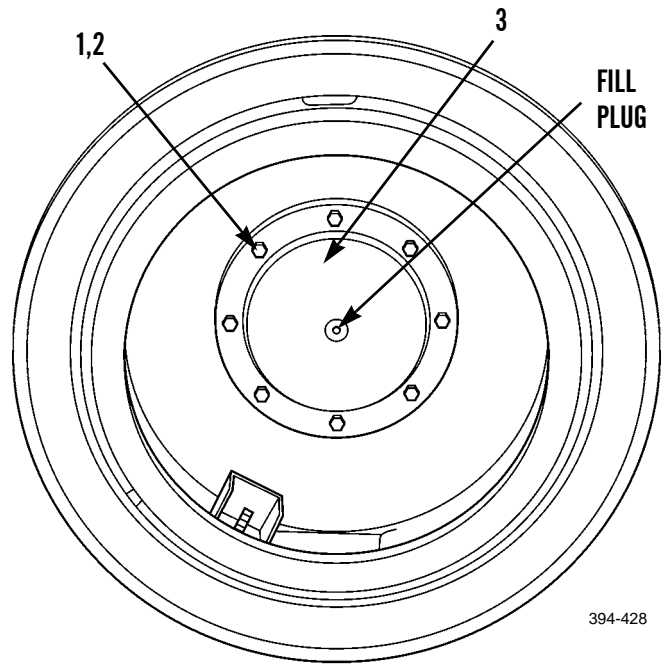


17. Install new preformed packing (4) in cap (3).



**INSTALLATION - CONTINUED**

18. Install cap (3), eight washers (2) and bolts (1) on wheel and tire assembly.
19. Refill lubricating oil in scraper wheel and tire until level reaches bottom of fill plug opening.
20. Install fill plug.



394-428

21. Connect brake actuator rod (WP 0151 00).
22. Use lifting device to lift machine and remove jack stand.
23. Lower machine to ground and remove lifting device.
24. Operate machine and verify correct operation of brakes (TM 5-3805-248-10).
25. Check for leaks around wheel area.

**END OF WORK PACKAGE**



---

**BRAKE DRUMS REPLACEMENT**

---

**0304 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 180 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 339 00)

**Personnel Required**

Two

**References**

WP 0149 00

**Equipment Condition**

Tire and wheel removed (WP 0302 00 or WP 0303 00)

**WARNING**

- Parts of the brake assembly may be coated with asbestos dust. Breathing this dust may be hazardous to your health. Use a filter mask approved for use against asbestos dust.
- Follow the cleaning procedure in this work package before removal to prevent the production of airborne asbestos fibers.
- Failure to follow this procedure may result in injury to personnel.

**NOTE**

The following replacement procedure is for the brake drums for one wheel. The replacement procedures for the brake drums for the remaining wheels are identical.

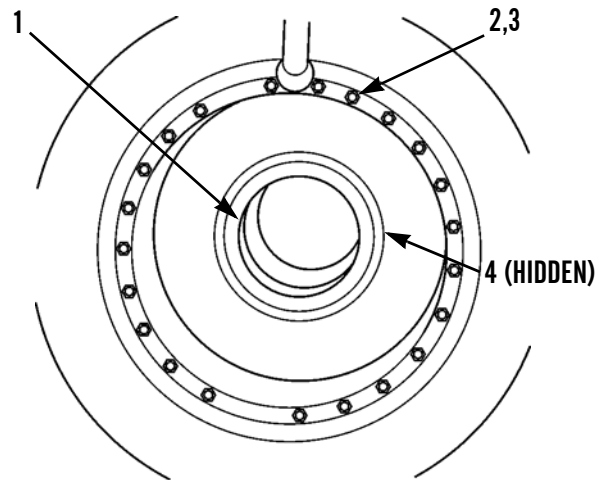
**REMOVAL****WARNING**

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**

Brake drum weighs 120 lb (55 kg).

1. Attach lifting device to brake drum (1).
2. Remove 27 nuts (2) and washers (3).
3. Remove brake drum (1).
4. Remove lifting device.
5. Remove guard (4).



394-444

**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.
  - Parts of the brake assembly may be coated with asbestos dust. Breathing this dust may be hazardous to your health. Use a filter mask approved for use against asbestos dust. Never use compressed air or dry brush to clean these assemblies. Dust shall be removed using an industrial-type vacuum cleaner equipped with a high-efficiency filter system. Clean dirt or mud from brake assemblies with water, using a soft-bristle brush or cloth.
1. Clean metal parts of brake assembly with solvent cleaning compound. Do not use a metal brush on brake assembly or to apply the solvent cleaning compound.
  2. Dry brake assembly using clean rags. **DO NOT** use compressed air to dry brake assembly. Dispose of rags in the proper manner for a hazardous waste.
  3. Clean brake assembly again using soap and water. Apply with a soft-bristle brush or a cloth.
  4. Clean all other parts.
  5. Inspect all parts and replace as necessary.

**INSTALLATION****WARNING**

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**

Brake drum weighs 120 lb (55kg).

1. Install guard (4).
2. Attach lifting device to brake drum (1).
3. Install brake drum (1).
4. Remove lifting device.
5. Install 27 washers (3) and nuts (2). Torque nuts (2) to 96 lb-ft (130 Nm).
6. Install tire and wheel (WP 0302 00 or WP 0303 00).
7. Adjust brakes (WP 0149 00).

**END OF WORK PACKAGE**





---

**TIRE REPLACEMENT**

**0305 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

Bead breaker, pneumatic, tire (Item 5, WP 0338 00)

Constrictor, bead expanding, pneumatic (Item 15, WP 0338 00)

Lifting device, 1,500 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Detergent, general purpose liquid (Item 13, WP 0339 00)

Packing, preformed

**Personnel Required**

Two

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

Bowl lowered to ground (TM 5-3805-248-10)

Engine shut down (TM 5-3805-248-10)

Battery disconnect switch in OFF position (TM 5-3805-248-10)

Wheels chocked

---



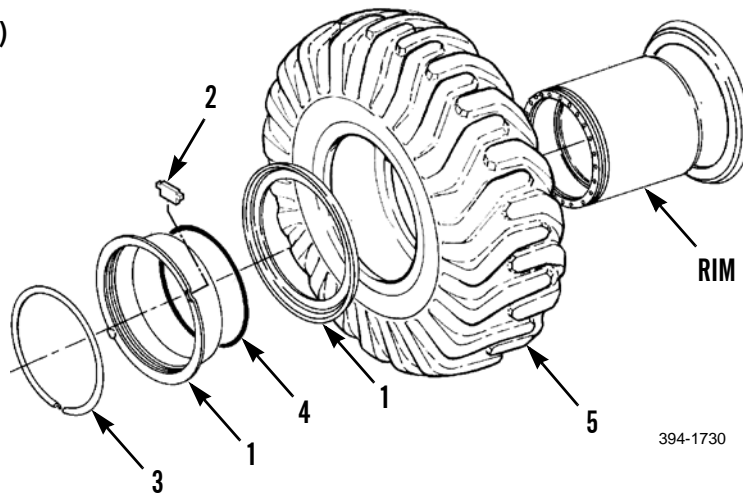
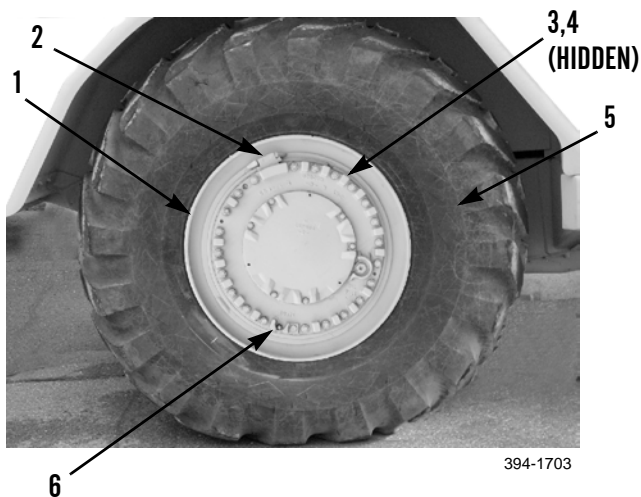
**WARNING**



- Deflate tire completely before unseating tire bead from rim. Failure to follow this procedure may cause 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.
- Eye protection must be worn during maintenance where components or particles could fly out during procedure. Failure to take precautions could cause injury.

**REMOVAL**

1. Raise machine using 20-ton jack and support on jack stand.
2. Remove valve stem core (6) and COMPLETELY deflate tire.
3. Use pneumatic bead breaker to break both inside and outside tire beads.
4. Push tire (5) and flange assembly (1) inward and remove lock tab (2), lockring (3), and preformed packing (4). Discard preformed packing.
5. Remove flange (1).



**REMOVAL - CONTINUED****WARNING**

Use caution when handling heavy parts. Provide adequate support and use assistance during this 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**

Weight of tire is 950 lb (635 kg).

6. Use lifting device and straps to remove tire (5) from wheel assembly.

**CLEANING AND INSPECTION****WARNING**

- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally complaint 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 eye protection.

1. Remove all material from tire mounting surfaces.
2. Clean all metal parts with solvent.
3. Make sure rim and flange (1) bead contact surfaces are clean.
4. Dry all parts with compressed air.
5. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

**CAUTION**

DO NOT damage the preformed packing during this process. If damage occurs at any point during the process, a new preformed packing must be installed.

1. Lubricate inner edges of tire (5) beads and preformed packing (4) with soapy water.



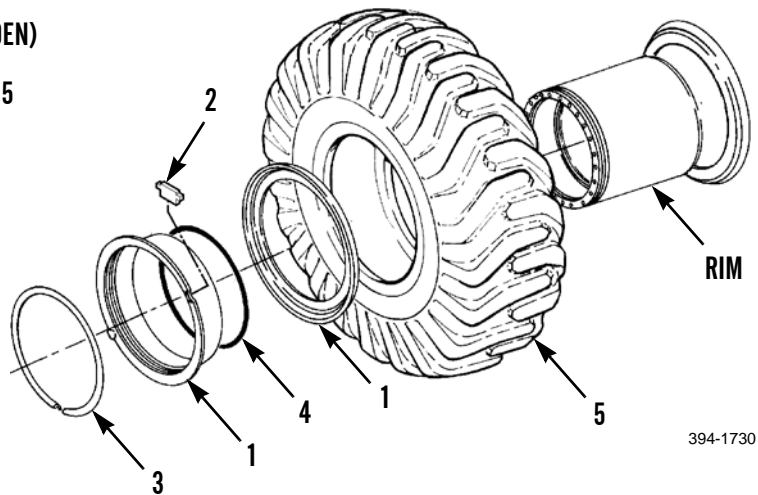
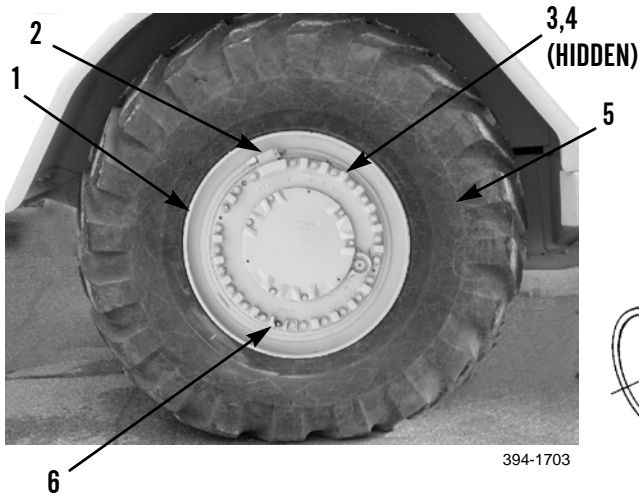
**WARNING**

Use caution when handling heavy parts. Provide adequate support and use assistance during this 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**

Weight of tire is 950 lb (635 kg).

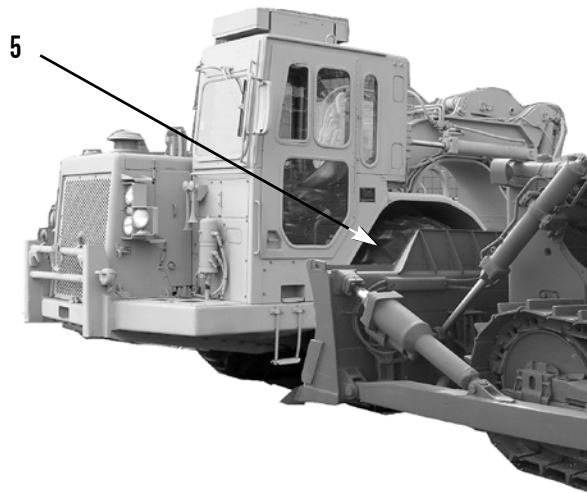
2. Use lifting device and straps to position tire (5) on rim. Push tire against inner bead surface of rim.
3. Push in on outer surface of tire (5) and install flange (1), new preformed packing (4), lockring (3) and lock tab (2).
4. Wrap bead constrictor around the CENTER of the tire (5).
5. Compress tire (5) until the tire beads reach both bead contact surfaces.



**INSTALLATION - CONTINUED****WARNING**

A machine should be used to contain flying parts. In the event of a rim lock malfunction, failure to follow this warning may result in injury or death.

6. Park a machine in front of tire (5) to be inflated to help prevent injury in case of rim lock malfunction.
7. Using a 15-ft (4.6-m) safety hose, inflate tire (5) until it begins to take air and STOP. Do not inflate tire all the way with constrictor still installed.
8. Install valve stem core (1), and remove the bead constrictor from the tire (5).



394-1704

9. Using a 15-ft (4.6-m) safety hose, inflate tire to proper pressure (TM 5-3805-248-10).
10. Check for leaks.
11. Remove jack stand and lower machine to ground.

**END OF WORK PACKAGE**



**STEERING FLOW METER TEE TEST PROCEDURES****0306 00****THIS WORK PACKAGE COVERS**

Preparation for Test, System Test, Comparison of Tests, Blocked Cylinder Test (All Cylinders Blocked), Comparison of Tests, Blocked Cylinder Test (Right Side Cylinder Blocked), Comparison of Tests

**INITIAL SETUP****Maintenance Level**

Direct Support

**References**

WP 0019 00

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

WP 0020 00

WP 0308 00

Shop equipment, field maintenance (Item 104, WP 0338 00)

WP 0312 00

WP 0322 00

Tool outfit, hydraulic system test and repair (HSTRU) (Item 114, WP 0338 00)

**Equipment Condition****Personnel Required**

Two

Machine parked on level ground (TM 5-3805-248-10)

**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 2,500 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

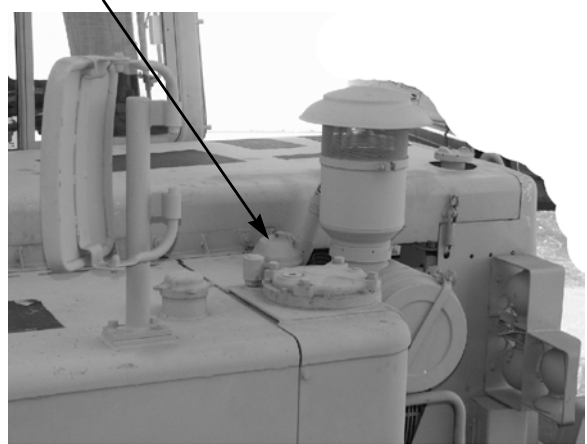
**NOTE**

- 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 determine if corrective action is needed.
- Perform PMCS for hydraulic system as outlined in WP 0019 00 and WP 0020 00 before performing tests.

**PREPARATION FOR TEST**

1. Loosen cap on hydraulic tank and release any pressure. Tighten cap.

**HYDRAULIC TANK CAP**



394-164E

2. Start engine and move ejector control lever fully forward. Stop engine.

**WARNING**

Do not install the flow meter adapter into the supply line of the implement pump with the engine running. Failure to do so may cause injury. If you are injured, seek medical attention immediately.

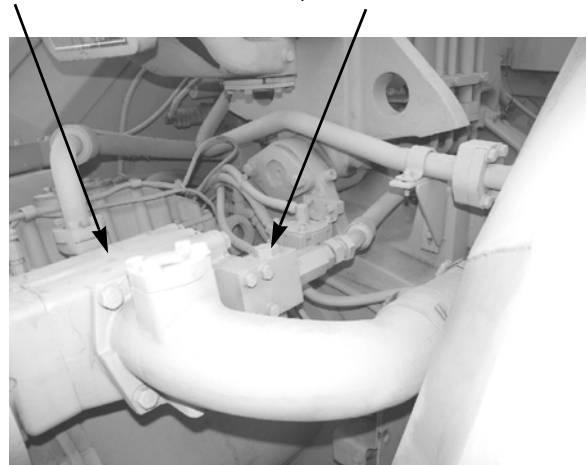
**NOTE**

Install adapter quickly to minimize loss of oil.

3. Remove plug and preformed packing from the supply side of implement pump. Install adapter. Install return line and connect to flow meter.

**HYDRAULIC IMPLEMENT PUMP**

**PLUG, PREFORMED PACKING**



394-1647



**PREPARATION FOR TEST - CONTINUED**

4. Return ejector control lever to rear position.
5. Install tachometer from flow meter test group.

**WARNING**

The manual load valve on the flow meter must be fully opened before starting the engine. Failure to follow this procedure may cause injury. If you are injured, seek medical attention immediately.

6. Open the manual load valve on flow meter fully.
7. Start engine and run at 1,900 RPM. Turn the steering wheel right and hold.
8. Slowly adjust the manual load valve on the flow meter to a pressure of 1,000 psi (6,895 kPa).
9. Check the oil temperature. When the oil temperature reaches 100°F (38°C), adjust the manual load valve on the flow meter to a pressure of 1,500 psi (10,342 kPa).
10. Move all hydraulic control levers several times.
11. Check the oil temperature. When the oil temperature reaches 160°F (71°C), move the cylinders through their cycles. Temperature throughout the system should be 150°F (66°C).

**SYSTEM TEST**

1. **Maximum Pressure Relief Valve Setting.**

**NOTE**

Before recording test data, make sure conditions in the hydraulic system are constant. Refer to *Table 1, Steering Flow Meter Tee Test* in this work package.

- a. Open manual load valve on the flow meter fully.
  - b. Start engine and run at 1,900 RPM. Turn the steering wheel right and hold.
  - c. Slowly close the manual load valve until the oil flow through the flow meter stops (zero gpm).
  - d. Record pressure. Refer to Table 1. Maximum pressure relief valve setting is between 2,200 and 2,300 psi (15,168 and 15,858 kPa).
2. **System Oil Temperature (Start).**
    - a. Open the manual load valve on the flow meter fully.
    - b. Start engine. Turn the steering wheel right and hold.
    - c. Record oil temperature. Refer to Table 1. System oil temperature should be 145°-155°F (63°-68°C).
  3. **System Base Flow Rate.**
    - a. Open the manual load valve on the flow meter fully.
    - b. Start engine and run at 1,900 RPM. Turn the steering wheel right and hold.

**NOTE**

Before recording test data, make sure the system pressure is at least 100 psi (689 kPa).

- c. Record flow rate. Refer to Table 1. Correct system base flow rate is 60 gpm.

**SYSTEM TEST - CONTINUED****NOTE**

System base flow rate will be the same as the low pressure flow reading of the hydraulic implement pump.

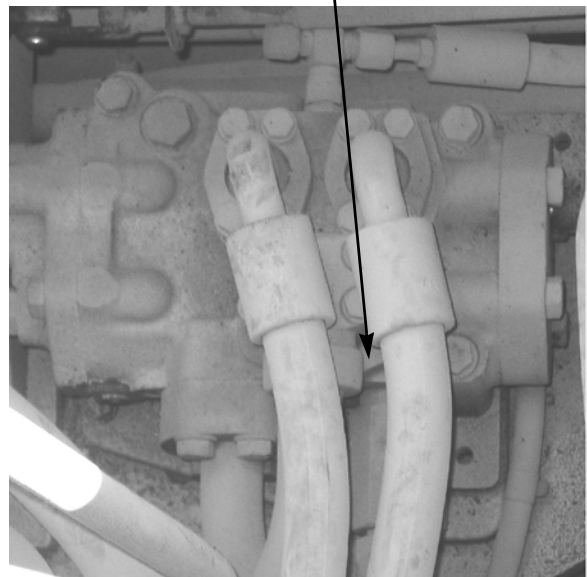
4. **Steer Right Flow Rate (Leakage Rate).**
  - a. Turn the steering wheel right and hold.
  - b. Open the manual load valve on the flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust the manual load valve on the flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 1. Correct steer right flow rate is 51 gpm.
5. **Steer Left Flow Rate (Leakage Rate).**
  - a. Turn the steering wheel left and hold.
  - b. Open the manual load valve on the flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust the manual load valve on the flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate.
  - f. Refer to Table 1. Correct steer left flow rate is 51 gpm.
6. **System Oil Temperature (Finish).**
  - a. Open the manual load valve on the flow meter fully.
  - b. Start engine. Turn the steering wheel right and hold.
  - c. Record oil temperature. Refer to Table 1. System oil temperature should be 145°-155°F (63°-68°C).

**COMPARISON OF TESTS**

1. Test reading is higher or lower than maximum pressure relief valve setting (Test 1) and the percent flow loss (Tests 4 and 5) is different by 15 to 50 percent.

Check the relief valve. Refer to *Steering Control Valve Maintenance* (WP 0312 00). If the relief valve opens at a low oil pressure, or is damaged or defective, service or replace. Refer to *Steering Control Valve Maintenance* (WP 0312 00).

**RELIEF VALVE  
(PARTIALLY HIDDEN)**

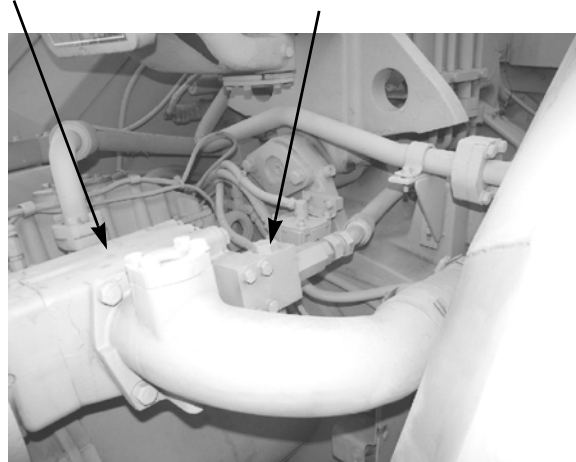


394-164E

**COMPARISON OF TESTS - CONTINUED**

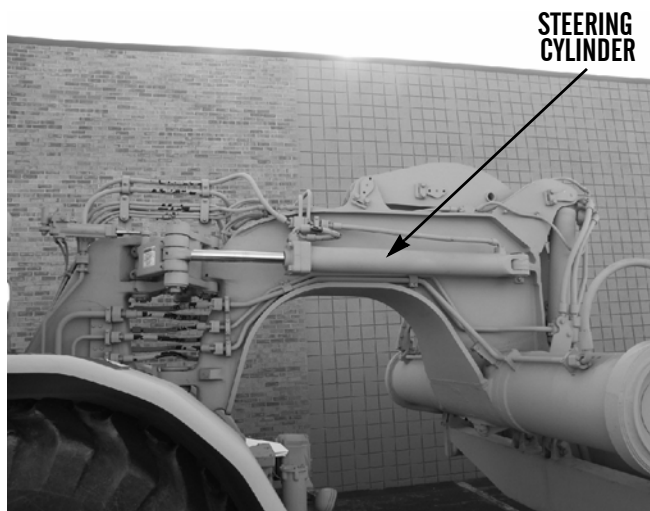
2. Flow loss (Tests 4 and 5) is 15 percent or more.
- a. Check the implement pump. If the implement pump is worn, damaged or defective, service or replace (WP 0322 00).

**HYDRAULIC  
IMPLEMENT PUMP**      **PLUG, PREFORMED PACKING**



394-1647

- b. Check the relief valve. Refer to *Steering Control Valve Maintenance* (WP 0312 00). If the relief valve opens at a low pressure, or is damaged or defective, service or replace.
- c. Check the steering control valve body and spool.
- (1) If the steering control valve spool moves too slowly in one direction, adjust. Refer to *Steering Control Valve Maintenance* (WP 0312 00).
  - (2) If the steering control valve assembly is worn, damaged or defective, service or replace. Refer to *Steering Control Valve Maintenance* (WP 0312 00).
- d. Check the seal on the piston in the steering cylinder.



394-164

- (1) If the seal is damaged or defective, replace. Refer to *Steering Cylinder Repair* (WP 0308 00).
- (2) If the flow loss is not caused by a bad implement pump, relief valve, steering control valve or piston seal, go to *Blocked Cylinder Test* in this work package.

**COMPARISON OF TESTS - CONTINUED**

3. Flow loss (Test 4) is 15 percent or more and flow loss (Test 5) is less than 15 percent.
  - a. Check the steering control valve body and spool.
    - (1) If the steering control valve spool moves too slowly in one direction, adjust.
    - (2) If the steering control valve body is worn, damaged or defective, service or replace.
  - b. Check relief valve. If the relief valve opens at a low pressure, or is damaged or defective, service or replace. Refer to *Steering Control Valve Maintenance* (WP 0312 00).
4. Flow loss (Test 5) is 15 percent or more and flow loss (Test 4) is less than 15 percent.
  - a. Check the steering control valve body and spool.
    - (1) If the steering control valve spool moves too slowly in one direction, adjust. Refer to *Steering Control Valve Maintenance* (WP 0312 00).
    - (2) If the steering control valve body is worn, damaged or defective, service or replace. Refer to *Steering Control Valve Maintenance* (WP 0312 00).
  - b. Check the relief valve.

If the relief valve opens at a low pressure, or is damaged or defective, service or replace. Refer to *Steering Control Valve Maintenance* (WP 0312 00).

**BLOCKED CYLINDER TEST (ALL CYLINDERS BLOCKED)****WARNING**

Before installing blocking plates, install a safety link. Move the steering wheel to the right and then to the left several times to release any pressure in the steering cylinder lines. Failure to follow this procedure may cause injury. If you are injured, seek medical attention immediately.

Install blocking plate assemblies at each end of the two steering cylinder lines.

1. **System Oil Temperature.**
  - a. Turn the steering wheel right and hold.
  - b. Open the manual load valve on the flow meter fully.
  - c. Step 3. Start engine and run at 1,900 RPM.

**NOTE**

Before recording test data, make sure the system pressure is at least 100 psi (689 kPa).

- d. Record oil temperature. Refer to Table 2, Steering Blocked Cylinder Test, in this work package. System oil temperature should be between 145°-155°F (63° -68°C).
2. **Steer Right Flow Rate (Leakage).**
  - a. Turn the steering wheel right and hold.
  - b. Open the manual load valve on the flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust the manual load valve on the flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 2. Correct steer right flow rate is 52 gpm.

**BLOCKED CYLINDER TEST (ALL CYLINDERS BLOCKED) - CONTINUED**

3. **Steer Left Flow Rate (Leakage).**
  - a. Turn the steering wheel left and hold.
  - b. Open the manual load valve on the flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust the manual load valve on the flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 2. Correct steer left flow rate is 52 gpm.
4. **System Oil Temperature.**
  - a. Turn the steering wheel right and hold.
  - b. Open the manual load valve on the flow meter fully.
  - c. Start engine and run at 1,900 RPM.

**NOTE**

Before recording test data, make sure the system pressure is at least 100 psi (689 kPa).

- d. Record oil temperature. Refer to Table 2. System oil temperature should be 145°-155°F (63°-68°C).

**COMPARISON OF TESTS**

1. Steer right flow rate (Test 8) and steer left flow rate (Test 9) indicate leakage in one or more cylinders.
  - a. Check the steering cylinder.
    - (1) If the steering cylinder or steering cylinders are leaking, go to Test 12.
2. Steer right flow rate (Test 8) and steer left flow rate (Test 9) indicate leakage in valves.
  - a. Check the relief valve.
    - (1) If the relief valve opens at a low oil pressure, or is damaged or defective, service or replace. Refer to *Steering Control Valve Maintenance* (WP 0312 00).

**BLOCKED CYLINDER TEST (RIGHT SIDE CYLINDER BLOCKED)****WARNING**

Before installing blocking plate, install a safety link. Move the steering wheel to the right and then to the left several times to release any pressure in the steering cylinder lines. Failure to follow this procedure may cause injury. If you are injured, seek medical attention immediately.

Install blocking plate assembly in the rod end of the right steering cylinder.

1. **System Oil Temperature.**

- a. Turn the steering wheel right and hold.
- b. Open the manual load valve on the flow meter fully.
- c. Start engine and run at 1,900 RPM.

**NOTE**

Before recording test data, make sure the system pressure is at least 100 psi (689 kPa).

d. Record system oil temperature. Refer to Table 2. System oil temperature should be 145°-155°F (63°-68°C).  
2. **Steer Right Flow Rate (Leakage).**

- a. Turn the steering wheel right and hold.
- b. Open the manual load valve on the flow meter fully.
- c. Start engine and run at 1,900 RPM.
- d. Slowly adjust the manual load valve on the flow meter to a pressure of 1,000 psi (6,895 kPa).
- e. Record flow rate. Refer to Table 2. Correct steer right flow rate is 51-52 gpm.

3. **System Oil Temperature.**

- a. Turn the steering wheel right and hold.
- b. Open the manual load valve on the flow meter fully.
- c. Start engine and run at 1,900 RPM.

**NOTE**

Before recording test data, ensure system pressure is at least 100 psi (689 kPa).

- d. Record system oil temperature. Refer to Table 2. System oil temperature should be 145°-155°F (63°-68°C).

**COMPARISON OF TESTS**1. **Leakage in Right or Left Steering Cylinder.**

- a. Check the seal on the piston in the right steering cylinder.
  - (1) If the seal is damaged or defective, replace. Refer to *Steering Cylinder Repair* (WP 0308 00).
- b. Check the steering cylinder assembly.
  - (1) If the steering cylinder assembly is damaged or defective, service or replace. Refer to *Steering Cylinder Repair* (WP 0308 00).

COMPARISON OF TESTS - CONTINUED

Table 1. Steering Flow Meter Tee Test.

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
	Maximum Pressure Relief Valve Setting	System Oil Temperature (Start)	System Base Flow Rate	Steer Right Flow Rate	Steer Left Flow Rate	System Oil Temperature (Finish)
Steering Wheel Position	Steer Right	Steer Right	Steer Right	Steer Right	Steer Left	Steer Left
Engine Speed	1,900 RPM	Any Speed	1,900 RPM	1,900 RPM	1,900 RPM	Any Speed
System Test Pressure	Maximum	0-100 psi (0-689 kPa)	100 psi (689 kPa)	1,000 psi (6,895 kPa)	1,000 psi (6,895 kPa)	0-100 psi (0-689 kPa)
Test Data	2,200-2,300 psi (15,168-15,858 kPa)	145°-155°F (63°-68C)	60 gpm	51 gpm	51 gpm	144°-155°F (62°-68°C)
Flow Differential				9.0 gpm	9.0 gpm	
Percent Flow Loss				15 percent	15 percent	

System Oil Temperature: Finish oil temperature (Test 6) must be within 10 percent±15°F (-9°C) of start oil temperature (Test 2).

For each 15 degrees that the finish oil temperature is higher than the start oil temperature (Test 6 greater than Test 2), subtract 0.5 gal. from the leakage rate.

For each 15 degrees that the finish oil temperature is lower than the start temperature (Test 6 less than Test 2), add 0.5 gal. to the leakage rate.

Low Differential Calculation: Test 4 = Test 3 - Test 4.

Test 5 = Test 3 - Test 5.

Percent Flow Loss Calculation: 
$$\frac{\text{Test 4} - (\text{Test 3} - \text{Test 4})}{3} \times 100$$

$$\frac{\text{Test 5} - (\text{Test 3} - \text{Test 5})}{3} \times 100$$

COMPARISON OF TESTS - CONTINUED

Table 2. Steering Blocked Cylinder Test.

	All Cylinders Blocked				Right Cylinder Blocked		
	Test 7	Test 8	Test 9	Test 10	Test 11	Test 12	Test 13
	System Oil Temperature (Start)	Steer Right Flow Rate	Steer Left Flow Rate	System Oil Temperature (Finish)	System Oil Temperature (Start)	Steer Right Flow Rate	System Oil Temperature (Finish)
Steering Wheel Position	Steer Right	Steer Right	Steer Left	Steer Left	Steer Right	Steer Right	Steer Right
Engine Speed	Any Speed	1,900 RPM	1,900 RPM	Any Speed	Any Speed	1,900 RPM	Any Speed
System Test Pressure	0-100 psi (0-689 kPa)	1,000 psi (6,895 kPa)	1,000 psi (6,895 kPa)	0-100 psi (0-689 kPa)	0-100 psi (0-689 kPa)	1,000 psi (6,895 kPa)	0-1,000 psi (0-6,895 kPa)
Test Data	145°-155°F (63°-68°C)	52 gpm	52 gpm	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	51-52 gpm	145°-155°F (63°-68°C)
Cylinder Leakage Rate		1 gpm	1 gpm		Right Cylinder Leakage	0-1 gpm	
Control Valve Group Leakage		2 gpm	2 gpm		Left Cylinder Leakage	1-0 gpm	

END OF WORK PACKAGE



---

**SUPPLEMENTAL STEERING PUMP REPLACEMENT**

**0307 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 75 lb minimum capacity

**References**

WP 0180 00

TM 5-3805-248-10

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (5)

**Equipment Condition**

Final drive oil drained (WP 0144 00)

Hydraulic tank drained (WP 0229 00))

Differential case drained (WP 0128 00)

Crankcase guards removed (WP 0201 00)

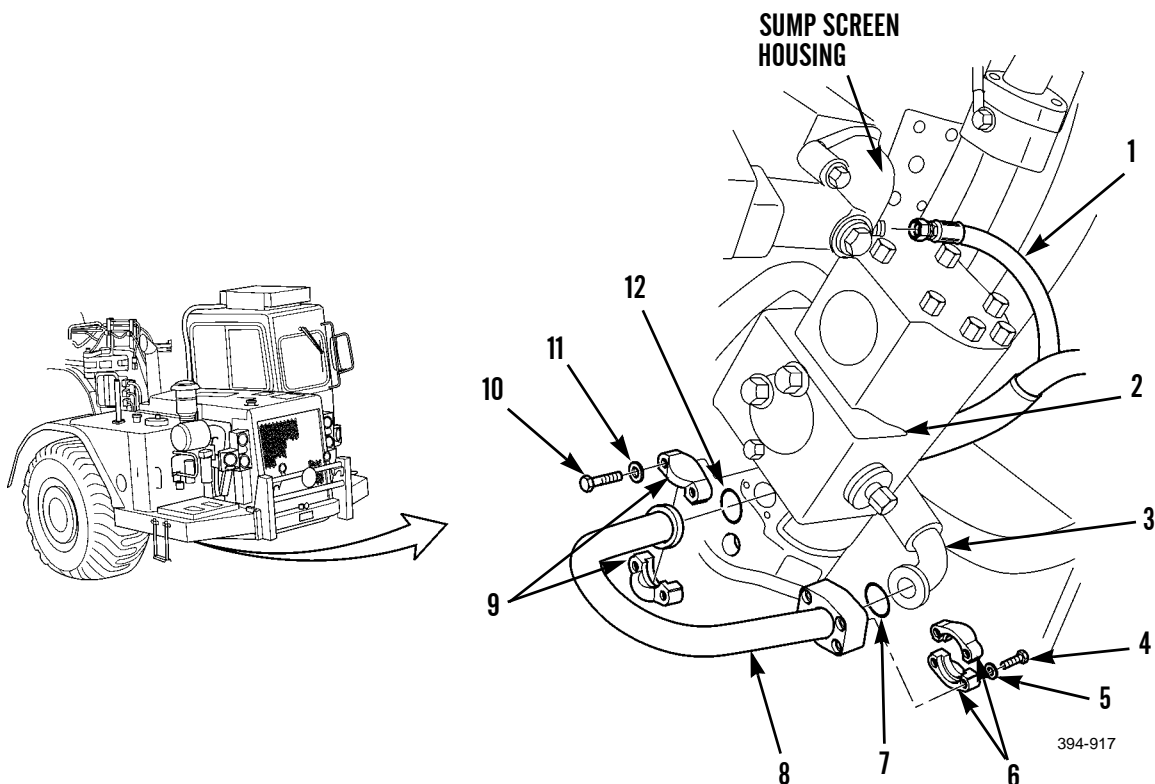
---

**REMOVAL****CAUTION**

Wipe area clean around all connections prior to removal. Cap lines and plug openings after removal. Contamination of system could result in premature failure.

**NOTE**

- Use a container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.
  - Tag hose and tube assemblies prior to removal to ensure correct installation.
  - Note routing of all hose assemblies prior to removal to ensure correct installation.
  - Remove and note location of all clips that secure hose assemblies to ensure correct installation.
1. Disconnect hose assembly (1) from sump screen housing and move to side of supplemental steering pump assembly (2).
  2. Remove four bolts (4), washers (5) and two flange halves (6) from hose assembly (3) and tube assembly (8).
  3. Disconnect hose assembly (3).
  4. Remove and discard preformed packing (7).
  5. Remove four bolts (10), washers (11), two flange halves (9) and tube assembly (8).
  6. Remove and discard preformed packing (12).



**REMOVAL - CONTINUED**

7. Remove four bolts (14), washers (13) and two flange halves (19).
8. Disconnect hose assembly (15).
9. Remove and discard preformed packing (16).

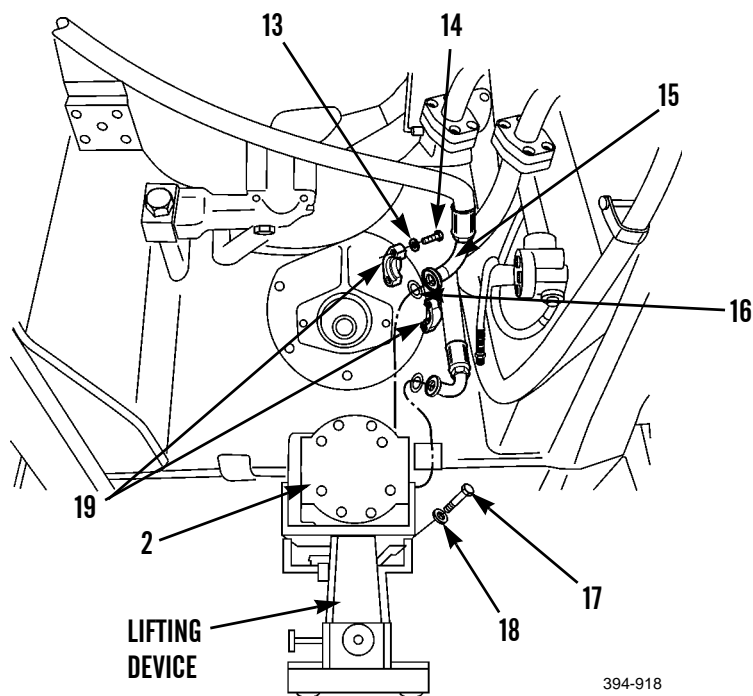
**WARNING**

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 death or injury.

**NOTE**

Supplemental steering pump assembly weighs 53 lb (43 kg).

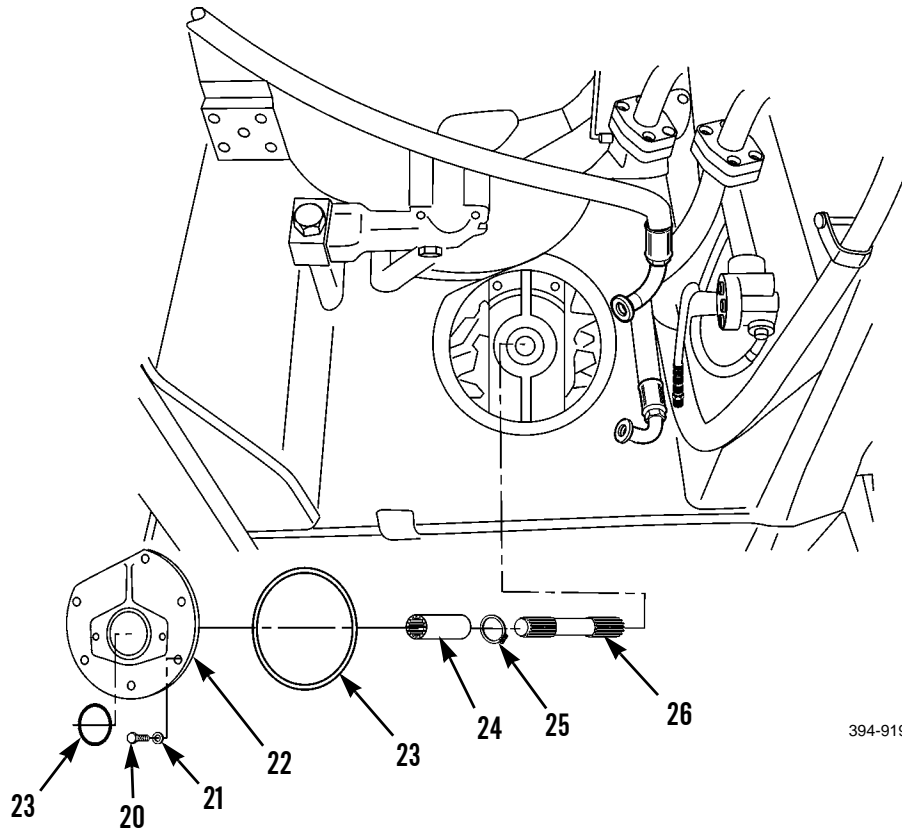
10. Position lifting device under supplemental steering pump assembly (2) and secure.
11. Remove two bolts (17) and washers (18).
12. Use lifting device to remove supplemental steering pump assembly (2) from machine.
13. Remove lifting device.



394-918

**REMOVAL - CONTINUED**

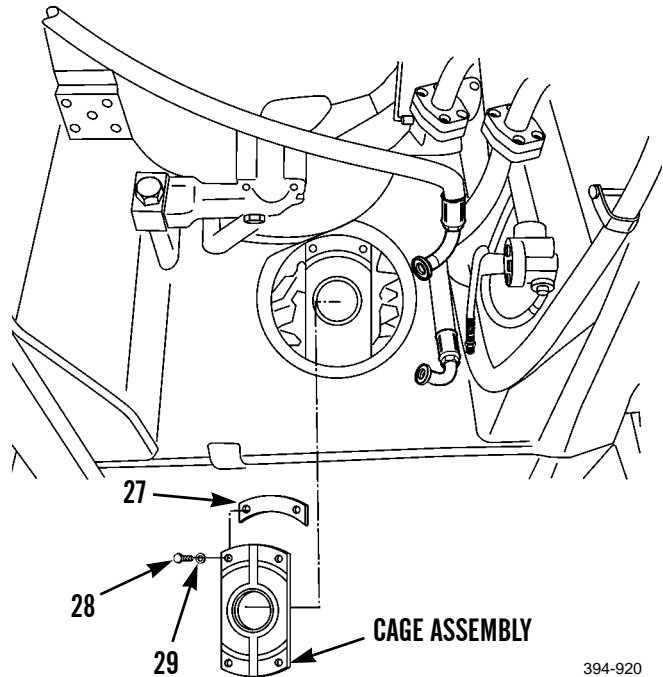
14. Remove four bolts (20), washers (21) and adapter (22).
15. Remove and discard two preformed packings (23).
16. Remove coupling (24), ring (25) and shaft (26).



**REMOVAL - CONTINUED****CAUTION**

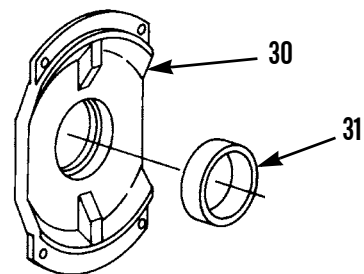
Do not allow shim(s) to fall into differential case when bolts and cage are removed. Failure to comply can cause damage to equipment.

17. Remove four bolts (28), washers (29), cage assembly and eight shims (27).

**CAUTION**

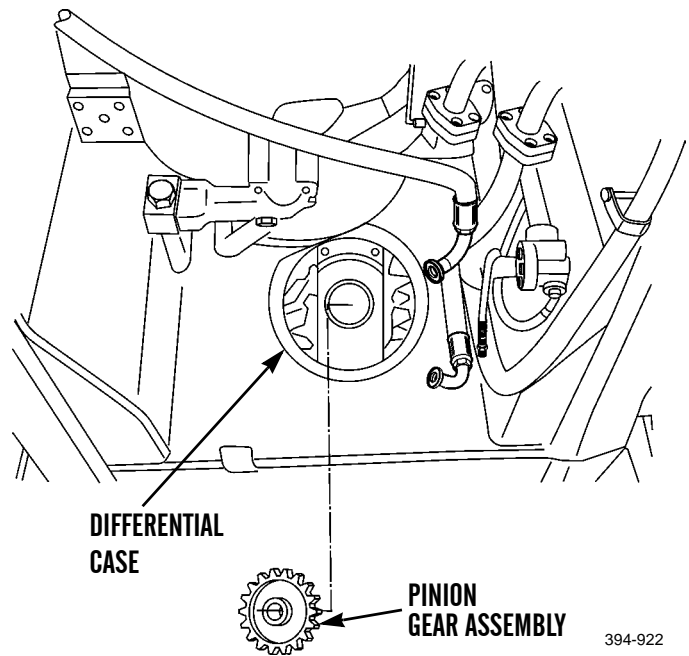
Removal of bearing from cage will cause destruction of bearing. Remove bearing only if inspection indicates replacement is necessary.

18. If bearing (31) is damaged, use a hammer and chisel to remove and discard bearing (31) from cage (30).



**REMOVAL - CONTINUED**

19. Remove pinion gear assembly from differential case.

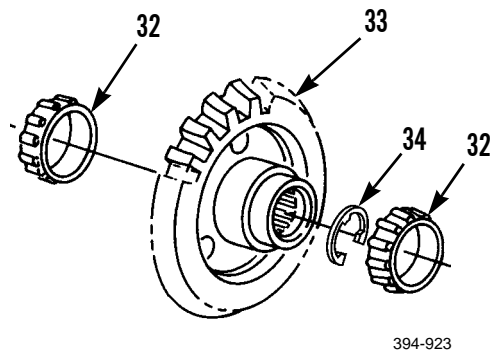


20. Remove retaining ring (34) from inner bore of pinion gear (33).

**CAUTION**

Removal of bearings from pinion gear may cause destruction of bearings. Remove bearings only if inspection indicates replacement is necessary.

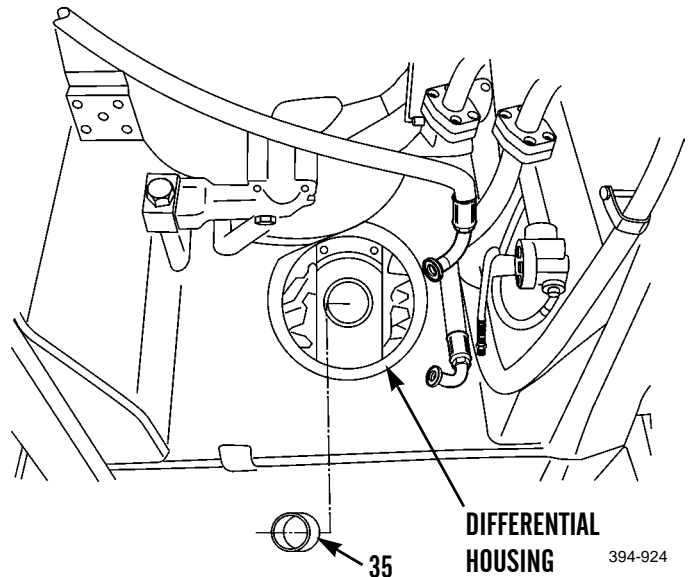
21. If two bearings (32) are damaged use a puller to remove two bearings from pinion gear (33).



**REMOVAL - CONTINUED****CAUTION**

Removal of bearing from rear cap of differential housing will cause destruction of bearing. Remove bearing only if inspection indicates replacement is necessary.

22. Use a hammer and chisel to remove and discard bearing (35), if necessary.

**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 cause 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. Remove all preformed packing material from mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry all parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

**WARNING**

Use gloves or tongs to handle extremely cold parts. Contact between cold parts and your skin may cause frostbite and other injury.

1. If removed, lower temperature of new bearing (35) and install.
2. Apply a thin coat of clean lubricating oil to bearing (35).

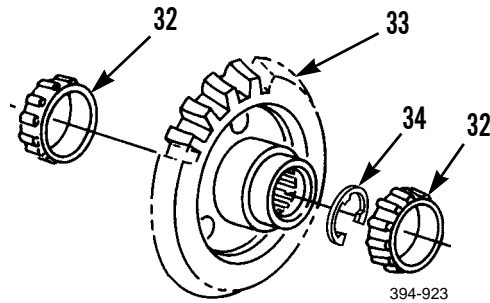


**WARNING**

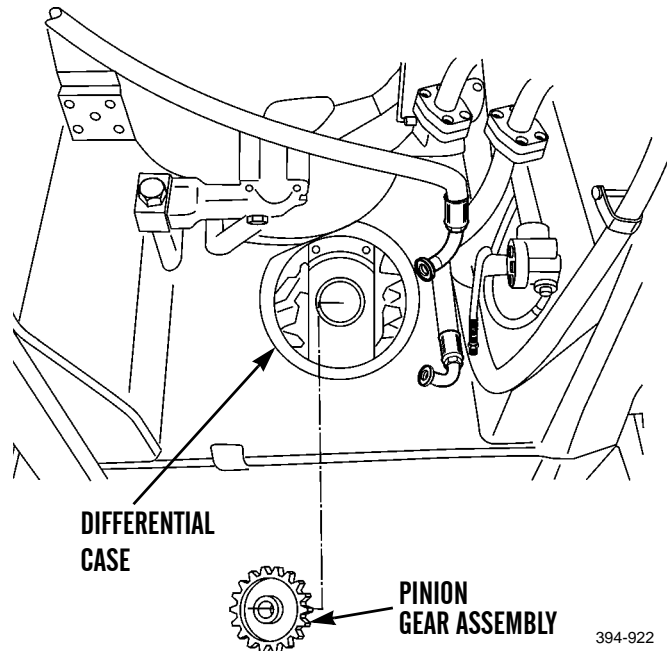


Wear protective gloves and goggles when working with hot oil. Failure to do so could result in injury. If you are injured, seek medical aid immediately.

3. If two bearings (32) were removed, use clean oil and heat bearings (32) to 275°F (135°C).
4. If two bearings (32) were removed, install bearings on pinion gear (33). Large end of bearings must seat against the hub shoulders of pinion gear.
5. Install retaining ring (34) in inner bore of pinion gear (33).



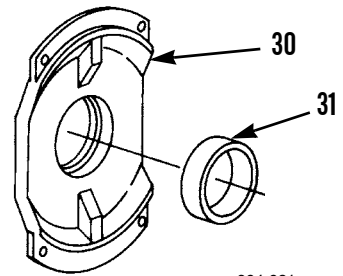
6. Install pinion gear assembly into differential case.





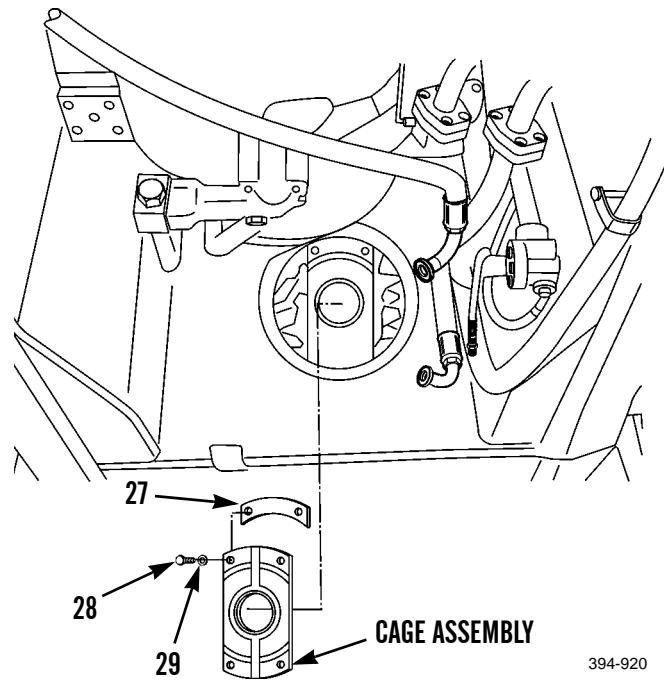
**INSTALLATION - CONTINUED**

7. If bearing (31) was removed, install bearing in cage (30).



394-921

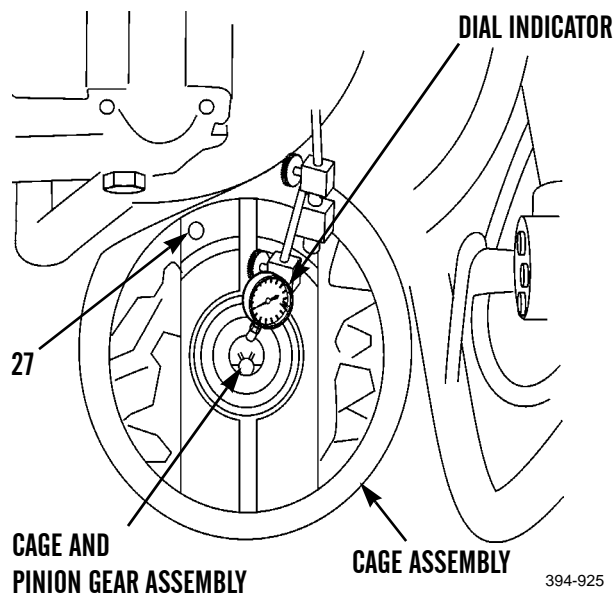
8. Install eight shims (27), cage assembly, four washers (29) and bolts (28).



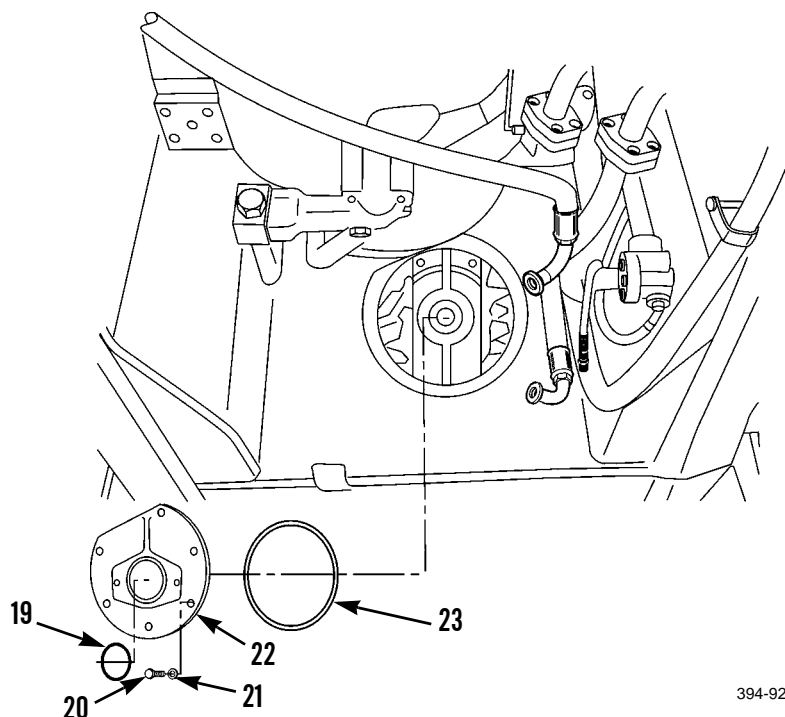
394-920

**INSTALLATION - CONTINUED**

9. Install dial indicator in differential housing.
10. Use dial indicator to measure end play of cage and pinion gear assembly. End play should be 0.001-0.007 in. (0.0254-0.1778 mm).
11. Remove dial indicator from differential housing.
12. Remove or add shim(s) (27) to obtain a reading between 0.001-0.007 in. (0.0254-0.1778 mm).



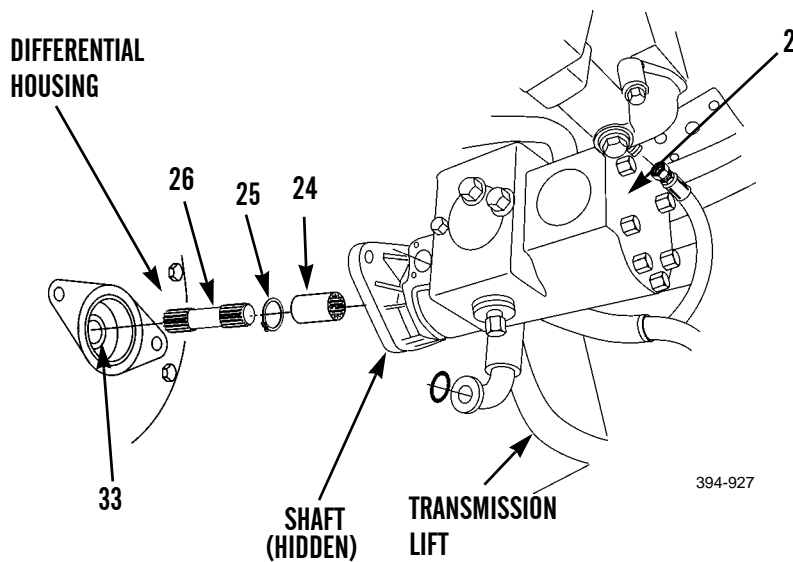
13. Use clean lubricating oil to lightly lubricate new preformed packing (23).
14. Install new preformed packing (23), adapter (22), four washers (21) and bolts (20).
15. Use clean lubricating oil to lightly lubricate bore of adapter (22).
16. Install new preformed packing (19).



**INSTALLATION - CONTINUED****WARNING**

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 death or injury.

17. Place supplemental steering pump assembly (2) on lifting device and secure.
18. Use lifting device to position supplemental steering pump assembly (2) next to differential housing.
19. Install coupling (24), ring (25) and shaft (26) on shaft of supplemental steering pump assembly (2).
20. Align shaft (26) with pinion gear (33).

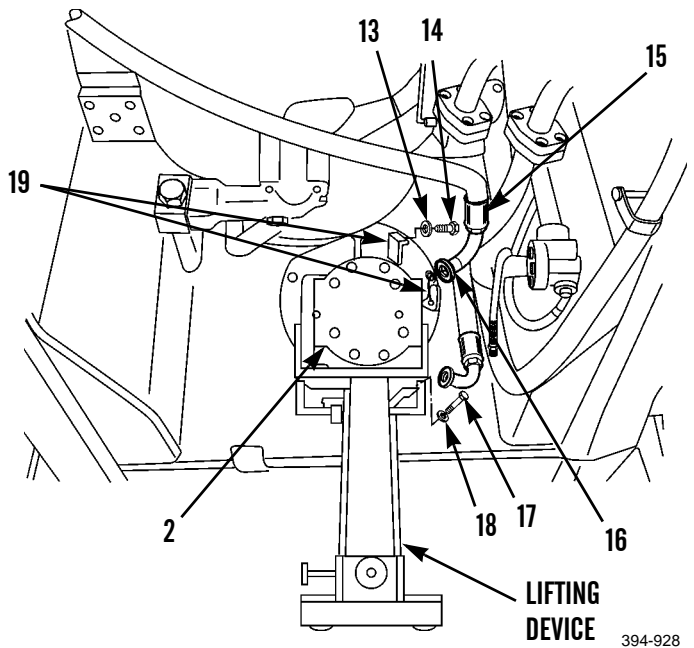


**SUPPLEMENTAL STEERING PUMP REPLACEMENT - CONTINUED**

0307 00

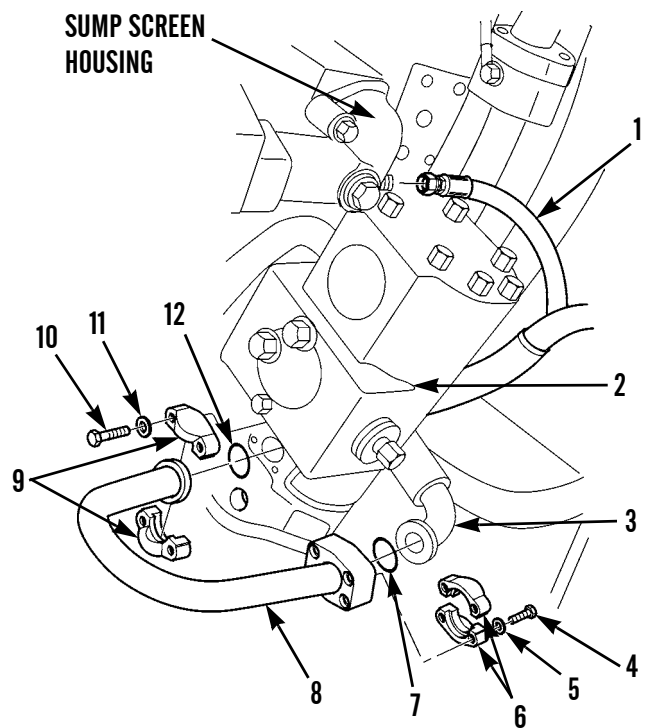
**INSTALLATION - CONTINUED**

21. Use lifting device to install supplemental steering pump assembly (2).
22. Install two washers (18) and bolts (17).
23. Remove lifting device.
24. Install new preformed packing (16).
25. Connect hose assembly (15).
26. Install two flange halves (19), four washers (13) and bolts (14).



394-928

27. Install new preformed packing (12).
28. Install tube assembly (8), two flange halves (9), four washers (11) and bolts (10).
29. Install new preformed packing (7).
30. Connect hose assembly (3) to tube assembly (8).
31. Install two flange halves (6), four washers (5) and bolts (4).
32. Connect hose assembly (1) to sump screen housing.



394-929

***INSTALLATION - CONTINUED***

33. Fill differential case to correct level (WP 0128 00).
34. Fill final drive with oil (WP 0144 00).
35. Fill hydraulic tank to correct level (WP 0229 00).
36. Inspect hoses and tubes for leaks (WP 0180 00).
37. Operate machine and verify correct operation (TM 5-3805-248-10).
38. Install crankcase guards (WP 0201 00).

**END OF WORK PACKAGE**



---

**STEERING CYLINDER REPAIR**

---

**0308 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Adapter, mechanical puller (Item 1, WP 0338 00)

Nut, fastener (Item 59, WP 0338 00)

Pump, hydraulic ram, hand driven (Item 91, WP 0338 00)

Seal guide (Item 100, WP 0338 00)

Sleeve (Item 106, WP 0338 00)

Stud, plain (Item 110, WP 0338 00)

Hydraulic cylinder repair stand

Lifting device, 300 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Cloth, abrasive (Item 9, WP 0339 00)

Compound, sealing (Item 10, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Primer, OK cure (Item 34, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed

Ring (3)

Seal (5)

**Personnel Required**

Two

**Equipment Condition**Steering cylinder removed (WP 0181 00)

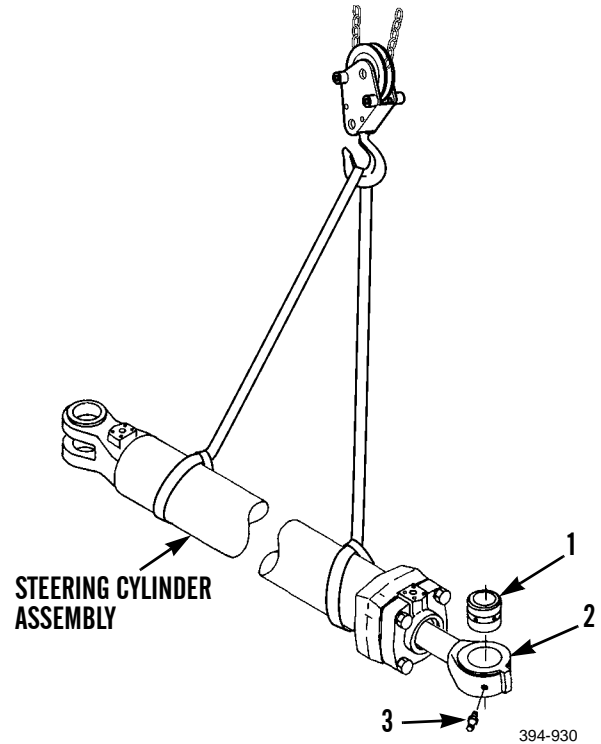
---

**NOTE**

The following repair procedure is for the right steering cylinder. The repair procedure for the left steering cylinder is identical.

**DISASSEMBLY**

1. Remove fitting (3) from end of rod (2).
2. Use hydraulic puller and pump group to remove bearing (1) from rod (2).

**WARNING**

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.

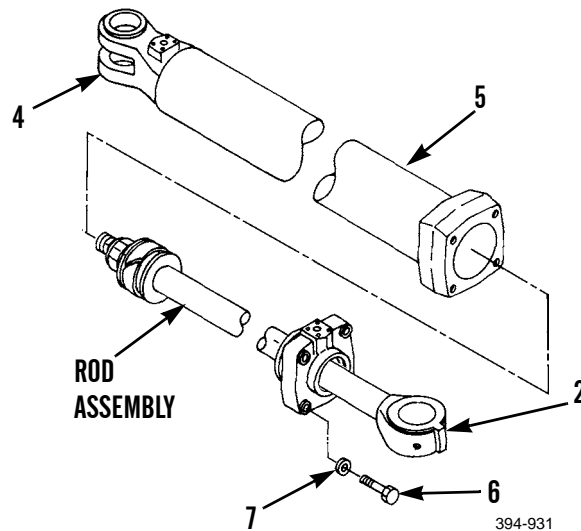


**DISASSEMBLY - CONTINUED**

**NOTE**

Steering cylinder weighs 200 lb (91 kg).

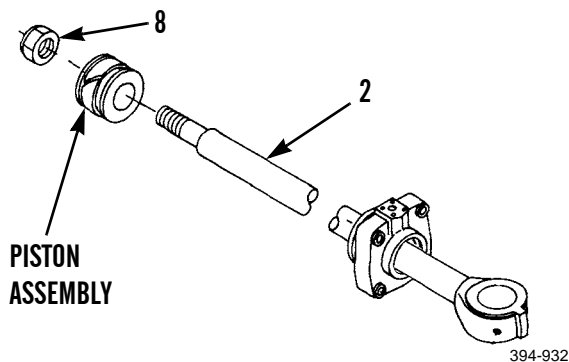
3. Attach lifting device to steering cylinder assembly (5). Position on hydraulic cylinder repair stand with openings for hydraulic lines facing down. Secure steering cylinder assembly to repair stand with straps.
4. Extend rod (2) fully and support .
5. Remove four bolts (6) and washers (7) and support steering cylinder assembly (5).
6. Remove cylinder assembly (5) from rod assembly.
7. Use driver and hammer to remove bearing (4) from cylinder (5).



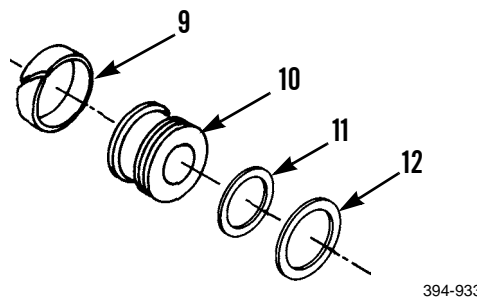
**CAUTION**

Use care when removing nut. Nut is torqued to 1,600 lb-ft (2,170 Nm).

8. Use torque multiplier to remove nut (8).
9. Remove piston assembly from rod assembly (2).

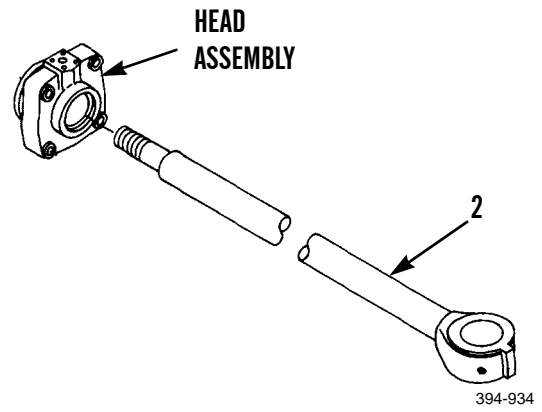


10. Remove and discard rings (9 and 12) and seal (11) from piston (10).

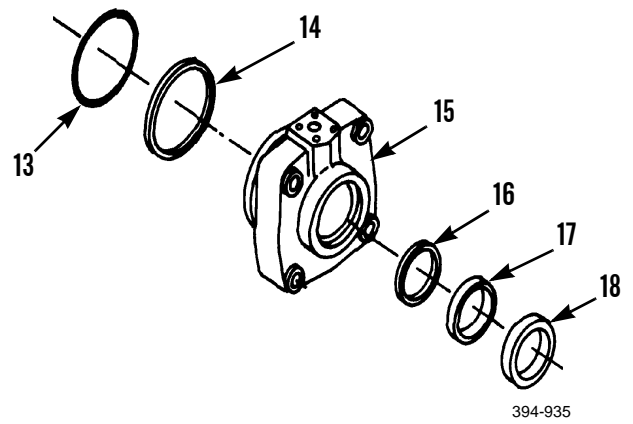


**DISASSEMBLY - CONTINUED**

11. Remove head assembly from rod (2).



12. Remove and discard preformed packing (13), ring (14) and seals (16, 17 and 18) from head (15).



**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 cause 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. Remove all preformed packing material from mounting surfaces.
  2. Use emery cloth to scuff surfaces of cylinder head counterbore and the outside diameter metal shell of new seals.
  3. Clean all parts with solvent cleaning compound.

**CAUTION**

The metal shell of the seal is coated with a corrosion inhibitor. This may prevent proper bonding of the seal to the cylinder head if the inhibitor is not removed. After cleaning, do not touch the counterbore of the metal shell. Oil from skin may prevent a good bond. Handle the seal by the lip only.

4. Clean the counterbore and the metal shell of the new seals until none of the components discolor a clean white towel.
5. Dry all parts with compressed air.
6. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Use clean lubricating oil to lightly lubricate lips of new seals (17 and 16).
2. Use driver and hammer to install new seals (17 and 16) in head (15), with the lips toward inside of cylinder. Install new seal (16) until it contacts counterbore in head (15).
3. Apply primer on counterbore and metal shell of new seal (18) and allow to dry (approximately 30 seconds).

**NOTE**

Do not allow sealing compound to contact the sealing lip.

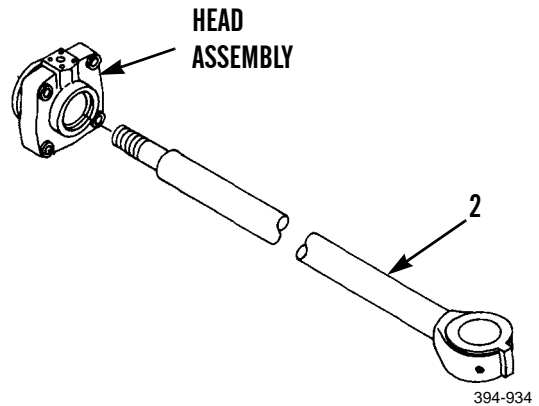
4. Apply sealing compound to counterbore and to metal shell of new seal (18).
5. Use clean lubricating oil to lightly lubricate lip of new seal (18).

**ASSEMBLY - CONTINUED**

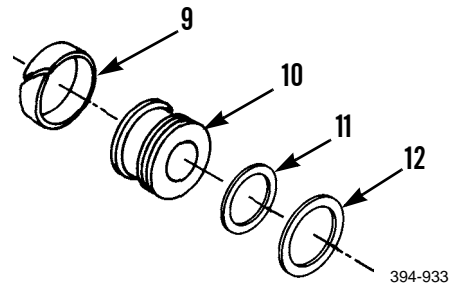
**NOTE**

Seals are label with "This side out," which should face the rod end.

6. Use driver and hammer to install new seal (18), with lip toward outside of cylinder.
7. Install ring (14) and new preformed packing (13).
8. Install seal guide on rod (2). Tapered end of seal guide faces threaded end of rod.
9. Install head assembly on rod (2).
10. Remove seal guide from rod (2).



11. Install new seal (11) and new rings (9 and 12) on piston (10).

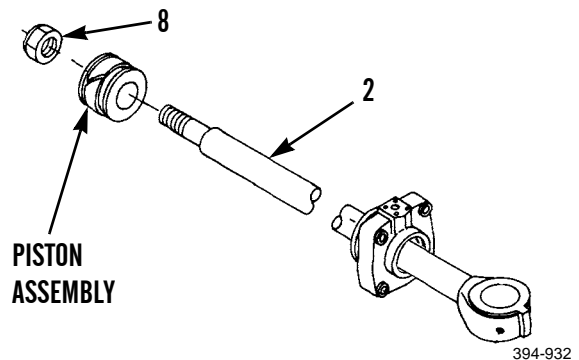


12. Install piston assembly on rod assembly (2).
13. Use clean lubricating oil to lubricate threads of nut (8).

**WARNING**

Use care when installing nut. Nut is torque to 1,600 lb-ft (2,170 Nm).

14. Use torque multiplier to install nut (8) and torque to 1,600 lb-ft (2,170 Nm).



ASSEMBLY - CONTINUED



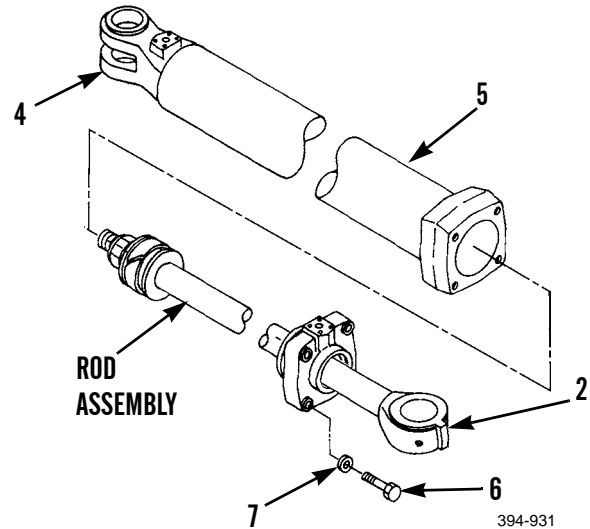
**WARNING**

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.

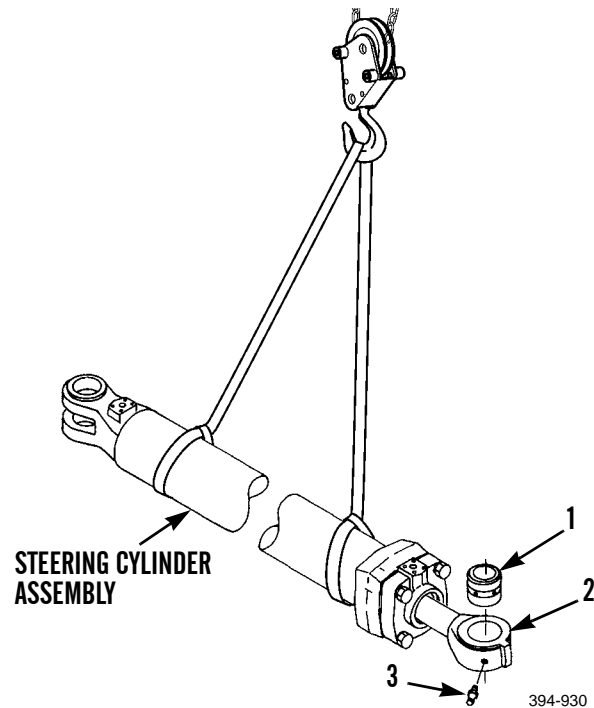
**NOTE**

Steering cylinder weighs 200 lb (91 kg).

15. Use driver and hammer to install bearing (4) in cylinder (5).
16. Install cylinder assembly (5) on rod assembly, with rod (2) fully extended.
17. Install four washers (7) and bolts (6). Tighten four bolts (6) a few turns at a time to pull cylinder assembly (5) together with rod assembly.



18. Attach lifting device to steering cylinder assembly (5).
19. Remove steering cylinder assembly from workbench and place on flat surface.
20. Use hydraulic puller and pump group to install bearing (1) in end of rod (2).
21. Install fitting (3).



22. Install steering cylinder (WP 0181 00).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bushing driver set (Item 11, WP 0338 00)

Pipe 1-1/4" OD x 4"

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Tag, marker (Item 42, WP 0339 00)

Locknut

Packing, preformed (11)

Seal (5)

**References**

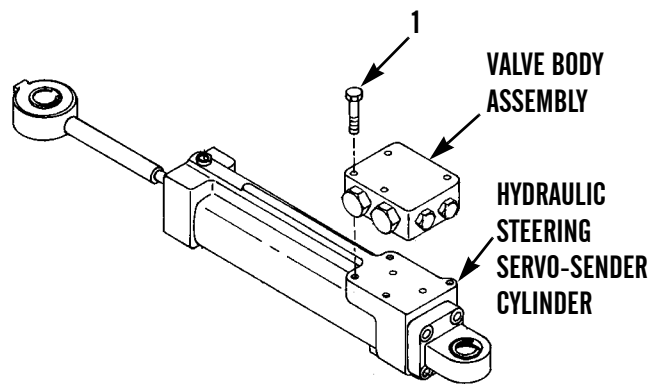
TM 5-3805-248-10

**Equipment Condition**

Hydraulic steering servo-sender cylinder removed (WP 0182 00)

**DISASSEMBLY**

1. Position hydraulic steering servo-sender cylinder assembly in soft-jawed vise, valve side up.
2. Remove four bolts (1).
3. Remove valve body assembly from hydraulic steering servo-sender cylinder assembly.



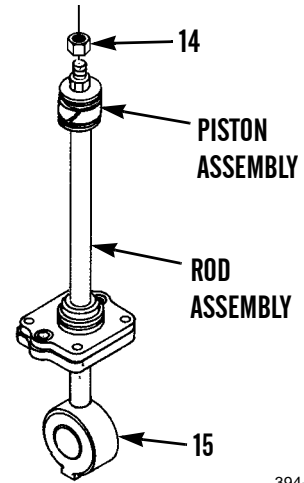
394-936





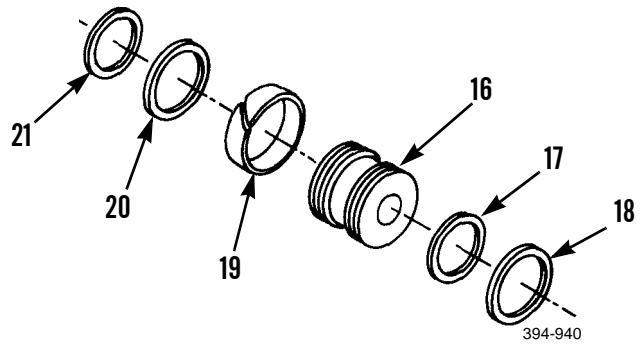
**DISASSEMBLY - CONTINUED**

11. Fasten eye of rod (15) in a soft-jawed vise.
12. Remove and discard locknut (14).
13. Remove piston assembly from rod assembly.



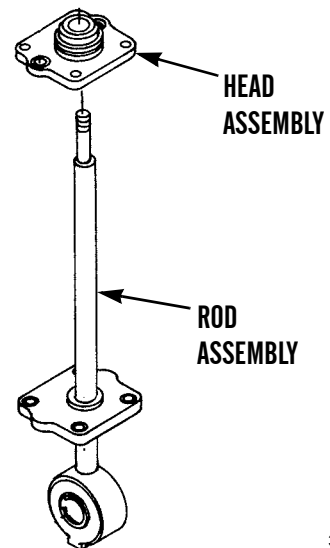
394-939

14. Remove and discard seals (18 and 17), ring (16) and seals (21 and 20) from piston (19).



394-940

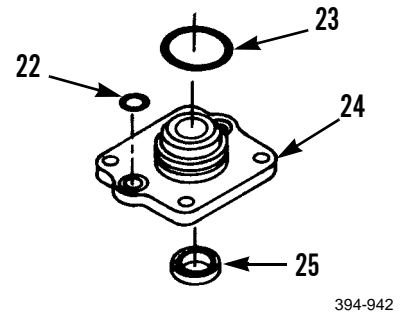
15. Remove head assembly from rod assembly.



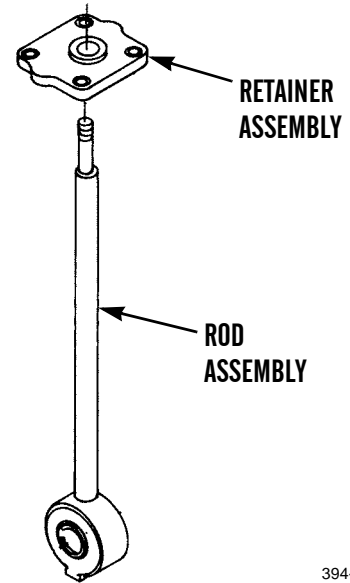
394-941

**DISASSEMBLY - CONTINUED**

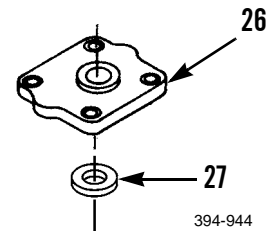
16. Remove and discard preformed packing (23), two preformed packings (22) and seal (25) from head (24).



17. Remove retainer assembly from rod assembly.

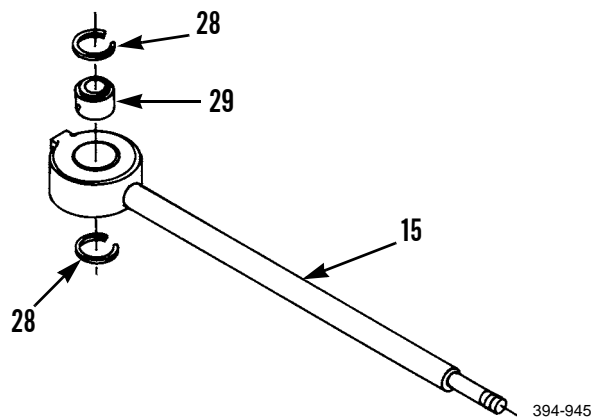


18. Remove and discard wiper (27) from retainer (26).

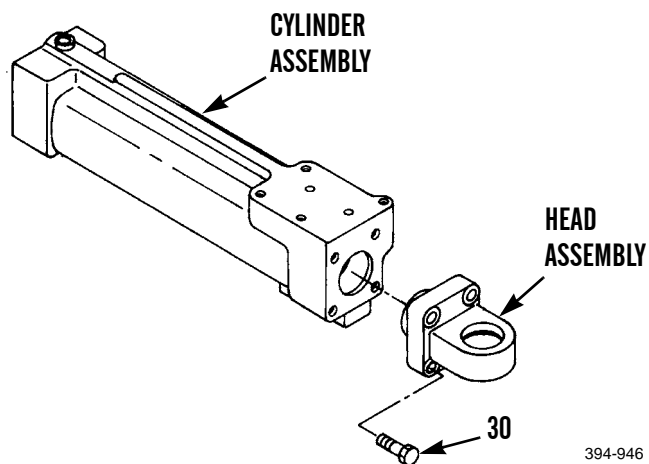


**DISASSEMBLY - CONTINUED**

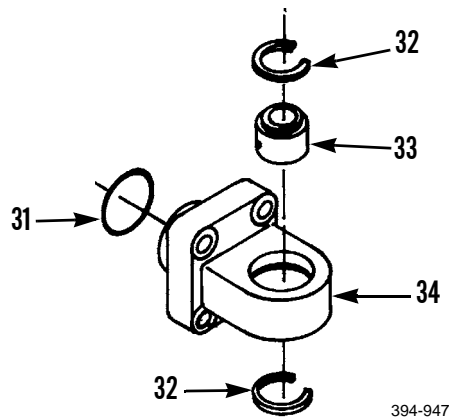
19. Remove rod assembly from soft-jawed vise.
20. Remove two rings (28).
21. Use driver and hammer to remove bearing (29) from rod (15).



22. Remove four bolts (30).
23. Remove head assembly from cylinder assembly.

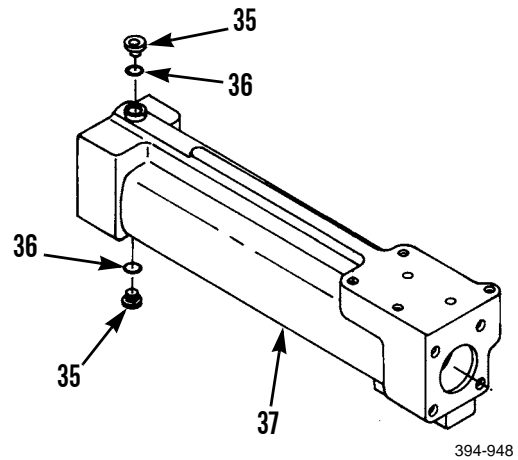


24. Remove and discard preformed packing (31).
25. Remove two rings (32).
26. Use driver and hammer to remove bearing (33) from head (34).



**DISASSEMBLY - CONTINUED**

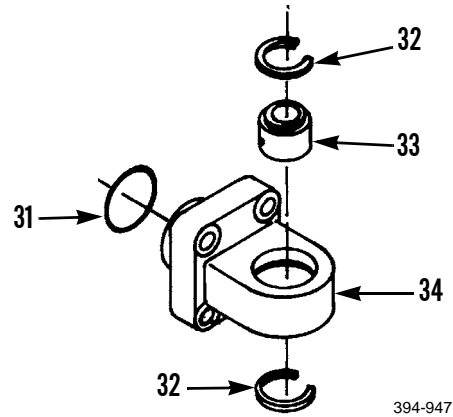
27. Remove two plugs (35) and preformed packings (36) from cylinder (37). Discard two preformed packings (36).

**CLEANING AND INSPECTION****WARNING**

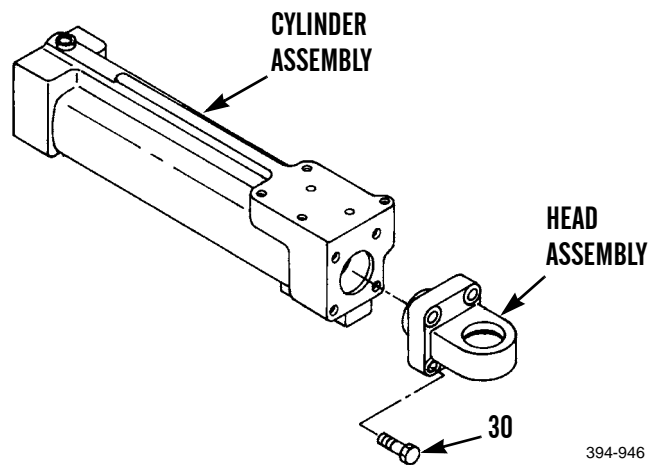
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
  - Particles blown by 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 cause 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. Remove all preformed packing material from mounting surfaces.
  2. Clean all parts with solvent cleaning compound.
  3. Dry all parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

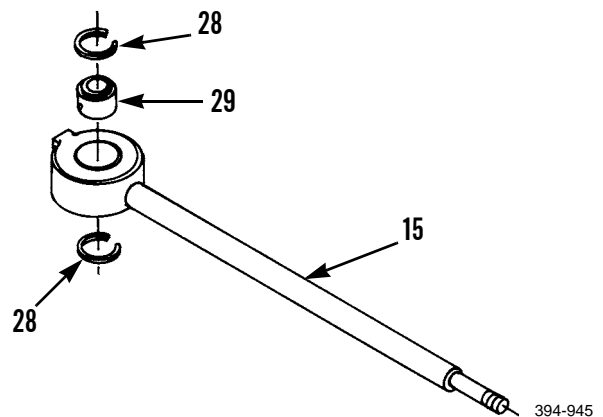
1. Install two new preformed packings (36) and plugs (35) in cylinder (37). Torque plugs to 9 lb-ft (12 Nm).
2. Install one of two rings (32) in head (34).
3. Use pipe and hammer to install bearing (33) until it is against one of two rings (32).
4. Install remaining ring (32).
5. Install new preformed packing (31).
6. Use clean oil to lubricate new preformed packing (31).



7. Install head assembly on cylinder assembly.
8. Install four bolts (30) in head assembly.

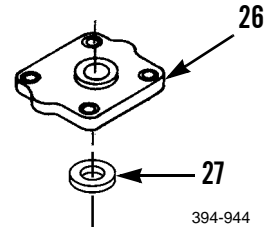


9. Install one of two rings (28) in rod (15).
10. Use pipe and hammer to install bearing (29) until it is against one of two rings (28).
11. Install remaining ring (28).

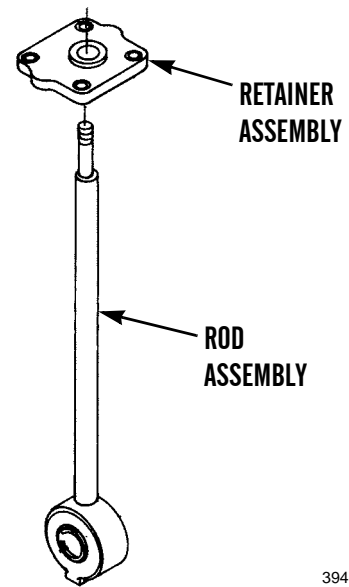


**ASSEMBLY - CONTINUED**

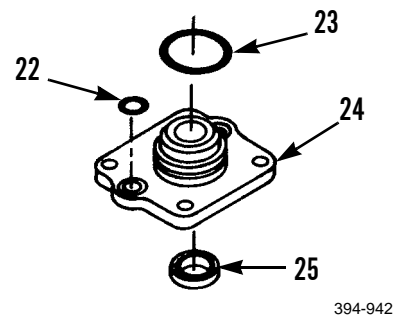
12. Use clean lubricating oil to lubricate lip of new wiper (27).
13. Use driver to install new wiper (27) in retainer (26) with lip facing out.



14. Fasten eye end of rod assembly in a soft-jawed vise.
15. Install retainer assembly on rod assembly.

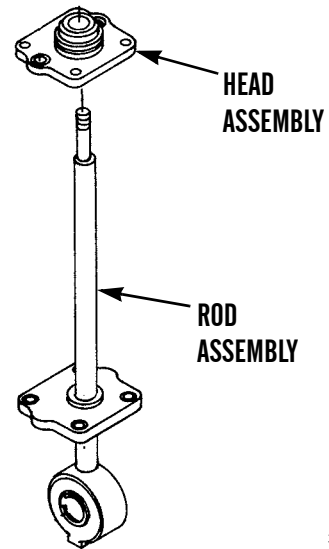


16. Install new seal (25), two new preformed packings (22) and new preformed packing (23) on head (24).



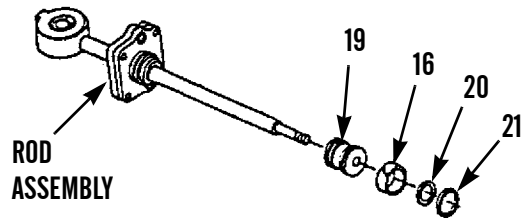
**ASSEMBLY - CONTINUED**

17. Install head assembly on rod assembly.



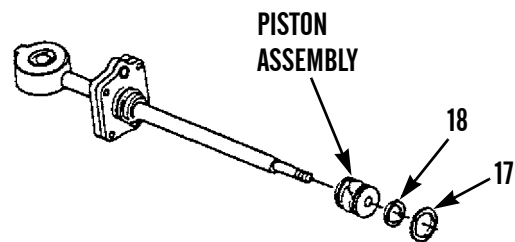
394-941

18. Install piston (19) on rod assembly.
19. Install new ring (16) and new seals (21 and 20) on piston (19).



394-949

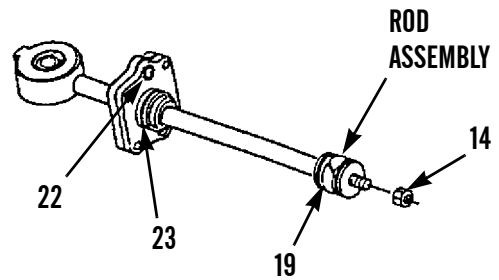
20. Remove piston assembly from rod assembly. Turn piston assembly over and install on rod assembly, with empty seal grooves facing up.
21. Install new seals (17 and 18).



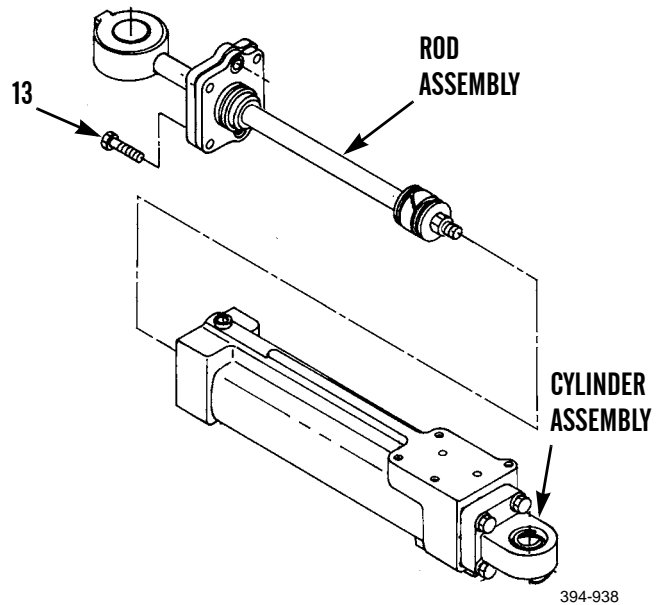
394-950

**ASSEMBLY - CONTINUED**

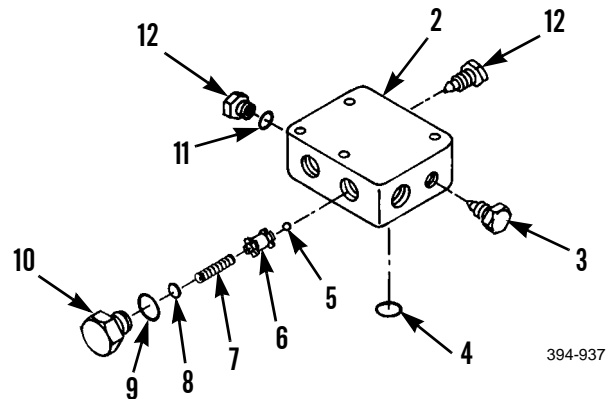
22. Install new locknut (14) on rod assembly. Torque locknut (14) to 35 lb-ft (47 Nm).
23. Use clean lubricating oil to lubricate piston (19), two new preformed packings (22) and new preformed packing (23).
24. Remove rod assembly from soft-jawed vise.



25. Fasten cylinder assembly in a soft-jawed vise.
26. Install rod assembly in cylinder assembly. Ensure rod is fully extended.
27. Install four bolts (13).



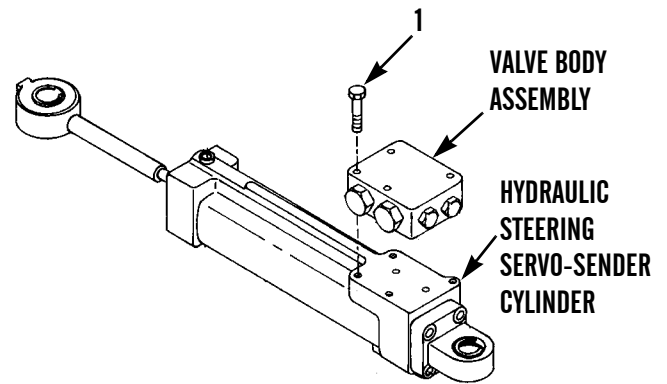
28. Install two new preformed packings (11) and plugs (12) in valve body (2).
29. Install two balls (5), retainers (6), springs (7), shims (8), new preformed packings (9) and plugs (10). Torque plugs to 42 lb-ft (57 Nm).
30. Install two bleeder valves (3) and new preformed packings (4).





**ASSEMBLY - CONTINUED**

31. Install valve body assembly on cylinder assembly.
32. Install four bolts (1).



394-936

33. Install hydraulic steering servo-sender cylinder (WP 0182 00).
34. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bushing driver set (Item 11, WP 0338 00)

Pipe 1-1/4" OD x 1-5/16" ID x 4"

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (6)

Seal (3)

**References**

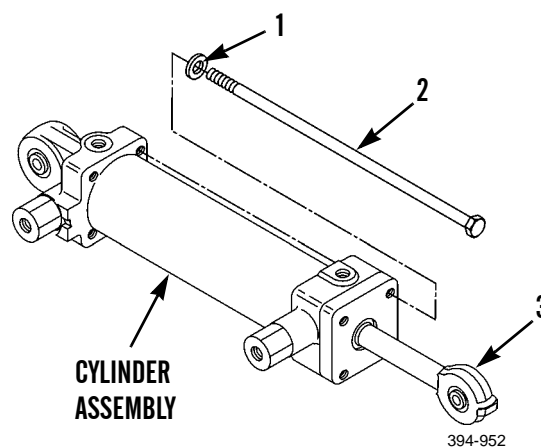
TM 5-3805-248-10

**Equipment Condition**

Hydraulic steering servo-receiver cylinder removed (WP 0311 00)

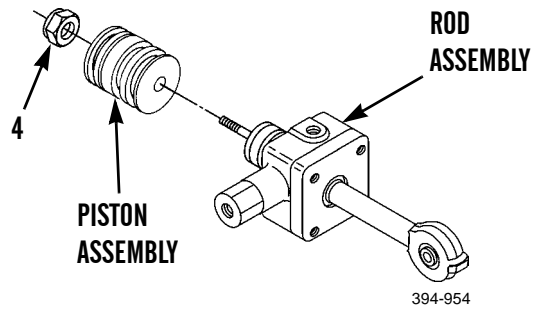
**DISASSEMBLY**

1. Remove four bolts (2) and washers (1) from hydraulic steering servo-receiver cylinder.
2. Attach hydraulic steering servo-receiver cylinder in soft-jawed vise.
3. Remove rod assembly (3) from cylinder assembly.
4. Remove cylinder assembly from soft-jawed vise.
5. Attach rod assembly (3) at eye of rod in soft-jawed vise.

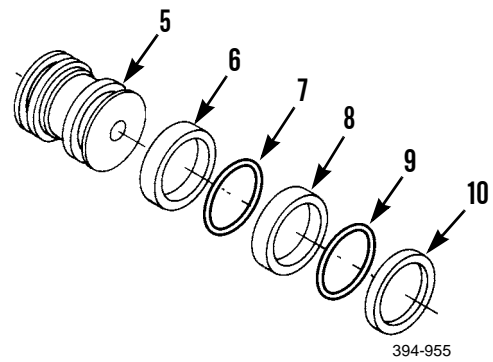


**DISASSEMBLY - CONTINUED**

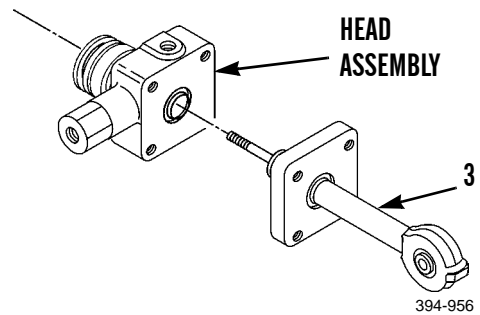
6. Remove nut (4).
7. Remove piston assembly from rod assembly (3).



8. Remove and discard seal (6), preformed packing (7), seal (10), preformed packing (9) and ring (8) from piston (5).

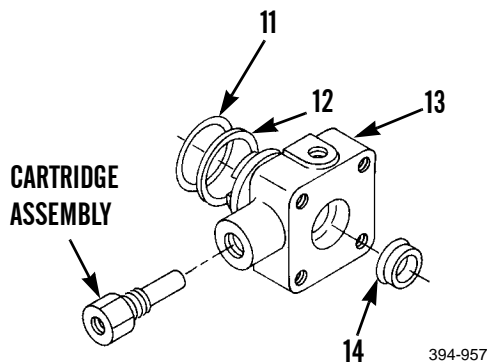


9. Remove head assembly from rod assembly (3).



**DISASSEMBLY - CONTINUED**

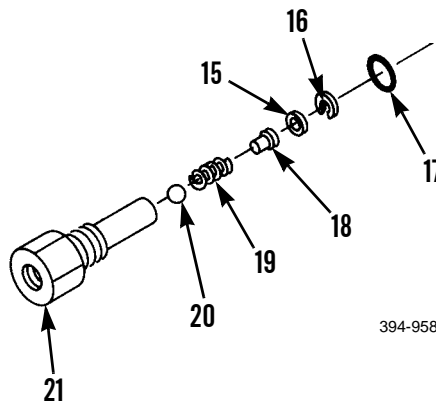
10. Remove preformed packing (11), ring (12) and seal (14) from head (13). Discard preformed packing and seal.
11. Remove cartridge assembly from head (13).



**WARNING**

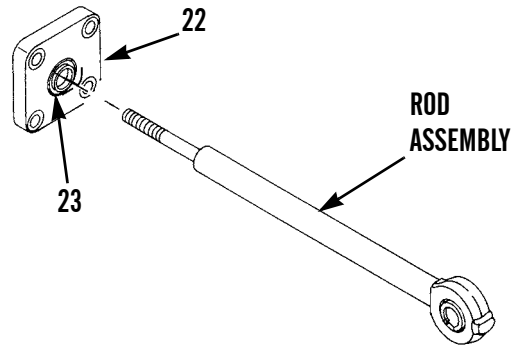
Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

12. Remove preformed packing (17), retainer ring (16), spacer (15), retainer (18), spring (19) and ball (20) from cartridge (21). Discard preformed packing.



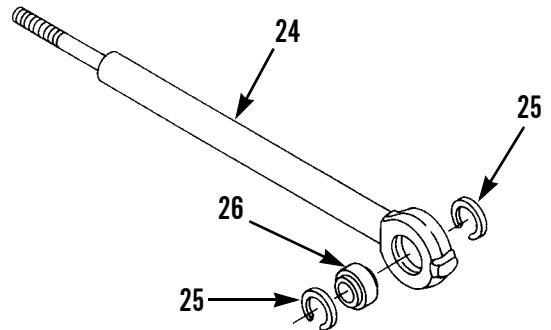
**DISASSEMBLY - CONTINUED**

13. Remove retainer (22) from rod assembly.
14. Using driver and hammer, remove and discard wiper (23) from retainer (22).



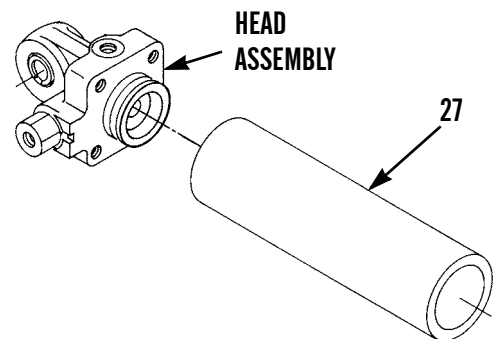
394-959

15. Remove two rings (25).
16. If bearing (26) is damaged, use pipe and hammer to remove bearing (26) from rod (24).



394-960

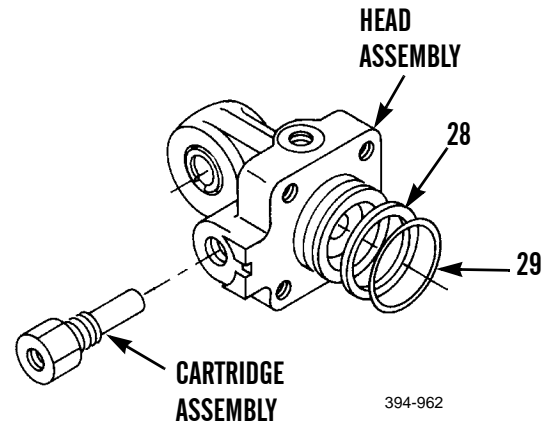
17. Remove head assembly from tube (27).



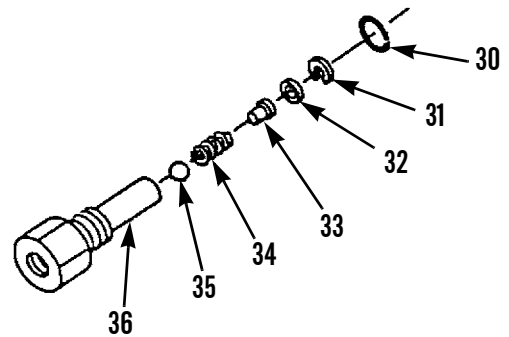
394-961

**DISASSEMBLY - CONTINUED**

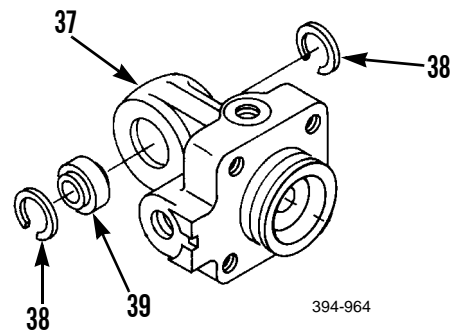
18. Remove preformed packing (29) and ring (28). Discard preformed packing.
19. Remove cartridge assembly from head assembly.



20. Remove preformed packing (30), retainer ring (31), spacer (32), retainer (33), spring (34) and ball (35) from cartridge (36). Discard preformed packing.



21. Remove two rings (38).
22. Use pipe and hammer to remove bearing (39) from head (37).



**CLEANING AND INSPECTION**



**WARNING**

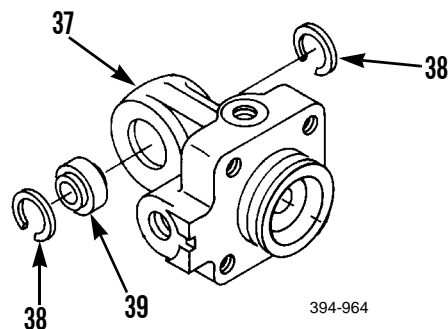


- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by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

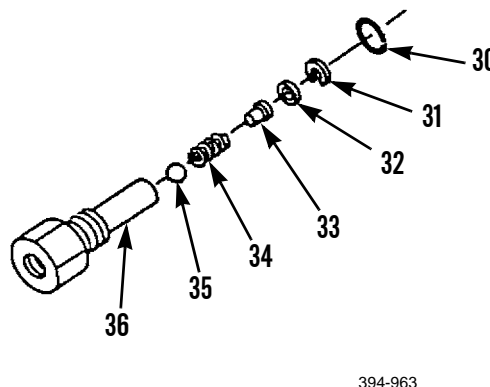
1. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install one of two rings (38) in head (37).
2. Use pipe and hammer to install bearing (39) until it is against one of two rings (38).
3. Install remaining ring (38).



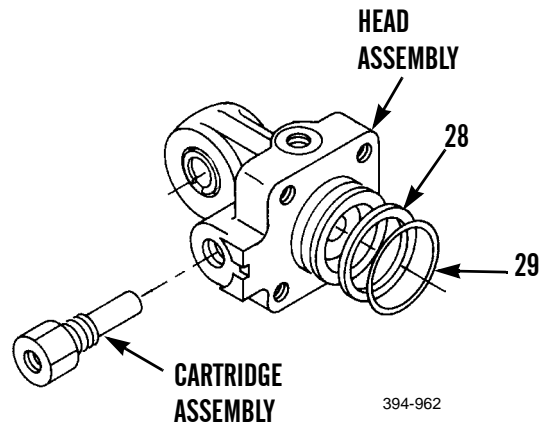
4. Install ball (35), spring (34), retainer (33), spacer (32), retainer ring (31) and new preformed packing (30) in cartridge (36).



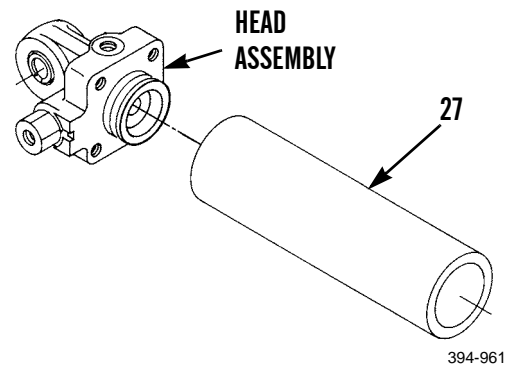


**ASSEMBLY - CONTINUED**

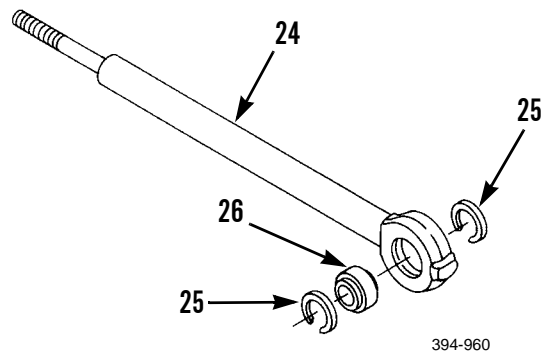
5. Install cartridge assembly in head assembly.
6. Install ring (28) and new preformed packing (29).
7. Use clean lubricating oil to lubricate ring (28) and new preformed packing (29).



8. Install head assembly in tube (27).

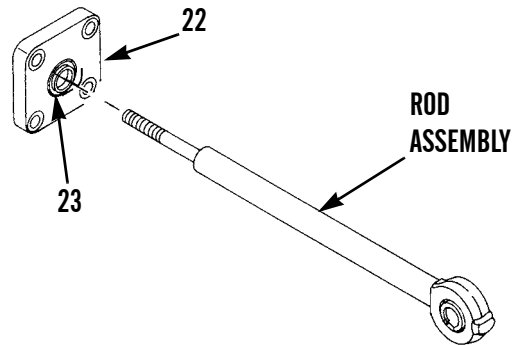


9. Install one of two rings (25) in rod (24).
10. Use pipe and hammer to install bearing (26) until it is against one of two rings (25).
11. Install remaining ring (25).



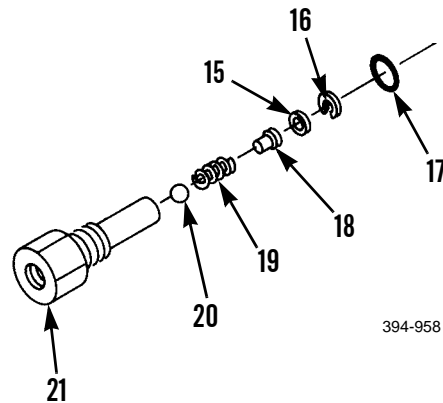
**ASSEMBLY - CONTINUED**

12. Use clean lubricating oil to lubricate lip of new wiper (23).
13. Use driver and hammer to install new wiper (23), with lip facing out, in retainer (22).
14. Install retainer (22) on rod assembly.



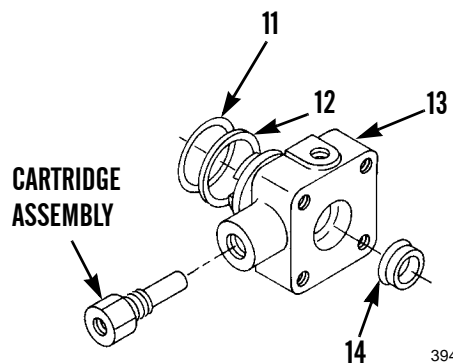
394-959

15. Install ball (20), spring (19), retainer (18), spacer (15), retainer ring (16) and new preformed packing (17) in cartridge (21).



394-958

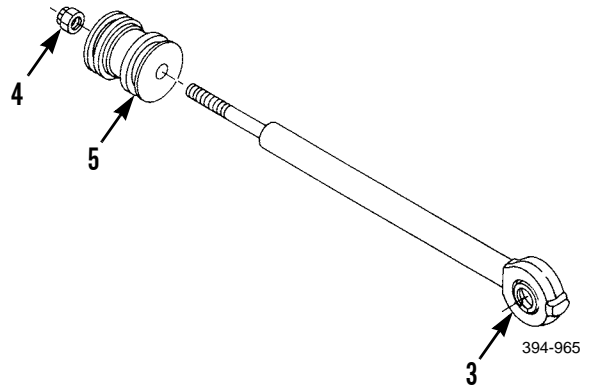
16. Install cartridge assembly in head (13).
17. Use driver and hammer to install new seal (14), with opening facing in.
18. Install ring (12) and new preformed packing (11).



394-957

**ASSEMBLY - CONTINUED**

19. Attach rod assembly (3) eye in soft-jawed vise.
20. Install piston (5) and nut (4) on rod assembly.



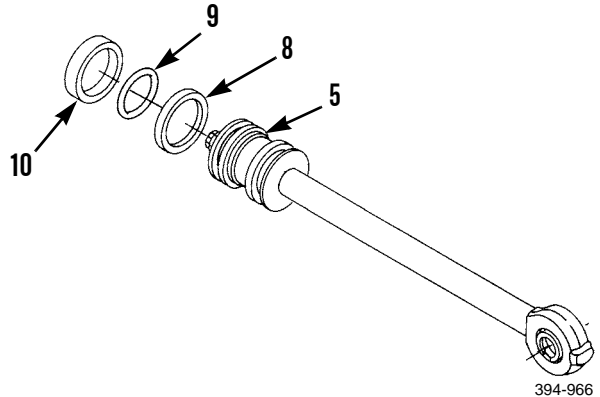
**CAUTION**

Use care when installing new seals. Outside diameter and both sides must be free of nicks, cuts, burrs and all other imperfections.

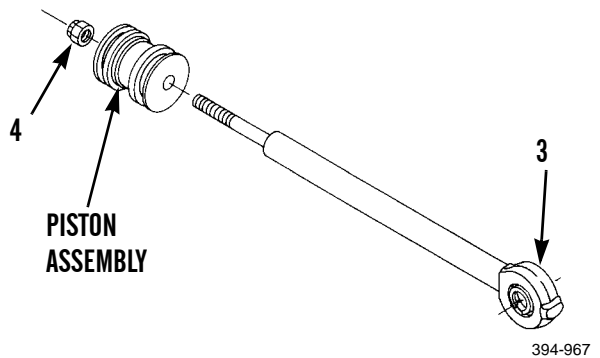
**NOTE**

Heat new seals in 180°F (82°C) water for 10 minutes to soften seal surfaces and aid in installation.

21. Install new ring (8), new preformed packing (9) and new seal (10) on piston (5).

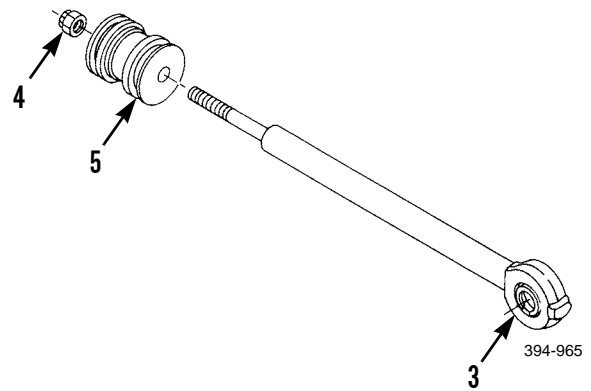


22. Remove nut (4) and piston assembly from rod assembly (3).

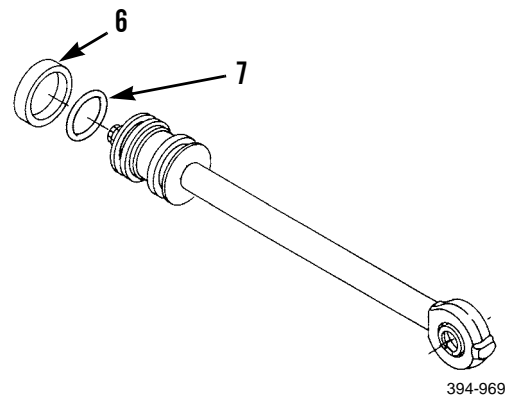


**ASSEMBLY - CONTINUED**

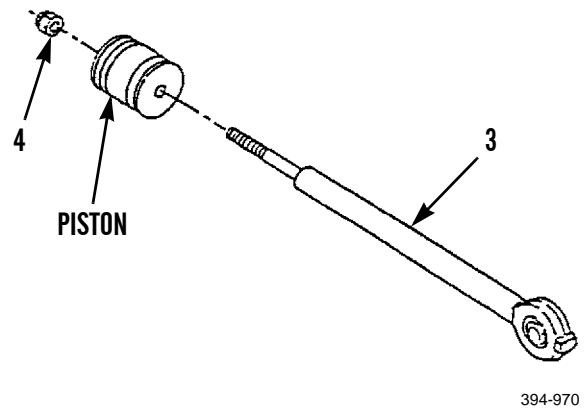
23. Install piston assembly (5) with empty seal groove facing up on rod assembly (3).
24. Install nut (4).



25. Install new preformed packing (7) and new seal (6).

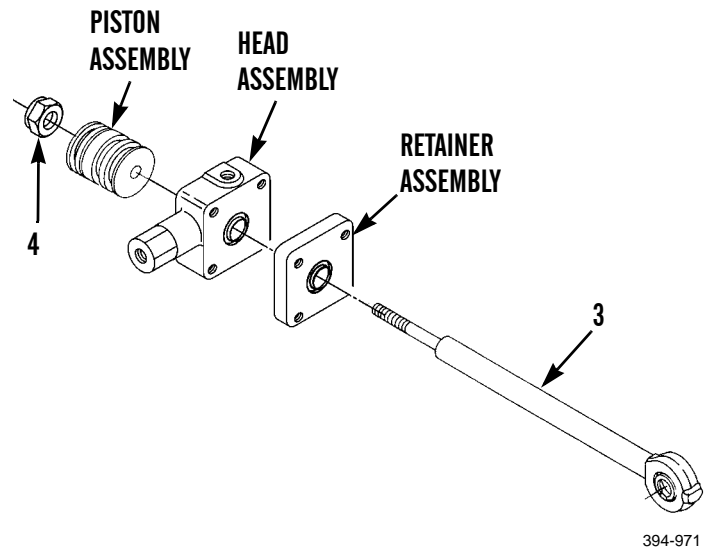


26. Remove nut (4) and piston assembly from rod assembly (3).

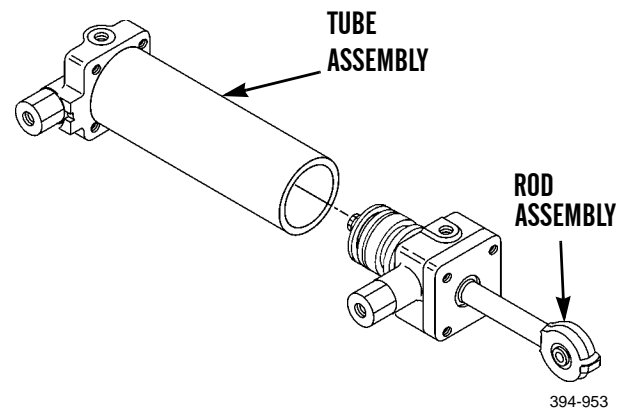


**ASSEMBLY - CONTINUED**

27. Install retainer assembly, head assembly, piston assembly and nut (4) on rod assembly (3). Torque nut (4) to 50 lb-ft (68 Nm).
28. Attach rod assembly in a soft-jawed vise.

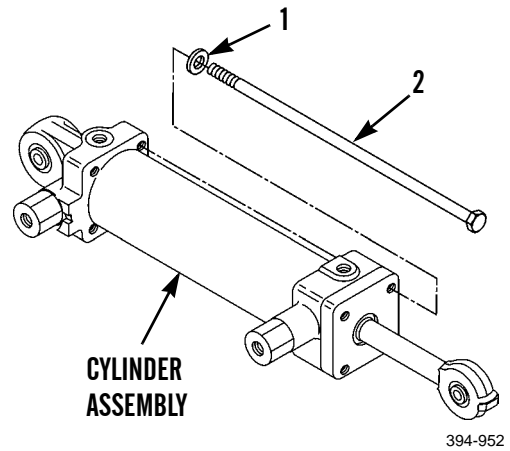


29. Use a soft hammer to install rod assembly in tube assembly, with rod fully extended.



**ASSEMBLY - CONTINUED**

30. Install four washers (1) and bolts (2) on cylinder assembly.



31. Install hydraulic steering servo-receiver cylinder (WP 0311 00).
32. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

---

**HYDRAULIC STEERING SERVO-RECEIVER CYLINDER REPLACEMENT**

---

0311 00

**THIS WORK PACKAGE COVERS**

Removal, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**Materials/Parts - Continued**

Packing, preformed (4)

Pin, cotter (2)

**References**

WP 0202 00

**Equipment Condition**

Hydraulic tank drained (WP 0229 00)

Retarder oil cooler assembly removed (WP 0291 00)

Hood removed (WP 0189 00)

---

**REMOVAL****WARNING**

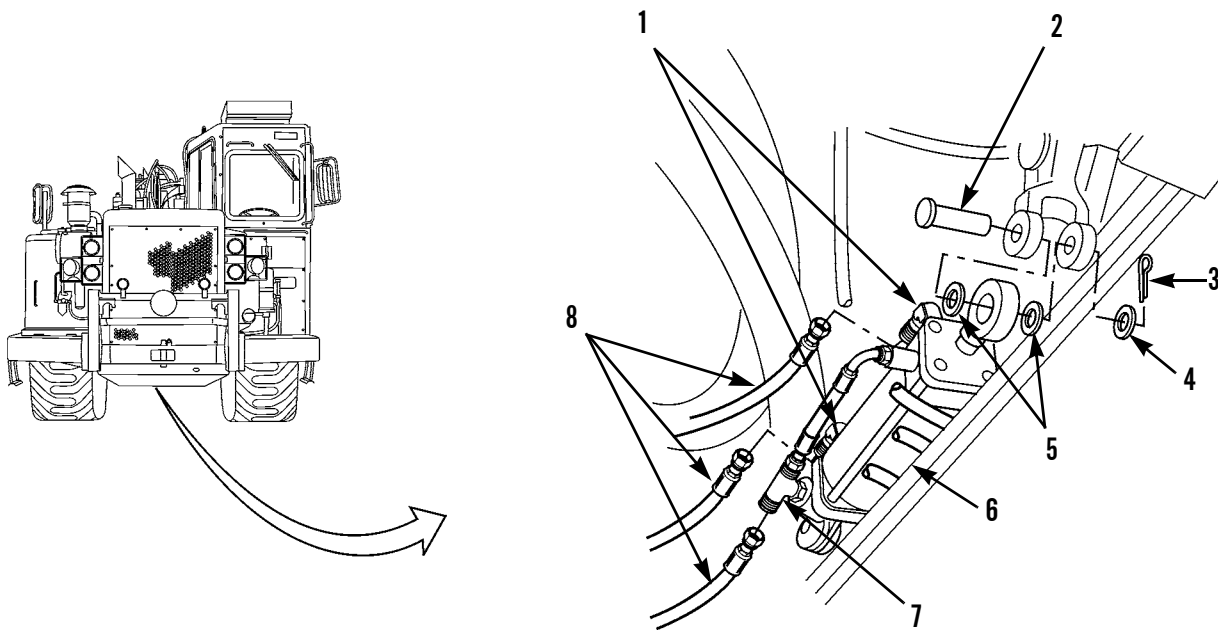
- Do not remove hydraulic tank filler cap or disconnect or remove any hydraulic system line or fitting unless hydraulic system pressure has been relieved. Hydraulic system pressure can be over 2,500 psi (17,237 kPa), even with engine and pump off. To relieve pressure, lower all hydraulic attachments 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 skin, causing injury or death.
- Hydraulic oil is very slippery. Immediately wipe up any spills. Failure to follow this warning may cause injury.

**REMOVAL - CONTINUED****CAUTION**

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

**NOTE**

- Use a container to capture draining hydraulic oil. Dispose of hydraulic oil IAW local policy and ordinances. Ensure all spills are cleaned up.
  - Tag hose and tube assemblies prior to removal to ensure correct installation.
1. Disconnect three hose assemblies (8) from two elbows (1) and tee (7) on hydraulic steering servo-receiver cylinder assembly (6).
  2. Remove cotter pin (3), washer (4), pin (2) and two spacers (5) from hydraulic steering servo-receiver cylinder assembly (6). Discard cotter pin.

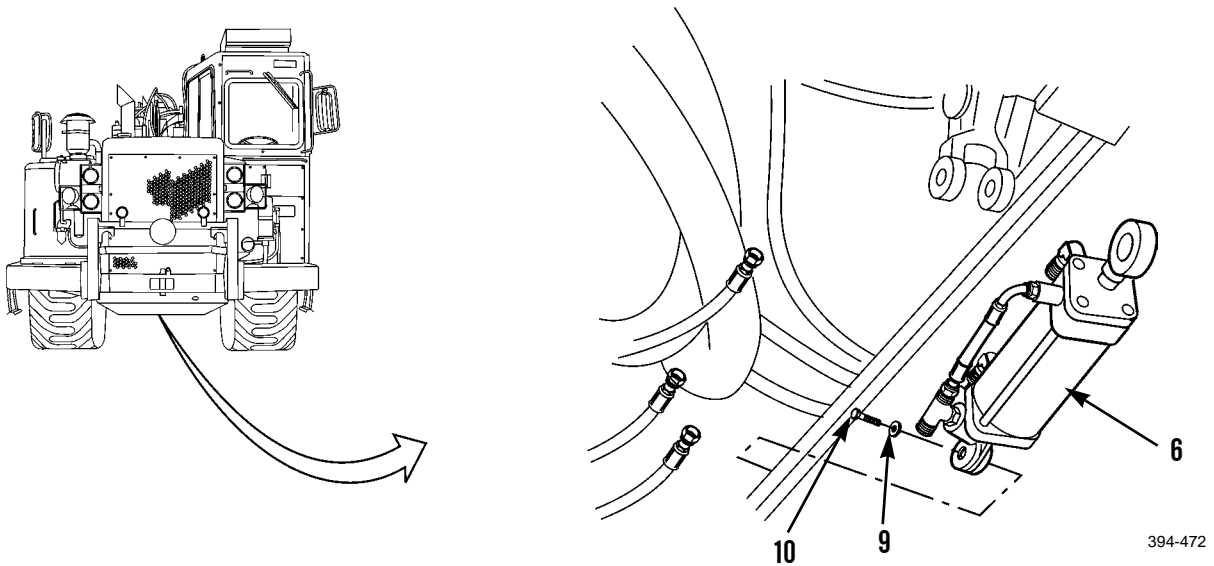


394-471

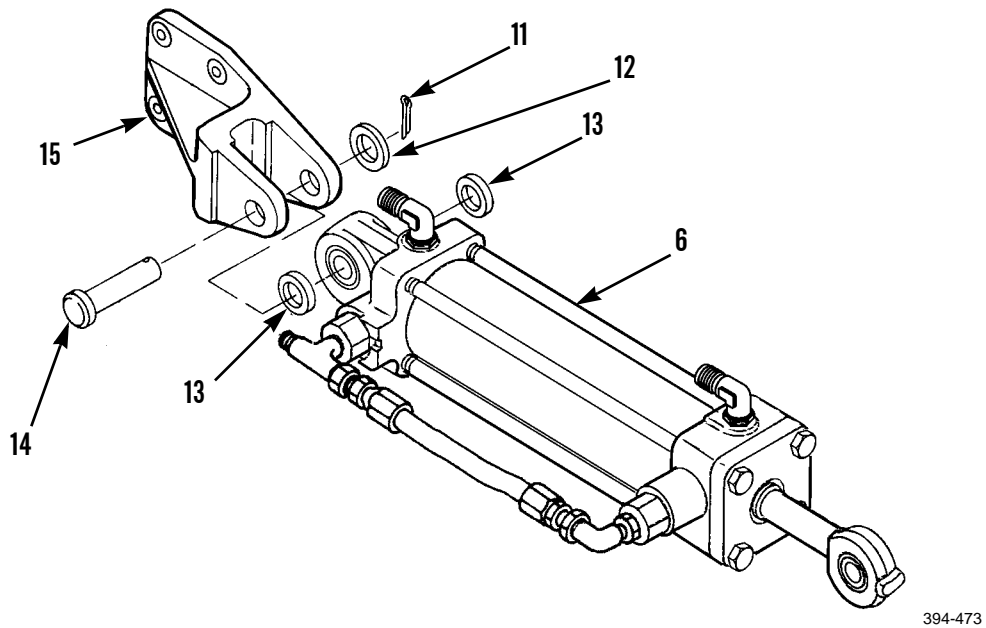


**REMOVAL - CONTINUED**

3. Remove four bolts (10) and washers (9).
4. Remove hydraulic steering servo-receiver cylinder assembly (6).

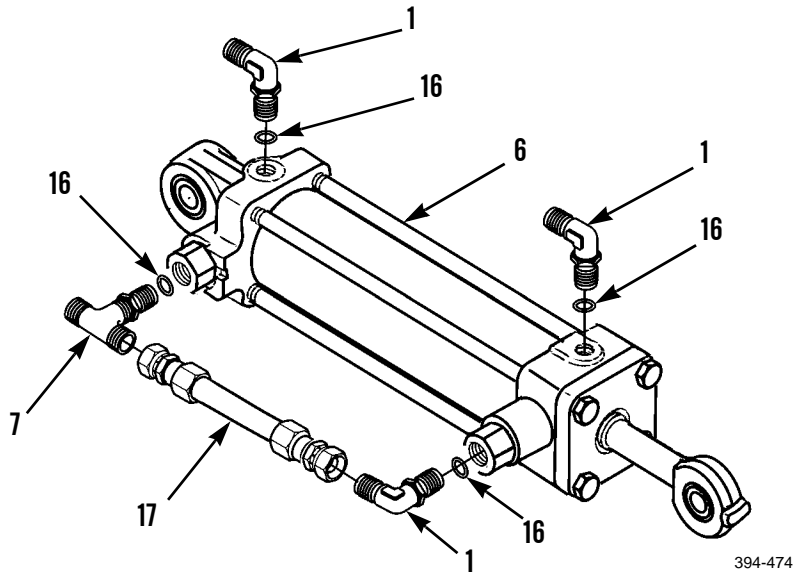


5. Remove cotter pin (11), washer (12), pin (14), support (15) and two spacers (13) from hydraulic steering servo-receiver cylinder assembly (6). Discard cotter pin.



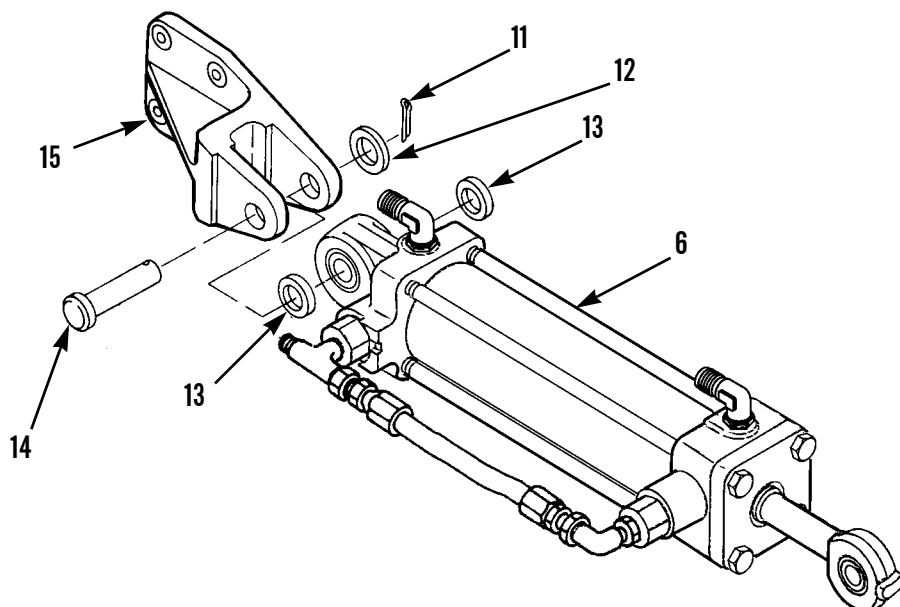
**REMOVAL - CONTINUED**

6. Disconnect hose assembly (17) from elbow (1) and tee (7) and remove hose from hydraulic steering servo-receiver cylinder assembly (6).
7. Remove three elbows (1), tee (7) and four preformed packings (16). Discard preformed packings.



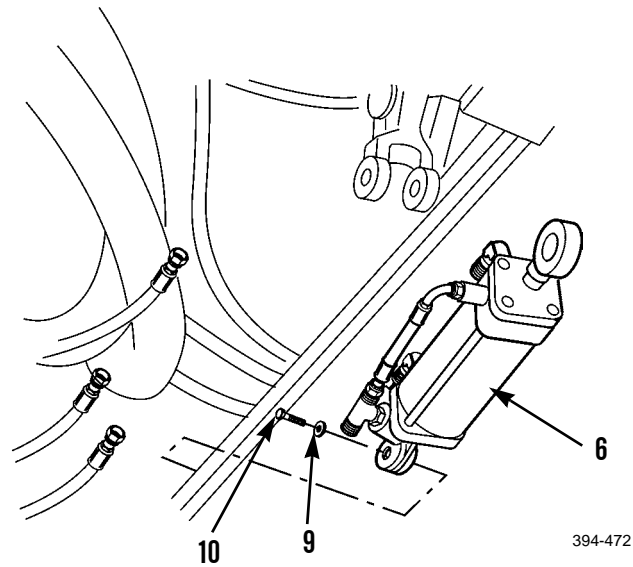
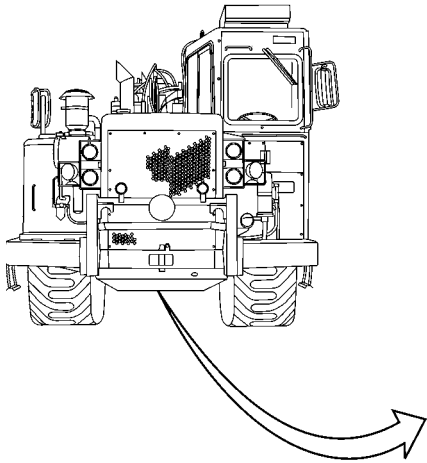
**INSTALLATION**

1. Install four new preformed packings (16), three elbows (1) and tee (7) on hydraulic steering servo-receiver cylinder assembly (6).
2. Install two spacers (13), support (15), pin (14), washer (12) and new cotter pin (11).

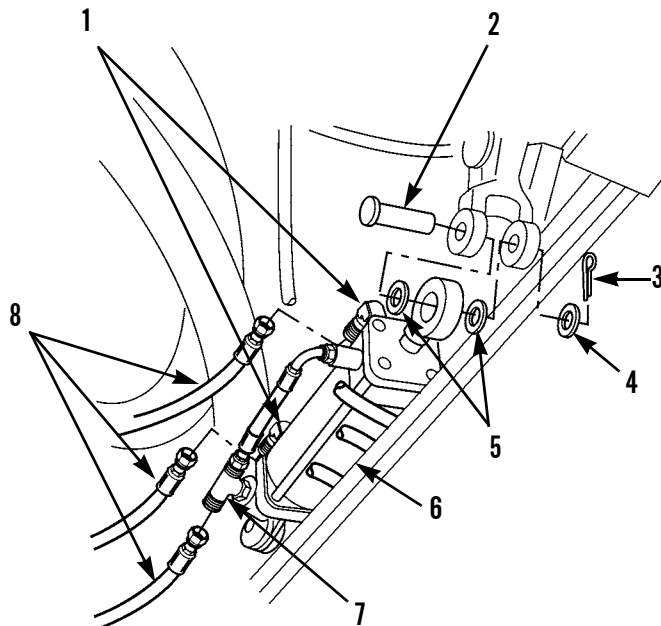
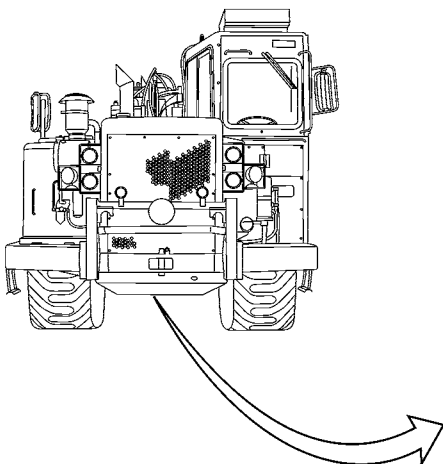


**INSTALLATION - CONTINUED**

3. Install hydraulic steering servo-receiver cylinder assembly (6) on machine.
4. Install four washers (9) and bolts (10).



5. Install two spacers (5), pin (2), washer (4) and new cotter pin (3).
6. Connect three hose assemblies (8) to tee (7) and two elbows (1) on hydraulic steering servo-receiver cylinder assembly (6).



***INSTALLATION - CONTINUED***

7. Install retarder oil cooler assembly (WP 0291 00).
8. Bleed follow-up circuit (WP 0202 00).
9. Refill hydraulic tank to proper level (TM 5-3805-248-10).
10. Start engine (TM 5-3805-248-10).
11. Operate steering. Move system through at least five full movements of travel. This will bleed air from system.
12. Shut down engine (TM 5-3805-248-10).
13. Check oil level in hydraulic tank and add if necessary (TM 5-3805-248-10).
14. Inspect all hose and tube assemblies for leaks.
15. Install hood (WP 0189 00).

**END OF WORK PACKAGE**

---

**STEERING CONTROL VALVE MAINTENANCE**

---

**0312 00****THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Testing

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop Equipment, field maintenance (Item 104, WP 0338 00)

Handle, transfer pump (Item 36, WP 0338 00)

Inserter, bearing and bushing (Item 43, WP 0338 00)

Puller kit (Item 83, WP 0338 00)

Lifting device, 100 lb minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packings, preformed (21)

Seal (3)

**Personnel Required**

Two

**References**

WP 0175 00

WP 0183 00

WP 0231 00

TM 5-3805-248-10

**Equipment Condition**

Hydraulic tank drained (WP 0229 00)

Steering control valve hoses and tubes disconnected (WP 0180 00)

Mechanical linkage removed (WP 0179 00)

---

**REMOVAL****CAUTION**

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

**NOTE**

- Use a container to capture draining hydraulic oil. Dispose of hydraulic oil IAW local policy and ordinances. Ensure all spills are cleaned up.
  - Tag hose and tube assemblies prior to removal to ensure correct installation.
  - Note routing of all hose assemblies prior to removal to ensure correct installation.
  - Remove and note location of all clips that secure hose assemblies to ensure correct installation.
1. Remove three bolts (1) and washers (2) from steering control valve (5).

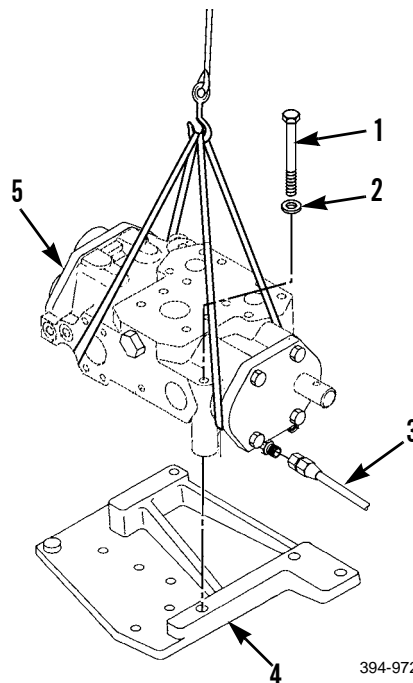
**WARNING**

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**

Steering control valve assembly weighs 52 lb (24 kg).

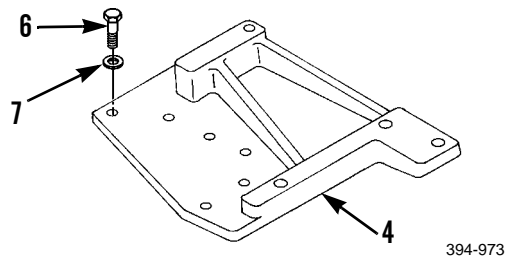
2. Install lifting device on steering control valve (5).
3. Use lifting device to lift steering control valve (5) 4 in. (10 cm).
4. Disconnect hose assembly (3) from steering control valve (5).
5. Use lifting device to remove steering control valve (5) from machine.
6. Remove lifting device from steering control valve (5).



394-972

**REMOVAL - CONTINUED**

7. Remove six bolts (6), washers (7) and support (4) from machine.



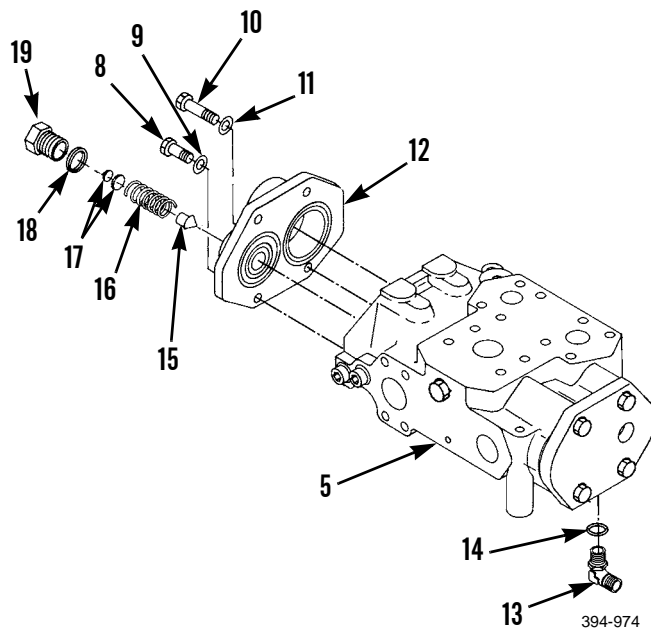
**DISASSEMBLY**



**WARNING**

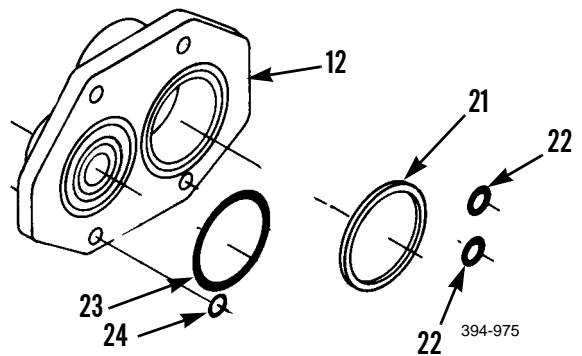
Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

1. Remove elbow (13) and preformed packing (14). Discard preformed packing.
2. Remove plug (19), preformed packing (18), two shims (17), spring (16) and valve (15) from steering control valve (5). Discard preformed packing.
3. Remove two capscrews (9) and washers (8) from steering control valve (5).
4. Remove two capscrews (10) and washers (11) from steering control valve (5).
5. Separate valve cap (12) from steering control valve (5).

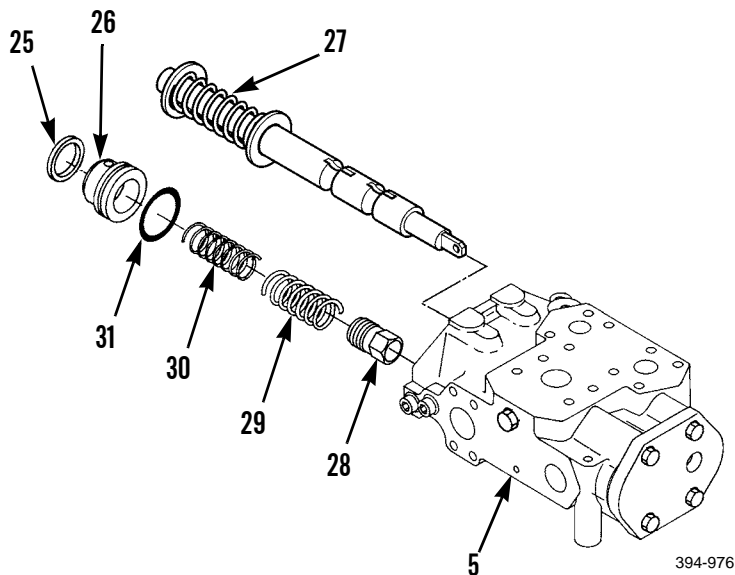


**DISASSEMBLY - CONTINUED**

6. Remove and discard preformed packings (24, 21 and 23) and two preformed packings (22) from cover (12).



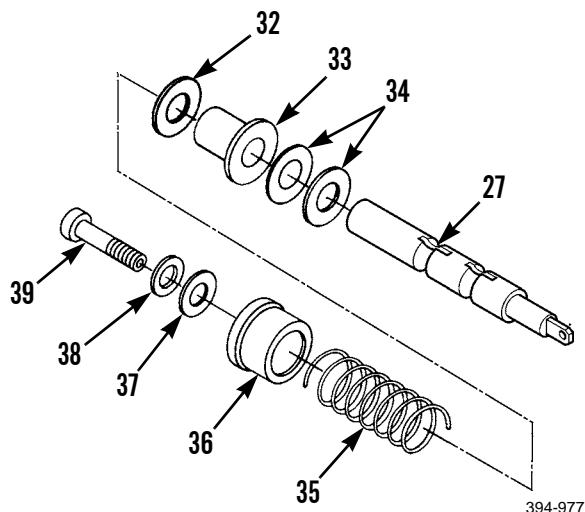
7. Remove pilot (25), seat (26) and seal (31) from steering control valve (5). Discard seal.
8. Remove springs (30 and 29) and valve (28) from steering control valve (5).
9. Remove valve stem (27) from steering control valve (5).



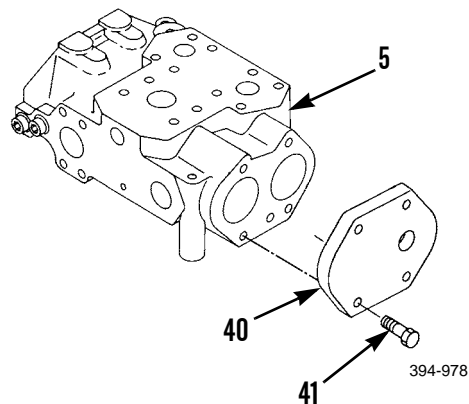


**DISASSEMBLY - CONTINUED**

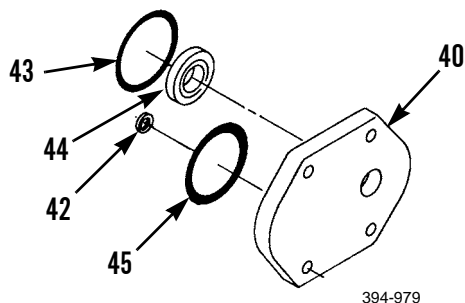
10. Compress spring (35) with retainer (36) from valve stem (27).
11. Remove bolt (39) and washers (37 and 38) from valve stem (27).
12. Separate retainer (36), spring (35), washer (32), retainer (33) and two shims (34) from valve stem (27).



13. Remove four bolts (41) and cover (40) from steering control valve (5).

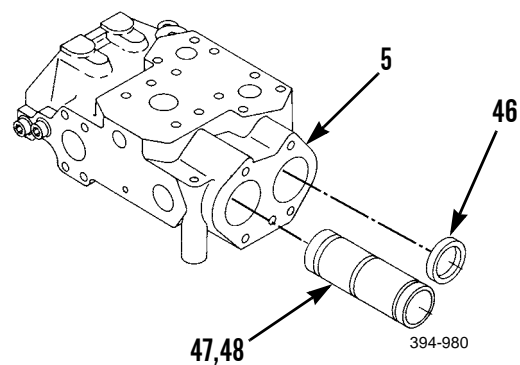


14. Remove and discard preformed packings (45, 43 and 42) from cover (40).
15. Use driver and hammer to remove and discard seal (44) from cover (40).

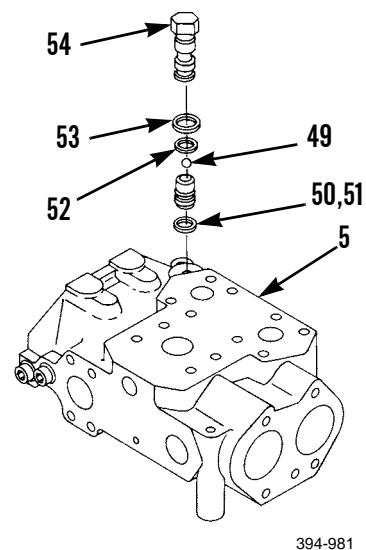


**DISASSEMBLY - CONTINUED**

16. Remove pilot (46) from steering control valve (5).
17. Remove spacer (47) and seal (48) from steering control valve (5). Discard seal.

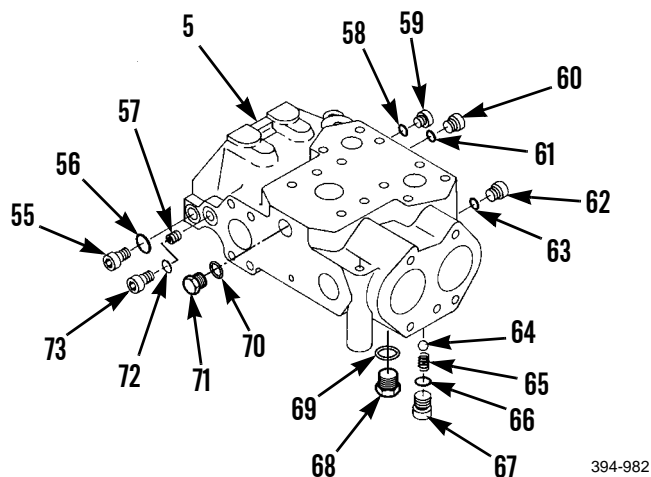


18. Remove plug (54), preformed packings (52 and 53) and ball (49) from steering control valve (5). Discard preformed packings.
19. Use puller group to remove seat (50) from steering control valve (5).
20. Remove and discard preformed packing (51) from seat (50).



**DISASSEMBLY - CONTINUED**

21. Remove plug (59) and preformed packing (58) from steering control valve (5). Discard preformed packing.
22. Remove plug (60) and preformed packing (61) from steering control valve (5). Discard preformed packing.
23. Remove plug (62) and preformed packing (63) from steering control valve (5). Discard preformed packing.
24. Remove plug (67), preformed packing (66), spring (65) and ball (64) from steering control valve (5). Discard preformed packing.
25. Remove plug (68) and preformed packing (69) from steering control valve (5). Discard preformed packing.
26. Remove plug (71) and preformed packing (70) from steering control valve (5). Discard preformed packing.
27. Remove plug (73), preformed packing (72) and plug (57) from steering control valve (5). Discard preformed packing.
28. Remove plug (55) and preformed packing (56) from steering control valve (5). Discard preformed packing.

**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 cause 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.

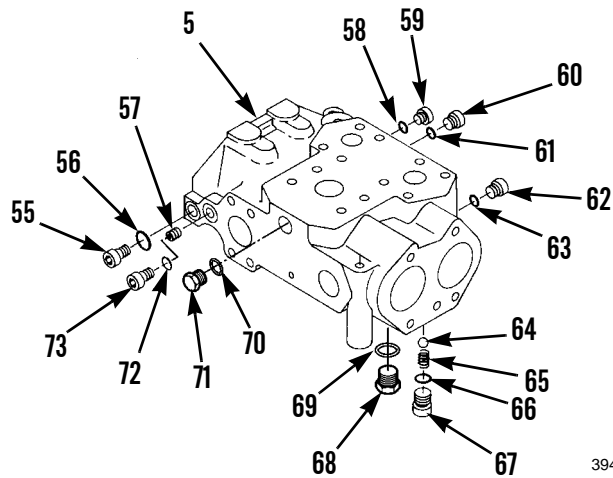
1. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

**NOTE**

Lubricate all internal moving parts of steering control valve with clean lubricating oil before assembly.

1. Install new preformed packing (56) and plug (55) in steering control valve (5). Torque plug to 10 lb-ft (14 Nm).
2. Install plug (57), new preformed packing (72) and plug (73) in steering control valve (5).
3. Install new preformed packing (70) and plug (71) in steering control valve (5).
4. Install new preformed packing (69) and plug (68) in steering control valve (5).
5. Use clean lubricating oil to lubricate ball (64) and spring (65) in steering control valve (5).
6. Install ball (64), spring (65), new preformed packing (66) and plug (67) in steering control valve (5).
7. Install new preformed packing (63) and plug (62) in steering control valve (5).
8. Install new preformed packing (61) and plug (60) in steering control valve (5).
9. Install new preformed packing (58) and plug (59) in steering control valve (5).



394-982

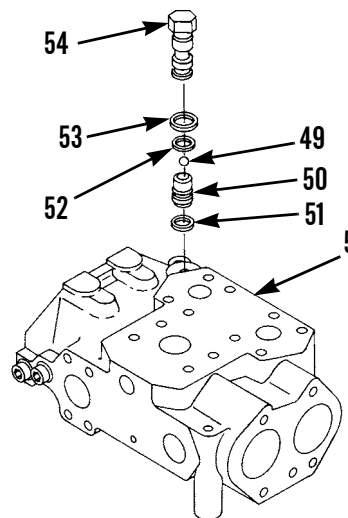
**ASSEMBLY - CONTINUED**

10. Install new preformed packing (51) on seat (50).

**NOTE**

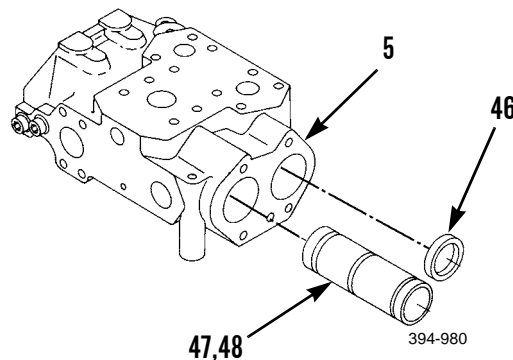
Lubricate bore of body with clean lubricating oil before installing seat.

11. Install seat (50), inserting preformed packing (51) end first.
12. Install ball (49) in seat (50).
13. Install new preformed packings (52 and 53) and plug (54) in steering control valve (5).



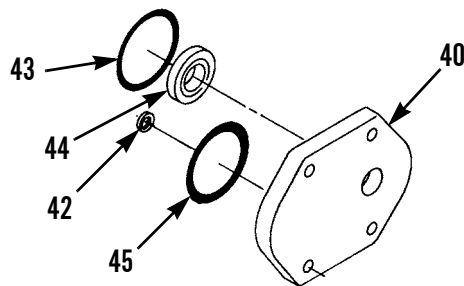
394-981

14. Install new seal (48) on spacer (47).
15. Use clean lubricating oil to lubricate bore of steering control valve (5) before installing spacer (47).
16. Install spacer (47) in steering control valve (5).
17. Install pilot (46) in steering control valve (5) until seated against counterbore.



394-980

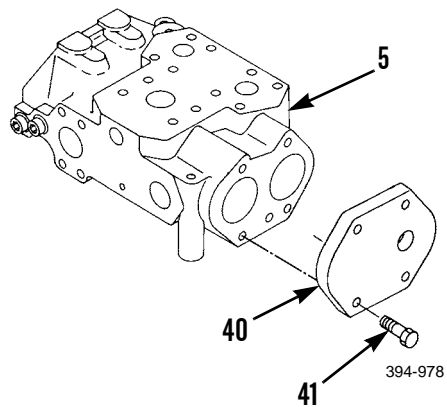
18. Use driver and hammer to install new seal (44) until lip of new seal (44) meets counterbore and is facing outside of cover (40).
19. Use clean lubricating oil to lubricate lip of new seal (44).
20. Install new preformed packings (45, 43 and 42) in cover (40).



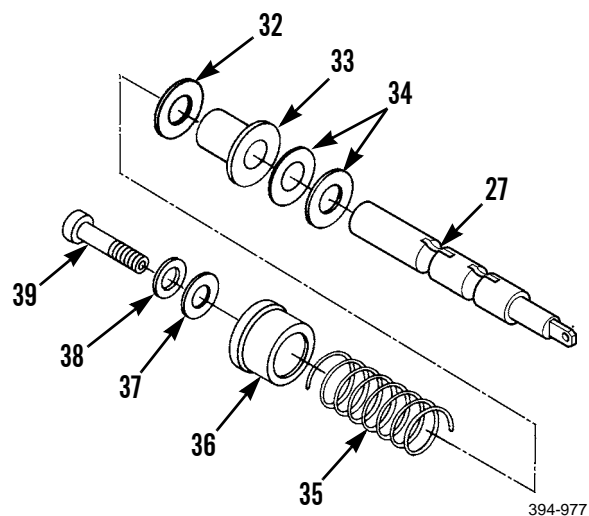
394-979

**ASSEMBLY - CONTINUED**

21. Install cover (40) on steering control valve (5).
22. Install four bolts (41) in cover (40).

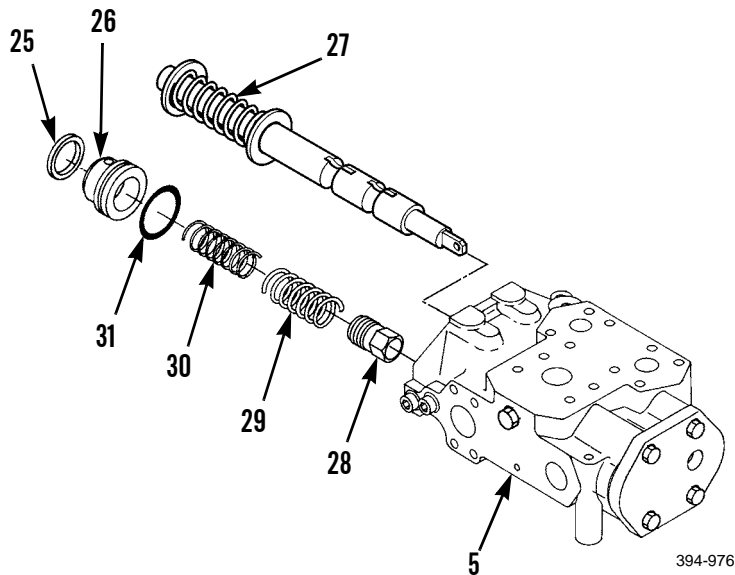


23. Install two shims (34), retainer (33), washer (32), spring (35) and retainer (36) on valve (27).
24. Install washers (38 and 37) and bolt (39) on valve (27).

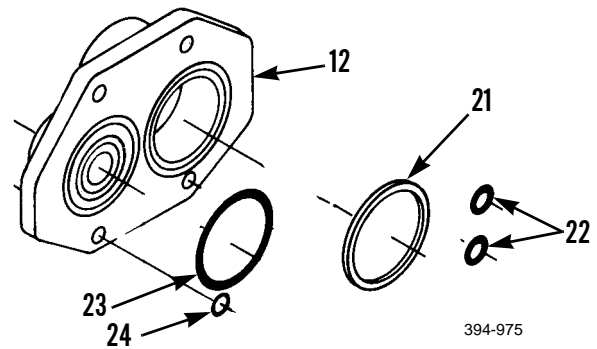


**ASSEMBLY - CONTINUED**

25. Use clean lubricating oil to lubricate bore in steering control valve (5) before installing valve (27).
26. Install valve (27) in steering control valve (5).
27. Install springs (30 and 29) in valve (28).
28. Use clean lubricating oil to lubricate seat (26).
29. Install new seal (31) and seat (26) on valve (28).
30. Install valve (28) assembly and pilot (25) in steering control valve (5).

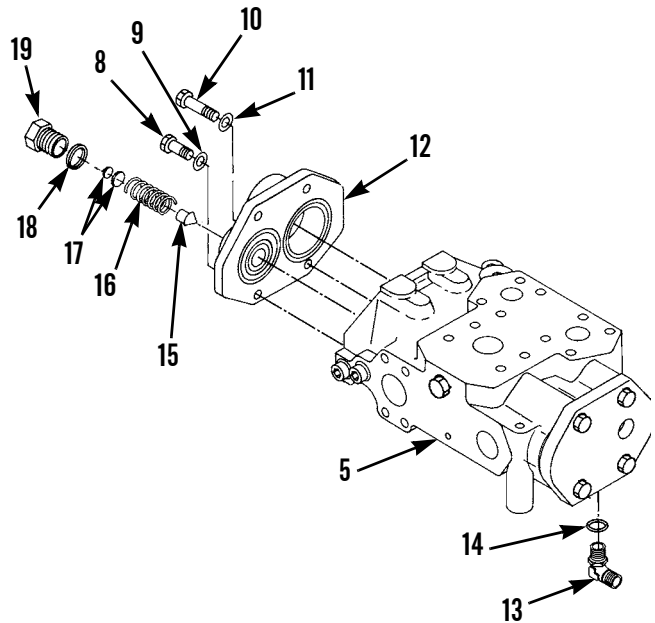


31. Install two new preformed packings (22) and new preformed packings (24, 21 and 23) in cover (12).



**ASSEMBLY - CONTINUED**

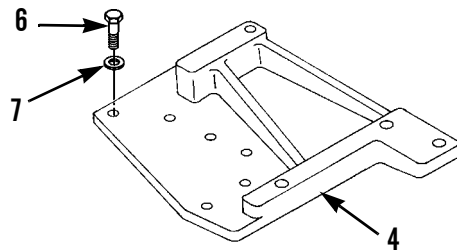
32. Install cover (12) on steering control valve (5).
33. Install two washers (11) and capscrews (10) in steering control valve (5).
34. Install two washers (9) and capscrews (8) in steering control valve (5).
35. Install valve (15), pointed end first, in steering control valve (5).
36. Install spring (16), shims (17), new preformed packing (18) and plug (19) in steering control valve (5).
37. Install new preformed packing (14) and elbow (13) in steering control valve (5).



394-974

**INSTALLATION**

1. Install support (4), six washers (7) and bolts (6) on machine.



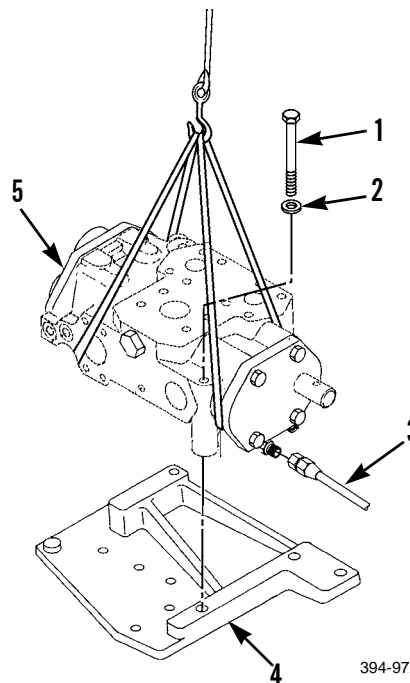
394-973



**INSTALLATION - CONTINUED****WARNING**

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.

2. Install lifting device on steering control valve (5).
3. Use lifting device to position steering control valve (5) as an assembly 4 in. (10 cm) above support (4).
4. Connect hose assembly (3) to elbow.
5. Use lifting device to position steering control valve (5), with hose assembly (3) attached, on support (4).
6. Remove lifting device.
7. Install three washers (2) and bolts (1) in steering control valve (5).



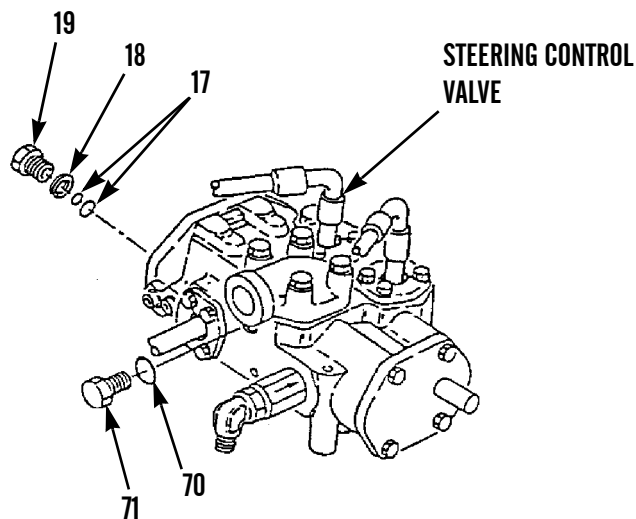
394-972

8. Connect all steering control valve hose and tube assemblies (WP 0180 00).

**TESTING RELIEF VALVE****NOTE**

Hydraulic pressure must be vented before beginning testing and adjustment procedures (WP 0231 00).

1. Remove plug (71) and preformed packing (70). Discard preformed packing.
2. Connect hydraulic pressure gage in plug (71) hole.



394-983

3. Operate engine (TM 5-3805-248-10).
4. Operate engine at high idle.
5. Test oil pressure at steering control valve. Gage must read 110-140 psi (758-965 kPa).
6. Turn steering full right and hold.
7. Record pressure at steering control valve. Gage must read approximately 2,250 psi (15,513 kPa). Refer to step 14 if reading is incorrect.
8. Shut down engine (TM 5-3805-248-10).

**WARNING**

Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

9. Remove plug (19) and preformed packing (18). Discard preformed packing.
10. Adjust steering control valve. Add shim(s) (17) to increase pressure and remove shim (17) to decrease pressure. See Table 1 for shim size and pressure change.

**TESTING RELIEF VALVE - CONTINUED****Table 1. Pressure Change for One Shim.**

Part Number	Thickness	Change in Pressure
3H2549	0.010 in. (0.254 mm)	40 psi (276 kPa)
3J7473	0.005 in. (0.127 mm)	20 psi (138 kPa)

11. Install new preformed packing (18) and plug (19).

**NOTE**

Repeat steps 3 through 11 to verify correct adjustment.

12. Remove hydraulic pressure gage from steering control valve.
13. Install new preformed packing (70) and plug (71).
14. Adjust valve spool travel (WP 0175 00).

**NOTE**

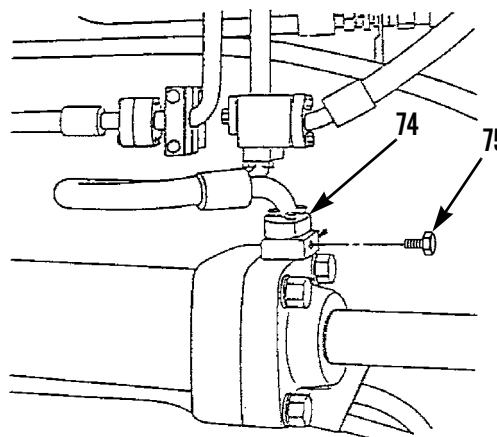
This task can be made with one gage by testing steering cylinders one at a time. If only one hydraulic pressure gage is used, remove only one of two valves at a time.

15. Remove two valves (75) from two steering cylinder blocks (74).
16. Install two pressure gages into two steering cylinder blocks (74).

**CAUTION**

Do not turn steering wheel when the engine is running and a low pressure hydraulic pressure gage is installed in the steering circuit. If the steering wheel is turned, the pressure of the oil to the steering cylinders will be too high for a low pressure hydraulic pressure gage.

17. Operate engine (TM 5-3805-248-10).
18. Test oil pressure. Gages must read between 40 and 70 psi.
19. Record pressure. If the difference between the two gages is more than 205 psi, refer to step 14 for adjusting valve spool travel.
20. Shut down engine (TM 5-3805-248-10).
21. Remove two hydraulic pressure gages.
22. Install two valves (75) and torque to 24 lb-ft (35 Nm).



394-984

---

**STEERING CONTROL VALVE MAINTENANCE - CONTINUED**

---

**0312 00*****TESTING RELIEF VALVE - CONTINUED***

23. Operate engine (TM 5-3805-248-10).
24. Turn steering wheel full right and hold.
25. Open valves (75). Keep valves open until only oil, with no air, runs out.
26. Close valves (75).
27. Turn steering wheel full left and hold.
28. Repeat steps 26 and 27. Torque valves (75) to 24 lb-ft (35 Nm).
29. Bleed air from follow-up steering circuit (WP 0183 00).
30. Fill hydraulic tank (WP 0229 00).
31. Install mechanical linkage (WP 0179 00).
32. Operate machine and check for leaks (TM 5-3805-248-10).
33. Verify correct steering operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**HITCH LINKS MAINTENANCE**

0313 00

**THIS WORK PACKAGE COVERS**

Removal, Cleaning, Inspection, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Lifting device, 500 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Grease, GAA (Item 20, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**References**

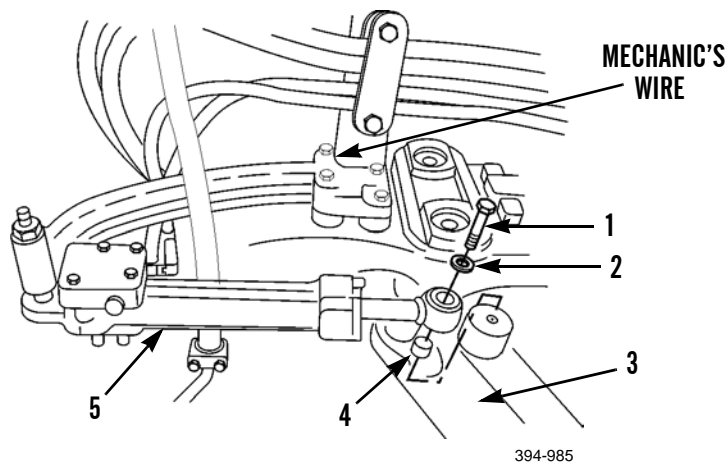
TM 5-3805-248-10

**Equipment Condition**

Hydraulic tank pressure vented (WP 0231 00)

**REMOVAL**

1. Secure steering servo-sender cylinder (5) at rod end with mechanic's wire and remove bolt (1) and washer (2).
2. Disconnect rod on steering servo-sender cylinder (5) from link (3) on left side of machine only.
3. Remove spacer (4) from steering servo-sender cylinder (5).



**REMOVAL - CONTINUED****NOTE**

The following is a maintenance procedure for the left steering link assembly. The maintenance procedure for the right steering link assembly is identical.

4. Remove four bolts (13), washers (14), two yokes (12) and pin (6).

**NOTE**

Keep pin wrapped in a clean cloth to prevent damage to surface of pin.

5. Secure steering cylinder (8) and disconnect rod end of steering cylinder (8) from links (3 and 7).

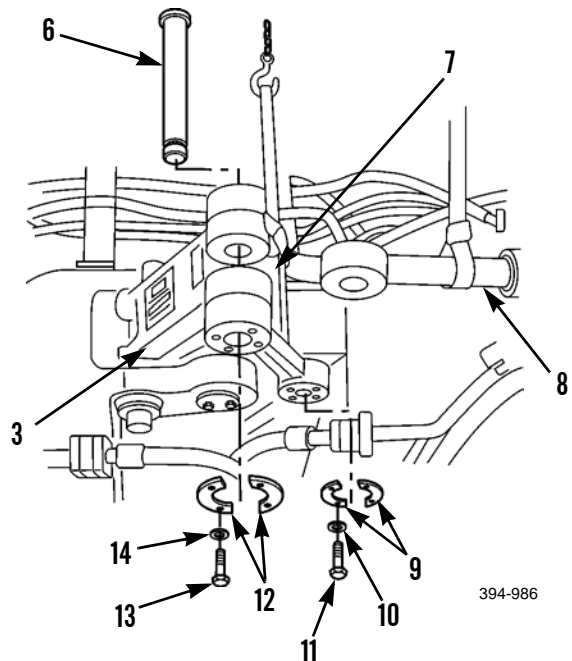
**WARNING**

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**

Link weighs 90 lb (41 kg).

6. Install lifting device to link (7).
7. Remove four bolts (11), washers (10) and two yokes (9) from link (7).



394-986

## HITCH LINKS MAINTENANCE - CONTINUED

0313 00

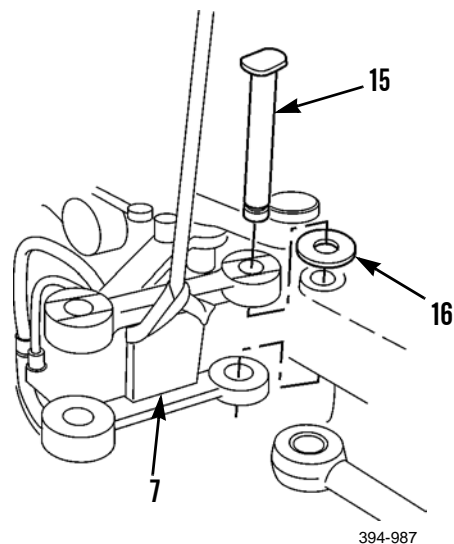
**REMOVAL - CONTINUED**

8. Remove pin (15) from link (7).

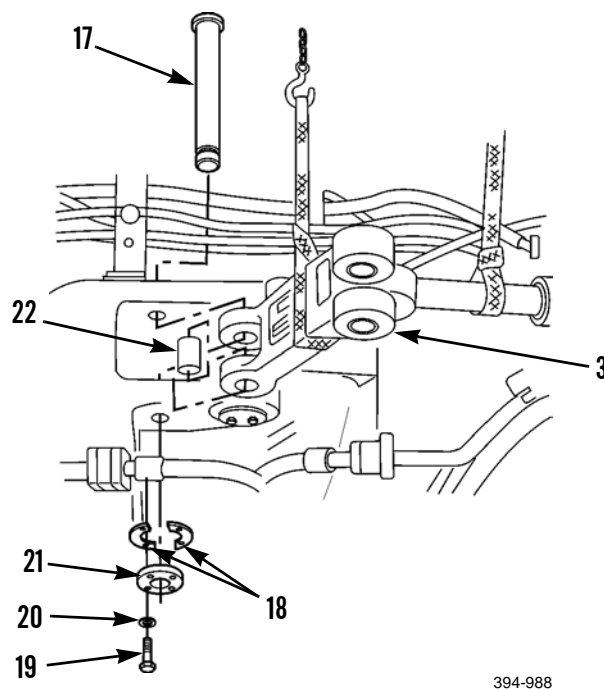
**NOTE**

Keep pin wrapped in a clean cloth to prevent damage to surface of pin.

9. Use lifting device to remove link (7) from machine.  
 10. Remove lifting device from link (7).  
 11. Remove washer (16) from draft frame.



12. Install lifting device to link (3).  
 13. Remove four bolts (19), washers (20), lock (21), two yokes (18) and pin (17).  
 14. Remove spacer (22) from link (3).  
 15. Use lifting device to remove link (3).  
 16. Remove lifting device from link (3).



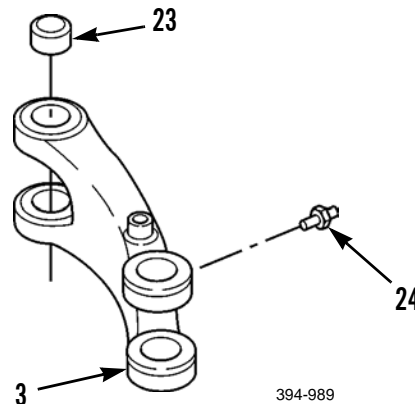
**REMOVAL - CONTINUED**

17. If damaged, remove four lubrication fittings (24) from link (3).

**NOTE**

Remove bearings only if inspection indicates replacement is necessary.

18. If necessary, use puller to remove and discard four bearings (23) from link (3).

**CLEANING****WARNING**

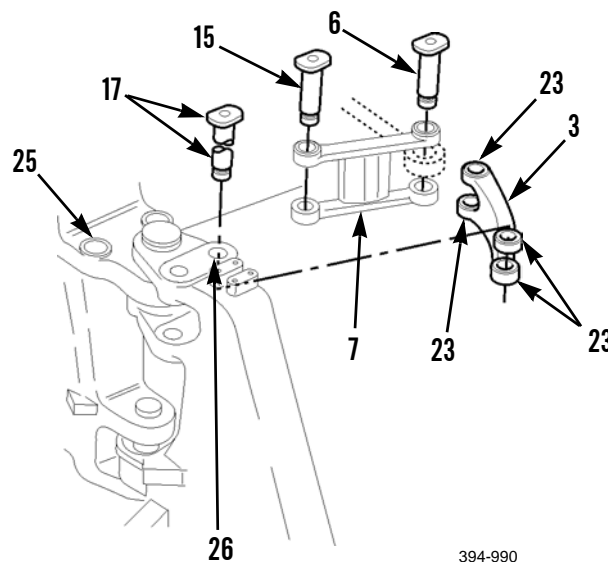
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 cause 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. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.



**INSPECTION**

1. Inspect link (7). Replace if inside diameter of bore is greater than 2.502 in. (63.55 mm).
2. Inspect four bearings (23) in link (3). Replace any bearings (23) with inside diameter greater than 2.509 in. (63.73 mm).
3. Inspect pins (6, 15 and 17). Replace if outside diameter is less than 2.515 in. (63.88 mm).
4. Inspect draft frame bearing (25). Replace if inside diameter of draft frame bearing (25) is greater than 2.509 in. (63.73 mm).
5. Inspect diameter of hitch frame bore (26). Replace if inside bore diameter of hitch frame bore (26) is greater than 2.503 in. (63.58 mm).
6. Inspect all remaining parts and replace if damaged.



394-990

**INSTALLATION**

**NOTE**

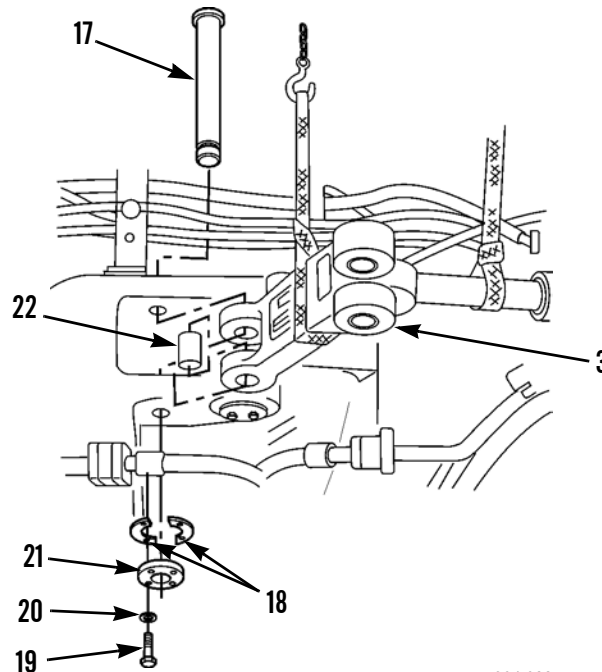
Install four new bearings flush with outer surface of link.

1. If removed, use puller to install four new bearings (23) in link (3).
2. If removed, install four lubrication fittings (24) in link (3).
3. Install lifting device to link (3).

**NOTE**

For left link assembly only, boss for steering servo-sender cylinder must be installed facing up.

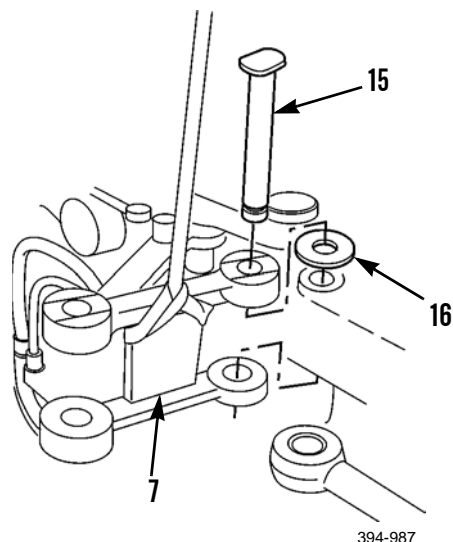
4. Use lifting device to install link (3) on machine.
5. Install spacer (22) on link (3).
6. Apply a thin coat of grease to pin (17) and install in link (3).
7. Install two yokes (18), lock (21), four washers (20) and bolts (19).
8. Remove lifting device from link (3).



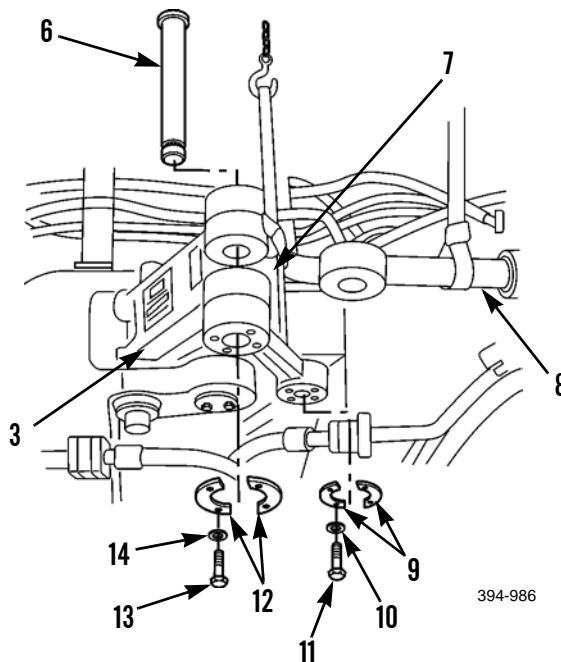
394-988

**INSTALLATION - CONTINUED**

9. Install washer (16) in draft frame.
10. Install lifting device on link (7) and install on machine.
11. Apply a thin coat of grease to pin (15) and install on machine.



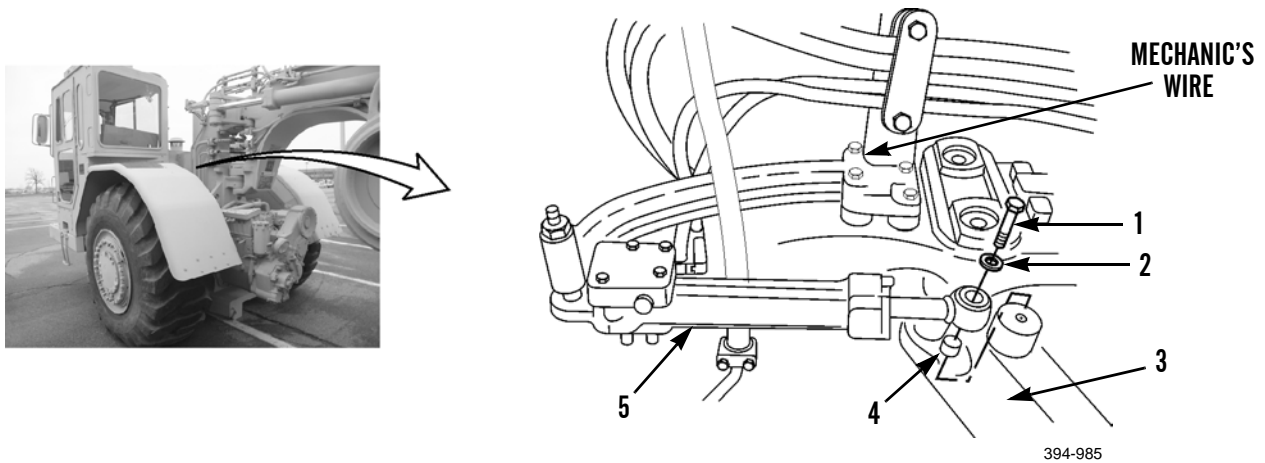
12. Install two yokes (9), four washers (10) and bolts (11).
13. Remove lifting device from link (7).
14. Connect rod end of steering cylinder (8) to links (3 and 7).
15. Remove support from steering cylinder (8).
16. Apply a thin coat of grease to pin (6) and install in links (3 and 7).
17. Install two yokes (12), four washers (14) and bolts (13) in link (7).
18. Lubricate steering cylinders and link bearings (TM 5-3805-248-10).



**INSTALLATION - CONTINUED****NOTE**

The following is a maintenance procedure for connection of steering servo-sender cylinder to left steering link assembly only.

19. Install spacer (4) in steering servo-sender cylinder (5).
20. Connect rod on steering servo-sender cylinder (5) to link (3).
21. Install washer (2) and bolt (1) in steering servo-sender cylinder (5).
22. Remove mechanic's wire securing steering servo-sender cylinder (5).



23. Check hydraulic oil level and add as necessary (TM 5-3805-248-10).
24. Operate machine and verify correct steering operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**DRAFT FRAME ASSEMBLY SHOES MAINTENANCE**

**0314 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation, Adjustment

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Jackstand (2) 10 ton minimum capacity

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Bowl lowered to ground (TM 5-3805-248-10)

Engine shut down (TM 5-3805-248-10)

Battery disconnect switch in OFF position (TM 5-3805-248-10)

---

**REMOVAL****NOTE**

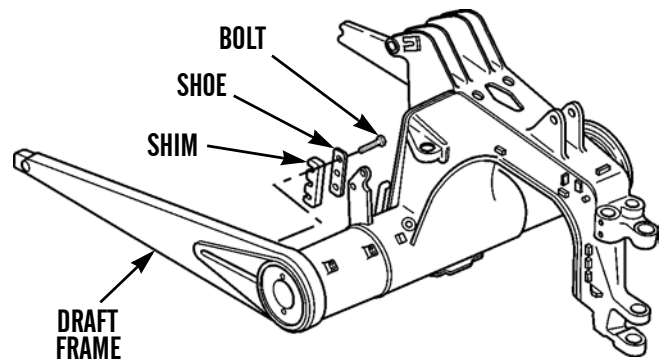
Right and left draft frame assembly shoes are replaced and adjusted the same way. Right draft frame assembly shoe is shown.

1. Lower bowl until assistant indicates that draft assembly shoe is accessible, forcing bowl against ground to raise rear of scraper.

**WARNING**

Do not work under scraper bowl assembly when wheels are raised off ground. Support bowl assembly with two jack stands placed under frame. Ensure that tractor wheels are chocked to prevent machine from rolling or shifting. Failure to follow this warning may cause injury.

2. Position jack stands under bowl assembly frame at rear of bowl.
3. Raise bowl assembly until it settles on jack stands, then move control to HOLD position.
4. Remove three bolts, draft frame assembly shoe and shim pack from draft frame. Tie shim pack together and tag to aid in installation.



394-1016

**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 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 parts with solvent cleaning compound and dry with compressed air.
  2. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

Install shim pack, draft frame assembly shoe and three bolts on draft frame.

**ADJUSTMENT**

1. Start engine (TM 5-3805-248-10).
2. Lower bowl (TM 5-3805-248-10) until weight of bowl is off jack stands.
3. Remove jack stands from rear of bowl.
4. Raise bowl (TM 5-3805-248-10). Hold in RAISE position until bowl assembly wheels are on ground.
5. Stop engine (TM 5-3805-248-10).
6. Measure draft frame assembly shoe (2) and bowl wear plate on draft frame (4). Clearance must not be greater than 0.12 in. (3 mm). Measure clearance at top and bottom of draft frame assembly shoe. If clearance is larger than specified, start engine (TM 5-3805-248-10) and repeat steps 1 through 5, adjusting shim pack until clearance is within specification.

**END OF WORK PACKAGE**





---

**OPERATOR COMPARTMENT REPLACEMENT**

---

**0315 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

Lifting device, 1500 lb minimum capacity

7/8-14NC, 3 in. lifting links

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Detergent (Item 13, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket (5)

Packing, preformed (3)

Seal

**References**

TM 5-3805-248-10

**Personnel Required**

Two

**Equipment Condition**

Transmission shift pedal removed (WP 0139 00)

Transmission shift lines and fittings removed (WP 0248 00)

Transmission shift control valve removed (WP 0174 00)

Differential lock pedal removed (WP 0171 00)

Differential lock lines and fittings removed (WP 0172 00)

Differential lock control valve assembly removed (WP 0173 00)

Scraper hydraulic controls, levers and linkage removed (WP 0222 00)

Left panel removed (WP 0071 00)

Right panel removed (WP 0072 00)

Fuse block removed (WP 0075 00)

Low air removed (WP 0099 00)

**Equipment Condition - Continued**

Dash panel circuit breakers removed (WP 0070 00)

Worklight, high beam, low beam and backup alarm relays removed (WP 0078 00)

Headlamp dimmer switch removed (WP 0079 00)

Turn signal flasher removed (WP 0081 00)

Backup alarm removed (WP 0100 00)

Operator compartment wiring harness removed (WP 0106 00)

Transmission shift control cable removed (WP 0125 00)

Transmission shift control lever and housing removed (WP 0126 00)

Brake retarder air lines removed (WP 0141 00)

Brake hoses and fittings removed (WP 0162 00, WP 0163 00, WP 0169 00)

Brake control valve removed (WP 0155 00)

Double check valve removed (WP 0158 00)

Brake control valve lines and fittings removed (WP 0161 00)

Air dryer removed (WP 0152 00)

Tractor air tanks removed (WP 0153 00)

Steering column and shaft removed (WP 0178 00)

Mechanical linkage removed (WP 0179 00)

Rollover protection system (ROPS) removed (WP 0203 00)

Operator compartment-upper front access plates removed (WP 0192 00)

Operator compartment-side panel plate removed (WP 0195 00)

Floormat and step removed (WP 0198 00)

Left fender removed (WP 0205 00)

Seat assembly removed (WP 0211 00)

Air horn assembly removed (WP 0218 00)

Tachometer drive cable removed (WP 0248 00)

Non-electrical gages lines and fittings removed (WP 0249 00, WP 0250 00)

Governor control removed (WP 0280 00)

Battery disconnect switch removed (WP 0074 00)

**REMOVAL**

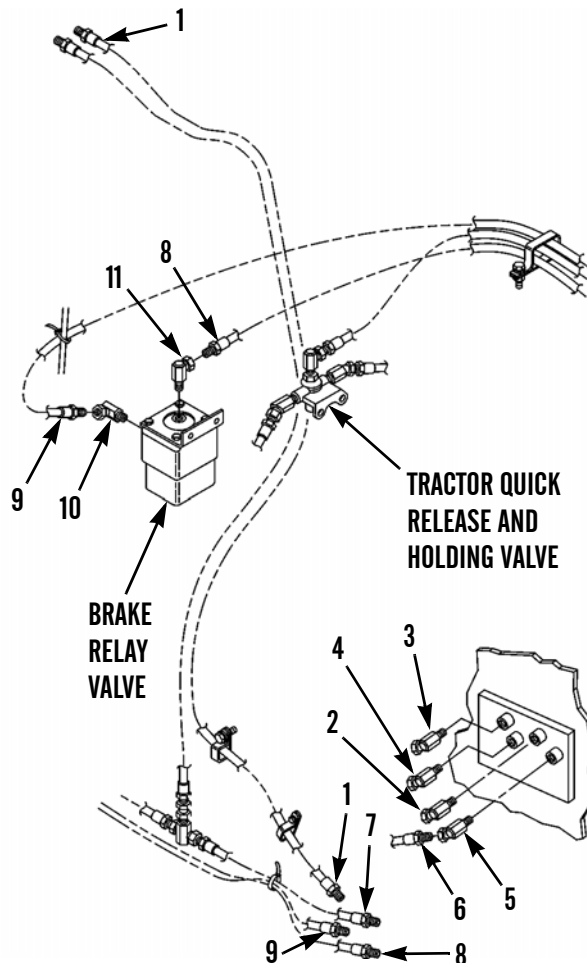
**CAUTION**

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

**NOTE**

- Tag lines prior to removal to ensure correct installation.
- Use container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

1. Disconnect hose assembly (1) at elbow (3) from center rear of machine.
2. Remove elbow (3).
3. Disconnect hose assembly (7) at elbow (2).
4. Remove elbow (2).
5. Disconnect hose assembly (9) at elbow (4).
6. Remove elbow (4).
7. Remove hose assembly (8), connector (6) and elbow (5).
8. Remove hose assembly (9) and elbow (10).
9. Disconnect hose assembly (8) at elbow (11).
10. Remove elbow (11).



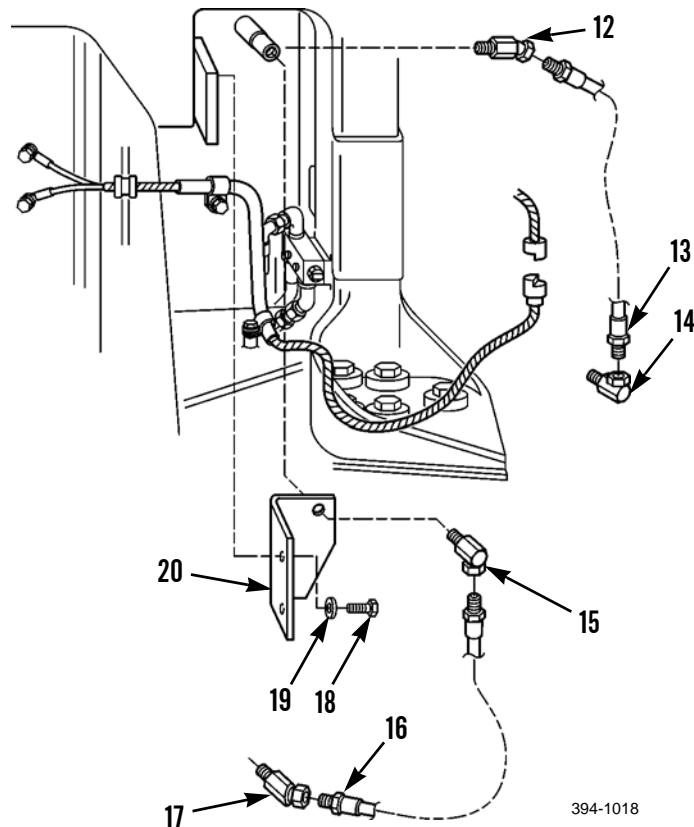
394-1017

**OPERATOR COMPARTMENT REPLACEMENT - CONTINUED**

0315 00

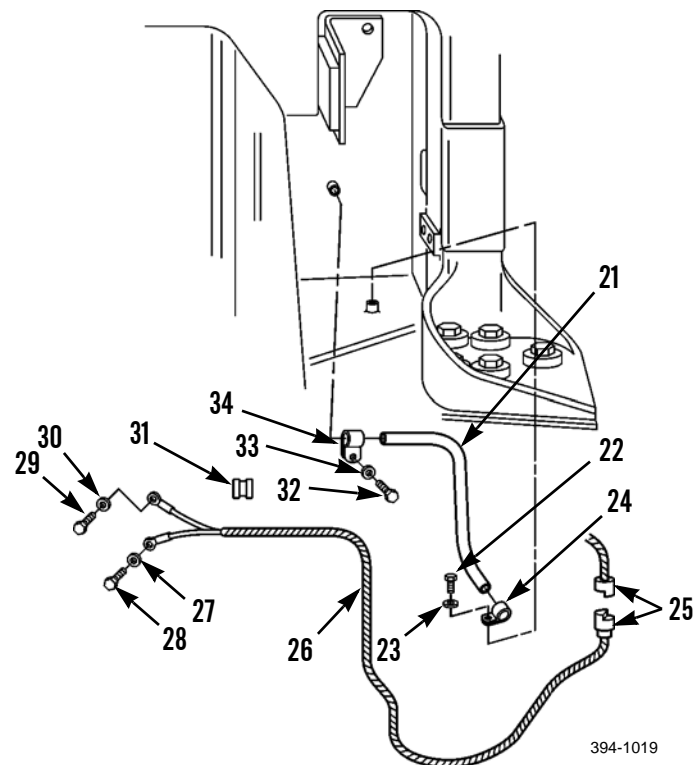
**REMOVAL - CONTINUED**

11. Disconnect hose assembly (16) at elbow (17) from right rear side of machine.
12. Remove elbow (17).
13. Remove hose assembly (16) and elbow (15).
14. Disconnect hose assembly (13) at elbow (14).
15. Remove elbow (14).
16. Remove hose assembly (13) and elbow (12).
17. Remove two bolts (18) and washers (19).
18. Remove bracket (20) from apron control valve assembly.



394-1018

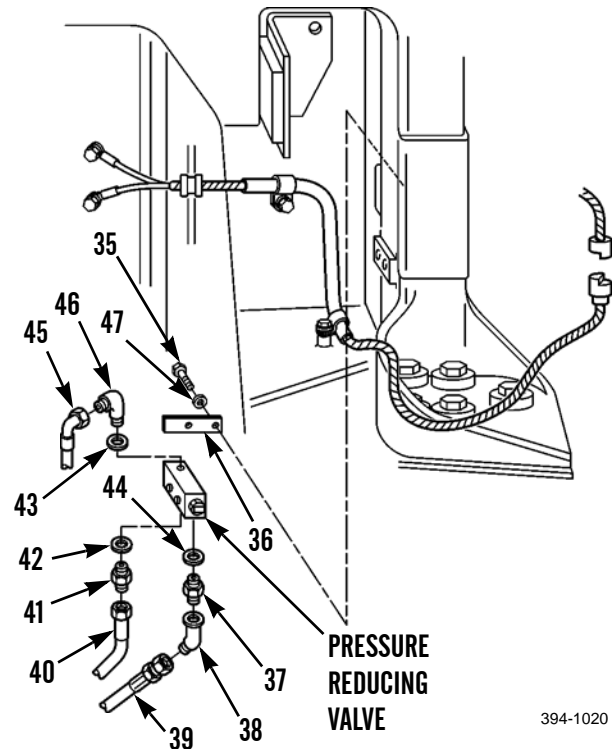
19. Disconnect harness assembly (26) at plug housing (25).
20. Remove bolt (22), washer (23) and clip (24).
21. Remove bolt (32), washer (33) and clip (34).
22. Remove grommet (31) from routing hole.
23. Remove screw (29) and washer (30) from harness assembly (26) at terminal.
24. Remove screw (28) and washer (27) from harness assembly (26) at terminal.
25. Remove harness (26) and pull out of tube (21).
26. Remove tube (21).



394-1019

**REMOVAL - CONTINUED**

27. Disconnect hose assembly (39) at elbow (38).
28. Remove elbow (38) and connector (37).
29. Remove and discard preformed packing (44).
30. Disconnect hose assembly (40) at connector (41).
31. Remove connector (41).
32. Remove and discard preformed packing (42).
33. Disconnect hose assembly (45) at elbow (46).
34. Remove elbow (46).
35. Remove and discard preformed packing (43).
36. Remove two bolts (35) and washers (47).
37. Remove bracket (36) at pressure reducing valve.



394-1020

**REMOVAL - CONTINUED**

38. Install four 7/8-14NC three-inch long eyebolts in corner holes of operator compartment.
39. Attach lifting device to four 7/8-14NC three inch long eyebolts.

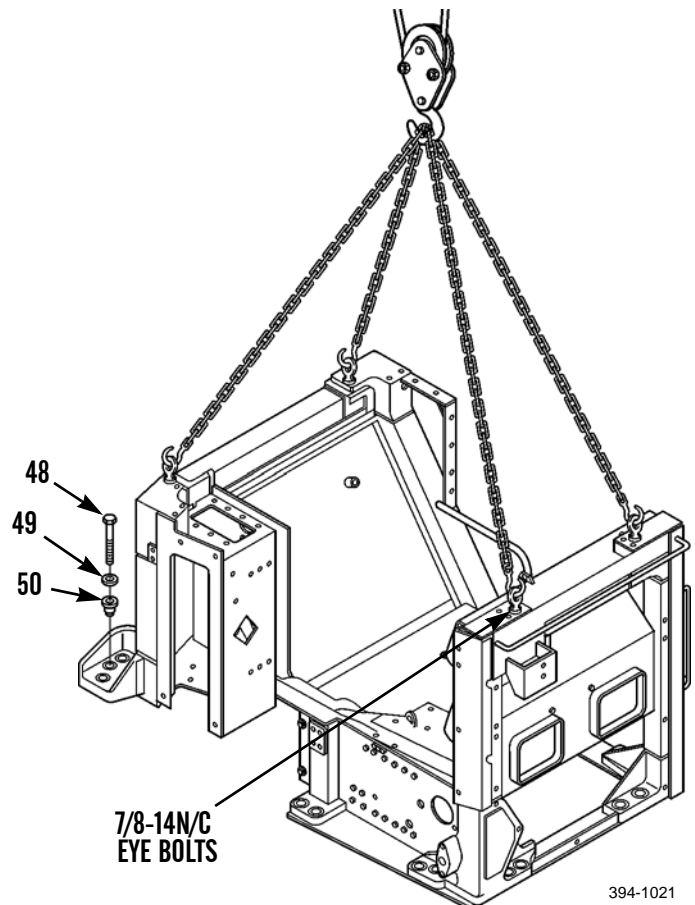
**WARNING**

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 result in injury or death.

**NOTE**

Weight of operator compartment is 920 lb (417 kg).

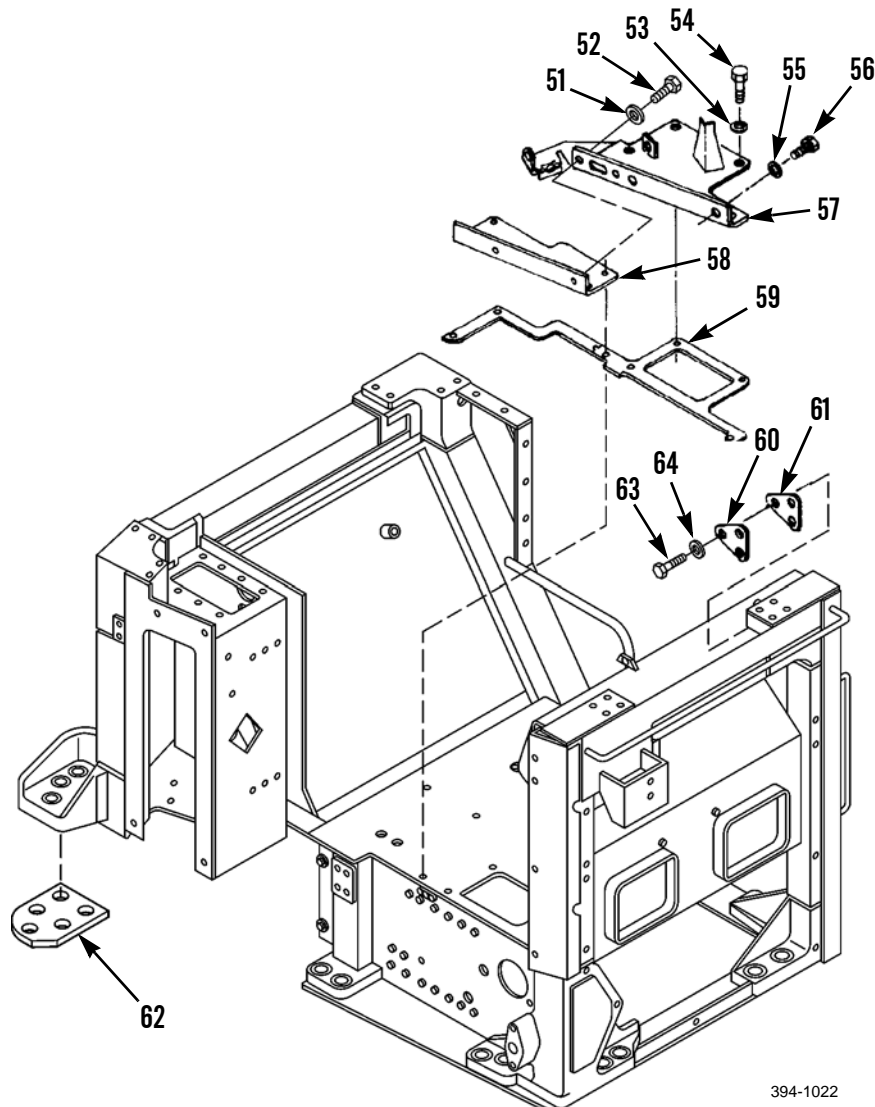
40. Remove 19 bolts (48), washers (49) and mountings (50).



**REMOVAL - CONTINUED****CAUTION**

Do not allow the operator compartment to swing or tilt while lifting. Carefully place on flat surface. Failure to follow this procedure could cause damage to equipment.

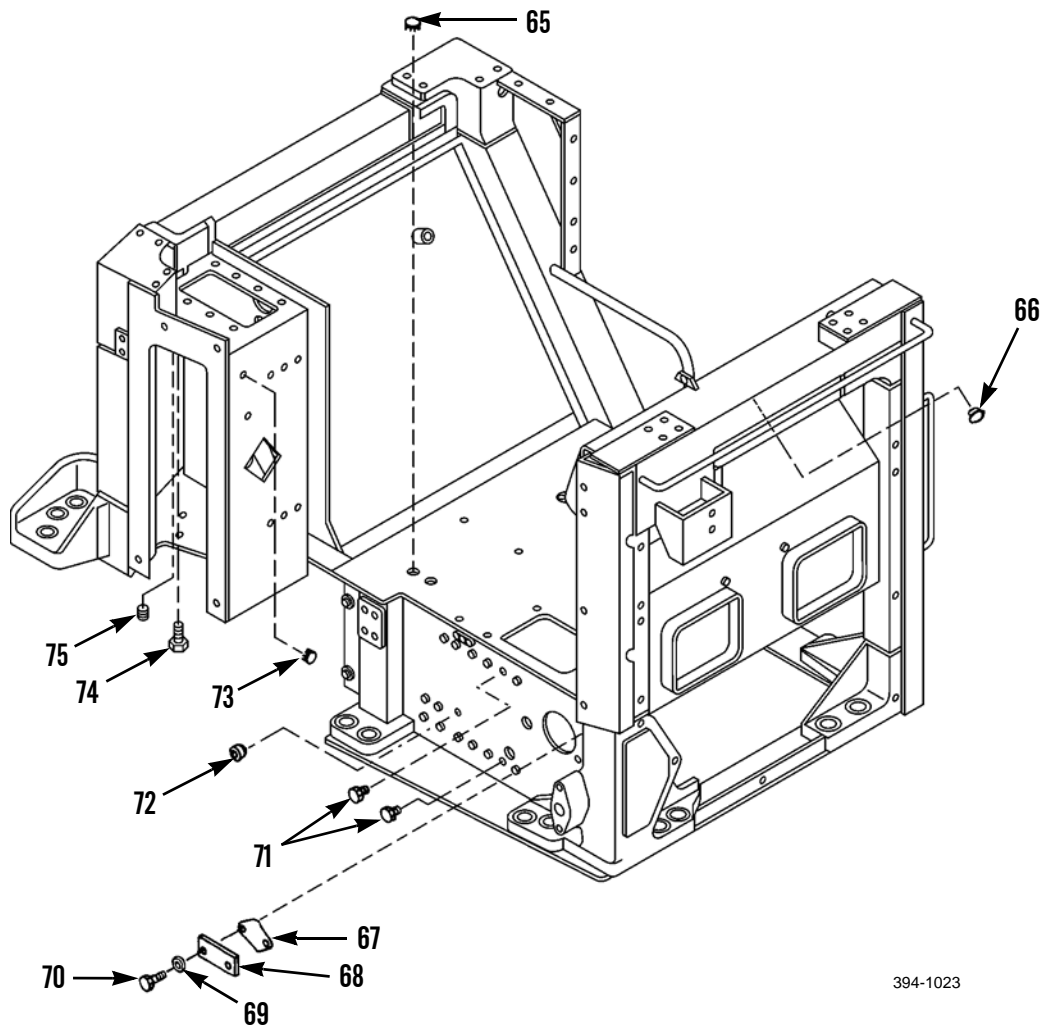
41. With assistance, remove operator compartment.
42. Remove lifting device from operator compartment.
43. Remove pad (62).
44. Remove six bolts (54) and washers (53) from operator compartment.
45. Remove bolt (52) and washer (51).
46. Remove bolt (56) and washer (55).
47. Remove plate assemblies (57) and (58).
48. Remove and discard gasket (59).
49. Remove three bolts (63) and washers (64).
50. Remove cover (60) and gasket (61). Discard gasket.



394-1022

**REMOVAL - CONTINUED**

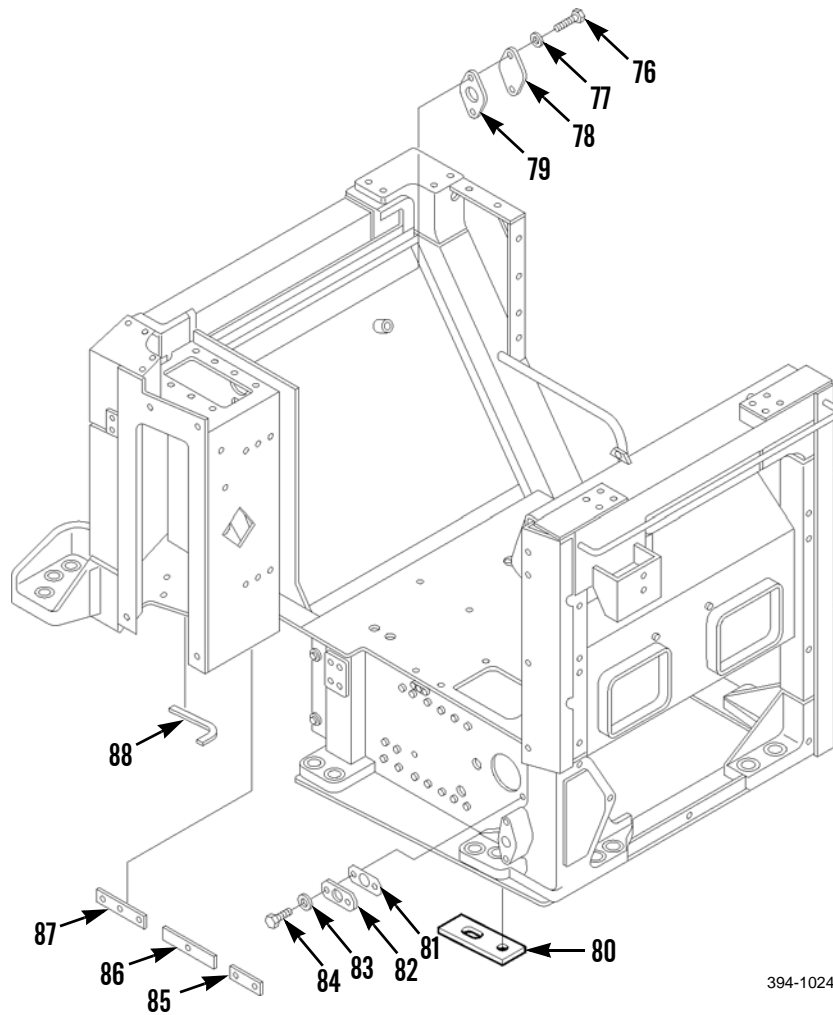
51. Remove plug (66).
52. Remove two bolts (70) and washers (69).
53. Remove cover (68) and gasket (67). Discard gasket.
54. Remove plugs (65, 71, 72, 73 and 75).
55. Remove four screws (74).



394-1023

**REMOVAL - CONTINUED**

56. Remove two bolts (84) and washers (83).
57. Remove cover (82) and gasket (81). Discard gasket.
58. Remove two bolts (76) and washers (77).
59. Remove cover (78) and gasket (79). Discard gasket.
60. Remove strips (80, 85, 86 and 87).
61. Remove and discard seal (88).



394-1024



**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 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.

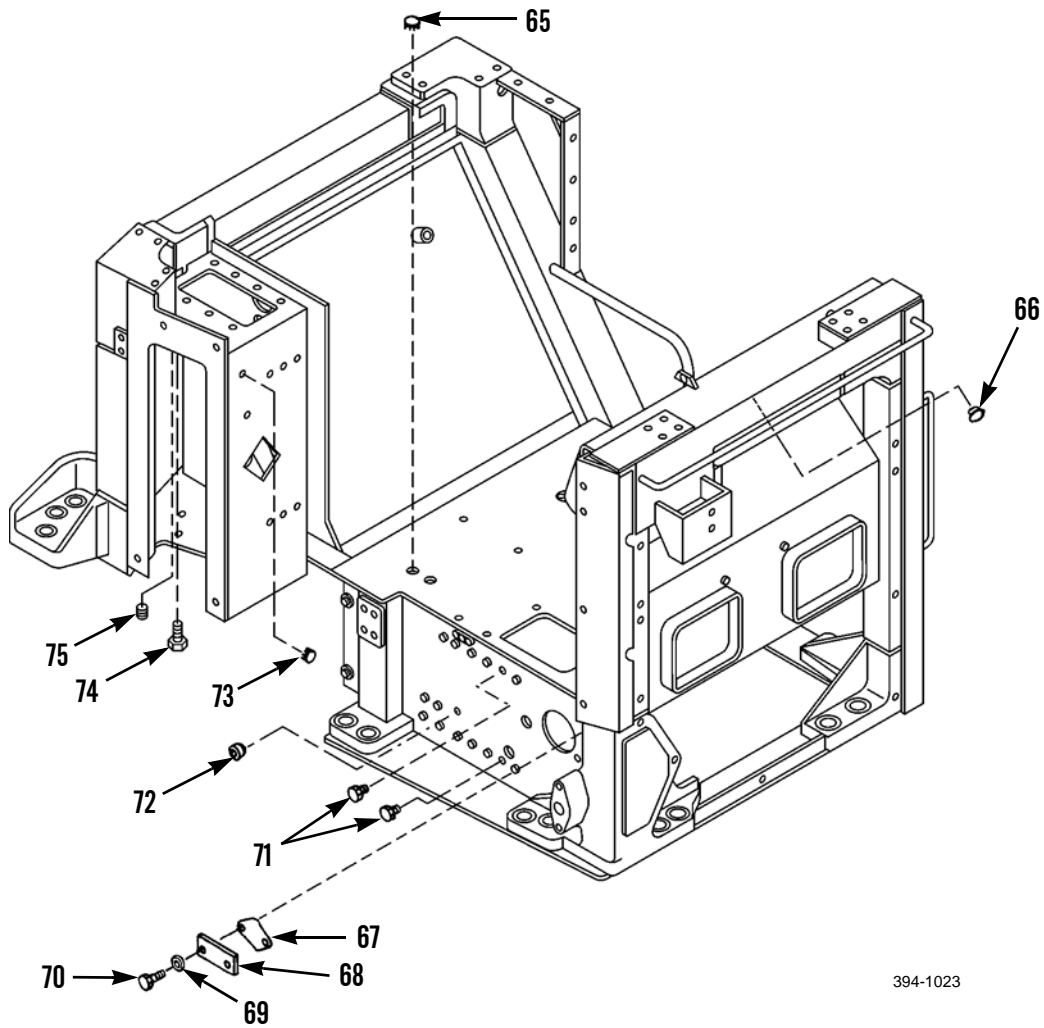
1. Remove gasket material from all mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install new seal (88) in operator compartment.
2. Install strips (80), (85), (86) and (87).
3. Install new gasket (79) and cover (78).
4. Install two washers (77) and bolts (76).
5. Install new gasket (81) and cover (82).
6. Install two washers (83) and bolts (84).

**INSTALLATION - CONTINUED**

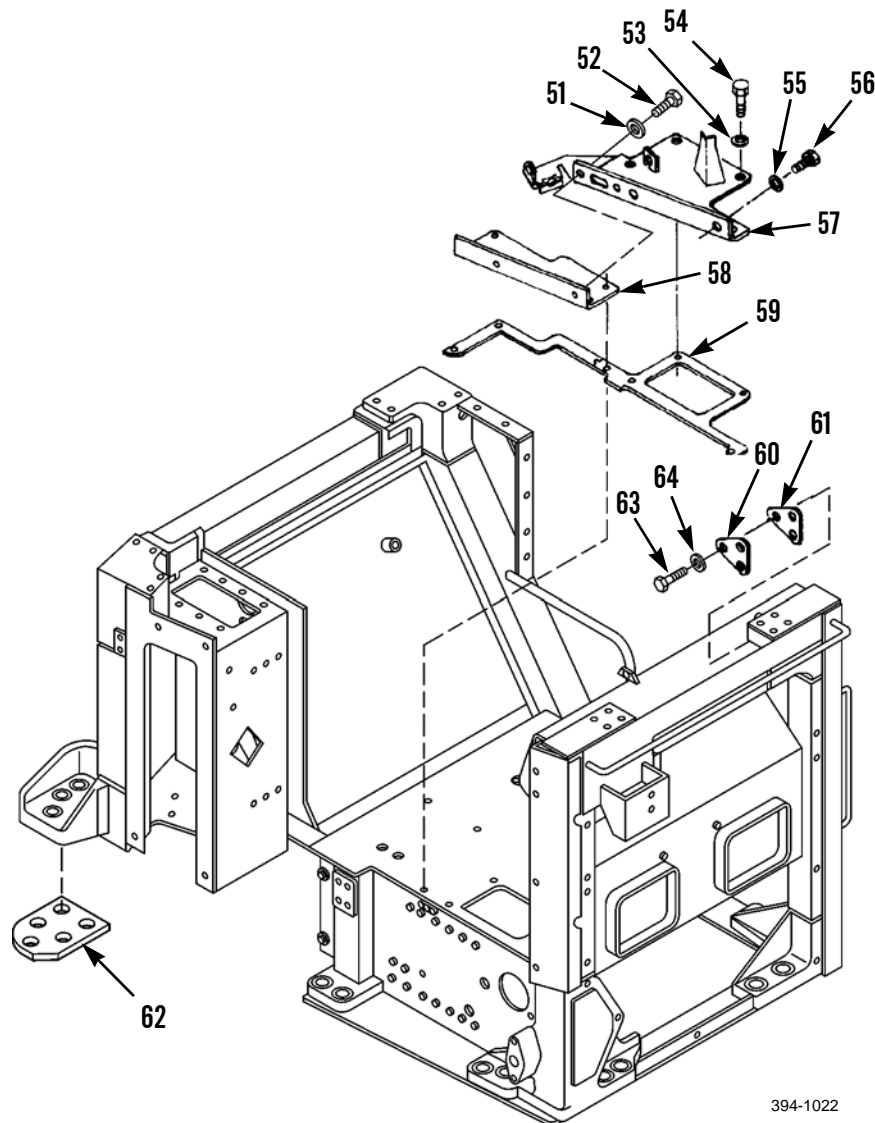
7. Install four screws (74).
8. Install plugs (65), (71), (72), (73) and (75).
9. Install new gasket (67) and cover (68).
10. Install two washers (69) and bolts (70).
11. Install plug (66).



394-1023

**INSTALLATION - CONTINUED**

12. Install new gasket (61) and cover (60).
13. Install three washers (64) and bolts (63).
14. Install new gasket (59) and plate assemblies (57) and (58).
15. Install washer (55) and bolt (56).
16. Install washer (51) and bolt (52).
17. Install six washers (53) and bolts (54).
18. Install pad (62).



394-1022

**INSTALLATION - CONTINUED**

19. Install four 7/8-14NC three-inch long eyebolts in corner holes of operator compartment.

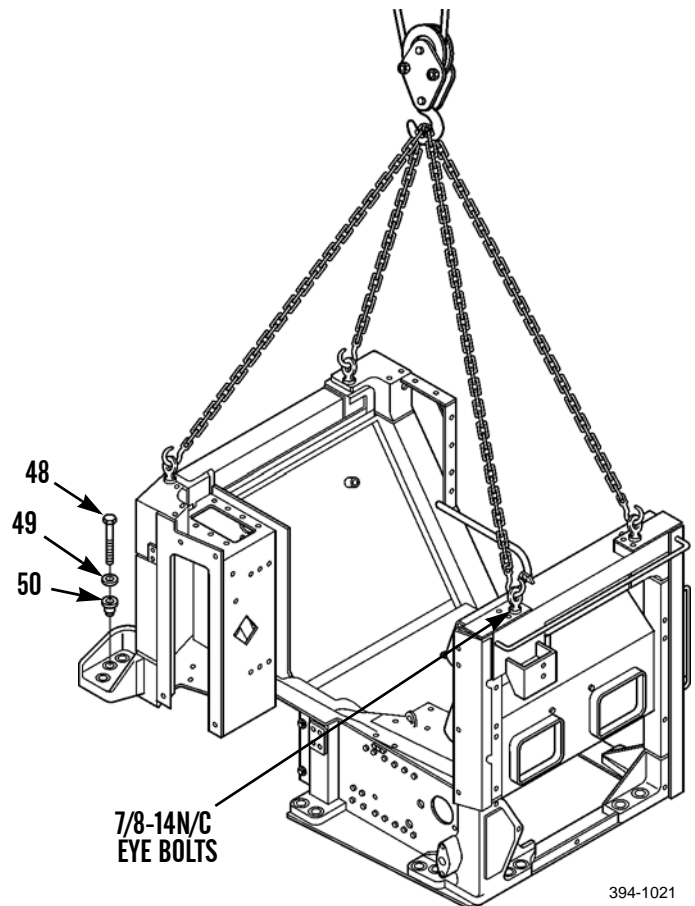
**WARNING**

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 lifting device. Failure to follow this warning may result in injury or death.

**NOTE**

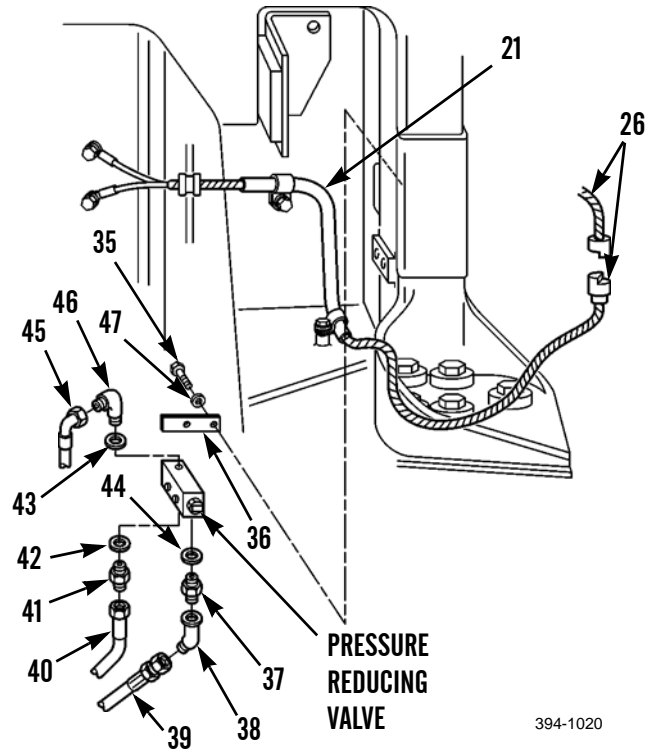
Weight of operator compartment is 920 lb (47 kg).

20. Attach lifting device to four 7/8-14NC three-inch long eyebolts.  
21. With assistance, install operator compartment.  
22. Remove lifting device.  
23. Remove four 7/8-14NC three-inch long eyebolts.  
24. Install 19 mountings (50), washers (49) and bolts (48).



**INSTALLATION - CONTINUED**

25. Install bracket (36) on pressure reducing valve assembly on rear right side of machine.
26. Install two washers (47) and bolts (35).
27. Install new preformed packing (43).
28. Install elbow (46).
29. Connect hose assembly (45).
30. Install new preformed packing (42).
31. Install connector (41).
32. Connect hose assembly (40).
33. Install new preformed packing (44).
34. Install connector (37) and elbow (38).
35. Connect hose assembly (39).
36. Install tube (21) around harness (26).



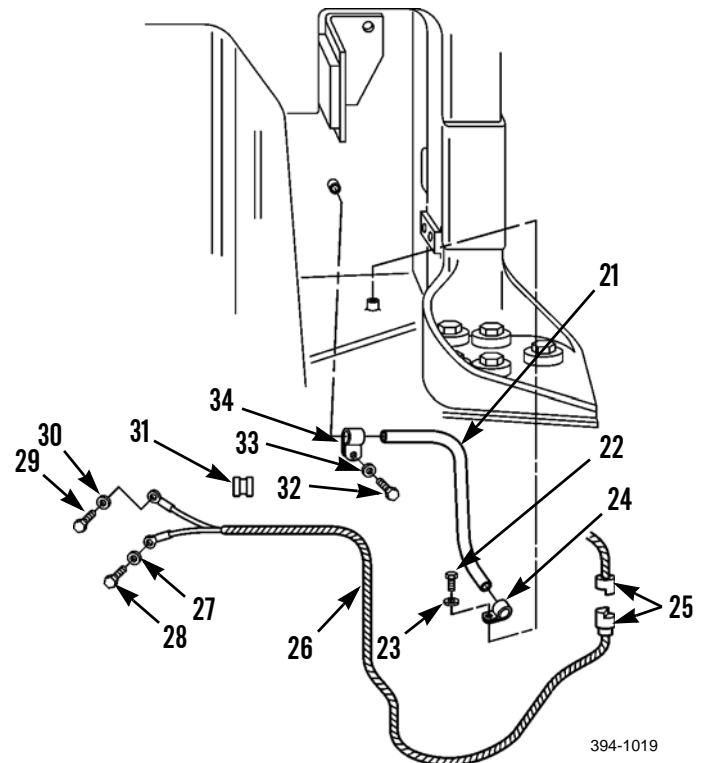
394-1020

**OPERATOR COMPARTMENT REPLACEMENT - CONTINUED**

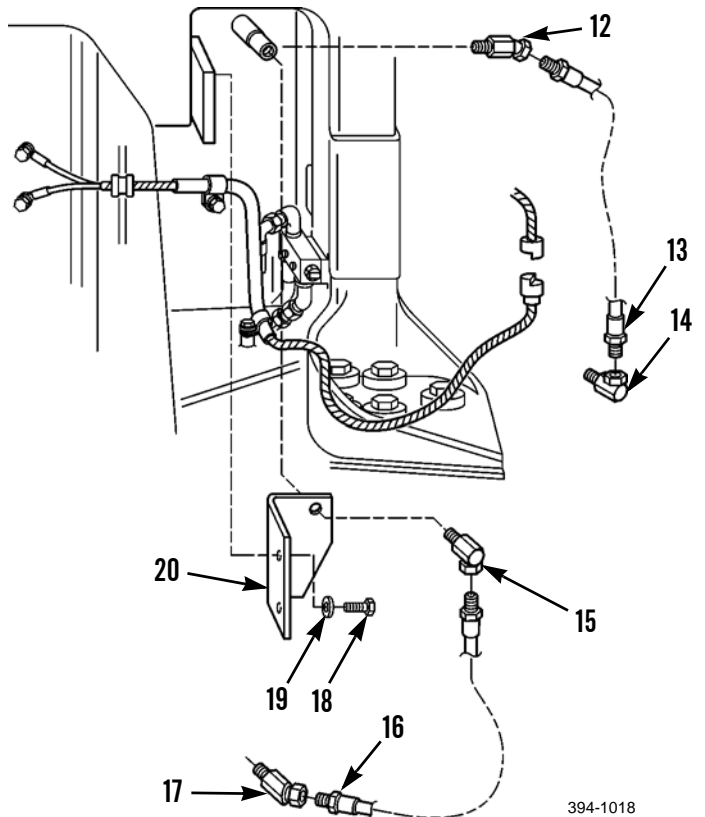
0315 00

**INSTALLATION - CONTINUED**

37. Install tube (21) and harness assembly (26).
38. Install washer (27) and screw (28).
39. Install washer (30) and screw (29).
40. Install grommet (31).
41. Install clip (34), washer (33) and bolt (32).
42. Install clip (24), washer (23) and bolt (22).
43. Connect harness assembly (26) at plug housing (25).

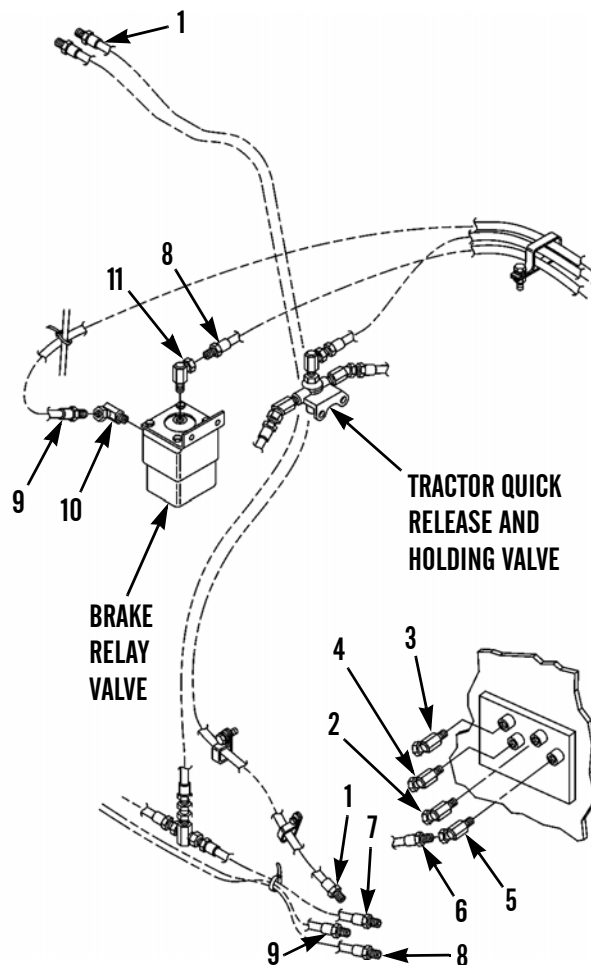


44. Install bracket (20) on apron control valve assembly.
45. Install two washers (19) and bolts (18).
46. Install elbow (12).
47. Install hose assembly (13).
48. Install elbow (14).
49. Connect hose assembly (13).
50. Install elbow (15).
51. Install hose assembly (16) to elbow (15).
52. Install elbow (17).
53. Connect hose assembly (16) to elbow (17) at center rear of machine.



**INSTALLATION - CONTINUED**

54. Install elbow (5) and connector (6).
55. Connect hose assembly (8).
56. Install elbow (11).
57. Connect hose assembly (8).
58. Install elbow (10).
59. Install hose assembly (9).
60. Install elbow (4).
61. Connect hose assembly (9).
62. Install elbow (2).
63. Connect hose assembly (7).
64. Install elbow (3).
65. Connect hose assembly (1).
66. Install left side instrument panel (WP 0071 00).
67. Install right side instrument panel (WP 0072 00).
68. Install fuse block (WP 0075 00).
69. Install low air alarm (WP 0099 00).



394-1017

**INSTALLATION - CONTINUED**

70. Install dash panel circuit breakers (WP 0070 00).
71. Install worklight, high beam, low beam and backup alarm relays (WP 0078 00).
72. Install headlamp dimmer switch (WP 0079 00).
73. Install turn signal flasher (WP 0081 00).
74. Install backup alarm (WP 0100 00).
75. Install operator compartment wiring harness (WP 0106 00).
76. Install transmission shift control cable (WP 0125 00).
77. Install transmission shift control lever and housing (WP 0126 00).
78. Install brake retarder air lines (WP 0141 00).
79. Install brake hoses and fittings (WP 0162 00, WP 0163 00, WP 0169 00).
80. Install brake control valve (WP 0155 00).
81. Install double check valve (WP 0158 00).
82. Install brake control valve lines and fittings (WP 0161 00).
83. Install air dryer (WP 0152 00).
84. Install tractor air tanks (WP 0153 00).
85. Install steering column and shaft (WP 0178 00).
86. Install mechanical linkage (WP 0179 00).
87. Install rollover protection system (ROPS) (WP 0203 00).
88. Install operator compartment-upper front access plates (WP 0192 00).
89. Install operator compartment-side panel plate (WP 0195 00).
90. Install floor mat and step (WP 0198 00).
91. Install left fender (WP 0205 00).
92. Install seat assembly (WP 0211 00).
93. Install air horn assembly (WP 0218 00).
94. Install tachometer drive cable (WP 0248 00).
95. Install non-electrical gages lines and fittings (WP 0249 00, WP 0250 00).
96. Install governor control (WP 0280 00).
97. Install battery disconnect switch (WP 0074 00).
98. Install transmission shift pedal (WP 0139 00).
99. Install transmission shift lines and fittings (WP 0248 00).
100. Install transmission shift control valve (WP 0174 00).
101. Install differential lock pedal (WP 0171 00).
102. Install differential lock lines and fittings (WP 0172 00).
103. Install differential lock control valve assembly (WP 0173 00).
104. Install scraper hydraulic controls, levers and linkage (WP 0222 00).
105. Operate machine and verify machine, accessories and controls operate correctly (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**SEAT SUSPENSION REPLACEMENT**

---

0316 00

**THIS WORK PACKAGE COVERS**

Removal, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 150 lb minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Tag, marker (Item 42, WP 0339 00)

Lockwasher (4)

O-ring

**Personnel Required**

Two

**References**

WP 0212 00

TM 5-3805-248-10

**Equipment Condition**

Seat assembly removed (WP 0211 00)

---

**REMOVAL****WARNING**

Ensure that hydraulic pressure has been relieved before removing any parts from seat suspension assembly. Failure to follow this warning may cause injury.

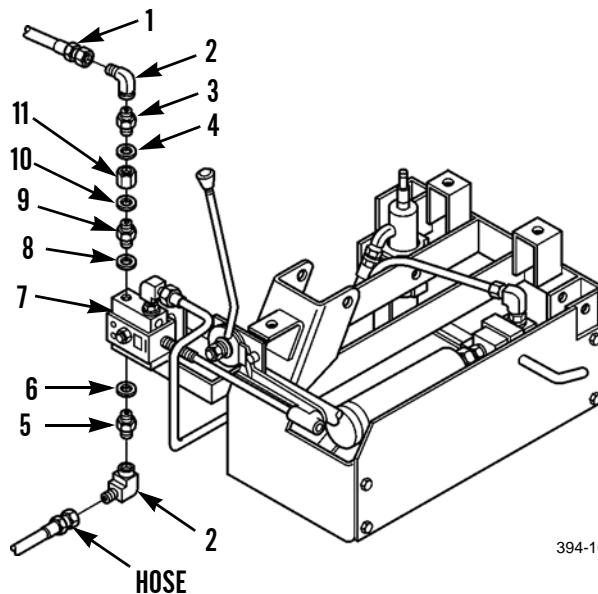
1. Set seat ride control handle to soft position (down) (TM 5-3805-248-10).
2. Set seat height control handle to low position (full back) to release hydraulic pressure (TM 5-3805-248-10).

**REMOVAL - CONTINUED**

**NOTE**

Tag hose and tube assemblies prior to removal to ensure correct installation.

3. Disconnect two hoses (1) from elbows (2) on height valve assembly (7).
4. Remove two elbows (2) from screen assembly (3) and connector (5).
5. Remove screen assembly (3), O-ring (4), connector (11), O-ring (10), connector (9) and O-ring (8) from height valve assembly (7). Discard O-rings.
6. Remove connector (5) and O-ring (6) from height valve assembly (7). Discard O-ring.



7. Disconnect hose (12) from elbow (13).
8. Remove elbow (13) from cylinder (14).
9. Remove four bolts (15), lockwashers (16) and panel (17) from seat suspension assembly (20). Discard lockwashers.
10. Remove four bolts (19) and washers (18) from seat suspension assembly (20).

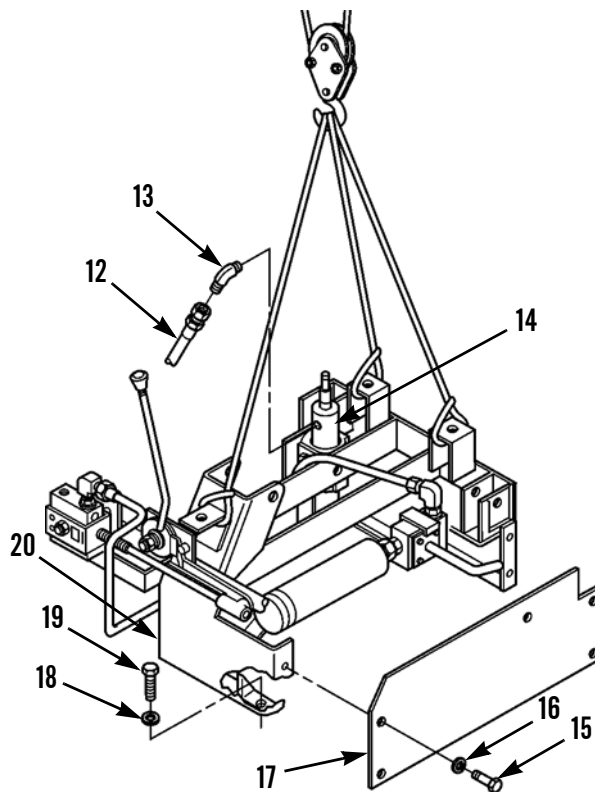
**REMOVAL - CONTINUED****WARNING**

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 injury or death.

**NOTE**

Seat suspension assembly weighs 100 lb (45 kg).

11. With assistance, install lifting device to seat suspension assembly (20).
12. Remove seat suspension assembly (20) from operator's compartment.
13. Remove lifting device from seat suspension assembly (20).



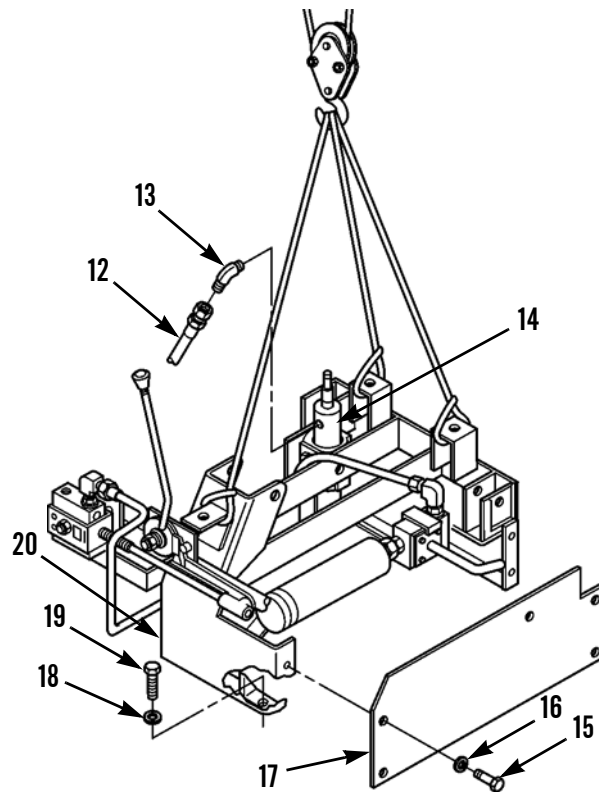
394-1026

**SEAT SUSPENSION REPLACEMENT - CONTINUED**

0316 00

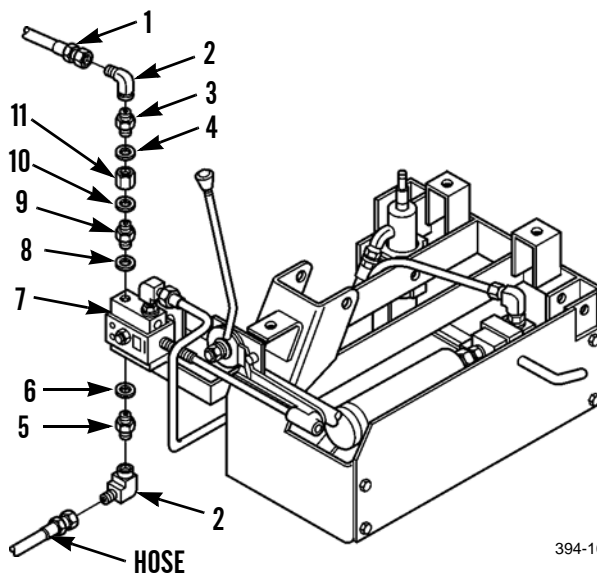
**INSTALLATION**

1. Install lifting device on seat suspension assembly (20) and position seat suspension assembly (19) in operator compartment.
2. Install four washers (18) and bolts (19) on seat suspension assembly (20).
3. Install panel (17) on seat suspension assembly (20) with four new lockwashers (16) and bolts (15).
4. Install elbow (13) in cylinder (14).
5. Connect hose (12) to elbow (13).



394-1026

6. Install new O-ring (6) on connector (5) and install connector in height valve assembly (7).
7. Install new O-ring (8), connector (9), new O-ring (10) and connector (11) on height valve assembly (7).
8. Install new O-ring (4) on screen assembly (3) and install screen assembly in height valve assembly (7).
9. Install two elbows (2) on screen assembly (3) and connector (5).
10. Connect two hoses (1) to elbows (2).



394-1025

11. Adjust seat suspension assembly (WP 0212 00).
12. Install seat assembly (WP 0211 00).
13. Operate machine and verify correct operation of seat suspension (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 103, WP 0338 00)

Lifting device, 150 lb (68 kg) minimum capacity

Kit, bearing

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Detergent, general purpose (Item 13, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Locknut

Lockwasher (12)

O-ring (5)

Pin, cotter

**Personnel Required**

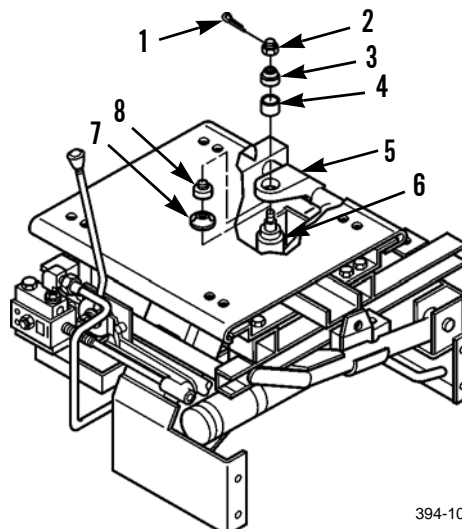
Two

**Equipment Condition**

Seat suspension assembly removed (WP 0316 00)

**DISASSEMBLY**

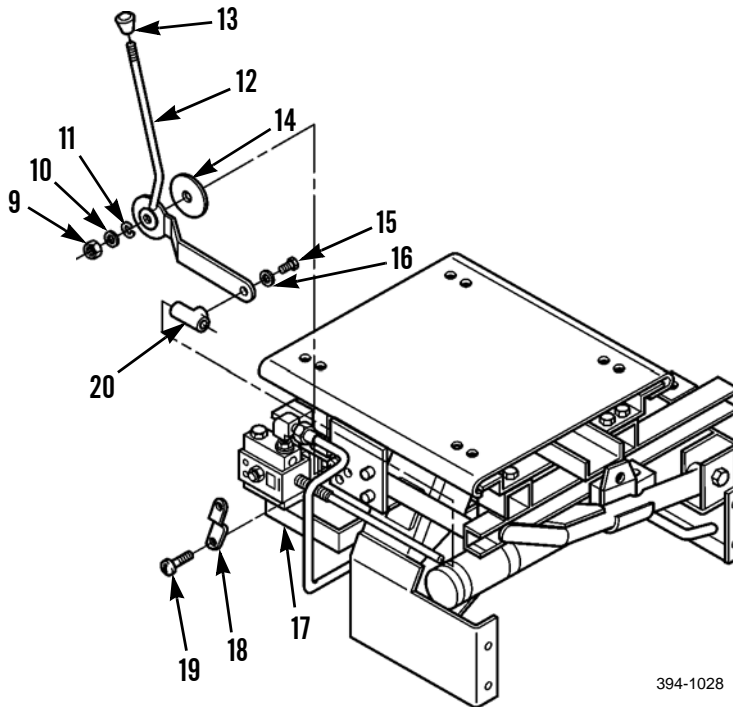
1. Remove cotter pin (1) from cylinder (6). Discard cotter pin.
2. Remove nut (2), washer (3) and bushing (4) from cylinder (6).
3. Uncouple cylinder (6) from suspension arm (5).
4. Remove bushing (7) and washer (8) from cylinder (6).



394-1027

**DISASSEMBLY - CONTINUED**

5. Remove screw (15), washer (16) and slide (20) from handle (12).
6. Remove screw (19) and spring (18) from suspension frame (17).
7. Remove locknut (9), spacer (10), washer (11), handle (12) and washer (14) from suspension frame (17). Discard locknut.
8. Remove knob (13) from handle (12).

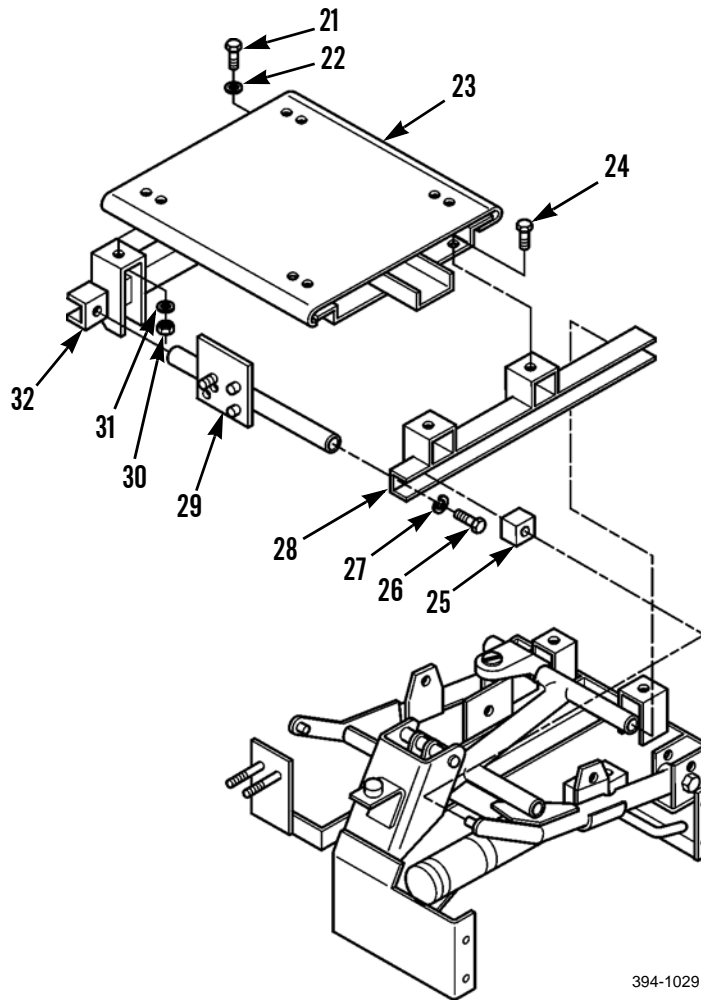


394-1028

9. Remove four bolts (21) and two washers (22) from adjuster assembly (23).
10. Remove adjuster assembly (23), channels (28 and 32) and rod assembly (29), as a unit, from suspension frame (17).
11. Remove two bolts (26), washers (27) and rod assembly (29) from adjuster assembly (23).

**DISASSEMBLY - CONTINUED**

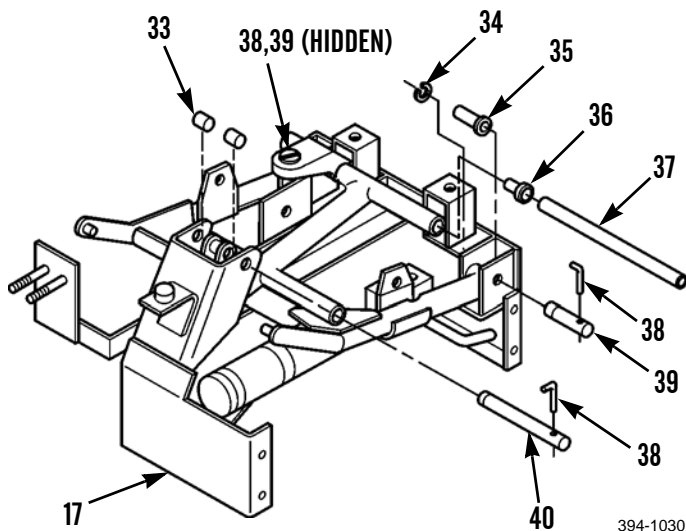
12. Remove four nuts (30), lockwashers (31), bolts (24) channels (28 and 32) and two sides (25) from adjuster assembly (23).



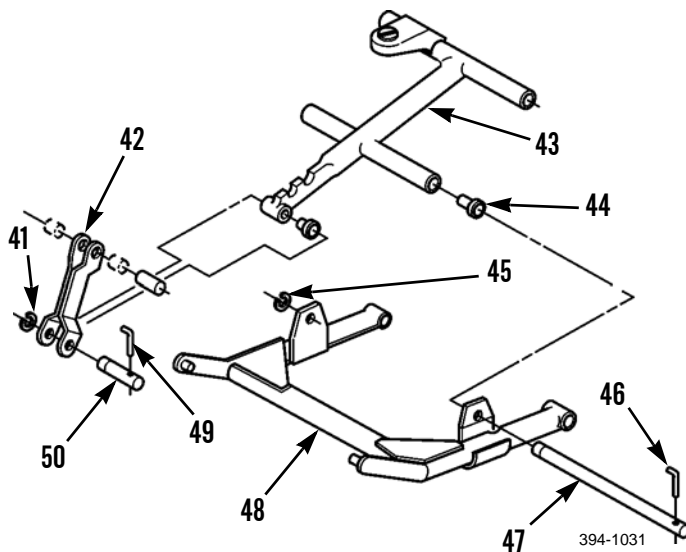
394-1029

**DISASSEMBLY - CONTINUED**

13. Remove two bearings (36) and spacer (37) from suspension frame (17). Discard bearings.
14. Remove three retaining rings (34) from shafts (39 and 40).
15. Remove three pins (38), two shafts (39) and bearings (35) from suspension frame (17). Discard bearings.
16. Remove two spacers (33) and shaft (40) from suspension frame (17).



17. Remove lever (48), arm (43) and lever (42), as a unit, from suspension frame (17).
18. Remove retaining ring (41), pin (49) and shaft (50) from lever (42). Discard retaining ring.
19. Remove lever (42) from arm (43).
20. Remove retaining ring (45), pin (46), shaft (47) and arm (43) from lever (48). Discard retaining ring.
21. Remove and discard four bearings (44) from arm (43).





**DISASSEMBLY - CONTINUED**

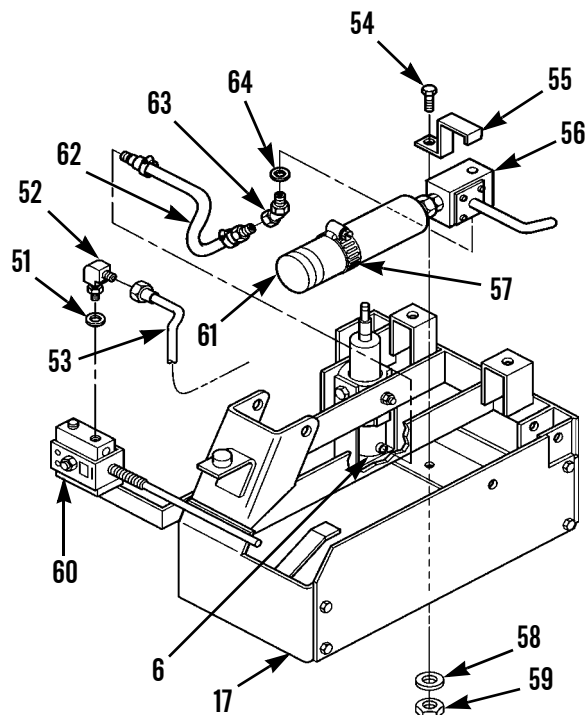
**CAUTION**

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

**NOTE**

- Tag all lines prior to removal to ensure correct installation.
- Use container to catch any draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

22. Disconnect hose assembly (62) from elbow (63).
23. Remove elbow (63) from valve assembly (56).
24. Remove and discard O-ring (64) from elbow (63).
25. Remove hose assembly (62) from cylinder (6).
26. Remove tube assembly (53) and two elbows (52) from actuator (60) and valve assembly (56).
27. Remove and discard two O-rings (51) from elbows (52 and 63).
28. Remove nut (59), lockwasher (58), bolt (54) and clamp (55) from suspension frame (17).
29. Loosen clamp (57) and slide onto accumulator (61).



394-1032

**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 injury or death.

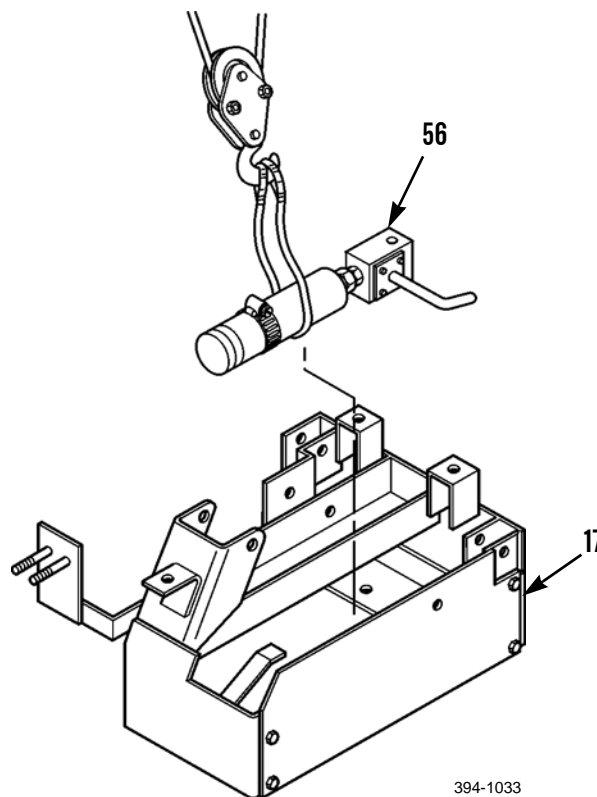
**NOTE**

Accumulator and valve assembly weigh 100 lb (45 kg).

30. With assistance, attach lifting device to valve assembly (56) and remove valve assembly from suspension frame (17).
31. Remove lifting device from valve assembly (56).

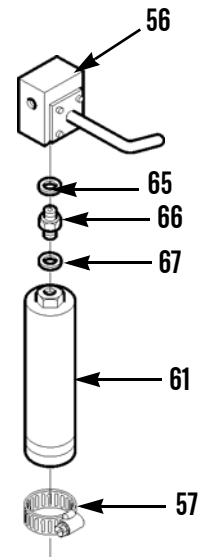
**NOTE**

Keep accumulator and cylinder in an upright position to prevent loss of fluid.



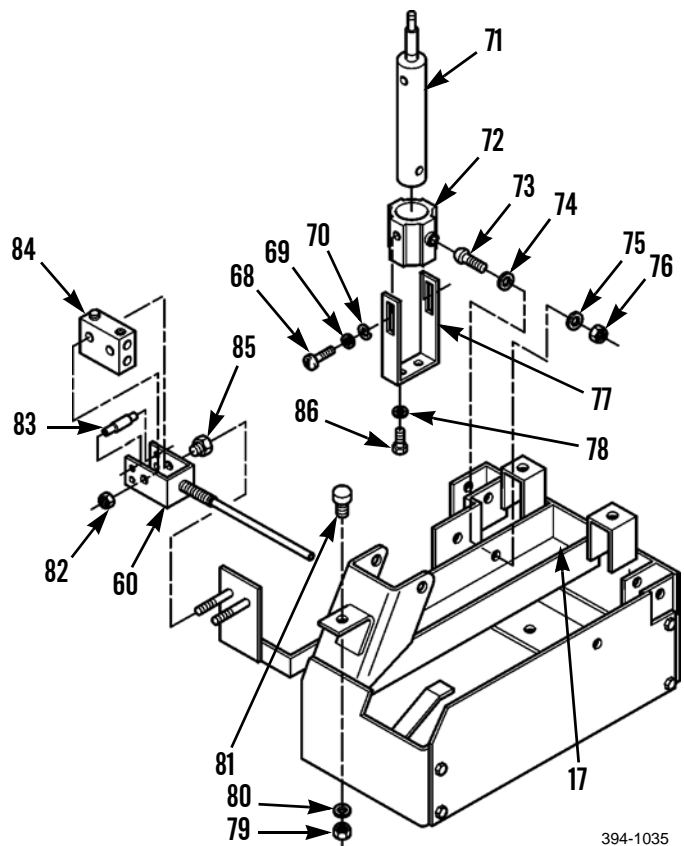
**DISASSEMBLY - CONTINUED**

32. Remove accumulator (61) from valve assembly (56).
33. Remove clamp (57) from accumulator (61).
34. Remove O-ring (65), connector (66) and O-ring (67) from accumulator (61). Discard O-rings.



394-1034

35. Remove two bolts (86), lockwashers (78) and cylinder (71) from retainer (72). Discard lockwashers.
36. Remove two screws (68), lockwashers (69), washers (70) and retainer (72) from bracket (77). Discard lockwashers.
37. Remove two nuts (76), washers (75), bearings (74) and screws (73) from retainer (72). Discard bearings.
38. Remove bracket (77) from retainer (72).
39. Remove two nuts (82) and bearings (85) from actuator (60). Discard bearings.
40. Remove valve assembly (84) from actuator (60).
41. Remove two valve actuator assemblies (83) from actuator (60).
42. Remove three nuts (79), lockwashers (80) and three bumpers (81) from suspension frame (17).



394-1035

**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 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.

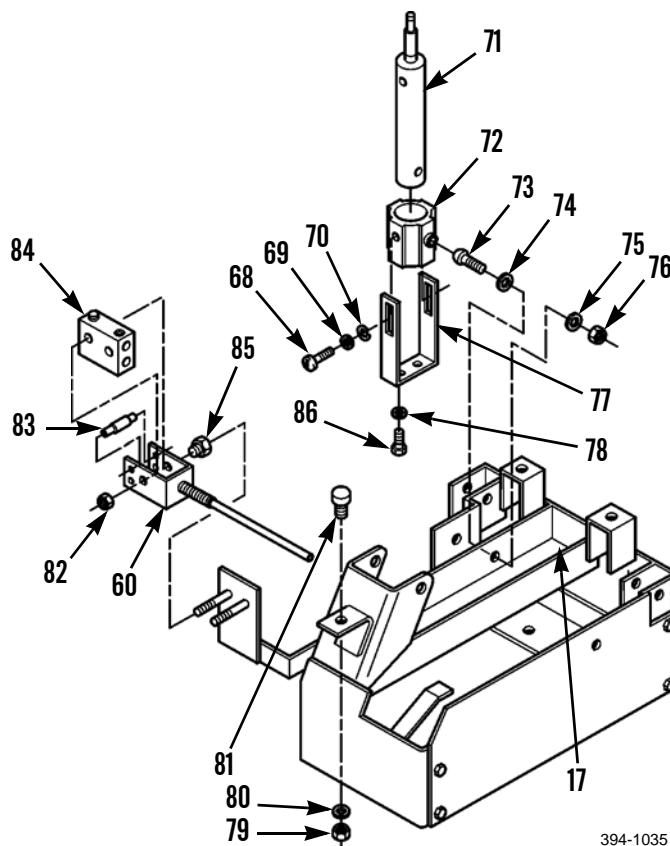
1. Clean all parts with solvent cleaning compound and dry with compressed air.
2. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

**NOTE**

All parts furnished in bearing kit will be used to replace like parts during assembly.

1. Install three bumpers (81) on suspension frame (17) with three new lockwashers (80) and nuts (79).
2. Position actuator (60) on valve assembly (84).
3. Install two valve actuator assemblies (83) on actuator (60).
4. Install two new bearings (85) and nuts (82) on actuator (60).
5. Install two new bearings (74) in retainer (72).
6. Position bracket (77) on suspension frame (17).
7. Install two screws (73), washers (75) and nuts (76) on retainer (72).
8. Position retainer (72) on bracket (77) and install two washers (70), new lockwashers (69) and screws (68).
9. Position cylinder (71) in retainer (72) and install two new lockwashers (78) and bolts (86).



394-1035

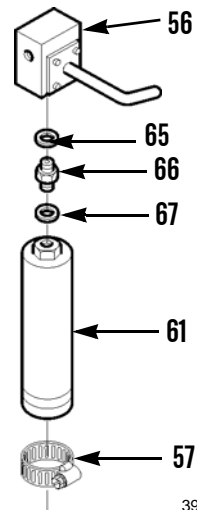
**ASSEMBLY - CONTINUED**

10. Install two new O-rings (65 and 67) on connector (66) and install connector in valve assembly (56).
11. Position clamp (57) on accumulator (61).

**NOTE**

If new accumulator is being installed, one pint of clean hydraulic fluid must be placed in oil chamber of upright accumulator. Allow accumulator to stand for approximately one minute before installation.

12. Install accumulator (61) on connector (66).



394-1034

**ASSEMBLY - CONTINUED**

13. Position clamp (55) on valve assembly (56).

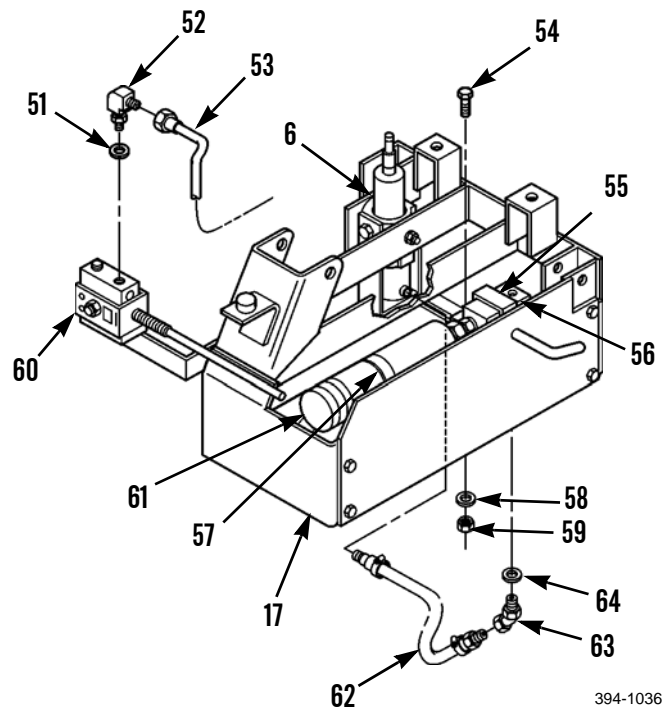
**WARNING**

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**

Accumulator and valve assembly weigh 100 lb (45 kg).

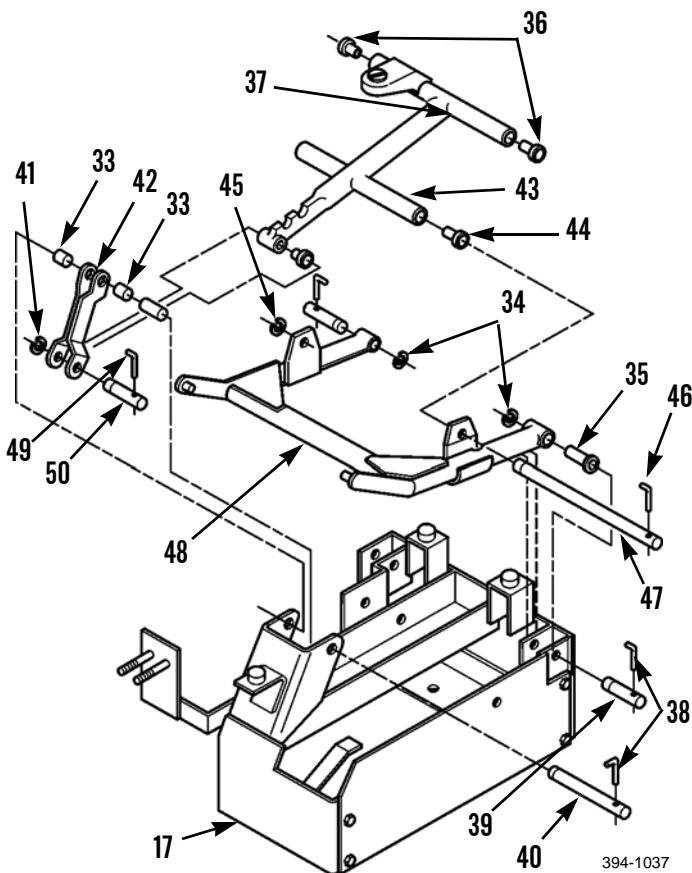
14. Attach lifting device to valve assembly (56) and accumulator (61) and position valve assembly and accumulator in suspension frame (17).
15. Install bolt (54), new lockwasher (58) and nut (59) through clamp (55).
16. Remove lifting device from valve assembly (56) and accumulator (61).
17. Tighten clamp (57).
18. Install two new O-rings (51) on two elbows (52).
19. Install two elbows (52) on valve assembly (56) and actuator (60).
20. Install tube assembly (53) on two elbows (52).
21. Connect hose assembly (62) to cylinder (6).
22. Install new O-ring (64) on elbow (63) and install elbow on valve assembly (56).
23. Connect hose assembly (62) to elbow (63).



394-1036

**ASSEMBLY - CONTINUED**

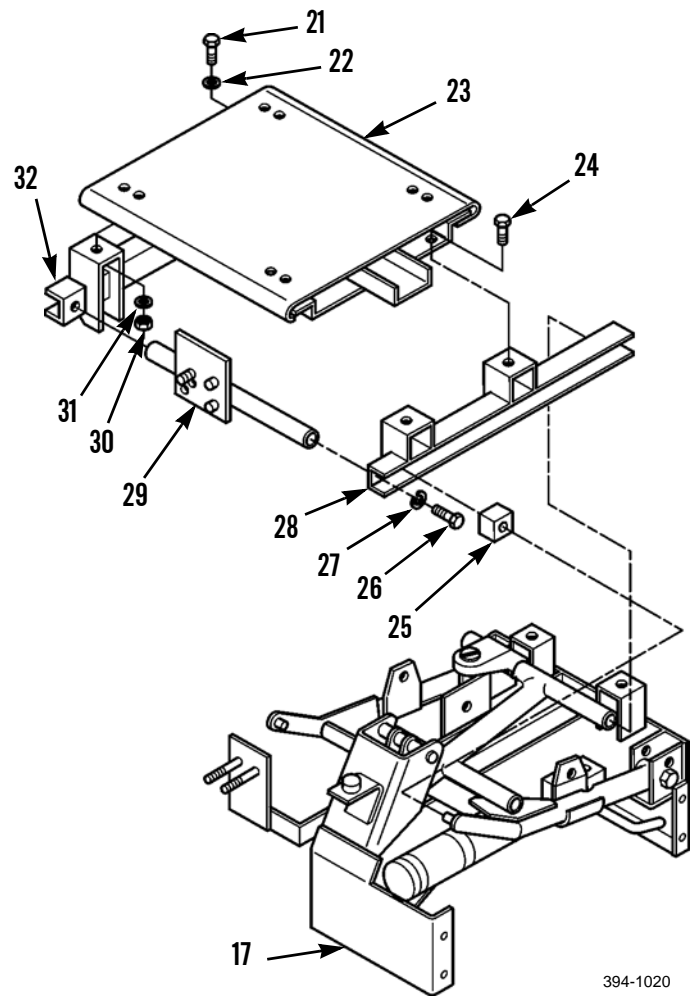
24. Install two new bearings (35) in lever (48).
25. Install four new bearings (44) in arm (43).
26. Install two new bearings (36) and spacer (37) in arm (43).
27. Install new bearing (50) in lever (42).
28. Position lever (42) and arm (43) together and align holes.
29. Install shaft (50) in lever (42) and arm (43).
30. Install pin (49) and new retaining ring (41) on shaft (50).
31. Position arm (43) and lever (48) together and align holes.
32. Install shaft (47) through brackets of lever (48) and tube of arm (43).
33. Install pin (46) and new retaining ring (45) on shaft (47).
34. Position arm (43) and lever (48) as a unit in suspension frame (17) and align mounting holes.
35. Install two shafts (39) and three pins (38) on suspension frame (17).
36. Install shaft (40) and two spacers (33) on suspension frame (17).
37. Install three new retaining rings (34) on pins (38).



394-1037

**ASSEMBLY - CONTINUED**

38. Install two slides (25) and channels (28 and 32) on adjuster assembly (23) with four bolts (24), new lock-washers (31) and nuts (30).
39. Install rod assembly (29) on adjuster assembly (23) with two washers (27) and bolts (26).
40. Install adjuster assembly (23), channels (28 and 32) and rod assembly (29) as a unit on suspension frame (17).
41. Install two washers (22) and four bolts (21) on adjuster assembly (23).

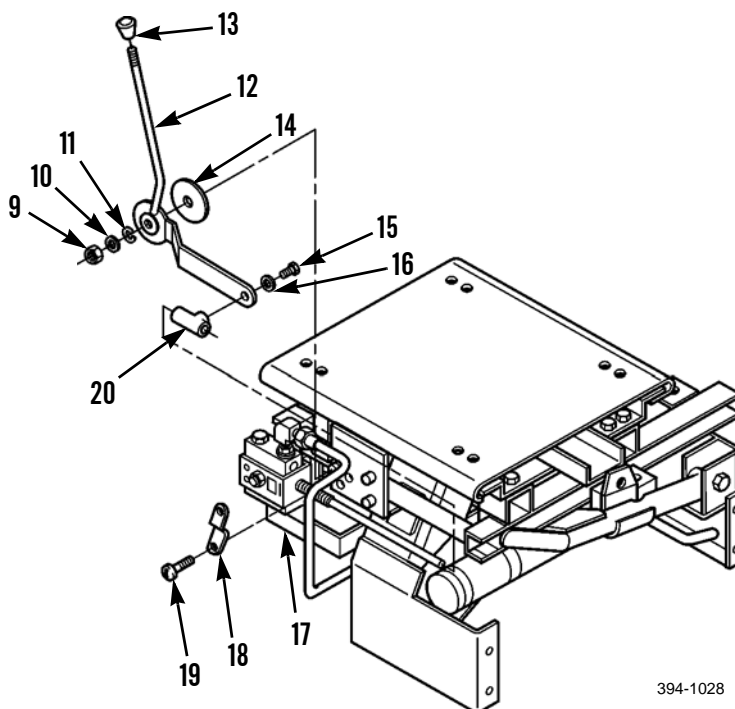


394-1020

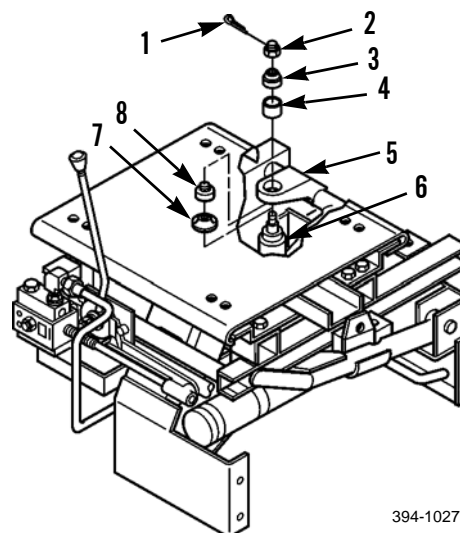


**ASSEMBLY - CONTINUED**

42. Install knob (13) on handle (12).
43. Install washer (14), handle (12), washer (11), spacer (10) and new locknut (9) on suspension frame (17).
44. Install spring (18) and screw (19) on suspension frame (17).
45. Install slide (20), washer (16) and screw (15) on handle (12).



46. Install washer (8) and bushing (7) on cylinder (6).
47. Couple cylinder (6) to suspension arm (5) and install bushing (4), washer (3) and nut (2).
48. Install new cotter pin (1) on cylinder (6).



49. Install seat suspension assembly (WP 0316 00).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Detergent, general purpose (Item 13, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Lockwasher (2)

Seal (5)

**References**

TM 5-3805-248-10

**Equipment Condition**

Heater assembly removed (WP 0224 00)

**REMOVAL**

1. Remove 16 bolts (1), washers (2), cover (3) and insulation (4) from case assembly (7).
2. Remove nut (14), washer (13) and clip (12) from hose (9).
3. Remove nut (10), washer (5) and clip (11) from hose (9).

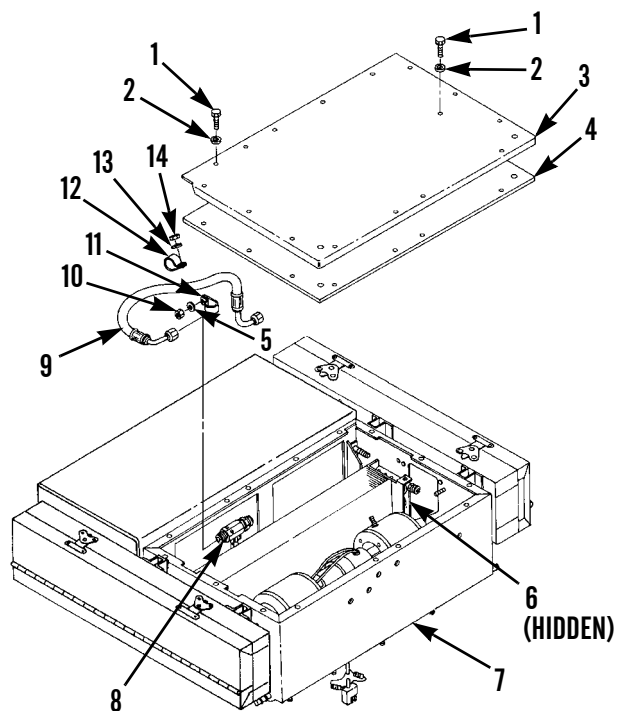
**CAUTION**

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

**NOTE**

Tag hose prior to removal to ensure correct installation.

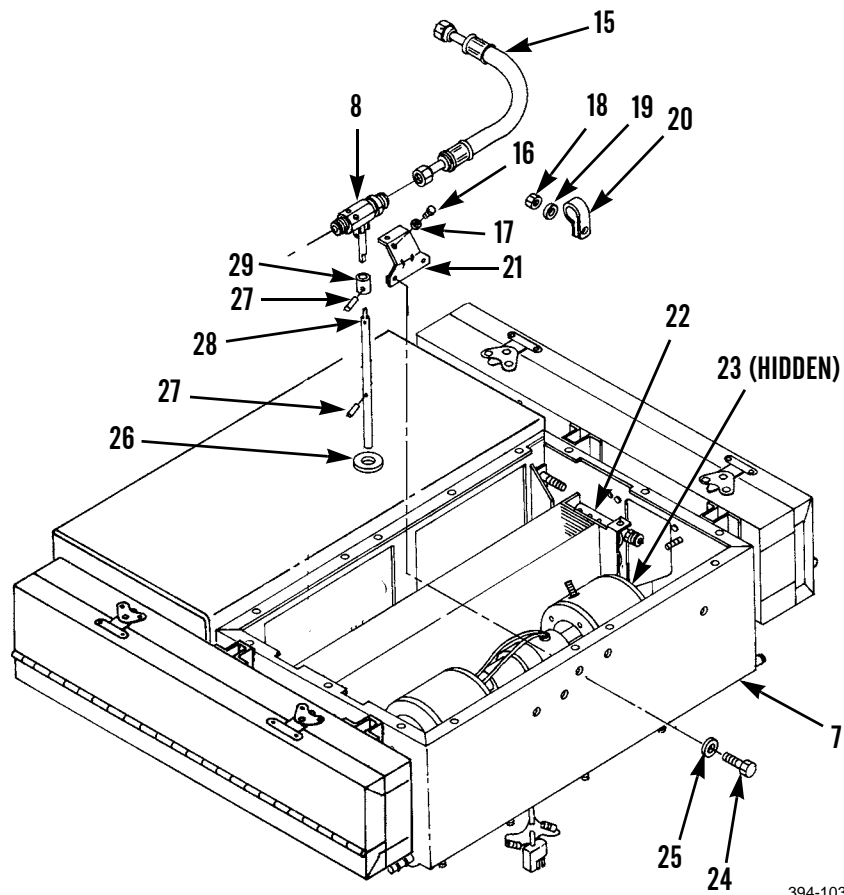
4. Remove hose (9) from valve assembly (8) and fitting (6).



394-1038

**REMOVAL - CONTINUED**

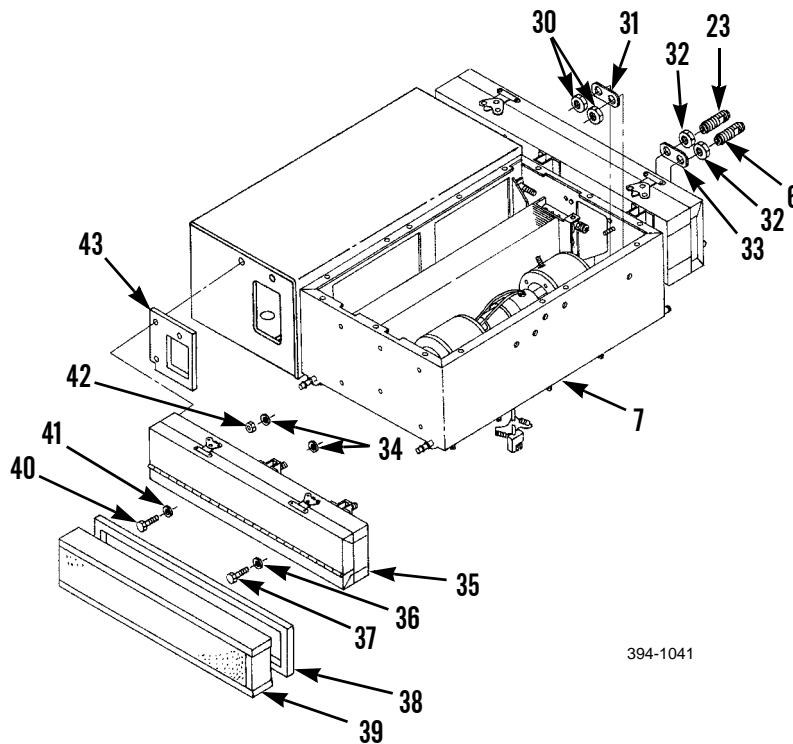
5. Remove nut (18), washer (19) and clip (20) from hose (15).
6. Remove hose (15) from coil (22) and valve assembly (8).
7. Remove two bolts (24), washers (25) and valve assembly (8) from case assembly (7).
8. Remove two screws (16), lockwashers (17), and bracket (21) from valve assembly (8). Discard lockwashers.
9. Remove washer (26) from rod (28).
10. Remove two pins (27), sleeve (29) and rod (28) from valve assembly (8)



394-1039

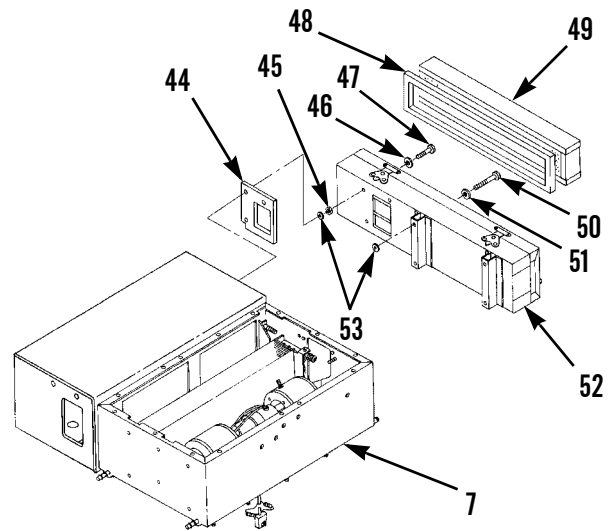
**REMOVAL - CONTINUED**

11. Remove two nuts (32), plates (31 and 33) and fitting (6 and 23) from case assembly (7).
12. Remove filter (39) and seal (38) from housing (35).
13. Remove seven retainers (34) from bolts (37 and 40).
14. Remove four bolts (37) and washers (36) from housing (35).
15. Remove three nuts (42), bolts (40) and washers (41) from housing (35).
16. Remove housing (35) and seal (43) from case assembly (7).



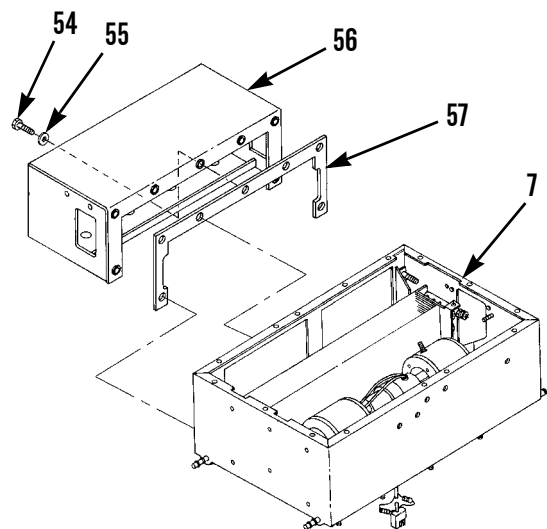
**REMOVAL - CONTINUED**

17. Remove filter (49) and seal (48) from housing (52).
18. Remove seven retainers (53) from bolts (47 and 50).
19. Remove four bolts (50) and washers (51) from housing (52).
20. Remove three nuts (45), bolts (47) and washers (46) from housing (52).
21. Remove housing (52) and seal (44) from case assembly (7).



394-1042

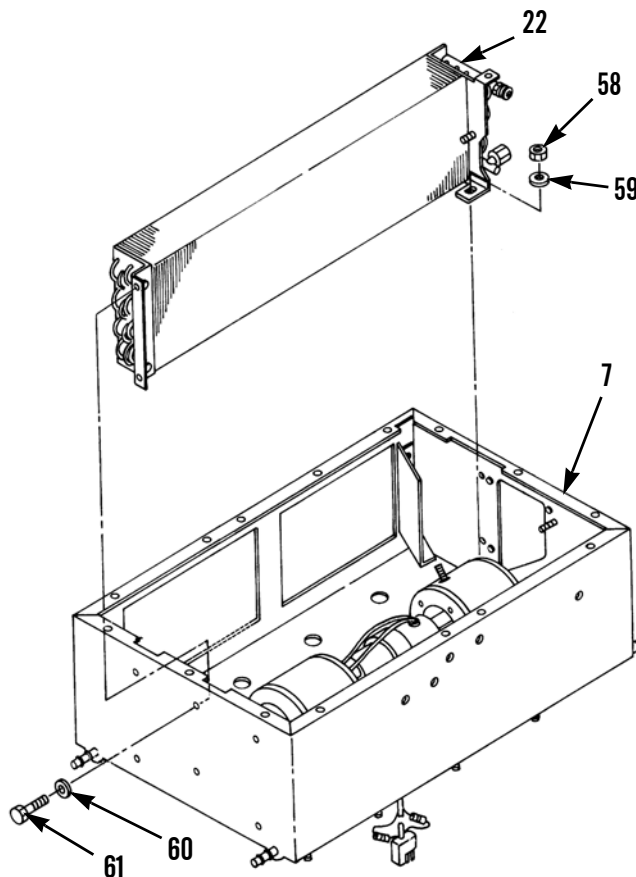
22. Remove seven bolts (54), washers (55), plenum assembly (56) and seal (57) from case assembly (7).



394-1043

**REMOVAL - CONTINUED**

23. Remove nut (58) and washer (59) from coil (22).
24. Remove two bolts (61), washers (60) and coil (22) from case assembly (7).



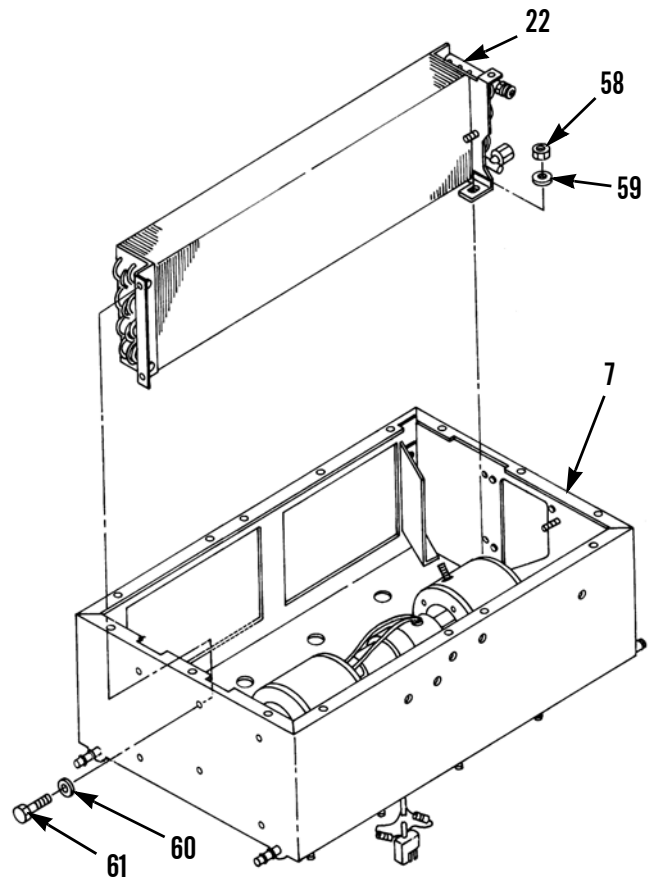
394-1040

**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 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 metal parts with solvent cleaning compound and plastic parts with detergent. Dry with compressed air. Ensure that all seal material is removed from mounting surfaces.
  2. Inspect all parts for damage and replace as necessary.

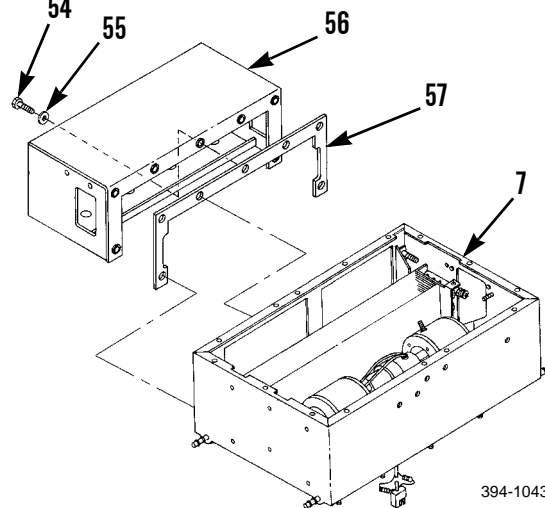
**INSTALLATION**

1. Install coil (22) in case assembly (7) with two washers (60) and bolts (61).
2. Install washer (59) and nut (58) on coil (22).



394-1040

3. Install new seal (57) and plenum assembly (56) on case assembly (7) with seven washers (55) and bolts (54).

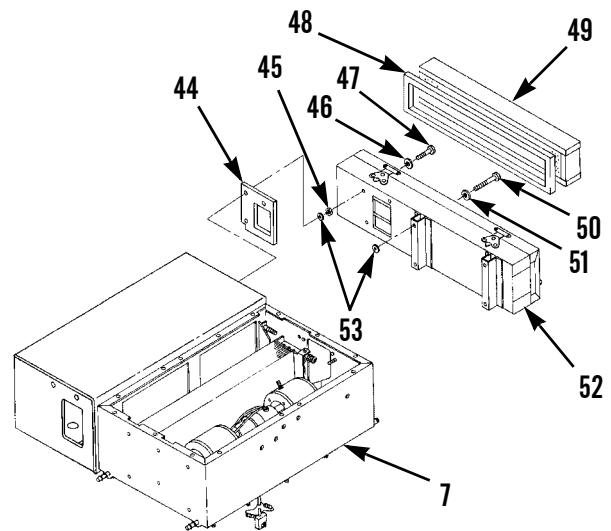


394-1043



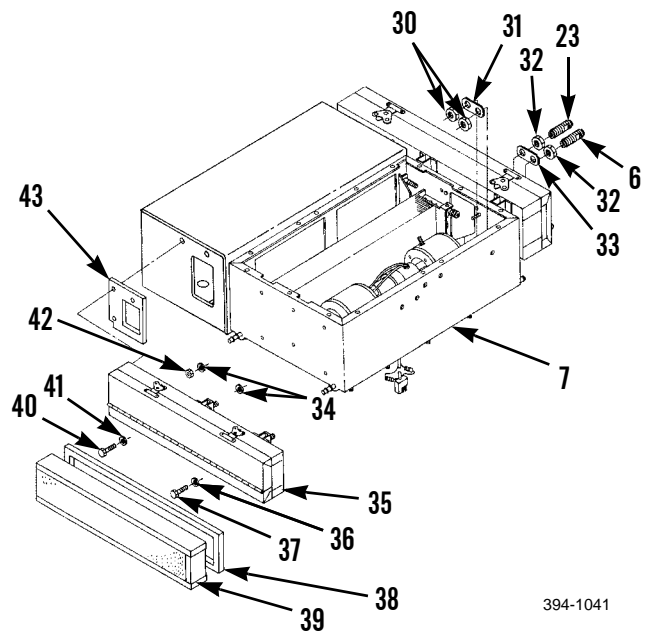
**INSTALLATION - CONTINUED**

4. Position new seal (44) and housing (52) in case assembly (7) and install three washers (46), bolts (47) and nuts (45).
5. Install four washers (51) and bolts (50) on housing (52).
6. Install seven retainers (53) on bolts (47 and 50).
7. Install new seal (48) and filter (49) in housing (52).



394-1042

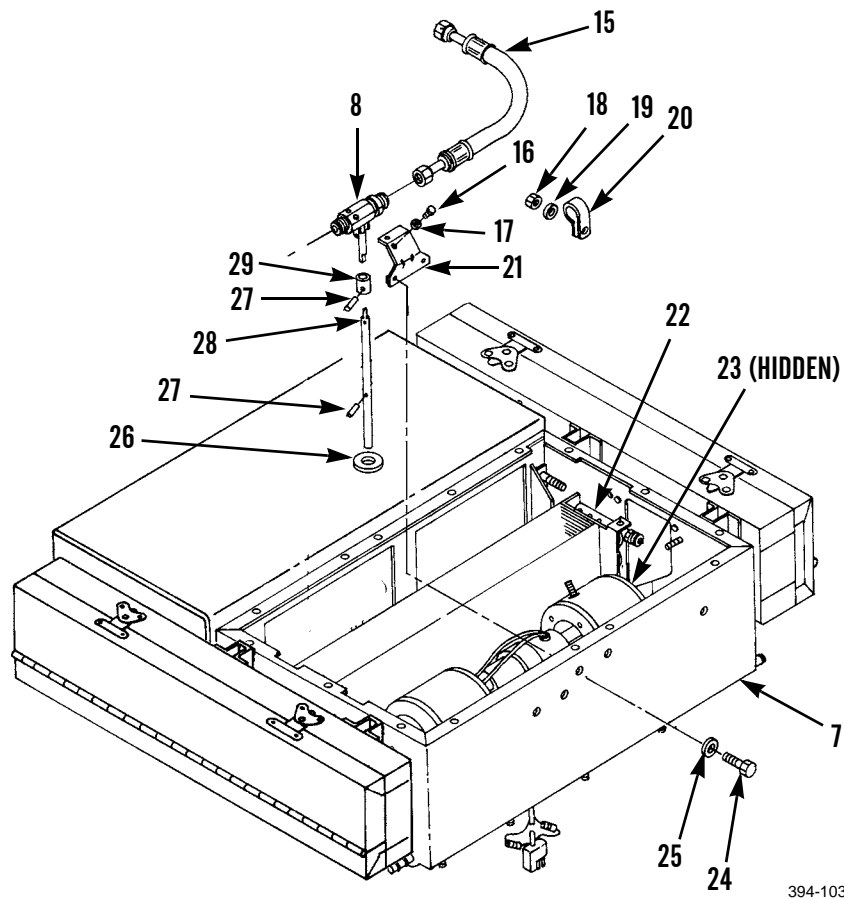
8. Position new seal (43) and housing (35) on case assembly (7) and install three washers (41), bolts (40) and nuts (42).
9. Install four washers (36) and bolts (37) on housing (35).
10. Install seven retainers (34) on bolts (37 and 40).
11. Install new seal (38) and filter (39) in housing (35).
12. Install fitting (6 and 23) and plates (31 and 33) on case assembly (7) with two nuts (30 and 32).



394-1041

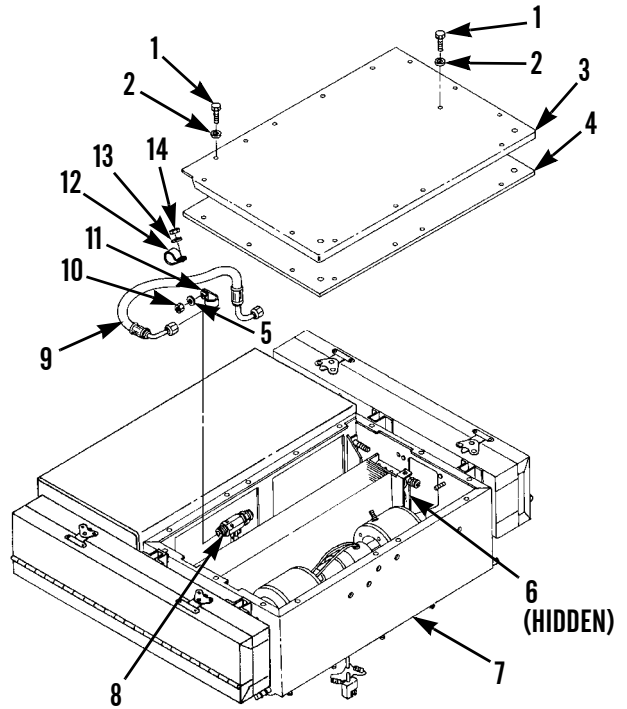
**INSTALLATION - CONTINUED**

13. Install rod (28), sleeve (29), two pins (27) and washer (26) in case assembly (7).
14. Install valve assembly (8) in case assembly (7).
15. Install bracket (21) with two new lockwashers (17), screws (16), washers (25) and bolts (24) in case assembly (7).
16. Install hose (15) on coil (22) and valve assembly (8).
17. Install clip (20) on hose (15) with washer (19) and nut (18).



**INSTALLATION - CONTINUED**

18. Install hose (9) on fitting (6) and valve assembly (8).
19. Install clip (11) on hose (9) with washer (5) and nut (10).
20. Install clip (12) on hose (9) with washer (13) and nut (14).
21. Install insulation (4) and cover (3) on case assembly (7) with 16 washers (2) and bolts (1).



394-1038

22. Install heater assembly (WP 0224 00).
23. Operate heating system and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)  
 Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Strap, tiedown (Item 40, WP 0339 00)  
 Tag, marker (Item 41, WP 0339 00)  
 Seal (4)

**Equipment Conditions**

Heater assembly plenum, housing and coil removed (WP 0318 00)

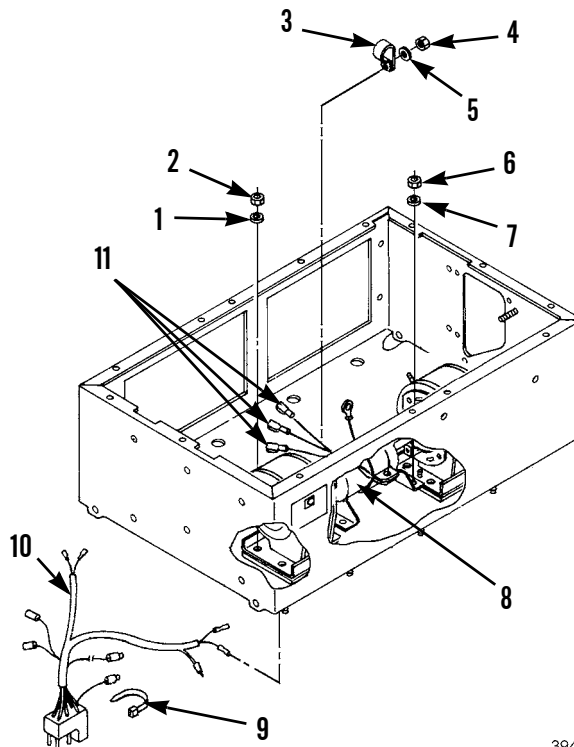
**DISASSEMBLY**

1. Remove nut (4), washer (5) and clip (3) from heater assembly (8).

**NOTE**

Tag wire connectors prior to removal to ensure correct installation.

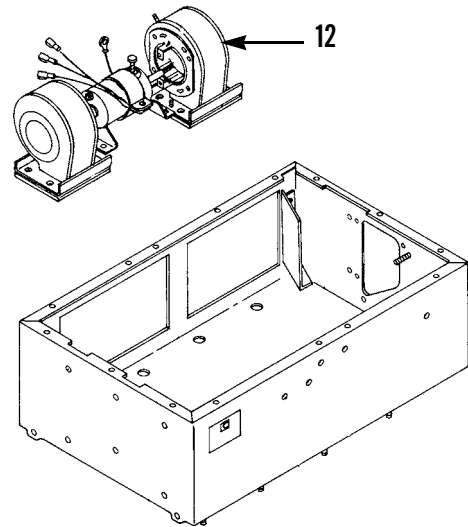
2. Disconnect three wire connectors (11) from harness assembly (10).
3. Remove and discard tie down strap (9) from harness (10).
4. Remove four nuts (6) and washers (7) from motor assembly (8).
5. Remove four nuts (2) and washers (1) from motor assembly (8).



394-1045

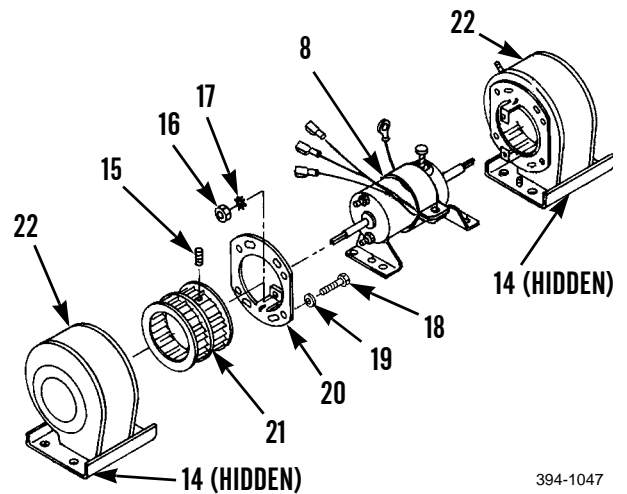
**DISASSEMBLY - CONTINUED**

6. Remove motor and blower assembly (12).



394-1046

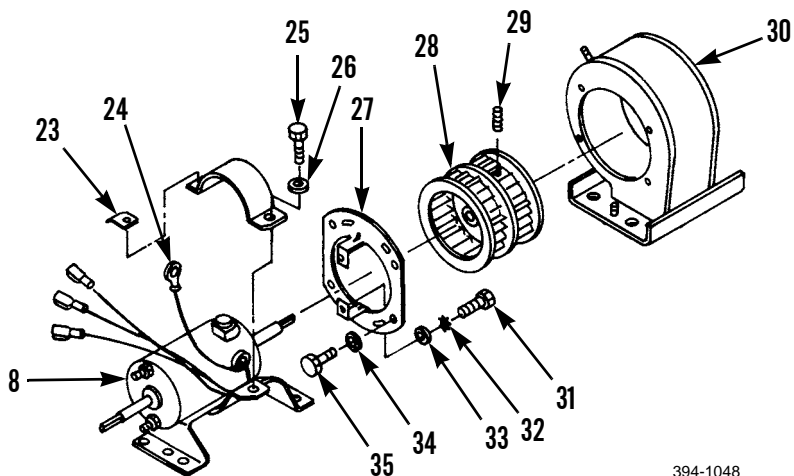
7. Remove two seals (14) from housing (22). Discard seals.
8. Remove three bolts (18), washers (19) and housing (22) from motor assembly (8).
9. Loosen setscrew (15) and remove blower wheel (21) from motor assembly (8).
10. Remove two nuts (16), washers (17) and plate (20) from motor assembly (8).



394-1047

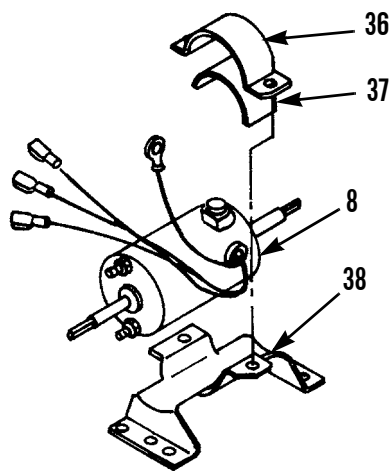
**DISASSEMBLY - CONTINUED**

11. Remove four bolts (35), washers (34) and housing (30) from motor assembly (8).
12. Loosen setscrew (29) and remove blower wheel (28) from motor assembly (8).
13. Remove two bolts (31), washers (32 and 33) and plate (27) from motor assembly (8).
14. Remove two bolts (25), washers (26) and lock (23) from motor assembly (8).
15. Disconnect wire connector (24) from terminal at bolt (25).



394-1048

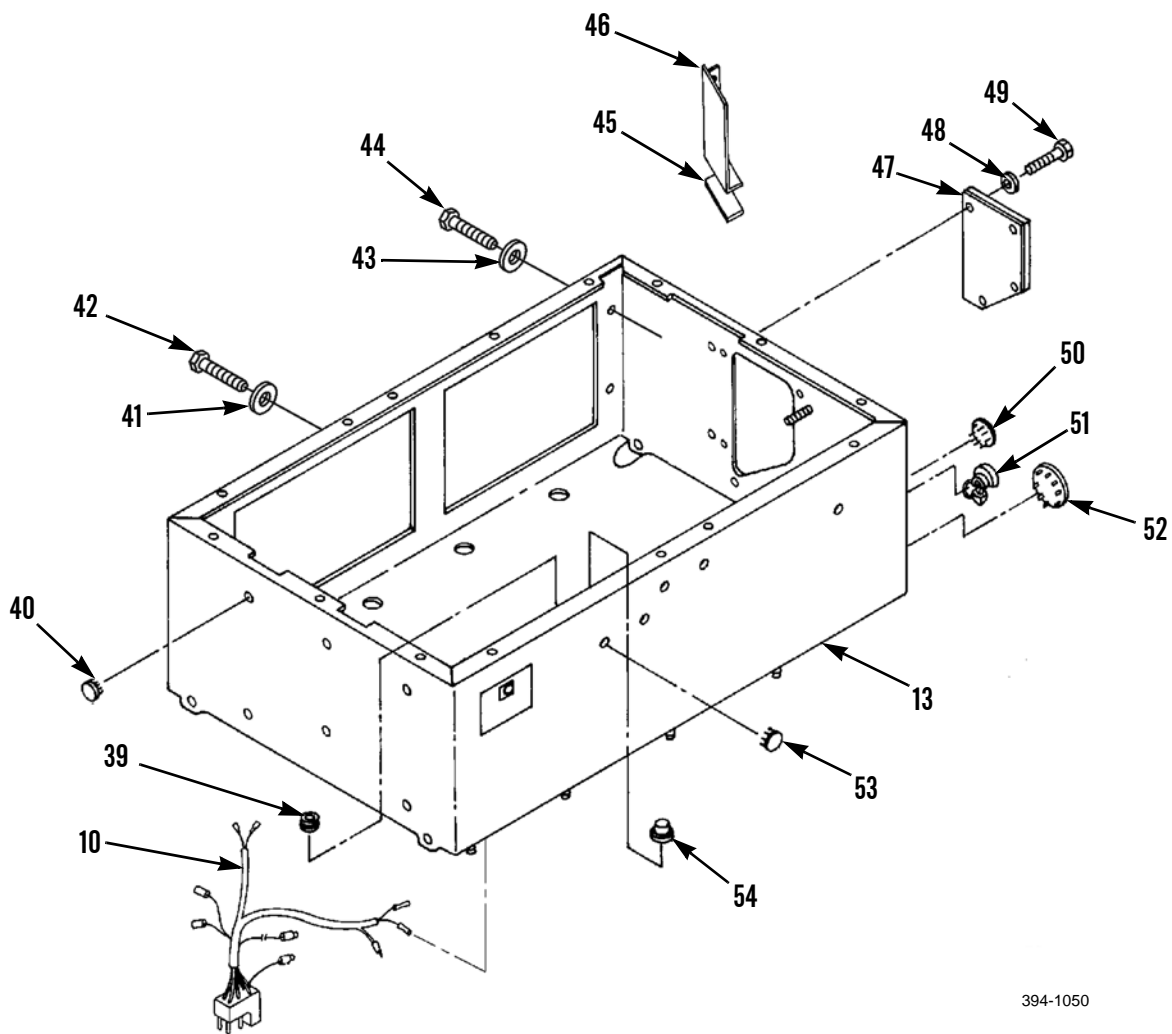
16. Remove strap (36), seal (37) and motor assembly (8) from bracket (38). Discard seal.



394-1049

**DISASSEMBLY - CONTINUED**

17. Remove harness (10) from blower case (13).
18. Remove bolt (42) and washer (41) from blower case (13).
19. Remove two bolts (44) and washers (43) from blower case (13).
20. Remove baffle (45) and seal (46) from blower case (13). Discard seal.
21. Remove four bolts (49), washers (48) and plate (47) from blower case (13).
22. Remove plugs (40, 50, 52, 53 and 54) from blower case (13).
23. Remove grommets (51 and 39) from blower case (13).



394-1050

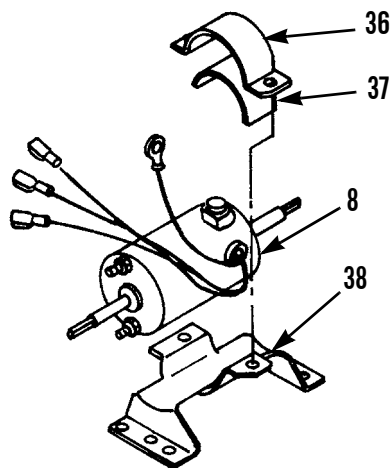


**CLEANING AND INSPECTION****WARNING**

- 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 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 parts with solvent cleaning compound and dry with compressed air. Ensure that all seal material is removed from mounting surfaces.
  2. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

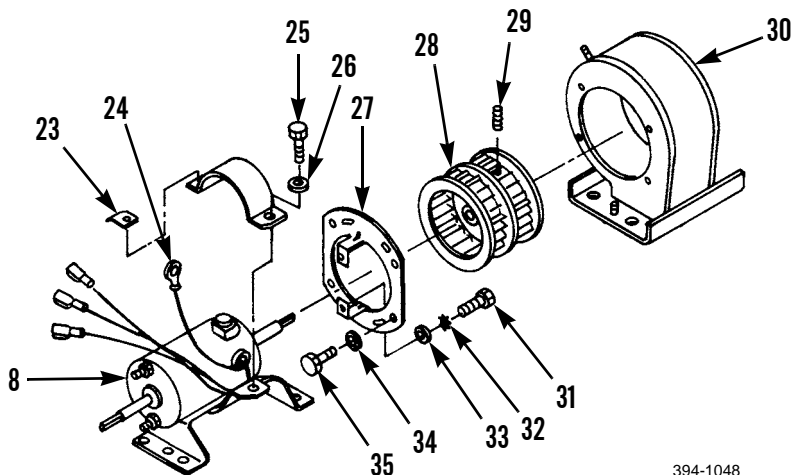
1. Install grommets (51 and 39) on blower case (13).
2. Install plugs (40, 50, 52, 53 and 54) on blower case (13).
3. Install plate (47) on blower case (13) with four washers (48) and bolts (49).
4. Install new seal (45) and baffle (46) on blower case (13).
5. Install two washers (43) and bolts (44) on blower case (13).
6. Install washer (41) and bolt (42) on blower case (13).
7. Install harness assembly (10) on blower case (13).
8. Install motor assembly (8) on bracket (38) with new seal (37) and strap (36).



394-1049

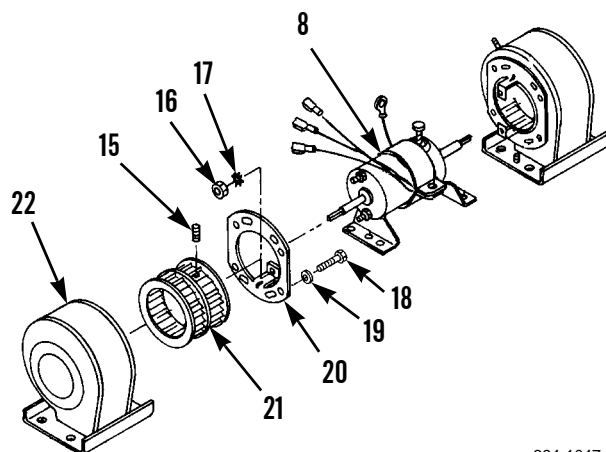
**ASSEMBLY - CONTINUED**

9. Connect wire connector (24) to bolt (25).
10. Install lock (23) on motor assembly (8) with two washers (26) and bolts (25).
11. Install plate (27) on motor assembly (8) with two washers (32 and 33) and bolts (31).
12. Position blower wheel (28) on motor assembly and tighten setscrew (29).
13. Install housing (30) on motor assembly (8) with four washers (34) and bolts (35).



394-1048

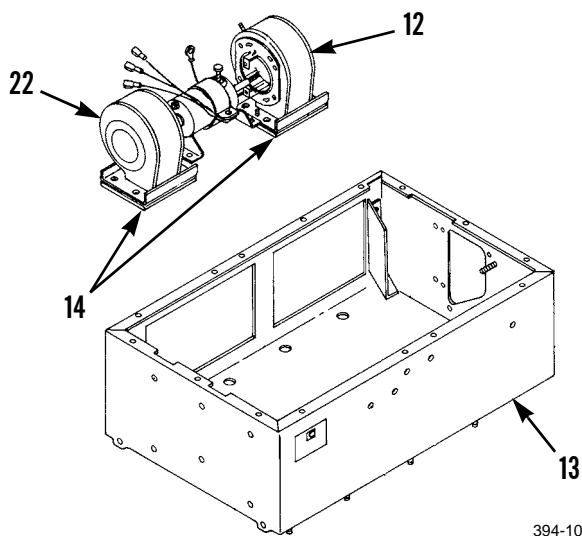
14. Install plate (20) on motor assembly (8) with two washers (17) and nuts (16).
15. Position blower wheel (21) on motor assembly (8) and tighten setscrew (15).
16. Install housing (22) on motor assembly (8) with three washers (19) and bolts (18).
17. Install two new seals (14) on housing (22).



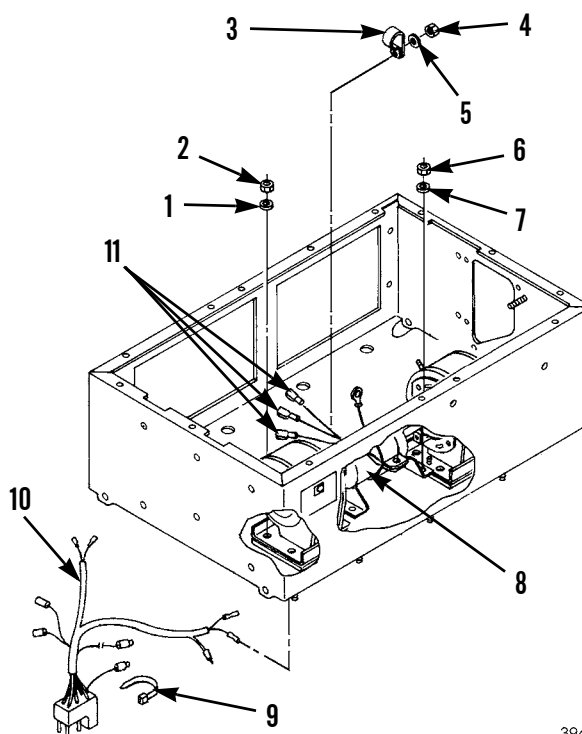
394-1047

**ASSEMBLY - CONTINUED**

18. Install motor and blower assembly (12) in case (13).



- 19. Install four washers (1) and nuts (2) on motor assembly (8).
- 20. Install four washers (7) and nuts (6) on motor assembly (8).
- 21. Install new tiedown straps (9) on harness assembly (10).
- 22. Connect three wire connectors (11) to harness assembly (10).
- 23. Install clip (3), on heater assembly (8) with washer (5) and nut (4).



24. Install heater assembly plenum, housing and coil (WP 0318 00).

**END OF WORK PACKAGE**



---

**HEATER MOTOR ASSEMBLY REPAIR**

---

0320 00

**THIS WORK PACKAGE COVERS**

Disassembly, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Materials/Parts**

Rag, wiping (Item 35, WP 0339 00)

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Equipment Condition**

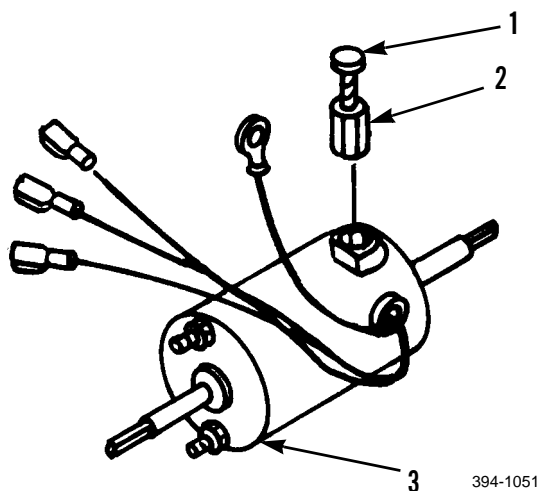
Motor assembly removed (WP 0319 00)

---

**DISASSEMBLY****CAUTION**

Use care not to damage brush caps when removing brushes from motor assembly.

Rotate caps (1) to left and remove two brushes (2) from motor assembly (3).

**ASSEMBLY**

394-1051

**CAUTION**

Use care not to damage brush caps when installing two brushes on motor assembly.

1. Install two brushes (2) on motor assembly (3). Rotate caps (1) to right.
2. Install motor assembly (WP 0319 00)

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Preparation for System Test, System Tests, Comparison of System Tests, Hydraulic Implement Pump Tests, Comparison of Pump Tests, Hydraulic Implement Pump Test-Aeration and Cavitation for Test 17 through 23, Comparison of Aeration and Cavitation Tests, Blocked Circuit Tests, Comparison of Blocked Circuit Tests, Blocked Component Tests, Comparison of Blocked Component Tests, Hydraulic System Tee Test

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Tool outfit, hydraulic system test and repair (HSTRU) (Item 114, WP 0338 00)

Shop equipment, common no. 1 (Item 101, WP 0338 00)

**References**

WP 0019 00

WP 0020 00

WP 0322 00

WP 0323 00

**References - Continued**

WP 0324 00

WP 0233 00

WP 0380 00

WP 0381 00

WP 0382 00

WP 0383 00

WP 0384 00

WP 0385 00

**Personnel Required**

Two

**Equipment Condition**

Tractor parked on level ground



**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 2,500 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**

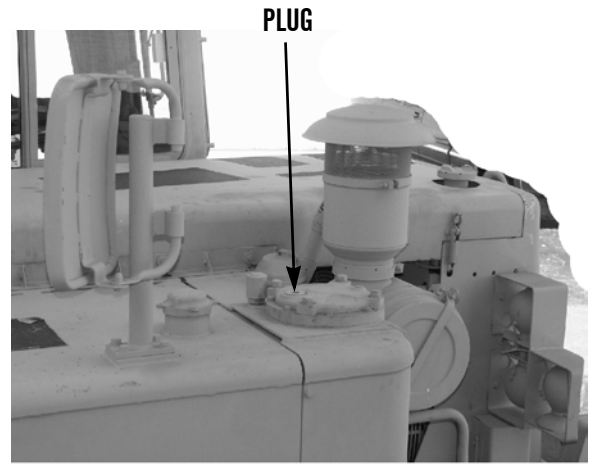
Wipe area clean around all hydraulic connections to be opened during removal. Cap oil lines and plug openings after removing lines. Contamination of hydraulic system could result in premature failure

**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 0019 00) and (WP 0020 00) before performing tests.

**PREPARATION FOR SYSTEM TEST**

- a. Loosen cap on hydraulic tank and release any pressure. Tighten cap.



394-164E

- b. Start engine and move ejector control lever fully forward. Stop engine.

**WARNING**

- Do not install flow meter adapter into supply line of hydraulic implement pump with the engine running. Failure to follow this procedure may cause INJURY. If you are injured, obtain medical help immediately.
  - A plain coupler will not open valve in supply line adapter. Use a valved coupler against a valved nipple with connecting hose.
- c. Remove plug and preformed packing from the supply side elbow of the hydraulic implement pump. Install adapter in place of plug. Install supply line hose and connect to flow meter.
  - d. Remove plug and preformed packing from filter cover on hydraulic tank. Install return line assembly in place of plug. Connect return line to flow meter.
  - e. Disconnect tachometer cable from vehicle. Install tachometer generator to vehicle. Connect correct cable from tachometer generator to flow meter RPM input connection.



394-1660



**PREPARATION FOR SYSTEM TEST - CONTINUED****WARNING**

Manual load valve on flow meter must be fully open before starting engine. Failure to follow this procedure may cause injury. If you are injured, obtain medical help immediately.

- f. Open manual load valve on flow meter fully.
- g. Start engine and run at 1,900 RPM.
- h. Slowly adjust manual load valve on flow meter to a pressure of 1,000 psi (6,895 kPa).
- i. Check oil temperature.
- j. When oil temperature reaches 100°F (38°C), adjust manual load valve on flow meter to a pressure of 1,500 psi (10,342 kPa).
- k. Move all hydraulic control levers several times.
- l. Check oil temperature.
- m. When oil temperature reaches 160°F (71°C), move cylinders through their cycles until temperature throughout system is lowered to 150°F (66°C).

**SYSTEM TESTS****1. Maximum Pressure Relief Valve Setting.****NOTE**

Before recording test data, make sure conditions in hydraulic system are constant. Refer to Preparation for Test.

- a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM. Move ejector control lever forward.
  - c. Slowly close manual load valve until oil flow through flow meter stops (zero gpm).
  - d. Record pressure. Refer to Table 1. Maximum pressure relief valve setting is between 2,100 and 2,200 psi (14,479 and 15,168 kPa).
- 2. System Oil Temperature (Start).**
- a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM. Move ejector control lever forward.
  - c. Record oil temperature. Refer to Table 1. System oil temperature should be between 145° and 155°F (63° and 68°C).
  - d. For pressures higher than 1,000 psi (6,895 kPa), slowly open manual load valve before releasing control lever.
- 3. System Base Flow Rate.**
- a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM. Move ejector control lever forward.

**NOTE**

Before recording test data, make sure system pressure is at least 100 psi (689 kPa).

- c. Record flow rate. Refer to Table 1. Correct system base flow rate is 70 gpm (265 l/min).

**SYSTEM TESTS - CONTINUED**

4. **Ejector Forward Flow Rate (Leakage Rate).**
  - a. Move ejector control lever to FORWARD position.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust manual load valve on flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 1. Correct ejector forward flow rate is 67 gpm (254 l/min).
5. **Ejector Return Flow Rate (Leakage Rate).**
  - a. Move ejector control lever to RETURN position.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust manual load valve on flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 1. Correct ejector return flow rate is 67 gpm (254 l/min).
6. **Bowl Raise Flow Rate (Leakage Rate).**
  - a. Move bowl control lever to RAISE position.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust manual load valve on flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 1. Correct bowl raise flow rate is 67 gpm (254 l/min).
7. **Bowl Lower Flow Rate (Leakage Rate).**
  - a. Move bowl control lever to LOWER position.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust manual load valve on flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 1. Correct bowl lower flow rate is 63 gpm (238 l/min).
8. **Apron Up Flow Rate (Leakage Rate).**
  - a. Move apron control lever to UP position.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust manual load valve on flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 1. Correct apron up flow rate is 67 gpm (254 l/min).
9. **Apron Down Flow Rate (Leakage Rate).**
  - a. Move apron control lever to DOWN position.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM.
  - d. Slowly adjust manual load valve on flow meter to a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 1. Correct apron down flow rate is 67 gpm (254 l/min).

**SYSTEM TESTS - CONTINUED**10. **System Oil Temperature (Finish).**

- a. Open manual load valve on flow meter fully.
- b. Start engine and run at 1,900 RPM. Move the ejector control lever forward.
- c. Record oil temperature. Refer to Table 1. System oil temperature should be between 145° and 155°F (63° and 68°C).

**NOTE**

Finish oil temperature (Test 10) must be within ten percent,  $\pm 5^{\circ}\text{F}$  ( $-9^{\circ}\text{C}$ ) of start oil temperature (Test 2).

- For each 15°F (-9°C) that the finish is higher than the start, (Test 10 greater than Test 2) subtract 0.5 gal. (2 l) from leakage rate.
- For each 15°F (-9°C) that the finish is lower than the start (Test 2 greater than Test 10) add 0.5 gal. (2 l) to the leakage rate.

11. **Bowl Circuit Drift Comparison.**

- a. Open manual load valve on flow meter fully.
- b. Start engine and run at 1,900 RPM. Move bowl control lever into RAISE position. Lift the bowl approximately 1 ft (0.3 m) off the ground.
- c. Move bowl control lever into HOLD position. Stop engine.
- d. Look for a downward drift (movement) in bowl.
- e. Move bowl control lever into RAISE position.
- f. Look for a downward drift (movement) in bowl.
- g. Record test results. If drift in RAISE position is more than drift in HOLD position, circle M on Test Table 1. If drift in RAISE position is less than or the same as drift in HOLD position, circle S on Test Table 1.

12. **Apron Circuit Drift Comparison.**

- a. Open manual load valve on flow meter fully.
- b. Start engine and run at 1,900 RPM. Move bowl control lever into RAISE position. Lift bowl approximately 10 in. (38 cm) off ground.
- c. Move apron control lever into UP position and raise until apron is open approximately 15 inches.
- d. Move apron control lever into HOLD position. Stop engine.
- e. Look for a downward drift (movement) in apron.
- f. Move apron control lever into RAISE position.
- g. Look for a downward drift (movement) in apron.
- h. Record test results. If drift in RAISE position is more than drift in HOLD position, circle M on test Table 1. If drift in RAISE position is less than or the same as drift in HOLD position, circle S on test Table 1.

**COMPARISON OF SYSTEM TESTS**

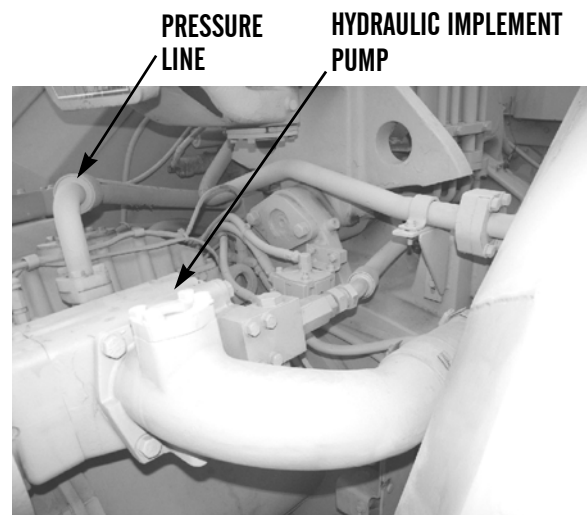
- a. Test reading is higher or lower than Maximum Pressure Relief Valve Setting (Test 1) and Percent Flow Loss (Tests 4 through 9) is different by 15 to 50 percent.
  - (1) Check hydraulic control relief valve setting.
  - (2) If setting is incorrect, make adjustments to obtain correct setting. Refer to WP 0323 00 and WP 0381 00.
  - (3) If hydraulic control relief valve is functioning properly, test hydraulic implement pump using flow meter. Refer to *Hydraulic Implement Pump Test*.
- b. Flow loss (Tests 4 through 9) is greater than percent shown in Table 1.
  - (1) Test hydraulic implement pump for proper operation. Refer to *Hydraulic Implement Pump Test*.
    - (a) If hydraulic implement pump is damaged or defective, replace.
    - (b) If hydraulic implement pump is operating properly, go to step 2.
  - (2) Check sequence valve for leakage.
    - (a) If sequence valve is leaking, stop leakage. Refer to WP 0382 00.
    - (b) If no leakage is present, go to step 3.
  - (3) Check hydraulic control valve spools and valve body for damage and wear.
    - (a) If hydraulic control valve and valve body is damaged or defective, adjust, service or replace. Refer to WP 0323 00 and WP 0381 00.
    - (b) If control valve spools and valve body are functioning, go to step 4.
- c. Flow loss for Tests 4 and/or 5 is more than 15 percent; flow loss for Tests 6, 7, 8 and 9 is less than percent shown in Table 1.
  - (1) Check hydraulic control valve body and spool for damage or wear.
    - (a) If hydraulic control valve body and spool are damaged or defective, adjust, service or replace. Refer to WP 0323 00 and WP 0381 00.
    - (b) If hydraulic control valve body and spools are functioning, proceed to step 2.
  - (2) Check ejector cylinder piston seals for leakage.
    - (a) If leakage is present, refer to WP 0384 00.
    - (b) If no leakage is present, perform Blocked Circuit Tests 26 and 27, in Troubleshooting, paragraph h.
    - (c) After performing Blocked Circuit Tests 26 and 27 and if flow rates exceed 68 gpm (257 l/min) replace or repair ejector control valve. Refer to WP 0323 00 and WP 0381 00.
- d. Flow loss for Tests 6 and 7 is more than the percent shown in Table 1; flow loss for Tests 4, 5, 8 and 9 is less than percent shown in Table 1.
  - (1) Check bowl cylinder piston seals for leakage (Figure 10-7).
    - (a) If leakage is present, refer to WP 0384 00. If no leakage is present, go to step 2.
  - (2) Check hydraulic control valve body and spools for damage and wear.
    - (a) If hydraulic control valve spools and body are damaged or defective, service or replace.
    - (b) If hydraulic control valve is functioning, proceed to next step.

**COMPARISON OF SYSTEM TESTS - CONTINUED**

- e. Flow loss for Tests 8 and 9 are more than percent shown in Table 1; flow loss for Tests 4, 5, 6 and 9 are less than percent shown in Table 1.
- (1) Check piston seals in apron cylinder for leakage.
    - (a) If seals are damaged or defective, replace. Refer to WP 0385 00.
    - (b) If no leakage is present, go to step 2.
  - (2) Check hydraulic control valve spools and body for damage or wear.
    - (a) If hydraulic control valve spools and body are damaged or defective; adjust, service or replace.
    - (b) If hydraulic control valve spools and body are functioning, go to step 3.
  - (3) Check sequence valve for apron circuit.
    - (a) If sequence valve leaks or is damaged or defective; service or replace. Refer to WP 0382 00.
    - (b) If apron cylinder and sequence valve are functioning, proceed to Blocked Circuits Test 30 and 31.
    - (c) If leakage is still too high, the problem is in the apron control valve. Refer to WP 0323 00 and WP 0381 00.
- f. Flow loss for Tests 5 and 9 is more than the percent shown in Chart I; flow loss for Tests 4, 6, 7 and 8 is less than percent shown in Table 1.
- (a) Check hydraulic control valve body and spools for ejector and apron circuits.
  - (b) If hydraulic control valve or spools are damaged or defective; adjust, service or replace. Refer to WP 0323 00 and WP 0382 00.

**HYDRAULIC IMPLEMENT PUMP TESTS**

Test is used to find the efficiency of the hydraulic implement pump. Remove pressure line of hydraulic implement pump. Install a blocking plate. This will prevent oil from going through the system. All of hydraulic implement pump flow now will go through flow meter.



394-1647

**HYDRAULIC IMPLEMENT PUMP TESTS- CONTINUED****WARNING**

Manual load valve on flow meter must be fully open before starting engine. Failure to follow this warning could result in INJURY.

1. **Hydraulic Implement Pump Flow At Low Pressure.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 100 psi (689 kPa).
  - d. Record oil temperature and flow rate. Refer to Chart II. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 79 gpm (300 l/min).
2. **Pump Flow At High Pressure.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 71 gpm (269 l/min).
3. **Pump Flow At Low Pressure (1/2 Test RPM).**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 950 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 100 psi (689 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 40 gpm (151 l/min).
4. **Pump Flow At High Pressure (1/2 Test RPM).**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 950 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 32 gpm (121 l/min).

**COMPARISON OF PUMP TESTS**

- a. Flow loss for Test 14 is 10 percent or more; flow loss for Tests 4 through 9 is more than percent shown in Table 1,
  - (1) Check leakage in hydraulic control valve.
    - (a) If hydraulic control valve has internal leakage or is damaged or defective; adjust, service or replace. Refer to WP 0323 00 and WP 0381 00.
    - (b) If hydraulic control valve leak does not leak, proceed to step 5.

**COMPARISON OF PUMP TESTS - CONTINUED**

- (2) Check leakage in ejector cylinder.
    - (a) If ejector cylinder has internal leaks or is damaged or defective; service or replace. Refer to WP 0384 00.
    - (b) If ejector cylinder does not leak, proceed to step 5.
  - (3) Check for leakage in bowl cylinders.
    - (a) If bowl cylinders are damaged or defective service or replace. Refer to WP 0383 00.
    - (b) If bowl cylinders leak, proceed to step 5.
  - (4) Check leakage in apron cylinder.
    - (a) If apron cylinder is damaged or defective; service or replace. Refer to WP 0385 00.
    - (b) If apron cylinder leaks, proceed to step 5.
  - (5) Check hydraulic implement pump for source of leakage. Do Blocked Cylinders Tests (Table 3) for leakage rate.
    - (a) If hydraulic implement pump is worn, damaged or defective; service or replace. Refer to WP 0380 00.
- b. Flow loss for Test 14 is 10 percent or more; flow differential for Test 14 is higher than flow differential for Test 16 by 2 gpm (8 l/min) or more.

Check hydraulic implement pump for aeration and cavitation.

**HYDRAULIC IMPLEMENT PUMP TEST-AERATION AND CAVITATION FOR TESTS 17 THROUGH 23**

1. **Test 17.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 700 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 22 gpm (83 l/min).
2. **Test 18.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 900 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C).
3. **Test 19.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,100 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 39 gpm (177 l/min).

**HYDRAULIC IMPLEMENT PUMP TEST-AERATION AND CAVITATION FOR TESTS 17-23 - CONTINUED**

4. **Test 20.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,300 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 47 gpm (214 l/min).
5. **Test 21.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,500 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 55 gpm (250 l/min).
6. **Test 22.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,700 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi. (6,895 kPa).
  - d. Step 4. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 63 gpm (239 l/min).
7. **Test 23.**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM.
  - c. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - d. Record oil temperature and flow rate. Refer to Table 2. Correct oil temperature is between 145° and 155°F (63° and 68°C). Correct flow rate is 71 gpm (269 l/min).

**CAUTION**

Immediately after stopping the engine, remove the blocking plate assembly from the pressure line for the pump to prevent any possible damage later.

**COMPARISON OF AERATION AND CAVITATION TESTS**

- a. Flow loss for Test 14 is 10 percent or more; flow differential for Test 14 is higher than flow differential for Test 16 by 2 gpm or more; Tests 17 through 23 have the same flow differential.
  - (1) Check oil level and type of hydraulic oil being used.
    - (a) If incorrect oil is being used, drain hydraulic tank and refill with correct oil to proper level. Refer to TM 5-3805-248-10.
    - (b) If oil level is too low, fill hydraulic tank to correct level. Refer to TM 5-3805-248-10.
    - (c) If correct type of oil is used and level is satisfactory, go on to step 2.
  - (2) Remove cover from hydraulic tank and check for leaks.
    - (a) If leakage is present, refer to (WP 0233 00).
    - (b) If no leakage is present, go to step 3.



**COMPARISON OF AERATION AND CAVITATION TESTS - CONTINUED**

- (3) Check suction line at pump for air leaks.
  - (a) Using an oil can, apply hydraulic fluid to suction line and connections.
  - (b) If fluid is sucked in, there is a leak in the line, tighten connections or replace lines.
  - (c) If no leakage is present, go to step 4.
- (4) Remove and disassemble hydraulic implement pump.
  - (a) If hydraulic implement pump is worn, damaged or defective; service or replace. Refer to WP 0322 00.
- b. Flow differential suddenly becomes lower at one test between Tests 17 through 23 but remains constant for following tests (at higher RPMs). Check the implement pump for cavitation (restriction in suction line). Inspect suction line and hydraulic tank for blockage. If no blockage is found, proceed to Blocked Circuit Tests, H.

**BLOCKED CIRCUIT TESTS**

If the System and Pump Tests indicate leakage in control valves or cylinders, a Blocked Circuit Test is performed.

1. **System Oil Temperature (Start).**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM. Move ejector control lever into FORWARD position.
  - c. Record oil temperature. Refer to Table 3. System oil temperature should be between 145° and 155°F (63° and 68°C).
2. **Ejector Forward Flow Rate (Leakage Rate).**
  - a. Block ejector circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move ejector control lever into FORWARD position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 3. Correct ejector forward flow rate is 68 gpm (257 l/min).
3. **Ejector Return Flow Rate (Leakage Rate).**
  - a. Block, ejector circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move ejector control lever into RETURN position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 3. Correct ejector return flow rate is 68 gpm (257 l/min).
4. **Bowl Raise Flow Rate (Leakage Rate).**
  - a. Block bowl circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into RAISE position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 3. Correct bowl raise flow rate is 68 gpm (257 l/min).

**BLOCKED CIRCUIT TESTS - CONTINUED**

5. **Bowl Lower Flow Rate (Leakage Rate).**
  - a. Block bowl circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the LOWER position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 3. Correct bowl lower flow rate is 68 gpm (257 l/min).
6. **Apron Up Flow Rate (Leakage Rate).**
  - a. Block apron circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move apron control lever into the UP position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 3. Correct apron up flow rate is 68 gpm (257 l/min).
7. **Apron Down Flow Rate (Leakage Rate).**
  - a. Block apron circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move apron control lever into the DOWN position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 3. Correct apron down flow rate is 68 gpm (257 l/min).
8. **System Oil Temperature (Finish).**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM. Move ejector control lever into FORWARD position.
  - c. Record oil temperature. Refer to Table 3. System oil temperature should be between 145° and 155°F (63° and 68°C).
  - d. Tests 25 through 30 are more than rates shown in Table 3.
    - (1) Check hydraulic control relief valve.
    - (2) If hydraulic control relief valve is damaged or defective; service or replace. Refer to WP 0323 00 and WP 0381 00.
  - e. Tests 25 and 26 indicate leakage in ejector circuit.
    - (1) Check ejector cylinder.
    - (2) If ejector cylinder is damaged or defective; service or replace. Refer to WP 0384 00.
  - f. Tests 27 and 28 indicate leakage in bowl circuit. Check bowl circuit.
    - (1) If bowl cylinders are damaged or defective; service or replace. Refer to WP 0383 00.
    - (2) If cause of flow loss is not identified; proceed to Tests 36 through 41.
  - g. Tests 29 and 30 indicate leakage in apron circuit. Check apron cylinder.
    - (1) If apron cylinder is damaged or defective; service or replace. Refer to WP 0385 00.
    - (2) If cause of flow loss is not identified, proceed to Tests 43 and 44.

**COMPARISON OF BLOCKED CIRCUIT TESTS**

1. **Bowl Raise Flow Rate (Bowl Circuit Blocked).**
  - a. Block bowl circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the RAISE position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 4. Correct bowl raise flow rate is 68 gpm (257 l/min).
2. **Bowl Raise Flow Rate (Right Bowl Control Circuit Blocked).**
  - a. Block right bowl control circuit with a blocking plate.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the RAISE position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 4. Correct bowl raise flow rate is 68 gpm (257 l/min).
3. **Bowl Lower Flow Rate (Right Bowl Control Circuit Blocked).**
  - a. Block right bowl control circuit with a blocking plate.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the LOWER position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 4. Correct bowl lower flow rate is 65.5 gpm (248 l/min).
4. **Bowl Raise Flow Rate (Right Cylinder And Balance Line Blocked).**
  - a. Block right cylinder and balance line with blocking plates.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the RAISE position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate.

**BLOCKED COMPONENTS TEST**

If Blocked Circuit Tests indicate that leakage is too high in cylinder valves or swivel joint, Blocked Component Tests are performed.

1. **System Oil Temperature (Start).**
  - a. Open manual load valve on flow meter fully.
  - b. Start engine and run at 1,900 RPM. Move ejector control lever into forward position.
  - c. Record oil temperature. Refer to Table 4. System oil temperature should be between 145° and 155°F (63° and 68°C).

**BLOCKED COMPONENTS TEST - CONTINUED**

2. **Ejector Forward Flow Rate (Ejector Circuit Blocked).**
  - a. Block ejector circuit with a blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move the ejector control lever into FORWARD position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate. Refer to Table 4. Correct ejector forward flow rate is 68 gpm (257 l/min).
3. **Bowl Lower Flow Rate (Right Cylinder And Balance Line Blocked).**
  - a. Block right cylinder and balance line with blocking plates.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the LOWER position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate.
4. **Bowl Raise Flow Rate (Left Cylinder And Balance Line Blocked).**
  - a. Block left cylinder and balance line with blocking plates.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the RAISE position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate.
5. **Bowl Lower Flow Rate (Left Cylinder And Balance Line Blocked).**
  - a. Block left cylinder and balance line with blocking plates.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move bowl control lever into the LOWER position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate.
6. **Apron Raise Flow Rate (Apron Circuit Blocked).**
  - a. Block apron circuit with blocking plate at circuit line.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move apron control lever in the RAISE position.
  - d. Slowly adjust manual load valve on low meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate.
7. **Apron Raise Flow Rate (Cylinder Blocked).**
  - a. Block apron cylinder with blocking plate.
  - b. Open manual load valve on flow meter fully.
  - c. Start engine and run at 1,900 RPM. Move apron control lever into RAISE position.
  - d. Slowly adjust manual load valve on flow meter for a pressure of 1,000 psi (6,895 kPa).
  - e. Record flow rate.

**BLOCKED COMPONENTS TEST - CONTINUED**8. **Apron Lower Flow Rate (Cylinder Blocked).**

- a. Block apron cylinder with blocking plate.
- b. Open manual load valve on flow meter fully.
- c. Start engine and run at 1,900 RPM. Move apron control lever into LOWER position.
- d. Slowly adjust manual load valve on slow meter for a pressure of 1,000 psi (6,895 kPa).
- e. Record flow rate.

9. **System Oil Temperature (Finish).**

- a. Open manual load valve on flow meter fully.
- b. Start engine and run at 1,900 RPM. Move ejector control lever into FORWARD position.
- c. Record oil temperature. Refer to Table 4. System oil temperature should be between 145° and 155°F (63° and 68°C).

**COMPARISON OF BLOCKED COMPONENTS TESTS**

- a. Leakage is in the right or left bowl cylinder.
  - (1) Check piston seals in bowl cylinder.  
If piston seals are damaged; replace. Refer to WP 0383 00.
  - (2) Disassemble bowl cylinder.  
If bowl cylinder is damaged or defective; service or replace. Refer to WP 0383 00.
- b. Leakage in bowl lift valves.  
Check bowl lift valve.  
If bowl lift valve is damaged or defective; service or replace. Refer to WP 0324 00.
- c. Leakage in apron cylinder. Check apron cylinder.  
If apron cylinder is damaged or defective; service or replace. Refer to WP 0385 00.
- d. Leakage in sequence relief valve for the apron.  
Check sequence valve for damage or wear.  
If sequence valve is damaged or defective; service or replace. Refer to WP 0382 00.
- e. Leakage in ejector cylinder.
  - (1) Check ejector cylinder.
  - (2) If ejector cylinder is damaged or defective; service or replace Refer to WP 0384 00.

**Table 1. Hydraulic System Tee Test.**

	Maximum Pressure Relief Valve Setting	System Oil Temperature (Start)	System Base Flow Rate	Ejector Forward Flow rate	Bowl Raise Flow Rate	Bowl Raise Flow Rate	Bowl Lower Flow Rate	Apron Up Flow Rate	Apron Down Flow Rate	System Oil Temperature (End)	Bowl Circuit Drift Compare	Apron Circuit Drift Compare
	1	2	3	4	5	6	7	8	9	10	11	12
Control Lever Position	Ejector Forward	Ejector Forward	Ejector Forward	Ejector Return	Bowl Raise	Bowl Raise	Bowl Lower	Apron Up	Apron Down	Ejector Forward	Bowl Hold Raise	Apron Hold Raise
Engine Speed in RPM	1,900	Any Speed	1,900	1,900	1,900	1,900	1,900	1,900	1,900	Any Speed	Low Idle	Low Idle
System Test Pressure - psi (kPa)	Maximum	0-100 (0-689)	100 (689)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	0-100 (0-689)	0	0
Test Data	2,100-2,200 psi (14,479-15,168 kPa)	145°-155°F (63°-68°C)	79 gpm (300 l/min)	67 gpm (254 l/min)	67 gpm (254 l/min)	67 gpm (254 l/min)	63 gpm (239 l/min)	67 gpm (254 l/min)	67 gpm (254 l/min)	145°-155°F (63°-68°C)	Hold M S	Hold M S
Flow Differential				12 gpm (45 l/min)	12 gpm (45 l/min)	12 gpm (45 l/min)	16 gpm (61 l/min)	12 gpm (45 l/min)	12 gpm (45 l/min)		Raise M S	Raise M S
Percent Flow Loss				15%	15%	15%	20%	15%	15%			
System Oil Temperature:	Finish oil temperature. Test 10 must be within ten percent $\pm 15^{\circ}\text{F}$ ( $-9^{\circ}\text{C}$ ) of start oil temperature, Test 2.  For each 15 degrees that the finish is higher than the start, Test 10 greater than Test 2, subtract 0.5 gal. from the leakage rate.  For each 15 degrees that the finish is lower than the start, Test 2 greater than Test 10, add 0.5 gal. to the leakage rate.											
Flow Differential Calculation	System Base Flow Rate - Test Flow Rate											
Percent Flow Loss	$\frac{\text{System Base Flow Rate} - \text{Test Flow Rate}}{\text{System Base Flow Rate}} \times 100$											

0321 00-16

HYDRAULIC SYSTEM TEE TEST

HYDRAULIC SYSTEM FLOW METER TEE TEST AND MAINTENANCE - CONTINUED

0321 00

TM 5-3805-248-23-2

**Table 2. Implement Pump Test.**

	Full Speed Pump Flow		Half Speed Pump Flow		Pump Test for Aeration/Cavitation Varied Speeds-Constant Pressure						
	Low Pressure	High Pressure	Low Pressure	High Pressure							
	13	14	15	16	17	18	19	20	21	22	23
Engine Speed in RPM	1,900	1,900	950	950	700	900	1,100	1,300	1,500	1,700	1,900
Pump Test Pressure in psi (kPa)	100 (689)	1,000 (6,895)	100 (689)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)
Oil Temperature	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)	145°-155°F (63°-68°C)
Test Data in gpm (l/min)	79 (300)	71 (269)	40 (151)	32 (121)	22 (83)	30 (114)	39 (148)	47 (178)	55 (208)	63 (239)	71 (269)
Flow Differential in gpm (l/min)		8 (30)		8 (30)	8 (30)	9 (34)	8 (30)	8 (30)	8 (30)	8 (30)	
Percent Flow Loss		10%									
Flow Differential Calculation:	System Base Flow Rate - Test Flow Rate										
Percent Flow Loss	(System Base Flow Rate - Test Flow Rate)					X 100					
	System Base Flow Rate										

**Table 3. Blocked Circuits Test.**

	System Oil Temperature (Start)	Ejector Forward Flow Rate	Ejector Return Flow Rate	Bowl Raise Flow Rate	Bowl Lower Flow Rate	Apron Up Flow Rate	Apron Down Flow Rate	System Oil Temperature (Finish)
	24	25	26	27	28	29	30	31
Control Lever Position	Ejector Forward	Ejector Forward	Ejector Return	Bowl Raise	Bowl Lower	Apron Up	Apron Down	Ejector Forward
Engine Speed in RPM	Any Speed	1,900	1,900	1,900	1,900	1,900	1,900	Any Speed
System Test Pressure in psi (kPa)	0-100 (0-689)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	0-100 (0-689)
Test Data	145°-155°F (63°-68°C)	68 gpm (469 l/min)	68 gpm (469 l/min)	68 gpm (469 l/min)	68 gpm (469 l/min)	68 gpm (469 l/min)	68 gpm (469 l/min)	145°-155°F (63°-68°C)
Circuit Leakage Rate		1 gpm (4 l/min)	1 gpm (4 l/min)	1 gpm (4 l/min)	5 gpm (19 l/min)	1 gpm (4 l/min)	1 gpm (4 l/min)	
Control Valve Group Linkage		3 gpm (11 l/min)	3 gpm (11 l/min)	3 gpm (11 l/min)	3 gpm (11 l/min)	3 gpm (11 l/min)	3 gpm (11 l/min)	
Circuit Leakage Rate	Subtract Flow Rate Table 1 from Flow Rate Table 3							
	Table 3	Table 1						
	Test 26	Test 4						
	Test 27	Test 5						
	Test 28	Test 6						
	Test 29	Test 7						
	Test 30	Test 8						
	Test 31	Test 9						
Control Valve Group Leakage	Subtract Flow Rate from High Pressure Flow Rate (Test 14)							
	Table 1	Table 3						
	Test 14	Test 26						
	Test 14	Test 27						
	Test 14	Test 28						
	Test 14	Test 29						
	Test 14	Test 30						
	Test 14	Test 31						



**Table 4. Blocked Circuits Test.**

	Ejector Circuit Blocked	Right & Left Bowl Control Circuit Blocked	Right Bowl Control Circuit Blocked		Right Cylinder & Balance Line		Left Cylinder & Balance Line Blocked		Apron Circuit Blocked	Apron Cylinder Blocked		System Oil Temperature (Finish)	
	System Oil Temperature (Start)	Ejector Forward Flow Rate	Bowl Raise Flow Rate	Bowl Raise Flow Rate	Bowl Lower Flow Rate	Bowl Raise Flow Rate	Bowl Raise Flow Rate	Bowl Raise Flow Rate	Bowl Lower Flow Rate	Apron Raise Flow Rate	Apron Raise Flow Rate		Apron Lower Flow Rate
	33	34	35	36	37	38	39	40	41	41	42		44
Control Lever Position	Ejector Forward	Ejector Forward	Bowl Raise	Bowl Raise	Bowl Lower	Bowl Raise	Bowl Lower	Bowl Raise	Bowl Lower	Apron Up	Apron Up	Apron Down	Ejector Forward
Engine Speed in RPM	Any Speed	1,900	1,900	1,900	1,900	1,900	1,900	Any Speed	1,900	1,900	1,900	1,900	Any Speed
System Test Pressure in psi (kPa)	0-100 (0-689)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)	1,000 (6,895)
Test Data	145°-155°F (63°-68°C)	68 gpm (469 l/min)	68 gpm (469 l/min)	65.5 gpm (248 l/min)									145°-155°F (63°-68°C)
Circuit Leakage Rate		Ejector Circuit Leakage (34-A) 1 gpm (4 l/min)	Bowl Circuit Leakage (35-6) 1 gpm (4 l/min)	Right Bowl Circuit Leakage		Right Cylinder Leakage		Left Cylinder Leakage		Apron Circuit Leakage (42-8)	Cylinder Leakage		
				(36-6) 1 gpm (4 l/min)	(37-7) 2.5 gpm (9.5 l/min)	(38-6)	(39-7)	(40-6) B=	(41-7) D=		(43-8)	(44-9)	
Control Valve Group Leakage				Left Bowl Circuit Leakage		Right Check Valve Leakage		Left Check Valve Leakage			Apron Sequence Valve Leakage		
				(28-38) A=1 gpm (4 l/min)	(29-39) C=2.5 gpm (9.5 l/min)	(38-40)	(39-41)	(28-38) A=1 gpm (4 l/min)	(29-39) C=2.5 gpm (9.5 l/min)		(42-43)	(42-44)	
<b>Leakage Rate</b>	<b>Table 4</b>	<b>Table 1</b>		<b>Leakage Rate</b>	<b>Table 3</b>	<b>Table 4</b>		<b>Leakage Rate</b>	<b>Table 4</b>	<b>Table 4</b>			
Ejector Circuit Leakage	Test 34	Test 4		Left Bowl Circuit Leakage	Test 28 Test 29	Test 38 Test 39		Right Check Valve Leakage	Test 38 Test 39	Test 40 Test 41			
Bowl Circuit Leakage	Test 35	Test 6						Left Check Valve Leakage	A C	B D			
Right Bowl Circuit Leakage	Test 36 Test 37	Test 6 Test 7						Apron Sequence Valve Leakage	Test 42 Test 42	Test 43 Test 44			
Right Cylinder Leakage	Test 38 Test 39	Test 6 Test 7											
Left Cylinder Leakage	Test 40 Test 41	Test 6 Test 7											
Apron Circuit Leakage	Test 42	Test 8											
Apron Cylinder Leakage	Test 43 Test 44	Test 8 Test 9											

0321 00-19/-20 Blank

HYDRAULIC SYSTEM TEE TEST - CONTINUED

HYDRAULIC SYSTEM FLOW METER TEE TEST AND MAINTENANCE - CONTINUED

TM 5-3805-248-23-2

0321 00



---

**HYDRAULIC IMPLEMENT PUMP REPLACEMENT**

**0322 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 200 lb minimum capacity

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (3)

Stud (2)

Bowl lowered to ground (TM 5-3805-248-10)

Engine shut down (TM 5-3805-248-10)

Battery disconnect switch in OFF position (TM 5-3805-248-10)

Hydraulic oil tank drained (TM 5-3805-248-10)

---

**REMOVAL**

1. Remove four bolts (1) and washers (2).

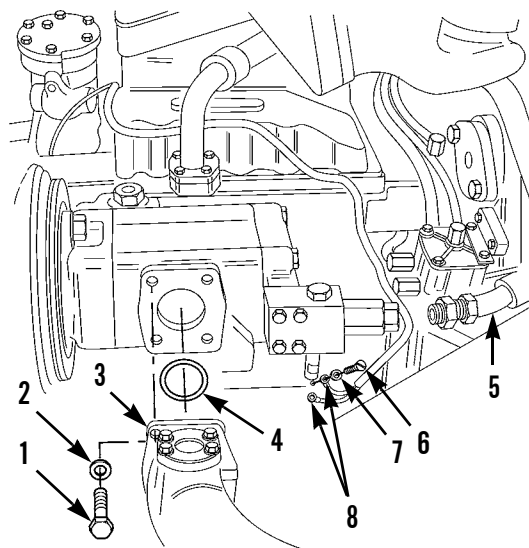
**CAUTION**

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

**NOTE**

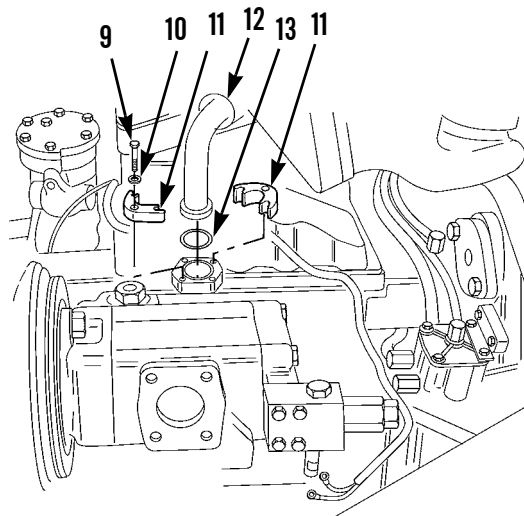
Tag hose and tube assemblies prior to removal to ensure correct installation.

2. Remove tube assembly (3) and preformed packing (4) from hydraulic pump. Discard preformed packing.
3. Disconnect hose assembly (5).
4. Remove two screws (6) and washers (7).
5. Disconnect two electrical wires (8) at terminals.



394-1056

6. Remove four bolts (9), washers (10) and two flange halves (11).
7. Remove tube assembly (12) and preformed packing (13). Discard preformed packing.



394-1057

**REMOVAL - CONTINUED****WARNING**

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**

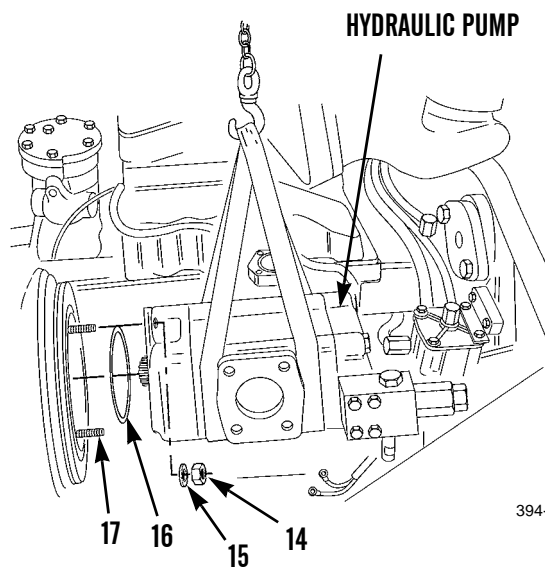
Weight of hydraulic pump is 120 lb (54 kg).

8. Install lifting device on hydraulic pump.
9. Remove two nuts (14) and washers (15).
10. Use lifting device to remove hydraulic pump. Pull out toward front of machine to disengage pump shaft from drive gear.
11. Remove and discard preformed packing (16).

**NOTE**

Remove two studs only if inspection indicates replacement is necessary.

12. Remove two studs (17), if necessary, from transfer case.
13. Remove lifting device.



394-1058

**INSTALLATION**



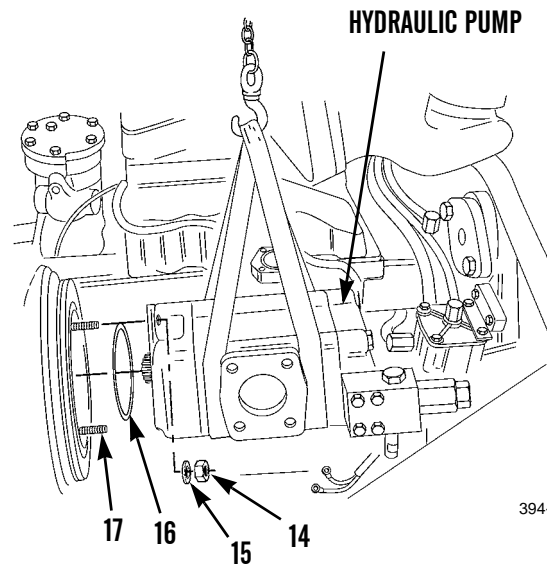
**WARNING**

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**

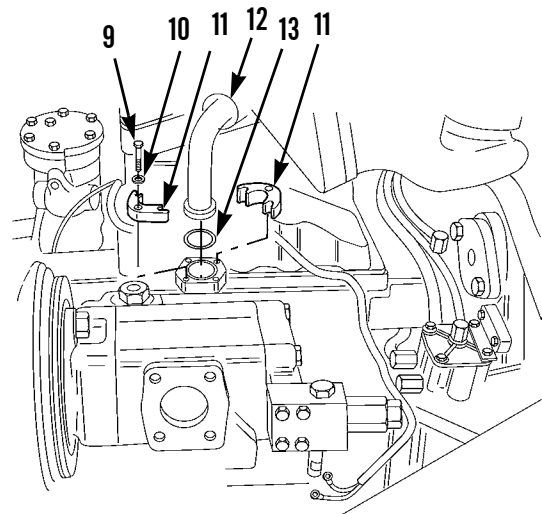
Weight of hydraulic pump is 120 lb (54 kg).

1. Install lifting device on hydraulic pump.
2. Install two studs (17), if removed.
3. Install new preformed packing (16) on hydraulic pump.
4. Position hydraulic pump on two studs (17).
5. Install two washers (15) and nuts (14).
6. Remove lifting device.



394-1058

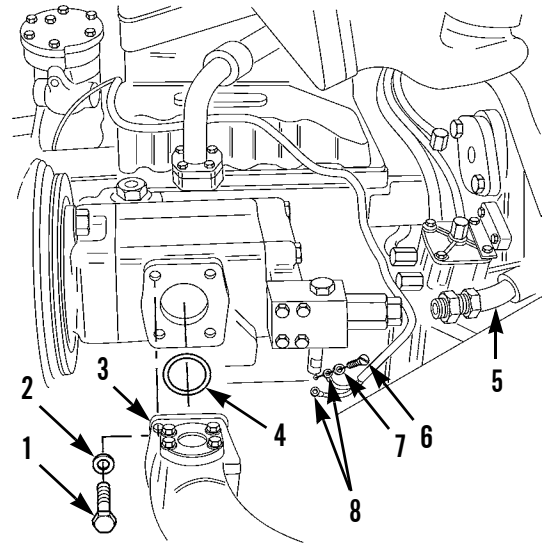
7. Prime pump with clean oil.
8. Install new preformed packing (13) and tube assembly (12).
9. Install two flange halves (11), four washers (10) and bolts (9).
10. Connect two electrical wires (8) at terminals.



394-1057

**INSTALLATION - CONTINUED**

11. Install two washers (7) and screws (6) on steering pressure switch.
12. Install new preformed packing (4) and tube assembly (3).
13. Install four washers (2) and bolts (1).
14. Connect hose assembly (5).



394-1056

15. Refill hydraulic oil tank (TM 5-3805-248-10).
16. Operate machine and verify proper operation of hydraulic system (TM 5-3805-248-10).
17. Shut down engine (TM 5-3805-248-10).
18. Inspect hydraulic oil lines and connections for leaks or damage.
19. Operate machine and verify correct operation of implement pump (TM 5-3805-248-10).

**END OF WORK PACKAGE**





---

**SCRAPER CONTROL VALVE REPLACEMENT**

---

**0323 00****THIS WORK PACKAGE COVERS**Removal, Installation, Testing and Adjustment

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 150 lb minimum capacity

**References**

WP 0232 00

**Materials/Parts**

Rag, wiping (Item 35, WP 0339 00)

Shims

**Equipment Condition**

Hydraulic oil tank drained (TM 5-3805-248-10)

Control lever linkage disconnected (WP 0325 00)

---

**REMOVAL****CAUTION**

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

**NOTE**

- Tag lines prior to removal to ensure correct installation.
- Use a container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

**REMOVAL - CONTINUED**

1. Disconnect hose and tube assemblies from scraper control valve (4) (WP 0223 00).

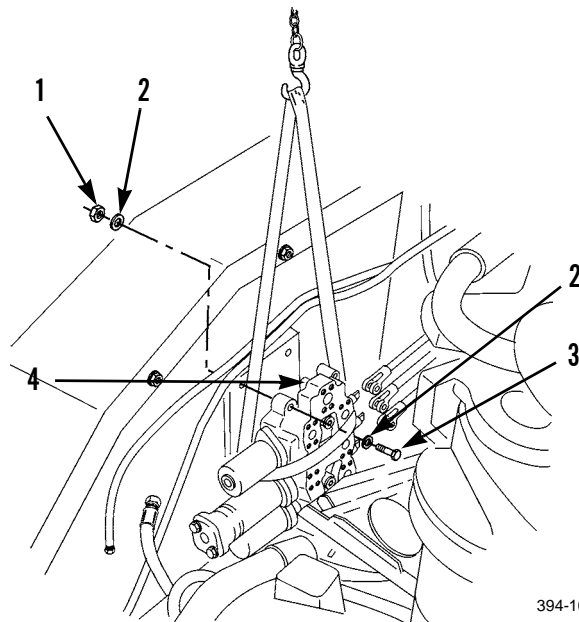
**WARNING**

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**

Weight of control valve assembly is 85 lb (39 kg).

2. Attach lifting device to control valve assembly (4).
3. Remove three bolts (3), six washers (2) and three nuts (1).
4. Remove control valve assembly (4).
5. Remove lifting device.



394-1059

**INSTALLATION****WARNING**

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**

Weight of control valve assembly is 85 lb (39 kg).

1. Fasten lifting device to control valve assembly (4).
2. Install control valve assembly (4) on machine.
3. Install three nuts (1), six washers (2) and three bolts (3).
4. Remove lifting device.

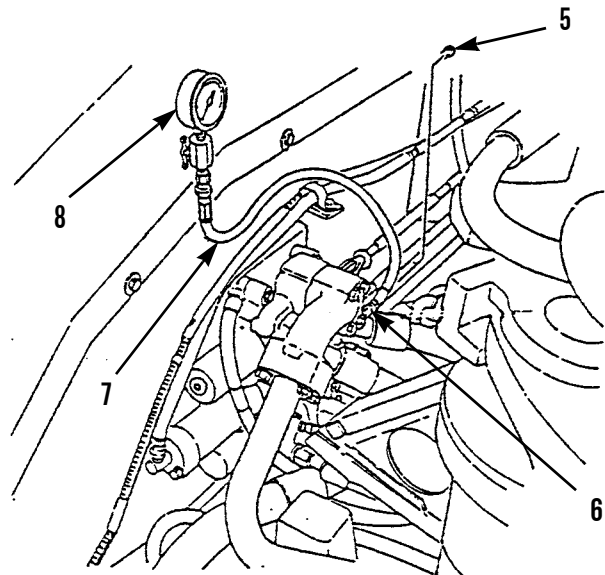
**INSTALLATION - CONTINUED**

5. Connect hose and tube assemblies (WP 0232 00).
6. Refill hydraulic oil tank (TM 5-3805-248-10).
7. Inspect hydraulic oil lines and connections for leaks or damage.

**TESTING AND ADJUSTMENT****Sequence Valve****WARNING**

Only qualified personnel may perform the following procedure. All other personnel must clear the immediate area of the machine. Failure to follow this procedure may cause injury.

1. Remove plug (5).
2. Install adapter (6).
3. Install hose (7) and gage (8).
4. Start engine and run at high idle (TM 5-3805-248-10).
5. Move apron control lever to raised position and hold. Observe gage. High reading on gage is pressure setting of relief valve. Correct reading is  $2,000 \pm 50$  psi ( $13,790 \pm 345$  kPa). If reading is NOT in these limits, proceed to next steps.
6. Stop engine.



394-1060

**TESTING AND ADJUSTMENT - CONTINUED**

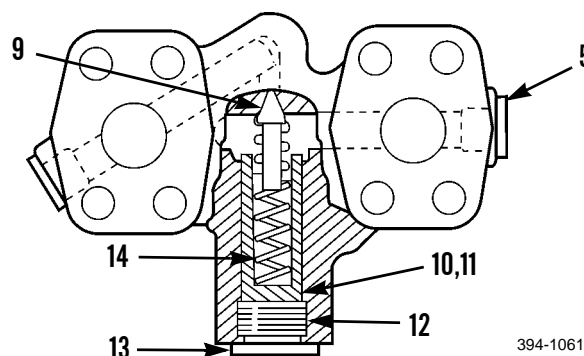
**Sequence Valve - Continued**

7. Remove plug (13), piston (12), shims (10) and (11), spring (14) and valve (9).
8. Add or remove shims (10) and (11). Decrease shim(s) thickness to lower pressure. Increase shim(s) thickness to raise pressure. Refer to following chart to determine the correct amount of shim(s) to be added or removed.

**Table 1. Pressure Change to Relief Valve by Removal or Addition of One Shim.**

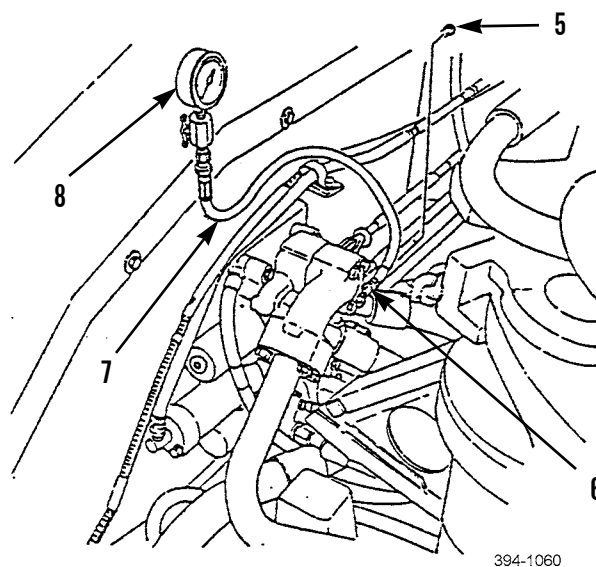
Part Number	Thickness	Change in Pressure
3J7473	0.005 in. (0.127mm)	90 psi (621 kPa)
3H2549	0.010 in. (0.254 mm)	175 psi (1,207 kPa)

9. Install valve (9), spring (14), shims (10) and (11), piston (12) and plug (13).
10. Start engine. Check gage (8). If reading is correct, remove gage and install plug (5). If reading is not correct, repeat steps 4 through 9.



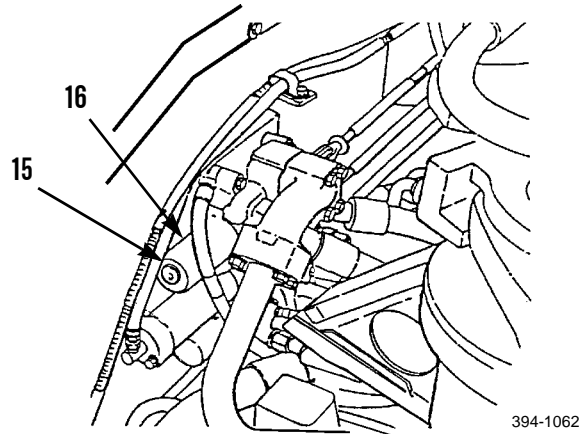
**Ejector Kickout Valve**

1. Position ejector gate return lever to full forward position.
2. Remove plug (5).
3. Install adapter (6).
4. Install hose (7) and gage (8).

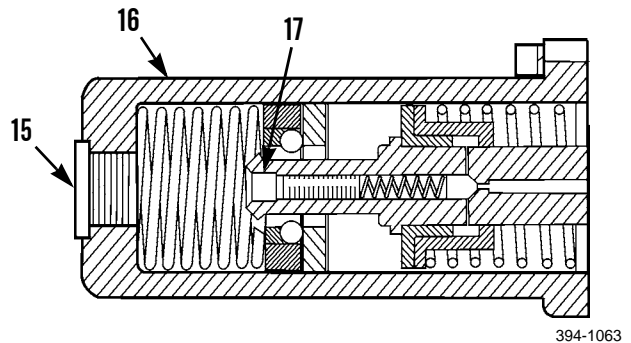


**TESTING AND ADJUSTMENT - CONTINUED****Ejector Kickout Valve - Continued**

5. Start engine and run at high idle (TM 5-3805-248-10).
6. Move ejector gate return lever. Observe gage (8) while gate is moving. When pressure is  $1,600 \pm 200$  psi ( $11,032 \pm 1,379$  kPa), kickout valve should open and move control lever to hold position. If pressure setting is incorrect, continue with following steps.



7. Remove plug (15) from ejector kickout valve (16).
8. Adjust screw (17). Insert 0.125 in. (3.175 mm) hex wrench into housing (16) through spring into adjusting screw. Turn screw clockwise to increase and counter-clockwise to decrease pressure. One turn of screw changes pressure setting 170 psi (1,172 kPa).
9. Install plug (15) in housing (16).
10. Start engine. Check gage (8). If reading is correct, remove gage and install plug (5). If reading is not correct, repeat steps 7 through 10.
11. Fill hydraulic oil tank (TM 5-3805-248-10).
12. Connect control lever linkage (WP 0325 00).

**END OF WORK PACKAGE**



---

**BOWL LIFT CHECK VALVES REPAIR**

**0324 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning, Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed

Seal (2)

**Equipment Condition**

Battery disconnect switch in OFF position (TM 5-3805-248-10)

Bowl lift check valve removed (WP 0228 00)

---

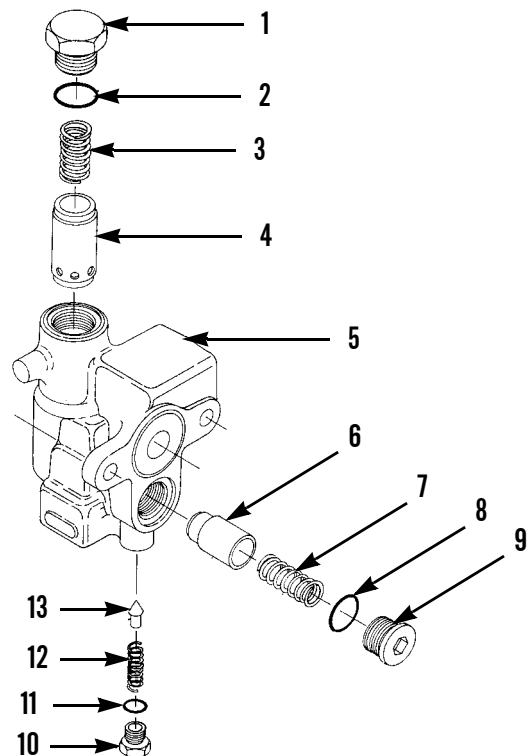
**DISASSEMBLY****WARNING**

- Eye protection must be worn when performing maintenance where components or particles could fly out. Failure to take precautions may cause injury.
- Some components are under spring tension. Wear eye protection and use caution during disassembly to avoid injury.

**NOTE**

The following maintenance procedure is for the right bowl lift check valve. The maintenance procedure for the left bowl lift check valve is identical.

1. Remove plug (10), spring (12), valve (13) and preformed packing (11) from body (5). Discard preformed packing.
2. Remove plug (1), spring (3), valve (4) and seal (2). Discard seal.
3. Remove plug (9), spring (7), valve (6) and seal (8). Discard seal.



394-1052



**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 cause 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. Remove gasket material from all mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.

**INSPECTION**

1. Apply 0.95 lb test force to spring (12).
2. Under test force, spring (12) length should be compressed to 0.31 in. (7.87 mm).
3. Release spring (12). Spring free length after test should measure 3 in. (76.2 mm).
4. Repeat test for spring (3), applying 32 lb test force. Length under test force should be 1.77 in. (44.96 mm) Free length after test should measure 2.42 in. (61.47 mm).
5. Repeat test for spring (7), applying 10.29 lb test force. Length under test force should be 2.31 in. (58.67 mm) Free length after test should measure 2.81 in. (71.37 mm).
6. Replace any spring that does not conform to test specifications.
7. Inspect springs (3), (7) and (12). Replace if cracked, broken, permanently set or if test lengths differ.
8. Inspect all other parts.

**ASSEMBLY**

1. Install new seal (8), valve (6), spring (7) and plug (9) in body (5).
2. Install new seal (2), valve (4), spring (3) and plug (1).
3. Install new preformed packing (11), valve (13), spring (12) and plug (10).
4. Install bowl lift check valve (WP 0228 00).

**END OF WORK PACKAGE**



**CONTROL LEVER LINKAGE REPLACEMENT****0325 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation, Adjustment

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**Materials/Parts - Continued**

Gasket

Pin, cotter (3)

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

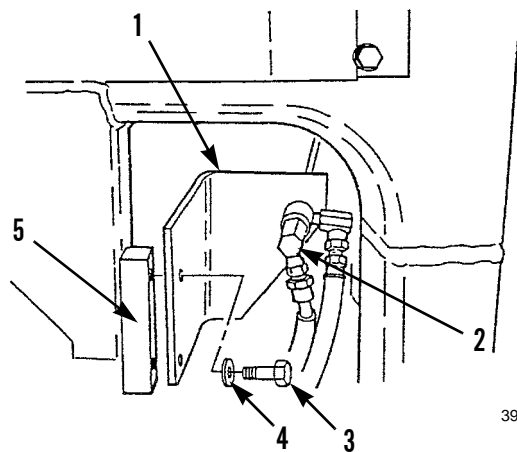
Bowl lowered to ground (TM 5-3805-248-10)

Engine shut down (TM 5-3805-248-10)

Battery disconnect switch in OFF position (TM 5-3805-248-10)

**REMOVAL**

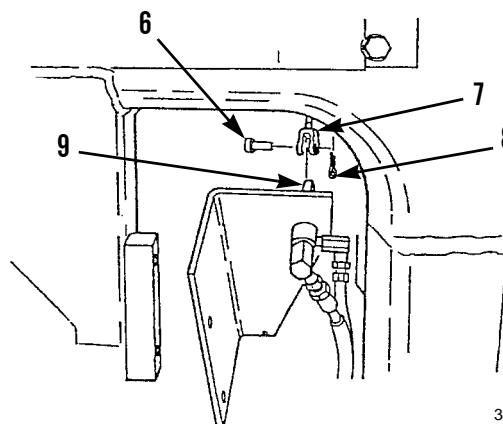
1. Remove two bolts (3) and washers (4) from apron control valve bracket (1) on bracket mounting (5) bottom left outside of operator compartment.
2. Position loose apron control valve bracket (1) and apron control valve (2) aside to gain access to apron control valve linkage.



391-1054

**REMOVAL - CONTINUED**

3. Remove cotter pin (8) and pin (6). Discard cotter pin.
4. Separate clevis of rod (7) from apron control valve spool (9).

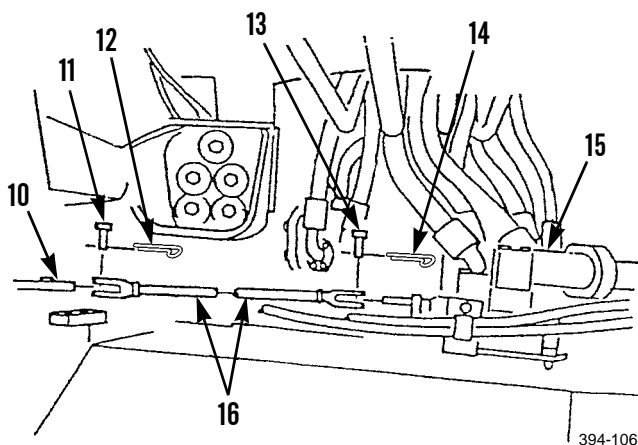


394-1055

**NOTE**

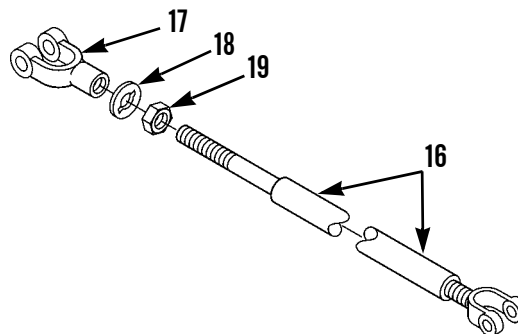
Steps 5 through 12 are the procedure for removal of ejector lever linkage from hydraulic control valve spool to the remote valve spool to the remote lever bracket. The maintenance procedure for the apron and bowl lever linkage segments is identical.

5. Remove cotter pin (14) and pin (13). Discard cotter pin.
6. Separate clevis (16) assembly from hydraulic control valve spool (15).
7. Remove cotter pin (12) and pin (11). Discard cotter pin.
8. Remove clevis (16) assembly from lever (10).



394-1064

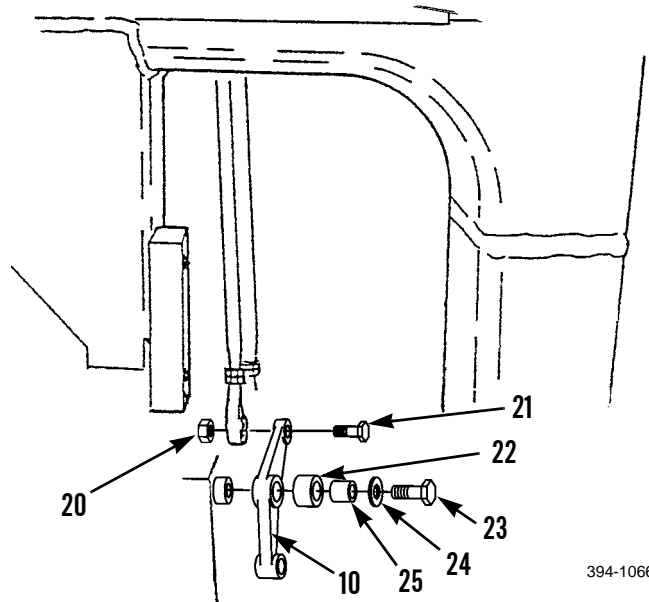
9. Loosen nut (19) on clevis (16).
10. Remove clevis (17), retainer (18) and nut (19) from clevis (16).



394-1065

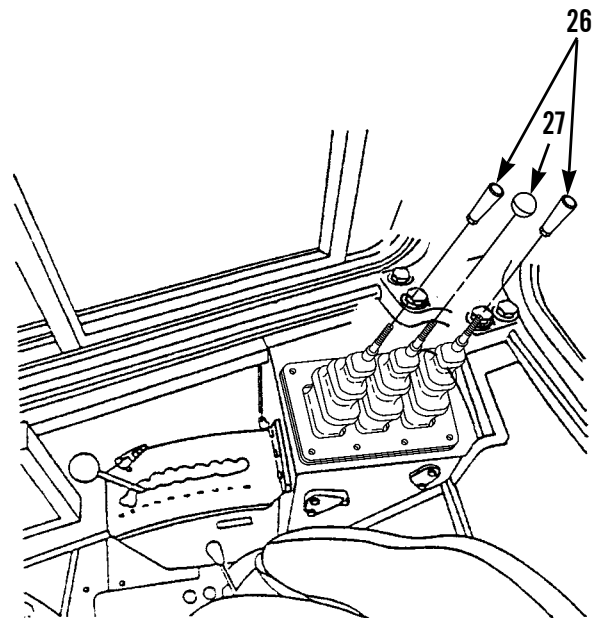
**REMOVAL - CONTINUED**

11. Remove bolt (23), washer (24), bushing (25) and spacer (22) from lever (10).
12. Remove nut (20) and bolt (21).
13. Remove lever (10).



394-1066

14. Remove two handles (26) and knob (27) from inside right of operator compartment.

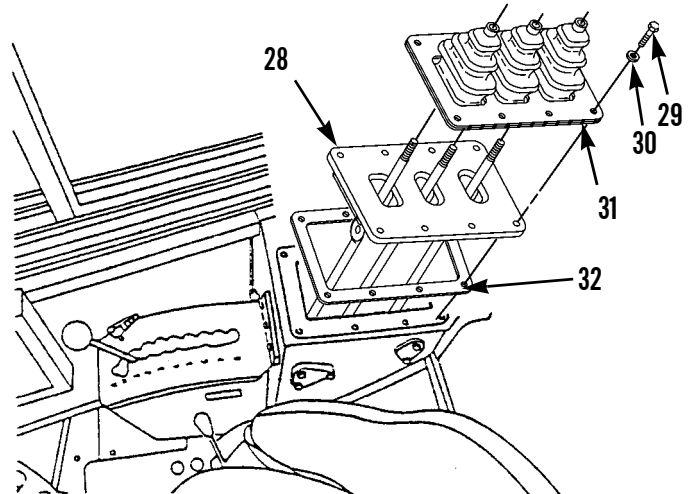


394-1067

**REMOVAL - CONTINUED****NOTE**

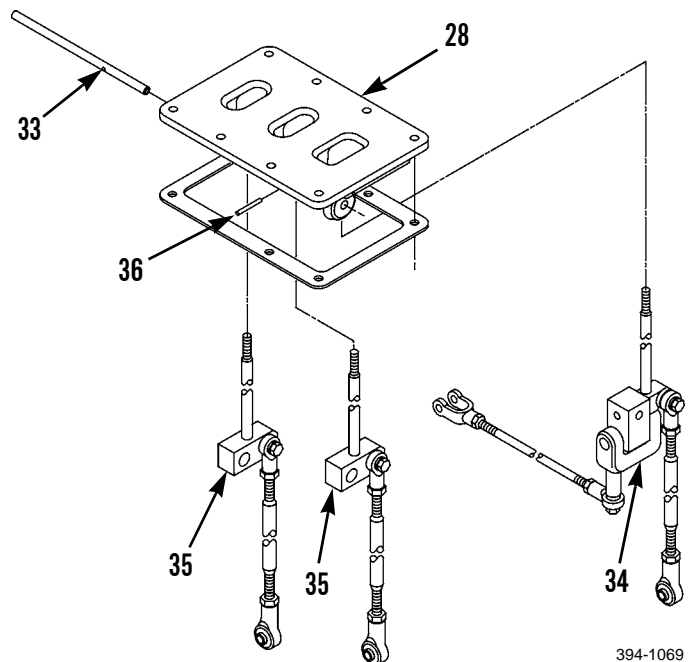
Steps 15 through 20 are the procedure for removal of remaining segment of the ejector lever linkage. The maintenance procedure for the remaining segment of the apron lever linkage is identical.

15. Remove eight bolts (29) and washers (30).
16. Remove boot (31).
17. Remove and discard gasket (32).
18. Remove support (28) assembly from inside right of operator compartment.



394-1068

19. Remove two pins (36) from pin (33) on support (28).
20. Remove pin (33), two connecting link (35) assemblies and lever (34) assembly from support (28).



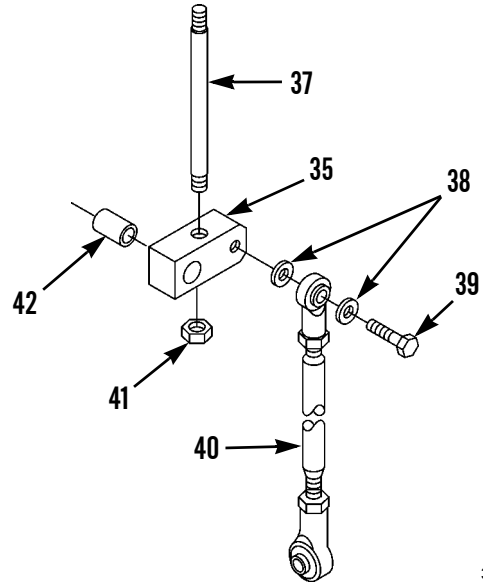
394-1069

**REMOVAL - CONTINUED**

**NOTE**

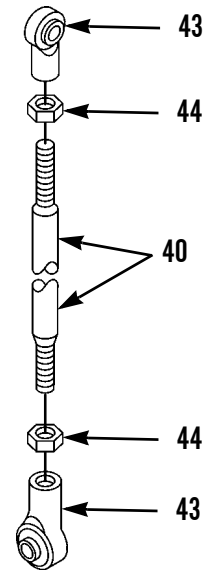
Steps 21 through 32 are the procedure for removal of remaining segment of bowl lever linkage.

21. Remove nut (41) and rod (37) from connecting link (35).
22. Remove bolt (39), rod (40) assembly and two washers (38).
23. Remove bearing (42).



394-1070

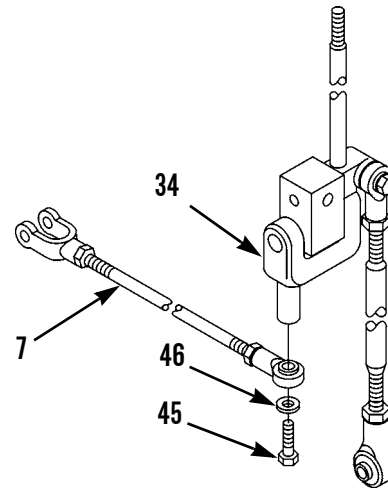
24. Loosen two nuts (44) on each end of rod (40).
25. Remove two rod ends (43) and nuts (44) from rod (40).



394-1071

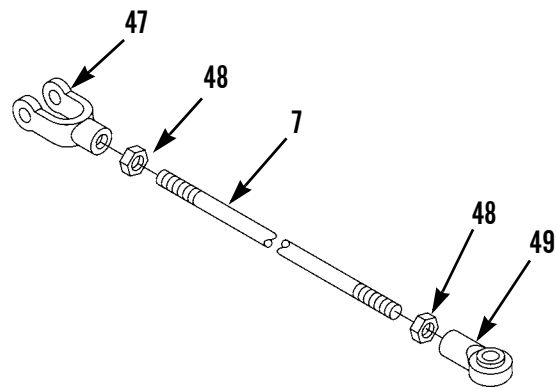
**REMOVAL - CONTINUED**

26. Remove bolt (45), washer (46) and rod (7) assembly from lever (34).



394-1072

27. Loosen two nuts (48) on rod (7).
28. Remove clevis (47) and rod end (49).
29. Remove two nuts (48).



394-1073

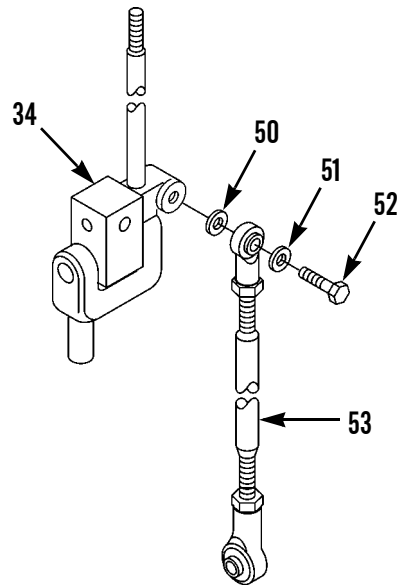


**CONTROL LEVER LINKAGE REPLACEMENT - CONTINUED**

**0325 00**

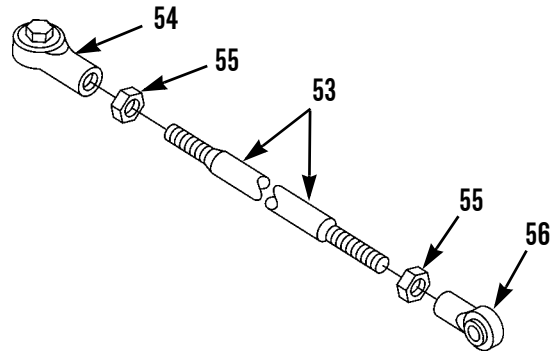
**REMOVAL - CONTINUED**

30. Remove bolt (52), washer (51), rod (53) assembly and washer (50) from lever (34).



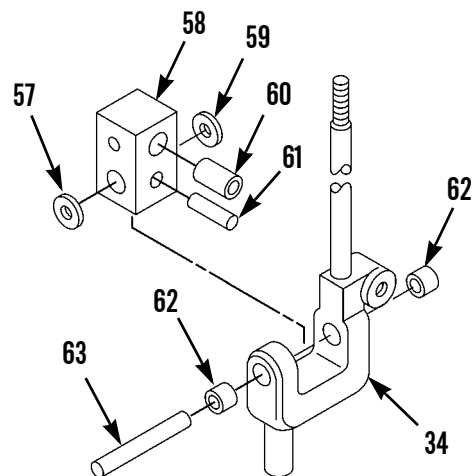
394-1074

31. Loosen two nuts (55) on rod (53).
32. Remove two rod ends (54) and (56) and nuts (55) from rod (53).



394-1075

33. Use a drive punch to remove pin (61) from connecting link (58).
34. Use a drive punch to remove shaft (63), washer (57), connecting link (58) and washer (59) from lever (34).
35. Remove bearing (60) from connecting link (58).
36. Remove two bearings (62) from lever (34).



394-1076

**CLEANING AND INSPECTION**



**WARNING**

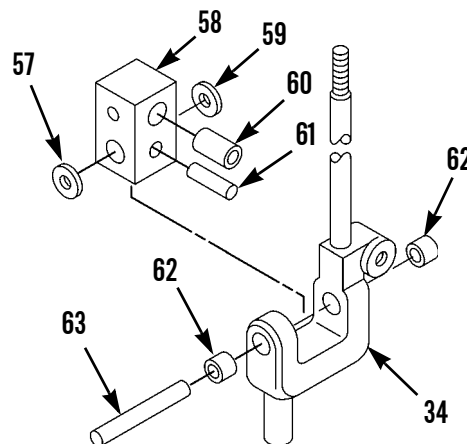


- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 cause 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. Remove gasket material from all mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install two bearings (62) in lever (34).
2. Install bearing (60) in connecting link (58).
3. Install washer (59), connecting link (58), washer (57) and shaft (63) in lever (34).
4. Install pin (61) in connecting link (58).

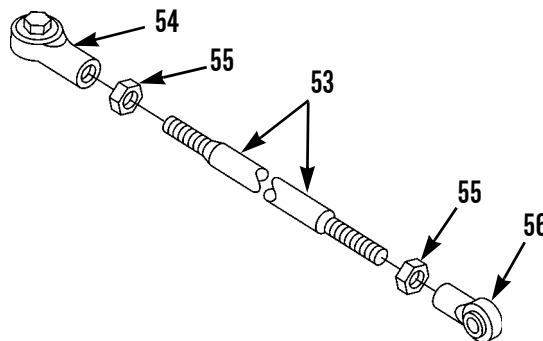


394-1076

**NOTE**

Do not tighten nuts until adjustment is made to rod lengths.

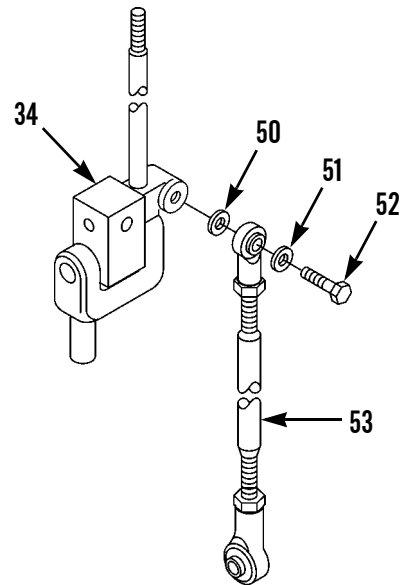
5. Install two nuts (55) and rod ends (54) and (56) on rod (53).



394-1075

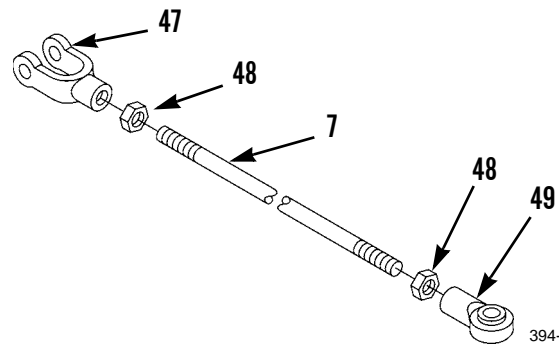
**INSTALLATION - CONTINUED**

6. Install washer (50), rod (53) assembly, washer (51) and bolt (52) on lever (34).



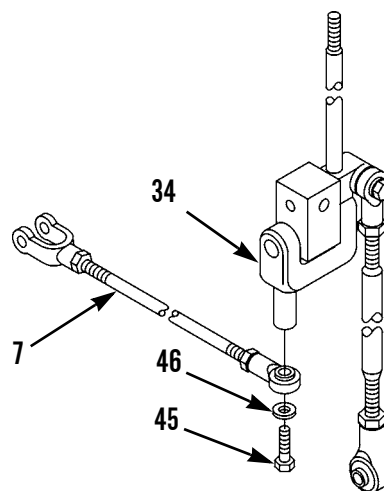
394-1074

7. Install two nuts (48), rod end (49) and clevis (47) on rod (7).



394-1073

8. Install rod (7) assembly, washer (46) and bolt (45) on lever (34).



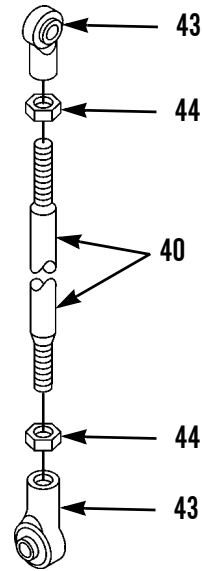
394-1072

**INSTALLATION - CONTINUED**

**NOTE**

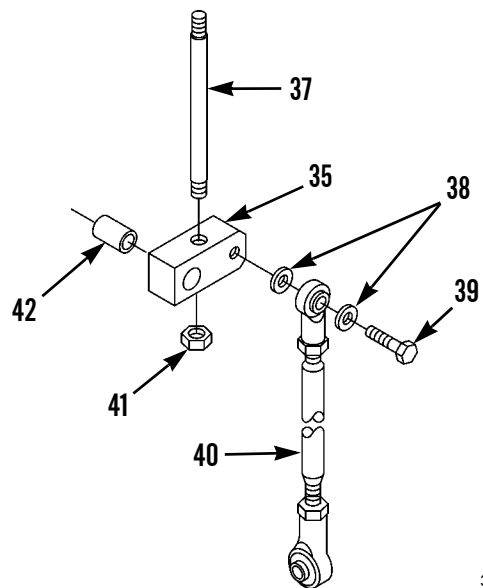
- Steps 9 through 12 are the maintenance procedure for the installation of the ejector lever linkage segment from support to remote lever bracket. The maintenance procedure for the apron lever linkage segment is identical.
- Do not tighten nuts until adjustment is made to rod lengths.

9. Install two nuts (44) and rod ends (43) on rod (40).



394-1071

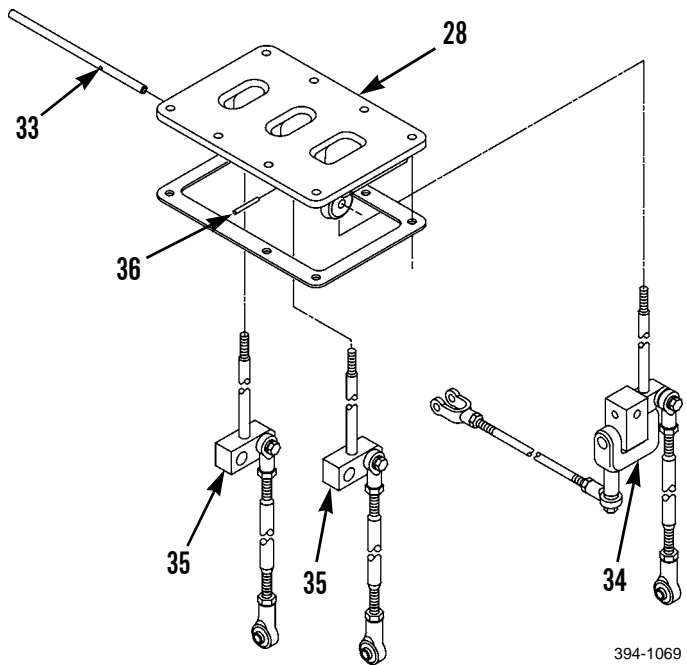
10. Install two washers (38), rod (40) assembly, and bolt (39) on connecting link (35).
11. Install bearing (42) in connecting link (35).
12. Install rod (37) and nut (41).



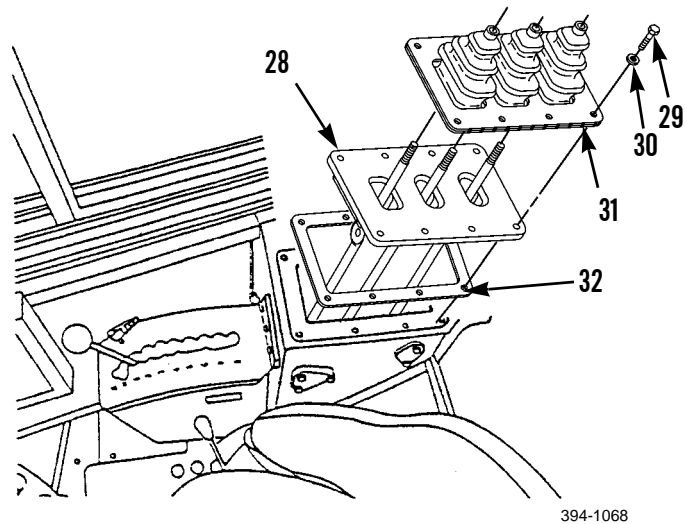
394-1070

**INSTALLATION - CONTINUED**

13. Position lever (34) assembly and two connecting link (35) assemblies on support (28).
14. Install pin (33) on connecting links (35).
15. Install two pins (36) in pin (33).

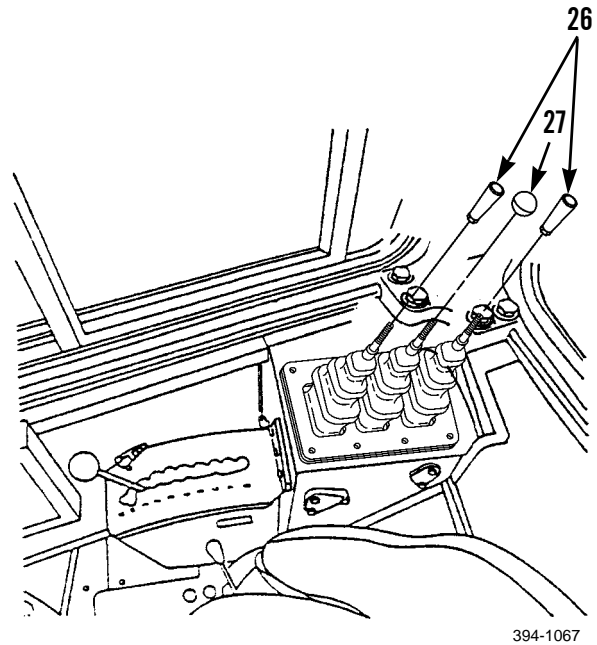


16. Install new gasket (32) on support (28) assembly.
17. Install support (28) assembly on inside right of operator compartment.
18. Install boot (31).
19. Install eight washers (30) and bolts (29).



**INSTALLATION - CONTINUED**

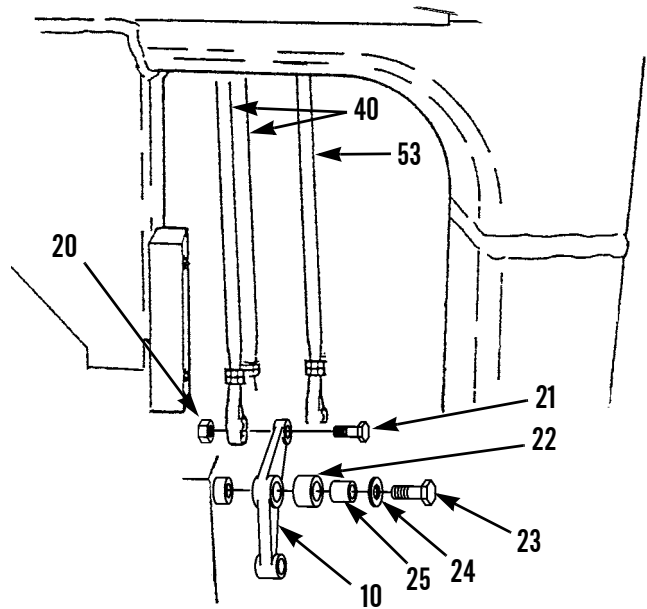
20. Install knob (27) and two handles (26).



**NOTE**

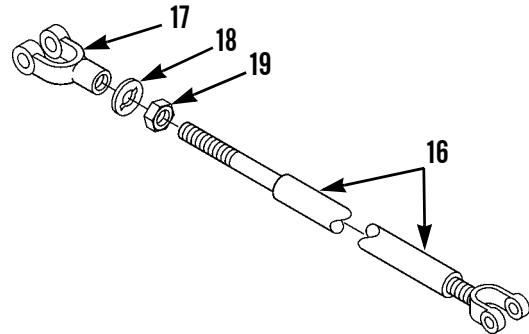
Steps 21 through 28 are the maintenance procedure for installation of ejector lever linkage from remote lever bracket to hydraulic control valve. The maintenance procedure for apron and bowl lever linkage segments is identical.

21. Install spacer (22) and bushing (25) in lever (10).
22. Install lever (10), washer (24) and bolt (23) in frame wall.
23. Install bolt (21), rod (53) assembly, rod (40) assemblies and nut (20) on lever (10).



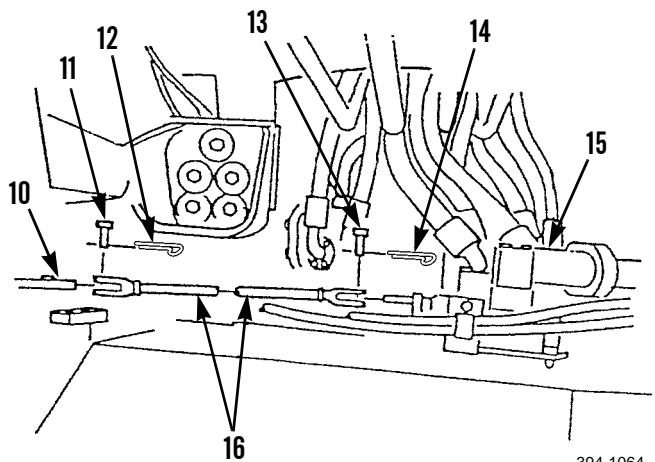
**INSTALLATION - CONTINUED**

24. Install nut (19), retainer (18) and clevis (17) on clevis (16).



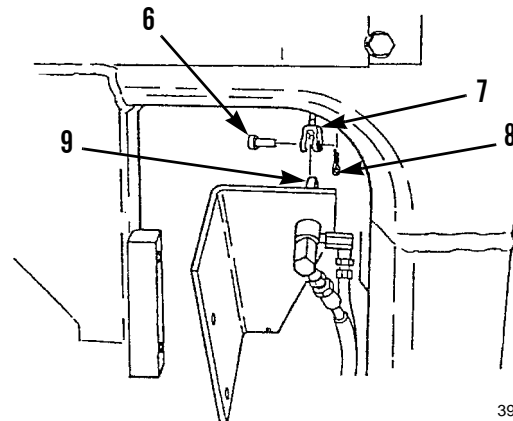
394-1065

25. Position clevis end of clevis (16) assembly on lever (10).
26. Install pin (11) and new cotter pin (12) on clevis (16).
27. Position rod end of clevis (16) assembly on hydraulic control valve spool (15).
28. Install pin (13) and new cotter pin (14) on clevis (16).



394-1064

29. Position clevis (7) assembly on apron control valve spool (9).
30. Install pin (6) and new cotter pin (8) on clevis (7).



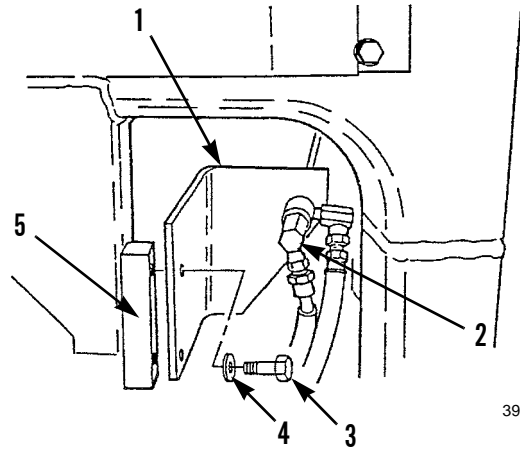
394-1055

**CONTROL LEVER LINKAGE REPLACEMENT - CONTINUED**

0325 00

**INSTALLATION - CONTINUED**

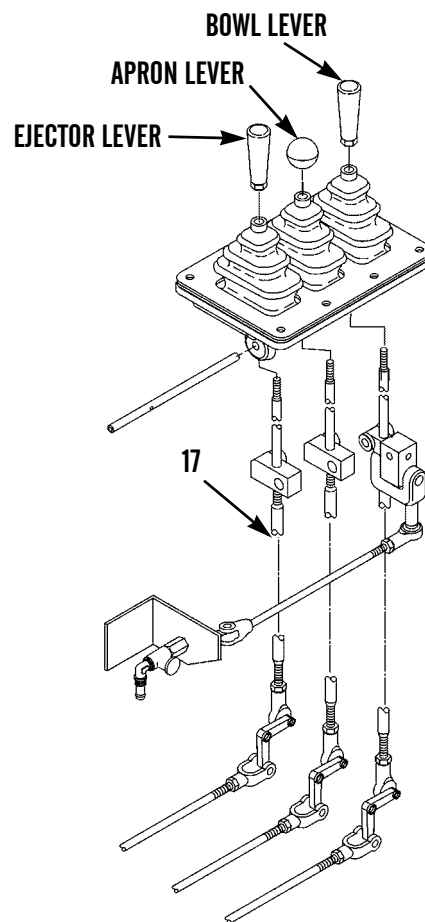
31. Adjust rod length to equalize side-to-side movement of bowl lever.
32. Position apron control valve bracket (1) and apron control valve (2) assembly on mounting bracket (5).
33. Install two washers (4) and bolts (3) on mounting bracket (5).



391-1054

**ADJUSTMENT**

1. Adjust length of bowl lever vertical rod to 21 in. (53 cm). Rotate clockwise into rod ends to shorten. Rotate counterclockwise to lengthen.
2. Adjust length of ejector lever vertical rod to 18 in. (46 cm). Rotate clockwise into rod ends to shorten. Rotate counterclockwise to lengthen.
3. Adjust length of apron lever vertical rod to 15 in. (38 cm). Rotate clockwise into rod ends to shorten. Rotate counterclockwise to lengthen.
4. Adjust length of ejector lever horizontal rod to 23 in. (58 cm). Rotate clockwise into rod end (17) to shorten. Rotate counterclockwise to lengthen.
5. Adjust length of apron lever horizontal rod to 26 in. (66 cm). Rotate clockwise into rod end (17) to shorten. Rotate counterclockwise to lengthen.
6. Adjust length of bowl lever horizontal rod to 29 in. (74 mm). Rotate clockwise into rod end (17) to shorten. Rotate counterclockwise to lengthen.
7. Verify correct operation (TM 5-3805-248-10).



394-1078

**END OF WORK PACKAGE**



**HYDRAULIC TANK FILTER BY-PASS VALVE REPAIR**

**0326 00**

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning, Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Packing, preformed (2)

**References**

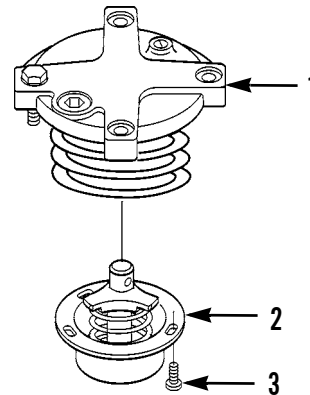
TM 5-3805-248-10

**Equipment Condition**

Hydraulic tank oil filter cover removed (WP 0229 00)

**DISASSEMBLY**

1. Remove three screws (3) separating housing (2) assembly from cover (1) assembly.



394-1079

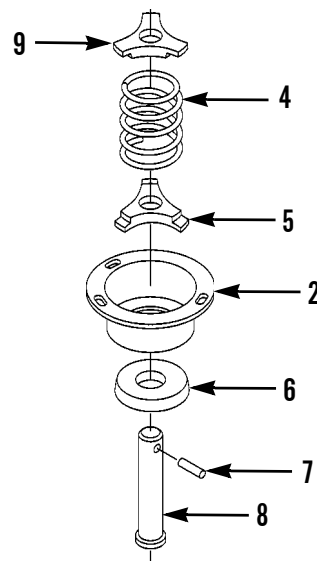
**DISASSEMBLY - CONTINUED**



**WARNING**

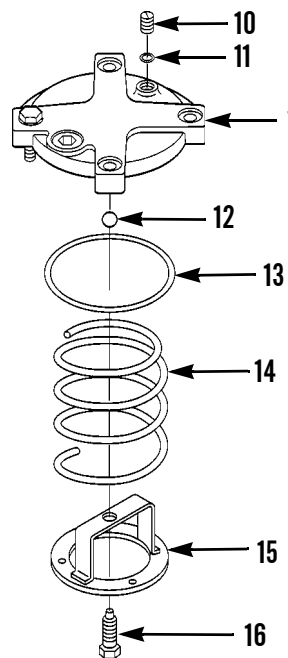
- Eye protection must be worn when performing maintenance where components or particles could fly out during procedure. Failure to take precautions may cause injury.
- Some components are under spring tension. Wear eye protection and use extreme caution during disassembly to avoid injury.

2. Remove pin (7) from shaft (8).
3. Remove retainer (9), spring (4) and retainer (5) from housing (2).
4. Remove plate (6) and shaft (8) from housing (2).



394-1080

5. Remove bolt (16) and retainer assembly (15) from cover (1).
6. Remove spring (14) from cover (1).
7. Remove and discard preformed packing (13) from cover (1).
8. Remove ball (12) from cover (1).
9. Remove plug (10) and preformed packing (11) from cover (1). Discard preformed packing.



394-1081

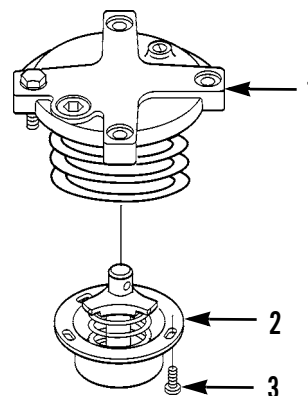
**CLEANING AND INSPECTION****WARNING**

- 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 cause 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. Remove gasket material from all mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install new preformed packing (11) and plug (10) on cover (1).
2. Install ball (12) on cover (1).
3. Install new preformed packing (13) on cover (1).
4. Install spring (14) on cover (1).
5. Install retainer assembly (15) and bolt (16) on cover (1).
6. Install shaft (8) and plate (6) on housing (2).
7. Install retainer (5), spring (4) and retainer (9) on housing (2).
8. Compress spring (4).
9. Install pin (7) in shaft (8).
10. Install three screws (3) and mounting housing (2) assembly on cover (1) assembly.



394-1079

11. Install hydraulic tank oil filter cover (WP 0229 00).
12. Check for leaks at the by-pass valve.
13. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)  
 Rag, wiping (Item 35, WP 0339 00)  
 Packing, preformed (4)

**Equipment Condition**

Breaker relief valve removed (WP 0230 00)

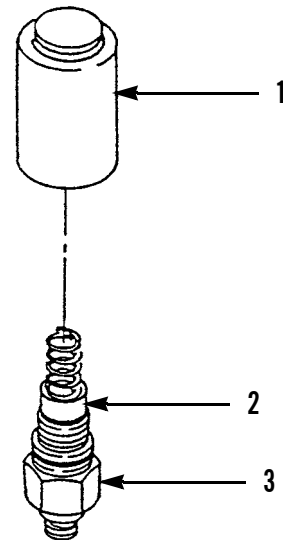
**DISASSEMBLY**



**WARNING**

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

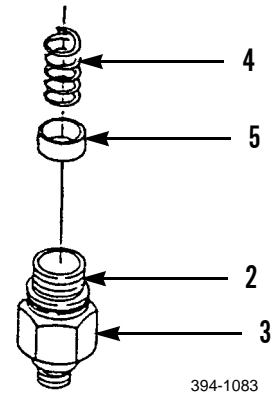
1. Unscrew base (3) and separate breather port (2) assembly from cover (1) assembly.



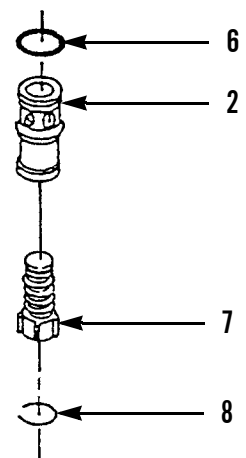
394-1082

**DISASSEMBLY - CONTINUED**

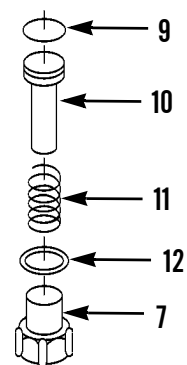
2. Remove spring (4) and retainer (5) from base (3).
3. Remove breather port (2) assembly from base (3).



4. Remove and discard preformed packing (6) from breather port (2).
5. Remove snap ring (8) from body (7) assembly.
6. Remove body (7) assembly from breather port (2).

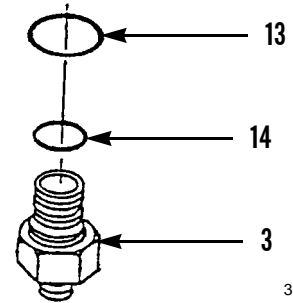


7. Remove body (7) from spring (11).
8. Remove snap ring (12) from body (7).
9. Remove spring (11) from poppet (10).
10. Remove and discard preformed packing (9) from poppet (10).



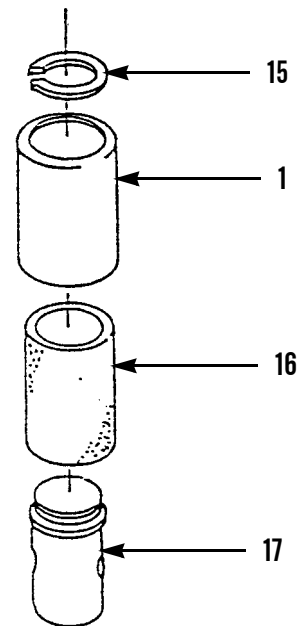
**DISASSEMBLY - CONTINUED**

11. Remove preformed packings (13) and (14) from base (3).



394-1086

12. Remove retaining ring (15) from top of coupling body (17).
13. Remove cover (1) and filter (16) from coupling body (17).



394-1087

**CLEANING AND INSPECTION**



**WARNING**

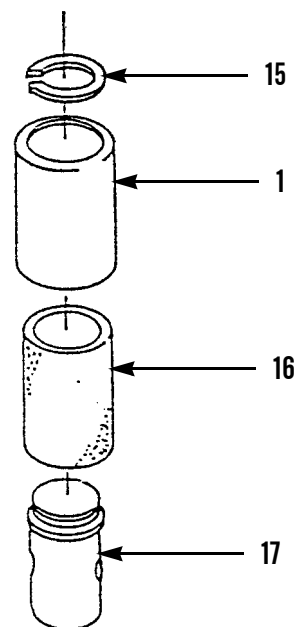


- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 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. Remove gasket material from all mounting surfaces.
2. Clean all parts except filter with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install filter (16) and cover (1) on coupling body (17).
2. Install ring (15) on top of coupling body (17).

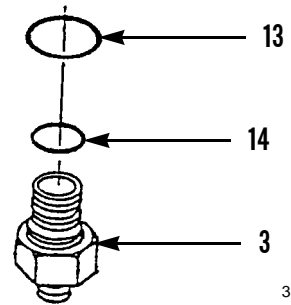


394-1087



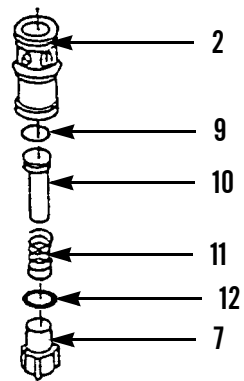
**ASSEMBLY - CONTINUED**

3. Install new preformed packings (13) and (14) on base (3).



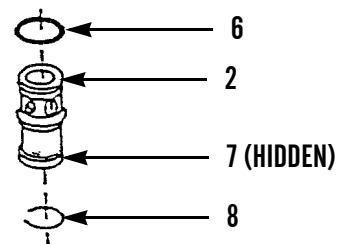
394-1086

4. Install new preformed packing (9) on poppet (10).
5. Install poppet (10) and spring (11) in breather port (2).
6. Install snap ring (12) and body (7) in breather port (2).



394-1088

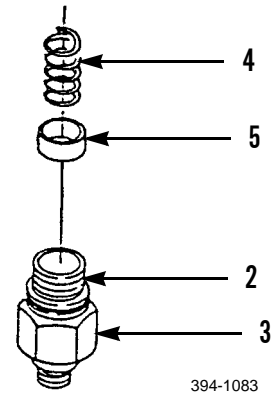
7. Compress body (7) assembly in breather port (2) and install snap ring (8) on body (7).
8. Install new preformed packing (6) on breather port (2).



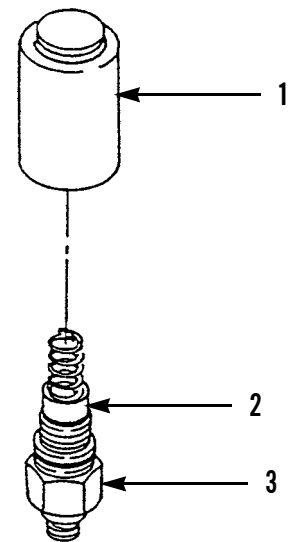
394-1089

**ASSEMBLY - CONTINUED**

9. Install breather port (2) assembly on base (3).
10. Install retainer (5) and spring (4) on base (3).



11. Install cover (1) assembly on breather port (2) assembly. Screw in base (3).



12. Install breaker relief valve (WP 0230 00).

**END OF WORK PACKAGE**

---

**EJECTOR ASSEMBLY REPLACEMENT**

---

**0328 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 2,000 lb minimum capacity

**References**

TM 5-3805-248-10

WP 0329 00

WP 0330 00

WP 0331 00

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Equipment Condition**Ejector cylinder removed (WP 0384 00)

---

**REMOVAL**

**WARNING**

Before removing the ejector assembly with lifting device, make sure the chains are placed on the ejector assembly to equally carry the weight of the ejector assembly. Failure to follow this procedure can cause injury or equipment damage.

1. Position three chains around the ejector assembly.
2. Attach ends of three chains to lifting device and take up slack.
3. Remove lower rear ejector rollers (WP 0329 00).
4. Remove lower front ejector rollers (WP 0330 00).
5. Remove ejector guide rollers (WP 0331 00).



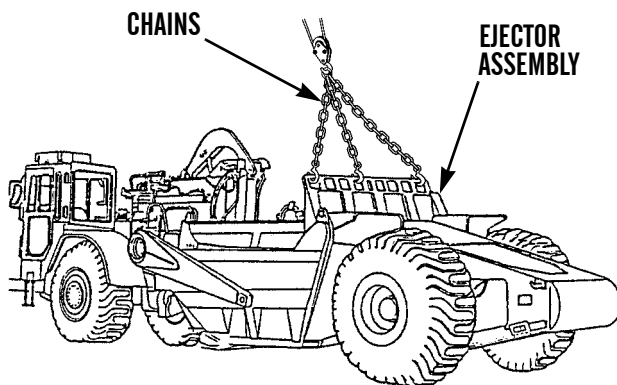
**WARNING**

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.

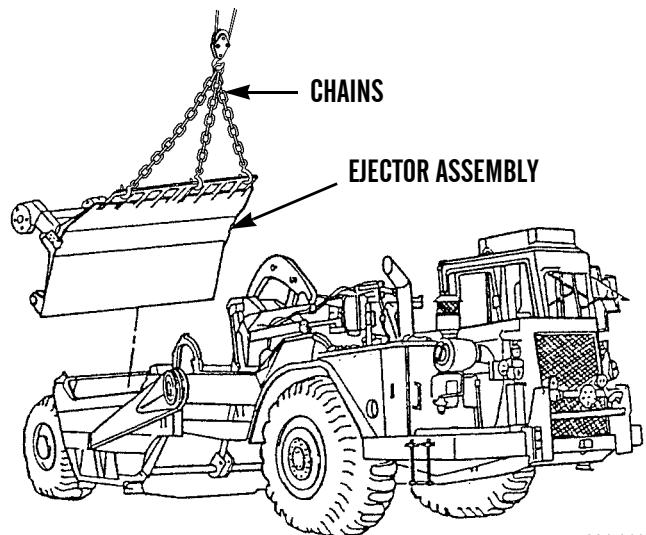
**NOTE**

Weight of ejector assembly is 1,300 lb (590 kg).

6. Using lifting device, remove ejector assembly and place securely on floor.
7. Remove lifting device.



394-1447



394-1448

**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 cause 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 parts with solvent cleaning compound.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION****WARNING**

Make sure chains are placed on the ejector assembly to equally carry the weight of the ejector assembly. Failure to follow this procedure can cause injury or equipment damage.

1. Install three chains on ejector assembly.

**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 ejector assembly is 1,300 lb (590 kg).

2. Using lifting device, position ejector assembly in vehicle.
3. Install ejector guide rollers (WP 0331 00).
4. Install lower front ejector rollers (WP 0330 00).
5. Install lower rear ejector rollers (WP 0329 00).
6. Remove lifting device.
7. Install ejector cylinder (WP 0384 00).
8. Operate ejector and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**LOWER REAR EJECTOR ROLLER REPLACEMENT**

---

**0329 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 2,000 lb minimum capacity

Screw, forcing, 3/8-16NC

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Grease (Item 18, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Seal (2)

Engine shut down (TM 5-3805-248-10)

Bowl lowered to the ground (TM 5-3805-248-10)

Battery disconnect switch in OFF position (TM 5-3805-248-10)

---

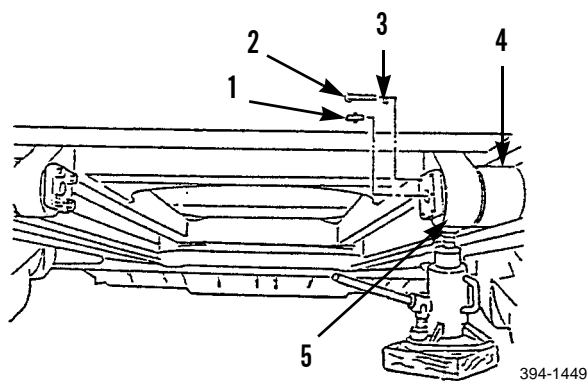
**REMOVAL****WARNING**

Ensure machine will not roll or shift before jacking it or placing it on jack stands. Use chock blocks to prevent machine from rolling. Death or injury may result if you fail to follow this procedure due to vehicle turning or slipping off jacks or jack stands.

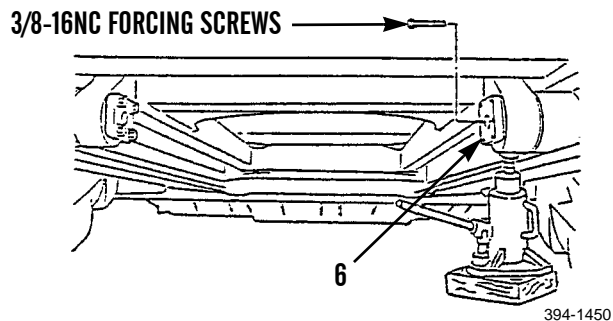
**NOTE**

The following procedure is for the lower-right, rear ejector roller. The procedure for the lower-left, rear ejector roller is identical.

1. Position lifting device firmly under ejector bracket on lower-rear, right side of ejector.
2. Using lifting device, raise ejector bracket (5) until roller (4) turns freely. Raising ejector bracket too high will bind roller in guide track.
3. Remove fitting (1), four bolts (2) and washers (3).



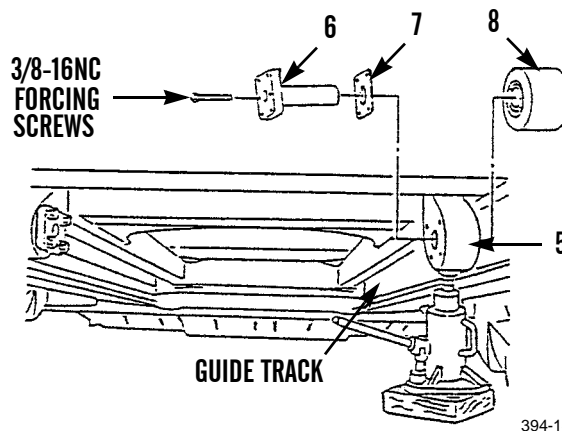
4. Install two forcing screws in shaft (6). Tighten evenly until shaft is loose.
5. Remove two forcing screws from shaft (6).



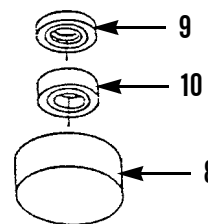


**REMOVAL - CONTINUED**

6. Remove shaft (6) and shim(s) (7).
7. Remove roller assembly (8) from guide track.



8. Remove and discard seal (9) from roller (8).
9. Use hammer and punch to remove bearing (10) and roller (8).



**CLEANING AND INSPECTION**

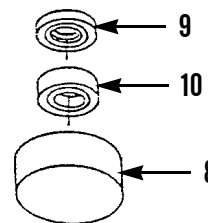


- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 cause 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 parts with solvent cleaning compound.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Use driver and hammer to install bearing (10) in roller (8) until bearing makes contact with bottom of roller bore.
2. Position new seal (9) with lip facing up on roller (8).
3. Use driver to install new seal (9) until it seats firmly against bearing (10).

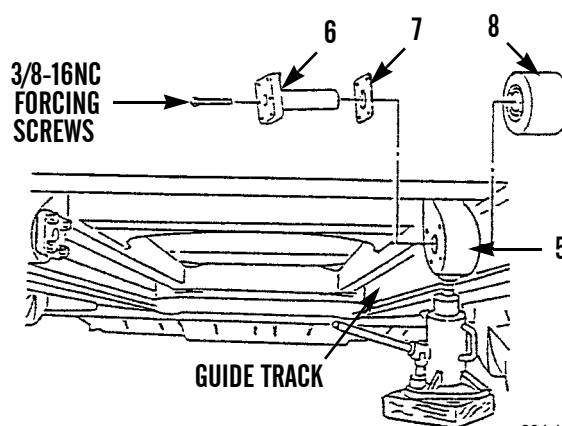


394-1452

4. Position shim(s) (7) on shaft (6).
5. Position roller assembly (8) on guide track.
6. Install shaft assembly (6) through ejector bracket (5) into roller assembly (8).

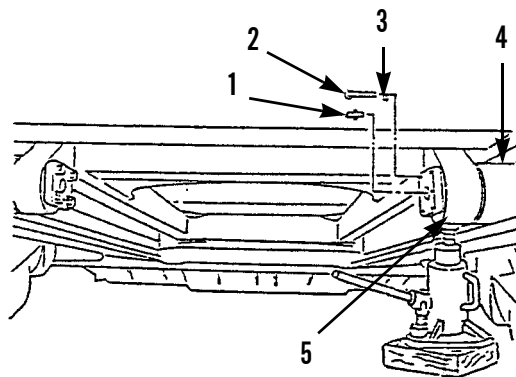
**NOTE**

Clearance between roller and guide track must be adjusted to 0.12 in. (3.05 mm). Add or remove shim(s) for proper clearance.



394-1451

7. Adjust roller (8) clearance to 0.12 in. (3.05 mm).
8. Install four washers (3), bolts (2) and fitting (1) in ejector bracket (5).



394-1449

9. Remove lifting device.
10. Using grease, lubricate fitting (1).
11. Operate ejector and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**LOWER FRONT EJECTOR ROLLER MAINTENANCE****0330 00****THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Chock blocks

Lifting device, 2000 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Grease (Item 18, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Gasket

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

Engine shut down (TM 5-3805-248-10)

Bowl lowered to the ground (TM 5-3805-248-10)

Battery disconnect switch in OFF position (TM 5-3805-248-10)

**WARNING**

Ensure machine will not roll or shift. Secure with chock blocks. Death or injury may result if you fail to follow this procedure due to vehicle turning or slipping off jacks or jack stands.

**NOTE**

The following maintenance procedure is for the lower-right, front ejector roller. The maintenance procedure for the lower-left, front ejector roller is identical.

**REMOVAL****WARNING**

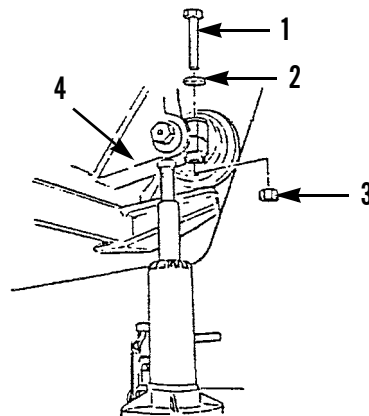
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in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

1. Position suitable lifting device under right-front roller bracket (4) on ejector assembly.

**NOTE**

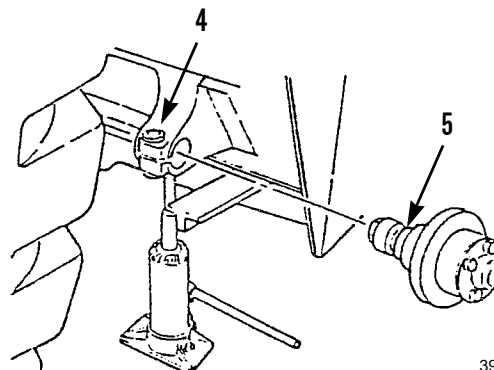
Raise roller bracket until roller turns freely.

2. Remove nut (3), bolt (1) and washer (2).



394-1454

3. Rotate roller assembly (5) by hand and remove from roller bracket (4).



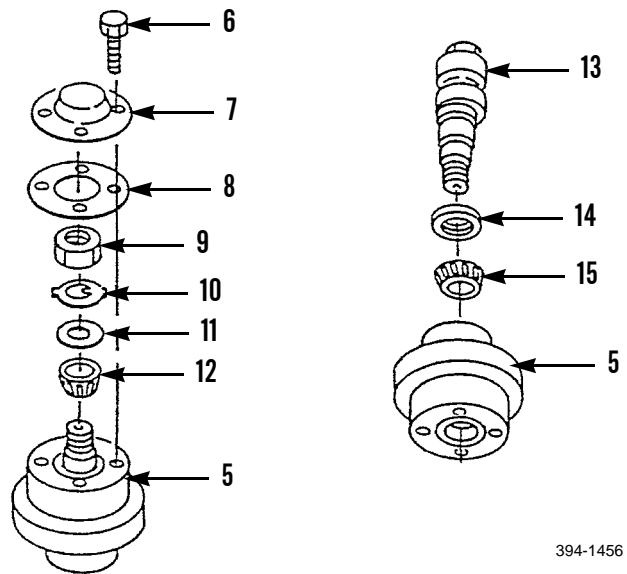
394-1455

**LOWER FRONT EJECTOR ROLLER MAINTENANCE - CONTINUED**

**0330 00**

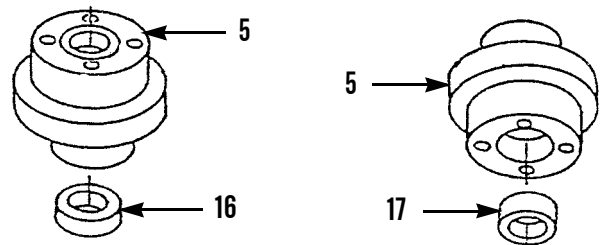
**DISASSEMBLY**

1. Remove four bolts (6), cap (7) and gasket (8). Discard gasket.
2. Remove nut (9), lock (10), washer (11) and bearing (12).
3. Disassemble roller assembly (5).
4. Remove shaft (13), seal (14) and bearing (15) from roller assembly (5).



394-1456

5. Use hammer and punch to remove bearing (16) from roller assembly (5). Tap gently to prevent damage.
6. Use hammer and punch to remove bearing (17) from roller assembly (5). Tap gently to prevent damage.



394-1457

**CLEANING AND INSPECTION**

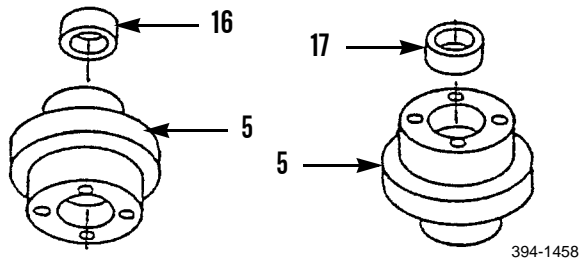


- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by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

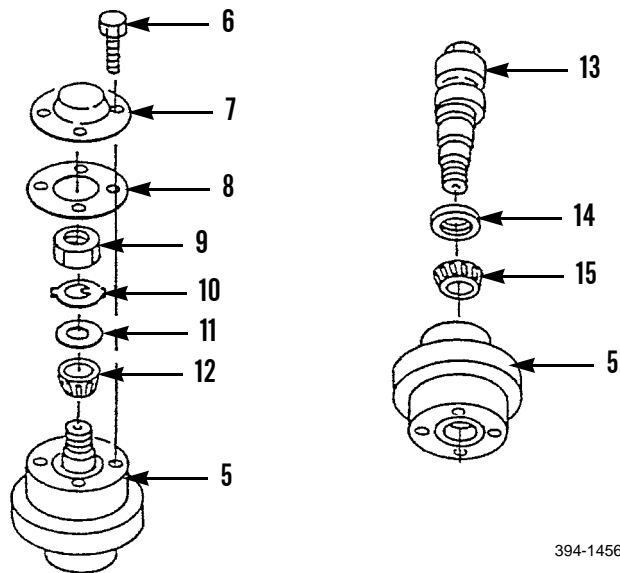
1. Clean all parts with solvent cleaning compound.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Use grease to lubricate bearing (14).
2. Use driver and hammer to install bearing (16) in roller (5). Tap driver gently until bearing is firmly against roller counterbore.
3. Use driver and hammer to install bearing (17) in roller assembly (5).



4. Use grease to lubricate bearing (15).
5. Install bearing (15) in roller assembly (5).
6. Use grease to lubricate lip of seal (14).



**NOTE**

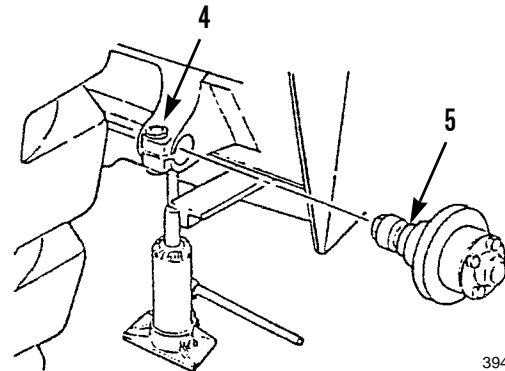
When installing seal, lip of seal must face inside of roller.

7. Use driver and hammer to install seal. Tap gently until seal (14) is seated firmly against bottom of roller assembly counterbore.
8. Install shaft (13).
9. Use grease to lubricate inside of roller (5).
10. Use grease to lubricate and install bearing (12) on roller assembly (5).
11. Install washer (11), lock (10) and nut (9). Tighten nut (9) until roller (5) will not turn by hand. Then loosen nut 1/16 of one turn.
12. Install new gasket (8), cover (7) and four bolts (6).

**INSTALLATION****NOTE**

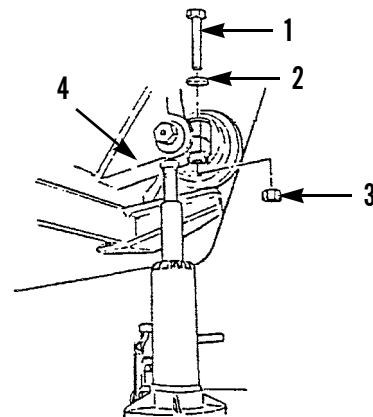
Clearance between ejector and bottom of bowl must not be less than 0.30 in. (7.6 mm) or more than a 0.50 in. (12.7 mm). Rotate shaft in roller bracket to adjust clearance.

1. Install roller assembly (5) in roller bracket (4).



394-1455

2. Adjust roller (5) clearance to a minimum of 0.30 in. (7.6 mm) and a maximum of 0.50 in. (12.7 mm).
3. Install washer (2), bolt (1) and nut (3) in bracket (4).



394-1454

4. Remove lifting device and chock blocks.
5. Operate machine and verify correct ejector operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**





**THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Grease (Item 18, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Gasket

Seal

**Equipment Condition**

Machine parked on level ground (TM 5-3805-248-10)

Parking/emergency brake applied (TM 5-3805-248-10)

Engine shut down (TM 5-3805-248-10)

Bowl lowered to the ground (TM 5-3805-248-10)

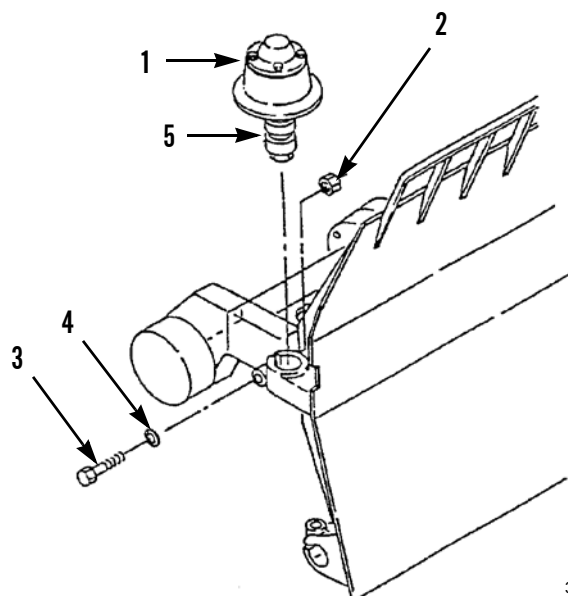
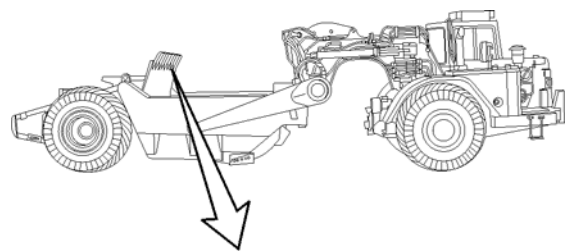
Battery disconnect switch in OFF position (TM 5-3805-248-10)

**NOTE**

The following maintenance procedure is for the right ejector guide roller. The maintenance procedure for the lower left ejector guide roller is identical.

**REMOVAL**

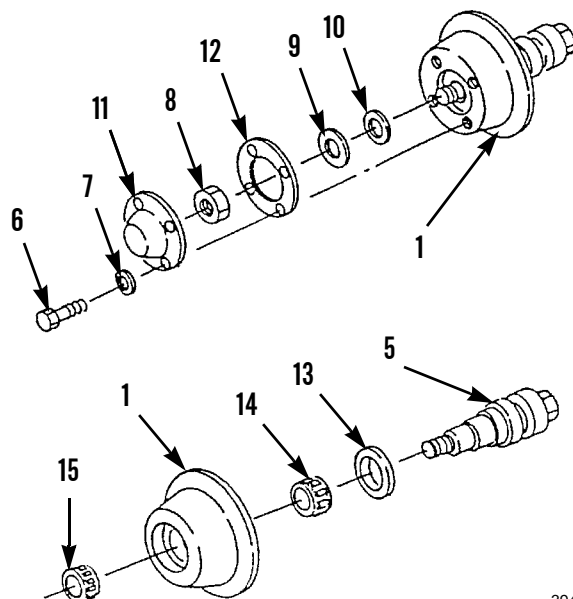
1. Remove nut (2), bolt (3) and washer (4) mounting ejector guide roller to ejector.
2. Use a soft hammer to tap shaft (5) until loose. Rotate clockwise until there is clearance between ejector guide roller (1) and rail.
3. Remove ejector guide roller (1).



394-1459

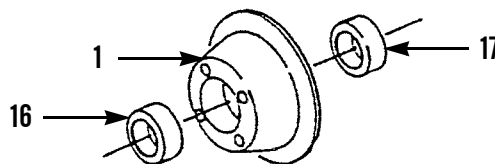
**DISASSEMBLY**

1. Remove four bolts (6), washers (7), cap (11) and gasket (12) from roller (1). Discard gasket.
2. Remove nut (8), lock (9) and washer (10).
3. Remove cone (15), shaft (5), seal (13) and cone (14) from roller (1). Discard seal.



394-1460

4. Use a driver and hammer to remove cups (16 and 17) from roller (1).



394-1461

**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 cause 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 parts with solvent cleaning compound.
2. Dry all parts with compressed air.

**CLEANING AND INSPECTION - CONTINUED**

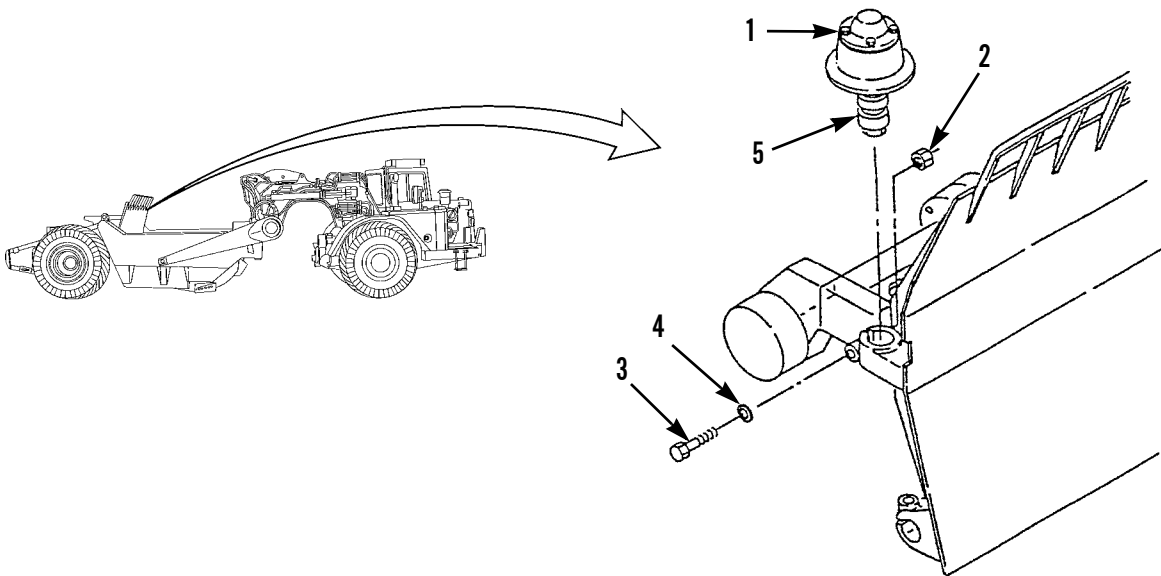
3. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Use a driver and hammer to install cup (17) up into roller (1) and seat against counterbore in roller.
2. Use a driver and hammer to install cup (16) down into roller (1) and seat against counterbore in roller.
3. Lubricate and install cone (14) up into roller (1). Apply grease evenly to cone bearing surface.
4. Use grease to lubricate lip of seal (13).
5. Use a driver and hammer to install new seal (13) up into roller (1) with lip toward inside of roller. Seat firmly against bottom of counterbore.
6. Install shaft (5) up into roller (1).
7. Lubricate shaft (5) and roller (1), and apply grease heavily to inside area.
8. Lubricate and install cone (15) down into roller (1). Apply grease evenly to cone bearing surface.
9. Install washer (10), lock (9) and nut (8). Hand tighten nut until roller will not rotate on shaft. Back off nut 1/16 turn.
10. Install new gasket (12), cap (11), four washers (7) and bolts (6).

**INSTALLATION**

1. Install ejector guide roller (1) on ejector frame.
2. Rotate shaft (5) until clearance between ejector and bowl is 0.12 in. minimum to 0.75 in. maximum.
3. Install washer (4), bolt (3) and nut (2), mounting ejector guide roller (1) to ejector frame.
4. Operate machine and verify correct ejector operation (TM 5-3805-248-10).



394-1459A

**END OF WORK PACKAGE**



---

**TACHOMETER DRIVE REPLACEMENT**

---

**0332 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Gasket (2)

**Materials/Parts - Continued**

Lockwasher (2)

O-ring

Seal

**References**

TM 5-3805-248-10

**Equipment Condition**

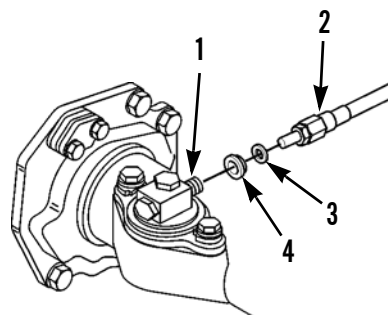
Air compressor removed (WP 0167 00)

Hood removed (WP 0189 00)

---

**REMOVAL**

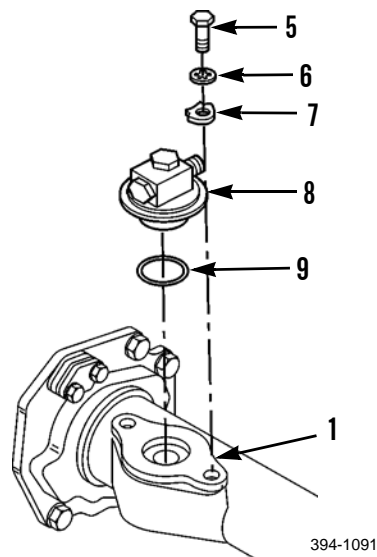
1. Disconnect tachometer drive cable (2) from governor drive housing (1).
2. Remove grommet (3) and gasket (4) from tachometer drive cable (2). Discard gasket.



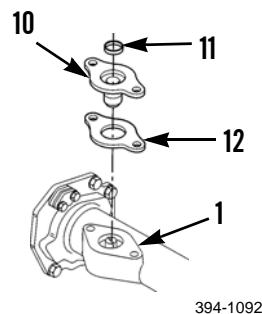
394-1090

**REMOVAL - CONTINUED**

3. Remove two bolts (5), lockwashers (6), clamps (7), adapter (8) and O-ring (9) from governor drive housing (1). Discard O-ring and lockwashers.



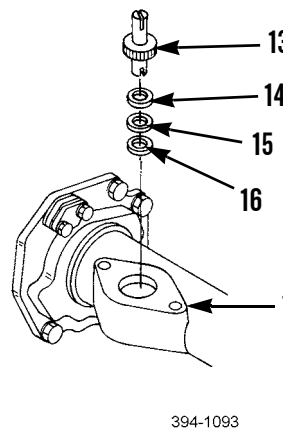
4. Remove adapter (10) and seal (11) from governor drive housing (1). Discard seal.
5. Remove and discard gasket (12) from governor drive housing (1).



**CAUTION**

Use care when removing shaft assembly so bearing or races do not fall into governor drive housing.

6. Remove shaft assembly (13) from governor drive housing (1).
7. Remove race (14), bearing (15) and race (16) from governor drive housing (1).



**CLEANING AND INSPECTION**

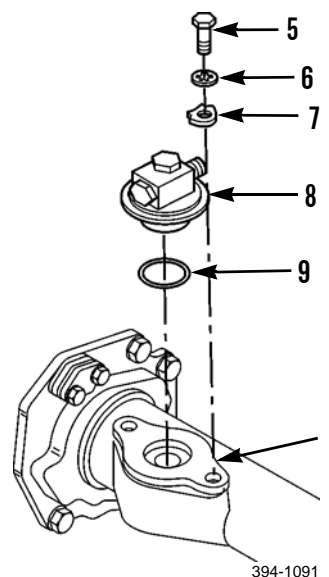
1. Remove any remaining gasket material from all mounting surfaces.

**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 cause 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 all parts with solvent cleaning compound.
  3. Dry parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

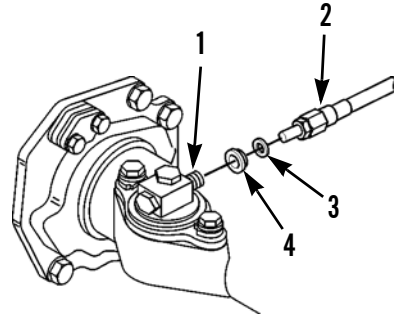
**INSTALLATION**

1. Apply a light coat of clean lubricating oil to bore of governor drive housing (1).
2. Install race (16), bearing (15) and race (14) in governor drive housing (1).
3. Install shaft assembly (13) on governor drive housing (1).
4. Install new gasket (12) on governor drive housing (1).
5. Install new seal (11) and adapter (10) on governor drive housing (1), aligning groove of adapter with groove in shaft assembly (13) gear.
6. Apply clean lubricating oil to new O-ring (9) and install O-ring on adapter (8).
7. Install adapter (8) on governor drive housing (1).
8. Install two clamps (7), new lockwashers (6) and bolts (5) on governor drive housing (1).



**INSTALLATION - CONTINUED**

9. Install new gasket (4) and grommet (3) on governor drive housing (1).
10. Connect tachometer drive cable (2) to governor drive housing (1).



394-1090

11. Install air compressor (WP 0167 00).
12. Install hood (WP 0189 00).
13. Operate machine and verify correct operation of tachometer (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**CHAPTER 5**  
**SUPPORTING INFORMATION**



**THIS WORK PACKAGE COVERS**

Preparation for Short-Term Storage

Preparation for Return to Service from Short-Term  
Storage

Preparation for Long-Term Storage

Preparation for Return to Service from Long-Term  
StoragePreparation for Shipment

---

**NOTE**

Short-term storage is storage for two weeks or less. Long-term storage is for more than two weeks.

***PREPARATION FOR SHORT-TERM STORAGE***

1. Thoroughly clean machine.
2. Perform Operator Preventive Maintenance Checks and Services (PMCS) (TM 5-3805-248-10).
3. Fill fuel tank completely to prevent condensation from forming (TM 5-3805-248-10).
4. Perform Unit PMCS (WP 0019 00 and WP 0020 00).
5. Schedule next PMCS on ULLS-G (Unit Level Logistics System – Ground).
6. Store machine indoors in a dry, protected area with scraper bowl lowered to the ground (TM 5-3805-248-10).
7. When moderate temperatures are expected, leave batteries in place. If extreme cold is expected, remove batteries (WP 0103 00) and store in a protected area.
8. Check engine coolant to ensure coolant has correct mixture for expected temperatures (TB 750-651).
9. Seal all openings in engine, including air intake, exhaust outlet, and crankcase breather tube.
10. Ensure battery disconnect switch is in OFF position (TM 5-3805-248-10).
11. Fill in Form DD 1397 completely and attach to a conspicuous part of machine.

***PREPARATION FOR RETURN TO SERVICE FROM SHORT-TERM STORAGE***

1. Remove seals from all engine openings, including air intake, exhaust outlet and crankcase breather tube.
2. If removed, install batteries (WP 0103 00).
3. Check oil and hydraulic fluid levels in engine crankcase, transmission, front axle differential, wheel end final drives and hydraulic reservoir.
4. Check coolant level in radiator (TM 5-3805-248-10).
5. Start engine and perform machine warmup (TM 5-3805-248-10). Verify proper operation of all gages, switches and lights.
6. Ensure fuel tank is full (TM 5-3805-248-10).
7. Operate machine without a load and check engine, transmission, brakes, steering and electrical accessories for proper operation (TM 5-3805-248-10).

***PREPARATION FOR LONG-TERM STORAGE***

1. Thoroughly clean machine.
2. Perform Operator Preventive Maintenance Checks and Services (PMCS) (TM 5-3805-248-10).
3. Perform Unit PMCS (WP 0019 00 and WP 0020 00).
4. Schedule next PMCS on ULLS-G.
5. Inspect machine for corrosion. Use touch-up paint where necessary to prevent rust.
6. Coat all exposed hydraulic cylinder rods with GAA grease to protect polished surfaces.

**NOTE**

If machine has accumulated very low mileage since its last scheduled lubrication service, do not drain and refill transmission and front axle; skip step 7.

7. Drain and refill transmission, differential and wheel end final drives (WP 0019 00 and WP 0020 00).
8. Drain engine crankcase and refill with recommended oil (WP 0019 00 and WP 0020 00).
9. Operate engine and treat upper cylinders by spraying recommended engine oil into air intake for about two minutes. Open throttle momentarily, shut down engine, and continue spraying oil into air intake until engine comes to a stop.
10. Completely drain fuel tank. Mix a solution of diesel fuel (Item 14 or 15, WP 0339 00) and flushing oil per instructions supplied with flushing oil. Pour mixture into fuel tank. Run engine for at least 10 minutes with this solution.
11. Check engine coolant to ensure coolant has correct mixture for expected temperatures (TB 750-651).
12. Seal all openings in engine, including air intake, exhaust outlet and crankcase breather tube.
13. Loosen or remove drive belts (WP 0053 00 and WP 0056 00).
14. Ensure battery disconnect switch is in OFF position (TM 5-3805-248-10).
15. Remove batteries (WP 0103 00). Clean batteries and ensure they are fully charged.
16. Completely drain fuel tank.
17. Place blocking under axles to remove weight from tires.
18. Fill in Form DD 1397 completely and attach to a conspicuous part of machine.

***PREPARATION FOR RETURN TO SERVICE FROM LONG-TERM STORAGE***

1. Ensure tires are inflated to 45 psi (310 kPa).
2. Remove blocking from under axles.
3. Remove GAA grease from exposed hydraulic cylinder rods. Wipe rods clean with a rag (Item 35, WP 0339 00) dipped in lubricating oil (Item 26, WP 0339 00).
4. Fill fuel tank with fuel (TM 5-3805-248-10).
5. Check oil and hydraulic fluid levels in engine crankcase, transmission, front axle differential, final drives and hydraulic reservoir.

---

**PREPARATION FOR STORAGE OR SHIPMENT - CONTINUED**

---

0333 00

**PREPARATION FOR RETURN TO SERVICE FROM LONG-TERM STORAGE - CONTINUED**

6. Check coolant level in radiator (TM 5-3805-248-10).
7. Install fully charged batteries (WP 0103 00).
8. Tighten or install drive belts (WP 0053 00 and WP 0056 00).
9. Remove seals from all engine openings, including air intake, exhaust outlet and crankcase breather tube.
10. Start engine and perform machine warmup (TM 5-3805-248-10). Verify proper operation of all gages, switches and lights.
11. Operate machine without a load and check engine, transmission, brakes, steering and electrical accessories for proper operation (TM 5-3805-248-10).

**PREPARATION FOR SHIPMENT**

1. Perform Operator Preventive Maintenance Checks and Services (PMCS) (TM 5-3805-248-10).
2. Perform Unit Maintenance Preventive Maintenance Checks and Services (PMCS) (WP 0019 00 and WP 0020 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 shipping and transportation data on data plate (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

**0334 00**

---

**THIS WORK PACKAGE COVERS**

Part number index

List of bulk material needed for making manufactured items

Illustrations with dimensions for making manufactured items

---

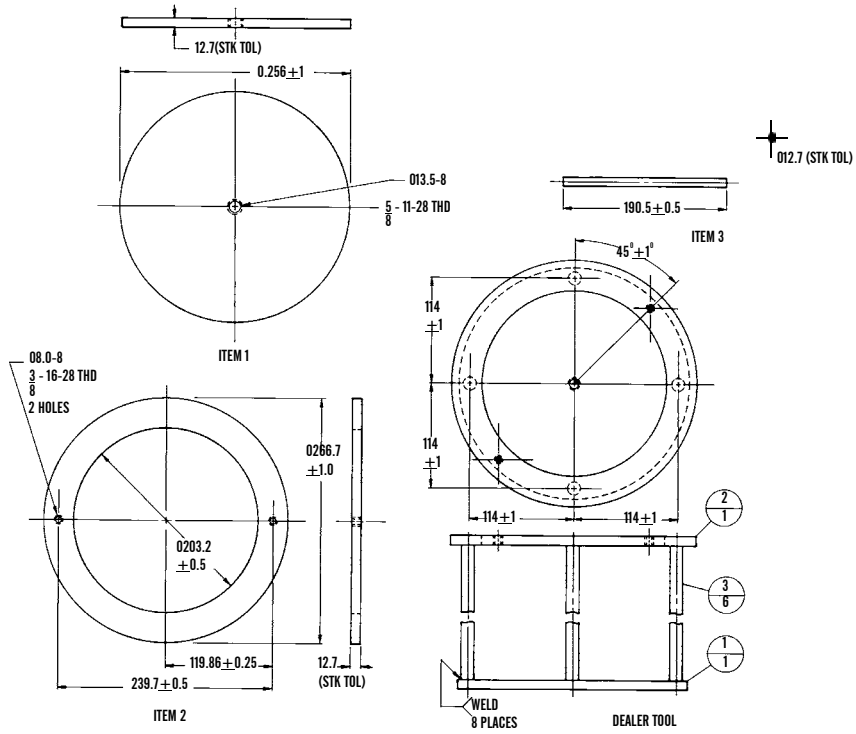
***PART NUMBER INDEX***

1. FT0165: Used for disassembly and assembly of turbocharger.
2. FT0174: Used to service turbocharger.
3. FT0808: Used to service turbocharger.
4. FT1206: Used for engine in-chassis seal and wear sleeve installation.

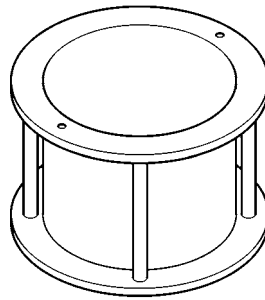
FT 0165

Material Chart			
Item	Quantity	Name	Material
1	1	Plate - Bottom	SAE 1020 Steel
2	1	Plate - Top	SAE 1020 Steel
3	4	Rod	SAE 1020 Steel

Weld four 1/2" x 7 1/2" rods at illustrated locations.



394-1699

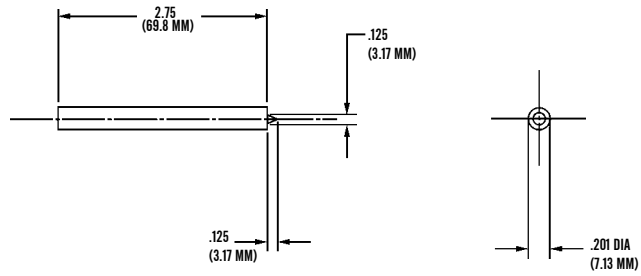


394-1608

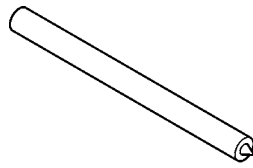


FT 0174

Material Chart			
Item	Quantity	Name	Material
—	1	Rod	SAE 4140 Steel



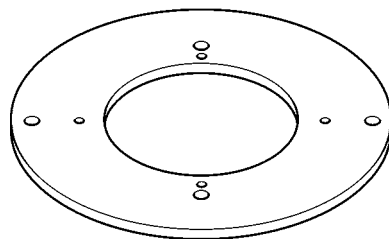
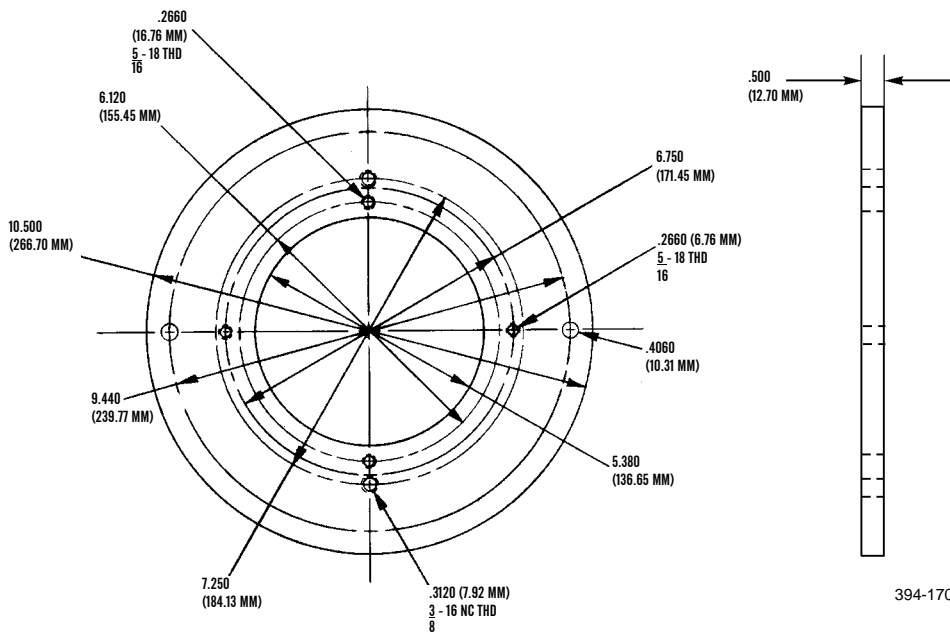
394-1700



394-1609

FT 0808

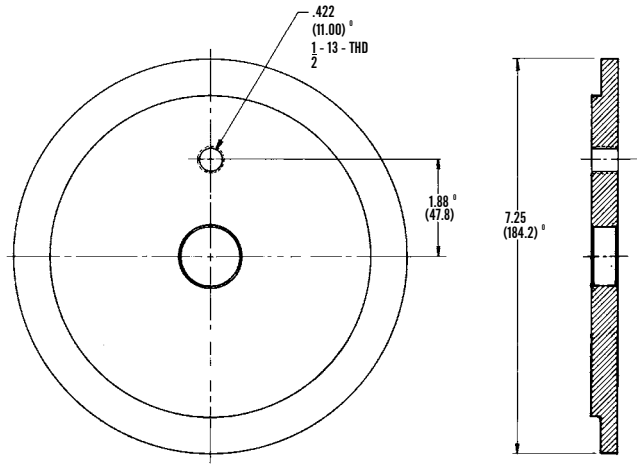
Material Chart			
Item	Quantity	Name	Material
—	1	Plate	1018 Steel



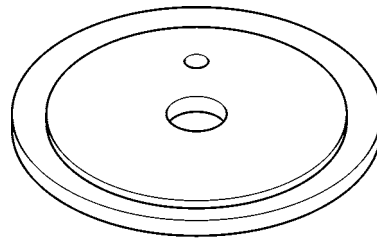
394-1610

**FT 1206**

FT 1206 is made from plate, seal inserter (Item 77, WP 0338 00).



394-1702



394-1611

**END OF WORK PACKAGE**

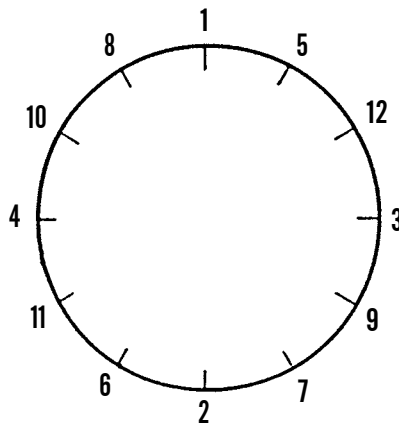


**SCOPE**

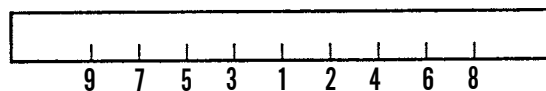
This work package lists standard torque values and provides general information for applying torque. Special torque values and tightening sequences are indicated in the maintenance procedures for applicable components.

**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  $\pm 10\%$ .
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.



CIRCULAR 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 overtightening.

Table 1. Torque Limits - SAE Standard Fasteners.




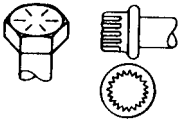
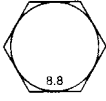
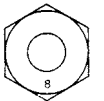
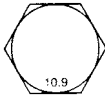
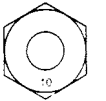
CURRENT USAGE	MUCH USED	MUCH USED	USED AT TIMES	USED AT TIMES
QUALITY OF MATERIAL	INDETERMINATE	MINIMUM COMMERCIAL	MEDIUM COMMERCIAL	BEST COMMERCIAL
SAE Grade Number	1 or 2	5	6 or 7	8
Capscrew Head Markings				
Manufacturer's marks may vary				
These are all SAE Grade 5 (3 line)				
CAPSCREW BODY SIZE IN. - THREAD	TORQUE LB-FT (NM)	TORQUE LB-FT (NM)	TORQUE LB-FT (NM)	TORQUE LB-FT (NM)
1/4 20 28	5 (7) 6 (8)	8 (11) 10 (14)	10 (14)	12 (16) 14 (19)
5/16 18 24	11 (15) 13 (18)	17 (23) 19 (26)	19 (26)	24 (33) 27 (37)
3/8 16 24	18 (24) 20 (27)	31 (42) 35 (47)	34 (46)	44 (60) 49 (66)
7/16 14 20	28 (38) 30 (41)	49 (66) 55 (75)	55 (75)	70 (95) 78 (106)
1/2 13 20	39 (53) 41 (56)	75 (102) 85 (115)	85 (115)	105 (142) 120 (163)
9/16 12 18	51 (69) 55 (75)	110 (149) 120 (163)	120 (163)	155 (210) 170 (231)
5/8 11 18	83 (113) 95 (129)	150 (203) 170 (231)	167 (226)	210 (285) 240 (325)
3/4 10 16	105 (142) 115 (156)	270 (366) 295 (400)	280 (380)	375 (508) 420 (569)
7/8 9 14	160 (217) 175 (237)	395 (536) 435 (590)	440 (597)	605 (820) 675 (915)
1 8 14	235 (319) 250 (339)	590 (800) 660 (895)	660 (895)	910 (1234) 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**





**REFERENCES**

**0336 00**

**SCOPE**

This work package lists all forms, field manuals, technical bulletins, technical manuals and other publications that are referenced in this manual and that apply to maintenance of the 621B Scraper.

**PUBLICATION INDEXES**

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, *Functional User's Manual for 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
- Maintenance Request . . . . . DA Form 2407
- Material Receiving and Inspection Report . . . . . DD Form 250
- Organizational Control Record for Equipment . . . . . DA Form 2401
- 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**

- Basic Cold Weather Manual . . . . . FM 31-70
- Chemical and Biological Contamination Avoidance . . . . . FM 3-3
- Desert Operations . . . . . FM 90-3
- First Aid. . . . . FM 4-25.11
- NBC Decontamination . . . . . FM 3-5
- Northern Operations . . . . . FM 31-71
- Nuclear Contamination Avoidance . . . . . FM 3-3-1
- Operations and Maintenance of Ordnance Materiel in Cold Weather . . . . . FM 9-207
- Recovery and Battlefield Damage Assessment and Repair . . . . . FM 9-43-2
- Rigging Techniques, Procedures, and Applications . . . . . FM 5-125

**TECHNICAL BULLETINS**

- CARC Spot Painting . . . . . TB 43-0242
- Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment  
and Materials Handling Equipment . . . . . TB 43-0209

**TECHNICAL MANUALS**

- Hand Receipt for Components of End Item (COEI), Basic Issue Items (BII) and  
Additional Authorization List (AAL) for 621B Scraper . . . . . TM 5-3805-248-10HR
- Inspection, Care and Maintenance of Antifriction Bearings. . . . . TM 9-214

**REFERENCES - CONTINUED**

**0336 00**

**TECHNICAL MANUALS - CONTINUED**

Joint Oil Analysis Program Laboratory Manual Vol. I, Introduction, Theory Benefits,  
 Customer Sampling Procedures, Programs and Reports (TO 33-1-37-1; NAVAIR 17-15-50.1) . . . . . TM 38-301-1

Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and  
 Related Materiels Including Chemicals . . . . . TM 9-247

Operator's Manual for 621B Scraper . . . . . TM 5-3805-248-10

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 Material . . . . . TM 43-0139

Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) . . . . . TM 750-244-3

Transportability Guidance, Tractor, Full-Track, Low-Speed DED, Medium Drawbar Pull . . . . . TM 5-3805-248-14

Unit, Direct Support and General Support Including Depot Maintenance RPSTL for 621B Scraper . . . . . TM 5-3805-248-23P

**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

Operator's Circular for Welding Theory and Application . . . . . TC 9-237

**END OF WORK PACKAGE**

**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 (WP 0338 00), Table 1) 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 0338 00) in column (4) as:

Field - includes subcolumns:

- C - Operator/Crew
- O - Unit
- F - Direct Support

Sustainment - includes subcolumns:

- H - General Support
- D - Depot

3. The tools and test equipment requirements (WP 0338 00, Table 2) 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 (WP 0338 00, Table 3) contain supplemental instructions and explanatory notes for 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 (i.e., 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 (e.g., 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), preserve, drain, paint or 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 achieve optimum or desired performance.
6. **Calibrate.** To determine and make corrections or adjustments on test, measurement 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 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 a 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
- F - Direct Support Maintenance

Sustainment:

- H - General Support Maintenance
- D - Depot Maintenance

**EXPLANATION OF COLUMNS IN THE MAC, TABLE 1 - 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" subcolumn 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.** Information pertinent to the maintenance function being performed as indicated in the MAC.

**END OF WORK PACKAGE**



Table 1. MAC for the 621B Scraper.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
01	<b>ENGINE</b>								
0100	Engine Assembly:	Inspect Service Adjust Replace Repair Overhaul	0.1  0.3	2.0	0.5 14.0	10.0	110.0	101,113 103,113 103,113 104,113 104,113	A B
	Engine Support Trunnion	Inspect Replace	0.1		1.0			113	
0101	Crankcase, Cylinder Block, and Head Assembly:								
	Cylinder Head Assembly	Replace Repair			2.0 1.0	2.3		103,113 13,22,30 38,41,104 113	
	Engine Block, Crankcase	Replace Repair				6.0 6.0	8.0	7,26,27,28, 40,46,55,64,69, 73,84,86,90,95, 104, 113	
0102	Crankshaft:								
	Crankshaft	Replace Repair				3.5 16.0		4,50,58 61,68,84,85,88, 91,113	
	Bearings	Replace				2.5		94,104,113	
	Seals, Main	Replace			2.5			6,8,45,48,52, 62,74,77,88, 113	
	Pulley & Dampers	Replace			1.3			113	
0103	Flywheel Assembly:								
	Flywheel	Replace			8.0			10,113	
	Housing, Flywheel	Replace			1.0			113	

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE	
			FIELD		SUSTAINMENT					
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
01	<b>ENGINE - Continued</b>									
0104	Pistons and Connecting Rod Assembly:									
	Piston and Connecting Rod Assembly	Replace Repair				2.0 3.0	14,20,49,113 70,71,104, 113			
0105	Valves, Camshafts and Timing System:									
	Valves and Springs	Replace Adjust				6.9 1.1	103,113 103,113	C		
	Pushrods	Replace				1.4	103,113			
	Rocker Arms	Replace				0.5	113			
	Covers, Valve	Replace		1.0			101,113			
	Lifters, Valve	Replace				1.2	103,113,120			
	Bridges	Adjust				0.3	103,113			
	Camshaft	Replace				1.0	67,104,113			
	Bearings, Camshaft	Replace				2.0	18,55,113			
	Timing Gears & Plate	Replace				1.5	36,44,72,87,109			
0106	Engine Lubrication System:									
	Oil Pump	Replace				0.4	11,103, 113	D		
	Oil Filter	Replace		0.2			101,113			
	Oil Filter Base	Replace		1.0			103,113			
	Oil Pan	Replace				2.0	103,113			
	Oil Lines & Fittings	Inspect Replace	1.0				113			
	Oil Cooler	Inspect Replace				0.5 1.5	113			
0108	Manifolds Exhaust	Inspect Replace		0.2		0.5	113			



MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE	
			FIELD		SUSTAINMENT					
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
<b>01</b>	<b>ENGINE - Continued</b>									
0109	Accessory Driving Mechanisms: Accessory Drive Group	Replace			1.0		113			
<b>03</b>	<b>FUEL SYSTEM</b>									
0301	Fuel Injector Nozzles: Fuel Injector	Replace			0.7		21,33,60,83,92,113,121			
	Lines, Fuel Injection	Inspect Replace	0.1	0.7			101,113			
0302	Fuel Pumps: Pump, Fuel Injection	Test Adjust Replace Repair			0.2 1.2 2.0	3.0	66,67,113 113 25,29,53,65,75,76,78,92,93,98,104,113,123,111	E E		
	Pump, Transfer	Replace			0.3		113,117 118			
	Lines and Fittings	Replace		0.4			113			
0304	Air Cleaner: Air Cleaner Assembly	Service Replace Repair	0.2	0.4			113 113 113			
	Precleaner	Service Replace Repair	0.2	1.1 0.3 0.8			113 113 113			
0305	Turbocharger: After Cooler	Replace Repair Replace			0.7 1.5	4.0	113 19,24,37,56,104,113,120 113			

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE
			FIELD		SUSTAINMENT				
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
<b>03</b>	<b>FUEL SYSTEM - Continued</b>								
0306	Tanks, Lines, Fittings: Tank, Fuel	Inspect Service Service Replace	0.1 0.3	0.3 9.8			101,113 101,113		
	Lines, Fuel	Inspect Replace	0.2 0.7				101,113		
0308	Engine Speed Governor and Controls Assembly: Governor Controls	Adjust Replace			0.5 0.7		113 113		
	Air-Fuel Ratio Control	Replace Repair				0.3 1.0	104,113 104,113,105,112		
	Automatic Timing Advance Unit	Replace			0.6		66,67,113		
	Governor and Fuel Pump Drive	Replace Repair			1.3 0.5		113		
0309	Fuel Filters: Secondary Filter	Replace		0.2					
	Primary Filter	Service Replace	0.1	0.2					
	Fuel Filter Base	Inspect Replace		0.2 0.5			101,113		
0311	Engine Starting Aids: Ether Start Group	Service Replace	0.1	0.2			101,113		
	Fuel Priming Pump	Test Replace	0.1	0.3			101,113		
<b>04</b>	<b>EXHAUST SYSTEM</b>								
0401	Muffler and Pipes	Inspect Replace	0.1	0.3			113		

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE	
			FIELD		SUSTAINMENT					
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
<b>05</b>	<b>COOLING SYSTEM</b>									
0501	Radiator Assembly:	Inspect Service Repair	0.1 0.2	0.6		12.0	101,113 113	F		
	Radiator Cap Assembly	Inspect Replace	0.1	0.1			113			
0502	Cowling Deflectors, Air Ducts, Shrouds, etc.:									
	Radiator Guard	Replace		1.5			113			
0503	Water Manifold, Headers, Thermostats and Housing:	Test Replace		1.0 0.4			101,113 101,113			
	Hoses, Coolant	Inspect Replace	0.1	0.8			113			
0504	Water Pump	Replace Repair		1.7	3.0		101,113 113,103			
0505	Fan and Fan Drive Assembly:									
	Fan and Fan Drive	Inspect Replace Repair	0.1		1.0 1.5		113 113			
	Fan Belts	Inspect Adjust Replace	0.1	0.2 0.8			113 113			
	Fan Belt Tensioner	Replace		0.5			113			
0508	Filter, Coolant	Replace		0.3			113			
<b>06</b>	<b>ELECTRICAL SYSTEM</b>									
0601	Alternator:	Test Replace Repair			0.5		113 101,113 113			
	Alternator Vee Belt	Inspect Adjust Replace	0.1	0.1 0.3		4.0	113 113			

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE	
			FIELD		SUSTAINMENT					
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
<b>06</b>	<b>ELECTRICAL SYSTEM - Continued</b>									
0603	Starting Motor:	Test Replace Repair		0.2 3.0			8.0	113 101,113 103,113		
	Starter Solenoid	Test Replace Repair		0.2 0.5			1.0	113 113 113		
0607	Instrument or Engine:									
	Control Panel	Inspect	0.1							
	Switches	Test Replace		0.2 1.4				113 113		
	Wiring	Inspect Replace	0.1	1.0				113		
	Gauges, Electrical	Inspect Test Replace	0.1	0.5 1.6				113 113		
	Lamps	Replace Inspect	0.1					113		
	Meters	Test Replace		0.4 1.8				113 113		
0608	Miscellaneous Items:									
	Fuses & Fuse Holders	Inspect Replace	0.1	0.2				113		
	Circuit Breakers	Inspect Replace	0.1	0.2				113		
	Master Battery Switch	Replace		0.3				113		
0609	Lights:									
	Headlamp	Inspect	0.1							
	Floodlamp	Replace		0.2				113		
	Taillights	Repair		0.2				113		
0610	Sending Units and Warning:									
	Switches Oil and Water Temp Senders	Inspect Replace		1.0 0.2				113		

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE	
			FIELD		SUSTAINMENT					
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
06	<b>ELECTRICAL SYSTEM - Continued</b>									
	Low Air Warning	Inspect		0.1						
	Pressure Switch	Replace		0.2			113			
0611	Horn and Alarm:									
	Low Air Warning	Inspect	0.1							
	Horn	Replace		1.0			113			
	Back-Up Alarm	Replace		1.4			113			
	Air Horn Switch	Replace		0.5			113			
0612	Batteries:							G		
	Storage Battery	Inspect	0.1							
		Service	0.2							
		Test		0.4			113			
		Replace		0.4			101,113			
	Box, Battery	Service	0.2							
		Replace		1.0			113			
	Cable, Battery	Inspect	0.1							
		Replace		0.3			113			
		Repair		0.5			113			
0613	Hull or Chassis Wiring Harness:									
	Harness, Tractor	Inspect		0.2						
		Test		1.0			113			
		Replace		4.2			113			
		Repair		1.0			113			
	Harness, Scraper	Inspect		0.2						
		Test		1.0			113			
		Replace		3.5			113			
		Repair		1.0			113			
0615	Radio Interference Suppression:									
	Capacitor	Replace		0.3			113			

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE
			FIELD		SUSTAINMENT				
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
07	<b>TRANSMISSION</b>								
0705	Transmission Shifting Components:								
	Hydraulic Controls	Test		1.0					
		Adjust		1.0					
		Replace		3.5					
		Repair		2.5					
	Control Linkage and Arms, Pedals, etc.	Adjust		1.1			113		
		Replace		2.1			113		
0708	Torque Converter	Replace			6.0		104,113	H	
		Repair				4.0	35,70,104		
							113		
0710	Transmission Assembly	Inspect	0.1						
		Service		0.3			101,113		
		Test			1.5		16,31,32,113		
		Adjust			0.5		16,31,32,113		
		Replace			7.0		113		
		Overhaul					36.0	104,113	
0719	Reduction or Transfer Gears:								
	Transfer Gears	Replace				1.0	104,113		
0721	Cooler, Pumps Motors:								
	Oil Pump, Scavenge	Test			0.5		113		
		Replace			1.0		113		
	Oil Pump Transmission	Replace				1.1	113		
	Oil Pump, Flywheel Scavenge and Differential	Replace			1.0		107,113		
		Repair				1.5	107,113		
	Oil Filter, Magnetic Screen	Replace		0.5			104,113		
		Service		0.3			104,113		
		Replace		0.5			104,113		
	Oil Cooler, Torque Converter	Replace		1.5					
	Oil Cooler Lines	Inspect		0.1					
		Replace		0.5			113		

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
<b>07</b>	<b>TRANSMISSION - Continued</b>								
0726	Brakes (Special) Hydraulic Retarder:								
	Oil Cooler, Brake	Replace			0.6			103,113	
	Retarder Oil Lines	Inspect		0.5					
		Replace		0.5				113	
	Air Lines and Fittings	Inspect		0.1					
		Replace		0.4				113	
	Retarder Control Valve	Replace			1.0			113	
		Repair			1.5			113	
	Regulator, Air Pressure	Replace		0.5				113	
<b>09</b>	<b>PROPELLER AND PROPELLER SHAFTS</b>								
0900	Propeller Shafts:								
	Drive Shafts	Replace		3.0				67,103,113,116	
<b>10</b>	<b>FRONT AXLE</b>								
1000	Front Axle:								
	Axle	Replace		0.8				113	
	Axle Housing	Replace			1.1			113	
1002	Differential:								
	Differential and Bevel Gear	Service	0.2						
		Replace			1.5			9,113	
		Repair				6.0		113	
	Breather	Service		0.3				113	
		Replace		0.5				113	
1003	Planetary or Final Drive:								
	Final Drives	Service	0.2						
		Replace		2.5				113	

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT				
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
<b>11</b>	<b>REAR AXLE</b>								
1100	Rear Axle Assembly: Axle Housing	Replace		1.1				113	
<b>12</b>	<b>BRAKES</b>								
1201	Hand Brakes, Valve, Park and Emergency: Hose and Fittings	Inspect Replace Inspect Replace	1.0 1.0	0.2				113 113	
1202	Service Brakes Shoe Assembly:	Replace		0.8				104,113	
	Brake, Camshafts and Slack Adjusters	Adjust Replace Repair		0.2 1.2 1.8				113 113 113	
1208	Air Brake System, Brake Actuator:	Replace		2.1				101,113	
	Air Tanks	Inspect Service Replace	0.2 0.2						
				2.2				101,113	
	Brake Control Valve	Replace Repair		0.5	0.5			113 113	
	Tractor and Scraper Relay Valves	Replace Repair		1.1	2.0			113 113	
	Quick-Release Valve	Replace		1.4				113	
	Double Check Valve	Inspect Replace		0.1 1.1				113 113	
	Air Dryer	Replace Repair			0.4 2.0			113 113	
1209	Air Compressor Assembly:								
	Air Compressor	Inspect Service Replace Repair	0.1 0.2	1.0		3.0		101,113 101,113	



MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE
			FIELD		SUSTAINMENT				
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
<b>12</b>	<b>BRAKES - Continued</b>								
	Governor, Air Compressor	Adjust Replace Repair		0.3 1.2		2.0		113 113 104,113	
	Lines and Fittings	Inspect Replace	0.1	1.1				113	
<b>13</b>	<b>WHEELS AND TRACKS</b>								
1311	Wheel Assembly:	Inspect			0.2			2,17,47,63, 96,103,107,107, 113,119	
	Wheels	Replace Repair			1.0 0.5			103,113 2,17,47,63, 96,103,107, 107,119	
	Wheel Bearings and Seals	Adjust			1.0			113	
	Brake Drums	Inspect Replace			0.1 1.0				
1313	Tires, Tubes:	Test	0.1						
	Tire Chains	Inspect	0.1					5,15,101,113	
	Tires	Service Replace	0.2	0.3					
<b>14</b>	<b>STEERING</b>								
1401	Mechanical:								
	Steering Gear	Adjust Replace Replace		0.3 4.5 0.6				101,113 113 104,113	
	Steering Wheel	Adjust		0.3				113	
	Steering Link Assemblies	Replace		3.0				113	

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE	
			FIELD		SUSTAINMENT					
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
1410	Hydraulic Pump Assembly:									
<b>14</b>	<b>STEERING - Continued</b>									
	Supplemental Steering Pump and Valve	Inspect Test Adjust Replace Repair		0.2			0.5 0.2 1.0 4.0	104,113 104,113 113 104,113		
1411	Hoses, Lines, and Fittings	Inspect Replace	0.2							
				0.5						
1412	Hydraulic Cylinders:									
	Steering Cylinders	Test Replace Repair		0.5 1.4		0.3		113 113 57,59,86,91,99, 104,106,109, 113		
	Cylinder Follow-Up (Sender)	Test Replace Repair		0.5 1.4		0.3		113 113 11,104,113		
	Cylinder Follow-Up (Receiver)	Test Replace Repair		0.5		0.6 0.3		113 113 11,104,113		
1414	Steering System Valves:									
	Steering Control Valve	Inspect Test Replace Repair		0.1		0.5 2.4 1.0		104,117,114 104,113 104,113		
	Pressure Reducing Valve	Inspect Test Replace		0.1 0.5 2.1				113,114 113		

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE	
			FIELD		SUSTAINMENT					
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
<b>15</b>	<b>FRAME, TOWING ATTACHMENTS, DRAWBARS AND ARTICULATED SYSTEMS</b>									
1503	Pintels and Towing Attachments:									
	Hitch King Pin Bearings	Service Replace	0.1				0.5	104,113		
	Hitch Link Bearings	Service Replace	0.2		0.5			104,113		
<b>18</b>	<b>BODY, CAB HOOD AND HULL</b>									
1801	Body, Cab Hood and Hull:									
	Cab, ROPS	Inspect	0.1							
		Service		0.3				113		
		Replace		3.5				113		
	Hood	Inspect	0.1							
		Replace		0.5				101,113		
	Door	Inspect	0.1							
		Replace		0.5				113		
		Repair			1.0			113		
	Engine Compartment Shield	Inspect	0.1							
		Replace		0.7				113		
	Crankcase Guards	Inspect	0.1							
		Replace		2.0				101,113		
1802	Fenders, Windshield:									
	Fenders	Replace		0.8				113		
	Windshield Assembly	Replace		1.0				113		
		Repair		1.0				113		
	Cab Window	Replace		1.0						
		Repair		1.0						

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE				
			FIELD		SUSTAINMENT								
			UNIT		DS	GS	DEPOT						
			C	O	F	H	D						
18  1806	<b>BODY, CAB HOOD AND HULL - Continued</b>  Upholstery, Seats:  Seat  Seat Belts  Seat Suspension  Seat Cylinder Seat Accumulator  Height Control Valve	Inspect Replace Repair  Inspect Replace  Adjust Replace Repair  Replace  Service Replace  Adjust Replace	0.1	1.2 0.8				113 113					
									0.1	0.5			113
			0.5		0.2 0.5		103,113 103,113						
								0.5		0.2		113 113	
			0.1	1.0			113						
								22  2202	<b>BODY, CHASSIS AND HULL ACCESSORY ITEMS</b>  Accessory Items:  Windshield Wiper and Washer  Mirror Assemblies  Air Horns Air Horn Valve	Service Replace  Adjust Replace  Replace Replace	0.1	1.0	
			0.1	0.5			113						
											1.0		
			1.0			113							
							0.1				2.4	1.5	
			0.1	2.4	1.5								

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD		SUSTAINMENT				
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
<b>18</b>	<b>BODY, CHASSIS AND HULL ACCESSORY ITEMS - Continued</b>								
2208	Data Plates and Instruction Holders	Inspect Replace	0.1	0.2				113	
<b>24</b>	<b>HYDRAULIC AND FLUID SYSTEMS</b>								
2400	Scraper Hydraulic System:								
	Systems Operation	Test		0.2				113,114	
2401	Pump and Motor Implement:								
	Hydraulic Pump	Test Replace Repair			0.5 1.0		2.1	113,114 113 5,104,113	
2402	Manifold and Control Valves:								
	Control Valves, Scraper	Test Replace Repair			0.2 3.8 0.5		1.9	113 113 11,104,113	
	Quick Drop Valve (Bowl)	Test Replace Repair		1.1	0.2 1.1			113 113 113	
	Sequence Valve (Apron)	Test Replace Repair					1.5 0.2 1.2	25,113 101,113 113	
2403	Hydraulic Manual Controls:								
	Control Levers and Linkage	Replace Repair			0.5 2.5			113 113	
2406	Strainers, Filters, Lines, and Fittings:								
	Filters and Strainers	Replace Service		0.4 0.2				101,113 101,113	

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE
			FIELD		SUSTAINMENT				
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
24	<b>HYDRAULIC AND FLUID SYSTEMS - Continued</b>								
2407	Lines and Fittings	Inspect Replace	0.1	1.0			103,113		
	Hydraulic Cylinders:								
	Bowl Lift Cylinder	Replace Repair			2.2 0.5	2.2	103,113 57,86,91,104, 113		
	Apron Cylinder	Replace Repair			3.5 0.5	3.0	103,113 57,86,91 104,113		
	Ejector Cylinder	Replace Repair			4.5 0.5	4.0	103,113 57,86,91,104, 113		
2408	Liquid Tanks or Reservoirs:								
	Hydraulic Tank	Inspect Service Replace	0.1 0.3	0.6 4.0			101,113 107,113	K	
47	<b>GAGES (NON- ELECTRICAL) WEIGHING AND MEASURING DEVICES</b>								
4701	Instruments (Speed and Distance):								
	Tachometer	Replace		0.6			113		
	Tachometer Drive Cable	Replace		1.0			113		
4702	Gages, Mounting, Lines and Fittings:								
	Oil Pressure Gage	Inspect Replace	0.1	0.5			113		
	Air Pressure Gage	Inspect Replace	0.1	0.5			113		

MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 1. MAC for the 621B Scraper - Continued.

(1)  GROUP NUMBER	(2)  COMPONENT/ ASSEMBLY	(3)  MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5)  TOOLS AND EQUIPMENT REF CODE	(6)  REMARKS CODE
			FIELD		SUSTAINMENT				
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
47	GAGES (NON-ELECTRICAL) WEIGHING AND MEASURING DEVICES - Continued								
4703	Hourmeter: Hourmeter Assembly	Inspect Replace	0.1	0.6				113	
74	EARTHMOVING EQUIPMENT COMPONENTS								
7448	Bowl and Discharge Components: Ejector Cutting Edges Apron Assembly	Replace Inspect Replace Adjust Replace	0.1	2.0 0.2		4.0 3.0		113 102,113 113 113	

Table 2. Tools and Test Equipment Requirements for 621B Scrapper.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
1	O	Adapter, Mechanical Puller	5120-01-286-8435	1P1835
2	O	Assembly, Base	(11083)	8S7610
3	O	Attachment, Bearing Cup Puller	5120-00-293-1430	8B7554
4	H	Attachment, Brg Pulling	(11083)	1H3110
5	F	Bead Breaker, Pneumatic Tire	4910-00-773-9341	2D2820
6	H	Bolt	5306-01-136-0057	5P1737
7	H	Bolt, Machine	5306-00-426-5835	7B5163
8	H	Bolt, Machine	5306-01-026-9992	9S8890
9	F	Bracket, Link	4940-01-268-2201	1387573
10	O	Bracket, Link	5340-01-476-1743	1387574
11	F	Bushing Driver Set	5120-01-030-1626	1P0510
12	F	Bushing, Driver Set (FD)	5120-01-039-4811	1P0520
13	F	Bushing, Sleeve	3120-01-273-0057	5P2396
14	H	Compressor, Piston Ring	5120-01-184-0331	5P3526
15	F	Constrictor, Bead Expanding, Pneumatic	4910-01-038-3865	31989A
16	H	Control, Throttle	(11083)	5P8602
17	O	Cylinder Assembly, Actuating, Linear	3040-01-264-9538	8S7650
18	H	Driver Kit, Bearing	4910-01-032-3128	8S2241
19	H	Driver Tool		FT0174
20	H	Expander, Piston Ring	5120-01-184-7174	7M3978
21	F	Extractor Adapter, Fuel Nozzle	4930-01-268-7417	5P6229
22	F	Extractor, Group Valve	4910-01-296-3862	1667441
23	F	Fixture, Adapter		FT0808
24	H	Fixture Assembly, Turbocharger	4910-01-264-4024	9S6363
25	H	Fuel Pump Adapter Group	(11083)	6V9441
26	H	Gage	(11083)	1P5507
27	H	Gage	(11083)	6V0118
28	H	Gage	(11083)	8T0843
29	H	Gage, Fuel Injection	5210-00-861-1344	5P4158



Table 2. Tools and Test Equipment Requirements for 621B Scraper - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
30	F	Gage, Gp Valves	2815-01-123-5983	5P3536
31	F	Gage, Pressure Kit	4940-01-266-5687	1U5481
32	H	Gage, Pressure Kit Adapter	4940-01-270-5380	1U5482
33	F	Guide, Seal	5120-01-350-5904	6V7025
34	H	Group, Pickup	5120-01-276-0544	6V4950
35	H	Handle, Driver	5120-01-123-5981	1P0531
36	F	Handle, Transfer Pump	4910-01-124-1723	1P0529
37	H	Holding Fixture, Turbo	5120-01-119-1777	9S6343
38	F	Honing Kit, Valve Guide	5180-01-229-1114	1P7451
39	F	Indicator, Dial	5210-00-314-6140	8T5096
40	H	Indicator Tool Gp	5210-01-124-1737	8T0455
41	F	Insertter And Remover, Stud	5120-01-030-1628	7S8859
42	F	Insertter And Remover, Bearing and Bushing	5120-01-338-7182	J25447B
43	F	Insertter, Bearing and Bushing	5120-01-123-5877	1P0465
44	H	Insertter, Bearing And Bushing	5120-01-123-5879	1P0487
45	H	Insertter, Seal	5120-01-295-1536	6V6143
46	H	Installer	4910-01-097-6946	2P8260
47	O	Installer, Seal		8T9206
48	H	Installing Tool	5120-01-276-0527	6V6142
49	H	Kystone, Ring Groove	5120-01-351-0594	1U6431
50	H	Leg, Mechanical Puller	5120-00-633-5075	1H3108 or 1110
51	O	Link, Bearing (Fd)	5120-01-451-1401	1387575
52	H	Locator	5840-01-136-1056	5P1733
53	H	Machine, Bolt	5306-00-260-4508	0S1594
54	H	Magnet Assembly	2815-01-126-5621	8S2293
55	H	Master Gage		6V6189
56	H	Modified Fixture		FT0165
57	F	Multiplier, Torque Wrench	5120-01-296-4234	6V0109
58	H	Nut		3H0466
59	F	Nut, Fastener	5310-01-483-6594	1P0544

## MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 2. Tools and Test Equipment Requirements for 621B Scraper - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
60	F	Nut, Plain, Hexagon	5310-00-208-9735	1B4201
61	H	Nut, Plain, Hexagon	5310-01-123-1417	1B4209
62	H	Nut, Sleeve	5310-01-038-8318	9S8858
63	O	Pin, Shoulder, Headless (Fd & Track)	5315-01-270-2832	8S7615
64	H	Pin, Straight, Knurled	5315-01-271-7753	5P2406
65	F	Pin, Timing	5315-01-159-8266	6V2112
66	H	Pin, Timing	5315-01-268-2194	6V4186
67	F	Pinion Turning Tool	3020-01-250-1610	9S9082
68	H	Plate		3H0468
69	H	Plate, Adapter	5120-01-275-2155	1P2396
70	H	Plate, Intermediate, Friction Clutch	2520-01-408-9266	1P479
71	H	Plate, Intermediate, Friction Clutch	2520-01-408-9263	1P481
72	H	Plate, Intermediate, Friction Clutch	2520-01-408-9278	1P491
73	H	Plate, Mechanical Puller	5120-01-124-1738	3H0465
74	H	Plate, Pusher		FT1206
75	H	Plate, Retaining, Bearing	3110-01-038-3898	1P7410
76	H	Plate, Retaining, Shaft	3040-01-268-0305	5P1744
77	H	Plate, Seal Inserter	5120-01-030-7422	9S8864
78	H	Pointer	5355-01-159-8267	5P1768
79	F	Press	4940-01-268-2202	5P8639
80	H	Prod, Test	6625-01-344-7987	8T0500
81	O	Puller Attachment, Mechanical	5120-01-512-7167	1H3112
82	O	Puller Attachment, Mechanical (Fd)	5120-00-288-6756	8B7551 or 5F7343
83	F	Puller Kit, Universal	5180-01-124-1903	1P3075
84	H	Puller, Dowel	5120-01-353-2224	5P0944
85	H	Puller, Hydraulic	5130-00-363-6680	6V3160
86	F	Puller, Hydraulic	5130-01-296-4277	6V3175
87	H	Puller, Mechanical	5120-00-589-1446	1P2321
88	H	Puller, Mechanical	5120-00-633-5074	1H3107
89	O	Puller, Mechanical	5120-00-417-2952	5P8665

## MAINTENANCE ALLOCATION CHART (MAC) - CONTINUED

0338 00

Table 2. Tools and Test Equipment Requirements for 621B Scraper - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
90	H	Puller, Mechanical	5120-00-633-5085	8B7548
91	O	Pump, Hydraulic Ram, Hand Driven (Fd & Track)	4320-00-374-1403	4C4865 or 9U6600
92	F	Pumping Unit, Hydraulic, Hand Driven	4320-01-263-9716	5P4150
93	H	Punch Driver	5120-01-484-9392	6V4818
94	H	Remover, Electrical Contact	5120-01-124-1906	2P5518
95	H	Repair Kit, Diesel Engine	2815-01-366-7229	5P4175
96	O	Repair Tool, Special Purpose (Track)	4910-01-264-4778	8S7621
97	O	Saddle Assembly, Lifting Block (Track)	2510-01-264-8424	8S8048
98	H	Screw, Cap	5305-00-252-8919	0S0509
99	O	Screw, Forcing	5120-00-302-5857	5F7345
100	F	Seal Guide	4320-01-050-3419	1P6079
101	O	<u>Shop Equipment</u> , Automotive Maintenance And Repair: <u>Common No. 1</u> , Less Power	4910-00-754-0654	SC4910-95CLA74
102	O	<u>Shop Equipment</u> , Automotive Maintenance And Repair: <u>Common No. 2</u> , Less Power	4910-00-754-0650	SC4910-95CLA72
103	F	Shop Equipment, Automotive Maintenance And Repair: Field Maintenance, Basic, Less Power	4910-00-754-0705	SC4910-95CLA31
104	O	<u>Shop Equipment</u> , <u>Machine Shop</u> : Field Maintenance, Basic	3470-00-754-0708	SC3470-95CLA02
105	H	Shut Off Group, Manual	11083	2W9161
106	F	Sleeve	5120-01-288-2445	9S5565
107	O	Stand Assembly (Fd)	4910-01-264-4777	8S7640
108	O	Stand, Lifting (Fd & Track)	5120-01-343-8085	4C6486
109	H	Step Plate, Mechanical Puller	5120-00-378-4254	8B7561
110	F	Stud, Plain	5307-01-286-8388	9S5558
111	H	Tachometer, Photo	6680-01-135-7427	6V3121

Table 2. Tools and Test Equipment Requirements for 621B Scraper - Continued.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
112	H	Tool Kit, Fuel Injection	5180-01-183-8580	6V6070
113	O	Tool Kit, General Mechanic's: Automotive, SC5180-90-CL-N05	5180-00-699-5273	SC5180-90-CL-N05
114	F	Tool Outfit, Hydraulic System Test and Repair (HSTRU)	4940-01-036-5784	SC3470-95-CL-B07 13221E6850 (97403)
115	F	Tool, Alignment		6V3069
116	F	Tool, Drive		6V0188
117	F	Tool, Pump Assembly, Fuel Transfer		5P2391
118	F	Tool, Pump Assembly, Fuel Transfer		5P2392
119	O	Tool, Special (Fd & Track)	4910-01-265-0428	8S7611
120	F	Tool, Valve Lifter	5120-01-276-0528	5P7433
121	F	Tube Assembly, Metal	4710-01-240-6763	7N8371
122	H	Turbine Holder	4910-01-181-5660	8S9944
123	H	Wrench, Bonnet	5120-01-266-7433	8T5287
124	O	Wrench, Ratchet	5120-01-123-5881	8H0684

Table 3. Remarks for 621B Scraper.

(1) REFERENCE CODE	(2) REMARKS
A	Inspect by checking lubricating oil level and checking for leaks.
B	Service by changing oil.
C	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.
D	Includes removal of suction bell.
E	Fuel injection pump timing checks can be performed with engine installed or removed.
F	Inspect by checking coolant level and by checking for leaks.
G	Battery maintenance instructions are provided in TM 9-6140-200-14.
H	Inspect by checking transmission oil level and checking for leaks.
I	Service by lubrication.
J	Check for damage and missing or loose bolts.
K	Service by changing hydraulic system oil.

END OF WORK PACKAGE

---

**EXPENDABLE AND DURABLE ITEMS LIST**

---

**0339 00****SCOPE**

This work package lists expendable and durable items you will need to maintain the 621B Scraper. 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 work package Initial Setup lists [e.g., Use antifreeze (Item 1, WP 0381 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
  - H - Sustainment Maintenance
3. **Column (3) - National Stock Number.** This is the NSN assigned to the item which you can use to requisition it.
4. **Column (4) - Description, Commercial and Government Entity Code (CAGEC), and Part Number.** This provides the other information you need to identify the item.
5. **Column (5) - (U/M) Unit of Measure.** This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List for 621B Scraper.

(1) NEW ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
1		8040-00-262-9026	Adhesive	OZ
2	O		ADHESIVE (71984) RTV732	
		8040-00-877-9872	3 Ounce Tube	OZ
3	O	8040-01-250-3969	ADHESIVE: Loctite (05972) 242	OZ
4	C		ANTIFREEZE: Permanent, Ethylene Glycol, Inhibited (81349) MILA461 53	
		6850-00-181-7929	1 Gallon Bottle	GAL
		6850-00-181-7933	5 Gallon Can	GAL
		6850-00-181-7940	55 Gallon Drum	GAL
5	C		ANTIFREEZE: Permanent, Arctic Grade (81349) MILLA1 1755	
		6850-00-174-1806	55 Gallon Drum	GAL
6	O	5340-00-450-5718	CAP SET, PROTECTIVE: Dust and Moisture Seal (19207) 10935405	EA
7	H	2825-00-827-1526	Caulking Strip (0129)	EA
8	C		CLEANING COMPOUND: Solvent, Type III (81349) MIL-PRF-680	
		6850-01-474-2320	5 Gallon Can	GAL
		6850-01-474-2321	55 Gallon Drum	GAL
9	O		CLOTH: Abrasive, Emery, Fine (80204) ANSI B74. 18	
		5350-00-584-4654	50 Sheet Package	EA
10	F	8030-00-180-6222	Compound, Sealing	
11	O		COMPOUND: Anti-seize (05972) 76764	
		8030-00-251-3980	1 Pound Can	LB

Table 1. Expendable and Durable Items List for 621B Scraper - Continued.

(1) NEW ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
12	O		COMPOUND: Gasket Forming, Silicone (05972) 77C  13 Ounce Cartridge	OZ
13	C	7930-00-282-9699	DETERGENT: General Purpose, Liquid (83421) 7930-00-282-9699  1 Gallon Can	GAL
14	C	9140-00-286-5286 9140-00-286-5287 9140-00-286-5288	FUEL: Diesel, DF-1 Grade, Winter (81346) ASTM D 975  Bulk 5 Gallon Can 55 Gallon Drum	GAL GAL GAL
15	C	9140-00-286-5294 9140-00-286-5295 9140-00-286-5296	FUEL: Diesel, DF-2 Grade (81346) ASTM D 975  Bulk 5 Gallon Can 55 Gallon Drum	GAL GAL GAL
16	F	5210-00-640-6176  5210-00-640-6177  5210-00-640-6178	GAGE: Bearing Clearance (77220)  PLASTIGAGEPB1 0.004-0.009 Inch Clearance  Range Blue Color, Box of 12 (77220) PG-1 0.001-0.003 Inch Clearance  Range Green Color, Box of 12 (77220) PLASTIGAGEPR1 0.002-0.006 Inch Clearance Range Red Color, Box of 12	EA  EA  EA
17	O	9150-00-190-0905	Grease, automotive (98308) MIL-G-10924D Braycote 610  1 Pound Can	LB

Table 1. Expendable and Durable Items List for 621B Scraper - Continued.

(1) NEW ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
18	O	9150-00-985-7248	Grease, gear, multi-purpose MIL-L-2105B  35 Pound Can	LB
19	H	9150-00-985-7316	GREASE, GENERAL PURPOSE (81349) MIL-G-23549	LB
20	C	9150-01-197-7688	GREASE: Automotive and Artillery, GAA (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
		9150-01-197-7688	(81349) M-10924-A 1-1/4 Ounce Tube	OZ
21	O	9150-01-361-8919	GREASE: Electrically Conductive (53711) 5190179	OZ
22	O		HOSE: Clear, Neoprene	FT
23	O	5970-00-815-1295	INSULATING SLEEVING: Electrical (81343) M23053/5-106-0 250 Foot Spool	FT
24	O	5970-00-161-7422	INSULATING VARNISH: Electrical Glyptal 1201(GE 1201) (65313)	OZ
25	O		INSULATING VARNISH: Electrical, Dielectric (75037) 1602	
		5970-00-476-6717	13 Ounce Can, Aerosol Spray	OZ
26	F	9150-00-231-6689	LUBRICATING OIL, GENERAL PURPOSE (D9455)	QT



Table 1. Expendable and Durable Items List for 621B Scraper - Continued.

(1) NEW ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
27	C	9150-01-035-5390 9150-01-035-5391	OIL: Lubricating, GO 75 (81349) MIL-PRF-2105  1 Quart Can 5 Gallon Can	QT GAL
28	C	9150-01-035-5392 9150-00-001-9395 9150-01-035-5394	OIL: Lubricating, GO 80W/90 (81349) MIL-PRF-2105  1 Quart Can 5 Gallon Can 55 Gallon Drum	QT GAL GAL
29	O	9150-01-048-4591 9150-01-035-5395 9150-01-035-5396	OIL: Lubricating, GO 85W/140 (81349) MIL-PRF-2105  1 Quart Can 5 Gallon Can 55 Gallon Drum	QT GAL GAL
30	C	9150-00-247-0481	OIL: Lubricating, OE/HDO 10W/30 (81349) MIL-L-2104	QT
31	C	9150-01-152-4117 9150-01-152-4118 9150-01-152-4119	OIL: Lubricating, OE/HDO 15W/40 (81349) MIL-PRF-2104  1 Quart Can 5 Gallon Can 55 Gallon Drum	QT GAL GAL
32	C	9150-00-186-6681 9150-00-188-9858	OIL: Lubricating, OE/HDO 30 (81349) MIL-PRF-2104  1 Quart Can 5 Gallon Can	QT GAL
33	F	9150-00-402-4478  9150-00-402-2372  9150-01-035-5396	OIL: Lubricating, OEA, Arctic (81349) MIL-L-46167  1 Quart Can  (81349) MIL-PRF-46167 5 Gallon Can (81349)  MIL-PRF-2104 55 Gallon Drum	QT  GAL  GAL

## EXPENDABLE AND DURABLE ITEMS LIST - CONTINUED

0339 00

Table 1. Expendable and Durable Items List for 621B Scraper - Continued.

(1) NEW ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
34	C	8030-01-163-0083	Primer, OK Cure	
35	C		RAG: Wiping (64067)	
		7290-00-205-1711	50 Pound Bale	LB
36	O	11083	Sealant, silicone, RTV blue (11083) RTV 8T-9022	OZ
37	O	11083	SEALANT: Pipe (11083) 5P3413	OZ
38	O	11083	SEALANT: Silicone (11083) 4C-9612	OZ
39	F	8030-01-509-1597	SEALING COMPOUND 9S3263 (11083)	OZ
40	H		SOLDER: Lead-Tin Alloy, Rosin Core (81348) QQ-S-571	
		3439-00-555-4629	1 Pound Spool	LB
41	O		STRAP: Tiedown, Electrical Components (96906) MS3367-4-0	
		5975-00-903-2284	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
42	O		TAG: Marker (64067) 9905-00-537-8954	EA.
		9905-00-537-8954	Package of 50	EA
43	O		TAPE: Anti-seizing (52152) 6195	
		8030-00-889-3535	260 Inch Roll	IN.
44	O	9330-00-753-5372	Tubing, Plastic spiral wrap	EA

END OF WORK PACKAGE

**CHAPTER 6**  
**GENERAL SUPPORT/DEPOT OR**  
**SUSTAINMENT MAINTENANCE**



---

**ENGINE FRONT COVER REPLACEMENT**

---

**0340 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, gasket forming, silicone (Item 12 WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Sealing compound (Item 39, WP 0339 00)

Gasket (2)

Packing, preformed

**References**

TM 5-3805-248-10

**Equipment Condition**

Oil filler tube removed (WP 0025 00)

Accessory drive removed (WP 0271 00)

Water pump removed (WP 0052 00)

Alternator removed (WP 0055 00)

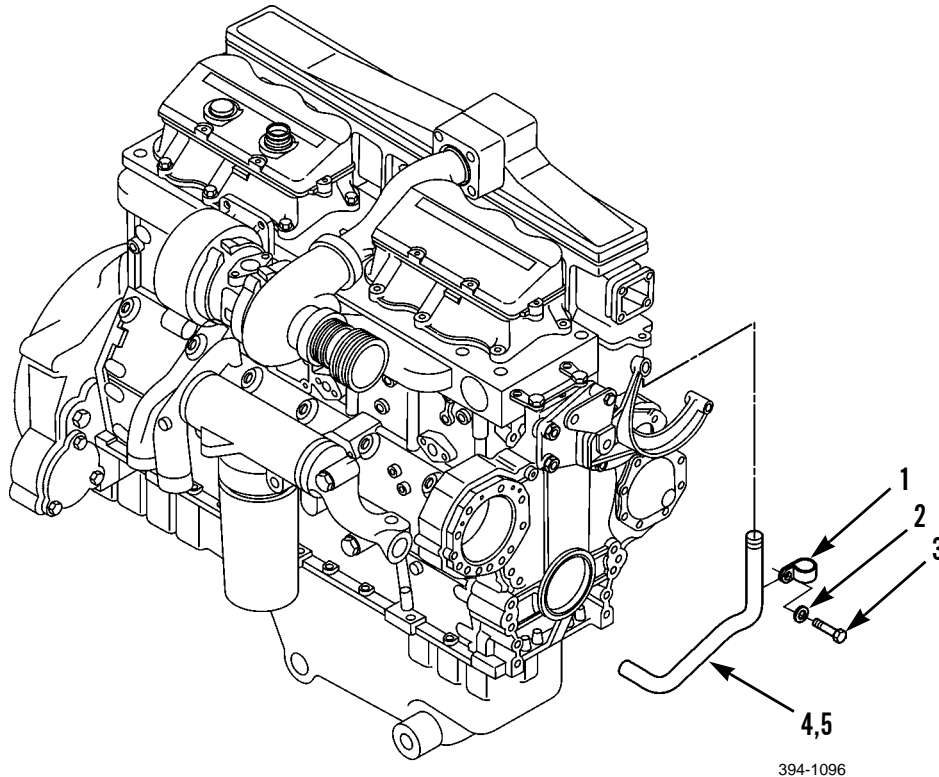
Engine front support and trunnion removed (WP 0258 00)

Oil pan removed (WP 0268 00)

---

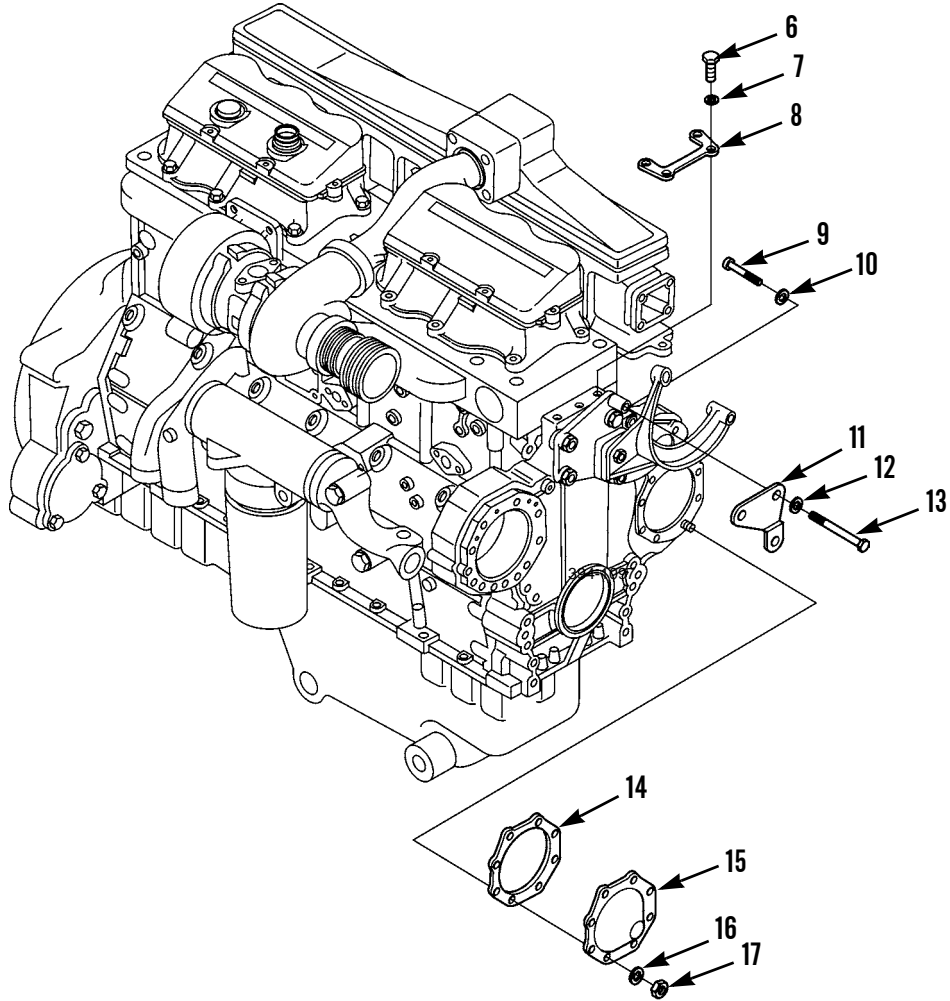
**REMOVAL**

1. Remove bolt (3), washer (2), clip (1) and tube (4) assembly from engine.
2. Remove and discard preformed packing (5) from tube (4).



**REMOVAL - CONTINUED**

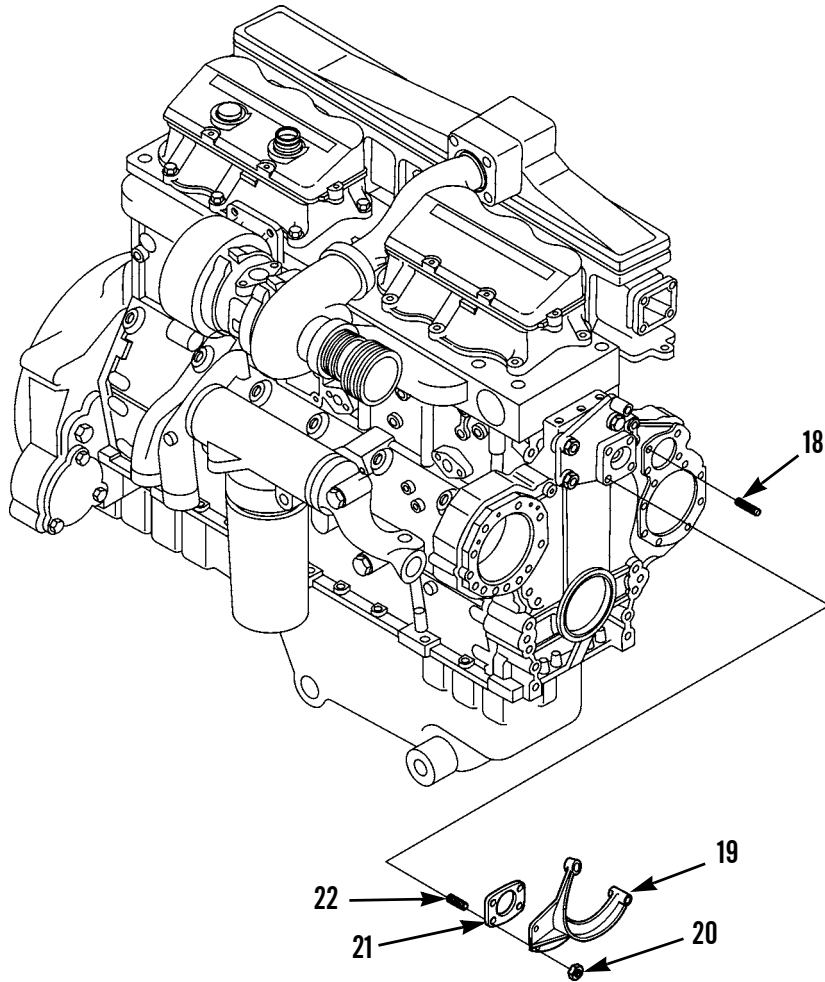
3. Remove three bolts (13), washers (12) and bracket (11) from engine.
4. Remove three bolts (6), washers (7) and plate (8) from engine.
5. Remove eight nuts (17), washers (16), cover (15) and gasket (14) from engine. Discard gasket.
6. Remove four bolts (9) and washers (10) from engine.



394-1097

**REMOVAL - CONTINUED**

7. Remove four nuts (20), bracket (19), gasket (21) and two studs (18 and 22) from engine.

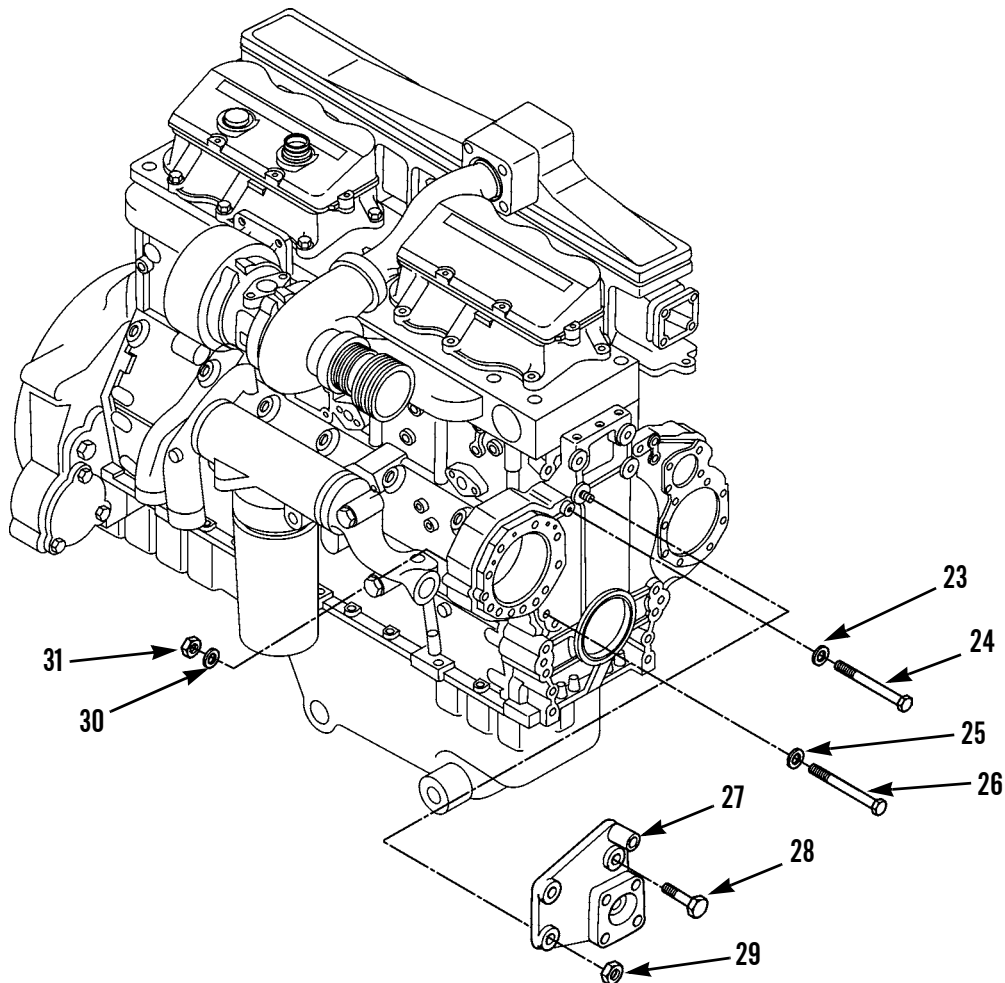


394-1098



**REMOVAL - CONTINUED**

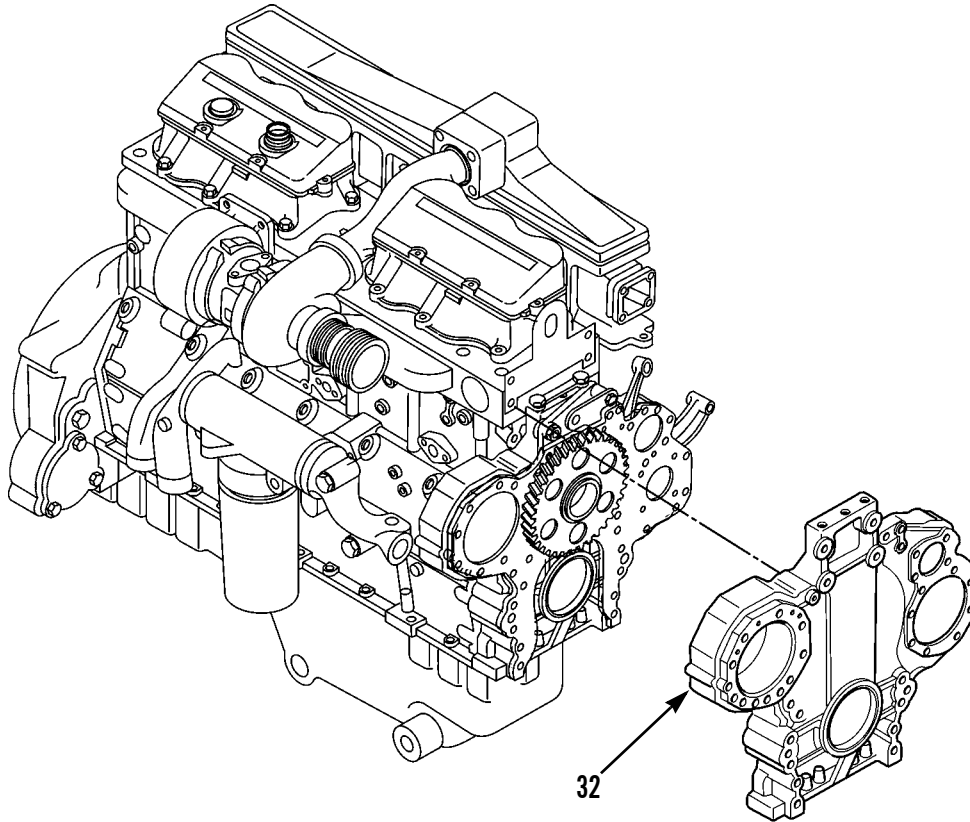
8. Remove two bolts (28), nuts (29) and support (27) from engine.
9. Remove nut (31), washer (30), bolt (26) and washer (25) from engine.
10. Remove two bolts (24) and washers (23) from engine.



394-1099

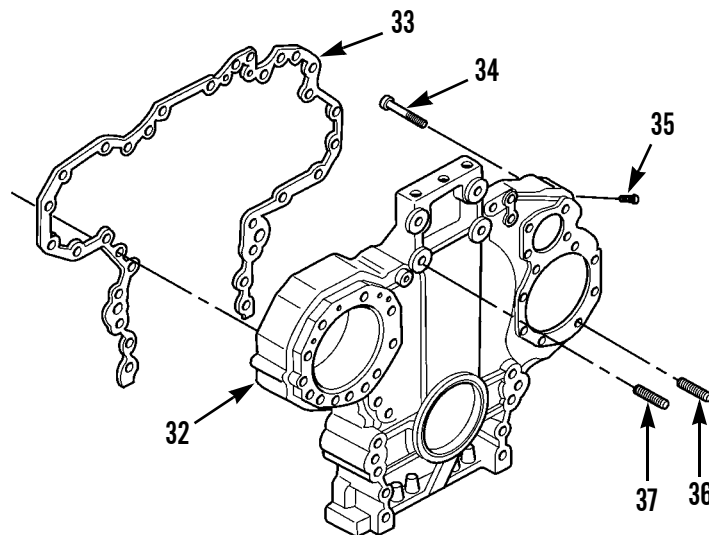
**REMOVAL - CONTINUED**

11. Remove housing (32) assembly from engine.



394-1100

12. Remove plug (35), gasket (33), two studs (37), eight studs (36) and three bolts (34) from housing (32). Discard gasket (33).



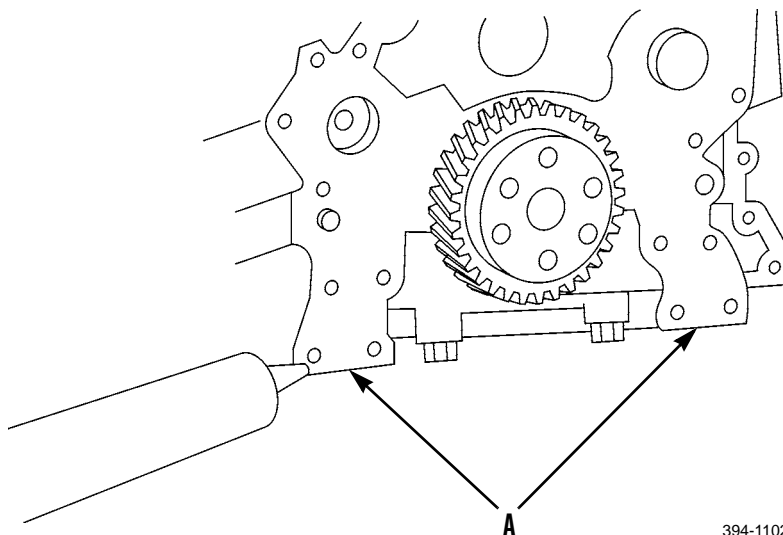
394-1101

**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 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. Remove all gasket material from mounting surfaces.
  2. Clean all parts with solvent and ensure that they are free of seal material, dirt and oil.
  3. Dry parts with compressed air.
  4. Visually inspect parts for cracks, heat deterioration or other damage. Replace damaged parts as necessary.

**INSTALLATION**

1. Apply thread sealant to three bolts (34), eight studs (36) and two studs (37) and install in housing (32).
2. Apply thread sealant to new gasket (33).
3. Apply silicone to cylinder block at points (A).

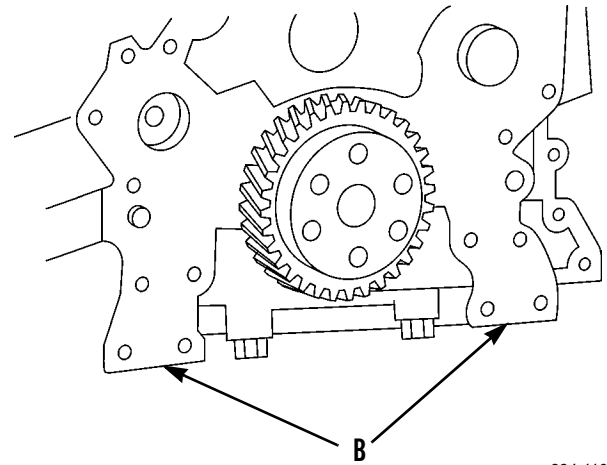


394-1102

4. Install new gasket (33) to cylinder block.

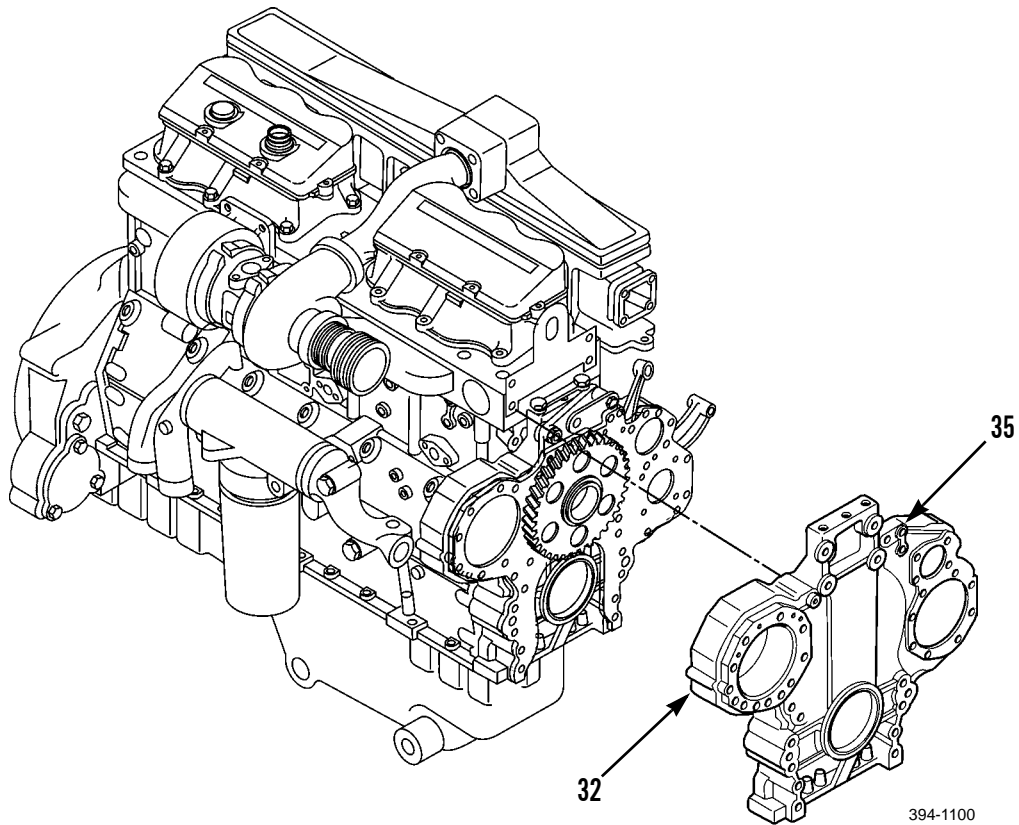
**INSTALLATION - CONTINUED**

5. Apply silicone to cylinder block at points (B).



394-1103

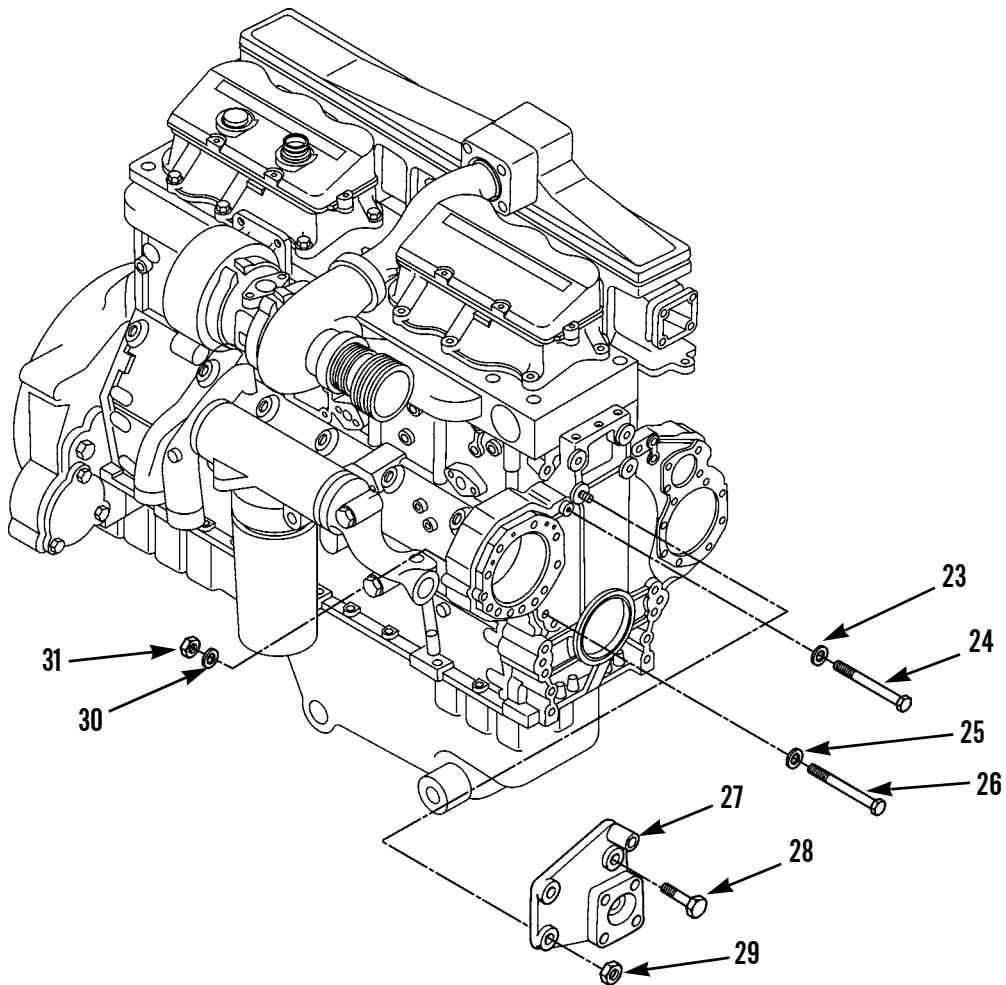
6. Install plug (35) on housing (32).
7. Install housing (32) assembly on engine.



394-1100

**INSTALLATION - CONTINUED**

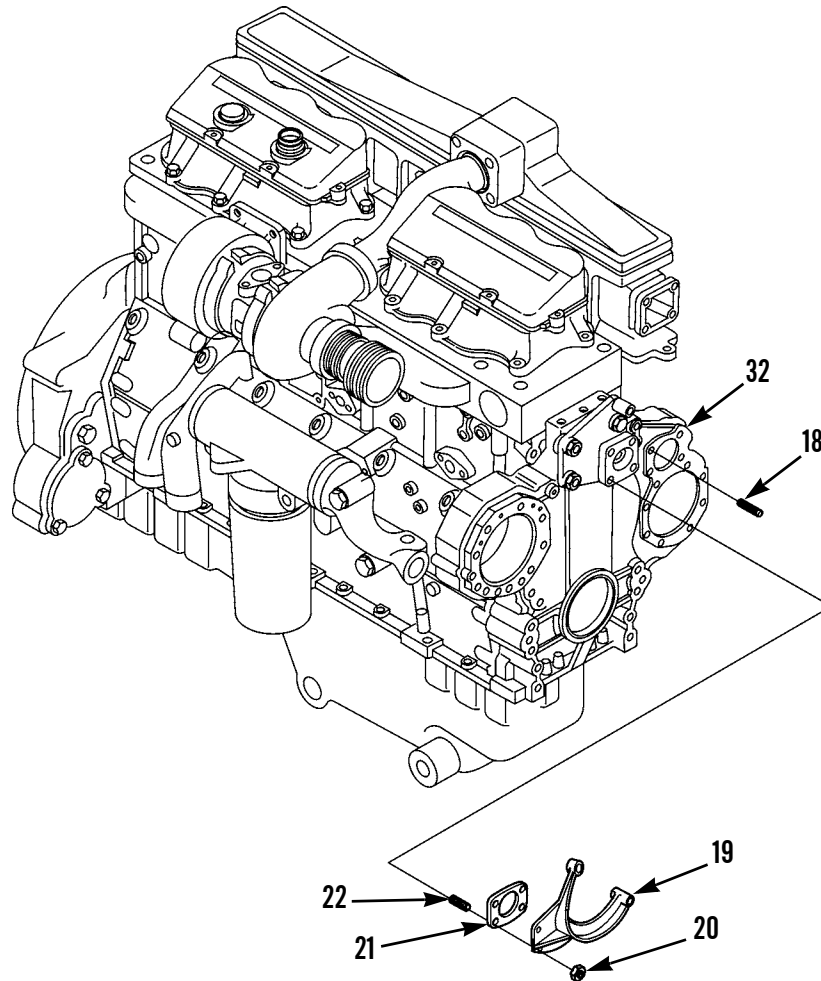
8. Install two washers (23) and bolts (24) on engine.
9. Install washer (25), bolt (26), washer (30) and nut (31) on engine.
10. Install support (27), two nuts (29) and bolts (28) on engine. Torque two nuts (29) and bolts (28) to 40 lb-ft (54 Nm).



394-1099

**INSTALLATION - CONTINUED**

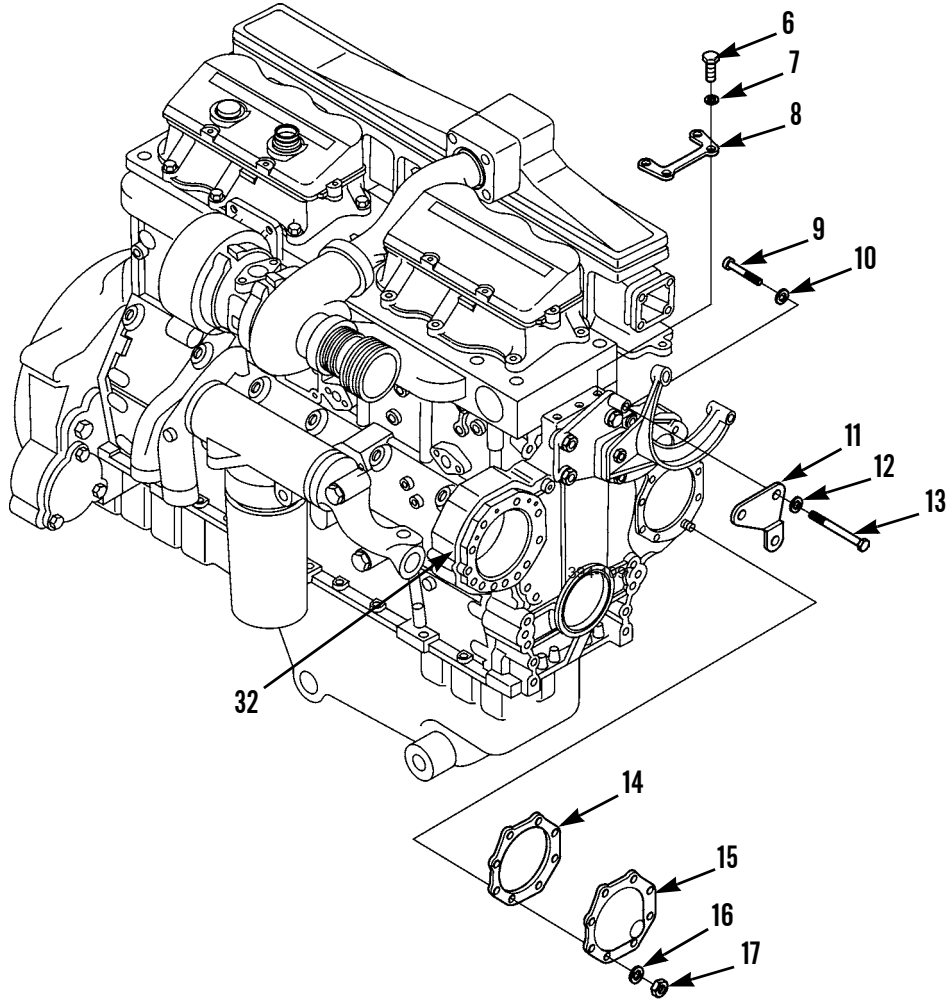
11. Apply thread sealant to two studs (18 and 22) and housing (32).
12. Install two studs (18 and 22) on housing (32).
13. Install new gasket (21), bracket (19) and four nuts (20) on housing (32).



394-1098

**INSTALLATION - CONTINUED**

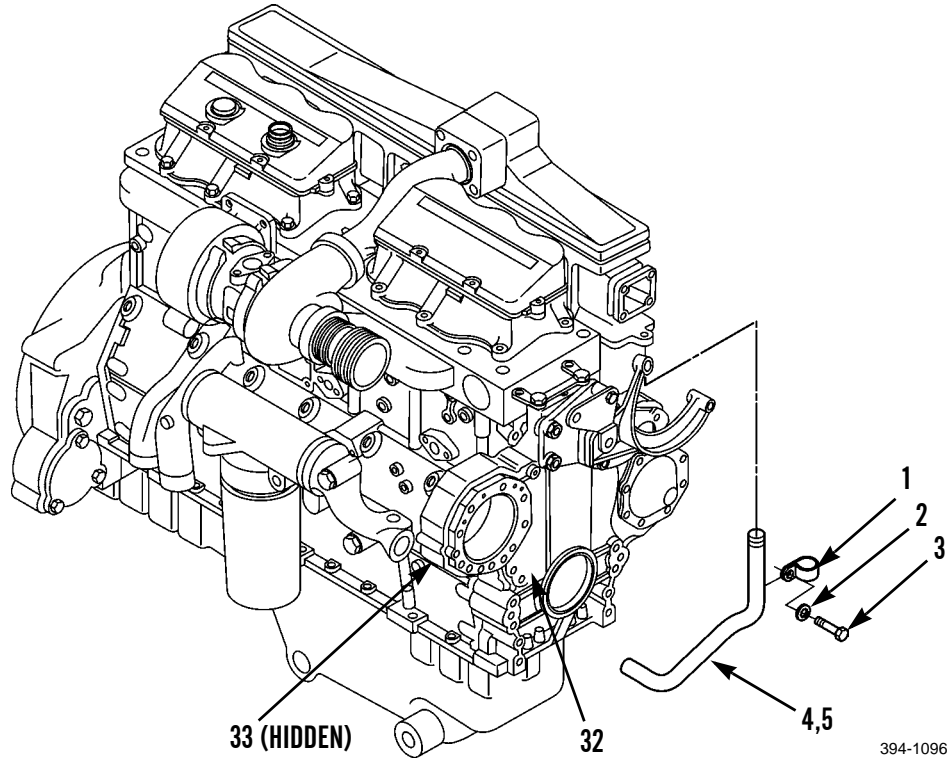
14. Install four washers (10) and bolts (9) on housing (32).
15. Install new gasket (14), cover (15), eight washers (16) and nuts (17) on housing (32).
16. Install plate (8), three washers (7) and bolts (6) to housing (32).
17. Install bracket (11), three washers (12) and bolts (13) on housing (32).



394-1097

**INSTALLATION - CONTINUED**

18. Using clean lubricating oil, lightly lubricate new preformed packing (5).
19. Install new preformed packing (5) on groove of tube (4).
20. Install tube (4) assembly, clip (1), washer (2) and bolt (3) on engine.
21. Trim new gasket (33) until it is flush with housing (32).



22. Install accessory drive (WP 0271 00).
23. Install water pump (WP 0052 00).
24. Install alternator (WP 0055 00).
25. Install engine front support and trunnion (WP 0258 00).
26. Install oil pan (WP 0268 00).
27. Install oil filler tube (WP 0025 00).
28. Operate machine and verify correct operation (TM 5-3805-248-10)

**END OF WORK PACKAGE**



---

**ENGINE FRONT COVER PLATE REPLACEMENT**

---

**0341 00**

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, sealing (Item 10, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Gasket (2)

**References**

TM 5-3805-248-10

**Equipment Condition**

Accessory drive group removed (WP 0271 00)

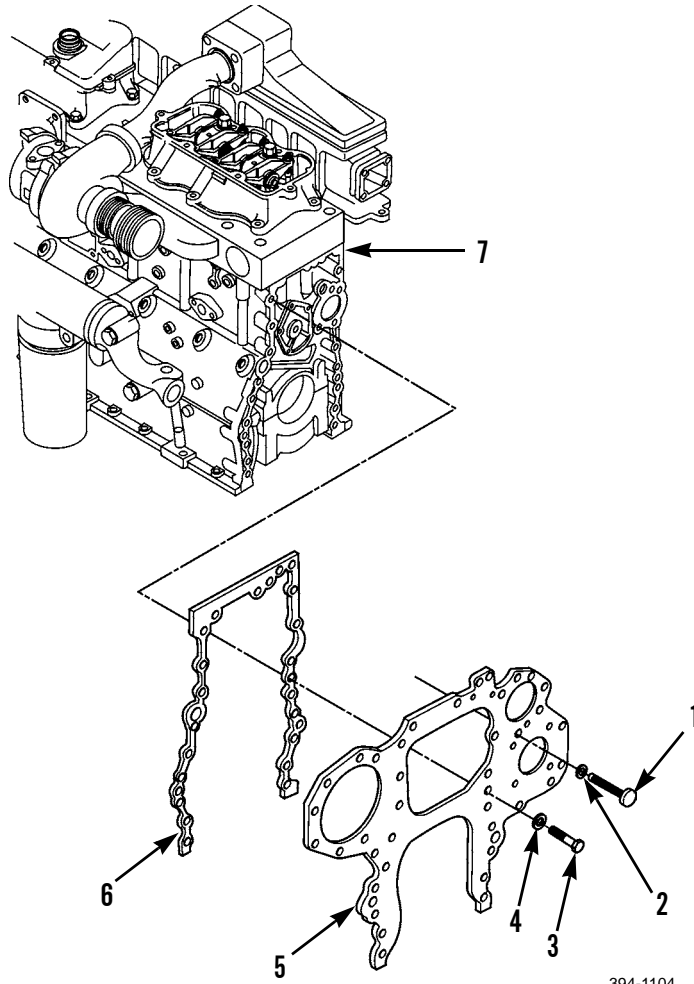
Automatic timing advance removed (WP 0278 00)

Idler gear removed (WP 0352 00)

---

**REMOVAL**

1. Using soft hammer, tap and remove stud (1) and washer (2) out of plate (5) from front of engine (7).
2. Remove seven bolts (3), washers (4), plate (5) and gasket (6) from front of engine (7). Discard gasket.



394-1104

**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 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. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent and ensure that they are free of seal material, dirt and oil.
3. Dry parts with compressed air.
4. Visually inspect parts for cracks, heat deterioration or other damage. Replace damaged parts as necessary.

**INSTALLATION**

1. Apply sealing compound to both faces of new gasket (6) and position new gasket and plate (5) on front of engine (7).
2. Install seven washers (4) and bolts (3) in front of engine (7).
3. Apply sealing compound to both faces of new gasket (2) and ribbed part of stud (1).
4. Install washer (2) and stud (1).
5. Cut excess of new gasket (6) flush with bottom of plate (5).
6. Install accessory drive group (WP 0271 00).
7. Install automatic timing advance (WP 0278 00).
8. Install idler gear (WP 0352 00).
9. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**CYLINDER BLOCK REPAIR**

---

**0342 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning, Inspection, Installation, Assembly

---

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop basic (Item 104, WP 0338 00)

Bolt, machine (Item 7, WP 0338 00)

Gage (Items 26, 27 and 28, WP 0338 00)

Indicator tool GP (Item 40, WP 0338 00)

Installer (Item 46, WP 0338 00)

Master gage (Item 55 WP 0338 00)

Pin, straight, knurled (Item 64, WP 0338 00)

Plate, adapter (Item 69, WP 0338 00)

Plate, mechanical puller (Item 73, WP 0338 00)

Puller, dowel (Item 84, WP 0338 00)

Puller, mechanical (Item 89, WP 0338 00)

Puller, mechanical (Item 90, WP 0338 00)

Repair kit, diesel engine (Item 95, WP 0338 00)

Bolts, 3/4-16 x 11, 3 in.

Bolts, 3/4-16 x 11, 7 in.

Magnaflux or other magnetic particle inspection equipment

Washers, flat, copper 3/4 in.

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Cloth, abrasive, emery, fine (Item 8, WP 0339 00)

Compound: gasket forming, silicone (Item 11, WP 0339 00)

**Materials/Parts - Continued**

Detergent (Item 12, WP 0339 00)

Oil, lubricating (Item 28, 29 or 31, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Sealing compound, (Item 38, WP 0339 00)

Band, filler (6)

Gasket (5)

Insert

Packing, preformed (20)

**References**

TM 5-3805-248-10

**Equipment Condition**

Thermostat removed (WP 0046 00)

Water temperature sender removed (WP 0092 00)

Ether start sender switch removed (WP 0098 00)

Engine mounts removed (WP 0258 00)

Cylinder head assembly removed (WP 0259 00)

Flywheel removed (WP 0261 00)

Oil pump and relief valve removed (WP 0267 00)

Oil pan removed (WP 0268 00)

Engine oil cooler removed (WP 0269 00)

Exhaust manifold removed (WP 0270 00)

Injection pump removed (WP 0273 00)

Aftercooler removed (WP 0277 00)

Hydraulic retarder removed (WP 0289 00)

Engine front cover removed (WP 0340 00)

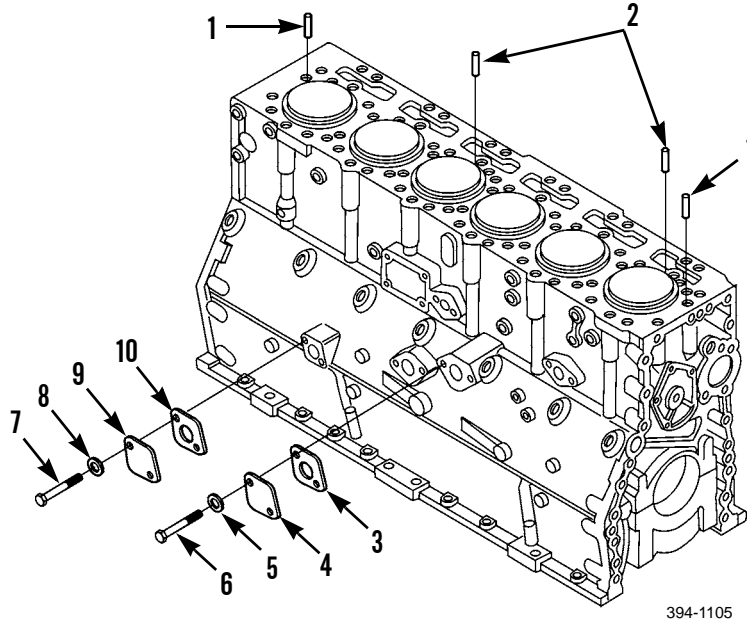
Crankshaft removed (WP 0346 00)

Main bearings removed (WP 0347 00)

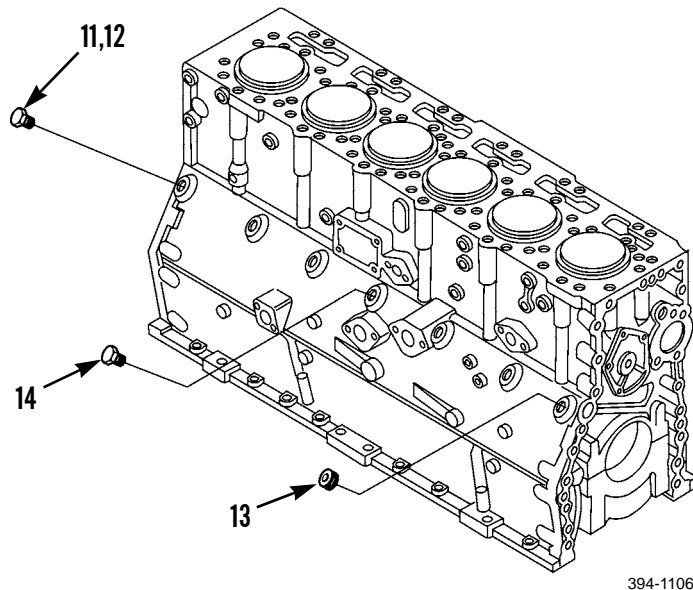
Piston assemblies removed (WP 0348 00)

**DISASSEMBLY**

1. Use dowel puller to remove two dowels (1 and 2) from cylinder block.
2. Remove two bolts (7), washers (8), cover (9) and gasket (10). Discard gasket.
3. Remove two bolts (6), washers (5), cover (4) and gasket (3). Discard gasket.

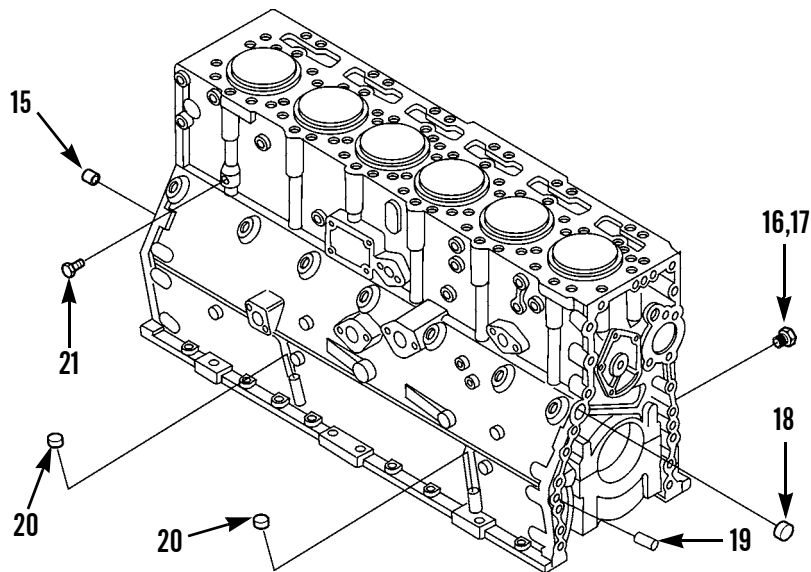


4. Remove plug (13) and five pipe plugs (14).
5. Remove plug (11) and preformed packing (12). Discard preformed packing.



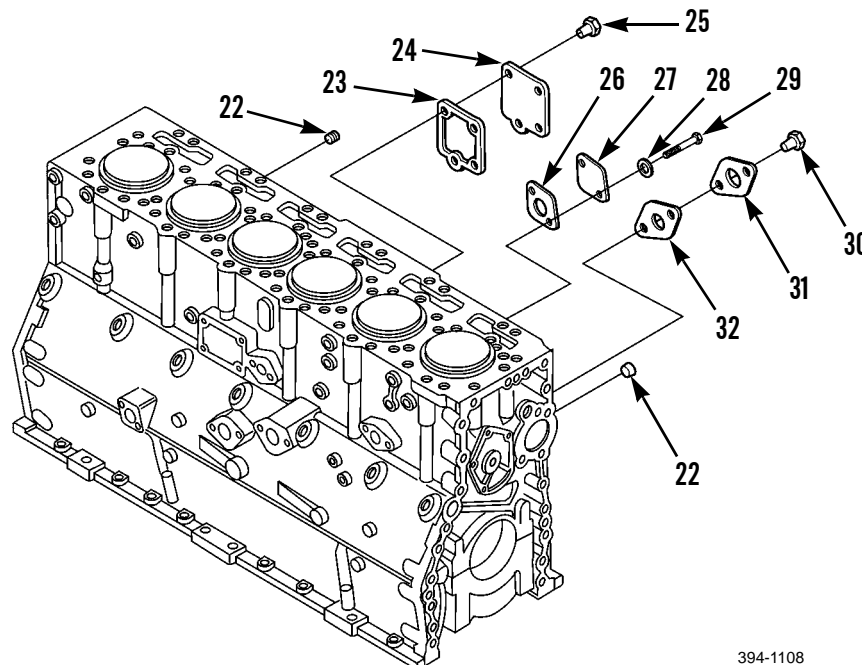
**DISASSEMBLY - CONTINUED**

6. Remove plug (21) and two plugs (20) from cylinder block.
7. Remove orifice plug (15).
8. Using dowel puller, remove dowel (19).
9. Remove two cup plugs (18).
10. Remove plug (20) and preformed packing (21). Discard preformed packing.



394-1107

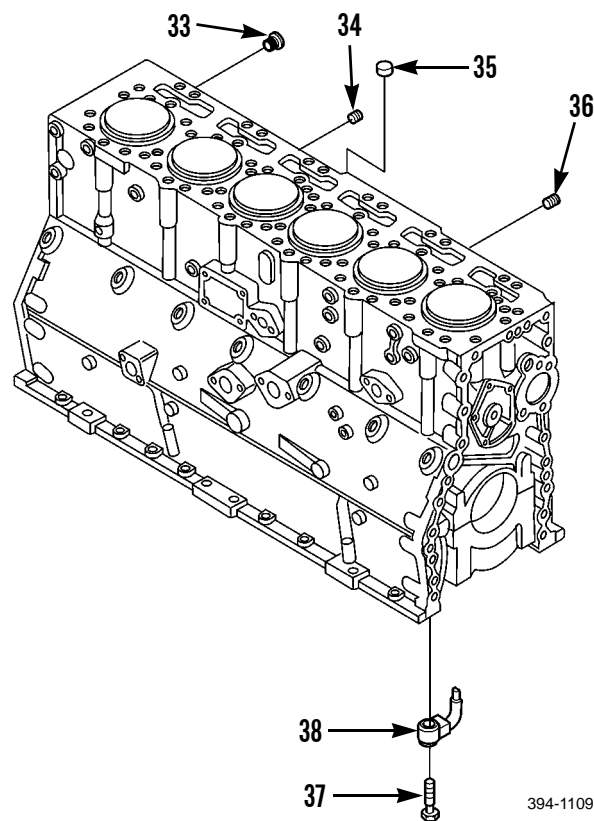
11. Remove three plugs (22) from cylinder block.
12. Remove four bolts (25), cover (24) and gasket (23). Discard gasket.
13. Remove two bolts (28), washers (29), cover (27) and gasket (26). Discard gasket.
14. Remove two bolts (30), cover (31) and gasket (32). Discard gasket.



394-1108

**DISASSEMBLY - CONTINUED**

15. Remove three plugs (36) from cylinder block.
16. Remove plugs (34 and 35) and pipe plug (33).
17. Remove six bolts (37) and oil jet tubes (38).



394-1109

**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 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.

**NOTE**

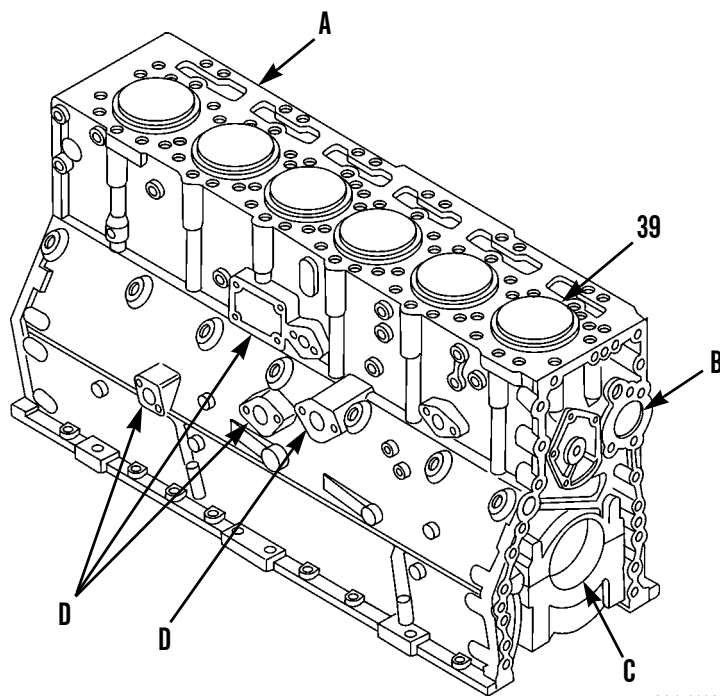
Cylinder lines, filler bands and preformed packings are not removed from cylinder block unless block reconditioning is necessary. Refer to *Inspection* in this work package.

1. Use scraper to remove all gasket material from top deck (a) and side ports (d) of engine block.
2. Use pressurized steam, or hot water and strong soap solution, to clean cylinder block thoroughly.
3. Clean all other parts with solvent.
4. Use compressed air and clean cloth to dry cylinder block thoroughly.



**INSPECTION**

1. Inspect all parts. Replace if cracked, broken, distorted or threads or bore damaged.
2. Use adequate light source to visually inspect cylinder block inside and out. Discard if cracks are observed at crankshaft bearing bores or camshaft bearing bores (B), at main bearing cap mounts or at any location on external surfaces.
3. Use magnaflux (preferred) to dye penetrate or magnetic particle equipment to inspect cylinder block. Follow manufacturer's instructions. Discard cylinder block if cracks are detected at bearing bores (B and C), cap mounts or external surfaces.
4. With main bearing caps in place, Use 5-6 in. inside micrometer to measure crankshaft bearing bores (C). Discard cylinder block if bores do not measure  $5.1138 \pm 0.0005$  in. ( $129.8905 \pm 0.0127$  mm).
5. Visually inspect top deck (A) area around each cylinder liner (39). Recondition according to steps 22 through 36 if scaling, pitting, corrosion or other evidence of liner seal failure is present.

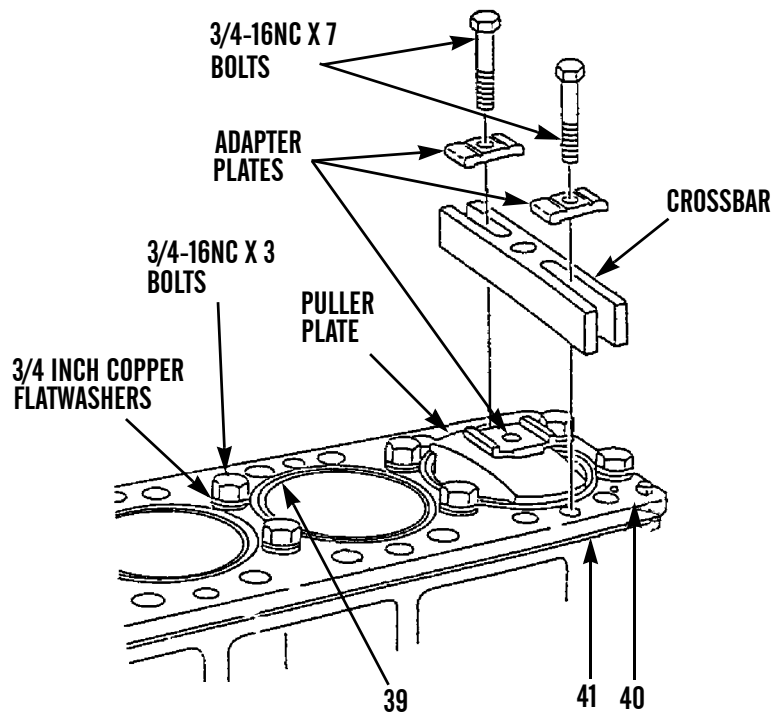


394-1110

**INSPECTION - CONTINUED****NOTE**

Gasket and block plate must be installed before cylinder liner (39) projection can be checked.

6. Install new gasket (41) and block plate (40) on dowels at top of cylinder block. Do not scratch or bend block plate (40).
7. Apply clean lubricating oil to 26-3/4 in. copper flatwashers.
8. Install 28-3/4 in. copper flatwashers and 14-3/4-16NCx3 bolts. Use two 3/4 in. copper washers for each 3/4-16NCx3 in. bolt.
9. Use torque wrench to torque 14-3/4-16NC x 3 in. bolts evenly in four steps: 10 lb-ft (14 Nm), 25 lb-ft (34 Nm), 50 lb-ft (68 Nm) and 70 lb-ft (95 Nm).
10. Install puller plate, adapter plate, crossbar, two adapter plates and two 3/4-16NCx7 bolts.
11. Use torque wrench to torque two 3/4-16NCx7 bolts evenly in four steps: 5 lb-ft (7 Nm), 15 lb-ft (20 Nm), 25 lb-ft (34 Nm) and 50 lb-ft (68 Nm).
12. Check distance from bottom of crossbar to top of block plate (40). Distance must be equal on both sides of cylinder liner.

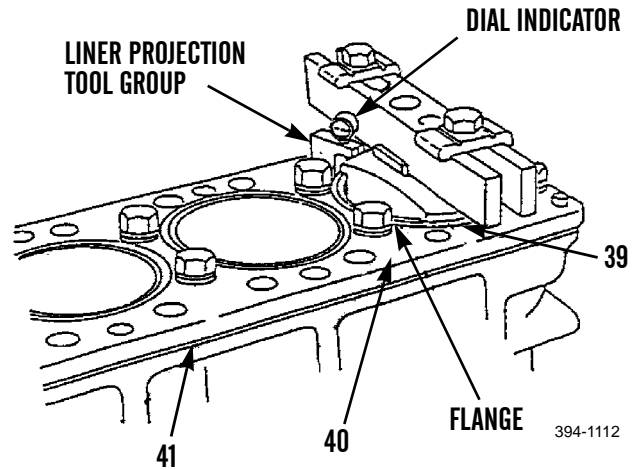


394-1111

13. Install liner projection tool group.
14. Adjust dial indicator in liner projection tool group to zero.
15. Use liner projection tool group to measure cylinder liner projection. Measure flange, not inner ring, at four equally spaced points on cylinder liner (39). Cylinder liner projection above block plate (40) must be within 0.002 in. (0.0508 mm) and 0.008 in. (0.2032 mm). The difference between the four points measured must not exceed 0.001 in. (0.0254 mm) on the same cylinder liner (39). Cylinder liners (39) next to each other must not vary more than 0.001 in. (0.0254 mm). Maximum average height difference for all cylinder liners (39) must not exceed 0.004 in. (0.1016 mm).

**INSPECTION - CONTINUED**

16. Remove liner projection tool group.
17. Remove two 3/4-16NCx7 bolts, two adapter plates, crossbar, puller plate, 14-3/4-16NCx3 bolts and 24-3/4 in. copper flatwashers.
18. Remove block plate (40) and gasket (41). Discard gas-ket.

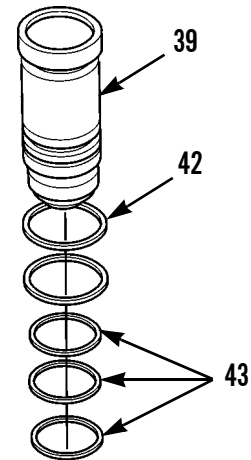
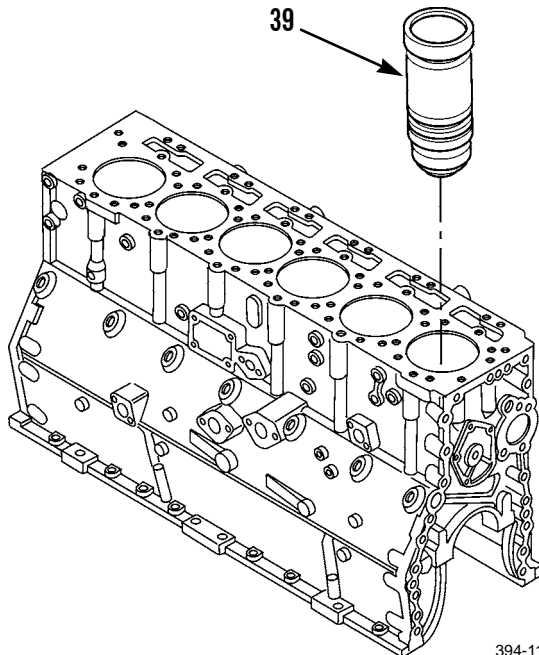


19. Use 5-6 in. inside micrometer to measure bore of cylinder liner (39) near upper limit of wear surface. Remove and discard each cylinder liner (39) that exceeds bore diameter of 5.405 in. (13.73 cm). Perform steps 20 and 21.

**NOTE**

Steps 20 through 36 must be completed for each cylinder liner seal area that has scaling, pitting or corrosion. If such defects are not noted, proceed to *Assembly* in this work package.

20. Use cylinder liner puller group and adapter plate to remove cylinder liner (39) assembly. Do not scratch or gouge surface of top deck.
21. Remove and discard filler band (42) and three preformed packings (43) from cylinder liner (39).



**INSPECTION - CONTINUED**

22. Use gage to determine amount of damage to top deck. If minor roughness is not more than 0.003 in. (0.0762 mm) deep, proceed to step 23. If medium-course roughness or erosion is 0.004-0.006 in. (0.1016-0.1524 mm) deep, complete step 26. If serious erosion with pitting is more than 0.006 in. deep, proceed to step 29.
23. Use a flat file to carefully file top deck area with minor roughness to a flat surface.

**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 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.

24. Use compressed air to thoroughly clean repaired top deck area.
25. Use oiled emery cloth to lightly sand around top surface of bore and top of inside bore of top deck area. Proceed to step 28.
26. Use flat file to carefully file top deck area with medium roughness to a flat surface.
27. Use compressed air to thoroughly clean repaired top deck area.

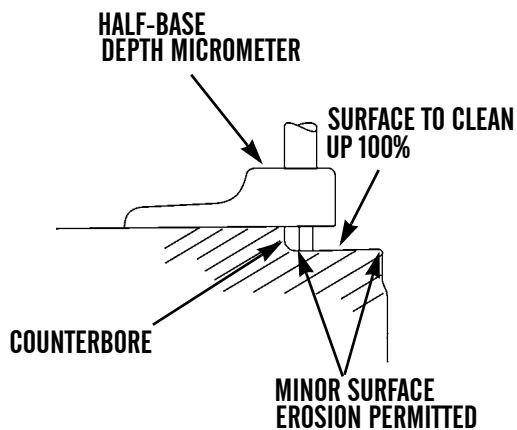
**CAUTION**

Boring tool must be stopped immediately when adjusting nut bottoms against positive stop. This will avoid tool chatter at end of cut. Failure to follow this procedure could result in damage to equipment.

**NOTE**

- Steps 28 through 36 are the procedures for the repair of one cylinder liner counterbore. Repeat these procedures for each of the six cylinder liners, if necessary.
- The counterbore for a cylinder liner seal insert must be cut parallel to top deck within 0.001 in. (0.0254 mm).

28. Use gage to set counterbore tool group for a depth of 0.060 in. (1.524 mm).
29. Use counterbore tool group to repair top deck area with serious erosion damage. Preliminary counterbore depth is  $0.060 \pm 0.001$  in. ( $1.524 \pm 0.0254$  mm).
30. Use a half-base micrometer or liner projection tool group to measure depth of counterbore. If bore is not deep enough, slightly raise adjusting nut on boring tool and repeat step 29.



394-1115

**INSPECTION - CONTINUED**

31. Visually inspect bottom of counterbore for surface smoothness and signs of erosion. If surface is not completely smooth or erosion is evident, proceed to step 32. If preliminary counterbore is satisfactory, proceed to step 36.
32. Use gage to set counterbore tool group for a depth of 0.104 in. (2.6416 mm).
33. Use counterbore tool group to make second counterbore.
34. Visually inspect bottom of counterbore for surface smoothness and signs of erosion. If surface is not completely smooth or erosion is evident, proceed to step 35. If surface is completely smooth and free of erosion, proceed to step 36.
35. Measure depth of second counterbore. If depth exceeds  $0.104 \pm 0.001$  in. ( $2.6416 \pm 0.0254$  mm), discard cylinder block. If depth is satisfactory, proceed to step 36. If depth does not exceed  $0.104 \pm 0.001$  in. ( $2.6416 \pm 0.0254$  mm), return to step 32.
36. Use oiled crocus cloth and flat file, if necessary to remove burrs and sharp edges from finished counterbore and restore surface to smooth, flat finish.

**INSTALLATION**

1. Measure and record exact depth at four places around each counterbore. Apply equal finger pressure on base of micrometer for each measurement. Locate micrometer rod as close as possible to radius.

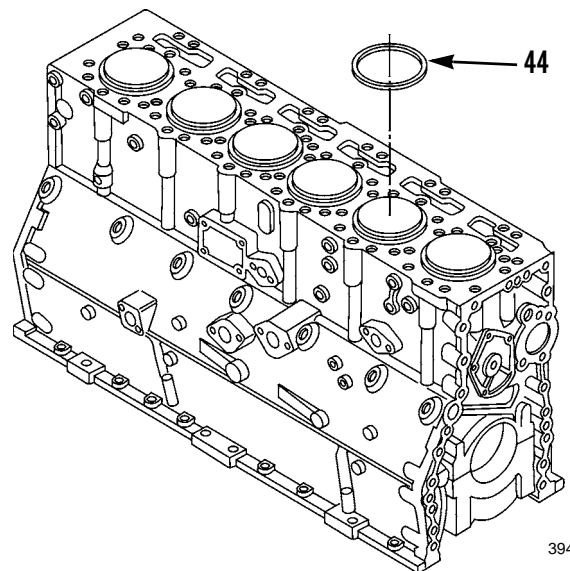
**NOTE**

- Remove inserts only if inspection indicates replacement is necessary.
  - Inserts are installed in counterbore with a slip (loose) fit. Top of insert is to project above top surface of cylinder block from 0.002 to 0.006 in. (0.0508 to 0.1524 mm) Inserts installed next to each other cannot differ in height more than 0.002 in. Inserts are variable in height so that proper combination of inserts can be used to meet height specifications.
2. Determine exact height of each new insert (44), if removed, needed in each counterbore. Use insert (44) for 0.060 in. (1.524 mm) counterbore and insert for 0.104 in. (2.6416 mm) counterbore. Inserts (44) can project over block 0.002 to 0.008 in. (0.0508 to 0.2032 mm), but inserts (44) adjacent to each other must be within 0.002 in. (0.0508 mm).
  3. Use measurements taken in steps 1 and 2 to select new inserts, if removed, for proper placement in counterbore.

**NOTE**

If only one insert is installed, coat both faces with gasket forming silicone compound. If more than one insert is used, place thinnest insert on bottom and apply compound to only bottom face of bottom insert and top face of top insert.

4. Install new inserts (44), if removed.



394-1118

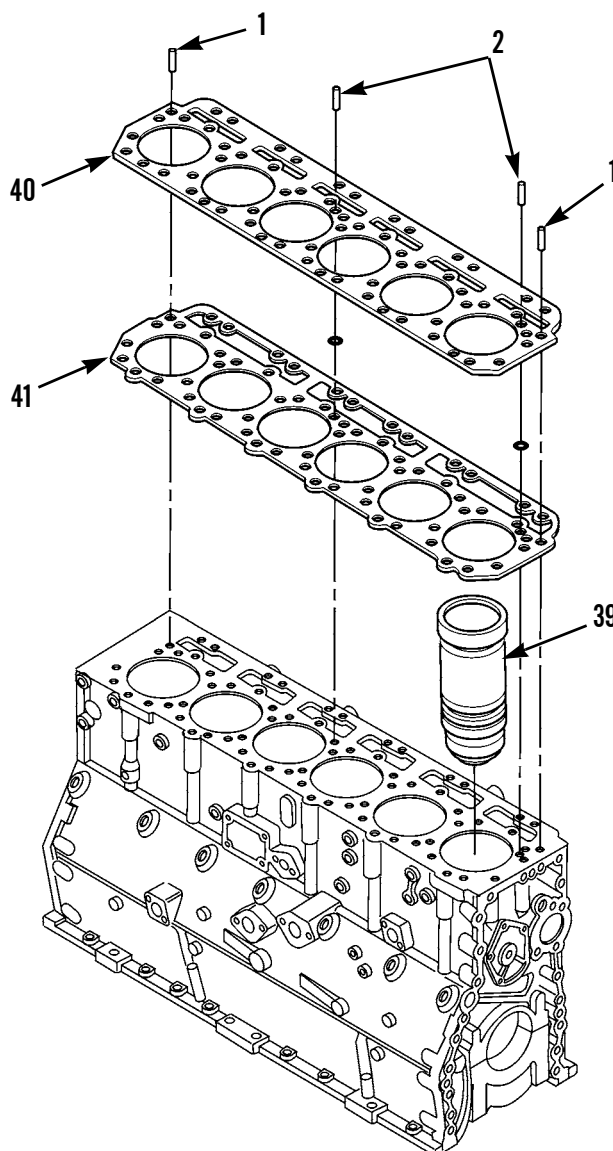
**ASSEMBLY****CAUTION**

Both surfaces of plate, top of cylinder block and both sides of gasket must be clean and dry when installed.  
Do not use gasket adhesives or other substances on these surfaces, or leaks may occur.

**NOTE**

Repeat steps 1 through 14 until liner specifications have been achieved.

1. Use dowel driver and hammer to install two dowels (1 and 2) in cylinder block.
2. Install cylinder liner (39) in cylinder block.
3. Install new gasket (41) and plate (40) on cylinder block. Measure and record projection of cylinder liner (39). Refer to *Inspection*, steps 6 through 18.



394-1119

## ASSEMBLY - CONTINUED

## CAUTION

Liner projection for all six liners must be measured and recorded before removing and replacing liners to meet projection specifications. This requirement applies when one or more counterbores are cut. Failure to follow this procedure could result in damage to equipment.

## NOTE

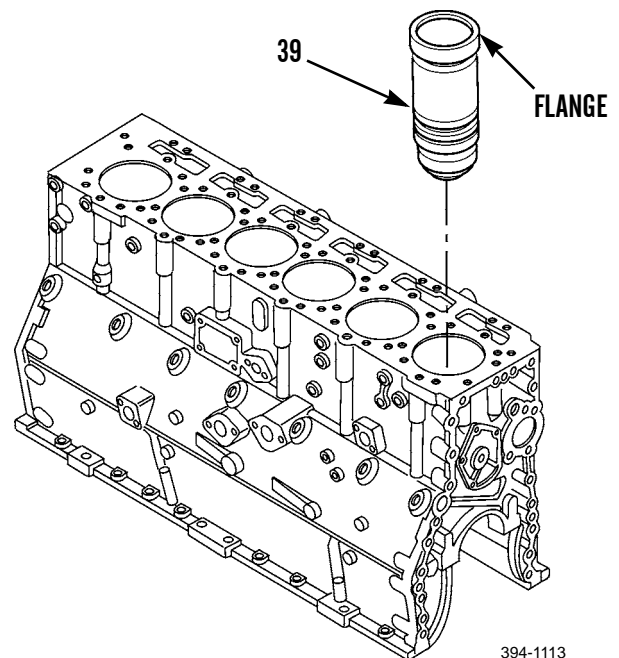
Counterbore depth, insert thickness and liner height may vary. In order to achieve uniform liner projection (height), liners can be placed in different cylinder bores until the correct placement is determined. In addition, rotating the liner in the bore may result in more uniform projection.

4. Compare measurements recorded in *Inspection*, step 15 with projection specifications. All six cylinder liners must project from 0.002 to 0.006 in. (0.0508 to 0.1524 mm) from spacer plate (40). If not, return to step 28.
5. Determine average projection for each of the six cylinder liners (39) by adding together the four measurements recorded in *Inspection*, step 15, and dividing by 4.
6. Determine average projection for all side-by-side cylinder lines (39) by subtracting smaller average from larger average. If average side-by-side liner projection difference is 0.001 in. (0.0254 mm) or less, proceed to step 13. If difference is more than 0.001 in. (0.0254 mm), complete steps 7 through 14.

## CAUTION

Liner projection specifications in steps 9 through 14 must be met before cylinder block is assembled. To meet the requirements, cylinder liners and counterbore inserts can be interchanged, as long as previous measurement criteria are within specifications. Failure to follow this procedure could result in damage to equipment.

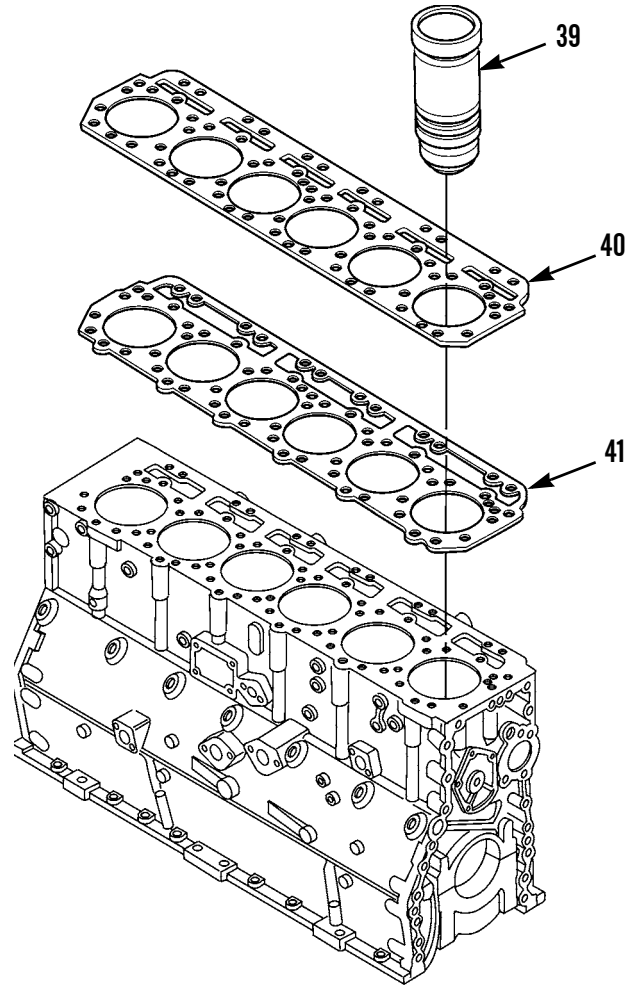
7. Remove liner projection tool group. Refer to *Inspection*, steps 16 through 18.
8. Remove cylinder liners (39) with highest and lowest projections from cylinder block.
9. Measure flange thickness of cylinder liners (39). Thickness must be  $0.350 \pm 0.008$  in. ( $8.89 \pm 0.2032$  mm).
10. Install cylinder liners (39) in positions where projection heights are within specifications.
11. Remove counterbore inserts from counterbore.



394-1113

**ASSEMBLY - CONTINUED**

12. Install inserts in positions where projection heights are within specifications. If liner projection specifications cannot be met, spacer plate (40) and gasket (41) must be removed and their thickness measured. Replace, if inspection indicates it is necessary. Cylinder liner flange thickness must also be measured and cylinder liners replaced, if necessary.
13. Remove plate (40), gasket (41) and cylinder liner (39) from cylinder block.
14. Measure thickness of plate (40), gasket (41) and cylinder liner and compare with chart below. Replace, if necessary.



394-1121



ASSEMBLY - CONTINUED

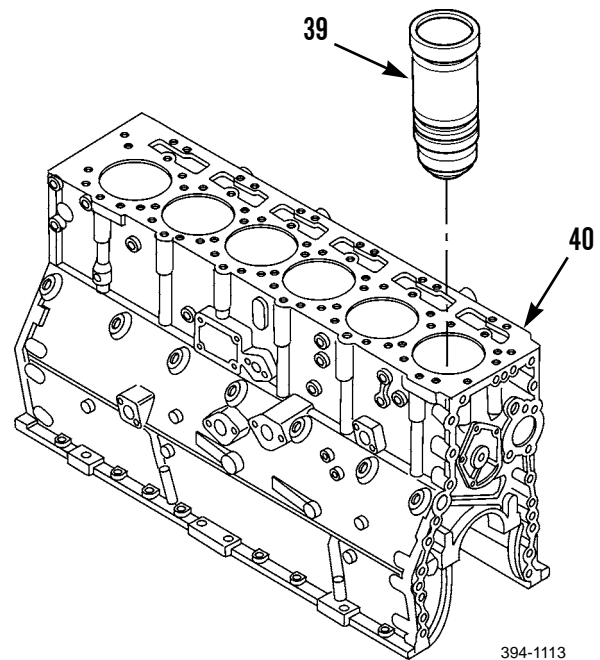
Table 1. Thickness Specifications (Inches).

Spacer plate	0.338±0.001
Gasket	0.008±0.001
Cylinder liner flange	0.3500±0.0009

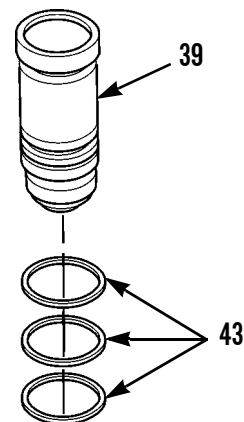
NOTE

Repeat steps 15 through 25 until all cylinder liners have been installed.

15. Use chalk or crayon to match-mark six cylinder liners (39) and plate (40) for exact relocation of cylinder liners (39) in block.
16. Remove cylinder liner (39). Use chalk or crayon to mark with bore block number.

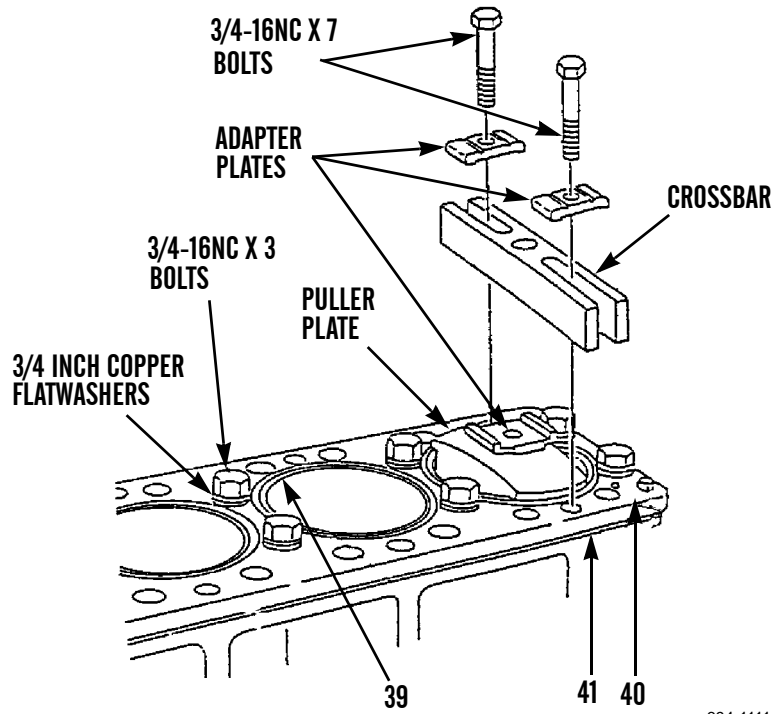


17. Use detergent to coat grooves of cylinder liner (39).
18. Install three new preformed packings (43) on cylinder liner (39).



**ASSEMBLY - CONTINUED**

19. Install two 3/4-16 x 11, 7 in. bolts, one plate and push puller crossbar over cylinder block bore.
20. Install cylinder liner installation tool, long bolt and washer on cylinder block. Be sure rod and pusher will reach center of cylinder block bore.
21. Use marks made in step 15 to position cylinder liner (39) so it can be correctly selected for installation.

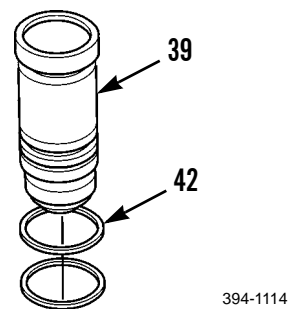


394-1111

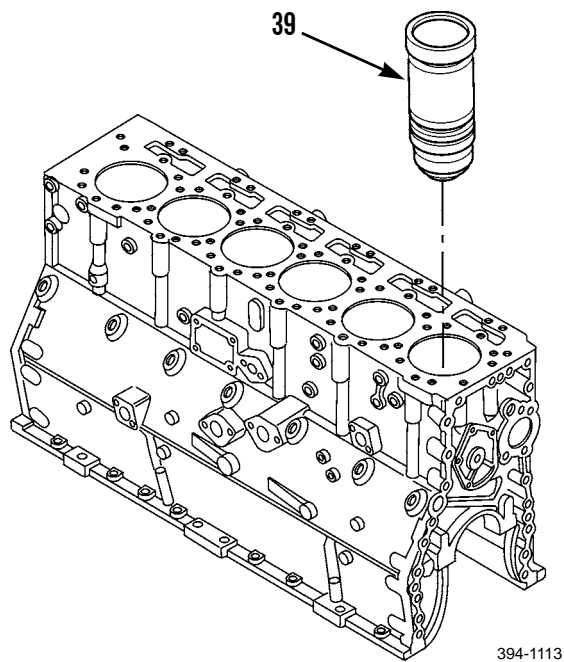
**ASSEMBLY - CONTINUED****CAUTION**

Do not immerse filler band in oil until proper cylinder liner is selected and ready for installation. Filler band must not be immersed for more than 30 seconds and must be installed on cylinder liner and in bore immediately. Failure to follow this procedure could result in damage to equipment.

22. Use clean lubricating oil to immerse filler band (42) for 30 seconds.
23. Install filler band (42) on cylinder liner (39).

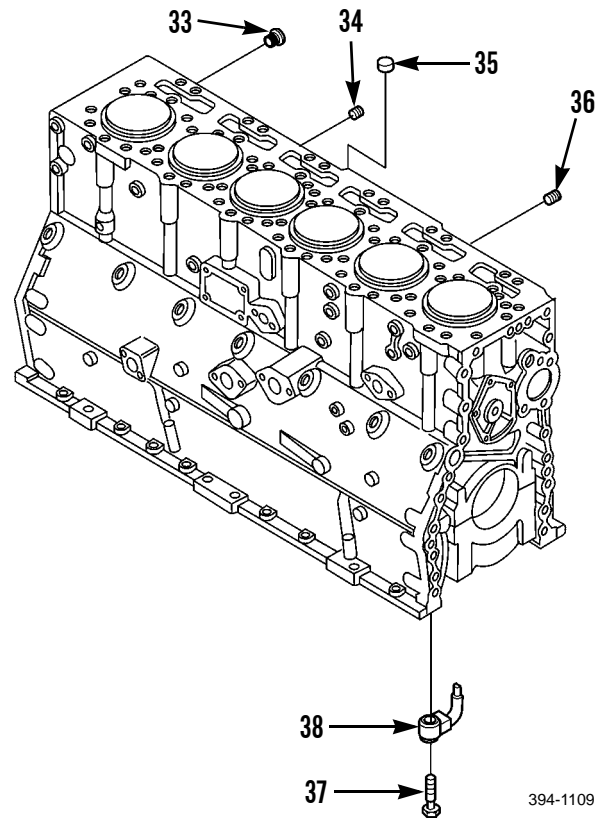


24. Use match-marks to position cylinder liner (39) assembly in proper cylinder bore.
25. Use liner installation tool to install cylinder liner (39) assembly to full depth in bore.



**ASSEMBLY - CONTINUED**

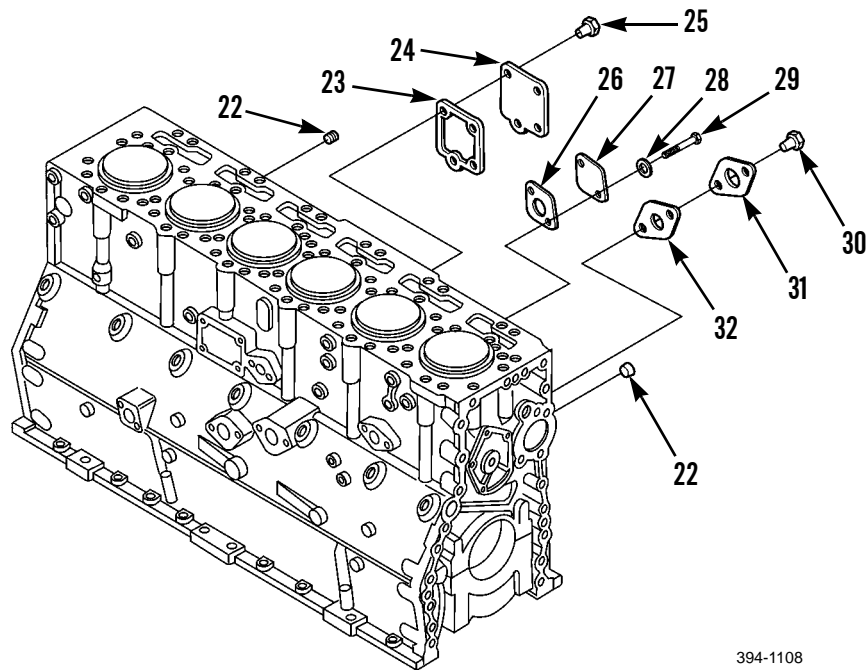
26. Install six oil jet tubes (38) and bolts (37). Torque six bolts to 18 lb-ft (24 Nm).
27. Coat threads of pipe plugs (33), plugs (34 and 35) and three plugs (36) with sealing compound.
28. Install pipe plug (33), plugs (34 and 35) and three plugs (36) with sealing compound.



394-1109

**ASSEMBLY - CONTINUED**

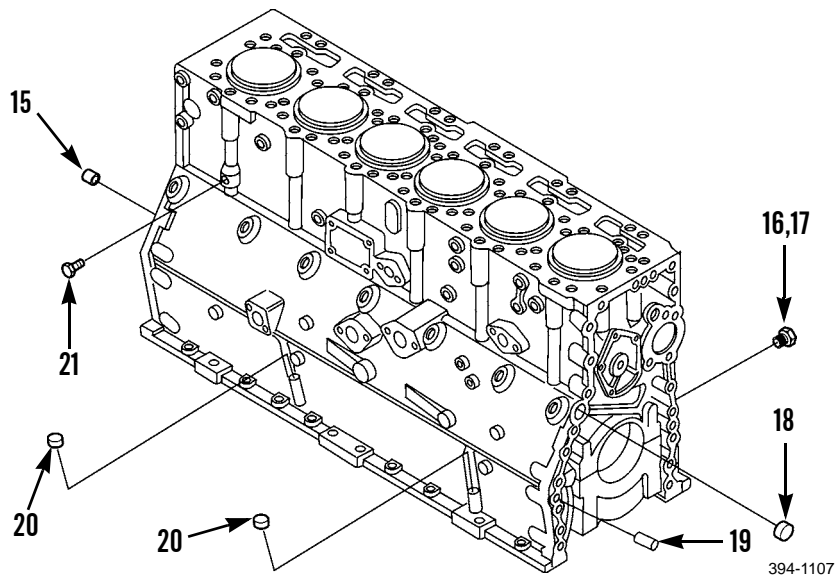
29. Install new gasket (32), cover (31) and two bolts (30).
30. Install new gasket (26), cover (27), two washers (29) and bolts (28).
31. Install new gasket (23), cover (24) and four bolts (25).
32. Coat threads of three plugs (22) with sealing compound.
33. Install three plugs (22).



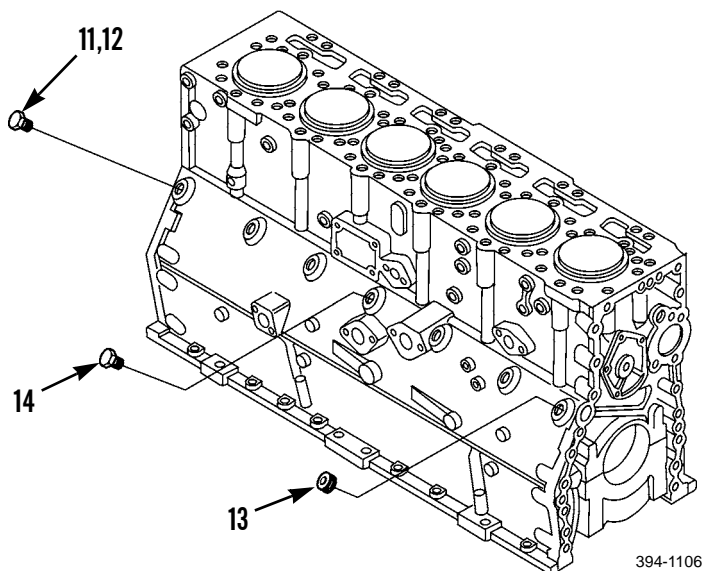
394-1108

**ASSEMBLY - CONTINUED**

34. Coat threads of plug (16) with sealing compound.
35. Install new preformed packing (17) and plug (16).
36. Install two cup plugs (18).
37. Use dowel driver and hammer to install dowel (19).
38. Coat threads of orifice plug (15), two plugs (20) and plug (21) with sealing compound.
39. Install orifice plug (17), two plugs (16) and plug (15).

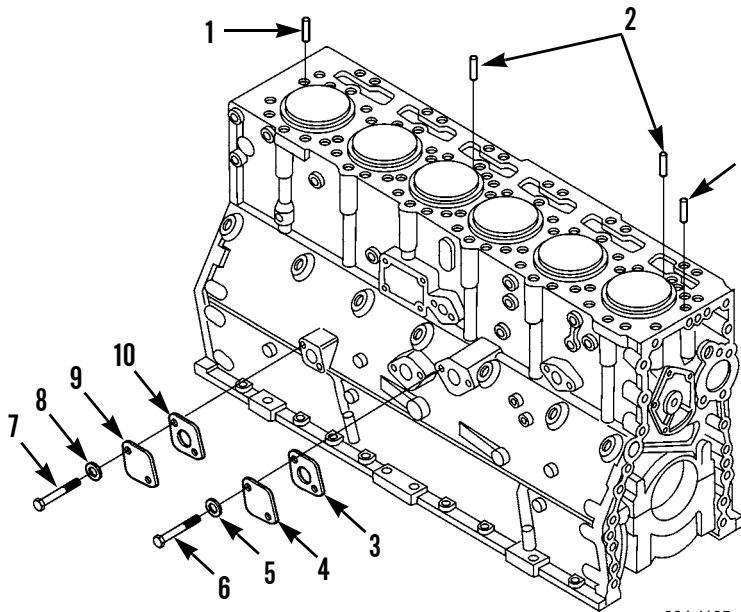


40. Coat threads of plug (11) with sealing compound.
41. Install new preformed packing (12) and plug (11).
42. Coat threads of five pipe plugs (14) and plug (13) with sealing compound.
43. Install five pipe plugs (14) and plug (13).



**ASSEMBLY - CONTINUED**

44. Install new gasket (10), cover (9), two washers (8) and bolts (7).
45. Install new gasket (3), cover (4), two washers (5) and bolts (6).
46. Use dowel driver and hammer to install two dowels (1 and 2).



394-1105

47. Install piston assemblies (WP 0348 00).
48. Install bearings (WP 0347 00).
49. Install crankshaft (WP 0346 00).
50. Install engine front cover (WP 0340 00).
51. Install thermostat (WP 0046 00).
52. Install water temperature sender (WP 0092 00).
53. Install ether start sender switch (WP 0098 00).
54. Install engine mounts (WP 0258 00).
55. Install cylinder head assembly (WP 0259 00).
56. Install flywheel (WP 0261 00).
57. Install oil pump and relief valve (WP 0267 00).
58. Install oil pan (WP 0268 00).
59. Install engine oil cooler (WP 0269 00).
60. Install exhaust manifold (WP 0270 00).
61. Install injection pump (WP 0273 00).
62. Install aftercooler (WP 0277 00).
63. Install hydraulic retarder (WP 0289 00).

**END OF WORK PACKAGE**





**HEAD ASSEMBLY OVERHAUL****0343 00****THIS WORK PACKAGE COVERS**

Cleaning, Inspection, Repair

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop: basic (Item 104, WP 0338 00)

Gage, GP valves (Item 30, WP 0338 00)

Wheel, abrasive (Item 27, WP 0338 00)

Lifting device, 450 lb minimum capacity

**Tools and Special Tools - Continued**

Magnaflux or other magnetic particle inspection equipment

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Personnel Required**

Two

**Equipment Condition**

Head assembly removed (WP 0259 00)

Valves and springs removed (WP 0263 00)

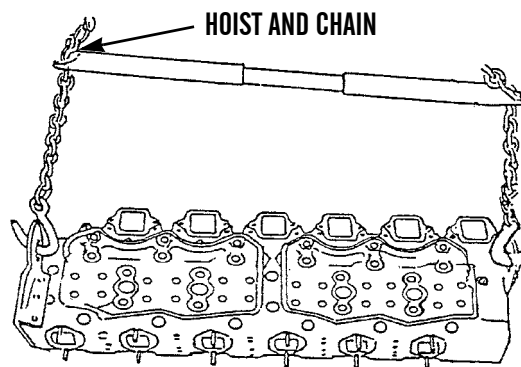
**CLEANING****WARNING**

Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure 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 cylinder head is approximately 300 lb (282 kg).

1. Attach lifting device to cylinder head.
2. Use lifting device to raise cylinder head.



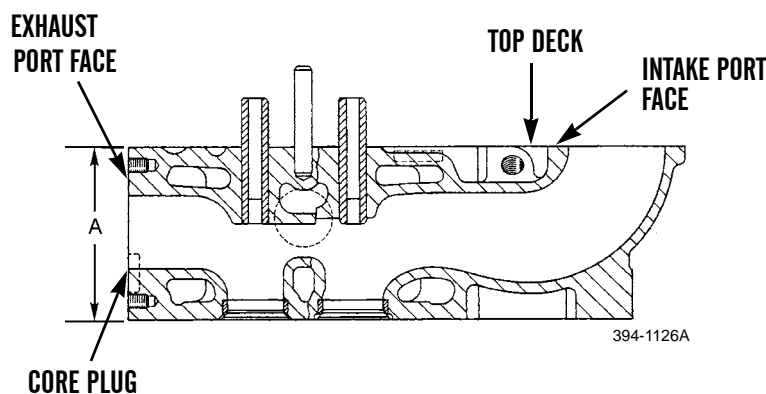
394-1125

**CLEANING - 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.
  - 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.
3. Use solvent cleaning compound to clean cylinder head of accumulations of grease, oil, carbon and grime.
  4. Use compressed air to dry cylinder head.
  5. Immerse cylinder head in solvent for eight hours or overnight.
  6. Remove cylinder head from solvent.
  7. Use scraper to remove all gasket residue while cylinder head is still wet.
  8. Use compressed air to dry cylinder head.

**INSPECTION**

1. Use gage to measure thickness (A) of cylinder head. Replace cylinder head if gage extends above combustion surface or head thickness is less than 4.390 in. (11.150 cm).



2. Use straightedge and feeler gage to check flatness of combustion surface along each edge and both diagonals. If more than 0.005 in. (0.127 mm) from flat, discard and replace cylinder head. If less than 0.005 in. (0.127 mm) from flat, refer to step 3 for machining instructions to correct warpage.

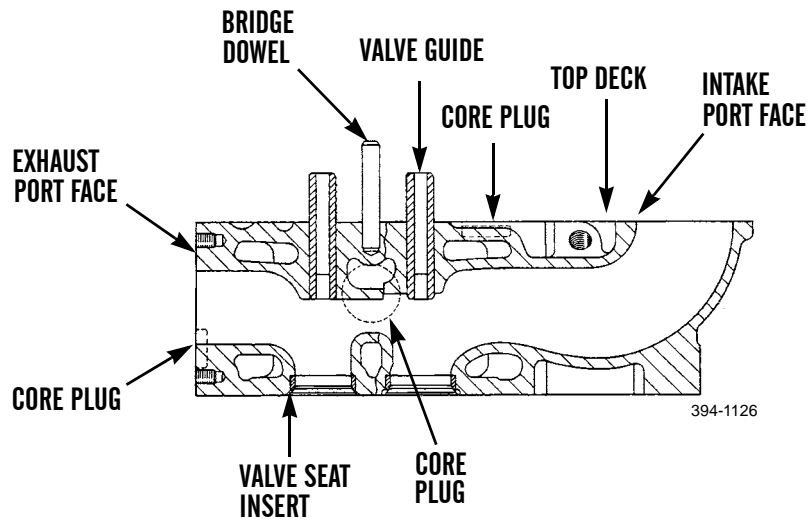
**INSPECTION - CONTINUED**

3. Use magnaflux (preferred) or dye penetrant method to inspect combustion surface and top deck for cracks. Discard and replace cylinder head if cracks appear between valve seats or between valve seat and injector nozzle holes. If cracks are in other areas and are less than 0.25 in. (0.635 mm) long and 0.125 in. (3.175 mm) deep, repair by welding.

**NOTE**

Discard and replace cylinder head if erosion is severe. If erosion is slight, refer to step 2 for grinding instructions.

4. Visually inspect combustion surface for damage and erosion across fire ring and seat area and between injector nozzle hole and valve seat area.
5. Use valve guide gage group to plug gage or equivalent, and measure inside diameter of both ends of each of the twelve valve guides.

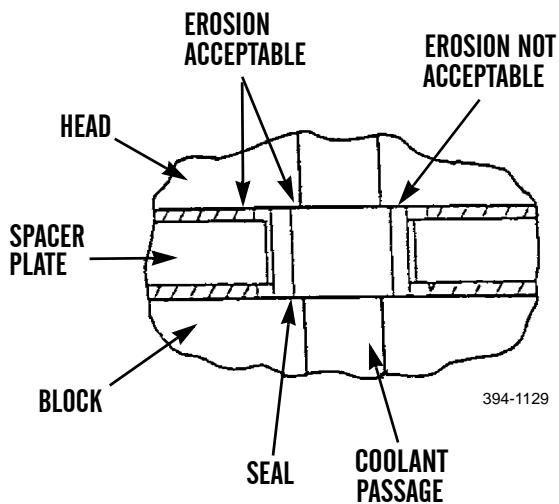
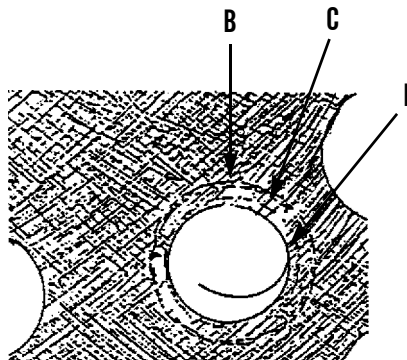


**INSPECTION - CONTINUED**

**NOTE**

Erosion is acceptable in areas B and C. If erosion is found in area D, refer to *Repair*, step 2.

6. Inspect circular areas where coolant passage seals contact combustion surface for erosion.
7. Visually inspect all threaded holes in cylinder head for damaged threads and broken bolts or studs. Extract all broken bolts and studs. Repair damaged threads with threaded inserts.
8. Inspect bridge dowels on top deck for looseness or visible movement. Remove and replace all loose bridge dowels (WP 0259 00).
9. Inspect valve seats on combustion surface. Remove and replace cracked or badly burned valve seats (WP 0259 00).



**REPAIR****WARNING**

Wear safety goggles and respirator when grinding. Failure to follow this procedure may result in injury.

**NOTE**

Cylinder head may appear streaked or discolored after grinding. This appearance is normal and does not indicate any defect in either the material or reconditioning procedure. New cylinder heads from the factory may also have the same appearance but are completely satisfactory for use.

1. Use grinding stone or equivalent to grind smooth all gas and coolant erosion on combustion surface of cylinder head.
2. Remove warpage of combustion surface. Use milling machine: table traverse 600 in./min.; down feed 0.001 in./cycle. Make 0.010 in. (0.254 mm) rough cut and 0.005 in. (0.127 mm) finish cut.
3. Check thickness of cylinder head. Refer to *Inspection* in this work package.
4. Check flatness of cylinder head. Refer to *Inspection* in this work package.
5. Install valves and springs (WP 0263 00).
6. Install head assembly (WP 0259 00).

**END OF WORK PACKAGE**



**CRANKSHAFT FRONT SEALS REPLACEMENT****0344 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Bolt (Item 6, WP 0338 00)

Bolt, machine (Item 8, WP 0338 00)

Insertor, seal (Item 45, WP 0338 00)

Installing tool (Item 48, WP 0338 00)

Locator (Item 52, WP 0338 00)

Nut, sleeve (Item 62, WP 0338 00)

Plate, pusher (Item 74, WP 0338 00)

Puller kit, universal (Item 83, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Sealing compound (Item 10, WP 0339 00)

Sleeve, wear, seal, front

**References**

TM 5-3805-248-10

WP 0022 00

**Equipment Condition**

Engine removed (WP 0257 00)

Crankshaft pulley and damper removed (WP 0260 00)

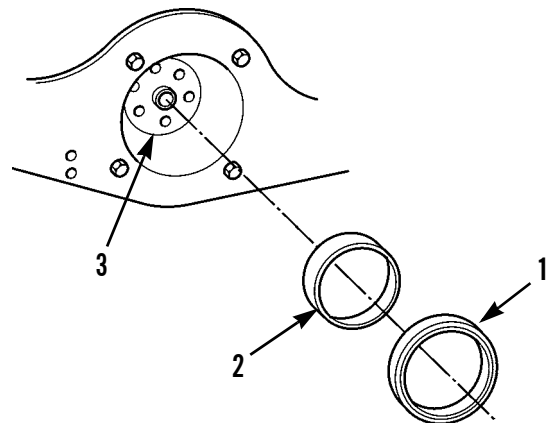
**REMOVAL**

1. Use puller group to remove and discard crankshaft front seal (1) from front of engine.

**CAUTION**

Use care not to damage surface of crankshaft during removal of crankshaft front seal wear sleeve. Failure to observe this caution could cause damage to crankshaft surface and result in damage to new seal after installation.

2. Use hammer and chisel to cut and discard front seal wear sleeve (2) from crankshaft (3).
3. Remove any cuts from crankshaft (3) caused by removal of front seal wear sleeve (2).



394-1131

**CLEANING AND INSPECTION**



**WARNING**

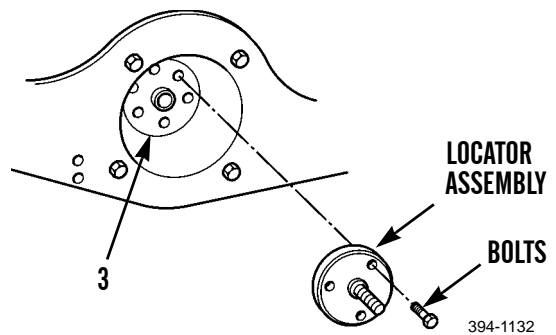


- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by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

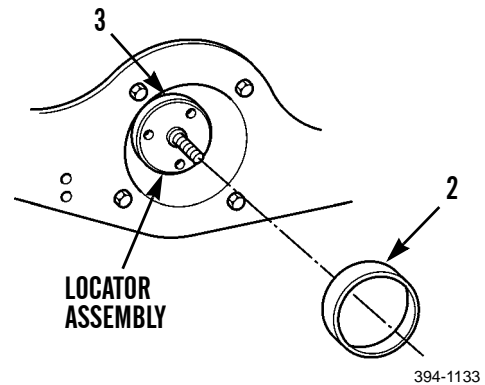
1. Remove all seal material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install locator assembly and three bolts on crankshaft (3).
2. Clean outside flange of crankshaft (3) and inside of new front seal wear sleeve (2).
3. Use clean sealing compound to coat outside flange of crankshaft (3) and diameter of new front seal wear sleeve (2).



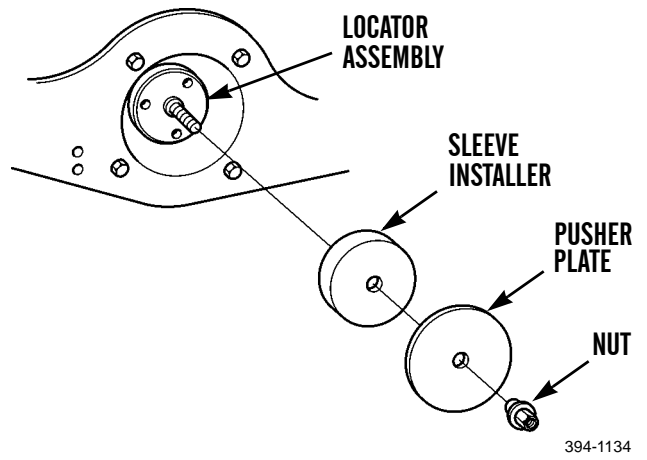
4. Position new front seal wear sleeve (2) on crankshaft (3) with outside diameter bevel facing out.



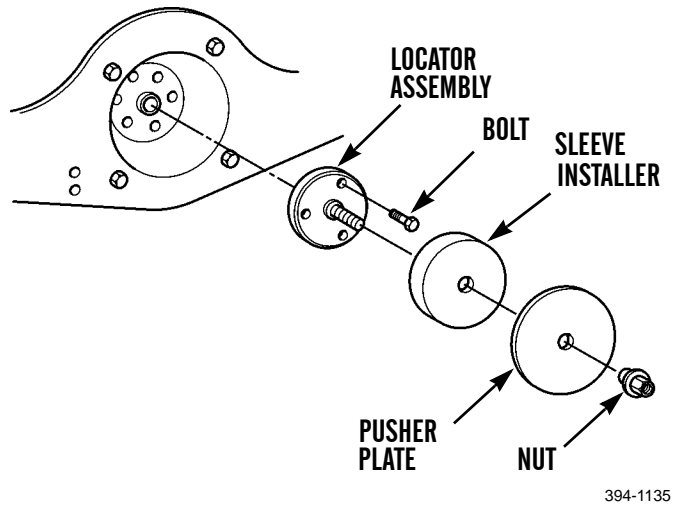


**INSTALLATION - CONTINUED**

5. Position sleeve installer on locator assembly.
6. Slide pusher plate on locator assembly stud.
7. Install nut on stud and tighten until pusher plate is at bottom.

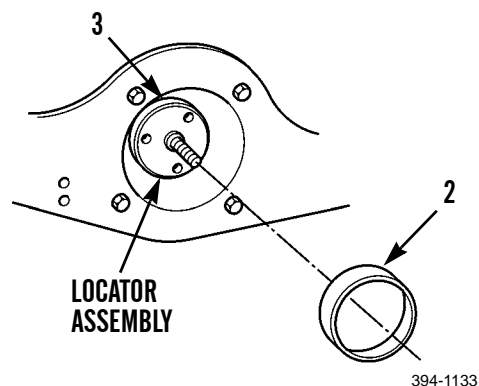


8. Remove nut from stud.
9. Remove pusher plate, sleeve installer and locator assembly from crankshaft (3).

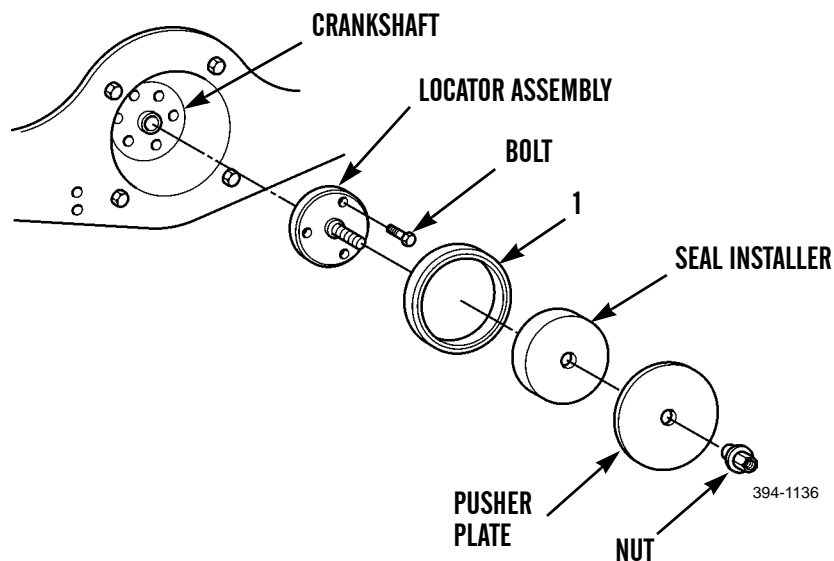


**INSTALLATION - CONTINUED**

10. Install locator assembly and three bolts on crankshaft (3).
11. Use clean engine oil to lubricate outside lip of new front seal wear sleeve (2) and lip of new crankshaft front seal (1).
12. Position new crankshaft front seal (1) on locator assembly.



13. Install seal installer on locator assembly.
14. Slide pusher plate on stud of the locator assembly.
15. Install nut on stud and tighten until pusher plate is at bottom.
16. Remove nut, pusher plate, seal installer, three bolts and locator assembly.



17. Install crankshaft pulley and damper (WP 0260 00).
18. Install engine (WP 0257 00).
19. Check engine oil level and add as necessary (WP 0022 00).
20. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**CRANKSHAFT REAR SEALS REPLACEMENT**

**0345 00**

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

- Tool kit, general mechanic's (Item 113, WP 0338 00)
- Bolt (Item 6, WP 0338 00)
- Locator (Item 52, WP 0338 00)
- Installing tool (Item 48, WP 0338 00)
- Insertor, seal (Item 45, WP 0338 00)
- Nut, sleeve (Item 62, WP 0338 00)
- Plate, seal inserter (Item 77, WP 0338 00)
- Puller kit, universal (Item 83, WP 0338 00)

**Materials/Parts**

- Cleaning compound, solvent (Item 8, WP 0339 00)
- Oil, lubricating (Item 30, 31 or 33, WP 0339 00)
- Rag, wiping (Item 35, WP 0339 00)
- Sealing compound (Item 10, WP 0339 00)
- Sleeve, wear, seal, rear

**References**

TM 5-3805-248-10

**Equipment Condition**

Flywheel removed (WP 0261 00)

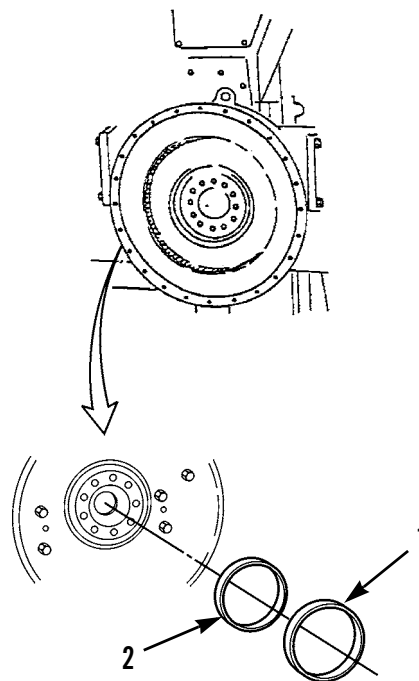
**REMOVAL**

1. Use puller group to remove and discard crankshaft rear seal (1) from rear of engine.

**CAUTION**

Do not cause damage to surface of crankshaft when hammer and chisel are being used to remove crankshaft front seal wear sleeve. Failure to observe this caution could cause damage to crankshaft surface and result in damage to new seal after installation.

2. Using hammer and chisel, cut and discard rear seal wear sleeve (2) from crankshaft.
3. Remove any cuts from crankshaft caused by removal of rear seal wear sleeve (2).



394-1137

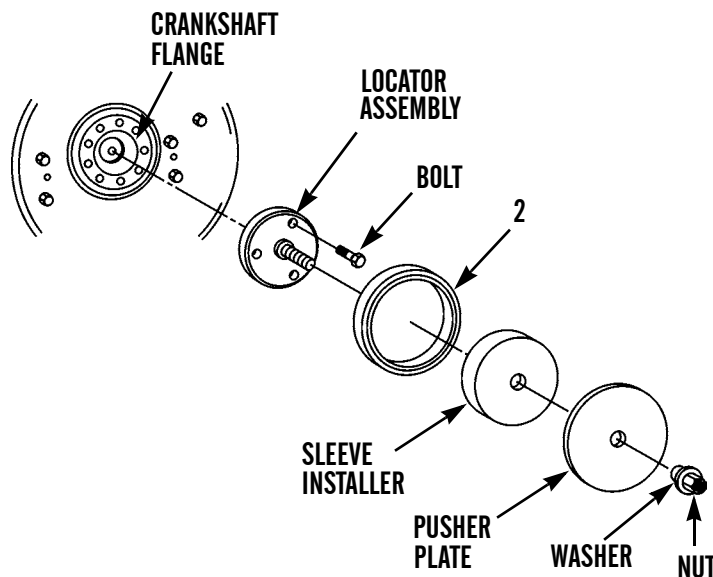
**CLEANING AND INSPECTION****WARNING**

- 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. Remove all seal material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

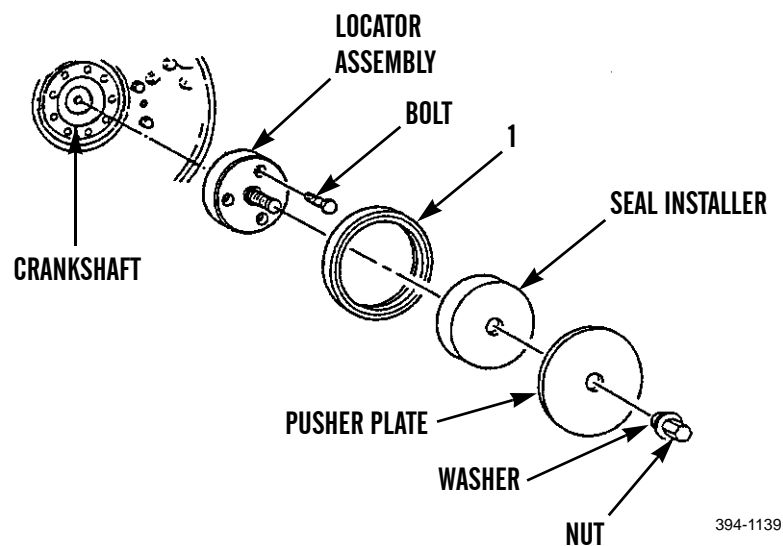
1. Install locator assembly and three bolts on crankshaft.
2. Clean outside diameter of crankshaft flange and inside of new rear seal wear sleeve (2).
3. Use sealing compound to coat outside of crankshaft flange and inside of new rear seal wear sleeve (2).
4. Use clean lubricating oil to lubricate outside of new rear seal wear sleeve (2) and inside face of washer on nut.
5. Position new rear seal wear sleeve (2) on crankshaft with outside diameter bevel facing out.
6. Position sleeve installer on locator assembly.
7. Slide pusher plate on locator assembly stud.
8. Install nut on stud and tighten until pusher plate is at bottom.



394-1138

**INSTALLATION - CONTINUED**

9. Remove nut from stud.
10. Remove pusher plate and sleeve installer from crankshaft.
11. Use clean lubricating oil to lubricate lip of new crankshaft rear seal (1) and inside face of washer on nut.
12. Position new crankshaft rear seal (1) on locator assembly with lip of new seal (1) toward engine.
13. Slide seal installer and pusher plate on the stud of the locator assembly.
14. Install nut on stud and tighten until pusher plate is at bottom.
15. Remove nut, pusher plate, seal installer, three bolts and locator assembly from crankshaft.



16. Install flywheel (WP 0261 00).
17. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**CRANKSHAFT REPLACEMENT****0346 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Attachment, pulling (Item 4, WP 0338 00)

Leg, mechanical puller (FD) (Item 35, WP 0338 00)

Nut (Item 58, WP 0338 00)

Nut, plain, hexagon (Item 61, WP 0338 00)

Plate (Item 61, WP 0338 00)

Puller, dowel (Item 84, WP 0338 00)

Puller, hydraulic (Item 85, WP 0338 00)

Puller, mechanical (Item 88, WP 0338 00)

Pump, hydraulic ram, hand driven (Item 91, WP 0338 00)

Lifting device, 525 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Spacer

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Engine removed (WP 0257 00)

Engine oil pan removed (WP 0268 00)

Engine front support removed (WP 0258 00)

Flywheel housing removed (WP 0262 00)

Engine front cover plate removed (WP 0340 00)

Crankshaft front seals removed (WP 0344 00)

Crankshaft rear seals removed (WP 0345 00)

Crankshaft main bearings removed (WP 0347 00)

Pistons and connecting rods removed (WP 0348 00)

**WARNING**

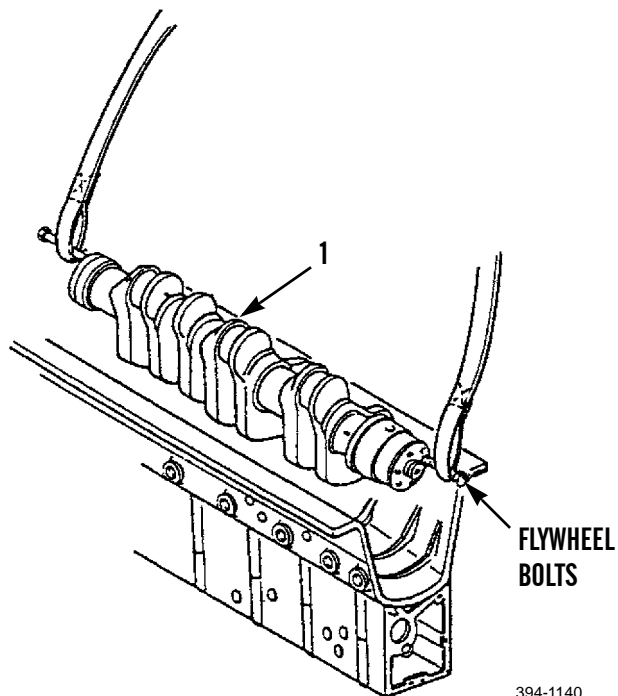
Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury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

**NOTE**

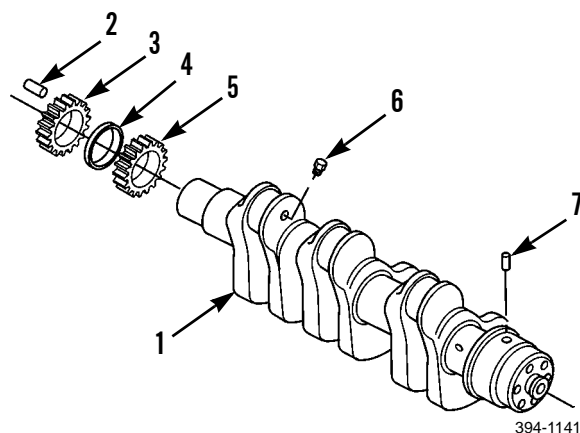
Weight of crankshaft assembly is 350 lb (159 kg).

**REMOVAL**

1. Install one flywheel bolt on each end of crankshaft assembly (1). These bolts were removed as part of equipment condition.
2. Install lifting device on flywheel bolts in crankshaft assembly (1).
3. Use lifting device to remove crankshaft assembly (1) and place on work table.
4. Remove lifting device and flywheel bolts.



5. Remove outer gear (3) from crankshaft assembly (1).
6. Use hammer and chisel to remove spacer (4). Discard spacer.
7. Use puller group to remove dowel pin (2) from end of crankshaft assembly (1).
8. Remove inner gear (5).
9. Remove six plugs (6).
10. Remove dowel pin (7).





**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. Remove all seal material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install dowel pin (7) in crankshaft assembly (1).
2. Install six plugs (6).

**WARNING**

Insulated gloves must be worn when handling heated parts. Severe burns will result if unprotected skin contacts heated surfaces. If you are injured, seek medical attention immediately.

3. Use oven to heat inner and outer gears (3 and 5) to a maximum temperature of 400°F (204°C).
4. Install inner gear (5) on crankshaft assembly (1).
5. Install dowel pin (2) in end of crankshaft assembly (1). Dowel pin (2) must extend no more than 0.19 in. (4.83 mm) from surface of crankshaft assembly (1).
6. Install new spacer (4).

**NOTE**

Dowel pin (2) in crankshaft assembly must be in alignment with notch in outer gear.

7. Install outer gear (3) with the “V” marks facing out and aligned with dowel pin (2).
8. Install flywheel bolts on each end of crankshaft assembly (1).
9. Install lifting device on flywheel bolts.
10. Use lifting device to install crankshaft assembly (1) in block.
11. Remove flywheel bolts from each end of crankshaft assembly (1).

---

**CRANKSHAFT REPLACEMENT - CONTINUED**

---

**0346 00*****INSTALLATION - CONTINUED***

12. Install crankshaft main bearings (WP 0347 00).
13. Install pistons and connecting rods (WP 0348 00).
14. Install engine oil pan (WP 0268 00).
15. Install engine front support (WP 0258 00).
16. Install flywheel housing (WP 0262 00).
17. Install engine front cover plate (WP 0340 00).
18. Install crankshaft front seals (WP 0344 00).
19. Install crankshaft rear seals (WP 0345 00).
20. Install engine (WP 0257 00).
21. Operate engine and verify correct operation (TM5 3805-248-10).

**END OF WORK PACKAGE**

**CRANKSHAFT MAIN BEARINGS MAINTENANCE**

0347 00

**THIS WORK PACKAGE COVERS**

Center and Intermediate Bearings: Removal, Adjustment, Installation

End Bearings: Removal, Adjustment, Installation

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop (Item 104, WP 0338 00)

Main bearing removal and installation tool (Item 94, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Gage, bearing clearance (Item 16, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Plate, thrust (2)

**References**

WP 0346 00

TM 5-3805-248-10

**Equipment Condition**

Oil pump removed (WP 0267 00)

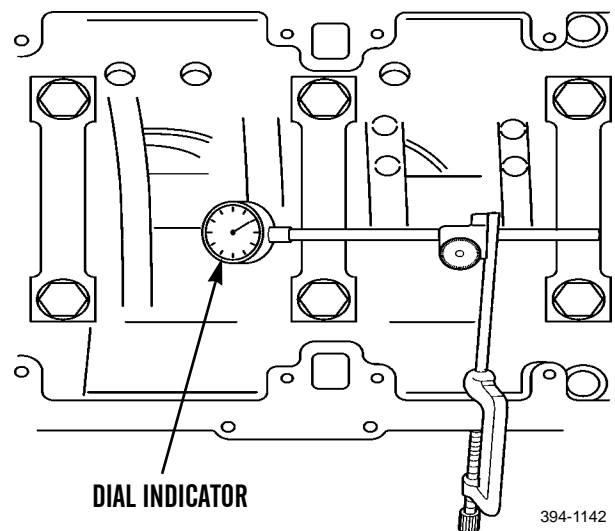
**CENTER AND INTERMEDIATE BEARINGS REMOVAL**

1. Install dial indicator on crankshaft journal number 4.
2. Adjust contact pin of dial indicator against side edge of crankshaft journal, and adjust dial face so indicator reads zero.

**CAUTION**

Do not use metal hammer to move crankshaft back and forth. Do not contact machined crankshaft surfaces with metal pry bar. Failure to follow this procedure could result in damage to equipment.

3. While moving crankshaft back and forth, observe dial indicator to determine end play.
4. Record end play reading on dial indicator.
5. Remove dial indicator.



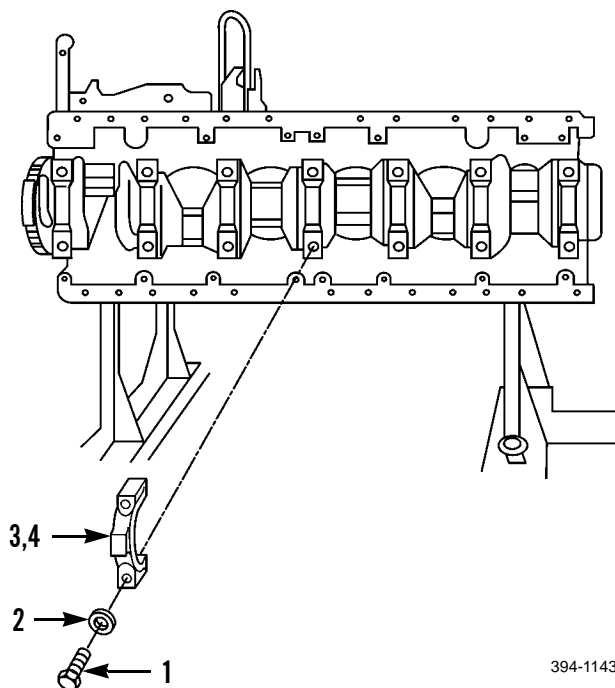
394-1142

## CENTER AND INTERMEDIATE BEARINGS REMOVAL - CONTINUED

**NOTE**

Each crankshaft bearing cap has a number and an arrow embossed on it. The numbers, ranging from 1 to 7 from front to rear of block, indicate the cap's location on the block where it is to be installed with its matching number appearing on outside of block. The arrows point to front of block when installed.

6. Remove two bolts (1), washers (2) and bearing cap (3) assembly.
7. Remove and discard lower half main bearing (4) from bearing cap (3).

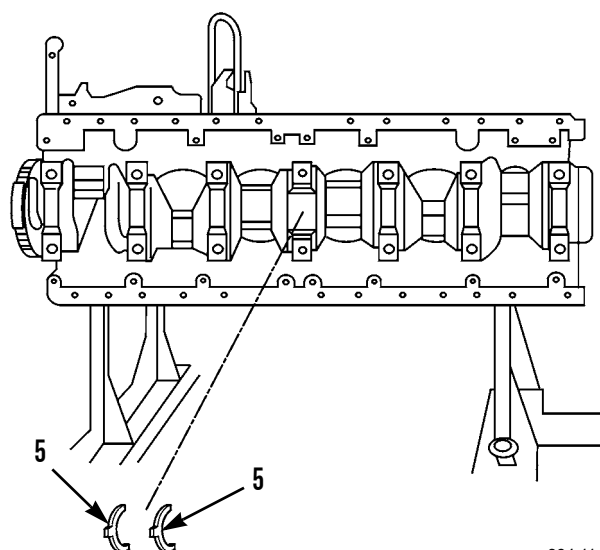


394-1143

**NOTE**

Remove two thrust plates only if end play recorded in step 4 exceeds 0.006-0.020 in. (.1524-0.508 mm). If not, proceed to step 9.

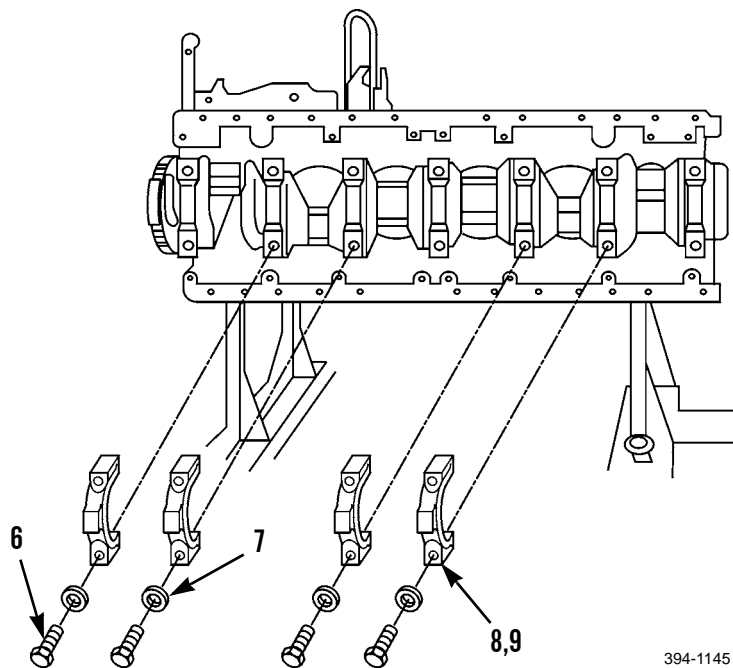
8. Remove two thrust plates (5).



394-1144

**CENTER AND INTERMEDIATE BEARINGS REMOVAL - CONTINUED****NOTE**

- Remainder of this task is divided into two sections: first: removal, adjustment and installation of five main bearings in center of crankshaft, and second: removal, adjustment and installation of two main bearings at end of crankshaft.
  - Bearing and cap number 4 must be reinstalled before removing numbers 2, 3, 5 and 6.
9. Repeat steps 6 and 7 to remove eight bolts (6), washers (7), four bearing caps (8) and lower half main bearings (9). Discard four lower half main bearings.



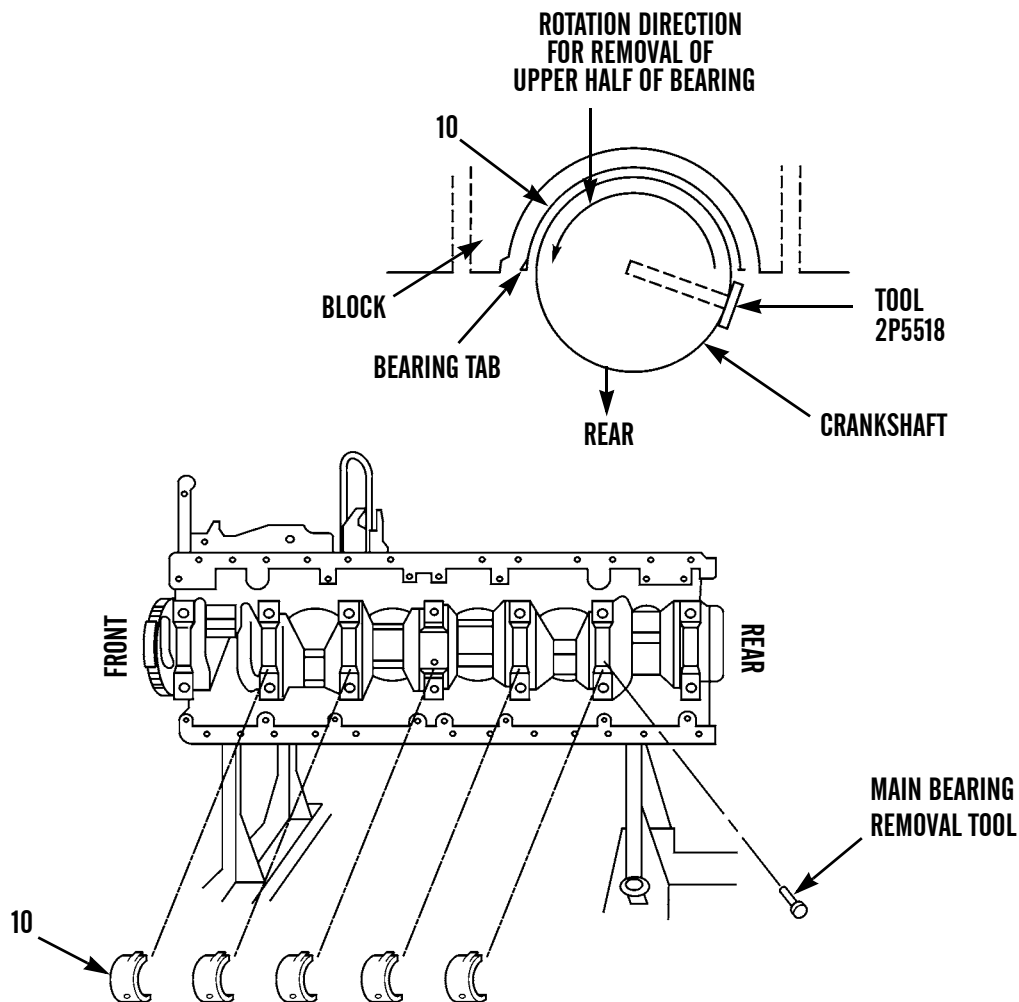
10. Install main bearing removal and installation tool in oil hole of crankshaft journal.

**CENTER AND INTERMEDIATE BEARINGS REMOVAL - CONTINUED**

**CAUTION**

Crankshaft must be rotated in direction of normal engine rotation when removing main bearings. Engine rotation is counterclockwise when viewed from rear. Failure to follow this procedure could result in damage to the block, crankshaft, or both.

11. Rotate crankshaft counterclockwise and remove and discard one of five upper half main bearings (10).
12. Remove main bearing removal and installation tool from oil hole in crankshaft journal.
13. Repeat steps 10, 11 and 12 to remove and discard remaining four of five upper half main bearings (10).



394-1146

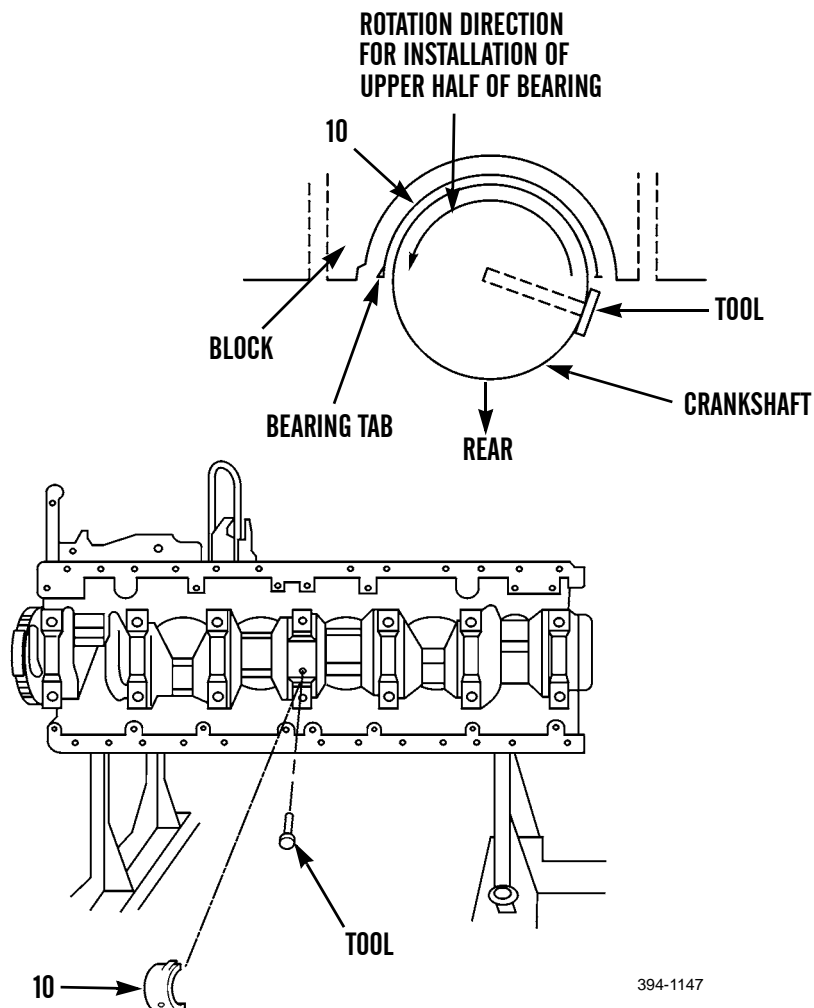
**CENTER AND INTERMEDIATE BEARINGS ADJUSTMENT**

1. Install main bearing removal and installation tool in oil hole in crankshaft journal.
2. Use clean engine oil to lubricate one of five new upper half main bearings (10) and its corresponding journal on crankshaft.
3. Position one of five new upper half main bearings (10) in cylinder block above crankshaft journal with bearing tab toward tab locator in block.

**CAUTION**

When installing upper half main bearings in cylinder block, crankshaft must be rotated in opposite direction from normal engine rotation. Viewed from rear, turn clockwise. Failure to follow this procedure could result in damage to block, crankshaft, or both.

4. Rotate crankshaft clockwise to push one of five new upper half main bearings (10) into position.
5. Remove main bearing removal and installation tool from oil hole in crankshaft.
6. Repeat steps 1 through 5 to install remaining four of five new upper half main bearings (10).



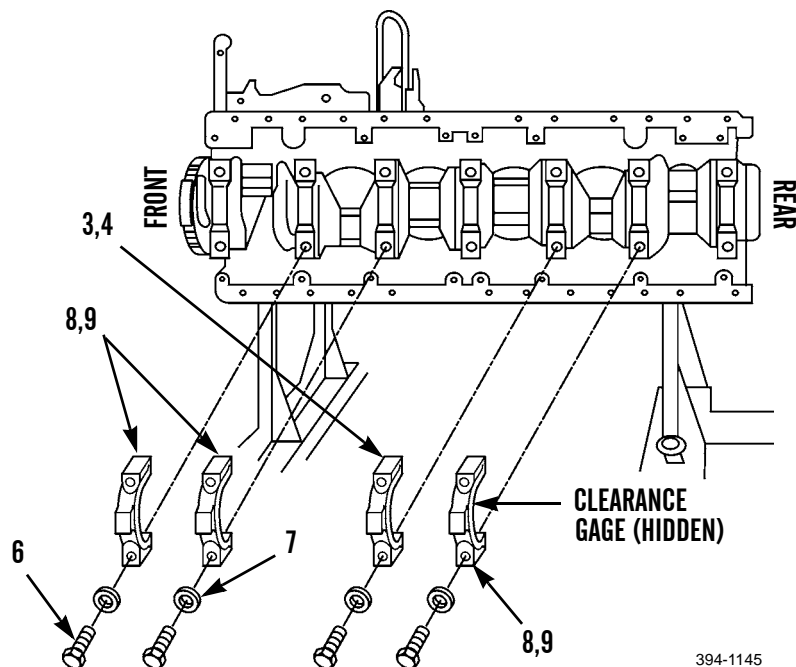
**CENTER AND INTERMEDIATE BEARINGS ADJUSTMENT - CONTINUED**

7. Use clean engine oil to lubricate new lower half main bearing (4).
8. Install new lower half main bearing (4) in bearing cap (3).
9. Position bearing clearance gage 1-1/2 in. long on surface of new lower half main bearing (4).

**CAUTION**

Arrow on bottom of bearing caps point to front of engine; number on bearing cap must match bearing number on side of cylinder block. Failure to follow this procedure could result in damage to equipment.

10. Position bearing cap (3) assembly and bearing clearance gage under crankshaft journal with arrow on bearing cap pointing toward front of engine and holes in bearing cap (3) aligned with holes in cylinder block.
11. Use clean engine oil to lubricate two bolts (1).
12. Install and hand-tighten two bolts (1).
13. Repeat steps 7 through 12 to install four new lower half main bearings (9), bearing caps (8) and eight bolts (6).

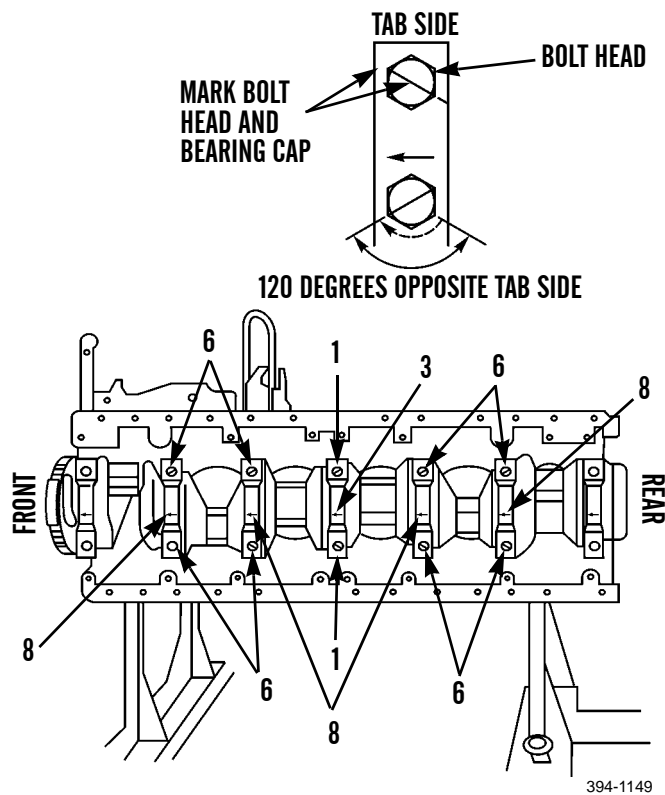


394-1145



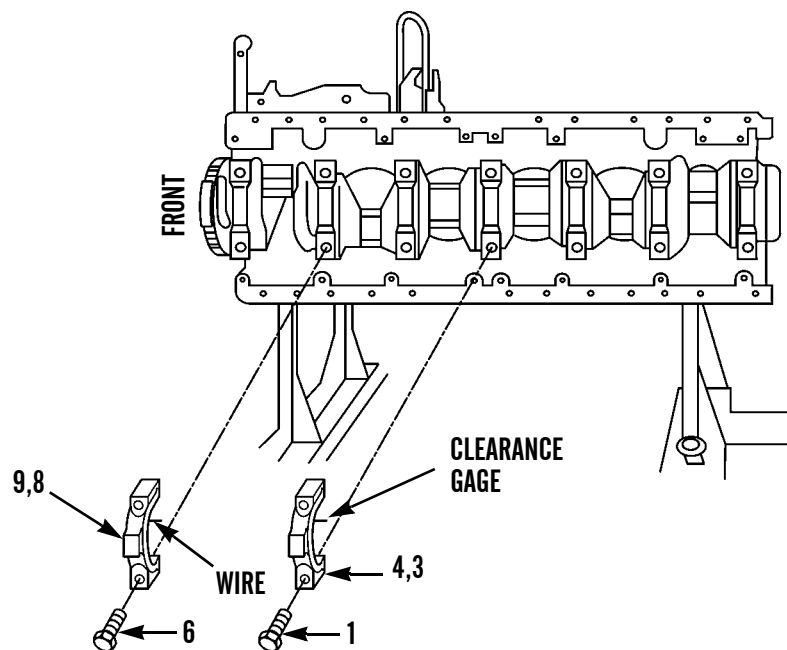
**CENTER AND INTERMEDIATE BEARINGS ADJUSTMENT - CONTINUED**

14. Torque bolt (1) at bearing tab side of bearing cap (3) to 190 lb-ft (258 Nm).
15. Torque bolt (1) opposite tab side of bearing cap (3) to 190 lb-ft (258 Nm).
16. Repeat steps 14 and 15 to tighten four bolts (6) at bearing tab side of bearing caps (8) and bolts (6) opposite tab side of bearing caps (8).
17. Use chalk to mark two bolts (1), bearing cap (3), eight bolts (6) and four bearing caps (8).
18. Tighten bolt (1) opposite tab side of bearing cap (3) and four bolts (6) opposite tab side of bearing caps (8) 120 degrees.
19. Tighten bolt (1) at bearing tab side of bearing cap (3) and four bolts (6) at bearing tab side of bearing caps (8) 120 degrees.



**CENTER AND INTERMEDIATE BEARINGS ADJUSTMENT - CONTINUED**

20. Remove two bolts (1) and bearing (4) and cap (3) from crankshaft.
21. Remove eight bolts (6) and four bearing (9) and cap (8) from crankshaft.

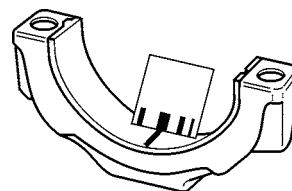


394-1150

22. Use the scale provided to measure thickness of each bearing clearance gage. Record measurement.

**NOTE**

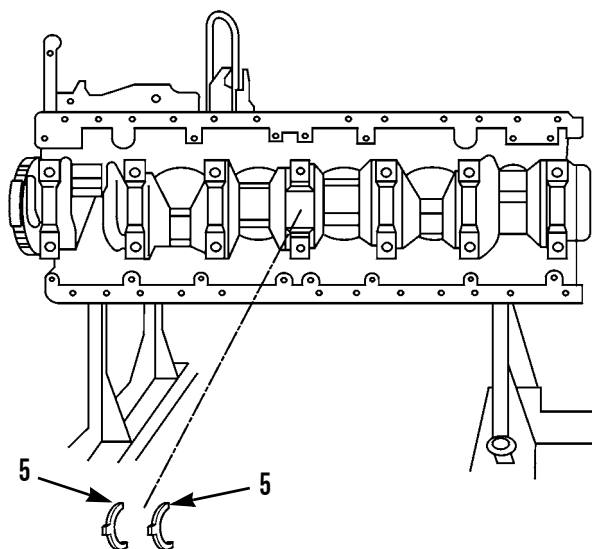
Thickness of bearing clearance gage must be within range of 0.003-0.0068 in. (0.005-0.009 mm) If measurement exceeds this range, replace crankshaft (WP 0346 00).



394-1151

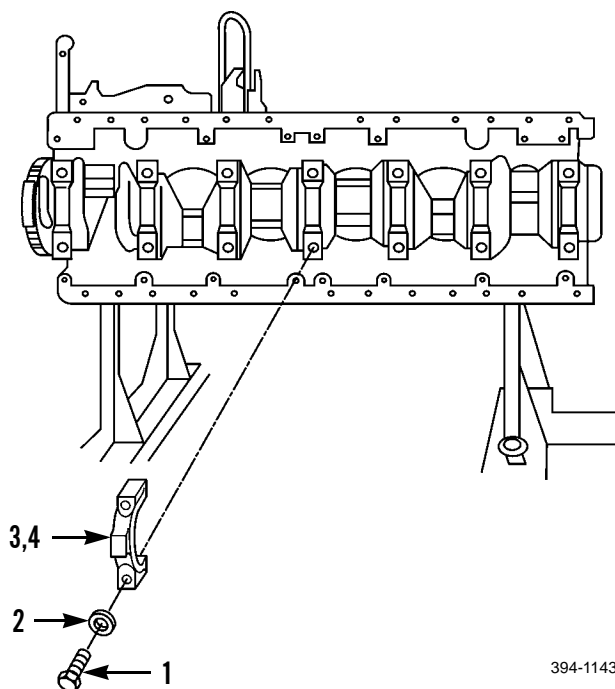
**CENTER AND INTERMEDIATE BEARINGS INSTALLATION**

1. Install two new thrust plates (5) on crankshaft journal at number 4 main bearing, if removed. Be sure sides of thrust plates (5) stamped "BLOCK SIDE" face cylinder block when installed.



394-1144

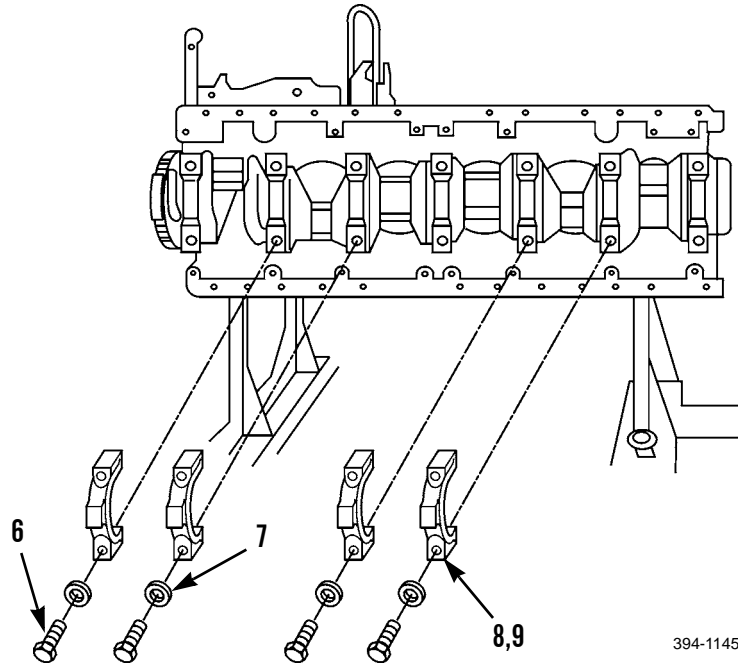
2. Use clean engine oil to lubricate two washers (2), bolts (1) and bearing (4).
3. Install bearing cap (3) assembly on crankshaft.
4. Install two washers (2) and bolts (1). Hand-tighten two bolts (1).



394-1143

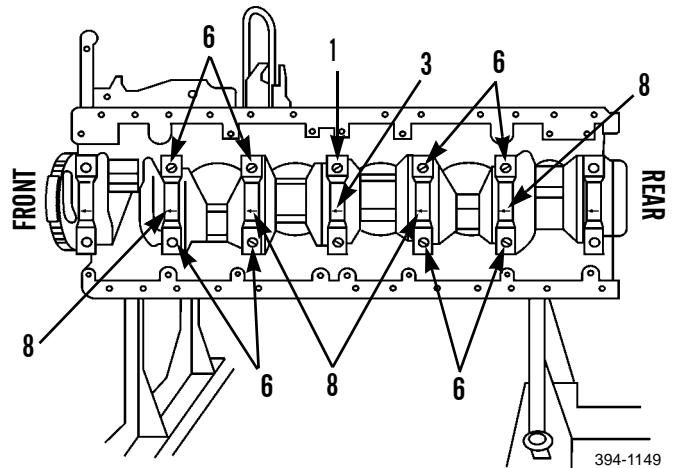
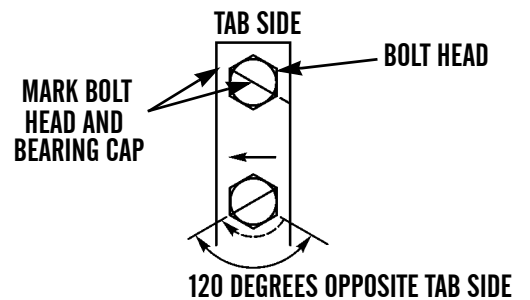
**CENTER AND INTERMEDIATE BEARINGS INSTALLATION - CONTINUED**

5. Install remaining bearing (9) and cap (8) assemblies.
6. Install eight washers (7) and bolts (6).



394-1145

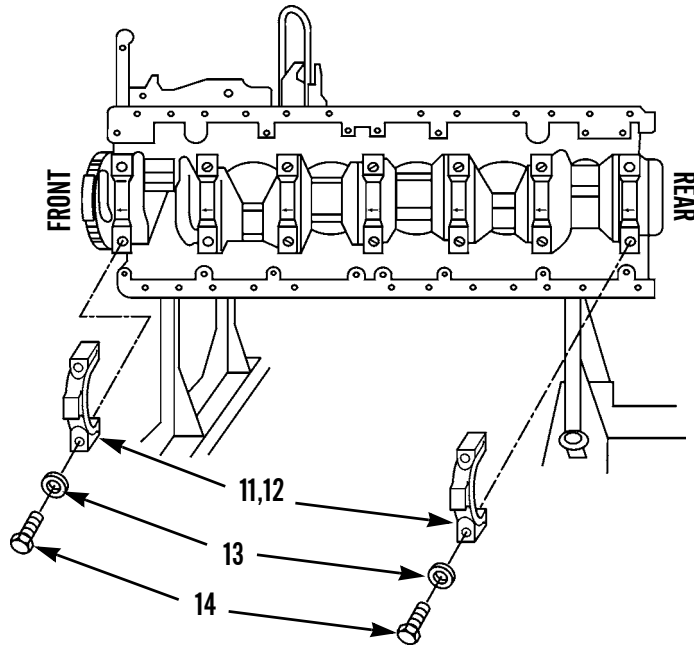
7. Torque bolt (1) at bearing tab side of bearing cap (3) and four bolts (6) at bearing tab side of bearing caps (8) to 190 lb-ft (258 Nm).
8. Torque bolt (1) opposite bearing tab side of bearing cap (3) and four bolts (6) opposite bearing tab side of bearing caps (8) to 190 lb-ft (258 Nm).
9. Use chalk to mark two bolts (1) and bearing cap (3).
10. Use chalk to mark eight bolts (6) and four bearing caps (8).
11. Tighten bolt (1) opposite bearing tab side of bearing cap (3) 120 degrees.
12. Tighten bolt (1) at bearing tab side of bearing cap (3) 120 degrees.
13. Repeat steps 10 and 11 to tighten eight bolts (6).



394-1149

**END BEARINGS REMOVAL**

1. Remove four bolts (14), washers (13) and two bearing cap (11) assemblies.
2. Remove and discard two lower half main bearings (12) from bearing caps (11).



394-1152

3. Install main bearing removal and installation tool in oil hole of crankshaft journal.

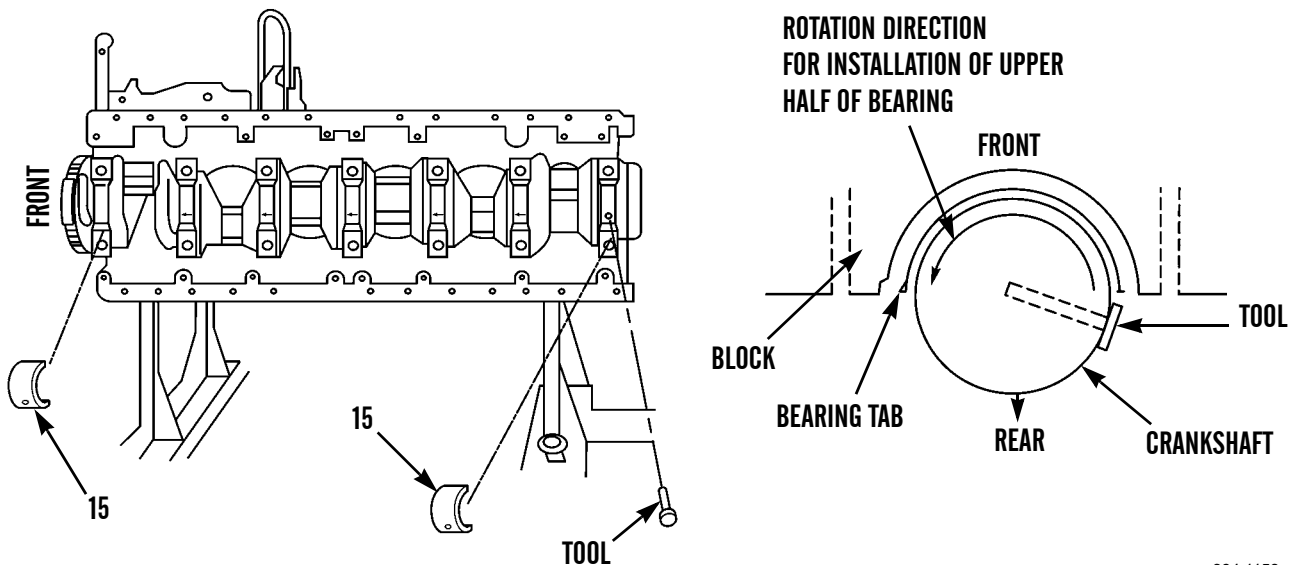
**END BEARINGS REMOVAL - CONTINUED****CAUTION**

Crankshaft must be rotated in direction of normal engine rotation when removing upper half main bearings. Engine rotation is counterclockwise when viewed from rear of engine. Failure to follow this procedure could result in damage to the block, crankshaft, or both.

4. Rotate crankshaft counterclockwise to remove and discard two upper half main bearings (15).
5. Remove main bearing removal and installation tool from oil hole of crankshaft journal.

**END BEARINGS ADJUSTMENT**

1. Install main bearing removal and installation tool in oil hole of crankshaft journal.
2. Use clean engine oil to lubricate two new upper half main bearings (15) and corresponding crankshaft journal.
3. Position two new upper half main bearings (15) in cylinder block above crankshaft journal with bearing tab toward tab locator on cylinder block.



394-1153

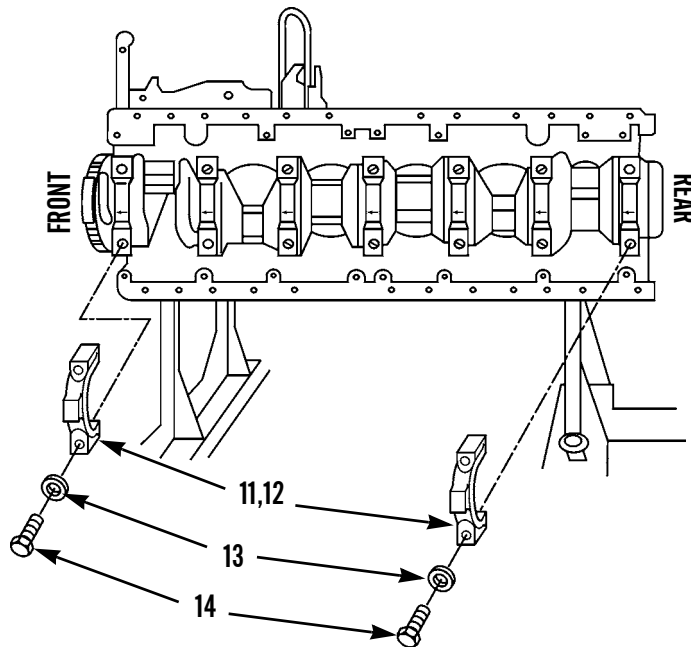
**CAUTION**

When installing bearings in cylinder block, crankshaft must be rotated in opposite direction from normal engine rotation. Failure to follow this procedure could result in damage to block, crankshaft, or both.

4. Rotate crankshaft clockwise to push two new upper half main bearings (15) into position.
5. Remove main bearing removal and installation tool from oil hole in crankshaft journal.

**END BEARINGS ADJUSTMENT - CONTINUED**

6. Position two new lower half main bearings (11) in bearing caps (12).
7. Position bearing clearance gage 1-1/2 in. long on surface of each of two new lower half main bearings (11).
8. Position two bearing cap (12) assemblies and bearing clearance gage on crankshaft, and align holes in bearing caps (12) with holes in cylinder block.
9. Use clean engine oil to lubricate four bolts (14).
10. Install and hand-tighten four bolts (14).
11. Torque two bolts (14) at bearing tab side of bearing caps (12) to 190 lb-ft (258 Nm).
12. Torque two bolts (14) opposite bearing tab side of bearing caps (12) to 190 lb-ft (258 Nm).
13. Use chalk to mark four bolts (14) and two bearing caps (12).
14. Tighten two bolts (14) opposite tab side of bearing caps (12) 120 degrees.
15. Tighten two bolts (14) at bearing tab side of bearing caps (12) 120 degrees.
16. Remove four bolts (14) and two bearing cap (12) assemblies from crankshaft.

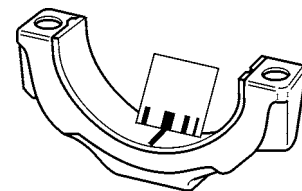


394-1152

17. Use the scale provided to measure thickness of each bearing clearance gage. Record measurement.

**NOTE**

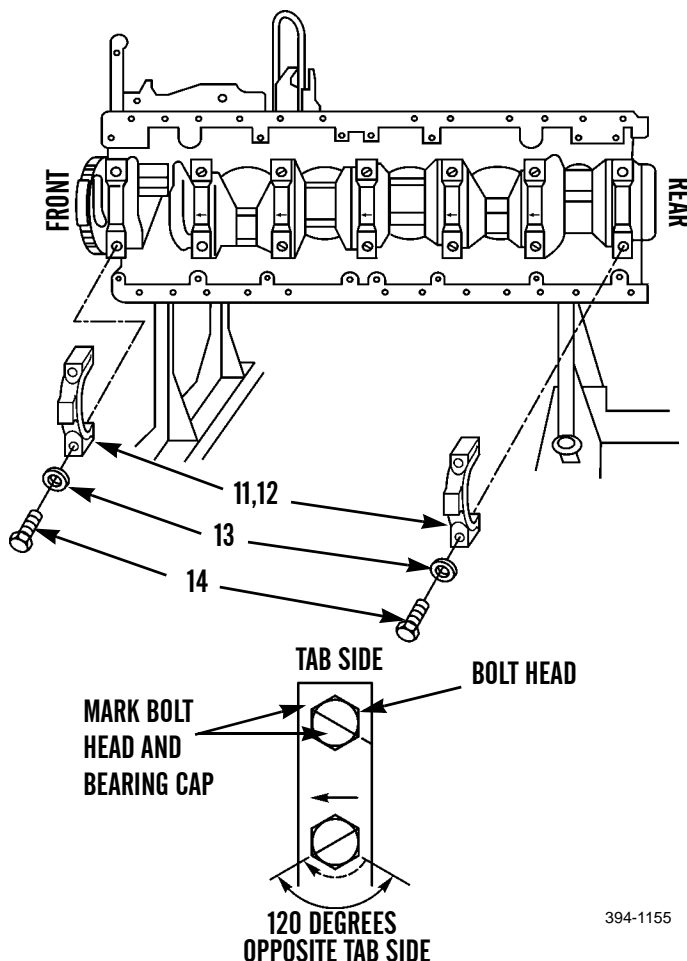
Thickness of bearing clearance gage must be within range of 0.0037-0.0068 in. (0.005-0.009 mm). If measurement exceeds this range, replace crankshaft (WP 0346 00). If not, proceed to *End Bearings Installation*.



394-1151

**END BEARINGS INSTALLATION**

1. Use clean engine oil to lubricate four washers (13), bolts (14) and two bearings (11).
2. Position two bearing cap (12) assemblies under corresponding crankshaft journals and align holes in two bearing caps (12) with holes in cylinder block.
3. Install and hand-tighten four washers (13) and bolts (14).
4. Torque two bolts (14) at bearing tab side of bearing caps (12) to 190 lb-ft (258 Nm).
5. Torque two bolts (14) opposite bearing tab side of bearing caps (12) to 190 lb-ft (258 Nm).
6. Use chalk to mark four bolts (14) and two bearing caps (12).
7. Tighten two bolts (14) opposite tab side of bearing caps (12) 120 degrees.
8. Tighten two bolts (14) at bearing tab side of bearing caps (12) 120 degrees.



394-1155

9. Install oil pump (WP 0267 00).
10. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**PISTON AND CONNECTING ROD MAINTENANCE****0348 00****THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning, Inspection, Assembly, Installation

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop: basic (Item 104, WP 0338 00)

Compressor, piston ring (Item 14, WP 0338 00)

Expander, piston ring (Item 20, WP 0338 00)

Handle, driver (Item 35, WP 0338 00)

Keystone, ring groove (Item 49, WP 0338 00)

Plate, intermediate, friction clutch (Item 70, WP 0338 00)

Plate, intermediate, friction clutch (Item 71, WP 0338 00)

Press (Item 75, WP 0338 00)

14 3/4 x 3NF bolts

Washer, copper 3/4 in.

Dowel, wood

Fine wire

Gage, bore

Tool, groove cleaning

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Bearing, pin (6)

Ring, piston (12)

Ring, oil (6)

**Personnel Required**

Two

**References**

WP 0342 00

WP 0346 00

TM 5-3805-248-10

**Equipment Condition**

Engine removed (WP 0257 00)

Cylinder head removed (WP 0259 00)

Oil pump removed (WP 0267 00)

**REMOVAL****CAUTION**

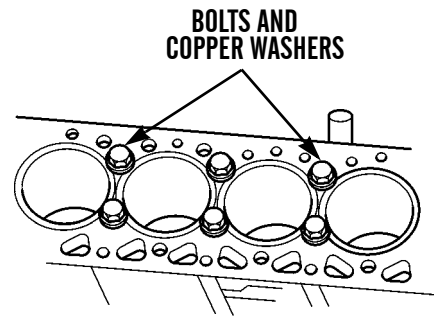
- Ridge reamer must NOT be used to remove the carbon ridge at top of cylinder wall. If necessary to remove the carbon ridge from cylinder liner, install new piston, liner, rings, retainers, gasket, rod, and pin. Refer to WP 0342 00 if liners require replacement.
- To prevent warping plate, tighten bolts twice, to specified torque. Copper washers must be used to prevent damage to plate.

**NOTE**

- The following maintenance procedure is for one piston and connecting rod set. The maintenance procedure for the remaining piston and connecting rod sets is identical.

**REMOVAL - CONTINUED**

1. Install 14-3/4 x 3NF bolts and 28-3/4 in. copper washers in block to secure top plate and six cylinder liners. Use two washers for each bolt. Torque 14-3/4 x 3NF bolts to 15 lb-ft (20 Nm), then once again to 40 lb-ft. (54 Nm).



394-1156

**NOTE**

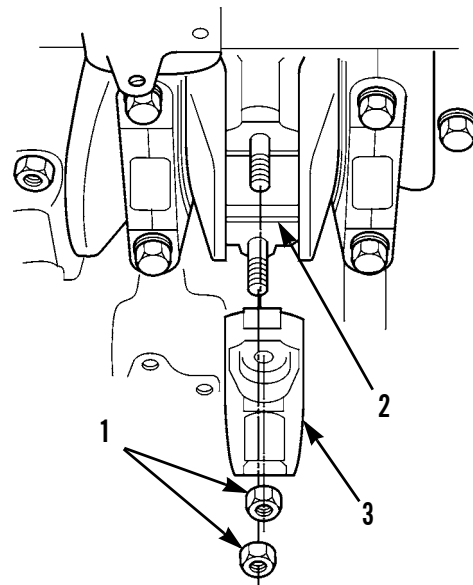
Repeat steps 2 through 6 for removal of remaining piston and connecting rod sets. Keep all sets separated and tag for identification.

2. From front of cylinder block, rotate crankshaft counterclockwise until two connecting rods are at bottom dead center.

**NOTE**

Inspect two connecting rods and cap for identifying mark. If no mark is present, scribe or stamp numbers to ensure proper installation in original location.

3. Remove two nuts (1) and cap (3) assembly from connecting rod (2) journal.



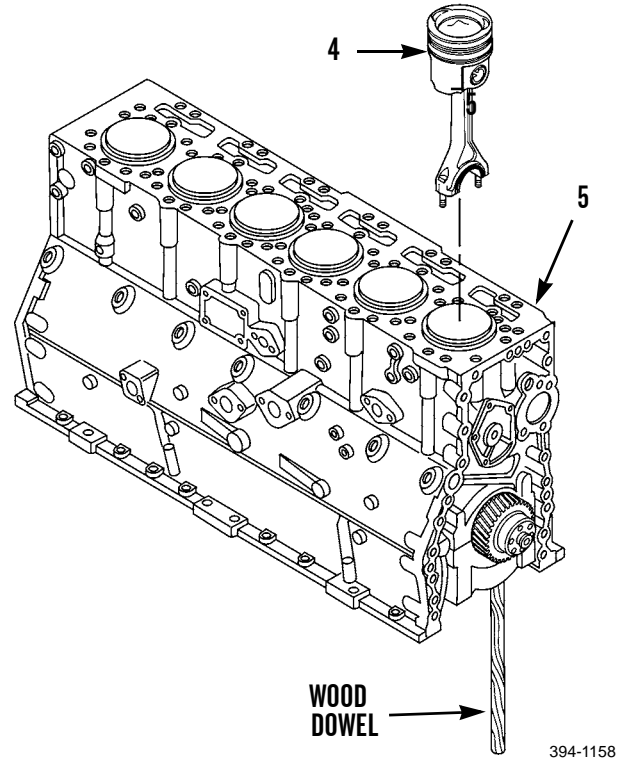
394-1157

**REMOVAL - CONTINUED**

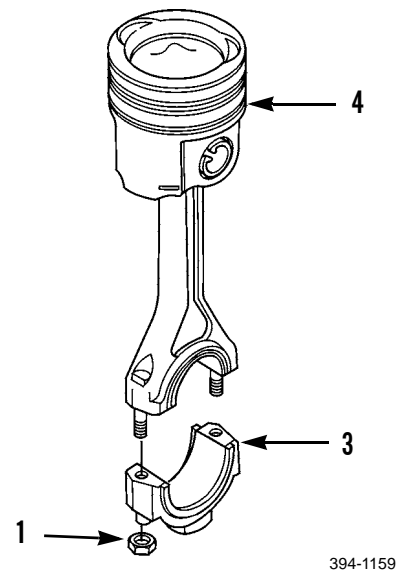
4. Use wood dowel to push up on piston (4) assembly.
5. Remove piston (4) assembly through top of cylinder block.

**NOTE**

Tag each piston and connecting rod set to ensure correct installation.



6. Install cap (3) assembly and two nuts (1) on piston (4) assembly to prevent possible mismatching during assembly.

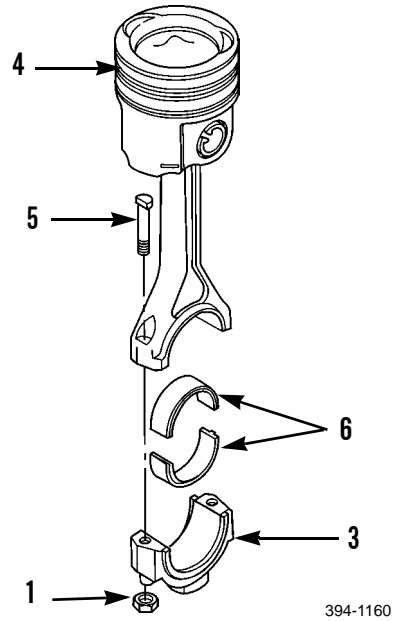


**DISASSEMBLY**

**NOTE**

- Repeat steps 1 through 7 for disassembly and remaining piston and connecting rod sets. Keep all sets separated and tag for identification.
- Tag each piston and connecting rod set to ensure correct assembly.

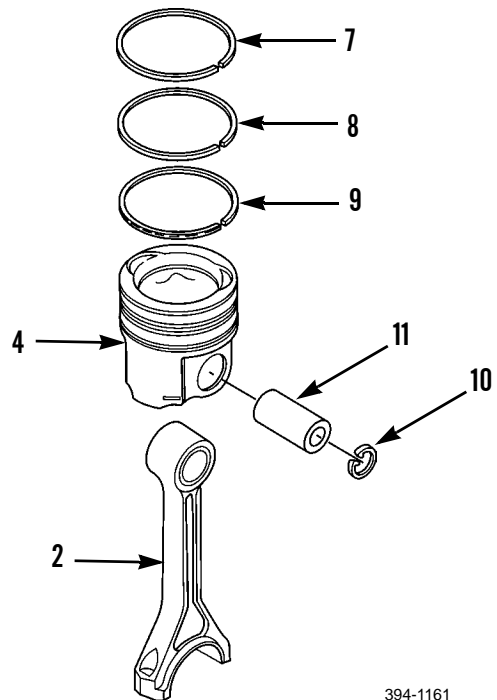
1. Remove two nuts (1), cap (3) assembly and two bolts (5).
2. Remove one of two bearings (6) from cap (3).
3. Remove remaining bearing (6) from piston (4) assembly.



**CAUTION**

Piston ring expander must be used to remove rings. Use of any other tool may cause damage to piston lands.

4. Remove and discard top piston ring (7), second piston ring (8) and oil ring (9) from piston (4).
5. Use retaining ring pliers to remove two retaining rings (10).
6. Remove pin (11) and piston (4) from connecting rod (2) assembly.

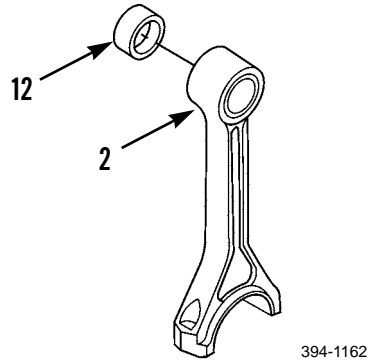


**DISASSEMBLY - CONTINUED**

**NOTE**

Remove piston pin bearing only if inspection indicates replacement is necessary.

7. Use press rod to remove pin bearing (12) from connecting rod journal (2), if necessary.

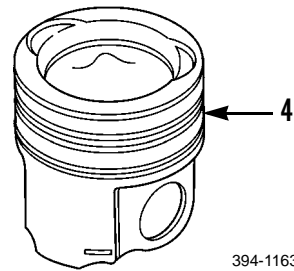


**CLEANING**

**NOTE**

Repeat steps 1 through 5 for all piston and connecting rod sets. Keep sets separated and tag for identification.

1. Remove carbon from piston (4), being careful not to scratch piston.
2. Use groove cleaning tool to remove any carbon or residue from piston ring grooves.
3. Use a small drill or fine wire to remove carbon or residue from piston oil hole.



**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 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.

4. Clean all parts with solvent.
5. Dry all parts with compressed air.

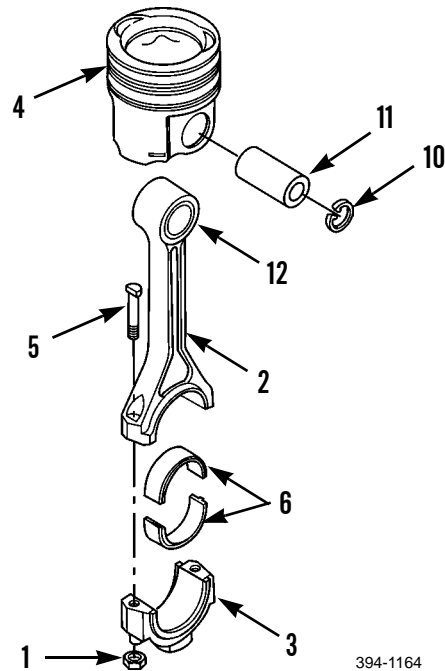
**INSPECTION**

1. Inspect two nuts (1) and bolts (5). Replace if cracked, broken, distorted or threads damaged.
2. Inspect cap (3) and connecting rod (2). Replace as an assembly if cracked, pitted, scored or excessively worn.
3. Inspect two bearings (6). Replace if scored, cracked, pitted, flaked or showing signs of overheating.
4. Inspect two retaining rings (10). Replace if damaged or if resiliency is lost.

**NOTE**

Discard and replace pin if outside diameter is less than 1.9996 in. (50.7898 mm).

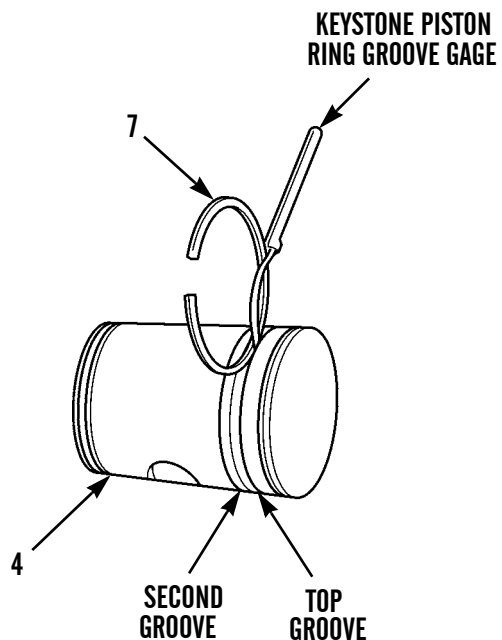
5. Inspect pin (11). Use micrometer to measure outside diameter of pin (11).
6. Inspect piston (4). Replace if cracked, scored, grooves damaged or shows signs of overheating. If not, proceed to step 7.
7. Use bore gage to measure pin bore in piston (4) in two places, 90 degrees apart.



394-1164

**INSPECTION - CONTINUED****NOTE**

- Reference diameter for new piston is  $2.0006 \pm 0.0003$  (50.8152 $\pm$ 0.0076 mm); reference diameter for new pin is  $1.998 + 0.0002$  (50.7492 $\pm$ 0.00508 mm). Maximum distance between pin bearing and worn pin is 0.003 in. (0.0762 mm). Replace piston if dimension is not correct. If correct, proceed to step 8.
  - Piston is reusable if there is clearance between flat edge of gage and piston, for both grooves. Replace piston if flat edge of gage contacts piston at any of the four test points in either groove.
8. Use keystone piston ring groove gage and piston ring (7) to measure top two ring grooves of piston (4). Put pin end of gage in piston groove at four places. Check both grooves.
  9. Inspect top and second ring grooves of piston (4) for burrs and closed oil holes. Remove burrs and clean oil holes, if necessary.



394-1165

**INSPECTION - CONTINUED****NOTE**

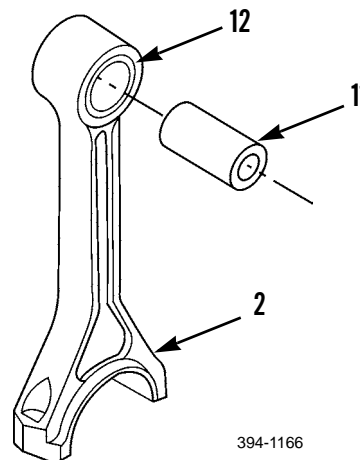
If replacement is necessary, proceed to step 15. If not, proceed to step 11.

10. Inspect pin bearing (12). Replace if scored, cracked, pitted, flaked or showing signs of overheating.
11. Install new pin (11), if removed, in connecting rod (2) assembly.

**NOTE**

Maximum permissible distance between worn pin and pin bearing is 0.0003 in. (0.0762 mm). If measurements exceed 0.0003 in. (0.0762 mm), remove and discard pin (11) and proceed to step 15.

12. Use feeler gage to measure clearance between new pin (11) and pin bearing (12).
13. Install new pin (11), if removed, in connecting rod (2) assembly.
14. Use feeler gage to measure clearance between new pin (11) and pin bearing (12). If measurement exceeds 0.0003 in. (0.00762 mm), proceed to step 15.

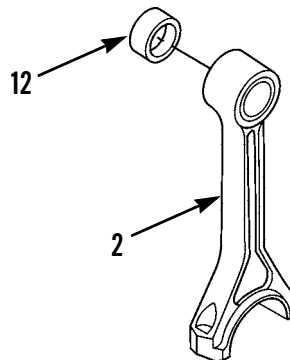


394-1166

**NOTE**

Perform following step only if piston pin bearing needs replacement.

15. Use handle and drive plate and press group to remove pin bearing (12) from connecting rod (2). Discard pin bearing (12).



394-1162

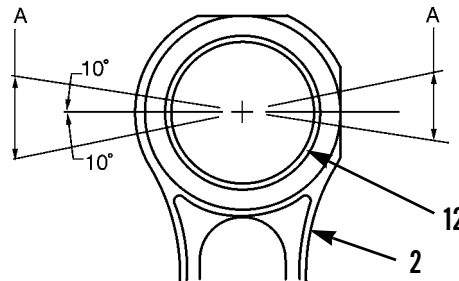


**INSPECTION - CONTINUED**

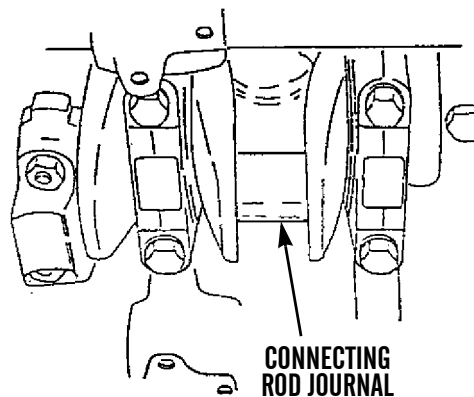
**NOTE**

Connecting rod must be heated for installation of piston pin bearing. Do not use torch.

16. Use oven to heat connecting rod (2) to 350-500°F (176-260°C).
17. Position new piston pin bearing (12) within areas "A" 90 degrees±10 degrees from centerline through bore of connecting rod (2).
18. Use handle and drive plate and press group to install new pin bearing (12). Align oil holes.
19. Use boring machine to bore new pin bearing (12) to 2.0012±0.0003 in (50.8304 mm±0.00762 mm).
20. Use micrometer to measure connecting rod journal taper from front to rear of journals on crankshaft. If taper exceeds 0.0008 in. (0.0203 mm), grind crankshaft journals (WP 0346 00).
21. Use micrometer to measure out-of-roundness in connecting rod journals (12) on crankshaft. Check 90 degrees from points checked in step 19. If out-of-roundness exceeds 3.8208 in. (97.0483 mm), refer to WP 0346 00.
22. Repeat steps 1 through 21 for the remaining piston and connecting rod sets.



394-1167



394-1168

**ASSEMBLY**

**CAUTION**

Piston ring expander must be used to install rings. Use of any other tool could cause damage to piston lands.

**NOTE**

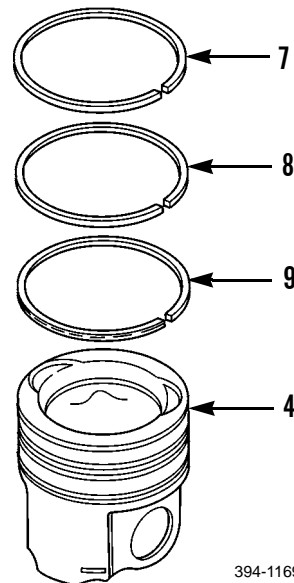
Check piston and connecting rod sets before assembly to ensure that parts are matched correctly.

1. Use piston ring expander to install new oil ring (9) on lowest groove on piston (4).

**NOTE**

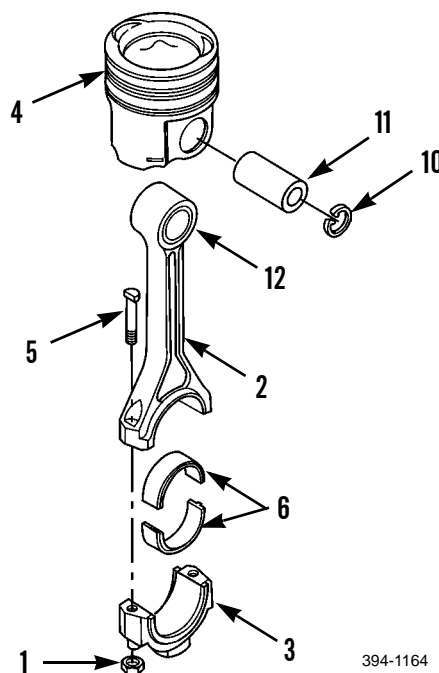
The top and second piston rings are marked "UP-1" and "UP-2". These marks must be on top of ring when installed and "UP-1" must be top ring.

2. Use piston ring expander to install new piston ring (8), facing up.
3. Use piston ring expander to install new top piston ring (7), UP-1 facing up.
4. Stagger gaps in new piston rings (7 and 8) and new oil ring (9) 120 degrees.



394-1169

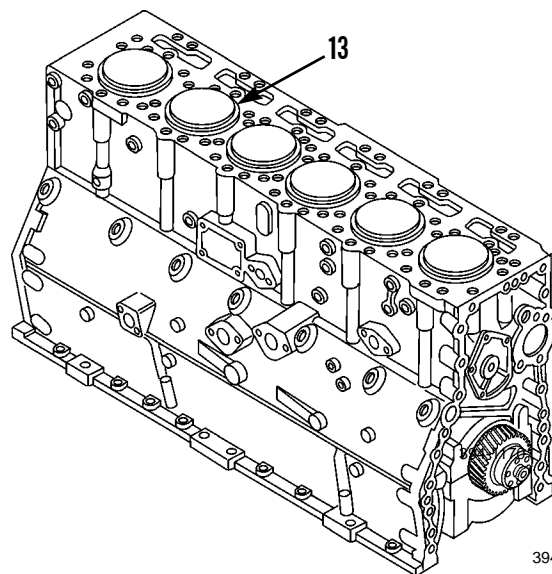
5. Position piston (4) on connecting rod (2) assembly. Be sure bearing tab groove on connecting rod (2) is on same side as valve cutouts in head of piston (4).
6. Use clean oil to lubricate pin (11).
7. Install pin (11) through piston (4) and bearing (12) in connecting rod (2).
8. Use retaining ring pliers to install two retaining rings (10).
9. Use clean engine oil to lubricate two bearings (6).
10. Install one of two bearings (6) in connecting rod (2) and remaining bearing (6) in cap (3). Slide two bearings (6) into position. To prevent bending of bearings (6), do not push on centers when installing.
11. Install two bolts (5) in connecting rod (2).



394-1164

**INSTALLATION**

1. From front of engine, rotate crankshaft counterclockwise until bearing journal for piston to be installed at bottom dead center.
2. Use clean oil to lubricate cylinder liner (13).



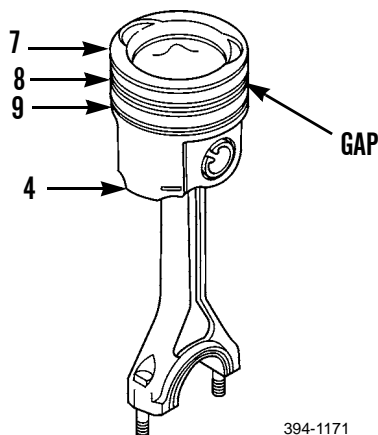
394-1170

3. Dip piston (4) assembly in clean engine oil.

**NOTE**

Make sure gaps are 120 degrees apart.

4. Inspect piston rings (7 and 8) and oil ring (9).



394-1171

**CAUTION**

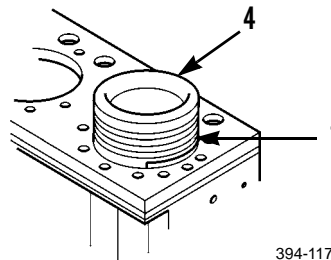
Be sure connecting rod bolts do not damage cylinder liner.

5. Insert piston (4) assembly in cylinder liner. "V" mark on piston must be in alignment with "V" mark on cylinder block. Rest piston on oil ring (7).

**NOTE**

Piston rings must be fully seated in grooves of piston before installation of ring compressor.

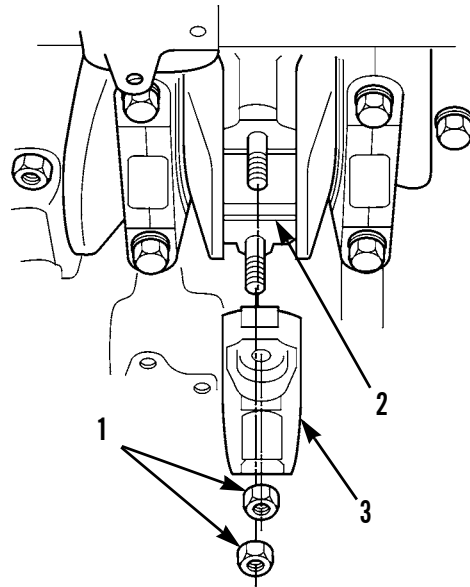
6. Use piston ring compressor to install piston (4) assembly in cylinder liner.



394-1172

**INSTALLATION - CONTINUED**

7. Put piston into place while assistant guides connecting rod journal (2) into position on crankshaft.
8. Use clean lubricating oil to lubricate connecting rod journal (2), cap (3) assembly and two nuts (1).
9. Install cap (3) assembly and two nuts (1). Tighten two nuts (1) to 60 lb-ft (81 Nm).

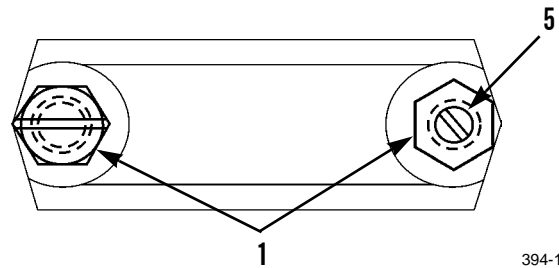


394-1157

10. Use a paint marker to mark each of two nuts (1) and ends of two bolts (5). Tighten two nuts (1) an additional 120 degrees.

**NOTE**

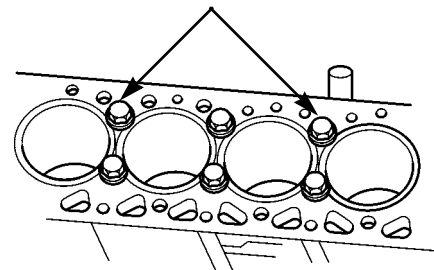
Repeat steps 1 through 21 for the remaining piston and connecting rod sets.



394-1173

11. Remove 14 3/4 x 3NF bolts and 28 3/4 in. copper washers from top of cylinder block.

**BOLTS AND  
COPPER WASHERS**



394-1156

12. Install oil pump (WP 0267 00).
13. Install cylinder head (WP 0259 00).
14. Install engine (WP 0257 00).
15. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)  
 Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)  
 Tag, marker (Item 42, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

Rocker shafts and push rods removed (WP 0265 00)

**DISASSEMBLY**

**NOTE**

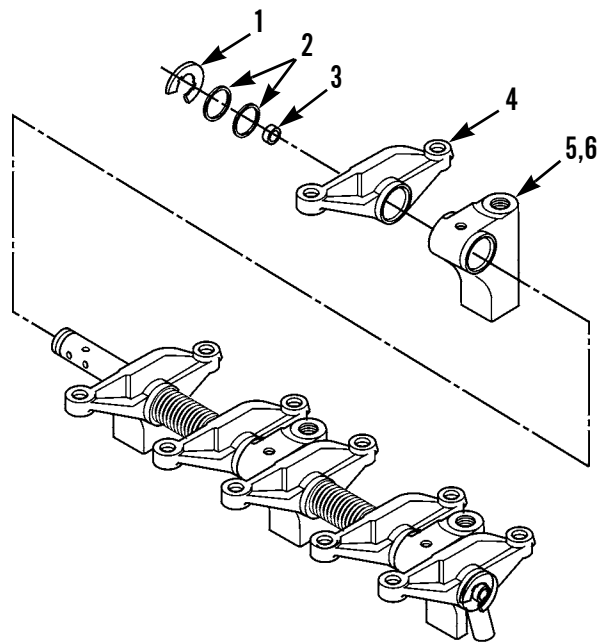
The following maintenance procedure is for the front bank rocker shaft assembly. The maintenance procedure for the rear bank rocker shaft assembly is identical.

1. Remove retaining ring (1), two washers (2) and plug cup (3).

**NOTE**

Tag all rocker arms and brackets during disassembly to aid in assembly.

2. Remove rocker arm (4) and bracket (5) assembly.
3. Remove dowel pin (6) from bracket (5).



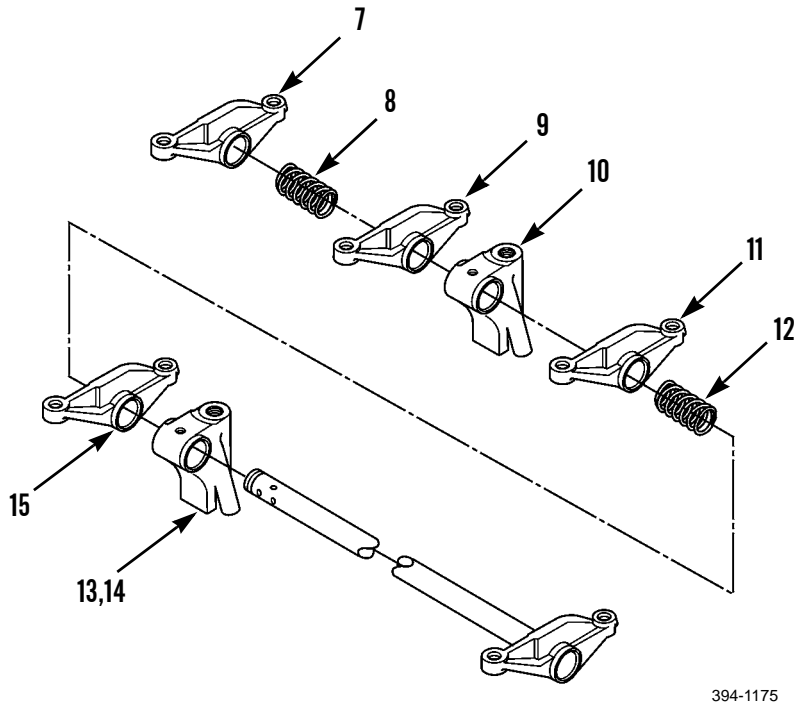
394-1174

## ROCKER ARMS REPAIR - CONTINUED

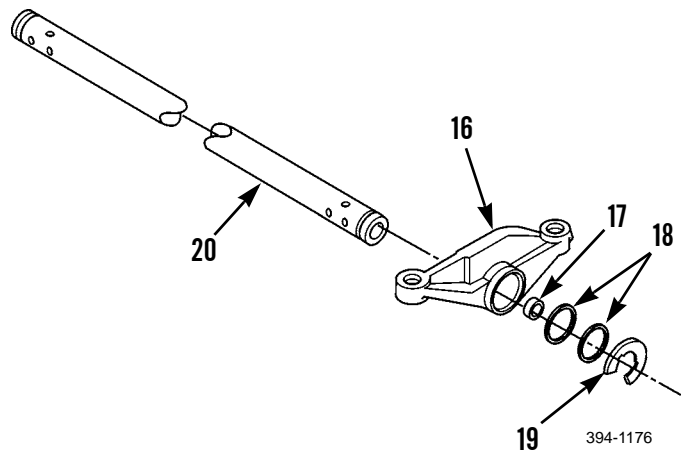
0349 00

**DISASSEMBLY - CONTINUED**

- Remove rocker arm (7), spring (8), rocker arm (9), bracket (10), rocker arm (11), spring (12), rocker arm (15) and bracket (13) assembly. Bracket (10) does not have a dowel pin.
- Remove dowel pin (14) from bracket (13).



- Remove rocker arm (16), plug cup (17), two washers (18) and retaining ring (19) from shaft (20).



**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 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.

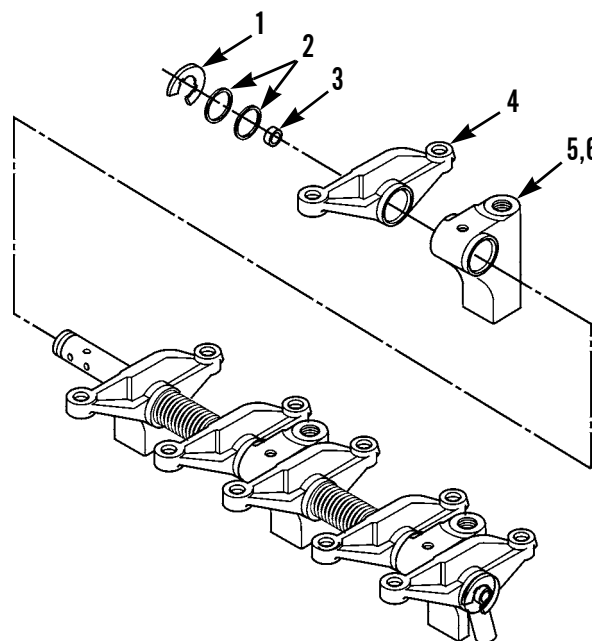
1. Clean all parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

**NOTE**

All rocker arms and brackets must be assembled in original positions.

1. Install rocker arm (16), plug cup (17), two washers (18) and retaining ring (19) on shaft (20).
2. Install dowel pin (14) in bracket (13).
3. Install bracket (13) assembly, rocker arm (15), spring (12), rocker arm (11), bracket (10), rocker arm (9), spring (8) and rocker arm (7). Bracket (10) does not have a dowel pin.
4. Install dowel pin (6) in bracket (5).
5. Install bracket (5) assembly, rocker arm (4), plug cup (3), two washers (2) and retaining ring (1).



394-1174

6. Install rocker shafts and push rods (WP 0262 00).
7. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**





**THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning, Inspection, Assembly, Installation

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop: basic (Item 104, WP 0338 00)

Pinion turning tool (Item 67, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Gasket

**References**

WP 0278 00

TM 5-3805-248-10

**Equipment Condition**

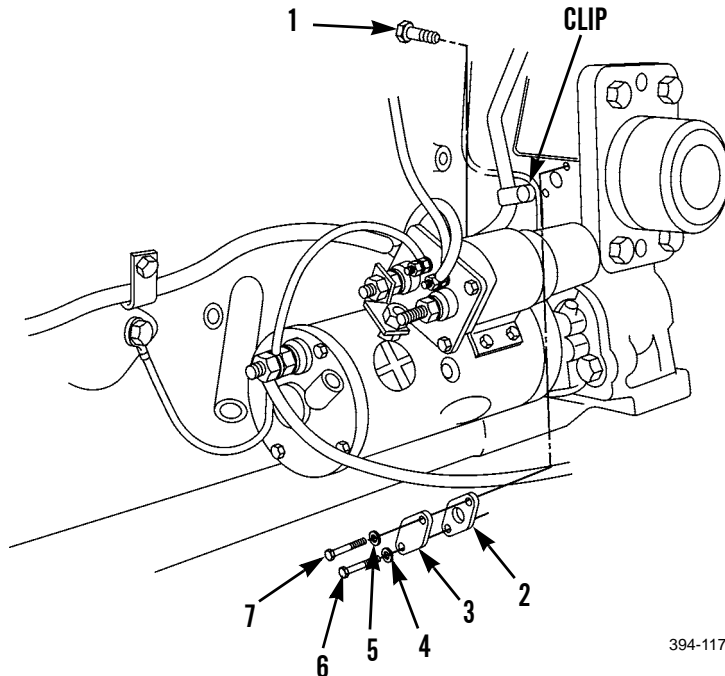
Engine removed (WP 0257 00)

Engine front cover removed (WP 0340 00)

Valve lifters removed (WP 0264 00)

**REMOVAL**

1. Remove timing bolt (6), washer (4) and clip from left side of flywheel housing. Leave clip attached to harness.
2. Remove bolt (7), washer (5), cover (3) and gasket (2). Discard gasket.
3. Remove plug (1).
4. Install engine turning tool through left side of flywheel housing until shoulder of engine turning tool is against flywheel housing. Engine turning tool engages ring gear on flywheel housing.



394-1177

**REMOVAL - CONTINUED**

5. Insert 1/2 in. ratchet in engine turning tool.
6. Position timing bolt (6) and locate against flywheel housing.

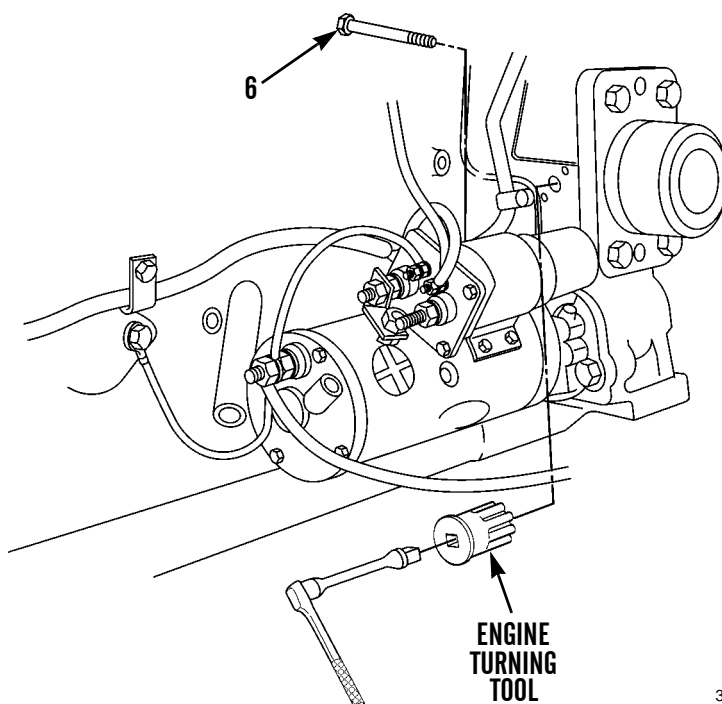
**NOTE**

When direction of engine rotation is specified, engine is viewed from rear.

7. Rotate 1/2 in. ratchet on engine counterclockwise while holding timing bolt (6) in position. Stop turning when timing bolt (6) can be threaded into hole in flywheel housing. Hand-tighten timing bolt (6).

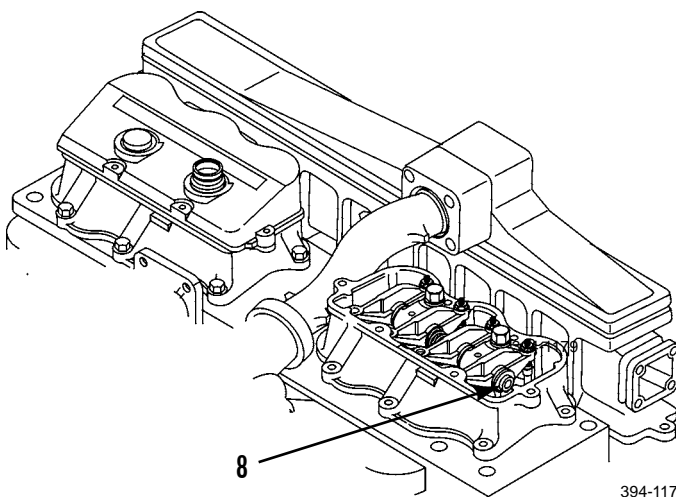
**NOTE**

If engine is turned past timing hole, rotate clockwise 30 degrees, then repeat step 7.



394-1178

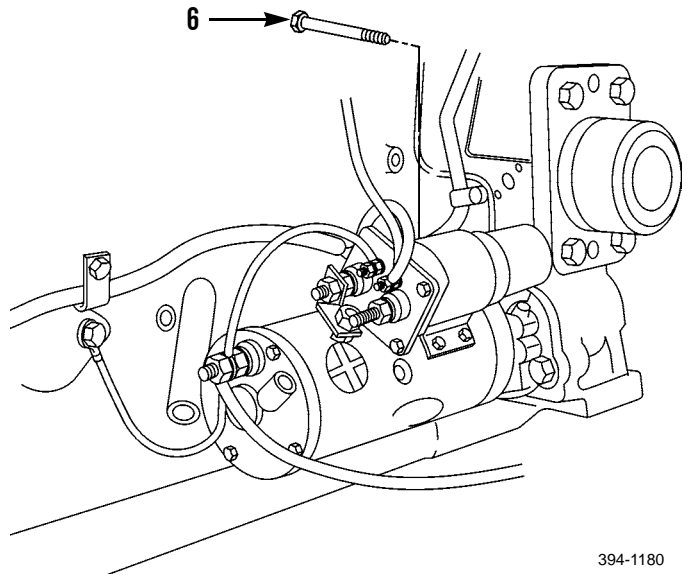
8. Pivot number one rocker arm (8) up and down on shaft by hand. If number 1 rocker arm can be moved by hand, engine is in position for camshaft removal (top, center, number 1 piston compression stroke). Proceed to step 10. If number 1 rocker arm cannot be moved by hand, complete step 9.



394-1179

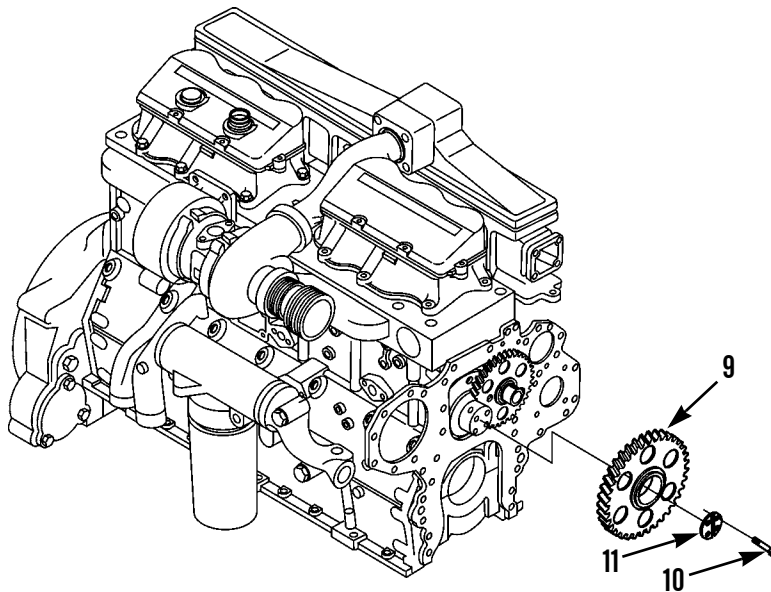
**REMOVAL - CONTINUED**

9. Remove timing bolt (6) and repeat steps 6 through 8.



394-1180

10. Remove four bolts (10), idler thrust plate (11) and idler gear (9).



394-1181

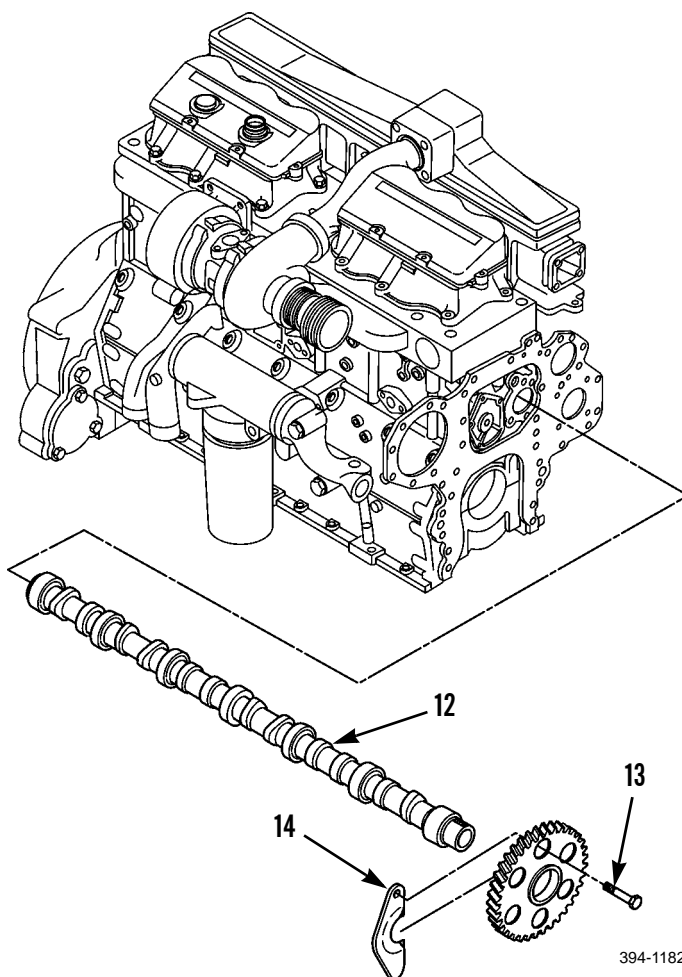
**REMOVAL - CONTINUED**

11. Remove two bolts (13) and camshaft thrust plate (14).

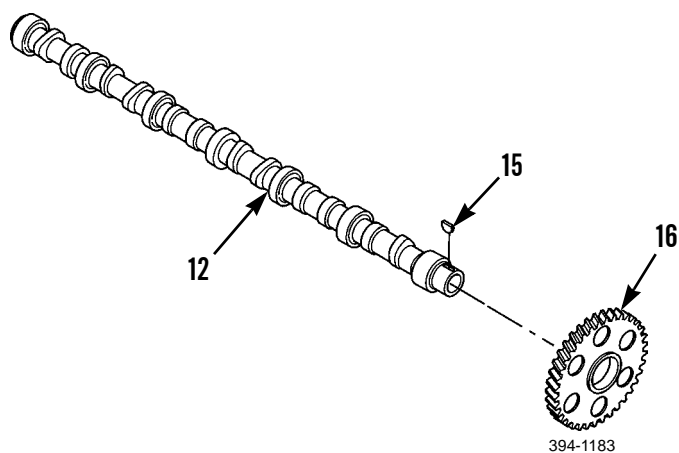
**CAUTION**

Exercise care when removing camshaft from engine block. Camshaft lobes and bearing journals must be protected against nicks and scrapes. Failure to follow this procedure could result in damage to equipment.

12. Remove camshaft (12) assembly from engine block.

**DISASSEMBLY**

1. Use gear puller to remove camshaft gear (16).
2. Remove key (15) from camshaft (12).



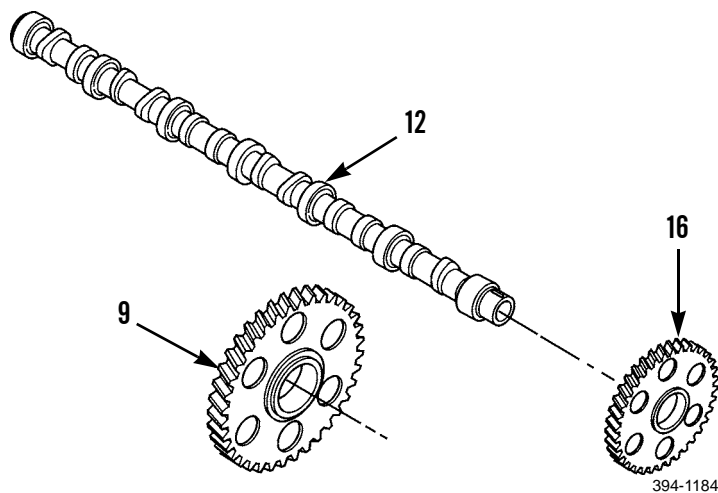
**CLEANING****WARNING**

- 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 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. Remove all gasket material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.

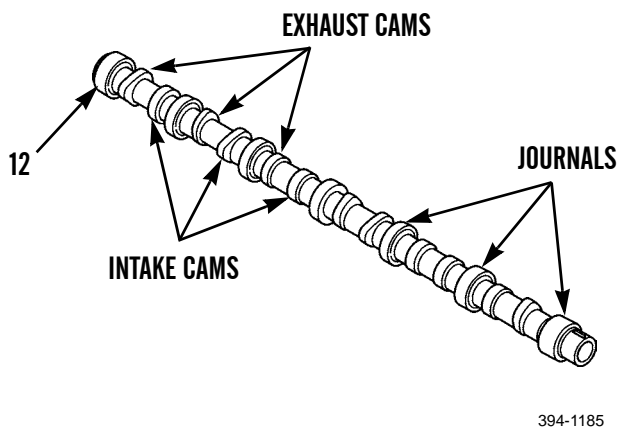
**INSPECTION**

1. Inspect gears (9 and 16). Replace if cracked, broken, distorted, teeth chipped or missing or if bore is damaged.
2. Visually inspect camshaft (12). Replace if journals are cracked, broken, or distorted, or if cams are scored or nicked.

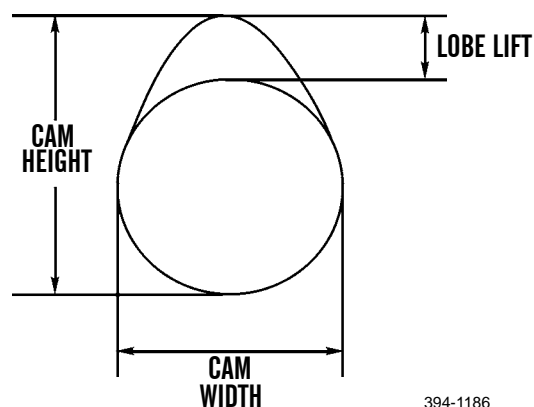


**INSPECTION - CONTINUED**

3. Use micrometer to measure journal diameters at each of the seven bearing locations on camshaft (12). Replace if any journal diameter is less than 2.7495 in. (69.8373 mm).
4. Use micrometer to measure and record cam height and width of each of the six intake and exhaust valve cams on camshaft (12).
5. Use measurements recorded in step 4 to determine camshaft lobe lift for each of the six intake and exhaust valve cams on camshaft (12) by subtracting cam width from cam height. Remainder is camshaft lobe lift. Replace camshaft (12) if any intake camshaft lobe lift is less than 0.3139 in. (7.973 mm) or if any exhaust camshaft lobe lift is less than 0.3408 in. (8.656 mm).



394-1185



394-1186

6. Inspect all other parts.

**ASSEMBLY**

**CAUTION**

Exercise care when installing key in camshaft. If necessary, tap key lightly with soft hammer to seat properly. Failure to follow this procedure could result in damage to equipment.

1. Install key (15) in camshaft (12).



**WARNING**

Use insulated, heat-resistant gloves or tongs to handle extremely hot components. Failure to follow these instructions may cause injury.

2. Use oven to heat camshaft gear (16) for a minimum of two hours to a maximum temperature of 500°F (260°C).

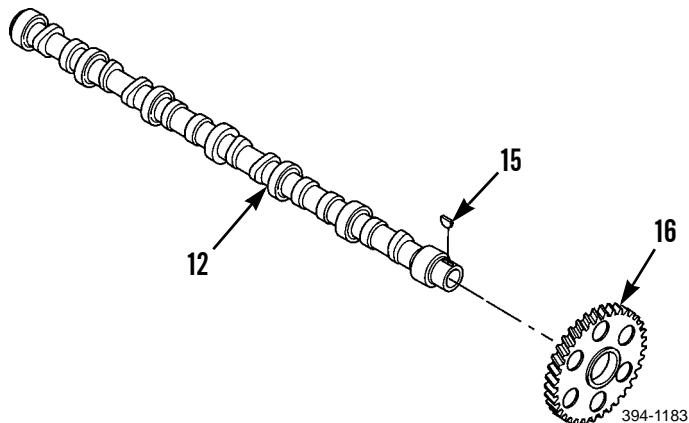
**ASSEMBLY - CONTINUED****CAUTION**

Exercise care when installing camshaft gear on camshaft. Camshaft gear must be thoroughly heated to install camshaft gear on camshaft. Do not strike camshaft gear with any object in an attempt to install it on camshaft. Failure to follow this procedure could result in damage to equipment.

**NOTE**

Be sure camshaft gear is flush with end of camshaft.

3. Install camshaft gear (16) on camshaft (12).



394-1183

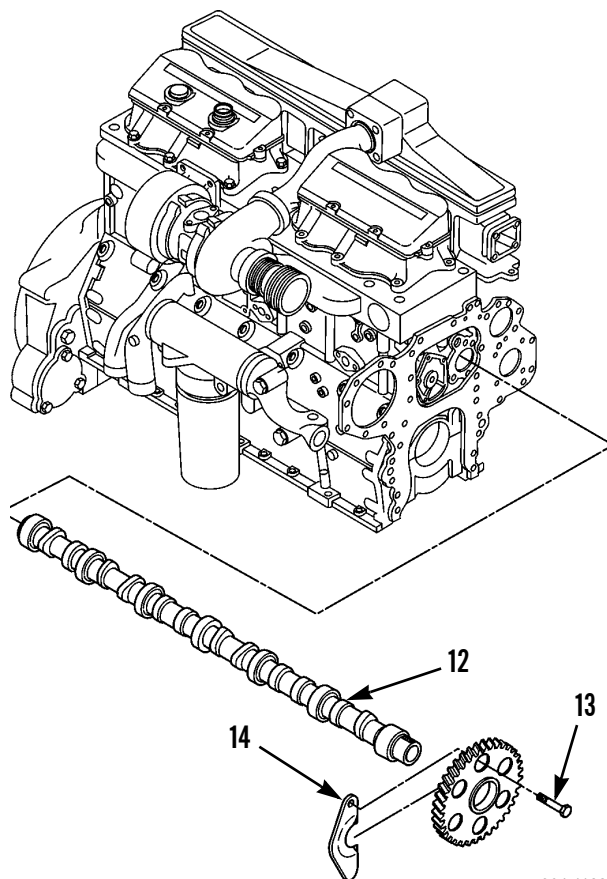
**INSTALLATION**

1. Use clean engine oil to lubricate lobes and journals of camshaft (12).

**CAUTION**

Exercise care when installing camshaft assembly into engine block. Do not nick or scratch cams or journals. Failure to follow this procedure could result in damage to equipment.

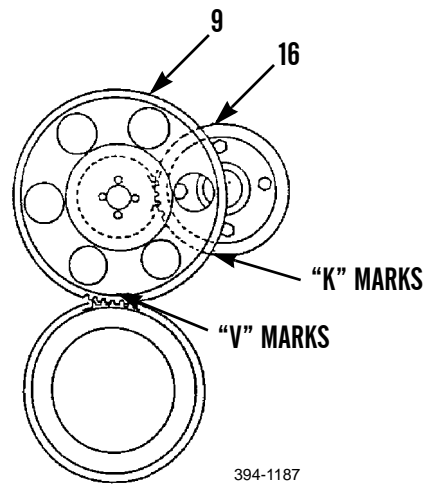
2. Install camshaft (12) assembly in engine block.
3. Install camshaft thrust plate (14) and two bolts (13).



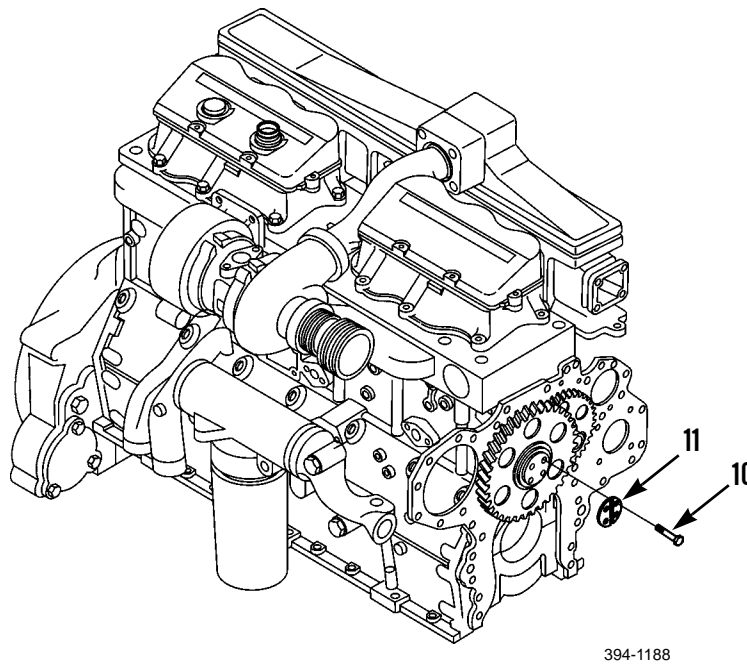
394-1182

**INSTALLATION - CONTINUED**

4. Position idler gear (9) on engine block. Align "V" mark on idler gear (9) with "V" mark on crankshaft gear. Align two "K" marks on camshaft gear (16) with right edge of idler gear (9).



5. Install thrust plate (11) and four bolts (10).



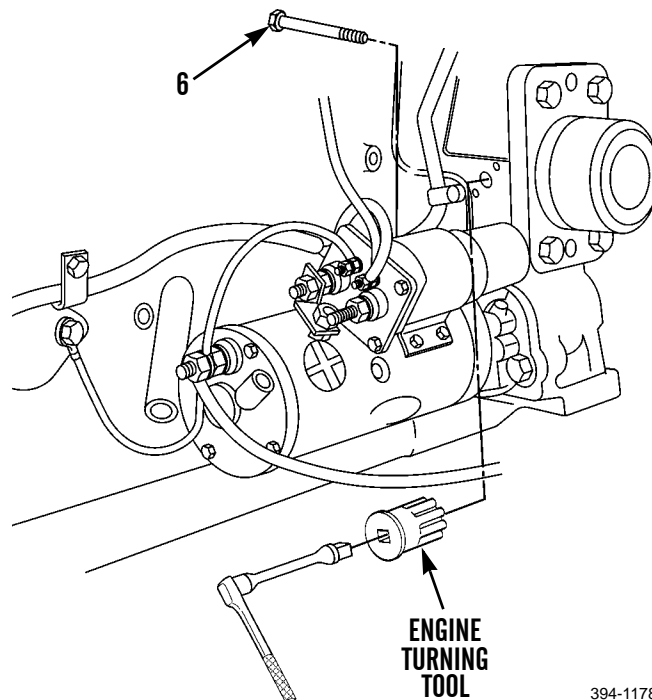


INSTALLATION - CONTINUED

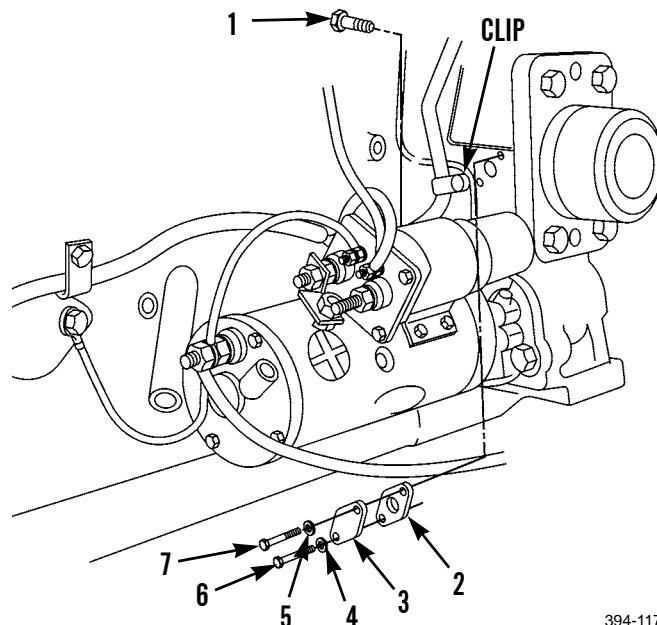
**CAUTION**

Before engine can be returned to service, the timing of the automatic timing advance unit must be checked. Refer to WP 0278 00.

6. Remove timing bolt (6).
7. Remove 1/2 in. ratchet and engine turning tool.



8. Install plug (1).
9. Install new gasket (2), cover (3), washer (5) and bolt (7).
10. Install clip, washer (4) and bolt (6).



11. Install engine (WP 0257 00).
12. Install engine front cover (WP 0340 00).
13. Install valve lifters (WP 0264 00).
14. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Driver kit, bearing (Item 18, WP 0338 00)

Magnet assembly (Item 54, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

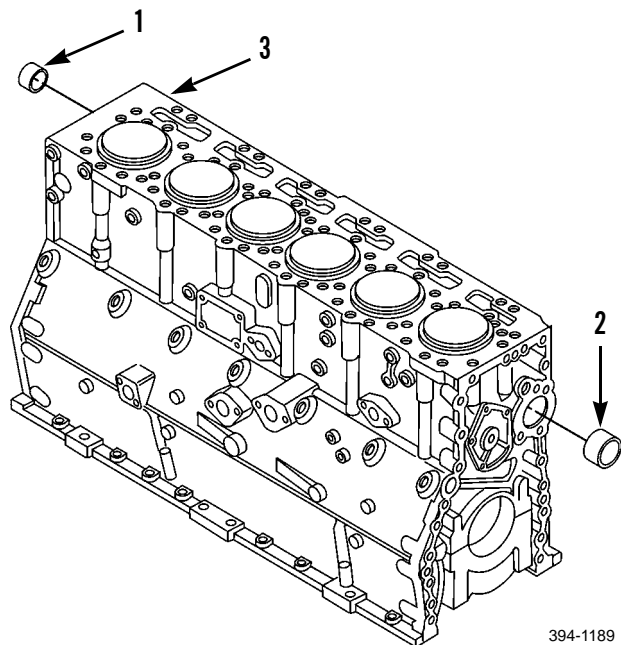
Flywheel housing removed (WP 0262 00)

Piston assemblies removed (WP 0348 00)

Camshaft removed (WP 0350 00)

**REMOVAL**

1. Remove and discard six sleeve bearings (1) from rear of cylinder block (3).
2. Remove and discard sleeve bearing (2) from front of cylinder block (3).



394-1189

**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 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.

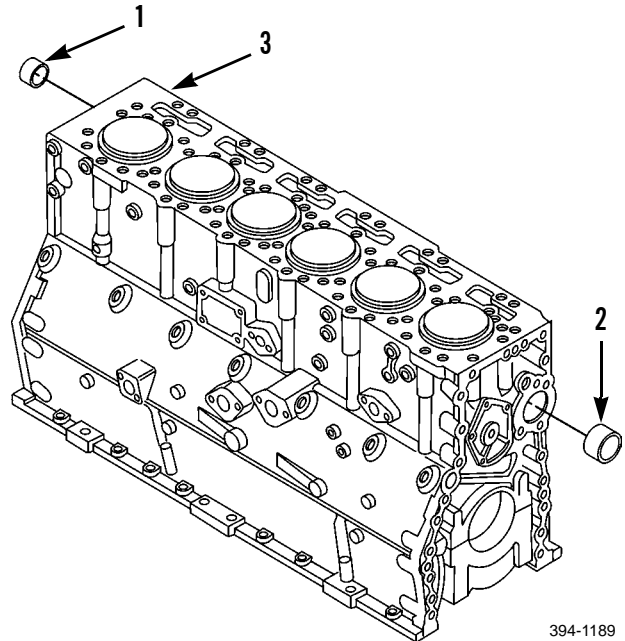
1. Clean all parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

**CAUTION**

All camshaft bearings must be installed with oil holes aligned with oil holes in cylinder block. Front bearings have two oil holes. Failure to follow this procedure could result in damage to equipment.

1. Install new sleeve bearing (2) in front of cylinder block (3).
2. Install six new sleeve bearings (1) in rear of cylinder block. Locate six new sleeve bearings (1) 0.11 in. (0.027 mm) from machined surface of cylinder block when installed.



394-1189

3. Install piston assembly (WP 0348 00).
4. Install camshaft (WP 0350 00).
5. Install flywheel housing (WP 0262 00).
6. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**IDLER GEAR REPLACEMENT**

0352 00

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Insertor, bearing and bushing (Item 44, WP 0338 00)

Handle, transfer pump (Item 36, WP 0338 00)

Plate, intermediate, friction clutch (Item 72, WP 0338 00)

Puller, mechanical (Item 87, WP 0338 00)

Step plate, mechanical puller (Item 109, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Bearing

**References**

WP 0278 00

TM 5-3805-248-10

**Equipment Condition**

Engine front cover removed (WP 0340 00)

No. 1 cylinder at top dead center (WP 0350 00)

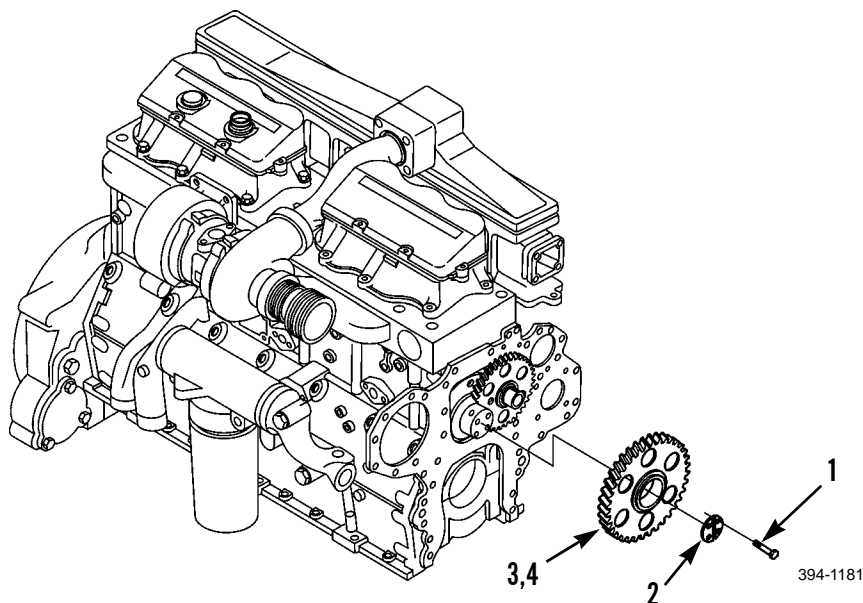
**REMOVAL**

1. Remove four bolts (1), plate (2) and gear (3) assembly.

**CAUTION**

Removal of bearing from idler gear will cause destruction of bearing. Remove bearing only if inspection proves necessary.

2. If damaged, remove and discard bearing (4) from gear (3).



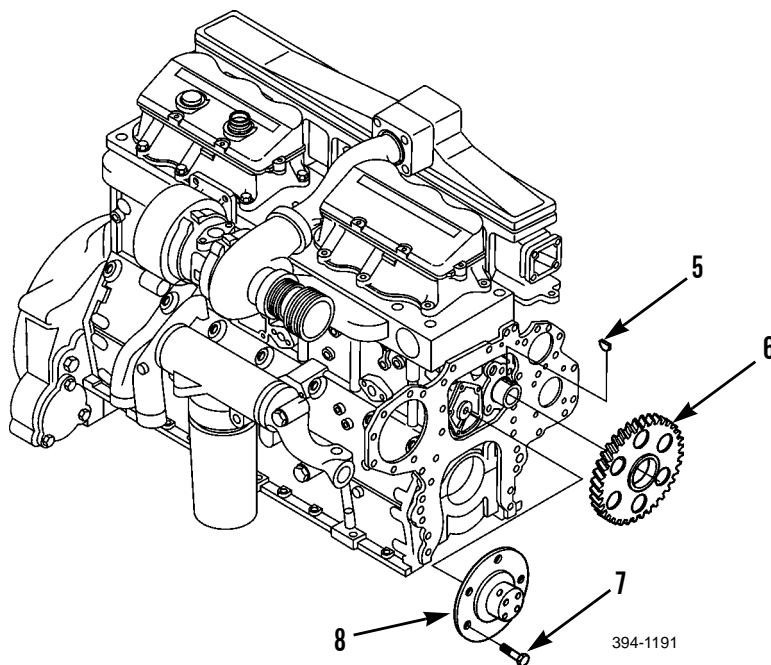
**REMOVAL - CONTINUED**

3. Remove camshaft gear (6).
4. Remove key (5).

**CAUTION**

Turning crankshaft when camshaft gear is removed can cause destruction of pistons and valves.

5. Remove five bolts (7) and drive idler shaft (8).

**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 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 parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Install shaft (8) and five bolts (7).

**CAUTION**

Exercise care when installing key in camshaft. If necessary, tap key lightly with soft hammer to seat properly. Make sure key is level and fully seated. Failure to follow this procedure could result in damage to equipment.

2. Install key (5) in groove of camshaft.

**WARNING**

Use insulated, heat-resistant gloves to handle extremely hot components. Failure to follow these instructions may cause injury.

**CAUTION**

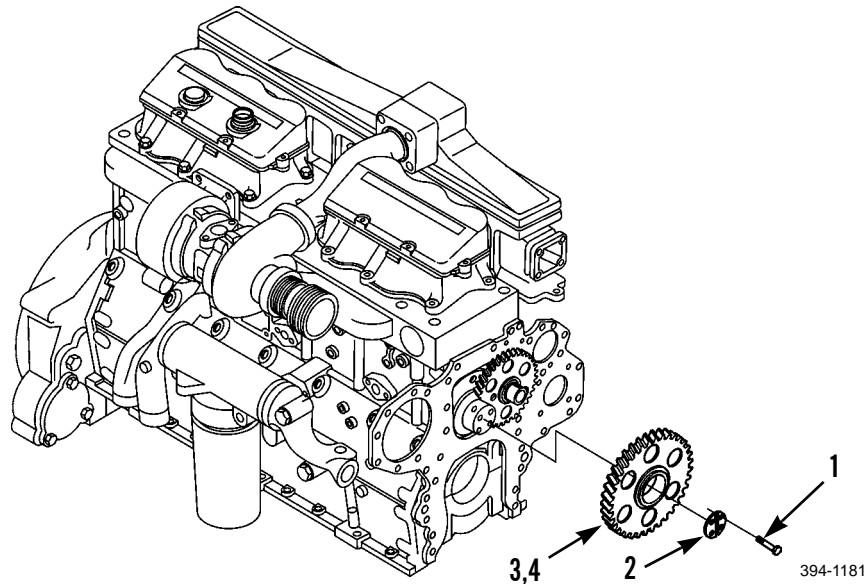
Use care when installing camshaft gear on camshaft. Camshaft gear must be thoroughly heated to install. Do not strike camshaft gear with any object in an attempt to install it on camshaft. Failure to follow this procedure could result in damage to equipment.

3. Use oven to heat camshaft gear (6) for a minimum of two hours to a maximum temperature of 500°F (260° C).
4. Install camshaft gear (6).

**INSTALLATION - CONTINUED****NOTE**

Drive bearing through from rear face of idler gear to a depth of 0.060 in. (1.524 mm).

5. If removed, install new bearing (4), in idler gear (3).
6. Position and install gear (3) assembly on engine block. Align "V" mark on idler gear (3) with "V" mark on crankshaft gear. Align two "K" marks on camshaft gear (6) with right edge of idler gear (3).
7. Install plate (2) and four bolts (1).

**CAUTION**

Before engine can be returned to service, the timing of the automatic timing advance unit must be checked. Refer to WP 0278 00 and WP 0380 00.

8. Install engine front cover (WP 0340 00).
9. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**FUEL INJECTION PUMP REPAIR**

---

**0353 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning, Inspection, Assembly/Adjustment

---

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Capscrew (Item 98, WP 0338 00)

Driver kit, bearing (Item 18, WP 0338 00)

Fuel pump adapter group (Item 25, WP 0338 00)

Gage, fuel injection (Item 29, WP 0338 00)

Machine, bolt (Item 53, WP 0338 00)

Pin, timing (Item 65, WP 0338 00)

Plate, retaining, bearing (Item 75, WP 0338 00)

Plate, retaining, shaft (Item 76, WP 0338 00)

Pointer (Item 78, WP 0338 00)

**Tools and Special Tools - Continued**

Pumping unit, hydraulic, hand driven (Item 92, WP 0338 00)

Punch driver (Item 93, WP 0338 00)

Wrench (Item 123, WP 0338 00)

0.007 in. pin gage

0.011 in. pin gage

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Bearing (3)

Packing, preformed (5)

**References**

TM 5-3805-248-10

**Equipment Condition**

Fuel injection pump housing and governor removed (WP 0273 00)

Fuel injection pump separated from governor (WP 0354 00)

---

**DISASSEMBLY****CAUTION**

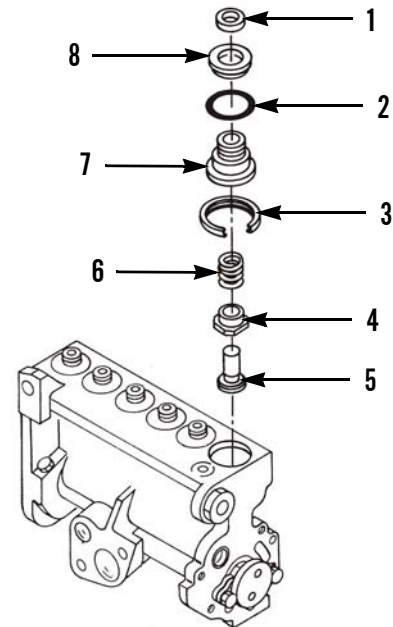
Parts from each injection pump must be kept together in a labeled container. All parts from each injection pump must be returned to the proper container during this procedure. Failure to follow this procedure could result in damage to equipment.

1. Remove washer (1) from injection pump.

**NOTE**

Steps 2 through 6 are the procedures for disassembly of one injection pump. Complete these steps for all six injection pumps before proceeding to step 7.

2. Remove bushing (8) and preformed packing (2). Discard preformed packing.
3. Remove bonnet (7), ring (3), spring (6), check valve collar (4) and check valve (5). Keep each set of parts separate and place in labeled containers.

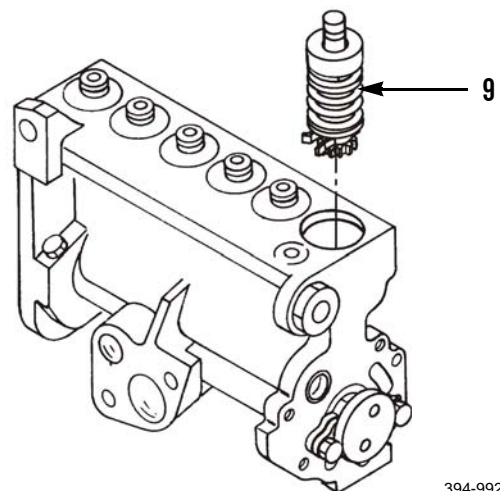


394-991

**CAUTION**

Exercise care when handling fuel injection pump barrels and plungers. Any nick or scratch could cause fuel injection pump to malfunction. Failure to follow this procedure could result in damage to equipment.

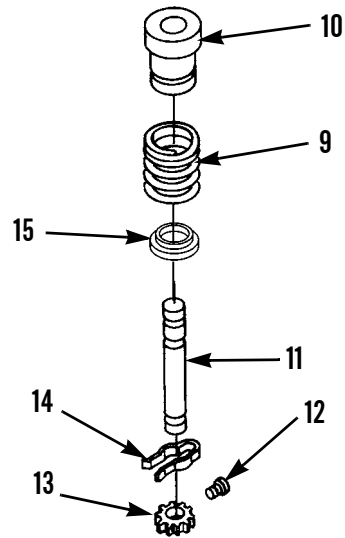
4. Remove lifter spring (9) assembly from injection pump.



394-992

**DISASSEMBLY - CONTINUED**

5. Remove barrel (10), lifter spring (9), washer (15), plunger (11), keeper (14), screw (12) and gear (13). Keep each set of parts separate and place in labeled containers.

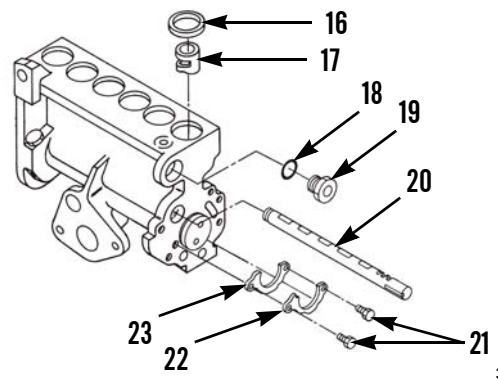


394-993

6. Remove fitting (19) and preformed packing (18) from injection pump. Discard preformed packing.
7. Remove two bolts (21).
8. Remove plate (22) and spacer (23).
9. Remove rack (20).

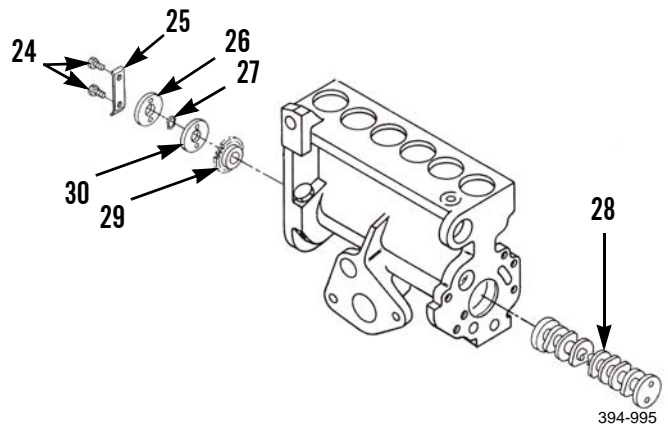
**CAUTION**

Spacers and lifters must be kept with pump parts in labeled containers for each chamber. Failure to keep parts separate could result in damage to equipment.



394-994

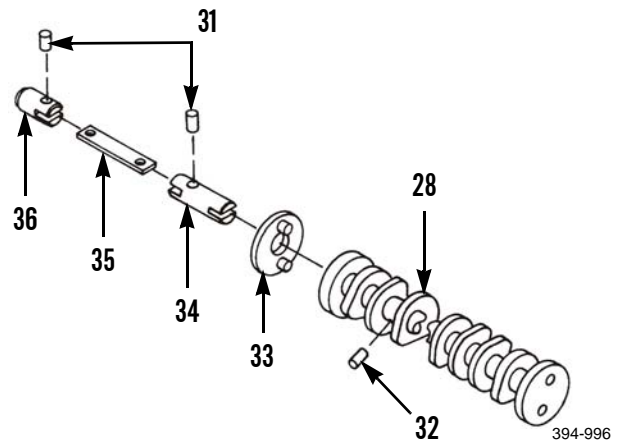
10. Remove six spacers (16) and lifters (17).
11. Remove two bolts (24) and lock (25) from injection pump.
12. Remove plate (26), spring (27), plate (30) and gear (29).
13. Remove camshaft (28) assembly.



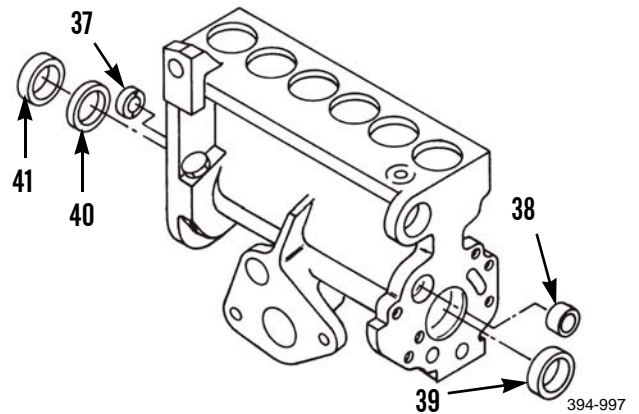
394-995

**DISASSEMBLY - CONTINUED**

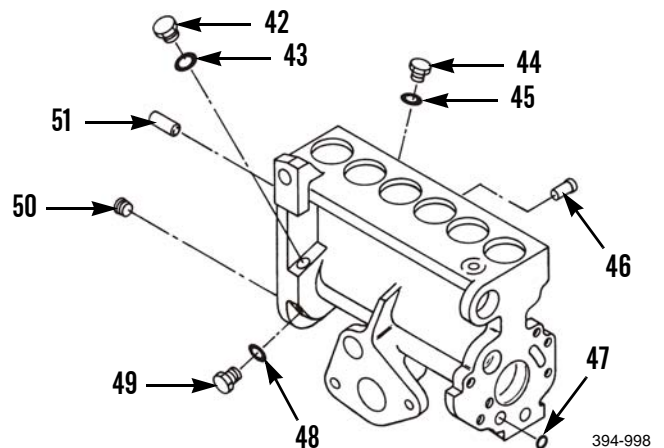
14. Remove spring pin (32) from camshaft (28) from slot of yoke.
15. Remove two pins (31) and pin (36).
16. Disassemble plate assembly (35), yoke (34) and plate assembly (33) from camshaft (28).



17. Remove and discard bearings (40 and 41).
18. Use driver to remove and discard bearing (37).
19. Remove and discard bearing (39).
20. Use driver to remove and discard bearing (38).



21. Remove plug (49) and preformed packing (48). Discard preformed packing.
22. Remove plug (44) and preformed packing (45). Discard preformed packing.
23. Remove plug (42) and preformed packing (43). Discard preformed packing.
24. Remove pipe plug (50).
25. Remove three pins (46).
26. Remove ball (47).
27. Remove dowel (51).



**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 cause 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. Remove all seal and preformed packing material from mounting surfaces.
  2. Clean all parts with solvent cleaning compound.
  3. Dry all parts with compressed air.

**INSPECTION****CAUTION**

Exercise care when inspecting and handling injection pump parts. Do not nick or scratch any parts. All parts put into containers before inspection must be returned to containers after inspection. Failure to follow this procedure could result in damage to equipment.

**NOTE**

Steps 1 through 4 are the procedures for inspecting the injection pump parts being kept in containers. Complete the steps for all parts in each container before inspecting any other parts.

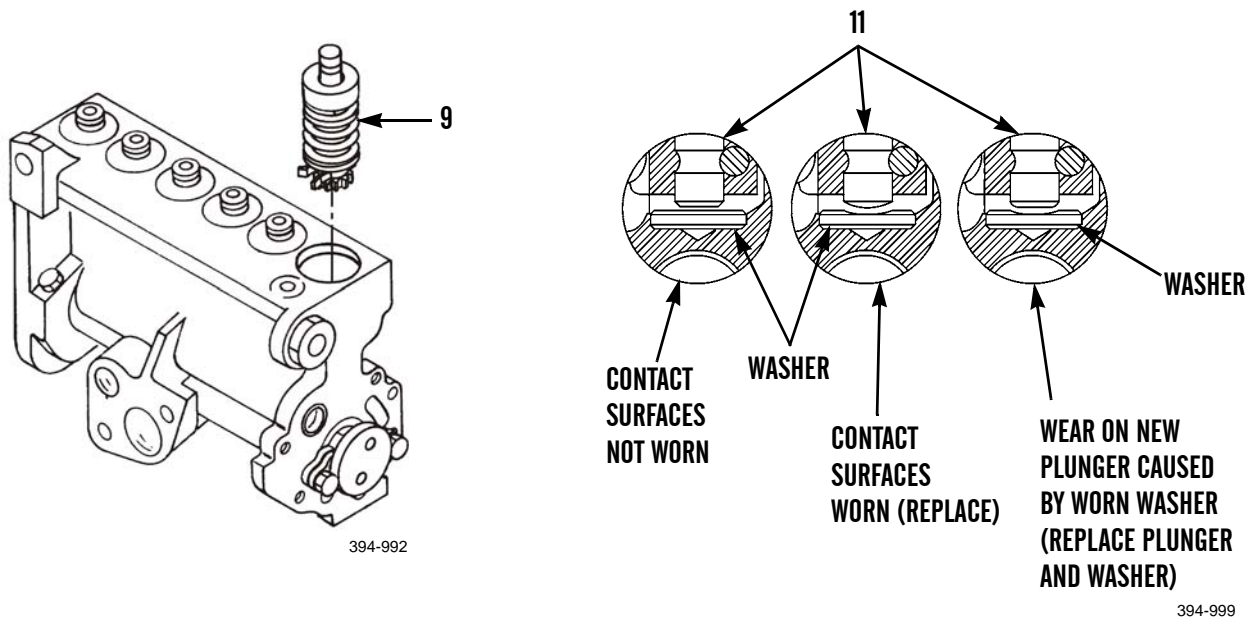
1. Inspect and test six springs. Replace if cracked, broken, distorted or permanently set. Using spring tester, apply test force of 11.9-13.1 lb (5.4-6.0 kg). Length under test force is .375 in. (9.53 mm). Free length after test is 0.513 in. (13 mm). Replace if lengths differ.
2. Inspect six lifter springs. Replace if cracked, broken, distorted or permanently set. Using spring tester, apply test force of 69.4-76.6 lb (31.5-34.7 kg). Length under test force is 1.152 in. (29.26 mm). Free length after test is 1.891 in. (4.8 cm). Replace if lengths differ.

**INSPECTION - CONTINUED**

**CAUTION**

For each plunger that is replaced, the barrel, lifter and washer from the same chamber must also be replaced. Failure to follow this procedure could result in damage to equipment.

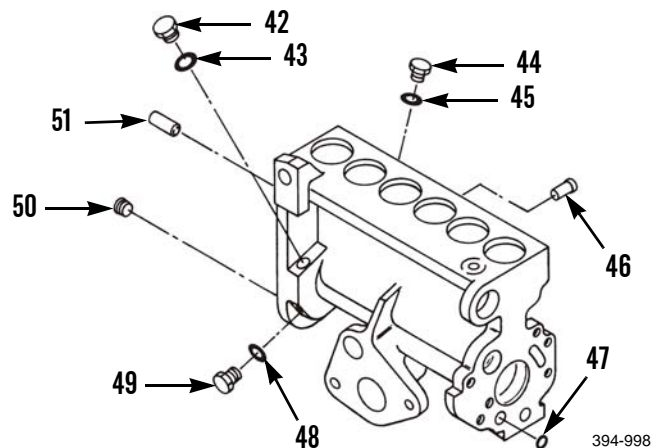
- Use 2-3 in. (50-76.2 cm) outside micrometer to measure length of six plungers (11). Replace lifter spring assembly (9) if plunger length is less than 2.7917 in. (71 mm).



- Inspect all remaining parts. Replace if cracked, broken, distorted, scored, worn, flat-spotted or if teeth or slot are damaged.

**ASSEMBLY/ADJUSTMENT**

- Install ball (47) in pump housing.
- Install three pins (46).
- Install pipe plug (50).
- Install new preformed packing (43) and plug (42).
- Install new preformed packing (45) and plug (44).
- Install new preformed packing (48) and plug (49).
- Install dowel (51).



**ASSEMBLY/ADJUSTMENT - CONTINUED****CAUTION**

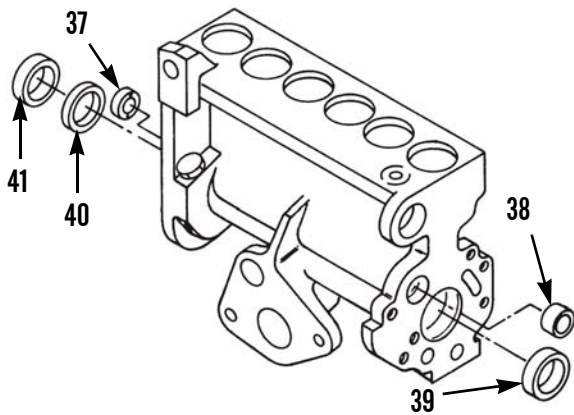
Exercise care when installing rack bearing. Bearing tab must be centered at top of bore in fuel injection pump housing. If not centered, governor and fuel injection pump will not operate properly, which could result in damage to equipment.

8. Use driver and plate to install new bearing (38) flush with housing face. Center bearing tab at top. Bore  $0.5023 \pm 0.0018$  in. ( $12.75 \pm 0.045$  mm) after installation.
9. Install new bearing (39) flush with housing face with bearing joint at top. Bore  $2.6905 \pm 0.0015$  in. ( $64.3387 \pm 0.0381$  mm) after installation.

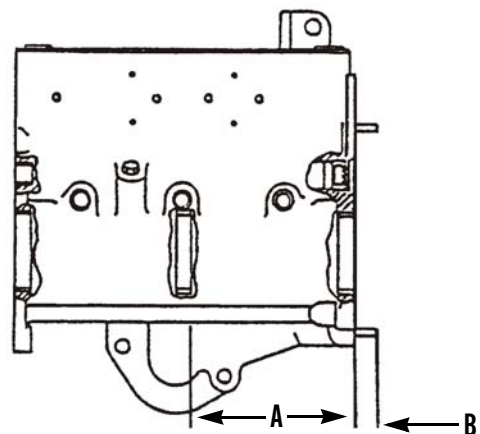
**CAUTION**

Exercise care when installing rack bearing. Two holes in bearing must be aligned vertically; bearing joint must be at top of pump housing bore. Failure to follow this procedure could result in damage to equipment.

10. Using driver and plate, install new bearing (37). Align holes vertically with bearing joint at top. Plate locates bearing at depth of  $0.282 \pm 0.005$  in. ( $7.1628 \pm 0.127$  mm).
11. Install new bearing (40). Distance from rear face of housing to bearing  $8.6 \pm 0.1$  in. ( $122.174 \pm 0.127$  mm) (measurement A).
12. Install new bearing (41) flush with face of housing. Bore after installation is  $2.6905 \pm 0.0015$  in. ( $68.3387 \pm 0.0381$  mm) with bearing joint at top.



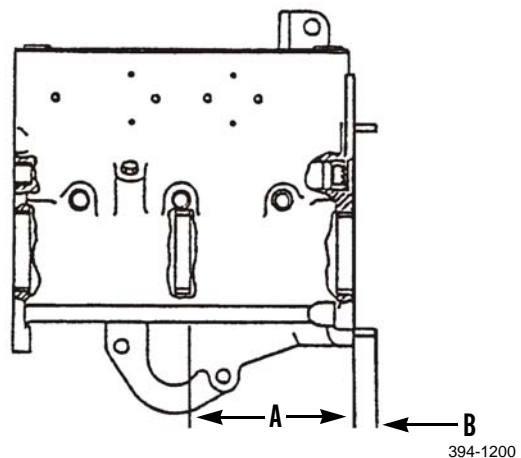
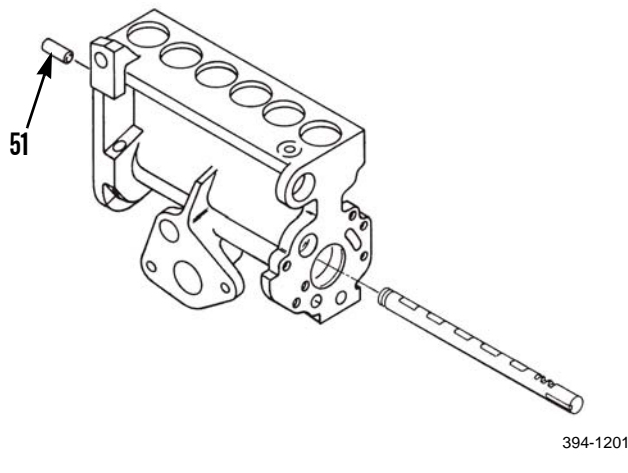
394-997



394-1200

**ASSEMBLY/ADJUSTMENT - CONTINUED**

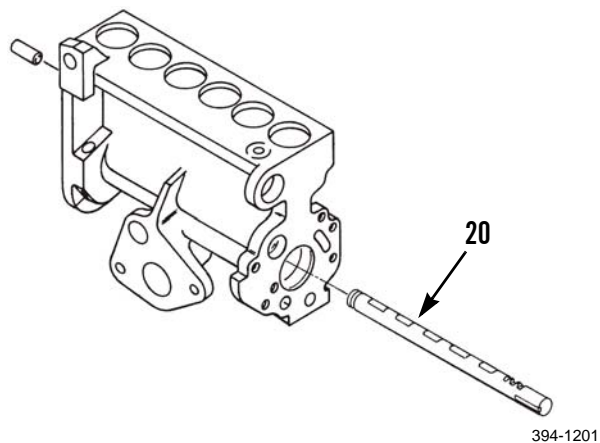
13. Install dowel (51). Distance from rear of housing to end of dowel is  $0.24 \pm 0.2$  in. ( $6.096 \pm 0.508$  mm) (measurement B).



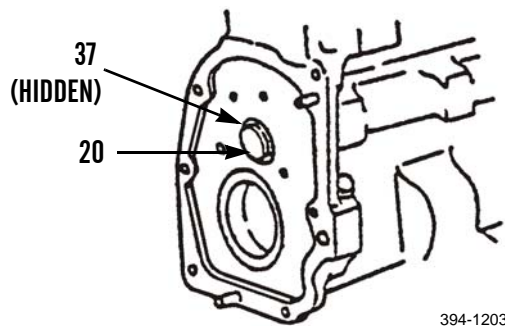
**CAUTION**

Steps 13 through 16 are the procedure to check rack bearing surface wear. Clearance between rack and bearings must not exceed 0.006 in. (0.1524 mm). Exercise care when performing this check. Failure to follow this procedure could cause damage to equipment.

14. Install rack (20) in pump housing. Ensure gear segments face toward pump chambers.
15. Center rack (20) in pump housing. Rack end should be flush with outside of pump housing at governor drive end. Opposite end of rack will extend 0.156 in. (3.9624 mm) outside housing.



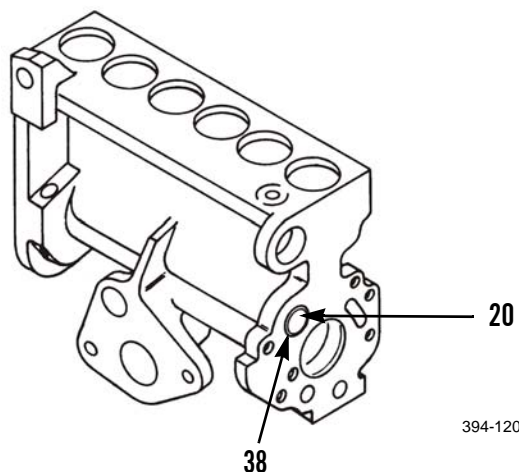
16. Check clearance with 0.007 in. (0.1778 mm) pin gage. Replace rack (20) if gage can be inserted between rack (20) and new bearing (37).



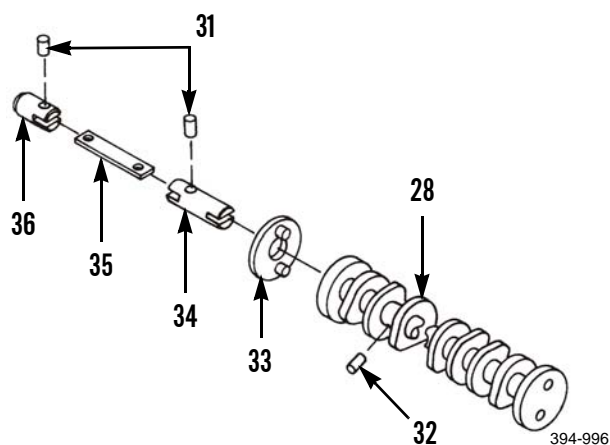


**ASSEMBLY/ADJUSTMENT - CONTINUED**

17. Check clearance with 0.007 in. (0.1778 mm) pin gage. Replace rack (20) if gage can be inserted between rack (20) and bearing (38).



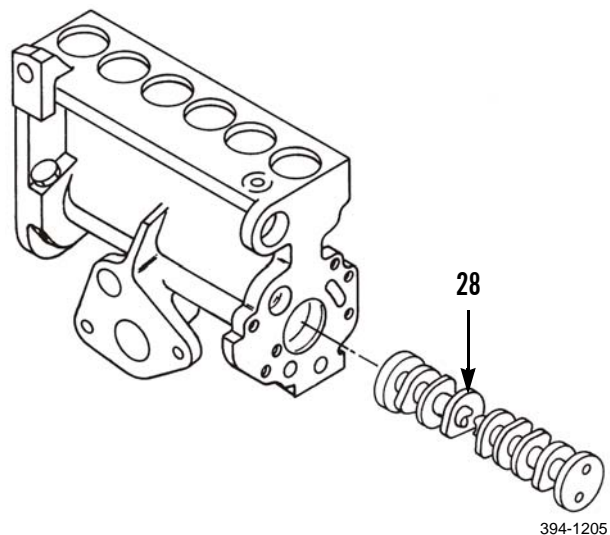
18. Assemble plate assembly (33), yoke (34), plate assembly (35) and pin (36). Align holes.
19. Install two pins (31) to secure shaft assembly.
20. Position shaft assembly on camshaft (28).
21. Install spring pin (32) through camshaft (28) into slot of yoke (34).



**CAUTION**

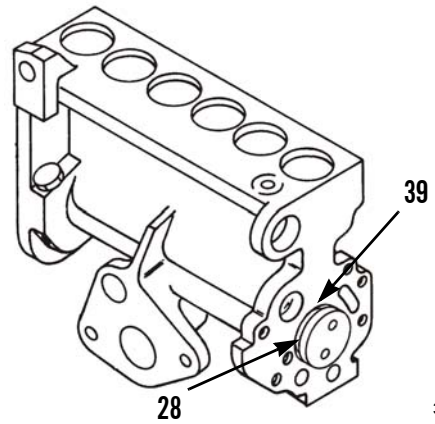
Steps 21 through 24 are the procedure to check camshaft bearing surface wear. Clearance between camshaft and bearings must not exceed 0.010 in. (0.254 mm). Exercise care when performing this check. Failure to follow this procedure could result in damage to equipment.

22. Coat camshaft assembly (28) with engine oil.
23. Install camshaft assembly (28) in fuel injection pump housing.



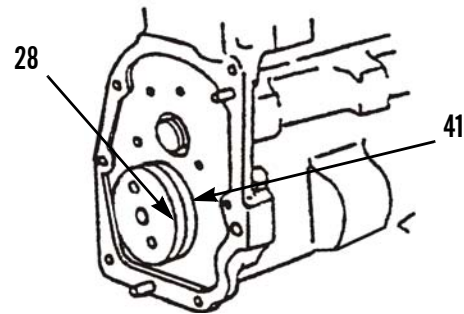
**ASSEMBLY/ADJUSTMENT - CONTINUED**

24. Check clearance with 0.011 in. (0.2794 mm) pin gage. Replace camshaft assembly (28) if gage can be inserted between camshaft and new bearing (39).



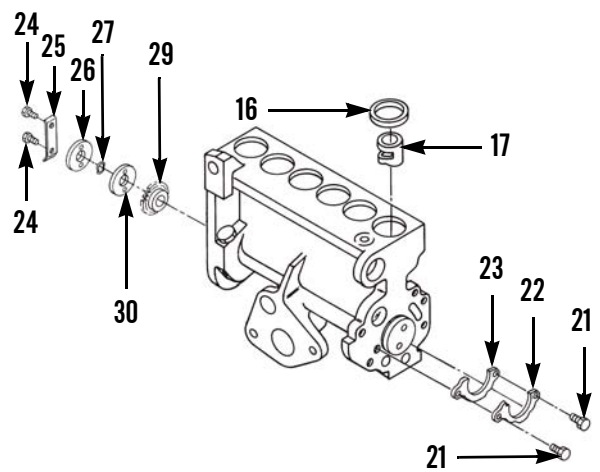
394-1206

25. Check clearance with 0.011 in. (0.2794 mm) pin gage. Replace camshaft assembly (28) if gage can be inserted between camshaft assembly and new bearing (41).



394-1207

26. Install spacer (23), plate (22) and two bolts (21).
27. Install gear (29) and plate (30).
28. Install spring (27).
29. Install plate (26), lock (25) and two bolts (24).

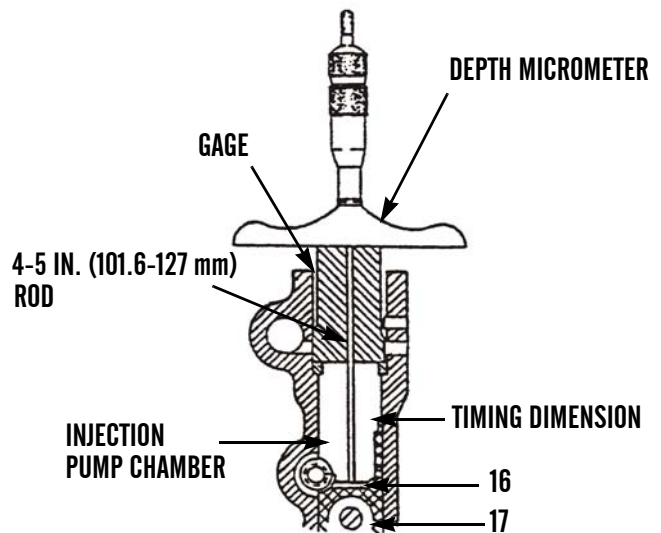


394-1208

**ASSEMBLY/ADJUSTMENT - CONTINUED****CAUTION**

Lifters and spacers must be installed in the same pump housing chamber from which they were removed. Failure to follow this procedure could result in damage to equipment.

30. Install six lifters (17) and spacers (16) in pump housing chambers.
31. Position pointer assembly on pump housing and governor drive control end. Align holes.
32. Install bolt to secure pointer assembly.
33. Install shaft in timing plate.
34. Install timing plate and shaft on camshaft (28).
35. Install timing pin through pump housing hole into notch of camshaft (28) notch. Hole is on side of housing. Rotate timing plate for correct camshaft position.
36. Rotate timing plate to align 0 degree mark on plate with pointer.
37. Install bolt through timing plate to secure plate to shaft.
38. Check timing plate alignment. Make sure pointer and 0 degree timing mark are aligned. Repeat steps 35 and 36 as necessary.
39. Remove timing pin.
40. Rotate timing plate counterclockwise to align pointer with mark 346.750 degrees. Camshaft (28) is in position to measure timing dimension for chamber 1. Chamber numbers are on side of housing.
41. Position gage inside pump chamber 1 on spacer (16).
42. Position depth micrometer with 4-5 in. (101.6-127 cm) rod through gage into chamber.



394-1209

**NOTE**

Pencil and paper are necessary to record depth measurement.

43. Measure depth micrometer chamber 1 timing dimension. Read measurement and record chamber 1 timing dimension.
44. Remove depth micrometer and gage.
45. Rotate timing plate counterclockwise to mark 286.75 degrees.
46. Install depth micrometer and gage in chamber 4.
47. Measure depth micrometer chamber 4 timing dimension. Read measurement and record chamber 4 timing dimension.
48. Remove depth micrometer and gage.
49. Rotate timing plate counterclockwise to mark 226.75 degrees.
50. Install depth micrometer and gage in chamber 2.

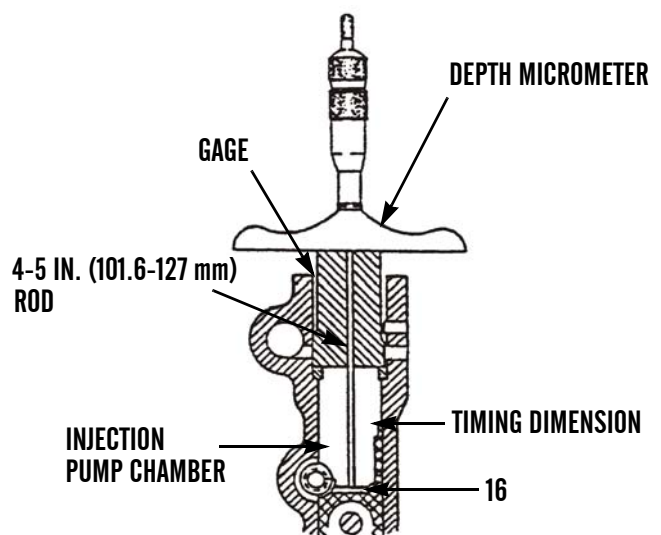
**ASSEMBLY/ADJUSTMENT - CONTINUED**

51. Measure depth micrometer chamber 2 timing dimension. Read measurement and record chamber 2 timing dimension.
52. Remove depth micrometer and gage.
53. Rotate timing plate counterclockwise to mark 166.75 degrees.
54. Install depth micrometer and gage in chamber 6.
55. Measure depth micrometer chamber 6 timing dimension. Read measurement and record chamber 6 timing dimension.
56. Remove depth micrometer and gage.
57. Rotate timing plate counterclockwise to mark 106.75 degrees.
58. Install depth micrometer and gage in chamber 3.
59. Measure depth micrometer chamber 3 timing dimension. Read measurement and record chamber 3 timing dimension.
60. Remove depth micrometer and gage.
61. Rotate timing plate counterclockwise to mark 46.75 degrees.
62. Install depth micrometer and gage in chamber 5.
63. Measure depth micrometer chamber 5 timing dimension. Read measurement and record chamber 5 timing dimension.

**NOTE**

Steps 63 through 67 are the procedure to determine the thickness of spacer required in each pump housing chamber. Complete these steps for each chamber before proceeding to step 68.

64. Compare recorded timing dimension for each chamber to required timing dimension range of 4.342-4.346 in. (110.286-11.038 mm). If within range, do not replace spacer (16). If greater than 4.346 in. (110.388 mm), refer to Table 1, Example A. If less than 4.342 in. (110.286 mm), refer to Table 1, Example B.
65. If spacer (16) must be replaced, complete steps 65 and 66. If spacer does not need to be replaced, proceed to step 67 after all six chambers have been serviced.



394-1209

ASSEMBLY/ADJUSTMENT - CONTINUED

Table 1. Timing Dimension

<b>Timing Dimension Requirements</b>		
	4.342 in. (11.028 cm) minimum	
	4.344 in. (11.034 cm) mid-range	
	4.346 in. (11.038 cm) maximum	
If measured timing dimension is within 4.342 in. (11.028 cm) (minimum) and 4.346 in. (11.038 cm) (maximum):		
Replacing spacer (16) is NOT NECESSARY		
If measured timing dimension is GREATER than 4.346 in. (11.038 cm):		
Example A:		
	MEASURED timing dimension:	4.352 in. (110.548 mm)
	Subtract MIDRANGE timing dimension:	4.344 in. (110.337 mm)
	Answer:	0.008 in. (0.2032 mm)
Action: Replace old spacer (16). New spacer must be 0.008 in. (0.021 cm) THINNER than old spacer. Complete step 67.		
If measured timing dimension is LESS than 4.342 in. (11.028 cm):		
Example B:		
	MEASURED timing dimension:	4.344 in. (110.337 mm)
	Subtract MIDRANGE timing dimension:	4.339 in. (110.210 mm)
	Answer:	-0.005 in. (0.127 mm)
Action: Replace old spacer (16). New spacer must be 0.005 in. (0.013 cm) THICKER than old spacer. Complete step 67.		

- 66. Remove spacer (16) from chamber and measure thickness. Use 0-1 in. (25.4 mm) outside micrometer.
- 67. Determine required thickness of new spacer (16). If new spacer must be thinner than old spacer, refer to Table 2, Example C. If new spacer must be thicker, refer to Table 2, Example D.

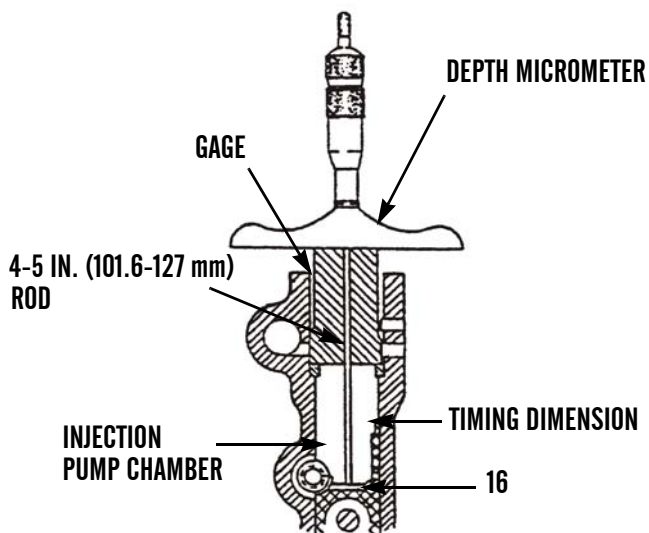
ASSEMBLY/ADJUSTMENT - CONTINUED

Table 2. Spacer Thickness

Spacer Part Number	Spacer Thickness in. (cm)
9N6496	0.162 (4.114)
0N6495	0.166 (4.216)
5M2697	0.170 (4.318)
2M4208	0.174 (4.419)
2M4209	0.178 (4.521)
2M4210	0.182 (4.6228)
2M4211	0.186 (4.7244)
2M4212	0.190 (4.826)
5M2691	0.194 (4.927)
5S7189	0.198 (5.029)
<p>If new spacer (16) must be THINNER than old spacer:                      Example C:                          Thickness of old spacer:                          Subtract answer from Example A,                          Table 1:                      Answer: thickness of new spacer must                              be:                       Action: Install new spacer (16) number 9N6496, step 67.</p> <p>If new spacer (16) must be THICKER than old spacer:                      Example D:                          Thickness of old spacer:                          ADD Answer from Example B, Table                          1:                      Answer: thickness of new spacer must be,                              minimum:                       Action: Install new spacer (16) number 2M4211, step 67.</p>	<p>0.170 in. (4.318 mm)                      0.008 in. (.2032 mm)                      0.162 in. (4.114 mm)</p> <p>0.182 in. (4.622 mm)                      -0.005 in. (1.27 mm)                      0.187 in. (4.749 mm)</p>
<p>NOTE: Select new spacer with thickness that is closest to answers determined in Examples C and D.</p>	

**ASSEMBLY/ADJUSTMENT - CONTINUED**

68. Install new spacer (16) in chamber.



394-1209

69. Repeat steps 41 through 59. Verify correct timing dimension for all six pump chambers.

**NOTE**

Steps 69 through 89 are the procedure for installation of the injection pumps in the fuel injection pump housing. Complete these steps for all six injection pumps before proceeding to step 90.

70. Rotate timing plate counterclockwise to correct position. Refer to Table 3.

**Table 3. Injection Pump Installation Sequence**

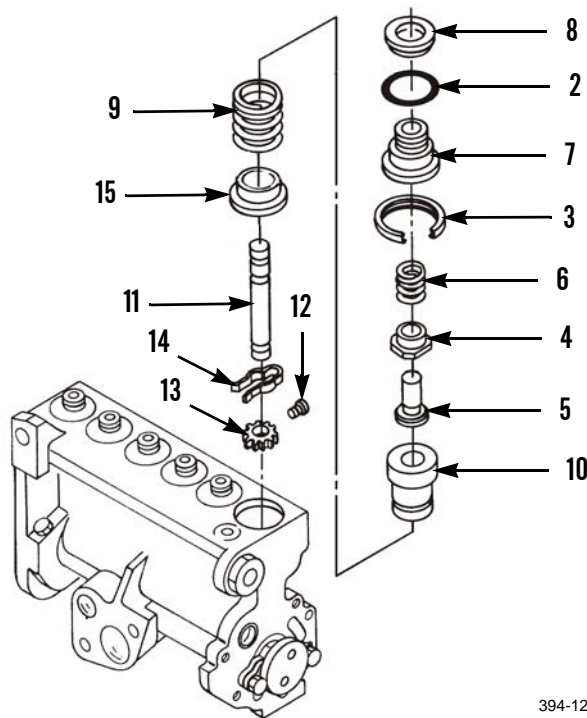
Order of Installation	Timing Plate Position (in degrees)	Pump Chamber Number
1	346.75	1
2	286.75	4
3	266.75	2
4	166.75	6
5	106.75	3
6	46.75	5

ASSEMBLY/ADJUSTMENT - CONTINUED

CAUTION

Exercise care when handling pump parts. Do not nick or scratch any parts. Each injection pump must be assembled without interchanging parts from other injection pumps. Failure to follow this procedure could result in damage to equipment.

71. Install gear (13) on plunger (11).
72. Install screw (12) in gear (13). Locate in groove of plunger (11).
73. Install keeper (14) on plunger (11).
74. Install washer (15) and lifter spring (9) on plunger (11).
75. Install barrel (10) on plunger (11) inside lifter spring (9).
76. Install check valve (5) and check valve collar (4) on plunger (11).
77. Install spring (6) on bonnet (7) over end of plunger (11).
78. Install ring (3) on bonnet (7).
79. Install new preformed packing (2) and bushing (8).
80. Attach pumping unit tester tool to injector pump assembly.
81. Align grooves in bonnet (7), barrel (10) and gear (13) sight down side of injection pump assembly. Groove in gear (13) must be aligned with center of grooves in bonnet (7) and barrel (10).

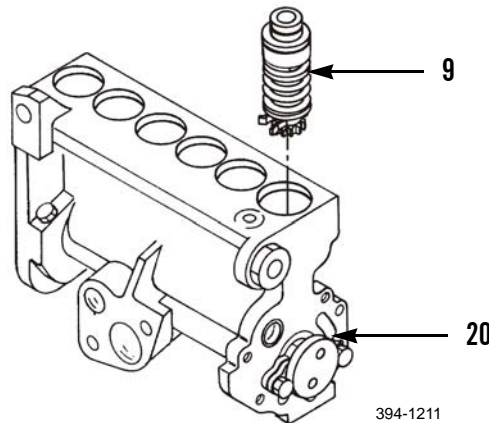


394-1210

CAUTION

Rack must be centered in fuel injection pump housing. At governor end of housing, when centered, rack will extend 0.156 in. (3.962 mm) beyond housing.

82. Locate guide pin in chamber of fuel injection pump housing.
83. Position injection pump and lifter spring (9) assembly inside chamber. Install pump straight down into chamber. Align grooves with guide pin.



394-1211



**ASSEMBLY/ADJUSTMENT - CONTINUED****CAUTION**

Exercise care when pressing injection pump assembly into chamber (step 83). If injection pump assembly cannot be positioned with moderate hand pressure, remove it from chamber and repeat steps 80 and 82. Failure to follow this procedure could result in damage to equipment.

84. Using pumping unit tester tool, apply pressure by hand to seat injection pump into chamber and hold in position.

**CAUTION**

Do not force bushing into position with wrench. If bushing installation by hand is impossible, remove bushing and injection pump. Repeat steps 80 through 83. Failure to follow this procedure could result in damage to equipment.

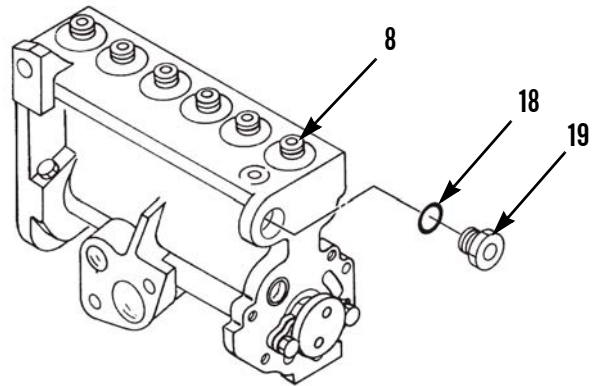
85. Tighten bushing (8) finger tight until flush with top surface of fuel injection pump housing.
86. Check travel of rack (20) after each injection pump assembly is installed. Rack travel must be 0.620 in. (15.74 mm). If rack travel is not 0.620 in. (15.74 mm), remove bushing (8) and injection pump assembly and repeat steps 80 through 84.
87. Center in housing must extend 0.156 in. (0.396 cm) beyond housing at governor end.
88. Remove pumping unit tester tool.

ASSEMBLY/ADJUSTMENT - CONTINUED

CAUTION

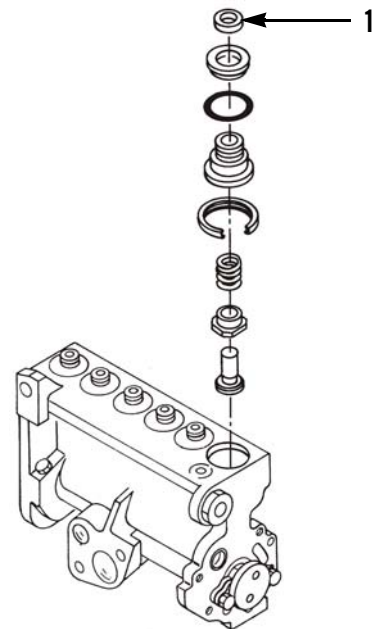
Exercise care when tightening bushing. If it is too tight, the fuel injection pump housing will be damaged. If not tight enough, leakage will result. Failure to follow this procedure could result in damage to equipment.

89. Use wrench to torque housing (8) to 30 lb-ft (41 Nm).



394-1212

90. Install new felt washer (1), new preformed packing (18) and fitting (19).



394-991

91. Remove bolt, timing plate, shaft, bolt and pointer assembly.  
 92. Connect governor to fuel injection pump (WP 0384 00).  
 93. Use adapter to test assembled fuel injection pump on a fuel injection test bench. Refer to *Test Bench* instruction manual.  
 94. Install fuel injection pump assembly on engine (WP 0273 00).  
 95. Operate machine and verify correct operation (TM 5-3805-248-10).

END OF WORK PACKAGE

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly, Fuel Setting Procedure

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, fuel injection (Item 112, WP 0338 00)

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Prod, test (Item 80, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**Materials/Parts - Continued**

Gasket (3)

Packing, preformed (5)

Seal

Washer, felt

**References**

TM 5-3805-248-10

**Equipment Condition**

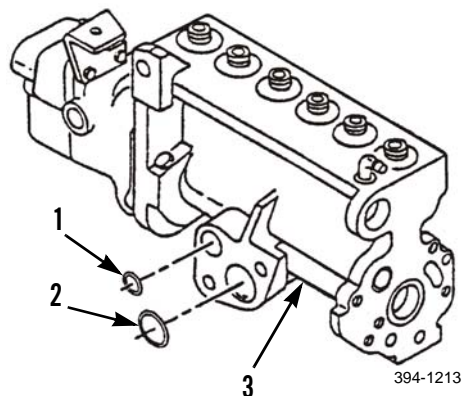
Injection pump housing and governor assembly removed (WP 0273 00)

Fuel transfer pump removed (WP 0275 00)

Air-fuel ratio control removed (WP 0355 00)

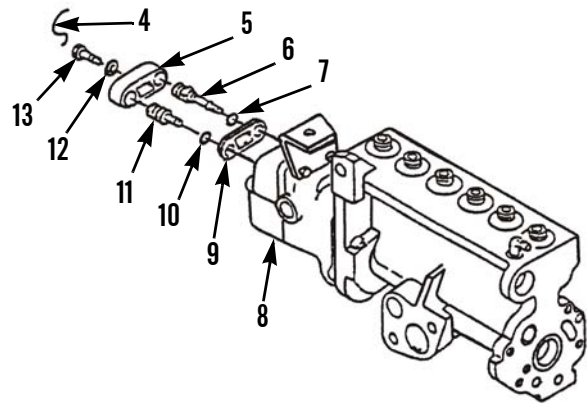
**DISASSEMBLY**

1. Remove and discard preformed packings (1 and 2) from fuel injection pump (3).



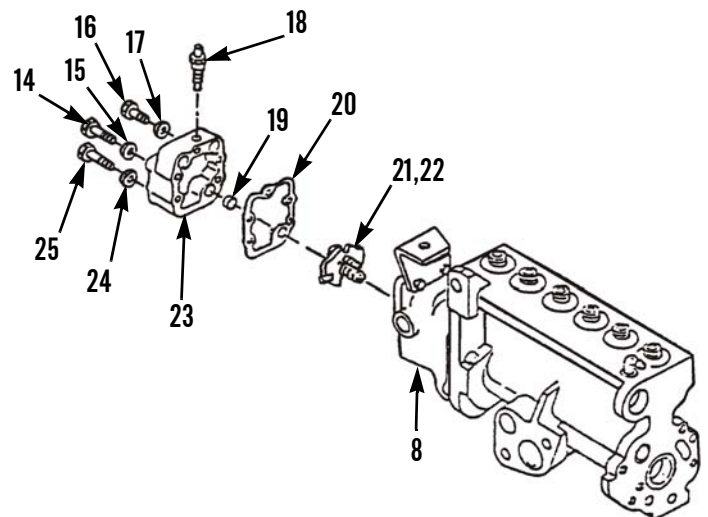
**DISASSEMBLY - CONTINUED**

2. Remove lock wire (4), capscrew (13) and washer (12) from housing (23).
3. Remove cover (5).
4. Remove screw (6) and preformed packing (7). Discard preformed packing.
5. Remove bolt (11) and preformed packing (10). Discard preformed packing.
6. Remove and discard gasket (9).



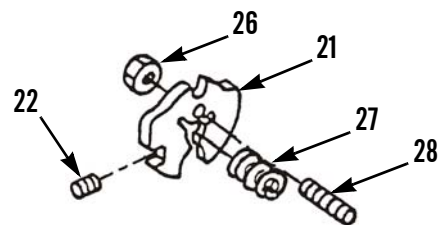
394-1214

7. Remove bolt (16) and washer (17) from governor assembly (8).
8. Remove bolt (14) and washer (15).
9. Remove three capscrews (25) and washers (24).
10. Remove housing (23) and gasket (20) from governor assembly (8). Discard gasket.
11. Remove strainer assembly (19) and insulator stud (18) from housing (23).
12. Loosen setscrew (22).
13. Remove collar (21) from governor assembly (8).



394-1215

14. Remove spring (27) and setscrew (22) from collar (21).
15. Remove nut (26) and setscrew (28) from collar (21).



394-1216

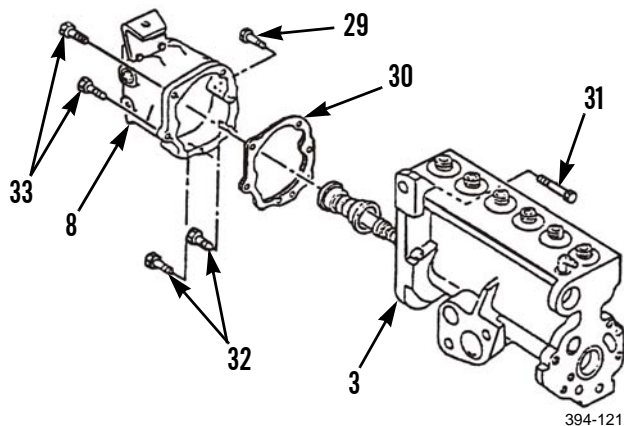
**DISASSEMBLY - CONTINUED**

16. Remove bolt (29) and two bolts (32) from governor assembly (8).
17. Remove two bolts (33) and bolt (31) from governor assembly (8).

**NOTE**

When governor assembly housing is removed from fuel injection pump, parts from inside the governor assembly will remain attached to the fuel injection pump.

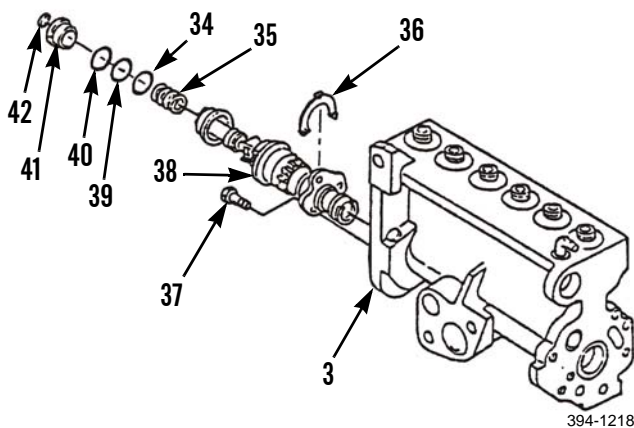
18. Remove governor assembly (8) from fuel injection pump (3).
19. Remove and discard gasket (30).



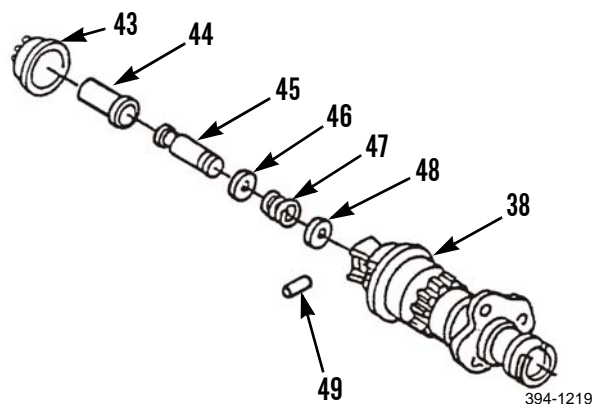
**WARNING**

Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

20. Use a spring compressor to compress spring (35) on rear of fuel injection pump (3).
21. Remove wave spring (42) and governor spring seat (41) from load stop bolt (45).
22. Release spring (35) and remove spring compressor from load stop bolt (45).
23. Remove washers (40, 39 and 34) and spring (35).
24. Remove three bolts (37), lockring (36) and cylinder assembly (38) from rear of fuel injection pump (3).

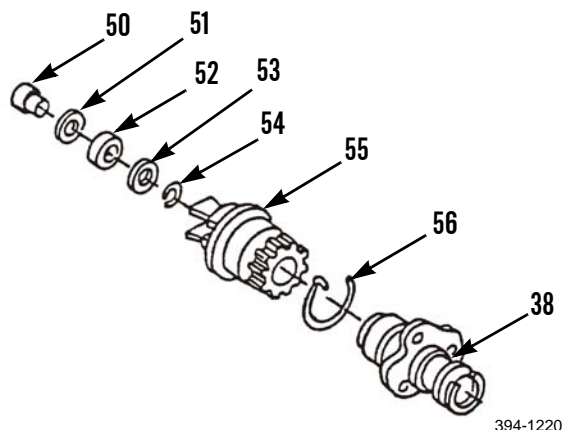


25. Remove dowel (49) from cylinder assembly (38).
26. Remove spring seat (43), governor riser (44) and load stop bolt (45).
27. Remove washer (46), spring (47) and washer (48) from cylinder assembly (38).

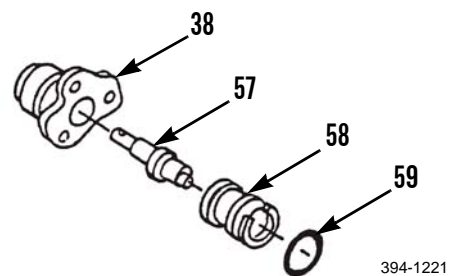


**DISASSEMBLY - CONTINUED**

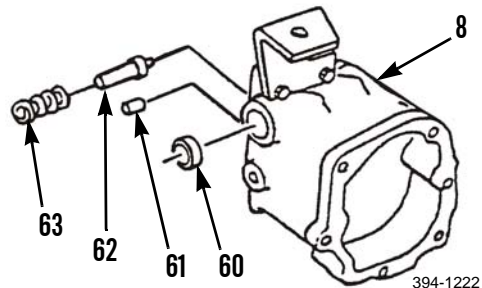
- 28. Remove sleeve (50), washer (51), thrust bearing (52) and washer (53) from weight assembly (55).
- 29. Remove lockrings (54 and 56) from weight assembly (55).
- 30. Remove weight assembly (55) from cylinder assembly (38).



- 31. Remove preformed packing (59), sleeve (58) and piston and valve assembly (57) from cylinder (38). Discard preformed packing.

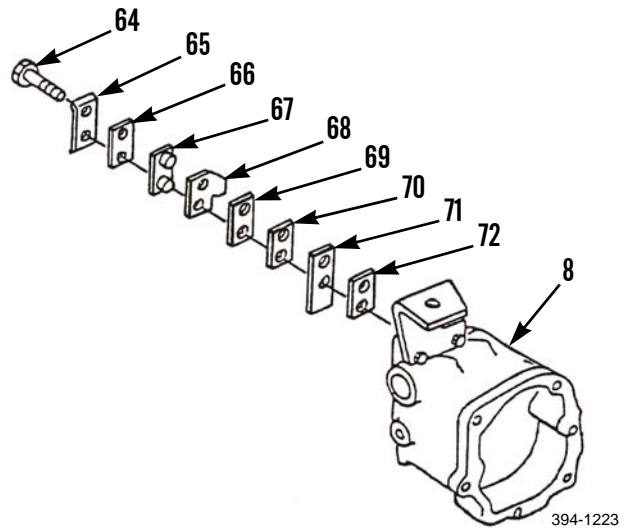


- 32. Remove spring pin (61) from governor assembly housing (8).
- 33. Remove core plug (60), spring (63) and stop plunger (62) from governor assembly housing (8).

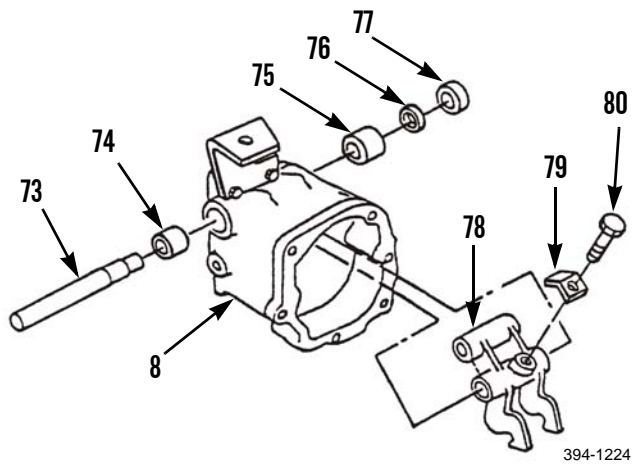


**DISASSEMBLY - CONTINUED**

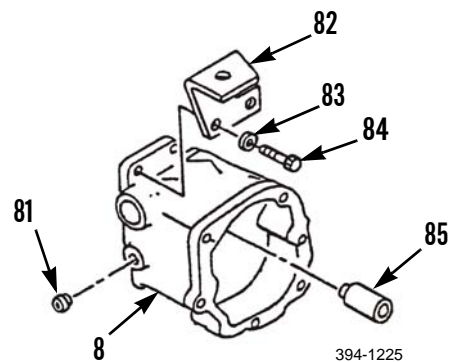
34. Remove two bolts (64), locking plate (65), retainer spring (66), insulator (67), contact (68), retainer (69), shim(s) (70), full load stop bar (71) and insulator (72) from governor assembly housing (8).



35. Remove bolt (80), lock (79) and shaft (73).  
 36. Remove lever (78).  
 37. Remove and discard felt washer (77) and seal (76).  
 38. Use brass driver and hammer to remove sleeve bearings (75 and 74) from governor assembly housing (8).



39. Remove spring guide (85).  
 40. Remove plug (81).  
 41. Remove two bolts (84), washers (83) and bracket assembly (82) from governor assembly housing (8).



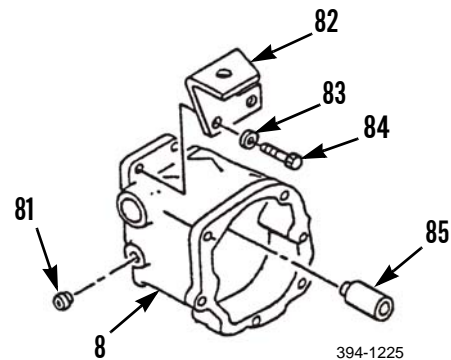
**CLEANING AND INSPECTION****WARNING**

- 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 cause 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.

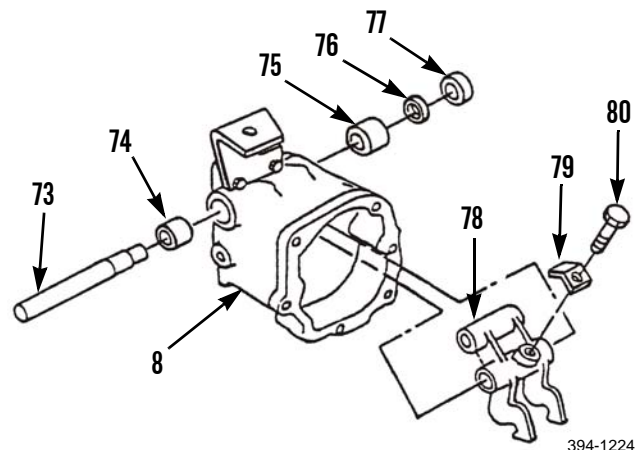
1. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install bracket assembly (82), two washers (83) and bolts (84) on governor assembly housing (8).
2. Install plug (81).
3. Install spring guide (85).



4. Use brass driver and hammer to install sleeve bearings (75 and 74) in governor assembly housing (8).
5. Install lock (79) and bolt (80) on lever (78). Do not tighten bolt (80) at this time.
6. Position lever (78) in governor assembly housing (8) and align holes.
7. Install shaft (73) through governor assembly housing (8) and lever (78).
8. Tighten bolt (80).
9. Install new seal (76) and felt washer (77).



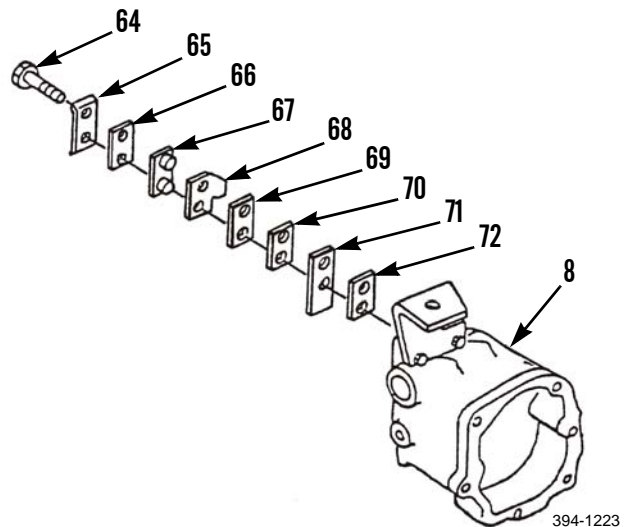


ASSEMBLY - CONTINUED

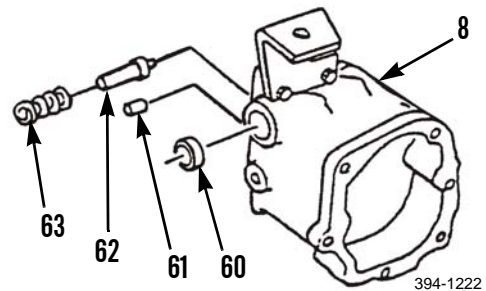
CAUTION

Exercise care when assembling parts in the following step. Refer to illustration to make sure all parts are in the correct position. Failure to follow this procedure could result in damage to the governor assembly.

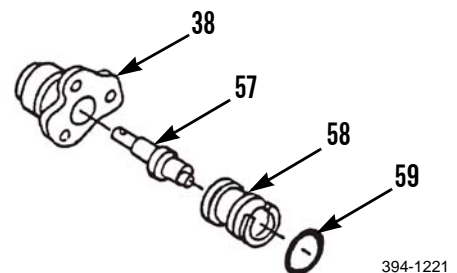
10. Assemble insulator (72), full load stop bar (71), shim(s) (70), retainer (69), contact (68), insulator (67) then retainer spring (66) and install in governor assembly housing (8).
11. Install locking plate (65) and two bolts (64). Lock tabs must face outward.



12. Install stop plunger (62) and spring (63) in governor assembly housing (8).
13. Install spring pin (61).
14. Install core plug (60) in governor assembly housing (8).

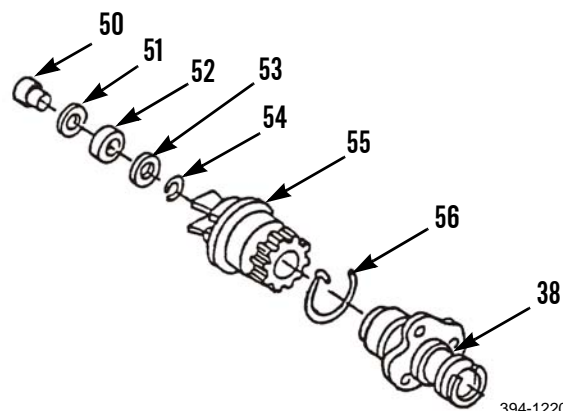


15. Install new preformed packing (59) and sleeve (58) in cylinder (38).
16. Install piston and valve assembly (57) in cylinder (38).

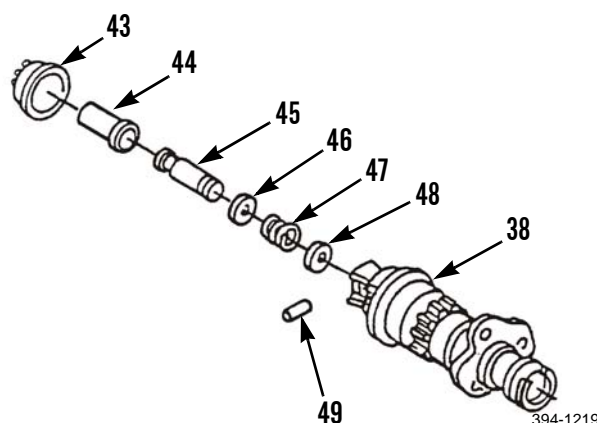


**ASSEMBLY - CONTINUED**

17. Install lockring (56) to secure weight assembly (55) to cylinder assembly (38).
18. Install lockring (54) on weight assembly (55).
19. Install washer (53), thrust bearing (52) and washer (51) on sleeve (50).
20. Install sleeve (50) in weight assembly (55) and on piston and valve assembly (57).
21. Install sleeve (58) through sleeve (50) and into piston and valve assembly (57).



22. Install washer (48), spring (47) and washer (46) on cylinder assembly (38).
23. Install governor riser (44) on load stop bolt (45).
24. Install load stop bolt (45) on cylinder assembly (38).
25. Install spring seat (43) on governor riser (44) on load stop bolt (45).
26. Install dowel (49) on cylinder assembly (38).



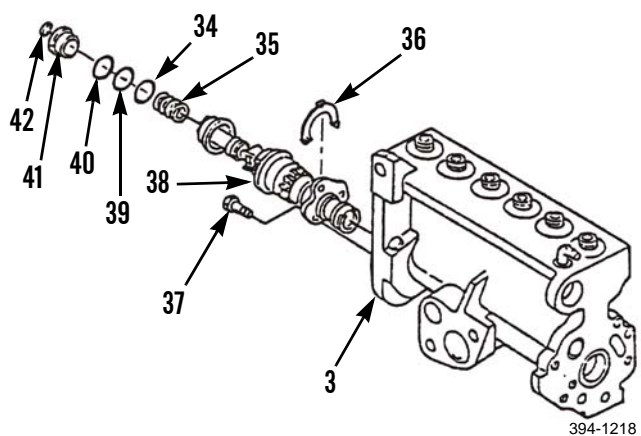
27. Position cylinder assembly (38) on rear of fuel injection pump (3).
28. Install lock ring (36) and three bolts (37).



**WARNING**

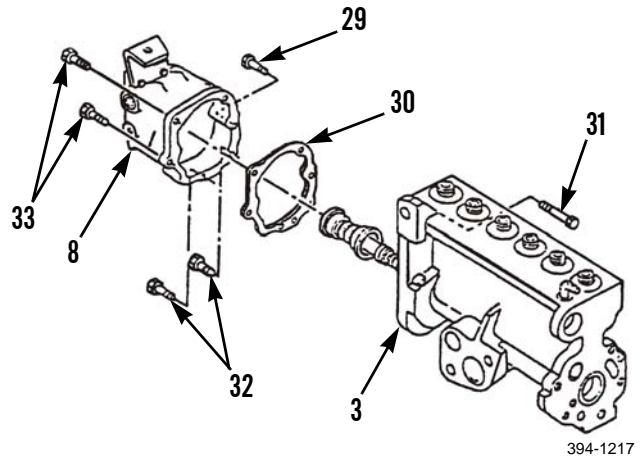
Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

29. Install spring (35), washers (40, 39 and 34) and governor spring seat (41) on load stop bolt (45).
30. Install wave spring (42) on load stop bolt (45).



**ASSEMBLY - CONTINUED**

31. Install new gasket (30) on rear of fuel injection pump (3).
32. Position governor assembly (8) on fuel injection pump (3).
33. Install two bolts (33), bolt (31), two bolts (32) and bolt (29) on governor assembly housing (8).

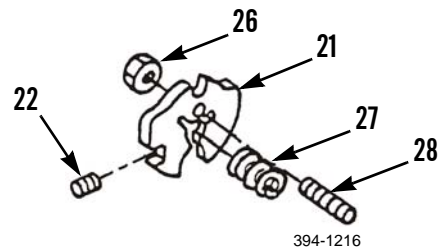


34. Install setscrew (28) flush with inside face of collar (21).
35. Install nut (26) on setscrew (28). Do not tighten nut (26) at this time.
36. Install setscrew (22) in collar (21). Rotate clockwise two turns.
37. Install spring (27) and collar assembly (21) on load stop bolt (45).

**NOTE**

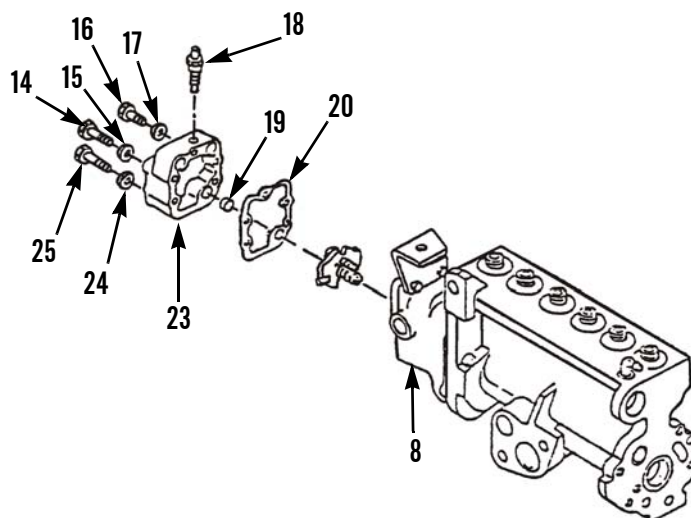
For proper location, collar must be pushed in to compress spring.

38. Push collar (21) in and hold.
39. Tighten setscrew (22).
40. Rotate setscrew (28) clockwise until screw bottoms against surface of governor assembly housing (8).
41. Torque nut (26) on setscrew (28) to 9 lb-ft (12 Nm).



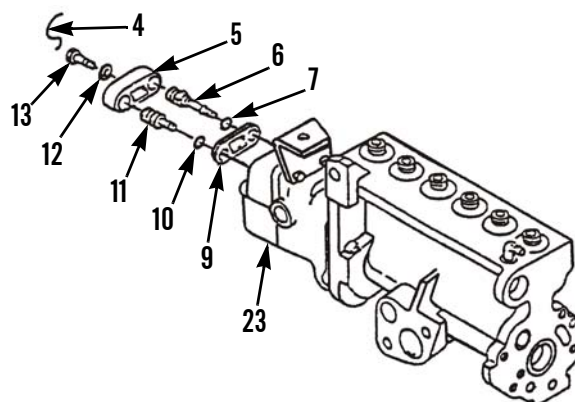
**ASSEMBLY - CONTINUED**

42. Install strainer assembly (19) in housing (23) with screen side toward governor assembly housing (8).
43. Install new gasket (20).
44. Install housing (23) on governor assembly housing (8).
45. Install three washers (24) and capscrews (25).
46. Install washer (15) and bolt (14).
47. Install washer (17) and bolt (16).
48. Install insulator stud (18) in housing (23) and torque to 40 lb-in. (4.5 Nm).



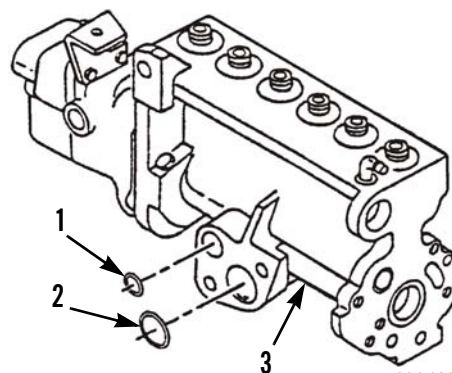
394-1215

49. Install new gasket (9) on housing (23).
50. Install new preformed packing (10) and bolt (11). Finger-tighten screw.
51. Install new preformed packing (7) and screw (6). Finger-tighten screw.
52. Install cover (5), washer (12), capscrew (13) and lock wire (4).



394-1214

53. Install new preformed packings (1 and 2) in fuel injection pump (3).



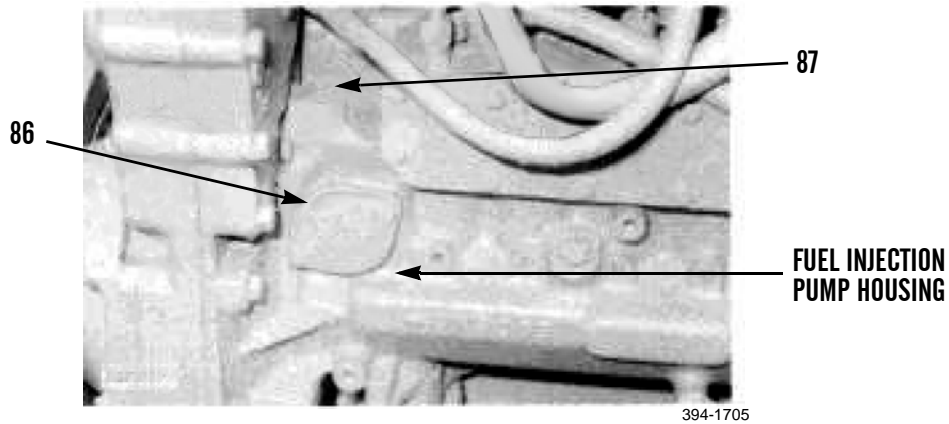
394-1213

**FUEL SETTING PROCEDURE**

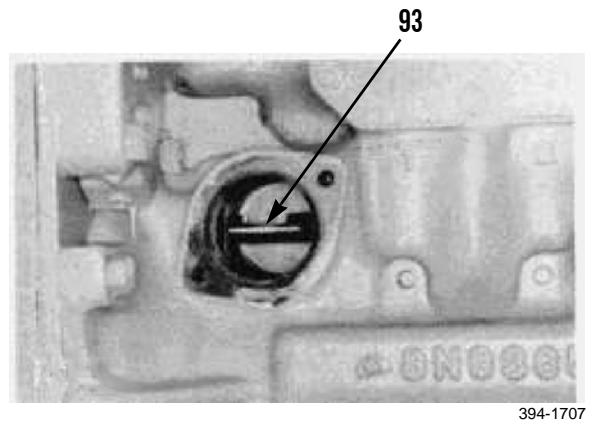
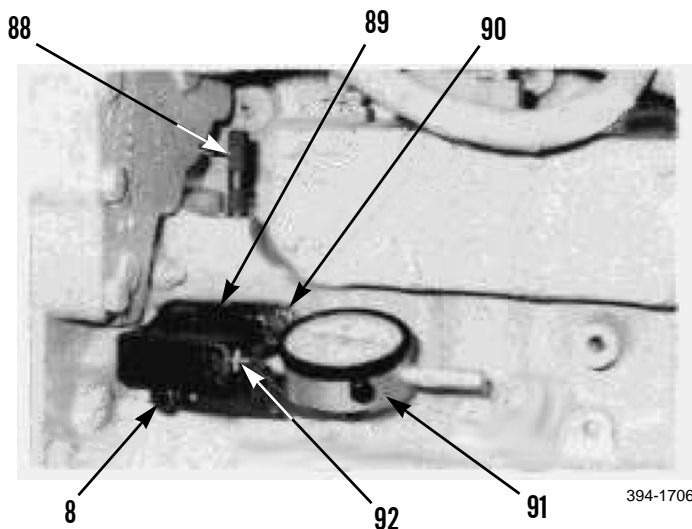
**NOTE**

The fuel setting procedure can be performed with the fuel injection pump and governor on or off the engine.

1. Remove plug (87) and cover (86) from fuel injection pump housing.



2. Install and zero fuel injection tool kit as follows:
  - a. Install collet (92) on bracket assembly (89).
  - b. Position indicator (91) arm in approximate middle of travel to ensure it engages in slot (93) in rack, and install bracket assembly (89) on fuel injection pump housing.
  - c. Install ground body bolt (8) first and bolt (90) and ensure indicator (91) arm moves freely.
  - d. Put indicator (91) in position in collet (92).



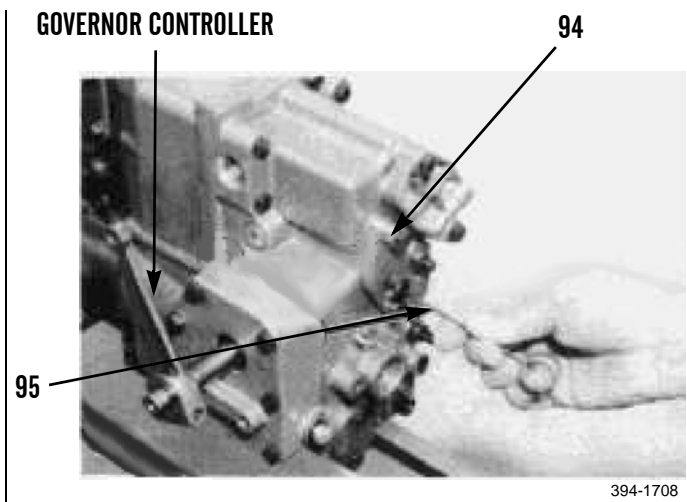
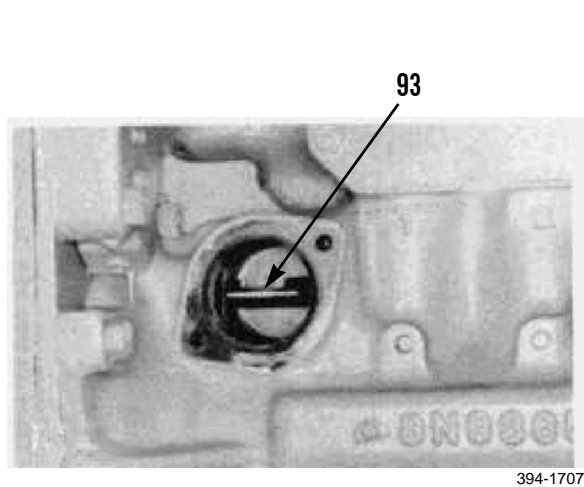
**NOTE**

The contact point will not go through collet and must be assembled after indicator stem has passed through collet.

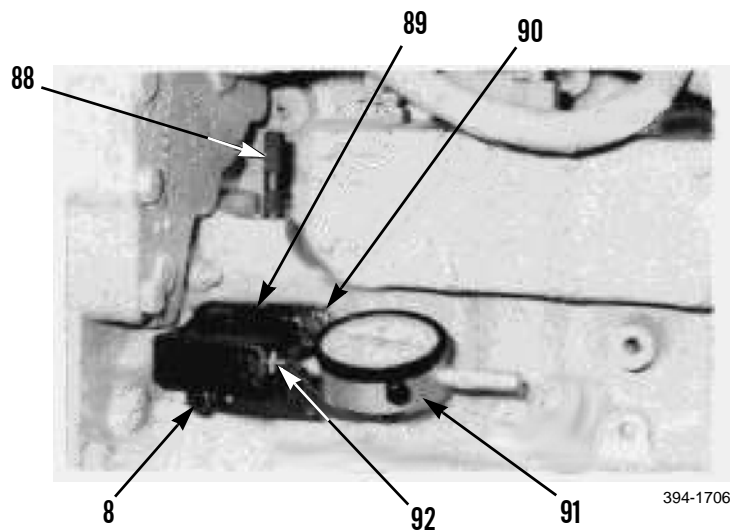
- e. Assemble fuel injection tool kit contact point and extension and install on indicator (91).
- f. Tighten collet (92) just enough to hold indicator (91).

**FUEL SETTING PROCEDURE - CONTINUED**

3. Remove shutoff solenoid, if equipped, or cover and install adapter (94).
4. Move governor control lever to LOW IDLE position (rotate governor shaft counterclockwise).



5. Install timing pin (88) in top of fuel injection pump housing.



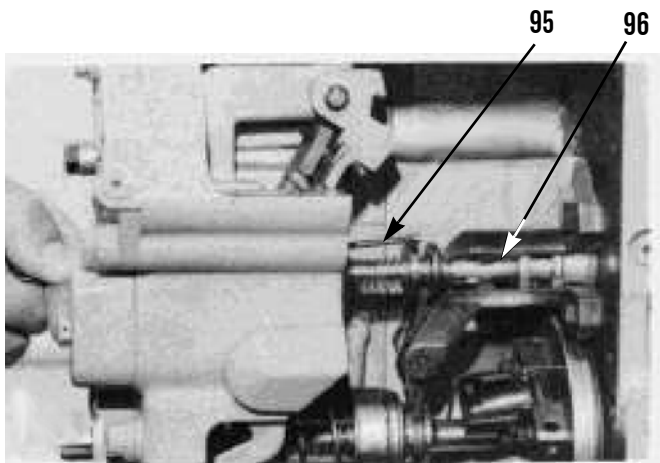
**NOTE**

Push timing pin in until it contacts fuel rack.

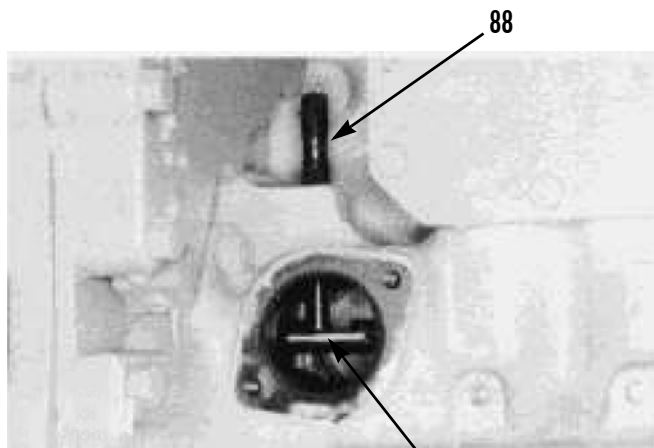
6. Use hook (95) through adapter (94) to push sleeve and rack to shutoff position. Ensure timing pin (88) engages in slot (93).

**FUEL SETTING PROCEDURE - CONTINUED**

7. Move governor control lever to FULL LOAD position (rotate governor shaft clockwise) and fasten in position.



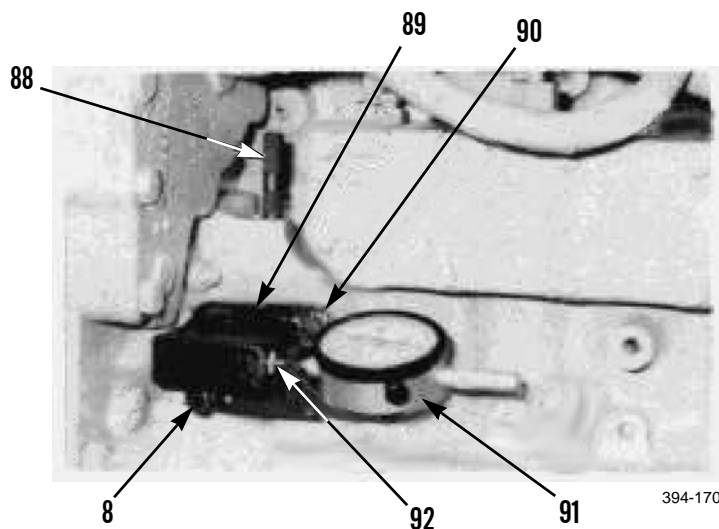
394-1709



SLEEVE AND RACK

394-1710

8. Use hook (95) to pull sleeve and rack through servo valve (96), against timing pin (88).

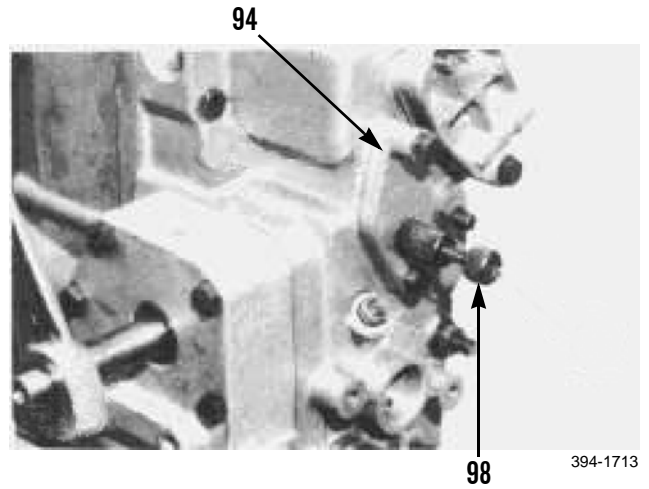
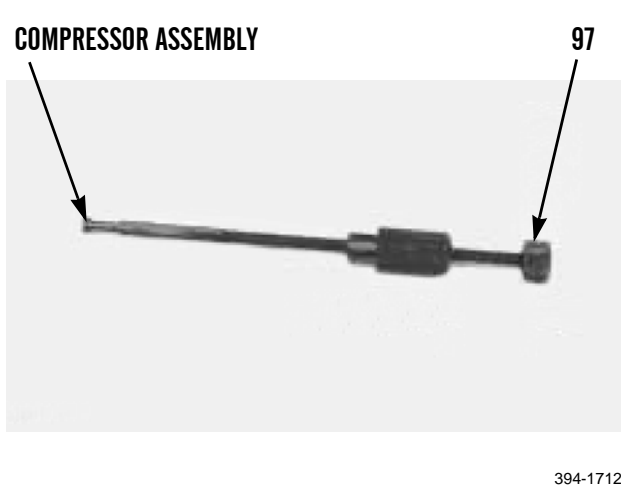


394-1706

**NOTE**

Ensure all needles of indicator are on zero.

9. Adjust dial indicator (91) in collet (92) to zero and tighten collet.
10. Remove timing pin (88), hook (95) and release governor control lever.

**FUEL SETTING PROCEDURE - CONTINUED**

11. Turn rod (97) in compressor assembly until knob is approximately 1 in. (25.4 mm) away from compressor body.

**CAUTION**

DO NOT turn the rod any further in if the rod begins to tighten. Damage to the governor can occur if the rod is turned in further.

**NOTE**

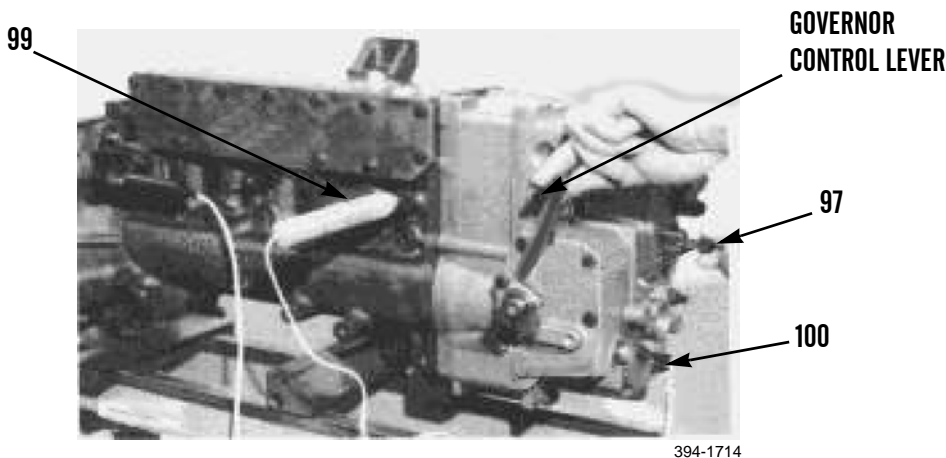
The compressor assembly is used to compress the overfueling spring through the linkage. The overfueling spring must be compressed to get an accurate fuel setting measurement.

12. Install compressor assembly (98) in adapter (94).



**FUEL SETTING PROCEDURE - CONTINUED**

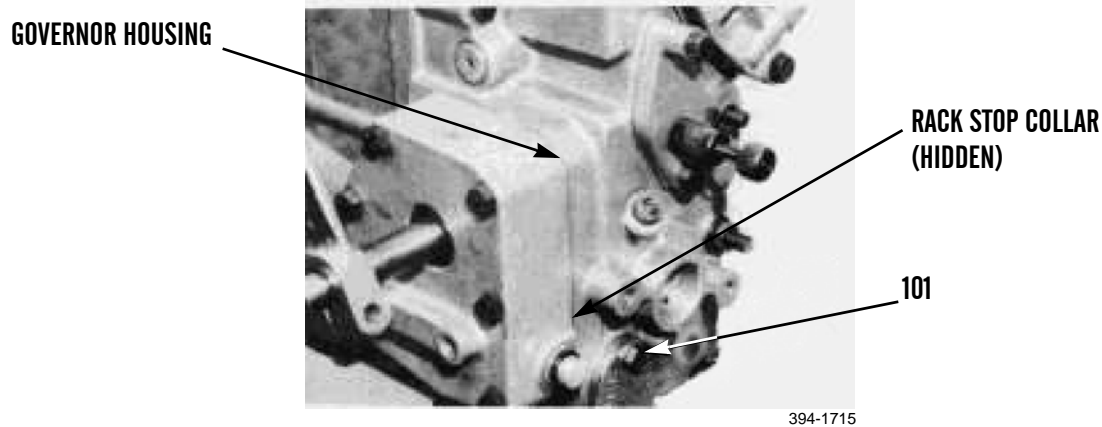
13. Secure clip end of circuit tester (99) to insulated terminal (100) and attach other end to good electrical ground.
14. Hold governor control lever in FULL LOAD position (rotate governor shaft clockwise).

**CAUTION**

DO NOT turn the rod any further in if the rod begins to tighten. Damage to the governor can occur if the rod is turned in further.

**NOTE**

- When the rod is turned out, there can be a small initial movement of the dial indicator hands. Hands will stop moving while the rod is turned out for approximately 1-1/2 additional turns. Indicator hands will begin to move again and will follow the turning of rod until setting is reached. It is important that the rod be turned slowly so rack can follow the governor components.
  - If rod is turned out too fast, a wrong measurement can be read on the dial indicator as the light comes on. Repeat steps 15 and 17 to make sure the correct measurement is taken.
15. Turn rod (97) of compressor assembly in (clockwise) until dial indicator hands move an additional -0.0787 in. (-2 mm) after light goes out (two complete revolutions of large needle on dial indicator).

**FUEL SETTING PROCEDURE - CONTINUED**

16. Remove adjustment screw cover (101) from rear of governor housing.

**NOTE**

The static fuel setting (step 17) and the static full torque setting (step 18) must be within  $\pm 0.00984$  in. (.25 mm) of the setting on the engine information plate. If the setting is within  $\pm 0.00984$  in. (.25 mm), an adjustment is not necessary.

17. Slowly turn rod (97) out (counterclockwise) until circuit tester light comes on. This is static fuel setting.  
 18. Continue to turn rod (97) out until indicator hands stops moving. Then turn rod out two additional turns. Push in on rack stop collar to ensure it is in correct position. New reading on indicator is full torque static setting.

Example:

Static Fuel Setting = 0.0858 in. (2.18 mm)

Full Torque = 0.1252 in. (3.18 mm)

This means the torque rise setting is 0.0393 in. (1.00 mm). A fuel setting and torque rise setting are not necessary.

19. Refer to engine information plate for correct static full torque setting.  
 20. Determine how much the settings will have to be changed. (See examples in this work package.) Use Table 1 in this work package to determine how far adjusting screws must be turned.

**FUEL SETTING PROCEDURE - CONTINUED****Table 1. Adjustment Screw Chart.**

<b>Amount of Change</b>	<b>Turns of Adjustment Screw</b>
.118 in. (3.00 mm)	3-3/4
.110 in. (2.79 mm)	3-1/2
.102 in. (2.59 mm)	3-1/4
.094 in. (2.39 mm)	3
.087 in. (2.21 mm)	2-3/4
.079 in. (2.01 mm)	2-1/2
.071 in. (1.80 mm)	2-1/4
.063 in. (1.60 mm)	2
.055 in. (1.40 mm)	1-3/4
.047 in. (1.19 mm)	1-1/2
.039 in. (0.99 mm)	1-1/4
.031 in. (0.79 mm)	1
.024 in. (0.61 mm)	3/4
.016 in. (0.41 mm)	1/2
.008 in. (0.20 mm)	1/4

**FUEL SETTING PROCEDURE - CONTINUED**

<b>Example 1</b>	
Actual Reading:	1.05 mm
Desired Setting:	1.25 mm
Difference:	0.20 mm

Since desired setting is higher than actual reading, turn adjusting screw out (counterclockwise) approximately 1/4 turn. Recheck new setting and readjust if necessary.

<b>Example 2</b>	
Actual Reading:	2.77 mm
Desired Setting:	1.85 mm
Difference:	0.92 mm

Since desired setting is lower than actual reading, turn adjusting screw in (counterclockwise) approximately 1-1/8 turns. Recheck new setting and readjust if necessary.

<b>Example 3</b>	
Actual Reading:	-1.05 mm
Desired Setting:	-1.25 mm
Difference:	0.20 mm

Negative numbers work differently than positive numbers. If one number (-1.25) has a larger digital value than another one (-1.05), first number (-1.25) is actually less than other one. Therefore, in this example desired setting is lower than actual reading. Turn adjusting screw in (clockwise) approximately 1/4 turn. Recheck new setting and readjust if necessary.

**FUEL SETTING PROCEDURE - CONTINUED**

<b>Example 4</b>	
Actual Reading:	-2.77 mm
Desired Setting:	-1.85 mm
Difference:	0.92 mm

The desired setting is higher than actual reading. Turn adjusting screw out (counterclockwise) approximately 1-1/8 turns. Recheck new setting and readjust if necessary.

<b>Example 5</b>	
Actual Reading:	+1.05 mm
Desired Setting:	-1.25 mm
Difference:	2.30 mm

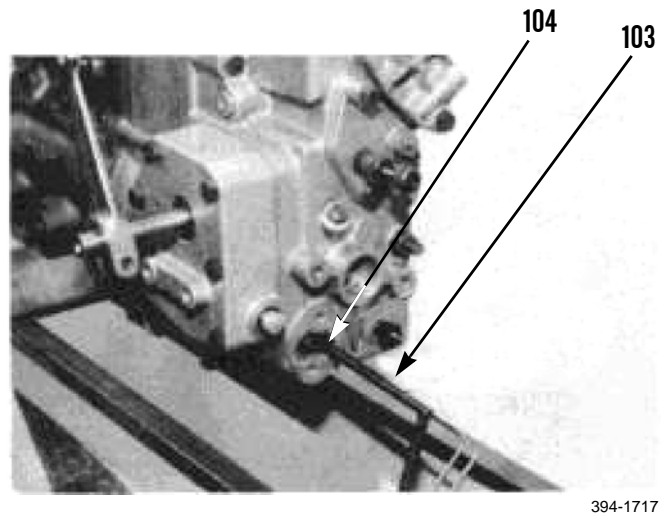
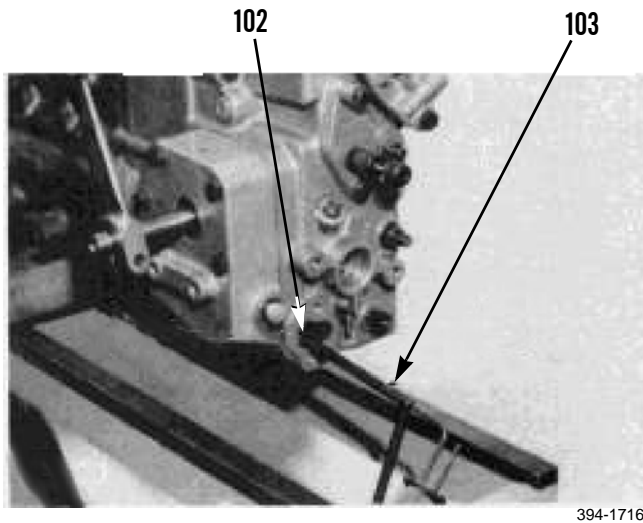
The desired setting is lower than actual reading. Turn adjusting screw in approximately 2-7/8 turns.

<b>Example 6</b>	
Actual Reading:	-1.05 mm
Desired Setting:	+1.25 mm
Difference:	2.30 mm

The desired setting is higher than actual reading. Turn adjusting screw out approximately 2-7/8 turns.

**FUEL SETTING PROCEDURE - CONTINUED****NOTE**

If you are working from the side of the engine and cannot see the adjusting screws, use the outer edge of the opening in the governor housing to guide the tool onto the fuel setting screw. Use the inner edge of the opening to guide the tool onto the full torque setting adjustment screw.



21. If both settings are to be increased, turn torque rise adjustment screw (104) out (counterclockwise) same number of turns as fuel setting adjustment screw (102) will be changed. If static fuel setting is to be decreased, it is not necessary to change full torque setting at this time.
22. Use rack adjustment tool (103) to loosen locknuts for adjustment screws (104) and to turn adjustment screws.
23. Adjust fuel setting adjustment screw (102) the number of turns determined in step 21. Always recheck setting after each adjustment and adjust again if needed.

**NOTE**

There is a zero tolerance for the fuel setting and full torque setting when an adjustment is made.

24. After static fuel setting is correct, adjust torque rise adjustment screw (104) the number of turns determined in step 21.
25. Always recheck setting after each adjustment and adjust again if needed.
26. Install injection pump housing and governor assembly (WP 0273 00).
27. Install fuel transfer pump (WP 0275 00).
28. Install air-fuel ratio control (WP 0355 00).
29. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Fuel Ratio Control and Governor Check, Fuel Ratio Control, Adjustment, Check and Adjustment of Fuel Ratio Control Linkage

---

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Tool kit, fuel injection (Item 112, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Pin, timing (Item 66, WP 0338 00)

Shutoff group, manual (Item 105, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued.**

Rag, wiping (Item 35, WP 0339 00)

Gasket (2)

Packing, preformed

Seal (2)

Wire

**References**

TM 5-3805-248-10

WP 0354 00

**Equipment Condition**

Hood removed (WP 0189 00)

Engine shields removed (WP 0191 00)

---

**REMOVAL**

**CAUTION**

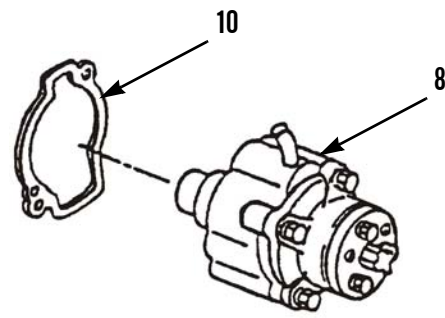
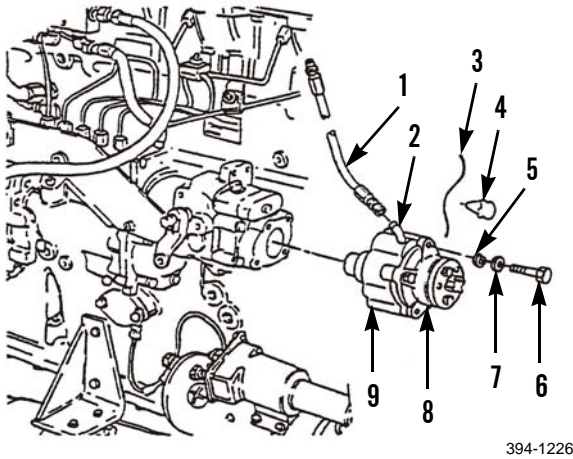
Wipe area clean around all connections prior to removal. Cap hydraulic oil lines and plug openings after removal. Contamination of hydraulic system could result in premature failure.

**NOTE**

- Use a container to capture draining fuel. Dispose of fuel IAW local policy and ordinances. Ensure all spills are cleaned up.
- Note routing of all hose assemblies prior to removal to ensure correct installation.
- Remove and note location of all clips that secure hose assemblies to ensure correct installation.

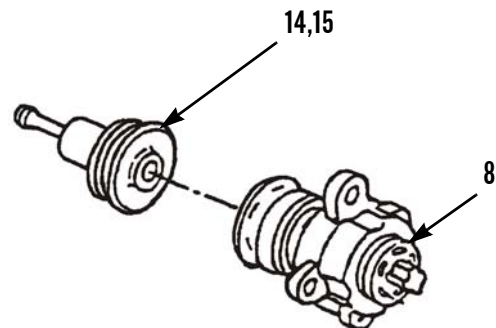
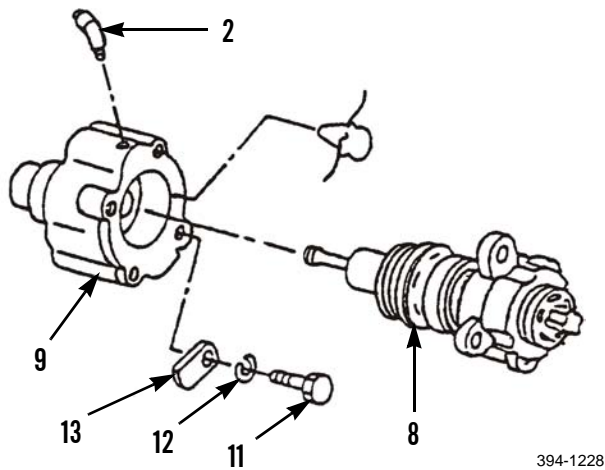
**REMOVAL - CONTINUED**

1. Disconnect hose assembly (1) from elbow (2) in diaphragm housing (9) on left side of engine.
2. Remove wire (3), seal (4), two bolts (6), washers (7) and lockwashers (5). Discard wire and seal.
3. Remove air-fuel ratio control (8) from machine.
4. Remove and discard gasket (10) from air-fuel ratio control (8).



**DISASSEMBLY**

1. Remove elbow (2).
2. Remove two bolts (11), washers (12) and tag (13).
3. Remove air-fuel ratio control (8) from diaphragm housing (9).
4. Remove valve (14) from air-fuel ratio control (8).
5. Remove seal (15) from valve (14). Discard seal.

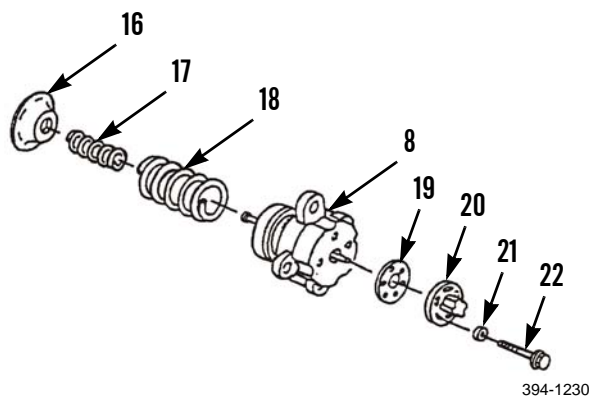




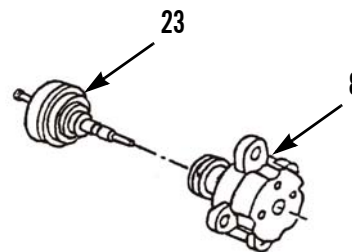
**DISASSEMBLY - CONTINUED****WARNING**

Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

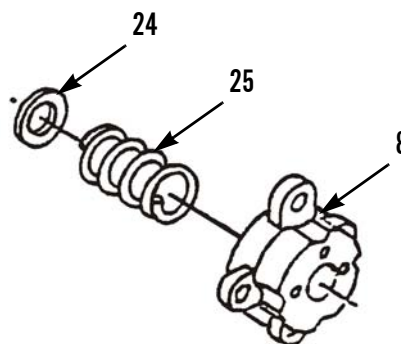
6. Remove retainer (16), spring (17 and 18), three bolts (22), washers (21), cover (20) and gasket (19). Discard gasket.



7. Remove diaphragm assembly (23) from air-fuel ratio control (8).

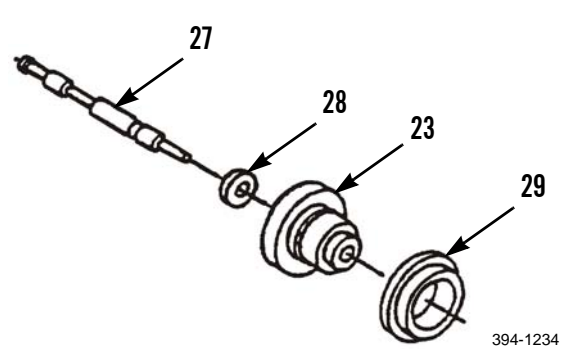
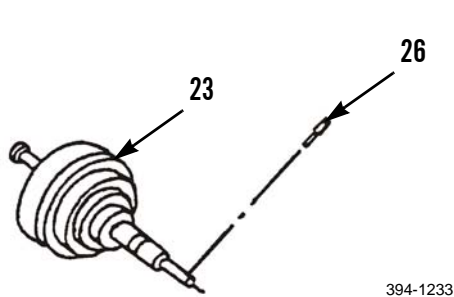


8. Remove retainer (24) spring (25) and air-fuel ratio control (8).



**DISASSEMBLY - CONTINUED**

9. Remove pin (26) from diaphragm assembly (23).
10. Remove valve (27), preformed packing (28) and diaphragm (23) from retainer (29). Discard preformed packing.

**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 cause 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.

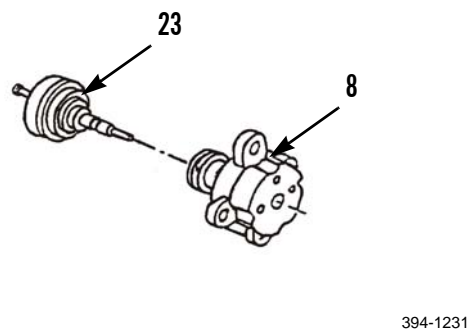
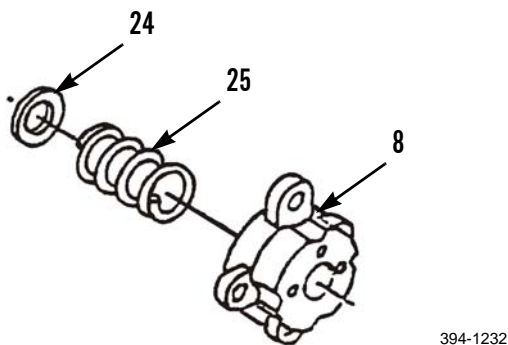
1. Remove all gasket and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Use clean lubricating oil to lubricate new preformed packing (28).
2. Install diaphragm (23), new preformed packing (28) and valve (27) in retainer (29).
3. Install pin (26) in diaphragm assembly (23).

ASSEMBLY - CONTINUED

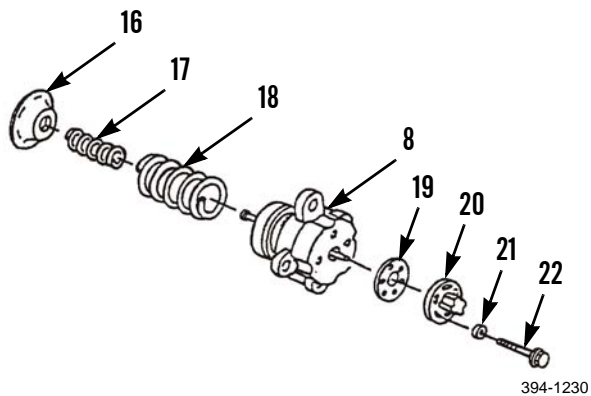
4. Install spring (25) and retainer (24) in air-fuel ratio control (8).
5. Install diaphragm assembly (23) in air-fuel ratio control (8).



**WARNING**

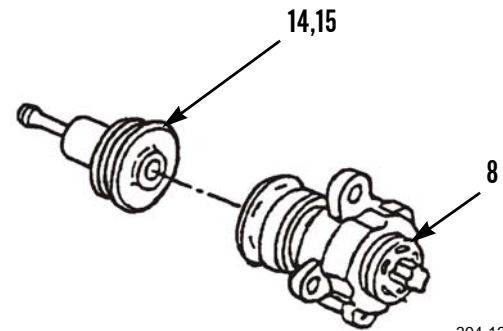
Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

6. Install new gasket (19), cover (20), three washers (21) and bolts (22) on air-fuel ratio control (8).
7. Install springs (17 and 18) and retainer (16).



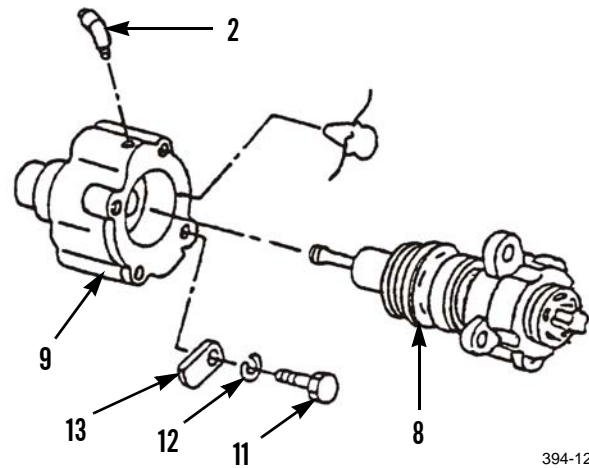
**ASSEMBLY - CONTINUED**

8. Install new seal (15) on valve (14).
9. Install valve (14) on air-fuel ratio control (8).



394-1229

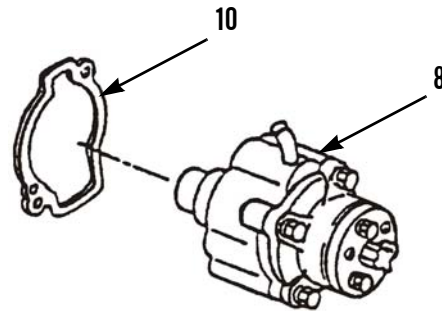
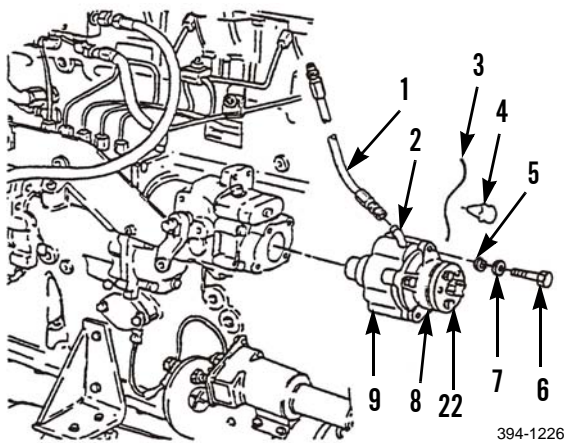
10. Install air-fuel ratio control (8) in diaphragm housing (9).
11. Install tag (13), two washers (12) and bolts (11).
12. Install elbow (2).



394-1228

**INSTALLATION**

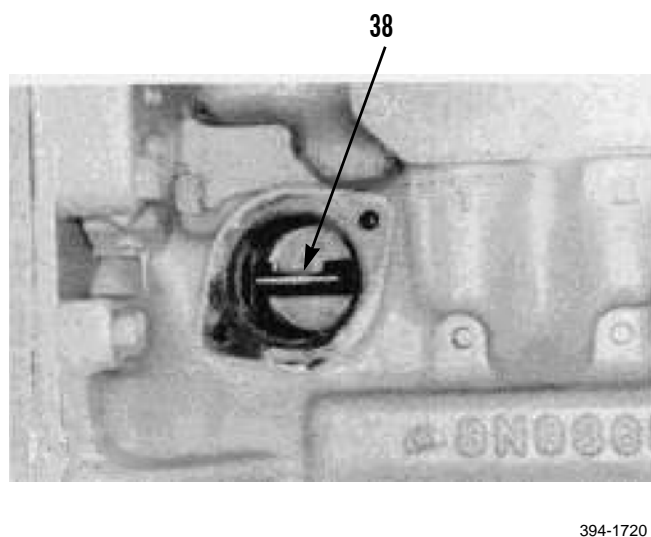
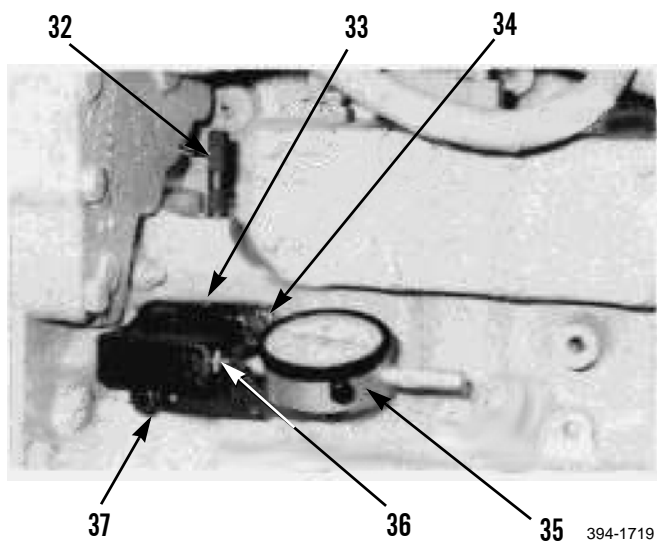
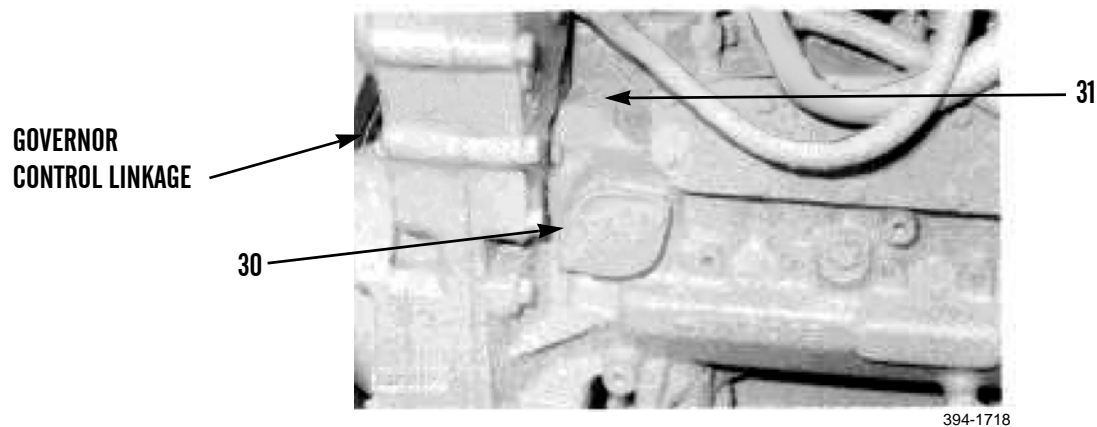
1. Install new gasket (10) on air-fuel ratio control (8).
2. Install air-fuel ratio control (8), two lockwashers (5), washers (7) and one of two bolts (6) on left side of engine.
3. Cut 11.8 in. (300 mm) length of new wire (3).
4. Install new wire (3) through holes in one of three bolts (22), remaining one of two bolts (6) and bolt on governor assembly.
5. Use crimping tool to install new seal (4) over new wire (3). Bend new seal (4) at score line.
6. Connect hose assembly (1) to elbow (2) in diaphragm housing (9).



**FUEL RATIO CONTROL AND GOVERNOR CHECK****NOTE**

Governor seals do not have to be cut or removed for procedure that follows.

1. Remove plug (31) and cover (30) from fuel injection pump housing.



2. Install and zero fuel injection tool kit as follows:
  - a. Install collet (36) on bracket assembly (33).
  - b. Position indicator (35) arm in approximate middle of its travel to ensure it engages in slot (38) in rack, and install bracket assembly (33) on fuel injection pump housing.
  - c. Install ground body bolt (37) first. Then install bolt (34) and ensure indicator (35) arm moves freely.
  - d. Position indicator (35) in collet (36).

**FUEL RATIO CONTROL AND GOVERNOR CHECK - CONTINUED****NOTE**

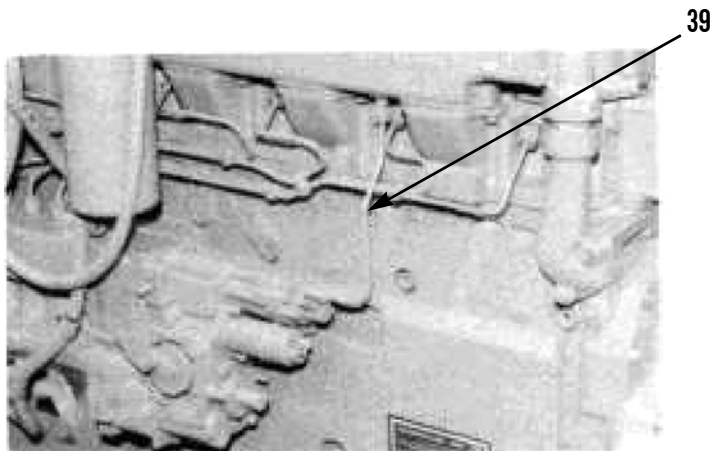
Contact point will not go through collet and must be assembled after indicator stem has passed through collet.

- e. Assemble fuel injection tool kit contact point and extension and install on indicator (35).
- f. Tighten collet (36) just enough to hold indicator (35).

**NOTE**

Do not start engine at this time.

3. Turn ignition switch to ON position to activate shutoff solenoid.
4. Move governor control linkage to full FUEL ON position and hold or fasten it in this position.
5. Install timing pin (32) in rack-zeroing hole near front of fuel injection pump housing.
6. With governor control lever in full FUEL ON position, move manual shutoff shaft slowly to FUEL OFF position (counterclockwise). Visually ensure timing pin (32) drops and engages with slot in fuel rack.
7. Release manual shutoff shaft move indicator (35) in collet and tighten collet when all three needles are on zero.
8. Remove timing pin (32) and note change in indicator (35) reading. Indicator (35) should show movement in FUEL ON direction. If no movement occurs, repeat steps 5, 6 and 7 to zero indicator.
9. Release governor control linkage.
10. Remove air line (39) from engine. Put plugs over openings to keep dirt out of system.

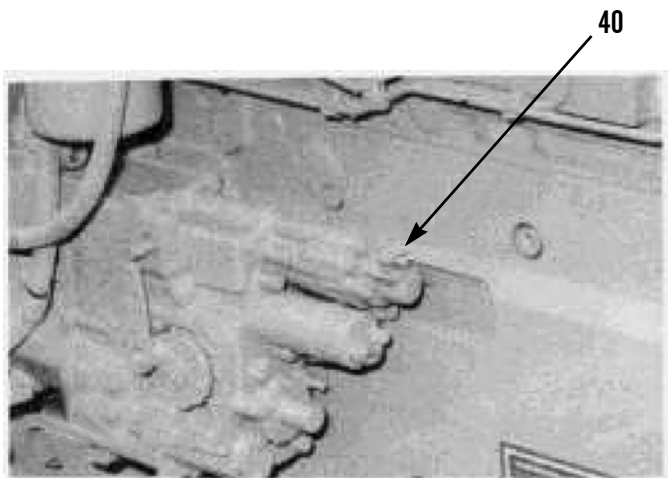


394-1721

**FUEL RATIO CONTROL AND GOVERNOR CHECK - CONTINUED****WARNING**

Work carefully around an engine that has been started. Failure to follow this warning may cause injury or death.

11. Start engine (TM 5-3805-248-10) and operate it for a minimum of five minutes to raise governor and engine temperature to normal operating temperatures.
12. Check leak-down rate of fuel ratio control (with engine operating at low idle) as follows:
  - a. Connect pressure shutoff valve, pressure regulator and air supply to fitting (40).



394-1722

- b. Apply 70 kPa (10 psi) air pressure to fuel ratio control.
- c. Turn shutoff valve to OFF and check leak-down rate. Leakage of 3 psi (20 kPa) in 30 seconds is acceptable.
- d. If leakage is more than 3 psi (20 kPa) in 30 seconds, fuel ratio control must be replaced before continuing to next step.
- e. Keep 10 psi (70 kPa) air pressure on fuel ratio control for step 13.

**NOTE**

Read indicator carefully because this reading will be a maximum for only a moment. Maximum indicator reading is dynamic full torque fuel setting of engine. This setting is .02 in. (0.5 mm) greater than static full torque setting given on engine information plate of later engines.

13. From low idle, rapidly move governor control shaft to full FUEL ON position and note reading on indicator. If dynamic full torque fuel setting is not reached, increase air pressure to ensure there is full fuel ratio control movement. Do not exceed 15 psi (100 kPa).

**NOTE**

Read indicator carefully because this reading will be a maximum for only a moment.

14. Release all air pressure from fuel ratio control. Start at 900 RPM and rapidly move governor control shaft to full FUEL ON position and note reading on indicator. Record maximum indicator reading. This is dynamic fuel ratio control setting for engine.



**FUEL RATIO CONTROL AND GOVERNOR CHECK - CONTINUED****NOTE**

If dynamic fuel ratio control setting is within  $\pm 0.010$  in. (0.25 mm) of specification given on engine information plate, an adjustment is not necessary.

15. For adjustment of control, refer to *Fuel Ratio Control Adjustment* in this work package.
16. Check boost pressure that gives full torque rack travel, as follows:
  - a. Connect pressure gage, pressure regulator and air supply to fitting (40).
  - b. Apply 4 psi (25 kPa) air pressure to fuel ratio control.
  - c. Start engine (TM 5-3805-248-10). Run engine at 900 RPM and rapidly move governor control shaft to full FUEL ON position. Record maximum indicator reading.
  - d. Repeat this procedure several times. Each time increase air pressure 7 psi (5 kPa).
  - e. Record first air pressure setting that gives full torque fuel setting. Full torque fuel setting was measured in step 13.
  - f. This is boost pressure that moves fuel ratio control out of rack control position. This pressure permits dynamic full torque fuel setting. If pressure recorded is less than rated boost, fuel ratio control cannot be a cause of low power complaint.

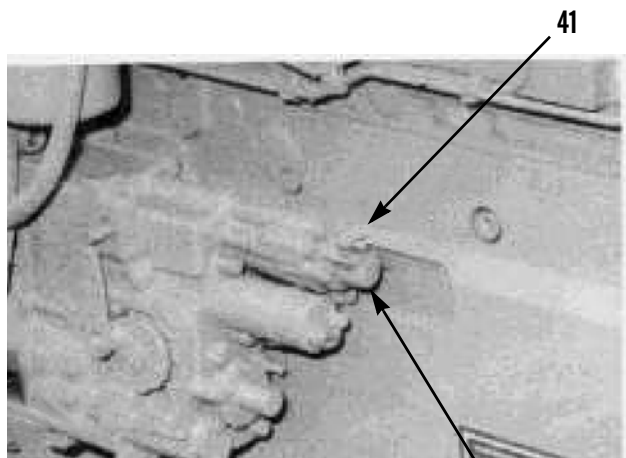
**FUEL RATIO CONTROL ADJUSTMENT****NOTE**

Before governor seals are cut or removed, refer to *Fuel Ratio Control and Governor Check* in this work package to make sure an adjustment is needed.

1. Refer to engine information plate for correct dynamic fuel ratio control setting specification before an adjustment is made.
2. Install and zero fuel injection tool kit. Refer to *Fuel Ratio Control and Governor Check* in this work package for procedure.
3. Remove air line (39) cover (42) and gasket (41) from engine.



394-1721

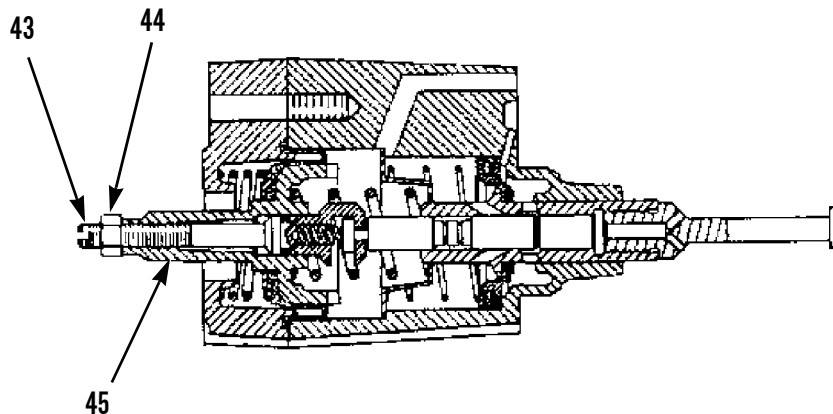


394-1722

**FUEL RATIO CONTROL ADJUSTMENT - CONTINUED****WARNING**

Work carefully around an engine that has been started. Failure to follow this warning may cause injury or death.

4. Start engine (TM 5-3805-248-10) and operate it for a minimum of five minutes to raise governor and engine temperature to normal operating temperature.



394-1723

5. Hold retainer (45) in position to keep fuel ratio control diaphragm from turning. Loosen nut (44).
6. Turn valve extension (43) to get correct setting. A clockwise direction gives a more positive setting. Counterclockwise direction will give a more negative setting. Several adjustments of valve extension (43) may be needed to get correct dynamic fuel ratio control setting.
7. After each adjustment is made, check dynamic fuel ratio control setting. Start engine (TM 5-3805-248-10). Run engine at 900 RPM and rapidly move governor control shaft to full FUEL ON position. Read measurement on dial indicator. Record maximum dial indicator reading.

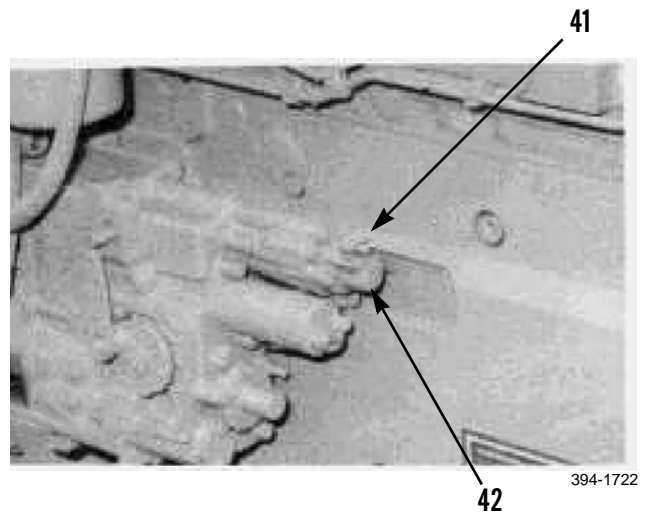
**NOTE**

If correct dynamic fuel ratio control setting cannot be made with this adjustment, internal governor linkage must be checked and adjusted or fuel ratio control needs repair or replacement.

8. After correct adjustment has been made, tighten nut (44). Check dynamic fuel ratio control setting again.

**FUEL RATIO CONTROL ADJUSTMENT - CONTINUED**

9. Install gasket (42) and cover (41) on fuel ratio control. Torque bolts to  $7\pm 2$  lb-ft ( $9\pm 3$  Nm).



10. Apply 10 psi (70 kPa) air pressure to fuel ratio control air line (39). This will fully extend fuel ratio control to obtain dynamic full torque.
11. Check dynamic full torque setting. Start engine (TM 5-3805-248-10). Run engine at 900 RPM and rapidly move governor control shaft to full FUEL ON position. Read maximum measurement on dial indicator.

**NOTE**

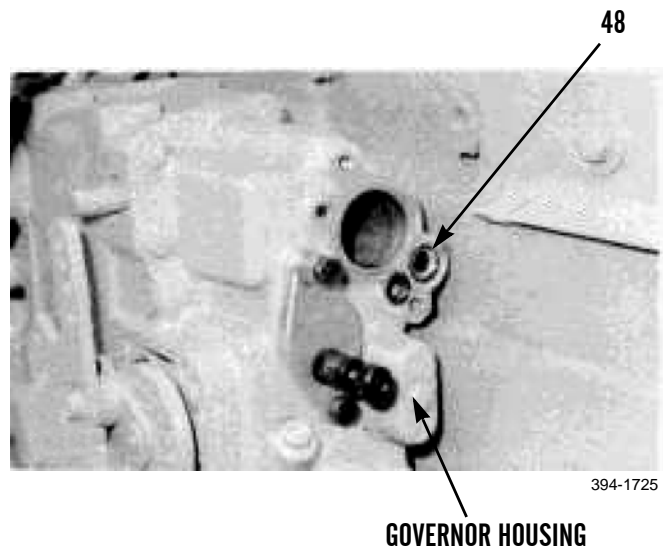
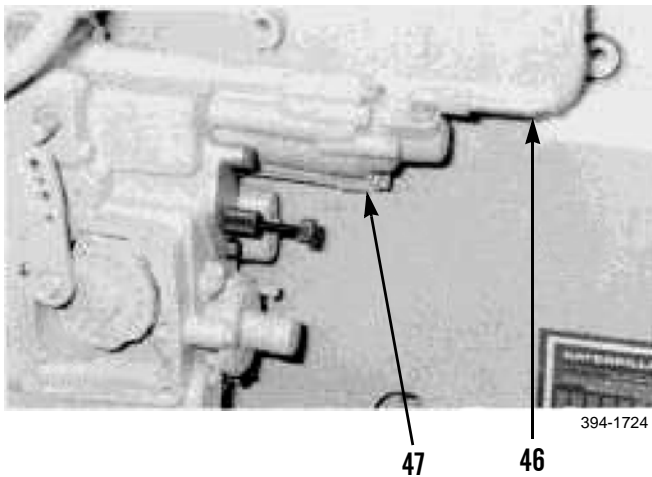
If dynamic full torque setting cannot be reached, fuel ratio control needs repair or replacement.

12. Shut down engine (TM 5-3805-248-10).
13. Install wire and seal on fuel ratio control.
14. Install air line (39) on engine.
15. Remove rack position indicator tooling.

**CHECK AND ADJUSTMENT OF FUEL RATIO CONTROL LINKAGE****NOTE**

Check and adjustment of fuel ratio control linkage can be performed with fuel injection pump and governor on or off engine.

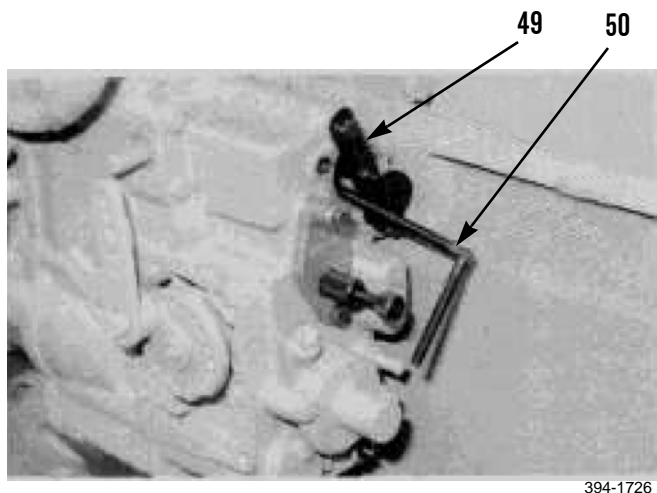
1. Remove air supply line (46) and fuel ratio control (47).
2. Remove orifice screen (48) from governor housing so governor adjusting tool (52) can fit squarely against governor housing.

**NOTE**

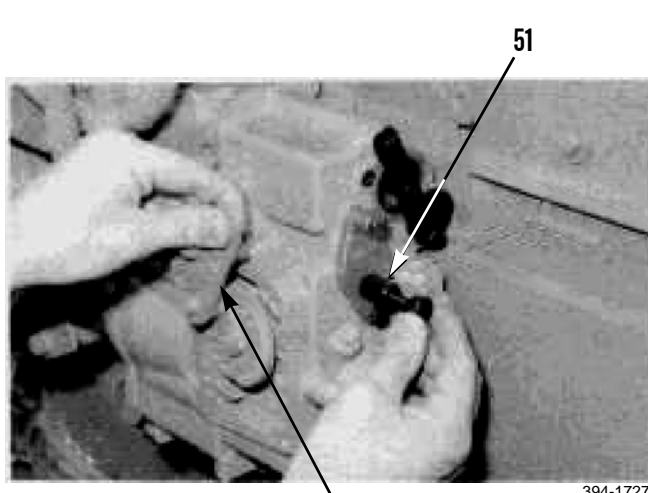
If it is necessary to change linkage adjustment, install outer part of rack adjusting tool along left side of governor before bolts for governor adjusting tool are tightened.

3. Move governor control lever to low idle position and install governor adjusting tool (49) as shown.
4. Move governor control lever to full load position and hold in position.
5. Turn knob so rod moves in compressor assembly (51) until needles of dial indicator move approximately 0.0394 in. (1 mm) or one revolution of large needle.
6. Slowly turn knob to move rod out of compressor assembly (51) until needles of dial indicator stop moving. This is the static fuel ratio control lever setting.

CHECK AND ADJUSTMENT OF FUEL RATIO CONTROL LINKAGE - CONTINUED



394-1726



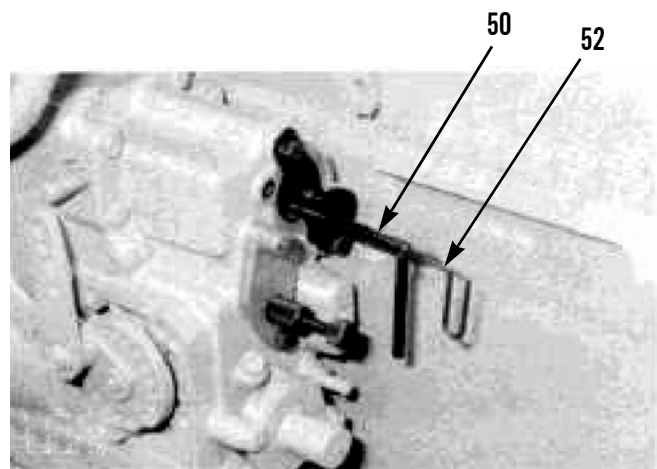
394-1727

GOVERNOR CONTROL LEVER

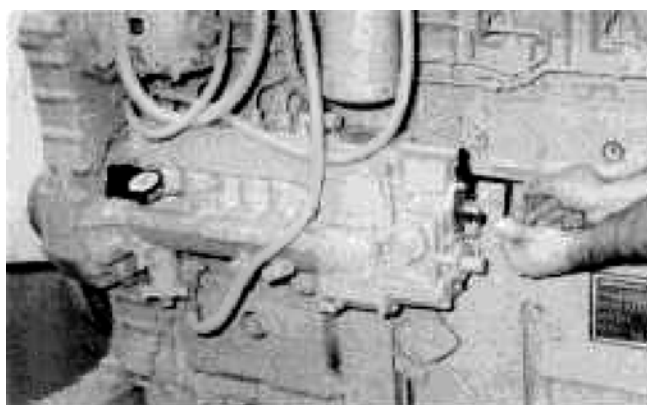
**NOTE**

When rod is turned out, there may be a small initial movement of dial indicator needles. Needles will stop moving while rod is turned out for approximately 1-1/2 additional turns. Indicator needles will begin to move again and will follow turning of knob until setting is reached. It is important that rod be turned slowly so fuel rack can follow movement of governor components.

7. Refer to *Fuel Setting Procedure* in WP 0354 00 for correct static fuel ratio control (lever) setting dimension, and compare it to dial indicator reading. Dial indicator reading must be within  $\pm .010$  in. (.25 mm) of dimension given in fuel setting procedure, or an adjustment is needed.



394-1728

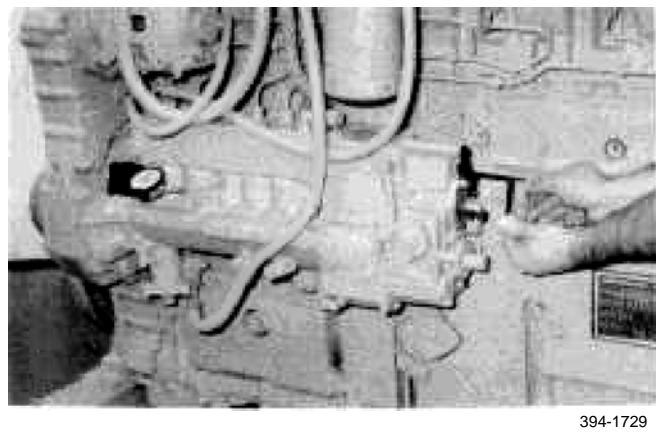
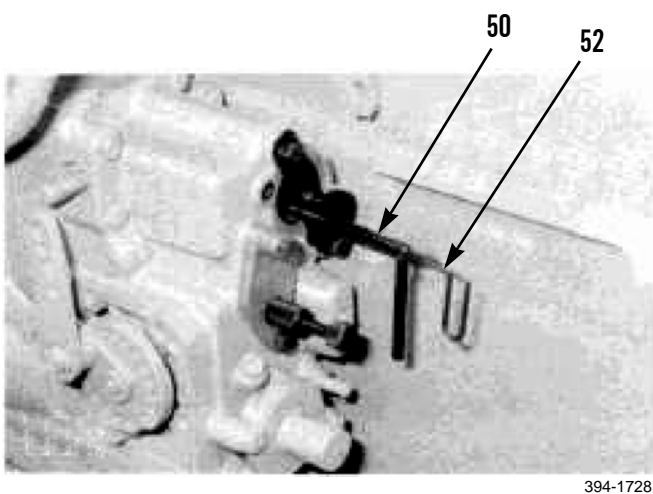


394-1729

**CHECK AND ADJUSTMENT OF FUEL RATIO CONTROL LINKAGE - CONTINUED****NOTE**

Needles of dial indicator will not follow turning of adjustment screw. It may be necessary to repeat steps 3 through 5 until adjustment is correct.

8. If an adjustment is necessary, use outer part (50) of rack adjusting tool to loosen locknut and then use hex wrench (52) to turn adjusting screw. Turn screw out to make setting more positive, or in to make setting more negative. Ensure that locknut is tight after adjustment. There is a zero tolerance for linkage setting if an adjustment is made.



9. Operate engine and verify correct operation (TM 5-3805-248-10).
10. Install hood (WP 0189 00).
11. Install side panel (WP 0191 00).

**END OF WORK PACKAGE**

---

**TURBOCHARGER REPAIR**

**0356 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

- Tool kit, general mechanic's (Item 113, WP 0338 00)
- Shop equipment, field maintenance (Item 104, WP 0338 00)
- Driver tool (Item 19, WP 0338 00)
- Fixture adapter (Item 23, WP 0338 00)
- Fixture assembly, turbocharger (Item 24, WP 0338 00)
- Holding fixture, turbo (Item 37, WP 0338 00)
- Modified fixture (Item 56, WP 0338 00)
- Turbine holder (Item 122, WP 0338 00)

**Materials/Parts**

- Cleaning compound, solvent (Item 8, WP 0339 00)
- Oil, lubricating (Item 32, WP 0339 00)
- Rag, wiping (Item 35, WP 0339 00)
- Bearing (3)
- Bolt (4)
- Collar
- Lock plate (4)
- Locknut
- Pin (2)
- Ring (7)

**Equipment Condition**

- Turbocharger removed (WP 0276 00)
-

**DISASSEMBLY**

1. Position turbocharger assembly on fixture assembly.



**WARNING**

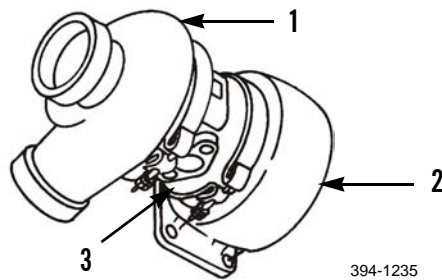


Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

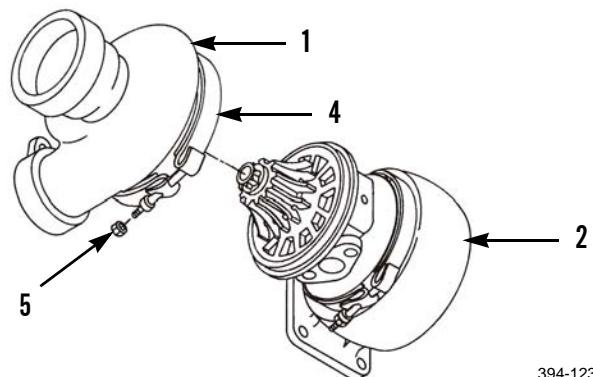
2. Use solvent cleaning compound and brush to thoroughly clean exterior of turbocharger assembly.

**NOTE**

Use scribe to match-mark compressor housing (1), housing (3) and housing (2) to aid in assembly.



3. Remove nut (5) from clamp (4).
4. Remove housing (1) from turbocharger assembly.
5. Remove clamp (4) from housing (1).





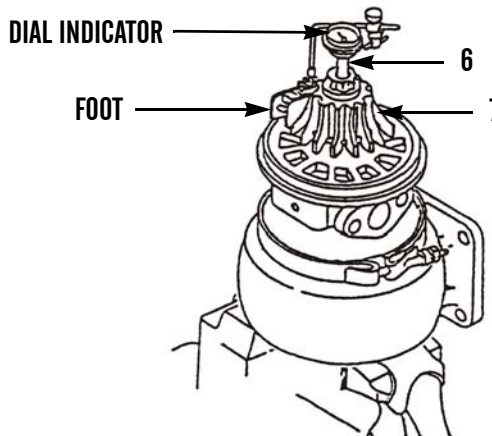
**DISASSEMBLY - CONTINUED**

6. Position turbocharger assembly in fixture assembly so that impeller (7) is facing up.

**NOTE**

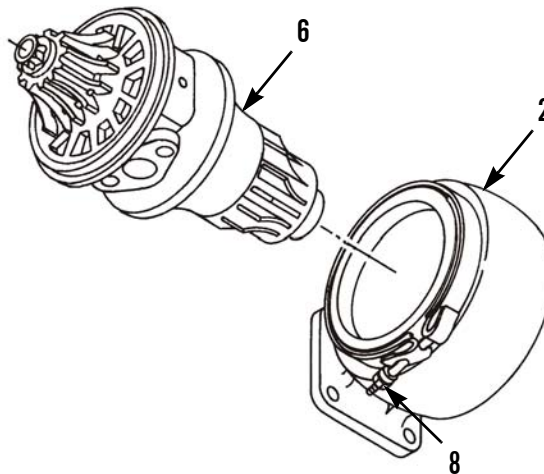
Ensure dial indicator is calibrated and foot does not make contact with sides of impeller; otherwise, it will be impossible to obtain an accurate reading.

7. Install dial indicator on top of shaft and wheel assembly (6).
8. Use dial indicator to measure end play of shaft and wheel assembly (6). Shaft end play must not be greater than 0.007 in. (0.1778 mm) and not less than 0.003 in. (0.0762 mm). Repair turbocharger if measurements do not fall within these limits.
9. Remove dial indicator.



394-1237

10. Loosen nut (8).
11. Separate shaft and wheel assembly (6) from housing assembly (2).
12. Position shaft and wheel assembly (6) in holding fixture.



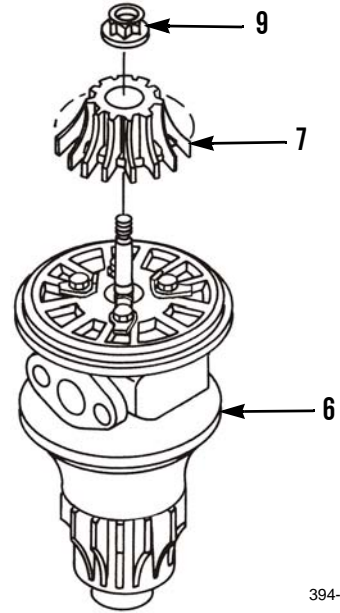
394-1238

**DISASSEMBLY - CONTINUED**

**CAUTION**

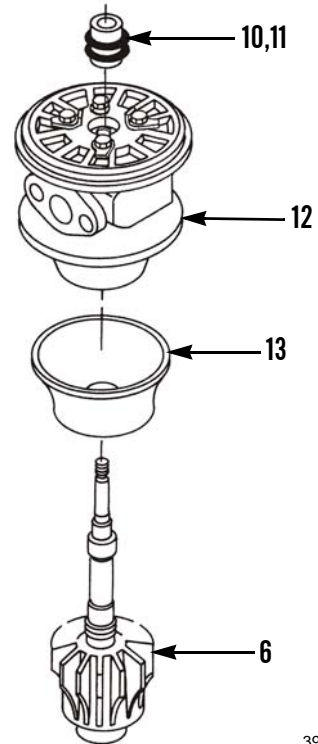
Do not put bending force on shaft and wheel assembly when removing nut.

13. Remove and discard locknut (9) from shaft and wheel assembly (6).
14. Use arbor press and driver tool to remove impeller (7).
15. Remove shaft and wheel assembly (6) from holding fixture.



394-1239

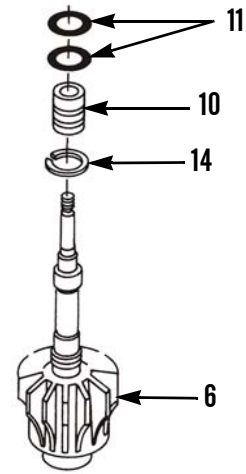
16. Remove shaft and wheel assembly (6), shroud (13), spacer (10) and rings (11) from housing (12).



394-1240

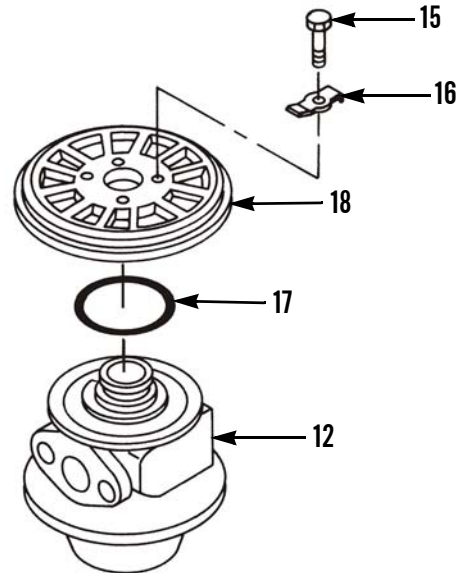
**DISASSEMBLY - CONTINUED**

17. Use snap ring pliers to remove and discard ring (14) from shaft and wheel assembly (6).
18. Use snap ring pliers to remove and discard two rings (11) from spacer (10).



394-1241

19. Bend up tabs on four lock plates (16) and remove four bolts (15) and lock plates (16) from back plate (18). Discard four lock plates.
20. Use soft hammer to remove back plate (18), tapping lightly to prevent damage.
21. Remove and discard ring (17) from housing (12).



394-1242

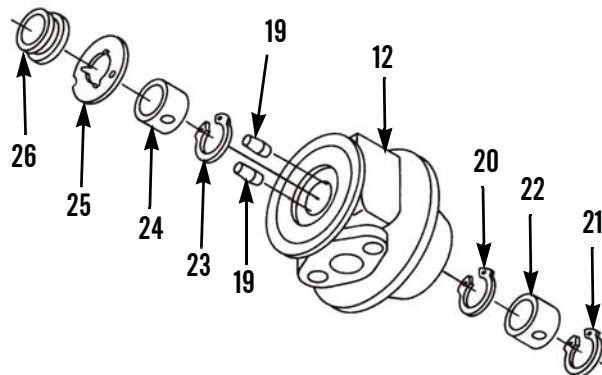
**DISASSEMBLY - CONTINUED**

- 22. Remove collar (26) and bearings (24 and 25). Discard bearings.
- 23. Use snap ring pliers to remove and discard rings (21 and 23).
- 24. Remove and discard bearing (22).
- 25. Use snap ring pliers to remove and discard ring (20).

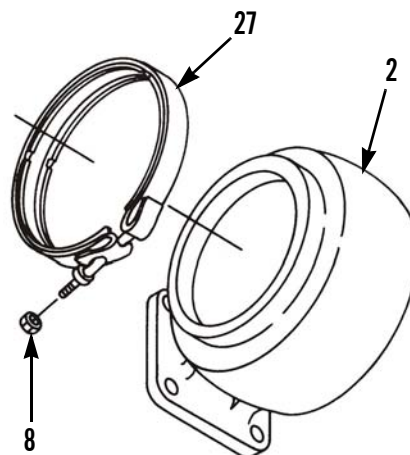
**CAUTION**

Removal of pins from housing will cause destruction of pins. Remove only if inspection indicates replacement is necessary.

- 26. If damaged, remove and discard two pins (19) from housing (12).
- 27. Remove nut (8) from clamp (27).
- 28. Remove clamp (27) from housing (2).
- 29. Remove housing (2) from fixture assembly.



394-1243



394-1244

**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 cause 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**

Never use a wire brush or steel blade scraper for cleaning turbocharger components. Failure to follow this procedure could cause damage to equipment.

**NOTE**

Before cleaning turbocharger parts, inspect all parts for burning, rubbing or other damage that might not be evident after cleaning.

1. Remove all gasket and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY****CAUTION**

Check each part prior to installation for cleanness. Exercise care to prevent entry of dirt and foreign matter during assembly. Failure to follow this procedure could cause damage to equipment.

1. Install housing (2) in fixture assembly.
2. Install clamp (27) on housing (2).
3. Install nut (8), loosely, on clamp (27).

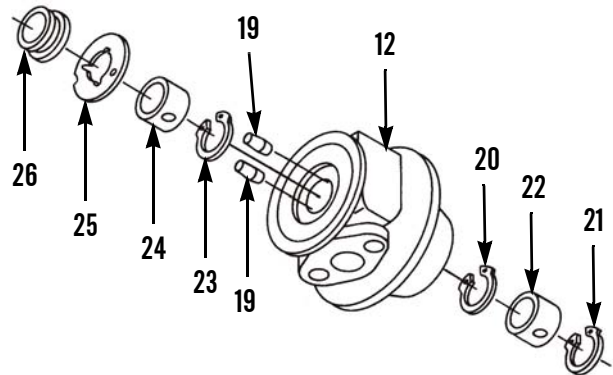
**CAUTION**

Use only minimum amount of force needed to install new pins in housing. Failure to follow this procedure could cause damage to the metal adjacent to pin holes in housing.

4. If removed, install two new pins (19) in housing (12). Two new pins (19) must project 0.082 in. (2.0828 mm) from housing (12) when installed.
5. Use snap ring pliers to install new ring (20) in bore of housing (12).
6. Use clean lubricating oil to lubricate new bearing (22), including outer face, and install.
7. Use snap ring pliers to install new rings (21 and 23).

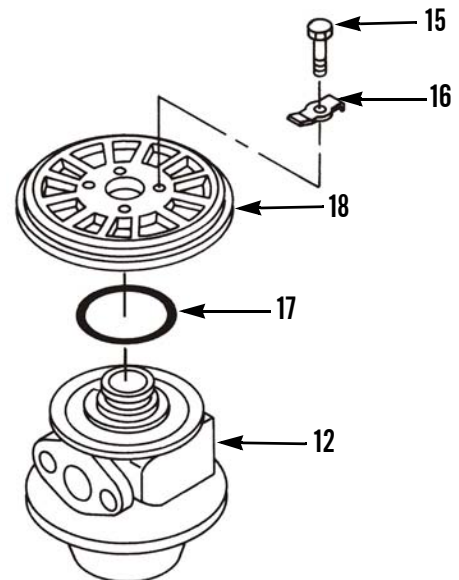
**ASSEMBLY - CONTINUED**

8. Use clean lubricating oil to lubricate new bearings (24 and 25), including outer faces, and install in bore of housing (12).
9. Use clean lubricating oil to lubricate new collar (26) and install on top of housing (12).



394-1243

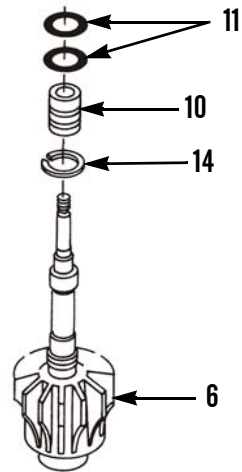
10. Install new ring (17) in groove of housing (12).
11. Position back plate (18) on housing (12), aligning oil holes.
12. Install four new lock plates (16) and bolts (15) on back plate (18). Torque bolts to 90 lb-ft (122 Nm). Bend four new lock plates up against four bolts.



394-1242

**ASSEMBLY - CONTINUED**

- 13. Use snap ring pliers to install new ring (14) on shaft and wheel assembly (6).
- 14. Install two new rings (11) on spacer (10).



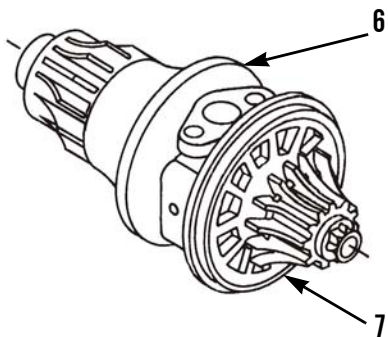
394-1241

- 15. Position shroud (13) against housing (12).

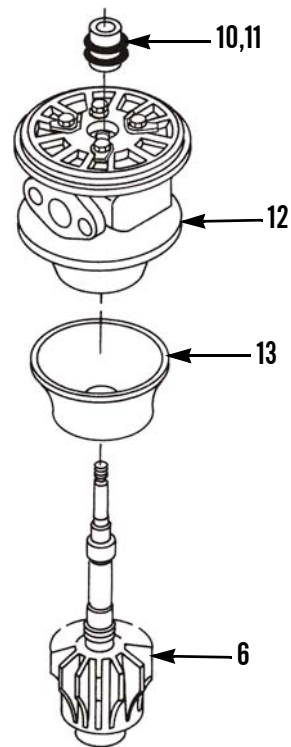
**CAUTION**

Use care not to scratch or scuff bearings and rings in housing when installing shaft and wheel assembly. Failure to follow this procedure could cause damage to equipment.

- 16. Install shaft and wheel assembly (6) through shroud (13) and housing assembly (12).
- 17. Install spacer (10) over shaft and wheel assembly (6). Ensure the small inside diameter of spacer is toward the impeller (7) end of shaft and wheel assembly.



394-1246



394-1240

**ASSEMBLY - CONTINUED**

18. Position shaft and wheel assembly (6) in holding fixture.



**WARNING**



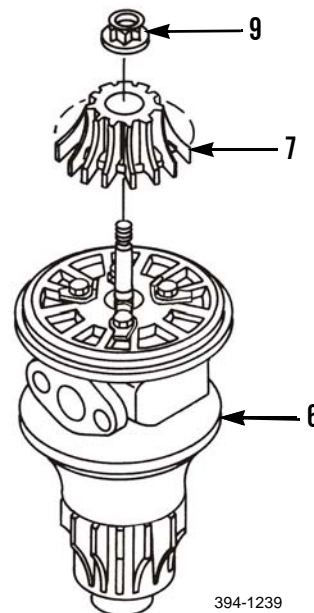
Wear protective gloves and goggles when working with hot oil. Failure to do so could result in injury.

19. Use clean oil to heat impeller (7) to a maximum temperature of 350°F (177°C).
20. Install impeller (7) on shaft and wheel assembly (6).

**CAUTION**

Do not push bending force on shaft and wheel assembly when tightening nut.

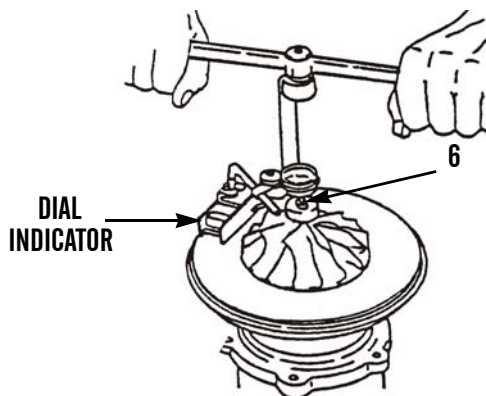
21. Install new locknut (9). Torque locknut to 120 lb-ft (163 Nm).



**CAUTION**

Allow impeller to cool below 150°F (66°C) before proceeding to the next step. Failure to follow this procedure could cause damage to the shaft and wheel assembly.

22. Loosen new locknut (9). Inspect faces of impeller (7) and new locknut to be sure they are clean and smooth.
23. Use clean oil to lubricate top of impeller (7) face beneath new locknut (9) and threads of shaft and wheel assembly (6).
24. Install impeller (7) and new locknut (9) if removed. Torque new locknut to 30 lb-ft (41 Nm).
25. Install dial indicator on impeller assembly (7).
26. Use dial indicator to measure length of projection of shaft and wheel assembly (6) above new locknut (9). Use a wrench and a tee handle to tighten new locknut until exposed length of shaft and wheel assembly is increased 0.007-0.008 in. (0.1778-0.2032 mm).
27. Remove dial indicator.

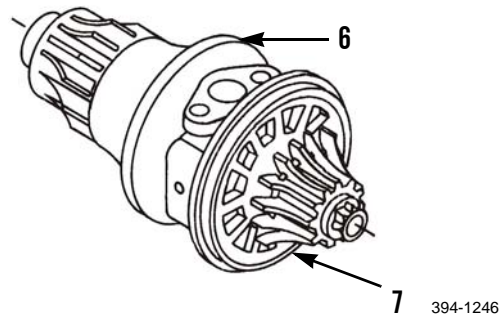


394-1245



**ASSEMBLY - CONTINUED**

- 28. Remove shaft and wheel assembly (6) from holding fixture.
- 29. Turn impeller (7). Impeller (7) should turn freely. If not, position shaft and wheel assembly (6) in holding fixture and repeat steps 25 through 29.

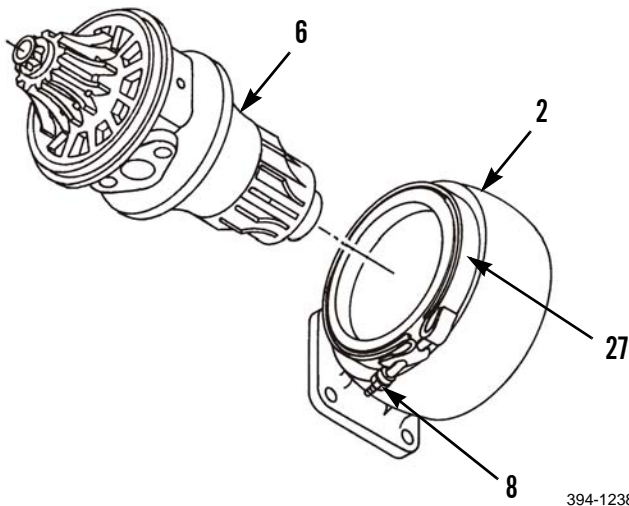


- 30. Position shaft and wheel assembly (6) in housing assembly (2) and align match-marks.

**CAUTION**

To ensure correct housing and clamp installation, lightly tap all around clamp. If clamp assembly comes loose, housing may impact impeller and cause damage to machine.

- 31. Torque nut (8) to 10 lb-ft (14 Nm).
- 32. Use a soft hammer to tap lightly all around clamp (27) and torque again to 10 lb-ft (14 Nm).
- 33. Repeat step 32 until nut (8) does not turn when specified torque is applied.



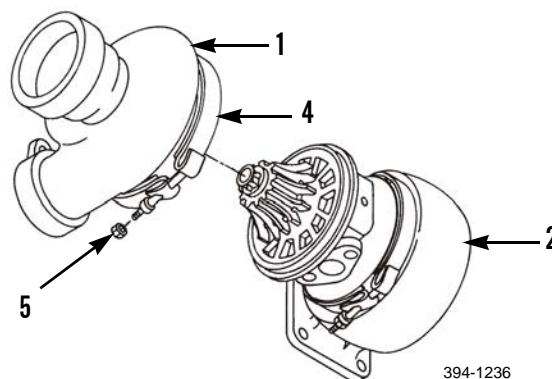
**ASSEMBLY - CONTINUED**

34. Position clamp (4) on compressor housing (1).
35. Install housing (1) on turbocharger assembly and align match-marks.

**CAUTION**

To ensure correct housing and clamp installation, lightly tap all around clamp. If clamp assembly comes loose, housing may impact impeller and cause damage to machine.

36. Install nut (5) on clamp (4). Torque nut to 10 lb-ft (14 Nm).
37. Use a soft hammer to tap all around clamp (4) and lightly torque again to 10 lb-ft (14 Nm).
38. Repeat step 37 until nut (5) does not turn when specified torque is applied.



39. Cover all open ports of turbocharger assembly to prevent contamination until it is installed on machine.
40. Install turbocharger (WP 0276 00).

**END OF WORK PACKAGE**

---

**RADIATOR REPAIR****0357 00**

---

**THIS WORK PACKAGE COVERS**Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Adhesive (Item 1, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Gasket (3)

Seal (2)

**References**

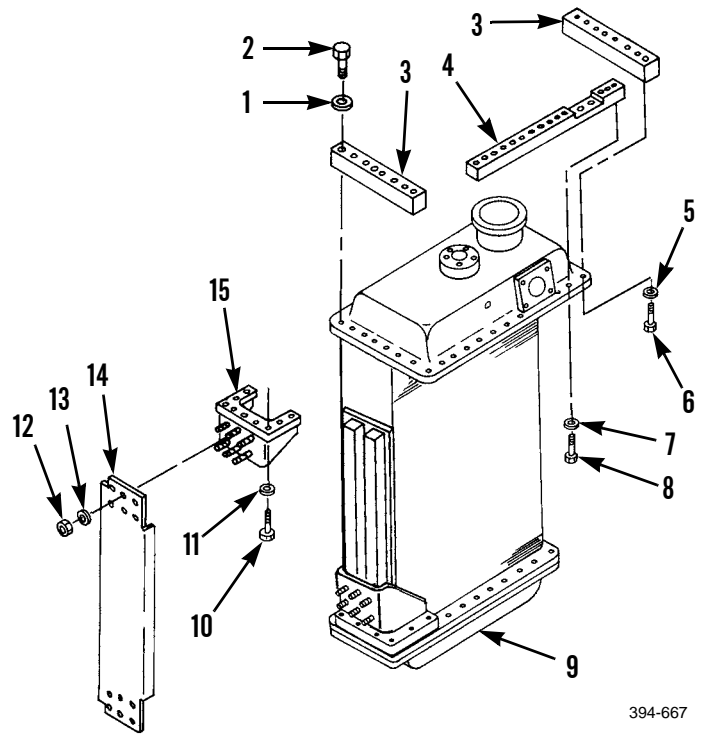
TM 5-3805-248-10

**Equipment Condition**Radiator, support assembly and mounting removed (WP 0044 00)

---

**DISASSEMBLY**

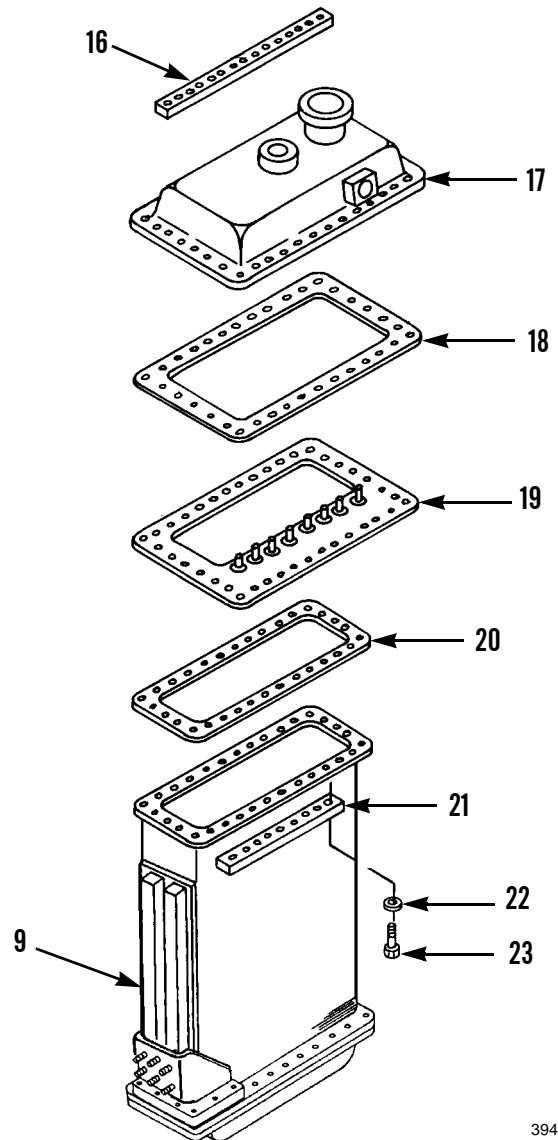
1. Remove 24 nuts (12), washers (13) and two access covers (14).
2. Remove ten capscrews (2) and washers (1).
3. Remove 12 capscrews (10), washers (11) and two brackets (15).
4. Remove four capscrews (6), washers (5) and two strips (3).
5. Remove 17 capscrews (8), washers (7) and strip (4).



394-667

**DISASSEMBLY - CONTINUED**

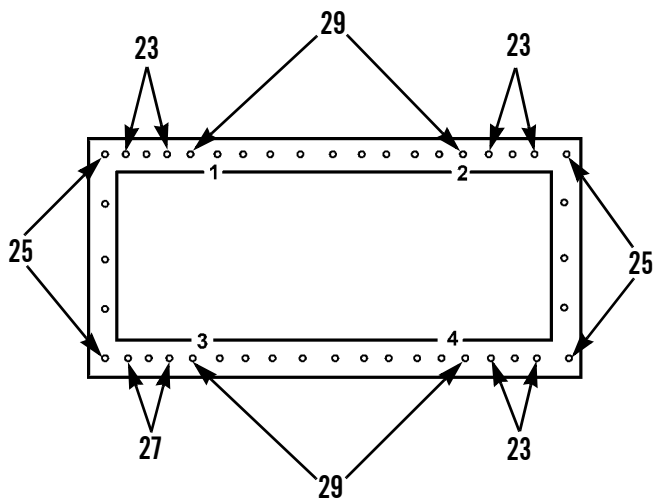
6. Remove 22 capscrews (23), washers (22), two strips (21) and strip (16) from core assembly (9).
7. Remove tank assembly (17) from core assembly (9).
8. Remove gasket (18) from core assembly (9) and discard.
9. Remove plate assembly (19) from core assembly (9).
10. Remove gasket (20) from core assembly (9) and discard.



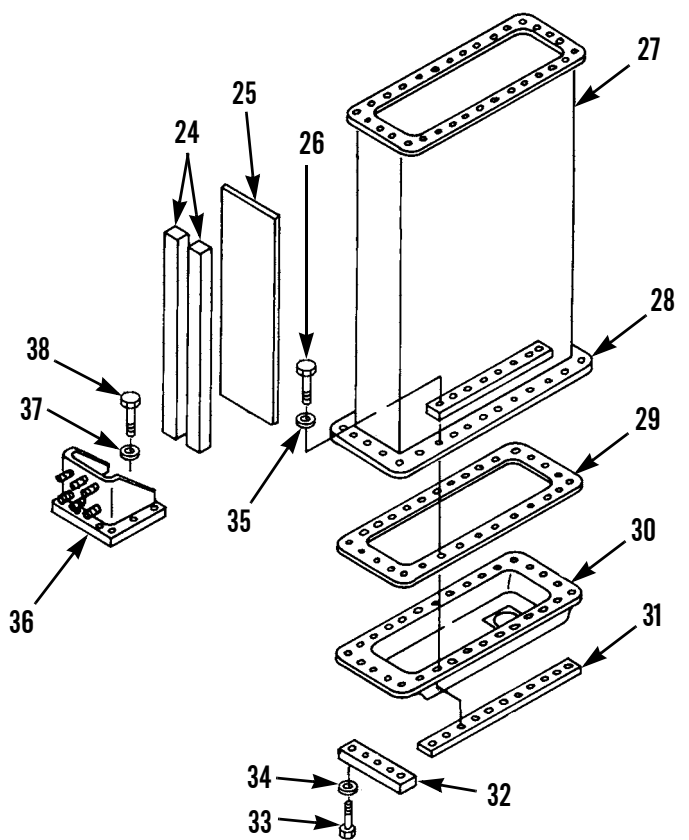
394-668

**DISASSEMBLY - CONTINUED**

11. Remove 12 capscrews (38) and washers (37).
12. Remove ten capscrews (33), washers (34), two strips (32) and two brackets (36).
13. Remove 22 capscrews (26), washers (35) and strips (28 and 31).
14. Remove tank assembly (30) and gasket (29) from core assembly (27). Discard gasket.
15. Remove and discard two seals (24).
16. Remove two damper assemblies (25) from core assembly (27).



394-670



394-669

**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 eye protection.

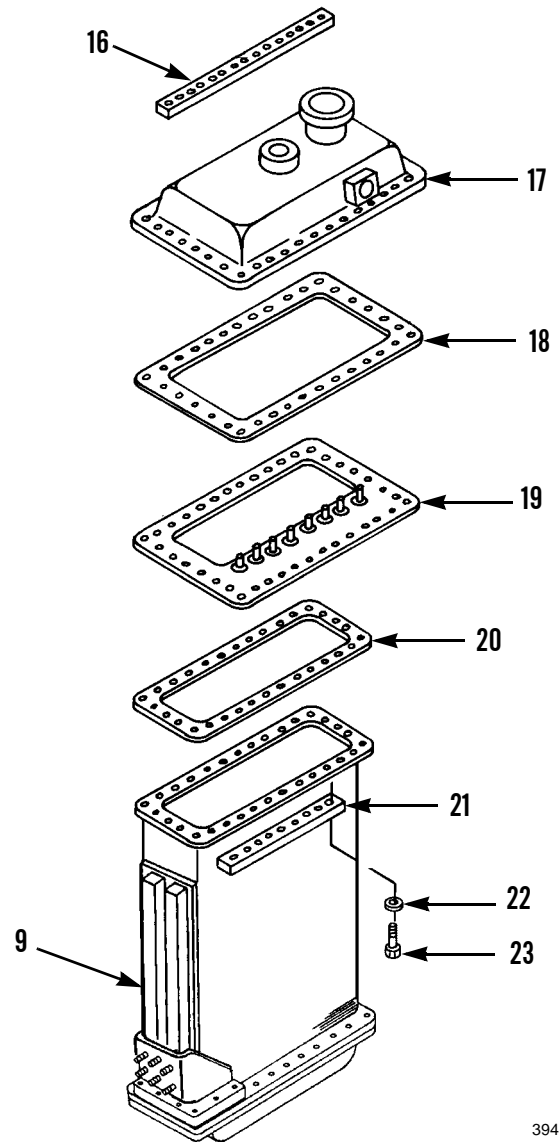
1. Remove all gasket and seal material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Apply adhesive to seal mounting surfaces of two damper assemblies (25) and install on core assembly (27).
2. Install two new seals (24) on two damper assemblies (25).
3. Install new gasket (29) and tank assembly (30) on core assembly (27).
4. Position strips (28 and 31).
5. Install 22 washers (35) and capscrews (26) hand tight.
6. Position two brackets (36) and strips (32).
7. Install ten washers (34) and capscrews (33) and hand-tighten.
8. Install 12 washers (37) and capscrews (38) and hand-tighten.
9. Tighten 22 capscrews (26), 12 capscrews (38) and ten capscrews (33) in sequence.

**ASSEMBLY - CONTINUED**

10. Install new gasket (20), plate assembly (19), new gasket (18) and tank assembly (17) on core assembly (9).
11. Position strip (16) and two strips (21).
12. Install 22 washers (22) and capscrews (23) and hand-tighten.

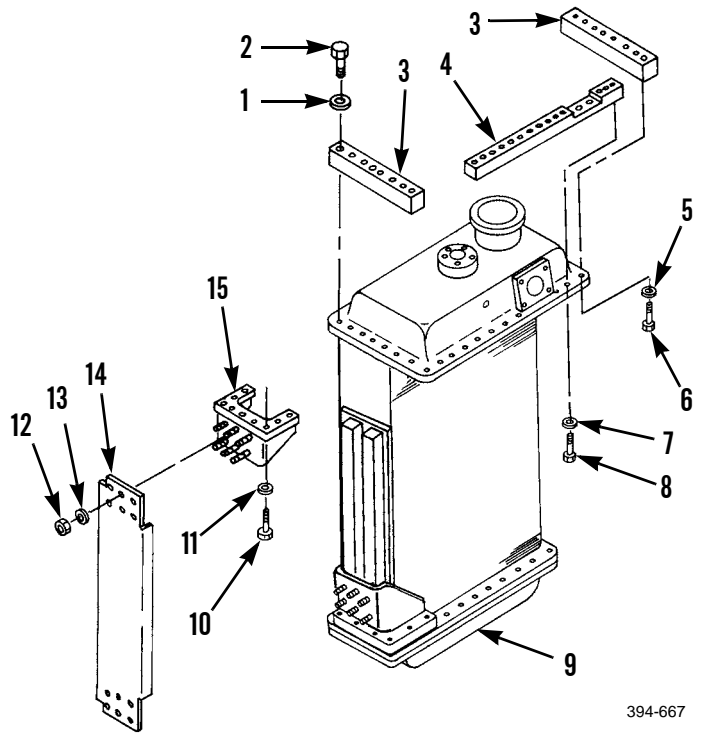


394-668

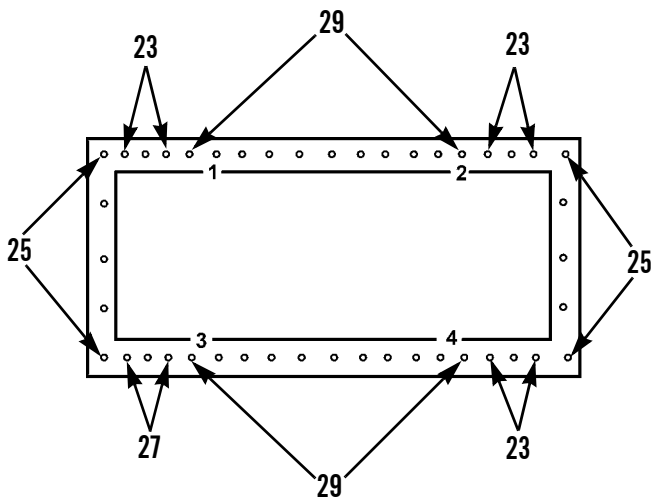


**ASSEMBLY - CONTINUED**

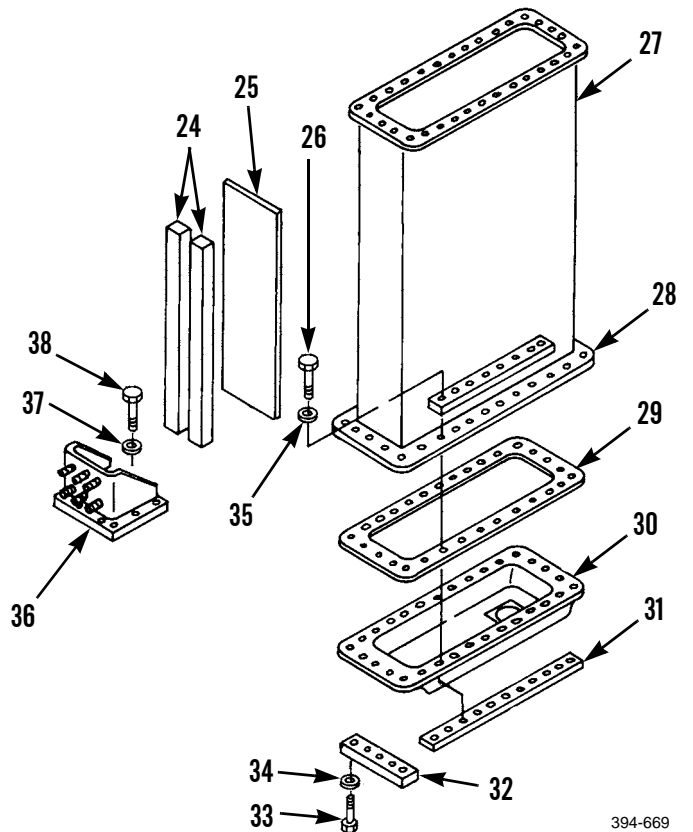
13. Position strip (4) on core assembly (9).
14. Install 17 washers (7) and capscrews (8) and hand-tighten.
15. Position two strips (3).
16. Install four washers (5) and capscrews (6) and hand-tighten.
17. Position two brackets (15).
18. Install 12 washers (11) and capscrews (10) and hand-tighten.
19. Install ten washers (1) and capscrews (2) and hand-tighten.
20. Install two access covers (14), 24 washers (13) and nuts (12).
21. Tighten 22 capscrews (23), 12 capscrews (10), 17 capscrews (8), ten capscrews (2) and four capscrews (6).
22. Pressure test radiator (27) and check for leaks.



394-667



394-670



394-669

***ASSEMBLY - CONTINUED***

23. Install radiator, support assembly and mounting (WP 0044 00).
24. Operate engine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

---

**ALTERNATOR (DELCO) REPAIR**

---

**0358 00**

**THIS WORK PACKAGE COVERS**

Disassembly, Testing, Cleaning, Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance level**

General support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

110V test lamp

24V battery

Multimeter

Three jumper leads

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Detergent, general purpose, liquid (Item 13, WP 0339 00)

Grease, GAA (Item 20, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Bearing (2)

Bushing (2)

Gasket

Lockwasher (20)

Plug (2)

Seal (2)

**References**

TM 5-3805-248-10

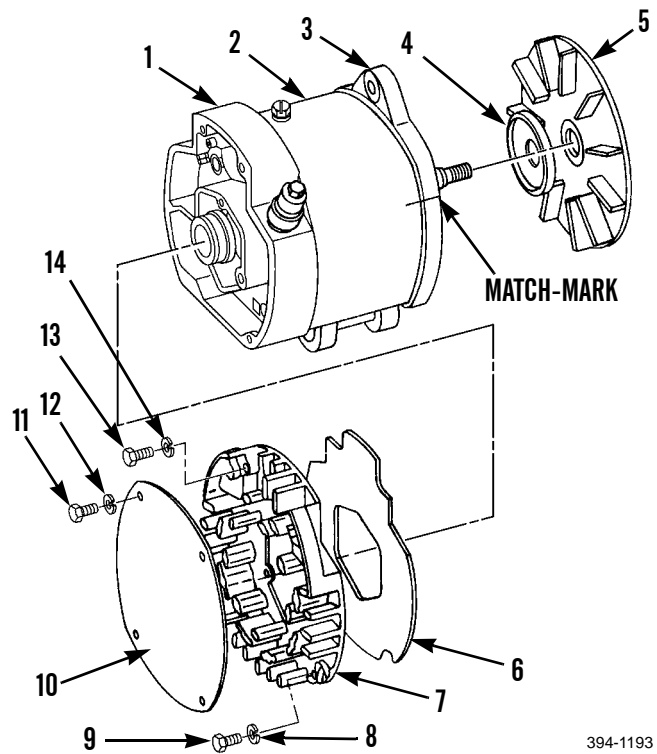
**Equipment Condition**

Alternator removed (WP 0359 00)

---

**DISASSEMBLY**

1. Remove fan (5) and slinger (4).
2. Position alternator assembly in soft-jawed vise.
3. Use scribe to match-mark frame (3), stator (1) and housing (2).
4. Remove four screws (11), lockwashers (12) and plate (10). Discard lockwashers.



394-1193

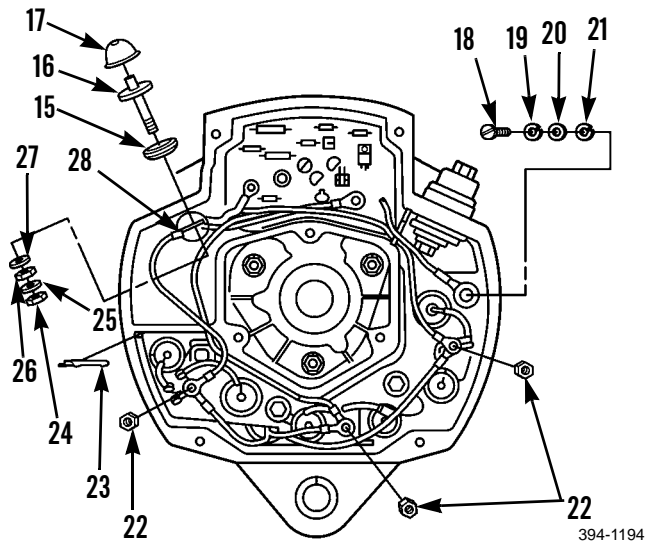
**NOTE**

Tag all wire connectors, cables and wiring harnesses before disconnecting to ensure correct installation.

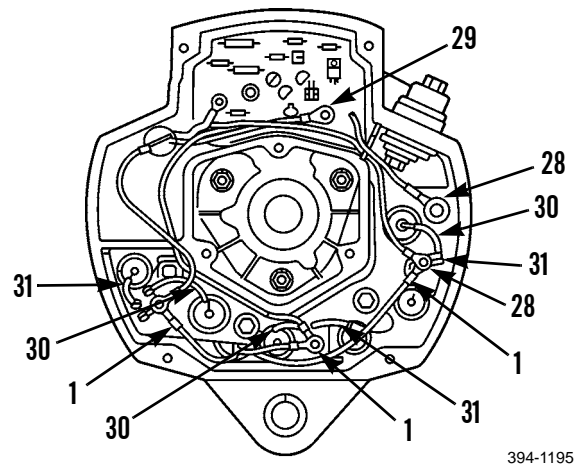
5. Remove three screws (13), lockwashers (14), four screws (9), lockwashers (8), cover (7) and gasket (6). Discard lockwashers and gasket.

**DISASSEMBLY - CONTINUED**

6. Remove cap (17), nut (24), washer (25), regulator wire (28), nut (26), insulator (27), stud (16) and bushing (15).
7. Remove three nuts (22).
8. Disconnect regulator (28) wires.
9. Remove grommet (23).
10. Remove screw (18), washers (19 and 21) and insulator (20).



11. Disconnect three regulator wires (28), stator wires (1), positive diode wires (30) and negative diode wires (31) from studs (29).



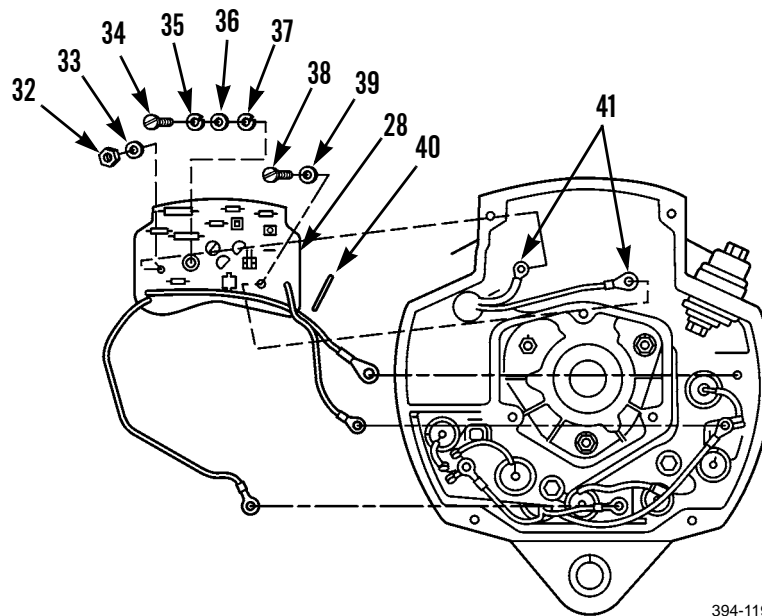
**DISASSEMBLY - CONTINUED**

12. Remove nut (32) and lockwasher (33) from regulator (28) stud.
13. Remove screw (38) and lockwasher (39). Discard lockwasher.
14. Disconnect two field coil wires (41).

**NOTE**

Testing of stator field coil positive and negative diodes is recommended prior to further disassembly.

15. Remove screw (34), lockwashers (35 and 37), washer (36) and regulator (28).
16. Remove insulator (40).



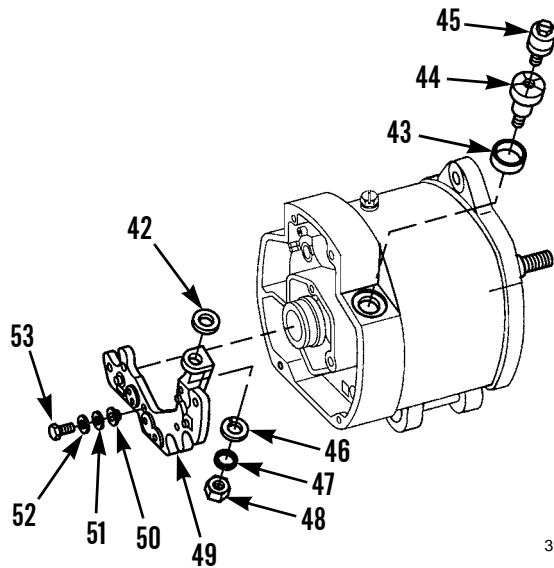
394-1196

**CAUTION**

Do not damage positive diodes. Destruction of negative diodes will require replacement of housing.

**DISASSEMBLY - CONTINUED**

17. Remove three screws (53), lockwashers (52), washers (51) and insulators (50) from heat sink (49).
18. Remove stud (45) from stud (44).
19. Remove nut (48), lockwasher (47), washer (46), heat sink (49) assembly, gasket (42), stud (44) and gasket (43).



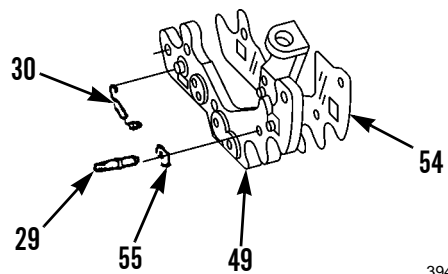
394-1197

20. Remove insulation (54).
21. Remove three studs (29) and insulators (55) from heat sink (49).

**CAUTION**

Removal of positive diodes from heat sink may cause destruction of diodes. Remove only if inspection or testing indicates removal is necessary.

22. Supporting heat sink (49), press out and remove three positive diodes (30).



394-1198

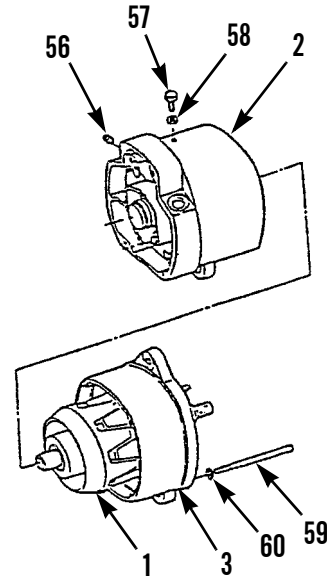
**DISASSEMBLY - CONTINUED**

23. Remove plug (56) from housing (2).
24. Remove screw (57) and lockwasher (58). Discard lockwasher.
25. Remove four screws (59) and washers (60) from frame (3).

**CAUTION**

Use care when prying frame assembly from stator. Do not damage stator with screwdrivers.

26. Use two screwdrivers to separate frame (3) assembly and stator (1).
27. Position frame (3) assembly in press.



394-1199



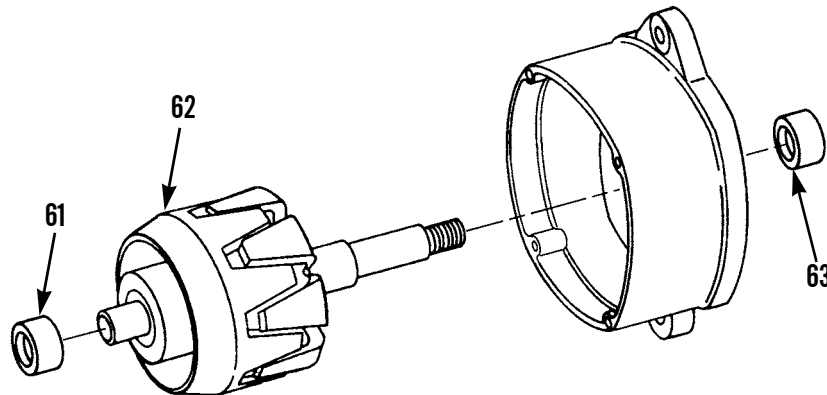
**DISASSEMBLY - CONTINUED**

28. Remove collar (61).
29. Use press to remove rotor (62).

**CAUTION**

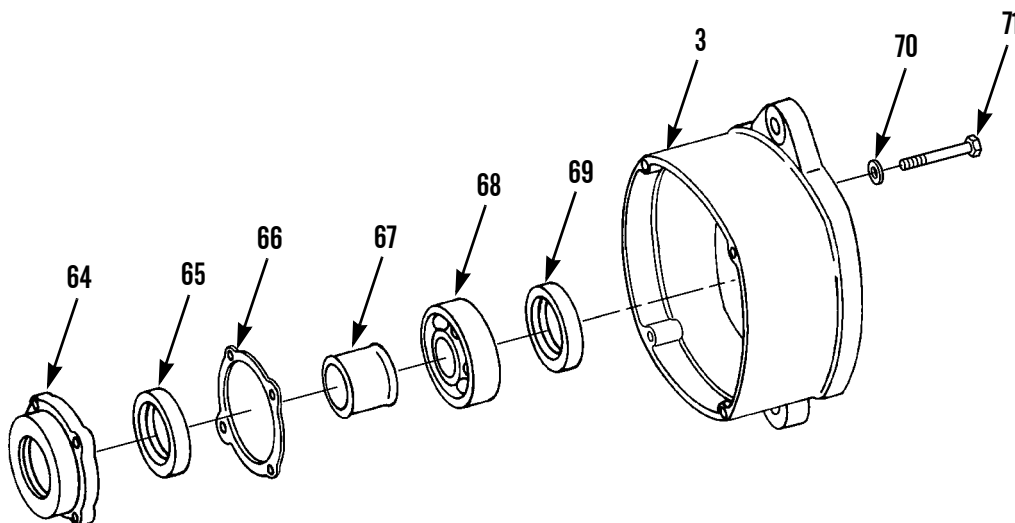
Removal of race from rotor will cause destruction of race. Remove only if inspection indicates removal is necessary.

30. Inspect race (63). Replace if cracked, broken, distorted, grooved or scored.
31. Use puller to remove race (63), if necessary.



394-1351

32. Remove four screws (71), washers (70), retainer (64), seal (65), gasket (66), collar (67), bearing (68) and seal (69) from frame (3). Discard seals (65 and 69) and gasket (66).



394-1352

**DISASSEMBLY - CONTINUED**

**NOTE**

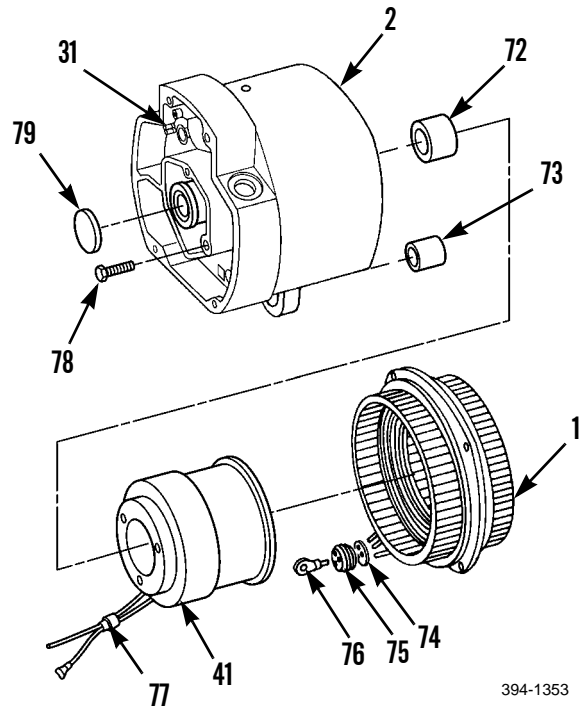
Inspection of stator is necessary before proceeding with further disassembly. Replace any parts if cracked, broken, corroded or deteriorated.

33. Inspect three terminals (75).
34. Inspect grommet (74) and insulator (73).
35. Remove three terminals (75), grommet (74) and insulator (73) from stator (1).
36. Remove three screws (78).
37. Separate grommet (77) and field coil (41). Do not damage grommet.
38. Use driver and hammer to remove and discard plug. Drive plug out from inside of housing (2).
39. Use driver and press to remove and discard bearing. Press out bearing from inside of housing (2).

**CAUTION**

Removal of bushing from housing will cause destruction of bushing. Remove only if inspection indicates removal is necessary.

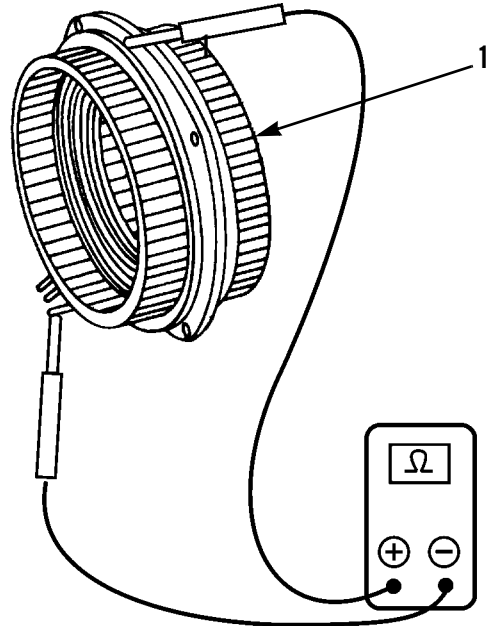
40. Inspect bushing (76).
41. Use driver and press to remove bushing (76), if necessary.
42. Do not remove three negative diodes (31).



394-1353

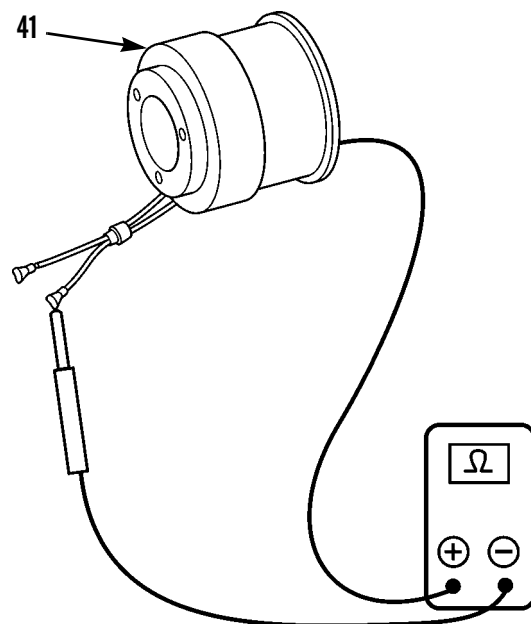
**TESTING**

1. Test stator (1) for grounds using 110V test lamp or ohmmeter. Connect one test wire to stator frame and the other test wire to each of the three stator wires. Replace stator (1) if lamp lights or meter reading is low.
2. Use a 110V lamp or ohmmeter to test stator (1) for opens. Perform at least three tests, switching test wires between any two of the stator wires. Replace stator (1) if lamp does not light or meter reading is high.



394-1354

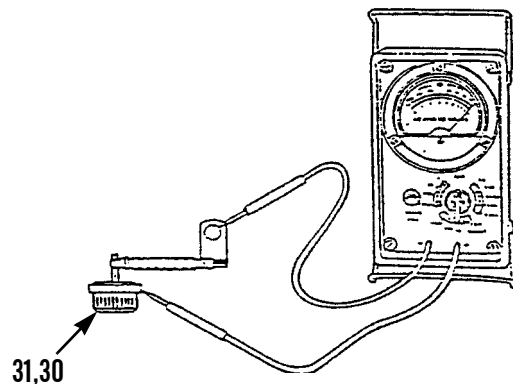
3. Use test lamp or ohmmeter to test field coil (41) for grounds. Connect one test lead alternator to housing and the other to each of the field coil wires. Replace field coil if lamp lights or ohmmeter reading is low.
4. Use test lamp or ohmmeter to test field coil (41) for opens. Connect both test wires to both field coil wires. Replace field coil if lamp does not light or meter reading is high.



394-1355

**TESTING - CONTINUED**

5. Use ohmmeter set to lowest range to test three positive diodes (30) and negative diodes (31). Touch one test wire to the diode casing and the other wire to the terminal on the diode wire, then switch test wires. Meter should indicate one high and one low reading. Replace diode if readings are the same.



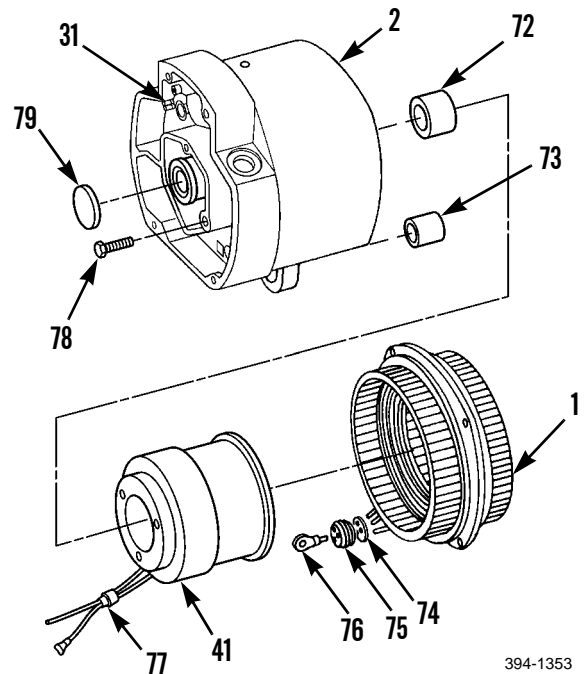
394-1356

**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. Remove all gasket material from mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry all part with compressed air.
  4. Inspect all parts for damage and replace as necessary.

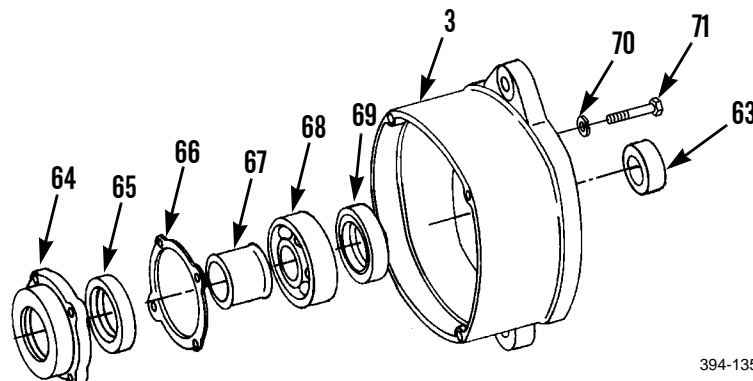
**ASSEMBLY**

1. Use driver and hammer, install bushing (76), if removed, in housing (2).
2. Pack new bearing (72) with clean lubricating oil.
3. Install new bearing (72) by pressing on the seal portion from inside of housing (2) until bearing (72) is a depth of 0.640 to 0.650 in. (16.256 to 16.51 mm).
4. Lubricate bearing (72) reservoir with clean lubricating oil. Fill housing (2) reservoir half full.
5. Install new plug (79), tapping in evenly with soft hammer.
6. Apply clean lubricating oil lightly to grommet (77).
7. Position field coil (41) by pulling field coil wires through bore in housing (2). Seat grommet (77) in hole and align field coil (41).
8. Install three screws (78).
9. Install insulator (73), grommet (74) and three terminals (75).
10. Apply lubricating oil lightly to grommet (74).
11. Position stator (1), aligning match-marks, and install. Pull stator (1) wires through bore in housing (2). Seat grommet (74) in bore.



394-1353

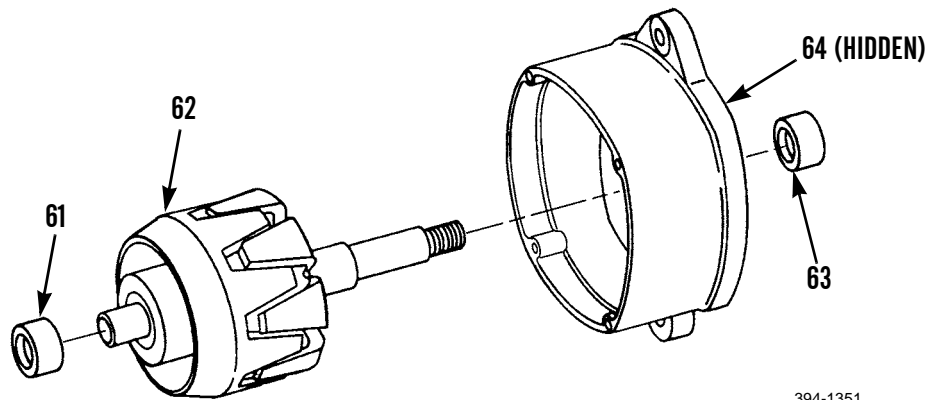
12. Lubricate new seal (69) in frame (3) by applying to seal lip and fill cavity between seal lip and steel casing.
13. Install new seal (69), in frame (3) with lip facing bearing (68).
14. Pack bearing (68) with lubricating oil and install.
15. Lubricate new seal (65) with clean lubricating oil by applying to lip and filling cavity between seal lip and steel casing.
16. Install new seal (65) in retainer (64), with lip facing bearing (68).
17. Install race (63), if removed. Press on until depth of 0.145 to 0.150 in. (3.683 to 3.81mm) is reached.
18. Install collar (67) through new seal (65) in retainer (64).
19. Lubricate retainer (64), collar (67) and new gasket (66) by filling reservoir between retainer (64) and collar (67) 3/4 full with clean lubricating oil.
20. Install four washers (70) and screws (71).



394-1357

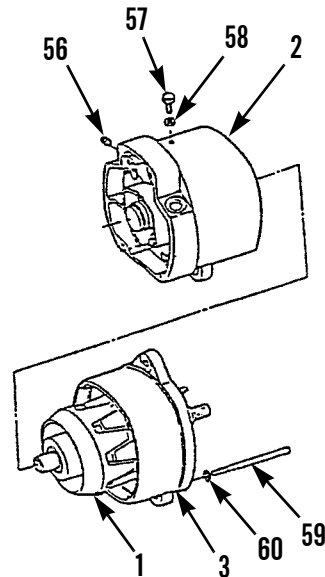
**ASSEMBLY - CONTINUED**

21. Use a press to install collar (61) on rotor (62). Support collar (61) and press rotor (62) into retainer (64).



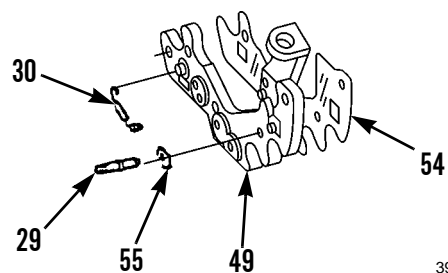
394-1351

22. Position frame (3) assembly with match-marks on stator (1) and install. Carefully slide rotor (62) through stator (1) onto field coil (41) in housing (2).
23. Install four washers (60) and screws (59).
24. Install new lockwasher (58) and screw (57).
25. Install plug (56).



394-1199

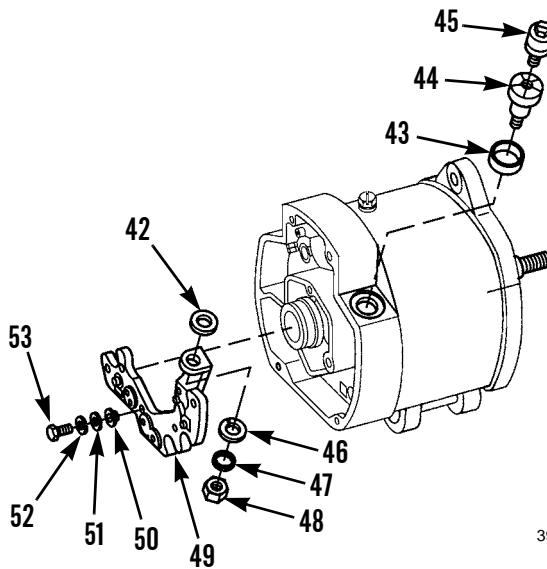
26. Install three positive diodes (30) and press into heat sink (49).
27. Install three insulators (55) and studs (29).
28. Coat insulation (54) lightly with grease and position on heat sink (49).



394-1198

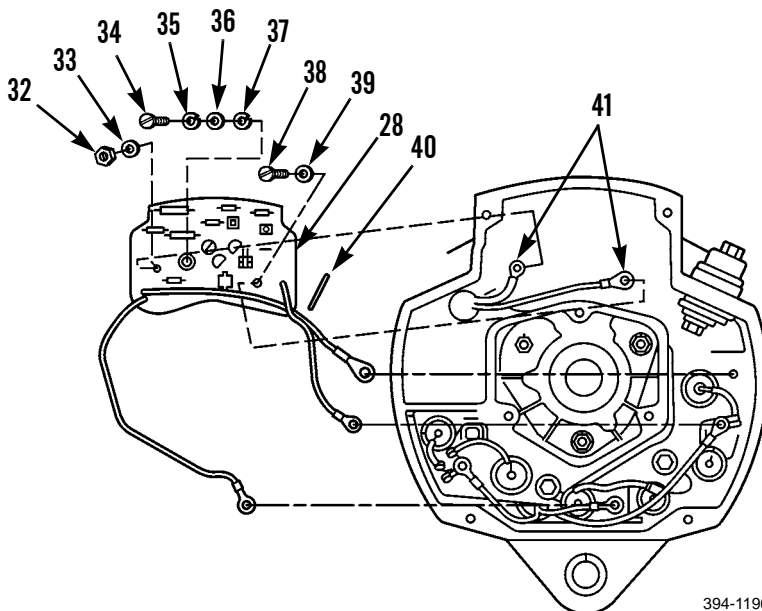
**ASSEMBLY - CONTINUED**

29. Loosely install new gasket (43), stud (44), new gasket (42), washer (46), new lockwashers (47 and 46), nut (48) and stud (45).
30. Install heat sink (49) assembly in stator (1).
31. Loosely install three insulators (50), washers (51), new lockwashers (52) and screws (53).
32. Tighten nut (48). Stud (44) must be properly seated.
33. Tighten three screws (53).



394-1197

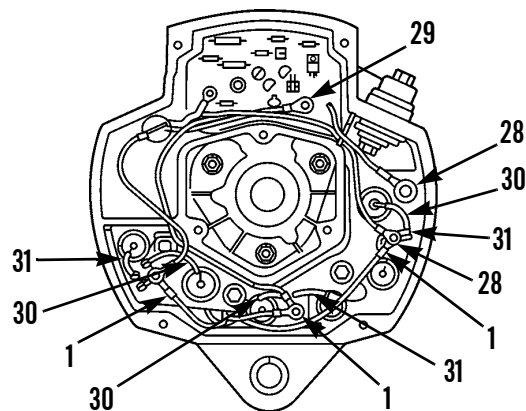
34. Position regulator (28).
35. Install washer (36), new lockwashers (35 and 37), screw (34) and insulator (40).
36. Position two field coil wires (41) on regulator (28).
37. Install lockwasher (39) and screw (38).
38. Install lockwasher (33) and nut (32).



394-1196

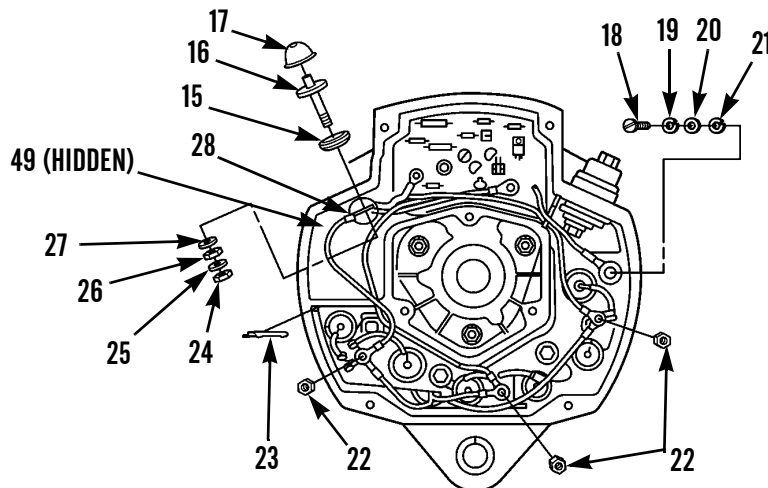
**ASSEMBLY - CONTINUED**

39. Position three negative diode (31) wires, positive diode (30) wires, stator (1) wires and regulator (28) wires on studs (29).



394-1195

40. Install three nuts (22).
41. Position regulator wire (28) on heat sink (49).
42. Install insulator (20), washers (19 and 21) and screw (18).
43. Install regulator wire (28) on grommet (23).
44. Install bushing (15), stud (16), insulator (27), nut (26), regulator wire (28), washer (25), nut (24) and cap (17).



394-1194



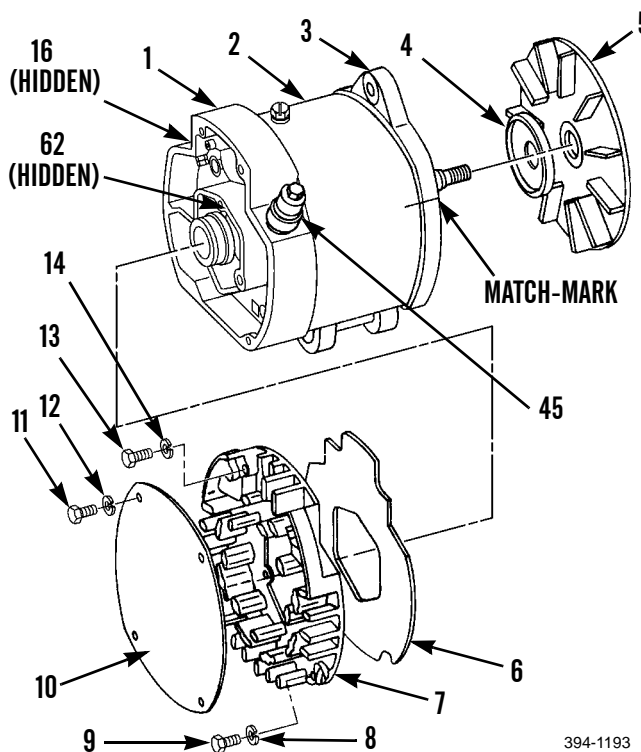
**ASSEMBLY - CONTINUED**

45. Position new gasket (6) and cover (7).
46. Install four new lockwashers (8), screws (9), three new lockwashers (14) and screws (13).
47. Install plate (10), four lockwashers (12) and screw (11).
48. Install slinger (4) and fan (5).

**NOTE**

After disassembly, rotor may lose magnetism or a new rotor may need to be magnetized.

49. Magnetize rotor (62) using 24V battery. Connect positive wire on stud (45) and negative wire to housing (2). Connect third jumper wire to the positive battery jumper wire. Momentarily touch the other end of the third jumper wire to stud (16). This will magnetize rotor.



394-1193

50. Install alternator (TM 5-3805-248-20).

**END OF WORK PACKAGE**



**ALTERNATOR (BOSCH) REPAIR**

**0359 00**

**THIS WORK PACKAGE COVERS**

Disassembly, Testing, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop, field maintenance (Item 104, WP 0338 00)

**Materials/Parts**

Caulking strip (Item 7, WP 0339 00)

**Materials/Parts - Continued**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Solder, lead-tin alloy, rosin core (Item 40, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Lockwasher (20)

**References**

TM 5-3805-248-10

**Equipment Condition**

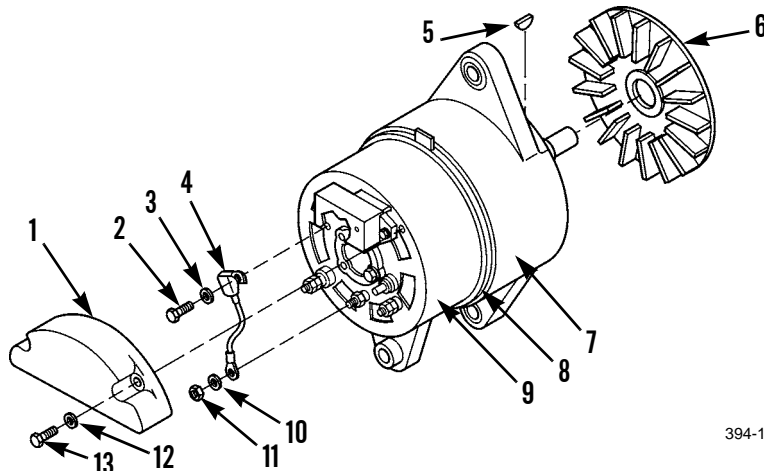
Alternator removed (WP 0055 00)

**DISASSEMBLY**

1. Position alternator assembly in soft-jawed vise.
2. Using scribe, match-mark frames (7 and 9) and stator (8).
3. Remove fan (6) and key (5).
4. Remove two screws (13), washers (12) and cover (1).
5. Remove nut (11) and lockwasher (10).

**NOTE**

- Tag all wire connectors, cables and wiring harnesses before disconnecting to ensure correct installation.
  - Testing of capacitor is necessary prior to removal. Refer to *Testing*, step 1 in this work package.
6. Disconnect capacitor wire (4).
  7. Remove screw (2), lockwasher (3) and capacitor wire (4).



394-1359

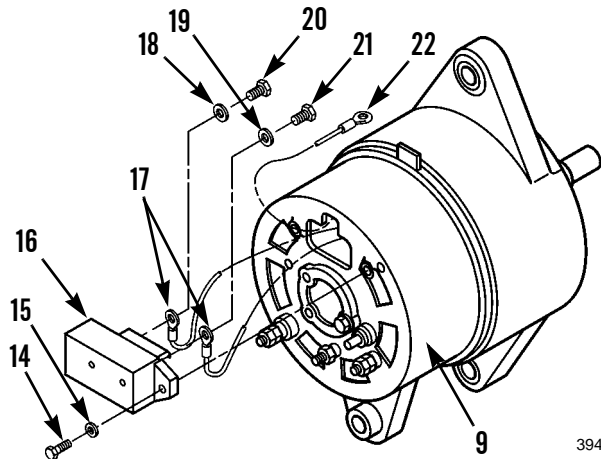
**DISASSEMBLY - CONTINUED**

8. Remove two screws (14) and lockwashers (15).

**NOTE**

Testing of regulator is necessary prior to removal. Refer to *Testing*, step 2.

9. Separate regulator (16) from frame (9), exposing two field coil wires (17) and diode assembly wire (22).
10. Remove screw (20), lockwasher (18), screw (21) and lockwasher (19), disconnecting two field coil wires (17) and diode assembly wire (22) from regulator (16).



394-1360

**NOTE**

Testing of field coil wire is necessary prior to further disassembly of alternator. Refer to *Testing*, step 4.

11. Remove four screws (31) and washer (32).

**CAUTION**

Use care not to damage stator with screwdrivers when prying from frames.

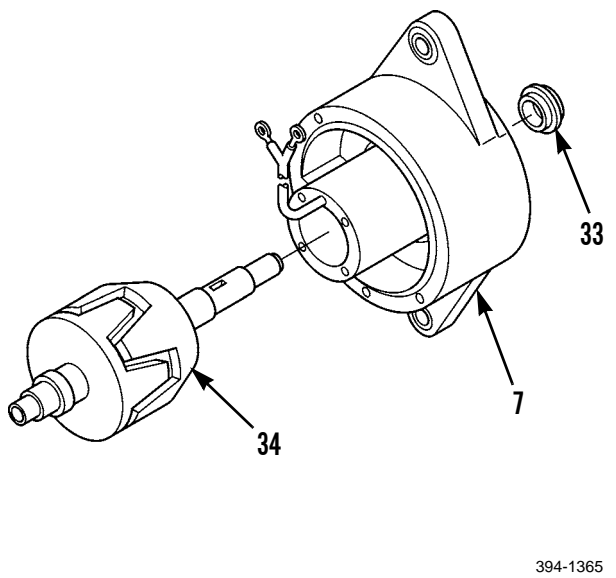
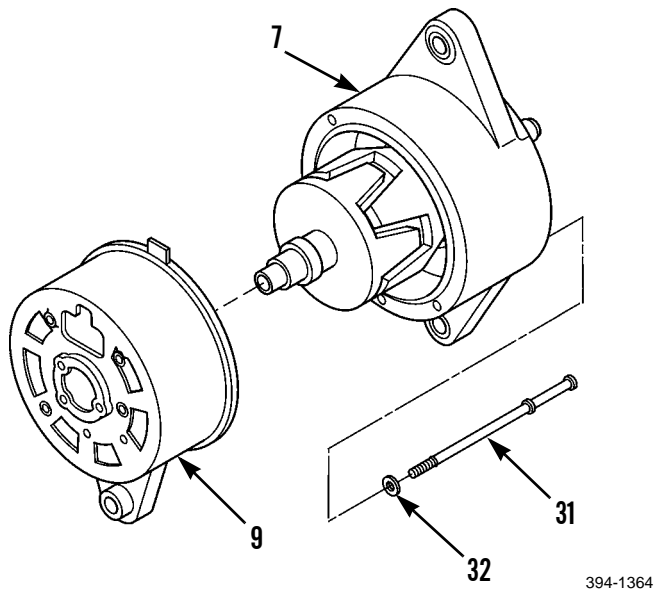
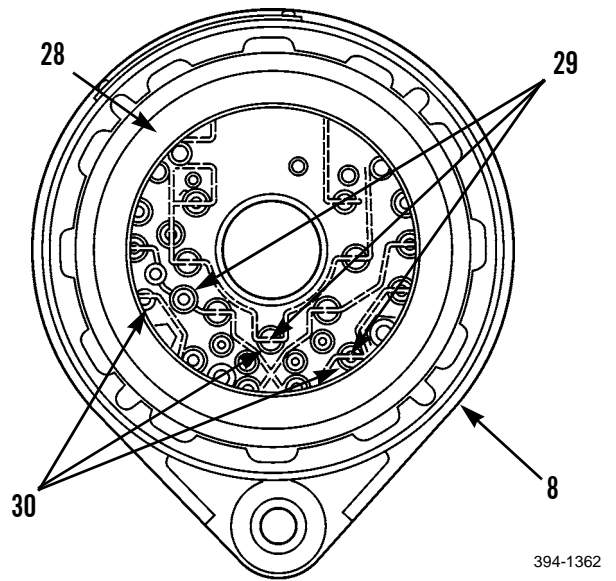
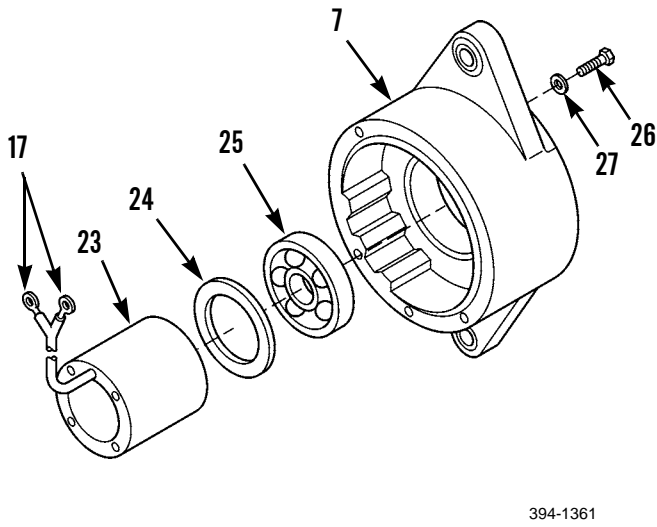
12. Use two screwdrivers to separate frame (9) assembly from frame (7) assembly.
13. Position frame (7) assembly in arbor press.
14. Using arbor press, remove rotor (34) from frame (7) assembly.
15. Remove spacer (33).

**CAUTION**

Epoxy putty covers field coil wires. Care must be taken when removing this epoxy so that wires are not damaged.

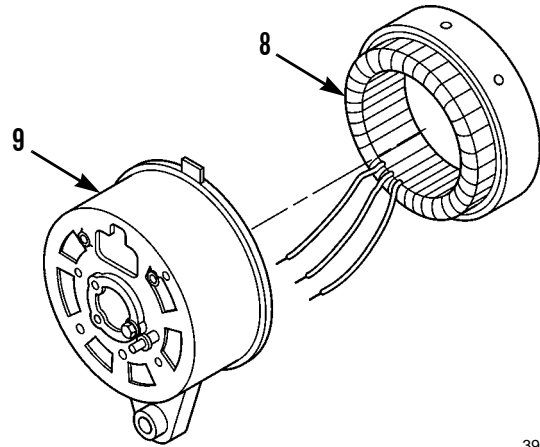
16. Separate field coil wires (17) and field coil (23) from frame (7).
17. Remove six screws (26) and lockwashers (27).
18. Remove all epoxy putty from groove in frame (7).
19. Remove ring (24) and bearing (25).
20. Un-solder three stator wires (29) at terminals (30) in diode assembly (28).

DISASSEMBLY - CONTINUED



**DISASSEMBLY - CONTINUED**

21. Pry apart stator (8) and frame (9) assembly.

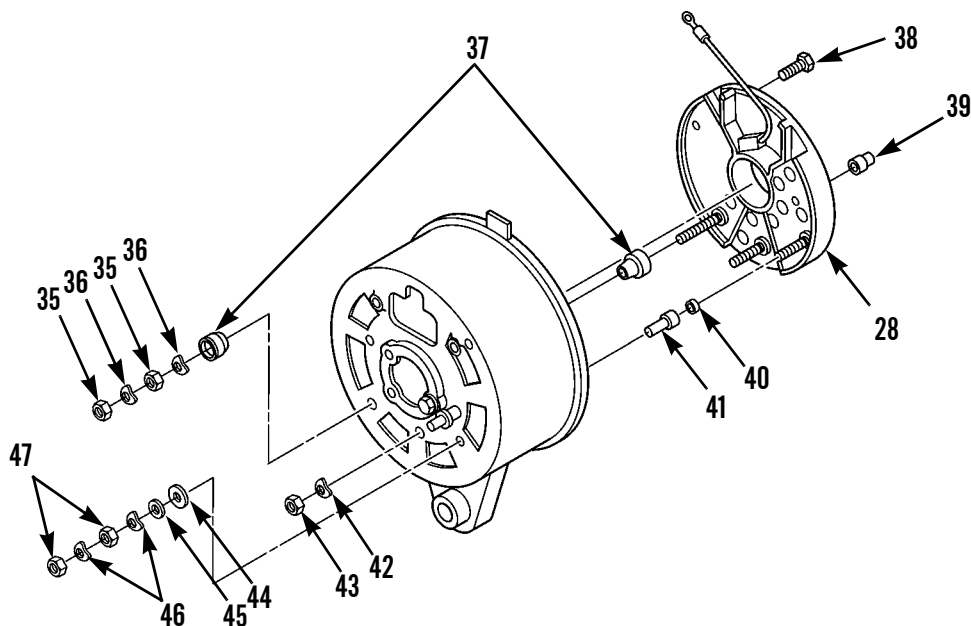


394-1363

**NOTE**

Testing of diode assembly is necessary prior to further disassembly. Refer to *Testing*, step 8.

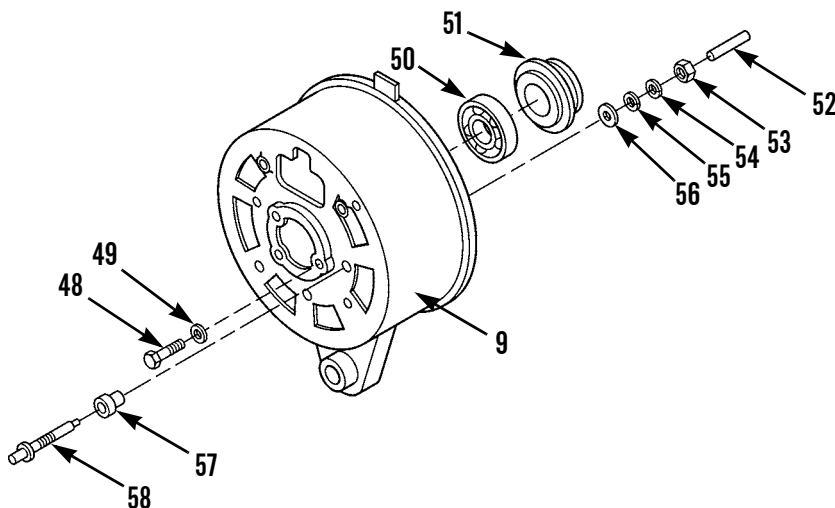
22. Un-solder sleeve (39).
23. Remove two screws (38) from diode assembly (28).
24. Remove nut (43) and lockwasher (42).
25. Remove two nuts (35) and lockwashers (36).
26. Remove two nuts (47), lockwashers (46), washer (45) and insulator (44).
27. Remove diode assembly (28) from frame (9).
28. Remove insulator (41) and washer (40).
29. Remove two bushings (37).



394-1366

**DISASSEMBLY - CONTINUED**

30. Remove insulator (52), nut (53), lockwasher (54), washer (55), insulator (56), pin terminal (58) and bushing (57).
31. Remove three screws (48), lockwashers (49) and ring (51) from frame (9).
32. Remove bearing (50).



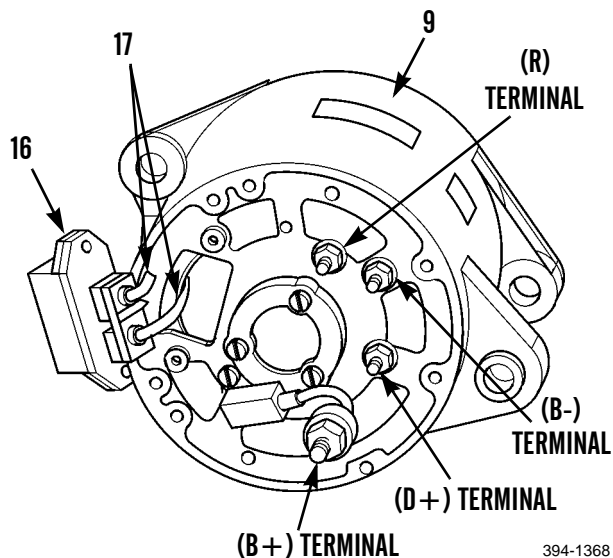
394-1367

**TESTING**

**WARNING**

Discharge capacitor after testing by touching wire of capacitor to ground. This will prevent accidental igniting of flammable fluids or fuels caused by a spark discharged by capacitor. Failure to follow this warning could result in injury or death.

1. Test capacitor on alternator. Disconnect capacitor wire from (D+) terminal. Connect ohmmeter between suppression capacitor and terminal (B-). Replace capacitor if meter reading is not 200K ohms or more.
2. Test regulator (16) on alternator, setting up alternator on test bench and connecting voltmeter, ammeter, battery and carbon pile.



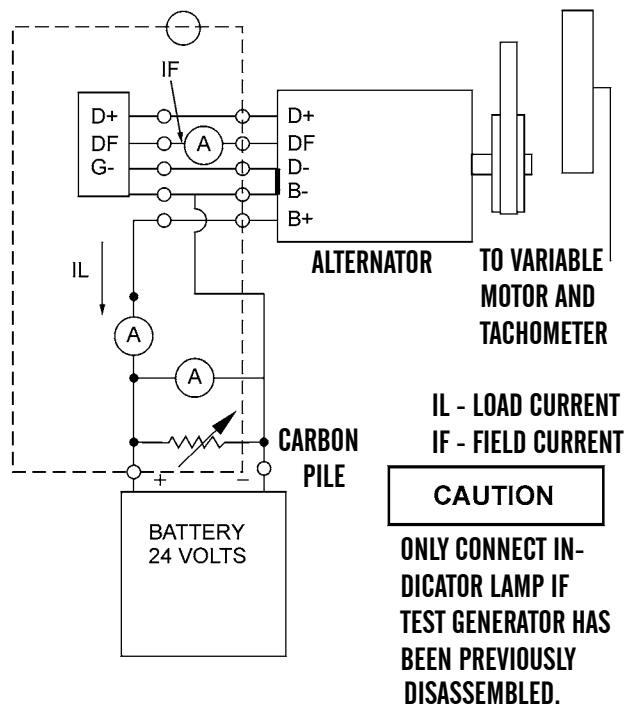
394-1368

TESTING - CONTINUED

CAUTION

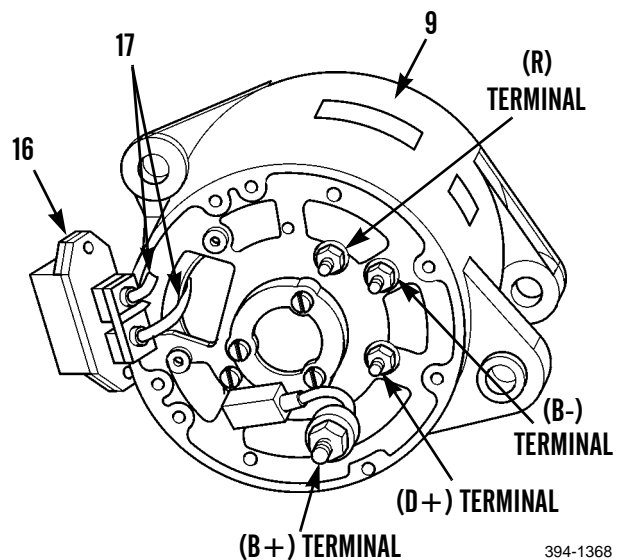
Observe correct polarity when connecting voltmeter to avoid damage to equipment.

3. Set load current to 5 amps by adjusting carbon pile at a test speed of 5,000 RPM. If after one minute, voltage does not read between 27 volts and 28.5 volts, replace regulator (16).
4. Test field coil for opens or shorts by connecting ohmmeter to two field coil wires (17). Replace field coil if reading is not 7 through 9 ohms.



394-1369

5. Test field coil for shorts to frame by connecting ohmmeter to the (B-) terminal and then to each of the two field coil wires (17). If readings are not high, field coil is shorting to frame and replacement is necessary.

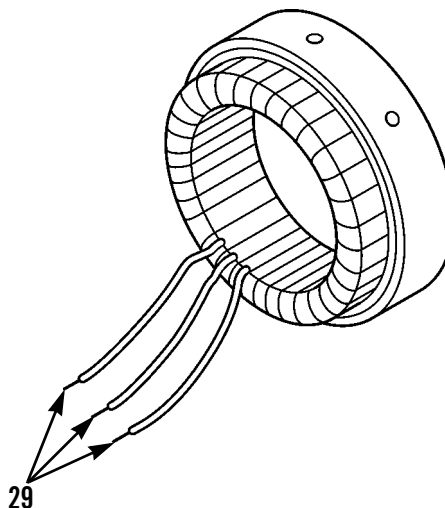


394-1368



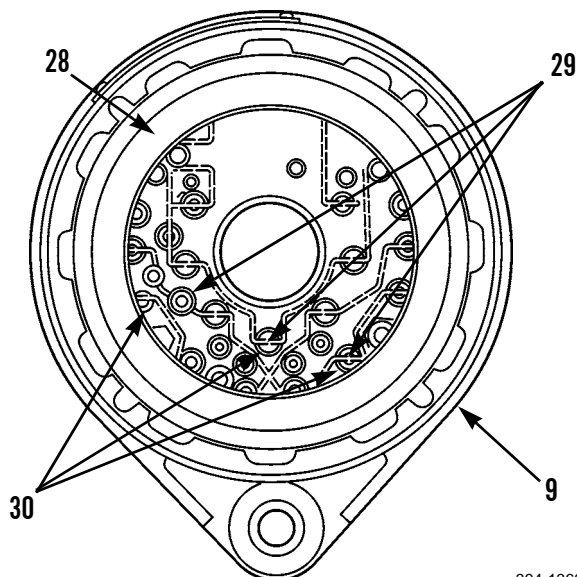
**TESTING - CONTINUED**

6. Use ohmmeter to test stator for windings continuity by taking three readings between pairs of the three stator wires (29). Replace if readings are not 0.15-0.25 ohms.
7. Use ohmmeter to test stator for shorts to frame by touching one wire to stator frame and touching the other to each of three stator wires (29). Readings should be very high. If not, replace stator.



394-1370

8. Use ohmmeter to test diode assembly (28) for minus diode test. Connect one test lead to frame (9) and the other test lead to each of the terminals (30) on the diode assembly (28) where the three stator wires (29) were disconnected. Then switch the test wires from diode assembly (28) to frame. If one high and one low reading are not obtained, replace diode assembly (28).
9. Test diode assembly (28) for positive diode test by performing test the same way as minus diode test, except connect one wire to the (B+) terminal. Results should be the same.
10. Test diode assembly (28) for excitation diode test by performing test the same way as minus diode test, except connect one test wire to (D+) terminal.



394-1362

**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 all parts with solvent.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

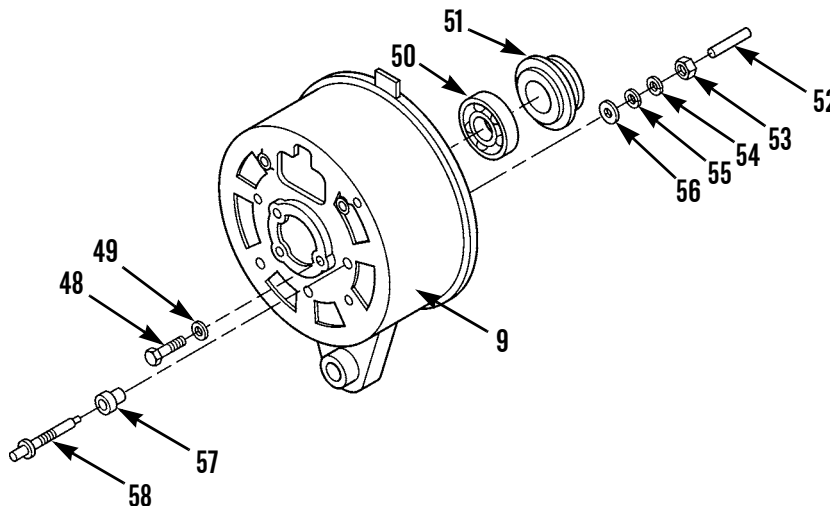
**ASSEMBLY**

1. Install bearing (50) in frame (9).
2. Position ring (51) over bearing (53).
3. Install three lockwashers (49) and screws (48).

**NOTE**

For steps 4 through 11 note correct placement of components in housing.

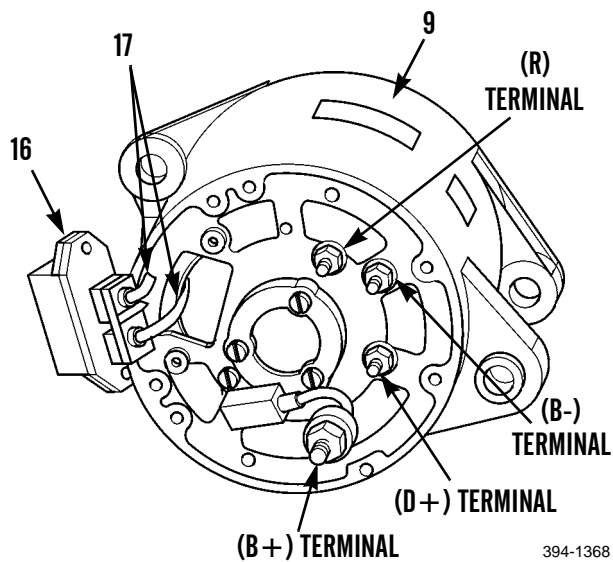
4. Install bushing (57), pin terminal (58), insulator (56), washer (55), new lockwasher (54), nut (53) and insulator (52) in hole of frame (9) marked.



394-1367

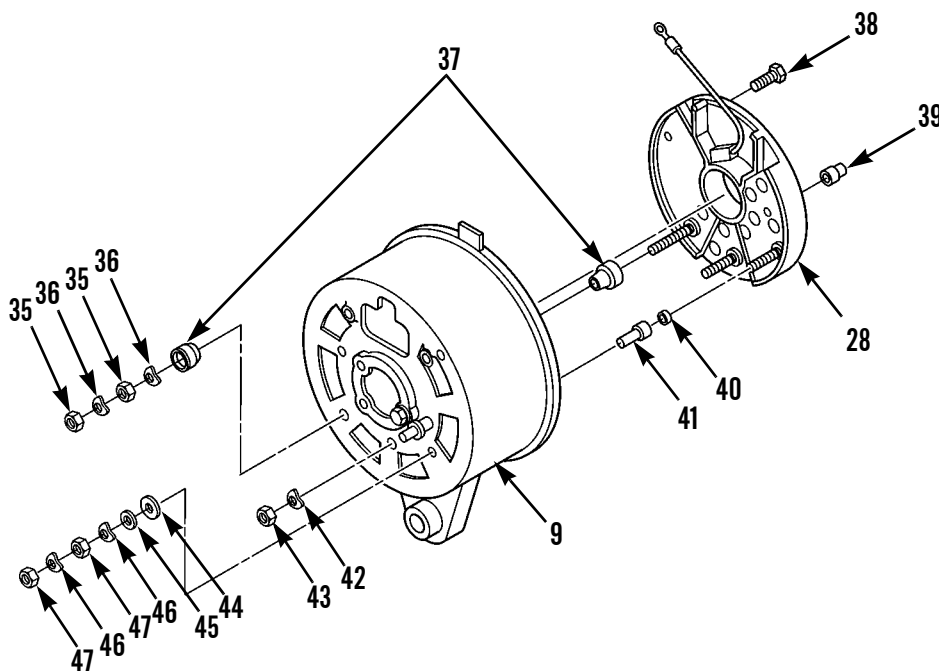
**ASSEMBLY - CONTINUED**

5. Position two bushings (37) in hole of frame (9) marked (B+).
6. Position washer (40) and insulator (41) in hole of frame (9) marked (D+).
7. Install diode assembly (28) in frame (9).
8. Install insulator (44), washer (45), two new lockwashers (46) and nuts (47) on terminal stud marked (D+).
9. Install two new lockwashers (36) and nuts (35) on terminal stud marked (B+).
10. Install new lockwasher (42) and nut (43) on terminal stud marked (B-).



394-1368

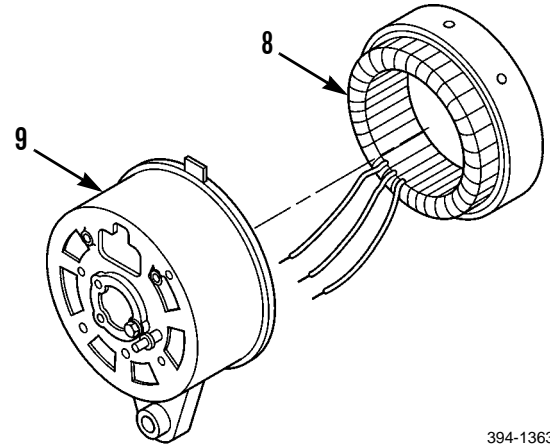
11. Install two screws (38) securing diode assembly (28) to frame (9).
12. Position sleeve (39) on end of diode assembly (28) terminal.
13. Solder sleeve (39) on end of diode assembly (28) terminal.



394-1366

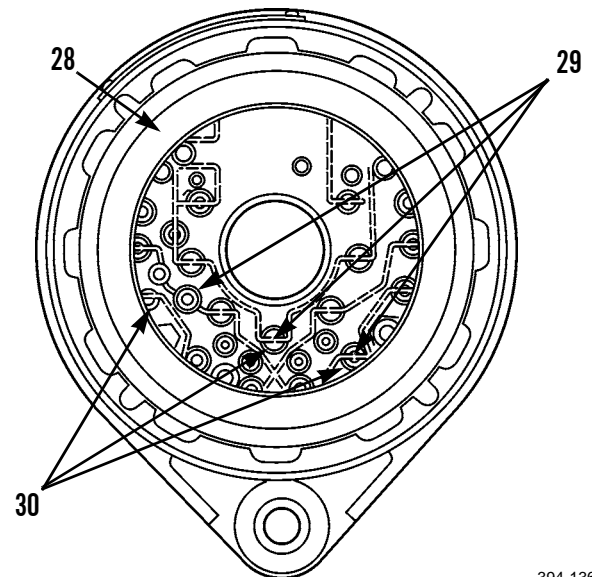
**ASSEMBLY - CONTINUED**

14. Position stator (8) on frame (9) by aligning match-marks and install.



394-1363

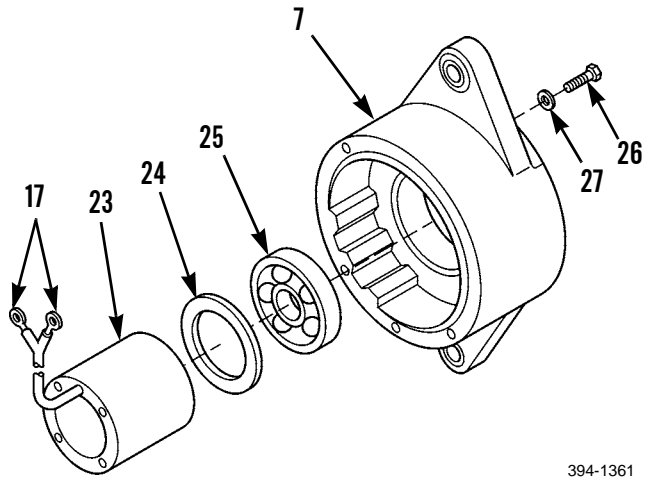
15. Position and solder three stator wires (29) at terminals (30) in diode assembly (28).



394-1362

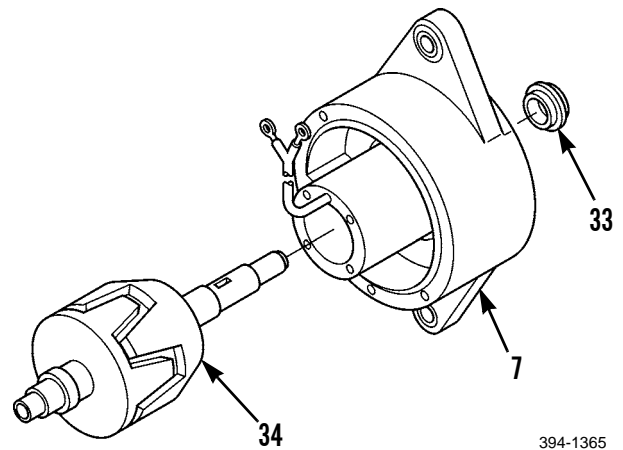
**ASSEMBLY - CONTINUED**

16. Install bearing (25) and ring (24) in frame (7).
17. Position field coil (23) in frame (7) and install field coil wires (17) in deep groove.
18. Install six new lockwashers (27) and screws (26).
19. Secure field coil wires (17) in deep groove of frame (7) with caulking strip.



394-1361

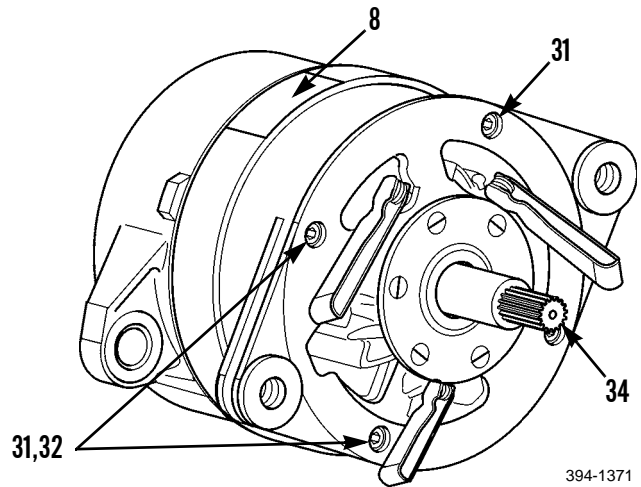
20. Install spacer (33).
21. Using arbor press, position rotor (34) supporting spacer (33) and install.
22. Position frame (7) assembly by aligning match-marks and install.



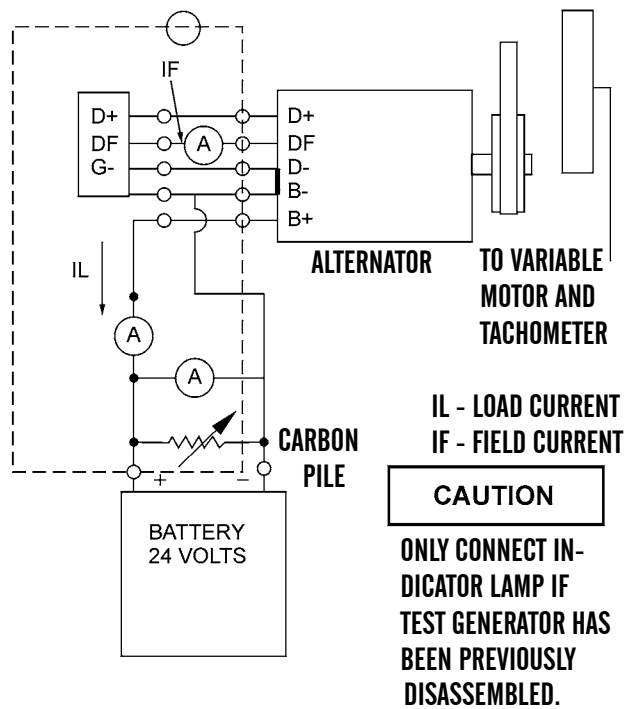
394-1365

**ASSEMBLY - CONTINUED**

23. Loosely install four washers (32) and screws (31).
24. Position three 0.001 in. (0.0254 mm) feeler gages and align stator (8) and rotor (34).
25. Torque four screws (31) to 4 lb-ft (5.4 Nm).
26. Remove three 0.001 in. (0.0254 mm) feeler gages.



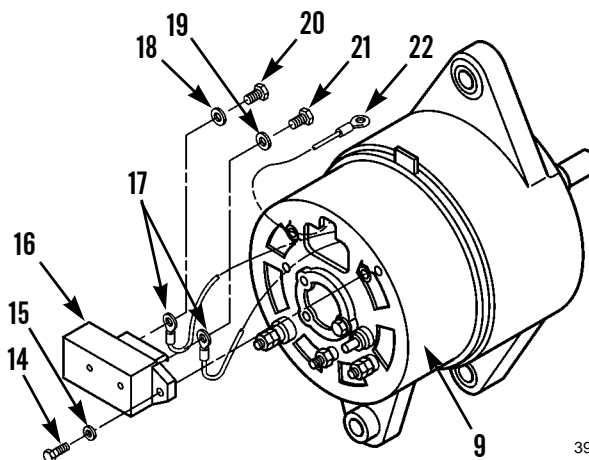
394-1371



394-1369

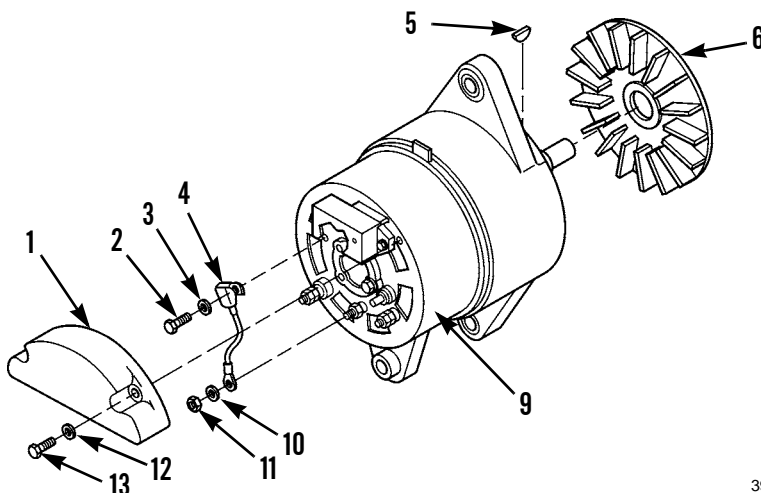
**ASSEMBLY - CONTINUED**

27. Position one of two field coil wires (17) on regulator (16) terminal marked (DF).
28. Install new lockwasher (19) and screw (21).
29. Position remaining one of two field coil wires (17) and diode assembly wire (22) on regulator (16) terminal marked (DF).
30. Install new lockwasher (18) and screw (20).
31. Position regulator (16) on rear of frame (9).
32. Install two new lockwashers (15) and screws (14).



394-1360

33. Install capacitor wire (4), new lockwasher (3) and screw (2) on rear of frame (9).
34. Install capacitor wire (4), new lockwasher (10) and nut (11) on terminal stud marked (D+).
35. Install cover (1), two washers (12) and screws (13).
36. Install key (5) and fan (6).



394-1359

37. Install alternator (WP 0055 00).
38. Operate machine and verify correct operation charging system (TM 5-3805-248-10).

**END OF WORK PACKAGE**





**STARTING MOTOR SOLENOID REPLACEMENT****0360 00****THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP****Maintenance Level**

Unit

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, common no. 1 (Item 101, WP 0338 00)

Lifting device, 100 lb minimum capacity

**Materials/Parts**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**Materials/Parts - Continued**

Gasket

Lockwasher (5)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

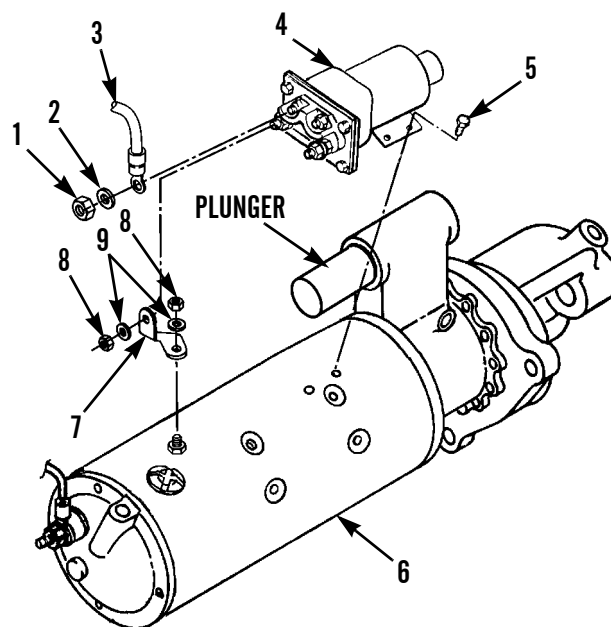
Crankcase guards removed (WP 0201 00)

Battery cables disconnected (WP 0104 00)

**REMOVAL****NOTE**

Tag all wire connectors, cables and wiring harnesses before disconnecting to ensure correct installation.

1. Remove nut (1) and lockwasher (2) from solenoid (4). Discard lockwasher.
2. Disconnect wire connector (3).
3. Remove two nuts (8), lockwashers (9) and connector (7). Discard lockwashers.
4. Remove four screws (5).
5. Carefully pull solenoid (4) from plunger mounted in starting motor housing (6).



394-069

**STARTING MOTOR SOLENOID REPLACEMENT - CONTINUED**

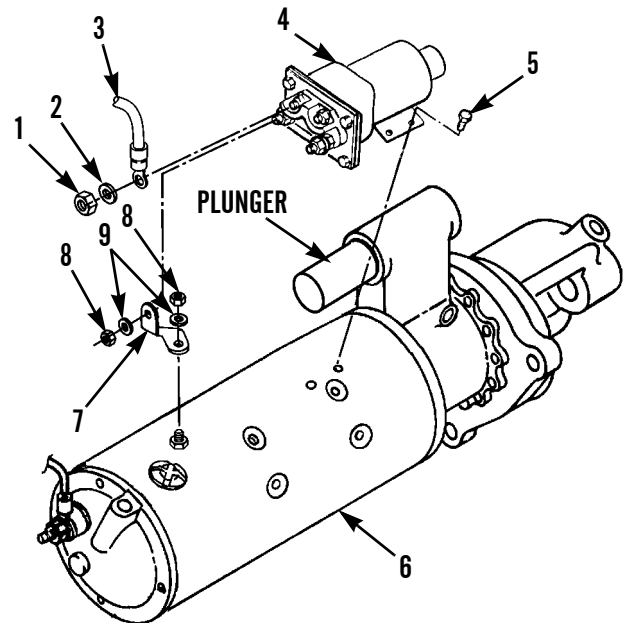
0360 00

**CLEANING AND INSPECTION**

1. Remove all gasket material from mounting surfaces.
2. Wipe all parts with clean rag.
3. Inspect all parts for damage and replace as necessary.

**INSTALLATION**

1. Position solenoid (4) and slide solenoid onto plunger, aligning mounting holes on starting motor (6).
2. Install four screws (5).
3. Install connector (7), two lockwashers (9) and nuts (8). Torque two nuts to 22 lb-ft (30 Nm).
4. Connect wire connector (3) to solenoid (4).
5. Install lockwasher (2) and nut (1).



394-069

6. Install crankcase guards (WP 0201 00).
7. Connect battery cables (WP 0104 00).

**END OF WORK PACKAGE**

**STARTING MOTOR (DELCO-REMY) REPAIR**

0361 00

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly, Adjustment

**INITIAL SETUP****Maintenance level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop, field maintenance (Item 104, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Bushing

**Materials/Parts - Continued**

Cup (3)

Field coil

Locknut

Packing, preformed

Seal (3)

**References**

TM 5-3805-248-10

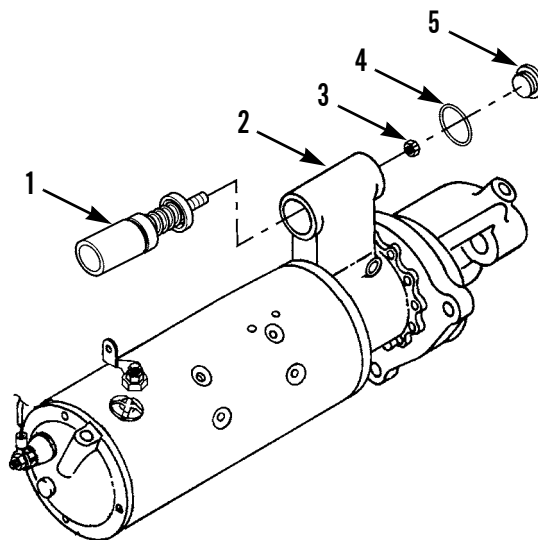
**Equipment Condition**

Starting motor removed (WP 0057 00)

Solenoid removed (WP 0360 00)

**DISASSEMBLY**

1. Remove plug (5) and preformed packing (4) from housing (2). Discard preformed packing.
2. Remove and discard locknut (3).
3. Remove plunger (1) assembly by pulling from housing (2).



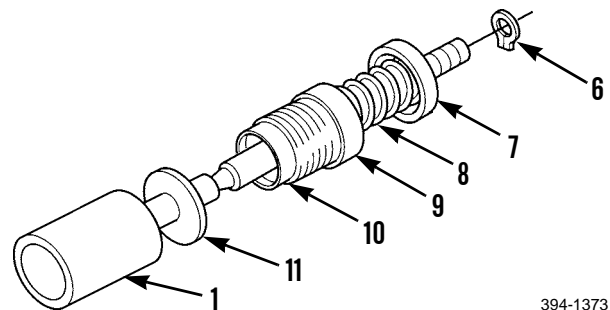
DISASSEMBLY - CONTINUED



WARNING

- Eye protection must be worn when performing maintenance where components or particles could fly out during procedure. Failure to follow these instructions may cause injury.
- Some components are under spring tension. Wear eye protection and use caution when disassembling to avoid injury.

4. Compress spring (8).
5. Remove ring (6), retainer (7), spring (8), retainer (9), boot (10) and washer (11) from shaft of plunger (1).



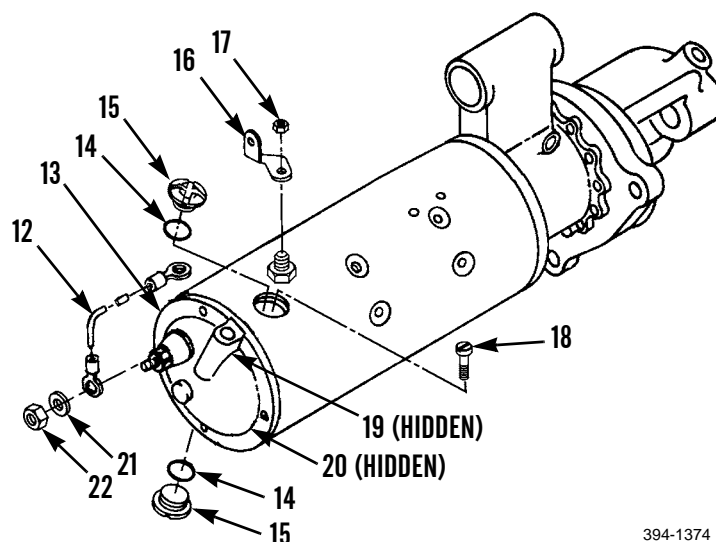
394-1373

6. Remove nut (17) and connector (16).
7. Remove nut (22) and washer (21).

NOTE

Tag all wire connectors, cables and wiring harnesses prior to disconnecting to ensure correct installation.

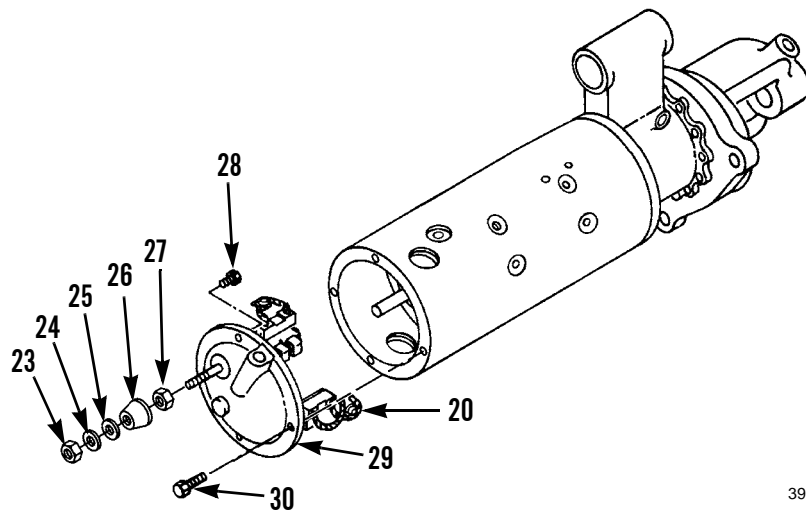
8. Disconnect wire assembly (12).
9. Remove two plugs (15) and seals (14) from housing (13). Discard two seals.
10. Remove two screws (18) through plug (15) ports, disconnecting field coil (19) from plate (20) assembly.
11. Use scribe to match-mark motor end frame housing (13) assembly.



394-1374

**DISASSEMBLY - CONTINUED**

12. Remove four bolts (30) from end frame (29).
13. Use driver and hammer to remove end frame (29) and plate assembly (20).
14. Remove nut (23), lockwasher (24), washer (25), insulator (26) and bushing (27) from stud of plate (20).
15. Remove three screws (28).
16. Separate end frame (29) and plate assembly (20).



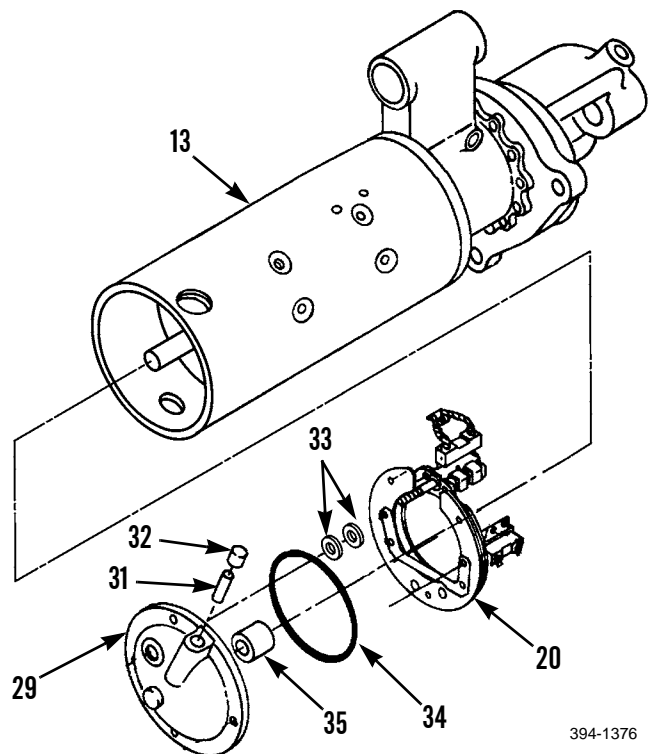
394-1375

17. Remove two insulators (33) from stud of plate (20).
18. Remove and discard preformed packing (34).
19. Remove and discard cup (32) and plug (31) from end frame (29).

**NOTE**

Removal of bushing from end frame will cause destruction of bushing. Remove only if inspection proves necessary.

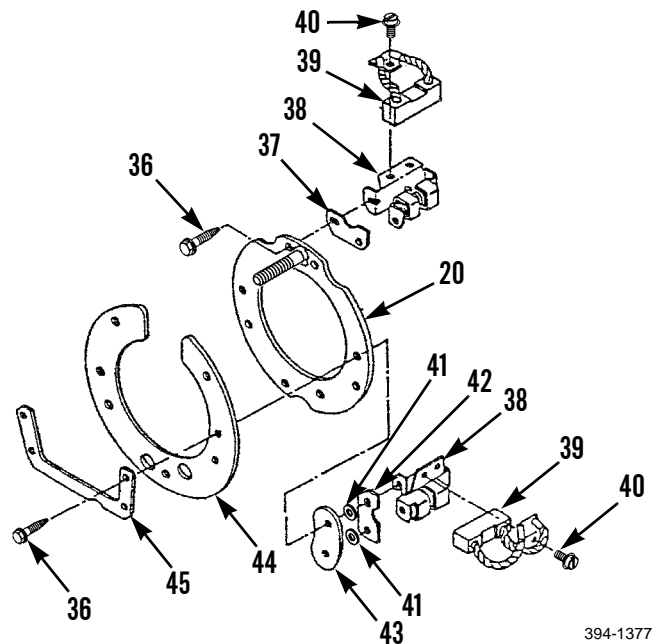
20. Inspect bushing (35). Replace if cracked, broken, grooved or scored.
21. Use driver and press to remove bushing (35).



394-1376

**DISASSEMBLY - CONTINUED**

22. Remove four screws (40).
23. Separate four brushes (39) from two holders (38).
24. Remove four screws (36), two holders (38) and plates (37).
25. Remove insulator (45), two plates (42), four washers (41) and two plates (43).
26. Separate insulator (44) and plate (20).
27. Remove washer (43) from shaft of armature (55).



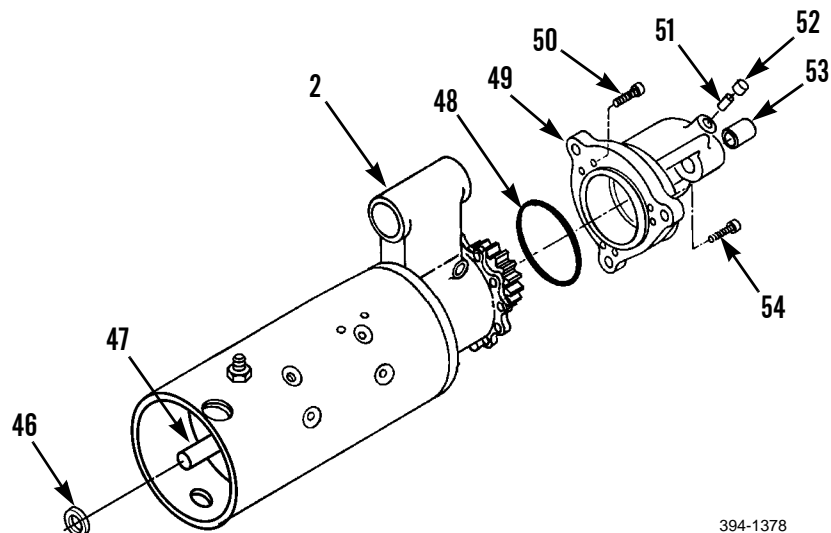
394-1377

28. Remove screw (50) and five screws (54) from housing (49).
29. Separate housing (49) from housing (2).
30. Remove and discard preformed packing (48).
31. Remove and discard cup (52) and plug (51).

**CAUTION**

Removal of bushing from housing will cause destruction of bushing. Remove only if inspection proves necessary.

32. Inspect bushing (53). Replace if cracked, broken, grooved or scored.
33. Use driver and press to remove bushing (53), if necessary.



394-1378



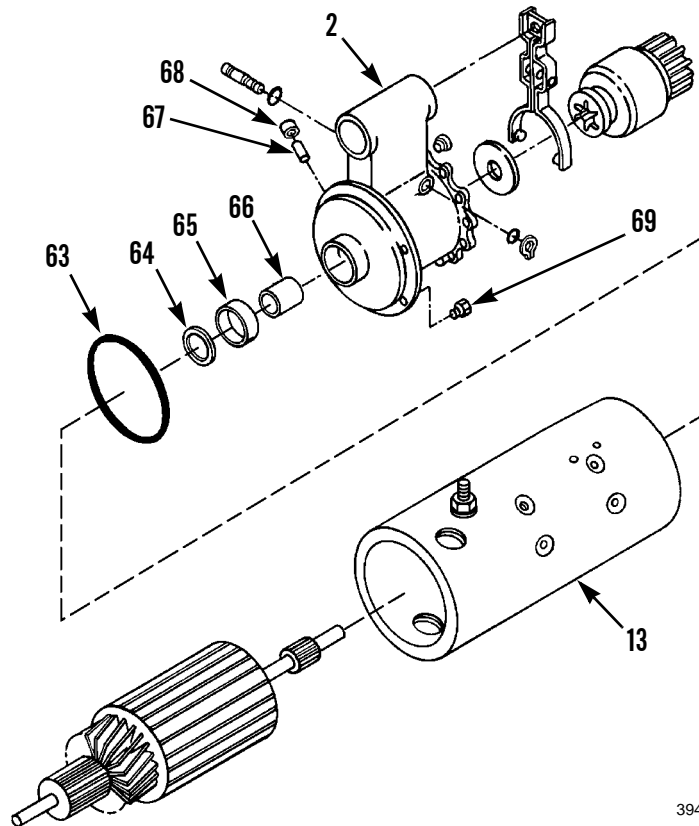
**DISASSEMBLY - CONTINUED**

39. Remove five bolts (69).
40. Separate housing (2) from housing (13).
41. Remove preformed packing (63), seal (64) and spacer (65). Discard preformed packing and seal.
42. Remove and discard cup (68) and plug (67).

**NOTE**

Removal of bushing from housing will cause destruction of bushing. Remove only if inspection proves necessary.

43. Inspect and remove bushing (66).



394-1379

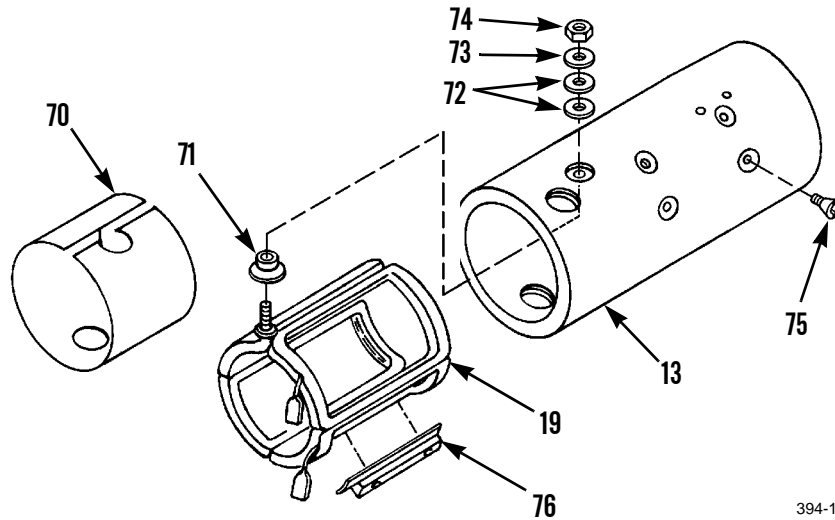


**DISASSEMBLY - CONTINUED**

44. Remove nut (74), washer (73) and two washers (72).
45. Remove eight screws (75).
46. Remove bushing (71) by bending up three tabs on commutator end of field coil (19). Pull wire assembly of field coil (19) through inside of housing (13). Remove four shoes (76) and field coil (19).

**NOTE**

- Remove field coil only if testing and inspection proves replacement is necessary.
  - Four shoes have a long lip on one side and a short lip on the other. The long lip should be assembled in the direction of armature rotation so it becomes the trailing (not leading) edge of the pole shoe.
47. Remove field coil (19), if necessary, insulator (70) and four shoes (76).



**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. Remove all seal and preformed packing material from all mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry all parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

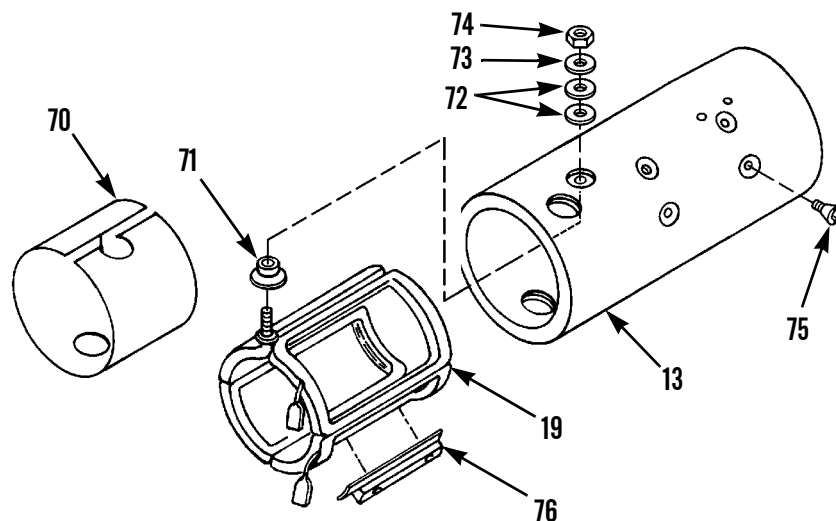
**ASSEMBLY**

1. Position insulator (70) by wrapping around field coil (19), if removed.
2. Position the sides of four shoes (76) with long lip being assembled in field coil (19), in the direction of armature rotation so it becomes the trailing (not leading) edge of four shoes (76).
3. Install field coil (19) in housing (13). Do not tear insulator (70). Support field coil (19) with hand or pole shoe spreader.

**NOTE**

Careful installation of the field coil is necessary to prevent shorting or grounding of the field coil as shoes are tightened into place.

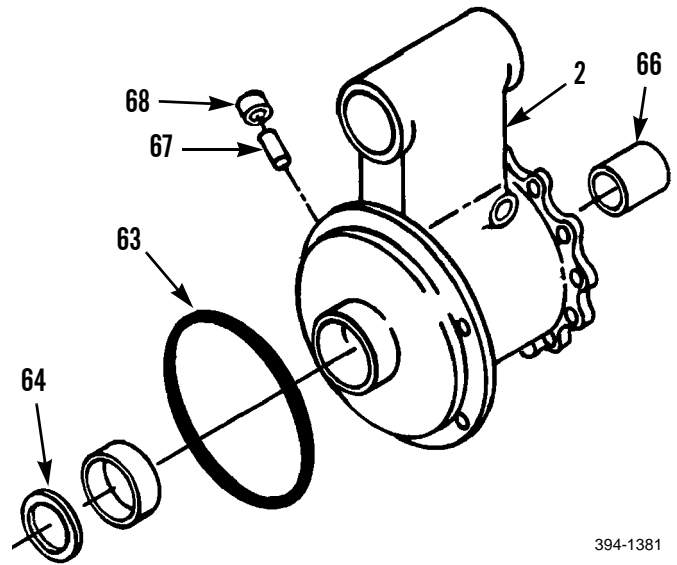
4. Install bushing (71) on stud of wire assembly on field coil (19). Position wire through port of housing (13). Position wire around inner circumference of housing (13) and hold in place by bending back three tabs.
5. Install eight screws (75) through housing (13), securing field coil (19) with four shoes (76). Tighten eight screws (75) evenly.
6. Install two washers (72), washer (73) and nut (74).



394-1380

**ASSEMBLY - CONTINUED**

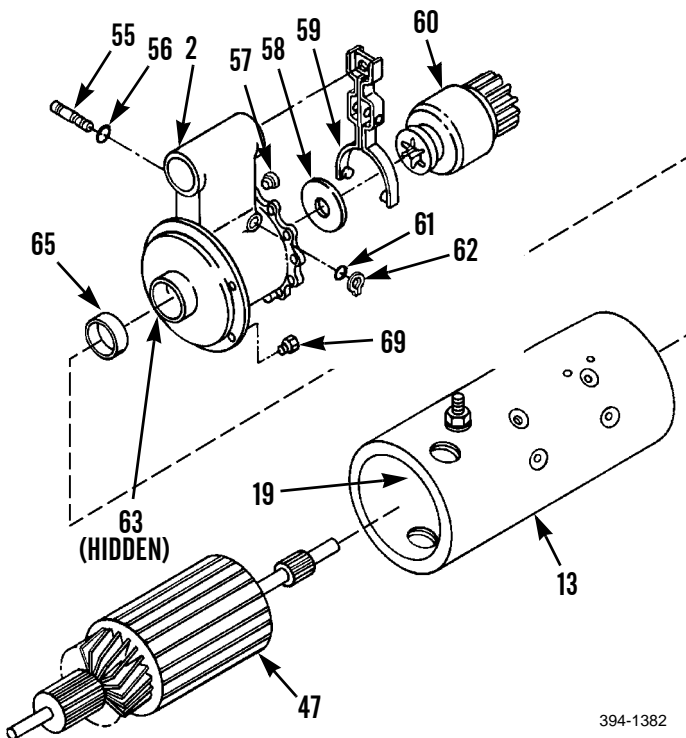
7. Soak new bushing (66) in clean lubricating oil and use driver and press to install new bushing (66) in housing (2).
8. Soak new plug (67) in clean lubricating oil.
9. Install new plug (67) and new cup (68).
10. Lubricate bore of new seal (64) lightly with clean lubricating oil.
11. Install new seal (64) in housing (2).
12. Install preformed packing (63).



394-1381

**ASSEMBLY - CONTINUED**

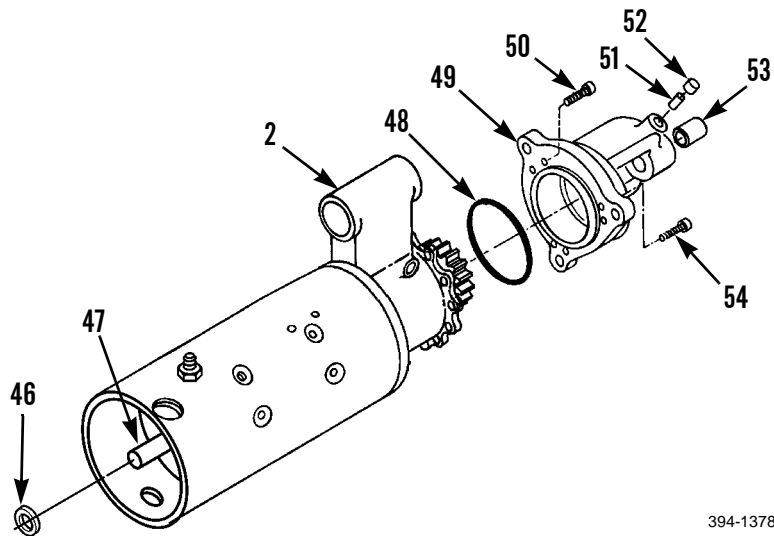
13. Install spacer (65) on drive (60) end of armature (47) shaft.
14. Position armature (47) with shaft end of drive (60) partially through housing (2).
15. Lubricate washer (58) with clean lubricating oil.
16. Install washer (58) on shaft of armature (47).
17. Position lever (59) on drive (60).
18. Position lever (59) and drive (60) in housing (2) aligning lever with bore in housing (2) for shaft (55).
19. Install armature (47) through drive (60).
20. Install new preformed packing (56) on shaft (55).
21. Install shaft (55) and preformed packing (56) through housing (2) and lever (59).
22. Install new preformed packing (61) and ring (62) on shaft (55).
23. Lubricate new preformed packing (63) lightly with clean lubricating oil and install.
24. Position housing (2) and armature assembly (47) by aligning housing (2) with match marks on housing (13). Carefully insert armature (47) through field coil (19).
25. Install five bolts (69).
26. Install plug (57).



394-1382

**ASSEMBLY - CONTINUED**

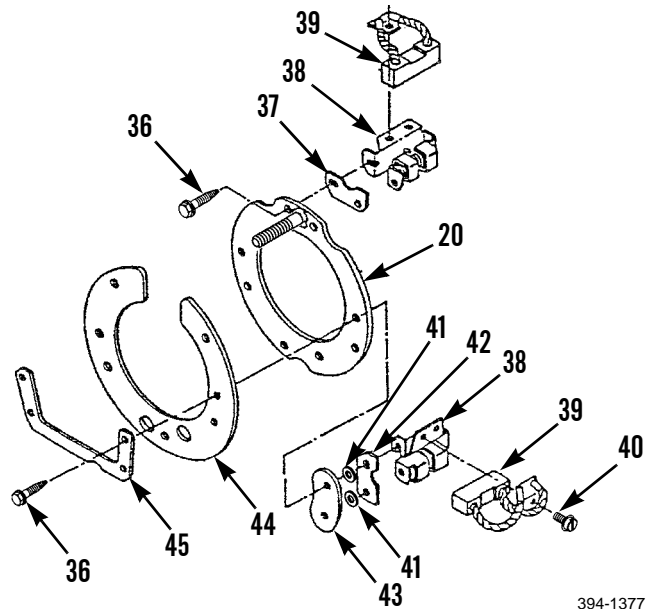
27. Soak new bushing (53) in clean lubricating oil and install in housing (51), if removed.
28. Soak new plug (51) in lubricating oil.
29. Install new plug (51) and new cup (52).
30. Apply clean lubricating oil lightly to outer face of new preformed packing (48).
31. Install new preformed packing (48) on housing (49).
32. Position housing (49), aligning with match marks on housing (2).
33. Install five screws (54) and screw (50). Torque screws (50 and 54) to 15 lb-ft (20 Nm).
34. Install washer (46) on commutator end of armature (47) shaft.



394-1378

**ASSEMBLY - CONTINUED**

- 35. Position plate (20), insulator (44), two plates (43), four washers (41), two plates (42), insulator (45) and two holders (38).
- 36. Install four screws (36).
- 37. Position two plates (37) and holders (38) on plate (20).
- 38. Install four brushes (39) and screws (40). When installing new brushes, ensure brush rides freely in holder (38).



394-1377

- 39. Soak new bushing (35) in clean lubricating oil and install in end frame (29).
- 40. Soak new plug (31) and new cup (32) in clean lubricating oil.
- 41. Install new plug (31) and new cup (32).
- 42. Apply clean lubricating oil to outer face of new preformed packing (34).
- 43. Install new preformed packing (34) on end frame (29).
- 44. Install two insulators (33) on stud of plate (20).
- 45. Position plate (20) assembly on end frame (29).



394-1376

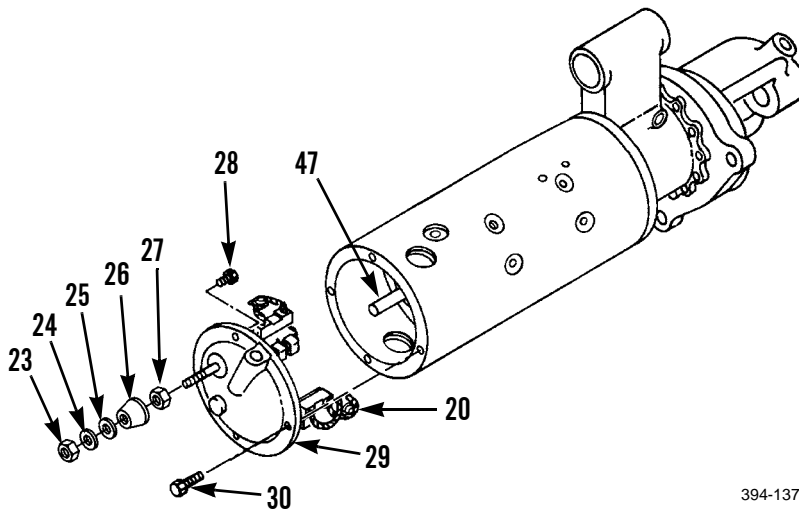
**ASSEMBLY - CONTINUED**

46. Install three screws (28).
47. Install bushing (27), insulator (26), washer (25), lockwasher (24) and nut (23).

**NOTE**

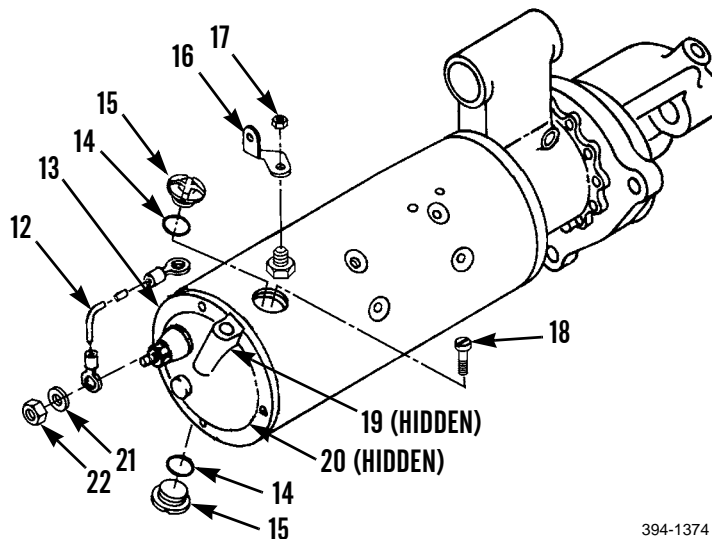
Two brush terminal wires connected to field coil must be in alignment with plug ports in housing before proceeding to assemble.

48. Position plate (20) assembly, aligning match-marks on end frame (29) with match-marks on housing (13).
49. Install plate (20) assembly by pulling armature (47) out just far enough to compress brushes to install on commutator.
50. Install four bolts (30).



394-1375

51. Install two screws (18) securing field coil (19).
52. Install two new seals (14) and plugs (15).
53. Connect wire assembly (12).
54. Install washer (21) and nut (22).
55. Install connector (16) and nut (17). Torque nut (17) to 22 lb-ft (30 Nm).



394-1374

**ASSEMBLY - CONTINUED**

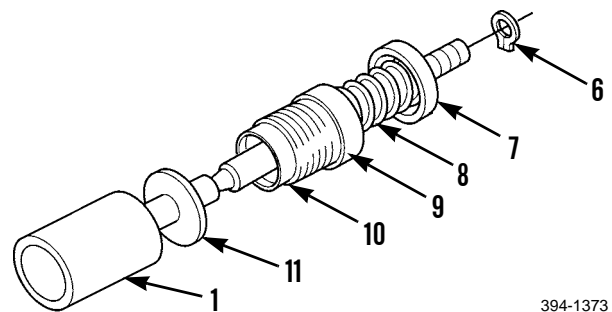
56. Install washer (11), boot (10), retainer (9), spring (8) and retainer (7) on plunger (1).



**WARNING**

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

57. Compress spring (8) and install ring (6) in groove of plunger shaft (1).

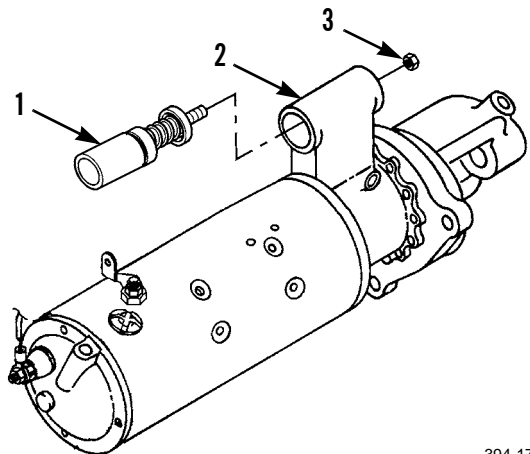


394-1373

58. Install shaft (1) assembly through housing (2).

59. Install solenoid (WP 0360 00).

60. Install new locknut (3) loosely in housing (2) on end of plunger shaft (1).

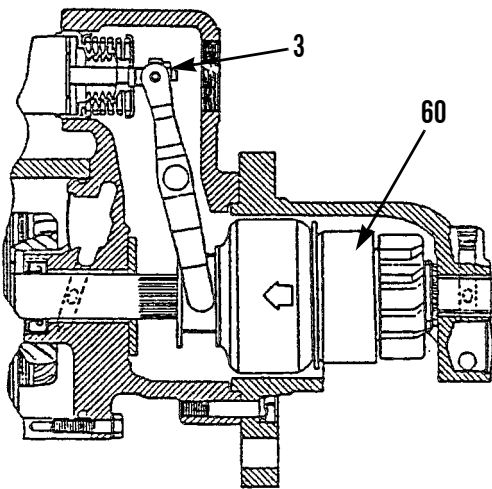


394-1754

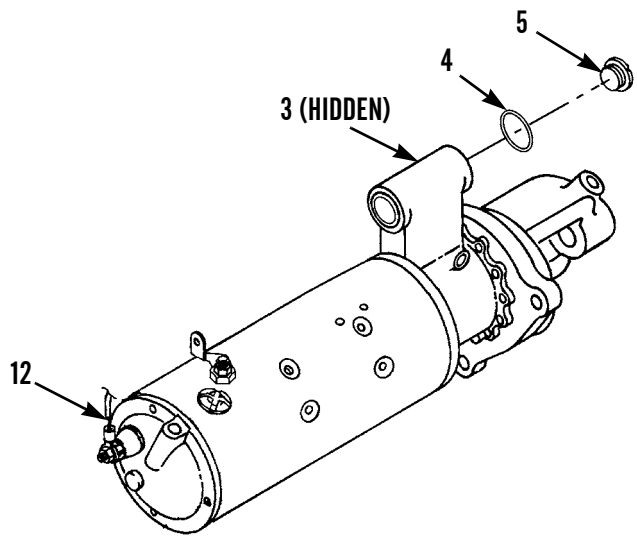


**ADJUSTMENT**

1. Disconnect wire assembly (12) from solenoid.
2. Position starter assembly in soft-jawed vise and connect to 24V battery using three jumper wires. Do not connect ground to MTR terminal at this time.
3. Momentarily flash jumper lead A from ground to MTR terminal. The drive (60) will shift into cranking position.
4. Press on drive (60) to take up movement.
5. Using thickness gage, measure pinion clearance.
6. Adjust pinion by turning locknut (3) until pinion clearance is 0.36 in.
7. Remove three jumper wires.
8. Install new preformed packing (4) and plug (5).
9. Connect wire assembly (12) to solenoid ground.



394-1383



394-1755

10. Install starting motor (WP 0057 00).
11. Start engine and verify correct operation of starting system (TM 5-380-248-10).

**END OF WORK PACKAGE**



**STARTING MOTOR (PRESTOLITE) REPAIR****0362 00****THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Testing, Assembly

**INITIAL SETUP****Maintenance level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop, field maintenance (Item 104, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Grease, GAA (Item 19, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Tag, marker (Item 42, WP 0339 00)

Gasket

Lockwasher (21)

Packing, preformed (3)

Seal

**References**

TM 5-3805-248-10

**Equipment Condition**

Starting motor removed (WP 0057 00)

Solenoid removed (WP 0057 00)

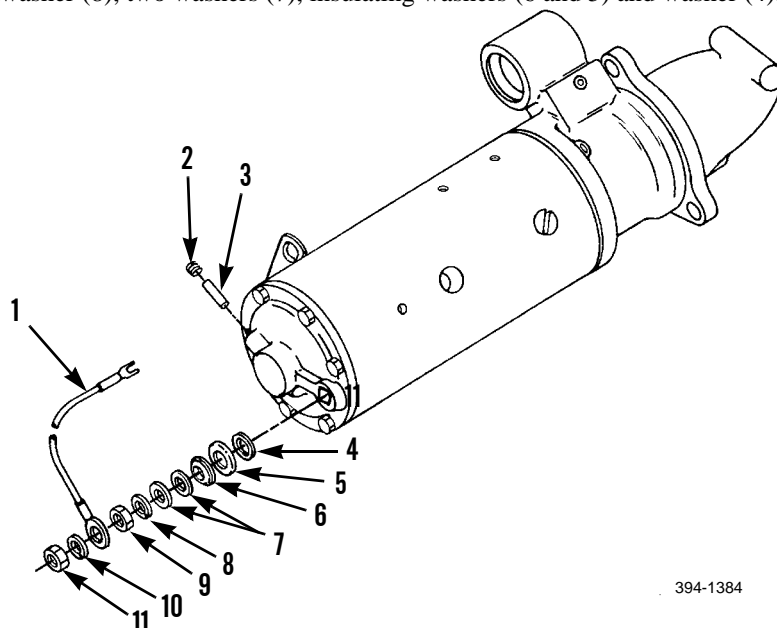
**DISASSEMBLY**

1. Remove plug (2) and wick (3).
2. Remove nut (11) and lockwasher (10). Discard lockwasher.

**NOTE**

Tag all wire connectors, cables and harnesses prior to disconnecting to ensure correct installation.

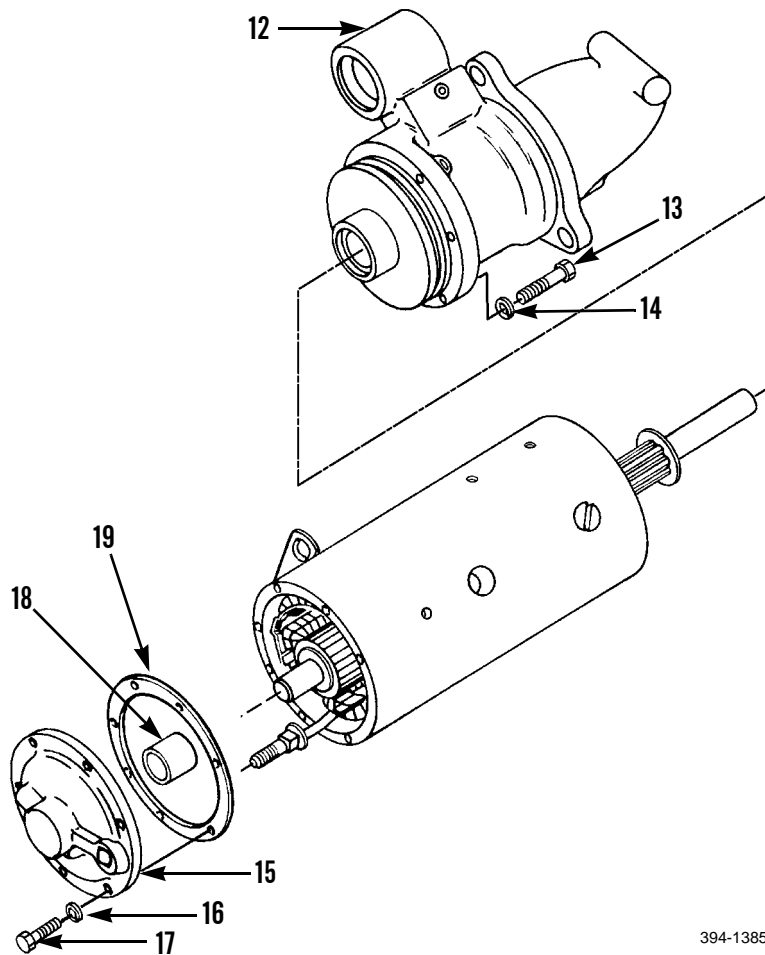
3. Disconnect wire connector (1).
4. Remove nut (9), lockwasher (8), two washers (7), insulating washers (6 and 5) and washer (4). Discard lockwasher.



394-1384

**DISASSEMBLY - CONTINUED**

5. Remove four screws (17) and lockwashers (16). Discard lockwashers.
6. Remove end assembly (15) and gasket (18). Discard gasket.
7. Remove bearing (19) from end assembly (15).
8. Remove seven screws (13) and lockwashers (14). Discard lockwashers.
9. Remove housing (12) assembly.



394-1385

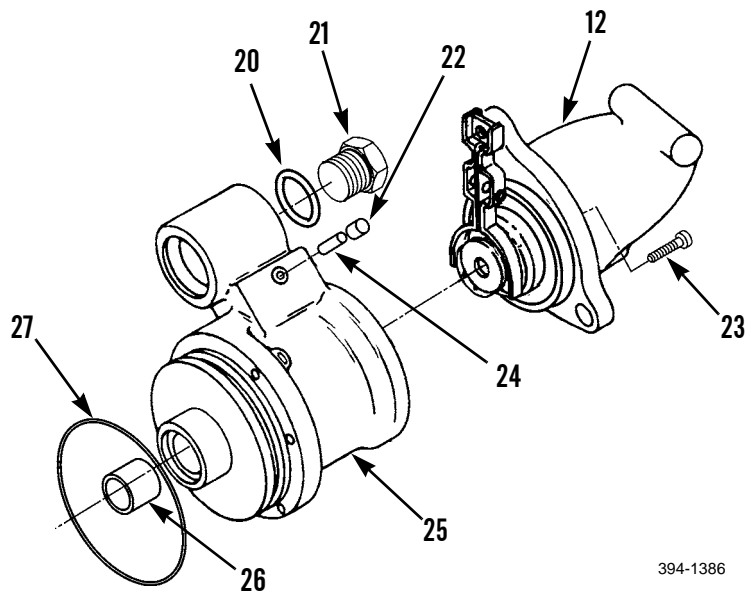
**DISASSEMBLY - CONTINUED**

10. Remove two plugs (22) and pin (24).
11. Remove bolt (21) and preformed packing (20). Discard preformed packing.
12. Remove and discard preformed packing (27).
13. Remove bearing (26).

**NOTE**

Head and housing must be match-marked before separation to aid in assembly.

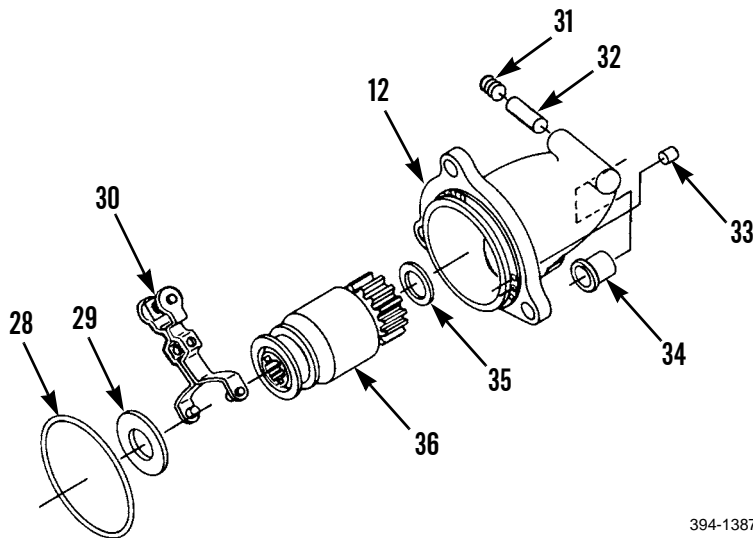
14. Remove three bolts (23).
15. Remove head (25) and housing (12) assembly.



394-1386

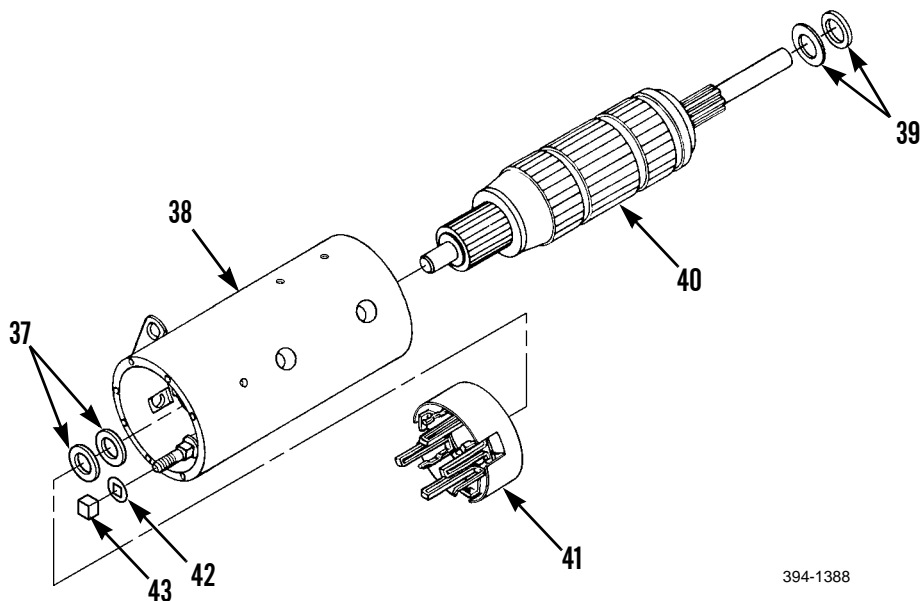
**DISASSEMBLY - CONTINUED**

16. Remove washer (29).
17. Remove preformed packing (28) from housing (12). Discard preformed packing.
18. Remove yoke (30), drive (36) and washer (35).
19. Remove plug (31), wick (32) and plug (33).
20. Use a brass driver and hammer to remove bearing (34) from housing (12).



394-1387

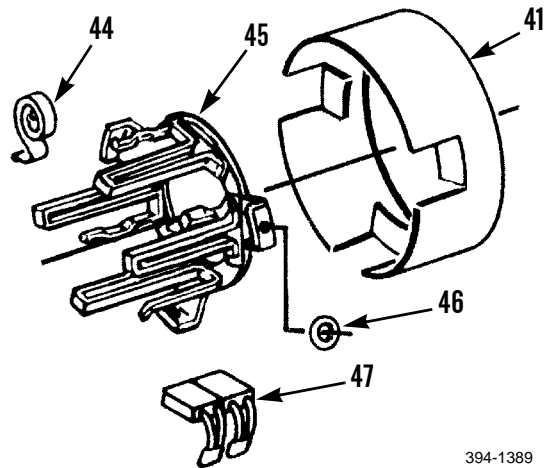
21. Remove armature (40), two washers (39) and two washers (37) from frame (38).
22. Remove spacer (43) and washer (42).
23. Remove insulation (41) assembly.



394-1388

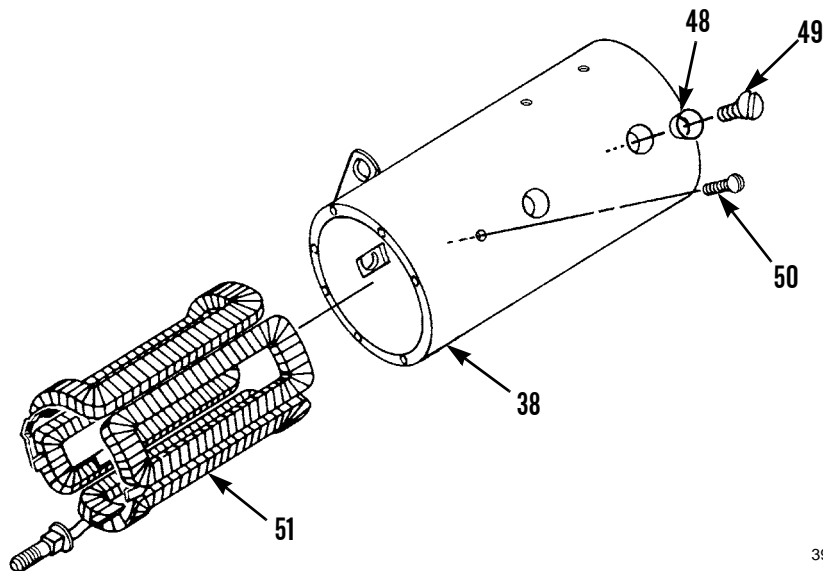
**DISASSEMBLY - CONTINUED**

24. Remove insulation (41).
25. Remove four springs (44) and brushes (47) from holders in plate (45).
26. Remove and discard seal (46).



394-1389

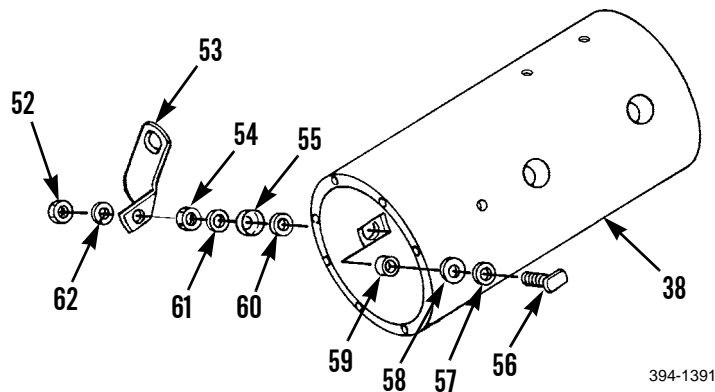
27. Remove coil (51) from frame (38).
28. Remove four screws (49), lockwashers (48) and screw (50). Discard lockwashers.



394-1390

**DISASSEMBLY - CONTINUED**

29. Remove nut (52), lockwasher (62) and connector (53) from frame (38). Discard lockwasher.
30. Remove nut (54), lockwasher (61), spacer (55) and lockwasher (60). Discard lockwashers.
31. Remove bolt (56), lockwasher (57), spacer (58) and insulator (59) from frame (38). Discard lockwasher.

**CLEANING AND INSPECTION****WARNING**

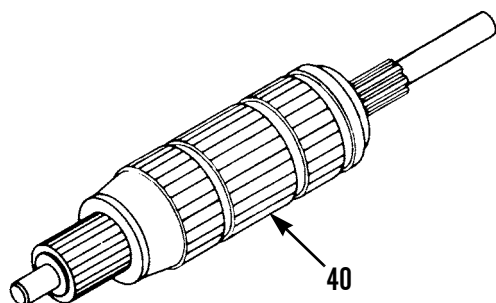
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 cause 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. Remove all gasket material from all mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.



**TESTING**

1. Use armature tester to test armature (40) for grounded windings. Replace if windings are grounded.
2. Use growler and steel blade to test armature (40) for shorted windings. Replace armature (40) if blade vibrates.
3. Test armature (40) commutator bars for opens and grounds. Replace if grounded or open. There should not be any accumulation of brush material between commutator bars.



394-1392

**NOTE**

Coil must be installed in frame before test can be conducted.

4. Use continuity tester, test coil (51) for ground between coil wire and frame. Replace if open.

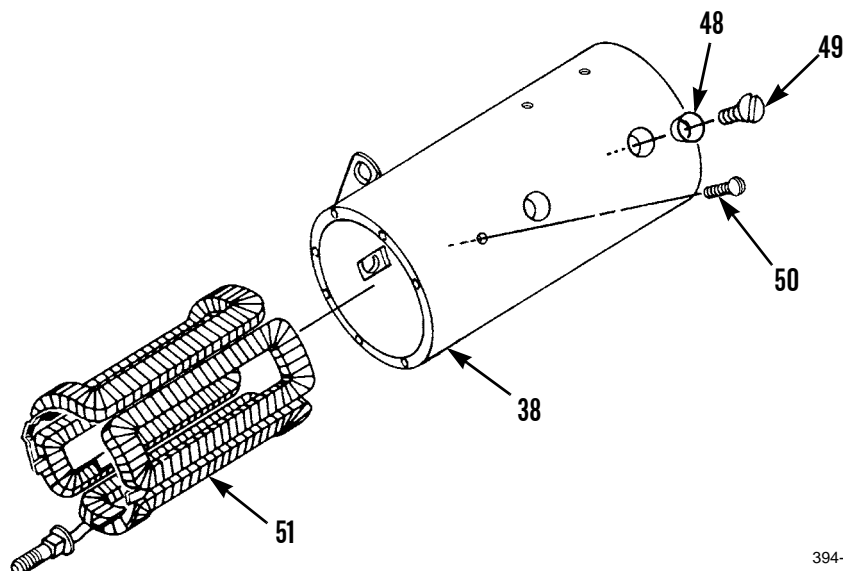
**NOTE**

Plate must be installed with insulation in frame before test can be conducted.

5. Use continuity tester to test plate (45) for grounds. Replace if grounded.

**ASSEMBLY**

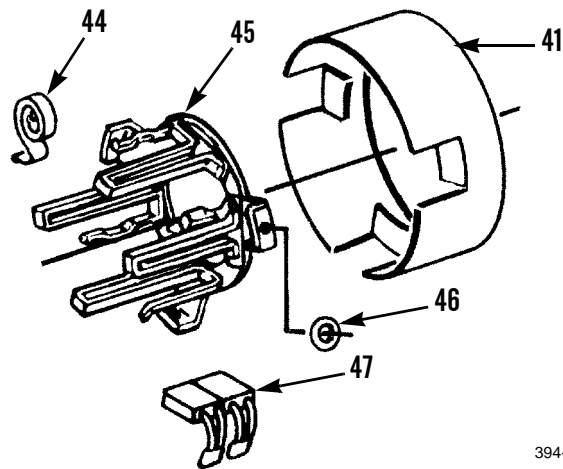
1. Install insulator (59), spacer (58), new lockwasher (57) and bolt (56).
2. Install new lockwasher (60), spacer (55), new lockwasher (61), nut (54) and bolt (56).
3. Install connector (53), new lockwasher (52) and nut (63) on bolt (56).
4. Install coil (51) in frame (38).
5. Install screw (50), four lockwashers (48) and screws (49) in frame (38).



394-1390

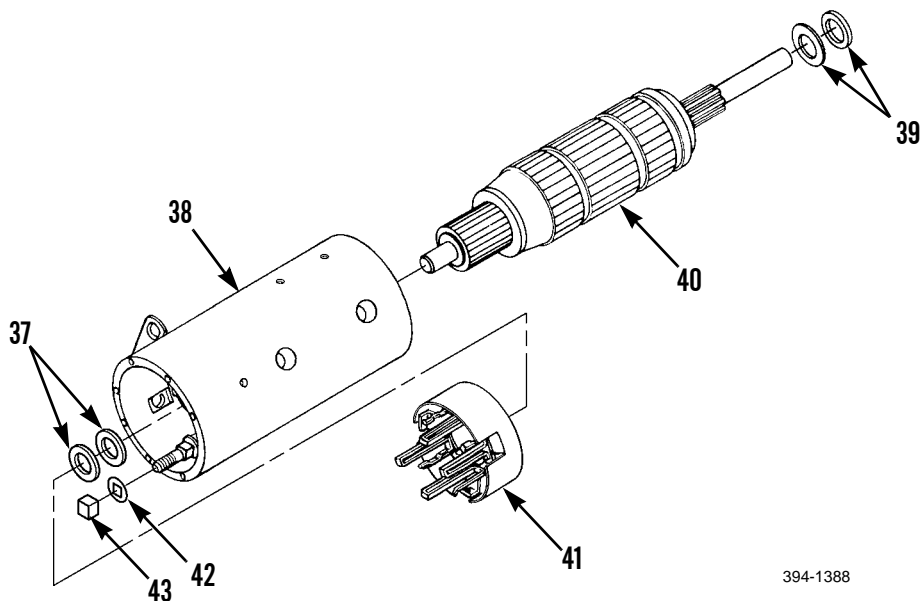
**ASSEMBLY - CONTINUED**

6. Install new seal (46) on plate (45).
7. Install four brushes (47) and springs (44) on plate (45).
8. Install insulation (41) on plate (45).



394-1389

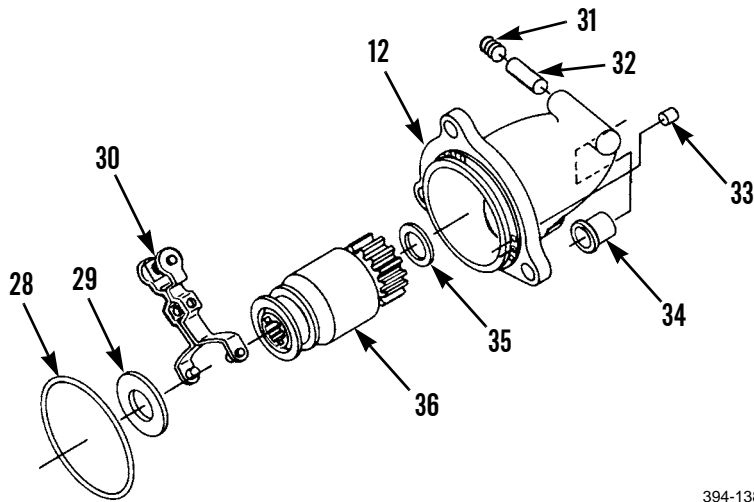
9. Install insulation (41) assembly.
10. Install washer (42) and spacer (43).
11. Install two washers (37) and two washers (39) on armature (40) shaft.
12. Coat bearing surfaces of armature (40) with clean lubricating oil and lubricate armature (40) shaft and splines with grease.
13. Install armature (40) in frame (38).



394-1388

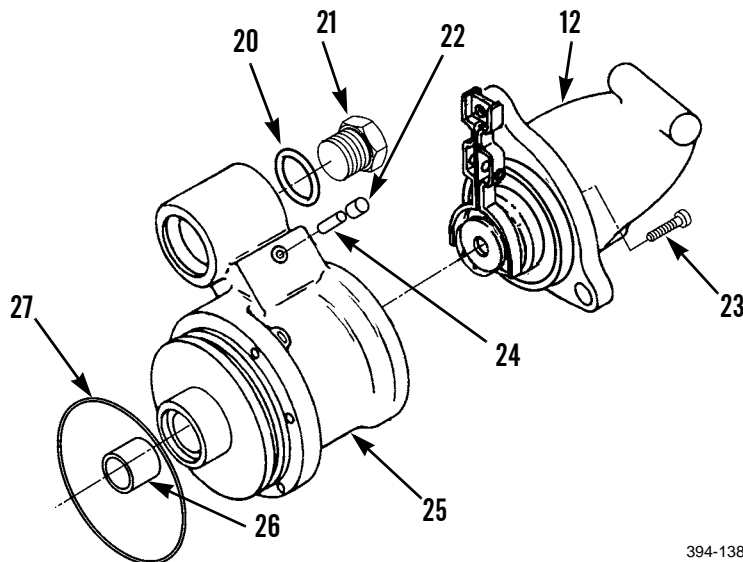
**ASSEMBLY - CONTINUED**

14. Use arbor press to install bearing (34) in housing (12).
15. Install plug (33).
16. Use clean oil to lubricate wick (32) and install in housing (12).
17. Install plug (31).
18. Install washer (35), drive (36) and yoke (30).
19. Install new preformed packing (28) and washer (29).



394-1387

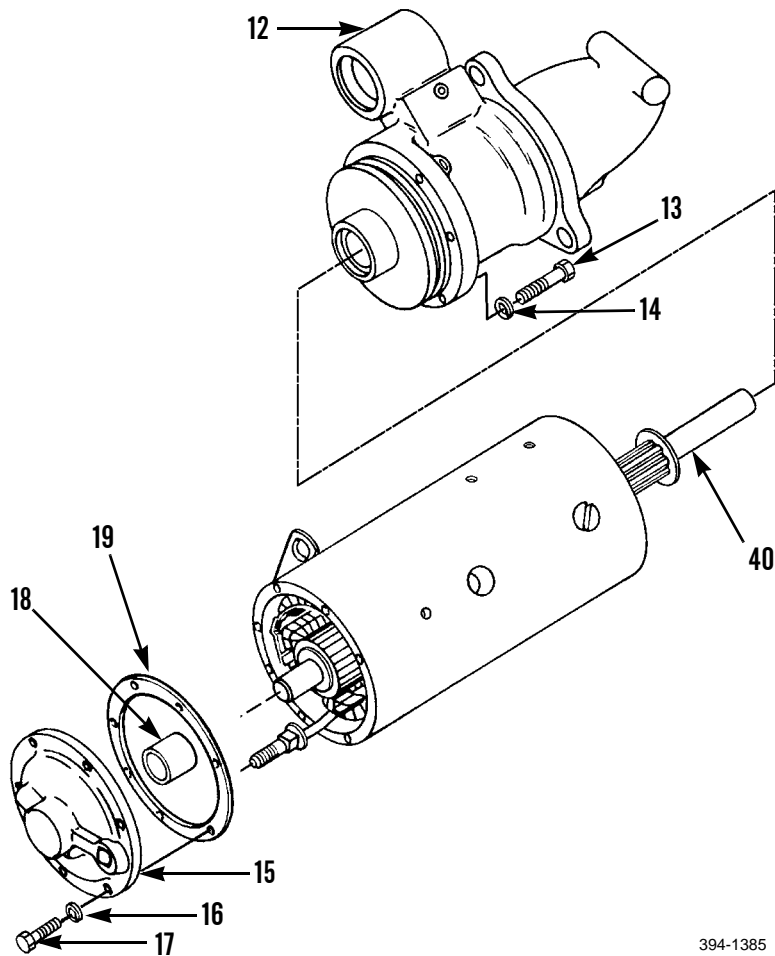
20. Install insulation (41) assembly.
21. Use arbor press to install bearing (26) in head (25).
22. Align match-marks on housing (12) assembly with match-marks on head (25).
23. Install three bolts (23) and torque to 8 lb-ft (11 Nm).
24. Install new preformed packings (20 and 27).
25. Install bolt (21), pin (24) and two plugs (22).



394-1386

**ASSEMBLY - CONTINUED**

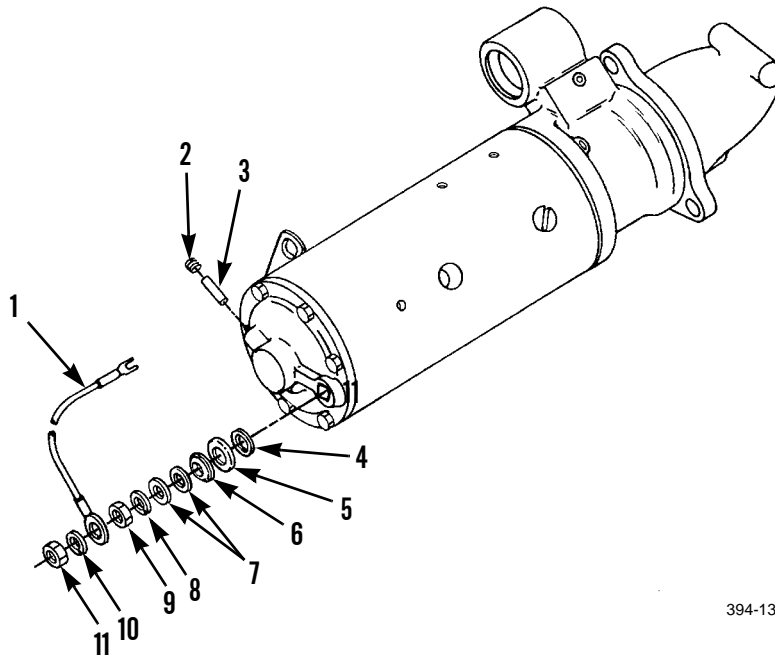
26. Install housing (12) assembly on armature (40).
27. Install seven lockwashers (14) and screws (13).
28. Use arbor press to install bearing (19) in end assembly (15).
29. Install new gasket (18) and end assembly (15).
30. Install four lockwashers (16) and screws (17).



394-1385

**ASSEMBLY - CONTINUED**

31. Install washer (4), insulating washers (6 and 5), two washers (7), new lockwasher (8) and nut (9).
32. Connect wire assembly (1).
33. Install new lockwasher (10) and nut (11).
34. Use clean oil to lubricate wick (3).
35. Install wick (3) and plug (2).



394-1384

36. Install starting motor and solenoid (WP 0057 00).
37. Start engine and verify correct operation of starting system (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**STARTING MOTOR SOLENOID (PRESTOLITE) REPAIR**

**0363 00**

**THIS WORK PACKAGE COVERS**

Testing, Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Carbon pile

Knife switch

12-volt batteries (2)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Insulating varnish, electrical, Glyptal 1201 (Item 24, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket

Parts kit, generator

Parts kit, solenoid

Parts kit, terminal

Washer

**References**

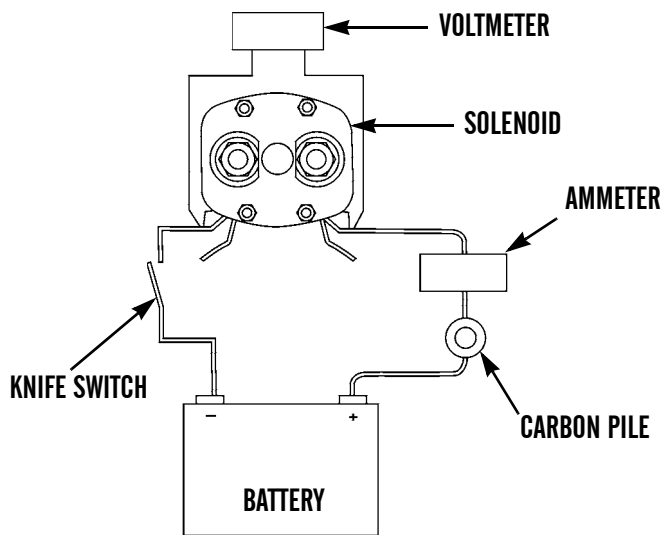
TM 5-3805-248-10

**Equipment Condition**

Starting solenoid removed (WP 0360 00)

**TESTING**

1. Connect two 12-volt batteries (connected in series) to carbon pile.
2. Connect ammeter to carbon pile. Observe polarity.
3. Connect ammeter to solenoid at small terminal on right side.
4. Connect voltmeter across solenoid terminals at motor stud terminal and small terminal on right side.
5. Connect knife switch to solenoid at motor stud terminal.



394-1393

**TESTING - CONTINUED****CAUTION**

Before making final connection between power supply and knife switch, contacts of knife switch must be in the open position. Failure to follow this procedure may result in damage to equipment.

6. Connect battery negative wire to knife switch.

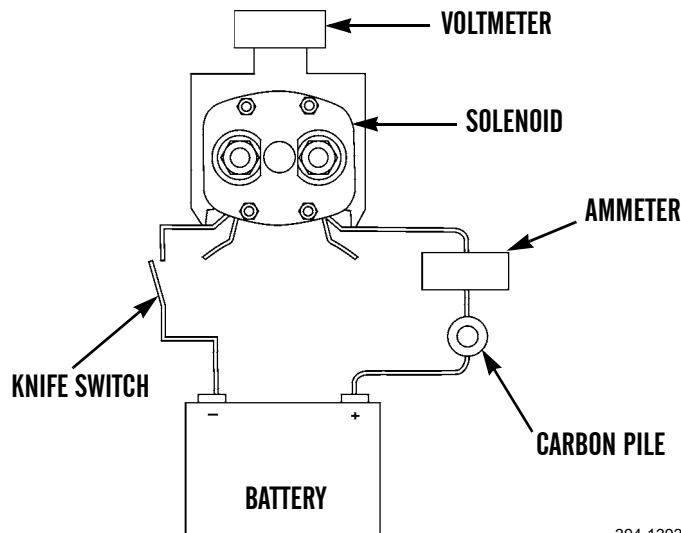
**CAUTION**

Do NOT allow test circuit to stay on more than 15 seconds. Overheating will occur in solenoid. Failure to follow this procedure could result in damage to equipment.

**NOTE**

Steps 7 through 9 adjust the carbon pile for nominal 23 volts across solenoid terminals. Steps should be repeated as necessary to get the required 12 volts indicated on the voltmeter. Circuit must not be on for more than 15 seconds. Allow 3 minutes for solenoid to cool before proceeding.

7. Close knife switch to energize test circuit.
8. Adjust carbon pile while observing voltmeter. Set for 12 volts on voltmeter.
9. Open knife switch to de-energize test circuit.



394-1393

**CAUTION**

If steps 7 through 9 are to be repeated, wait three minutes for solenoid winding to cool. Failure to follow this procedure could result in damage to equipment.

10. Repeat steps 7 through 9 as necessary for 12-volt reading.



**TESTING - CONTINUED****CAUTION**

Before proceeding, wait three minutes for solenoid winding to cool. Do NOT allow test circuit to stay on more than 15 seconds. Overheating will occur in solenoid and test results will be in error. Failure to follow this procedure could result in damage to equipment.

**NOTE**

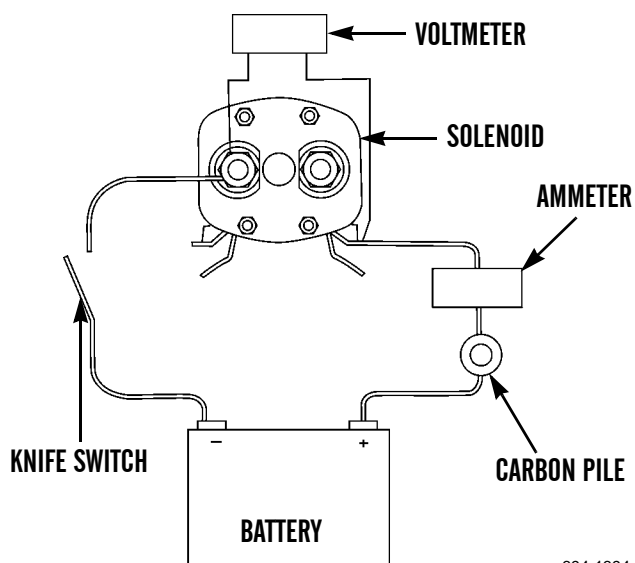
Readings from ammeter and voltmeter are to be recorded.

11. Close knife switch to energize test circuit.
12. Read and record ammeter indication.
13. Open knife switch to de-energize test circuit.
14. Check test result of recorded ammeter indication. If reading is 23 to 27 amperes, proceed to step 15. If reading is 0 amperes, solenoid winding is open (broken wire). Replace solenoid. If reading is 30 amperes or higher, solenoid winding is shorted. Replace solenoid.

**CAUTION**

Before proceeding, wait three minutes for solenoid to cool. Do NOT allow test circuit to stay on more than 15 seconds. Overheating will occur in solenoid and test results will be in error. Failure to follow this procedure could result in damage to equipment.

15. Disconnect voltmeter from solenoid at motor stud terminal.
16. Connect voltmeter to solenoid at small terminal on left side.
17. Disconnect knife switch from solenoid at motor stud terminal.
18. Connect knife switch to solenoid at small terminal on left side.



394-1394

**TESTING - CONTINUED****CAUTION**

Do NOT allow test circuit to stay on more than 15 seconds. Overheating will occur in solenoid. Failure to follow this procedure could result in damage to equipment.

**NOTE**

Steps 19 through 21 adjust the carbon pile for nominal 12 volts across solenoid terminals. Steps should be repeated as necessary to get the required 12 volts indicated on the voltmeter. Circuit must not be on for more than 15 seconds. Allow 3 minutes for solenoid to cool before proceeding.

19. Close knife switch to energize test circuit.
20. Adjust carbon pile while observing voltmeter. Set for 12 volts on voltmeter.
21. Open knife switch to de-energize test circuit.

**CAUTION**

If steps 19 through 21 are to be repeated, wait three minutes for solenoid winding to cool. Failure to follow this procedure could result in damage to equipment.

22. Repeat steps 19 through 21 for 12-volt reading.

**CAUTION**

Before proceeding, wait 3 minutes for solenoid to cool. Do NOT allow test circuit to stay on more than 15 seconds. Overheating will occur in solenoid and test results will be in error. Failure to follow this procedure could result in damage to equipment.

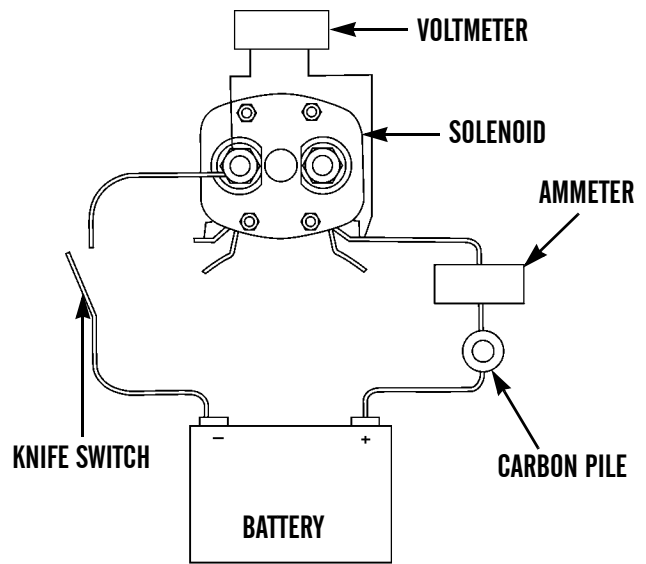
**NOTE**

Reading from ammeter and voltmeter are to be recorded.

23. Close knife switch to energize test circuit.
24. Read and record indication on ammeter.
25. Open knife switch to de-energize test circuit.

**TESTING - CONTINUED**

26. Check test result of recorded ammeter reading. If reading is 4 to 5 amperes, proceed to step 27. If reading is 0 amperes, solenoid winding is open (broken wire). Replace solenoid. If reading is 6 volts or higher, solenoid winding is shorted. Replace solenoid.



394-1394

**DISASSEMBLY**

**NOTE**

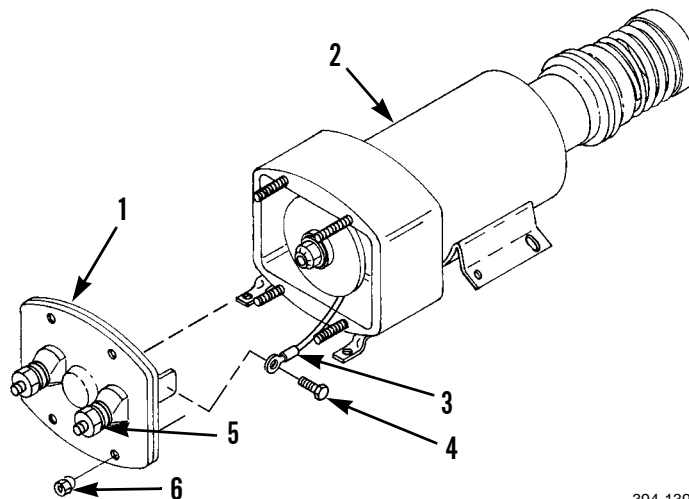
Before disassembly, solenoid must be disconnected from test setup.

1. Remove four nuts (6).
2. Separate cover (1) assembly from housing (2) to access screw (4).
3. Remove screw (4).

**NOTE**

Tag all wire connectors, cables and wiring harnesses prior to disconnecting to ensure correct installation.

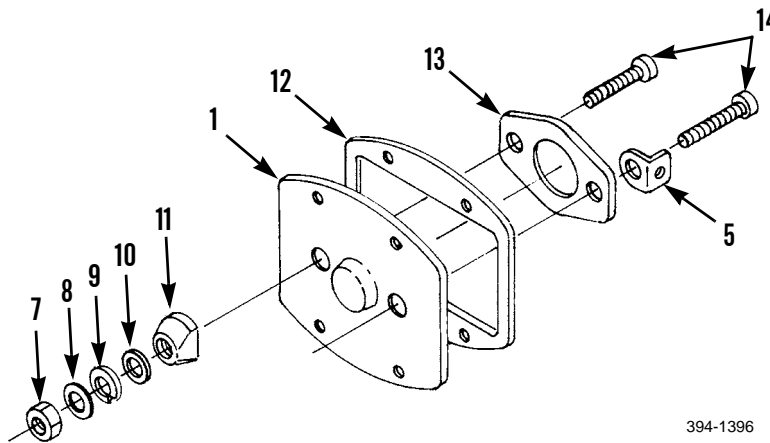
4. Disconnect wire connector (3) from terminal (5).
5. Remove cover (1) assembly from housing (2).



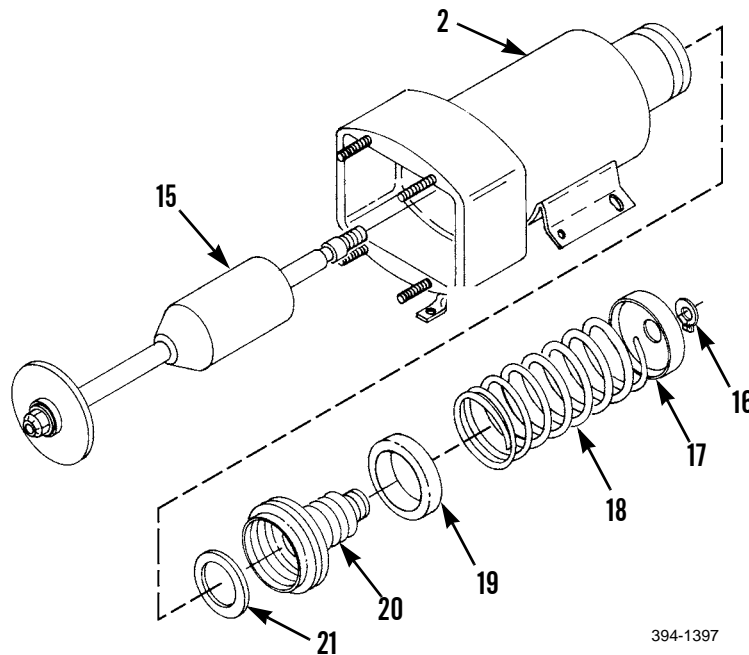
394-1395

**DISASSEMBLY - CONTINUED**

6. Remove and discard two nuts (7), washers (8), lockwashers (9), washers (10) and spacers (11).
7. Remove and discard two studs (14) and terminal (5).
8. Remove and discard insulator (13) and gasket (12) from cover (1).

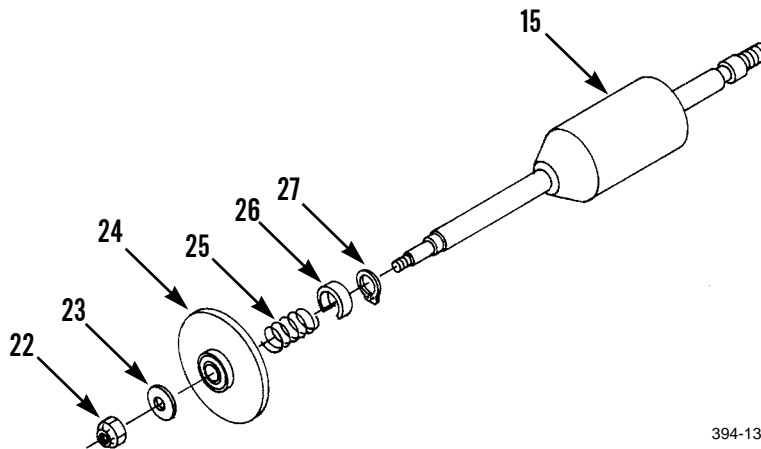


9. Use retaining ring pliers to remove and discard retaining ring (16), retainer (17), spring (18) and retaining ring (19).
10. Remove boot (20) and washer (21). Discard washer.
11. Remove core (15) assembly from housing (2).



**STARTING MOTOR SOLENOID (PRESTOLITE) REPAIR - CONTINUED****0363 00****DISASSEMBLY - CONTINUED**

12. Remove and discard nut (22).
13. Remove washer (23), contact assembly (24), spring (25) and retainer (26). Discard contact assembly (24) and retainer (26).
14. Use retaining ring pliers to remove and discard retaining ring (27) from core (15).

**CLEANING AND INSPECTION****WARNING**

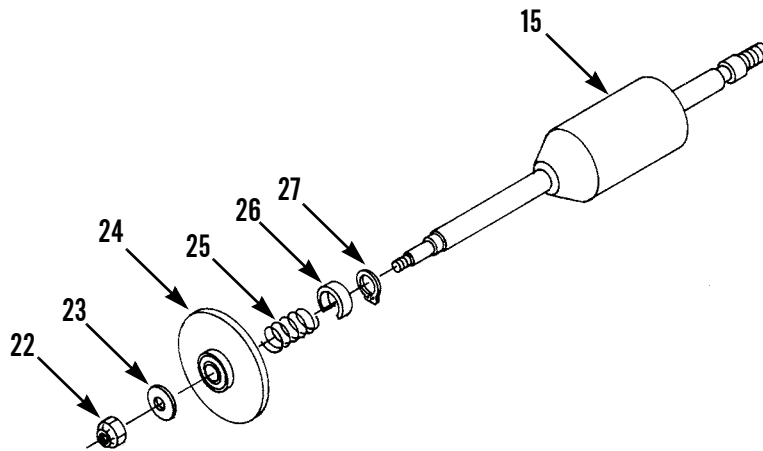
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 cause 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. Remove all gasket material from all mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY****NOTE**

All parts furnished in kits will be used to replace like parts being discarded during disassembly. Entire kits will be used.

1. Install new retaining ring (27) on core (15) shaft.
2. Install new retainer (26), spring (25), new contact assembly (24) and washer (23) on core (15).
3. Install new nut (22).
4. Install core (15) assembly in housing (2).
5. Install new washer (21) on core (15) shaft.
6. Use clean lubricating oil, lubricate inside of large end of boot (20) and install on housing (2).
7. Install new retaining ring (19), new spring (18), new retainer (17) and new retaining ring (16) on core (15).



394-1398

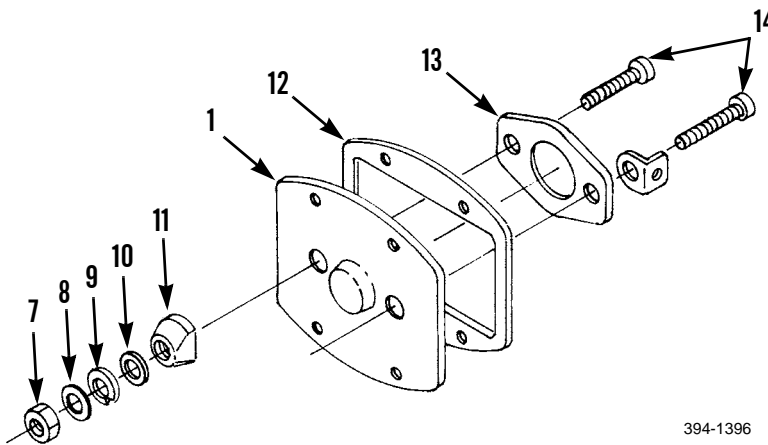
**ASSEMBLY - CONTINUED**

8. Install new gasket (12) in cover (1).
9. Install new insulator (13) in cover (1).
10. Install new terminal (5) on one of two new studs (14).

**NOTE**

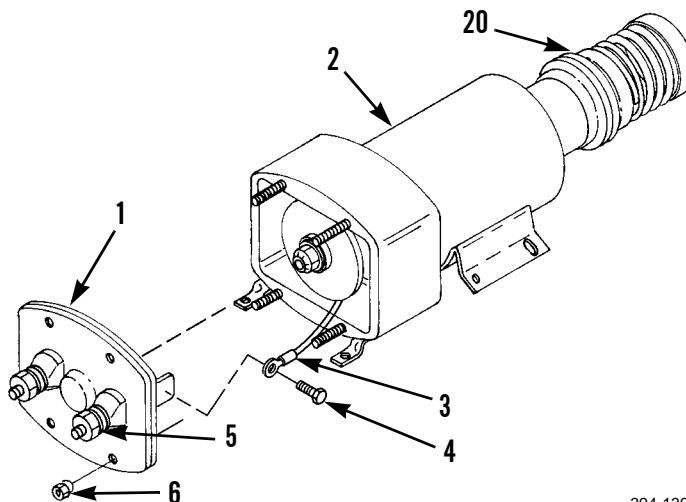
Stud with terminal is to be installed in left mounting hole of cover.

11. Install two new studs (14) through new insulator (13) and cover (1).
12. Using insulating varnish, coat two new spacers (11), new washers (10), new lockwashers (9), new washers (8) and new nuts (7) and install on two new studs (14).



394-1396

13. Position cover (6) assembly over housing (2).
14. Connect wire assembly (3) on terminal (5).
15. Install screw (4) on terminal (5).
16. Install four nuts (6).



394-1395

17. Install starter solenoid (WP 0360 00).
18. Start engine and verify correct operation of starting system (TM 5-3805-248-10).

**END OF WORK PACKAGE**





---

**PRESSURE AND SELECTOR VALVE ASSEMBLY REPLACEMENT**

---

**0364 00****THIS WORK PACKAGE COVERS**Removal, Cleaning and Inspection, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 150 lb minimum capacity

Pin, guide 5/16-18NC x 6-1/2 (6)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Gasket (4)

Packing, preformed (36)

Seal (2)

**References**

TM 5-3805-248-10

**Equipment Condition**

Transmission fluid drained (WP 0128 00)

Transmission removed (WP 0286 00)

---

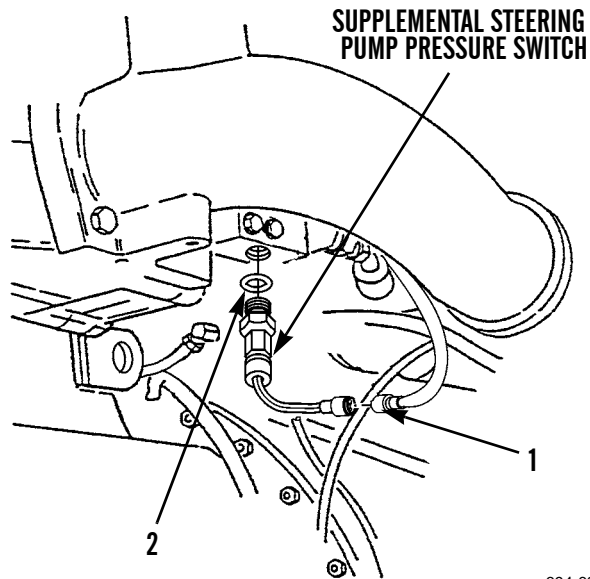
**REMOVAL**

1. Disconnect wire connector (1) from supplemental steering pump pressure switch at right-rear of machine.

**CAUTION**

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

2. Remove supplemental steering pump switch and pre-formed packing (2).

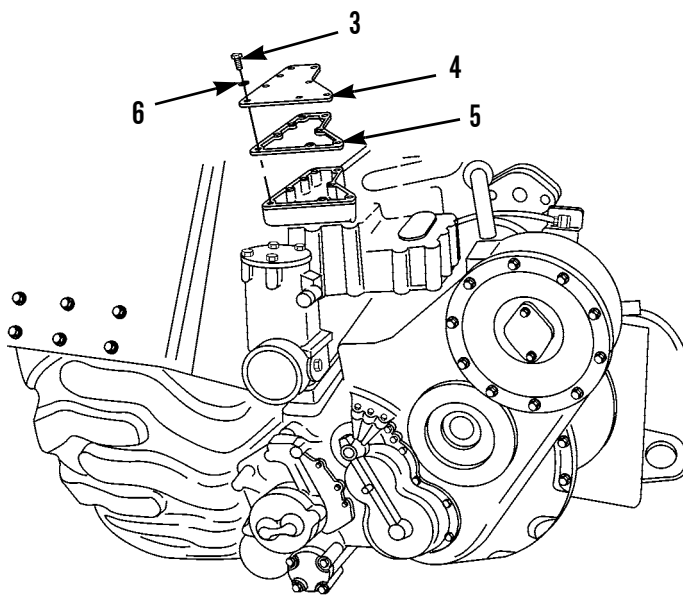


394-681

**NOTE**

- Use a container to capture draining hydraulic oil. Dispose of hydraulic oil IAW local policy and ordinances. Ensure all spills are cleaned up.
- Tag hose and tube assemblies prior to removal to ensure correct installation.
- Note routing of all hose assemblies prior to removal to ensure correct installation.

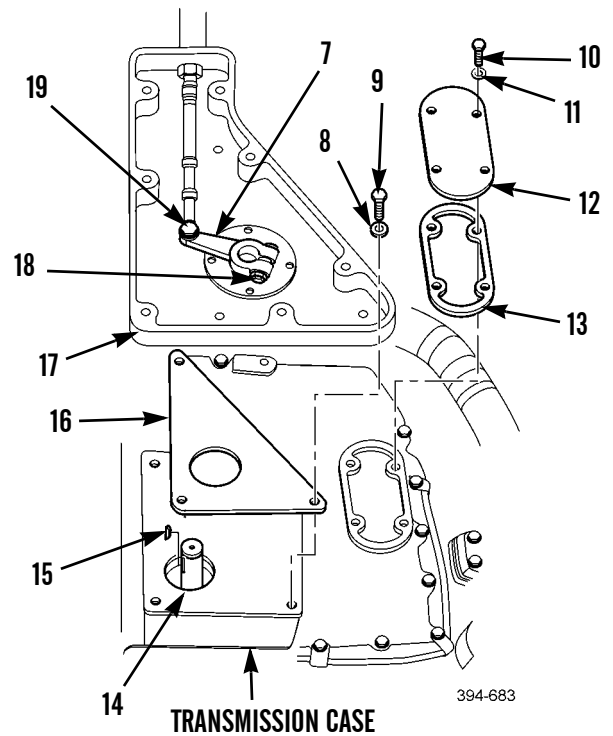
3. Remove seven bolts (3), washers (6), cover (4) and gasket (5). Discard gasket.



394-682

**REMOVAL - CONTINUED**

4. Loosen bolt (19) and nut (18).
5. Disconnect lever assembly (7) from shaft (14).
6. Remove three bolts (9) and washers (8).
7. Disconnect housing assembly (17) from transmission case and position out of the way.
8. Remove and discard gasket (16).
9. Remove woodruff key (15).
10. Remove four bolts (10), washers (11), cover (12) and gasket (13). Discard gasket.

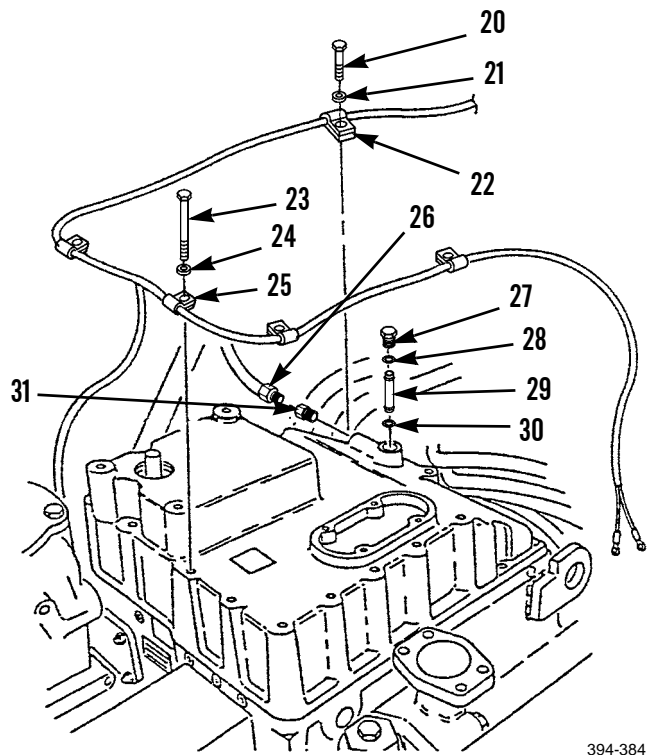


11. Remove plug (27), preformed packing (28), sleeve (29) and preformed packing (30). Discard preformed packings.

**NOTE**

Tag hose and tube assemblies prior to removal to ensure correct installation.

12. Disconnect hose assembly (26).
13. Remove union (31).
14. Remove 12 bolts (23) and lockwashers (24). Discard lockwashers.
15. Disconnect seven clips (25) and position out of the way. Do not remove seven clips from wiring harness.
16. Remove nine bolts (20) and lockwashers (21). Discard lockwashers.
17. Disconnect two clips (22) and position out of the way. Do not remove two clips from wiring harness.



REMOVAL - CONTINUED



WARNING

Use adequate hoist and sling for lifting. Failure to follow this procedure may cause injury. If you are injured, obtain medical help immediately.

CAUTION

Exercise care to keep dust, dirt and other contaminants out of transmission control valve assembly housing. Make sure hands, clothing and tools are clean. Do not perform this task where wind may carry airborne particles. Keep parts and case covered with a clean sheet of plastic when left unattended. Failure to follow this procedure could result in damage to equipment.

NOTE

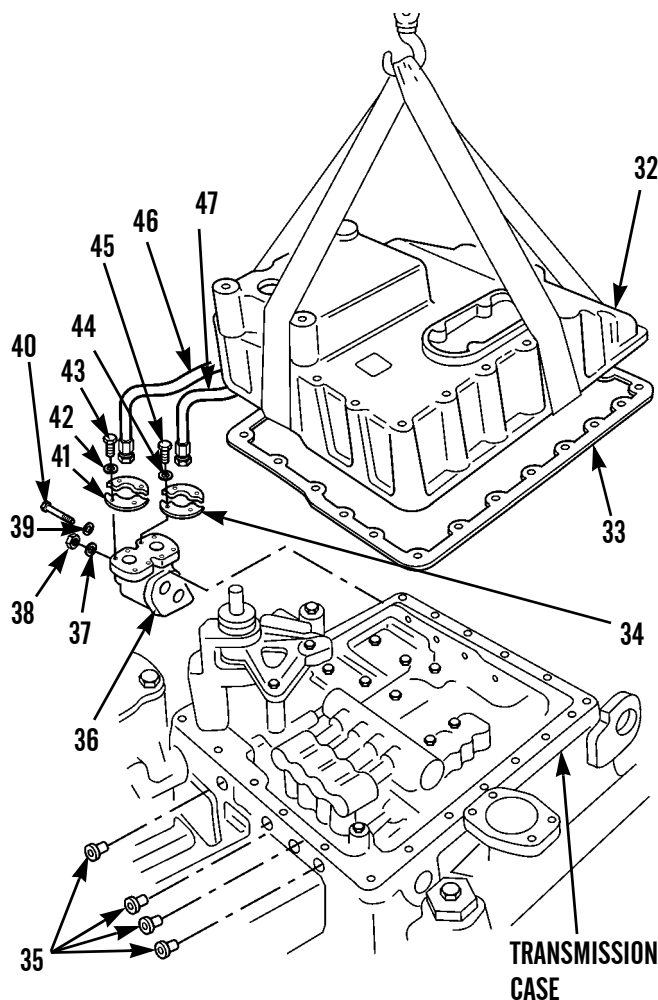
Weight of cover is 70 lb (32 kg).

18. Attach lifting device to cover (32).
19. Use lifting device to remove cover (32).
20. Remove lifting device.

CAUTION

Do not allow gasket material or other contaminants inside the transmission case. Failure to follow this procedure could result in damage to equipment.

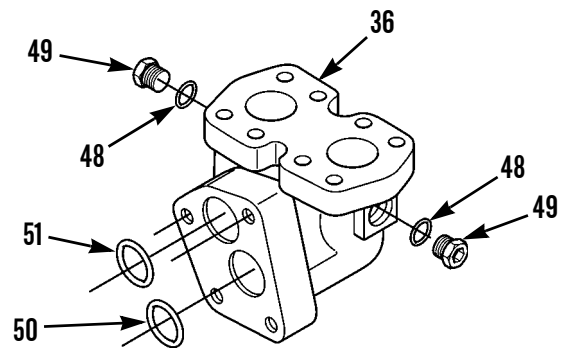
21. Remove gasket (33) and four plugs (35) from transmission case. Discard gasket.
22. Remove four bolts (43), washers (42) and two flange halves (41).
23. Disconnect hose assembly (46) and position out of the way.
24. Remove four bolts (45), washers (44) and two flange halves (34).
25. Disconnect hose assembly (47) and position out of the way.
26. Remove three nuts (38) and lockwashers (37). Discard lockwashers.
27. Remove bolt (40), lockwasher (39) and manifold assembly (36). Discard lockwasher.



394-685

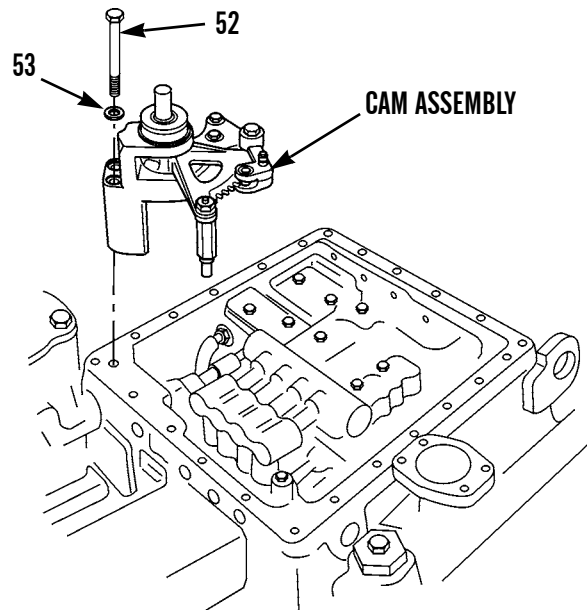
**REMOVAL - CONTINUED**

28. Remove two plugs (49) and two preformed packings (48) from manifold (36). Discard preformed packings.
29. Remove and discard preformed packings (50 and 51) from manifold (36).



394-1756

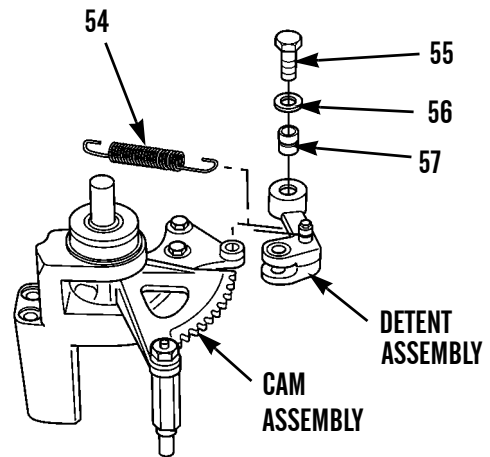
30. Remove four bolts (52), washers (53) and cam assembly.



394-687

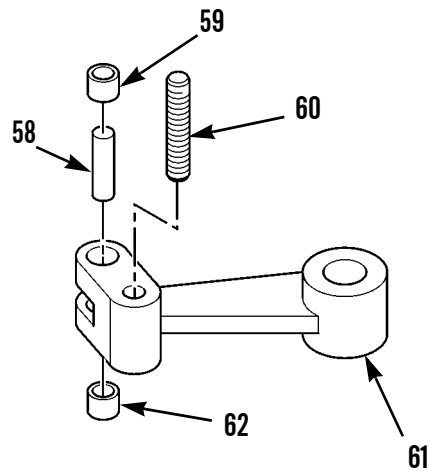
**REMOVAL - CONTINUED**

31. Remove spring (54).
32. Remove bolt (55), washer (56), spacer (57) and detent assembly from cam assembly.



394-688

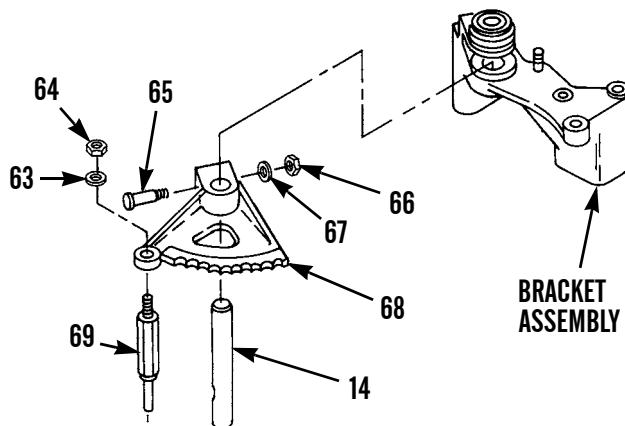
33. Remove dowel (60) and pin (58).
34. Use hammer and brass driver to remove two bearings (59 and 62) from detent (61).



394-689

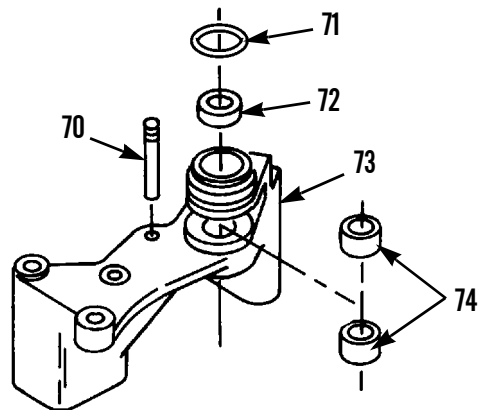
**REMOVAL - CONTINUED**

- 35. Remove nut (64), washer (63) and spacer (69).
- 36. Remove nut (66), washer (67) and pin (65) from cam (68).
- 37. Remove shaft (14) and cam (68) from bracket assembly.



394-690

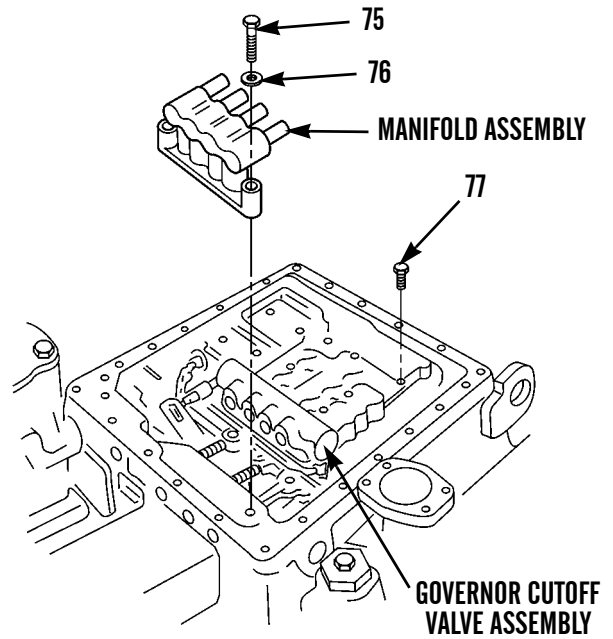
- 38. Remove and discard preformed packing (71) and seal (72).
- 39. Remove dowel (70).
- 40. Use hammer and brass driver to remove two bearings (74) from bracket (73).



394-691

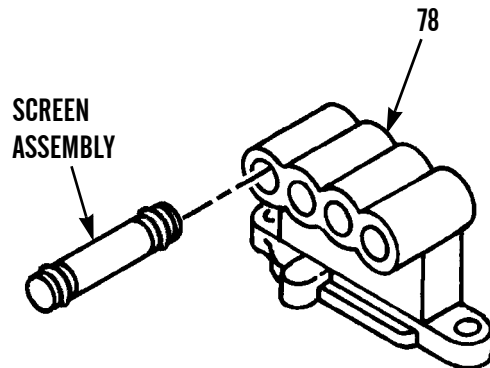
**REMOVAL - CONTINUED**

41. Remove plug (77).
42. Remove two bolts (75), lockwashers (76) and manifold assembly from governor cutoff valve assembly. Discard lockwashers.



394-692

43. Remove screen assembly from manifold (78).

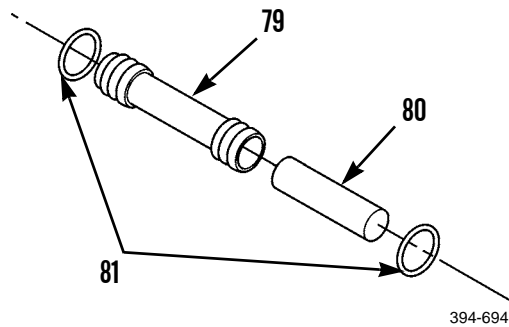


394-693

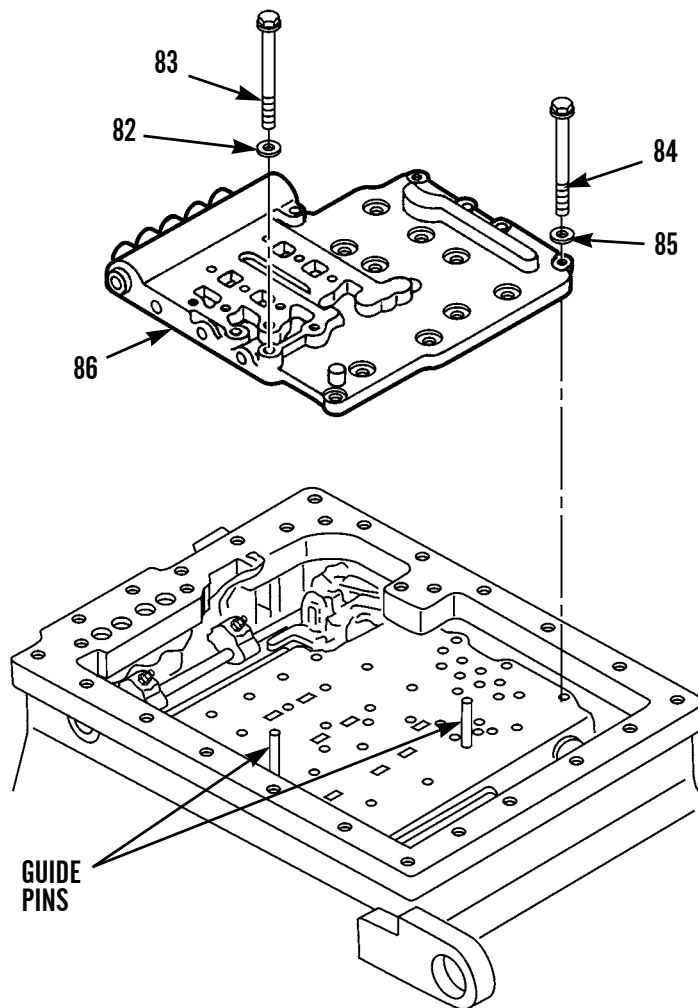


**REMOVAL - CONTINUED**

- 44. Remove and discard eight preformed packings (81) and four screens (80) from sleeves (79).
- 45. Remove 15 bolts (84) and washers (85).



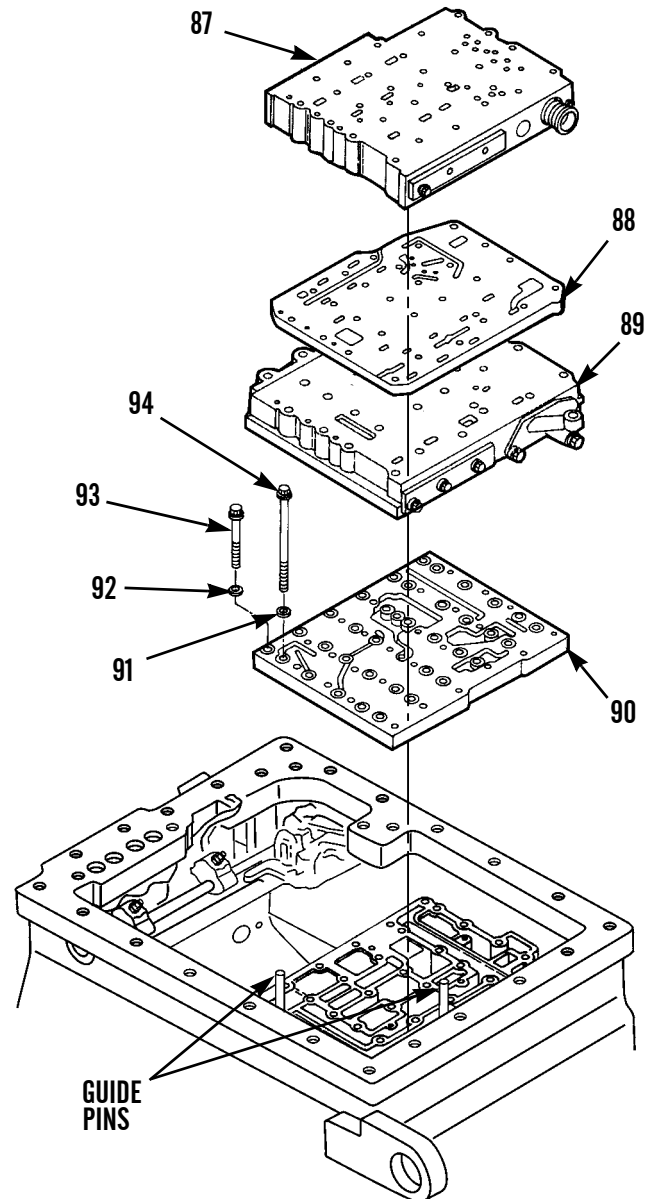
- 46. Install three 5/16-18NC x 6-1/2 in. long guide pins in governor cutoff valve assembly (86).
- 47. Remove 12 bolts (83), washers (82) and governor cutoff valve assembly (86).



394-695

**REMOVAL - CONTINUED**

48. Remove selector valve assembly (87), plate (88) and shift pressure valve assembly (89).
49. Remove six bolts (93) and washers (92).
50. Remove 29 bolts (94), washers (91) and plate (90).



394-696

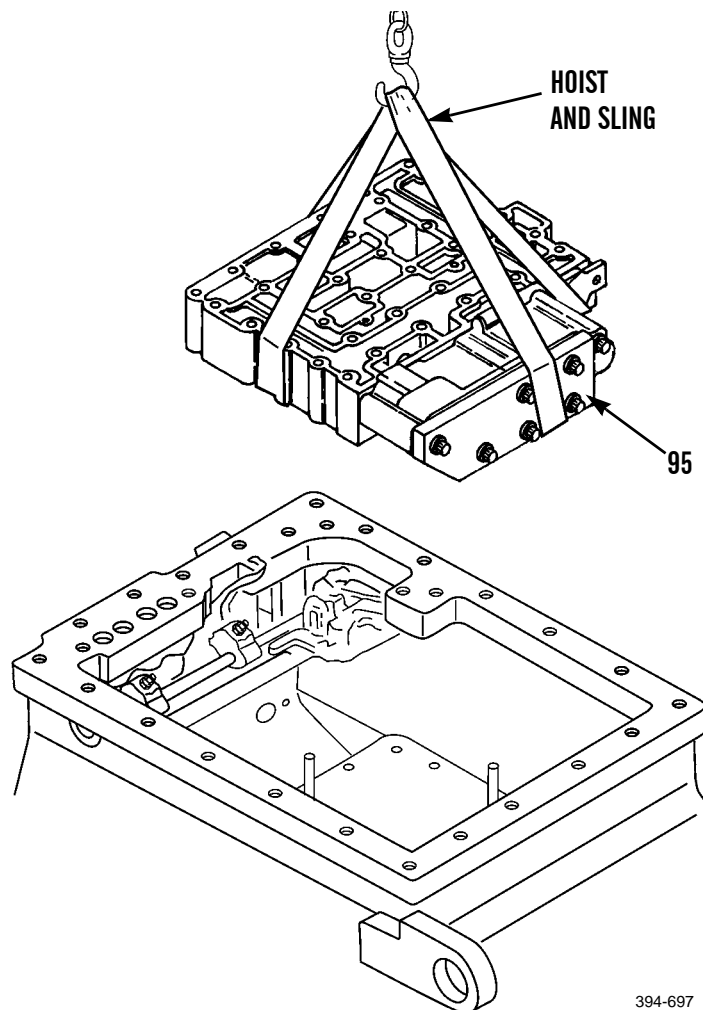
**REMOVAL - CONTINUED****WARNING**

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

**NOTE**

Weight of pressure control valve assembly is 41 lb (136 kg).

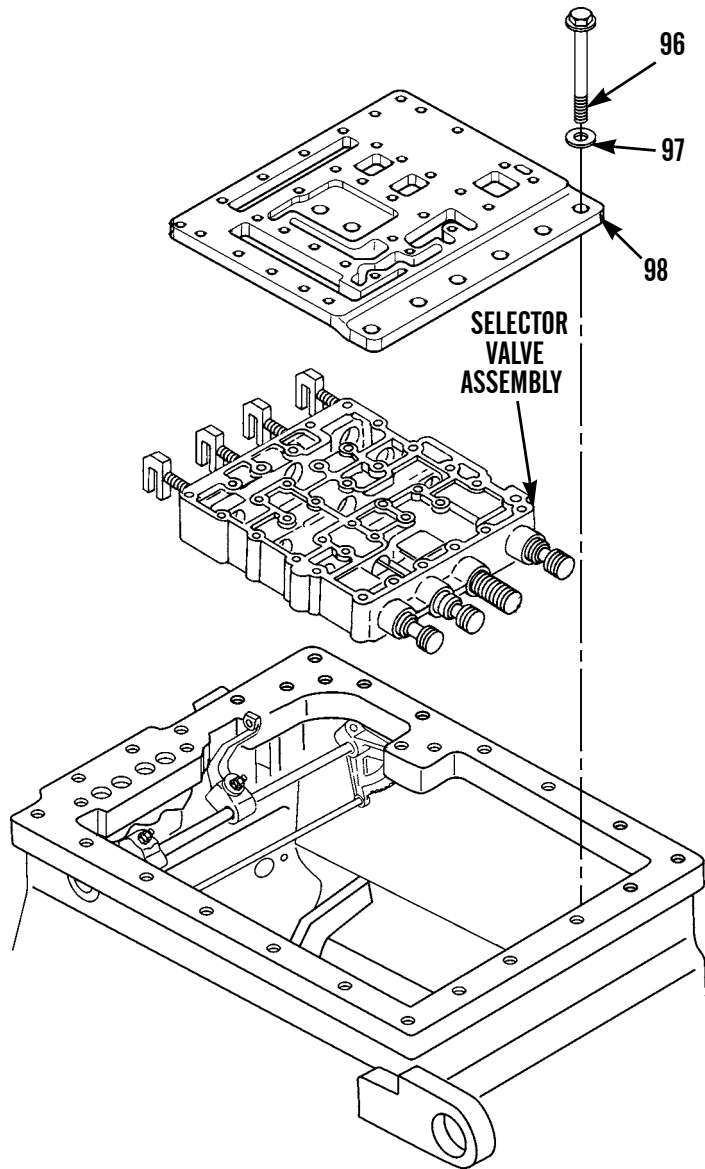
51. Attach lifting device to pressure control valve assembly (95).
52. Use lifting device to remove pressure control valve assembly (95) from transmission case.
53. Remove lifting device.



394-697

**REMOVAL - CONTINUED**

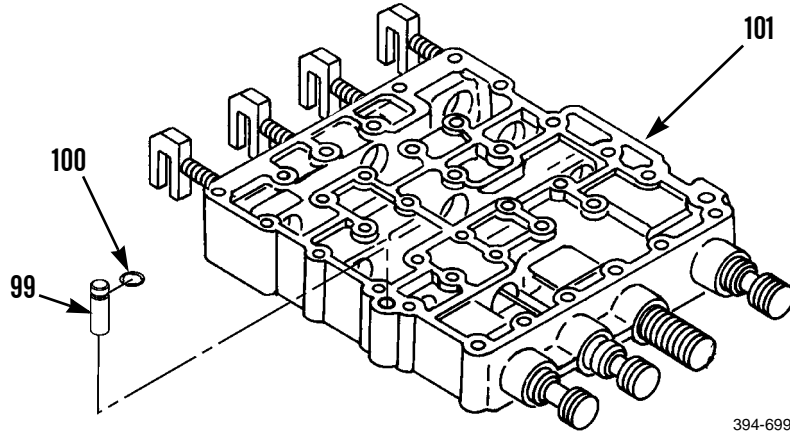
54. Remove six bolts (96), washers (97) and manifold (98).
55. Remove selector valve assembly.



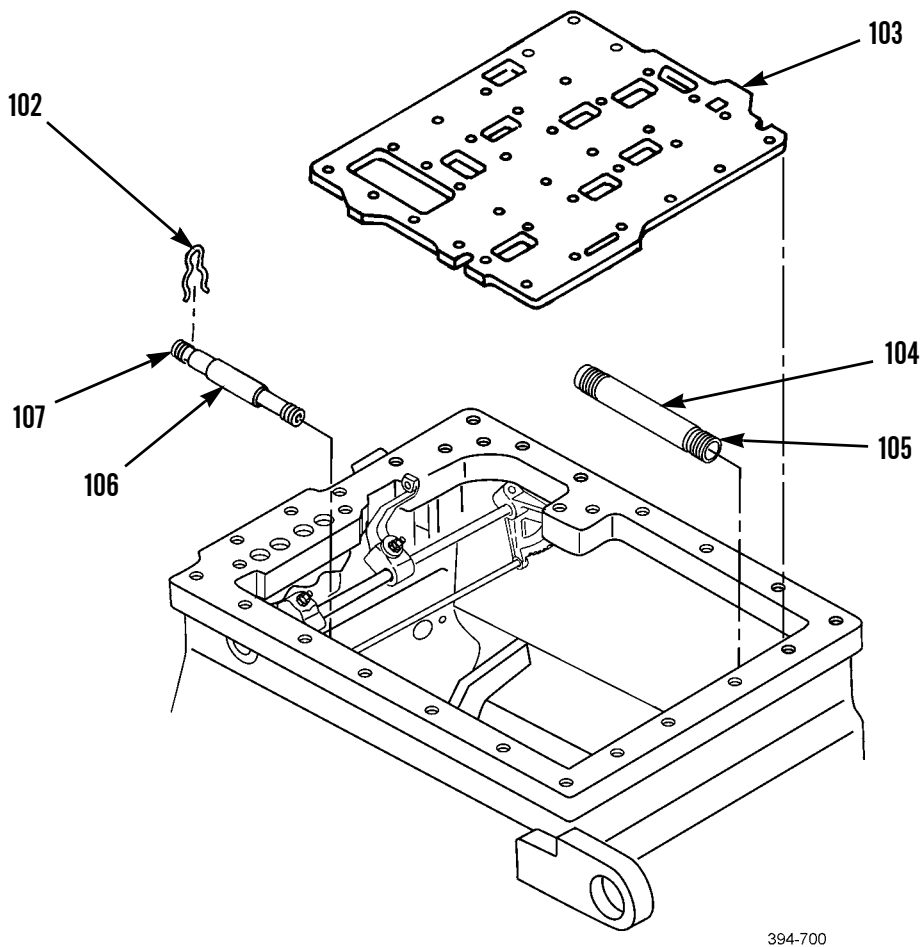
394-698

**REMOVAL - CONTINUED**

56. Remove two retaining rings (100) and dowels (99) from selector valve assembly (101).

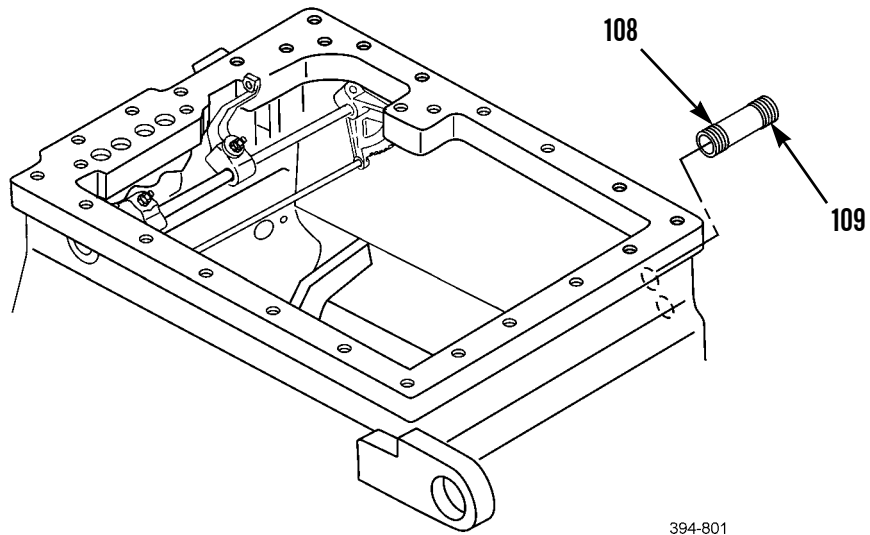


57. Remove plate (103), retaining clip (102) and sleeves (104 and 106).  
 58. Remove and discard two preformed packings (105 and 107).



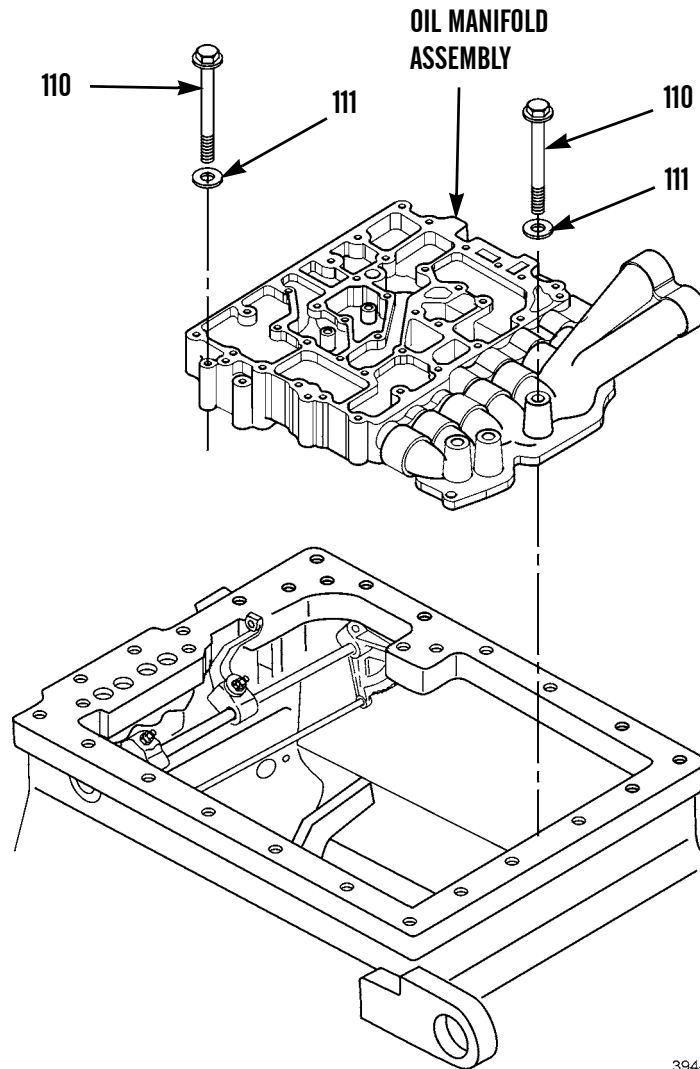
**REMOVAL - CONTINUED**

59. Remove two sleeves (109) and four preformed packings (108). Discard preformed packings.



**REMOVAL - CONTINUED**

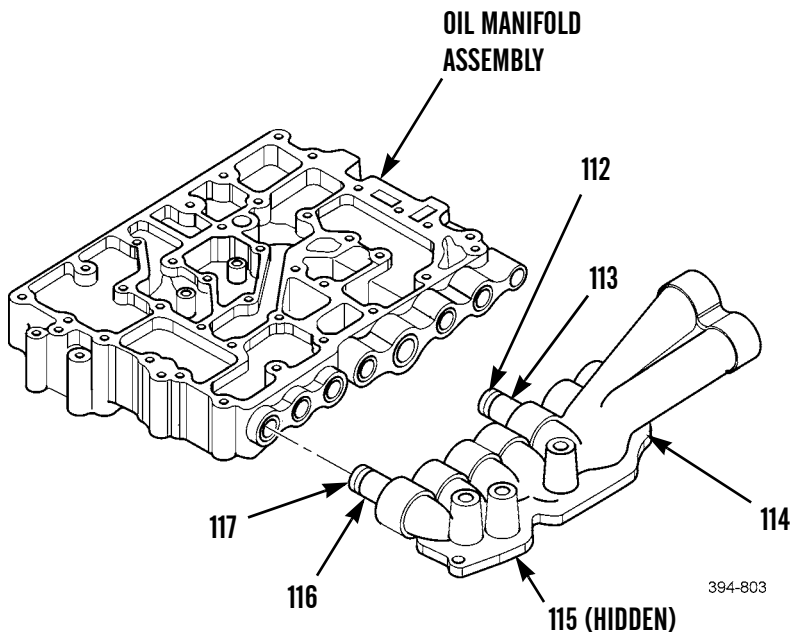
- 60. Remove 10 bolts (110) and washers (111).
- 61. Remove oil manifold assembly.



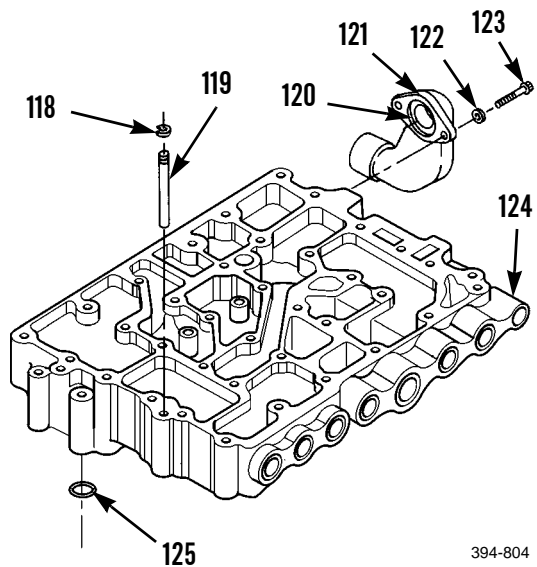
394-802

**REMOVAL - CONTINUED**

- 62. Remove manifold assembly (114) from oil manifold assembly.
- 63. Remove and discard preformed packing (115).
- 64. Remove six sleeves (116) and sleeve (113) from manifold (114).
- 65. Remove and discard 12 preformed packings (117) from six sleeves (116) and two preformed packings (112) from sleeve (113).



- 66. Remove two retaining rings (118) and dowels (119).
- 67. Remove two bolts (122) and washers (123) from oil manifold (124).
- 68. Remove and discard preformed packing (120) from elbow (121).
- 69. Remove and discard preformed packing (125) from oil manifold (124).

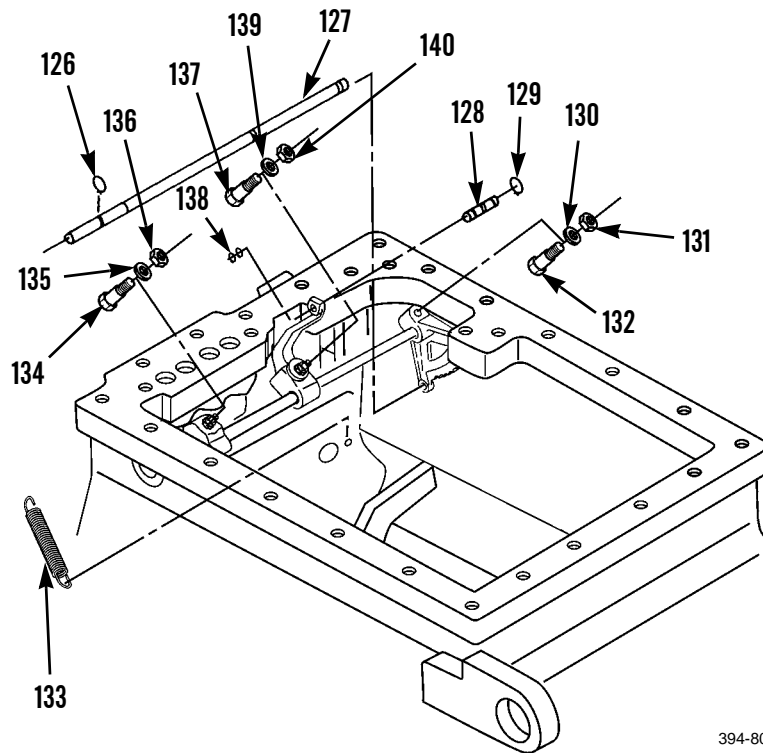




**REMOVAL - CONTINUED****NOTE**

Do not perform steps 71 through 81 unless visual inspection indicates items are damaged.

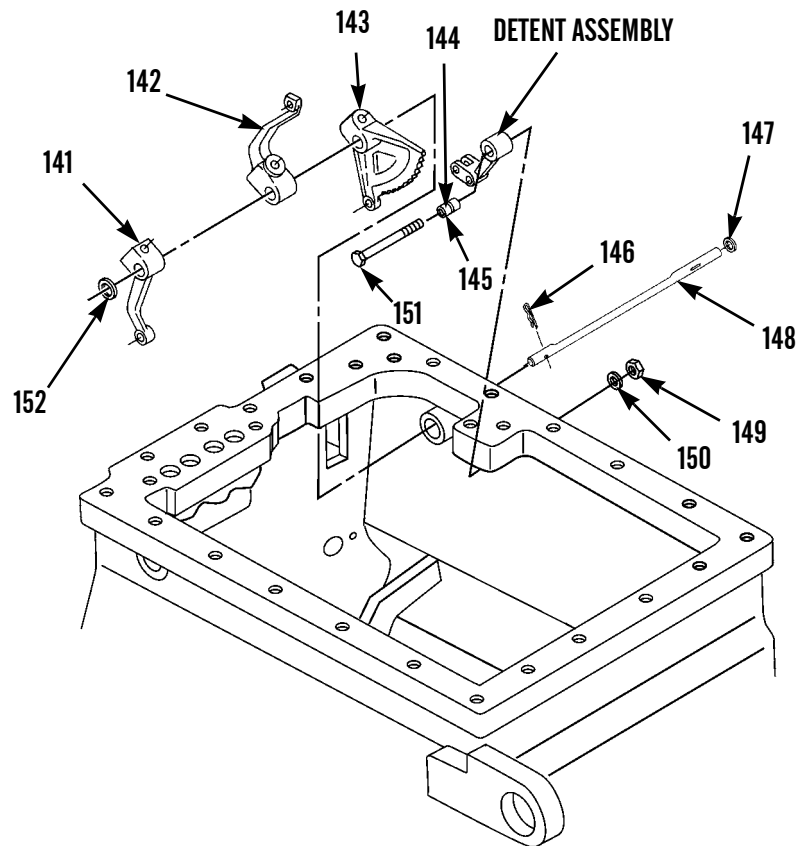
70. Remove spring (133), two retaining rings (138) and pin (128).
71. Remove retaining ring (129) from pin (128).
72. Remove three retaining rings (126) from pin (127).
73. Remove pin (127).
74. Remove nut (136), washer (135) and bolt (134).
75. Remove nut (140), washer (139) and bolt (137).
76. Remove nut (131), washer (130) and bolt (132).



394-805

**REMOVAL - CONTINUED**

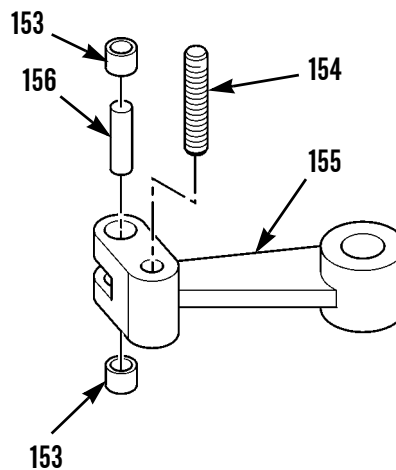
77. Remove seal (147) and pin (146). Discard seal.
78. Pull shaft (148) through transmission case and remove washer (152), levers (141 and 142) and cam (143).
79. Remove nut (149), washer (150), bolt (151), washer (144), spacer (145) and detent assembly.



394-806

**REMOVAL - CONTINUED**

80. Remove dowel (154) and pin (156).
81. Use a hammer and brass driver to remove two bearings (153) from detent (155).



394-689

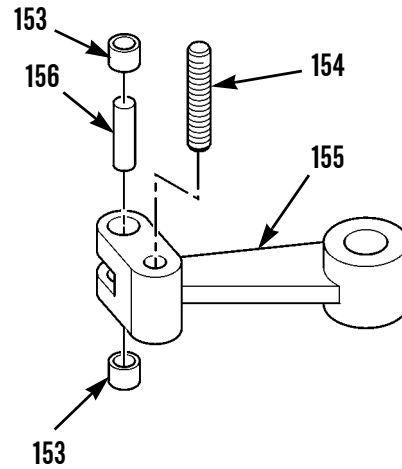
**WARNING**

- 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.
  - 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. Remove all seal and preformed packing material from mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry parts with compressed air.
  4. Visually inspect parts for damage. Replace damaged parts as necessary.

**INSTALLATION****CAUTION**

All parts in the transmission control valve assembly must be clean, dry and free of dust, dirt or other contaminants. Make sure hands, clothing and tools are clean. Do not perform this task where wind may carry airborne particles. Keep parts and case covered with a clean sheet of plastic when left unattended. Failure to follow this procedure could result in damage to equipment.

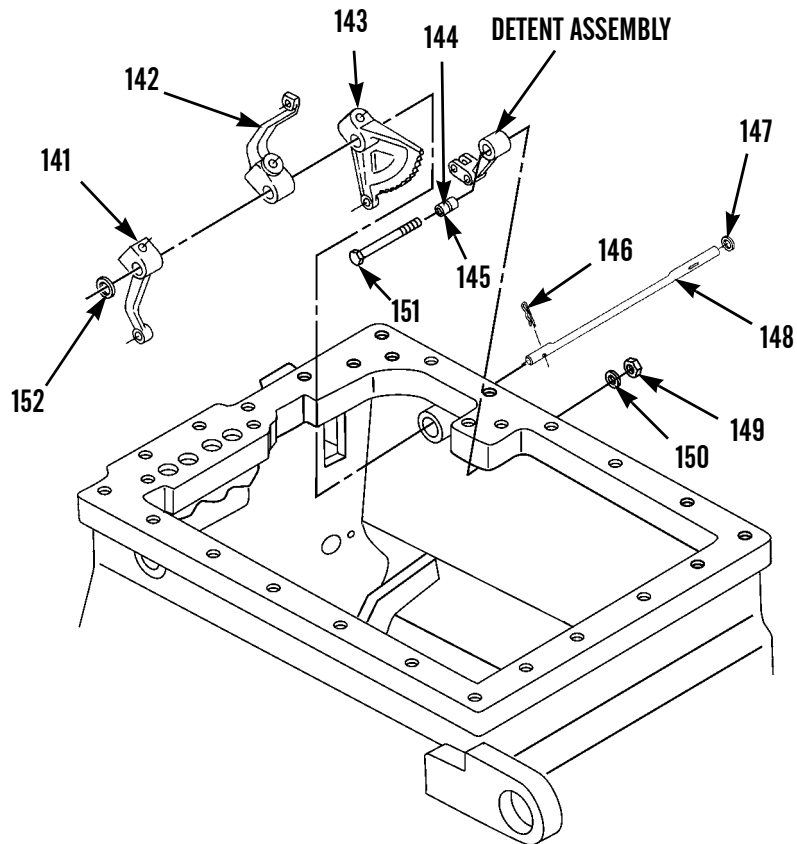
1. Use arbor press to install two bearings (153) in detent (155).
2. Use arbor press to install pin (156) in two bearings (153).
3. Install dowel (154).



394-689

**INSTALLATION - CONTINUED**

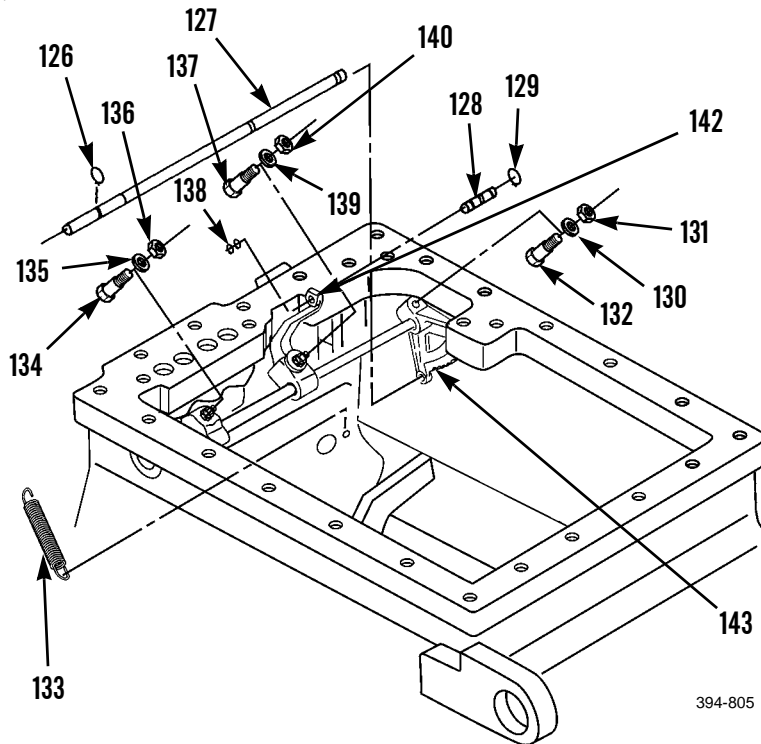
4. Position detent assembly and install spacer (145), washer (144), bolt (151), washer (150) and nut (149).
5. Push shaft (148) through transmission case and install cam (143), levers (141 and 142), washer (152), pin (146) and new seal (147).
6. Align cam (143) teeth on pin (156).



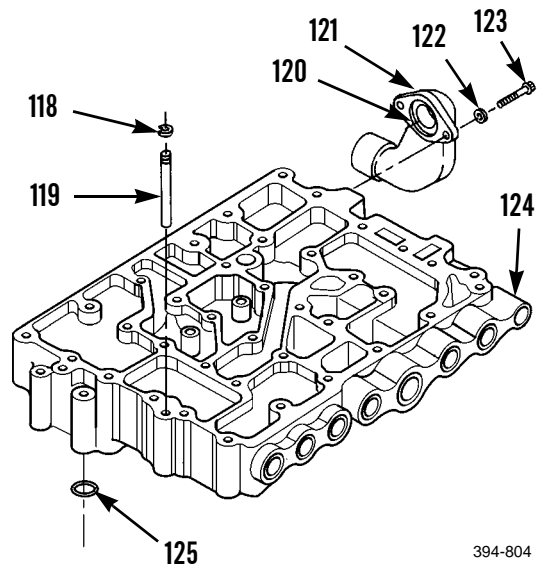
394-806

**INSTALLATION - CONTINUED**

7. Install bolt (132), washer (130) and nut (131). Hand tighten on cam (143).
8. Install bolt (137), washer (139) and nut (140). Hand tighten on lever (142).
9. Install bolt (134), washer (135) and nut (136). Hand tighten on lever (141).
10. Install pin (127) and three retaining rings (126).
11. Install pin (128), two retaining rings (138) and retaining ring (129).
12. Install spring (133).

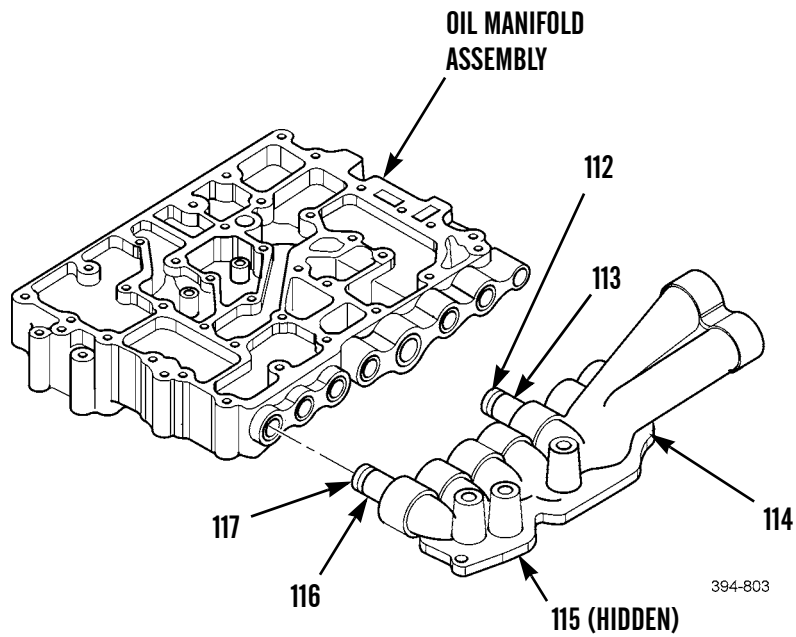


13. Install new preformed packing (120) in elbow (121).
14. Install elbow (121), two washers (123) and bolts (122) in oil manifold (124).
15. Install two dowels (119) and retaining rings (118).
16. Install new preformed packing (125).



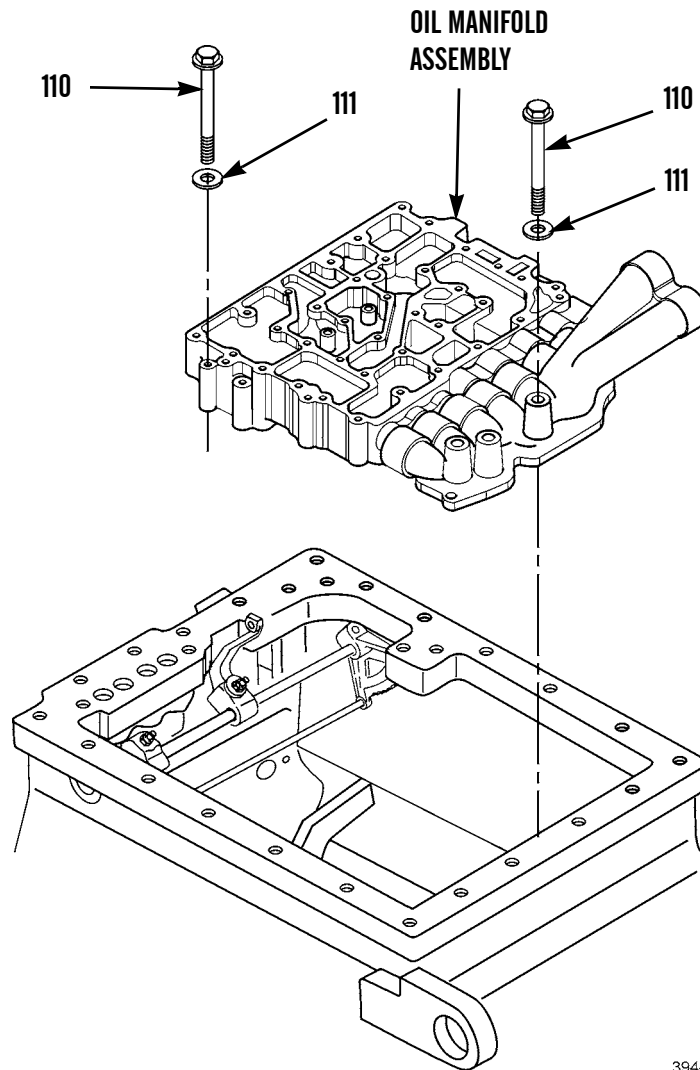
**INSTALLATION - CONTINUED**

17. Install two new preformed packings (112) on sleeve (113) and 12 new preformed packings (117) on six sleeves (116).
18. Install six sleeves (116) and sleeve (113) in manifold (114).
19. Install new preformed packing (115).
20. Install items manifold (114) on oil manifold assembly.



**INSTALLATION - CONTINUED**

21. Install oil manifold assembly in transmission case.
22. Install ten washers (111) and bolts (110). Torque three bolts (110) to 35 lb-ft (47 Nm).

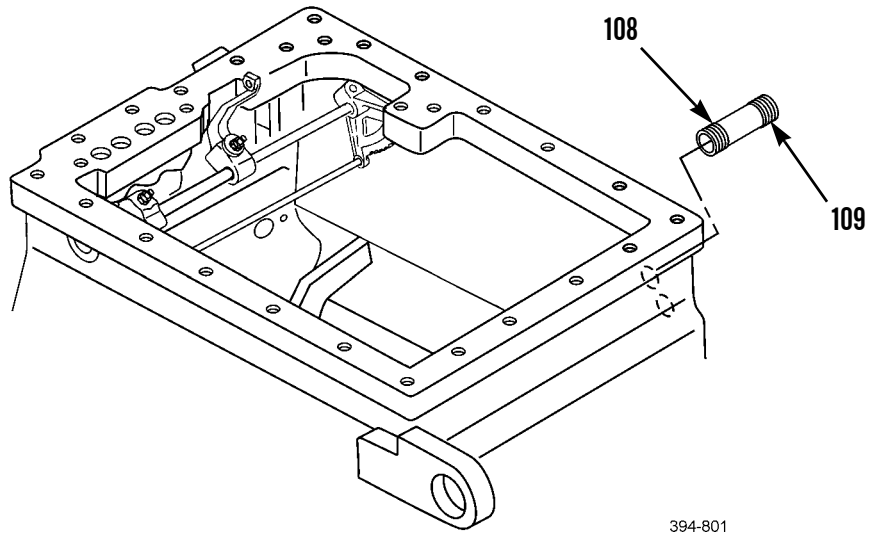


394-802



**INSTALLATION - CONTINUED**

23. Install four new preformed packings (109) on two sleeves (108).
24. Install two sleeves (108) in manifold.



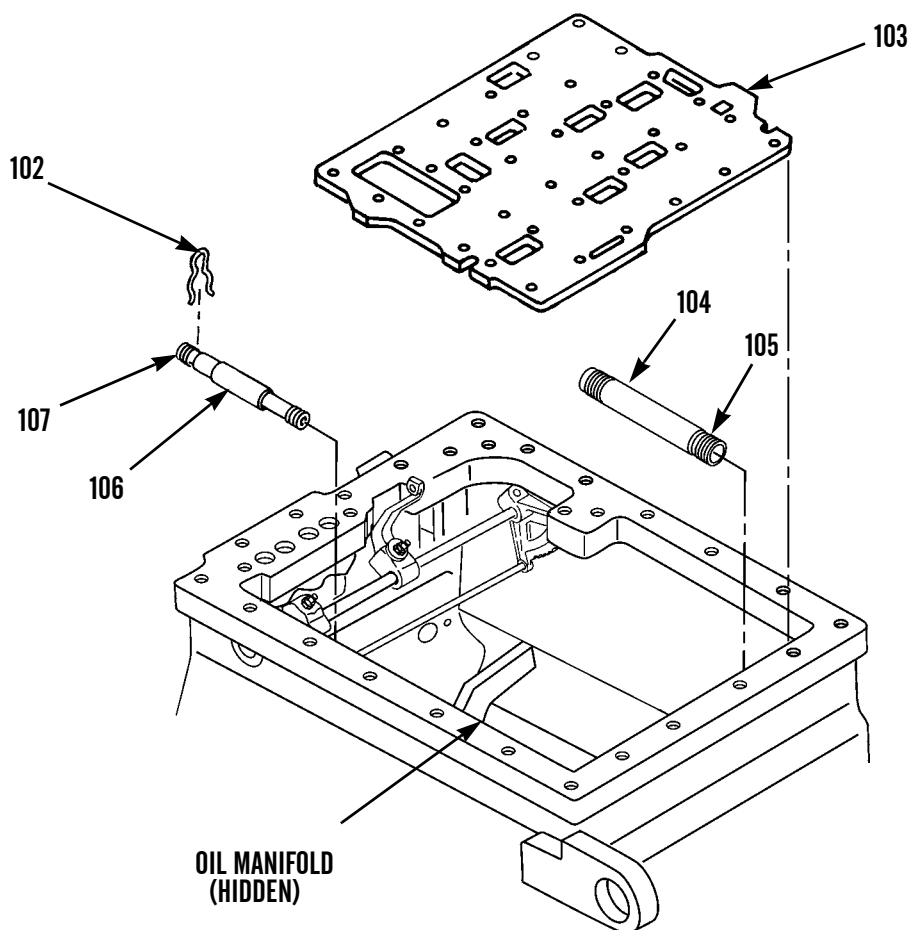
**INSTALLATION - CONTINUED**

25. Install two new preformed packings (105) on sleeve (104) and two new preformed packings (107) on sleeve (106).
26. Install sleeves (104 and 106) and retaining clip (102).
27. Install three 5/16-18NC x 6-1/2 in. long guide pins in oil manifold.

**CAUTION**

Exercise care when installing transmission control valve assemblies. Do not nick, scratch or scrape valve assembly surfaces. Gently place assemblies in position; do not drop. Failure to follow this procedure could result in damage to equipment.

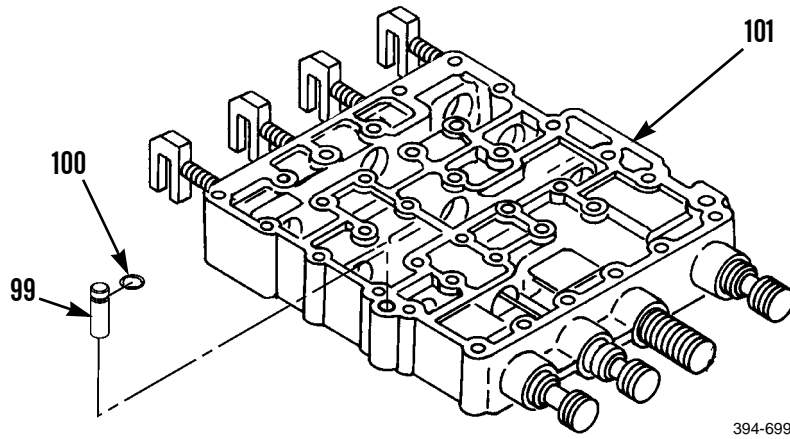
28. Position plate (103) on three 5/16-18NC x 6-1/2 in. long guide pins and install.



394-700

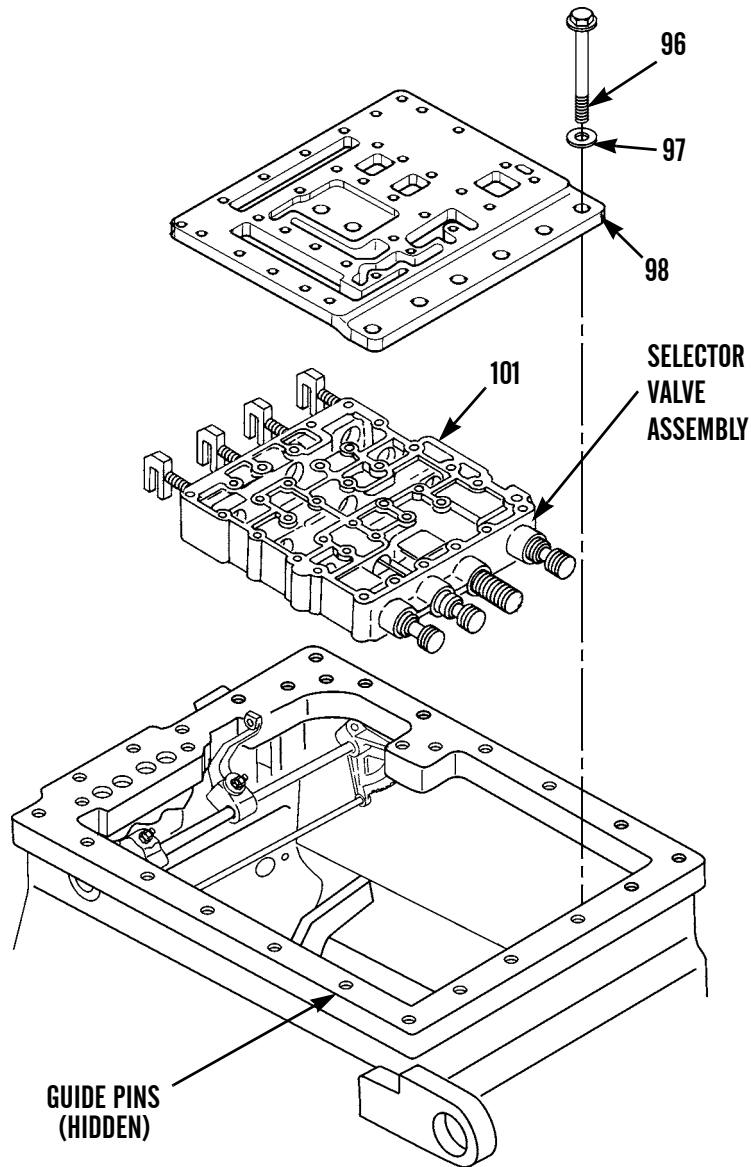
**INSTALLATION - CONTINUED**

29. Position selector valve assembly (101) on three guide pins and install.
30. Install two dowels (99) and retaining rings (100).



**INSTALLATION - CONTINUED**

31. Position manifold (98) on three guide pins and install.
32. Install six washers (97) and bolts (96). Torque bolts to 22 lb-ft (30 Nm).



394-698

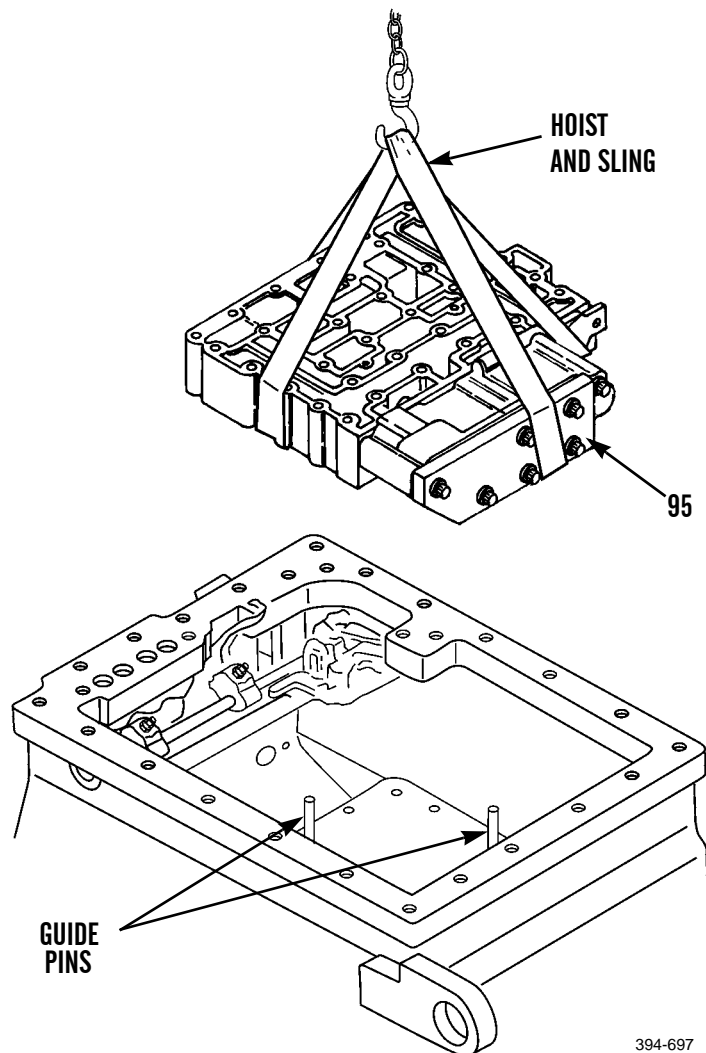
**INSTALLATION - CONTINUED****WARNING**

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

**NOTE**

Weight of pressure control valve assembly is 41 lb (136 kg).

33. Attach lifting device to pressure control valve assembly (95).
34. Position pressure control valve assembly (95) on three guide pins and install.
35. Remove lifting device.



394-697

**INSTALLATION - CONTINUED****NOTE**

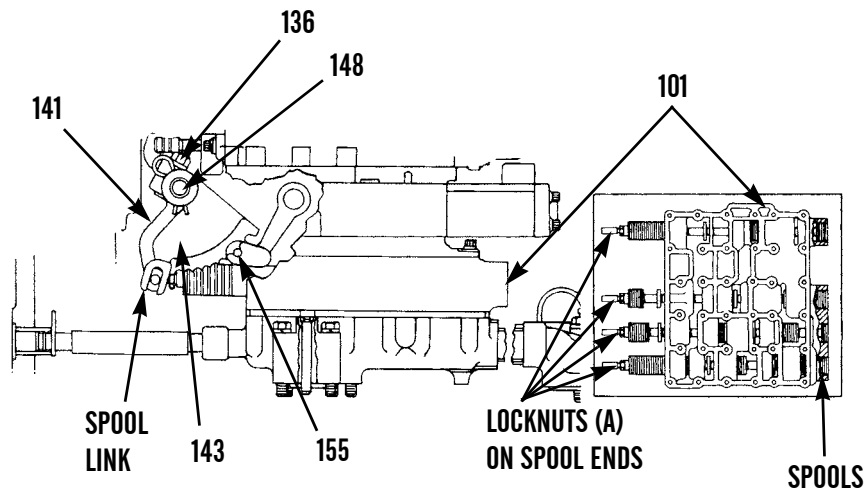
Shaft is in **FIRST** speed position when detent is in the third notch of cam.

36. Turn shaft (148) until detent (155) is in **FIRST** speed position on cam (143).
37. Inspect selector valve assembly (101) spool ends to ensure spool ends are flush with face of valve body. If position is not correct, complete steps 39 through 44.

**NOTE**

Steps 39 through 44 are performed only if inspection indicated selector valve assembly spool ends are not in proper position.

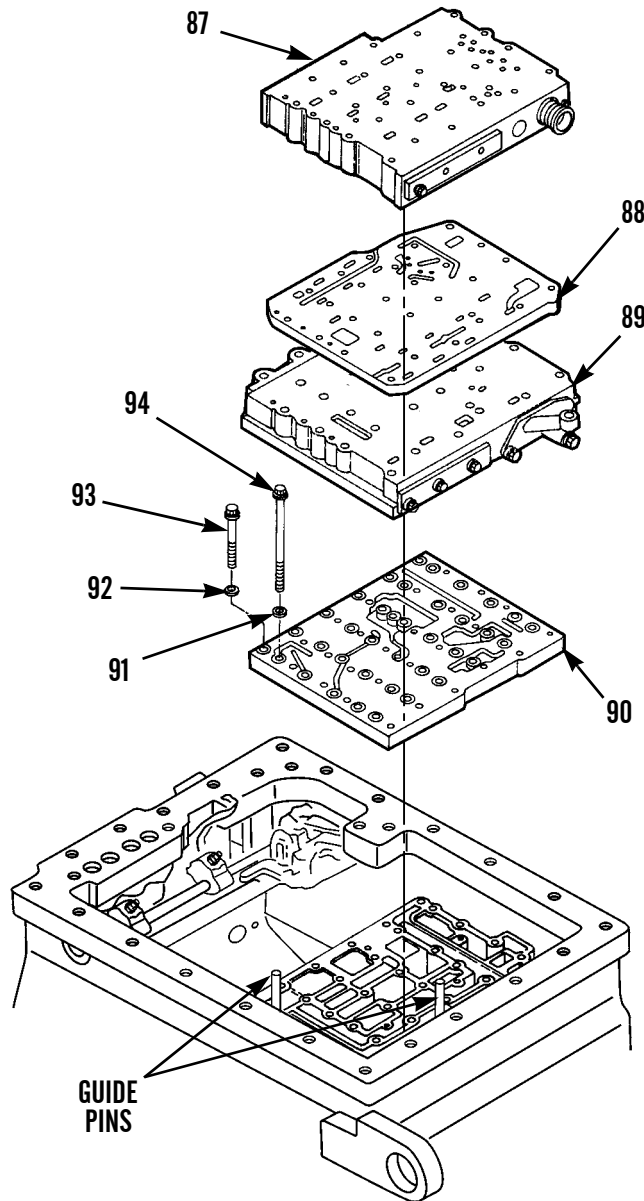
38. Loosen locknuts (A) on spool ends.
39. Rotate spools until ends are flush with face of valve body.
40. Holding spools to prevent them from turning, torque locknuts (A) to 25 lb-ft (34 Nm).
41. Use 0.060 in. feeler gage to position lever (141) on shaft (148) so it is 0.060 in. from spool link.
42. Torque nut (136) to 25 lb-ft (34 Nm).
43. Remove 0.060 in. feeler gage.



394-808

**INSTALLATION - CONTINUED**

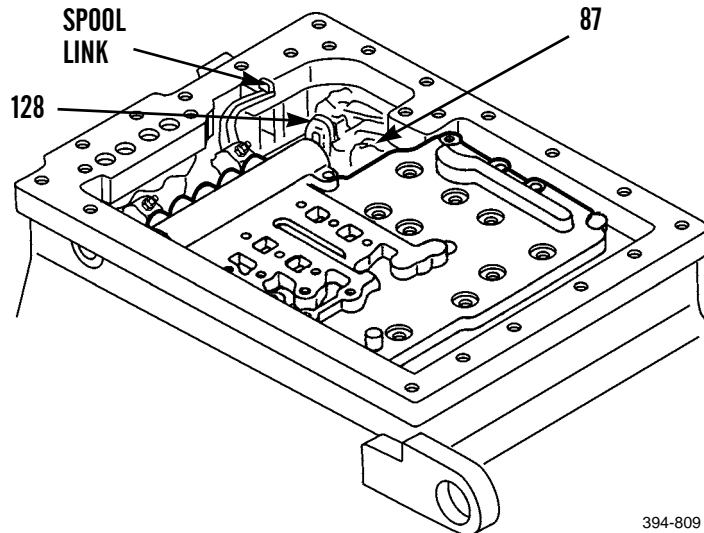
44. Position plate (90) on three guide pins and install.
45. Install 29 washers (91) and bolts (94). Torque 29 bolts (88) to 22 lb-ft (30 Nm).
46. Install six washers (92) and bolts (93). Torque six bolts to 22 lb-ft (30 Nm).
47. Install shift pressure valve (89), plate (88) and selector valve assembly (87).



394-696

**INSTALLATION - CONTINUED**

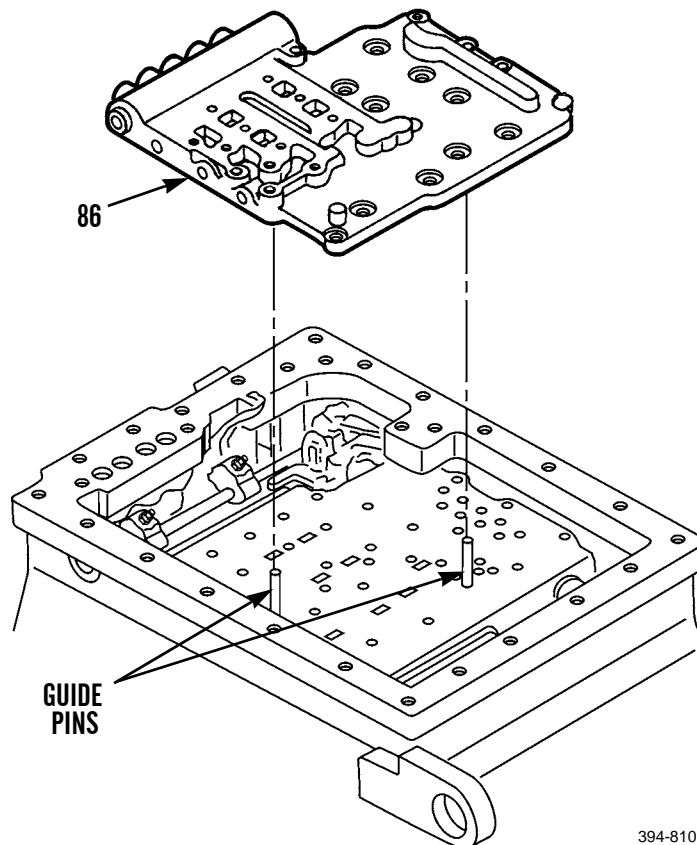
48. Position spool link on selector valve assembly (87) and pin (128).



394-809

49. Position governor cutoff valve assembly (86) on three guide pins and install.

50. Remove three guide pins.

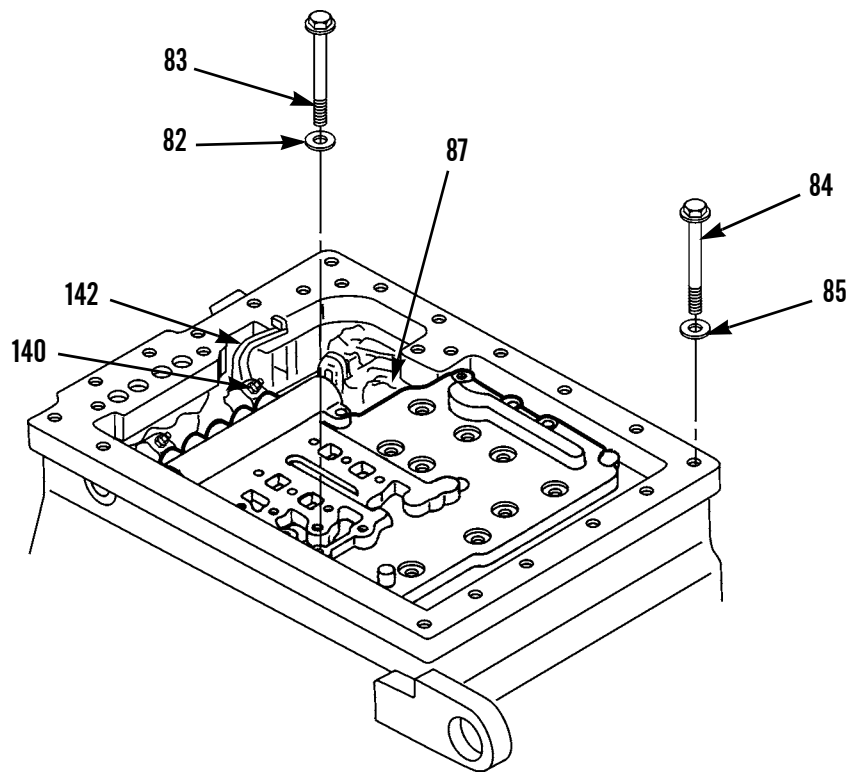


394-810



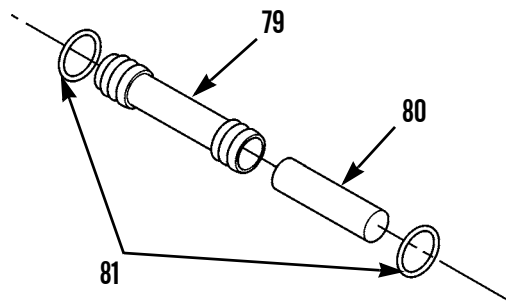
**INSTALLATION - CONTINUED**

51. Use 0.090 in. feeler gage to position lever (142) so it is 0.090 in. from spool link on selector valve assembly (87).
52. Tighten nut (140) to 25 lb-ft (34 Nm).
53. Remove 0.090 in. feeler gage.
54. Install 12 washers (82) and bolts (83). Tighten bolts to 22 lb-ft (30 Nm).
55. Install 15 washers (85) and bolts (84). Tighten bolts to 22 lb-ft (30 Nm).



394-811

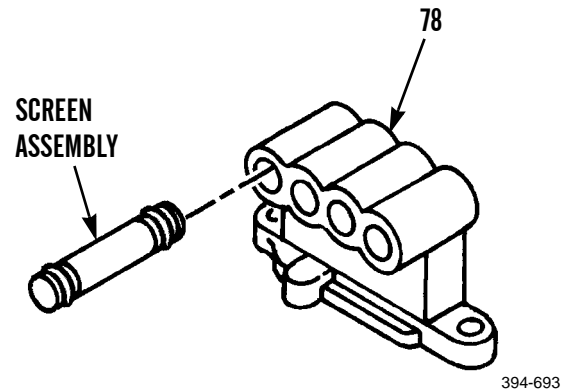
56. Install four new screens (80) and eight new preformed packings (81) on four sleeves (79).



394-694

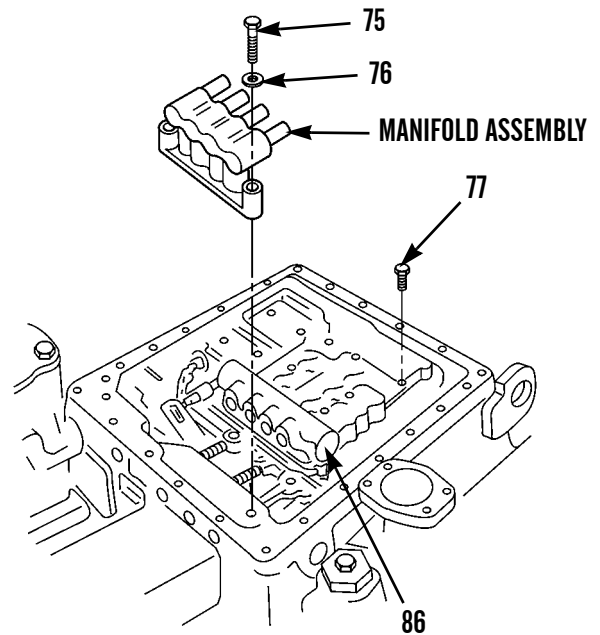
**INSTALLATION - CONTINUED**

57. Install four screen assemblies in manifold (78).



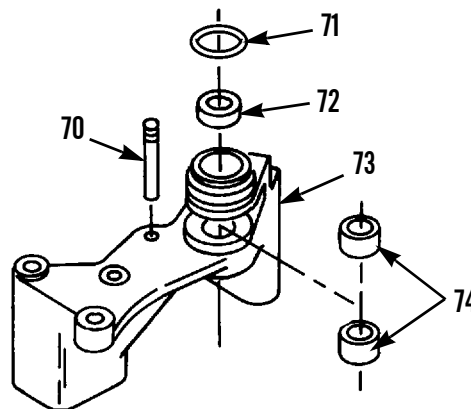
58. Install manifold assembly. Four screen assemblies engage governor cutoff valve assembly. (86).

59. Install plug (77), two lockwashers (76) and bolts (75). Torque two bolts to 35 lb-ft (47 Nm).



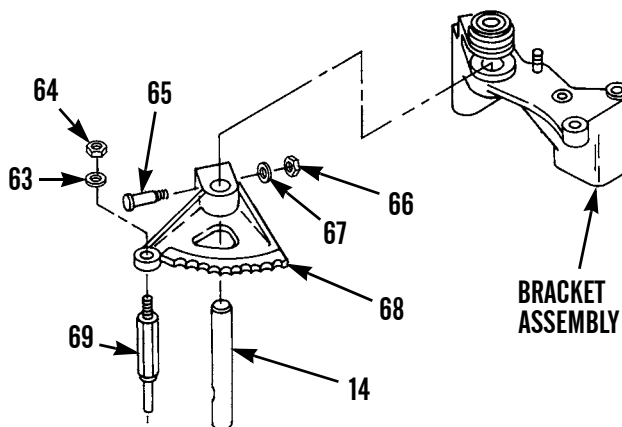
**INSTALLATION - CONTINUED**

- 60. Use arbor press to install two bearings (74) in bracket (73). Allow full clearance between two bearings (74).
- 61. Install pin (70).
- 62. Use clean hydraulic fluid to lubricate new seal (72) and install.
- 63. Install new preformed packing (71).



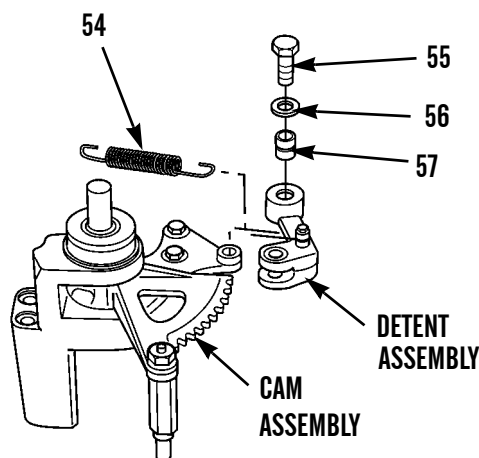
394-691

- 64. Position cam (68) in bracket assembly.
- 65. Install shaft (14).
- 66. Install pin (65), washer (67) and nut (66). Torque nut to 25 lb-ft (34 Nm).
- 67. Install spacer (69), washer (63) and nut (64) and hand tighten.



394-690

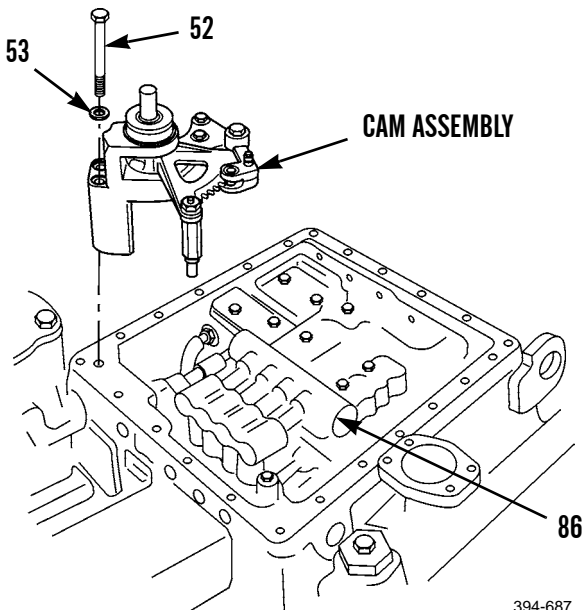
- 68. Position detent assembly on cam assembly. Position detent in FIRST position on cam.
- 69. Install spacer (57), washer (56) and bolt (55).
- 70. Install spring (54).



394-688

**INSTALLATION - CONTINUED**

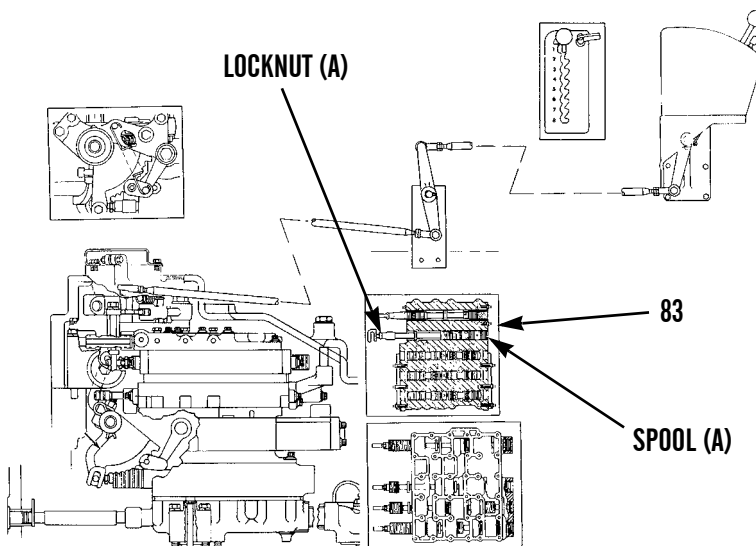
- 71. Position cam assembly in transmission case over governor cutoff valve assembly (86). Spacer (69) engages spool link on selector valve assembly (87).
- 72. Install four washers (53) and bolts (52). Torque four bolts to 35 lb-ft (47 Nm).
- 73. Inspect selector valve assembly (87) spool (A). Make sure spool end is flush with face of valve body. If position is not correct, complete steps 76 through 78.



**NOTE**

Steps 76 through 78 are performed only if inspection indicates selector valve assembly spool is not in proper position.

- 74. Loosen locknut (A) on spool (A).
- 75. Rotate spool (A) until end is flush with face of valve body.
- 76. Holding spool (A) to prevent it from turning, torque locknut (A) to 15 lb-ft (20 Nm).

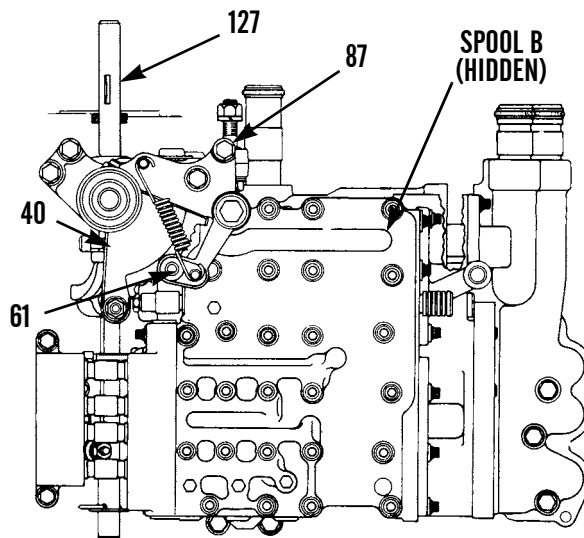


**INSTALLATION - CONTINUED**

**NOTE**

Shaft is in FOURTH speed position when detent is in the sixth notch of cam.

- 77. Use locking pliers to rotate shaft (127) until detent (61) is in FOURTH position (sixth notch) on cam (40).



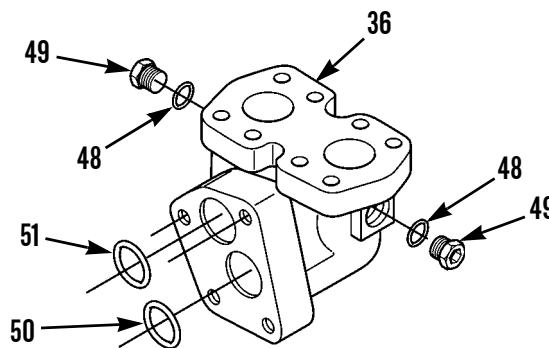
394-813

- 78. Inspect selector valve assembly (87) spool (B). Make sure spool (B) end is flush with face of valve body. If position is not correct, complete steps 81 through 83.

**NOTE**

Steps 81 through 83 are performed only if inspection indicates selector valve assembly spool is not in proper position.

- 79. Loosen locknut (B) on spool (B).
- 80. Rotate spool (B) until end is flush with face of valve body.
- 81. Holding spool (B) to prevent it from turning, torque locknut (B) to 15 lb-ft (20 Nm).
- 82. Install new preformed packings (51 and 52) in manifold (36).
- 83. Install two new preformed packings (48) and plugs (49).



394-1756

**INSTALLATION - CONTINUED**

- 84. Install manifold assembly (36), lockwasher (39), bolt (40), three lockwashers (37) and nuts (38) on transmission case.
- 85. Install hose assembly (47), two flange halves (34), four washers (44) and bolts (45).
- 86. Install hose assembly (46), two flange halves (41), four washers (42) and bolts (43).
- 87. Install four plugs (35).
- 88. Install new gasket (33).



**WARNING**

Use adequate hoist and sling for lifting. Failure to follow this procedure may cause injury. If you are injured, obtain medical help immediately.

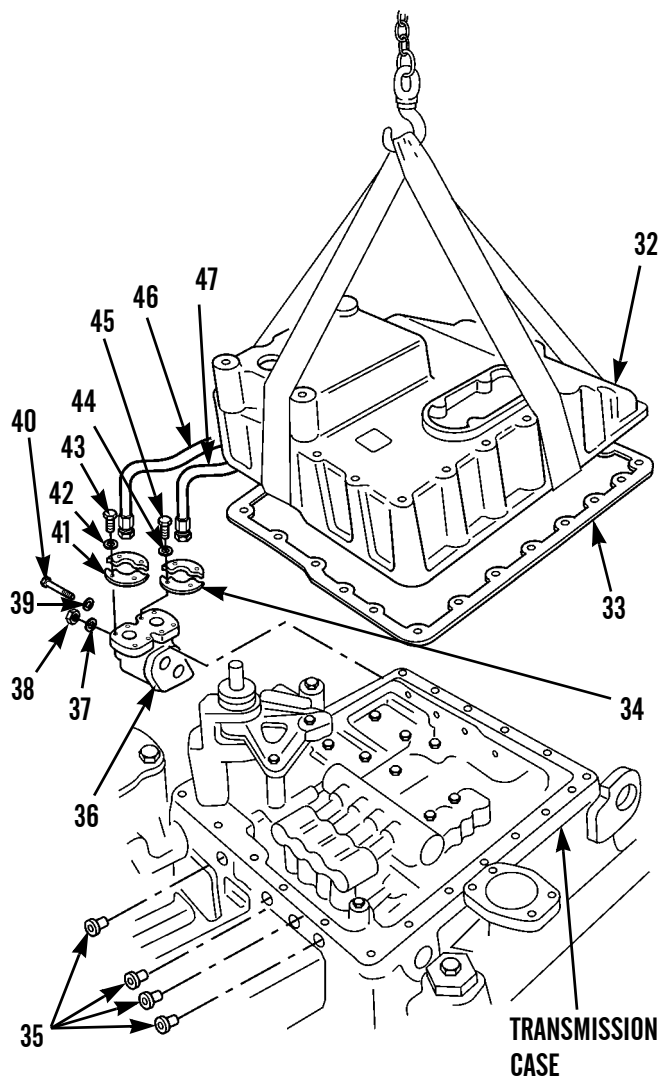
**NOTE**

Weight of cover is 70 lb (32 kg).

**CAUTION**

Exercise care not to allow gasket material or other contaminants inside transmission case. Failure to follow this procedure could result in damage to equipment.

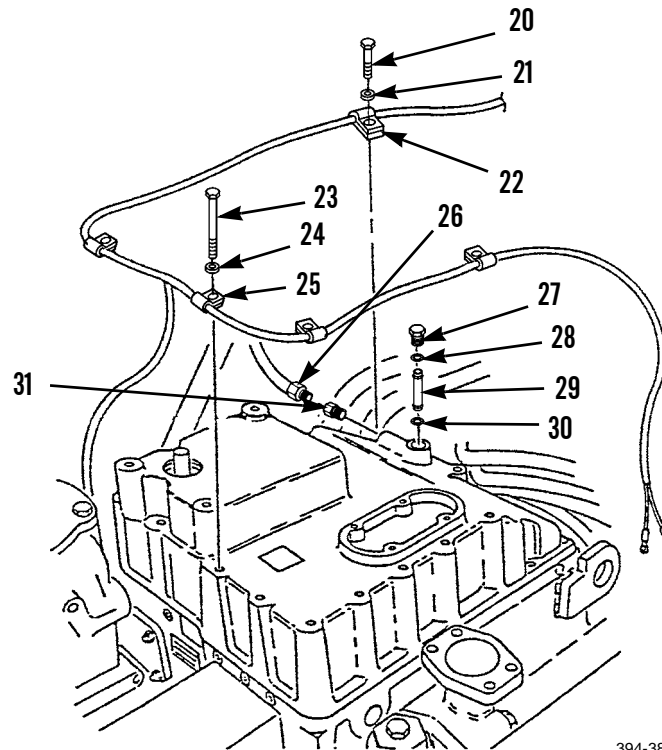
- 89. Attach lifting device to cover (32) and install.
- 90. Remove lifting device.



394-685

**INSTALLATION - CONTINUED**

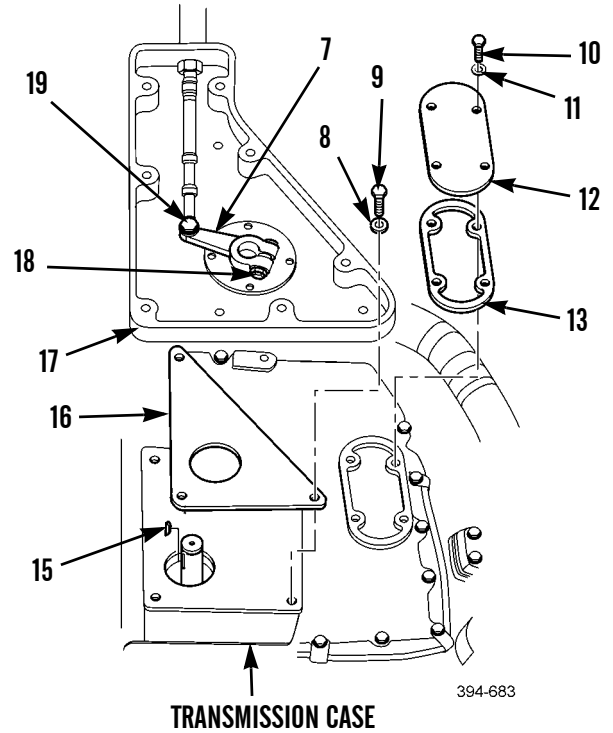
91. Install two clips (22), nine washers (21) and bolts (20).
92. Install seven clips (25), 12 lockwashers (24) and bolts (23).
93. Install union (31).
94. Connect hose assembly (26).
95. Install new preformed packing (30), sleeve (29), new preformed packing (28) and plug (27).



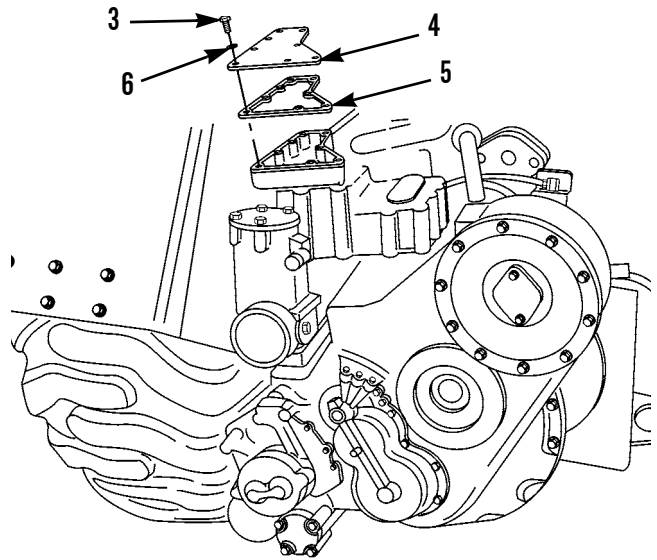
394-384

**INSTALLATION - CONTINUED**

- 96. Install new gasket (13), cover (12), four washers (11) and bolts (10).
- 97. Install key (15) and new gasket (16).
- 98. Connect housing assembly (17).
- 99. Install three washers (8) and bolts (9).
- 100. Connect lever assembly (7).
- 101. Tighten nut (18) and bolt (19).



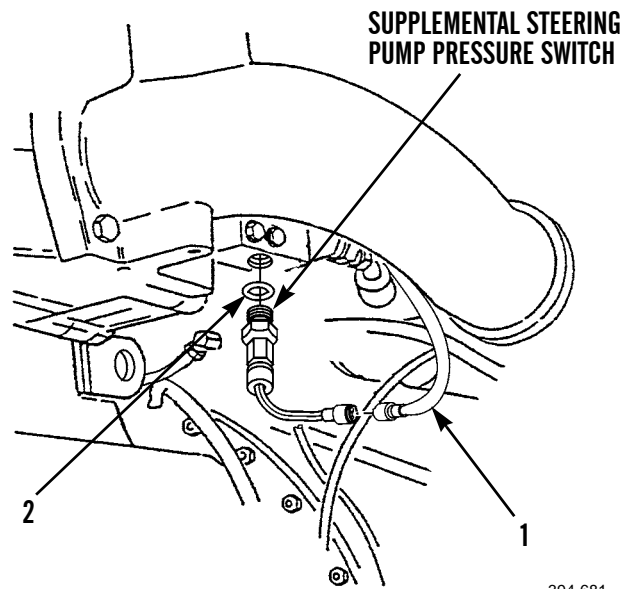
- 102. Install new gasket (5), cover (4), seven washers (6) and bolts (3).





**INSTALLATION - CONTINUED**

103. Connect wire connector (1) to supplemental steering pump pressure switch.
104. Install new preformed packing (2) and switch.



394-681

105. Fill transmission (WP 0128 00).
106. Install transmission (WP 0286 00).

**END OF WORK PACKAGE**



**GOVERNOR CUTOFF VALVE REPAIR****0365 00****THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

O-ring (2)

**References**

TM 5-3805-248-10

**Equipment Condition**

Governor cutoff valve removed (WP 0364 00)

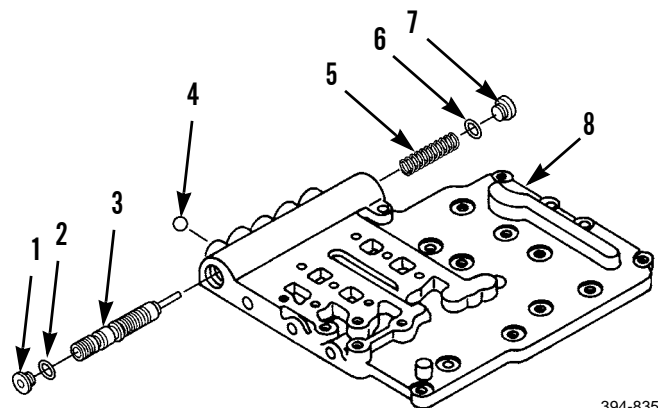
**CAUTION**

Use care when handling transmission control valve assemblies and parts. Do not nick, scratch or scrape valve bodies or spools. Failure to follow this caution may result in damage to equipment.

**DISASSEMBLY****WARNING**

Always wear eye protection when removing parts under spring tension. Remove restraining parts slowly to relieve spring pressure. Failure to follow this warning may result in injury.

1. Remove plug (1), O-ring (2) and spool (3) from governor cutoff valve body (8). Discard O-ring.
2. Remove plug (7), O-ring (6) and spring (5) from governor cutoff valve body (8). Discard O-ring.
3. Remove four balls (4) from governor cutoff valve body (8).



394-835

**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 cause 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 parts with solvent cleaning compound. Ensure all O-ring material is removed from mounting surfaces.
  2. Dry parts with compressed air.

**CAUTION**

All parts are critical to proper operation of the transmission control valve assembly and must be inspected closely. If defective parts are assembled, the transmission will not operate properly, resulting in damage to equipment.

3. Inspect all parts for damage and replace as necessary.
4. Use spring tester to apply test force of 26.6 lb (12 kg) to spring (5) and measure length of spring. Measurement should be 2.05 in. (5.20 cm). Replace spring if measurement is not as specified.
5. Release test force from spring (5) and measure length of spring. Measurement should be 2.89 in. (7.34 cm). Replace spring if measurement is not as specified.
6. Measure outer diameter of spring (5). Measurement should be 0.596 in. (15.128 mm). Replace spring if measurement is not as specified.

**ASSEMBLY****CAUTION**

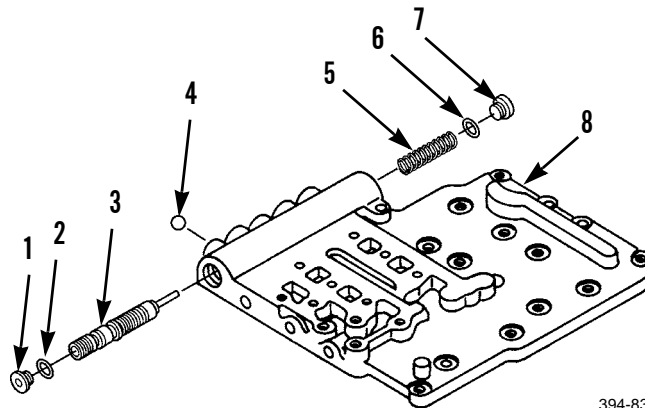
Use care to keep dust, dirt and other contaminants out of governor cutoff valve. Ensure hands, clothing and tools are clean. Do not assemble governor cutoff shaft valve where wind may carry airborne particles. Failure to follow this caution may result in damage to equipment.

1. Install four balls (4) in governor cutoff valve body (8).
2. Install spring (5), new O-ring (6) and plug (7) in governor cutoff valve body (8). Torque plug to 35 lb-ft (47 Nm). Match color code of spring (5).
3. Apply a coat of clean lubricating oil to spool (3) and install in governor cutoff valve body (8).

**WARNING**

Always wear eye protection when removing parts under spring tension. Remove restraining parts slowly to relieve spring pressure. Failure to follow this warning may result in injury.

4. Install new O-ring (2) and plug (1) in governor cutoff valve body (8). Torque plug to 35 lb-ft (47 Nm).



394-835

5. Install governor cutoff valve in transmission (WP 0364 00).
6. Operate machine to verify correct transmission operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**AUTOMATIC SELECTOR VALVE REPAIR**

---

**0366 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

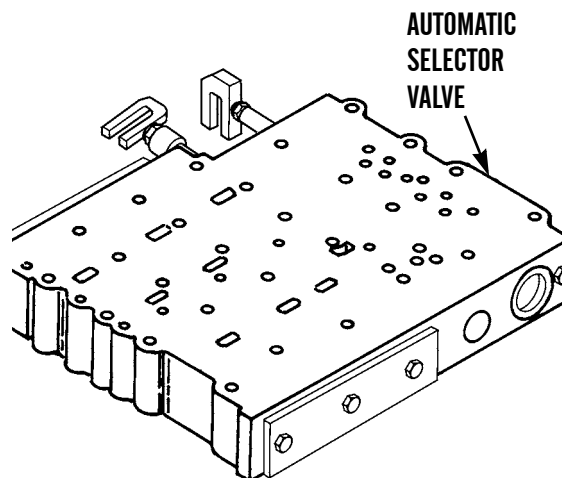
Tag, marker (Item 42, WP 0339 00)

**Equipment Condition**Automatic selector valve from transmission removed (WP 0364 00)

---

**CAUTION**

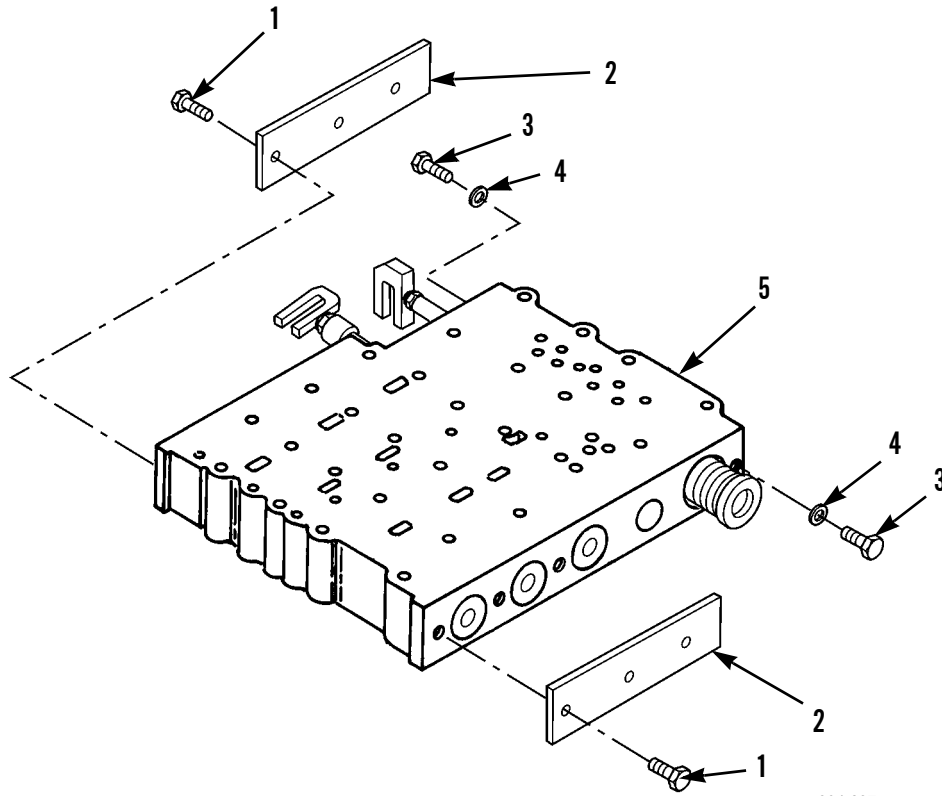
Exercise care when handling transmission control valve assemblies and parts. Do not nick, scratch or scrape valve bodies or spools. Failure to follow this procedure could result in damage to equipment.

**DISASSEMBLY**

394-836

**DISASSEMBLY - CONTINUED**

1. Remove two bolts (3) and washers (4) from valve body (5).
2. Remove six bolts (1) and two strips (2).



394-837

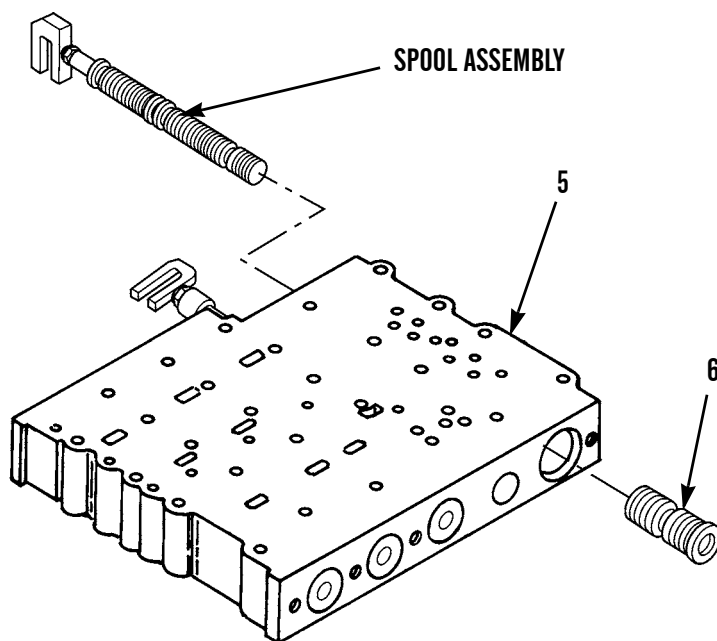


**DISASSEMBLY - CONTINUED**

**CAUTION**

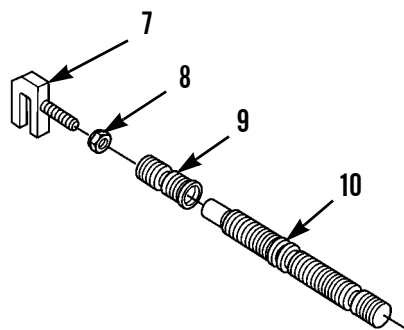
The letters "R", "S" and "T" appear on each spool and on the valve body near the corresponding bore, to aid in correct assembly. Spools, slugs and retainers from each bore must be kept separate and tagged after disassembly. They must be assembled in the same bore from which they were removed. Failure to follow this procedure could result in damage to equipment.

3. Remove retainer (6).
4. Remove spool assembly from valve body (5).



394-838

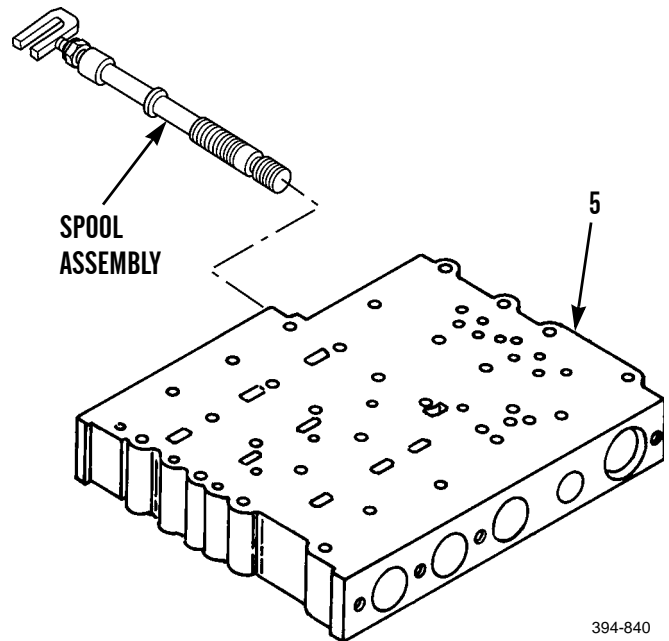
5. Loosen nut (8).
6. Remove link (7).
7. Remove nut (8).
8. Remove retainer (9) from spool (10).



394-839

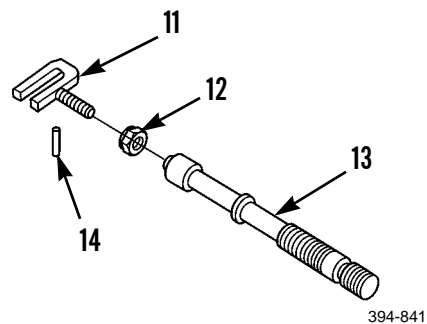
**DISASSEMBLY - CONTINUED**

9. Remove spool assembly from valve body (5).



394-840

10. Loosen nut (12).  
 11. Remove link (11).  
 12. Remove pin (14) from link (11).  
 13. Remove nut (12) from spool (13).



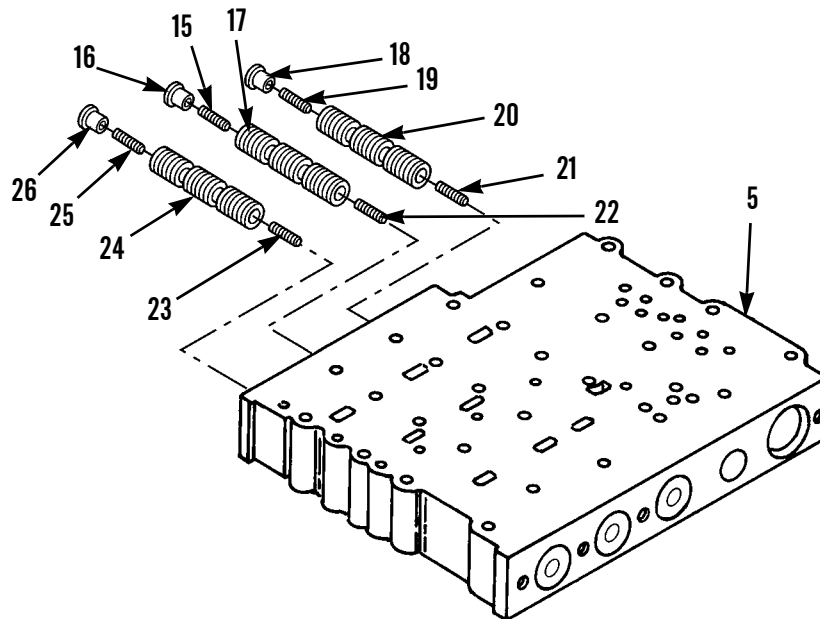
394-841

**NOTE**

Keep all parts from each bore separate and labeled.

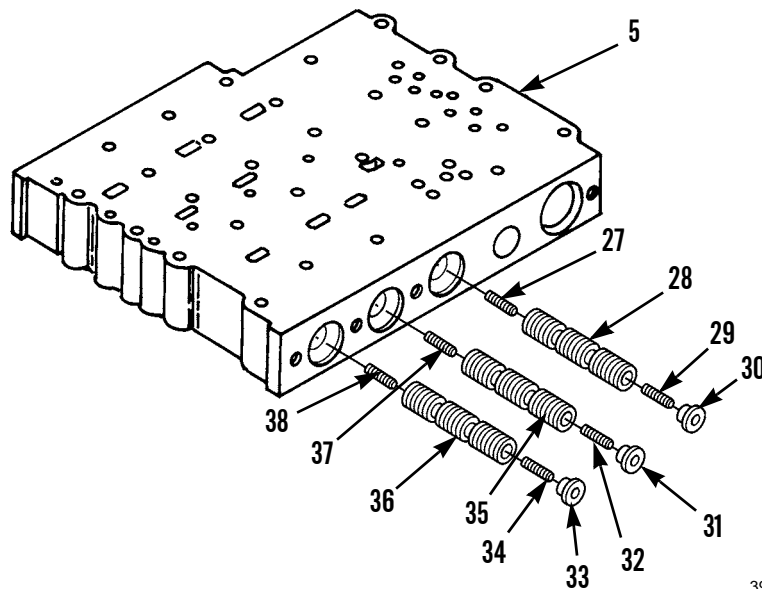
14. Remove stop (18), slug (19), spool (20) and slug (21) from valve body (5).  
 15. Remove stop (16), slug (15), spool (17) and slug (22).  
 16. Remove stop (26), slug (25), spool (24) and slug (23).

DISASSEMBLY - CONTINUED



394-842

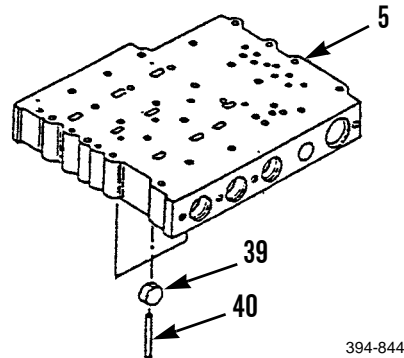
17. Remove stop (30), slug (29), spool (28) and slug (27) from valve body (5).
18. Remove stop (31), slug (32), spool (35) and slug (37).
19. Remove stop (33), slug (34), spool (36) and slug (38).



394-843

**DISASSEMBLY - CONTINUED**

20. Use a brass punch to remove three dowels (40) and stops (39) from valve body (5).

**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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

**CAUTION**

Do not use dirty cleaning solvent P-D-680 to clean transmission control valve assemblies and parts. Use only clean, fresh solvent that will leave no residue. Failure to follow this procedure could result in damage to equipment.

1. Remove all preformed packing from mounting surfaces.
2. Clean all parts with solvent.
3. Dry parts with compressed air.

**CAUTION**

All parts are critical to the operation of the transmission control valve assembly and must be inspected closely. If defective parts are assembled, the transmission will not operate properly, resulting in damage to equipment.

4. Inspect all parts for damage and replace if damaged.

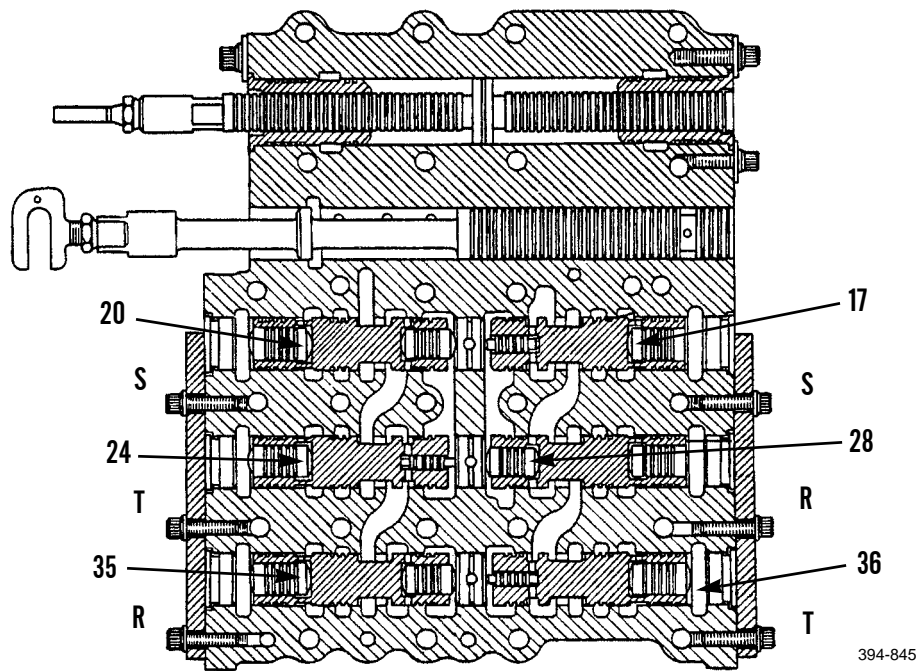
**ASSEMBLY**

1. Cool three stops (39) to -60°F (-51°) and install in valve body (5).
2. Install three dowels (40). Be sure three dowels (40) are below the surface of each face of the valve body (5).

DISASSEMBLY - CONTINUED

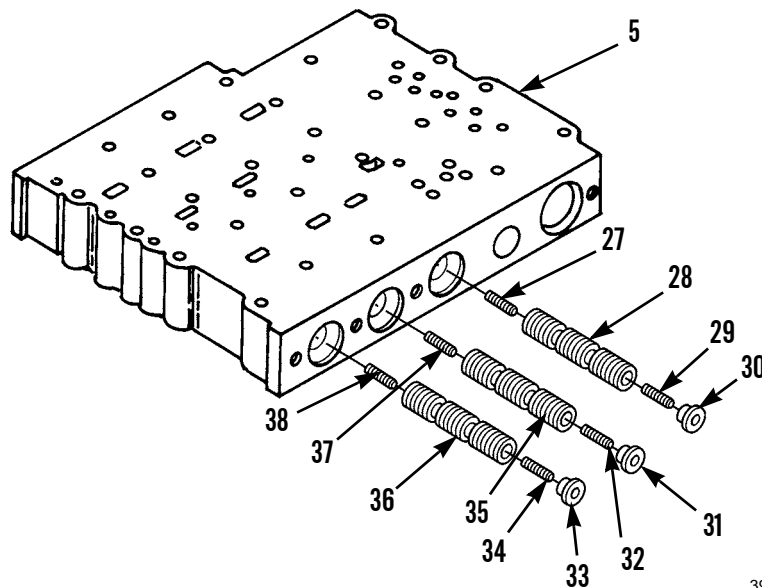
CAUTION

Spools marked with "R", "S" or "T" must be installed in automatic selector valve body in the bores with identical marking. Make sure spools and slugs are installed in the same position, in the same bore, from which they were removed. Failure to follow this procedure could result in damage to equipment.



394-845

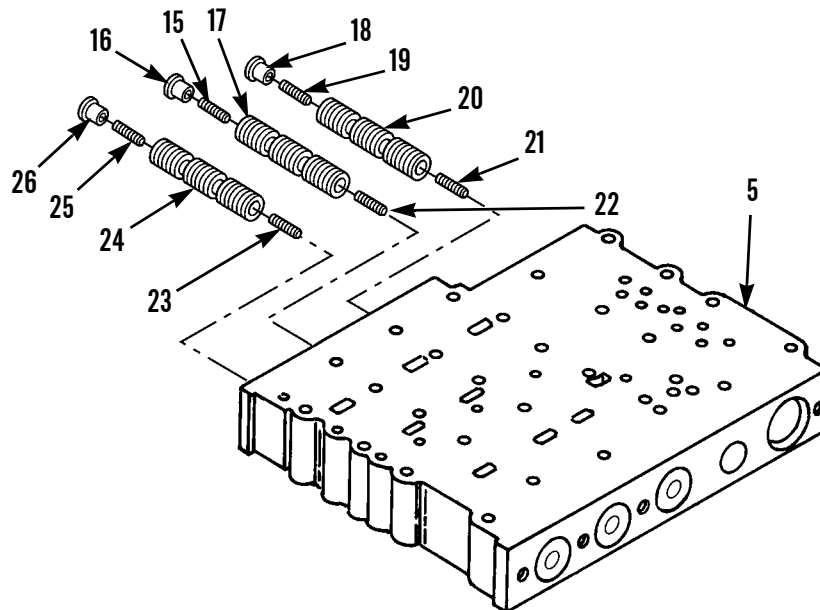
3. Use clean lubricating oil to lubricate slug (38), spool (36), slug (34) and stop (33) and install in valve body (5).
4. Use clean lubricating oil to lubricate slug (37), spool (35), slug (32) and stop (31) and install.
5. Use clean lubricating oil to lubricate slug (27), spool (28), slug (29) and stop (30) and install.



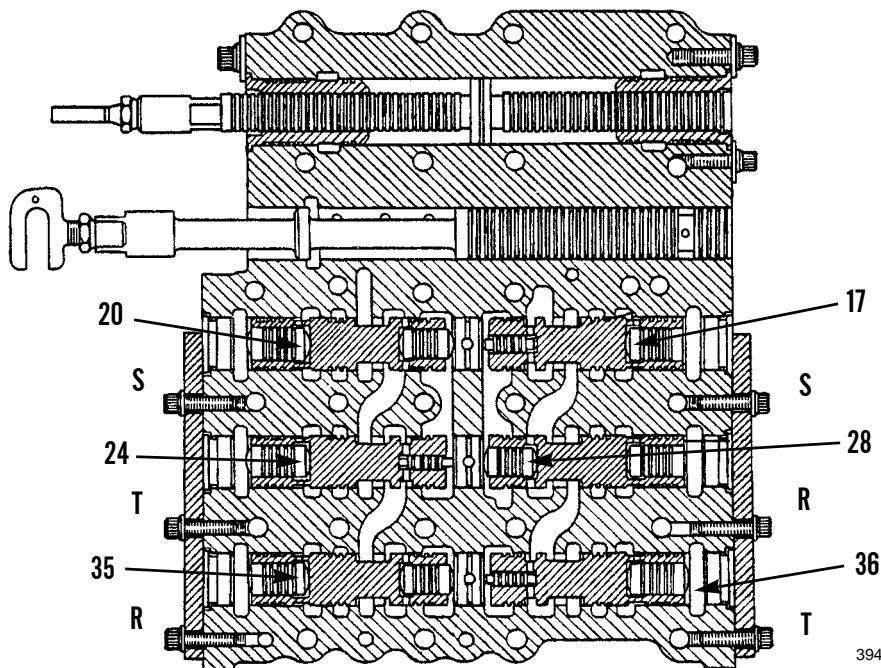
394-843

**ASSEMBLY - CONTINUED**

6. Use clean lubricating oil to lubricate slug (23), spool (24), slug (25) and stop (26) and install in valve body (5).
7. Use clean lubricating oil to lubricate slug (22), spool (17), slug (15) and stop (16) and install.
8. Use clean lubricating oil to lubricate slug (21), spool (20), slug (19) and stop (18) and install.



394-842

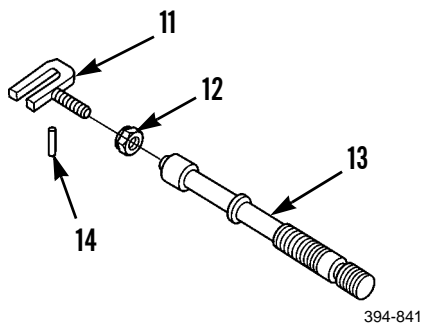


394-845

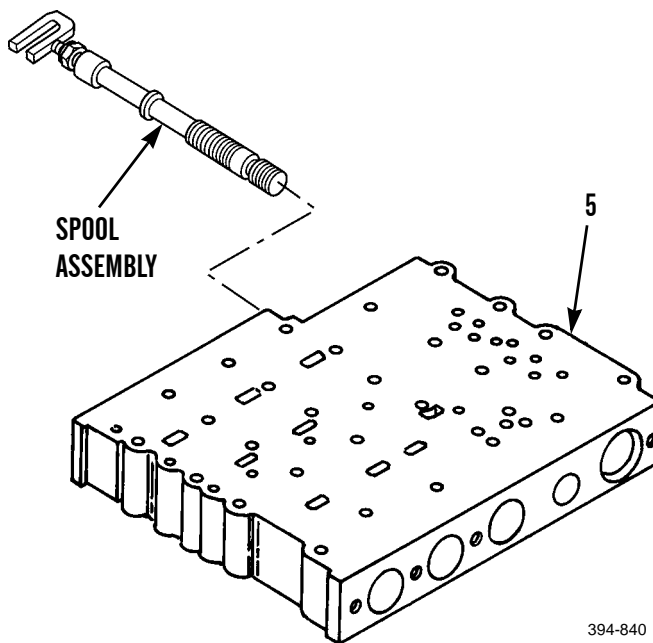
394-845

**ASSEMBLY - CONTINUED**

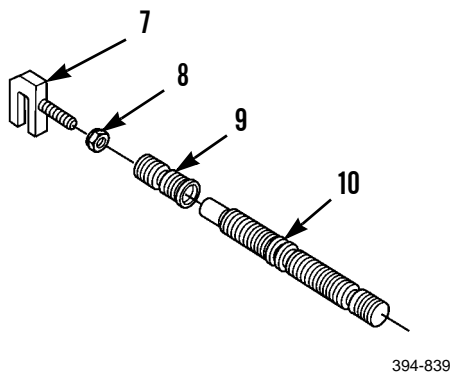
9. Use brass driver and hammer to install pin (14) in link (11).
10. Install nut (12) on link (11).
11. Use clean lubricating oil to lubricate spool (13).
12. Install link (11) on spool (13).



13. Install spool assembly in valve body (5).

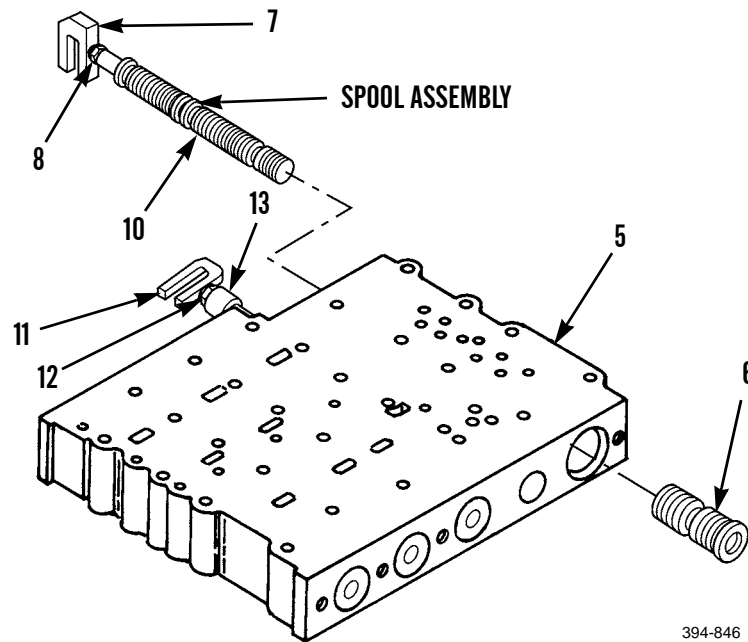


14. Install nut (8) on link (7).
15. Install link (7) on retainer (9).
16. Use clean lubricating oil to lubricate and install retainer (9) on spool (10).



**ASSEMBLY - CONTINUED**

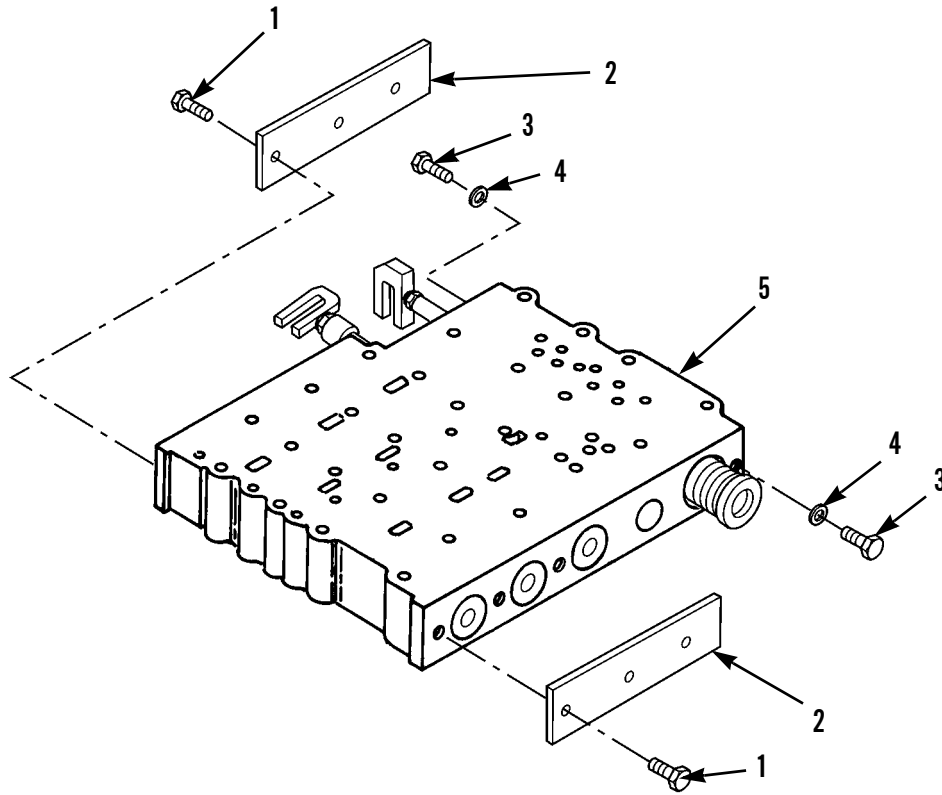
17. Install spool assembly in valve body (5).
18. Adjust links (7 and 11) and nuts (8 and 12) to correct position on spool (13) and retainer (10). Link (11) is to be vertical and link (7) perpendicular.
19. Tighten nuts (8 and 12) while holding spool (13) and retainer (10) to prevent links (7 and 11) from turning.
20. Install retainer (6).





**ASSEMBLY - CONTINUED**

21. Install two strips (2) and six bolts (1) in valve body (5). Torque bolts to 22 lb-ft (30 Nm).
22. Install two washers (4) and bolts (3). Torque bolts to 22 lb-ft (30 Nm).



394-837

23. Install automatic selector valve in transmission (WP 0364 00).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning, Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed (3)

**Equipment Condition**

Shift pressure valve removed (WP 0364 00)

**CAUTION**

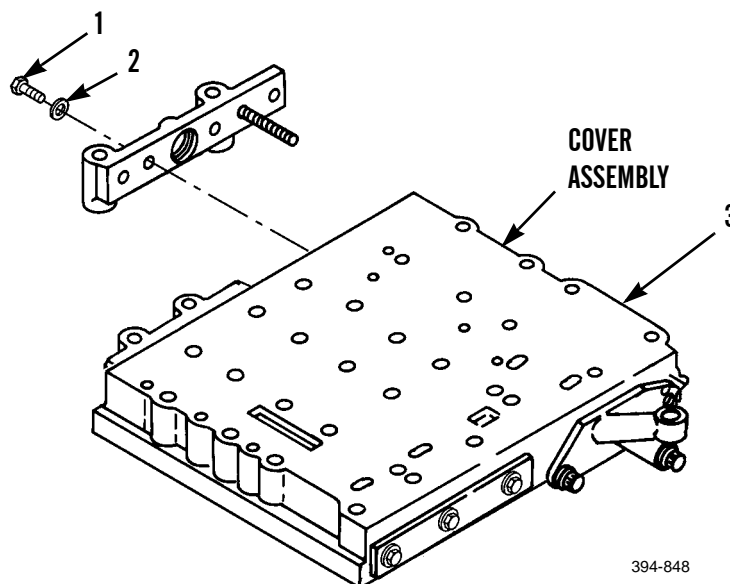
Exercise care when handling transmission control valve assemblies and parts. Do not nick, scratch or scrape valve bodies or spools. Failure to follow this procedure could result in damage to equipment.

**DISASSEMBLY**

**NOTE**

If service of the shift pressure valve is limited to adding or taking out spacers, it is only necessary to complete steps 1 and 10 of disassembly and steps 12 and 24 of assembly.

1. Remove three bolts (1), washers (2) and cover assembly from valve body (3).



394-848

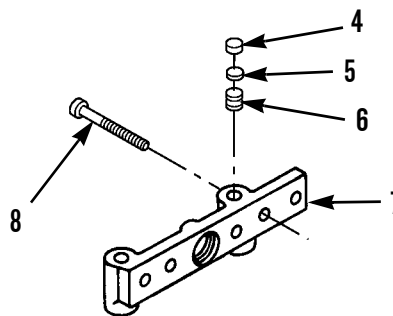
DISASSEMBLY - CONTINUED



**WARNING**

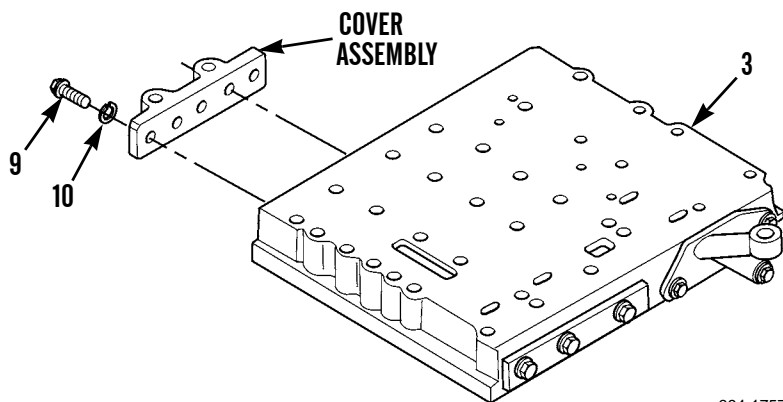
Always wear safety glasses when removing or installing parts restraining compressed springs. Remove restraining parts slowly to relieve spring pressure. Injury may result if you do not follow this procedure.

2. Remove three bolts (8), plugs (4), spacers (5) and springs (6) from cover (7).

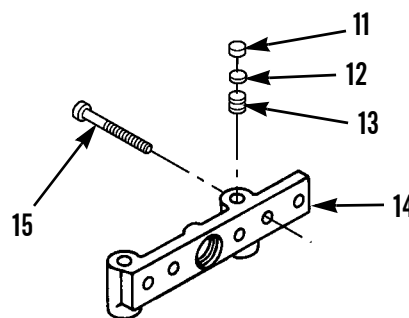


394-849

3. Remove three bolts (9), washers (10) and cover assembly from valve body (3).
4. Remove two bolts (15), plugs (11), spacers (12) and springs (13) from cover (14).



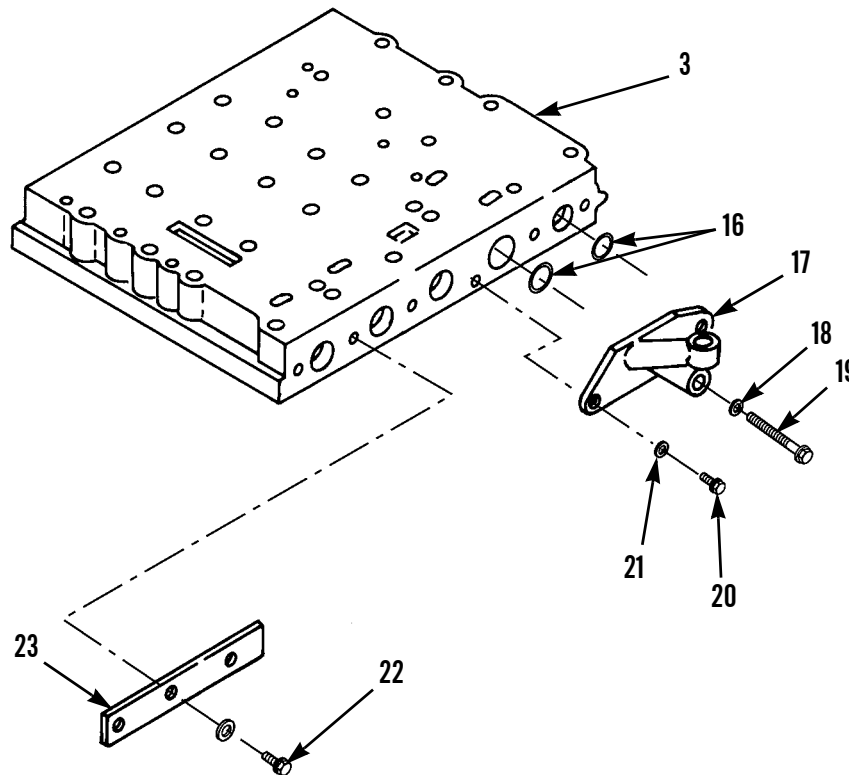
394-1757



394-851

**DISASSEMBLY - CONTINUED**

5. Remove three bolts (22) and strip (23) from valve body (3).
6. Remove two bolts (20) and washers (21).
7. Remove bolt (19), washer (18), cover (17) and two preformed packings (16). Discard preformed packings.

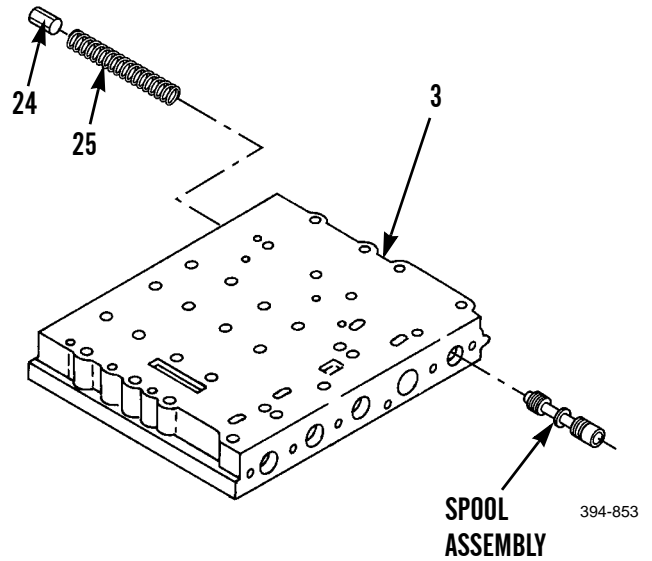


394-852

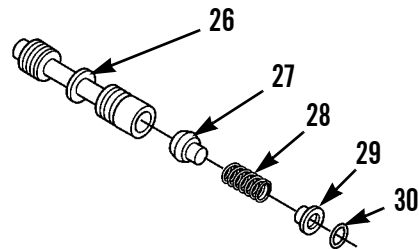
**DISASSEMBLY - CONTINUED****CAUTION**

Spools, springs, retainers, pistons and slugs from each bore must be kept separate and labeled after disassembly. They must be assembled in the same bore from which they were removed. Failure to follow this procedure could result in damage to equipment.

8. Remove spacer (24), spring (25) and spool assembly from valve body (3).



9. Remove ring (30), retainer (29), spring (28) and plunger (27) from spool (26).



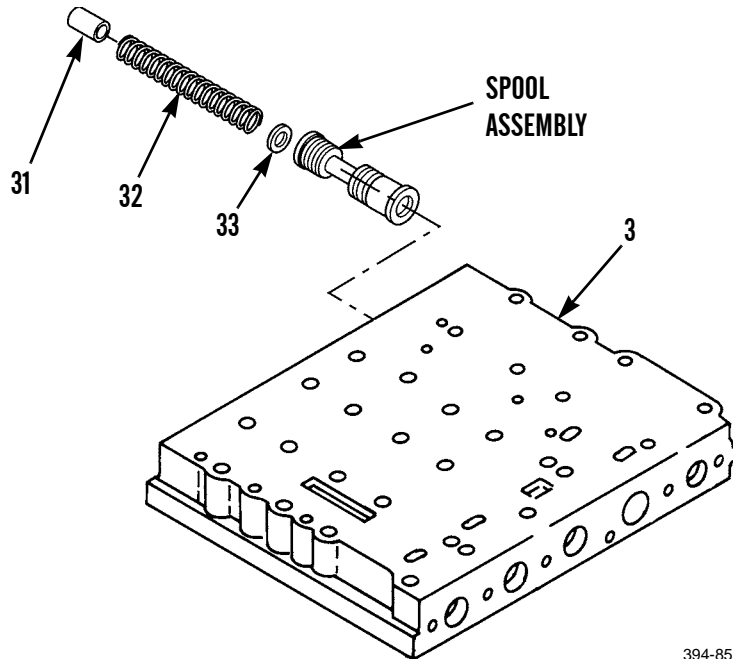
394-854

**DISASSEMBLY - CONTINUED**

**NOTE**

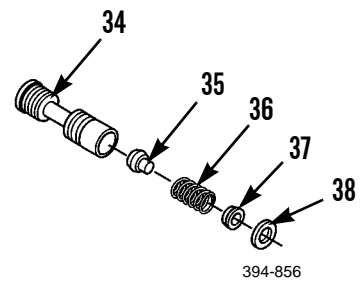
Spacers are used in the shift pressure valve assembly to increase pressure. Therefore, the quantity of spacers in use is variable.

10. Remove spacer (31), spring (32), spacers (33) and spool assembly from valve body (3).



394-855

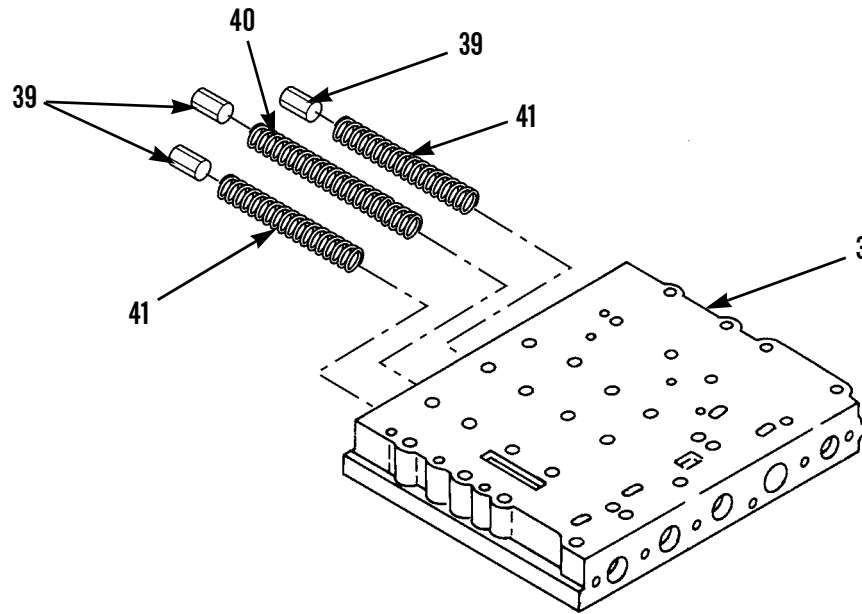
11. Remove ring (38), retainer (37), spring (36) and valve (35) from spool (34).



394-856

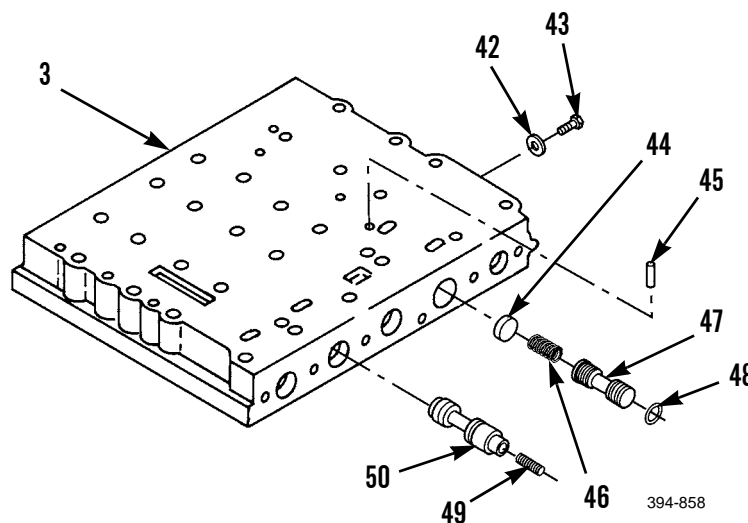
**DISASSEMBLY - CONTINUED**

12. Remove three spacers (39) from valve body (3).
13. Remove spring (40) and two springs (41).



386-857

14. Remove piston (47), preformed packing (48) and spring (46) from valve body (3). Discard preformed packing.
15. Use a brass punch to remove dowel (45).
16. Remove stop (44).
17. Remove three slugs (49) and spools (50).
18. Remove screw (43) and washer (42) from valve body (3).



394-858



**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 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**

Do not use dirty cleaning solvent P-D-680 to clean transmission control valve assemblies and parts. Use only clean, fresh solvent that will leave no residue. Failure to follow this procedure could result in damage to equipment.

1. Remove all preformed packing material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry parts with compressed air.

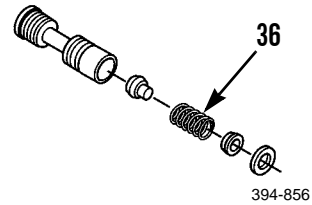
**INSPECTION****CAUTION**

All parts are critical to the operation of the transmission control valve assembly and must be inspected closely. If defective parts are assembled, the transmission will not operate properly, resulting in damage to equipment.

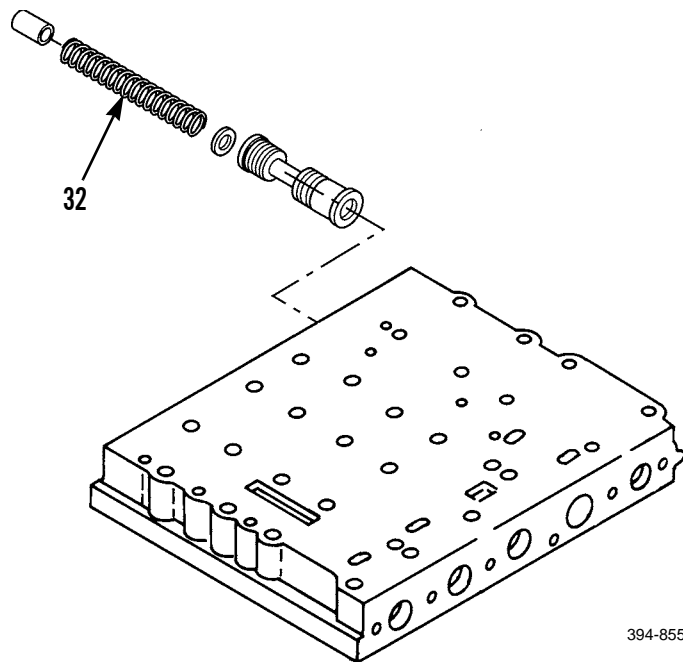
1. Inspect all parts.
2. Apply test force of 21.20 lb to spring (46). The length under test force should be 1.81 in. (45.97 mm). Free length after applying the test force should be 2.48 in. (62.99 mm). The O.D. of spring should be 0.590 in. (14.99 mm). Replace spring if it does not meet these requirements.
3. Apply test force of 8.07 lb to two springs (41). The length under test force should be 3.96 in. (100.58 mm). Free length after applying the test force should be 5.50 in. (13.97 cm). The O.D. of two springs should be 0.859 in. (21.82 mm). Replace two springs if they do not meet these requirements.
4. Apply test force of 15.70 lb to spring (40). The length under test force should be 3.90 in. (99.06 mm). Free length after applying the test force should be 8.33 in. (21.16 cm). The O.D. of spring should be 0.859 in. (21.82 mm). Replace spring if it does not meet these requirements.

**INSPECTION - CONTINUED**

5. Apply test force of 1.00 lb to spring (36). The length under test force should be 0.84 in. (21.34 mm). Free length after applying the test force should be 1.34 in. (34.04 mm). The O.D. of spring should be 0.48 in. (12.19 mm). Replace spring if it does not meet these requirements.

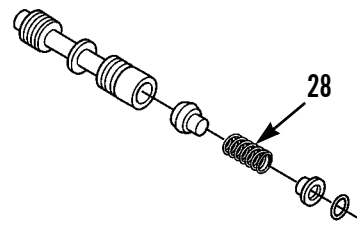


6. Apply test force of 189.00 lb to spring (32). The length under test force should be 3.38 in. (85.85 mm). Free length after applying the test force should be 4.35 in. (11.05 cm). The O.D. of spring should be 0.780 in. (19.81 mm). Replace spring if it does not meet these requirements.

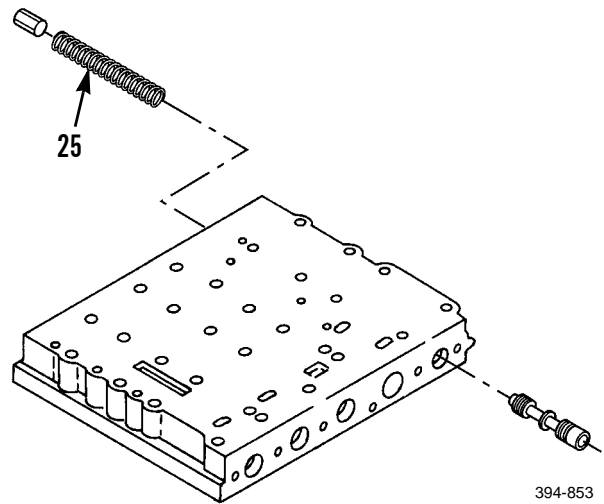


**INSPECTION - CONTINUED**

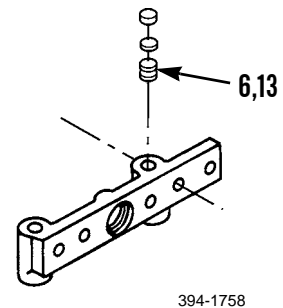
7. Apply test force of 0.517 lb to spring (28). The length under test force should be 0.48 in. (12.19 mm). Free length after applying the test force should be 0.89 in. (22.61 mm). The O.D. of spring should be 0.30 in. (7.62 mm). Replace spring if it does not meet these requirements.



8. Apply test force of 69.23 lb to spring (25). The length under test force should be 3.63 in. (92.20 mm). Free length after applying the test force should be 5.88 in. (14.94 cm). The O.D. of spring should be 0.859 in. (21.82 mm). Replace spring if it does not meet these requirements.



9. Apply test force of 70.00 lb to springs (6 and 13). The length under test force should be 0.374 in. (9.50 mm). Free length after applying the test force should be 0.547 in. (13.89 mm). The O.D. of springs should be 0.375 in. (9.53 mm). Replace springs if they do not meet these requirements.



**ASSEMBLY****CAUTION**

Exercise care to keep dust, dirt and other contaminants out of shift pressure valve assembly. Make sure hands, clothing and tools are clean. Do not assemble these parts where wind may carry airborne particles. Failure to follow this procedure could result in damage to equipment.

1. Install washer (42) and screw (43) in valve body (3).

**CAUTION**

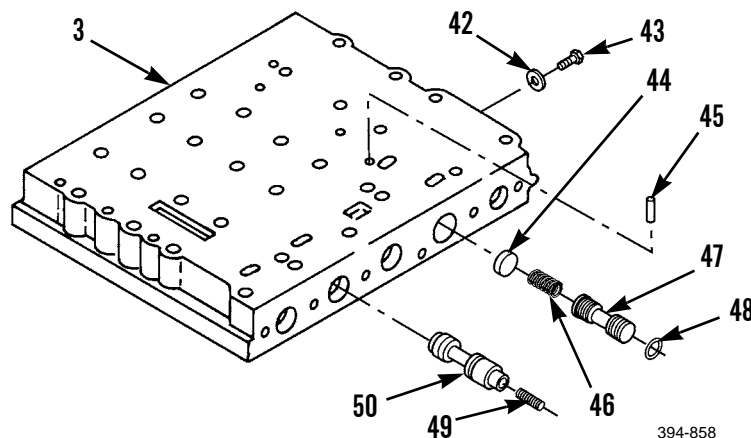
Spools, slugs, pistons and springs must be installed in the same position, in the same bore from which they were removed. Some springs are color coded to match the color coding on the valve body, to aid in proper assembly. Failure to follow this procedure could result in damage to equipment.

2. Use clean lubricating oil to lubricate three spools (50) and slugs (49) and install.
3. Chill stop (44) to  $-60^{\circ}\text{F}$  ( $-51^{\circ}\text{C}$ ) and position in valve body (3).
4. Use a brass punch to install dowel (45) in stop (44). Ends of dowel (45) must be below surfaces of valve body (3).

**WARNING**

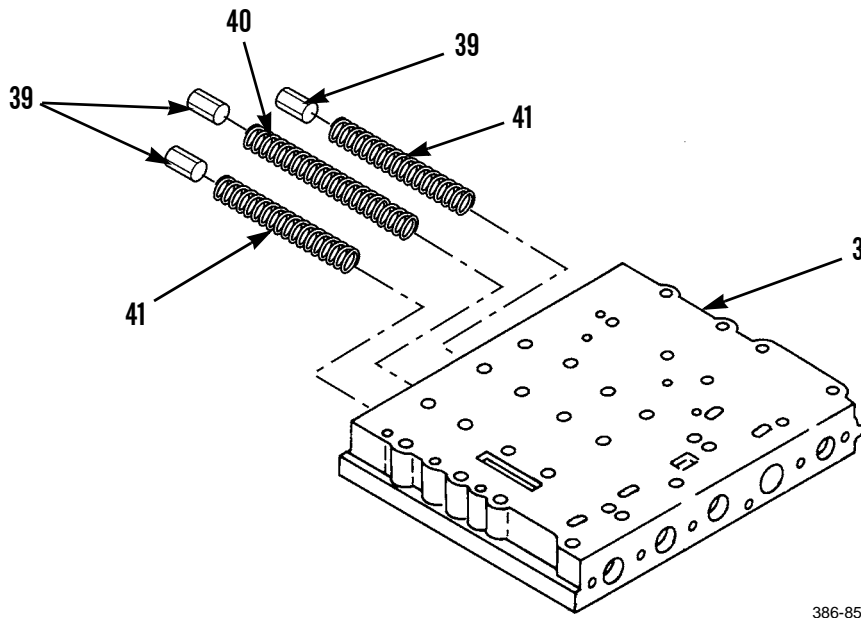
Always wear safety glasses when removing or installing parts restraining compressed springs. Remove restraining parts slowly to relieve spring pressure. Injury may result if you do not follow this procedure.

5. Install spring (46).
6. Use clean lubricating oil to lubricate and install new preformed packing (48) and piston (47).



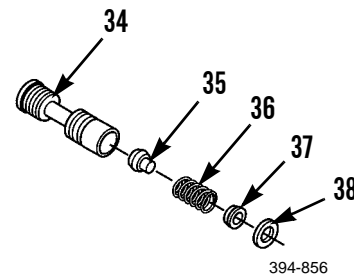
**ASSEMBLY - CONTINUED**

7. Match color codes and install spring (40) and two springs (41) in valve body (3).
8. Install three spacers (39).



386-857

9. Use clean lubricating oil to lubricate valve (35) on spool (34) and install.
10. Install spring (36), retainer (37) and ring (38) on spool (34).



394-856

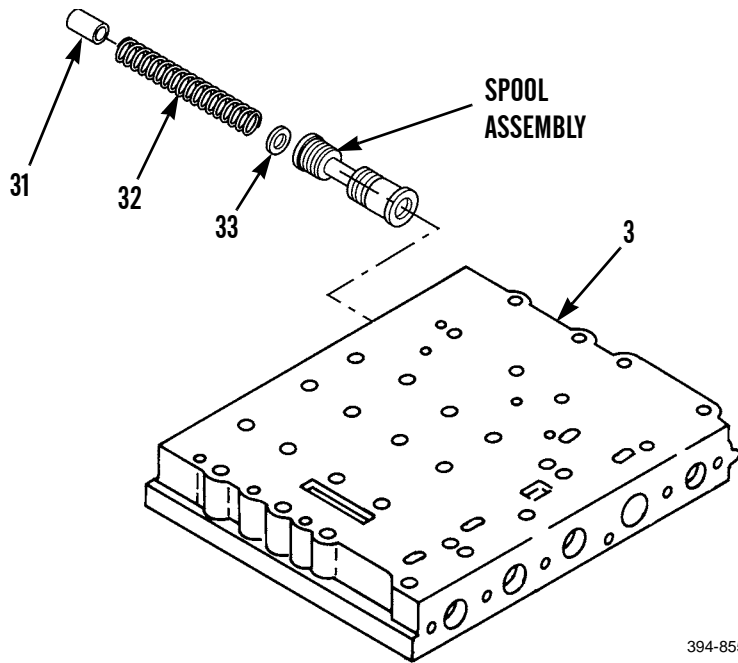
**ASSEMBLY - CONTINUED**

11. Use clean lubricating oil to lubricate spool assembly and install in valve body (3).

**NOTE**

If number of spacers in the shift pressure valve assembly does not change, install the same number of spacers that were removed.

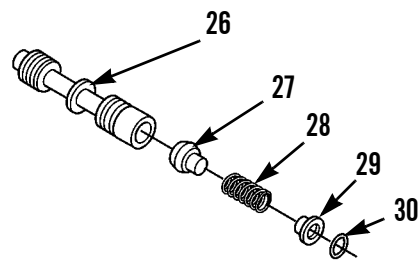
12. Install spacers (33), spring (32) and spacer (31).



394-855

13. Install plunger (27), spring (28) and retainer (29) in spool (26).

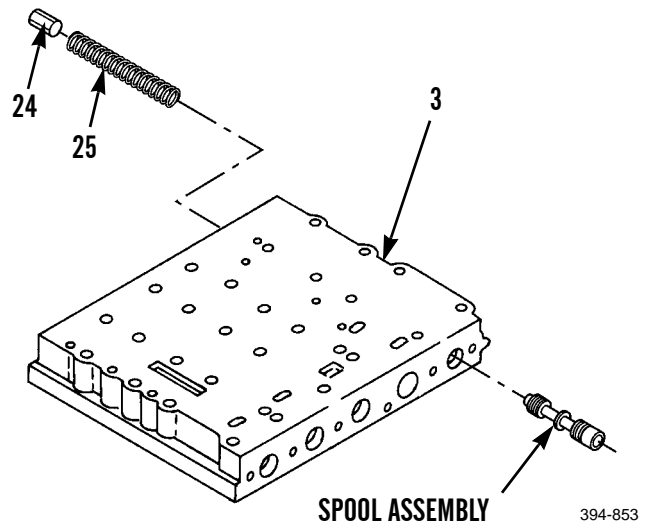
14. Use retaining ring pliers to install ring (30) on spool (26).



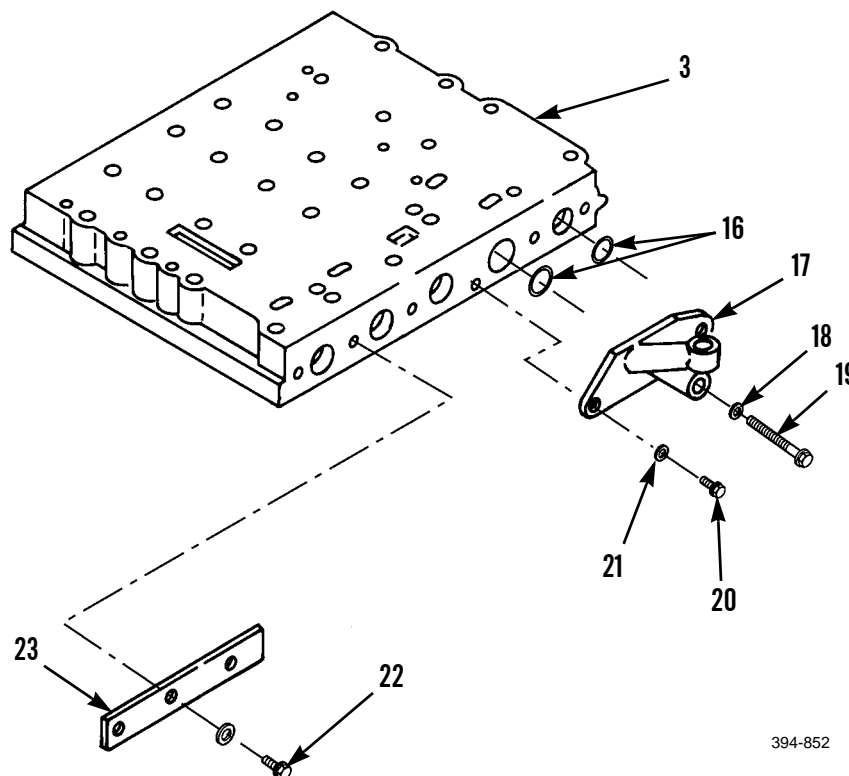
394-854

**ASSEMBLY - CONTINUED**

15. Use clean lubricating oil to lubricate spool assembly and install in valve body (3).
16. Install spring (25) and spacer (24).

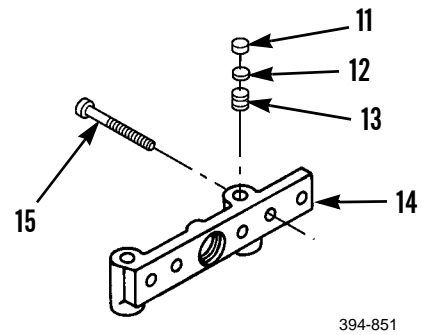
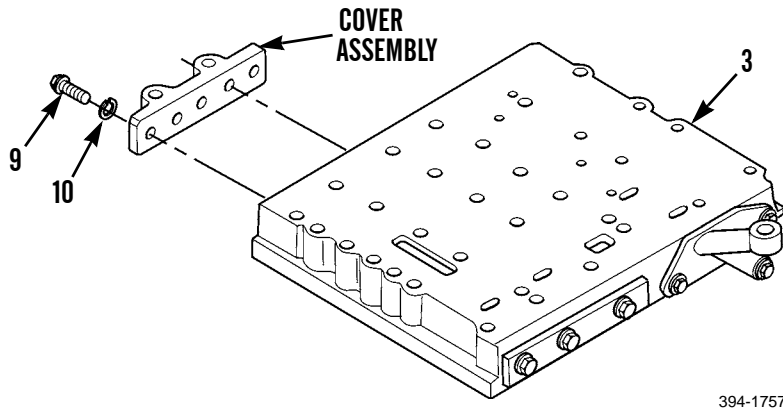


17. Install two new preformed packings (16) in cover (17).
18. Install cover (17), washer (18) and bolt (19) on valve body (3). Torque bolt to 22 lb-ft (30 Nm).
19. Install two washers (21) and bolts (20). Torque two bolts to 22 lb-ft (30 Nm).
20. Install strip (23) and three bolts (22) on valve body (3). Torque three bolts to 22 lb-ft (30 Nm).

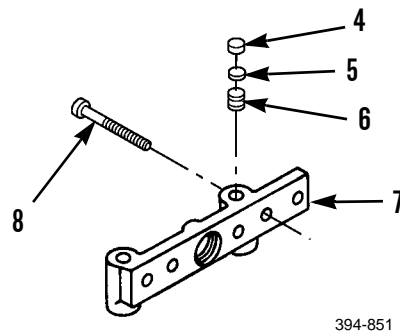


**ASSEMBLY - CONTINUED**

21. Install two springs (13), spacers (12), plugs (11) and bolts (15) in cover (14).
22. Install cover assembly, three washers (10) and bolts (9) on valve body (3). Torque three bolts to 22 lb-ft (30 Nm).



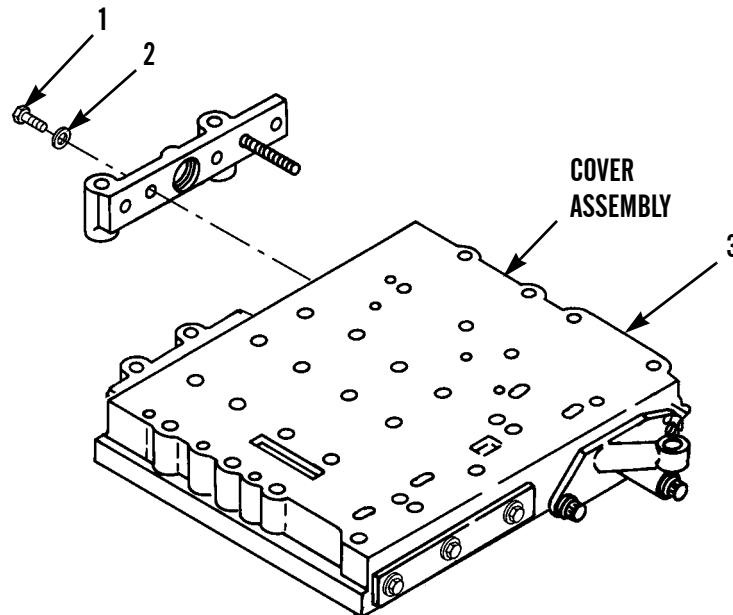
23. Install two springs (6), spacers (5), plugs (4) and three bolts (8) in cover (7).





**ASSEMBLY - CONTINUED**

24. Install cover assembly, three washers (2) and bolts (1) in valve body (3). Torque three bolts to 22 lb-ft (30 Nm).



394-848

25. Install shift pressure valve in transmission (WP 0364 00).  
26. Operate machine to verify correct operation of transmission (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**PRESSURE CONTROL VALVE REPAIR**

**0368 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning, Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)  
Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed (9)

Seal (2)

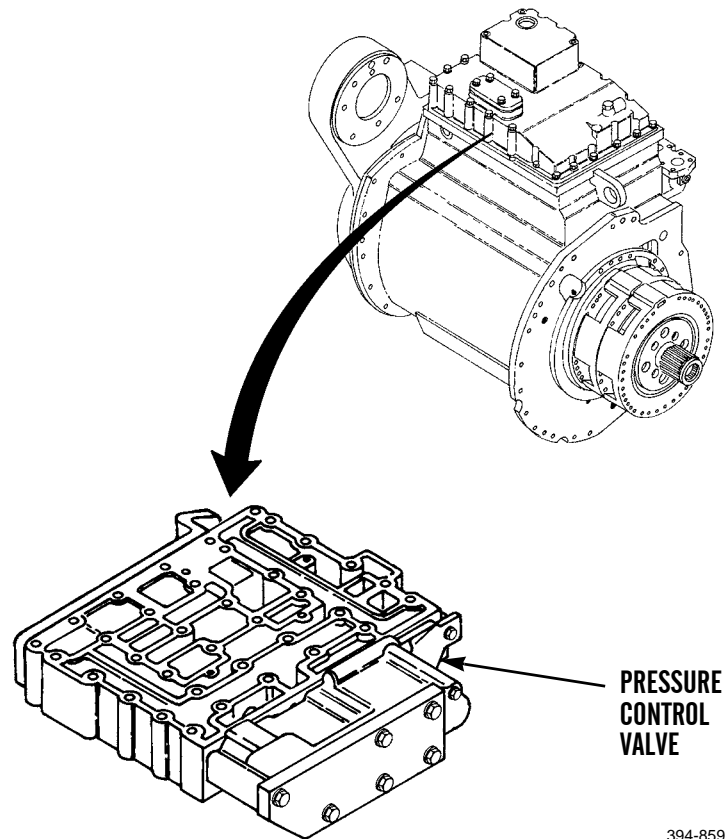
**Equipment Condition**

Pressure control valve removed (WP 0364 00)

---

**CAUTION**

Exercise care when handling transmission control valve assemblies and parts. Do not nick, scratch or scrape valve bodies or spools. Failure to follow this procedure could result in damage to equipment.

**DISASSEMBLY**

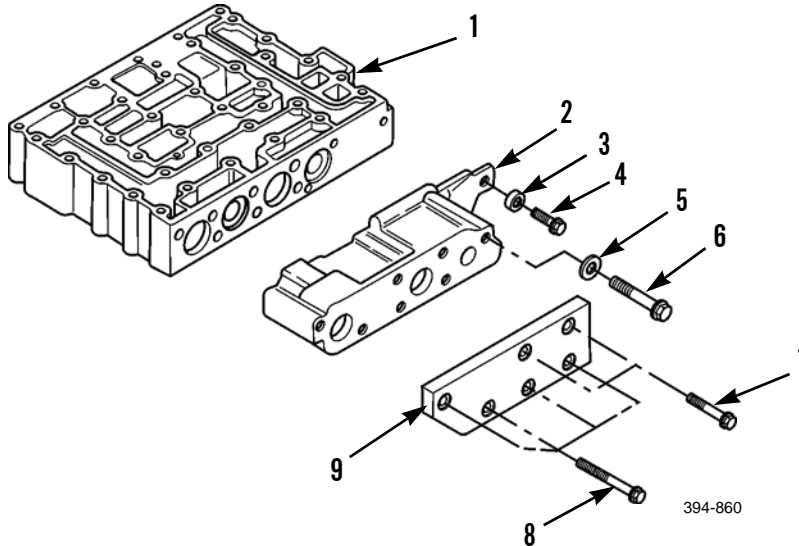
394-859

**NOTE**

If service of the pressure control valve is limited to adding or taking out spacers, it is only necessary to complete the following steps: disassembly 1, 3, 6, 11 and 17; assembly: 18, 30, 36 and 37.

1. Remove four bolts (8), two bolts (7) and cover (9) from body (2).
2. Remove bolt (6), washer (5), bolt (4) and washer (3).
3. Remove body (2) from valve body (1).

DISASSEMBLY - CONTINUED



4. Remove piston (20) and preformed packing (19) from body (2). Discard preformed packing.
5. Remove piston (18) and preformed packing (17). Discard preformed packing.



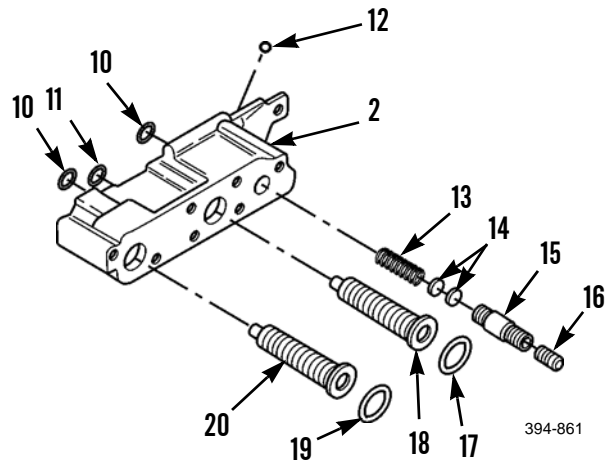
**WARNING**

Always wear safety glasses when removing or installing parts restraining compressed springs. Remove restraining parts slowly to relieve spring pressure. Injury may result if you do not follow this procedure.

**NOTE**

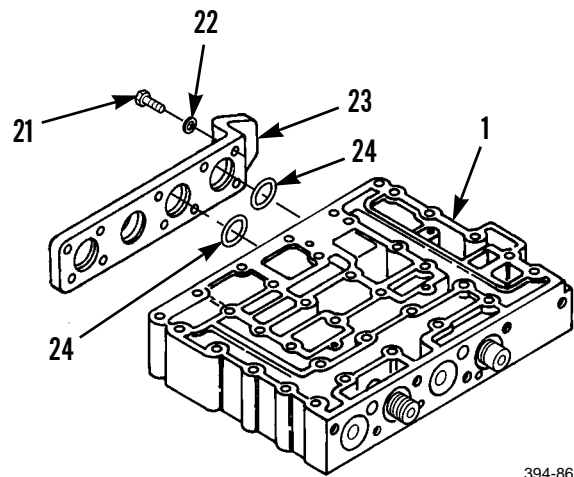
Spacers in step 7 are used in the pressure control valve to increase pressure. Therefore, the quantity of spacers in use is variable.

6. Remove slug (16), spool (15), spacers (14) and spring (13).
7. Remove and discard two preformed packings (10) and preformed packing (11).
8. Remove two balls (12) from body (2).



**DISASSEMBLY - CONTINUED**

9. Remove 10 bolts (21) and washers (22) from valve body (1).
10. Remove cover (23) and two preformed packings (24). Discard preformed packings.



394-862

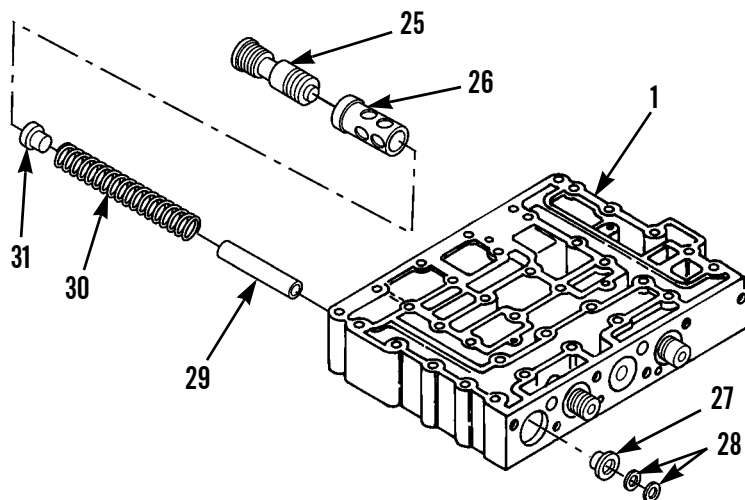
**CAUTION**

Spacers, springs, retainers, pistons, plungers and slugs from each bore must be kept separate and labeled after disassembly. They must be assembled in the same bore from which they were removed. Failure to follow this procedure could result in damage to equipment.

**NOTE**

Spacers in step 12 are used in the pressure control valve to increase pressure. Therefore, the quantity of spacers in use is variable.

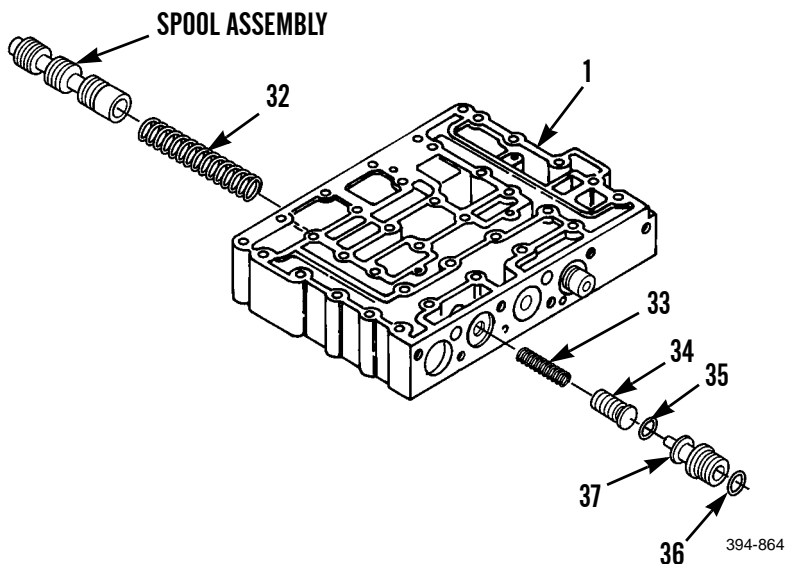
11. Remove spacers (28) and retainer (27) from valve body (1).
12. Remove spool (25), sleeve (26), retainer (31), spring (30) and spacer (29).



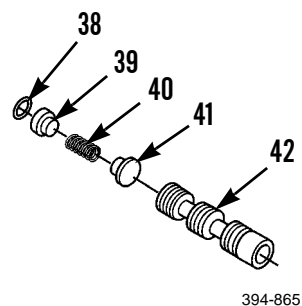
394-863

**DISASSEMBLY - CONTINUED**

13. Remove stop (37), preformed packing (36), seal (35), plunger (34) and spring (33) from valve body (1). Discard preformed packing and seal.
14. Remove spool assembly and spring (32).



15. Use retaining ring pliers to remove ring (38).
16. Remove retainer (39), spring (40) and poppet (41) from spool (42).

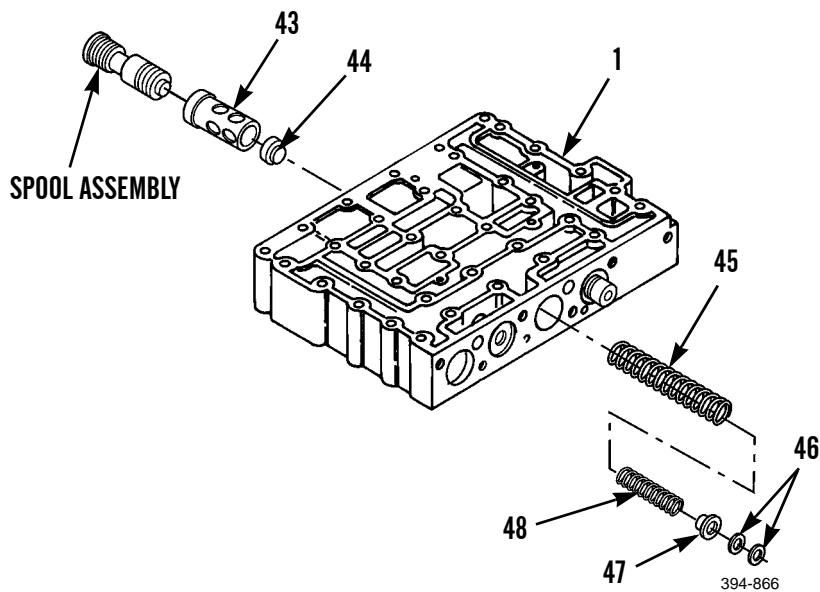


**DISASSEMBLY - CONTINUED**

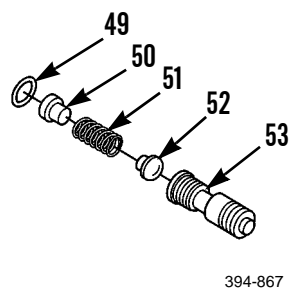
**NOTE**

Spacers in step 18 are used in the pressure control valve to increase pressure. Therefore, the quantity of spacers in use is variable.

- 17. Remove spacers (46) from valve body (1).
- 18. Remove retainer (47), springs (48 and 45), spool assembly, sleeve (43) and retainer (44).



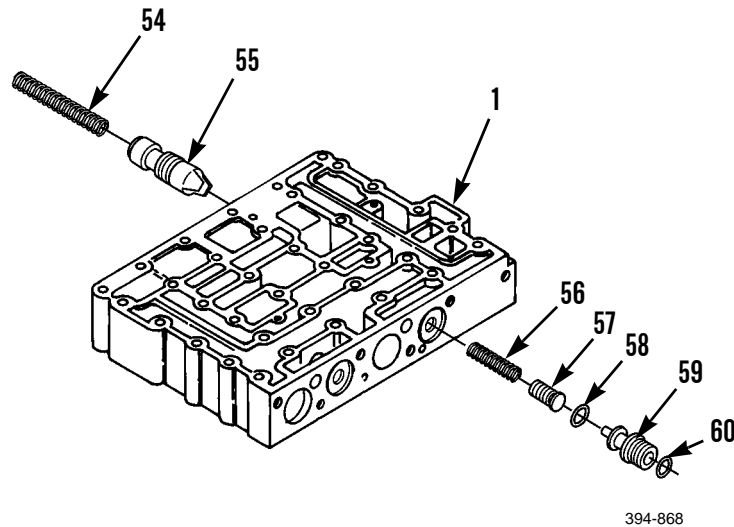
- 19. Use retaining ring pliers to remove ring (49).
- 20. Remove retainer (50), spring (51) and poppet (52) from spool (53).



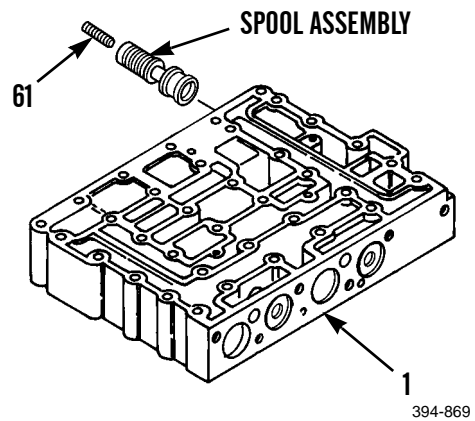


**DISASSEMBLY - CONTINUED**

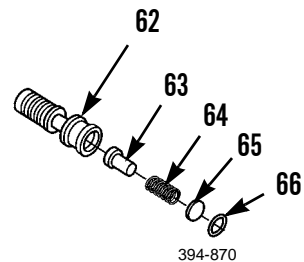
21. Remove stop (59), preformed packing (60), seal (58), plunger (57) and spring (56) from valve body (1). Discard preformed packing and seal.
22. Remove spring (54) and plunger (55).



23. Remove slug (61) and spool assembly from valve body (1).

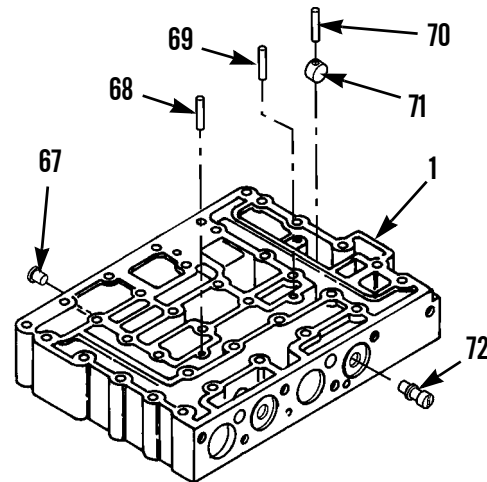


24. Use retaining ring pliers to remove ring (66).
25. Remove retainer (65), spring (64) and plunger (63) from spool (62).



**DISASSEMBLY - CONTINUED**

26. Use a brass punch to remove dowel (70) from valve body (1).
27. Remove stop (71).
28. Use a brass punch to remove dowel (69).
29. Remove stop (72).
30. Use a brass punch to remove dowel (68).
31. Remove stop (67).



394-871

**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 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**

Do not use dirty cleaning solvent P-D-680 to clean transmission control valve assemblies and parts. Use only clean, fresh solvent that will leave no residue. Failure to follow this procedure could result in damage to equipment.

1. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry parts with compressed air.

**INSPECTION****CAUTION**

All parts are critical to the operation of the transmission control valve assembly and must be inspected closely. If defective parts are assembled, the transmission will not operate properly, resulting in damage to equipment.

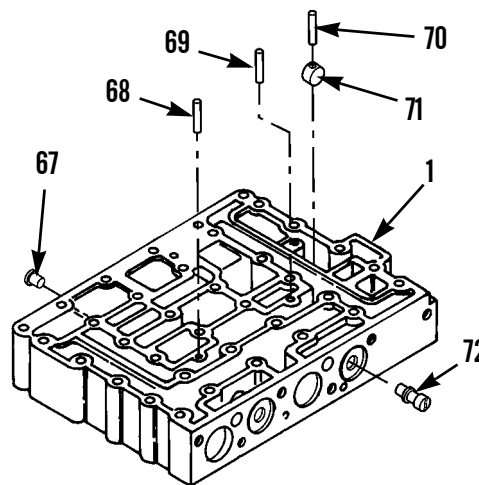
1. Inspect all parts.
2. Apply test force of 22.40 lb (10.16 kg) to spring (13). The length under test force should be 1.44 in. (36.58 mm). Free length after applying the test force should be 1.84 in. (46.74 mm). The O.D. of spring should be 0.562 in. (14.28 mm). Replace spring if it does not meet these requirements.
3. Apply first test force of 48.10 lb (21.81 kg) to spring (30). The length under test force should be 4.885 in. (124.08 mm).
4. Apply second test force of 211.70 lb (96.03 kg) to spring (30). The length under test force should be 3.542 in. (89.97 mm). Free length after applying the test force should be 5.28 in. (34.11 mm). The O.D. of spring (30) should be 1.375 in. (34.93 mm). Replace spring if it does not meet these requirements.
5. Apply test force of 3.02 lb (1.37 kg) to springs (33 and 56). The length under test force should be 1.35 in. (34.29 mm). Free length after applying the test force should be 1.78 in. (45.21 mm). The O.D. of springs should be 0.297 in. (7.54 mm). Replace springs if they do not meet these requirements.
6. Apply test force of 1.00 lb (.45 kg) to springs (40 and 51). The length under test force should be 0.84 in. (21.34 mm). Free length after applying the test force should be 1.34 in. (34.04 mm). The O.D. of springs should be 0.48 in. (12.19 mm). Replace springs if they do not meet these requirements.
7. Apply test force of 10.00 lb (4.54 kg) to spring (32). The length under test force should be 2.12 in. (53.85 mm). Free length after applying the test force should be 3.68 in. (93.47 mm). The O.D. of spring should be 0.700 in. (17.78 mm). Replace spring if it does not meet these requirements.
8. Apply first test force of 13.50 lb (6.12 kg) to spring (48). The length under test force should be 4.989 in. (126.72 mm).
9. Apply second test force of 68.40 lb (31.03 kg) to spring (48). The length under test force should be 3.719 in. (94.46 mm). Free length after applying the test force should be 5.30 in. (134.62 mm). The O.D. of spring should be 0.812 in. (20.62 mm). Replace spring if it does not meet these requirements.
10. Apply first test force of 21.40 lb (9.71 kg) to spring (45). The length under test force should be 4.989 in. (126.72 mm).
11. Apply second test force of 246.00 lb (111.5 kg) to spring (45). The length under test force should be 3.719 in. (94.46 mm). Free length after applying the test force should be 5.11 in. (129.79 mm). The O.D. of spring should be 1.297 in. (32.94 mm). Replace spring if it does not meet these requirements.
12. Apply test force of 24.40 lb (11.07 kg) to spring (54). The length under test force should be 2.24 in. (56.90 mm). Free length after applying the test force should be 3.26 in. (82.80 mm). The O.D. of spring should be 0.600 in. (15.24 mm). Replace spring (54) if it does not meet these requirements.
13. Apply test force of 0.517 lb (.24 kg) to spring (64). The length under test force should be 0.517 in. (13.13 mm). Free length after applying the test force should be 0.89 in. (22.60 mm). The O.D. of spring should be 0.300 in. (7.62 mm). Replace spring if it does not meet these requirements.

**ASSEMBLY**

**CAUTION**

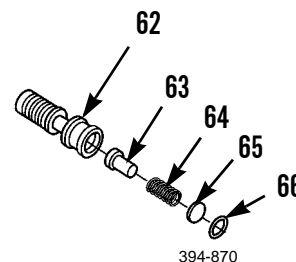
Exercise care to keep dust, dirt and other contaminants out of shift pressure valve assembly. Make sure hands, clothing and tools are clean. Do not assemble these parts where wind may carry airborne particles. Failure to follow this procedure could result in damage to equipment.

1. Install stops (71, 72 and 67) in valve body (1) Align holes.
2. Use a brass punch to install dowels (70, 69 and 68). The ends of dowels (70, 69 and 68) must be below the surfaces of valve body (1).



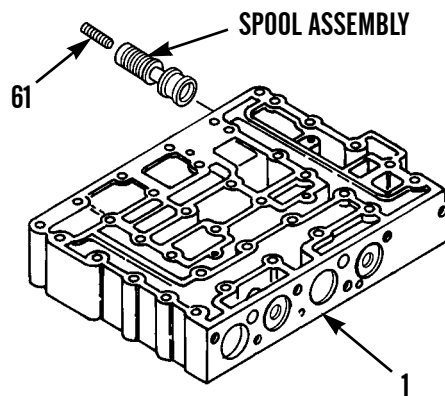
394-871

3. Install plunger (63), spring (64) and retainer (65) in spool (62).
4. Use retaining ring pliers to install ring (66) on spool (62).



394-870

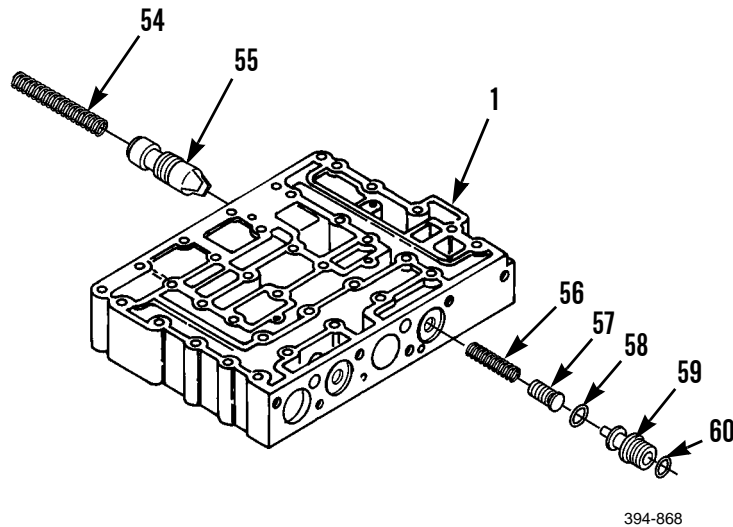
5. Use clean lubricating oil to lubricate spool assembly and install in valve body (1).
6. Install slug (61).



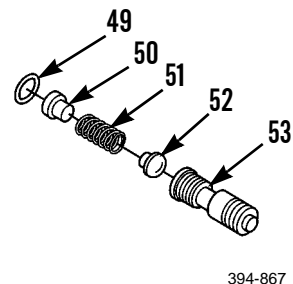
394-869

**ASSEMBLY - CONTINUED**

7. Use clean lubricating oil to lubricate plunger (55) and spring (54) and install in valve body (1). Match color code of spring (54).
8. Install spring (56).
9. Use clean lubricating oil to lubricate plunger (57) and install.
10. Install new seal (58) and new preformed packing (60) on stop (59).
11. Install stop (59).



12. Use clean lubricating oil to lubricate spool (53).
13. Install poppet (52), spring (51) and retainer (50) in spool (53).
14. Use retaining ring pliers to install ring (49) on spool (53).



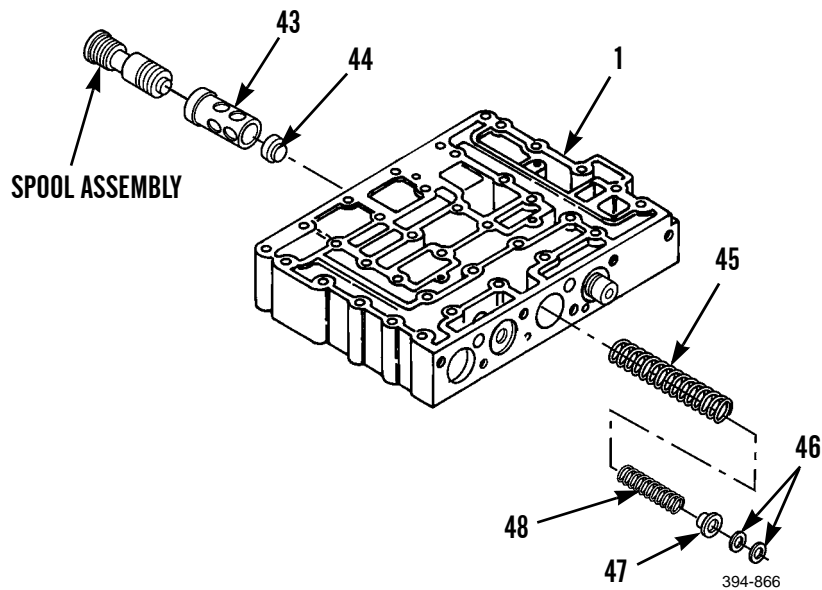
**ASSEMBLY - CONTINUED**

15. Install retainer (44) in valve body (1).
16. Use clean oil to lubricate sleeve (43) and install.
17. Install spool assembly, spring (48 and 45) and retainer (47).

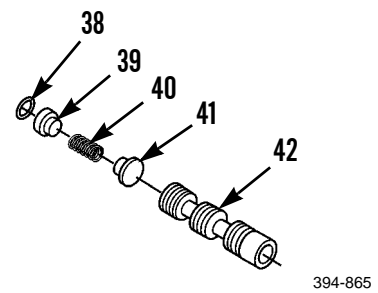
**NOTE**

If number of spacers in pressure control valve does not change, install same number of spacers that were removed.

18. Install spacers (46).

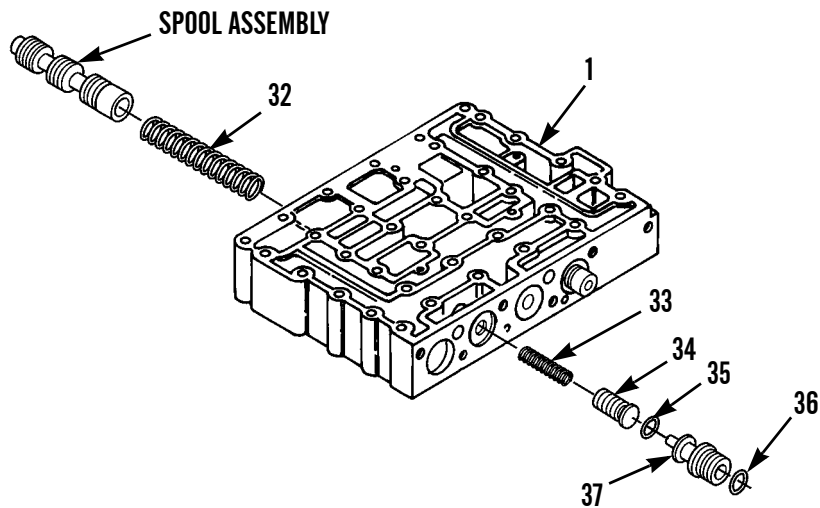


19. Install poppet (41), spring (40) and retainer (39) in spool (42).
20. Use retaining ring pliers to install ring (38) on spool (42).



**ASSEMBLY - CONTINUED**

21. Use clean lubricating oil to lubricate spring (32) and install in valve body (1). Match color code.
22. Install spool assembly in valve body (1).
23. Install spring (33).
24. Use clean lubricating oil to lubricate plunger (34) and install.
25. Install new seal (35) and new preformed packing (36) on stop (37).
26. Install stop (37).



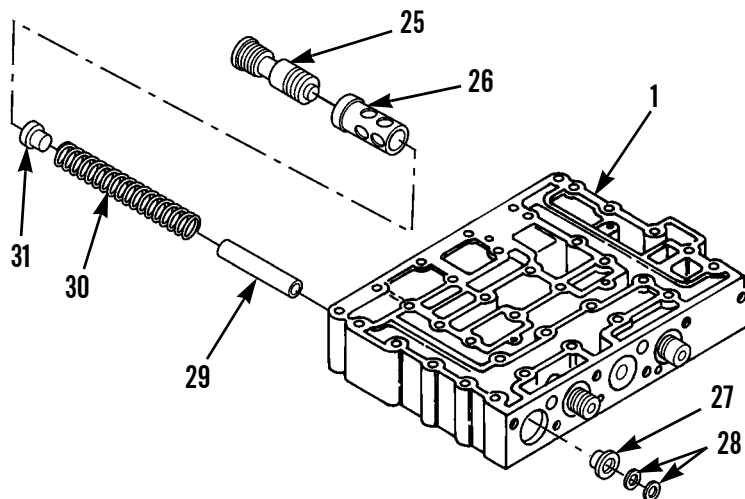
394-864

27. Install spacer (29), spring (30) and retainer (31) in valve body (1). Match color code.
28. Use clean lubricating oil to lubricate sleeve (26) and spool (25) and install.
29. Install retainer (27).

**NOTE**

If number of spacers in pressure control valve does not change, install same number of spacers that were removed.

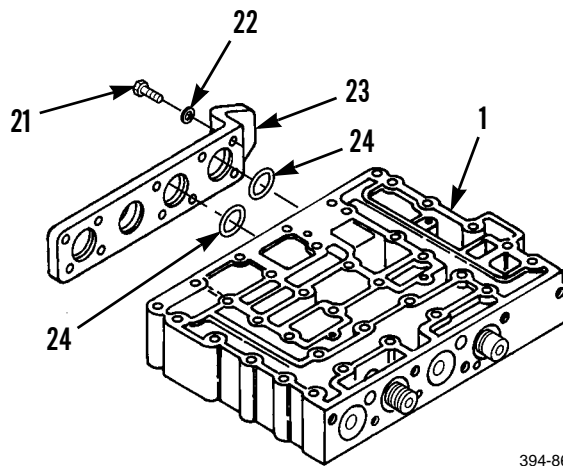
30. Install spacers (28).



394-863

**ASSEMBLY - CONTINUED**

31. Install two new preformed packings (24) and cover (23) on valve body (1). Align holes of cover (23).
32. Install 10 washers (22) and bolts (21). Torque bolts to 22 lb-ft (30 Nm).



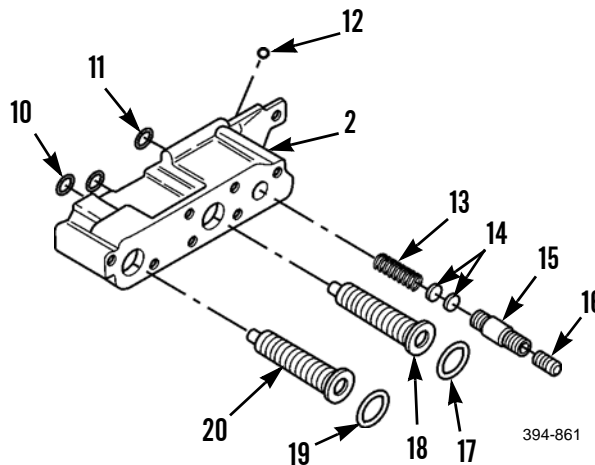
394-862

33. Install two balls (12) in body (2).
34. Install new preformed packing (11) and two new preformed packings (10).
35. Install spring (13).

**NOTE**

If number of spacers in pressure control valve does not change, install same number of spacers that were removed.

36. Install spacers (14).
37. Use clean lubricating oil to lubricate spool (15) and slug (16) and install.
38. Use clean lubricating oil to lubricate new preformed packing (17) and piston (18) and install.
39. Use clean lubricating oil to lubricate new preformed packing (19) and piston (20) and install.

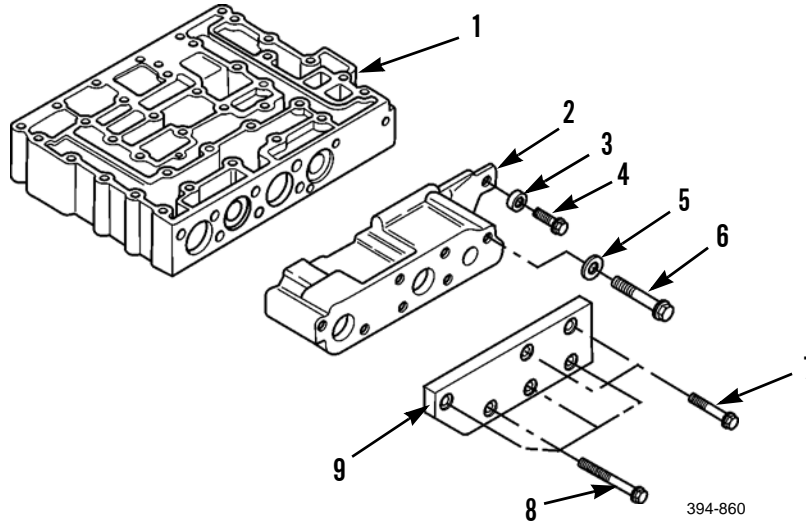


394-861



**ASSEMBLY - CONTINUED**

40. Install body assembly (2) on valve body (1).
41. Install washer (3), bolt (4), washer (5) and bolt (6).
42. Install cover (9), two bolts (7) and four bolts (8) on body (2). Torque bolts to 22 lb-ft (30 Nm).



43. Install pressure control valve in transmission (WP 0364 00).
44. Operate machine to verify correct operation of transmission (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning, Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**References**

TM 5-3805-248-10

**Equipment Condition**

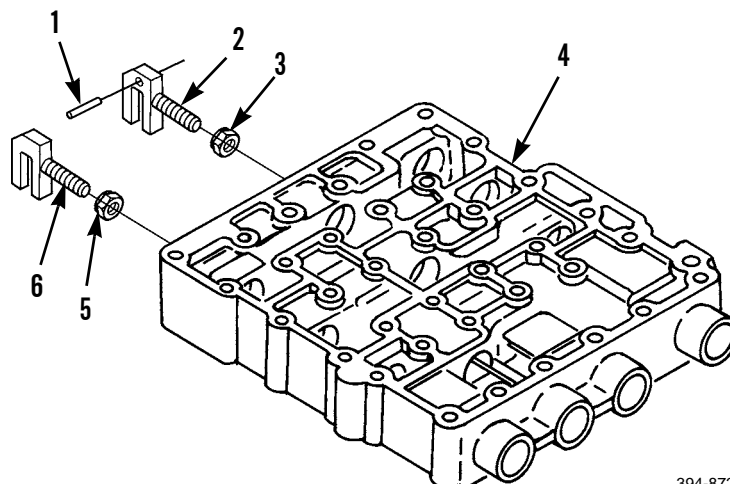
Manual selector valve removed (WP 0364 00)

**CAUTION**

Use care when handling transmission control valve assemblies and parts. Do not nick, scratch or scrape valve bodies or spools. Failure to follow this caution may result in damage to equipment.

**DISASSEMBLY**

1. Loosen nut (5) and remove link (6) from valve body (4). Remove nut from link.
2. Loosen three nuts (3) and links (2) from valve body (4).
3. Remove three nuts (3) and pins (1) from links (2).

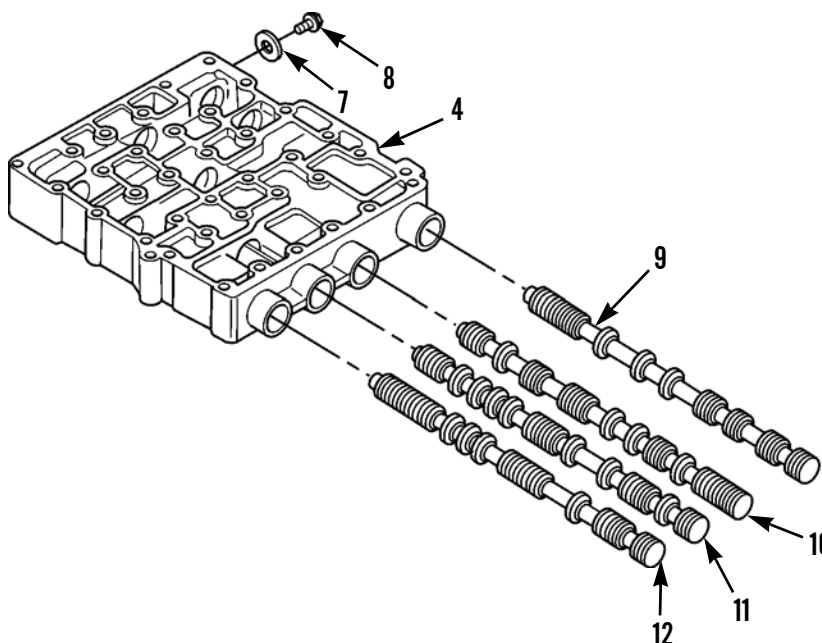


394-872

**DISASSEMBLY - CONTINUED****CAUTION**

Each spool must be tagged after disassembly and must be assembled in the same bore from which it were removed. Failure to follow this procedure could result in damage to equipment.

4. Remove four spools (9, 10, 11 and 12) from valve body (4).
5. Remove screw (8) and plate (7).



394-874

**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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

**CAUTION**

Do not use dirty cleaning solvent P-D-680 to clean transmission control valve assemblies and parts. Use only clean, fresh solvent that will leave no residue. Failure to follow this procedure could result in damage to equipment.

**CLEANING - CONTINUED**

1. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent.
3. Dry parts with compressed air.

**INSPECTION****CAUTION**

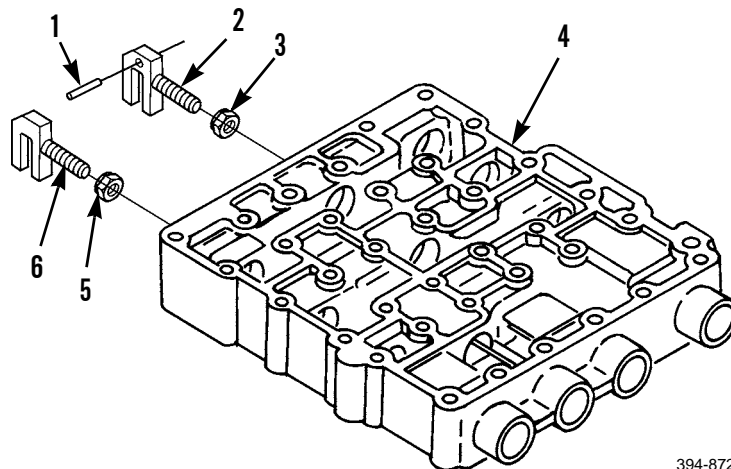
All parts are critical to the operation of the transmission control valve assembly and must be inspected closely. If defective parts are assembled, the transmission will not operate properly, resulting in damage to equipment.

Inspect all parts and replace if damaged.

**ASSEMBLY****CAUTION**

Exercise care to keep dust, dirt and other contaminants out of shift pressure valve assembly. Make sure hands, clothing and tools are clean. Do not assemble these parts where wind may carry airborne particles. Failure to follow this procedure could result in damage to equipment.

1. Install plate (7) and screw (8) in valve body (4).
2. Use clean lubricating oil to lubricate spools (9, 10, 11 and 12) and install. Be sure to install in the same bore from which they were removed.
3. Install three nuts (3) on links (2).
4. Install three links (2) in valve body (4).
5. Install three pins (1) in links (2).
6. Install nut (5) on link (6).
7. Install link (6) in valve body (4).
8. Adjust nuts (5 and 3) so that links (6 and 2) are in the same position.



394-872

9. Install manual selector valve in transmission (WP 0364 00).
10. Operate machine to verify correct transmission operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



**THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, automotive maintenance (Item 103, WP 0338 00)

Screw, 3/8 in. forcing (2)

**Materials/Parts**

Adhesive, loctite (Item 3, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Gasket

Packing, preformed (9)

**References**

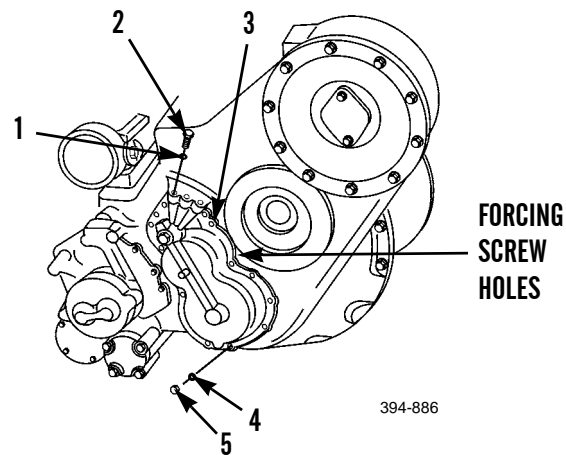
TM 5-3805-248-10

**Equipment Condition**

Transmission removed (WP 0286 00)

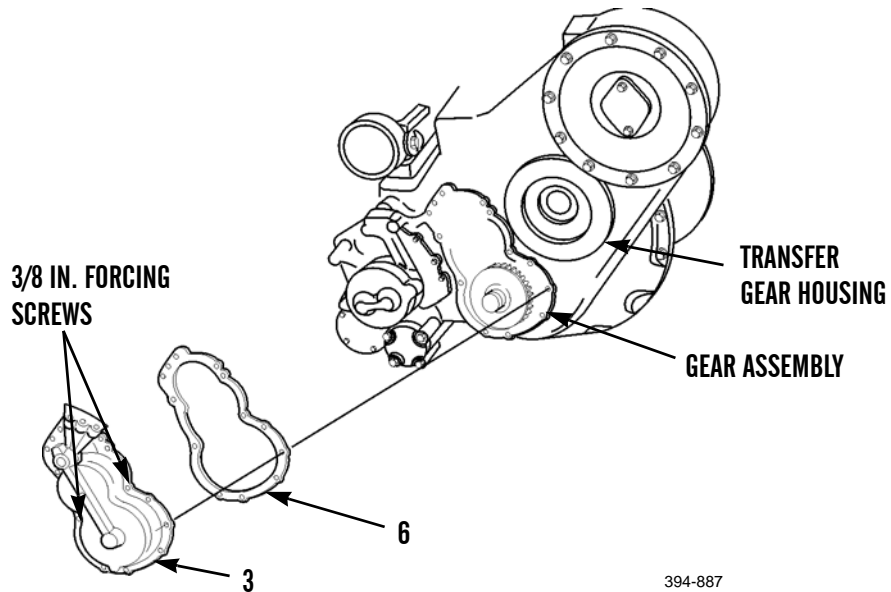
**REMOVAL**

1. Remove five plugs (2) and preformed packings (1). Discard preformed packings.
2. Remove 13 bolts (5) and washers (4).
3. Install two 3/8 in. forcing screws in cover (3).

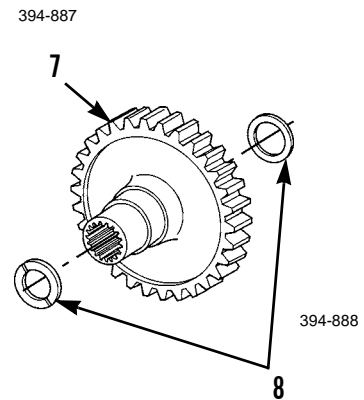


**REMOVAL - CONTINUED**

4. Tighten two 3/8 in. forcing screws and remove cover assembly, gasket (6) and gear assembly. Discard gasket.
5. Remove two 3/8 in. forcing screws from cover (3).



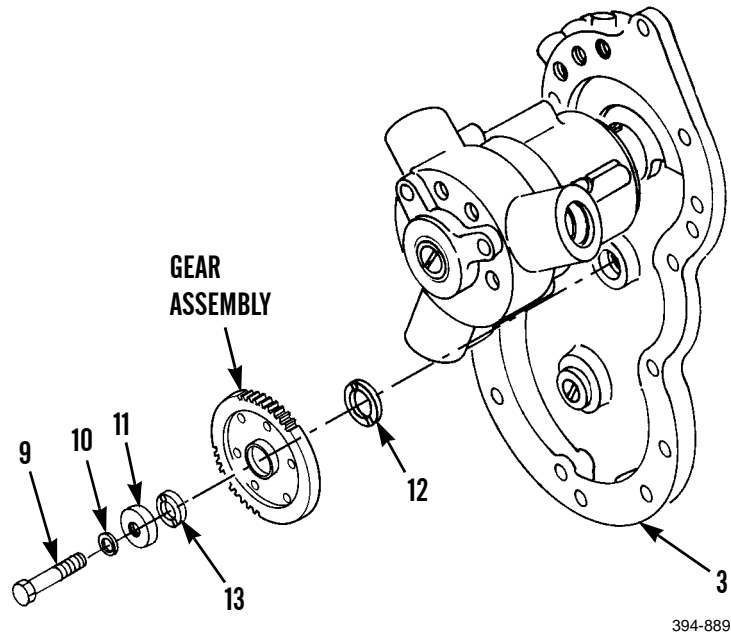
6. Remove two washers (8) from gear (7).



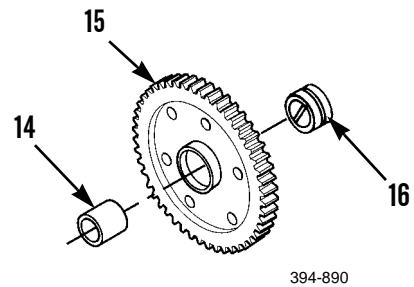


**REMOVAL - CONTINUED**

7. Remove bolt (9), washer (10), orifice (11), washer (13), gear assembly and washer (12) from cover (3).

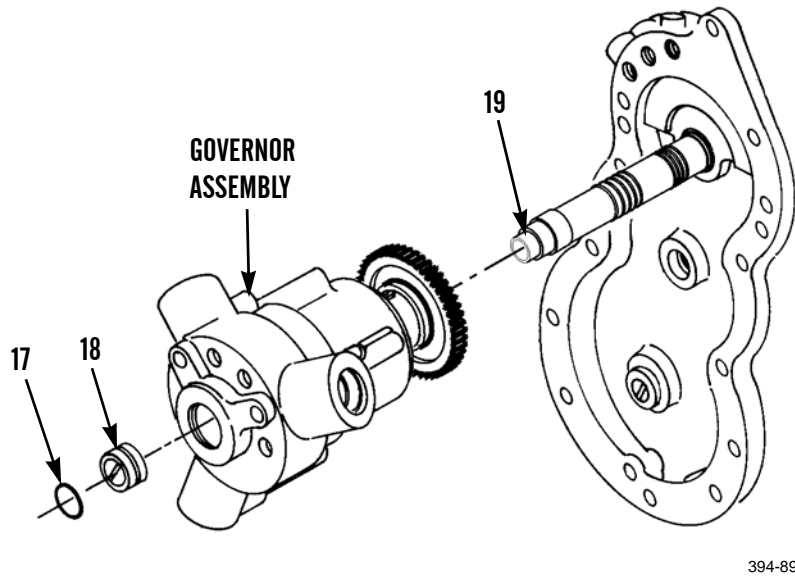


8. Use arbor press to remove bearing (16) and gear (15) from shaft (14).

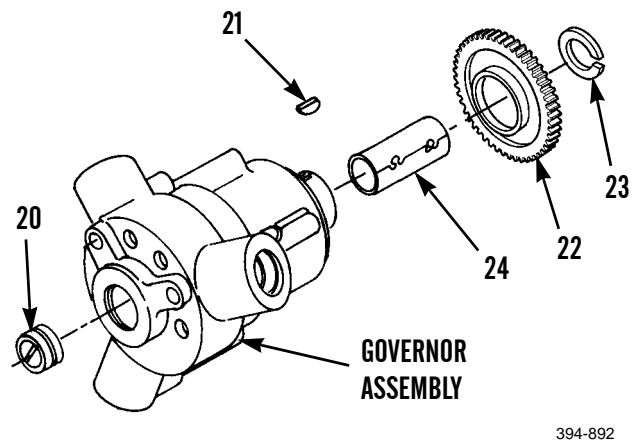


**REMOVAL - CONTINUED**

9. Remove preformed packing (17), washer (18) and governor assembly from shaft (19). Discard preformed packing.



10. Remove retaining ring (23), gear (22) and woodruff key (21) from governor assembly.
11. Remove bearings (20 and 24).

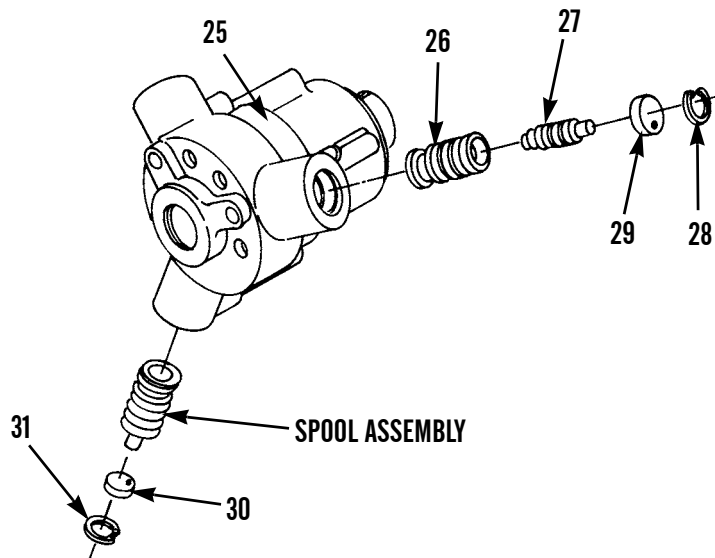


**DISASSEMBLY**

**NOTE**

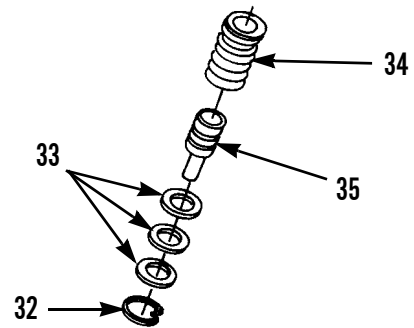
All parts removed from the governor valve bodies must be kept separate and installed in original position.

1. Use retaining ring pliers to remove retaining ring (28) from governor (25).
2. Remove stop (29), slug (27) and spool (26).
3. Use retaining ring pliers to remove retaining ring (31) from governor (25).
4. Remove stop (30) and spool assembly.



394-893

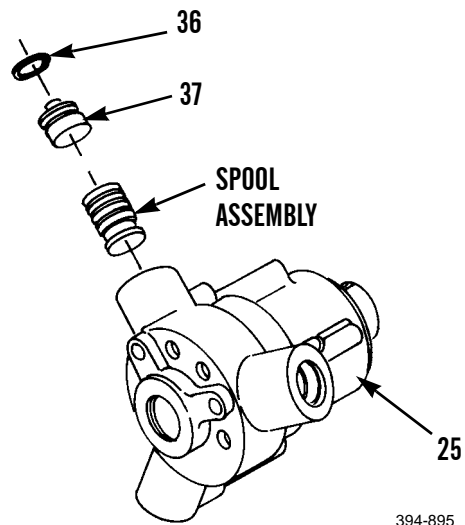
5. Use retaining ring pliers to remove retaining ring (32).
6. Remove three straps (33) and slug (35) from spool (34).



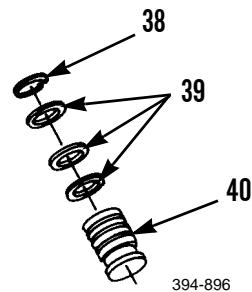
394-894

**DISASSEMBLY - CONTINUED**

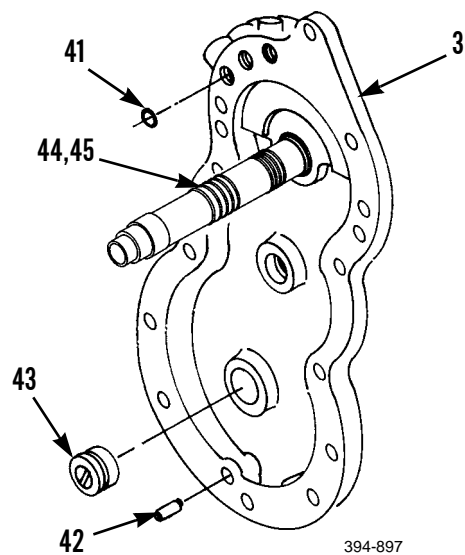
7. Use retaining ring pliers to remove retaining ring (36) from governor (25).
8. Remove stop (37) and spool assembly.



9. Use retaining ring pliers to remove retaining ring (38).
10. Remove three spacers (39) from spool (40).



11. Use dowel puller to remove dowel (42).
12. Remove and discard three preformed packings (41).
13. Use puller to remove bearing (43).
14. Use driver and hammer to remove shaft (44) from cover (3).
15. Remove three setscrews (45) from shaft (44).

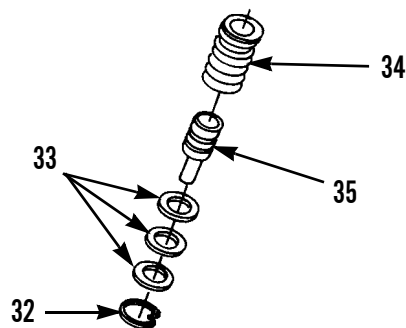


**CLEANING AND INSPECTION****WARNING**

- 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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.
1. Remove all gasket and preformed packing material from mounting surfaces.
  2. Clean all parts with solvent.
  3. Dry parts with compressed air.
  4. Inspect all parts and replace if damaged.

**ASSEMBLY**

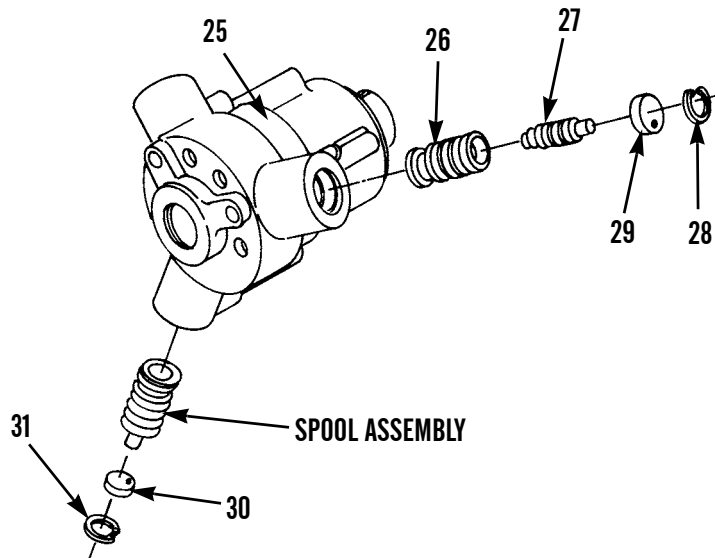
1. Apply loctite to threads of three setscrews (45) and install in shaft (44).
2. Lower temperature of shaft (44) and install in cover (3). Shaft (44) must extend  $4.969 \pm 0.005$  in. ( $126.21 \pm 0.13$  mm) above cover (3).
3. Use driver and hammer to install bearing (43) 0.020 in. (0.50 mm) below surface of cover (3).
4. Install three new preformed packings (41) and dowel (42). Dowel (42) must extend 0.28 in. (7.11 mm) above cover (3).
5. Install three spacers (39) in spool (40).
6. Use retaining ring pliers to install retaining ring (38), with bevel facing down.
7. Install spool assembly and stop (37) in governor (25).
8. Use retaining ring pliers to install retaining ring (36), with bevel facing down.
9. Install slug (35) and three spacers (33) in spool (34).
10. Use retaining ring pliers to install retaining ring (32), with bevel facing down.



394-894

**ASSEMBLY - CONTINUED**

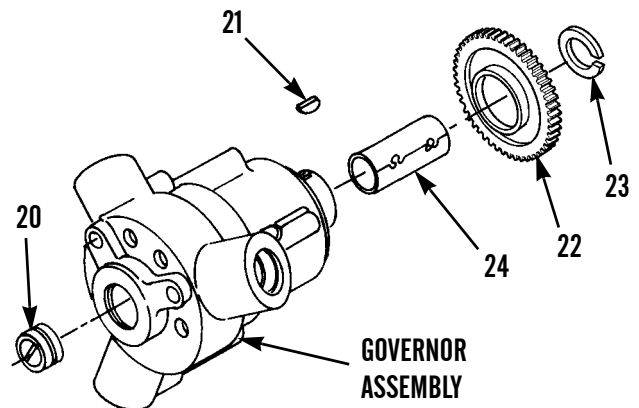
11. Install spool assembly and stop (30) in governor (25).
12. Use retaining ring pliers to install retaining ring (31), with bevel facing down.
13. Install spool (26), slug (27) and stop (29) in governor (25).
14. Use retaining ring pliers to install retaining ring (28), with bevel facing down.



394-893

**INSTALLATION**

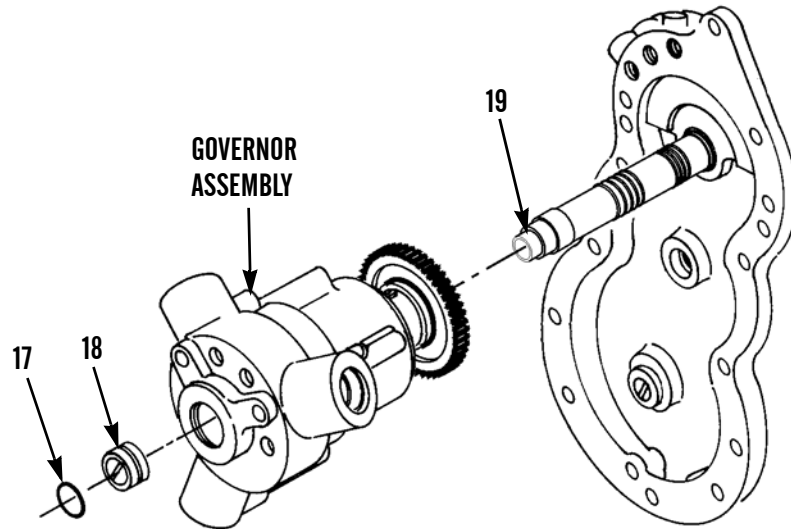
1. Install bearings (20 and 24) in governor assembly.
2. Install woodruff key (21), gear (22) and retaining ring (23).



394-892

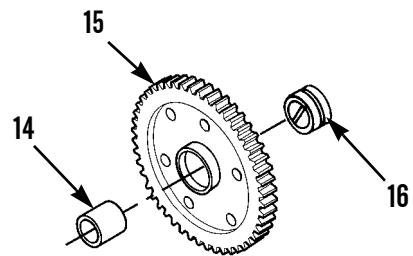
**INSTALLATION - CONTINUED**

3. Install governor assembly on shaft (19).
4. Install washer (18) and new preformed packing (17).



394-891

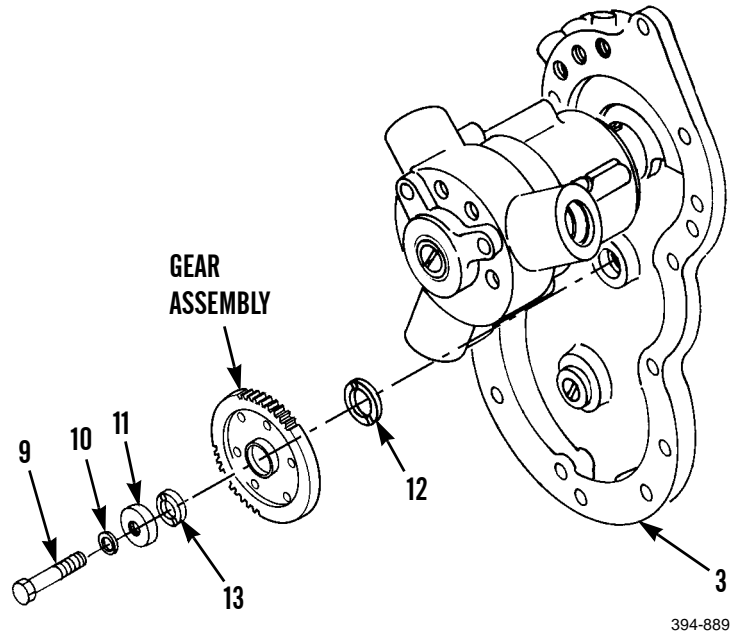
5. Use arbor press to install gear (15) and bearing (16) on shaft (14).



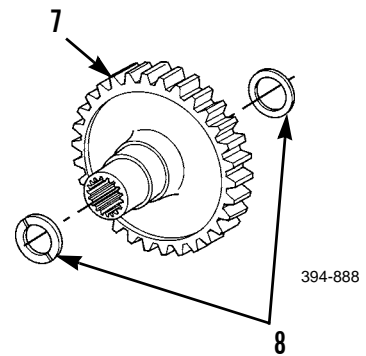
394-890

**INSTALLATION - CONTINUED**

- Install washer (12), gear assembly, washer (13), orifice (11), washer (10) and bolt (9) in cover (3). Torque bolt to 20 lb-ft (27 Nm).



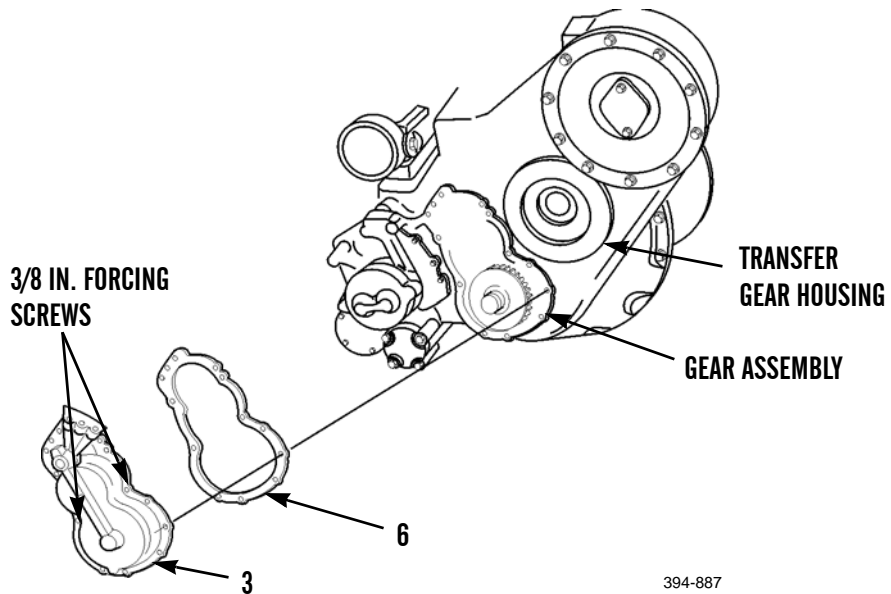
- Install two washers (8) on gear (7).



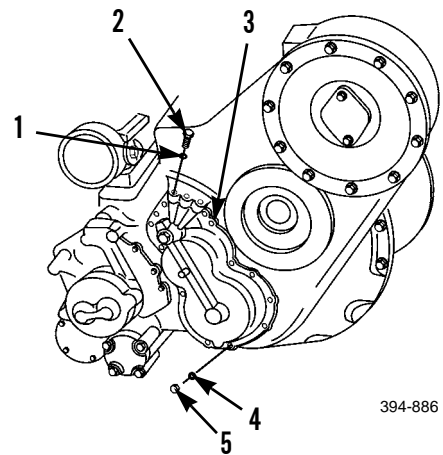


**INSTALLATION - CONTINUED**

8. Install gear assembly, new gasket (6) and cover assembly (3) on transfer gear housing.



9. Install 13 washers (4) and bolts (5) in cover (3).
10. Install five new preformed packings (1) and plug (2) in cover (3).



11. Install transmission (WP 0286 00).
12. Operate machine to verify correct transmission operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**TORQUE CONVERTER MAINTENANCE**

---

**0371 00****THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

Handle, driver (Item 35, WP 0338 00)

Plate, intermediate, friction clutch (Item 70, WP 0338 00)

Forcing screws 3/8-16NC (2)

Lifting device, 450 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Personnel Required**

Two

**References**

TM 10-5-3805-248-10

**Equipment Condition**Torque converter and planetary assembly removed from transmission case (WP 0373 00)

---

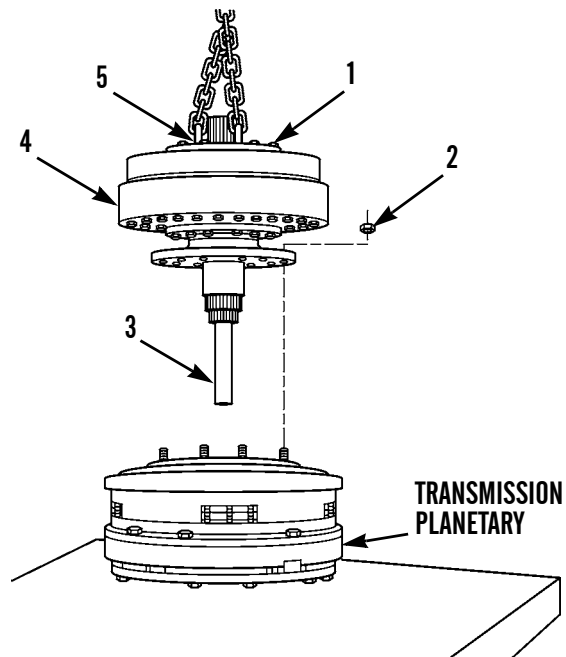
**REMOVAL****WARNING**

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**

Torque converter assembly weighs 300 lb (136 kg).

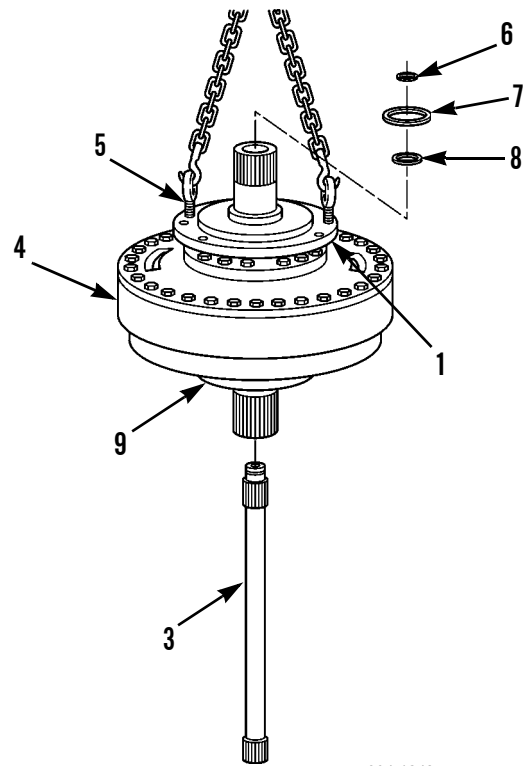
1. Install two link brackets (5) in flange assembly (1).
2. Attach lifting device to two link brackets (5).
3. Remove nine nuts (2) from torque converter (4).
4. Use lifting device to separate torque converter (4) from transmission planetary gear.



394-1247

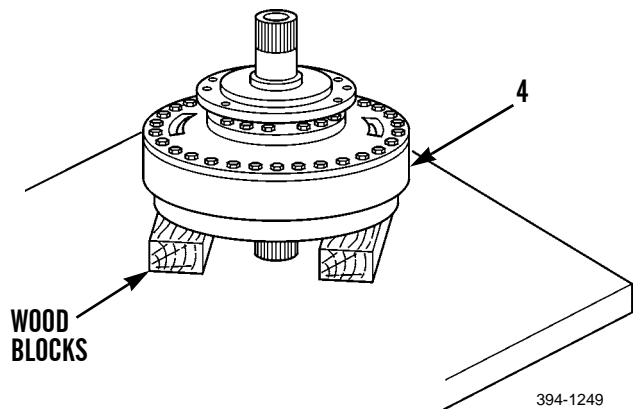
**REMOVAL - CONTINUED**

5. Suspend torque converter (4) with lifting device and support lower end of shaft (3).
6. Remove ring (6) and washer (7) from upper end of shaft (3).
7. Remove shaft (3) from torque converter (4).
8. Remove ring (8) from top of flange assembly (1).
9. Use lifting device to position torque converter (4) on its side, securing with wood blocks.
10. Remove lifting device and two link brackets (5) from flange assembly (1).
11. Install two link brackets (5) in carrier support (9) on opposite side of torque converter.
12. Attach lifting device to two link brackets (5).



394-1248

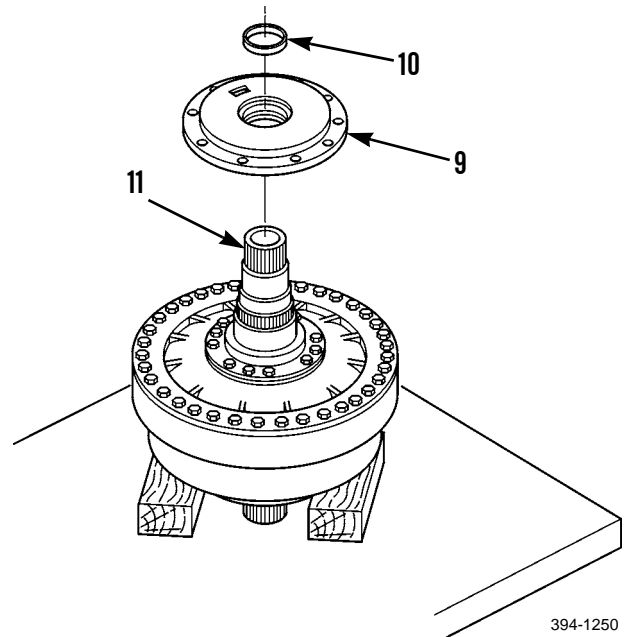
13. Use lifting device to raise torque converter (4) from its side position and lower to flat position on two wood blocks.
14. Remove lifting device and two link brackets (5).



394-1249

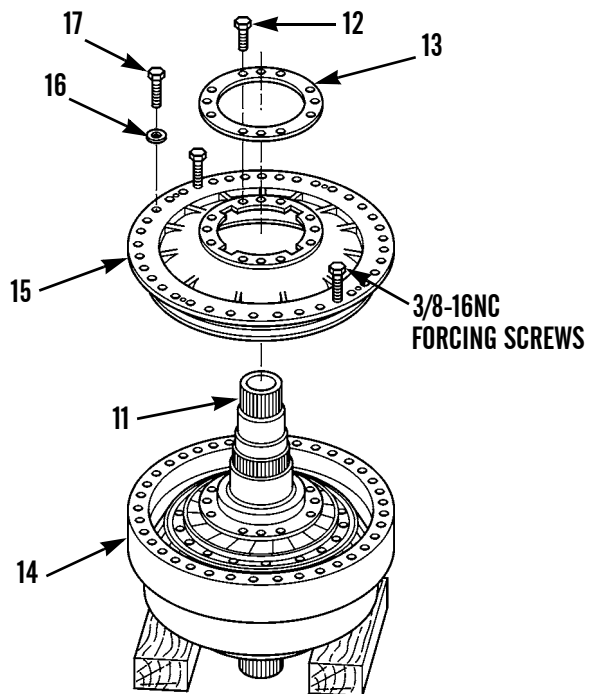
**DISASSEMBLY**

1. Remove retaining ring (10) and carrier support (9) from hub body (11).



394-1250

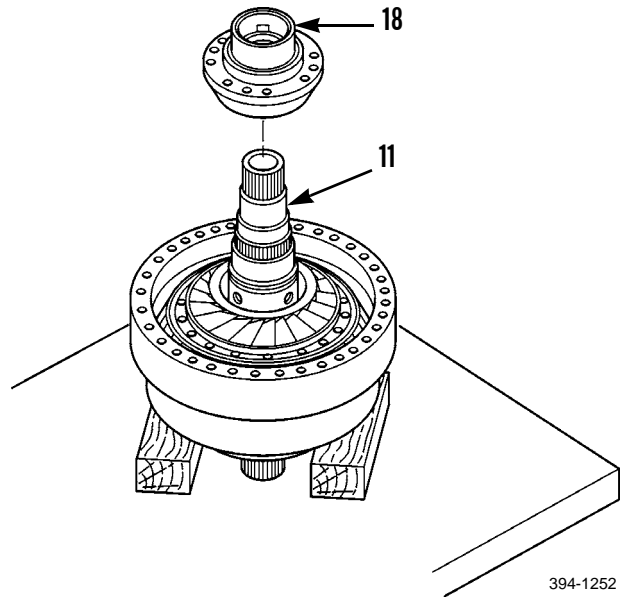
2. Remove 12 bolts (12) and spacer ring (13) from hub body (11).
3. Remove 36 bolts (17) and washers (16) from impeller (15).
4. Use a scribe to match-mark impeller (15) and housing (14) before removing impeller (15) to aid in proper assembly.
5. Install two 3/8-16NC forcing screws opposite each other in impeller (15).
6. Remove impeller (15) from hub body (11).



394-1251

**DISASSEMBLY - CONTINUED**

7. Remove impeller hub assembly (18) from hub body (11).

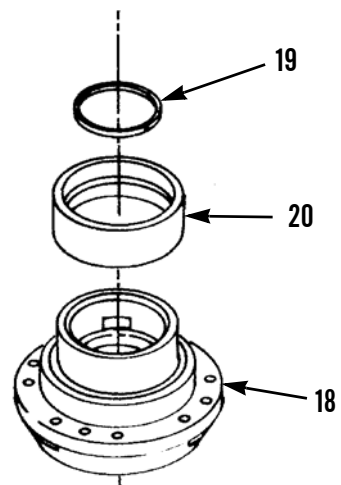


8. Remove race (19) from impeller hub (18).

**NOTE**

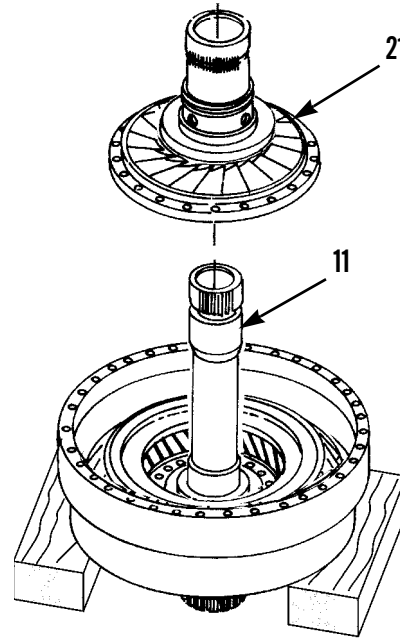
Removal of bearing from impeller hub will cause destruction of bearing. Remove bearing only if inspection indicates replacement is necessary.

9. Inspect bearing (20). If damaged, use bearing puller to remove bearing (20) from impeller hub (18).



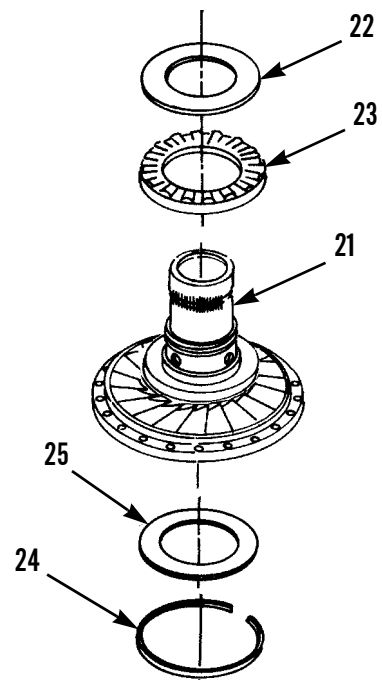
**DISASSEMBLY - CONTINUED**

10. Remove impeller assembly (21) from hub body (11).



394-1254

11. Remove race (22), retainer and roller (23), snap ring (24) and clutch disc (25) from impeller assembly (21).



394-1255

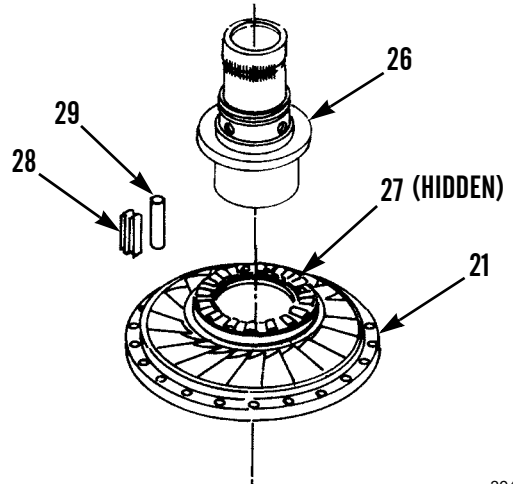


**DISASSEMBLY - CONTINUED**

**NOTE**

Removal of housing from camshaft will release 11 rollers and springs from cutaways in bore of camshaft.

12. Turn housing (26) to the right and remove by pulling from camshaft (27) in impeller (21).
13. Remove 11 rollers (29) and springs (28). If damaged, discard rollers and springs.

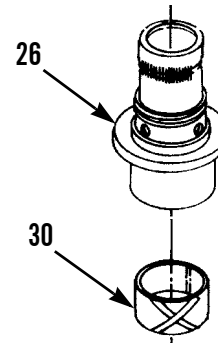


394-1256

**NOTE**

Removal of bearing from housing will cause destruction of bearing. Remove bearing only if inspection indicates replacement is necessary.

14. Inspect bearing (30). If damaged, use bearing puller to remove bearing (30) from housing (26).



394-1257

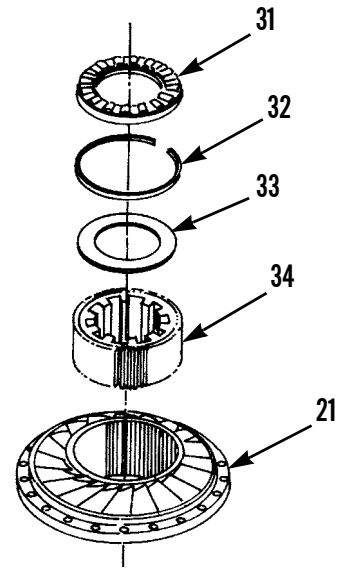
**DISASSEMBLY - CONTINUED**

15. Remove bearing (31), snap ring (32) and clutch disc (33) from impeller (21).

**NOTE**

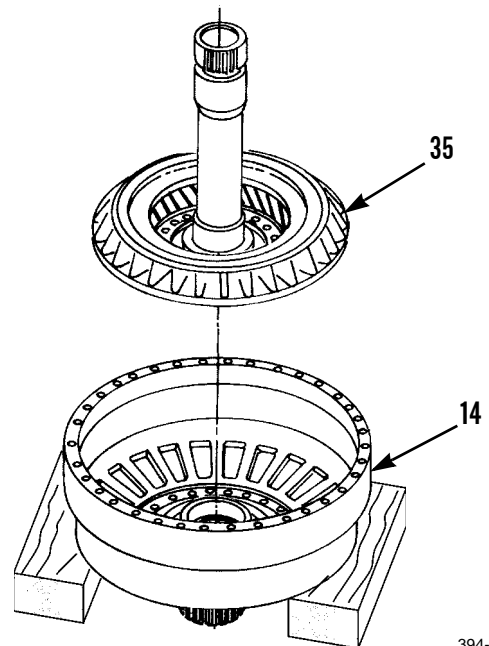
Remove cam only if inspection indicates replacement of impeller is necessary.

16. If damaged, remove cam (34) from impeller (21).



394-1258

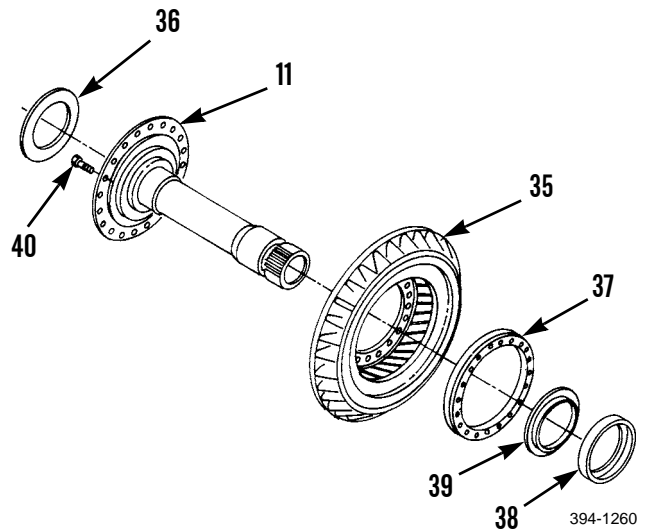
17. Remove impeller assembly (35) from housing (14).



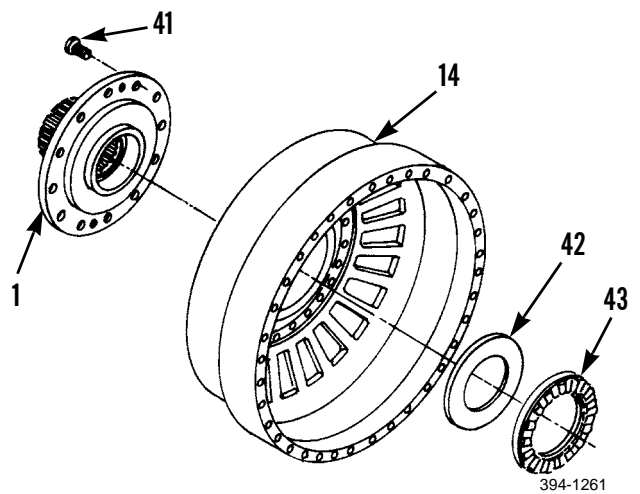
394-1259

**DISASSEMBLY - CONTINUED**

18. Remove bearing (38) and thrust bearing washer (39) from impeller (35).
19. Remove race (36) from hub body (11).
20. Use a scribe to match-mark hub body (11) and impeller (35) to aid in proper assembly.
21. Remove 20 bolts (40) from hub body (11).
22. Remove retainer clamp (37) from impeller (35).
23. Press hub body (11) from impeller (35).



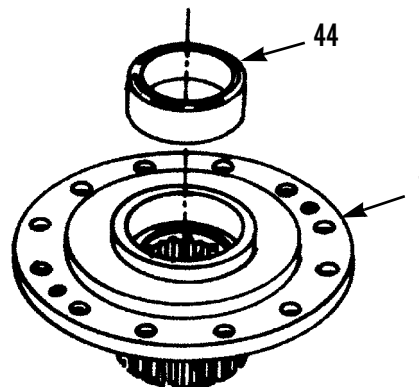
24. Remove retainer and roller (43) and race (42) from housing (14).
25. Remove 12 bolts (41) and flange assembly (1) from housing (14).



**DISASSEMBLY - CONTINUED****NOTE**

Removal of bearing from flange assembly will cause destruction of bearing. Remove bearing only if inspection indicates replacement is necessary.

26. Inspect bearing (44). If damaged, use bearing puller to remove bearing from flange assembly (1).



394-1262

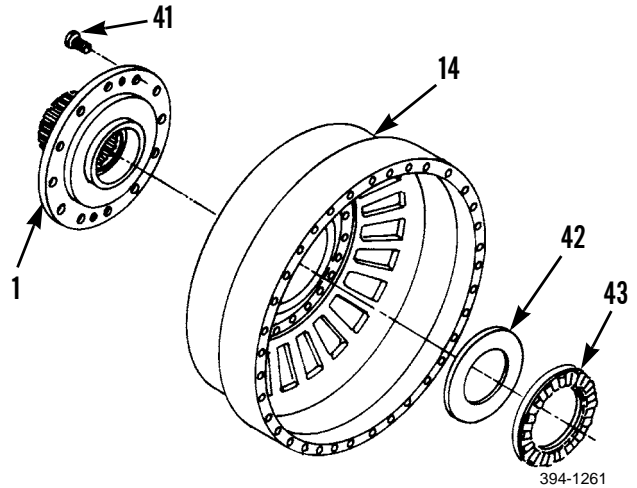
**CLEANING AND INSPECTION****WARNING**

- 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 cause 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.

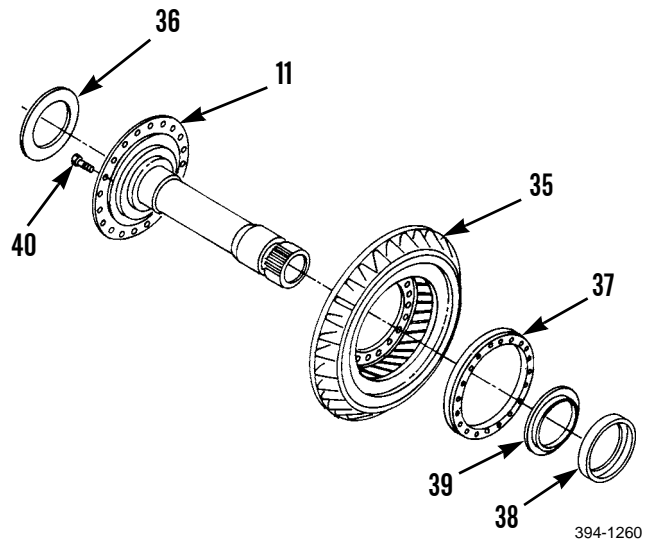
1. Remove all gasket and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. If removed, use handle and drive plate to install new bearing (44) in flange assembly (1).
2. Install flange assembly (1) and 12 bolts (41) on housing (14). Torque 12 bolts to 81 lb-ft (110 Nm).
3. Use clean oil to lubricate and install race (42) and retainer and roller (43) in housing (14).

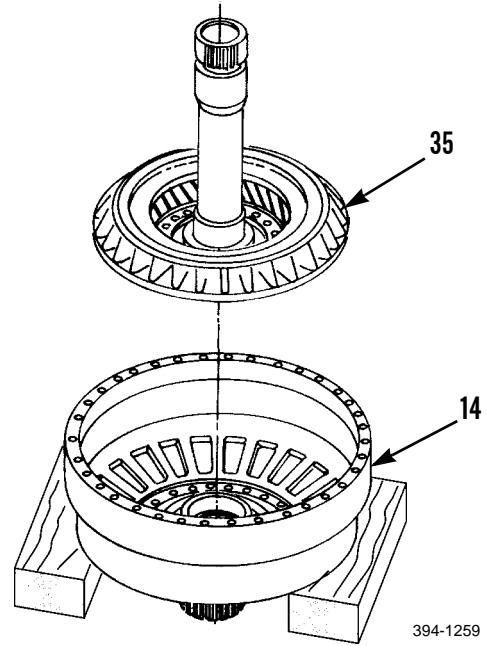


4. Use scribe marks made in disassembly to align and install hub body (11) in impeller (35).
5. Install retainer clamp (37) in impeller (35).
6. Install 20 bolts (40) in hub body (11) and torque to 36 lb-ft (49 Nm).
7. Use clean lubricating oil to lubricate race (36) and install on hub body (11).
8. Using clean oil, lubricate and install thrust bearing washer (39) and bearing (38) in impeller (35).

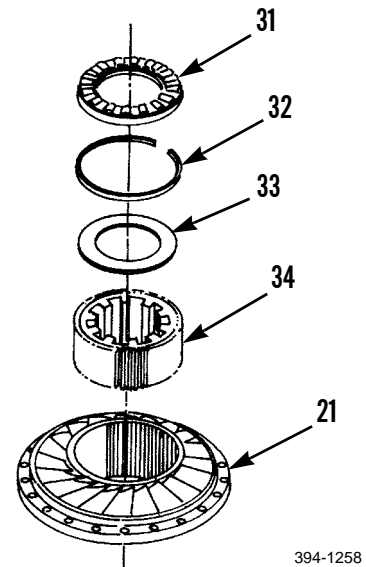


**ASSEMBLY - CONTINUED**

9. Install impeller assembly (35) in housing (14).

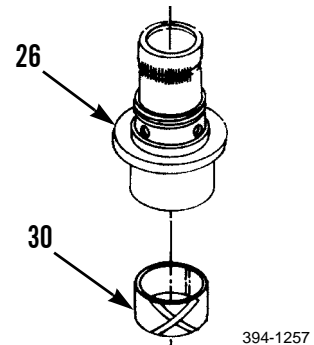


10. If replaced, heat new impeller (21) in oil and install cam (34), if removed, in new impeller (21). Align splines of cam (34) with those of new impeller (21).
11. Install clutch disc (33), snap ring (32) and bearing (31) in impeller (21).

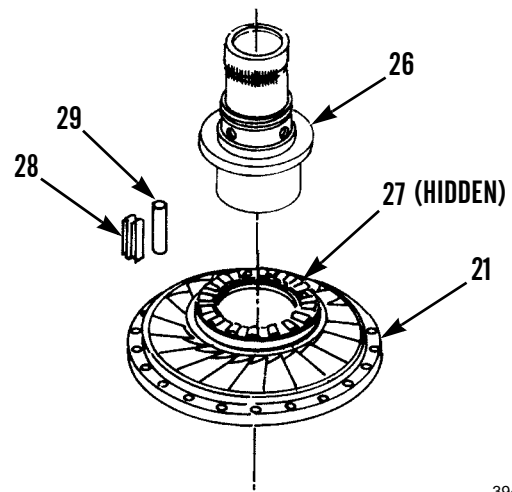


**ASSEMBLY - CONTINUED**

12. If removed, using a handle and drive plate, install new bearing (30) 0.16 in. (0.41 cm) deep in bore of housing (26).

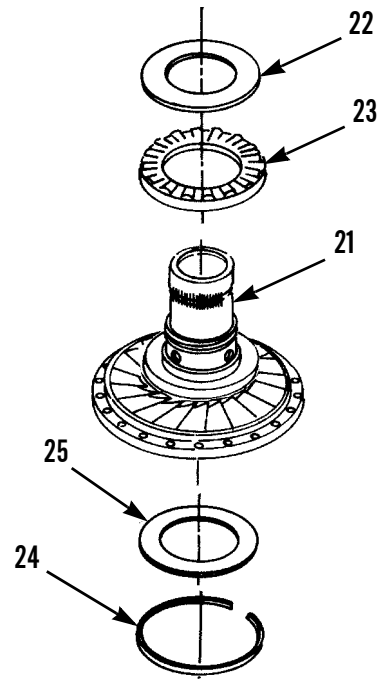


13. Install housing (26) in cam (27) of impeller (21).
14. Use clean oil to lubricate 11 rollers (29) and install 11 springs (28) and rollers (29) in slots between housing (21) and cam (27). Place 11 springs (28) in the wider area of the slot.



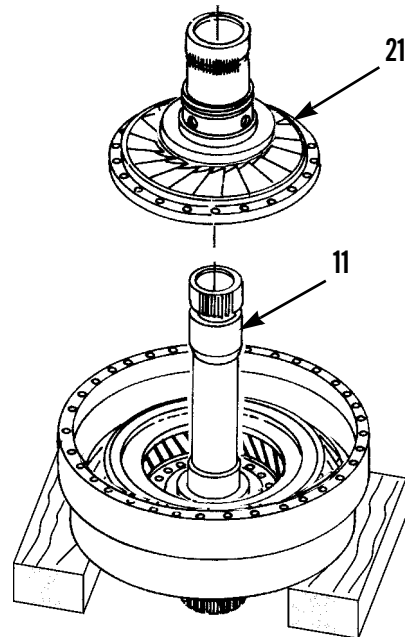
**ASSEMBLY - CONTINUED**

15. Use clean oil to lubricate and install clutch disc (25), snap ring (24), retainer and roller (23) and race (22) on housing (21).



394-1255

16. Install impeller assembly (21) on hub body (11).

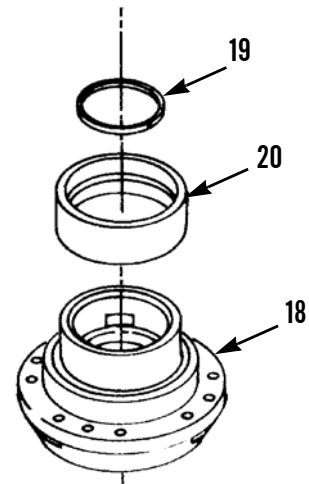


394-1254



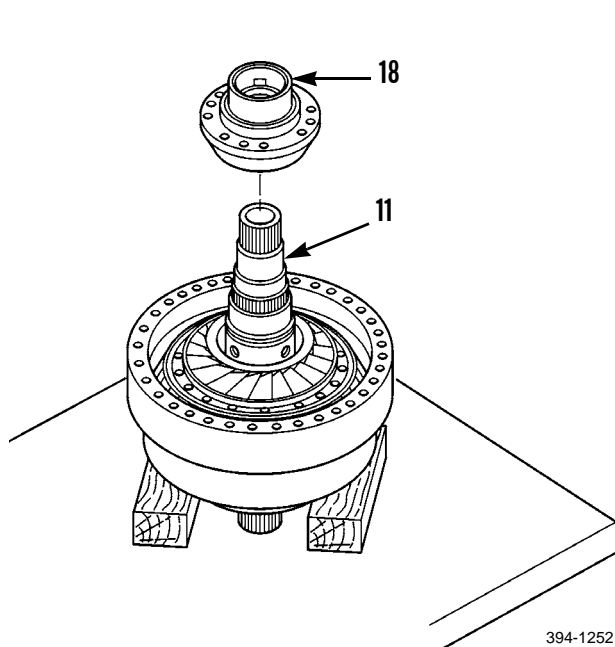
**ASSEMBLY - CONTINUED**

17. If removed, use a handle and drive plate to install new bearing (20) in impeller hub (18).
18. Install race (19) in impeller hub (18).

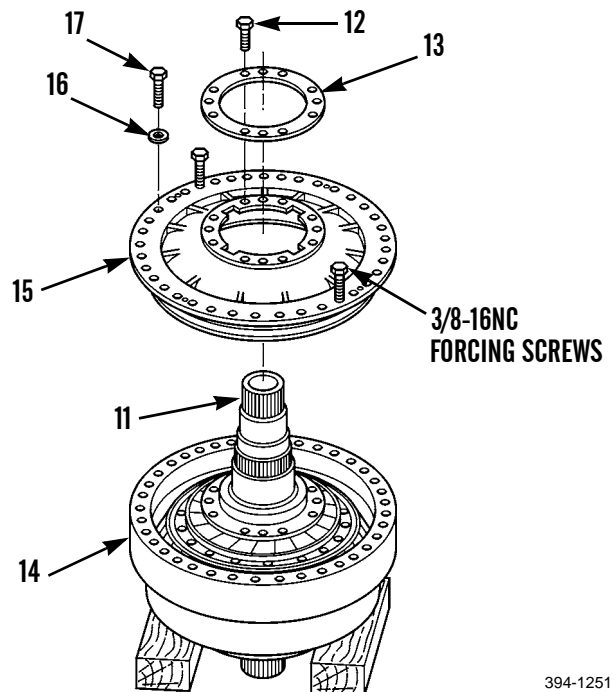


394-1253

19. Install impeller hub assembly (18) on hub body (11).
20. Use scribe marks made in disassembly to align impeller (15) with housing (14) and install on hub body (11).
21. Install 36 washers (16) and bolts (17) in impeller (15). Torque 36 bolts (17) to 36 lb-ft (49 Nm).
22. Install spacer ring (13) and 12 bolts (12) on hub body (11). Torque 12 bolts (8) to 36 lb-ft (49 Nm).



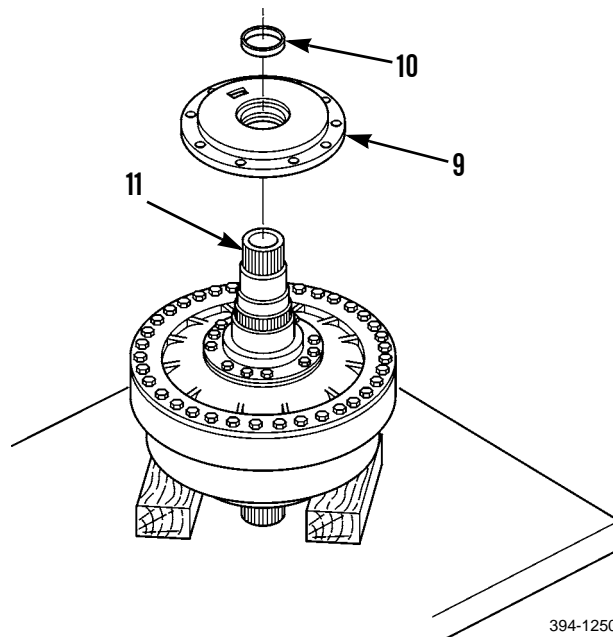
394-1252



394-1251

**ASSEMBLY - CONTINUED**

23. Install carrier support (9) and retaining ring (10) on hub body (11).

**INSTALLATION**

1. Install two link brackets (5) in carrier support (9).

**WARNING**

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.

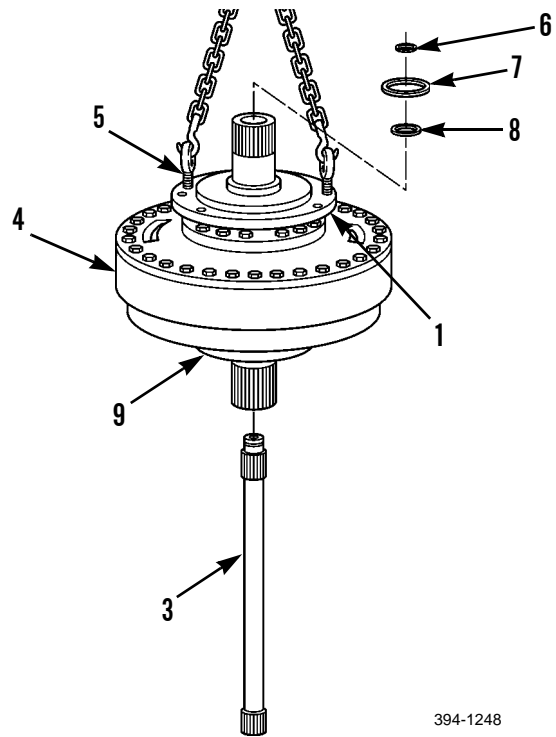
**NOTE**

Torque converter assembly weighs 300 lb (136 kg).

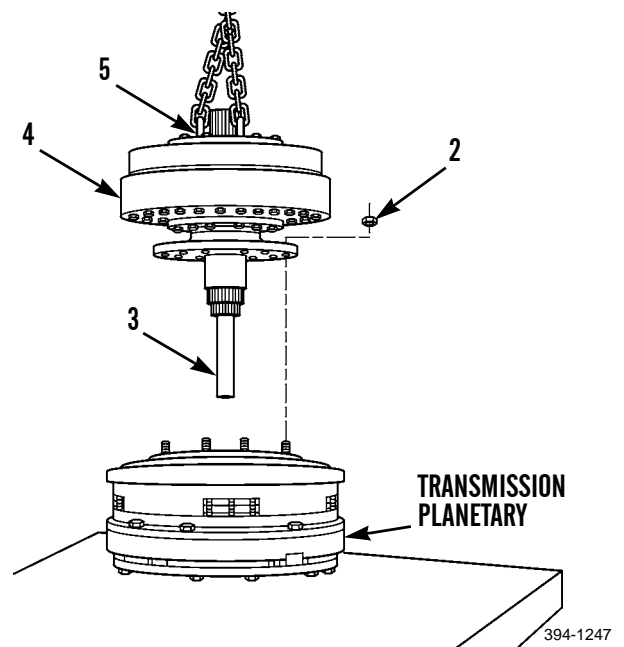
2. Attach lifting device to two link brackets (5).

**INSTALLATION - CONTINUED**

3. Use lifting device to position torque converter (4) on its side, securing with wood blocks.
4. Remove lifting device and two link brackets (5).
5. Install two link brackets (5) in flange assembly (1) on opposite side of torque converter.
6. Use lifting device to raise torque converter and suspend while installing shaft (3).
7. Install ring (8) on flange assembly (1).
8. Install shaft (3) through torque converter (4).
9. Install washer (7) and ring (6) on upward end of shaft (3).



10. Use lifting device to position torque converter (4) on transmission planetary gear.
11. Install nine nuts (2) to mount torque converter (4) on transmission planetary gear.
12. Remove lifting device and two link brackets (5).



13. Install torque converter and planetary assembly on transmission case (WP 0373 00).
14. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**TRANSMISSION CASE ASSEMBLY MAINTENANCE**

---

**0372 00****THIS WORK PACKAGE COVERS**Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

Lifting device, 500 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Materials/Parts - Continued**

Gasket (2)

Preformed, packing (5)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Pressure and selector valve assembly removed (WP 0364 00)

Transmission removed (WP 0286 00)

Differential removed from transmission (WP 0295 00)

Transfer gears removed from transmission (WP 0374 00)

---

**REMOVAL**

1. Install two link brackets (1) in transmission case (2).

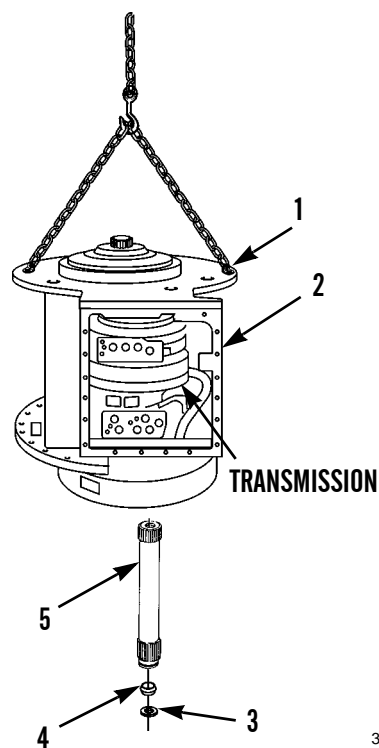
**WARNING**

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**

Weight of transmission case is 462 lb (210 kg).

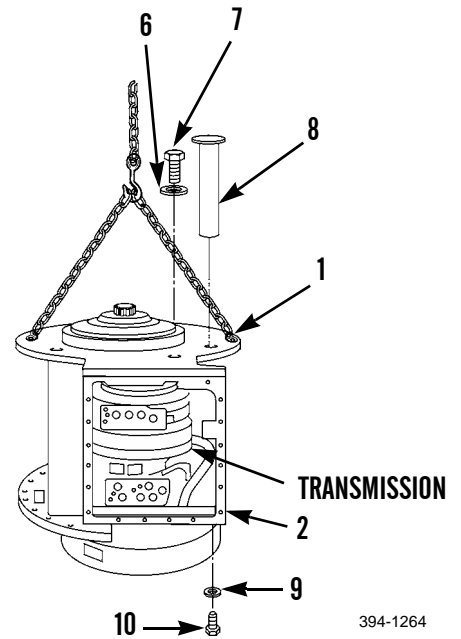
2. Install lifting device on two link brackets (1).
3. Lift transmission and case (2) off ground level.
4. Remove ring (3), adapter (4) and shaft (5).
5. Lower transmission and case (2) to ground level.



394-1263

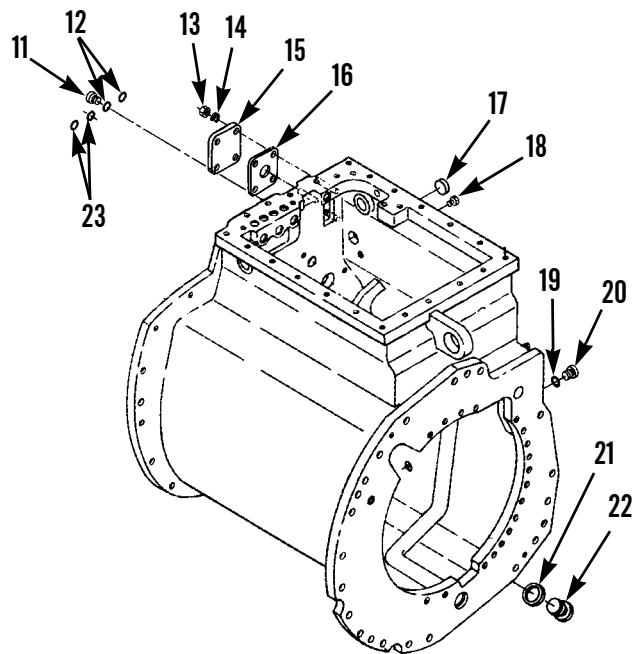
**REMOVAL - CONTINUED**

6. Remove 12 bolts (7) and washers (6) from transmission case (2).
7. Remove oil tube (8).
8. Remove 18 bolts (10) and washers (9).
9. Use lifting device to lift case (2) from transmission.
10. Lower case (2) to ground level.
11. Remove lifting device and two link brackets (1) from transmission case (2).



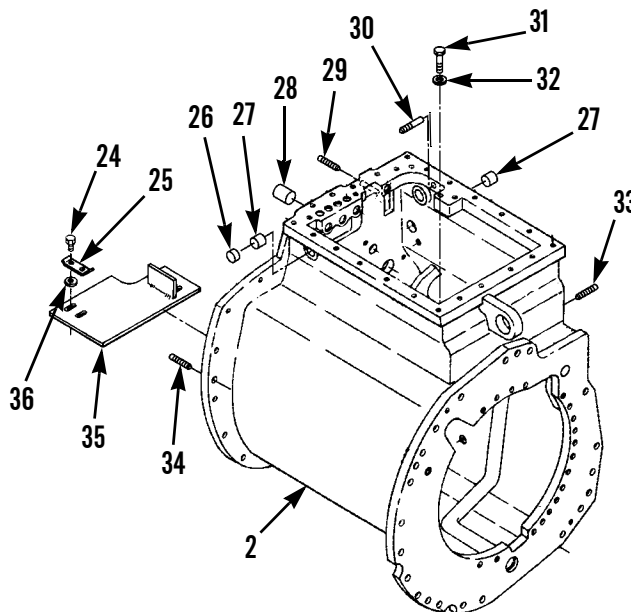
**DISASSEMBLY**

1. Remove plug (20) and preformed packing (19). Discard preformed packing.
2. Remove plug (22) and gasket (21). Discard gasket.
3. Remove plugs (17 and 18).
4. Remove four plugs (11) and two preformed packings (12 and 23). Discard preformed packings.
5. Remove four nuts (13) and washers (14).
6. Remove cover (15) and gasket (16). Discard gasket.



**DISASSEMBLY - CONTINUED**

7. Remove four bolts (24), two locks (25) and four washers (36) from baffle (35).
8. Remove baffle (35) from transmission case (2).
9. Remove four studs (29) and three studs (33).
10. Remove two dowels (34) and pin (30).
11. Remove plug (26) and three bearings (27).
12. Remove sleeve (28).
13. Remove bolt (31) and washer (32).



394-1266

**CLEANING AND INSPECTION****WARNING**

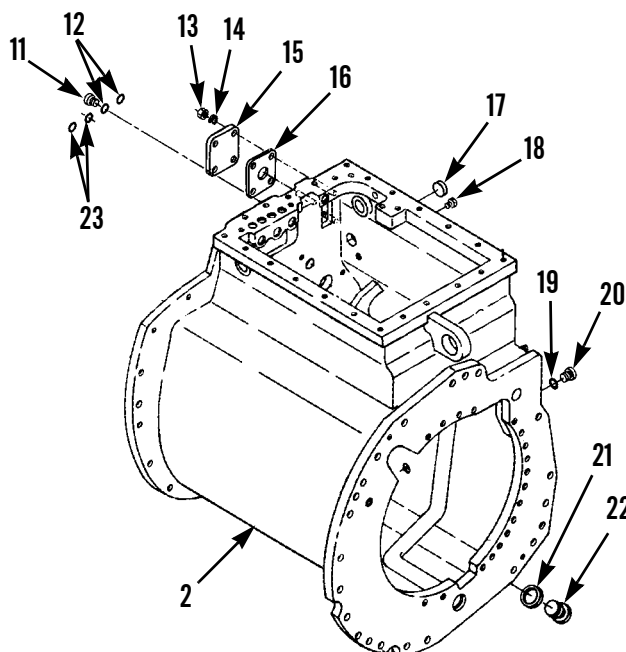
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Particles blown by 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 cause 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. Remove all gasket and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.



**ASSEMBLY**

1. Install washer (32) and bolt (31) in transmission case (2).
2. Install sleeve (28).
3. Install three bearings (27) and plug (26).
4. Install pin (30) and two dowels (34).
5. Install three studs (33) and four studs (29).
6. Install baffle (35).
7. Install four washers (36), two locks (25) and four bolts (24) in baffle (35).
8. Install new gasket (16) and cover (15) on transmission case (2).
9. Install four washers (14) and nuts (13).
10. Install two new preformed packings (12 and 23) and plugs (11).
11. Install plugs (18 and 17).
12. Install new gasket (21) and plug (22).
13. Install new preformed packing (19) and plug (20).



394-1265

**INSTALLATION**

1. Install two link brackets (1) in transmission case (2).

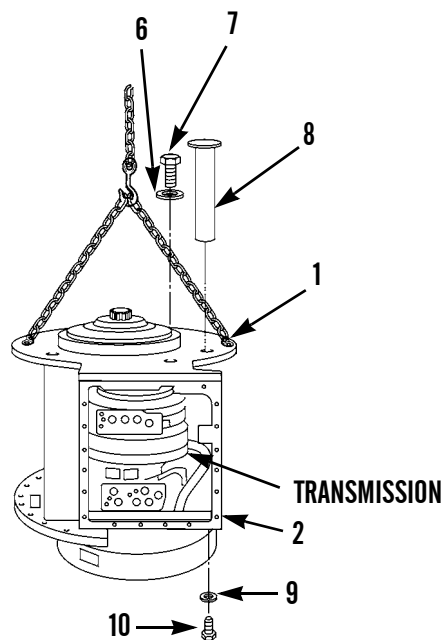
**WARNING**

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**

Weight of transmission case is 462 lb (210 kg).

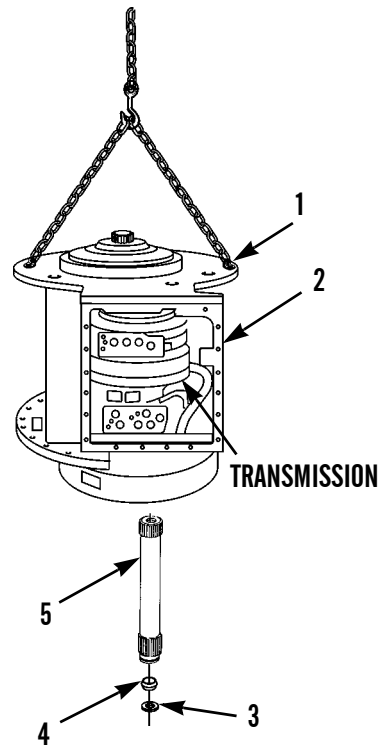
2. Install lifting device on two link brackets (1).
3. Use lifting device to lift transmission case (2) off ground level and position on transmission.
4. Install 18 washers (9) and bolts (10).
5. Install oil tube (8) in transmission case (2).
6. Install 12 washers (6) and bolts (7).
7. Use lifting device to lift transmission and case (2) off ground level.



394-1264

**INSTALLATION - CONTINUED**

8. Install shaft (5), adapter (4) and ring (3) in transmission case (2).
9. Lower transmission case (2) to ground level.
10. Remove lifting device and two link brackets (1).



394-1263

11. Install pressure and selector valve assembly (WP 0364 00).
12. Install transmission (WP 0286 00).
13. Install differential on transmission (WP 0295 00).
14. Install transfer gears on transmission (WP 0374 00).
15. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**TRANSMISSION PLANETARY REPAIR**

---

**0373 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bracket, link (Items 9 and 10, WP 0338 00)

Drive plates and handles

Forcing screws, 3/8-16NC (2)

Lifting bolts, (2)

Lifting device, 750 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating oil (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed (6)

Rivet (5)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**Torque converter removed (WP 0371 00)

---

**DISASSEMBLY**

1. Use a scribe to match-mark the clutch housing (4) and exposed plate surfaces to aid in assembly.
2. Install nine torque converter mounting nuts (1) on studs (2).
3. Install two link brackets (3) in number one clutch housing (4).



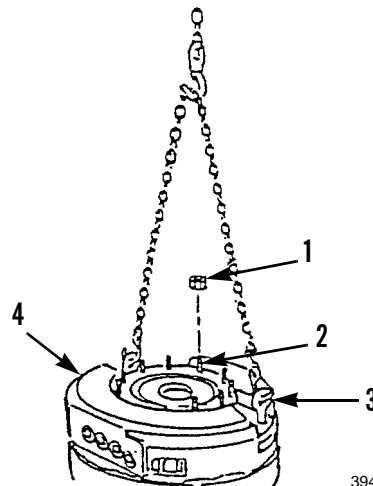
**WARNING**

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**

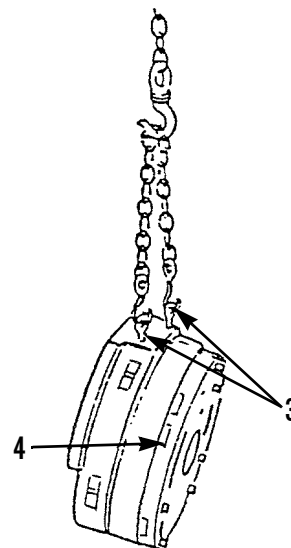
Weight of clutch assembly is 350 lb (159 kg).

4. Attach lifting device to two link brackets (3).
5. Lift number one clutch housing (4) and position on workbench.
6. Remove lifting device and two link brackets (3).



394-1267

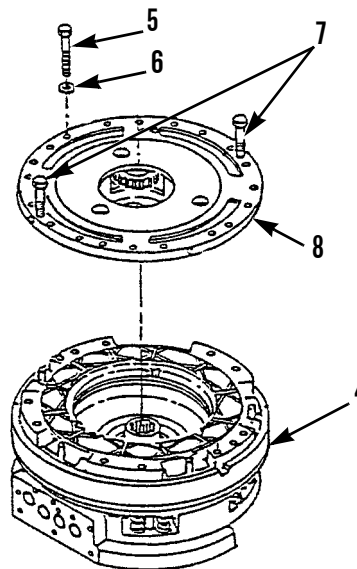
7. Install two link brackets (3) in number one clutch housing (4).
8. Attach lifting device to two link brackets (3).
9. Lift number one clutch housing (4) and reposition upside down on workbench.
10. Remove lifting device and two link brackets (3).



394-1268

**DISASSEMBLY - CONTINUED**

11. Remove 10 bolts (5) and washers (6) from number one clutch housing (4).
12. Install two lifting bolts (7) to aid in lifting.
13. Remove planetary gear assembly (8).
14. Remove two lifting bolts (7).
15. Turn over planetary gear assembly (8).



394-1269

**NOTE**

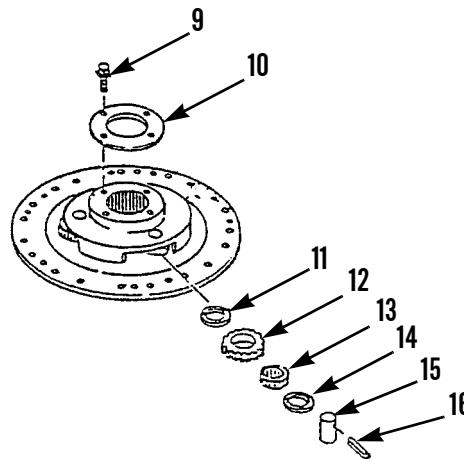
There are three shaft assemblies of this type in carrier. The following disassembly procedure is for one shaft assembly. The disassembly procedure for the remaining two shaft assemblies is identical.

16. Remove four bolts (9) and plate (10).

**NOTE**

Remove spring pin only if inspection indicates replacement is necessary.

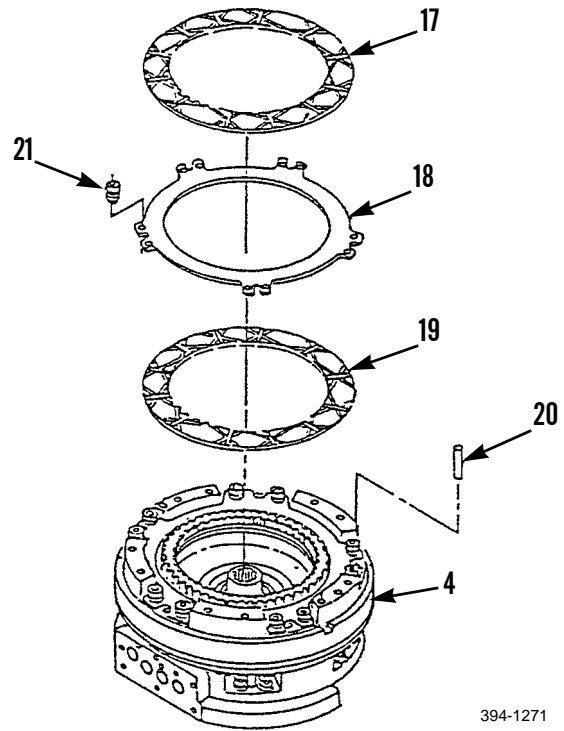
17. Using pin punch and hammer, depress spring pin (16) into center of shaft (15).
18. Remove spring pin (16) and shaft (15).
19. Remove spring pin (16) from shaft (15).
20. Remove thrust washer (14).
21. Remove bearing (13) and gear (12).
22. Use driver and hammer to remove bearing (13) from gear (12).
23. Remove thrust washer (11).



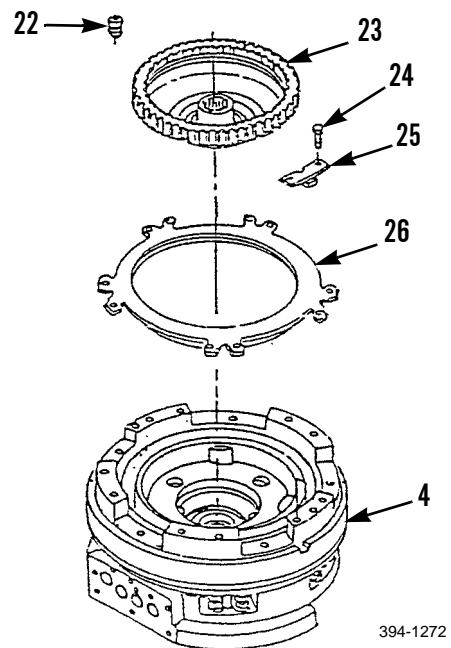
394-1270

**DISASSEMBLY - CONTINUED**

- 24. Remove five pins (20) and ten springs (21) from number one clutch housing (4).
- 25. Remove friction disc (17), clutch plate (18) and friction disc (19).



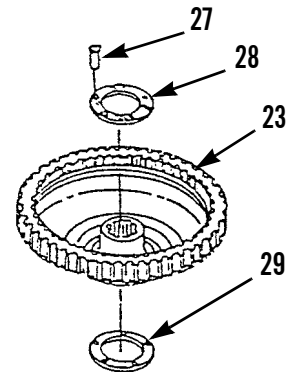
- 26. Remove 10 springs (22) and ring gear assembly (23).
- 27. Remove ten bolts (24) and five plates (25).
- 28. Remove piston assembly (26).





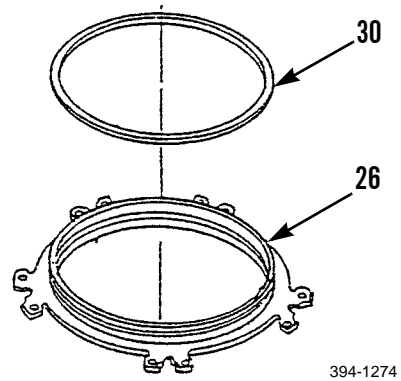
**DISASSEMBLY - CONTINUED**

29. Remove and discard five rivets (27).
30. Remove washers (28 and 29) from ring gear (23).

**NOTE**

Remove seal ring only if inspection indicates replacement is necessary.

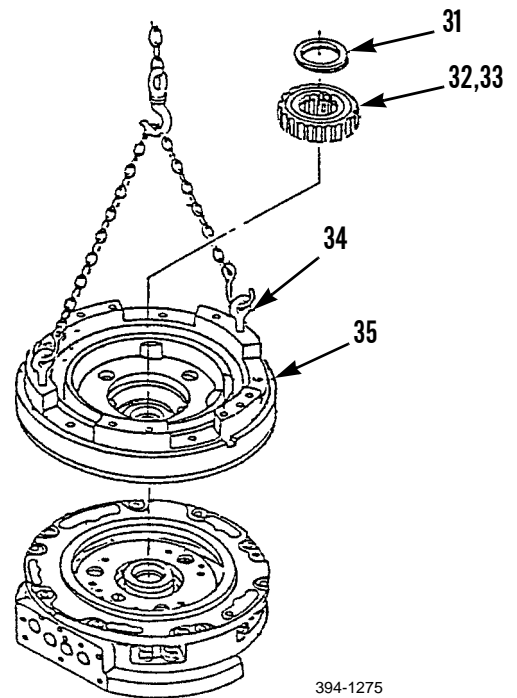
31. If damaged, remove seal ring (30) from piston (26).



**DISASSEMBLY - CONTINUED****WARNING**

Eye protection must be worn when performing maintenance where components could fly out during procedure. Failure to take precautions could cause injury.

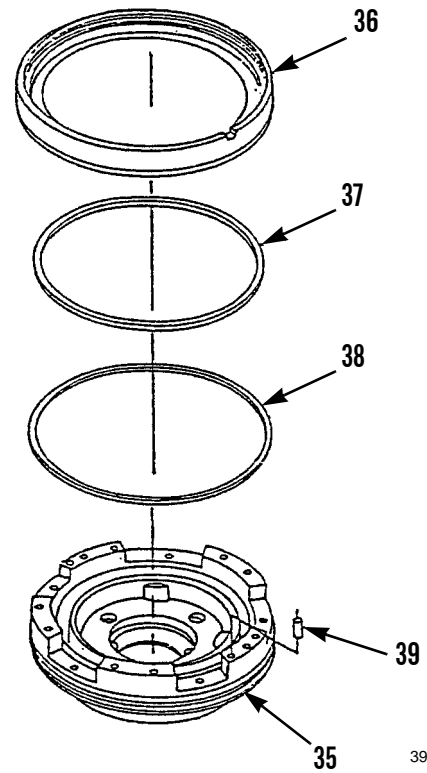
32. Remove snap ring (31), gear (32) and retaining ring (33).
33. Install two link brackets (34) in housing assembly (35) and attach lifting device.
34. Remove housing assembly (35).
35. Remove lifting device and two link brackets (34).



394-1275

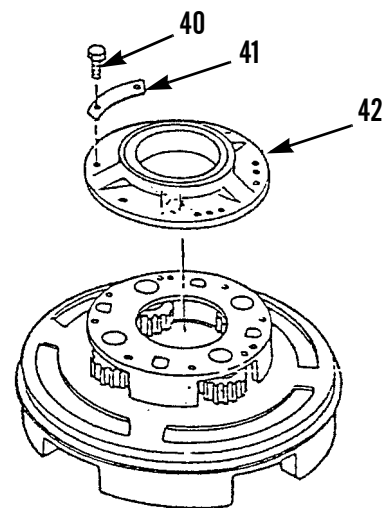
**DISASSEMBLY - CONTINUED**

36. Remove piston (36).
37. Remove and discard preformed packings (37 and 38).
38. Remove two dowels (39).
39. Turn over housing assembly (35).



394-1276

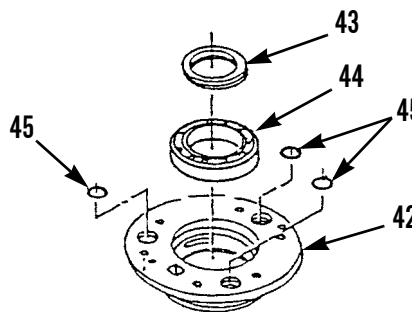
40. Match-mark cage with carrier before removal to aid in assembly.
41. Bend three lock tabs (41) away from six bolts (40).
42. Remove six bolts (40) and three lock tabs (41).
43. Remove cage assembly (42) and place upside down on workbench.



394-1277

**DISASSEMBLY - CONTINUED**

44. Remove and discard three preformed packings (45).
45. Remove ring (43).
46. Use suitable driver and hammer to remove bearing (44) from cage (42).

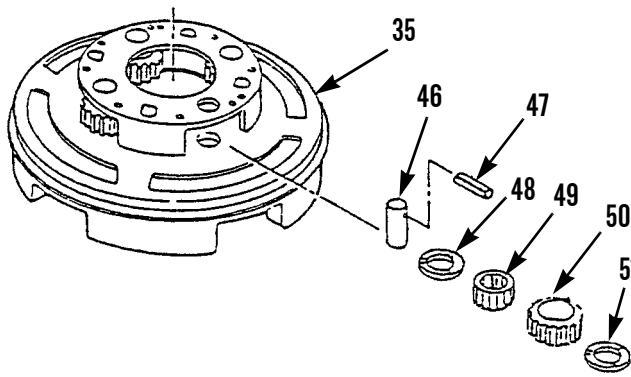


394-1278

**NOTE**

- There are three shaft assemblies in carrier. The following disassembly procedure is for one shaft assembly. The disassembly procedure for the remaining two shaft assemblies is identical.
- Remove spring pin only if inspection indicates replacement is necessary.

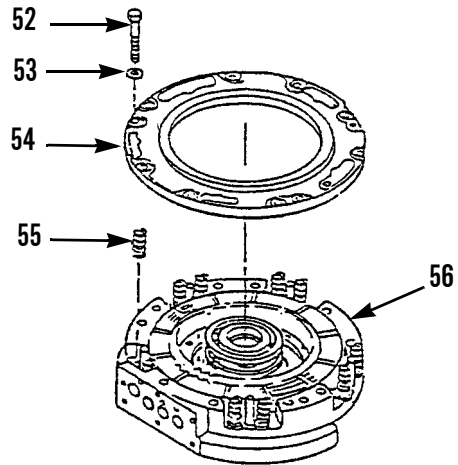
47. Use pin punch and hammer to depress spring pin (47) into center of shaft (46).
48. Remove spring pin (47) and shaft (46) from housing (35).
49. Remove spring pin (47) from shaft (46).
50. Remove thrust washer (48).
51. Remove bearing (49) and gear (50) from housing (35).
52. Use suitable driver and hammer to remove bearing (49) from gear (50).
53. Remove thrust washer (51).



394-1279

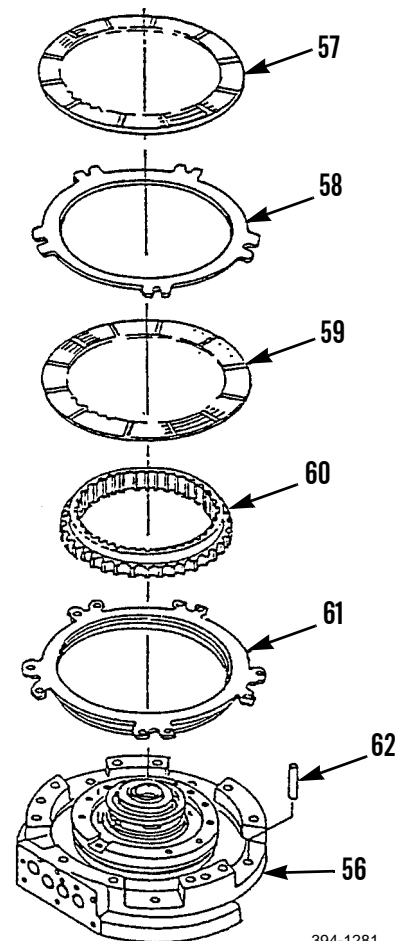
**DISASSEMBLY - CONTINUED**

- 54. Remove 10 bolts (52), washers (53) and cover plate (54) from clutch housing (56).
- 55. Remove 10 springs (55) from clutch housing (56).



394-1280

- 56. Remove five pins (62) from clutch housing (56).
- 57. Remove friction disc (57), clutch plate (58) and friction disc (59).
- 58. Remove ring gear (60).
- 59. Remove piston assembly (61).



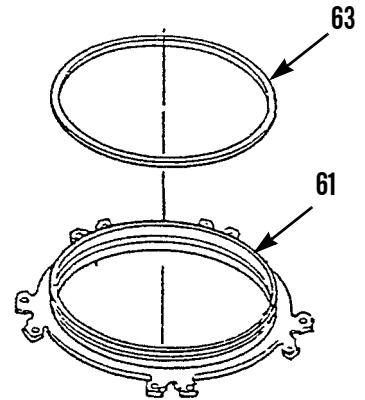
394-1281

**DISASSEMBLY - CONTINUED**

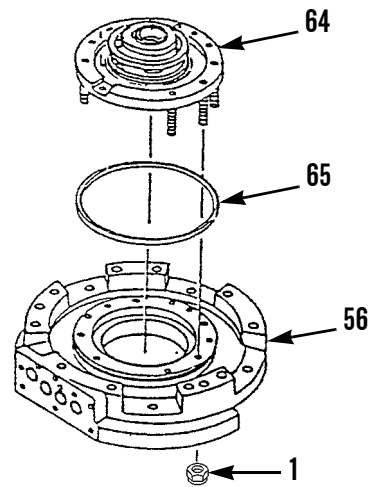
**NOTE**

Remove seal ring only if inspection indicates replacement is necessary.

- 60. If damaged, remove seal ring (63) from piston (61).

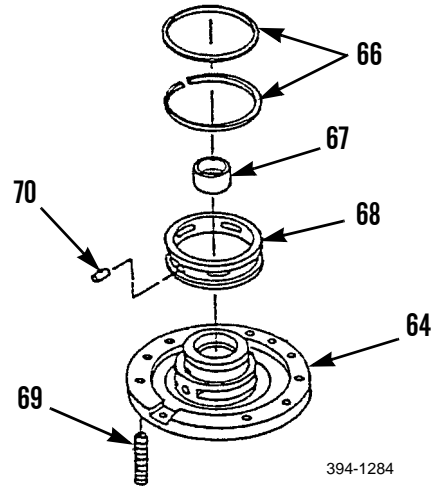


- 61. Remove nine torque converter mounting nuts (1) from clutch housing (56).
- 62. Remove center manifold assembly (64).
- 63. Remove seal ring (65).

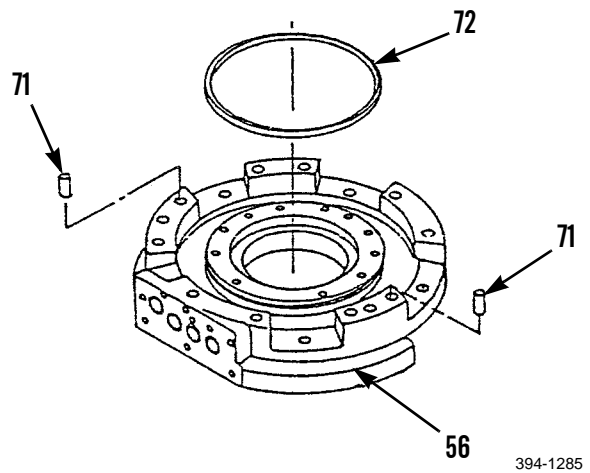


**DISASSEMBLY - CONTINUED**

- 64. Remove two seal rings (66) from center manifold assembly (64).
- 65. Use suitable driver and hammer to remove bearing (67).
- 66. Remove pin (70) and carrier (68).
- 67. Remove nine studs (69) from center manifold (64).

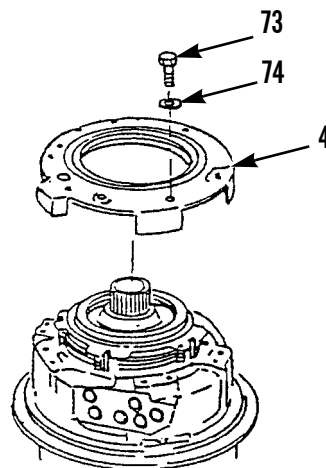


- 68. Remove two dowels (71) and seal ring (72) from clutch housing (56).



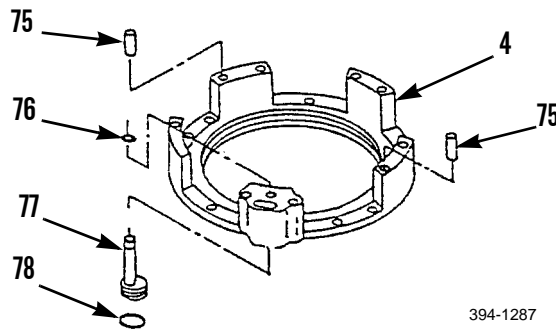
**DISASSEMBLY - CONTINUED**

- 69. Remove seven bolts (73) and washers (74) from number one clutch housing (4).
- 70. Remove number one clutch housing (4).



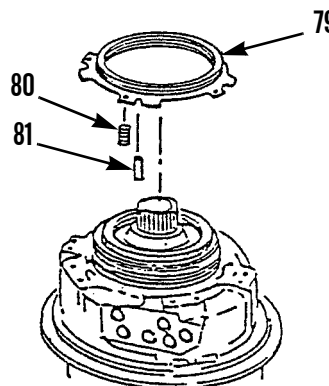
394-1286

- 71. Remove ring (76) from number one clutch housing (4).
- 72. Remove plug (77) and preformed packing (78). Discard preformed packing.
- 73. Remove two dowels (75) from number one clutch housing (4).



394-1287

- 74. Remove piston assembly (79) from planetary assembly.
- 75. Remove five pins (81) and springs (80).



394-1288

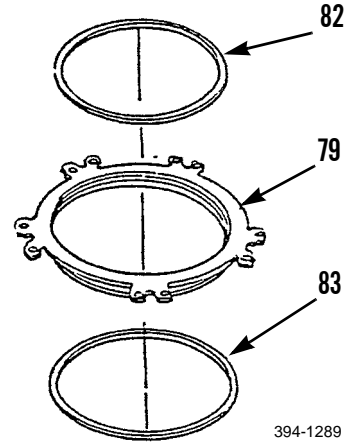


**DISASSEMBLY - CONTINUED**

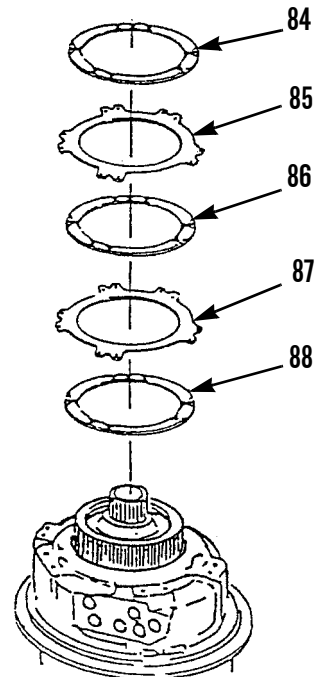
**NOTE**

Remove seal rings only if inspection indicates replacement is necessary.

76. If damaged, remove seal rings (82 and 83) from piston (79).



77. Remove friction disc (84), clutch plate (85), friction disc (86), clutch plate (87) and friction disc (88).



**DISASSEMBLY - CONTINUED**

78. Install two link brackets (3) in planetary assembly.

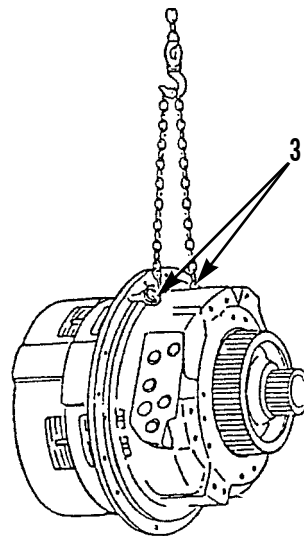
**WARNING**

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**

Weight of transmission is 600 lb (272 kg).

79. Attach lifting device to two link brackets (3).
80. Raise planetary assembly and position on workbench with input end up.
81. Remove lifting device and two link brackets (3).



394-1291

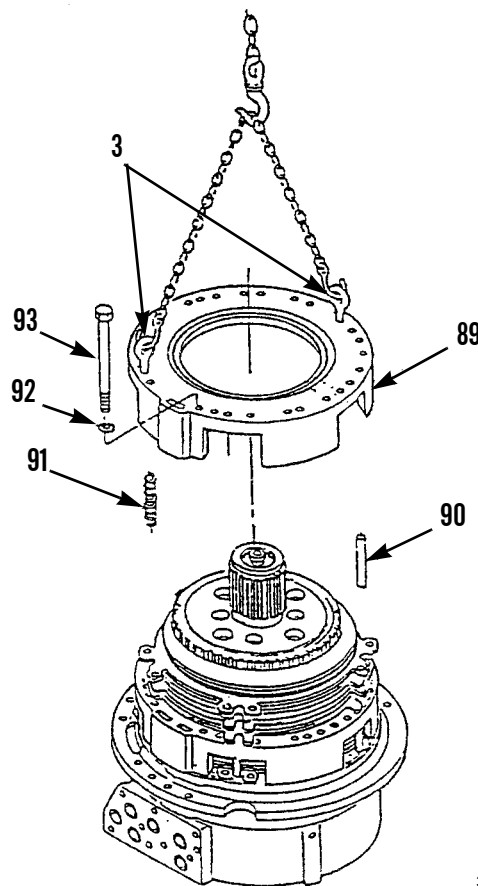
**DISASSEMBLY - CONTINUED****WARNING**

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**

- Weight of number seven piston housing is 65 lb (29 kg).
- When removing number seven piston housing, do not allow piston to fall out.

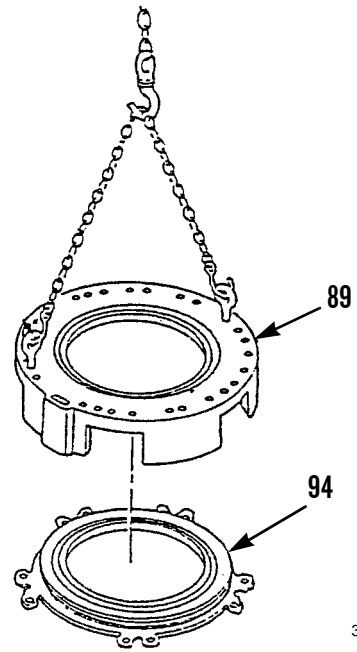
82. Install two link brackets (3) and lifting device on number seven piston housing (89).
83. Remove 16 bolts (93) and washers (92).
84. Use lifting device to remove number seven piston housing (89).
85. Remove five pins (90) and ten springs (91) from planetary assembly.



394-1292

**DISASSEMBLY - CONTINUED**

86. Remove piston assembly (94) from number seven piston housing (89).

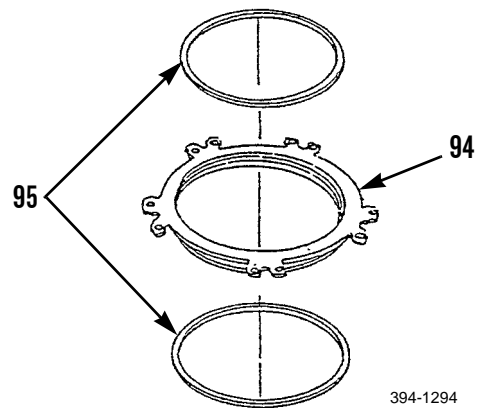


394-1293

**NOTE**

Remove seal rings only if inspection indicates replacement is necessary.

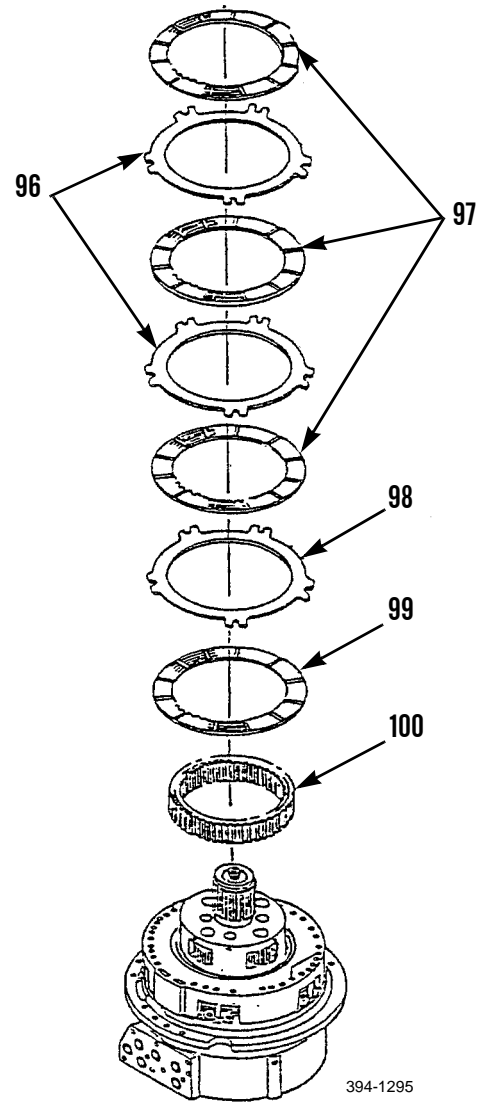
87. If damaged, remove two seal rings (95) from piston (94).



394-1294

**DISASSEMBLY - CONTINUED**

- 88. Remove three friction discs (97), two clutch plates (96), friction disc (97), clutch plate (98) and friction disc (99).
- 89. Remove ring gear (100) from planetary assembly.



394-1295

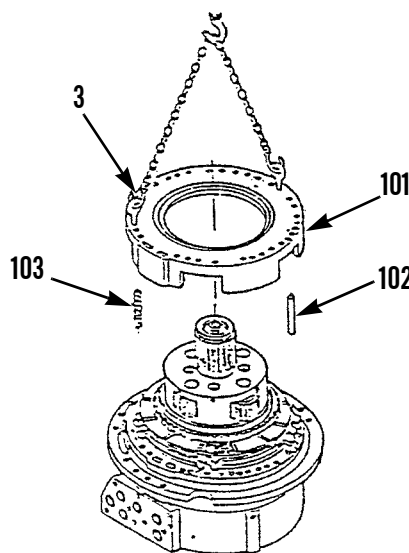
**DISASSEMBLY - CONTINUED****WARNING**

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**

- Weight of number six piston housing is 50 lb (23 kg).
- When removing number six piston housing, do not allow piston to fall out.

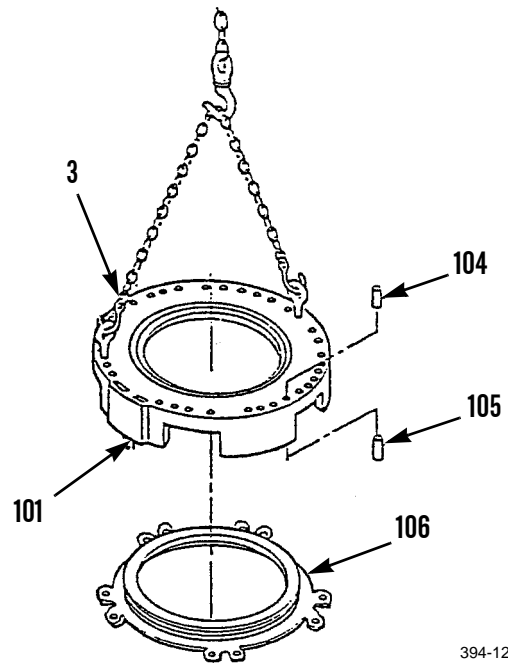
90. Install two link brackets (3) and attach lifting device.
91. Remove number six piston assembly (101) from planetary assembly.
92. Remove five pins (102) and ten springs (103).



394-1296

**DISASSEMBLY - CONTINUED**

93. Remove piston assembly (106) from number six clutch housing (101).
94. Remove dowels (104 and 105).

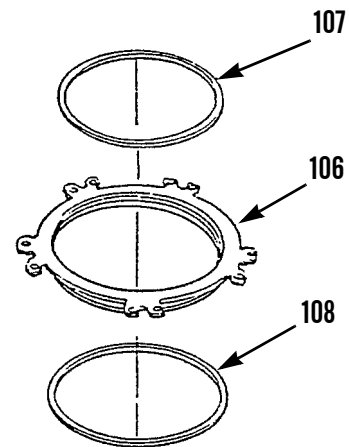


394-1297

**NOTE**

Remove seal rings only if inspection indicates replacement is necessary.

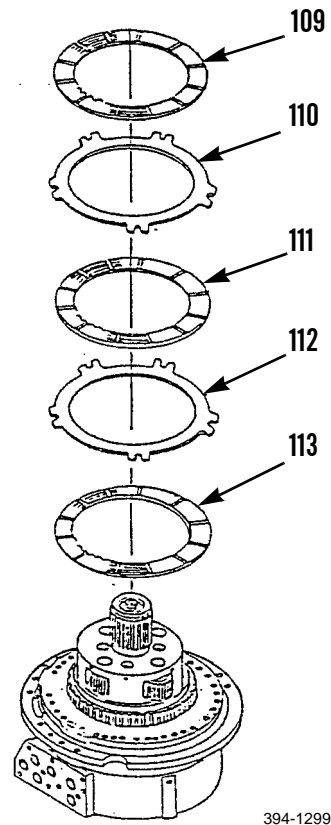
95. If damaged, remove seal rings (107 and 108) from piston (106).



394-1298

**DISASSEMBLY - CONTINUED**

96. Remove friction disc (109), clutch plate (110), friction disc (111), clutch plate (112) and friction disc (113) from planetary assembly.



394-1299



**DISASSEMBLY - CONTINUED**

97. Remove retaining ring (114) from carrier assembly (115).

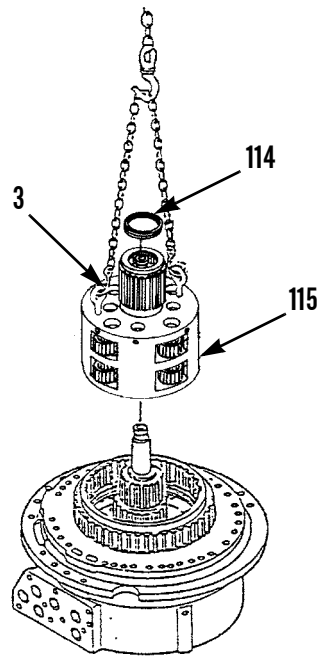
**WARNING**

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**

Weight of carrier assembly is 75 lb (34 kg).

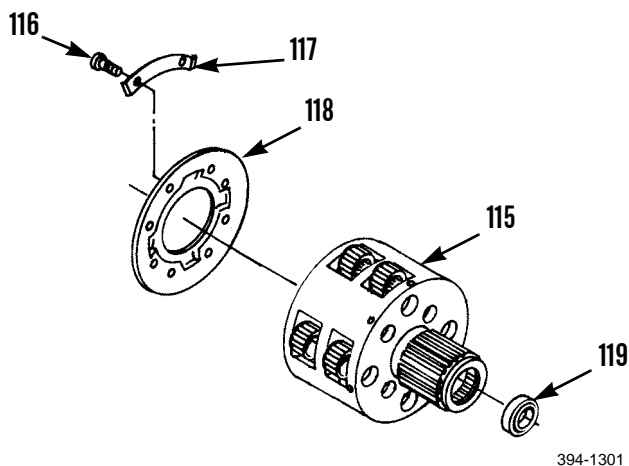
98. Install two link brackets (3) and lifting device.  
99. Remove carrier assembly (115) from planetary assembly.  
100. Remove lifting device and two link brackets (3).



394-1300

**DISASSEMBLY - CONTINUED**

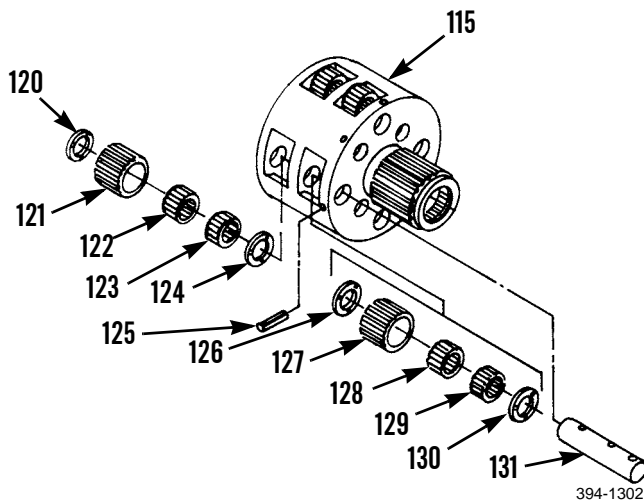
101. Bend four lock tabs (117) away from eight bolts (116).
102. Remove eight bolts (116) and four lock tabs (117).
103. Remove cover (118) from carrier assembly (115).
104. Use driver and hammer to remove bearing (119).



**NOTE**

- There are two shaft assemblies of this type in carrier. The following disassembly procedure is for one shaft assembly. The disassembly procedure for the remaining shaft assembly is identical.
- Remove spring pin only if inspection indicates replacement is necessary.

105. Use pin punch and hammer to depress spring pin (125) into center of shaft (131).
106. Remove shaft (131) and spring pin (125) from carrier assembly (115).
107. If damaged, remove spring pin (125) from shaft (131).
108. Remove gear (127) and thrust washer (130).
109. Use driver and hammer to remove bearings (128 and 129).
110. Remove thrust washer (126).
111. Remove gear (121) and thrust washer (124).
112. Use driver and hammer to remove bearings (122 and 123).
113. Remove thrust washer (120).



**DISASSEMBLY - CONTINUED**

**NOTE**

- There are four shaft assemblies of this type in carrier. The following disassembly procedure is for one shaft assembly. The disassembly procedure for the remaining three shaft assemblies is identical.
- Remove spring pin only if inspection indicates replacement is necessary.

114. Use pin punch and hammer to depress spring pin (132) into center of shaft (139).

115. Remove shaft (139) and spring pin (132) from carrier (115).

**NOTE**

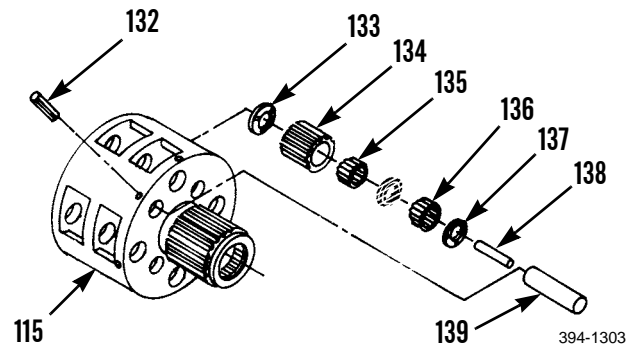
Remove spring pin only if inspection indicates replacement is necessary.

116. If damaged, remove spring pin (132) from shaft (139).

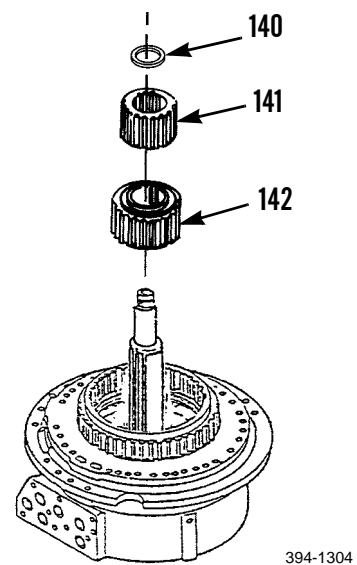
117. Remove tube (138), gear (134) and thrust washer (137).

118. Use driver and hammer to remove bearings (135 and 136).

119. Remove thrust washer (133) from carrier (115).

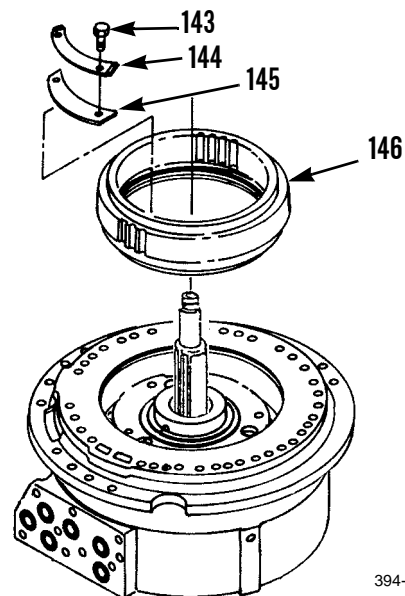


120. Remove retaining ring (140) and gears (141 and 142) from planetary assembly.



**DISASSEMBLY - CONTINUED**

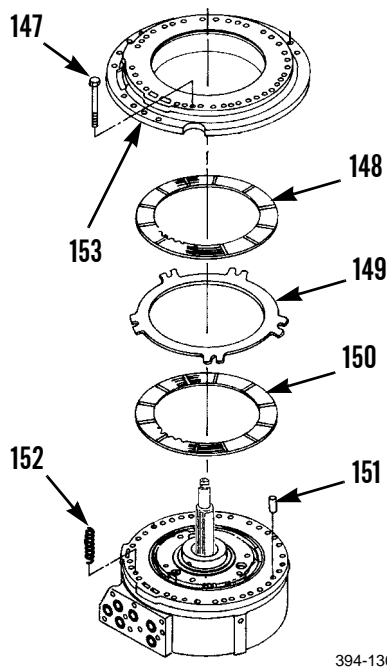
- 121. Bend three lock tabs (144) away from six bolts (143).
- 122. Remove six bolts (143), three lock tabs (144) and plates (145).
- 123. Remove ring gear (146).



**NOTE**

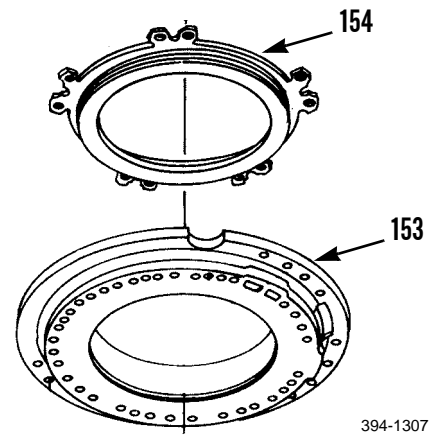
When removing number five piston housing, do not allow piston to fall out.

- 124. Remove two bolts (147) and number five piston housing (153).
- 125. Remove 10 springs (152) and five dowels (151).
- 126. Remove friction disc (148), clutch plate (149) and friction disc (150).



**DISASSEMBLY - CONTINUED**

127. Remove piston assembly (154) from number five piston housing (153).

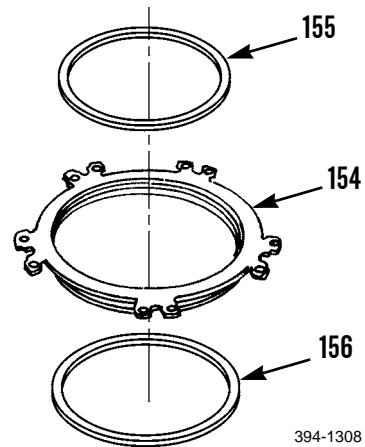


394-1307

**NOTE**

Remove seal rings only if inspection indicates replacement is necessary.

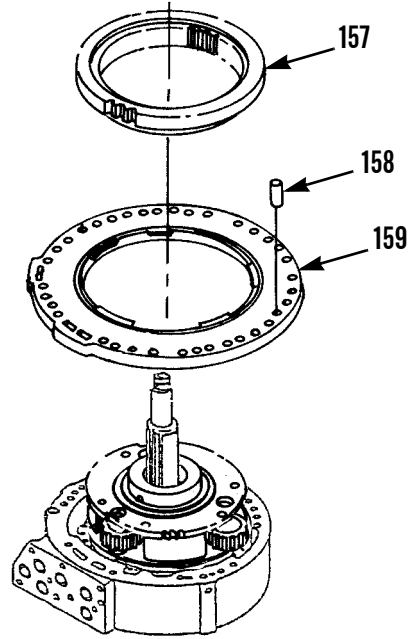
128. If damaged, remove seal rings (155 and 156) from piston (154).



394-1308

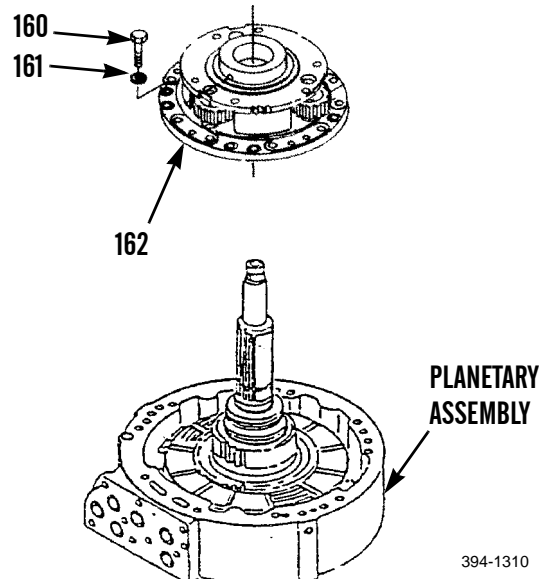
**DISASSEMBLY - CONTINUED**

129. Remove ring gear (157), plate (159) and two dowels (158).



394-1309

130. Remove eight bolts (160) and washers (161) from carrier assembly (162).
131. Remove carrier assembly (162) from planetary assembly.

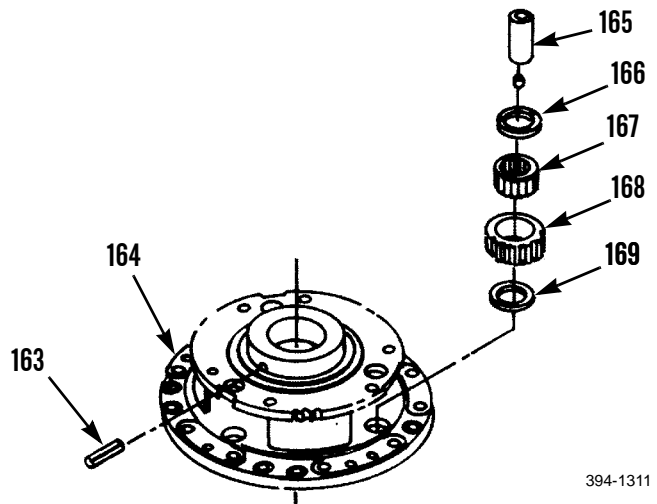


394-1310

**DISASSEMBLY - CONTINUED****NOTE**

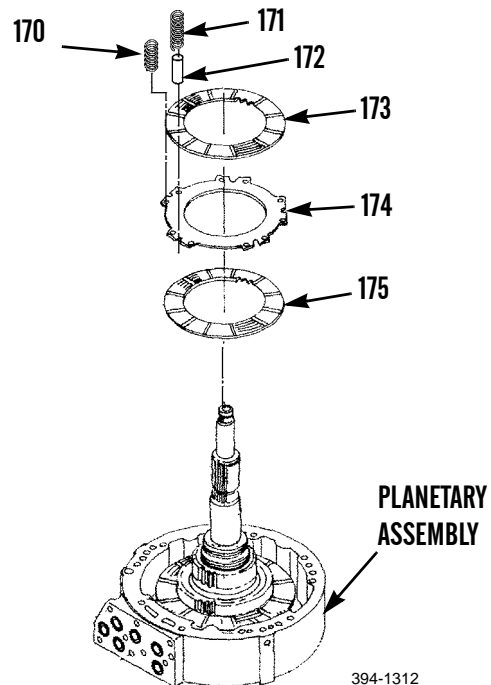
- There are three shaft assemblies in carrier. The following disassembly procedure is for one shaft assembly. The disassembly procedure for the remaining two shaft assemblies is identical.
- Remove spring pin only if inspection indicates replacement is necessary.

132. Use pin punch and hammer to depress spring pin (163) into center of shaft (165).
133. Remove shaft (165) and spring pin (163).
134. Remove gear (168) and thrust washer (166).
135. Use driver and hammer to remove bearing (167).
136. Remove thrust washer (169) from carrier (164).



394-1311

137. Remove 10 short springs (170), five long springs (171) and dowels (172) from planetary assembly.
138. Remove friction disc (173), clutch plate (174) and friction disc (175).



394-1312

**DISASSEMBLY - CONTINUED**

139. Remove 10 springs (176) and five retaining clips (182) from planetary assembly.
140. Remove and discard two seal rings (181).
141. Remove gear (180).
142. Remove retaining ring (178).

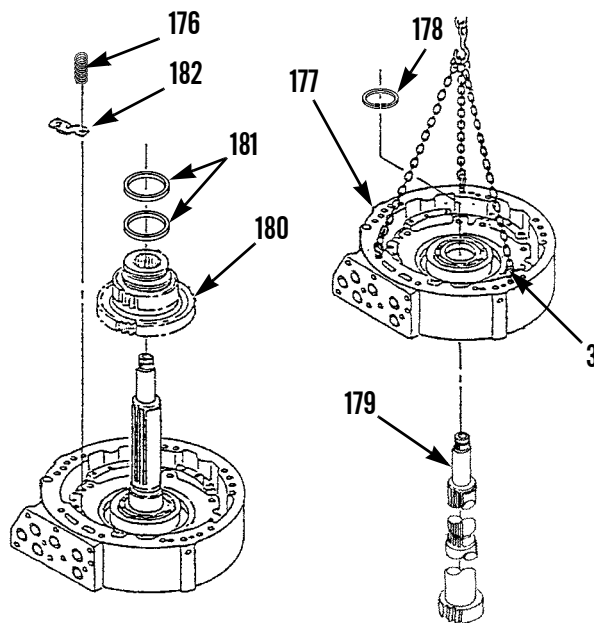
**WARNING**

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**

Weight of manifold is 67 lb (30.39 kg).

143. Install two link brackets (3) and attach suitable lifting device.
144. Remove manifold assembly (177) from shaft (179).
145. Remove lifting device and two link brackets (3).



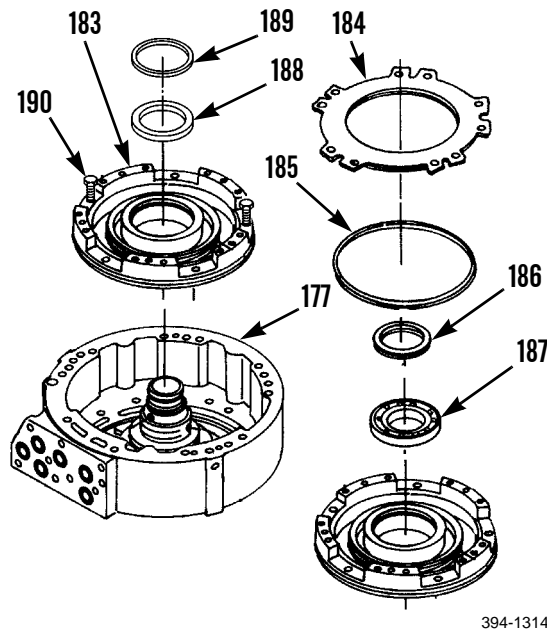
394-1313

146. Remove seal ring (189) and retaining ring (188).
147. Install two lifting bolts (190) and remove housing assembly (183) from planetary assembly.



**DISASSEMBLY - CONTINUED**

- 148. Remove two lifting bolts (190).
- 149. Remove piston assembly (184) from housing (183).
- 150. Remove seal ring (185).
- 151. Remove snap ring (186).
- 152. Use driver and hammer to remove bearing (187).

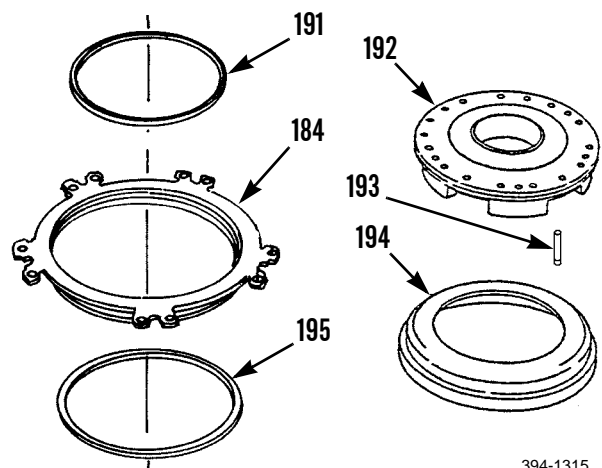


394-1314

**NOTE**

Remove seal rings only if inspection indicates replacement is necessary.

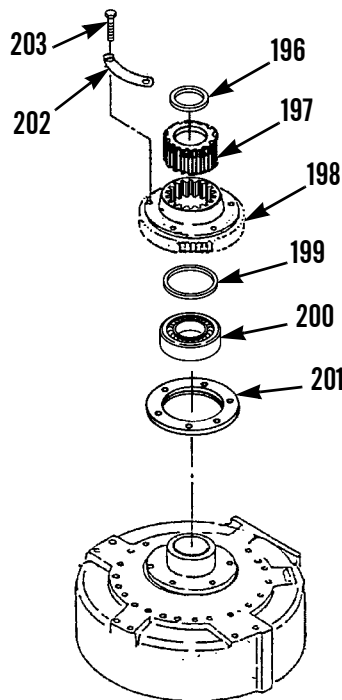
- 153. If damaged, remove seal rings (191) and (195) from piston (184).
- 154. Remove two dowels (193).
- 155. Remove housing (192) from balance piston (194).



394-1315

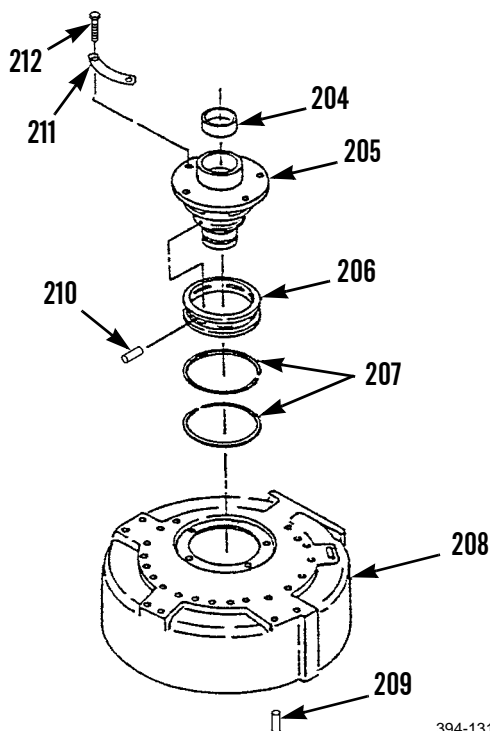
**DISASSEMBLY - CONTINUED**

- 156. Remove six bolts (203) and three locks (202).
- 157. Remove snap ring (196) and gear (197).
- 158. Remove hub (198).
- 159. Remove retaining ring (199).
- 160. Install two 3/8-16NC forcing screws into retaining plate (201).
- 161. Tighten two 3/8-16NC forcing screws until retaining plate (201) and bearing (200) are free.
- 162. Use driver and hammer to remove bearing (200) from retainer plate (201).



394-1316

- 163. Use driver and hammer to remove bearing (204).
- 164. Remove six bolts (212) and three locks (211).
- 165. Install two 3/8-16NC forcing screws in cage (205).
- 166. Tighten two 3/8-16NC forcing screws until cage (205) is free.
- 167. Remove two 3/8-16NC forcing screws.
- 168. Remove cage (205), pin (210), carrier (206) and two seal rings (207).
- 169. Remove two dowels (209) from manifold (208).



394-1317

**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 cause 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. Remove all preformed packing material from mounting surfaces.
  2. Clean all parts with solvent cleaning compound.
  3. Dry all parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install two dowels (209) in manifold (208).
2. Install two seal rings (207).
3. Install carrier (206) and pin (210).
4. Install cage (205) into manifold (208).
5. Install three locks (211) and six bolts (212). Bend ends of three locks upward against six bolts.
6. Immerse bearing (204) in clean engine oil.

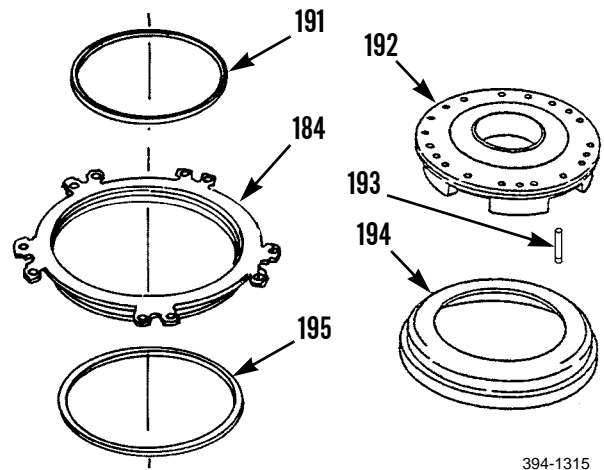
**NOTE**

Exercise care when installing any bearing without a sleeve. Drive only on the race adjacent to the mounting surface.

7. Use driver and hammer to install bearing (204).
8. Immerse bearing (200) in clean engine oil.
9. Note position of notch in bearing (200). Use driver and hammer to install bearing in retaining plate (201).
10. Install retaining plate (201).
11. Install retaining ring (199).
12. Install hub (198), gear (197) and snap ring (196).
13. Install three locks (202) and six bolts (203). Bend ends of three locks upward against six bolts.

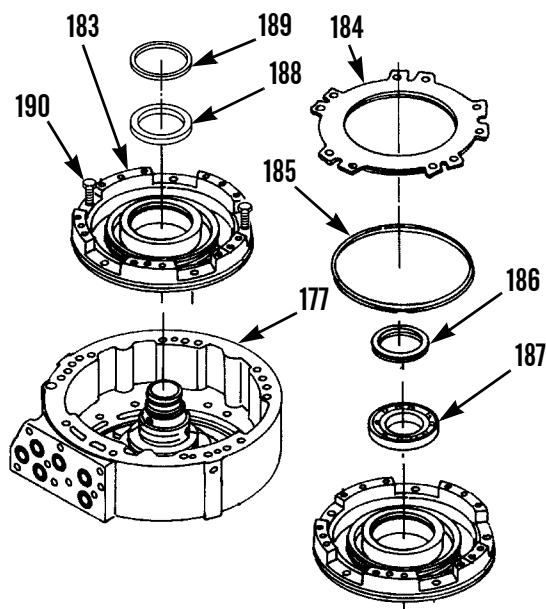
**ASSEMBLY - CONTINUED**

14. Install balance piston (194) on housing (192).
15. Install two dowels (193).
16. If removed, install new seal rings (191) and (195) on piston (184).



394-1315

17. Immerse bearing (187) in clean engine oil.
18. Use driver and hammer to install bearing (187) and align bearing with ball.
19. Install snap ring (186) and seal ring (185).
20. Install piston assembly (184).
21. Attach two lifting bolts and install housing assembly (183).
22. Remove two lifting bolts (190).
23. Install retaining ring (188) and seal ring (189).



394-1314

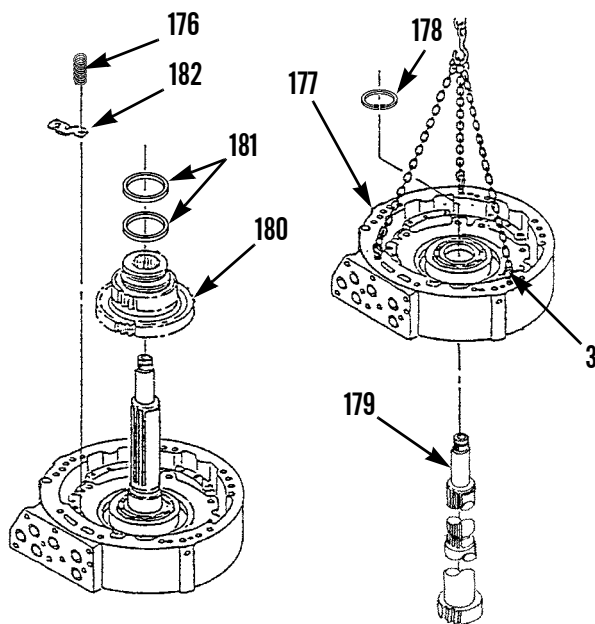
**ASSEMBLY - CONTINUED****WARNING**

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**

Weight of manifold is 67 lb (30.39 kg).

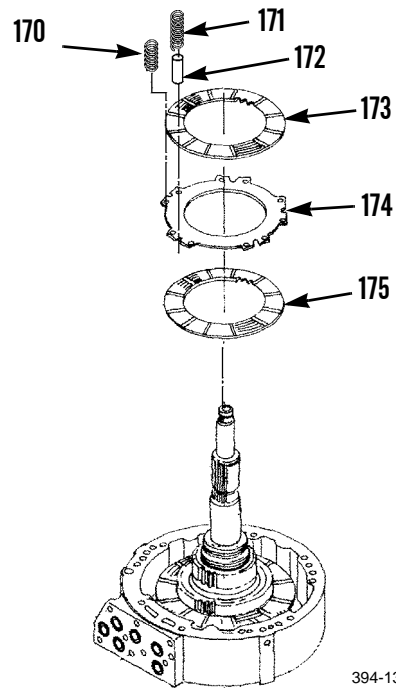
24. Install two link brackets (3) and attach lifting device to link brackets (3).
25. Install manifold assembly (177) on shaft (179).
26. Remove lifting device and two link brackets (3).
27. Install retaining ring (178).
28. Install gear (180) and two new seal rings (181).
29. Install five retaining clips (182) and ten springs (176).



394-1313

**ASSEMBLY - CONTINUED**

30. Install friction disc (175), clutch plate (174) and friction disc (173).
31. Install five dowels (172) and long springs (171).
32. Install ten short springs (170).



394-1312

**ASSEMBLY - CONTINUED**

**NOTE**

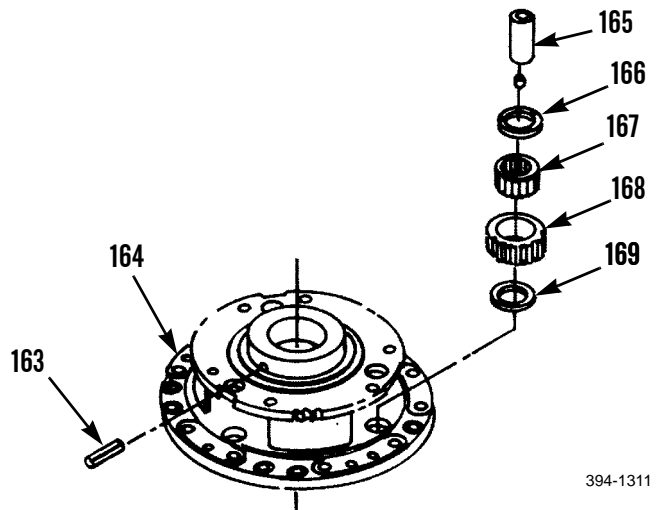
There are three shaft assemblies in carrier. The following assembly procedure is for one shaft assembly. The assembly procedure for the remaining two shaft assemblies is identical.

- 33. Install thrust washer (169) on carrier (164).
- 34. Immerse bearing (167) in clean engine oil.
- 35. Install bearing (167), thrust washer (166), gear (168) and shaft (165).

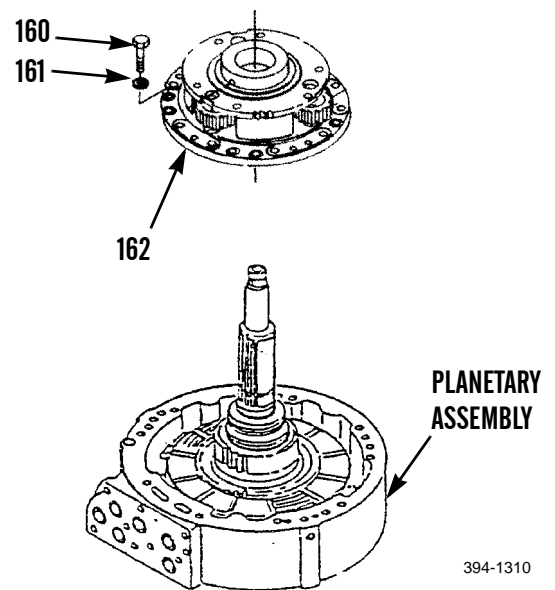
**CAUTION**

Pins that hold shafts to carriers must be installed flush with outer surface of carrier. If they are installed further, they will prevent oil flow for lubrication of the gears.

- 36. Use pin punch and hammer to install new spring pin (163), if removed, in carrier assembly (164).

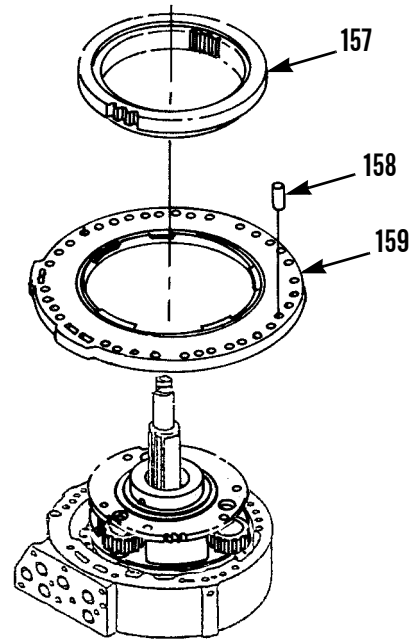


- 37. Install carrier assembly (162) in planetary gear assembly.
- 38. Install eight washers (161) and bolts (160).



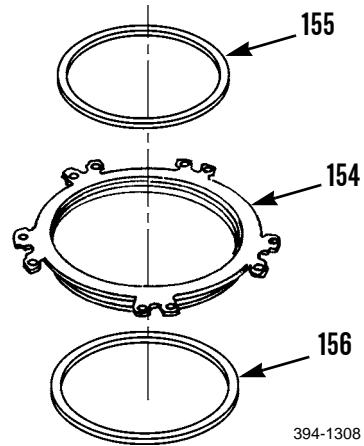
**ASSEMBLY - CONTINUED**

- 39. Install two dowels (158) and plate (159) on planetary gear assembly.
- 40. Install ring gear (157).



394-1309

- 41. If removed, install new seal ring (155) and (156) on piston (154).

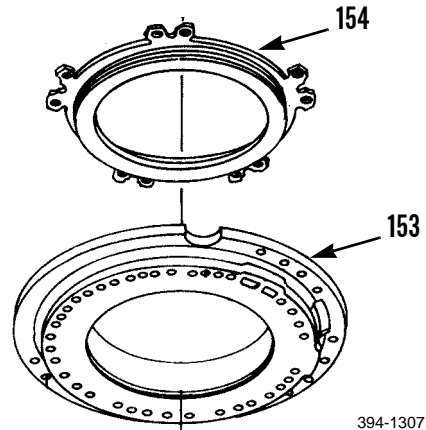


394-1308



**ASSEMBLY - CONTINUED**

- 42. Install piston assembly (154) on number five piston housing (153).



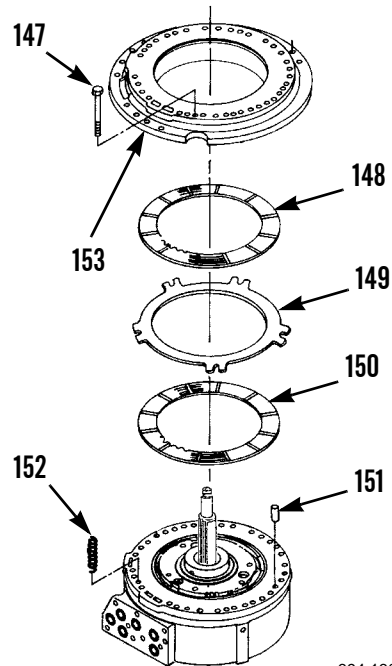
394-1307

- 43. Install friction disc (150), clutch plate (149) and friction disc (148) planetary assembly.
- 44. Install five dowels (151) and ten springs (152).

**NOTE**

When installing number five piston housing, do not allow piston to fall out.

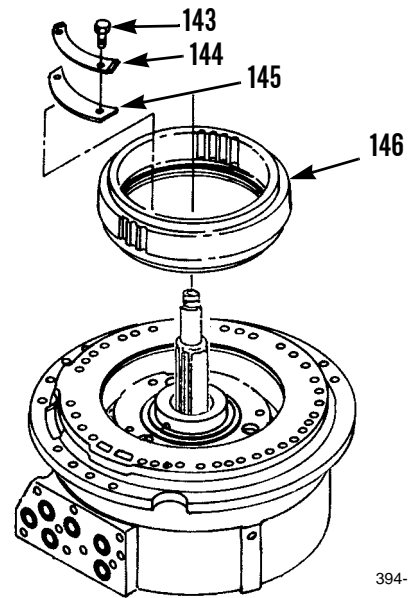
- 45. Install piston housing assembly (153) on planetary gear assembly.
- 46. Install two bolts (147).



394-1306

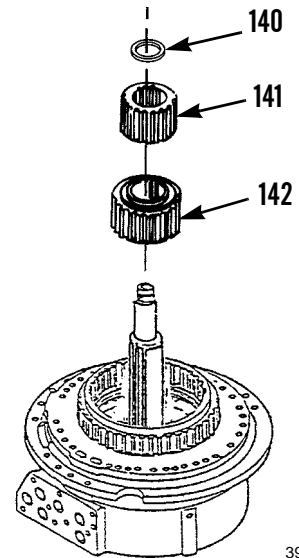
**ASSEMBLY - CONTINUED**

47. Install ring gear (146) in planetary gear assembly.
48. Install three plates (145), lock tabs (144) and six bolts (143).
49. Bend ends of three lock tabs (144) against six bolts (143).



394-1305

50. Install gears (141) and (142) in planetary gear assembly.
51. Install retaining ring (140).



394-1304

**ASSEMBLY - CONTINUED**

**NOTE**

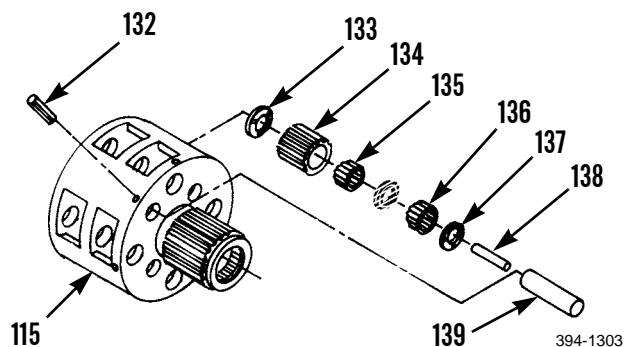
There are four shaft assemblies of this type in carrier. The following assembly procedure is for one shaft assembly. The assembly procedure for the remaining three shaft assemblies is identical.

- 52. Install thrust washer (133) in carrier (115).
- 53. Immerse bearings (136) and (135) in clean engine oil and install.
- 54. Install thrust washer (137), gear (134) and tube (138).
- 55. Install shaft (139).

**CAUTION**

Pins that hold shafts to carriers must be installed flush with outer surface of carrier. If they are installed further, they will prevent oil flow for lubrication of the gears.

- 56. If removed, install new spring pin (132) in carrier (115).



394-1303

**NOTE**

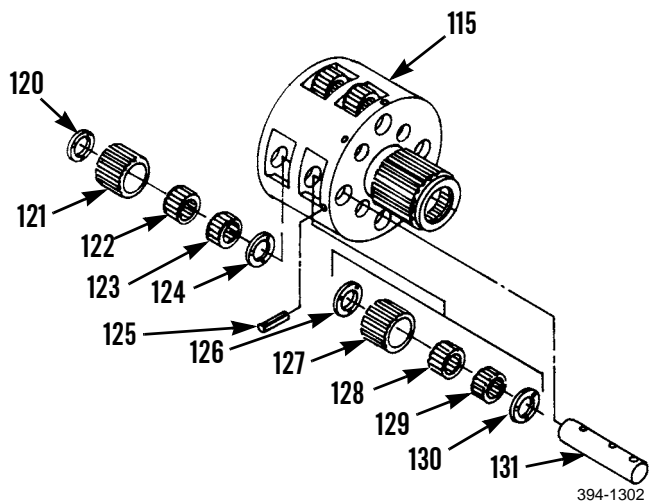
There are two shaft assemblies of this type in carrier. The following is an assembly procedure for one shaft assembly. The assembly procedure for the remaining shaft assembly is identical.

- 57. Install thrust washer (120) in carrier (115).
- 58. Immerse bearings (123) and (122) in clean engine oil and install.
- 59. Install thrust washer (124), gear (121) and thrust washer (126) in carrier (115).
- 60. Immerse bearings (129) and (128) in clean engine oil and install.
- 61. Install thrust washer (130), gear (127) and shaft (131) in carrier (115).

**CAUTION**

Pins that hold shafts to carriers must be installed flush with outer surface of carrier. If they are installed further, they will prevent oil flow for lubrication of the gears.

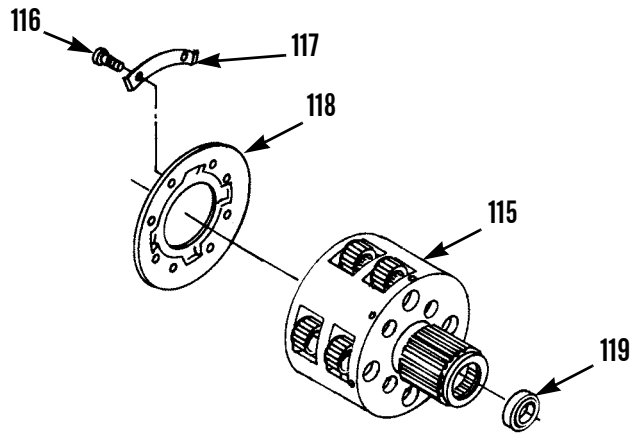
- 62. If removed, install new spring pin (125).



394-1302

**ASSEMBLY - CONTINUED**

63. Immerse bearing (119) in clean engine oil and install.
64. Install cover (118), four lock tabs (117) and eight bolts (116) in carrier (115).
65. Bend ends of four lock tabs (117) upward against eight bolts (116).



394-1301



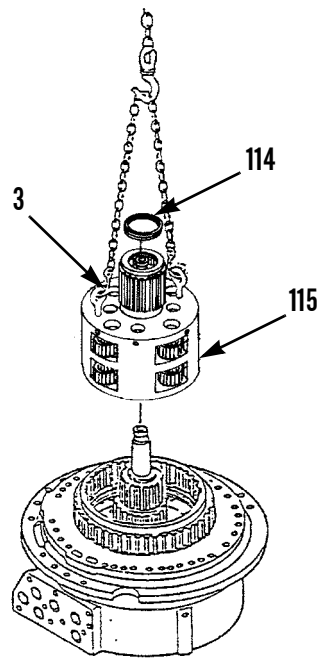
**WARNING**

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**

Weight of carrier assembly is 75 lb (34 kg).

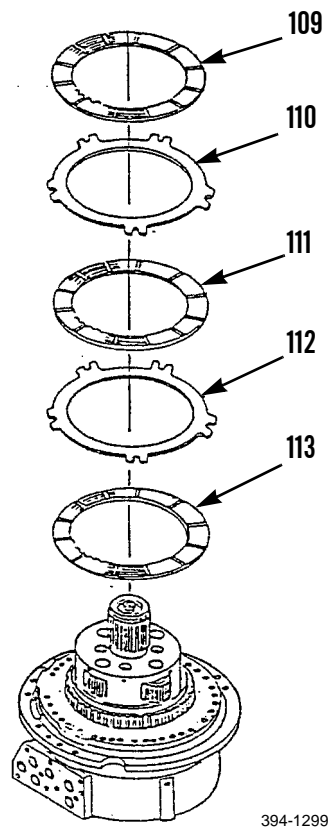
66. Install two link brackets (3) and attach lifting device to carrier assembly (115).
67. Install carrier assembly (115) in planetary housing.
68. Install retaining ring (114).
69. Remove lifting device and two link brackets (3).



394-1300

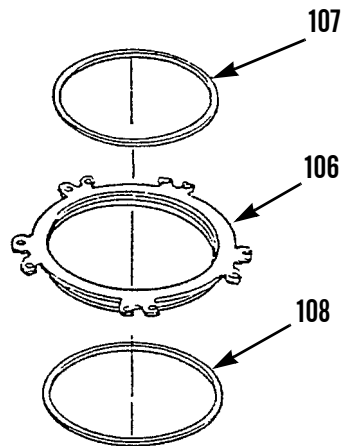
**ASSEMBLY - CONTINUED**

70. Install friction disc (113), clutch plate (112), friction disc (111), clutch plate (110) and friction disc (109) in planetary gear assembly.



394-1299

71. If removed, install new seal rings (107) and (108) on piston (106).



394-1298

ASSEMBLY - CONTINUED



**WARNING**

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**

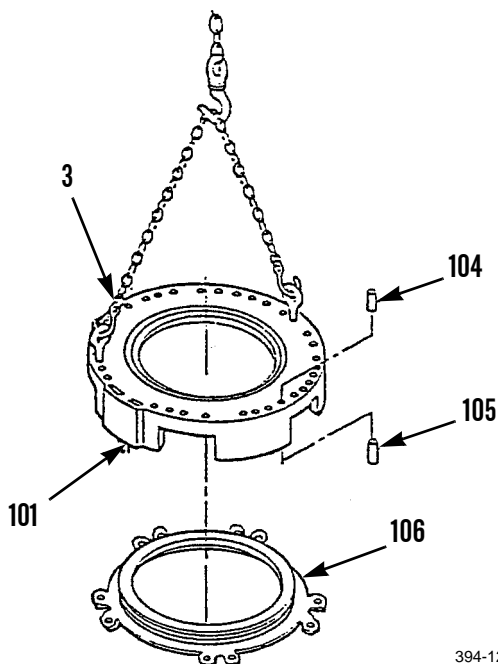
Weight of number six piston housing is 50 lb (23 kg).

- 72. Install two link brackets (3) and attach lifting device.
- 73. Install dowels (105) and (104).
- 74. Install piston assembly (106) in number six clutch housing (101).
- 75. Install 10 springs (103) and five pins (102) in planetary gear assembly.
- 76. Install two link brackets (3) and attach lifting device.

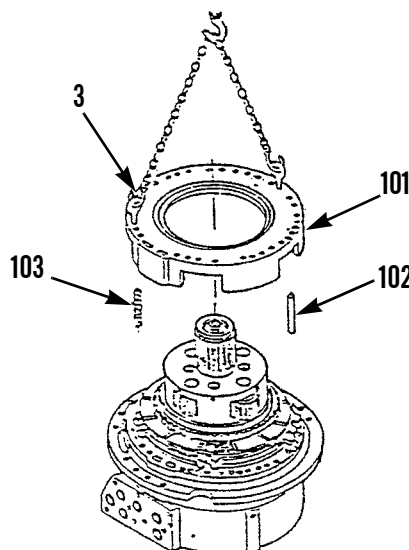
**NOTE**

When installing number six piston housing, do not allow piston to fall out.

- 77. Install piston assembly (101) in planetary assembly.
- 78. Remove lifting device and two link brackets (3).



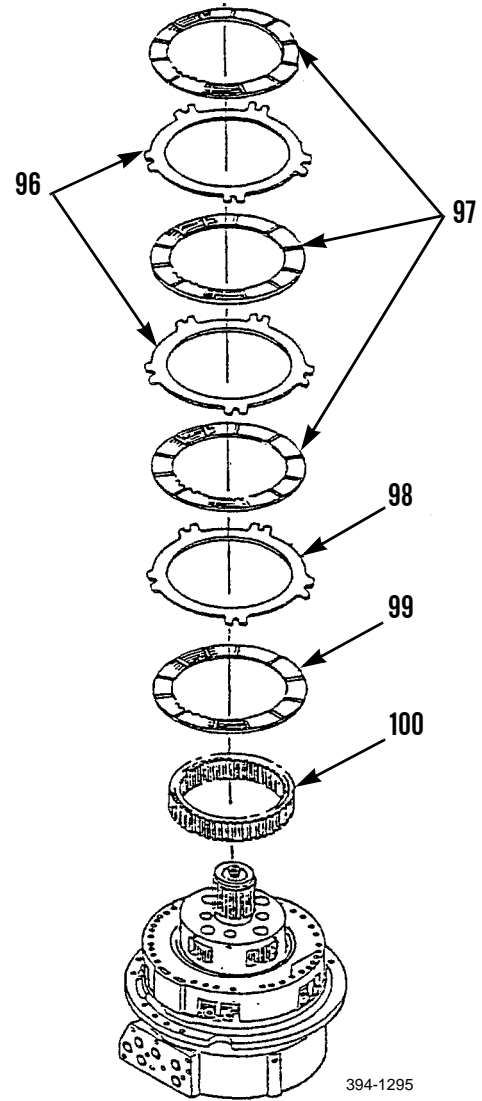
394-1297



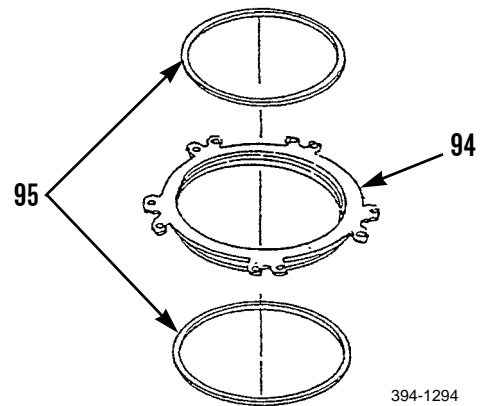
394-1296

**ASSEMBLY - CONTINUED**

- 79. Install ring gear (100) on planetary assembly.
- 80. Install friction disc (99), clutch plate (98), three friction discs (97) and two clutch plates (96).

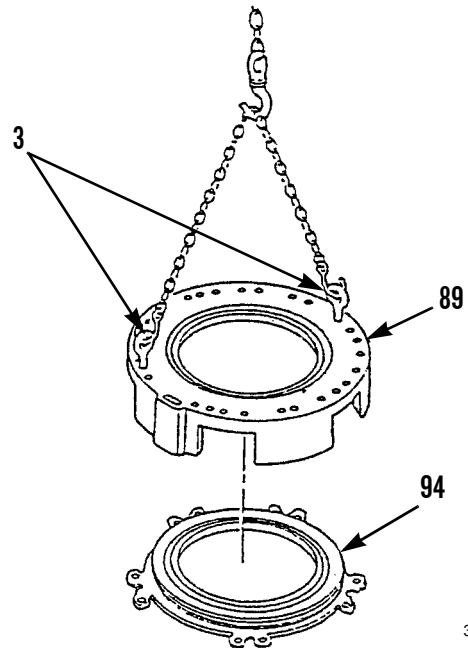


- 81. If removed, install seal rings (95) on piston (94).



**ASSEMBLY - CONTINUED**

- 82. Install two link brackets (3) and attach lifting device.
- 83. Install piston assembly (94) in number seven piston housing (89).



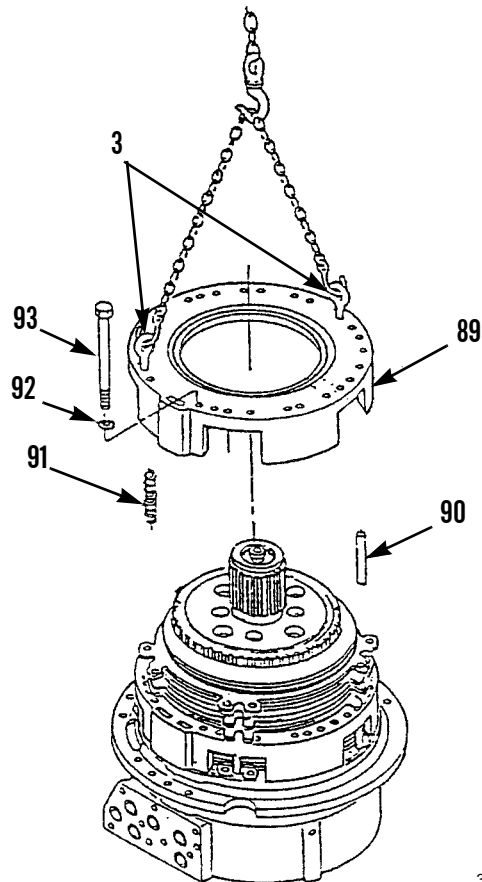
394-1293

- 84. Install 10 springs (91) and five pins (90) in planetary assembly.

**NOTE**

When installing number seven piston housing, do not allow piston to fall out.

- 85. Install number seven housing piston housing (89) on planetary assembly.
- 86. Install 16 washers (92) and bolts (93).
- 87. Remove lifting device and two link brackets (3).



394-1292



**ASSEMBLY - CONTINUED**

88. Install two link brackets (3) in planetary assembly.



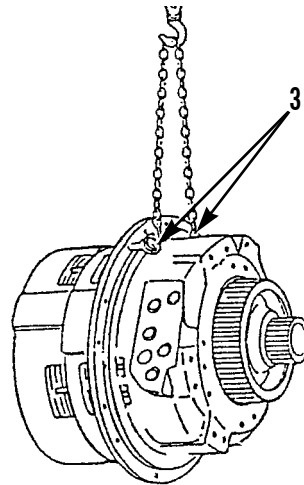
**WARNING**

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**

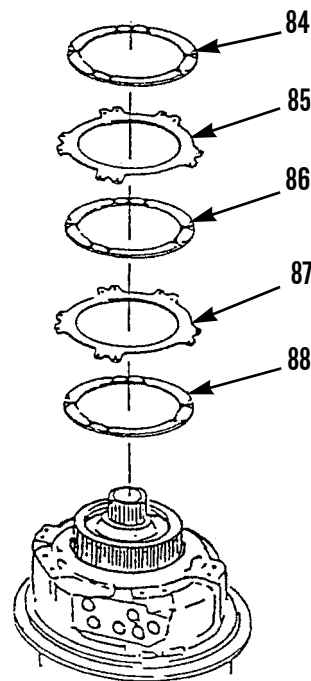
Weight of transmission is 600 lb (272 kg).

- 89. Attach lifting device to two link brackets (3).
- 90. Raise planetary assembly and position on workbench with output end up.



394-1291

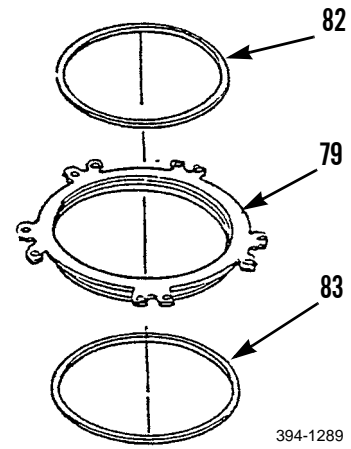
91. Install friction disc (88), clutch plate (87), friction disc (86), clutch plate (85) and friction disc (84).



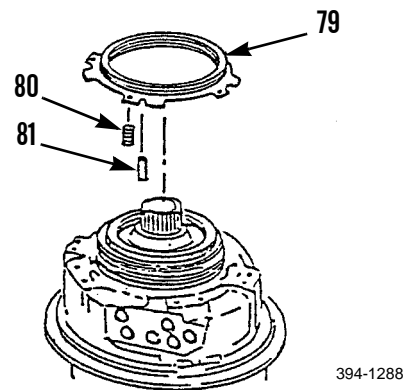
394-1290

**ASSEMBLY - CONTINUED**

92. If removed, install seal rings (82) and (83) on piston (79).

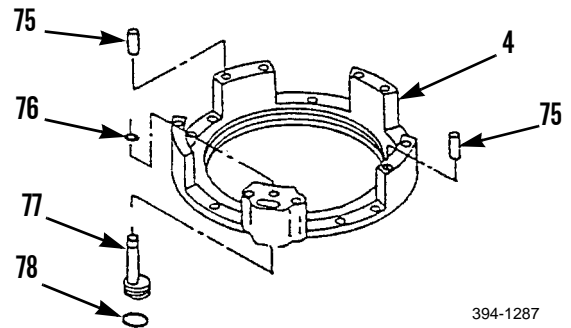


93. Install five springs (80) and pins (81) on planetary assembly.
94. Install piston assembly (79).



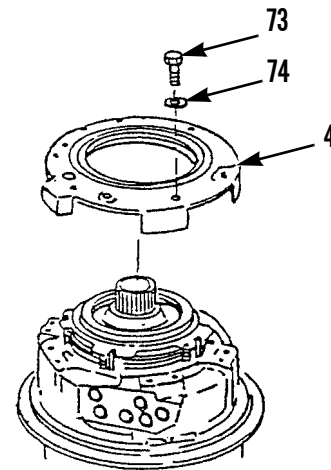
**ASSEMBLY - CONTINUED**

- 95. Install two dowels (75) in number one clutch housing (4).
- 96. Install new preformed packing (78), plug (77) and ring (76).



394-1287

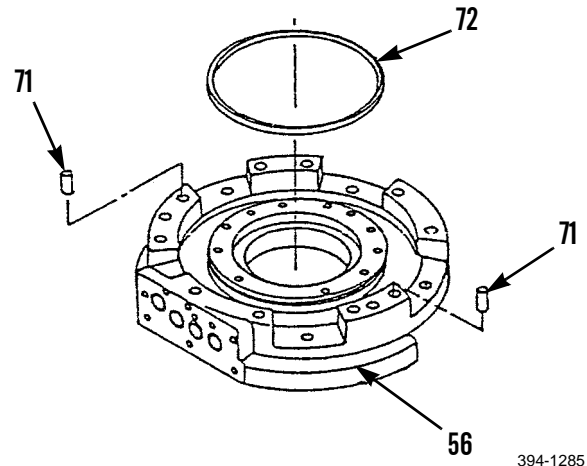
- 97. Install number one clutch housing (4) in planetary assembly.
- 98. Install seven washers (74) and bolts (73).



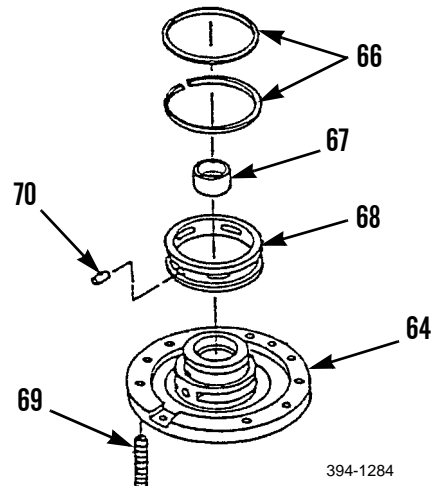
394-1286

**ASSEMBLY - CONTINUED**

99. Install seal ring (72) and two dowels (71) in clutch housing assembly (56).

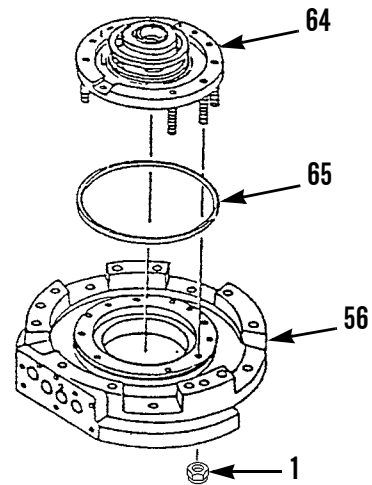


100. Install nine studs (69) in center manifold (64).
101. Install carrier (68) and pin (70).
102. Immerse bearing (67) in clean engine oil.
103. Install bearing (67) and two seal rings (66) in center manifold (64).



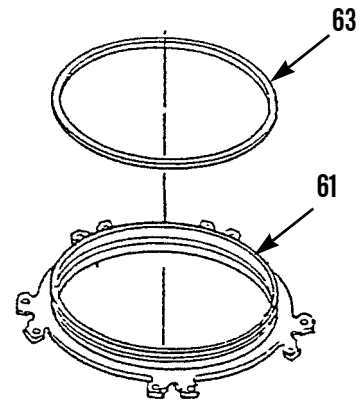
**ASSEMBLY - CONTINUED**

104. Install seal ring (65) in clutch housing assembly (56).
105. Install center manifold assembly (64).
106. Install nine torque converter mounting nuts (1).



394-1283

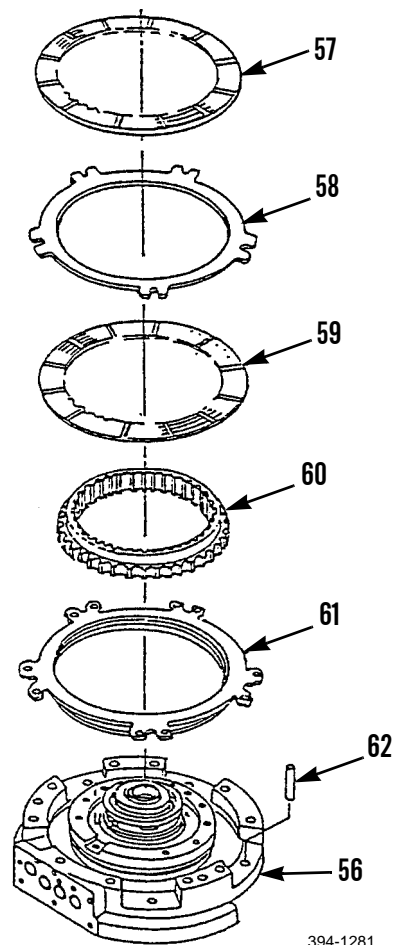
107. If removed, install new seal ring (63) in piston assembly (61).



394-1282

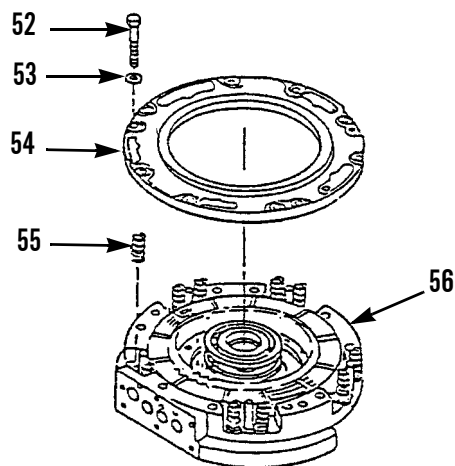
**ASSEMBLY - CONTINUED**

- 108. Install piston assembly (61) in clutch housing assembly (56).
- 109. Install ring gear (60).
- 110. Install friction disc (59), clutch plate (58) and friction disc (57).
- 111. Install five pins (62).



394-1281

- 112. Install 10 springs (55) and cover plate (54) in clutch housing assembly (56).
- 113. Install 10 washers (53) and bolts (52).



394-1280

**ASSEMBLY - CONTINUED**

**NOTE**

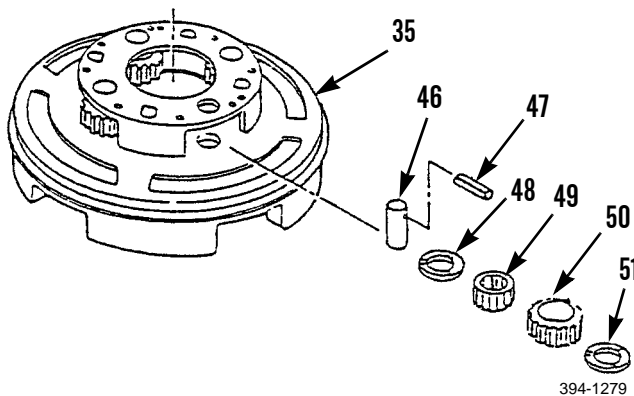
There are three shaft assemblies of this type in carrier. The following assembly procedure is for one shaft assembly. The assembly procedure for the remaining two shaft assemblies is identical.

- 114. Install thrust washer (51).
- 115. Immerse bearing (49) in clean engine oil.
- 116. Install gear (50), bearing (49), thrust washer (48) and shaft (46).

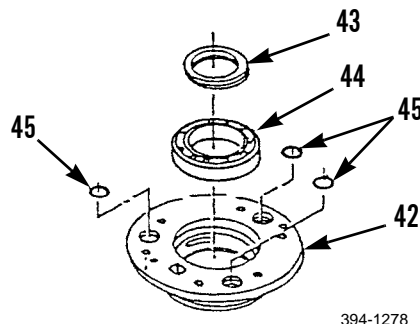
**CAUTION**

Pins that hold shafts to carriers must be installed flush with outer surface of carrier. If they are installed further, they will prevent oil flow for lubrication of the gears.

- 117. Use pin punch and hammer to install new spring pin (47), if removed, in housing (35).

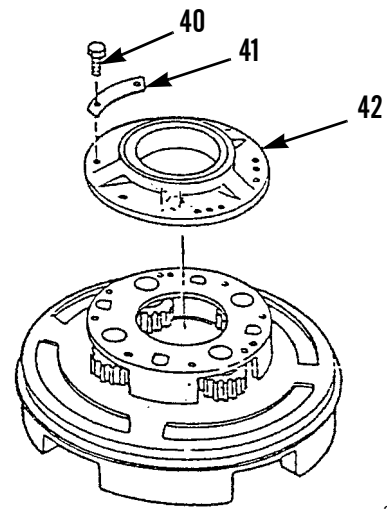


- 118. Immerse bearing (44) in clean engine oil.
- 119. Note position of notch in bearing (44). Install bearing (44) and ring (43).
- 120. Install three new preformed packings (45) in cage (42) and turn cage (42) over.



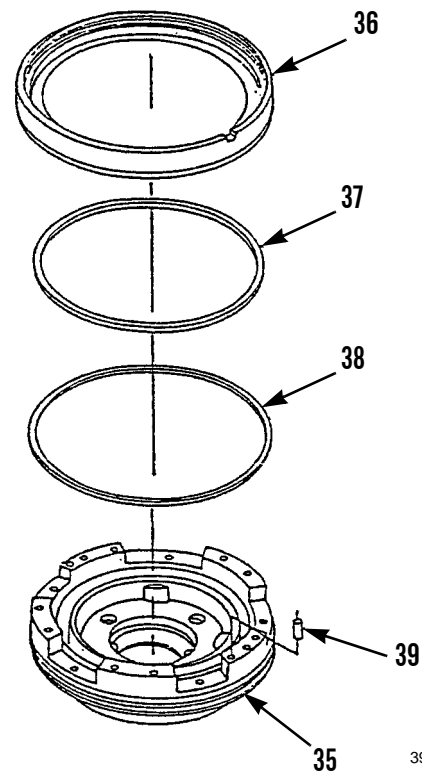
**ASSEMBLY - CONTINUED**

121. Install cage assembly (42) in housing (35).
122. Install three lock tabs (41) and six bolts (40).
123. Bend ends of three lock tabs (41) upward against six bolts (40).
124. Turn housing (35) over.



394-1277

125. Install two dowels (39) in housing (35).
126. Install new preformed packings (38 and 37).
127. Install piston (36).

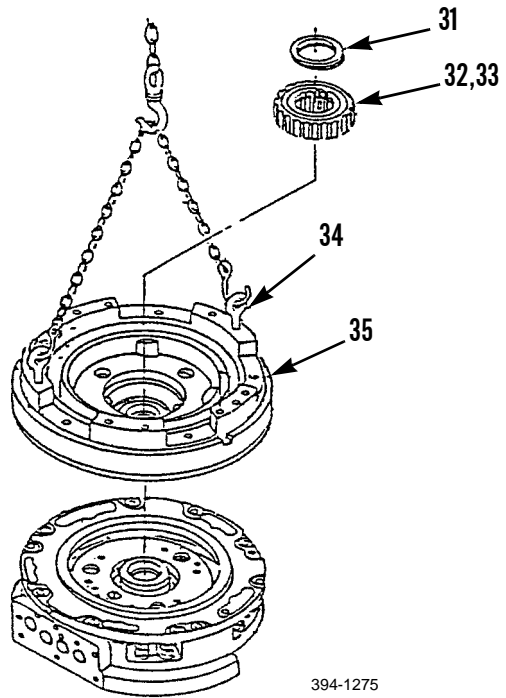


394-1276

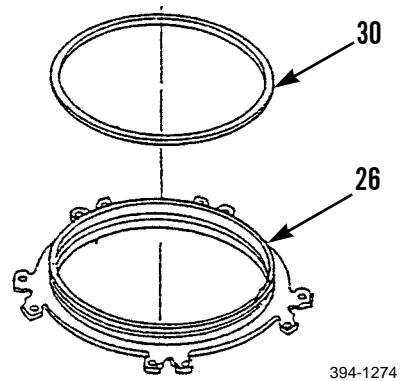


**ASSEMBLY - CONTINUED**

- 128. Install retaining ring (33) in gear (32). Note position of notch in gear (32) to aid in installation.
- 129. Install two link brackets (34) and lifting device.
- 130. Install housing assembly (35) on planetary gear assembly.
- 131. Install gear (32) in housing (35).
- 132. Install snap ring (31).

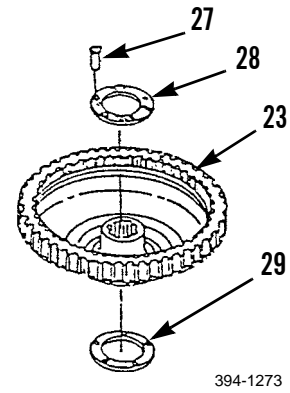


- 133. If removed, install new seal ring (30) in piston (26).

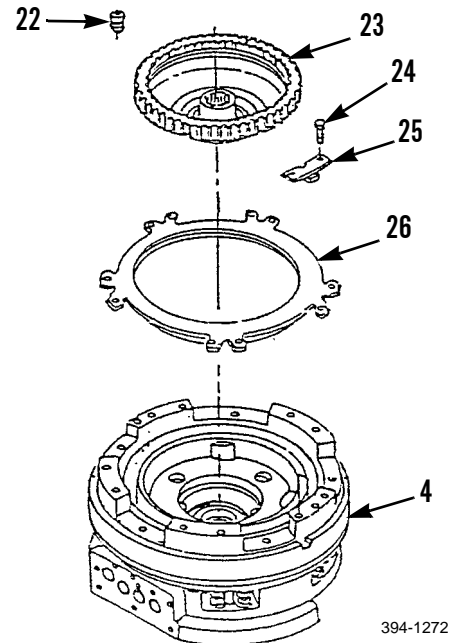


**ASSEMBLY - CONTINUED**

- 134. Install washers (28 and 29) on ring gear (23).
- 135. Install five new rivets (27).

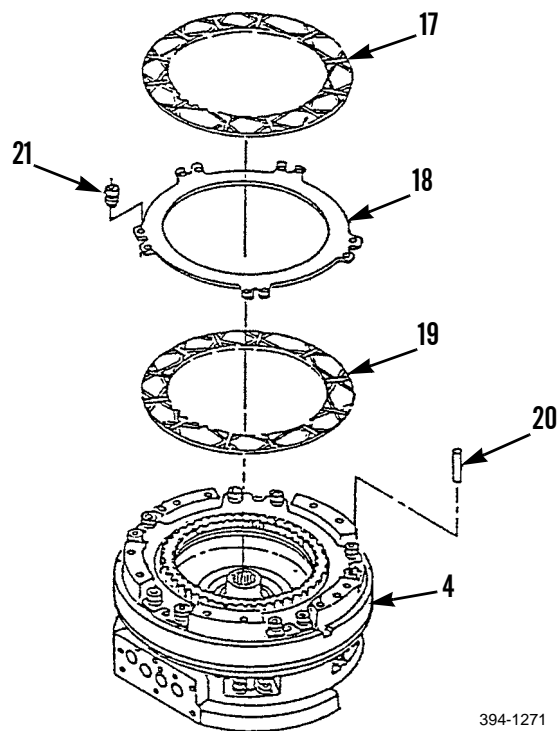


- 136. Install piston (26) in number one clutch housing (4).
- 137. Install five plates (25) and 10 bolts (24).
- 138. Install ring gear (23) in number one clutch housing (4).
- 139. Install 10 springs (22).



**ASSEMBLY - CONTINUED**

- 140. Install friction disc (19), clutch plate (18) and friction disc (17) in number one clutch housing (4).
- 141. Install 10 springs (21) and five pins (20).



394-1271

**NOTE**

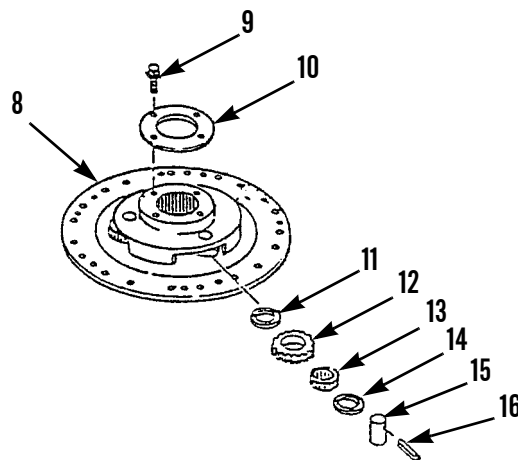
There are three shaft assemblies of this type in carrier. The following assembly procedure is for one shaft assembly. The assembly procedure for the remaining two shaft assemblies is identical.

- 142. Install thrust washer (11). Immerse bearing (13) in clean engine oil.
- 143. Install gear (12), bearing (13), thrust washer (14) and shaft (15) in carrier (8).

**CAUTION**

Pins that hold shafts to carriers must be installed flush with outer surface of carrier. If they are installed further, they will prevent oil flow for lubrication of the gears.

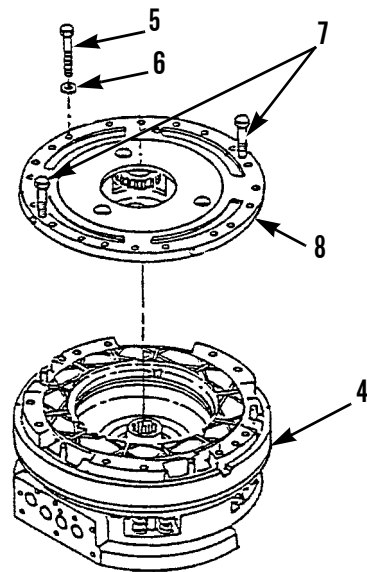
- 144. Use pin punch and hammer to install new spring pin (16), if removed.
- 145. Install plate (10) and four bolts (9). Torque bolts to 25 lb-ft (34 Nm).



394-1270

**ASSEMBLY - CONTINUED**

- 146. Turn over carrier assembly (8) and install two lifting bolts (7).
- 147. Install carrier gear assembly (8).
- 148. Install ten washers (6) and bolts (5).
- 149. Remove two lifting bolts (7).



394-1269

- 150. Install two link brackets (3) in number one clutch housing (4).



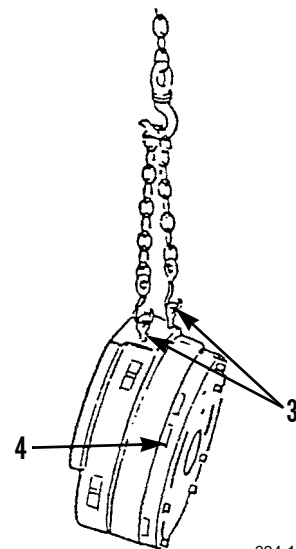
**WARNING**

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**

Weight of clutch assembly is 350 lb (159 kg).

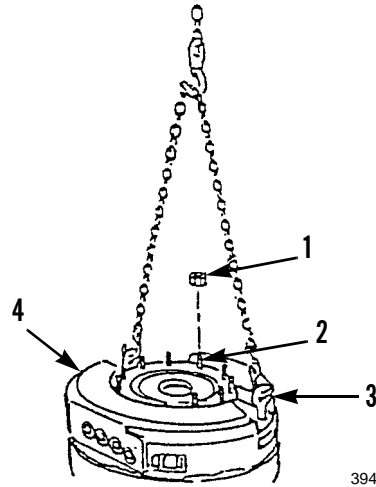
- 151. Attach lifting device to two link brackets (3).
- 152. Lift number one clutch housing (4) and reposition upside down on workbench.
- 153. Remove lifting device and two link brackets (3).



394-1268

**ASSEMBLY - CONTINUED**

154. Install two link brackets (3) and attach lifting device to number one clutch housing (4).
155. Install number one clutch housing (4).
156. Remove nine torque converter mounting nuts (2) from studs (1).
157. Remove lifting device and two link brackets (3).



158. Install torque converter (WP 0371 00).
159. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**TRANSFER GEARS REPAIR****0374 00**

---

**THIS WORK PACKAGE COVERS**Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bracket, link (Item 10, WP 0338 00)

Forcing screws, 3/8-16

Lifting device, 750 lb minimum capacity

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, sealing (Item 10, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

**Materials/Parts - Continued**

Gasket

Packing, preformed (16)

Seal

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Rear cutting edge worklight removed (WP 0086 00)

Transmission oil filter removed (WP 0128 00)

Magnetic strainer removed (WP 0130 00)

Transmission oil pump suction screen removed (WP 0131 00)

Governor and automatic shift drive removed (WP 0370 00)

Transfer gears and transmission removed (WP 0286 00)

Scavenger pump, oil pump and manifold removed (WP 0375 00)

---

**DISASSEMBLY**

1. Remove seven nuts (3), washers (5) and bolts (6) from case (9).
2. Remove seven nuts (7) and washers (8) from studs (2) on transmission housing.
3. Install link bracket (1) in case (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 cause injury or death.

**NOTE**

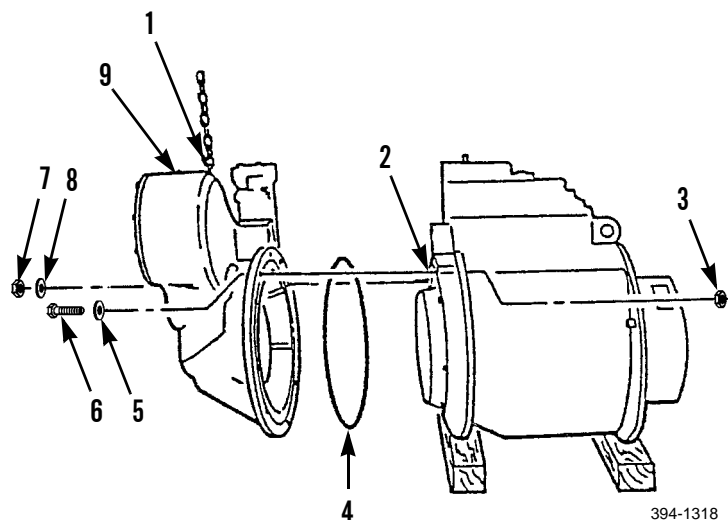
Weight of transfer gears assembly is 500 lb (227 kg).

4. Attach lifting device to case (9).

**NOTE**

Take care separating transfer gear assembly from transmission. If studs are damaged during removal, replace.

5. Use lifting device to remove case (9) and place in stand.
6. Remove and discard preformed packing (4) from case (9).



394-1318

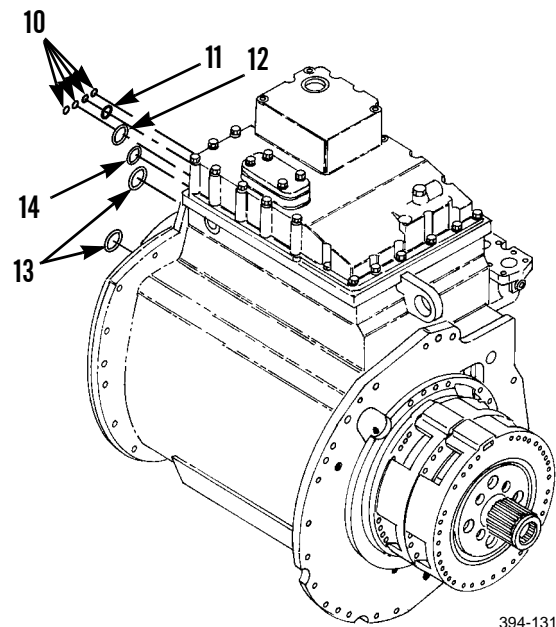


## TRANSFER GEARS REPAIR - CONTINUED

0374 00

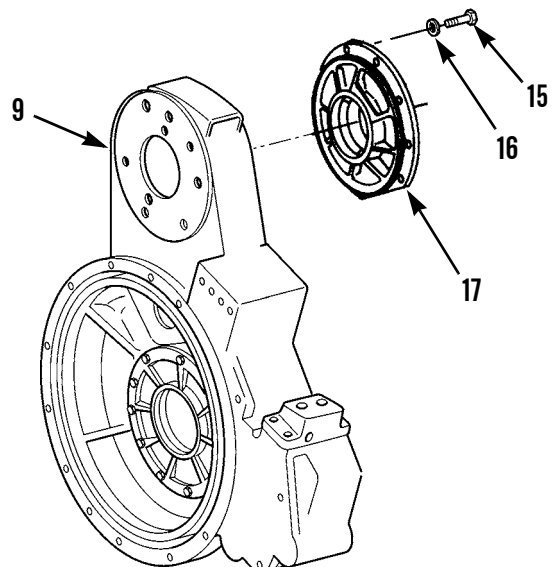
**DISASSEMBLY - CONTINUED**

7. Remove link bracket (1) and lifting device from case.
8. Remove and discard four preformed packings (10), two preformed packings (13) and preformed packings (11, 12 and 14) from transmission housing.



394-1319

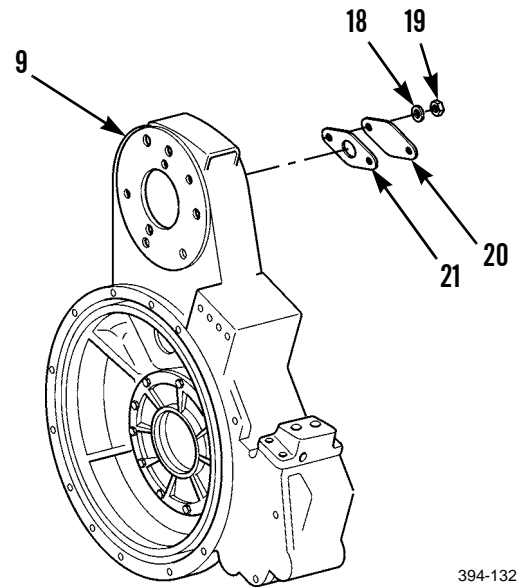
9. Remove nine bolts (15) and washers (16) from case (9).
10. Remove cage (17) from case (9).



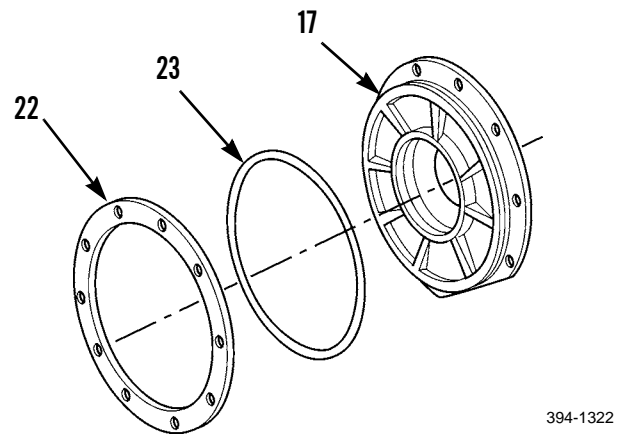
394-1320

**DISASSEMBLY - CONTINUED**

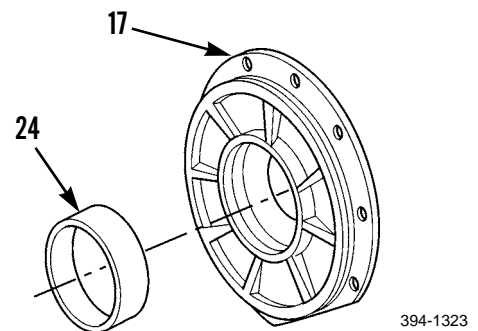
11. Remove two nuts (19) and washers (18) from case (9).
12. Remove cover (20) and gasket (21). Discard gasket.



13. Remove shim(s) (22) from cage (17).
14. Remove and discard preformed packing (23) from cage (17).

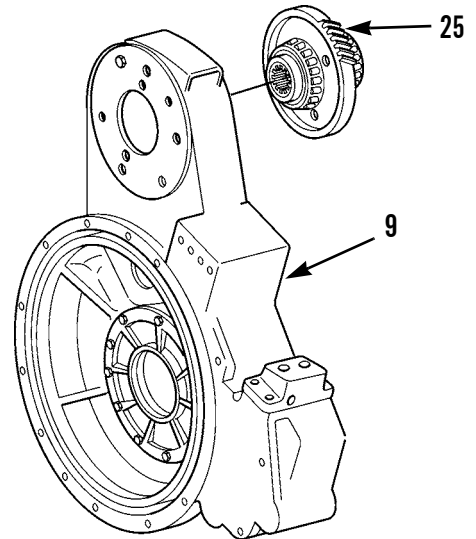


15. Remove cup (24) from cage (17).

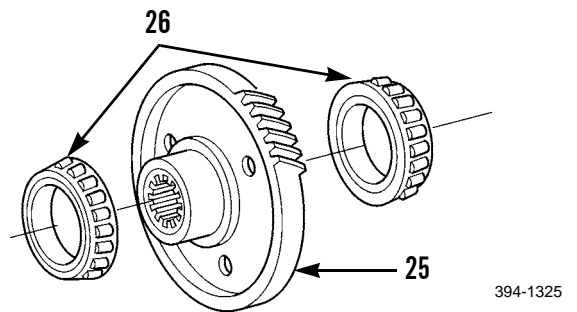


**DISASSEMBLY - CONTINUED**

16. Remove gear assembly (25) from case (9).

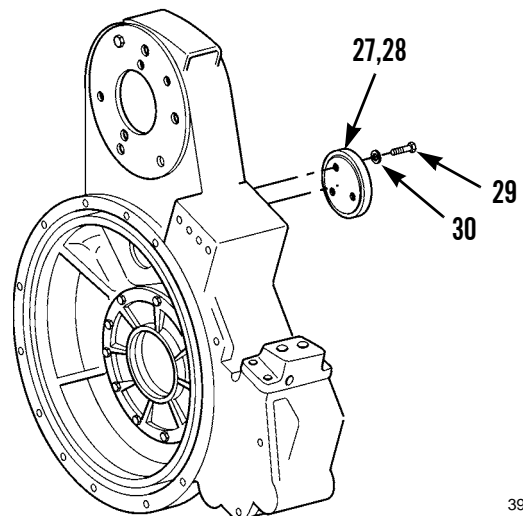


17. Use a bearing puller to remove two bearings (26) from gear (25).



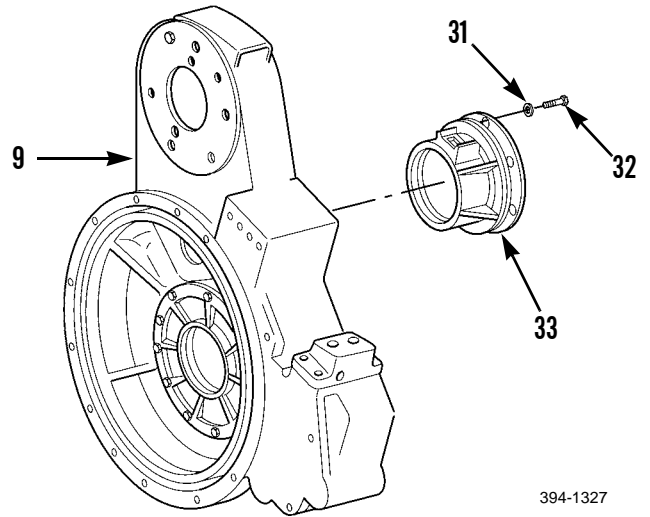
18. Remove three bolts (29), washers (30) and cover assembly (27).

19. Remove and discard seal (28) from cover (27).

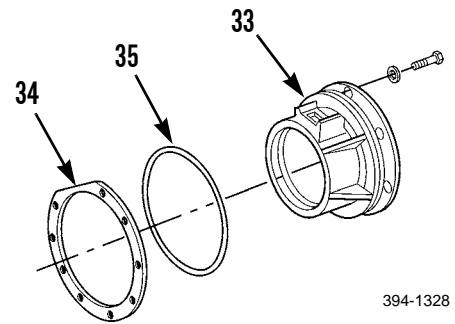


**DISASSEMBLY - CONTINUED**

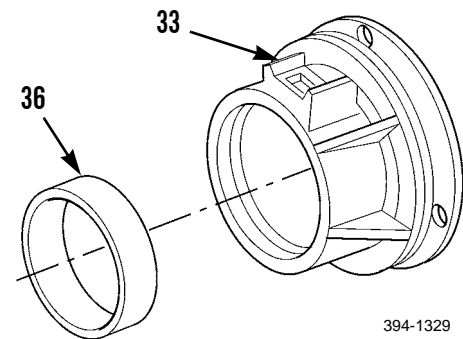
- 20. Remove six bolts (32) and washers (31).
- 21. Remove cage (33) from case (9).



- 22. Remove shim(s) (34) from cage (33).
- 23. Remove and discard preformed packing (35).

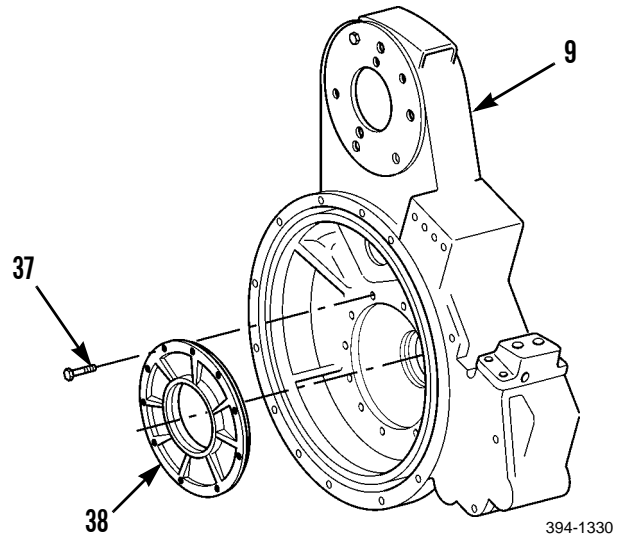


- 24. Remove cup (36) from cage (33).

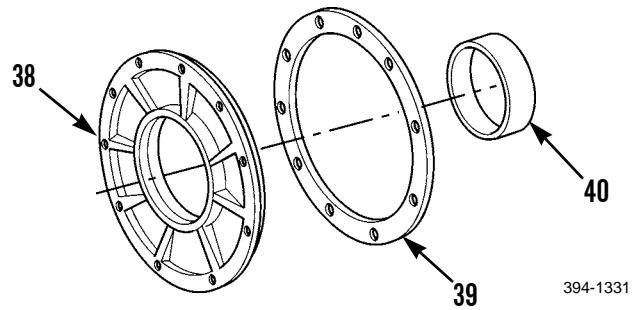


**DISASSEMBLY - CONTINUED**

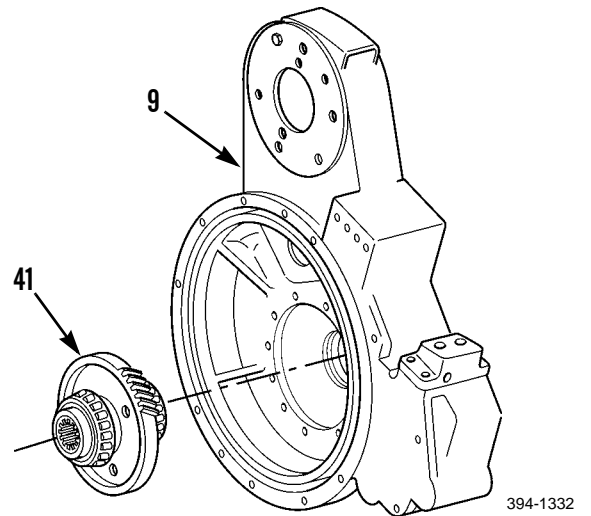
- 25. Remove 10 bolts (37).
- 26. Remove cage (38) from case (9).



- 27. Remove shim(s) (39) from cage (38).
- 28. Remove cup (40) from cage (38).

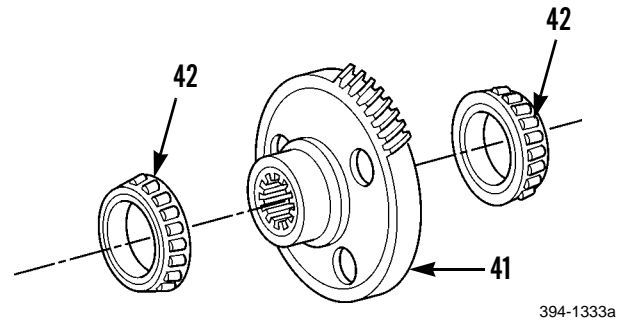


- 29. Remove gear assembly (41) from case (9).

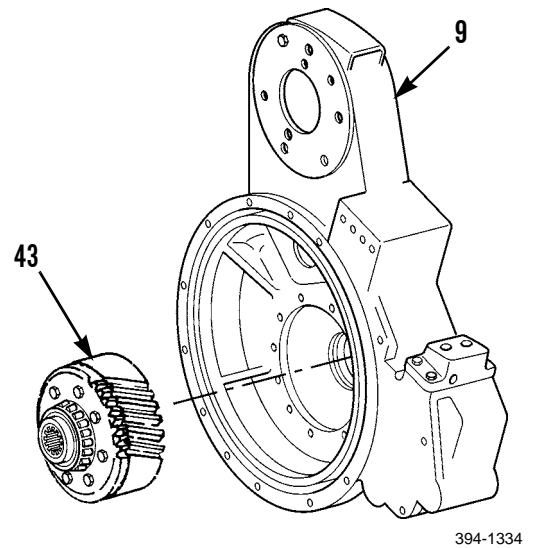


**DISASSEMBLY - CONTINUED**

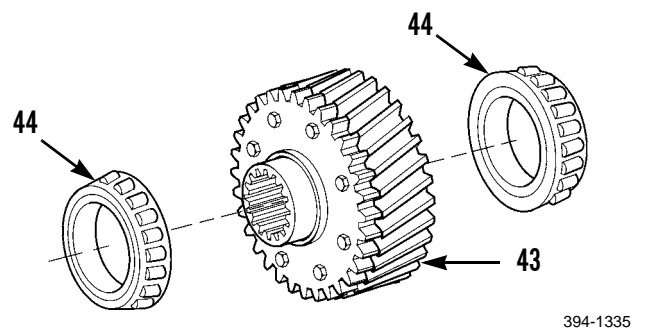
30. Use a bearing puller to remove two bearings (42) from gear (41).



31. Remove gear assembly (43) from case (9).

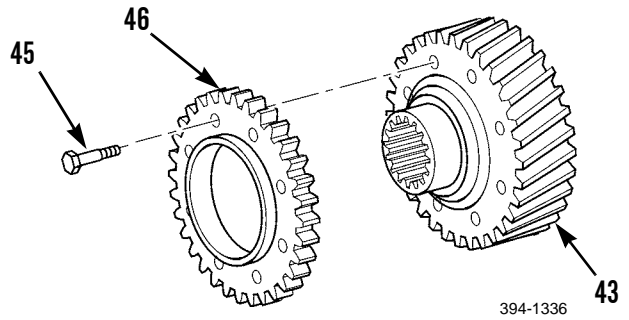


32. Use a bearing puller to remove two bearings (44) from gear assembly (43).

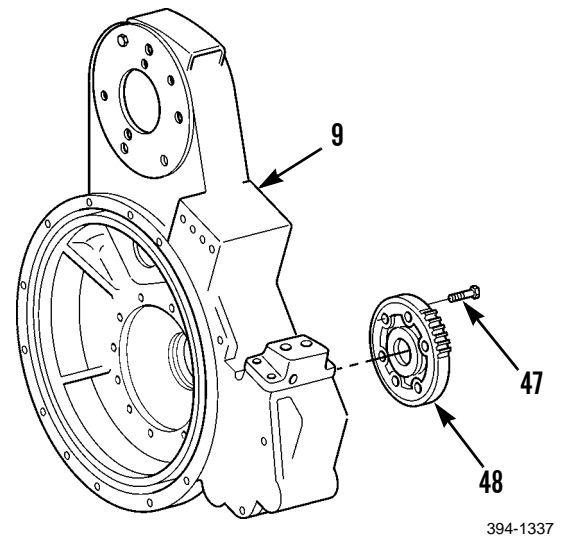


**DISASSEMBLY - CONTINUED**

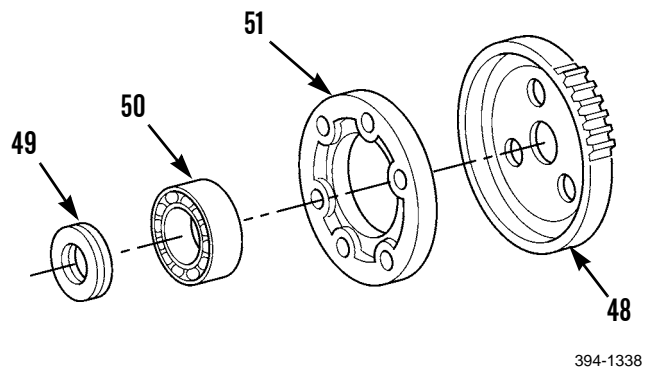
- 33. Remove six bolts (45) from gear (43).
- 34. Remove plate (46) from gear (43).



- 35. Remove three bolts (47) from gear assembly (48).
- 36. Remove gear assembly (48) from case (9).

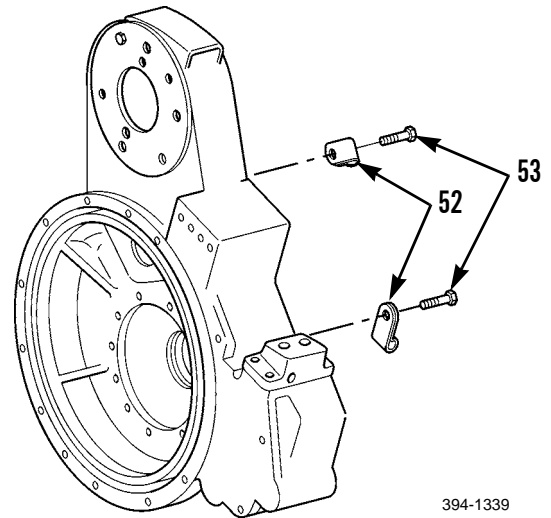


- 37. Remove two retainers (49) from gear (48).
- 38. Remove bearing (50) from cage (51).
- 39. Remove cage (51) from gear (48).



**DISASSEMBLY - CONTINUED**

40. Remove two bolts (53) and clips (52).



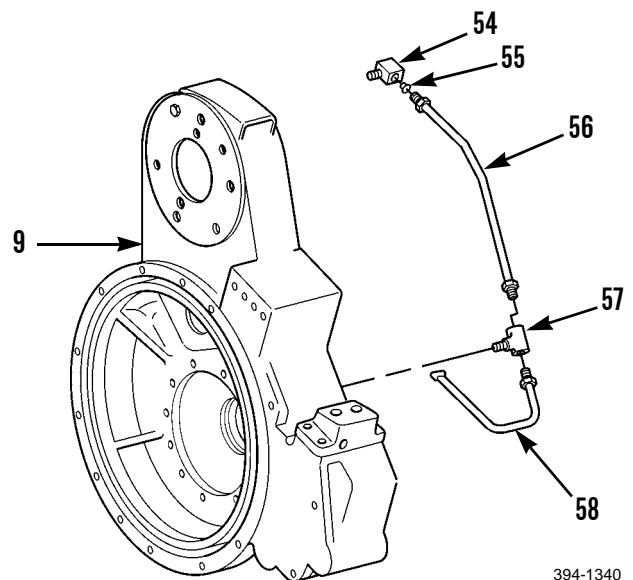
**CAUTION**

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

**NOTE**

- Use a container to capture draining hydraulic oil. Dispose of oil IAW local policy. Ensure all spills are cleaned up.
- Tag hose and tube assemblies prior to removal to ensure correct installation.
- Note routing of all hose assemblies prior to removal to ensure correct installation.
- Remove and note location of all clips that secure hose assemblies to ensure correct installation.

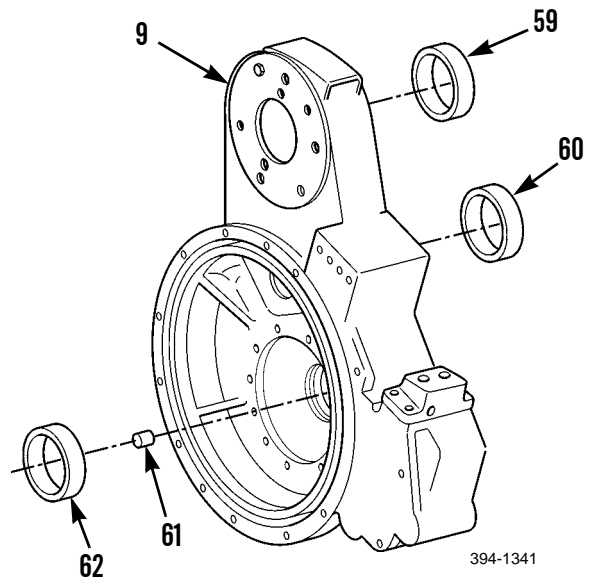
41. Disconnect tube assembly (56) from elbow (54).
42. Remove seal bonnet tube (55) from tube assembly (56).
43. Remove elbow (54).
44. Remove tube assembly (56) from tee (57).
45. Remove tube assembly (58) from tee (57).
46. Remove tee (57) from case (9).



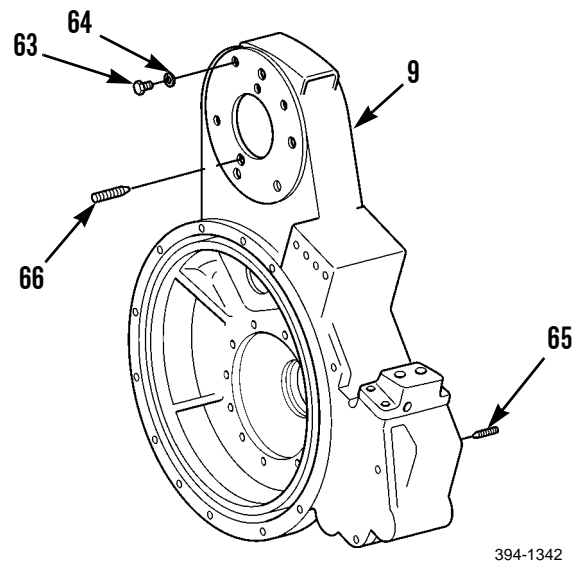


**DISASSEMBLY - CONTINUED**

- 47. Use a hammer and punch to remove bearing (61) from case (9).
- 48. Use a hammer and punch to remove tapered roller cups (62, 59 and 60) from case (9).

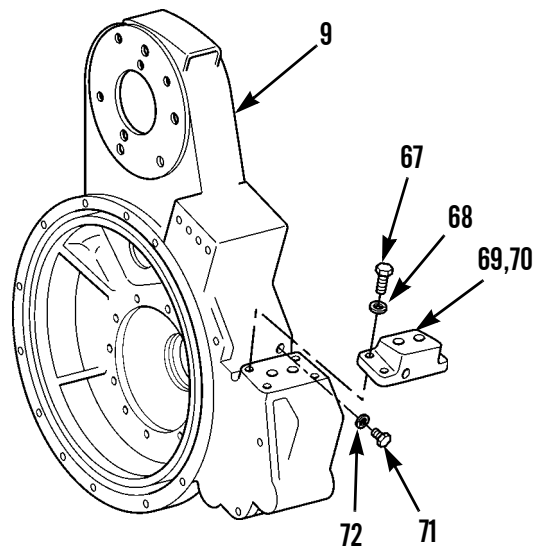


- 49. Remove two pins (65) from case (9).
- 50. Remove plug (63) and preformed packing (64). Discard preformed packing.
- 51. Remove two studs (66).



**DISASSEMBLY - CONTINUED**

52. Remove four bolts (67), washers (68) and block (69) from case (9).
53. Remove and discard two preformed packings (70) from block (69).
54. Remove plug (71) and preformed packing (72). Discard preformed packing.



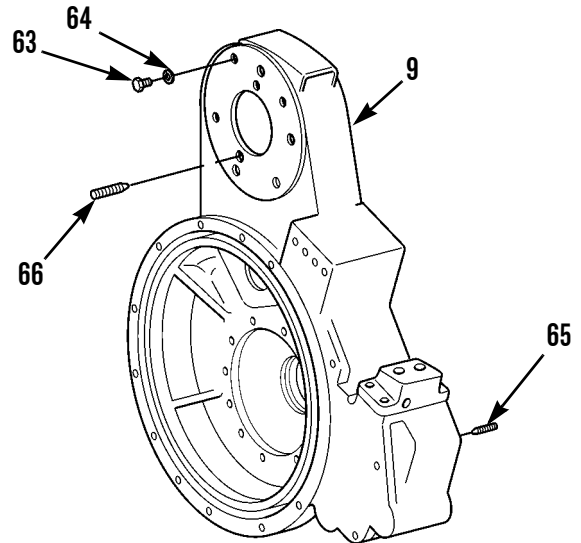
394-1343

**CLEANING AND INSPECTION****WARNING**

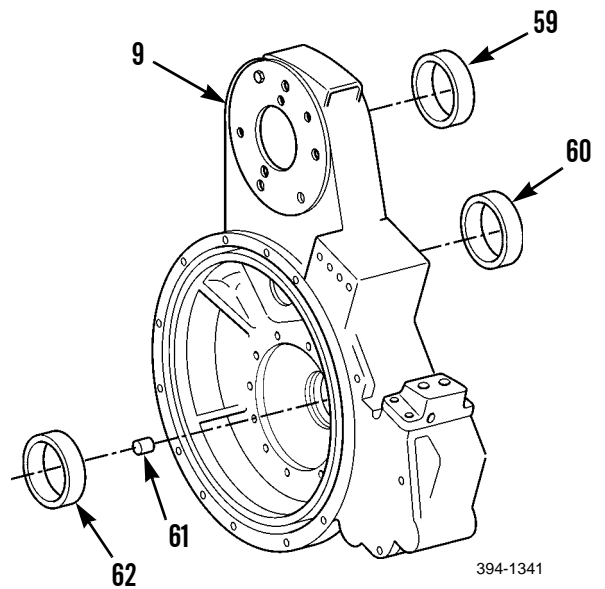
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
  - Particles blown by 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 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. Remove all gasket and preformed packing material from mounting surfaces.
  2. Clean all parts with solvent cleaning compound.
  3. Dry all parts with compressed air.
  4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install two new preformed packings (70) in block (69).
2. Install new preformed packing (72) and plug (71).
3. Install block (69), four washers (68) and bolts (67) on case (9).
4. Install two studs (66) on case (9).
5. Install new preformed packing (64) and plug (63).
6. Install two pins (65).

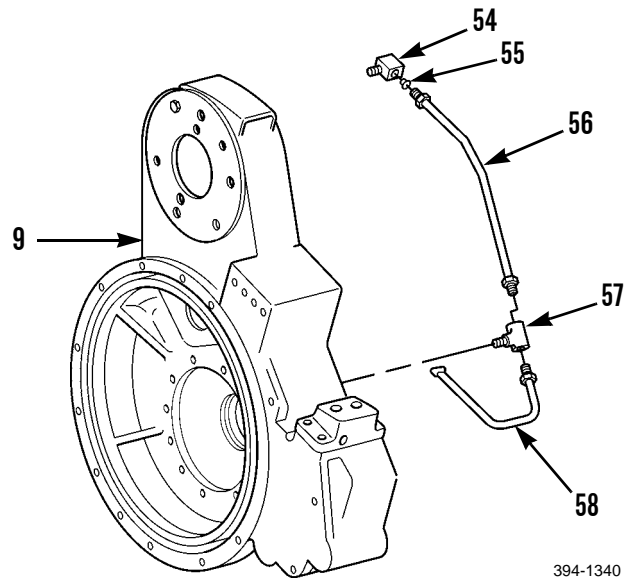


7. Install bearing (61) in case (9).
8. Lower the temperature of cups (62, 60 and 59).
9. Install cups (62, 60 and 59). Ensure that cups (62, 60 and 59) are properly seated in case (9).

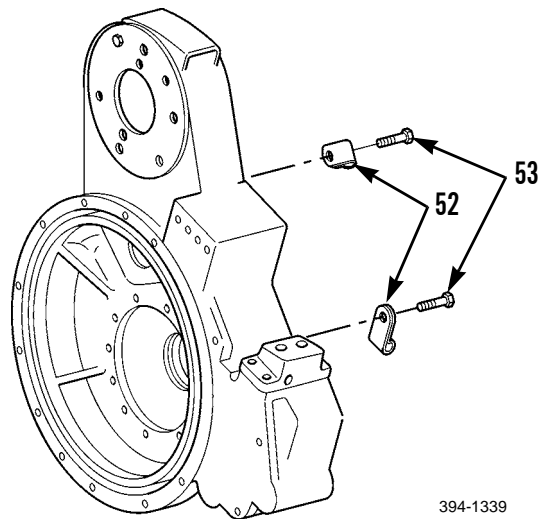


**ASSEMBLY - CONTINUED**

10. Install tee (57).
11. Install tube assembly (58) in tee (57).
12. Install elbow (54).
13. Install tube assembly (56) on tee (57).
14. Install bonnet (55).
15. Connect tube assembly (56) to elbow (54).

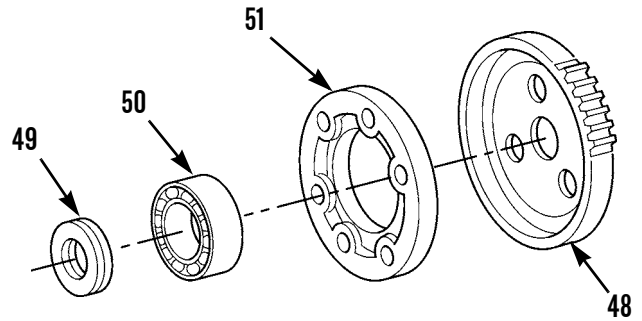


16. Install two clips (52) and bolts (53).



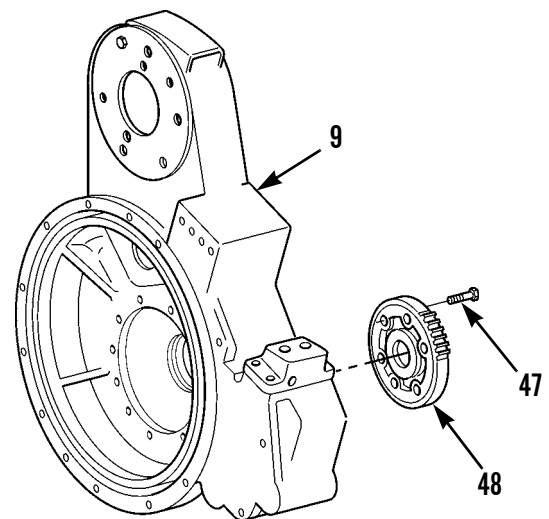
**ASSEMBLY - CONTINUED**

17. Install cage (51), bearing (50) and two retainers (49) in gear (48).



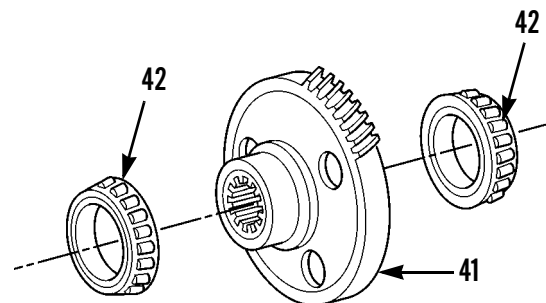
394-1338

18. Install gear assembly (48) and three bolts (47) on case (9). Torque bolts to 36 lb-ft (49 Nm).



394-1337

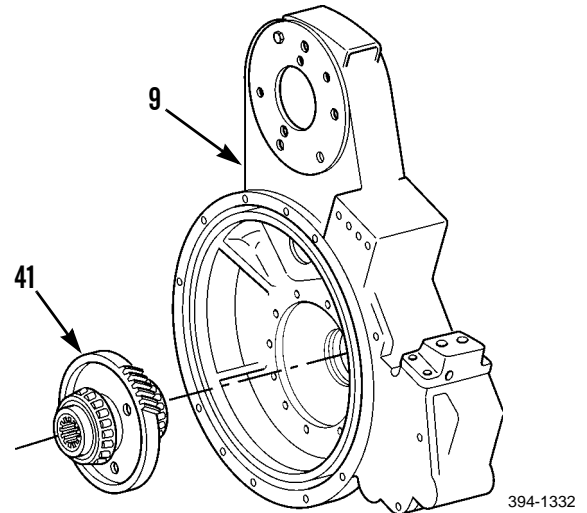
19. Heat two bearings (42) to a maximum of 300°F (149°C) and install on gear (41).



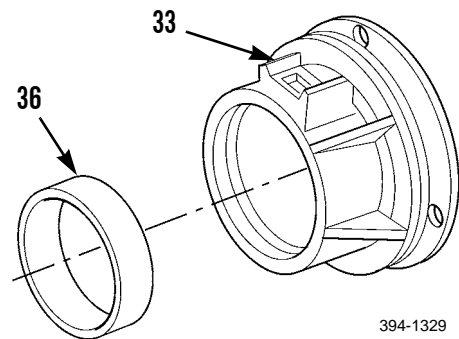
394-1333a

**ASSEMBLY - CONTINUED**

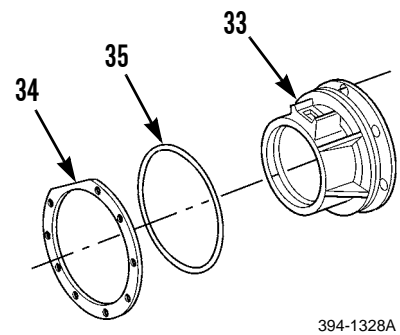
20. Install gear assembly (41) in case (9).



21. Lower the temperature of cup (36) and install in cage (33).

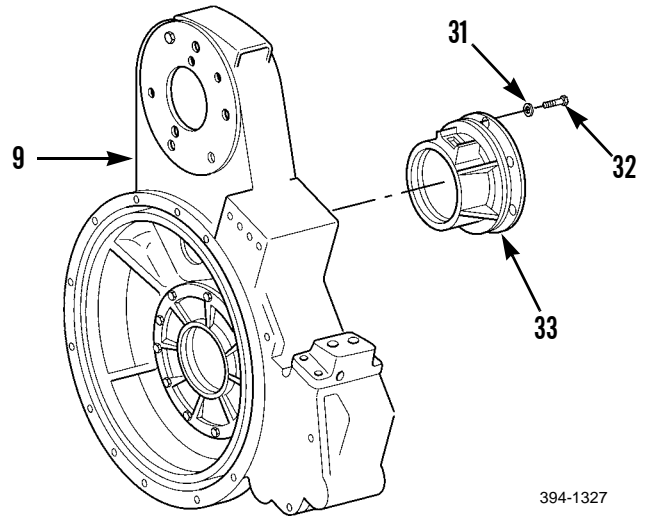


22. Install new preformed packing (35) and shim (34) on cage (33).

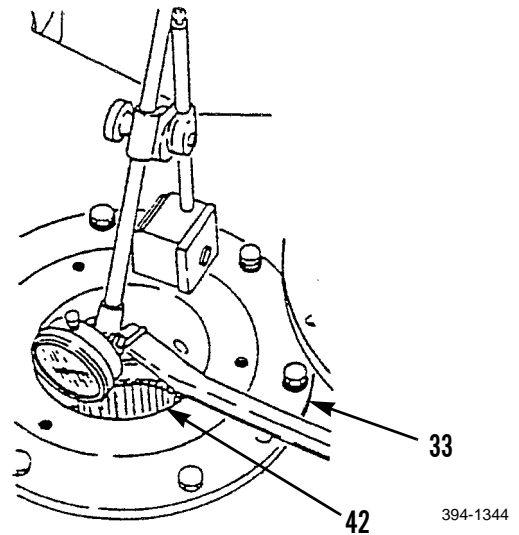


**ASSEMBLY - CONTINUED**

23. Install cage assembly (33), six washers (31) and bolts (32) in case (9). Torque bolts to  $36 \pm 2$  lb-ft ( $49 \pm 2.7$  Nm).

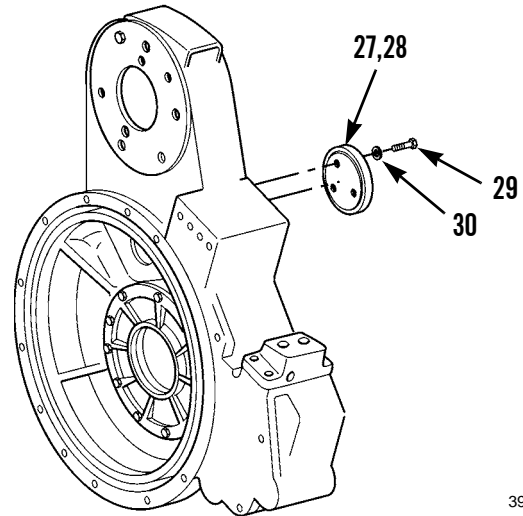


24. Use a dial indicator to measure end play of gear (42).
25. Adjust end play to  $0.006 \pm 0.002$  in. by increasing or decreasing number of shims on cage (33).



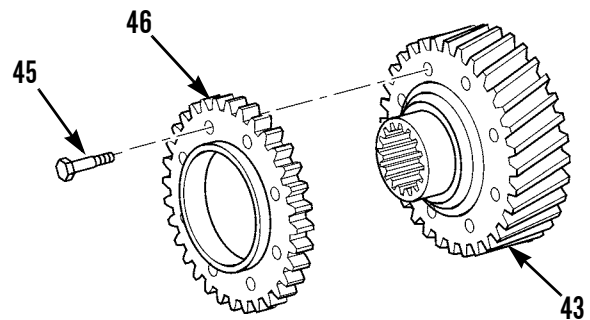
**ASSEMBLY - CONTINUED**

26. Install new seal (27) to cover (28).
27. Install cover assembly (28), three washers (30) and bolts (29).



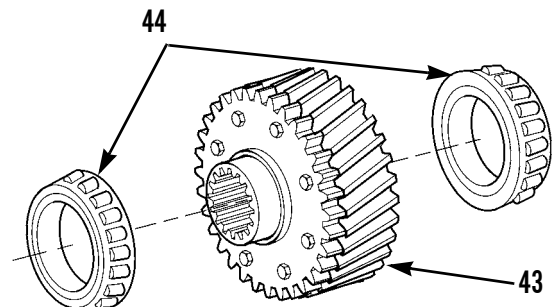
394-1326

28. Install gear (46) and six bolts (45) on gear (43).  
Torque six bolts (45) to  $36 \pm 2$  lb-ft ( $49 \pm 2.7$  Nm).



394-1336

29. Heat two bearings (44) to a maximum of 300°F (149°C) and install on gear assembly (43).

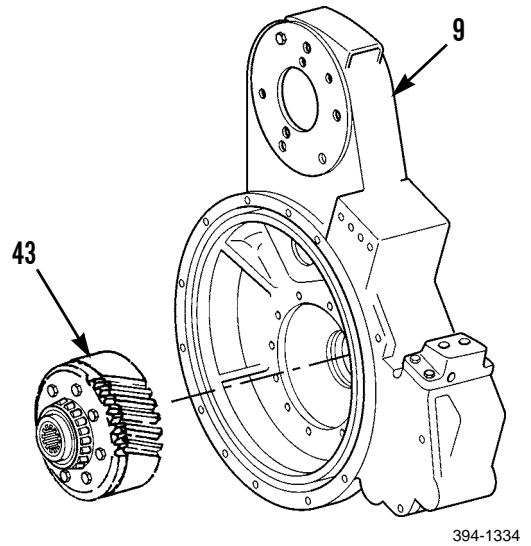


394-1335

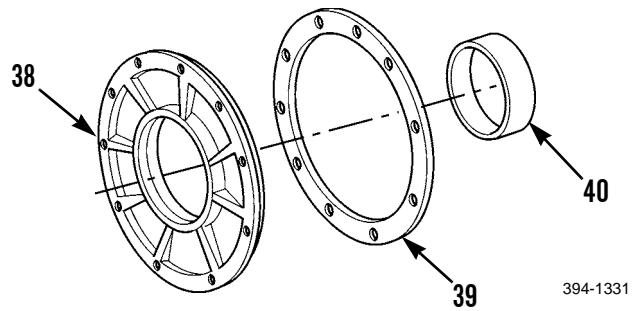


**ASSEMBLY - CONTINUED**

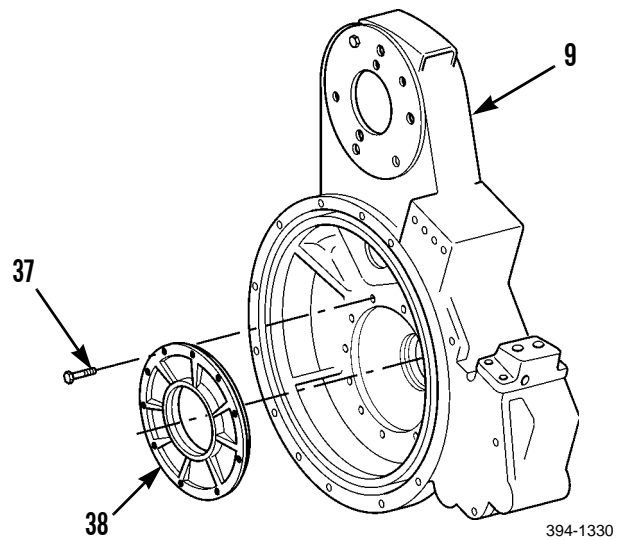
30. Install gear assembly (43) in case (9).



31. Lower temperature of cup (40) and install in cage (38).  
 32. Install shim(s) (39) on cage (38).

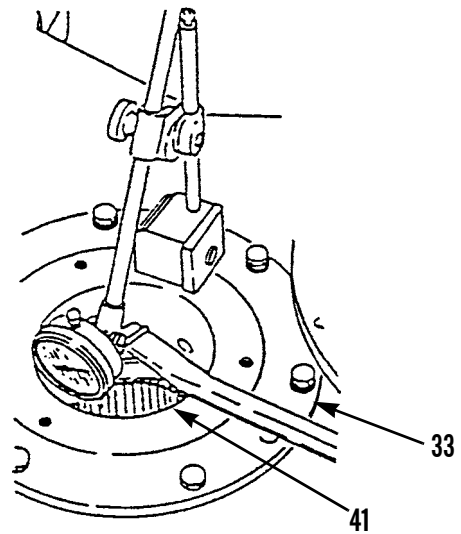


33. Install cage assembly (38) and nine bolts (37), in case (9). Torque bolts to  $36 \pm 2$  lb-ft ( $49 \pm 2.7$  Nm).



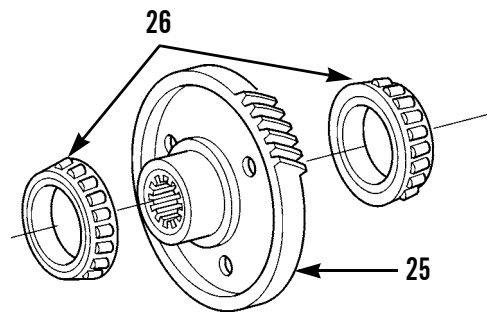
**ASSEMBLY - CONTINUED**

34. Use a dial indicator to measure end play of gear (41).
35. Adjust end play to 0.006-0.002 in. by increasing or decreasing number of shims (33).



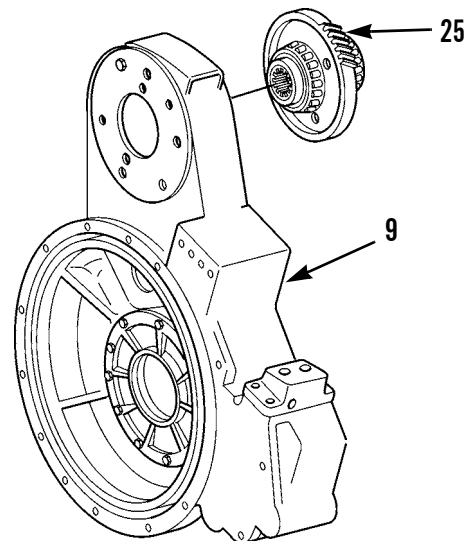
394-1345

36. Heat two bearings (26) to a maximum of 300°F (149°C) and install on gear (25).



394-1325

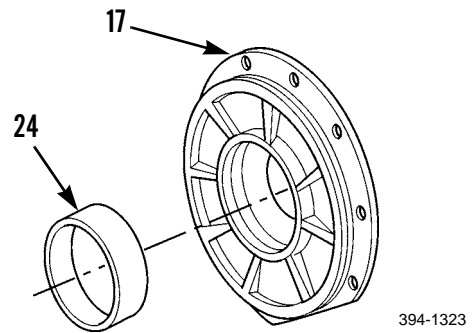
37. Install gear assembly (25) in case (9).



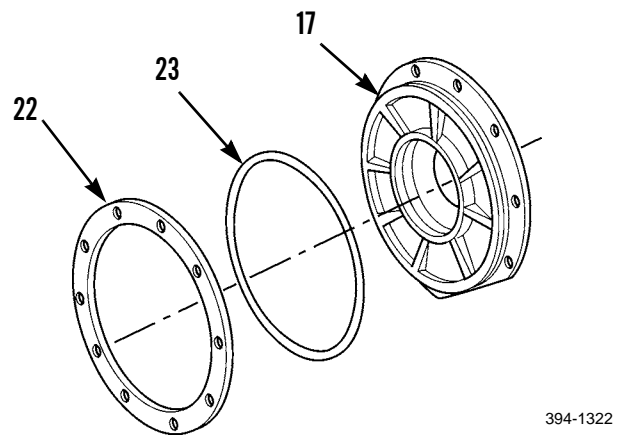
394-1324

**ASSEMBLY - CONTINUED**

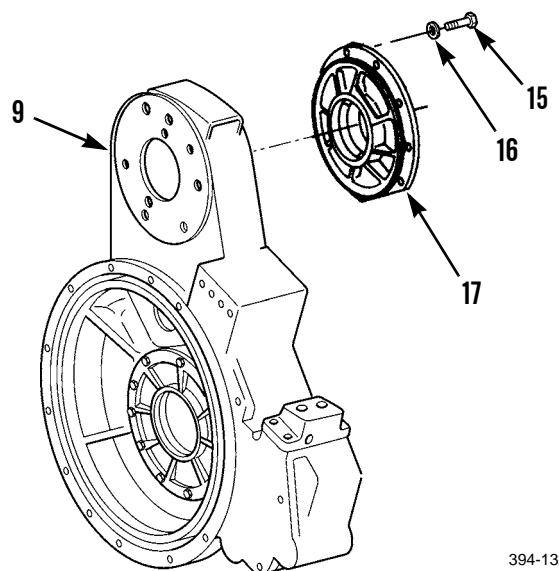
38. Lower the temperature of cup (24) and install in cage (17).



39. Install new preformed packing (23) and shim (22) on cage (17).

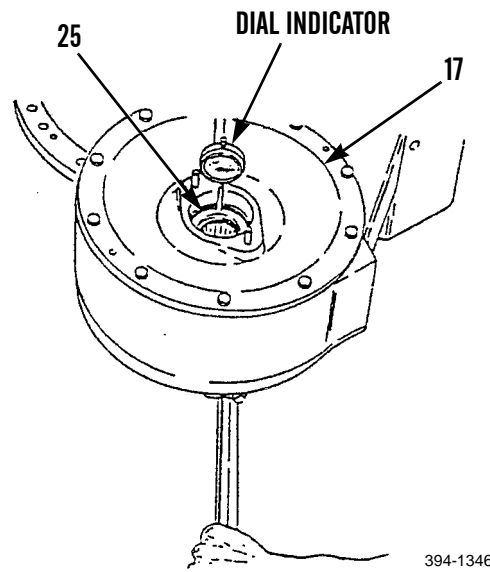


40. Install cage assembly (17), nine washers (16) and bolts (15) on case (9). Torque nine bolts (15) to  $36 \pm 2$  lb-ft ( $49 \pm 2.7$  Nm).

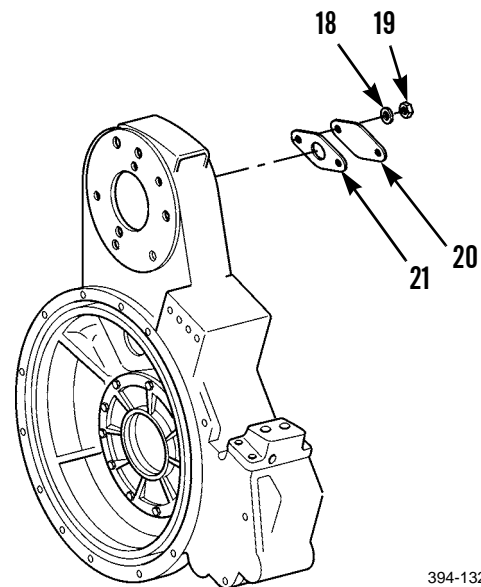


**ASSEMBLY - CONTINUED**

41. Use a dial indicator to measure the end play for gear (25).
42. Adjust end play to  $0.006 \pm 0.002$  in. by increasing or decreasing number of shims on cage (17).

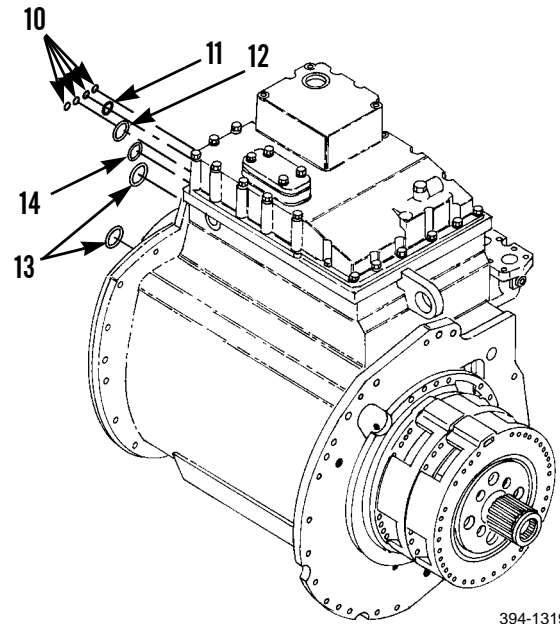


43. Install new gasket (21), cover (20), two washers (18) and nuts (19).



**ASSEMBLY - CONTINUED**

44. Install new preformed packings (11, 12 and 14), two new preformed packings (13) and four new preformed packings (10) on transmission housing.



394-1319

**ASSEMBLY - CONTINUED**

45. Install link bracket (1) in case (9).

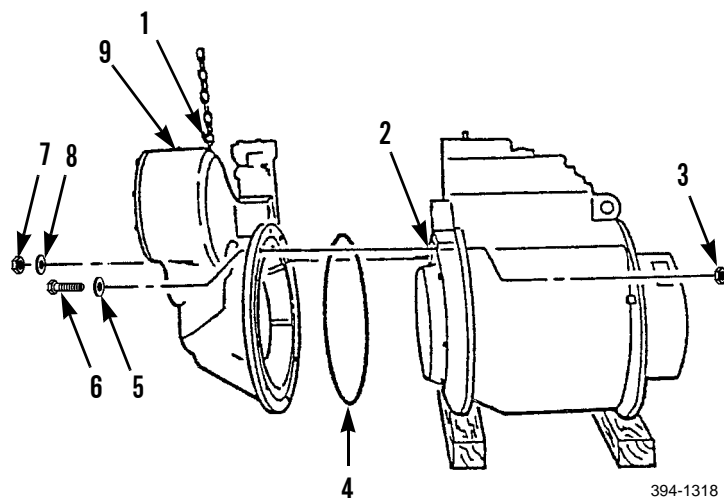
**WARNING**

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 cause injury or death.

**NOTE**

Weight of transfer gear assembly is 500 lb (227 kg).

46. Attach lifting device to link brackets (1).  
 47. Install new preformed packing (4) in case (9).  
 48. Position case (9) on transmission housing on studs (2).  
 49. Install seven washers (8) and nuts (7).  
 50. Install seven bolts (6), washers (5) and nuts (3).  
 51. Remove lifting device.  
 52. Remove link bracket (1).



53. Install rear cutting edge worklight (WP 0086 00).  
 54. Install transmission oil filter (WP 0128 00).  
 55. Install magnetic strainer (WP 0130 00).  
 56. Install transmission oil pump suction screen (WP 0131 00).  
 57. Install governor and automatic shift drive (WP 0370 00).  
 58. Install transfer gears and transmission (WP 0286 00).  
 59. Install scavenger pump, oil pump and manifold (WP 0375 00).  
 60. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**THIS WORK PACKAGE COVERS**

Removal, Cleaning and Inspection, Installation

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Gasket

**Materials/Parts - Continued**

Lockwasher (12)

Packing, preformed (7)

**Equipment Condition**

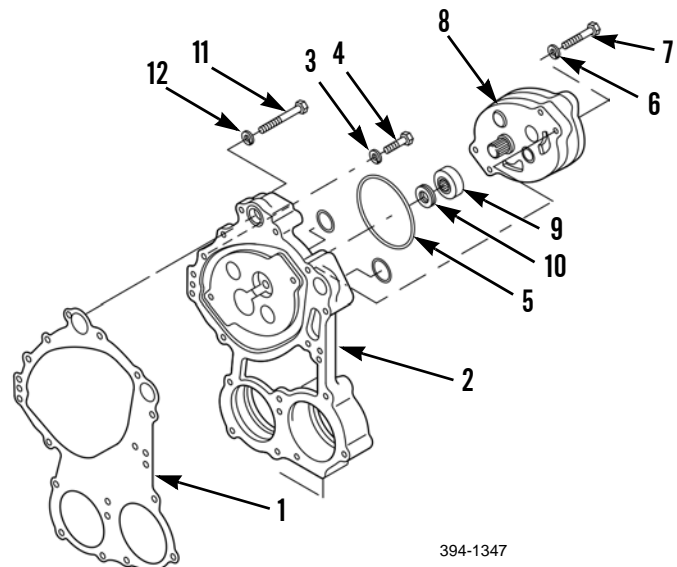
Transmission fluid drained (WP 0128 00)

Magnetic screen removed (WP 0130 00)

Screen assembly removed (WP 0131 00)

**REMOVAL**

1. Remove two bolts (7) and lockwashers (6), scavenge oil pump (8) and preformed packing (5) from transmission housing. Discard lockwashers and preformed packing.
2. Use retaining ring pliers to remove retaining ring (10).
3. Remove coupling (9).
4. Remove six bolts (4) and lockwashers (3). Discard lockwashers.
5. Remove four bolts (11), lockwashers (12), pump housing (2) and gasket (1). Discard gasket and lockwashers.



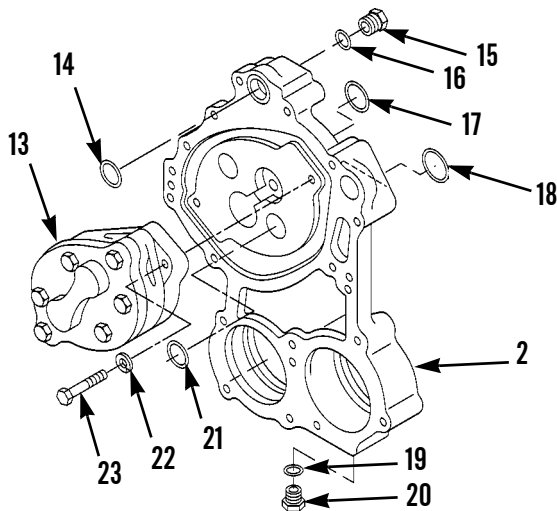
394-1347

**SCAVENGE OIL PUMP, MANIFOLD AND TRANSMISSION OIL PUMP  
REPLACEMENT - CONTINUED**

0375 00

**REMOVAL - CONTINUED**

6. Remove two bolts (23), washers (22) and transmission oil pump (13) from pump housing (2).
7. Remove and discard preformed packings (14, 17, 18 and 21).
8. Remove plug (15) and preformed packing (16). Discard preformed packing.
9. Remove plug (20) and preformed packing (19). Discard preformed packing.



394-1348

**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. Remove all gasket and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

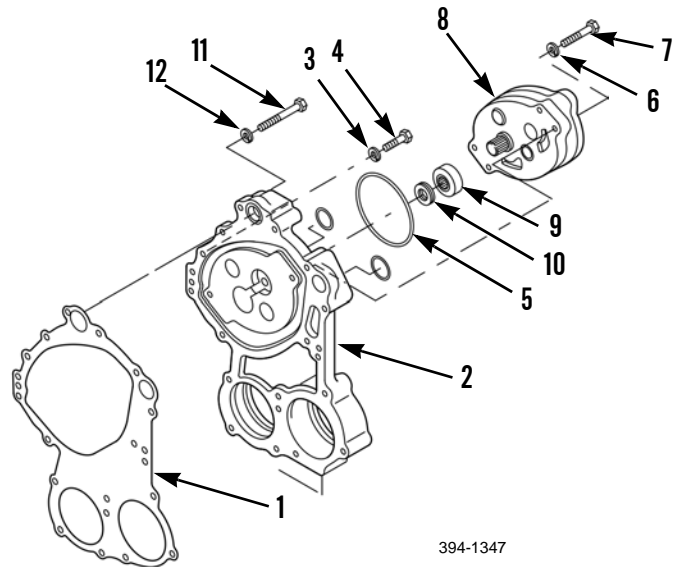


**SCAVENGE OIL PUMP, MANIFOLD AND TRANSMISSION OIL PUMP  
REPLACEMENT - CONTINUED**

0375 00

**INSTALLATION**

1. Install new preformed packing (19) and plug (20) in pump housing (2).
2. Install new preformed packing (16) and plug (15).
3. Install new preformed packings (21, 18, 17 and 14).
4. Position transmission oil pump (13) on pump housing (2) and install two washers (22) and bolts (23).
5. Install new gasket (1), pump housing (2), four new lockwashers (12), bolts (11), six new lockwashers (3) and bolts (4) on transmission housing.
6. Install coupling (9).
7. Use retaining ring pliers to install retaining ring (10).
8. Install preformed packing (5).
9. Install scavenge oil pump (8), two new lockwashers (6) and bolts (7).



394-1347

10. Fill transmission fluid (WP 0128 00).
11. Install magnetic strainer (WP 0130 00).
12. Install screen assembly (WP 0131 00).

**END OF WORK PACKAGE**



---

**DIFFERENTIAL AND BEVEL GEAR REPAIR**

---

**0376 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Attachment, bearing cup puller (Item 3, WP 0338 00)

Attachment, mechanical puller (Item 1, WP 0338 00)

Bushing driver set (FD) (Item 12, WP 0338 00)

Handle, driver (Item 35, WP 0338 00)

Indicator, dial (Item 39, WP 0338 00)

Leg, mechanical puller (Item 50, WP 0338 00)

Puller attachment, mechanical (Item 81, WP 0338 00)

Puller, hydraulic (Item 85, WP 0338 00)

Pump, hydraulic ram, hand-driven (Item 91, WP 0338 00)

Puller, mechanical (Item 88, WP 0338 00)

Screw, forcing (Item 99, WP 0338 00)

Wrench, ratchet (Item 122, WP 0338 00)

Lifting device, 300 lb minimum capacity

Screws, forcing, 1/2-13NC

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Grease (Item 17, WP 0339 00)

Lock wire (3)

Locknut (24)

Packing, preformed (6)

Seal (4)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**Differential and bevel gear removed (WP 0295 00)

---

**DISASSEMBLY**

1. Remove clip (7) from hose assembly (8) on differential assembly.

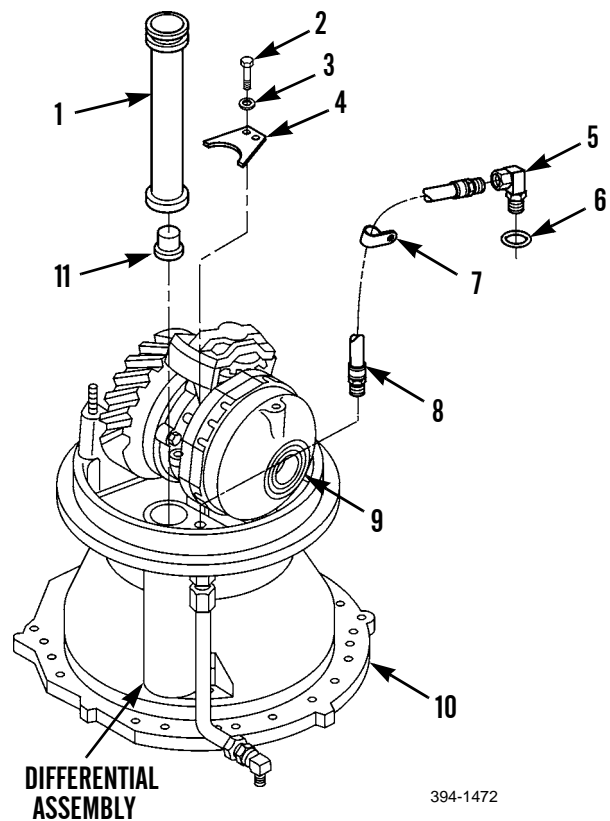
**CAUTION**

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

**NOTE**

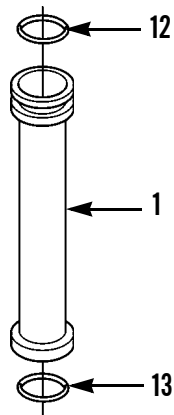
Use container to capture draining oil. Dispose of oil IAW local policy and ordinances. Ensure all spills are cleaned up.

2. Disconnect hose assembly (8) from carrier (10).
3. Remove hose assembly (8), elbow (5) and preformed packing (6) from cylinder assembly (9). Discard preformed packing.
4. Remove two bolts (2), washers (3) and bracket (4).
5. Remove tube assembly (1) and bearing (11).



**DISASSEMBLY - CONTINUED**

6. Remove and discard preformed packings (12 and 13) from tube (1).



394-1473



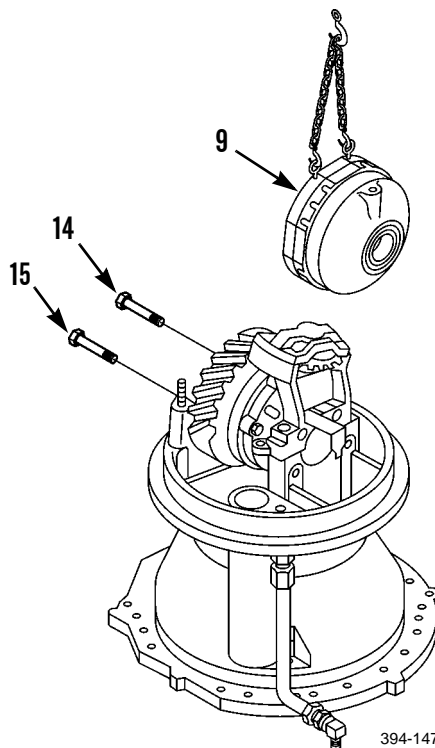
**WARNING**

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**

Differential lock weighs 85 lb (39 kg).

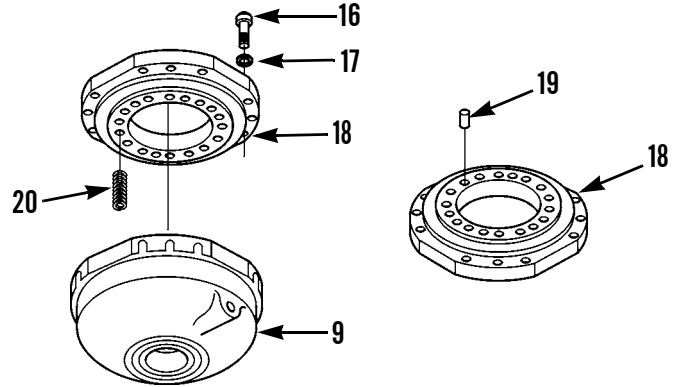
7. Attach lifting device to cylinder assembly (9). Take up slack on chain.
8. Remove two bolts (14 and 15).
9. Use lifting device to remove cylinder assembly (9).
10. Remove lifting device.



394-1474

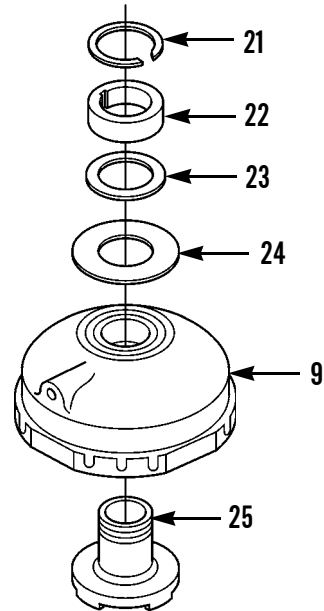
**DISASSEMBLY - CONTINUED**

11. Remove 12 bolts (16) and washers (17) from cylinder assembly (9).
12. Remove housing assembly (18) and 12 springs (20) from cylinder assembly (9).
13. Use dowel puller to remove two dowels (19) from housing (18).
14. Invert cylinder assembly (9).



394-1475

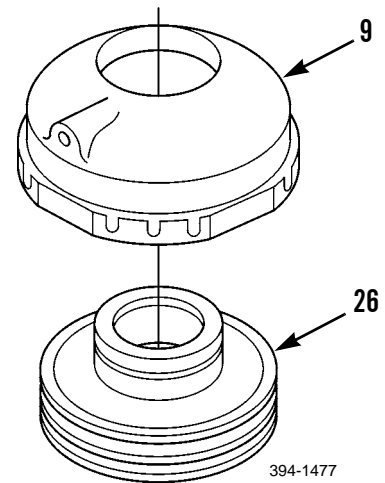
15. Use retaining ring pliers to remove retaining ring (21).
16. Remove spacer (22), washers (23 and 24) and cylinder assembly (9) from jaw (25).



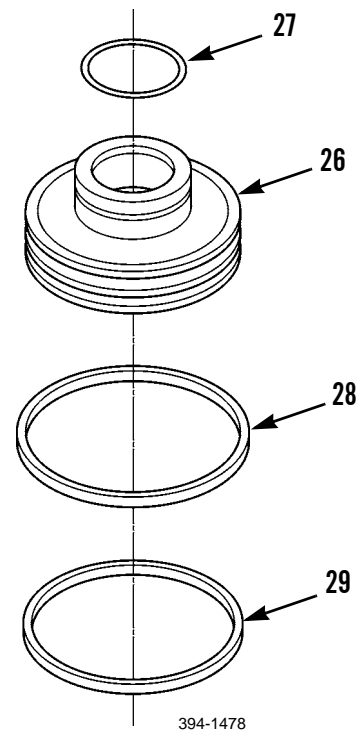
394-1476

**DISASSEMBLY - CONTINUED**

17. Use hammer and driver to remove cylinder assembly (9) from piston (26).

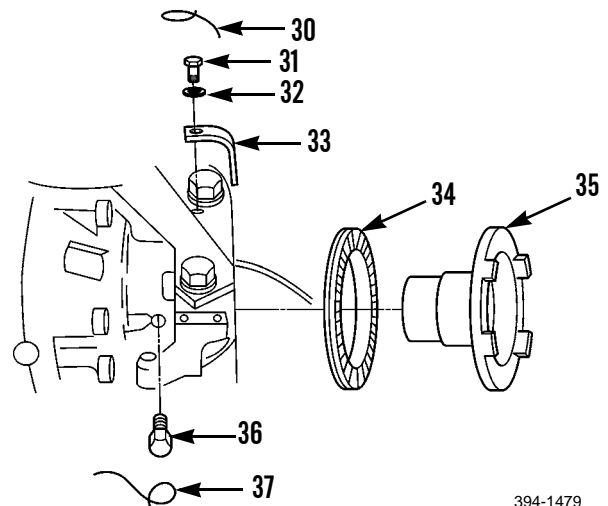


18. Remove and discard seals (27 and 29) and ring (28) from piston (26).



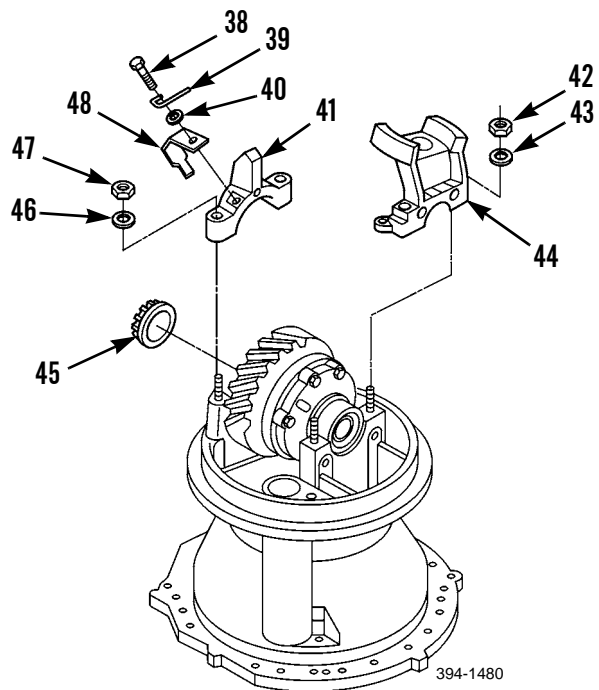
**DISASSEMBLY - CONTINUED**

19. Remove lock wire (37) and two bolts (36). Discard lock wire.
20. Remove jaw (35).
21. Remove lock wire (30), bolt (31), washer (32) and lock (33). Discard lock wire.
22. Rotate ring (34) counterclockwise and remove.



394-1479

23. Remove lock wire (39), bolt (38), washer (40) and lock (48). Discard lock wire.
24. Rotate ring (45) counterclockwise and remove.
25. Remove two nuts (42), washers (43) and bearing cap (44).
26. Remove two nuts (47), washers (46) and bearing cap (41).

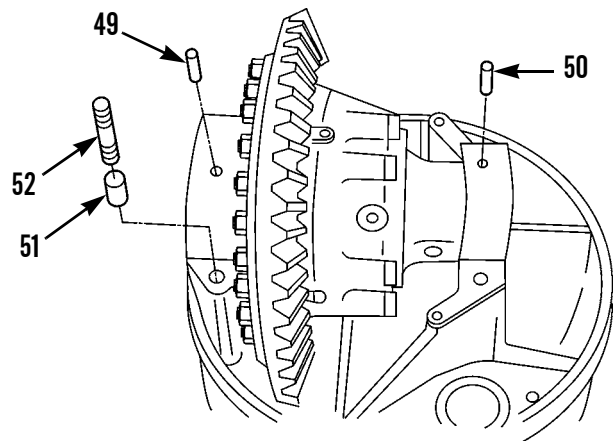


394-1480



**DISASSEMBLY - CONTINUED**

27. Remove dowel (49 and 50), four studs (52) and sleeves (51).



394-1481

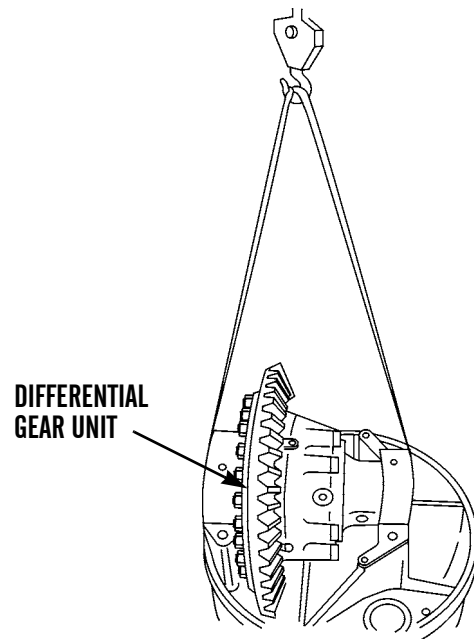
**WARNING**

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**

Differential gear weighs 270 lb (122 kg).

28. Attach lifting device to differential gear unit.  
 29. Use lifting device to remove differential gear unit and place on wood blocks with teeth down.  
 30. Remove lifting device.



394-1482

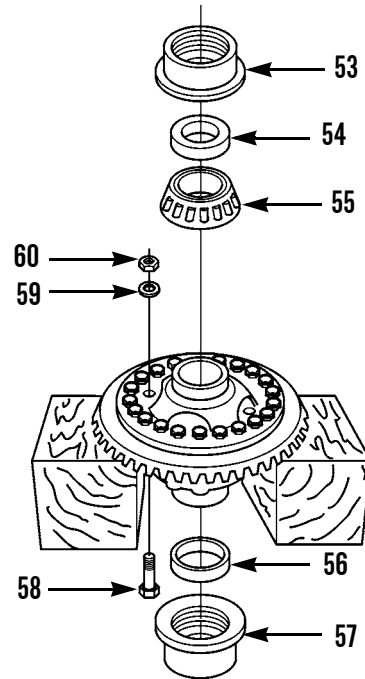
**DISASSEMBLY - CONTINUED**

31. Remove cage (57) and bearing cup (56).
32. Remove cage (53) and bearing cup (54).

**CAUTION**

Removal of bearing will destroy bearing. Remove bearing only if inspection indicates replacement is necessary.

33. If necessary, use bearing puller attachment to remove bearing (55).
34. Remove eight nuts (60), washers (59) and bolts (58).



394-1483

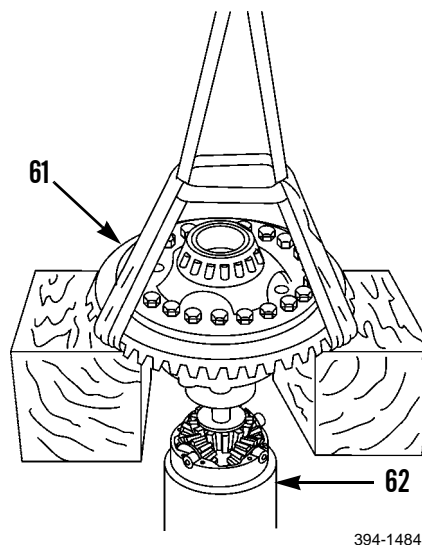
**DISASSEMBLY - CONTINUED****WARNING**

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.

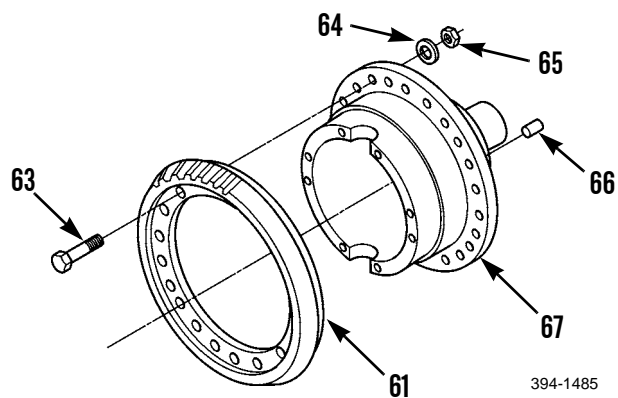
**NOTE**

Differential half weighs 135 lb (61 kg).

35. Install lifting device on gear assembly (61).
36. Use lifting device to remove gear assembly (61) from bevel gear assembly (62).
37. Remove lifting device.

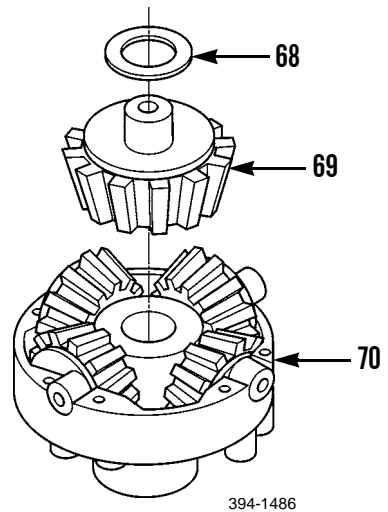


38. Remove 24 locknuts (65), washers (64) and bolts (63). Discard locknuts.
39. Use dowel puller to remove four dowels (66).
40. Remove housing (67) from gear (61).

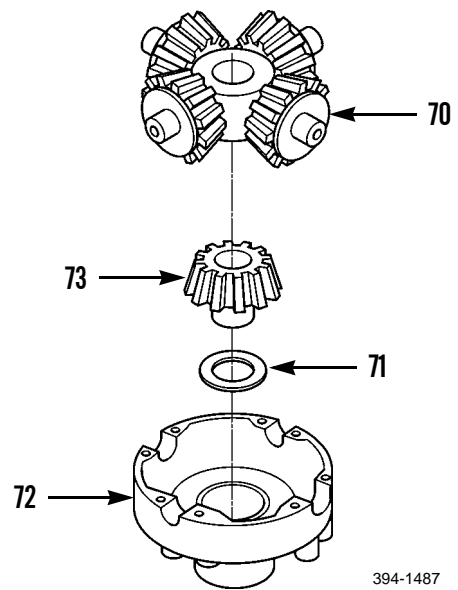


**DISASSEMBLY - CONTINUED**

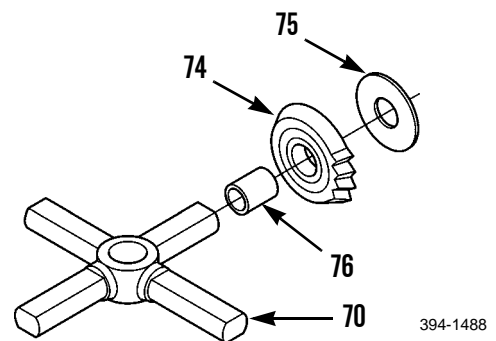
41. Remove washer (68) and gear (69) from bevel gear assembly (70).



42. Remove spider assembly (70), gear (73) and thrust plate (71) from housing assembly (72).

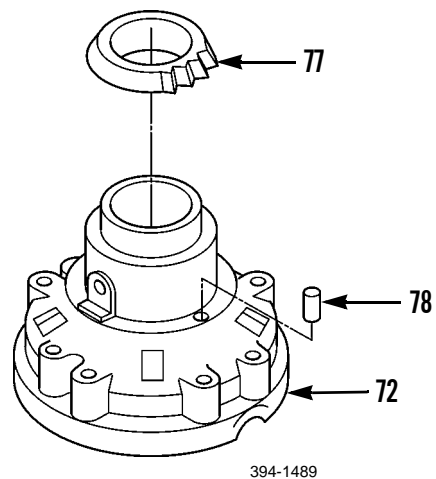


43. Remove four washers (75), gears (74) and bearings (76) from spider (70).

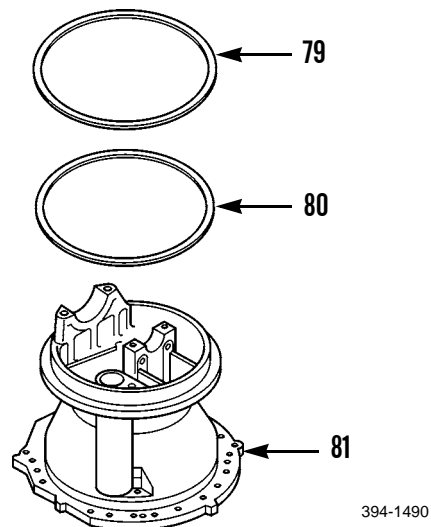


**DISASSEMBLY - CONTINUED**

- 44. Invert housing assembly (72).
- 45. Use bearing puller attachment to remove bearing (77).
- 46. Use dowel puller to remove four dowels (78) from housing (72).

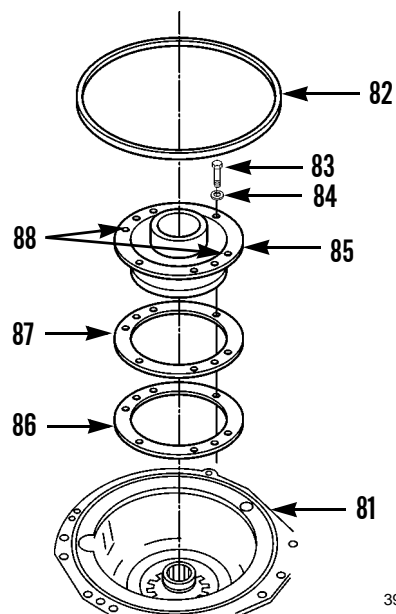


- 47. Remove and discard preformed packing (79) and seal (80) from carrier assembly (81).
- 48. Invert carrier assembly (81).



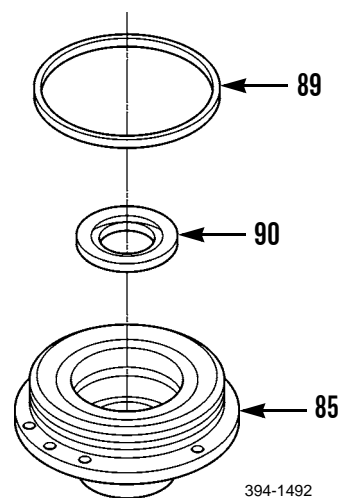
**DISASSEMBLY - CONTINUED**

- 49. Remove and discard preformed packing (82).
- 50. Remove six bolts (83) and washers (84).
- 51. Install two forcing screws in holes (88) of retainer (85).
- 52. Use two forcing screws (88) to remove pinion gear retainer (85) from carrier (81).
- 53. Remove shims (86 and 87).
- 54. Remove two 1/2-13NC forcing screws (88) from pinion gear retainer (85).



394-1491

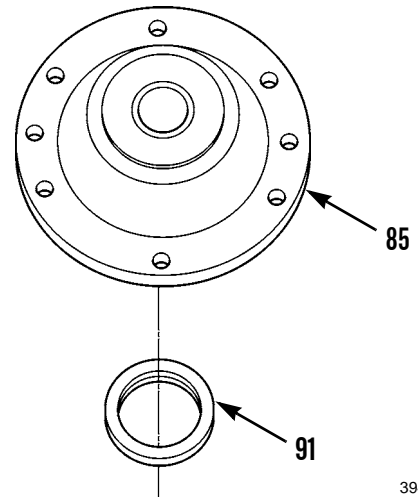
- 55. Remove and discard preformed packing (89).
- 56. Use puller assembly to remove bearing (90).
- 57. Invert retainer assembly (85).



394-1492

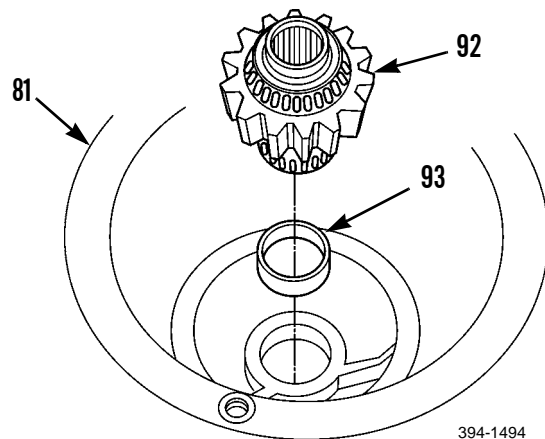
**DISASSEMBLY - CONTINUED**

58. Use hammer and driver to remove and discard seal (91) from retainer (85).



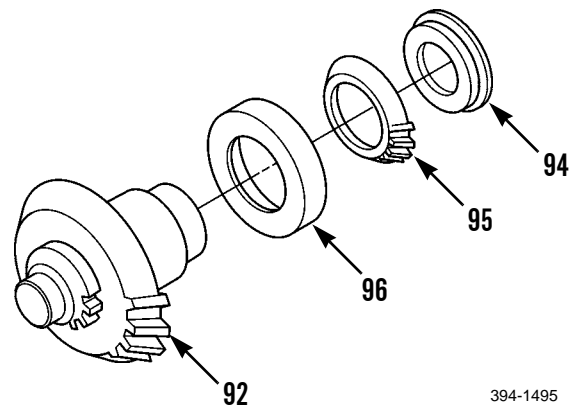
394-1493

59. Remove pinion gear assembly (92) and bearing (93) from carrier assembly (81).



394-1494

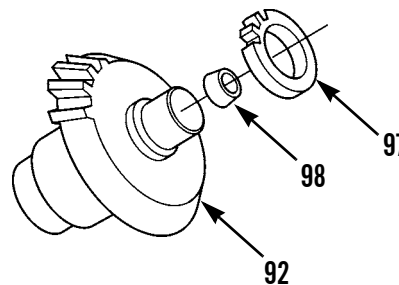
60. Remove ring (94) from pinion gear (92).  
 61. Use bearing puller attachment to remove bearings (95 and 96).



394-1495

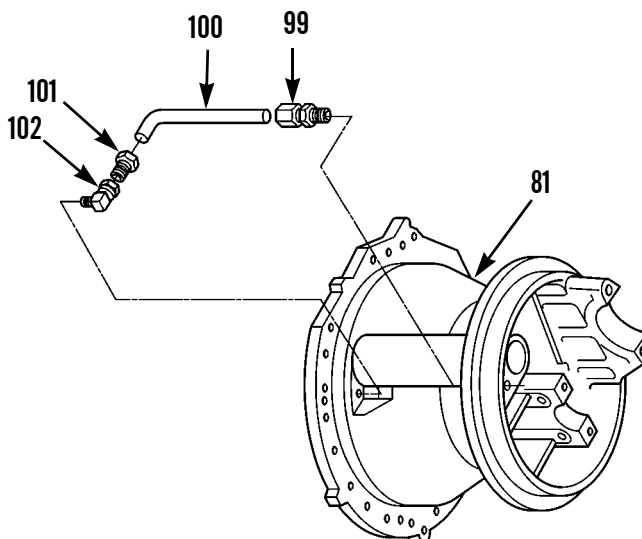
**DISASSEMBLY - CONTINUED**

- 62. Use bearing puller attachment to remove bearing (97) from pinion gear (92).
- 63. Remove slug (98) from pinion gear (92).



394-1496

- 64. Remove tube assembly (100), connector (99), nut (101) and fitting (102) from carrier (81).



394-1497

**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 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. Remove all preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound and dry with compressed air.
3. Inspect all parts for damage and replace as necessary.



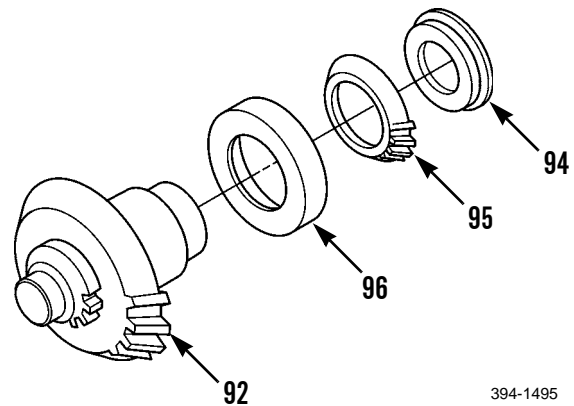
**ASSEMBLY**

1. Install fitting (102), nut (101), connector (99) and tube assembly (100) in carrier (81).
2. Install slug (98) on pinion gear (92).
3. Heat bearing (97) to a maximum temperature of 275°F (135°C).
4. Install bearing (97).
5. Heat bearing (96) to a maximum temperature of 275°F (135°C).
6. Install bearing (96) on pinion gear (92).

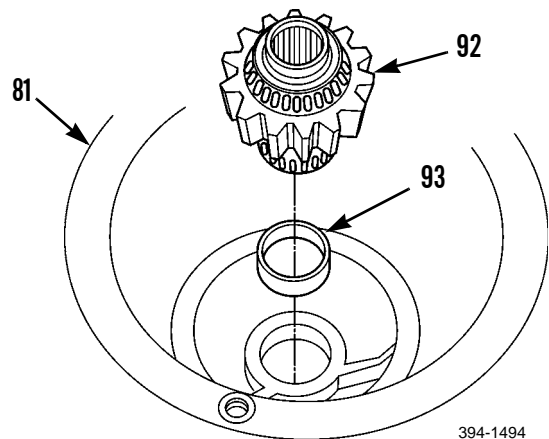
**NOTE**

Temperature of bearing cups must be lowered before installation.

7. Lower temperature of bearing (95).
8. Install bearing (95) and ring (94) on pinion gear (92).

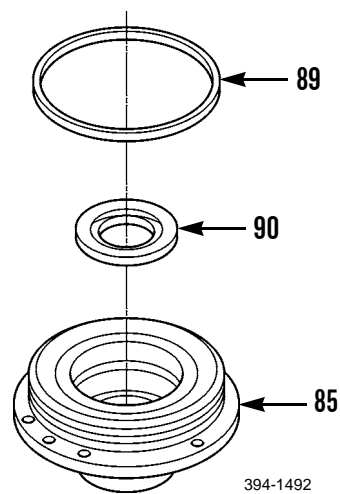


9. Lower temperature of bearing (93).
10. Install bearing (93) and pinion gear assembly (92) in carrier assembly (81).

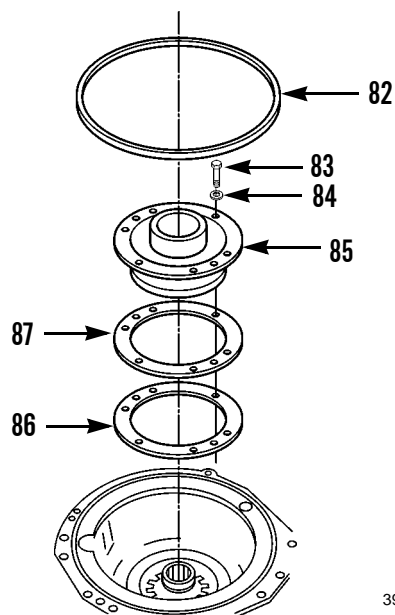


**ASSEMBLY - CONTINUED**

11. Install bearing (90) and new preformed packing (89) in retainer (85).



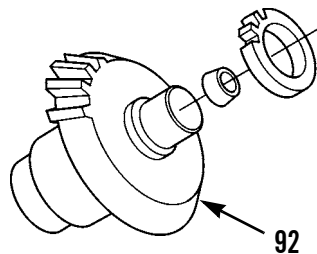
12. Install shims (87 and 86), retainer assembly (85) and six washers (84) and bolts (83).



**NOTE**

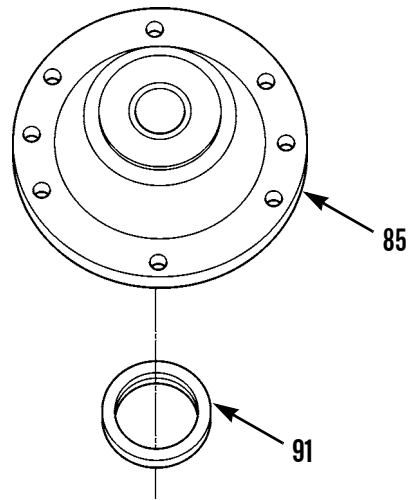
Universal puller kit must be installed on pinion shaft. Use torque wrench to check amount of torque needed to turn pinion. Torque of 20 lb-in. (5 Nm) is obtained by adding or removing shim(s) as required.

13. Use universal puller kit and torque wrench to adjust pinion (92).



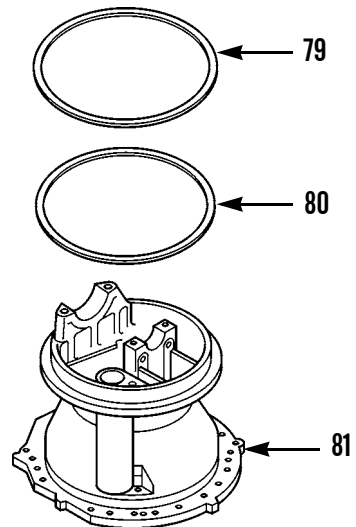
**ASSEMBLY - CONTINUED**

14. Remove six bolts (83), washers (84) and retainer (85).
15. Use driver and hammer to install new seal (91) on retainer (85).



394-1493

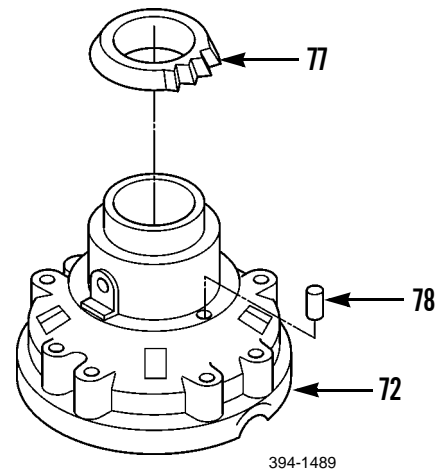
16. Install retainer assembly (85), six washers (84) and bolts (83).
17. Install new preformed packing (82).
18. Invert carrier assembly (81).
19. Install new seal (80) and preformed packing (79) on carrier assembly (81).



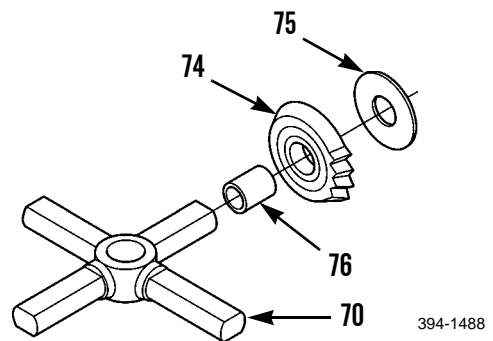
394-1490

**ASSEMBLY - CONTINUED**

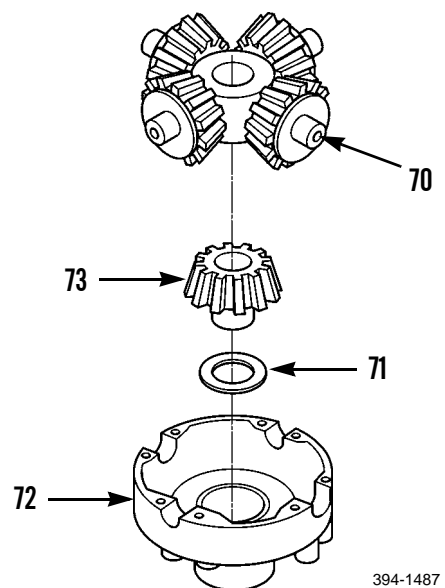
20. Heat bearing (77) to a maximum temperature of 275°F (135°C).
21. Install bearing (77) in housing (72).
22. Install four dowels (78).



23. Install four bearings (76), gears (74) and washers (75) on spider (70).

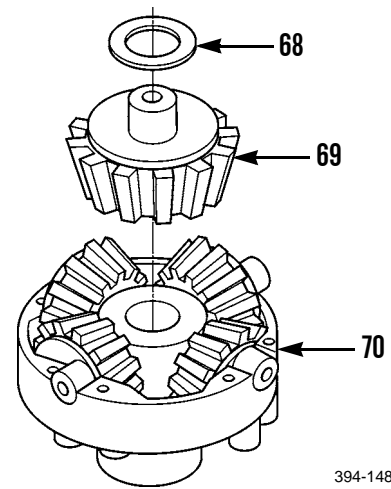


24. Invert housing assembly (72).
25. Install thrust plate (71), gear (73) and spider assembly (70).

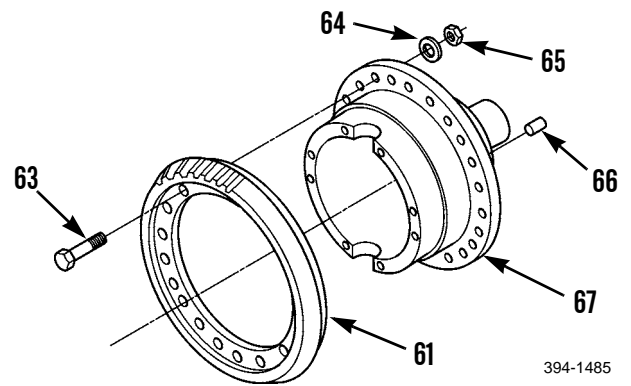


**ASSEMBLY - CONTINUED**

26. Install gear (69) on bevel gear assembly (70).
27. Coat washer (68) with grease.
28. Install washer (68) on gear (69).



29. Install four dowels (66) in housing (67).
30. Install gear (61), 24 bolts (63), washers (64) and new locknuts (65). Torque bolts to 265 lb-ft (359 Nm).



ASSEMBLY - CONTINUED



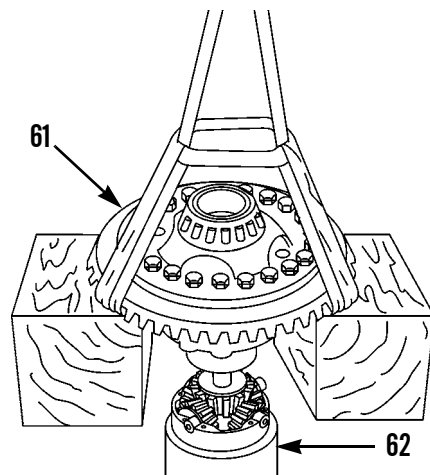
**WARNING**

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**

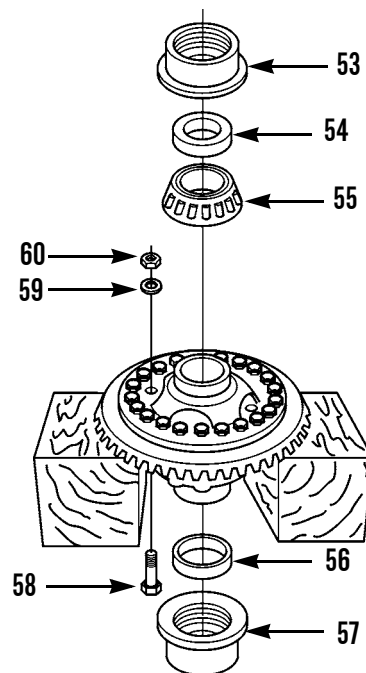
Differential lock weighs 85 lb (39 kg).

31. Attach lifting device to gear assembly (61).
32. Use lifting device to install gear assembly (61) on bevel gear assembly (62).
33. Remove lifting device.



394-1484

34. Install eight bolts (58), washers (59) and nuts (60). Torque bolts to 220 lb-ft (298 Nm).
35. Heat bearing (55) to a maximum of 275°F (135°C).
36. Lower temperature of bearing (55).
37. Install new bearing (55), if removed, bearing cup (54) and cage (53).
38. Install bearing cup (56) and cage (57).



394-1483

## ASSEMBLY - CONTINUED

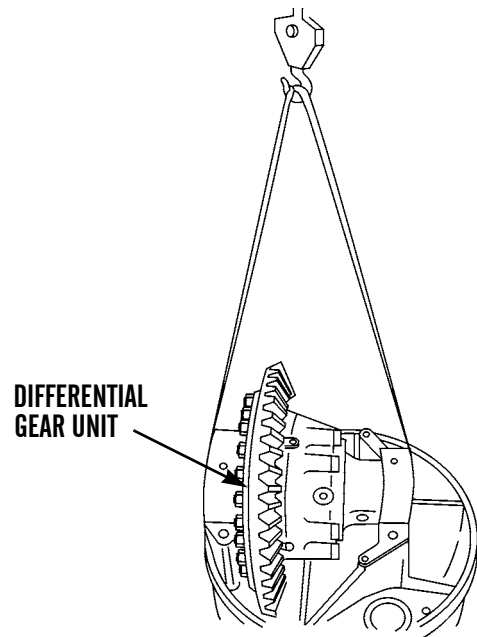
**WARNING**

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**

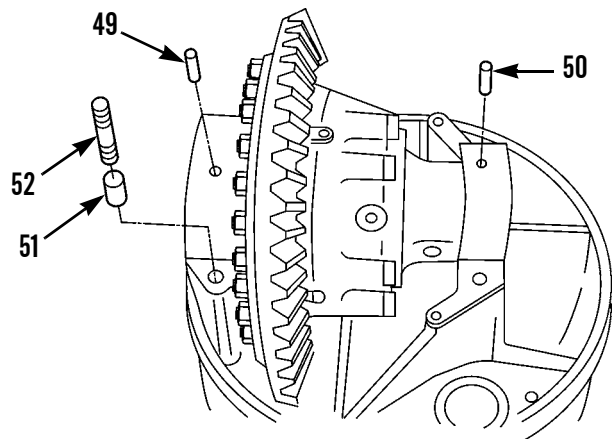
Differential gear unit weighs 270 lb (122 kg).

39. Install lifting device on differential gear unit.
40. Use lifting device to install differential gear unit.
41. Remove lifting device.



394-1482

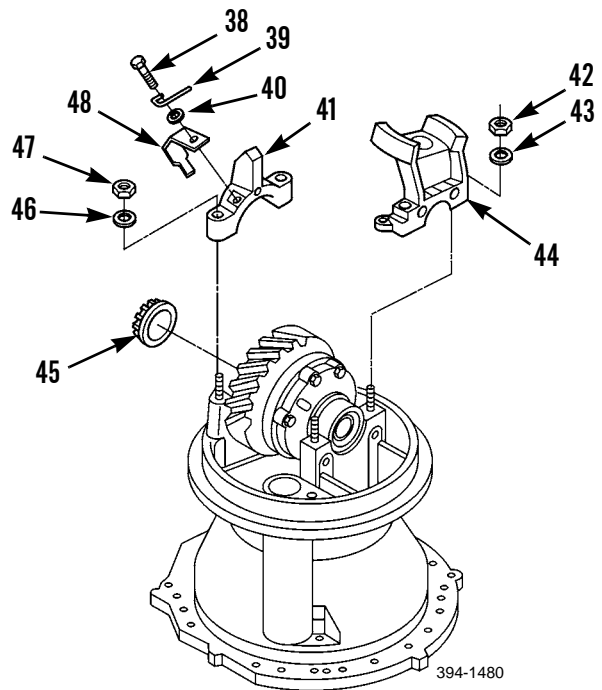
42. Install four sleeves (51) and studs (52). Torque studs to 240 lb-ft (325 Nm).
43. Install dowels (49 and 50).



394-1481

**ASSEMBLY - CONTINUED**

- 44. Install bearing cap (41), two washers (46) and nuts (47). Torque nuts to 640 lb-ft (868 Nm).
- 45. Install bearing cap (44), two washers (43) and nuts (42). Torque nuts to 640 lb-ft (868 Nm).



- 46. Install rings (34 and 45). Turn rings (34 and 45) clockwise to secure.
- 47. Attach lifting device to differential and ring (34) as an assembly.
- 48. Use lifting device to position differential assembly so that axle center line is vertical and gear (61) is on the bottom.

**NOTE**

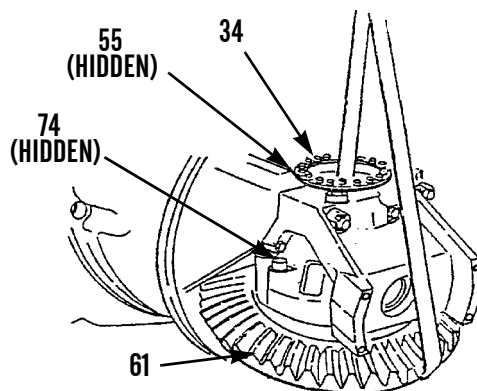
Ring gear backlash is measured between gears (61 and 74). Backlash should be  $0.014 \pm 0.005$  in. ( $0.356 \pm 0.127$  mm). To adjust, rotate rings (34 and 45) in the same direction and same amount to get the correct backlash.

- 49. Use dial indicator to adjust gear (61) backlash.

**NOTE**

Preload bearing (55) with use of a dial indicator. Measure between ring (34) and gear (61). To preload, increase dimension by  $0.007 \pm 0.002$  in. ( $0.178 \pm 0.051$  mm). Check gear backlash and adjust if necessary.

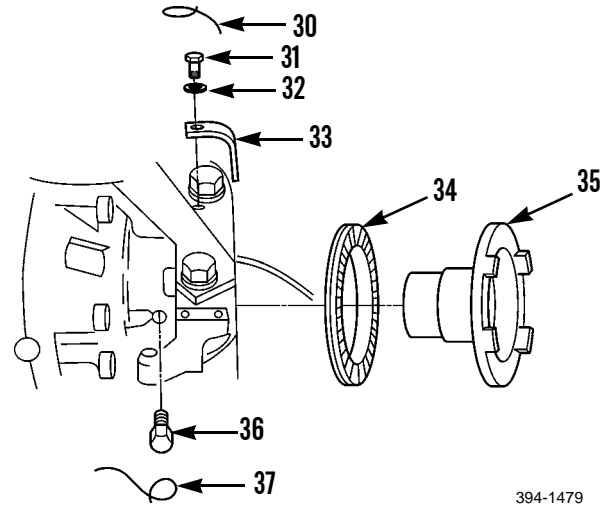
- 50. Use dial indicator to preload bearing (55).
- 51. Adjust gear (61), if necessary.
- 52. Position differential assembly upright.
- 53. Remove lifting device.





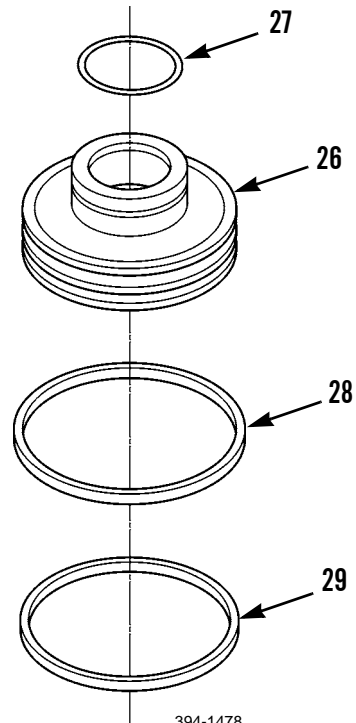
**ASSEMBLY - CONTINUED**

- 54. Install lock (48), washer (40), bolt (38) and new lock wire (39).
- 55. Install lock (33), washer (32), bolt (31) and new lock wire (30).
- 56. Install jaw (35).
- 57. Install two bolts (36) and new lock wire (37).



394-1479

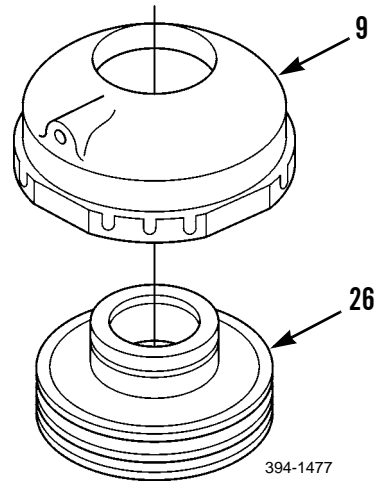
- 58. Install new seals (27 and 29) and ring (28) on piston (26).



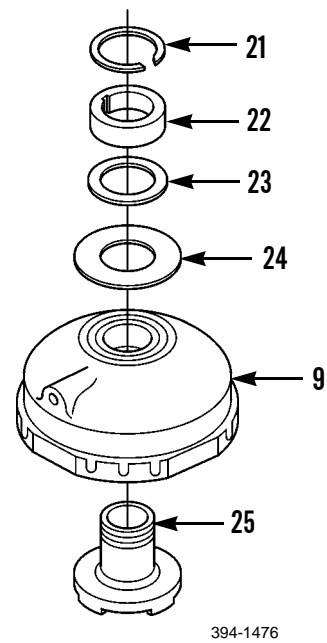
394-1478

**ASSEMBLY - CONTINUED**

59. Install cylinder (26) on cylinder assembly (9).

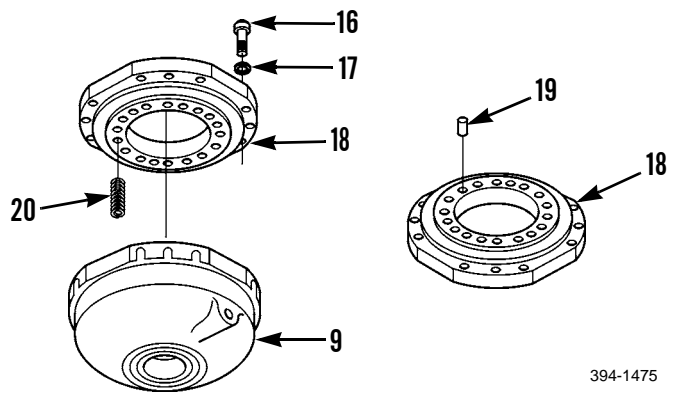


- 60. Install jaw (25) in cylinder assembly (9).
- 61. Install washers (23 and 24) and spacer (22).
- 62. Use retaining ring pliers to install retaining ring (21).



**ASSEMBLY - CONTINUED**

- 63. Install two dowels (19) in housing (18).
- 64. Install 12 springs (20), housing assembly (18), 12 washers (17) and bolts (16) in cylinder assembly (9).



394-1475



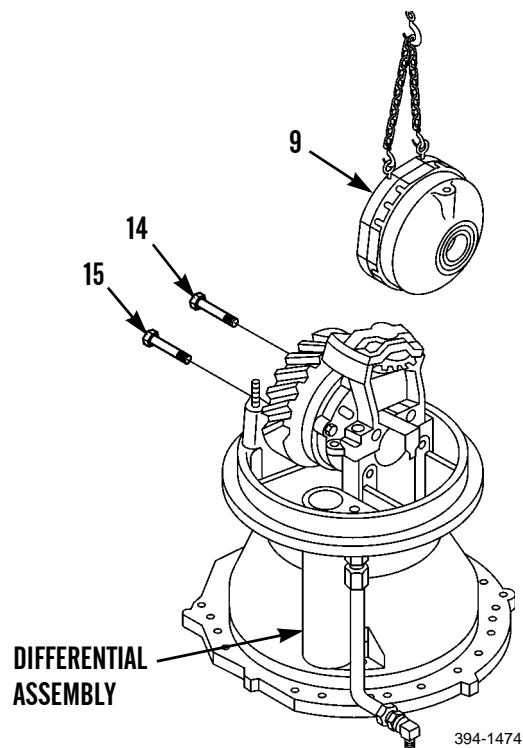
**WARNING**

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**

Differential lock weighs 85 lb (39 kg).

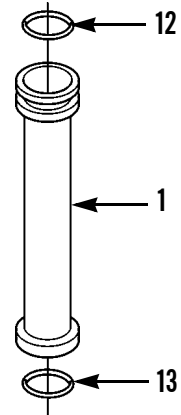
- 65. Attach lifting device to cylinder assembly (9).
- 66. Use lifting device to position cylinder assembly (9) on differential assembly.
- 67. Install two bolts (15 and 14)



394-1474

**ASSEMBLY - CONTINUED**

- 68. Install new preformed packings (12 and 13) in tube (1).



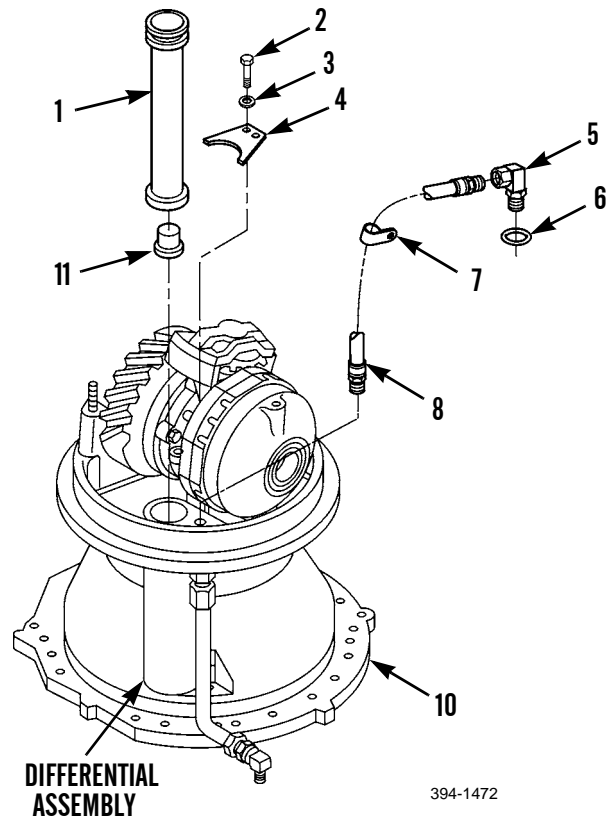
394-1473

- 69. Install bearing (11).

**NOTE**

Lubricate tube assembly with grease before installation.

- 70. Install tube assembly (1).
- 71. Install bracket (4), two washers (3) and bolts (2).
- 72. Install new preformed packing (6) and elbow (5).
- 73. Install hose assembly (8).
- 74. Connect hose assembly (8) to carrier (10).
- 75. Install clip (7) on hose assembly (8).



394-1472

- 76. Install differential and bevel gear (WP 0295 00).
- 77. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Insertor and remover, bearing and bushing (Item 44, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Major repair kit

Piston ring kit

**References**

TM 5-3805-248-10

**Equipment Condition**

Air compressor removed (WP 0167 00)

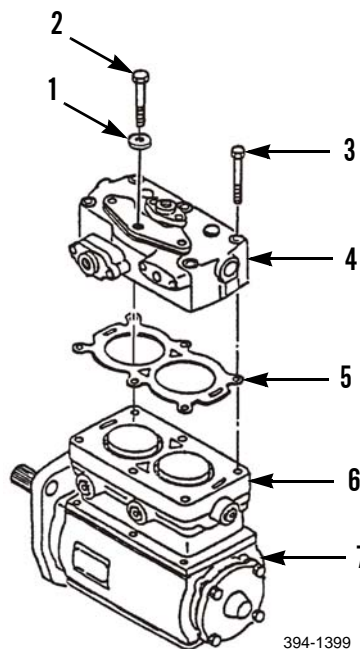
**DISASSEMBLY**

1. Match-mark cylinder head (4), block (6) and crankcase (7).

**NOTE**

It may be necessary to tap cylinder head with soft hammer.

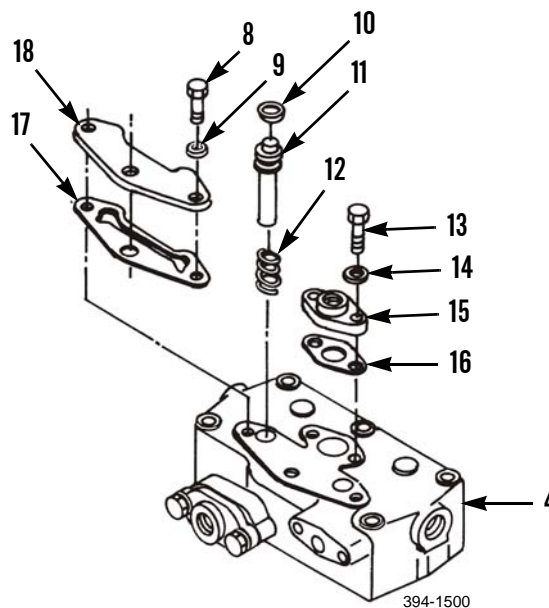
2. Remove five bolts (3), bolt (2), washer (1) and cylinder block (6).
3. Remove and discard gasket (5).



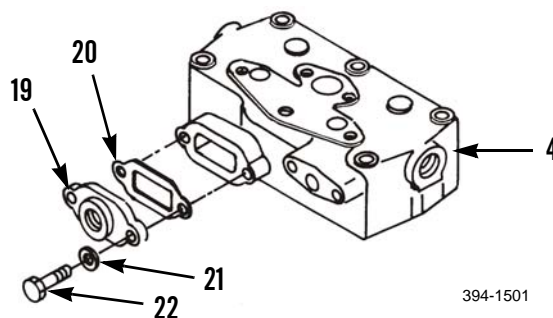
394-1399

**DISASSEMBLY - CONTINUED**

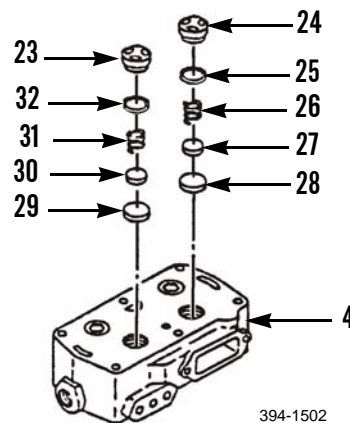
4. Remove two bolts (8), lockwashers (9), cover (18) and gasket (17) from cylinder head (4). Discard gasket.
5. Remove and discard two seals (10), unloading valves (11) and springs (12) from unloading ports of cylinder head (4).
6. Remove two bolts (13), lockwashers (14), adapter (15) and gasket (16) from cylinder head (4). Discard gasket.



7. Remove two bolts (22), lockwashers (21), adapter (19) and gasket (20) from cylinder head (4). Discard gasket and lockwashers.

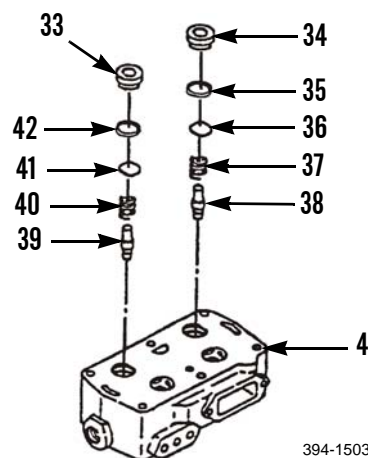


8. Remove and discard guide (23), spring (31), inlet valve (30), seat (29) and washer (32) from cylinder head (4).
9. Remove and discard guide (24), spring (26), inlet valve (27), seat (28) and washer (25) from cylinder head (4).



**DISASSEMBLY - CONTINUED**

10. Remove and discard seat (33), exhaust valve (41), spring (40), stop (39) and washer (42) from cylinder head (4).
11. Remove and discard seat (34), exhaust valve (36), spring (37), stop (38) and washer (35) from cylinder head (4).

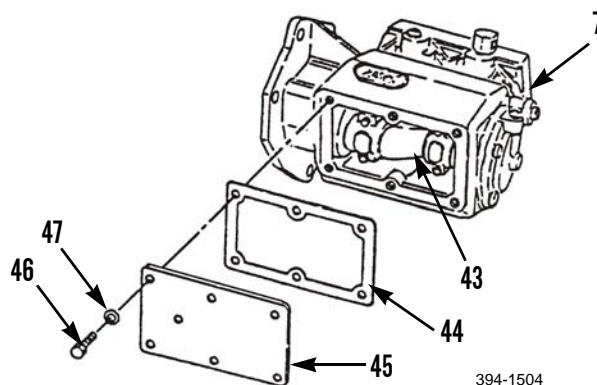


12. Turn crankcase (7) on side and remove six bolts (46), lockwashers (47), cover (45) and gasket (44) from crankcase (7). Discard gasket.

**NOTE**

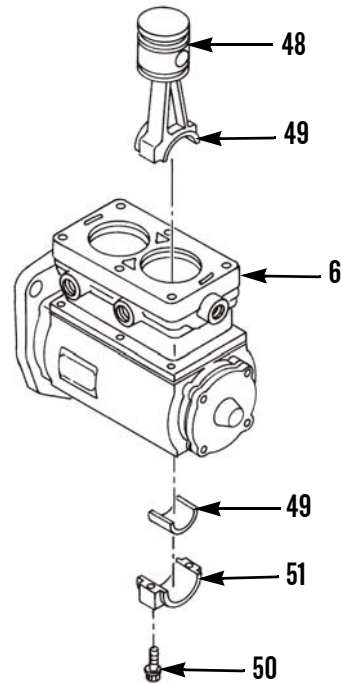
Note direction of crankshaft arrows and piston and location of rod assemblies to aid in assembly.

13. Turn crankshaft (43) and locate arrows. Record direction of arrows in relation to crankshaft.



**DISASSEMBLY - CONTINUED**

14. Remove two bolts (50), cap (51) and two inserts (49). Discard two bolts and inserts.
15. Remove piston (48) from cylinder block (6).

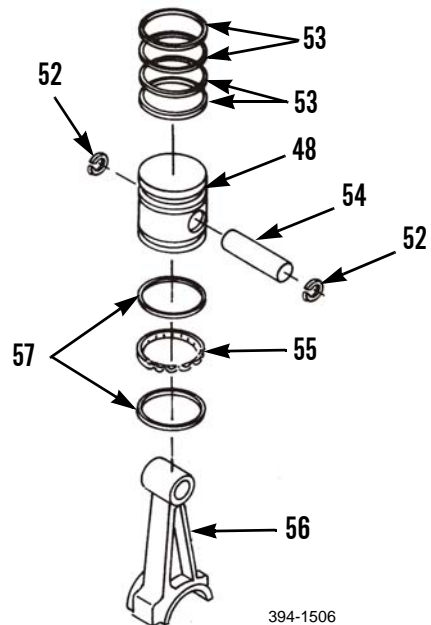


394-1505

**NOTE**

Record cylinder from which piston and rod assembly were removed.

16. Remove two rings (52) and pin (54) from piston (48). Discard rings.
17. Remove connecting rod (56) from piston (48).
18. Remove and discard four compression rings (53), two oil rings (57) and oil expander ring (55) from piston (48).

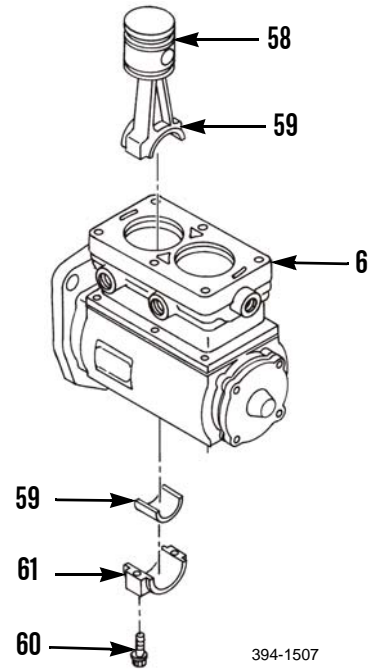


394-1506

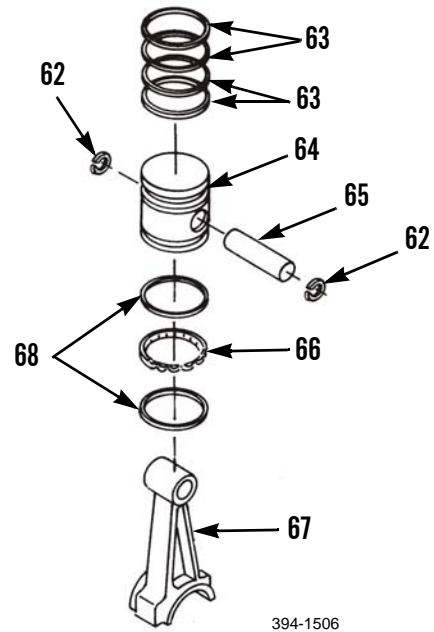


**DISASSEMBLY - CONTINUED**

19. Remove two bolts (60), cap (61) and two inserts (59) from cylinder block (6). Discard two bolts and insert.
20. Remove piston (58) from cylinder block (6).

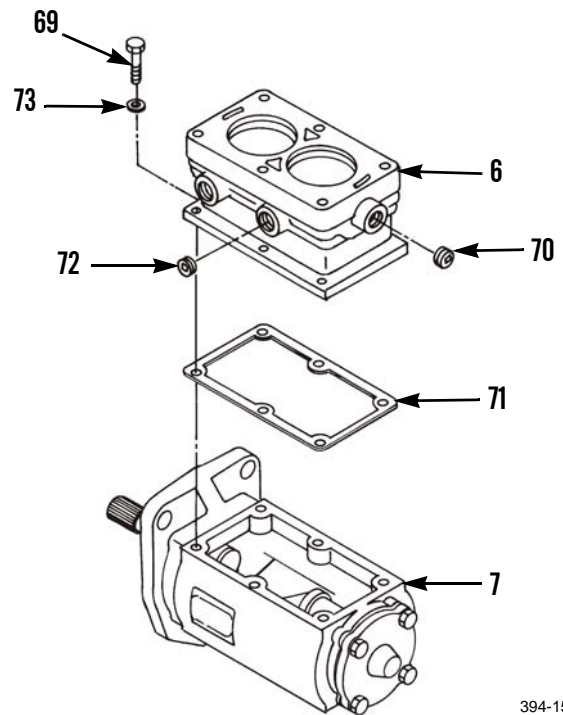


21. Remove two rings (62) and pin (65) from piston (64). Discard rings.
22. Remove connecting rod (67) from piston (64).
23. Remove and discard four compression rings (63), two oil rings (68) and oil expander ring (66) from piston (64).



**DISASSEMBLY - CONTINUED**

24. Remove six bolts (69), lockwashers (73), cylinder block (6) and gasket (71) from crankcase (7). Discard gasket.
25. Remove two plugs (72) from cylinder block (6).
26. Remove plug (70) from cylinder block (6).



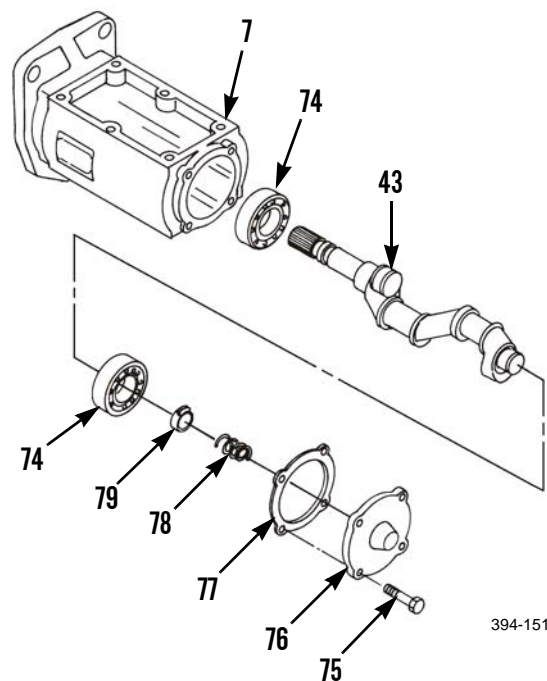
394-1509

27. Remove four bolts (75), cover (76) and gasket (77) from crankcase (7). Discard gasket.
28. Remove and discard seal (79) and spring (78) from cover (76).
29. Remove crankshaft (43) from crankcase (7).

**NOTE**

Removal of bearings from crankshaft will cause destruction of bearings. Remove bearings only if inspection indicates replacement is necessary.

30. If necessary, remove two bearings (74) from crankshaft (43).



394-1510

**CLEANING AND INSPECTION****WARNING**

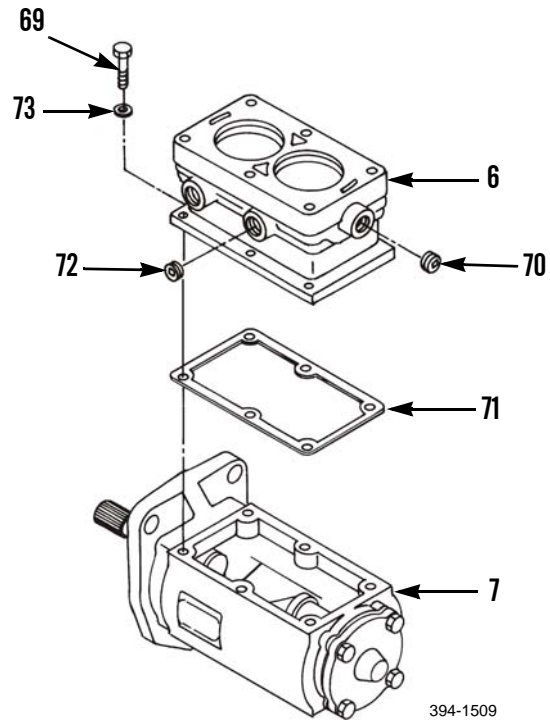
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
  - Particles blown by 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 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. Remove all gasket material from mounting surfaces.
  2. Clean all parts with solvent cleaning compound and dry with compressed air.
  3. Inspect all parts for damage and replace as necessary.

**ASSEMBLY****NOTE**

- All parts furnished in repair kits will be used to replace like parts during assembly.
  - Perform steps 1 and 2 only if bearings were removed.
1. Heat two bearings (74) in clean engine oil to a temperature not exceeding 350°F (176°C) and install bearings on crankshaft (43) until seated against shoulder.
  2. Install crankshaft (43) in crankcase (7).
  3. Measure distance of two bearings (74) at mounting surfaces. Bearings must extend out of crankcase (7) 0.135 in. (3.43 mm).
  4. Turn crankshaft (43) to ensure free movement.
  5. Apply a coat of clean lubricating oil to crankshaft (43) journals.
  6. Apply a coat of clean lubricating oil to new spring (78) and seal (79) and install spring and seal on cover (76).
  7. Install new gasket (77) and cover (76) on crankcase (7) with four bolts (75). Torque one bolt to 80 lb-in. (9 Nm) and one bolt diagonal from first bolt to 80 lb-in. (9 Nm). Torque other two bolts to 160 lb-in. (18 Nm), then torque first two bolts to 160 lb-in. (18 Nm).

**ASSEMBLY - CONTINUED**

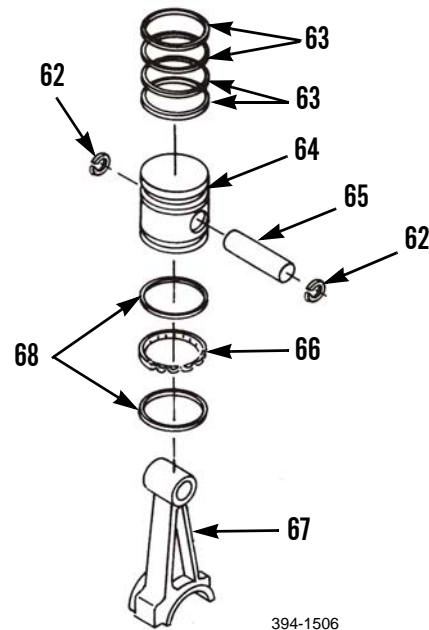
8. Install plug (70) in cylinder block (6).
9. Install two plugs (72) in cylinder block (6).
10. Align match-marks and install new gasket (71) and cylinder block (6) on crankcase (7) with six lockwashers (73) and bolts (69). Torque two center bolts to 8 lb-ft (11 Nm), then torque other four bolts to 8 lb-ft (11 Nm). Torque two center bolts again to 21 lb-ft (28 Nm), then torque other four bolts to 21 lb-ft (28 Nm).



**NOTE**

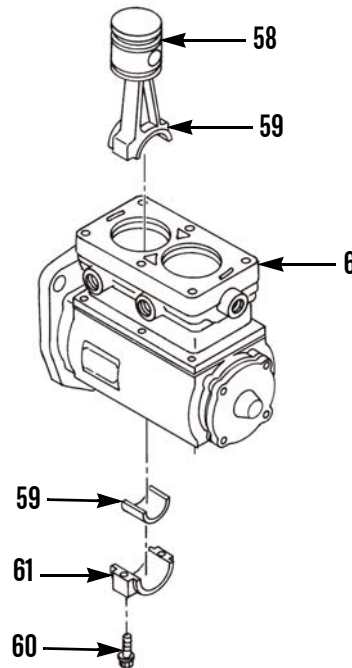
Piston rings usually have a dot or the word TOP to indicate which side of ring faces top of piston.

11. Install new oil expander ring (66) on piston (64).
12. Install two new oil rings (68) on piston (64).
13. Measure gap clearance of two oil rings (68). Clearance should be 0.015-0.055 in. (0.381-1.397 mm). If measurement is larger than specified, replace piston (64). If measurement is smaller than specified, clean piston.
14. Measure side clearance of two oil rings (68). Measurement should be 0.0005-0.0021 in. (0.0127-0.0533 mm). If measurement is larger than specified, clean piston (64). If measurement is smaller than specified, replace piston.
15. Install four new compression rings (63) on piston (64).
16. Measure gap clearance of four compression rings (63). Clearance should be 0.002-0.007 in. (0.0508-0.1778 mm). If measurement is larger than specified, replace piston (64). If measurement is smaller than specified, clean piston.



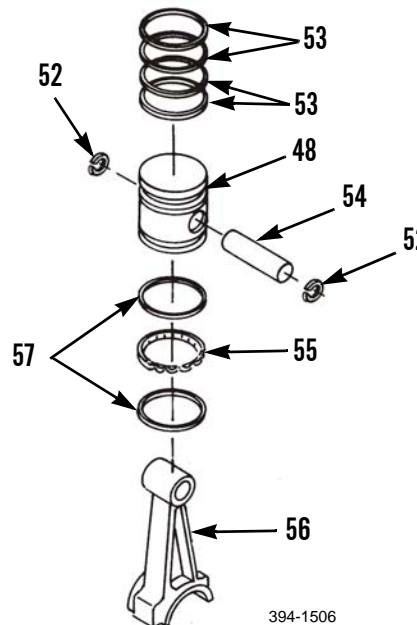
**ASSEMBLY - CONTINUED**

17. Measure side clearance of four compression rings (63). Measurement should be 0.0015-0.0045 in. (0.0381-0.1143 mm). If measurement is larger than specified, clean piston (64). If measurement is smaller than specified, replace piston.
18. Install connecting rod (67) on piston (64) with pin (65) and two new rings (62).
19. Apply a coat of clean lubricating oil to surfaces of two new inserts (59) and install inserts in connecting rod (67) and cap (61).
20. Apply a coat of clean lubricating oil to walls of cylinder block (6).
21. Install piston (58) in cylinder block (6).
22. Align arrow on cap (61) with arrow on connecting rod (67) and install cap on connecting rod with two bolts (61). Torque bolts to 225 lb-in. (25 Nm).



394-1507

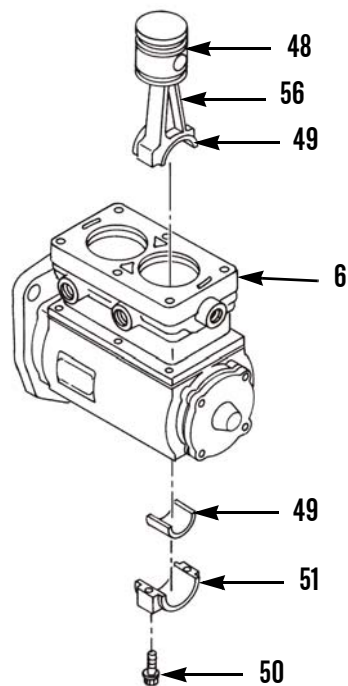
23. Install new oil expander ring (55) on piston (48).
24. Install two new oil rings (57) on piston (48).
25. Measure gap clearance of two oil rings (57). Clearance should be 0.015-0.055 in. (0.381-1.397 mm). If measurement is larger than specified, replace piston (64). If measurement is smaller than specified, clean piston.
26. Measure side clearance of two oil rings (57). Measurement should be 0.0005-0.0021 in. (0.0127-0.0533 mm). If measurement is larger than specified, clean piston (64). If measurement is smaller than specified, replace piston.
27. Install four new compression rings (53) on piston (48).
28. Measure gap clearance of four compression rings (53). Measurement should be 0.002-0.007 in. (0.0508-0.1778 mm). If measurement is larger than specified, replace piston (48). If measurement is small than specified, clean piston.
29. Measure side clearance of four compression rings (53). Measurement should be 0.0015-0.0045 in. (0.0381-0.1143 mm). If measurement is larger than specified, clean piston (48). If measurement is smaller than specified, replace piston.
30. Install connecting rod (56) on piston (48) with pin (54) and two new rings (52).



394-1506

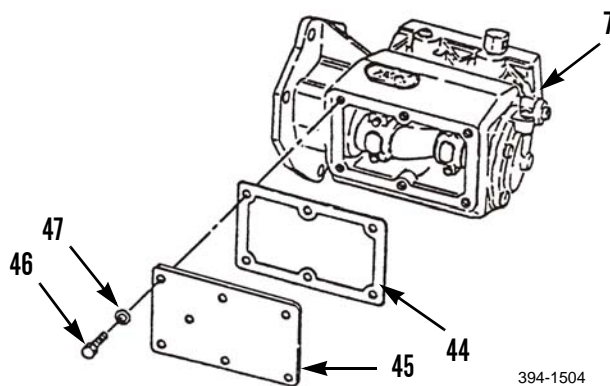
**ASSEMBLY - CONTINUED**

31. Apply a coat of clean lubricating oil to surfaces of two new inserts (49) and install inserts in connecting rod (56) and cap (51).
32. Apply a coat of clean lubricating oil to walls of cylinder block (6).
33. Install piston (48) in cylinder block (6).
34. Align arrows on cap (51) with arrow on connecting rod (56), and align cap on connecting rod with two bolts (50). Torque bolts to 225 lb-in. (25 Nm).



394-1505

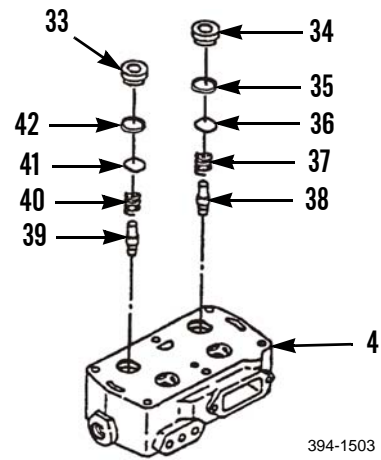
35. Install new gasket (44) and cover (45) on crankcase (7) with six new lockwashers (47) and bolts (46). Torque bolts to 150 lb-in. (17 Nm).



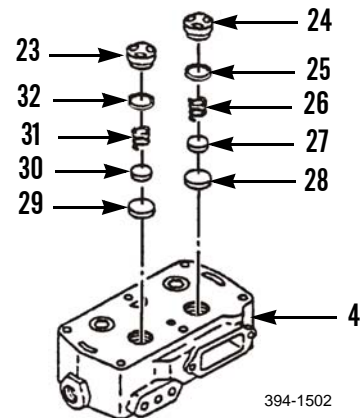
394-1504

**ASSEMBLY - CONTINUED**

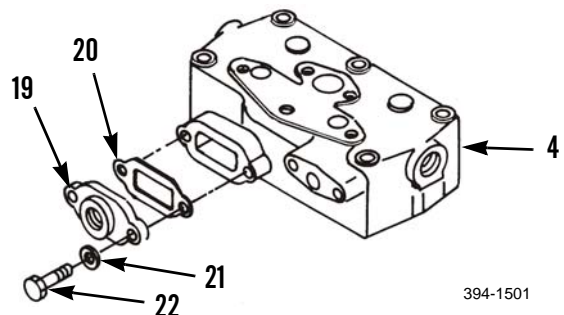
- 36. Install new washer (35), stop (38), new spring (37), exhaust valve (36) and seat (34) in exhaust port of cylinder head (4). Torque seat to 90 lb-ft (122 Nm).
- 37. Install new washer (42), stop (39), new spring (40), exhaust valve (41) and seat (33) in cylinder head (4).



- 38. Install new washer (25), seat (28), inlet valve (27), spring (26) and guide (24) in intake port of cylinder head (4). Use an inserter and remover tool to torque guide to 90 lb-ft (122 Nm).
- 39. Install new washer (32), seat (29), inlet valve (30), spring (31) and guide (23) in cylinder head (4).

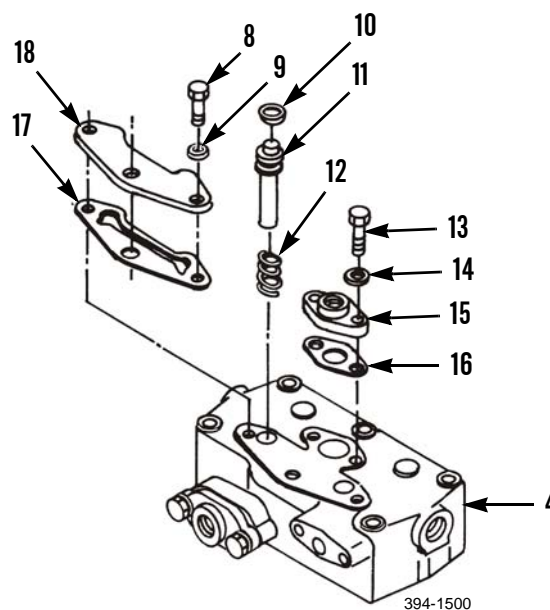


- 40. Install new gasket (20) and adapter (19) on cylinder head (4) with two lockwashers (21) and bolts (22).

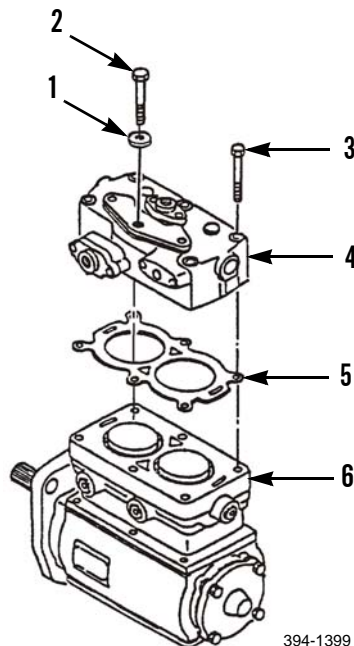


**ASSEMBLY - CONTINUED**

41. Install new gasket (16) and adapter (15) on cylinder head (4) with two lockwashers (14) and bolts (13).
42. Install two new springs (12) in unloader ports on cylinder head (4).
43. Apply a coat of silicone grease provided in repair kit to two new unloading valves (11) and install valves in cylinder head (4). Apply 1/2 in. ball of silicone grease to end of unloading valves.
44. Apply a coat of silicone grease provided with repair kit to two new seals (10). Install seals on unloading valves (11).
45. Install new gasket (17) and cover (18) on cylinder head (4) with two new lockwashers (9) and bolts (8). Torque bolts to 105 lb-in. (12 Nm).



46. Align match-marks and install new gasket (5) and cylinder head (4) on cylinder block (6) with washer (1), bolt (2) and five bolts (3).
47. Torque bolt (2) and five bolts (3) in numbered sequence to 22 lb-ft (30 Nm). Torque bolts again to 33 lb-ft (45 Nm).



48. Install air compressor (WP 0167 00).
49. Operate engine until normal operating pressures are reached (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**AIR COMPRESSOR GOVERNOR ASSEMBLY REPAIR**

---

0378 00

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, machine shop, basic (Item 104, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating, general purpose (Item 26, WP 0339 00)

**Materials/Parts - Continued**

Rag, wiping (Item 35, WP 0339 00)

Governor overhaul kit

O-ring (2)

**References**

TM 5-3805-248-10

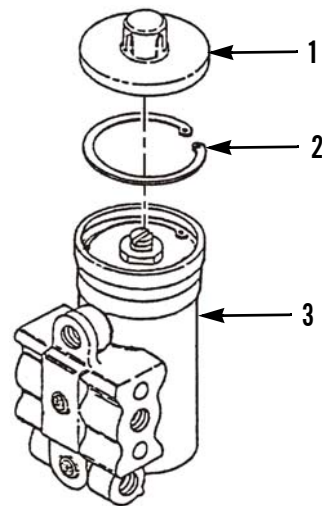
**Equipment Condition**

Air compressor removed (WP 0167 00)

---

**DISASSEMBLY**

1. Remove cover (1) and snap ring (2) from governor body (3).



**DISASSEMBLY - CONTINUED**

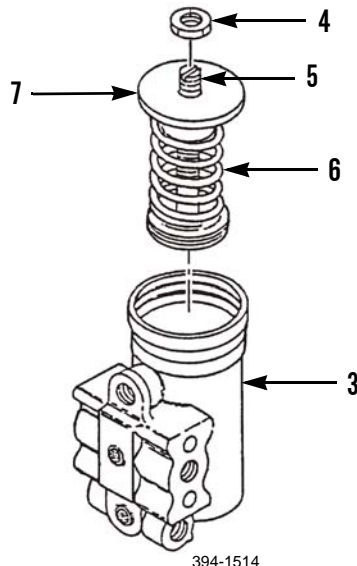
2. Remove spring (6) assembly from governor body (3).



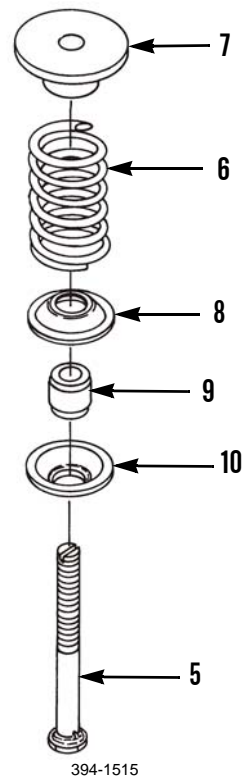
**WARNING**

Components are under spring tension. Wear eye protection and use extreme care when removing parts under spring tension. Failure to follow this warning may result in injury.

3. Measure distance from end of adjusting screw (5) to top of spring seat (7). Record measurement for use in installation.

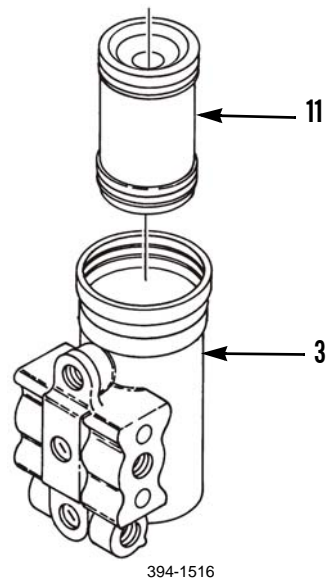


4. Hold spring seat (7) to keep spring (6) from flying out, hold adjusting screw (5) with screwdriver and remove nut (4).
5. Turn spring seat (7) to release tension on spring (6) and remove spring from adjusting screw (5).
6. Remove spring (6), spring seat (8), guide (9) and spring seat (10) from adjusting screw (5).

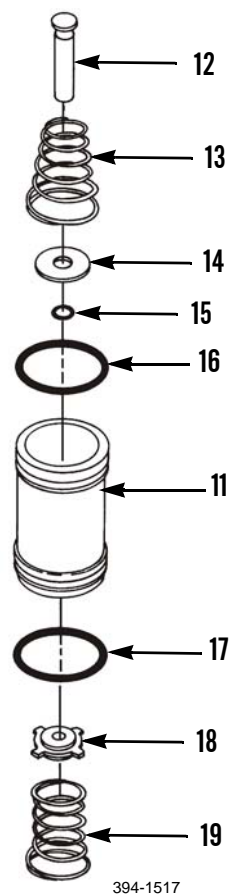


**DISASSEMBLY - CONTINUED**

7. Remove piston (11) assembly from governor body (3).

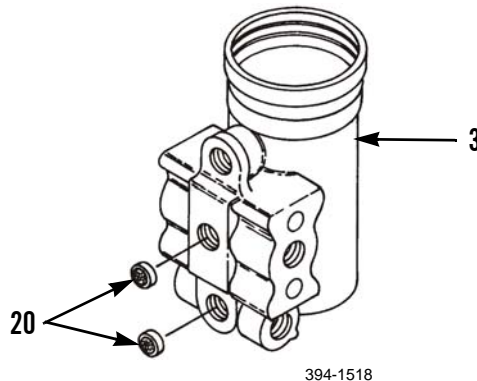


8. Remove exhaust stem (12) and spring (13) from piston (11). Discard spring.
9. Remove washer (14) and seal (15) from exhaust stem (12). Discard seal.
10. Remove O-rings (16 and 17), valve (18) and spring (19) from piston (11). Discard two O-rings, valve and spring.



**DISASSEMBLY - CONTINUED**

11. Remove and discard two filters (20) from governor body (3).

**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 injury or death. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear eye protection.

1. Clean all parts with solvent cleaning compound and dry with compressed air.
2. Inspect all parts for damage and replace as necessary.

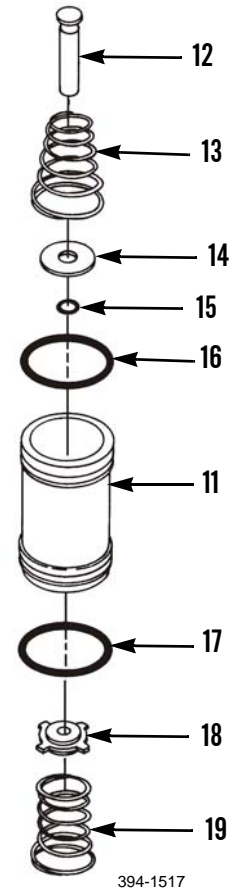
**ASSEMBLY****NOTE**

All parts furnished in governor overhaul kit will be used to replace like parts during assembly.

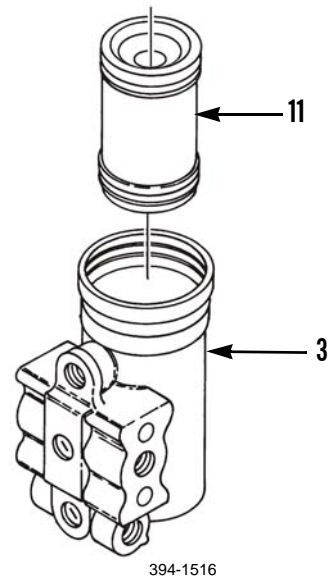
1. Install two new filters (20) in governor body (3).

**ASSEMBLY - CONTINUED**

2. Install new spring (19) and new valve (18) in piston (11).
3. Install new O-rings (16 and 17) on piston (11).
4. Install new seal (15) and washer (14) on exhaust stem (12).
5. Install new spring (13) and exhaust stem (12) in piston (12).

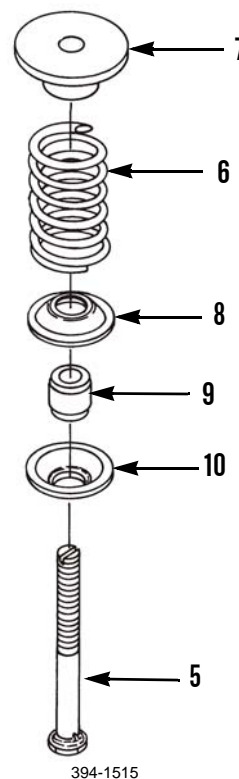


6. Apply a coat of clean lubricating oil to outer portion of piston (11) and inner bore of governor body (3) and install piston in governor body.



**ASSEMBLY - CONTINUED**

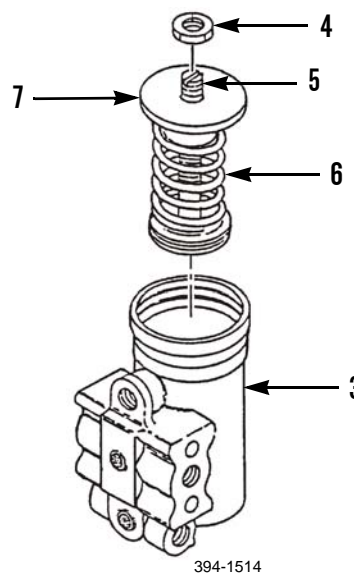
7. Apply a coat of clean lubricating oil to adjusting screw (5) and guide (9).
8. Position spring seat (10), guide (9), spring seat (8) and spring (6) on adjusting screw (5).
9. Install spring seat (7) on adjusting screw (5).



**WARNING**

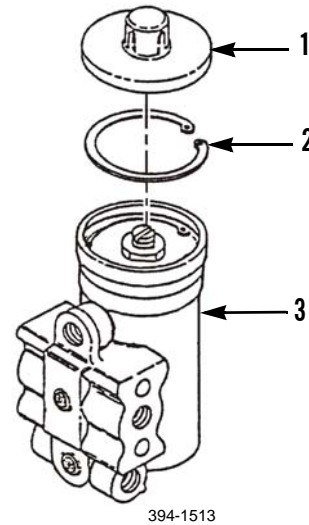
Components are under spring tension. Wear eye protection and use extreme care when installing parts under spring tension. Failure to follow this warning may result in injury.

10. Turn spring seat (7) on adjusting screw (5) until measurement from end of adjusting screw to top of spring seat is the same as noted during disassembly.
11. Install nut (4) on adjusting screw (5).
12. Install spring (6) on governor body (3).



**ASSEMBLY - CONTINUED**

13. Install snap ring (2) and cover (1) on governor body (3).



14. Install air compressor (WP 0167 00).  
15. Operate engine (TM 5-3805-248-10) to verify correct air compressor operation.

**END OF WORK PACKAGE**





---

**SUPPLEMENTAL STEERING PUMP REPAIR**

---

**0379 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning, Inspection, Assembly, Adjustment, Testing

---

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Nut 3/8-16NC

Screw, forcing 3/8-16NC x 3-1/2

Spacer 1.375 in. ID

Washers 3/8 in.

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Grease, general purpose (Item 19, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 30, 31 or 33, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Sealing compound (Item 38, WP 0339 00)

Locknut

Packing, preformed (11)

Pin, cotter

Ring, back-up (9)

Ring, snap (4)

Seal (6)

Separator (16)

Setscrew

Strip, sealing (8)

**References**

TM 5-3805-248-10

**Equipment Condition**

Supplemental steering pump removed (WP 0307 00)

**DISASSEMBLY**

**NOTE**

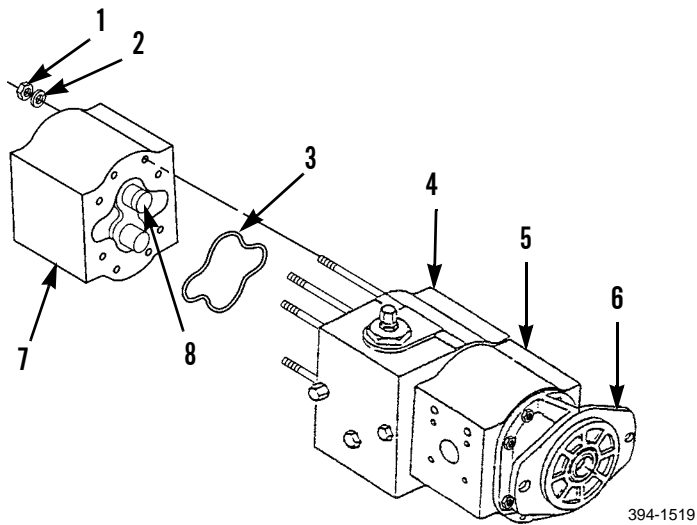
All front section parts must be kept with the front section and all rear section parts must be kept with the rear section to ensure proper assembly.

1. Use a scribe to match-mark one side of rear body (7), valve body (4), front body (5) and flange (6) to aid in installation.
2. Remove eight nuts (1) and washers (2) from rear body (7).

**CAUTION**

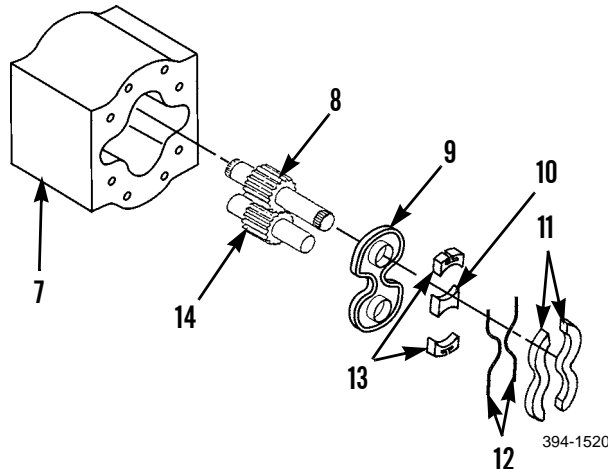
Do not pry pump sections apart. Doing so could cause damage to the machined surfaces.

3. Use a leather hammer to tap around seam of rear body (7) and remove rear body (7) assembly from valve body (4).
4. Remove and discard preformed packing (3).



394-1519

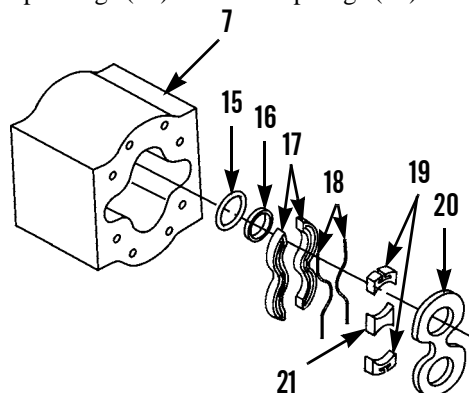
5. Remove two isolation plates (11), sealing strips (12), end separators (13) and center separator (10) from rear body (7). Discard two sealing strips, end separators and center separator.
6. Carefully remove pressure plate (9). Do not pry off.
7. Remove rear drive gear (8) and rear idler gear (14).



394-1520

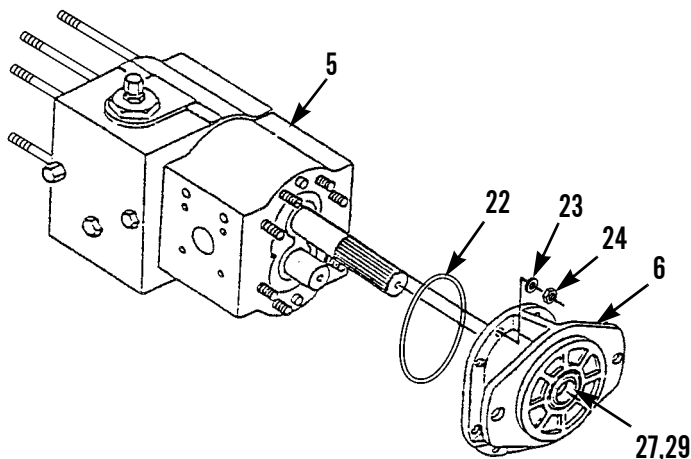
**DISASSEMBLY - CONTINUED**

8. Remove pressure plate (20). Take care when removing pressure plate. Do not pry off.
9. Remove two isolation plates (17), sealing strips (18), end separators (19) and center separator (21). Discard two sealing strips, end separators and center separator.
10. Remove and discard two preformed packings (16) and back-up rings (15) from rear body (7).



394-1521

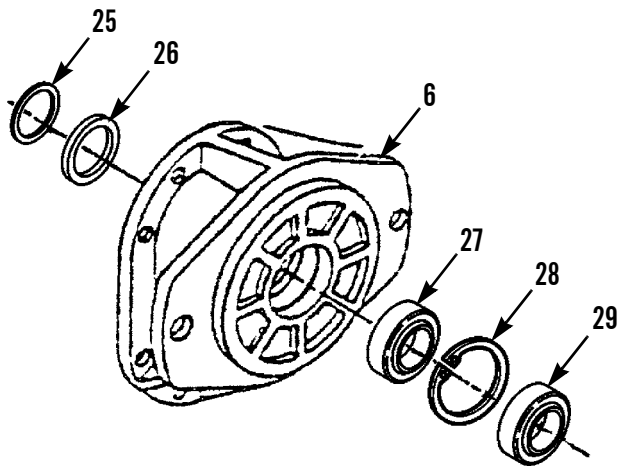
11. Remove eight nuts (24) and washers (23) from flange (6).
12. Use a leather hammer to remove flange assembly (6) from front body (5). Do not pry apart.
13. Remove and discard preformed packing (22).



394-1522

**DISASSEMBLY - CONTINUED**

14. Remove and discard seal (29).
15. Use snap ring pliers to remove snap ring (28). Discard snap ring.
16. Remove and discard seal (27).
17. Invert flange (6) and remove and discard two preformed packings (25) and back-up rings (26) from flange (6).

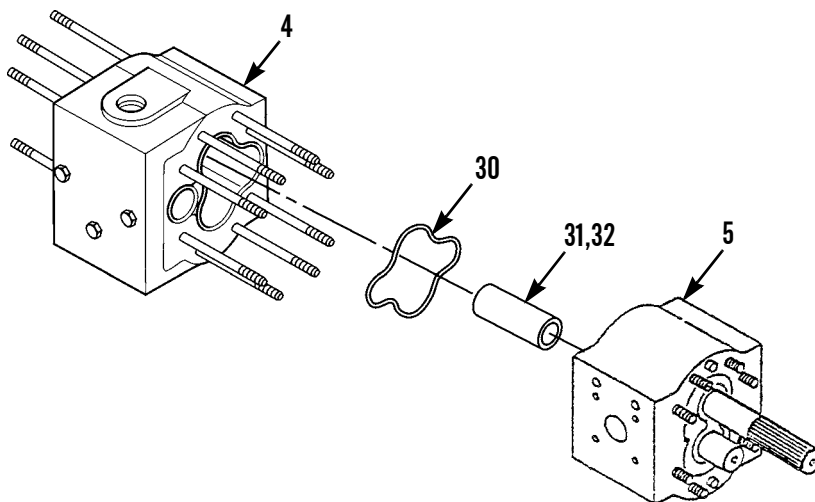


394-1523

**CAUTION**

Do not pry pump sections apart. Doing so could cause damage to machined surfaces.

18. Use a leather hammer to remove front body (5) assembly from valve body (4). Do not pry sections apart, but tap around seam of valve body (4).
19. Remove and discard preformed packing (30).
20. Remove coupling assembly (31).
21. Use snap ring pliers to remove two snap rings (32) from bore of coupling (31).



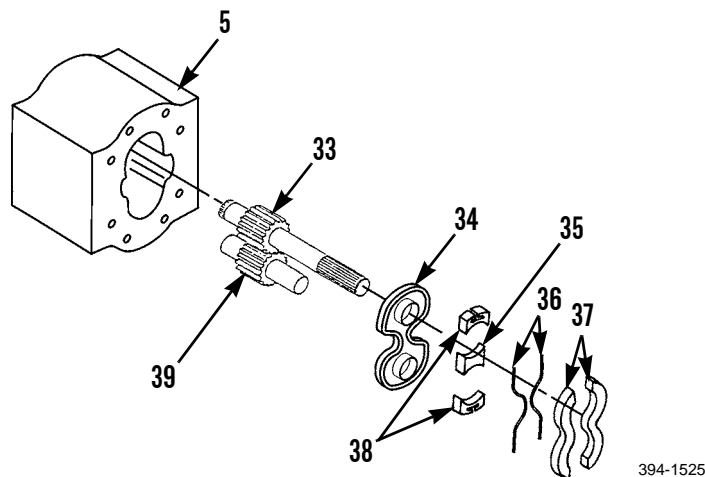
394-1524

## SUPPLEMENTAL STEERING PUMP REPAIR - CONTINUED

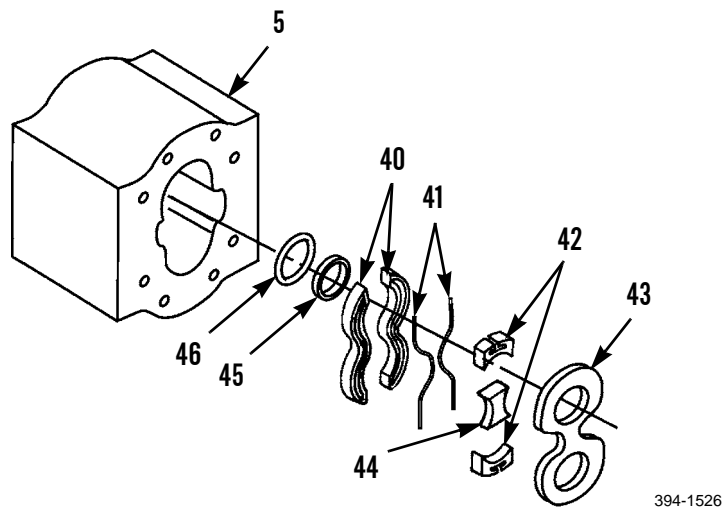
0379 00

**DISASSEMBLY - CONTINUED**

22. Remove two isolation plates (37), sealing strips (36), end separators (38) and center separator (35) from front body (5). Discard two sealing strips, end separators and center separator.
23. Remove pressure plate (34). Take care when removing pressure plates. Do not pry off.
24. Remove front driver gear (33) and front idler gear (39).



25. Remove pressure plate (43). Take care when removing pressure plate. Do not pry off.
26. Remove two isolation plates (40), sealing strips (41), end separators (42) and center separator (44). Discard two sealing strips, end separators and center separator.
27. Remove and discard two preformed packings (45) and back-up rings (46) from front body (5).



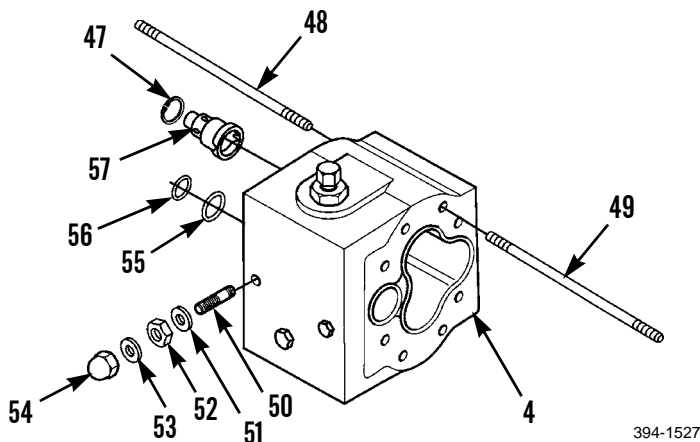
**DISASSEMBLY - CONTINUED**

28. Remove eight studs (49 and 48) from valve body (4).
29. Position valve body (4) soft-jawed vise with flow control valve pointing upward.

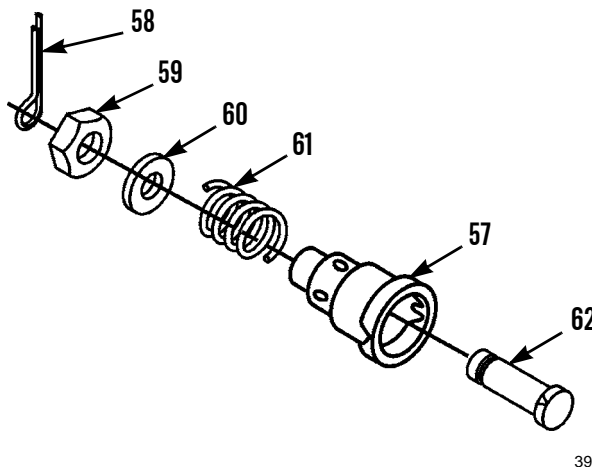
**NOTE**

Discard parts only when told to do so. Certain parts are unavailable and inspection will be necessary to verify if part is reusable.

30. Remove and discard two preformed packings (56) and back-up rings (55).
31. Remove acorn nut (54).
32. Loosen locknut (52) while holding setscrew (50).
33. Remove seal (53), locknut (52), seal (51) and setscrew (50). Discard seal.
34. Use snap ring pliers to remove snap ring (47). Discard snap ring.
35. Remove orifice (57) assembly from valve body (4).

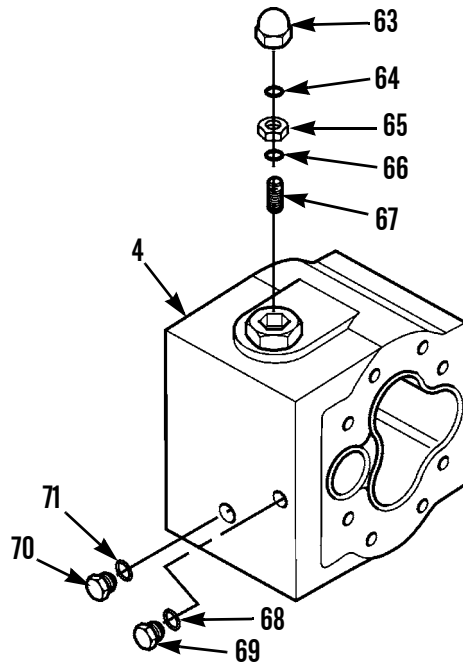


36. Remove cotter pin (58), nut (59) and washer (60). Discard cotter pin.
37. Remove spring (61) and piston (62) from orifice (57).



**DISASSEMBLY - CONTINUED**

38. Remove plug (70) and preformed packing (71). Do not discard preformed packing.
39. Remove plug (69) and preformed packing (68). Do not discard preformed packing.
40. Position valve body (4) assembly in soft-jawed vise with acorn nut (63) facing upward.
41. Remove acorn nut (63).
42. Loosen locknut (65) while holding setscrew (67).
43. Remove seal (64), locknut (65), seal (66) and setscrew (67). Discard locknut, seals and setscrew.

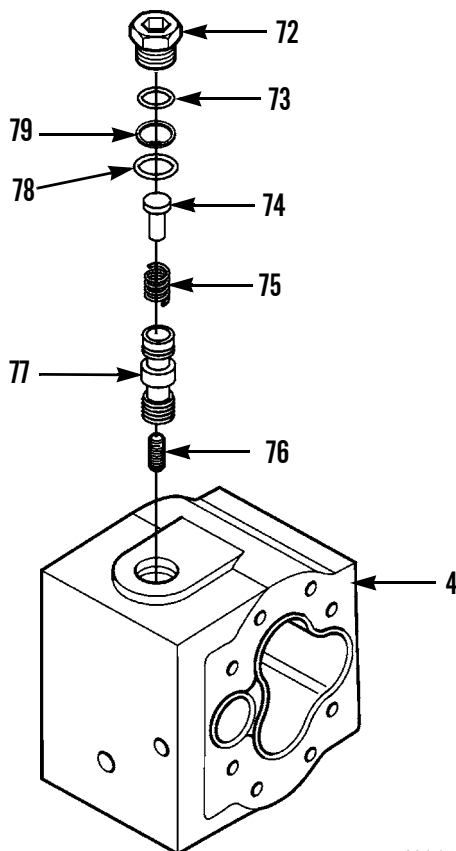


394-1528

**DISASSEMBLY - CONTINUED****WARNING**

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

44. Remove plug (72) from valve body (4) carefully because of spring (75) pressure.
45. Remove preformed packing (73), back-up ring (79) and preformed packing (78) from plug (72). Discard back-up ring only.
46. Remove retainer (74) and spring (75).
47. Remove valve spool (77).
48. Remove setscrew (76) from valve spool (77).

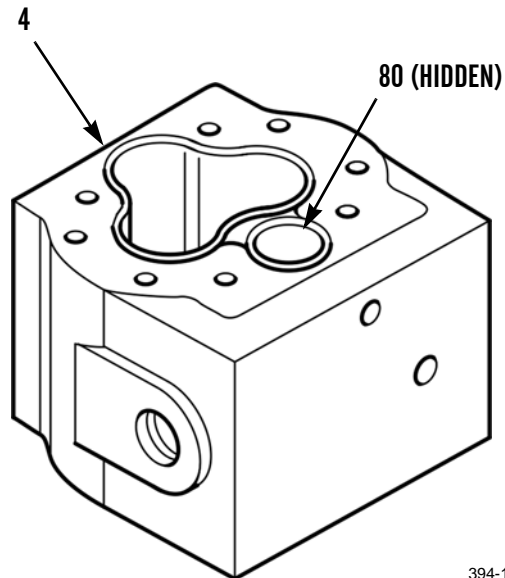


394-1529



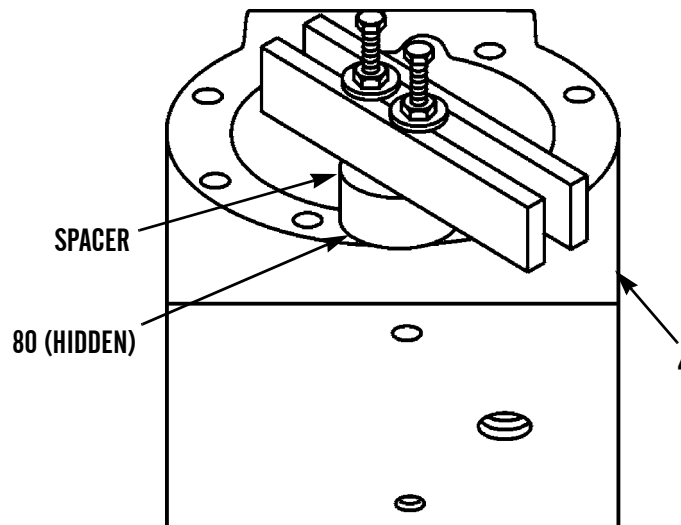
**DISASSEMBLY - CONTINUED**

49. Position valve body (4) assembly in soft-jawed vise with retainer (80) facing upward.



394-1530

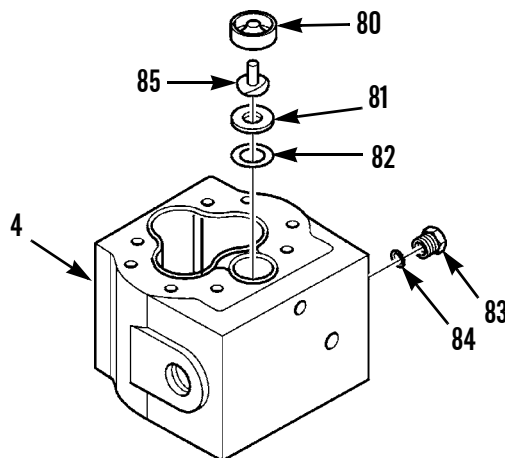
50. Use a 3/8-16NC tap to tap two holes opposite each other in the retainer (80).
51. Position a 1.375 in. (3.49 cm) ID spacer over the center of retainer (80). Spacer is to have a height of 1 in. (2.54 cm) and an outer diameter large enough to position on the machined surface of valve body (4).
52. Install two 3/8-16NC x 3-1/2 forcing screws, 3/8-16NC nuts, 3/8 in. washers and block. Install nut and washer on each forcing screw. Install one forcing screw through the center and another screw in one of the slots in block. Align and install forcing screws in each tapped hole of retainer (80).



394-1531

**DISASSEMBLY - CONTINUED**

53. Remove retainer (80). Tighten nuts on forcing screws evenly to pull retainer from valve body (4).
54. Remove piston (85).
55. Use snap ring pliers to remove seat (81).
56. Remove preformed packing (82) from seat (81). Do not discard preformed packing.
57. Remove plug (83) and preformed packing (84) from valve body (4). Do not discard preformed packing.



394-1532

**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 cause 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.

**NOTE**

Keep all front section parts with the front section and rear section parts with the rear section to ensure proper assembly.

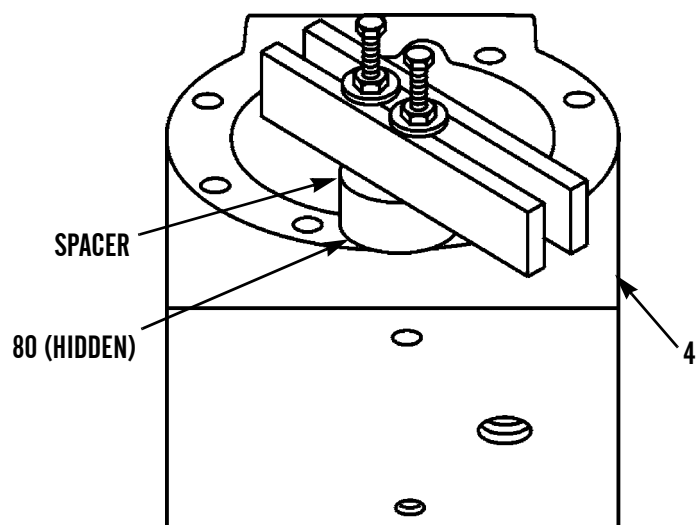
1. Remove all gasket material from all mounting surfaces.
2. Thoroughly clean all metal chips from valve body (4).
3. Clean all parts with solvent cleaning compound.
4. Dry all parts with compressed air.

**INSPECTION**

1. Inspect two isolation plates and pressure plates. If replacement is necessary, replace complete valve body and rear body assembly.
2. Inspect rear drive gear and rear idler. If replacement is necessary, replace complete valve body and rear body assembly.
3. Inspect rear body. If replacement is necessary, replace complete valve body and rear body assembly.
4. Inspect flange. If replacement is necessary, replace complete valve body and rear body assembly.
5. Inspect isolation plates and pressure plates. If replacement is necessary, replace complete front body assembly.
6. Inspect front drive gear and front idler gear. If replacement is necessary, replace complete front body assembly.
7. Inspect front body. If replacement is necessary, replace complete front body assembly.
8. Inspect springs. If replacement is necessary, replace complete valve body and rear body assembly.
9. Inspect orifice, piston, retainer, valve spool, retainer, piston and seat. If replacement is necessary, replace complete valve body and rear body assembly.
10. Inspect all other parts for damage and replace as necessary.

**ASSEMBLY**

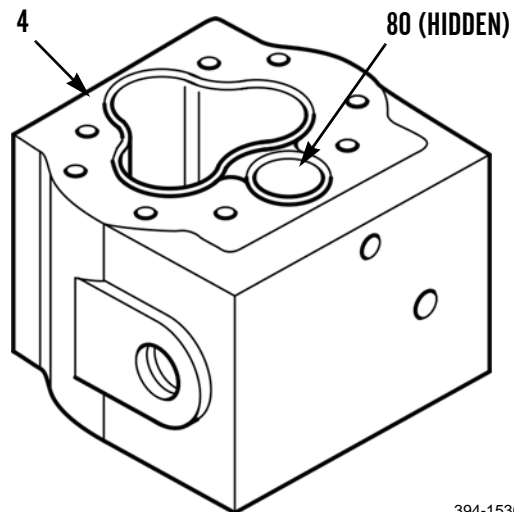
1. Install preformed packing (84) and plug (83) in valve body (4).
2. Install preformed packing (82) on seat (81). Use clean oil to lubricate outer face of preformed packing.
3. Use clean oil to lubricate all inner bores of valve body (4).
4. Use clean oil to lubricate and install seat (81) in valve body (4).
5. Use clean oil to lubricate and install piston (85) with stem side out.
6. Position valve body (4) assembly in a press with bore of retainer (80) facing upward.



394-1531

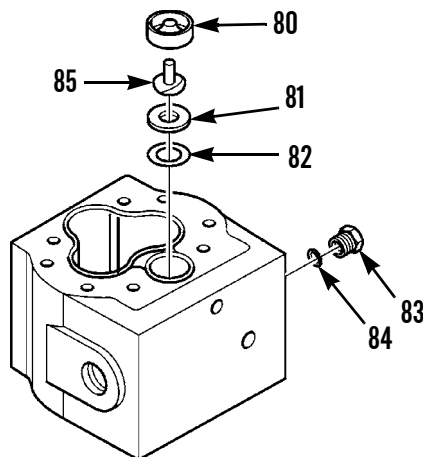
**ASSEMBLY - CONTINUED**

7. Position retainer (80) in bore of valve body (4), aligning center bore of retainer (80) with stem of piston (85).



394-1530

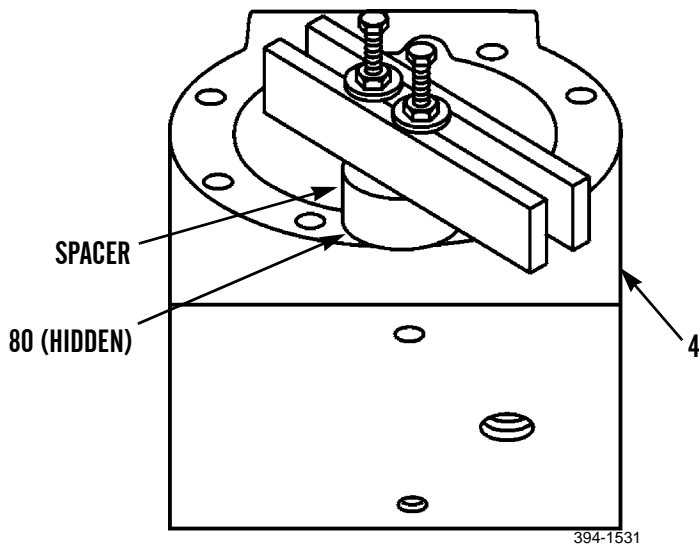
8. Position spacer over retainer (80). Spacer must be 1-1/8 in. OD (2.85 cm), 1/2 in. (1.3 cm) ID and 1/8 in. (0.32 cm) thick.



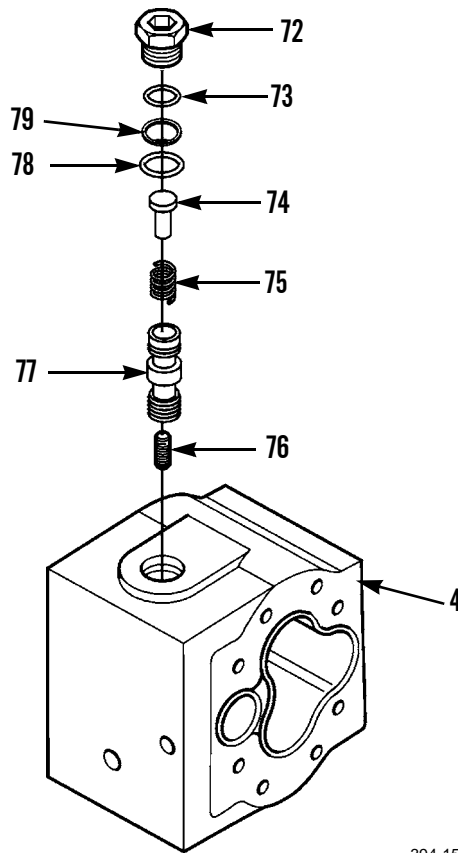
394-1532

**ASSEMBLY - CONTINUED**

9. Use press to apply pressure on spacer and install retainer (80). Press until retainer (80) is seated against seat (81).

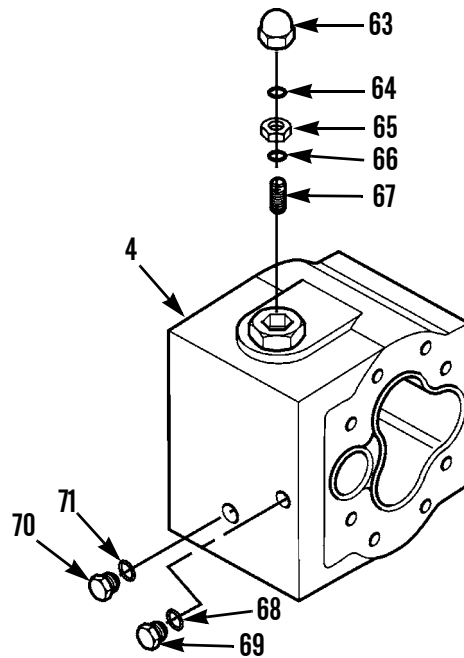


10. Install setscrew (76) in valve spool (77).
11. Use clean oil to lubricate and install valve spool (77) in valve body (4). Valve spool (77) must move freely in valve body (4).
12. Use clean oil to lubricate and install spring (75) and retainer (74).
13. Use clean oil to lubricate and install preformed packing (78), new back-up ring (79) and preformed packing (73) on plug (72).
14. Install plug (72) and torque to 100 lb-ft (136 Nm).



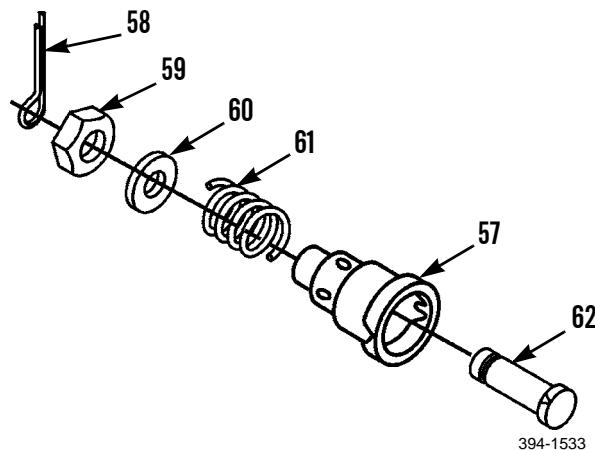
**ASSEMBLY - CONTINUED**

15. Install setscrew (67), new seal (66), locknut (65), new seal (64) and acorn nut (63).
16. Install preformed packing (68) and plug (69).
17. Install preformed packing (71) and plug (70).



394-1528

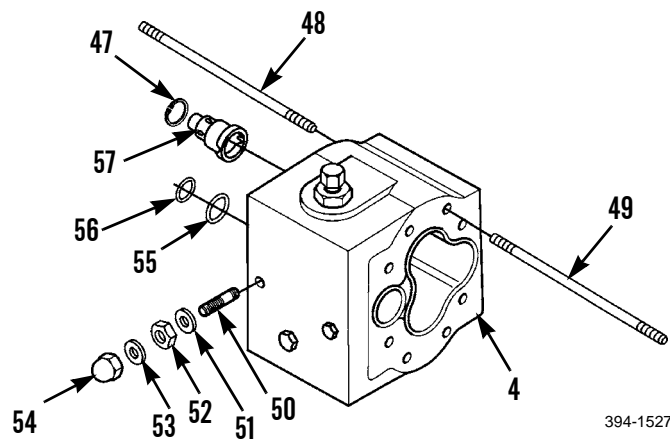
18. Install piston (62) in orifice (57).
19. Install spring (61), washer (60) and nut (59) on piston (62). Compress spring (61) until one of the slots in nut (59) aligns with hole in stem of piston (62).
20. Install new cotter pin (58) through slot of nut (59) and hole in stem of piston (62).
21. Lubricate orifice (59) assembly by submerging in oil and install in valve body (4). Align hole in orifice (57) with the pin in the bore of the valve body (4).



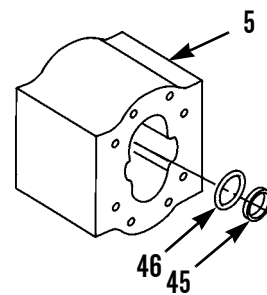
394-1533

**ASSEMBLY - CONTINUED**

22. Use snap ring pliers to install snap ring (47) on orifice (57) in valve body (4).
23. Use new setscrew kit to install new setscrew (50), new seal (51), locknut (52), new seal (53) and acorn nut (54). Set-screw (50) must be in alignment with hole in orifice (57) in valve body (4).
24. Install two new preformed packings (56) in groove of two new back-up rings (55).
25. Install two new back-up rings (55) on lip of protruding bearing insert on flow control valve side of valve body (4).
26. Install eight studs (48) with short studs on side of flow control valve. Apply sealing compound to threads of eight studs (48).
27. Install eight studs (49). Apply sealing compound to threads of eight studs (49) being installed.
28. Lubricate eight studs (49).

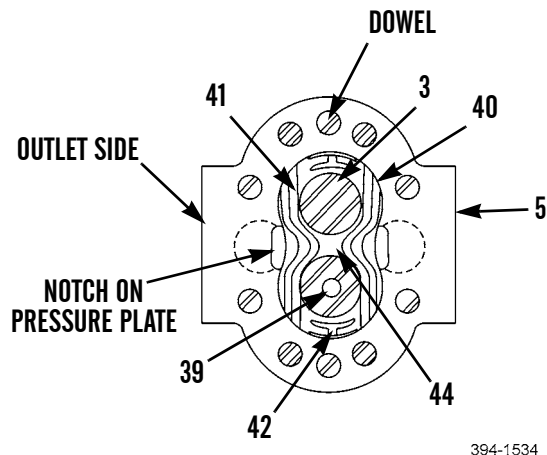


29. Install two new preformed packings (45) in groove of two new back-up rings (46).
30. Install two new back-up rings (46) on bearing insert in front body (5).



**ASSEMBLY - CONTINUED**

31. Install new center separator (44), two new end separators (42), new sealing strips (41) and insulation plates (40). Rounded edges on outer radius of isolation plates (40) should face bottom of front body (5). Two new sealing strips (41) must not be twisted after installation.

**CAUTION**

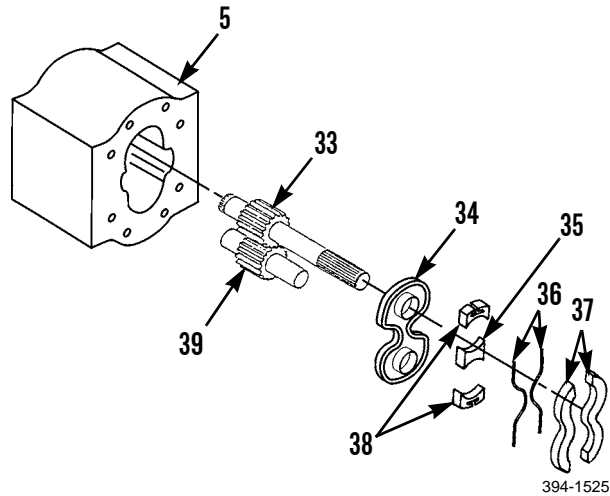
Do not force plate into position. Doing so could cause damage to the plate and pump.

32. Use clean oil to lubricate and install pressure plate (34). Hold pressure plate (34) as level as possible and carefully slide into position with the bronze side facing the gear and the notched side facing the outlet side.
33. Use clean oil to lubricate and install front idler gear (39) and front drive gear (33). With inner pocket of front body (5) facing up and outlet port to the left, position front drive (33) in top slot. Align by turning front drive gear (36) until one of the valleys between two teeth is in alignment with dowel in front body (5). Do not move gears (33 and 39) after alignment.
34. Use clean oil to lubricate and install pressure plate (34). Hold pressure plate (34) as level as possible and carefully slide into position with the bronze side facing the gear and the notched side facing the outlet side.



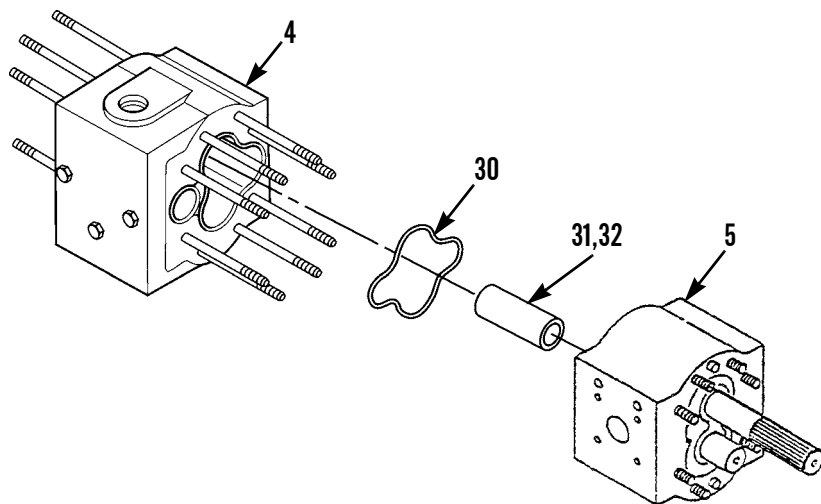
**ASSEMBLY - CONTINUED**

35. Use clean oil to lubricate and install new center separator (35), two new end separators (38), new sealing strips (36) and isolation plates (37). Isolation plates (37) have the same edge on either side and can be installed either way. Two new sealing strips (36) must not be twisted after installation.



394-1525

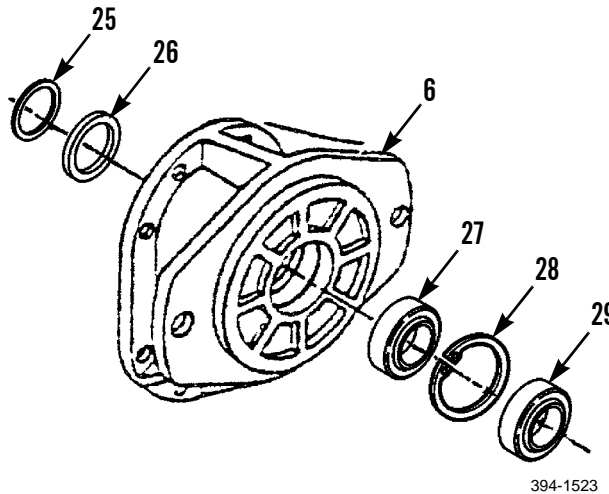
36. Use snap ring pliers to install two snap rings (32) in coupling (31).
37. Install coupling (31) assembly on front drive gear (33). Do not turn gears.
38. Install new preformed packing (30) in groove of valve body (4).
39. Install front body (5) assembly on valve body (4). Align, using scribe marks from step 1 of *Disassembly* in this work package.



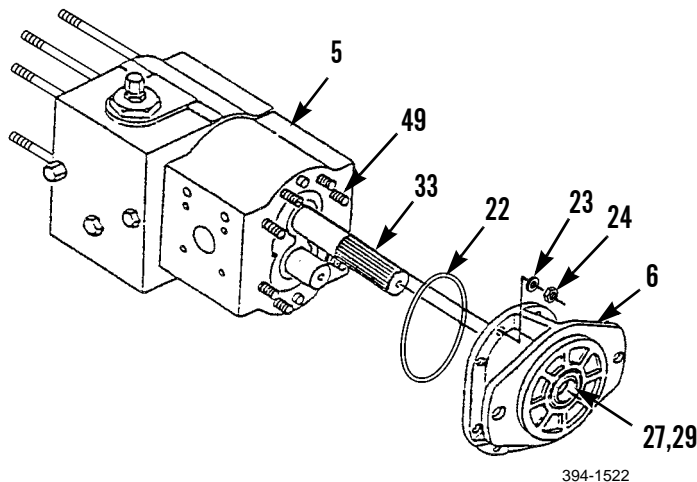
394-1524

**ASSEMBLY - CONTINUED**

40. Install two new preformed packings (25) in groove of two new back-up rings (26).
41. Install two new back-up rings (26) on lip of protruding bearing insert on rear face of flange (6).
42. Invert flange (6) and use a suitable driver to install new seal (27) in flange (6) with lip side down toward inside of flange (6). Use clean oil to lubricate bore of new seal (27) and install to a depth of 0.711 in. (18.1 mm).
43. Install new snap ring (28). Opening in snap ring (28) must be in alignment with oil hole in bore of flange (6).
44. Use a driver to install new seal (29) in flange (6) with lip side down toward inside of flange (6). Using clean oil, lubricate bore of new seal (29) and install to a depth of 0.154 in. (3.91 mm).



45. Use grease to lubricate front drive gear (33) splines to prevent seals (27 and 29) from being damaged when flange (6) is installed. Do not turn gears.
46. Install new preformed packing (22) in groove of flange (6).
47. Install flange (6) assembly on front body (5), aligning with scribe marks made in step 1 of *Disassembly* in this work package.
48. Install eight washers (23) and nuts (24) loosely on studs (49).



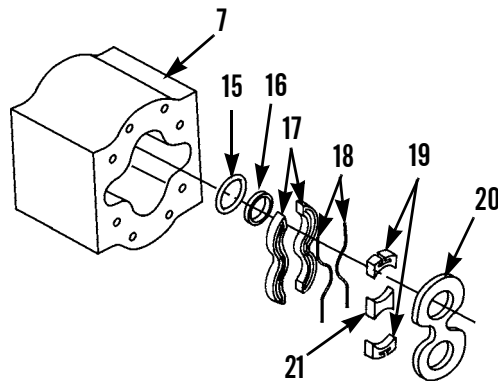
**ASSEMBLY - CONTINUED**

49. Use clean oil to lubricate inner bores of rear body (7).
50. Install two new preformed packings (16) in groove of two new back-up rings (15).
51. Install two new back-up rings (15) on lip of protruding bearing inserts inside rear body (7).
52. Install new center separator (21), two new end separators (19), new sealing strips (18) and isolation plates (17). Rounded edges on outer radius of isolation plates (17) should face bottom of rear body (7). Two new sealing strips (18) must not be twisted after installation.

**CAUTION**

Do not force pressure plate into position. Doing so could cause damage to the plate and pump.

53. Use clean oil to lubricate and install pressure plate (20). Hold pressure plate (20) as level as possible and carefully slide into position with the bronze side facing the gear and the notched side facing the outlet side.



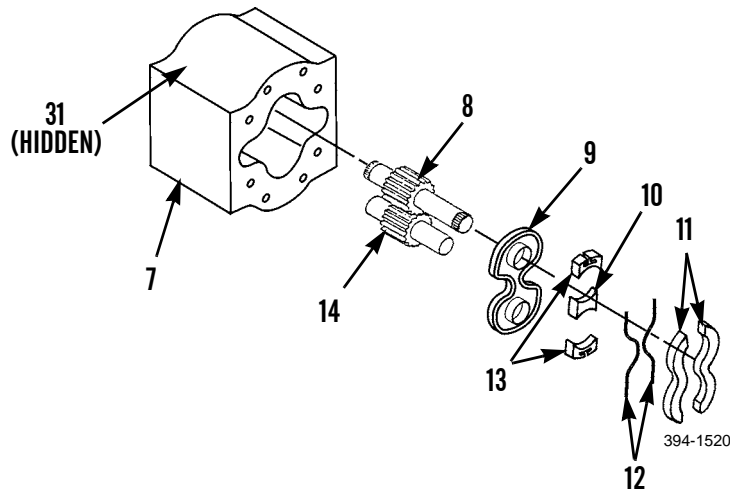
394-1521

**ASSEMBLY - CONTINUED**

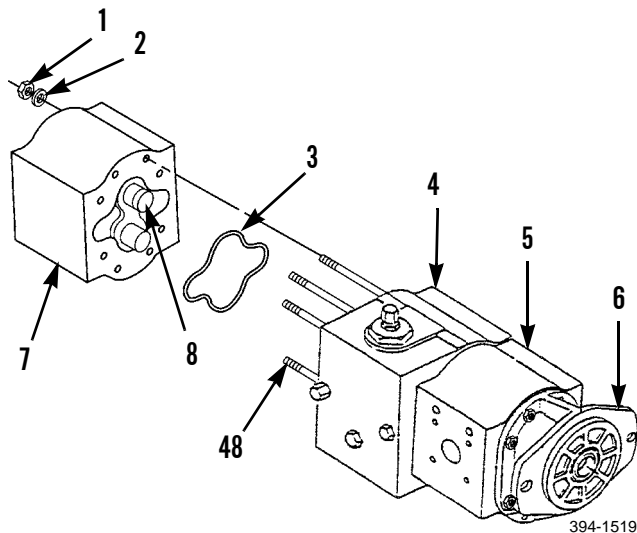
**CAUTION**

Do not drop or let rear idler gear or rear drive gear fall into position. Lower slowly so as not to damage pressure plate.

54. Use clean oil to lubricate and install rear idler gear (14) and rear drive gear (8) in rear body (7). Install rear drive gear (8) in pocket which will align with coupling (31) in valve body (4). Turn rear drive gear (8) until one of the gear teeth is in alignment with dowel in rear body (7). Do not move gears after aligning.
55. Use clean oil to lubricate and install pressure plate (9). Hold pressure plate (9) as level as possible and carefully slide into position with the bronze side facing the gear and the notched side facing the outlet side.
56. Use clean lubricating oil to lubricate and install new center separator (10), two new end separators (13), new sealing strips (12) and isolation plates (11). Isolation plates (11) have the same edge on either side and can be installed either way. Two new sealing strips (12) must not be twisted after installation.

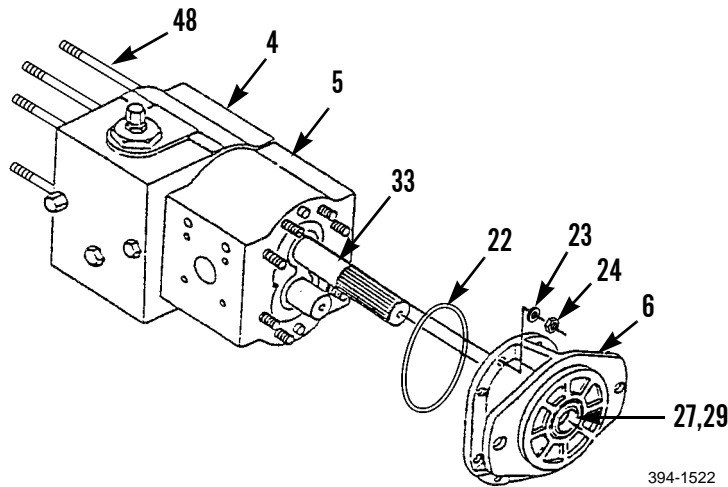


57. Install new preformed packing (3) in groove of valve body (4).



**ASSEMBLY - CONTINUED**

58. Use clean oil to lubricate eight studs (48).
59. Install rear body (7) assembly on studs (48) in valve body (4). Be sure to install rear drive gear (8) in coupling (31). If splined end of rear drive gear (8) cannot be installed in coupling (31), turn front drive gear (33) a small amount until splines engage.
60. Install eight washers (2) and nuts (1) loosely on studs (48).
61. Tighten two nuts (1 and 24), on opposite ends of supplemental steering pump, to 85 lb-ft (115 Nm). Two nuts (24) on flange (6) must be tightened first.
62. Use a torque wrench to turn front drive gear (33) counterclockwise, applying 5 to 10 lb-ft (14 Nm) to turn shaft. If shaft does not turn in the specified range, disassembly pump and inspect.
63. Torque six nuts (1 and 24) to 85 lb-ft (115 Nm).

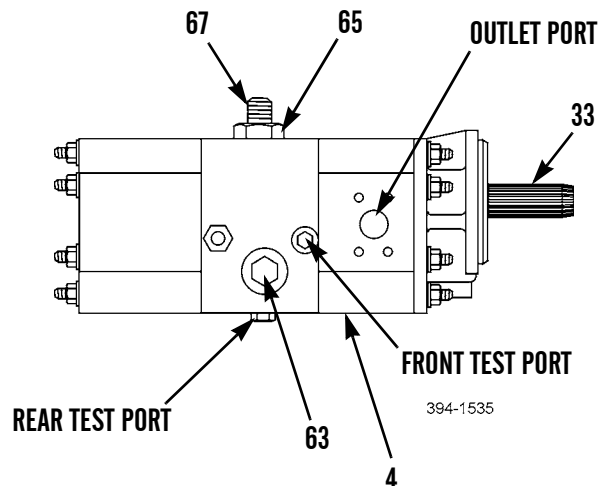


**ADJUSTMENT**

**WARNING**

Use adequate test bench and bench and equipment when performing this procedure. Wearing of protective goggles and gloves is also recommended. Failure to do so could result in severe injury. If you are injured, seek medical aid immediately.

1. Secure supplemental steering pump in adequate test bench.
2. Install flow meter in supplemental steering pump.
3. Remove acorn nut (63) from top of valve body (4).
4. Use long-nosed pliers to hold setscrew (67) while loosening locknut (65).
5. Adjust setscrew (67) by turning until seven threads are above locknut (65) after locknut (65) has been tightened.
6. Tighten locknut (65).
7. Install acorn nut (63) and tighten to 85 lb-ft (115 Nm).
8. Use adequate power drive to turn front drive gear (33) counterclockwise at 1,200 RPM.



**ADJUSTMENT - CONTINUED**

9. Remove acorn nut (54) from side of valve body (4).
10. Loosen locknut (52).

**NOTE**

With the pump shaft at 1,600 RPM, the output from the rear pump section must completely stop. The oil from the pump outlet must be 33.5 gal/min (127 l/min) with pump at 1,600 RPM at a pressure of 100 psi (690 kPa).

11. Tighten locknut (52).
12. Install acorn nut (54) and torque to 85 lb-ft (115 Nm).
13. Remove flow meter from supplemental steering pump.

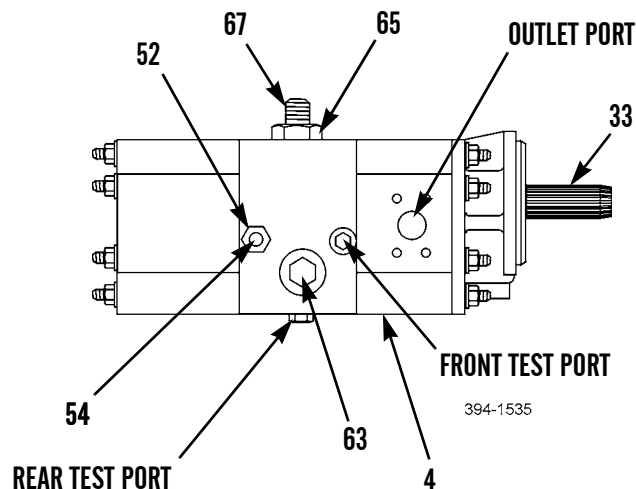
**TESTING****NOTE**

The following procedure is for bench-top testing of supplemental steering pump.

1. Use adequate power drive to turn front drive gear (33) counterclockwise.
2. Record supplemental steering pump output flow. Record output flow "A" at 500 psi (3,447 kPa) and 2,000 RPM. Record output flow "B" at 1,500 psi (10,342 kPa) and 2,000 RPM.
3. Equate the flow loss of the supplemental steering pump by using the following formula:

$$\frac{\text{Output Flow "A"} - \text{Output Flow "B"} \times 100}{\text{Output Flow "A"}} = \text{Flow loss}$$

Output flow must equal 10 or less.



4. Install supplemental steering pump (WP 0307 00).
5. Operate machine and verify correct operation of supplemental steering pump (TM 5-3805-248-10)

**END OF WORK PACKAGE**

---

**HYDRAULIC IMPLEMENT PUMP REPAIR**

**0380 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bushing driver set (Item 11, WP 0338 00)

**Materials/Parts**

Cap set, protective (Item 6, WP 0339 00)

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, sealing (Item 10, WP 0339 00)

**Materials/Parts - Continued**

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Tag, marker (Item 42, WP 0339 00)

Packing, preformed (6)

Seal (9)

**References**

TM 5-3805-248-10

**Equipment Condition**

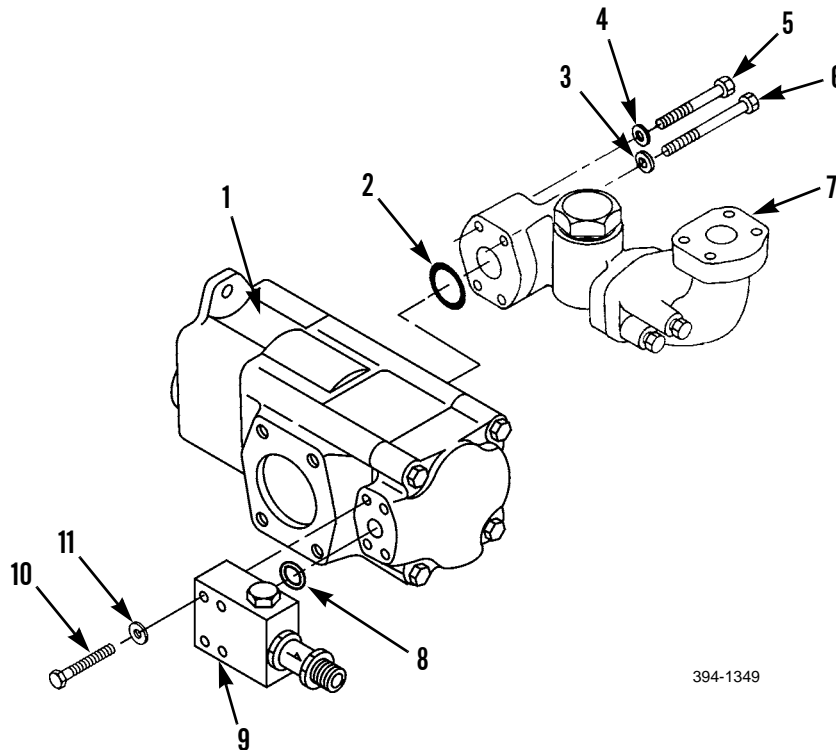
Hydraulic implement pump removed (WP 0322 00)

---

**DISASSEMBLY****NOTE**

The following maintenance procedure is for disassembly of the front cartridge assembly. The maintenance procedure for the rear cartridge assembly is identical.

1. Remove four bolts (10) and washers (11) from hydraulic pump (1).
2. Remove valve (9) and preformed packing (8). Discard preformed packing.
3. Remove two bolts (5) and washers (4).
4. Remove two bolts (6) and washers (3).
5. Remove elbow assembly (7).
6. Remove and discard preformed packing (2).

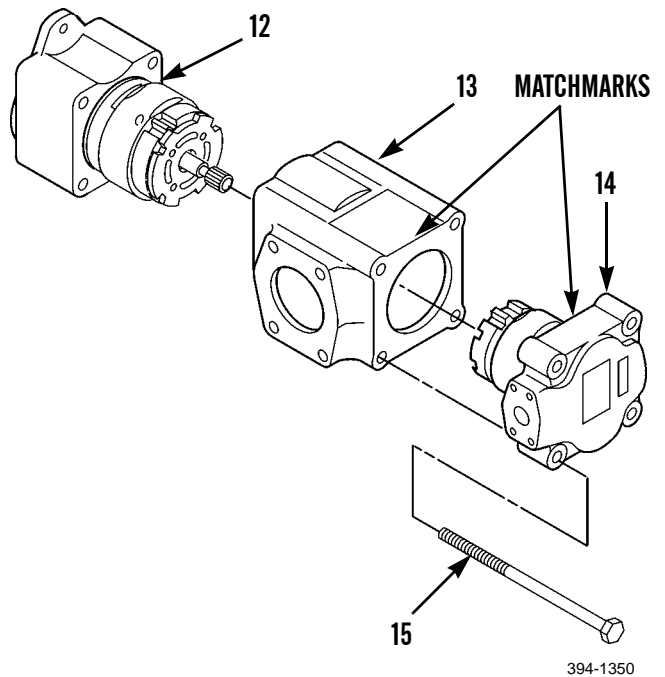


394-1349



**DISASSEMBLY - CONTINUED**

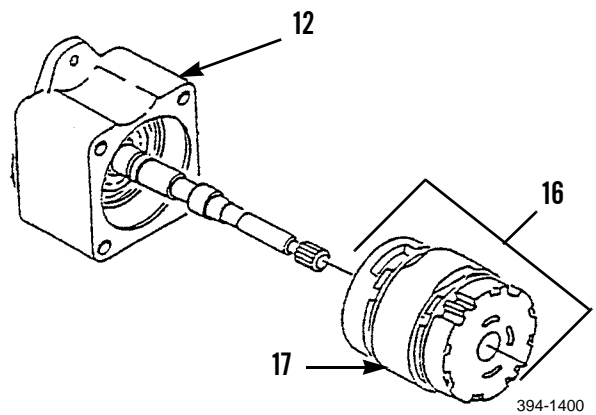
7. Match-mark access cover (14) and cover (13) to ensure correct installation.
8. Remove four bolts (15).
9. Separate access cover (14), cover (13) and housing (12).



**NOTE**

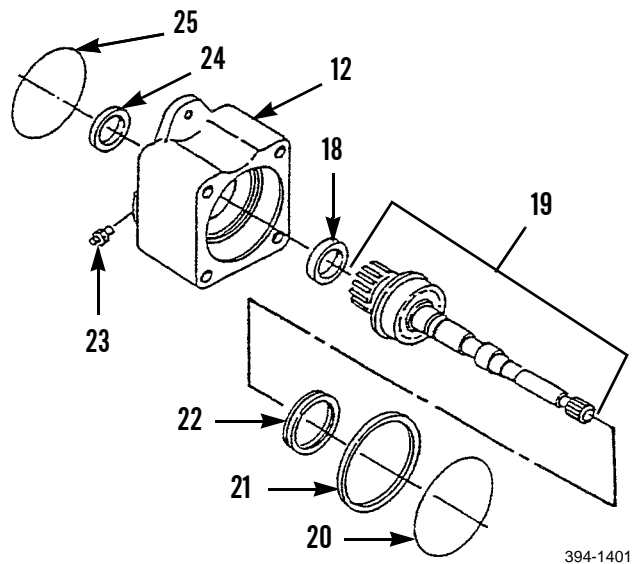
Note direction of rotor rotation with cam ring to ensure proper assembly.

10. Observe direction of rotation arrow on front cartridge assembly cam ring (17). Mark direction on housing (12) to aid in assembly.
11. Remove front cartridge assembly (16). Carefully set aside to disassemble later in this procedure.

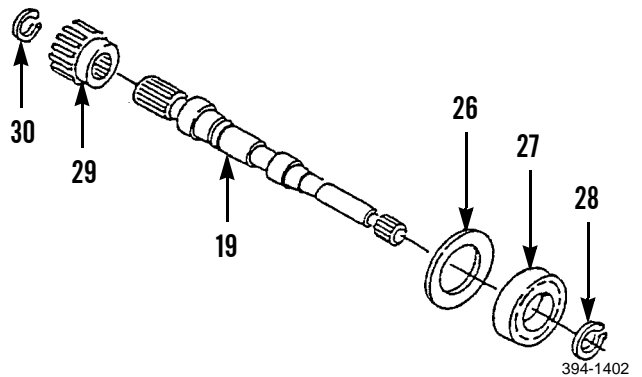


**DISASSEMBLY - CONTINUED**

12. Remove and discard preformed packing (20) from housing (12).
13. Remove and discard seal (21).
14. Remove ring (22).
15. Remove shaft assembly (19).
16. Remove and discard seal (18).
17. Turn housing (12) over, and remove and discard seal (24).
18. Remove and discard preformed packing (25).
19. Remove valve (23).



20. Use snap ring pliers to remove ring (28) from shaft (19).
21. Use bearing pullers to remove bearing (27) and ring (26).
22. Use snap ring pliers to remove ring (30) from shaft (19).
23. Remove coupling (29) from shaft (19).



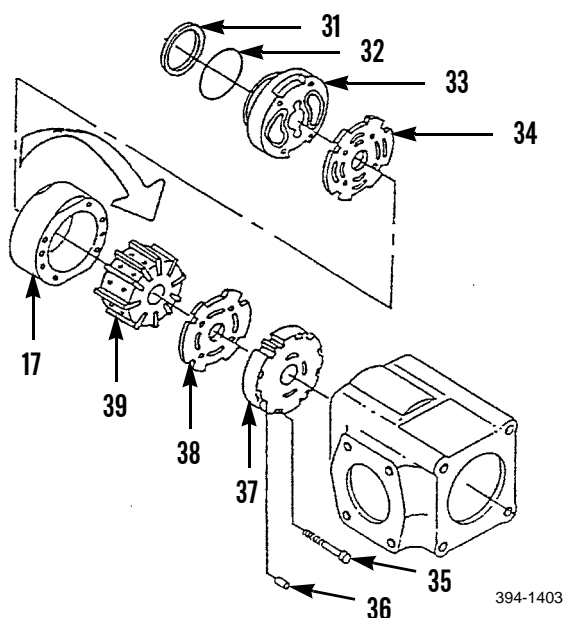
**DISASSEMBLY - CONTINUED**

24. Remove and discard seal (31) from cartridge (33).
25. Remove and discard preformed packing (32).
26. Remove two bolts (35).

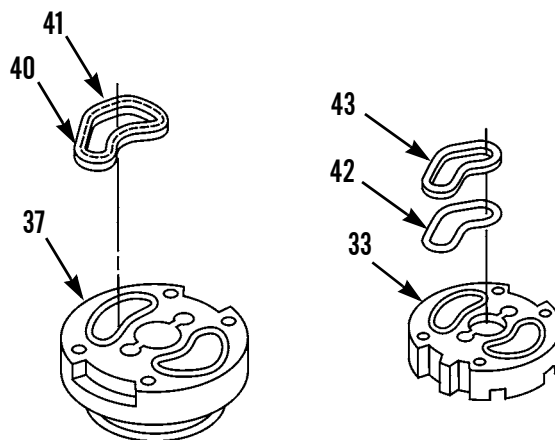
**NOTE**

Note direction of rotor rotation with cam ring to ensure proper assembly.

27. Observe direction of rotation arrow on front cartridge assembly cam ring (17) and rotor (39). Make note of it to aid in assembly.
28. Separate plates (37 and 38), rotor (39), front cartridge assembly cam ring (17), plate (34) and cartridge (33).
29. Remove two dowel pins (36) from plate (37).



30. Remove two seals (43) and retainers (42) from cartridge (33). Discard two seals.
31. Remove two seals (41) and retainers (40) from plate (37). Discard two seals.



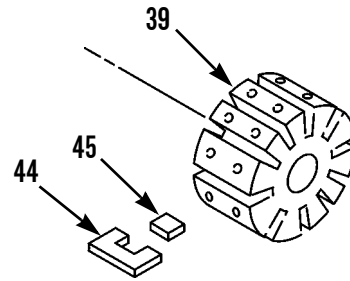
394-1404

**DISASSEMBLY - CONTINUED**

**NOTE**

Record direction of sharp edge of vanes to ensure proper assembly. Sharp edges should point toward direction of rotor rotation.

32. Remove ten vanes (44) and vane inserts (45) from rotor (39).



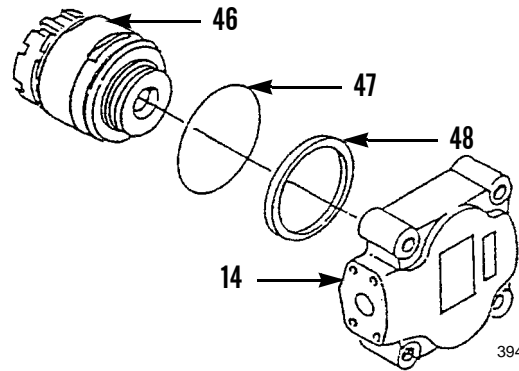
394-1405

33. Remove rear cartridge assembly (46) cam ring from access cover (14).
34. Remove and discard preformed packing (47).
35. Remove and discard seal (48).

**NOTE**

Note direction of rotor rotation with cam ring to ensure proper assembly.

36. Observe direction of rotation arrow on rear cartridge assembly (46) cam ring. Mark direction on access cover (14) to aid in assembly.
37. Repeat steps 24 through 32 for disassembly of rear cartridge assembly (46).



394-1406

**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 cause 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. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

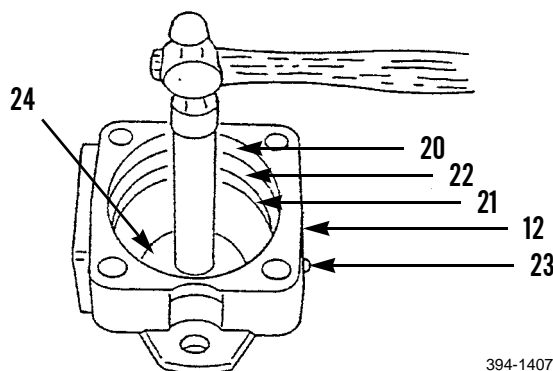
**ASSEMBLY**

1. Install new preformed packing (20) in housing (12).

**NOTE**

Lip must be toward inside of housing. Check new seal to ensure that it is installed evenly with the outside surface of housing.

2. Use driver and hammer to install new seal (24).
3. Install new seal (21) and ring (22).
4. Install valve (23) and ring (22).



394-1407

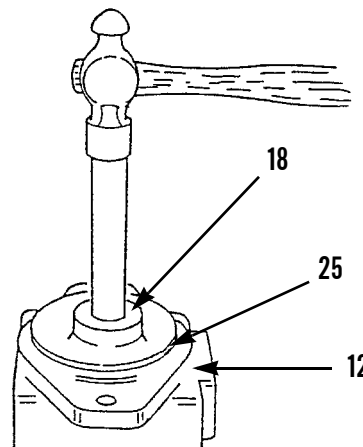
**ASSEMBLY - CONTINUED**

5. Turn housing (12) over and install new preformed packing (25).

**NOTE**

Lip of new seal should be toward inside of housing, even with bottom of counterbore.

6. Use driver and hammer to install new seal (18).



394-1408

7. Install coupling (29) on shaft (19).
8. Using snap ring pliers, install ring (30).

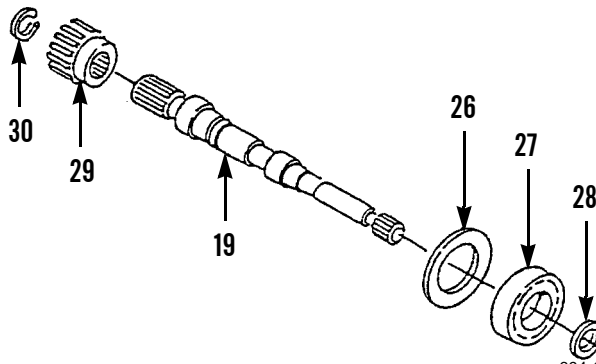


**WARNING**



Hot oil or metal parts can cause severe burns. Wear insulated gloves, long sleeves and eye protection when working with heated parts. Failure to follow this warning may cause injury.

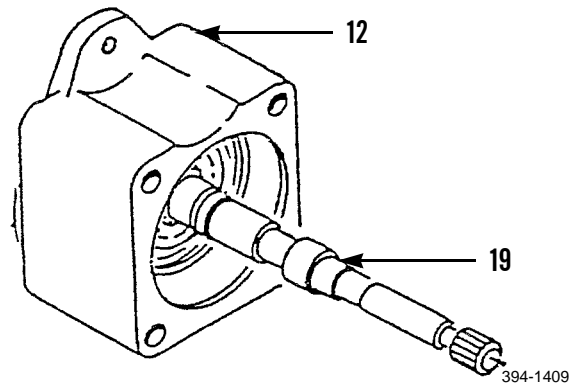
9. Use clean oil to heat bearing (27) to a maximum temperature of 275°F (135°C).
10. Install bearing (27).
11. Use snap ring pliers to install ring (28).
12. Install ring (26) on shaft (19) from coupling (29) end of shaft.



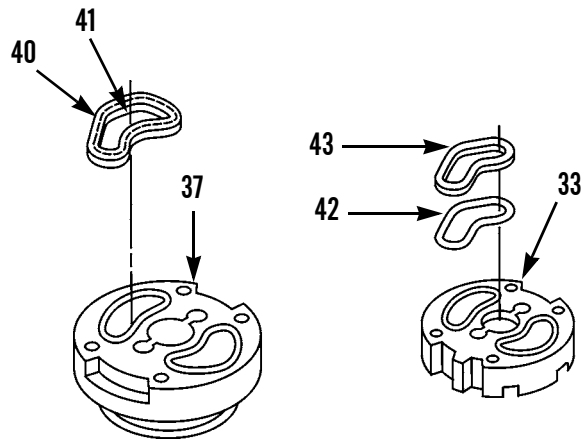
394-1402

**ASSEMBLY - CONTINUED**

13. Install shaft assembly (19) into housing (12).



14. Install two new seals (43) in retainers (42).
15. Install two seals (43) and retainers (42) in cartridge (33).
16. Install two new seals (41) in retainers (40).
17. Install two new seals (41) and retainers (40) in plate (37).

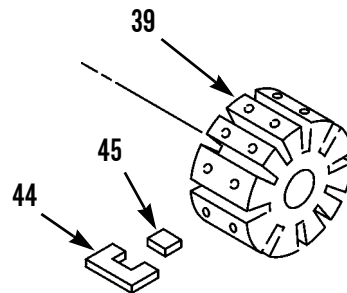


394-1404

**NOTE**

Sharp edge of vane points toward direction of rotor rotation.

18. Install 10 vane inserts (45) and vanes (44) into rotor (39).



394-1405

**ASSEMBLY - CONTINUED**

**NOTE**

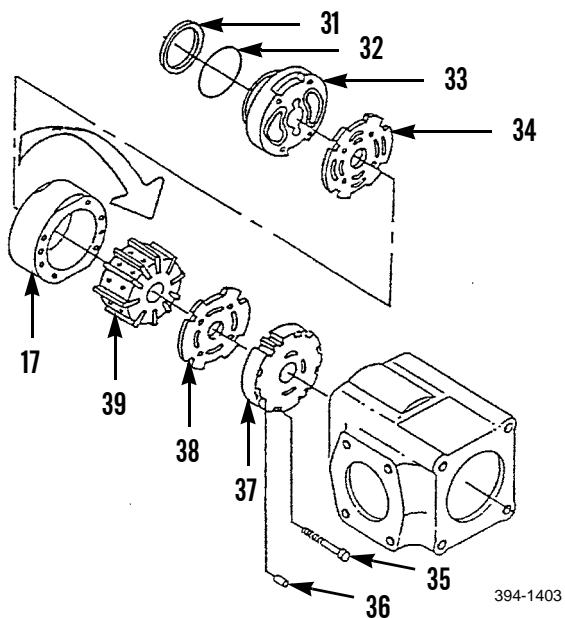
The rotation arrows on front cartridge assembly cam ring and rotor must be in same direction.

19. Lubricate bore of rotor (39) and front cartridge assembly cam ring (17).
20. Install rotor (39) into front cartridge assembly cam ring (17).
21. Install plates (38 and 34) on front cartridge assembly cam ring (17) with bronze side of plates toward front cartridge assembly cam ring (17).
22. Install two dowel pins (36) on plate (37).

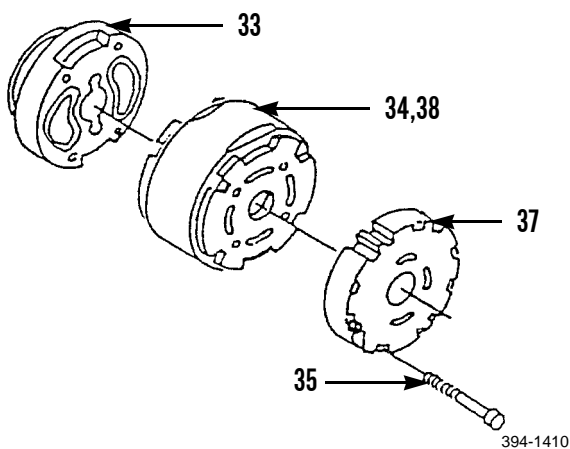
**NOTE**

Preformed packing faces side of groove toward center.

23. Install new preformed packing (32) and new seal (31) on cartridge (33).



24. Position plate (37) and cartridge (33) on plates (34 and 38).
25. Install and hand-tighten two bolts (35).



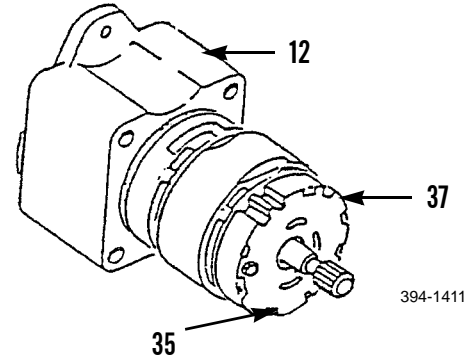


**ASSEMBLY - CONTINUED**

**NOTE**

Rotation marks on front cartridge assembly cam ring and access cover must be installed in the same direction.

26. Install plate assembly (37) in housing (12).
27. Tighten two bolts (35).

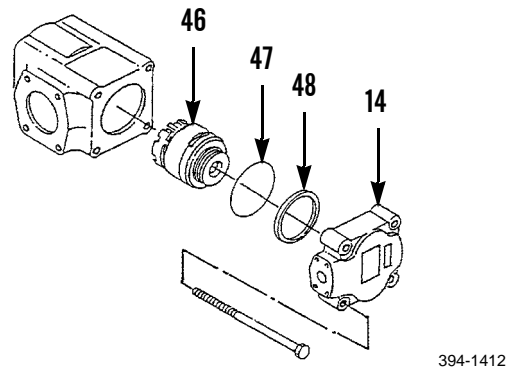


28. Assemble rear cartridge assembly cam ring (46) using steps 1 through 7.
29. Install new preformed packing (47) and new seal (48) in access cover (14).

**NOTE**

Marks showing direction of rotation of front cartridge assembly cam ring must match marks in same direction on access cover.

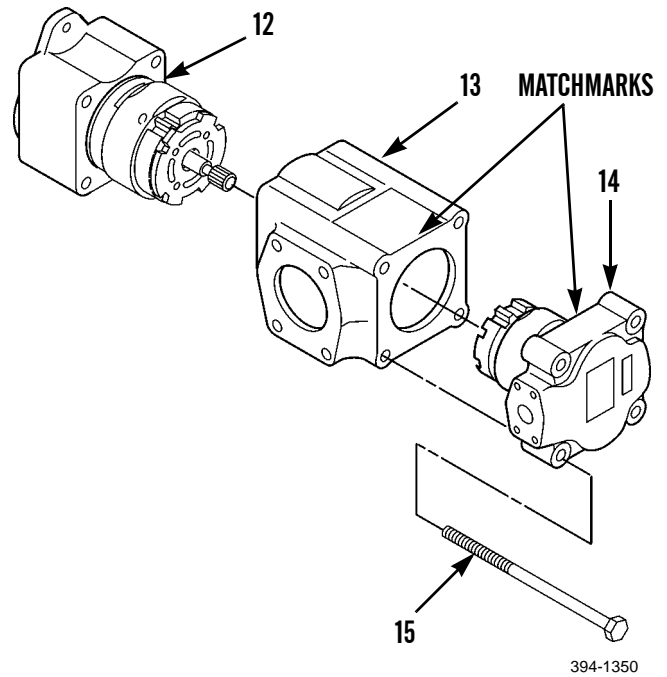
30. Install rear cartridge assembly cam ring (46) in access cover (14).



**ASSEMBLY - CONTINUED****NOTE**

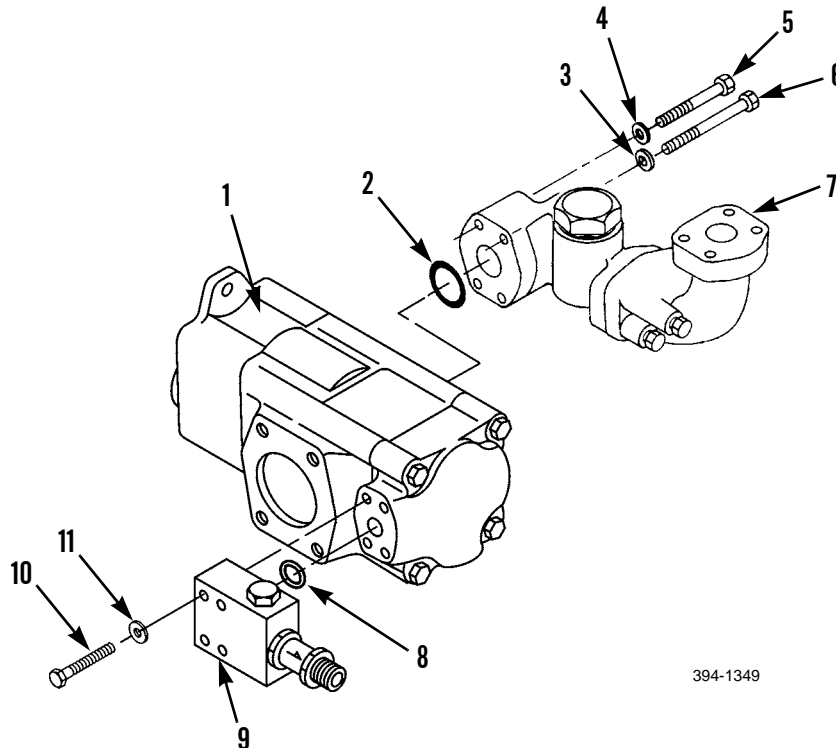
Dowels must be in alignment with holes in cover and all match-marks must align.

31. Install access cover (14) and housing (12) in cover (13).
32. Install four bolts (15).



**ASSEMBLY - CONTINUED**

33. Install new preformed packing (2) and elbow assembly (7) on hydraulic pump (1).
34. Install two washers (3), bolts (6), washers (4) and bolts (5).
35. Install new preformed packing (8) and valve (9).
36. Install four washers (11) and bolts (10).



394-1349

37. Install hydraulic implement pump (WP 0322 00).
38. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**SCRAPER CONTROL VALVE REPAIR**

---

0381 00

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

General Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Bushing driver set (Item 11, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed (13)

Seal (5)

**References**

TM 5-3805-248-10

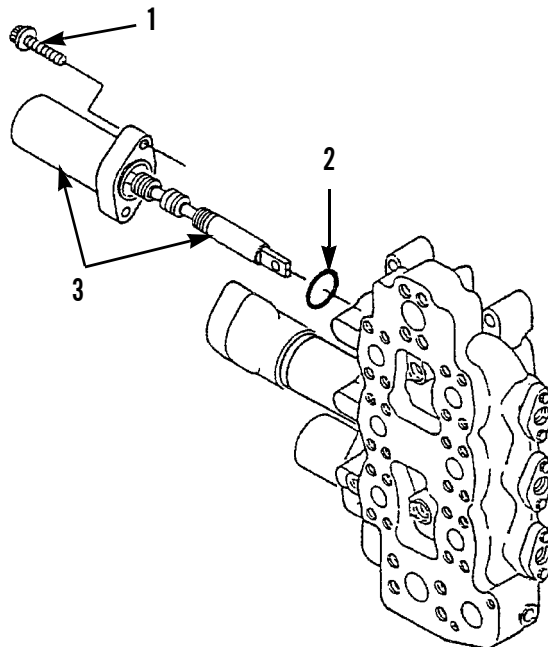
**Equipment Condition**

Scraper control valve removed (WP 0323 00)

---

**DISASSEMBLY**

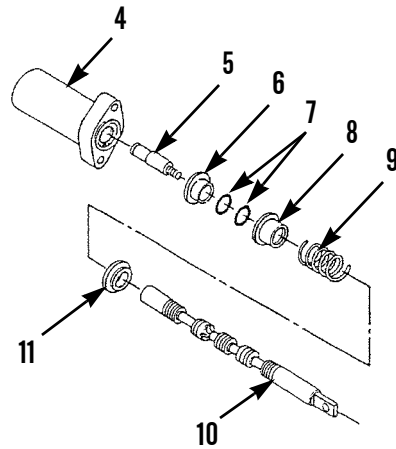
1. Remove two bolts (1) from stem and housing assembly (3).
2. Remove stem and housing assembly (3).
3. Remove and discard preformed packing (2).



394-1413

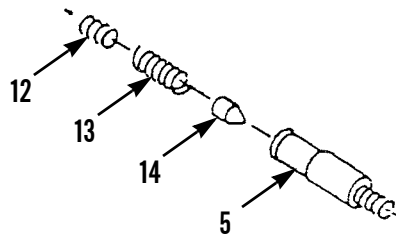
**DISASSEMBLY - CONTINUED**

4. Remove stem assembly from housing assembly (4).
5. Remove detent (5) from stem (10).
6. Remove retainer (6) from stem (10).
7. Remove and discard two preformed packings (7).
8. Remove retainer (8).
9. Remove spring (9) and washer (11).



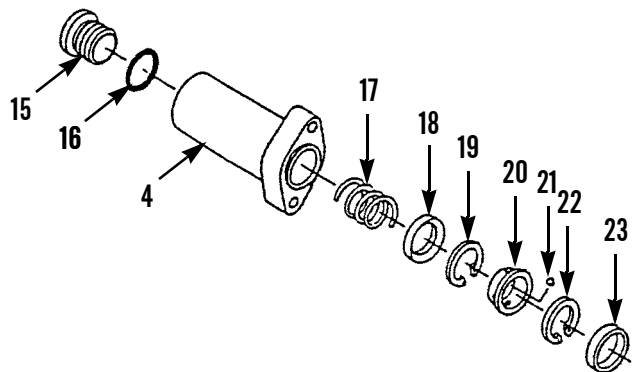
394-1414

10. Remove screw (12), spring (13) and poppet (14) from detent (5).



394-1415

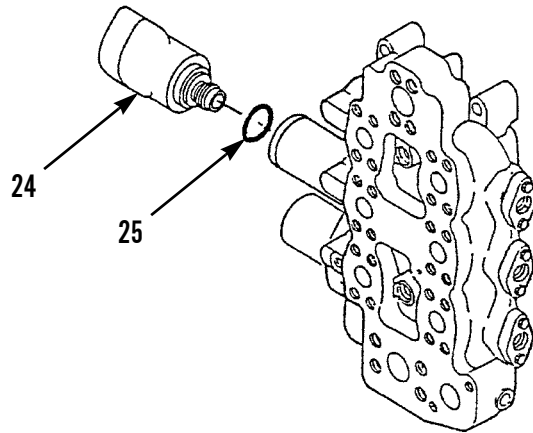
11. Remove spacer (23) from housing (4).
12. Using snap ring pliers, remove ring (22).
13. Remove retainer (20) and four balls (21) from housing (4).
14. Use snap ring pliers to remove ring (19).
15. Remove ring (18) and spring (17).
16. Remove plug (15).
17. Remove and discard preformed packing (16).



394-1416

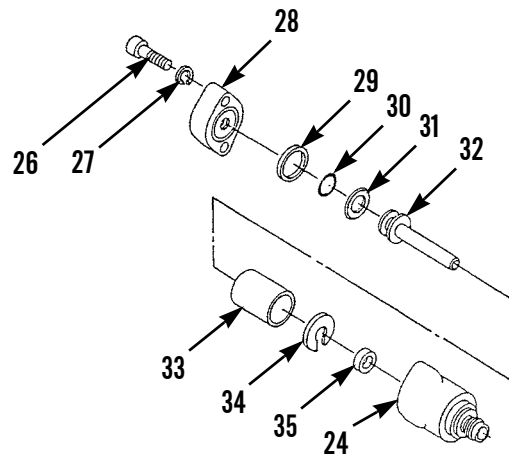
**DISASSEMBLY - CONTINUED**

18. Remove piston assembly (24) by rotating counter-clockwise.
19. Remove and discard preformed packing (25).



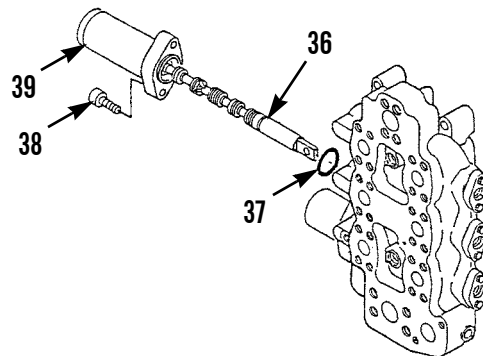
394-1417

20. Remove two bolts (26) and washers (27) from piston assembly (24).
21. Remove cover (28).
22. Remove and discard preformed packing (29).
23. Remove piston (32).
24. Remove and discard preformed packing (30).
25. Remove and discard seal (31).
26. Remove bushing (33), washer (34) and seal (35) from body (24). Discard seal.



394-1418

27. Remove two bolts (38) from stem (36) and housing assembly (39).
28. Remove stem (36) and housing assembly (39).
29. Remove and discard preformed packing (37).



394-1419

**DISASSEMBLY - CONTINUED**

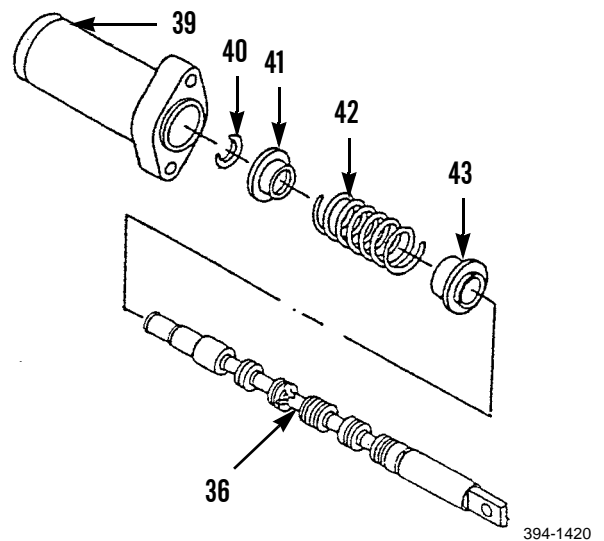
30. Separate stem (36) from housing assembly (39).



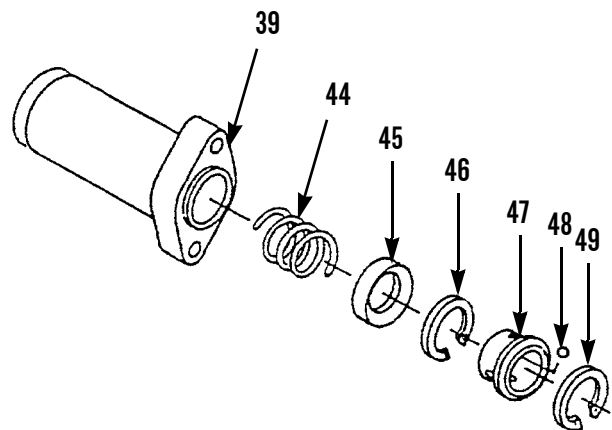
**WARNING**

Some components are under spring tension. Wear eye protection and use caution when disassembling them, to avoid injury.

31. Depress retainer (41) and spring (42).
32. Use snap ring pliers to remove ring (40) from stem (36).
33. Remove retainer (41) and spring (42) slowly.
34. Remove retainer (43) from stem (36).



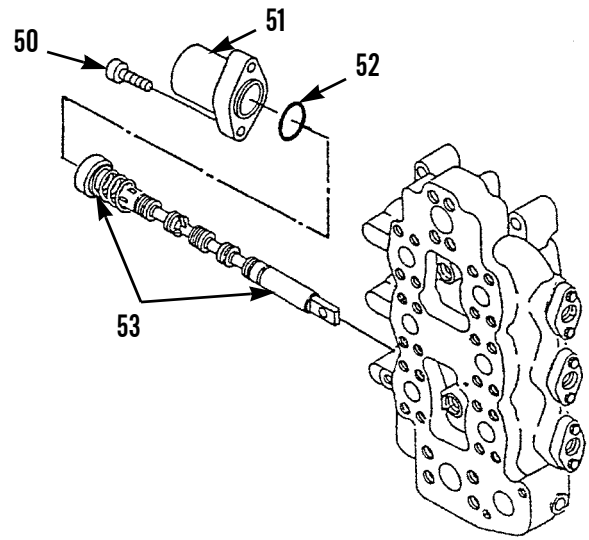
35. Use snap ring pliers to remove ring (49) from housing assembly (39).
36. Remove retainer (47) and four balls (48).
37. Use snap ring pliers to remove ring (46).
38. Remove retainer (45) and spring (44) from housing (39).





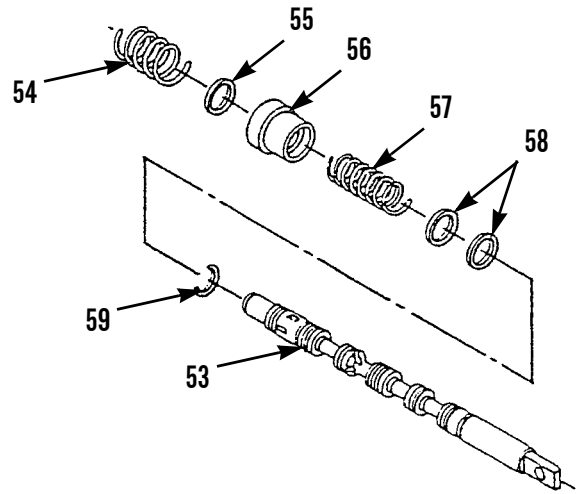
**DISASSEMBLY - CONTINUED**

39. Remove two bolts (50), housing (51), preformed packing (52) and stem assembly (53). Discard preformed packing.



394-1422

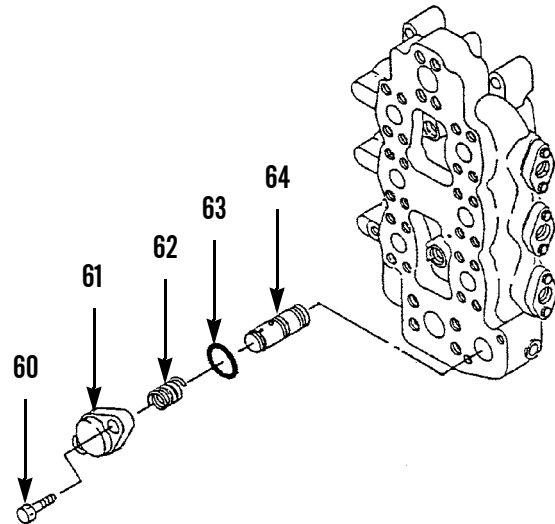
40. Compress spring (57) and remove ring (59) from stem assembly (53).
41. Slowly release spring (57) and remove two washers (58) and spring (57).
42. Remove retainer (56), washer (55) and spring (54) from stem (53).



394-1423

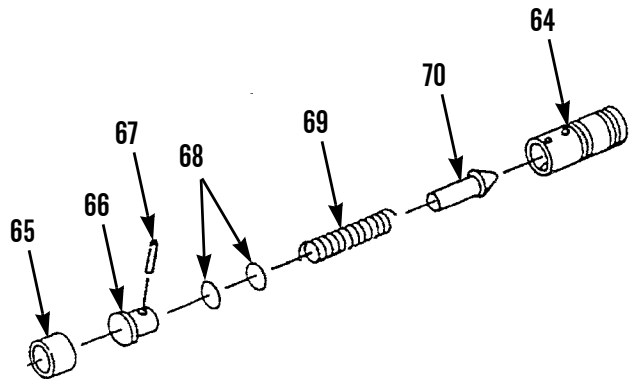
**DISASSEMBLY - CONTINUED**

43. Remove two bolts (60) and cover (61) from scraper control valve.
44. Remove and discard preformed packing (63).
45. Remove spring (62).
46. Remove piston assembly (64).



394-1424

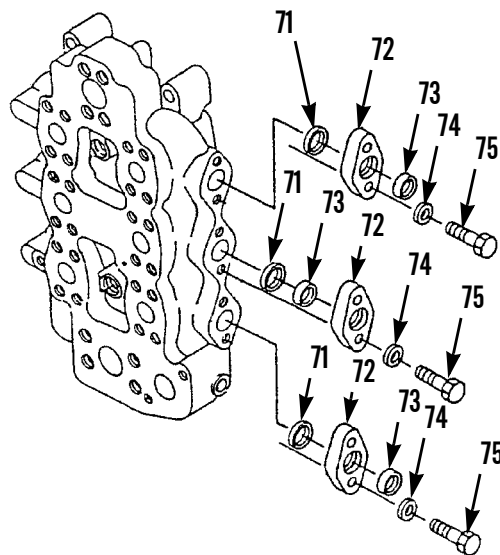
47. Remove piston (64) from valve (70).
48. Remove retainer (65).
49. Remove pin (67).
50. Remove cap (66), two shims (68), spring (69) and valve (70).



394-1425

**DISASSEMBLY - CONTINUED**

51. Remove six bolts (75) and washers (74) from scraper control valve.
52. Remove three covers (72).
53. Remove and discard three preformed packings (71).
54. Remove and discard three seals (73).



394-1426

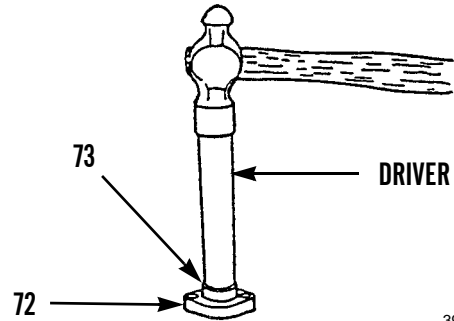
**CLEANING AND INSPECTION****WARNING**

- 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 cause 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. Remove all seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

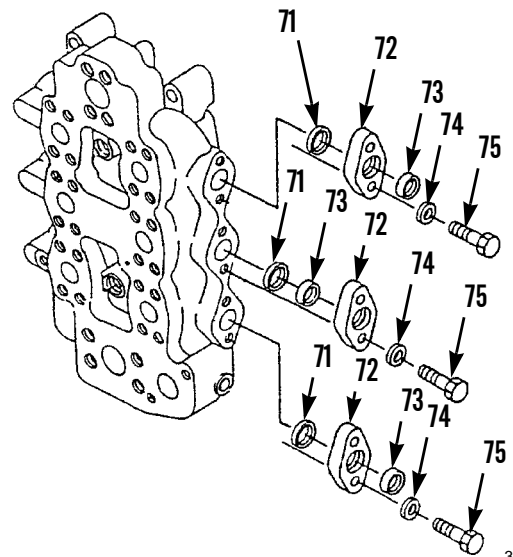
**ASSEMBLY**

1. Use a driver to install three new seals (73) on covers (72).



394-1427

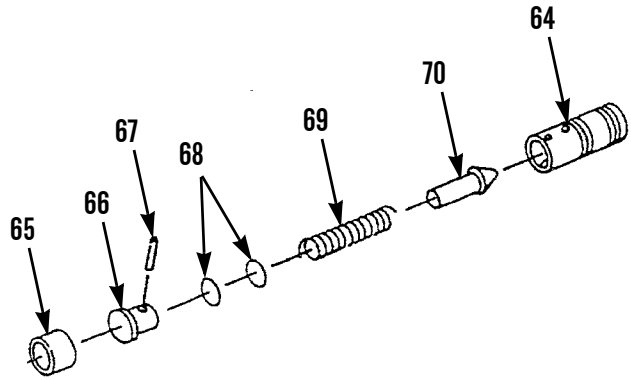
2. Install three new preformed packings (71) on covers (72).
3. Install three covers (72) on scraper control valve.
4. Install six washers (74) and bolts (75).



394-1426

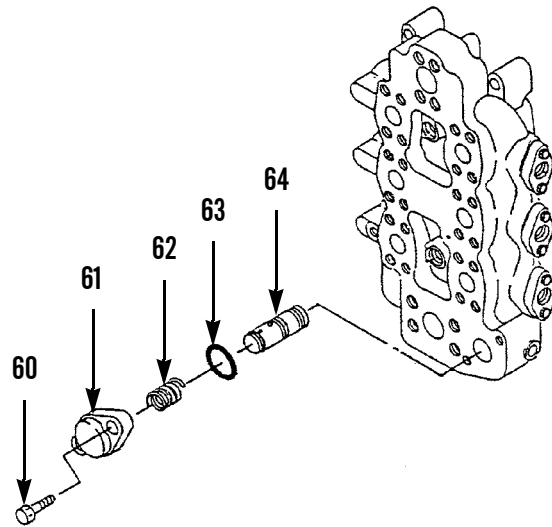
**ASSEMBLY - CONTINUED**

5. Install valve (70), spring (69), two shims (68) and cap (66).
6. Install pin (67).
7. Install retainer (65).
8. Install piston (64) in valve (70).



394-1425

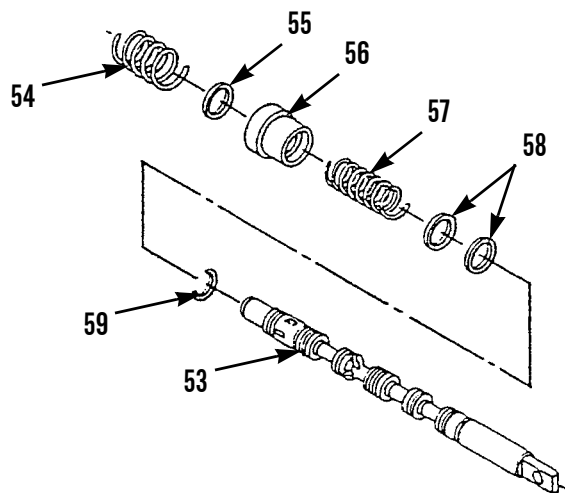
9. Install piston assembly (64) in scraper control valve.
10. Install spring (62).
11. Install new preformed packing (63).
12. Install cover (61) and two bolts (60).



394-1424

**ASSEMBLY - CONTINUED**

13. Install spring (54), washer (55) and retainer (56) on stem (53).
14. Install spring (57) and two washers (58).
15. Depress retainer (56) and spring (57).
16. Use snap ring pliers to install ring (59).

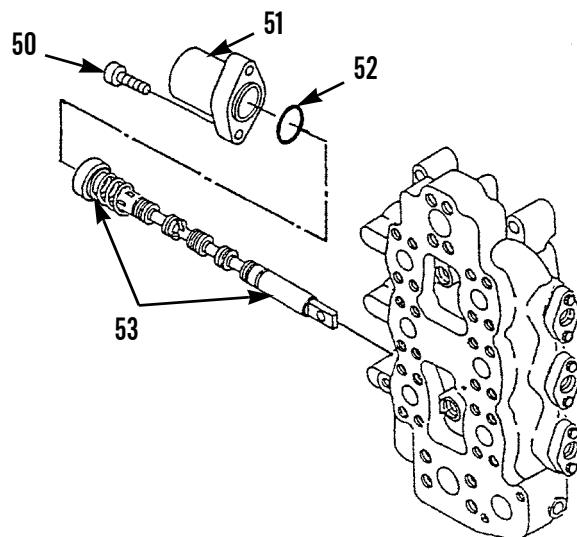


394-1423

**NOTE**

Apply a thin coat of clean engine oil to stem assembly.

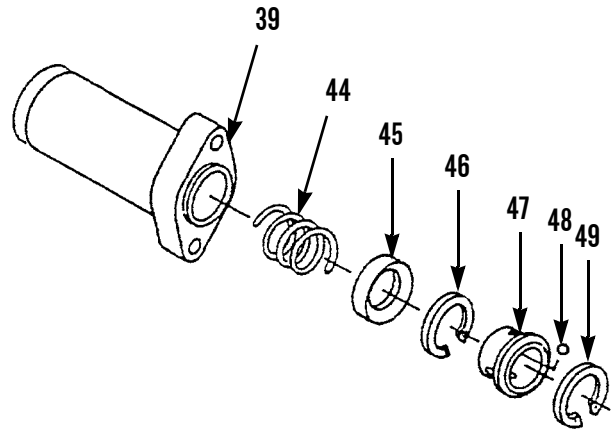
17. Install stem assembly (53) in scraper control valve.
18. Install new preformed packing (52).
19. Install housing (51).
20. Install two bolts (50).



394-1422

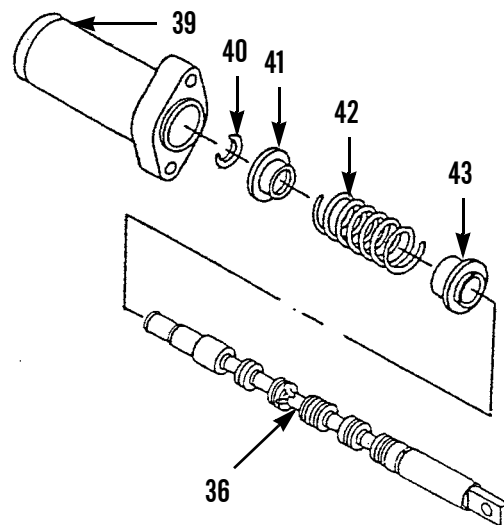
**ASSEMBLY - CONTINUED**

21. Install spring (44) and retainer (45) on housing (39).
22. Use snap ring pliers to install ring (46) by compressing spring (44) and retainer (45).
23. Install four balls (48) and retainer (47).
24. Use snap ring pliers to install ring (49).



394-1421

25. Install retainer (43) on stem (36).
26. Install spring (42) and retainer (41) and depress.
27. Use snap ring pliers to install ring (40).
28. Install stem assembly (36) in housing assembly (39).



394-1420

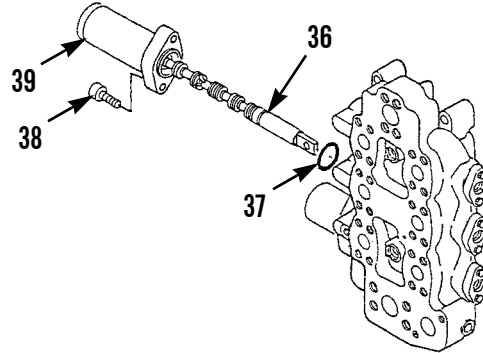
**ASSEMBLY - CONTINUED**

29. Install new preformed packing (37) on scraper control valve.

**NOTE**

Apply a thin coat of clean engine oil to stem and housing assembly.

30. Lubricate and install stem (36) and housing assembly (39).
31. Install two bolts (38).

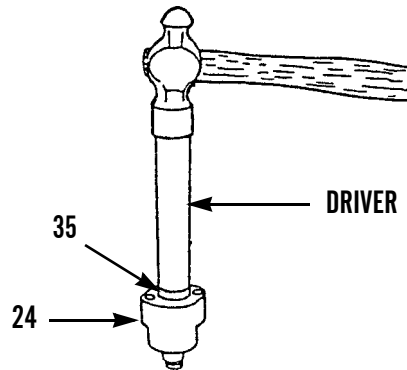


394-1419

**NOTE**

Position seal with lip toward threaded end of body.

32. Use driver to install new seal (35) in body (24), making contact with bottom of counterbore.

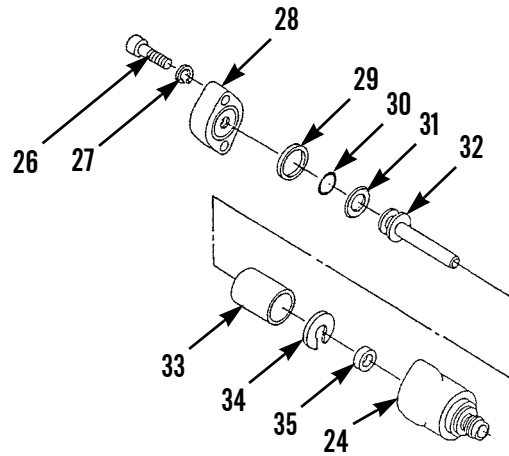


4-1428



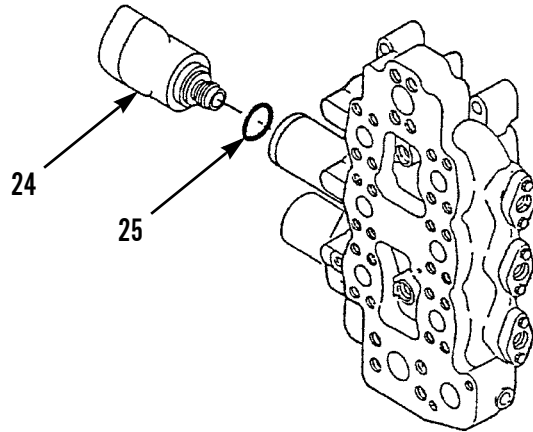
**ASSEMBLY - CONTINUED**

33. Install washer (34) and bushing (33) in body (24).
34. With groove of seal facing out, install new seal (31) on piston (32).
35. Install new preformed packing (30).
36. Install piston (32).
37. Install new preformed packing (29).
38. Install cover (28).
39. Install two washers (27) and bolts (26).



394-1418

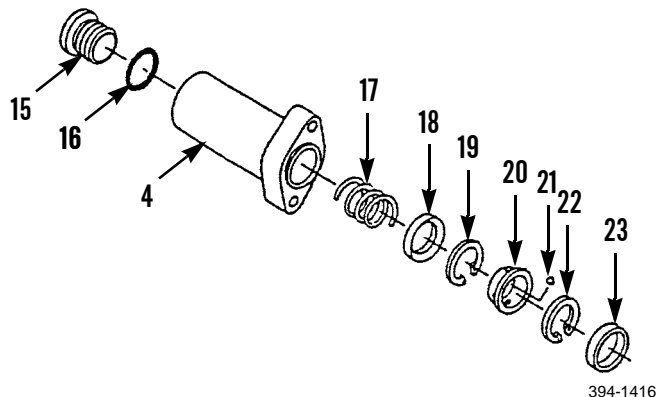
40. Install new preformed packing (25) on scraper control valve.
41. Install piston assembly (24).



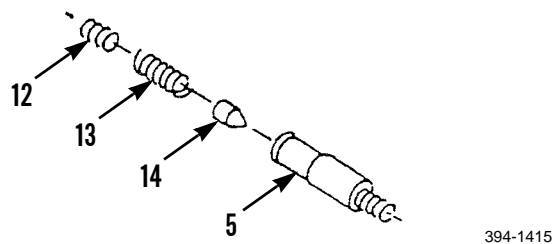
394-1417

**ASSEMBLY - CONTINUED**

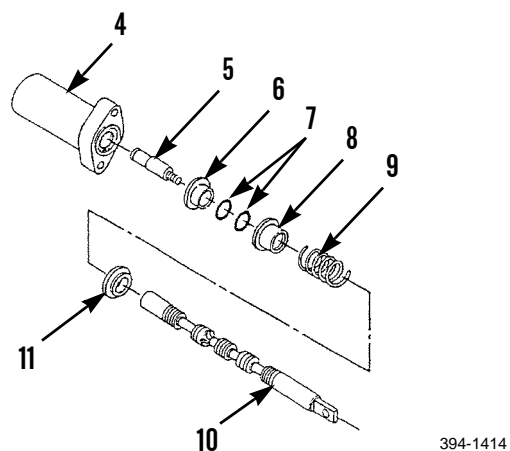
- 42. Install new preformed packing (16) on housing (4).
- 43. Install plug (15).
- 44. Install spring (17) and ring (18) and compress.
- 45. Use snap ring pliers to install ring (19).
- 46. Install four balls (21) and retainer (20) in housing (4).
- 47. Use snap ring pliers to install ring (22).
- 48. Install spacer (23) in housing (4).



- 49. Install poppet (14), spring (13) and screw (12) on detent (5).

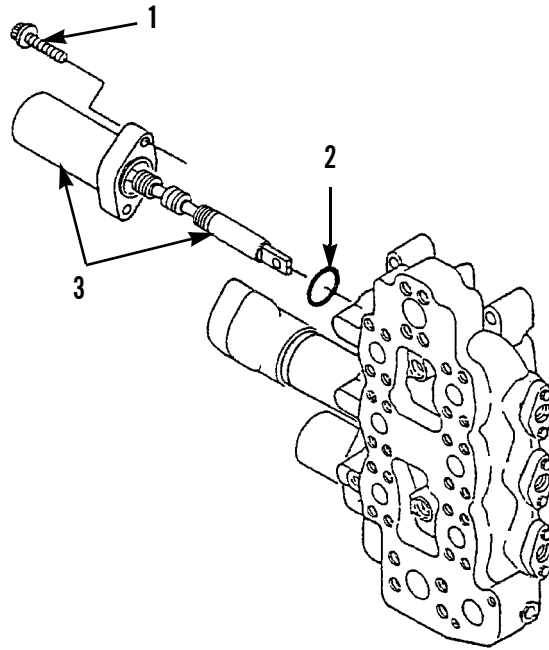


- 50. Install washer (11) and spring (9) on stem (10).
- 51. Install retainer (8).
- 52. Install two new preformed packings (7).
- 53. Install retainer (6).
- 54. Install detent assembly (5) on stem (10).
- 55. Install stem assembly (10) in housing assembly (4).



**ASSEMBLY - CONTINUED**

56. Install new preformed packing (2) on scraper control valve.
57. Install stem and housing assembly (3) on scraper control valve.
58. Install two bolts (1).



394-1413

59. Install scraper control valve (WP 0323 00).
60. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**SEQUENCE VALVE REPAIR**

**0382 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning and Inspection, Assembly, Testing

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Pressure kit, gage (Item 31, WP 0338 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed (3)

**References**

TM 5-3805-248-10

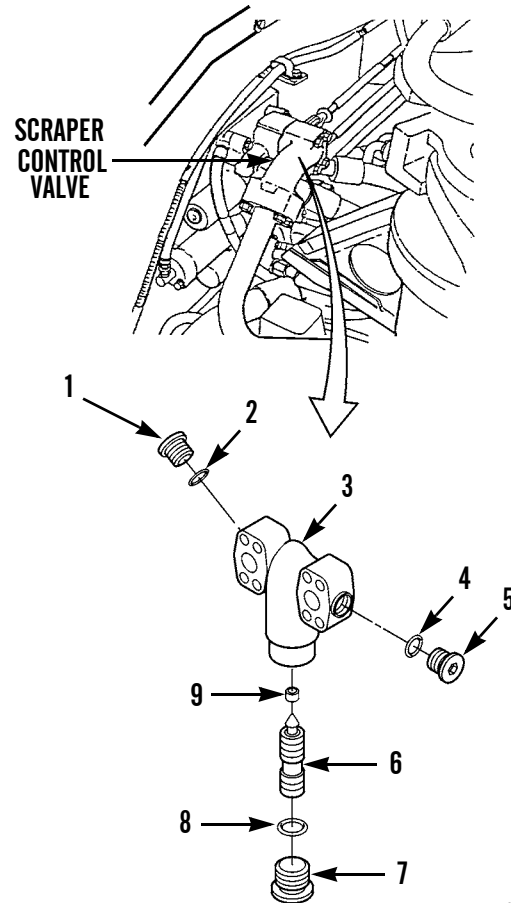
**Equipment Condition**

Scraper control valve removed (WP 0354 00)

---

**DISASSEMBLY**

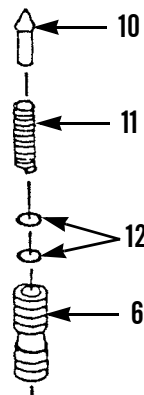
1. Remove plug (1) and preformed packing (2) from sequence valve (3). Discard preformed packing.
2. Remove plug (5) and preformed packing (4). Discard preformed packing.
3. Remove plug (7).
4. Remove and discard preformed packing (8).
5. Remove seat (9) and piston assembly (6).



394-1429

**DISASSEMBLY - CONTINUED**

6. Remove valve (10), spring (11) and two shims (12) from piston (6).



394-1430

**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 cause 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.

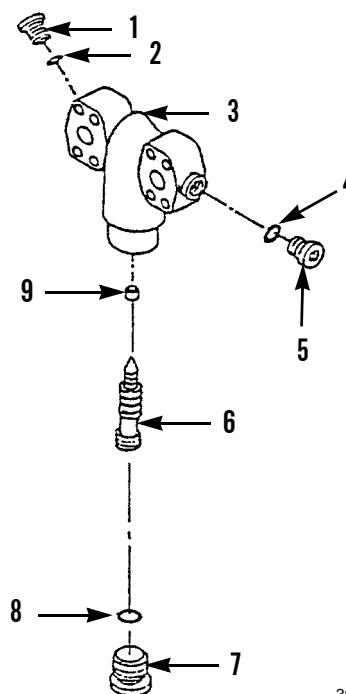
1. Remove all preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Install two shims (12), spring (11) and valve (10) in piston (6).

**ASSEMBLY - CONTINUED**

2. Install new preformed packing (8) and plug (7).
3. Install piston assembly (6) in sequence valve (3).
4. Install new preformed packing (4) and plug (5).
5. Install new preformed packing (2) and plug (1).



394-1430

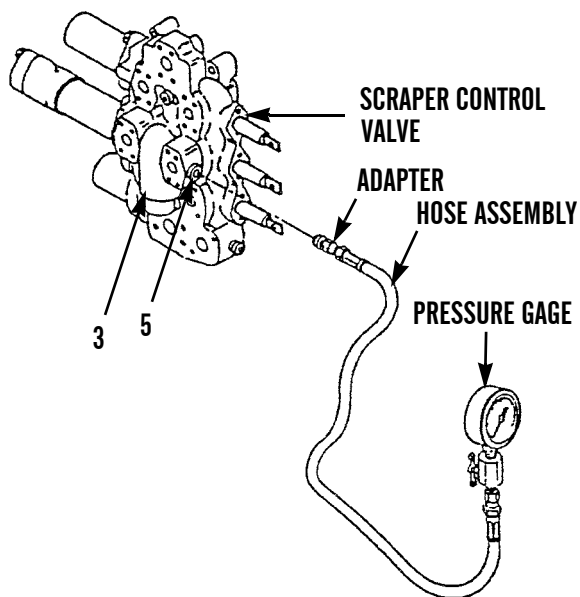
6. Install scraper control valve (WP 0354 00).

**TESTING**

**NOTE**

Prior to testing, battery negative ground must be connected.

1. Remove plug (5) from side of sequence valve (3).
2. Install adapter in place of plug (5).
3. Install hose assembly and pressure gage on adapter.



394-1432



**TESTING - CONTINUED**

4. Operate engine and run at high idle (TM 5-3805-248-10).
5. Move apron control lever to raise position and hold. Observe pressure gage. When pressure reaches 1,000±50 psi, the sequence valve must open. If it does not open, proceed to next step.
6. Shut down engine.
7. Disassemble valve. Refer to *Disassembly*, steps 3 through 6, in this work package.

**NOTE**

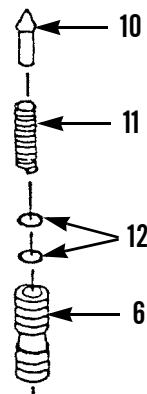
Decrease shim thickness to lower pressure. Increase shim thickness to raise pressure.

8. Add or remove two shims (12), as necessary. Refer to Table 1 to determine correct amount of shim(s) to add or remove.

**Table 1. Pressure Change to Sequence Valve by Removal or Addition of One Shim.**

Part Number	Thickness	Change in Pressure
8J4436	0.005 in. (0.127 mm)	20 psi (138 kPa)
9J1330	0.031 in. (0.787 mm)	120 psi (827 kPa)

9. Assemble valve. Refer to *Assembly*, steps 1 through 4, in this work package.
10. Operate engine. Check gage. If reading is correct, remove pressure gage, hose assembly and adapter. Install plug (5). If valve does not open at 1000±50 psi, repeat test until valve opens at correct pressure.



394-1430

**END OF WORK PACKAGE**



---

**BOWL LIFT CYLINDERS REPAIR**

---

**0383 00****THIS WORK PACKAGE COVERS**Disassembly, Cleaning, Inspection, Assembly

---

**INITIAL SETUP****Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Adapter, mechanical puller (Item 1, WP 0338 00)

Pump, hydraulic ram, hand-driven (Item 91, WP 0338 00)

Hydraulic cylinder repair stand

Lifting device, 300 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Gasket

Locknut

Packing, preformed (2)

Seal (2)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**Bowl lift cylinders removed (WP 0242 00)

---

**NOTE**

The following maintenance procedure is for the right bowl lift cylinder. The maintenance procedure for the left bowl lift cylinder is identical.

**DISASSEMBLY**



**WARNING**

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**

Weight of bowl lift cylinder is 270 lb (122 kg).

1. Attach lifting device to bowl lift cylinder assembly.

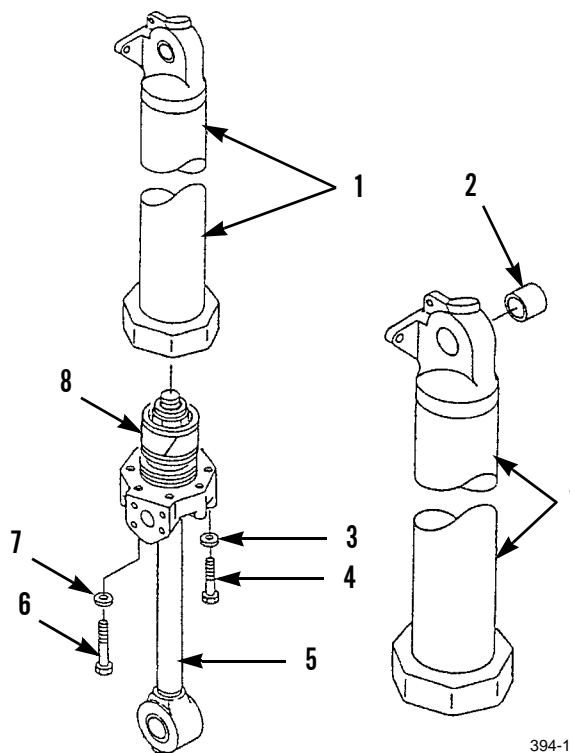
**NOTE**

Place cylinder assembly on cylinder repair stand with holes for hydraulic lines facing down.

**CAUTION**

Use care when placing support under rod. Rod must be protected against nicks and scratches. Failure to follow this procedure could result in damage to equipment.

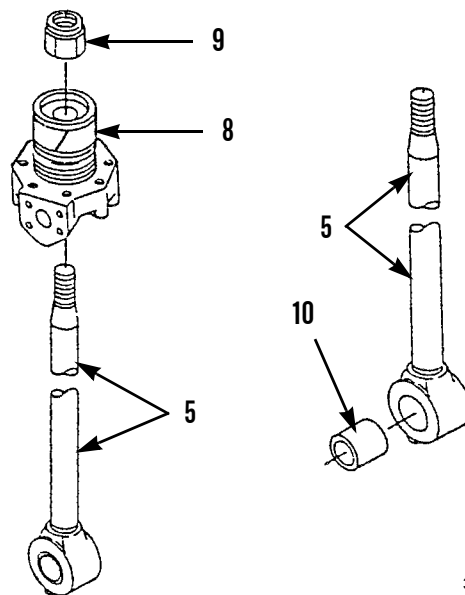
2. Place cylinder assembly on cylinder repair stand and remove lifting device.
3. Extend rod (5) to its farthest length of travel and secure or support.
4. Remove two bolts (4) and washers (3).
5. Remove six bolts (6) and washers (7).
6. Use hydraulic puller to remove head assembly (8) from collar (1).
7. Use pump group to remove bearing (2) from collar (1).



394-1433

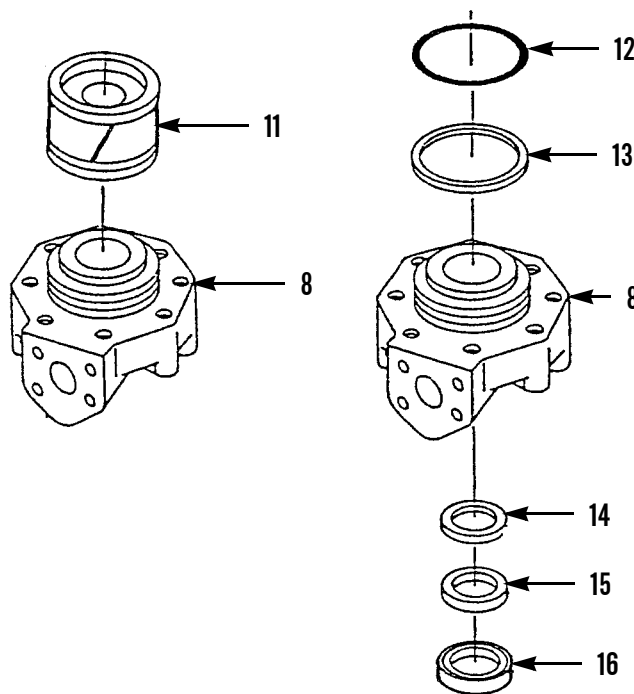
**DISASSEMBLY - CONTINUED**

8. Use torque multiplier to remove locknut (9) from rod (5) and discard.
9. Remove head assembly (8) from rod (5).
10. Use pump group to remove bearing (10) from rod (5).



394-1434

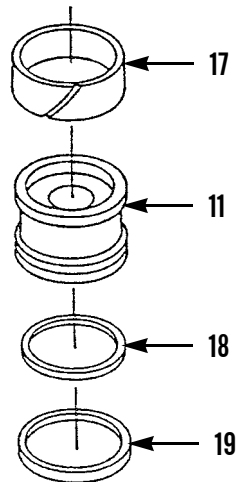
11. Remove piston assembly (11) from head assembly (8).
12. Remove and discard preformed packing (12).
13. Remove and discard ring (13).
14. Remove and discard seal (16), preformed packing (15) and gasket (14) from head (8).



394-1435

**DISASSEMBLY - CONTINUED**

15. Remove and discard rings (18 and 19) from piston (11).
16. Remove and discard seal (17).



394-1436

**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 cause 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. Remove all gasket, seal and preformed packing material from mounting surfaces.
2. Clean all parts with solvent cleaning compound.
3. Dry all parts with compressed air.

**INSPECTION**

1. Inspect collar (1) for dents, rust or other damage. Replace if necessary. Bore of a new collar (1) must be  $6.000+0.005$  or  $-0.002$  in. ( $152.4+0.127$  or  $0.051$  mm).
2. Inspect rod (5) for nicks, scratches or other damage. Replace if necessary. Diameter of new rod (5) must be  $2.4980\pm 0.0015$  in. ( $63.4492\pm 0.0381$  mm).
3. Inspect head (8) for dents, cracks, rust or other damage. Replace if necessary. Bore in new head (8) must be  $2.503\pm 0.001$  in. ( $63.576\pm 0.025$  mm).
4. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**



**WARNING**



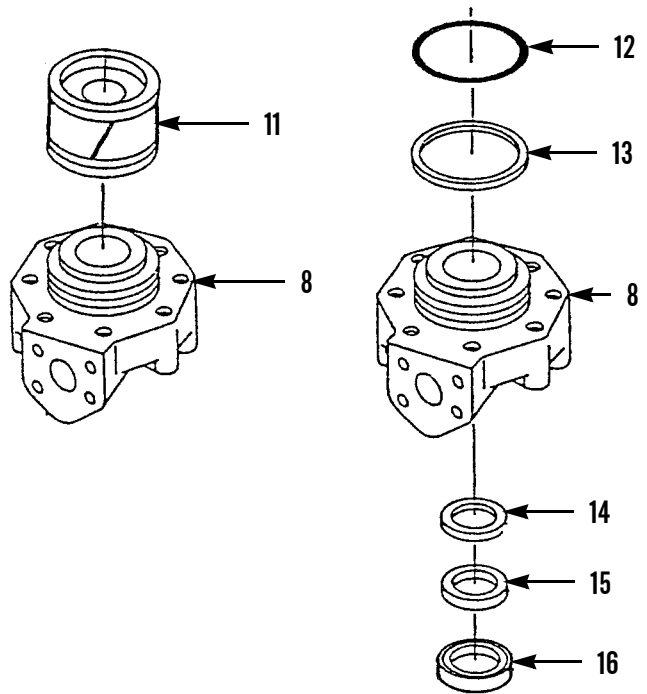
Prolonged contact with lubricating oil, MIL-L-2105, may cause skin rash. Skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be well ventilated to keep fumes to a minimum.

1. Apply primer to counterbore and metal shell of new seal (16) and allow to dry (approximately 30 seconds).

**NOTE**

Do not allow sealing compound to contact the sealing lip.

2. Apply sealing compound to counterbore and to metal shell of new seal (16).
3. Coat new gasket (14), new preformed packing (15) and new seal (16) with clean lubricating oil and install in head (8).
4. Coat new ring (13) and new preformed packing (12) with clean oil and install.

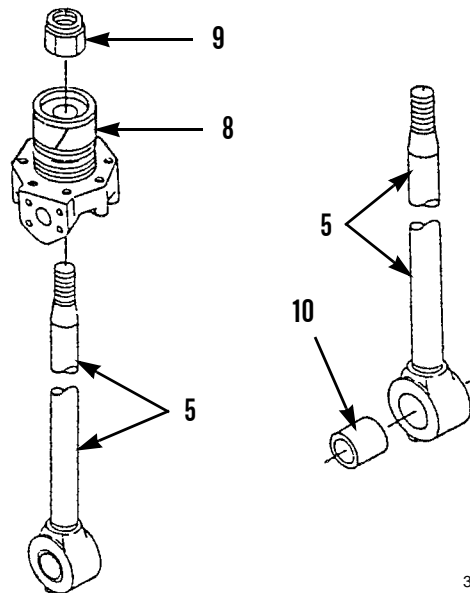


394-1435

5. Coat new seal (17) and new rings (18 and 19) with clean lubricating oil and install on piston (11).
6. Install piston (11) assembly on head assembly (8).

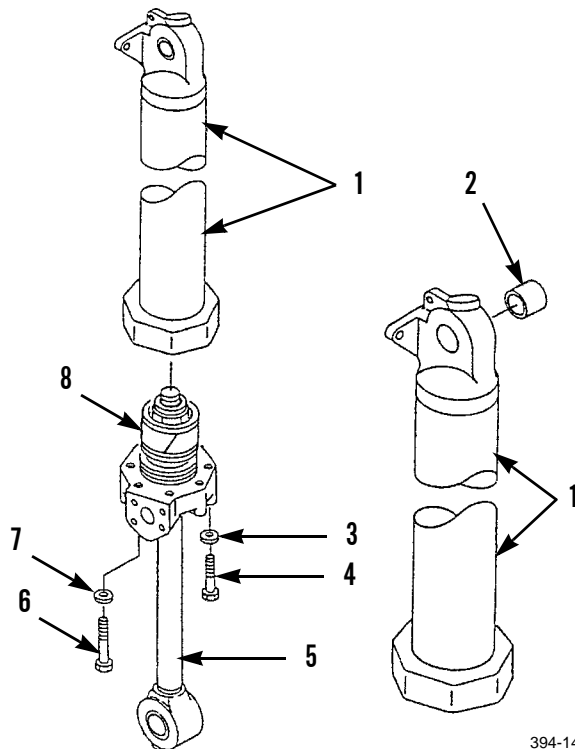
**ASSEMBLY - CONTINUED**

7. Install head assembly (8) on rod (5).
8. Using torque multiplier, install new nut (9) on rod (5).  
Torque nut (9) to 1,200±100 lb-ft (1,627±136 Nm).



394-1434

9. Use pump group to install bearing (2) in collar (1).
10. Use an inside micrometer to measure inside diameter of bearing (2). Diameter must not be less than 2.251 in. (57.175 mm).
11. Use pump group to install bearing (10) in rod (5).
12. Use an inside micrometer to measure inside diameter of bearing (10). Diameter must not be less than 2.251 in. (57.175 mm).
13. Coat head assembly (8) with clean oil.
14. Install collar (1) over head assembly (8).
15. Extend rod (5) to its farthest length of travel.
16. Install six washers (7) and bolts (6) in head (8).
17. Install two washers (3) and bolts (4).
18. Torque six bolts (6) and two bolts (4) to 300±35 lb-ft.



394-1433

19. Install bowl lift cylinders (WP 0242 00).
20. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



---

**EJECTOR CYLINDER REPAIR**

**0384 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning, Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance (Item 104, WP 0338 00)

Multiplier, torque wrench (Item 57, WP 0338 00)

Puller, hydraulic (Item 86, WP 0338 00)

Pump, hydraulic ram, hand-driven (Item 91, WP 0338 00)

Hydraulic cylinder repair stand

Lifting device, 1,000 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Packing, preformed

Seal (4)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Ejector cylinder removed (WP 0243 00)

---

**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 cause injury or death.

**NOTE**

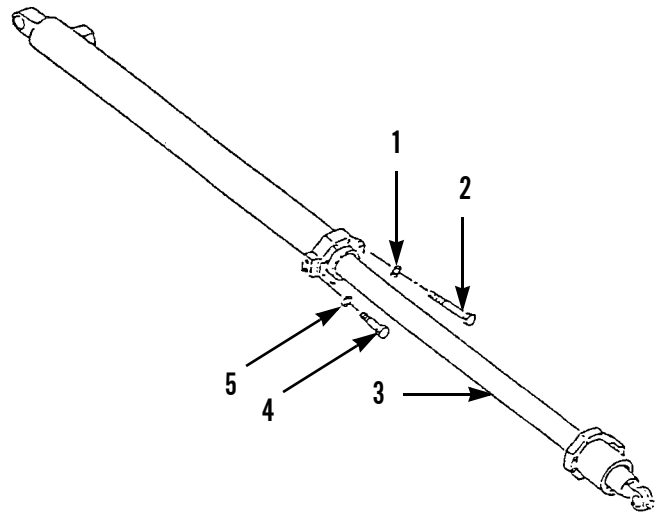
- Place ejector cylinder with holes for hydraulic lines facing down.
- Weight of ejector cylinder is 725 lb (329 kg).

1. Use lifting device to place ejector cylinder on cylinder repair stand.
2. Remove lifting device.

**CAUTION**

Exercise care when securing rod to support. Rod must be protected against nicks and scratches. Failure to follow this procedure could result in damage to equipment.

3. Extend rod (3) to its farthest length of travel and secure to support.
4. Remove six bolts (4) and washers (5).
5. Remove two bolts (2) and washers (1).



394-1437

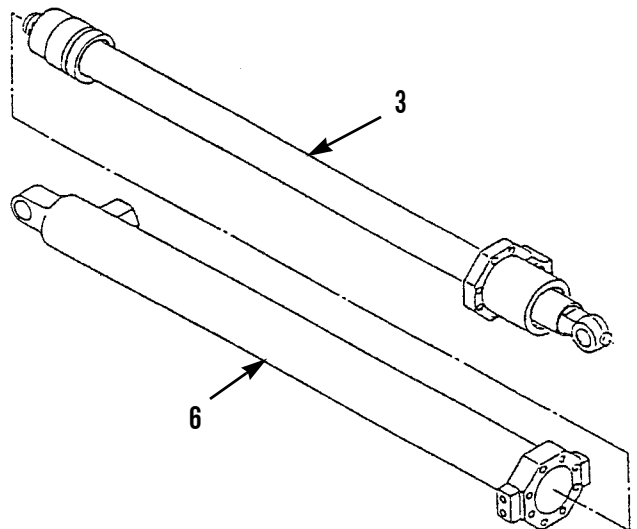
**DISASSEMBLY - CONTINUED****WARNING**

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**

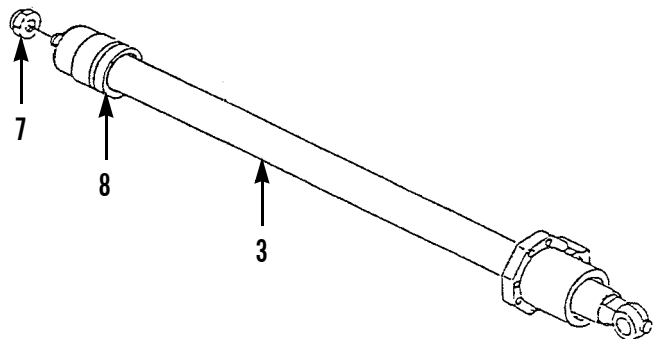
Weight of cylinder assembly is 490 lb (222 kg).

6. Use hydraulic puller to remove rod assembly (3) from cylinder (6).



394-1438

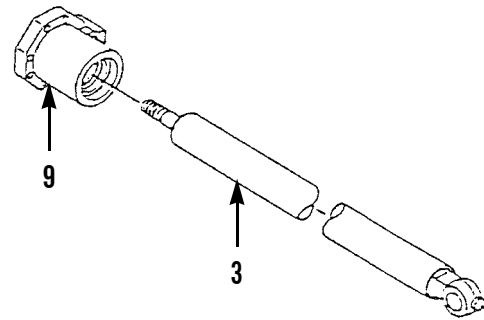
7. Use torque multiplier to remove nut (7) from rod (3).
8. Remove piston assembly (8).



394-1439

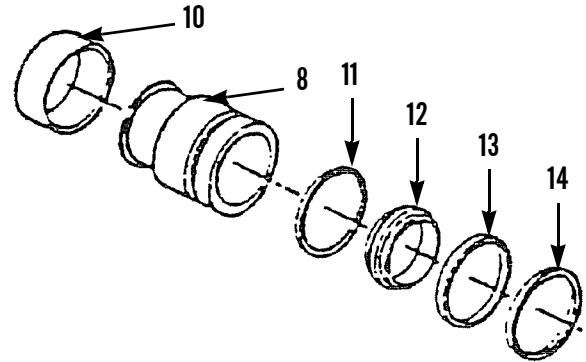
**DISASSEMBLY - CONTINUED**

9. Remove head assembly (9) from rod (3).



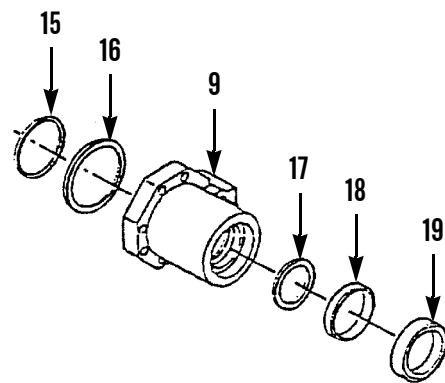
394-1440

10. Remove and discard ring (14), seal (13) and rings (12 and 11) from piston (8).
11. Remove and discard ring (10) from piston (8).



394-1441

12. Remove and discard seals (19, 18 and 17) from head (9).
13. Remove and discard preformed packing (15) and ring (16) from head (9).



394-1442

**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 cause 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. Remove all preformed packing material from mounting surfaces.
  2. Use emery cloth to scuff surfaces of the counterbore in the cylinder head and the outside diameter of the new seals' metal shell.
  3. Clean all parts with solvent cleaning compound.
  4. Clean the counterbore and the metal shell of the new seals until none of the components discolor a clean white towel.

**NOTE**

The metal shell of the seal is coated with a corrosion inhibitor. This may prevent proper bonding of the seal to the cylinder head if the inhibitor is not removed. After cleaning, do not touch the counterbore of the metal shell because the oil from your fingers may prevent a good bond. Handle the seal by the lip only.

5. Dry all parts with compressed air.

**INSPECTION**

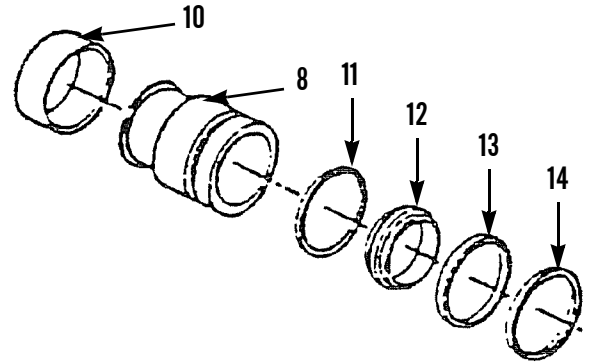
1. Inspect cylinder (5) for dents, rust or other damage. Replace if necessary. Bore of a new cylinder (5), if replaced, must be  $6.500+0.005$  or  $-0.002$  in. ( $165.1+0.127$  or  $-0.0508$  mm).
2. Inspect rod (7) for nicks, scratches or other damage. Replace if necessary. Diameter of new rod (7), if replaced, must be  $3.998\pm 0.001$  in. ( $101.549\pm 0.0254$  mm).
3. Inspect head (19) for dents, cracks, rust or other damage. Replace if necessary. Bore in new rod (19), if replaced, must be  $4.003\pm 0.001$  in. ( $101.676\pm 0.0254$  mm).
4. Inspect all other parts.

**ASSEMBLY**

1. Use clean engine oil to coat new ring (16) and new preformed packing (15).
2. Install new ring (16) and new preformed packing (15) in head (9).
3. Use clean engine oil to coat new seals (19, 18 and 17).
4. Install new seal (17) in innermost groove of head (9).
5. Install new seal (18) on side with groove toward seal (17).
6. Install new seal (19) with lip facing outward.

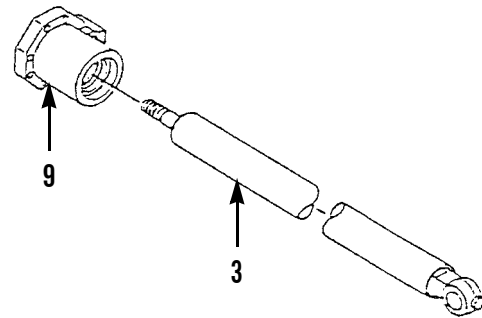
**ASSEMBLY - CONTINUED**

7. Install new ring (10) on piston (8).
8. Install new rings (12 and 11), new seal (13) and new ring (14) on piston (8).



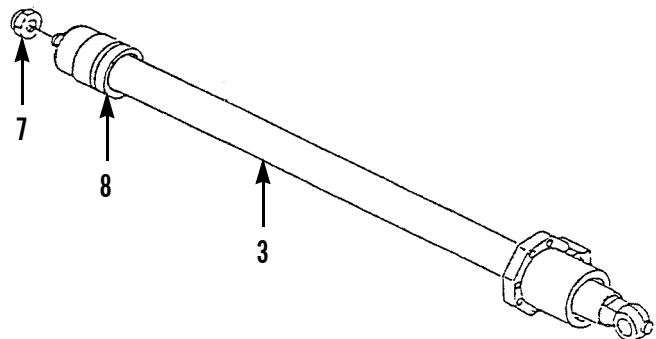
394-1441

9. Install head assembly (9) on rod (3).



394-1440

10. Apply generous coat of clean oil to piston assembly (8).
11. Install piston assembly (8) on rod (3).
12. Install nut (7) on rod (3).
13. Use torque multiplier to torque nut (7) to  $800 \pm 75$  lb-ft ( $1085 \pm 102$  Nm).



394-1439

**ASSEMBLY - CONTINUED**

14. Use clean engine oil to coat inside of cylinder (6).



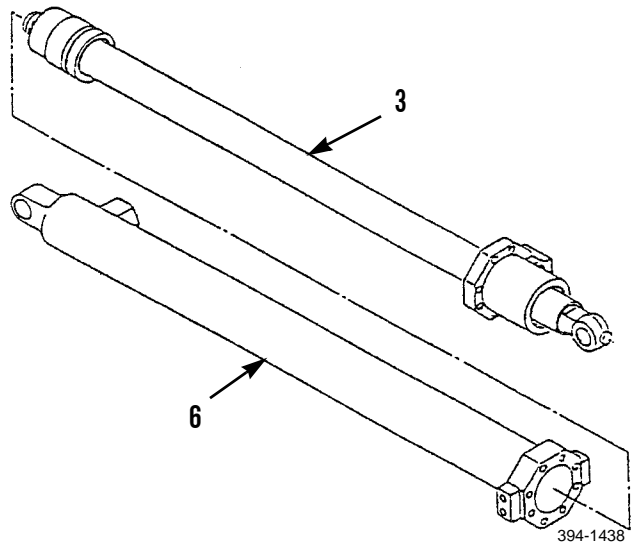
**WARNING**

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 cause injury or death.

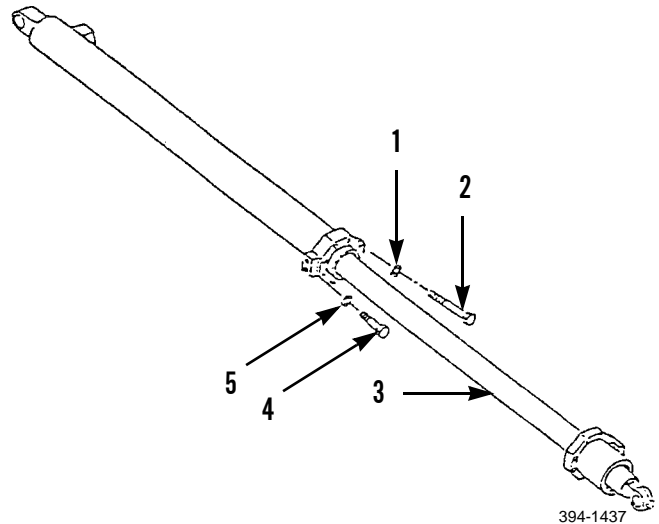
**NOTE**

Weight of ejector cylinder is 725 lb (329 kg).

15. Use lifting device to install cylinder (6) over rod assembly (3).
16. Remove lifting device.



17. Extend rod (3) to its farthest length of travel.
18. Install two washers (1) and bolts (2).
19. Install six washers (5) and bolts (4).



20. Install ejector cylinder (WP 0234 00).
21. Operate machine and verify correct operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**





---

**APRON CYLINDER REPAIR**

**0385 00**

---

**THIS WORK PACKAGE COVERS**

Disassembly, Cleaning, Inspection, Assembly

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment: field maintenance (Item 104, WP 0338 00)

Multiplier, torque wrench (Item 57, WP 0338 00)

Puller, hydraulic (Item 86, WP 0338 00)

Pump, hydraulic ram, hand driven (Item 91, WP 0338 00)

Hydraulic cylinder repair stand

Lifting device, 1,000 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Compound, sealing (Item 10, WP 0339 00)

Oil, lubricating (Item 32, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

Primer, OK cure (Item 34, WP 0339 00)

Lockwasher (4)

Packing, preformed

Seal (5)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Apron cylinder removed (WP 0244 00)

---

**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.

**NOTE**

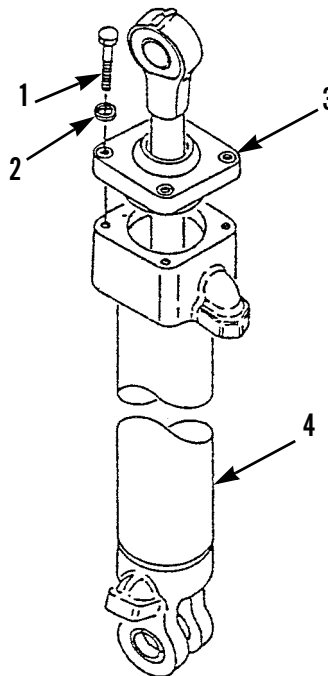
Weight of apron cylinder is 460 lb (208 kg).

1. Attach lifting device to apron cylinder (4).

**CAUTION**

Place apron cylinder with openings for hydraulic hoses on side and extend rod to its farthest length of travel.

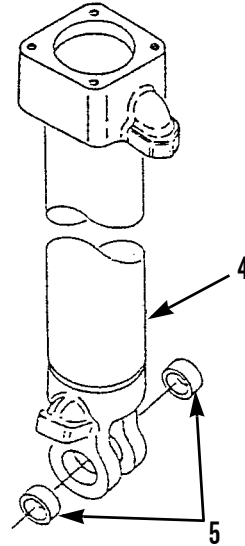
2. Place apron cylinder (4) on cylinder repair stand and remove lifting device.
3. Remove four bolts (1) and lockwashers (2). Discard lockwashers.
4. Use hydraulic puller, remove head assembly (3) from apron cylinder (4).



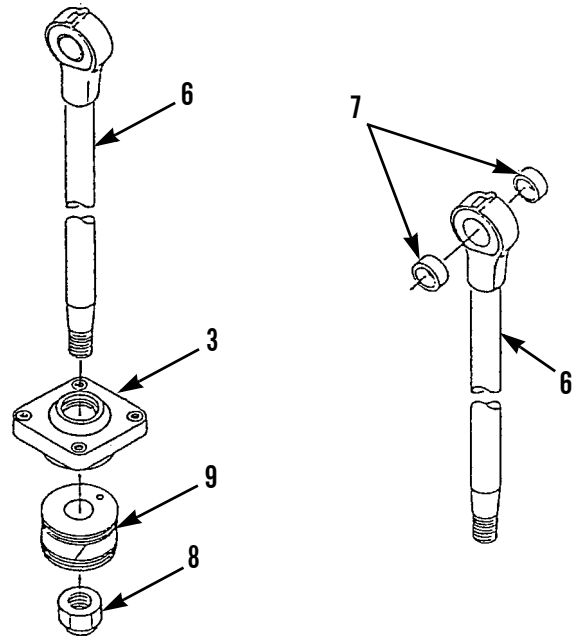
394-1443

**DISASSEMBLY - CONTINUED**

5. Use pump group to remove two bearings (5) out of apron cylinder (4).

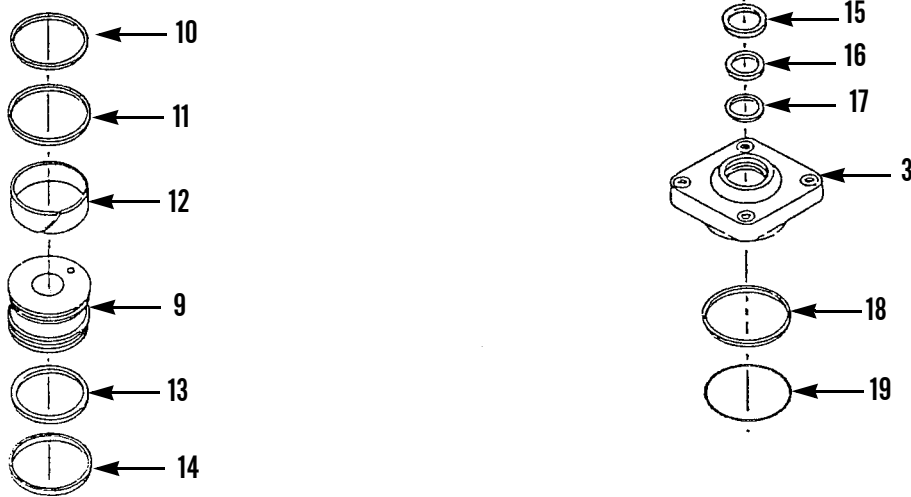


6. Use torque multiplier to remove nut (8) from rod (6).
7. Remove piston assembly (9) and head assembly (3) from rod (6).
8. Use pump group to remove two bearings (7) from rod (6).



**DISASSEMBLY - CONTINUED**

9. Remove and discard ring (14), seal (13), ring (12), seal (11) and ring (10) from piston (9).
10. Remove and discard preformed packing (19), washer (18) and seals (15, 16 and 17) from head (3).



394-1446

**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. Remove all preformed packing material from mounting surfaces.
2. Use emery cloth to scuff surfaces of the counterbore in the cylinder head and the outside diameter of the new seals' metal shell.
3. Clean all parts with solvent.
4. Clean the counterbore and the metal shell of the new seals until none of the components discolor a clean white towel.

**CLEANING - CONTINUED**

**NOTE**

The metal shell of the seal is coated with a corrosion inhibitor. This may prevent proper bonding of the seal to the cylinder head if the inhibitor is not removed. After cleaning, do not touch the counterbore of the metal shell because the oil from your fingers may prevent a good bond. Handle the seal by the lip only.

5. Dry all parts with compressed air.

**INSPECTION**

1. Inspect apron cylinder (4) for dents, rust or other damage. Replace apron cylinder (4), if necessary. Bore of a new apron cylinder (4), if removed, must be  $7.250+0.005$  or  $-0.002$  in.
2. Inspect rod (6) for nicks, scratches or other damage. Replace rod (6), if necessary. Diameter of new rod (6), if replaced, must be  $2.7480\pm 0.0015$  in.
3. Inspect head (19) for dents, cracks, rust or other damage. Replace head (19), if necessary. Bore in new head (19), if replaced, must be  $2.753\pm 0.001$  in.
4. Inspect all other parts.

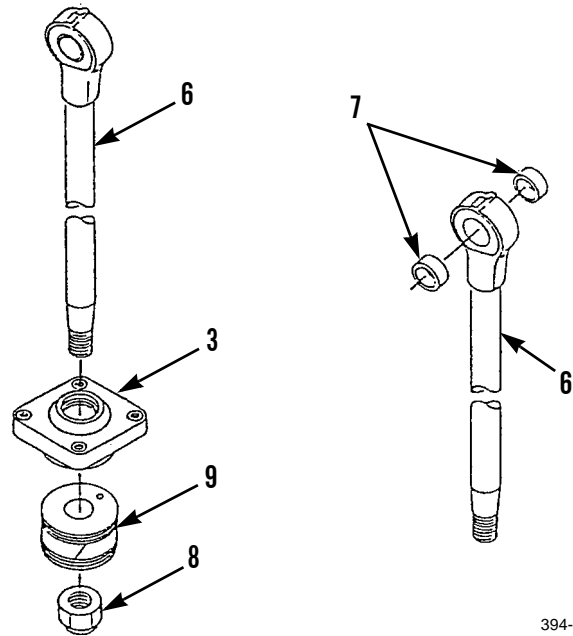
**ASSEMBLY**

1. Apply primer on counterbore and metal shell of new seal (16) and allow to dry (approximately 30 seconds).

**NOTE**

Do not allow sealing compound to contact the sealing lip.

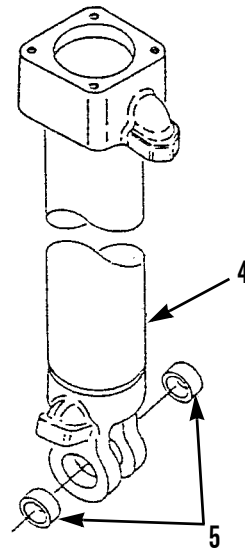
2. Apply sealing compound to counterbore and to metal shell of new seal (16).
3. Use clean engine oil to coat new seals (15, 16 and 17), new washer (18) and new preformed packing (19).
4. Install new seals (15, 16 and 17), new washer (18) and new preformed packing (19) in head (3).
5. Install new ring (12) on piston (9).
6. Install new ring (10), new seal (11), new seal (13) and new ring (14) on piston (9).
7. Use pump group to install two bearings (7) in rod (6).
8. Use generous amount of clean engine oil to coat piston assembly (8). Install head assembly (3) and piston assembly (9) on rod (6) in its fully extended position.
9. Use a torque multiplier to install nut (8) and torque to  $1200\pm 100$  lb-ft ( $1627\pm 136$  Nm).



394-1445

**ASSEMBLY - CONTINUED**

10. Use pump group to install two bearings (5) into apron cylinder (4).

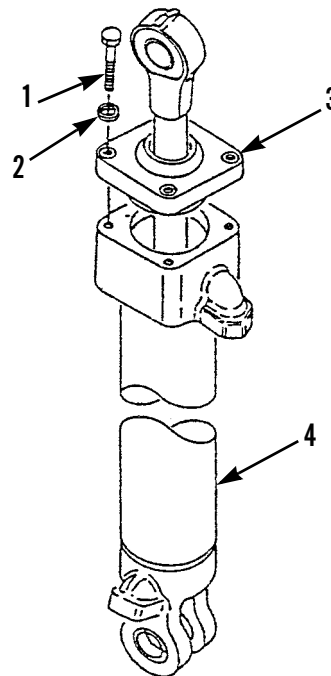


394-1444

**NOTE**

Ensure rod is extended to its farthest length of travel before installing attaching hardware.

11. Install four new lockwashers (2) and bolts (1) on head assembly (3) onto apron cylinder (4).



394-1443

12. Install apron cylinder (WP 0244 00).

**END OF WORK PACKAGE**

---

**APRON ASSEMBLY REPLACEMENT**

**0386 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Cleaning, Inspection, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Personnel Required**

Two

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Lifting device, 2,500 lb minimum capacity

**References**

TM 5-3805-248-10

**Equipment Condition**

Apron blocked (WP 0253 00)

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

---

**REMOVAL**



**WARNING**

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**

Weight of apron assembly is 2,025 lb (919 kg).

1. Attach lifting device to apron assembly (1) and take up slack.

**CAUTION**

Before raising apron assembly using engine power, make sure bowl remains lowered and parking brake is applied. Failure to follow this procedure could result in damage to equipment.

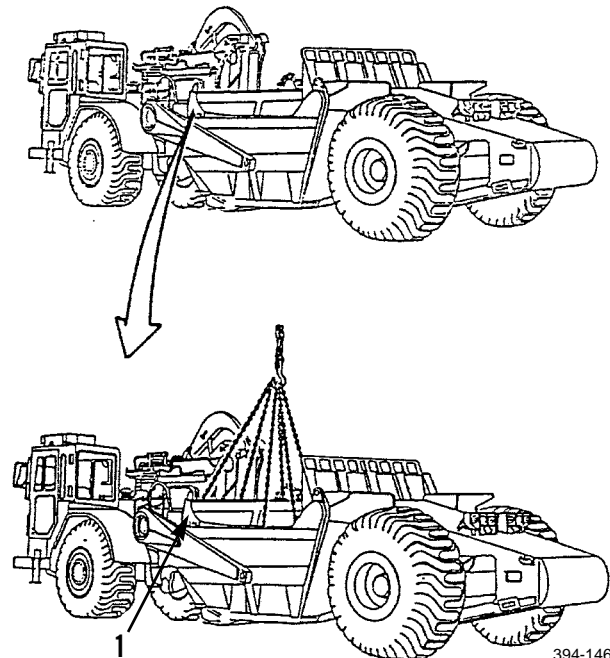
2. Operate engine (TM 5-3805-248-10).
3. Using engine power, raise apron assembly (1) as high as it will go.
4. Shut down engine, remove key, turn master disconnect switch off and disconnect battery negative ground.



**WARNING**

Before removing apron assembly with hoist and chains, make sure the three chains are in place under the apron assembly to equally carry the weight of the apron assembly. Failure to follow this procedure can cause injury or equipment damage.

5. Using lifting device, raise apron assembly (1) until chains are tight and lifting device is supporting apron assembly (1).



394-1462



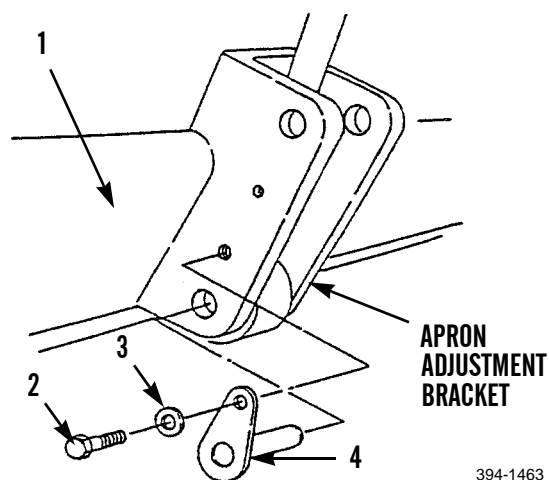
**REMOVAL - CONTINUED**

6. Remove bolt (2) and washer (3) from pin (4) at bottom of apron assembly (1).

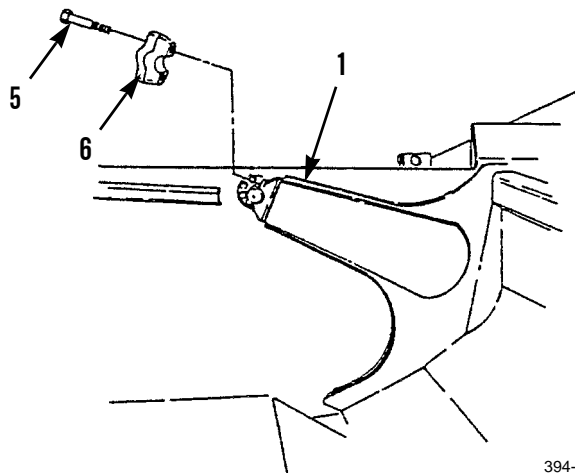
**WARNING**

If pin removal is difficult, slightly raise or lower hoist to relieve pressure on pin. Do not try to remove pin by using a hammer. Failure to follow this procedure could result in injury or equipment damage. If you are injured, seek medical aid immediately.

7. Remove pin (4) from apron adjustment bracket.



8. Remove four bolts (5) and two caps (6) from ends of apron assembly (1) arms.



REMOVAL - CONTINUED



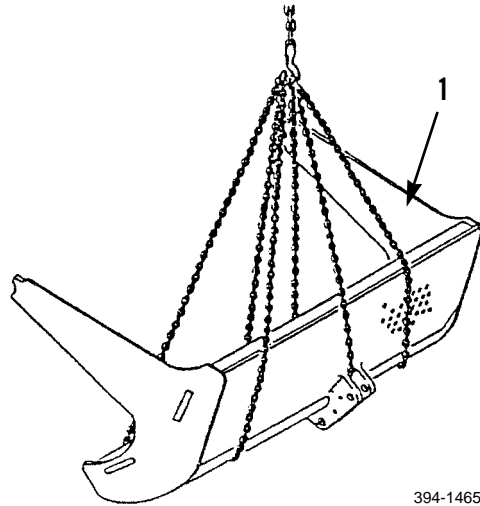
**WARNING**

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**

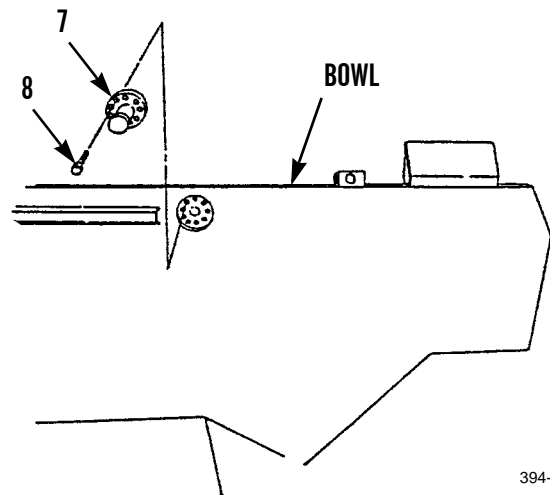
Weight of apron assembly is 2,025 lb (919 kg).

9. Use lifting device to remove apron assembly (1) and place securely on floor.



394-1465

10. Remove lifting device.
11. Remove 16 bolts (8) from two trunnions (7) on both sides of bowl.
12. Remove two trunnions (7).



394-1466

**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 cause 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. Scrape off all dirt from apron body and arms and hose down, removing all remaining particles.
2. Clean trunnion mounts on bowl with solvent cleaning compound.
3. Dry all parts with compressed air.
4. Inspect all parts for damage and replace as necessary.

**INSTALLATION**



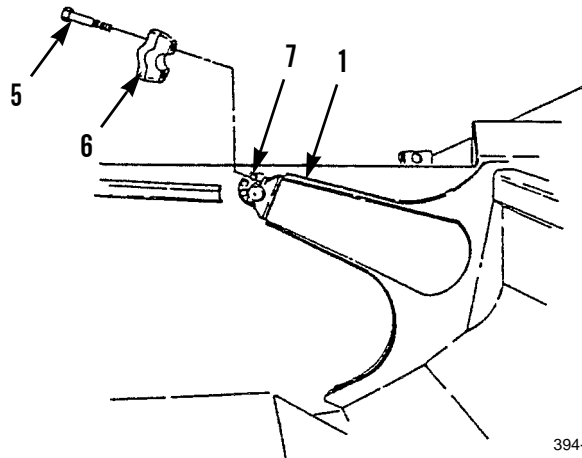
**WARNING**

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**

Weight of apron assembly is 2,025 lb (919 kg).

1. Install two trunnions (7) and 16 bolts (8) on inner wall of bowl. Torque bolts to 95 lb-ft (129 Nm).
2. Install lifting device on apron assembly (1).
3. Using lifting device, position apron assembly (1) in bowl with arms on two trunnions (7).
4. Install two caps (6) and four bolts (5) over two trunnions (7) on apron assembly (1) arms. Torque bolts to 480 lb-ft (651 Nm).



394-1464

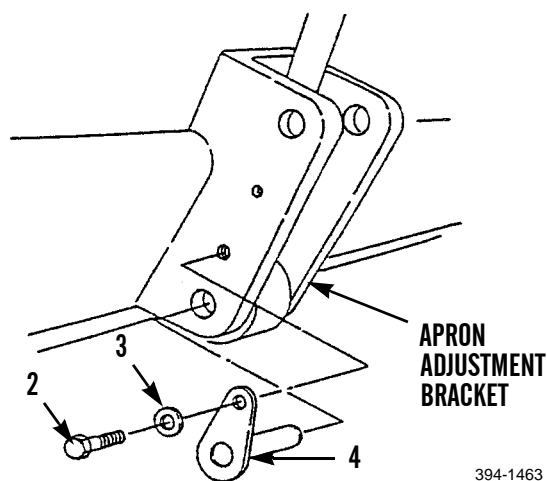
**INSTALLATION - CONTINUED****WARNING**

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**

Weight of apron assembly is 2,025 lb (919 kg).

5. Using lifting device, align hole of apron adjustment bracket with bushing in apron raising link.
6. Install pin (4) through apron adjustment bracket.
7. Install washer (3) and bolt (2) in pin (4).



394-1463

8. Remove lifting device.
9. Unblock apron blocking pin (WP 0253 00).

**END OF WORK PACKAGE**

---

**APRON LIFT MECHANISM MAINTENANCE**

**0387 00**

---

**THIS WORK PACKAGE COVERS**

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

---

**INITIAL SETUP**

**Maintenance Level**

Direct Support

**Tools and Special Tools**

Tool kit, general mechanic's (Item 113, WP 0338 00)

Shop equipment, field maintenance, (Item 104, WP 0338 00)

Lifting device, 750 lb minimum capacity

**Materials/Parts**

Cleaning compound, solvent (Item 8, WP 0339 00)

Rag, wiping (Item 35, WP 0339 00)

**Personnel Required**

Two

**References**

TM 5-3805-248-10

**Equipment Condition**

Apron blocked (WP 0253 00)

Apron cylinder removed (WP 0244 00)

---

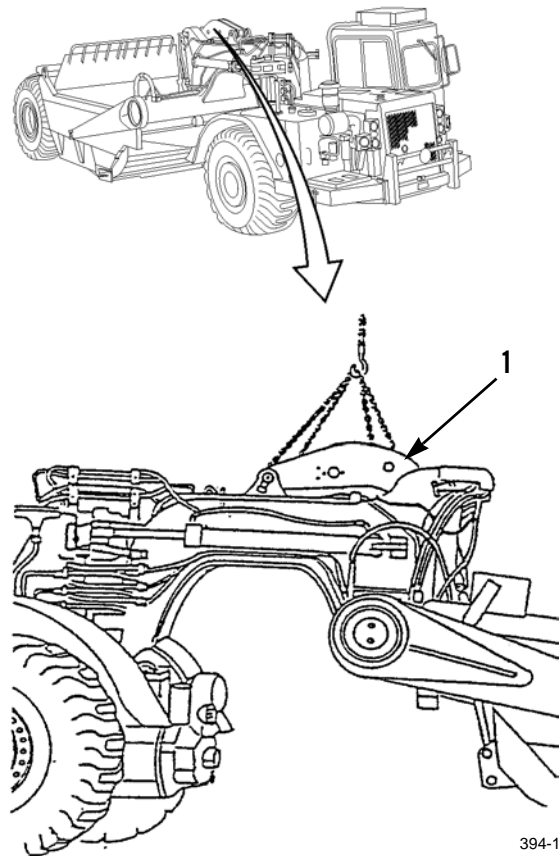
**REMOVAL****WARNING**

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**

Weight of frame is 430 lb (197 kg).

1. Attach lifting device to crossbar of frame (1) and tighten to remove slack in line.



394-1467

**REMOVAL - CONTINUED**

- Remove bolt (4) and washer (5) from pin (3) at bottom of link (2).

**WARNING**

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 result in death or injury to personnel.

**NOTE**

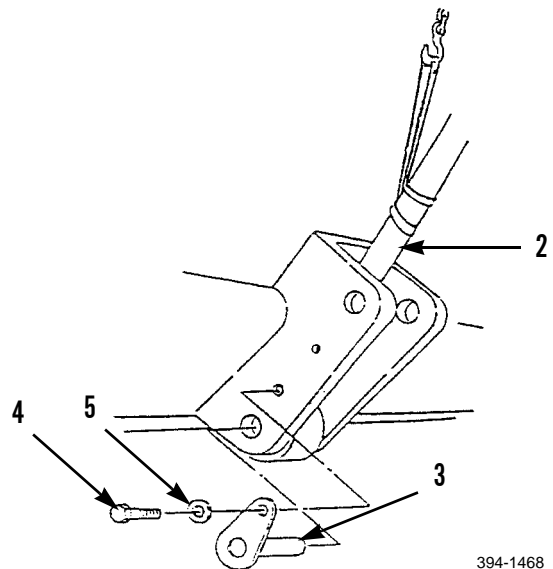
Weight of link is 105 lb (48 kg).

- Attach lifting device to link (2) and tighten to remove any slack in line.

**WARNING**

If pin removal is difficult, slightly raise or lower lifting device to relieve pressure on pin. Do not try to remove pin by using a hammer. Failure to follow this procedure may cause injury or equipment damage.

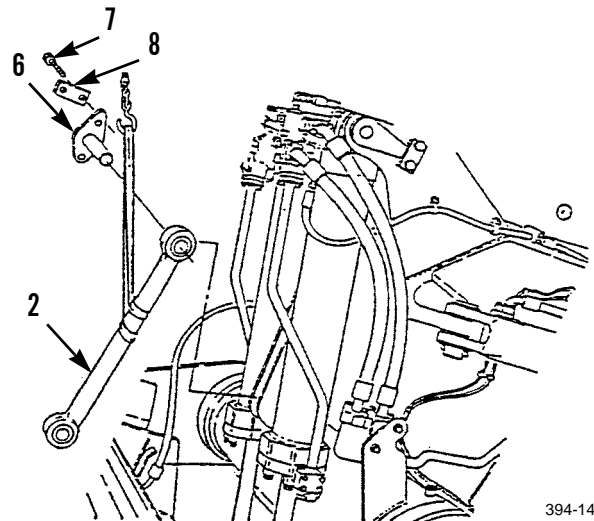
- Remove pin (3).



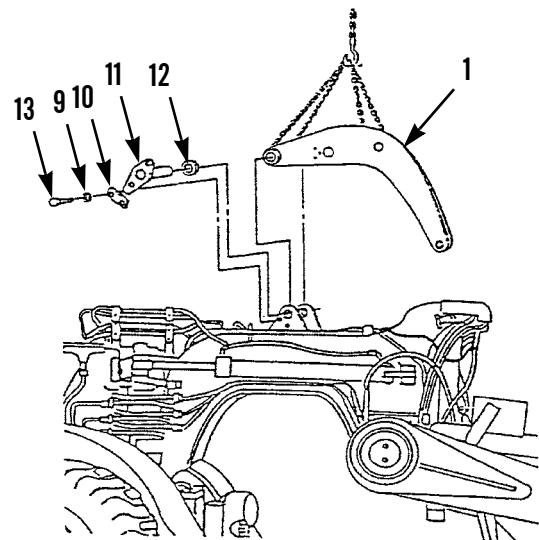
394-1468

**REMOVAL - CONTINUED**

5. Remove two bolts (7) and plate (8) from pin (6) at top of link (2).
6. Remove pin (6).
7. Use lifting device to remove link (2) from vehicle and place on clean surface.
8. Remove lifting device from link (2).



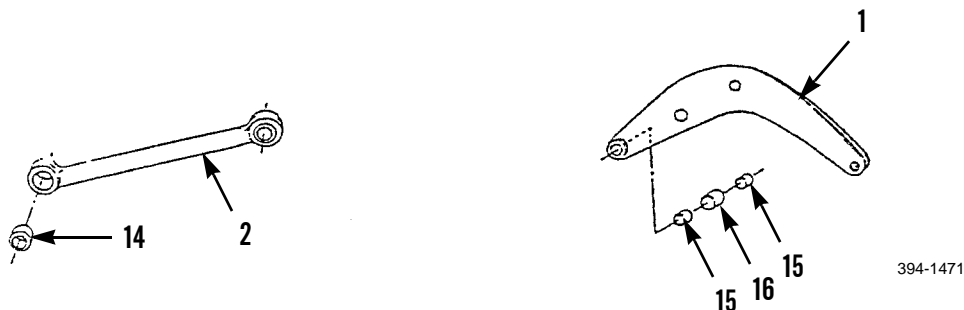
9. Remove two bolts (13), washers (9) and plate (10) from pin (11) at top of frame (1).
10. Remove pin (11) and two washers (12).
11. Use lifting device to remove frame (1) from vehicle and place on wood blocks.
12. Remove lifting device from frame (1).





**DISASSEMBLY**

1. Use a brass driver and hammer to remove two bushings (14), one from each end of link (2).
2. Use a brass driver and hammer to remove two bearings (15) and spacer (16) from larger end of frame (1).

**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 cause 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 trunnion mounts on bowl with solvent cleaning compound.
2. Dry all parts with compressed air.
3. Inspect all parts for damage and replace as necessary.

**ASSEMBLY**

1. Use a brass driver and hammer to install spacer (16) and two bearings (15) in the larger end of frame (1).
2. Use a brass driver and hammer to install two bushings (14), one in each end of link (2).

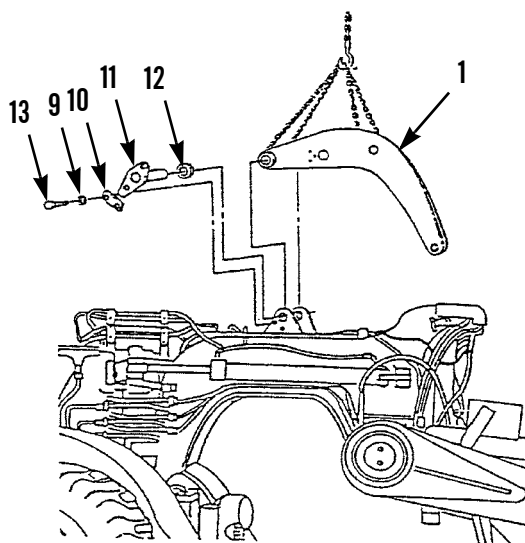
**INSTALLATION****WARNING**

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**

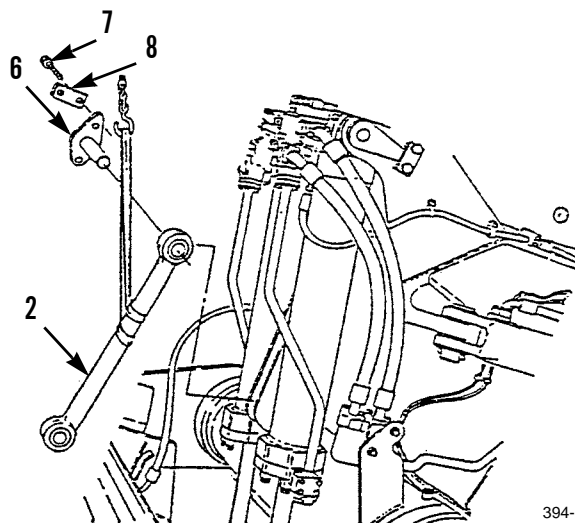
Weight of frame is 430 lb (197 kg).

1. Attach lifting device to frame (1).
2. Use lifting device to position frame (1) on machine.
3. Install two washers (12) and pin (11), mounting frame (1) to machine.
4. Install plate (10), two washers (9) and bolts (13) on pin (11).



394-1470

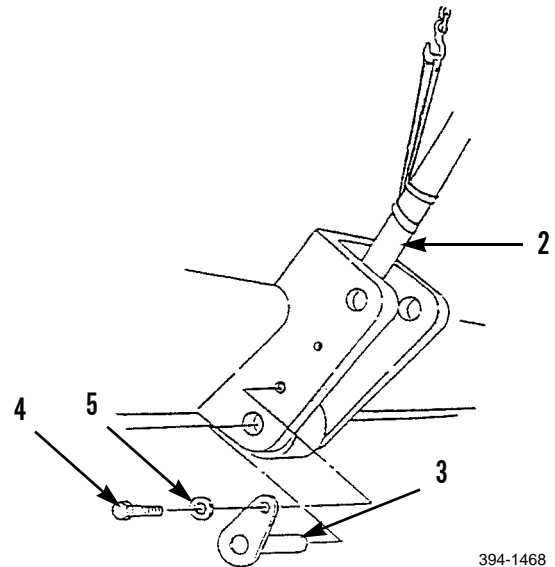
5. Attach lifting device to link (2).
6. Use lifting device to position link (2) on machine.
7. Install pin (6) mounting link (2) on frame (1).
8. Install plate (8) and two bolts (7) in pin (6).



394-1469

**INSTALLATION - CONTINUED**

9. Install pin (3) connecting link (2) on apron adjustment bracket.
10. Install washer (5) and bolt (4) in pin (3).
11. Remove lifting device from link (2).
12. Remove lifting device from frame (1).



13. Install apron cylinder (WP 0244 00).
14. Unblock apron (WP 0253 00).
15. Operate machine and verify correct apron operation (TM 5-3805-248-10).

**END OF WORK PACKAGE**



## INDEX

<i>Subject</i>	<i>Work Package/Page</i>
<b>A</b>	
Accessory Drive Group Replacement .....	0270 00-1
Adjustment	
Air-Fuel Ratio Control .....	0355 00-1
Control Lever Linkage, Scraper .....	0325 00-1
Draft Frame Assembly Shoes .....	0314 00-1
Scraper Control Valve .....	0323 00-1
Shift Point .....	0285 00-1
Transmission Linkage .....	0283 00-1
Valve Bridges .....	0266 00-1
Valve Lash .....	0265 00-1
Aftercooler Replacement .....	0276 00-1
Air Compressor	
Governor Assembly Repair .....	0378 00-1
Repair .....	0377 00-1
Air Dryer Repair .....	0301 00-1
Air-Fuel Ratio Control Maintenance .....	0355 00-1
Alternator	
(Bosch) Repair .....	0359 00-1
(Delco) Repair .....	0358 00-1
Apron	
Assembly Maintenance .....	0386 00-1
Lift Mechanism Maintenance .....	0387 00-1
Apron Cylinder Repair .....	0385 00-1
Automatic	
Selector Valve Repair, Transmission .....	0366 00-1
Shift Drive Maintenance .....	0370 00-1
Timing Advance Unit Maintenance .....	0277 00-1
Axle Housing Replacement, Rear .....	0298 00-1
Axle, Front Housing Replacement .....	0294 00-1
<b>B</b>	
Bevel Gear and Differential Assembly Replacement .....	0295 00-1
Block Repair, Cylinder .....	0342 00-1
Bowl, Lift Cylinders Repair .....	0383 00-1
Bowl Lift Check Valve Assembly Repair .....	0324 00-1
Brake Drum Replacement .....	0304 00-1
Brake Control Valve Repair .....	0299 00-1

## INDEX - Continued

*Subject* *Work Package/Page*

### B - Continued

Breaker Relief Valve Assembly Repair .....	0327 00-1
Bridges Maintenance, Valve .....	0266 00-1

### C

Camshaft	
Bearings Replacement .....	0351 00-1
Maintenance .....	0350 00-1
Case Assembly Maintenance, Transmission .....	0372 00-1
Check Valve Assembly, Bowl Lift Repair .....	0324 00-1
Check Valve Double, Repair .....	0300 00-1
Compartment, Operator, Replacement .....	0315 00-1
Compressor, Air, Repair .....	0377 00-1
Connecting Rod and Piston Maintenance .....	0348 00-1
Control Group Pressure Test, Transmission .....	0284 00-1
Control Lever Linkage Replacement, Scraper .....	0325 00-1
Control Valve Maintenance	
Retarder .....	0292 00-1
Steering .....	0312 00-1
Control Valve, Scraper	
Repair .....	0381 00-1
Replacement .....	0323 00-1
Testing and Adjustment .....	0323 00-1
Crankshaft	
Front Seals Replacement .....	0344 00-1
Main Bearings Maintenance .....	0347 00-1
Pulley and Damper Replacement .....	0260 00-1
Rear Seals Replacement .....	0345 00-1
Replacement .....	0346 00-1
Cutoff Valve, Governor	
Repair .....	0365 00-1
Replacement .....	0364 00-1
Cylinder	
Block Repair .....	0342 00-1
Head Assembly Overhaul .....	0343 00-1
Cylinder Head	
Assembly Maintenance .....	0259 00-1
Valve and Springs Maintenance .....	0263 00-1

## INDEX - Continued

*Subject* *Work Package/Page*

### C - Continued

Cylinder Repair	
Apron .....	0385 00-1
Bowl Lift .....	0383 00-1
Ejector .....	0384 00-1
Hydraulic Steering Servo-Receiver .....	0310 00-1
Hydraulic Steering Servo-Sender .....	0309 00-1
Steering .....	0308 00-1
Cylinder Replacement, Hydraulic Steering Servo-Receiver .....	0311 00-1
Cylinder, Apron Repair .....	0385 00-1
Cylinder, Ejector Repair .....	0384 00-1

### D

Differential	
Filler Hose Replacement .....	0297 00-1
Filler Replacement .....	0296 00-1
Differential and Bevel Gear Assembly	
Repair .....	0376 00-1
Replacement .....	0295 00-1
Double Check Valve Repair .....	0300 00-1
Draft Frame Assembly Shoes Maintenance .....	0314 00-1
Driveshaft Replacement .....	0293 00-1
Drum Replacement, Brake .....	0304 00-1
Dryer, Air, Repair .....	0301 00-1

### E

Ejector Assembly Replacement .....	0328 00-1
Ejector Cylinder, Repair .....	0384 00-1
Ejector Roller Maintenance	
Lower Front .....	0330 00-1
Lower Rear .....	0329 00-1
Engine Assembly Replacement .....	0257 00-1
Engine Front Cover	
Plate Replacement .....	0341 00-1
Replacement .....	0340 00-1
Engine Mounts Replacement .....	0258 00-1
Engine Oil Cooler Replacement .....	0269 00-1
Exhaust Manifold Replacement .....	0280 00-1

## INDEX - Continued

*Subject* *Work Package/Page*

### E - Continued

Expendable and Durable Items List ..... 0339 00-1

### F

Fan and Fan Drive Maintenance ..... 0282 00-1

Fan Drive Maintenance ..... 0282 00-1

Filler Hose Replacement, Differential ..... 0297 00-1

Filler Replacement

    Differential ..... 0296 00-1

    Transmission ..... 0287 00-1

Filter By-Pass Valve Repair, Hydraulic Tank ..... 0326 00-1

Flywheel

    Housing Replacement ..... 0262 00-1

    Replacement ..... 0261 00-1

    Scavenge Retarder Pump Maintenance ..... 0288 00-1

Front Axle Housing Replacement ..... 0294 00-1

Front Cover

    Plate Replacement, Engine ..... 0341 00-1

    Replacement, Engine ..... 0340 00-1

Fuel

    Pump Drive Replacement ..... 0278 00-1

    Transfer Pump Maintenance ..... 0274 00-1

Fuel Injection

    Pump Housing and Governor Adjustment ..... 0273 00-1

    Pump Housing and Governor Assembly Replacement ..... 0272 00-1

    Pump Repair ..... 0353 00-1

### G

Gear Replacement, Idler ..... 0352 00-1

Governor

    Assembly Repair ..... 0354 00-1

    Control Maintenance ..... 0279 00-1

Governor and Automatic Shift Drive Maintenance ..... 0370 00-1

Governor Cutoff Valve

    Repair ..... 0365 00-1

    Replacement ..... 0364 00-1

Governor, Air Compressor, Repair ..... 0378 00-1

### H

Head Assembly Overhaul, Cylinder ..... 0343 00-1



**INDEX - Continued**

*Subject* *Work Package/Page*

**H - Continued**

Heater Assembly	
Heater Assembly, Motor, Blower Assemblies and Case Repair .....	0319 00-1
Heater Assembly, Plenum, Housing and Coil Replacement .....	0318 00-1
Heater Motor Assembly Repair .....	0320 00-1
Hitch Links Maintenance .....	0313 00-1
Hydraulic Implement Pump	
Repair .....	0380 00-1
Replacement .....	0322 00-1
Hydraulic Retarder Maintenance .....	0289 00-1
Hydraulic Steering	
Servo-Receiver Cylinder Repair .....	0310 00-1
Servo-Receiver Cylinder Replacement .....	0311 00-1
Servo-Sender Cylinder Repair .....	0309 00-1
Hydraulic System Flow Meter Tee Test and Maintenance .....	0321 00-1
Hydraulic Tank	
Breaker Relief Valve Repair .....	0327 00-1
Filter By-Pass Valve Repair .....	0326 00-1

**I**

Idler Gear Replacement .....	0352 00-1
Illustrated List of Manufactured Items .....	0334 00-1
Implement Pump, Hydraulic	
Repair .....	0380 00-1
Replacement .....	0322 00-1
Injector Valve and Nozzle Maintenance .....	0271 00-1

**L**

Lift Cylinder, Bowl Repair .....	0383 00-1
Lift Mechanism Maintenance, Apron .....	0387 00-1
Lifters Replacement, Valve .....	0264 00-1
Lines Replacement Retarder Coolant .....	0290 00-1
Links Maintenance, Hitch .....	0313 00-1
List	
Expendable and Durable Items .....	0339 00-1
Manufactured Items, Illustrated .....	0334 00-1
Tools and Special Tools .....	0337 00-1
Lubrication, Oil Pump Replacement .....	0267 00-1

## INDEX - Continued

<i>Subject</i>	<i>Work Package/Page</i>
<b>M</b>	
Main Bearings Maintenance, Crankshaft .....	0347 00-1
Maintenance Allocation Chart (MAC)	
Introduction .....	0337 00-1
Table .....	0338 00-1
Manifold Replacement, Exhaust .....	0280 00-1
Manual Selector Valve Repair, Transmission .....	0369 00-1
Mounts Replacement, Engine .....	0258 00-1
<b>O</b>	
Oil	
Cooler Assembly Replacement, Retarder .....	0291 00-1
Cooler Replacement, Engine .....	0269 00-1
Pan Maintenance .....	0268 00-1
Oil Pump, Lubrication, Replacement .....	0267 00-1
Operator Compartment Replacement .....	0315 00-1
<b>P</b>	
Piston and Connecting Rod Maintenance .....	0348 00-1
Planetary Repair, Transmission .....	0373 00-1
Preparation for Storage or Shipment .....	0333 00-1
Pressure and Selector Valve Assembly Replacement, Transmission .....	0364 00-1
Pressure Control Valve Repair, Transmission .....	0368 00-1
Pulley and Damper Replacement, Crankshaft .....	0260 00-1
Pump Drive Replacement, Fuel .....	0278 00-1
Pump, Water, Repair .....	0281 00-1
Push Rods and Arms Replacement .....	0265 00-1
<b>R</b>	
Radiator Repair .....	0357 00-1
Rear Axle Housing Replacement .....	0298 00-1
References .....	0336 00-1
Retarder	
Control Valve Maintenance .....	0292 00-1
Coolant Lines Replacement .....	0290 00-1
Maintenance, Hydraulic .....	0289 00-1
Oil Cooler Assembly Replacement .....	0291 00-1
Rocker Arms Repair .....	0349 00-1

## INDEX - Continued

*Subject* *Work Package/Page*

### R - Continued

Roller Maintenance	
Ejector Guide .....	0331 00-1
Ejector, Lower Front .....	0330 00-1
Ejector, Lower Rear .....	0329 00-1

### S

Scavenge Oil Pump, Manifold and Transmission Oil Pump Replacement .....	0375 00-1
Scavenge Retarder Pump Maintenance, Flywheel .....	0288 00-1
Scraper	
Control Lever Linkage Replacement .....	0325 00-1
Control Valve Repair .....	0381 00-1
Control Valve Replacement .....	0323 00-1
Wheel and Tire Replacement .....	0303 00-1
Seals Replacement	
Front, Crankshaft .....	0344 00-1
Rear, Crankshaft .....	0345 00-1
Seat Suspension Assembly	
Repair .....	0317 00-1
Replacement .....	0316 00-1
Sequence Valve Maintenance .....	0382 00-1
Shift	
Point Adjustment .....	0285 00-1
Pressure Valve Repair, Transmission .....	0367 00-1
Shoes Maintenance, Draft Frame Assembly .....	0314 00-1
Solenoid (Prestolite) Repair, Starting Motor .....	0363 00-1
Solenoid Replacement, Starting Motor .....	0360 00-1
Starting Motor	
(Delco-REMY) Repair .....	0361 00-1
(Prestolite) Repair .....	0362 00-1
Solenoid (Prestolite) Repair .....	0363 00-1
Solenoid Replacement .....	0360 00-1
Steering	
Control Maintenance .....	0312 00-1
Cylinder Repair .....	0308 00-1
Supplemental Pump	
Repair .....	0379 00-1
Replacement .....	0307 00-1
Steering System Flow Meter Tee Test Procedures .....	0306 00-1

## INDEX - Continued

<i>Subject</i>	<i>Work Package/Page</i>
<b>S - Continued</b>	
Supplemental Steering Pump	
Repair .....	0379 00-1
Replacement .....	0307 00-1
<b>T</b>	
Tachometer Drive Replacement .....	0332 00-1
Test	
Control Group, Pressure, Transmission .....	0284 00-1
Hydraulic System Flow Meter Tee Test .....	0321 00-1
Scraper Control Valve .....	0323 00-1
Steering Control Valve .....	0312 00-1
Steering System Flow Meter Tee Test Procedures .....	0306 00-1
Timing Advance Unit Maintenance, Automatic .....	0277 00-1
Tire and Wheel Assembly Replacement, Scraper .....	0303 00-1
Tire Replacement .....	0305 00-1
Tools and Special Tools List .....	0338 00-1
Torque Converter Maintenance .....	0371 00-1
Torque Limits .....	0335 00-1
Tractor Wheel with Tire Maintenance .....	0302 00-1
Transfer Gears Repair, Transmission .....	0374 00-1
Transfer Pump Maintenance, Fuel .....	0274 00-1
Transmission	
Automatic Selector Valve Repair .....	0366 00-1
Case Assembly Maintenance .....	0372 00-1
Control Group Pressure Test .....	0284 00-1
Filler Replacement .....	0287 00-1
Linkage Adjustment .....	0283 00-1
Manual Selector Valve Repair .....	0369 00-1
Planetary Repair .....	0373 00-1
Pressure and Selector Valve Assembly Replacement .....	0364 00-1
Pressure Control Valve Repair .....	0368 00-1
Replacement .....	0286 00-1
Scavenge Oil Pump, Manifold and Transmission Oil Pump Replacement .....	0375 00-1
Shift Pressure Valve Repair .....	0367 00-1
Transfer Gears Repair .....	0374 00-1
Turbocharger	
Repair .....	0356 00-1
Replacement .....	0275 00-1


## INDEX - Continued

<i>Subject</i>	<i>Work Package/Page</i>
<b>V</b>	
Valve	
Bridges Maintenance .....	0266 00-1
Lash Adjustment .....	0265 00-1
Lifters Replacement .....	0264 00-1
Valves and Springs Maintenance .....	0263 00-1
<b>W</b>	
Water Pump Repair .....	0281 00-1
Wheel and Tire Assembly Replacement, Scraper .....	0303 00-1
Wheel and Tire Replacement, Scraper .....	0303 00-1

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*  
0601210

**DISTRIBUTION:** To be distributed in accordance with the initial distribution requirements for IDN: 252308, requirements for TM 5-3805-248-23-2.

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> 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 2006
---	---	---------------------

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 TM 5-3805-248-23-2	DATE 15 February 2006	TITLE Maintenance Manual for Scraper, Earth Moving, Motorized, DED, Model 621B
---	--------------------------	--

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON
	0007 00-1					Part number supplied for item 2 is incorrect.

SAMPLE

*\* Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE Johnny Wilson, E-5, MOTOR SGT	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION DSN 867-7967	SIGNATURE
---	--	-----------

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i>	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
---	--	-------------

**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
<b>SAMPLE</b>								

**PART III - REMARKS** *(Use for additional remarks, references, or suggestions for improvement of publications and catalogs. Additional sheets may be used if space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--	-----------



<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 25-30; the proponent agency is OAASA						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
<b>TO:</b> ( <i>Forward to proponent of publication or form</i> ) ( <i>Include ZIP Code</i> )						<b>FROM:</b> ( <i>Activity and location</i> ) ( <i>Include ZIP Code</i> )	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 5-3805-248-23-2						DATE 15 February 2005	TITLE Maintenance Manual for Scraper, Earth Moving, Motorized, DED, Model 621B
ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON	
TYPED NAME, GRADE OR TITLE					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i>	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
---	--	-------------

**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 - REMARKS** *(Any general 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
----------------------------	--	-----------

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 25-30; the proponent agency is OAASA						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
<b>TO:</b> ( <i>Forward to proponent of publication or form</i> ) ( <i>Include ZIP Code</i> )						<b>FROM:</b> ( <i>Activity and location</i> ) ( <i>Include ZIP Code</i> )	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 5-3805-248-23-2						DATE 15 February 2005	TITLE Maintenance Manual for Scraper, Earth Moving, Motorized, DED, Model 621B
ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON	
TYPED NAME, GRADE OR TITLE					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i>	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
---	--	-------------

**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 - REMARKS** *(Any general 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
----------------------------	--	-----------

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 25-30; the proponent agency is OAASA						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
<b>TO:</b> ( <i>Forward to proponent of publication or form</i> ) ( <i>Include ZIP Code</i> )						<b>FROM:</b> ( <i>Activity and location</i> ) ( <i>Include ZIP Code</i> )	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 5-3805-248-23-2						DATE 15 February 2005	TITLE Maintenance Manual for Scraper, Earth Moving, Motorized, DED, Model 621B
ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON	
TYPED NAME, GRADE OR TITLE					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i>	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
---	--	-------------

**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 - REMARKS** *(Any general 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
----------------------------	--	-----------

## THE METRIC SYSTEM AND EQUIVALENTS

<p><b>Linear Measure</b></p> <p>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</p> <p><b>Weights</b></p> <p>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</p> <p><b>Liquid Measure</b></p> <p>1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces              1 Liter = 1000 Milliliters = 33.82 Fluid Ounces</p>	<p><b>Square Measure</b></p> <p>1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches              1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet              1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles</p> <p><b>Cubic Measure</b></p> <p>1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches              1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet</p> <p><b>Temperature</b></p> <p><math>5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}</math>              212° Fahrenheit is equivalent to 100° Celsius              90° Fahrenheit is equivalent to 32.2° Celsius              32° Fahrenheit is equivalent to 0° Celsius  <math>9/5 \text{ C}^{\circ} + 32 = \text{F}^{\circ}</math></p>
--	--

## 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

