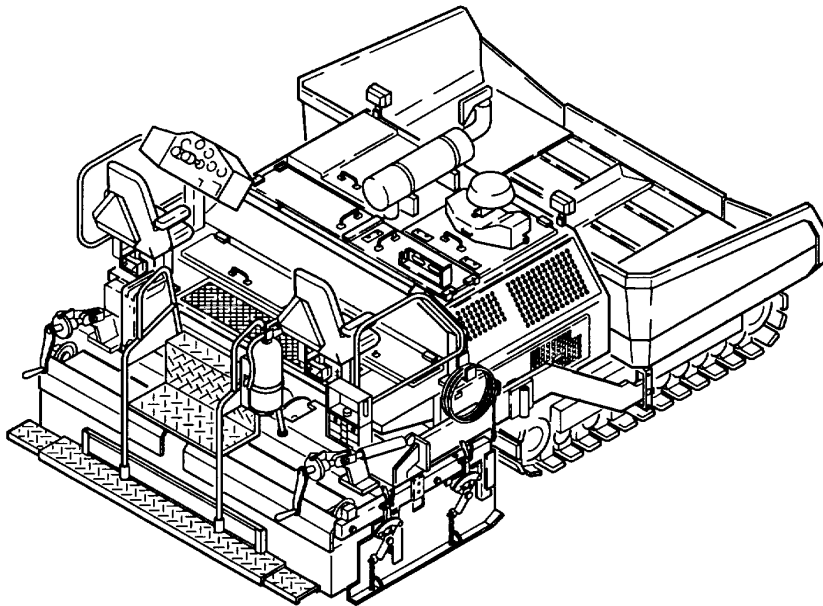


TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT  
MAINTENANCE MANUAL



PAVING MACHINE,  
BITUMINOUS MATERIAL;  
CRAWLER MOUNTED,  
DIESEL ENGINE DRIVEN  
NSN 3895-01-379-1102  
END ITEM CODE (EIC: E47)

INGERSOLL-RAND COMPANY  
MODEL 780T  
CONTRACT NUMBER DAAE07-93C-0501

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DISTRIBUTION RESTRICTION STATEMENT A Approved for Public Release; Distribution Is Unlimited.

## WARNING

### HAZARDOUS FLUIDS

Cleaning solvent P-D-680, hydraulic oil, and diesel fuel can be dangerous. When you use these fluids, be sure that your work area is well ventilated. Avoid prolonged breathing of vapors or skin contact with the liquid. WEAR GLOVES AND EYE PROTECTION.

IF YOU GET CLEANING SOLVENT, HYDRAULIC OIL, OR DIESEL FUEL IN YOUR EYES OR ON YOUR SKIN, FLUSH THE LIQUID AWAY WITH WATER FOR 15 MINUTES; THEN GET IMMEDIATE MEDICAL ATTENTION.

Do not use cleaning solvent, hydraulic oil, or diesel fuel near an open flame, arcing equipment, or other ignition sources. The flash point for P-D-680, Type m cleaning solvent is 200°F (93.3°C).

NEVER MIX GASOLINE OR JP-4 WITH PAVING MACHINE FUEL.

Post signs that read "NO SMOKING WITHIN 50 FEET" and keep at least a B-C fire extinguisher within easy reach when working on fuel system.

DO NOT WORK ON FUEL SYSTEM WHEN ENGINE IS HOT.

Shut down engine before refueling. Do not remove fuel tank cap until rear and dispenser ground wires are properly connected.

Fuel fumes can accumulate in STE/ICE-R transit case. Do not open, use, or store the transit case near open flame.

Clean up spilled oils, cleaning solvent, or fuel with rags or absorbent materials.

Refer to FM-21-11 for artificial respiration or other first aid procedures.

### HIGH PRESSURE FLUIDS

High pressure hydraulic oil or diesel fuel leaks are hard to see. Always use cardboard, wood, or similar material to check for leaks in a pressurized fluid system. Slowly bleed off pressure prior to opening a high pressure circuit.

USING BARE HANDS OR LOOKING CLOSELY TO FIND LEAKS OR QUICKLY OPENING A HIGH PRESSURE CIRCUIT CAN CAUSE LOSS OF LIMB, LOSS OF VISION, OR OTHER SERIOUS INJURY.

### FALLING EQUIPMENT HAZARDS

NEVER WORK UNDER OR AROUND HEAVY EQUIPMENT OR COMPONENTS RAISED BY PAVING MACHINE HYDRAULICS UNLESS EQUIPMENT IS SECURELY BLOCKED.

KEEP CLEAR WHEN EQUIPMENT IS BEING RAISED OR LOWERED. ENSURE ALL LIFTING EQUIPMENT IS IN GOOD CONDITION AND ARE OF ADEQUATE LIFTING CAPACITY.

**WARNING**

**MOVING EQUIPMENT HAZARDS**

can cause severe injury or death to personnel.

TURN OFF IGNITION SWITCH AND REMOVE KEY PRIOR TO PERFORMING MAINTENANCE ON ROTATING EQUIPMENT.

If working on or near running engine, avoid loose clothing and shield yourself from rotating engine components.

**ELECTRICAL SHOCK AND BATTERY EXPLOSION HAZARDS**

ELECTRICAL SHOCK, SHORT CIRCUIT, OR BATTERY EXPLOSION CAN CAUSE SEVERE INJURY OR DEATH.

Turn off ignition switch and remove key when working on paving machine electrical system.

Disconnect batteries and remove jewelry when working in immediate area of battery or starter circuits.

TO AVOID POSSIBLE BATTERY EXPLOSION, TURN VTM POWER SWITCH OFF BEFORE CONNECTING VTM TO POWER SOURCE.

**DEATH OR SERIOUS INJURY**

could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (207 kPa) or less. When working with compressed air, always use chip guards, eye protection, and other personal protective equipment.

**CONTACT WITH SEALANT MATERIALS**

and cleaning agents used on fasteners, pipe threads, and electrical connections can cause serious eye damage or skin irritation. WEAR GLOVES AND EYE PROTECTION WHEN USING.

IF YOU GET SEALANT OR SEALANT CLEANING AGENTS IN YOUR EYES, FLUSH WITH WATER AND GET IMMEDIATE MEDICAL ATTENTION.

**WARNING**

**CONTACT WITH HOT SURFACES**  
can cause serious burns to personnel.

ALLOW ENGINE TO COOL BEFORE PERFORMING MAINTENANCE ON THE MUFFLER, EXHAUST PIPE, EXHAUST MANIFOLD, TURBOSUPERCHARGER, OR COOLING SYSTEM.

DO NOT TOUCH HEATED PAVING MACHINE COMPONENTS WITH BARE HANDS. IF MAINTENANCE OF A HEATED SURFACE IS NECESSARY, USE INSULATED PADS AND GLOVES.

DO NOT REMOVE RADIATOR CAP WHEN ENGINE IS HOT; STEAM AND HOT COOLANT CAN ESCAPE AND BURN PERSONNEL.

Use thick waste cloth to cover radiator cap when removing; avoid gloves. HOT ENGINE COOLANT CAN SOAK THROUGH GLOVES, CAUSING HANDS TO BE SERIOUSLY SCALDED.

**EYE AND EAR HAZARDS**

Snap rings and retaining rings can act as projectiles when released, and could cause severe eye injury.

WEAR EYE PROTECTION WHEN REMOVING OR INSTALLING SNAP RINGS OR RETAINING RINGS.

Hearing protection is required when working on or around the paving machine while the engine is running.

FAILURE TO WEAR HEARING PROTECTION CAN RESULT IN PERMANENT HEARING LOSSES TO PERSONNEL.

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TECHNICAL MANUAL  
 DIRECT SUPPORT AND GENERAL SUPPORT  
 MAINTENANCE MANUAL

PAVING MACHINE, BITUMINOUS MATERIAL;  
 CRAWLER MOUNTED, DIESEL ENGINE DRIVEN  
 NSN 3895-01-379-1102  
 END ITEM CODE (EIC: E47)  
 INGERSOLL-RAND COMPANY, MODEL 780T  
 CONTRACT NUMBER DAAE07-93C-0501

**REPORTING OF ERRORS**

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

**DISTRIBUTION RESTRICTION STATEMENT A. Approved for Public Release; Distribution Is Unlimited.**

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## HOW TO USE THIS MANUAL

This manual provides troubleshooting and task-oriented maintenance procedures authorized for use by Direct Support and General Support level maintenance personnel by the Maintenance Allocation Chart (MAC) in TM 5-3895-373-20.

The front cover includes a quick reference index of important topics and all maintenance sections in the manual. The pages that cover a topic listed in this index have a black tab in line with the index block. Thumb through the manual to find the related pages. An alphabetical index is provided at the back of the manual, as well as at the start of each maintenance section. A malfunction symptom index is located at the start of the troubleshooting section to help you locate a troubleshooting procedure quickly.

Use the troubleshooting section to locate the cause of failed electric and/or hydraulic equipment functions. Electrical and hydraulic foldout schematics are located at the back of the troubleshooting section for convenient reference.

When mechanical equipment failures are found or reported, refer to the related Functional Group in the MAC. The MAC will quickly indicate whether the appropriate repair task is located in TM 5-3895-373-20 or in this manual. Some equipment repair actions are authorized at the Unit level, and will not be found in this manual.

Each authorized maintenance task is preceded by a task summary. The task summary lists the tools, materials, equipment, and personnel required to perform the task. Using the task summary as a check list, make sure that you have all the tools, materials, and assistance required before starting the task.

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**CHAPTER 1**  
**INTRODUCTION**

**SECTION I. GENERAL INFORMATION**

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**1.1 SCOPE.**

a. Type of Manual: Direct Support and General Support Maintenance.

b. Model Number and Equipment Name: Ingersoll-Rand Company Model 780T Crawler Mounted, Diesel Engine Driven, Bituminous Material Paving Machine, NSN 3895-01-379-1102.

c. Purpose of Equipment: The Paving Machine is used to repair and maintain damaged or worn landing pads, airfields, taxiways, roads, and parking areas in combat related facilities, as well as new road construction. The paving machine will also be used to construct extensions to existing facilities such as roads, airfields, and taxiways.

**1.2 MAINTENANCE FORMS, RECORDS, AND REPORTS.**

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

**1.3 CORROSION PREVENTION AND CONTROL (CPC).**

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problem be reported so the problem can be corrected and improvements can be made to prevent the problem in the future.

While corrosion is typically associated with the rusting of metals, it also includes the deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling or breaking of these materials may indicate a corrosion problem.

If a corrosion problem is identified, report it using an SF 368, Product Quality Deficiency Report. Completed forms should be submitted to the address specified in DA PAM 738-750. Use of key words such as "corrosion", "rust", "deterioration" and "cracking" will ensure the information is identified as a CPC problem.



**1.4 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.**

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

**1.5 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).**

If the Paving Machine needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, U. S. Army Tank-automotive and Armaments Command, Attn: AMSTA-TR-E/MPA, Warren, MI 48397-5000.

**1.6 WARRANTY INFORMATION.**

The Paving Machine warranty is detailed in Warranty Technical Bulletin (WTB) number TB 5-3895-373-14.

**1.7 OFFICIAL NOMENCLATURE.**

This list provides a cross-reference between the nomenclature used in the manual and the nomenclature specified in the Repair Parts and Special Tools List (RPSTL).

Nomenclature Cross-Reference List

Manual Nomenclature	Official Nomenclature
Paving Machine	780T Bituminous Asphalt Paving Machine
Screed	Hydraulic Vibratory Extendable Screed, ES-80 (Diesel)
Hopper	Aggregate Feeder
Hopper Wing	Aggregate Feeder
Auger	Screw Conveyor
Flashing	Solid Rubber Sheet
Dipstick	Liquid Gauge Rod-cap
Bendix	Electric Engine Drive
Coolant Temperature Sensor	Thermostatic Switch
Hydraulic Oil Temperature Sensor	Thermostatic Switch
Hemi Auger Flight	Screw Conveyor Auger
Quarter Auger Flight	Screw Conveyor Auger
Sound Foam	Sound Control Batten
Alternator	Engine AC Generator
Latch	Pawl Fastener
Fuel/Water Separator	Fuel Filter
Fuel Spray Wand Assembly	Nozzle and Hose Assembly
Pump Drive Gearbox	Angle Drive Unit
Speed Reduction Gearbox	Speed Gear Assembly

**1.8 USE OF METRIC UNITS.**

The equipment described herein contains metric components and requires metric common tools. Therefore, metric units are used for components or systems that are metrically dimensioned and no U. S. standard unit is applicable. In all other situations, U. S. standard units and metric units are both referenced.

**1.9 PREPARATION FOR STORAGE OR SHIPMENT.**

Requirements, including packaging and administrative, will be carried out in accordance with the Paving Machine Organizational Maintenance Manual, TM 5-3895-373-20.

**1.10 CALIBRATION.**

Items requiring calibration are to be calibrated in accordance with applicable procedures as described in or referenced by this manual.

- a. Fuel injection pump
- b. Fuel injectors
- c. Main control handle subassembly

**SECTION II. EQUIPMENT DESCRIPTION AND DATA**

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## 1.11 DIESEL ENGINE.

The diesel engine is Perkins model T4.236 turbo-supercharged, liquid-cooled, four-stroke cycle, vertical in-line four cylinder, with overhead valves. The engine has a 236.0 cubic inch (3,86 ℓ) displacement with a horsepower rating of 102 bhp (76 kW) at 2600 rpm. The engine has a direct fuel-injection system and a 24 volt electric starter. The turbosupercharged engine increases the power output rating by 26%, and is configured with piston cooling jets. The engine provides the power required to operate the paving machine.

The engine main components are identified and located, as shown.

a. **Turbosupercharger:** The turbosupercharger is located on the right side of the engine, mounted on the engine exhaust manifold outlet, and is connected to the air intake manifold. The turbosupercharger is lubricated by engine oil. The air intake manifold draws air into the diesel engine turbosupercharger.

b. **Air Intake Manifold:** The air intake manifold is located on the right side of the engine, mounted on the cylinder head air intake and connected to the turbosupercharger.

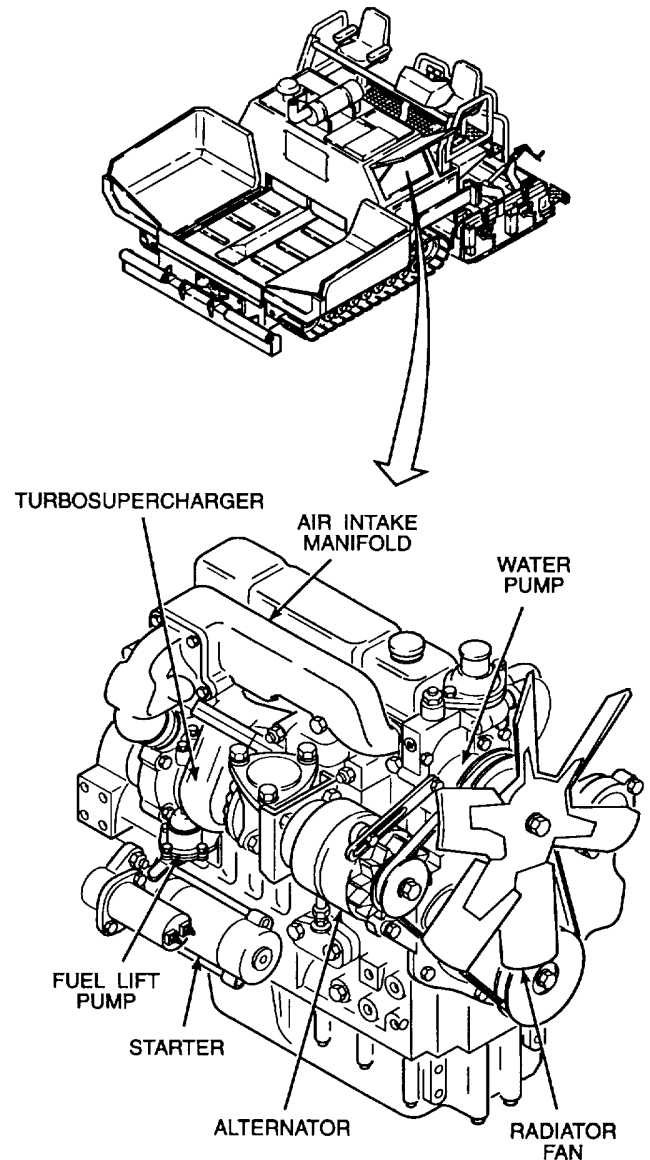
c. **Water Pump:** The water pump is located on the front face of the engine block, mounted on a vertical outlet behind the fan assembly. The water pump circulates coolant through the engine and radiator. The water pump is a centrifugal, impeller-driven unit. It is linked to the fan assembly and has self-lubricating bearings. An external bypass system is used on turbosupercharged engines.

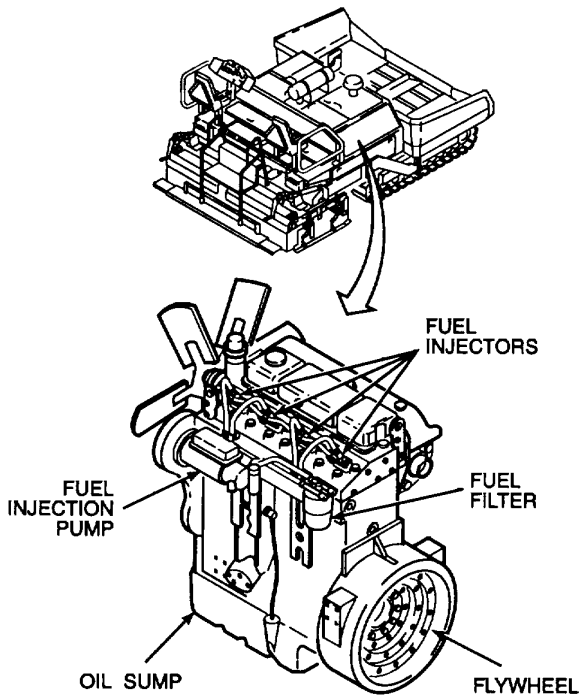
d. **Radiator Fan Assembly:** The fan assembly is located on the front of the engine, mounted on the water pump pulley. The fan has six blades for maximum air cooling circulation.

e. **Alternator:** The alternator is located on the right side of the engine, mounted on the belt adjusting arm and a support bracket. The alternator operates at 24 volts DC and is negative-grounded. The alternator has an open, ventilated enclosure and a fan on the alternator pulley for air circulation through the unit. Operating amperage for the alternator is 45 amps.

f. **Starter:** The 24 V starter is located on the right side of the engine, mounted on the forward side of the flywheel housing. The starter operates on a 24 volt DC current drawn from two batteries wired in series. The starter has a maximum current rating of 900 amps. The drive pinion assembly is self-indexing to ensure a smooth engagement between the bendix and the flywheel spur gear teeth before the starter motor begins to turn.

g. **Fuel Lift Pump:** The fuel lift pump is located on the right side of the engine, mounted on the engine block below the turbosupercharger. The fuel lift pump is an eccentric-on-camshaft type. The fuel lift pump draws fuel from the fuel tank and sends it through the fuel filter to the fuel injection pump and turbosupercharger.





l. Fuel Injection Pump: The fuel injection pump is located on the left side of the engine, mounted on the back of the engine timing housing. The pump is a mechanical governor type, configured with a D.P.A. distributor. The fuel injection pump is connected to the engine camshaft by a gear. The fuel injection pump sends fuel into the engine cylinders for combustion. The engine cold-starting induction heater is also fed by the fuel injection pump, through the fuel filter. Fuel input is adjusted by a transfer pressure screw on the injection pump.

### 1.12 PUMP DRIVE GEARBOX.

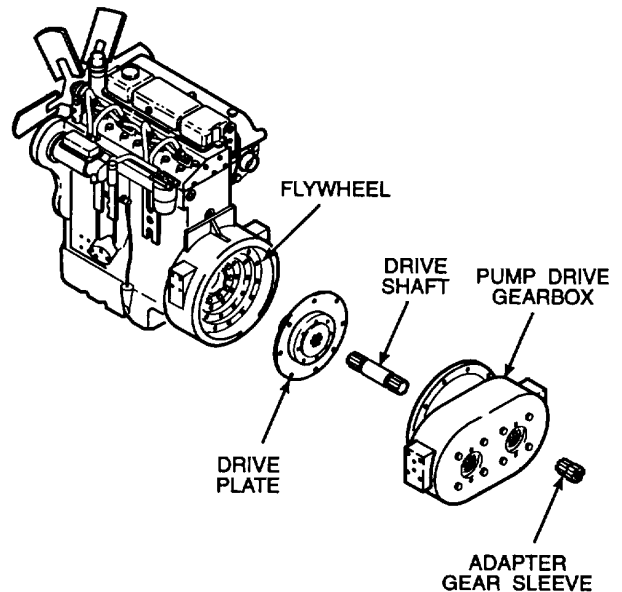
The pump drive gearbox links the engine to the two hydraulic propulsion pumps. A drive plate and drive shaft connect the engine flywheel to the gearbox. An adapter gear sleeve links the gearbox to each hydraulic propulsion pump. The pump drive gearbox has a 1:1 ratio and is lubricated by gear oil. Two horizontal output gears are driven by one central input gear inside the gearbox housing. An oil drain hose and plug are attached to the bottom of the gearbox housing.

h. Fuel Injectors: The fuel injectors are located on the top left side of the engine, mounted on the cylinder head with vertical fuel injection lines. The fuel injectors are configured with a four-hole injector nozzle for maximum fuel flow.

i. Fuel Filter: The fuel filter is located on the left side of the engine, mounted on the cylinder head in line between the fuel injection pump and the fuel tank. The cartridge type filter element removes particles from the fuel system.

j. Flywheel: The flywheel is located on the back of the engine. The flywheel is held in place on the crankshaft with six bolts with washers. The flywheel transmits power from the crankshaft to an attached pump drive gearbox through the drive plate.

k. Oil Sump: The oil sump is located on the bottom of the engine block. Engine oil is circulated by a gear-type oil pump driven from the rear of the front-mounted balancer unit, located inside the oil sump. The oil sump drain is connected to a hose for remote draining.



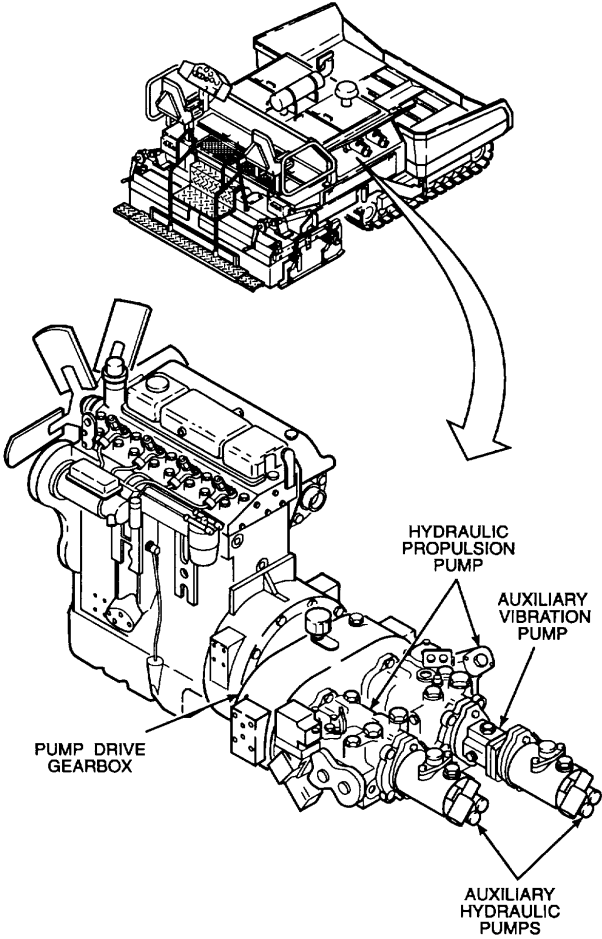
**1.13 HYDRAULIC PROPULSION PUMPS.**

Two separate variable displacement hydraulic propulsion pumps are directly coupled to the pump drive gearbox. The propulsion pumps are identical models and are used to drive the left and right hydraulic propulsion motors. Each includes an electric displacement control pump pilot control valve that provides a continuously variable displacement.

**1.14 AUXILIARY HYDRAULIC PUMPS.**

Three separate auxiliary hydraulic pumps are attached to the hydraulic propulsion pumps. Two identical 2500 psi (17 237 kPa) auxiliary hydraulic pumps power the auger/conveyor assemblies, tow point cylinders, screed, and stack valve. Displacement for the two pumps is 0.70 cubic inches (11,5 mℓ) in front and 0.58 cubic inches (9,5 mℓ) in rear.

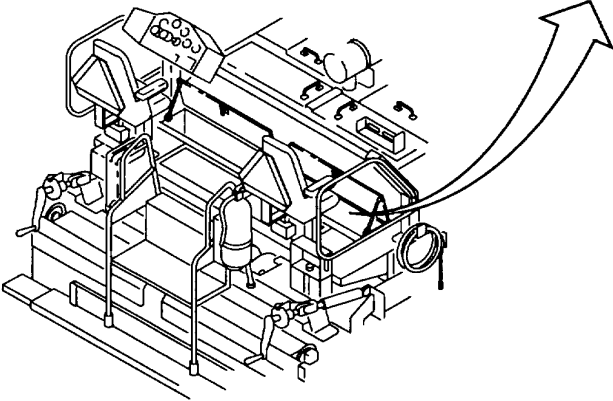
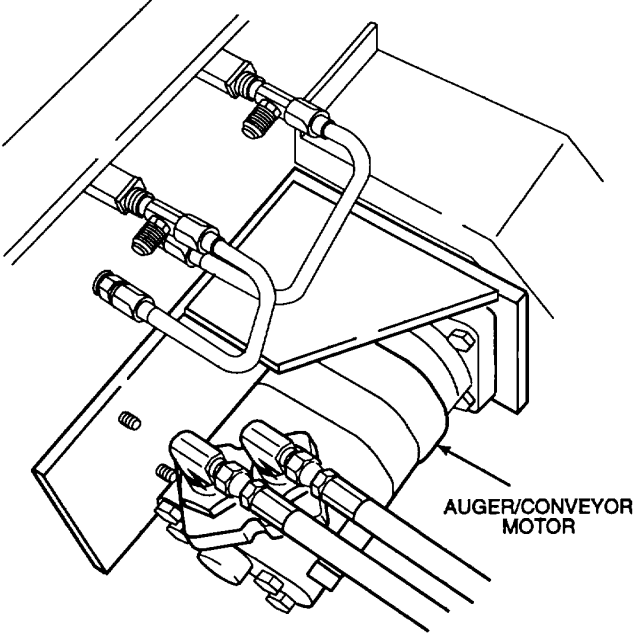
A 2500 psi (17 237 kPa) hydraulic auxiliary vibration pump supplies additional power to the screed vibration system. The auxiliary vibration pump has a displacement per revolution of 0.24 cubic inches (3,9 mℓ). Each pump is mechanically linked by spline shafts to the hydraulic propulsion pumps.



**1.15 AUGER/CONVEYOR MOTOR.**

The paving machine uses two auger/conveyor motors. A separate motor is used for right and left side of the paving machine and are independently controlled. The motors are powered by the left and right auxiliary hydraulic pumps. The following description applies to either motor.

The auger/conveyor motor is a gear rotor type, low speed, high torque hydraulic motor. The motor is mounted on the main frame weldment inside the paving machine, above the auger/conveyor assemblies. It has a displacement of 19.9 cubic inches (326,4 ml) per revolution and operates at 2750 psi (18 961 kPa). The fixed-displacement motor is reversible and is lubricated by the hydraulic oil flowing through it. Oil flows through the gear rotor to the internal gear assembly. The internal gear assembly drives the multiple gear shaft. An internal check valve regulates case pressure. The motor drive shaft is mounted in two tandem roller bearings for a high radial load capacity and smooth operation.

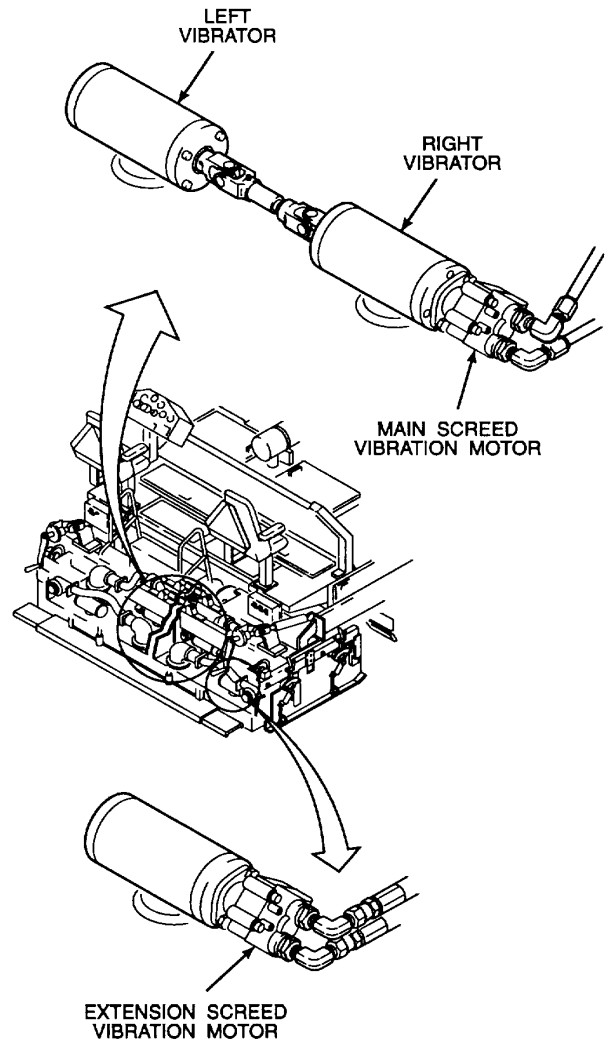


## 1.16 SCREED VIBRATION MOTORS.

There are two different screed vibration motors, described as follows:

a. Main screed vibration motor. The main screed vibration motor is a gear-type, fixed displacement, bi-directional hydraulic motor. It is located on the main screed and provides power to both the left and right main screed vibrators. The motor has a displacement of 0.45 cubic inches (7,37 mℓ) per revolution and operates at 2000 psi (13 790 kPa). It is powered by the left auxiliary hydraulic pump and the auxiliary vibration pump. Hydraulic oil flows through a gerotor to power the drive shaft. The motor is equipped with a check valve to regulate case pressure. A two-bolt motor mount connects the hydraulic motor to the right vibrator on the main screed. The left vibrator is driven by the right vibrator through a drive shaft.

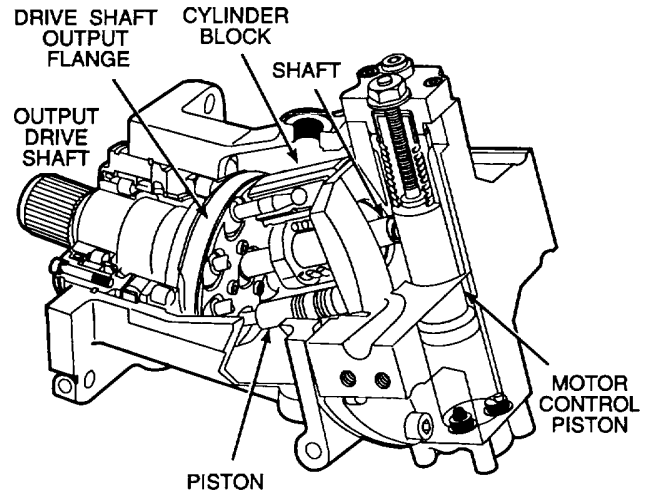
b. Extension screed vibration motors. The extension screed vibration motors are gear-type, fixed displacement, bi-directional hydraulic motors. The left extension screed vibration motor is located on the left extension screed. The right extension screed vibration motor is located on the right extension screed. Hydraulic oil flowing out of the main screed vibration motor is directed to the extension screed vibration motors. A 50/50, spool-type flow divider splits hydraulic oil between the two extension screed vibration motors. A two-bolt motor mount connects each motor to the offset vibrators. Each motor has a displacement of 0.218 cubic inches (3,57 mℓ) per revolution and operates at 2000 psi (13 790 kPa). A gerotor powers the drive shaft on each motor. Each motor is equipped with a check valve to regulate case pressure.



**1.17 HYDRAULIC PROPULSION MOTOR.**

The paving machine uses two hydraulic propulsion motors. A separate motor is used for the right and left side. The left motor is powered by the left hydraulic propulsion pump and the right motor is powered by the right hydraulic propulsion pump. The following description applies to either motor.

The hydraulic propulsion motor is a bent axis, piston type, high torque, variable speed, bi-directional motor. It has a maximum displacement of 3.05 cubic inches (49,98 mℓ) and a minimum displacement of 1.13 cubic inches (18,52 mℓ) per revolution. Operating pressure is 5000 psi (34 475 kPa). The charge pump in the left propulsion pump provides flow and pressure, 350 psi (2413 kPa), to the high speed shift valve. The high speed shift valve controls the paving speed and travel speed of the propulsion motors.



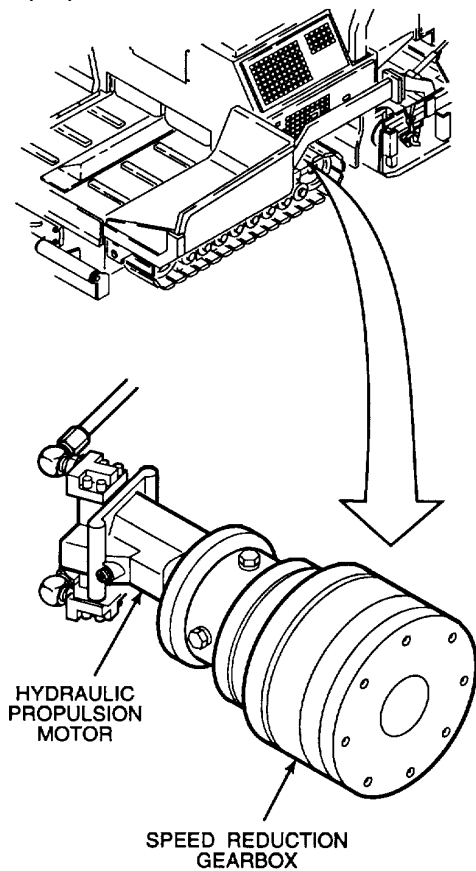
Oil flow through the high speed shift valve positions the motor control piston. The control piston is linked by a shaft to the cylinder block and sets the angle at which the cylinder block turns. The greater the angle of the cylinder block, the slower the motor turns; the lesser the angle, the greater the speed output.

The cylinder block contains seven pistons. Each piston applies force, through a connecting rod, to the drive shaft output flange causing the output flange to rotate. High pressure oil forces the pistons out, which causes a downward rotation on the output flange. Rotation of the output flange produces a rotation of the output drive shaft. Meanwhile, pistons on the opposite side of the flange are retracting, forcing the oil out at low pressure, back to the reservoir.

The propulsion motors are cooled by controlled fluid leakage. A three-way, pressure driven, flushing valve allows heated hydraulic oil to exit the system and return to the hydraulic reservoir.

**1.18 SPEED REDUCTION GEARBOX.**

The speed reduction gearbox links the hydraulic propulsion motors to the track hubs and drive sprocket gears. There is one reduction gearbox for each track. The reduction gearbox is a triple-stage unit with a reduction ratio of 65:6:1 and a continuous operating torque of 4700 lb-ft (6372 N•m).



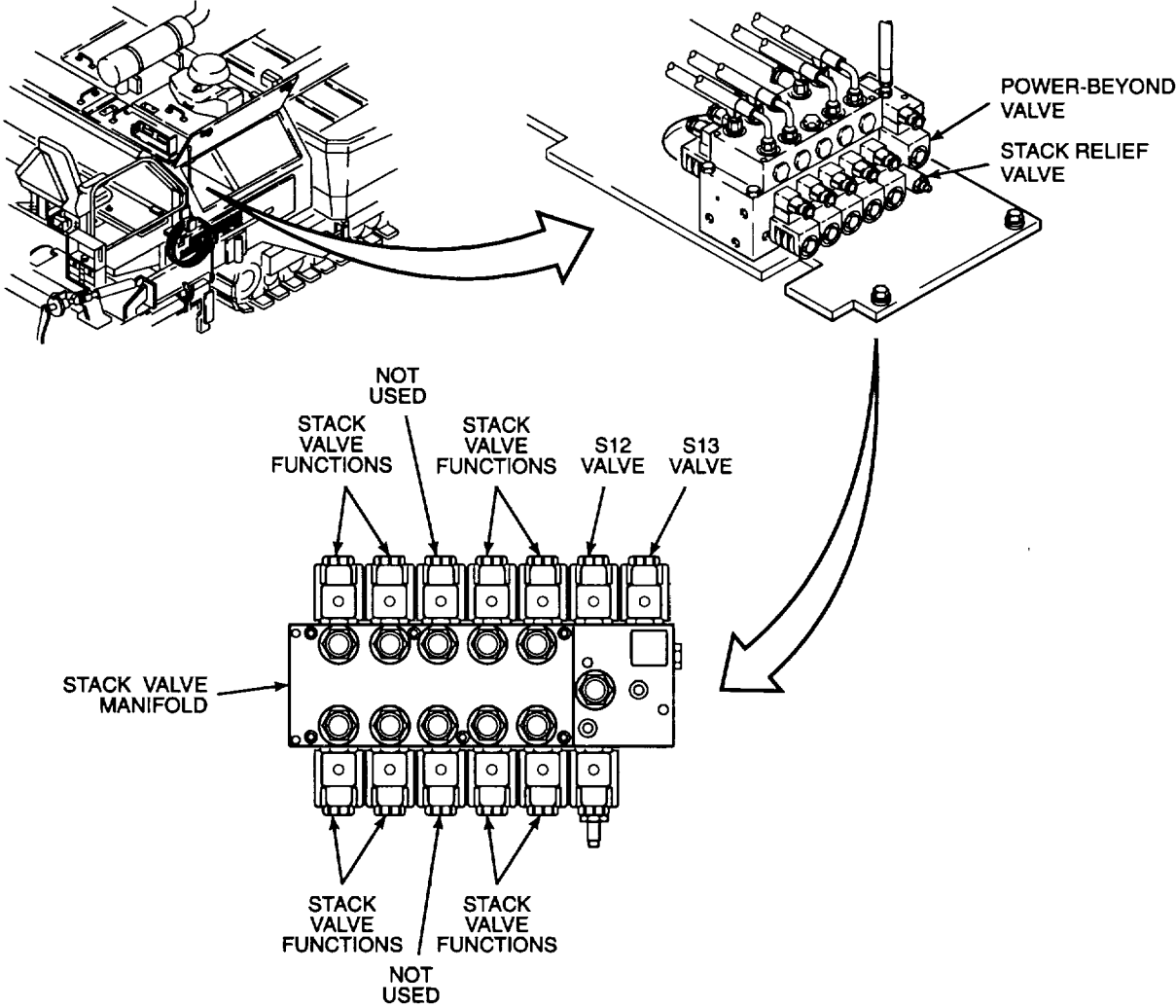


1.19 **STACK VALVE.**

The stack valve is located on the right side of the valve panel assembly. It consists of 13 separate valves. Three valves control hydraulic flow to and from the stack valve. Eight valves control screed extension cylinders and hopper lift cylinders. Two valves are not used. The stack valve operates at a maximum pressure of 2500 psi (17 237 kPa). Hydraulic oil for the stack valve is supplied by the right auxiliary hydraulic pump. Each valve in the stack valve is controlled by a 12 volt DC electric coil.

Three valves control oil flow to the hydraulic stack valve as follows:

a. The power-beyond valve is a two-way valve that switches hydraulic oil flow from the track tensioning cylinders to the stack valve. It is normally open. When a cylinder function is being controlled through the stack valve, the power-beyond valve closes, turning off oil flow to the track tensioning cylinders. When the stack valve controlled cylinders are not operating, a coil spring opens the power-beyond valve, turning on the oil flow to the track tensioning cylinders. The - V power-beyond valve has a nominal flow of 2.5 gallons (9,4 ℓ) per minute. Maximum internal leakage is 5.0 cubic inches (81,9 mℓ) per minute.



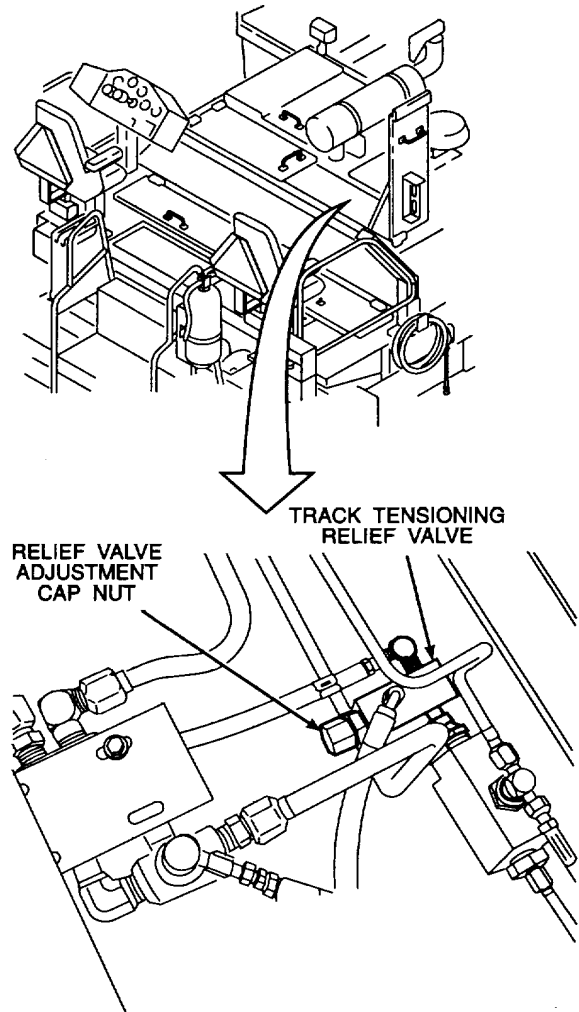
b. The S12 valve is a three-way, two-position spooled valve that switches hydraulic flow from the stack valve to the screed lift cylinders. The valve is normally open to allow oil flow to remain in the stack valve. When the screed lift system is activated, S12 diverts flow from the stack valve to the screed lift cylinders. When deactivated, a coil spring returns the spool to the normally-open position, allowing flow into the stack valve. The valve has a nominal flow of 2.5 gal. (9,4 ℓ) per minute. Maximum internal leakage is 5.0 cubic inches (81,9 mℓ) per minute.

c. The S13 valve is a two-way, pilot-operated poppet valve that is normally closed. Opening the valve allows oil from the screed lift cylinders to return to the hydraulic reservoir, lowering the screed. When de-energized, a coil spring closes the valve. Nominal flow through the valve is 5.0 gal. (18,9 ℓ) per minute. Internal leakage is 0-5 drops per minute.

Eight identical four-way, two-position directional control valves govern cylinder extend and retract functions. Left and right screed extension and hopper lift cylinders are each controlled by two valves. Each valve cartridge spool is opened by an electric coil, and closed by a spring. The valves have a nominal flow of 1.75 gal. (6,62 ℓ) per minute. Maximum internal leakage is 5.0 cubic inches (81,9 mℓ) per minute.

**1.20 RELIEF VALVES.**

Relief valves are direct-acting, one-way poppet valves that protect components from excessive hydraulic pressure. Relief valves are located near track tensioning cylinders, propulsion pumps, auxiliary pumps, propulsion motors, auger/conveyor motors, and the stack valve assembly. Relief valves are equipped with an adjusting screw located underneath a hex head adjustment cap nut. The adjustment increases or decreases spring pressure on the internal valve, which changes the pressure at which the valve opens. Relief valves are closed until the adjusted pressure setting is exceeded. When the pressure setting is exceeded, the relief valve opens and excess oil flows through the return manifold back to the hydraulic reservoir. Relief valves in the paving machine have a nominal flow of 6.0 gal. (22,7 ℓ) per minute.



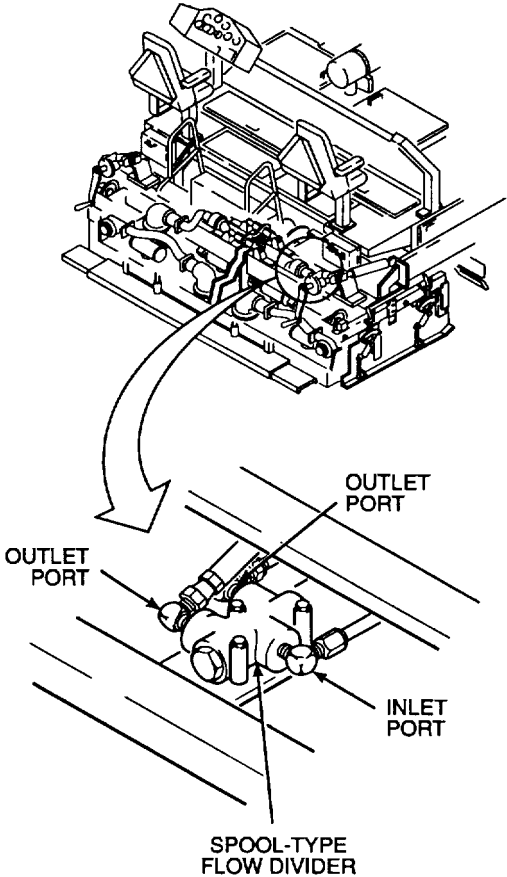
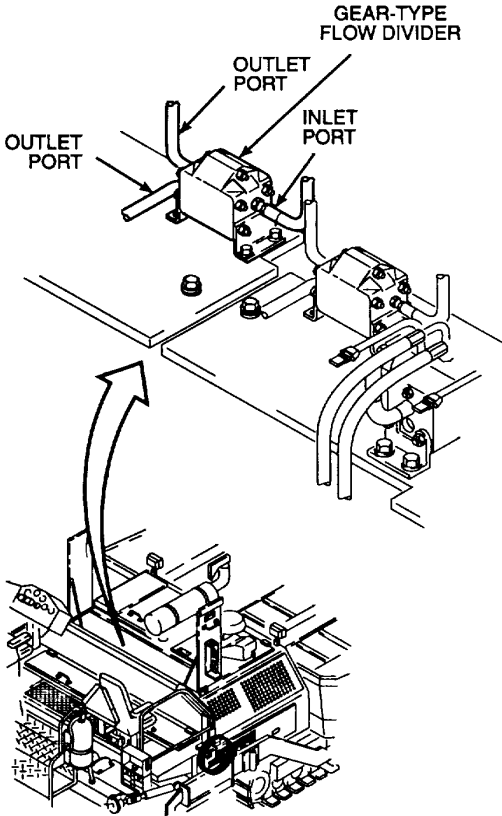
NOTE: THE TRACK TENSIONING RELIEF VALVE IS ILLUSTRATED AS A TYPICAL EXAMPLE OF RELIEF VALVES LOCATED THROUGHOUT THE PAVING MACHINE.

1.21 **50/50 FLOW DIVIDER.**

50/50 flow dividers split the flow from a single input into two equal output flows. There are two types of 50/50 flow divider used in the paving machine.

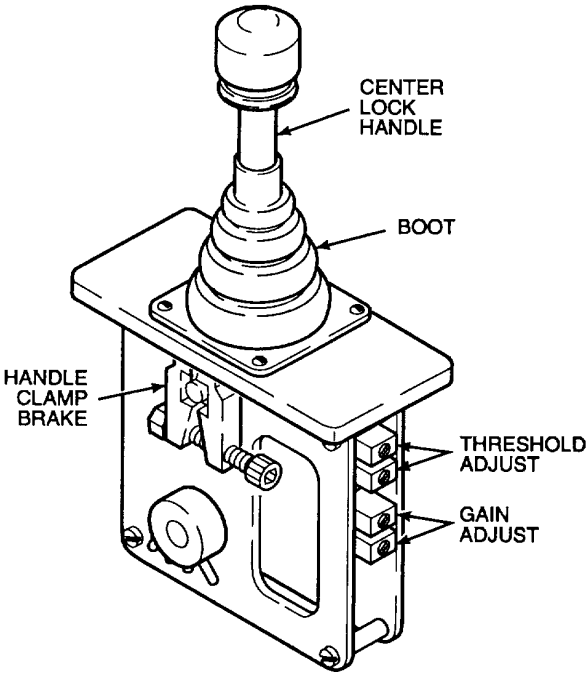
a. Gear-type flow dividers. Gear-type flow dividers are mounted on brackets that attach to the valve panel. There are three gear-type flow dividers in the paving machine. One flow divider splits the input flow to the two auger/conveyor systems. A second flow divider splits flow between the stack valve and the tow point cylinders. Each displaces 0.32 cubic inches (5,24 mℓ) per side. A third flow divider splits flow between two tow point cylinder circuits and has a displacement of 0.109 cubic inches (1,786 mℓ) per side. Hydraulic oil enters the inlet port and passes through two sets of meshing, double-gear assemblies. Each double gear assembly consists of two gears joined by a single shaft. As oil passes over the gears, they turn and engage an opposite set of gears. Hydraulic oil flow is equally regulated by the inertia created by the meshing sets of gears. Hydraulic oil output is equal from both outlet ports.

b. Spool-type flow dividers. Spool-type flow dividers contain a pressure-compensated spool that balances oil flow. There is one spool-type flow divider located in the screed vibrator assembly. The flow divider input is channeled through a bored spool. The spool centers and self-adjusts as the oil passes through. This compensates for unequal hydraulic oil draw from each of the components and ensures an equal and constant output flow.



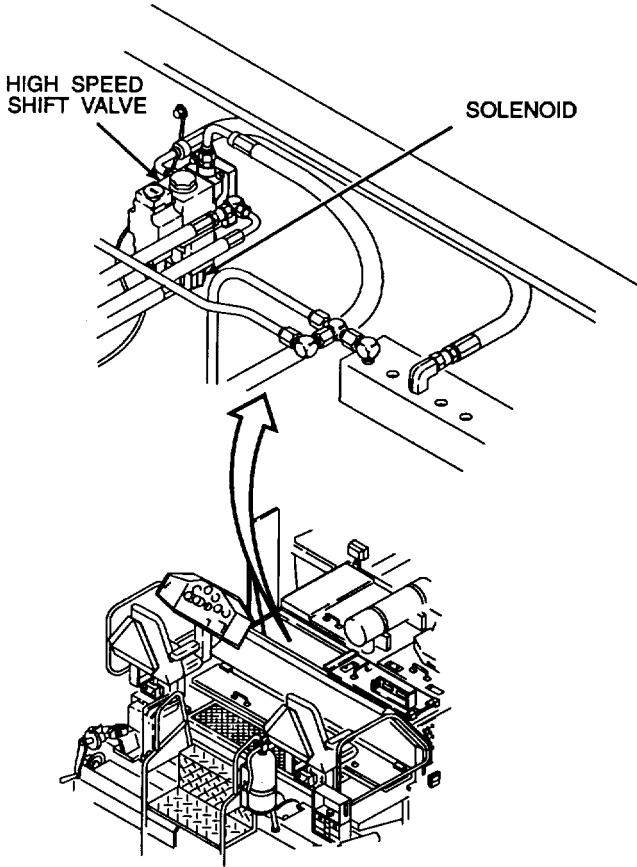
**1.22 CONTROL HANDLES.**

Two control handles (joysticks) are located on the operator console. Each control handle is a friction held, bi-directional unit with adjustable drag. A clamp-type brake holds each handle at set position. Each handle has a throw of 30° on either side of center. Control handles operate on a 12 volt DC current. A printed circuit board on each handle subassembly converts the 12 volts DC to a 96 mA signal to power the coils on pump pilot control valves. Full current output, with the control handles at 30°, is a maximum of 2 amps into a 5 ohm load. Step current (96 mA) is a maximum of 50% of full current output. The current can be adjusted through the use of threshold and gain controls. Control handles govern startup functions, travel speed variations, brake release (when engaging paving machine travel), and automatic screed vibration operation. The paving machine engine will not start unless both control handles are centered. Each control handle operates its respective track. When paving with screed vibration in automatic, screed vibration is halted when either control handle is centered. Screed vibration resumes when both handles are moved out of the center position.



**1.23 HIGH SPEED SHIFT VALVE.**

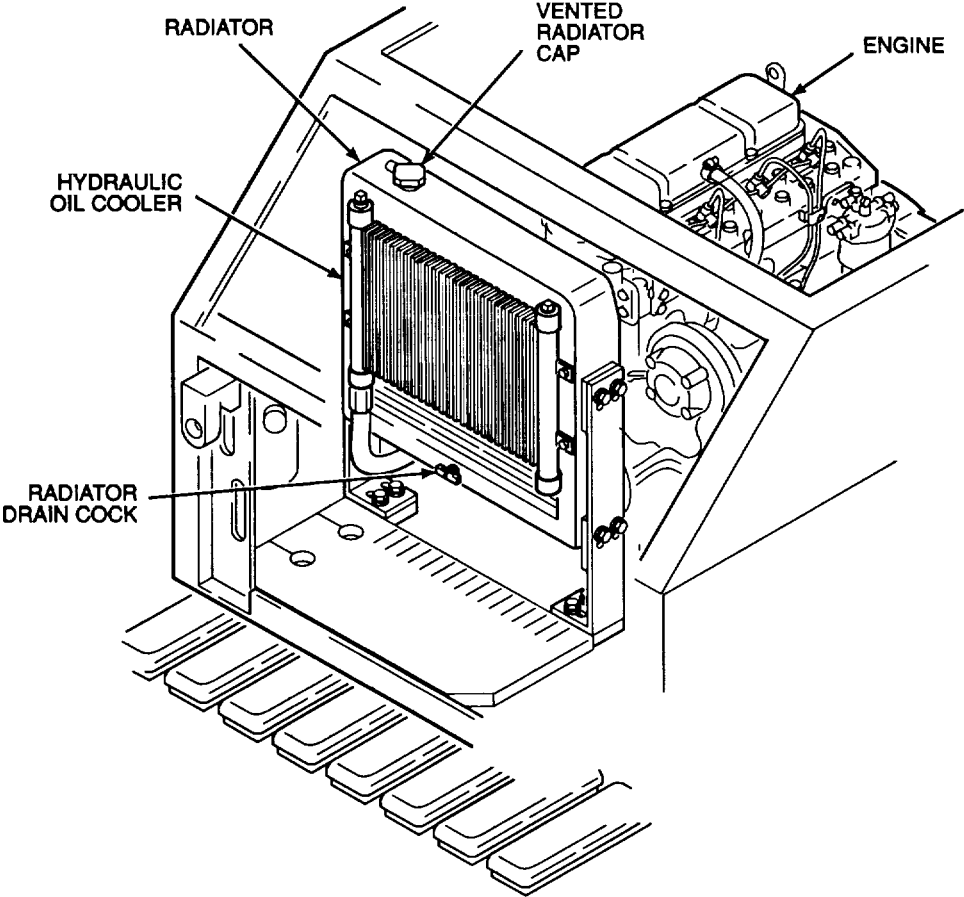
The high speed shift valve is a 12 volt DC, solenoid activated, two-position, four-way valve that enables the paving machine to move at two separate speed ranges. The high speed is used for traveling, and the low speed is used for paving. The solenoid is wet-operated for low impact and smooth operation. The high speed shift valve controls oil flow to the hydraulic motor control pistons. The oil flow determines the control piston angle, which determines drive speed. The internal charge circuit of the left propulsion pump provides the required flow of hydraulic oil to the high speed shift valve.



1.24 RADIATOR ASSEMBLY.

The radiator cools the engine coolant. The radiator is located in the left side engine compartment and is attached to the main frame, directly behind the hydraulic oil cooler. The hydraulic oil cooler is joined to the radiator by four brackets. A fan draws air through the oil

cooler and radiator. Engine coolant is circulated through the radiator and engine by the water pump on the engine. The radiator operates at 7 psi (48 kPa) maximum capacity. The radiator cap vents excess cooling system pressure. The radiator has a drain cock for coolant drainage.



## 1.25 TRACK SUSPENSION ASSEMBLY.

The track suspension assembly assists in supporting, propelling, and steering the paving machine.

a. **Drive Hub Assembly:** The drive hub assembly is bolted to the main frame of the paving machine. The drive hub transfers energy from the hydraulic propulsion system to the drive sprocket gear.

b. **Drive Sprocket Gear:** The drive sprocket gear transfers drive power to the track chain.

c. **Track Tensioning Cylinder:** The track tensioning cylinder receives a 900 psi (6205 kPa) hydraulic charge after engine startup and applies this constant pressure to the track idler to establish and maintain proper track tension.

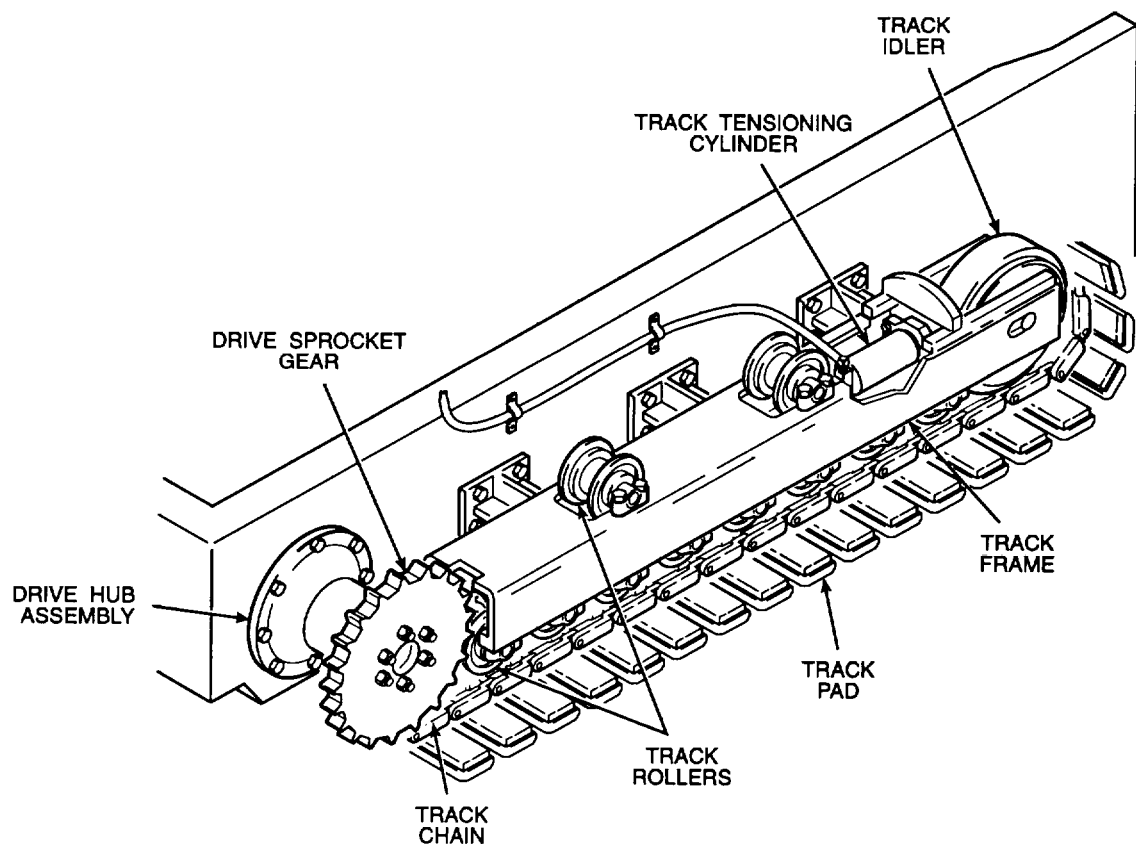
d. **Track Idler:** The track idler is located at the forward end of the track frame and has a fixed amount of

travel to compensate for changes in track tension. From its forward location, the track idler supports the front end track loop and maintains proper track tension by sliding forward and back in conjunction with the track tensioning cylinder. The track idler roller also helps reduce track rolling resistance.

e. **Track Frame:** The track frame is bolted directly to the machine frame. It provides support to two top track rollers and eight lower rollers. The unit houses the track tensioning cylinder and track idler.

f. **Track:** The track consists of a series of track pads bolted to a track chain. The track chain, engaged with the rotating drive sprocket gear, propels the paving machine along the ground.

g. **Track Rollers:** Track rollers provide support for the track chain and aid in its alignment. The rollers also create a lower demand for drive power by reducing track rolling resistance.



1.26 **FRAME COMPONENTS.**

Frame components consist of weldments and certain weldment features. They provide a means for lifting and tying down the paving machine, as well as supporting the hopper wings. The paving machine's forward-most frame component is a specialized counterweight.

a. Hopper Support Arms: The front and rear hopper support arms provide support to left and right hopper wings after the wings are lowered. The front hopper support arms also serve as front tiedowns.

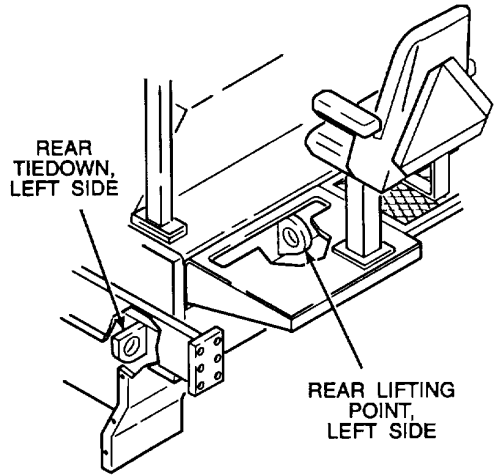
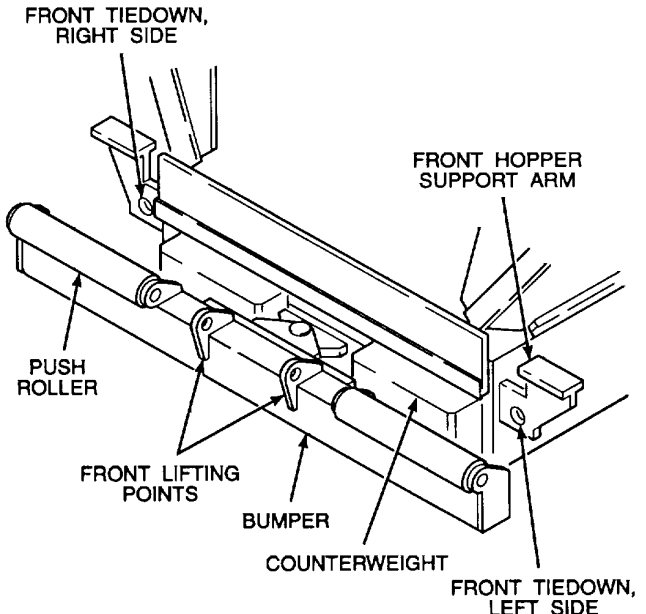
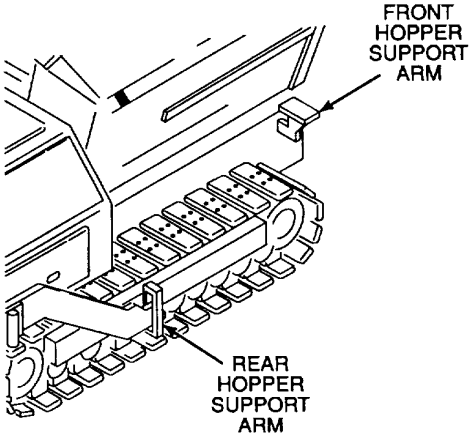
b. Counterweights: Two permanently mounted counterweights help keep the paving machine's center of balance forward when the hopper is empty of paving material and the screed is in the travel position.

c. Bumper: A vehicular bumper pivots at the front of the paving machine. The bumper acts as a floating bogie for the push rollers.

d. Push Rollers: Two push rollers are fastened to the bumper. Each push roller is mounted on bearing shafts and rotates between spherical bearings. The rollers are designed to ride against the rear wheels of the paving material haul truck.

e. Tiedowns: Tiedowns provide a means of securing the paving machine. Two front tiedowns are located on the hopper support arms and two rear tiedowns are located near the operator platform.

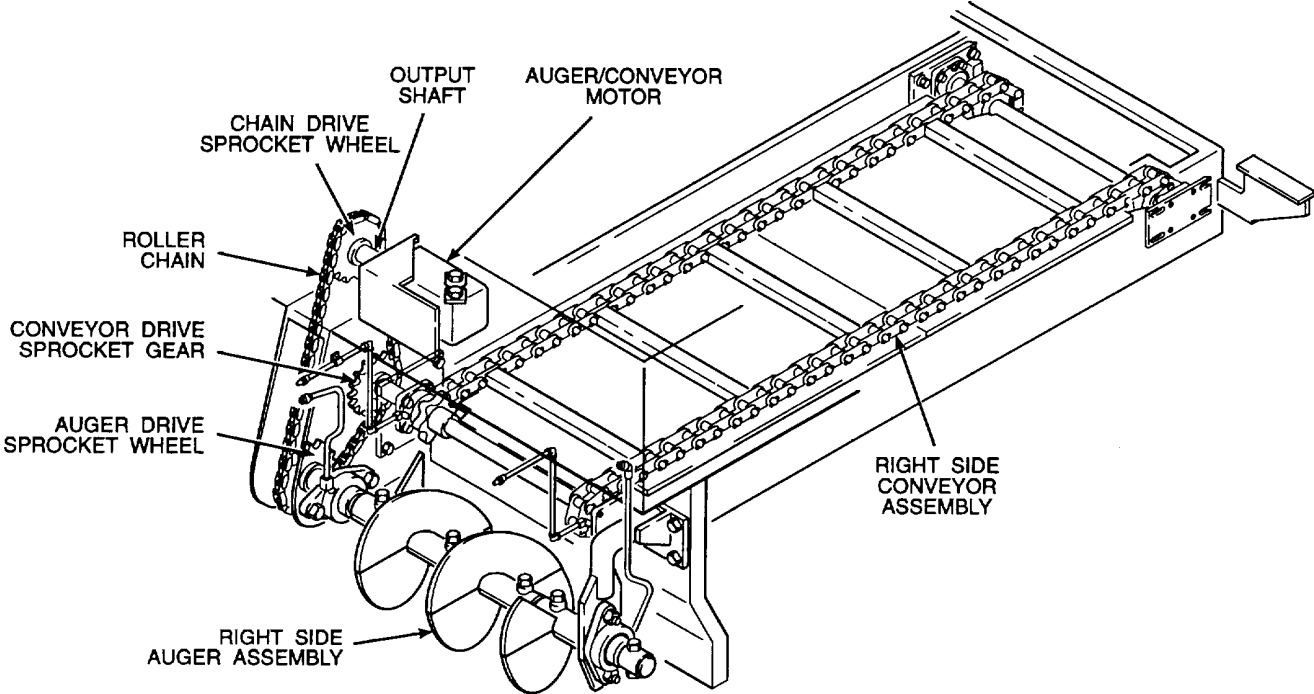
f. Lifting Points: Lifting points serve as hoist points for the paving machine. Two forward lifting points are located on the bumper. Rear lifting points are located beneath and slightly forward of each operator seat.



1.27 AUGER/CONVEYOR ASSEMBLIES.

The paving machine is equipped with a right and a left auger/conveyor assembly. Each is driven by an independently controlled hydraulic motor mounted on the main frame bulkhead. Hydraulic motor controls are located on the operator control console and screed

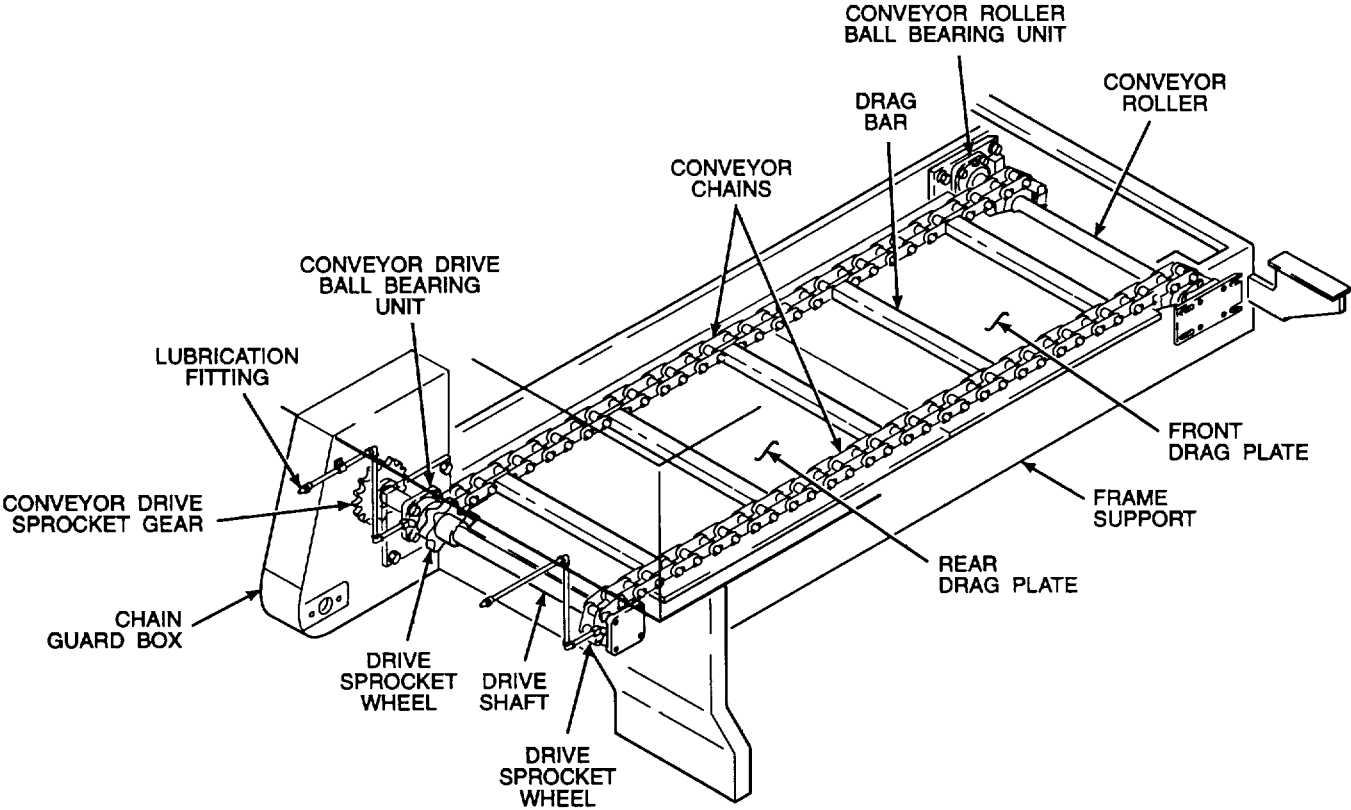
control panels. Each hydraulic motor output shaft is fitted with a chain drive sprocket wheel. A roller chain, one for each auger/conveyor assembly, connects the chain drive sprocket wheel with drive sprocket wheel on the auger shaft and the drive sprocket wheel on the conveyor shaft.

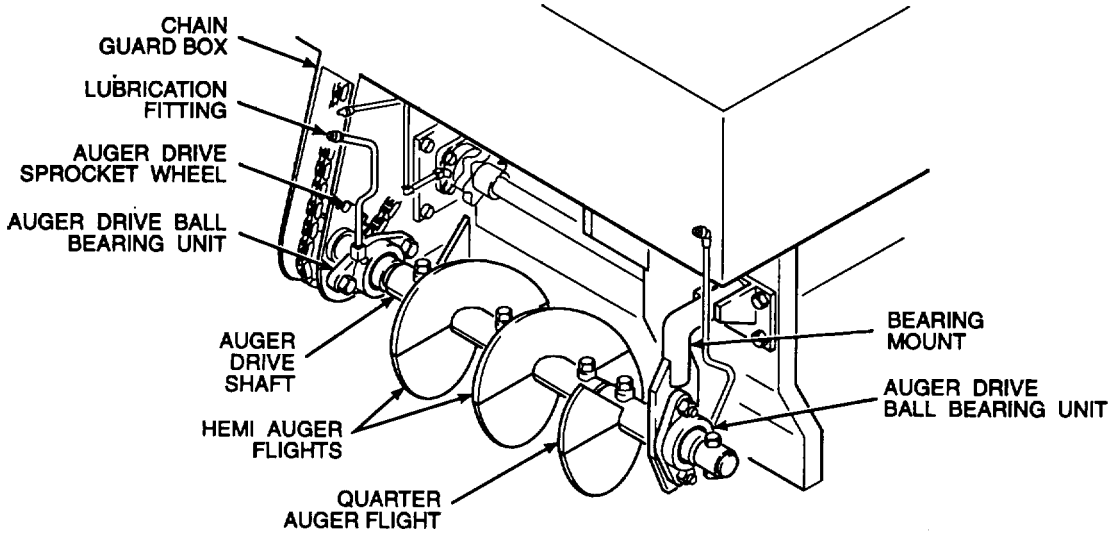




1.27.1 Conveyor Assembly. Each conveyor assembly consists of a pair of conveyor chains driven by a drive sprocket wheel mounted on a drive shaft at the rear of the conveyor assembly. The drive sprocket wheel is located inside the chain guard housing. The drive shaft is supported at either end by two conveyor drive ball bearing units. Each bearing unit is equipped with a remote lubrication fitting for easy access. A conveyor

roller, located at the front of the conveyor, is supported by two conveyor roller ball bearing units. The bearing units are mounted on adjustable support plates. Each bearing unit is equipped with a lubrication fitting. Front and rear drag plates are mounted onto the main frame support structures below the conveyor chain assemblies. Each conveyor chain assembly includes 14 drag bars that are pulled forward or back by the conveyor chains.



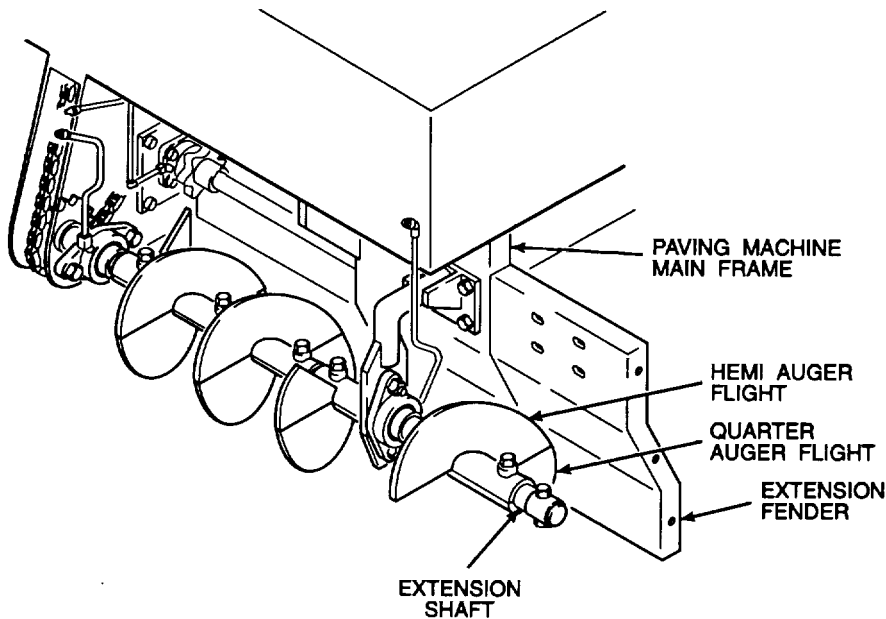


1.27.2 Auger Assembly. The right and left auger assemblies each consist of an auger drive shaft supported by two auger drive ball bearing units. The inboard bearing units are mounted onto the chain guard housing, and the outboard bearing units are mounted onto bearing mounts. Each ball bearing unit is equipped with a remote lubrication fitting for easy access. The auger assembly is driven by an auger drive sprocket wheel located at the inboard end of the auger drive shaft, inside the chain guard housing.

Five hemi auger flights and two quarter auger flights are bolted onto each auger drive shaft. Paving width can be

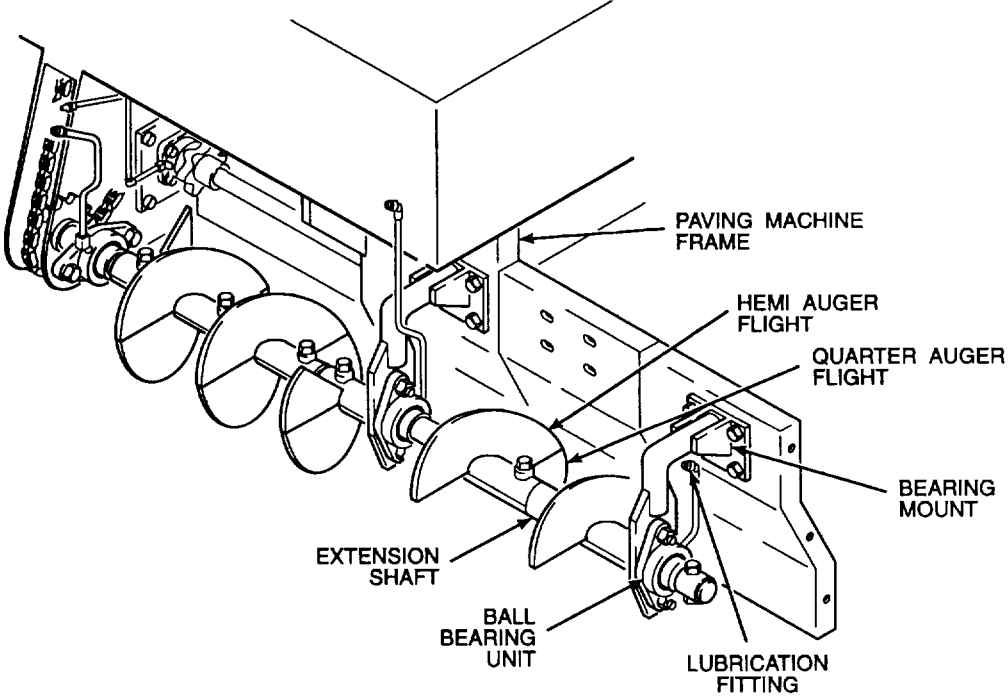
increased by adding bolt-on auger and fender extensions.

- a. One Foot (0.3 m) Auger and Fender Extension: The 1 foot (0,3 m) auger and fender extension consists of an extension fender and an auger extension shaft with attached auger flights. The fender extension is bolted onto the paving machine main frame. The auger extension is bolted onto the end of the main auger drive shaft. One hemi auger flight and one quarter auger flight is bolted to the auger extension shaft.



b. Two Foot (0,6 m) Auger and Fender Extension: The 2 foot (0,6 m) auger and fender extension is an additional set of 1 foot (0,3 m) auger and fender extensions. When attached to the 1 foot (0,3 m) extension, an additional 2 feet (0,6 m) of paving width is created. One hemi auger flight and one quarter auger

flight is bolted to each auger extension shaft. The outboard end of the 2 foot (0,6 m) auger extension shaft is supported by a ball bearing unit mounted onto a bearing mount. The bearing mount is attached to the extension fender. Each ball bearing unit is equipped with a lubrication fitting.



## 1.28 MAIN SCREED COMPONENTS.

The main screed provides the structural rigidity for the main screed plate and is attached to the tractor by two screed tow arms. The main screed plate, bolted to the bottom of the main screed, rides on top of the paving mat and creates a smooth finish. A strike plate controls the amount of paving material that reaches the main and extension screed plates. The weight and vibration of the main screed provides the initial compaction for the mat.

The crown adjustment control is mounted in the center of the main screed and can be adjusted to create the desired contour of the finished paving material.

Two hydraulic cylinders are mounted inside the main screed and extend and retract the extension screeds to and from their maximum width of 14 ft. A full length, telescopic, nonskid step is attached to the main and extension screeds, and adjusts with the travel of the

extension screeds. On the outside end of each extension screed, an endgate is attached to prevent the outward movement of paving material beyond the material mat being laid. The endgates also provide a finished edge to the mat.

The 8 foot to 14 foot (2,4 to 4,3 m) hydraulic extendable screed is equipped with four hydraulically driven eccentric vibrators and four individually controlled diesel fuel burners with remote electrical ignition. The burners preheat the screed plate to prevent paving material from sticking to the screed as it is applied to the surface being paved.

The bolt on screed extensions provide an additional 2 feet of paving width. The cutoff plates are used to reduce the paving width to four feet.

The main screed components are identified and located, as shown.

a. **Screed Tow Point:** The main screed assembly is attached to the tractor on each side of the paving machine. These points of attachment are known as the screed tow points. The attachment is made by a metal flange plate to flange plate connection between the screed arm and screed tow arm.

b. **Screed Control Panels:** The screed control panels are located on both the left and right sides of the screed. Each control panel protective cover can be removed to gain access for repairs. The wire connections inside the control box are composed of pin connectors and hard soldered joints. Both screed control boxes have identical control switch functions and indicators, with the exception that the left control box is also configured with a fuel pump switch and indicator. The dual screed control box configurations allow for the positioning of two screed operators, or allows a single screed operator convenient access to controls for safe machine operation. The screed control boxes contain the following switches:

- (1) Extension Screed Control
- (2) Extension Screed Blower
- (3) Extension Screed Burner Control
- (4) Tow Point Movement
- (5) Auger/Conveyor Reverse Control
- (6) Feeder Control
- (7) Flow Gate
- (8) Emergency Stop
- (9) Fuel Pump (left control panel only)
- (10) Main Screed Blower
- (11) Main Screed Burner Control
- (12) Panel Light

c. **Extension Screeds:** The extension screeds are hydraulically operated with two extension screed height adjustments mounted on each extension screed to control the desired slope. The height adjustments can

be raised or lowered independently of each other by removing a quick release pin from the adjusting wheel shaft. Quick release pins are not removed from the adjusting wheel shaft if the same adjustments are required.

d. **Thickness Control:** Paving mat thickness is changed by altering the setting of the thickness control, which changes the angle of the screed in relation to the surface being paved. This is referred to as angle of attack. The thickness control is operated by a manual hand crank mounted in a mounting bracket supported by two roller bearings. The hand crank shaft is attached to a universal joint which is connected to a threaded rod and link bolted to the screed arm.

e. **Screed Vibrators:** The screed vibrators are hydraulically driven and operated by toggle switches on the operator control panel. The main screed is configured with two vibrators connected with two universal joints on rotating shafts. Each extension screed is configured with one vibrator each.

f. **Screed Burners/Blowers:** The screed is equipped with four independently controlled burners and blowers to increase the temperature of a cold bottom screed plate to approximately 300°F (150°C). The burners are diesel fuel atomizing, configured with a burner chamber and an internal fuel nozzle. Each burner chamber has a glow plug used for the fuel ignition. Each burner is also equipped with an exhaust heat distribution duct to deflect the hot air evenly across the screed plates.

Each fuel burner has a blower assembly driven by a 12 volt DC motor mounted on support brackets. The fuel burner is attached to the blower with a steel flexible pipe connected at the blower exhaust and the burner chamber inlet.

**1.29 EQUIPMENT DATA.**

**NOTE**

**Refer to TM 5-3895-373-20 for additional paving machine equipment data.**

**FUEL INJECTORS**

Make .....Perkins  
 Body .....LRB67014  
 Nozzle .....JB6801019  
 Working Pressure ..... 250 atm (258 kgf/cm<sup>2</sup>)  
 Setting Pressure ..... 250 atm (258 kgf/cm<sup>2</sup>)

**FUEL LIFT PUMP**

Make .....AC Delco  
 Type ..... V.P. series, eccentric on camshaft drive  
 Rated Delivery Pressure ..... 6 to 10 lb-ft/in<sup>2</sup> (0,42 to 0,70 kgf/cm<sup>2</sup>)  
 Minimum Test Pressure ..... 4 lb-ft/in<sup>2</sup> (0,31 kgf/cm<sup>2</sup>)  
 Return Spring Color .....red

**HIGH SPEED SHIFT VALVE**

Make ..... Camel Precision Co., Ltd.  
 Type ..... 4 way 2 position directional valve with subplate  
 Model ..... WE 42-G02-B2-D 12

**BRAKE VALVE**

Make .....Delta Power Hydraulic Co.  
 Model .....DF-S3A-00  
 Type ..... 3 way 2 position spool valve

**TRACK TENSIONING RELIEF VALVE**

Make .....Prince Mfg. Corp.  
 Model .....RD-1837-H  
 Operating Pressure ..... 2500 psi (17 237,5 kPa), maximum  
 Flow Rate .....20 gpm (7,75 ℓpm), maximum  
 Relief Setting ..... 1800 psi (12 411 kPa)

**TRACK TENSION UNLOADING VALVE**

Make ..... Fluid Power Systems  
 Model ..... 10446672IR17-1-6-250/800-80%  
 Type .....3/4 in. adjustable hydraulic unloading valve  
 Unloading Pressure ..... 900 psi (6205,5 kPa)

**AUGER/CONVEYOR CONTROL VALVE**

Make ..... Fluid Power Systems  
 Model ..... MV4-HR2750-42K-12LA  
 Type .....electric coil operated directional valve with manual override  
 Relieve Valve Setting .....2750 psi (18 961 kPa)

**TOW POINT CONTROL VALVE**

Make ..... Fluid Power Systems  
 Model ..... MV5-R2250-10A-SO-12LA  
 Type .....4 way 3 position spool valve  
 Operating Pressure ..... 3000 psi (20 685 kPa), maximum  
 Flow ..... 5 gpm (18,93 ℓpm), maximum  
 Relieve Valve Setting .....2250 psi (15 513,75 kPa)

**SCREED VIBRATION SOLENOID VALVE**

Make ..... Hydra Force  
 Model ..... SV08-21P-2P-N-12DL  
 Type .....solenoid coil operated directional valve with manual override

**AUGER/CONVEYOR SPEED CONTROL VALVE**

Make ..... Fluid Power Systems  
 Model ..... PFC-13-15-D-4-10-0-Q5  
 Type .....adjustable bypass flow control valve

**TOW POINT FLOW CONTROL VALVE**

Make ..... Danfoss Fluid Power  
 Model ..... 2F95-P-444-15-S  
 Type ..... adjustable flow control valve

**SCREED VIBRATION CONTROL VALVE**

Make ..... Alkon Corp.  
 Model ..... JF3  
 Type ..... 3/8 in. adjustable flow control valve

**SCREED TRAVEL LOCK VALVE**

Make ..... Alkon Corp.  
 Model ..... JF3  
 Type ..... 3/8 in. adjustable flow control valve

**AUGER/CONVEYOR MOTOR**

Make ..... Eaton Corp.  
 Model ..... 6000 Series Geroler  
 Displacement ..... 19.9 in<sup>3</sup>/rev. (326,1 cm<sup>3</sup>/rev.)  
 Operating Pressure .....2750 psi (18 961 kPa)

MAIN SCREED VIBRATION MOTOR

Make ..... Gresen Mfg. Co.
Model ..... MGG20020 BA1A3
Type ..... bi-directional fixed displacement geroter
Displacement ..... .045 in^3/rev. (7,37 cm^3/rev.)
Operating Pressure, Continuous..... 2000 psi
(13 790 kPa)
Rated Flow/1000 rpm, nominal ....1.95 gpm (7,4 lpm)
Rated, Maximum.....5000

EXTENSION SCREED VIBRATION MOTOR

Make .....Gresen Mfg. Co.
Model..... MGG20010 BA1A3
Type..... bi-directional fixed displacement geroter
Displacement..... 0.218 in^3/rev. (3,57 cm^3/rev.)
Operating Pressure, Continuous .....2000 psi
(13 790 kPa)
Rated Flow/1000 rpm, nominal...0.95 gpm (3,6 lpm)
Rated, Maximum ..... 5000

## CHAPTER 2 DIRECT SUPPORT/GENERAL SUPPORT MAINTENANCE OF PAVING MACHINE

### 2.1 GENERAL MAINTENANCE PROCEDURES.

General maintenance procedures include procedures to follow for equipment washdown, component cleaning, removal and disassembly, inspection, reassembly and installation, and repainting. Refer to maintenance tasks for specific guidelines. All maintenance operations must include good shop practices and proper safety. Some general maintenance procedures are as follows:

a. Wear protective clothing as specified in maintenance tasks. Observe all warnings, cautions, and notes specified in maintenance tasks.

b. Areas of the paving machine exposed to paving material require washdown prior to maintenance. Use spray washdown equipment located on the paving machine in an approved washdown area. Use mechanical means such as scrapers and stiff wire brushes to remove paving material buildup. Dispose of paving material residue in accordance with local hazardous material disposal procedures.

c. Clean components before servicing. Steam cleaning may be required. Use cleaning solvent as a general degreaser unless specified otherwise in the maintenance task. Rinse all components thoroughly with cleaning solvent. Use a stiff bristle brush to remove hardened deposits.

d. Unless otherwise specified in maintenance procedures, all fasteners are treated with thread locking compound. If the fastener cannot be removed by mechanical methods, heat fasteners with heater gun to 500° to 600°F (2320 to 315°C) for several minutes. Use thread locking compound solvent to remove thread locking compound from fasteners after they are removed from the machine. If thread locking compound solvent does not remove buildup on threads, discard fastener.

e. Use a backup wrench when loosening or tightening inline fittings. Using a backup wrench will

prevent unnecessary damage to attached lines and/or smaller fittings.

f. During removal and disassembly procedures, inspect all parts and components for signs of wear or damage. Discard all gaskets and preformed packings. When scraping gasket material from parts, do not scratch or gouge metal surfaces. Check for cracked or warped castings. Clean all parts with cleaning solvent after inspection unless specified otherwise in maintenance task. Dry parts with a clean, cleaning cloth or compressed air. For critical internal hydraulic components, use a clean, lint-free cloth. Do not use greater than 30 psi (207 kPa) maximum air pressure to dry components. Protect internal parts of engine and hydraulic components to prevent contamination after cleaning. Always tag electrical wires, harnesses, hydraulic hoses, fuel hoses, coolant hoses and metal tube assemblies, etc, prior to removal. Cap or plug hydraulic and fuel hoses and fitting after removal.

g. During removal and disassembly procedures, check all fasteners for damaged threads. Replace damaged fasteners. Drill out any broken bolts or studs. Retap holes to correct size after drilling. Replace all lockwashers and self-locking nuts. Replace distorted flat washers.

h. Observe all torque values stated in maintenance tasks. Torque values are based on modified SAE Grade 8 fasteners and clamping load.

i. Replace all tie-wraps removed from hoses and wiring. Replace tie-wrap in approximately the same positions they were in prior to removal.

j. Check hydraulic hoses for leaks, blisters, or kinks. Replace damaged hydraulic hoses. Check hydraulic fittings for damage or stripped threads. Replace fittings if damaged. Use protective caps and plugs on lines and components to prevent contamination. Use only clean hydraulic oil when refilling hydraulic systems. Lubricate all seals and preformed packings when reassembling hydraulic components. Replace missing, worn, or damaged chafing gear.



k. Use only authorized replacement parts as specified in maintenance tasks. Do not repair or replace any part or component on a temporary basis. Refer to TM 5-3895-37324P, Repair Parts and Special Tools List (RPSTL) for correct replacement parts.

- 1. Remove rust, corrosion, and coating oils

on components before repainting. Thoroughly clean surfaces before repainting. Do not paint over seals or gaskets. Do not allow paint overspray to enter air intakes or hydraulic components. Do not paint over bearings or lubricated parts. Refer to TM 43-0139 for TACOM equipment painting requirements.

**SECTION I. REPAIR PARTS; TOOLS; SPECIAL TOOLS;  
TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE);  
AND SUPPORT EQUIPMENT**

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Special Tools and Equipment.....	2.3	2-2

**2.2 COMMON TOOLS AND EQUIPMENT.**

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to the CTA 5-970 or CTA 8-100, as applicable to your unit. Refer to Appendix D for common tools used in maintenance procedures.

**2.3 SPECIAL TOOLS AND EQUIPMENT.**

Special tools are listed in TM 5-3895-373-24P, Repair Parts and Special Tools List (RPSTL) and in the Maintenance Allocation Chart (MAC) (TM 5-3895-373-20).

**2.4 REPAIR PARTS.**

Repair parts are listed and illustrated in TM 5-3895-373-24P, Repair Parts and Special Tools List (RPSTL) covering direct support/general support maintenance for this equipment.

SECTION II. TROUBLESHOOTING

	Para	Page
Auger/Conveyor System.....	2.12	2-46
Engine .....	2.6	2-5
Hopper Lift System .....	2.11	2-40
Introduction .....	2.5	2-3
Malfunction Symptom Index.....	2.5.1	2-4
Propulsion System .....	2.8	2-22
Screed Extension System .....	2.14	2-59
Screed Lift System .....	2.10	2-36
Tow Point Lift System .....	2.9	2-33
Track Tension System .....	2.7	2-18
Vibration System .....	2.13	2-52

**2.5 INTRODUCTION.**

This section contains troubleshooting information for direct support and general support maintenance levels. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help to determine probable causes and corrective actions to take. Perform the tests/inspections and corrective actions in the order presented.

- a. engine
- b. track tension
- c. propulsion system
- d. tow point
- e. screed lift
- f. hopper lift
- g. auger/conveyor
- h. vibration
- i. screed extensions

This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor. Only those functions within the Maintenance Allocation Chart (MAC) for direct support and general support maintenance are listed.

Malfunctions, tests or inspections, and corrective actions are listed for each system. Parts with the highest chance of failure are tested or inspected first. Each test or inspection leads to the next likely cause of system failure.

This troubleshooting section is arranged into several tables. Each table addresses one of the following paving machine systems:

Perform the tests, inspections, and corrective actions for each faulty system. To repair or replace each faulty system component, refer to the procedure listed in each table's corrective actions.

**2.5.1 Malfunction Symptom Index.**

The malfunction symptom index is a reference list of the troubleshooting tables. Refer to the malfunction symptom index before troubleshooting. Each system and its faults are listed in the order they appear in the troubleshooting tables. To find the correct test or inspection procedure, refer to the system and its symptom. A troubleshooting procedure reference is listed for each symptom. Refer to the correct procedure in the troubleshooting tables.

**Malfunction Symptom Index**

**TROUBLESHOOTING TABLE**

Engine ..... 2-1  
 Engine fails to start or fails to start easily  
 Low power output, excessive fuel consumption/black exhaust, or misfiring  
 Blue or white exhaust  
 Low oil pressure  
 High oil pressure  
 Engine knocking  
 Rough or erratic running/excessive engine vibration  
 Overheating  
 Poor compression

Track tension ..... 2-2  
 Track fails to maintain operating tension  
 Track fails to maintain correct tension (in reverse only)  
 Auxiliary hydraulic supply to vibration and cylinder circuits faulty

Propulsion system ..... 2-3  
 Track fails to move or moves sluggishly  
 Track fails to move at either travel or pave speed  
 Track moves one direction only  
 Mistracking  
 No hydraulic functions

Tow point ..... 2-4  
 Tow point lift cylinders do not operate  
 One tow point lift cylinder fails to operate  
 Auxiliary hydraulic supply to vibration and cylinder circuits faulty

Screed lift ..... 2-5  
 Screed fails to lift  
 Screed fails to lower  
 Screed fails to maintain position  
 Auxiliary hydraulic supply to vibration and cylinder circuits faulty

Hopper lift ..... 2-6  
 Hopper fails to operate  
 One hopper wing fails to operate  
 Hopper wing fails to remain in raised position  
 Auxiliary hydraulic supply to vibration and cylinder circuits faulty

Auger/conveyor ..... 2-7  
 Auger/conveyor does not operate or operates sluggishly  
 Auger/conveyor operates continuously

Vibration ..... 2-8  
 Vibrators fail to operate or operate sluggishly  
 Extension screed vibrators fail to operate  
 Vibrator runs continuously  
 Auxiliary hydraulic supply to vibration and cylinder circuits faulty  
 Vibration pump hydraulic supply faulty

Auxiliary Screed extension..... 2-9  
 Screed extension fails to operate  
 One screed extension function fails to operate  
 Auxiliary hydraulic supply to vibration and cylinder circuits faulty

**2.6 ENGINE.**

Table 2-1 lists common malfunctions associated with the engine that may be found during operation or maintenance of the paving machine. Perform the tests/inspections and corrective actions for a particular

malfunction in order given. This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

*Table 2-1. Engine Troubleshooting.*

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
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1. ENGINE FAILS TO START OR FAILS TO START EASILY.

**WARNING**

Fuel is very flammable and can explode easily. To avoid injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on a fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read, "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

Direct contact with a high pressure fuel spray may cause serious injuries. Avoid direct contact with fuel spray. If fuel spray penetrates your skin, get medical aid immediately. Eye protection and rubber gloves should be worn when working with fuel.

**NOTE**

Individual plungers are used in the fuel injection pump to provide fuel to each individual injector. A worn or damaged fuel injection pump plunger will only affect one cylinder.

Make sure to tighten fuel injector nozzle fitting after each cylinder is tested.

Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. ENGINE FAILS TO START OR FAILS TO START EASILY - Continued.

**WARNING**

Fuel is very flammable and can explode easily. To avoid injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on a fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read, "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

Direct contact with a high pressure fuel spray may cause serious injuries. Avoid direct contact with fuel spray. If fuel spray penetrates your skin, get medical aid immediately. Eye protection and rubber gloves should be worn when working with fuel.

Step 1. Open front top left access door per TM 5-3895-373-10. Check for fuel supplied from fuel injection pump at each injector. Loosen (but do not remove) one fuel injector nozzle fitting and crank engine for five seconds. Tighten fuel injector nozzle fitting. Repeat at each fuel injector.

If fuel does not appear at fitting, fuel injection pump is faulty. Replace or repair faulty fuel injection pump per paragraph 2.19.

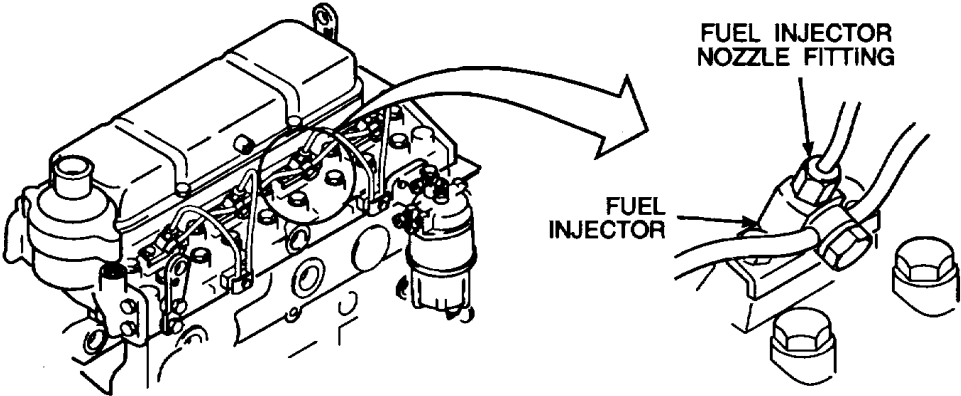


Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. ENGINE FAILS TO START OR FAILS TO START EASILY Continued.		
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	Step 2. Check for faulty fuel injection pump. Run engine per TM 5-3895-373-10. Look for excessive smoke and oil flowing from dipstick flange. Remove dipstick and inspect viscosity of engine oil.	
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		If engine oil is thin or watery, if excessive exhaust smoke is observed, or if oil is seen flowing from the dipstick flange, replace/repair faulty fuel injection pump per paragraph 2.19. After replacing or repairing fuel injection pump, change engine oil per LO 5-3895-373-12.
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<b>WARNING</b>
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Fuel is very flammable and can explode easily. To avoid injury or death: Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on a fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read, "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

Direct contact with a high pressure fuel spray may cause serious injuries. Avoid direct contact with fuel spray. If fuel spray penetrates your skin, get medical aid immediately. Eye protection and rubber gloves should be worn when working with fuel.

	Step 3. Check function of fuel injectors.	
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		If the engine will not start and fuel has been found at each injector per step 1, inspect and repair or replace faulty fuel injectors per paragraph 2.18.
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		If no fuel is found at any injectors, replace/repair fuel injection pump per paragraph 2.19.
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Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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## 1. ENGINE FAILS TO START OR FAILS TO START EASILY Continued.

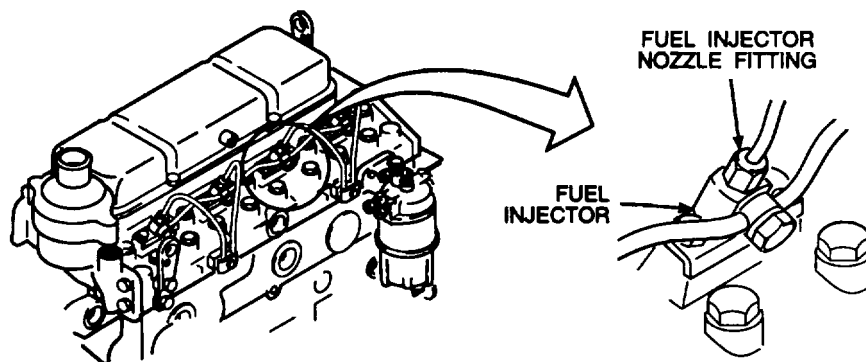
**NOTE**

A drop in engine speed caused by loosening fuel line supplying fuel injector indicates the injector was delivering fuel to cylinder. If engine speed is not affected by loosening fuel line supply to fuel injector, fuel injector is faulty.

If the engine does not start easily; once the engine is operating, loosen a fuel line at one fuel injector nozzle fitting. Listen for a change in engine speed. Check the injector for each cylinder until faulty fuel injector is found.

If a fuel injector is determined faulty, adjust or replace fuel injectors as necessary per paragraph 2.18.

If replacement of a faulty fuel injector does not correct malfunction, or is not out of adjustment, replace/repair fuel injection pump per paragraph 2.19.



Step 4. Check adjustment and timing of intake and exhaust valves per TM 5-3895-373-20.

Adjust intake and/or exhaust valves per TM 5-3895-373-20.

Step 5. Check for balanced engine compression per TM 9-4910-571-12&P.

If engine fails compression unbalance test, compression is below 300 psi (2068 kPa) or varies \*25 psi (172 kPa) between cylinders, refer to MALFUNCTION 9. POOR COMPRESSION.

Step 6. Inspect intake and exhaust valves, push rods, springs, and guides. Refer to paragraph 2.17.

Replace or repair intake/exhaust valves and valve seat inserts showing signs of pitting. Replace push rods, springs, and guides as necessary. Refer to paragraph 2.17.

Step 7. Close front top left access door per TM 5-3895-373-10.

Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2.	LOW POWER OUTPUT, EXCESSIVE FUEL CONSUMPTION/BLACK EXHAUST, OR MISFIRING.	Refer to MALFUNCTION 1. ENGINE FAILS TO START OR FAILS TO START EASILY.
3.	BLUE OR WHITE EXHAUST.	Step 1. Perform steps 1 to 4 of MALFUNCTION 1. ENGINE FAILS TO START OR FAILS TO START EASILY.
Step 2.	Check for broken/worn, or sticking piston rings by performing a compression test on engine.	If compression in one or more cylinders is less than 275 psi (1896 kPa), replace or repair damaged components as necessary. Refer to paragraph 2.17.
Step 3.	Remove and inspect intake and exhaust valves, push rods, springs, and guides. Refer to paragraph 2.17.	Replace or repair intake/exhaust valves and valve seat inserts showing signs of pitting. Replace push rods, springs, and guides as necessary. Refer to paragraph 2.17.
4.	LOW OIL PRESSURE.	<b>NOTE</b>
Coolant mixed with oil produces a milky discoloration or a brown sludge and will cause low oil pressure.		
Step 1.	Open front top left access door per TM 5-3895-373-10. Remove dipstick and check if oil has a milky discoloration or has become a brown sludge. The following list contains possible causes of contamination. Check each possible cause using the method described. Repair or replace damaged components as necessary.	
If oil is contaminated with coolant, go to step 2.		
If oil is not contaminated with coolant, go to step 6.		



Table 2-1. Engine Troubleshooting - Continued.

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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4. LOW OIL PRESSURE- Continued.

**WARNING**

Do not touch hot engine with bare hands; injury to personnel will result. Use insulated gloves when working with a hot engine.

Step 2. While engine is 180°F (82,2°C), remove valve cover and pressurize coolant system through radiator cap to 20 psi (138 kPa) per TM 750-254.

If core plug leaks, replace core plug. If leakage is present from water jacket, replace cylinder head. Refer to paragraph 2.15.

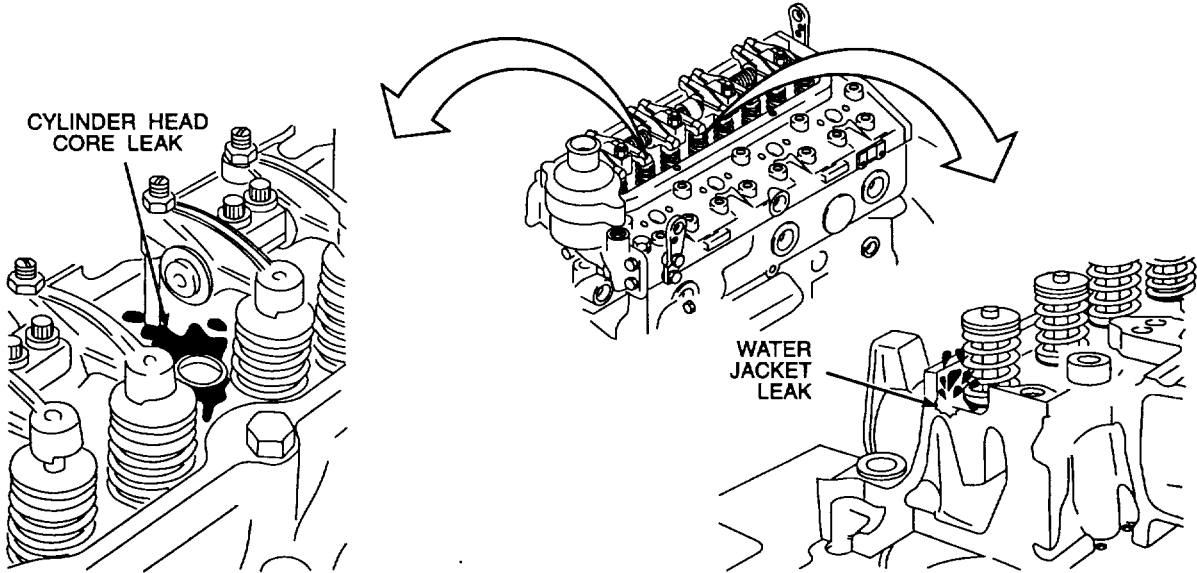


Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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4. LOW OIL PRESSURE - Continued.

**NOTE**

If engine has been at low idle for more than 1 hour, fuel may have entered past piston rings into the lubrication oil system.

Step 3 If oil is watery or thin, test fuel injectors per paragraph 2.18.

If fuel injectors are faulty, adjust or replace fuel injectors as necessary. Refer to paragraph 2.18.

If fuel injectors operate normally, replace or repair faulty fuel injection pump per paragraph 2.19.

Step 4. Remove right access cover per TM 5-3895-373-10. Check for faulty oil pump by removing oil filter and ensuring oil filter is filled to the top with oil.

If oil filter is partially filled or empty, replace/repair faulty oil pump per paragraph 2.17.

Step 5. Remove cylinder head per paragraph 2.15 and inspect for cracks in water jacket.

Replace cylinder head per TM 5-3895-373-20 or engine block if damaged per paragraph 2.17.

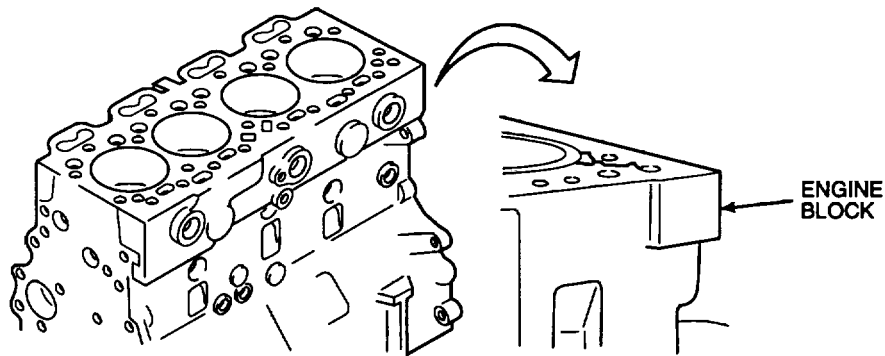


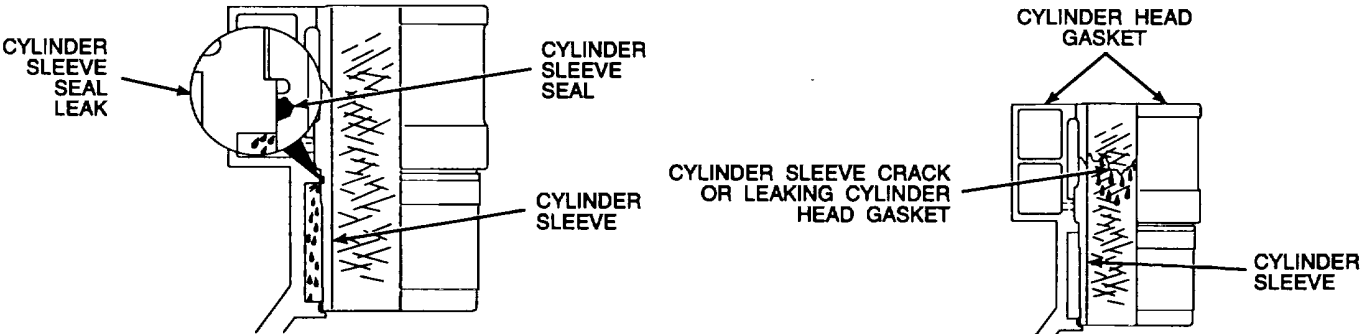
Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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4. LOW OIL PRESSURE - Continued.

Step 6. Remove oil sump per paragraph 2.17 and pressurize engine water jacket to 20 psi (138 kPa). Seal water pump outlet and pressurize through thermostat housing.

If leakage is present at bottom end of cylinder sleeves (between sleeve and block) replace cylinder sleeves per paragraph 2.17. If leakage is present at inside of sleeve bore, check cylinder head gasket. If gasket is damaged, replace per paragraph 2.15. If gasket is not damaged, replace cylinder sleeve per paragraph 2.17.



Step 7. Remove oil sump per paragraph 2.17. Check operation of oil pressure relief valve.

Replace/repair oil pressure relief valve if stuck open or has a broken relief valve spring per paragraph 2.17

Step 8. Remove oil sump per paragraph 2.17. Check oil pump strainer tube for blockage or leaks.

Replace per paragraph 2.17 or clear blocked oil pump strainer tube.

Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. LOW OIL PRESSURE- Continued.	Step 9. Remove oil sump per paragraph 2.17. Check for loose main bearing caps and worn main sleeve bearings per paragraph 2.17.	Replace main sleeve bearings with bearing caps. Refer to paragraph 2.17.
	Step 10. Install right access cover per TM 5-3895-373-10. Close front top left access door per TM 5-3895-373-10.	
5. HIGH OIL PRESSURE.		

**NOTE**

After fault isolation procedure of TM 5-3895-373-20 has been performed, high oil pressure can only be caused by a faulty oil pressure relief valve (stuck closed).

Step 1. Remove oil sump per paragraph 2.17. Check oil pressure relief valve.

Replace oil pressure relief valve per paragraph 2.17.

Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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## 6. ENGINE KNOCKING.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on a fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read, "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

Direct contact with a high pressure fuel spray may cause serious injuries. Avoid direct contact with fuel spray. If fuel spray penetrates your skin, get medical aid immediately. Eye protection and rubber gloves should be worn when working with fuel.

Step 1. Open front top left access door per TM 5-3895-373-10. Check function of fuel injectors.

**NOTE**

A drop in engine speed caused by loosening fuel line supplying fuel injector indicates the injector was delivering fuel to cylinder. If engine speed is not affected by loosening fuel line supply to fuel injector, fuel injector is faulty or is not receiving fuel.

Run engine per TM 5-3895-373-10. Loosen fuel line at one injector and listen for a change in engine speed. Check injector for each cylinder until faulty fuel injector is found.

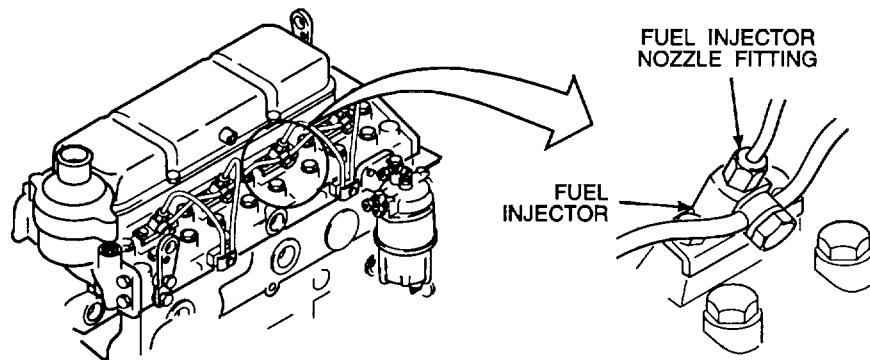
If a fuel injector is determined faulty, replace fuel injector per paragraph 2.18 or replace or repair fuel line to injector.

If replacement of a fuel injector or fuel line does not correct the malfunction, or is not out of adjustment, replace/repair fuel injection pump per paragraph 2.19.

Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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## 6. ENGINE KNOCKING - Continued.



Step 2. Check if engine temperature is 194°F (90°C) or greater.

If engine temperature is 194°F (90°C) or greater, perform steps 1 and 2 of MALFUNCTION 8. OVERHEATING.

Step 3. Check if engine is audibly misfiring.

If engine is audibly misfiring, adjust intake and exhaust valves, if necessary, per TM 5-3895-373-20.

Step 4. Remove and inspect intake and exhaust valves, push rods, springs, and guides. Refer to paragraph 2.17.

Replace or repair intake/exhaust valves and valve seat inserts showing signs of pitting. Replace push rods, springs, and guides as necessary. Refer to paragraph 2.17.

Step 5. Check for worn cylinder bores, broken/worn, or sticking piston rings, worn/damaged bearings, piston seizure or incorrect piston height. Refer to paragraph 2.17.

Replace worn or damaged components. Refer to paragraph 2.17.

Step 6. Close front top left access door per TM 5-3895-373-10.

Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. ROUGH OR ERRATIC RUNNING/EXCESSIVE ENGINE VIBRATION.	Step 1. Perform steps 1 through 5 of MALFUNCTION 1. ENGINE FAILS TO START OR FAILS TO START EASILY.	
	Step 2. Check if engine temperature is 194°F (90°C) or greater.	If engine temperature is 194°F (90°C) or greater, perform steps 11 and 2 of MALFUNCTION 8. OVERHEATING.
	Step 3. Remove and inspect intake and exhaust valves, push rods, springs, and guides. Refer to paragraph 2.17.	Replace or repair intake/exhaust valves and valve seat inserts showing signs of pitting. Replace push rods, springs and guides as necessary. Refer to paragraph 2.17.
	Step 4. Check for broken/worn, or sticking piston rings, worn/damaged bearings, or incorrect piston height. Refer to paragraph 2.17.	Replace worn or damaged components. Refer to paragraph 2.17.
8. OVERHEATING.		

**NOTE**

Coolant mixed with oil produces a milky discoloration and will cause low oil pressure.

Step 1. Open front top left access door per TM 5-3895-373-10. Remove dipstick and check if engine oil has a milky discoloration or is a brown sludge.

If coolant is present in oil, perform step 1 of MALFUNCTION 4. LOW OIL PRESSURE.

Step 2. Remove water pump per TM 5-3895-373-20.

If water pump is defective, repair water pump per paragraph 2.23.

Step 3. Check for restriction in water jacket per paragraph 2.17.

Remove restriction.

Step 4. Close front top left access door per TM 5-3895-373-10.

Table 2-1. Engine Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. POOR COMPRESSION.	Step 1. Open front top left access door per TM 5-3895-373-10. Check if compression can be raised significantly by squirting oil into cylinder with low compression.	If compression can be raised significantly by squirting oil into cylinder, repair engine by replacing piston rings. Refer to paragraph 2.17.
	Step 2. Check if compression is 275 psi (1896 kPa) or less on one or more nonadjacent cylinders.	<b>NOTE</b>
		Valve leakage is often audible from intake or exhaust manifolds.
		Replace or repair cylinder head. Refer to paragraph 2.15.
	Step 3. Check if compression is 275 psi (1896 kPa) or less on one or more adjacent cylinders. If compression is 275 psi (1896 kPa) or less on one or more adjacent cylinders, remove cylinder head per paragraph 2.15 and inspect for blown head gasket.	If head gasket is blown, replace head gasket per paragraph 2.15.
		If head gasket is not blown, replace/repair cylinder head. Refer to paragraph 2.15.
	Step 4. Check for broken/worn or sticking piston rings or worn/damaged bearings. Refer to paragraph 2.17.	Replace worn or damaged components. Refer to paragraph 2.17.
	Step 5. Close front top left access door per TM 5-3895-373-10.	



**2.7 TRACK TENSION SYSTEM.**

Table 2-2 lists common malfunctions associated with the track tension system that may be found during operation or maintenance of the paving machine. Perform the tests/ inspections and corrective actions for a particular

malfunction in order given. This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

*Table 2-2. Track Tension Troubleshooting.*

<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

1. TRACK FAILS TO MAINTAIN OPERATING TENSION.

Step 1. Check operation of hopper lift cylinders and screed extension cylinders.

If hopper lift cylinders and screed extension cylinders operate normally, go to step 3.

If hopper lift cylinders and screed extension cylinder fail to operate normally, go to step 2.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at pressure test point indicated by each individual test per TM 9-4940-468-14. Make sure all ratings of fittings and hoses used are adequate for maximum pressures and flows being tested.

**NOTE**

System operating pressure must be at 2475 -25 psi (17 066 ±172 kPa) before performing this test. If pressure is not correct, refer to paragraph 2.51, and reset system operating pressure.

Table 2-2. Track Tension Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. TRACK FAILS TO MAINTAIN OPERATING TENSION - Continued.

Step 2. Open center top right and center top left access doors per TM 5-3895-373-10. Open right access door per TM 5-3895-373-10. Check track tensioning relief valve setting of track tension relief.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Relieve system pressure by loosening hose fitting at accumulator before installing hydraulic system tester at port (2). Install hydraulic system tester for pressure test at port (2) per TM 9-4940-468-14. To check relief valve, turn track tensioning unloading valve adjustment screw all the way in to obtain maximum pressure. With paving machine at high idle, track tensioning relief valve should unload at 1800 psi (12 411 kPa). After checking relief valve setting, turn engine off and relieve system pressure by loosening hose fitting at accumulator. Tighten fitting and adjust unloading valve adjustment screw to reset system pressure to 900 psi (6205 kPa).

If relief lifts below 1800 psi (12 411 kPa), or is stuck open, adjust track tensioning relief valve per paragraph 2.51, or replace/repair per paragraph 2.38.

If track tension relief functions properly, replace/repair track tensioning unloading valve per 2.38.

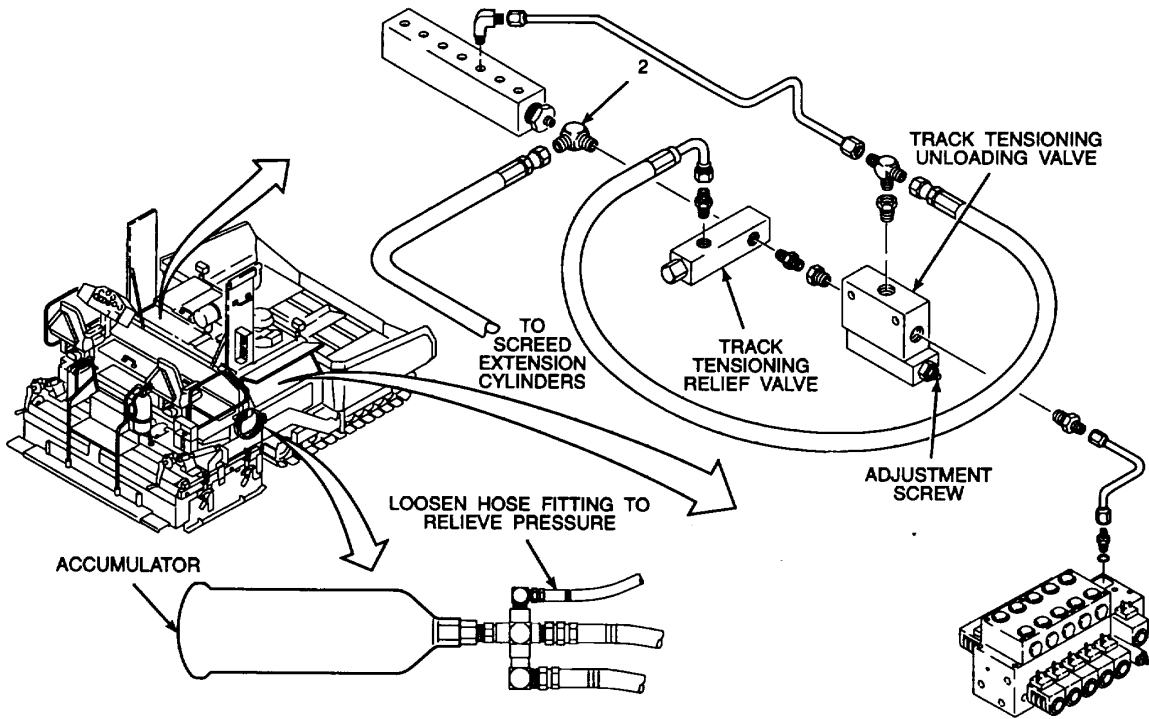


Table 2-2. Track Tension Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. TRACK FAILS TO MAINTAIN OPERATING TENSION- Continued.

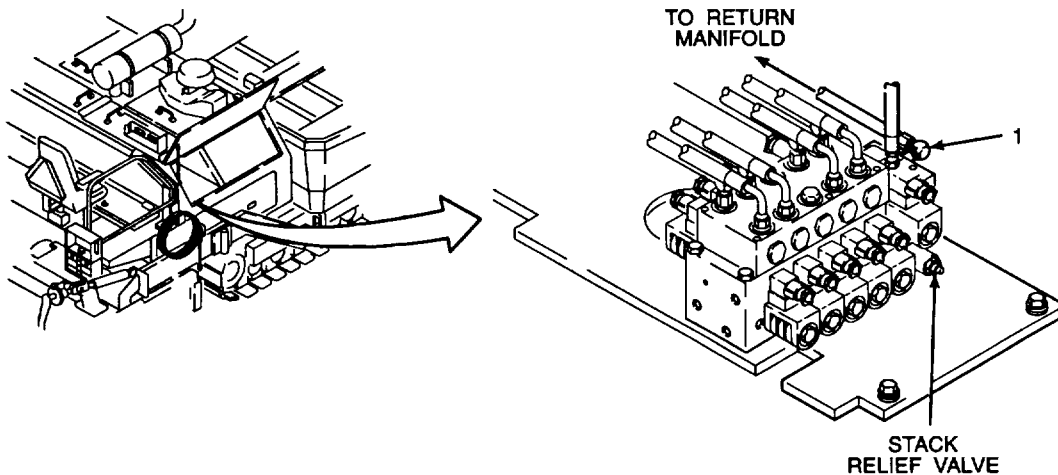
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- Step 3. Install hydraulic system tester at outlet (1) for flow test per TM 9-4940-468-14. Check for flow at stack valve outlet (1) to return manifold with screed lift switch in raise position.

If flow is present, replace stack relief valve per paragraph 2.44.

If no flow is detected, refer to MALFUNCTION 3. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.



- Step 4. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Close center top left and center top right access doors per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10.

2. TRACK FAILS TO MAINTAIN CORRECT TENSION (IN REVERSE ONLY).

Check if track maintains correct tension in forward direction.

If track fails to maintain correct tension in forward direction, refer to MALFUNCTION 1. TRACK FAILS TO MAINTAIN OPERATING TENSION.

If track maintains correct tension in forward direction, replace/repair track tensioning relief valve per paragraph 2.38.

Table 2-2. Track Tension Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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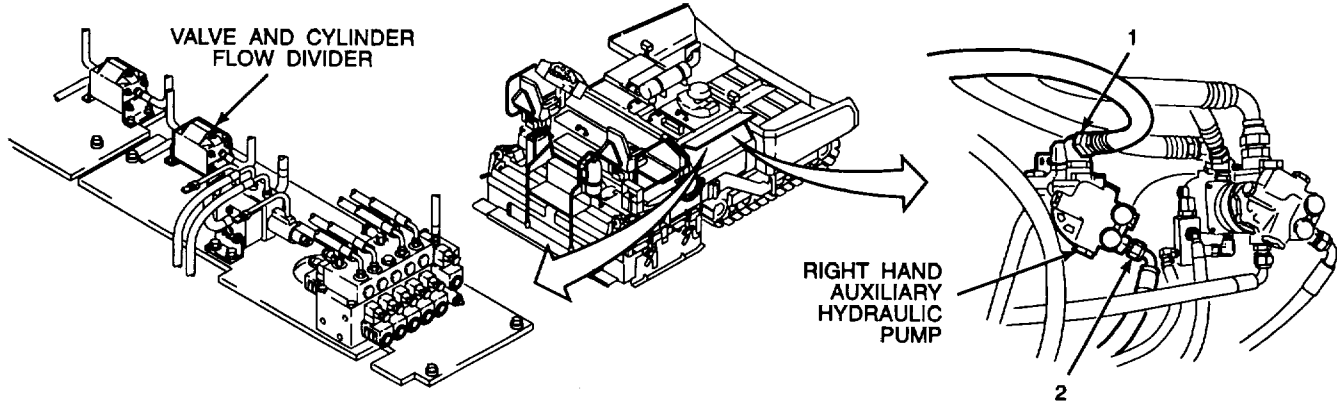
3. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 1. Open center top right and center top left access doors per TM 5-3895-373-10. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. With paving machine off per TM 5-3895-373-10, check right hand auxiliary hydraulic system suction lines at (1) using hand pump per TM 9-4940-468-14.

Replace or repair components (auxiliary hydraulic system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.



**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

Step 2. Install hydraulic system tester at port (2) for flow test per TM 9-4940-468-14. Check flow at right hand auxiliary hydraulic pump discharge port (2). Measure flow rate at 2475 ±25 psi (17 066 ±172 kPa) with engine at 2640 ±40 rpm.

If flow rate is less than 5 gpm (19 ℓ/min) at 2475 ±25 psi (17 066 ±172 kPa), replace/repair right hand auxiliary hydraulic pump per paragraph 2.42.

If flow rate is at least 5 gpm (19 ℓ.min) at 2475 ±25 psi (17 066 +172 kPa), replace valve and cylinder flow divider per paragraph 2.55 and repair per paragraph 2.49.

Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10. Close center top left and center top right access doors per TM 5-3895-373-10.

**2.8 PROPULSION SYSTEM.**

Table 2-3 lists common malfunctions associated with the propulsion system that may be found during operation or maintenance of the paving machine. Perform the tests/inspections and corrective actions for a particular

malfunction in the order given. This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

*Table 2-3. Propulsion System Troubleshooting.*

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**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**NOTE**

Throughout propulsion system troubleshooting (Table 2-3), reference is made to right and left hydraulic propulsion pumps, pilot control valves, etc. These references do not represent physical location of individual components. They refer to physical locations of systems. For example, the left hydraulic propulsion pump refers to the hydraulic propulsion pump that drives the left hand propulsion motor and track.

The following test requires use of a hydraulic system tester per TM 9-4940-468-14. Install tester in-line at test point indicated. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

Table 2-3. Propulsion System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. TRACK FAILS TO MOVE OR MOVES SLUGGISHLY.

**WARNING**

The following test is completed with paving machine supported off of the ground. Use extreme caution while manually engaging pump pilot control valve as the paving machine tracks may move. Make sure BOTH tracks are clear before manually engaging pilot control valve. Severe personnel injury or death may result from crushing hazard or from sudden movement of paving machine track if extreme caution is not used.

Never crawl under paving machine or screed to perform maintenance unless equipment is securely cribbed. Equipment may fall and cause serious injury or death to personnel.

Step 1. Jack and crib (for track maintenance) paving machine per TM 5-3895-373-20. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. Check operation of pump pilot control valve by manually engaging valve of faulty track drive. If track moves, pump pilot control valve is faulty.

Replace pump pilot control valve per paragraph 2.31.

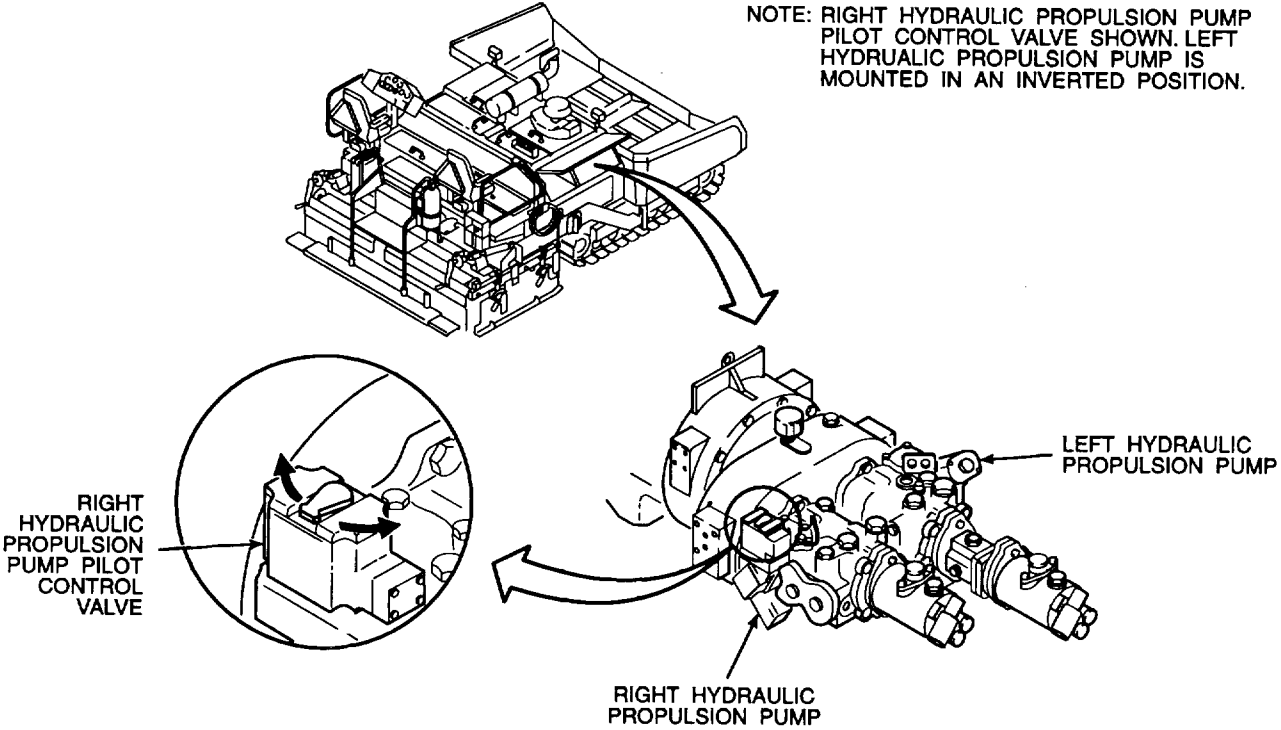


Table 2-3. Propulsion System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. TRACK FAILS TO MOVE OR MOVES SLUGGISHLY- Continued.

Step 2. Check if one brake releases by engaging track drive with control handle.

If one brake releases, replace/repair brake not releasing per paragraph 2.33. Go to step 4.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 3. Open center top right and center top left access doors per TM 5-3895-373-10. Install hydraulic system tester at inlet (1) for pressure test per TM 9-4940-468-14. Check pressure at brake valve inlet (1) with brake valve energized. Pressure at brake valve inlet should be greater than 135 psi (931 kPa).

If brake valve inlet pressure is greater than 135 psi (931 kPa), replace/repair brake valve per paragraph 2.28.

If brake valve inlet pressure is less than 135 psi (931 kPa), replace/repair left hand hydraulic propulsion pump per paragraph 2.30.

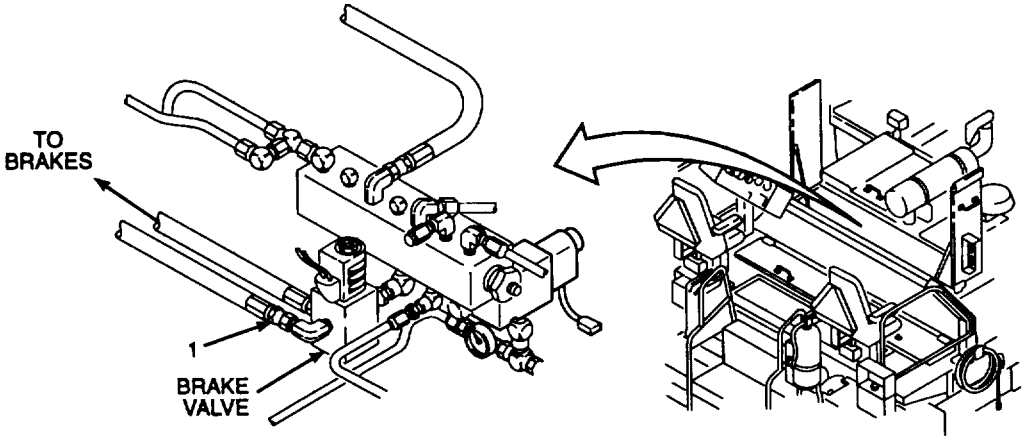


Table 2-3. Propulsion System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. TRACK FAILS TO MOVE OR MOVES SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 4. With paving machine off, check hydraulic system suction lines at right hydraulic propulsion pump inlet (2) using hand pump per TM 9-4940-468-14. Propulsion system suction lines are faulty if hydraulic oil does not flow through hand pump when hand pump is operated.

Replace/repair components (propulsion system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

NOTE: RIGHT HYDRAULIC PROPULSION PUMP SUCTION SHOWN. LEFT HYDRAULIC PROPULSION PUMP IS MOUNTED IN AN INVERTED POSITION.

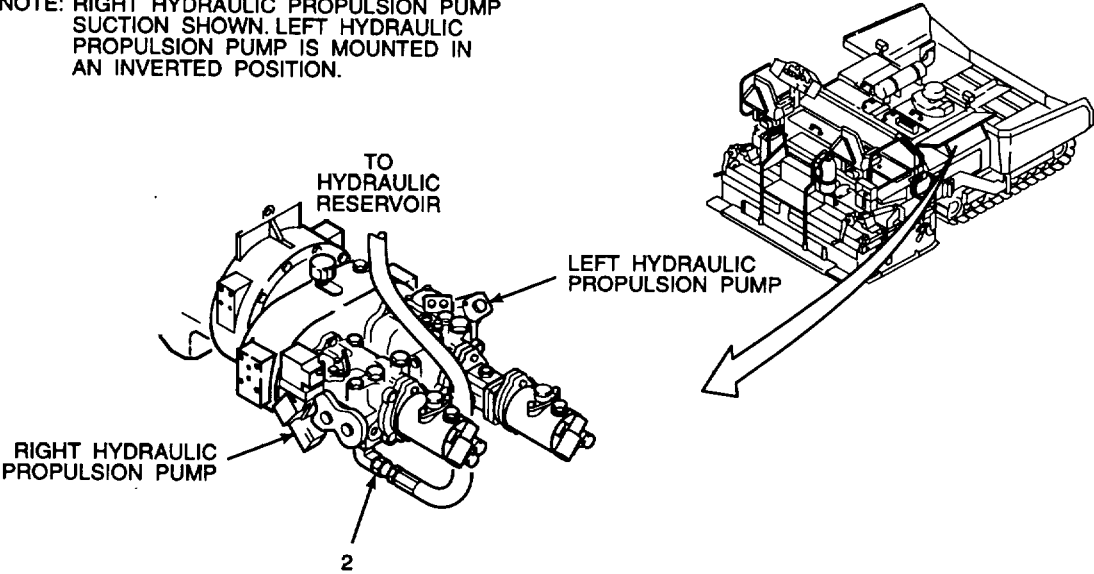




Table 2-3. Propulsion System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. TRACK FAILS TO MOVE OR MOVES SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at discharge of hydraulic pump per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

There are two discharges located on each hydraulic propulsion pump. One discharge supplies the hydraulic propulsion motor in forward travel. The other discharge supplies the hydraulic propulsion motor in reverse travel. Replace or repair faulty hydraulic propulsion pump if either discharge fails the following check.

Step 5. Connect hydraulic system tester pressure port to (3) and reservoir port to (4). With control handle at maximum forward position, check flow. Connect hydraulic system tester pressure port to (4) and reservoir port to (3). With control handle in maximum reverse position, check flow. Check maximum discharge flow rate of hydraulic propulsion pump. Propulsion pump discharge flow rate should be no less than 26 +1-1/2 gpm (98 ±5,7 ℓ/min) at 3000 psi (20 685 kPa) with engine at 2640 ±40 rpm.

If discharge is less than 26 +1-1/2 gpm (98 +5,7 ℓ/min) at 3000 psi (20 685 kPa), replace/repair hydraulic propulsion pump per paragraph 2.30.

NOTE: RIGHT HYDRAULIC PROPULSION PUMP DISCHARGES SHOWN. LEFT HYDRAULIC PROPULSION PUMP IS MOUNTED IN AN INVERTED POSITION.

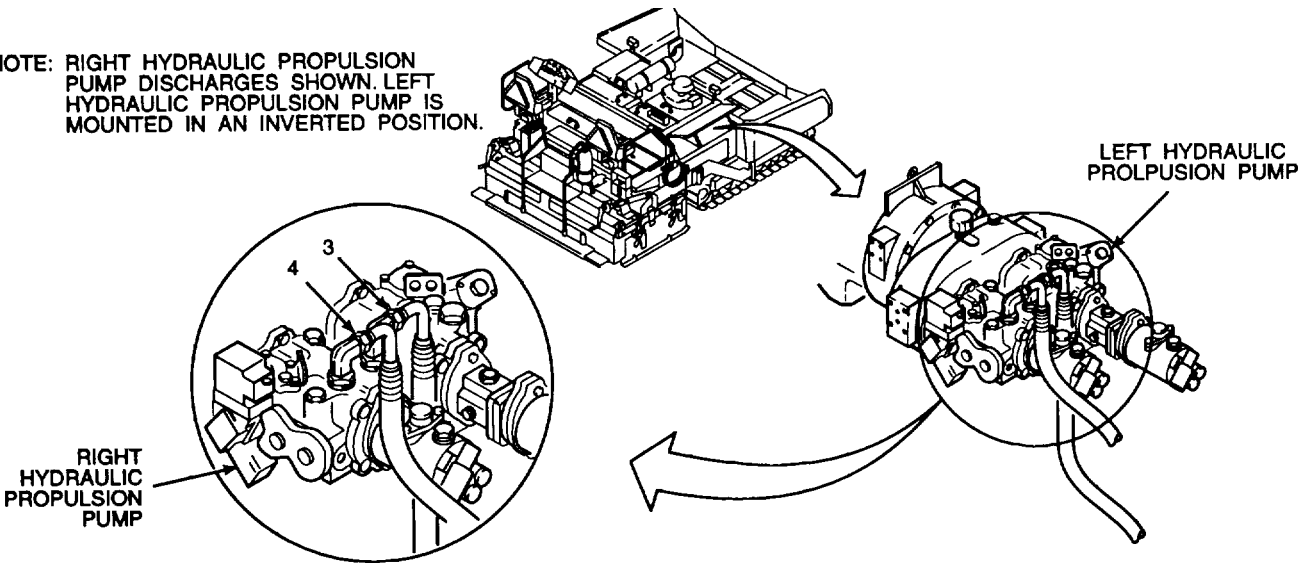


Table 2-3. Propulsion System Troubleshooting - Continued.

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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1. TRACK FAILS TO MOVE OR MOVES SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 6. Install hydraulic system tester at ports (5 and 6) for flow tests per TM 94940-468-14. Check hydraulic propulsion motor case drainage rate. Check rate at port (5) for left hydraulic propulsion motor and at port (6) for right hydraulic propulsion motor. Acceptable drainage rate is less than 3 gpm (11 l/min) with engine at 2640 +40 rpm and control handles full forward.

Replace/repair hydraulic propulsion motor per paragraph 2.32. Most likely cause of problem is malfunctioning flushing valve.

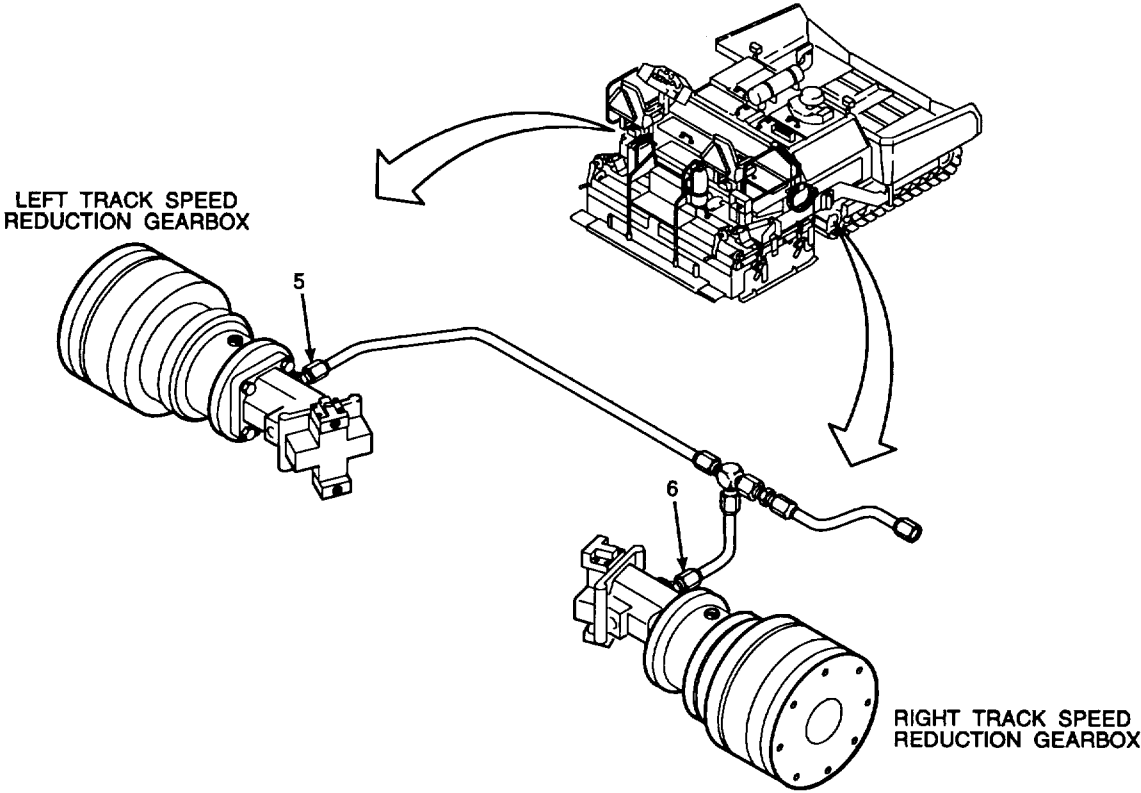


Table 2-3. Propulsion System Troubleshooting - Continued.

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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## 1. TRACK FAILS TO MOVE OR MOVES SLUGGISHLY- Continued.

Step 7. Remove speed reduction gearbox per paragraph 2.33. Check speed reduction gearbox for damaged gear subassemblies, gears, bearings, or drive hub for broken drive hub shaft.

Replace/repair speed reduction gearbox per paragraph 2.33 or broken hub drive shaft per paragraph 2.40.

Step 8. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Remove cribbing and lower per TM 5-3895-373-20. Install right access door per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10. Close center top left and center top right access doors per TM 5-3895-373-10.

## 2. TRACK FAILS TO MOVE AT EITHER TRAVEL OR PAVE SPEED.

**WARNING**

The following test is completed with the paving machine supported off of the ground. Use extreme caution when engaging track drive as the tracks may move. Make sure BOTH tracks are clear before engaging track drive. Severe personnel injury or death may result from crushing hazard or from sudden movement of paving machine track if extreme caution is not used.

Never crawl under paving machine or screed to perform maintenance unless equipment is securely cribbed. Equipment may fall and cause serious injury or death to personnel.

Step 1. Jack and crib (for track maintenance) paving machine per TM 5-3895-373-20. Check if track operates normally at other speed.

Replace high speed shift valve per paragraph 2.27.

Step 2. Remove cribbing and lower per TM 5-3895-373-20.

Table 2-3. Propulsion System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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3. TRACK MOVES ONE DIRECTION ONLY (FORWARD OR REVERSE).

**WARNING**

The following test is completed with paving machine supported off of the ground. Use extreme caution while manual engaging pump pilot control valve as the paving machine tracks may move. Make sure BOTH tracks are clear before manually engaging pilot control valve. Severe personnel injury or death may result from crushing hazard or from sudden movement of paving machine track if extreme caution is not used.

Never crawl under paving machine or screed to perform maintenance unless equipment is securely cribbed. Equipment may fall and cause serious injury or death to personnel.

Step 1. Jack and crib (for track maintenance) paving machine per TM 5-3895-373-20. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. Check operation of pump pilot control valve by manually engaging pilot control valve of faulty track drive. If track moves in both directions, pump pilot control valve is faulty.

Replace pump pilot control valve per paragraph 2.31.

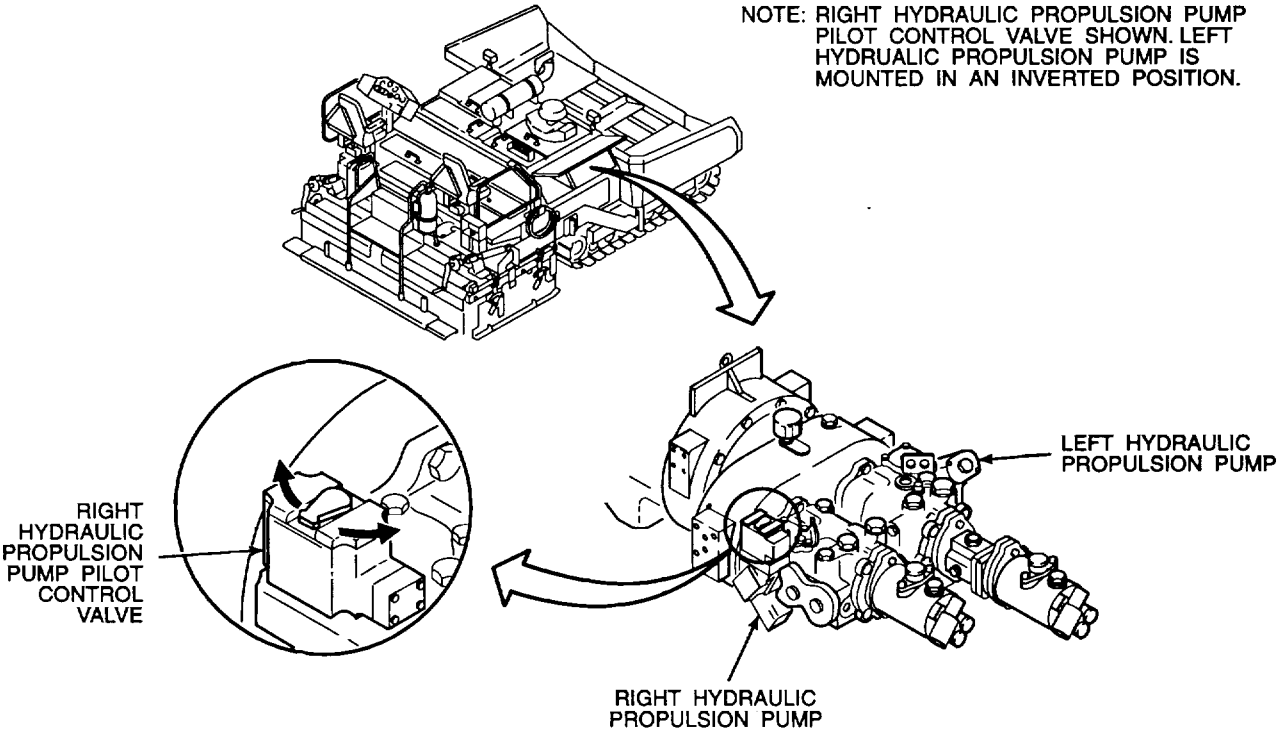


Table 2-3. Propulsion System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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3. TRACK MOVES ONE DIRECTION ONLY (FORWARD OR REVERSE) - Continued.

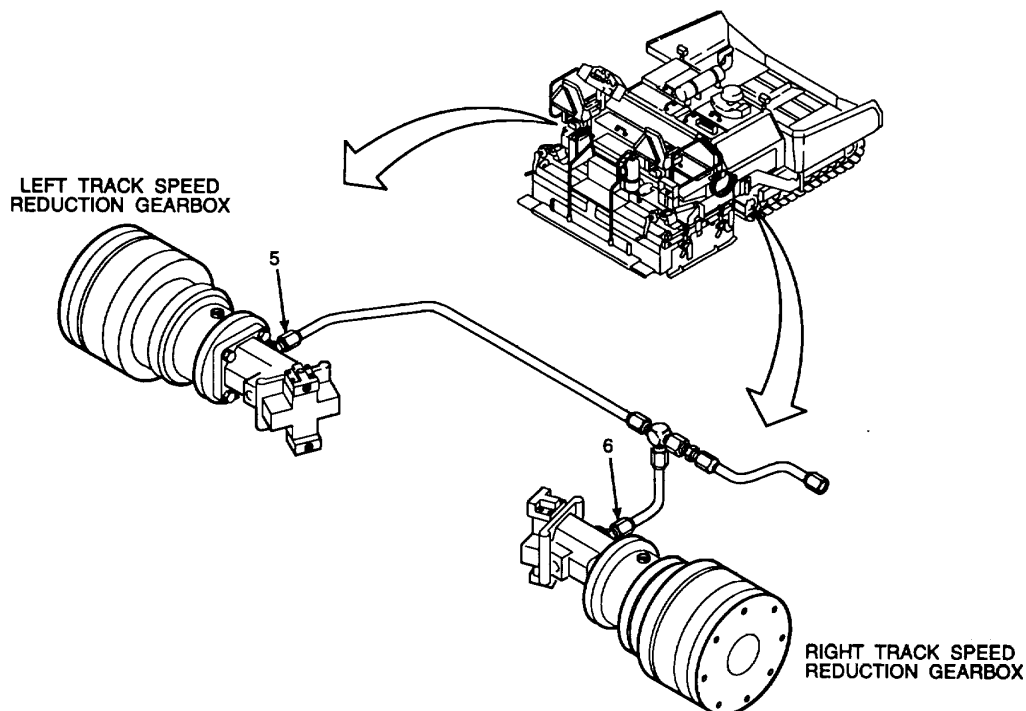
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Never crawl under paving machine or screed to perform maintenance unless equipment is securely cribbed. Equipment may fall and cause serious injury or death to personnel.

Step 2. Install hydraulic system tester at ports (5 and 6) for flow tests per TM 9-4940-468-14. Check hydraulic propulsion motor case drainage rate. Check flow rate at port (5) for left hydraulic propulsion motor and at port (6) for right hydraulic propulsion motor. Acceptable drainage rate is less than 3 gpm (11 l/min) with engine at 2640 ±40 rpm and control handles at full forward.

Replace/repair hydraulic propulsion motor per paragraph 2.32. Most common problem is malfunctioning flushing valve.



Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Remove cribbing and lower per TM 5-3895-373-20.

Table 2-3. Propulsion System Troubleshooting - Continued.

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<hr/> <b>4. MISTRACKING.</b>		
Step 1.	Check operation of main control handle by performing voltage check per TM 5-3895-373-20.	If voltage is not correct, calibrate main control handle per TM 5-3895-373-20.
Step 2.	Check which direction paving machine mistracks in forward and reverse.	If right track is slower in forward direction and faster in reverse direction, repair right hydraulic propulsion pump by adjusting neutral setting per paragraph 2.30.  If left track is slower in forward direction and faster in reverse direction, repair left hydraulic propulsion pump by adjusting neutral setting per paragraph 2.30.

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Table 2-3. Propulsion System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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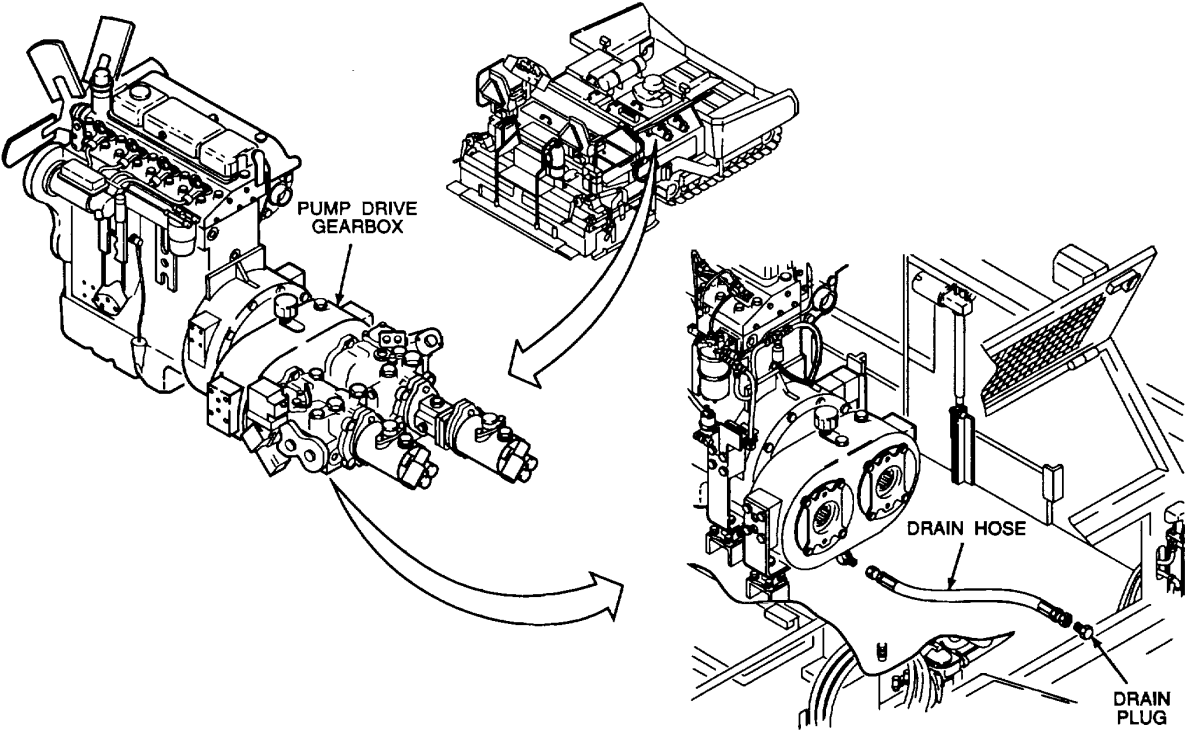
5. NO HYDRAULIC FUNCTIONS.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 1. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. Sample pump drive gearbox oil. Remove drain plug from drain hose and drain 112 pint of oil from drain hose into utility pail. Place sample bottle per DA-PAM 738-750 under drain hose and fill the sample bottle to approximately 1/2 in. (1, 3 cm) below the neck of the bottle. Replace drain plug into drain hose. Inspect oil sample for metallic particles indicating damaged gears, bearings, etc.

Replace/repair pump drive gearbox per paragraph 2.29.



Step 2. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10.

2.9 TOW POINT LIFT SYSTEM.

Table 2-4 lists common malfunctions associated with the tow point lift system that may be found during operation or maintenance of the paving machine. Perform the tests/ inspections and corrective actions for a particular malfunction in order given.

This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

*Table 2-4. Tow Point Lift System Troubleshooting.*

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. TOW POINT CYLINDERS DO NOT OPERATE.

**NOTE**

**The following tests may require use of a hydraulic system tester. Install tester in-line at pressure test point indicated by each individual test per TM 9-4940-468-14. Make sure all ratings of fittings and hoses used are adequate for maximum pressures and flows being tested.**

**NOTE**

**Ensure that shutoff valves on both tow point cylinders are fully opened.**

Step 1. Check if both tow point cylinders fail to operate per TM 5-3895-373-10.

If both tow point cylinders fail to operate, go to step 2.

If either tow point cylinder fails to operate normally, go to step 3.

**WARNING**

**Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

Step 2. Open center top right and center top left access doors per TM 5-3895-373-10. Open left access door per TM 5-3895-373-10. Install hydraulic system tester at outlet (2) for flow test per TM 9-4940468-14. Check flow rate at tow point control valve outlet (2) to flow control valve outlet tee with flow control valve fully closed, clockwise. Flow control valve is normally opened, counterclockwise, during machine operation.

If flow is present with flow control valve closed, replace tow point flow control valve per paragraph 2.55 and repair per paragraph 2.50.

If no flow is detected, refer to MALFUNCTION 3. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.



Table 2-4. Tow Point Lift System Troubleshooting - Continued.

**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

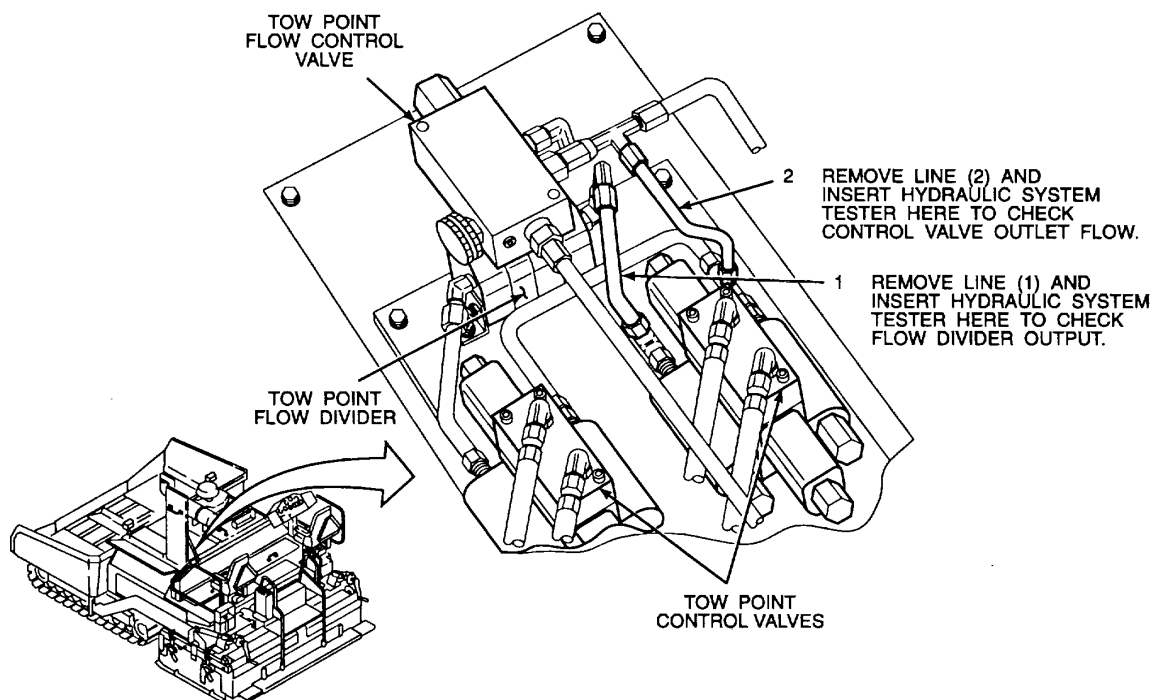
1. TOW POINT CYLINDERS DO NOT OPERATE-Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 3. Install hydraulic system tester at inlet (1) for flow test per TM 9-4940-468-14. Open center top right and center top left access doors per TM 5-3895-373-10. Open left access door per TM 5-3895-373-10. Check maximum flow rate at tow point flow divider outlet to control valve inlet (1).

If flow is less than 1 gpm (3, 8 l/min) or more than 2 gpm (7, 6 l/min) replace tow point flow divider per paragraph 2.55 and repair per paragraph 2.49.



Step 4. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Close left access door per TM 5-3895-373-10. Close center top left and center top right access doors per TM 5-3895-373-10.

2. ONE TOW POINT CYLINDER FAILS TO OPERATE.

Replace tow point control valve per paragraph 2.55 and repair per paragraph 2.46.

Table 2-4. Tow Point Lift System Troubleshooting - Continued.

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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## 3. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- Step 1. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. With paving machine off per TM 5-3895-373-10, check right hand auxiliary hydraulic pump suction at (1) using hand pump per TM 9-4940-468-14.

Replace or repair components (auxiliary hydraulic pump suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

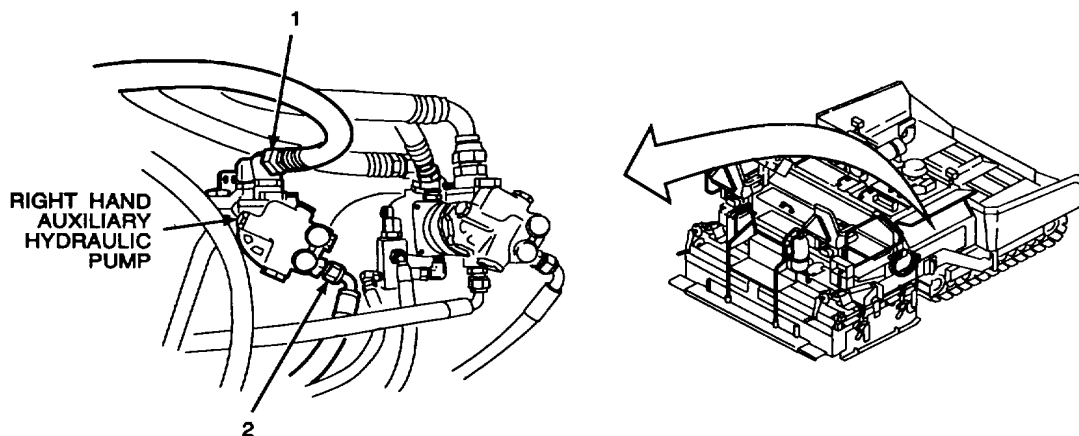
**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

- Step 2. Install hydraulic system tester at port (2) for flow test per TM 9-4940-468-14. Check flow at right hand auxiliary hydraulic pump discharge port (2). Measure flow rate at 2475 +25 psi (17 066 ±172 kPa) with engine at 2640 +40 rpm.

If flow rate is less than 5 gpm (19 l/min), replace/repair right hand auxiliary hydraulic pump per paragraph 2.42.

If flow rate is at least 5 gpm (19 l/min), replace valve and cylinder flow divider per paragraph 2.55 and repair per paragraph 2.49.



- Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10.
-

2.10 SCREED LIFT SYSTEM.

Table 2-5 lists common malfunctions associated with the screed lift system that may be found during operation or maintenance of the paving machine. Perform the tests/inspections and corrective actions for a particular malfunction in order given.

This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

Table 2-5. Screed Lift System Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. SCREED FAILS TO LIFT.

Step 1. Check operation of hopper lift cylinders and screed extension cylinders.

If hopper lift cylinders and screed extension cylinders operate normally, go to step 2.

If hopper lift cylinders and screed extension cylinders fail to operate normally, go to step 3.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

The following tests require use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

**NOTE**

System operating pressure must be at 2475 ±25 psi (17 066 +172 kPa) before performing this test. If pressure is not correct, refer to paragraph 2.51 and reset system operating pressure.

Step 2. Open right access door per TM 5-3895-373-10. Install hydraulic system tester for flow test at port (1) per TM 9-4940-468-14. With screed lift switch in lift position, check for flow from stack relief valve to return manifold at port (1).

If flow is present, replace stack relief valve per paragraph 2.44.

If flow is not present, refer to MALFUNCTION 4. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

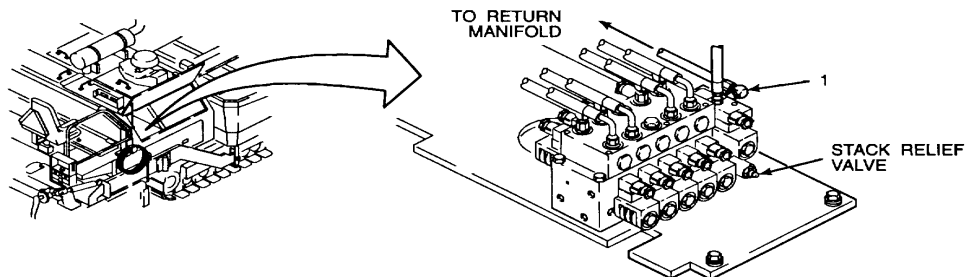


Table 2-5. Screed Lift System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. SCREED FAILS TO LIFT - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 3. Install hydraulic system tester for flow test at outlet (1) per TM 9-4940-468-14. Check flow at stack valve outlet (1) to return manifold with screed lift switch in lift position.

If flow is present, replace or repair valve controlled by electrical coil S13 per paragraph 2.44 or replace stack valve per paragraph 2.55.

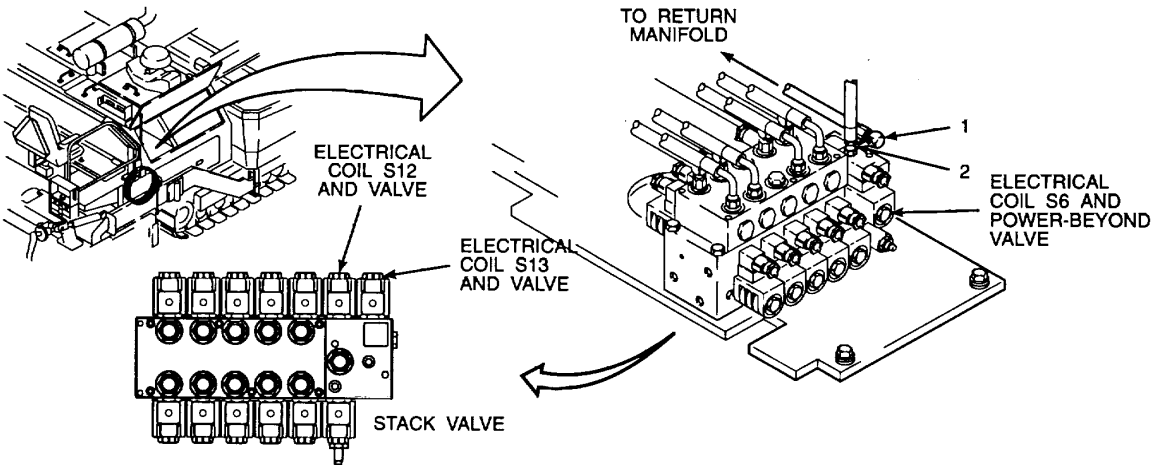
If no flow is detected, replace or repair valve controlled by electrical coil S12 per paragraph 2.44 or replace stack valve per paragraph 2.55.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at pressure test point indicated by each individual test per TM 9-4940-468-14. Make sure all ratings of fittings and hoses used are adequate for maximum pressures and flows being tested.

Step 4. Install hydraulic system tester for pressure test at port (2) per TM 9-4940-468-14. Check pressure at power-beyond outlet to track tension system at port (2) with screed lift switch in lift position.

If pressure is 2500 psi (17 238 kPa) with screed lift switch in lift position, replace power beyond valve per paragraph 2.44 or replace stack valve per paragraph 2.55.



Step 5. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Close right access door per TM 5-3895-373-10.

Table 2-5. Screed Lift System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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2. SCREED FAILS TO LOWER.

Step 1. Ensure screed travel lock valve is fully open.

If screed travel lock valve is closed, open screed travel lock valve.

If screed travel lock valve is open, go to step 2.

Step 2. Check if screed raises normally.

If screed fails to raise normally, refer to MALFUNCTION 1. SCREED FAILS TO LIFT.

If screed raises normally, replace or repair valve S13 per paragraph 2.44 or replace stack valve per paragraph 2.55.

3. SCREED FAILS TO MAINTAIN POSITION.

Check position of screed travel lock valve.

If screed travel lock valve is open, replace stack valve's check valve for electrical coil S12 per paragraph 2.44 or replace stack valve per paragraph 2.55.

If screed travel lock valve is closed, replace valve per paragraph 2.57.

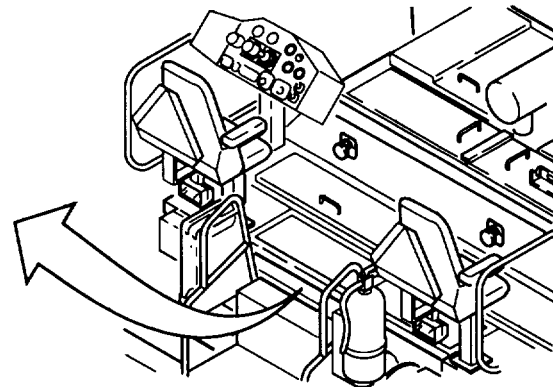
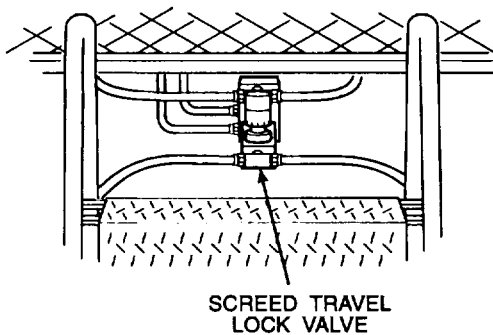


Table 2-5. Screed Lift System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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4. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 1. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. With paving machine off per TM 5-3895-373-10, check right hand auxiliary hydraulic system suction lines at (1) using hand pump per TM 9-4940-468-14.

Replace or repair components (auxiliary hydraulic system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

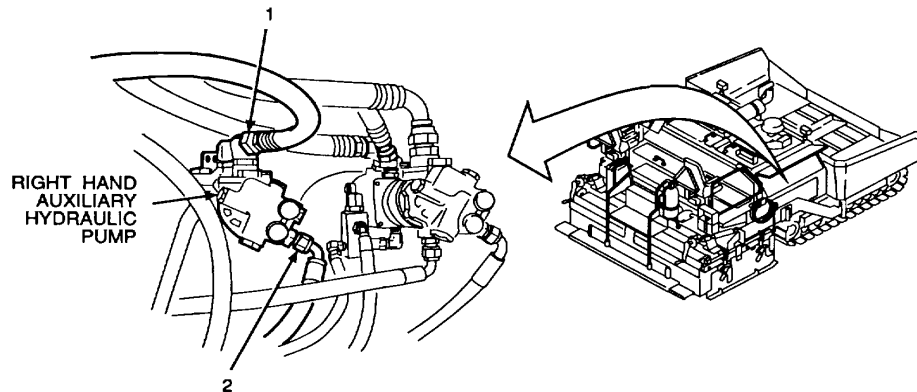
**NOTE**

The following tests requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

Step 2. Install hydraulic system tester for flow test at port (2) per TM 9-4940-468-14. Check flow at right hand auxiliary hydraulic pump discharge port (2). Measure flow rate at 2475 ±25 psi (17 066 ±172 kPa) with engine at 2640 :40 rpm.

If flow rate is less than 5 gpm (19 l/min) at 2475 ±25 psi (17 066 ±172 kPa), replace/repair right hand auxiliary hydraulic pump per paragraph 2.42.

If flow rate is at least 5 gpm (19 l/min) at 2475 ±25 psi (17 066 ± 172 kPa), replace valve and cylinder flow divider per paragraph 2.55 and repair per paragraph 2.49.



Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10.

2.11 HOPPER LIFT SYSTEM.

Table 2-6 lists common malfunctions associated with the hopper lift system that may be found during operation or maintenance of the paving machine. Perform the tests/inspections and corrective actions for a particular malfunction in order given.

This table cannot list all possible malfunctions that may occur nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

Table 2-6. Hopper Lift System Troubleshooting.

---

<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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**WARNING**

Do not disconnect any hydraulic lines, cylinders, or valves without securely blocking both hopper wings. The hopper wing may fall if not properly secured in position when the hydraulic system is opened. Severe personal injury or death may result from a falling hopper wing.

**NOTE**

The following tests require use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

**NOTE**

System operating pressure must be at 2475 ±25 psi (17 066 ±172 kPa) before performing this test. If pressure is not correct, refer to paragraph 2.51, and reset system operating pressure.

Table 2-6. Hopper Lift System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. HOPPER FAILS TO OPERATE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

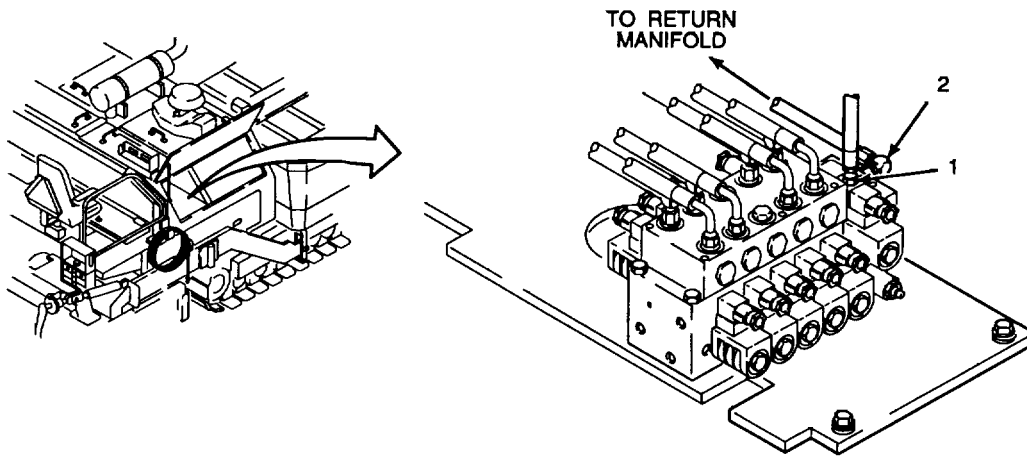
Step 1. Open right access door per TM 5-3895-373-10. Install hydraulic system tester at outlet (1) for flow test per TM 9-4940-468-14. Check flow rate at power-beyond valve outlet (I) with hopper wing lift in operation. Measure flow rate at 2475 +25 psi (17 066 +172 kPa).

If flow is present, at 2475 ±25 psi (17 066 ±172 kPa) replace power-beyond valve. Refer to paragraph 2.44.

Step 2. Install hydraulic system tester at outlet (2) for flow test per TM 9-4940-468-14. Check flow rate at stack valve outlet (2) to return manifold with hopper wing lift in operation.

If flow is present below 2450 psi (16 893 kPa), replace stack relief valve per paragraph 2.44.

If no flow is present below 2450 psi (16 893 kPa), refer to MALFUNCTION 4. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.



Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Close right access door per TM 5-3895-373-10.



Table 2-6. Hopper Lift System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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2. ONE HOPPER WING FAILS TO OPERATE.

Step 1. Check if hopper lift cylinder extends.

**WARNING**

Do not disconnect any hydraulic lines, cylinders, or valves without securely blocking both hopper wings. The hopper wing may fall if not properly secured in position when the hydraulic system is opened. Severe personal injury or death may result from a falling hopper wing.

If cylinder does not extend, hoist and crib hopper wing per TM 5-3895-373-20 and remove and clean adapter orifice per paragraph 2.60.

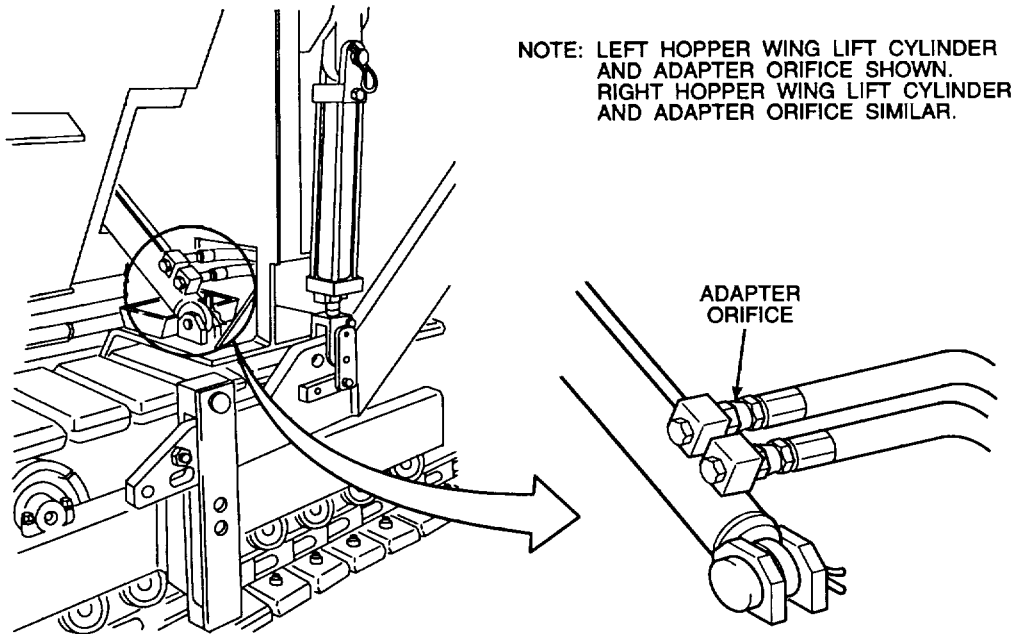


Table 2-6. Hopper Lift System Troubleshooting - Continued.

**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

2. ONE HOPPER WING FAILS TO OPERATE - Continued.

**WARNING**

Do not disconnect any hydraulic lines, cylinders, or valves without securely blocking both hopper wings. The hopper wing may fall if not properly secured in position when the hydraulic system is opened. Severe personal injury or death may result from a falling hopper wing.

Step 2. Determine which hopper hydraulic function fails to operate.

Replace faulty valve per the following chart and paragraph 2.44.

HOPPER LIFT CYLINDER MALFUNCTION CHART	
FUNCTION NOT OPERATING	REPLACE FAULTY VALVE
Left hopper wing does not lift.	B2
Left hopper wing does not lower.	A2
Right hopper wing does not lift.	B4
Right hopper wing does not lower.	A4

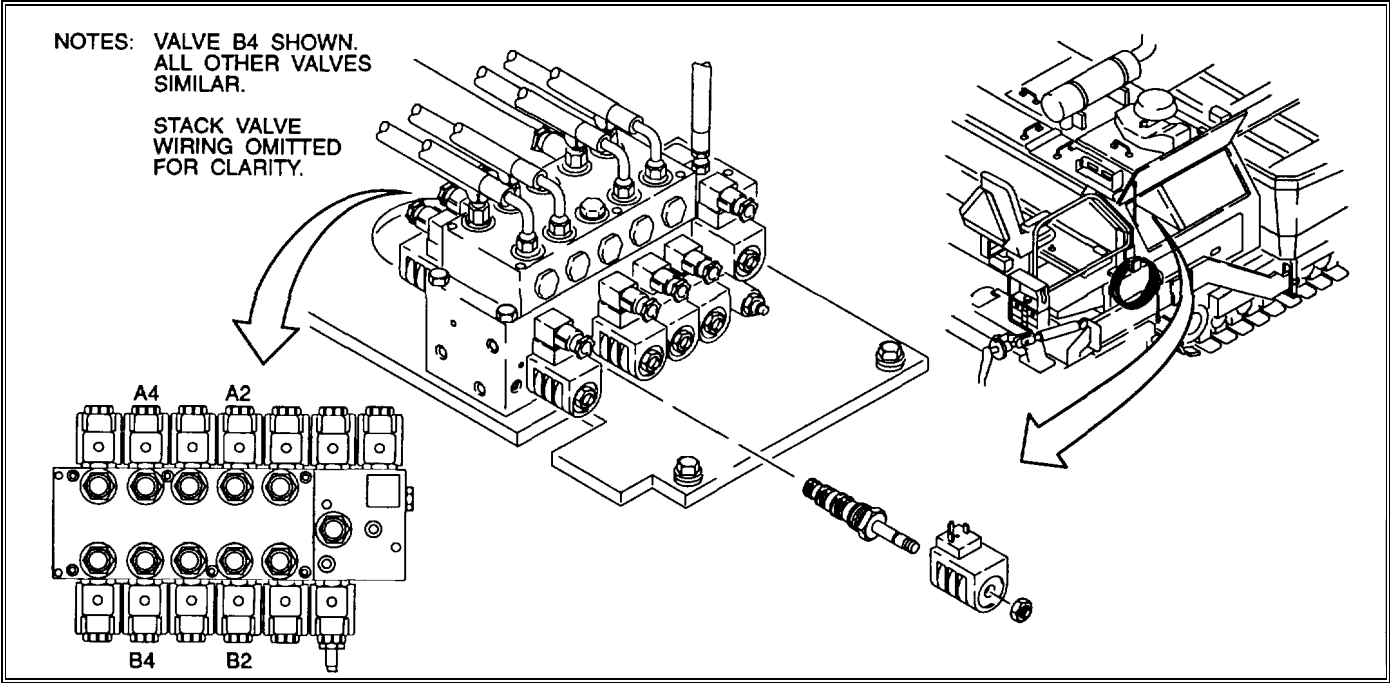


Table 2-6. Hopper Lift System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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3. HOPPER WING FAILS TO REMAIN IN RAISED POSITION.

**WARNING**

Do not disconnect any hydraulic lines, cylinders, or valves without securely blocking both hopper wings. The hopper wing may fall if not properly secured in position when the hydraulic system is opened. Severe personal injury or death may result from a falling hopper wing.

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

With paving machine off per TM 5-3895-373-10, check if pressure leaks by check valve per TM 9-4940468-14. After securely blocking hopper wing, disconnect hose at hopper lift cylinder port (3). Connect proof pressure tester to disconnect hose. Pressurize hose to 2500 psi (17 238 kPa). Pressure should remain at 2500 psi (17 238 kPa) for at least 5 minutes.

If pressure does not remain at 2500 psi (17 238 kPa) for five minutes, replace or repair check valve of affected hopper wing per paragraph 2.44.

NOTE: LEFT HOPPER LIFT CYLINDER SHOWN.  
RIGHT HOPPER LIFT CYLINDER SIMILAR.

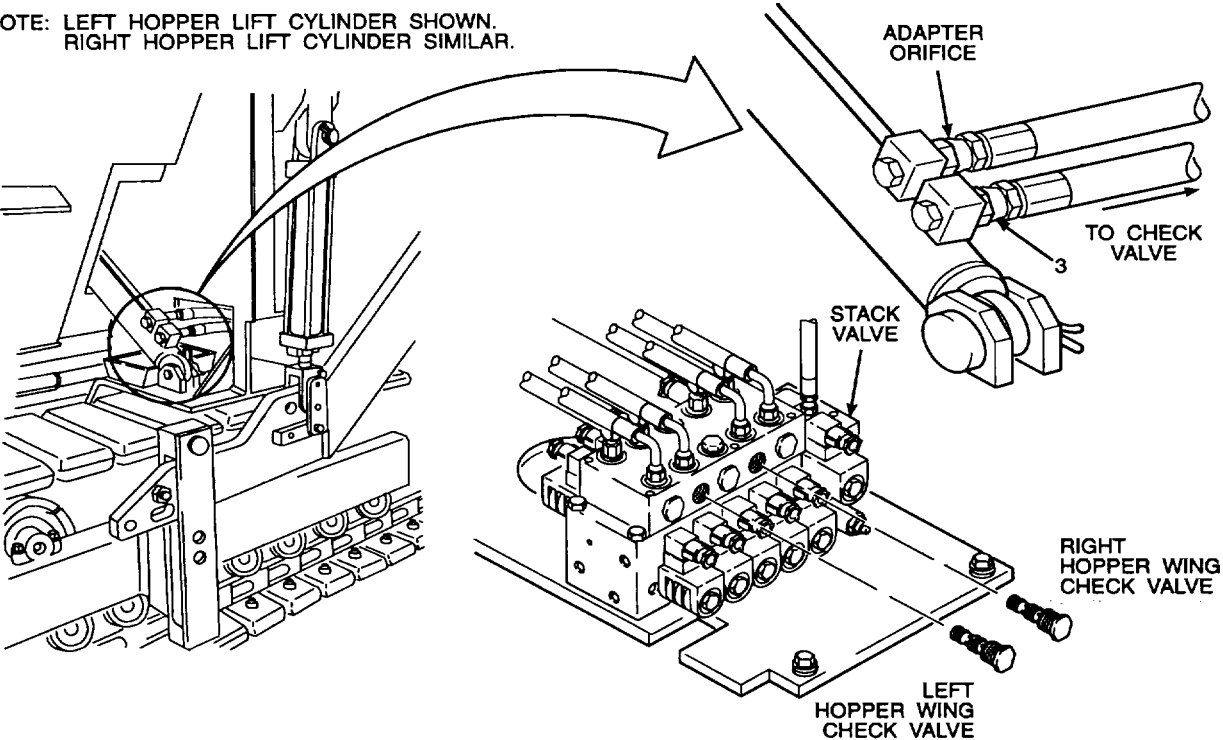


Table 2-6. Hopper Lift System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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4. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 1. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. With paving machine off per TM 5-3895-373-10, check right hand auxiliary hydraulic system suction lines at (1) using hand pump per TM 9-4940-468-14.

Replace or repair components (auxiliary hydraulic system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

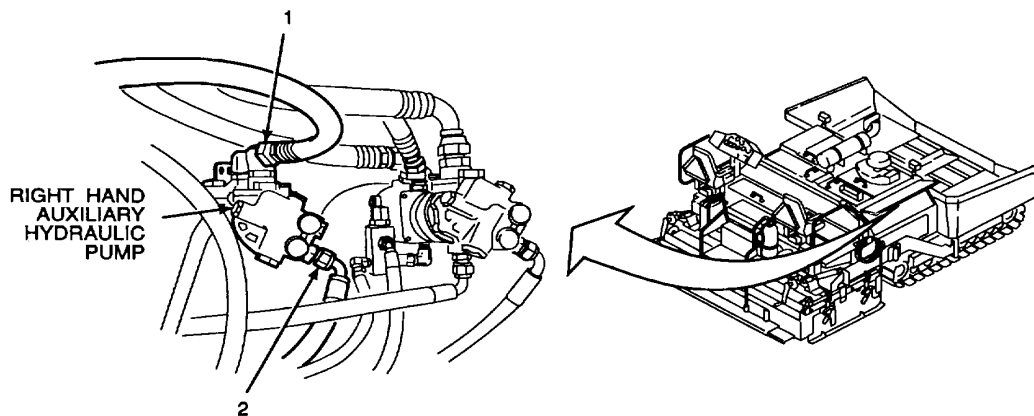
**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

Step 2. Start paving machine per TM 5-3895-373-10. Install hydraulic system tester at port (2) for flow test per TM 9-4940-468-14. Check flow at right hand auxiliary hydraulic pump discharge port (2). Measure flow rate at 2475 ±25 psi (17 066 ±172 kPa) with engine at 2640 ±40 rpm.

If flow rate is less than 5 gpm (19 l/min), replace/repair right hand auxiliary hydraulic pump per paragraph 2.42.

If flow rate is at least 5 gpm (19 l/min), replace right auger/conveyor flow divider per paragraph 2.55 and repair per paragraph 2.49.



Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10.

2.12 AUGER/CONVEYOR SYSTEM.

Table 2-7 lists common malfunctions associated with the auger/conveyor system that may be found during operation or maintenance of the paving machine. Perform the tests/ inspections and corrective actions for a particular malfunction in the order given.

This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

Table 2-7. Auger/Conveyor System Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. AUGER/CONVEYOR DOES NOT OPERATE OR OPERATES SLUGGISHLY.

NOTE

Throughout auger/conveyor system troubleshooting (Table 2-7), reference is made to right and left auxiliary hydraulic pumps, manual auger/conveyor speed control valves, etc. These references do not represent the physical location of individual components. They refer to the physical locations of systems. For example, the left auxiliary hydraulic pump refers to the auxiliary hydraulic pump that drives the left hand auger and conveyor.

Step 1. With paving machine turned off, turn auger by hand.

If auger turns easily, replace auger/conveyor hydraulic motor key, auger shaft key, conveyor shaft key, or drive chain, as necessary. Refer to paragraphs 2.63, 2.64, 2.68, and 2.69.

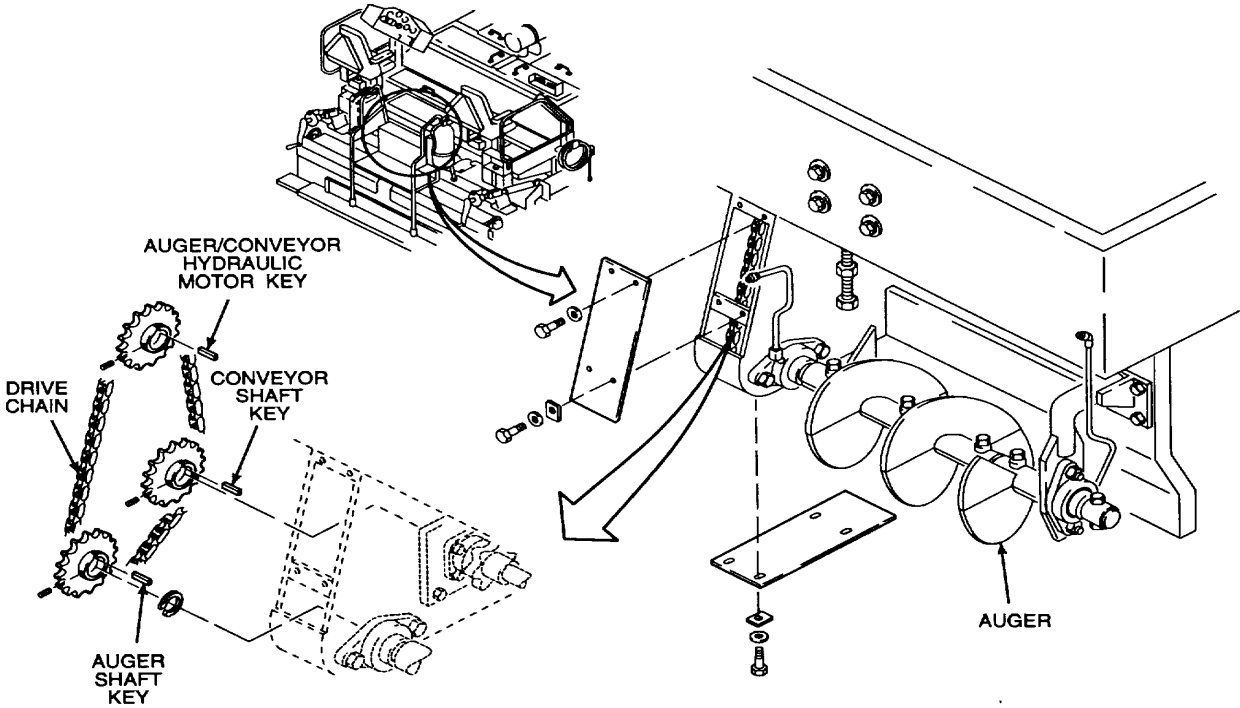


Table 2-7. Auger/Conveyor System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. AUGER/CONVEYOR DOES NOT OPERATE OR OPERATES SLUGGISHLY- Continued.

**NOTE**

In step 2, the auger must be blocked from rotating. This is done to simulate a load so the affected hydraulic system can build load pressure. If pressure is checked with auger free, system pressure will not increase to the specified pressure at test ports.

Step 2. Block rotation of auger, and check system pressure as follows:

- a. Place cribbing beneath inside edge of auger being tested. Cribbing must be positioned to stop auger rotation.
- b. Install pressure gauge into test manifold, using test port #3 for left hand auger/conveyor and test port #4 for right hand auger/conveyor.

**CAUTION**

Ensure flat part of inside auger flight is against cribbing before setting throttle to MAX. If auger flight is not against cribbing when throttle is set to MAX, sudden shock may break auger flight.

- c. Start engine and set throttle control switch to MAX. Refer to TM 5-3895-373-10.
- d. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895373-10. Energize blocked auger until it is stopped against cribbing for a maximum of five seconds. System pressure should be 2750 psi (28 961 kPa) with engine at 2640 ±50 rpm.

If pressure is not 2750 psi (18 961 kPa), adjust relief pressure on auger/conveyor control relief valve to 2750 psi (18 961 kPa) when measured at test port, per paragraph 2.51.

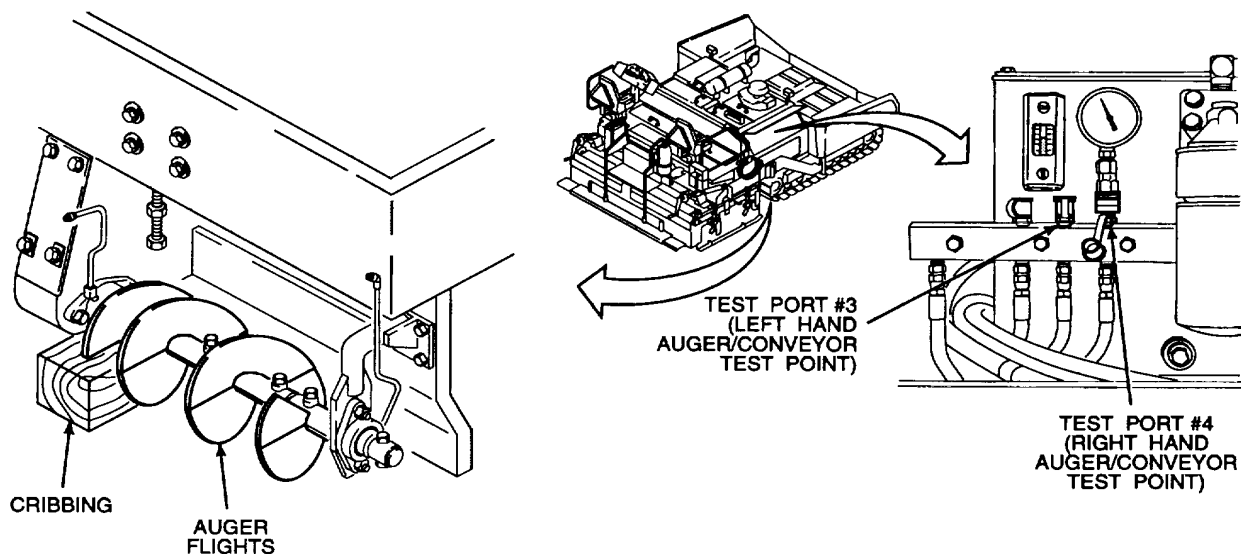


Table 2-7. Auger/Conveyor System Troubleshooting - Continued.

**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

1. AUGER/CONVEYOR DOES NOT OPERATE OR OPERATES SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure all ratings of fittings and hoses used are adequate for maximum pressures and flows being tested. Pressure requirements of step 2 must be met to verify flow rate.

Step 3. Open center top right and center top left access doors per TM 5-3895-373-10. Open rear top right access door per TM 5-3895-373-10. Open rear top left access door per TM 5-3895-373-10. Install hydraulic system tester at inlet (1) for flow test per TM 9-4940-468-14. Check maximum flow rate supplied to auger/conveyor motor inlet (1). Flow rate should be at least 7.9 gpm (30 l/min).

If flow rate is at least 7.9 gpm (30 l/min), replace/repair auger/conveyor motor per paragraph 2.69.

Step 4. Install hydraulic system tester at outlet (2) for flow test per TM 9-4940-468-14. Check maximum flow rate between manual auger/conveyor speed control valve and auger/conveyor control valve at control valve inlet (2). Flow rate should be at least 7.9 gpm (30 l/min).

If flow rate is at least 7.9 gpm (30 l/min), replace auger/conveyor control valve per paragraph 2.55 and repair per paragraph 2.45.

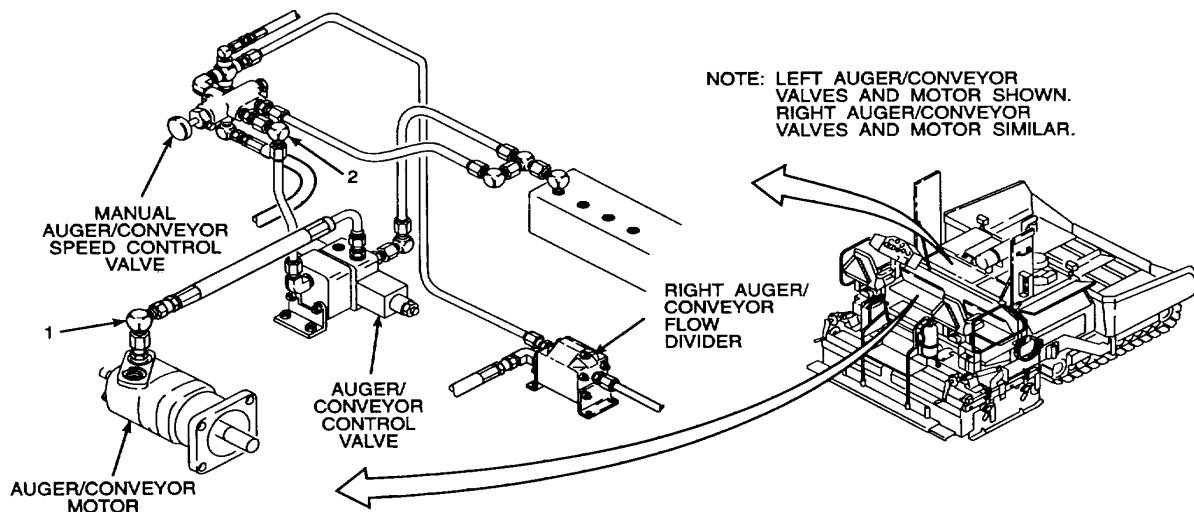


Table 2-7. Auger/Conveyor System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

1. AUGER/CONVEYOR DOES NOT OPERATE OR OPERATES SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 5. Install hydraulic system tester at inlet (3) for flow test per TM 9-4940-468-14. Check maximum flow rate at manual auger/conveyor speed control valve inlet (3). Flow rate should be at least 7.9 gpm (30 l/min). Refer to illustration.

If flow rate is at least 7.9 gpm (30 l/min), replace manual auger/conveyor speed control valve per paragraph 2.55 and repair per paragraph 2.48.

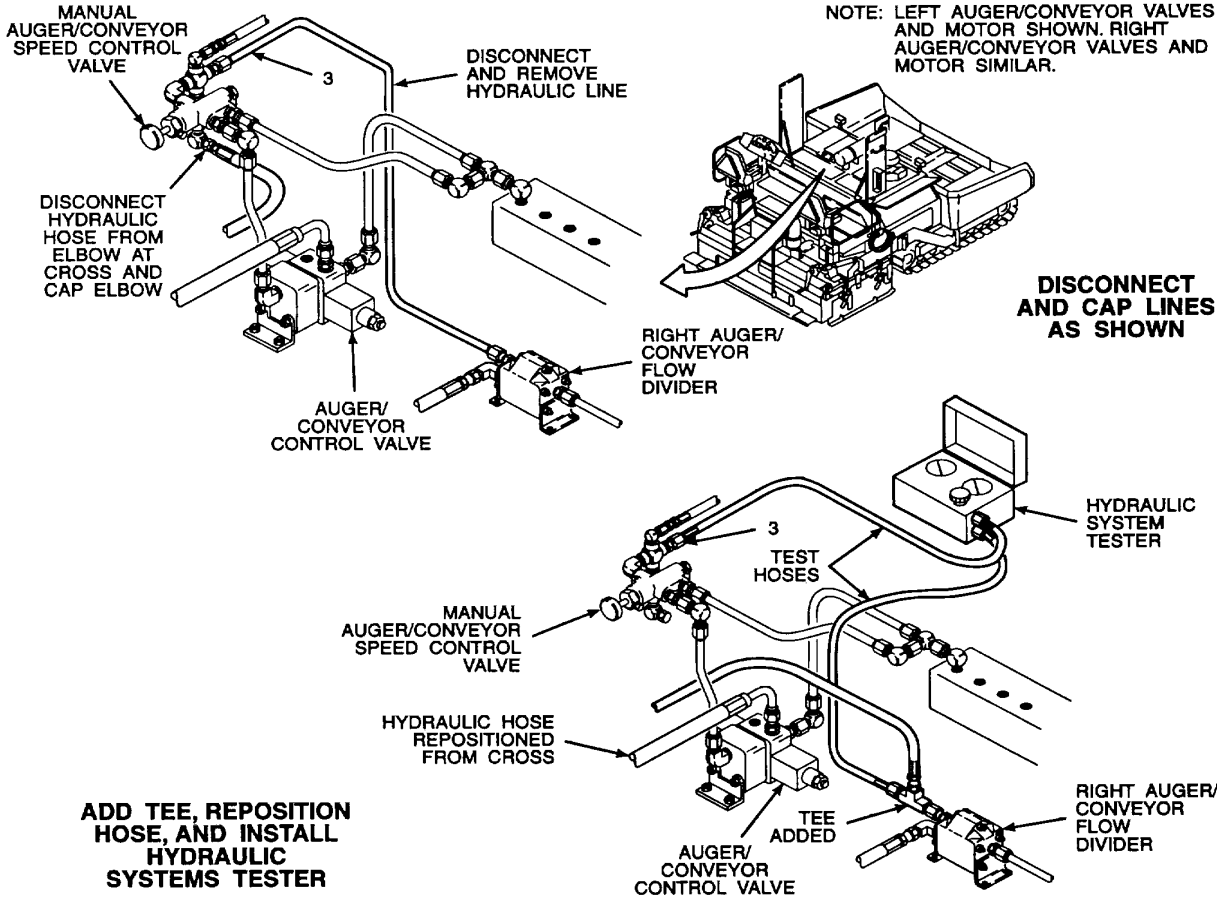




Table 2-7. Auger/Conveyor System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

1. AUGER/CONVEYOR DOES NOT OPERATE OR OPERATES SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 6. With paving machine off, check auxiliary hydraulic system suction lines using hand pump. Check suction lines at right hand auxiliary hydraulic pump (4) and at left hand auxiliary hydraulic pump (5).

Replace or repair components (auxiliary hydraulic system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

Step 7. Install hydraulic system tester at ports (6 and 7) for flow tests per TM 9-4940-468-14. Check flow rate at auxiliary hydraulic pump discharge. Check discharge at right hand auxiliary hydraulic pump port (6) and at left hand auxiliary hydraulic pump port (7). Flow rate should be at least 5.5 gpm (21 l/min) at 2750 psi (18 961 kPa).

If discharge is less than 5.5 gpm (21 l/min) at 2750 psi (18 961 kPa), replace/repair auxiliary hydraulic pump per paragraph 2.42.

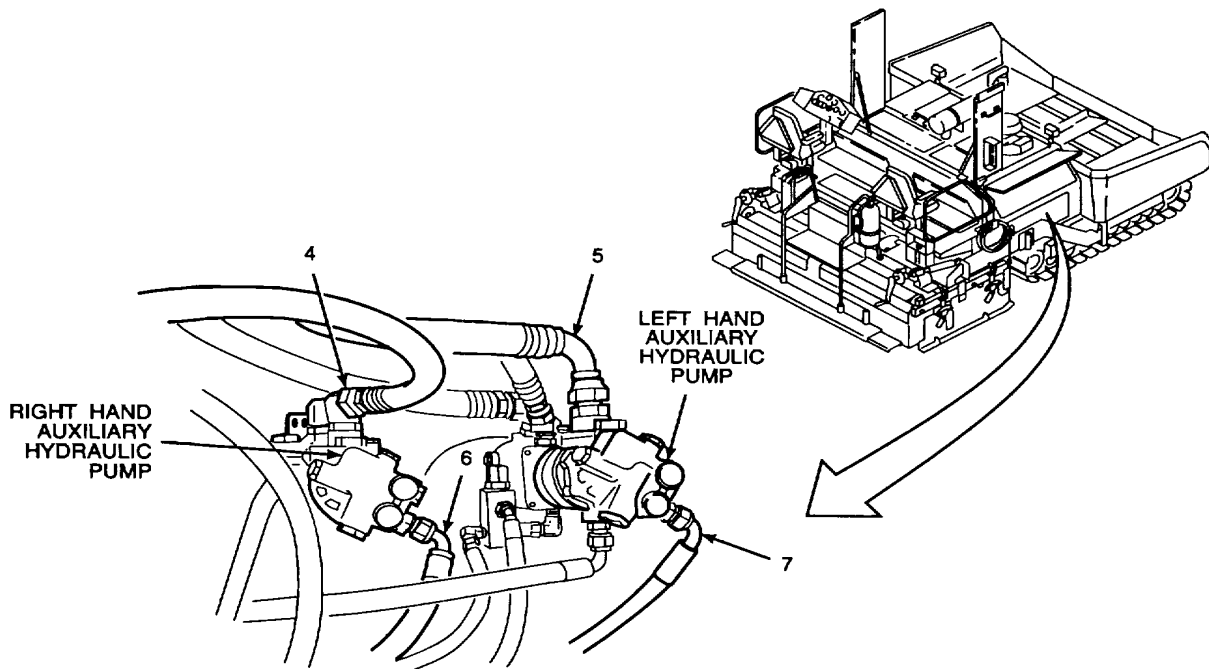


Table 2-7. Auger/Conveyor System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

1. AUGER/CONVEYOR DOES NOT OPERATE OR OPERATES SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

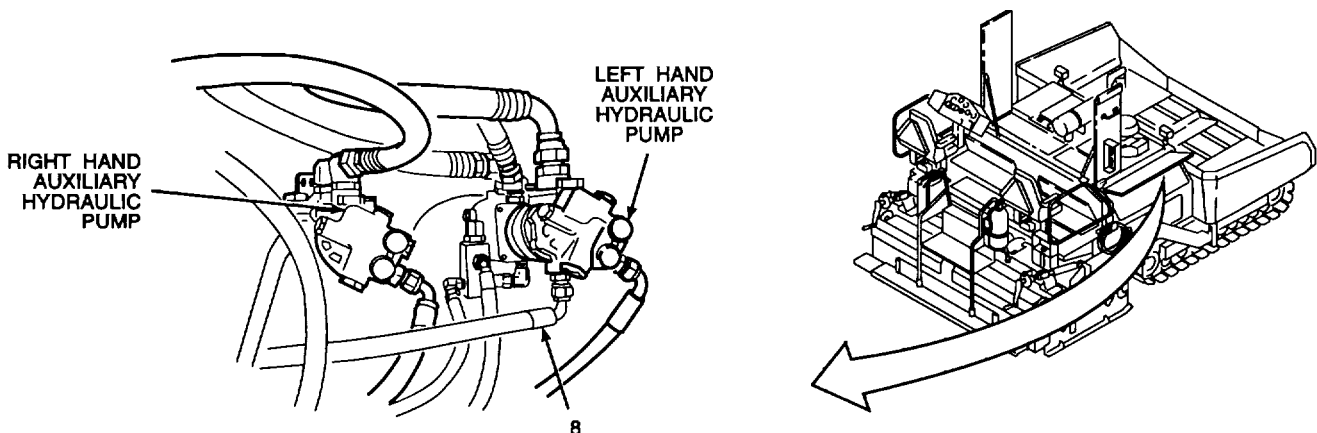
**NOTE**

The left hand auxiliary hydraulic pump supplies the left hand auger/conveyor circuit and the right auger/conveyor flow divider. The output of the flow divider supplements flow to both auger/conveyor motors.

Step 8. Install hydraulic system tester at port (8) for flow test per TM 9-4940-468-14. Check flow rate of left hand auxiliary pump discharge port (8) to right auger/conveyor flow divider.

If discharge is at least 5 gpm (19 l/min) at 2500 psi (17 238 kPa), replace right auger/conveyor flow divider per paragraph 2.55 and repair per paragraph 2.49.

If discharge is less than 5 gpm (19 l/min) at 2500 psi (17 238 kPa), replace/repair left auxiliary hydraulic pump per paragraph 2.42.



Step 9. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10. Close center top left and center top right access doors per TM 5-3895-373-10. Close rear top left access door per TM 5-3895-373-10. Close rear top right access door per TM 5-3895-373-10.

2. AUGER/CONVEYOR OPERATES CONTINUOUSLY.

Replace auger/conveyor speed control valve per paragraph 2.55 and repair per paragraph 2.48.

2.13 VIBRATION SYSTEM.

Table 2-8 lists common malfunctions associated with the vibration system that may be found during operation or maintenance of the paving machine. Perform the tests/inspections and corrective actions for a particular malfunction in order given.

This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 2-8. Vibration System Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. VIBRATORS FAIL TO OPERATE OR OPERATE SLUGGISHLY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

Step 1. Open center top right and center top left access doors per TM 5-3895-373-10. Open rear top right access door per TM 5-3895-373-10. Open rear top left access door per TM 5-3895-373-10. Check vibration system hydraulic pressure. Install hydraulic system tester at outlet (1) for pressure test per TM 9-4940-468-14. With paving machine on and screed vibration control valve fully opened, check for pressure at vibration control valve outlet (1). Pressure should be 2000 psi (13 970 kPa). If hydraulic pressure is at 2000 psi (13 970 kPa), leave hydraulic system tester installed and continue to step 2.

If pressure is not 2000 psi (13 970 kPa), adjust vibration relief valve per paragraph 2.51. If no pressure is present, replace/repair faulty vibration solenoid valve per paragraph 2.47.

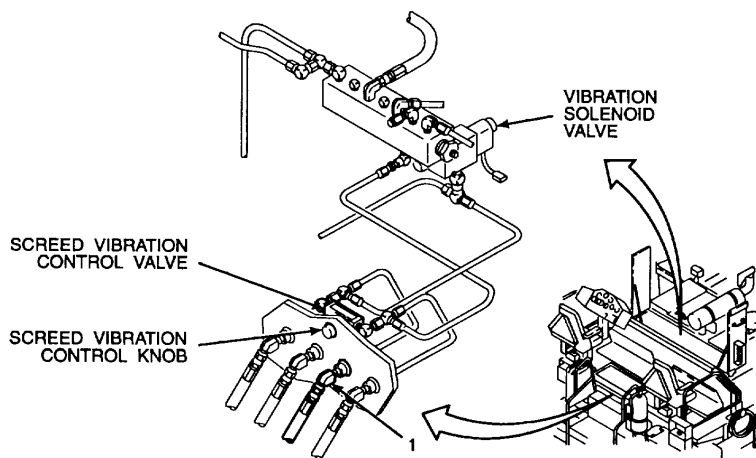


Table 2-8. Vibration System Troubleshooting - Continued.

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1. VIBRATORS FAIL TO OPERATE OR OPERATE SLUGGISHLY- Continued.

Step 2. Fully extend extension screeds per TM 5-3895-373-10. Check if extension vibrators operate normally.

If extension vibrators operate normally and a visual inspection shows no damage of main vibrator components, replace main vibration motor per TM 5-3895-373-20 and repair per paragraph 2.76.

Step 3. With paving machine turned off per TM 5-3895-373-10, check main vibrator components for seized bearings or other damaged main screed vibrator components by turning main screed universal joint shaft by hand.

Replace main screed vibrator components per paragraph 2.74.

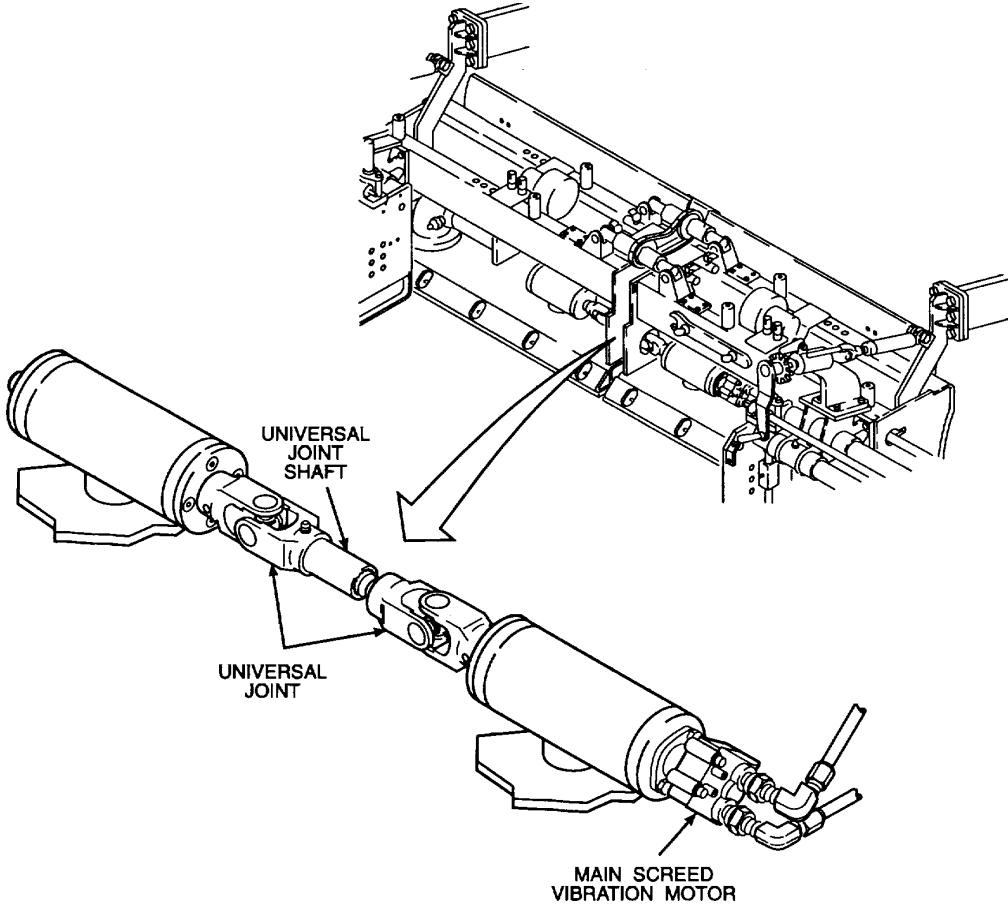


Table 2-8. Vibration System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

1. VIBRATORS FAIL TO OPERATE OR OPERATE SLUGGISHLY- Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

All flow rates specified in the test are at a pressure of 2000 psi (13 790 kPa) unless otherwise noted.

Step 4. With screed vibration control valve fully closed (counterclockwise), check for flow at vibration control valve outlet (1). No flow rate or pressure should be present.

If flow is present, replace faulty screed vibration control valve per paragraph 2.56.

Step 5. Check operation of hopper lift cylinders and tow point cylinders.

If hopper lift cylinders and tow point cylinders do not function normally, refer to MALFUNCTION 4. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

If hopper lift cylinders and tow point cylinders function normally, refer to MALFUNCTION 5. AUXILIARY VIBRATION PUMP HYDRAULIC SUPPLY FAULTY.

Step 6. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Close center top left access door and center top right access door per TM 5-3895-373-10. Close rear top left access door per TM 5-3895-373-10. Close rear top right access door per TM 5-3895-373-10. Retract extension screeds per TM 5-3895-373-10.

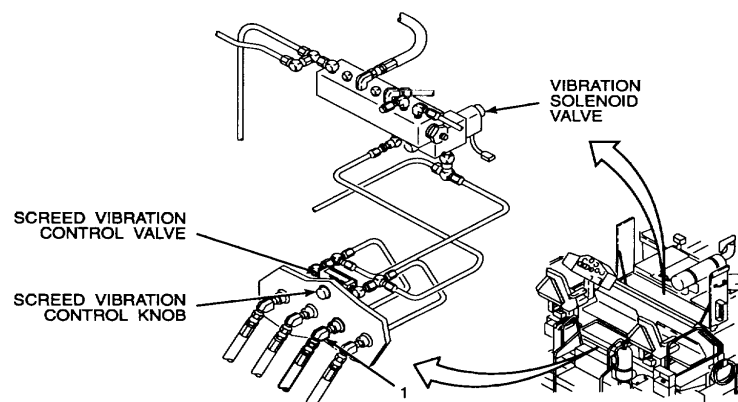


Table 2-8. Vibration System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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2. EXTENSION SCREED VIBRATORS FAIL TO OPERATE.

Step 1. Check if both extension screed vibrators fail to operate.

If both extension screed vibrators fail to operate, refer to MALFUNCTION 1. VIBRATORS FAIL TO OPERATE OR OPERATE SLUGGISHLY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

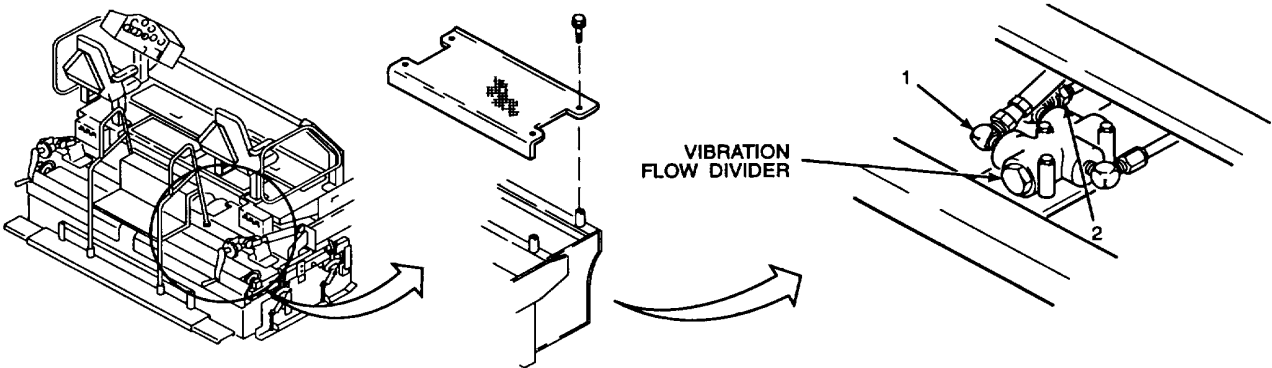
**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

Step 2. Remove screed cover plate per TM 5-3895-373-20. Check flow at outlet of screed vibration flow divider. Install hydraulic system tester at outlets (1 and 2) for flow tests per TM 9-4940-46-14. Test flow for right extension screed vibrator at outlet (1) and for left extension screed vibrator at outlet (2).

If flow rate is less than 2.5 gpm (9,5 l/min) or more than 3.4 gpm (12,9 l/min) replace/repair vibration flow divider per paragraph 2.77.

If flow rate is at least 2.5 to 3.4 gpm (9, 5 to 12,9 l/min), replace extension screed vibration motor per TM 5-3895-373-20 and repair per paragraph 2.76.



Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Install screed cover plate per TM 5-3895-373-20.

Table 2-8. Vibration System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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3. VIBRATOR RUNS CONTINUOUSLY.

Check if vibrator runs with screed vibrator switch off (solenoid valve open and dumping to reservoir).

Replace/repair faulty vibration solenoid valve per paragraph 2.47.

4. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 1. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. With paving machine off, check right hand auxiliary hydraulic system suction line at port (1) using hand pump per TM 9-4940-468-14.

Replace or repair components (auxiliary hydraulic system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

Step 2. Install hydraulic system tester at port (2) for flow test per TM 9-4940-468-14. Check flow at right hand auxiliary hydraulic pump discharge port (2).

If flow rate is less than 5.5 gpm (21 l/min) at 2000 psi (13 790 kPa), replace/repair right hand auxiliary hydraulic pump per paragraph 2.42.

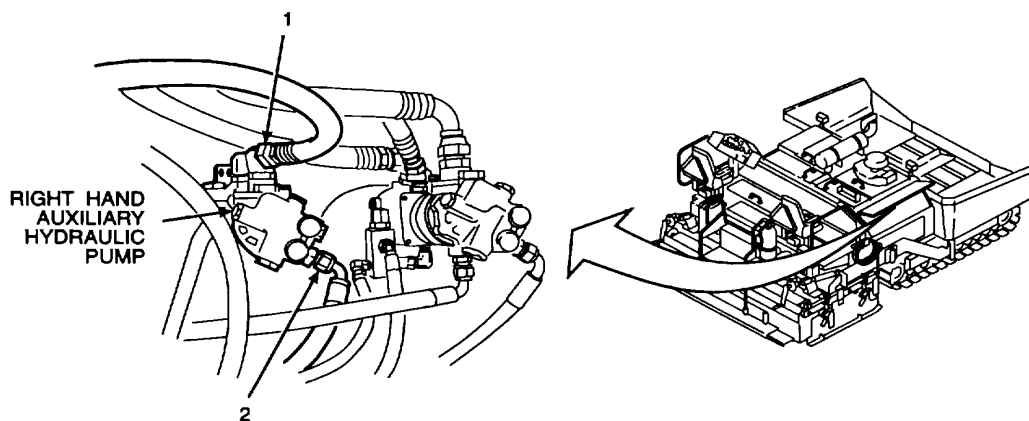


Table 2-8. Vibration System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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4. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY- Continued.

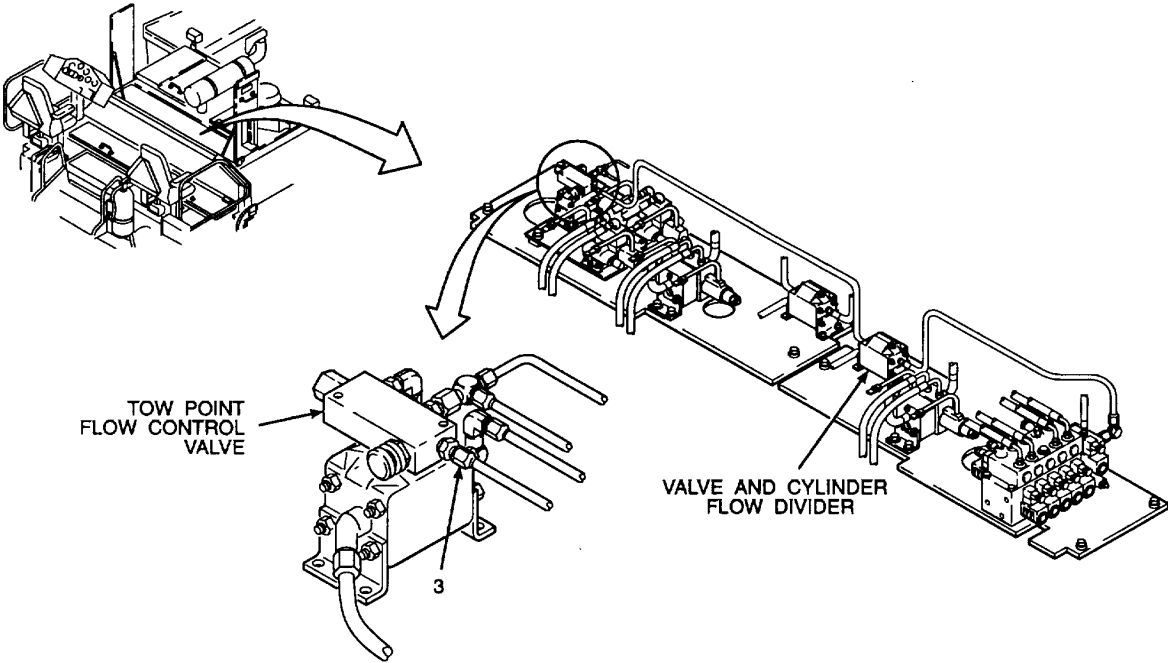
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 3. Open center top right and center top left access doors per TM 5-3895-373-10. Install hydraulic system tester at port (3) for flow test per TM 9-4940-468-14. Check maximum flow rate at valve and cylinder flow divider outlet to port (3) of tow point flow control valve.

If flow rate is less than 2.5 gpm (9,5 l/min) or more than 3.4 gpm (12,9 l/min), replace valve and cylinder flow dividers per paragraph 2.55 and repair per paragraph 2.49.

If flow rate is at least 2.5 to 3.4 gpm (9,5 to 12,9 l/min), refer to MALFUNCTION 5. AUXILIARY VIBRATION PUMP HYDRAULIC SUPPLY FAULTY.



Step 4. Disconnect hydraulic system tester per TM 9-4940-463-14. Reconnect all hydraulic lines. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10. Close center top left and center top right access doors per TM 5-3895-373-10.



Table 2-8. Vibration System Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

5. AUXILIARY VIBRATION PUMP HYDRAULIC SUPPLY FAULTY.

**NOTE**

The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Step 1. Open right access door per TM 5-3895-373-10. Remove right access cover per TM 5-3895-373-10. Install hydraulic system tester at port (1) for flow test per TM 9-4940-468-14. Check for flow at vibration relief valve port (1).

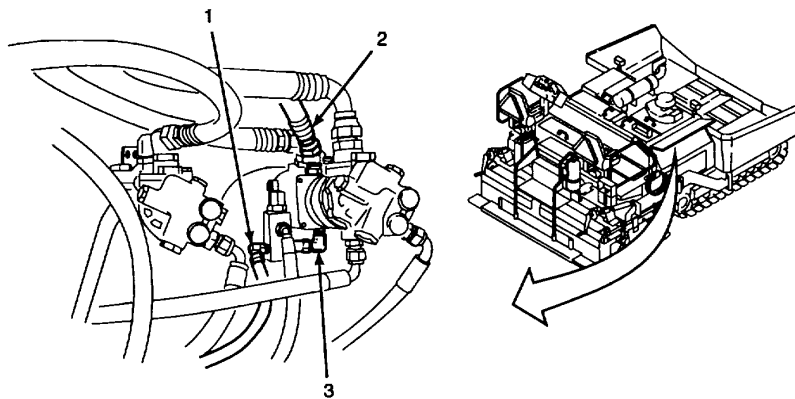
If flow is present at 2000 psi (13 790 kPa), replace/repair vibration relief valve per TM 53895-373-20.

Step 2. With paving machine off per TM 5-3895-373-10, check hydraulic vibration system suction line at (2) using hand pump per TM 9-4940-468-14.

Replace or repair components (hydraulic vibration system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

Step 3. Install hydraulic system tester at port (3) for flow test per TM 9-4940-468-14. Check maximum flow rate at hydraulic auxiliary vibration pump discharge port (3).

If flow rate is less than 3.5 gpm (13 l/min) at 2000 psi (13 790 kPa), replace/repair hydraulic auxiliary vibration pump per paragraph 2.43.



Step 4. Disconnect hydraulic system tester per TM 9-4940-468-14. Install right access cover per TM 5-3895373-10. Close right access door per TM 5-3895-373-10.

2.14 SCREED EXTENSION SYSTEM.

Table 2-9 lists common malfunctions associated with the screed extension system that may be found during operation or maintenance of the paving machine. Perform the tests/ inspections and corrective actions for a particular malfunction in order given.

This table cannot list all possible malfunctions that may occur, nor all tests, inspections, or corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

Table 2-9. Screed Extension System Troubleshooting.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. SCREED EXTENSION FAILS TO OPERATE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

The following tests require use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.

**NOTE**

System operating pressure must be at 2475 ±25 psi (17 066 ±172 kPa) before performing this test. If pressure is not correct, refer to paragraph 2.51 and reset system operating pressure.

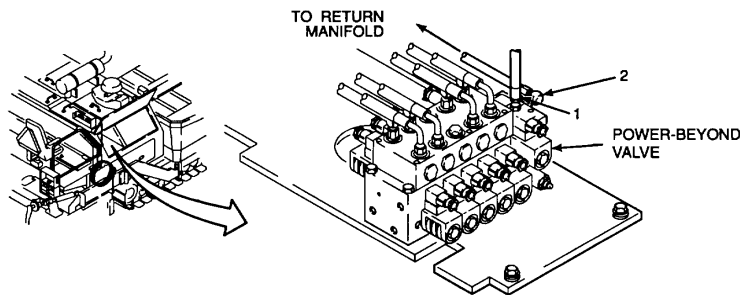
Step 1. Open right access door per TM 5-3895-373-10. Install hydraulic system tester at outlet (1) for flow test per TM 9-4940-468-14. Check flow rate at outlet of power-beyond valve outlet (I) with screed extension in operation.

If flow is present, replace power-beyond valve. Refer to paragraph 2.44.

Step 2. Check flow rate at stack relief outlet to reservoir (2) with screed extension in operation.

If flow is present, replace stack relief valve. Refer to paragraph 2.44.

If no flow is present, refer to MALFUNCTION 3. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.



Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Close right access door per TM 5-3895-373-10.

Table 2-9. Screed Extension System Troubleshooting - Continued.

**MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION**

2. ONE SCREED EXTENSION FUNCTION FAILS TO OPERATE.

Step 1. Determine function not operating.

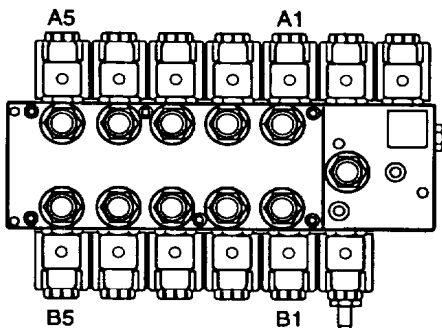
Replace valve for function not operating per paragraph 2.44. Refer to the following chart for location of faulty valve.

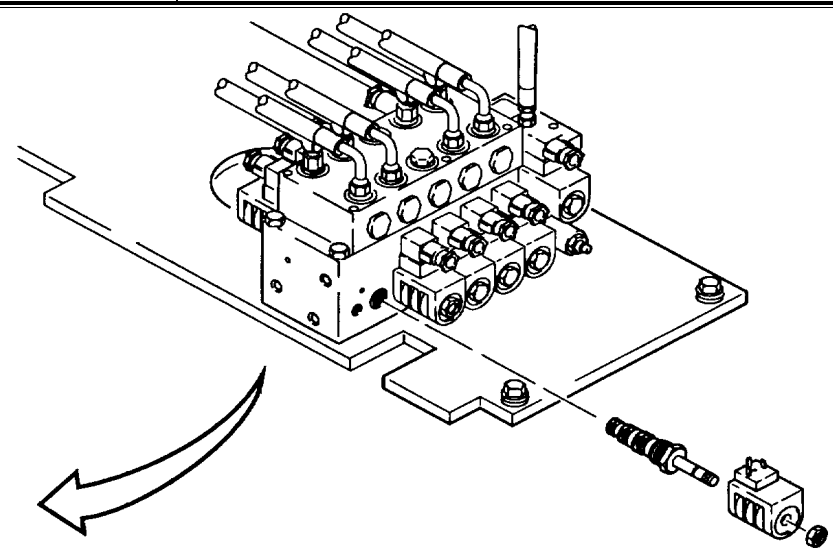
<b>SCREED EXTENSION CYLINDER MALFUNCTION CHART</b>	
<b>FUNCTION NOT OPERATING</b>	<b>REPLACE FAULTY VALVE</b>
Left extension screed does not extend.	A1
Left extension screed does not retract.	B1
Right extension screed does not extend.	A5
Right extension screed does not retract.	B5

**NOTE: VALVE B5 SHOWN. ALL OTHER VALVES SIMILAR.**

**STACK VALVE**





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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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3. AUXILIARY HYDRAULIC SUPPLY TO VIBRATION AND CYLINDER CIRCUITS FAULTY.

**WARNING**

**Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

Step 1. Open front top left access door per TM 5-3895-373-10. Check for fuel supplied from fuel injection pump at each injector. Loosen (but do not remove) one fuel injector nozzle fitting and crank engine for five seconds. Tighten fuel injector nozzle fitting. Repeat at each fuel injector.

Replace or repair components (auxiliary hydraulic system suction hoses, lines, and fittings per paragraph 2.54, hydraulic reservoir components per paragraph 2.53) as necessary.

**NOTE**

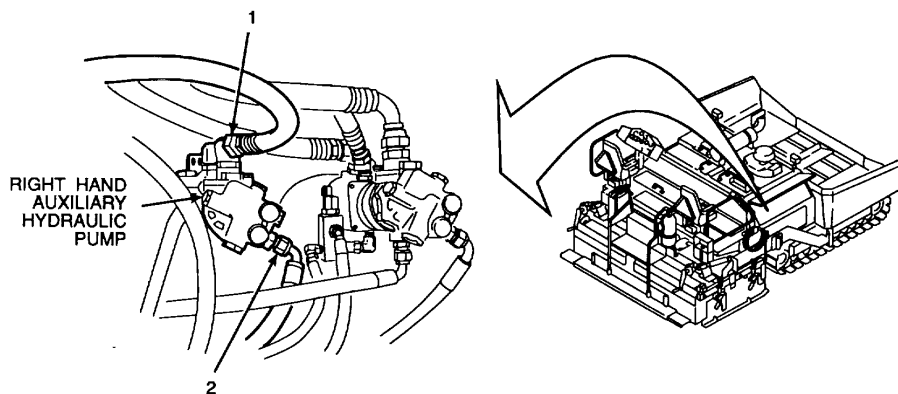
**The following test requires use of a hydraulic system tester. Install tester in-line at flow test point indicated by each individual test per TM 9-4940-468-14. Make sure ratings of all fittings and hoses used are adequate for maximum pressures and flows being tested.**

Step 2. Install hydraulic system tester for flow test at port (2) per TM 9-4940-468-14. Check flow at right hand auxiliary hydraulic pump discharge (2). Measure flow rate at 2475 +25 psi (17 066 +172 kPa) with engine at 2640 ±40 rpm.

If flow rate is less than 5 gpm (19 l/min) at 2475 ±25 psi (17 066 ±172 kPa), replace/repair right hand auxiliary hydraulic pump per paragraph 2.42.

If flow rate is at least 5 gpm (19 l/min) at 2475 ±25 psi (17 066 ±172 kPa), replace valve and cylinder flow divider per paragraph 2.55 and repair per paragraph 2.49.

Step 3. Disconnect hydraulic system tester per TM 9-4940-468-14. Reconnect all hydraulic lines. Install right access cover per TM 5-3895-373-10. Close right access door per TM 5-3895-373-10.



**SECTION III. ENGINE MAINTENANCE**

	Para	Page
Diesel Engine Repair .....	2.17	2-153
Engine Replacement .....	2.16	2-82
Replace Cylinder Head Assembly .....	2.15	2-62

**2.15 REPLACE CYLINDER HEAD ASSEMBLY.**

This task covers:      a. Remove      b. Clean      c. Install

**INITIAL SETUP**

Tools:

- General mechanic's automotive tool kit (Item 105, Appendix D)
- Chain assembly (Item 29, Appendix D)
- Cleaning brush (Item 12, Appendix D)
- Stud remover and setter (Item 98, Appendix D)
- Torque wrench (Item 132, Appendix D)

Material/Parts:

- Cleaning solvent (Item 31, Appendix B)
- Electrical insulating compound (Item 10, Appendix B)
- Electrical insulating varnish (Item 38, Appendix B)
- Engine oil (Item 22, Appendix B)
- Lint-free cloth (Item 7, Appendix B)
- Pipe sealant (Item 27, Appendix B)
- Tags (Item 34, Appendix B)
- Thread locking compound (Item 13, Appendix B)
- Tie wraps (Item 36, Appendix B)
- Cylinder head assembly
- Cylinder head bolts
- Cylinder head gasket
- End cover gasket
- Lockwashers
- Preformed packing
- Self-locking screws
- Thermostat housing gasket
- Valve cover gasket

Personnel Required:

Two 62B construction equipment repairers. Second person needed to assist in hoisting the cylinder head assembly and removing and installing the muffler support bracket.

References:

- TM 5-3895-373-10
- TM 5-3895-373-20
- TM 5-3895-373-24P

Equipment Conditions:

- Left access door open per TM 5-3895-373-10.
- Left access cover removed per TM 5-3895-373-10.
- Front top right and front top left access doors removed per TM 5-3895-373-10.
- Rear top left access door open per TM 5-3895-373-10.
- Radiator drained per TM 5-3895-373-20.
- Exhaust system and pipes removed per TM 5-3895-373-20.
- Air intake and exhaust manifolds removed per TM 5-3895-373-20.
- Turbosupercharger removed per TM 5-3895-373-20.
- Engine fuel filter assembly removed per TM 5-3895-373-20.
- Fuel injectors and injector lines removed per paragraph 2.18.

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## A. REMOVE.

**WARNING**

Disconnect batteries prior to performing maintenance on the electrical system. Failure to disconnect batteries may lead to electrical shock or short circuit and result in severe personnel injury or damage to equipment.

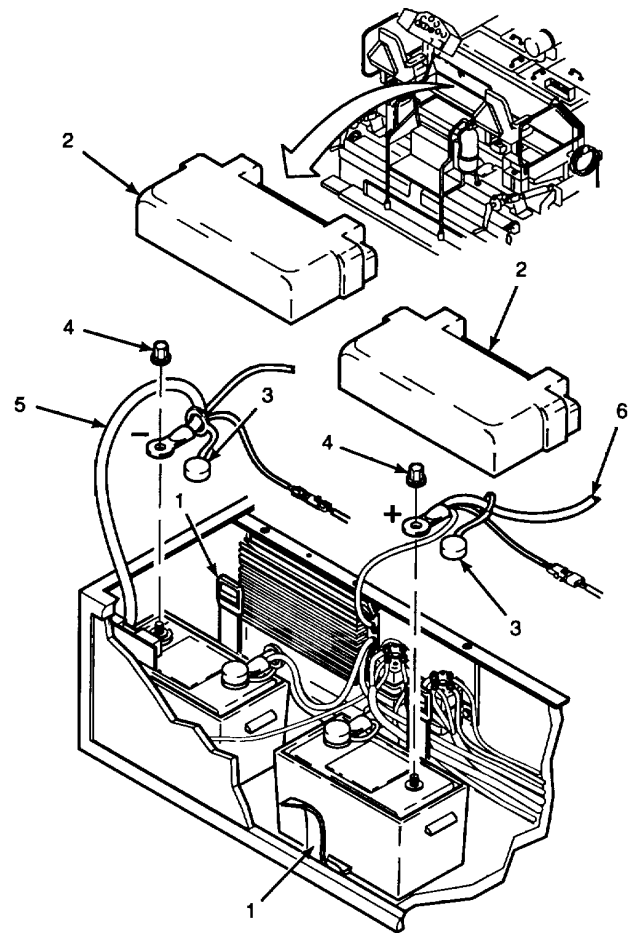
## 1. DISCONNECT THE BATTERY.

- a. Unbuckle battery box hold-down straps (1) and remove battery box covers (2) from both batteries.

**WARNING**

When disconnecting batteries, disconnect negative battery cable before disconnecting positive battery cable. Failure to disconnect batteries in the proper sequence may lead to electrical shock or short circuit and result in severe personnel injury.

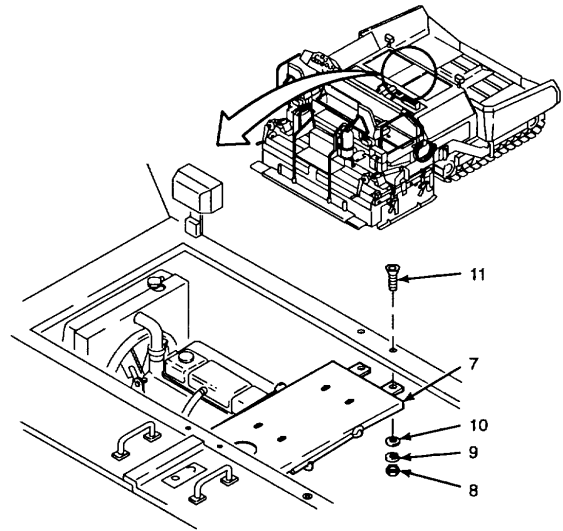
- b. Lift rubber battery terminal caps (3) from battery terminals.
- c. Remove battery nut (4) and negative battery cable (5) from negative terminal of outboard battery.
- d. Remove battery nut (4) and positive battery cable (6) from positive terminal of inboard battery.



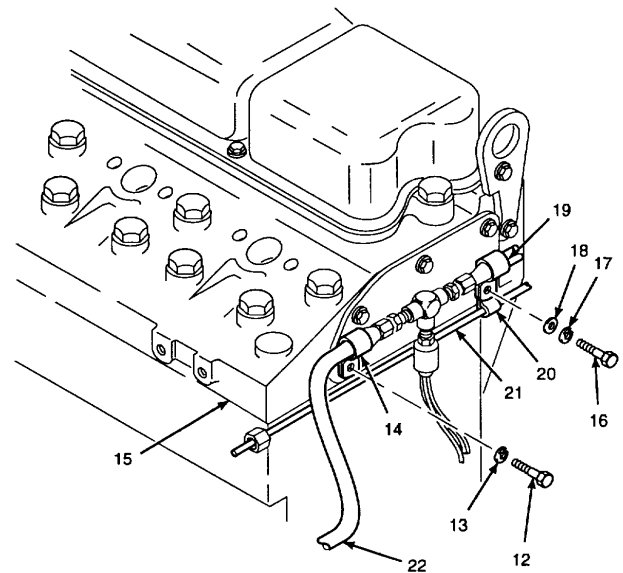
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**2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.**

- A. REMOVE - Continued.
- 2. REMOVE MUFFLER SUPPORT BRACKET.
  - a. With the assistance of a second person, support the weight of muffler support bracket (7).
  - b. Remove hex nuts (8), lockwashers (9), flat washers (10), socket head cap screws (11), and muffler support bracket (7). Discard lockwashers.



- 3. DISCONNECT FUEL LINES FROM CYLINDER HEAD ASSEMBLY.
  - a. Remove screw (12), lockwasher (13), and clamp (14) from cylinder head assembly (15). Discard lockwasher.
  - b. Remove screw (16), lockwasher (17), washer (18), and clamps (19 and 20). Position induction heater fuel pipe (21) and fuel inlet hose (22) so that there is no interference during cylinder head assembly removal. Discard lockwasher.



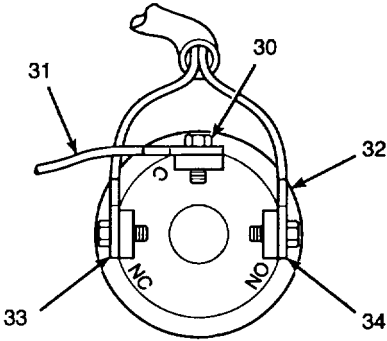
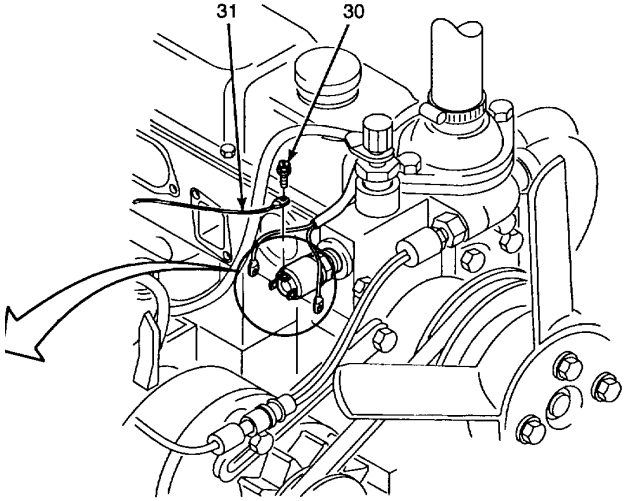
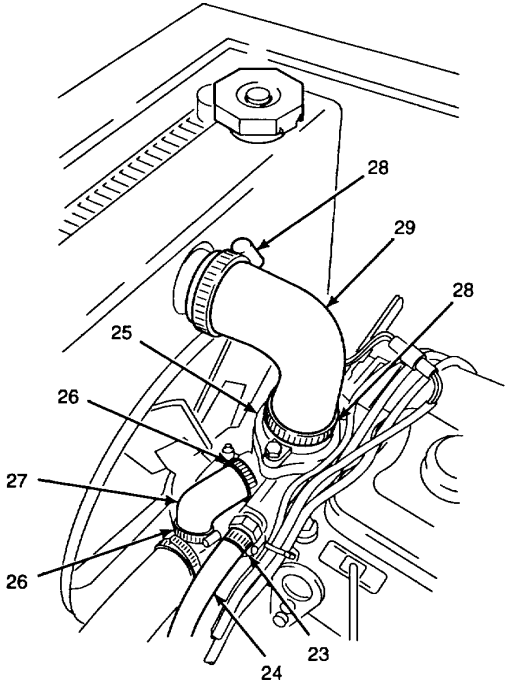
**GO TO NEXT PAGE**

A. REMOVE - Continued.  
4 DISCONNECT COOLANT HOSES FROM THERMOSTAT HOUSING.

- a. Loosen hose clamp (23) and disconnect coolant hose (24) at thermostat housing (25).
- b. Loosen hose clamps (26) and remove coolant bypass hose (27).
- c. Loosen hose clamps (28) and remove upper coolant radiator hose (29).

5. DISCONNECT WIRING FROM THERMOSTAT HOUSING.

- a. Tag wire 111 (31), remove self-locking screw (30), and disconnect wire 111 from terminal C on high temperature shutdown sensor (32).
- b. Tag wire 151 (33), remove self-locking screw (30), and disconnect wire 151 from terminal NC on high temperature shutdown sensor (32).
- c. Tag wire 152 (34), remove self-locking screw (30), and disconnect wire 152 from terminal NO on high temperature shutdown sensor (32). Discard self-locking screws.



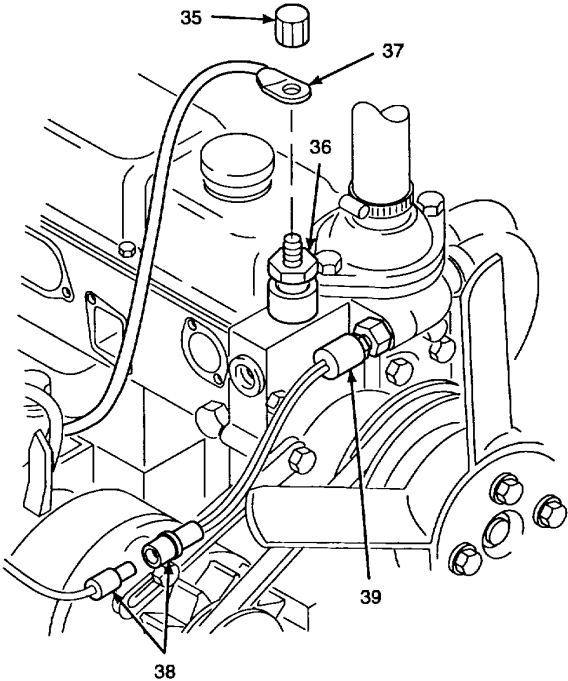
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**2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.**

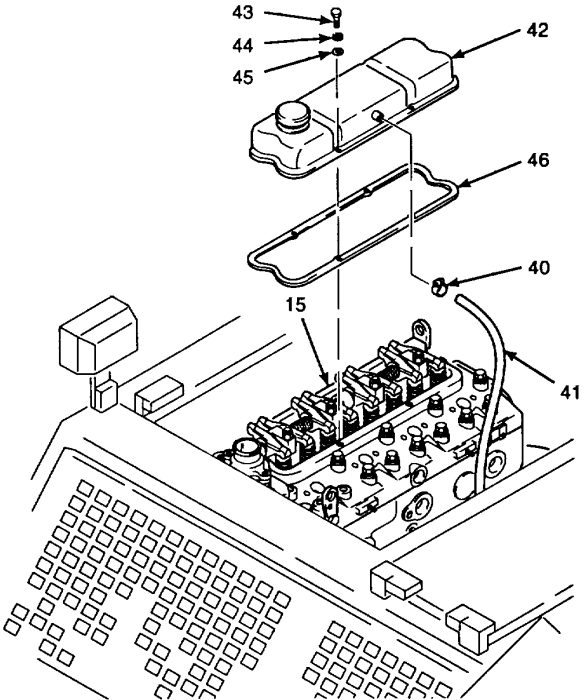
**A. REMOVE - Continued.**

- d. Tag wire 105 (37), remove knurled nut (35) from terminal on coolant temperature sensor (36), and disconnect wire 105. Reinstall knurled nut onto terminal.
- e. Tag and disconnect wiring harness connector (38) to engine coolant temperature transducer (39).



**6. REMOVE VALVE COVER, VALVE COVER GASKET, AND OIL BREATHER HOSE FROM CYLINDER HEAD ASSEMBLY.**

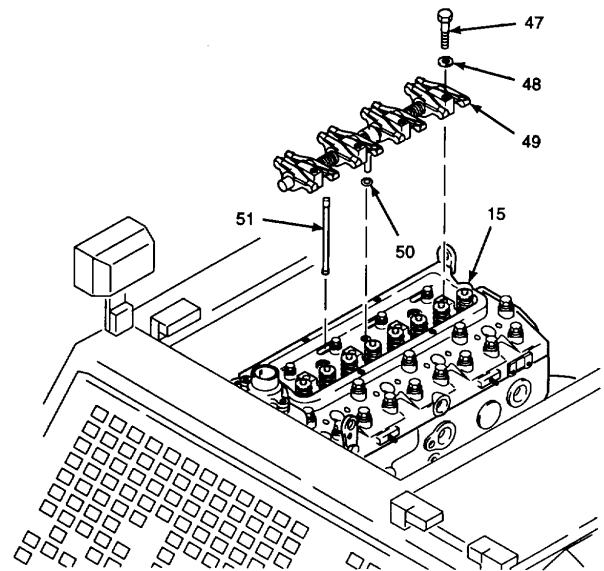
- a. Loosen hose clamp (40) and disconnect oil breather hose (41) from valve cover (42).
- b. Remove bolts (43), lockwashers (44), and washers (45). Discard lockwashers.
- c. Remove valve cover (42) from cylinder head assembly (15).
- d. Remove and discard valve cover gasket (46).



**GO TO NEXT PAGE**

- A. REMOVE - Continued.
- 7. REMOVE ROCKER SHAFT ASSEMBLY AND PUSH RODS FROM CYLINDER HEAD ASSEMBLY.

- a. Remove screws (47) and washers (48) from rocker shaft assembly (49).
- b. Remove rocker shaft assembly (49) from cylinder head assembly (15).
- c. Remove and discard preformed packing (50) from recess in cylinder head assembly (15).



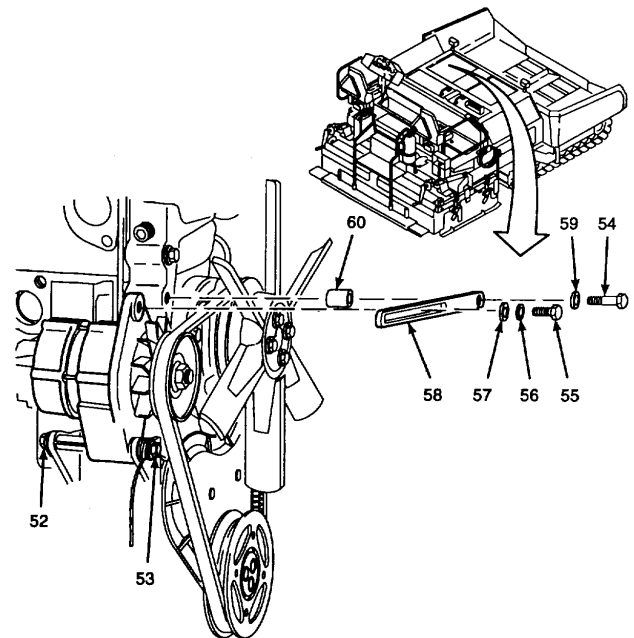
**NOTE**

**Note the position that each push rod is removed from to ensure correct positioning during installation.**

- d. Remove push rods (51) from cylinder head assembly (15). Mark each push rod with the position removed from to ensure that push rods are positioned in the same location during assembly.

- 8. REMOVE ALTERNATOR BELT ADJUSTING ARM.

- a. Hold pivot bolt (52) and loosen self-locking hex nut (53).
- b. Loosen hex head cap screw (54). Remove adjustment screw (55) and flat washers (56 and 57). Move belt adjusting arm (58) up and out of the way. Reinstall adjustment screw (55) and flat washers (56 and 57) back into alternator.
- c. Remove hex head cap screw (54), lockwasher (59), belt adjusting arm (58) and sleeve spacer (60).



**GO TO NEXT PAGE**

**2.15 REPLACE CYLINDER HEAD ASSEMBLY- Continued.**

- A. REMOVE - Continued.
9. REMOVE CYLINDER HEAD ASSEMBLY FROM ENGINE BLOCK.
- Cut any tie wraps necessary and move the wiring harnesses out of the way so that they will not interfere with the removal of cylinder head assembly (15).
  - Remove and discard cylinder head machine bolts (61, 62, and 63) from cylinder head assembly (15) in the order shown.
  - Attach a chain assembly to front and rear lifting brackets (64 and 65).

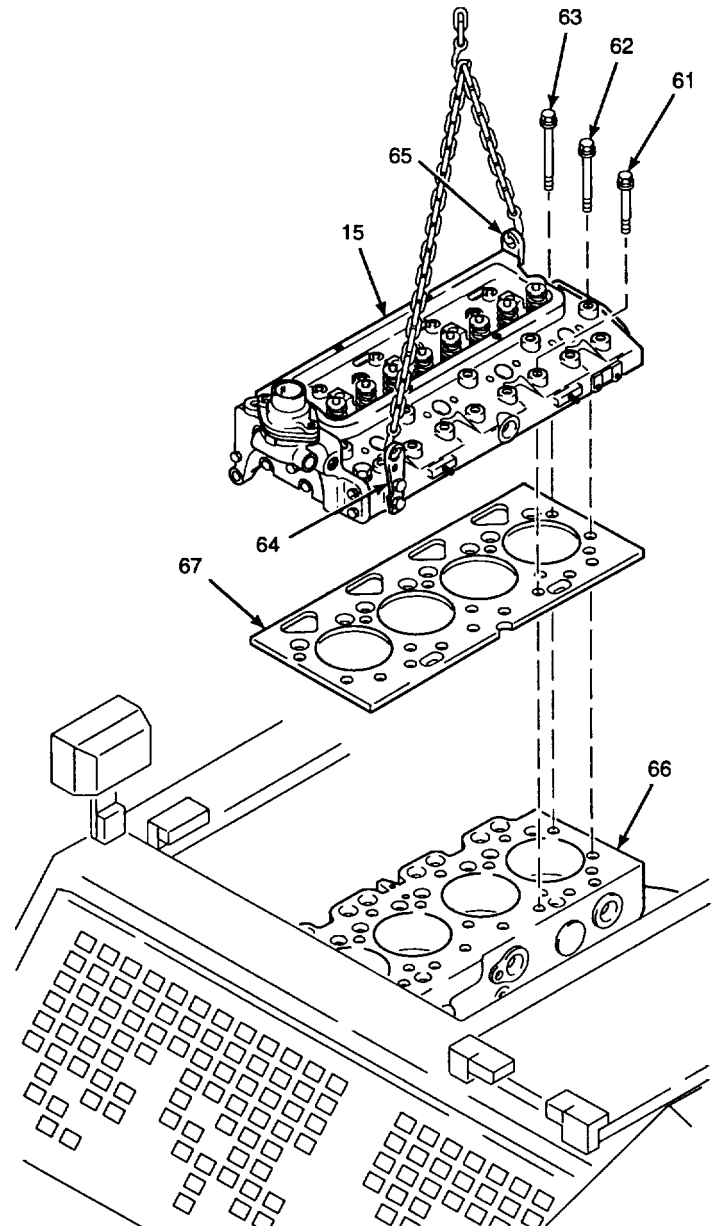
**WARNING**

To avoid personal injury, use a hoist when lifting the cylinder head assembly, which weighs more than 110 lbs (50 kg). Ensure the chains and hooks are in good condition and are of correct capacity. Ensure hooks are positioned correctly.

Keep clear of paving machine when the cylinder head assembly is being raised. The cylinder head assembly could fall and cause serious injury or death.

Do not allow the cylinder head assembly to swing while hanging from the lifting device. The cylinder head assembly may strike personnel and cause serious injury.

- Lift cylinder head assembly (15) off of engine block (66) using an overhead hoist. Make sure to hold all wiring harnesses out of the way as the cylinder head assembly is being lifted. Place the cylinder head assembly onto a flat work surface and remove the chain assembly.



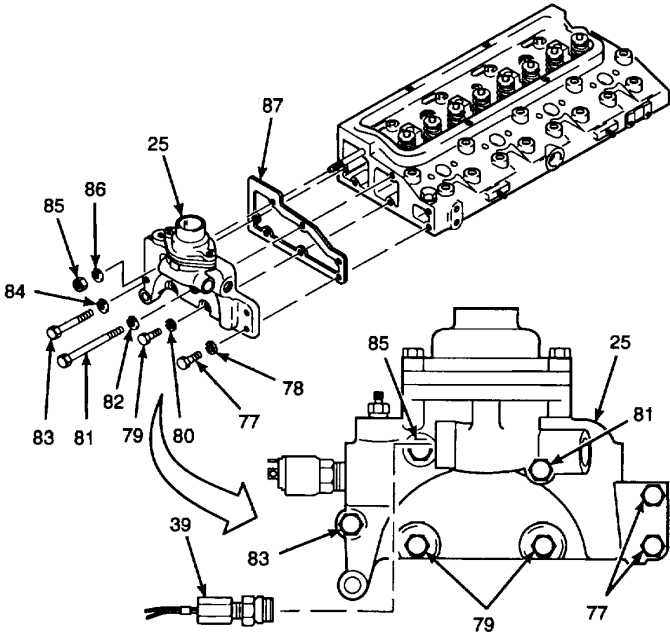
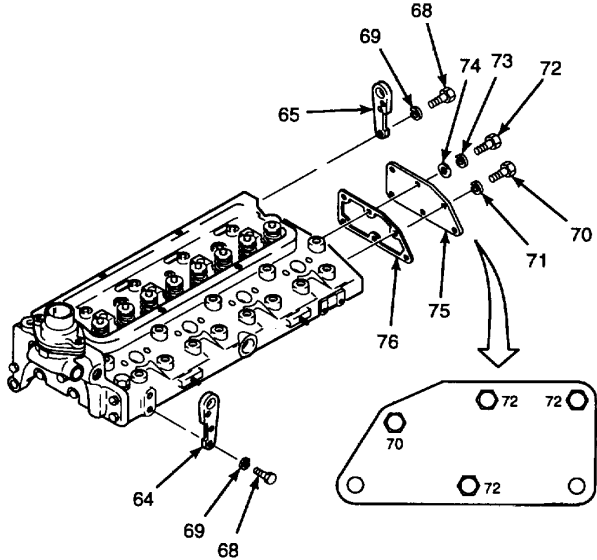
- Remove and discard cylinder head gasket.
- Cover the open ports on engine block (66) with a lint-free cloth until needed for installation.

**GO TO NEXT PAGE**

A. REMOVE - Continued.

10. REMOVE LIFTING BRACKETS, CYLINDER HEAD END COVER, THERMOSTAT HOUSING, AND STUDS FROM CYLINDER HEAD ASSEMBLY.

- a. Remove hex head cap screws (68), lockwashers (69) and front and rear lifting brackets (64 and 65). Discard lockwashers.
- b. Remove screw (70) and lockwasher (71). Discard lockwashers.
- c. Remove screws (72), lockwashers (73), washer (74) and cylinder head end cover (75). Discard lockwashers. Only the top center screw uses washer (74).
- d. Remove and discard end cover gasket (76).
- e. Remove engine coolant temperature transducer (39) from thermostat housing (25).
- f. Remove bolts (77) and lockwashers (78). Discard lockwashers.
- g. Remove screws (79) and lockwashers (80). Discard lockwashers.
- h. Remove screw (81) and lockwasher (82). Discard lockwasher.
- i. Remove bolt (83) and lockwasher (84). Discard lockwasher.
- j. Remove hex nut (85), lockwasher (86) and thermostat housing (25). Discard lockwasher.
- k. Remove and discard thermostat housing gasket (87).



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2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.

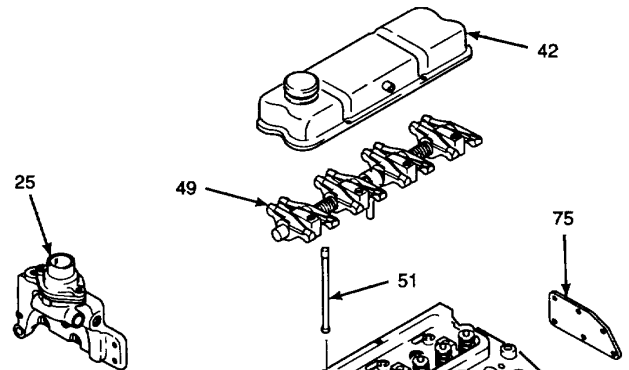
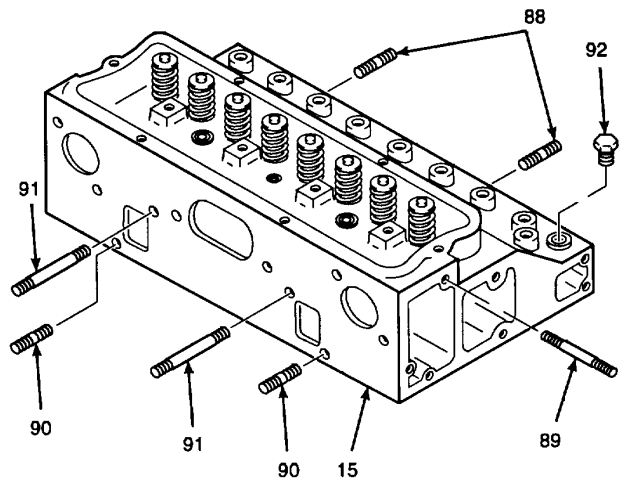
A. REMOVE - Continued.

- i. Remove studs (88, 89, 90, and 91) using stud remover and setter.
- m. Remove pipe plug (92) from cylinder head assembly (15).

**WARNING**

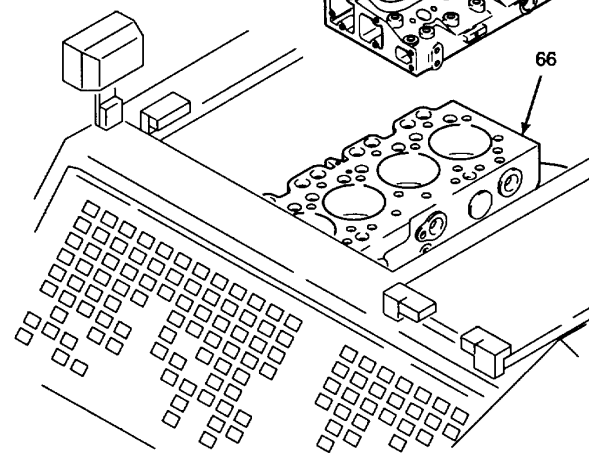
Cleaning solvent, PD-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent: the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy when using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.



B. CLEAN.

1. USE A CLEAN, LINT-FREE CLOTH SOAKED IN CLEANING SOLVENT TO CLEAN THERMOSTAT HOUSING (25), VALVE COVER (42), ROCKER SHAFT ASSEMBLY (49), PUSH RODS (51), CYLINDER HEAD END COVER (75), AND THE TOP OF ENGINE BLOCK (66).
2. USE A PARTS CLEANING BRUSH AND CLEANING SOLVENT TO REMOVE ANY HARD DEPOSITS AND CARBON BUILDUP.



GO TO NEXT PAGE

B. CLEAN - Continued.

**CAUTION**

Use caution when scraping gasket sealing surfaces with putty knife. Putty knife may score sealing surfaces and debris may fall into open ports. Failure to do so may result in poor seal and component damage.

3. USE A PUTTY KNIFE, IF NECESSARY TO REMOVE ANY GASKET MATERIAL FROM SEALING SURFACES. DO NOT SCORE THE SEALING SURFACE OR ALLOW ANY GASKET MATERIAL TO FALL INTO THE OPEN PORTS.

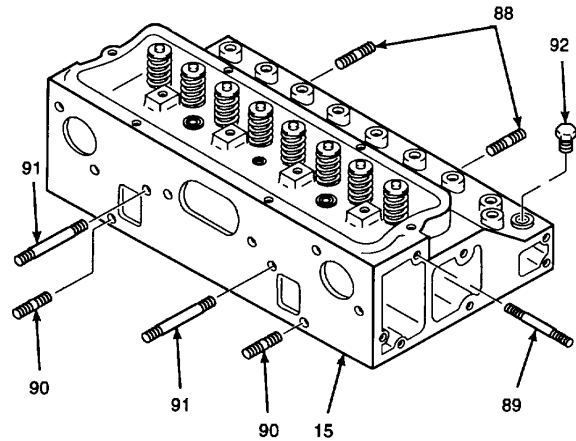
4. DRY ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.

C. INSTALL.

1. INSTALL STUDS, LIFTING BRACKETS, CYLINDER HEAD END COVER, AND THERMOSTAT HOUSING TO THE CYLINDER HEAD ASSEMBLY.

a. Install studs (91, 90, 89, and 88) into cylinder head assembly (15) using stud remover and setter.

b. Tighten studs (88) to 42 lb-ft (57 N•m) and studs (89, 90, and 91) to 30 lb-ft (41 Nm).



**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

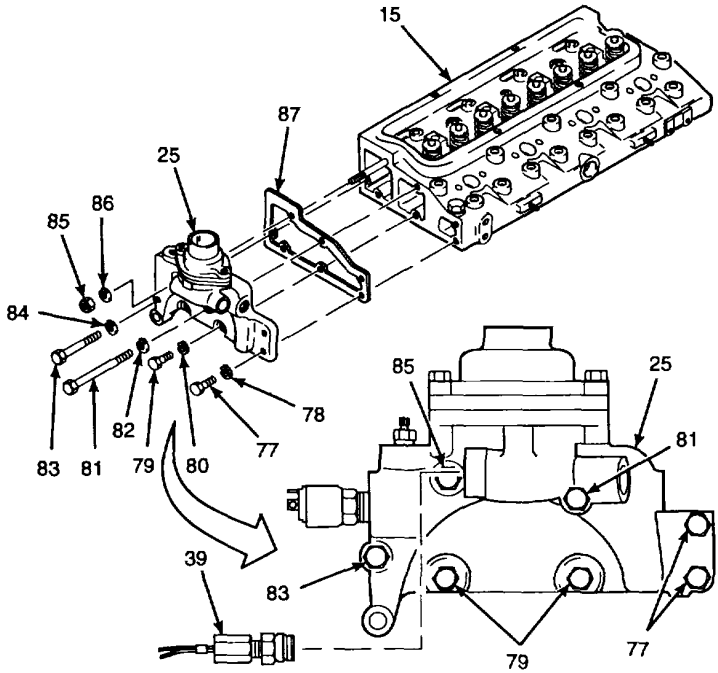
c. Apply pipe sealant to threads of pipe plug (92) and install into cylinder head assembly (15). Tighten plug.

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2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.

C. INSTALL Continued.

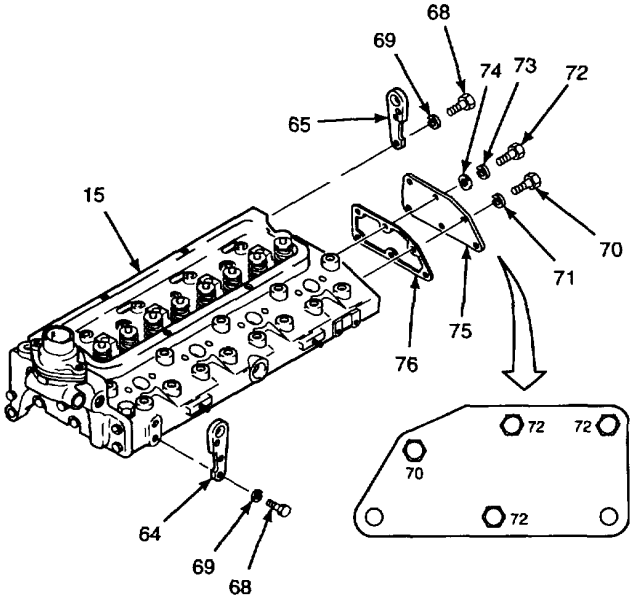
- d. Place thermostat housing gasket (87) and thermostat housing (25) onto cylinder head assembly (15). Secure in place with lockwashers (78) and bolts (77).
- e. Install lockwashers (80) and screws (79).
- f. Install lockwasher (82) and screw (81).
- g. Install lockwasher (84) and bolt (83).
- h. Install lockwasher (86) and hex nut (85).
- i. Tighten bolts (77 and 83) and hex nut (85) to 42 lb-ft (57 N•m).
- j. Tighten screws (79 and 81) to 21 lb-ft (28 N•m).



**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- k. Apply pipe sealant to the threads of engine coolant temperature transducer (39). Install transducer into thermostat housing (25).
- l. Install front and rear lifting brackets (64 and 65), lockwashers (69) and hex head cap screws (68).
- m. Tighten hex head cap screws (68) to 42 lb-ft (57 N•m).
- n. Place end cover gasket (76) and cylinder head end cover (75) onto cylinder head assembly (15). Secure with lockwasher (71), and screw (70).
- o. Place washer (74) at the top center position on cylinder head end cover (75). Install lockwashers (73) and screws (72).



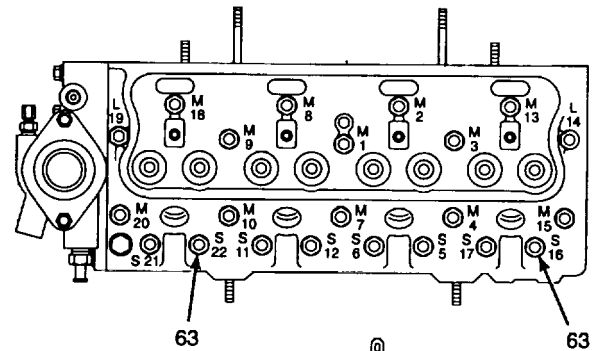
- p. Tighten screws (72) to 42 lb-ft (N•m) and screw (70) to 21 lb-ft (28 N•m).

GO TO NEXT PAGE

C. INSTALL Continued.

2. INSTALL CYLINDER HEAD ASSEMBLY ONTO ENGINE BLOCK.

- a. Place cylinder head gasket (67) onto engine block (66).
- b. Attach chain assembly to front and rear lifting brackets (64 and 65).
- c. Ensure that all wiring harnesses are out of the way when installing the cylinder head assembly.



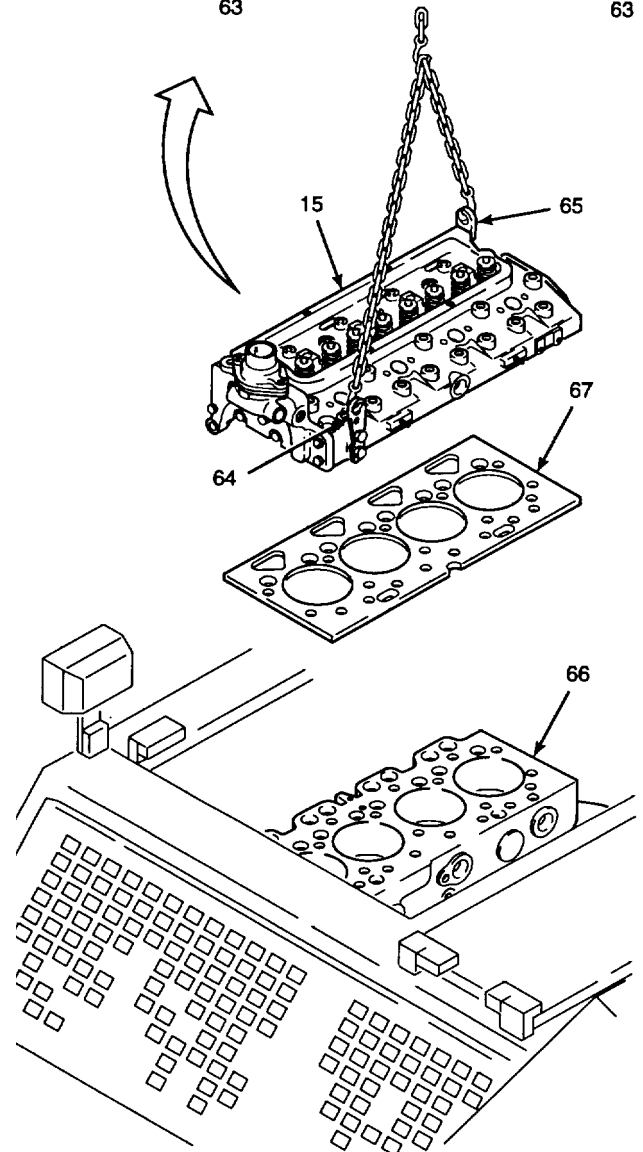
**WARNING**

To avoid personal injury, use a hoist when lifting the cylinder head assembly which weighs more than 110 lbs (50 kg). Ensure all chains and hooks are in good condition and are of correct capacity. Ensure hooks are positioned correctly.

Keep clear of paving machine when the cylinder head assembly is being lowered. The cylinder head assembly may fall and cause serious injury or death.

Do not allow the cylinder head assembly to swing while hanging by the lifting device. The cylinder head assembly may strike personnel and cause serious injury.

- d. Lift cylinder head assembly (15) with overhead hoist. Position the cylinder head assembly so that it is approximately 1/2 in. (13 mm) over the top of the engine block.
- e. Place the longest of bolts (63) through the cylinder head assembly at bolt positions S16 and S22. Hand tighten bolts.
- f. Lower the cylinder head assembly onto the engine block and remove chain assembly from front and rear lifting brackets (64 and 65).
- g. Remove chain assembly from front and rear lifting brackets (64 and 65).

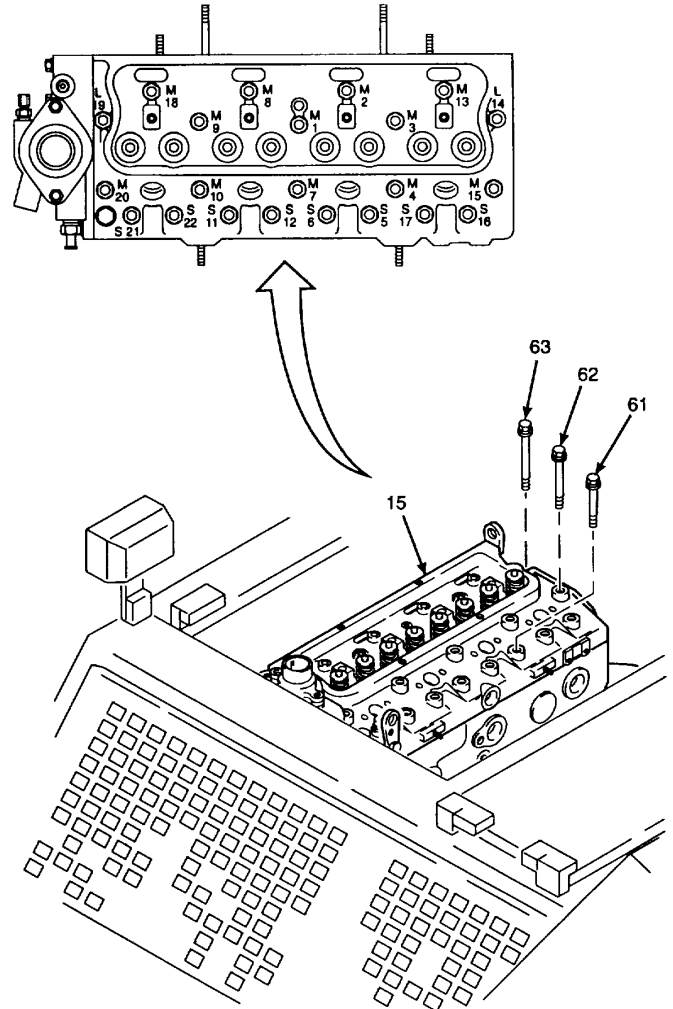


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**2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.****C. INSTALL - Continued.**

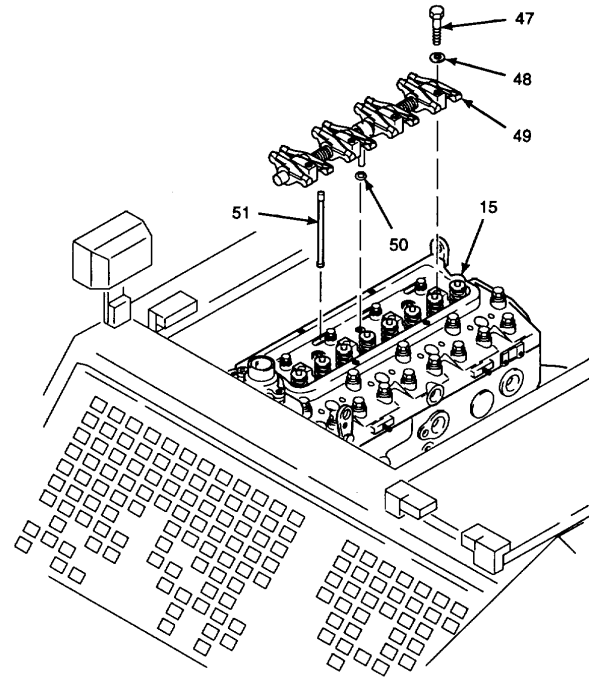
- h. Remove bolts (63) used for alignment.
- i. Lightly oil bolts (61, 62, and 63) with engine oil.
- j. Install bolts (61) short, (62) medium, and (63) long, into cylinder head assembly (15). Ensure that the correct size bolt is installed into the correct hole as shown. Place short bolts (61) in holes marked S, medium bolts (62) in holes marked M, and long bolts (63) in holes marked L.
- k. Tighten the bolts to 89 lb-ft (121 N•m) in the sequence shown.
- l. After tightening, verify that all of the bolts are set to the proper torque before continuing on to the next step.
- m. Tighten each bolt another one half turn (180°) in the sequence shown.

**GO TO NEXT PAGE**

C. INSTALL Continued.

3. INSTALL ROCKER SHAFT ASSEMBLY AND PUSH RODS INTO CYLINDER HEAD ASSEMBLY.

- a. Install push rods (51) into cylinder head assembly (15). Make sure that the push rods are installed in the same locations from which they were removed.
- b. Place preformed packing (50) in the oil feed connection recess of cylinder head assembly (15).
- c. Install rocker shaft assembly (49) straight down onto cylinder head assembly (15).
- d. Lightly oil screws (47) with engine oil.
- e. Install washers (48) and screws (47).
- f. Tighten screws to 30 lb-ft (41 N•m).

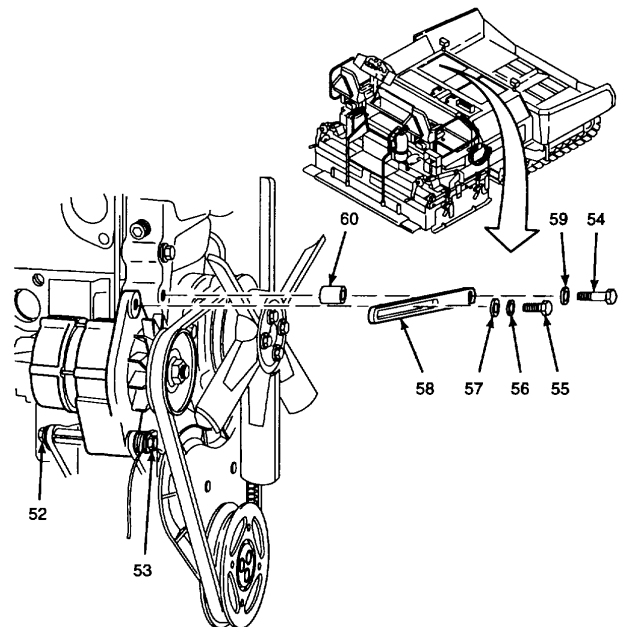


4. ADJUST FAN BELT TENSION AND TIGHTEN ALTERNATOR HARDWARE.

**NOTE**

**Install, but do not tighten, any of the alternator mounting hardware until the fan belt tension adjustment has been completed per TM 5-3895-373-20.**

- a. Attach belt adjusting arm (58) and sleeve spacer (60) with lockwasher (59) and hex head cap screw (54). Do not tighten cap screw at this time.
- b. Ensure that fan belt is seated properly onto all pulleys.
- c. Install adjustment screw (55) and flat washers (56 and 57) into alternator through belt adjusting arm (58). Do not tighten the screw at this time.
- d. Adjust fan belt tension and tighten alternator mounting hardware per TM 5-3895-373-20.



**NOTE**

**Before installing the valve cover, perform valve adjustment procedure per TM 5-3895-373-20.**

**GO TO NEXT PAGE**

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**2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.**


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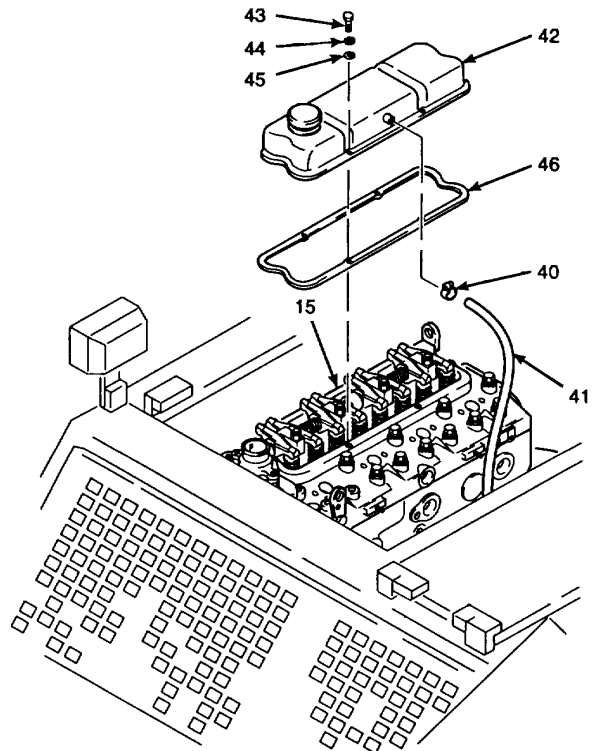
## C. INSTALL Continued.

5. INSTALL VALVE COVER, VALVE COVER GASKET, AND OIL BREATHER HOSE TO CYLINDER HEAD ASSEMBLY.
- a. Place valve cover gasket (46) and valve cover (42) onto cylinder head assembly (15). Secure with washers (45), lockwashers (44) and bolts (43).

**CAUTION**

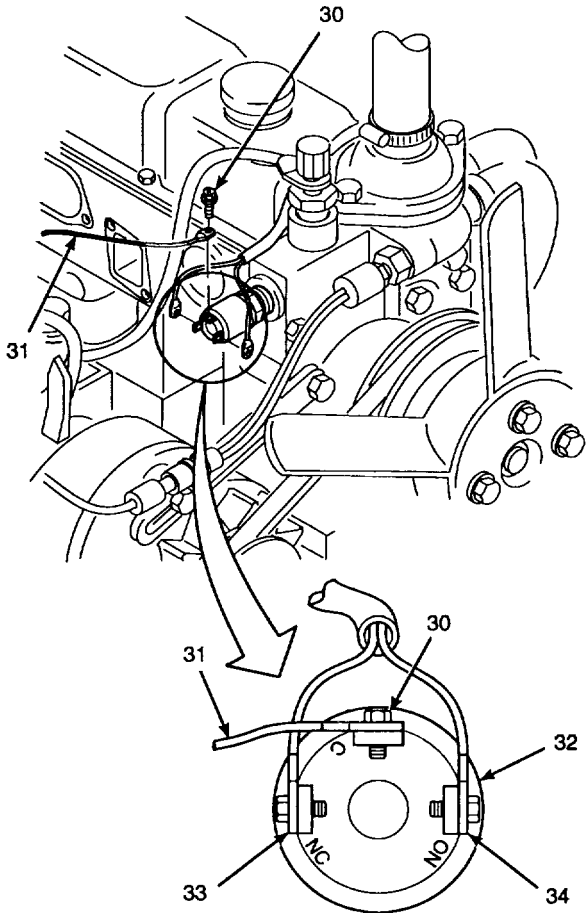
**Do not overtighten bolts. If bolts are overtightened, damage may occur to valve cover or bolts.**

- b. Install and securely tighten bolts (43). Do not overtighten bolts. Overtightening may cause bolts to break or damage valve cover (42) or valve cover gasket (46).
- c. Do not install oil breather hose (41) or hose clamp (40) until after fuel injectors and lines have been installed per paragraph 2.18.



**GO TO NEXT PAGE**

- C. INSTALL Continued.
- 6. CONNECT WIRING TO THERMOSTAT HOUSING.
  - a. Install wire 111 (31) to terminal C on high temperature shutdown sensor (32). Secure with self-locking screw (30).
  - b. Install wire 151 (33) to terminal NC on high temperature shutdown sensor (32).
  - c. Install wire 152 (34) to terminal NO on high temperature shutdown sensor (32).



TERMINAL	WIRE NO.	INDEX NO.
C	111	31
NO	152	34
NC	151	33

GO TO NEXT PAGE

**2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.**

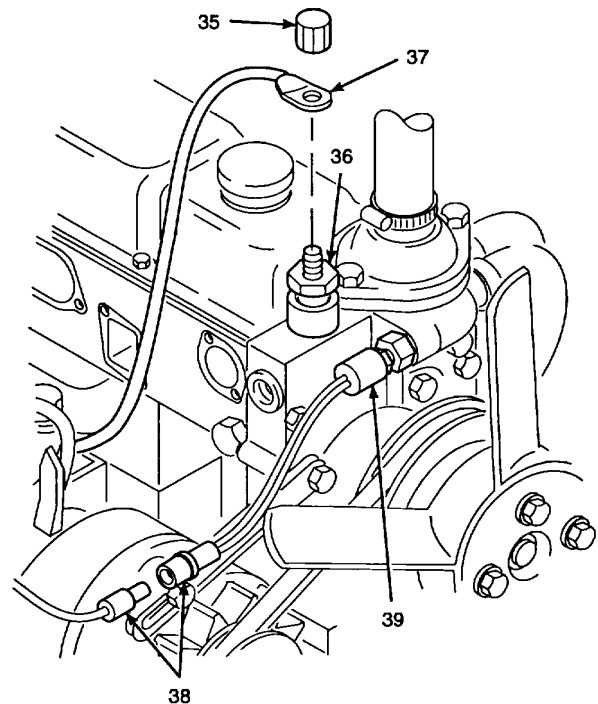
C. INSTALL Continued.

- d. Install wire 105 (37) to coolant temperature sensor (36).
- e. Install knurled nut (35) onto the terminal of coolant temperature sensor (36).

**WARNING**

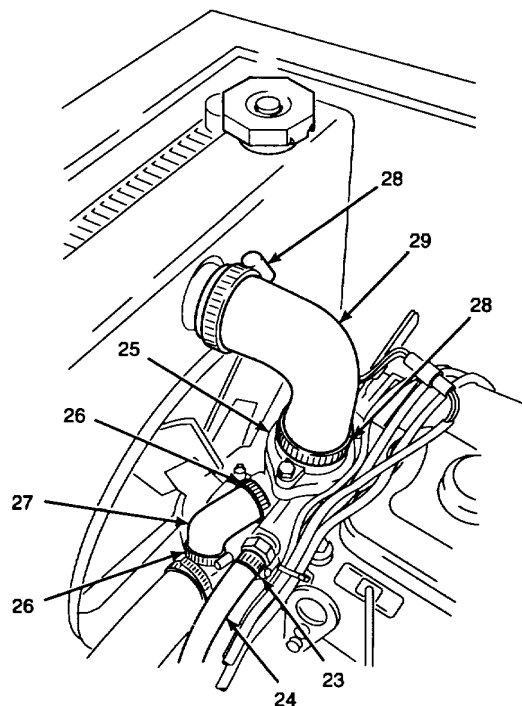
**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- f. Apply electrical insulating varnish to all wires and connectors.
- g. Apply electrical insulating compound to male end of wiring harness connector (38).
- h. Connect wiring harness connector (38) with engine coolant temperature transducer (39).
- i. Use tie wraps as necessary to secure the wiring harness away from the exhaust manifold and any moving parts.



7. CONNECT COOLANT HOSES TO THERMOSTAT HOUSING.

- a. Connect coolant hose (24) to thermostat housing (25) and tighten hose clamp (23).
- b. Install coolant bypass hose (27) between thermostat housing (25) and water pump. Tighten hose clamps (26).
- c. Install upper coolant hose (29) between thermostat housing (25) and radiator. Tighten hose clamps (28).

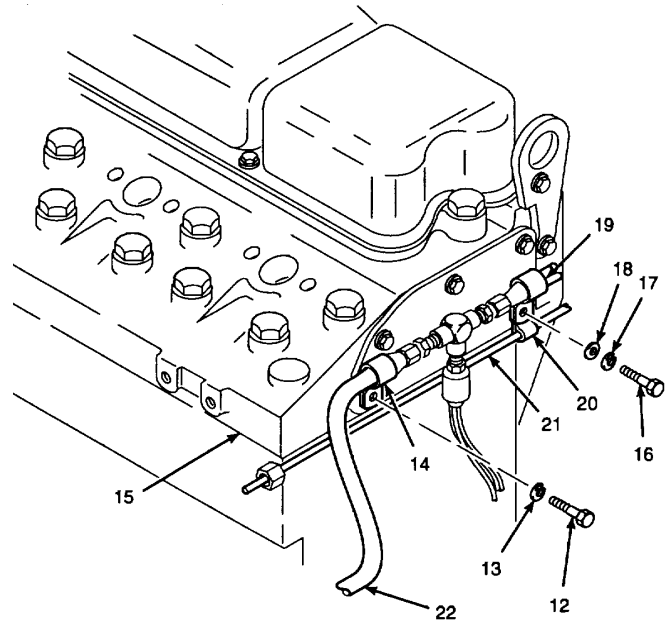


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C. INSTALL Continued.

8. INSTALL FUEL LINES.

- a. Before connecting any fuel lines, clean all fittings and connectors to prevent fuel system contamination.
- b. Adjust induction heater fuel pipe (21) and fuel inlet hose (22) so that clamps (14, 19, and 20) align with the proper holes.
- c. Attach clamps (19 and 20) to cylinder head assembly (15) with washer (18), lockwasher (17) and screw (16).
- d. Attach clamp (14) to cylinder head assembly (15) with lockwasher (13) and screw (12).
- e. Tighten screw (16) to 21 lb-ft (28 N•m).
- f. Tighten screw (12) to 42 lb-ft (57 N•m).



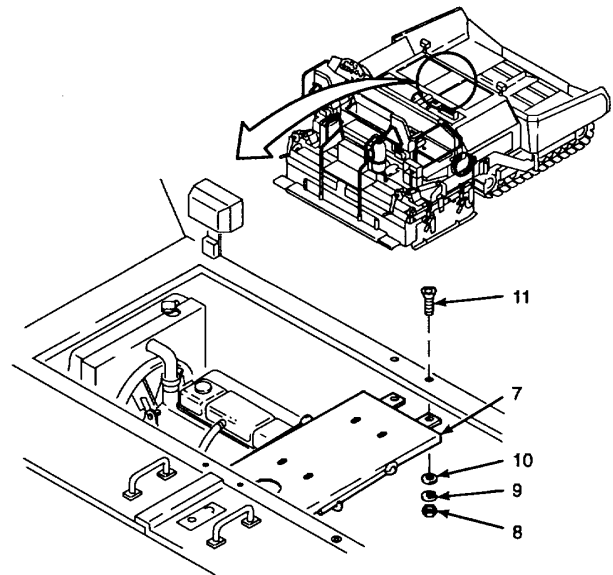
9. INSTALL MUFFLER SUPPORT BRACKET.

- a. With the assistance of a second person, support the weight of muffler support bracket (7).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- b. Apply thread locking compound to threads of socket head cap screws (11).
- c. Install socket head cap screws (11), flat washers (10), lockwashers (9), and hex nuts (8).
- d. Tighten hex nuts (8) to 37 lb-ft (50 N•m).



**GO TO NEXT PAGE**

**2.15 REPLACE CYLINDER HEAD ASSEMBLY - Continued.**

- C. INSTALL Continued.
10. CONNECT BATTERY.

**WARNING**

When connecting batteries, connect positive battery cable before connecting negative battery cable.

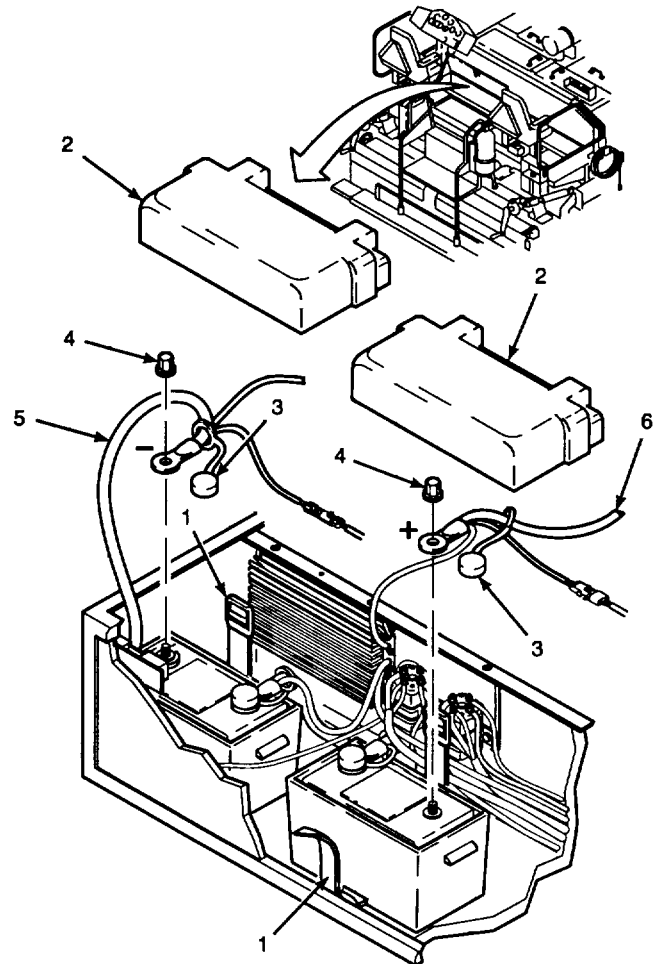
Failure to connect batteries in the proper sequence may lead to electrical shock or short circuit and result in severe personnel injury.

- a. Reconnect positive battery cable (6) and battery nut (4) to positive terminal on inboard battery.
- b. Reconnect negative battery cable (5) and battery nut (4) to negative terminal of outboard battery.

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- c. Apply electrical insulating varnish to terminals of battery.
- d. Install rubber battery terminal caps (3) onto battery terminals.
- e. Install battery box covers (2) on both batteries and buckle battery box holddown straps (1).



**GO TO NEXT PAGE**

C. INSTALL - Continued.

**NOTE**

**FOLLOW-ON-TASKS:** Install fuel injector and lines per paragraph 2.18.  
Install turbosuperchargers per TM 5-3895-373-20.  
Install air intake per TM 5-3895-373-20.  
Install exhaust mufflers and pipes per TM 5-3895-373-20.  
Install engine fuel filter assembly per TM 5-3895-373-20.  
Purge engine fuel lines per TM 5-3895-373-20.  
Service engine coolant per LO 5-3895-373-12.  
Service engine oil per LO 5-3895-373-12.  
Install left access cover per TM 5-3895-373-20.  
Close left access door per TM 5-3895-373-20.  
Close rear top left access door per TM 5-3895-373-10.  
Install front top right access door per TM 5-3895-373-20.  
Install front top left access door per TM 5-3895-373-20.

**END OF TASK**

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**2.16 ENGINE REPLACEMENT.**


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This task covers:      a. Remove      b. Clean      c. Install

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**INITIAL SETUP**
Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Adjustable wrench (Item 114, Appendix D)  
Automotive engine stand (Item 97, Appendix D)  
Chain assembly (Item 29, Appendix D)  
Combination wrench (Item 115, Appendix D)  
Combination wrench (Item 116, Appendix D)  
Crowbar (Item 36, Appendix D)  
Crowfoot wrench (Item 123, Appendix D)  
Drain pan (Item 63, Appendix D)  
Hex head screw cap (Item 77, Appendix D)  
Lifting shackle (Item 82, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Torque wrench, 100 to 500 lb-ft (Item 133, Appendix D)  
Sling strap (Item 98, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Socket wrench set (Item 135, Appendix D)

Materials/Parts:

Anti-seize compound (Item 8, Appendix B)  
Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Electrical insulating compound (Item 10, Appendix B)  
Electrical insulating varnish (Item 38, Appendix B)  
Machinery wiping towels (Item 37, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Tie wraps (Item 36, Appendix B)  
Cotter pin  
Lockwashers  
Self-locking hex nuts  
Self-locking screws  
Shock mounts  
Solvent

Personnel Required:

Three 62B construction equipment repairers. Second person needed for removal of components; second and third person needed for hoisting engine and pump assembly.

References:

TM 5-3895-373-10  
TM 5-3895-373-12  
TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Right access door opened per TM 5-3895-373-10.  
Right access cover removed per TM 5-3895-373-10.  
Left access door opened per TM 5-3895-373-10.  
Left access cover removed per TM 5-3895-373-10.  
Front top right and front top left access door slot removed per TM 5-3895-373-20.  
Rear top left access door opened per TM 5-3895-373-10.  
Engine access cover removed per TM 5-3895-373-20.  
Exhaust muffler and pipes removed per TM 5-3895-373-20.  
Hydraulic oil cooler removed per TM 5-3895-373-20.  
Radiator removed per TM 5-3895-373-20.

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A. REMOVE.

**NOTE**

Cut and remove tie wraps as required during removal of electrical wires, harnesses, and hoses.

1. DISCONNECT BATTERIES.

**WARNING**

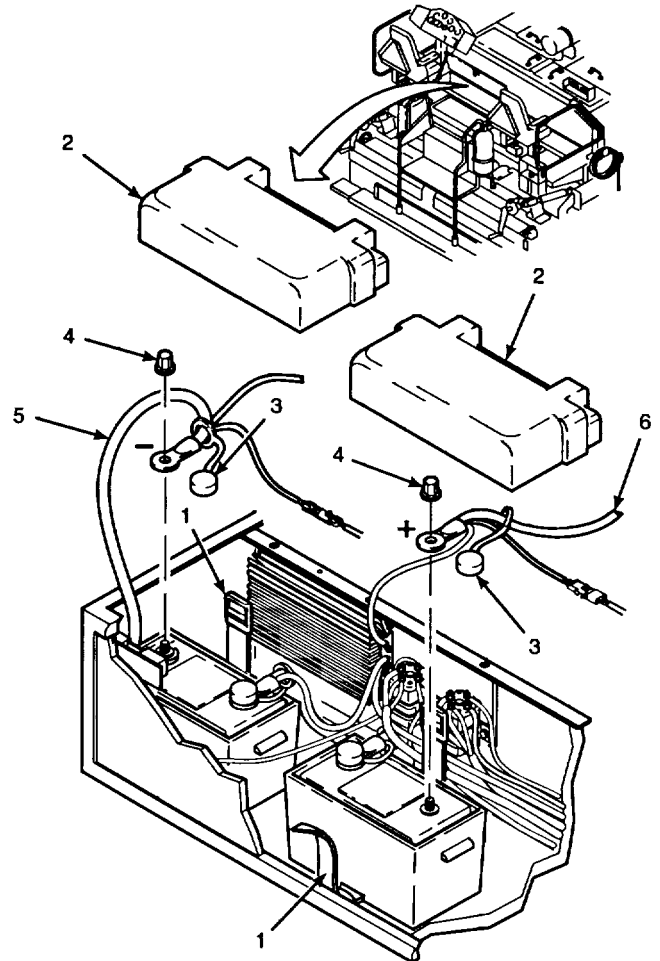
Disconnect batteries prior to performing maintenance in the engine compartment. Failure to disconnect batteries may lead to electrical shock or short circuit and result in severe personnel injury or damage to equipment.

- a. Unbuckle battery box holddown straps (1) and remove battery box covers (2) from both batteries.
- b. Lift rubber battery terminal caps (3) from battery terminals.

**WARNING**

When disconnecting batteries, disconnect negative battery cable before disconnecting positive battery cable. Failure to disconnect batteries in the proper sequence may lead to electrical shock or short circuit and result in severe personnel injury.

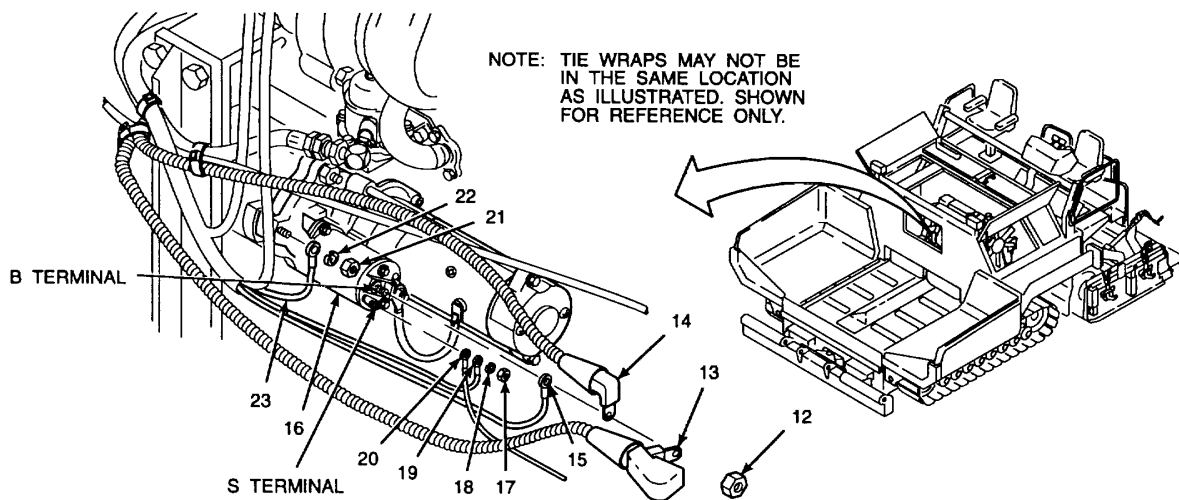
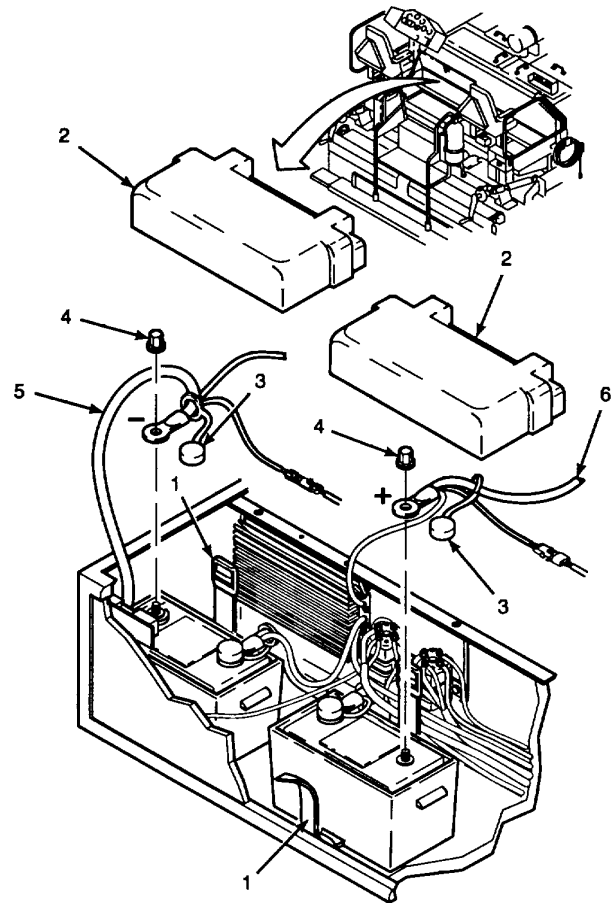
- c. Remove battery nut (4) and negative battery cable (5) from negative terminal of outboard battery.
- d. Remove battery nut (4) and positive battery cable (6) from positive terminal of inboard battery.



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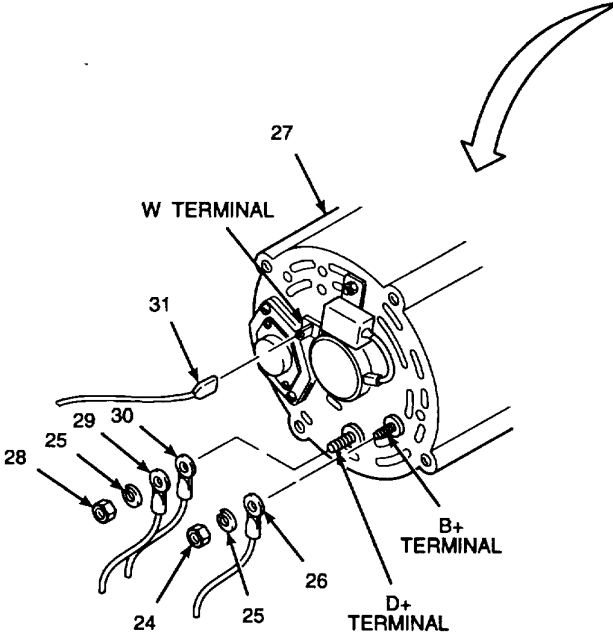
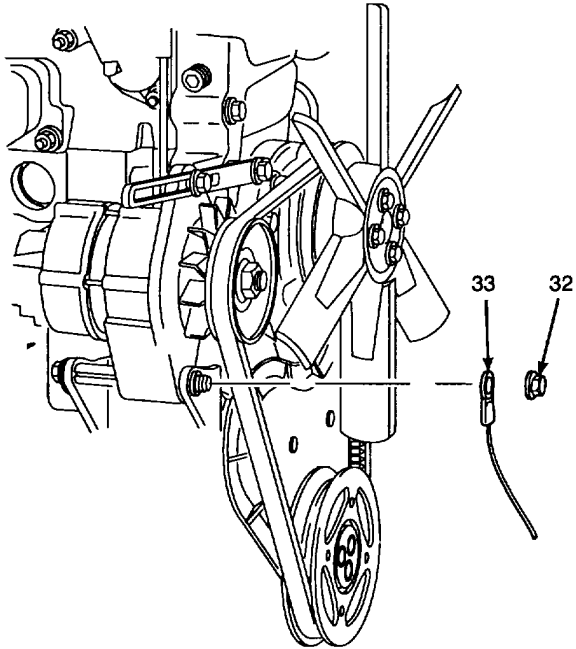
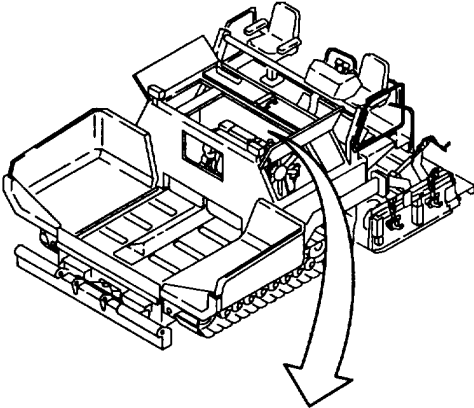
**2.16 ENGINE REPLACEMENT - Continued.**

- A. REMOVE Continued.
- 2. REMOVE MUFFLER SUPPORT BRACKET.
  - a. With the help of another person to support the weight of muffler support bracket (7), remove socket head cap screws (8), flat washers (9), lockwashers (10) and hex nuts (11). Discard lockwashers.
  - b. Remove muffler support bracket (7) from paving machine.
- 3. DISCONNECT ELECTRICAL CONNECTIONS FROM STARTER.
  - a. Remove hex nut (12), slave cable (13), positive battery cable (14), and wire 331 (15) from B terminal on starter (16). Install hex nut back onto terminal.
  - b. Remove hex nut (17), lockwasher (18), wire 332 (19), and wire 166 (20) from S terminal on starter. Discard lockwasher. Install hex nut back onto terminal.
  - c. Remove hex nut (21), lockwasher (22), and wire 333 (23) from starter mounting stud. Discard lockwasher. Install hex nut back onto mounting stud.



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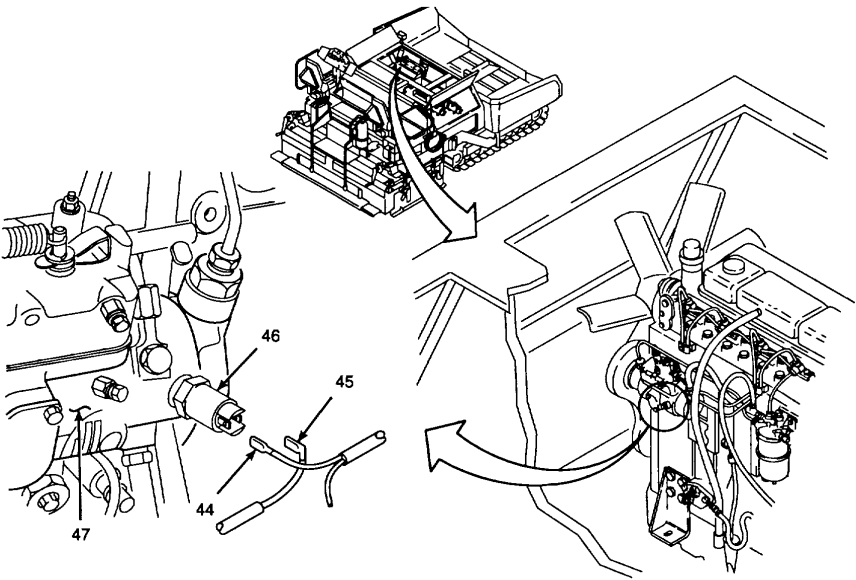
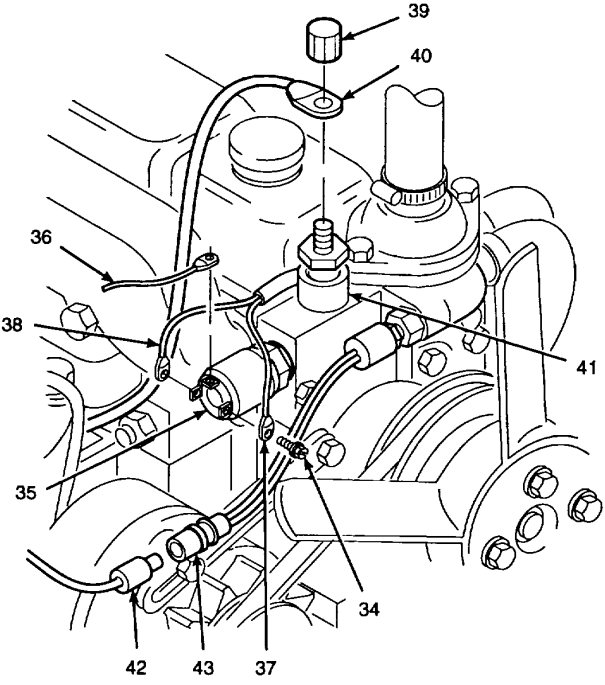
- A. REMOVE Continued.
- 4. DISCONNECT ELECTRICAL CONNECTIONS FROM ALTERNATOR.
  - a. Remove hex nut (24), lockwasher (25), and wire 328 (26) from B+ terminal on alternator (27). Discard lockwasher. Install hex nut back onto terminal.
  - b. Remove hex nut (28), lockwasher (25), wire 329 (29), and wire 160 (30) from D+ terminal of alternator (27). Discard lockwasher. Install hex nut back onto terminal.
  - c. Disconnect wire 102 (31) from W terminal on alternator.
  - d. Remove self-locking hex nut (32) and DCA ground wire 330 (33) from pivot bolt of alternator (27). Temporarily reinstall nut back onto alternator pivot bolt. This nut will need to be replaced with a new nut at reassembly.



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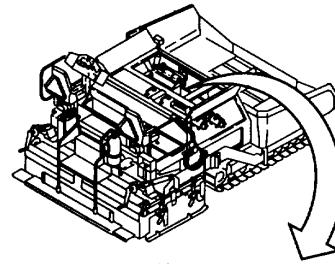
**2.16 ENGINE REPLACEMENT - Continued.**

- A. REMOVE - Continued.
- 5. DISCONNECT ELECTRICAL CONNECTIONS FROM THERMOSTAT HOUSING.
  - a. Remove self-locking screws (34) from high temperature shutdown sensor (35). Discard self-locking screws.
  - b. Tag and remove wire 111 (36) from C terminal, wire 152 (37) from NO terminal, and wire 151 (38) from NC terminal of high temperature shutdown sensor (35).
  - c. Remove knurled nut (39) and wire 105 (40) from coolant temperature sensor (41). Install knurled nut back onto sensor terminal. Tag wire.
  - d. Tag and disconnect harness connector (42) from engine coolant temperature transducer connector (43).
- 6. TAG AND DISCONNECT WIRE G201 (44) AND WIRE 322 (45) FROM FUEL SHUTOFF SOLENOID (46) ON FUEL INJECTION PUMP (47).

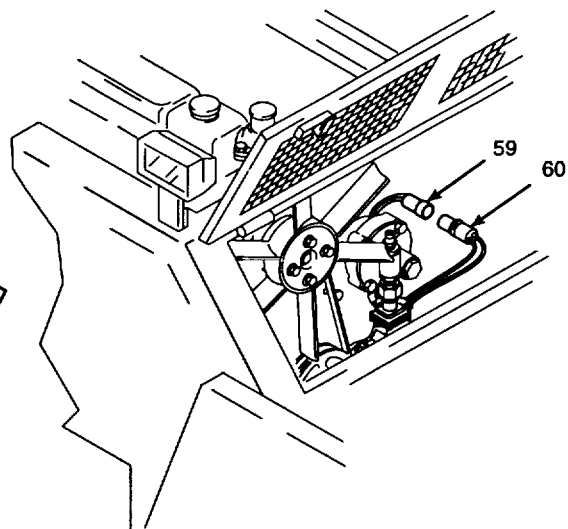
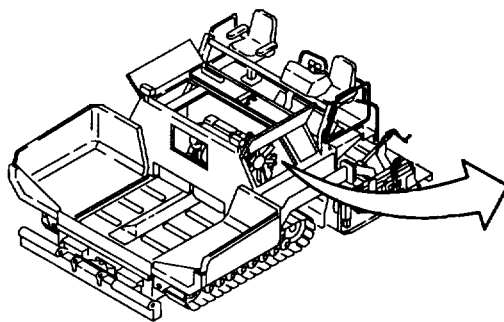
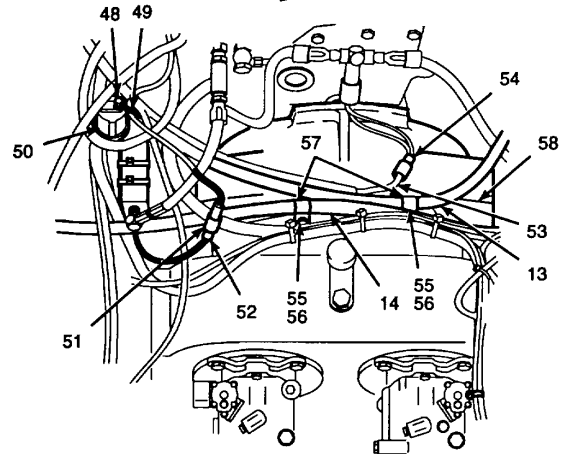


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- A. REMOVE - Continued.
7. REMOVE KNURLED NUT (48) AND WIRE 104 (49) FROM ENGINE OIL PRESSURE TRANSMITTER (50). INSTALL KNURLED NUT BACK ONTO OIL PRESSURE TRANSMITTER. TAG WIRE.
  8. TAG AND DISCONNECT HARNESS CONNECTOR (51) FROM FUEL DIFFERENTIAL PRESSURE SWITCH CONNECTOR (52).
  9. TAG AND DISCONNECT HARNESS CONNECTOR (53) FROM FUEL PRESSURE TRANSMITTER CONNECTOR (54).
  10. REMOVE HEX HEAD CAP SCREWS (55), LOCKWASHERS (56), AND CLAMPS (57) SECURING POSITIVE BATTERY CABLE (14) AND SLAVE CABLE (13) TO FLYWHEEL HOUSING (58). DISCARD LOCKWASHERS. INSTALL HEX HEAD CAP SCREWS BACK INTO FLYWHEEL HOUSING.
  11. TAG AND DISCONNECT HARNESS CONNECTOR (59) FROM TACHOMETER GENERATOR CONNECTOR (60).



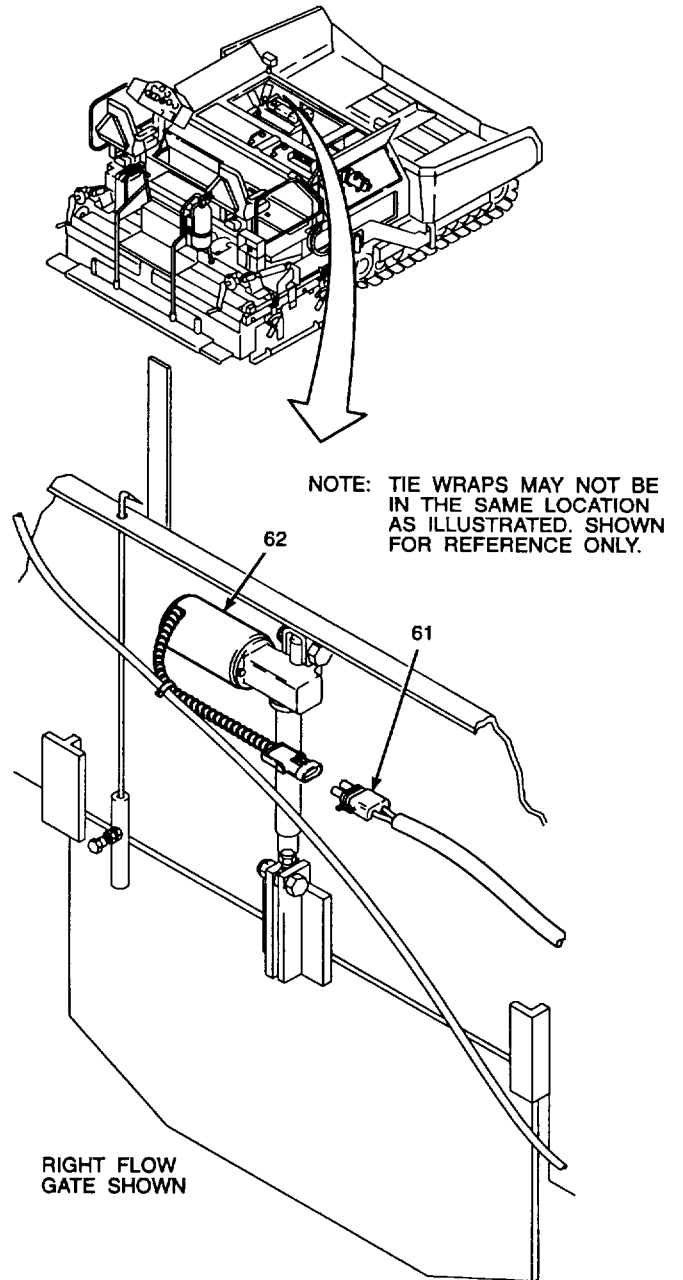
NOTE: TIE WRAPS MAY NOT BE IN THE SAME LOCATION AS ILLUSTRATED. SHOWN FOR REFERENCE ONLY.



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**2.16 ENGINE REPLACEMENT - Continued.**

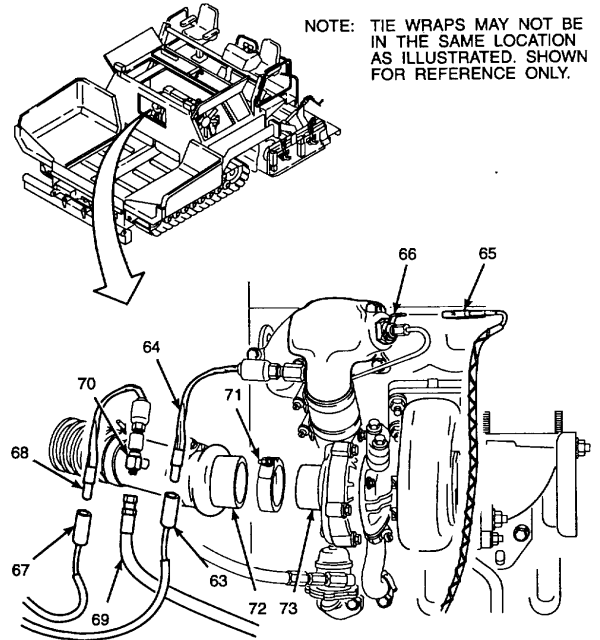
- A. REMOVE - Continued.
12. TAG AND DISCONNECT HARNESS CONNECTORS (61) FROM BOTH LEFT AND RIGHT FLOW GATE ACTUATOR CONNECTORS (62).



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A. REMOVE - Continued.

13. TAG AND DISCONNECT HARNESS CONNECTOR (63) FROM TURBOSUPERCHARGER PRESSURE TRANSMITTER CONNECTOR (64) AT TURBOSUPERCHARGER INTAKE ELBOW MANIFOLD.
14. TAG AND DISCONNECT INDUCTION HEATER WIRE 165 (65) FROM INDUCTION HEATER (66) TERMINAL.
15. TAG AND DISCONNECT HARNESS CONNECTOR (67) FROM AIR PRESSURE TRANSMITTER CONNECTOR (68).
16. TAG AND DISCONNECT AIR CLEANER SERVICE INDICATOR KNOB HOSE (69) FROM TEE (70).
17. LOOSEN CLAMP (71) AND REMOVE AIR HOSE (72) AND CLAMP FROM TURBOSUPERCHARGER (73) AIR INTAKE.

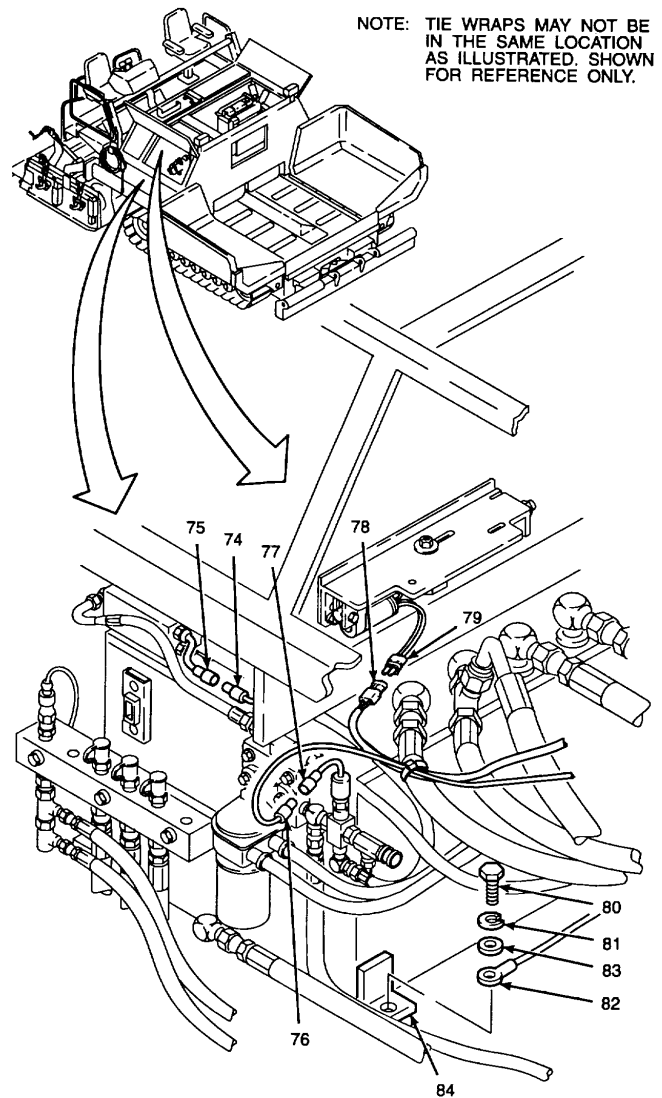


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**2.16 ENGINE REPLACEMENT - Continued.**

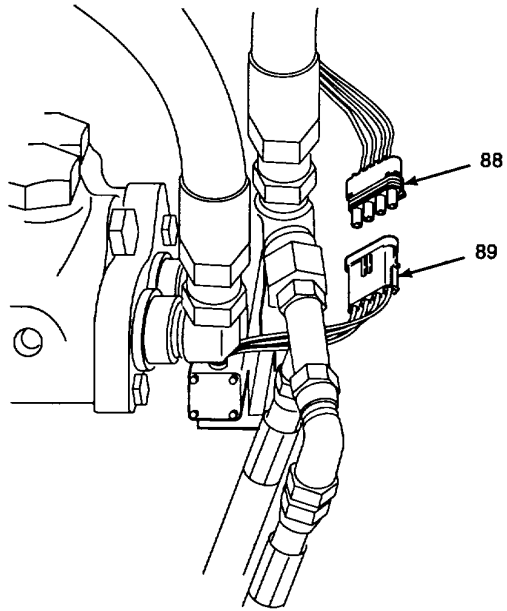
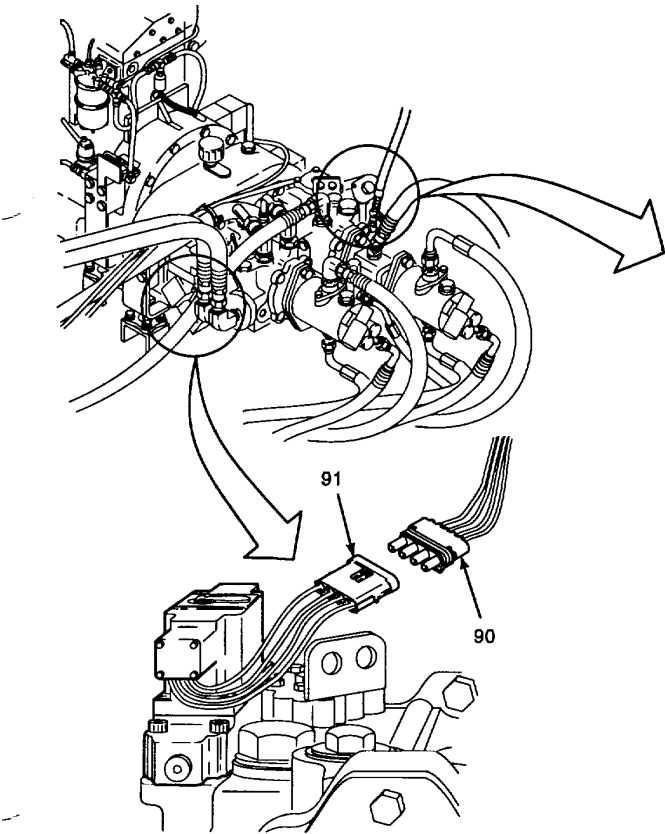
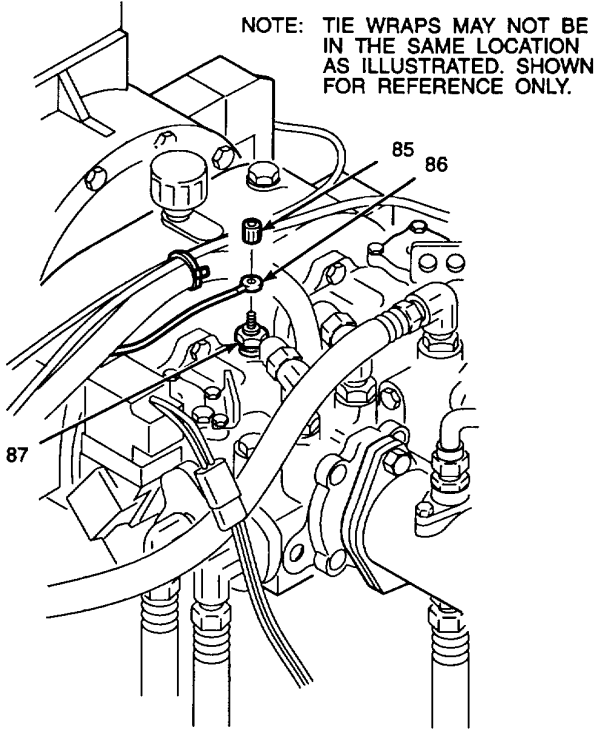
- A. REMOVE - Continued.
18. TAG AND DISCONNECT HARNESS CONNECTOR (74) FROM ENGINE OIL FILTER DIFFERENTIAL PRESSURE TRANSMITTER CONNECTOR (75).
  19. TAG AND DISCONNECT HARNESS CONNECTOR (76) FROM ENGINE OIL PRESSURE TRANSMITTER CONNECTOR (77).
  20. TAG AND DISCONNECT HARNESS CONNECTOR (78) FROM THROTTLE ACTUATOR CONNECTOR (79).
  21. REMOVE GROUND WIRE G201 FROM HYDRAULIC RESERVOIR MOUNTING BRACKET.
    - a. Remove hex head cap screw (80), lockwasher (81), wire G201 (82), and flat washer (83). Discard lockwasher. Tag wire.
    - b. Install hex head cap screw (80) and flat washer (83) back into hydraulic reservoir mounting bracket (84).



**GO TO NEXT PAGE**

A. REMOVE Continued.

- 22. REMOVE KNURLED NUT (85) AND WIRE 150 (86) FROM HYDRAULIC OIL TEMPERATURE SENSOR (87). INSTALL KNURLED NUT BACK ONTO SENSOR TERMINAL. TAG WIRE.
- 23. TAG AND DISCONNECT HARNESS CONNECTOR (88) FROM LEFT PROPULSION PUMP PUMP PILOT CONTROL VALVE CONNECTOR (89).
- 24. TAG AND DISCONNECT HARNESS CONNECTOR (90) FROM RIGHT PROPULSION PUMP PUMP PILOT CONTROL VALVE CONNECTOR (91).



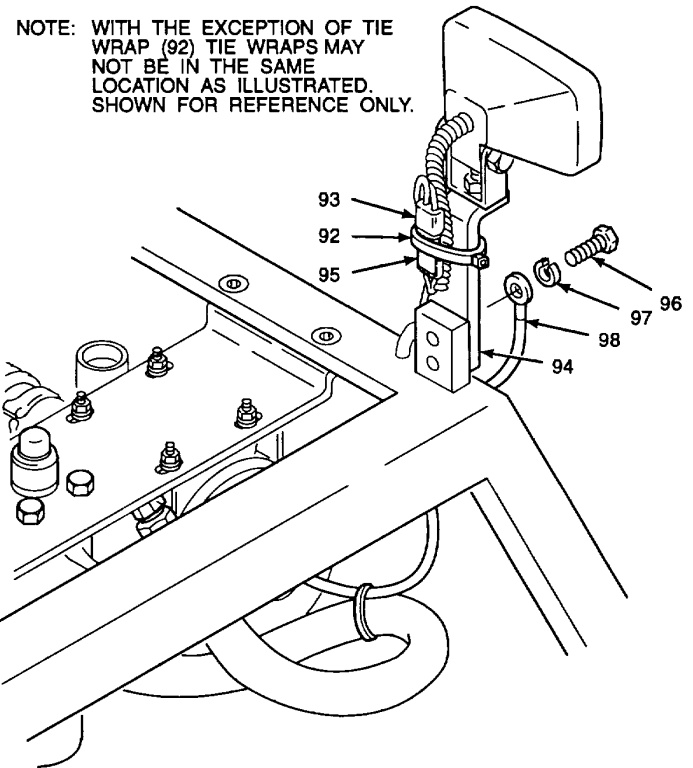
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**2.16 ENGINE REPLACEMENT - Continued.**

A. REMOVE Continued.

25. TAG AND DISCONNECT HARNESS CONNECTORS FROM LEFT AND RIGHT FORWARD WORK LIGHT CONNECTORS.

- a. Cut and remove tie wraps (92) securing harness connectors (93) to mounting bracket (94).
- b. Tag and disconnect harness connectors (93) from left and right forward work light connectors (95).
- c. Remove hex head cap screw (96), lockwasher (97), and ground wire (98) from mounting bracket (94). Discard lockwasher.
- d. Replace hex head cap screw (96) back into mounting bracket (94).

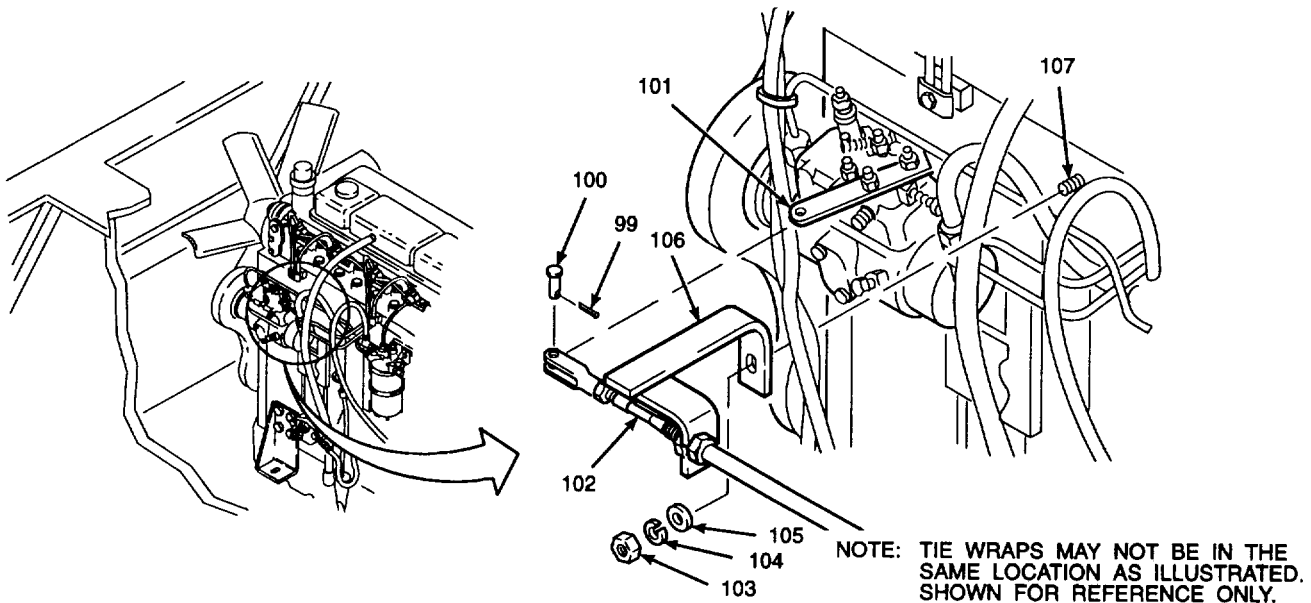


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A. REMOVE Continued.

26. DISCONNECT THROTTLE CONTROL CABLE FROM FUEL INJECTION PUMP.

- a. Remove cotter pin (99) and clevis pin (100) at throttle lever (101). Discard cotter pin. Save clevis pin for reassembly at installation.
- b. Separate throttle control cable (102) from throttle lever (101).
- c. Remove hex nut (103), lockwasher (104), washer (105), and throttle cable bracket (106) from mounting stud (107) on the left side of the engine. Save bracket and mounting hardware for reassembly at installation. Discard lockwasher.



GO TO NEXT PAGE

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**2.16 ENGINE REPLACEMENT - Continued.**


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A. REMOVE Continued.

27. DISCONNECT FUEL LINES FROM FUEL LIFT PUMP AND ENGINE FUEL FILTER.

**WARNING**

**Fuel is very flammable and can explode easily.**

**To avoid serious injury or death: Always wear safety glasses/goggles at all times.**

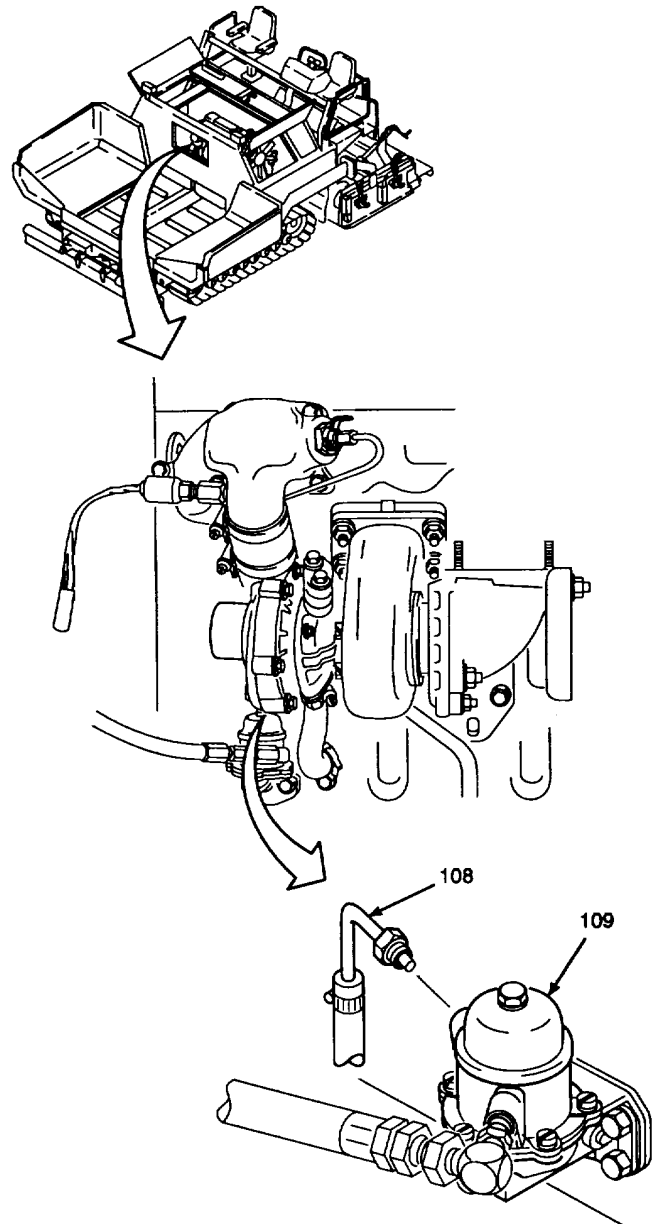
**Keep fuel away from open flame or any spark (ignition source).**

**Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.**

**Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.**

**Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.**

- a. Place machinery wiping towel below fuel lift pump to absorb any fuel that will leak out of fuel lines.
- b. Disconnect fuel intake line (108) at fuel lift pump (109). Plug fuel intake line opening in fuel lift pump and cap fuel intake line.



**GO TO NEXT PAGE**

## A. REMOVE Continued.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death:

Always wear safety glasses/goggles at all times.

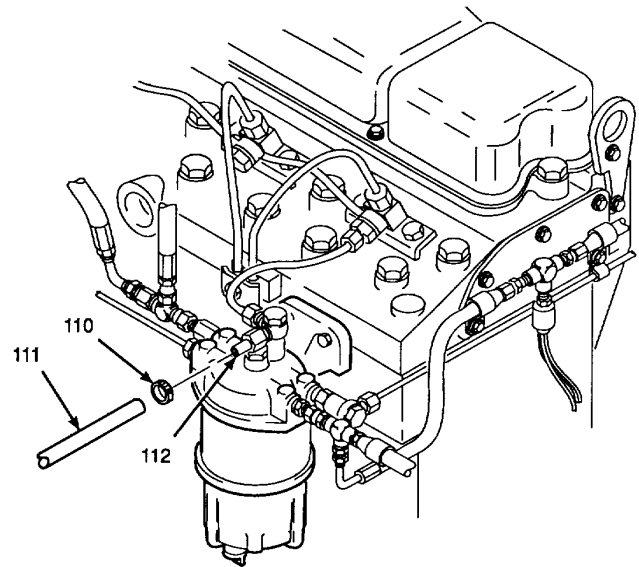
Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

- c. Place machinery wiping towel below engine fuel filter to absorb any fuel that will leak out of fuel line.
- d. Loosen hose clamp (110) and pull fuel hose (111) from engine fuel filter fuel tube (112).
- e. Remove hose clamp (110) and set aside for reassembly during installation.
- f. Plug fuel hose (111).
- g. Plug engine fuel filter fuel tube (112).



**GO TO NEXT PAGE**

## 2.16 ENGINE REPLACEMENT - Continued.

## A. REMOVE Continued.

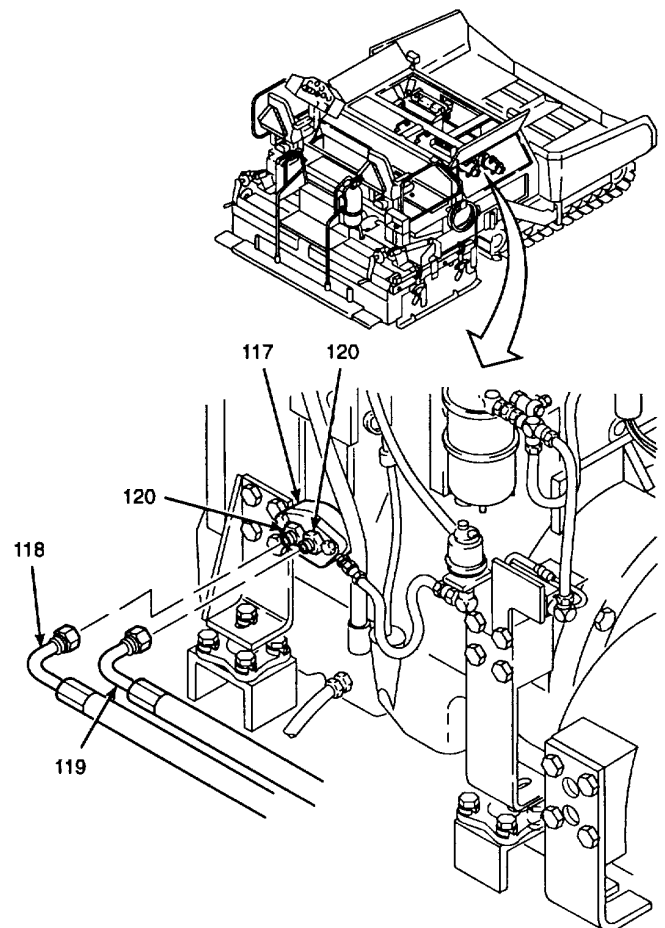
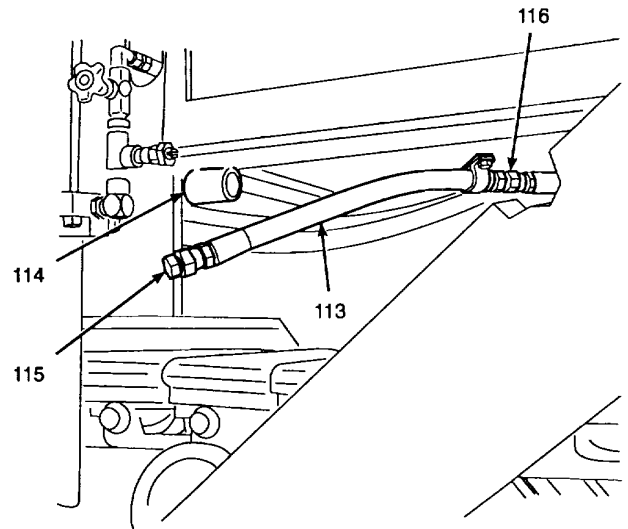
## 28. DRAIN ENGINE OIL AND DISCONNECT ENGINE OIL FILTER HOSES AND DRAIN HOSE FROM ENGINE.

- a. Remove engine oil drain hose extension (113) from bracket (114).
- b. Place drain pan under oil drain hose extension (113).

**WARNING**

**Do not drain engine oil while engine is hot. Oils can burn when in contact with very hot surfaces or if ignited when released as a spray. Keep ignition sources away. Provide adequate ventilation. Wear protective clothing/equipment.**

- c. Remove drain plug (115) from oil drain hose extension (113). Drain engine oil into drain pan.
- d. Disconnect engine oil drain hose extension (113) from engine oil drain hose (116).
- e. Install drain plug (115) into engine oil drain hose (116).
- f. Dispose of engine oil in accordance with local procedures.
- g. Place machinery wiping towel below adapter plate (117).
- h. Tag and disconnect engine oil filter hoses (118 and 119) from straight adapters (120). Plug hose ends and cap straight adapters.

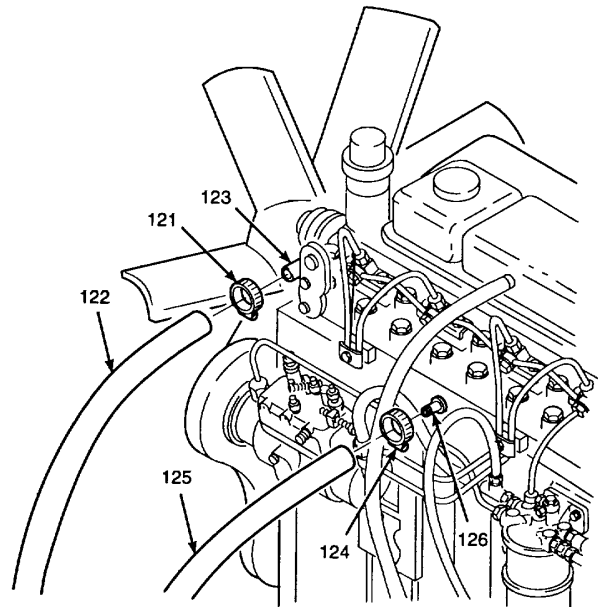


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A. REMOVE Continued.

29. DISCONNECT ENGINE OIL COOLER HOSES.

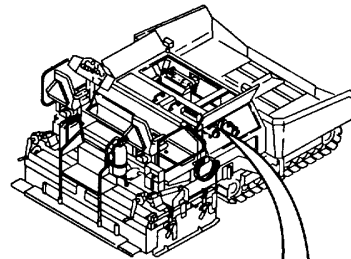
- a. Loosen hose clamp (121) and tag and remove coolant hose (122) from thermostat housing adapter (123).
- b. Loosen hose clamp (124) and tag and remove coolant hose (125) from engine block coolant gallery fitting (126).
- c. Remove hose clamps (121) and (124). Set aside for reassembly during installation.



**WARNING**

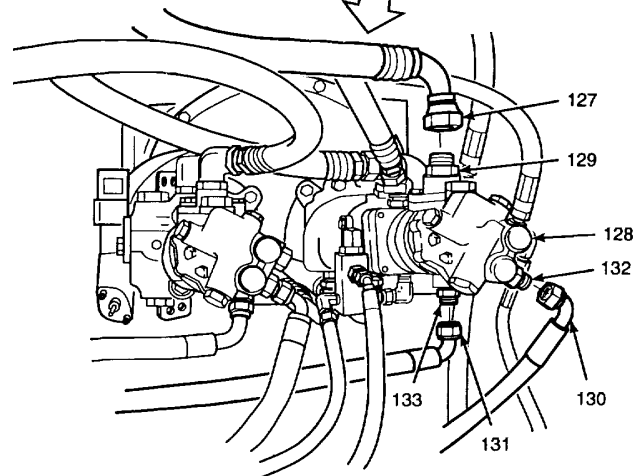
**Hydraulic oil can be moderately flammable and can be irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

30. DRAW HYDRAULIC OIL FROM HYDRAULIC OIL HOSES AND HYDRAULIC PUMPS BACK INTO HYDRAULIC RESERVOIR USING VACUUM SUCTION METHOD PER PARAGRAPH 2.54.



31. DISCONNECT HYDRAULIC HOSES FROM LEFT AND RIGHT AUXILIARY PUMPS.

- a. Place machinery wiping towels underneath left and right auxiliary pumps.
- b. Using combination wrench (Item 115, Appendix D), tag and disconnect suction hose (127) connected to left auxiliary pump (128) intake straight adapter (129) and hydraulic reservoir port #8A. Plug suction hose ends and cap straight adapter and hydraulic reservoir elbows.
- c. Tag and disconnect outlet hoses (130 and 131) connected to left auxiliary pump (128) straight adapters (132 and 133). Plug outlet hose ends and cap straight adapters.



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## 2.16 ENGINE REPLACEMENT - Continued.

### A. REMOVE Continued.

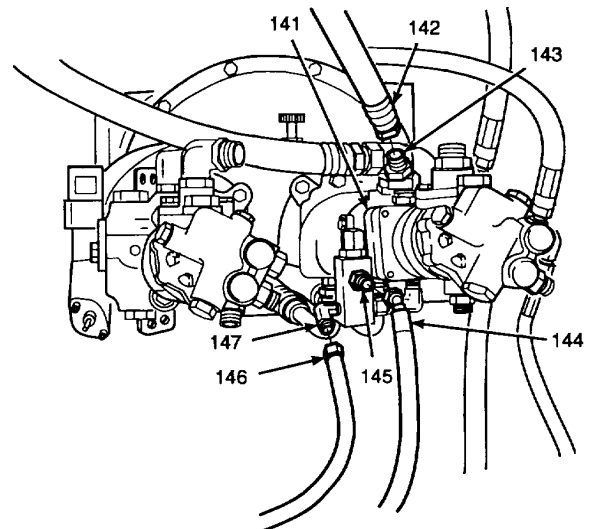
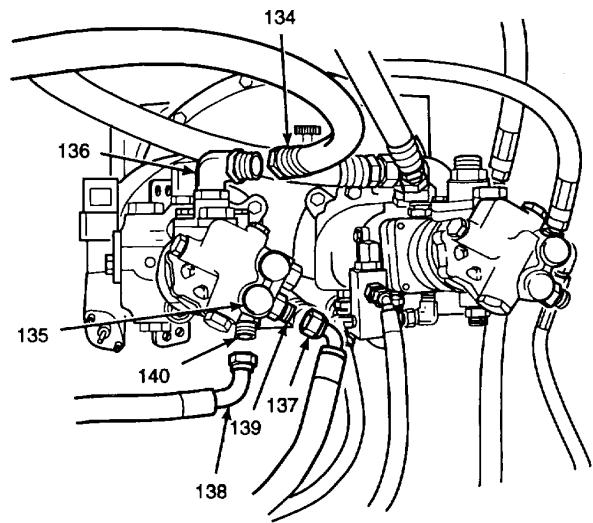
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- d. Using combination wrench (Item 116, Appendix D), tag and disconnect suction hose (134) connected to right auxiliary pump (135) intake elbow (136) and hydraulic reservoir port #9. Plug suction hose ends and cap elbows.
- e. Tag and disconnect outlet hoses (137 and 138) connected to right auxiliary pump (135) straight adapters (139 and 140). Plug outlet hose ends and cap straight adapters.

### 32. DISCONNECT HYDRAULIC HOSES FROM AUXILIARY VIBRATION PUMP.

- a. Place machinery wiping towels underneath auxiliary vibration pump (141).
- b. Using combination wrench (Item 115, Appendix D), tag and disconnect suction hose (142) connected to auxiliary vibration pump (141) elbow (143) and hydraulic reservoir port #8. Plug suction hose ends and cap elbows.
- c. Tag and disconnect outlet hose (144) connected to straight adapter (145). Plug outlet hose end and cap straight adapter.
- d. Tag and disconnect outlet hose (146) connected to elbow (147). Plug outlet hose end and cap elbow.



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A. REMOVE Continued.

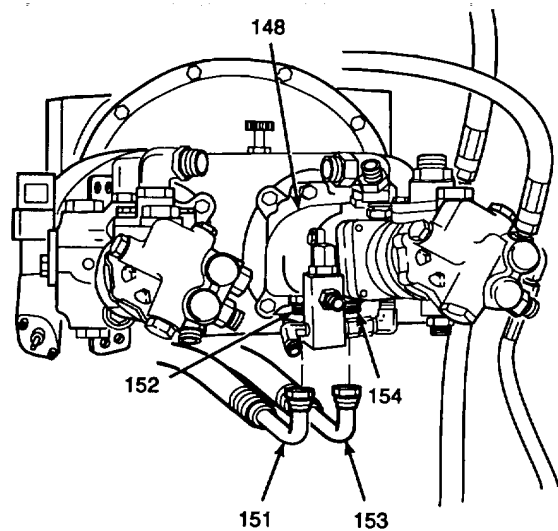
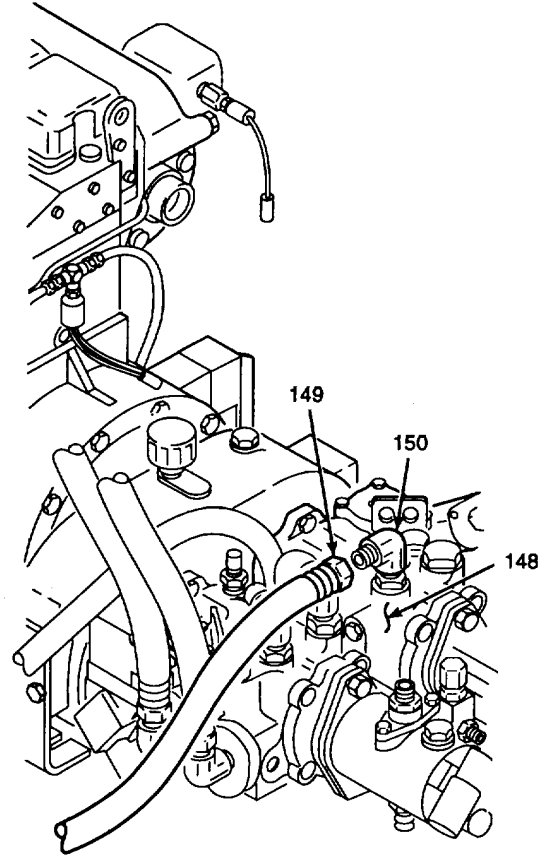
33. DISCONNECT HYDRAULIC HOSES FROM LEFT PROPULSION PUMP.

- a. Place machinery wiping towels underneath left propulsion pump (148).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Tag suction hose (149). Disconnect suction hose connected to left propulsion pump (148) elbow (150), and hydraulic reservoir port #7. Cap elbows and plug suction hose ends.
- c. Using combination wrench (Item 115, Appendix D), tag and disconnect propulsion pump port A hose (151) connected to left propulsion pump (148) straight adapter (152). Plug hose end and cap straight adapter.
- d. Using combination wrench (Item 115, Appendix D), tag and disconnect propulsion pump port B hose (153) connected to left propulsion pump (148) straight adapter (154). Plug hose end and cap straight adapter.



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## 2.16 ENGINE REPLACEMENT - Continued.

## A. REMOVE Continued.

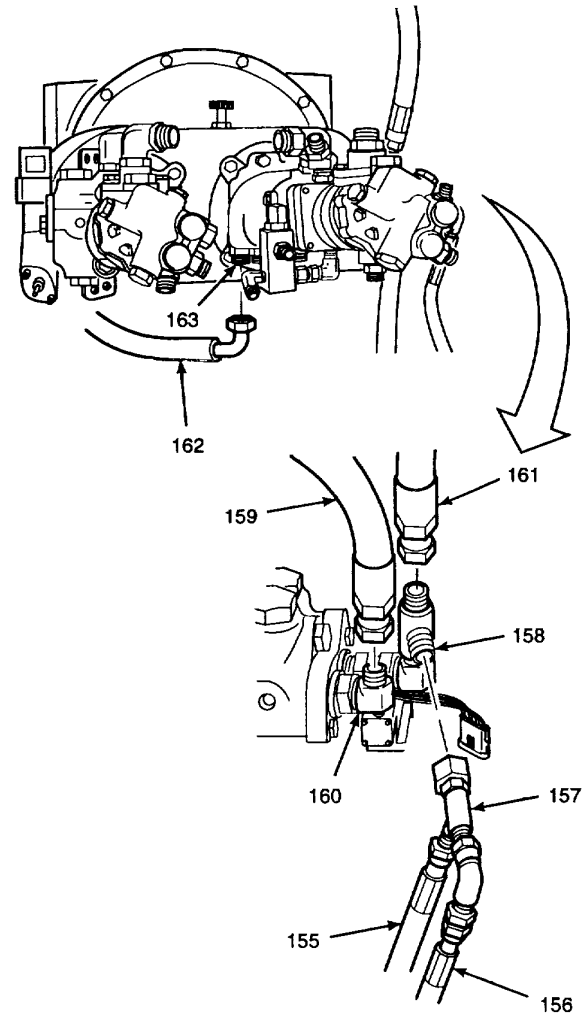
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- e. Tag high speed shift valve hose (155) and brake valve hose (156) connected to swivel tube tee (157) at left hand propulsion pump. Disconnect swivel tube tee from swivel tee (158). Plug swivel tube tee and cap swivel tee.
- f. Tag and disconnect charge pump port A hose (159) connected to elbow (160) at left hand propulsion pump.

Plug hose end and cap elbow.

- g. Tag and disconnect charge pump port B hose (161) connected to swivel tee (158) at left hand propulsion pump. Plug hose end and cap swivel tee.
- h. Tag and disconnect case drain hose (162) connected to left propulsion pump straight adapter (163). Plug hose end and cap straight adapter.



**GO TO NEXT PAGE**

A. REMOVE Continued.

34. DISCONNECT HYDRAULIC HOSES FROM RIGHT PROPULSION PUMP.

- a. Place machinery wiping towels underneath right propulsion pump (164).

**WARNING**

**Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

- b. Tag suction hose (165). Disconnect suction hose connected to right propulsion pump (164) elbow (166) and hydraulic reservoir port #6. Cap elbows and plug suction hose ends.
- c. Tag and disconnect case drain hose (167) connected to right propulsion pump (164) straight adapter (168). Plug hose end and cap straight adapter.
- d. Using combination wrench (Item 115, Appendix D), tag and disconnect propulsion pump port A hose (169) connected to right propulsion pump (164) elbow (170).

Plug hose end and cap elbow.

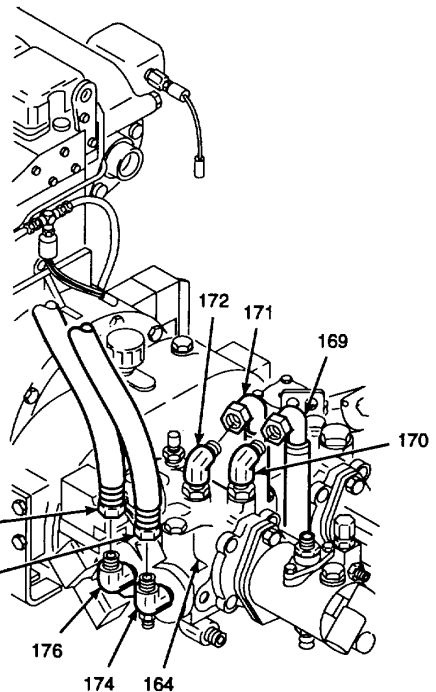
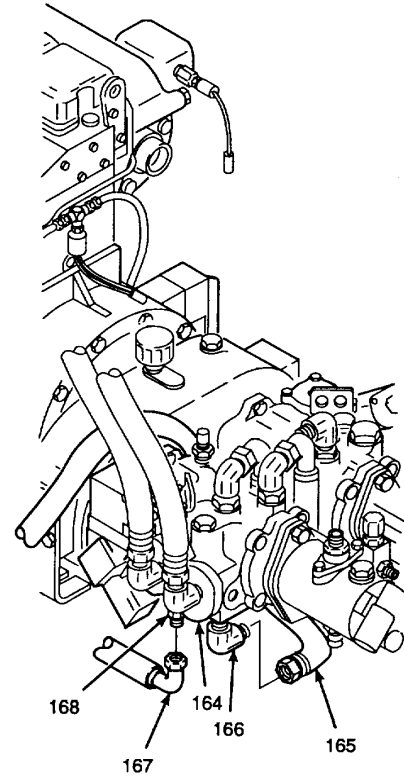
- e. Using combination wrench (Item 115, Appendix D), tag and disconnect propulsion pump port B hose (171) connected to right propulsion pump (164) elbow (172).

Plug hose end and cap elbow.

- f. Tag and disconnect charge pump port A hose (173) connected to right propulsion pump (164) elbow (174).

Plug hose end and cap elbow.

- g. Tag and disconnect charge pump port B hose (175) connected to right propulsion pump (164) elbow (176). Plug hose end and cap elbow.



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## 2.16 ENGINE REPLACEMENT - Continued.

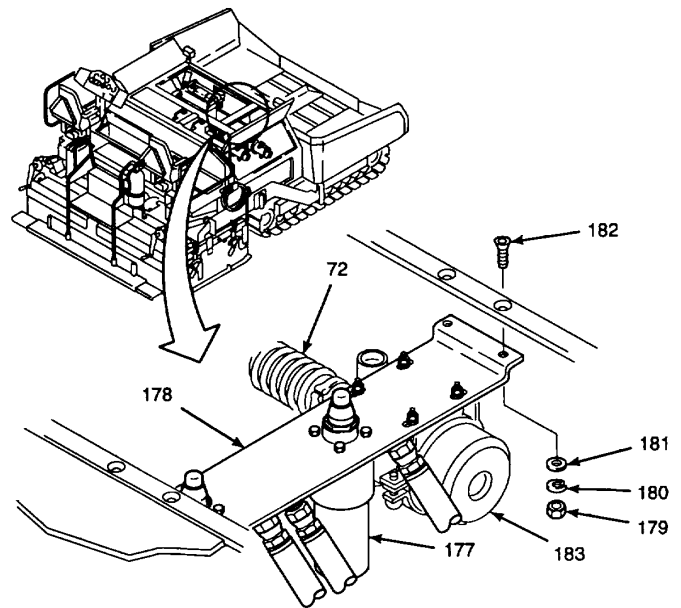
A. REMOVE Continued.

35. REMOVE HYDRAULIC CHARGE FILTERS, AIR CLEANERS AND CHARGE FILTER MOUNTING BRACKET.

- a. Using a second person to support hydraulic charge filters (177), air cleaner (183), and charge filter mounting bracket (178), remove hex nuts (179), lockwashers (180), flat washers (181), and socket head cap screws (182). Discard lockwashers.
- b Remove charge filter mounting bracket (178) hydraulic charge filters (177), air cleaner (183), and air hose (72) from the paving machine.

### NOTE

**Ensure all electrical wires, wire harnesses, hydraulic oil hoses, fuel lines, coolant hoses, and engine oil hoses are clear of engine and pump assembly. Any components that interfere with engine and pump assembly removal must be tagged and relocated.**



36. MOVE ALL DISCONNECTED ELECTRICAL WIRES AND WIRE HARNESSSES, HYDRAULIC OIL HOSES, FUEL LINES, COOLANT LINES, AND ENGINE OIL HOSES OUT OF THE WAY. THEY MUST BE MOVED CLEAR OF THE ENGINE SO THAT THEY WILL NOT INTERFERE WITH THE ENGINE AND PUMP ASSEMBLY AS IT IS REMOVED FROM THE MACHINE. DISPOSE OF ALL CONTAMINATED MACHINERY WIPING TOWELS IN ACCORDANCE WITH LOCAL PROCEDURES.

**GO TO NEXT PAGE**

A. REMOVE Continued.

37. DISCONNECT ENGINE AND PUMP ASSEMBLY FROM MOUNTS. LIFT ENGINE AND PUMP ASSEMBLY FROM THE PAVING MACHINE.

**WARNING**

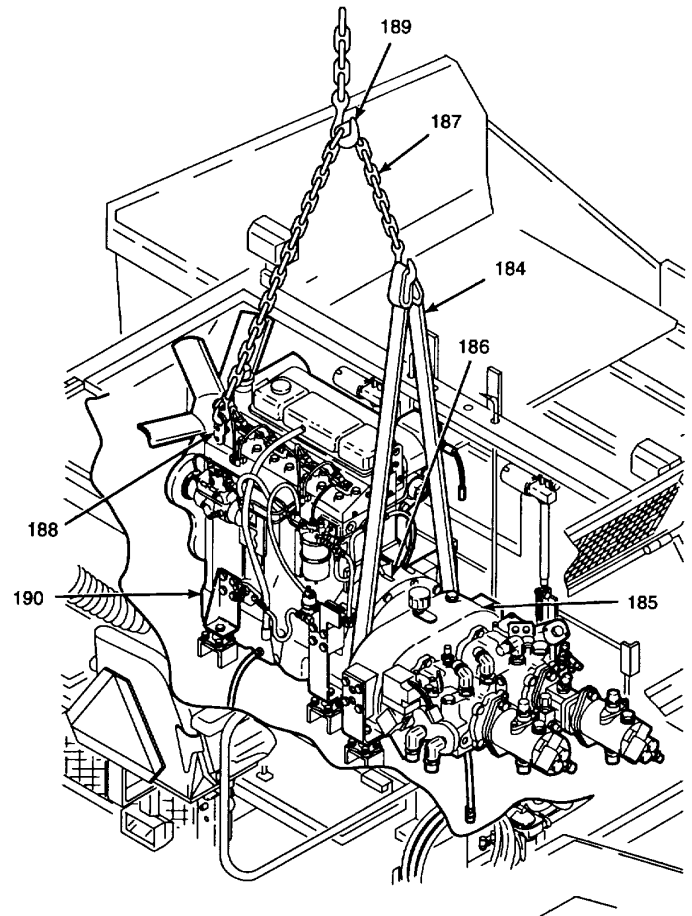
Engine and pump assembly weigh approximately 2,000 lbs (908 kg). Ensure chain assembly and sling strap are in good condition and are of correct capacity. Ensure sling strap is positioned between pump drive gearbox and flywheel housing. Chain assembly must be attached securely to front lifting bracket. Failure to do so may result in the engine and pump assembly shifting causing equipment to fall. This may cause serious injury or death to personnel.

- a. Guide sling strap (184) between pump drive gearbox (185) and flywheel housing (186).
- b. Attach chain assembly (187) to front engine lifting bracket (188) and to the loops on sling strap (184).

**NOTE**

Use the sling strap and chain assembly to support the engine and pump assembly against shifting while removing the engine and pump assembly mounting hardware. Take up slack while the mounting hardware is being removed. Do not raise up on the engine and pump assembly. This will put added stress on the mounting hardware making removal difficult.

- c. Attach overhead hoist hook (189) to the lifting center of chain assembly (187). Take up slack in chain assembly and sling strap (184), but do not raise up on the engine and pump assembly (190).



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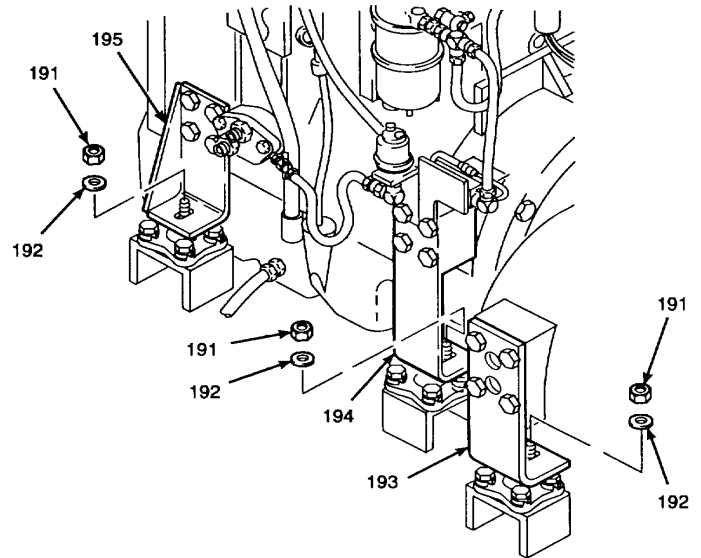
2.16 ENGINE REPLACEMENT - Continued.

A. REMOVE Continued.

**NOTE**

Right side mounting and support brackets attached to pump drive gearbox and flywheel housing can be accessed through engine access cover in hopper.

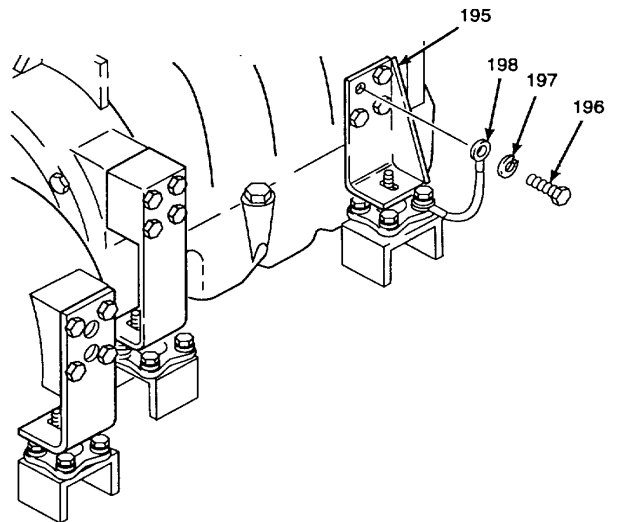
- d. Remove self-locking hex nuts (191), and flat washers (192) from pump drive gearbox support brackets (193) and flywheel housing mounting brackets (194) on both left and right sides of the engine and pump assembly. Discard self-locking hex nuts.



**NOTE**

Front engine mounting brackets can be reached through access door openings on left side of the paving machine.

- f. Remove hex head cap screw (196) and lockwasher (197) securing engine ground wire (198) to front engine mounting bracket (195). Install hex head cap screw and lockwasher back onto front engine mount.



**WARNING**

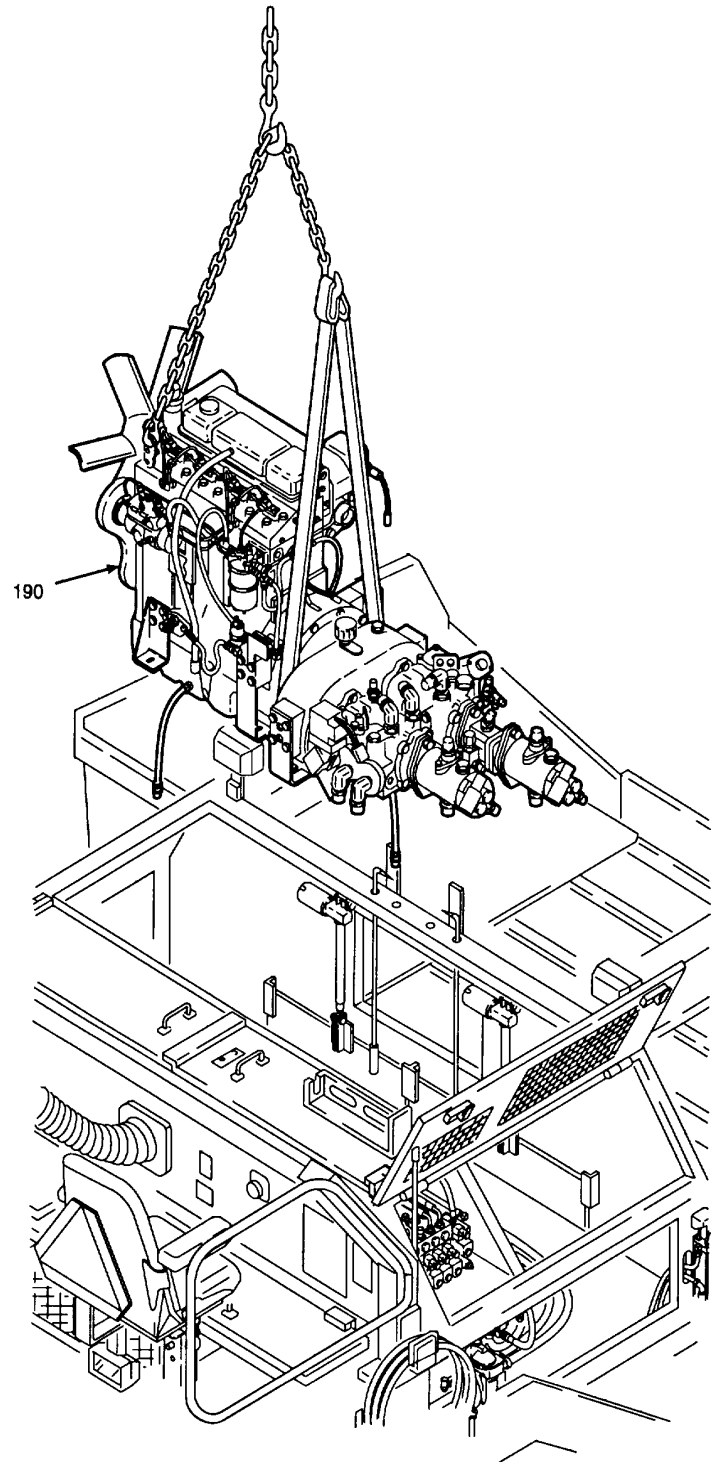
Do not allow engine and pump assembly to swing free from hoist during removal from the paving machine. Engine and pump assembly may strike personnel and cause serious injury or damage to machine if allowed to swing free. Two additional personnel are needed to help guide the engine and pump assembly out of the machine during removal.

- g. Position two persons on top of paving machine over the valve panel to steady the engine and pump assembly during removal. One person should be stationed at pump end, the other person should be stationed at the radiator fan end on the opposite side.

GO TO NEXT PAGE

## A. REMOVE Continued.

- h. Slowly lift engine and pump assembly (190) out of the paving machine. Ensure that the engine and pump assembly does not hit the machine or catch on disconnected electrical wires or hoses being lifted from the machine.



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**2.16 ENGINE REPLACEMENT - Continued.**

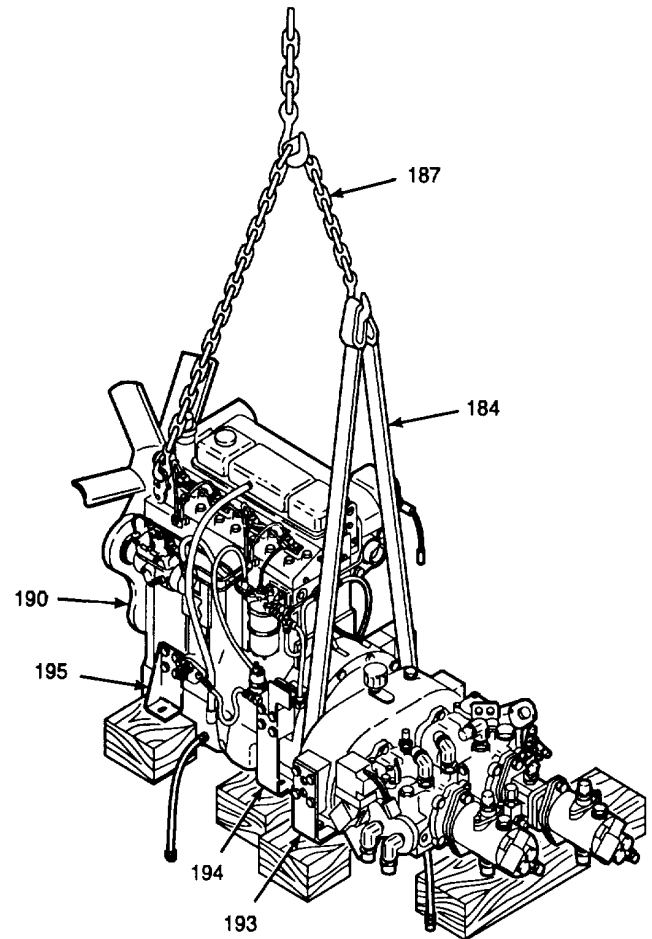
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## A. REMOVE Continued.



Do not set engine and pump assembly down so that the weight of the engine and pump assembly rests on the oil sump. Place cribbing underneath engine mounting brackets and underneath hydraulic pumps. Failure to do so may result in damage to engine and hydraulic pumps.

- i. Lower engine and pump assembly (190) down until it is positioned just over cribbing. Arrange cribbing so that front engine mounting brackets (195), flywheel mounting brackets (194), pump drive gearbox support brackets (193), and hydraulic pumps are supported evenly with cribbing.
- j. Lower engine and pump assembly (190) down onto cribbing.
- k. Remove chain assembly (187) and sling strap (184).

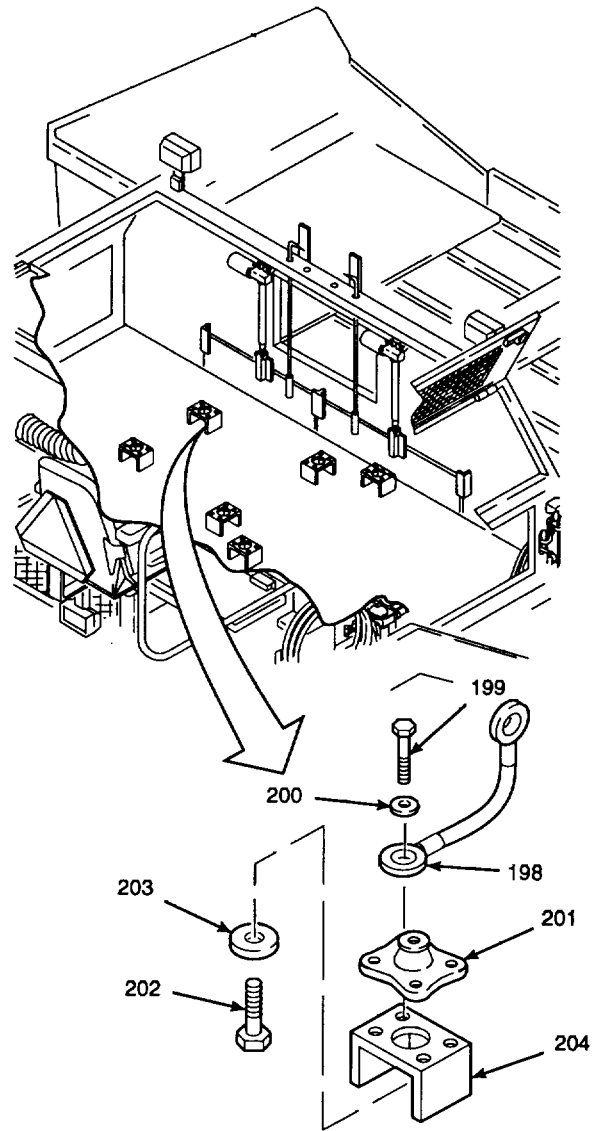


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A. REMOVE Continued.

38. REMOVE AND DISCARD SHOCK RESILIENT MOUNTS FROM ENGINE, FLYWHEEL HOUSING, AND PUMP DRIVE GEARBOX MOUNTS IN PAVING MACHINE.

- a. Remove hex head cap screws (199), flat washer (200), and shock mounts (201). Discard shock resilient mounts. On front right engine mount, tag and remove engine ground wire (198).
- b. Remove hex head cap screws (202) and washers (203) from engine mounts (204).



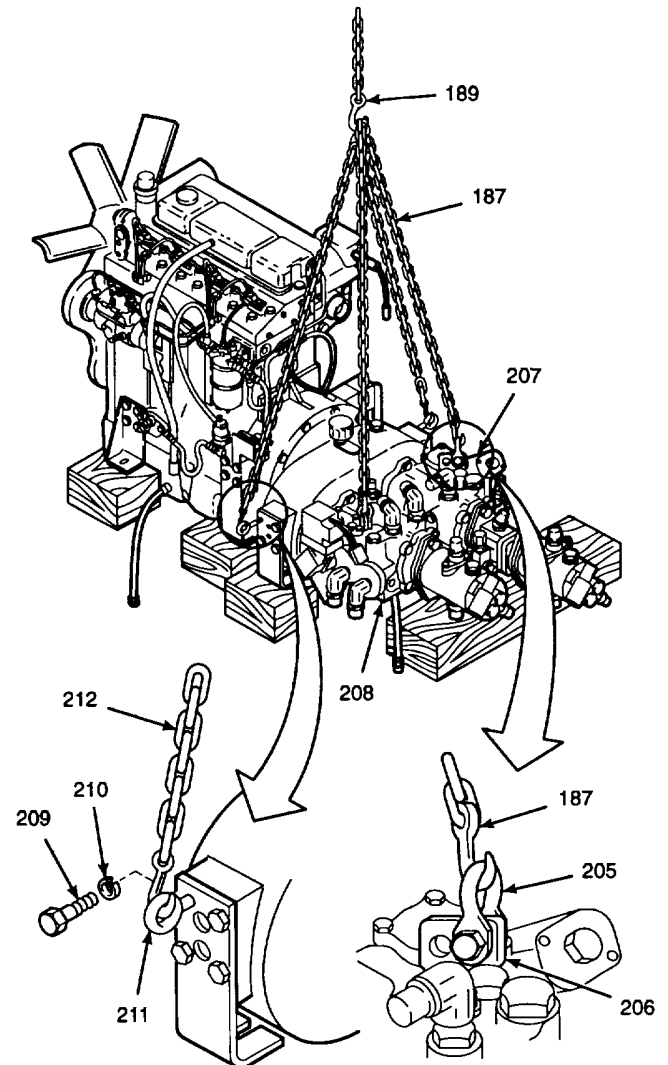
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## 2.16 ENGINE REPLACEMENT - Continued.

### A. REMOVE Continued.

39. REMOVE PUMP DRIVE GEARBOX AND HYDRAULIC PUMPS, DRIVE SHAFT, AND DRIVE PLATE. INSTALL ENGINE ONTO AN ENGINE STAND.

- a. Attach two 1/4 in. lifting shackles (205) to lift brackets (206) on left and right propulsion pumps (207 and 208).
- b. Attach chain assembly (187) hooks to throats of lifting shackles (205).
- c. Attach overhead hoist hook (189) to lifting center of chain assembly (187).
- d. Remove hex head cap screws (209) and lockwasher (210) on both left and right pump drive gearbox support brackets. Discard lockwasher. Set aside hex head cap screw for reinstallation.
- e. Install two hex head screw caps (211) into empty screw holes on pump drive gearbox support brackets. Screw screw caps in 2 in. leaving 2 in. remaining out.
- f. Attach chain assembly (212) lifting hooks to hex head screw caps (211).
- g. Attach overhead hoist hook (189) to lifting center of chain assembly (212). Take up slack in chain assembly.



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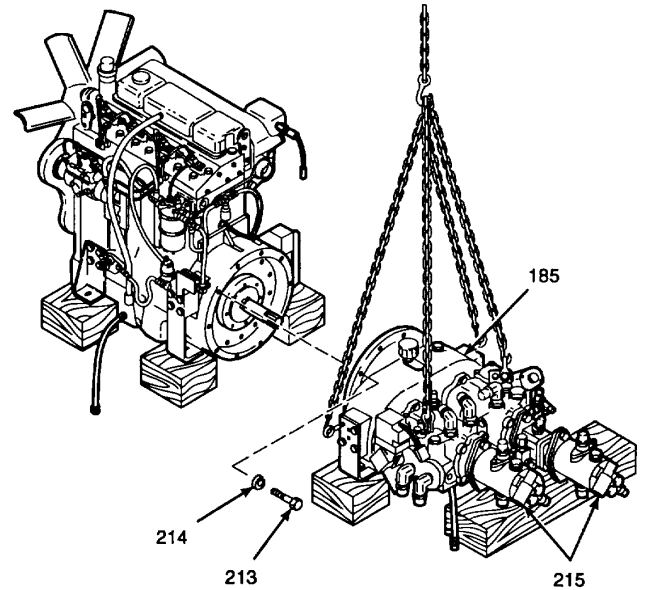
A. REMOVE Continued.

- h. Remove hex head cap screws (213) and lockwashers (214). Discard lockwashers.

**WARNING**

Pump and gearbox weigh approximately 410 lbs (187 kg). Ensure chain assembly and sling strap are in good condition and are of correct capacity. Ensure sling strap is positioned between pump drive gearbox and flywheel housing. Chain assembly must be attached securely to front lifting bracket. Failure to do so may result in the engine and pump assembly shifting causing equipment to fall. This may cause serious injury or death to personnel.

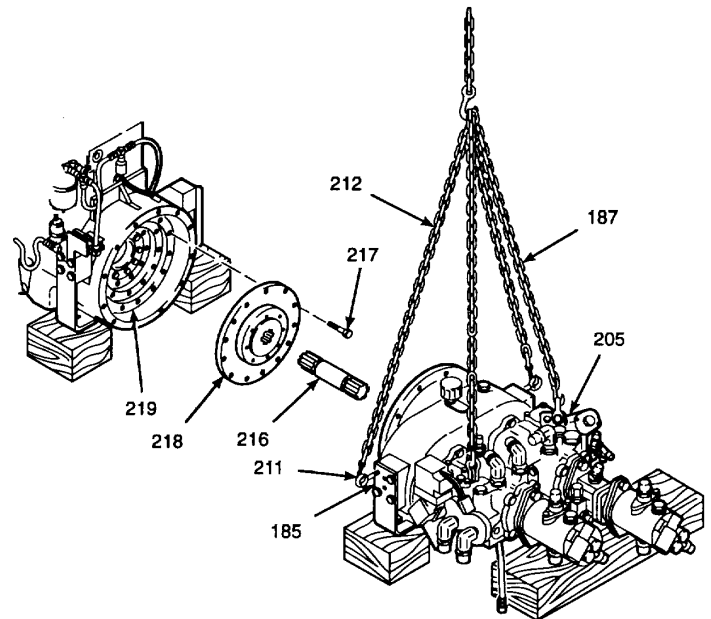
Do not allow engine and pump assembly to swing free from hoist during removal from the paving machine. Engine and pump assembly may strike personnel and cause serious injury or damage to machine if allowed to swing free. Two additional personnel are needed to help guide the engine and pump assembly out of the machine during removal.



- i. Using overhead hoist and two persons on either side of the pump drive gearbox (185), pull pump drive gearbox away from engine. Place cribbing beneath the pump drive gearbox and hydraulic pumps (215) as shown.

**NOTE**

Drive shaft (216) may stay attached to the drive plate (218), or it may come off with the pump drive gearbox (185).



- j. Remove drive shaft (216).
- k. Remove socket head cap screws (217) and drive plate (218) from engine flywheel assembly (215).
- l. Remove chain assemblies (187 and 212) from lifting shackles (205) and hex head screw caps (211). Do not remove lifting shackles or screw caps.

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**2.16 ENGINE REPLACEMENT - Continued.**

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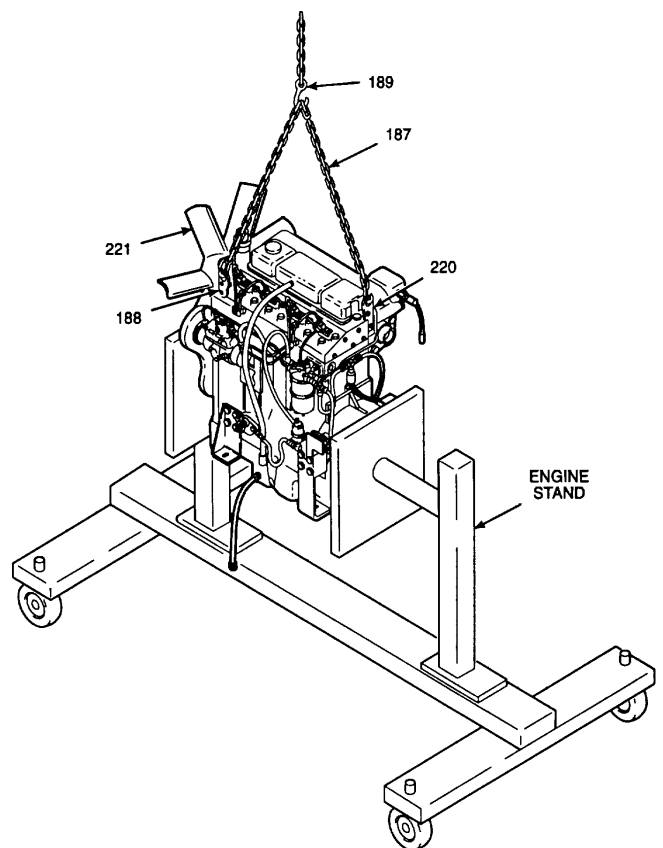
**A. REMOVE Continued.**

- m. Attach chain assembly (187) to lifting brackets (188 and 220) on engine (221).
- n. Attach overhead hoist hook (189) to the lifting center of chain assembly (187). Take up slack in chain assembly.

**WARNING**

**Engine weighs approximately 1, 600 lbs (726 kg). Do not allow engine to swing from hoist while installing into engine stand. Personnel are needed to guide the engine into the engine stand. Engine may strike personnel and cause serious injury if allowed to swing.**

- o. Lift engine (221) up off cribbing and secure into an engine stand.



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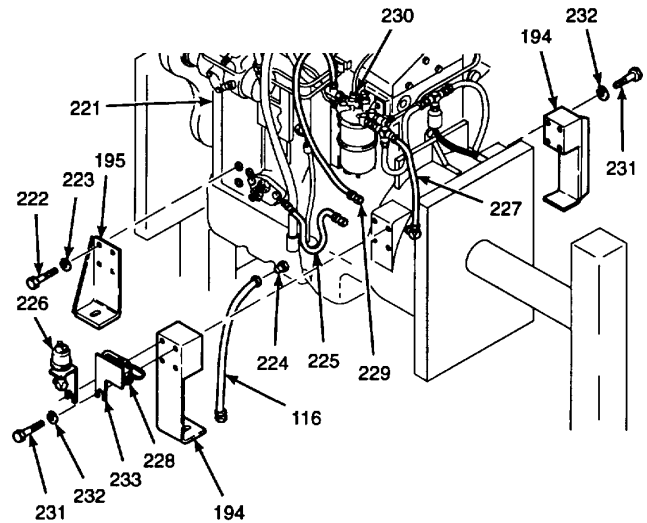
A. REMOVE Continued.

40. REMOVE FRONT ENGINE MOUNTING BRACKETS, OIL DRAIN HOSE, AND FLYWHEEL HOUSING MOUNTING BRACKETS FROM ENGINE.



Ensure hex head cap screws removed from engine mounting brackets are tagged for reassembly. If hex head cap screws of incorrect length are used for reassembly, serious engine damage may occur.

- a. Tag and remove hex head cap screws (222), lockwashers (223), and engine mounting brackets (195) on left and right sides of engine. Discard lockwashers.
- b. Remove engine oil drain hose (116) and plug oil sump straight adapter (224).
- c. Remove engine oil pressure transmitter hose (225) from engine oil pressure transmitter (226).
- d. Disconnect fuel differential pressure switch hose (227) from fuel differential pressure switch (228).
- e. Disconnect fuel hose (229) connected to engine fuel filter outlet (230). Disconnect other end of fuel hose from fuel differential pressure switch (228).
- f. On the left side of engine (221), remove hex head cap screws (231), lockwashers (232), engine oil pressure transmitter and bracket (226), fuel differential pressure switch (228) and bracket (233), and left flywheel housing mounting bracket (194). Discard lockwashers.
- g. On the right side of the engine, remove hex head cap screws (231), lockwashers (232), and right flywheel housing mounting bracket (194). Discard lockwashers.



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**2.16 ENGINE REPLACEMENT - Continued.**

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**B. CLEAN.****WARNING**

Avoid contact with steam. Steam can cause burns, blindness, and other serious injury. Ensure the wearing of protective aprons, gloves, and safety goggles when using live steam.

**CAUTION**

Do not direct live steam against electrical wiring harnesses. Live steam may cause damage to electrical connectors and wire insulation. Ensure all electrical wiring harnesses are moved out of the way prior to steam cleaning.

1. STEAM CLEAN ENGINE COMPARTMENT USING GENERAL PURPOSE DETERGENT TO REMOVE DIRT, GREASE, ENGINE OIL AND HYDRAULIC OIL RESIDUE. DO NOT DIRECT STEAM DIRECTLY AGAINST ANY ELECTRICAL WIRES - V OR HARNESSSES.

**GO TO NEXT PAGE**

## B. CLEAN Continued.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

2. WIPE OFF DIRT, GREASE AND OIL RESIDUE FROM PUMP DRIVE GEARBOX WITH A CLEANING CLOTH MOISTENED IN CLEANING SOLVENT. IF NECESSARY USE A PUTTY KNIFE TO CLEAN OFF COVER PLATE WHERE PUMP DRIVE GEARBOX ATTACHES TO FLYWHEEL HOUSING.
3. CLEAN DIRT, GREASE AND OIL RESIDUE FROM FRONT ENGINE MOUNTING BRACKETS, FLYWHEEL MOUNTING BRACKETS AND PUMP DRIVE GEARBOX SUPPORT BRACKETS WITH A CLEANING CLOTH MOISTENED IN CLEANING SOLVENT.
4. CLEAN GREASE AND FOREIGN MATERIAL FROM DRIVE SHAFT AND DRIVE PLATE WITH A CLEANING CLOTH MOISTENED IN CLEANING SOLVENT.

**GO TO NEXT PAGE**



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**2.16 ENGINE REPLACEMENT - Continued.**


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## B. CLEAN Continued.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

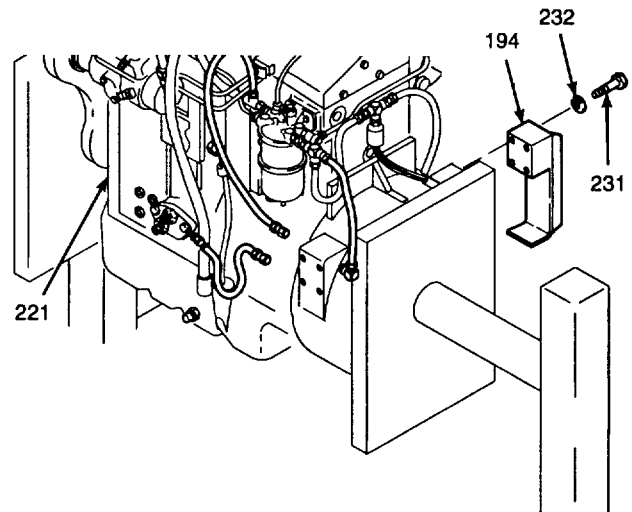
5. CLEAN THREADS OF HEX HEAD CAP SCREWS WITH THREAD LOCKING COMPOUND SOLVENT. WIPE DRY WITH A CLEANING CLOTH.

## C. INSTALL.

**NOTE**

During installation secure cables, wires and hoses with tie wraps where necessary to avoid contact with chaffing surfaces, moving parts, heated components and hot manifolds inside engine compartment.

1. INSTALL FLYWHEEL HOUSING MOUNTING BRACKETS, OIL DRAIN HOSE, AND FRONT ENGINE MOUNTING BRACKETS ONTO ENGINE.
  - a. Install four lockwashers (232) onto four hex head cap screws (231).



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Coat threads of hex head cap screws (231) with thread locking compound.

- c. Install hex head cap screws (231) and right flywheel mounting bracket (194) onto right side of engine (221).
- d. Tighten hex head cap screws (231) 95 lb-ft (122 N•m).

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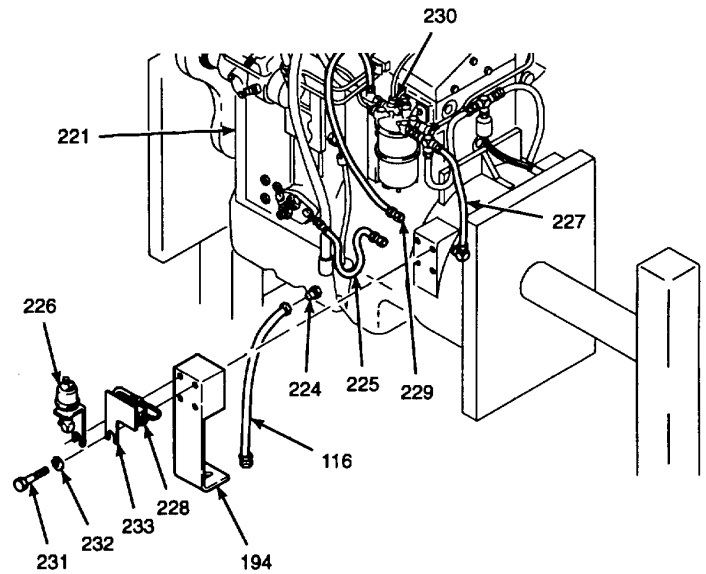
C. INSTALL Continued.

- e. Install four lockwashers (232) onto four hex head cap screws (231).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- f. Coat threads of hex head cap screws (231) with thread locking compound.
- g. Install hex head cap screws (231), engine oil pressure transmitter and bracket (226), fuel pressure transmitter (228) and bracket (233), and left flywheel housing mounting bracket (194) to left side of engine (221).
- h. Tighten hex head cap screws (231) 95 lb-ft (129 N•m).
- i. Connect fuel hose (227 and 229) to fuel pressure transmitter (228). Connect other end of fuel hose (229) to fuel filter outlet (230).
- j. Install engine oil pressure transmitter hose (225) to engine oil pressure transmitter (226).
- k. Install engine oil drain hose (116) onto oil sump straight adapter (224).



**GO TO NEXT PAGE**

## 2.16 ENGINE REPLACEMENT - Continued.

## C. INSTALL Continued.

**CAUTION**

Ensure the correct size and length hex head cap screws are used for installing engine mounting brackets back onto engine. Failure to do so may result in serious engine damage if proper cap screw size and length are not used.

- l. Install lockwashers (223) onto hex head cap screws (222).

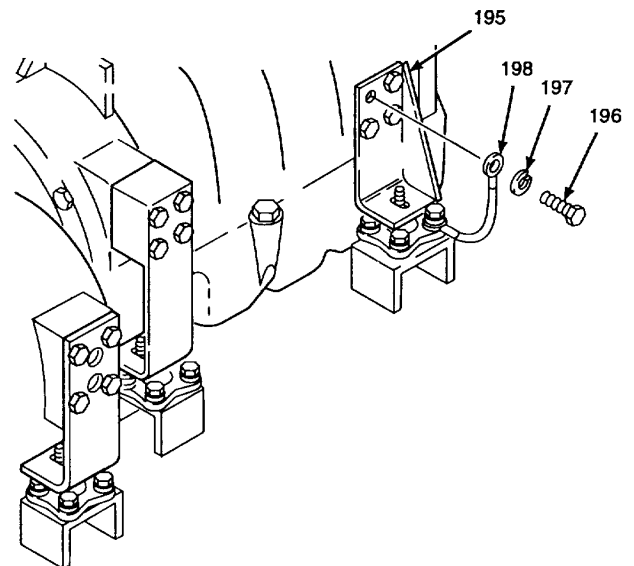
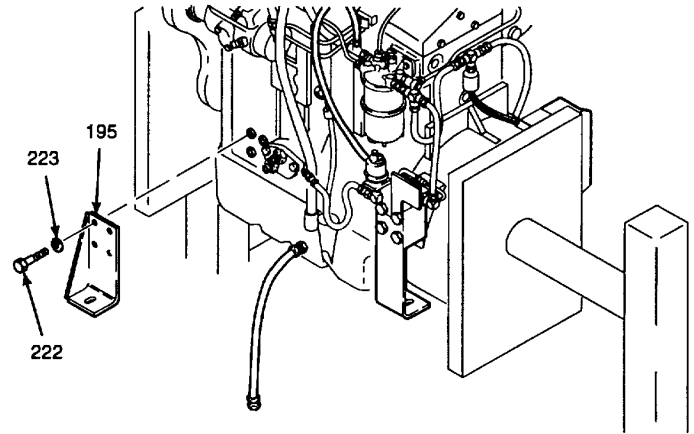
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

Threads of hex head cap screw (196) located on right front engine mounting bracket (195) upper left corner does not get coated with thread locking compound until engine ground wire (198) is installed.

- m. Coat threads of hex head cap screws (222) with thread locking compound. Do not coat threads of hex head cap screw (196) to be installed in upper left corner of right front engine mounting bracket hole.
- n. Install hex head cap screw (222) with lockwasher (223) and hex head cap screw (196) with lockwasher (197) into left and right hand front engine mounting brackets (195).
- o. Tighten hex head cap screws (222) 66 lb-ft (90 N•m). Do not tighten hex head cap screw (196) installed in right front engine mounting bracket (195) upper left corner. Tighten this cap screw finger tight.

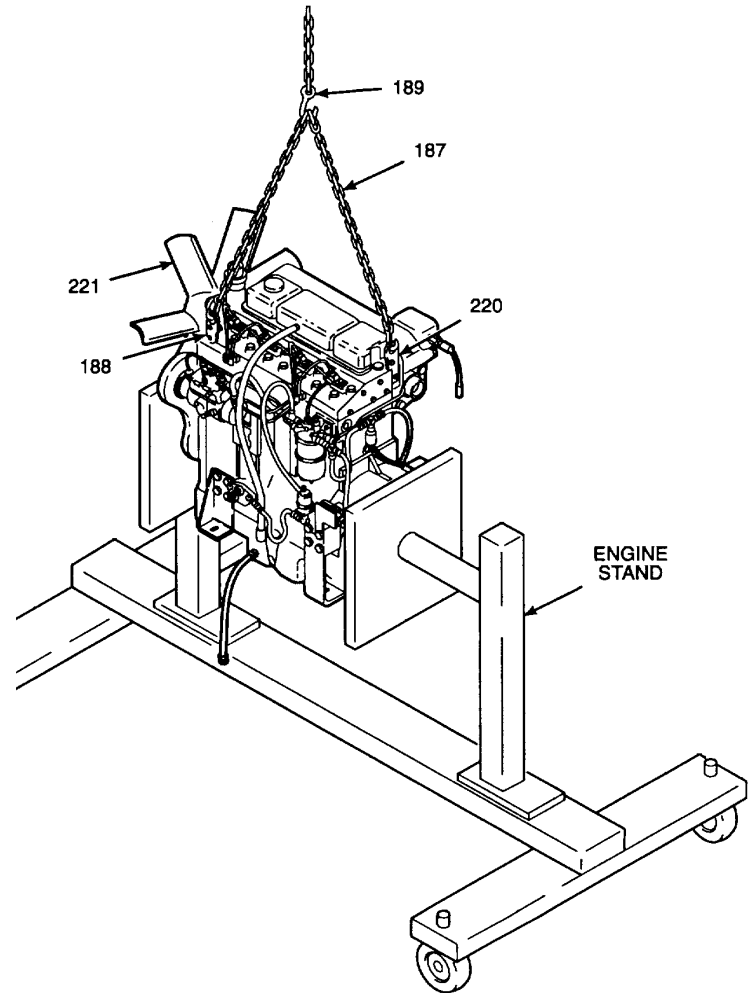


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- C. INSTALL Continued.
2. REMOVE ENGINE FROM ENGINE STAND AND PLACE ON CRIBBING.
- Attach chain assembly (187) to lifting brackets (188 and 220) on engine (221).
  - Attach overhead hoist hook (189) to the lifting center of chain assembly (187). Take up slack in chain assembly.

**WARNING**

Engine weighs approximately 1, 600 lbs (726 kg). Do not allow engine to swing from hoist while removing engine from engine stand. Personnel are needed to guide the engine out of the engine stand. Engine may strike personnel and cause serious injury if allowed to swing.



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## 2.16 ENGINE REPLACEMENT - Continued.

### C. INSTALL Continued.

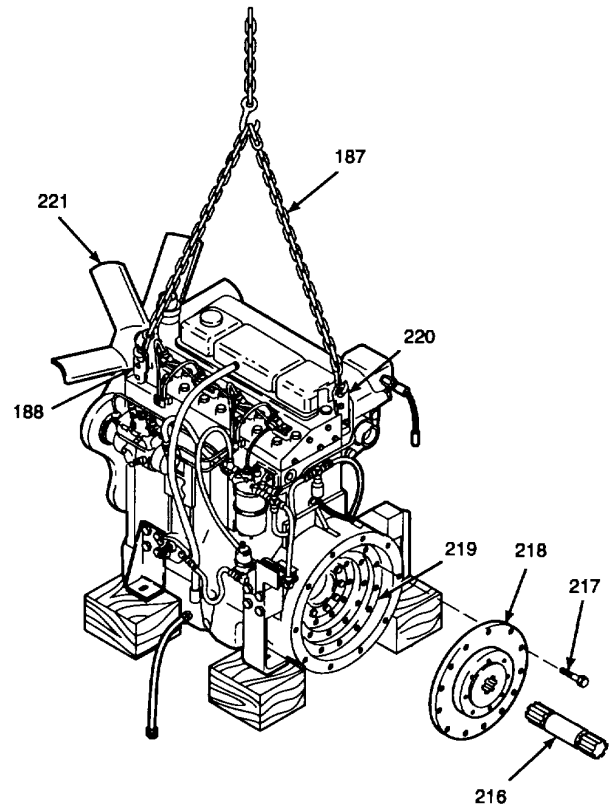
#### CAUTION

Do not set engine down so that the weight of the engine rests on the engine oil sump. Place cribbing underneath engine mounting brackets. Failure to do so may result in damage to the oil sump.

- c. With the help of another person, lift and guide engine (221) up out of engine stand and lower down onto cribbing as shown.
- d. Remove chain assembly (187) from lifting brackets (188 and 220).

### 3. INSTALL PUMP DRIVE GEARBOX AND HYDRAULIC PUMPS, DRIVE PLATE, AND DRIVE SHAFT ONTO ENGINE.

- a. Align mounting holes on drive plate (218) with mounting holes on engine flywheel assembly (219).



#### WARNING

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of socket head cap screws (217) and install cap screws and drive plate (218) onto engine flywheel assembly (219). Tighten hex head cap screws 37 lb-ft (50 N•m).

- c. Apply a light coating of anti-seize compound to the gear splines on drive shaft (216).
- d. Install drive shaft (216) into drive plate (218).

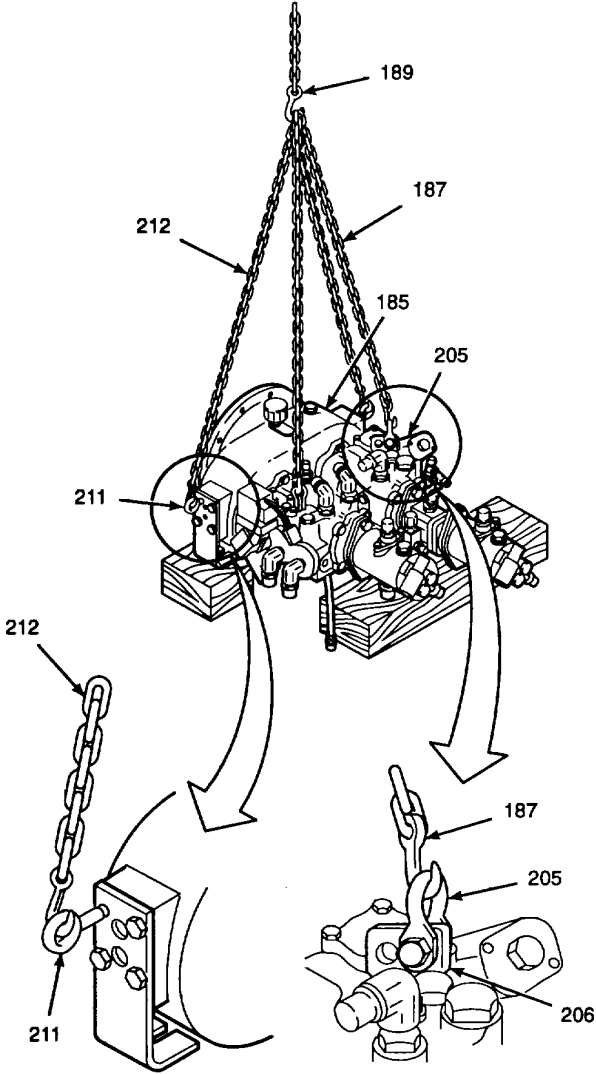
#### WARNING

Anti-seize compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

GO TO NEXT PAGE

C. INSTALL Continued.

- e. Attach chain assembly (187) hooks to throats of lifting shackles (205) on lift brackets (206).
- f. Attach overhead hoist hook (189) to the lifting center of chain assembly (187).
- g. Attach chain assembly (212) hooks to hex head screw caps (211). Attach overhead hoist hook (189) to the lifting center of chain assembly (212). Take up slack in chain assemblies (187 and 212).



GO TO NEXT PAGE

**2.16 ENGINE REPLACEMENT - Continued.**

C. INSTALL...Continued.

**WARNING**

Pump and gearbox weigh approximately 410 lbs (187 kg). Ensure chain assembly and sling strap are in good condition and are of correct capacity. Ensure sling strap is positioned between pump drive gearbox and flywheel housing. Chain assembly must be attached securely to front lifting bracket. Failure to do so may result in the engine and pump assembly shifting causing equipment to fall. This may cause serious injury or death to personnel.

**CAUTION**

Do not allow pump drive gearbox (185) to swing and hit engine when aligning drive shaft with mating gear in gearbox. Move gearbox slowly in place using overhead hoist. Gearbox mounting surfaces may be damaged if gearbox was allowed to strike engine.

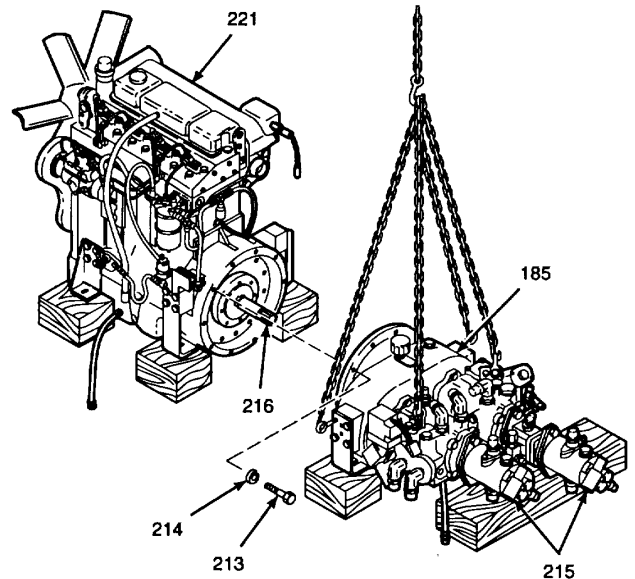
**NOTE**

Cribbing underneath pump drive gearbox (185) and hydraulic pumps has to be shifted to support pump drive gearbox and hydraulic pumps during installation to engine.

- h. With the help of two persons, align drive shaft (216) with mating gear in pump drive gearbox (185) slowly using overhead hoist. Install gearbox onto engine (221). Do not let gearbox hit engine. Shift cribbing over underneath gearbox and hydraulic pumps (215) as shown.
- i. Install lockwashers (214) onto hex head cap screws (213).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

When installing the pump drive gearbox onto the engine, the top two mounting holes on gearbox are left open. Hardware is installed when battery and slave cable clamps are reinstalled in a later procedure.

- j. Apply thread locking compound to threads of ten hex head cap screws (213) and install cap screws into cover plate of pump drive gearbox (185) securing it to engine (221). Do not install cap screws and lockwashers into top two mounting holes. Tighten cap screws 42 lb-ft (57 N•m).

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C. INSTALL - Continued.

- k. Remove chain assembly (212) from overhead hoist hook (189) and hex head screw caps (211). Remove chain assembly.

**WARNING**

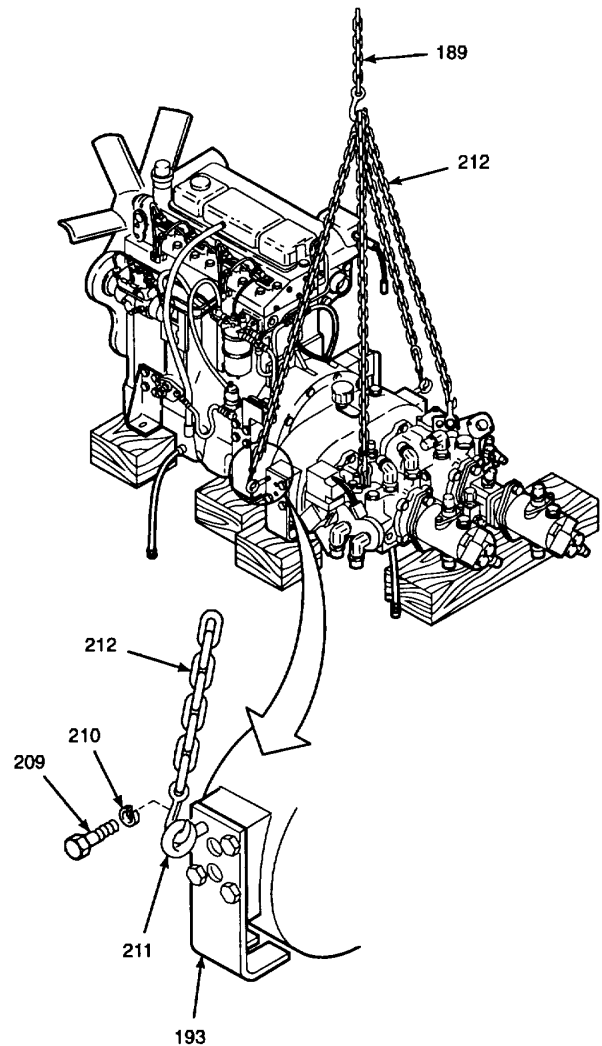
Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- l. Clean threads of hex head cap screws with thread locking compound solvent. Wipe dry with a cleaning cloth.
- m. Install lockwasher (210) onto hex head cap screw (209).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- n. Coat threads of hex head cap screws (209) with thread locking compound and reinstall into pump drive gearbox support bracket (193). Tighten cap screws 180 lb-ft (244 N•m).



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2.16 ENGINE REPLACEMENT - Continued.

C. INSTALL - Continued.

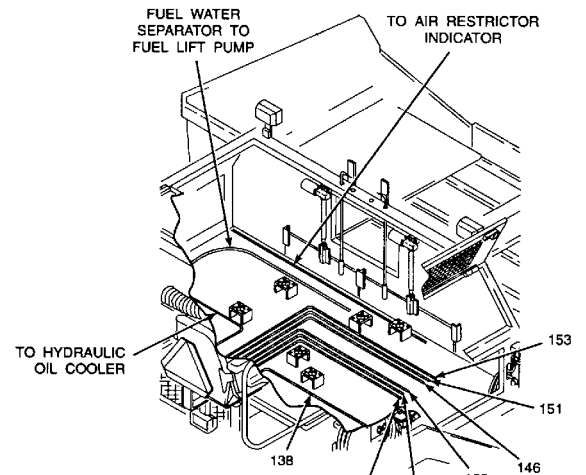
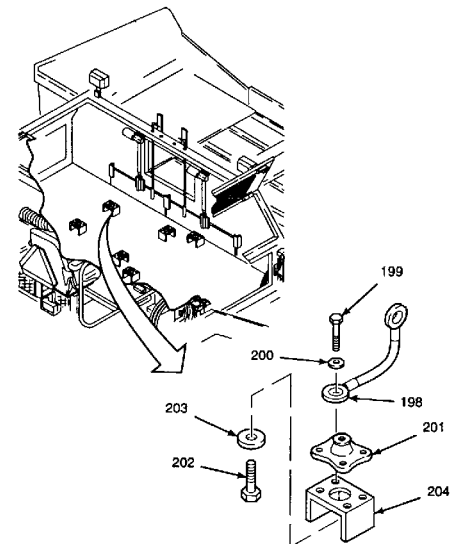
4. INSTALL SHOCK MOUNTS ONTO ENGINE, FLYWHEEL HOUSING AND PUMP DRIVE GEARBOX MOUNTS IN PAVING MACHINE.

- a. Install washers (203) onto hex head cap screws (202) and install into engine mounts (204) and shock mounts (201). Ensure hex head cap screw shaft extends all the way through center of shock mount.
- b. Install flat washers (200) onto hex head cap screws (199).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Coat threads of hex head cap screws (199) with thread locking compound and install cap screws and shock mounts (201). Install engine ground wire (198) to front right engine mount (204) as shown. Tighten cap screws 37 lb-ft (50 N•m).
- d. Position hydraulic hoses (138, 137, 131, 130, 146, 151 and 153) and fuel line as shown in illustration. Ensure hydraulic hoses are laid flat and not stacked.



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C. INSTALL - Continued.

5. INSTALL ENGINE AND PUMP ASSEMBLY AND PUMP DRIVE GEARBOX INTO ENGINE COMPARTMENT ONTO SHOCK MOUNTS AND ENGINE MOUNTS.

**WARNING**

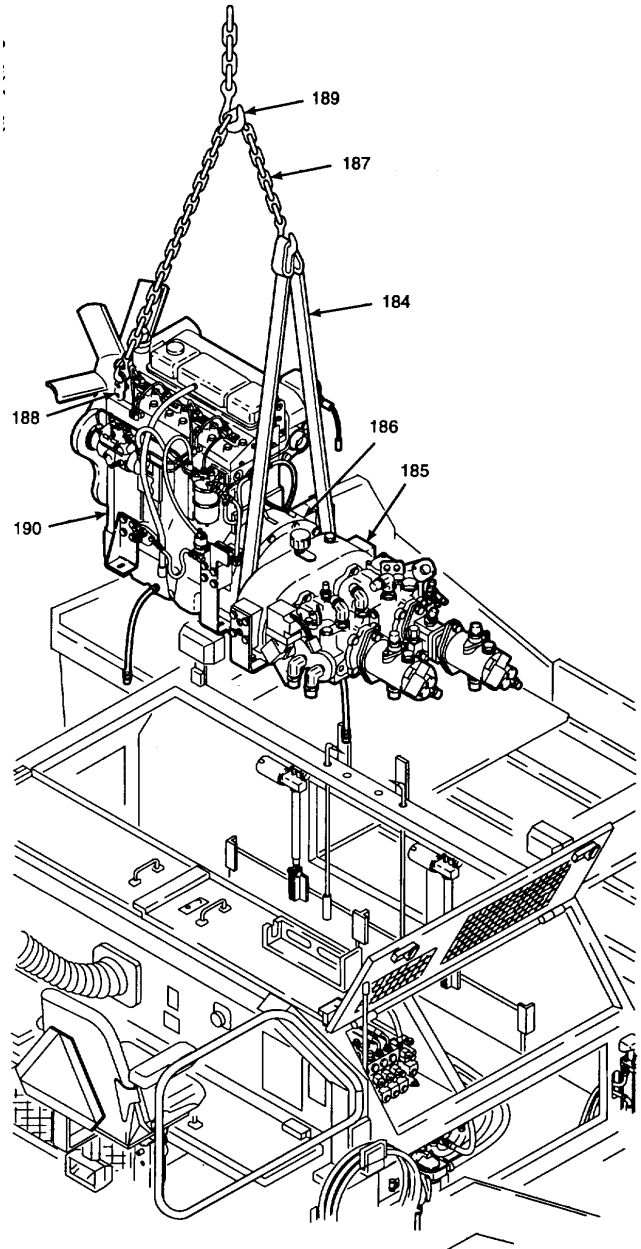
Engine and pump assembly weigh approximately 2,000 lbs (908 kg). Ensure chain assembly and sling strap are in good condition and are of correct capacity. Ensure sling strap is positioned between pump drive gearbox and flywheel housing. Chain assembly must be attached securely to front lifting bracket. Failure to do so may result in the engine and pump assembly shifting causing equipment to fall and cause serious injury or death to personnel.

- a. Guide sling strap (184) between pump drive gearbox (185) and flywheel housing (186).
- b. Attach chain assembly (187) to front lifting bracket (188) and to the loops on sling strap (184).
- c. Attach overhead hoist hook (189) to the lifting center of chain assembly (187). Take up slack in chain assembly and sling strap (184).

**WARNING**

Do not allow heavy engine and pump assembly to swing from hoist while raising engine and pump assembly off cribbing. Engine and pump assembly may strike personnel and cause serious injury if allowed to swing.

- d. Lift engine and pump assembly (190) up off cribbing and position engine and pump assembly over paving machine engine compartment.



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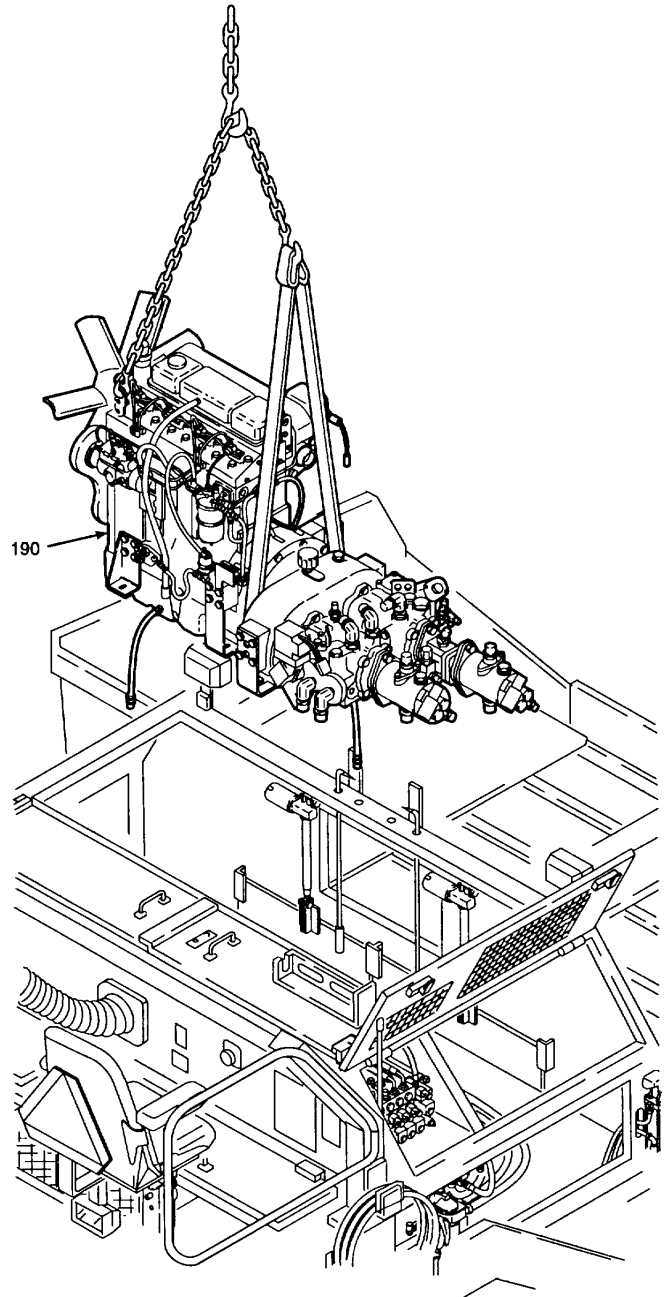
## 2.16 ENGINE REPLACEMENT - Continued.

## C. INSTALL - Continued.

**CAUTION**

Do not let the engine and pump assembly hit the sides of the engine compartment or catch on disconnected wiring harnesses, fuel hoses or hydraulic hoses. Lower engine and pump assembly slowly. Failure to do so may cause damage to the electrical system, fuel hoses, hydraulic hoses and engine and pump assembly.

- e. Position two persons on top of the paving machine to steady the engine and pump assembly during installation. Place one person at the pump end and the other person at the opposite radiator fan end of the engine. Ensure the engine and pump assembly does not hit the sides of the engine compartment or catch on disconnected electrical wires, fuel hoses, and hydraulic hoses when lowered into the paving machine engine compartment.
- f. Slowly lower engine and pump assembly (190) into paving machine; stop just before resting on the engine mounts. Make sure that you do not hit the sides of the engine compartment or catch on disconnected electrical wires, fuel hoses, and hydraulic hoses. Personnel should guide engine and pump assembly into the engine compartment.



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## C. INSTALL - Continued.

- g. Align mounting holes in front engine mounting brackets (195), flywheel housing mounting brackets (194), and pump drive gearbox support brackets (193) with engine mounts (204) and shock mounts (201).

**NOTE**

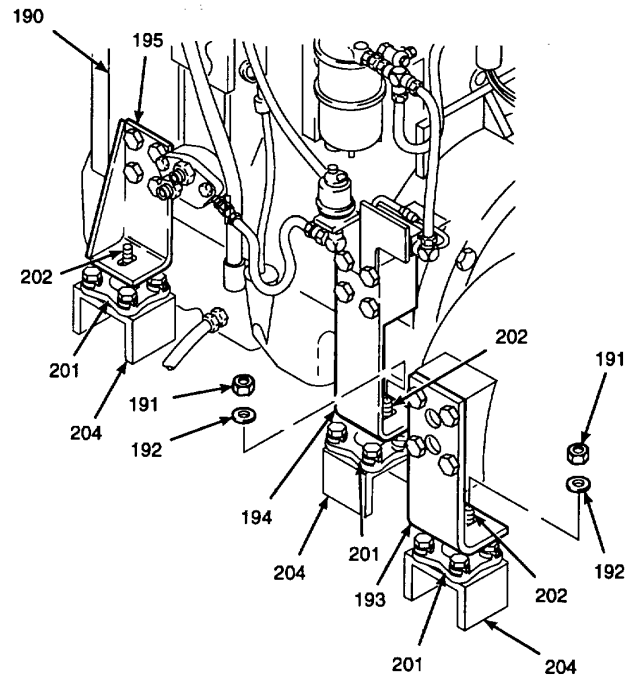
**It may be necessary to use overhead hoist and a pry bar to pry on support and mounting brackets attached to engine and pump assembly in order to get support and mounting brackets over hex head cap screws in engine mounts.**

- h. Lower engine and pump assembly (190) onto engine mounts (204) and over hex head cap screws (202). Ensure support and mounting brackets are seated squarely on shock mounts (201) and hex head cap screws are positioned to secure support and mounting brackets to engine mounts. Use overhead hoist or a pry bar to pry on support and mounting brackets to seat squarely on engine mounts and align with hex head cap screws.

**NOTE**

**Right side support and mounting brackets attached to pump drive gearbox and flywheel housing can be accessed through engine access cover in hopper.**

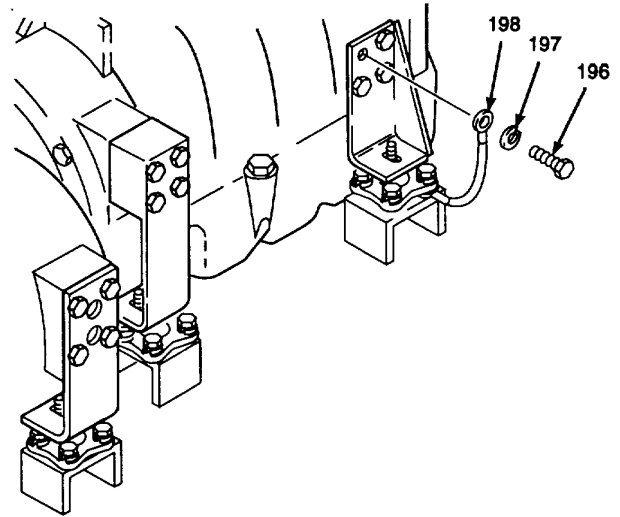
- i. Install flat washers (192), and self-locking hex nuts (191) on hex head cap screws (202) securing pump drive gearbox support brackets (193) and flywheel mounting brackets (194) on both left and right sides of the engine and pump assembly. Access the right side support and mounting brackets through the engine access cover.



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**2.16 ENGINE REPLACEMENT - Continued.****C. INSTALL - Continued.**

- j. Remove hex head cap screw (196) and lockwasher (197) from upper left front engine mounting bracket hole as shown. Discard lockwasher.
- k. Install lockwasher (197) and engine ground wire (198) onto hex head cap screw.

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- l. Coat threads of hex head cap screw (196) with thread locking compound and reinstall into upper left front engine mounting bracket hole.
- m. Tighten hex head cap screw (196) to 66 lb-ft (90 N•m).

**WARNING**

**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- n. Apply electrical insulating varnish to engine ground wire (198) and hex head cap screw (196).

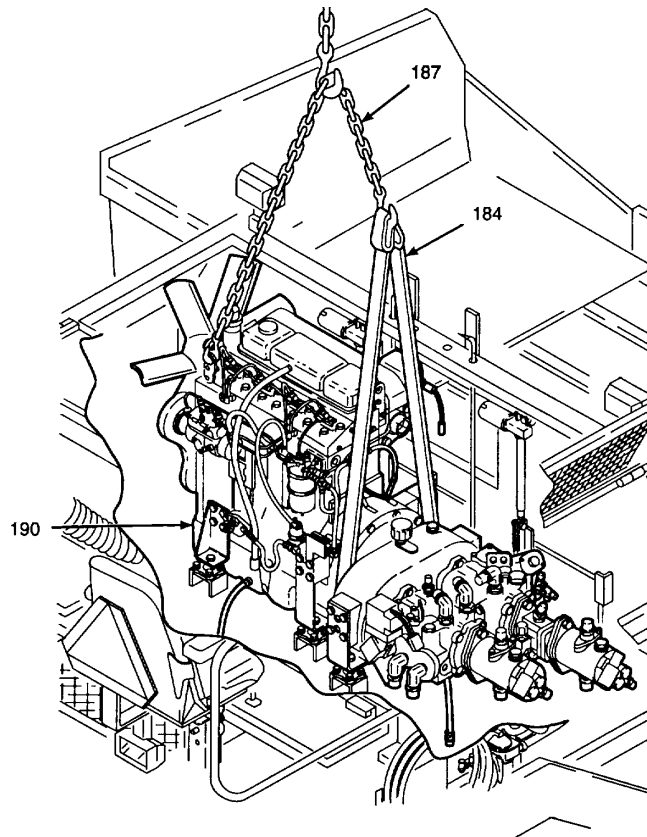
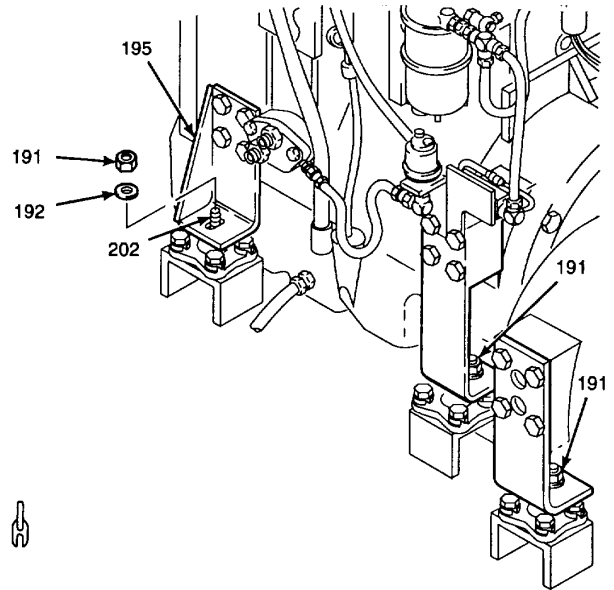
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C. INSTALL - Continued.

**NOTE**

**Front engine mounting brackets and mounts can be reached through access door openings on the left side of the paving machine.**

- o. Install flat washers (192), and self-locking hex nuts (191) on hex head cap screws (202) securing front engine mounting brackets (195) attached to the front of the engine.
- p. Tighten engine mounting self-locking hex nuts (191) and flywheel housing mounting selflocking hex nuts (191) to 150 lb-ft (203 N•m). Securely tighten pump drive gearbox support self-locking hex nuts (191).
- q. Remove chain assembly (187) and sling strap (184) from engine and pump assembly (190).



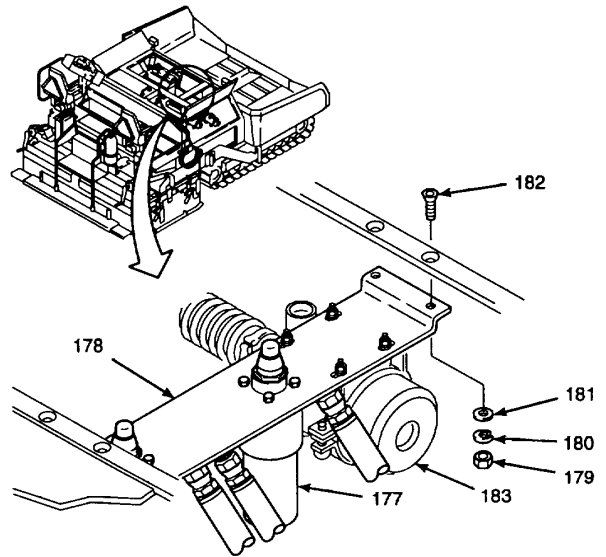
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2.16 ENGINE REPLACEMENT - Continued.

C. INSTALL - Continued.

6. INSTALL CHARGE FILTER MOUNTING BRACKET, AIR CLEANER, AND HYDRAULIC CHARGE FILTERS ONTO PAVING MACHINE FRAME.

- a. Turn charge filter mounting bracket (178), air cleaner (183), and hydraulic charge filters (177) sideways and lower into place aligning mounting holes in mounting bracket with holes in paving machine frame.



**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

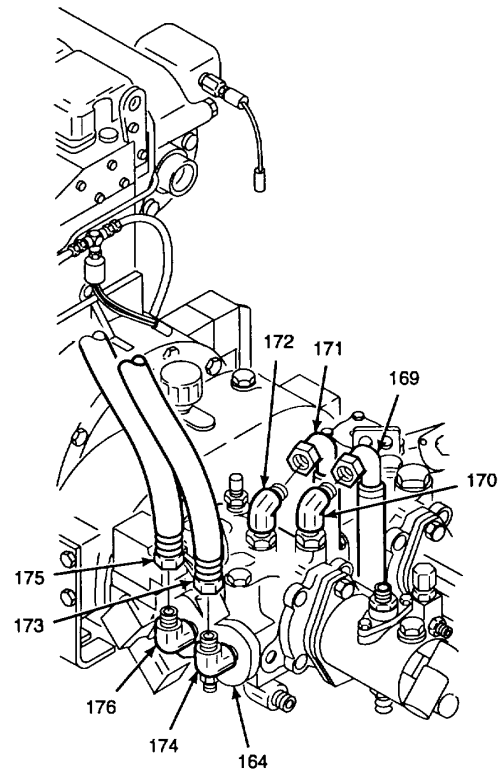
- b. Coat threads of socket head cap screws (182) with thread locking compound.
- c. Install and tighten socket head cap screws (182), flat washer (181), lockwasher (180), and hex nut (179).

7. RECONNECT HYDRAULIC HOSES TO RIGHT PROPULSION PUMP.

**WARNING**

**Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Coat threads of elbows (174 and 176) with hydraulic fitting sealant and install charge pump port A and port B hoses (173 and 175) to right propulsion pump (164).
- b. Coat threads of elbows (172 and 170) with hydraulic  $\frac{1}{2}$ " fitting sealant and, using combination wrench (Item 115, Appendix D), install propulsion pump port B hose (171) and propulsion pump port A hose (169) to right propulsion pump (164).



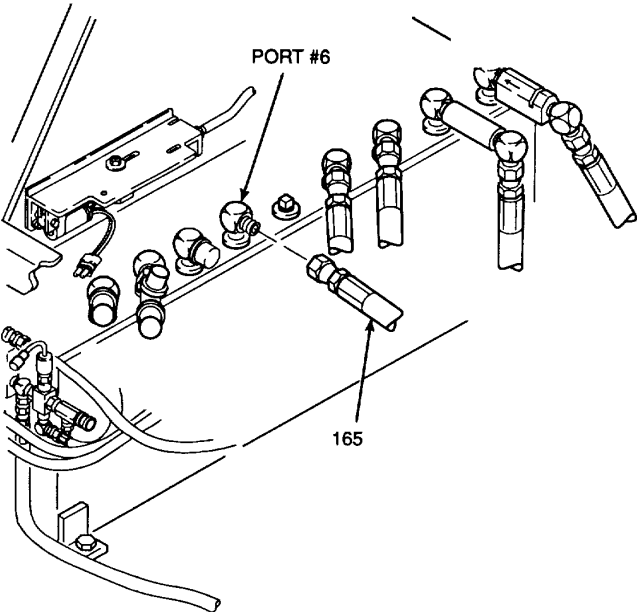
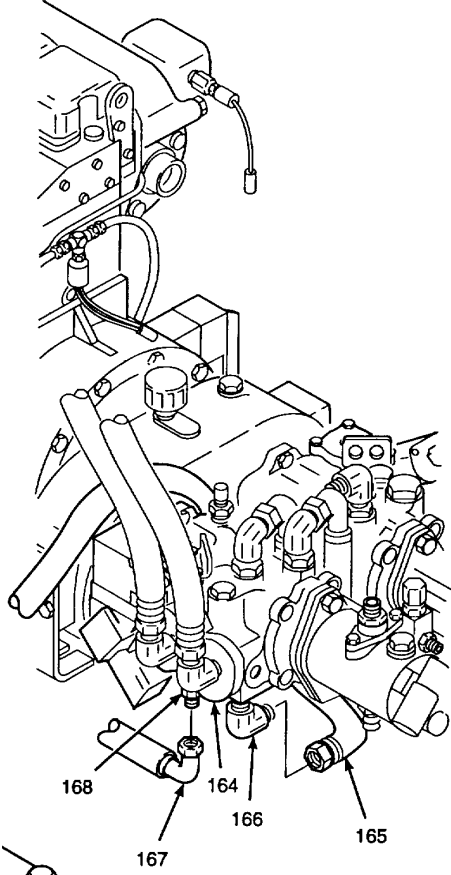
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2-128**

C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- c. Coat threads of straight adapter (168) with hydraulic fitting sealant and install case drain hose (167) to right propulsion pump (164).
- d. Coat threads of elbow (166) and hydraulic reservoir elbow port #6 with hydraulic fitting sealant. Install suction hose (165) between right propulsion pump (164) and hydraulic reservoir elbow port #6.



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2.16 ENGINE REPLACEMENT - Continued.

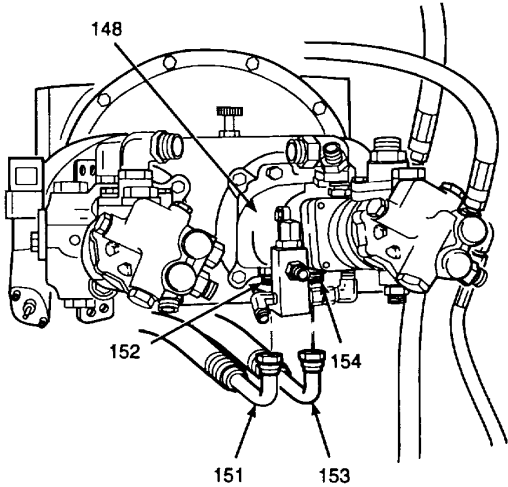
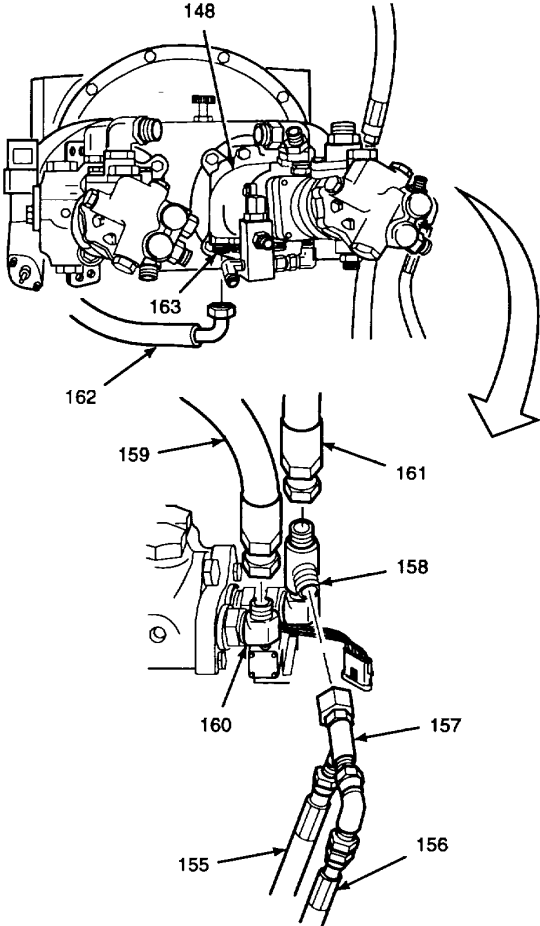
C. INSTALL - Continued.

8. RECONNECT HYDRAULIC HOSES TO LEFT PROPULSION PUMP.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Coat threads of straight adapter (163) with hydraulic fitting sealant and install case drain hose (162) to left propulsion pump (148).
- b. Coat threads of elbow (160) and swivel tee (158) with hydraulic fitting sealant and install charge pump port A hose (159) and charge pump port B hose (161) to left propulsion pump (148).
- c. Coat threads of swivel tee (158) with hydraulic fitting sealant and install swivel tube tee (157) and attached high speed shift valve hose (155) and brake valve hose (156) to left propulsion pump (148).
- d. Coat threads of straight adapters (152 and 154) with hydraulic fitting sealant and, using combination wrench (Item 115, Appendix D), install propulsion pump ports A and B hoses (151 and 153) to left propulsion pump (148).



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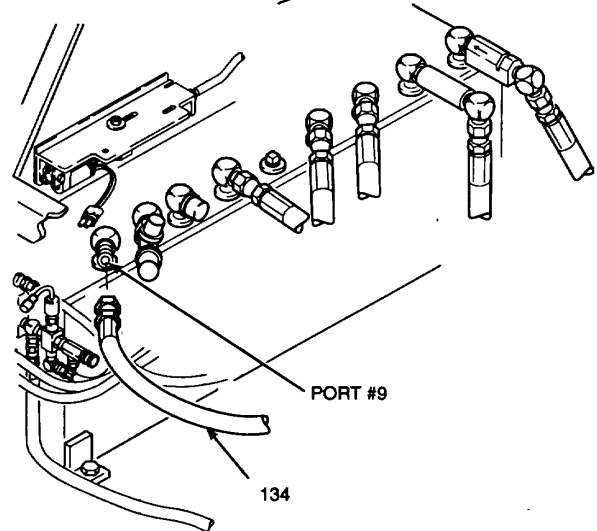
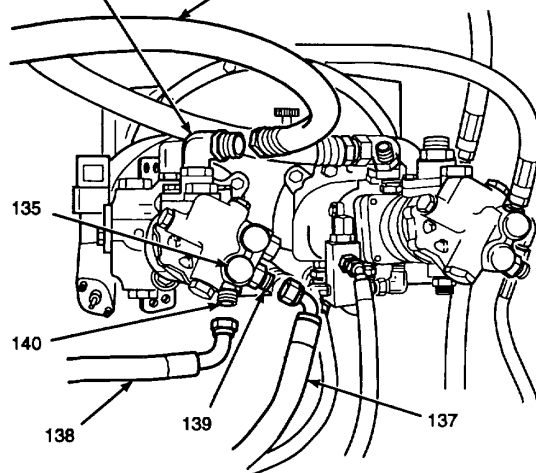
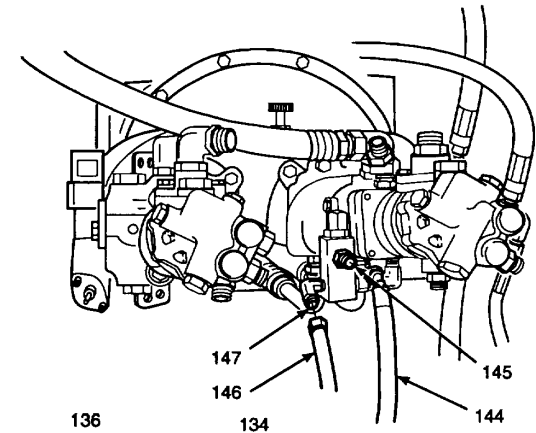
- C. INSTALL - Continued.
- 9. RECONNECT HYDRAULIC HOSES (144 AND 146) TO AUXILIARY VIBRATION PUMP.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Coat threads of straight adapter (145) and elbow (147) with hydraulic fitting sealant.
  - b. Install outlet hoses (144 and 146) on auxiliary vibration pump (141).
10. RECONNECT HYDRAULIC HOSES TO LEFT AND RIGHT AUXILIARY PUMPS.

- a. Coat threads of straight adapters (139 and 140) with hydraulic fitting sealant and install outlet hoses (137 and 138) onto right auxiliary pump (135).
- b. Coat threads of intake elbow (136) and hydraulic reservoir elbow, port #9 with hydraulic fitting sealant. Using combination wrench (Item 116, Appendix D) install suction hose (134) onto right auxiliary pump (135) and hydraulic reservoir elbow, port #9.



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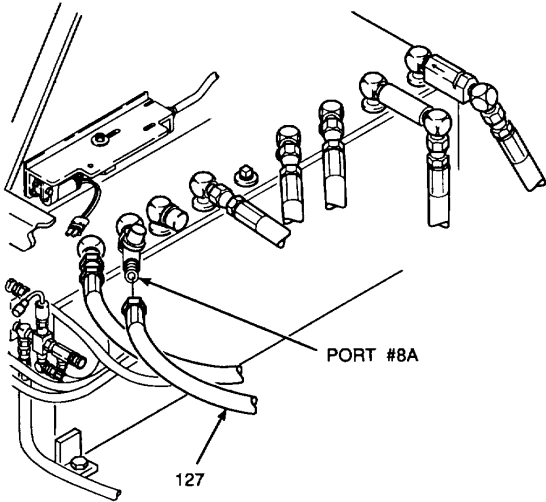
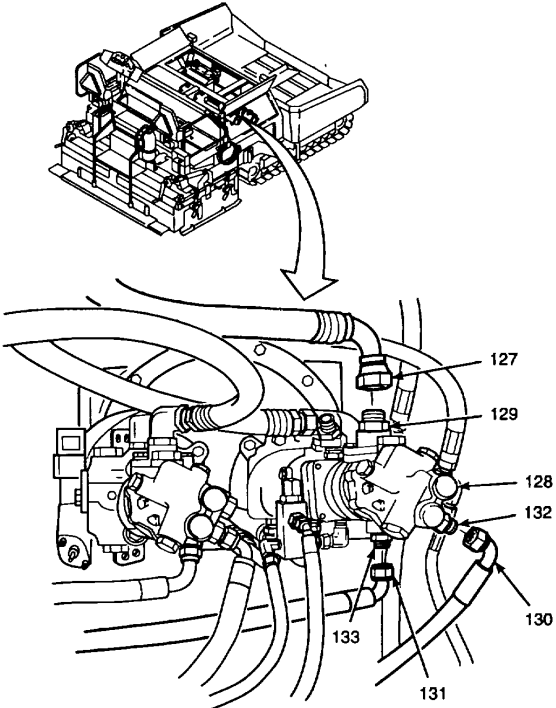
2.16 ENGINE REPLACEMENT - Continued.

C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- c. Coat threads of straight adapters (132 and 133) with hydraulic fitting sealant and install outlet hoses (130 and 131) onto left auxiliary pump (128).
- d. Coat threads of intake straight adapter (129) and hydraulic reservoir adapter, port #8A, with hydraulic fitting sealant. Using combination wrench (Item 115, Appendix D), install suction hose (127) onto left auxiliary pump (128) and on hydraulic reservoir adapter #8A.



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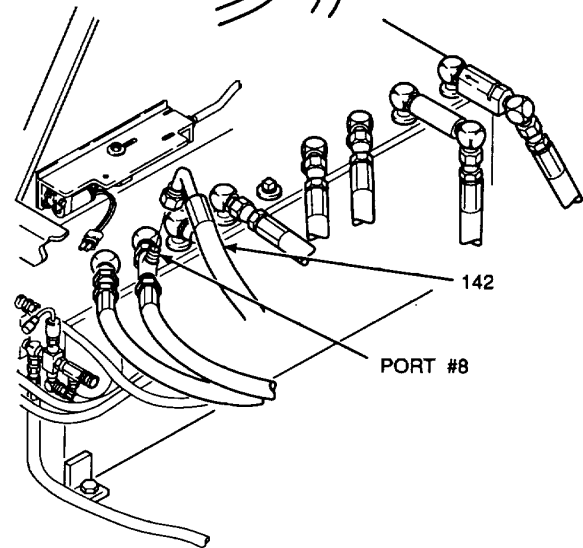
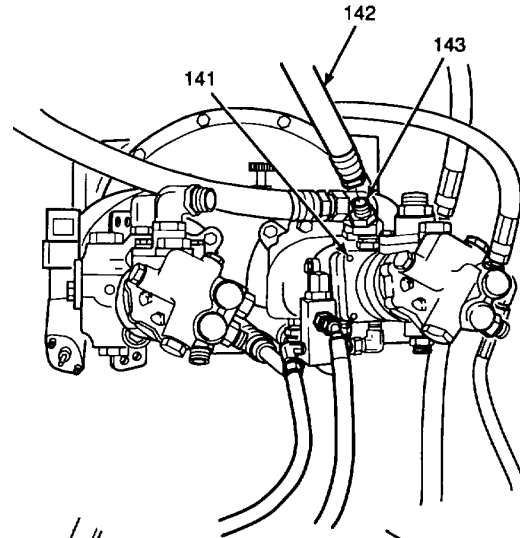
C. INSTALL - Continued.

11. RECONNECT HYDRAULIC HOSE (142) TO AUXILIARY VIBRATION PUMP AND HYDRAULIC HOSE (149) TO LEFT PROPULSION PUMP.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Coat threads of elbow (143) and hydraulic reservoir fitting port #8 with hydraulic fitting sealant and, using combination wrench (Item 115, Appendix D), install suction hose (142) on auxiliary vibration pump (141) and hydraulic reservoir fitting, port #8.

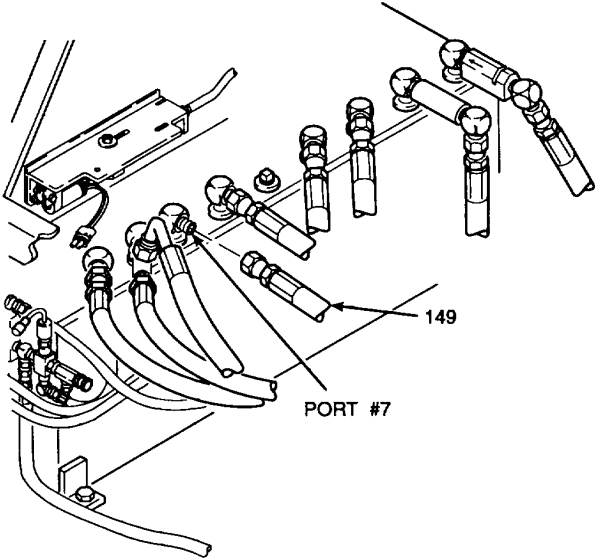
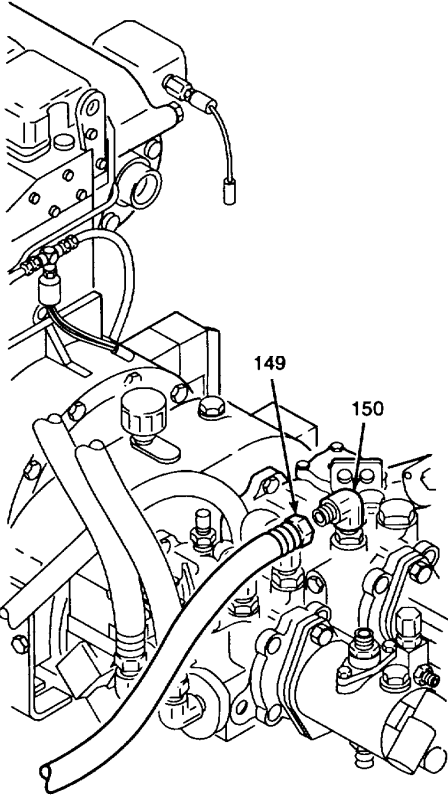


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2.16 ENGINE REPLACEMENT - Continued.

C. INSTALL - Continued.

- b. Coat threads of elbow (150) and hydraulic reservoir elbow port #7 with hydraulic fitting sealant. Using combination wrench (Item 116, Appendix D), install suction hose (149) between left propulsion pump elbow (150) and hydraulic reservoir elbow, port #7.

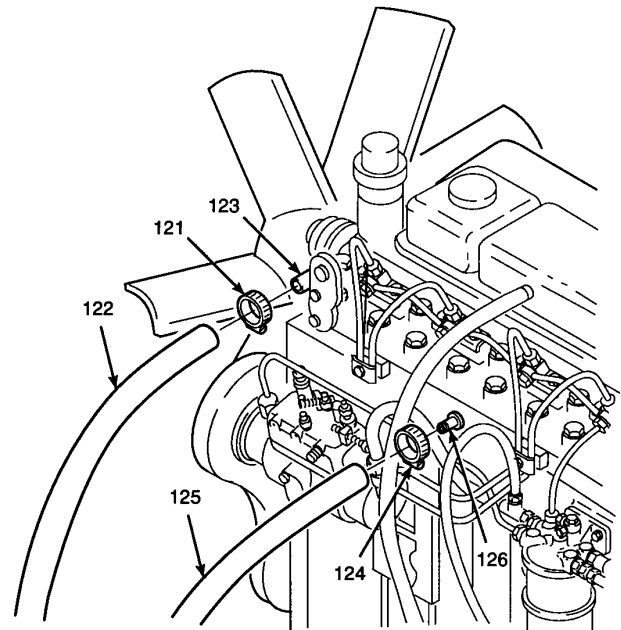


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C. INSTALL - Continued.

12. RECONNECT ENGINE OIL COOLER HOSES TO THERMOSTAT HOUSING AND ENGINE BLOCK COOLANT GALLERY.

- a. Install hose clamp (124) and coolant hose (125) onto engine block coolant gallery fitting (1226). Tighten hose clamp.
- b. Install hose clamp (121) and coolant hose (122) onto thermostat housing fitting (123). Tighten hose clamp.

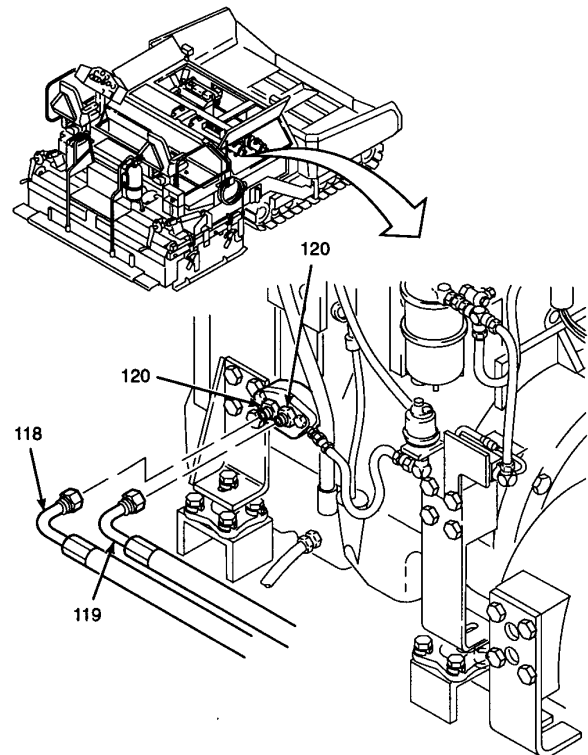


13. RECONNECT ENGINE OIL HOSES TO ADAPTER PLATE AND INSTALL ENGINE OIL DRAIN HOSE EXTENSION ONTO ENGINE OIL DRAIN HOSE.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Coat threads of adapter plate straight adapters (120) with hydraulic fitting sealant. Install engine oil filter hoses (118 and 119) onto adapter plate straight adapters.



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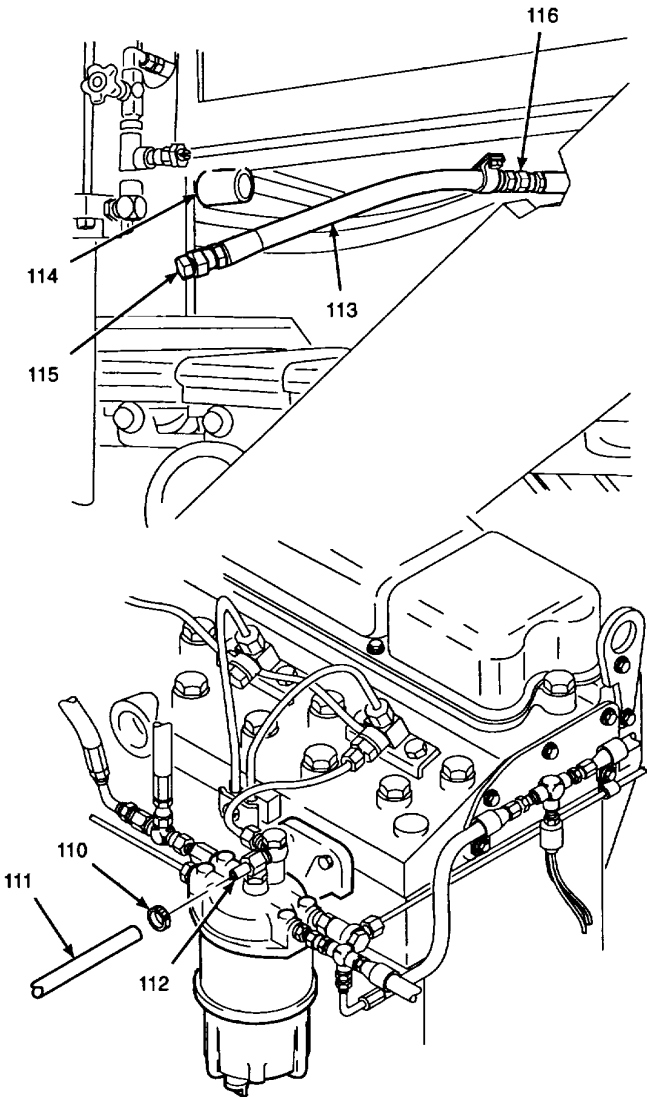
2.16 ENGINE REPLACEMENT - Continued.

C. INSTALL - Continued.

**NOTE**

Ensure engine oil drain hose (116) is routed under all other hoses in engine compartment, with no sharp bends, before installation into bracket (114). Engine oil will not drain properly if hose is not routed correctly.

- b. Remove drain plug (115) from engine oil drain hose (116).
  - c. Reconnect engine oil drain hose extension (113) to engine oil drain hose (116).
  - d. Install drain plug (115) into engine oil drain hose extension (113).
  - e. Install engine oil drain hose extension (113) in bracket (114).
14. CONNECT FUEL LINES TO FUEL LIFT PUMP AND ENGINE FUEL FILTER ON ENGINE.
- a. Install hose clamp (110) and fuel hose (111) onto engine fuel filter fuel tube (112).
  - b. Tighten hose clamp (110).



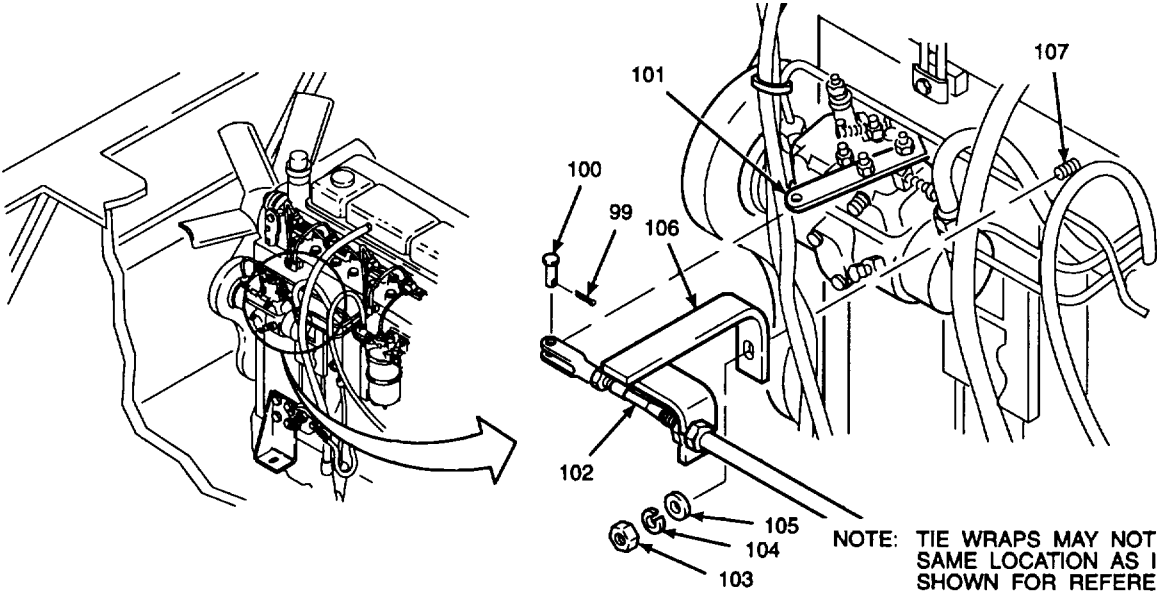
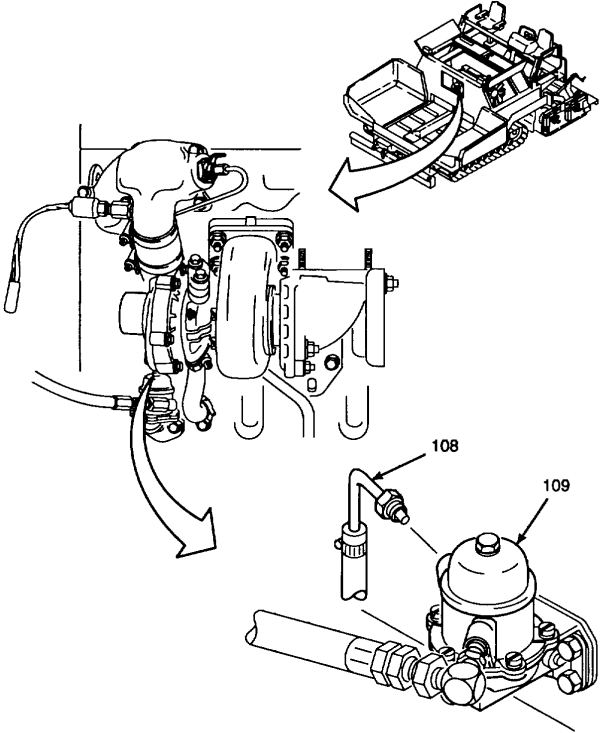
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C. INSTALL - Continued.

- c. Reconnect fuel intake line (108) to fuel lift pump (109).

15. INSTALL THROTTLE CONTROL CABLE ONTO FUEL INJECTION PUMP.

- a. Install throttle cable bracket (106), washer (105), lockwasher (104), and hex nut (103) onto mounting stud (107).
- b. Pull throttle control cable (102) forward to engage throttle lever (101).
- c. Install clevis pin (100) through throttle control cable (102) and throttle lever (101).
- d. Install cotter pin (99) through clevis pin (100).



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**2.16 ENGINE REPLACEMENT - Continued.****C. INSTALL - Continued.****16. RECONNECT HARNESS CONNECTORS TO LEFT AND RIGHT FORWARD WORK LIGHT CONNECTORS.**

- a. Apply electrical insulating compound to male end of harness connector (93) and reconnect harness connectors to left and right forward work light connectors (95).
- b. Secure harness connectors (93) to mounting bracket (94) with tie wraps (92).
- c. Remove hex head cap screw (96) from mounting bracket (94).

**WARNING**

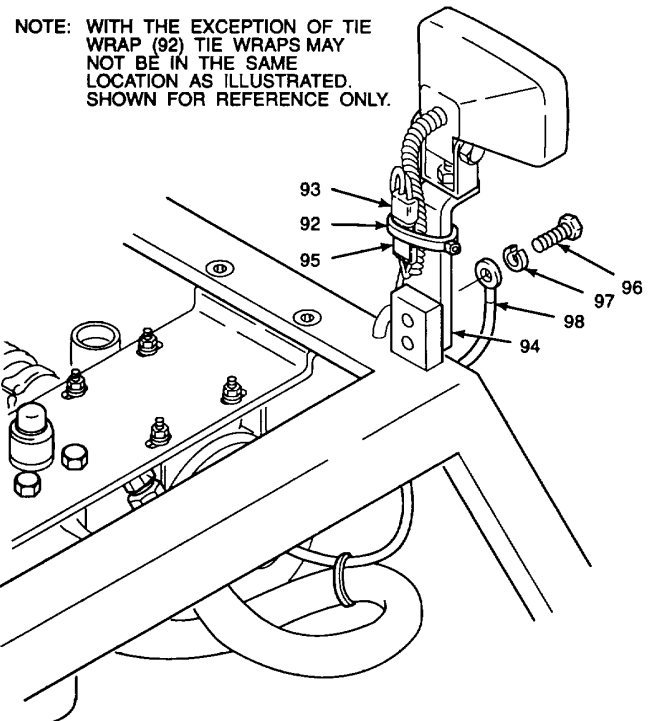
**Thread locking compound can cause eye damage. Wear safety goggles when using thread locking compound. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- d. Install lockwashers (97) onto hex head cap screws (96) and coat threads of cap screws with thread locking compound.
- e. Install hex head cap screw (96), lockwasher (97) and ground wire (98) onto mounting bracket (94). Tighten to 20 lb-ft (27 N•m).

**WARNING**

**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

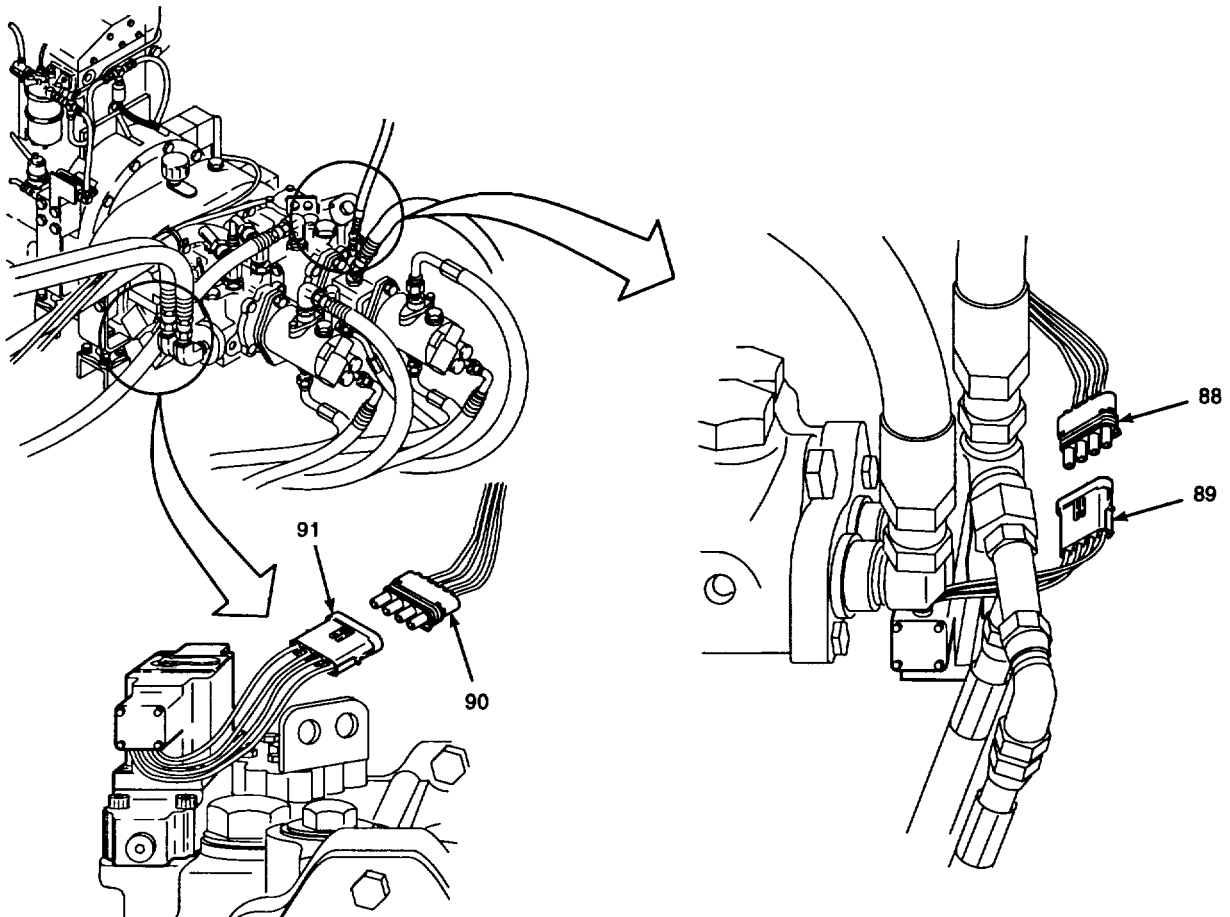
- f. Apply electrical insulating varnish to installed ground wire (98), lockwasher (97), and hex head cap screw (96).



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2-138**

C. INSTALL - Continued.

17. APPLY ELECTRICAL INSULATING COMPOUND TO MALE END OF HARNESS CONNECTOR (90) AND RECONNECT TO RIGHT PROPULSION PUMP PUMP PILOT CONTROL VALVE CONNECTOR (91).
18. APPLY ELECTRICAL INSULATING COMPOUND TO MALE END OF HARNESS CONNECTOR (88) AND RECONNECT TO LEFT PROPULSION PUMP PUMP PILOT CONTROL VALVE CONNECTOR (89).

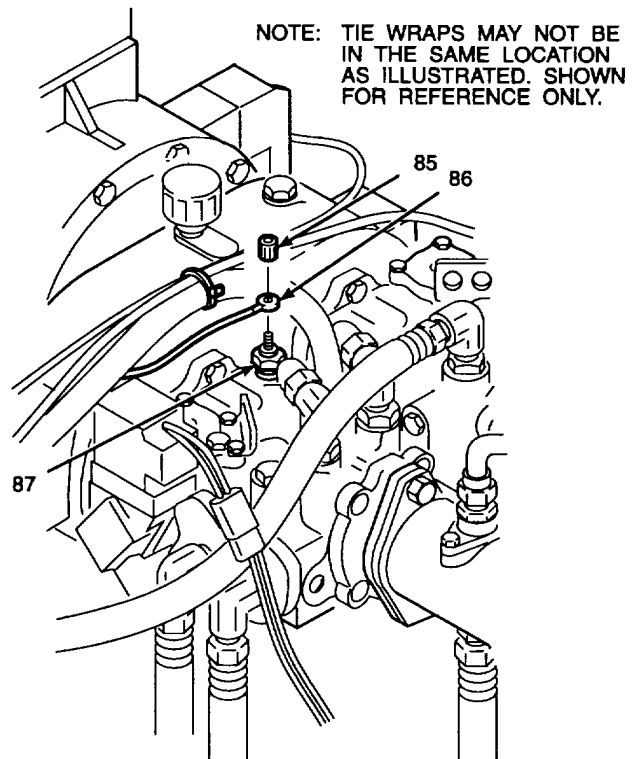


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**2.16 ENGINE REPLACEMENT - Continued.****C. INSTALL - Continued.****WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

19. INSTALL WIRE 150 (86) ONTO HYDRAULIC OIL TEMPERATURE SENSOR (87) TERMINAL AND SECURE WITH KNURLED NUT (85). COAT WIRE 150 TERMINAL AND HYDRAULIC OIL TEMPERATURE SENSOR WITH ELECTRICAL INSULATING VARNISH.



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C. INSTALL - Continued.

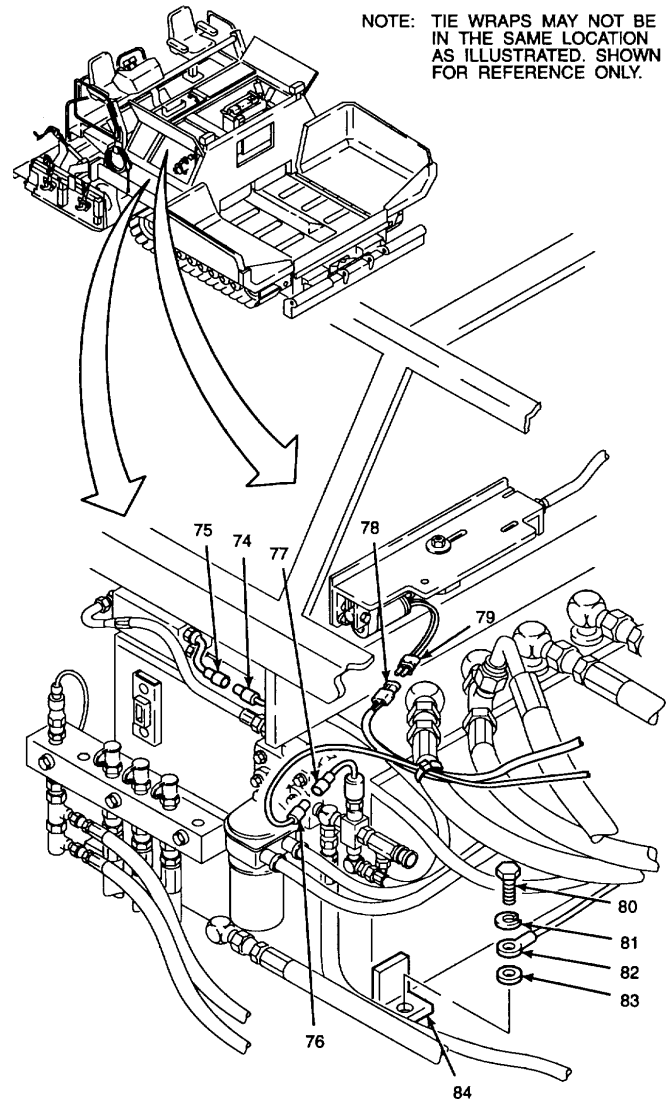
20. INSTALL GROUND WIRE G201 ONTO HYDRAULIC RESERVOIR MOUNTING BRACKET.

- a. Remove hex head cap screw (80) and flat washer (83).
- b. Install lockwasher (81), ground wire G201 (82), and flat washer (83) onto hex head cap screw (80).
- c. Install hex head cap screw (80) into hydraulic reservoir mounting bracket (84). Tighten hex head cap screw 37 lb-ft (50 N•m).

**WARNING**

**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- d. Apply electrical insulating varnish to installed flat washer (83), ground wire G201 (82), lockwasher (81), and hex head cap screw (80).
21. APPLY ELECTRICAL INSULATING COMPOUND TO END OF HARNESS CONNECTOR (78) AND RECONNECT TO THROTTLE ACTUATOR CONNECTOR (79).
22. APPLY ELECTRICAL INSULATING COMPOUND TO END OF HARNESS CONNECTORS (76) AND RECONNECT TO ENGINE OIL PRESSURE TRANSMITTER CONNECTOR (77).
23. APPLY ELECTRICAL INSULATING COMPOUND TO END OF HARNESS CONNECTOR (74) AND RECONNECT TO ENGINE OIL FILTER DIFFERENTIAL PRESSURE TRANSMITTER CONNECTOR (75).



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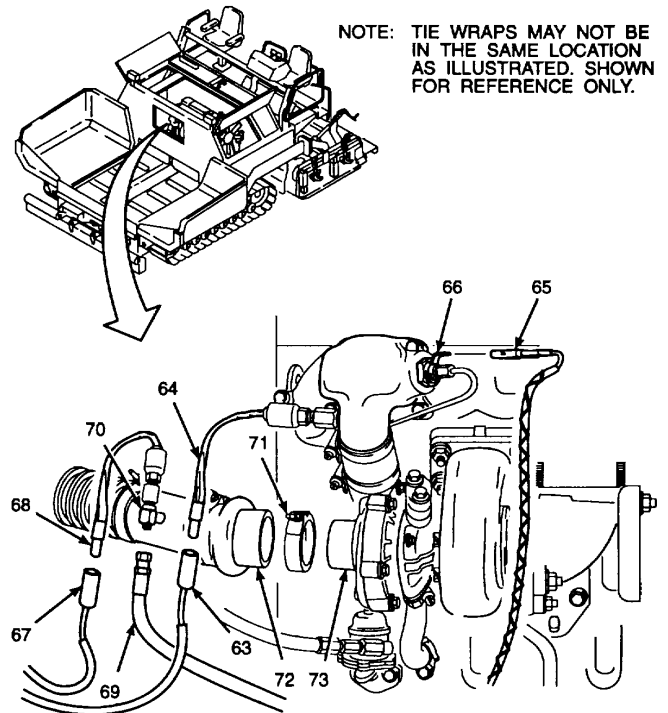
**2.16 ENGINE REPLACEMENT - Continued.****C. INSTALL - Continued.**

24. APPLY ELECTRICAL INSULATING COMPOUND TO INDUCTION HEATER (66). INSTALL INDUCTION HEATER WIRE 165 (65) ONTO INDUCTION HEATER WIRE TERMINAL.
25. APPLY ELECTRICAL INSULATING COMPOUND ONTO END OF HARNESS CONNECTOR (63). RECONNECT HARNESS CONNECTOR TO TURBOSUPERCHARGER PRESSURE TRANSMITTER CONNECTOR (64).
26. INSTALL AIR HOSE (72) AND CLAMP (71) ONTO TURBOSUPERCHARGER (73) AIR INTAKE. TIGHTEN CLAMP.

<b>WARNING</b>
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Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

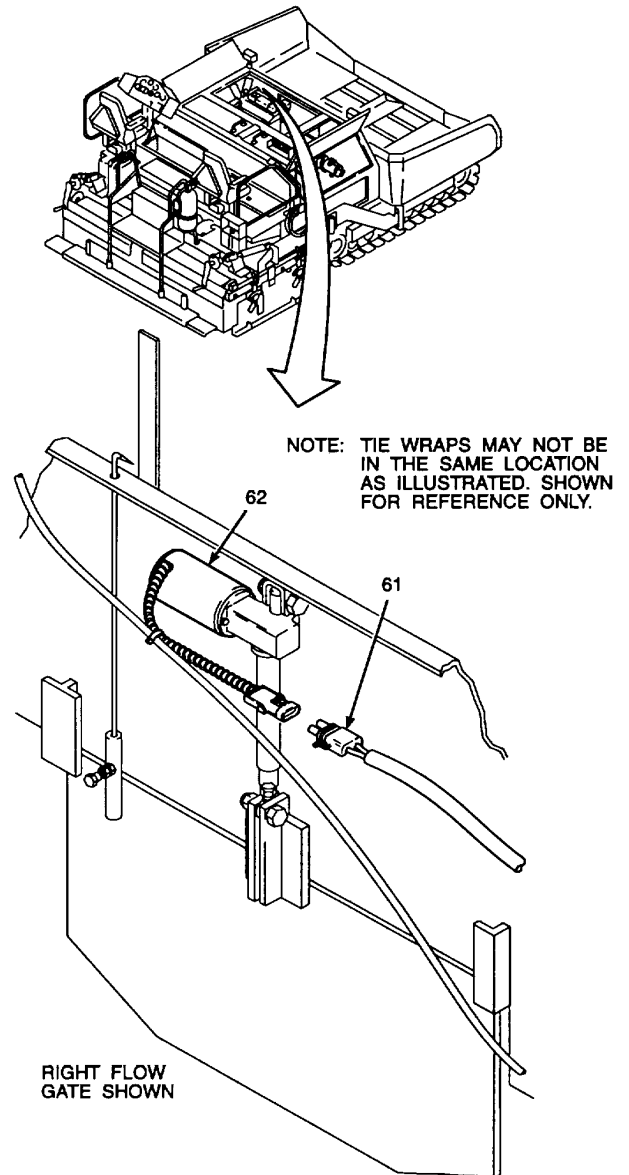
27. APPLY HYDRAULIC FITTING SEALANT TO THREADS OF TEE (70). INSTALL AIR CLEANER SERVICE INDICATOR KNOB HOSE (69) ONTO TEE.
28. APPLY ELECTRICAL INSULATING COMPOUND ONTO END OF HARNESS CONNECTOR (67). RECONNECT HARNESS CONNECTOR TO AIR PRESSURE TRANSMITTER CONNECTOR (68).



**GO TO NEXT PAGE**

C. INSTALL - Continued.

29. APPLY ELECTRICAL INSULATING COMPOUND ONTO END OF HARNESS CONNECTORS (61). RECONNECT HARNESS CONNECTORS TO LEFT AND RIGHT FLOW GATE ACTUATOR CONNECTORS (62).

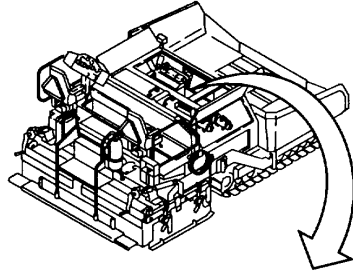
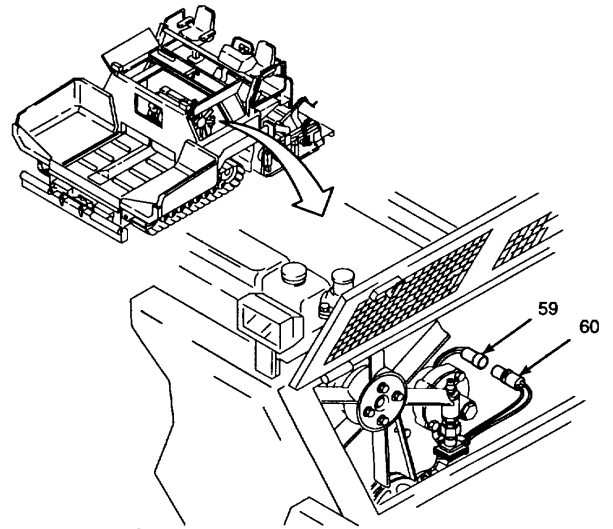


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2.16 ENGINE REPLACEMENT - Continued.

C. INSTALL - Continued.

30. APPLY ELECTRICAL INSULATING COMPOUND ONTO END OF HARNESS CONNECTOR (59) AND RECONNECT HARNESS CONNECTOR TO TACHOMETER GENERATOR CONNECTOR (60).
31. APPLY ELECTRICAL INSULATING COMPOUND ON END OF HARNESS CONNECTOR (53) AND RECONNECT TO FUEL PRESSURE TRANSMITTER CONNECTOR (54).
32. APPLY ELECTRICAL INSULATING COMPOUND ON END OF HARNESS CONNECTOR (51) AND RECONNECT TO FUEL DIFFERENTIAL PRESSURE SWITCH CONNECTOR (52).

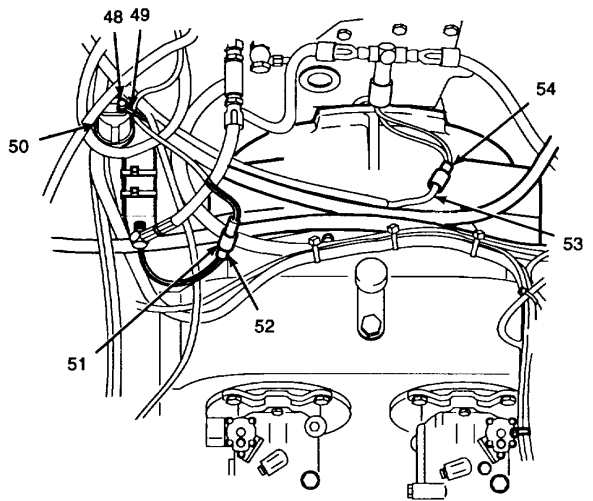


NOTE: TIE WRAPS MAY NOT BE IN THE SAME LOCATION AS ILLUSTRATED. SHOWN FOR REFERENCE ONLY.

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

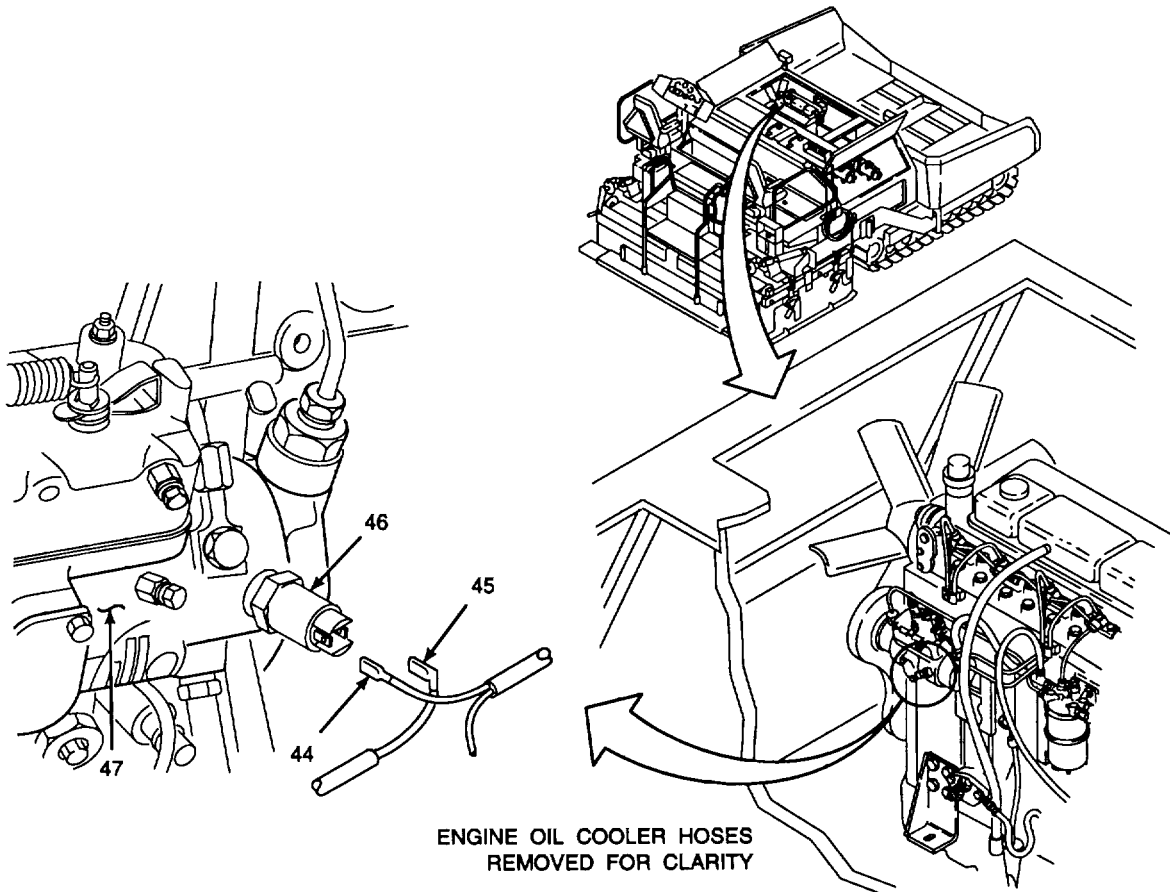
33. REMOVE KNURLED NUT (48) AND INSTALL WIRE 104 (49) ONTO ENGINE OIL PRESSURE TRANSMITTER (50) TERMINAL AND SECURE WITH KNURLED NUT COAT WIRE 104 TERMINAL WITH ELECTRICAL INSULATING VARNISH.



GO TO NEXT PAGE

C. INSTALL - Continued.

34. APPLY ELECTRICAL INSULATING COMPOUND ONTO MALE ENDS OF FUEL SHUTOFF SOLENOID (46) AND PLUG WIRES G201 AND 322 (44 AND 45) INTO FUEL SHUTOFF SOLENOID ON FUEL INJECTION PUMP (47).



ENGINE OIL COOLER HOSES  
REMOVED FOR CLARITY

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**2.16 ENGINE REPLACEMENT - Continued.**

C. INSTALL - Continued.

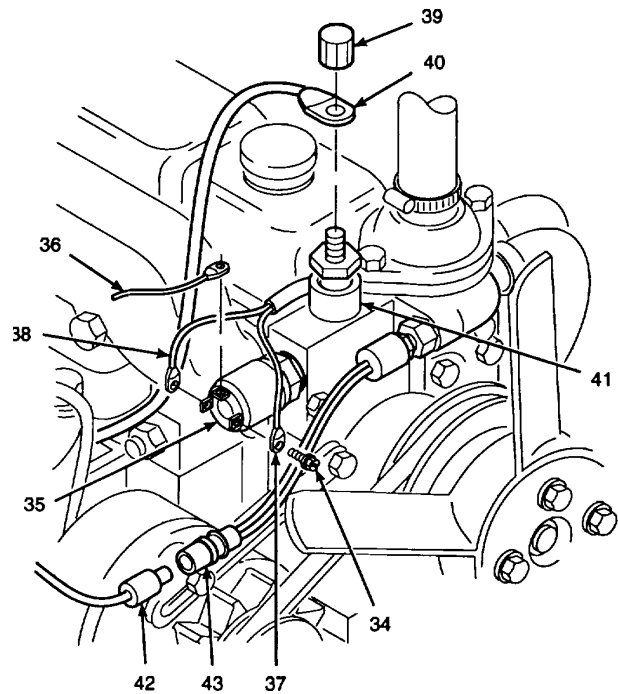
**35. RECONNECT ELECTRICAL CONNECTIONS TO THERMOSTAT HOUSING.**

- a. Apply electrical insulating compound to end of harness connector (42) and reconnect to engine coolant temperature transducer connector (43).

<b>WARNING</b>
----------------

**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- b. Remove knurled nut (39) and install wire 105 (40) on coolant temperature sensor (41) terminal and secure with knurled nut. Coat wire 105 terminal with electrical insulating varnish.
- c. Install self-locking screw (34) and wire 151 (38) onto NC terminal on high temperature shutdown sensor (35).
- d. Install self-locking screw (34) and wire 152 (37) onto the NO terminal on high temperature shutdown sensor (35).
- e. Install self-locking screw (34) and wire 111 (36) onto the C terminal on high temperature shutdown sensor (35).
- f. Coat wire 151 (38), wire 152 (37), and wire 111 (36) terminals with electrical insulating varnish.

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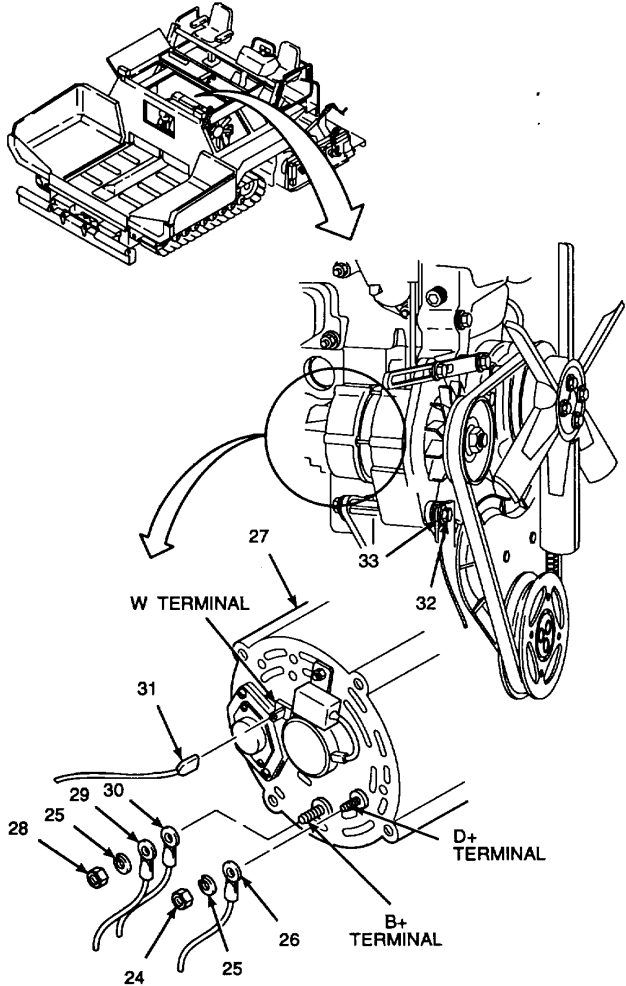
C. INSTALL - Continued.

36. INSTALL ELECTRICAL CONNECTIONS ON ALTERNATOR.

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- a. Remove and discard self-locking hex nut (32).
- b. Install DCA ground wire 330 (33) onto alternator (27) pivot bolt and secure with selflocking hex nut (32). Coat DCA ground wire 330 terminal with electrical insulating varnish.
- c. Coat male end of W terminal on alternator with electrical insulating compound and install wire 102 (31) to the W terminal on alternator (27) and plug in.
- d. Install wire 160 (30) and wire 329 (29) onto B+ terminal on alternator (27) and secure with lockwasher (25) and hex nut (28).
- e. Install wire 328 (26) onto D+ terminal on alternator (27) and secure with lockwasher (25) and hex nut (24).
- f. Coat wire 160 (30), wire 329 (29), and wire 328 (26) terminals with electrical insulating varnish.



TERMINAL	WIRE NO.	INDEX NO.
B+	160	30
B+	329	29
D+	328	26
W	102	31
GROUND	330	33

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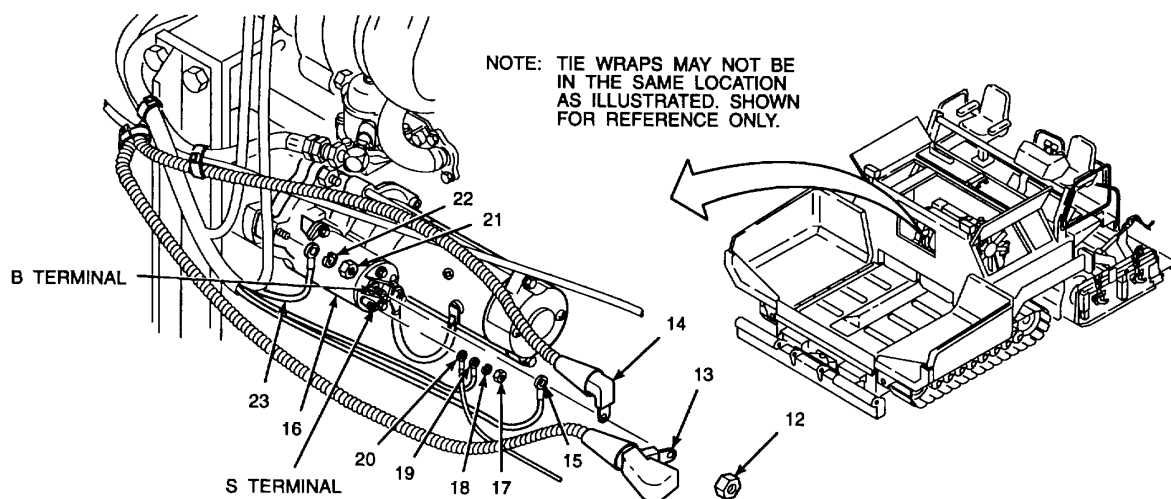
**2.16 ENGINE REPLACEMENT - Continued.****C. INSTALL - Continued.****37. INSTALL ELECTRICAL CONNECTIONS ON STARTER.**

- a. Install wire 333 (23) onto mounting stud on starter (16) and secure with lockwasher (22) and hex nut (21).
- b. Install wire 166 (20) and wire 332 (19) onto terminal S on starter (16) and secure with lockwasher (18) and hex nut (17).
- c. Install wire 331 (15), positive battery cable (14), and slave cable (13) onto terminal B on starter and secure hex nut (12).

**WARNING**

**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- d. Coat wire 333 (23), wire 166 (20), wire 332 (19), wire 331 (15), positive battery cable (14), and slave cable (13) terminals with electrical insulating varnish.

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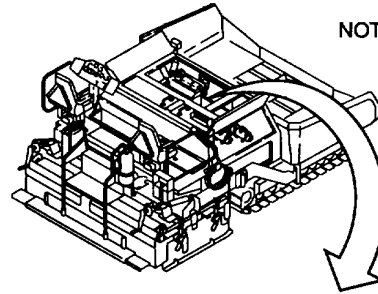
C. INSTALL - Continued.

38. INSTALL CLAMPS ONTO POSITIVE BATTERY CABLE AND SLAVE CABLE.

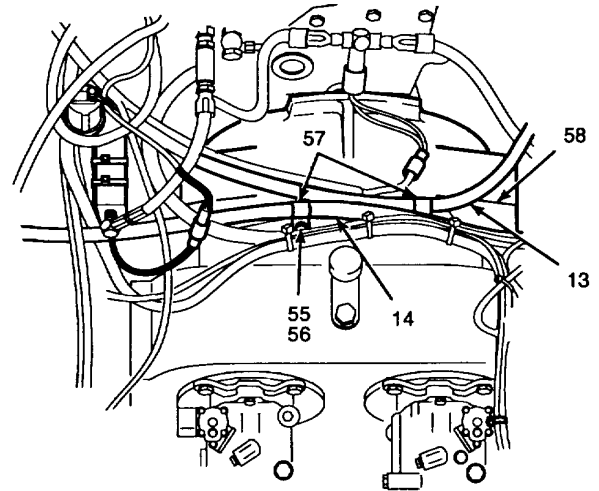
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles when using thread locking compound. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Install lockwashers (56) onto hex head cap screws (55). Apply a small amount of thread locking compound to threads of hex head cap screws.
- b. Install hex head cap screws (55), clamps (57), securing slave cable (13) and positive battery cable (14) to flywheel housing (58). Tighten hex head cap screws to 42 lb-ft (57 N•m).



NOTE: TIE WRAPS MAY NOT BE IN THE SAME LOCATION AS ILLUSTRATED. SHOWN FOR REFERENCE ONLY.



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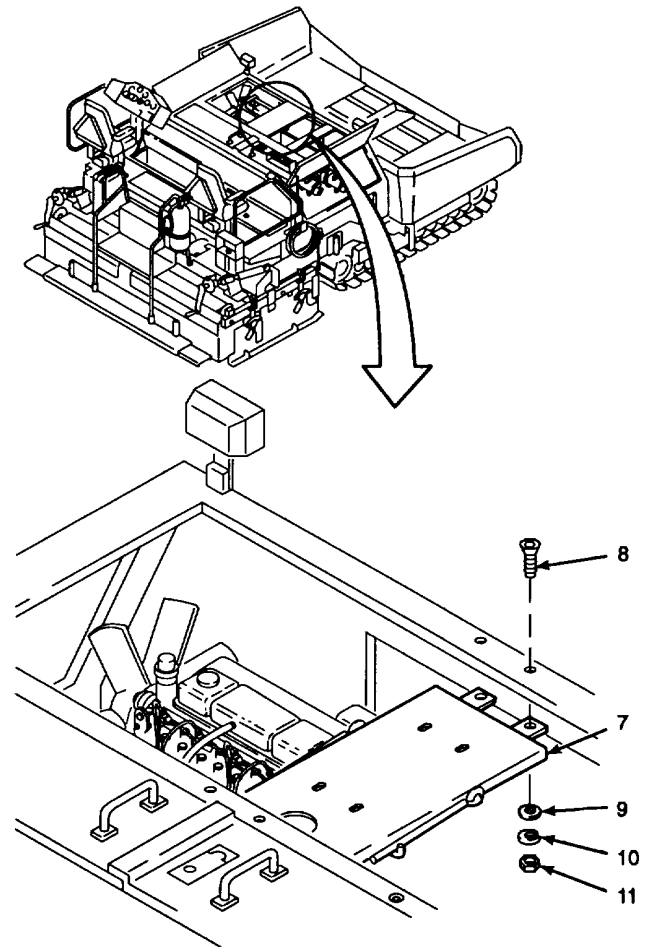
**2.16 ENGINE REPLACEMENT - Continued.****C. INSTALL - Continued.****39. INSTALL MUFFLER SUPPORT BRACKET.**

- a. With the help of another person, position muffler support bracket (7) and align mounting flanges of plate with mounting holes in paving machine frame.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles when using thread locking compound. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Coat threads of socket head cap screws (8) with thread locking compound.
- c. Install socket head cap screws (8), flat washer (9), lockwasher (10) and hex nut (11) securing muffler support bracket (7) in place.



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C. INSTALL - Continued.

40. RECONNECT BATTERY CABLES TO BATTERIES.

**WARNING**

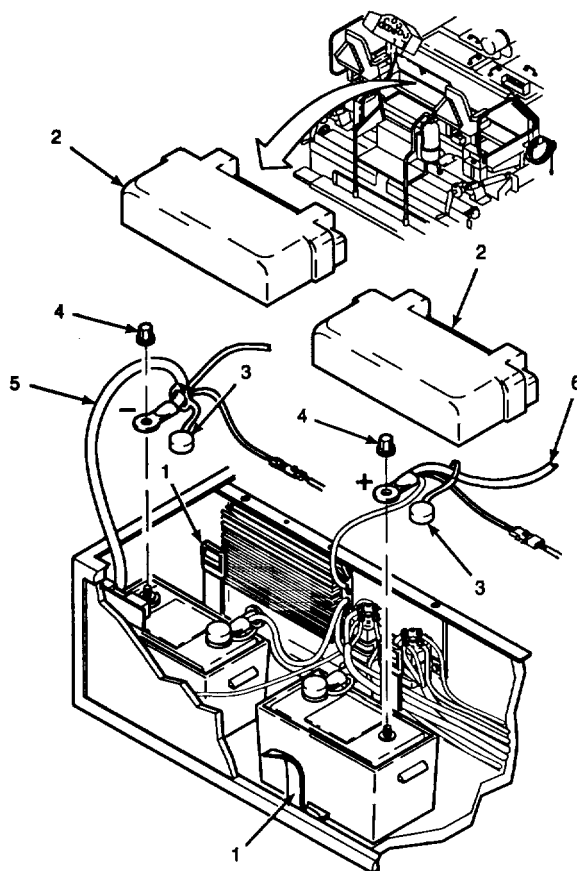
When connecting batteries, connect positive battery cable before connecting negative battery cable. Failure to connect batteries in the proper sequence may lead to electrical shock or short circuit and result in severe personnel injury.

- a. Install positive battery cable (6) and battery nut (4) onto positive terminal of inboard battery.
- b. Install negative battery cable (5) and battery nut (4) onto negative terminal of outboard battery.

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- c. Apply electrical insulating varnish to battery nuts (4).
- d. Install rubber battery terminal caps (3) onto battery terminals.
- e. Install battery box covers (2) and secure with battery box holddown straps (1).



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**2.16 ENGINE REPLACEMENT - Continued.**

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C. INSTALL - Continued.

**NOTE**

FOLLOW-ON-TASKS: Install radiator per TM 5-3895-373-20.  
Install exhaust and air intake per TM 5-3895-373-20.  
Install turbosupercharger per TM 5-3895-373-20.  
Install exhaust mufflers and pipes per TM 5-3895-373-20.  
Install engine fuel filter assembly per TM 5-3895-373-20.  
Fill engine crankcase with oil per TM 5-3895-373-10.  
Service hydraulic reservoir with oil per TM 5-3895-373-10.  
Purge engine fuel lines per TM 5-3895-373-20.  
Service engine coolant per TM 5-3895-373-10.  
Install left access cover per TM 5-3895-373-10.  
Close left access door per TM 5-3895-373-10.  
Close rear top left access door per TM 5-3895-373-10.  
Install front top right access door per TM 5-3895-373-10.  
Install front top left access door per TM 5-3895-373-10.

**END OF TASK**

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**2.17 DIESEL ENGINE REPAIR.**


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This task covers:

- |                                      |  |   |
|--------------------------------------|--|---|
| <p>a. Removal<br/>b. Disassembly</p> | <p>c. Inspection<br/>d. Reassembly</p> | <p>e. Pre-Load Check of Bearing<br/>f. Installation</p> |
|--------------------------------------|--|---|
- 

**INITIAL SETUP**
**Tools:**

General mechanic's tool kit  
(Item 106, Appendix D)  
Centering tool (Item 28, Appendix D)  
Chain assembly (Item 29, Appendix D)  
Crowfoot wrench (Item 118, Appendix D)  
Dial indicator (Item 52, Appendix D)  
Flywheel guide pins (Item 7, Appendix C)  
Gasoline blow torch (Item 11, Appendix D)  
Hex head screw cap (Item 75, Appendix D)  
Hollow pipe (Item 8, Appendix C)  
Hydraulic press frame (Item 41, Appendix D)  
Insert valve seat remover and replacer  
(Item 71, Appendix D)  
Inside caliper (Item 14, Appendix D)  
Liner puller (Item 56, Appendix D)  
Liner puller adapter (Item 57, Appendix D)  
Mandrel (Item 10, Appendix C)  
Mandrel (Item 11, Appendix C)  
Mandrel (Item 12, Appendix C)  
Mandrel (Item 13, Appendix C)  
Outside micrometer (Item 15, Appendix D)  
Outside micrometer (Item 16, Appendix D)  
Outside micrometer (Item 17, Appendix D)  
Piston ring compressor (Item 32, Appendix D)  
Piston ring expander (Item 38, Appendix D)  
Plastic hammer (Item 50, Appendix D)  
Portable electric drill (Item 67, Appendix D)  
Seal installer (Item 80, Appendix D)  
Seal installer (Item 81, Appendix D)  
Slide caliper (Item 20, Appendix D)  
Snap ring pliers (Item 66, Appendix D)  
Socket wrench adapter (Item 5, Appendix D)  
Thickness gage (Item 46, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 131, Appendix D)  
Twist drill set (Item 109, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Valve guide remover and replacer (Item 72, Appendix D)  
Valve spring compressor (Item 33, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Crocus cloth (Item 4, Appendix B)  
Engine oil (Item 22, Appendix B)  
Gasket sealing compound (Item 11, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Sealing compound (Item 28, Appendix B)  
Tags (Item 34, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Camshaft bushing  
Dowel pins  
Dowels  
Expansion plugs  
Gasket kit  
Lockwashers  
Piston kit  
Preformed packings  
Sleeve bearing set  
Spring pin  
Timing gear housing nonmetallic seal  
Timing gear washer

**Personnel Required:**

One 62B construction equipment repairer. Second person needed for removal and installation of oil sump, balancer unit, flywheel, and crankshaft assembly.

**References:**

TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Engine removed per paragraph 2.16.

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**2.17 DIESEL ENGINE REPAIR - Continued**

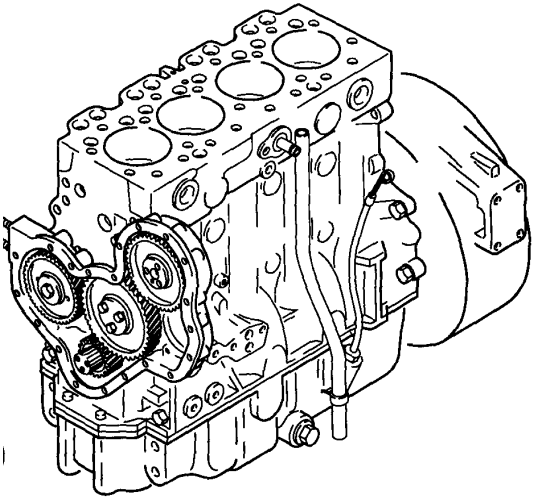
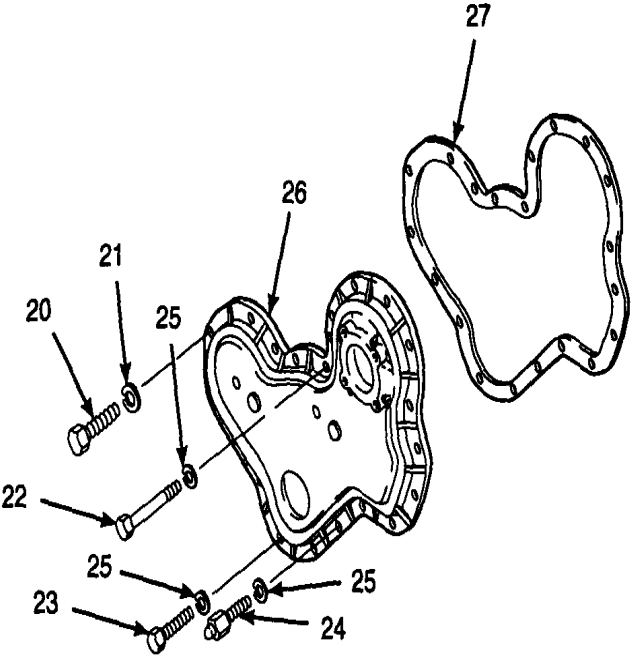
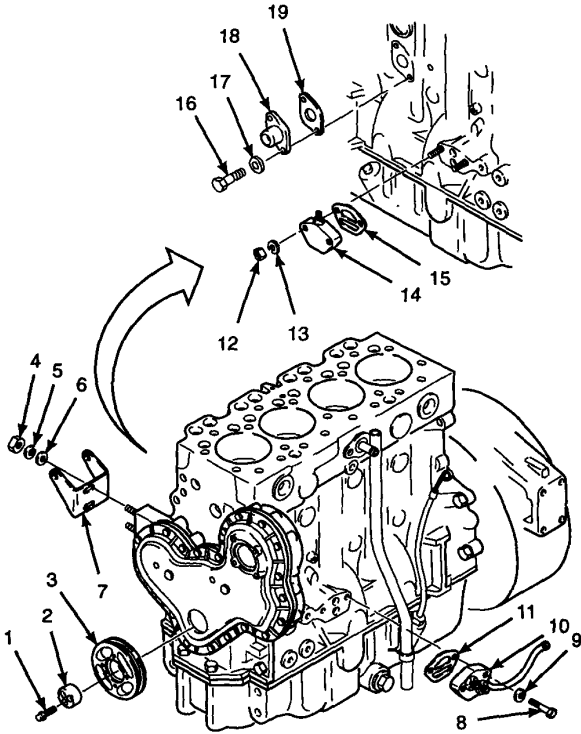
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- A. REMOVE.
1. REMOVE STARTER ASSEMBLY FROM FLYWHEEL HOUSING PER TM 5-3895-373-20.
  2. REMOVE ALTERNATOR ASSEMBLY FROM CYLINDER HEAD ASSEMBLY AND TIMING GEAR HOUSING PER TM 5-3895-373-20.
  3. REMOVE TURBOSUPERCHARGER ASSEMBLY FROM ENGINE BLOCK AND CYLINDER HEAD ASSEMBLY PER TM 5-3895-373-20.
  4. REMOVE EXHAUST AND INTAKE MANIFOLDS FROM CYLINDER HEAD ASSEMBLY PER TM 5-3895-373-20.
  5. REMOVE FUEL INJECTORS AND LINES FROM CYLINDER HEAD ASSEMBLY PER PARAGRAPH 2.18.
  6. REMOVE FUEL INJECTION PUMP FROM TIMING GEAR HOUSING PER PARAGRAPH 2.19.
  7. REMOVE FUEL LIFT PUMP FROM ENGINE BLOCK PER TM 5-3895-373-20.
  8. REMOVE WATER PUMP, RADIATOR FAN, AND WATER PUMP PULLEY FROM ENGINE BLOCK PER TM 5-3895-373-20.
  9. REMOVE CYLINDER HEAD ASSEMBLY FROM ENGINE BLOCK PER PARAGRAPH 2.15.
  10. REMOVE CRANKSHAFT PULLEY, ALTERNATOR SUPPORT BRACKET, ADAPTER PLATE, COVER, TIMING GEAR COVER, TIMING GEAR HOUSING SEAL, FUEL INJECTION PUMP GEAR, CAMSHAFT GEAR, IDLER GEAR, AND TIMING GEAR HOUSING FROM ENGINE BLOCK.

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A. REMOVE - Continued.

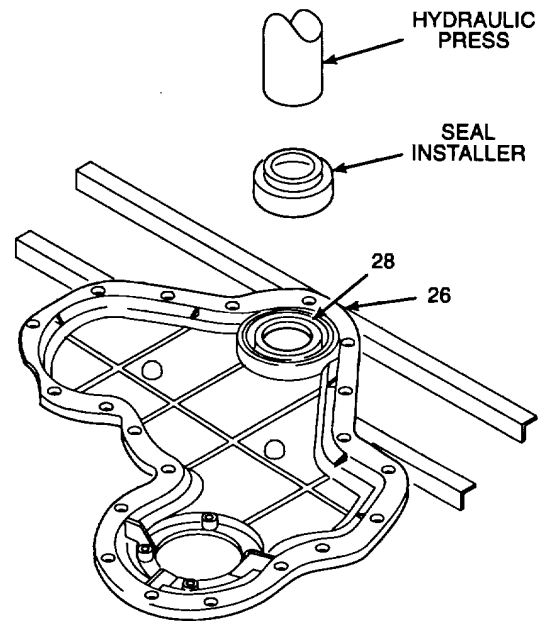
- a. Remove bolt (1), thrust block (2), and crankshaft pulley (3).
- b. Remove hex nuts (4), lockwashers (5), washers (6), and alternator support bracket (7). Discard lockwashers.
- c. Remove hex head cap screw (8), lockwashers (9), adapter plate (10), and gasket (11). Discard lockwashers and gaskets.
- d. Remove nuts (12), lockwashers (13), cover (14), and gasket (15). Discard lockwashers and gasket.
- e. Remove bolts (16), flat washers (17), hose flange (18), and gasket (19). Discard lockwashers and gasket.
- f. Remove bolt (20), lockwasher (21), screws (22), screws (23), straight headed pin (24), and lockwashers (25). Discard lockwashers.
- g. Use a flat blade screwdriver to pry off timing gear cover (26), prying evenly around timing gear cover.
- h. Remove gasket (27). Discard gasket.



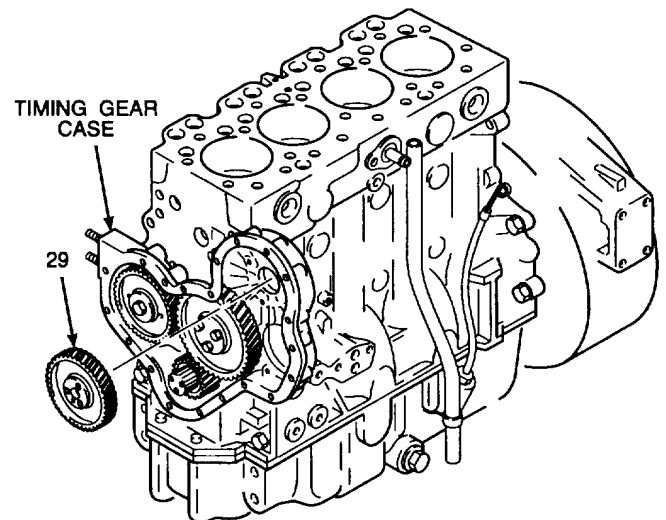
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**2.17 DIESEL ENGINE REPAIR - Continued****A. REMOVE - Continued.**

- i. Place timing gear cover (26) on hydraulic press frame, with outside of timing gear cover facing down.
- j. Use seal installer (Item 80, Appendix D) to press out timing gear housing seal (28). Discard nonmetallic seal.



- k. Lift out fuel injection pump gear (29) from timing gear housing.



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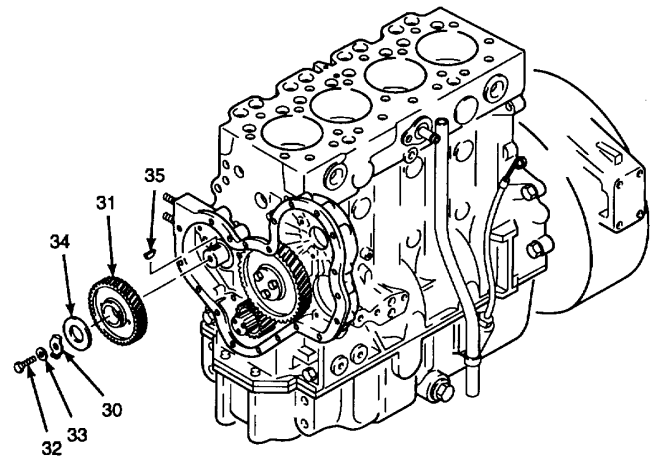
A. REMOVE - Continued.

- l. Use a flat-blade screwdriver to pry corner of timing gear retaining washer (30) on camshaft gear (31) to allow for removal of screw (32).
- m. Remove screw (32) and washers (33, 30 and 34). Discard timing gear washer (30).

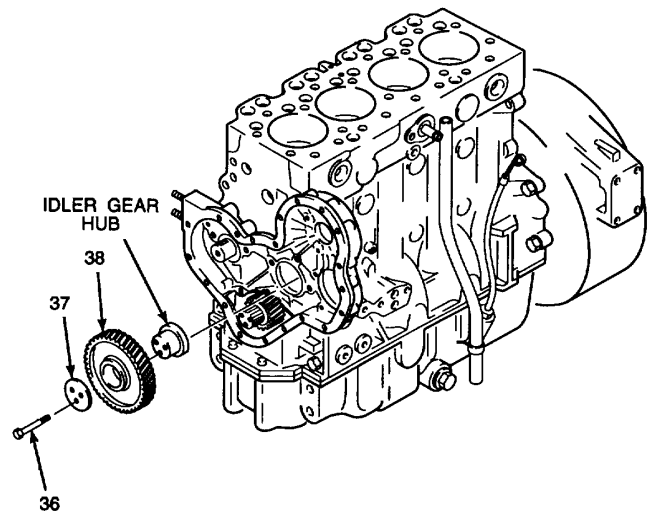
**NOTE**

**Threaded holes for attachment of bearing puller on camshaft gears are metric.**

- n. Use a bearing puller from universal puller kit to remove camshaft gear (31).
- o. Use a pair of pliers to remove woodruff key (35).



- p. Remove hex head cap screws (36), retaining plate (37), idler gear (38), and idler gear hub.

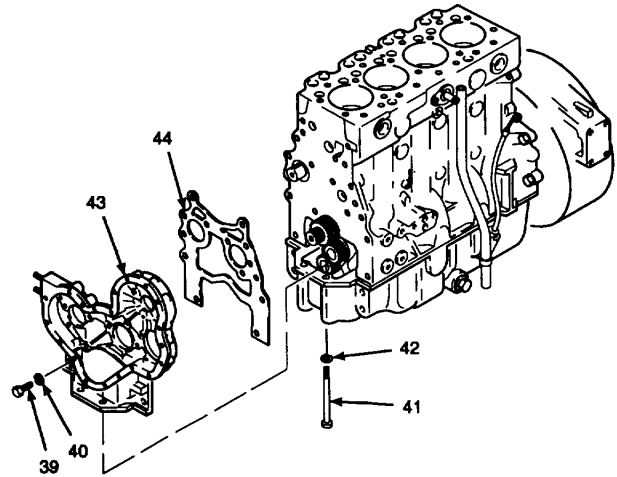


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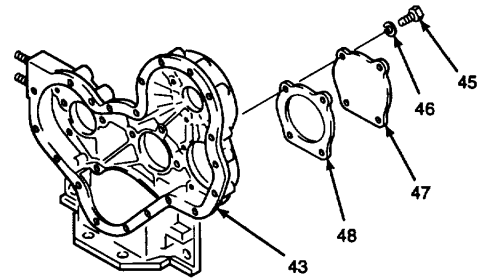
**2.17 DIESEL ENGINE REPAIR - Continued**

## A. REMOVE - Continued.

- q. Remove bolts (39), lockwashers (40), bolts (41), and lockwashers (42). Discard lockwashers.
- r. Use a flat-blade screwdriver to pry timing gear housing (43) from engine block, prying evenly around timing gear housing.
- s. Remove gasket (44). Discard gasket.



- t. Remove hex head cap screws (45), lockwashers (46), and blanking cover (47) from timing gear housing (43).
- u. Remove gasket (48). Discard gasket.

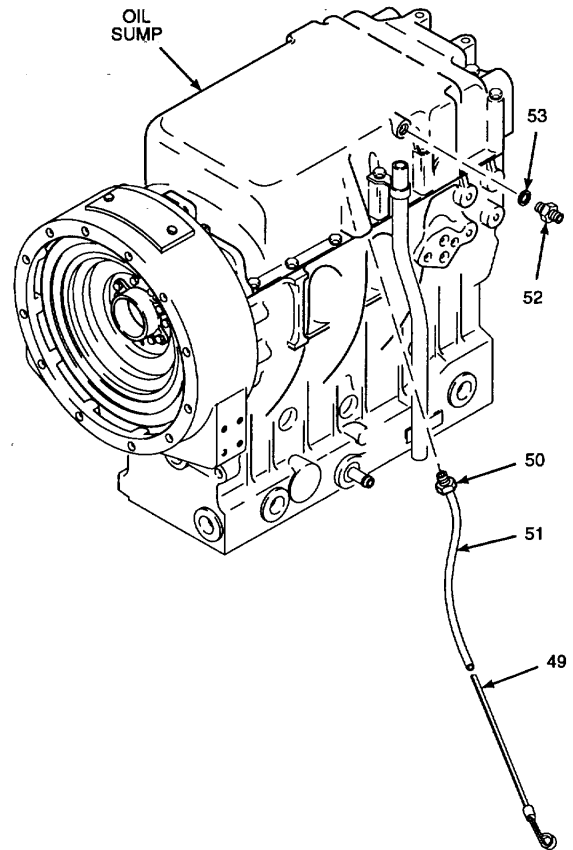


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A. REMOVE - Continued.

11. REMOVE OIL SUMP, DIPSTICK, DRAIN LINE STRAIGHT ADAPTER, AND OIL BREATHER HOSE FROM ENGINE BLOCK.

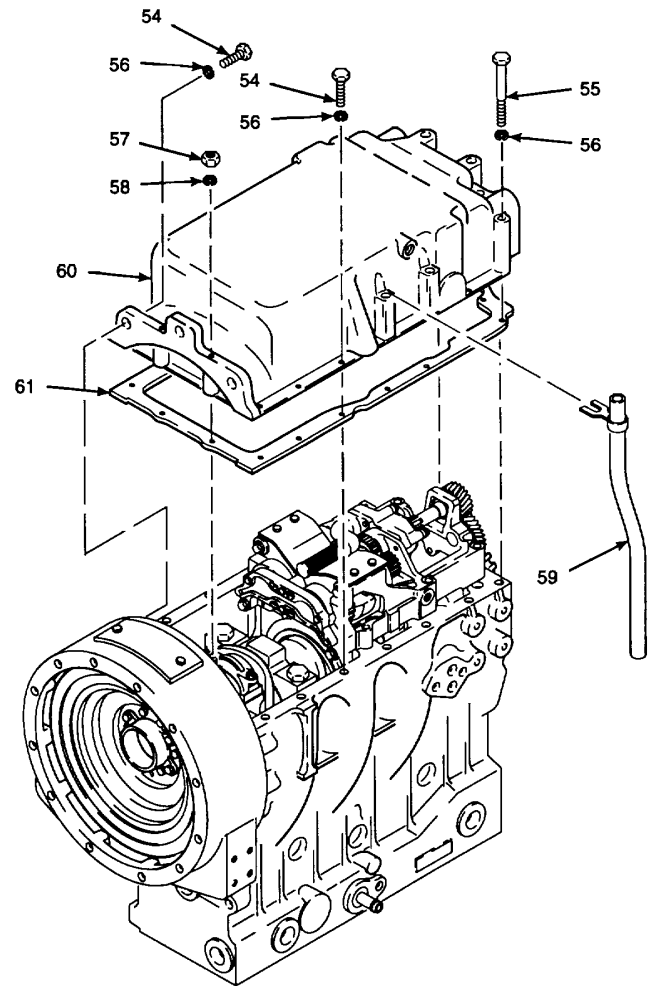
- a. Turn engine over so bottom of oil sump is facing up.
- b. Remove dipstick (49).
- c. Loosen dipstick bushing (50) and remove dipstick tube (51).
- d. Remove drain line straight adapter (52) and preformed packing (53).



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**2.17 DIESEL ENGINE REPAIR - Continued****A. REMOVE - Continued.**

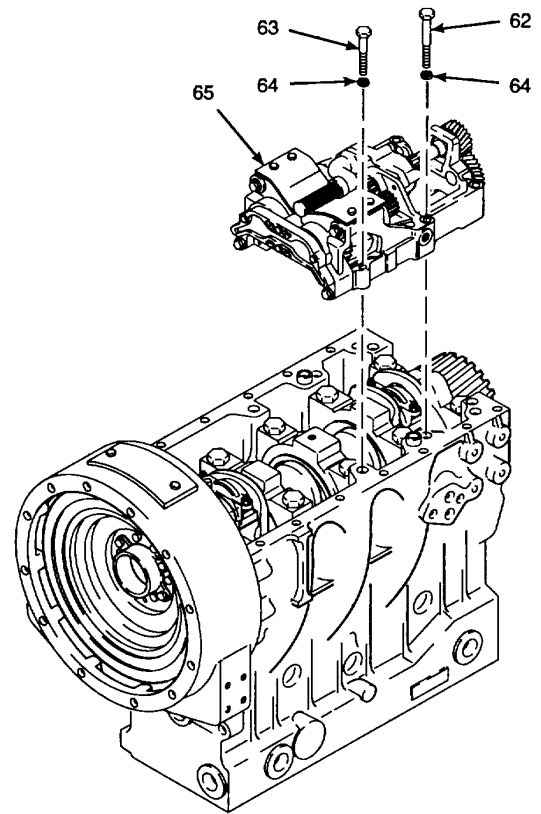
- e. Remove screws and bolts (54 and 55) and lockwashers (56). Discard lockwashers.
- f. Remove hex nuts (57) and lockwashers (58). Discard lockwashers.
- g. Remove oil breather hose (59).
- h. Use a flat-blade screwdriver to pry oil sump (60) loose from engine.
- i. With the help of another person, lift oil sump (60) from engine.
- j. Remove gasket (61). Discard gasket.

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A. REMOVE - Continued.

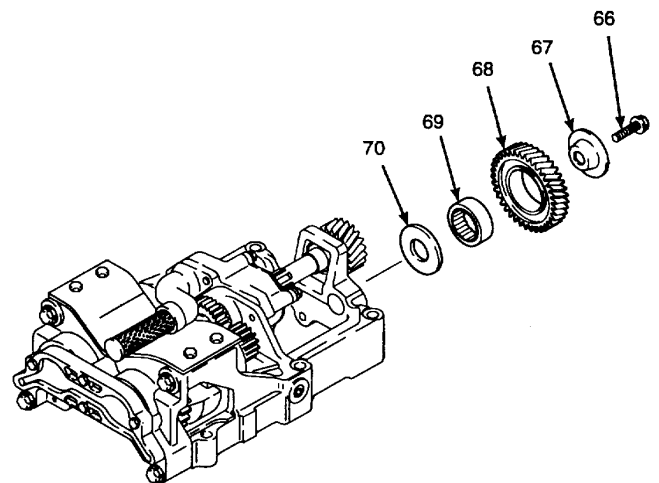
12. REMOVE BALANCER UNIT FROM ENGINE BLOCK.

- a. Remove hex head cap screws (62), screws (63), and flat washers (64).
- b. With the help of another person, lift balancer unit (65) from engine block.



13. REMOVE TIMING GEAR, SPUR GEARS, GEAR SHAFT, OIL PUMP, BALANCER UNIT FRAME END, AND OIL RELIEF VALVE FROM BALANCER UNIT.

- a. Remove screw (66), hub (67), timing gear (68), bearing (69), and flat washer (70).



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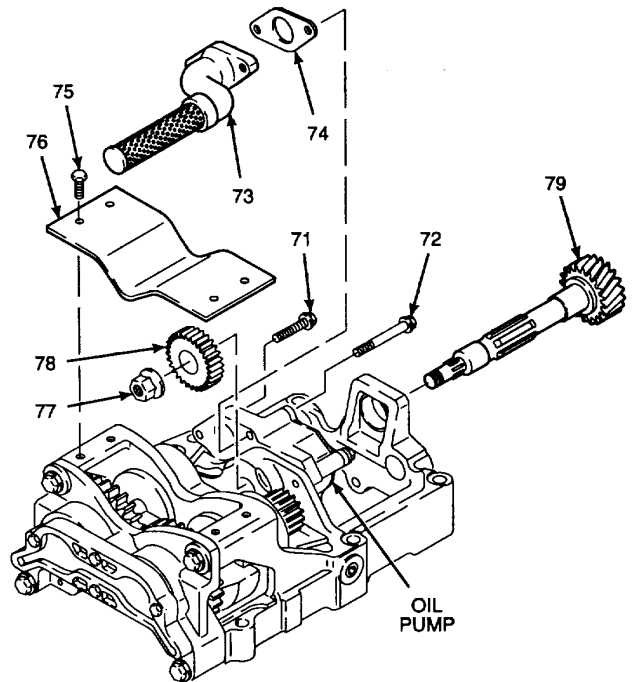


**2.17 DIESEL ENGINE REPAIR - Continued****A. REMOVE - Continued.**

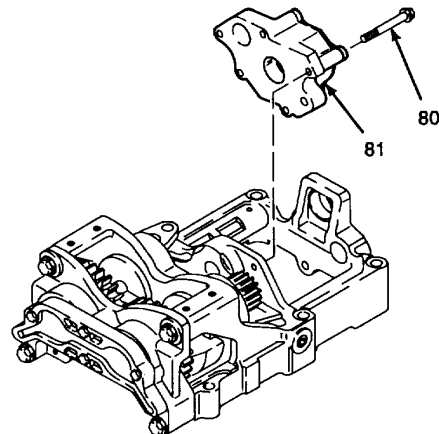
- b. Remove hex head cap screws (71), machine screws (72), tube (73), gasket (74), hex head cap screws (75), and balancer unit cover (76). Discard gasket.
- c. Remove hex nut (77) and spur gear (78). Loosen hex nut by lightly tapping with a plastic hammer if required.



**Do not damage gear shaft threads and needle bearings when removing gear shaft from oil pump. Oil pump damage and engine damage may result from a damaged gear shaft. Pull gear shaft slowly from oil pump when removing.**



- d. Use a plastic hammer to lightly tap and pull gear shaft (79) through oil pump.
- e. Remove machine screws (80) and oil pump (81).

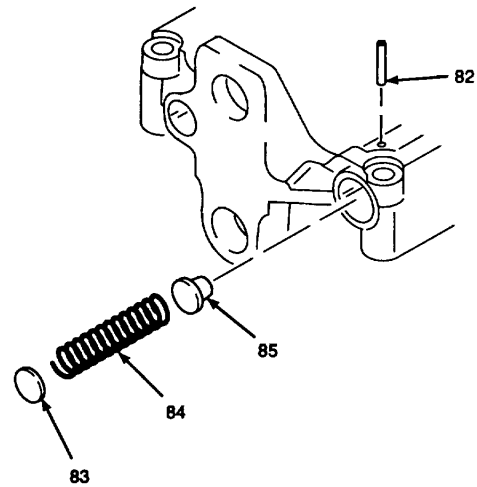


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A. REMOVE - Continued.

**WARNING**

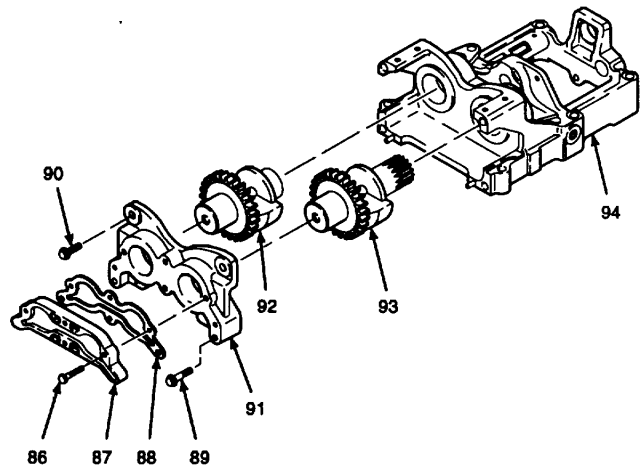
Use caution when removing spring pin. Spring held by spring pin is under tension. Personnel injury may result from sudden release of spring from oil balancer unit. Do not place fingers over spring when removing spring pin.



- f. Use a drive pin punch to remove spring pin (82). Discard spring pin.
- g. Remove cap (83), spring (84), and plunger (85).
- h. Remove screws (86) and cover (87).
- i. Remove gasket (88). Discard gasket.
- j. Remove bolts (89 and 90) and balancer unit frame end (91).

**CAUTION**

Spur gears are heavy and may damage needle bearings when removed. Do not damage needle bearings when removing gears. Pull gears slowly and keep gears level with balancer unit frame during removal.



- k. Remove spur gears (92 and 93) by sliding gears out of balancer unit frame (94). Keep gears level with frame during removal.

**GO TO NEXT PAGE**

2.17 DIESEL ENGINE REPAIR - Continued

A. REMOVE - Continued.

14. REMOVE PISTONS AND CONNECTING ROD ASSEMBLIES FROM ENGINE BLOCK.

**NOTE**

Tag each connecting rod assembly, hex nut, and bolt for each piston as they are removed from engine block.

- a. Remove connecting rod hex nuts (95) and bolts (96) from connecting rod assembly (97).

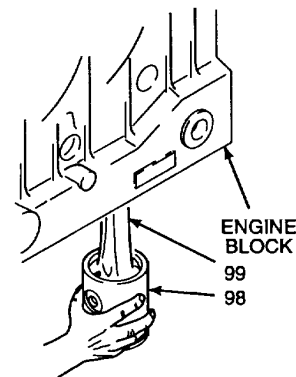
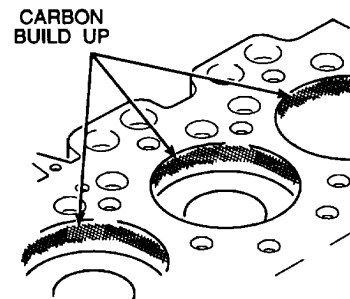
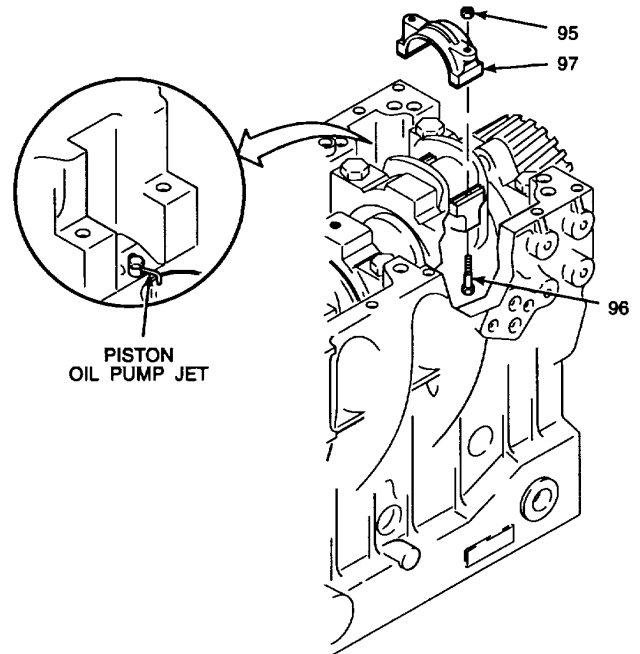


Do not allow pistons to fall from engine block when they are removed. Damage to pistons may occur from piston falling onto floor from engine block. Place a hand beneath engine block to catch piston before it emerges from engine block.

Be careful not to damage piston oil pump jets during piston and connecting rod assembly removal. Engine damage may occur if piston oil pump jets do not function properly.

Before removing pistons and connecting rod assemblies, use crocus cloth to remove any carbon buildup from top of cylinder sleeves. Damage to piston or cylinder sleeves may occur if carbon buildup is not removed.

- b. Push piston (98) and connecting rod assembly (99) out through top of engine block.
- c. Tag location of components with reference to cylinder bore.



GO TO NEXT PAGE

A. REMOVE - Continued.

15. REMOVE SLEEVE BEARINGS, PISTON RINGS, GUDGEON PIN, SLEEVE BUSHING, AND CONNECTING ROD ASSEMBLY FROM PISTON.

**NOTE**

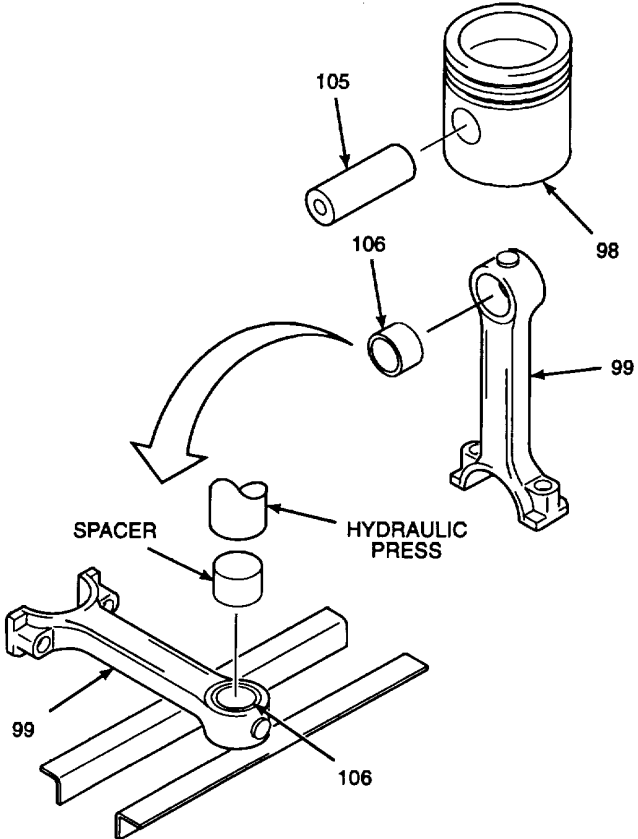
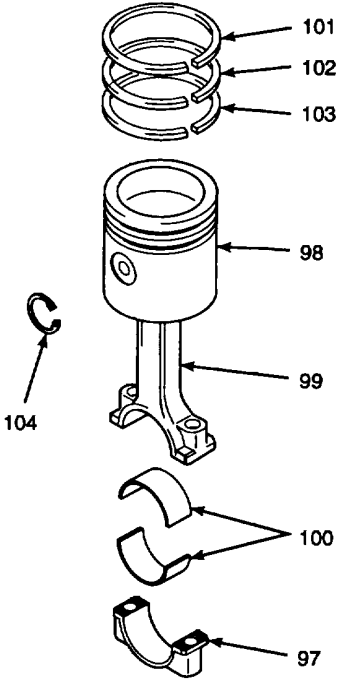
**Keep piston and connecting rod components grouped together and tagged for each cylinder bore.**

- a. Remove sleeve bearings (100) from connecting rod assembly (97 and 99).
- b. Remove piston rings (101, 102, and 103) from piston (98) with a piston ring expanding tool.

**WARNING**

**Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- c. Use inside snap ring pliers to remove retaining rings (104).
- d. Remove gudgeon pin (105).
- e. If gudgeon pin is tight in piston bore, warm piston (98) in clean water to a temperature of 100° to 120°F (38° to 49°C), then remove gudgeon pin (105).
- f. Use a hydraulic press frame and universal puller kit spacer to remove sleeve bushing (106) from connecting rod assembly (99). Tag for reassembly.



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**2.17 DIESEL ENGINE REPAIR - Continued**

A. REMOVE - Continued.

**16. REMOVE FLYWHEEL AND FLYWHEEL HOUSING FROM ENGINE BLOCK.****CAUTION**

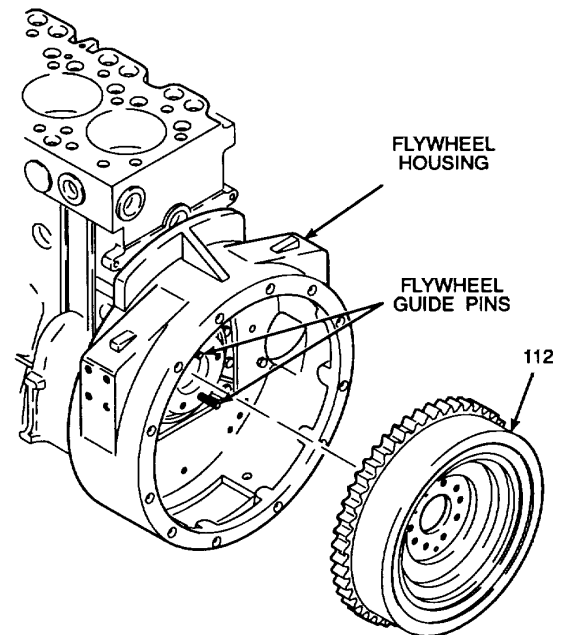
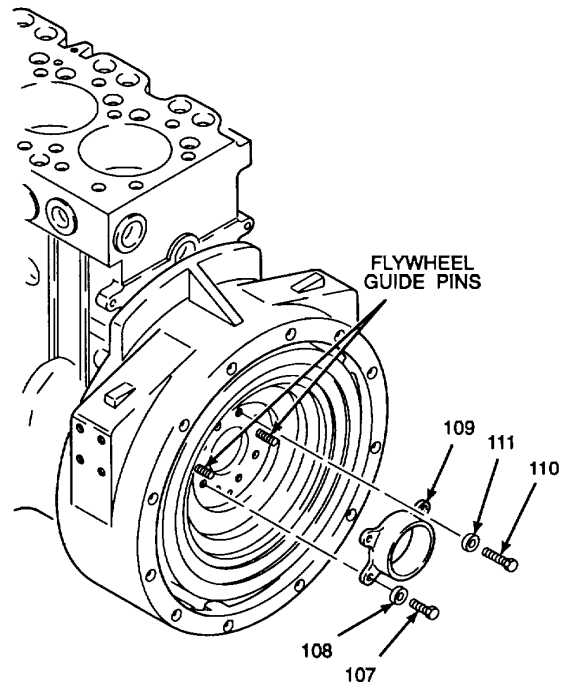
**Use caution when removing flywheel. Flywheel is heavy and may cause serious injury. Have an extra person assist with removal of flywheel.**

- a. Turn engine over so top of engine block is facing up.
- b. Remove screws (107), flat washers (108), and housing (109).
- c. Remove two opposing hex head cap screws (110) and flat washers (111). Insert flywheel guide pins in hex head cap screw holes. Tighten hand tight.

**WARNING**

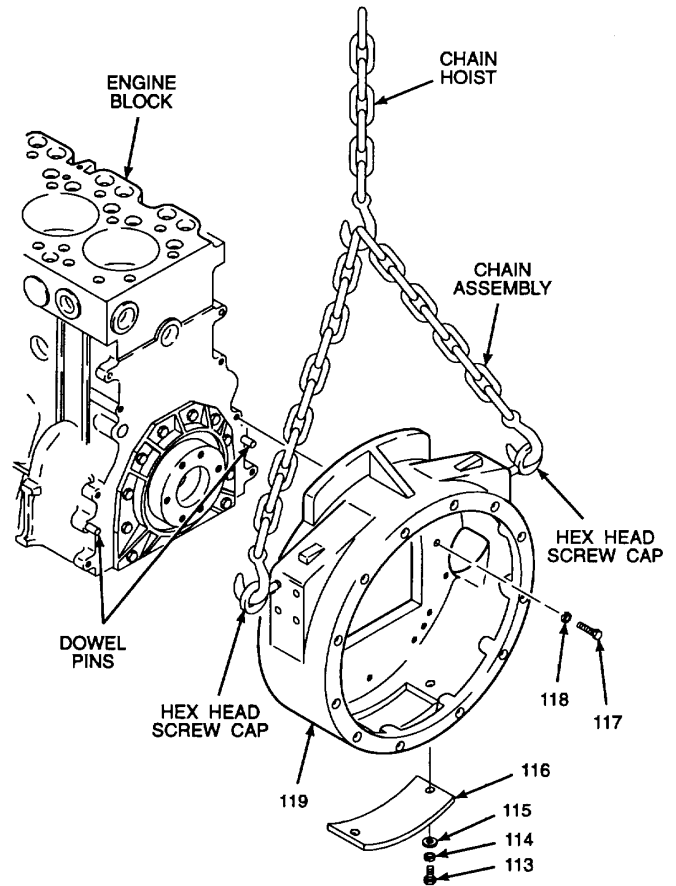
**Flywheel is heavy and may cause serious injury. Do not allow weight of flywheel to shift and flywheel to fall from flywheel housing. Have an extra person hold flywheel against crankshaft so it will not fall off when hex head cap screws are removed.**

- d. With a second person holding flywheel against engine block, remove remaining hex head cap screws (110), and flat washers (111).
- e. With flywheel resting on flywheel guide pins, pull flywheel (112) from flywheel housing far enough for another person to assist with removal.
- f. With the help of another person, slide flywheel (112) from flywheel guide pins.

**GO TO NEXT PAGE**

A. REMOVE - Continued.

- g. Attach two hex head screw caps to inner most flywheel housing lifter holes.
- h. Attach chain assembly to hex head screw caps.
- i. Attach chain assembly to chain hoist.
- j. Remove hex head cap screws (113), lockwashers (114), flat washers (115), and pressure plate (116). Discard lockwashers.
- k. Remove bolts (117) and lockwashers (118). Discard lockwashers.
- l. Use a plastic hammer to strike the front face of flywheel housing (119) to loosen flywheel housing from engine block.



**WARNING**

Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.

Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause serious injury or death to personnel.

Do not allow heavy components to swing while hanging by lifting device. Equipment may strike personnel and cause serious injury.

Exercise extreme caution when working near a cable or chain under tension. A snapped cable or a shifting or swinging load may cause injury or death to personnel.

- m. Lift flywheel housing (119) clear of engine block and dowel pins.

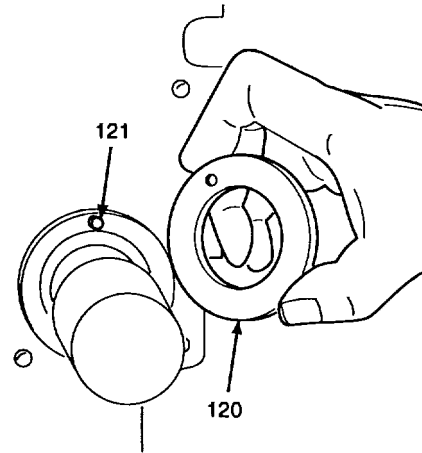
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**2.17 DIESEL ENGINE REPAIR.**

A. REMOVE - Continued.

**17. REMOVE THRUST WASHER, CAMSHAFT, AND MAIN BEARING THIMBLES FROM ENGINE BLOCK.**

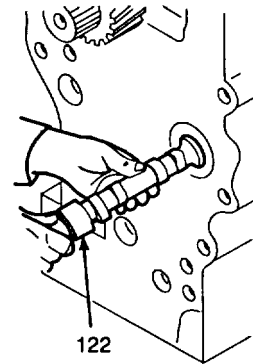
- a. Turn engine block over so bottom of engine block is facing up.
- b. Remove thrust washer (120) by pulling camshaft out of engine block until thrust washer can be removed by hand.
- c. Use a pair of vise grip pliers to remove dowel (121). Discard dowel.



**Camshaft is machined to precise tolerances. Do not bump camshaft against camshaft bushings or engine block when removing camshaft from engine block. Damage to camshaft or camshaft bushings may result from careless handling.**

**NOTE**

**When camshaft is removed, camshaft bushing should be replaced. Refer to step D.8.**



- d. Pull camshaft (122) from engine block, using care not to bump camshaft against camshaft bushings or engine block when removing.

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A. REMOVE - Continued.

**NOTE**

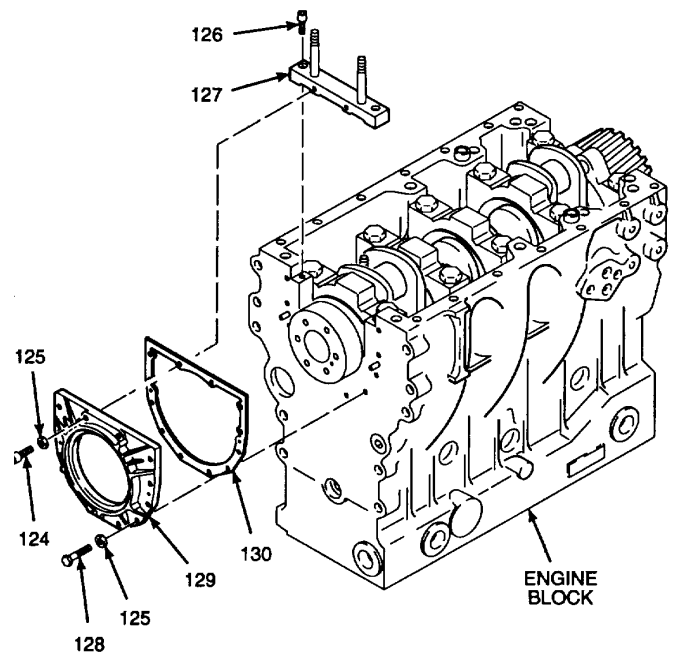
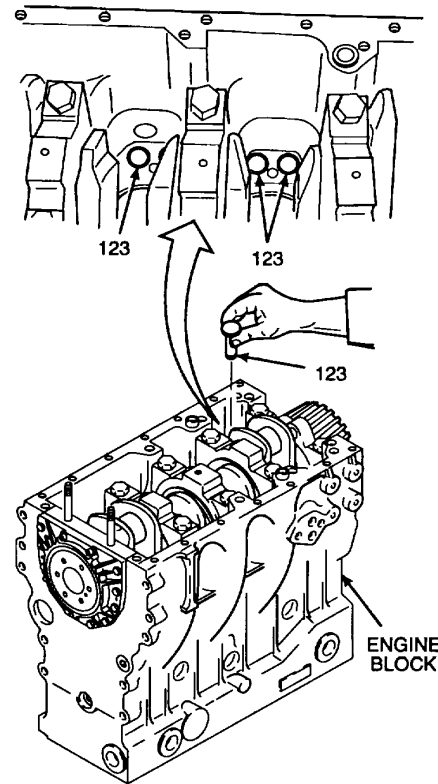
**If not replacing main bearing thimbles, tag for reassembly.**

- e. Remove main bearing thimbles (123) by lifting out of engine block individually.
18. REMOVE REAR FILLER BLOCK, MAE BEARING CAPS, MAIN SLEEVE BEARINGS THRUST WASHER BEARINGS, CRANKSHAFT SEAL HOUSING, AND CRANKSHAF ASSEMBLY FROM ENGINE BLOCK.

**NOTE**

**Tag each main bearing screw, main bearing cap, thrust washer bearing, and sleeve bearing, for each part of crankshaft assembly as they are removed from engine block.**

- a. Remove socket head cap screws (124) and flat washers (125).
- b. Remove socket head cap screws (126) and rear filler block (127).
- c. Remove screws (128), and flat washers (125) crankshaft seal housing (129), and gasket (130) Discard gasket.

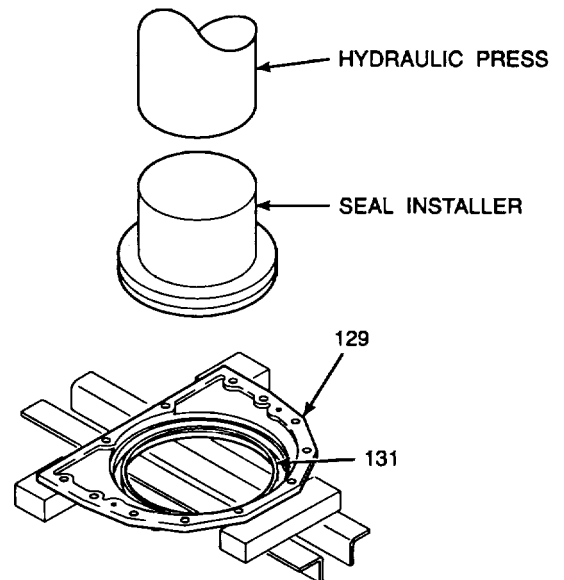


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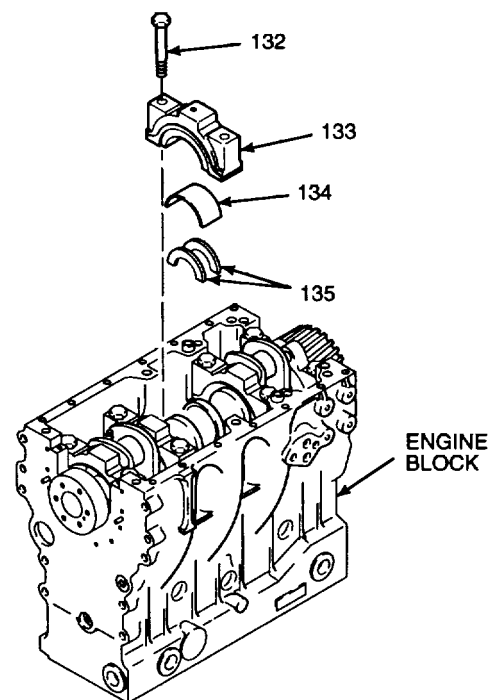


**2.17 DIESEL ENGINE REPAIR.****A. REMOVE - Continued.**

- d. Place crankshaft seal housing (129) on support blocks on a hydraulic press frame, with outer part of housing facing up.
- e. Use seal installer (Item 81, Appendix D) to press out crankshaft seal (131). Discard special seal.



- f. Remove main bearing screws (132).
- g. Remove main bearing caps (133).
- h. Remove main sleeve bearings (134).
- i. Remove thrust washer bearings (135).

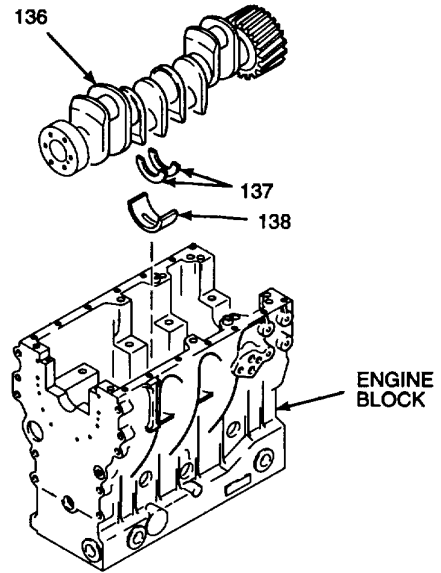
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A. REMOVE - Continued.



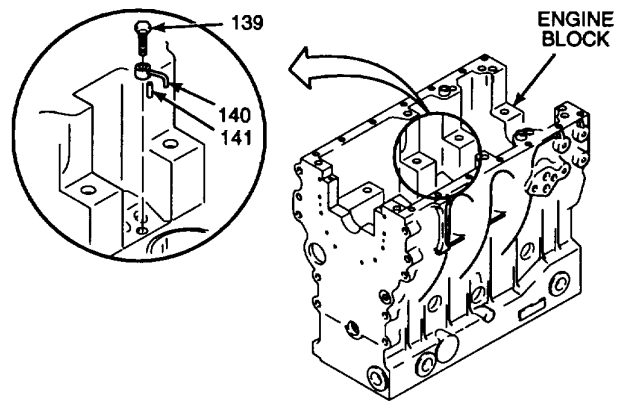
Crankshaft assembly is machined to precise tolerances. Do not bump crankshaft assembly against engine block when removing crankshaft assembly from engine block. Damage to crankshaft assembly may result from careless handling.

- j. With the help of another person, remove crankshaft assembly (136).
- k. Remove thrust washer bearings (137).
- l. Remove main sleeve bearings (138).



19. REMOVE PISTON OIL PUMP JETS FROM ENGINE BLOCK.

- a. Remove oil pressure relief valves (139).
- B piston oil pump jets (140).
- c. Use a pair of pliers to remove dowel pins (141). Discard dowel pins.



GO TO NEXT PAGE

**2.17 DIESEL ENGINE REPAIR.****B. CLEAN.****WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

Do not damage bearing surfaces of crankshaft or camshaft.

1. RINSE ALL METAL ENGINE PARTS IN CLEANING SOLVENT USING A CLEANING CLOTH.
2. USE A WIRE SCRATCH BRUSH TO REMOVE HEAVY DEPOSITS AND GRIME FROM OUTSIDE OF ENGINE BLOCK.

**CAUTION**

Use caution when scraping gasket material from sealing surfaces. Do not scrape or gouge sealing surfaces when scraping gasket material. Poor sealing may result from scratches or gouges in sealing surfaces.

3. USE A PUTTY KNIFE TO REMOVE GASKET MATERIAL FROM SEALING SURFACES.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

4. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO REMOVE ANY FOREIGN MATERIAL OR DEBRIS FROM INSIDE OF ENGINE BLOCK, PISTONS, OIL SUMP, AND CYLINDER HEAD ASSEMBLY.

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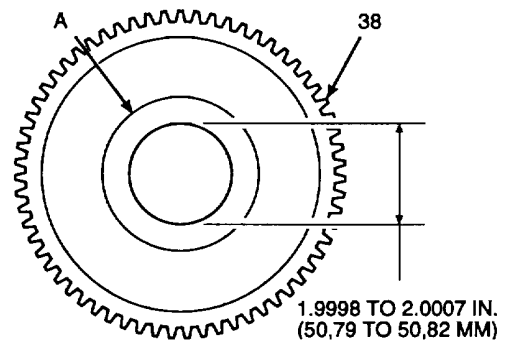
C. INSPECT.

**NOTE**

**Refer to step D.9 for serviceable wear limits.**

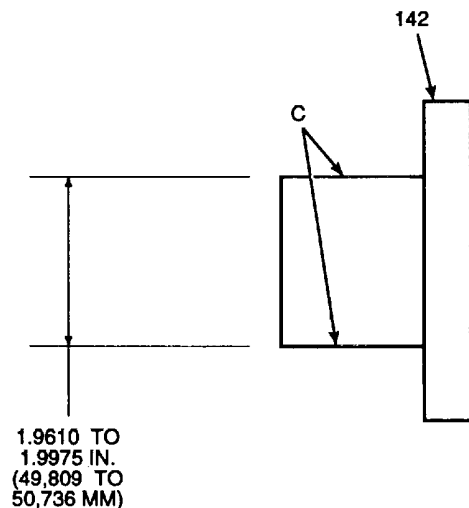
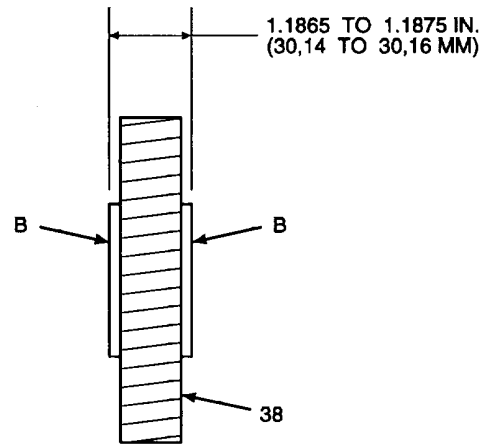
1. INSPECT IDLER GEAR BUSHING FOR WEAR.

- a. Use a slide caliper (Item 20, Appendix D) to measure inside diameter of Surface A of idler gear (38) bushing.
- b. Inside diameter of idler gear (38) bushing must be 1.9998 to 2.0007 in. (50,79 to 50,82 mm).
- c. If inside diameter of idler gear bushing exceeds 2.0007 in. (50,82 mm), replace idler gear.
- d. Use an outside micrometer (Item 16, Appendix D) to measure width of Surface B of idler gear (38) bushings.
- e. Idler gear bushing width must be 1.1865 to 1.1875 in. (30,14 to 30,16 mm).
- f. If idler gear bushing width is less than 1.1865 in. (30,14 mm), replace idler gear.



2. INSPECT IDLER GEAR HUB FOR WEAR.

- a. Use an outside micrometer (Item 16, Appendix D) to measure outside diameter C of idler gear hub (142).
- b. Outside diameter of idler gear hub must be 1.9610 to 1.9975 in. (49,809 to 50,736 mm).
- c. If outside diameter of idler gear hub (142) is less than 1.9610 in. (49,809 mm), replace idler gear hub.

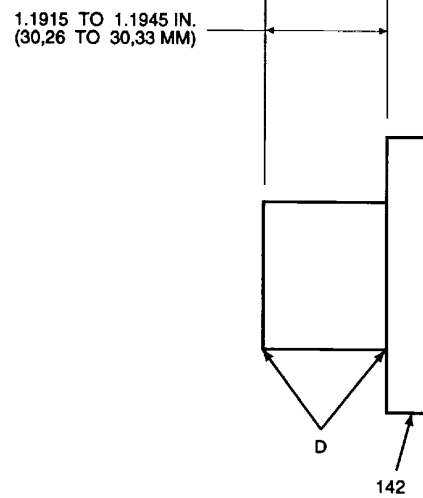


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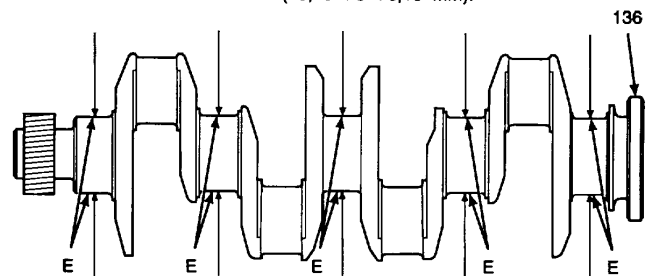
**2.17 DIESEL ENGINE REPAIR.**

C. INSPECT - Continued.

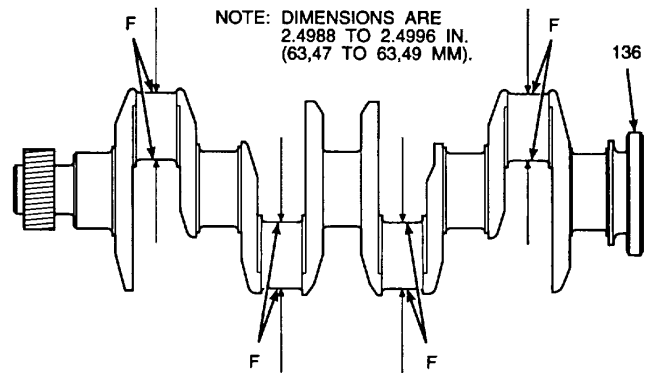
- d. Use an inside caliper to measure width of idler gear hub (142) Surface D.
  - e. Idler gear hub width must be 1.1915 to 1.1945 in. (30,26 to 30,33 mm).
  - f. If idler gear hub width is greater than 1.1945 in. (30,33 mm), replace idler gear hub.
3. INSPECT CRANKSHAFT ASSEMBLY MAIN JOURNALS AND CONNECTING ROD JOURNALS FOR WEAR AND OVALITY.



NOTE: DIMENSIONS ARE  
2.9984 TO 2.9992 IN.  
(76,16 TO 76,18 MM).



NOTE: DIMENSIONS ARE  
2.4988 TO 2.4996 IN.  
(63,47 TO 63,49 MM).



- a. Use an outside micrometer (Item 17, Appendix D) to measure outside diameters of main journal Surfaces E on crankshaft assembly (136).
- b. Outside diameters of main journal Surfaces E must be 2.9984 to 2.9992 in. (76,16 to 76,18 mm), with a maximum wear/ovality allowance of 0.0015 in. (0,04 mm).
- c. If main journal surface outer diameters are less than 2.9984 in. (76,16 mm) or ovality exceeds 0.0015 in. (0,04 mm), regrind or replace crankshaft assembly (136).
- d. Use an outside micrometer (Item 17, Appendix D) to measure outside diameters of connecting rod journal Surfaces F on crankshaft assembly (136).
- e. Outside diameters of connecting rod journal Surfaces F must be 2.4988 to 2.4996 in. (63,47 to 63,49 mm), with a maximum wear/ovality allowance of 0.0015 in. (0,04 mm).
- f. If connecting rod journal surface diameters are less than 2.4988 in. (63,49 mm) or ovality exceeds 0.0015 in. (0,04 mm), regrind or replace crankshaft assembly (136).

**GO TO NEXT PAGE**

C. INSPECT - Continued.

g. Use an inside caliper to measure width of connecting rod journal Surfaces G on crankshaft assembly (136).

h. Connecting rod journal width on Surfaces G must be 1.5885 to 1.5915 in. (40,35 to 40,42 mm).

i. If connecting rod journal width is greater than 1.5915 in. (40,42 mm), regrind or replace crankshaft assembly (136).

j. Use an inside caliper to measure width of Number 2, Number 4, and Number 5 main journal Surfaces H on crankshaft assembly (136).

k. Number 2, Number 4, and Number 5 main journal width on Surfaces H must be 1.545 to 1.549 in. (39,24 to 39,34 mm).

l. If main journal widths are greater than 1.549 in. (39,34 mm) regrind or replace crankshaft assembly (136).

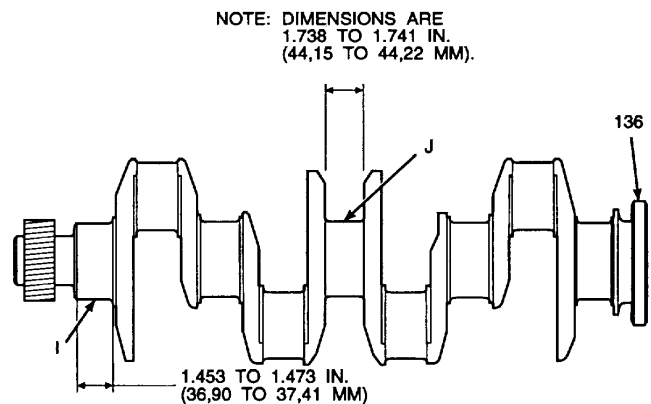
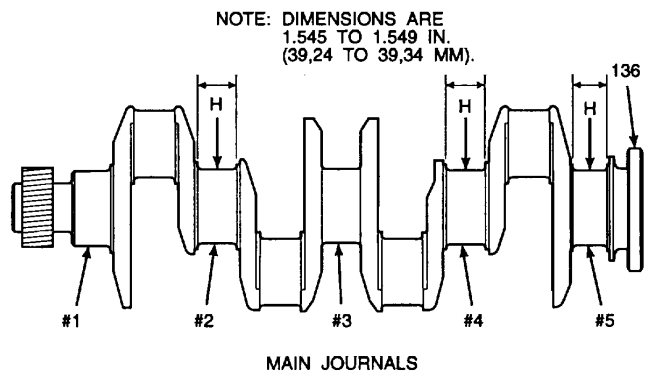
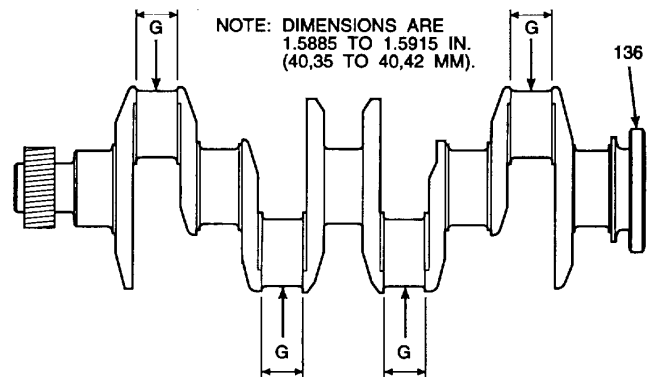
m. Use an inside caliper to measure width of Number 1 main journal Surface I and Number 3 main journal Surface J on crankshaft assembly (136).

n. Number 1 main journal width on Surface I must be 1.453 to 1.473 in. (36,90 to 37,41 mm).

o. Number 3 main journal width on Surface J must be 1.738 to 1.741 in. (44,15 to 44,22 mm).

p. If Number 1 main journal width exceeds 1.473 in. (37,41 mm), regrind or replace crankshaft assembly (136).

q. If Number 3 main journal width exceeds 1.741 in. (44,22 mm), regrind or replace crankshaft assembly (136).



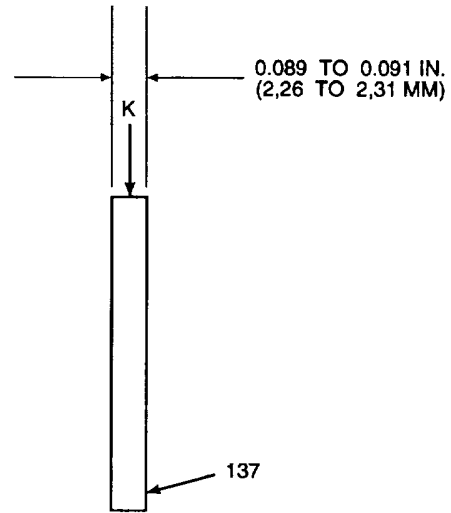
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**2.17 DIESEL ENGINE REPAIR.**

C. INSPECT - Continued.

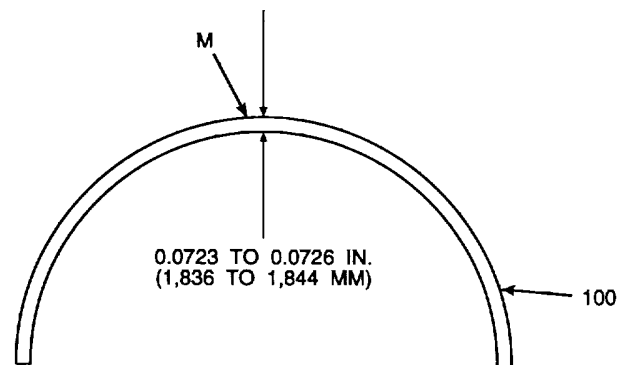
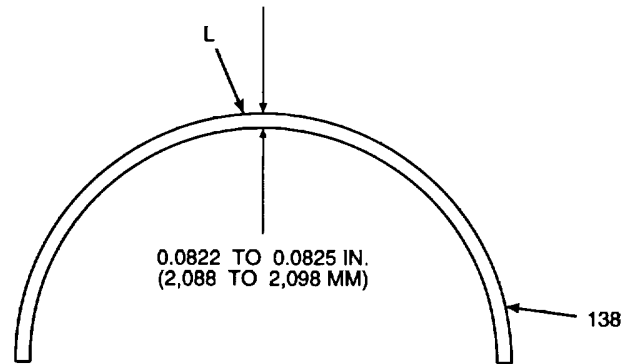
4. INSPECT THRUST WASHER BEARINGS AND MAIN SLEEVE BEARINGS FOR WEAR.

- a. Use an outside micrometer (Item 15, Appendix D) to measure thickness of Surface K on thrust washer bearings (137).
- b. Thrust washer bearing thickness on Surface K must be 0.089 to 0.091 in. (2,26 to 2,31 mm).
- c. If thrust washer bearing thickness is less than 0.089 in. (2,26 mm), replace thrust washer bearings.
- d. Use an outside micrometer (Item 15, Appendix D) to measure thickness of Surface L on main sleeve bearings (138).
- e. Main sleeve bearing thickness on Surface L must be 0.0822 to 0.0825 in. (2,088 to 2,098 mm).
- f. If main sleeve bearing thickness is less than 0.0822 in. (2,088 mm), replace main sleeve bearing.



5. INSPECT CONNECTING ROD ASSEMBLY SLEEVE BEARINGS, PISTONS, GUDGEON PIN, AND CONNECTING ROD ASSEMBLIES FOR WEAR.

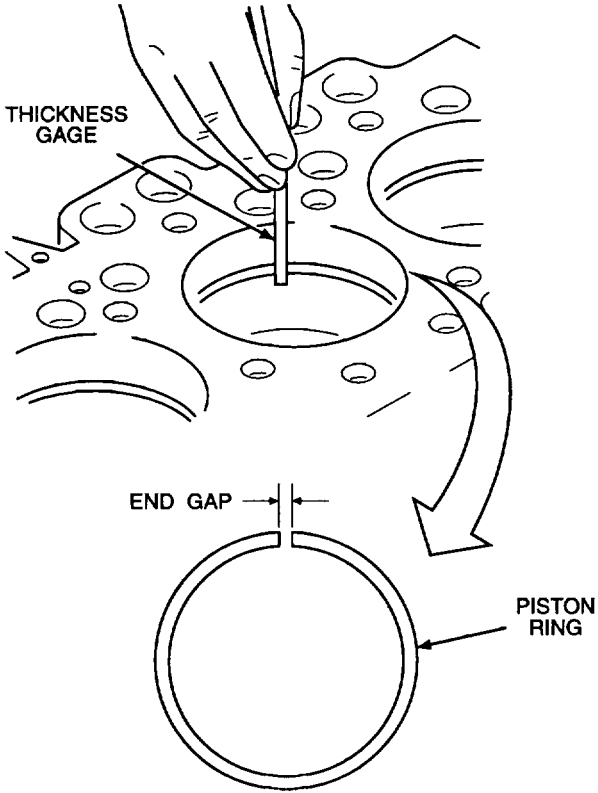
- a. Use an outside micrometer (Item 15, Appendix D) to measure the thickness of Surface M on connecting rod assembly sleeve bearings (100).
- b. Sleeve bearing thickness on Surface M must be 0.0723 to 0.0726 in. (1,836 to 1,844 mm).
- c. If sleeve bearing thickness is less than 0.0723 in. (1,836 mm), replace sleeve bearings.



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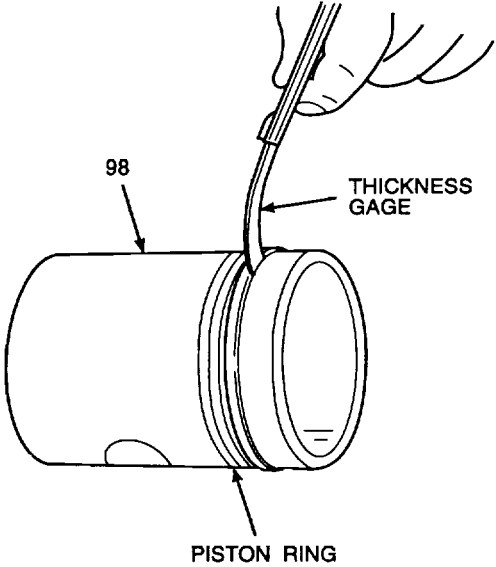
C. INSPECT - Continued.

- d. Insert new piston rings, one at a time, into cylinder sleeves, about 1.0 in. (254 mm) down inside cylinder sleeve.
- e. Use a thickness gage to measure piston ring end gaps.
- f. For gap tolerances on each piston ring, refer to the table below.



Piston Ring	Ring Type	Minimum Gap	Maximum Gap
Top Number 1	Compression	0.010 in. (0,25 mm)	0.022 in. (0,55 mm)
Center Number 2	Compression	0.008 in. (0,20 mm)	0.022 in. (0,55 mm)
Bottom Number 3	Scraper	0.010 in. (0,25 mm)	0.032 in. (0,81 mm)

- g. Using piston ring expanding tool, fit new piston rings into their respective grooves in piston (98).
- h. Use a thickness gage to check fit of piston rings in groove. Refer to table below.



Piston Ring	Ring Type	Minimum Fit	Maximum Fit
Top Number 1	Compression	0.0035 in. (0,088 mm)	0.0050 in. (0,127 mm)
Center Number 2	Compression	0.0025 in. (0,063 mm)	0.0040 in. (0,106 mm)
Bottom Number 3	Scraper	0.0020 in. (0,050 mm)	0.0032 in. (0,081 mm)

- i. If clearance between ring and groove exceeds maximum fit specifications, replace piston.
- j. Remove new piston rings from piston (98).

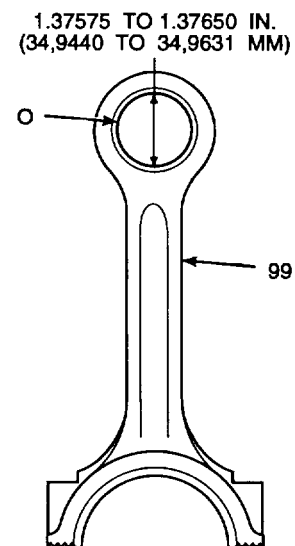
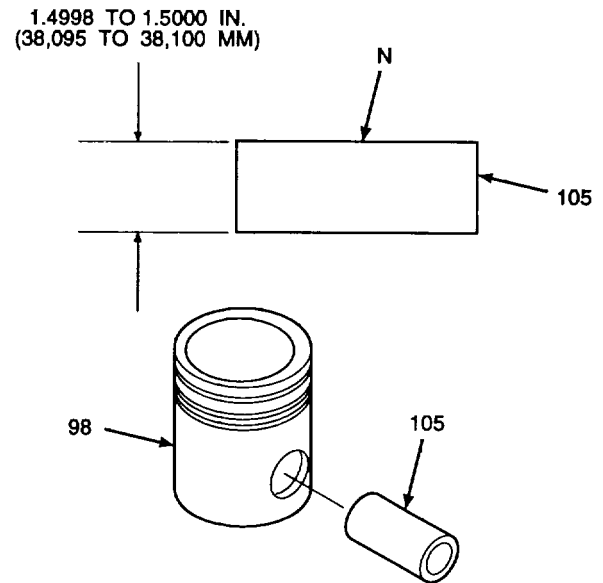
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**2.17 DIESEL ENGINE REPAIR.**

## C. INSPECT - Continued.

- k. Check fit of gudgeon pin (105) in piston (98) by inserting gudgeon pin into piston (98).
- l. If gudgeon pin fits loose in piston, remove gudgeon pin and measure outer diameter of gudgeon pin Surface N with an outside micrometer (Item 16, Appendix D).
- m. Outer diameter of gudgeon pin Surface N must be 1.4998 to 1.5000 in. (38,095 to 38,100 mm).
- n. If outer diameter of gudgeon pin (105) is within tolerance, replace piston.
- o. If outer diameter of gudgeon pin is less than 1.4998 in. (38,095 mm), replace gudgeon pin.
- p. Visually inspect piston (98) for cracks, grooves or missing material. If cracks, grooves, or missing material are detected, replace piston.
- q. Use a slide caliper to measure inside diameter Surface O of sleeve bushing bore of connecting rod assembly (99). Inside diameter of bore Surface O must be 1.37575 to 1.37650 in. (34,9440 to 34,9631 mm).
- r. If inside diameter of bore is greater than 1.37650 in. (34,9631 mm), replace connecting rod assembly. Refer to step E.6.

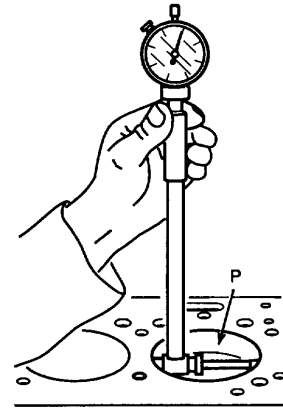


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C. INSPECT - Continued.

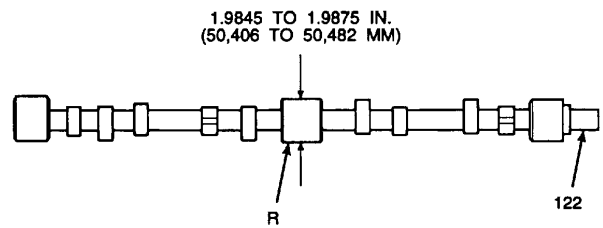
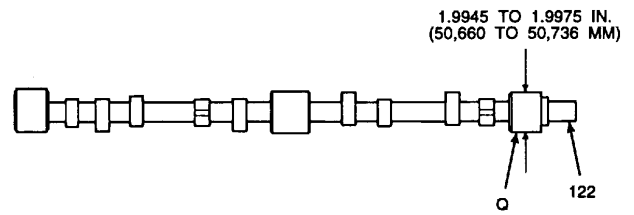
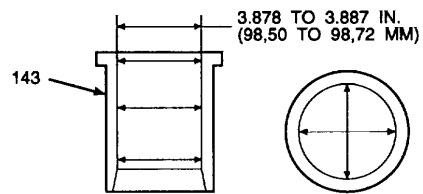
6. INSPECT CYLINDER SLEEVES FOR WEAR.

- a. Use a dial indicator to check the internal bore of Surface P in each cylinder sleeve (143). Check the internal diameter at the top, middle, and bottom of the cylinder sleeve.
- b. Cylinder sleeve internal bore diameter must be 3.878 to 3.887 in. (98,50 to 98,72 mm), with cylinder sleeve installed in engine block.
- c. If cylinder sleeve internal bore exceeds 3.887 in. (98,72 mm), replace cylinder sleeve. Refer to paragraph D.



7. INSPECT CAMSHAFT AND CAMSHAFT WASHER FOR WEAR.

- a. Use an outside micrometer (Item 16, Appendix D) to measure diameter of Surface Q on Number 1 journal on camshaft (122).
- b. Diameter of Number 1 journal on camshaft must be 1.9945 to 1.9975 in. (50,660 to 50,736 mm).
- c. If Number 1 journal is less than 1.9945 in. (50,660 mm), replace camshaft (122).
- d. Use an outside micrometer (Item 16, Appendix D) to measure diameter of Surface R of Number 2 journal on camshaft (122).
- e. Diameter of Number 2 journal on camshaft must be 1.9845 to 1.9875 in. (50,406 to 50,482 mm).
- f. If Number 2 journal is less than 1.9845 in. (50,406 mm), replace camshaft (122).

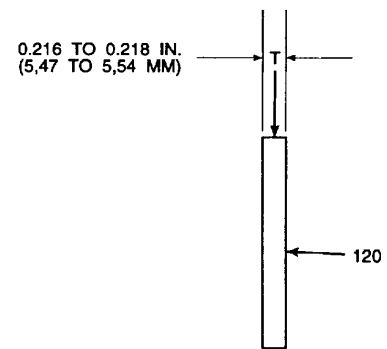
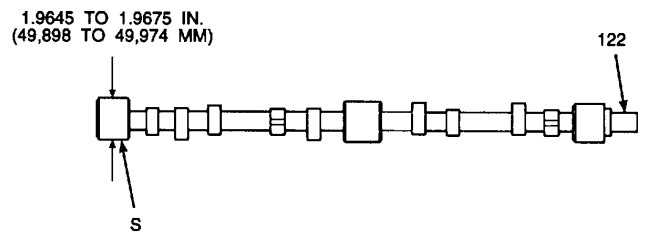


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**2.17 DIESEL ENGINE REPAIR.**

## C. INSPECT - Continued.

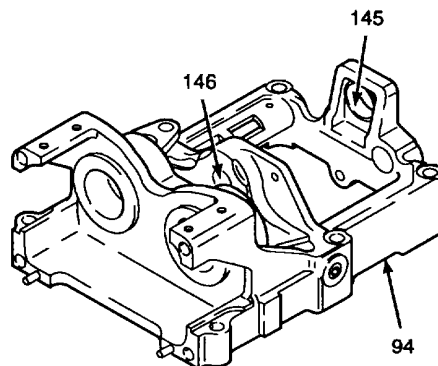
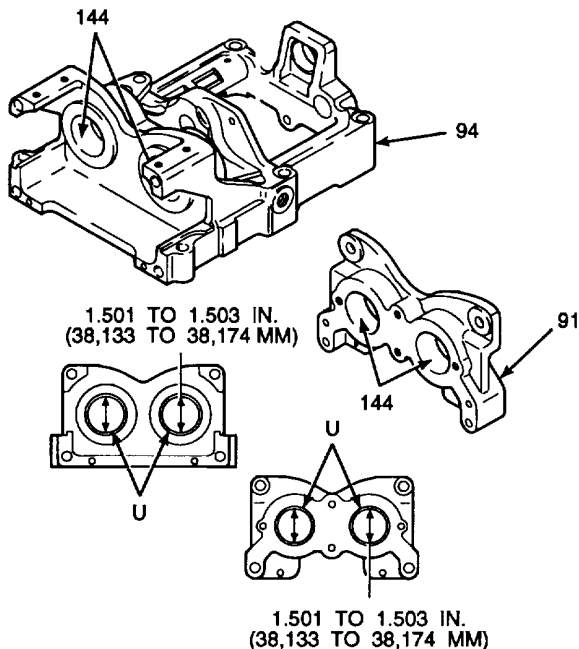
- g. Use an outside micrometer (Item 16, Appendix D) to measure diameter of Surface S of Number 3 journal on camshaft (122).
- h. Diameter of Number 3 journal on camshaft must be 1.9645 to 1.9675 in. (49,898 to 49,974 mm).
- i. If Number 3 journal is less than 1.9645 in. (49,898 mm), replace camshaft (122).
- j. Use an outside micrometer (Item 15, Appendix D) to measure thickness of Surface T on camshaft washer (120).
- k. Washer thickness must be 0.216 to 0.218 in. (5,47 to 5,54 mm).
- l. If washer thickness is less than 0.216 in. (5,47 mm), replace washer (120).

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C. INSPECT - Continued.

8. INSPECT BALANCER UNIT SLEEVE BUSHINGS AND NEEDLE BEARINGS FOR WEAR.

- a. Use a slide caliper to measure inside diameters of Surfaces U in sleeve bushings (144) in balancer unit frame end (91) and frame (94).
- b. Inside diameter of sleeve bushings (144) in balancer unit frame end (91) and frame (94) must be 1.501 to 1.503 in. (38,133 to 38,174 mm).
- c. If sleeve bushing inside diameters are greater than 1.503 in. (38,174 mm), replace sleeve bushings. Refer to paragraph D.
- d. Turn needle bearings (145 and 146) by hand. Feel for any roughness or excessive play.
- e. If needle bearings turn rough, or show signs of excessive play when turned, replace needle bearings. Refer to paragraph D.



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2.17 DIESEL ENGINE REPAIR - Continued.

D. REPAIR.

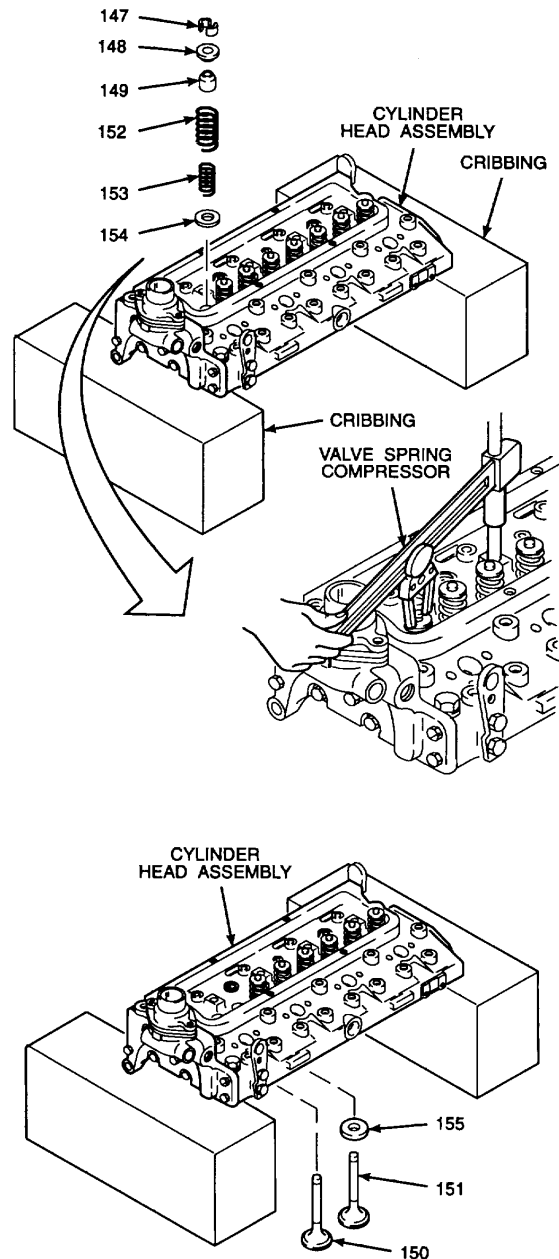
1. REPAIR CYLINDER HEAD ASSEMBLY.

a. Disassemble cylinder head assembly.

**NOTE**

To ensure valves removed from the cylinder head assembly are replaced in their original positions, tag all valves.

- (1) Remove rocker shaft assembly per paragraph 2.15.
- (2) Place cylinder head assembly on cribbing, high enough to reach beneath and retrieve valves as they are removed.
- (3) Use a valve spring compressor to compress valve springs.
- (4) Remove valve spring locks (147 and 148).
- (5) Remove preformed packing (149) from intake valves (150) and exhaust valves (151). Discard preformed packing.
- (6) Remove springs (152 and 153).
- (7) Remove seats (154).
- (8) Remove and tag intake valves (150) and exhaust valves (151) from bottom of cylinder head assembly.
- (9) Remove exhaust valve seat inserts (155) with valve seat remover and replacer.



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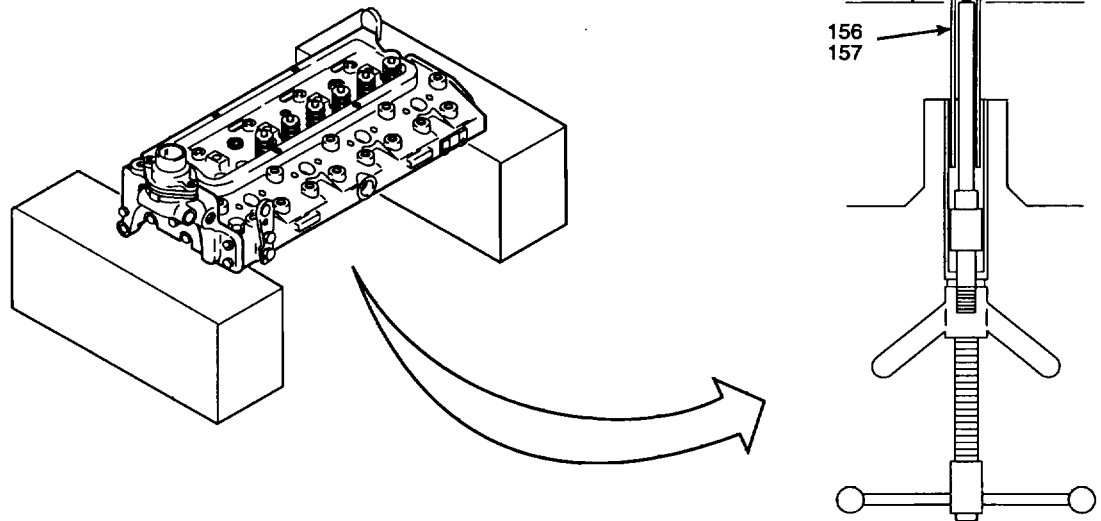
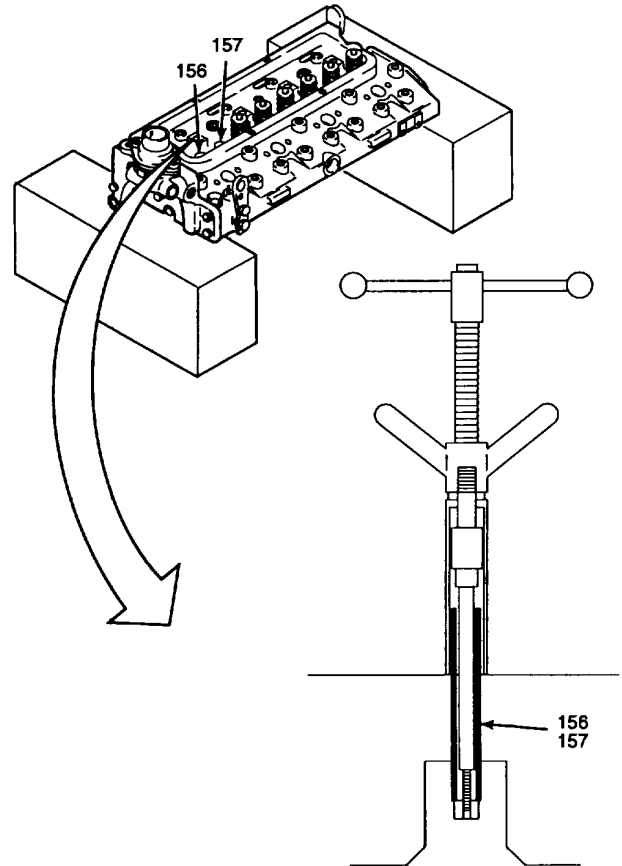
D. REPAIR - Continued.

(10) Use a valve guide remover and replacer to remove valve stem guides (156 and 157) from cylinder head assembly.

b. Assemble cylinder head assembly.

(1) Lubricate outsides of new valve stem guides (156 and 157) with clean engine oil.

(2) Use a valve guide remover and replacer to install valve stem guides (156 and 157) into cylinder head assembly until valve stem guides are protruding 0.594 in. (15,08 mm) above cylinder head assembly.



2.17 DIESEL ENGINE REPAIR - Continued.

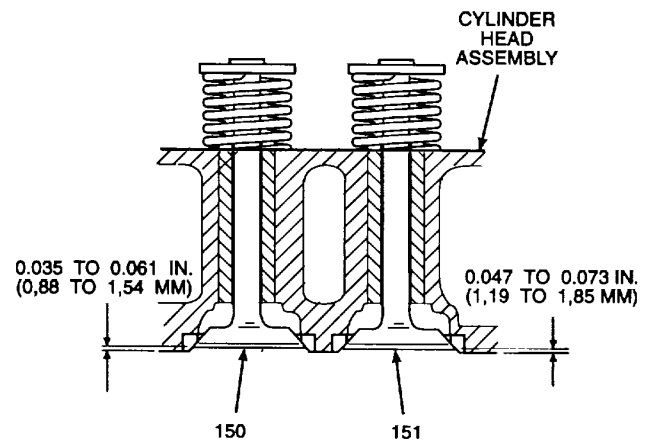
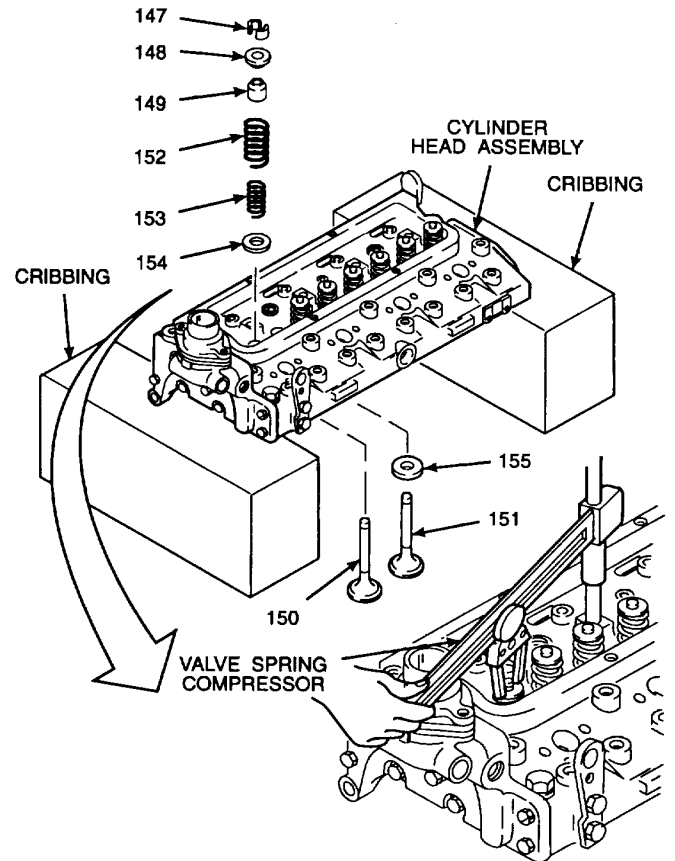
D. REPAIR - Continued.

- (3) Install exhaust valve seat inserts (155) using universal puller kit, hydraulic press frame, and insert valve seat remover and replacer. Install exhaust valve seat inserts with bevel-edge facing out from cylinder head assembly. Refer to paragraph D.9.
- (4) Install exhaust valves (151) through bottom of cylinder head assembly.
- (5) Install intake valves (150) through bottom of cylinder head assembly.

**NOTE**

**Tightly wound end of valve spring is installed toward cylinder head assembly.**

- (6) Install seats (154).
- (7) Install springs (153 and 152).
- (8) Install preformed packings (149) on intake and exhaust valves.
- (9) Use a valve spring compressor to compress valve springs (153 and 152).
- (10) Install valve spring locks (148 and 147).
- (11) After installing valves in the cylinder head assembly and cleaning cylinder head assembly face with a cleaning cloth, use a steel machinist's rule and a thickness gage to check valve head depth below cylinder head assembly face.
- (12) Exhaust valves (151) should be 0.047 to 0.073 in. (1,19 to 1,85 mm) below cylinder head assembly face.
- (13) Intake valves (150) should be 0.035 to 0.061 in. (0,88 to 1,54 mm), below cylinder head assembly face.
- (14) If exhaust valve (151) depth is greater than 0.073 in. (1,85 mm), replace valve and/or washer (154).
- (15) If intake valve depth is greater than 0.061 in. (1,54 mm), it will be necessary to replace valve or cylinder head assembly.



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- D. REPAIR - Continued.
- 2. REPAIR ROCKER SHAFT ASSEMBLY.
  - a. Disassemble rocker shaft assembly.

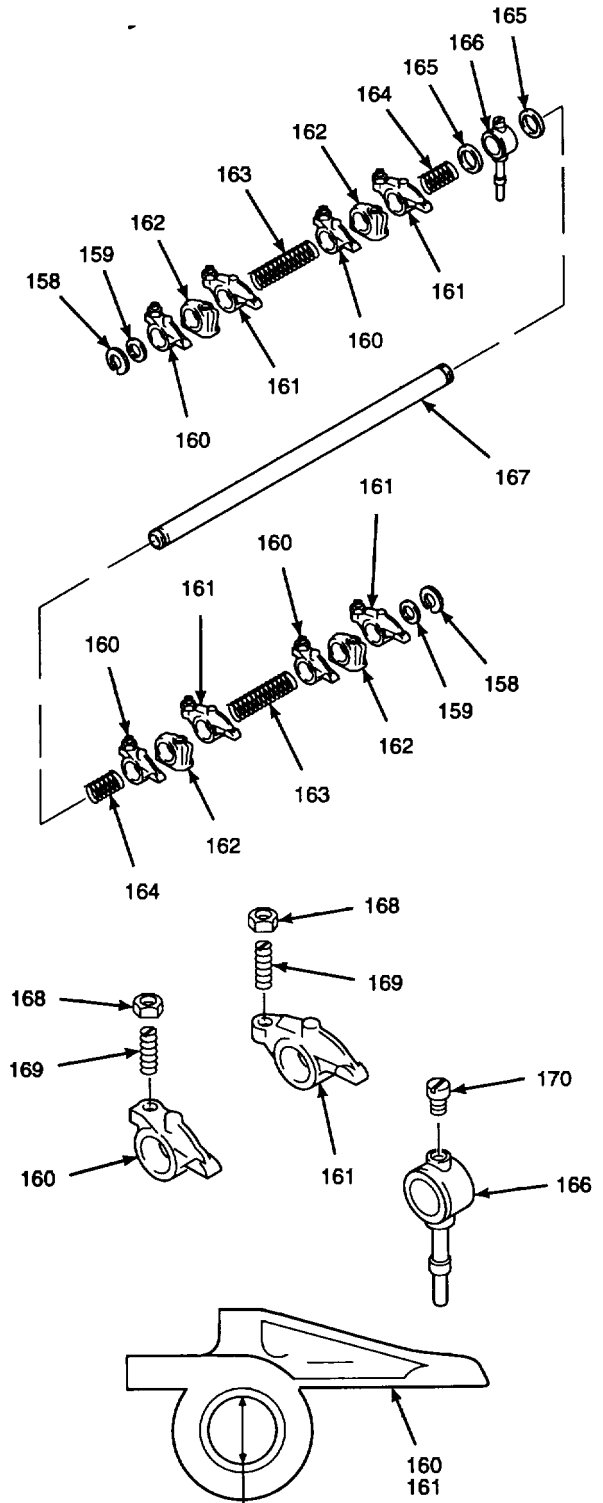
**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

**NOTE**

When disassembling rocker shaft assembly, remove components from both ends at the same time, working toward the center.

- (1) Remove retaining rings (158) and thrust washer bearings (159).
- (2) Remove rocker arms (160 and 161) and brackets (162).
- (3) Remove springs (163).
- (4) Remove rocker arms (160 and 161) and brackets (162).
- (5) Remove springs (16483).
- (6) Remove shims (165) and connection (166) from shaft (167).
- (7) Remove hex nut (168) and set screw (169) from rocker arms (160 and 161).
- (8) Remove screw (170) from connection (166).
- (9) Use a slide caliper (Item 20, Appendix D) to measure inside diameter of rocker arms (160 and 161).
- (10) Inside diameter of rocker arms must be 0.7505 to 0.7570 in. (19,062 to 19,227 mm).
- (11) If rocker arm inside diameters exceed 0.7570 in. (19,227 mm), replace rocker arm bushings.



0.7505 TO 0.7570 IN.  
(19,062 TO 19,227 MM)

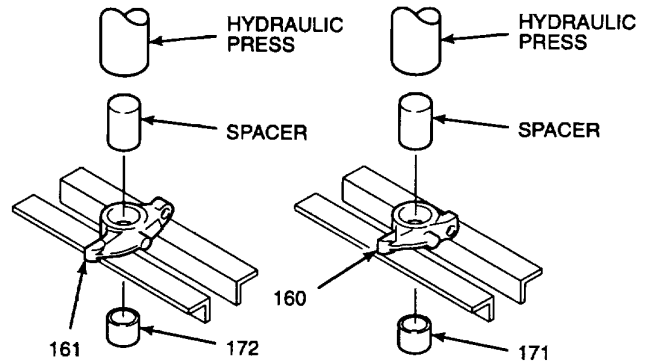
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2.17 DIESEL ENGINE REPAIR - Continued.

D. REPAIR - Continued.

- (12) Place rocker arms (160 and 161) on hydraulic press frame.
- (13) Use a spacer from universal puller kit to press out bushings (171 and 172) from rocker arms (160 and 161).

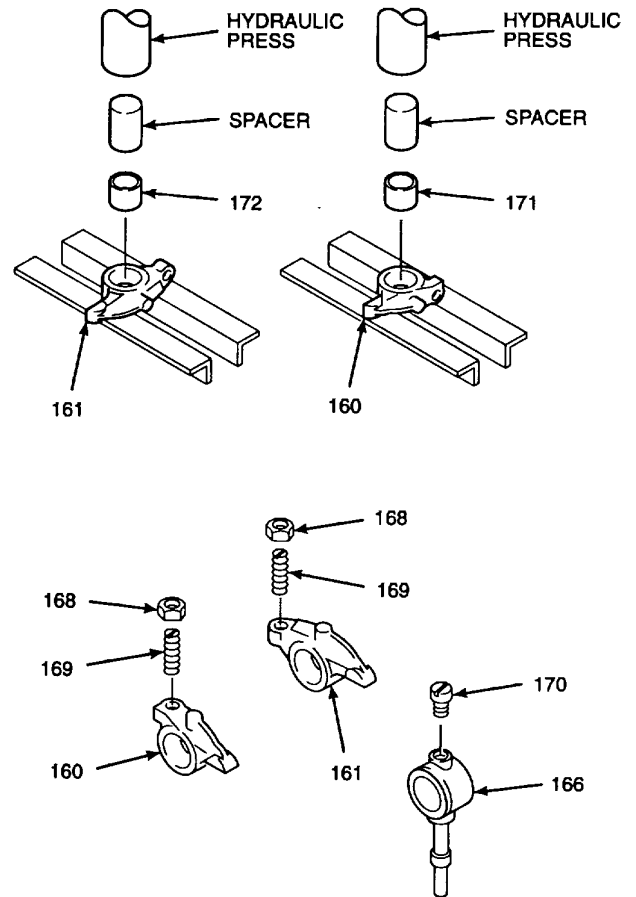


b. Assemble rocker shaft assembly.

**NOTE**

**When assembling rocker shaft assembly, start in the center and install components on both ends at the same time, working toward the outside of the rocker shaft assembly.**

- (1) Use a spacer from universal puller kit to press bushings (171 and 172) into rocker arms (161 and 160) until flush with edges of rocker arm bushing bores.
- (2) Install screw (170) into connection (166).
- (3) Install set screw (169) and hex nut (168) into rocker arms (161 and 160).



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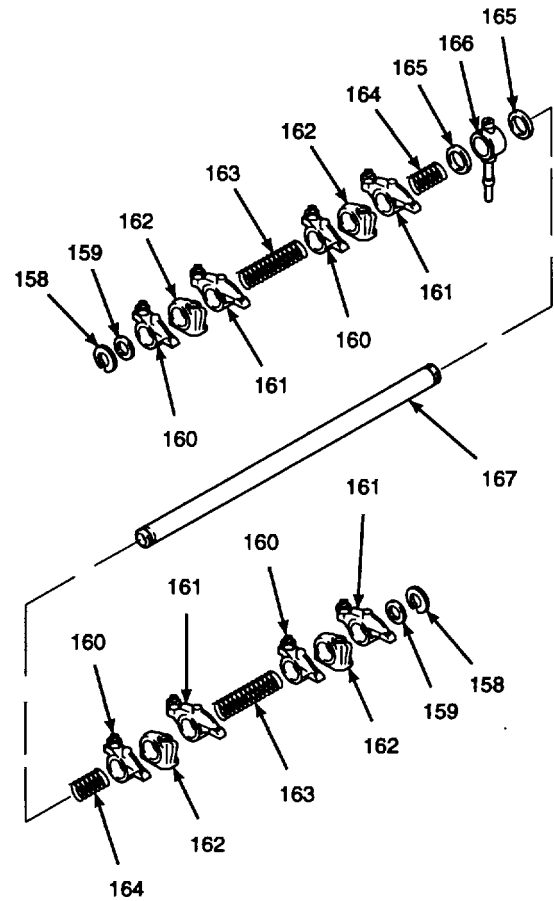
D. REPAIR - Continued.

- (4) Slide connection (166) onto shaft (167). Position connection in center of shaft.
- (5) Install shims (165).
- (6) Install springs (164).
- (7) Install rocker arms (161 and 160) and brackets (162).
- (8) Install springs (163).
- (9) Install rocker arms (161 and 160) and brackets (162).
- (10) Install thrust washer bearings (159).

**WARNING**

**Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- (11) Install retaining rings (158) by pressing over flanged end of shaft (167).
- (12) Install rocker shaft assembly per paragraph 2.15.



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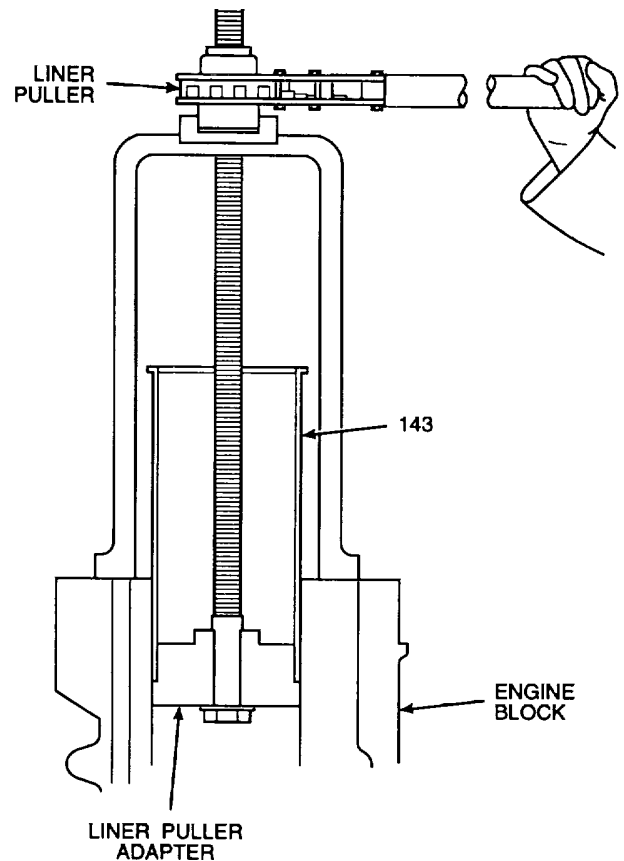
**2.17 DIESEL ENGINE REPAIR - Continued.**

- D. REPAIR - Continued.
3. REPAIR ENGINE BLOCK BY REPLACEMENT OF CYLINDER SLEEVES.
- Place engine block on cribbing, on a clean work surface, with top of engine block facing up.
  - Using a liner puller and liner puller adapter, pull cylinder sleeves (143) out through top of engine block. Discard cylinder sleeves.



Use extreme caution while handling new cylinder sleeves. The slightest burr or piece of dirt on outside of cylinder sleeves may damage cylinder sleeve when fitted. Do not allow cylinder sleeves to bump against engine block or become damaged in any way.

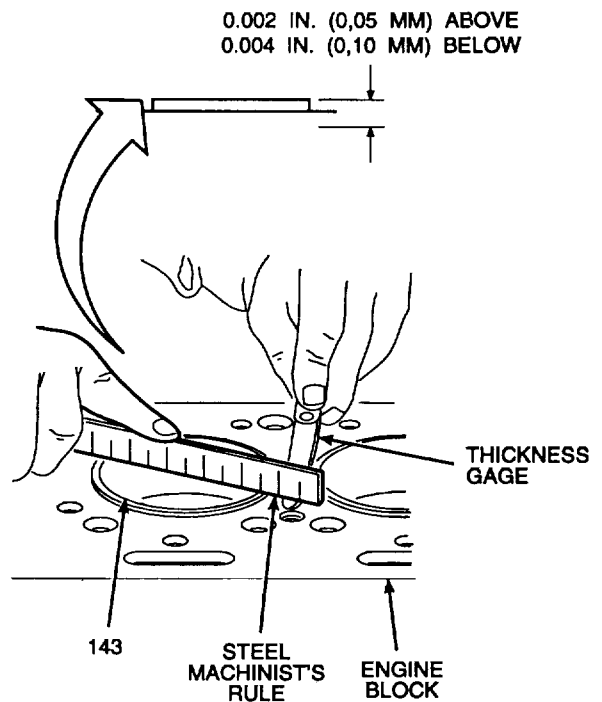
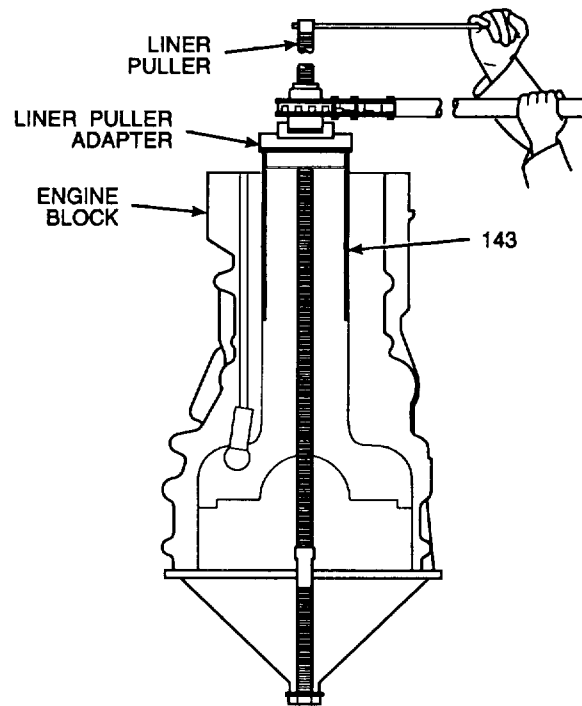
- Use a clean, lint-free cloth to wipe any dirt or residue from outside of new cylinder sleeves (143) and inside of engine block sleeve bores.
- Lubricate outside diameter of cylinder sleeves (143) with clean engine oil except the top 2.0 in. (50,8 mm).



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D. REPAIR - Continued.

- e. Use a liner puller adapter with liner puller to press cylinder sleeves into engine block, until approximately 2.0 in. (50,8 mm) of cylinder sleeve protrudes from engine block top face.
- f. Apply sealing compound to top 1.0 in. (25,4 mm) of outer surface of cylinder sleeve and under flange. Also apply sealing compound to bottom of flange recess in engine block.
- g. Press cylinder sleeve (143) into engine block until nearly flush with engine block top face.
- h. Place a steel machinist's rule across top of cylinder sleeve (143).
- i. Slide a thickness gage into gap between steel machinist's rule and top of engine block.
- j. Measure protrusion of cylinder sleeve above top face of engine block. Cylinder sleeve protrusion must be from 0.002 in. (0,05 mm) above engine block top face to 0.004 in. (0,10 mm) below engine block top face.

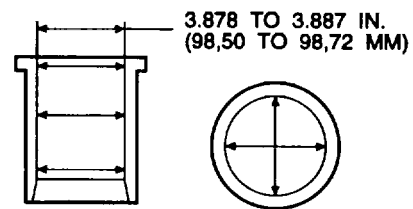
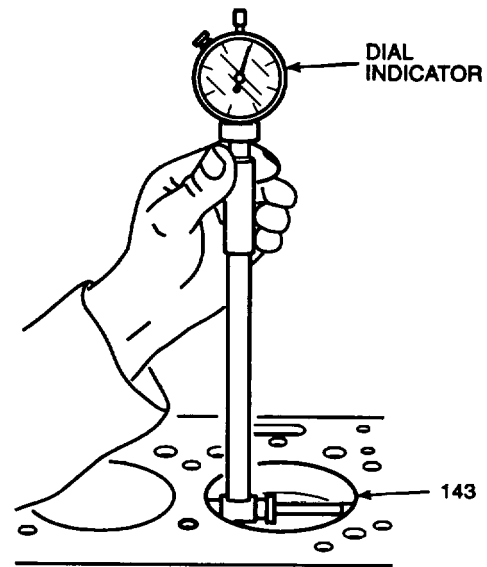


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**2.17 DIESEL ENGINE REPAIR - Continued.**

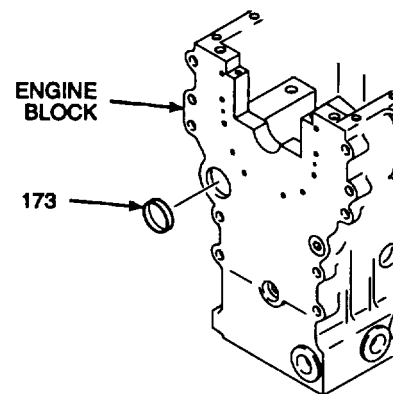
**D. REPAIR - Continued.**

- k. After allowing new cylinder sleeves (143) to settle inside engine block for one hour, use a dial indicator to check the inside diameter of each cylinder sleeve. Check the internal diameter at the top, middle, and bottom of the sleeve.
- l. Internal diameter of cylinder sleeves must be 3.878 to 3.887 in. (98,50 to 98,72 mm).



**4. REPAIR ENGINE BLOCK BY REPLACEMENT OF EXPANSION PLUGS.**

- a. Use a portable electric drill and a 0.375 in. (9,52 mm) drill bit from twist drill set to bore a hole through expansion plug (173) to be replaced.
- b. Insert a flat blade screwdriver into hole in expansion plug and pry expansion plug from engine block. Discard expansion plug.
- c. Use a cleaning cloth to wipe any remaining dirt or debris from expansion plug hole in engine block.
- d. Apply sealing compound to outer edge of expansion plug (173).
- e. Position expansion plug (173) inside expansion plug bore in engine block.



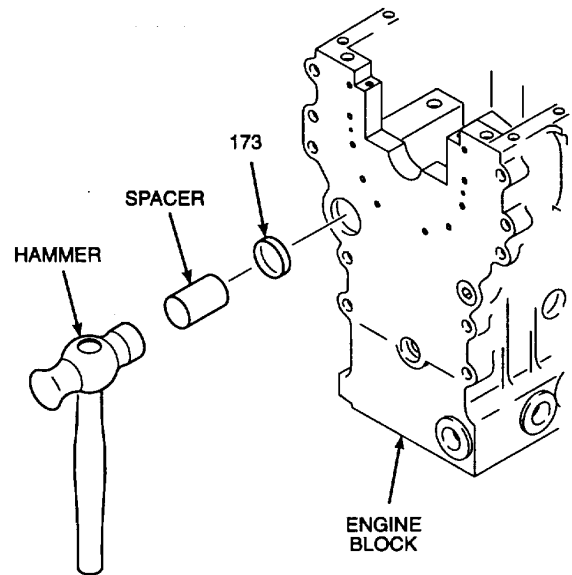
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D. REPAIR - Continued.

- f. Use a hammer and a spacer from universal puller kit to tap expansion plug (173) into engine block until flush with machined face of engine block.

5. REPAIR FLYWHEEL BY REPLACEMENT OF SPUR GEAR.

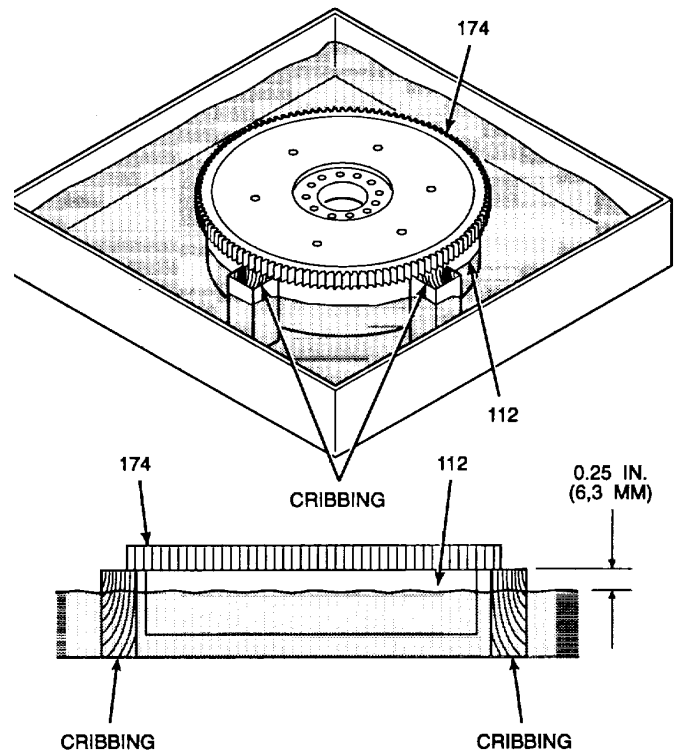
- a. With spur gear (174) facing up, place flywheel (112) in clean, cold water about 60°F (21°C), supported by four pieces of cribbing under spur gear (174). Bottom of spur gear must be approximately 0.25 in. (6,3 mm) above water surface.



**WARNING**

Use caution when handling hot spur gear. Severe burns may result if caution is not used when handling heated spur gear. Use a suitable tool and wear insulated gloves when handling heated spur gear.

- b. Use a gasoline blowtorch to heat spur gear (174) evenly around circumference until flywheel (112) drops away from spur gear.
- c. After allowing flywheel to cool, remove flywheel (112) from water.
- d. Heat new spur gear (174) to approximately 475°F (246°C).



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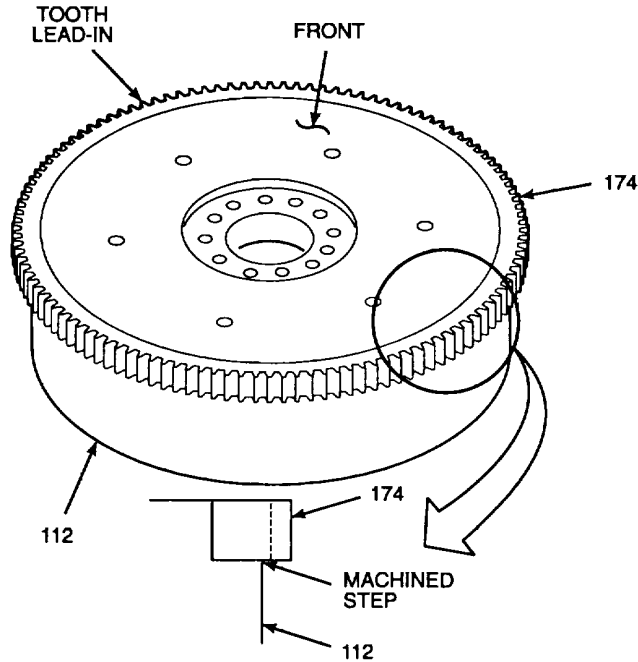
2.17 DIESEL ENGINE REPAIR - Continued.

D. REPAIR - Continued.

**WARNING**

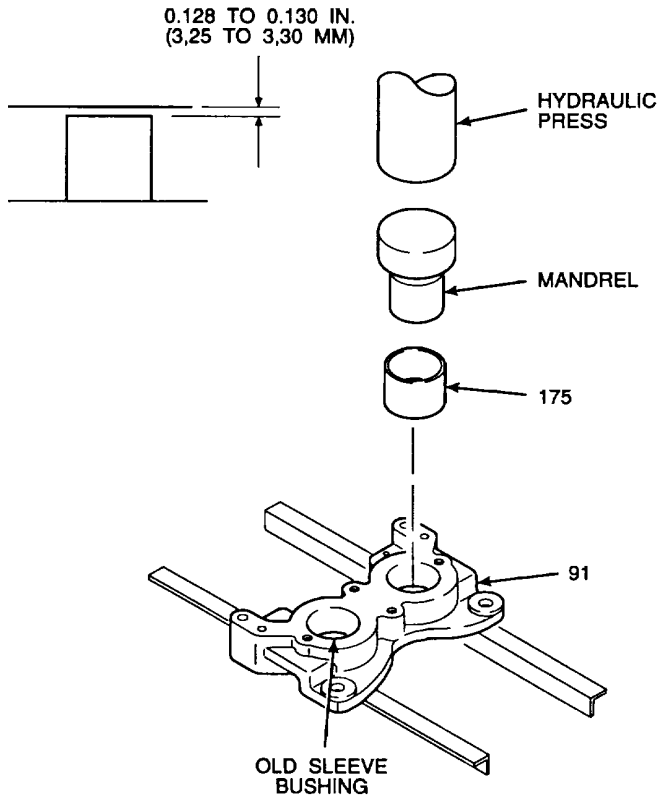
Use caution when handling hot spur gear. Severe burns may result if caution is not used when handling heated spur gear. Use a suitable tool and wear insulated gloves when handling heated spur gear.

- e. Place heated spur gear (174) on flywheel (112) with lead-in on teeth facing front of flywheel. Ensure spur gear is fully seated against machined step on flywheel.
- f. Allow flywheel and spur gear to cool to room temperature before handling.



6. REPAIR BALANCER UNIT BY REPLACEMENT OF SLEEVE BUSHINGS AND NEEDLE BEARINGS.

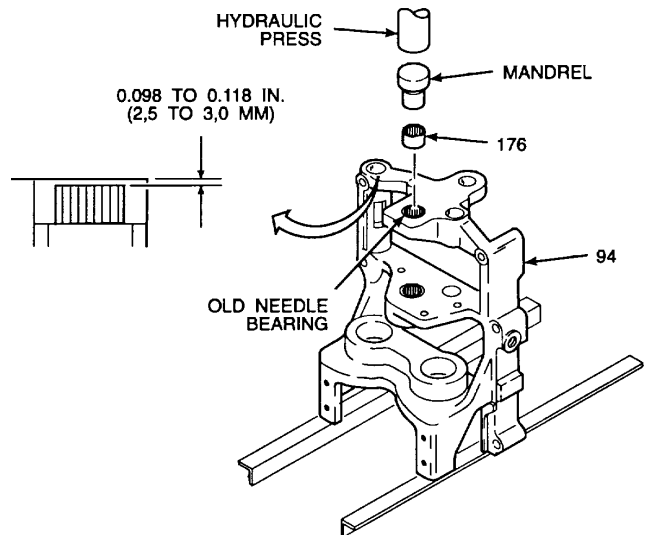
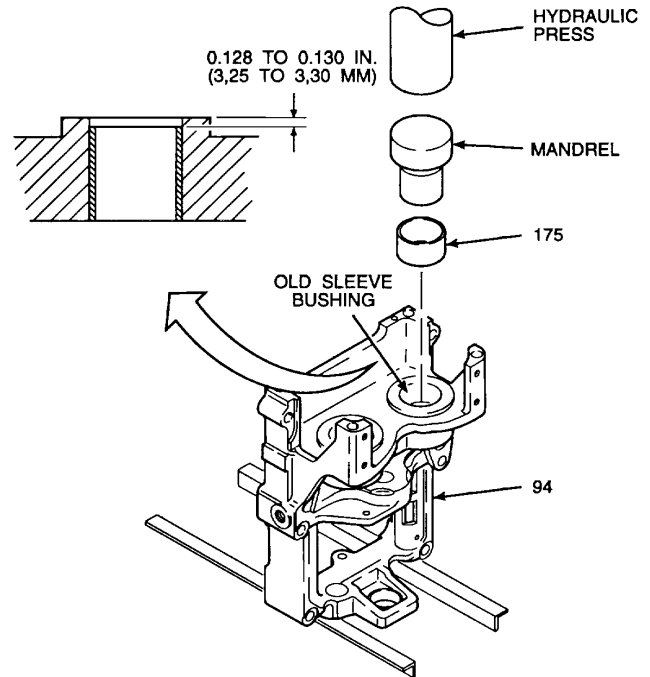
- a. Place balancer unit frame end (91) on a hydraulic press frame.
- b. Use a mandrel (Item 11, Appendix C) to press new sleeve bushings (175) into balancer unit frame end (91), at the same time pressing out old sleeve bushings. Discard old sleeve bushings.
- c. Sleeve bushings (175) must be 0.128 to 0.130 in. (3,25 to 3,30 mm) below machined face of balancer unit frame end when installed.



GO TO NEXT PAGE

D. REPAIR - Continued.

- d. Place balancer unit frame (94) on hydraulic press frame, with rear of frame facing up.
- e. Use a mandrel (Item 11, Appendix C) to press new sleeve bushings (175) into balancer unit frame (94), at the same time pressing out old sleeve bushings.
- f. Sleeve bushings (175) must be 0.128 to 0.130 in. (3,25 to 3,30 mm) below machined face of balancer unit frame when installed.
- g. Turn balancer unit frame (94) over so front end is facing up.
- h. Use a mandrel (Item 12, Appendix C) to press new needle bearing (176) into front end of balancer unit frame (94), at the same time pressing out old needle bearing. Discard needle bearing.
- i. Needle bearing (176) must be 0.098 to 0.118 in. (2,5 to 3,0 mm) below front face of balancer frame (94) when installed.

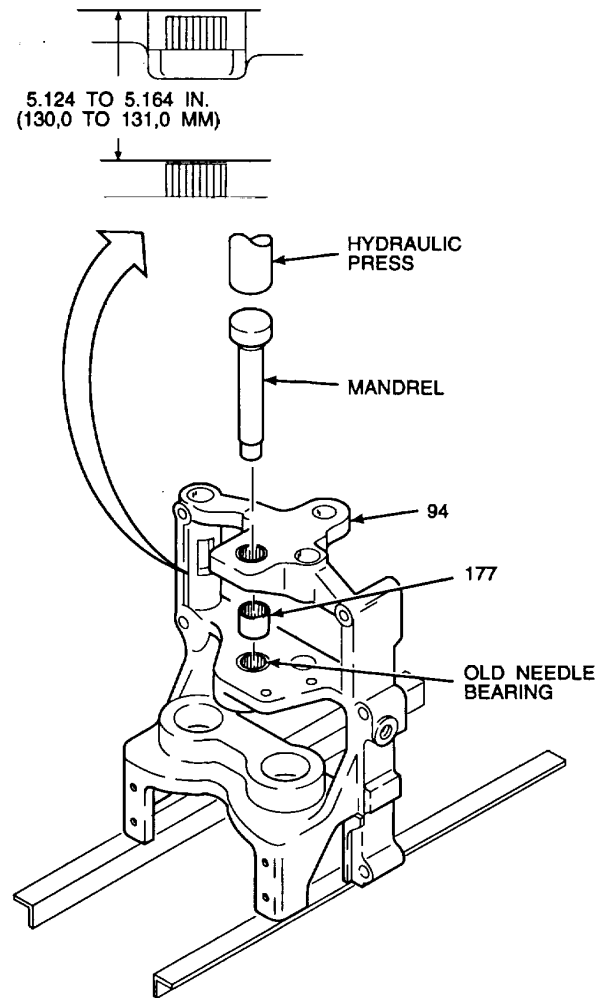


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**2.17 DIESEL ENGINE REPAIR - Continued.****D. REPAIR - Continued.**

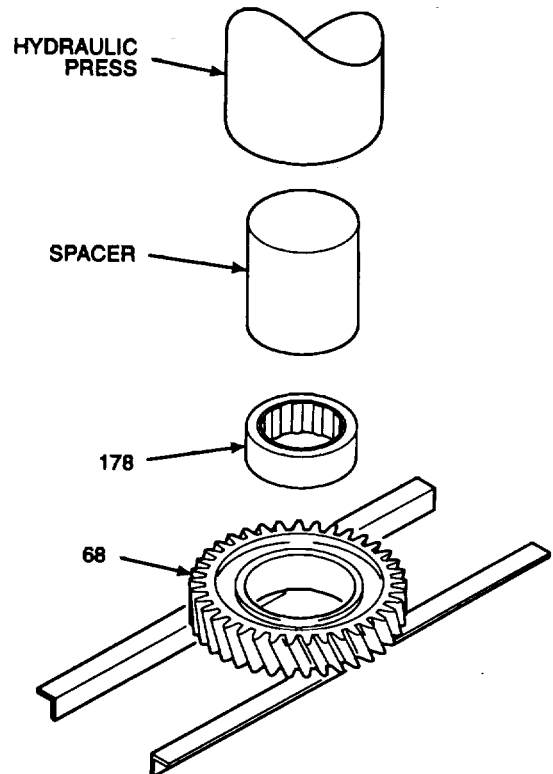
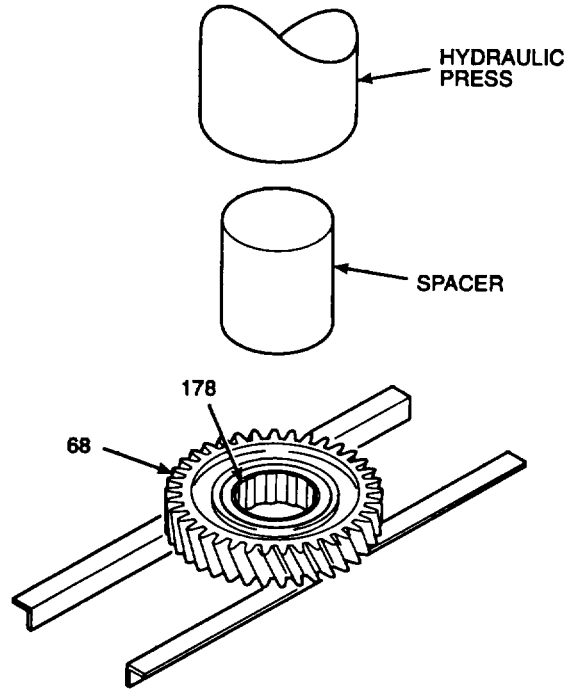
- j. Use a mandrel (Item 10, Appendix C) to press new needle bearing (177) into rear end of balancer unit frame (94), at the same time pressing out old needle bearing. Discard needle bearing.
- k. Needle bearing (177) must be 5.124 to 5.164 in. (130,0 to 131,0 mm) from front of balancer unit frame (94).

**GO TO NEXT PAGE**

D. REPAIR - Continued.

7. REPAIR TIMING GEAR BY REPLACEMENT OF BEARING.

- a. Place timing gear (68) on a hydraulic press frame, supported by blocks on outer edges of inner flange.
- b. Use a spacer from universal puller kit to press out bearing (178) on outer race.
- c. Use a spacer from universal puller kit to press new bearing (178) into timing gear, pressing on outer race of bearing until seated flush inside timing gear.



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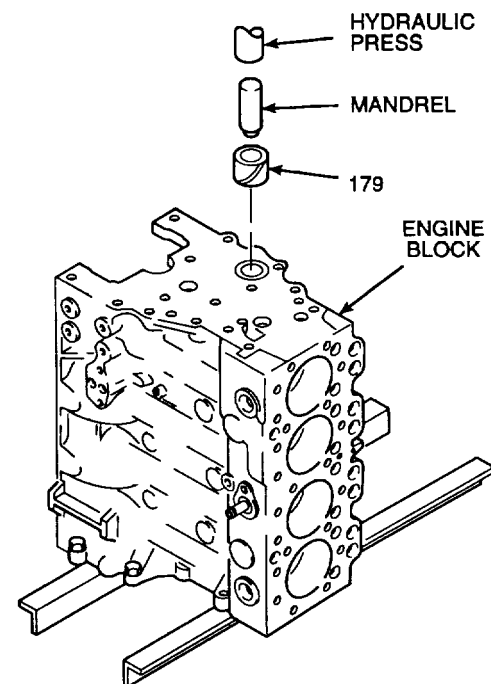
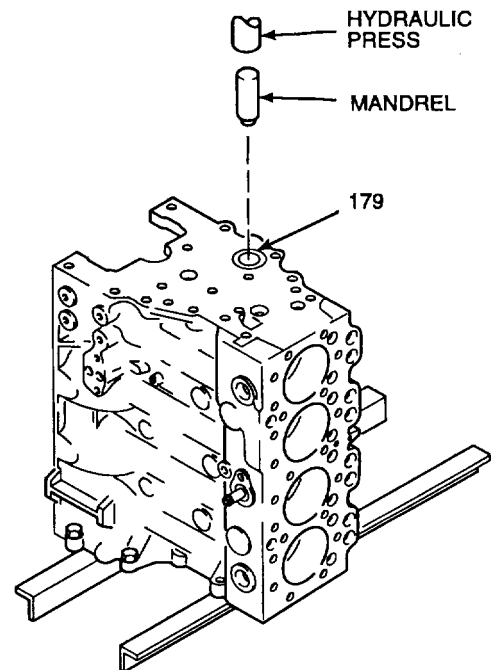
**2.17 DIESEL ENGINE REPAIR - Continued.**

- D. REPAIR - Continued.
8. REPAIR CAMSHAFT ASSEMBLY BY REPLACEMENT OF BUSHING IN ENGINE BLOCK.

**NOTE**

**Two inside camshaft bushings cannot be repaired. Replace engine block if two inside cam bushings are determined defective.**

- a. Place engine block on a hydraulic press frame with front face of engine block pointing up.
- b. Use a mandrel (Item 13, Appendix C) to press out camshaft bushing (179) into engine block. Discard camshaft bushing.
- c. Lubricate outer diameter of camshaft bushing (179) with engine oil.
- d. Align camshaft bushing on engine block over camshaft bore. Ensure hole in camshaft bushing will align with oil hole in engine block after installation.
- e. Use a mandrel (Item 13, Appendix C) to press camshaft bushing (179) into engine block until flush with front of camshaft bore.



**GO TO NEXT PAGE**

- D. REPAIR - Continued.
- 9. SERVICE WEAR LIMITS.

**NOTE**

**These wear limits indicate the respective items that should be serviced or replaced.**

Cylinder head assembly bow	
Transverse.....	0.003 in. (0,08 mm)
Longitudinal .....	0.006 in. (0,15 mm)
Maximum bore wear .....	0.008 in. (0,2 mm)
Crankshaft main and big end journal wear, ovality.....	0.0015 in. (0,04 mm)
Maximum crankshaft end float .....	0.015 in. (0,38 mm)
Valve stem to bore guide clearance	
Intake.....	0.005 in. (0,13 mm)
Exhaust.....	0.006 in. (0,15 mm)
Valve head thickness between run-out of valve seat and face of valve.....	1/32 in. (0,79 mm)
Rocker clearance on rocker shaft assembly .....	0.005 in. (0,13 mm)
Camshaft journals, ovality and wear .....	0.002 in. (0,05 mm)
Camshaft end float .....	0.020 in. (0,51 mm)
Idler gear end float .....	0.010 in. (0,25 mm)
Valve head depth below cylinder head assembly face	
Intake.....	0.061 in. (1,55 mm) maximum
Exhaust.....	0.073 in. (1,85 mm) maximum

**ENGINE BLOCK**

Parent bore diameter for flanged cast iron cylinder liner.....	4.1025 to 4.1035 in. (104,20 to 104,23 mm)
Depth of recess for liner flange .....	0.150 to 0.154 in. (3,81 to 3,91 mm)
Main bearing parent bore diameter.....	3.166 to 3.167 in. (80,42 to 80,44 mm)
Camshaft bore diameter number 1 for bushing (where fitted) .....	2.1875 to 2.1887 in. (55,56 to 55,59 mm)
Camshaft bearing bushing internal diameter, fitted.....	2.0000 to 2.0017 in. (50,80 to 50,84 mm)
Camshaft bore diameters	
Number 1 .....	2.000 to 2.001 in. (50,80 to 50,83 mm)
Number 2.....	1.990 to 1.9918 in. (50,55 to 50,59 mm)
Number 3.....	1.970 to 1.9718 in. (50,04 to 50,08 mm)

**CAST IRON CYLINDER SLEEVES**

Outside diameter of flanged, prefinished service liner,	
flanged non-flame ring.....	4.1025 to 4.1035 in. (104,20 to 104,23 mm)
Bore diameter of prefinished service liner in block.....	3.878 to 3.887 in. (98,50 to 98,72 mm)
Height of top of liners above engine block face.....	0.028 to 0.037 in. (0,71 to 0,94 mm)
Flange thickness of liner.....	0.150 to 0.152 in. (3,81 to 3,86 mm)
Relationship of liner flange to engine block face.....	0.002 in. (0,03 mm) above to 0.004 in. (0,10 mm) below
Overall length of liner.....	8.899 to 8.930 in. (226,04 to 226,84 mm)

**GO TO NEXT PAGE**

**2.17 DIESEL ENGINE REPAIR - Continued.**

D. REPAIR - Continued.

**PISTONS**

Type.....	Cavity-in-crown
Bore diameter for gudgeon pin.....	1.5000 to 1.50002 in. (38,10 to 38,106 mm)
Compression ring groove width	
Number 1 .....	Tapered
Number 2.....	0.0955 to 0.0963 in. (2,43 to 2,45 mm)
Scraper ring groove width	
Number 3.....	0.1885 to 0.1893 in. (4,79 to 4,81 mm)

**PISTON RINGS**

Number 1 compression .....	Molybdenum-faced wedge
Number 2 compression .....	Chrome taper faced
Number 3 scraper.....	Chrome faced, spring loaded conformable
Compression width	
Number 1 .....	Wedge-shaped
Number 2.....	0.093 to 0.0935 in. (2,36 to 2,37 mm)
Number 3 scraper width .....	0.186 to 0.1875 in. (4,72 to 4,76 mm)
Clearance in groove	
Number 2.....	0.002 to 0.0033 in. (0,05 to 0,08 mm)
Number 3.....	0.001 to 0.0033 in. (0,03 to 0,08 mm)
Ring gap	
Number 1 .....	0.010 to 0.024 in. (0,25 to 0,61 mm)
Number 2.....	0.010 to 0.027 in. (0,25 to 0,66 mm)
Number 3.....	0.010 to 0,031 in. (0,25 to 0,79 mm)

**GUDGEON PIN**

Type.....	Fully floating
Outer diameter .....	1.4998 to 1.5000 in. (38,095 to 38,100 mm)
Length.....	3.244 to 3.260 in. (82,40 to 82,80 mm)
Clearance fit for piston boss.....	0.000 to 0.0004 in. (0,000 to 0,010 mm)

**CONNECTING ROD ASSEMBLY SLEEVE BUSHING**

Type.....	Steel-backed, lead bronze lined
Outer diameter .....	1.65975 to 1.66125 in. (42,16 to 42,20 mm)
Inner diameter after reaming .....	1.37575 to 1.37650 in. (34,94 to 34,96 mm)
Clearance between connecting rod assembly sleeve bushing and gudgeon pin .....	0.00075 to 0.0017 in. (0,019 to 0,043 mm)

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D. REPAIR - Continued.

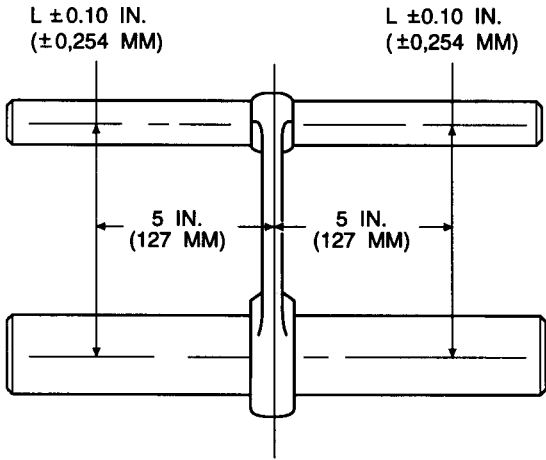
CONNECTING ROD ASSEMBLIES

Type.....	H-section, wedge-shaped small end
Cap location to connecting rod.....	Serrations
Parent bore diameters	
Big end.....	2.6460 to 2.6465 in. (67,21 to 67,22 mm)
Small end.....	1.65625 to 1.65725 in. (42,07 to 42,09 mm)
Length from center line of big end to center	
line of small end.....	8.624 to 8.626 in. (219,05 to 219,10 mm)
Big end width.....	1.577 to 1.580 in. (40,06 to 40,13 mm)
Connecting rod end float on crankpin.....	0.0085 to 0.0145 in. (0,21 to 0,37 mm)

CONNECTING ROD ASSEMBLY ALIGNMENT

NOTE

Large and small end bores must be square and parallel with each other within the limits of ±0.010 in. (0,25 mm), measured 5.0 in. (127 mm) each side of the axis of the rod on test mandrel with the small end bush fitted, the limit of ±0.010 in. (0,25 mm) is reduced to ±0.0025 in. (0,06 mm).



CRANKSHAFT ASSEMBLY

NOTE

Crankshaft assembly is tufftrided and must be retufftrided after any regrinding. When retufftride facilities are not available, a factory replacement crankshaft assembly should be obtained.

Overall length .....	24.01 to 24.04 in. (609,85 to 610,62 mm)
Main journal diameter.....	2.9984 to 2.9992 in. (76,16 to 76,18 mm)

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**2.17 DIESEL ENGINE REPAIR - Continued.**

D. REPAIR - Continued.

**NOTES****Fillet radii and surface finish must be maintained during regrinding.****Length of Number 3 main journal not to exceed 1.759 in. (44,68 mm) after regrinding.**

## Main journal lengths

Number 1 .....	1.453 to 1.473 in. (36,91 to 37,41 mm)
Number 2 .....	1.545 to 1.549 in. (39,24 to 39,34 mm)
Number 3 .....	1.738 to 1.741 in. (44,15 to 44,22 mm)
Number 4 .....	1.545 to 1.549 in. (39,24 to 39,34 mm)
Number 5 .....	1.545 to 1.549 in. (39,24 to 39,34 mm)
Journal fillet radii.....	0.145 to 0.156 in. (3,68 to 3,96 mm)

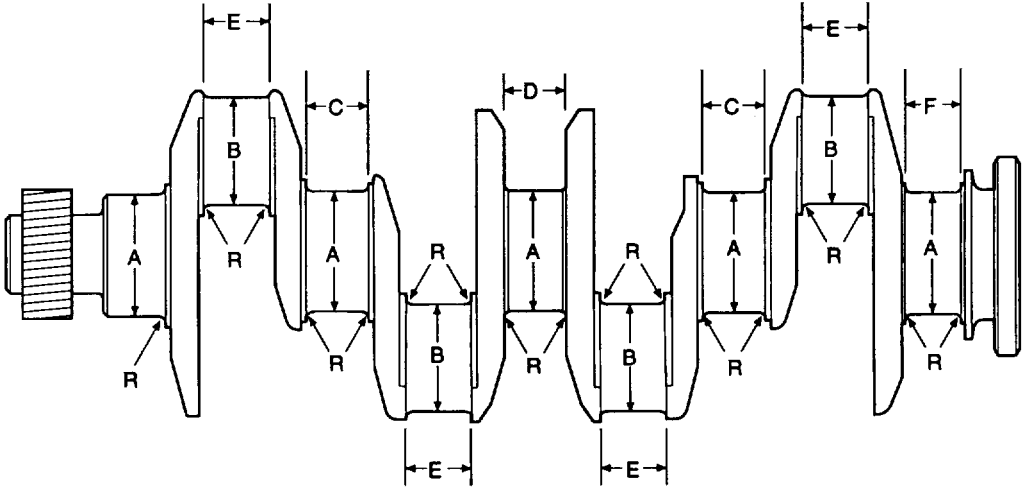
**NOTE****Width of crankpins must not exceed 1.5965 in. (40,55 mm) after regrinding. Use oversize thrust washer bearings where necessary.**

Crankpin diameter .....	2.4988 to 2.4996 in. (63,47 to 63,49 mm)
Crankpin length .....	1.5885 to 1.5915 in. (40,35 to 40,42 mm)
Crankpin fillet radii.....	0.145 to 0.156 in. (3,68 to 3,69 mm)
Surface finish	
All journals .....	16.0 $\mu$ in. (0,4 p) maximum
Fillet radii .....	50 $\mu$ in. (1,3 p) maximum
Main journal and crankpin regrind undersizes.....	-0.010, 0.020, and 0.030 in. (-0,25, 0,51, and 0,76 mm)

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D. REPAIR - Continued.

CRANKSHAFT ASSEMBLY REGRIND DATA



Undersize 0.010 in. (0,25 mm)

A .....	2.9884 to 2.9892 in. (75,91 to 75,93 mm)
B .....	2.4888 to 2.4896 in. (63,22 to 63,24 mm)
C .....	1.554 in. (39,47 mm) maximum
D .....	1.759 in. (44,68 mm) maximum
E .....	1.759 in. (44,68 mm) maximum
F .....	1.554 in. (39,47 mm) maximum
R .....	0.145 to 0.156 in. (3,68 to 3,96 mm) (all journals and crankpins)

Undersize 0.020 in. (0,51 mm)

A .....	2.9784 to 2.9792 in. (75,65 to 75,67 mm)
B .....	2.4788 to 2.4796 in. (62,96 to 62,98 mm)
C .....	1.554 in. (39,47 mm) maximum
D .....	1.759 in. (44,68 mm) maximum
E .....	1.759 in. (44,68 mm) maximum
F .....	1.554 in. (39,47 mm) maximum
R .....	0.145 to 0.156 in. (3,68 to 3,96 mm) (all journals and crankpins)

Undersize 0.030 in. (0,76 mm)

A .....	2.9684 to 2.9692 in. (75,40 to 75,42 mm)
B .....	2.4688 to 2.4696 in. (62,70 to 62,72 mm)
C .....	1.554 in. (39,47 mm) maximum
D .....	1.759 in. (44,68 mm) maximum
E .....	1.759 in. (44,68 mm) maximum
F .....	1.554 in. (39,47 mm) maximum
R .....	0.145 to 0.156 in. (3,68 to 3,96 mm) (all journals and crankpins)

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**2.17 DIESEL ENGINE REPAIR - Continued.**

D. REPAIR - Continued.

**NOTES**

**Surface finish, journals and crankpins, is 16.0 μ in. (0,4 p) C.L.A. maximum.**

**Surface finish, fillet radii, is 50.0 μ in. (1,3 p) C.L.A.**

**MAXIMUM RUNOUT WITH CRANKSHAFT ASSEMBLY  
MOUNTED ON END MAIN JOURNALS**

Crankshaft pulley - Diameter T.I.R.....	0.002 in. (0,05 mm)
Rear oil seal - Diameter T.I.R.....	0.002 in. (0,05 mm)
Flywheel flange - Diameter T.I.R.....	0.002 in. (0,05 mm)
Journals T.I.R.	
Number 1.....	Mounting
Number 2.....	0.003 in. (0,08 mm)
Number 3.....	0.006 in. (0,15 mm)
Number 4.....	0.003 in. (0,08 mm)
Number 5.....	Mounting
Oil seals	
Helix diameter (rope seals only).....	3.124 to 3.125 in. (79,35 to 79,38 mm)
Helix width.....	0.050 to 0.080 in. (1,27 to 2,03 mm)
Helix depth.....	0.004 to 0.008 in. (0,10 to 0,20 mm)
Flange diameter.....	5.247 to 5.249 in. (133,27 to 133,32 mm)
Spigot bearing recess	
Depth.....	0.781 in. (19,84 mm)
Bore.....	1.8497 to 1.8502 in. (46,98 to 47,00 mm)
Crankshaft end float.....	0.002 to 0.015 in. (0,05 to 0,38 mm)

**CRANKSHAFT THRUST WASHER BEARINGS**

Type.....	Steel backed, aluminum tin, or lead bronze faced
Position in engine.....	Center main bearing
Thrust washer bearing thickness (std).....	0.089 to 0.091 in. (2,26 to 2,31 mm)
Thrust washer bearing thickness (o/s).....	0.096 to 0.099 in. (2,44 to 2,51 mm)
Outside diameter.....	4.088 to 4.098 in. (103,84 to 104,90 mm)
Inside diameter.....	3.420 to 3.430 in. (86,87 to 87,12 mm)

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D. REPAIR - Continued.

MAIN BEARING SLEEVES

Type.....	Prefinished, steel backed, aluminum tin, or lead bronze faced
Shell width	
Number 1 .....	1.245 to 1.255 in. (31,62 to 31,88 mm)
Number 2 .....	1.245 to 1.255 in. (31,62 to 31,88 mm)
Number 3 .....	1.435 to 1.445 in. (36,45 to 36,70 mm)
Number 4 .....	1.245 to 1.255 in. (31,62 to 31,88 mm)
Number 5 .....	1.245 to 1.255 in. (31,62 to 31,88 mm)
Shell thickness .....	0.0822 to 0.0825 in. (2,088 to 2,098 mm)
Main bearing	
Outside diameter .....	3.167 in. (80,41 mm)
Inside diameter .....	3.0010 to 3.0026 in. (76,23 to 76,27 mm)
Running clearance.....	0.0018 to 0.0042 in. (0,05 to 0,11 mm)

CONNECTING ROD ASSEMBLY BEARING SLEEVES

Type.....	Prefinished, steel backed, aluminum tin, or lead bronze faced
Shell width .....	1.245 to 1.255 in. (31,62 to 31,88 mm)
Outside diameter .....	2.6465 in. (67,22 mm)
Inside diameter .....	2.5008 to 2.5019 in. (63,52 to 63,55 mm)
Running clearance .....	0.0012 to 0.0031 in. (0,03 to 0,08 mm)
Shell thickness .....	0.0723 to 0.0726 in. (1,836 to 1,844 mm)

CAMSHAFT

Journal diameters	
Number 1 .....	1.9945 to 1.9975 in. (50,66 to 50,74 mm)
Number 2 .....	1.9845 to 1.9875 in. (50,40 to 50,48 mm)
Number 3 .....	1.9645 to 1.9675 in. (49,89 to 49,98 mm)
Engine block camshaft bore diameter	
Number 1 .....	2.000 to 2.001 in. (50,8 to 50,83 mm)
Number 2 .....	1.990 to 1.992 in. (50,55 to 50,60 mm)
Number 3 .....	1.970 to 1.972 in. (50,04 to 50,09 mm)
Journal running clearance	
Number 1 .....	0.0025 to 0.0045 in. (0,06 to 0,11 mm)
Number 2 .....	0.0025 to 0.0053 in. (0,06 to 0,14 mm)
Number 3 .....	0.0025 to 0.0053 in. (0,06 to 0,14 mm)
Cam lift .....	0.300 to 0.303 in. (7,62 to 7,70 mm)
Oilways for rocker shaft assembly lubrication .....	Number 2 journal

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**2.17 DIESEL ENGINE REPAIR - Continued.**

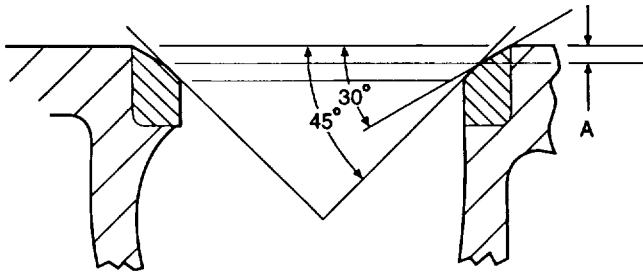
D. REPAIR - Continued.

**CAMSHAFT THRUST WASHER**

Type.....	360°
Outside diameter .....	2.872 to 2.874 in.(72,95 to 73,00 mm)
Inside diameter .....	1.75 in.(44,45 mm)
Thickness .....	0.216 to 0.218 in.(5,47 to 5,54 mm)
Engine block recess diameter for thrust washer .....	2.875 to 2.885 in.(73,03 to 73,28 mm)
Engine block recess depth for thrust washer .....	0.215 to 0.218 in.(5,46 to 5,33 mm)
Thrust washer protrusion beyond engine block front face .....	0.026 to 0.031 in.(0,66 to 0,79 mm)
Clearance fit of thrust washer in recess .....	0.001 to 0.0013 in.(0,03 to 0,33 mm)
Thrust washer relationship to engine block front face.....	-0.002 to +0.003 in.(-0,05 to +0,07 mm)
Camshaft end float .....	0.004 to 0.016 in.(0,10 to 0,41 mm)

**CYLINDER HEAD ASSEMBLY**

Skimming allowance on cylinder head assembly face .....	0.012 in.(0,30 mm)
Minimum cylinder head assembly depth after skimming.....	4.0355 in.(102,51 mm)
Maximum nozzle protrusion after skimming.....	0.175 in.(4,44 mm)
Leak test pressure.....	30 lbf/in. <sup>2</sup> (2,11 kgf/cm <sup>2</sup> ) (206 kNm)
Valve seat insert angle .....	45°
Valve seat insert angle (intake) .....	30°
Valve bore in cylinder head assembly.....	0.37425 to 0.37525 in.(9,51 to 9,53)
Valve stem guide parent bore diameter .....	0.6247 to 0.6257 in.(15,87 to 15,89 mm)
Overall length of valve stem guide (intake) .....	2.281 in.(57,94 mm)



SHOWING FLARE TO BE CUT AT 30°  
 DIMENSION A  
 0.094 TO 0.099 IN. (2,39 TO 2,51 MM) FOR  
 EXHAUST VALVE  
 0.100 TO 0.105 IN. (2,54 TO 2,67 MM) FOR  
 INTAKE VALVE

**GO TO NEXT PAGE**

D. REPAIR - Continued.

VALVE STEM GUIDES

Inside diameter	
Intake .....	0.375 to 0.376 in.(9,53 to 9,55 mm)
Exhaust.....	0.375 to 0.376 in.(9,53 to 9,55 mm)
Outside diameter .....	0.6260 to 0.6265 in.(15,90 to 15,91)
Bore in cylinder head assembly for guide.....	0.625 to 0.6255 in.(15,87 to 15,88 mm)
Interference fit of guide in cylinder head assembly bore .....	0.0002 to 0.0018 in.(0,007 to 0,046 mm)
Overall length of guide	
Intake .....	2.281 in.(57,94 mm)
Exhaust.....	2.4375 in.(61,92 mm)
Depth of counterbore (exhaust guide).....	0.4062 in.(10,32 mm)
Guide protrusion above cylinder head assembly top face.....	0.594 in.(15,09 mm)

EXHAUST VALVES

Valve head diameter .....	1.435 to 1.445 in.(36,45 to 36,70 mm)
Valve stem diameter.....	0.372 to 0.3728 in.(9,45 to 9,47 mm)
Valve face angle .....	45°
Overall length of valve.....	4.847 to 4.863 in.(123,11 to 123,52 mm)
Clearance fit of valve in valve stem guide .....	0.00225 to 0.004 in.(0,06 to 0,10 mm)
Clearance fit of valve in cylinder head assembly.....	0.00145 to 0.00325 in.(0,04 to 0,08)
Valve head depth below cylinder head assembly face.....	0.047 to 0.073 in.(1,19 to 1,85 mm)
Service valve stem oversizes .....	0.003, 0.015, and 0.030 in.(0,08, 0,38, and 0,76 mm)

INTAKE VALVES

Valve head diameter .....	1.736 to 1.746 in.(44,09 to 44,36 mm)
Valve stem diameter.....	0.3725 to 0.3735 in.(9,46 to 9,48 mm)
Valve face angle .....	30°
Overall length of valve.....	4.831 to 4.847 in.(122,71 to 123,11 mm)
Clearance fit of valve in valve stem guide .....	0.0015 to 0.0035 in.(0,04 to 0,09 mm)
Clearance fit of valve in cylinder head assembly.....	0.00075 to 0.00275 in.(0,02 to 0,07 mm)
Valve head depth below cylinder head assembly face.....	0.035 to 0.061 in.(0,89 to 1,54 mm)
Service valve stem oversizes .....	0.003, 0.015, and 0.030 in.(0,08, 0,38, and 0,76 mm)

INNER VALVE SPRINGS

Fitted length.....	1.5625 in.(39,7 mm)
Load at fitted length.....	15.4 lb ±1 lb (7 kg ±0,45 kg)
Fitted position .....	Damper coils to cylinder head assembly

OUTER VALVE SPRINGS

Fitted length.....	1.780 in.(45,22 mm)
Load at fitted length.....	40 lb ±2 lb (18,1 kg ±0,91 kg)
Fitted position .....	Damper coils to cylinder head assembly

GO TO NEXT PAGE

**2.17 DIESEL ENGINE REPAIR - Continued.**

## D. REPAIR - Continued.

## MAIN BEARING THIMBLES

Outside diameter of thimble shank.....	0.7475 to 0.7485 in.(18,99 to 19,01)
Engine block thimble bore diameter.....	0.750 to 0.7513 in.(19,05 to 19,08 mm)
Thimble running clearance in bore.....	0.0015 to 0.0038 in.(0,04 to 0,10 mm)

## ROCKER SHAFT ASSEMBLY

Outside diameter of shaft.....	0.7485 to 0.7495 in.(19,01 to 19,04 mm)
--------------------------------	---

## ROCKER ARMS

Inside diameter of arm bore.....	0.7505 to 0.7520 in.(19,06 to 19,10 mm)
Lever clearance on rocker shaft assembly.....	0.001 to 0.0035 in.(0,03 to 0,09 mm)

## ROCKER ARMS WITH REPLACEABLE BUSHINGS

Arm parent bore.....	0.875 to 0.8762 in.(22,23 to 22,26 mm)
Outside diameter of bushing.....	0.877 to 0.8785 in.(22,28 to 22,31 mm)
Interference fit of bushing in bore.....	0.0008 to 0.0035 in.(0,02 to 0,09 mm)
Finish machine bushing bore.....	0.7505 to 0.752 in.(19,06 to 19,10 mm)
Clearance of bushing on shaft.....	0.001 to 0.0035 in.(0,03 to 0,09 mm)

## VALVE CLEARANCES

Clearances between valve stem and rocker arm.....	0.012 in.(0,30 mm) cold
---	-------------------------

## CAMSHAFT GEAR

Inside diameter of gear boss.....	1.375 to 1.376 in.(34,93 to 34,96 mm)
Outside diameter of camshaft hub.....	1.3741 to 1.3747 in.(34,90 to 34,91 mm)
Fit of gear on camshaft hub.....	-0.0009 to +0.0013 in.(-0,002 to +0,03 mm)

## FUEL INJECTION PUMP GEAR

Inside diameter of gear bore.....	1.750 to 1.751 in.(44,45 to 44,47 mm)
Fuel injection pump hub diameter.....	1.748 to 1.7488 in.(44,40 to 44,42 mm)

## IDLER GEAR AND HUB - STANDARD

Bore diameter of gear bushing (requires boring in situ).....	1.9998 to 2.0007 in.(50,79 to 50,82 mm)
Outside diameter of gear hub.....	1.9610 to 1.9975 in.(49,80 to 50,74 mm)
Running clearance of gear on hub.....	0.0023 to 0.0047 in.(0,06 to 0,12 mm)
Idler gear width including bushings.....	1.1865 to 1.1875 in.(30,14 to 30,16 mm)
Hub width.....	1.1915 to 1.1945 in.(30,26 to 30,33 mm)
Idler gear end float.....	0.004 to 0.008 in.(0,10 to 0,20 mm)

**GO TO NEXT PAGE**

D. REPAIR - Continued.

CRANKSHAFT GEAR

Gear bore ..... 1.875 to 1.876 in.(47,63 to 47,65 mm)
Crankshaft diameter for gear ..... 1.8750 to 1.8755 in.(47,63 to 47,64 mm)

TIMING GEAR BACKLASH

All gears..... 0.003 in.(0,08 mm) minimum

OIL PUMP, CENTER MOUNTED BALANCER UNIT

Inner and outer rotor end clearance ..... 0.001 to 0.003 in.(0,025 to 0,076 mm)
Outer rotor to pump body ..... 0.012 to 0.017 in.(0,304 to 0,44 mm)
Inner to outer rotor clearance ..... 0.001 to 0.005 in.(0,035 to 0,127 mm)

RELIEF VALVE, CENTER MOUNTED BALANCER UNIT

Type Spring-loaded plunger
Pressure setting ..... 76 lbf² (5,34 kgf/cm²) 523 kN/m²
Plunger
Length..... 1.476 in.(37,48 mm)
Outer diameter..... 0.6279 to 0.6291 in.(15,95 to 15,98 mm)
Inner diameter of valve housing bore ..... 0.62 to 0.63 in.(16,00 to 16,03 mm)
Clearance of plunger in bore ..... 0.007 to 0.003 in.(0,02 to 0,08 mm)
Spring fitted length..... 1.68 in.(42,66 mm)
Spring load at fitted length (13.5 coils) ..... 7.64 to 8.54 lbf (3,47 to 3,87 kgf) 34,5 - 38,0 N

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**2.17 DIESEL ENGINE REPAIR - Continued.**

## D. REPAIR - Continued.

## BALANCER UNIT, CENTER MOUNTED

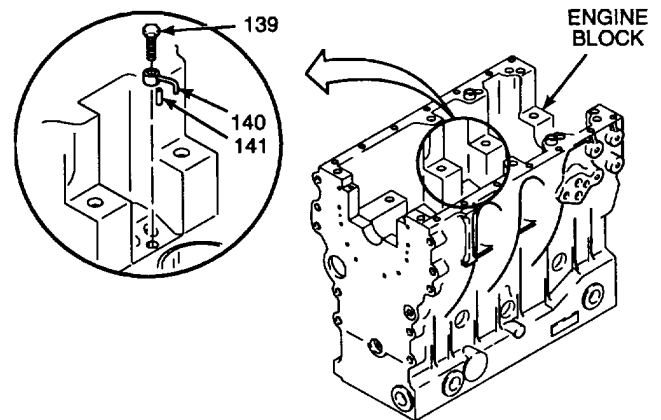
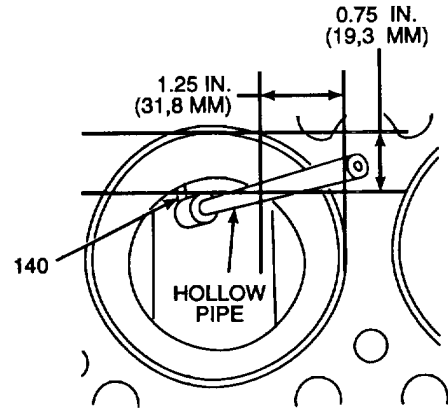
Drive shaft diameters	
At front bearing .....	1.124 to 1.125 in.(28,562 to 28,575 mm)
At rear bearing.....	0.936 to 0.937 in.(23,787 to 23,800 mm)
Oil pump drive splines	
Diameter .....	1.124 to 1.125 in.(28,562 to 28,575 mm)
Spur gear splines	
Diameter .....	0.650 to 0.651 in.(15,51 to 15,53 mm)
Diameter of front bearing bore (gear shaft) .....	1.374 to 1.375 in.(34,912 to 34,937 mm)
Front bearing (gear shaft)	
Outer diameter.....	1.3748 in.(34,92 mm)
Inner diameter .....	1.125 in.(28,58 mm)
Diameter of rear bearing bore (gear shaft).....	1.800 to 1.805 in.(29,972 to 29,993 mm)
Rear bearing (gear shaft)	
Outer diameter.....	1.181 in.(30,00 mm)
Inner diameter .....	0.937 in.(23,8 mm)
Diameter of balancer unit frame and frame end bushing bores .....	1.656 to 1.657 in.(42,070 to 42,095 mm)
Balance frame and frame end bushings	
Outer diameter.....	1.66 in.(42,164 mm)
Inner diameter .....	1.501 to 1.503 in.(38,133 to 38,174 mm)
Clearance of spur gear shafts in bushings .....	0.0025 to 0.0047 in.(0,064 to 0,120 mm)
Spur gears	
Shaft diameter .....	1.498 to 1.499 in.(38,054 to 38,069 mm)
Minimum and maximum backlash .....	0.004 to 0.010 in.(0,10 to 0,265 mm)
Backlash of gear shaft to spur gear .....	0.002 to 0.007 in.(0,051 to 0,200 mm)
End floats	
Spur gear.....	0.0073 to 0.0148 in.(0,186 to 0,377 mm)
Gear shaft.....	0.004 to 0.012 in.(0,10 to 0,30 mm)
Number of teeth on timing gear.....	37
Gear backlash	
Timing/gear shaft.....	0.003 to 0.014 in.(0,07 to 0,35 mm)
Engine crank/timing gear.....	0.004 to 0.016 in.(0,10 to 0,40 mm)
Inner diameter of gear bore.....	1.8754 to 1.8760 in.(47,635 to 47,650 mm)
Timing gear bearing	
Outer diameter.....	1.875 in.(47,62 mm)
Inner diameter .....	1.5 in.(38,1 mm)
Outer diameter of timing gear hub .....	1.4996 to 1.500 in.(38,090 to 38,100 mm)
Timing gear hub screw .....	7/16-20 UNF
Timing gear end float.....	0.003 to 0.009 in.(0,06 to 0,23 mm)
Flat washer	
Thickness .....	0.163 to 0.169 in.(4,14 to 4,29 mm)
Outer diameter.....	2.323 in.(59 mm)
Inner diameter .....	0.787 in.(20 mm)

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E. INSTALL.

1. INSTALL PISTON OIL PUMP JETS AND ALIGN IN ENGINE BLOCK.

- a. Turn engine block over so bottom of engine block is facing up.
- b. Use a pair of pliers to install dowel pins (141).
- c. Install piston oil pump jets (140), aligning hole in bottom of oil pump jet with dowel pin.
- d. Install pressure relief valve (139). Tighten valve hand tight.
- e. Insert a hollow pipe over end of piston oil pump jet (140). Hollow pipe must project over the top of the cylinder bore on the engine block.
- f. Adjust angle of hollow pipe to a point 0.75 in. (19,3 mm) from fuel injection pump side of the bore to and 1.25 in. (31,8 mm) from the engine front side of the bore.
- g. While holding hollow pipe in correct position, tighten pressure relief valve (139) to 20 lb-ft (27 N•m).



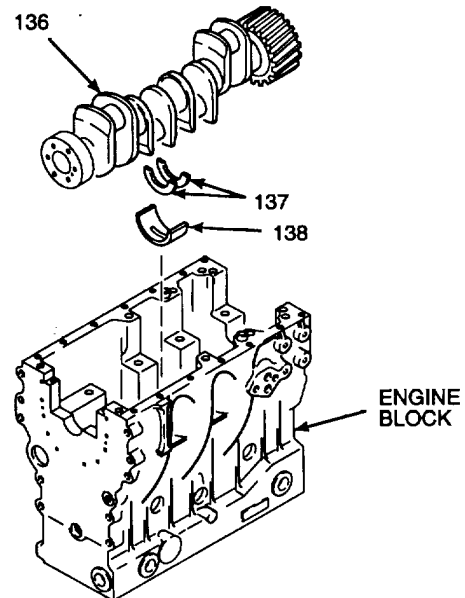
2. INSTALL MAIN SLEEVE BEARINGS, MAIN BEARING CAPS, CRANKSHAFT ASSEMBLY, REAR FILLER BLOCK, CRANKSHAFT SEAL, AND CRANKSHAFT SEAL HOUSING INTO ENGINE BLOCK.

- a. Lubricate main sleeve bearings (138) with engine oil.
- b. Install main sleeve bearings (138) on engine block.



**Crankshaft assembly is machined to precise tolerances. Do not bump crankshaft assembly against engine block when installing crankshaft assembly into engine block. Damage to crankshaft assembly may result from careless handling.**

- c. Install crankshaft assembly (136) into engine block.
- d. Lubricate thrust washer bearings (137) with engine oil.
- e. Install thrust washer bearings (137), with bronze side facing outward.



**GO TO NEXT PAGE**



**2.17 DIESEL ENGINE REPAIR - Continued.****E. INSTALL - Continued.****NOTE**

The main bearing caps are numbered starting with "1" at the front of the engine through a "5" at the rear of the engine.

- f. Install main sleeve bearings (134) into main bearing caps (133) in numerical order, starting with 1 at the front of the engine block.
- g. Lubricate thrust washer bearings (135) with engine oil.

**CAUTION**

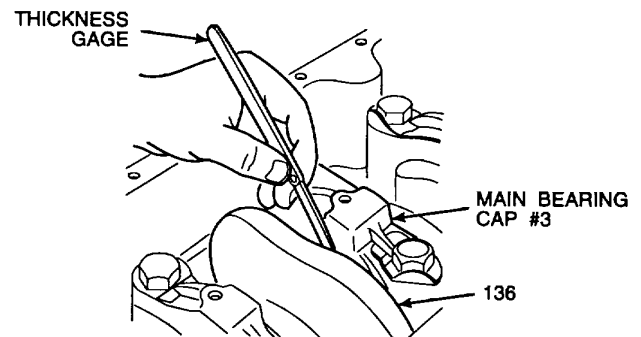
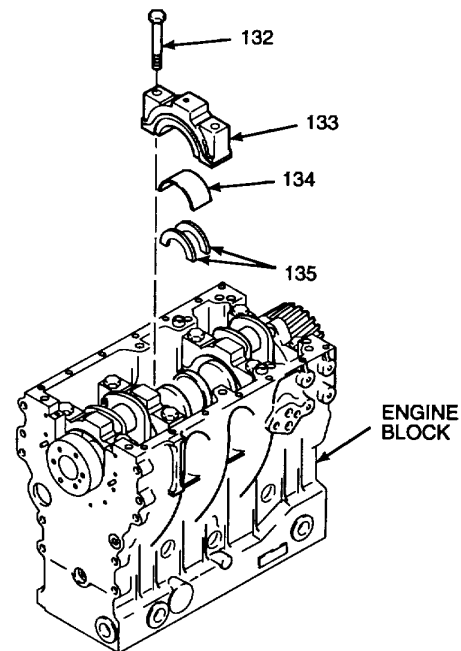
With bottom of engine block facing up, ensure that engine serial number stamp on main bearing caps is facing fuel injection pump side of engine block. Serious engine damage may result if main bearing caps are not installed correctly.

- h. Install main bearing caps (133). Ensure thrust washer bearings (135) are assembled to bearing cap #3 with bronze side facing toward crankshaft assembly (136).

**NOTE**

Lightly lubricate threads and underside of heads of main bearing screws with engine oil before assembly.

- i. Install main bearing screws (132). Tighten to 180 lb-ft (244 N•m).
- j. Using a large, flat-blade screwdriver, thrust crankshaft assembly (136) forward and check end float at main bearing cap #3.
- k. Use a thickness gage to check crankshaft assembly (136) end float. Crankshaft assembly end float must be 0.004 to 0.015 in. (0,10 to 0,38 mm).

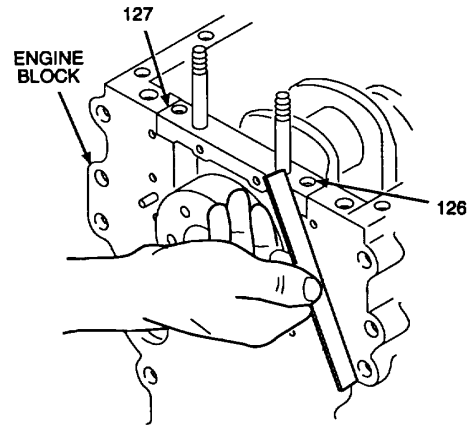


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E. INSTALL - Continued.

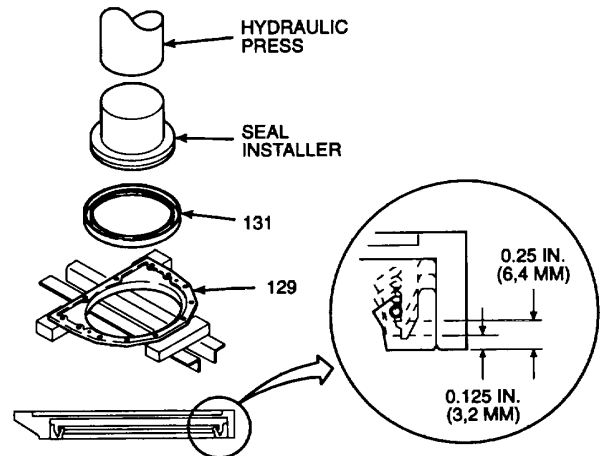
**WARNING**

Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.



1. Apply a coating of gasket sealing compound to surfaces of rear filler block (127) that meet engine block.

- m. Install rear filler block (127).
- n. Place a steel machinist's rule against rear of engine block, extending across rear filler block (127).
- o. Set rear filler block (127) flush with rear of engine block.
- p. Install and tighten socket head cap screws (126).
- q. Place crankshaft seal housing (129) on a hydraulic press frame, with front side facing down.
- r. Lubricate outside of crankshaft seal (131) and inside diameter of crankshaft seal housing (129) with engine oil.



**NOTE**

When installing a new crankshaft assembly, press crankshaft seal into crankshaft seal housing until outside diameter of seal is flush with the inside diameter of chamfer on rear of housing.

When a worn crankshaft assembly is installed, crankshaft seal must be seated 0.125 in. (3, 2 mm) from rear of crankshaft seal housing.

If this position on crankshaft seal housing has been used, crankshaft seal must be fitted 0.25 in. (6, 4 mm) from rear of crankshaft seal housing.

- s. Use seal installer (Item 81, Appendix D) to press in new crankshaft seal (131) until seal is positioned in appropriate location for condition of crankshaft assembly.

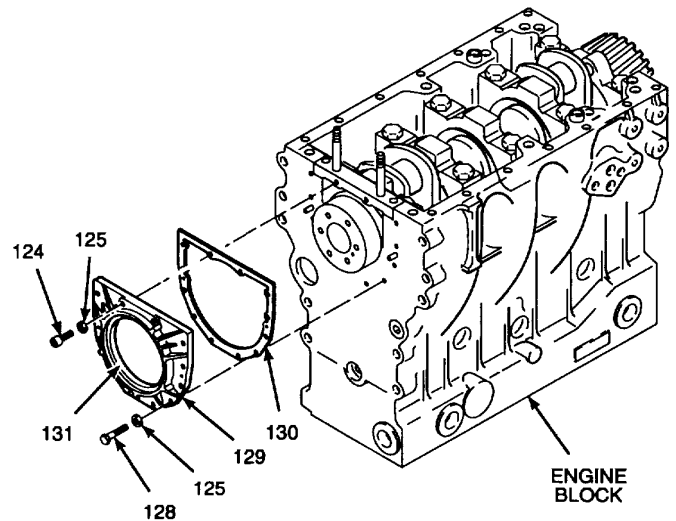
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2-211

2.17 DIESEL ENGINE REPAIR - Continued.

E. INSTALL - Continued.

**WARNING**

Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.



- t. Apply a thin coat of gasket sealing compound to both sides of gasket (130).
- u. Install gasket (130).
- v. Lubricate new crankshaft seal (131) with engine oil.
- w. Install crankshaft seal housing (129), securing with flat washers (125) and screws (128). Tighten screws.
- x. Install flat washers (125) and socket head cap screws (124). Tighten socket head cap screws.

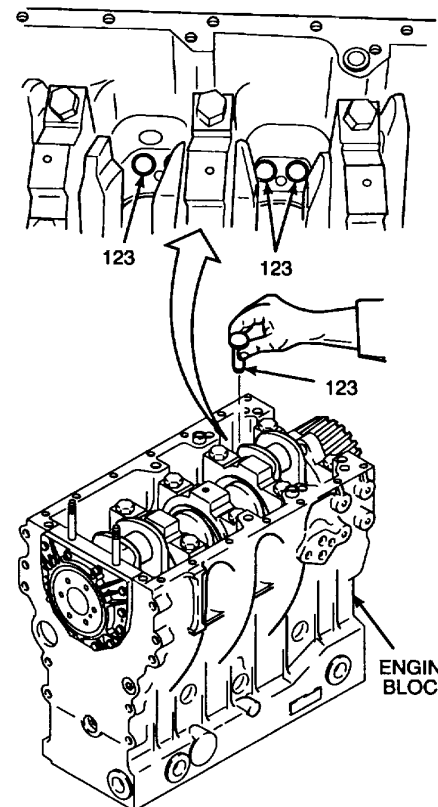
3. INSTALL MAIN BEARING THIMBLES AND CAMSHAFT INTO ENGINE BLOCK.

- a. Lubricate main bearing thimbles (123) with clean engine oil.

**NOTE**

Main bearing thimbles must be installed in engine block in the same order in which they were removed.

- b. Install main bearing thimbles (123) into engine block, in the same order in which they were removed.



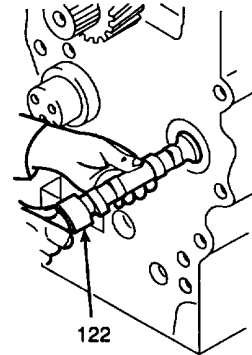
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E. INSTALL - Continued.

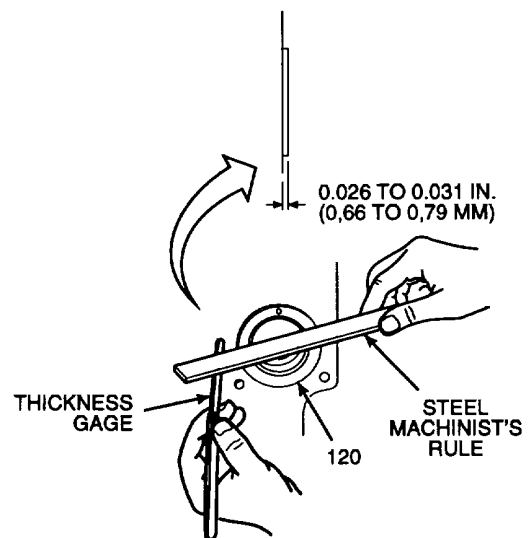
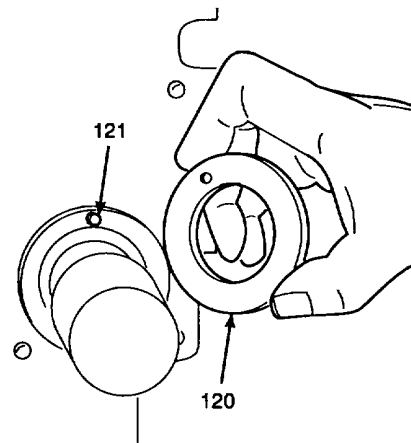
- c. Lubricate camshaft (122) with clean engine oil.



**Camshaft is machined to precise tolerances. Do not bump camshaft against engine block during installation. Damage to camshaft and engine may result from nicks or dents in camshaft surface.**



- d. Install camshaft (122) into engine block.
- e. Lubricate camshaft thrust washer (120) with clean engine oil.
- f. Install camshaft thrust washer (120), with hole for dowel (121) aligned with hole in engine block.
- g. Install dowel (121) until flush with surface of camshaft thrust washer.
- h. Place a steel machinist's rule across face of camshaft thrust washer (120).
- i. Use a thickness gage to check camshaft thrust washer (120) protrusion beyond front face of engine block. Camshaft thrust washer protrusion must be 0.026 to 0.031 in. (0,66 to 0,79 mm).



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## 2.17 DIESEL ENGINE REPAIR - Continued.

E. INSTALL - Continued.

## 4. INSTALL AND ALIGN FLYWHEEL HOUSING ON ENGINE BLOCK.

- a. Attach two hex head screw caps to inner most flywheel housing lifter holes.

<b>WARNING</b>
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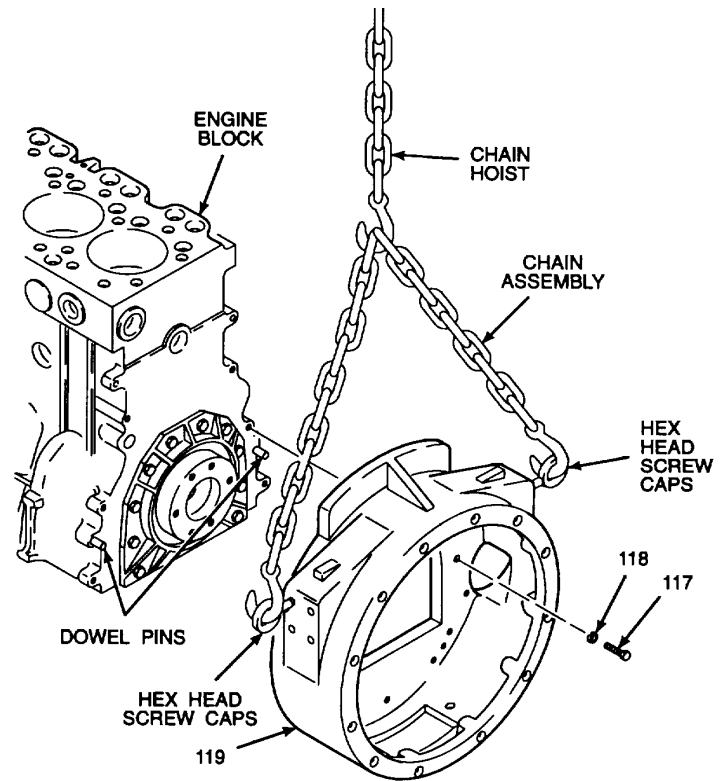
Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.

Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause serious injury or death to personnel.

Do not allow heavy components to swing while hanging by lifting device. Equipment may strike personnel and cause serious injury.

Exercise extreme caution when working near a cable or chain under tension. A snapped cable or a shifting or swinging load may cause injury or death to personnel.

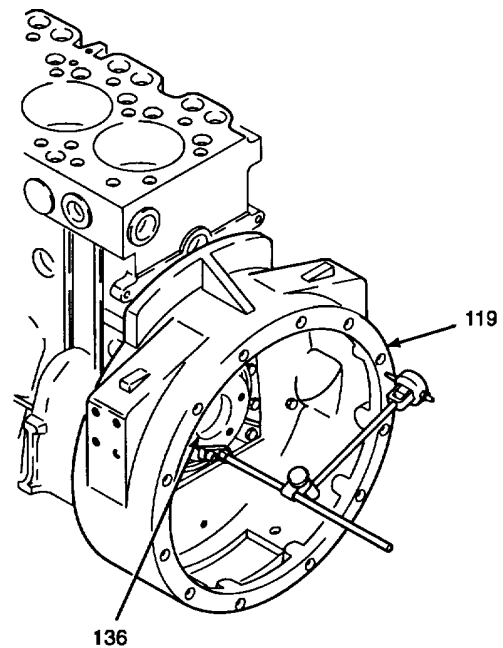
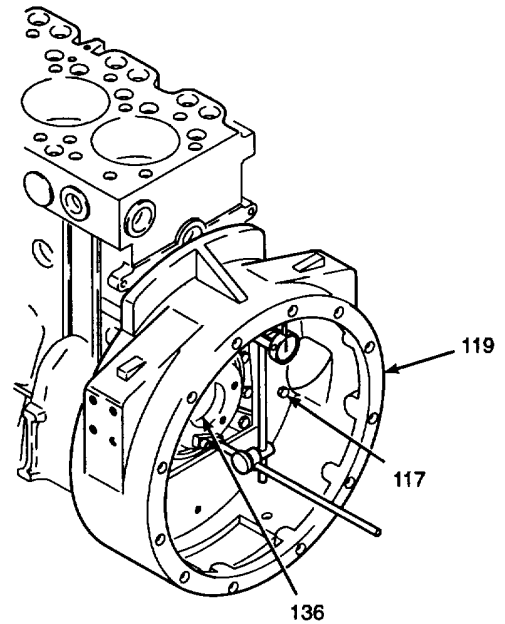
- b. Attach chain hoist to hex head screw caps.
- c. Remove any dirt or foreign material on mating surfaces of flywheel housing (119) and engine block with a cleaning cloth.
- d. Lift flywheel housing (119) into position on engine block dowel pins.
- e. Align and seat flywheel housing (119) on rear of engine block.
- f. Install lockwashers (118) and bolts (117). Tighten bolts to 36 lb-ft (48 N•m).



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## E. INSTALL - Continued.

- g. Attach a dial indicator to end of crankshaft assembly (136).
- h. Measure concentric alignment of flywheel housing (119) from center of crankshaft assembly.
- i. Flywheel housing (119) concentric alignment must be within a total reading of 0.008 in. (0, 20 mm) from center of crankshaft assembly.
- j. If flywheel housing is not within a total reading of 0.008 in. (0, 20 mm), loosen bolts (117).
- k. Use a soft head hammer to tap flywheel housing (119) in direction of lower reading.
- l. Tighten bolts (117) to 36 lb-ft (48 N.m).
- m. Repeat until flywheel housing is in tolerance or replace flywheel housing.
- n. Use dial indicator, attached to crankshaft assembly (136), to measure perpendicular alignment of flywheel housing (119) from center of crankshaft assembly.
- o. Flywheel housing (119) must be within a total reading of 0.008 in. (0, 20 mm) limit from center of crankshaft assembly.
- p. If flywheel housing is not within a total reading of 0.008 in. (0, 20 mm), ensure rear face of engine block and mating face of flywheel housing are clean.
- q. Recheck perpendicular alignment.
- r. If flywheel housing is still not within tolerance, replace flywheel housing.



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## 2.17 DIESEL ENGINE REPAIR - Continued.

## E. INSTALL - Continued.

## 5. INSTALL AND ALIGN FLYWHEEL ON ENGINE BLOCK.

- a. Insert flywheel guide pins in two opposing crankshaft assembly (136) holes.
- b. Remove any dirt or foreign material on mating surfaces of flywheel and crankshaft assembly (136) with a cleaning cloth.

**WARNING**

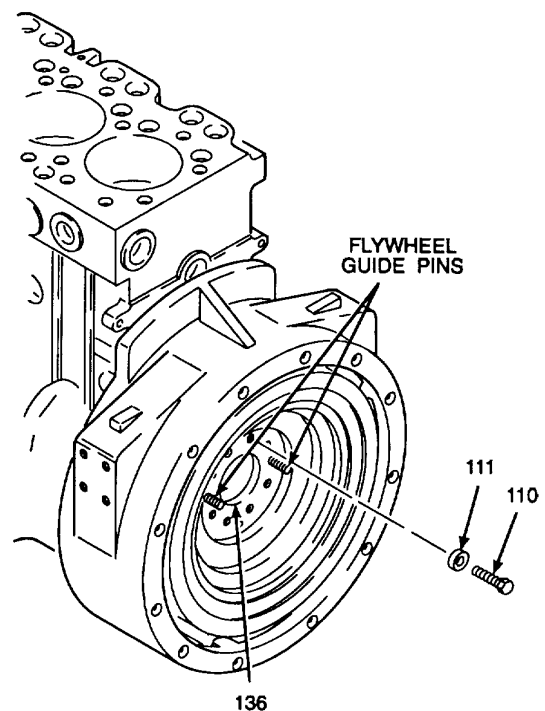
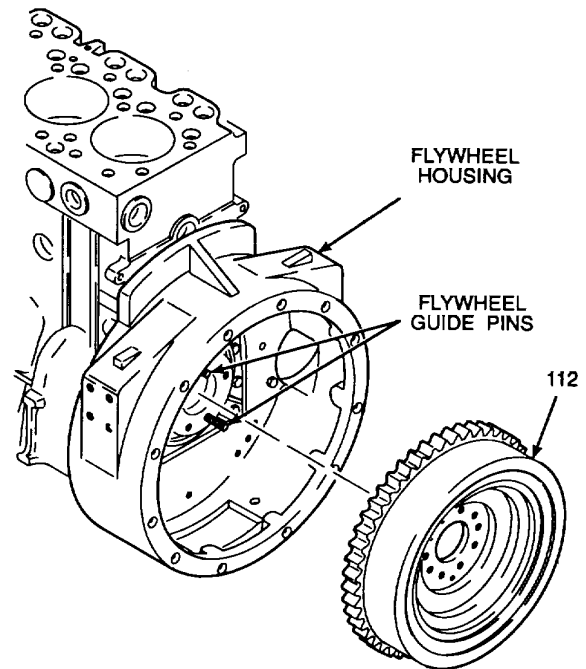
Use caution when installing flywheel. Flywheel is heavy and, if dropped, may cause serious injury. Have an extra person assist with installation of flywheel.

- c. With the help of another person, install and slide flywheel (112) up against crankshaft assembly and onto guide pins.

**WARNING**

Flywheel is heavy and may cause serious personnel injury if dropped. Do not allow weight of flywheel to shift and fall from flywheel housing. Hold flywheel against crankshaft assembly so it will not fall.

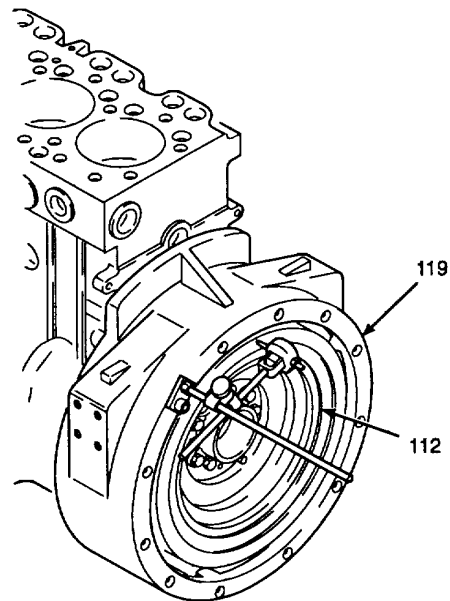
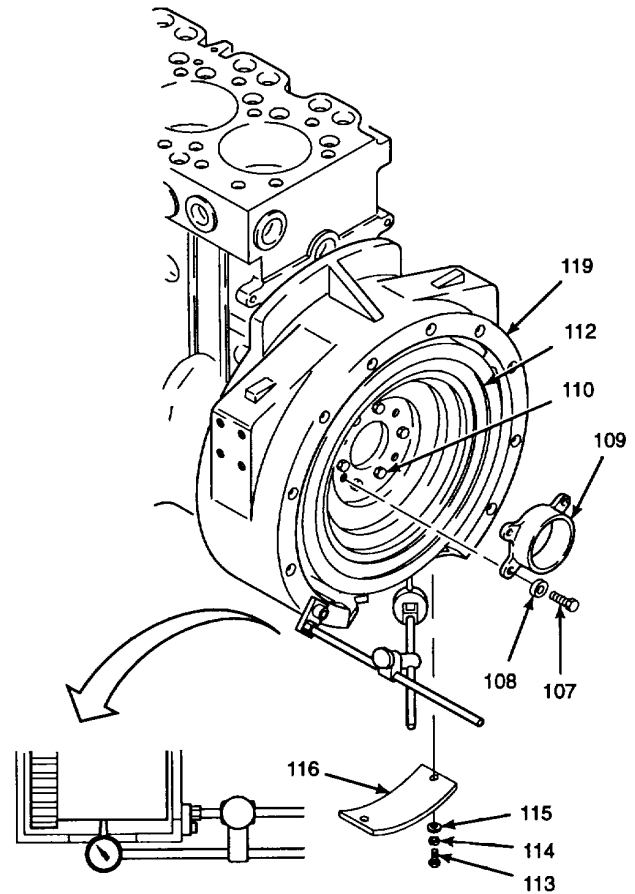
- d. While holding flywheel (112) against crankshaft assembly (136), install flat washers (111), and hex head cap screws (110). Remove flywheel guide pins and install remaining flat washers and hex head cap screws. Tighten to 80 lb-ft (108 N•m).



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E. INSTALL - Continued.

- e. Install a dial indicator onto edge of flywheel housing (119).
- f. With tip of dial indicator against outer diameter of flywheel (112), turn flywheel and measure trueing of flywheel.
- g. Flywheel trueing must be within 0.012 in. (0, 30 mm) of total dial indicator reading.
- h. If flywheel is not within 0.012 in. (0, 30 mm) of total dial indicator reading, loosen hex head cap screws (110).
- i. Tap flywheel in opposite direction of higher reading.
- j. Tighten hex head cap screws (110) to 80 lb-ft (108 N.m).
- k. Install housing (109) with flat washers (108) and screws (107). Tighten to 36 lb-ft (48 N.m).
- l. Install pressure plate (116) and secure with flat washers (115), lockwashers (114), and hex head cap screws (113). Tighten cap screws to 80 lb-ft (108 N.m).
- m. Press flywheel (112) toward engine block to take up crankshaft assembly end float.
- n. Use dial indicator, attached to edge of flywheel housing (119), to measure outermost point of machined face runout of flywheel (112), in 1.0 in. (25, 0 mm) increments.
- o. Flywheel runout must be within 0.001 in. (0, 025 mm) per 1.0 in. (25, 0 mm) of flywheel radius from crankshaft assembly axis to dial indicator tip.
- p. If flywheel is out of tolerance, replace flywheel (112) or crankshaft assembly.
- q. Remove dial indicator.



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## 2.17 DIESEL ENGINE REPAIR - Continued.

## E. INSTALL - Continued.

## 6. INSTALL SLEEVE BUSHING, GUDGEON PIN, RETAINING RINGS, SLEEVE BEARINGS, AND CONNECTING ROD ASSEMBLIES ONTO PISTON.

**NOTE**

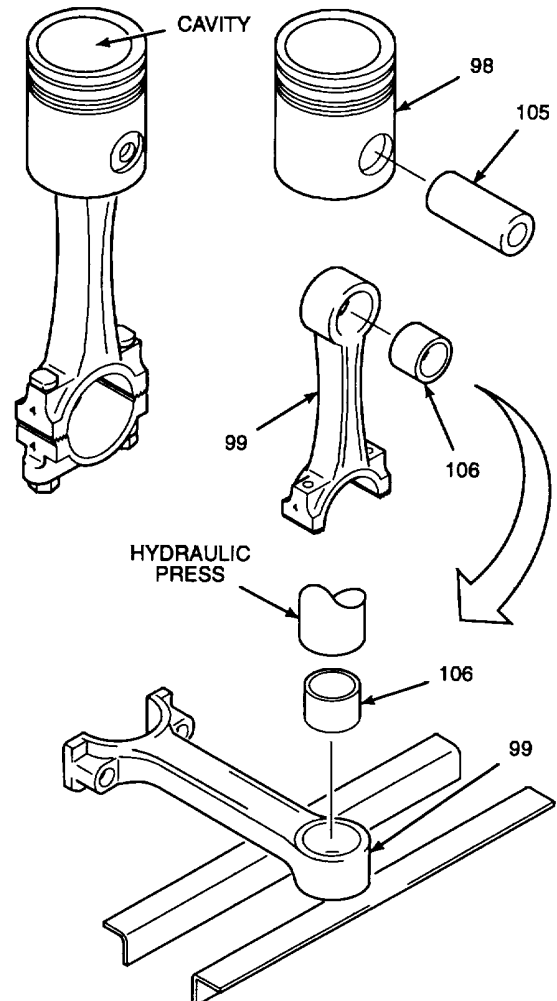
**New sleeve bushings will need to be machined to match profile of small end on connecting rod assembly.**

- a. Install sleeve bushing (106) into connecting rod assembly (99) using hydraulic press frame and universal puller kit. Ensure oil hole in sleeve bushing aligns with oil hole in connecting rod assembly.
- b. Ream new sleeve bushings to correct size and align with gudgeon pin. Refer to service wear limits section.

**NOTE**

**Cavity on top of piston is offset toward rod and cap identification number on connecting rod assembly. Piston and connecting rod assembly must be assembled with piston cavity offset toward rod and cap identification number on connecting rod assembly.**

- c. Place connecting rod assembly (99) inside piston (98), with piston cavity offset toward rod and cap identification number on connecting rod assembly.
- d. Install gudgeon pin (105) through piston (98) and connecting rod assembly (99).



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E. INSTALL - Continued.

**WARNING**

Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- e. Use inside snap ring pliers to install retaining rings (104).
- f. Using piston ring expanding tool, install piston ring (101) on piston, with latch pin entering both ends of the spring.
- g. Install piston ring (102) on piston with manufacturer's mark facing toward top of piston.
- h. Install piston ring (103) on piston, with manufacturer's mark facing toward top of piston.

**NOTE**

If sleeve bearings are reused after removal, make sure sleeve bearings are reassembled in original position as tagged.

- i. Install sleeve bearings (100) on connecting rod assembly (97). Ensure oil hole in sleeve bearing aligns with oil hole in connecting rod assembly.
- j. Lubricate sleeve bearings (100) generously with engine oil.

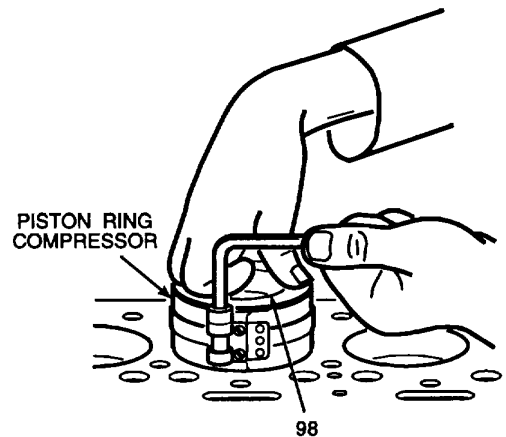
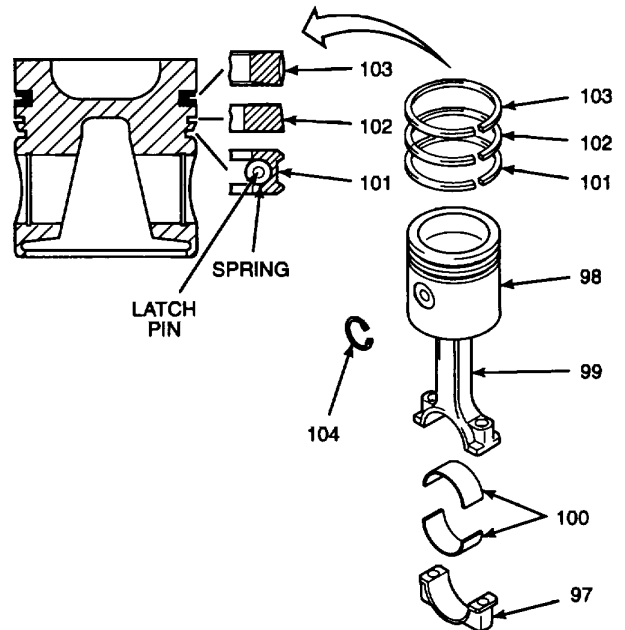
7. INSTALL PISTONS AND CONNECTING ROD ASSEMBLIES INTO ENGINE.

- a. Lubricate each cylinder bore and piston generously with clean engine oil.

**NOTE**

Each piston and connecting rod assembly must be replaced in the same cylinder bore from which it was removed. Use the following list of checks to make sure piston was assembled correctly, and is replaced in correct position.

Piston and connecting rod assembly number must match (1 through 4) cylinder bore number.



**NOTE**

Rod identification number must be on the fuel injection pump side of connecting rod assembly.

The word "FRONT" marked on piston crown must point toward front of engine.

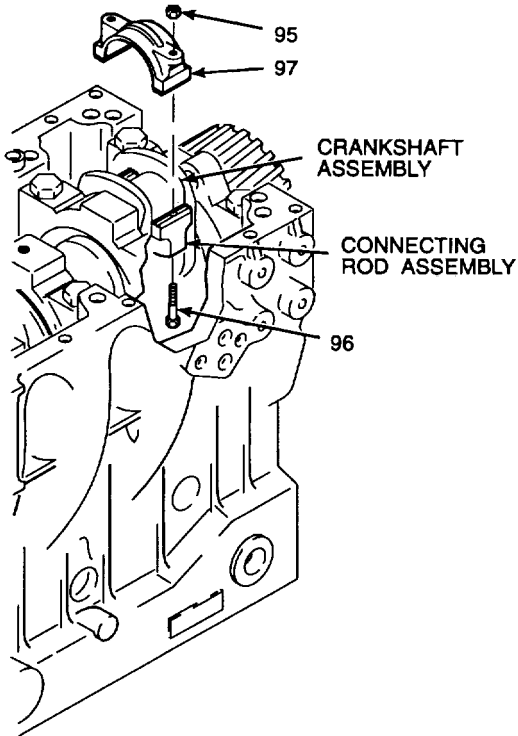
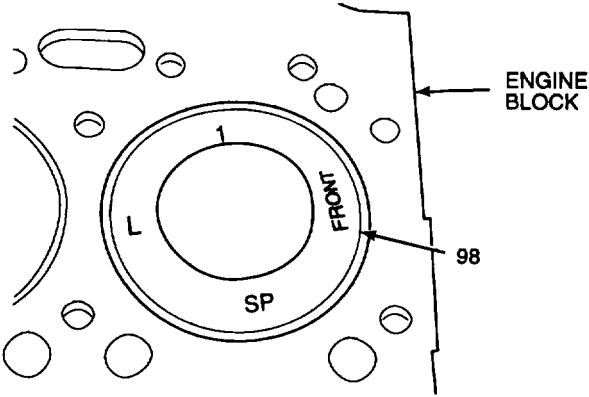
- b. Use a piston ring compressor to insert pistons (98) into respective cylinder bores.

GO TO NEXT PAGE

2.17 DIESEL ENGINE REPAIR - Continued.

E. INSTALL - Continued.

- c. Orient piston (98) as required, so the word "FRONT" faces the front of engine block.
- d. Push piston (98) into engine block until connecting rod assembly is seated on crankshaft assembly.
- e. Install connecting rod assembly (97) cap and secure with bolts (96) and connecting rod nuts (95). Tighten nuts to 90 lb-ft (122 N.m).



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## E. INSTALL - Continued.

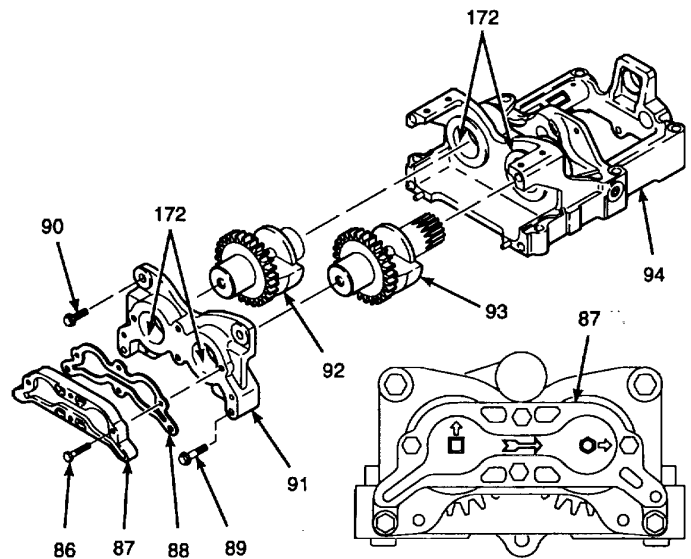
## 8. INSTALL SPUR GEARS, BALANCER UNIT FRAME END, OIL PUMP, GEAR SHAFT, OIL RELIEF VALVE, AND TIMING GEAR ONTO BALANCER UNIT.

- a. Lubricate sleeve bushings (172) in balancer unit frame end (91) and frame (94) with clean engine oil.



Spur gears are heavy and may damage sleeve bushings when installed. Do not damage sleeve bushings when installing gears. Install gears slowly and keep gears level with balancer unit frame during installation.

- b. Install spur gears (93 and 92) into balancer unit frame (94), with flat areas in line with one another.
- c. Install balancer unit frame end (91) and bolts (90 and 89). Tighten to 40 lb-ft (54 Nom).



Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

- d. Apply a thin coating of gasket sealing compound to both sides of gasket (88).
- e. Install gasket (88) and cover (87), with hexagonal symbol on right and square symbol on left.
- f. Install screws (86). Tighten to 24 lb-ft (33 N.m).

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## 2.17 DIESEL ENGINE REPAIR - Continued.

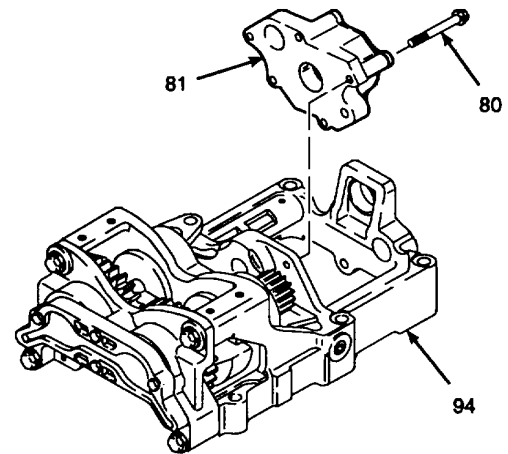
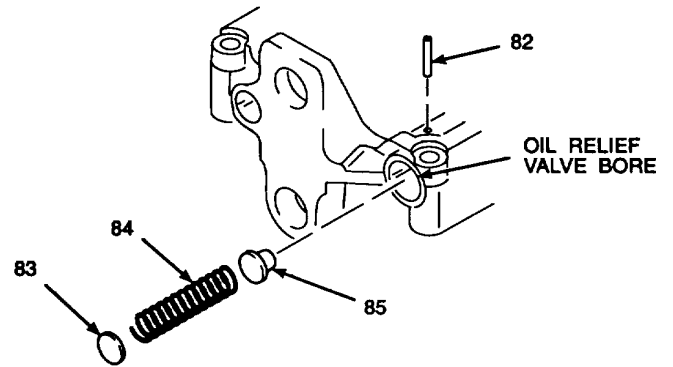
## E. INSTALL - Continued.

- g. Lubricate oil relief valve bore with clean engine oil.
- h. Install plunger (85), spring (84), and cap (83).

**WARNING**

Use caution when installing spring pin. Spring held by spring pin is under tension. Personnel injury may result from sudden release of spring from oil balancer unit. Do not place fingers over spring when installing spring pin.

- i. Compress spring with a flat-blade screwdriver and install spring pin (82).
- j. Install oil pump (81) onto balancer unit frame (94).
- k. Install machine screws (80). Tighten to 22 lb-ft (30 N•m).



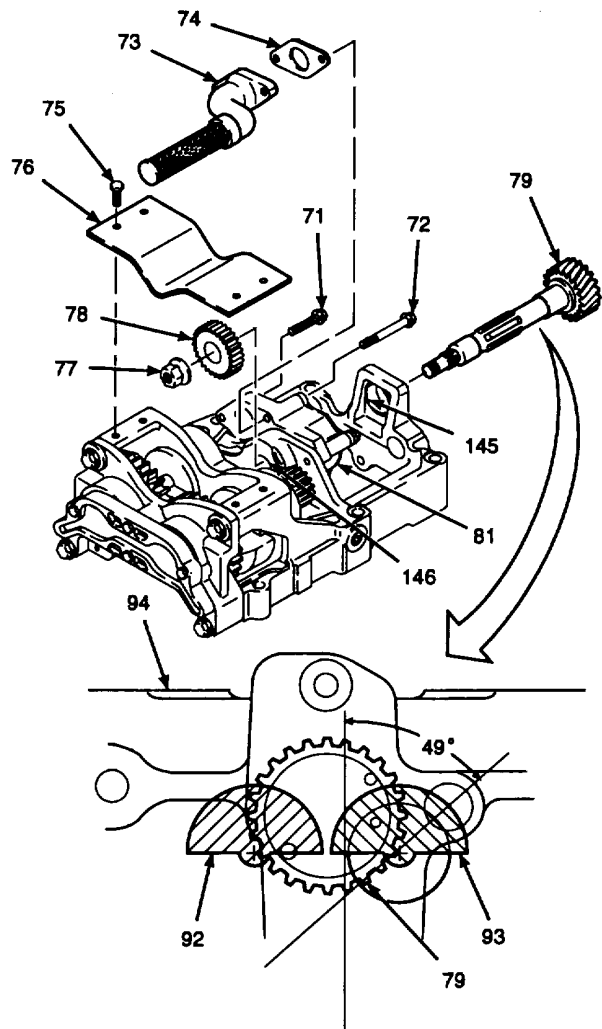
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E. INSTALL - Continued.

**CAUTION**

Do not damage gear shaft threads and needle bearings when installing gear shaft into oil pump. Oil pump damage and engine damage may result from a damaged gear shaft. Slide gear shaft slowly into oil pump when installing.

1. Lubricate needle bearings (145 and 146) with clean lubricating oil.
- m. Turn spur gears (93 and 92) until flat areas are aligned with one another, with both weighted ends facing directly up. Use a small piece of wood wedged between gear teeth to maintain this position, if required.
- n. Position gear shaft (79) to its timed position, with both holes in gear shaft outside face at a 49° angle, smaller hole on right, pointing up.
- o. Install gear shaft (79) through oil pump (81), keeping holes in face of gear shaft at a 49° angle, with smallest hole on right, pointing up.



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If thread locking compound contacts eyes, flush eyes with water and get immediate medical attention.

- p. Apply thread locking compound to both splines of gear shaft (79).

**NOTE**

Keep torque wrench and crowfoot wrench at a 90° angle to one another when tightening hex nut (77).

- q. Install spur gear (78) and hex nut (77). Hold gear shaft (79) by inserting an aligning punch into hole(s) in outside face of gear shaft. Use a socket wrench adapter and a crowfoot wrench to tighten hex nut to 70 lb-ft (95 N•m).
- r. Ensure gear shaft (79) turns freely in oil pump (81).
- s. Install balancer unit cover (76) hex head cap screws (75). Tighten to 8 lb-ft (10 N.m).
- t. Install gasket (74), tube (73), machine screws (72), and hex head cap screws (71). Tighten machine screws to 22 lb-ft (30 N•m).

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2-223

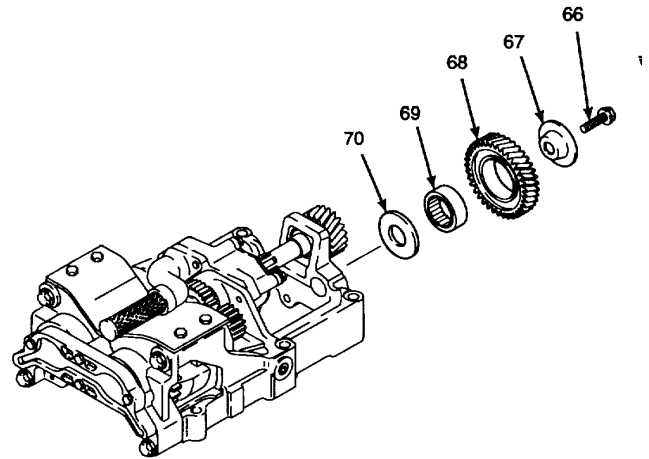
2.17 DIESEL ENGINE REPAIR - Continued.

E. INSTALL - Continued.

u. Lubricate flat washer (70) with engine oil.

v. Install bearing (69) into timing gear (68).

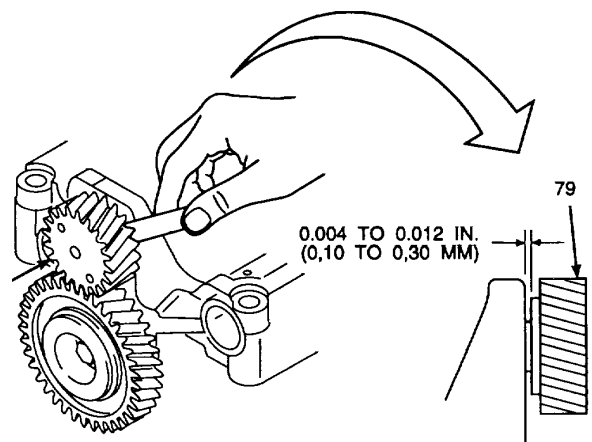
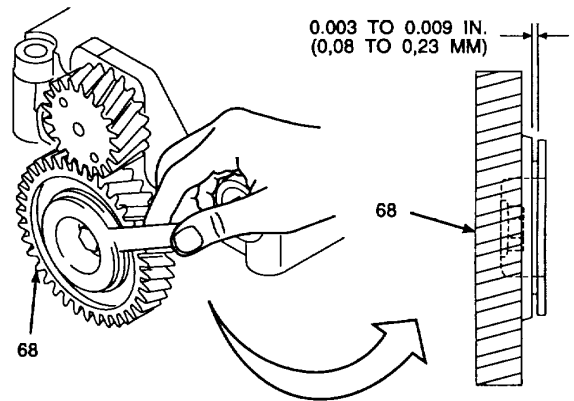
w. Install timing gear (68) and hub (67).



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If thread locking compound contacts eyes, flush eyes with water and get immediate medical attention.

- x. Apply thread locking compound to screw (66).
- y. Install screw (66). Tighten to 55 lb-ft (75 N.m).
- z. Use a thickness gage to check end float of timing gear (68). End float of timing gear must be 0.003 to 0.009 in. (0,08 to 0,23 mm).
- aa. Use a thickness gage to check gear shaft (79) end float. Gear shaft end float must be 0.004 to 0.012 in. (0,10 to 0,30 mm).

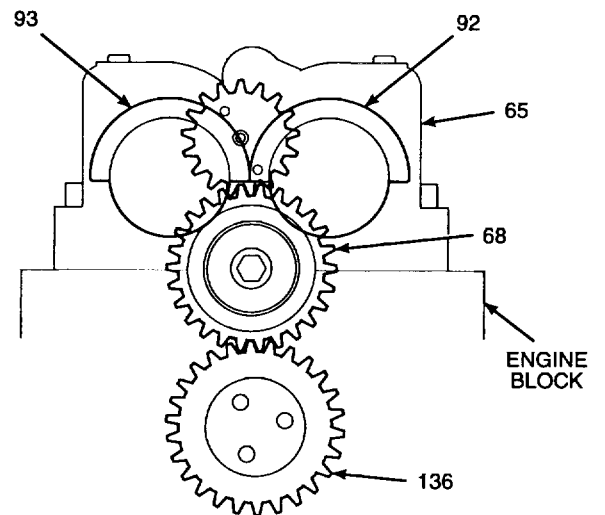
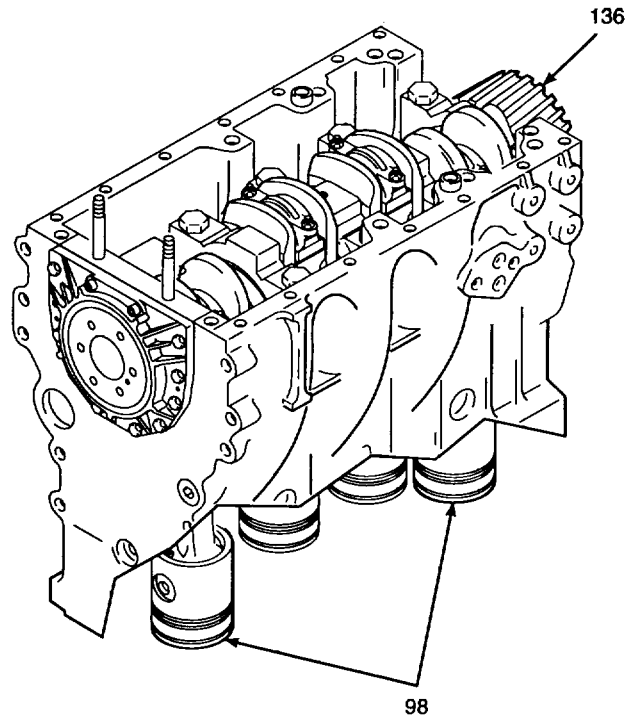


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E. INSTALL - Continued.

9. INSTALL BALANCER UNIT INTO ENGINE.

- a. Turn crankshaft assembly (136) to place pistons (98) 1 and 4 at top dead center position in engine block.
- b. Place balancer unit (65) on engine block, without engaging timing gear (68) with crankshaft assembly (136).
- c. While observing positions of spur gears (93 and 92), turn timing gear (68) until both gears are level and facing up, directly away from engine block.
- d. With spur gears facing away from engine block, engage timing gear (68) with crankshaft assembly (136).



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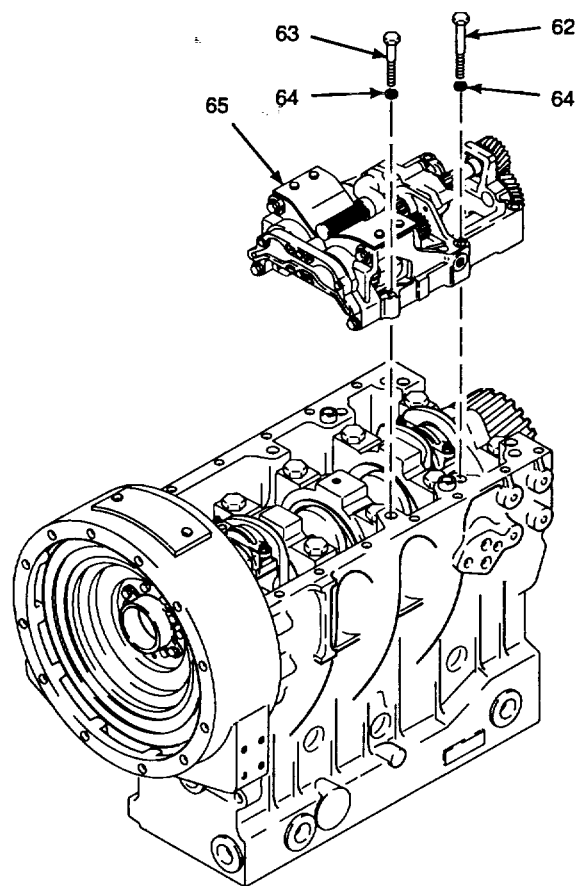
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**2.17 DIESEL ENGINE REPAIR - Continued.**

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**E. INSTALL - Continued.**

- e. Install flat washers (64) screws (63), hex head cap screws (62), and balancer unit (65) into engine. Tighten screws and hex head cap screws to 40 lb-ft (50 Nm).



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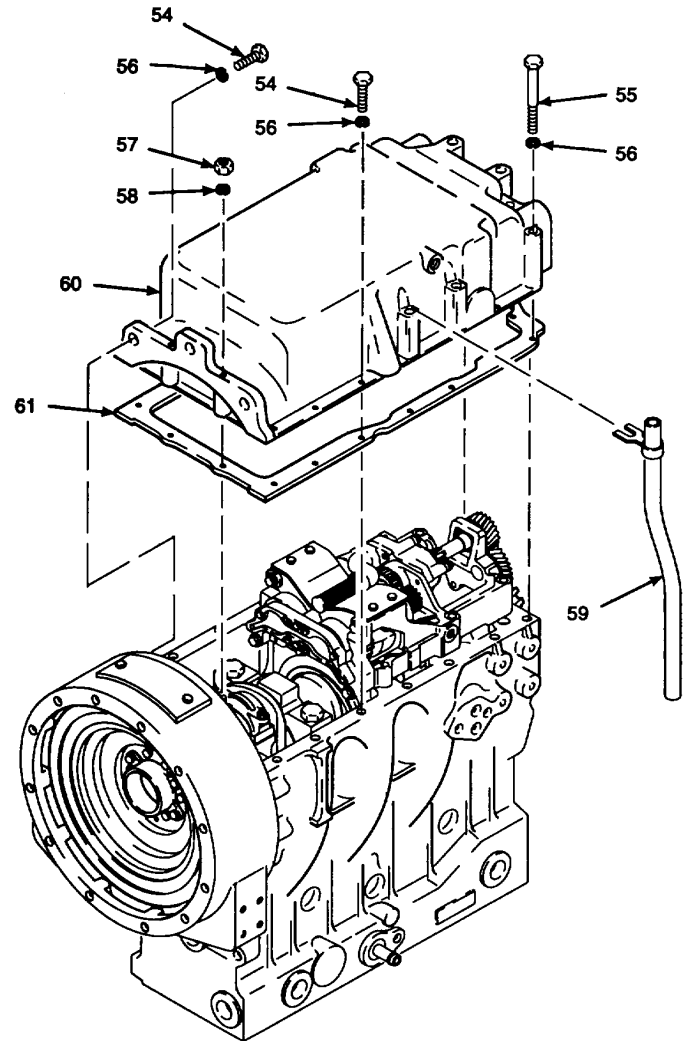
## E. INSTALL - Continued.

10. INSTALL OIL BREATHER HOSE, DRAIN LINE STRAIGHT ADAPTER, DIPSTICK, AND OIL SUMP ONTO ENGINE.

**WARNING**

Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

- a. Apply a thin coating of gasket sealing compound to both sides of gasket (61)
- b. Install gasket (61) and oil sump (60).
- c. Install lockwashers (58) and hex nuts (57).
- d. Install lockwashers (56) and bolts (55).
- e. Install oil breather hose (59), lockwashers (56), and screws (54).
- f. Tighten all fasteners evenly around oil sump.



**GO TO NEXT PAGE**

E. INSTALL - Continued.

- g. Install dipstick tube (51) by threading dipstick bushing (50) into oil sump. Orient dipstick tube to point away from engine block.
- h. Install dipstick (49).



Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

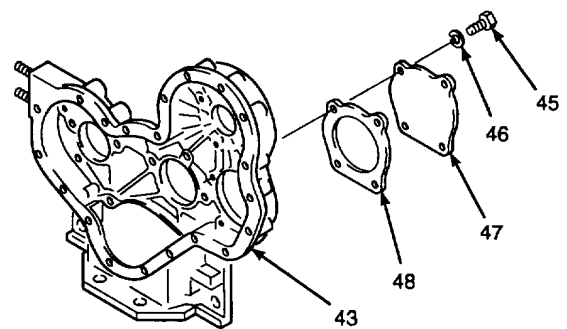
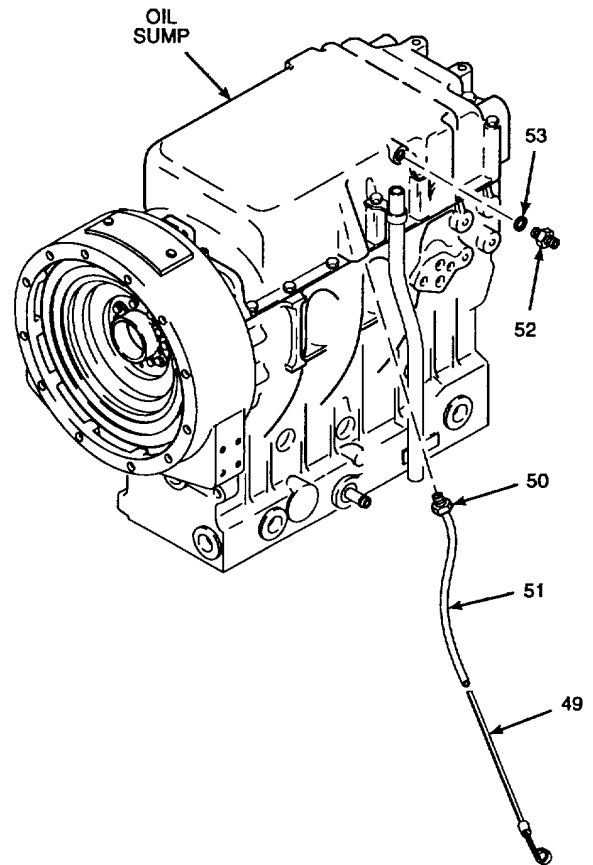
- i. Install preformed packing (53) onto drain line straight adapter (52) and install adapter.

11. INSTALL TIMING GEAR HOUSING, IDLER GEAR HUB, IDLER GEAR, CAMSHAFT GEAR, FUEL INJECTION PUMP GEAR, TIMING GEAR COVER SEAL, TIMING GEAR COVER, AND CRANKSHAFT PULLEY ONTO ENGINE.



Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

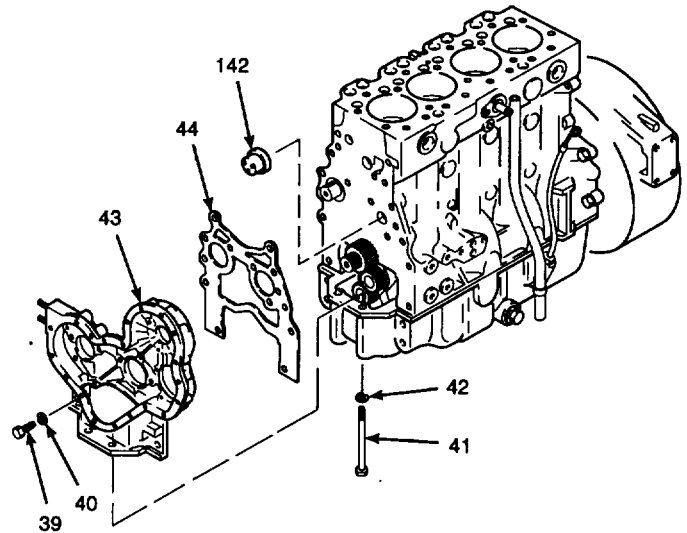
- a. Apply a thin coating of gasket sealing compound to both sides of gasket (48).
- b. Install gasket (48), blanking plate (47), lockwashers (46), and hex head cap screws (45) onto timing gear housing (43).



## E. INSTALL - Continued.

**WARNING**

Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.



- c. Apply a thin coating of gasket sealing compound to both sides of gasket (44).

**NOTE**

**When installing a new gasket, it may be necessary to trim gasket legs to ensure a flush fit with oil sump gasket.**

- d. Install gasket (44) and timing gear housing (43) onto engine block.
- e. Install lockwashers (42) and bolts (41).
- f. Install lockwashers (40) and bolts (39).
- g. Install idler gear hub (142) onto engine block.

**GO TO NEXT PAGE**

2.17 DIESEL ENGINE REPAIR - Continued.

E. INSTALL - Continued.

- h. Turn crankshaft assembly (136) until two timing marks on crankshaft gear are at the one o'clock position.

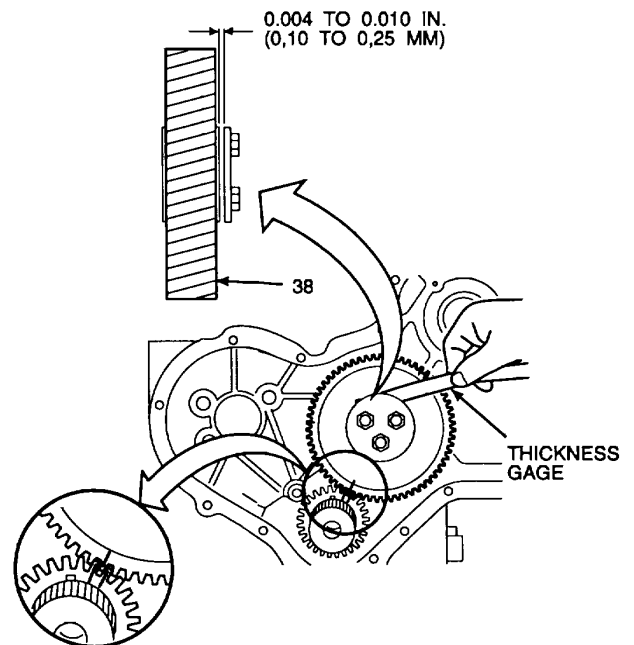
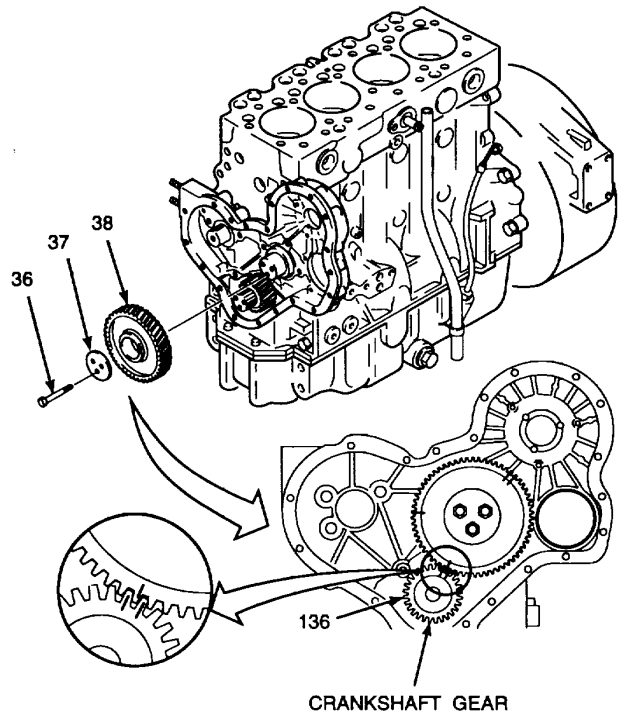
**WARNING**

**Ensure oil hole in idler gear hub aligns with hole in engine block before installation of idler gear. Serious engine damage may result if oil holes do not align.**

- i. Install idler gear (38) with single timing mark aligned between two timing marks on crankshaft gear.
- j. Install retaining plate (37) and hex head cap screws (36). Tighten hex head cap screws to 30 ft-lb (40 N.m).
- k. Use a thickness gage to measure idler gear (38) end float. Idler gear end float must be 0.004 to 0.010 in. (0, 10 to 0, 25 mm).

**NOTE**

**With correct timing mark on idler gear aligned with two timing marks on crankshaft gear, there will also be a single mark at 9 o'clock and a dual mark at 2 o'clock.**



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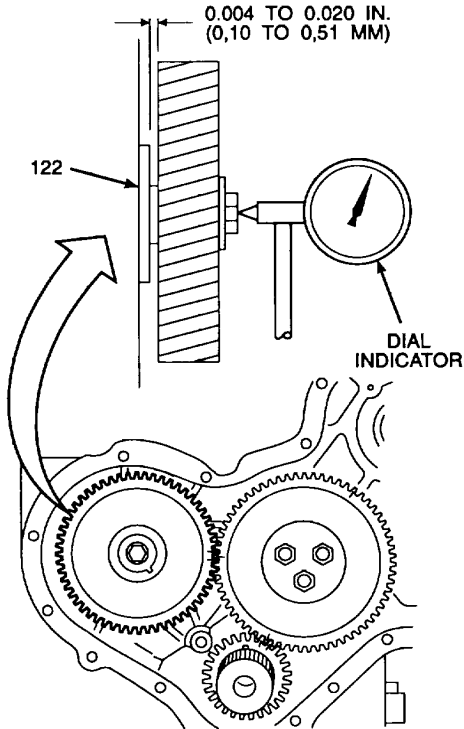
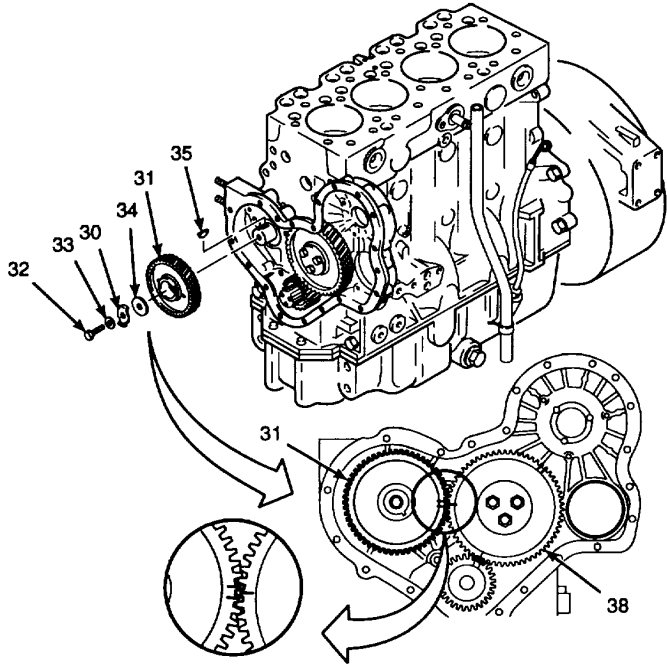
E. INSTALL Continued.

- 1. Install woodruff key (35) into camshaft.

**NOTE**

**Camshaft gear must be drawn onto camshaft by installation and tightening of fasteners. Hold camshaft gear in position while installing fasteners on camshaft.**

- m. Install camshaft gear (31) with two timing marks aligned on either side of single timing mark on idler gear (38).
- n. While holding camshaft gear (31) in correct position, install washer (34), retaining washer (30), washer (33), and screw (32). Tighten screw to 30 lb-ft (41 N.m) to secure camshaft gear.
- o. Use a flat-blade screwdriver to bend tab on retaining washer (30) over edge of screw (32).
- p. Use a dial indicator to measure camshaft (122) end float. Camshaft end float must be 0.004 to 0.020 in. (0, 10 to 0, 51 mm).

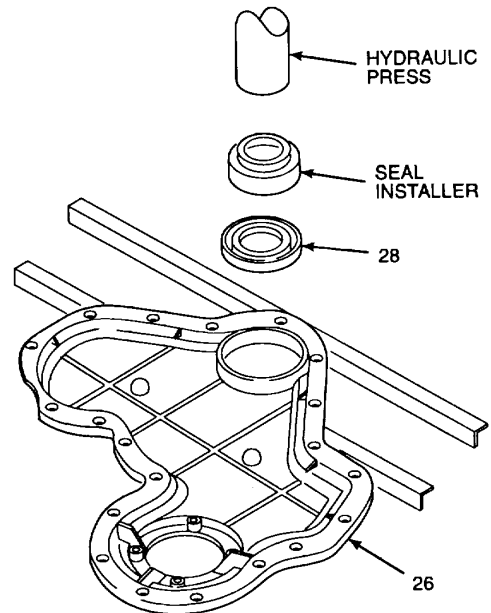
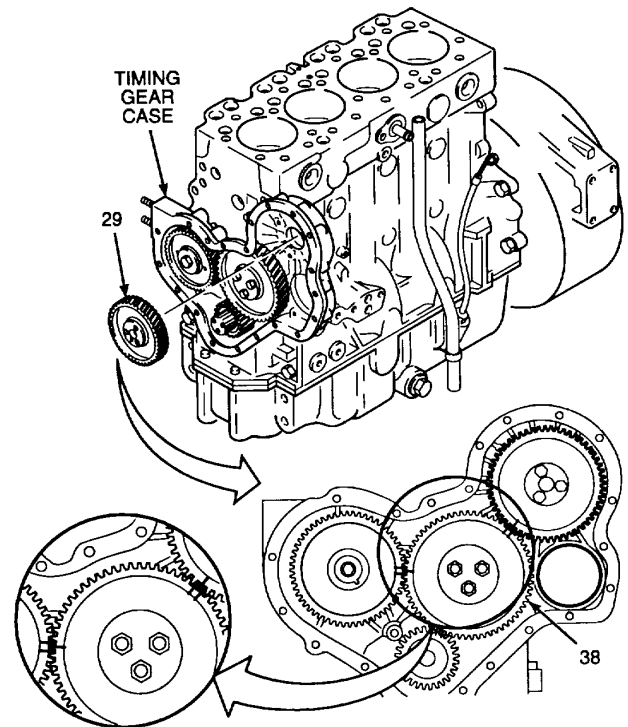


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2.17 DIESEL ENGINE REPAIR - Continued.

E. INSTALL Continued.

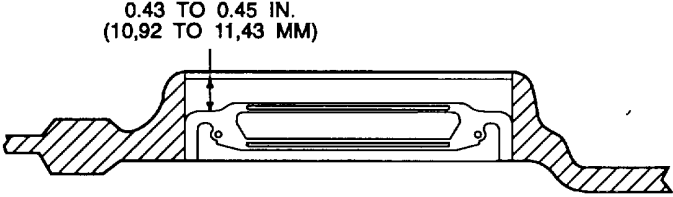
- q. Install fuel injection pump gear (29) loose inside timing gear housing, with single timing mark aligned between two timing marks on idler gear (38).
- r. Place timing gear cover (26) on a hydraulic press frame.
- s. Use seal installer (Item 80, Appendix D) to press in timing gear housing seal (28), with spring-loaded lip toward inside of timing gear cover.



GO TO NEXT PAGE

E. INSTALL Continued.

t. Press in timing gear housing seal until front of seal is 0.43 to 0.45 in. (10, 92 to 11, 43 mm) below front face of timing gear cover.



u. Install centering tool onto crankshaft assembly (136) with bolts (1).

**WARNING**

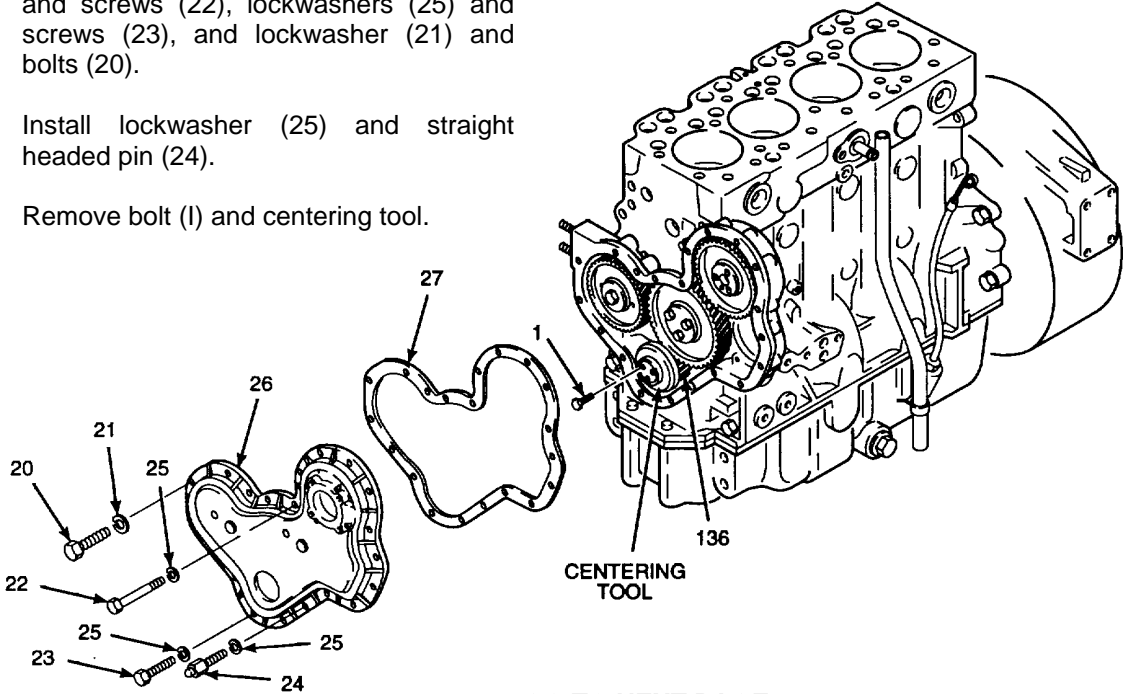
Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

v. Apply a thin coating of gasket sealing compound to both sides of gasket (27).

w. Install gasket (27) and timing gear cover (26), and secure with lockwashers (25) and screws (22), lockwashers (25) and screws (23), and lockwasher (21) and bolts (20).

x. Install lockwasher (25) and straight headed pin (24).

y. Remove bolt (1) and centering tool.



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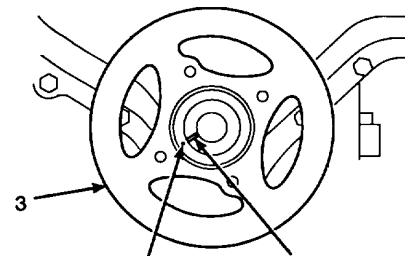
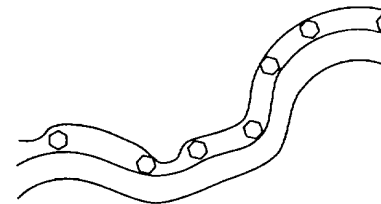
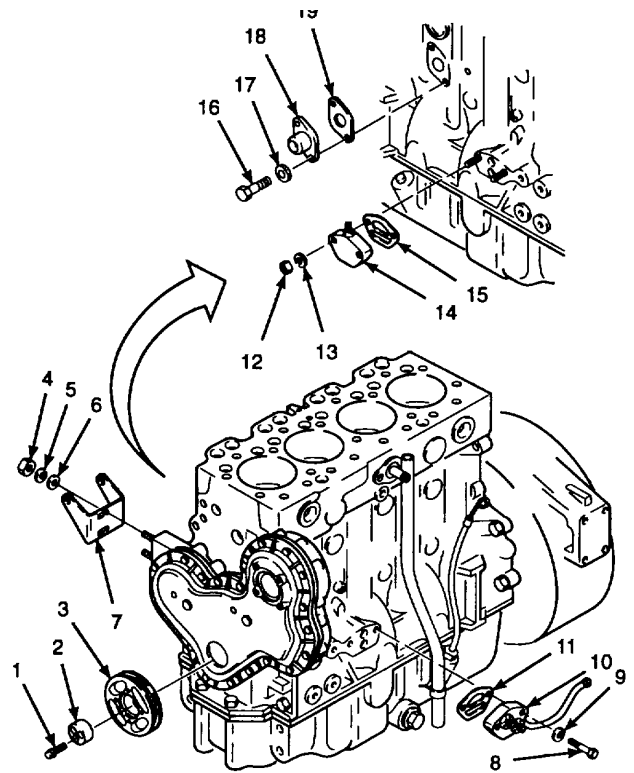
2.17 DIESEL ENGINE REPAIR - Continued.

E. INSTALL Continued.

**WARNING**

Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

- z. Apply gasket sealing compound to both sides of gasket (15).
- aa. Install gasket (15), cover (14), lockwashers (13), and nuts (12).
- ab. Apply gasket sealing compound to both sides of gasket (11).
- ac. Install gasket (11), adapter plate (10), lockwashers (9), and hex head cap screws (8).
- ad. Apply gasket sealing compound to both sides of gasket (19).
- ae. Install gasket (19), hose flange (18), flat washers (17), and bolts (16).
- af. Install alternator support bracket (7) and secure with washers (6), lockwashers (5), and hex nuts (4).
- ag. Install crankshaft pulley (3), aligning crankshaft pulley timing mark with timing mark on crankshaft assembly.
- ah. Install thrust block (2) and bolts (1). Tighten bolts to 70 lb-ft (95 N.m).



CRANKSHAFT PULLEY TIMING MARK      CRANKSHAFT ASSEMBLY TIMING MARK

**GO TO NEXT PAGE**

E. INSTALL - Continued.

12. INSTALL CYLINDER HEAD ASSEMBLY PER PARAGRAPH 2.15.

13. INSTALL WATER PUMP, RADIATOR FAN, AND WATER PUMP PULLEY PER TM 5-3895-373-20.

14. INSTALL FUEL LIFT PUMP PER TM 5-3895-37320.

15. INSTALL FUEL INJECTION PUMP PER PARAGRAPH 2.19.

16. INSTALL FUEL INJECTORS AND HOLDERS PER PARAGRAPH 2.18.

17. INSTALL EXHAUST AND INTAKE MANIFOLDS PER TM 5-3895-373-20.

18. INSTALL TURBOSUPERCHARGER ASSEMBLY PER TM 5-3895-373-20.

19. INSTALL ALTERNATOR ASSEMBLY PER TM 53895-373-20.

20. INSTALL STARTER ASSEMBLY PER TM 5-3895373-20.

**NOTE**

**FOLLOW-ON-TASK: Install engine per paragraph 2.16.**

**END OF TASK**

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**SECTION IV. FUEL SYSTEM MAINTENANCE**

	Para	Page
Repair Fuel Lift Pump.....	2.20	2-291
Repair Turbosupercharger .....	2.21	2-297
Repair/Replace Fuel Tank .....	2.22	2-306
Replace/Repair Fuel Injection Pump .....	2.19	2-248
Replace/Repair Fuel Injectors and Lines .....	2.18	2-236

**2.18 REPLACE/REPAIR FUEL INJECTORS AND LINES.**

This task covers:

- |            |           |         |
|------------|-----------|---------|
| a. Removal | b. Repair | c. Test |
| d. Replace |           |         |

**INITIAL SETUP**

Tools:

- General mechanic's automotive tool kit  
(Item 106, Appendix D)
- Bench vise (Item 112, Appendix D)
- Crowfoot wrench (Item 120, Appendix D)
- Crowfoot wrench (Item 121, Appendix D)
- Fuel injector test set (Item 100, Appendix D)
- O-ring tool (Item 103, Appendix D)
- Socket wrench adapter (Item 7, Appendix D) <sup>1</sup>-
- Torque wrench (Item 131, Appendix D)

References:

- TM 5-3895-373-10
- TM 5-3895-373-24P

Equipment Condition:

- Front top left access door open per TM 5-3895-373-10.
- Front top right access door open per TM 5-3895-373-10.

Materials/Parts:

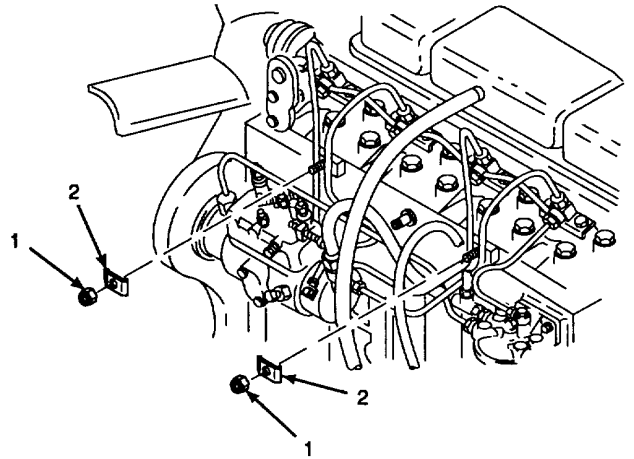
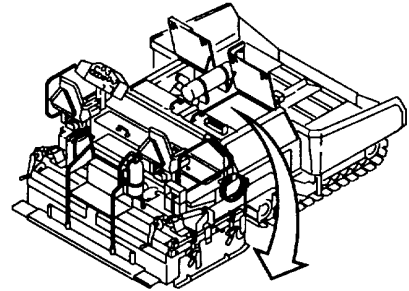
- Carbon removing compound (Item 9, Appendix B)
- Diesel fuel (Item 16, Appendix B)
- Machinery wiping towels (Item 37, Appendix B)
- Protective caps (Item 3, Appendix B)
- Tags (Item 34, Appendix B)
- Compression sleeves
- Shims
- Spacers
- Washers

**GO TO NEXT PAGE**

**NOTE**

There are four fuel injectors on the engine. This procedure refers to removal, repair, and installation of one fuel injector. Procedures are identical for all fuel injectors. Only one fuel injector is shown in this procedure.

- A. REMOVE.
- 1. REMOVE FUEL LINES.
  - a. Remove nuts (1) and tube clips (2).



**GO TO NEXT PAGE**

## 2.18 REPLACE/REPAIR FUEL INJECTORS AND LINES - Continued.

## A. REMOVE - Continued.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death: Always wear safety goggles/glasses at all times.

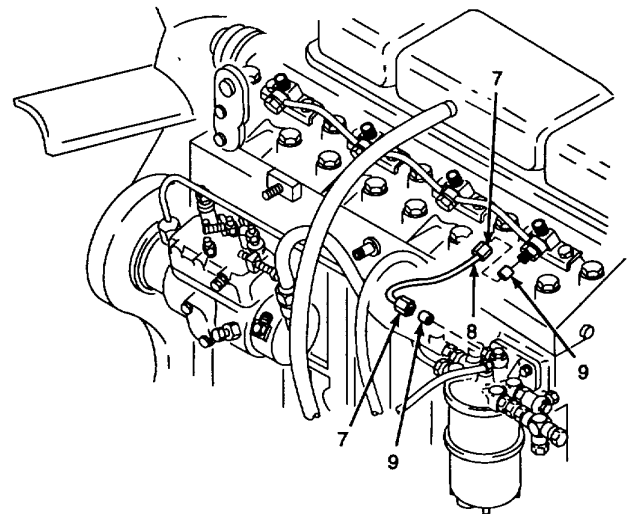
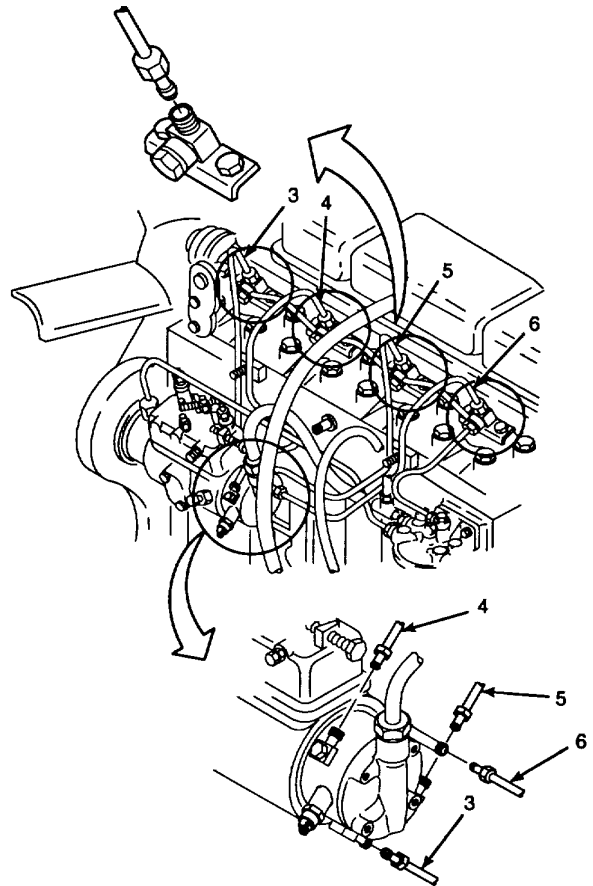
Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

- b. Tag and remove injection tubes (3, 4, 5, and 6). Hold machinery wiping towels around ends of injection tubes during removal.
- c. Unscrew tube coupling nuts (7). Remove metal fuel tube (8) and compression sleeves (9). Discard compression sleeves.



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A. REMOVE - Continued.

**WARNING**

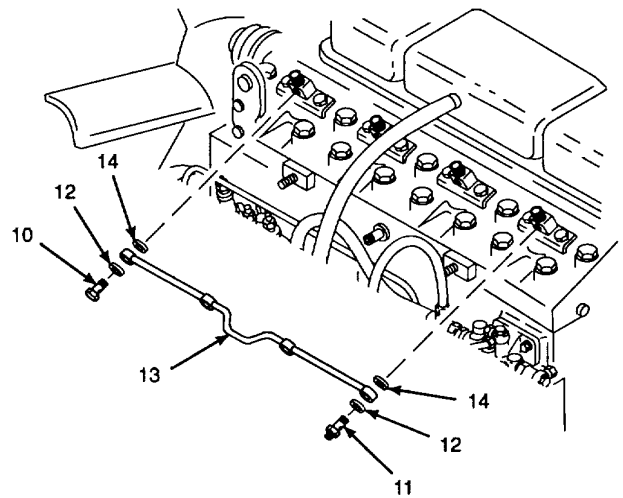
Fuel is very flammable and can explode easily. To avoid serious injury or death: Always wear safety goggles/glasses at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.



- d. Remove fluid passage bolts (10 and 11) and flat washers (12).
- e. Remove leak-off pipe (13) and flat washers (14).
- f. Plug and cap all exposed fuel fittings with protective caps.

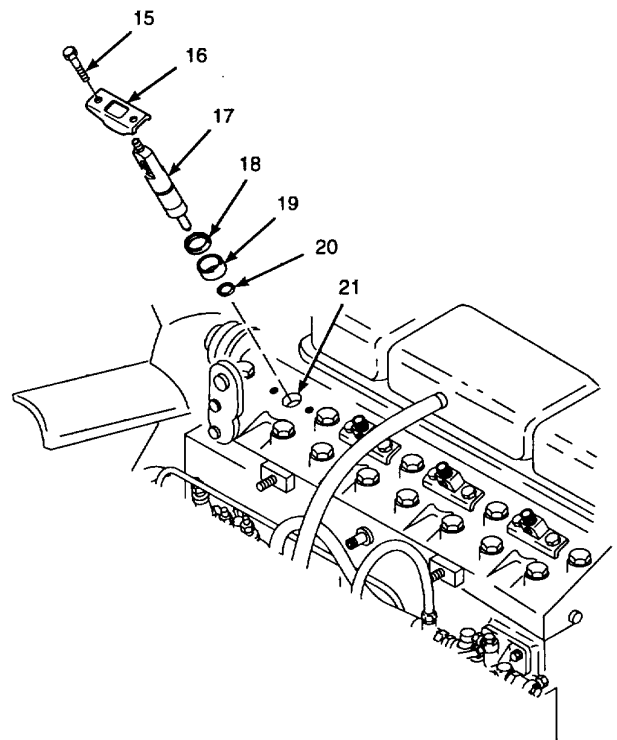
2. REMOVE FUEL INJECTOR.

- a. Remove bolts (15) and clamp (16).
- b. Remove fuel injector (17).
- c. Remove and discard gasket (18) and spacer (19).

**NOTE**

Washer (20) may not be attached to the nozzle face of fuel injector (17) when removed. Washer may need to be removed from injector ports with an o-ring tool.

- d. Remove washer (20) from fuel injector (17) nozzle face. If washer is not on nozzle face, use an o-ring tool to remove washer from injector port (21).
- e. Plug injector port with protective cap.



**GO TO NEXT PAGE**

2.18 REPLACE/REPAIR FUEL INJECTORS AND LINES - Continued.

**NOTE**

The repair and test procedures apply to all four fuel injectors. For these procedures, only one fuel injector is shown.

B. REPAIR.

1. DISASSEMBLE FUEL INJECTOR.

**NOTE**

Carefully remove cap from nozzle assembly. Small parts inside may be lost or damaged.

- a. Place fuel injector in a bench vise. Remove cap (22) and nozzle assembly (23) from holder (24).
- b. Remove adapter (25) and seat (26).

**NOTE**

It may be necessary to tap holder (24) on a flat surface to jar shims (28) loose.

- c. Remove spring (27) and shims (28). Tap holder (24) on a flat surface to remove shims if shims do not easily fall out of holder.

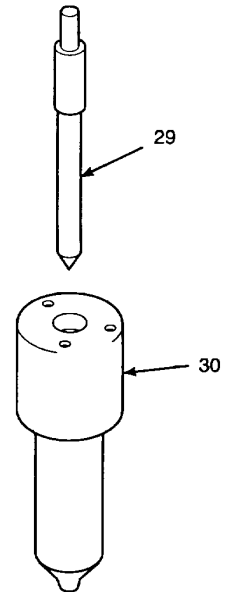
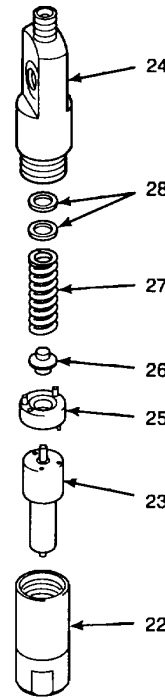
2. CLEAN FUEL INJECTOR.

- a. Separate needle (29) from nozzle (30).

**WARNING**

Carbon removing compound is TOXIC and caustic. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using. Failure to do so may result in injury or death to personnel.

If personnel become dizzy when using carbon removing compound, immediately get fresh air and medical help. If compound contacts skin or clothes, flush with plentiful amounts of water. If compound contacts eyes, flush eyes with plentiful amounts of water for at least 15 minutes and get immediate medical attention.



- b. Immerse all fuel injector components in carbon removing compound. Rinse all components in water except needle and nozzle (29 and 30).

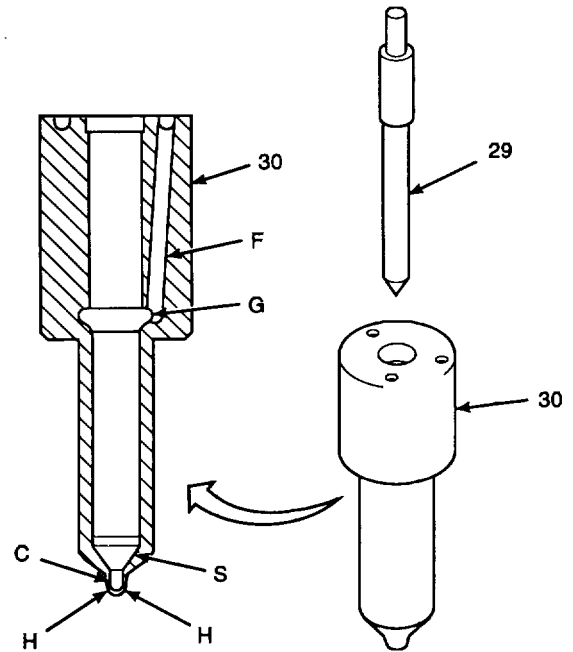
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## B. REPAIR - Continued.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield, gloves, etc.). Failure to take proper precautions may result in severe injury or loss of vision.

- c. Use 30 psi (207 kPa) maximum compressed air to dry off all components.
- d. Use tools from fuel injector test set to remove all traces of carbon deposit from exterior of nozzle (30) and needle (29). Rinse needle with water and dry with 30 psi (207 kPa) maximum compressed air.
- e. Use tools from fuel injector test set to clean nozzle gallery G, nozzle seat S, and cavity C.
- f. Use tools from fuel injector test set to clean spray holes H and feed hole F.
- g. Flush nozzle to remove all particles of carbon.



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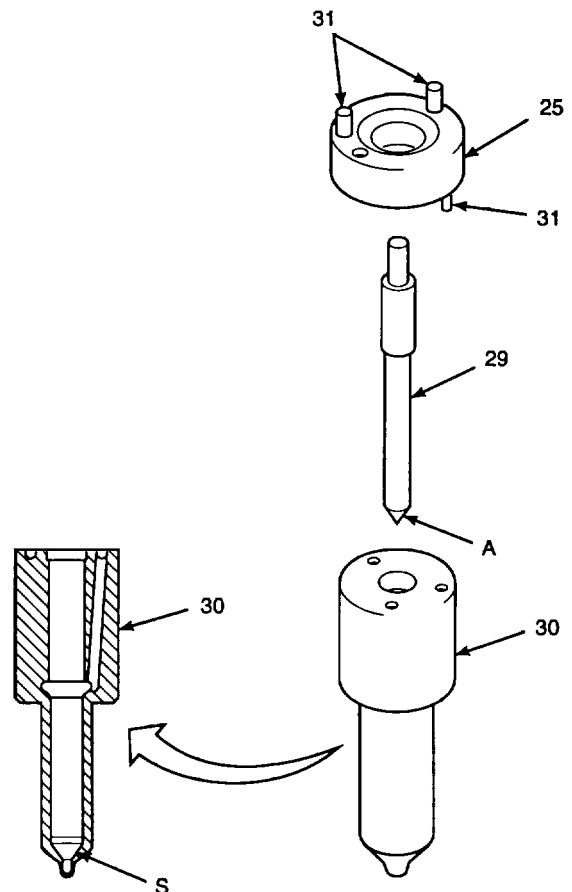
## 2.18 REPLACE/REPAIR FUEL INJECTORS AND LINES - Continued.

- B. REPAIR - Continued.
3. INSPECT COMPONENTS.



Do not touch needle with bare hands. Use a clean pair of pliers to handle needle. Use only clean tools and ensure work area is clean when handling fuel injector components. Even a tiny particle of dirt can upset fuel injector performance.

- Examine nozzle (30) seat S and needle (29) valve face A. If surfaces are "blued", indicating over-heating, replace both nozzle and needle. Do not touch needle with bare hands.
- Inspect for distortion of dowels (31) that are press fit into adapter (25).
- When clean, needle (29) should drop freely under its own weight onto nozzle seat S.
- Press needle (29) against nozzle seat. The needle should fall freely when nozzle (30) is inverted and pressure is removed.
- Install needle (29) into nozzle (30).



GO TO NEXT PAGE

B. REPAIR - Continued.

4. ASSEMBLE FUEL INJECTOR.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

**CAUTION**

Ensure work area and tools are clean when handling fuel injector components. Even a tiny particle of dirt can upset fuel injector performance.

**NOTE**

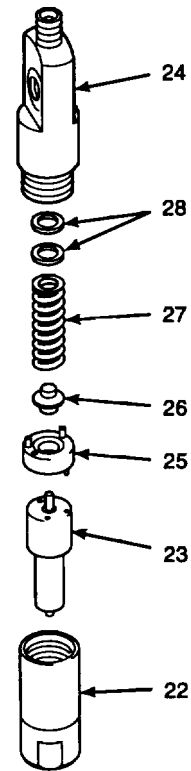
All fuel injector components should be assembled wet from clean diesel fuel.

- a. Wet all fuel injector components except cap (22) and holder (24) with diesel fuel.
- b. Install shims (28) and spring (27) into holder (24).

**NOTE**

Ensure proper engagement of dowels during assembly of adapter and nozzle assembly.

- c. Install seat (26) and adapter (25).
- d. Install nozzle assembly (23) and cap (22). Place holder (24) in bench vise and tighten cap to 420 lb-in (47,5 N•m) using socket wrench adapter and crowfoot wrench (Item 121, Appendix D).



## C. TEST.

## I. FUEL INJECTOR PRESSURE AND SPRAY TEST.

- a. Mount fuel injector on test stand from fuel injector test set.

**NOTE**

Used fuel injectors should open between 3674 to 3792 psi (25 33 1 to 26 142 kPa). If a new nozzle assembly or spring is installed in a used fuel injector, the opening pressure will increase by 73 psi (507 kPa). New fuel injectors, or used fuel injectors with both a new nozzle assembly and a new spring, should open between 3821 to 3939 psi (26 345 to 27 155 kPa).

- b. Perform testing procedures to ensure fuel injector nozzle opens within required pressure range. Used fuel injectors should open between 3674 to 3792 psi (25 331 to 26 142 kPa). New fuel injectors should open between 3821 to 3939 psi (26 345 to 27 155 kPa).
- c. The four sprays should be of equal length and without distortion or visible streaks of unvaporized fuel.

## 2. ADJUST FUEL INJECTOR.

- a. Disassemble fuel injector per steps B.1.a through B.1.c.
- b. Add shims to increase pressure or remove shims to decrease pressure at which fuel injector opens.
- c. Assemble fuel injector per steps B.4.a through B.4.c.
- d. Test fuel injector per steps C.1.a through C.1.c.
- e. Repeat step C.2 procedures until fuel injector meets setting pressure requirements.

**GO TO NEXT PAGE**

C. TEST - Continued.

3. BACK LEAKAGE TEST.

- a. With fuel injector mounted on test stand, apply a pressure of 2204 psi (15 199 kPa) to fuel injector.
- b. The amount of time for the pressure to fall to 1470 psi (10 133 kPa) should be between 15 to 35 seconds.
- c. If fuel injector fails back leakage test, disassemble and clean per step B and retest. If fuel injector fails a second time, discard fuel injector.

4. SEAT DRYNESS TEST.

- a. With fuel injector mounted on test stand, apply pressure to fuel injector until nozzle assembly opens. Hold a paper towel against nozzle assembly tip, immediately after fuel spray stops, for one minute.
- b. Ensure stain on paper towel is not larger than 1/2 in. in diameter after one minute with the pressure maintained at 147 psi (1013 kPa) below the setting pressure.
- c. If fuel injector fails seat dryness test disassemble and clean per step B. If fuel injector fails a second time, discard fuel injector.

D. INSTALL.

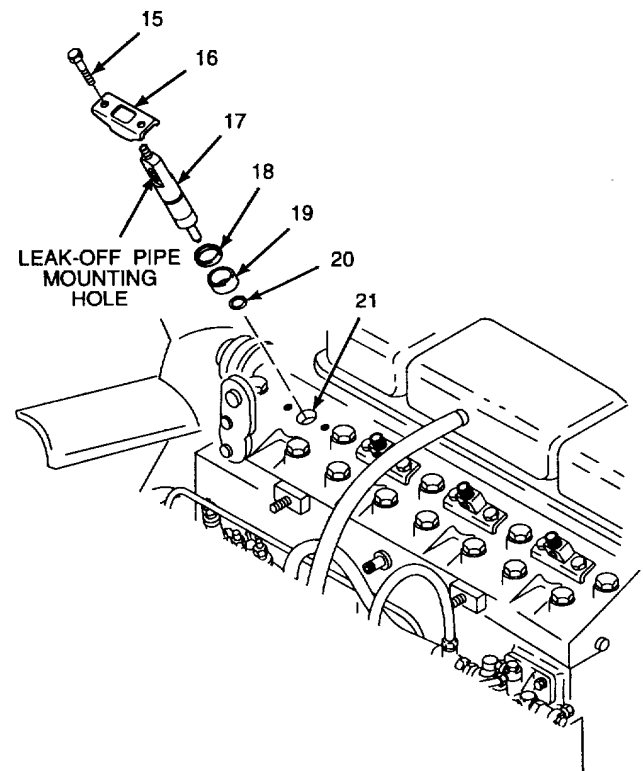
1. INSTALL FUEL INJECTOR.

- a. Install spacer (19) and gasket (18) onto fuel injector (17).

**NOTE**

Ensure leak-off pipe mounting hole is facing away from cylinder head assembly during installation of fuel injector.

- b. Install washer (20) onto end of fuel injector (17) and install fuel injector into injector port (21).
- c. Install clamp (16) and bolts (15). Evenly tighten bolts to 168 lb-in (19 N•m).



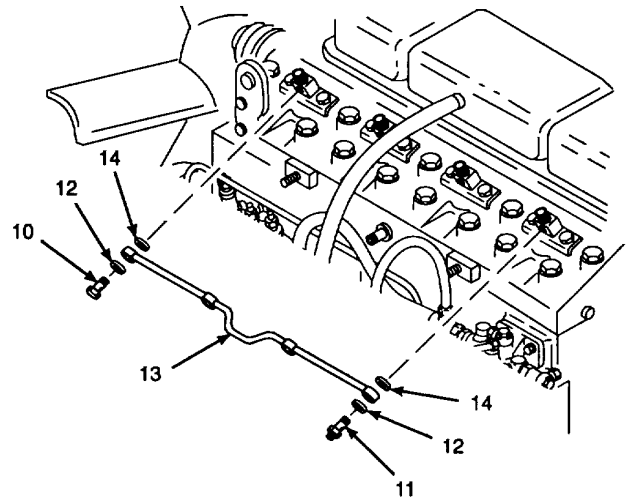
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## 2.18 REPLACE/REPAIR FUEL INJECTORS AND LINES - Continued.

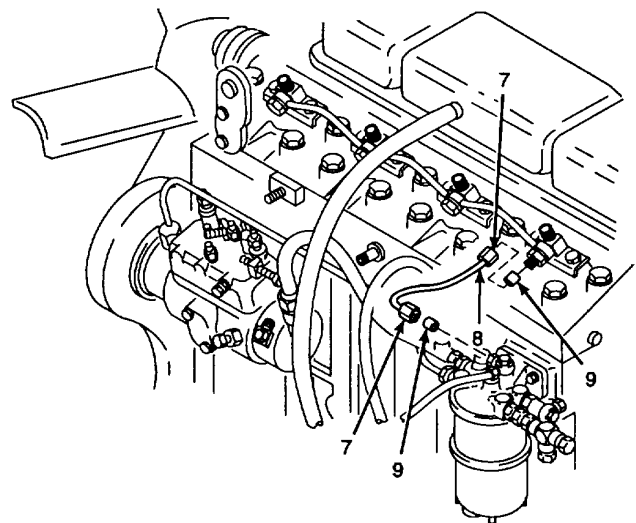
D. INSTALL - Continued.

## 2. INSTALL FUEL LINES.

- a. Install flat washers (14), leak-off pipe (13), and flat washers (12).
- b. Install and tighten fluid passage bolts (10 and 11).

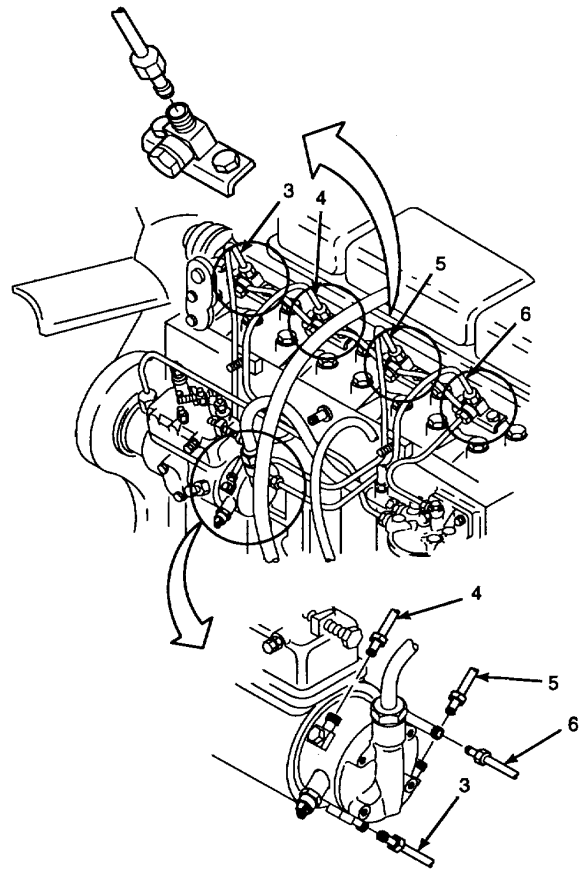


- c. Install compression sleeves (9) and metal fuel tube (8). Install and tighten tube coupling nuts (7).

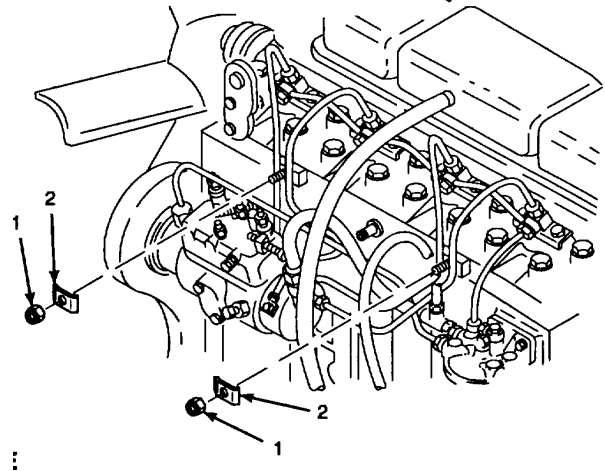
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D. INSTALL - Continued.

- d. Install injection tubes (3, 4, 5, and 6). Tighten injection tube nuts at both ends of injection tubes using crowfoot wrench (Item 120, Appendix D).



- e. Install tube clips (2) and nuts (1). Tighten nuts.



**NOTE**

FOLLOW-ON-TASKS: Bleed engine fuel system per TM 5-3895-373-20.  
 Close front top left access door per TM 5-3895-373-10.  
 Close front top right access door per TM 5-3895-373-10.

**END OF TASK**

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**2.19 REPLACE/REPAIR FUEL INJECTION PUMP.**


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This task covers:

- |            |                |          |
|------------|----------------|----------|
| a. Remove  | b. Disassemble | c. Clean |
| d. Inspect | e. Assemble    | f. Test  |
| g. Install |                |          |
- 

**INITIAL SETUP**
Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Contact point dresser (Item 37, Appendix D)  
Dial indicator (Item 52, Appendix D)  
DPA tool kit (Item 104, Appendix D)  
DPA workbench tool kit (Item 105, Appendix D)  
Drain pan (Item 63, Appendix D)  
Fuel injection pump mounting jig (Item 53, Appendix D)  
Fuel injector test stand (Item 102, Appendix D)  
Plastic hammer (Item 49, Appendix D)  
Slide caliper (Item 20, Appendix D)  
Snap ring pliers (Item 66, Appendix D)  
Socket wrench adapter (Item 5, Appendix D)  
Stud remover and setter (Item 99, Appendix D)  
Thickness gage (Item 46, Appendix D)  
Torque wrench, 5 to 150 lb-in (Item 129, Appendix D)  
Torque wrench, 150 to 750 lb-in (Item 130, Appendix D)

Materials/Parts:

Calibrating fluid (Item 2, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Electrical insulating compound (Item 10, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Lubricating oil (Item 19, Appendix B)  
Machinery wiping towels (Item 37, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Antipilferage seal  
Diesel engine parts kit  
Fuel injection pump gasket  
Gasket  
Helical compression spring  
Lock wire  
Lockwashers  
Tachometer generator gasket  
Wire rope

Personnel Required:

Two 62B construction equipment repairers. Second person needed to help with rotating the radiator fan during installation.

References:

TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P  
TM 9-4910-778-14&P

Equipment Condition:

Front top left access door opened per TM 5-3895-373-10.  
Front top right access door opened per TM 5-3895-373-10.  
Radiator drained per TM 5-3895-373-20.  
Lower coolant hose removed at water pump per  
TM 5-3895-373-20.  
Throttle control cable disconnected per TM 5-3895-373-20.  
Fuel filter to fuel injector lines removed per  
TM 5-3895-373-20.  
Fuel injector lines removed per paragraph 2.18.  
Fuel shutoff solenoid removed per TM 5-3895-373-20.  
Exhaust mufflers and pipes removed per  
TM 5-3895-373-20 (for installation only).  
Valve cover removed per TM 5-3895-373-20  
(for installation only).

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A. REMOVE.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death:

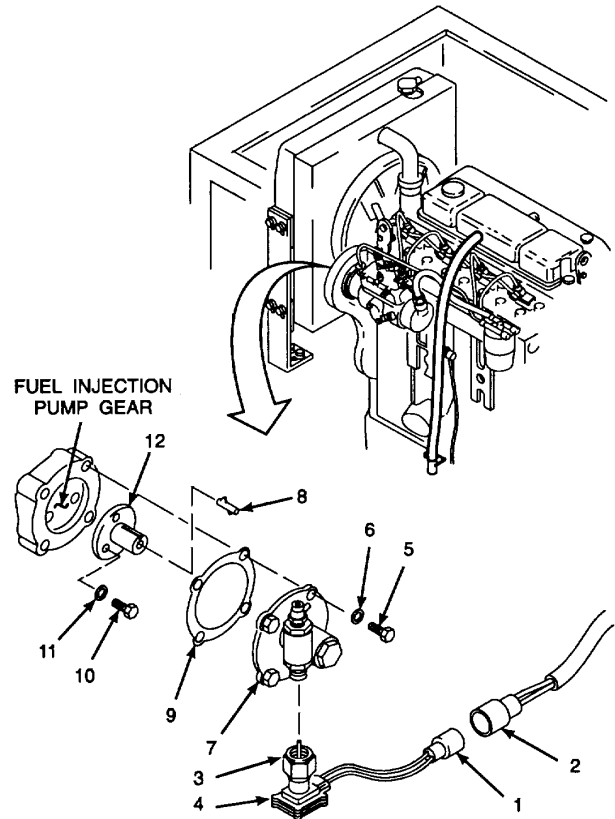
Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.



I. REMOVE TACHOMETER GENERATOR FROM ENGINE.

- a. Tag and disconnect tachometer generator electrical connector (1) from engine harness connector (2).
- b. Unscrew swivel nut (3) and remove tachometer generator (4).
- c. Remove hex head cap screws (5) and lockwashers (6). Discard lockwashers.
- d. Remove tachometer drive angle (7), key (8), and gasket (9). Discard gasket.

**CAUTION**

Do not drop any parts or foreign material into fuel injection pump gear housing during fuel injection pump removal. Serious engine damage may occur. Insert a clean, lint-free cloth into space around adapter to ensure nothing enters fuel injection pump housing.

- e. Remove hex head cap screws (10) and flat washers (11).
- f. Remove adapter (12).



2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

A. REMOVE - Continued.

**WARNING**

Fuel is very flammable and can explode easily.

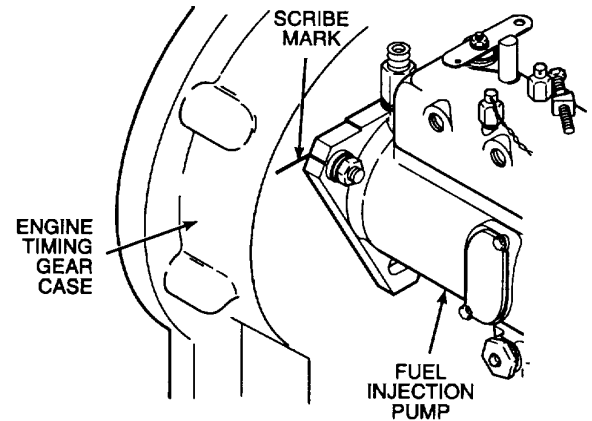
To avoid serious injury or death: Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

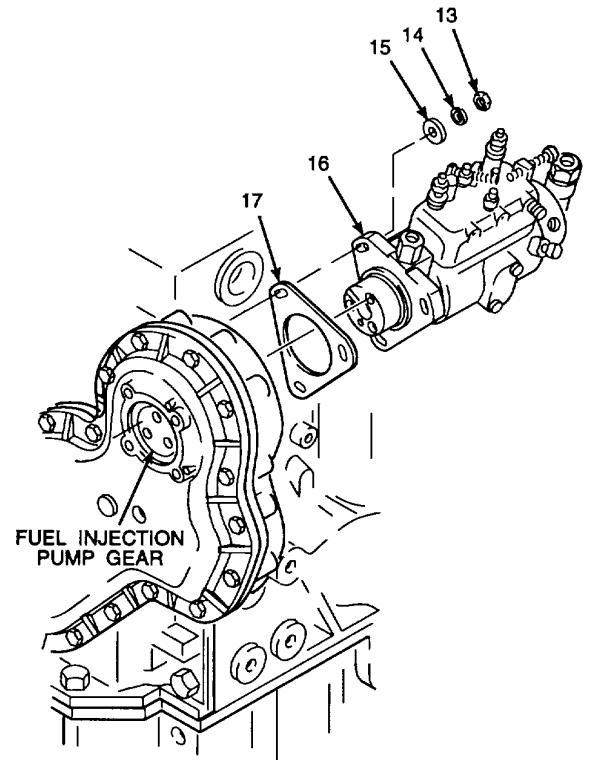


2. REMOVE FUEL INJECTION PUMP FROM ENGINE.

**CAUTION**

Fuel injection pump gear must not be allowed to move from its position when fuel injection pump is removed from timing gear case. Do not turn engine over or allow timing gear to move in any way when fuel injection pump is removed. Erratic operation and equipment damage may result from misalignment of fuel injection pump gear inside timing gear case.

- a. Remove hex nuts (13), lockwashers (14), and flat washers (15). Discard lockwashers.
- b. Pull fuel injection pump (16) from engine timing gear case.
- c. Remove and discard gasket (17).



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A. REMOVE - Continued.

**WARNING**

Fuel is very flammable and can explode easily.

To avoid serious injury or death: Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

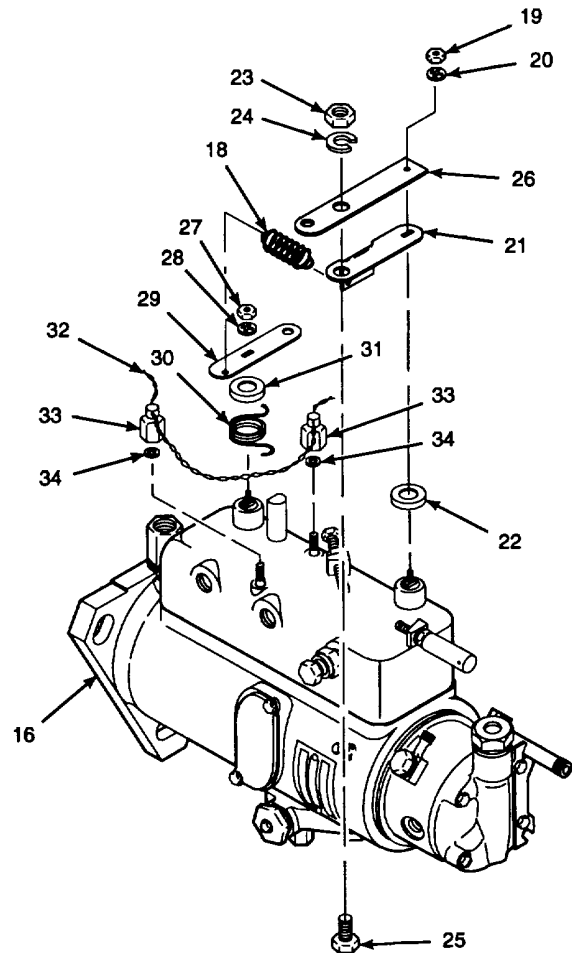
Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

3. DRAIN DIESEL FUEL FROM FUEL INJECTION PUMP INTO A DRAIN PAN. DISPOSE OF DIESEL FUEL IN ACCORDANCE WITH LOCAL PROCEDURES.

B. DISASSEMBLE.

1. REMOVE LEVERS, GOVERNOR CAPS, SPRINGS, WIRE ROPE, CAP NUTS, SLEEVE, HEX HEAD CAP SCREWS, THROTTLE SHAFT, SHUTOFF SPINDLE, AND CONTROL COVER FROM FUEL INJECTION PUMP.

- a. Place fuel injection pump (16) into a jig. Install jig, with injection pump installed, into bench vise, with top of injection pump facing up
- b. Place machinery wiping towels beneath fuel injection pump (16) to catch any spilled fuel during disassembly.
- c. Remove spring (18).
- g. Cut and remove wire rope (32). Discard wire rope.
- d. Remove hex nut (19), lockwasher (20), lever (21), and governor cap (22). Discard lockwasher and governor cap.



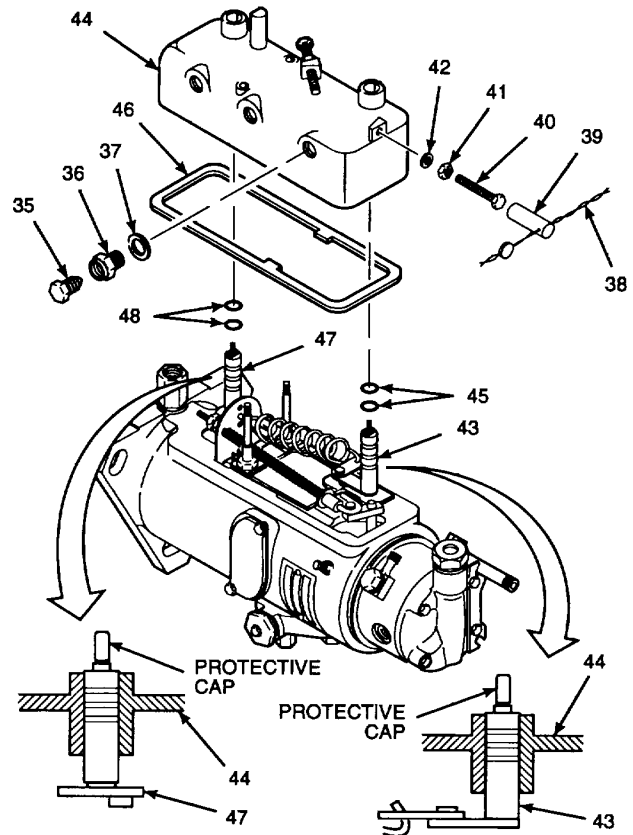
- e. Remove hex nut (23), lockwasher (24), hex head cap screw (25), and throttle lever (26) from lever (21). Discard lockwasher.
- f. Remove hex nut (27), lockwasher (28), governor lever (29), spring (30), and governor cap (31). Discard lockwasher and governor cap.
- g. Cut and remove wire rope (32). Discard wire rope.
- h. Remove cap nuts (33) and washers (34). Discard washers.

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2.19 REPLACE/REPAIR FUEL INJECTION PUMP- Continued.

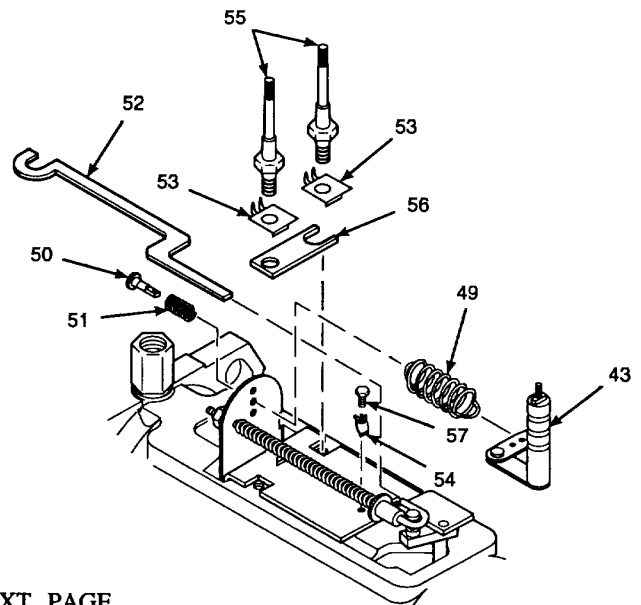
B. DISASSEMBLE - Continued.

- i. Remove hex head cap screws (35 and 36) and washer (37). Discard washer.
- j. Cut and remove wire rope (38). Discard wire rope.
- k. Remove sleeve (39), hex head cap screw (40), nut (41), and flat washer (42).
- l. Install protective cap from DPA tool kit onto throttle shaft (43).
- m. Remove control cover (44), and at the same time, press down on protective cap with a finger, pressing throttle shaft (43) from control cover (44).
- n. Remove seals (45). Discard seals.
- o. Remove gasket (46). Discard gasket.
- p. Transfer protective cap from DPA tool kit to shutoff spindle (47).
- q. Press shutoff spindle (47) out of control cover (44) with a finger.
- r. Remove seals (48). Discard seals.



2. REMOVE SPRING, THROTTLE SHAFT, SPRING HOLDER, SPRING, SHUTOFF BAR, SHOULDERED STUDS, KEEP PLATE, AND THROTTLE SHAFT.

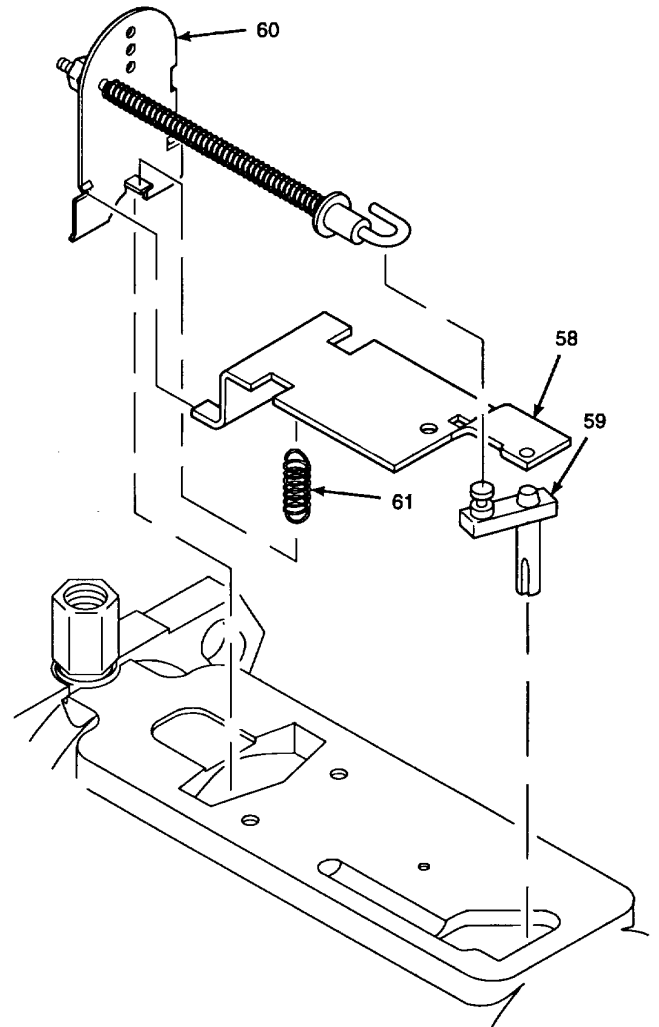
- a. Remove spring (49) from throttle shaft (43).
- b. Remove spring holder (50) and spring (51).
- c. Remove shutoff bar (52).
- d. Press tabs down on lockwashers (53 and 54) with a flat-blade screwdriver.
- e. Remove shouldered studs (55), lockwashers (53), keep plate (56), screw (57), and lockwasher (54). Discard lockwashers.



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- B. DISASSEMBLE - Continued.
3. REMOVE GOVERNOR ARM ASSEMBLY, METERING VALVE, AND SPRING LINK.
- Prepare a bath of clean calibrating fluid in which to place removed parts.
  - As an assembly, remove governor arm assembly (58), metering valve (59), and spring link (60).
  - Disconnect and remove spring link (60) from metering valve (59) by manually compressing spring link.
  - Place metering valve (59) in a bath of clean calibrating fluid.
  - Remove spring (61) from spring link (60) and governor arm assembly (58). Discard compression helical spring.
  - Separate governor arm assembly (58) from spring link (60).

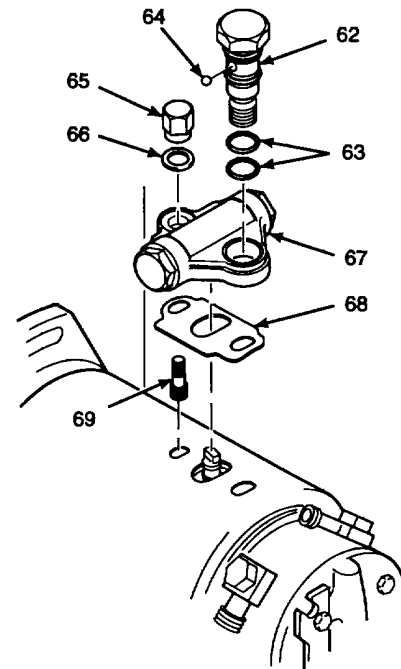


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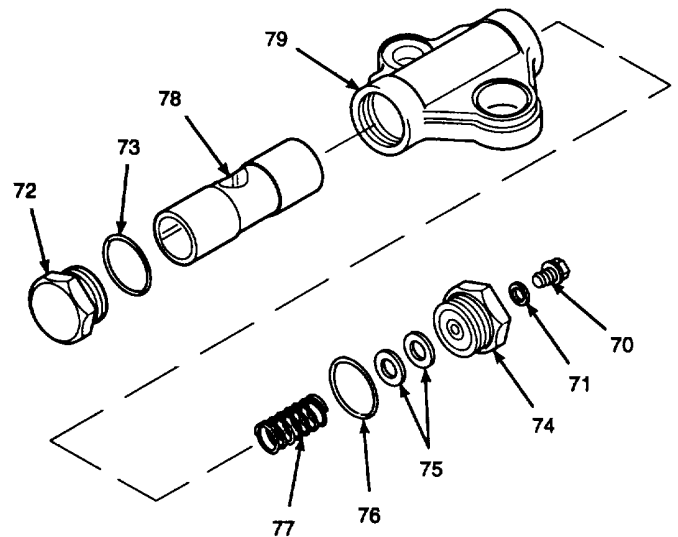
2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

B. DISASSEMBLE Continued.

4. REMOVE FLUID PASSAGE BOLT, CAP NUT, AUTO ADVANCE PISTON HOUSING ASSEMBLY, GASKET, AND STUD.
  - a. Turn fuel injection pump over so bottom is facing up.
  - b. Remove fluid passage bolt (62), sealing rings (63), and ball (64). Discard sealing ring and ball.
  - c. Remove cap nut (65) and flat washer (66).
  - d. Remove auto advance piston housing assembly (67).
  - e. Remove gasket (68). Discard gasket.
  - f. Use a stud remover and setter to remove stud (69).



5. REMOVE HEX HEAD CAP SCREW, PLUG, SPRING CAP, AND SPRING.
  - a. Remove hex head cap screw (70) and flat washer (71). Discard flat washer.
  - b. Remove plug (72) and preformed packing (73). Discard preformed packing.
  - c. Remove spring cap (74), shims (75), preformed packing (76), and spring (77). Discard preformed packing.
  - d. Remove piston (78) from auto advance housing (79).

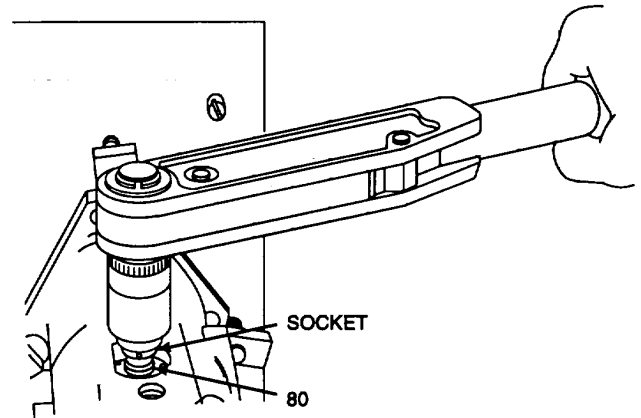


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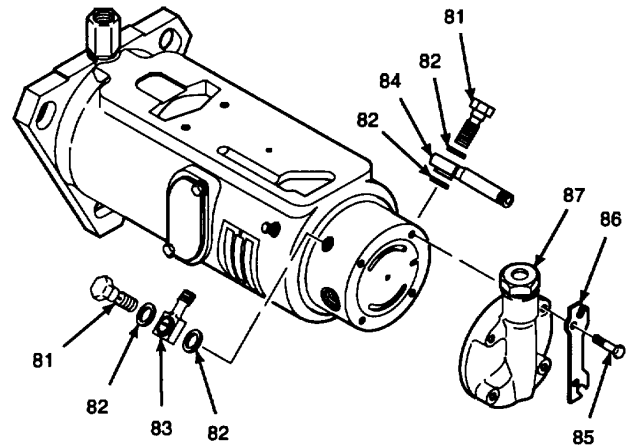
B. DISASSEMBLE Continued.

6. LOOSEN SCREW AND REMOVE FUEL BANJO BOLTS, FLUID PASSAGE BOLTS, AND END PLATE ASSEMBLY.

- a. Use a socket from DPA tool kit to loosen screw (80).
- b. If necessary, tap screw (80) gently with a plastic hammer to release.



- c. Turn fuel injection pump over so top is facing up.
- d. Remove banjo bolts (81), flat washers (82), banjo bolt (83), and fluid passage bolt (84). Discard flat washers.
- e. Remove hex head cap screws (85), clamp (86), and end plate assembly (87).



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2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

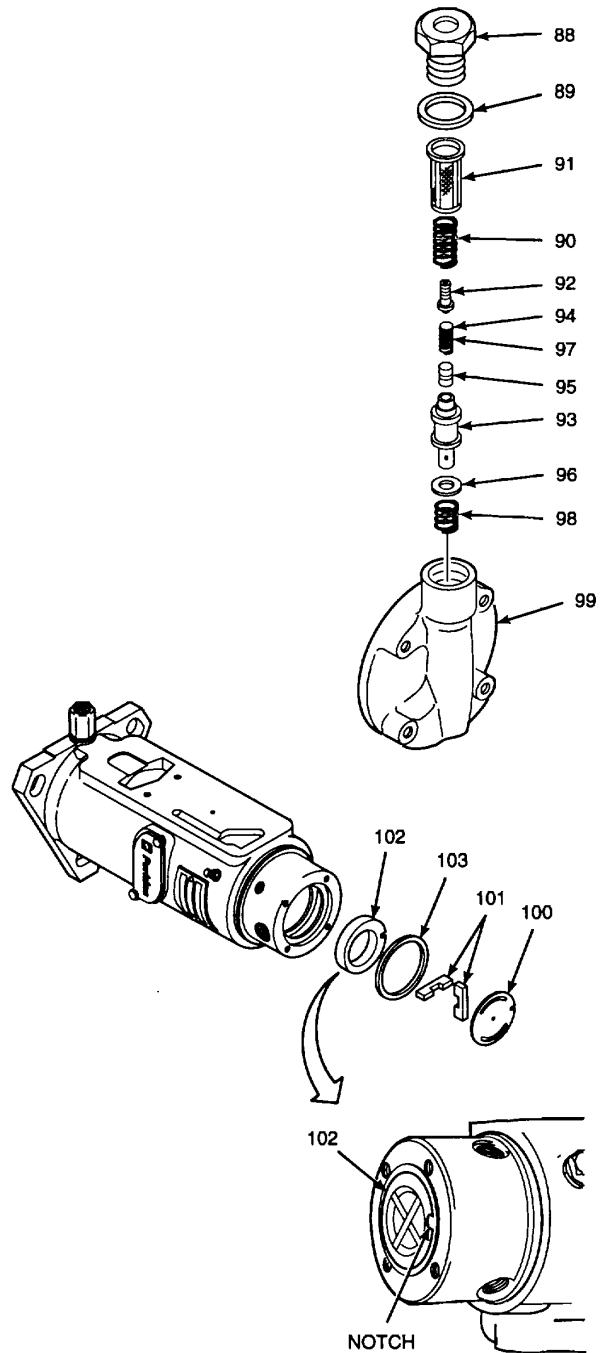
B. DISASSEMBLE Continued.

7. REMOVE BOSS COUPLING, SPRING, FILTER ELEMENT, FUEL ADJUSTER, PUMP PISTONS, FUEL PUMP GUIDE, AND SPRING.

- a. Remove boss coupling (88) and washer (89).
- b. Remove spring (90), filter element (91), and fuel adjuster (92).
- c. Remove pump piston (93), fuel pump guide (94), pump piston (95), flat washer (96), and springs (97 and 98) from end plate (99).

8. REMOVE SANDWICH PLATE, FUEL PUMP BLADES, AND TRANSFER PUMP LINER.

- a. Remove sandwich plate (100).
- b. Remove fuel pump blades (101).
- c. Write down position of transfer pump liner (102) in fuel injection pump by indicating position of notch in relation to open end of pump. For example, 3 o'clock, etc.
- d. Remove gasket (103) and transfer pump liner (102).



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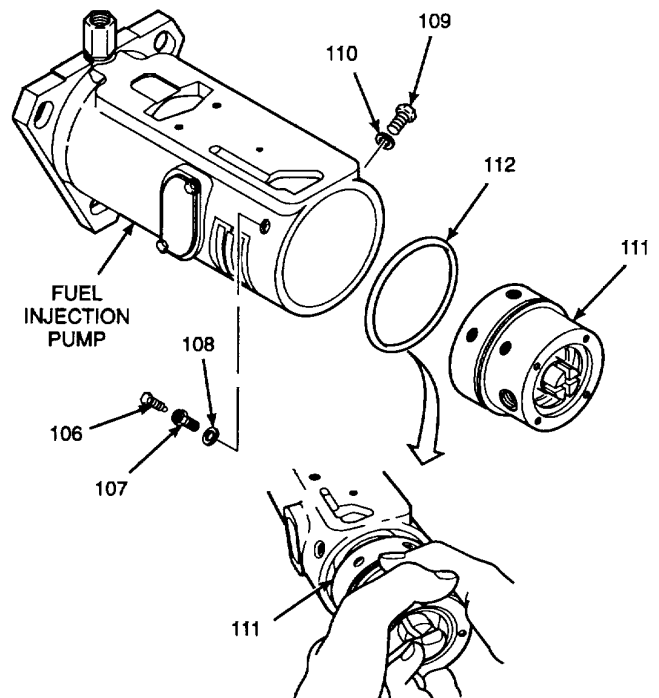
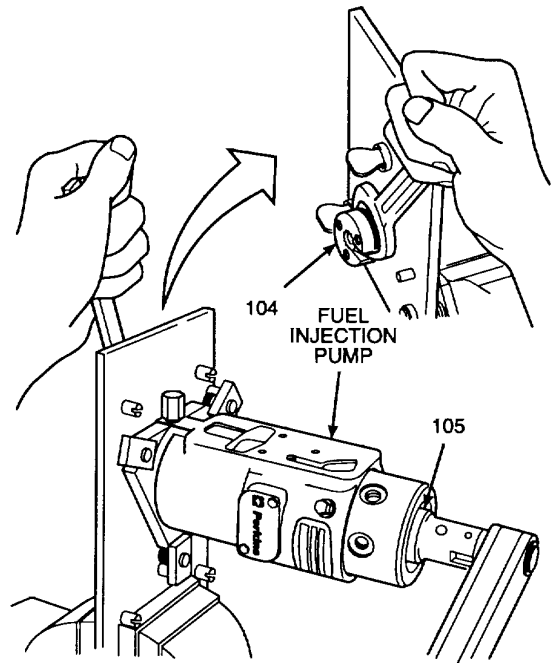
B. DISASSEMBLE Continued.

9. LOOSEN AND REMOVE OUTER ROTOR HEAD ASSEMBLY AND SEALING RING.

**NOTE**

The direction to slacken the transfer pump rotor is marked by an arrow on the face of the outer rotor head assembly.

- a. Use a spanner wrench from DPA tool kit to hold drive hub (104) while loosening pump impeller (105) with spanner wrench from DPA tool kit.
- b. Remove tools and finger tighten pump impeller (105) inside fuel injection pump.
- c. Remove hex head cap screw (106), fluid flow restrictor (107), and washer (108). Discard washer.
- d. Remove hex head cap screw (109) and washer (110). Discard washer.
- e. Remove outer rotor head assembly (111) with a slight twisting motion side-to-side while gently pulling from fuel injection pump.
- f. Remove sealing ring (112). Discard sealing ring.



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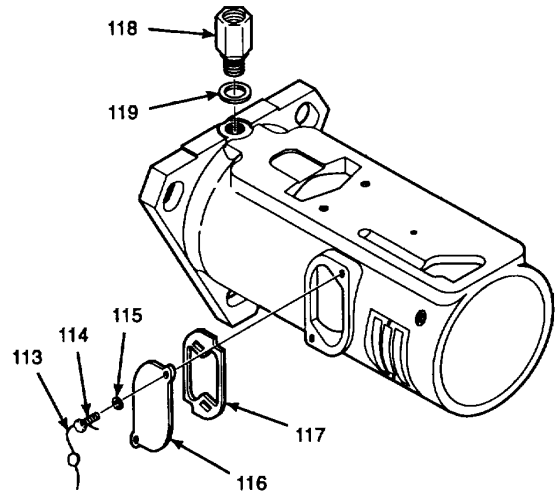


2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

B. DISASSEMBLE Continued.

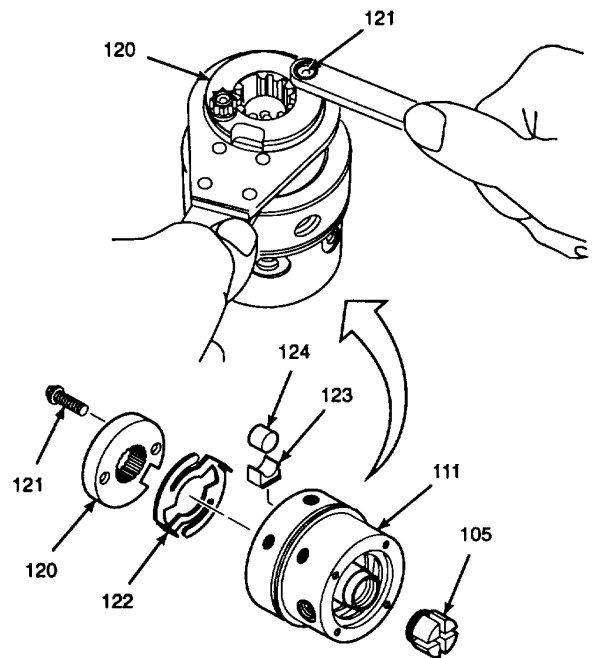
10. REMOVE ACCESS COVER AND FUEL CONNECTION.

- a. Cut and remove wire rope (113). Discard wire rope.
- b. Remove screw (114), lockwasher (115), access cover (116), and gasket (117). Discard lockwasher and gasket.
- c. Remove fuel connection (118) and flat washer (119).



11. REMOVE PUMP IMPELLER, GOVERNOR HUB, PUMP PLATE ASSEMBLY, ROLLER SHOES, AND ROLLERS FROM OUTER ROTOR HEAD ASSEMBLY.

- a. Place outer rotor head assembly (111) on bench.
- b. Remove pump impeller (105).
- c. Use a spanner wrench from DPA tool kit to hold governor hub (120).
- d. Loosen drive screws (121) with an adapter from DPA tool kit. Do not remove drive screws.
- e. Remove governor hub (120).
- f. Remove pump plate assembly (122), roller shoes (123), and rollers (124).
- g. Place roller shoes (123) and rollers (124) in a bath of clean calibrating fluid.



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B. DISASSEMBLE Continued.

- h. Fit protective caps into inner rotor head assembly (125) slots to hold plungers (126) in place.
- i. Remove pump impeller (105) and inner rotor head assembly (125) from outer rotor head assembly (111).
- j. Detach pump plate assembly (127).
- k. Tighten drive screws (121) all the way into inner rotor head assembly (125) with an adapter from DPA tool kit.

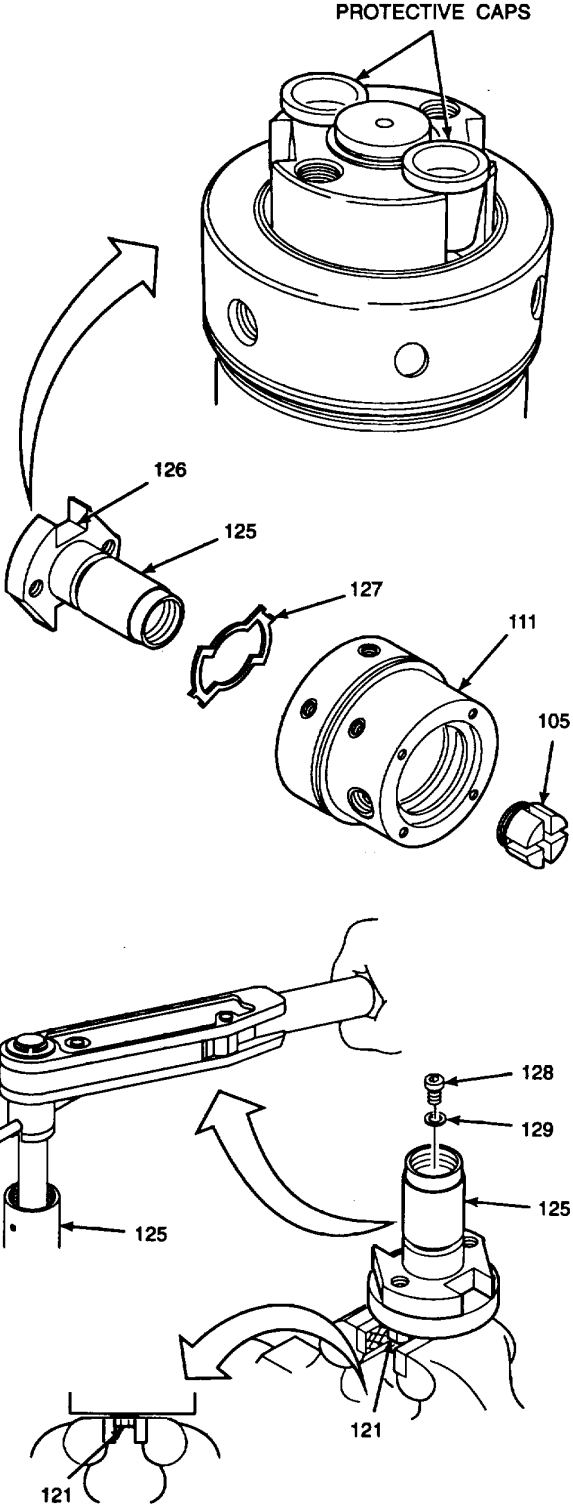
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

If screw (128) is loose, it must be removed and reinstalled using thread locking compound at this stage of disassembly.

- l. If screw (128) is loose, place inner rotor head assembly (125) vertically into bench vise, so only drive screws (121) are gripped by vise jaws.
- m. Use a spanner wrench from DPA tool kit to remove screw (128) and flat washer (129) from inner rotor head assembly (125). Discard flat washer.



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2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

B. DISASSEMBLE Continued.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- n. Clean threads of screw (128) with thread locking compound solvent.
- o. Wipe screw (128) dry with a lint-free cloth.

**WARNING**

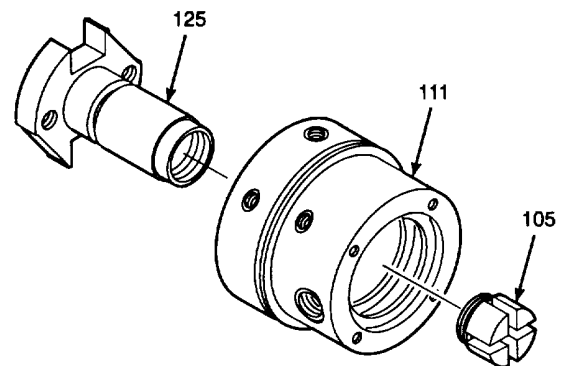
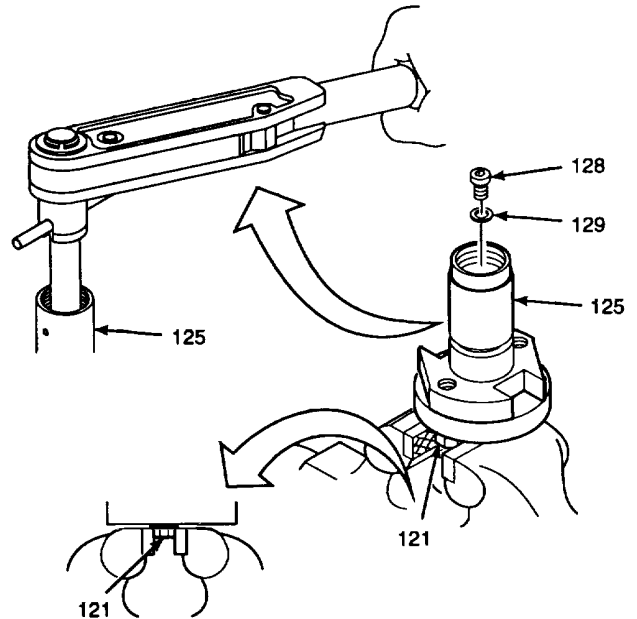
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- p. Install flat washer (129) onto screw (128) and apply thread locking compound to threads of screw.
- q. Install screw (128) into inner rotor head assembly (125). Use a spanner wrench from DPA tool kit to tighten screw to 250 lb-in (28 N•m).
- r. Remove inner rotor head assembly (125) from bench vise.
- s. Loosen drive screws (121).

**NOTE**

Inner rotor head assembly is reassembled into outer rotor head assembly only to protect bearing surfaces.

- t. Insert inner rotor head assembly (125) into outer rotor head assembly (111) to protect bearing surfaces.
- u. Install pump impeller (105) inside outer rotor head assembly (111), hand tight, to hold inner rotor head assembly (125) secure.



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2-260

B. DISASSEMBLE - Continued.

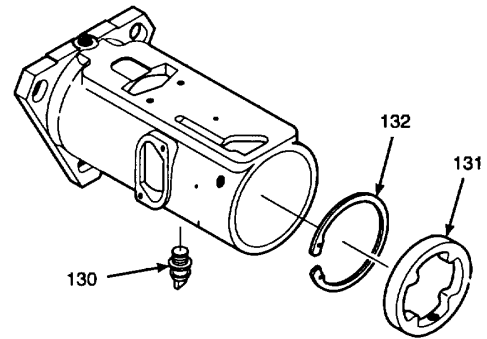
12. REMOVE SCREW, CAM RING, AND RETAINING RING.

- a. Remove screw (130) from fuel injection pump.
- b. Remove cam ring (131) from fuel injection pump.

**WARNING**

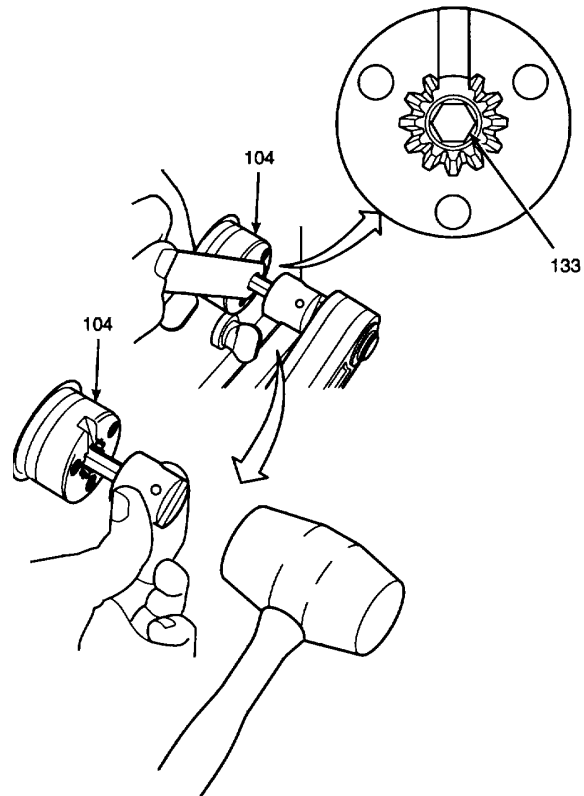
Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- c. Use snap ring pliers to remove retaining ring (132).



13. REMOVE DRIVE HUB AND GOVERNOR WEIGHT CAGE.

- a. Turn fuel injection pump around.
- b. Hold drive hub (104) with a wrench from DPA tool kit.
- c. Use an adapter from DPA tool kit to loosen socket head cap screw (133) two full turns.
- d. Tap the end of the tool holding socket head cap screw (133) to loosen internal parts.

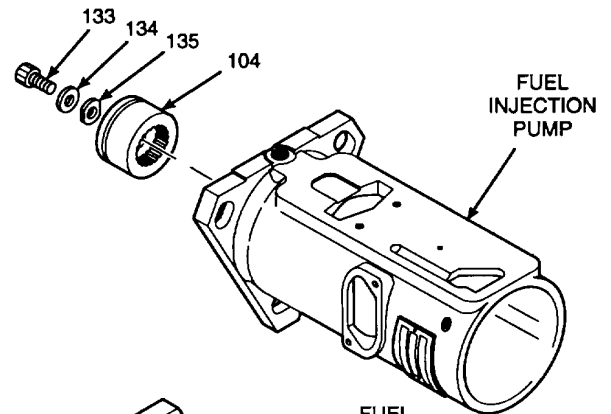


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2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

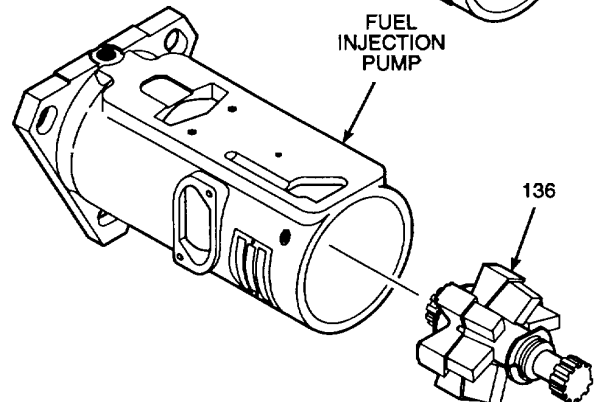
B. DISASSEMBLE Continued.

e. Remove socket head cap screw (133), lockwasher (134), and flat washer (135). Discard lockwasher.



f. Pull drive hub (104) from fuel injection pump.

g. Remove governor weight cage (136) as an assembly from fuel injection pump.



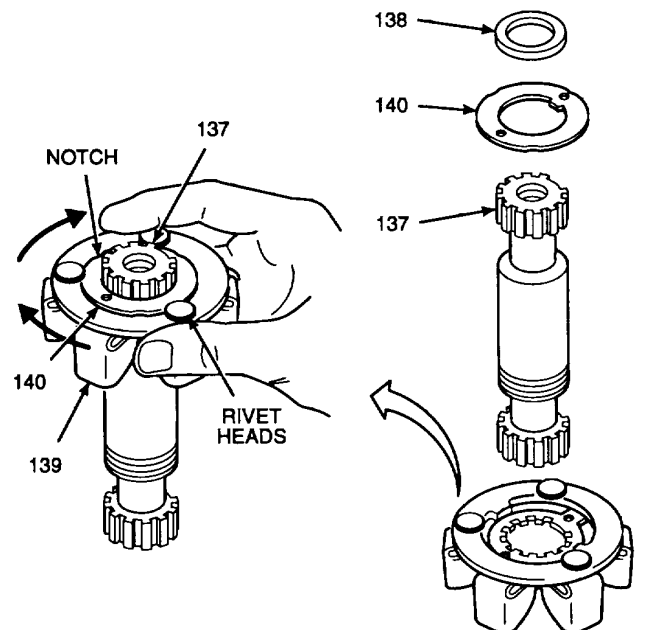
14. REMOVE DRIVE SHAFT SEAL, BACK PLATE, DRIVE PLATE, INSERTS, GOVERNOR WEIGHTS, THRUST WASHER BEARING, AND THRUST SLEEVE.

a. Stand drive shaft (137) vertically, with drive shaft seal (138) facing up.

b. Remove drive shaft seal (138). Discard drive shaft seal.

c. Lift governor weight cage (139) until back plate (140) is level with groove on drive shaft (137).

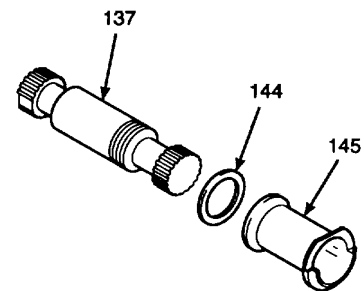
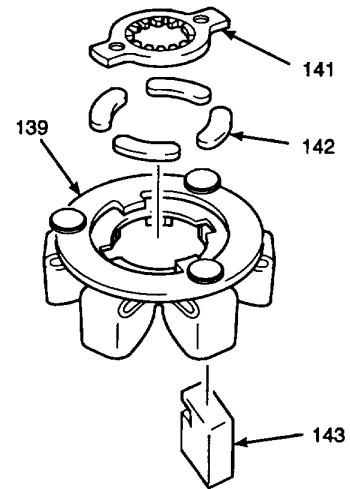
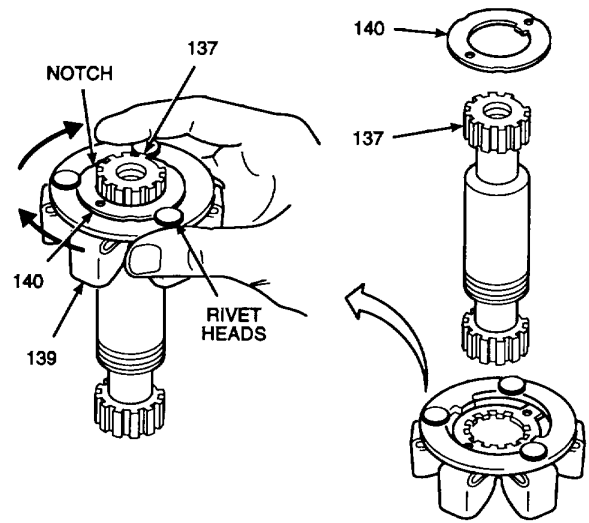
d. Hold back plate (140) and turn governor weight cage (139) until back plate notches are aligned with rivet heads on governor weight cage.



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B. DISASSEMBLE Continued.

- e. Lower governor weight cage (139) until it rests on work surface.
- f. Turn back plate (140) until internal lip is in line with drive shaft (137) splines.
- g. Lift back plate (140) from governor weight cage (139) and remove drive shaft (137).
- h. Remove drive plate (141), inserts (142), and governor weights (143).
- i. Remove thrust washer bearing (144) and thrust sleeve (145) from drive shaft (137).



GO TO NEXT PAGE

## 2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

## B. DISASSEMBLE Continued.

## 15. REMOVE SEALING RING.

- a. Remove fuel injection pump housing (146) from jig.



Do not scratch or gouge inside sealing surface of fuel injection pump when removing sealing ring. Leakage and poor performance may result from scratches or gouges on sealing surfaces. Use caution when prying out sealing ring from fuel injection pump.

- b. Remove sealing ring (147) using an extractor from DPA tool kit. Pry out sealing ring from fuel injection pump housing (146). Discard sealing ring.

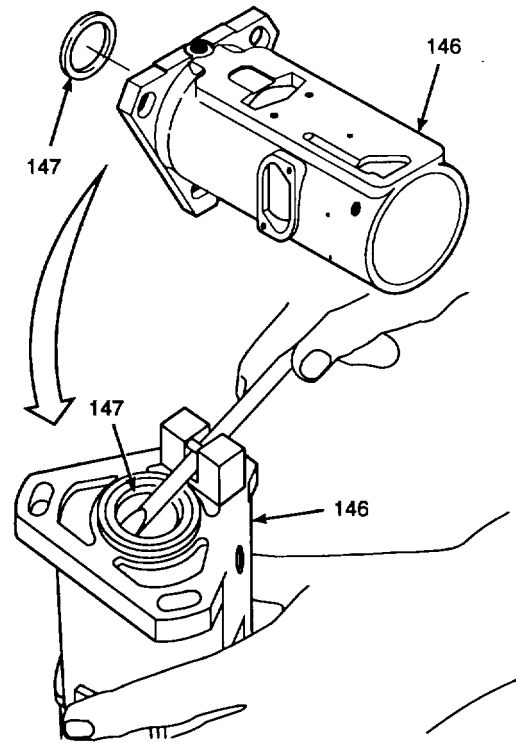
## C. CLEAN.

1. CLEAN ALL INTERNAL PARTS WITH LUBRICATING OIL.
2. DRY ALL INTERNAL PARTS WITH A CLEAN, LINT-FREE CLOTH.



Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.



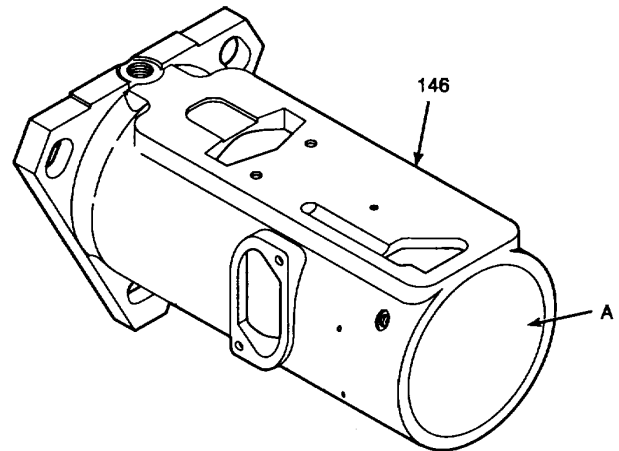
3. RINSE FUEL INJECTION PUMP HOUSING WITH CLEANING SOLVENT.
4. DRY FUEL INJECTION PUMP HOUSING WITH A CLEAN, LINT-FREE CLOTH.

**GO TO NEXT PAGE**

D. INSPECT.

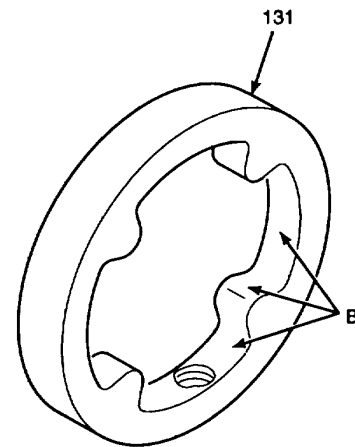
1. INSPECT FUEL INJECTION PUMP HOUSING FOR CORROSION AND SCORING.

- a. Inspect interior surfaces A of fuel injection pump housing (146) for corrosion, scoring, wear, and gouging caused by broken or out of alignment internal components.
- b. Replace fuel injection pump housing (146) if any sign of internal damage is detected.



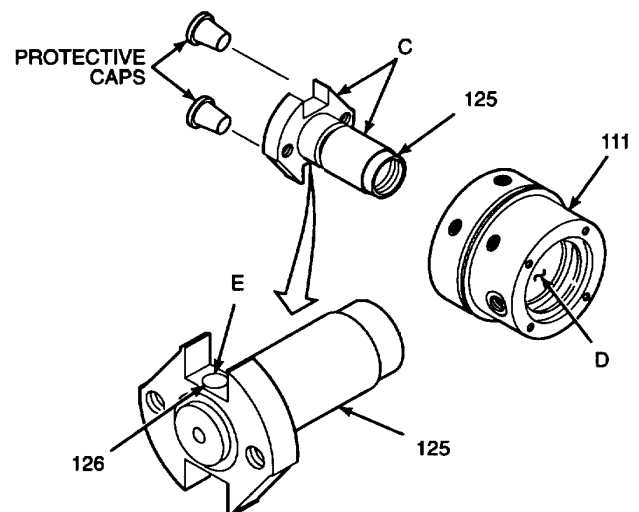
2. INSPECT CAM RING FOR CORROSION AND SCORING.

- a. Inspect cam ring (131) for worn down cam lobes, flat spots, or scoring on internal lobe surfaces B.
- b. Replace cam ring (131) if cam lobes are worn and if flat spots or scoring are detected.



3. INSPECT INNER AND OUTER ROTOR HEAD ASSEMBLIES FOR SCORING, SCRATCHES, AND CORROSION.

- a. Inspect inner and outer rotor head assemblies (125 and 111), surfaces C and D, for scoring, scratches, and corrosion.
- b. Remove protective caps from inner rotor head assembly (125). Inspect plungers (126), surfaces E, for corrosion, varnish, scoring, scratches, or chips. Install caps after inspecting plungers.
- c. Replace inner and outer rotor head assemblies (125 and 111) if scoring, scratches, or corrosion are detected on either part.



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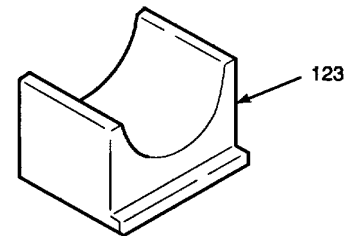
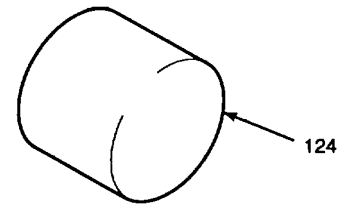


## 2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

## D. INSPECT Continued.

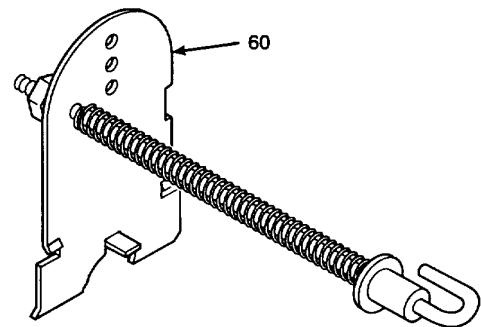
## 4. INSPECT ROLLER SHOES AND ROLLERS FOR FREE ROTATION AND DAMAGE.

- a. Inspect roller shoes (123) and rollers (124) for free rotation in roller shoes.
- b. Replace roller shoes (123) and rollers (124) if rollers fail to rotate freely inside roller shoes.



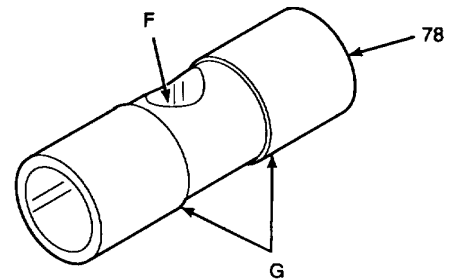
## 5. INSPECT SPRING LINK SPRING FOR DAMAGE.

- a. Inspect spring link (60) spring for broken, fractured, or corroded spring coils.
- b. Replace spring link (60) if spring coils are broken, fractured, or corroded.



## 6. INSPECT PISTON FOR SCORING, SCRATCHES, AND CORROSION.

- a. Inspect piston (78), surface F, for scoring, scratches, and corrosion.
- b. Inspect piston (78), surface G, for scoring, scratches, and corrosion.
- c. Replace piston (78) if scoring, scratches, or corrosion are detected.

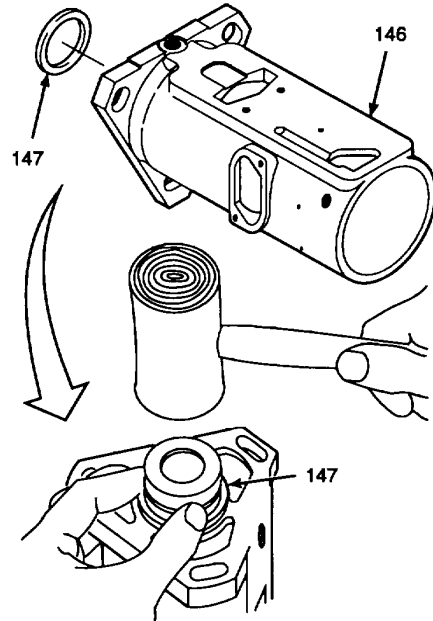


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E. ASSEMBLE.

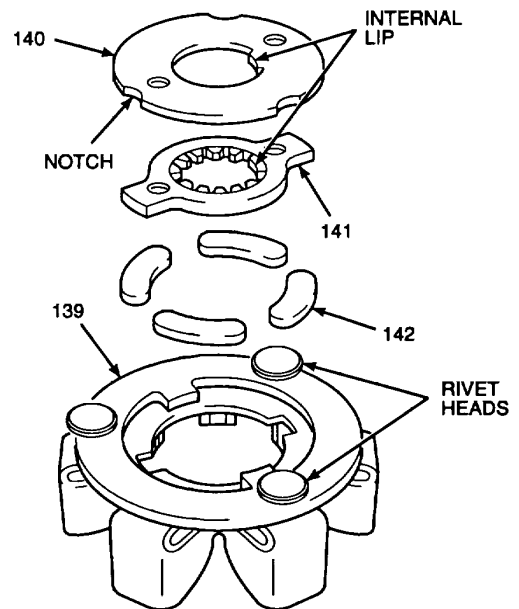
1. INSTALL SEALING RING.

- a. Lubricate sealing ring (147) with clean calibrating fluid.
- b. Use a guide from DPA workbench tool kit and a plastic hammer to tap in sealing ring (147).
- c. Install fuel injector pump housing (146) into jig, with top of fuel injection pump housing facing up.
- d. Install jig into bench vise.



2. ASSEMBLE DRIVE PLATE, BACK PLATE, AND INSERTS ONTO GOVERNOR WEIGHT CAGE AND INSTALL GOVERNOR WEIGHTS AND DRIVE SHAFT ONTO ASSEMBLED GOVERNOR WEIGHT CAGE.

- a. Assemble inserts (142) onto governor weight cage (139).
- b. Install drive plate (141), small diameter end facing down, onto governor weight cage (139).
- c. Position back plate (140) notches to slide over rivet heads.
- d. Rotate back plate (140) until internal lip aligns with lip on drive plate (141).

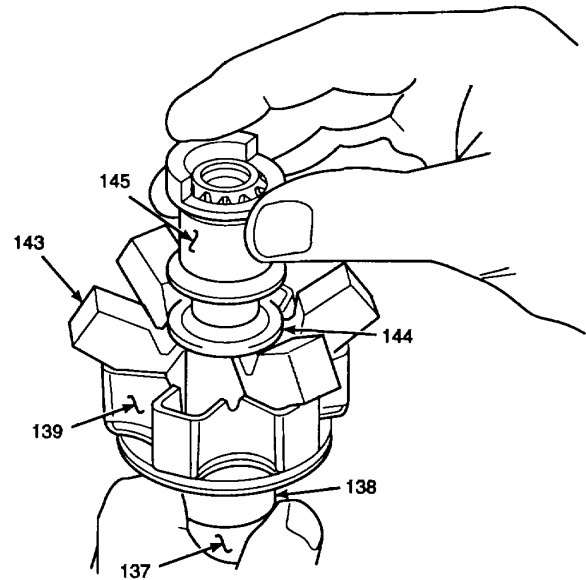


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2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

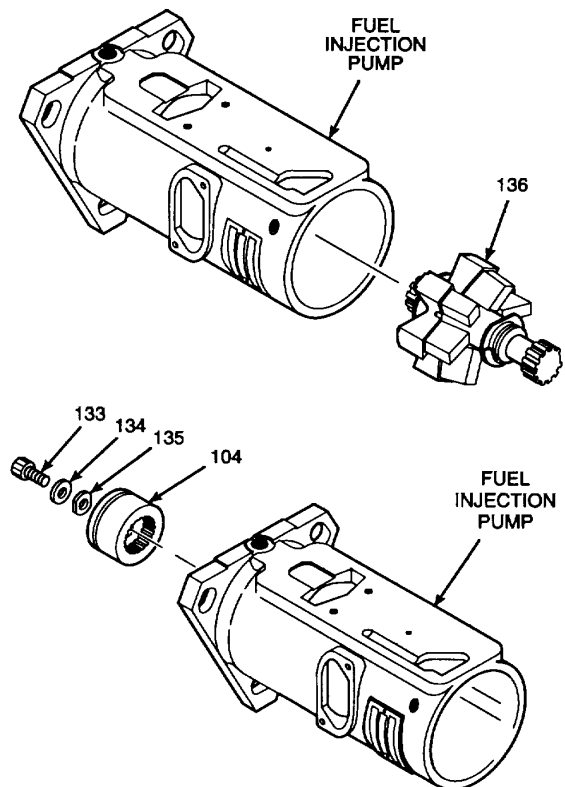
E. ASSEMBLE Continued.

- e. Assemble thrust sleeve (145) and thrust washer bearing (144) onto drive shaft (137).
- f. Place drive shaft (137) into governor weight cage (139) with seal groove on top.
- g. Add a governor weight (143) to governor weight cage (139). Adjust tool until lip of governor weight sits on thrust washer bearing (144).
- h. Place remaining governor weights (143) around drive shaft (137).
- i. Align assembled governor weight cage (139) with drive shaft (137) spline and manually push drive shaft down to seat governor weights (143) in governor weight cage.
- j. Use a protective cap from DPA tool kit and install drive shaft seal (138) onto assembled drive shaft (137).



3. INSTALL DRIVE HUB AND GOVERNOR WEIGHT CAGE INTO FUEL INJECTION PUMP.

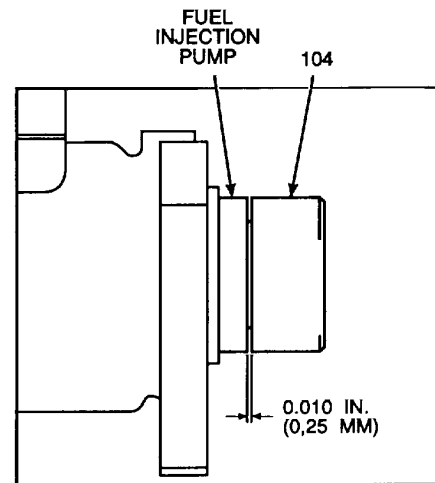
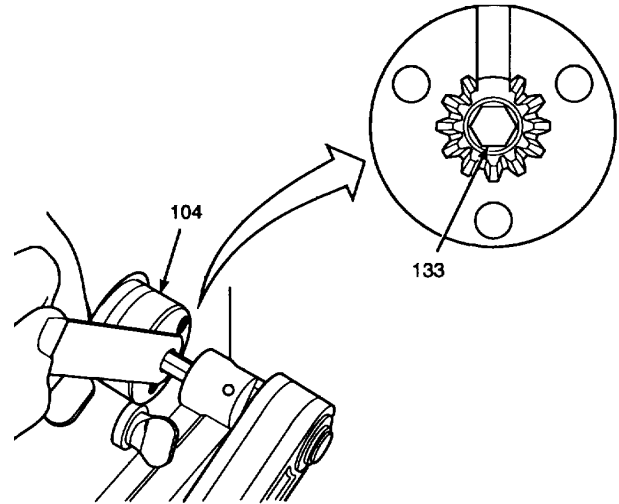
- a. Insert governor weight cage (136), weight-end first, inside fuel injection pump.
- b. Insert drive hub (104) into opposite end of fuel injection pump, touching governor weight cage (136).
- c. Install flat washer (135), lockwasher (134), and socket head cap screw (133).



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## E. ASSEMBLE Continued.

- d. Hold drive hub (104) with a spanner wrench from DPA tool kit.
- e. Use an adapter from DPA tool kit to tighten socket head cap screw (133) to 285 lb-in (32 N•m) while holding drive hub (104) with spanner wrench from DPA tool kit. Loosen socket head cap screw and repeat this operation three times to ensure socket head cap screws are tightened correctly.
- f. Use a thickness gage to check drive hub end float.
- g. Drive hub end float must not exceed 0.010 in. (0,25 mm) measured between rear face of drive hub (104) and fuel injection pump.
- h. If drive shaft end float is greater than 0.010 in. (0,25 mm), governor weight cage or fuel injection pump housing must be replaced.



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## 2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

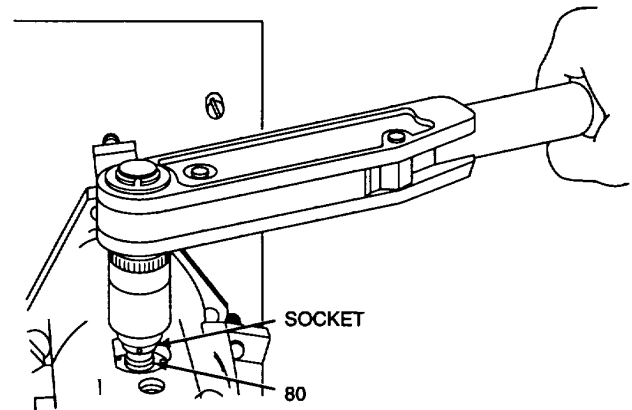
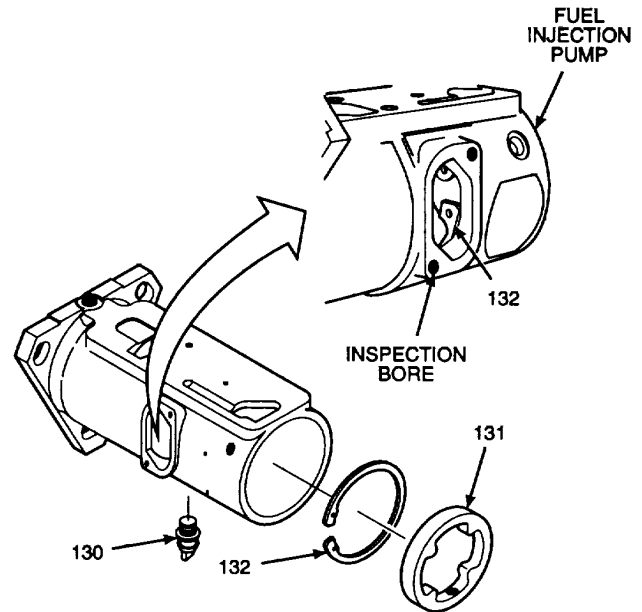
## E. ASSEMBLE - Continued.

## 4. INSTALL RETAINING RING, CAM RING, AND SCREW INTO FUEL INJECTION PUMP.

**WARNING**

Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Use snap ring pliers to install retaining ring (132).
- b. Center open points of retaining ring (132) in fuel injection pump inspection bore.
- c. Install cam ring (131) with arrow facing open end of fuel injection pump, going in same direction as arrow printed on housing label.
- d. Turn fuel injection pump over so bottom is facing up.
- e. Install screw (130). Use a socket from DPA tool kit to tighten screw (80) to 450 lb-in (51 N•m).
- f. Remove tool and use a plastic hammer to tap screw (130) lightly, to ensure cam ring is not binding inside fuel injection pump.

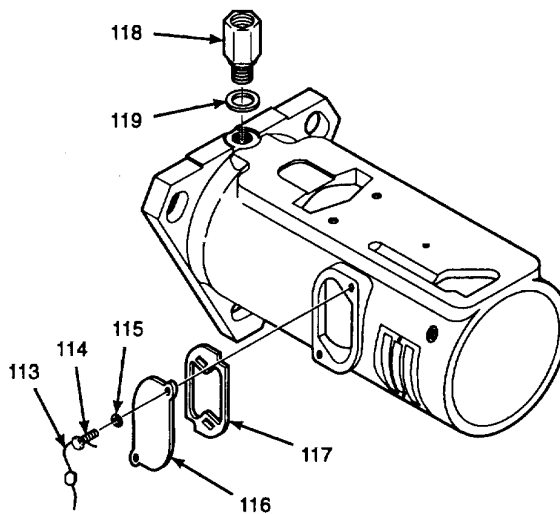


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**E. ASSEMBLE - Continued.**

**5. INSTALL FUEL CONNECTION AND ACCESS COVER.**

- a. Install flat washer (119) and fuel connection (118).
- b. Install gasket (117) and access cover (116) and secure with lockwasher (115) and screw (114).
- c. Install wire rope (113) through screws (114). Do not permanently attach wire rope until after fuel injection pump testing is completed.



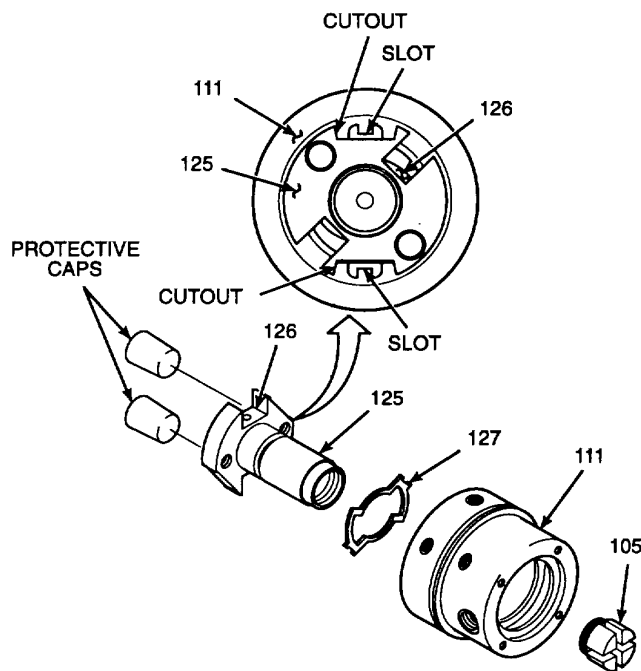
**6. INSTALL TRANSFER PUMP ROTOR.**

- a. Position outer rotor head assembly (111) with machined surfaces facing up.
- b. Remove pump impeller (105) and inner rotor head assembly (125) from outer rotor assembly (111).

**CAUTION**

Do not allow plungers to fall out of inner rotor head assembly. If plungers become damaged, the entire rotor head assembly must be replaced. Failure to replace damaged plungers may cause fuel injection pump failure or poor performance.

- c. Remove protective caps holding plungers (126) on inner rotor head assembly (125).

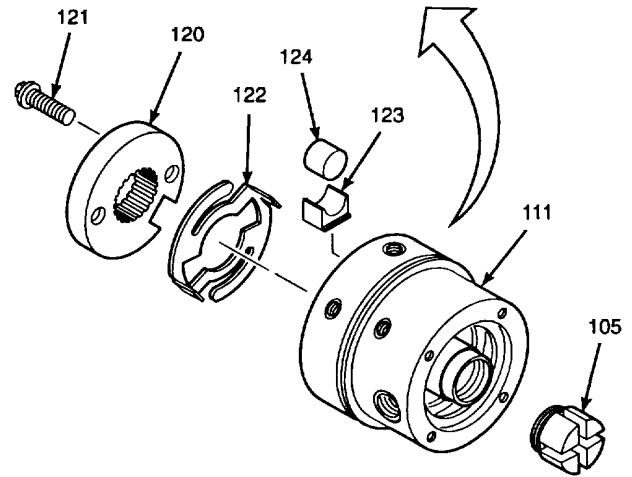
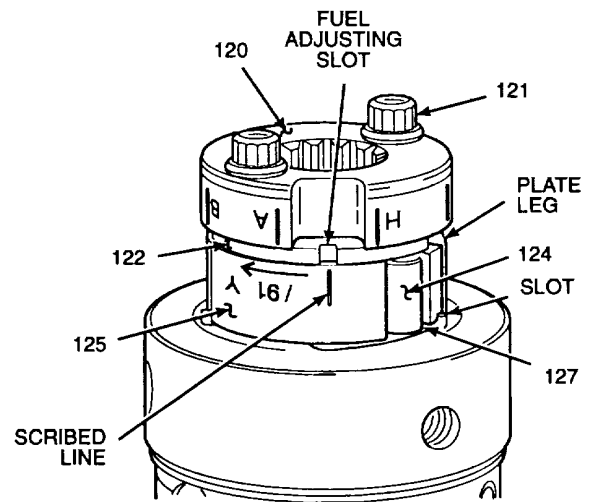


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**2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.**

**E. ASSEMBLE - Continued.**

- d. Position pump plate assembly (127) on rotor head assembly. Line up slots on plate assembly with cutouts on inner rotor head assembly (125). Refer to illustration.
- e. Insert inner rotor head assembly (125) into outer rotor head assembly (111).
- f. Install roller shoes (123) and rollers (124) into inner rotor head assembly (125).
- g. Install pump plate assembly (122), chamfered edges facing down, and engage plate legs in slots of pump plate assembly (127).
- h. Turn pump plate assemblies (127 and 122), so fuel adjusting slot in plate assembly (122) lines up with scribe line on inner rotor head assembly (125).
- i. Install governor hub (120), with machined side facing down, and slot between letters "A" and "H" aligned with pump plate assembly (122).
- j. Install drive screws (121) into governor hub (120) hand tight.
- k. Install pump -impeller (105) into outer rotor head assembly (111) hand tight.



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E. ASSEMBLE - Continued.

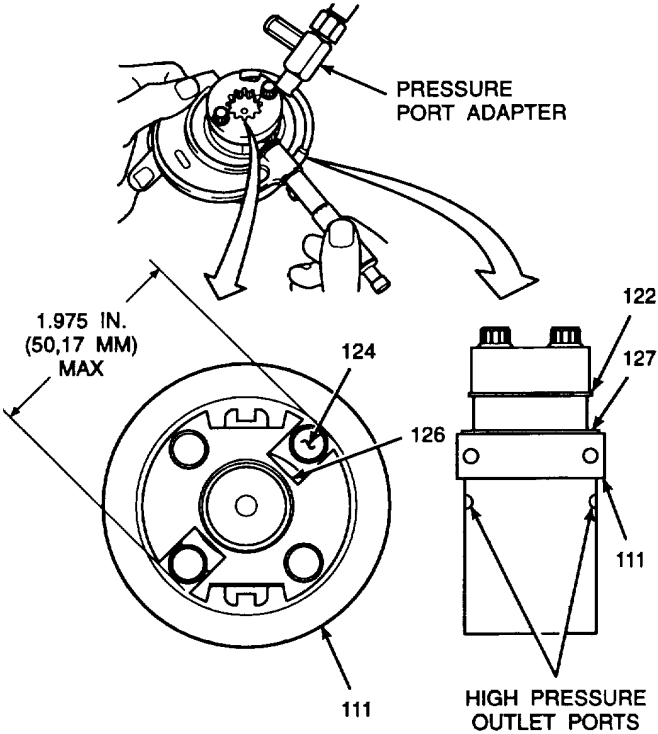
7. INSTALL NOZZLE TESTING UNIT ONTO ROTOR HEAD ASSEMBLY AND MEASURE ROLLER-TO-ROLLER DIMENSION.

- a. Install adapter from DPA tool kit to two high pressure outlet ports on rotor head assembly (111). Refer to illustration.
- b. Connect pressure port adapter from DPA tool kit to an air compressor unit equipped with a relief valve, set to 440 psi (3034 kPa).

**CAUTION**

Do not allow test pressure to exceed 440 psi (3034 kPa). Damage to plungers and roller shoes may result from exceeding test pressure limits. Use an air compressor unit equipped with an adjustable relief valve when testing rotor head assembly.

- c. Raise test pressure to 440 psi (3034 kPa).
- d. Turn rotor head assembly until plungers (126) and rollers (124) are forced outward to the maximum position.
- e. Use slide caliper to measure roller-to-roller dimension.
- f. Roller-to-roller dimension must be a maximum of 1.975 in. (50,17 mm).
- g. Turn pump plate assemblies (122 and 127) until maximum roller-to-roller dimension is correct.



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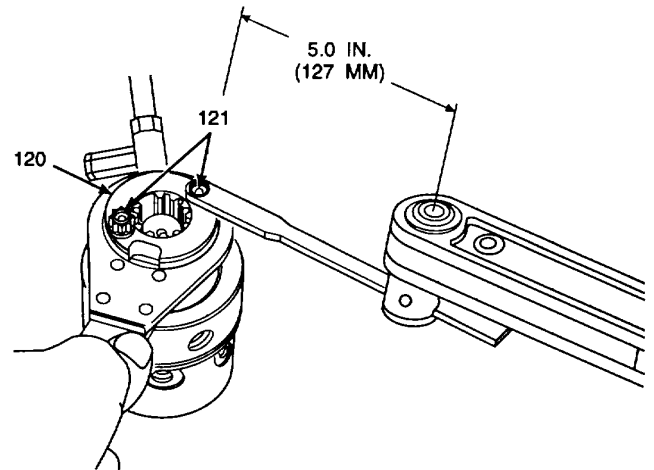


2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

E. ASSEMBLE - Continued.

NOTE

Torque wrench handle and adapter handle must remain in a straight line during tightening procedure.

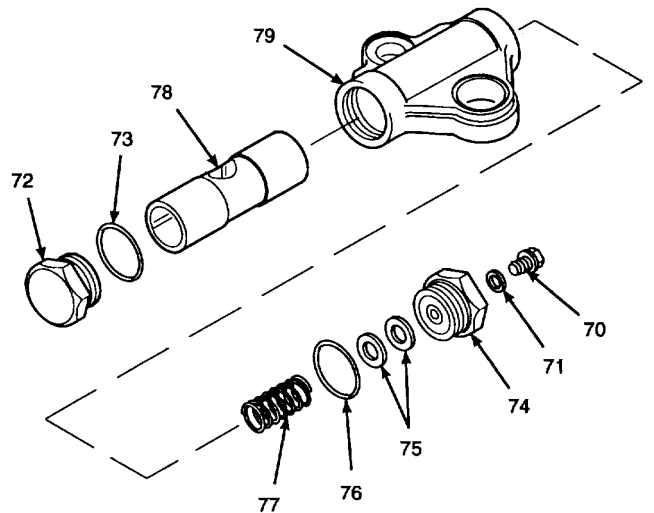


- h. Hold governor hub (120) with a spanner wrench from DPA tool kit.
- i. Use an adapter from DPA tool kit to tighten drive screws (121). Holding tool handles in a straight line, with center of adapter and center of spanner wrench at a distance of 5.0 in. (127 mm). Tighten screws to 180 lb-in (21 N•m).
- j. Partially loosen drive screws (121) one turn and repeat tightening operation three times to ensure torque is correct.
- k. Turn off nozzle testing unit.
- l. Disconnect pressure port adapter.

8. INSTALL PISTON, SPRING, SHIM, SPRING CAP, AND HEX HEAD CAP SCREW INTO AUTO ADVANCE HOUSING.

NOTE

Hollow end of piston must face spring cap on housing.



- a. Install piston (78), with hollow end of piston facing spring cap (74) and piston bore aligned with bore in auto advance housing (79).
- b. Lubricate preformed packings (76 and 73) and flat washer (71) with clean calibrating fluid.



Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- c. Install spring (77), shims (75), preformed packing (76), and spring cap (74). Tighten spring cap to 250 lb-in
- d. Install flat washer (71) and hex head cap screw (70). Tighten cap screw to 40 lb-in (5 N•m).
- e. Install preformed packing (73) and plug (72) hand tight.

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E. ASSEMBLE - Continued.

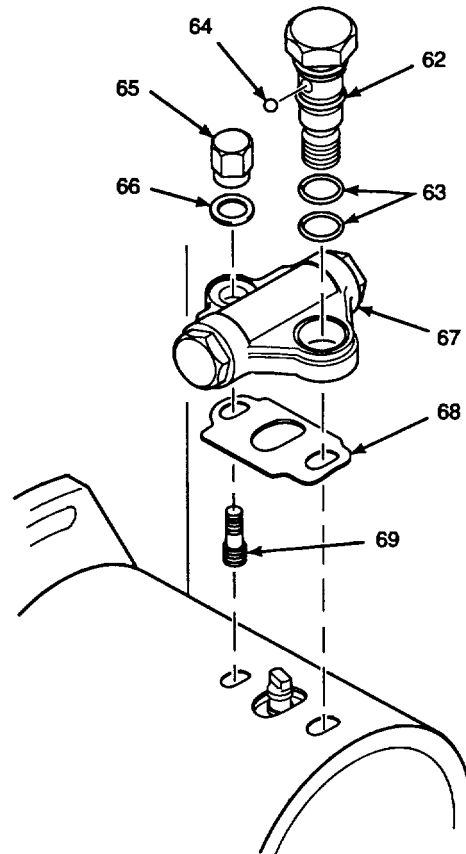
9. INSTALL GASKET, AUTO ADVANCE PISTON HOUSING ASSEMBLY, AND CAP NUT TO FUEL INJECTION PUMP AND ASSEMBLE SEALING RINGS AND BALL TO FLUID PASSAGE BOLT.

- a. Use a stud remover and setter to install stud (69).
- b. Install gasket (68) and auto advance piston housing assembly (67).
- c. Lubricate sealing rings (63) with clean calibrating fluid.



Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- d. Install sealing rings (63) and ball (64) onto fluid passage bolt (62).
- e. Set assembled fluid passage bolt (62) aside for later installation.
- f. Install flat washer (66) and cap nut (65) hand tight.



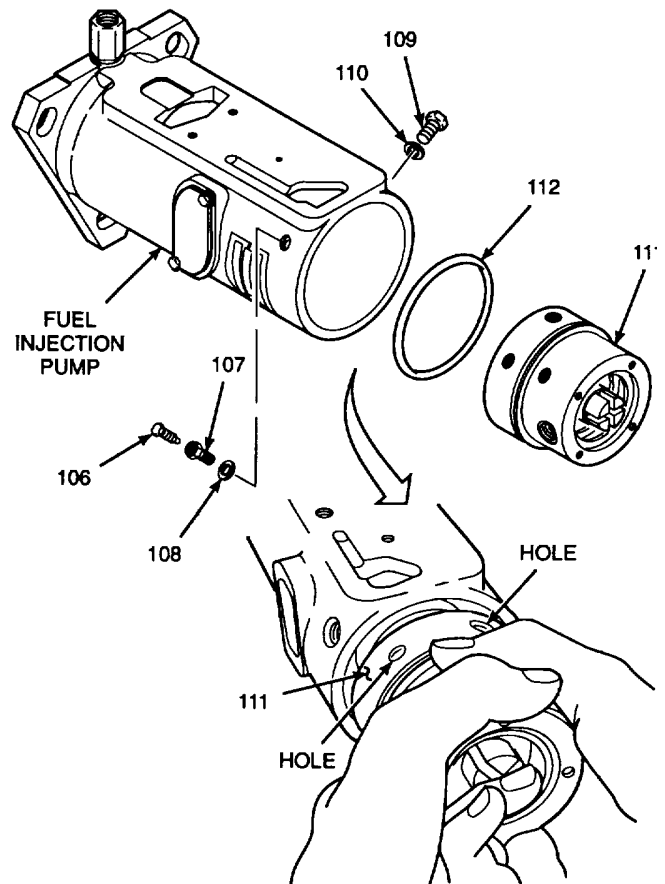
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**2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.**

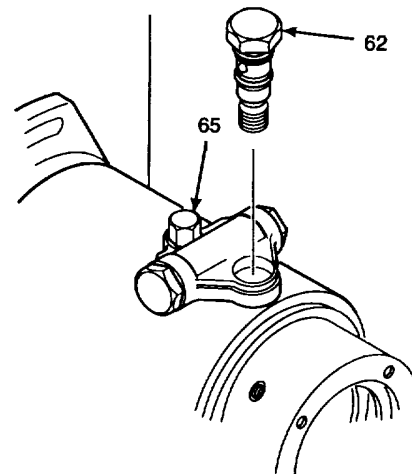
**E. ASSEMBLE - Continued.**

**10. INSTALL ROTOR HEAD ASSEMBLY TO FUEL INJECTION PUMP.**

- a. Turn fuel injection pump over so top is facing up.
- b. Lubricate rotor head assembly (111) and sealing ring (112) with clean calibrating fluid.
- c. Install sealing ring (112).
- d. Insert rotor head assembly (111) into fuel injection pump with a side-to-side rotating motion, until seated inside fuel injection pump.
- e. Align all holes in rotor head assembly (111) with holes in fuel injection pump, turning rotor head assembly as needed.
- f. Install washer (108), hex head cap screw (106), and fluid flow restrictor (107) hand tight.
- g. Install washer (110) and hex head cap screw (109) hand tight.



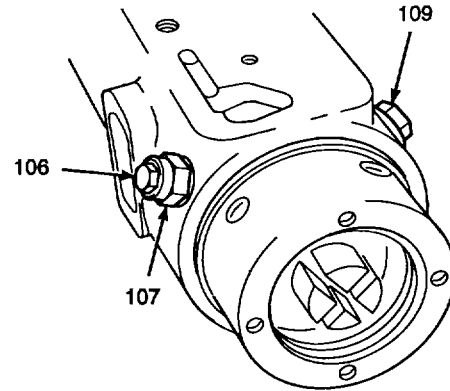
- h. Turn injection pump over so bottom is facing up.
- i. Install fluid passage bolt (62). Tighten to 285 lb-in (32 N•m).
- j. Tighten cap nut (65) to 130 lb-in (15 N•m).



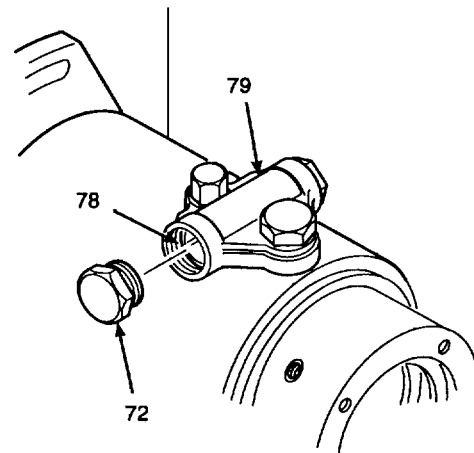
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**E. ASSEMBLE - Continued.**

- k. Turn fuel injection pump over so top is facing up.
- l. Tighten hex head cap screw (106) to 65 lb-in (7 N•m) and fluid flow restrictor (107) to 40 lb-in (5 N•m).
- m. Tighten hex head cap screw (109) to 170 lb-in (19,1 N•m).
- n. Turn fuel injection pump over so bottom is facing up.



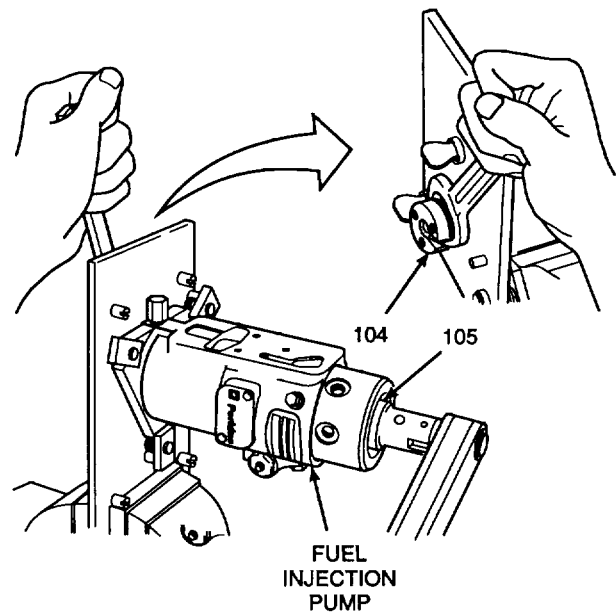
- o. Remove plug (72) and ensure piston (78) is free to move inside auto advance housing (79).
- p. Install plug (72). Tighten to 250 lb-in (28 N•m).



**NOTE**

**Pump impeller must be tightened in the opposite direction of fuel injection pump rotation.**

- q. Use a spanner wrench from DPA tool kit to hold drive hub (104) while tightening pump impeller (105) in a counterclockwise direction with a spanner wrench from DPA tool kit. Tighten pump impeller to 65 lb-in (7 N•m).



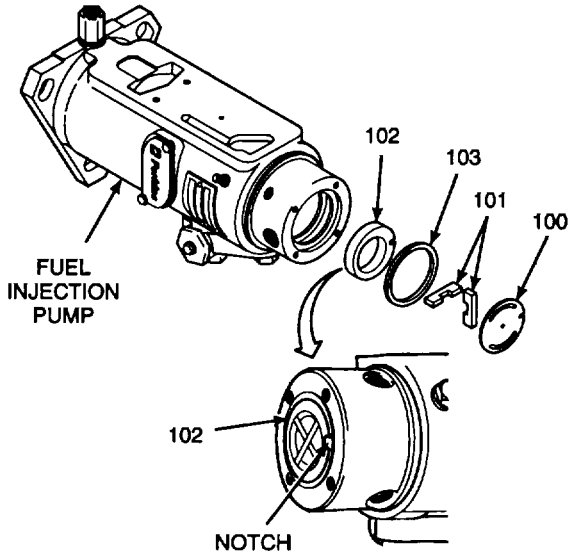
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**2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.**

**E. ASSEMBLE - Continued.**

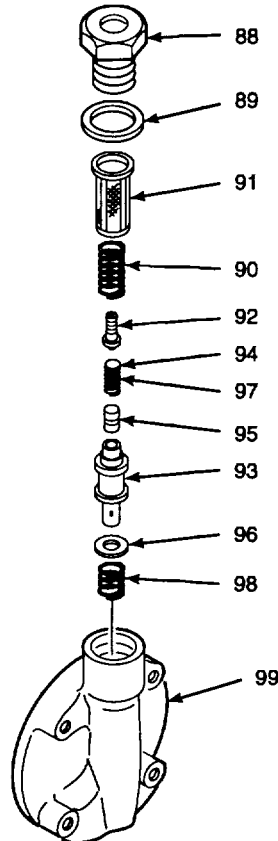
**11. INSTALL TRANSFER PUMP LINER, FUEL PUMP BLADES, AND SANDWICH PLATE.**

- a. Lubricate gasket (103) with clean calibrating oil.
- b. Install gasket (103) and transfer pump liner (102). Position transfer pump liner notch at the 3 o'clock position.
- c. Install fuel pump blades (101).
- d. Install sandwich plate (100), with notch in sandwich plate aligned with notch in transfer pump liner (102).



**12. ASSEMBLE SPRING, PUMP PISTONS, FUEL PUMP GUIDE, FUEL ADJUSTER, FILTER ELEMENT, SPRING, AND BOSS COUPLING.**

- a. Install spring (98) into end plate (99).
- b. Install spring (97), pump piston (95), and flat washer (96) into small end of pump piston (93).
- c. Install fuel pump guide (94) into large end of pump piston (93) and install assembled pump piston into end plate (99).
- d. Install filter element (91), fuel adjuster (92), and spring (90).
- e. Install washer (89) and boss coupling (88) onto assembled end plate (99). Tighten boss coupling hand tight.

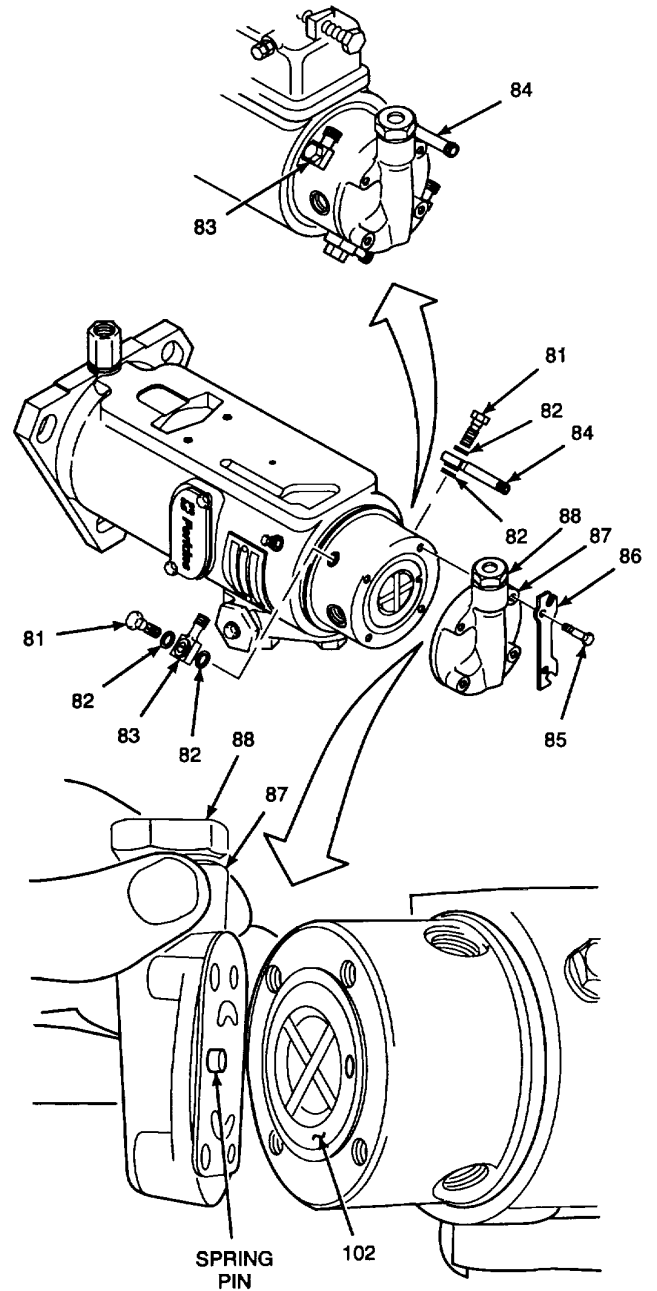


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E. ASSEMBLE - Continued.

13. INSTALL END PLATE ASSEMBLY, BANJO BOLTS, AND FLUID PASSAGE BOLTS ONTO FUEL INJECTION PUMP.

- a. Position end plate assembly (87) onto fuel injection pump by aligning spring pin on end plate assembly with notch in transfer pump liner (102).
- b. Install end plate assembly (87) and clamp (86) onto fuel injection pump and secure with hex head cap screws (85). Tighten to 45 lb-in (5 N•m).
- c. Tighten boss coupling (88) to 450 lb-in (51 N•m).
- d. Install banjo bolts (81 and 83), flat washers (82), and fluid passage bolt (84) onto fuel injection pump. Refer to illustration for bolt positioning.
- e. Tighten banjo bolts (81) to 240 lb-in (27 N•m).



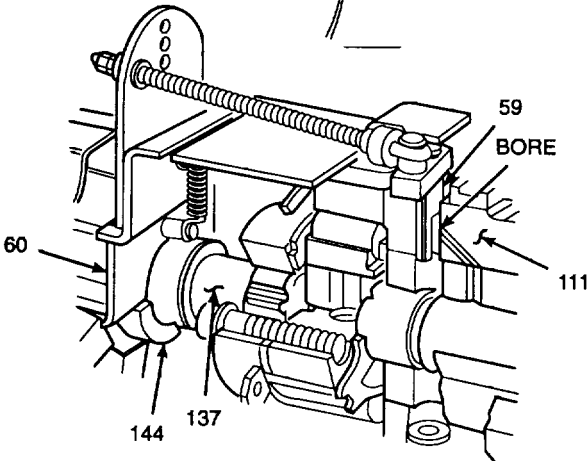
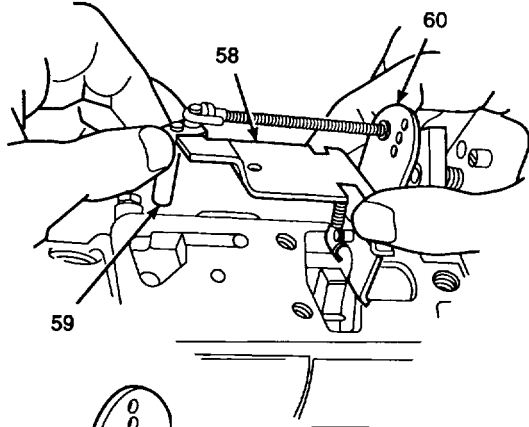
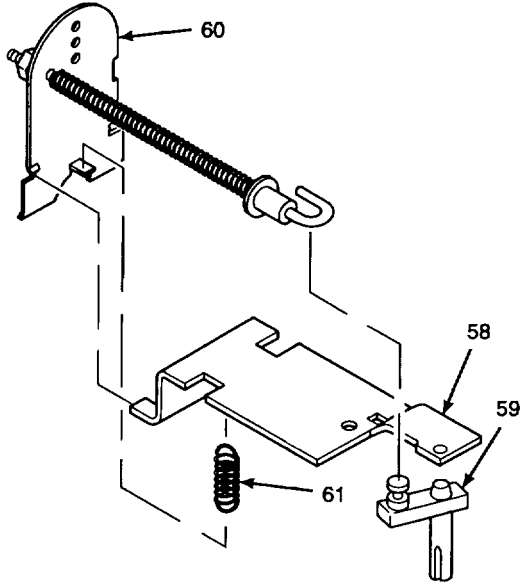
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2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.

E. ASSEMBLE - Continued.

14. ASSEMBLE AND INSTALL SPRING LINK, METERING VALVE, AND GOVERNOR ARM ASSEMBLY.

- a. Assemble governor arm assembly (58) to spring link (60) and attach spring (61) to tabs on governor arm assembly and spring link.
- b. Manually compress spring link (60) spring and install metering valve (59) onto hooked end of spring link (60).
- c. As an assembly, install spring link (60), metering valve (59), and governor arm assembly (58) onto fuel injection pump. Install bottom of spring link (60) into fuel injection pump, to rest on flat part of thrust washer bearing (144) on drive shaft (137).
- d. Insert shaft end of metering valve (59) into bore on rotor head assembly (111).

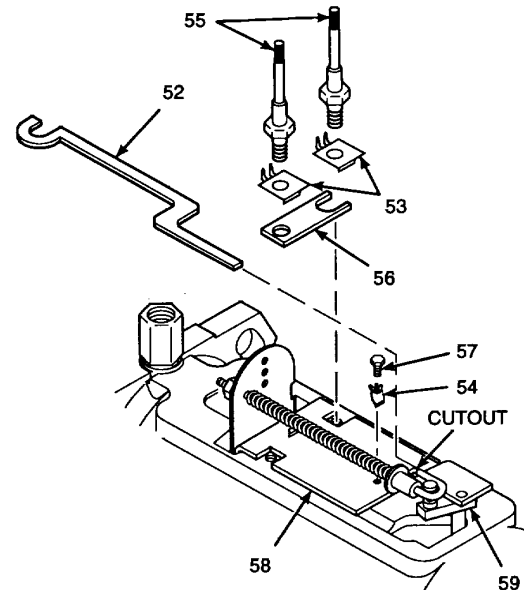


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**E. ASSEMBLE - Continued.**

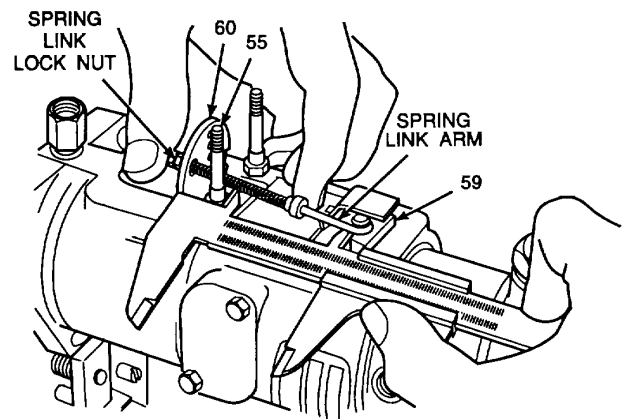
**15. INSTALL SHUTOFF BAR, KEEP PLATE, AND SHOULDERED STUDS.**

- a. Install shutoff bar (52) into cutout on governor arm assembly (58).
- b. Install keep plate (56).
- c. Install lockwashers (53) over keep plate (56), with tabs nearest to the metering valve (59).
- d. Install shouldered studs (55) hand tight.
- e. Install lockwasher (54), with tail resting below edge of governor arm assembly (58) closest to metering valve (59).
- f. Install screw (57). Tighten to 21 lb-in (2 N•m).
- g. Tighten shouldered studs (55) to 60 lb-in (7 N•m).
- h. Use a flat-blade screwdriver to bend tabs on lockwashers (54 and 53) up to secure shouldered studs (55) and screw (57).



**16. ADJUST SPRING LINK LENGTH.**

- a. Place a slide caliper between metering valve (59) and larger diameter of shouldered stud (55), gently extending metering valve as far as it can go, using the inside measuring part of micrometer.
- b. When metering valve (59) is extended, manually retract spring link (60) spring and check that metering valve is fully open (metering valve arm should almost touch edge of fuel injection pump housing).
- c. To adjust length of spring link (60), loosen spring link lock nut and adjust spring link arm length.
- d. Tighten spring link (60) lock nut when spring link arm length is correct.



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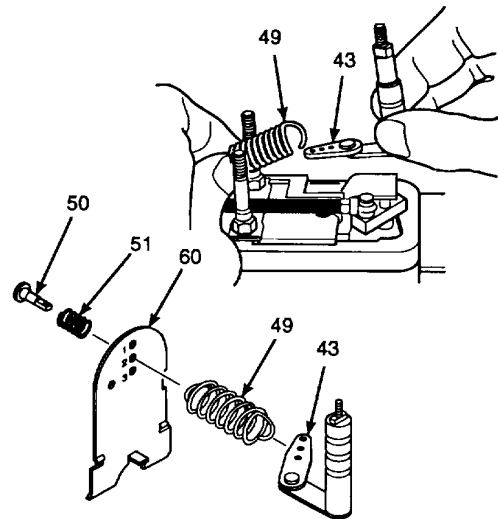


**2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.**

**E. ASSEMBLE - Continued.**

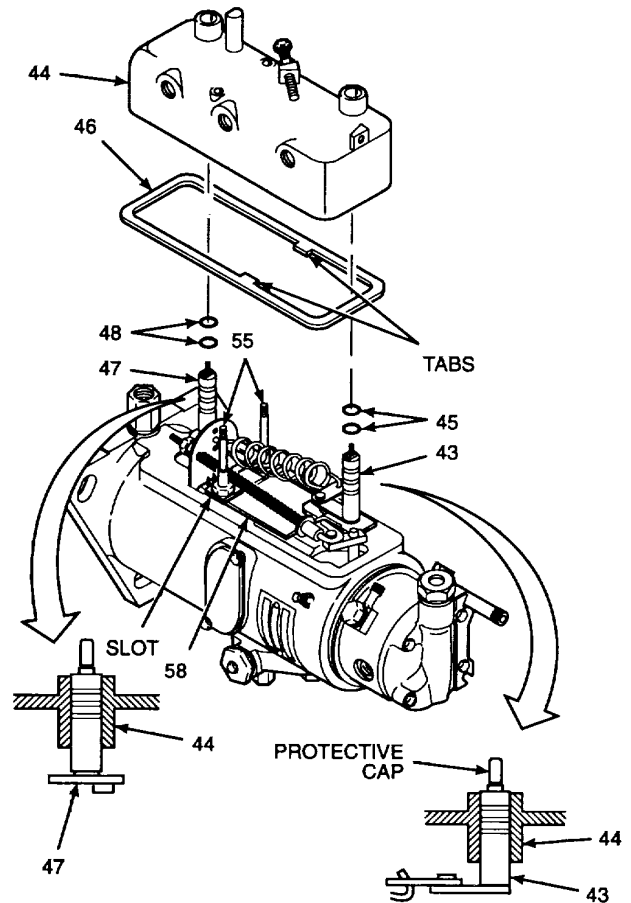
**17. INSTALL SPRING, SPRING HOLDER, AND SPRING, AND ATTACH SPRING TO THROTTLE SHAFT.**

- a. Assemble spring (51) and spring holder (50) through second hole in spring link (60) plate. Refer to illustration.
- b. While holding spring holder (50), compressed, through spring link plate, install spring (49). Release spring holder (50).
- c. Hold spring (49) and insert hooked end of spring through second hole in throttle shaft (43).



**18. INSTALL GASKET, THROTTLE SHAFT, SHUTOFF SPINDLE, AND CONTROL COVER ONTO FUEL INJECTION PUMP.**

- a. Install gasket (46) onto top face of fuel injection pump, with gasket tabs inserted into slots on governor arm assembly (58).
- b. Install protective cap from DPA tool kit over throttle shaft (43).
- c. Lubricate seals (48 and 45) with clean calibrating fluid.
- d. Install seals (45) onto throttle shaft (43).
- e. Install throttle shaft (43) through control cover (44).
- f. Remove protective cap from throttle shaft (43) and install onto shutoff spindle (47).
- g. Install seals (48) onto shutoff spindle (47).
- h. Install shutoff spindle (47) through control cover (44), with arm turned toward nearest outer edge of control cover.
- i. Remove protective cap from shutoff spindle (47).
- j. Seat control cover (44) onto shouldered studs (55) and align with gasket (46).

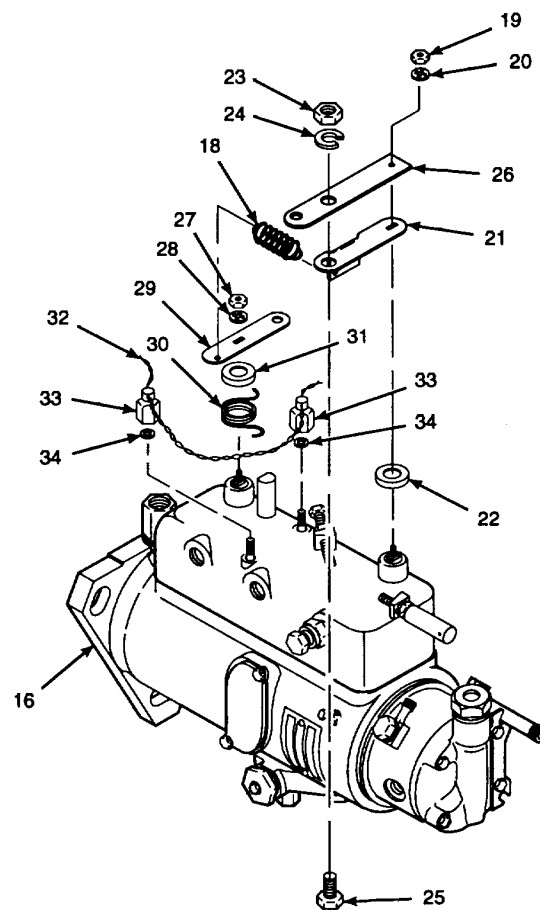
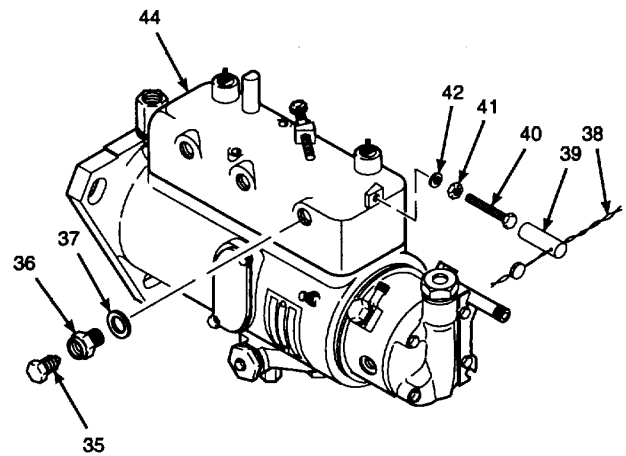


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**E. ASSEMBLE - Continued.**

**19. INSTALL HEX HEAD CAP SCREWS, CAP NUTS, SLEEVE, WIRE ROPE, SPRINGS, AND LEVERS ONTO FUEL INJECTION PUMP.**

- a. Install washer (37) and hex head cap screws (36 and 35) onto control cover (44) and tighten.
- b. Install flat washer (42), nut (41), and hex head cap screw (40) and tighten.
- c. Install wire rope (38) onto sleeve (39). Do not permanently attach wire rope until fuel injection pump testing is completed.
- d. Install sleeve (39) over hex head cap screw (40), with wire rope (38) loose.
- e. Install washers (34) and cap nuts (33).
- f. Install throttle, lever (26) and secure with hex head cap screw (25), lockwasher (24), and hex nut (23).
- g. Install governor cap (22), lever (21), lockwasher (20), and hex nut (19).
- h. Install governor cap (31), spring (30), governor lever (29), lockwasher (28), and hex nut (27).
- i. Install wire rope (32) onto cap nuts (33). Do not permanently attach wire rope until fuel injection pump testing is completed.
- j. Install spring (18) onto governor lever (29) and throttle lever (26).
- k. Remove fuel injection pump (16) from jig.



**20. INSTALL FUEL SHUTOFF SOLENOID PER TM 5-3895-373-20.**

**GO TO NEXT PAGE**

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**2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.**

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**F. TEST.**

1. PERFORM IMMERSION LEAK TEST BY SEALING OFF LOW PRESSURE OUTLET ON FUEL INJECTION PUMP AND INSTALLING AIR COMPRESSOR LINE INTO PUMP INLET CONNECTION. RAISE AIR PRESSURE IN FUEL INJECTION PUMP TO 20 LB-IN<sup>2</sup> (1,41 KG/CM<sup>2</sup>). IMMERSE PUMP IN CLEAN CALIBRATING FLUID FOR 10 MINUTES TO ALLOW TRAPPED AIR TO ESCAPE, THEN, IF NO LEAKS ARE DETECTED, REDUCE AIR PRESSURE TO 2 LB-IN<sup>2</sup> (0,14 KG/CM<sup>2</sup>) FOR 30 SECONDS. IF PUMP STILL DOES NOT LEAK, RAISE AIR PRESSURE AGAIN TO 20 LB-IN<sup>2</sup> (1,41 KG/CM<sup>2</sup>) FOR 30 SECONDS. IF NO LEAKS ARE DETECTED, THEN REMOVE PUMP FROM CALIBRATING FLUID AND DISCONNECT AIR COMPRESSOR LINE.
2. SET UP FUEL INJECTION PUMP TEST BY MOUNTING FUEL INJECTION PUMP TO FUEL INJECTION PUMP TESTER. REFER TO TM 9-4910-778-14&P.



Fuel injection pump operates in a clockwise direction, viewed from drive end. Do not operate fuel injection pump in a counterclockwise direction during testing. Damage to fuel injection pump can result from operation in a counterclockwise direction.

3. TEST FUEL INJECTION PUMP FOR PRIMING, TRANSFER PRESSURE, ADVANCE SETTING, FULL ADVANCE, BACK LEAKAGE, MAXIMUM DELIVERY SETTING, DELIVERY CHECK, GOVERNOR SETTING, CUTOFF OPERATION, THROTTLE OPERATION, SOLENOID SHUTOFF OPERATION, AND TIMING. REFER TO TM 9-4910-778-14&P.

**NOTE**

Use only calibrating fluid as specified in Appendix B.

- a. Use calibrating fluid at 104°F (40°C), with nozzle opening pressure at 172 +3 -0 bar.

**GO TO NEXT PAGE**

**F. TEST - Continued.**

b. Screw transfer pressure adjuster fully out and then 1-1/2 turns in before starting test.

TEST OPERATION	RPM	REQUIREMENTS
Priming	100 max	Obtain fuel delivery from all injectors.
Transfer pressure	100	8 lb-ft (0,5 bar) minimum.
Advance setting	800	Adjust transfer pressure screw to obtain advance of 2.5°.
Transfer pressure	800	56 to 72 lb-ft (3,9 to 5,0 bar).
Full advance	1400	4.75° to 5.25°.
Back leakage	800	20 to 70 cm <sup>3</sup> per 100 strokes time cycle. (Flow rate of 160 to 560 ml/minute.)
Maximum delivery setting	1300	Record average delivery in cm <sup>3</sup> (spring position code 4).
Governor setting	1450	Set throttle by maximum speed adjustment screw to obtain maximum average delivery of 2,0 cm <sup>3</sup> . No line to exceed 3,0 cm <sup>3</sup> . Lock stop screw.
Delivery check	1300	With throttle set same as governor setting test, delivery not to be less than at maximum delivery setting test, minimum 0,4 cm <sup>3</sup> .
Cutoff operation	200	Average delivery not to exceed 0,8 cm <sup>3</sup> . Shutoff lever closed.
Throttle operation	200	Average delivery not to exceed 1,0 cm <sup>3</sup> . Throttle lever closed.

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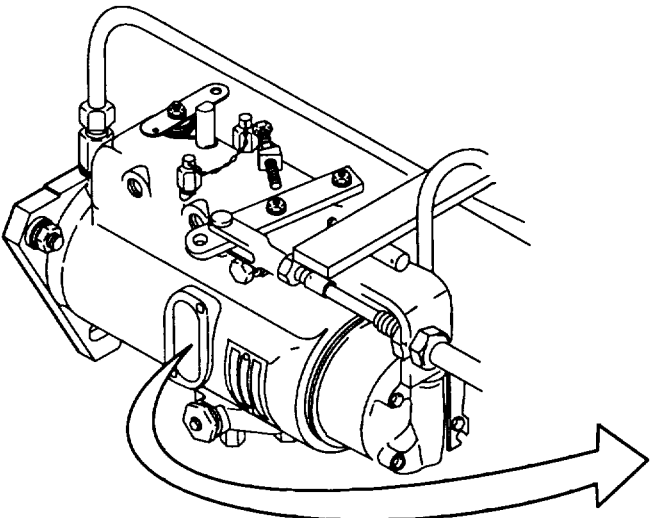
2.19 REPLACE/REPAIR FUEL INJECTION PUMP- Continued.

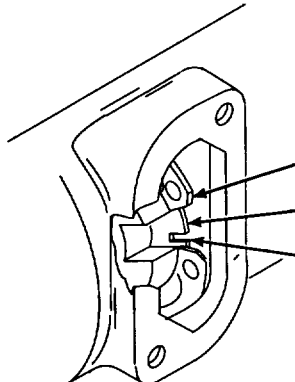
F. TEST - Continued.

- c. Run machine down to 100 RPM and stop. Disconnect transfer pressure gauge.
- d. Start machine and prime fuel injection pump. Refer to priming test operation in table below.

TEST OPERATION	RPM	REQUIREMENTS
Priming	100 max	Obtain fuel delivery from all injectors.
Delivery Check	100	Minimum delivery to be as at maximum delivery setting, minus 12,5 mm <sup>3</sup> /stroke.
Solenoid shutoff operation	325	Deenergize solenoid and wait for 5 seconds before operating trip gear. Average fuel delivery not to exceed 0,5 mm <sup>3</sup> .
Governor setting	set 1/2 speed on n/plate	Set throttle to give average delivery of 2,0 cm <sup>3</sup> . Lock stop screw.
Timing		<p>Apply 300 psi to #1 pump outlet. Use spanner wrench to rotate injection pump drive hub clockwise until pump stops turning.</p> <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;"><b>Retaining ring is moved to provide a quick reference for knowing when injection pump pressure port is open for #1 engine cylinder.</b></p> <p>Use a pair of snap ring pliers to compress and turn retaining ring so that flat inside surface of retaining ring lines up with fuel adjusting slot in pump plate assembly.</p>





RETAINING RING  
 PUMP PLATE ASSEMBLY  
 FUEL ADJUSTING SLOT

GO TO NEXT PAGE

**F. TEST - Continued.**

- e. If fuel injection pump fails any of the above tests, disassemble the pump far enough to remedy the cause of pump test failure.

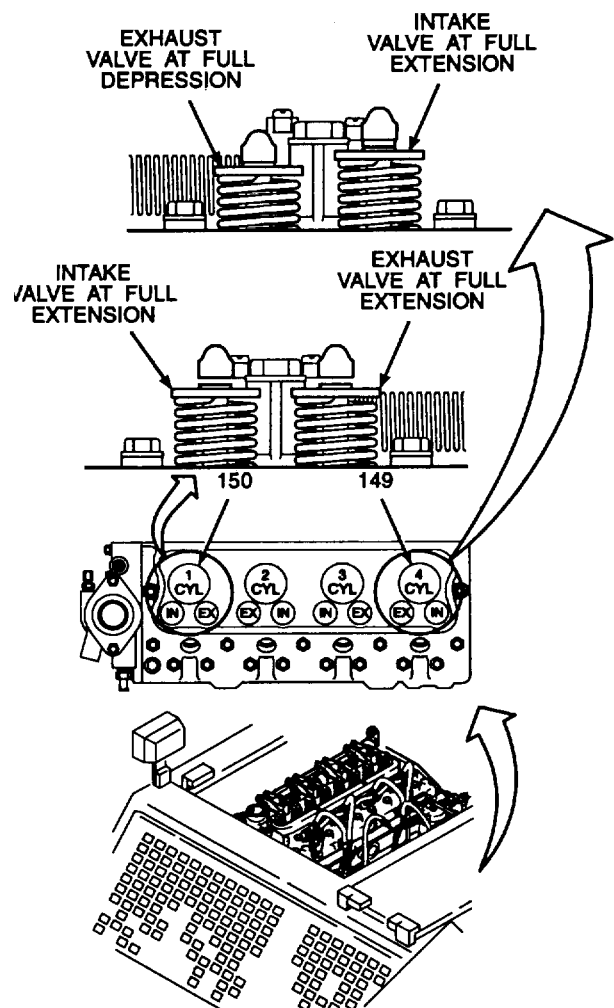
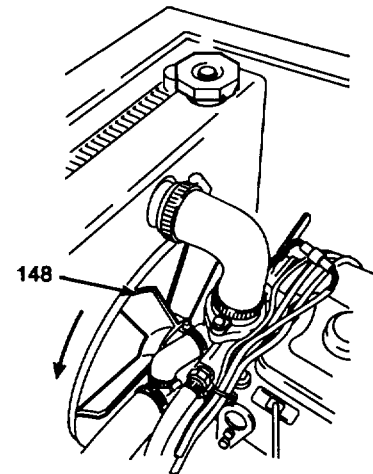
**G. INSTALL.**

**1. SET #1 PISTON TO TOP DEAD CENTER POSITION.**

**NOTE**

Rotate the radiator fan clockwise and ensure that the fan belt rotates the crankshaft pulley. If this does not occur, adjust the fan belt tension per TM 5-3895-373-20.

- a. Rotate radiator fan (148) clockwise and ensure that the fan belt rotates the crankshaft pulley.
- b. With the help of a second person, use radiator fan (148) and rotate the engine until the valves on number #4 cylinder (149) reach the "rocking" position. A visual inspection of the valves in the rocking position will indicate the period between the opening of the intake valve and the closing of the exhaust valve.
- c. With number #4 cylinder (149) valves in the "rocking" position, a visual inspection of the number #1 cylinder (150) valves will show both the intake and exhaust valves at full extension.



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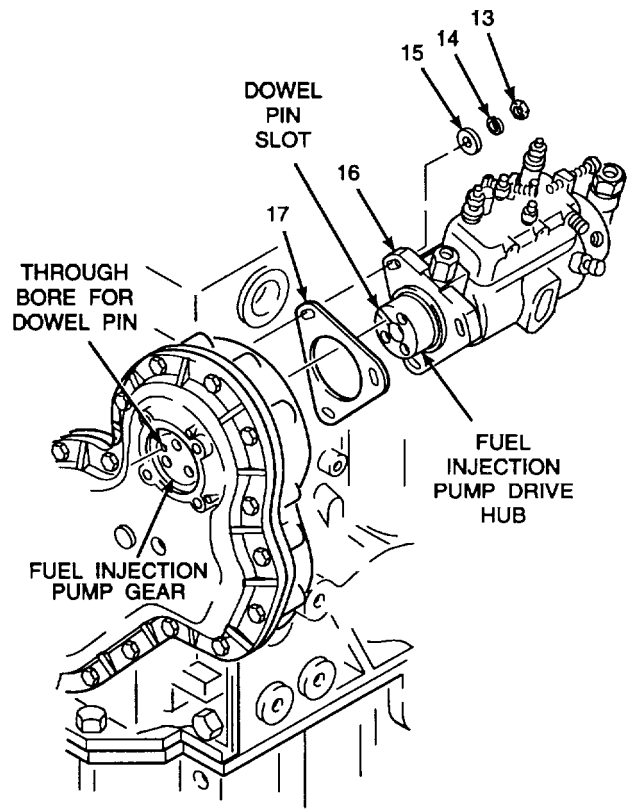
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**2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.**


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**G. INSTALL- Continued.****2. INSTALL FUEL INJECTION PUMP ONTO ENGINE.**

- a. Install gasket (17) onto fuel injection pump (16).
- b. Locate position of dowel pin through bore on fuel injection pump gear.
- c. Rotate drive hub of fuel injection pump (16) to line up slot in drive hub with dowel pin in fuel injection pump gear.
- d. Install fuel injection pump on engine timing gear case. Ensure dowel pin in fuel injection pump gear mates with slot in drive hub of fuel injection pump.
- e. Install flat washers (15), lockwashers (14), and hex nuts (13). Do not tighten hex nuts.

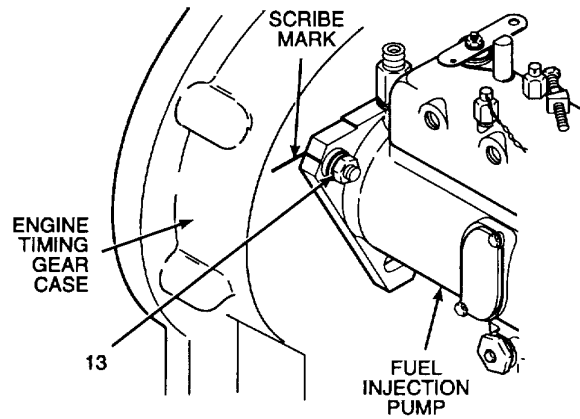
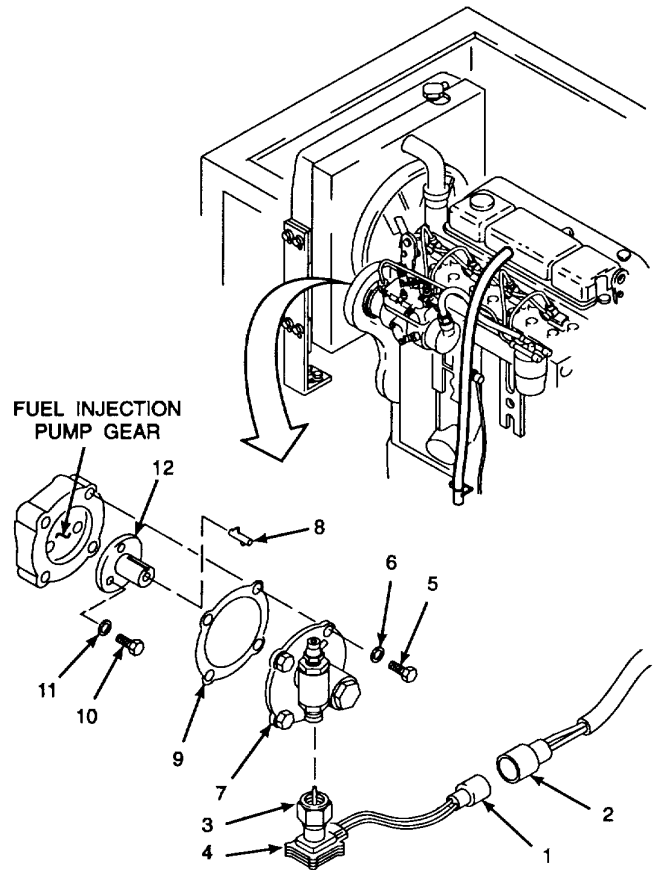


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**G. INSTALL - Continued.**

**3. INSTALL TACHOMETER GENERATOR ONTO ENGINE.**

- a. Install adapter (12) and secure to fuel injection pump gear with hex head cap screws (10) and flat washers (11).
- b. Install key (8) into drive angle (7).
- c. Install gasket (9) and tachometer drive angle (7), securing with hex head cap screws (5) and lockwashers (6).
- d. Install tachometer generator (4) and secure with swivel nut (3).
- e. Apply electrical insulating compound to tachometer generator electrical connector (1).
- f. Reconnect tachometer generator electrical connector (1) to engine harness connector (2).
- g. Align scribe mark on fuel injection pump (16) with scribe mark on engine timing gear case. Tighten hex nuts (13).



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**2.19 REPLACE/REPAIR FUEL INJECTION PUMP - Continued.**

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**G. INSTALL - Continued.****NOTE**

**FOLLOW-ON-TASKS:** Install fuel shutoff solenoid per TM 5-3895-373-20.  
Install fuel injector lines per paragraph 2.18.  
Install fuel injector line from fuel filter per TM 5-3895-373-20.  
Install valve cover per TM 5-3895-373-20.  
Install lower coolant hose per TM 5-3895-373-20.  
Install muffler and pipes per TM 5-3895-373-20.  
Fill radiator per TM 5-3895-373-20.  
Purge engine fuel system per TM 5-3895-373-20.  
Connect throttle control cable and check engine speed per TM 5-3895-373-20.  
Close front top left access door per TM 5-3895-373-10.  
Close front top right access door per TM 5-3895-373-10.

**END OF TASK**

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**2.20 REPAIR FUEL LIFT PUMP.**

This task covers:           a. Disassemble           b. Clean           c. Inspect  
   d. Assemble

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)

Contact point dresser (Item 37, Appendix D)

Materials/parts:

Emery cloth (Item 5, Appendix B)

Lint-free cloth (Item 7, Appendix B)

Parts Kit

References:

TM 5-3895-373-20

TM 5-3895-373-24P

Equipment Condition:

Fuel lift pump removed per TM 5-3895-373-20.

**A. DISASSEMBLE.****1. REMOVE FUEL LIFT PUMP COVER FROM BODY.****WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death:

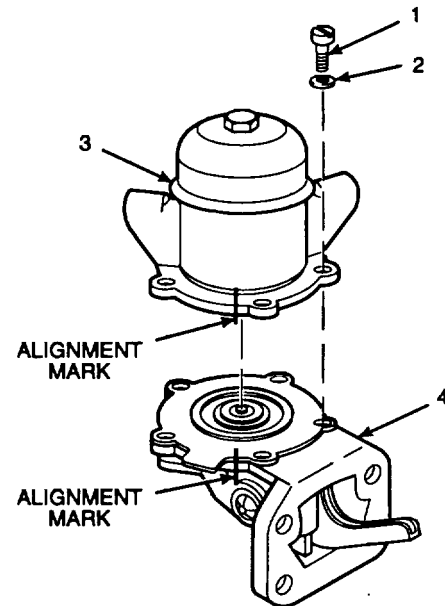
Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

- a. Use a contact point dresser and make an alignment mark across top and bottom flanges of fuel lift pump for alignment during assembly.
- b. Remove machine screws (1) and lockwashers (2) from cover (3) and body (4).
- c. Separate cover from body.



**GO TO NEXT PAGE**

2.20 REPAIR FUEL LIFT PUMP - Continued.

A. DISASSEMBLE - Continued.

2. REMOVE FILTER COVER, PREFORMED PACKING, FILTER SCREEN, AND VALVES FROM COVER.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death:

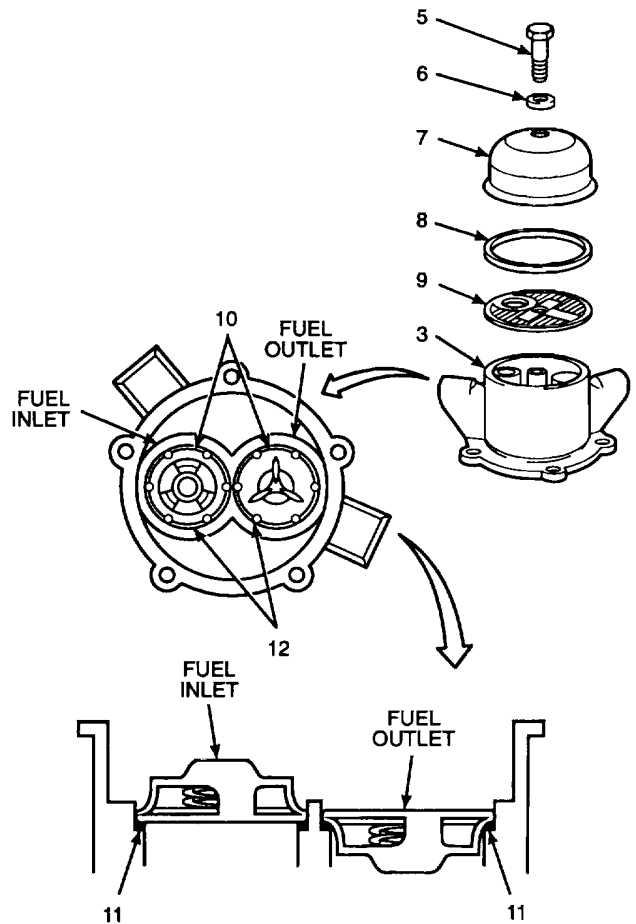
Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

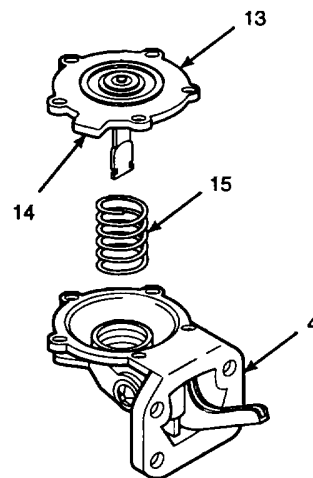
Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

- a. Remove hex head cap screw (5) and seal washer (6) from filter cover (7).
- b. Remove filter cover (7) and preformed packing (8). Discard preformed packing.
- c. Remove and discard filter screen (9).
- d. Remove valves (10) and gaskets (11) from valve seats (12) inside cover (3).



3. REMOVE DIAPHRAGM AND SPRING FROM BODY.

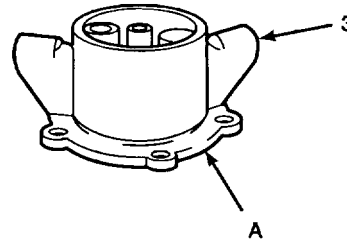
- a. Press down hard on center of diaphragm (13). Grasp tab (14) on diaphragm and turn diaphragm 1/4 turn clockwise while pressing down on diaphragm.
- b. Pull up on diaphragm to remove diaphragm from body (4). Discard diaphragm.
- c. Remove diaphragm spring (15) from body.



GO TO NEXT PAGE

**B. CLEAN.**

1. CLEAN ALL PARTS IN WARM, SOAPY WATER. ALLOW PARTS TO SOAK FOR SEVERAL MINUTES.
2. RINSE ALL PARTS IN WATER.



<b>WARNING</b>
----------------

Compressed air used for cleaning will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

3. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO BLOW WATER AND FOREIGN MATTER FROM BODY, COVER, AND FASTENERS.
  4. DRY ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.
- C. INSPECT.**
1. INSPECT COVER (3) FOR WARPED FLANGES AND STRIPPED THREADS.
    - a. Inspect cover (3) surface A, for warped flanges. Fit cover and body flanges together with file marks aligned and check for gaps between flanges.
    - b. If cover surface is warped, place emery cloth on a flat surface and place cover flange on paper.
    - c. Lightly sand flange until smooth. Check cover and body flange fit. Repeat procedure as needed.
    - d. Rinse cover in warm, soapy water and use compressed air to remove foreign matter. Dry cover with a clean, lint-free cloth.

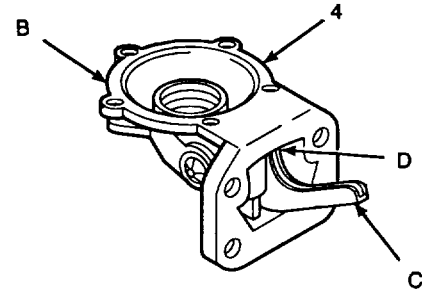
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**2.20 REPAIR FUEL LIFT PUMP - Continued.**

**C. INSPECT - Continued.**

**2. INSPECT BODY (4) FOR WARPED FLANGES, WORN ROCKER ARM, AND WORN OR BROKEN ROCKER ARM SPRING.**

- a. Inspect body (4), surface B, for warped flanges. Fit body and cover flanges together with file marks aligned and check for gaps between flanges.
- b. If body flange is warped, place emery cloth on a flat surface and place body flange on paper.
- c. Lightly sand flange until smooth. Check body and cover flange fit. Repeat procedure as needed.
- d. Rinse body in warm, soapy water and use compressed air to remove foreign matter. Dry body with a clean, lint-free cloth.
- e. Inspect rocker arm surface C for wear and rocker arm spring surface D for wear or damage. Replace fuel lift pump if rocker arm surface is worn or rocker arm spring is worn or damaged.



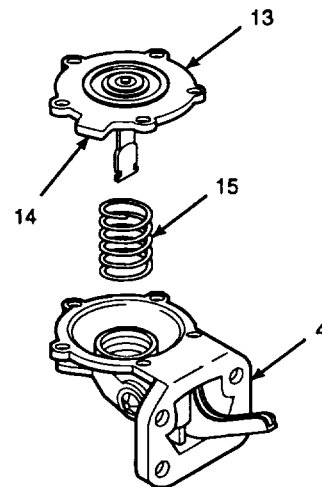
**3. INSPECT DIAPHRAGM SPRING (15) FOR WEAR, COMPRESSION, AND CORROSION.**

**4. REPLACE DIAPHRAGM SPRING (15) IF WEAR, COMPRESSION, OR CORROSION ARE DETECTED.**

**D. ASSEMBLE.**

**1. INSTALL DIAPHRAGM SPRING AND DIAPHRAGM ON BODY.**

- a. Install diaphragm spring (15) into body (4).
- b. Position diaphragm (13) on spring with tab (14) on diaphragm positioned in line with mounting flange on body.
- c. Press down hard on center of diaphragm. Grasp tab on diaphragm and turn diaphragm approximately 1/4 turn clockwise while pressing down on diaphragm. Align screw holes on diaphragm with screw holes on body.



**NOTE: DIAPHRAGM TAB (14) SHOWN IN POSITION AFTER BEING TURNED APPROXIMATELY 1/4 TURN.**

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D. ASSEMBLE - Continued.

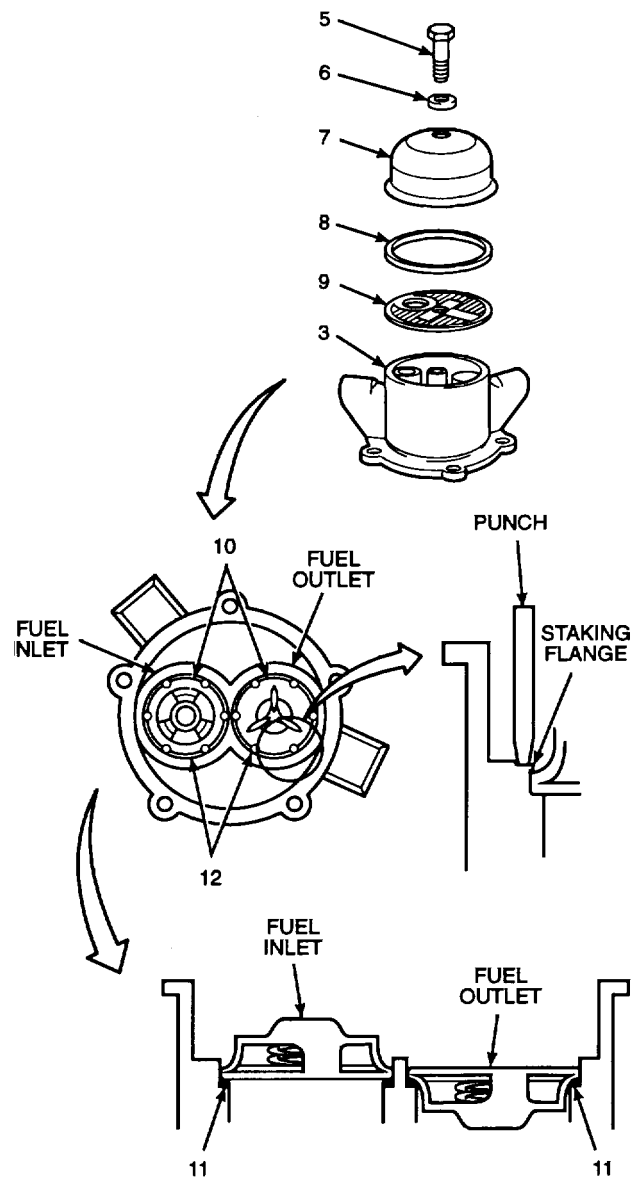
2. INSTALL VALVES, PREFORMED PACKING, FILTER SCREEN, AND FILTER COVER ON COVER.

- a. Use contact point dresser and remove old staking flanges from valve seats (12) on inside of cover (3).

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves.). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Rinse cover in warm, soapy water and use compressed air to remove metal particles from filing. Dry cover with a clean, lint-free cloth.
- c. Position gasket (11) and valve (10) on fuel inlet to allow fuel to flow into fuel lift pump. Install valve on inlet with a flat blade screwdriver.
- d. Position gasket (11) and valve (10) on fuel outlet to allow fuel to exit fuel lift pump. Install valve on outlet with a flat blade screwdriver.
- e. Use a small punch and punch six new staking flanges on each valve to hold valves in position.
- f. Install filter screen (9) into cover (3).
- g. Install preformed packing (8) into cover.
- h. Install hex head cap screw (5) through seal washer (6).
- i. Install hex head cap screw through filter cover (7) and into cover. Tighten cap screw (5).



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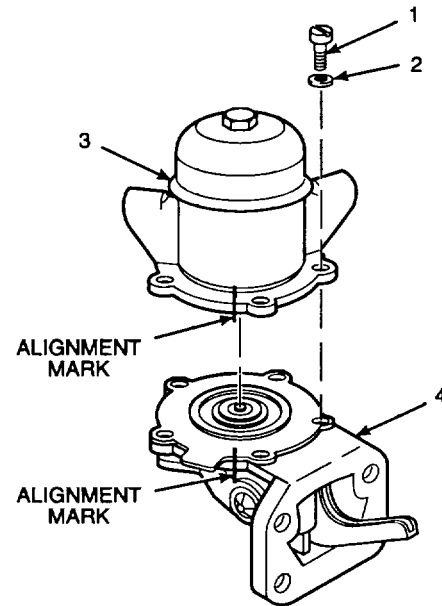
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**2.20 REPAIR FUEL LIFT PUMP - Continued.**

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**D. ASSEMBLE - Continued.****3. ASSEMBLE FUEL LIFT PUMP COVER TO BODY.**

- a. Position cover (3) on body (4) by lining up alignment marks on flanges.
- b. Install machine screws (1) through lockwashers (2).
- c. Install machine screws (1) through cover and into body (4). Tighten screws (1).

**NOTE**

**FOLLOW-ON-TASK: Install fuel lift pump per TM 5-3895-373-20. .J**

**END OF TASK**

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**2.21 REPAIR TURBOSUPERCHARGER.**


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This task covers:            a. Disassemble            b. Clean            c. Inspect  
    d. Assemble

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**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)  
 Bench vise (Item 112, Appendix D)  
 Cleaning brush (Item 12, Appendix D)  
 Micrometer depth gage (Item 44, Appendix D)  
 Plastic hammer (Item 49, Appendix D)  
 Snap ring pliers (Item 66, Appendix D)  
 Torque wrench (Item 129, Appendix D)

References:

TM 5-3895-373-20  
 TM 5-3895-373-24P

Equipment Condition:

Turbosupercharger removed per TM 5-3895-373-20.

Materials/Parts:

Anti-seize compound (Item 8, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Crocus cloth (Item 4, Appendix B)  
 Engine oil (Item 22, Appendix B)  
 Lint-free cloth (Item 7, Appendix B)  
 Petrolatum (Item 24, Appendix B)  
 Thread locking compound (Item 14, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Bearings  
 Impeller shaft  
 Lock nut  
 Preformed packing  
 Repair kit  
 Retaining rings  
 Rings  
 Special plates  
 Towtract clamps

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**A. DISASSEMBLE.**

1. REMOVE WHEEL HOUSING AND IMPELLER HOUSING FROM COMPRESSOR HOUSING.

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2.21 REPAIR TURBOSUPERCHARGER - Continued.

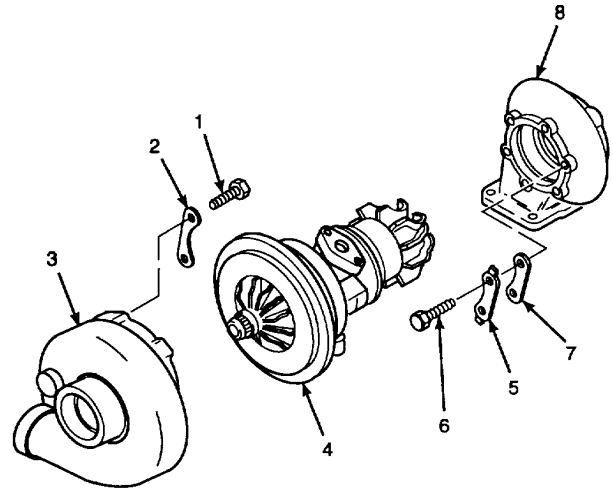
A. DISASSEMBLE - Continued.

- a. Remove bolts (1) and clamps (2).

**NOTE**

**A plastic hammer may be used to tap housings loose if needed.**

- b. Pull wheel housing (3) from compressor housing (4).
- c. Use a straight-blade screwdriver and flatten bent edges on plates (5).
- d. Remove bolts (6), plates (5), and clamps (7). Discard special plates and towtract clamps.
- e. Pull impeller housing (8) from compressor housing (4).



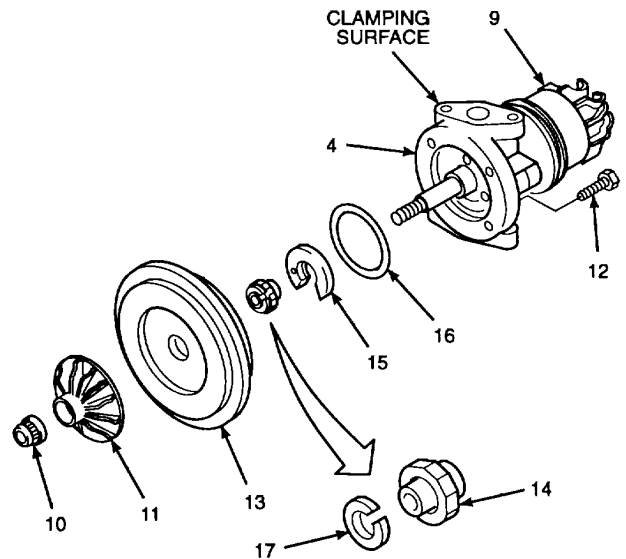
2. CLAMP COMPRESSOR HOUSING IN A VISE AND REMOVE COMPRESSOR WHEEL AND PLATE.

- a. Clamp flat surfaces of compressor housing (4) in a bench vise.

**NOTE**

**Back side of impeller shaft (9) has a 9/16 in. hex. This hex may have been ground into flats during balancing. When disassembling impeller shaft, select a wrench to securely grip shaft across ground flats.**

- b. Use a wrench to hold onto impeller shaft (9) while removing lock nut (10) from opposite end of impeller shaft. Discard lock nut.
- c. Remove compressor wheel (11).
- d. Remove bolts (12) and plate (13).
- e. Remove assembled collar (14), bearing (15), and preformed packing (16). Discard bearing and preformed packing.
- f. Remove ring (17) from collar (14). Discard ring.

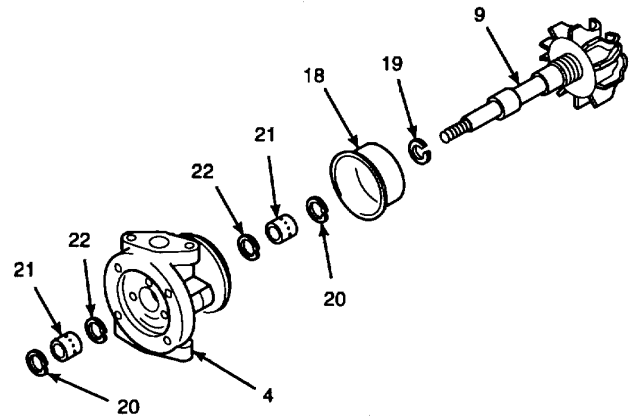


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**A. DISASSEMBLE - Continued.**

**3. REMOVE IMPELLER SHAFT, BEARINGS, AND SHROUD FROM COMPRESSOR HOUSING.**

- a. Tap impeller shaft (9) lightly with a plastic hammer.
- b. Remove impeller shaft (9) and shroud (18).
- c. Remove compressor housing (4) from bench vise.
- d. Remove ring (19). Discard ring.



**WARNING**

**Use care when removing or installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- e. Use snap ring pliers and remove retaining rings (20). Discard retaining rings.
- f. Remove bearings (21). Discard bearings.
- g. Remove retaining rings (22). Discard retaining rings.

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**2.21 REPAIR TURBOSUPERCHARGER - Continued.**

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**B. CLEAN.****WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

**If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- 1. RINSE ALL PARTS IN CLEANING SOLVENT. USE A CLEANING BRUSH TO REMOVE DIRT PARTICLES AND VARNISH DEPOSITS FROM HOUSINGS, IMPELLER SHAFT, AND COMPRESSOR WHEEL.**

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and glove). Failure to take proper precautions may result in severe injury or loss of vision.

- 2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO REMOVE ANY FOREIGN MATTER FROM HOUSINGS, IMPELLER SHAFT, AND COMPRESSOR WHEEL. DRY ALL PARTS WITH A LINT-FREE CLOTH.**

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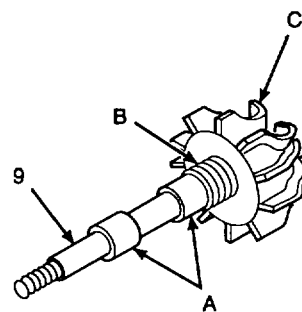
**B. CLEAN - Continued.****WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention

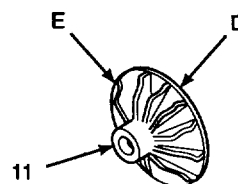
3. **CLEAN FASTENERS TREATED WITH THREAD LOCKING COMPOUND WITH THREAD LOCKING COMPOUND SOLVENT.**
4. **WIPE FASTENERS DRY WITH A CLEAN, LINT-FREE CLOTH.**

**C. INSPECT.****1. INSPECT IMPELLER SHAFT FOR CHAFING, SCORING, AND BENT, OR DAMAGED BLADES.**

- a. Visually inspect impeller shaft (9) surface A and B for chafing and scoring.
- b. Visually inspect impeller shaft (9) surface C for bent or damaged blades.
- c. Replace impeller shaft if chafing, scoring, or bent blades are detected.

**2. INSPECT COMPRESSOR WHEEL FOR CHAFING AND BENT OR DAMAGED BLADES.**

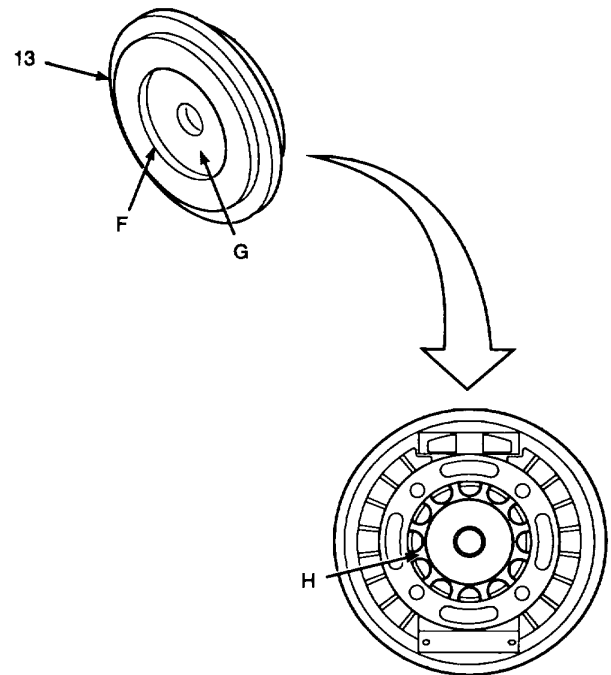
- a. Visually inspect compressor wheel (11) surface D and E for chafing and bent or damaged blades.
- b. Replace compressor wheel (11) if chafing or bent or damaged blades are detected.



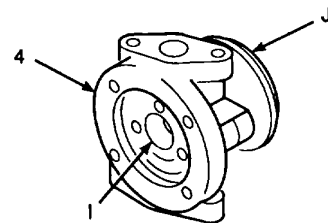
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**2.21. REPAIR TURBOSUPERCHARGER - Continued****C. INSPECT - Continued.****3. INSPECT PLATE FOR CHAFING AND SCORING.**

- a. Inspect plate (13) surfaces F and G for chafing and scoring.
- b. Polish out minor scoring and chafing with crocus cloth.
- c. Clean plate after polishing. Refer to cleaning procedure B.1.
- d. Replace plate (13) if scoring cannot be removed with crocus cloth.
- e. Inspect star washer surfaces H inside plate (13) for damage or missing teeth.

**4. INSPECT COMPRESSOR HOUSING FOR VARNISH DEPOSITS, CHAFING, AND SCORING.**

- a. Use a strong light and visually inspect compressor housing (4) surfaces I and J for varnish deposits, chafing, and scoring.
- b. Replace compressor housing (4) if varnish deposits, chafing, or scoring are detected.



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**D. ASSEMBLE.****1. INSTALL BEARINGS, SHROUD, AND IMPELLER SHAFT ONTO COMPRESSOR HOUSING.****WARNING**

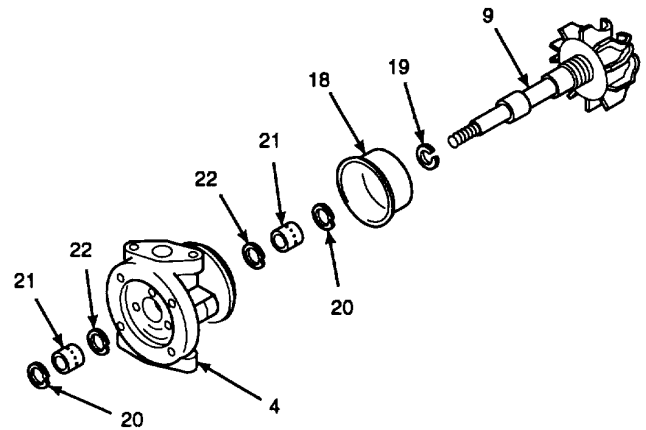
Use care when removing or installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Use snap ring pliers and install retaining rings (22).
- b. Lubricate bearings (21) with clean engine oil.
- c. Install bearings (21).

**WARNING**

Use care when removing or installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- d. Install retaining rings (20).
- e. Install shroud (18).
- f. Install ring (19).
- g. Gently guide impeller shaft (9) through compressor housing (4).
- h. Firmly push impeller shaft (9) into compressor housing (4) until ring (19) is seated.



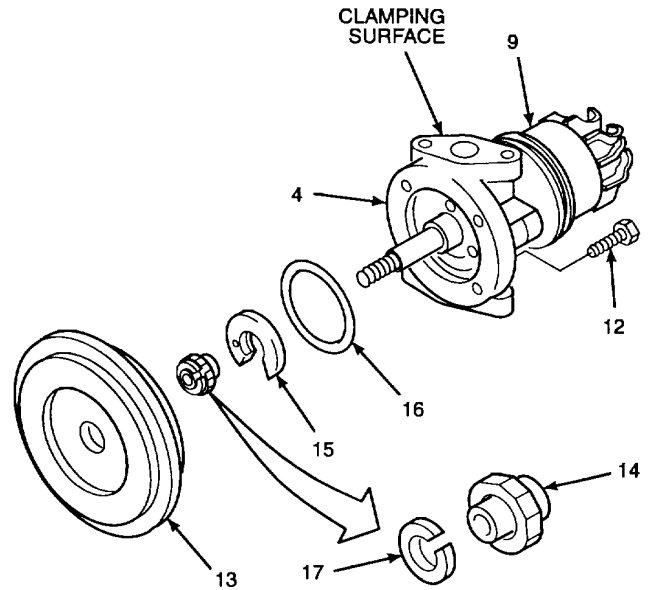
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2.21. REPAIR TURBOSUPERCHARGER - Continued

D. ASSEMBLE.

2. CLAMP COMPRESSOR HOUSING IN A BENCH VISE AND INSTALL COMPRESSOR WHEEL AND PLATE.

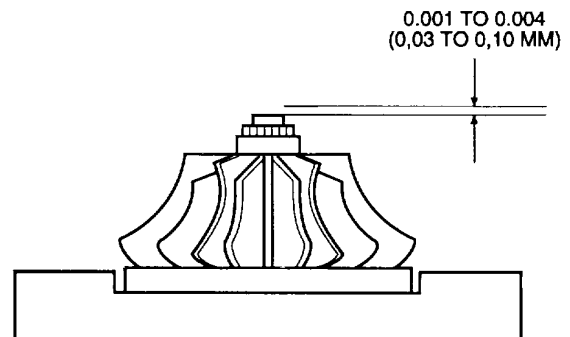
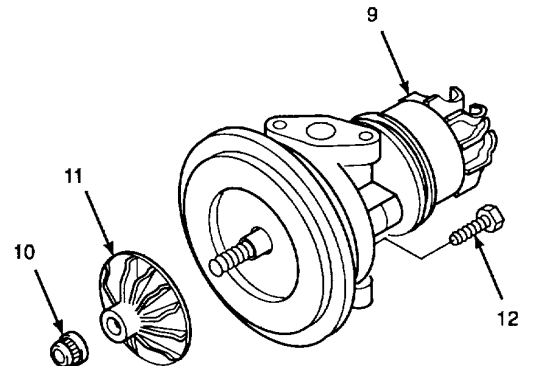
- a. Clamp flat surfaces of compressor housing (4) in a vise.
- b. Lubricate preformed packing (16) with petrolatum.
- c. Install preformed packing (16).
- d. Install ring (17) and bearing (15) onto collar (14).
- e. Install assembled collar (14) onto compressor housing (4).
- f. Slide plate (13) onto impeller shaft (9). Seat firmly.



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- g. Apply thread locking compound to bolts (12).
- h. Install and securely tighten bolts (12).
- i. Install compressor wheel (11).
- j. Use engine oil to lubricate threads of impeller shaft (9).
- k. Use a wrench to hold onto impeller shaft (9) while installing lock nut (10) on opposite end of impeller shaft. Tighten lock nut to 20 lb-in (2 N•m). Continue tightening through to a 110° angle.
- l. Use a depth gage and check for impeller shaft endplay. Endplay should be 0.001 to 0.004 in (0,03 to , 0,10 mm). If endplay is not within specified dimensions, disassemble turbosupercharger and replace impeller shaft (9) with a new impeller shaft.
- m. Remove impeller housing from vise.



GO TO NEXT PAGE

D. ASSEMBLE - Continued.

3. INSTALL WHEEL HOUSING AND IMPELLER HOUSING ONTO COMPRESSOR HOUSING.

- a. Position impeller housing (8) against compressor housing (4) as shown.

**WARNING**

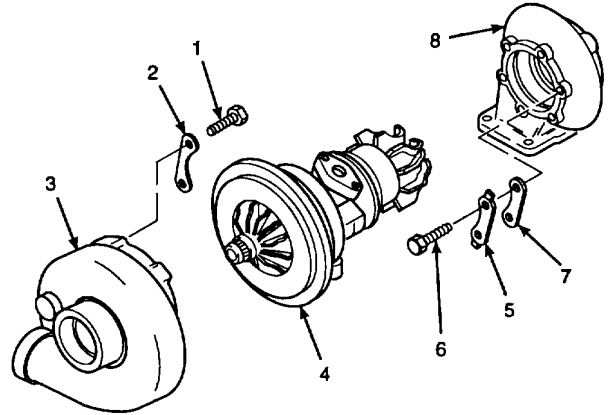
Anti-seize compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Coat threads of bolts (6) with anti-seize compound.
- c. Install bolts (6) through plates (5) and clamps (7) and into impeller housing (8). Securely tighten bolts (6).
- d. Use a flat-blade screwdriver to bend edges of clamps up to secure bolts.
- e. Position wheel housing (3) against compressor housing (4) as shown.

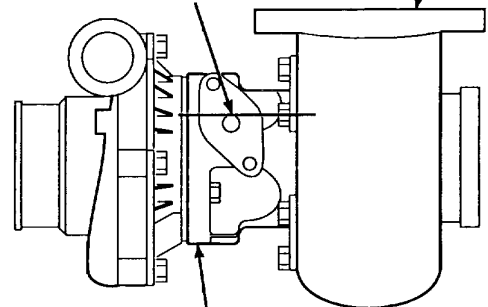
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

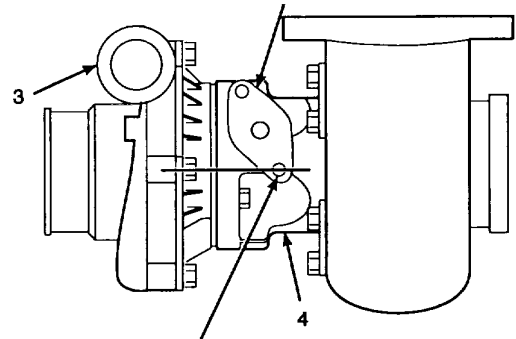
- f. Install clamp (2) on bolt (1). Apply thread locking compound to threads of bolts (1).
- g. Install and securely tighten bolts (1) through clamps (2) and into wheel housing (3).



POSITION IMPELLER HOUSING (8) SO THAT CENTER OF BOLT HOLE ALIGNS WITH EDGE OF OIL SUPPLY HOLE IN COMPRESSOR HOUSING (4) AS SHOWN.



4 OIL SUPPLY MOUNTING FLANGE



POSITION WHEEL HOUSING (3) SO THAT CENTER OF BOLT HOLE ALIGNS WITH TAPPED HOLE OF OIL SUPPLY MOUNTING FLANGE IN COMPRESSOR HOUSING (4) AS SHOWN.

**NOTE**

**FOLLOW-ON-TASK: Install turbosupercharger per TM 5-3895-373-20.**

**END OF TASK**



**2.22. REPLACE/REPAIR FUEL TANK.**

This task covers:                      a. Remove                      b. Clean                      c. Adjust  
     d. Install

**INITIAL SETUP**

Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)  
 Sling strap, 2 ea (Item 98, Appendix D)  
 Socket wrench extension, (Item 39, Appendix D)  
 Torque wrench (Item 132, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Electrical insulating compound (Item 10, Appendix B)  
 Electrical insulating varnish (Item 38, Appendix B)  
 Sealing compound (Item 12, Appendix B)  
 Tags (Item 34, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound (Item 14, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Fuel filler assembly  
 Fuel level liquid transmitter  
 Lockwashers  
 Screws

Personnel Required:

Two 62B construction equipment repairers. Second person to assist when removing and installing fuel tank.

References:

TM 5-3895-373-20  
 TM 5-3895-373-24P

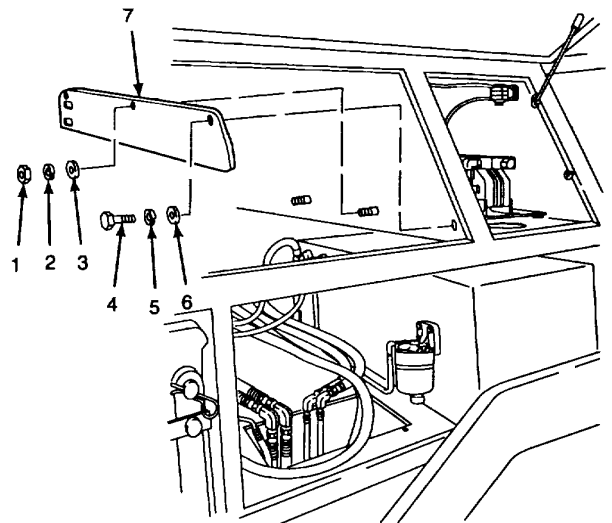
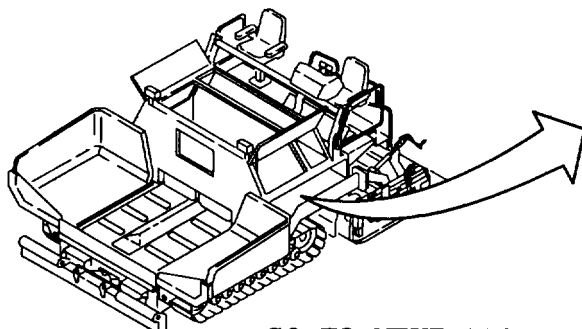
Equipment Condition:

Screed tow arm removed per TM 5-3895-373-20  
 (only required for fuel tank removal).  
 Fuel tank drained per TM 5-3895-373-20.  
 Engine removed per paragraph 2.16.

**A. REMOVE.**

**1. REMOVE BULKHEAD PARTITION.**

- a. Remove hex nuts (1), lockwashers (2), and flat washers (3). Discard lockwashers.
- b. Remove hex head cap screw (4), lockwasher (5), and flat washer (6). Discard lockwasher.
- c. Remove bulkhead partition (7).



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**A. REMOVE - Continued.**

**2. DISCONNECT FUEL HOSES FROM FUEL TANK.**

**WARNING**

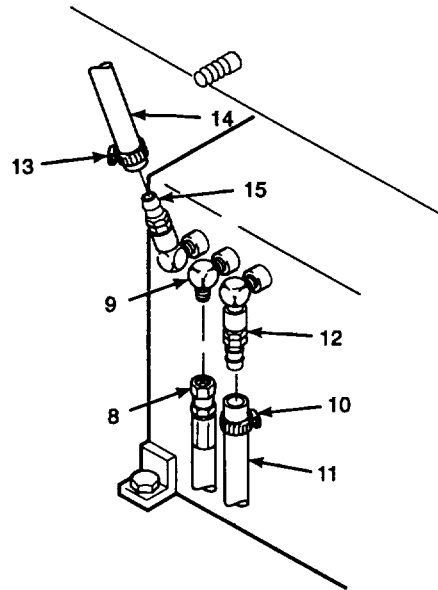
Fuel is very flammable and can explode easily. To avoid serious injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

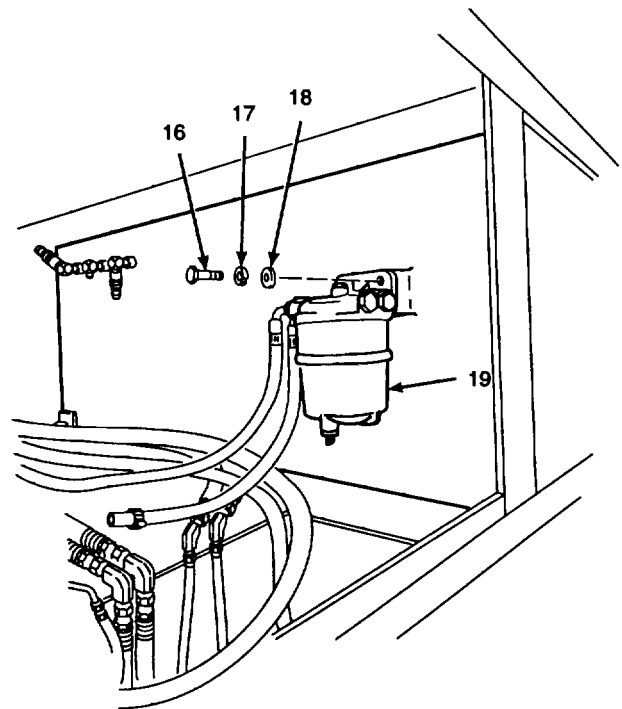
Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.



- a. Remove hose (8) from elbow (9). Tag hose and elbow "TO SCREED FUEL FILTER".
- b. Loosen hose clamp (10). Remove hose (11) from fitting (12). Tag hose and fitting "TO FUEL/WATER SEPARATOR".
- c. Loosen hose clamp (13). Remove hose (14) from fitting (15). Tag hose and fitting "FROM FUEL FILTER". Lay hose aside for reuse.

**3. REMOVE FUEL/WATER SEPARATOR.**

- a. Remove bolts (16), lockwashers (17), and flat washers (18). Discard lockwashers.
- b. Remove fuel/water separator (19) with attached hoses.



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2.22. REPLACE/REPAIR FUEL TANK - Continued

A. REMOVE - Continued.

**WARNING**

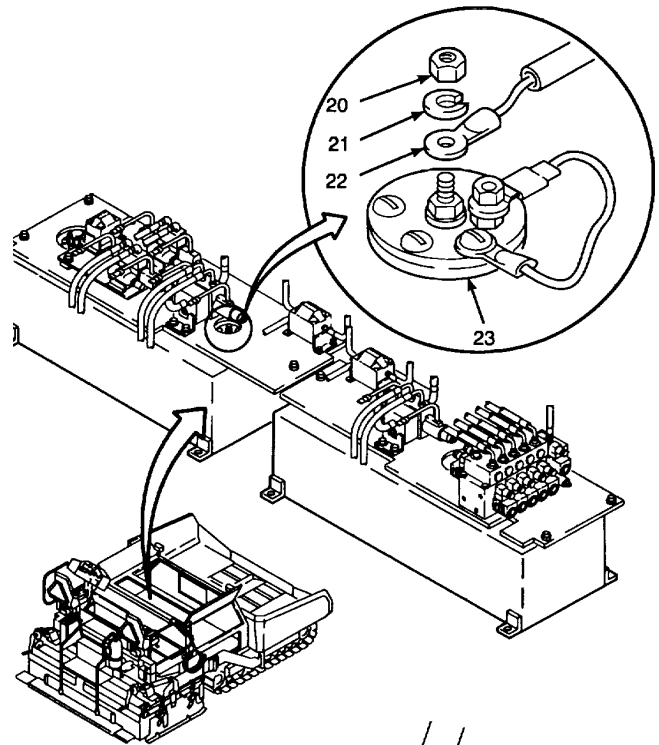
Fuel is very flammable and can explode easily. To avoid serious injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.



4. DISCONNECT LEAD WIRE FROM FUEL LEVEL TRANSMITTER.

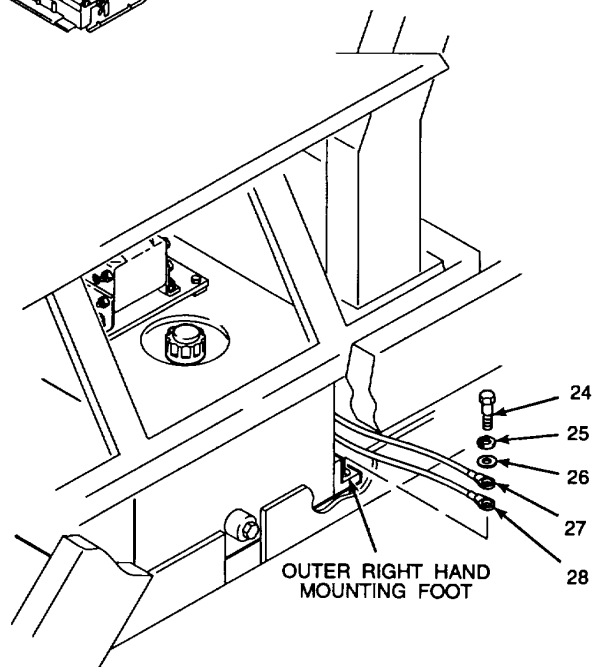
- a. Remove hex nut (20) and lockwasher (21). Discard lockwasher.
- b. Disconnect lead wire (22) from fuel level transmitter (23).

5. REMOVE FUEL TANK.

**NOTE**

Additional 10 in-socket wrench extension is helpful when removing hex head cap screw (24) at rear of fuel tank.

- a. Remove hex head cap screws (24), lockwashers (25), and flat washers (26). Discard lockwashers.
- b. Remove battery ground cable (27) and harness ground wire (28) from the outer right hand mounting foot.



GO TO NEXT PAGE

## A. REMOVE - Continued.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

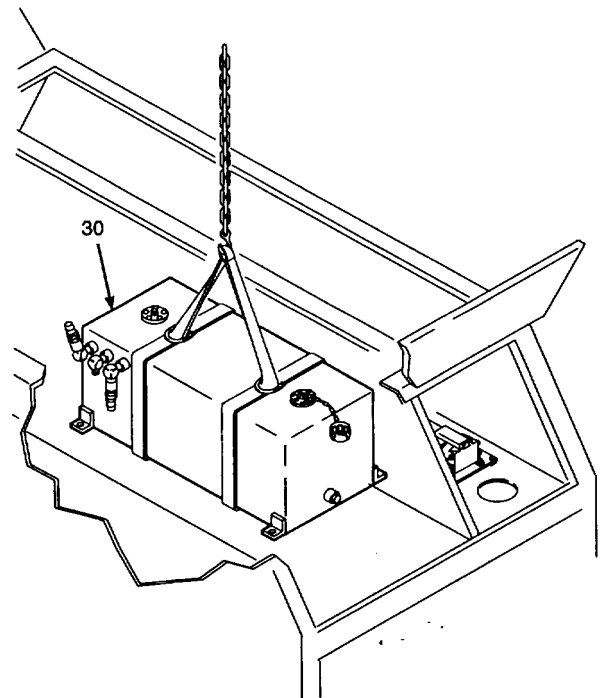
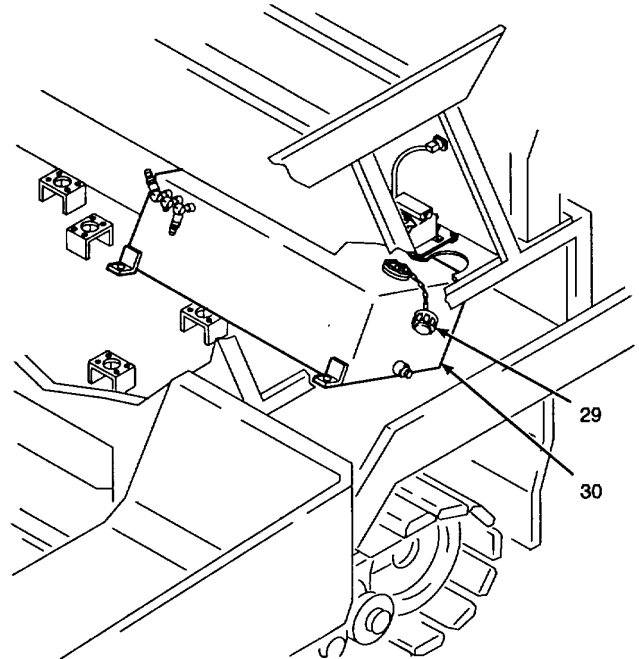
- c. Unscrew fuel tank cap (29) and drape cap over side of fuel tank (30).
- d. With the help of another person, move fuel tank into engine compartment.
- e. Attach two sling straps around fuel tank (30). Ensure sling straps are evenly spaced.

**WARNING**

Fuel tank weighs approximately 75 lbs (34 kg). To avoid personnel injury, ensure all sling straps are in good condition and are of correct lifting capacity. Ensure overhead hoist is in good condition and hooks are positioned correctly.

Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.

- f. Connect overhead hoist to sling straps.
- g. Lift fuel tank (30) out of engine compartment. Set fuel tank down in a clean shop area.



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**2.22. REPLACE/REPAIR FUEL TANK.****A. REMOVE - Continued.****WARNING**

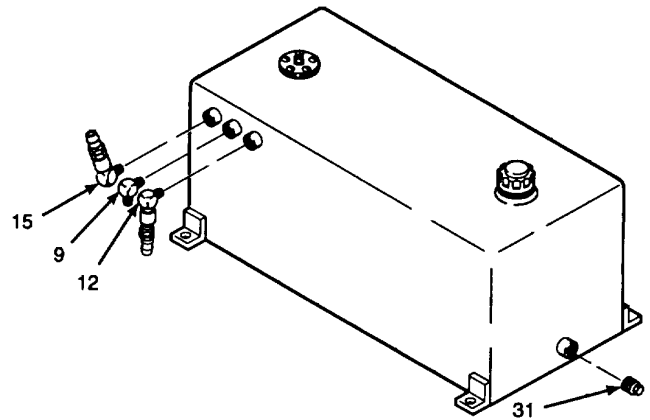
Fuel is very flammable and can explode easily. To avoid serious injury or death:

Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

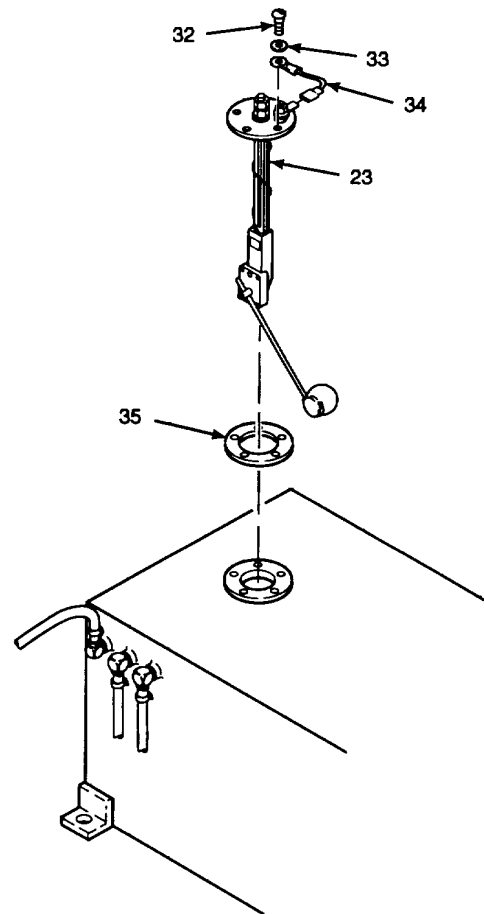
**6. REMOVE ELBOW, FITTINGS, AND DRAINPLUG.****NOTE**

Tag elbow and fittings to ensure correct positioning during assembly.

- a. Remove and tag elbow (9).
- b. Remove and tag fittings (12 and 15).
- c. Remove drain plug (31).

**7. REMOVE FUEL LEVEL TRANSMITTER.**

- a. Remove machine screws (32), and gaskets (33). Discard gaskets. Save machine screws for reuse at installation of new fuel level transmitter.
- b. Unplug ground jumper (34) from fuel level transmitter (23).
- c. Remove fuel level transmitter (23) and gasket (35). Discard fuel level liquid transmitter and gasket.



**GO TO NEXT PAGE**

**A. REMOVE - Continued.**

**8. REMOVE FUEL FILLER ASSEMBLY.**

- a. Remove machine screws (36) and lockwashers (37). Discard lockwashers. Be sure to save machine screws for reuse at installation of new fuel filler assembly.
- b. Remove filler neck (38), gasket (39), strainer (40), and gasket (41). Discard fuel filler assembly.

**B. CLEAN.**

**1. CLEAN AND FLUSH FUEL TANK.**

- a. Flush fuel tank with warm, soapy water. Allow water to stand in tank for several minutes.
- b. Drain soapy water from tank into approved container. Dispose of contaminated water in accordance with local procedures.

**WARNING**

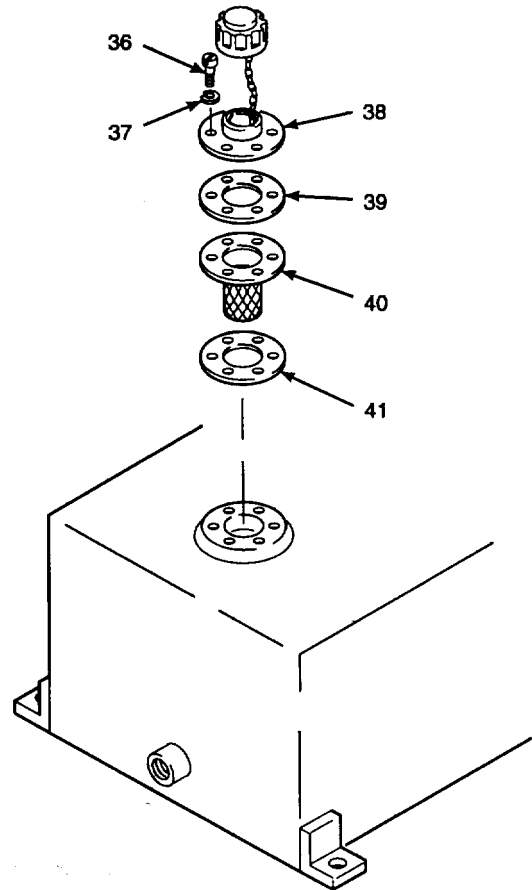
Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C).

Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

Use caution when scraping gasket material from fuel tank. Do not scratch or gouge tank sealing surfaces when scraping gasket material. Poor sealing and fuel leakage may result from scratches or gouges in tank sealing surfaces.



- c. Saturate any remaining gasket residue with cleaning solvent. After 15 minutes, scrape residue off with putty knife.

- d. Flush tank with cleaning solvent. Allow tank to drain completely.

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**2.22. REPLACE/REPAIR FUEL TANK.****B. CLEAN - Continued.****WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- e. Use 30 psi (207 kPa) maximum compressed air to dry fuel tank interior. Tilt fuel tank to drain moisture through drain plug opening. Blow compressed air through fuel suction hose openings, fuel level transmitter opening, and fuel filler opening.

**2. CLEAN FASTENER THREADS.****WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

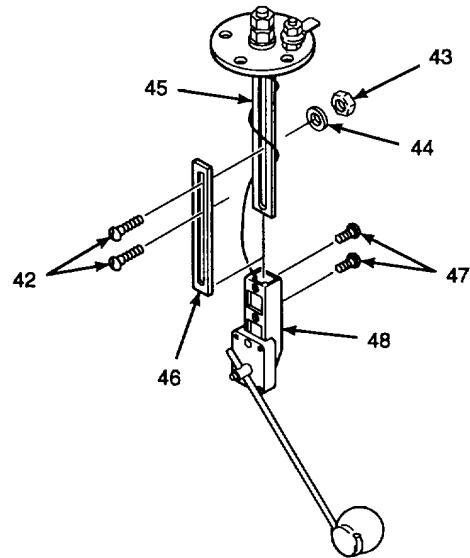
- a. Clean all cap screws with thread locking compound solvent.
- b. Dry cap screws with cleaning cloths.
- c. Wipe excess pipe sealant from tank drain plug and fittings using cleaning cloth.

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**C. ADJUST.**

**1. ADJUST CONFIGURATION OF NEW FUEL LEVEL TRANSMITTER.**

- a. Remove adjustment screws (42), lockwasher (43), and hex nut (44). Discard screws.
- b. Separate upper adjustment bracket (45) from lower adjustment bracket (46).
- c. Remove screws (47) from float control head (48) and remove from lower adjustment bracket (46). Discard lower adjustment bracket.
- d. Slide float control head (48) onto upper adjustment bracket (45) as shown.
- e. Install screws (47) but do not tighten at this time.

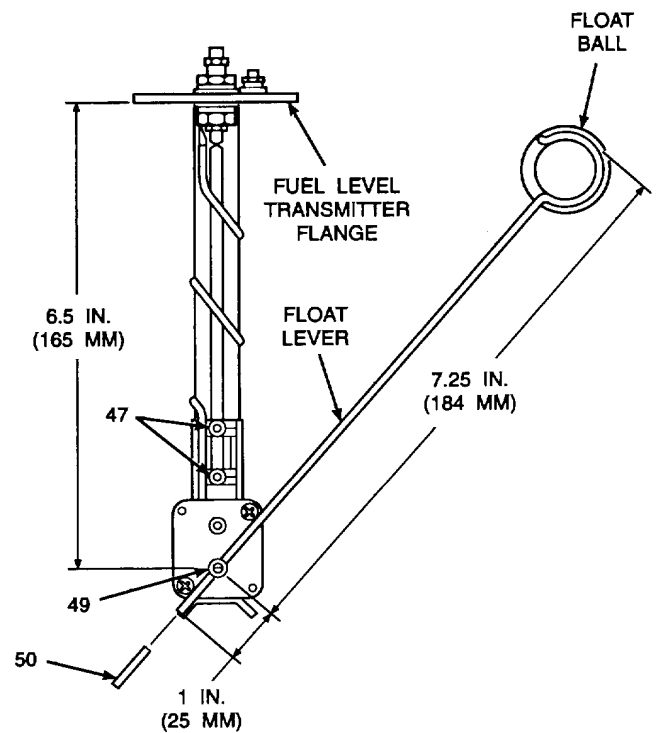


**2. ADJUST FUEL LEVEL TRANSMITTER.**

- a. Adjust distance between bottom of fuel level transmitter flange and pivot point of float lever to 6.5 in. (165 mm).
- b. Tighten screws (47).

**3. ADJUST FLOAT LEVER.**

- a. Loosen set screw (49). Remove shipping pin (50) from pivot point. Discard pin.
- b. Install float lever. Adjust float lever to 7.25 in. (184 mm) between center of pivot point and curved end of float lever with float ball positioned as shown.
- c. Tighten set screw (49).
- d. Trim excess length of float lever, leaving 1 in. (25 mm) from pivot point to end of float lever.



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**2.22. REPLACE/REPAIR FUEL TANK - Continued****D. INSTALL.****1. INSTALL FUEL LEVEL TRANSMITTER.**

- a. Position gasket (35) on fuel tank (30).

**NOTE**

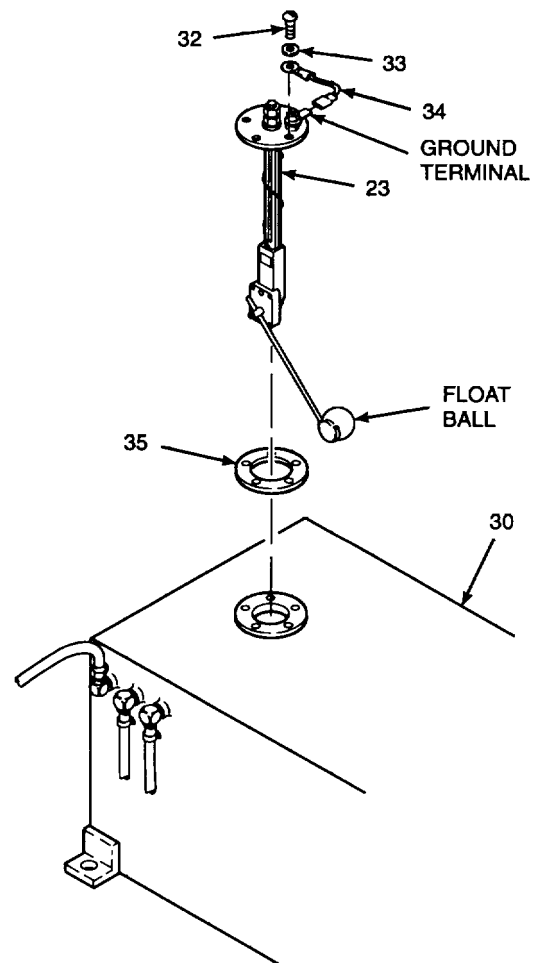
**Float ball can become dislodged from float lever and fall into fuel tank. To avoid dislodging float ball, insert fuel level transmitter carefully.**

- b. Position fuel level transmitter float ball to face rear of fuel tank (30).
- c. Install fuel level transmitter (23). Line up holes in fuel level transmitter and gasket (35) with threaded holes in fuel tank (30).



**Do not use metric screws provided with replacement fuel level transmitter. Reuse machine screws (32) that were removed from tank. Use of metric screws will damage tank screw threads.**

- d. Coat connector tab of fuel level transmitter ground terminal with electrical insulating compound.
- e. Install gaskets (33), machine screws (32), and ground jumper (34). Tighten machine screws evenly.
- f. Install ground jumper (34) to connector tab of fuel level transmitter ground terminal.



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**D. INSTALL - Continued.**

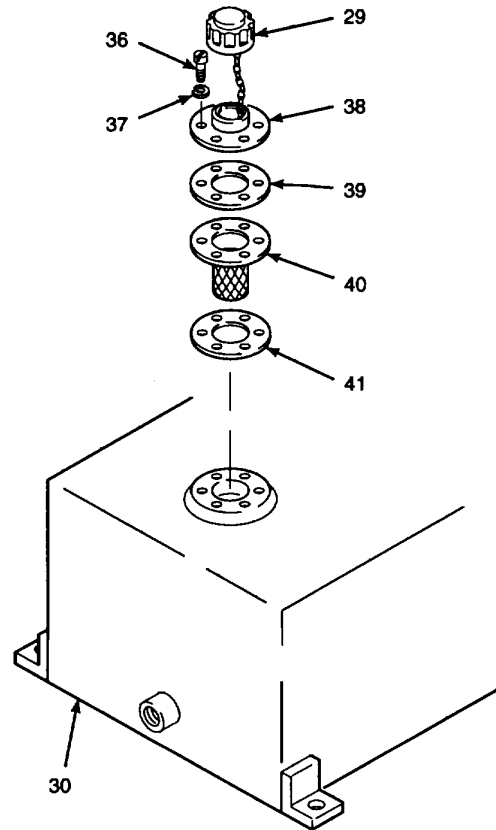
**2. INSTALL FUEL FILLER ASSEMBLY.**

- a. Install gasket (41), strainer (40), and gasket (39).
- b. Install filler neck (38).
- c. Align holes in gaskets (39 and 41), strainer (40), and filler neck (38) with threaded holes in fuel tank (30).



**Do not use metric screws provided with replacement fuel filler assembly. Reuse machine screws (36) that were removed from fuel tank. Use of metric screws will damage tank screw threads.**

- d. Install lockwashers (37) and machine screws (36). Tighten machine screws evenly.
- e. Install fuel tank cap (29) to avoid contamination.

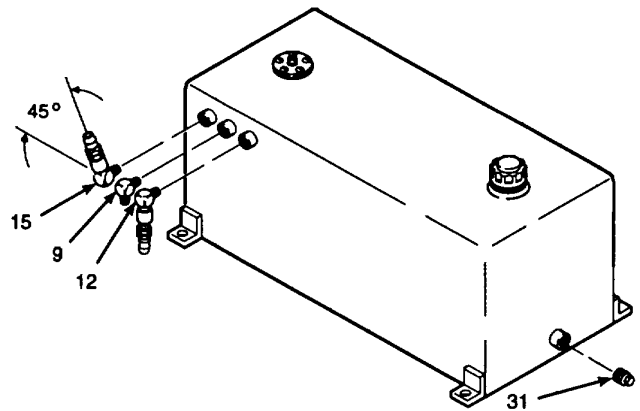


**3. INSTALL DRAIN PLUG, ELBOW, AND FITTINGS.**



**Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush with water and get immediate medical attention.**

- a. Apply sealing compound to threads of drain plug (31), elbow (9), and fittings (12 and 15). Install drain plug.
- b. Install fitting (15). When tightened, fitting should point upward at 45° toward corner of fuel tank.
- c. Install fitting (12). When tightened, fitting should point straight down.
- d. Install elbow (9). When tightened, elbow should point straight down.



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**2.22. REPLACE/REPAIR FUEL TANK - Continued****D. INSTALL - Continued.****4. INSTALL FUEL TANK.****NOTE**

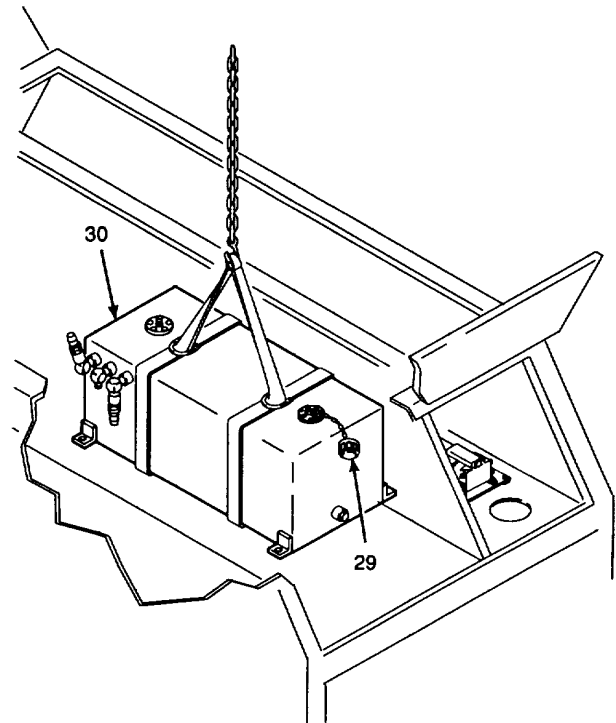
To provide clearance for fuel tank installation and mounting, hoses and harnesses may have to be held against end of hydraulic reservoir.

- a. Attach two sling straps around fuel tank (30). Ensure straps are evenly spaced.

**WARNING**

Fuel tank weighs approximately 75 lbs (34 kg). To avoid personnel injury, ensure all sling straps are in good condition and are of correct lifting capacity. Ensure overhead hoist is in good condition and hooks are positioned correctly.

- b. Connect overhead hoist to sling straps and position fuel tank (30) over engine compartment. Ensure drain plug is facing outward.
- c. With the help of another person, guide and lower fuel tank into engine compartment. Remove sling straps.
- d. Unscrew fuel tank cap (29) and drape over the edge of fuel tank (30). Ensure that the fuel tank does not become contaminated while being positioned. Install the fuel tank cap as soon as the tank is in position.
- e. Move fuel tank (30) into place. Align mounting feet with bolt holes in main frame.



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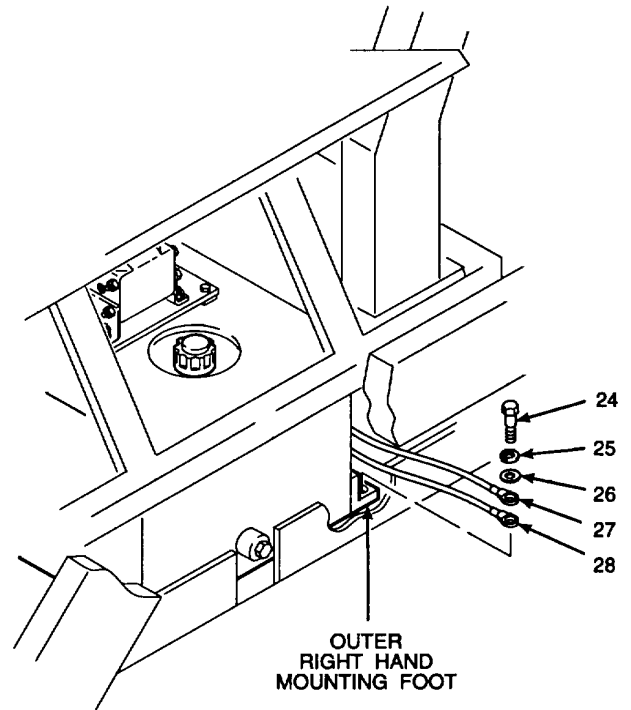
**D. INSTALL - Continued.**

- f. Install lockwashers (25) and flat washers (26) onto hex head cap screws (24).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- g. Apply thread locking compound (Item 14, Appendix B) to threads of hex head cap screws (24).
- h. Install three hex head cap screws (24) into tank mounting feet. Do not tighten at this time. Do not install into outer right hand mounting foot at this time.
- i. Install remaining hex head cap screw (24) with battery ground cable (27) and harness ground wire (28) in outer right hand mounting foot. Tighten all cap screws to 37 lb-ft (50 N•m).

**WARNING**

**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- j. Apply electrical insulating varnish to hex head cap screw (24), battery ground cable (27), and harness ground wire (28).

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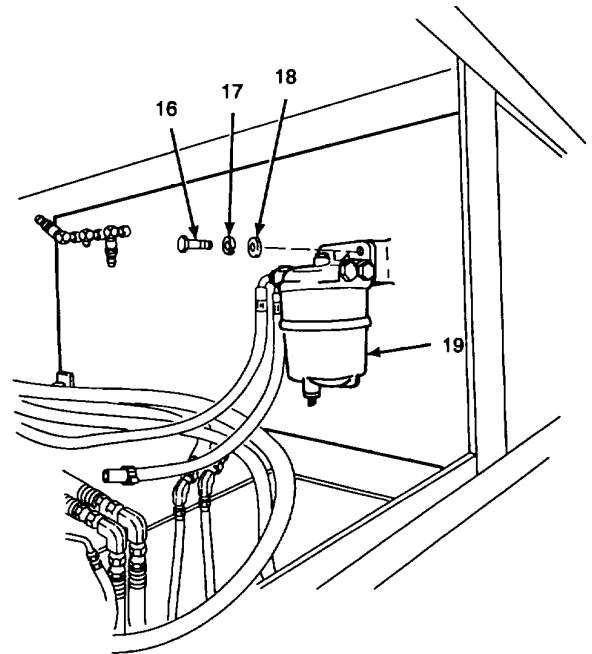
**2.22. REPLACE/REPAIR FUEL TANK - Continued****D. INSTALL - Continued.****5. INSTALL FUEL/WATER SEPARATOR.**

- a. Install lockwashers (17) and flat washers (18) onto bolts (16).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound (Item 13, Appendix B) to threads of bolts (16).
- c. Install fuel/water separator (19) with bolts (16). Tighten to 19 lb-ft (26 N•m).

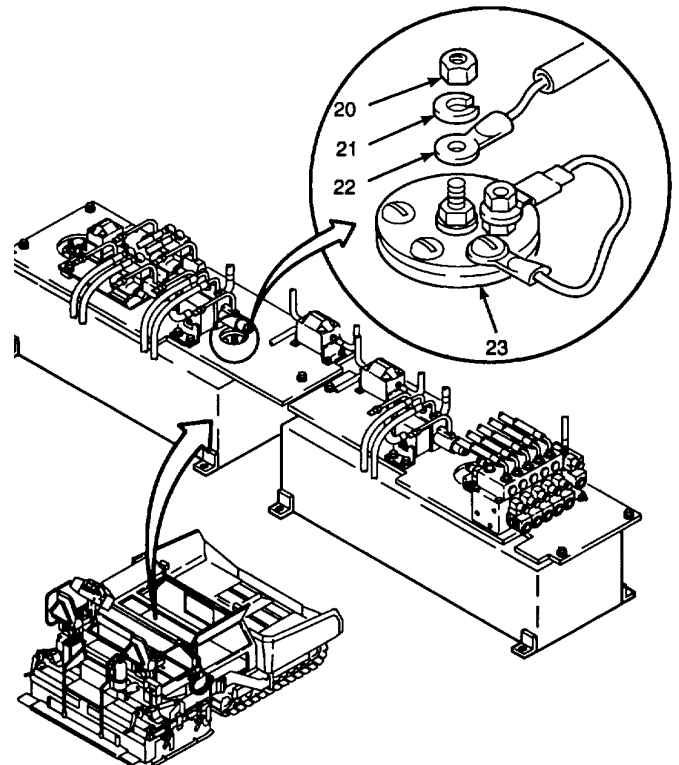
**6. INSTALL FUEL LEVEL TRANSMITTER LEAD WIRES.**

- a. Install lead wire (22), lockwasher (21), and hex nut (20) onto fuel level transmitter (23).

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- b. Apply electrical insulating varnish to fuel level transmitter terminals.

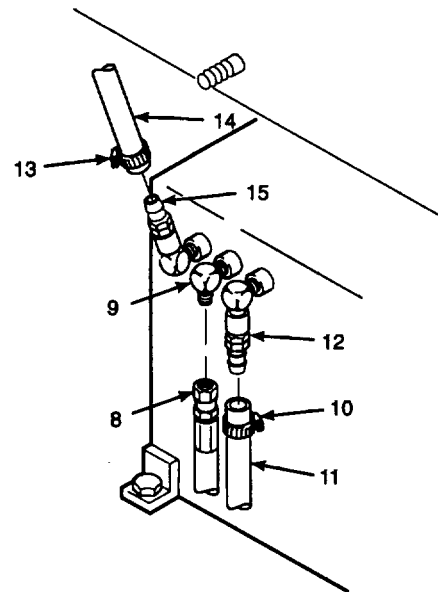


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**D. INSTALL - Continued.**

**7. INSTALL FUEL HOSES.**

- a. Install hose (14) tagged "FROM FUEL FILTER" onto fitting (15). Tighten hose clamp (13).
- b. Install hose (8) tagged "TO SCREED FUEL FILTER" onto elbow (9).
- c. Install hose (11) tagged "TO FUEL/WATER SEPARATOR" onto fitting (12). Tighten hose clamp (10).



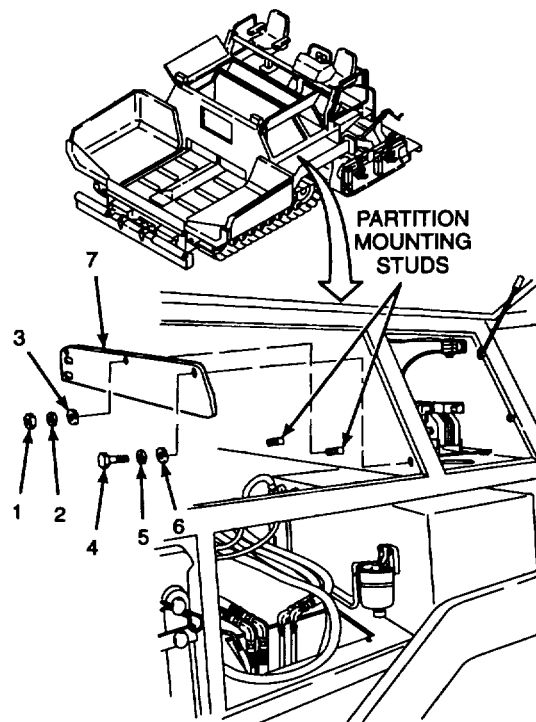
**8. INSTALL BULKHEAD PARTITION.**

- a. Install bulkhead partition (7). Inner two mounting holes must mate with threaded studs in bulkhead frame.
- b. Install lockwasher (5) and flat washer (6) onto hex head cap screw (4).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound (Item 14, Appendix B) to threads of hex head cap screw (4).
- d. Install hex head cap screw (4) through bulkhead partition (7). Tighten cap screw to 9 lb-ft (12 N•m).
- e. Apply thread locking compound (Item 14, Appendix B) to threads of partition mounting studs.
- f. Install flat washers (3), lockwashers (2), and hex nuts (1). Tighten hex nuts to 9 lb-ft (12 N•m).



**NOTE**

**FOLLOW-ON-TASKS:** Install engine per paragraph 2.16.  
Install screed tow arm per TM 5-3895-373-20.

**END OF TASK**

SECTION V. COOLING SYSTEM MAINTENANCE

Repair Water Pump.....	Para 2.23	Page 2-320
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2.23 REPAIR WATER PUMP.

This task covers:      a    Disassemble                              b. Clean                              c. Assemble

INITIAL SETUP

Tools:

- General mechanic's automotive tool kit (Item 106, Appendix D)
- Cleaning brush (Item 12, Appendix D)
- Hydraulic press frame (Item 41, Appendix D)
- Plastic hammer (Item 49, Appendix D)
- Snap ring pliers (Item 66, Appendix D)
- Thickness gage (Item 46, Appendix D)
- Torque wrench (Item 132, Appendix D)
- Universal puller kit (Item 69, Appendix D)

References:

- TM 5-3895-373-20
- TM 5-3895-373-24P

Equipment Condition:

Water pump removed per TM 5-3895-373-20.

Materials/Parts:

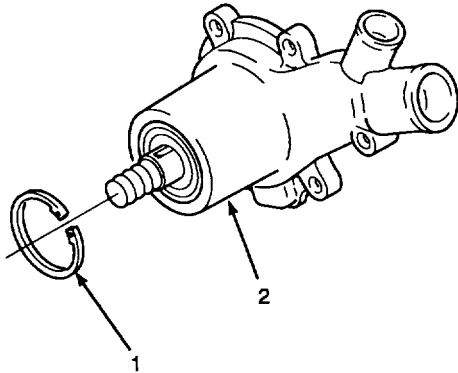
- Cleaning cloth (Item 6, Appendix B)
- Cleaning solvent (Item 31, Appendix B)
- Grease (Item 18, Appendix B) -,J
- Repair kit

A. DISASSEMBLE.

1. REMOVE IMPELLER, SHAFT, BEARINGS, AND SEALS FROM BEARING BODY.

**WARNING**

Use care when removing snap and retaining rings. Wear eye protection when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.



- a. Use snap ring pliers to remove snap ring (1) from bearing body (2). Discard snap ring.

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**A. DISASSEMBLE - Continued.**

- b. Place bearing body (2) on hydraulic press frame, with impeller (3) facing up.
- c. Support bearing body (2) with spacer blocks.
- d. Place spacer from universal puller kit on shaft (4). Select a spacer smaller than shaft diameter.
- e. Press out assembled shaft (5) through impeller (3).

**2. PRY SEAL (6) OUT OF IMPELLER END OF BEARING BODY (2).**

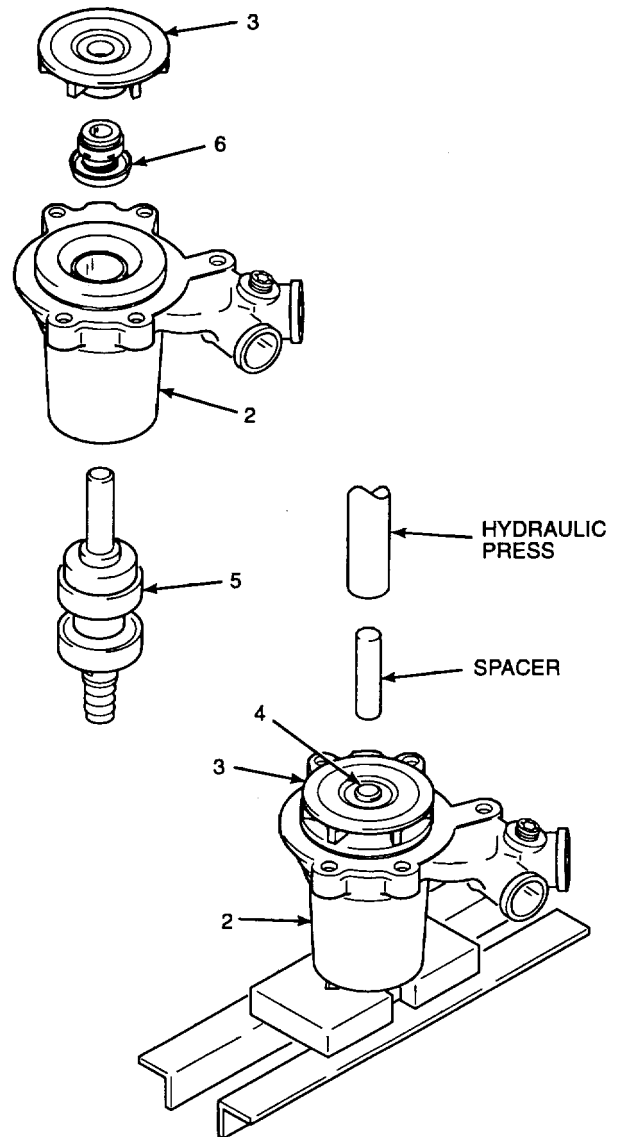
**B. CLEAN**

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- 1. RINSE BEARING BODY (2) IN CLEANING SOLVENT. USE A CLEANING BRUSH TO REMOVE HARD DEPOSITS.



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**2.22. REPLACE/REPAIR FUEL TANK - Continued****B. CLEAN - Continued.****CAUTION**

Use caution when scraping gasket material from water pump. Do not scratch or gouge water pump sealing surfaces when scraping gasket material.

Poor sealing and coolant leakage may result from scratches or gouges in water pump sealing surfaces.

2. USE A PUTTY KNIFE TO SCRAPE GASKET RESIDUE FROM BEARING BODY GASKET SEALING SURFACES.

**WARNING**

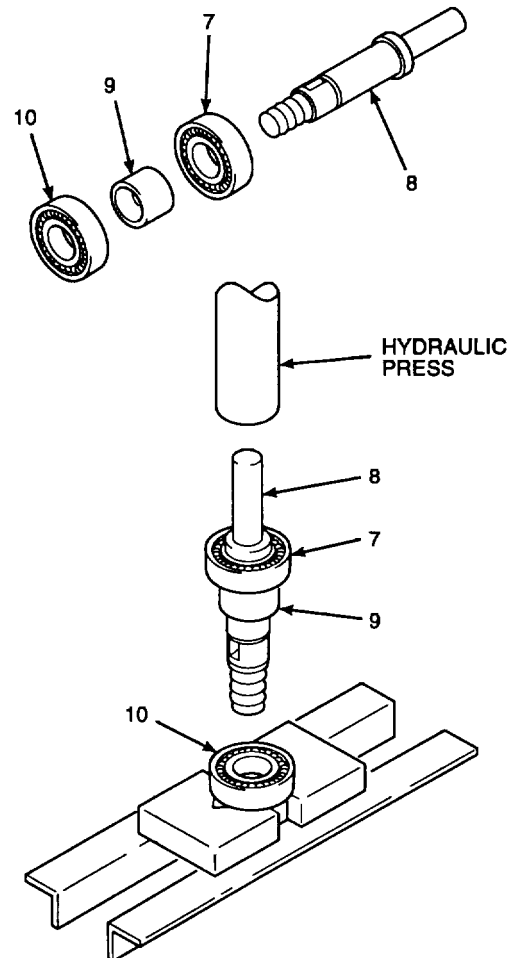
Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves).

Failure to take proper precautions may result in severe injury or loss of vision.

3. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO REMOVE ANY FOREIGN MATERIAL. DRY WITH A CLEANING CLOTH.

**C. ASSEMBLE.****1. INSTALL BEARINGS ONTO SHAFT.**

- a. Place inner bearing (7) onto hydraulic press frame.
- b. Press inner bearing (7) onto threaded end of shaft (8) until it seats against shaft flange.
- c. Install spacer (9) against inner bearing (7).
- d. Press outer bearing (10) onto shaft until it seats against spacer (9).
- e. Fill space between bearings half full with grease.



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**C. ASSEMBLE - Continued.**

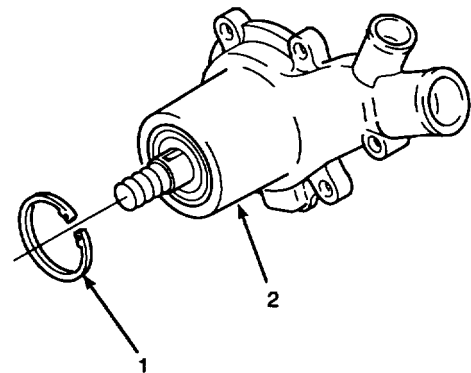
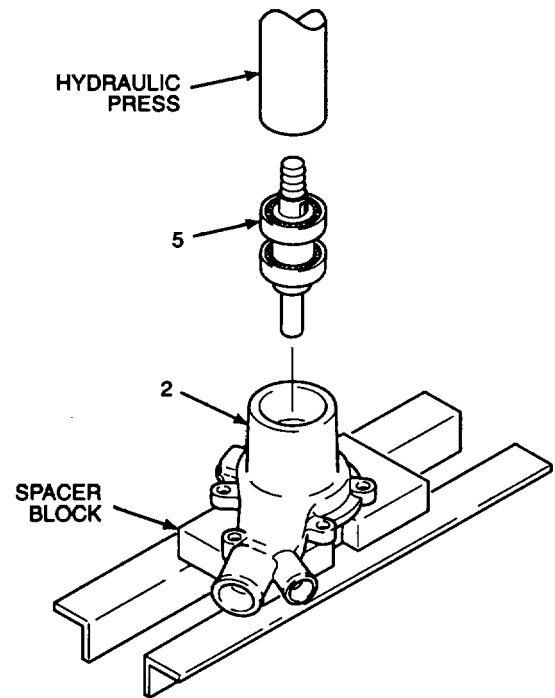
**2. INSTALL ASSEMBLED SHAFT AND SEAL INTO BODY.**

- a. Place bearing body (2) on spacer blocks on hydraulic press frame.
- b. Press assembled shaft (5) into bearing body until seated inside bearing body.

**WARNING**

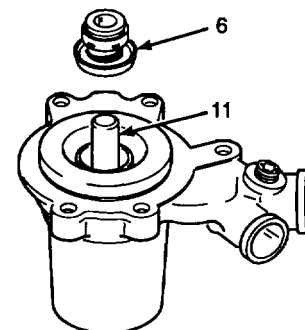
**Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- c. Use snap ring pliers and install snap ring (1) into bearing body (2).



**3. INSTALL SEAL INTO BEARING BODY.**

- a. Apply a light coating of grease to water pump shaft (11).
- b. Press seal (6) over shaft into bearing body using firm finger pressure. If necessary use a spacer from the universal puller kit and a plastic hammer to seat seal into bearing body. Only light taps with the hammer should be used.



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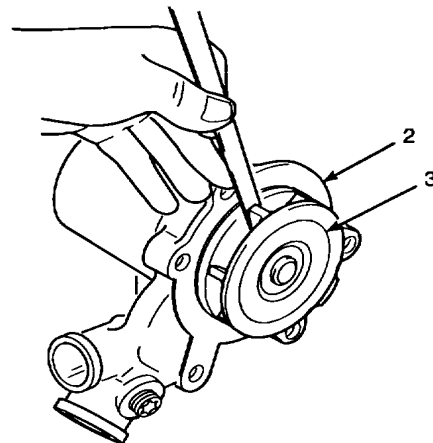
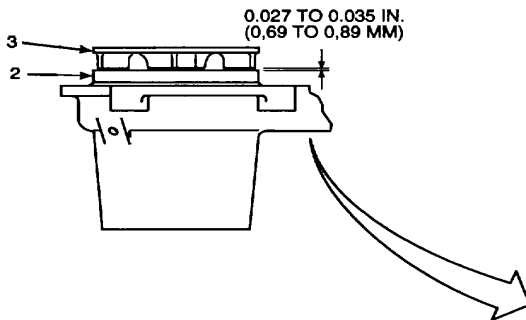
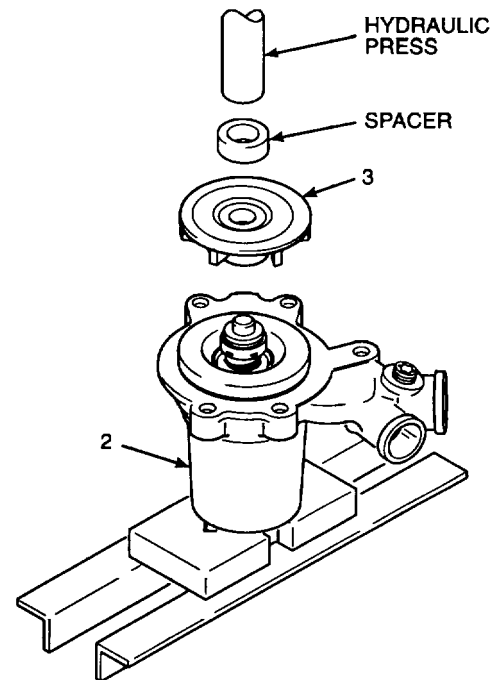
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**2.23. REPAIR WATER PUMP - Continued**


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**C. ASSEMBLE - Continued.****4. INSTALL IMPELLER ONTO ASSEMBLED SHAFT.**

- a. Place bearing body (2) onto hydraulic press frame.
- b. Select a spacer from universal puller kit that will pass over the water pump shaft. Place on top of impeller (3).
- c. Press impeller (3) onto shaft in increments, stopping to check clearance between impeller and bearing body.
- d. Use a thickness gage to ensure clearance of 0.027 to 0.035 in. (0,69 to 0,89 mm) is maintained between impeller (3) blades and bearing body (2).

**NOTE****FOLLOW-ON-TASK:**

Install water pump per TM 5-3895-373-20.

**END OF TASK**

SECTION VI. ELECTRICAL SYSTEM MAINTENANCE

Repair Alternator .....	Para 2.24	Page 2-325
Repair Control Handle.....	2.26	2-353
Repair Starter Assembly.....	2.25	2-336

**2.24 REPAIR ALTERNATOR.**

- |                   |                |             |            |
|-------------------|----------------|-------------|------------|
| This task covers: | a. Disassemble | b. Clean    | c. Inspect |
|                   | d. Repair      | e. Assemble |            |

Tools:

- General mechanic's automotive tool kit (Item 106, Appendix D)
- Dial indicator (Item 52, Appendix D)
- Digital multimeter (Item 59, Appendix D)
- Hydraulic press frame (Item 41, Appendix D)
- Outside micrometer (Item 16, Appendix D)
- Screwdriver bit set (Item 10, Appendix D)
- Solder (Item 93, Appendix D)
- Soldering iron (Item 94, Appendix D)
- Steel machinist's rule (Item 74, Appendix D)
- Thickness gage (Item 46, Appendix D)
- Torque wrench (Item 129, Appendix D)
- Universal puller kit (Item 69, Appendix D)
- V-blocks (Item 111, Appendix D)

References:

- MIL-STD-2000A
- TM 5-3895-373-20
- TM 5-3895-373-24P
- TM 9-2920-247-34

Equipment Condition:

Alternator removed per TM 5-3895-373-20.

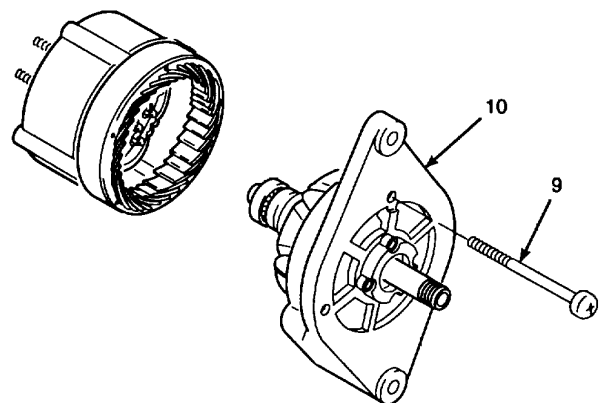
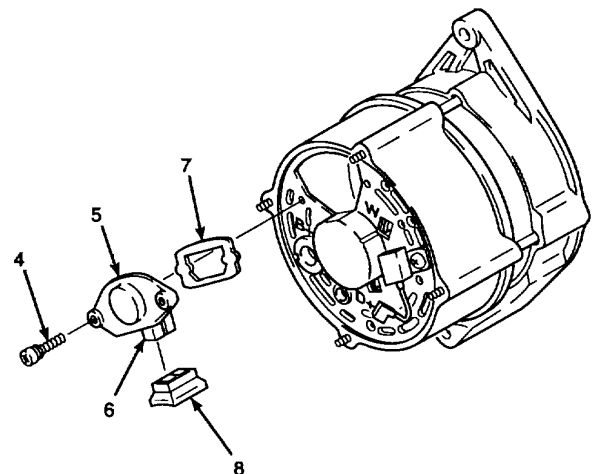
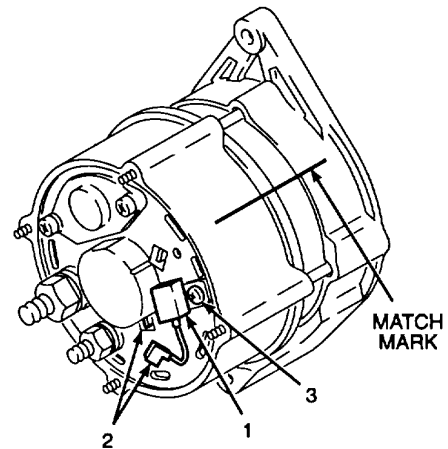
Materials/Parts:

- Cleaning cloth (Item 6, Appendix B)
- Cleaning solvent (Item 31, Appendix B)
- Electrical insulating compound (Item 10, Appendix B)
- Collector rings
- Gasket
- Lockwashers
- O-rings
- Seals
- Transistor

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**2.24. REPAIR ALTERNATOR - Continued****A. DISASSEMBLE.**

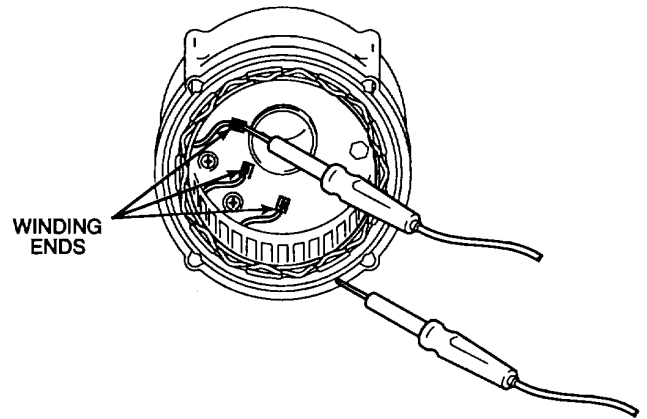
1. **SCRIBE, OR MARK WITH A MARKER, A MATCH MARK ACROSS ALTERNATOR FOR ALIGNMENT DURING REASSEMBLY.**
2. **REMOVE IGNITION SUPPRESSOR (1) LEAD FROM (+) TERMINAL (2). TEST IGNITION SUPPRESSOR PER TM 9-2920-247-34 USING A DIGITAL MULTIMETER. SPECIFIED VALUE SHOULD BE 1.8 TO 2.6  $\mu$ F. AFTER TESTING, DISCHARGE IGNITION SUPPRESSOR BY SHORT CIRCUITING.**
3. **IF DEFECTIVE, REMOVE IGNITION SUPPRESSOR (1) BY REMOVING OVAL HEAD MACHINE SCREW (3).**
4. **REMOVE TRANSISTOR AND CARBON BRUSH ASSEMBLY.**
  - a. Remove screws (4).
  - b. Tilt transistor (5) backward so carbon brush assembly (6) can be removed without damaging brushes.
  - c. Transistor (5), gasket (7), and o-ring (8) will come out as an assembly. Discard gasket and o-ring.
5. **REMOVE OVAL HEAD MACHINE SCREWS (9) AND ASSEMBLED ROTOR AND DRIVE END BELL (10).**



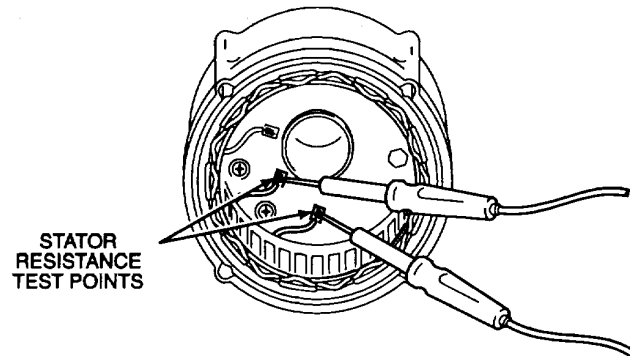
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A. DISASSEMBLE - Continued.

6. TEST RECTIFIER DIODES AT WINDING ENDS PER TM 9-2920-247-34 USING A DIGITAL MULTIMETER.

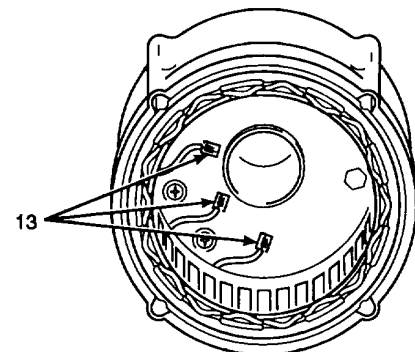
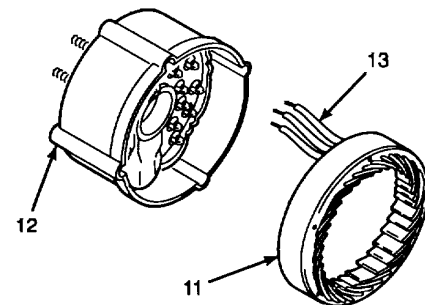


7. TEST STATOR RESISTANCE PER TM 9-2920-247-34 USING A DIGITAL MULTIMETER. RESISTANCE VALUE FOR STATOR SHOULD BE  $0.18!Q + 10\%$ .



8. REMOVE STATOR FROM COLLECTOR RING END SHIELD.

- a. Pull stator (11) from collector ring end shield (12).
- b. Remove solder from stator leads (13) from rectifier board mounting eyes, per MIL-STD-2000A.. Withdraw leads.



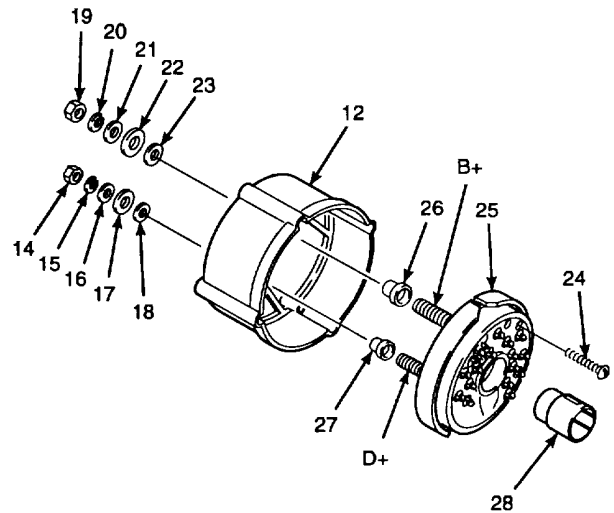
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**2.24. REPAIR ALTERNATOR - Continued**

**A. DISASSEMBLE - Continued.**

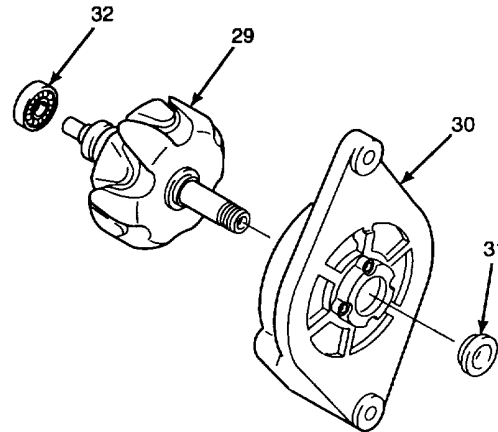
**9. REMOVE RECTIFIER AND ELECTRICAL COVER FROM COLLECTOR RING END SHIELD.**

- a. Remove hex nut (14), lockwasher (15), flat washer (16), large fibre washer (17) and small fibre washer (18) from D+ terminal of collector ring end shield (12). Discard lockwasher.
- b. Remove hex nut (19), lockwasher (20), flat washer (21), large fibre washer (22), and small fiber washer (23) from B+ terminal. Discard lockwasher.
- c. Remove screws (24) and rectifier (25) from collector ring end shield (12).
- d. Pull insulated bushing (26) from large (B+) terminal of rectifier (25) and unthread insulated bushing (27) from small (D+) terminal of rectifier.
- e. Remove electrical cover (28).



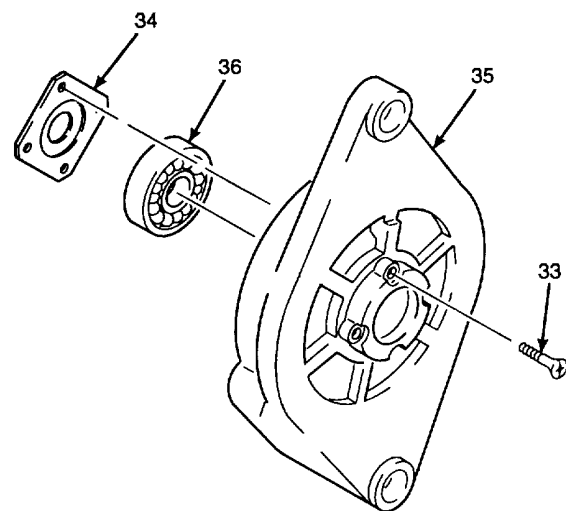
**10. REMOVE ROTOR AND SEAL FROM DRIVE END BELL.**

- a. Remove rotor (29) from drive end bell (30).
- b. If rotor cannot be removed from drive end bell by hand, use a bearing puller from the universal puller kit to press rotor from drive end bell (30).
- c. Remove seal (31).
- d. Use a bearing puller from universal puller kit to remove bearing (32) from rotor.



**11. REMOVE BEARING FROM DRIVE END BELL.**

- a. Remove screws (33).
- b. Remove retaining plate (34) from inside of drive end bell (35).
- c. Slide bearing (36) from inside of drive end bell.



**GO TO NEXT PAGE**

**B. CLEAN.****WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

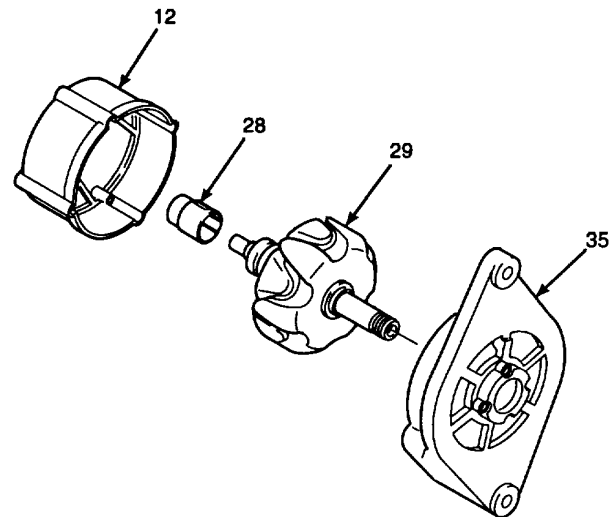
1. WIPE DRIVE END BELL (35), ROTOR (29), COLLECTOR RING END SHIELD (12), AND ELECTRICAL COVER (28) WITH A CLEANING CLOTH DAMPENED WITH CLEANING SOLVENT.

**WARNING**

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

Failure to take proper precautions may result in severe injury or loss of vision.

2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO DRY DRIVE END BELL (35), COLLECTOR RING END SHIELD (12), AND ELECTRICAL COVER (28).



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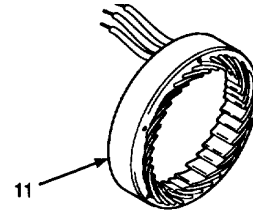
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**2.24. REPAIR ALTERNATOR - Continued**

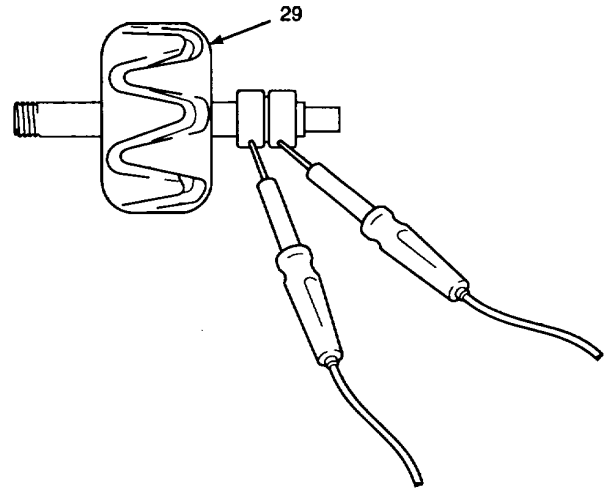
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**C. INSPECT.**

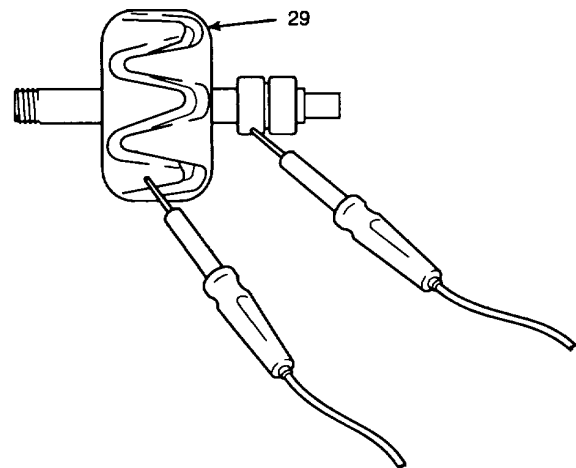
1. TEST STATOR (11) FOR SHORT CIRCUIT TO GROUND USING DIGITAL MULTIMETER. REFER TO TM 9-2920-247-34. TEST VOLTAGE IS 80 VAC.



2. TEST ROTOR (29) RESISTANCE PER TM 9-2920-247-34 USING DIGITAL MULTIMETER. ROTOR RESISTANCE SHOULD BE  $2.9\Omega \pm 10\%$ .



3. TEST ROTOR (29) FOR SHORT CIRCUIT TO GROUND USING DIGITAL MULTIMETER. REFER TO TM 9-2920-247-34. TEST VOLTAGE IS 80 VAC.



4. INSPECT BEARINGS FOR LOOSENESS OR ROUGH TURNING.

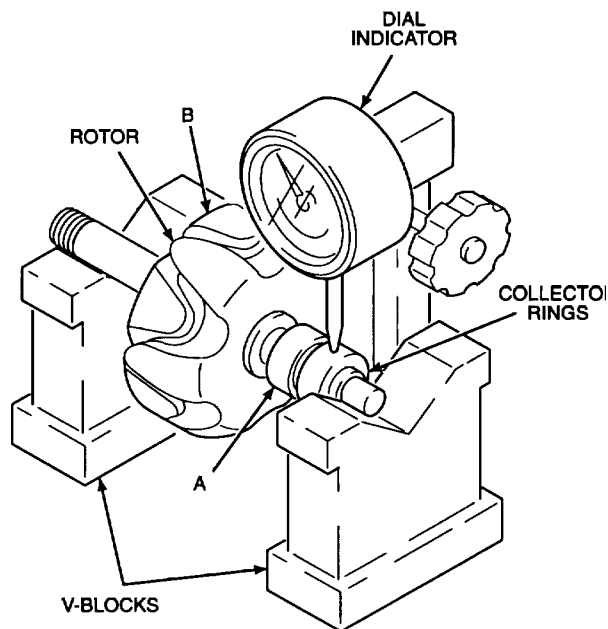
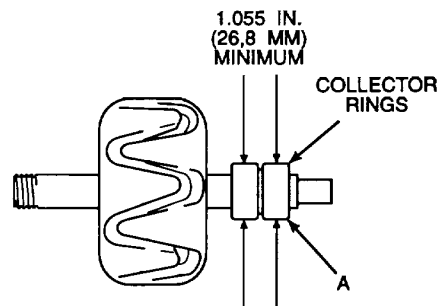
- a. Turn bearings by hand. Feel for looseness or rough turning.
- b. Replace bearings if looseness or rough turning is detected. Refer to step D.

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C. INSPECT - Continued.

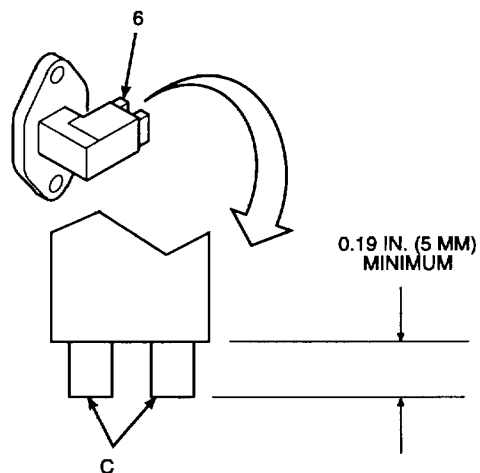
5. INSPECT COLLECTOR RINGS AND ROTOR FOR WEAR AND OUT-OF-ROUNDNESS.

- a. Use an outside micrometer to measure outer diameter surface A of collector rings.
- b. If outer diameter of collector rings is less than 1.055 in. (26, 8 mm), replace collector rings per step D.
- c. Place ends of rotor shaft on V-blocks and align exactly horizontal.
- d. Turn rotor on V-blocks and measure amount of running error on collector rings and rotor using a dial indicator.
- e. If maximum amount of running error on collector ring surface A is 0.001 in. (0, 03 mm), replace collector rings per step D.
- f. If maximum amount of running error on rotor surface R B is 0.019 in. (0, 5 mm), replace rotor.



6. INSPECT TRANSISTOR CARBON BRUSH ASSEMBLY (6) FOR WEAR.

- a. Use a steel machinist's rule to measure brush projection length on surface C.
- b. If brush projection length is less than 0.19 in. (5 mm), replace transistor.



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2.24 REPAIR ALTERNATOR - Continued.

D. REPAIR.

1. REMOVE COLLECTOR RINGS.

- a. Remove solder from leads on collector rings (37) per MIL-STD-2000A.
- b. Use a bearing puller from universal puller kit to remove collector rings (37). Discard collector rings.

2. REPLACE COLLECTOR RINGS.

**NOTE**

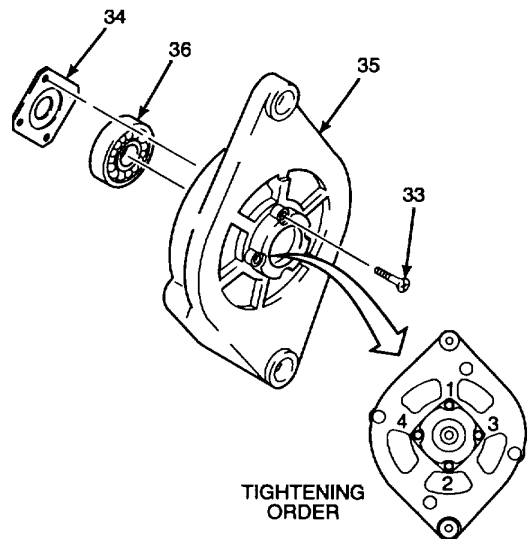
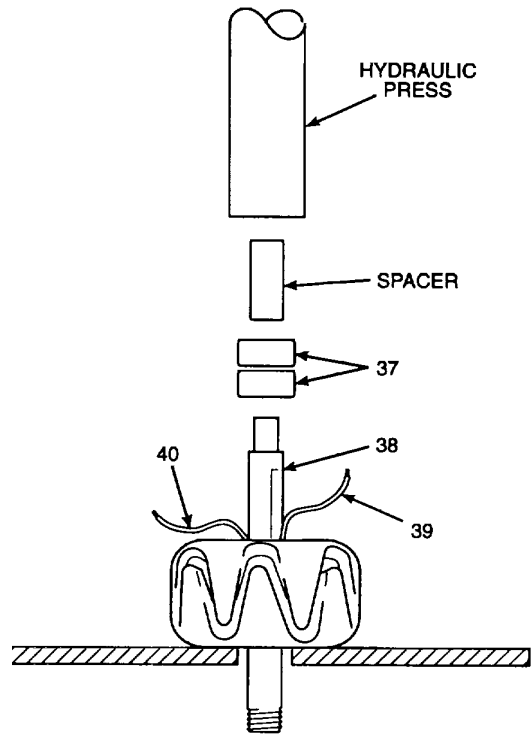
**Replace collector rings only if determined defective per step C.**

- a. Place rotor on hydraulic press frame, with threaded end of shaft pointing down.
- b. Place new collector rings (37) on rotor shaft (38).
- c. Place one lead (39) into groove on collector rings (37).
- d. Use universal puller kit spacer and hydraulic press to press on collector rings as far as they will go on rotor. Lead should be visible through collector rings after pressing on collector rings.
- e. Solder leads (39 and 40) on collector rings per MILSTD-2000A.

E. ASSEMBLE.

1. INSTALL BEARING INTO DRIVE END BELL.

- a. Slide bearing (36) into inside of drive end bell (35).
- b. Install retaining plate (34).
- c. Install screws (33). Refer to illustration and tighten crosswise to 23 lb-in (2, 6 N.m).



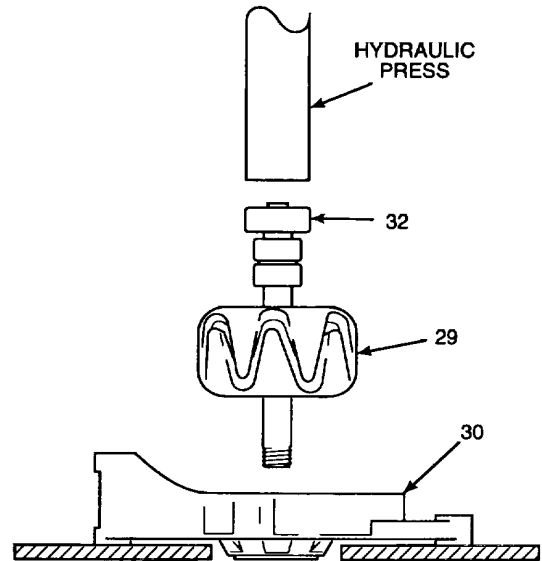
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E. ASSEMBLE - Continued.

2. USE HOLLOW SPACER FROM UNIVERSAL PULLER KIT AND HYDRAULIC PRESS FRAME TO PRESS BEARING (32) ONTO ROTOR (29) AS FAR AS IT WILL GO.

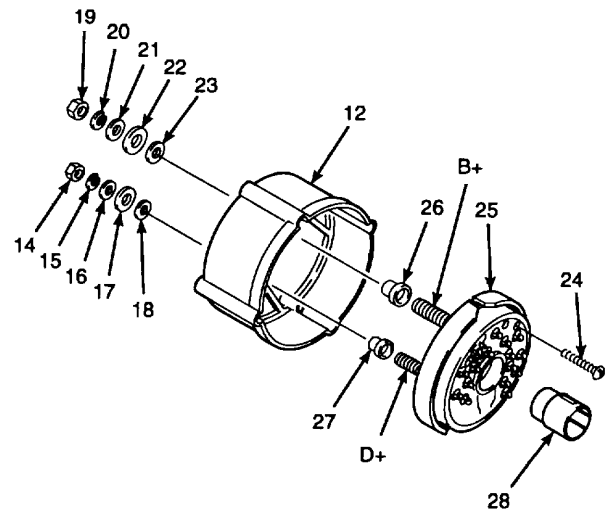
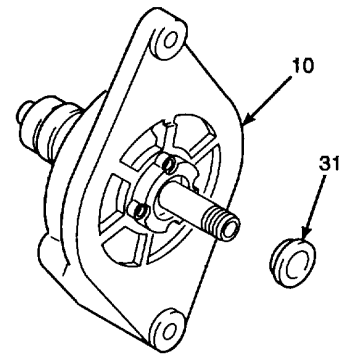
3. INSTALL ROTOR, SEAL, AND ELECTRICAL COVER INTO DRIVE END BELL.

- a. Place drive end bell (30), inside face up, on hydraulic press frame.
- b. Press shaft of rotor (29) into drive end bell (30) bearing as far as it will go.
- c. Remove assembled rotor and drive end bell (10) from hydraulic press frame.
- d. Install seal (31) bevel-end down. Seat seal by pressing gently, moving around the seal surface, with a straight punch.



4. INSTALL RECTIFIER INTO COLLECTOR RING END SHIELD.

- a. Thread insulated bushing (27) onto small (D+) terminal of rectifier (25)
- b. Install insulated bushing (26) onto large (B+) terminal of rectifier (25).
- c. Install rectifier (25) and screws (24) into collector ring end shield (12). Terminals B+ and D+ must extend through collector ring end shield (12) with insulated bushings fully seated in holes. Tighten screws to 15 lb-in (1, 7 N.m).
- d. Install small fibre washer (23), large fibre washers (22), flat washer (21), lockwasher (20), and hex nut (19) onto large (B+) terminal. Tighten hex nut finger tight.
- e. Install small fibre washer (18) large fibre washer (17), flat washer (16), lockwasher (15), and hex nut (14) onto small (D+) terminal. Tighten hex nut finger tight.



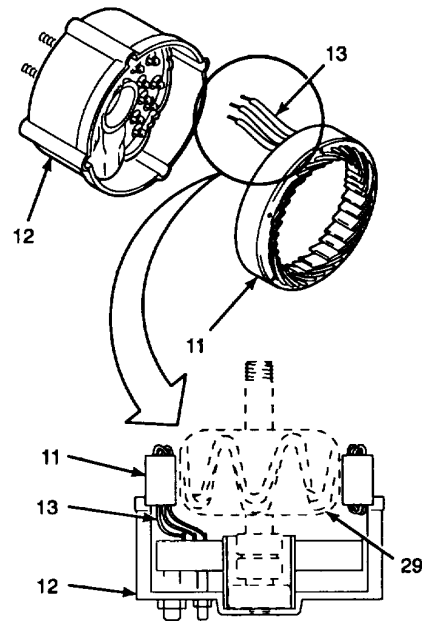
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2.24 REPAIR ALTERNATOR - Continued.

E. ASSEMBLE - Continued.

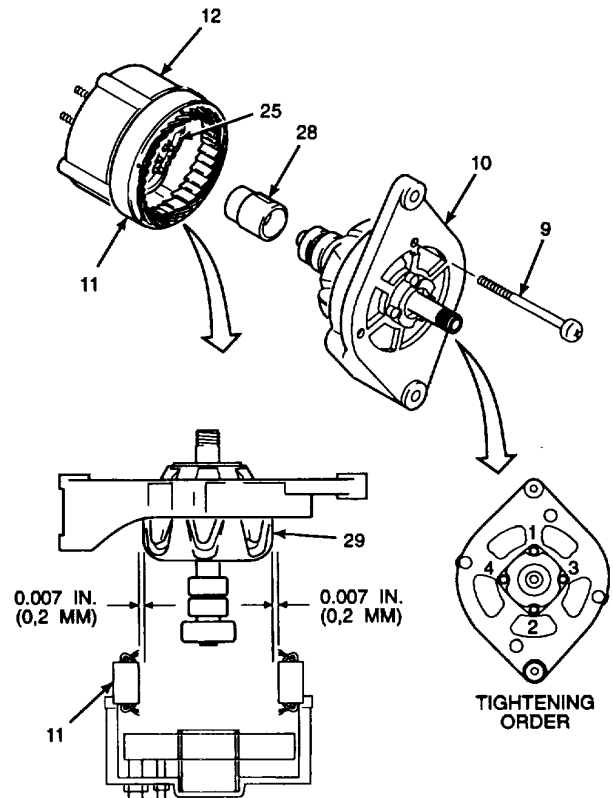
5. INSTALL STATOR INTO COLLECTOR RING END SHIELD.

- a. Install stator (11) into collector ring end shield (12). Make sure stator leads align with mounting eyes on rectifier.
- b. Insert stator leads (13) through mounting eyes.
- c. Solder stator leads (13) per MIL-STD-2000A, ensuring wires do not touch rotor (29) when installed.



6. INSTALL DRIVE END BELL ONTO COLLECTOR RING END SHIELD.

- a. Insert electrical cover (28) through rectifier (25) into bore in collector ring end shield (12). Make sure electrical cover is fully seated and aligned with transistor opening. End of cover should be flush with rectifier (25).
- b. Install assembled rotor and drive end bell (10) into stator (11) and collector ring end shield (12). Make sure match marks made before disassembling alternator are aligned.
- c. Insert a thickness gage, between stator (11) and rotor (29) to measure minimum correct clearance between components of 0.007 in. (0, 2 mm). Insert through openings in drive end bell.
- d. Hold assembled components together in centered position and install oval head machine screws (9) hand tight.
- e. Refer to illustration and tighten oval head machine screws crosswise to 42 lb-in (4, 8 N•m).



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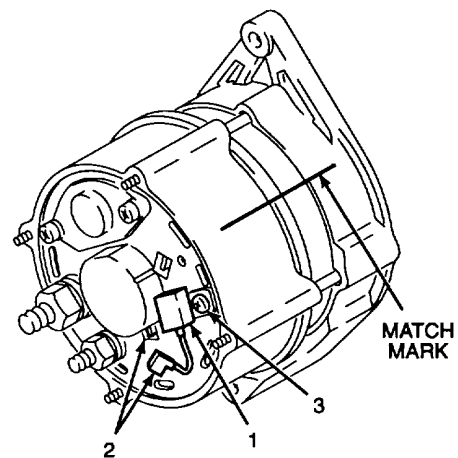
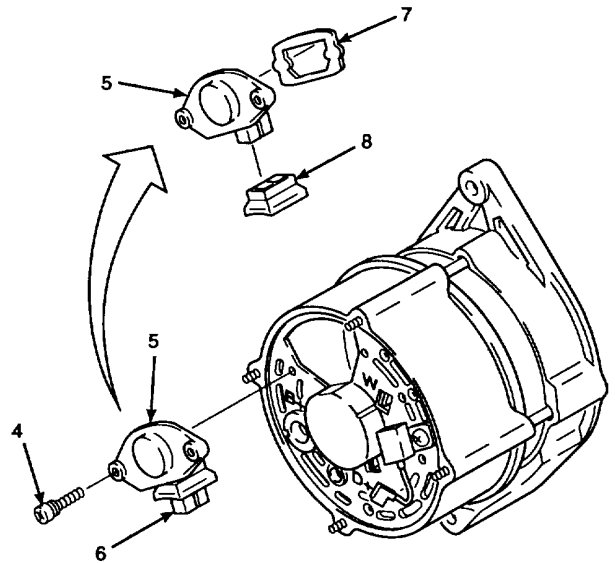
E. ASSEMBLE - Continued.

7. INSTALL TRANSISTOR AND CARBON BRUSH ASSEMBLY.

- a. Install gasket (7) and o-ring (8) on transistor (5).
- b. Install transistor (5) with carbon brush assembly (6) inserted first.
- c. Install screws (4). Tighten to 17 lb-in (2, 0 N.m).

8. INSTALL IGNITION SUPPRESSOR (1) AND OVAL HEAD SCREW MACHINE (3). TIGHTEN TO 32 lb-in (3, 5 N•m).

9. APPLY ELECTRICAL INSULATING COMPOUND TO IGNITION SUPPRESSOR (1) LEAD. CONNECT IGNITION SUPPRESSOR LEAD TO (+) TERMINAL (2).



**NOTE**

FOLLOW-ON-TASK: Install alternator per TM 5-3895-373-20.

**END OF TASK**

---

**2.25 REPAIR STARTER ASSEMBLY.**

---

This task covers:

- |                |             |            |
|----------------|-------------|------------|
| a. Disassemble | b. Clean    | c. Inspect |
| d. Repair      | e. Assemble | f. Test    |
- 

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Adapter (Item 1, Appendix D)  
Adapter (Item 2, Appendix D)  
Adapter (Item 3, Appendix D)  
Adapter (Item 4, Appendix D)  
Automotive and generator test stand (Item 101, Appendix D)  
Bench vise (Item 112, Appendix D)  
Drift punch (Item 70, Appendix D)  
Hydraulic press frame (Item 41, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Outside micrometer (Item 15, Appendix D)  
Outside micrometer (Item 16, Appendix D)  
Pinion stop support block (Item 14, Appendix C)  
Plastic hammer (Item 49, Appendix D)  
Shaft bearing removal tool (Item 15, Appendix C)  
Torque wrench (Item 129, Appendix D)  
Universal puller kit (Item 69, Appendix D)

Materials/Parts:

Crocus cloth (Item 4, Appendix B)  
Grease (Item 17, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Tape (Item 35, Appendix B)  
Annular ball bearings  
Brushes  
Commutator end frame o-ring  
Drive end sleeve bearing  
Lockwashers  
Preformed packing  
Sleeve bushing  
Stop ring

References:

TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Starter assembly removed per TM 5-3895-373-20.

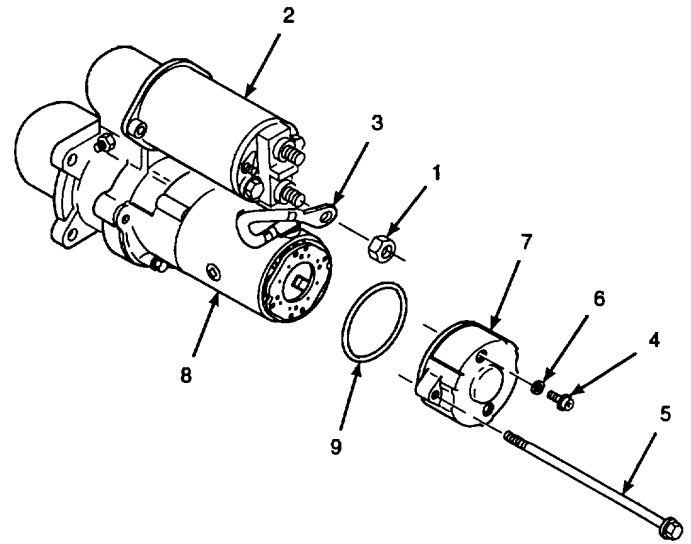
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## A. DISASSEMBLE.

## 1. REMOVE MOTOR LEAD, FRAME AND BRUSH ASSEMBLY, ARMATURE, AND SOLENOID FROM DRIVE HOUSING AND ARMATURE ASSEMBLY.

- a. Remove hex nut (1) from solenoid (2).
- b. Disconnect motor lead (3). Make a note which terminal the motor lead is connected to for use during installation.
- c. Install hex nut (1) back on solenoid.
- d. Remove screws (4 and 5) and preformed packing (6). Discard preformed packing.



**CAUTION**

Use caution when removing commutator end frame. Terminal lead wires may be damaged from excessive force when removing commutator end frame from starter. Do not use excessive pulling force during removal of commutator end frame.

- e. Use a flat blade screwdriver to gently and evenly pry commutator end frame (7) from frame and brush assembly (8).
- f. Use an o-ring tool to remove o-ring (9). Discard commutator end frame o-ring.

**GO TO NEXT PAGE**



## 2.25 REPAIR STARTER ASSEMBLY - Continued

## A. DISASSEMBLE - Continued.

**CAUTION**

Do not allow dowel pin (10) to become misplaced from frame and brush assembly. Dowel pin is required for assembly and must not be lost. Use a piece of tape and attach dowel pin to frame and brush assembly. Equipment damage may result from loss of dowel pin.

- g. Remove frame and brush assembly (8) and dowel pin (10). Attach dowel pin to frame and brush assembly with a piece of tape.

**CAUTION**

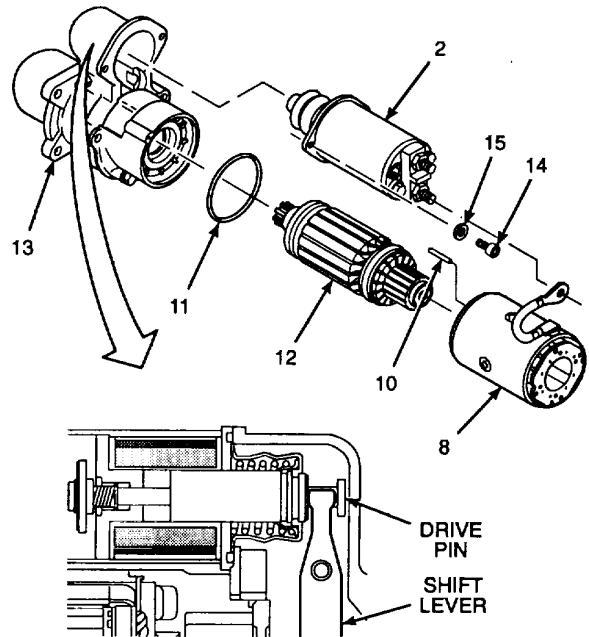
Use caution when removing preformed packing (11). Preformed packing is not procurable separately. If damaged, order drive housing.

- h. Use an o-ring tool to remove preformed packing (11).

**NOTE**

Armature may come off with frame and brush assembly or may remain with drive housing. Bearings must not be removed from armature during disassembly.

- i. Pull armature (12) from frame and brush assembly (8) or drive housing (13) with bearings intact.
- j. Remove screws (14) and lockwashers (15). Discard lockwashers.
- k. Disconnect solenoid (2) by tilting end of solenoid down so that drive pin disengages from shift lever. Remove solenoid from drive housing (13).

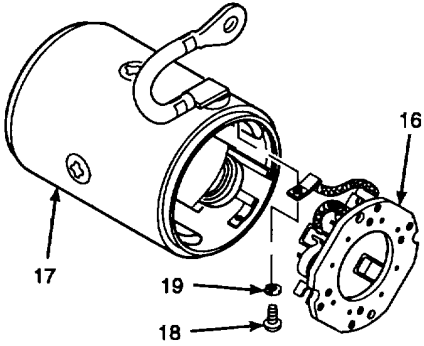


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A. DISASSEMBLE - Continued.

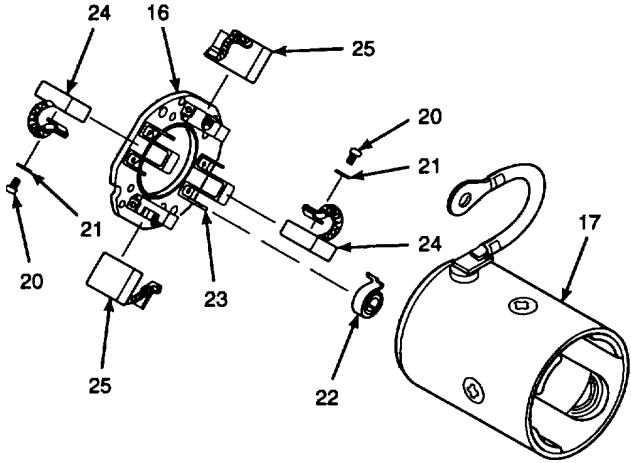
2. REMOVE BRUSHES, BRUSH SPRINGS, AND BRUSH HOLDER ASSEMBLY FROM FRAME AND BRUSH ASSEMBLY.

- a. Hold brush holder assembly (16) away from frame/field assembly (17) to access screws (18).
- b. Remove screws (18) and lockwashers (19) from frame/field assembly (17). Discard lockwashers.



Remove brush holder assembly (16) from frame/field assembly.

- c. Remove brush screws (20) and lockwashers (21) from brush holder assembly (16). Discard lockwashers.
- d. Use needle nose pliers to move brush springs (22) away from brush sockets (23) on brush holder assembly (16).
- e. Remove grounded brushes (24) and insulated brushes (25).
- f. Remove brush spring (22) by sliding off of post.



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## 2.25 REPAIR STARTER ASSEMBLY - Continued

A. DISASSEMBLE - Continued.

3. REMOVE ARMATURE SUPPORT, SHIFT LEVER, AND DRIVE SHAFT FROM DRIVE HOUSING.

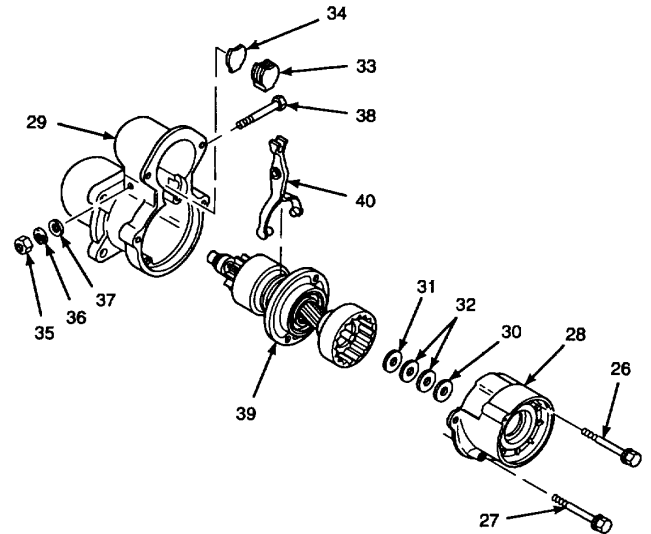
- a. Remove screws (26 and 27).
- b. Pull armature support (28) from drive housing (29).

### NOTE

**Washers and spacers may stick to armature support or assembled drive shaft when armature support is removed from drive housing.**

**Spacers are factory installed and quantity may vary from none to several.**

- c. Remove washers (30 and 31) and spacers (32), keeping washers and spacers in order as they are removed. They should be reinstalled in the same order as they were removed.
- d. Pry out housing plug (33) and plate (34) with a large flat-blade screwdriver.
- e. Remove hex nut (35), lockwasher (36), washer (37), and screw (38). Discard lockwasher.
- f. Pull assembled drive shaft (39) and shift lever (40) from drive housing (29).
- g. Pull shift lever (40) from assembled drive shaft (39).



GO TO NEXT PAGE

A. DISASSEMBLE - Continued.

4. REMOVE SLEEVE BUSHING, STOP RING, BENDIX, AND DRIVE SUPPORT FROM DRIVE SHAFT AND REMOVE BURRS FROM DRIVE SHAFT.

**NOTE**

**Disassembly of assembled drive shaft is not required unless it is necessary to clean, inspect, and replace one or more parts of the assembled drive shaft separately.**

- a. Set assembled drive shaft (39) on work surface with internal gear end facing down.
- b. Place adapter (Item 2, Appendix D) over sleeve bushing (41).
- c. Use a plastic hammer and drive sleeve bushing (41) down toward assembled drive shaft (39) to break staking and expose stop ring (42).



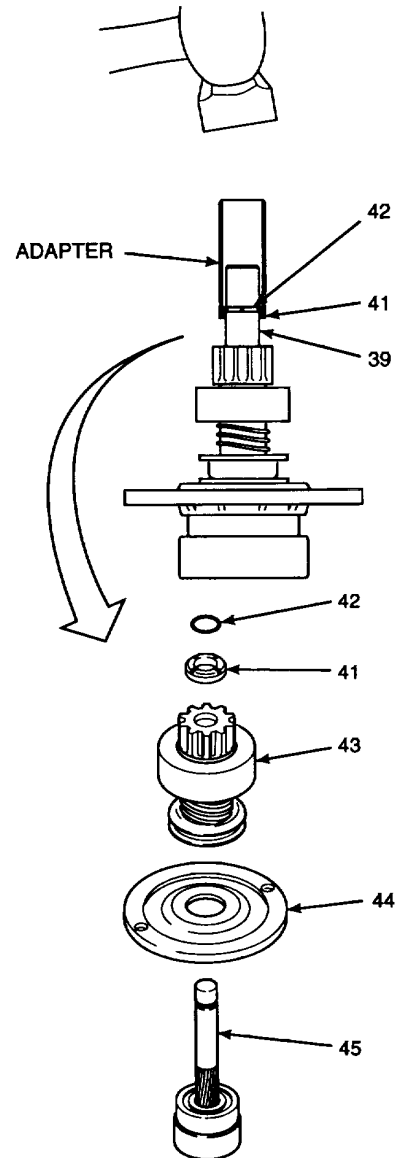
**Use caution when removing stop ring. Do not use excessive force when removing stop ring from assembled drive shaft. Scratches and gouges may impair starter performance. Pry stop ring gently from assembled drive shaft.**

- d. Gently pry stop ring (42) from assembled drive shaft (39) with a flat-blade screwdriver. Discard stop ring. Remove sleeve bushing (41) from drive shaft.



**Do not remove base metal on assembled drive shaft when removing burrs. Use a fine file to remove burrs. Excessive removal of base metal may impair starter performance. Work carefully and remove burrs sparingly.**

- e. Use a file to remove any burrs from end of assembled drive shaft (39), being careful not to remove base metal during filing.
- f. Slide bendix (43) and drive support (44) from drive shaft (45).



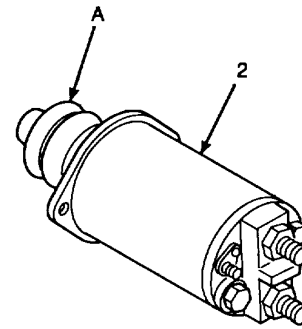
**2.25 REPAIR STARTER ASSEMBLY - Continued**

**B. CLEAN.**

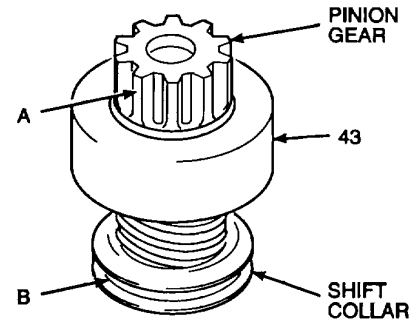
1. WIPE ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.
2. PLACE ALL PARTS ON A CLEAN WORK SURFACE FOR INSPECTION.

**C. INSPECT.**

1. INSPECT SOLENOID (2) FOR CUT OR TORN BOOT (SURFACE A). REPLACE SOLENOID IF BOOT IS TORN OR CRACKED.
2. INSPECT BENDIX COMPONENTS FOR DAMAGE AND WEAR.

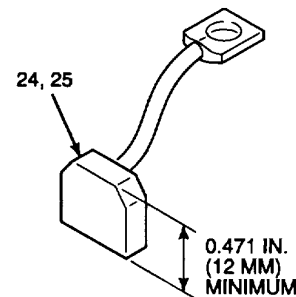
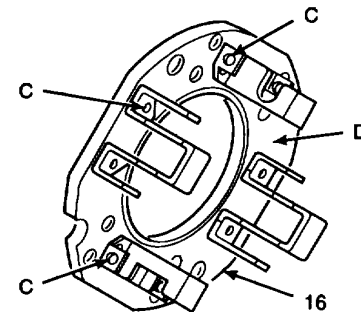


- a. Turn pinion gear manually on bendix (43).
- b. Check for rough turning and the ability of pinion gear to turn in both directions.
- c. Inspect pinion gear surface A for broken teeth and step wear.
- d. Inspect shift collar surface B for deep scoring and damage.
- e. Replace bendix if pinion gear turns rough or in both directions, pinion gear teeth are damaged or worn, or shift collar is scored or damaged.



3. INSPECT BRUSH HOLDER ASSEMBLY FOR LOOSE RIVETS AND CRACKED OR BROKEN INSULATION. MEASURE BRUSHES.

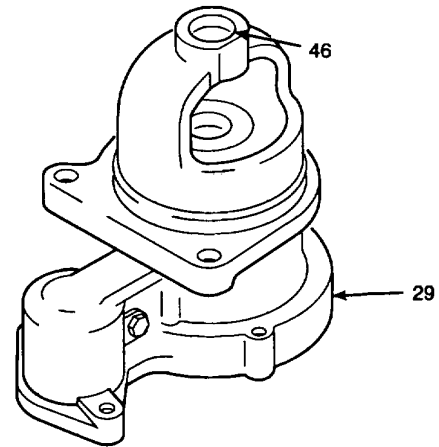
- a. Inspect brush holder assembly (16) surface C for loose riveted joints and surface D for cracked or broken insulation.
- b. Replace brush holder assembly (16) if rivets are loose or insulation is cracked or broken.
- c. Use an outside micrometer (Item 15, Appendix D) to measure brush (24 and 25) length.
- d. Minimum allowable brush (24 and 25) length is 0.472 in. (12 mm). If any one brush length is 0.471 in. (12 mm) or less, replace all brushes.



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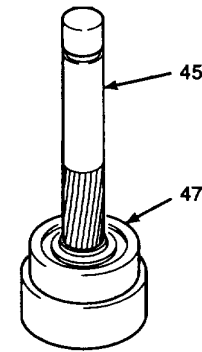
C. INSPECT - Continued.

4. INSPECT SLEEVE BEARING (46) FOR SCORING AND DAMAGE. REPLACE SLEEVE BEARING IF DAMAGE OR SCORING IS DETECTED. REFER TO REMOVE AND REPLACE SLEEVE BEARING IN DRIVE HOUSING (29), IN STEP D.



5. INSPECT BEARINGS ON DRIVE SHAFT AND ARMATURE.

- a. Slowly turn bearing (47) on drive shaft (45) and bearings (48 and 49) on armature (12) by hand.
- b. Check for binding and the feel of flat spots while turning bearings.
- c. Replace damaged or worn bearings. Refer to steps D.2 and D.3.



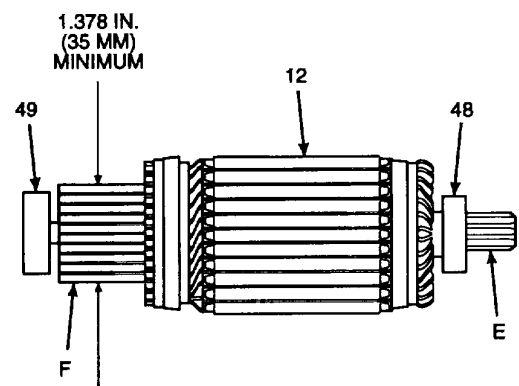
6. INSPECT ARMATURE FOR DAMAGED TEETH, WORN COMMUTATOR, AND ROUGH COMMUTATOR SURFACE.

- a. Inspect armature (12) surface E for broken gear teeth, step wear, and root interference on gear teeth.
- b. Use an outside micrometer (Item 16, Appendix D) to measure commutator outer diameter surface F.
- c. If commutator outer diameter is less than 1.378 in. (35 mm) or if undercut depth at any point is less than 0.008 in. (0, 2 mm), replace armature (12).

(35 mm) or if undercut depth at any point is less than 0.008 in. (0, 2 mm), replace armature (12).

- d. Feel for roughness on commutator surface F. Refer to step D.4 if commutator feels rough.

7. INSPECT DRIVE SHAFT (45) FOR SCORING, DAMAGE, BROKEN OR DAMAGED INTERNAL GEAR TEETH, AND SPLINE DAMAGE. REPLACE DRIVE SHAFT IF SCORED, DAMAGED, OR IF GEAR TEETH OR SPLINE IS DAMAGED.



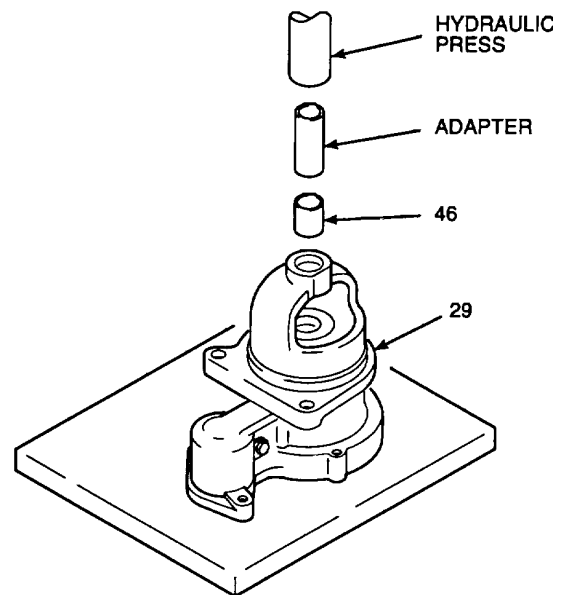
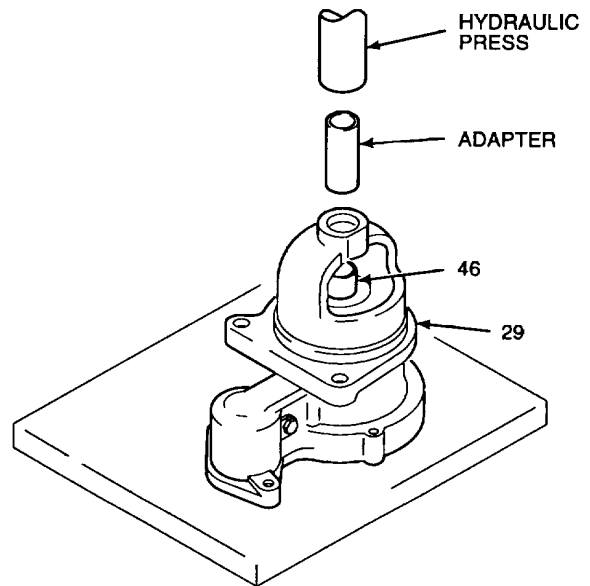
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## 2.25 REPAIR STARTER ASSEMBLY - Continued

## D. REPAIR.

## 1. REMOVE AND REPLACE SLEEVE BEARING IN DRIVE HOUSING.

- a. Place drive housing (29) with sleeve bearing (46) facing up on a hydraulic press frame.
- b. Use adapter (Item 2, Appendix D) to press out sleeve bearing (46). Discard drive end sleeve bearing.
- c. Place new sleeve bearing (46) on top of drive housing (29).
- d. Use adapter (Item 2, Appendix D) to press sleeve bearing (46) into drive housing (29). Press until bottom of sleeve bearing is flush with inside of drive housing.

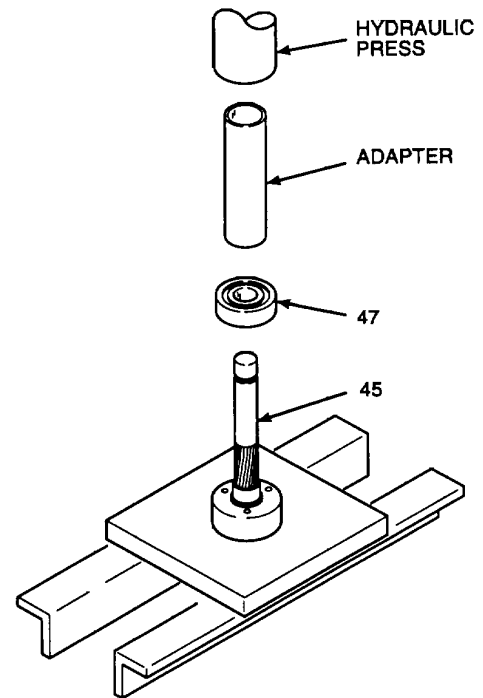
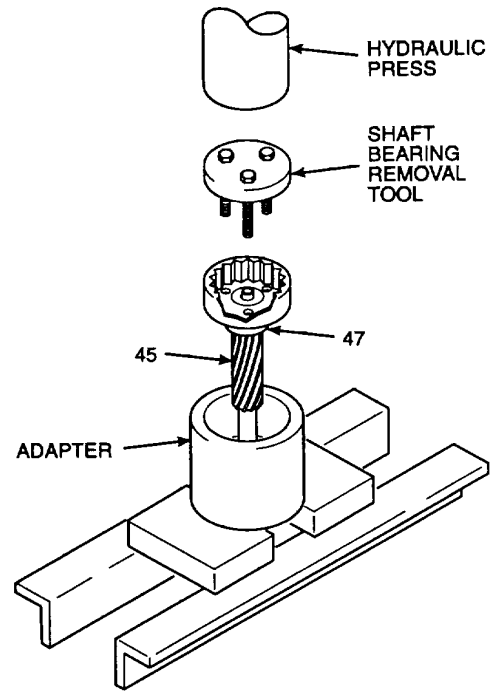


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D. REPAIR - Continued.

2. REMOVE AND REPLACE BEARING ON DRIVE SHAFT.

- a. Place an adapter (Item 3, Appendix D) beneath drive shaft (45), with internal gear end of drive shaft facing up.
- b. Place drive shaft (45) on a hydraulic press frame.
- c. Place shaft bearing removal tool through holes in wide end of drive shaft (45).
- d. Press bearing (47) from drive shaft (45). Discard annular ball bearing.
- e. Remove drive shaft (45) from adapter.
- f. Place drive shaft (45) with splined end facing up on hydraulic press frame.
- g. Place new bearing (47) over splined end of drive shaft (45).
- h. Place an adapter (Item 4, Appendix D) over inner race of bearing (47).
- i. Press bearing (47) onto drive shaft (45) until seated against wide end of drive shaft.



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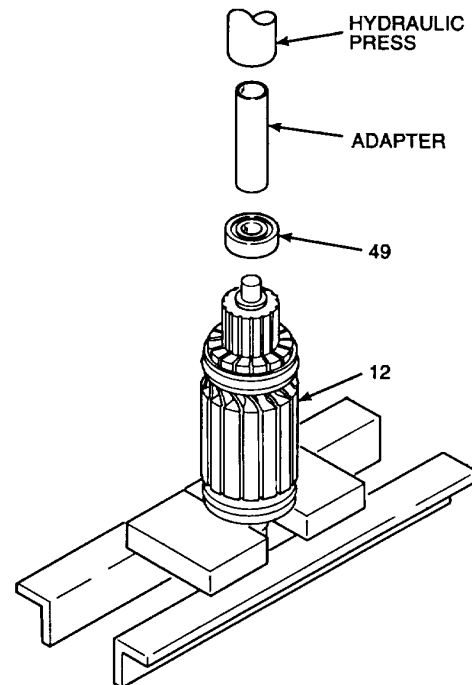
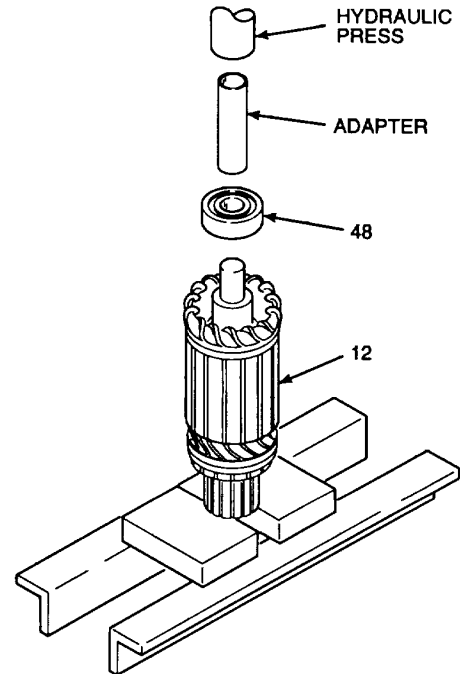
2.25 REPAIR STARTER ASSEMBLY - Continued

D. REPAIR - Continued.

3. REMOVE AND REPLACE BEARINGS ON ARMATURE.

- a. Use a bearing puller from universal puller kit to remove bearings (48 and 49) from armature (12). Discard annular ball bearings.
- b. Place armature (12) onto hydraulic press frame.
- c. Place new bearing (48) over splined end of armature (12).
- d. Using an adapter (Item 3, Appendix D) to press on inner race of bearing, support armature (12) with cribbing and press bearing onto armature until inner race bottoms out against shoulder on armature shaft.
- e. Turn armature (12) over on hydraulic press frame.
- f. Place new bearing (49) over commutator end of armature (12).
- g. Support armature (12) with cribbing and use an adapter (Item 1, Appendix D) to press on inner race of bearing. Press bearing onto armature until inner race bottoms out against shoulder on armature shaft.
- h. Remove armature (12) from hydraulic press frame.

4. POLISH COMMUTATOR ON ARMATURE (12) WITH CROCUS CLOTH. DO NOT TURN COMMUTATOR ON A LATHE. USE A PARTS CLEANING BRUSH TO REMOVE METAL DUST FROM BETWEEN COMMUTATOR BARS.

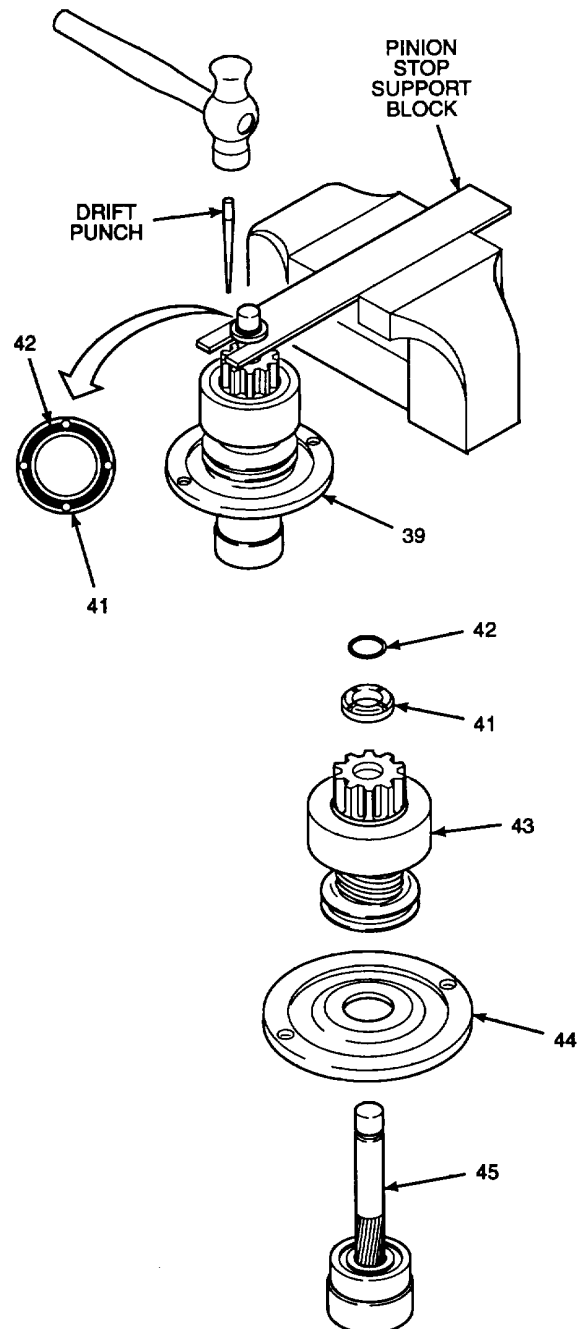


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E. ASSEMBLE.

1. ASSEMBLE DRIVE SUPPORT, BENDIX, STOP RING, AND SLEEVE BUSHING ONTO DRIVE SHAFT.

- a. Place drive shaft (45) on work surface with internal gear end facing down.
- b. Slide drive support (44) onto drive shaft (45) and seat bearing in drive support.
- c. Lubricate drive shaft (45) splines with grease.
- d. Install bendix (43).
- e. Slide sleeve bushing (41) onto drive shaft (45), with end with recess for stop ring facing up.
- f. Install stop ring (42) in groove in drive shaft (45).
- g. Install pinion stop support block in a bench vise.
- h. Place assembled drive shaft (39) into pinion stop support block. Use cribbing beneath assembled drive shaft to hold sleeve bushing (41) directly over groove in drive shaft and against stop ring (42).



**CAUTION**

**Do not allow staked metal to contact drive shaft. Use caution when staking sleeve bushing. Damage to drive shaft and impaired operation of starter may result from damaged drive shaft. Do not allow punch to slip during staking.**

- i. With stop ring (42) fully seated inside sleeve bushing (41), use a drift punch to stake upper edge of sleeve bushing over stop ring in four, equally-spaced places.
- j. Remove assembled drive shaft (39) from pinion stop support block.

**GO TO NEXT PAGE**

## 2.25 REPAIR STARTER ASSEMBLY - Continued

## E. ASSEMBLE - Continued.

## 2. ASSEMBLE ARMATURE SUPPORT, SHIFT LEVER, AND DRIVE SHAFT INTO DRIVE HOUSING.

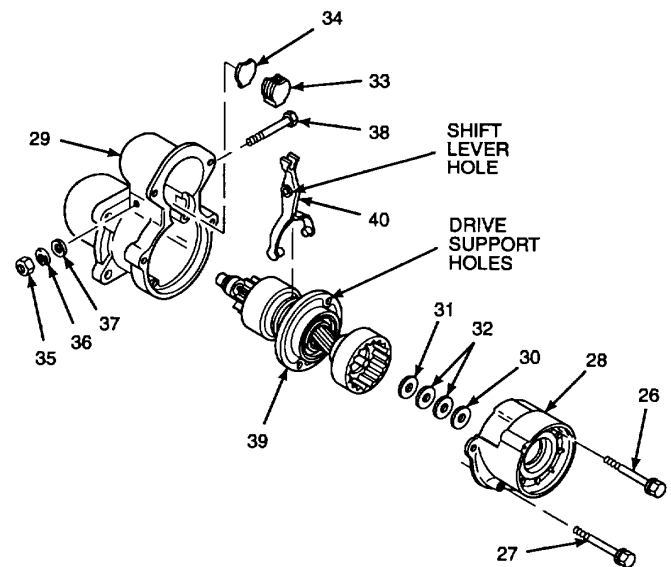
- a. Lubricate shift lever (40) and assembled drive shaft (39) with grease.
- b. Install shift lever (40) onto shift collar on assembled drive shaft (39).
- c. Install shift lever (40) and assembled drive shaft (39) into drive housing (29).
- d. Use a drift punch to align hole in shift lever with holes in drive housing (29).
- e. Use a drift punch to align holes in drive support with holes in drive housing (29).

**NOTE**

**Drive support must be fully seated in drive housing.**

**Drive shaft bearing must be fully seated in drive support.**

- f. With drive shaft bearing seated in drive support and drive support seated in drive housing (29), install screw (38), washer (37), lockwasher (36), and hex nut (35). Tighten hex nut to 40 lb-in (4, 5 N•m).
- g. Install plate (34) and housing plug (33).
- h. Install spacers (32) and washers (31 and 30), in exactly the same order noted at disassembly.
- i. Install armature support (28).
- j. Install screws (27 and 26). Tighten to 75 lb-in (8, 5 N•m).



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E. ASSEMBLE - Continued.

3. ASSEMBLE BRUSHES AND BRUSH SPRINGS.  
INSTALL BRUSH HOLDER ASSEMBLY INTO  
FRAME/FIELD ASSEMBLY.

- a. Install brush springs (22) onto post of brush holder assembly (16), enough to hold inside end of spring from turning.
- b. Use needle nose pliers to turn brush springs clockwise over top of brush sockets (23).
- c. Push brush springs (22) onto posts and position springs in notches in brush sockets (23).



**Brush leads are fragile. Do not overflex leads near clip welds on brushes. Brush leads may be damaged by overflexing and clip welds may break off.**

**NOTE**

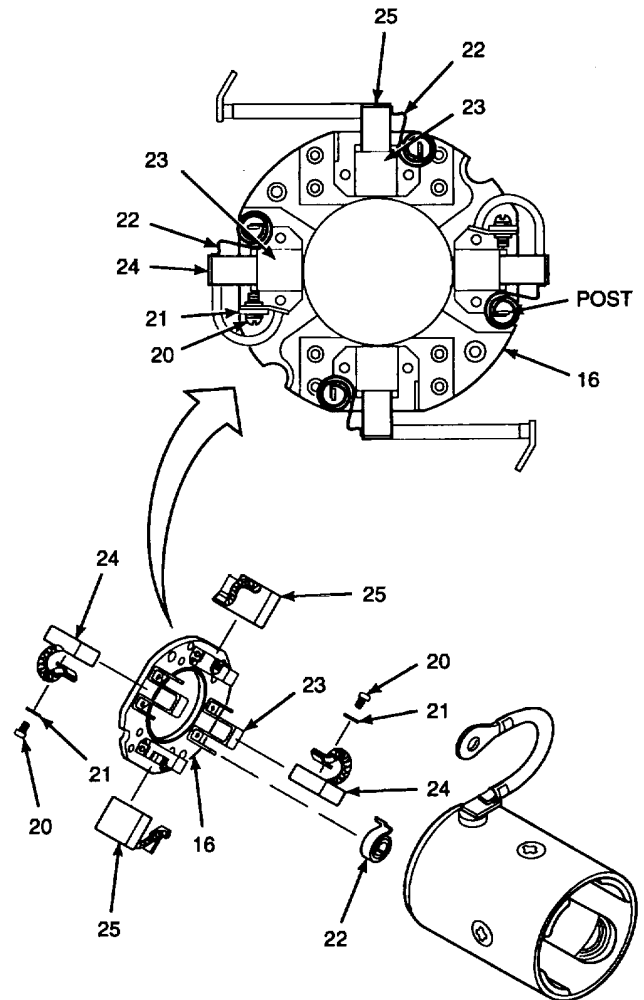
**Insulated brushes must be installed in brush sockets of brush holder assembly that are mounted on insulation.**

- d. Use needle nose pliers to turn brush spring (22) clockwise to clear brush socket (23).
- e. Insert insulated brushes (25) and grounded brushes (24) partially into brush sockets (23).
- f. Release brush spring (22) slowly to touch sides of brushes (25 and 24).

**NOTE**

**Brushes will remain retracted until after brush holder assembly is installed over armature.**

- g. Insert lockwashers (21) onto brush screws (20).
- h. Install brush screws (20) through grounded brush leads and into brush holder assembly (16). Tighten screws to 13 lb-in (1, 5 N.m).

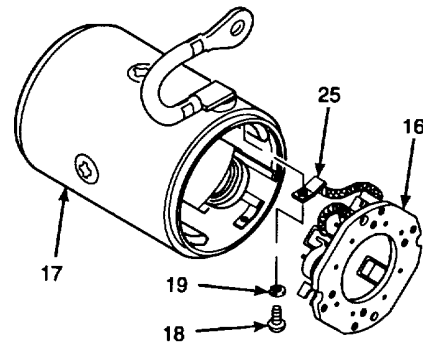


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2.25 REPAIR STARTER ASSEMBLY - Continued

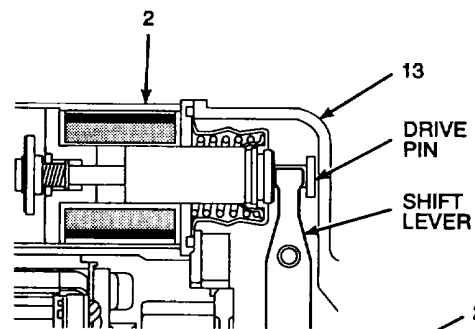
E. ASSEMBLE Continued.

- i. Position brush holder assembly (16) close to frame/field assembly (17).
- j. Install lockwashers (19) onto screws (18).
- k. Attach insulated brush (25) leads to frame/field assembly (17) with screws (18).
- l. Tighten screws (18) to 13 lb-in (1, 5 N•m).

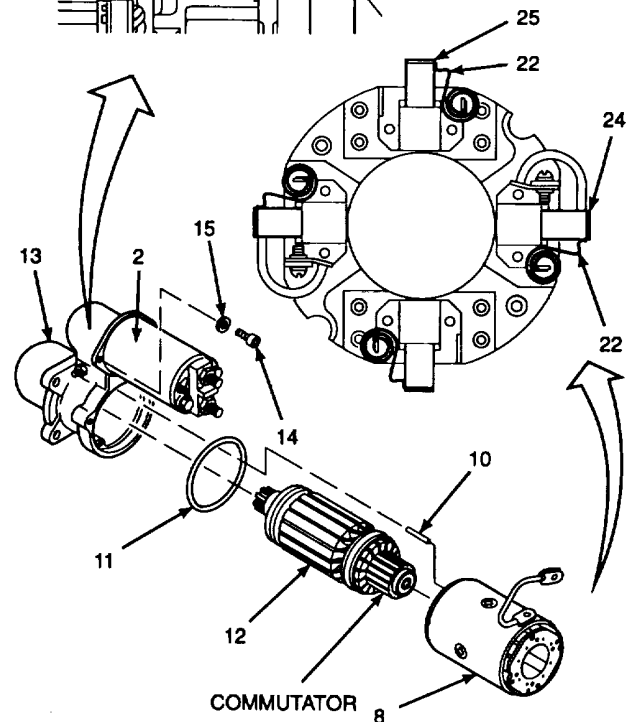


4. INSTALL SOLENOID INTO DRIVE HOUSING.

- a. Install solenoid (2) into shift lever by tilting rear of solenoid downward and pushing toward drive housing (13), then leveling solenoid. Make sure that pin on the end of the solenoid engages the shift lever.
- b. Position solenoid (2) onto drive housing (13) by matching up holes for screws (14).
- c. Install lockwashers (15) onto screws (14).
- d. Install screws (14). Tighten to 25 lb-in (2, 8 N m).



- e. Install preformed packing (11) onto frame and brush assembly (8).
- f. Install armature (12) into drive housing (13) by aligning gear teeth on armature, seat bearing fully in far end of drive housing.
- g. Place dowel pin (10) into drive housing (13).
- h. Position frame and brush assembly (8) over armature (12), aligning hole for dowel pin (10).
- i. Move brush springs (22) away from grounded brushes (24) and insulated brushes (25).
- j. Slide brushes (24 and 25) inward to contact armature (12).
- k. Release brush springs (22) to tension brushes (24 and 25) against commutator.



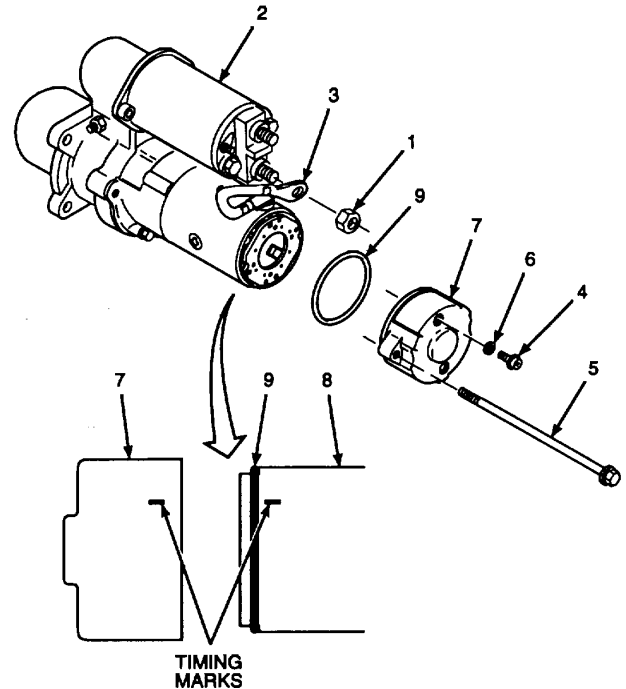
- l. Secure frame and brush assembly (8) to drive housing (13) by pressing firmly together.

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2-350

E. ASSEMBLE Continued.

5. INSTALL O-RING, FRAME AND BRUSH ASSEMBLY, AND COMMUTATOR END FRAME ONTO DRIVE HOUSING AND ARMATURE ASSEMBLY. INSTALL MOTOR LEAD ONTO SOLENOID.

- a. Install o-ring (9) on frame and brush assembly (8), positioning o-ring against shoulder of frame and brush assembly that contacts commutator end frame (7).
- b. Slowly roll out o-ring (9) from its position against the frame and brush assembly shoulder until it is on the outer diameter of the frame and brush assembly.
- c. Align match marks on commutator end frame (7) and frame and brush assembly (8).
- d. Position commutator end frame (7) onto frame and brush assembly (8), leaving a gap slightly larger than o-ring diameter.
- e. Use a drift punch to align tapped holes in brush holder assembly and commutator end frame (7).
- f. Install preformed packing (6) and brush plate screws (4). Tighten screws to 25 lb-in (2, 8 N.m).
- g. Without closing gap between commutator end frame (7) and frame and brush assembly (8), install screws (5) and tighten by hand.
- h. Roll o-ring (9) down into gap between commutator end frame (7) and frame and brush assembly (8).



- k. Remove hex nut (1) from terminal on solenoid (2).
- l. Install motor lead (3) onto the terminals marked during disassembly
- m. Install hex nut (1). Tighten to 100 lb-in (11 N•m).

**NOTE**

**Timing marks are located in two places, but will only align one way.**

- i. Align timing mark on edge of commutator end frame (7) with timing mark on frame and brush assembly (8)..
- j. Tighten screws (5) on commutator end frame (7) to 75 lb-in (8, 5 N•m)

**GO TO NEXT PAGE**

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**2.25 REPAIR STARTER ASSEMBLY - Continued**


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## F. TEST.

1. USE AN AUTOMOTIVE AND GENERATOR TEST STAND TO TEST STARTER FOR THE FOLLOWING PARAMETERS OF OPERATION.

No-Load Test (includes solenoid current)				
Volts	Min. Amps	Max. Amps	Min. RPM	Max. RPM
20	75	90	3600	5400

2. USE AN AUTOMOTIVE AND GENERATOR TEST STAND TO TEST SOLENOID FOR THE FOLLOWING PARAMETERS OF OPERATION.

Current Consumption (rated @ 24V)					
Pull-in Winding			Hold-in Winding		
Amps	Volts	Ohms	Amps	Volts	Ohms
100- 125	20	0.16/0.20	12- 14	20	1.45/1.65

NOTE: Resistance for test between solenoid terminals and solenoid casing shall not exceed 1.75 ohms.

**NOTE**

**FOLLOW-ON-TASK: Install starter per TM 5-3895-373-10.**

**END OF TASK**

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**2.26 REPAIR CONTROL HANDLE.**


---

This task covers:

- a. Disassemble      b. Clean      c. Assemble
- 

**INITIAL SETUP**
Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Six-point screwdriver set (Item 79, Appendix D)

References:

TM 5-3895-373-20  
TM 5-3895-373-24P

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Sealing compound (Item 29, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Boot  
Case fasteners  
Case gasket

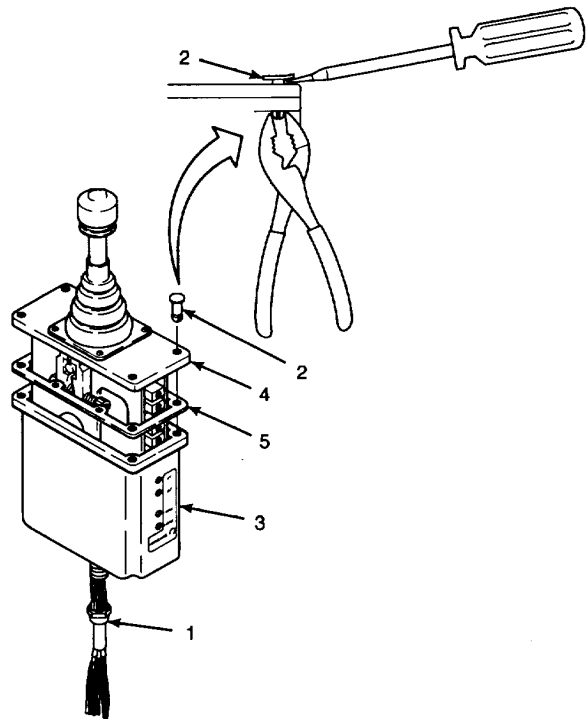
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Equipment Condition:

Control handle removed per TM 5-3895-373-20.

**A. DISASSEMBLE.**
**1. LOOSEN STRAIN RELIEF CONNECTOR, AND SEPARATE CASE, AND CASE GASKET FROM CONTROL HANDLE.**

- a. Loosen strain relief connector (1).
- b. Use a pair of pliers and a flat blade screwdriver to remove case fasteners (2). Discard case fasteners.
- c. Pull case (3) from control handle (4) far enough to allow access to case gasket (5).
- d. Remove case gasket (5). Discard case gasket.



**GO TO NEXT PAGE**



## 2.26 REPAIR CONTROL HANDLE. - Continued

### A. DISASSEMBLE Continued.

#### 2. REMOVE KNOB, HANDLE, CENTER LOCK SPRING, AND CENTER LOCK HANDLE FROM CONTROL HANDLE.

- a. Grasp knob (6) and control handle (7) firmly.

#### NOTE

**Handle (10) may either remain inside control handle (7) or may remain in knob (6) when knob is turned and removed.**

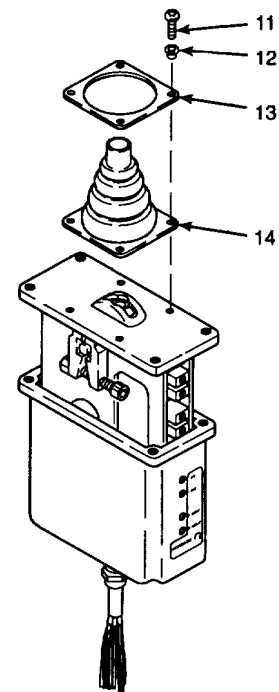
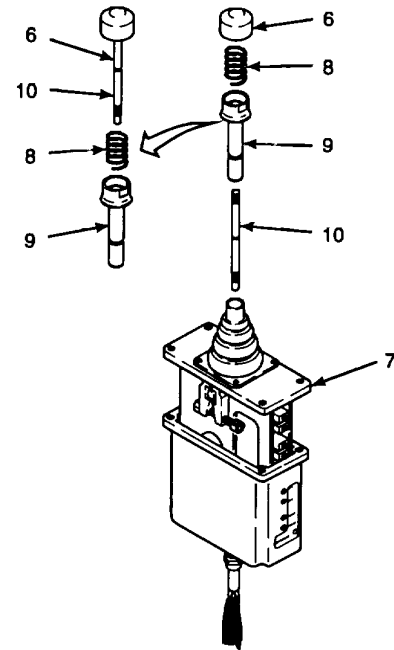
- b. Turn knob (6) counterclockwise and remove.
- c. Remove center lock spring (8).
- d. Remove center lock handle (9).

#### NOTE

**Do not remove handle (10) from control handle (7) unless it needs to be replaced.**

- e. If handle (10) remains in control handle (7), use vise grip pliers to remove handle.
  - f. If handle (10) remains in knob (6), replace both handle and knob, if required.
- #### 3. REMOVE RETAINING PLATE AND BOOT FROM CONTROL HANDLE.

- a. Use a screwdriver from six-point screwdriver set to remove pan head cap screws (11).
- b. Remove collar seals (12).
- c. Remove retaining plate (13).
- d. Remove boot (14). Discard boot.



**GO TO NEXT PAGE**

## B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. WIPE GASKETED MATING SURFACES OF CASE AND CONTROL HANDLE WITH A CLEANING CLOTH MOISTENED WITH CLEANING SOLVENT.
2. WIPE MATING SURFACES OF CASE AND CONTROL HANDLE ASSEMBLY DRY WITH A CLEAN CLOTH.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

3. CLEAN THREADS ON HANDLE WITH THREAD LOCKING COMPOUND SOLVENT TO REMOVE SEALING COMPOUND RESIDUE.
4. WIPE THREADS ON HANDLE DRY WITH A CLEAN, LINT-FREE CLOTH.

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2.26 REPAIR CONTROL HANDLE - Continued.

C. ASSEMBLE.

1. INSTALL BOOT AND RETAINING PLATE ONTO CONTROL HANDLE.

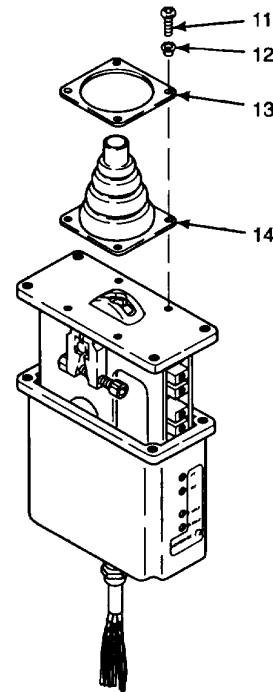
- a. Install boot (14).
- b. Install retaining plate (13).
- c. Install collar seal (12) onto pan head cap screws (11).

**NOTE**

**Pan head cap screws will be tightened after mounting onto gauge panel.**

- d. Use a screwdriver from six-point screwdriver set to install pan head cap screws (11) hand tight.

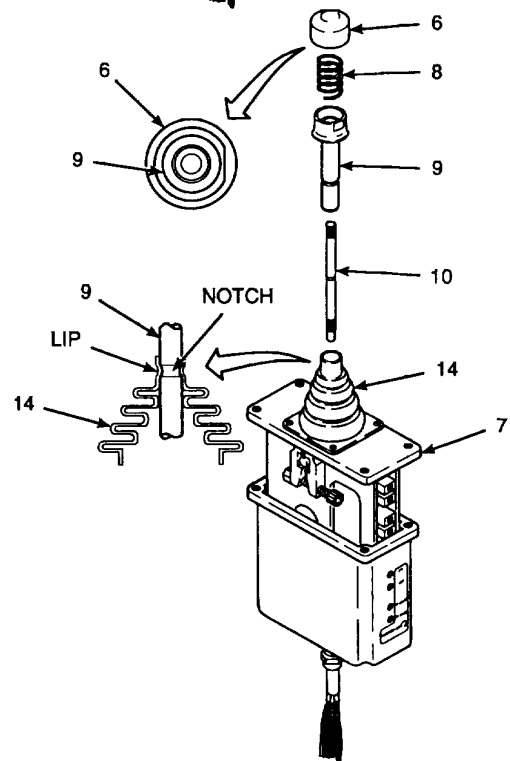
2. INSTALL HANDLE, CENTER LOCK HANDLE, CENTER LOCK SPRING, AND KNOB ONTO CONTROL HANDLE.



**WARNING**

Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If sealing compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply sealing compound to threads on bottom of handle (10).
- b. Install handle (10).
- c. Install center lock handle (9) through boot (14) and onto control handle (7). Fit lip in boot (14) into notch in center lock handle (9).
- d. Install center lock spring (8).
- e. Apply sealing compound to threads on top of handle (10).
- f. Install knob (6) onto handle (10), fitting flat spot on knob with flat spot on center lock handle (9). Tighten knob hand tight.

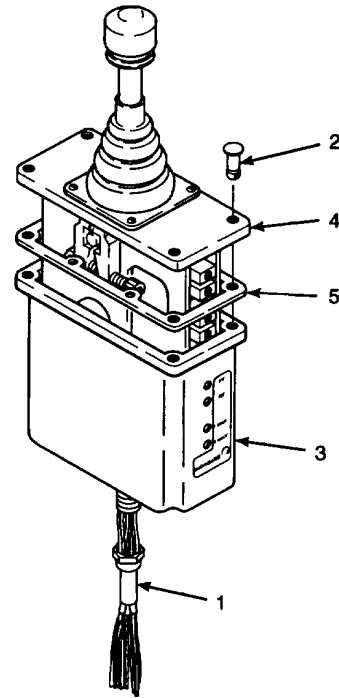


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## C. ASSEMBLE Continued.

## 3. INSTALL CASE GASKET, CASE, AND STRAIN RELIEF CONNECTOR ONTO CONTROL HANDLE.

- a. Install case gasket (5) over top of control handle and position with adhesive-backed side facing control handle (4).
- b. Remove adhesive cover tape and place case gasket (5) on control handle (4).
- c. Install case (3) onto control handle (4).
- d. Insert case fasteners (2) through control handle (4) and case.
- e. Install strain relief connector (1) hand tight.

**NOTE**

**FOLLOW-ON-TASK: Install control handle per TM 5-3895-373-20.**

**END OF TASK**

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SECTION VII. TRANSMISSION SYSTEM MAINTENANCE

	Para	Page
Replace Pump Pilot Control Valve .....	2.31	2-438
Replace/Repair Brake Valve .....	2.28	2-373
Replace/Repair High Speed Shift Valve .....	2.27	2-358
Replace/Repair Propulsion Motor .....	2.32	2-442
Replace/Repair Propulsion Pump .....	2.30	2-394
Replace/Repair Pump Drive Gearbox .....	2.29	2-379
Replace/Repair Speed Reduction Gearbox .....	2.33	2-470

2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE.

This task covers:

- |            |                |            |
|------------|----------------|------------|
| a. Removal | b. Disassemble | c. Clean   |
| d. Inspect | e. Assemble    | f. Install |

INITIAL SETUP

Tools:

- General mechanic's automotive tool kit  
(Item 106, Appendix D)
- Adjustable wrench (Item 114, Appendix D)
- Bench vise (Item 112, Appendix D)
- Machinist's steel rule (Item 74, Appendix D)
- Torque wrench (Item 132, Appendix D)

References:

- TM 5-3895-373-10
- TM 5-3895-373-24P

Equipment Condition:

Center top left access door open per TM 5-3895-373-10.

Materials/Parts:

- Cleaning cloth (Item 6, Appendix B)
- Cleaning solvent (Item 31, Appendix D)
- Culture swabs (Item 33, Appendix B)
- Electrical insulating compound (Item 10, Appendix B)
- Electrical insulating varnish (Item 38, Appendix B)
- Emery cloth (Item 5, Appendix B)
- Hydraulic fitting sealant (Item 26 Appendix B)
- Lint-free cloth (Item 7, Appendix B)
- Machinery wiping towel (Item 37, Appendix B)
- Petrolatum (Item 24, Appendix B)
- Pipe sealant (Item 27, Appendix B)
- Protective caps (Item 3, Appendix B)
- Tags (Item 34, Appendix B)
- Thread locking compound (Item 14, Appendix B)
- Thread locking compound solvent (Item 32, Appendix B)
- High speed shift valve
- Lockwashers
- Seal kit
- Solenoid assembly

GO TO NEXT PAGE

- A. REMOVE.
1. REMOVE ELECTRICAL AND HYDRAULIC CONNECTIONS.
    - a. Disconnect high speed shift valve electrical connector (1) from harness electrical connector (2).

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 30C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

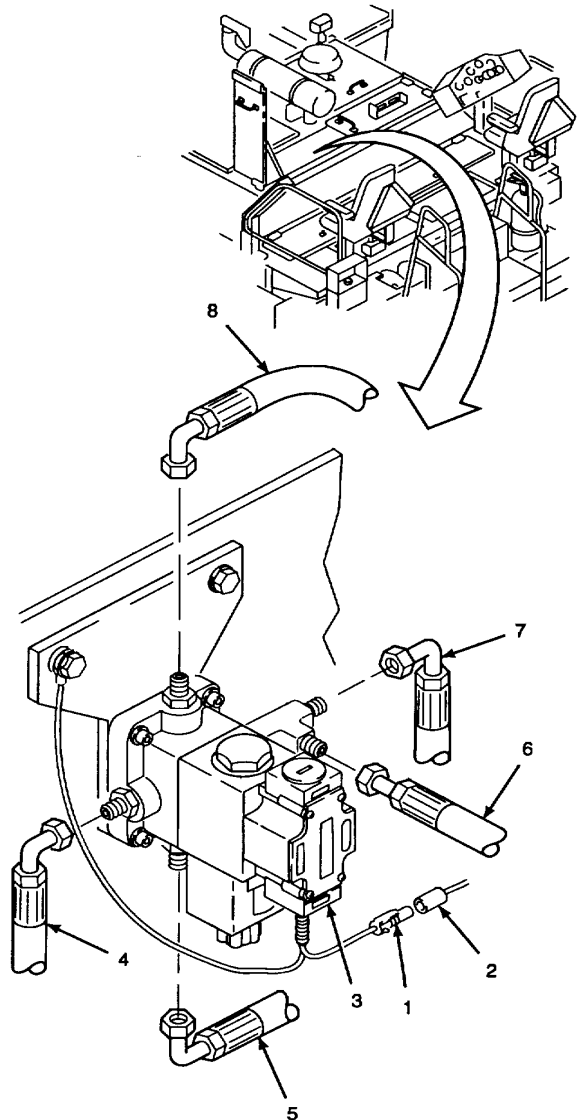
**CAUTION**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- b. Use cleaning solvent and cleaning cloth to clean around high speed shift valve (3) hydraulic hose (4 through 8) fittings.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.



- c. Place a machinery wiping towel below high speed shift valve (3) to absorb hydraulic oil that may leak from hoses when removed.
- d. Tag and disconnect track drive hoses (4 and 5), charge pump hose (6), brake hose (7), and return manifold hose (8). Plug hose ends and cap off valve fittings

**2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE.**

A. REMOVE Continued.

2. REMOVE HIGH SPEED SHIFT VALVE.

- a. Remove bolts (9), sleeve spacers (10), and ground wire (11) from mounting bracket (12).
- b. Remove high speed shift valve (3) and mounting bracket (12) from engine cowling.

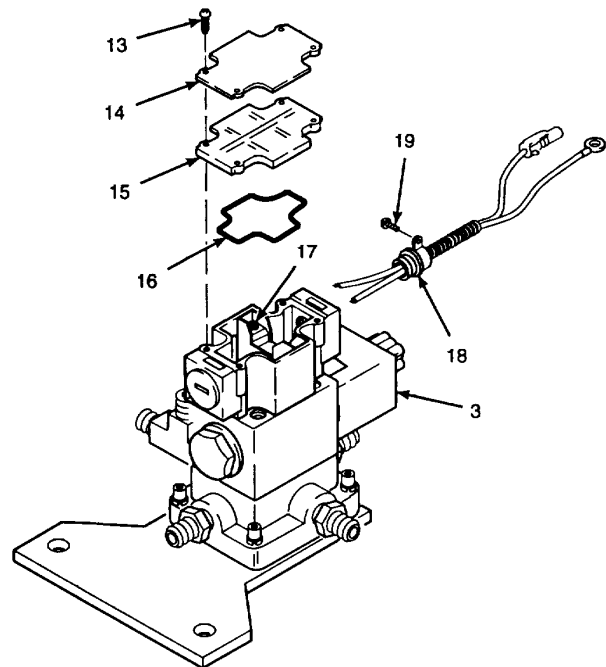
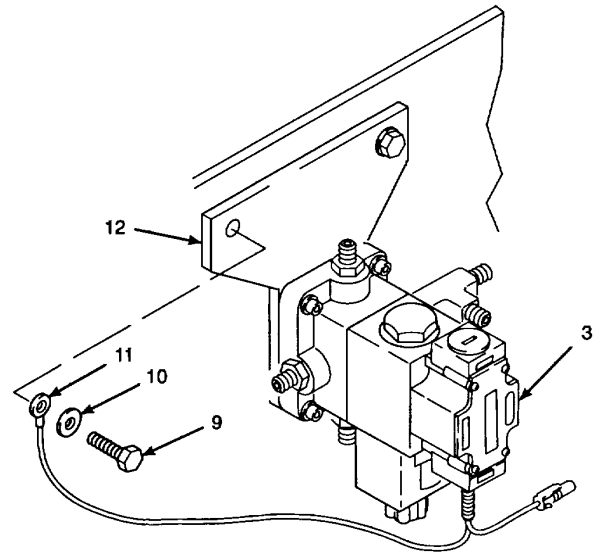
B. DISASSEMBLE.

**NOTE**

If replacing complete high speed shift valve, perform only those disassembly and assembly tasks necessary to remove and install the mounting bracket, hydraulic fittings, and electrical cable onto new valve. The new valve body must be removed from the subplate to install the valve socket head cap screw mounting screws that hold the valve to the mounting bracket.

1. REMOVE ELECTRICAL CABLE.

- a. Remove screws (13), identification plate (14), and plate (15). Gasket (16) should remain in plate.
- b. Loosen terminal screws (17).
- c. Loosen and remove clamp screws (19) from electrical box connector (18).
- d. Unscrew electrical box connector (18) and pull connector harness leads from electrical housing on high speed shift valve (3).



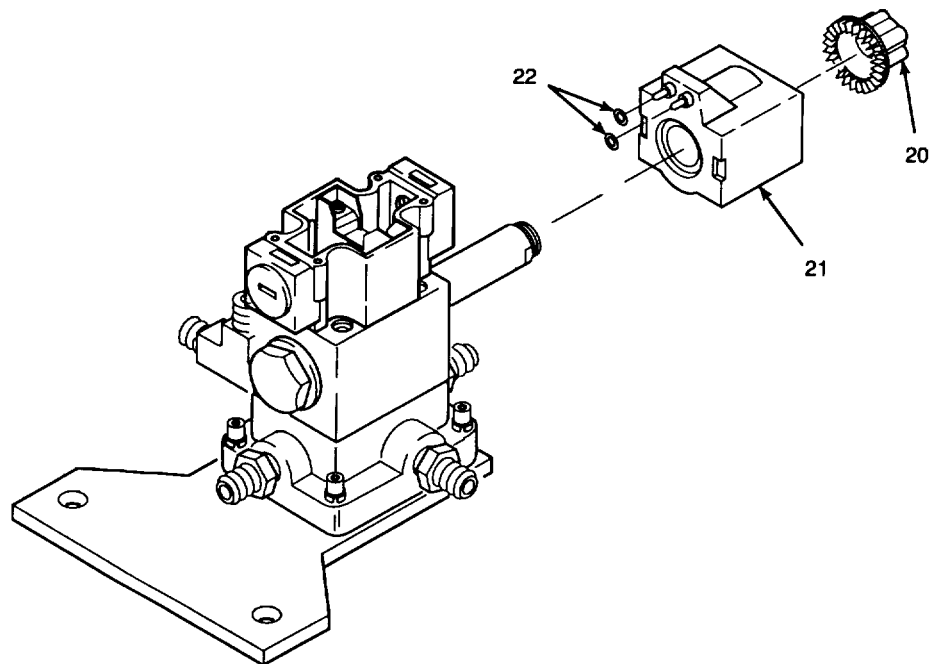
**GO TO NEXT PAGE -**

- B. DISASSEMBLE - Continued.
2. REMOVE SOLENOID ASSEMBLY.

**CAUTION**

Do not damage plastic nut upon removal from solenoid armature. Plastic nut has a serrated bottom surface and may be difficult to remove. If too much force is used during removal, plastic nut may be damaged or deformed.

- a. Remove plastic nut (20). It may be necessary to use a pair of pliers to break the nut loose.
- b. Pull solenoid assembly (21) from high speed shift valve.
- c. Remove preformed packings (22). Discard preformed packings.



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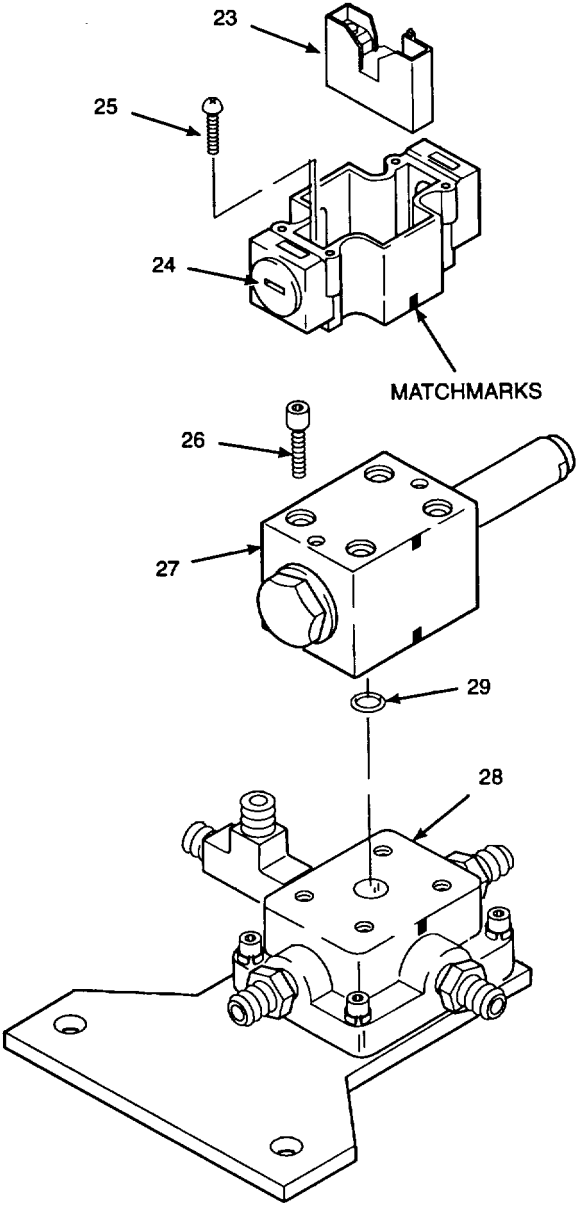
2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE - Continued.

- B. DISASSEMBLE - Continued.
- 3. REMOVE ELECTRICAL HOUSING AND VALVE BODY.

**NOTE**

**Electrical housing, valve body, and subplate should be matchmarked to simplify parts orientation on reassembly.**

- a. Matchmark components before disassembling.
- b. Pull terminal box connector (23) from electrical housing (24).
- c. Remove screws (25) and remove electrical housing (24).
- d. Remove socket head cap screws (26) and separate valve body (27) from subplate (28).
- e. Remove preformed packing (29) from bottom of valve body (27). Discard preformed packing.- ,



GO TO NEXT PAGE

B. DISASSEMBLE - Continued.

**NOTE**

Pipe plugs in bottom of subplate are used to alter valve configuration. Do not remove pipe plugs.

**NOTE**

Use bench vise, as required, to hold subplate and mounting bracket during disassembly.

4. REMOVE AND DISASSEMBLE SUBPLATE.

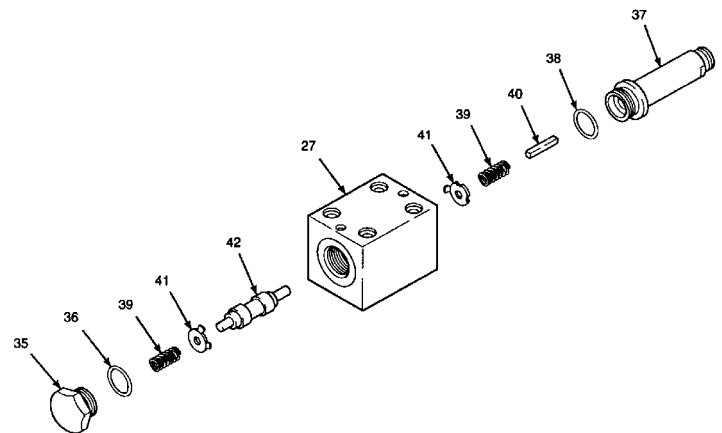
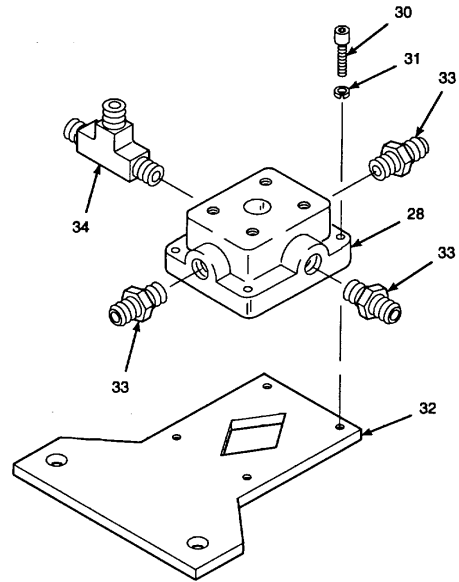
- a. Remove socket head cap screws (30) and lockwashers (31). Discard lockwashers. Separate subplate (28) from mounting bracket (32). Do not remove pipe plugs in bottom of subplate.
- b. Remove straight adapters (33).
- c. Remove tee (34).

5. DISASSEMBLE VALVE BODY.



Internal components are small. Avoid loss of internal components during disassembly.

- a. Remove plug (35) and preformed packing (36). Discard preformed packing.
- b. Remove armature (37) and preformed packing (38). Discard preformed packing.
- c. Remove springs (39) from both sides of valve body. Remove pin (40) from inside of armature (37).
- d. Remove spring followers (41) from both ends of spool (42). Pull spool from valve body (27).



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**2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE - Continued.**

C. CLEAN.

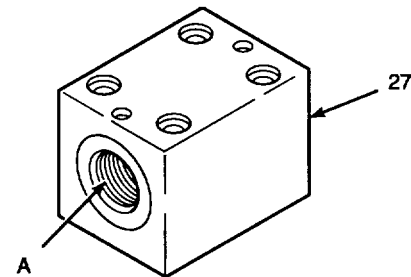
1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

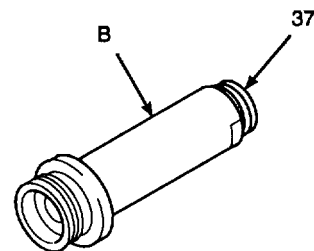
If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent.
- b. Flush valve body (27) with cleaning solvent. Use a culture swab to remove any material from interior of valve passages A.
- c. Wipe exterior shaft B of armature (37). If necessary, polish with emery cloth and wipe clean with cleaning solvent.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield, gloves, etc.). Failure to take proper precautions may result in severe injury or loss of vision.

- d. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from valve body, threaded surfaces, and bores.
- e. Dry parts with a lint-free cloth.

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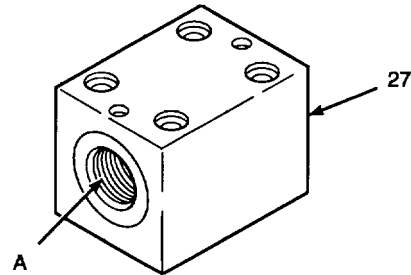
- C. CLEAN - Continued.
2. CLEAN BOLT THREADS AND ADAPTER THREADS.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean threads of bolts used to mount high speed shift valve to engine cowling with thread locking compound solvent.
- b. Wipe dry with a clean lint-free cloth.
- c. Use cleaning cloth to wipe residue from threads of straight adapters and tee.
- D. INSPECT.
1. INSPECT VALVE BODY.

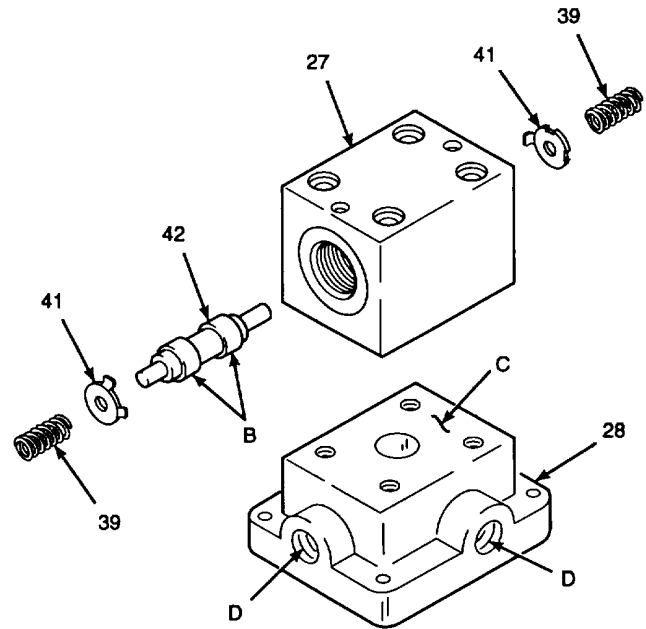
- a. Inspect valve body (27) for stripped threads. Use a strong light and inspect valve passage, area A, for scoring.
- b. Replace high speed shift valve if stripped threads or scoring of valve passage is observed.



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**2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE - Continued.**

- D. INSPECT - Continued.
2. INSPECT SPOOL.
- Inspect spool (42), surface B, visually for scoring. Replace high speed shift valve if scoring is observed.
  - Fit spool (42) into valve body (27). Spool should fit snug and require slight pressure to install into valve body. Remove spool from valve body.
  - Replace high speed shift valve if spool (42) fits loosely into valve body (27).
  - Inspect springs (39) and spring followers (41) for damage and distortion.
  - Replace springs (39) and spring followers (41) if damaged or distorted.
3. INSPECT SUBPLATE AND WIRING FOR DAMAGE.
- Inspect subplate (28) surface C for flatness. Use a machinist's steel rule, placed on its lengthwise edge, to visually check for flatness.
  - Inspect subplate (28) surfaces D, on all sides of subplate, for stripped threads. Use a strong light and inspect interior of subplate for foreign material.
  - Inspect high speed shift valve wiring for damage. Replace if damaged.



**GO TO NEXT PAGE**

- E. ASSEMBLE.
- 1. ASSEMBLE VALVE BODY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves should be worn when working with hydraulic oil.

**CAUTION**

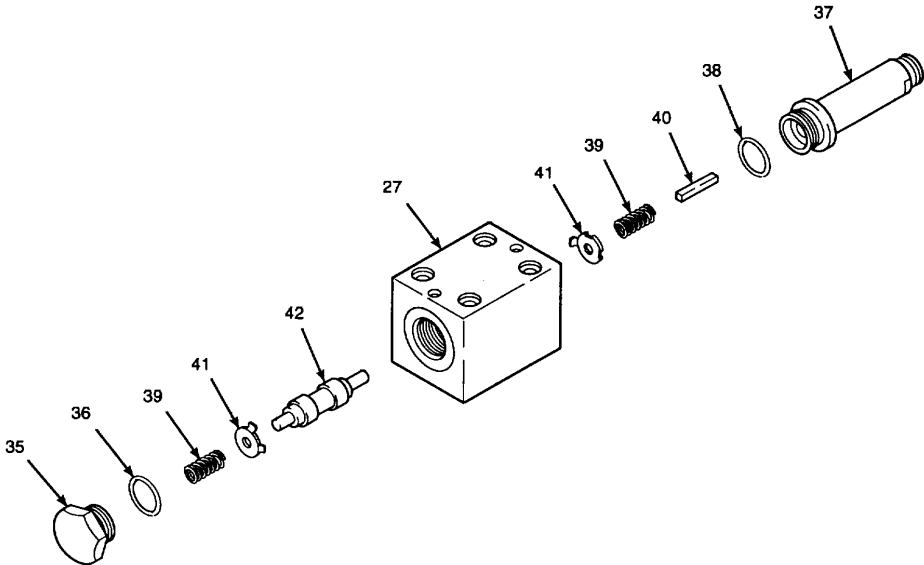
Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

**NOTE**

**Flats on spool (42) face armature (37).**

- a. Lubricate spool (42) with clean hydraulic oil. Insert spool into valve body (27). Flats on spool face armature (37). Install spring followers (41) onto both ends of spool.

- b. Lubricate preformed packing (38) with clean hydraulic oil. Install preformed packing onto armature (37).
- c. Insert one of springs (39) and pin (40) into cavity in armature (37) and install armature into valve body (27). Make sure spring engages pin end of spool (42). Using a wrench, tighten armature onto valve body. Tighten just snug, do not overtighten.
- d. Lubricate preformed packing (36) with clean hydraulic oil. Install preformed packing onto plug (35).
- e. Insert remaining spring (39) into cavity of plug (35) and install plug into valve body. Make sure spring engages pin end of spool (42). Using a wrench, tighten plug onto valve body. Tighten just snug, do not overtighten.



**GO TO NEXT PAGE**

**2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE - Continued.**

- E. ASSEMBLE - Continued.
2. ASSEMBLE SUBPLATE AND INSTALL ONTO MOUNTING BRACKET.

<b>WARNING</b>
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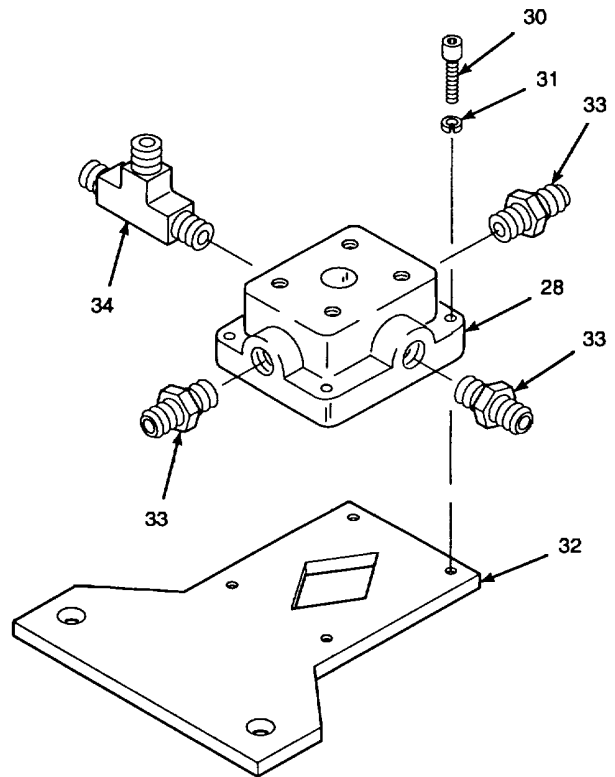
Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply pipe sealant to pipe threads of straight adapters (33) and tee (34).
- b. Install straight adapters (33) onto subplate (28). Tighten straight adapters.

**NOTE**

**Pipe plugs in bottom of subplate (28) are used to alter valve configuration. Do not remove pipe plugs.**

- c. Install tee (34) onto subplate (28). Position tee so that when tightened, tee points in direction as shown in illustration.
- d. Install subplate (28) onto mounting bracket (32). Position subplate so that tee (34) points to the left when installed on the mounting bracket. The mounting bracket should be placed on a flat work surface with the large mounting holes toward you. Refer to illustration.
- e. Install lockwashers (31) and socket head cap screws (30). Tighten cap screws.



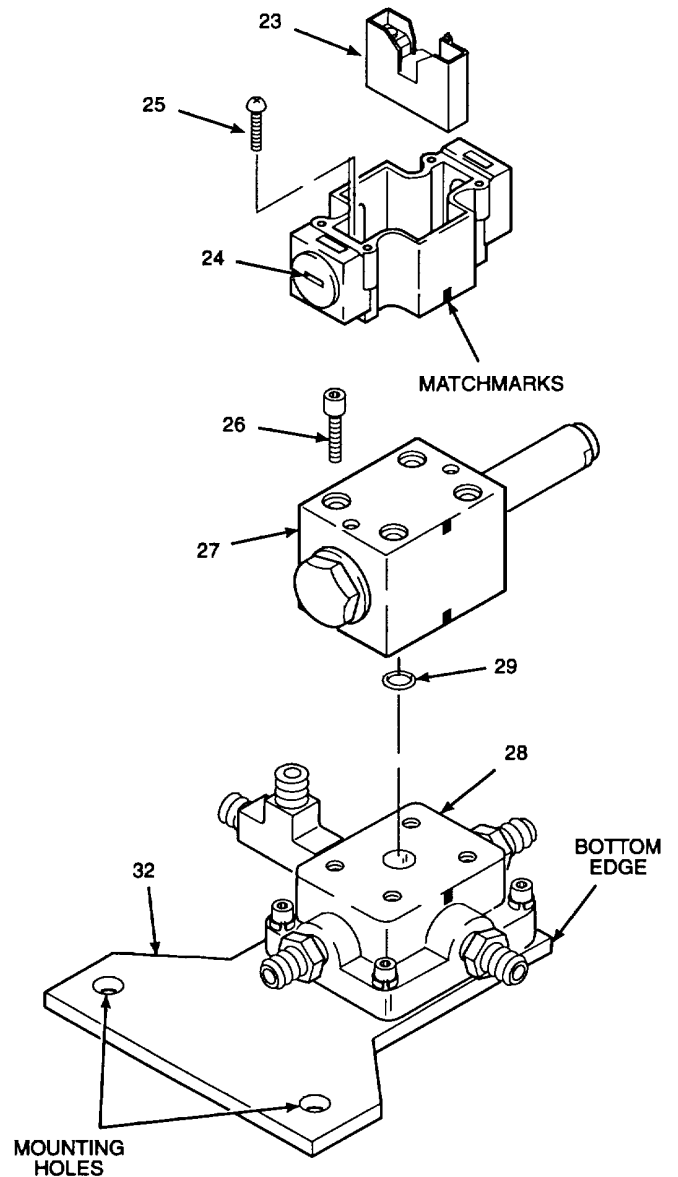
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- E. ASSEMBLE - Continued.
3. INSTALL VALVE BODY AND ELECTRICAL HOUSING ONTO SUBPLATE.

**NOTE**

**When installing same parts as removed during disassembly, align matchmarks.**

- a. Lubricate preformed packing (29) with petrolatum and install preformed packing into bottom of valve body (27).
- b. Position valve body (27) onto subplate (28). Armature end of assembled valve body will point to the bottom edge of mounting bracket (32) away from the mounting holes.
- c. Install and tighten socket head cap screws (26).
- d. Position electrical housing (24) onto valve body (27). Open end of housing will align with the armature.
- e. Install and tighten screws (25).
- f. Install terminal box connector (23) into electrical housing (24). Terminal box connector should be installed on the open threaded end of the electrical housing. Refer to illustration.

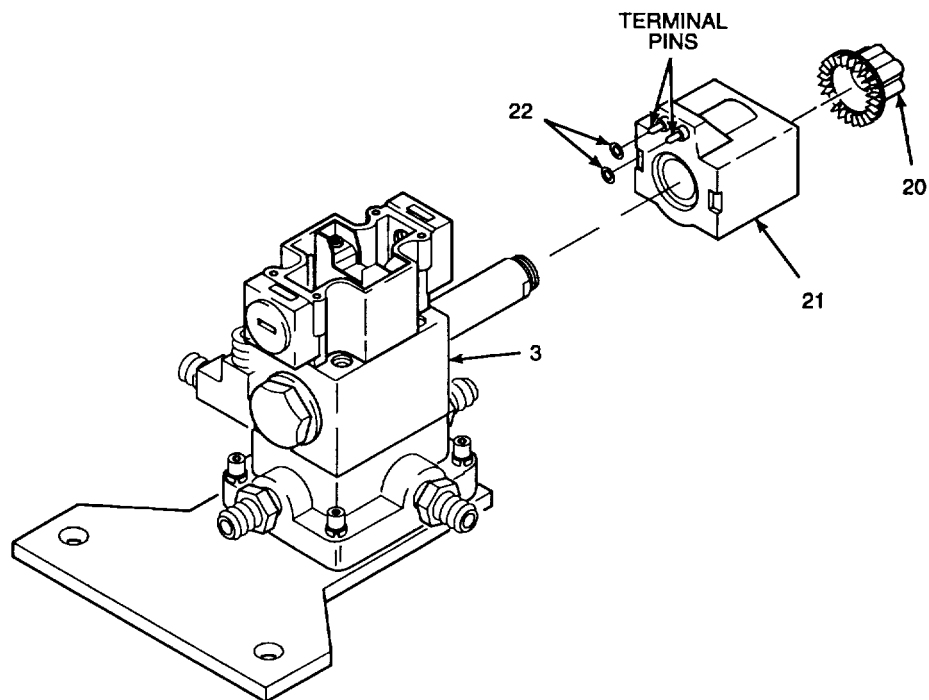


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**2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE- Continued.**

- E. ASSEMBLE - Continued.
4. INSTALL SOLENOID ASSEMBLY.
- Lubricate preformed packings (22) with petrolatum.
  - Install preformed packings (22) onto contact pins of solenoid assembly (21).
  - Apply electrical insulating compound to terminal pins of solenoid assembly (21).
  - Plug solenoid assembly (21) into high speed shift valve (3).
  - Install plastic nut (20) onto threaded end of armature. Tighten plastic nut by hand until snug, then tighten an additional 1/4 to 1/2 turn with an adjustable wrench.

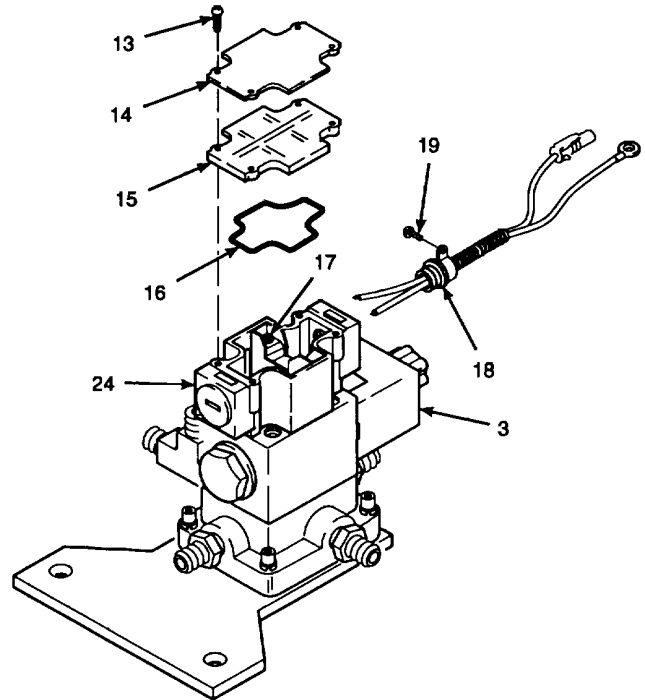


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E. ASSEMBLE - Continued.

5. INSTALL ELECTRICAL CABLE.

- a. Insert wire ends of electrical cable into electrical housing (24). Thread electrical box connector (18) into electrical housing.
- b. Install and tighten clamp screws (19) in electrical box connector (18).
- c. Install stripped ends of harness lead wires in terminal box terminals. Tighten terminal screws (17).
- d. Make sure gasket (16) is positioned in plate (15). Install plate and identification plate (14). Install and tighten screws (13).



F. INSTALL.

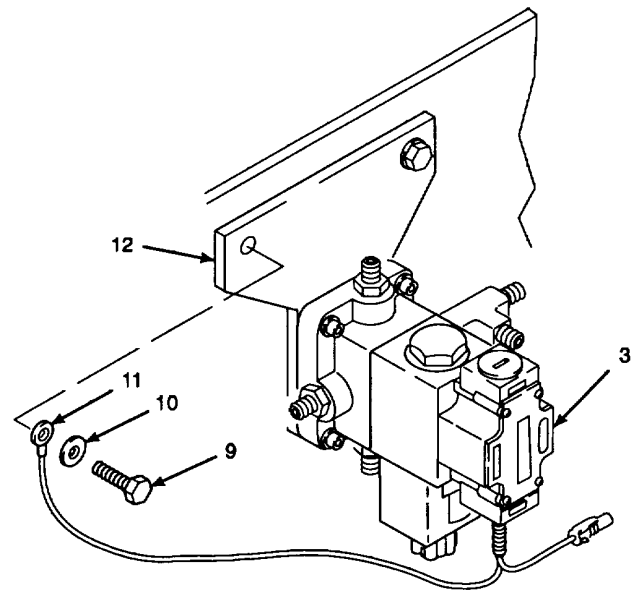
1. INSTALL HIGH SPEED SHIFT VALVE ONTO PAVING MACHINE.

- a. Install sleeve spacers (10) on bolts (9). Install ground wire (11) on one of the two bolts.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of bolts (9).
- c. Install high speed shift valve (3) and secure with bolts (9). Install bolt with ground wire (11) in left hand mounting hole of mounting bracket (12).
- d. Tighten bolts (9) to 19 lb-ft (26 N•m).



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**2.27 REPLACE/REPAIR HIGH SPEED SHIFT VALVE - Continued.****F. INSTALL - Continued.****WARNING**

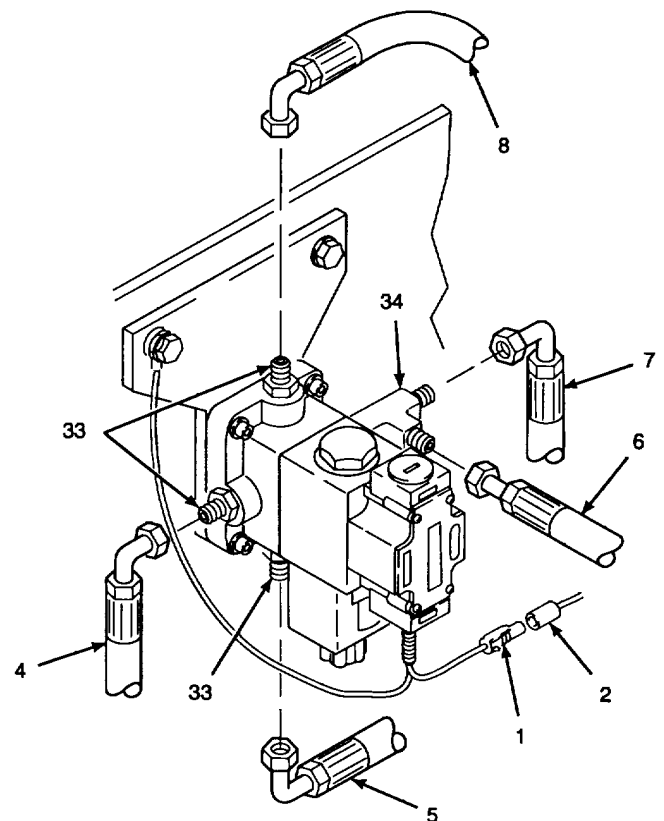
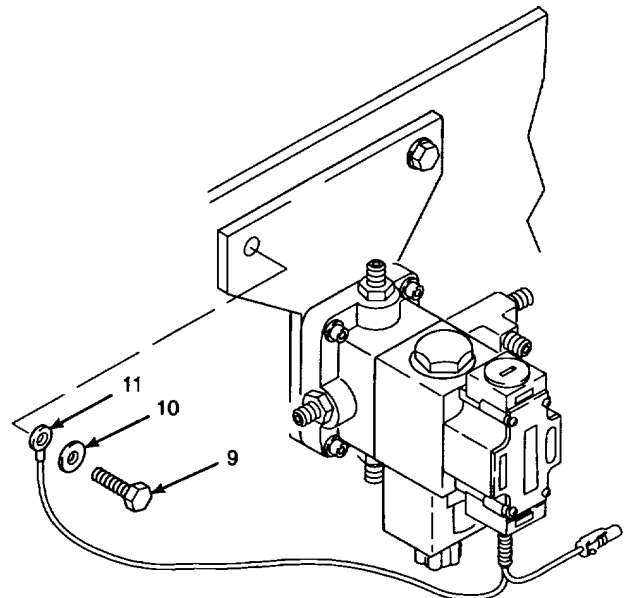
Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- e. Apply electrical insulating varnish to exposed surfaces of bolt (9), sleeve spacer (10), and ground wire (11).

**2. INSTALL ELECTRICAL AND HYDRAULIC CONNECTIONS.****WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to threads of straight adapters (33) and tee (34).
- b. Connect return manifold hose (8), brake hose (7), charge pump hose (6), and track drive hoses (5 and 4). Tighten hose.
- c. Apply electrical insulating compound to male end of high speed shift valve electrical connector (1).
- d. Connect high speed shift valve electrical connector (1) to harness electrical connector (2).

**NOTE**

**FOLLOW-ON-TASK:** Close center top left access door per TM 5-3895-373-10.

**END OF TASK**

**2.28 REPLACE/REPAIR BRAKE VALVE.**

This task covers:            a. Remove            b. Repair            c. Install

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Torque wrench (Item 129, Appendix D)

References:

TM 5-3895-373-24P

Equipment Condition:

Return manifold removed per paragraph 2.55.

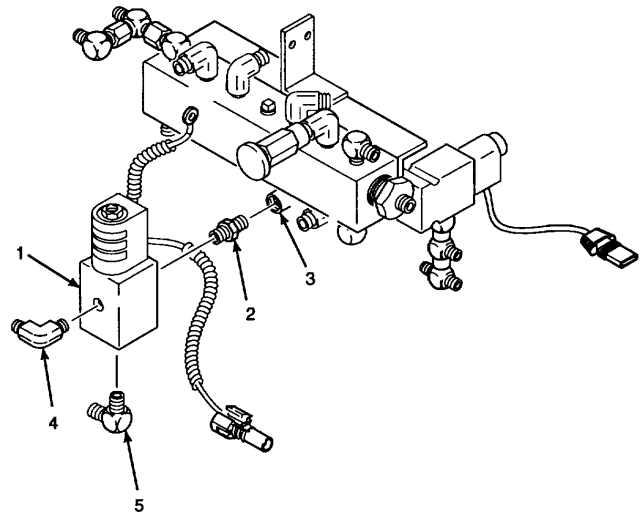
Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Direct rotary valve  
Seal kit

**A. REMOVE.****NOTE**

**Secure return manifold and brake valve, as required, in a bench vise to assist in removing brake valve and adapters.**

1. REMOVE BRAKE VALVE (1) BY UNTHREADING STRAIGHT ADAPTER (2) FROM RETURN MANIFOLD ELBOW (3).
2. REMOVE ELBOW (4), STRAIGHT ADAPTER (2), AND ELBOW (5) FROM BRAKE VALVE (1).



**GO TO NEXT PAGE**

2.28 REPLACE/REPAIR BRAKE VALVE - Continued.

B. REPAIR.

1. DISASSEMBLE BRAKE VALVE.

**NOTE**

Use bench vise, as required, to support valve during disassembly.

- a. Remove hex nut (6) and linear valve (7).
- b. Remove rotary valve (8) from valve body (9).

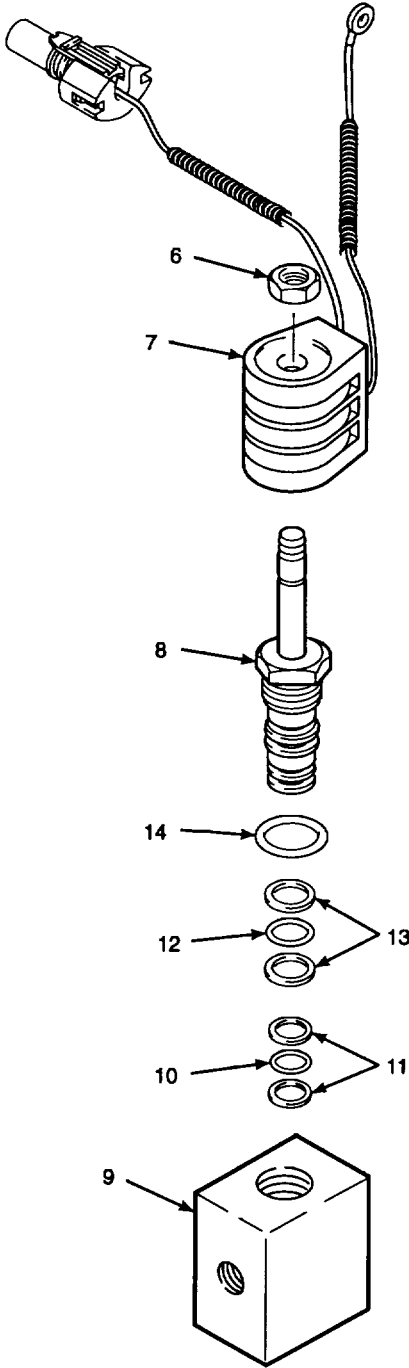
**NOTE**

If replacing complete rotary valve, it is not necessary to remove preformed packings and packing retainers. Discard complete direct rotary valve. If installing only a seal kit, remove preformed packings and packing retainers.

**CAUTION**

Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.

- c. Using an o-ring tool, remove preformed packing (10), packing retainers (11), preformed packing (12), packing retainers (13), and preformed packing (14). Discard preformed packings and packing retainers.



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- B. REPAIR - Continued.
- 2. CLEAN VALVE BODY AND ROTARY VALVE.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type II cleaning solvent is 200°F (93,3DC). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse rotary valve with cleaning solvent. Flush valve body with cleaning solvent.
- b. Use a culture swab to clean valve body interior and rotary valve seal grooves.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- c. Use 30 psi (207 kPa) maximum compressed air to remove any remaining foreign matter from valve body interior. Dry components with a lint-free cloth.

**GO TO NEXT PAGE**

2.28 REPLACE/REPAIR BRAKE VALVE - Continued.

- B. REPAIR - Continued.
- 3. CLEAN THREADED COMPONENTS.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean threads of rotary valve stem with thread locking compound solvent.
- b. Remove pipe sealant and hydraulic fitting sealant from elbow and adapters with cleaning cloth.

- 4. ASSEMBLE BRAKE VALVE.

**WARNING**

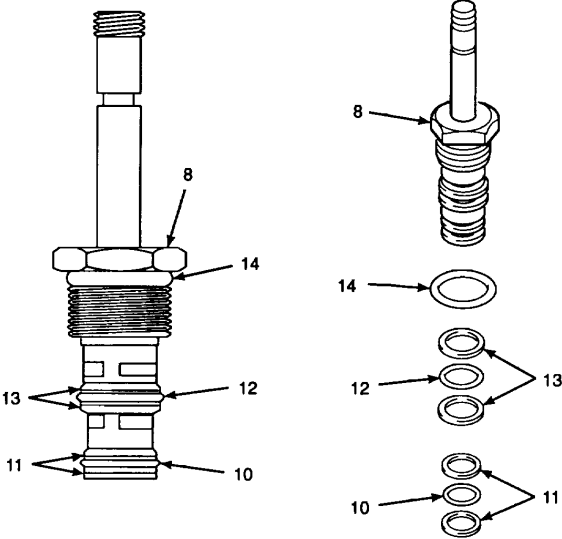
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate rotary valve (8) with clean hydraulic oil.

**CAUTION**

Use caution when installing preformed packings over threads. Threads can cut and damage preformed packings. Ensure threads do not damage preformed packings during installation.

- b. Lubricate preformed packings (10, 12, and 14) and packing retainers (11 and 13) with petrolatum. Install preformed packings and packing retainers.



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B. REPAIR - Continued.

**NOTE**

Use bench vise, as required, to support valve during assembly of rotary valve and linear valve.

**WARNING**

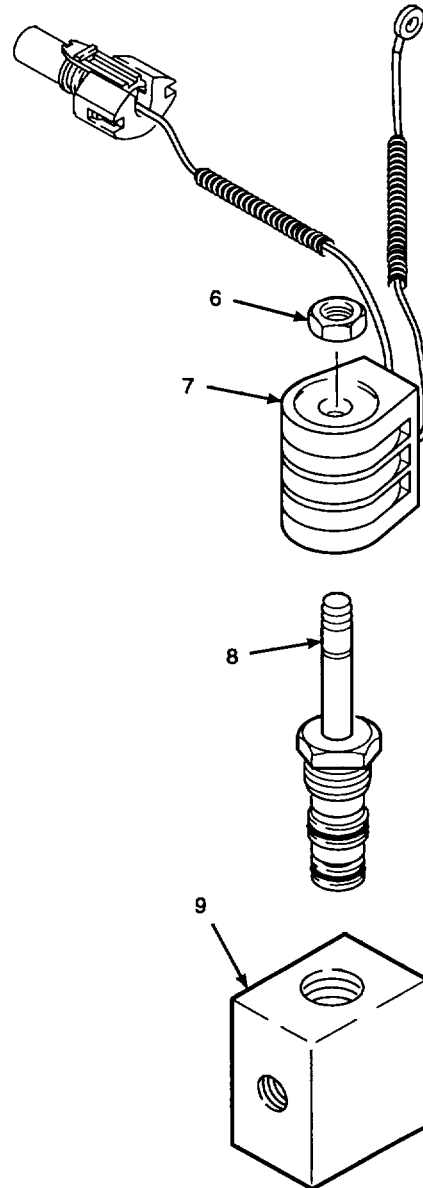
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- c. Lubricate interior of valve body (9) with clean hydraulic oil. Thread rotary valve (8) into valve body and tighten until snug. Do not over tighten.
- d. Install linear valve (7).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply thread locking compound to threads on rotary valve (8) stem.
- f. Install hex nut (6). Tighten hex nut to 14 lb-in (1,6 N•m).



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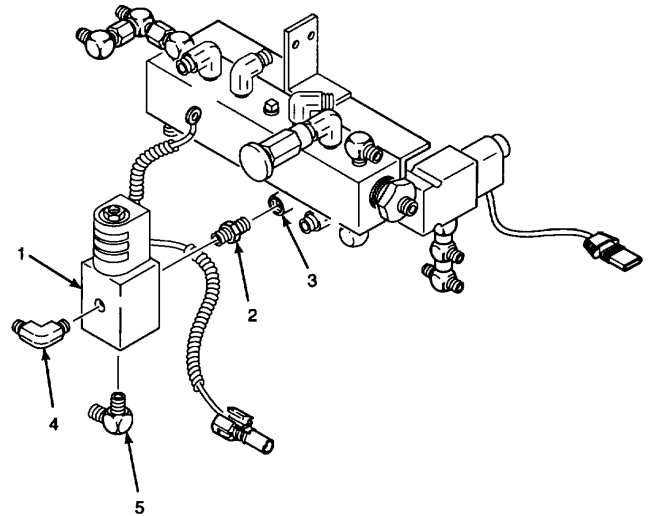


**2.28 REPLACE/REPAIR BRAKE VALVE - Continued.****C. INSTALL.****NOTE**

Secure brake valve and return manifold, as required, in a bench vise to assist in installing adapters and brake valve.

**1. INSTALL ELBOW AND STRAIGHT ADAPTERS.****WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- a. Apply pipe sealant to pipe fitting threads of elbows (4 and 5).
- b. Install elbows (4 and 5) onto brake valve (1). Mount elbows so that when tightened, they will face to your left when looking at the fitting. Refer to illustration.
- c. Apply pipe sealant to smaller pipe fitting threads of straight adapter (2).
- d. Install and tighten straight adapter (2) into brake valve (1).

**2. INSTALL BRAKE VALVE.**

- a. Apply pipe sealant to exposed pipe fitting threads of straight adapter (2).
- b. Install brake valve (1) by threading straight adapter (2) into return manifold elbow (3). Mount brake valve so that when tightened, linear valve will be on top. Refer to illustration.

**NOTE**

**FOLLOW-ON-TASK:** Install return manifold per paragraph 2.55.

**END OF TASK**

**2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX.**

This task covers:	a. Remove	b. Disassemble	c. Clean
	d. Inspect	e. Repair	f. Assemble
	g. Install		

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit (Item 106, Appendix D)  
 Chain assembly (Item 29, Appendix D)  
 Cleaning brush (Item 12, Appendix D)  
 Hex head screw cap, 2 ea (Item 76, Appendix D)  
 Hydraulic press frame (Item 41, Appendix D)  
 Plastic hammer (Item 50, Appendix D)  
 Socket wrench adapter (Item 6, Appendix D)  
 Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
 Torque wrench, 100 to 500 lb-ft (Item 133, Appendix D)  
 Universal puller kit (Item 69, Appendix D)  
 Utility pail (Item 62, Appendix D)

Materials/Parts:

Anti-seize compound (Item 8, Appendix B)  
 Cleaning cloth (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Gasket sealing compound (Item 11, Appendix B)  
 Gear oil (Item 20, Appendix B)  
 Hydraulic fitting sealant (Item 26, Appendix B)  
 Lint-free cloth (Item 7, Appendix B)  
 Pipe sealant (Item 27, Appendix B)  
 Protective Caps (Item 3, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Annular ball bearings  
 Gears  
 Hex head cap screws  
 Lockwashers  
 Plain encased seal  
 Self-locking hex nuts

Personnel Required:

Two 62B construction equipment repairers. Extra person to assist with removal, disassembly, assembly, and installation of pump drive gearbox.

References:

LO 5-3895-373-12  
 TM 5-3895-373-10  
 TM 5-3895-373-20  
 TM 5-3895-373-24P

Equipment Condition:

Open right access door per TM 5-3895-373-10.  
 Remove right access cover per TM 5-3895-373-10.  
 Open front top right access door per TM 5-3895-373-10.  
 Open front top left access door per TM 5-3895-373-10.  
 Remove engine access cover per TM 5-3895-373-10.  
 Remove auxiliary pump per paragraph 2.42.  
 Remove auxiliary vibration pump per paragraph 2.43.  
 Remove propulsion pump per paragraph 2.30.

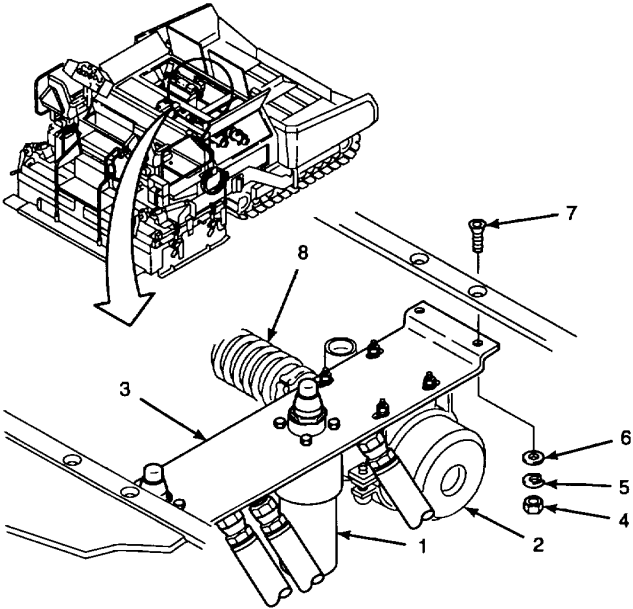
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**2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX - Continued.**

**A. REMOVE.**

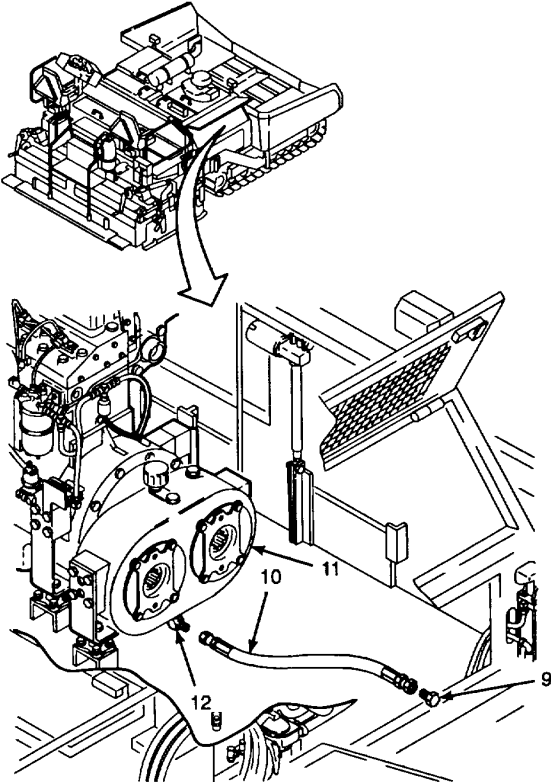
**1. REMOVE HYDRAULIC CHARGE FILTERS, AIR CLEANERS AND CHARGE FILTER MOUNTING BRACKET.**

- a. Using a second person to support hydraulic charge filters (1), air cleaner (2), and charge filter mounting bracket (3), remove hex nuts (4), lockwashers (5), flat washers (6), and socket head cap screws (7). Discard lockwashers.
- b. Remove charge filter mounting bracket (3), hydraulic charge filters (1), air cleaner (2), and air hose (8) from the paving machine.



**2. DRAIN PUMP DRIVE GEARBOX OIL AND REMOVE DRAIN LINE.**

- a. Remove drain plug (9) from drain hose (10) and drain gear oil from pump drive gearbox (11) into a utility pail.
- b. Reinstall drain plug (9) into drain hose (10).
- c. Dispose of waste gear oil in accordance with local procedures.
- d. Remove drain hose (10) from pump drive gearbox (11).
- e. Plug drain hose (10) and cap pump drive gearbox elbow (12).



**GO TO NEXT PAGE**

- A. REMOVE - Continued.
- 3. REMOVE PUMP DRIVE GEARBOX FROM ENGINE.

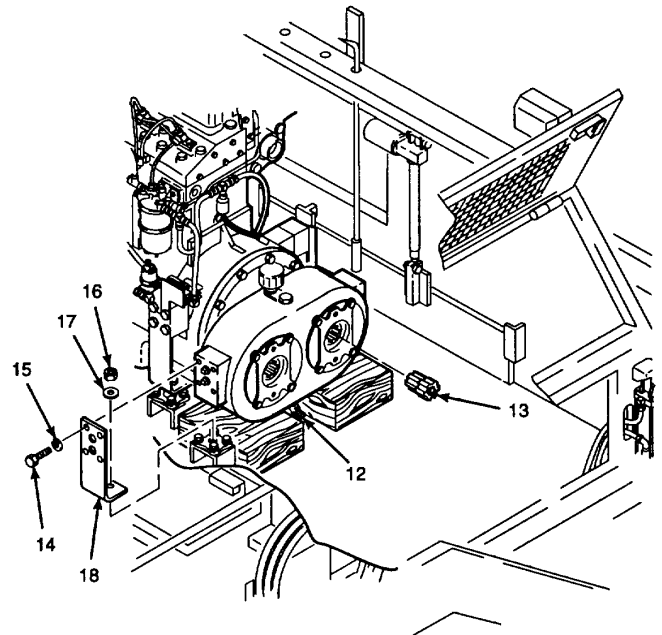
**NOTE**

**Adapter gear sleeves (13) may stay attached to propulsion pump during propulsion pump removal.**

- a. Remove adapter gear sleeves (13).

**WARNING**

**Pump drive gearbox weighs approximately 150 lbs (68 kg). Ensure cribbing is beneath pump drive gearbox prior to removal. Equipment damage and personnel injury could result from dropping the pump drive gearbox when removing from engine.**



- b. Remove hex head cap screws (14) and lockwashers (15). Discard lockwashers.
- c. Remove self-locking hex nuts (16), flat washers (17), and pump drive gearbox support brackets (18). Discard self-locking hex nuts.
- d. Place two pieces of cribbing beneath pump drive gearbox, on either side of elbow (12).

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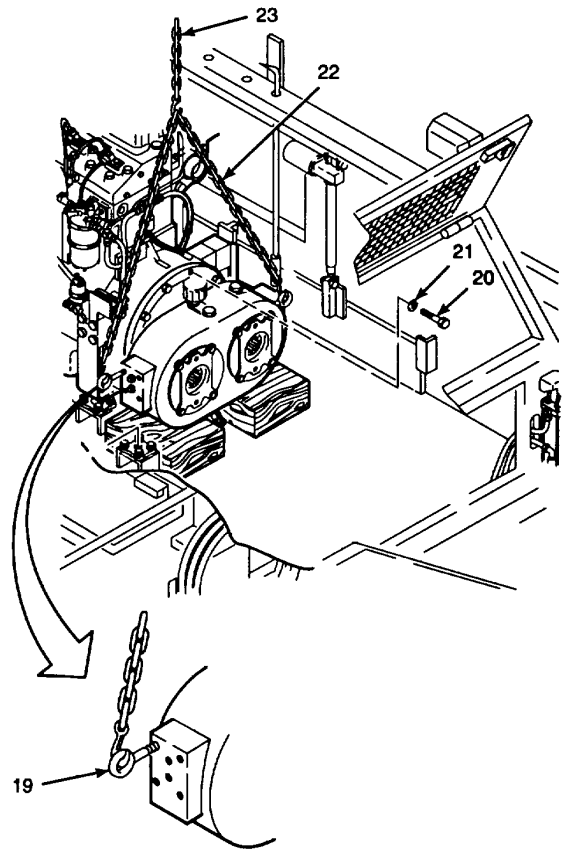
**2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX - Continued.**

A. REMOVE - Continued.

**WARNING**

Pump drive gearbox weighs approximately 150 lbs (68 kg). To avoid personnel injury, ensure all chains and hooks are in good condition and are of correct capacity. Ensure overhead hoist is in good working condition and hooks are positioned correctly. Lifting hooks must not be side loaded. Damage to equipment and personnel injury can result from unexpected movement of pump drive gearbox.

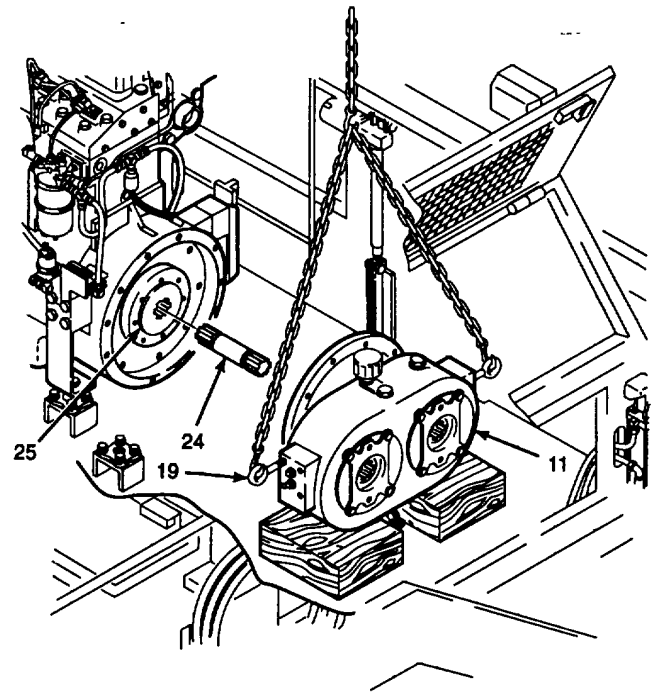
- e. Install hex head screw caps (19) into the front top hole on the left side of the pump drive gearbox, and the rear top hole on the right side of the pump drive gearbox.
- f. Remove hex head cap screws (20) and lockwashers (21). Discard lockwashers.
- g. Attach chain assembly (22) to hex head screw caps (19).
- h. Attach chain hoist (23) hook to chain assembly. Take up slack in hoist.

**GO TO NEXT PAGE**

## A. REMOVE - Continued.

**WARNING**

All personnel must stand clear during lifting operation. Do not allow pump drive gearbox to swing while hanging from overhead hoist. A swinging or shifting load may cause injury or death to personnel.



- i. With the help of another person, pull pump drive gearbox away from engine and onto cribbing.
- j. Remove drive shaft (24) from drive plate (25) or pump drive gearbox (11).

## 4. REMOVE PUMP DRIVE GEARBOX FROM ENGINE COMPARTMENT.

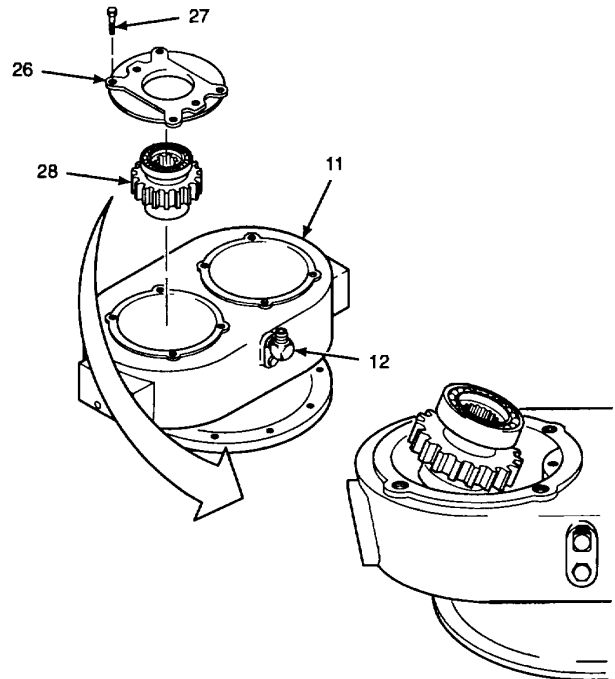
- a. Lift pump drive gearbox (11) slowly from cribbing and out of engine compartment through front top right access door.
- b. Set pump drive gearbox (11) down on clean work surface with hydraulic pump openings facing up.
- c. Remove hex head screw caps (19) from pump drive gearbox (11).

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**2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX - Continued.**

**B. DISASSEMBLE.**

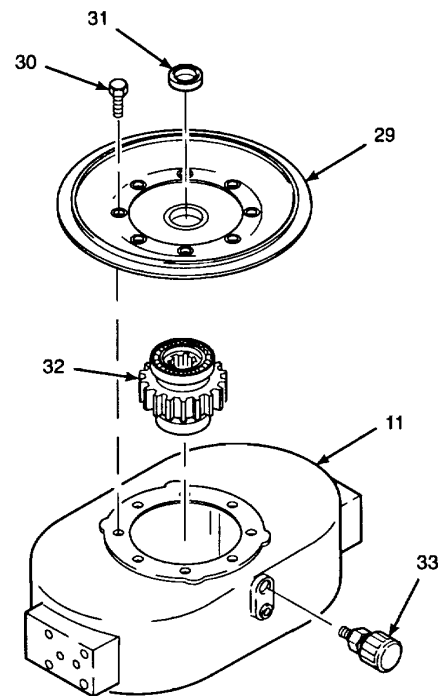
1. MATCHMARK COVER PLATES (26) AND PUMP DRIVE GEARBOX (11) FOR ASSEMBLY.
2. REMOVE HEX HEAD CAP SCREWS (27) AND COVER PLATES (26). DISCARD HEX HEAD CAP SCREWS.
3. LIFT GEARS (28) FROM PUMP DRIVE GEARBOX BY TIPPING GEARS SLIGHTLY TO CLEAR GEAR BEARING POCKETS.
4. REMOVE ELBOW (12) FROM THE BOTTOM OF PUMP DRIVE GEARBOX (11).
5. WITH THE HELP OF ANOTHER PERSON, TURN PUMP DRIVE GEARBOX (11) OVER WITH ENGINE CONNECTION SIDE FACE UP.
6. MATCH MARK CONNECTOR COVER PLATE (29) AND PUMP DRIVE GEARBOX (11) FOR REASSEMBLY.
7. REMOVE HEX HEAD CAP SCREWS (30) AND CONNECTOR COVER PLATE (29). A PLASTIC HAMMER MIGHT BE REQUIRED TO BREAK THE SEAL BETWEEN THE CONNECTOR COVER PLATE AND PUMP DRIVE GEARBOX (11). DISCARD HEX HEAD CAP SCREWS.



**CAUTION**

Use caution when removing seal from connector cover plate. Scratched or dented seal grooves may cause oil leakage and equipment damage. Do not scratch or dent seal groove in connector cover plate.

8. REMOVE SEAL (30) BY DRIVING SEAL OUT TOWARD ENGINE SIDE OF CONNECTOR COVER PLATE (29) WITH A FLAT BLADE SCREWDRIVER. DISCARD PLAIN ENCASED SEAL.
9. LIFT GEAR (32) FROM PUMP DRIVE GEARBOX (11).
10. REMOVE BREATHER (33).



**GO TO NEXT PAGE**

- C. CLEAN.
1. CLEAN ALL METAL PARTS WITH CLEANING SOLVENT.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent. Use a cleaning brush to remove any hard deposits. Dispose of waste cleaning solvent in accordance with local procedures.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to remove any foreign material from housing, gears, breather, adapter gear sleeves, and drive shaft.
- c. Wipe all parts dry with a cleaning cloth.

**GO TO NEXT PAGE**



**2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX - Continued.**

## C. CLEAN - Continued.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

2. CLEAN FASTENERS, PARTS, AND THREADED HOLES TREATED WITH THREAD LOCKING COMPOUND WITH THREAD LOCKING COMPOUND SOLVENT.

- a. Clean all hex head cap screws with thread locking compound solvent.
- b. Dry fasteners and holes with a clean, lint-free cloth.

## D. INSPECT.

## 1. INSPECT BALL BEARINGS.

- a. Turn ball bearings by hand.
- b. If ball bearings turn rough or do not spin freely, remove and replace ball bearings. Refer to repair step E for ball bearing removal.

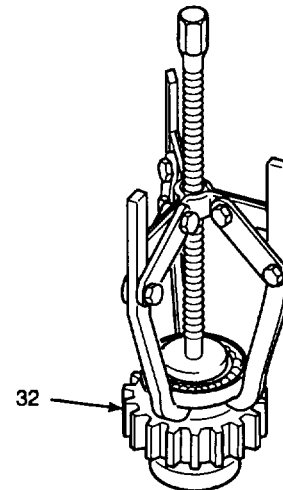
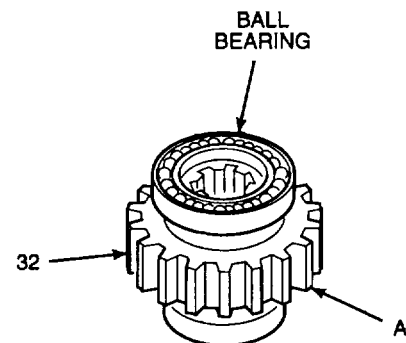
## 2. INSPECT GEAR TEETH.

- a. Inspect gear (32) teeth surface A for pointed or damaged teeth.
- b. Replace gears if pointed or damaged teeth are found.

## E. REPAIR.

1. USE A BEARING PULLER FROM UNIVERSAL PULLER KIT TO REMOVE BALL BEARINGS FROM GEARS. DISCARD ANNULAR BALL BEARINGS.

2. USE HYDRAULIC PRESS FRAME AND UNIVERSAL PULLER KIT TO PRESS NEW BALL BEARINGS ON GEAR.



**GO TO NEXT PAGE**

F. ASSEMBLE.

1. INSTALL BREATHER, GEARS, CONNECTOR COVER PLATE, COVER PLATES, AND DRAIN HOSE ELBOW.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply pipe sealant to threads of breather (33). Install breather.
- b. Install gear (32).

**NOTE**

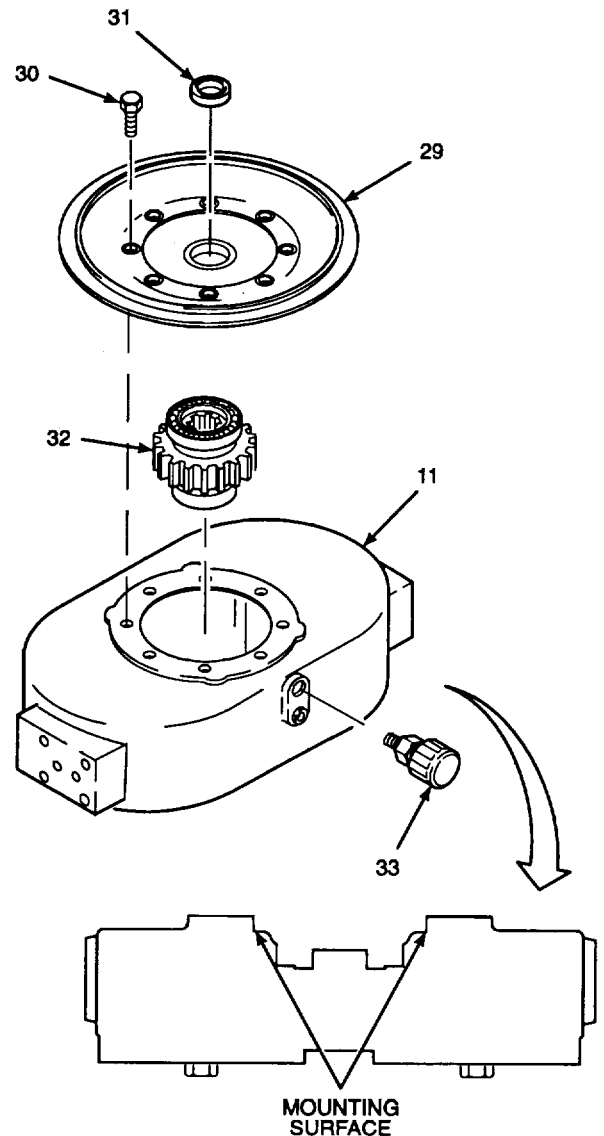
Rubber lip of seal must point toward inside of pump drive gearbox.

- c. Install seal (31) by pressing hand tight into connector cover plate (29). Press from the engine side of connector cover plate, with rubber lip pointing toward inside of pump drive gearbox. Press seal until flush with engine side of connector cover plate. Tap lightly with a plastic hammer if necessary.

**WARNING**

Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

- d. Apply a coating of gasket sealing compound to connector cover plate mounting surface of pump drive gearbox.
- e. Aligning match marks, install connector cover plate (29) onto pump drive gearbox (11) and align hex head cap screw holes.



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- f. Coat threads of hex head cap screws (30) with thread locking compound.
- g. Install hex head cap screws (30) using socket wrench adapter. Tighten to 85 lb-ft (115 N•m).
- h. With the help of another person, turn pump drive gearbox over with engine connection side face down.

**GO TO NEXT PAGE**

**2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX - Continued.****F. ASSEMBLE - Continued.**

- i. Install gears (28) into pump drive gearbox (11).

**WARNING**

Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

- j. Apply a coating of gasket sealing compound to cover plate mounting surface of pump drive gearbox.
- k. Align matchmarks and install cover plates (26) onto pump drive gearbox (11).

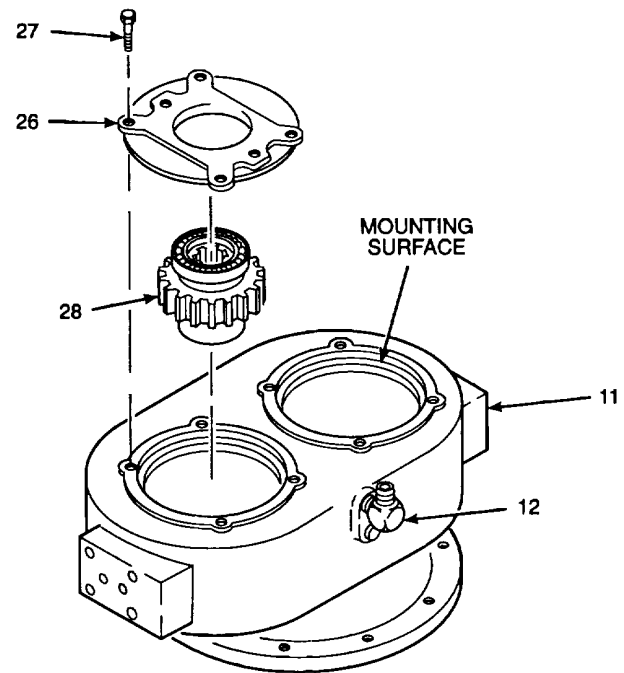
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- l. Coat threads of hex head cap screws (27) with thread locking compound.
- m. Install hex head cap screws (27) using socket wrench adapter. Tighten to 85 lb-ft (115 N•m).

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- n. Apply pipe sealant to pipe thread end of elbow (12) that will be installed into pump drive gearbox (11). Install elbow into pump drive gearbox. Orient to direction shown. Refer to illustration.

G. INSTALL.

1. INSTALL PUMP DRIVE GEARBOX INTO ENGINE COMPARTMENT.

- a. Install hex head screw caps (19) into the front top hole on the left side of the pump drive gearbox (11) and the rear top hole on the right side of the pump drive gearbox.

**WARNING**

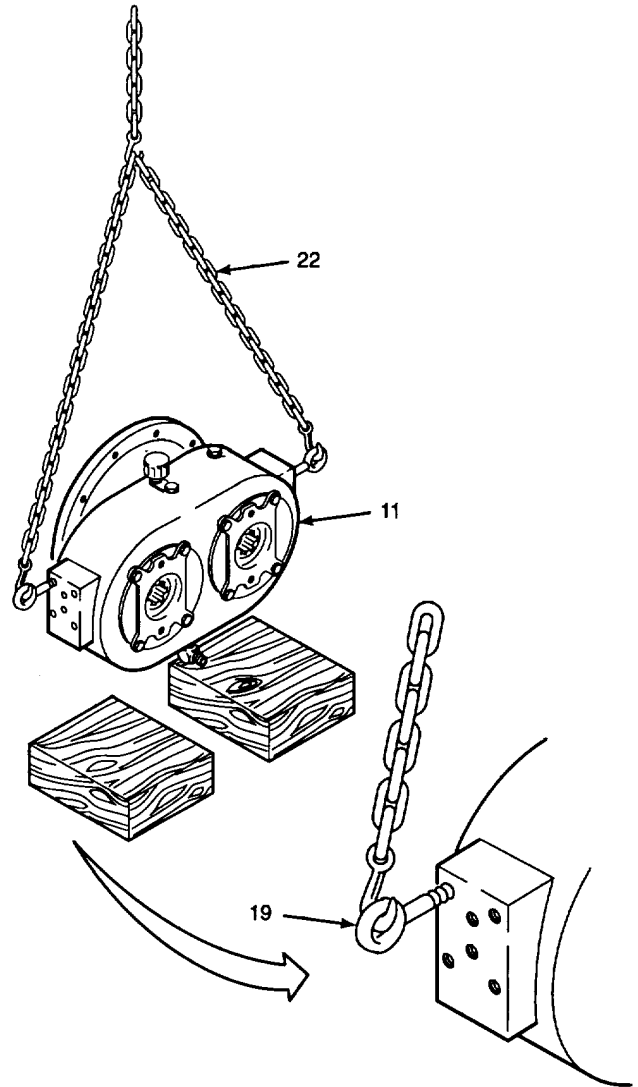
Pump drive gearbox weighs approximately 150 lbs (68 kg). To avoid personnel injury, ensure all chains and hooks are in good condition and are of correct capacity. Ensure overhead hoist is in good working condition and hooks are positioned correctly. Lifting hooks must not be side loaded. Damage to equipment and personnel injury can result from unexpected movement of pump drive gearbox.

- b. Attach chain assembly (22) hooks to hex head screw caps (19).

**WARNING**

All personnel must stand clear during lifting operation. Do not allow pump drive gearbox to swing while hanging from overhead hoist. A swinging or shifting load may cause injury or death to personnel.

- c. Lift pump drive gearbox (11) slowly from work area and into engine compartment through front top right access door.
- d. Set pump drive gearbox down on cribbing.



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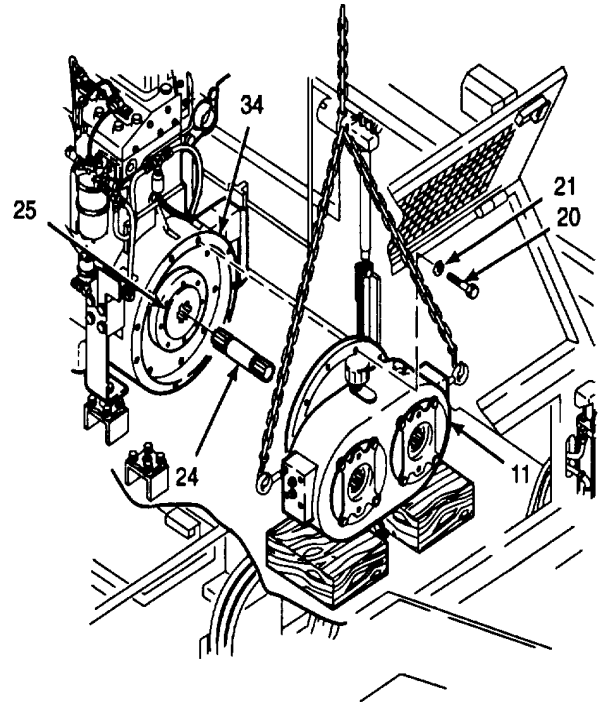
**2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX - Continued.**

- G. INSTALL - Continued.
2. INSTALL PUMP DRIVE GEARBOX ONTO ENGINE.

<b>WARNING</b>
----------------

**Anti-seize compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Coat gear teeth of drive shaft (24) with anti-seize compound.
- b. Install drive shaft (24) into pump drive gearbox (11).
- c. Using chain hoist, position pump drive gearbox (11) so drive shaft (24) aligns with drive plate (25).
- d. Insert drive shaft (24) into drive plate (25) while pushing pump drive gearbox (11) toward engine. A slight rotation of drive shaft may be required to align splines.
- e. Install lockwashers (21) onto hex head cap screws (20).



**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- f. Apply thread locking compound to threads of hex head cap screws (20).
- g. Align pump drive gearbox mounting holes with flywheel housing (34) and install hex head cap screws (20). Tighten to 37 lb-ft (50 N•m).

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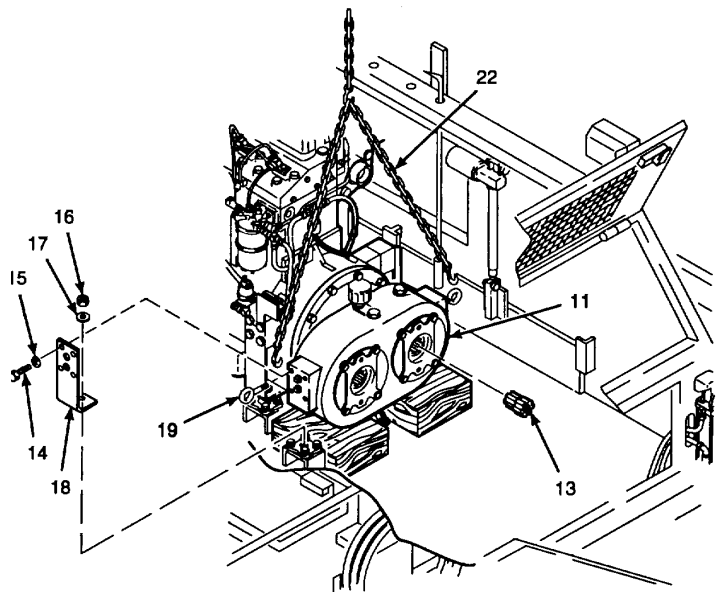
G. INSTALL Continued.

- h. Remove chain assembly (22) and hex head screw caps (19).
- i. Coat gear teeth of adapter gear sleeve (13) with anti-seize compound.
- j. Install adapter gear sleeves (13) into pump drive gearbox (11).
- k. Install pump drive gearbox support brackets (18), flat washers (17), and self-locking hex nuts (16). Do not tighten self-locking hex nuts.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- l. Install lockwashers (15) onto hex head cap screws (14). Apply thread locking compound to threads of hex head cap screws.
- m. Install hex head cap screws (14) and lockwashers (15). Tighten to 180 lb-ft (244 N•m).
- n. Tighten self-locking hex nuts (16).



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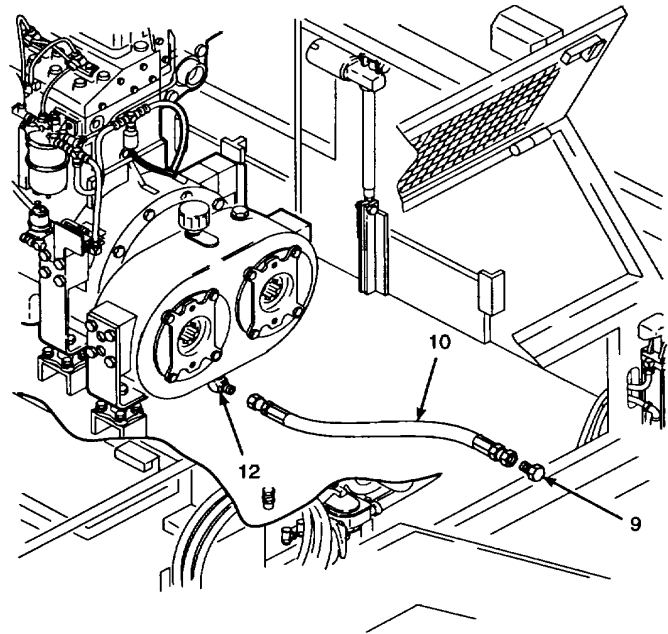
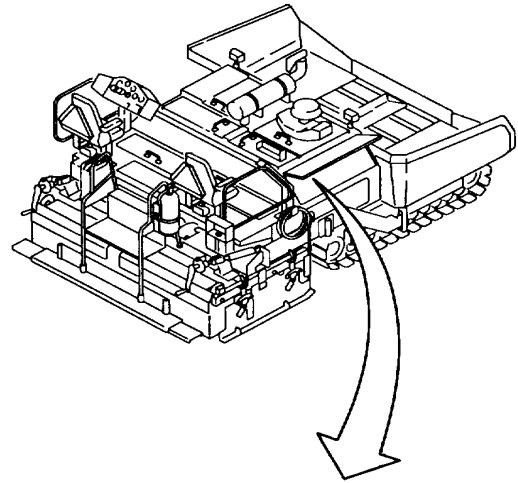
## 2.29 REPLACE/REPAIR PUMP DRIVE GEARBOX - Continued.

## G. INSTALL Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- o. Apply hydraulic fitting sealant onto exposed threads of elbow (12).
- p. Install drain hose (10) onto elbow (12).
- q. Ensure drain plug (9) is tight in drain hose (10).



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## G. INSTALL - Continued.

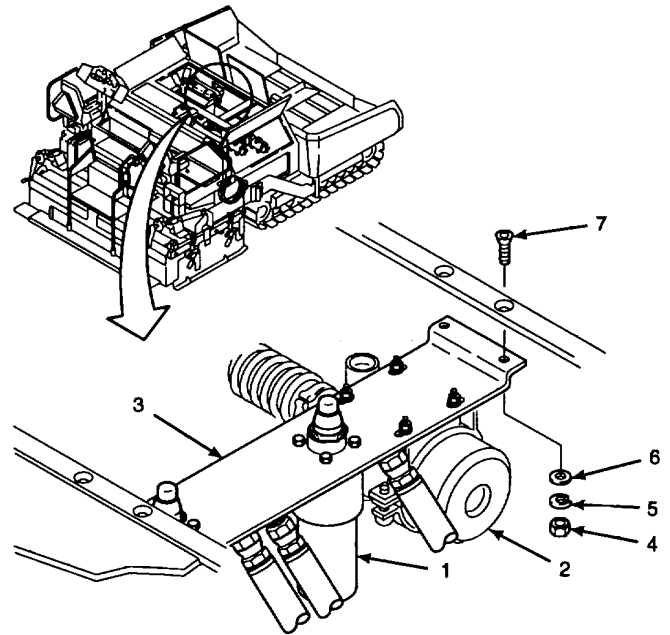
## 3. INSTALL CHARGE FILTER MOUNTING BRACKET, AIR CLEANER, AND HYDRAULIC CHARGE FILTERS ONTO PAVING MACHINE FRAME.

- a. Turn charge filter mounting bracket (3), air cleaner (2), and hydraulic charge filters (1) sideways and lower into place aligning mounting holes in mounting bracket with holes in paving machine frame.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- b. Coat threads of socket head cap screws (7) with thread locking compound.
- c. Install and tighten socket head cap screws (7), flat washer (6), lockwasher (5), and hex nut (4).

**NOTE**

FOLLOW-ON-TASKS: Install propulsion pump per paragraph 2.30.  
 Install auxiliary vibration pump per paragraph 2.43.  
 Install auxiliary pump per paragraph 2.42.  
 Fill pump drive gearbox with gear oil per TM 5-3895-373-12.  
 Install engine access cover per TM 5-3895-373-20.  
 Install right access cover per TM 5-3895-373-10.  
 Close right access door per TM 5-3895-373-10.  
 Close front top right access door per TM 5-3895-373-10.  
 Close front top left access door per TM 5-3895-373-10.

**END OF TASK**



**2.30 REPLACE/REPAIR PROPULSION PUMP.**

This task covers:      a. Remove                      b. Inspection                      c. Clean                      d. Inspect  
                                  e. Assemble                      f. Install                      g. Adjust

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit (Item 106, Appendix D)  
 Combination wrench (Item 115, Appendix D)  
 Combination wrench (Item 116, Appendix D)  
 Crowfoot wrench (Item 119, Appendix D)  
 Crowfoot wrench (Item 120, Appendix D)  
 Hex head driver socket (Item 84, Appendix D)  
 Hydraulic press frame (Item 41, Appendix D)  
 Hydraulic systems test and repair tool outfit (Item 108, Appendix D)  
 Micrometer depth gage (Item 44, Appendix D)  
 O-ring tool (Item 103, Appendix D)  
 Screwdriver bit set (Item 10, Appendix D)  
 Snap ring pliers (Item 66, Appendix D)  
 Socket wrench adapter (Item 7, Appendix D)  
 Torque wrench, 5 to 150 lb-in (Item 129, Appendix D)  
 Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
 Universal puller kit (Item 69, Appendix D)

Materials/Parts:

Anti-seize compound (Item 8, Appendix B)  
 Cleaning cloth (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Electrical insulating compound (Item 10, Appendix B)  
 Electrical insulating varnish (Item 38, Appendix B)  
 Emery cloth (Item 5, Appendix B)  
 Gasket sealing compound (Item 11, Appendix B)  
 Hydraulic fitting sealant (Item 26, Appendix B)  
 Hydraulic oil (Item 21, Appendix B)  
 Lint-free cloth (Item 7, Appendix B)  
 Machinery wiping towels (Item 37, Appendix B)  
 Petrolatum (Item 24, Appendix B)  
 Plastic bags (Item 1, Appendix B)  
 Protective caps (Item 3, Appendix B)  
 Tags (Item 34, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Tie wraps (Item 36, Appendix B)

Bearings  
 Lockwashers  
 Overhaul gasket kit  
 Preformed packings  
 Retaining rings  
 Seal replacement parts kit

Personnel Required:

Two 62B construction equipment repairers.  
 Additional person to assist with propulsion pump removal and installation.

References:

TM 5-3895-373-10  
 TM 5-3895-373-24P  
 TM 9-4940-468-14

Equipment Condition:

Front top right access door opened per TM 5-3895-373-10.  
 Right access door opened per TM 5-3895-373-10.  
 Right access cover removed per TM 5-3895-373-10.  
 Pump drive gearbox drained per paragraph 2.29.  
 Evacuate oil from hydraulic system per paragraph 2.54.  
 Auxiliary pump removed per paragraph 2.42.  
 Auxiliary vibration pump removed per paragraph 2.43  
 (if removing left hydraulic propulsion pump).

**NOTE**

The propulsion pumps are identical, but the left is inverted from the right when installed on the pump drive gearbox. Separate removal and installation instructions for the left pump and right pump are included.

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## A. REMOVE.

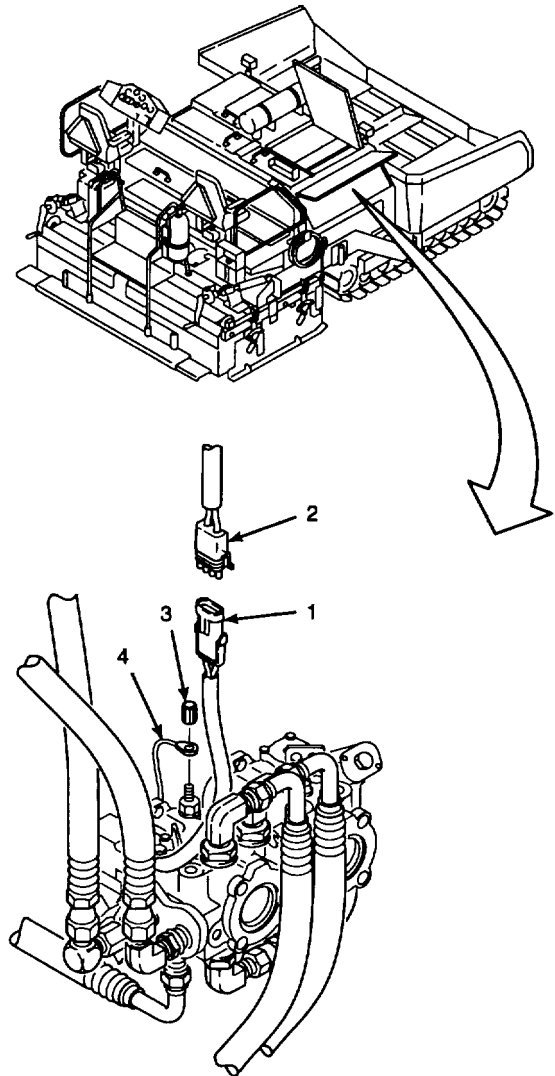
## 1. DISCONNECT ELECTRICAL CONNECTIONS AND HYDRAULIC HOSES FROM RIGHT PROPULSION PUMP.

- a. Disconnect pump pilot control valve electrical connector (1) from harness electrical connector (2).
- b. Disconnect hydraulic oil temperature sensor knurled nut (3) and remove harness ring terminal (4).

**WARNING**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- c. Wipe off hydraulic hoses and fittings with a cleaning cloth.
- d. Place machinery wiping towels beneath propulsion pump.



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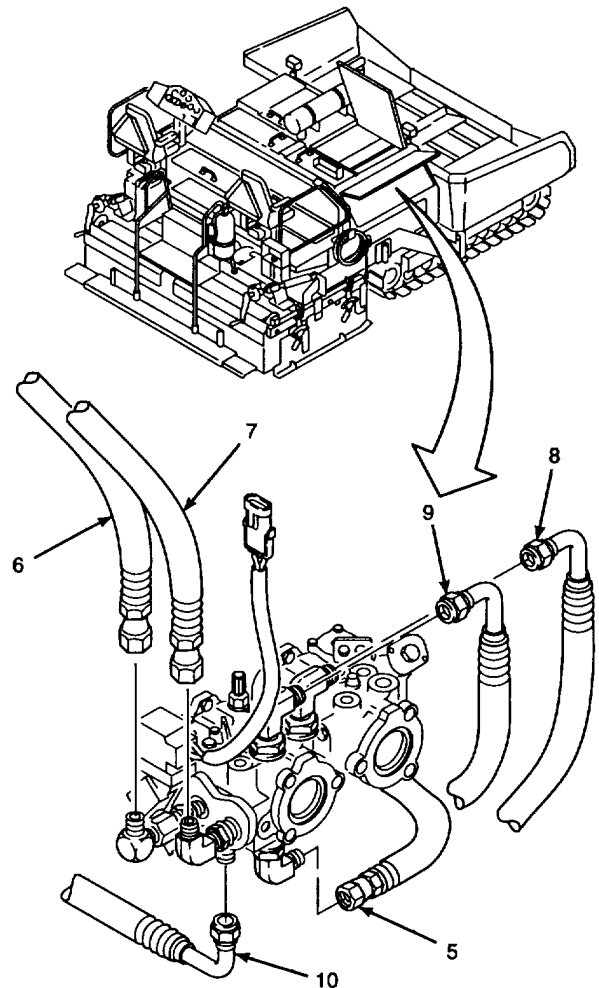
**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

## A. REMOVE Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- e. Tag and disconnect propulsion pump suction hose (5) from propulsion pump, using combination wrench (Item 116, Appendix D). Plug hose and cap elbow with protective caps.
- f. Tag and disconnect hydraulic charge filter hoses (6 and 7). Plug hoses and cap elbows with protective caps.
- g. Tag and disconnect propulsion motor hoses (8 and 9) from propulsion pump, using combination wrench (Item 115, Appendix D). Plug hoses and cap elbows with protective caps.
- h. Tag and disconnect case drain hose (10) from propulsion pump. Plug drain hose and cap straight adapter with protective caps.
- i. Cover exposed end of propulsion pump with a plastic bag. Secure bag with rubber bands or tie wraps.

**GO TO NEXT PAGE**

- A. REMOVE Continued.
- 2. DISCONNECT ELECTRICAL CONNECTIONS AND HYDRAULIC HOSES FROM LEFT PROPULSION PUMP.
  - a. Disconnect pump pilot control valve electrical connector (11) from harness electrical connector (12).

**CAUTION**

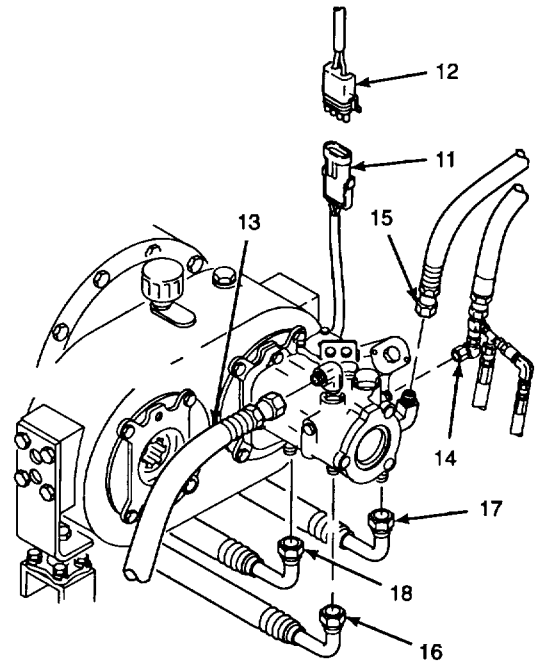
Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- b. Wipe off hydraulic hoses and fittings with a cleaning cloth.
- c. Place machinery wiping towels beneath propulsion pump.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- d. Tag and disconnect propulsion pump suction hose (13) from propulsion pump, using combination wrench (Item 116, Appendix D). Plug hose and cap elbow with protective caps.
- e. Tag and disconnect hydraulic charge filter hoses (14 and 15). Plug hoses and cap elbow and straight adapter with protective caps.
- f. Tag and disconnect propulsion motor hoses (16 and 17) from propulsion pump, using combination wrench (Item 115, Appendix D). Plug hoses and cap straight adapters with protective caps.



NOTE: RIGHT PROPULSION PUMP REMOVED FOR CLARITY.

- g. Tag and disconnect case drain hose (18) from propulsion pump. Plug case drain hose and cap straight adapter with protective caps.
- h. Cover exposed end of left propulsion pump with a plastic bag. Secure bag with rubber bands or tie wraps.

**GO TO NEXT PAGE**

**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

- A. REMOVE Continued.
3. REMOVE PROPULSION PUMP.

<b>WARNING</b>
----------------

Propulsion pump weighs 75 lbs (34 kg). Place cribbing beneath pump prior to removal from pump drive gearbox. Damage to equipment and personnel injury may result from unexpected movement of propulsion pump.

**NOTE**

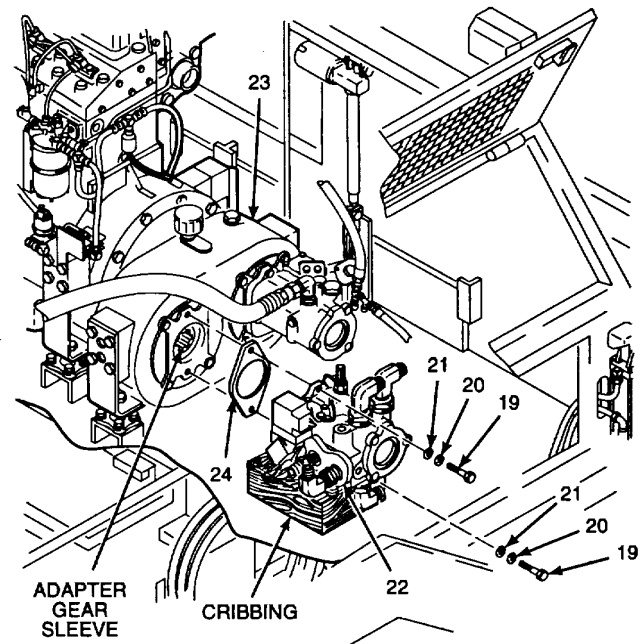
Procedures for removing the left and right propulsion pumps are identical. The right propulsion pump is illustrated in this procedure; perform the same steps for the left propulsion pump.

- a. Remove lower hex head cap screw (19), lockwasher (20), and flat washer (21) securing propulsion pump to pump drive gearbox. Discard lockwasher.
- b. Place cribbing beneath propulsion pump (22).
- c. Remove upper hex head cap screw (19), lockwasher (20), and flat washer (21) securing propulsion pump to pump drive gearbox. Discard lockwasher.
- d. Pull propulsion pump (22) from pump drive gearbox (23) and position onto cribbing.
- e. With the help of another person, lift propulsion pump from cribbing and out of engine compartment.
- f. Remove gasket (24) from pump drive gearbox (23). Discard gasket.

**NOTE**

Adapter gear sleeve may come out of pump drive gearbox with propulsion pump. If adapter gear sleeve is removed, replace adapter gear sleeve " into pump drive gearbox.

- g. Place propulsion pump on a clean work surface.



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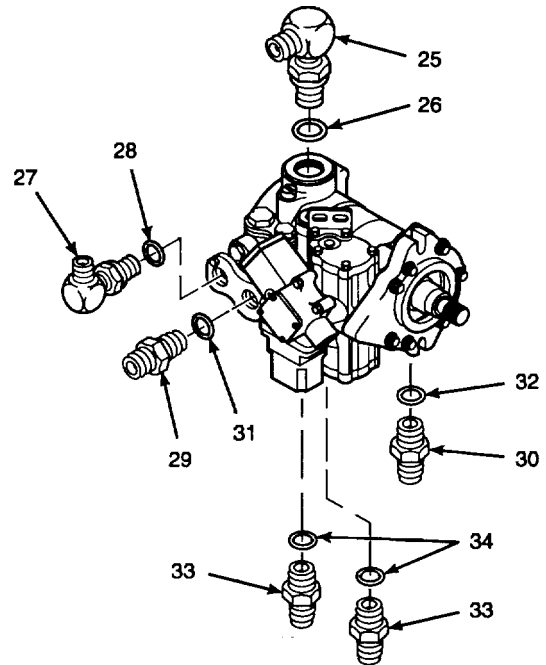
B. DISASSEMBLE.

**NOTE**

Left and right propulsion pumps have hydraulic fittings in different locations. Both propulsion pumps are addressed in this procedure.

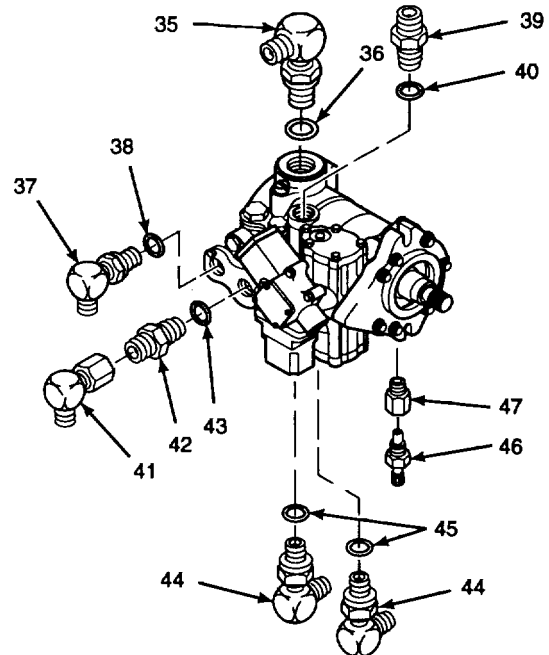
1. REMOVE HYDRAULIC FITTINGS FROM LEFT PROPULSION PUMP.

- a. Using combination wrench (Item 115, Appendix D), remove elbow (25) and preformed packing (26). Discard preformed packings.
- b. Remove elbow (27) and preformed packing (28). Discard preformed packing.
- c. Remove straight adapters (29 and 30) along with preformed packings (31 and 32). Discard preformed packings.
- d. Using combination wrench (Item 115, Appendix D), remove straight adapters (33) and preformed packings (34). Discard preformed packings.
- e. Plug all hydraulic ports with protective caps if not disassembling propulsion pump.



2. REMOVE HYDRAULIC FITTINGS FROM RIGHT PROPULSION PUMP.

- a. Using combination wrench (Item 115, Appendix D), remove elbow (35) and preformed packing (36). Discard preformed packing.
- b. Remove elbow (37) and preformed packing (38). Discard preformed packing.
- c. Remove straight adapter (39) and preformed packing (40). Discard preformed packing.
- d. Remove elbow (41), straight adapter (42), and preformed packing (43). Discard preformed packing.
- e. Using combination wrench (Item 115, Appendix D), remove elbows (44) and preformed packings (45). Discard preformed packings.
- f. Remove hydraulic oil temperature sensor (46) and straight adapter (47).
- g. Plug all hydraulic ports with protective caps if not disassembling propulsion pump.



**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

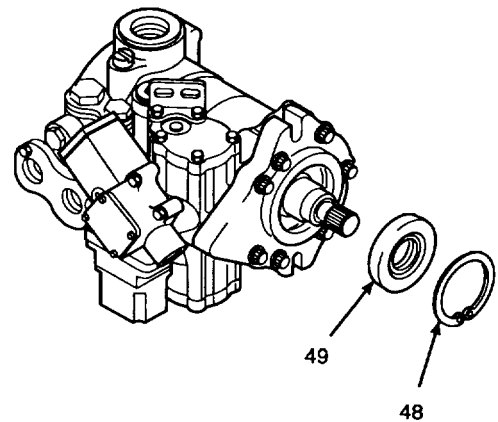
B. DISASSEMBLE Continued.

## 3. REMOVE PLAIN SEAL.

**WARNING**

Use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Use snap ring pliers and remove retaining ring (48).

**CAUTION**

Use caution when removing seal. Scratched or dented seal groove can cause bypass leakage. Do not scratch or dent seal groove when removing seal.

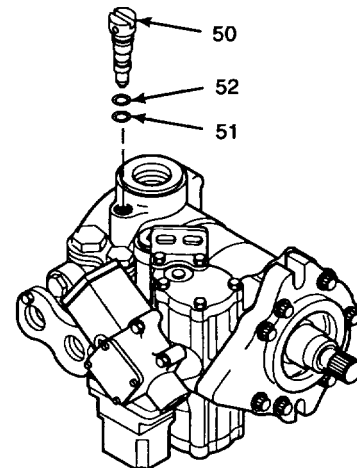
- b. Remove plain seal (49) with a screw attached to bearing puller in universal puller kit. Punch hole in plain seal and insert screw. Use bearing puller attached to screw to remove seal. Discard plain seal.
4. REMOVE SAFETY RELIEF VALVE.

- a. Unscrew safety relief valve (50) from end cap assembly housing.

**CAUTION**

Use caution when removing preformed packings and packing retainers. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force to remove preformed packings and packing retainers. Use an o-ring tool to remove preformed packings and packing retainers.

- b. Use an o-ring tool to remove o-ring (51) and packing retainer (52) from safety relief valve. Discard o-ring and packing retainer.

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B. DISASSEMBLE Continued.

5. REMOVE SCR VALVES.

- a. Remove plugs (53).
- b. Remove preformed packings (54) from plugs. Discard preformed packings.

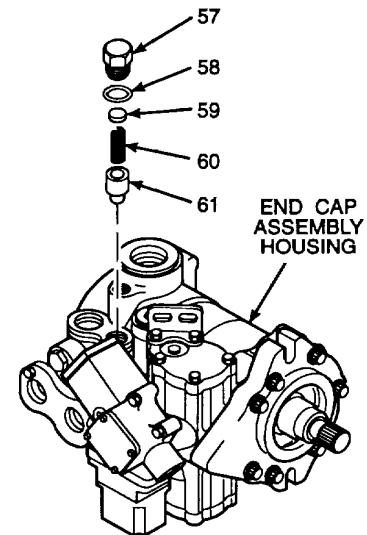
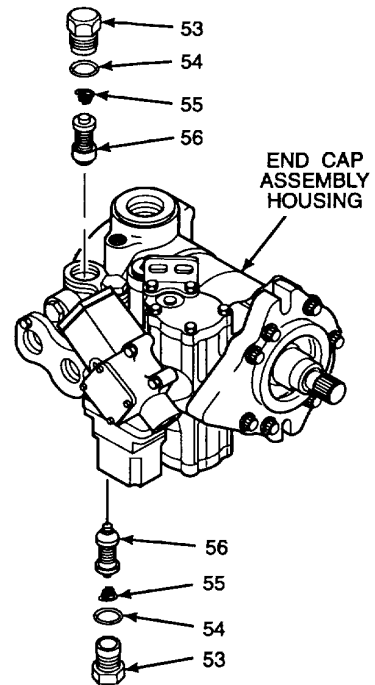


SCR valve is factory set and must not be altered in any way. Do not disassemble valve, alter shims, or interchange parts with another valve. Erratic operation of propulsion pump may result from altering or interchanging valve parts.

- c. Remove springs (55) and SCR valves (56).

6. REMOVE SPRING SEAT.

- a. Remove plug (57).
- b. Remove preformed packing (58) from plug. Discard preformed packing.
- c. Remove shim (59), spring (60), and spring seat (61).



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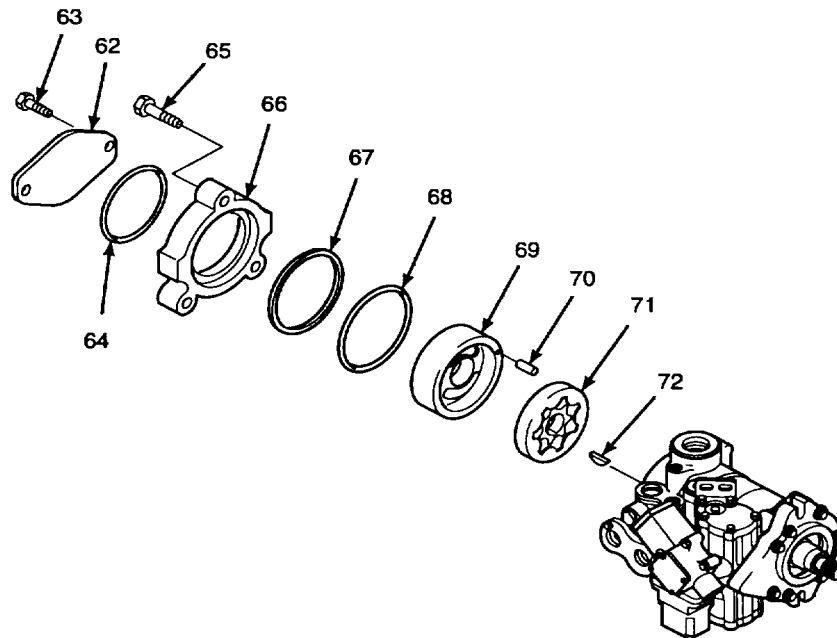


**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

- B. DISASSEMBLE - Continued.
7. REMOVE COVER PLATE, A-FLANGE ADAPTER AND GEROTOR SET.
- a. If cover plate (62) is installed on propulsion pump, remove cover plate by removing hex head cap screws(63).
  - b. Use an o-ring tool to remove preformed packing (64).
  - c. Remove hex head cap screws (65) and A-flange adapter (66).
  - d. Remove ring spacer (67). Discard ring spacer.
  - e. Use an o-ring tool to remove preformed packing (68). Discard preformed packing.
  - f. Remove gerotor cover (69).
  - g. If necessary, remove pin (70) from gerotor cover.
  - h. Remove gerotor set (71) and woodruff key (72).

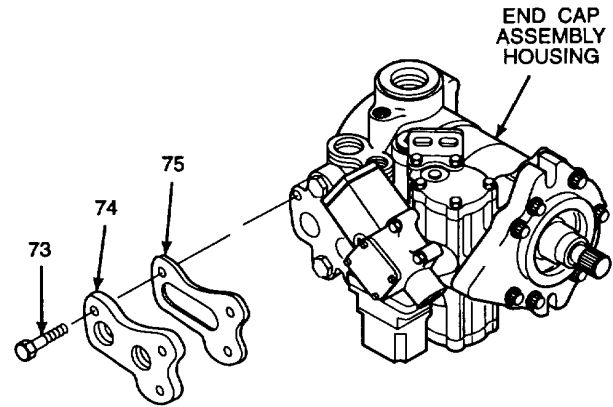


Use caution when removing preformed packings and packing retainers. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force to remove preformed packings and packing retainers. Use an o-ring tool to remove preformed packings and packing retainers.



**GO TO NEXT PAGE**

- B. DISASSEMBLE Continued.
- 8. REMOVE REMOTE FILTER ADAPTER.
  - a. Remove hex head cap screws (73) and remote filter adapter (74).
  - b. Use an o-ring tool to remove filter adapter seal (75). Discard filter adapter plain seal.
- 9. REMOVE ELECTRONIC DISPLACEMENT CONTROL.



**NOTE**

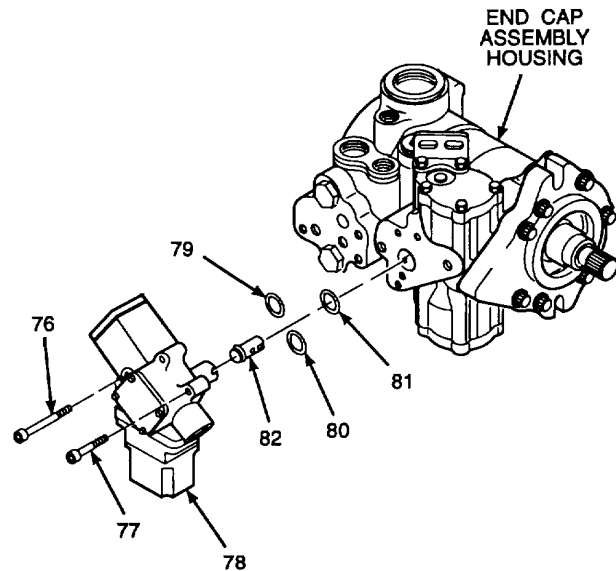
If pump pilot control valve is being removed, refer to paragraph 2.31.

- a. Remove hex head cap screws (76 and 77) and electronic displacement control (78).



Use caution when removing preformed packings and packing retainers. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force to remove preformed packings and packing retainers. Use an o-ring tool to remove preformed packings and packing retainers.

- b. Use an o-ring tool to remove preformed packings (79, 80, and 81) from electronic displacement control. Discard preformed packings.
- c. Remove spool (82) by carefully prying out with a thin, flat-blade screwdriver.



**GO TO NEXT PAGE**

**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.****B. DISASSEMBLE** Continued.**10. REMOVE FRONT COVER, GASKET, AND SWASH PLATE.**

- a. Turn end cap assembly housing so front cover (83) is facing up.



Do not remove front cover until A-flange adapter has been removed. Damage to propulsion pump may occur if woodruff key (Item 72, step 7) is not removed before front cover.

**NOTE**

Spring tension may force front cover up 0.125 in.(3,18 mm) when screws are removed.

- b. Remove screws (84 and 85) from front cover (83).
- c. Pull front cover (83) and gasket (86) from end cap assembly housing. Discard gasket.

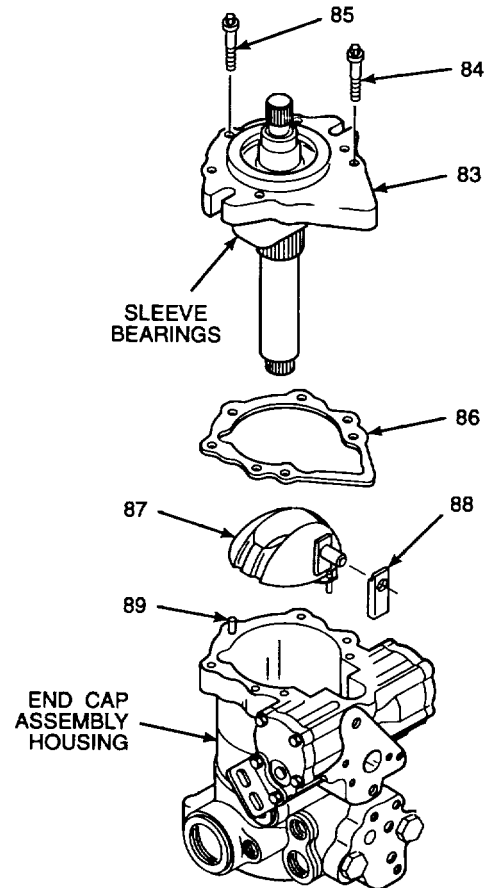
**NOTE**

Sleeve bearings may stay attached to swash plate during front cover removal.

- d. Remove swash plate (87).
- e. Remove sleeve bearing (88) from swash plate.

**NOTE**

Pin (89) may be removed with front cover or stay in end cap assembly housing.



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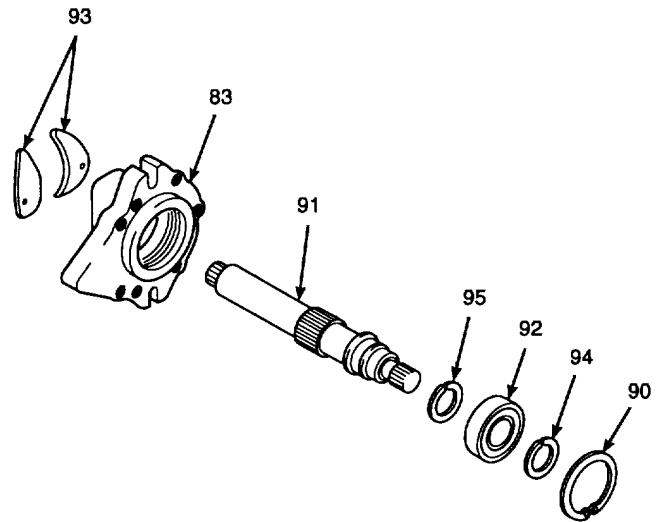
B. DISASSEMBLE Continued.

11. REMOVE PUMP SHAFT, BEARING, AND SLEEVE BEARINGS.

**WARNING**

Use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Use snap ring pliers and remove retaining ring (90) from front cover (83).
- b. Pull pump shaft (91) and bearing (92) from front cover.
- c. Remove sleeve bearings (93) from front cover.
- d. Remove retaining ring (94) from pump shaft.
- e. Use a bearing puller from universal puller kit to remove bearing (92).
- f. Remove retaining ring (95) from pump shaft.

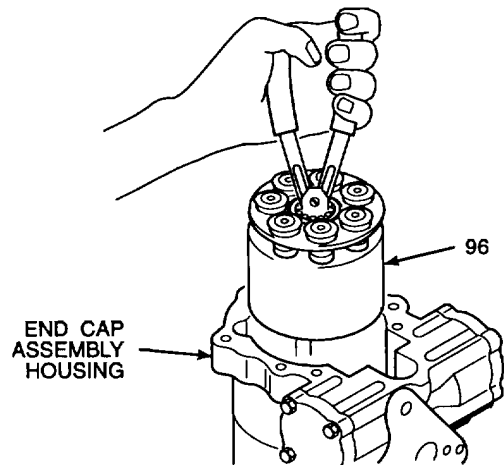


12. REMOVE CYLINDER BLOCK ASSEMBLY.

**CAUTION**

Cylinder block assembly is held together by fitted parts. Do not allow cylinder block assembly to fall apart during removal from end cap assembly housing. Cylinder block assembly may fall apart if not lifted correctly.

- a. Use snap ring pliers to grasp cylinder block assembly (96) on inner splined opening.
- b. Lift cylinder block assembly (96) from end cap assembly housing.
- c. Set cylinder block assembly down on clean work surface.

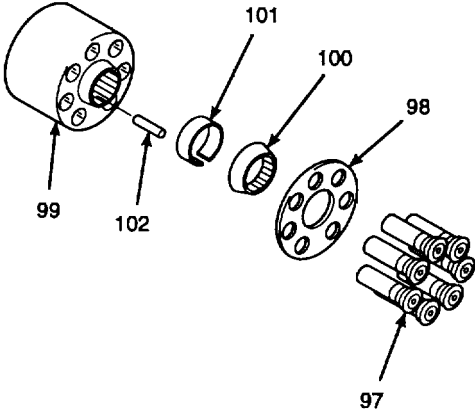


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**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

**B. DISASSEMBLE Continued.**

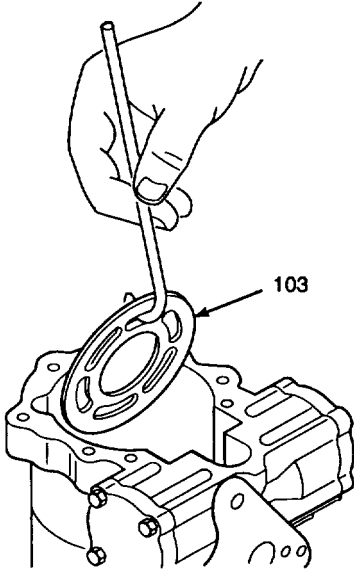
- 13. REMOVE PUMP PISTONS, SLIPPER RETAINER, AND RETAINER GUIDE.
  - a. Remove pump pistons (97) and slipper retainer (98) from cylinder block (99).
  - b. Remove retainer guide (100), retainer (101), and holddown pins (102).
  
- 14. REMOVE VALVE PLATE FROM END CAP ASSEMBLY HOUSING.



**NOTE**

Valve plate is positioned onto pin inside end cap assembly housing.

- a. Use hooked end of o-ring tool to lift valve plate (103).
- b. Set valve plate (103) down on clean work surface.



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B. DISASSEMBLE Continued.

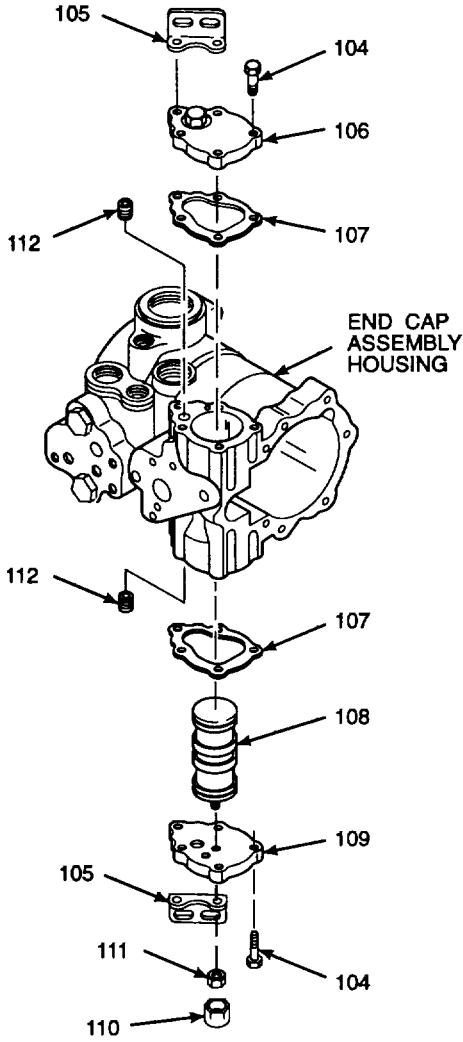
15. REMOVE SERVO PISTON.

- a. Turn end cap housing assembly housing on side.
- b. Remove hex head cap screws (104) and lift brackets (105) from both ends of end cap housing assembly.
- c. Remove servo cover (106) and gasket (107).

**NOTE**

Servo piston (108) is screwed into servo cover (109) and will come out along with servo cover.

- d. Remove servo cover (109), along with servo piston (108), and gasket (107).
- e. Remove cap (110) and hex nut (111) from servo piston.
- f. Unscrew servo piston (108) from servo cover (109).
- g. Set servo piston (108) on clean work surface.
- h. Remove plugs (112).



**GO TO NEXT PAGE**

**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

B. DISASSEMBLE Continued.



Do not disassemble servo piston unless there is visible damage to the piston or snap ring/spring seat area.

**16. REMOVE SERVO SPRING FROM SERVO PISTON.**

- a. Insert allen wrench into special screw (113).
- b. Use a wrench and hold hex nut (114) from turning.
- c. Compress servo spring (115) by turning special screw (113) clockwise to relieve pressure on retaining ring (116). Use two flat-blade screwdrivers to compress spring further to allow for removal of retaining ring.



Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

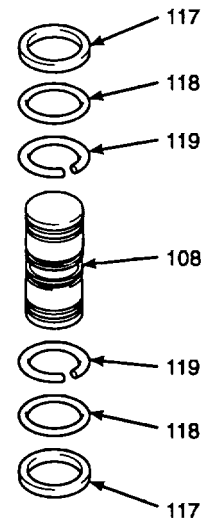
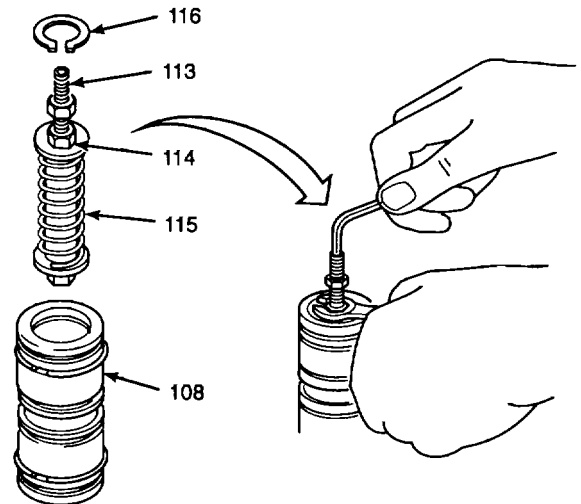
- d. When servo spring is compressed enough to reach inside servo piston (108), remove retaining ring (116) from servo piston. Discard retaining ring.
- e. Slide servo spring from servo piston.

**17. REMOVE PISTON RINGS, PREFORMED PACKINGS, AND BEARING RINGS FROM SERVO PISTON.**



Use caution when removing preformed packings and packing retainers. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force to remove preformed packings and packing retainers. Use an o-ring tool to remove preformed packings and packing retainers.

- a. Use an o-ring tool to remove piston rings (117) from Discard servo piston (108). Discard piston rings. bearing rings.



- b. Use an o-ring tool to remove preformed packings (118) from servo piston.
- c. Remove bearing rings (119). from servo piston. Discard preformed packings

**GO TO NEXT PAGE**

B. DISASSEMBLE Continued.

18. REMOVE SPRING GUIDES, SERVO STOP, AND SPECIAL SCREW FROM SERVO SPRING.

- a. Remove hex nuts (114 and 120) from special screw (113).
- b. Pull spring guides (121), special screw (113), and servo stop (122) from servo spring (123).

19. REMOVE NEEDLE BEARING.



Do not damage end cap assembly housing while removing needle bearing. Damage to sealing surface may occur if care is not taken when using bearing puller.

- a. Install bearing puller through inside of needle bearing (124).
- b. Position needle bearing puller on inner surface of end cap assembly housing.
- c. Pull needle bearing from end cap assembly housing.
- d. Remove needle bearing from bearing puller.

C. CLEAN.

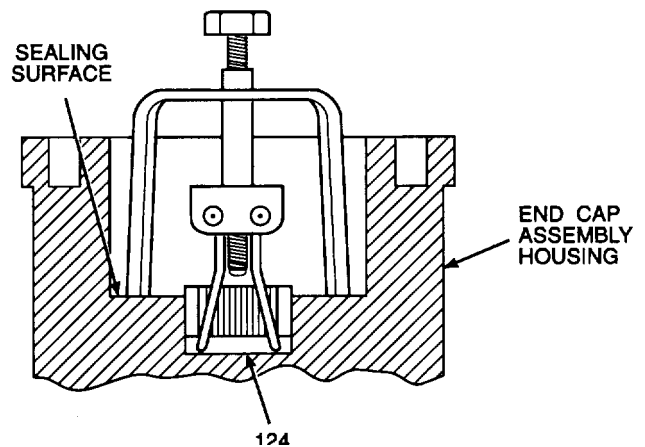
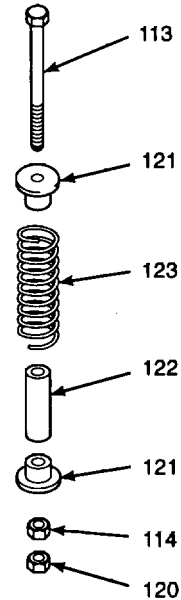


Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. CLEAN ALL PARTS IN CLEANING SOLVENT.

- a. Rinse all parts in cleaning solvent.





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**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

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**C. CLEAN Continued.****WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from end cap assembly housing, threaded surfaces, bores, valve seats, and bearings.
- c. Dry all parts with a clean, lint-free cloth.

**2. CLEAN CAP SCREWS.****WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

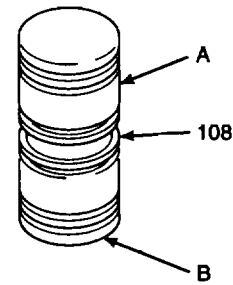
- a. Clean cap screws used to mount propulsion pump to pump drive gearbox with thread locking compound solvent.
  - b. Wipe cap screws dry with a clean, lint-free cloth.
3. WIPE HYDRAULIC FITTING SEALANT RESIDUE FROM HYDRAULIC OIL TEMPERATURE SENSOR AND STRAIGHT ADAPTER WITH A CLEANING CLOTH.

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D. INSPECT.

1. INSPECT SERVO PISTON FOR DAMAGE AND EXCESSIVE WEAR.

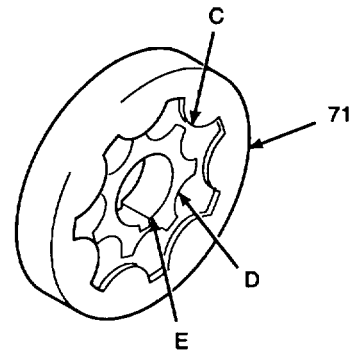
- a. Visually inspect servo piston (108), surface A, for bending or damage.
- b. Replace servo piston (108) if bending or damage is detected.
- c. Inspect servo piston (108), surface B, for scratches or deformation.
- d. Replace servo piston if scratches or deformation is detected.



2. INSPECT NEEDLE BEARING AND BEARING FOR EXCESSIVE WEAR BY TURNING MANUALLY. DISCARD NEEDLE BEARING AND BEARING IF ROUGH OR NOISY WHEN TURNED.

3. INSPECT GEROTOR SET FOR DAMAGE AND EXCESSIVE WEAR.

- a. Inspect gerotor set (71), surfaces C and D, for scoring, nicks, and corrosion.
- b. Replace gerotor set (71) if scoring or nicks are detected. If corrosion cannot be removed with emery cloth or has caused pitting, replace gerotor set.
- c. Inspect gerotor set (71), surface E, for scoring and scratching.
- d. Replace gerotor set (71) and gerotor cover if scoring or scratching is detected.



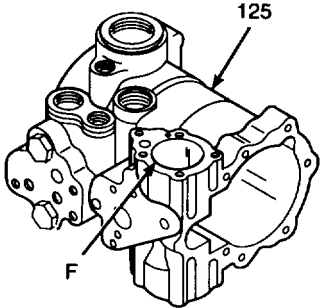
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**2. REPLACE/REPAIR PROPULSION PUMP - Continued.**

D. INSPECT Continued.

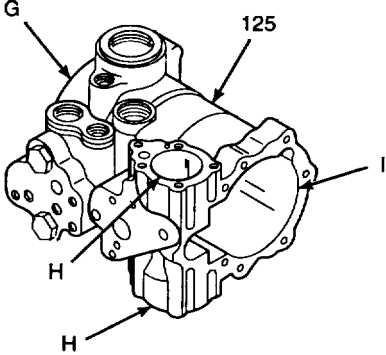
4. INSPECT SERVO BORE IN END CAP ASSEMBLY HOUSING FOR NICKS, SCRATCHES, AND SIGNS OF CONTAMINATION.

- a. Use a strong light and inspect servo bore, surface F, inside end cap assembly housing (125) for nicks or scratches that can be felt with a fingernail and signs of contamination.
- b. Use emery cloth to remove nicks and scratches that can be felt with a fingernail. Clean end cap assembly housing (125) after removing nicks and scratches. Refer to cleaning procedure.
- c. Replace end cap assembly housing (125) if any signs of contamination or pitting are detected or if nicks and scratches cannot be removed with emery cloth.



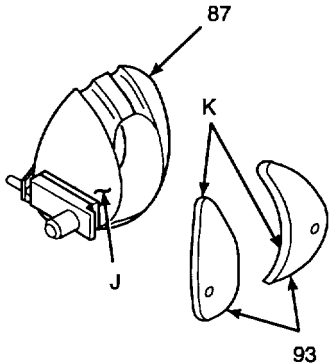
5. INSPECT SEALING SURFACES IN END CAP ASSEMBLY HOUSING.

- a. Visually inspect sealing surfaces G, H, and I on end cap assembly housing (125) for nicks, scratches, or any damage that can prevent proper sealing.
- b. Replace end cap assembly housing (125) if nicks, scratches, or damage can prevent proper sealing when propulsion pump is assembled.



6. INSPECT SWASH PLATE AND SLEEVE BEARINGS FOR NICKS, SCRATCHES, AND SCORING.

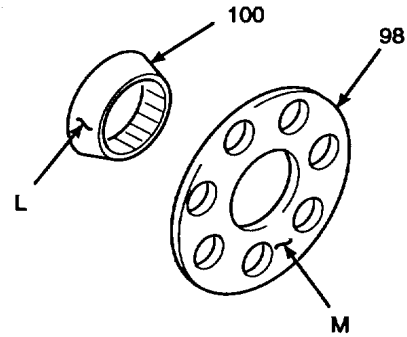
- a. Inspect swash plate (87) and sleeve bearings (93), surface J and K, for nicks, scratches, and for scoring.
- b. Use emery cloth to remove nicks and scratches from swash plate (87). Clean swash plate after removing nicks and scratches. Refer to cleaning procedure.
- c. Replace swash plate (87) if nicks and scratches cannot be removed with emery cloth or if scoring is detected.
- d. Replace sleeve bearings (93) if nicks, scratches, or scoring is detected.



D. INSPECT Continued.

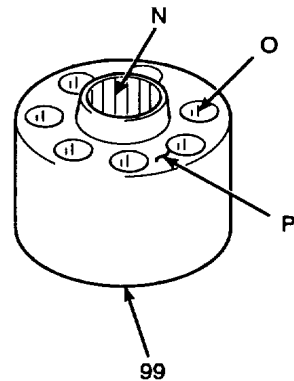
7. INSPECT RETAINER GUIDE AND SLIPPER RETAINER FOR SCORING.

- a. Visually inspect retainer guide (100), surface L, and slipper retainer (98), surface M, for scoring.
- b. Replace retainer guide (100) and slipper retainer (98) if scoring is detected.



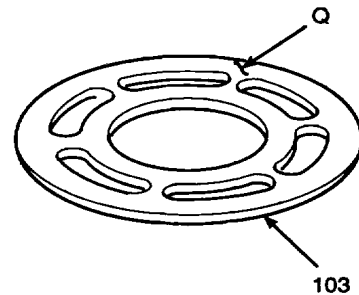
8. INSPECT CYLINDER BLOCK BORES AND RUNNING FACE FOR NICKS, SCRATCHES, AND SCORING.

- a. Inspect cylinder block (99) surfaces N, O, and P for nicks, scratches, and scoring.
- b. Use emery cloth to remove nicks and scratches. Clean cylinder block (99) after removing nicks and scratches. Refer to cleaning procedure.
- c. Replace cylinder block (99) if scoring is detected, or if nicks and scratches cannot be removed with emery cloth.



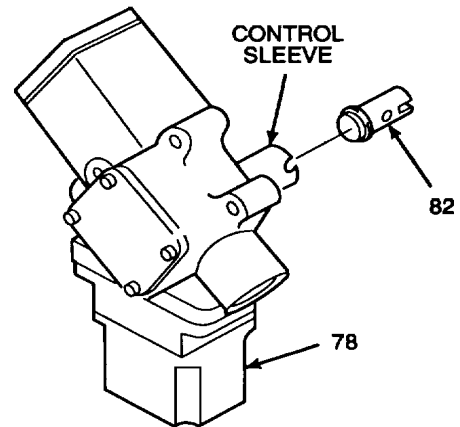
9. INSPECT VALVE PLATE FOR NICKS, SCRATCHES, AND SCORING.

- a. Visually inspect valve plate (103), surface Q, for nicks, scratches, and scoring.
- b. Use emery cloth to remove nicks and scratches. Clean valve plate (103) after removing nicks and scratches. Refer to cleaning procedure.
- c. Replace valve plate (103) if scoring is detected, or if nicks and scratches cannot be removed with emery cloth.



10. INSPECT CONTROL SLEEVE AND SPOOL FOR NICKS, SCRATCHES, AND SCORING.

- a. Visually inspect control sleeve on electronic displacement control (78) and spool (82) for nicks, scratches, and scoring.
- b. Use emery cloth to remove nicks and scratches. Clean control sleeve and spool (82) after removing nicks and scratches. Refer to cleaning procedure.
- c. Replace electronic displacement control (78) if scoring is detected, or if nicks and scratches cannot be removed with emery cloth.



**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

**E. ASSEMBLE.**

**1. INSTALL NEEDLE BEARING.**



Oils from skin and moisture can cause corrosion on needle bearings. Do not handle bearings with bare hands. Wear cotton gloves when handling bearings.

- a. Place end cap assembly housing on hydraulic press frame.
- b. Insert needle bearing (124) into end cap assembly housing.

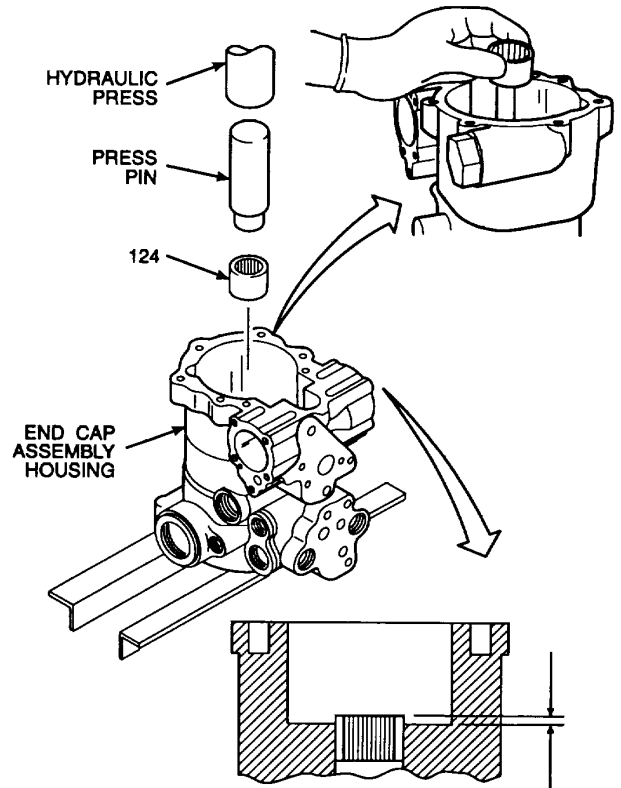


Ensure printed (numbered) end of needle bearing faces bearing press pin. Do not install needle bearing with printed (numbered) side down. Damage to needle bearing and end cap assembly housing may result from improper installation.

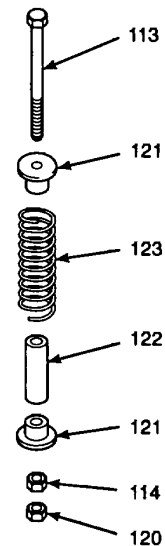
- c. Insert press pin into needle bearing (124), resting against outer race.
- d. Align needle bearing (124) with bore on inside end cap assembly housing.
- e. Press needle bearing (124) into position.
- f. Remove press pin from needle bearing (124).
- g. Use a micrometer depth gage and check needle bearing protrusion from inside surface of end cap assembly housing. Bearing should protrude 0.08 to 0.10 in. (2,0 to 2,5 mm).

**2. INSTALL SPECIAL SCREW, SERVO STOP, AND SPRING GUIDES ON SERVO SPRING.**

- a. Install one spring guide (121), servo stop (122), servo spring (123), and second spring guide (121) on special screw (113).
- b. Install hex nuts (114 and 120) on special screw.
- c. Use a wrench and hold special screw (113) from turning.
- d. Tighten hex nut (114) closest to servo spring (123) to compress servo spring. Tighten until light resistance is felt.



0.08-0.10 IN.  
(2,0-2,5 MM)



**GO TO NEXT PAGE**

E. ASSEMBLE - Continued.

3. INSTALL SERVO SPRING INTO SERVO PISTON.

**WARNING**

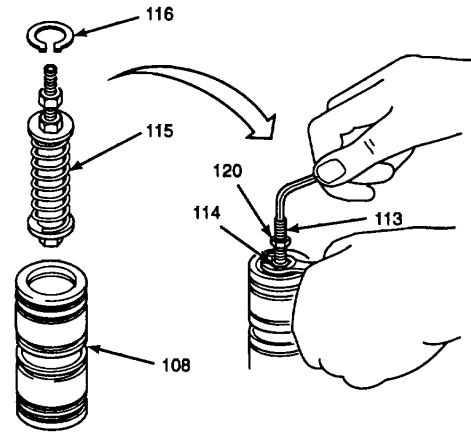
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate all parts with clean hydraulic oil.
- b. Slide servo spring (115) into servo piston (108).
- c. Use an allen wrench and hold special screw (113) on servo spring from turning.
- d. Compress servo piston by tightening hex nut closest to servo spring with a wrench. Be sure to expose the complete internal retaining ring groove. Use two flat-blade screwdrivers to further compress servo spring to allow retaining ring (116) to be installed.

**WARNING**

Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- e. When spring is compressed, install retaining ring (116).
- f. If retaining ring cannot be installed, additionally compress servo spring by tightening inner hex nut.



**CAUTION**

Be sure retaining ring is fully seated in groove. Propulsion pump control will be lost if retaining ring is not fully seated in retaining ring groove.

- g. Ensure retaining ring is fully seated in retaining ring groove.

**CAUTION**

Neutral position cannot be obtained in propulsion pump if any looseness exists between servo spring and servo piston. Ensure servo spring is correctly tightened and seated inside servo piston. Equipment damage may result from improper installation of servo spring inside servo piston.

- h. If hex nut (114) is overtightened, servo spring will be loose in servo piston. Loosen hex nut.
- i. If hex nut (114) is undertightened, special screw will be loose between spring guides. Tighten hex nut.
- j. When servo spring is correctly seated inside servo piston, hold inner hex nut (114) from turning and tighten outer hex nut (120) against inner hex nut (114) to 22 lb-ft (30 N•m) to lock servo spring in position.

**GO TO NEXT PAGE**

**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

## E. ASSEMBLE Continued.

**CAUTION**

Bearing rings, preformed packings, and piston rings may be distorted during installation. Allow a minimum of one hour for bearing rings, preformed packings, and piston rings to conform to original shape before reassembling component. Bypass leakage can result from poor installation.

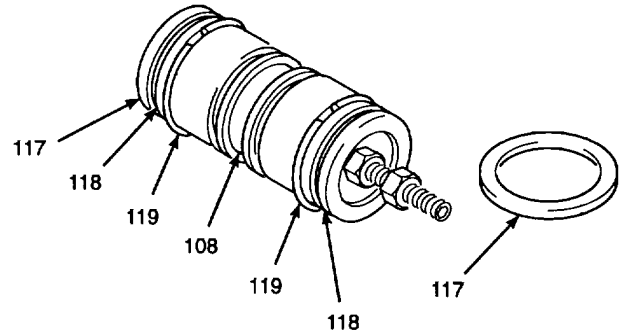
4. INSTALL BEARING RINGS, PREFORMED PACKINGS, AND PISTON RING ON SERVO PISTON.

- a. Lubricate all parts with petrolatum.

**CAUTION**

Bearing rings, preformed packings, and piston rings may be distorted during installation. Use care during installation to prevent damage to bearing rings, preformed packings, and piston rings. Bypass leakage can result from poor installation.

- b. Install bearing rings (119) on servo piston (108).
- c. Install preformed packings (118) on servo piston.
- d. Install one piston ring (117) over preformed packing on servo piston end opposite servo spring opening.
- e. Set other piston ring (117) aside for later installation.



**GO TO NEXT PAGE**

E. ASSEMBLE Continued.

5. INSTALL SERVO PISTON.

a. Turn end cap assembly housing on side.



Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

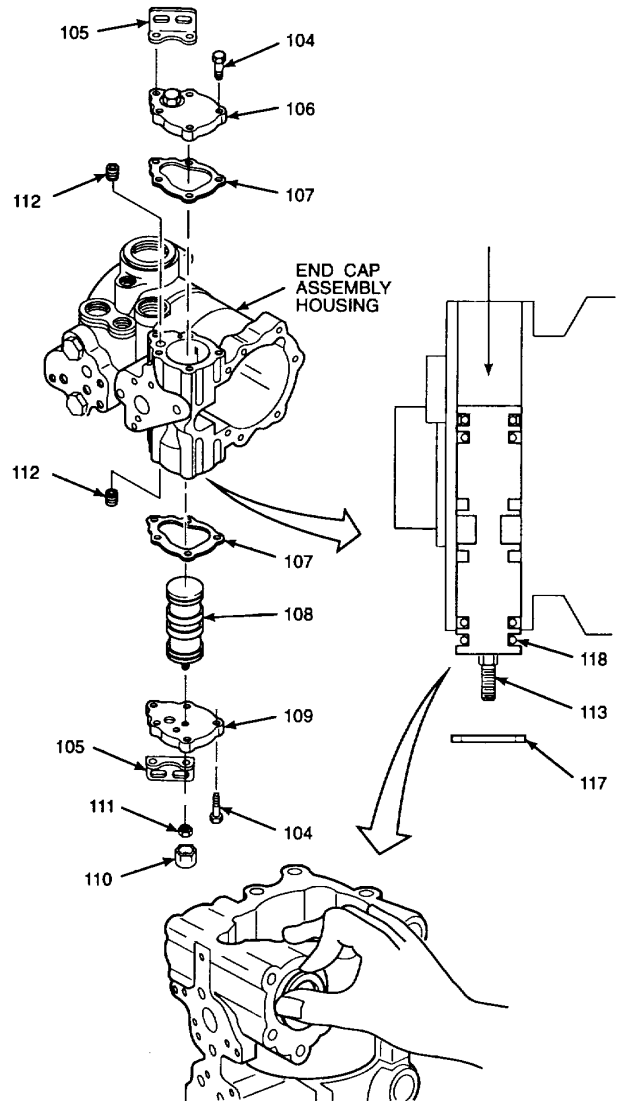
b. Lubricate servo piston (108) with clean hydraulic oil.



Sharp edges on end cap assembly housing can damage piston ring during servo piston installation. Do not slide servo piston through end cap assembly housing further than necessary to install piston ring. Poor or erratic pump operation can result from damage to piston rings.

Ensure servo piston is oriented correctly in end cap assembly housing. Propulsion pump cannot be correctly assembled if servo piston is installed incorrectly.

- c. Slide servo piston (108) into end cap assembly housing until piston emerges slightly from opposite side.
- d. Lubricate piston ring (117) with petrolatum.
- e. Install piston ring (117) over the top of preformed packing (118) on servo piston (108).
- f. Slide servo piston back into end cap assembly housing.
- g. Install plugs (112) into end cap assembly housing.
- h. Install gaskets (107).
- i. Thread servo cover (109) onto servo piston (108).
- j. Install hex nut (111) onto servo cover (109). Do not tighten at this time.
- k. Install hex head cap screws (104) through lift brackets (105), servo covers (106 and 109), and gaskets (107) into end cap assembly housing. Tighten cap screws to 11 lb-ft (16 N•m) using screwdriver bit set.



**NOTE**

Centering the servo piston is a preliminary neutral adjustment. Final adjustment is made during calibration, after propulsion pump is installed and connected to the engine.

- l. Position servo piston in approximate center of travel by turning special screw (113) with an allen wrench. Install cap (110).

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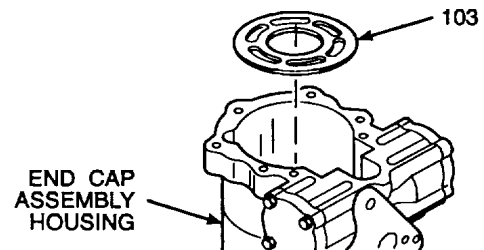
**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

- E. ASSEMBLE Continued.
6. INSTALL VALVE PLATE.

<b>WARNING</b>
----------------

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate valve plate (103) with clean hydraulic oil.
- b. Install valve plate (103), bronze face up, into end cap assembly housing.
- c. Align valve plate until notch is seated flush on pin inside end cap assembly housing.

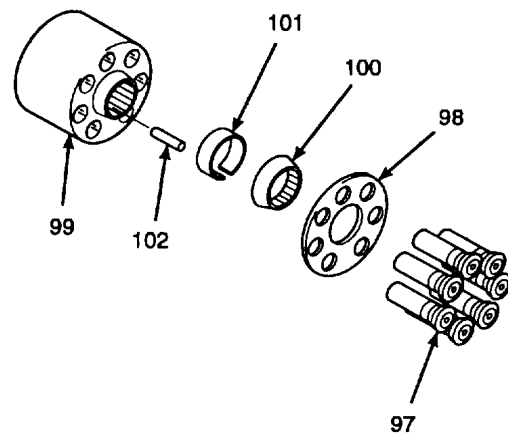


7. INSTALL RETAINER GUIDE, SLIPPER RETAINER, AND PUMP PISTONS INTO CYLINDER BLOCK.

**NOTE**

Holddown pins must be inserted into the large grooves in the cylinder block.

- a. Lubricate holddown pins (102) with petrolatum.
- b. Install retainer (101), holddown pins (102), and retainer guide (100) into cylinder block (99).
- c. Lubricate outside surface of retainer guide (100) with petrolatum.
- d. Install retainer guide (100) on top of holddown pins (102), aligning splines.
- e. Install pump pistons (97) into slipper retainer (98).
- f. Lubricate pump pistons (97) with clean hydraulic oil.
- g. Install slipper retainer (98) and pump pistons (97) into cylinder block (99). Ensure retainer guide splines and cylinder block splines stay aligned.



**GO TO NEXT PAGE**

- E. ASSEMBLE Continued.
8. INSTALL CYLINDER BLOCK ASSEMBLY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate valve plate (103) with clean hydraulic oil.

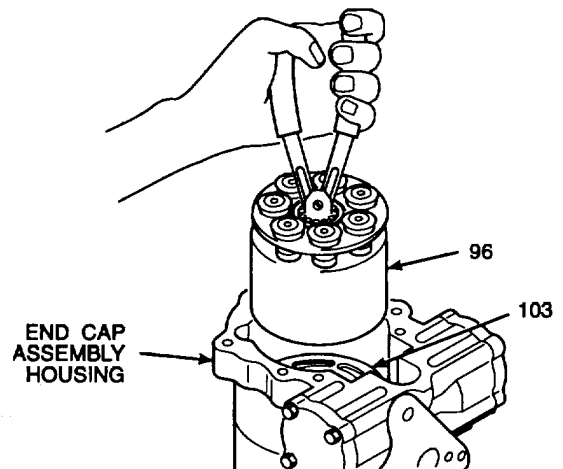
**CAUTION**

Cylinder block assembly is held together by fitted parts. Do not allow cylinder block assembly to fall apart during installation into end cap housing. Cylinder block assembly may fall apart if not lifted correctly.

- b. Use a pair of snap ring pliers and grasp cylinder block assembly (96) on inner splined opening.
- c. Lower cylinder block assembly (96) into end cap assembly housing. Seat cylinder block assembly onto valve plate (103).

**NOTE**

Cylinder block bore must be aligned with needle bearing bore to permit installation of pump shaft.



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**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

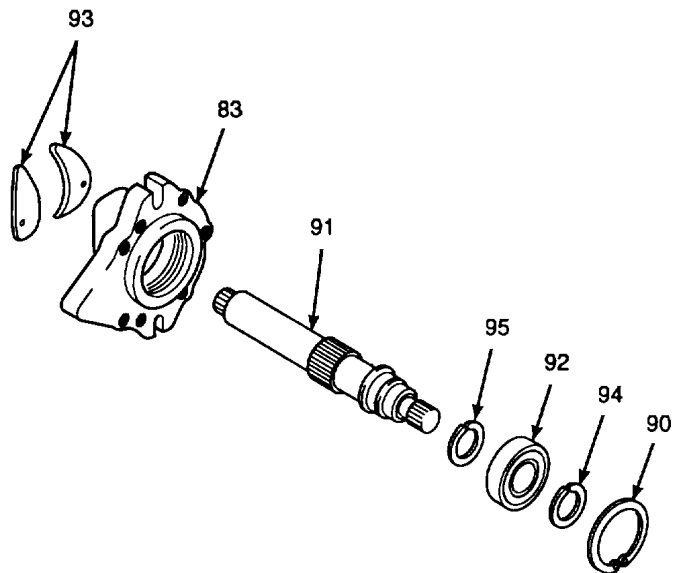
E. ASSEMBLE Continued.

## 9. INSTALL BEARING, PUMP SHAFT, AND SLEEVE BEARING.

**WARNING**

Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Install retaining ring (95) onto pump shaft (91) retaining ring groove.
- b. Place bearing (92) over pump shaft.
- c. Use hydraulic press frame to install bearing (92) onto pump shaft (91) until seated.
- d. Install retaining ring (94) onto pump shaft retaining ring groove.
- e. Install bearing and pump shaft into front cover (83).
- f. Use snap ring pliers and install retaining ring (90) into front cover.
- g. Lubricate bronze side of sleeve bearings (93) with petrolatum.
- h. Install sleeve bearings (93) onto front cover.

**GO TO NEXT PAGE**

E. ASSEMBLE Continued.

10. INSTALL SWASH PLATE, GASKET, AND FRONT COVER.

- a. Turn end cap assembly housing on end to allow front cover (83) installation while facing up.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Lubricate cylinder block assembly with clean hydraulic oil.

**NOTE**

Sleeve bearing must be installed to allow clearance for sleeve bearings on front cover.

- c. Install sleeve bearing (88) onto swash plate (87).

**NOTE**

When installed, swash plate must rest flush on cylinder block assembly and sleeve bearing must engage large center groove on servo piston.

- d. Install swash plate (87) into end cap assembly housing.
- e. Install gasket (86) onto end cap assembly housing.

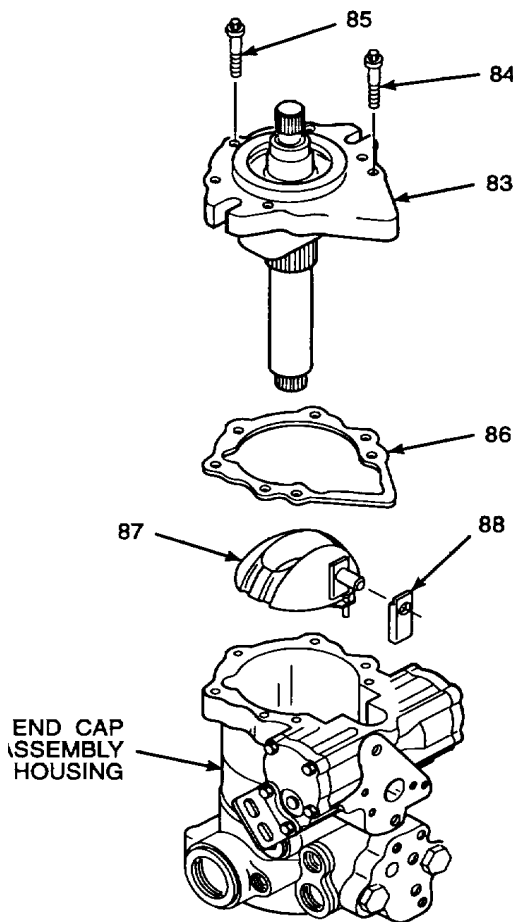
**CAUTION**

All parts must be properly aligned before front cover screws are installed. Do not force front cover into position if front cover is difficult to position. Check alignment of internal parts prior to installing front cover screws. Damage to swash plate and front cover may occur if front cover is forced into position.

**CAUTION**

Ensure sleeve bearings stay in position on front cover during installation.

- f. Install front cover (83) onto end cap assembly housing. Align pump shaft splines with cylinder block splines. Pump shaft may need slight rotation for spline alignment.



**NOTE**

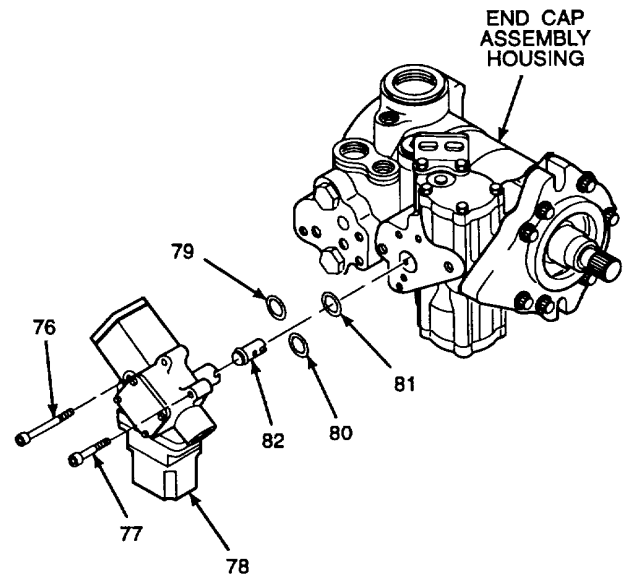
When properly aligned, cylinder block spring holds cover away from end cap assembly housing a maximum distance of 0.125 in. (3, 18 mm).

- g. Install screws (84) into front cover. Tighten screws to 43 lb-ft (58 N.m).
- h. Install screws (85) into front cover. Tighten screws to 67 lb-ft (91 Nom).
- i. Attach slip joint pliers to pump shaft. Rotate shaft. Slight resistance should be noted when turning pump shaft.
- j. If pump shaft does not turn or turns with no resistance, remove screws from front cover, remove front cover and swash plate and repeat steps d through i as necessary.

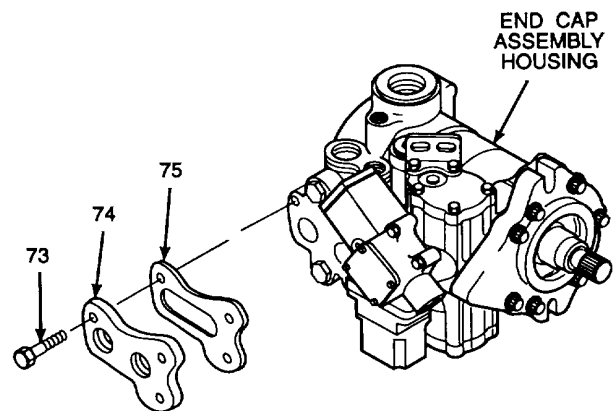
**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.****E. ASSEMBLE Continued.****11. INSTALL ELECTRONIC DISPLACEMENT CONTROL.****NOTE**

If pump pilot control valve is being installed, refer to paragraph 2.31.

- a. Lubricate preformed packings (79, 80, and 81) with petrolatum.
- b. Install preformed packings (79, 80, and 81) onto electronic displacement control.
- c. Align and install spool (82) slotted end to engage swash plate pin. Ensure retaining ring on control sleeve is seated against end cap assembly housing.
- d. Install hex head cap screws (76 and 77) through electronic displacement control (78) and into end cap assembly housing. Use socket wrench adapter and hex head driver socket and tighten to 10 lb-ft (14 N•m). Ensure preformed packings stay in place on electronic displacement control during installation.

**12. INSTALL REMOTE FILTER ADAPTER ONTO END CAP ASSEMBLY HOUSING.**

- a. Install hex head cap screws (73) through remote filter adapter (74) and filter adapter seal (75).
- b. Install hex head cap screws (73) into end cap assembly housing. Tighten cap screws to 19 lb-ft (25 N•m)..



**GO TO NEXT PAGE**

E. ASSEMBLE Continued.

13. INSTALL GEROTOR SET, A-FLANGE ADAPTER, AND COVER PLATE ONTO END CAP ASSEMBLY HOUSING.

- a. Install woodruff key (72) into end cap assembly housing.

**WARNING**

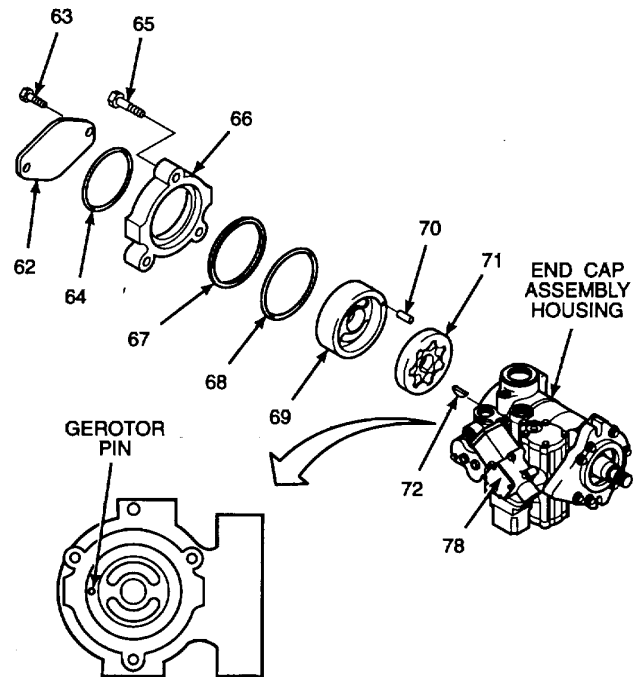
Hydraulic oil can be moderately flammable and can be an irritant to the eyes, skin, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Lubricate gerotor set (71) with clean hydraulic oil.
- c. Align and install gerotor set to engage woodruff key.
- d. Install pin (70) into gerotor cover (69).

**CAUTION**

Pin and gerotor cover must be aligned exactly to ensure counterclockwise operation of charge pump. Improper alignment of pin and gerotor cover may result in equipment damage. Align pin and gerotor cover correctly to prevent improper rotation of charge pump.

- e. Align pin and gerotor cover so pin is on opposite side of electronic displacement control (78).
- f. Install pin and gerotor cover into end cap assembly housing.
- g. Lubricate preformed packing (68) and ring spacer (67) with petrolatum.
- h. Install preformed packing (68) onto outside diameter of gerotor cover (69).
- i. Install ring spacer (67) into gerotor cover (69) groove.



- j. Install hex head cap screws (65) through A-flange adapter (66) and into end cap assembly housing. Tighten screws to 32 lb-ft (44 N•m).
- k. Rotate pump shaft with slip joint pliers to ensure charge pump does not bind.
- l. Remove hex head cap screws, A-flange adapter, ring spacer, preformed packing, and gerotor cover and pin and repeat steps e through l if pump shaft rotates with no resistance or does not turn.
- m. If removed, install preformed packing (64) into A-flange adapter.
- n. If required, install hex head screws (63) through cover plate (62) and into A-flange adapter. Tighten screws to 22 lb-ft (30 N•m).

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2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.

E. ASSEMBLE - Continued.

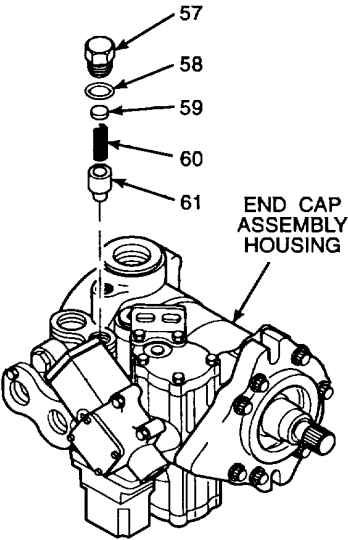
14. INSTALL SPRING SEAT INTO END CAP ASSEMBLY HOUSING.

- a. Lubricate preformed packing (58) with petrolatum.



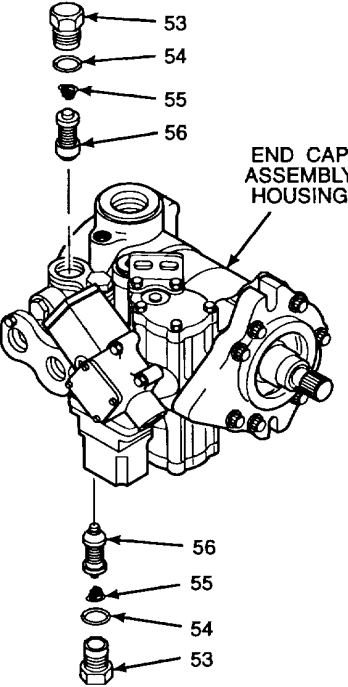
Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- b. Install preformed packing (58) onto plug (57).
- c. Install spring seat (61), spring (60), and shim (59) into end cap assembly housing.
- d. Install plug (57) into end cap assembly housing. Tighten plug to 50 lb-ft (68 N.m).



15. INSTALL SCR VALVES INTO END CAP ASSEMBLY HOUSING.

- a. Lubricate preformed packings (54) with petrolatum.
- b. Install preformed packings (54) onto plugs (53).
- c. Install SCR valves (56) and springs (55) into end cap assembly housing. Ensure valves and springs are seated.
- d. Install plugs (53). Tighten plugs to 50 lb-ft (68 N.m).

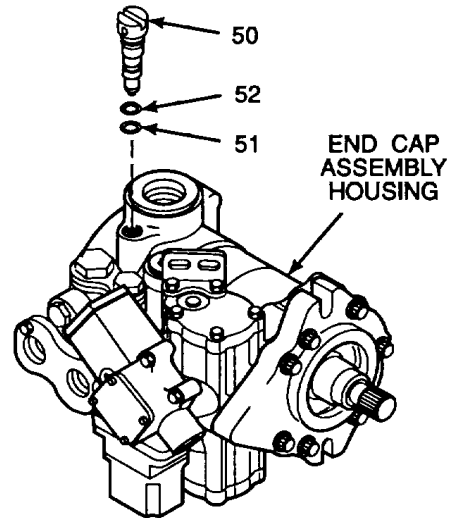


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E. ASSEMBLE - Continued.

16. INSTALL SAFETY RELIEF VALVE INTO END CAP ASSEMBLY HOUSING.

- a. Lubricate o-ring (51) and packing retainer (52) with petrolatum.
- b. Install o-ring (51) and packing retainer (52) onto safety relief valve (50).
- c. Install safety relief valve into end cap assembly housing. Use a screwdriver bit set to tighten valve to 8 lb-ft (11 N•m).



**CAUTION**

Thoroughly clean hydraulic hoses and fittings before connecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- d. Install protective caps in all hydraulic ports after assembly to avoid contamination of propulsion pump.

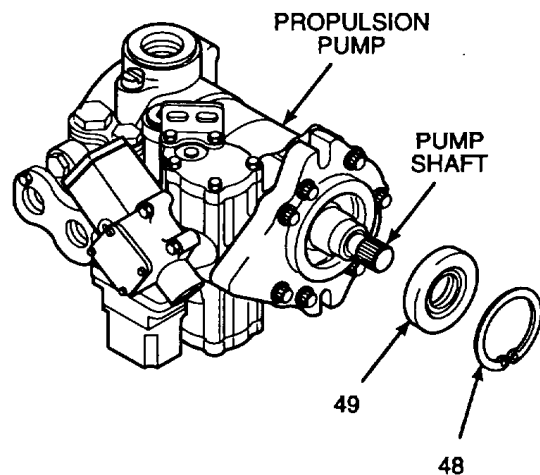
17. INSTALL PLAIN SEAL INTO PROPULSION PUMP.

- a. Lubricate inside diameter of plain seal (49) and inside diameter of propulsion pump with petrolatum.
- b. Wrap end of pump shaft with plastic bags to prevent damage to plain seal during installation.
- c. Slide plain seal over pump shaft and press into propulsion pump.
- d. Remove plastic bags from pump shaft.

**WARNING**

Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- e. Using snap ring pliers, install retaining ring (48) into propulsion pump.



**GO TO NEXT PAGE**



2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.

E. ASSEMBLE - Continued.

**NOTE**

Left and right propulsion pumps have hydraulic fittings in different locations. Each propulsion pump is addressed in this procedure.

18. INSTALL HYDRAULIC FITTINGS ONTO RIGHT PROPULSION PUMP.

- a. Remove protective caps.



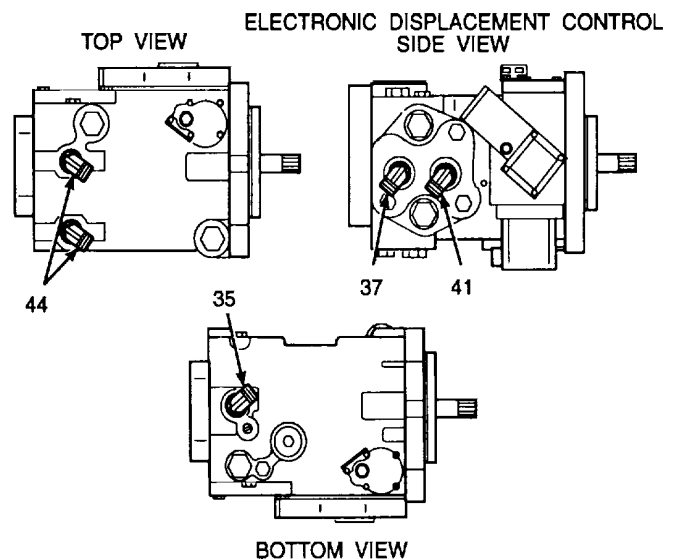
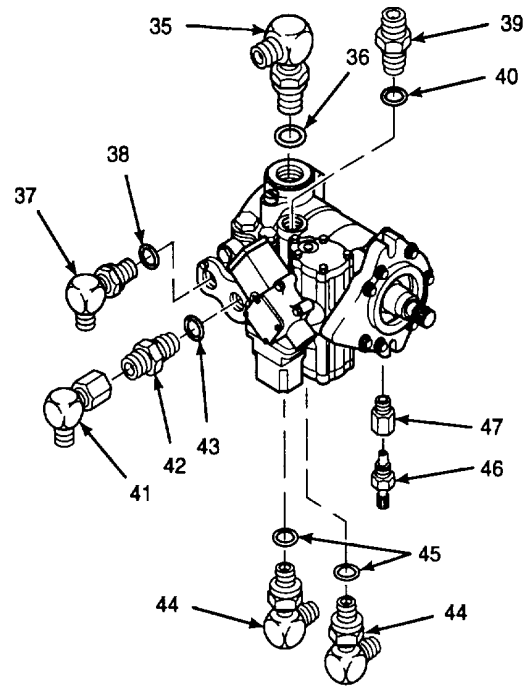
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply hydraulic fitting sealant to threads of straight adapter (47) and hydraulic oil temperature sensor (46).
- c. Install hydraulic oil temperature sensor (46) and straight adapter (47).
- d. Lubricate preformed packings (36, 38, 40, 43, and 45) with petrolatum.



Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- e. Install preformed packings (45) into packing grooves of elbows (44). Screw elbows in until packing meets packing seat in mating port. Aim elbows as shown in illustration and tighten locking nut, using combination wrench (Item 116, Appendix D).
- f. Install preformed packings (40 and 43) onto straight adapters (39 and 42). Install and tighten straight adapters.
- g. Install preformed packing (38) into packing grooves of elbow (37). Screw elbow in until packing meets packing seat in mating port. Aim elbow as shown in illustration and tighten locking nut.



- h. Install preformed packing (36) into packing grooves of elbow (35). Screw elbow in until packing meets packing seat in mating port. Aim elbow as shown in illustration and tighten locking nut, using combination wrench (Item 116, Appendix D).
- i. Apply hydraulic fitting sealant to the threads of straight adapters.
- j. Install elbow (41) onto straight adapter (42). Aim nut elbow as shown in illustration and tighten.

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2-426

E. ASSEMBLE - Continued.

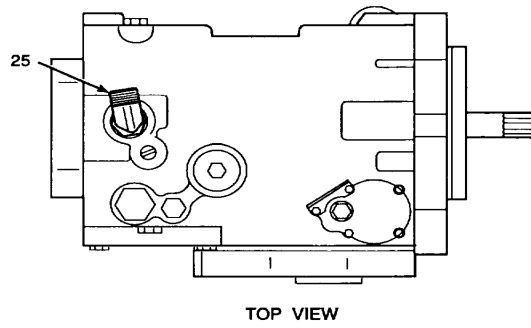
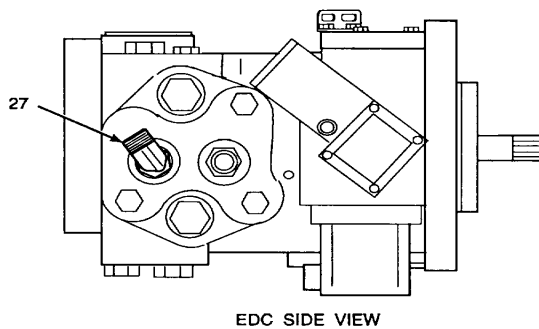
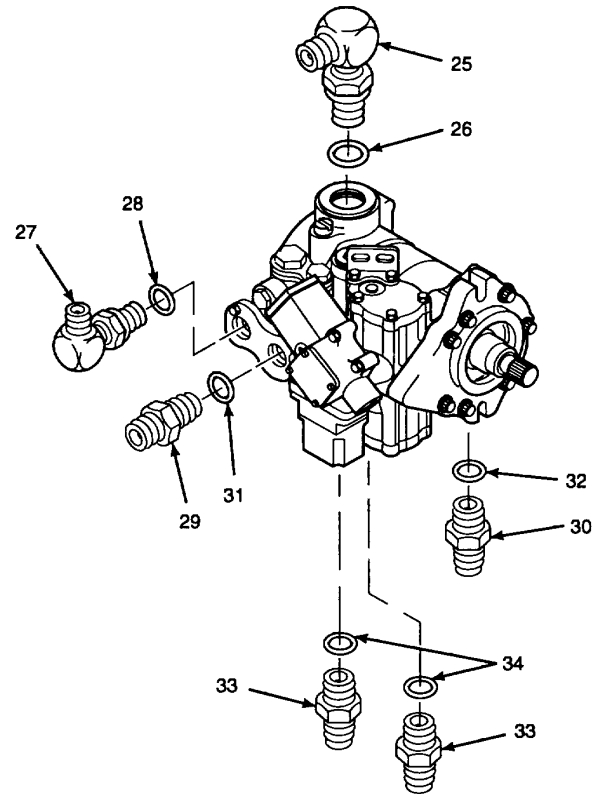
19. INSTALL HYDRAULIC FITTINGS ONTO LEFT PROPULSION PUMP.

- a. Remove protective caps.
- b. Lubricate preformed packings (26, 28, 31, 32, and 34) with petrolatum.



Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- c. Install preformed packings (34) onto straight adapters (33). Install and tighten straight adapters, using combination wrench (Item 116, Appendix D).
- d. Install preformed packings (31 and 32) onto straight adapters (29 and 30). Install and tighten straight adapters.
- e. Install preformed packing (28) into packing grooves of elbow (27). Screw elbow in until packing meets packing seat in mating port. Aim elbow as shown in illustration and tighten locking nut.
- f. Install preformed packing (26) into packing grooves of elbow (25). Screw elbow in until packing meets packing seat in mating port. Aim elbow as shown in illustration and tighten locking nut, using combination wrench (Item 116, Appendix D).



**GO TO NEXT PAGE**

**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.****F. INSTALL.**

1. INSTALL PROPULSION PUMP INTO ENGINE COMPARTMENT AND INSTALL PUMP ONTO PUMP DRIVE GEARBOX.

**WARNING**

Propulsion pump weighs 75 lbs (34 kg). Place cribbing beneath pump prior to connecting to pump drive gearbox. Damage to equipment and personnel injury may result from unexpected movement of propulsion pump.

**NOTE**

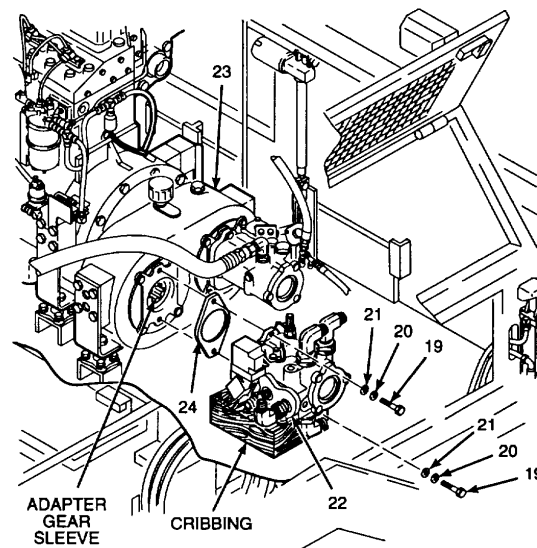
Left and right propulsion pumps are identical but the left is inverted from right while mounted on pump drive gearbox. Procedures for installing the left and right propulsion pumps are identical. The right propulsion pump is illustrated in this procedure; perform the same steps for the left propulsion pump.

- a. Place cribbing in engine compartment in front of pump drive gearbox (23).
- b. With the help of another person, install propulsion pump (22) into engine compartment and onto cribbing.
- c. Assemble flat washers (21) and lockwashers (20) onto hex head cap screws (19).

**WARNING**

Anti-seize compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Coat splines of pump shaft with anti-seize compound. If necessary, install adapter gear sleeve into pump drive gearbox (23).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply thread locking compound to hex head cap screws.

**WARNING**

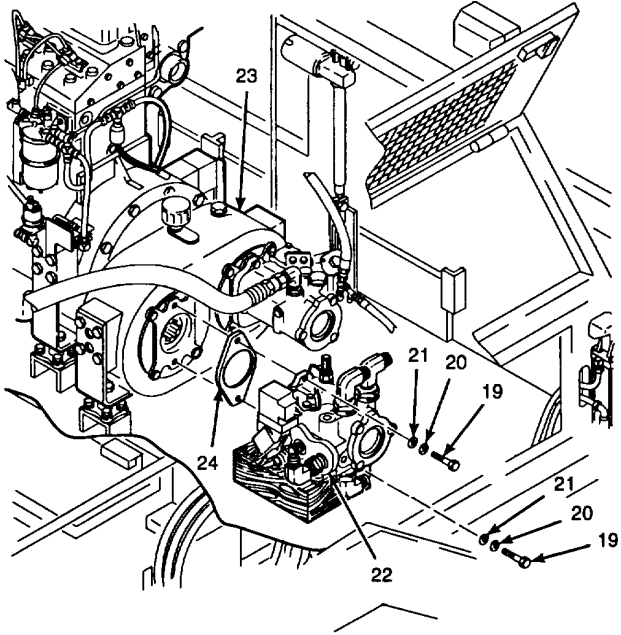
Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.

- f. Apply gasket sealing compound to both sides of gasket (24).

**GO TO NEXT PAGE**

F. INSTALL - Continued.

- g. Install upper hex head cap screw (19) with lockwasher (20) and flat washer (21) assembled through propulsion pump (22) and gasket (24).
- h. Lift and install propulsion pump (22) into pump drive gearbox (23). A slight rotation of pump may be required in order to align pump shaft splines with pump drive gearbox.
- i. Install but do not tighten hex head cap screw (19).
- j. Install lower hex head cap screw (19) with lockwasher (20) and flat washer (21) assembled through propulsion pump, gasket (24), and into pump drive gearbox. Tighten cap screws (19).

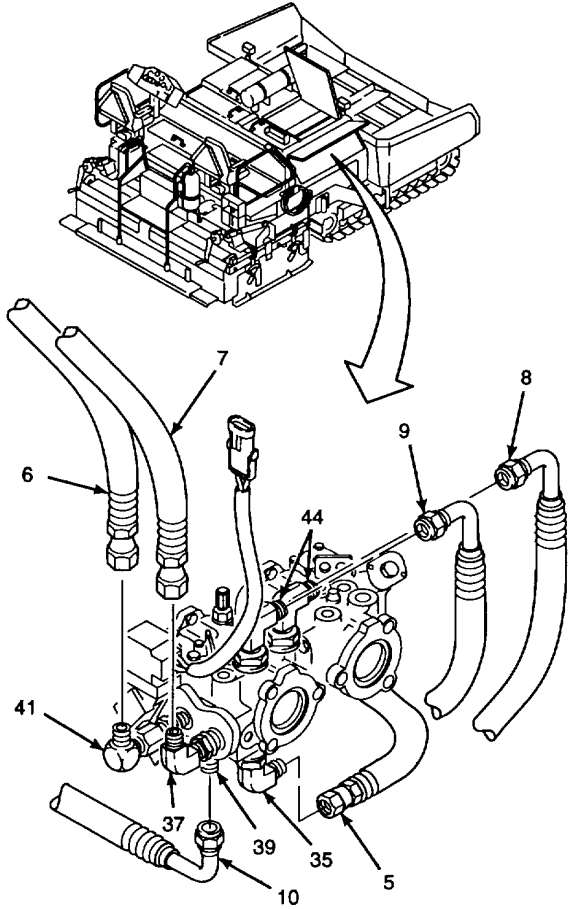


2. CONNECT HYDRAULIC HOSES AND ELECTRICAL CONNECTIONS TO IGH T PROPULSION PUMP.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to straight adapter (39) and elbows (35, 37, 41, and 44).
- b. Connect case drain hose (10) to propulsion pump. Tighten drain hose.
- c. Connect propulsion motor hoses (9 and 8) to propulsion pump. Tighten motor hoses, using combination wrench (Item 115, Appendix D).
- d. Connect hydraulic charge filter hoses (7 and 6) to propulsion pump. Tighten charge filter hoses.
- e. Connect propulsion pump suction hose (5) to propulsion pump. Tighten suction hose, using combination wrench (Item 116, Appendix D).



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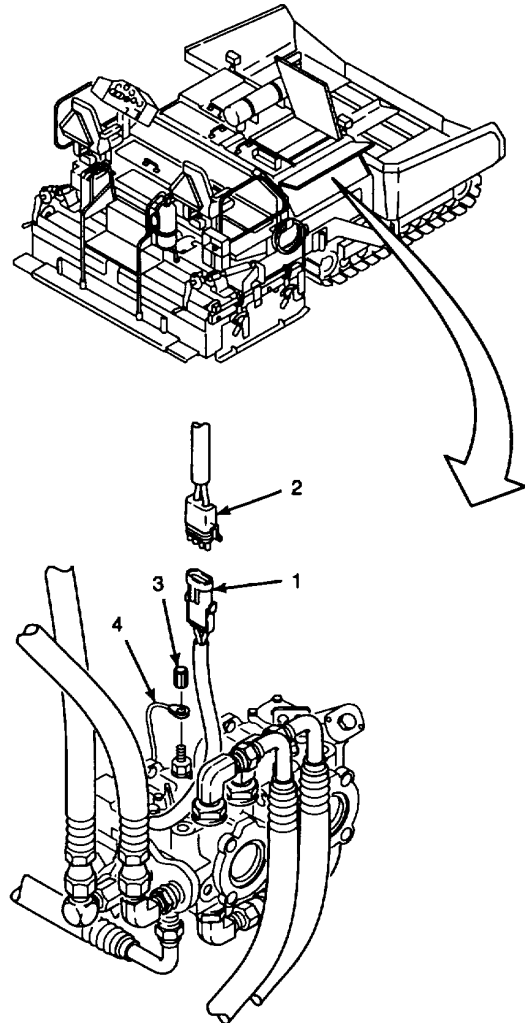
**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.****F. INSTALL - Continued.**

- f. Remove hydraulic oil temperature sensor knurled nut (3) and install harness ring terminal (4). Install knurled nut.

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- g. Apply electrical insulating varnish to hydraulic oil temperature sensor knurled nut (3) and ring terminal.
- h. Apply electrical insulating compound to male terminals of harness electrical connector (2).
- i. Connect pump pilot control valve electrical connector (1) to harness electrical connector (2).

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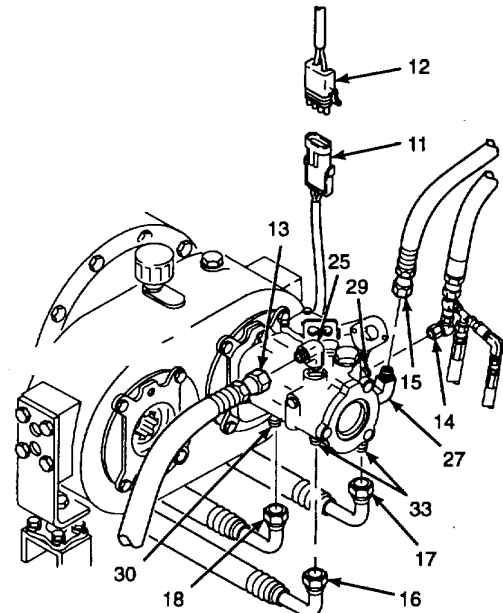
F. INSTALL - Continued.

3. CONNECT HYDRAULIC HOSES AND ELECTRICAL CONNECTIONS TO LEFT PROPULSION PUMP.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to threads of straight adapters (29, 30, and 33).
  - b. Connect propulsion motor hoses (16 and 17) to straight adapters (33) on propulsion pump. Tighten motor hoses, using combination wrench (Item 115, Appendix D).
  - c. Connect hydraulic charge filter hose (15) to elbow (27) on propulsion pump. Connect hydraulic charge filter hose (14) elbow to straight adapter (29) on propulsion pump. Tighten hose and elbow.
  - d. Connect propulsion pump suction hose (13) to elbow (25) on propulsion pump. Tighten suction hose, using combination wrench (Item 116, Appendix D).
  - e. Connect case drain hose (18) to straight adapter (30) on propulsion pump. Tighten drain hose.
  - f. Apply electrical insulating compound to male terminals of harness electrical connector (12).
  - g. Connect pump pilot control valve electrical connector (11) to harness electrical connector (12).
4. IF INSTALLING LEFT PROPULSION PUMP, INSTALL AUXILIARY VIBRATION PUMP ONTO LEFT PROPULSION PUMP PER PARAGRAPH 2.43.
  5. INSTALL AUXILIARY PUMP PER PARAGRAPH 2.42.
  6. PRIME HYDRAULIC SYSTEM PER PARAGRAPH 2.54.



NOTE: RIGHT PROPULSION PUMP REMOVED FOR CLARITY.

7. FILL PUMP DRIVER GEARBOX PER LO 5-3895-373-12.

**GO TO NEXT PAGE**

2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.

G. ADJUST.

**WARNING**

Paving machine tracks may move during this procedure. Do not allow personnel to stand on or near tracks when they are moving. Severe personnel injury or death may result from standing on or near tracks when they are moving.

- 1. JACK AND CRIB PAVING MACHINE PER TM 53895-373-20.

**NOTE**

Procedure for adjustment is the same for right and left propulsion pumps. Right propulsion pump is referenced in adjust procedure.

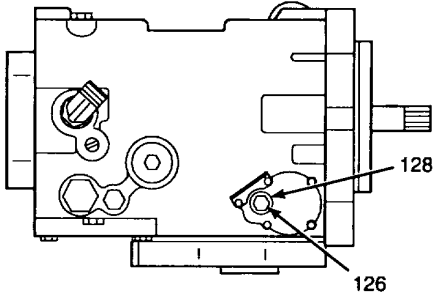
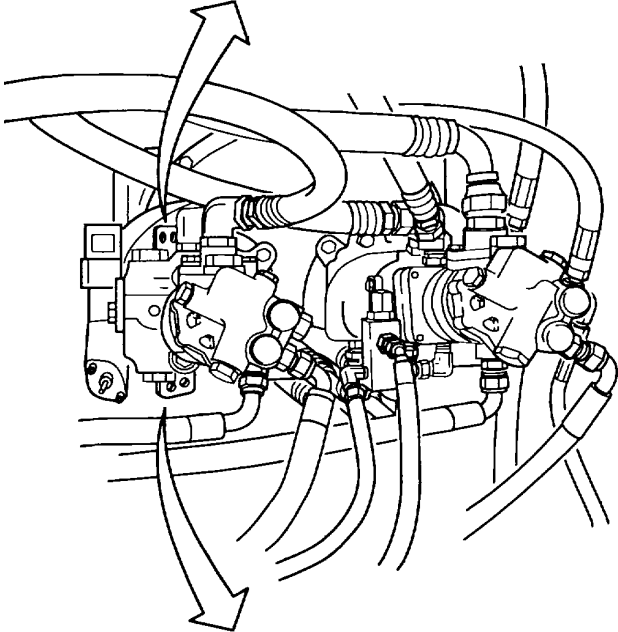
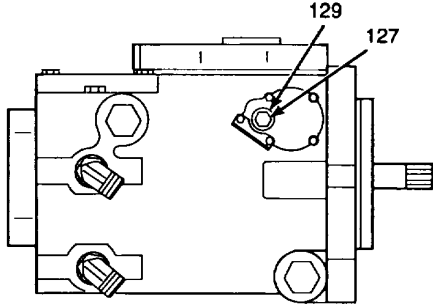
- 2. SET PROPULSION PUMP SWASH PLATE POSITION TO NEUTRAL.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Place machinery wiping towels beneath propulsion pump.
- b. Remove plugs (126 and 127) from servo ports (128 and 129).
- c. Use hydraulic systems test and repair tool outfit (HSTRU) and cross-port servo port (128 and 129). Refer to TM 9-4940-468-14.

TOP VIEW  
(HOSES REMOVED FOR CLARITY)



BOTTOM VIEW  
(HOSES REMOVED FOR CLARITY)

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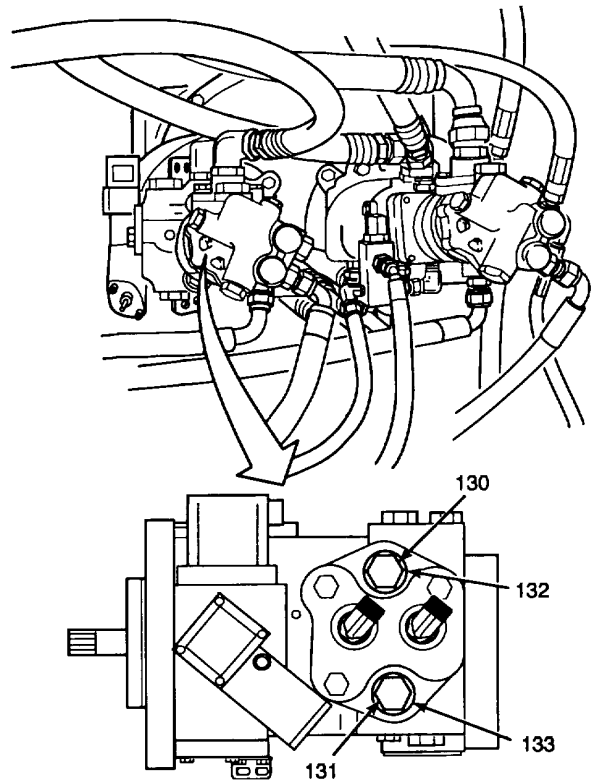
## G. ADJUST - Continued.

- d. Remove plugs (130 and 131) from servo ports (132 and 133).

**NOTE**

Use 10, 000 psi (690 BAR) pressure gauges for this procedure.

- e. Install pressure gauges into servo ports (132 and 133).
- f. Start paving machine. Refer to TM 5-3895-373-10.
- g. With the throttle control set at IDLE, allow hydraulic system to reach normal operating temperature. Refer to TM 5-3895-373-10.



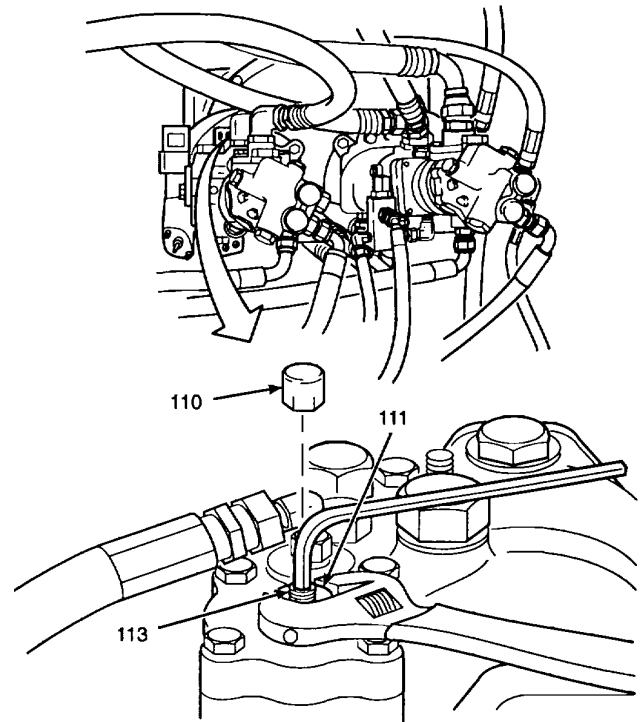
LEFT SIDE VIEW OF RIGHT PROPULSION PUMP (HOSES REMOVED FOR CLARITY)

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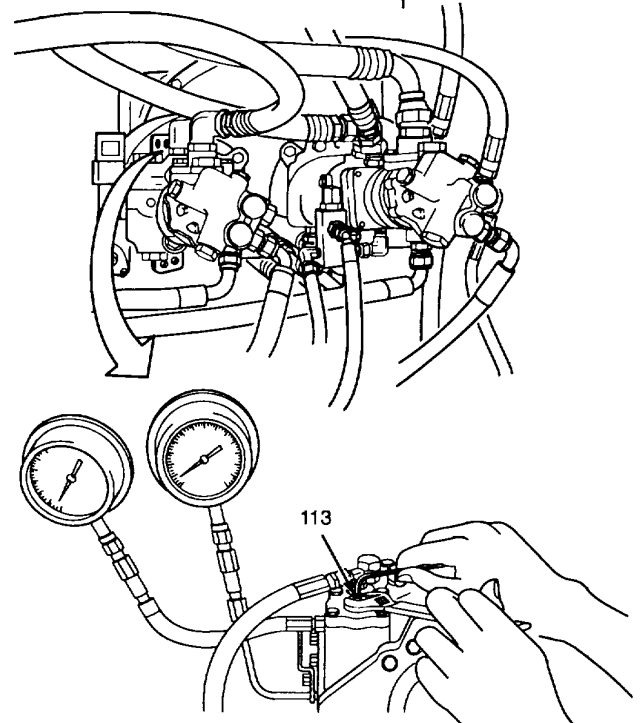


**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.****G. ADJUST - Continued.**

- h. Remove cap (110) and loosen hex nut (111) while holding special screw (113) with an alien wrench.
- i. Set throttle control idle to MAX. Refer to TM 53895-373-10.



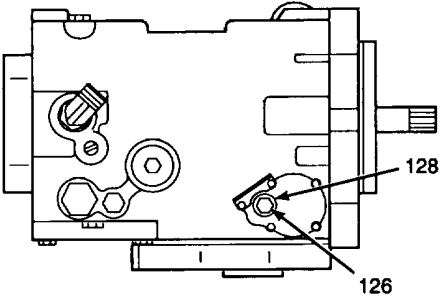
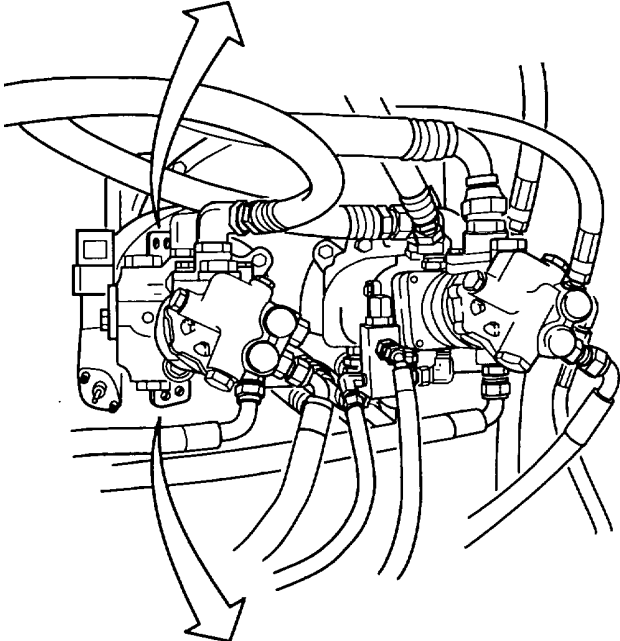
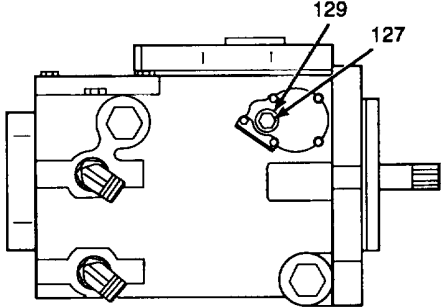
- j. Turn special screw (113) in either direction until both pressure gauge readings are equal.
- k. Turn special screw (113) clockwise until one of the pressure gauge readings increases. Turn special screw counterclockwise until other pressure gauge reading increases. Note the number of turns in the counterclockwise rotation until the second pressure gauge reading increases.
- l. Turn special screw (113) clockwise, half the amount of rotation noted in step k.
- m. While holding special screw (113) from turning, use an adapter and a crowfoot wrench (Item 120, Appendix D) to tighten hex nut (111) to 15 lb-ft (20 N.m).
- n. Shut off engine and remove key from ignition switch. Refer to TM 5-3895-373-10.
- o. Install cap (110).

**GO TO NEXT PAGE**

G. ADJUST - Continued.

- p. Remove cross-port connections from servo ports (128 and 129).
- q. Install and tighten plugs (126 and 127).

TOP VIEW  
(HOSES REMOVED FOR CLARITY)



BOTTOM VIEW  
(HOSE REMOVED FOR CLARITY)

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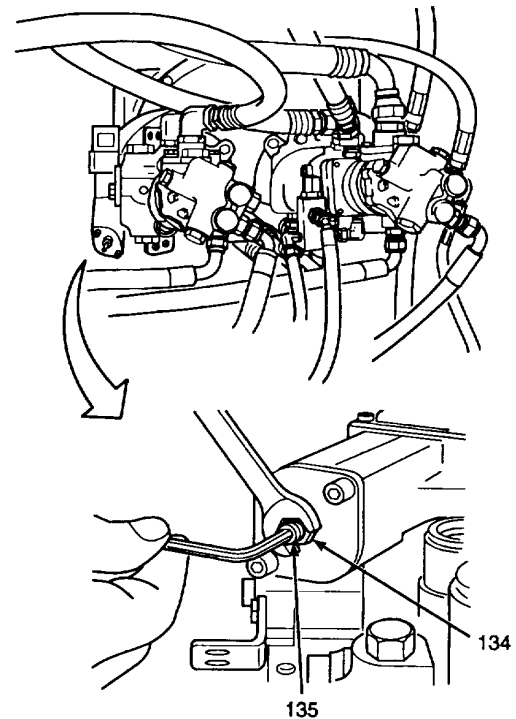
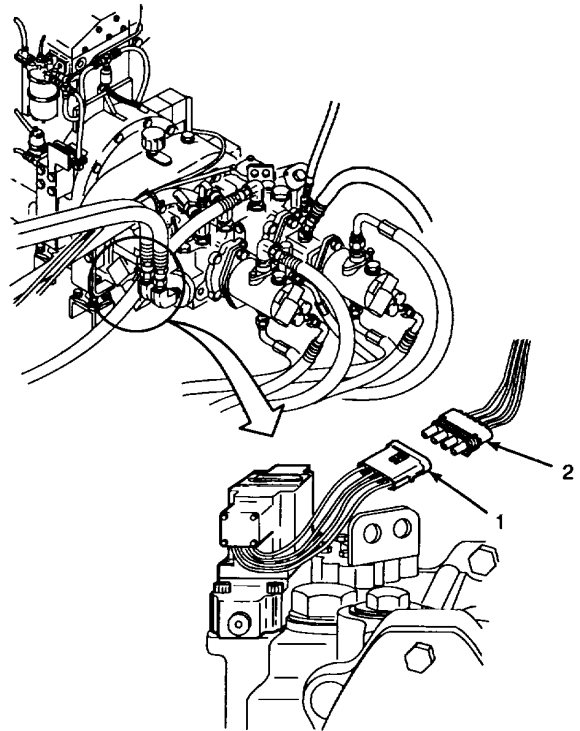
**2.30 REPLACE/REPAIR PROPULSION PUMP - Continued.**

G. ADJUST - Continued.

**3. SET ELECTRONIC DISPLACEMENT CONTROL POSITION TO NEUTRAL.****WARNING**

Paving machine tracks may move during this procedure. Do not allow personnel to stand on or near tracks when they are moving. Severe personnel injury or death may result from standing on or near tracks when they are moving.

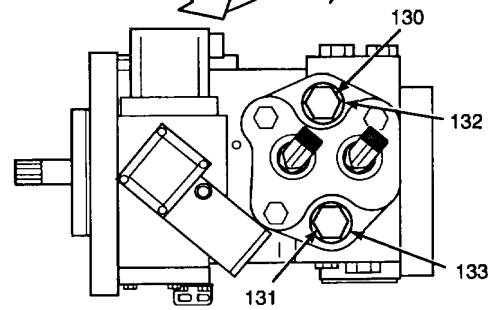
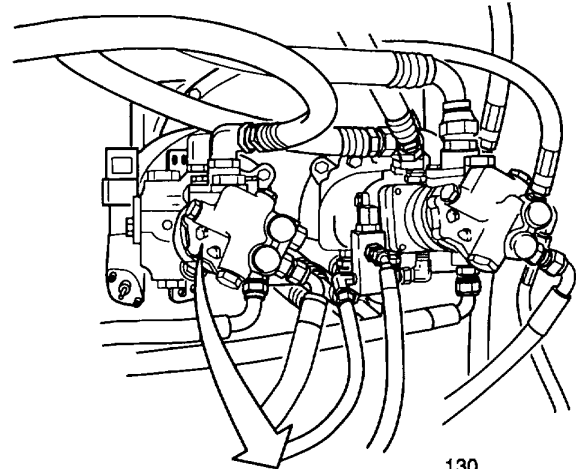
- a. Disconnect pump pilot control valve electrical connector (1) from harness electrical connector (2).
- b. Start paving machine. Refer to TM 5-3895-373-10.
- c. With the throttle control set at IDLE, allow hydraulic system to reach normal operating temperature. Refer to TM 5-3895-373-10.
- d. Loosen lock nut (134) while holding screw (135) with an allen wrench.
- e. Set throttle control to MAX. Refer to TM 5-3895373-10.
- f. Slowly turn screw (135) in either direction until one of the pressure gauge readings increases. Turn screw in the opposite direction until other pressure gauge reading increases. Note the number of turns made until the second pressure gauge reading increases.
- g. Turn screw (135) backward, half the amount of rotation noted in step f.
- h. While holding screw (135) from turning, use a crowfoot wrench (Item 119, Appendix D) to tighten lock nut (134) to 27 lb-in (3 N.m).
- i. Shut off engine and remove key from ignition switch. Refer to TM 5-3895-373-10.

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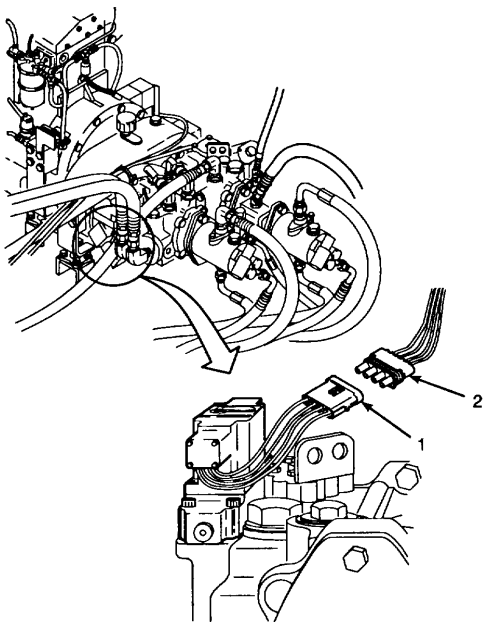
G. ADJUST - Continued.

- j. Remove pressure gauges from servo ports (132 and 133).
- k. Install and tighten plugs (130 and 131).
- l. Apply electrical insulating compound to male terminals of harness electrical connectors (2).
- m. Connect pump pilot control valve electrical connector (1) to harness electrical connector (2).

4. REMOVE CRIBBING AND LOWER PAVING MACHINE PER TM 5-3895-373-20.



LEFT SIDE VIEW OF RIGHT PROPULSION PUMP (HOSES REMOVED FOR CLARITY)



**NOTE**

FOLLOW-ON-TASKS: Adjust/calibrate control handle per TM 5-3895-373-20.  
 Install right access cover per TM 5-3895-373-10.  
 Close right access door per TM 5-3895-373-10.  
 Close front top right access door per TM 5-3895-373-10.

**END OF TASK**

**2.31 REPLACE PUMP PILOT CONTROL VALVE.**

This task covers:      a. Remove                      b. Install

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
O-ring tool (Item 103, Appendix D)

**References:**

TM 5-3895-373-10  
TM 5-3895-373-24P

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Electrical insulating compound (Item 10, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Preformed packings  
Pump pilot control valve

**Equipment Condition:**

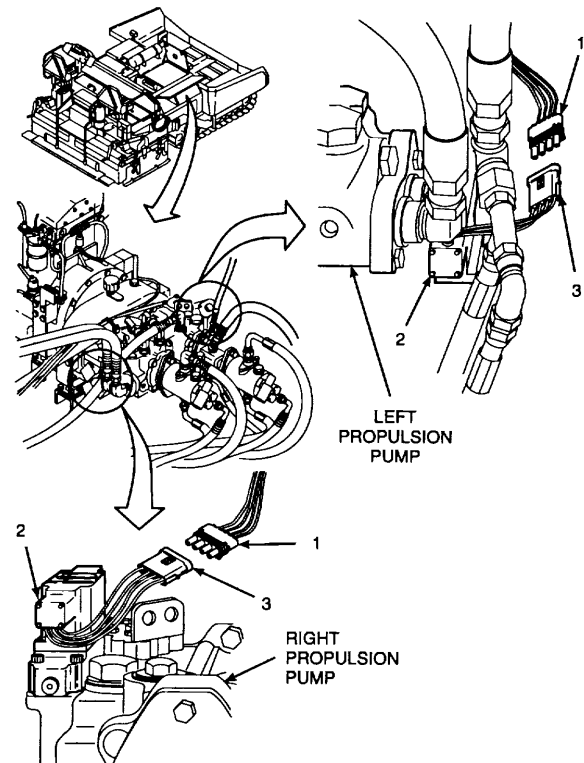
Right access door open per TM 5-3895-373-10.  
Right access cover removed per TM 5-3895-373-10.  
Front top right access door open per TM 5-3895-373-10.

**NOTE**

Refer to the illustration for the location of the pump pilot control valves on both the right and left propulsion pumps. The procedures given are for the right propulsion pump. Procedures for the left propulsion pump are identical.

**A. REMOVE.****1. REMOVE PUMP PILOT CONTROL VALVE FROM ELECTRONIC DISPLACEMENT CONTROL.**

- a. Disconnect harness electrical connector (1) from pump pilot control valve (2) electrical connector (3).



**GO TO NEXT PAGE**

- A. REMOVE - Continued.
  - b. Remove socket head cap screws (4) from pump pilot control valve (2).
  - c. Remove pump pilot control valve (2).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

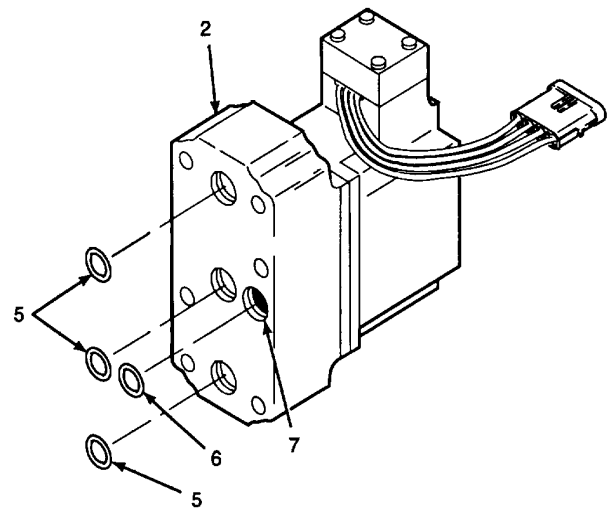
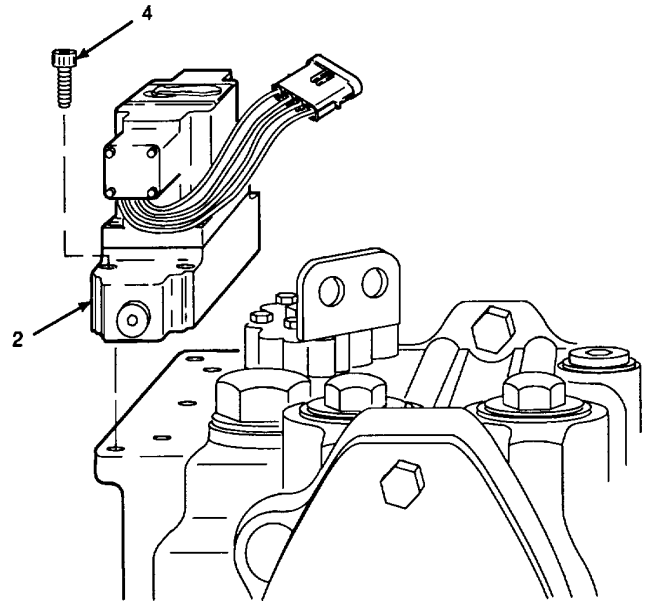
- d. Use a cleaning cloth to clean up any excess hydraulic oil.

2. REMOVE PREFORMED PACKINGS FROM PUMP PILOT CONTROL VALVE.

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings. Scratched or dented seal grooves can cause valve leakage.

- a. Use an o-ring tool and remove preformed packings (5) from pump pilot control valve (2). Discard preformed packings.
- b. Use an o-ring tool and remove preformed packing (6) from screen (7). Discard preformed packing.



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## 2.31 REPLACE PUMP PILOT CONTROL VALVE.

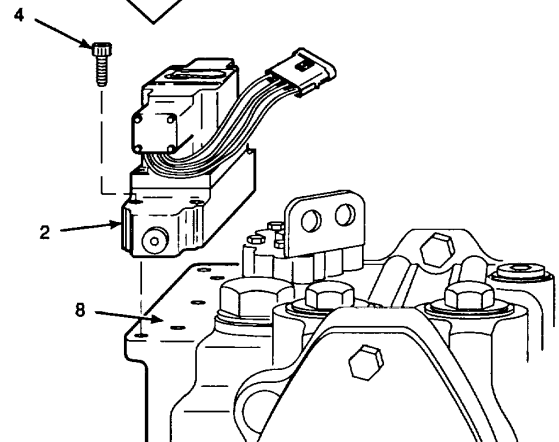
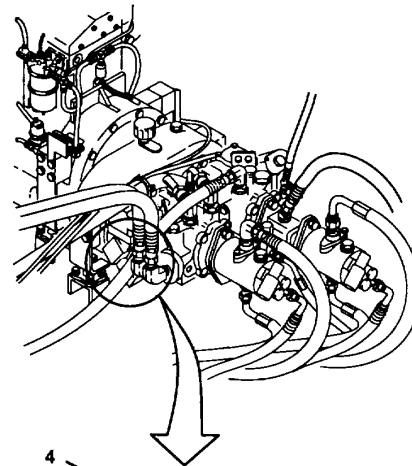
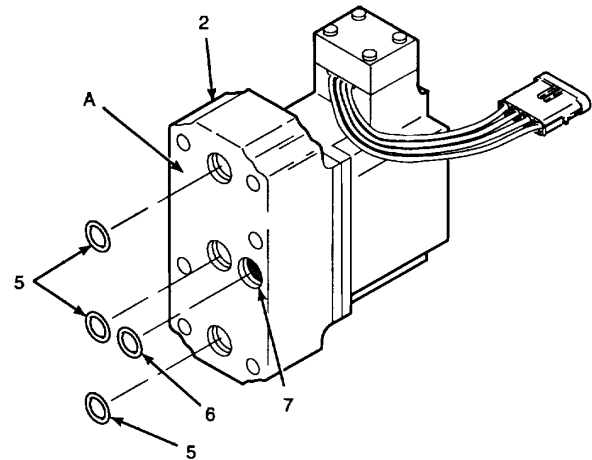
### B. INSTALL.

1. INSTALL PREFORMED PACKINGS ON PUMP PILOT CONTROL VALVE.
  - a. Wipe off pump pilot control valve mounting, surface A, with a clean, lint-free cloth.
  - b. Lubricate preformed packings (5) with petrolatum.
  - c. Install preformed packings (5) into grooves on pump pilot control valve (2).
  - d. Lubricate preformed packing (6) with petrolatum.
  - e. Install preformed packing (6) into groove around screen (7).
2. INSTALL PUMP PILOT CONTROL VALVE ON ELECTRONIC DISPLACEMENT CONTROL.



Do not allow contamination or dirt to enter electronic displacement control or pump pilot control valve. Wipe mating surfaces of electronic displacement control and pump pilot control valve with a clean, lint-free cloth to remove contamination and dirt. Poor performance or equipment damage can result from contamination or dirt entering propulsion system.

- a. Wipe mounting surface of electronic displacement control (8) with a clean, lint-free cloth.
- b. Position pump pilot control valve (2) on electronic displacement control (8).
- c. Install socket head cap screws (4) through pump pilot control valve (2) and into electronic displacement control. Tighten socket head cap screws until snug.



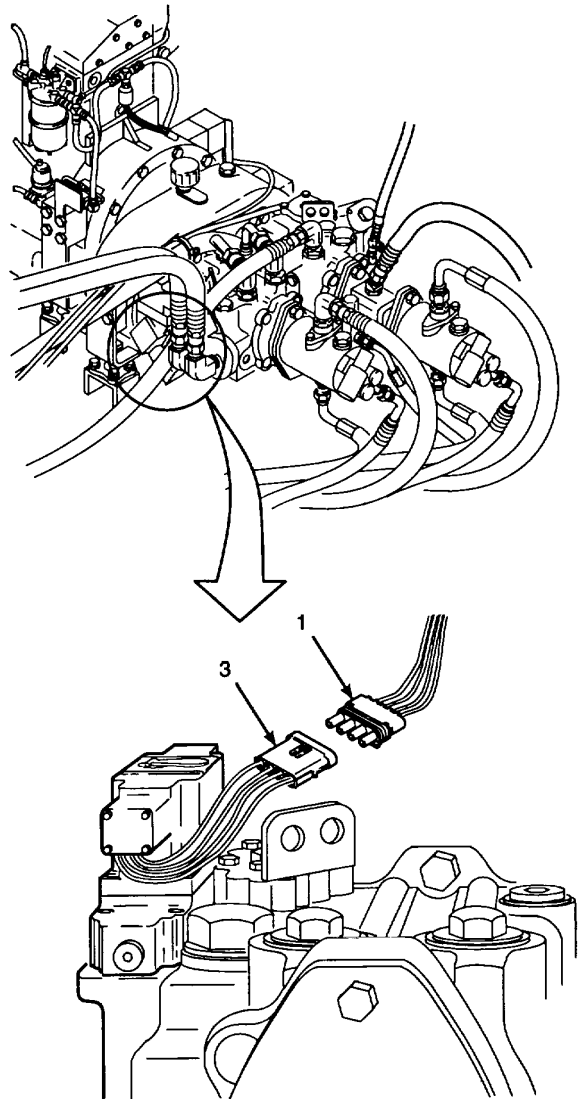
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## B. INSTALL - Continued.

- d. Apply electrical insulating compound to male terminals of harness electrical connector (1).
- e. Connect pump pilot control valve electrical connector (3) to harness electrical connector (1).

## 3. CHECK PAVING MACHINE CONTROL HANDLE TRACKING.

- a. Start engine per TM 5-3895-373-10 and drive paving machine forward for several hundred feet with both left and right control handles pressed forward evenly. Repeat the same in reverse. Check for mistracking in left and right tracks in forward and reverse directions. Shut off engine.
- b. Control handles may need adjustment if left and right tracks are not moving together at the same speed. Refer to TM 5-3895-373-20 for control handle adjustment procedure.

**NOTE**

**FOLLOW-ON-TASKS:** Install right access cover per TM 5-3895-373-10.  
 Close right access door per TM 5-3895-373-10.  
 Close front top right access door per TM 5-3895-373-10.

**END OF TASK**



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**2.32 REPLACE/REPAIR PROPULSION MOTOR.**


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This task covers:

a. Remove	b. Disassemble	c. Clean
d. Inspect	e. Assemble	f. Adjust
g. Install		

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Centering jig (Item 2, Appendix C)  
Combination wrench (Item 115, Appendix D)  
Drain pan (Item 63, Appendix D)  
Hex head cap screws (Item 26, Appendix D)  
Hex head cap screws (Item 27, Appendix D)  
Hex head driver socket (Item 89, Appendix D)  
Hex head driver socket (Item 90, Appendix D)  
Hex head driver socket (Item 91, Appendix D)  
Hydraulic systems test and repair tool outfit  
(HSTRU) (Item 108, Appendix D)  
Micrometer depth gage (Item 44, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Plastic hammer (Item 50, Appendix D)  
Retaining ring pliers (Item 65, Appendix D)  
Shaft seal installation tool (Item 21, Appendix C)  
Snap ring pliers (Item 66, Appendix D)  
Thickness gage (Item 46, Appendix D)  
Torque wrench, 0 to 175 lb-ft, 1/2 in. drive  
(Item 132, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Valve sleeve installation tool (Item 26, Appendix C)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Gasket sealing compound (Item 11, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound (Item 15, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers  
O-rings  
Preformed packings  
Metal seal rings  
Shaft assembly  
Shims

Personnel Required:

Two 62B construction equipment repairers. Second person to assist with removal and installation of propulsion motor from speed reduction gearbox.

References:

TM 5-3895-373-20  
TM 5-3895-373-24P  
TM 9-4940-468-14

Equipment Condition:

Evacuate oil from hydraulic system per paragraph 2.54.  
Paving machine jacked and cribbed per TM 5-3895-373-20.

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**GO TO NEXT PAGE**

A. REMOVE.

**NOTE**

The instructions for disassembly and assembly of both the left and right propulsion motors are shown.

1. DISCONNECT TUBES FROM PROPULSION MOTOR.

**CAUTION**

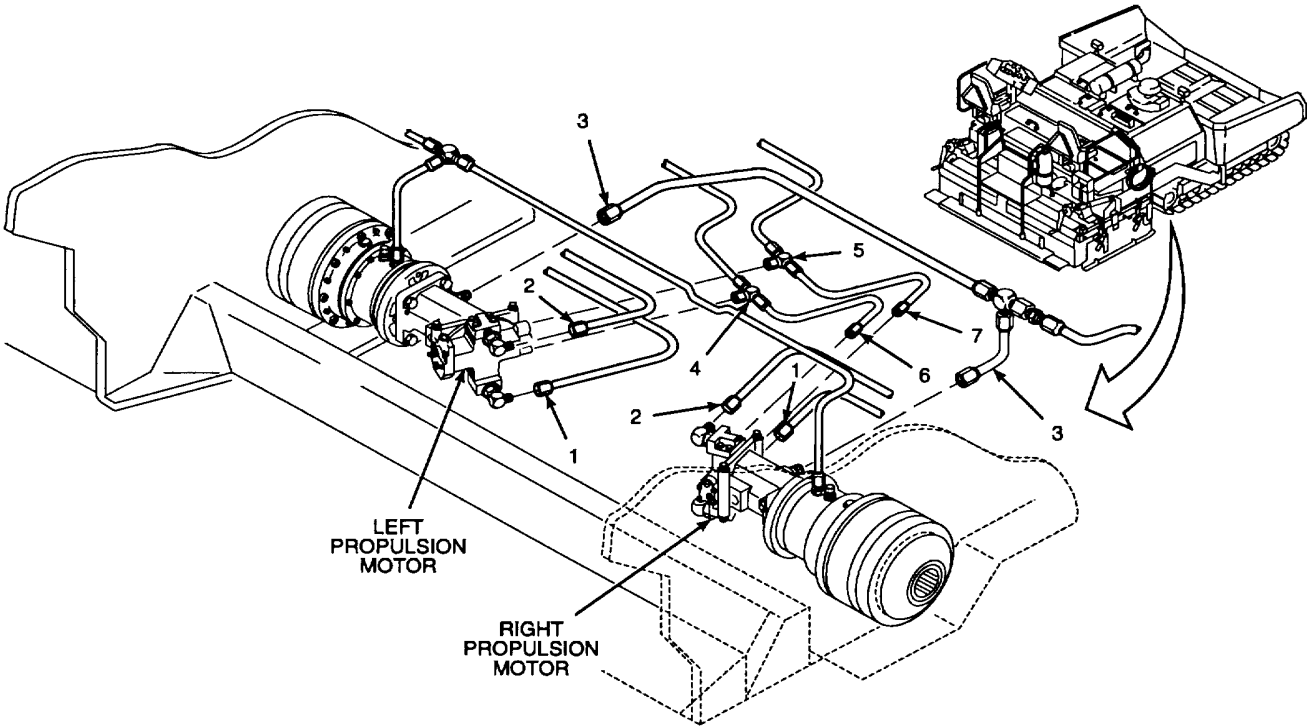
Thoroughly clean hydraulic tubes and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

a. Wipe off hydraulic tubes and fittings with a cleaning cloth.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Tag and disconnect tubes (1 through 3) at left or right propulsion motor and allow hydraulic oil to drain into drain pan. Plug tubes and cap elbows and straight adapters.
- c. Tag and disconnect tees (4 and 5) at left propulsion motor, or tubes (6 and 7) at right motor.
- d. Plug tees (4 and 5) and cap straight adapter on left propulsion motor, or plug tubes (6 and 7) and cap straight adapter on right propulsion motor.



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**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued**


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A. REMOVE - Continued.

2. REMOVE PROPULSION MOTOR.

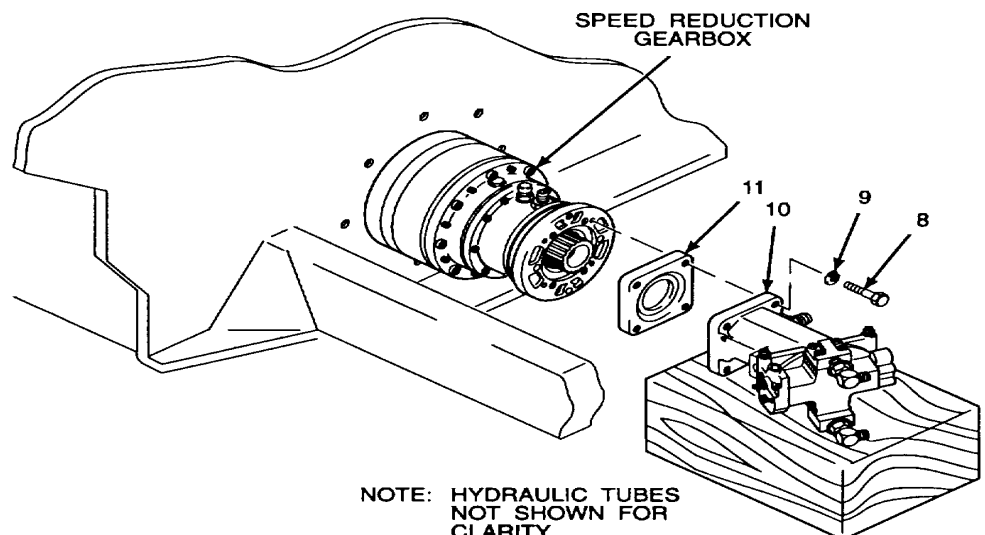
**WARNING**

Propulsion motor weighs approximately 70 lbs (32 kg). Place cribbing beneath propulsion motor prior to removal from speed reduction gearbox. Damage to equipment and personnel injury may result from unexpected movement of propulsion motor.

**NOTE**

Universal joint, 1/2 in. by 1/2 in., may be needed to access hex head cap screws.

- a. Place cribbing beneath propulsion motor.



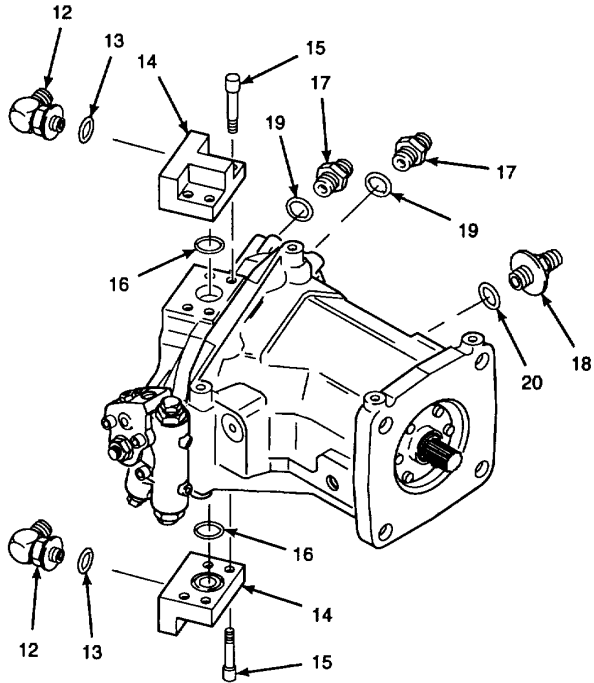
- b. Remove hex head cap screws (8) and lockwashers (9). Discard lockwashers.
- c. With the help of another person, pull propulsion motor (10) straight back from speed reduction gearbox. Set motor down on cribbing.
- d. Remove mounting flange (11) by tapping with a plastic hammer.
- e. Take propulsion motor (10) to clean work area for disassembly and repair.

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A. REMOVE - Continued.

3. REMOVE HYDRAULIC FITTINGS.

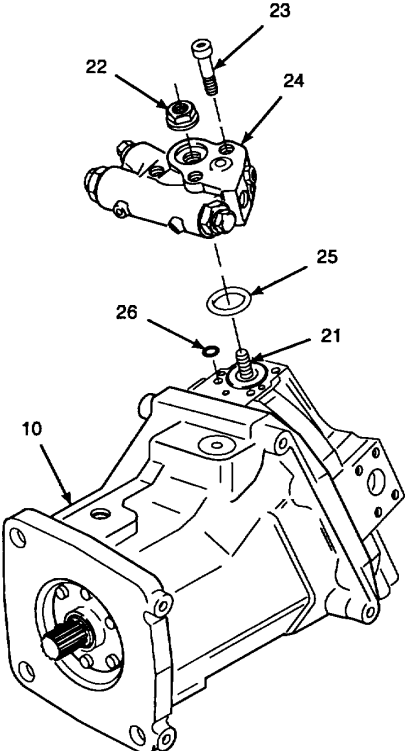
- a. Loosen adapter nuts and remove elbows (12) and preformed packings (13) from adapter blocks (14). Discard preformed packings.
- b. Remove socket head cap screws (15).
- c. Remove adapter blocks (14) and preformed packings (16).
- d. Remove straight adapters (17 and 18) and preformed packings (19 and 20). Discard preformed packings.



B. DISASSEMBLE.

1. REMOVE HYDRAULIC ASSEMBLY HOUSING.

- a. Measure length of exposed threads on adjustment bolt (21). This measurement will be used at reassembly.
- b. While holding adjustment bolt (21) with wrench, remove nut (22).
- c. Remove socket head cap screws (23).
- d. While turning adjustment bolt (21) clockwise, remove hydraulic assembly housing (24), o-ring (25), and preformed packing (26) from propulsion motor (10). Discard o-ring and preformed packing.



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**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued**


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B. DISASSEMBLE - Continued.

2. REMOVE VALVE ASSEMBLY FROM HYDRAULIC ASSEMBLY HOUSING.

**NOTE**

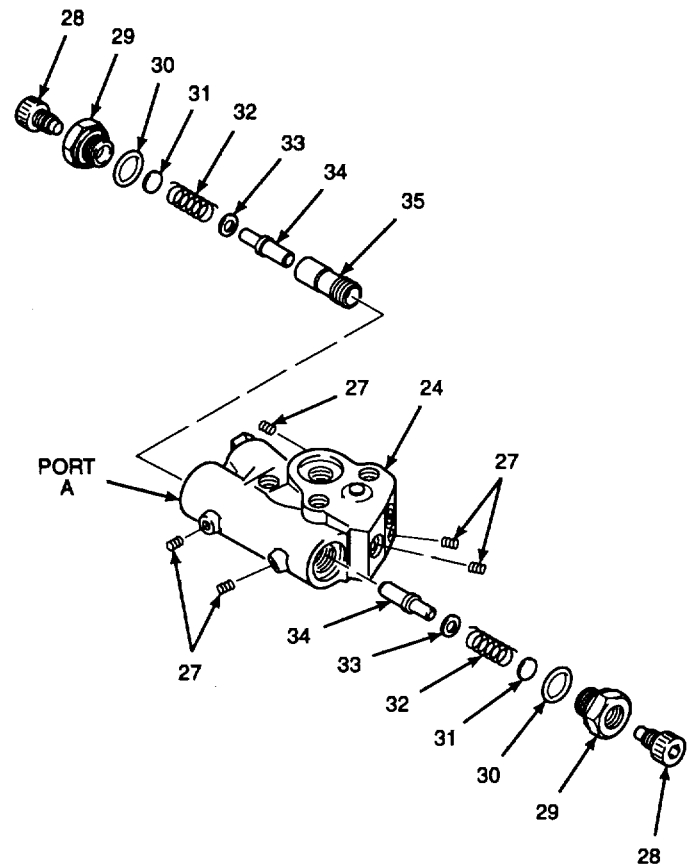
Set screws (27) will only need to be removed if replacing hydraulic assembly housing (24).

- a. Remove set screws (27).
- b. Remove plugs (28 and 29) and o-rings (30). Discard o-rings.
- c. Remove washers (31) and springs (32).
- d. Remove flat washers (33) and hydraulic pistons (34).



Valve sleeve can only be removed from hydraulic assembly housing using valve sleeve installation tool. Do not force valve sleeve from hydraulic assembly housing. Damage to valve sleeve and hydraulic assembly housing can result from improper removal of valve sleeve.

- e. Use valve sleeve installation tool to unscrew and remove valve sleeve (35) from port (A) of hydraulic assembly housing.

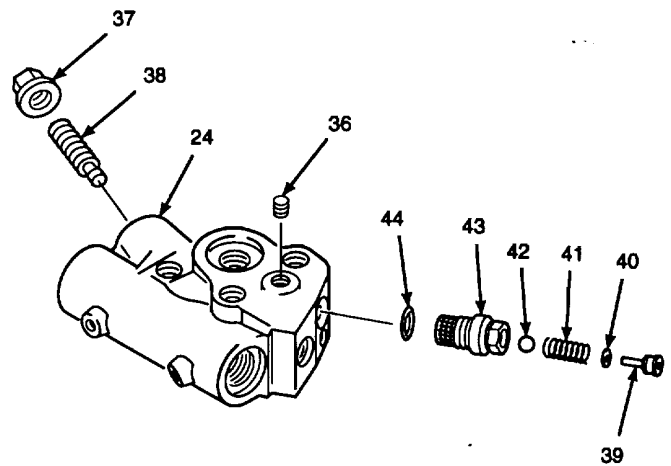


**GO TO NEXT PAGE**

B. DISASSEMBLE - Continued.

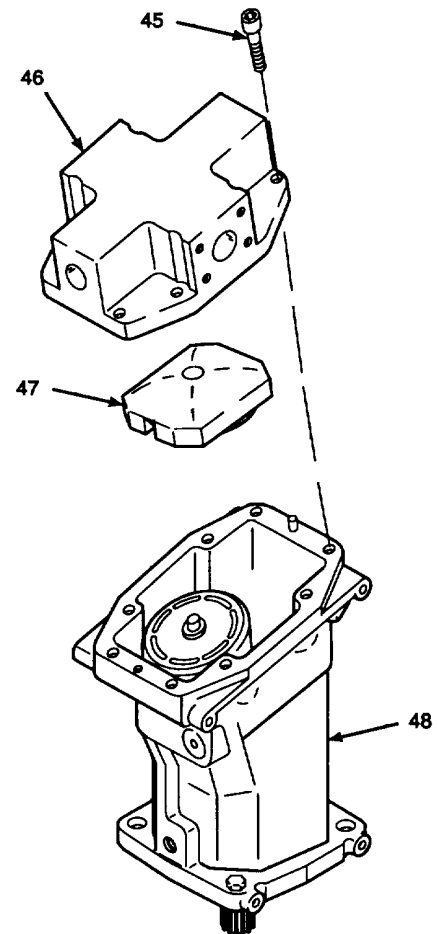
3. REMOVE PRESSURE VALVE ASSEMBLY FROM HYDRAULIC ASSEMBLY HOUSING.

- a. Remove set screw (36), nut (37), and screw (38) from hydraulic assembly housing (24).
- b. Remove plug (39), shim (40), spring (41), and steel ball (42) from valve sleeve (43).
- c. Remove valve sleeve (43) and o-ring (44). Discard o-ring.



4. REMOVE PORT PLATE HOUSING AND PORT PLATE FROM MECHANICAL DRIVE HOUSING.

- a. Remove socket head cap screws (45) and lift off port plate housing (46).
- b. Remove port plate (47) from mechanical drive housing (48).



GO TO NEXT PAGE

## 2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued

B. DISASSEMBLE - Continued.

### 5. REMOVE PISTON AND DISPLACEMENT ROD FROM PORT PLATE HOUSING.

- a. While holding displacement rod (49) and piston (50), press down on sleeve spacer (51) to compress spring (52).

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- b. Use an o-ring tool to remove retaining ring (53) from piston (50).
- c. Remove sleeve spacer (51), spring (52), and adjustment bolt (54).
- d. Remove set screw (55).

**NOTE**

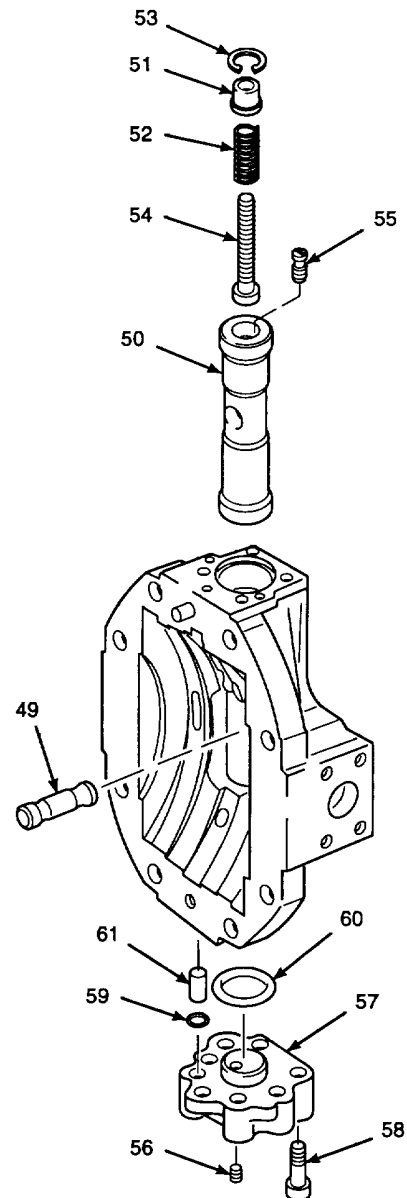
Displacement rod is hardened. Pliers may be used for removal of displacement rod.

- e. Remove displacement rod (49) and piston (50).
- f. Remove nozzle (56) from port plate cover (57).

**NOTE**

Tube (61) is pressed-fit and held in place with thread locking compound. Do not remove unless damaged.

- g. Remove socket head cap screws (58), preformed packing (59), o-ring (60), tube (61), and port plate cover (57). Discard preformed packing and o-ring.



**GO TO NEXT PAGE**

B. DISASSEMBLE - Continued.

6. REMOVE CYLINDER BLOCK FROM MECHANICAL DRIVE HOUSING.

- a. Install a bearing puller from universal puller kit using two hex head cap screws (Item 27, Appendix D).
- b. Compress spring (62) in cylinder block (63) with bearing puller.

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- c. Use snap ring pliers to remove retaining ring (64) from cylinder block (63).

**WARNING**

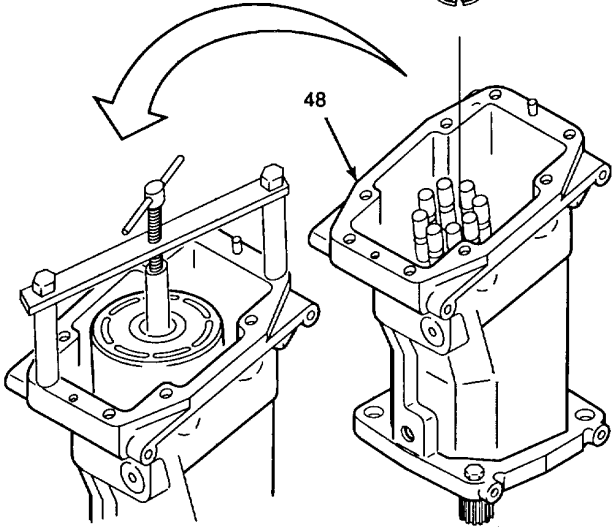
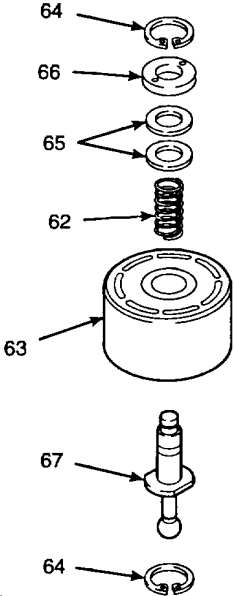
Use care when releasing spring pressure. Spring could fly out and cause injury.

- d. Slowly release pressure on spring (62).
- e. Remove bearing puller and hex head cap screws.

**NOTE**

Shims (65) may be installed underneath ring spacer (66) at the factory to obtain correct cylinder block projection.

- f. Remove spring (62) and ring spacer (66). Remove shims (65) if present.
- g. Lift cylinder block (63) straight out of mechanical drive housing (48).
- h. Use snap ring pliers to remove retaining ring (64) from cylinder block (63).
- i. Remove shaft (67).



**GO TO NEXT PAGE**



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**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued**


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## B. DISASSEMBLE - Continued.

## 7. REMOVE MOTOR COVER AND SHAFT ASSEMBLY FROM MECHANICAL DRIVE HOUSING.

- a. Remove socket head cap screws (68) and seal rings (69) from motor cover (70). Discard metal seal rings.
- b. Thread two hex head cap screws (Item 26, Appendix D) through small holes in motor cover (70).
- c. Use a bearing puller to pull motor cover (70) from mechanical drive housing (48).
- d. Remove bearing puller and hex head cap screws from motor cover (70).

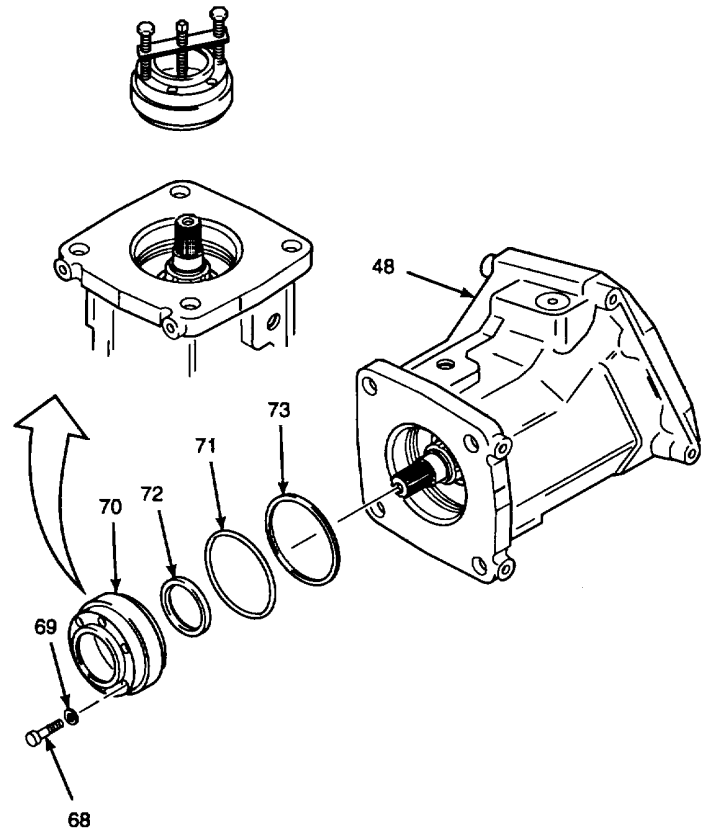


Use caution when removing seals and o-rings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and o-rings. Use an o-ring tool to remove seals and o-rings.

**NOTE**

O-ring (71) may remain inside mechanical drive housing.

- e. Use an o-ring tool to remove o-ring (71) from motor cover (70). Discard o-ring.
- f. Use a flat blade screwdriver and carefully remove seal ring (72) from motor cover (70). Discard metal seal ring.
- g. Remove shim (73).



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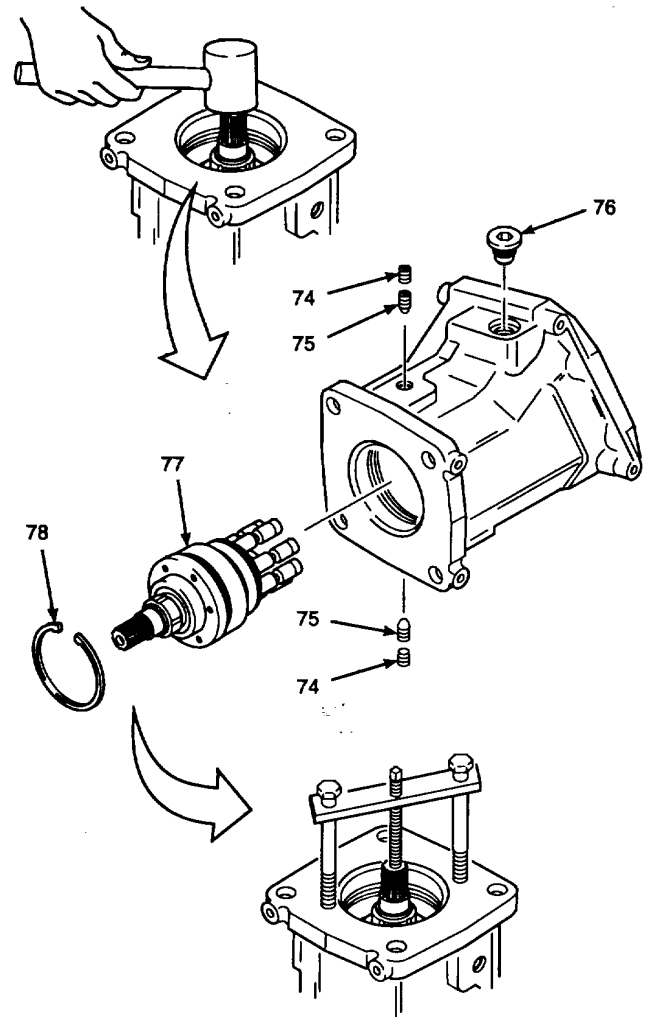
B. DISASSEMBLE - Continued.

- h. Remove set screws (74 and 75) and plug (76).
- i. Use a plastic hammer and tap shaft assembly (77) lightly into mechanical drive housing.

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- j. Use retaining ring pliers and remove retaining ring (78).
- k. Install bearing puller onto mechanical drive housing.
- l. Attach bearing puller to shaft assembly.
- m. Pull shaft assembly (77) from mechanical drive housing.
- n. Remove bearing puller and screws from mechanical drive housing.



C. CLEAN.

- 1. CLEAN ALL METAL PARTS IN CLEANING SOLVENT.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent.

GO TO NEXT PAGE

**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.****C. CLEAN - Continued.**

Use caution when scraping residue from flanges of mechanical drive housing and port plate housing. Putty knife may score sealing surfaces and debris may fall into open ports. Failure to do so may result in poor sealing and equipment damage.

- b. Use a putty knife to scrape sealant residue from flanges of mechanical drive housing and port plate housing.



Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield, and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- c. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from housings, threaded surfaces, bores, and valve seats.
- d. Dry all parts with a clean, lint-free cloth.



Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**2. CLEAN FASTENERS, SET SCREWS AND PARTS TREATED WITH THREAD COMPOUND IN THREAD LOCKING COMPOUND SOLVENT.**

- a. Clean hex head cap screws, socket head cap screws and set screws with thread locking compound solvent.

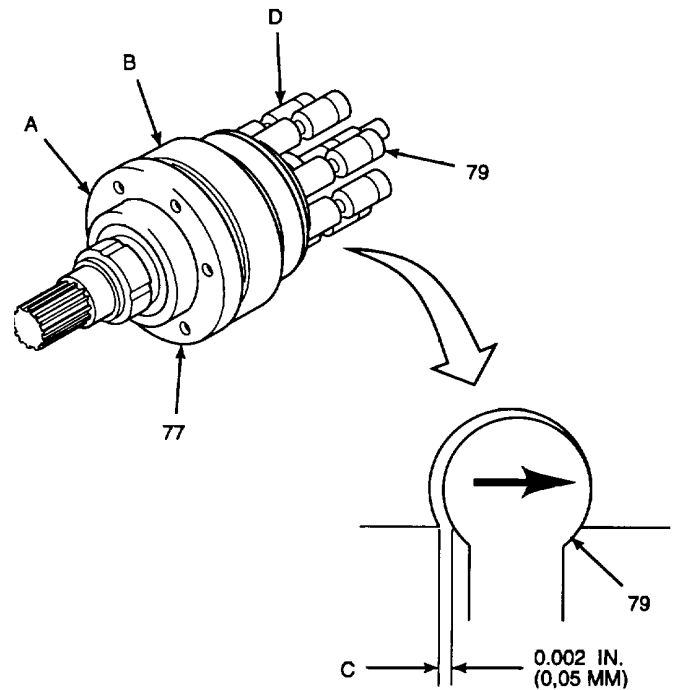
- b. Clean valve sleeve, pin, nozzle, and tube with thread locking compound solvent.
- c. Wipe fasteners, set screws, and parts with a clean, lint-free cloth.

**GO TO NEXT PAGE**

D. INSPECT.

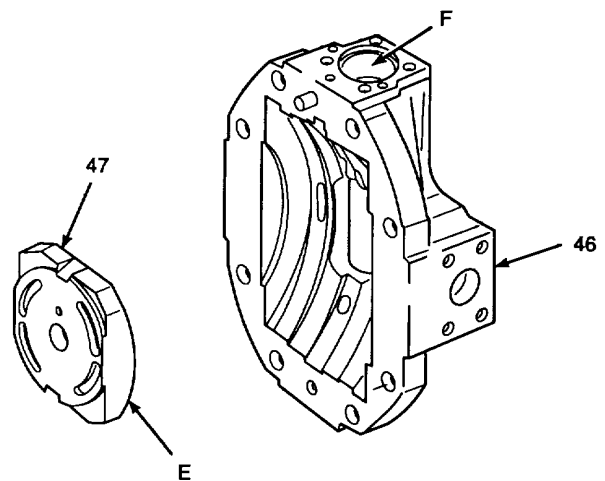
1. INSPECT SHAFT ASSEMBLY FOR DAMAGED BEARINGS AND EXCESSIVE WEAR.

- a. Manually turn bearings, A and B, on shaft assembly (77).
- b. If bearings turn rough or do not spin freely, replace shaft assembly (77).
- c. Use a thickness gage and check piston/socket end-play, dimension C, by inserting end of thickness gage between rounded end of each piston (79) where it connects into shaft assembly (77).
- d. Measure amount of free play between pistons (79) and shaft assembly (77) by moving each piston back and forth in its socket.
- e. Check each piston (79) in this manner.
- f. If end play, dimension C, exceeds 0.002 in. (0,05 mm) in any piston (79) and socket, replace shaft assembly (77).
- g. Inspect piston (79), surfaces D, for scratches.
- h. If surfaces of pistons (79) have scratches that can be felt with a fingernail, replace shaft assembly (77).



2. INSPECT PORT PLATE AND PORT PLATE HOUSING FOR DAMAGE AND EXCESSIVE WEAR.

- a. Visually inspect port plate (47), surface E, for scratches.
- b. Use emery cloth to remove any scratches from port plate that can be felt with a fingernail.
- c. Clean port plate (47) after polishing. Refer to cleaning procedure.
- d. Replace port plate (47), and port plate housing (46) if deep scratches cannot be removed with emery cloth.
- e. Use a strong light and inspect port plate housing (46) inner bore, surface F, for discoloration and scratches that can be felt with a fingernail.



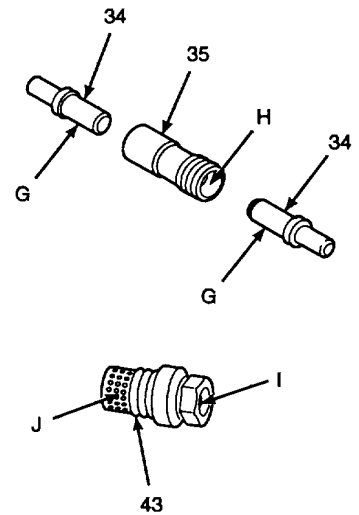
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**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.**

D. INSPECT - Continued.

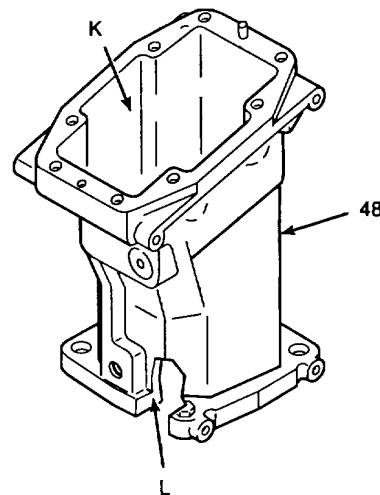
3. INSPECT VALVE ASSEMBLY COMPONENTS FOR NICKS, DAMAGE, AND SIGNS OF CONTAMINATION.

- a. Inspect hydraulic piston (34), surfaces G, for nicks, scratches, and signs of contamination, including discoloration and the presence of foreign material.
- b. Inspect valve sleeve (35), inner surface H, for nicks, scratches, and signs of contamination, including discoloration and the presence of foreign material.
- c. Inspect valve sleeve (43), surfaces I, and holes J, for signs of nicks, scratches, or deformation.
- d. If nicks, damage, or signs of contamination are detected, replace hydraulic pistons (34) and valve sleeve (35) as a set.
- e. If valve sleeve (43) is nicked, scratched, or deformed, replace valve sleeve.



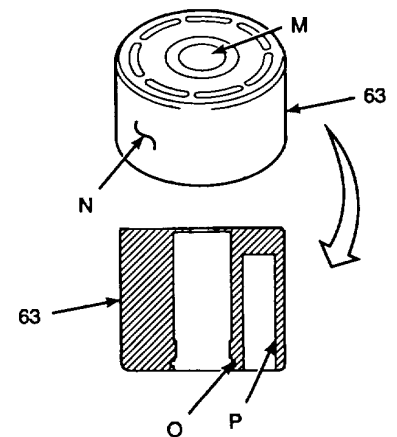
4. INSPECT MECHANICAL DRIVE HOUSING FOR DAMAGE AND SIGNS OF CONTAMINATION.

- a. Inspect mechanical drive housing (48), inner surfaces K and L, for signs of contamination, including discoloration and the presence of foreign material.
- b. Reclean mechanical drive housing (48) if signs of contamination or foreign material are detected. Use emery cloth to remove discoloration or rust. Reclean after using emery cloth. Refer to cleaning procedure.
- c. Replace mechanical drive housing (48) if any signs of contamination cannot be removed by emery cloth.



5. INSPECT CYLINDER BLOCK FOR SIGNS OF WEAR AND CONTAMINATION.

- a. Use a strong light and inspect cylinder block (63), surfaces M and N, for visible wear and contamination.
- b. Inspect cylinder block (63), interior surfaces O and P, for signs of visible wear, contamination, or nicks and scratches.
- c. Replace cylinder block (63) if any signs of visible wear, contamination, nicks, or scratches are detected.



**GO TO NEXT PAGE**

E. ASSEMBLE.

1. INSTALL SHAFT ASSEMBLY AND MOTOR COVER INTO MECHANICAL DRIVE HOUSING.

- a. Install shaft assembly (77) into mechanical drive housing (48). Lightly tap with plastic hammer if necessary.

**WARNING**

Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

**NOTE**

Ensure retaining ring is seated in retaining ring groove.

- b. Use retaining ring pliers and install retaining ring (78). Ensure retaining ring is positioned to allow installation of socket head cap screws (68).

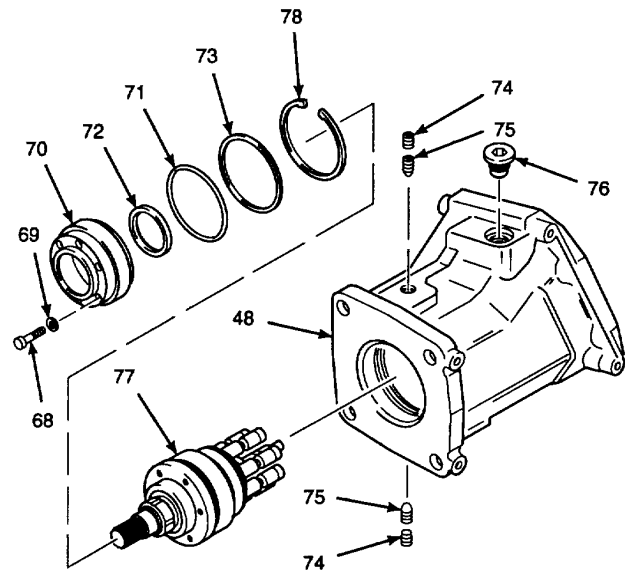
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

Shaft assembly (77) must be seated against retaining ring to allow set screws to seat in groove of shaft assembly.

- c. Coat threads of set screws (75 and 74) with thread locking compound (Item 14, Appendix B).
- d. Install set screws (75 and 74). Use a hex head driver socket (Item 89, Appendix D) and tighten screws to 7 lb-ft (10 N•m).
  - e. Install plug (76).

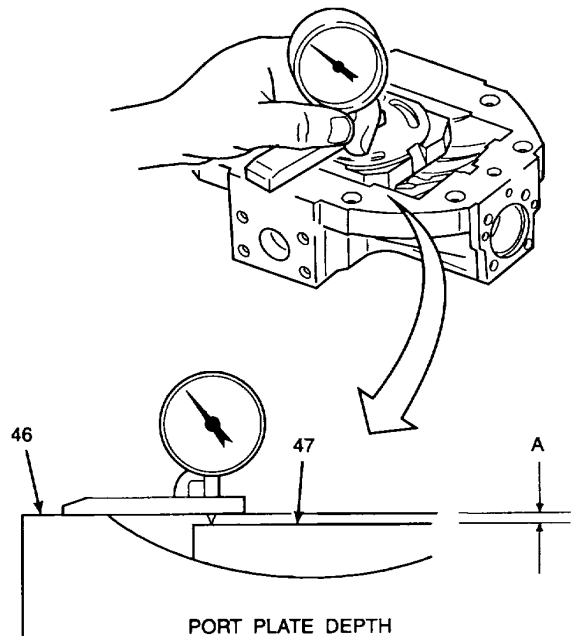


- f. Install shim (73) into mechanical drive housing (48) against retaining ring (78).
- g. Lubricate o-ring (71) and seal ring (72) with petrolatum.
- h. Install o-ring (71) into mechanical drive housing (48) against shim (73).
- i. Use shaft seal installation tool and install seal ring (72), sealing lip up, into motor cover (70).
- j. Align screw holes on motor cover (70) with screw holes on shaft assembly (77).
- k. Press motor cover (70) into mechanical drive housing (48) by tapping with a plastic hammer.
- l. Install seal rings (69) onto socket head cap screws (68).
- m. Install socket head cap screws (68) into motor cover (70). Use a hex head driver socket (Item 90, Appendix D) and tighten cap screws to 7 lb-ft (10 N•m).

**GO TO NEXT PAGE**

**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.**

- E. ASSEMBLE - Continued.
2. MEASURE DEPTH OF PORT PLATE IN RELATION TO PORT PLATE HOUSING FLANGE.
    - a. On a level, clean surface, insert port plate (47) into port plate housing (46).
    - b. Level port plate (47) in port plate housing (46).
    - c. Use a micrometer depth gage and measure depth (A) of port plate in relation to port plate cover flange.
    - d. Write measurement down and retain for reassembly of cylinder block.
  3. INSTALL CYLINDER BLOCK INTO MECHANICAL DRIVE HOUSING AND MEASURE CYLINDER BLOCK END PROJECTION.
    - a. Install shaft (67) into cylinder block (63).



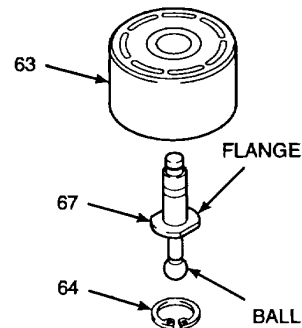
**WARNING**

Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

**NOTE**

Retaining ring will fit between ball end of shaft and flange of shaft when installed in cylinder block.

- b. Use snap ring pliers to install retaining ring (64) between ball end of shaft and flange of shaft. Ensure retaining ring is fully seated in cylinder block (63).



**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves should be worn with clean hydraulic oil.

- c. Lubricate piston holes inside of cylinder block (63) when working with hydraulic oil.

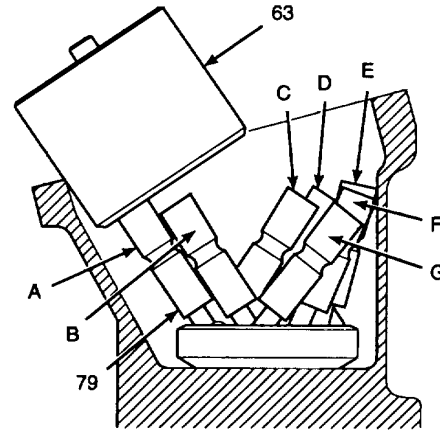
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E. ASSEMBLE - Continued.

**NOTE**

**Pistons A and B are inserted to the left while pistons C and D, E and F, and G are laying to the right of the mechanical drive housing.**

- d. Install cylinder block at an angle, fitting pistons (79) one at a time into cylinder block (63) as shown.
- e. After pistons A and B are inserted in cylinder block (63), insert pistons C and D, moving the pistons from right to left. Install pistons E, F, and G while gradually lowering the cylinder block.
- f. Seat cylinder block (63) down firmly on pistons (79).

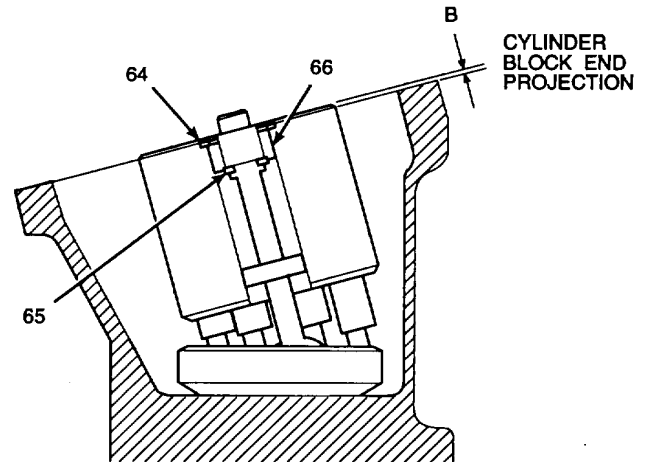


**WARNING**

**Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

**NOTE**

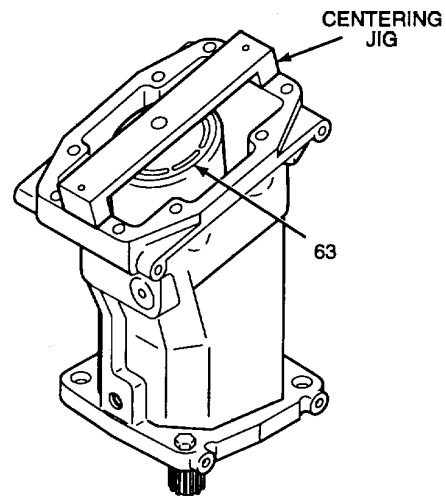
**If shims (65) were removed from cylinder block (63) at disassembly, install them at this time.**



- g. Use retaining ring pliers and install shims (65), ring spacer (66), and retaining ring (64) into cylinder block (63) retaining ring groove.
- h. Center cylinder block (63) in mechanical drive housing with a centering jig.
- i. Use a depth gage and measure distance (B) cylinder block end projects from mechanical drive housing.
- j. Refer to measurement (A) taken in step 2.d for port plate depth in port plate housing.
- k. Combined cylinder block end projection (B) and port plate depth (A) must not exceed 0.007 in. (0,02 mm) total.
- l. If cylinder block projection exceeds 0.007 in. (0,02 mm), subtract the difference from combined measurement. This will give the required shim thickness as follows:

$$A - B = \text{total} - 0.007 \text{ in. (0,02 mm)} = \text{total shim thickness}$$

$$\text{Total less } 0.007 \text{ in. (0,02 mm)} = \text{shim thickness required.}$$



**GO TO NEXT PAGE**



2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.

E. ASSEMBLE - Continued.

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- m. Remove retaining ring (64) and ring spacer (66) from cylinder block (63).

**NOTE**

**Shims (65) may be needed to obtain correct cylinder block projection.**

- n. Add shims (65) as needed to obtain correct cylinder block projection. Repeat steps g through l as needed.

4. INSTALL SPRING, RING SPACER, AND RETAINING RING INTO CYLINDER BLOCK.

- a. Install spring (62) and ring spacer (66) back into cylinder block (63).
- b. Install a bearing puller, using hex head cap screws (Item 27, Appendix D) into mechanical drive housing.

**WARNING**

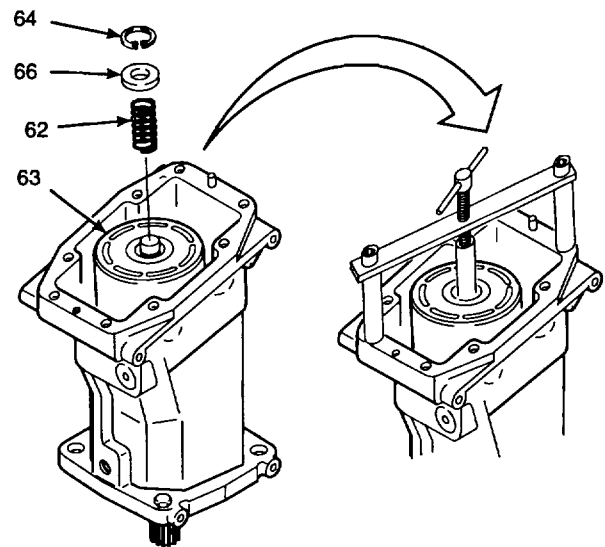
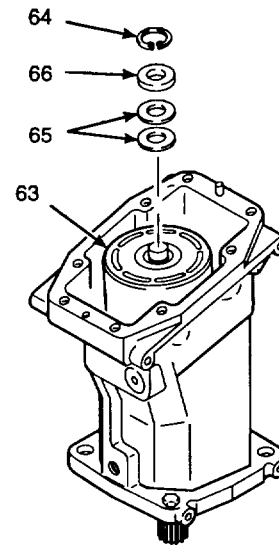
Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- c. Compress spring (62) and install retaining ring (64) into cylinder block (63) retaining ring groove.

**NOTE**

**Ensure retaining ring is fully seated in cylinder block retaining ring groove.**

- d. Release spring (62).
- e. Remove bearing puller and hex head cap screws.



**GO TO NEXT PAGE**

E. ASSEMBLE - Continued.

5. INSTALL PISTON AND DISPLACEMENT ROD INTO PORT PLATE HOUSING.

- a. Install piston (50). Align displacement rod mounting hole in piston with face opening in port plate housing (46).
- b. Install displacement rod (49) into piston (50).

**WARNING**

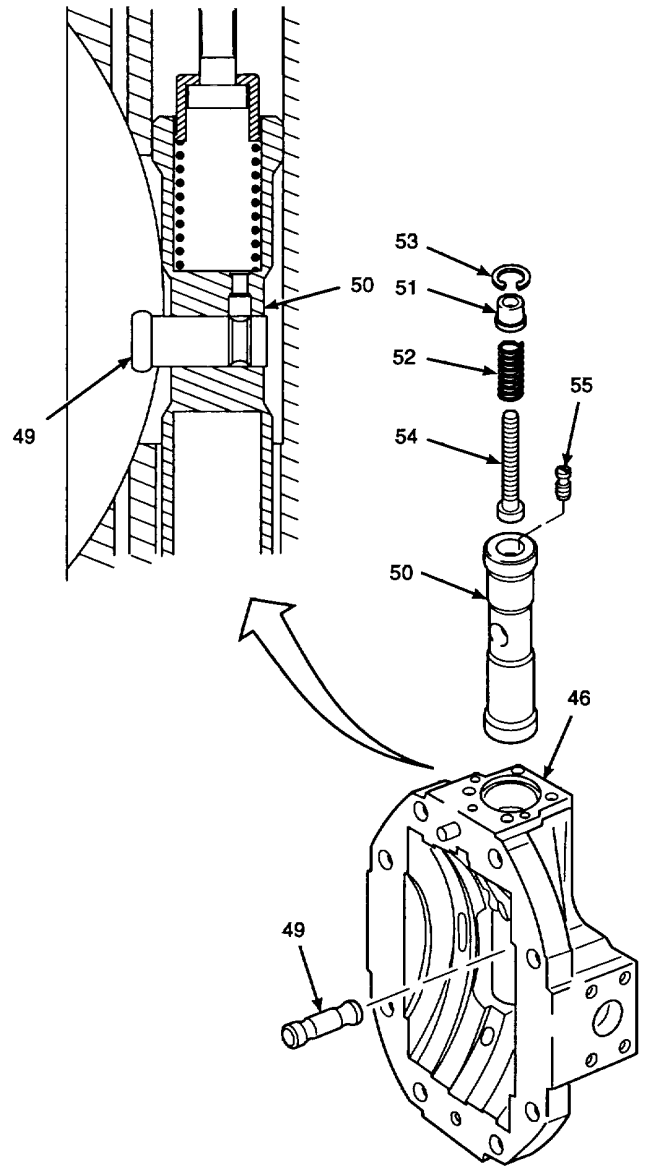
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Coat threads of set screw (55) with thread locking compound (Item 14, Appendix B).
- d. Install set screw (55) into piston (50). Tighten set screw.
- e. Install adjustment bolt (54), spring (52), and sleeve spacer (51).

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- f. Compress spring (52) and install retaining ring (53).
- g. Release spring (52).



GO TO NEXT PAGE

2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.

E. ASSEMBLE - Continued.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- h. Coat outer surface of tube (61) with thread locking compound (Item 14, Appendix B).

**NOTE**

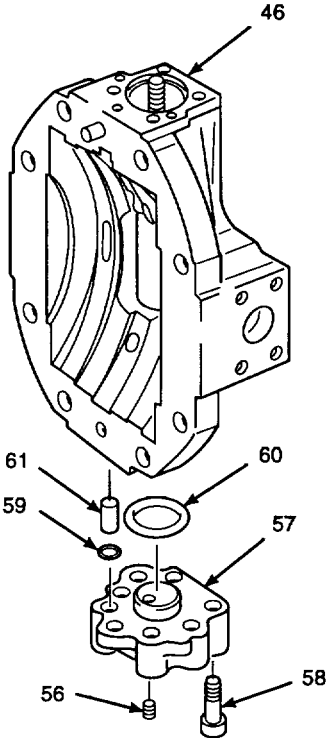
Tube (61) is pressed-fit into port plate housing (46).

- i. Install tube (61) into port plate housing (46).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- j. Lubricate preformed packing (59) and o-ring (60) with clean hydraulic oil.
- k. Install preformed packing (59) and o-ring (60) into port plate cover (57).
- l. Apply thread locking compound (Item 13, Appendix D) to threads and install socket head cap screws (58 through port plate cover (57) and into port plate housing (46). Use a hex head driver socket (Item 90, Appendix D) and tighten cap screws to 10 lb-ft (14 N•m).
- m. Coat threads of nozzle (56) with thread locking compound (Item 14, Appendix B).
- n. Install nozzle (56) into port plate cover (57).



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- E. ASSEMBLE - Continued.
- 6. INSTALL PORT PLATE HOUSING ONTO MECHANICAL DRIVE HOUSING.

**NOTE**

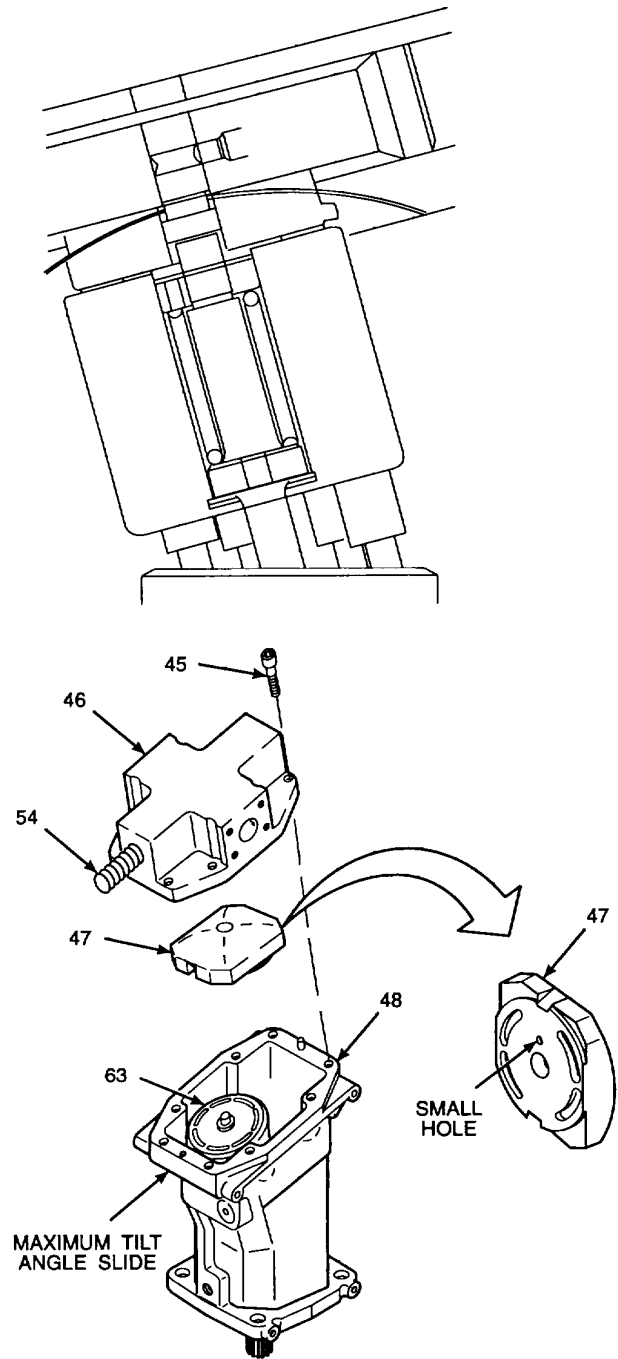
**Ensure port plate is positioned correctly. It is possible to position it wrong.**

- a. Install port plate (47) onto cylinder block (63). Ensure small hole in the port plate is positioned toward the maximum tilt angle side of port plate housing (46). Oil ports in port plate housing must be offset toward maximum tilt angle.

**WARNING**

**Uncured gasket sealing compound can cause eye damage or skin irritation. Avoid contact with eyes and skin. If compound contacts eyes, flush eyes with water for 15 minutes and get immediate medical attention. If sealing compound contacts skin, remove from skin with a dry cloth or paper towel and wash thoroughly with soap and water. Sealing compound releases acetic acid while curing. Use with adequate ventilation.**

- b. Apply gasket sealing compound to mating surfaces of mechanical drive housing (48).
- c. Fit port plate housing (46) over center of cylinder block (63). Port plate housing is positioned with adjustment bolt (54) to the maximum tilt angle side of mechanical drive housing (48). Ensure cylinder block fits securely into port plate housing.
- d. Install socket head cap screws (45) through port plate housing (46) and into mechanical drive housing (48). Use hex head driver socket (Item 90, Appendix D) and tighten cap screws to 25 lb-ft (34 N•m).



**GO TO NEXT PAGE**

**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.**

- E. ASSEMBLE - Continued.
7. INSTALL PRESSURE VALVE ASSEMBLY INTO HYDRAULIC ASSEMBLY HOUSING.

**WARNING**

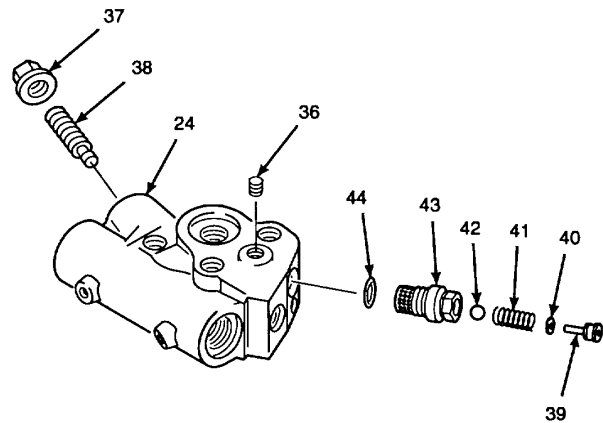
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate o-ring (44) with clean hydraulic oil.

**CAUTION**

Be careful not to damage o-ring when sliding over threads. Sharp edges of thread can cut or damage o-ring. Damaged o-ring will cause leakage and affect performance.

- b. Install o-ring (44) onto valve sleeve (43).  
 c. Install valve sleeve (43) into hydraulic assembly housing (24).  
 d. Install steel ball (42), spring (41), shim (40), and plug (39) into valve sleeve (43).  
 e. Install screw (38) and nut (37).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- f. Coat threads of set screw (36) with thread locking compound (Item 14, Appendix B).  
 g. Install set screw (36).

**GO TO NEXT PAGE**

- E. ASSEMBLE - Continued.
8. INSTALL VALVE ASSEMBLY INTO HYDRAULIC ASSEMBLY HOUSING.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Coat threads of valve sleeve (35) with thread locking compound (Item 14, Appendix B).

**CAUTION**

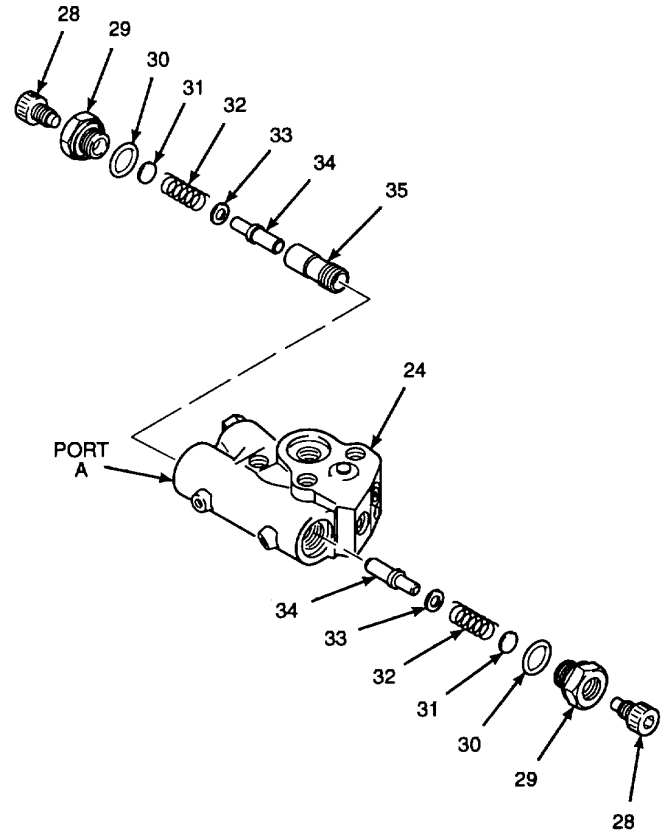
Valve sleeve can only be inserted into hydraulic assembly housing using valve sleeve installation tool. Do not force valve sleeve into hydraulic assembly housing. Damage to valve sleeve assembly and hydraulic assembly housing can result from improper installation of valve sleeve.

- b. Install valve sleeve (35) into port A of hydraulic assembly housing (24) with valve sleeve installation tool.
- c. Install hydraulic pistons (34) and flat washers (33) into hydraulic assembly housing (24).
- d. Install springs (32) and washers (31).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- e. Lubricate o-rings (30) with clean hydraulic oil.



**CAUTION**

Be careful not to damage o-rings when sliding over threads. Sharp edges of thread can cut or damage o-ring. Damaged o-ring will cause leakage and affect performance.

- f. Install o-rings (30) onto plugs (29).
- g. Install plugs (29) into hydraulic assembly housing (24).
- h. Install plugs (28).

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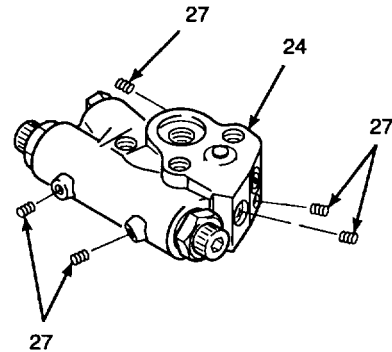
**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.****E. ASSEMBLE - Continued.****WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

Set screws (27) will only need to be installed if replacing hydraulic assembly housing (24).

- i. Coat threads of set screws (27) with thread locking compound (Item 15, Appendix B).
- j. Install set screws (27) into hydraulic housing assembly (24).

**GO TO NEXT PAGE**

- E. ASSEMBLE - Continued.
9. INSTALL HYDRAULIC ASSEMBLY HOUSING ONTO MECHANICAL DRIVE HOUSING.

**WARNING**

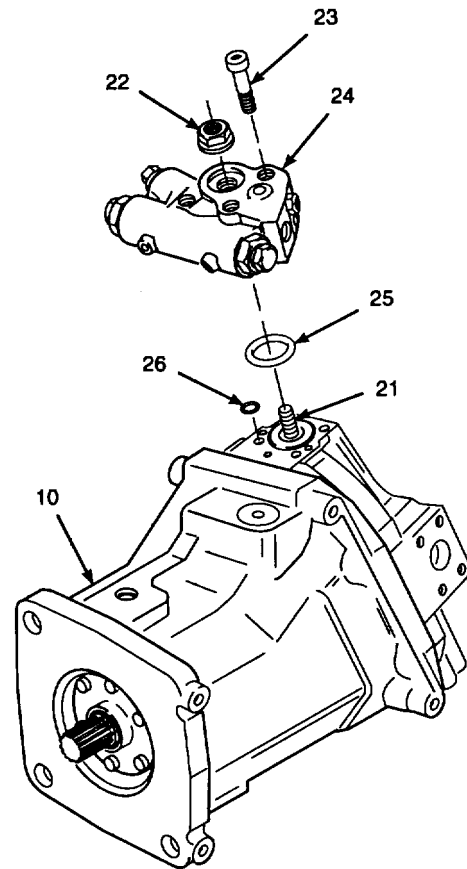
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- Lubricate o-ring (25) and preformed packing (26) with clean hydraulic oil.
- Install o-ring (25) and preformed packing (26) on hydraulic assembly housing (24).
- Thread hydraulic assembly housing onto adjustment bolt (21) while turning adjustment bolt counterclockwise.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- Apply thread locking compound to socket head cap screws (23).
- Install socket head cap screws (23) through hydraulic assembly housing (24) and into propulsion motor (10). Use a hex head driver socket (Item 89, Appendix D) and tighten screws to 10 lb-ft (14 N•m).
- While holding adjustment bolt (21) with an allen wrench, install nut (22). Do not tighten nut.
- Set adjustment bolt (21) exposed threads to measurement recorded in step B.1.a. Hold adjustment bolt with a wrench and tighten nut.



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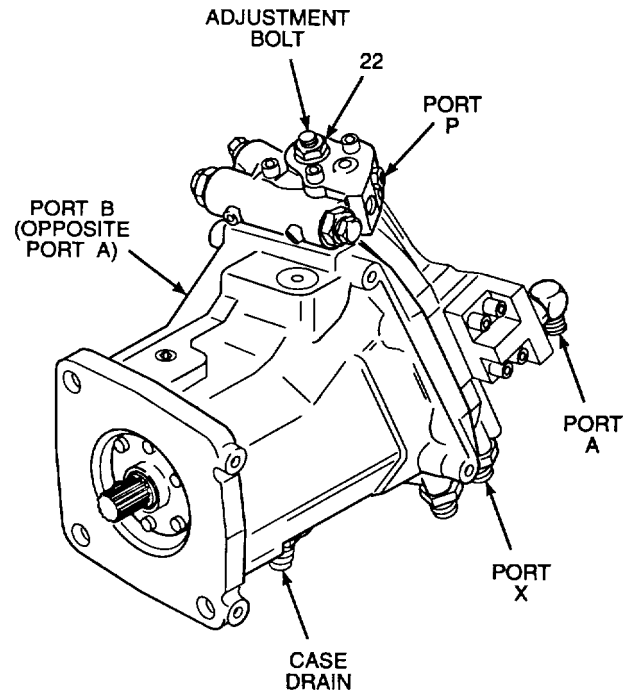


**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.**

F. ADJUST.

1. CONNECT PROPULSION MOTOR TO HYDRAULIC SYSTEMS TEST AND REPAIR TOOL OUTFIT (HSTRU) AND SET PROPULSION MOTOR OPERATIONAL PARAMETERS. REFER TO TM 9-4940-468-14 AND TABLE BELOW.

MOTOR PORT	CONNECT PORT TO	REQUIRED FLOW/PRESSURE
X	Variable source	120 to 220 psi (827,37 to 1516,86 kPa)
P	Constant source	220 psi (1516,86 kPa) constant
T	Tank return	N/A
A	Pump input	26.5 ±1.5 gpm (98 ±5,7 ℓ/min) at 3000 psi (20 685 kPa)
B	Pump output	23.5 ±1.5 gpm (89 ±5,7 ℓ/min), minimum
CASE DRAIN	Tank return	3.0 gpm (11 ℓ/min) or less



2. WITH A CONTINUOUS INPUT FLOW AT PROPULSION MOTOR PORT A OF 26.5 ±1.5 gpm (98 ±5,7 ℓ/min) AT 3000 PSI (20 685 kPa), MOTOR ROTATION SHOULD BE 1962.75 RPM WITH 120 PSI (827,37 kPa) PROVIDED AT VARIABLE PRESSURE SOURCE X AND 3925.5 RPM AT 220 PSI (1516,86 kPa) PROVIDED AT VARIABLE PRESSURE SOURCE X.
3. LOOSEN NUT (22) AND TURN ADJUSTMENT BOLT AS REQUIRED TO ATTAIN CORRECT RPM AT DESIGNATED PRESSURE AND FLOW. TIGHTEN NUT TO 37 lb-ft (50 N•m).

**GO TO NEXT PAGE**

- G. INSTALL.
1. INSTALL HYDRAULIC FITTINGS ONTO PROPULSION MOTOR.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate preformed packings (19 and 20) with clean hydraulic oil.

**CAUTION**

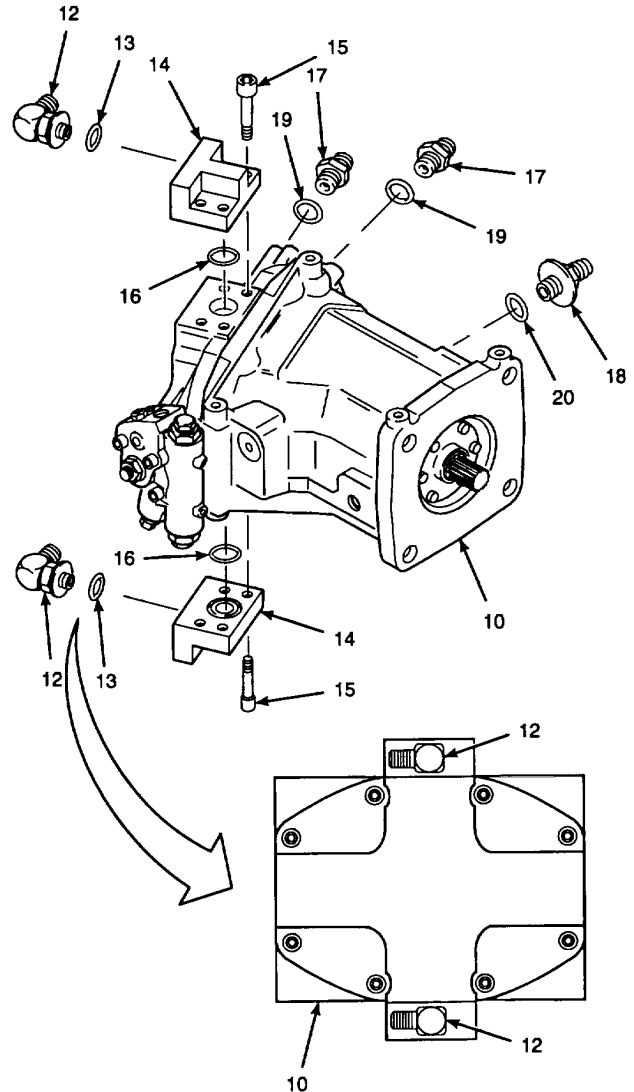
Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- b. Install preformed packings (19 and 20) onto straight adapters (17 and 18). Install straight adapters onto propulsion motor (10).
- c. Lubricate preformed packings (16) with clean hydraulic oil. Install preformed packings onto propulsion motor (10).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screw (15).
- e. Install adapter blocks (14) and socket head cap screws (15). Use a hex head driver socket (Item 91, Appendix D) and tighten cap screws to 45 lb-ft (61 N•m).



- f. Install preformed packings (13) onto elbows (12). Screw elbows into adapter blocks (14) until packing meets packing seat in mating adapter block port. Aim elbow to point toward left side of propulsion motor (10). Tighten adapter nut.

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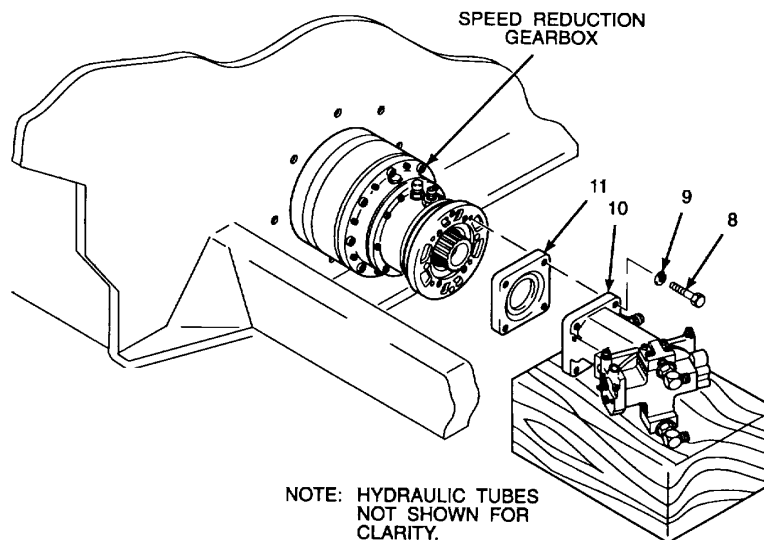
**2.32 REPLACE/REPAIR PROPULSION MOTOR - Continued.**

- G. INSTALL - Continued.
2. INSTALL PROPULSION MOTOR.
- a. Place cribbing in front of speed reduction gearbox beneath propulsion motor installation location.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves should be worn when working with hydraulic oil.

- b. Lubricate both faces of mounting flange (11) with a light coating of clean hydraulic oil.



- c. Install mounting flange (11) over drive shaft of propulsion motor (10).
- d. Install lockwashers (9) onto hex head cap screws (8).
- e. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (8).
- f. With the help of another person, lift propulsion motor (10) and insert spline shaft into mating spline coupler in speed reduction gearbox.
- g. Install lockwashers (9) and hex head cap screws (8). Tighten cap screws to 125 lb-ft (170 N•m).
- h. Remove cribbing.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

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G. INSTALL - Continued.

3. CONNECT HYDRAULIC TUBES.

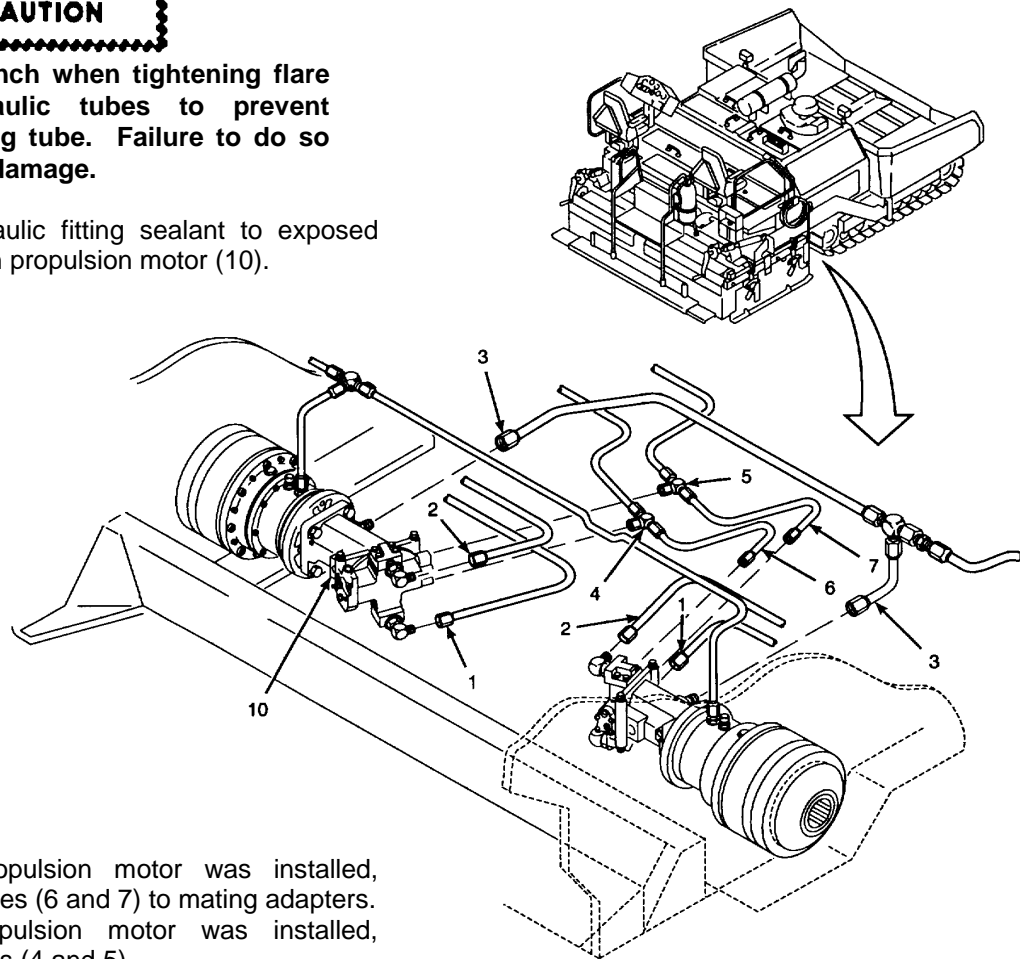
## WARNING

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

## CAUTION

Use a backup wrench when tightening flare fittings on hydraulic tubes to prevent twisting or breaking tube. Failure to do so may result in tube damage.

- a. Apply hydraulic fitting sealant to exposed adapters on propulsion motor (10).



- b. If right propulsion motor was installed, connect tubes (6 and 7) to mating adapters.
- c. If left propulsion motor was installed, connect tees (4 and 5).
- d. Connect tubes (1 through 3).

### NOTE

**FOLLOW-ON-TASKS:** Remove paving machine from jacks and cribbing per TM 5-3895-373-20.  
 Fill hydraulic reservoir per TM 5-3895-373-10.  
 Adjust/calibrate control handles per TM 5-3895-373-20.

**END OF TASK**

**2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX.**

**This task covers:**

a. Remove	b. Disassemble	c. Clean
d. Inspect	e. Assemble	f. Install

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit (Item 106, Appendix D)  
 Drain pan (Item 63, Appendix D)  
 Driver (Item 3, Appendix C)  
 Driver (Item 4, Appendix C)  
 Driver (Item 5, Appendix C)  
 Hex head driver socket (Item 88, Appendix D)  
 Hex head driver socket (Item 89, Appendix D)  
 Hex nut, 2 ea (Item 60, Appendix D)  
 Hydraulic press frame (Item 41, Appendix D)  
 Hydraulic systems test and repair tool outfit (HSTRU) (Item 108, Appendix D)  
 Input bearing driver (Item 6, Appendix C)  
 Metal bar, 2 ea (Item 8, Appendix D)  
 O-ring tool (Item 103, Appendix D)  
 Plastic hammer (Item 49, Appendix D)  
 Snap ring pliers (Item 66, Appendix D)  
 Support cylinder (Item 23, Appendix C)  
 Torque wrench (Item 131, Appendix D)  
 Transmission jack (Item 55, Appendix D)  
 Universal puller kit (Item 69, Appendix D)

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Crocus cloth (Item 4, Appendix B)  
 Gear oil (Item 20, Appendix B)  
 Hydraulic fitting sealant (Item 26, Appendix B)  
 Lint-free cloth (Item 7, Appendix B)  
 Machinery wiping towel (Item 37, Appendix B)  
 Petrolatum (Item 24, Appendix B)  
 Protective caps (Item 3, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound (Item 14, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Annular ball bearings  
 Flat washers  
 Gasket  
 O-rings  
 Plain seals

Preformed packings  
 Retaining rings  
 Ring seal  
 Spring pins  
 Thrust washer bearings

**Personnel Required:**

Two 62B construction equipment repairers. Second person to assist with moving speed reduction gearbox during removal and installation.

**References:**

LO 5-3895-373-12  
 TM 5-3895-373-20  
 TM 5-3895-373-24P  
 TM 9-4940-468-14

**Equipment Condition:**

Propulsion motor removed per paragraph 2.32.

**NOTE**

**There is a left side and a right side speed reduction gearbox on the paving machine. This procedure refers to replacing and repairing the left side speed reduction gearbox. Procedure is identical for the right side speed reduction gearbox. Remove the propulsion motor only from the side being worked on.**

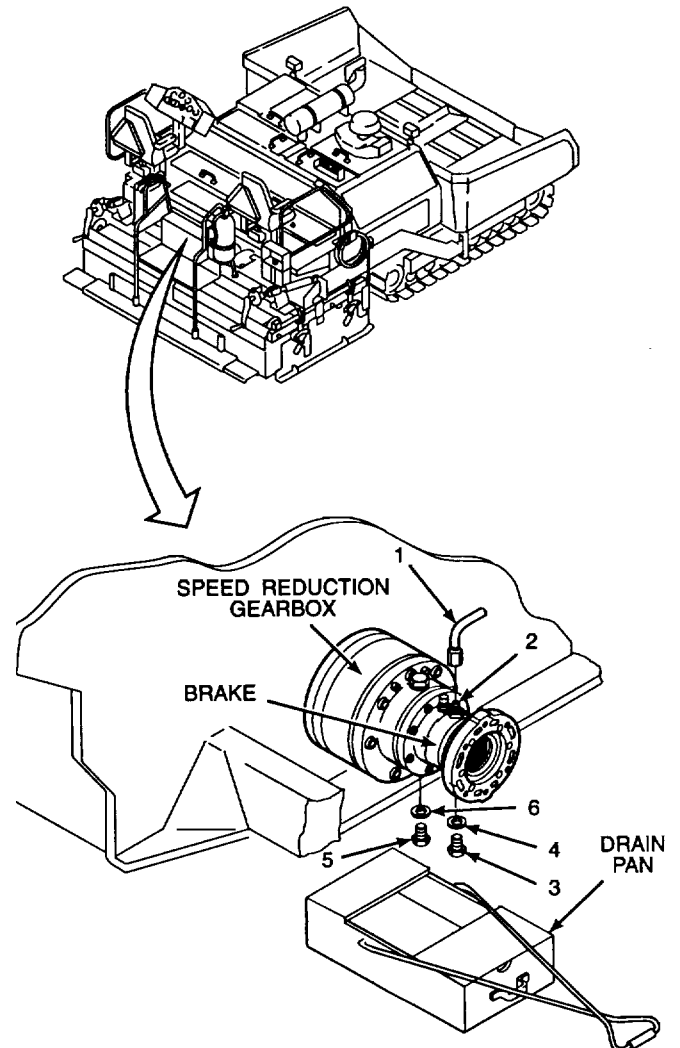
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- A. REMOVE.
1. REMOVE HYDRAULIC LINE AND DRAIN OIL.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves should be worn when working with hydraulic oil.

- a. Place machinery wiping towel around hydraulic tube (1) and mating straight adapter (2). Place backup wrench across flats of straight adapter and loosen tube fitting.
- b. Disconnect fitting on tube (1). Plug hydraulic tube fitting with protective cap. If saturated, dispose of machinery wiping towel in accordance with local procedures.
- c. Place drain pan below brake. Remove plug (3) with flat washer (4). Drain gear oil from brake. Reinstall plug and flat washer.
- d. Place drain pan below speed reduction gearbox. Remove plug (5) and seal ring (6). Drain gear oil from speed reduction gearbox. Reinstall plug and seal ring. Dispose of used gear oil in accordance with local procedures.



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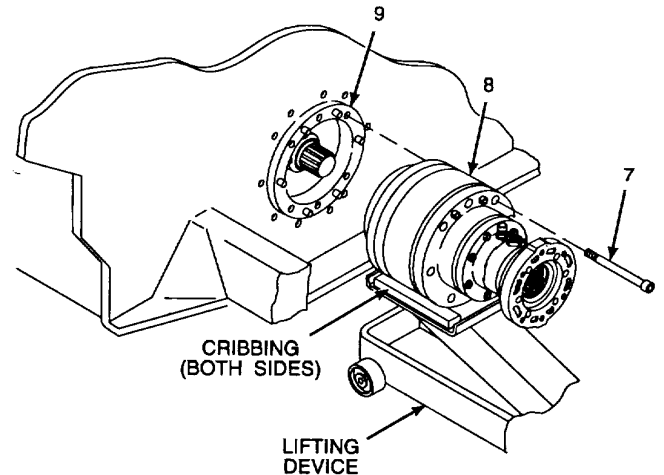
**2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.**

- A. REMOVE - Continued.
2. REMOVE SPEED REDUCTION GEARBOX.
- Loosen socket head cap screws (7).
  - Raise lifting device to support speed reduction gearbox (8). Place small cribbing blocks on both sides of gearbox.

**WARNING**

**Speed reduction gearbox with brake weighs approximately 110 lbs (50 kg). Make sure full weight of gearbox is supported by lifting device and that gearbox is not allowed to roll. Careless handling of gearbox could result in serious injury to personnel or damage to equipment.**

- Remove socket head cap screws (7).
- Instruct another person to move lifting device with speed reduction gearbox (8) away from installed track drive hub (9). Steady gearbox while other person moves lifting device away from drive hub.
- When speed reduction gearbox (8) is free of track drive hub (9), instruct other person to lower lifting device. Remove gearbox from under paving machine.
- Transport speed reduction gearbox (8) and socket head cap screws (7) to work area. With help of another person, lift and set gearbox on work bench.



**GO TO NEXT PAGE**

- A. REMOVE - Continued.
- 3. REMOVE FLANGE AND RING SEAL.
  - a. Stand speed reduction gearbox (8) on end, with installed brake (10) up. Use scribe or marker to matchmark mating flanges of brake and gearbox. Also, place a pair of matchmarks along main body of gearbox, one wide and one narrow.

**NOTE**

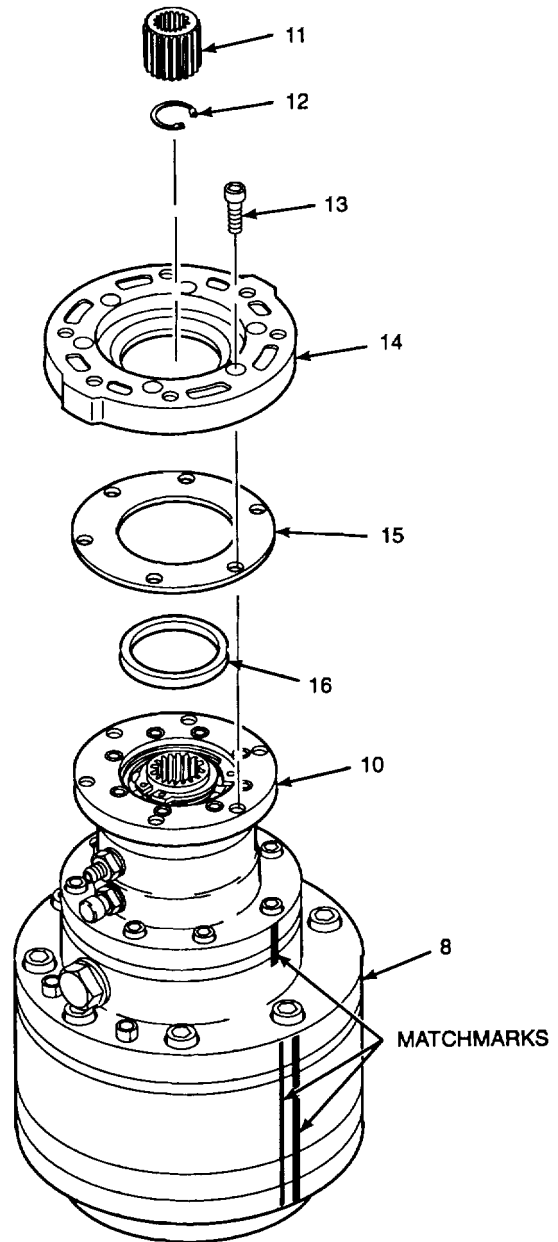
**Spline coupling (11) may have remained on propulsion motor drive shaft during motor removal.**

- b. Remove spline coupling (11).

**WARNING**

**Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- c. Use snap ring pliers to remove retaining ring (12) from spline coupling (11). Discard retaining ring.
- d. Remove bolts (13). Use plastic hammer to loosen flange (14) from its seating surface. Remove flange.
- e. Remove and discard gasket (15).
- f. Use plastic hammer to drive ring seal (16) from flange (14). Discard ring seal.



**GO TO NEXT PAGE**



**2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.****B. DISASSEMBLE.****1. REMOVE BRAKE COMPONENTS.****WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

**NOTE**

Retaining ring (17) is the smallest of two retaining rings at center of mechanical drive housing (18).

- a. Use snap ring pliers to remove retaining ring (17). Discard retaining ring.

**NOTE**

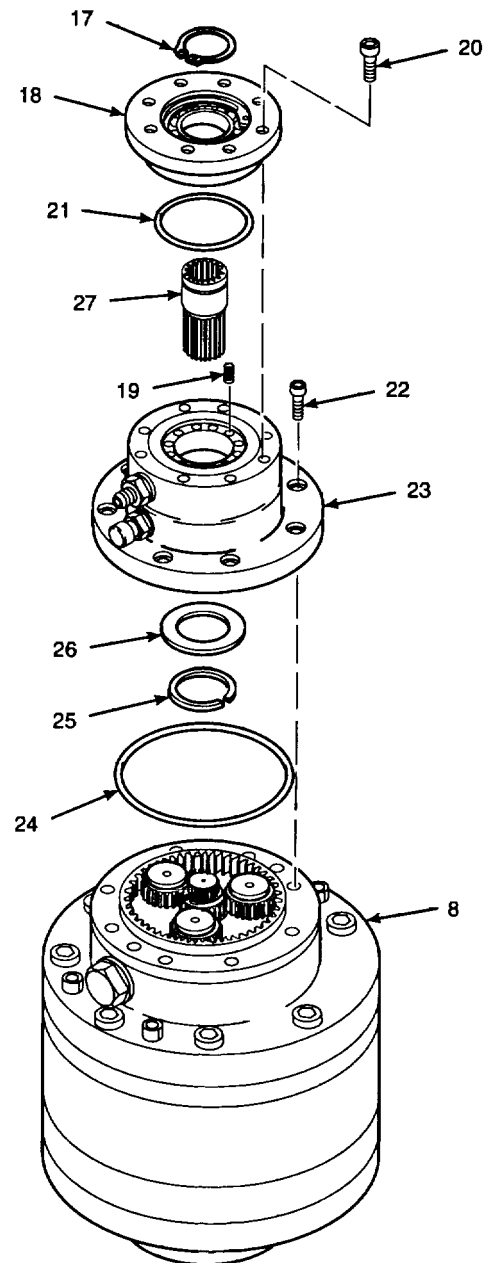
Mechanical drive housing (18) is under tension of springs (19). Bolts (20) should be removed evenly to avoid binding.

- b. Evenly loosen and remove bolts (20).
- c. Use plastic hammer to tap upward around perimeter of mechanical drive housing (18). Remove mechanical drive housing, springs (19), and o-ring (21). Discard o-ring.
- d. Remove bolts (22).
- e. Lift brake housing (23) from speed reduction gearbox (8). Remove and discard o-ring (24).

**NOTE**

A second thrust bearing (26) is installed inside brake housing (23). Second thrust bearing will be removed later.

- f. Use snap ring pliers to remove retaining ring (25). Discard retaining ring. Remove thrust bearing (26).
- g. Loosen shouldered shaft (27) by tapping on male spline end with a plastic hammer. Remove shaft.



**GO TO NEXT PAGE**

B. DISASSEMBLE - Continued.

- h. Set brake housing (23) on work surface, large flange down.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield, gloves, etc.). Failure to take proper precautions may result in severe injury or loss of vision.

**NOTE**

Ring spacer (28) and cylindrical piston (29) have a close sliding fit in brake housing (23). Ring spacer has a close sliding fit on cylindrical piston.

- i. Direct compressed air into straight adapter (2) to force cylindrical piston (29) from brake housing (23). Remove cylindrical piston.

**CAUTION**

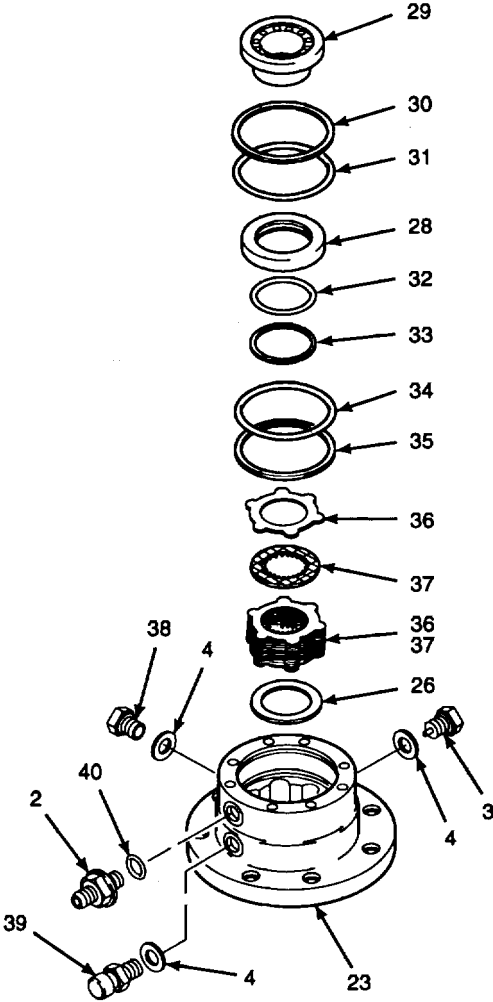
Use caution when removing seals and o-rings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and o-rings. Use an o-ring tool to remove seals and o-rings.

- j. Use an o-ring tool to remove plain seal (30) and o-ring (31). Discard plain seal and o-ring.
- k. Using an o-ring tool, gently pry ring spacer (28) loose inside brake housing (23). Remove ring spacer.
- l. Use o-ring tool to remove o-ring (32) and plain seal (33) from ring spacer (28). Discard o-ring and plain seal.

**NOTE**

Plain seal (35) may not be used in all applications.

- m. Use an o-ring tool to remove o-ring (34) and plain seal (35) from brake housing (23). Discard o-ring and plain seal.



- n. Remove steel disc brakes (36), sintered disc brake shoes (37), and thrust bearing (26) from brake housing (23).
- o. Remove plug (3), liquid sight indicator (38), breather (39), straight adapter (2), preformed packing (40), and seal rings (4). Discard preformed packing and seal rings.

**GO TO NEXT PAGE**

2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.

B. DISASSEMBLE - Continued.

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

p. Use snap ring pliers to remove retaining ring (41) from mechanical drive housing (18). Discard retaining ring.

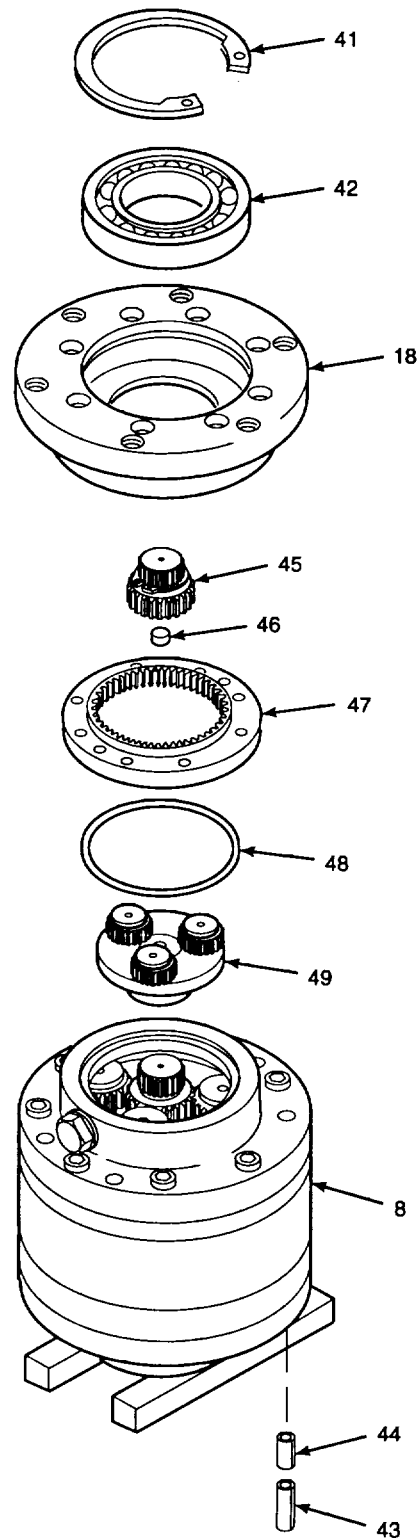
q. Use bearing puller from universal puller kit to remove bearing (42) from mechanical drive housing (18). Discard annular ball bearing.

2. REMOVE SPEED REDUCTION GEARBOX COMPONENTS.

a. Stand speed reduction gearbox (8) on wooden support blocks, as shown. Locate spring pin holes off edge of work surface to allow clearance for removal of spring pins (43 and 44).

b. Use 3/8 in. diameter metal bars and drive pin punch to drive spring pins (43 and 44) out of speed reduction gearbox (8). Discard spring pins.

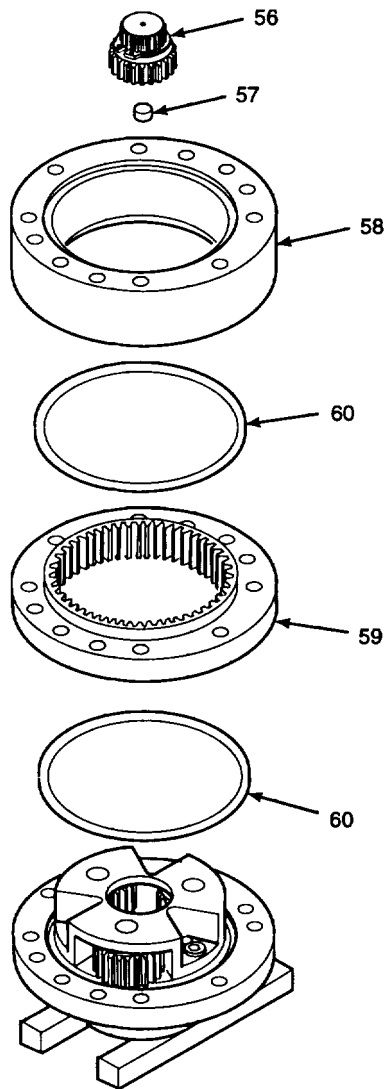
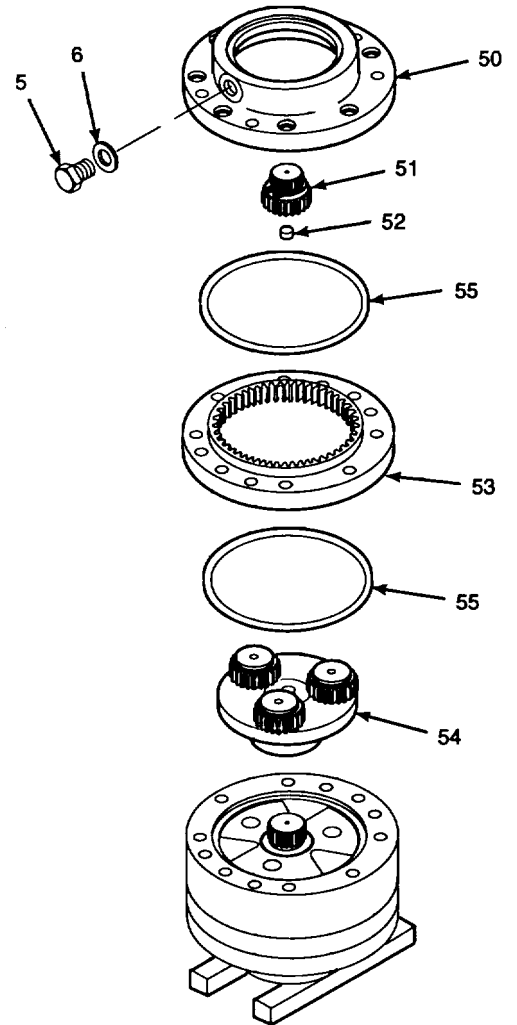
c. Remove spur gear (45), thrust washer bearing (46), internal gear (47), o-ring (48), and speed reducer gearset (49). Discard thrust washer bearing and o-ring.



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B. DISASSEMBLE - Continued.

- d. Remove plugs (5), seal rings (6), and input housing (50).
- e. Remove spur gear (51), thrust washer bearing (52), internal gear (53), speed reducer gear assembly (54), and o-rings (55). Discard thrust washer bearing and o-rings.
- f. Remove spur gear (56), thrust washer bearing (57), ring spacer (58), internal gear (59), and o-rings (60). Discard thrust washer bearing and o-rings.



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## 2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.

## B. DISASSEMBLE - Continued.

**CAUTION**

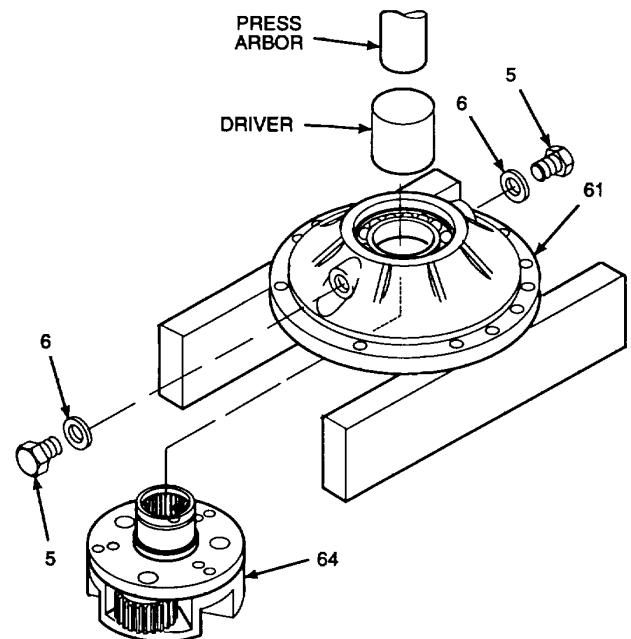
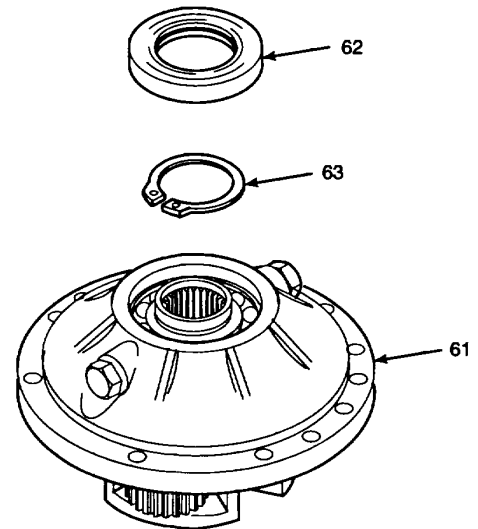
Be careful not to scratch seal seating surface in gearbox housing (61) when prying out plain seal (62). A scratched seal surface may allow oil to leak past the seal.

- g. Turn large flange of gearbox housing (61) down. Use thin, flat head screwdriver to remove plain seal (62). Be careful not to scratch seal seat. Discard plain seal.

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- h. Use snap ring pliers to remove retaining ring (63). Discard retaining ring.
- i. Using hydraulic press frame, support large flange of gearbox housing (61) on parallel support blocks. Use hydraulic press frame and driver (Item 3, Appendix C) to press out angle drive unit (64).
- j. Remove plugs (5) and seal rings (6). Discard seal rings.



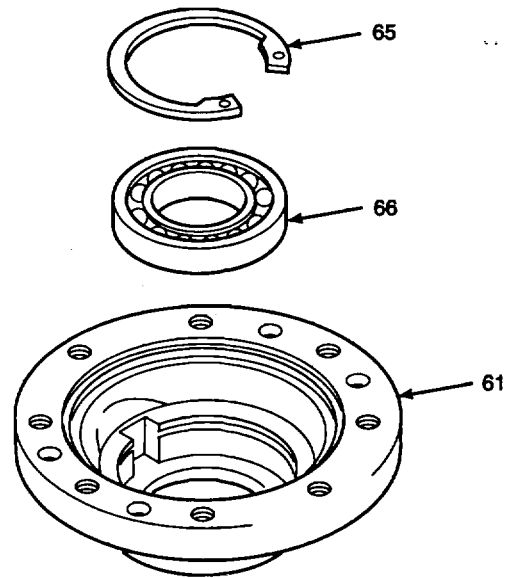
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B. DISASSEMBLE - Continued.

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- k. Use snap ring pliers to remove retaining ring (65) from gearbox housing (61). Discard retaining ring.
- l. Using hydraulic press frame, turn large flange of gearbox housing (61) down. Use driver (Item 4, Appendix C) to press out bearing (66). Discard annular ball bearing.



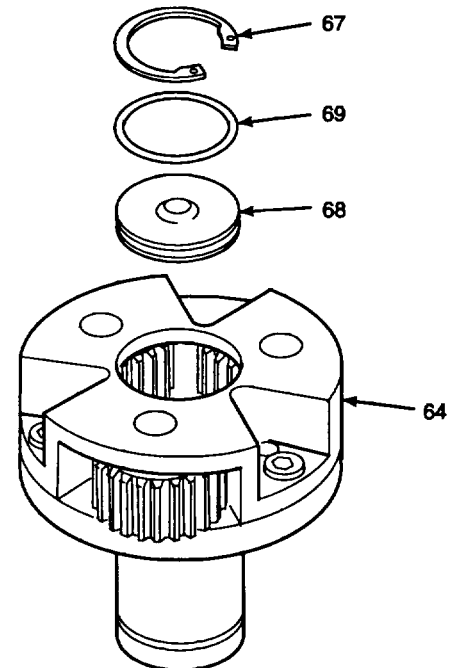
3. DISASSEMBLE ANGLE DRIVE UNIT.

- a. Use snap ring plier to remove retaining ring (67). Discard retaining ring.
- b. Insert hammer handle into splined center of angle drive unit (64) and push out thrust plate (68).

**CAUTION**

Use caution when removing preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing preformed packings. Use an o-ring tool to remove preformed packings.

- c. Use an o-ring tool to remove preformed packing (69). Discard preformed packing.



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**2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.**

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- C. CLEAN.
- 1. CLEAN METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal components in cleaning solvent.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield, and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to blow away loose debris in hard to reach places.
- c. Dry all metal components with clean, lint-free cloths.

**GO TO NEXT PAGE**

C. CLEAN Continued.

2. CLEAN THREADED FASTENERS.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse threaded fasteners with thread locking compound solvent.
- b. Dry fasteners with cleaning cloths.

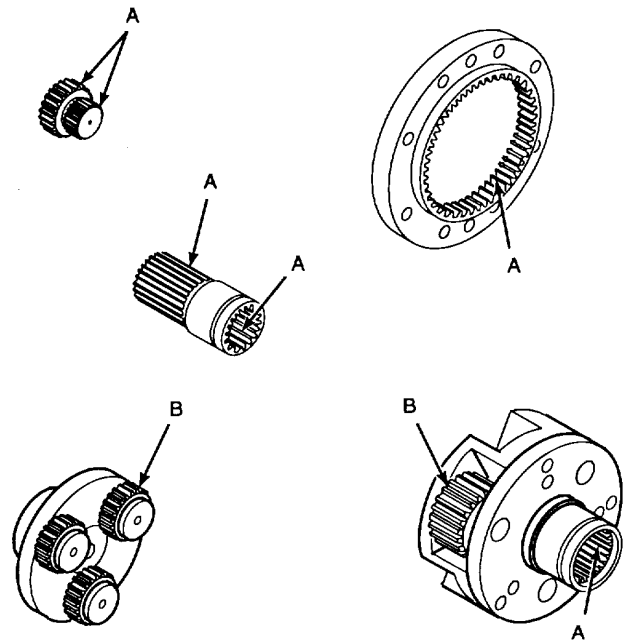
D. INSPECT.

1. INSPECT GEARS AND SPLINES.

- a. Visually inspect gear and spline teeth A for cracks, chips, and wear. Replace mating gearsets if gear or spline teeth are worn or damaged.
- b. Rotate gears B to check for bearing damage. Replace gear assembly if bearing rotation feels rough or if all bearings do not spin freely.

2. INSPECT COMPONENT SURFACES AND PACKING GROOVES.

- a. Inspect preformed packing grooves C, packing seats D, and seal seats E for sharp edges or burrs caused by nicks, scratches, or dents. Remove sharp edges or burrs with crocus cloth.
- b. Visually inspect all component surfaces for indications of cracks, chipping, or breaks. Replace cracked, chipped, or broken components.
- c. Inspect all machined mating surfaces for raised edges caused by nicks, scratches, or dents. Remove raised material with crocus cloth.



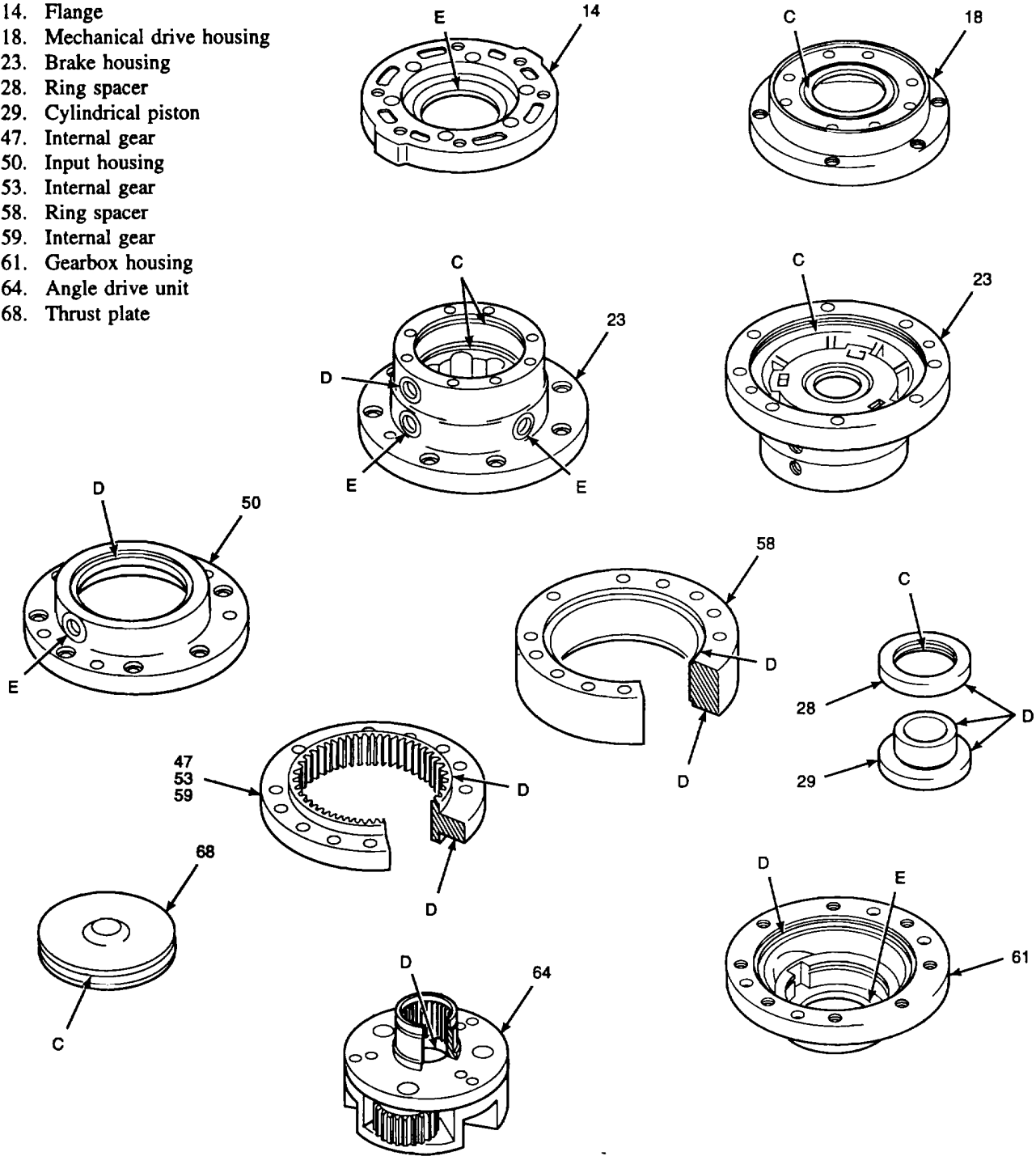
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2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.

D. INSPECT - Continued.

- 14. Flange
- 18. Mechanical drive housing
- 23. Brake housing
- 28. Ring spacer
- 29. Cylindrical piston
- 47. Internal gear
- 50. Input housing
- 53. Internal gear
- 58. Ring spacer
- 59. Internal gear
- 61. Gearbox housing
- 64. Angle drive unit
- 68. Thrust plate

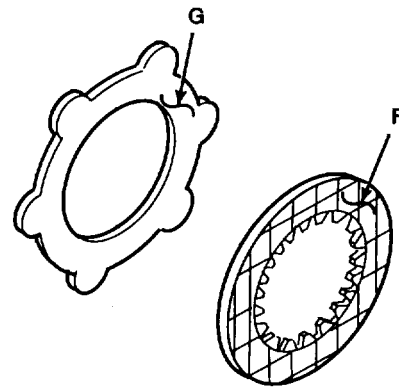


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D. INSPECT Continued.

3. INSPECT DISC BRAKES AND DISC BRAKE SHOES.

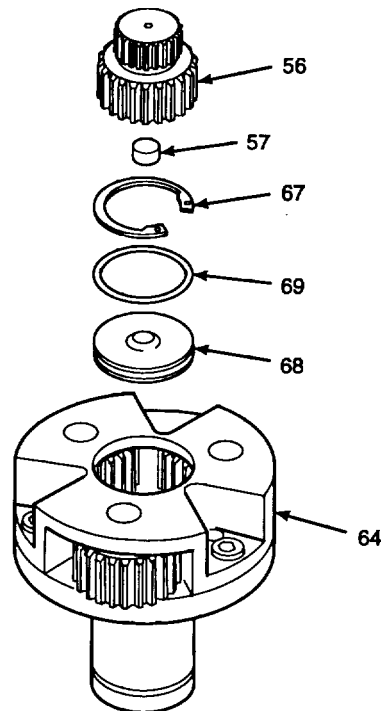
- a. Visually inspect surfaces F of sintered disc brake shoes for excessive wear, cracks, and missing material. Replace all sintered disc brake shoes if any surface grooves are worn away or if one or more disc brake shoes are cracked.
- b. Inspect surfaces G of steel disc brakes for scoring or cracks. Replace scored or cracked disc brakes.



E. ASSEMBLE.

1. ASSEMBLE ANGLE DRIVE UNIT.

- a. Press thrust washer bearing (57) into mating bore of spur gear (56).
- b. Apply thin coat of petrolatum to preformed packing (69). Install packing in mating groove of thrust plate (68).
- c. Apply thin coating of petrolatum to wall of thrust plate bore in angle drive unit (64).
- d. With raised boss of thrust plate (68) facing up, press thrust plate to seat in center bore of angle drive unit (64).



**WARNING**

Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- e. Use snap ring pliers to install retaining ring (67).

**GO TO NEXT PAGE**

**2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.**

E. ASSEMBLE Continued.

**2. ASSEMBLE SPEED REDUCTION GEARBOX COMPONENTS.**

- a. Using hydraulic press frame and driver (Item 5, Appendix C), press bearing (66) to seat in gearbox housing (61). Apply press force to outer race of bearing only.

**WARNING**

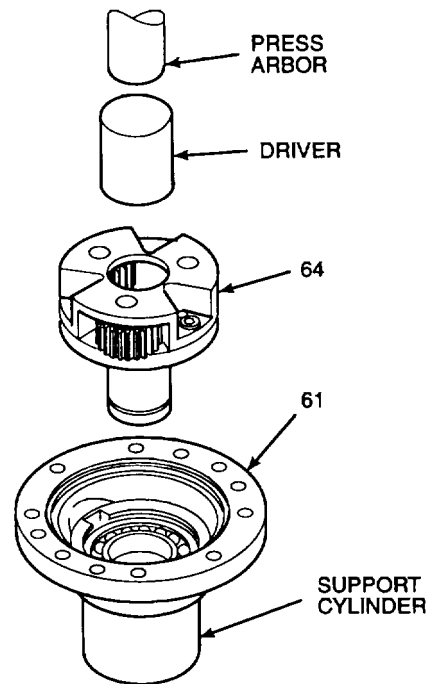
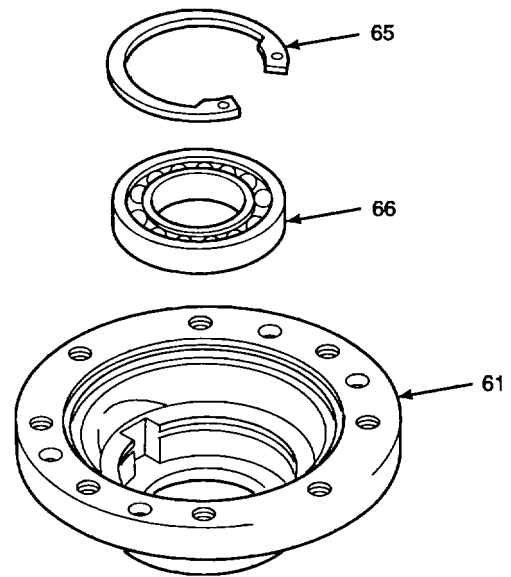
Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- b. Use snap ring pliers to install retaining ring (65).

**CAUTION**

Inner race of installed bearing (66) must be supported when pressing angle drive unit (64) to seat. Failure to properly support inner bearing race may result in premature bearing and speed reduction gearbox failure.

- c. Using hydraulic press frame, support cylinder, and driver (Item 4, Appendix C), press angle drive unit (64) to seat in gearbox housing (61).



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E. ASSEMBLE Continued.

**WARNING**

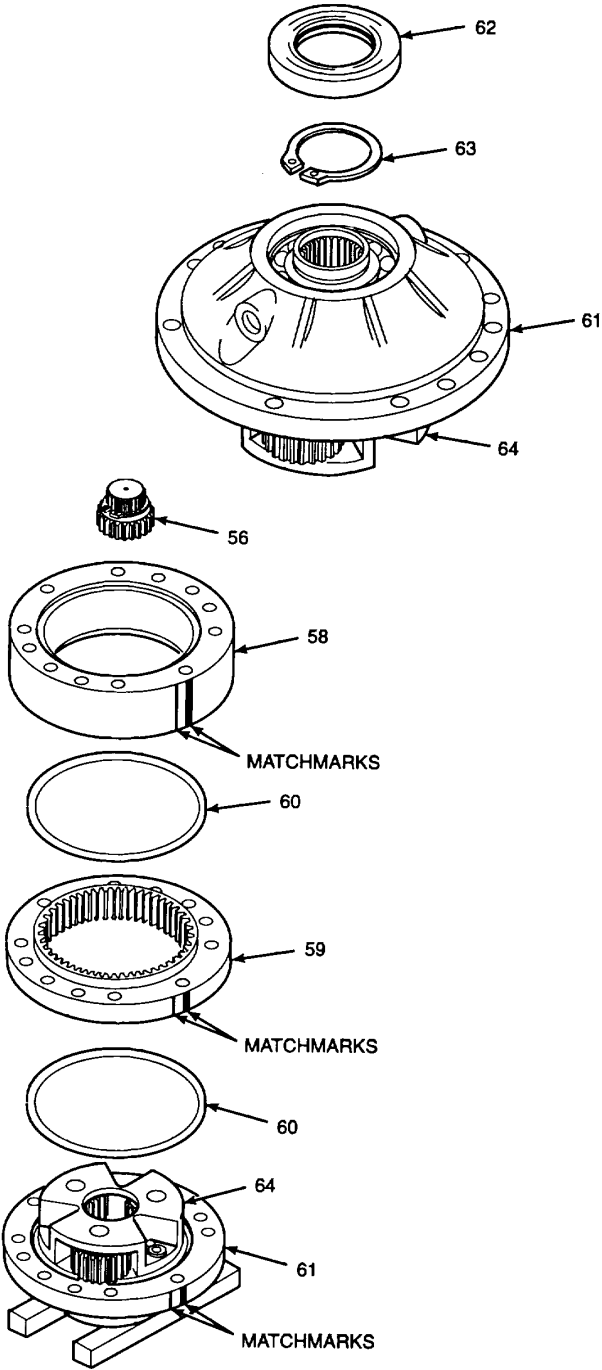
Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- d. Turn gearbox housing (61) over. Use snap ring pliers to install retaining ring (63).
- e. Apply light coating of petrolatum to plain seal (62). Install plain seal, sealing lip down, on hub of installed angle drive unit (64)
- f. Using plastic hammer, evenly tap plain seal (62) to seat in gearbox housing (61). Plain seal should be flush with housing flange.
- g. Support gearbox housing (61) on cribbing, large flange up.
- h. Lubricate o-rings (60) with petrolatum. Install o-rings on both sides of internal gear (59).

**NOTE**

Speed reduction gearbox components that align with through holes in outer flange of gearbox housing (61) can be installed in only one position for all holes to align.

- i. Align matchmarks on internal gear (59) and ring spacer (58) with those on gearbox housing (61). Carefully install and seat internal gear and ring spacer.
- j. Align and install spur gear (56) in center of installed angle drive unit (64).

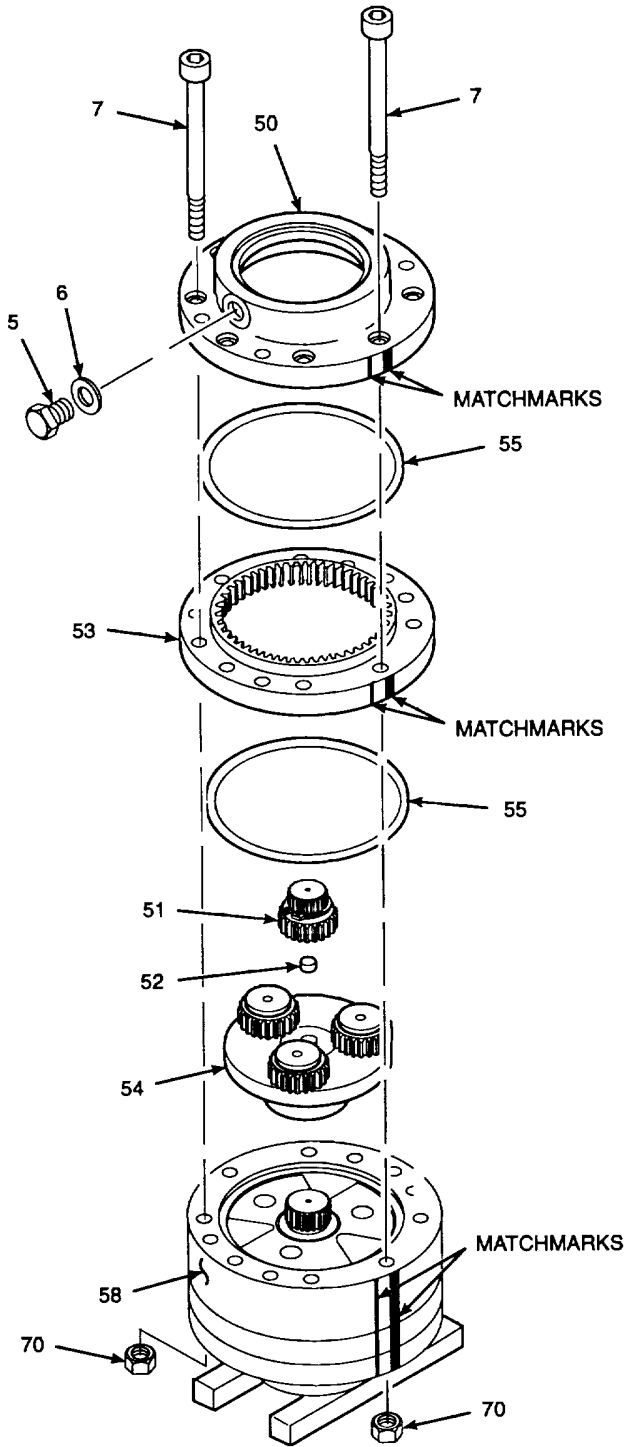


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2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.

E. ASSEMBLE Continued.

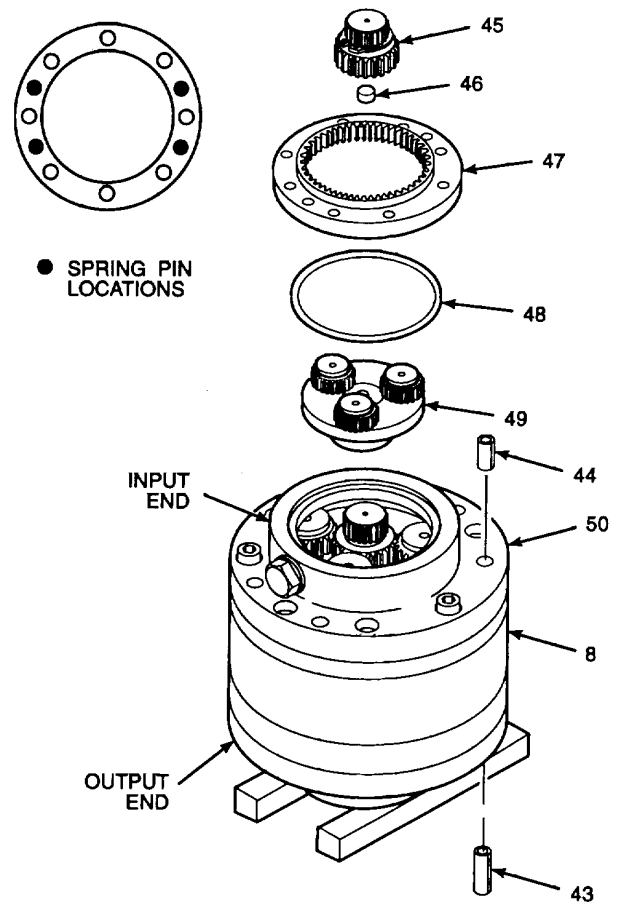
- k. Install speed reducer gear assembly (54).
- l. Press thrust washer bearing (52) into mating bore of spur gear (51).
- m. Align and install spur gear (51) in center of installed speed reducer gear assembly (54).
- n. Lubricate o-rings (55) with petrolatum. Install o-rings on both sides of internal gear (53).
- o. Align matchmarks on internal gear (53) with those on ring spacer (58). Seat internal gear on ring spacer.
- p. Align matchmarks on input housing (50) with those on internal gear (53). Seat input housing on internal gear.
- q. Install two socket head cap screws (7) in through holes shown. Secure cap screws with hex nuts (70) from tools list. Tighten hex nuts to ensure full seating of stacked speed reduction gearbox components.



GO TO NEXT PAGE

E. ASSEMBLE Continued.

- r. Using 3/8 in. drive pin punch, drive shortest spring pins (44) to seat in mating holes at top of speed reduction gearbox (8). Leave about 1/2 in. of spring pin exposed. Refer to inset view for location of spring pin bores.
- s. Turn speed reduction gearbox (8) on its side. Using 3/8 in. drive pin punch, drive longest spring pins (43) into mating holes on output end of gearbox. Drive spring pins until trailing ends are seated about 3/8 in. (10 mm) deep in gearbox.
- t. Stand speed reduction gearbox (8) on cribbing, input housing (50) up. Install speed reducer gearset (49).
- u. Press thrust washer bearing (46) into mating bore of spur gear (45).
- v. Align and install spur gear (45) in center of installed speed reducer gearset (49).
- w. Lubricate o-ring (48) with petrolatum. Install o-ring on bottom side of internal gear (47).
- x. With mounting holes aligned, seat internal gear (47) on installed input housing (50).



GO TO NEXT PAGE

2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.

E. ASSEMBLE - Continued.

3. ASSEMBLE BRAKE COMPONENTS.

- a. Install one thrust bearing (26), followed by one steel disc brake (36), then one sintered disc brake shoe (37) in brake housing (23). Repeat installation of steel disc brake, then sintered disc brake shoe until all disc brakes and shoes are installed. Each sintered disc brake shoe must be installed between two steel disc brakes.



O-rings, seals, ring spacer, and cylindrical piston must be well lubricated with petrolatum. Inadequate lubrication may cause damage to o-ring or seal during installation of ring spacer or cylindrical piston.

**NOTE**

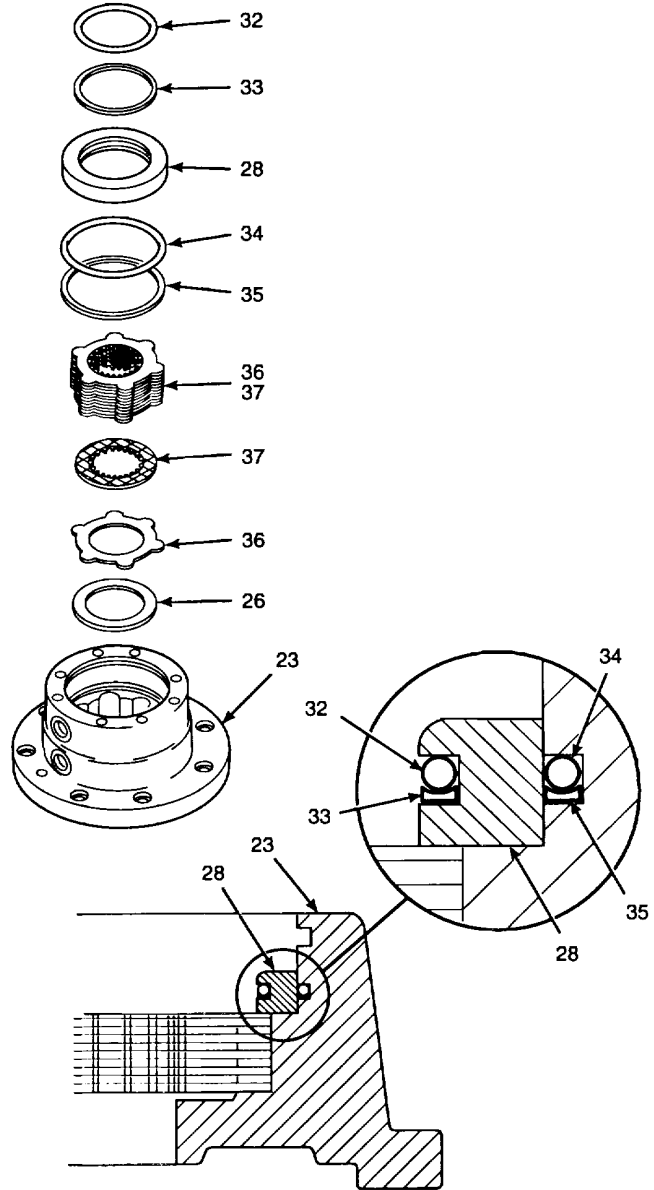
Refer to sectional view for proper positioning of seals and o-rings.

O-rings may have to be stretched slightly to fit tightly against outer diameter of mating grooves.

**NOTE**

Plain seal (35) may not be used in all applications.

- b. Lubricate o-rings (32 and 34) and plain seals (33 and 35) with petrolatum.
- c. Turn concave side of plain seal (35) up. Install seal, concave side up, in bottom of lower packing groove inside brake housing (23).
- d. Install o-ring (34) directly above installed plain seal (35). Coat exposed surfaces of installed o-ring and seal with petrolatum.
- e. Turn part number side of ring spacer (28) down. Install plain seal (33), concave side up, in bottom of packing groove in ring spacer.



**SECTIONAL VIEW**

- f. Install o-ring (32) directly above installed plain seal (33). Coat exposed surfaces of installed o-ring and seal with petrolatum.
- g. With part number side down, insert ring spacer (28) in brake housing (23). Press ring spacer squarely down until seated. Be careful not to extrude o-ring (34) or plain seal (35).

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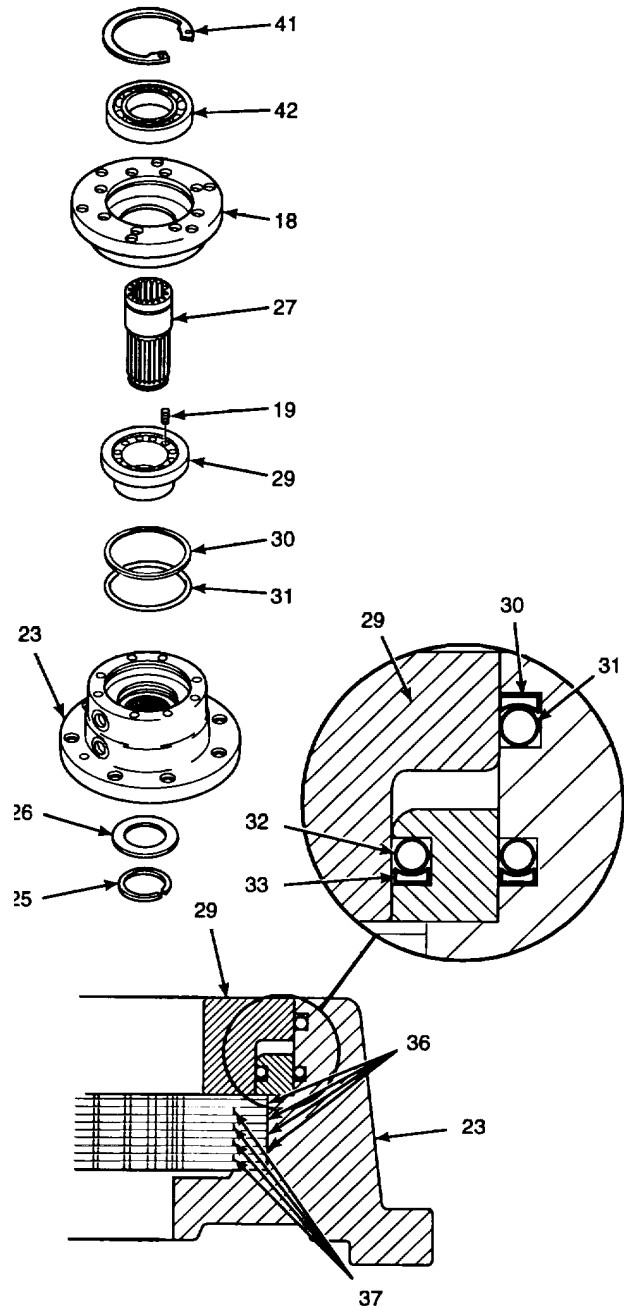
E. ASSEMBLE Continued.

- h. Lubricate o-ring (31) and plain seal (30) with petrolatum.
- i. Turn concave side of plain seal (30) down. Install seal, concave side down, in upper packing groove of brake housing (23).
- j. Install o-ring (31) underneath installed plain seal (30) in upper packing groove of brake housing (23). Coat exposed surfaces of installed o-ring and seal with petrolatum.
- k. Install and tap cylindrical piston (29) down squarely until fully seated inside brake housing (23) and installed ring spacer. Be careful not to extrude o-rings (31 and 32) or plain seals (30 and 33).
- l. Line up double-tooth gaps in spline teeth of installed sintered disc brake shoes (37). Use straightedge to align spline teeth straight up and down.
- m. Insert shouldered shaft (27) into installed steel disc brakes (36) and sintered disc brake shoes (37). Work shaft downward until seated. When seated, retaining ring groove can be seen at bottom of brake housing (23).

**WARNING**

Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- n. Install second thrust bearing (26) and retaining ring (25) on leading end of shouldered shaft (27). Verify that shaft turns freely.
- o. Using hydraulic press frame and input bearing driver, press outer race of bearing (42) to seat in mechanical drive housing (18). Using snap ring pliers, install retaining ring (41).
- p. Insert springs (19) into every third bore hole of cylindrical piston (29). Installed springs must be spaced evenly.



**GO TO NEXT PAGE**



2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.

E. ASSEMBLE Continued.

- q. Lubricate o-ring (21) with petrolatum. Install o-ring in mating groove of mechanical drive housing (18).

**WARNING**

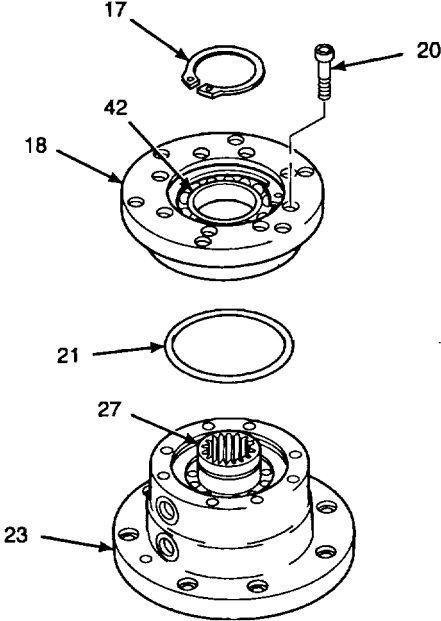
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- r. Apply thread locking compound (Item 14, Appendix B) to threads of bolts (20).
- s. Center installed bearing (42) on shouldered shaft (27). Lightly and evenly tap around perimeter of mechanical drive housing (18) with plastic hammer until housing is close enough to install bolts (20).
- t. Make sure o-ring (21) is still seated in mating groove of mechanical drive housing (18).
- u. Install and evenly tighten bolts (20) until mechanical drive housing (18) is fully seated on brake housing (23). Using hex head driver socket (Item 89, Appendix D), evenly tighten bolts to 8 lb-ft (11 N•m).

**WARNING**

Use care then installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- v. Using snap ring pliers, install retaining ring (17).



**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves should be worn when working with hydraulic oil.

- w. Use HSTRU to pressure test brake at 350 psig (2413 kPa gauge) for leakage. Apply pressure at hydraulic adapter port. If hydraulic oil leakage is detected at either end of brake housing after 5 minutes, failed preformed packings must be replaced.
- x. Disconnect brake from HSTRU and drain hydraulic oil into drain pan. Dispose of drained hydraulic oil in accordance with local procedures.

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E. ASSEMBLE Continued.

**CAUTION**

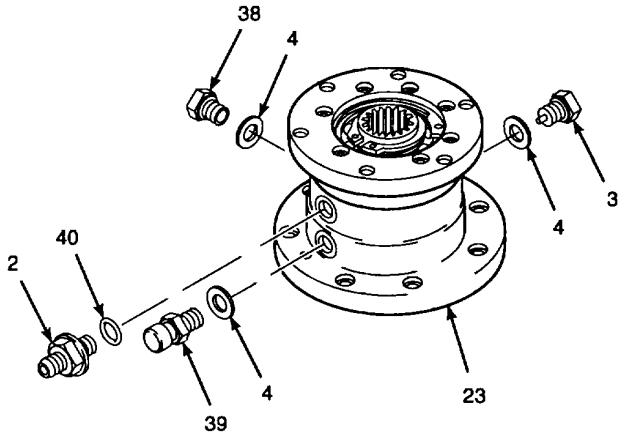
Be careful not to damage preformed packing when sliding over threads. Sharp edges of threads can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- y. Apply petrolatum to preformed packing (40). Install preformed packing in mating groove of straight adapter (2).

**CAUTION**

Be careful not to overtighten threaded brass components (2, 3, 38, and 39) during installation. Overtightening will cause stripping of screw threads or shearing off of brass component.

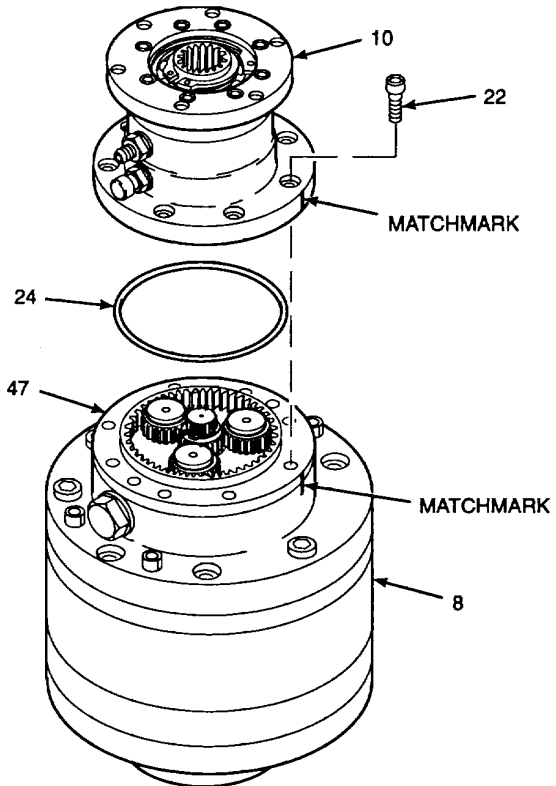
- z. Screw straight adapter (2) into mating port of brake housing (23) until installed preformed packing (40) meets packing seat. Carefully tighten adapter and install protective cap on exposed threads of straight adapter.
- aa. Install and carefully tighten plug (3), liquid sight indicator (38), and breather (39) with seal rings (4) in mating ports of brake housing (23).



F. INSTALL.

1. INSTALL BRAKE ON SPEED REDUCTION GEARBOX.

- a. Lubricate o-ring (24) with petrolatum. Install o-ring on mating flange of installed internal gear (47).
- b. Align matchmarks on brake (10) and speed reduction gearbox (8). Seat brake on gearbox.



- c. Apply thread locking compound (Item 14, Appendix B) to threads of bolts (22). Install and securely tighten bolts.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.**

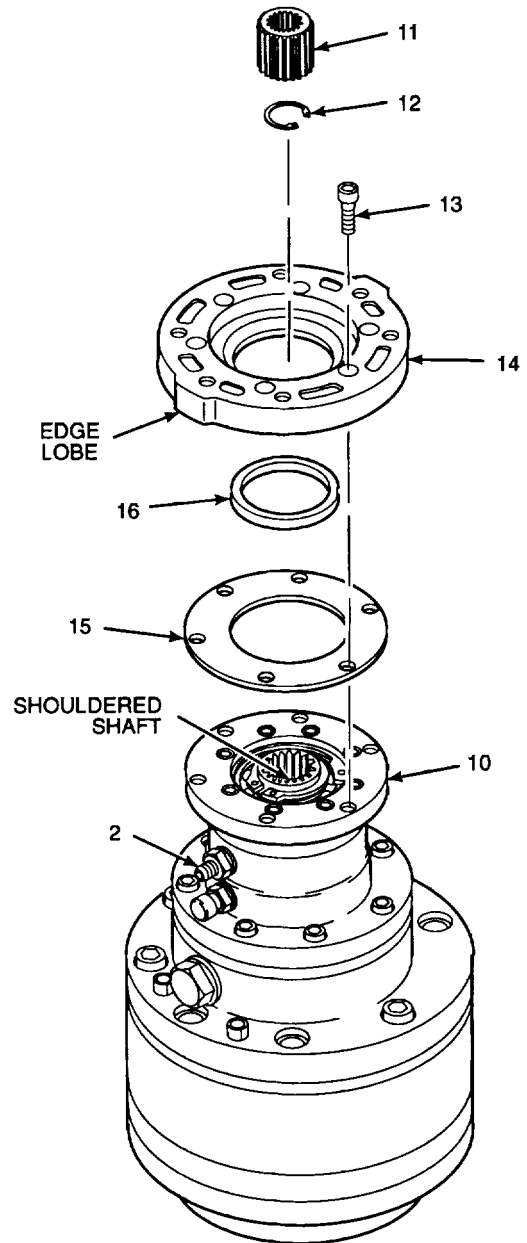
F. INSTALL Continued.

2. INSTALL FLANGE COMPONENTS.

**NOTE**

Ring seal (16) can only be installed on brake mounting side of flange (14).

- a. Lubricate ring seal (16) with petrolatum. With sealing lip up, use plastic hammer to evenly tap ring seal into flange (14).
- b. Install gasket (15) on mating flange of brake (10).
- c. Line up edge lobe of flange (14) with installed straight adapter (2).
- d. Carefully slide flange (14) with installed ring seal (16) over shouldered shaft of brake (10).



**WARNING**

Thread locking compound can cause eye damage. Wear eye safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply thread locking compound (Item 13, Appendix B) to threads of bolts (13). Install bolts. Using hex head driver socket (Item 88, Appendix D), evenly tighten bolts to 45 lb-ft (61 N•m).

**WARNING**

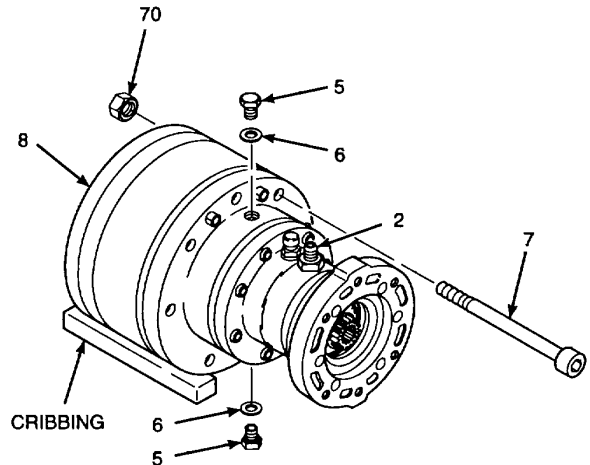
Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- f. Use snap ring pliers to install retaining ring (12) in mating groove of spline coupling (11).
- g. With retaining ring end of spline coupling (11) facing down, insert coupling into mating shouldered shaft of brake (10).

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F. INSTALL - Continued.

- h. Crib speed reduction gearbox (8) horizontally with installed straight adapter (2) at 12 o'clock position.
- i. Install lower seal ring (6) and plug (5). Tighten plug.
- j. Lubricate speed reduction gearbox (8) with gear oil per LO 5-3895-373-12.
- k. Install upper seal ring (6) and plug (5). Tighten plug.
- l. Remove socket head cap screws (7) and hex nuts (70) from speed reduction gearbox (8). Return hex nuts to tool storage.



3. INSTALL SPEED REDUCTION GEARBOX.

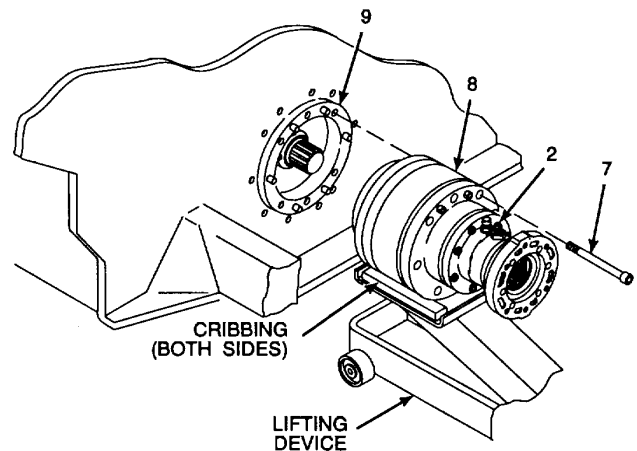
**WARNING**

Speed reduction gearbox with brake weighs approximately 110 lbs (50 kg). Make sure full weight of gearbox is supported on lifting device and that gearbox is not allowed to roll. Careless handling of gearbox could result in serious injury to personnel or damage to equipment.

- a. Transport speed reduction gearbox (8) and socket head cap screws (7) to paving machine. With help of another person, lift and set gearbox on lifting device. Crib both sides of gearbox. Make sure installed straight adapter (2) is at 12 o'clock position.
- b. Instruct another person to move lifting device with speed reduction gearbox (8) under paving machine toward track drive hub (9). Steady gearbox while lifting device is in motion.
- c. Instruct another person to raise lifting device. Help position speed reduction gearbox (8) in line with track drive hub (9).

**NOTE**

Make sure installed straight adapter (2) is straight up, 12 o'clock position, with speed reduction gearbox in place.



**NOTE**

Brake may have to be released for alignment of position speed reduction gearbox with track drive hub. If necessary, use manual hydraulic pump from universal puller kit or pressure from HSTRU to release brake.

- d. Slide speed reduction gearbox (8) onto mating spline up, of track drive hub (9). Ensure engagement of dowel pins in drive hub with spring pin holes of gearbox.

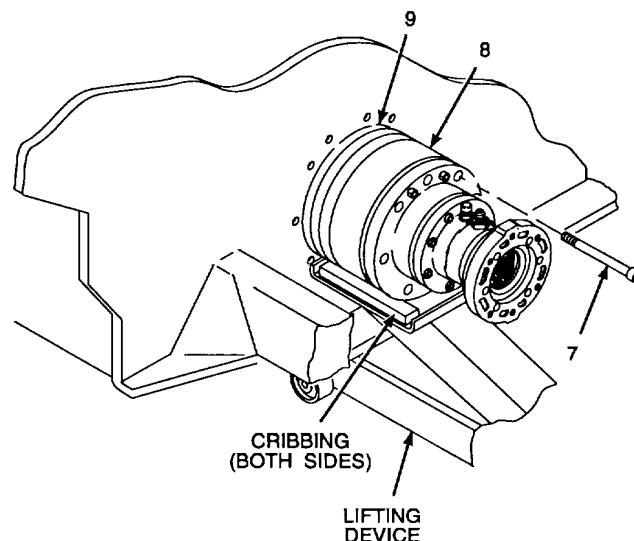
**2.33 REPLACE/REPAIR SPEED REDUCTION GEARBOX - Continued.****F. INSTALL Continued.**

- e. When speed reduction gearbox (8) is fully mated with track drive hub (9), instruct another person move lifting device from under paving machine.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- f. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screws (7). Install cap screws. Using hex head driver (Item 88, Appendix D), evenly tighten cap screws to 45 lb-ft (61 N•m).

**4. INSTALL HYDRAULIC LINE.**

- a. Remove protective caps from fitting of tube (1) and straight adapter (2).

**WARNING**

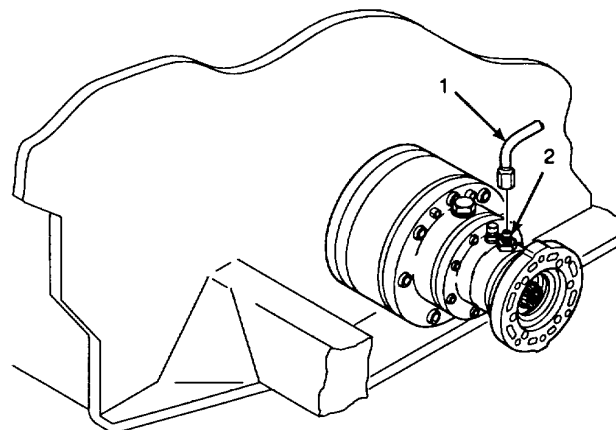
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply hydraulic fitting sealant to exposed threads of straight adapter (2).

**CAUTION**

Be careful not to overtighten fitting of tube (1) on straight adapter (2). Overtightening will cause stripping of brass screw threads or shearing off of adapter.

- c. Install and tighten fitting of tube (1) on straight adapter (2). Use backup wrench across adapter flats and do not overtighten tube fitting.

**NOTE**

FOLLOW-ON-TASK: Install propulsion motor per paragraph 2.32.

**END OF TASK**

**SECTION VIII. TRACK ASSEMBLY MAINTENANCE**

	<b>Para</b>	<b>Page</b>
Repair Track Tensioning Cylinder .....	2.39	2-535
Replace Track Chain Assembly .....	2.41	2-558
Replace Track Frame .....	2.34	2-495
Replace Track Rollers .....	2.35	2-501
Replace Track Tensioning Cylinder .....	2.37	2-514
Replace/Repair Track Drive Hub.....	2.40	2-544
Replace/Repair Track Idler Roller Assembly.....	2.36	2-506
Replace/Repair Track Tensioning Relief Valve and Unloading Valve.....	2.38	2-518

**2.34 REPLACE TRACK FRAME.**

This task covers:

- a. Removal
- b. Replace

**INITIAL SETUP**

**Tools:**

- General mechanic's automotive tool kit (Item 106, Appendix D)
- Chain assembly (Item 29, Appendix D)
- Torque wrench (Item 134, Appendix D)
- Track frame offset wrench (Item 24, Appendix C)
- Transmission jack (Item 55, Appendix D)

**Materials/Parts:**

- Thread locking compound (Item 13, Appendix B)
- Thread locking compound solvent (Item 32, Appendix B)
- Lockwashers
- Track frame

**Personnel Required:**

Two 62B construction equipment repairers. Second person needed to assist hoisting track frame.

**References:**

- TM 5-3895-373-20
- TM 5-3895-373-24P

**Equipment Condition:**

Screed tow arm removed per TM 5-3895-373-20.  
 Paving machine jacked up and cribbed (for track maintenance)  
 per TM 5-3895-373-20.  
 Track chain assembly removed per paragraph 2.41.  
 Track idler roller assembly removed per paragraph 2.36.  
 Track tensioning cylinder removed per paragraph 2.37.  
 Track rollers removed per paragraph 2.35.

**NOTE**

There are two track frames on the paving machine, one on the right side and one on the left side. Remove the screed tow arm and track chain components from the side being worked.

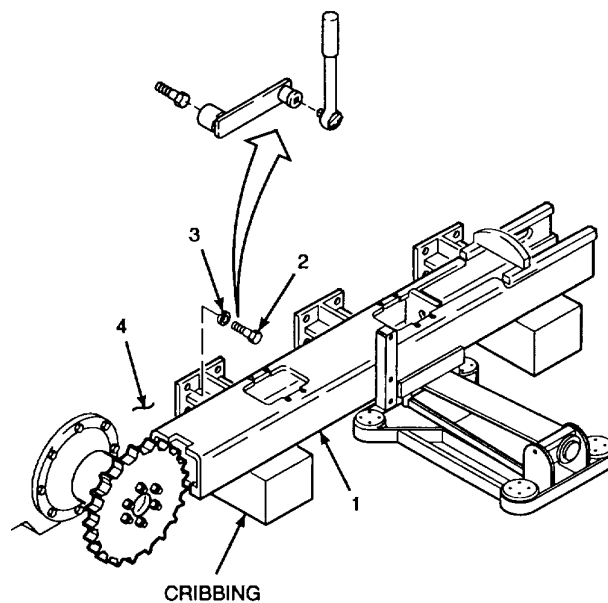
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**2.34 REPLACE TRACK FRAME - Continued.****NOTE**

There are two track frames. The procedure is the same for both the left and right sides. The right t# side is shown in this procedure.

**A. REMOVE.****1. REMOVE TRACK FRAME FROM MAIN FRAME.**

- a. Place cribbing beneath track frame (1).
- b. Place transmission jack beneath center of track frame (1). Raise transmission jack against track frame to keep frame from dropping onto cribbing.
- c. Remove hex head cap screws (2) and lockwashers (3) from main frame (4). Track frame offset wrench may be used. Discard lockwashers.

**2. USE TRANSMISSION JACK TO MOVE TRACK FRAME CLEAR OF MAIN FRAME.**

- a. With the help of another person, pull transmission jack and track frame (1) away from main frame (4).
- b. Set track frame (1) down on cribbing.
- c. Remove transmission jack from beneath track frame (1).

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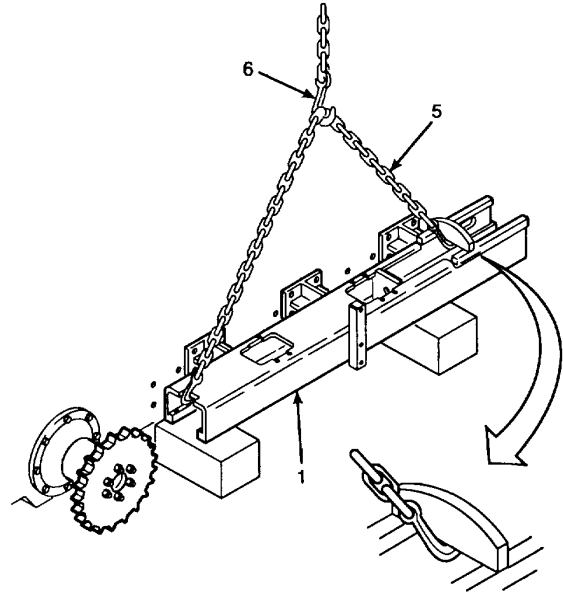
- A. REMOVE Continued.
3. LIFT TRACK FRAME CLEAR OF MAIN FRAME.

**WARNING**

Track frame weighs approximately 500 lbs (227 kg) capacity should exceed that weight by three times to ensure safety in lifting operations.

To avoid personnel injury, ensure all chains and hooks are in good condition and are of correct capacity. Ensure overhead hoist is in good working condition and hooks are positioned. Overhead hoist correctly. Lifting hooks must not be side loaded. Personnel injury can result from unexpected movement of track frame.

- a. Connect chain assembly (5) hooks to both ends of track frame (1).
- b. Attach overhead hoist hook (6) to lifting center of chain assembly (5).



**WARNING**

All personnel must stand clear during lifting operation. Do not allow track frame to swing while hanging from overhead hoist. Equipment may strike personnel and cause injury.

- c. With the help of another person to steady track frame (1), slowly raise overhead hoist to take up slack in chain assembly (5) until weight of track frame is supported by overhead hoist.
- d. Lower track frame (1) down so it is resting flat on the ground.
- e. Disconnect chain assembly (5) hooks from track frame (1).

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**2.34 REPLACE TRACK FRAME - Continued.****B. REPLACE.**

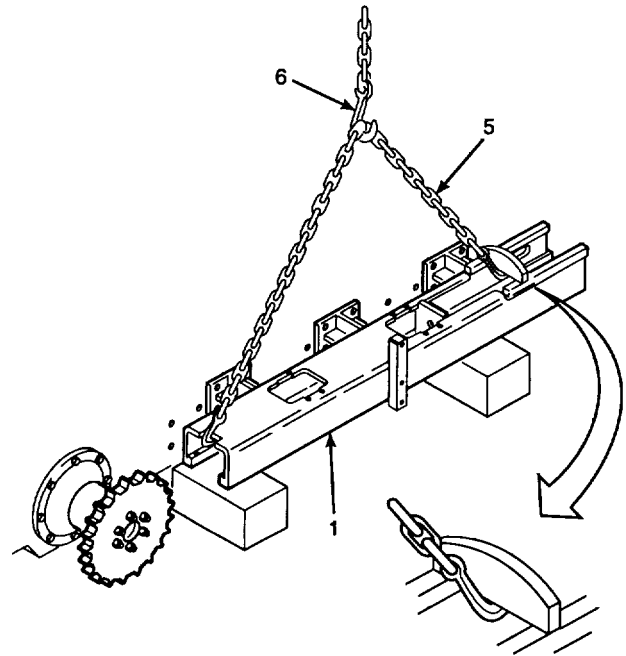
1. LIFT TRACK FRAME INTO POSITION FOR INSTALLATION ON MAIN FRAME.

**WARNING**

Track frame weighs approximately 500 lbs (227 kg). Overhead hoist capacity should exceed that weight by three times to ensure safety in lifting operations.

To avoid personnel injury, ensure all chains and hooks are in good condition and are of correct capacity. Ensure overhead hoist is in good working condition and hooks are positioned correctly. Lifting hooks must not be side loaded. Damage to equipment and personnel injury can result from unexpected movement of track frame.

- a. Connect chain assembly (5) hooks to both ends of track frame (1).
- b. Attach overhead hoist hook (6) to lifting center of chain assembly (5).

**WARNING**

All personnel must stand clear during lifting operations. Do not work or move beneath track frame while it is being lifted. Severe injury or death to personnel can occur.

- c. With the help of another person to steady track frame (1), slowly raise overhead hoist to take up slack in chain assembly (5) until weight of track frame is supported by overhead hoist.
- d. Raise overhead hoist until track frame (1) is clear of floor.
- e. Lower track frame (1) onto cribbing near main frame.
- f. Disconnect chain assembly (5) hooks from track frame (1).

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- B. REPLACE Continued.
2. USE TRANSMISSION JACK TO MOVE TRACK FRAME INTO POSITION ON MAIN FRAME.
    - a. Place transmission jack beneath center of track frame (1).
    - b. Lift track frame (1) until off of cribbing.
    - c. With the help of another person, push transmission jack and track frame (1) into position on main frame (4).
    - d. Reposition cribbing beneath track frame (1) to prevent tipping.
  3. INSTALL TRACK FRAME ON MAIN FRAME.

**WARNING**

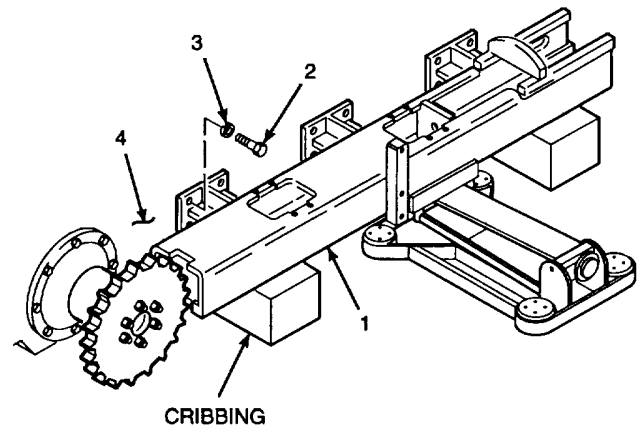
Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean threads of hex head cap screws (2) with thread locking compound solvent.
- b. Install lockwashers (3) onto hex head cap screws (2).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to threads of hex head cap screws (2).



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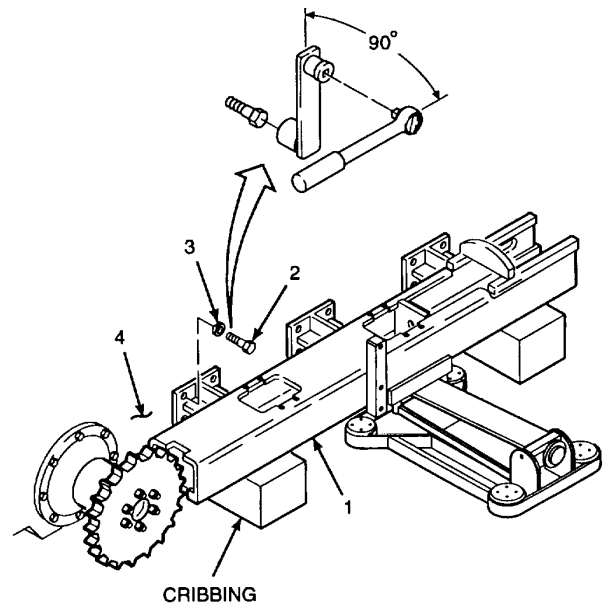
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**2.34 REPLACE TRACK FRAME - Continued.**

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**B. REPLACE Continued.**

- d. Install hex head cap screws (2) with lockwashers (3) through track frame (1) into main frame (4).
- e. Insert track frame offset wrench onto torque wrench at a 90° angle.
- f. Tighten hex head cap screws (2) to 570 lb-ft (773 N•m).
- g. Remove transmission jack and cribbing from beneath track frame (1).

**NOTE**

**FOLLOW-ON-TASKS:** Install track rollers per paragraph 2.35.  
Install track tensioning cylinder per paragraph 2.37.  
Install track idler roller assembly per paragraph 2.36.  
Install track chain assembly per paragraph 2.41.  
Lower paving machine from jacks per TM 5-3895-373-20.  
Install screed tow arm per TM 5-3895-373-20.

**END OF TASK**

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**2.35 REPLACE TRACK ROLLERS.**

---

This task covers:      a. Inspect                                  b. Remove                                  c. Clean  
                                 d. Install

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Outside micrometer (Item 19, Appendix D)  
Torque wrench (Item 132, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Track rollers

**References:**

TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Paving machine jacked and cribbed (for track maintenance) per  
TM 5-3895-373-20.  
Track chain assembly removed per paragraph 2.41.

**NOTE**

Upper and lower track rollers are identical. Differences in mounting hardware are addressed in text. Remove track chain assembly only on side being repaired. This procedure refers to track rollers on right hand track frame. Procedure is identical for track rollers on left hand track frame. Track rollers on right hand track frame are shown in this procedure.

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**GO TO NEXT PAGE**

**2.35 REPLACE TRACK ROLLERS - Continued.**

A. INSPECT.

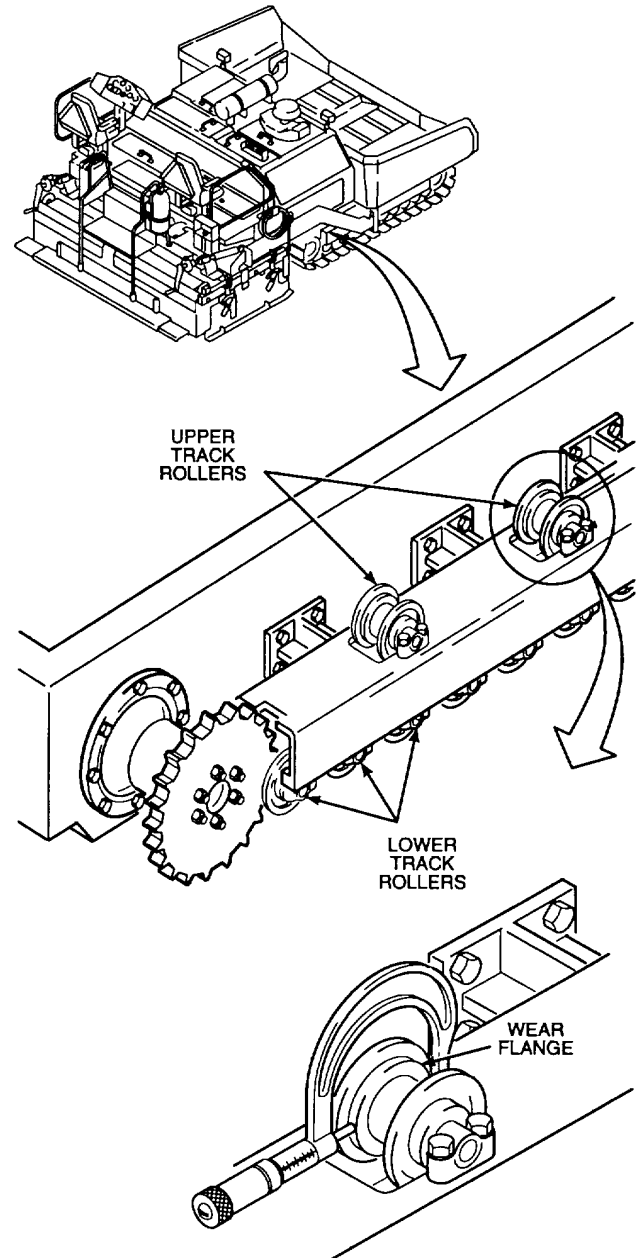
1. INSPECT UPPER AND LOWER TRACK ROLLERS FOR CRACKS, OIL LEAKAGE, AND FREE PLAY. DAMAGED TRACK ROLLERS MUST BE REPLACED.
2. INSPECT TRACK ROLLERS FOR FLAT SPOTS ON THE WEAR FLANGES OR OTHER SIGNS OF FROZEN TRACK ROLLERS. FROZEN TRACK ROLLERS MUST BE REPLACED.

**NOTE**

When measuring flange diameter, measure both inside and outside flange diameters.

3. MEASURE SMALLEST DIAMETER OF TRACK ROLLER WEAR FLANGES WITH OUTSIDE MICROMETER. REPLACE TRACK ROLLER WHEN LESS THAN 25% OF FLANGE WEAR REMAINS. REFER TO THE FOLLOWING CHART TO FIND PERCENT WEAR REMAINING.

Wear Flange Diameter	Wear Remaining
5.859 in. (150 mm)	100%
5.812 in. (148 mm)	50%
5.750 in. (146 mm)	25%



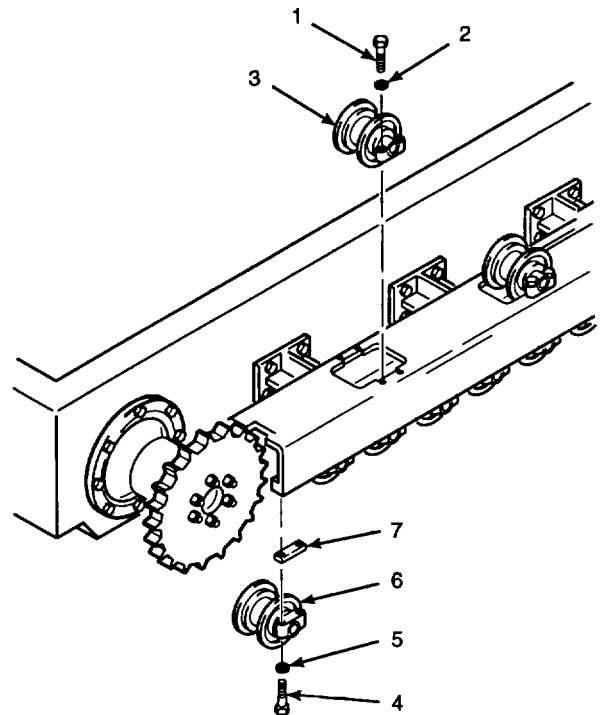
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B. REMOVE.

1. REMOVE HEX HEAD CAP SCREWS (1) AND FLAT WASHERS (2). REMOVE UPPER TRACK ROLLER (3).
2. REMOVE HEX HEAD CAP SCREWS (4) AND FLAT WASHERS (5) WHILE HOLDING LOWER TRACK ROLLER (6) IN PLACE. REMOVE LOWER TRACK ROLLER (6) AND SPACERS (7).

C. CLEAN.

1. CLEAN TRACK ROLLER MOUNTING SURFACES.
  - a. Clean exposed mounting surfaces of track rollers with wire scratch brush.



**WARNING**

Cleaning solvent, P-D-680 is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint of Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical attention. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- b. Use cleaning solvent and cleaning cloth to further clean remaining buildup deposits from mounting surfaces and track rollers.

**GO TO NEXT PAGE**

**2.35 REPLACE TRACK ROLLERS - Continued.**

C. CLEAN Continued.

2. CLEAN MOUNTING HARDWARE.

**WARNING**

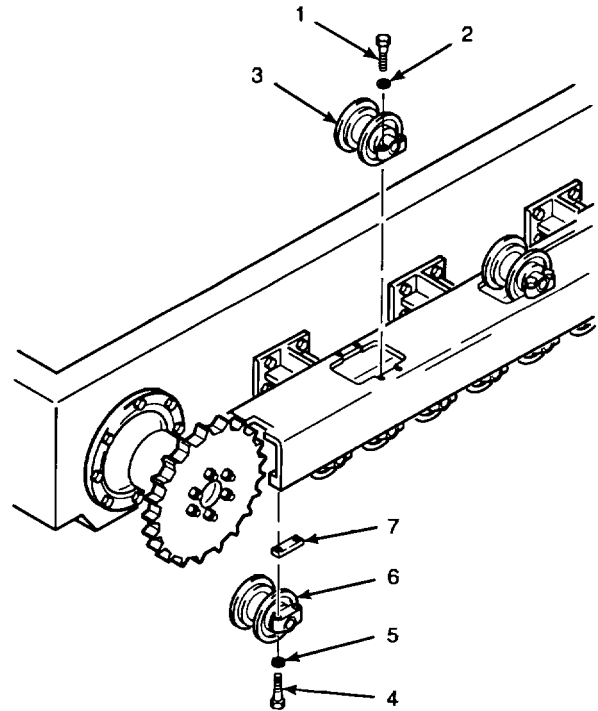
Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean threads of hex head cap screws with thread locking compound solvent.
- b. Dry threads with a cleaning cloth.

D. INSTALL.

**NOTE**

Short hex head cap screws (1) and flat washers (2) are used to secure upper track rollers (3). Longer hex head cap screws (4) and flat washers (5) are used with spacers (7) on the lower track rollers (6).



1. INSTALL UPPER TRACK ROLLER.

- a. Install flat washers (2) onto hex head cap screws (1).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (1).

**GO TO NEXT PAGE**

D. INSTALL Continued.

**CAUTION**

Ensure that before installing the track rollers that bearing retainer keys are installed in the track roller mounting pad and flush with the pad's machined surface. Failure to get the key and pad flush will cause component damage and track system failure.

- c. Ensure that bearing retainer keys (8) are installed in track roller (3) mounting pads and flush with the pad's machined surface.

**CAUTION**

Track roller mounting hex head cap screws must be tightened evenly for equal clamping loads between roller and frame. Failure to evenly tighten mounting cap screws may result in shortened roller life.

- d. Install upper track roller (3) and secure with hex head cap screws (1) and flat washers (2). Evenly tighten cap screws to 59 lb-ft (80 N•m).

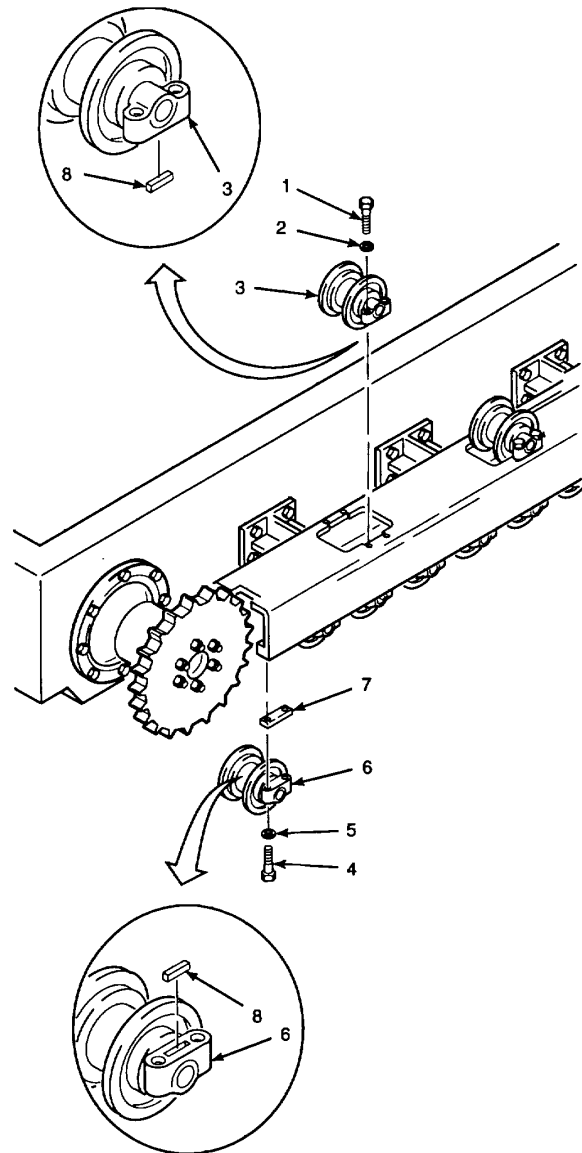
2. INSTALL LOWER TRACK ROLLER.

- a. Install flat washers (5) onto hex head cap screws (4).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (4).
- c. Ensure that bearing retainer keys (8) are installed in track roller (6) mounting pads and flush with the pad's machined surface.



- d. Install spacers (7) and lower track roller (6). Secure with hex head cap screws (4) and flat washers (5). Evenly tighten cap screws to 59 lb-ft (80 N•m).

**NOTE**

FOLLOW-ON-TASKS: Install track chain assembly per paragraph 2.41.  
Lower paving machine from jacks per TM 5-3895-373-20.

**END OF TASK**



---

**2.36 REPLACE/REPAIR TRACK IDLER ROLLER ASSEMBLY.**

---

**This task covers:**

- a. Disassemble                      b. Clean                                  c. Inspect  
d. Assemble
- 

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit (Item 106, Appendix D)  
C-clamp (Item 30, Appendix D)  
Chain assembly (Item 29, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Crowbar (Item 35, Appendix D)  
Hex head driver socket (Item 84, Appendix D)  
Slide caliper (Item 20, Appendix D)  
Sling strap (Item 98, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Socket wrench adapter (Item 7, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Torque wrench, 100 to 500 lb-ft (Item 133, Appendix D)  
Universal puller kit (Item 69, Appendix D)

**Personnel Required:**

Two 62B construction equipment repairers. Second person needed to help move track idler roller assembly.

**References:**

LO 5-3895-373-12  
TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Paving machine jacked and cribbed (for track maintenance) per TM 5-3895-373-20.  
Track chain assembly removed per paragraph 2.41.

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Grease (Item 18, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Sleeve bushings  
Lockwashers  
Plain seals

---

**NOTE**

There is a right hand track idler roller assembly and a left hand track idler roller assembly on the paving machine. Remove the track chain assembly only from the side being worked on. The procedure for both the right and left hand track idler roller assemblies is the same. Any differences are noted in the text. The right hand track idler roller assembly is shown in the illustrations.

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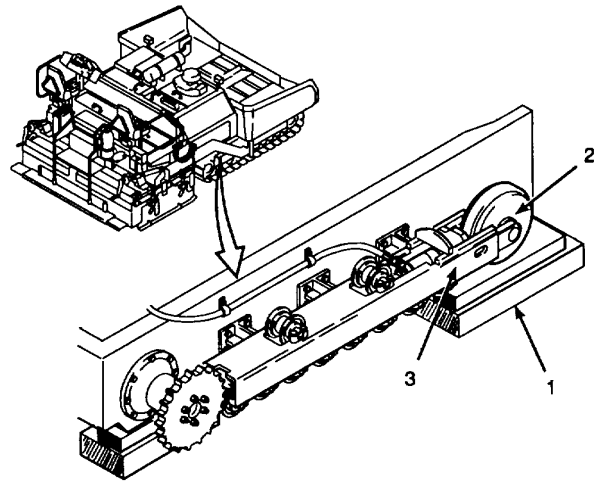
A. DISASSEMBLE.

1. REMOVE TRACK IDLER ROLLER ASSEMBLY FROM TRACK FRAME.

**WARNING**

The track idler roller assembly weighs approximately 95 lbs (43 kg) and is difficult to handle. Be careful when sliding track idler roller assembly from track frame. Damage to equipment and personnel injury may result from unexpected movement.

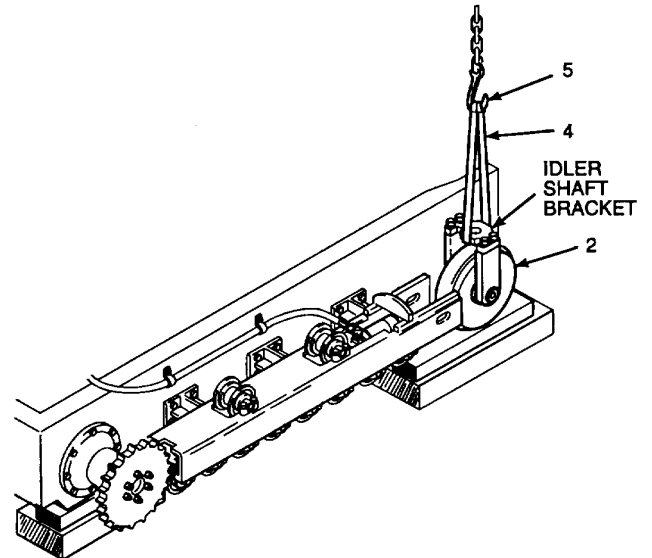
- a. Stack cribbing (1) under and in front of track idler roller assembly (2). Carefully pry track idler roller assembly out of track frame (3) using a crowbar.



**WARNING**

Ensure sling strap is in good condition and is of correct capacity. Failure to do so may allow track idler roller assembly to fall causing serious injury or death to personnel.

- b. Place sling strap (4) around idler shaft bracket of track idler roller assembly (2). Connect loops on sling strap to overhead hoist hook (5).
- c. With the help of another person, transport track idler roller assembly to workbench.



**GO TO NEXT PAGE**

2.36 REPLACE/REPAIR TRACK IDLER ROLLER ASSEMBLY - Continued.

A. DISASSEMBLE Continued.

2. DISASSEMBLE TRACK IDLER ROLLER ASSEMBLY.

a. Remove set screws (6).

**NOTE**

The circular end of the track slide is offset so that the longer flat surface is on the bottom.

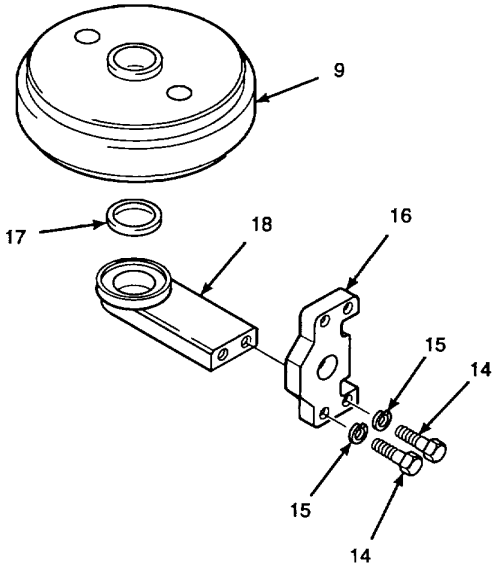
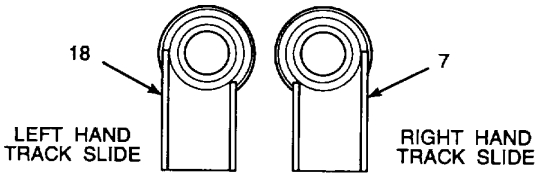
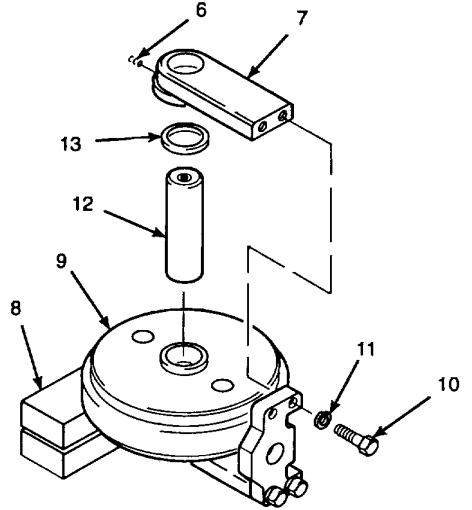
b. Position track idler roller assembly on its side with RH track slide (7) up. Place cribbing (8) below track idler roller (9) to prevent tipping.

c. Secure track idler roller assembly to workbench with a C-clamp.

d. Remove hex head cap screws (10) and lockwashers (11). Lift RH track slide (7) from shaft (12). Discard lockwashers.

e. Lift shaft (12) from track idler roller (9). Remove and discard plain seal (13) from RH track slide (7).

f. Remove hex head cap screws (14) and lockwashers (15). Remove idler shaft bracket (16). Discard lockwashers.



**CAUTION**

LH and RH track slides are not interchangeable with each other. Ensure that the LH and RH track slides are separated out so as not to be intermixed.

g. Remove track idler roller (9) and plain seal (17) from LH track slide (18). Discard plain seal.

GO TO NEXT PAGE

## B. CLEAN.

## 1. CLEAN TRACK IDLER ROLLER ASSEMBLY COMPONENTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean all components with cleaning solvent and cleaning cloth.
  - b. Use a cleaning brush to remove buildup deposits.
2. CLEAN HEX HEAD CAP SCREWS AND SET SCREWS.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean threads of set screws and hex head cap screws with thread locking compound solvent.
- b. Wipe threads dry with a cleaning cloth.

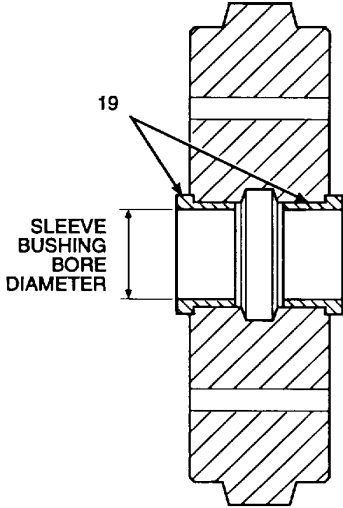
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2.36 REPLACE/REPAIR TRACK IDLER ROLLER ASSEMBLY - Continued.

C. INSPECT.

1. INSPECT SLEEVE BUSHINGS AND TRACK SLIDES.

- a. Use slide caliper to measure sleeve bushing (19) bore diameters near outer edges of bushings. If either bore diameter measurement exceeds 2.540 in. (64,5 mm), replace both bushings.
- b. Inspect track slide (7 and 18) shaft bores in long axis of track slide. If the bore is visibly out of round, replace track slide.
- c. Inspect shaft (12) surface for nicks, scratches or damage. Use emery cloth to polish out any raised metal edges. If polishing out does not effectively repair damage, replace shaft.

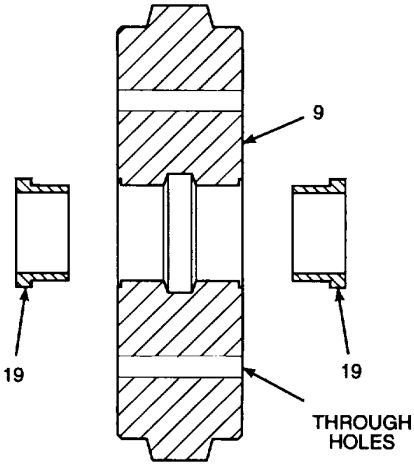
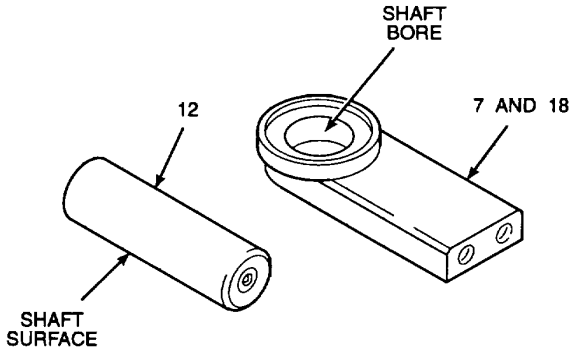


2. REPLACE SLEEVE BUSHINGS.

**NOTE**

Sleeve bushing should only be replaced if worn beyond inspection limits. Sleeve bushings must be replaced as a set.

- a. Use internal puller tool from universal puller kit to remove sleeve bushings (19) from track idler roller (9).
- b. Install replacement sleeve bushings with portable press tools from universal puller kit. Two 1 in. (25 mm) diameter through holes are provided in track idler roller (9) for ram press setup.



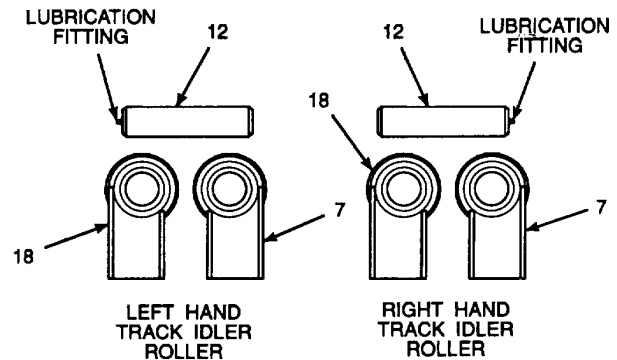
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D. ASSEMBLE.

1. ASSEMBLE TRACK IDLER ROLLER ASSEMBLY COMPONENTS.

**CAUTION**

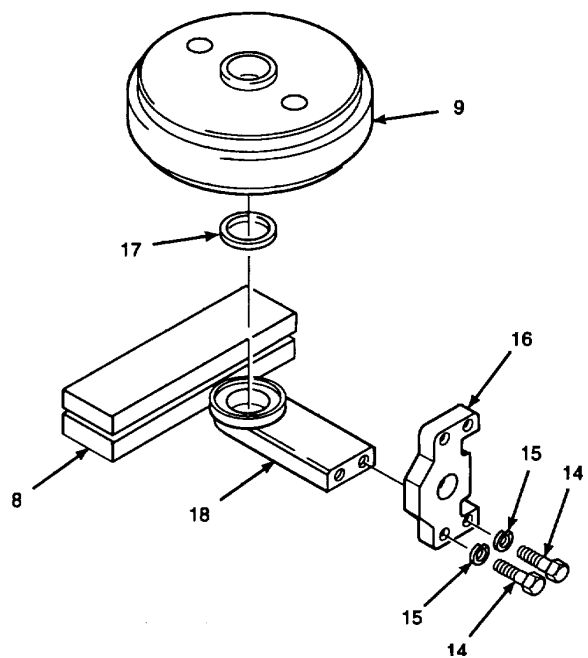
RH and LH track slides are not interchangeable with each other. When assembling track idler roller assemblies, make sure that track slides are installed in the correct locations.



- a. Refer to the illustration and layout the RH track slide (7), LH track slide (18), and shaft (12) for the track idler roller being assembled.
- b. Place LH track slide (18) on a flat work surface.
- c. Press plain seal (17) in LH track slide (18). Metallic side of plain seal must be fully seated in track slide seal bore.
- d. Install lockwashers (15) onto hex head cap screws (14).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.



- e. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (14).
- f. Install idler shaft bracket (16) on LH track slide (18) and secure with hex head cap screws (14). Do not tighten at this time.
- g. Mate track idler roller (9) with assembled LH track slide (18) and idler shaft bracket (16). Have cribbing (8) in place to help support track idler roller.

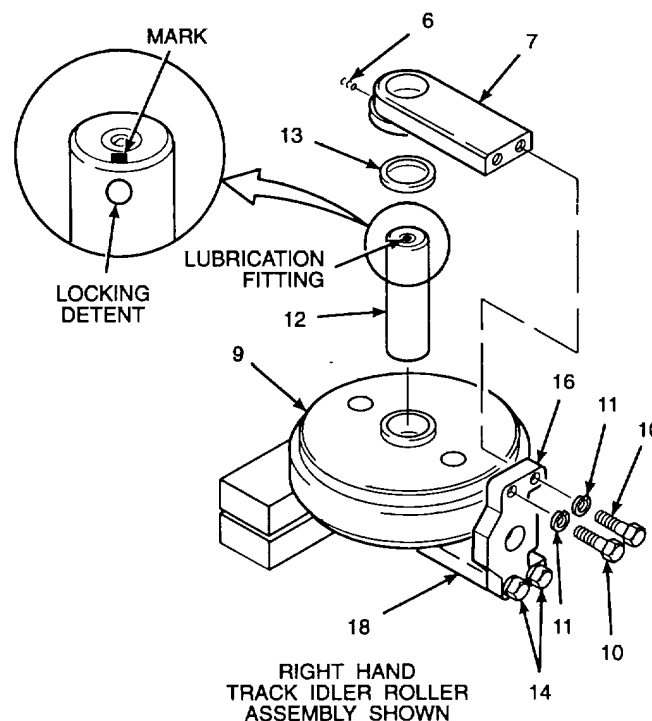
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2-511

**2.24. REPLACE/REPAIR TRACK IDLER ROLLER ASSEMBLY- Continued**

## D. ASSEMBLE - Continued.

**NOTE**

The lubrication fitting on the shaft must be pointing to the outside of the paving machine. When assembling the RH track idler roller assembly, install the shaft with the lubrication fitting up. When assembling the LH track idler roller assembly, install the shaft with the lubrication fitting down.



- h. Place shaft (12) with the lubrication fitting up if assembling the RH track idler roller assembly, and with the lubrication fitting down if assembling the LH track idler roller assembly.
- i. Use a marker to indicate location of set screw (6) locking detents in shaft (12). Mark on the top end of the shaft.
- j. Apply a thin coating of grease to shaft (12).
- k. Install shaft (12), with mark up, in bore of track idler roller (9). Fully seat installed shaft in mating bore of LH track slide (18). Line up the marks on the shaft with the set screw hole on the LH track slide.
- l. Press plain seal (13) in RH track slide (7). Metallic side of plain seal must be fully seated in RH track slide seal bore.
- m. Slide RH track slide (7) down onto shaft (12). Line up mounting holes in RH track slide with idler shaft bracket (16).
- n. Install lockwashers (11) onto hex head cap screws (10).

**WARNING**

Thread locking compound can cause eye damage.

Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- o. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (10).

- p. Install lockwashers (11) and hex head cap screws (10).
- q. Secure track idler roller assembly to workbench using a C-clamp.
- r. Tighten hex head cap screws (10 and 14) to 355 lb-ft (481 N•m) using socket wrench adapter (Item 6, Appendix D).
- s. Remove C-clamp and cribbing from track idler roller assembly.
- t. Apply thread locking compound (Item 14, Appendix B) to threads of set screws (6). Install set screws and tighten to 42 lb-ft (57 N.m) using hex head driver socket and socket wrench adapter (Item 7, Appendix D). Ensure set screws engage locking detents of shaft (12).

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2-512

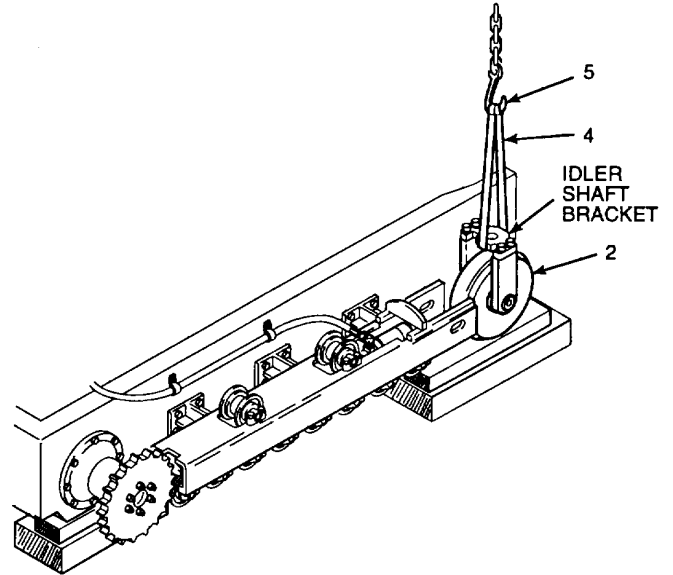
D. ASSEMBLE - Continued.

2. INSTALL TRACK IDLER ROLLER ASSEMBLY.

**WARNING**

Ensure sling strap is in good condition and is of correct capacity. Failure to do so may allow track idler to fall causing serious injury or death to personnel.

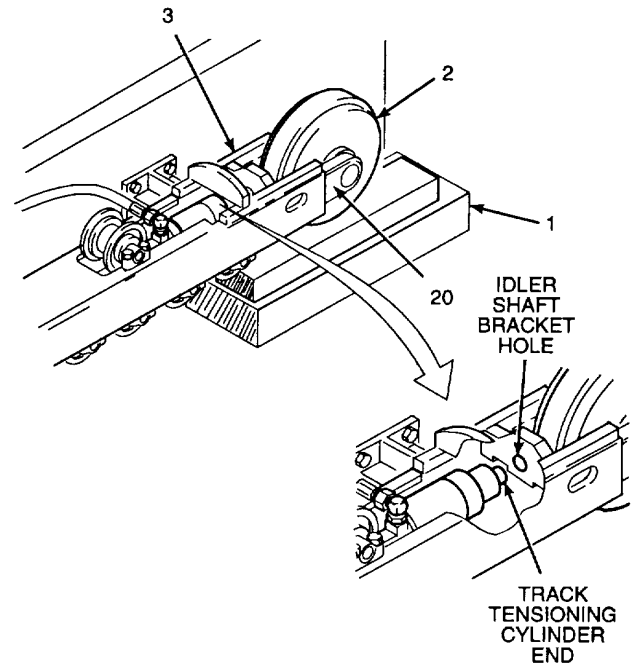
- a. Place sling strap (4) around idler shaft bracket of track idler roller assembly (2). Connect loops on sling strap to overhead hoist hook (5).
- b. With the help of a second person, transport track idler roller assembly to paving machine. During installation, ensure that the lubrication fitting is toward the outside of the paving machine and the long slide area on each track slide is on the bottom.
- c. Set track idler roller assembly (2) onto cribbing (1) with the lubrication fitting on the outside, and line up track slides (20) with mating surfaces in track frame (3).



**WARNING**

The track idler roller assembly weighs approximately 95 lbs (43 kg) and is difficult to handle. Be careful when sliding track idler roller assembly into track frame. Damage to equipment and personnel injury may result from unexpected movement.

- d. Apply a thin coating of grease to outer faces of track slides (20). Slide or pry track idler roller assembly (2) and track slides part way into track frame (3).
- e. Center track tensioning cylinder end with idler shaft bracket hole. Slide or pry track idler roller assembly (2) and track slides (20) fully into track frame (3).



**NOTE**

**FOLLOW-ON-TASKS:**

Install track chain assembly per paragraph 2.41.  
 Lubricate track idler roller assembly shaft per LO 5-3895-373-12.  
 Lower paving machine from jacks per TM 5-3895-373-20.

**END OF TASK**



**2.37. REPLACE TRACK TENSIONING CYLINDER.**

This task covers: a. Removal b. Install

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Crowbar (Item 35, Appendix D)  
Drip pan (Item 64, Appendix D)

References:

TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Paving machine jacked and cribbed (for track maintenance) per  
TM 5-3895-373-20.  
Track chain assembly removed per 2.41.

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Machinery wiping towels (Item 37, Appendix B)  
Protective caps (Item 3, Appendix B)  
Track tensioning cylinder

**NOTE**

There is a left hand and a right hand track tensioning cylinder on the paving machine.

Remove the track chain assembly only from the side being worked on. This procedure refers to replacement of right hand track tensioning cylinder. Procedure is identical for left hand track tensioning cylinder. Right hand track tensioning cylinder is shown in this procedure.

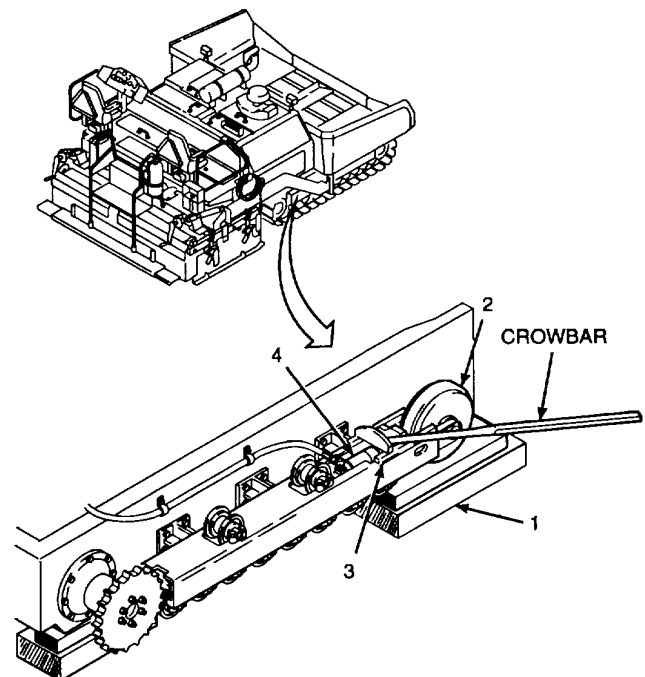
**A. REMOVE.**

1. SEPARATE TRACK IDLER ROLLER ASSEMBLY FROM TRACK TENSIONING CYLINDER.

**WARNING**

The track idler roller assembly weighs approximately 95 lbs (43 kg) and is difficult to handle. Be careful when moving track idler roller assembly from track frame. Damage to equipment and personnel injury may result from unexpected movement.

- a. Stack cribbing (1) under and in front of track idler roller assembly forward only as far as needed to roller assembly (2).



- b. Carefully pry track idler roller assembly (2) partly out of track frame (3) using crowbar. Move track idler, remove track tensioning cylinder (4).

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- A. REMOVE - Continued.
- 2. REMOVE TRACK TENSIONING CYLINDER.

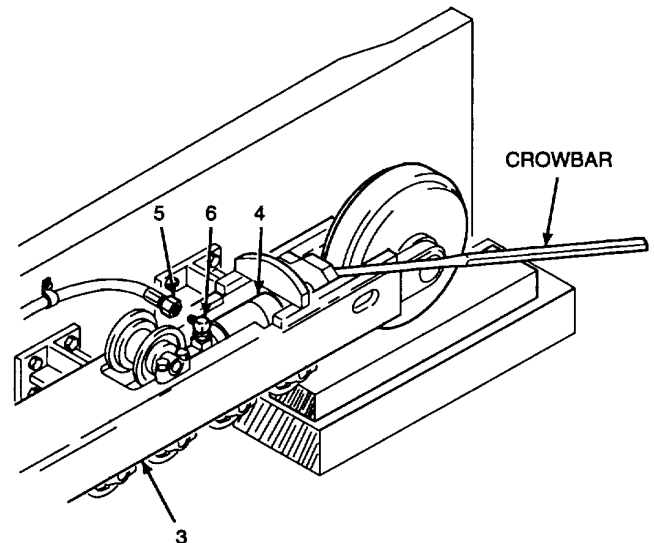
**WARNING**

Cleaning solvent, P-D-680 is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint of Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical attention. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

Thoroughly clean hydraulic hoses, tubes, and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.



- a. Use cleaning brush and cleaning solvent to clean all dust, dirt, and oil or grease residue from hose (5) end and fitting at track tensioning cylinder (4).
- b. Wipe off cleaned areas with a cleaning cloth.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- c. Place machinery wiping towels around elbow (6). Unscrew hose (5) from elbow and drain hydraulic oil from hose into drip pan. Plug hose and cap elbow.
- d. Wipe up any spilled hydraulic oil with machinery wiping towels. Dispose of hydraulic oil and machinery wiping towels in accordance with local procedures.
- e. Slide track tensioning cylinder forward to dislodge rear end of track tensioning cylinder from track frame (3). Remove track tensioning cylinder (4).

**2.37. REPLACE TRACK TENSIONING CYLINDER - Continued**

A. REMOVE - Continued.

3. REMOVE ELBOW AND PIPE BUSHING FROM CYLINDER.

**CAUTION**

Do not clamp cylinder against metal jaws in vise. Use wooden blocks between vise jaws and cylinder. Damage to surface of cylinder can result from contact with metal vise jaws.

- a. Clamp cylinder in a bench vise. Pad vise jaws with wooden blocks.
- b. Remove elbow (6) and pipe bushing (7).

B. INSTALL.

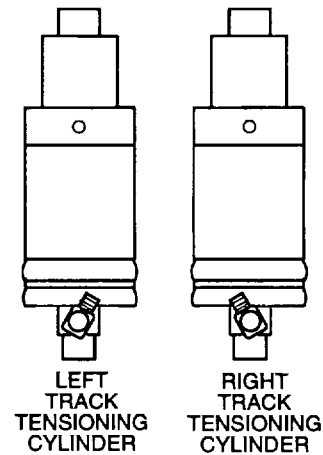
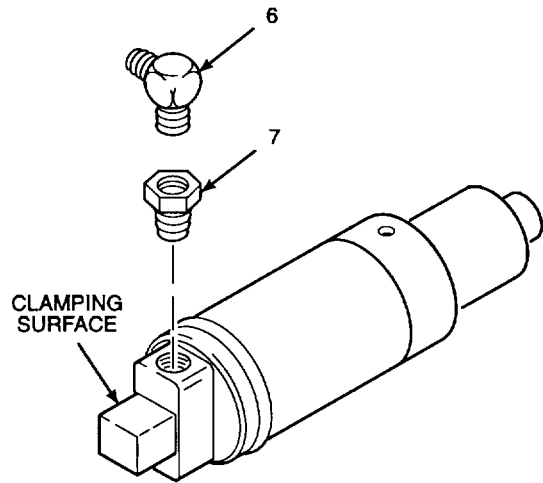
1. INSTALL PIPE BUSHING AND ELBOW ON CYLINDER.

- a. Clamp cylinder in a bench vise. Pad vise jaws with wooden blocks.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply pipe sealant to threads of pipe bushing (7) and install.
- c. Apply pipe sealant to threads of elbow (6) that will be installed into pipe bushing (7).
- d. Install elbow (6) into pipe bushing (7). Tighten elbow. Elbow must point in direction shown at right.
- e. Remove cylinder from bench vise.



**GO TO NEXT PAGE**  
**2-516**

B. INSTALL - Continued.

2. INSTALL TRACK TENSIONING CYLINDER.

- a. Install track tensioning cylinder (4). Seat rear end of track tensioning cylinder into square recess in track frame (3).

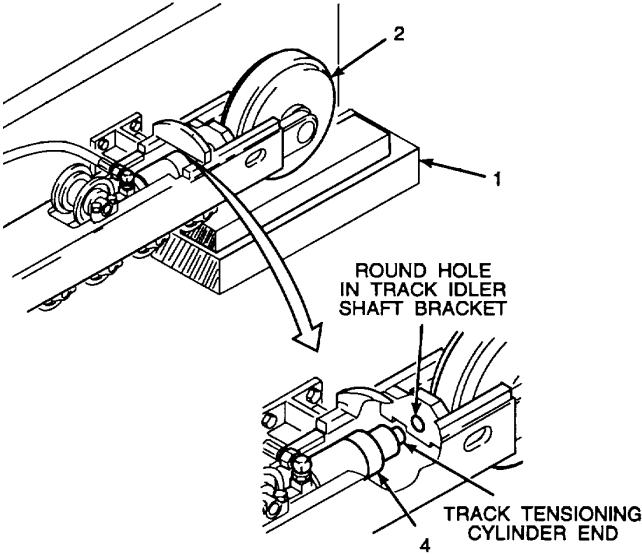
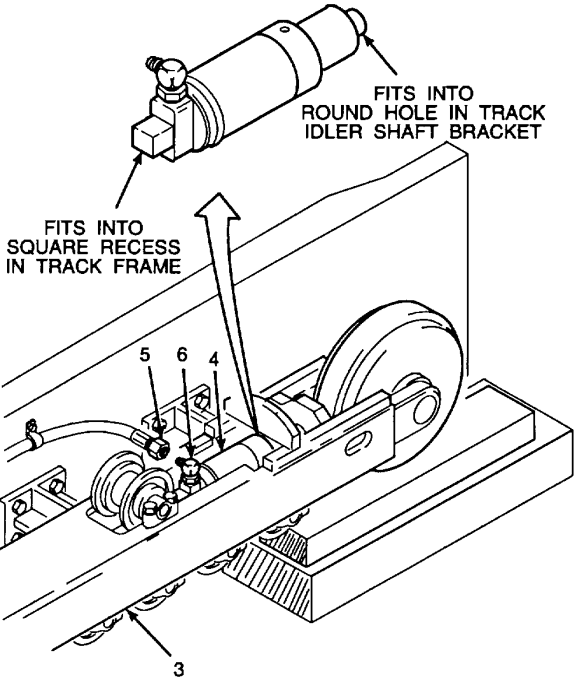
**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply hydraulic fitting sealant to threads of elbow (6).
- c. Connect hose (5) end and tighten fitting.

3. INSTALL TRACK IDLER ROLLER ASSEMBLY.

- a. Slide or pry track idler roller assembly (2) to the rear to center track tensioning cylinder (4) end into round hole in track idler shaft bracket.
- b. Remove cribbing (1).



**NOTE**

FOLLOW-ON-TASKS: Install track chain assembly per paragraph 2.41.  
Lower paving machine from jacks per TM 5-3895-373-20.

**END OF TASK**

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**2.39. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE.**

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This task covers:

a. Remove	b. Disassemble	c. Clean
d. Inspect	e. Assemble	f. Install

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Gasoline blowtorch (Item 11, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Snap ring pliers (Item 66, Appendix D)  
Torque wrench (Item 132, Appendix D)

References:

TM 5-3895-373-10  
TM 5-3895-373-24P

Equipment Conditions:

Center top right access door open per TM 5-3895-373-10.  
Right access door open per TM 5-3895-373-10.

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Protective caps (Item 3, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Flat washer  
Lockwashers  
Preformed packing  
Valve parts kits  
Valve seat

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**GO TO NEXT PAGE**  
**2-518**

A. REMOVE.

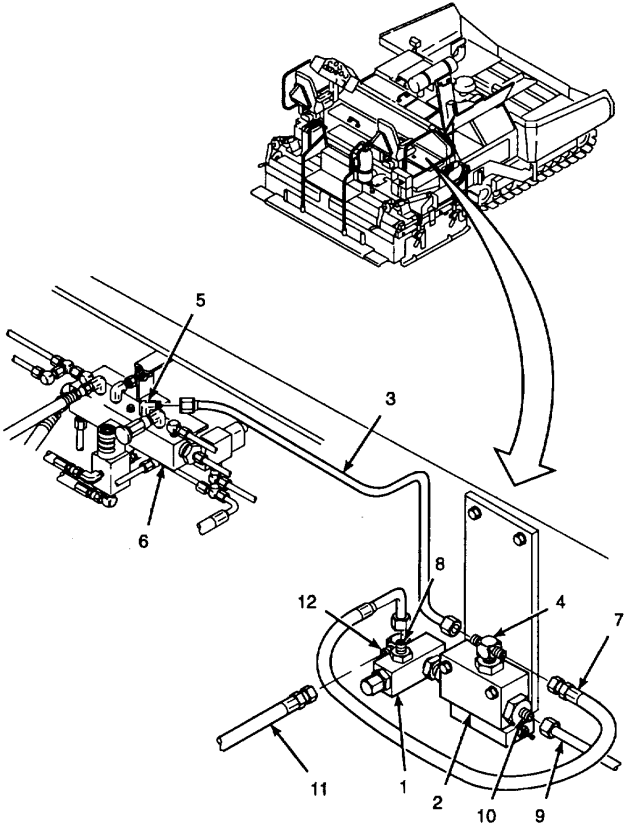
1. DISCONNECT HOSES AND TUBES FROM TRACK TENSIONING RELIEF VALVE AND TRACK TENSIONING UNLOADING VALVE.

- a. Place a machinery wiping towel below track tensioning relief valve (1) and track tensioning unloading valve (2).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Disconnect tube (3) from tee (4) on track tensioning unloading valve (2) and elbow (5) on return manifold (6).
- c. Disconnect hose (7) from tee (4) on track tensioning unloading valve (2) and straight adapter (8) on track tensioning relief valve (1).
- d. Disconnect tube (9) from straight adapter (10) and stack valve straight adapter.
- e. Disconnect hose (11) from elbow (12).



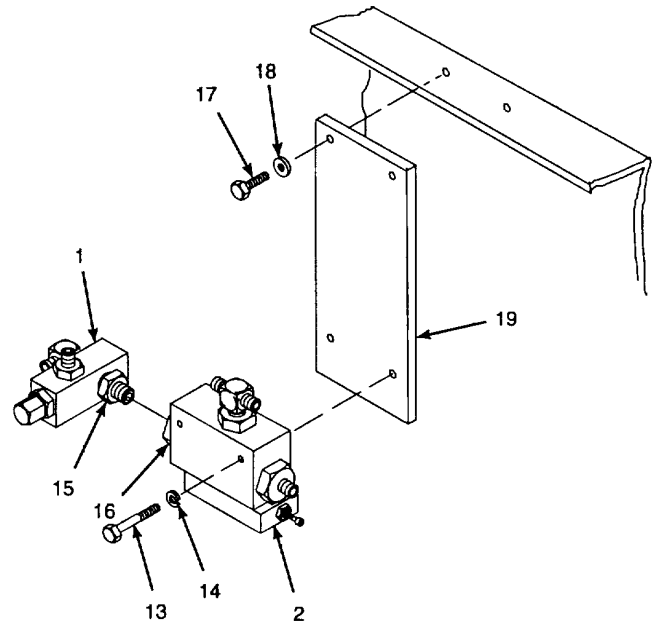
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**2-519**

**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued**

A. REMOVE - Continued.

2. REMOVE AND SEPARATE TRACK TENSIONING RELIEF VALVE AND TRACK TENSIONING UNLOADING VALVE.

- a. Remove bolts (13) and lockwashers (14). Discard lockwashers.
- b. Remove track tensioning relief valve (1) and track tensioning unloading valve (2) as an assembly through the center top right access door.
- c. Use a wrench on pipe nipple (15) and separate track tensioning relief valve (1) from bushing (16) on track tensioning unloading valve (2).
- d. Plug hydraulic hoses and tubes.



3. REMOVE BOLTS (17) AND SLEEVE SPACERS (18) FROM BRACKET (19) AND REMOVE BRACKET.

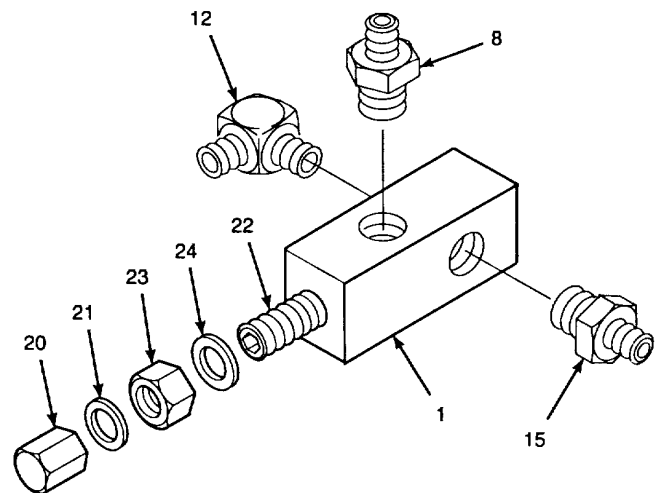
B. DISASSEMBLE.

**NOTE**

Use bench vise, as required, to support valve bodies during disassembly.

1. DISASSEMBLE TRACK TENSIONING RELIEF VALVE.

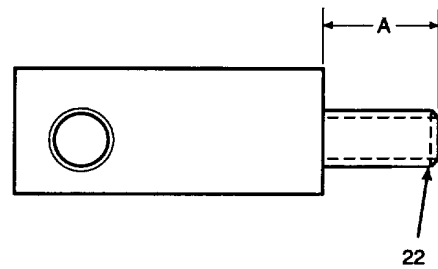
- a. Remove elbow (12), straight adapter (8), and pipe nipple (15) from track tensioning relief valve (1).
- b. Remove cap nut (20) and flat washer (21).
- c. Hold adjusting screw (22) in position with an allen wrench, and loosen hex nut (23). Remove hex nut and flat washer (24), making sure that the adjusting screw does not turn.



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2-520

B. DISASSEMBLE - Continued.

- d. Measure the exposed threads on adjusting screw (22). This is measurement A. This measurement will be needed during reassembly.



**CAUTION**

Adjusting screw is spring loaded and may be released when removed. Place a cleaning cloth over screw to catch screw and spring. Failure to do so may result in damage to screw and loss of spring.

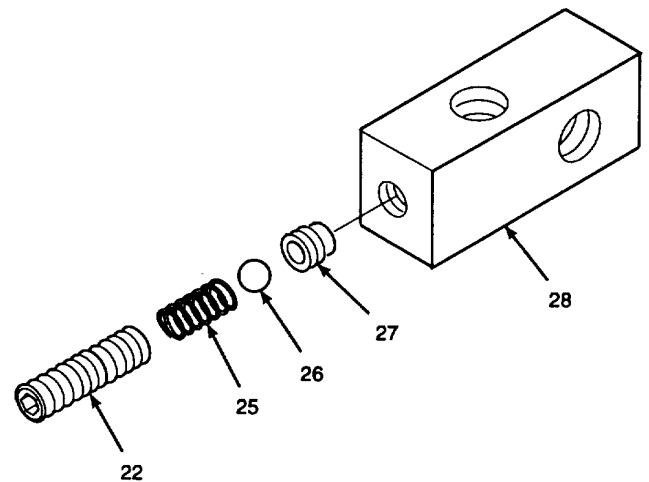
- e. Remove adjusting screw (22), spring (25), and check ball (26). Take care when removing the adjusting screw. Spring (25) is under pressure.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

Valve seat may require heat to remove. Heat valve seat with a gasoline blowtorch if necessary.



- f. Use a culture swab soaked with thread locking compound solvent to loosen valve seat (27) from valve body (28).

**GO TO NEXT PAGE**  
2-521

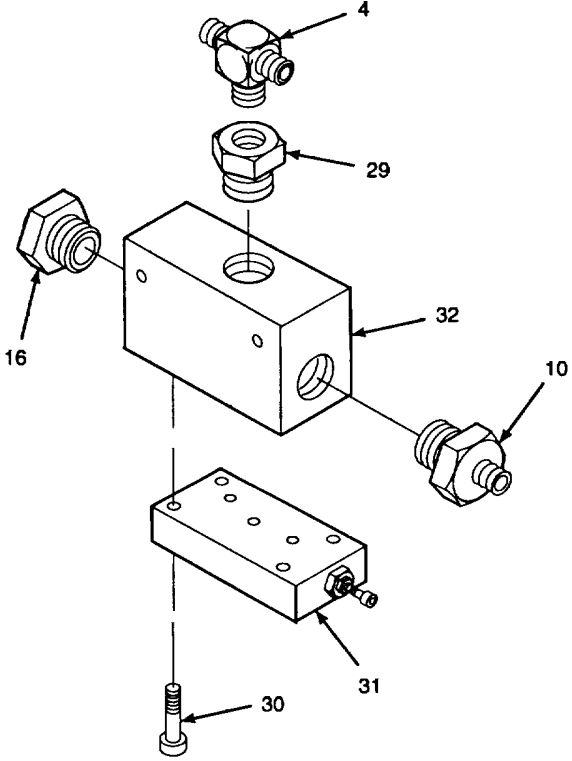


**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued**

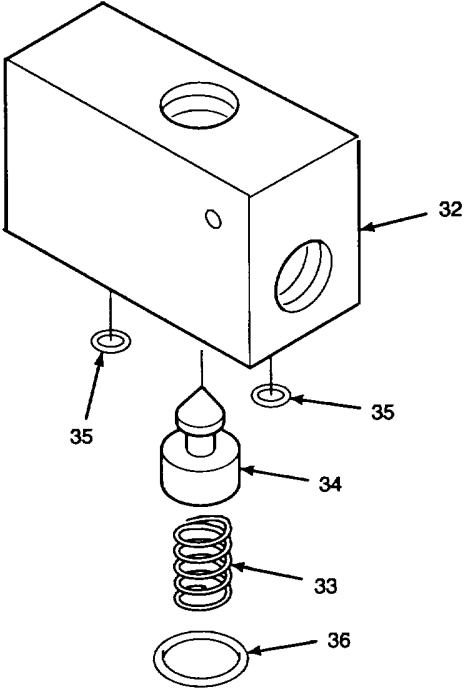
B. DISASSEMBLE - Continued.

2. DISASSEMBLE TRACK TENSIONING UNLOADING RELIEF VALVE.

- a. Remove tee (4) and bushing (29).
- b. Remove straight adapter (10) and bushing (16).
- c. Remove socket head cap screws (30) and separate valve body (31) from valve body (32).



- d. Remove spring (33) and valve disk (34) from valve body (32).
- e. Remove and discard preformed packings (35 and 36).



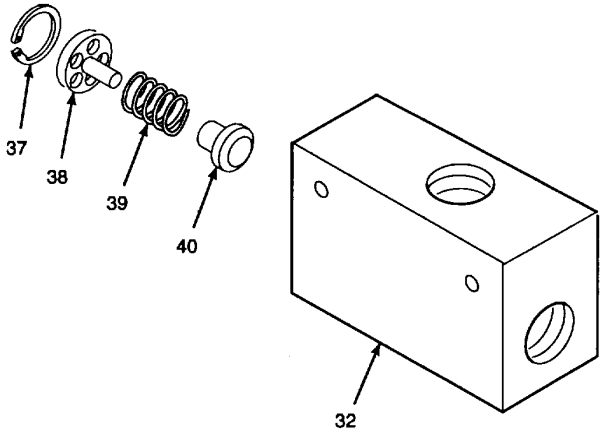
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**2-522**

B. DISASSEMBLE - Continued.

**WARNING**

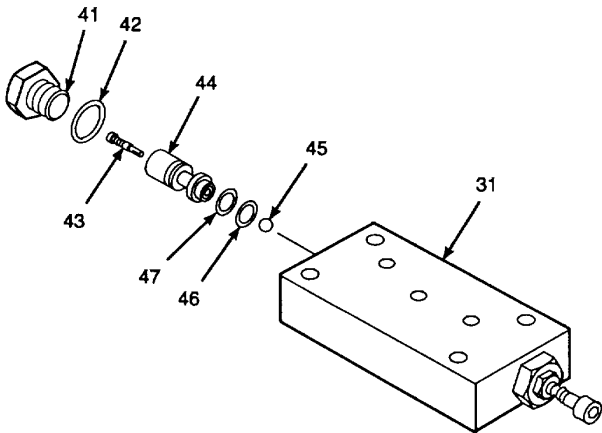
Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- f. Use snap ring pliers and remove retaining ring (37), valve guide (38), spring (39), and valve disk (40) from valve body (32).
- g. Remove plug (41) and preformed packing (42) from valve body (31). Discard preformed packing.
- h. Remove valve slide (43), valve liner (44), and check ball (45).



**CAUTION**

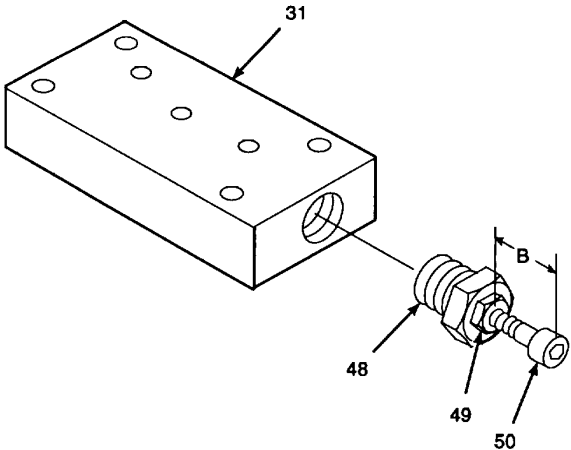
Use caution when removing seals and preformed packings. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings. Scratched or dented seal grooves can cause valve leakage.



**NOTE**

Preformed packing (46) may remain inside of valve body (31) when removing valve liner (44). Use an o-ring tool to remove preformed packing if necessary.

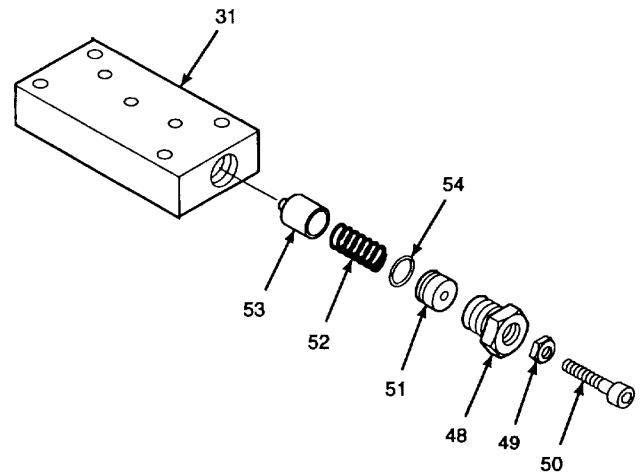
- i. Remove preformed packings (46 and 47) from valve liner (44). If preformed packing (46) did not come out with valve liner, use o-ring tool to remove preformed packing from valve body (31). Discard preformed packings.
- j. Use a wrench on valve retainer (48) and remove valve retainer, hex nut (49) and adjustment screw (50) as an assembly from valve body (31).
- k. Measure the thread exposure on adjustment screw (50). This is measurement B. This measurement will be used during reassembly.



**GO TO NEXT PAGE**  
**2-523**

**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued****B. DISASSEMBLE - Continued.**

- l. Loosen hex nut (49) and separate hex nut, adjustment screw (50) and valve retainer (48).
- m. Remove valve guide (51), spring (52), and spring holder (53) from valve body (31).
- n. Remove preformed packing (54) from valve guide (51). Discard preformed packing.

**C. CLEAN.**

1. CLEAN TRACK TENSIONING RELIEF VALVE AND TRACK TENSIONING UNLOADING VALVE COMPONENT PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent.

**GO TO NEXT PAGE****2-524**

## C. CLEAN - Continued.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from valve body, threaded surfaces, bores, and seal grooves.
- c. Dry all parts with a clean, lint-free cloth.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- d. Use a culture swab soaked in thread locking compound solvent to clean thread locking compound residue from valve body.
2. CLEAN BOLTS TREATED WITH THREAD LOCKING COMPOUND.
- a. Clean threads of valve mounting bolts and valve bracket bolts with thread locking compound solvent.
  - b. Dry bolts with a cleaning cloth.

**GO TO NEXT PAGE**  
**2-525**

**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued**

## D. INSPECT.

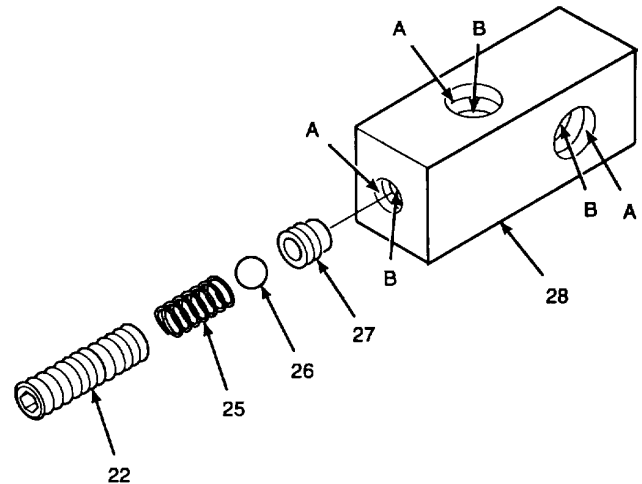
## 1. INSPECT TRACK TENSIONING RELIEF VALVE.

- a. Visually inspect valve body (28), surfaces A, for stripped threads. Use a strong light and inspect inner bores B for foreign material.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.



- b. Flush valve body (28) with cleaning solvent to remove any foreign material present. Use a culture swab to remove foreign material from valve body inner bore. If foreign material cannot be removed, replace valve body.
- c. Replace valve body (28) if threads are stripped.
- d. Inspect spring (25) for distortion. Replace spring if distortion is detected.
- e. Inspect check ball (26) and valve seat (27) for nicks, dents, or excessive wear. Replace check ball and valve seat if damaged.
- f. Inspect adjusting screw (22) for stripped threads. Replace adjusting screw if threads are damaged.

**GO TO NEXT PAGE**  
2-526

D. INSPECT - Continued.

2. INSPECT TRACK TENSIONING UNLOADING VALVE.

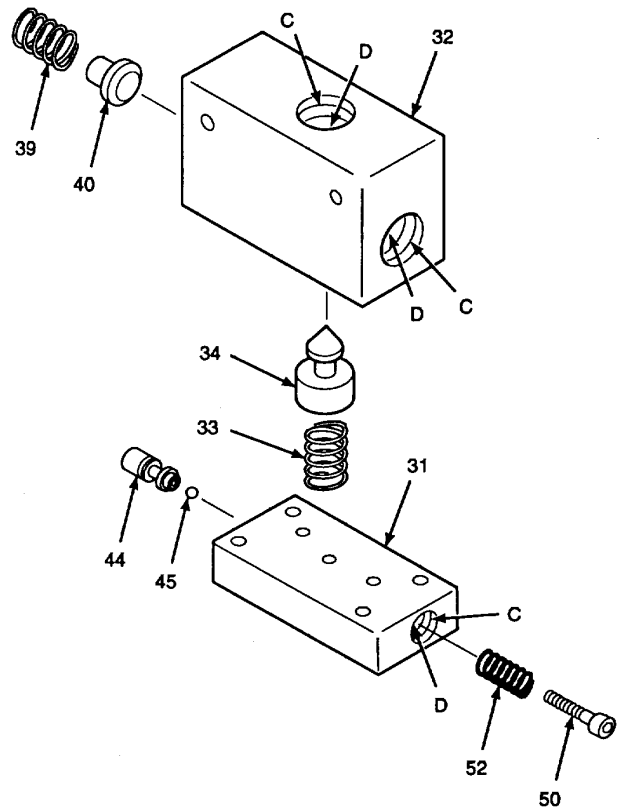
- a. Visually inspect valve bodies (31 and 32), surfaces C, for stripped threads. Use a strong light and inspect inner bores D for foreign material.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type ml cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- b. Flush valve bodies (31 and 32) with cleaning solvent to remove any foreign material present. Use a culture swab to remove foreign material from valve body inner bores. If foreign material cannot be removed, replace valve bodies.
- c. Replace valve bodies (31 and 32) if threads are stripped.
- d. Inspect springs (33, 39, and 52) for distortion. Replace springs if distortion is detected.
- e. Inspect valve disks (34 and 40), valve liner (44), and check ball (45) for nicks, dents, or excessive wear. Replace damaged components.
- f. Inspect adjustment screw (50) for stripped threads. Replace adjustment screw if threads are damaged.



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2-527

**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued**

E. ASSEMBLE.

1. ASSEMBLE TRACK TENSIONING UNLOADING VALVE.

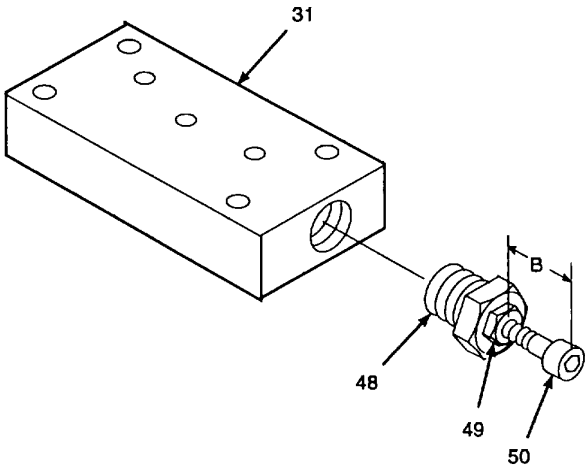
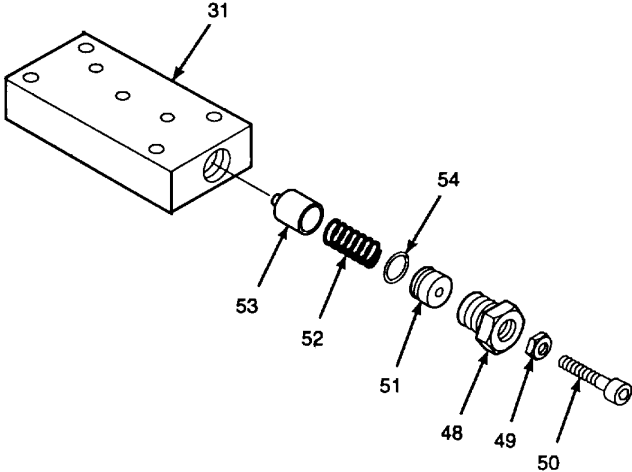
**NOTE**

Use bench vise, as required, to support valve bodies during assembly.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

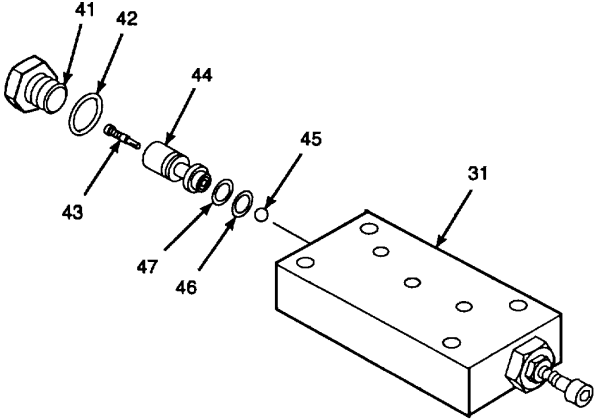
- a. Lubricate all parts with clean hydraulic oil before assembly.
- b. Install preformed packing (54) onto valve guide (51).
- c. Install spring holder (53), spring (52), and valve guide (51) into valve body (31).
- d. Install hex nut (49) onto adjustment screw (50).
- e. Install adjustment screw (50) into valve retainer (48).
- f. Set adjustment screw (50) to measurement B taken during disassembly and tighten hex nut (49).
- g. Install assembled valve retainer (48) into valve body (31).



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**2-528**

E. ASSEMBLE - Continued.

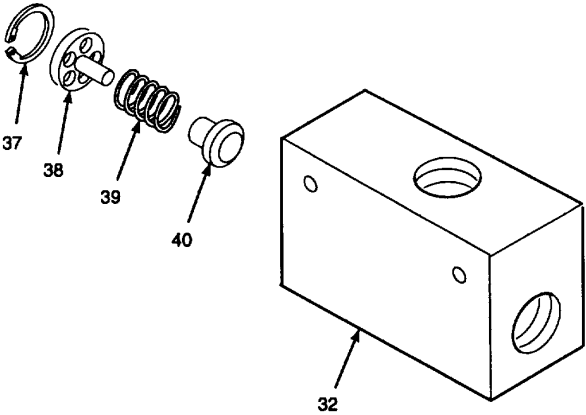
- h. Install preformed packings (47 and 46) onto valve liner (44).
- i. Install valve slide (43) into valve liner (44).
- j. Install check ball (45) and assembled valve slide (43) and valve liner (44) into valve body (31).
- k. Install preformed packing (42) and plug (41).



**WARNING**

Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- 1. Install valve disk (40), spring (39), and valve guide (38) into valve body (32) and secure with retaining ring (37).



**GO TO NEXT PAGE**  
2-529



**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued**

E. ASSEMBLE - Continued.

- m. Install valve disk (34) and spring (33).
- n. Install preformed packings (35 and 36).

**NOTE**

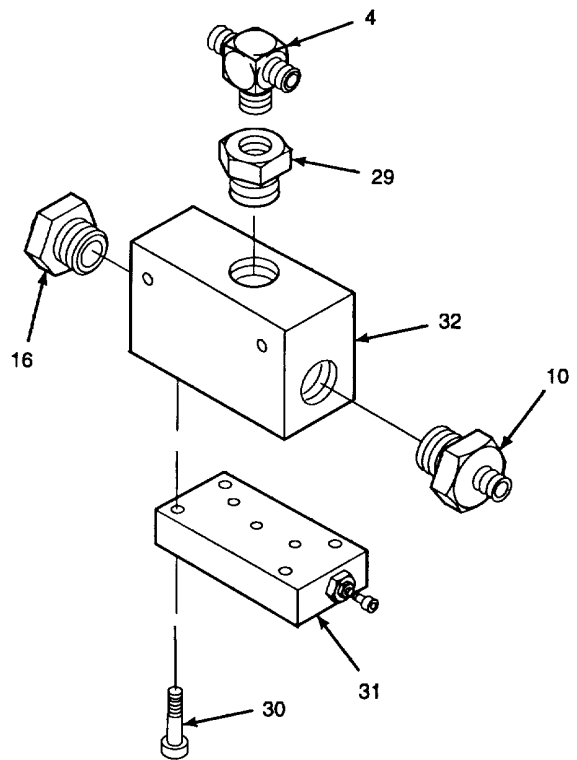
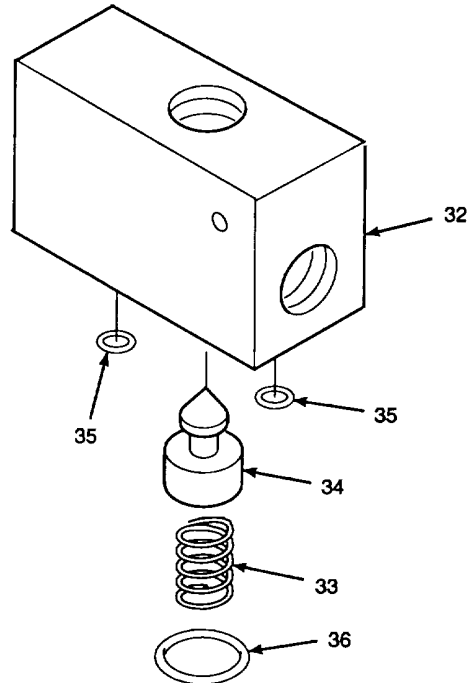
Ensure ports on valve body (31) are aligned with ports on valve body (32) when assembled.

- o. Place assembled valve body (31) and valve body (32) together and ensure ports are aligned. Secure with socket head cap screws (30).

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- p. Apply pipe sealant to male ends of bushings (16 and 29), to pipe thread end of straight adapter (10), and to the single end of tee (4).
- q. Install straight adapter (10) and bushings (16 and 29) into valve body (32).
- r. Install tee (4) into bushing (29). Orient as shown.



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2-530

E. ASSEMBLE - Continued.

2. ASSEMBLE TRACK TENSIONING RELIEF VALVE.

- a. Ensure that valve body (28) is completely dry and free of all contaminants.

**WARNING**

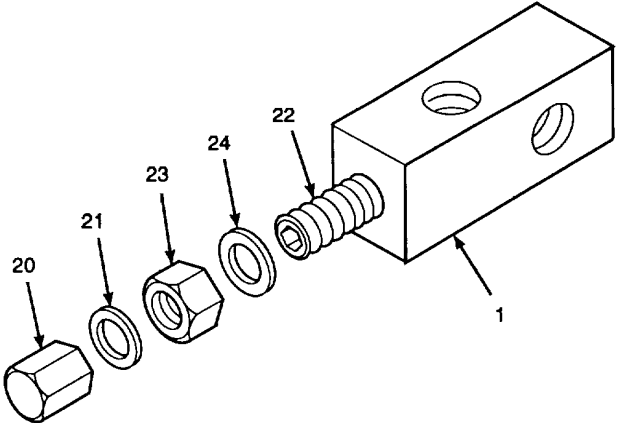
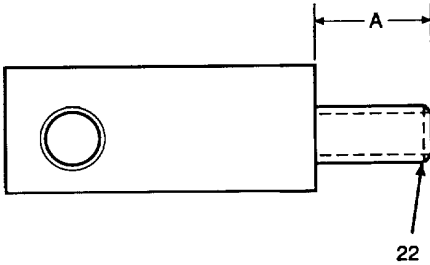
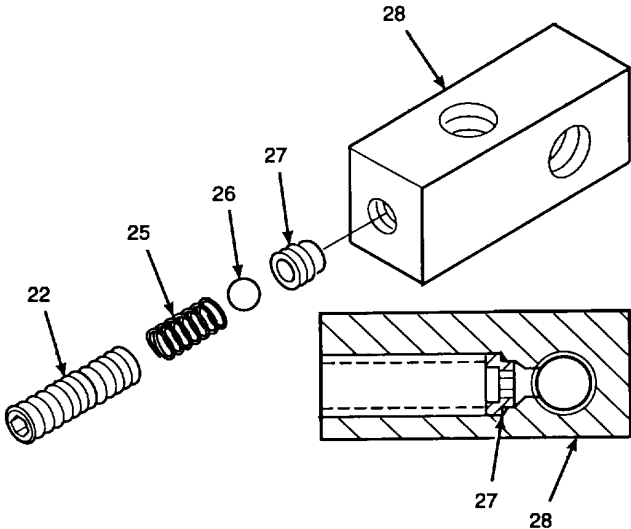
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply a thin coating of thread locking compound to valve seat (27).

**CAUTION**

Ensure that thread locking compound does not plug the port opening on the valve body. Relief valve failure and hydraulic system failure could result.

- c. Install valve seat (27) into valve body (28) and allow to dry for a minimum of 5 hours. Ensure that thread locking compound does not plug the port opening.
- d. Install check ball (26) and spring (25).
- e. Install adjusting screw (22) and set to measurement A taken during disassembly.
- f. Install flat washer (24) and hex nut (23). Ensure that adjusting screw (22) does not move when tightening the hex nut.
- g. Install flat washer (21) and cap nut (20).



**GO TO NEXT PAGE**  
2-531

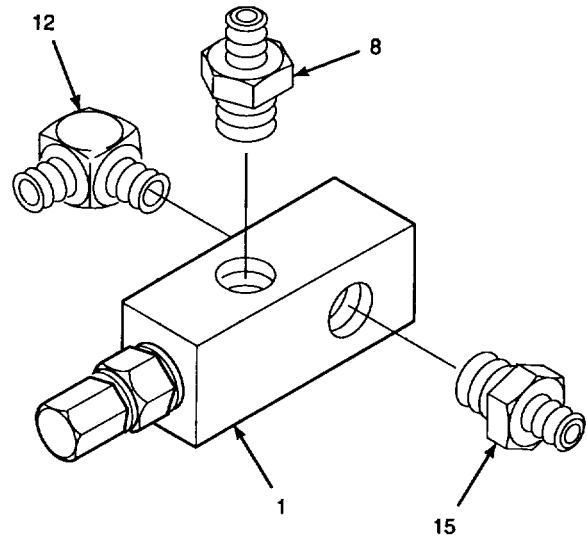
**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued**

## E. ASSEMBLE - Continued.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- h. Apply pipe sealant to straight adapter (8), pipe nipple (15), and elbow (12).
- i. Install straight adapter (8), pipe nipple (15), and elbow (12) onto track tensioning relief valve (1). Orient elbow as shown.



## F. INSTALL.

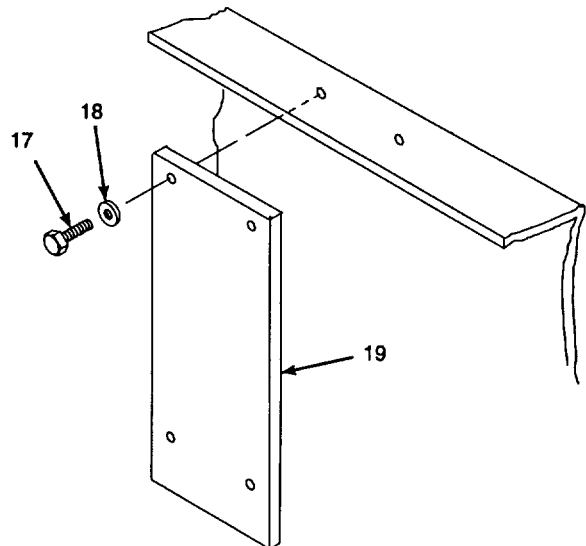
## 1. INSTALL BRACKET.

- a. Install sleeve spacers (18) onto bolts (17).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of bolts (17).
- c. Install bolts (17) and bracket (19). Tighten bolts to 21 lb-ft (29 N•m).



**GO TO NEXT PAGE**  
**2-532**

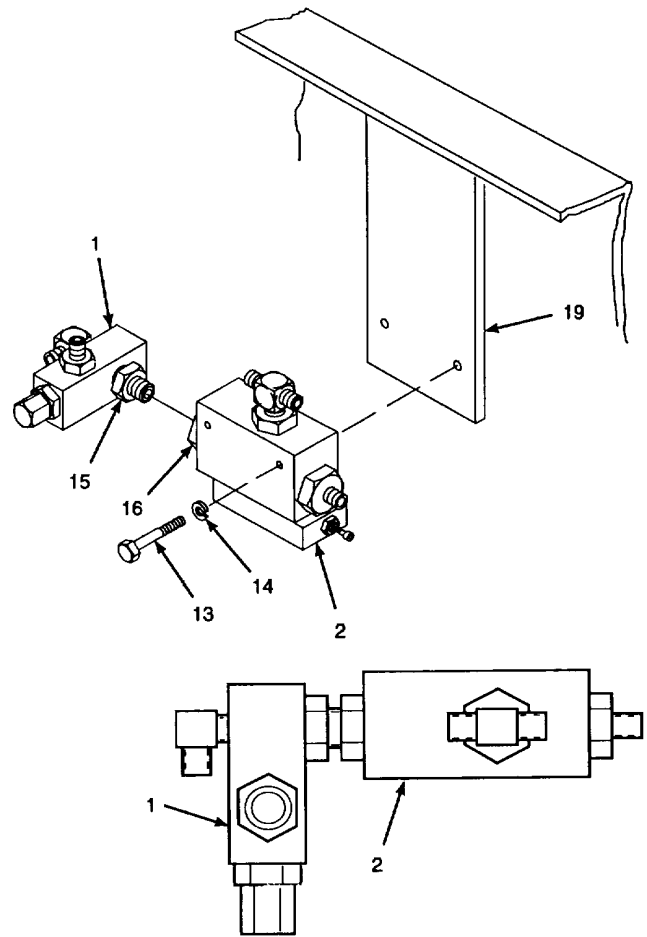
F. INSTALL - Continued.

2. INSTALL TRACK TENSIONING RELIEF VALVE AND TRACK TENSIONING UNLOADING VALVE.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply pipe sealant to exposed threads of pipe nipple (15).
- b. Install track tensioning relief valve (1) onto track tensioning unloading valve (2) by threading pipe nipple (15) into bushing (16). Orient valves as shown.
- c. Place assembled track tensioning relief valve (1) and track tensioning unloading valve (2) into the paving machine through the center top right access door.
- d. Install lockwashers (14) onto bolts (13).



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply thread locking compound to threads of bolts (13), and install valves (1 and 2) onto bracket (19). Tighten bolts to 21 lb-ft (29 N•m).

**GO TO NEXT PAGE**  
2-533

**2.38. REPLACE/REPAIR TRACK TENSIONING RELIEF VALVE AND UNLOADING VALVE - Continued**

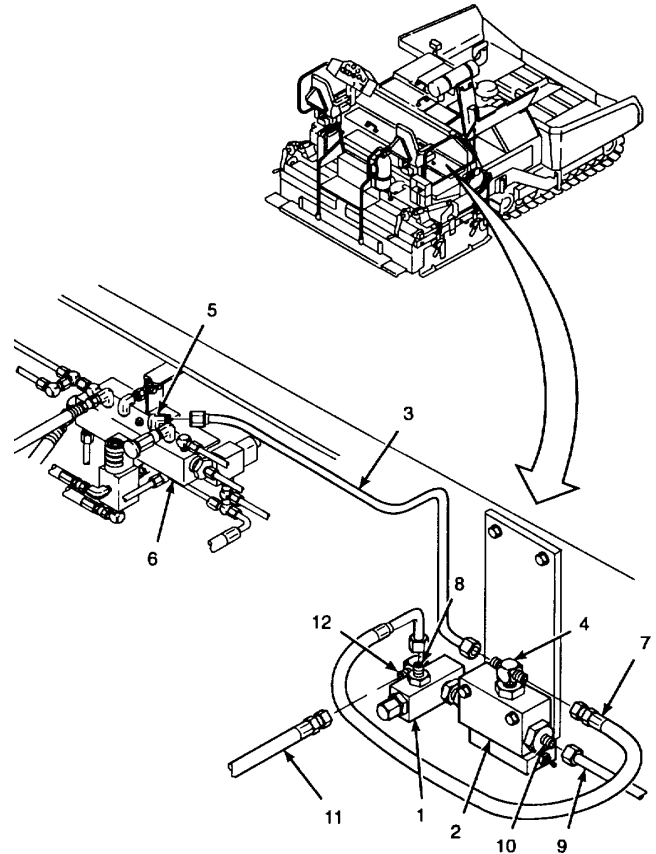
F. INSTALL - Continued.

3. CONNECT HYDRAULIC LINES AND HOSES.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to the exposed threaded ends of tee (4), straight adapters (8 and 10), and elbows (12 and 5).
- b. Connect hose (7) to straight adapter (8) on track tensioning relief valve (1) and tee (4) on track tensioning unloading valve (2).
- c. Connect tube (9) to straight adapter (10) and stack valve straight adapter.
- d. Connect hose (11) to elbow (12).
- e. Connect tube (3) to elbow (5) on return manifold (6) and tee (4) on track tensioning unloading valve (2).

**NOTE**

**FOLLOW-ON-TASKS:** Close center top right access door per TM 5-3895-373-10.  
Close right access door per TM 5-3895-373-10.

**END OF TASK**

---

**2.39. REPAIR TRACK TENSIONING CYLINDER - Continued**

---

This task covers:

a. Disassemble	b. Clean	c. Inspect
d. Assemble		

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Plastic hammer (Item 49, Appendix D)  
Spanner wrench (Item 95, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

References:

TM 5-3895-373-24P

Equipment Condition:

Track tensioning cylinder removed per paragraph 2.37.

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Crocus cloth (Item 4, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Seal kit

---

**NOTE**

There is a left hand and a right hand track tensioning cylinder. The repair procedure for the cylinders are identical. Place of fittings are shown in the procedures.

**GO TO NEXT PAGE**  
**2-535**

**2.39. REPAIR TRACK TENSIONING CYLINDER - Continued****A. DISASSEMBLE.****1. REMOVE CYLINDER HEAD FROM CYLINDER.****WARNING**

Cleaning solvent, P-D-680 Type m, is TOXIC and flammable. Use only in a well ventilated area. Avoid contact with skin, eyes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 2000F (93,3°C). Failure to do so may result in injury or death to personnel.

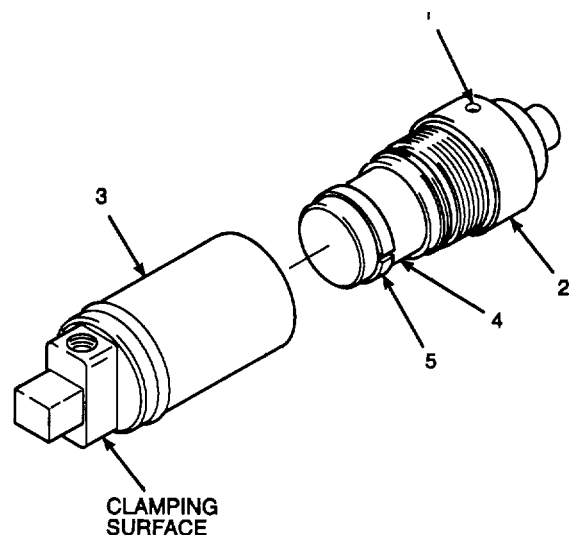
If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean and remove any dirt or foreign matter from cylinder exterior with cleaning solvent. Scrub off hard deposits with a wire scratch brush. Wipe dry with a clean, cleaning cloth.

**CAUTION**

Do not clamp cylinder against metal jaws in vise. Use wooden blocks between vise jaws and cylinder. Damage to surface of cylinder can result from contact with metal vise jaws.

- b. Clamp cylinder in a bench vise. Pad vise jaws with wooden blocks.
- c. Insert spanner wrench into holes (1).
- d. Rotate cylinder head (2) counterclockwise. Tap cylinder tube (3) with a plastic hammer if cylinder head is difficult to turn.
- e. Pull cylinder head (2), piston rod (4), and split piston halves (5) from cylinder tube.
- f. Remove cylinder tube (3) from bench vise.



**GO TO NEXT PAGE**  
**2-536**

- A. DISASSEMBLE - Continued.
- 2. DISASSEMBLE PISTON ROD ASSEMBLY.
  - a. Remove split piston halves (5) from piston rod (4).
  - b. Remove cylinder head (2) from piston rod (4).
- 3. DISASSEMBLE CYLINDER HEAD.

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force. Use an o-ring tool to remove seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage.

- a. Use an o-ring tool to remove preformed packing (6), packing material (7), and preformed packing (8) from cylinder head (2). Do not use a screwdriver or other sharp metal tool. Discard preformed packings and packing material.
- b. Use an o-ring tool to remove wiper ring (9) and seal (10) from seal grooves inside cylinder head (2). Discard wiper ring and nonmetallic seal.

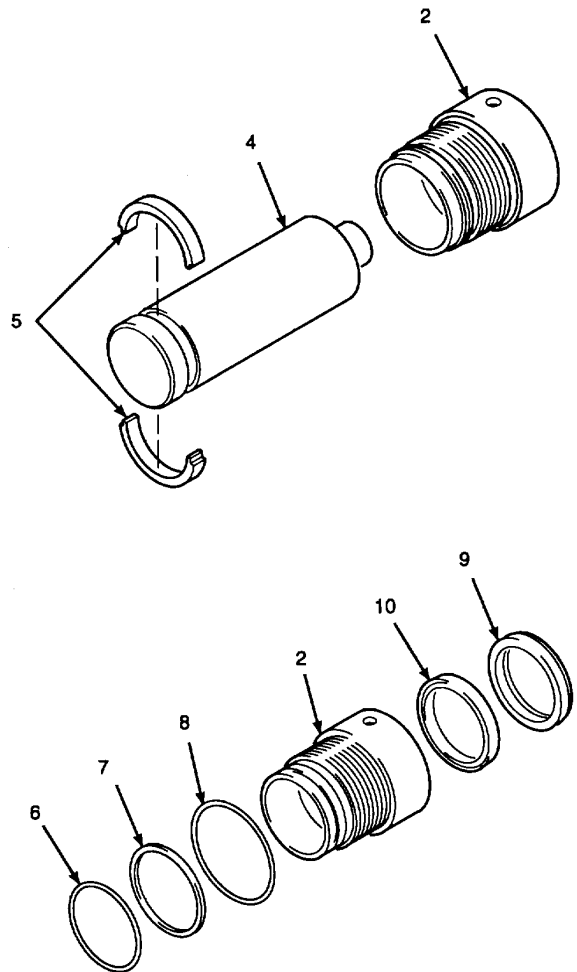
B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680 Type III, is TOXIC and flammable. Use only in a well ventilated area. Avoid contact with skin, eyes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- 1. RINSE ALL METAL PARTS WITH CLEANING SOLVENT.





**2.39. REPAIR TRACK TENSIONING CYLINDER - Continued**

## B. CLEAN - Continued.

**WARNING**

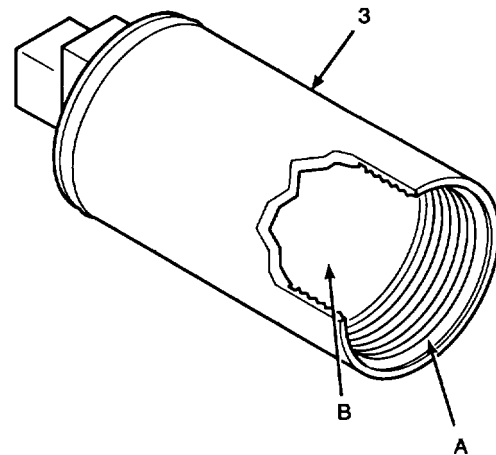
Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves) Failure to take proper precautions may result in severe injury or loss of vision.

2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO BLOW ANY FOREIGN MATERIAL FROM SEAL GROOVES, INSIDE OF CYLINDER TUBE, AND THREADED SURFACES. DRY PARTS WITH A CLEAN, LINT-FREE CLOTH.

## C. INSPECT.

## 1. INSPECT CYLINDER TUBE.

- a. Run your finger along inside non-threaded surface A of cylinder tube (3) and cylinder wall B. Feel for any nicks, scratches, or sharp edges that may damage preformed packings and seals.
- b. Remove sharp edges of nicks or scratches using crocus cloth.
- c. Replace cylinder tube (3) if scratches or pits cannot be polished out, or if scratches exceed 0.5 in. (12, 7 mm) in length.

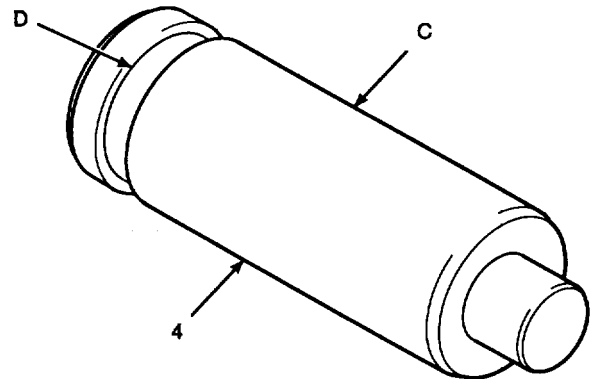


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**2-538**

## C. INSPECT - Continued.

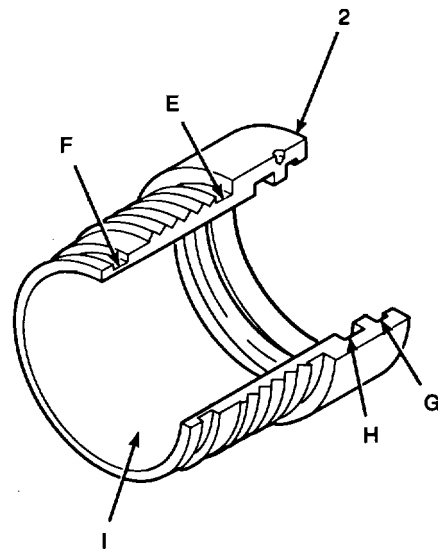
## 2. INSPECT PISTON ROD.

- a. Run your fingernail along piston rod (4) surface C. Feel for any scratches or sharp edges that may damage preformed packings and seals. Inspect circumference of piston rod for scratches, pits, or wear that expose base metal through chrome plating.
- b. Remove sharp edges or nicks and scratches using crocus cloth.
- c. Replace piston rod (4) if scratches or pits cannot be polished out, if scratch exceeds 0.5 in. (12,7 mm) in length, or base metal is exposed through chrome plating.
- d. Run your finger along edge of split piston groove surface D and feel for nicks and sharp edges. Remove sharp edges using crocus cloth.
- e. If split piston groove edge is broken off, replace piston rod.



## 3. INSPECT CYLINDER HEAD.

- a. Run your finger along the edges of preformed packing groove E and preformed packing groove F on cylinder head (2). Feel for any raised edges or nicks that may damage the cylinder tube interior surfaces. Remove raised edges and nicks with crocus cloth.
- b. Run your finger along the inside bore wiper ring groove G and seal groove H. Feel for any raised edges or nicks that may damage wiper ring and preformed packing on piston rod (4). Remove raised edges and nicks with crocus cloth.
- c. Run your finger over cylinder head (2) inside bore surface I. Feel for any nicks, pits, or scratches. Remove nicks, pits, or scratches of less than 0.5 in. (12,7 mm) in length with crocus cloth. If scratch exceeds 0.5 in. (12,7 mm), replace cylinder head.



**GO TO NEXT PAGE**  
2-539

**2.39. REPAIR TRACK TENSIONING CYLINDER - Continued**

C. INSPECT - Continued.

4. INSPECT SPLIT PISTON HALVES.

- a. Run your finger along split piston halves (5) surface J. Feel for any nicks, pits, or scratches.
- b. Remove nicks, raised edges, and scratches with crocus cloth. If nicks or scratches cannot be removed, replace piston halves.

5. CLEAN ALL METAL PARTS AFTER INSPECTION.

**WARNING**

Cleaning solvent, P-D-680 Type III, is TOXIC and flammable. Use only in a well ventilated area. Avoid contact with skin, eyes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C).

Failure to do so may result in injury or death to personnel.

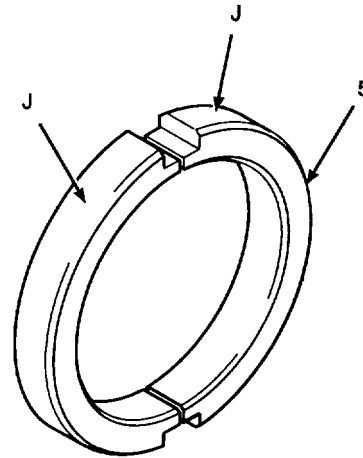
If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts with cleaning solvent.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves) Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to " blow any foreign material from seal grooves, inside of cylinder tube, and threaded surfaces.



**GO TO NEXT PAGE  
2-540**

- C. INSPECT - Continued.
  - c. Dry parts with a clean, lint-free cloth. Set dry parts on clean surface.
  - d. Place a clean, lint-free cloth into open end of cylinder tube to prevent contamination.
- D. ASSEMBLE.
  - 1. REPLACE SEALS AND PACKINGS ON CYLINDER HEAD.

**WARNING**

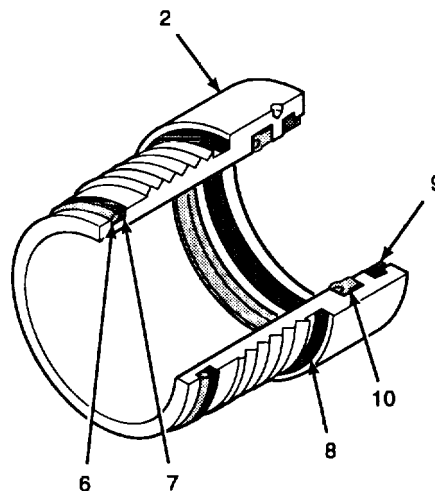
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate assemblies and all seals with clean hydraulic oil prior to reassembly.

**CAUTION**

New seals and packings are distorted during installation. Use care during installation to prevent damage to seals and seal grooves. Bypass leakage can result from poor installation.

- b. Twist seal (10) into a C-shape. Install seal inside cylinder head (2) and allow to snap into seal groove.
- c. Twist wiper ring (9) into a C-shape. Install wiper ring inside cylinder head (2) and allow to snap into wiper ring groove.
- d. Install preformed packing (8), packing material (7), and preformed packing (6) on cylinder head (2).



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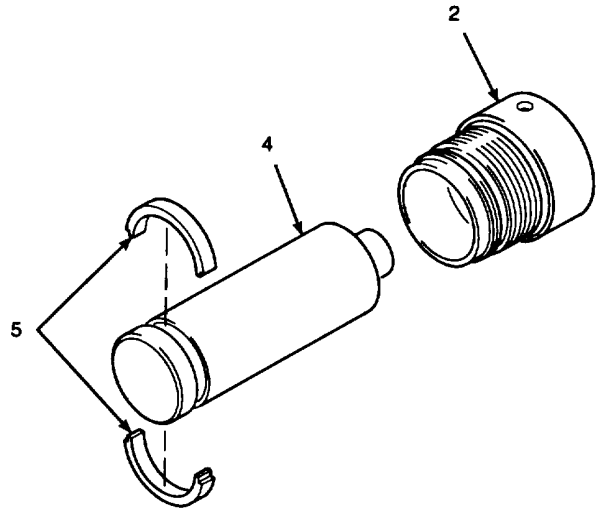
**2.39 REPAIR TRACK TENSIONING CYLINDER - Continued.**

- D. ASSEMBLE - Continued.
2. REASSEMBLE PISTON ROD ASSEMBLY.

**WARNING**

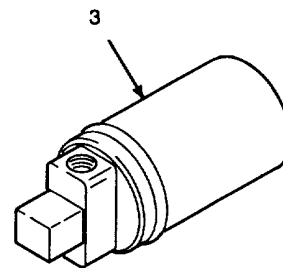
**Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

- Lubricate piston rod (4) with clean hydraulic oil.
  - Slide cylinder head (2) onto piston rod (4).
  - Lubricate split piston halves (5) with clean hydraulic oil.
  - Install split piston halves (5) on piston rod (4).
3. INSERT PISTON ROD ASSEMBLY AND CYLINDER HEAD INTO CYLINDER TUBE.

**CAUTION**

**Do not clamp cylinder tube against metal jaws in vise. Use wooden blocks between vise jaws and cylinder. Damage to surface of cylinder tube can result from contact with metal vise jaws.**

- Clamp cylinder tube (3) in a bench vise. Pad vise jaws with wooden blocks.



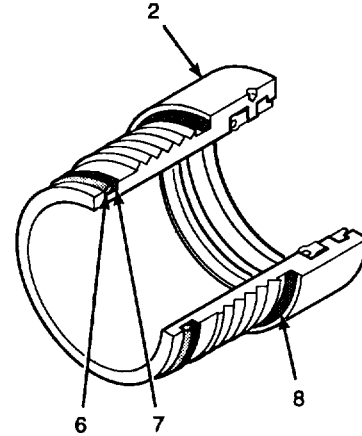
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## D. ASSEMBLE - Continued.

**WARNING**

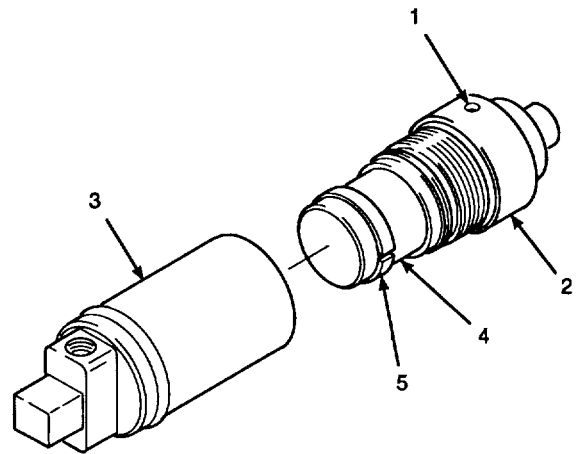
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Apply hydraulic oil to threads on cylinder head (2), preformed packing (8), packing material (7), and preformed packing (6).
- c. Remove lint-free cloth from cylinder tube (3). Ensure no foreign material is present in cylinder tube and on piston rod (4).
- d. Dip entire piston rod (4) in clean hydraulic oil.

**CAUTION**

Threads on inside of cylinder tube are sharp. Ensure preformed packing and packing retainer are not cut by threads in cylinder opening. Leakage can result from damaged seals.

- e. Slide split piston halves (5), piston rod (4), and cylinder head (2) into cylinder tube (3). Ensure split piston halves are seated correctly as piston rod goes into cylinder tube.
- f. Thread cylinder head (2) into cylinder tube (3).
- g. Insert spanner wrench into holes (1). Tighten cylinder head (2) until snug.
- h. After tightening, turn cylinder head (2) clockwise an extra 1/8 to 1/4 turn to secure cylinder head on cylinder tube (3).

**NOTE**

**FOLLOW-ON-TASK:** Install track tensioning cylinder per paragraph 2.37.

---

END OF TASK

---

**2.40 REPLACE/REPAIR TRACK DRIVE HUB.**


---

**This task covers:**

a. Remove	b. Clean	c. Inspect
d. Install		

---

**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Adapter (Item 1, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Chain assembly (Item 29, Appendix D)  
Flat washer (Item 113, Appendix D)  
Hex nut (Item 61, Appendix D)  
Hydraulic press frame (Item 42, Appendix D)  
Lock nut torquing adapter (Item 9, Appendix C)  
Plastic hammer (Item 49, Appendix D)  
Socket wrench set (Item 135, Appendix D)  
Stud remover and setter (Item 99, Appendix D)  
Torque wrench (Item 134, Appendix D)  
Transmission jack (Item 55, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Grease (Item 18, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Drive sprocket gear mounting studs  
Encased plain seal  
Lockwashers  
Lubrication fitting  
Nonmetallic seal  
Self-locking nuts  
Tapered roller bearings  
Tapered roller cups

Personnel Required:

Two 62B construction equipment repairers. Second person needed to assist in removing and installing drive sprocket gear and track drive hub and installing bearing self-locking nut.

References:

TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Track chain assembly removed per paragraph 2.41.  
Propulsion motor removed per paragraph 2.32.  
Speed reduction gearbox removed per paragraph 2.33.

**NOTE**

**There are two track drive hubs on the paving machine, one in the right track drive and one in the left track drive. Remove the track chain assembly, propulsion motor, and speed reduction gearbox only from the side being worked on.**

**NOTE**

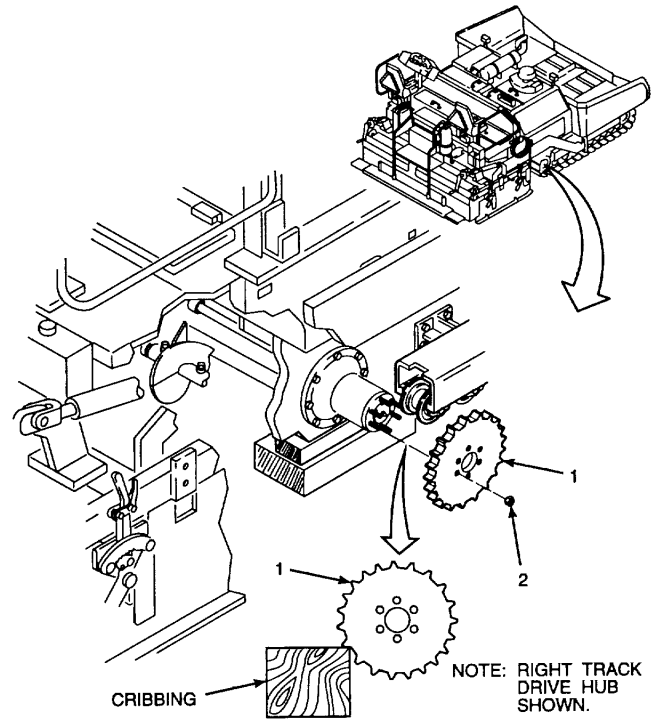
**The procedure for both track drive hubs is the same. Any differences are noted in the text. The right track drive hub is shown in the illustrations.**

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A. REMOVE.

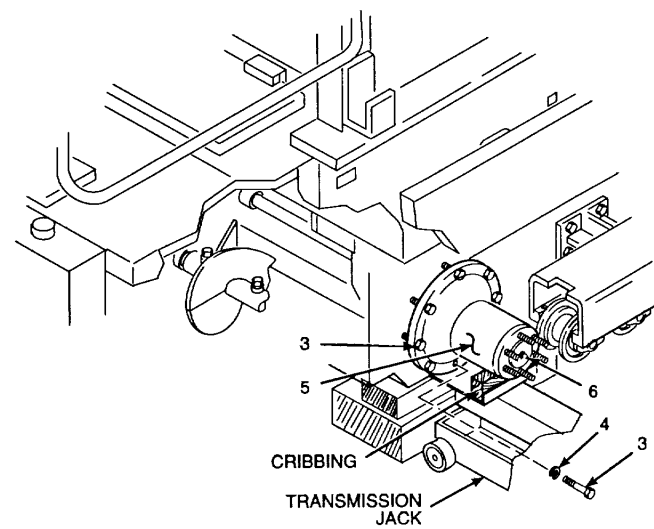
1. REMOVE DRIVE SPROCKET GEAR.

- a. Install cribbing below drive sprocket gear (1) to prevent drive sprocket gear from turning. When removing the left track drive hub, place the cribbing in front of the drive sprocket gear. When removing the right track drive hub, place the cribbing in back of the drive sprocket gear.
- b. Using a 1-1/16 in. socket and sliding tee handle from socket wrench set, loosen self-locking nuts (2).
- c. Remove cribbing from below drive sprocket gear (1). Remove and discard self-locking nuts (2).
- d. With the help of another person, remove drive sprocket gear (1). Set drive sprocket gear aside.



2. REMOVE TRACK DRIVE HUB FROM PAVING MACHINE.

- a. Use grease pencil to matchmark main frame and track drive hub for reassembly.
- b. Loosen all hex head cap screws (3). Remove lowermost cap screw (3) and lockwasher (4). Back the remaining cap screws out 1-1/2 in. (38 mm) from large flange of track drive hub (5).
- c. With the help of another person, push up on end of hub drive shaft (6). Lift and slide track drive hub (5) outward part way.
- d. Position transmission jack to support large flange of track drive hub (5). Install 3-1/2 in. (88 mm) high cribbing between hub and jack support plate.
- e. Raise transmission jack slightly and remove the weight of track drive hub (5) from hex head cap screws (3).



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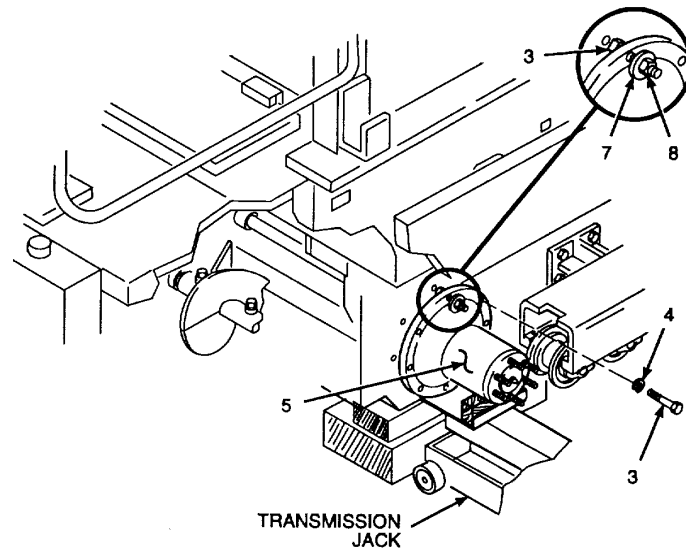
**2.40 REPLACE/REPAIR TRACK DRIVE HUB -Continued.**

A. REMOVE - Continued.

**WARNING**

Track drive hub weighs approximately 125 lbs (57 kg). Make sure full weight of track drive hub is supported on transmission jack and that track drive hub is not allowed to roll. Careless handling of track drive hub could result in serious injury to personnel or damage to equipment.

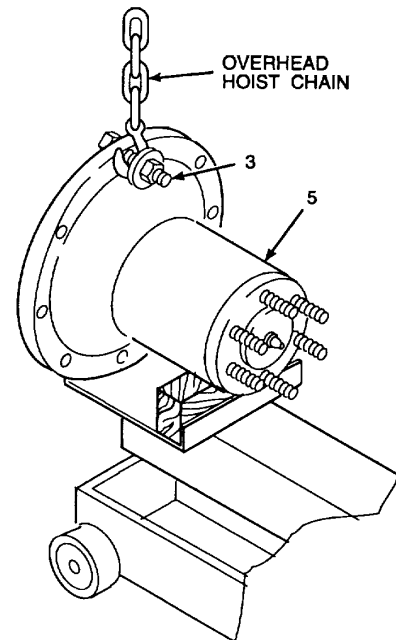
- f. Remove uppermost hex head cap screw (3) and lockwasher (4). Discard lockwasher. Reinstall cap screw with large flat washer (7) and hex nut (8) from tools list.
- g. While one person steadies track drive hub (5), remove remaining hex head cap screws (3) and lockwashers (4). Discard lockwashers.
- h. With one person steadying track drive hub (5), pull transmission jack with track drive hub back from paving machine.

**WARNING**

Track drive hub weighs approximately 125 lbs (57 kg). To avoid personal injury, use a hoist when lifting track drive hub. Ensure lifting chain, hook, etc. are in good condition and are of correct capacity. The lifting hook must not be side loaded.

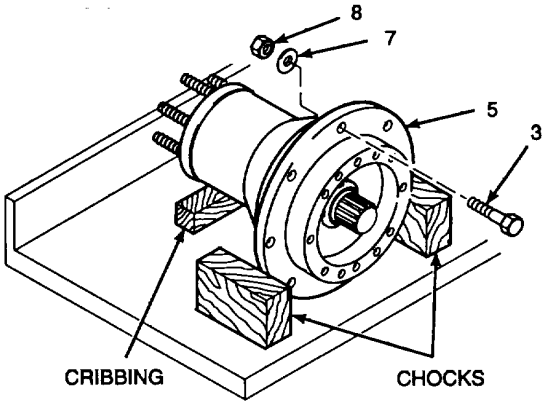
Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause serious injury or death to personnel.

- i. Hook chain of overhead hoist to installed hex head cap screw (3). Raise and transport track drive hub (5) to work bench.

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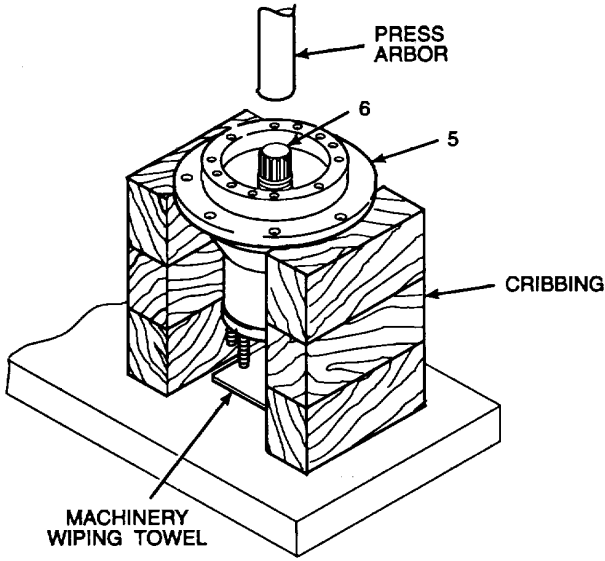
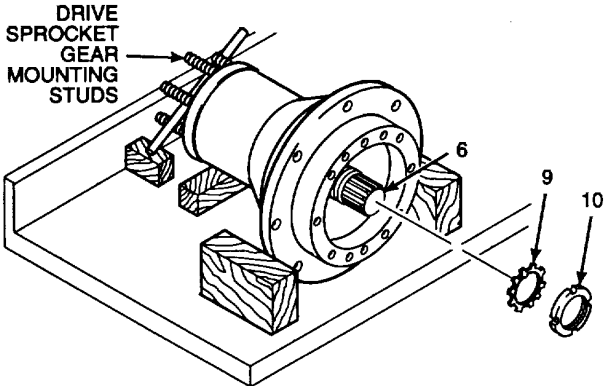
A. REMOVE - Continued.

- j. Set track drive hub (5) down on work bench. Crib track drive hub in horizontal axis. Securely chock both sides of large flange to keep track drive hub from rolling. Remove overhead hoist chain hook from hex head cap screw (3).
- k. Remove hex nut (8), flat washer (7), and hex head cap screw (3) from track drive hub (5).



3. REMOVE HUB DRIVE SHAFT.

- a. Flatten keyed tabs on lockwasher (9).
- b. Install adapter between drive sprocket gear mounting studs to keep hub drive shaft (6) from turning.
- c. Use sliding tee handle and lock nut torquing adapter to unscrew bearing self-locking nut (10). Remove nut and lockwasher (9). Discard lockwasher.
- d. Use overhead hoist to transport track drive hub (5) to hydraulic press frame. Set up track drive hub on press bed. Evenly crib up track drive hub flange to provide at least 2-1/2 in. (64 mm) clearance between drive sprocket gear mounting studs and press bed.
- e. Center hub drive shaft (6) below press arbor. Place machinery wiping towel or similar padding below track drive hub (5) to cushion fall of hub drive shaft.
- f. Press hub drive shaft (6) squarely out of track drive hub (5). Transport track drive hub and hub drive shaft back to work bench.



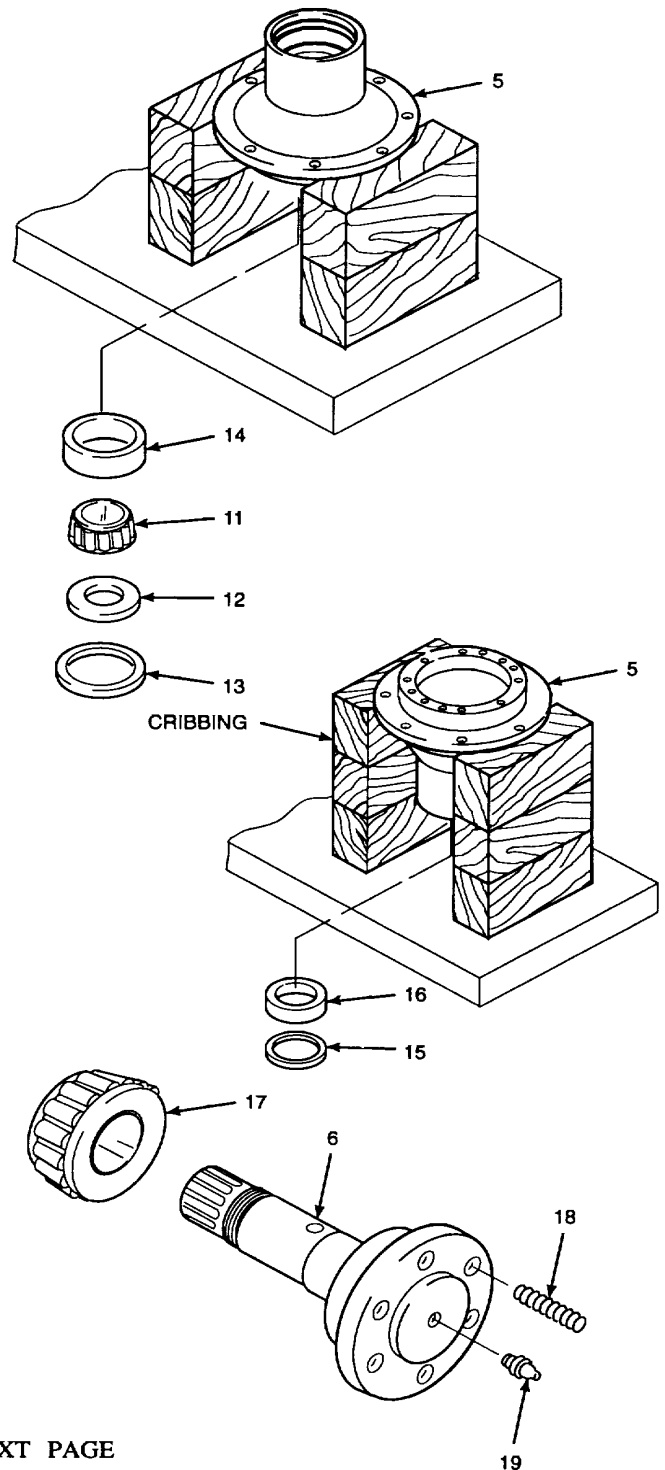
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**2.40 REPLACE/REPAIR TRACK DRIVE HUB - Continued.**

A. REMOVE - Continued.

4. REMOVE REMAINING BEARING COMPONENTS, FLAT WASHER, PLAIN SEAL, NONMETALLIC SEAL, DRIVE SPROCKET GEAR MOUNTING STUDS, AND LUBRICATION FITTING.

- a. Set track drive hub (5) on cribbing, large flange down. Use brass drive pin punch and hammer to drive out tapered roller bearing (11), flat washer (12), and plain seal (13). Discard encased plain seal and tapered roller bearing.
- b. Carefully and evenly drive tapered roller cup (14) from track drive hub (5). Discard tapered roller cup.
- c. Set track drive hub (5) on cribbing, large flange up. Allow at least 1 in. (25 mm) clearance between track drive hub and surface of work bench.
- d. Using brass drive pin punch and plastic hammer, tap evenly around full perimeter of nonmetallic seal (15). Drive nonmetallic seal out of track drive hub (5). Discard nonmetallic seal.
- e. Repeat procedure in step d to remove tapered roller cup (16). Discard tapered roller cup.
- f. Using universal puller kit, pull tapered roller bearing (17) from drive shaft hub (6). Discard tapered roller bearing.
- g. Using stud remover and setter, remove drive sprocket gear mounting studs (18) from hub drive shaft (6). Remove lubrication fitting (19). Discard drive sprocket gear mounting studs and lubrication fitting.



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D. INSTALL.

1. INSTALL DRIVE SPROCKET GEAR MOUNTING STUDS AND LUBRICATION FITTING INTO HUB DRIVE SHAFT.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply thread locking compound to threads of drive sprocket gear mounting studs (18).
- b. Install drive sprocket gear mounting studs (18) into hub drive shaft (6). Hand tighten.
- c. Using stud remover and setter, tighten drive sprocket gear mounting studs (18) to 355 lb-ft (481 N.m).
- d. Install and tighten lubrication fitting (19).

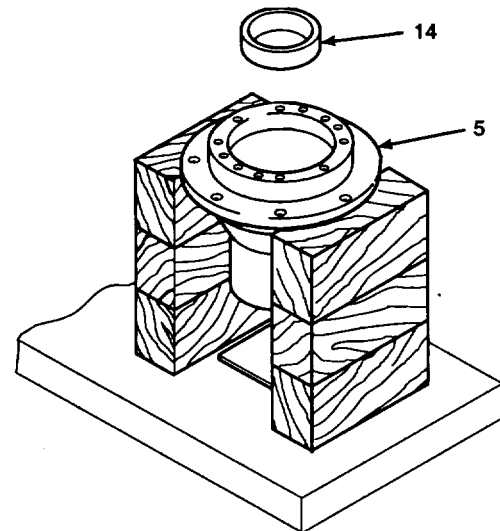
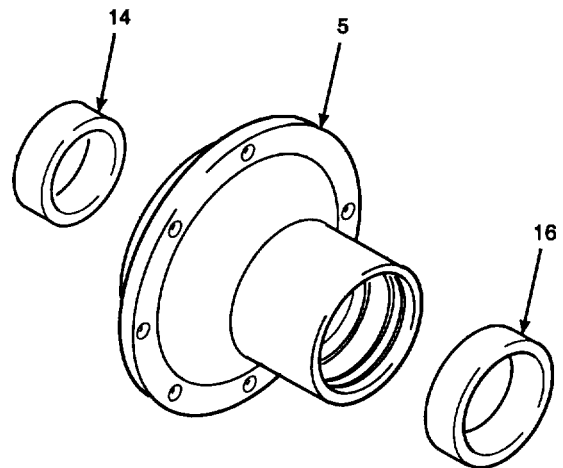
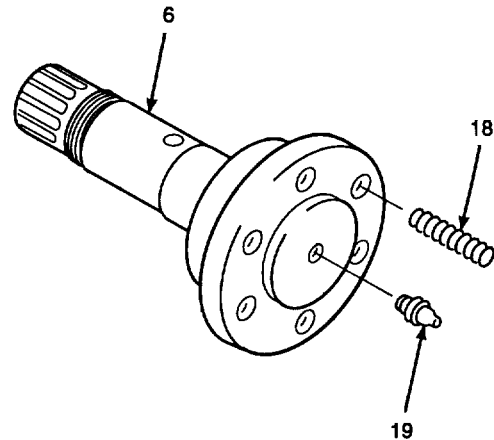
2. INSTALL TAPERED ROLLER CUPS.

- a. Freeze tapered roller cups (14 and 16) for 12 hours at 0°F (-32°C).

**WARNING**

Use insulated gloves when handling frozen tapered roller cups. Parts were kept at 0°F (-32°C) and may stick to unprotected skin causing freezer burns. Do not allow bare skin to contact frozen metal parts. Failure to wear insulated gloves may cause burns to unprotected skin.

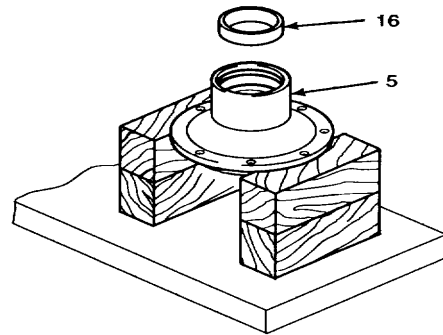
- b. With large flange of track drive hub (5) facing up, remove tapered roller cup (14) from freezer and immediately center in mating bore. Use hammer and brass drive pin punch to evenly tap tapered roller cup into seat.



GO TO NEXT PAGE

**2.40 REPLACE/REPAIR TRACK DRIVE HUB - Continued.****D. INSTALL - Continued.**

- c. After 3 or 4 minutes, turn track drive hub (5) up-side down. Remove tapered roller cup (16) from freezer and immediately center in mating bore. Use a hammer and brass drive pin punch to evenly tap tapered roller cup into seat.

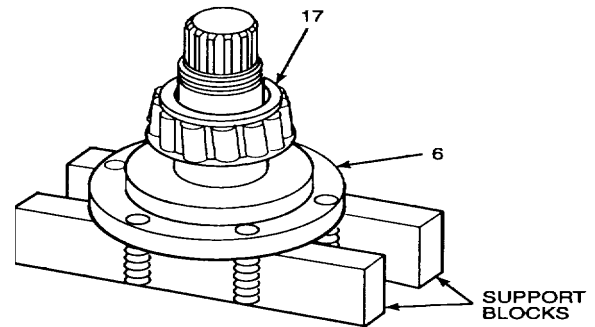
**3. INSTALL TAPERED ROLLER BEARING.**

- a. Pack tapered roller bearing (17) with grease.
- b. Apply a light film of grease to inside diameter of tapered roller bearing (17) and mating outside diameter of hub drive shaft (6).

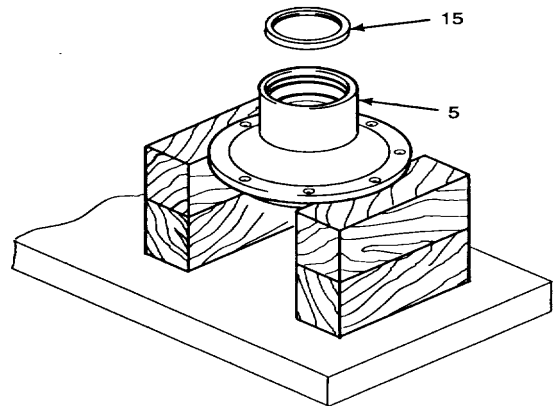
**NOTE**

**A minimum of 20 tons press force is required to seat tapered roller bearing (17) on hub drive shaft (6).**

- c. Using hydraulic press frame, parallel support blocks, and bearing driver, press tapered roller bearing (17) to seat on hub drive shaft (6).

**4. INSTALL NONMETALLIC SEAL, HUB DRIVE SHAFT, AND TAPERED ROLLER BEARING.**

- a. Coat sealing surfaces of nonmetallic seal (15) with grease.
- b. Center nonmetallic seal (15) in track drive hub (5), sealing lip down. Carefully tap nonmetallic seal squarely into seal bore with plastic hammer until fully seated.



**GO TO NEXT PAGE**

D. INSTALL - Continued.

- c. Pack tapered roller bearing (11) with grease.
- d. Apply a light film of grease to inside diameter of tapered roller bearing (11) and mating journal of hub drive shaft (6).
- e. Set up hub drive shaft (6), spline end up, on hydraulic press frame. Support hub drive shaft with parallel support blocks.
- f. Place track drive hub (5) over hub drive shaft (6).

**NOTE**

**A minimum of 20 tons press force is required to drive tapered roller bearing (11) onto hub drive shaft (6).**

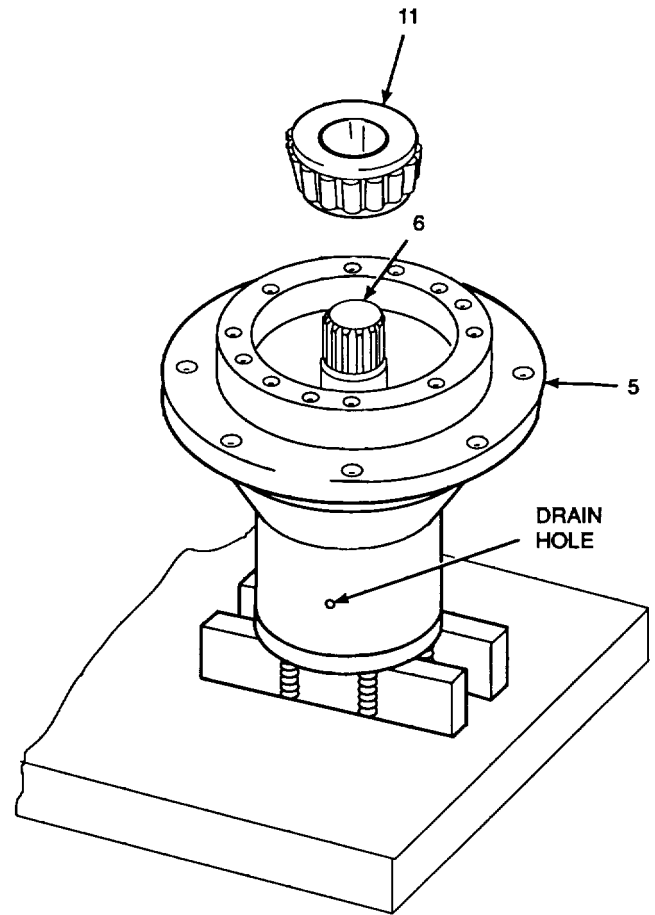
- g. Center tapered roller bearing (11) on hub drive shaft (6). Using cylindrical driver on inside diameter of bearing, carefully drive bearing down until bearing just meets installed tapered roller cup.

**WARNING**

**Track drive hub weighs approximately 125 lbs (57 kg). To avoid personal injury, use a hoist when lifting track drive hub. Ensure lifting chain, hook, etc. are in good condition and are of correct capacity. The lifting hook must not be side loaded.**

**Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause serious injury or death to personnel.**

- h. Use overhead hoist to transport track drive hub (5) with installed hub drive shaft (6) to work bench.



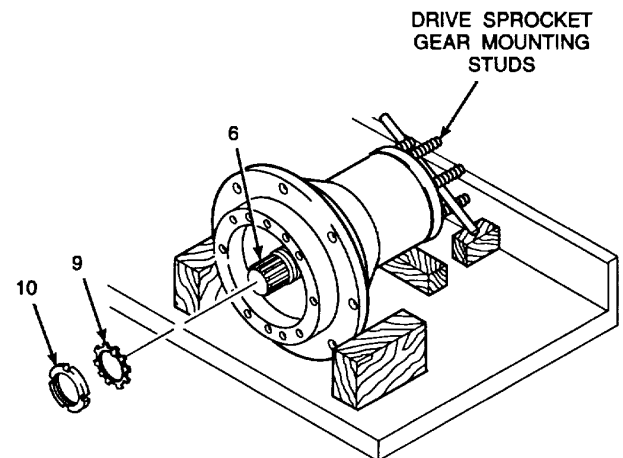
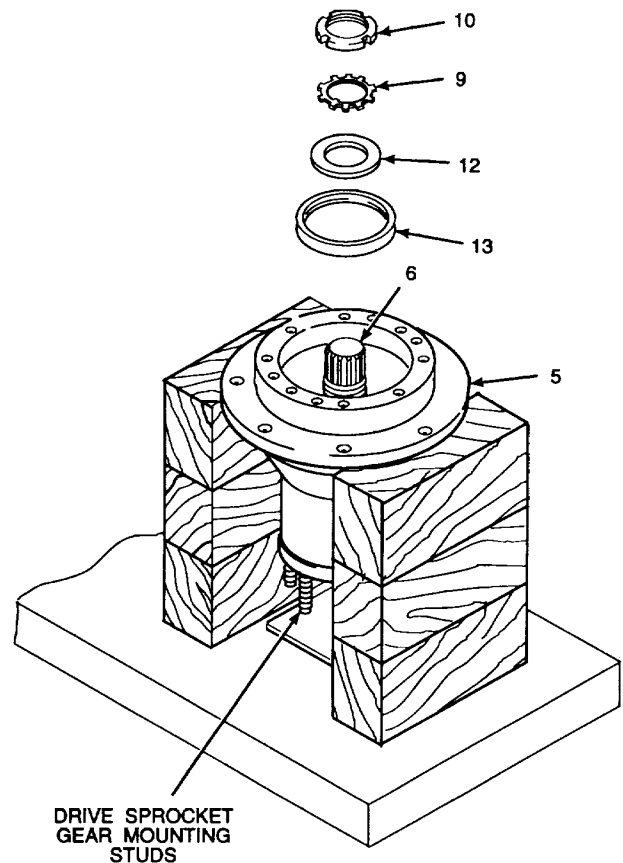
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**2.40 REPLACE/REPAIR TRACK DRIVE HUB - Continued.**

**D. INSTALL - Continued.**

**5. INSTALL PLAIN SEAL, FLAT WASHER, AND BEARING SELF-LOCKING NUT.**

- a. Coat sealing surfaces of plain seal (13) with grease.
- b. Center plain seal (13) in track drive hub (5), sealing lip down. Carefully tap plain seal squarely to seat with brass drive pin punch and plastic hammer.
- c. Using brass drive pin punch and plastic hammer, evenly drive plain seal (12) to seat.
- d. Install lockwasher (9). With beveled face toward lockwasher, install and hand tighten bearing selflocking nut (10).
- e. Install lock nut torquing adapter and torque wrench on bearing self-locking nut (10).
- f. Insert adapter between drive sprocket gear mounting studs to keep hub drive shaft (6) from turning.
- g. With another person holding the adapter, tighten bearing self-locking nut (10) and check hub drive shaft rotation intermittently. When hub drive shaft will no longer turn, stop.
- h. While holding hub drive shaft with adapter, unscrew bearing self-locking nut (10) two full turns.
- i. Retighten bearing self-locking nut (10) while holding hub drive shaft with adapter. Intermittently check resistance felt while rotating hub drive shaft.
- j. When the first increase in hub drive shaft rotation resistance is felt, stop. Tighten bearing self-locking nut an additional 1/16 turn.
- k. Bend at least one tab of lockwasher (9) into notch of bearing self-locking nut (10).



**GO TO NEXT PAGE**

D. INSTALL - Continued.

6. INSTALL TRACK DRIVE HUB IN PAVING MACHINE.

- a. Install hex head cap screw (3) with large flat washer (7) and hex nut (8) from tools list. Install cap screw in mounting hole opposite from drain hole in small diameter of track drive hub section.

**WARNING**

Track drive hub weighs approximately 125 lbs (57 kg). To avoid personal injury, use a hoist when lifting track drive hub. Ensure lifting chain, hook, etc. are in good condition and are of correct capacity. The lifting hook must not be side loaded.

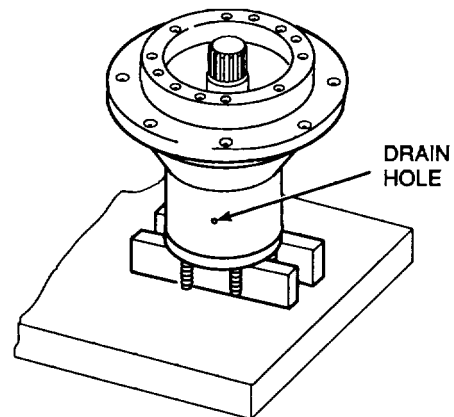
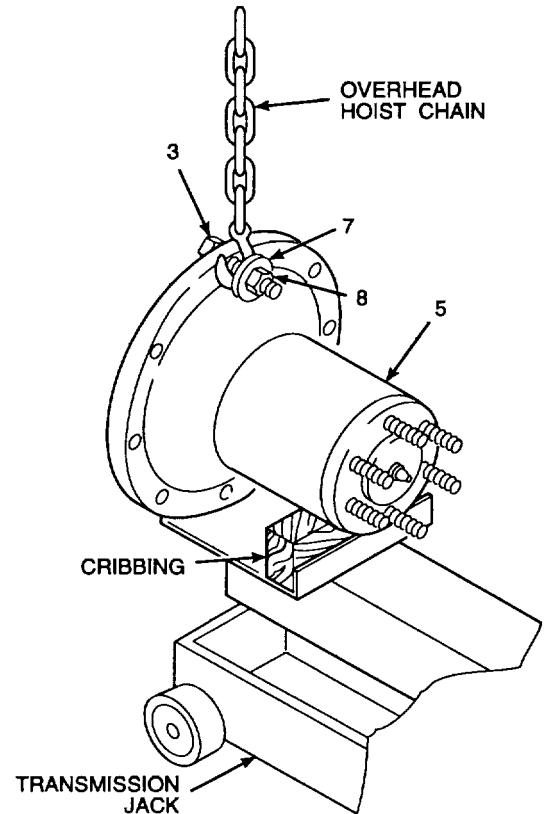
Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause serious injury or death to personnel.

- b. Hook chain of overhead hoist to installed hex head cap screw (3). Raise track drive hub (5).

**WARNING**

Track drive hub weighs approximately 125 lbs (57 kg). Make sure full weight of track drive hub is supported on transmission jack and that track drive hub is not allowed to roll. Careless handling of track drive hub could result in serious injury to personnel or damage to equipment.

- c. Lower and position large flange of track drive hub (5) on transmission jack. Install 3-1/2 in. (88 mm) high cribbing between track drive hub and jack support plate.



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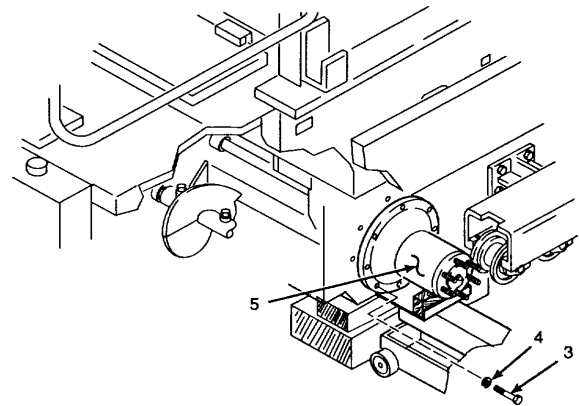
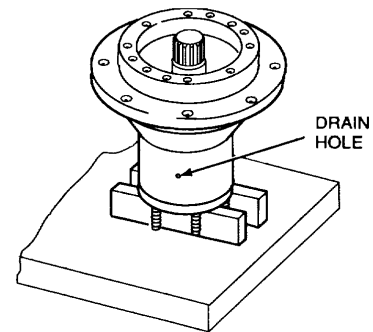
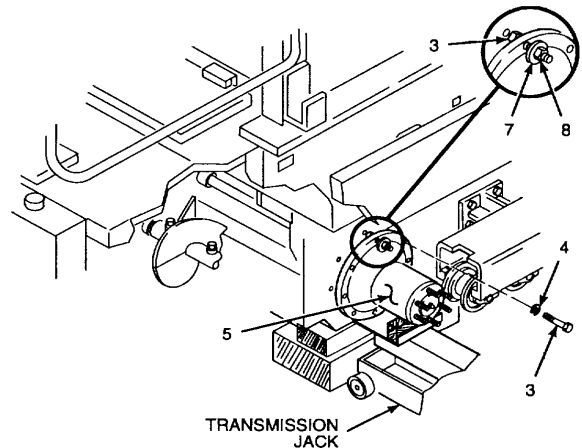
**2.40 REPLACE/REPAIR TRACK DRIVE HUB -Continued.****D. INSTALL - Continued.**

- d. Remove hoist chain from hex head cap screw (3). Remove hex nut (8), flat washer (7), and cap screw.
- e. With the help of another person, steady track drive hub (5) and move transmission jack with track drive hub toward paving machine. Raise jack to required height and seat track drive hub in mating bore of main frame.
- f. Align matchmarks on main frame and track drive hub (5). If installing a new track drive hub or track drive hub with no matchmarks, position drain hole [approximately .050 in. (1,3 mm)] to bottom.
- g. With help of another person, align mounting holes in track drive hub (5) and main frame.
- h. Install lockwashers (4) onto hex head cap screws (3).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

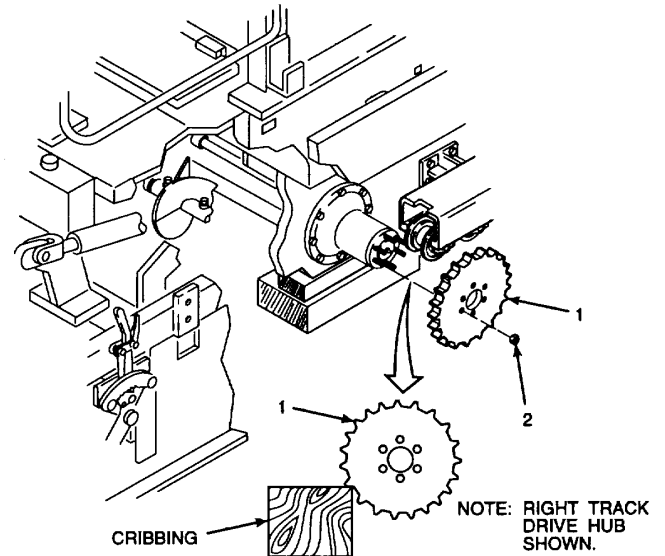
- i. Apply thread locking compound to threads of hex head cap screws (3) and install into track drive hub (5). Tighten cap screws to 225 lb-ft (305 N.m) evenly in a crisscross pattern.

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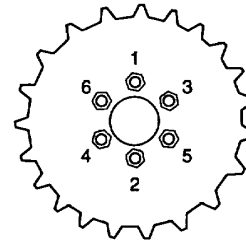
D. INSTALL - Continued.

7. INSTALL DRIVE SPROCKET GEAR.

- a. With help of another person, install drive sprocket gear (1) and self-locking nuts (2).
- b. Install cribbing below drive sprocket gear (1) to prevent drive sprocket gear from turning. When installing the left track drive hub, place the cribbing in back of the drive sprocket gear. When installing the right track drive hub, place the cribbing in front of the drive sprocket gear.
- c. Using 1-1/16 in. socket, evenly tighten all self-locking nuts (2) to 355 lb-ft (481 N.m) in a crisscross pattern.



TIGHTENING  
SEQUENCE



**NOTE**

**FOLLOW-ON-TASKS:** Lubricate per LO 5-3895-373-12.  
 Install speed reduction gearbox per paragraph 2.33.  
 Install propulsion motor per paragraph 2.32.  
 Install track chain assembly per paragraph 2.41.

**END OF TASK**

2-557

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**2.41 REPLACE TRACK CHAIN ASSEMBLY.**

---

**This task covers:**                      a. Remove                      b. Install

---

**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Crowbar (Item 36, Appendix D)  
Drip pan (Item 64, Appendix D)  
Tube caps, 2 ea (Item 22, Appendix D)  
Pin removal tool kit (Item 107, Appendix D)  
Universal puller kit (Item 69, Appendix D)

Material/Parts:

Anti-seize compound (Item 8, Appendix B)  
Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Machinery wiping towels (Item 37, Appendix B)  
Protective caps (Item 3, Appendix B)  
Spacers

Personnel Required:

Two 62B construction equipment repairers.  
Second person required for general assistance.

References:

LO 5-3895-373-12  
TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Hopper wings fully closed per TM 5-3895-373-10.  
Paving machine jacked and cribbed (for track maintenance)  
per TM 5-3895-373-20.

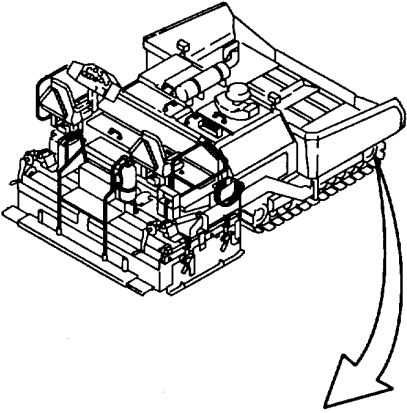
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**NOTE**

There is a left hand and a right hand track chain assembly on the paving machine. This procedure refers to replacement of right hand track chain assembly. Procedure is identical for left hand track chain assembly. Right hand track chain assembly is shown in this procedure.



- A. REMOVE.
- 1. DISCONNECT TRACK TENSIONING CYLINDER HOSE.

**NOTE**

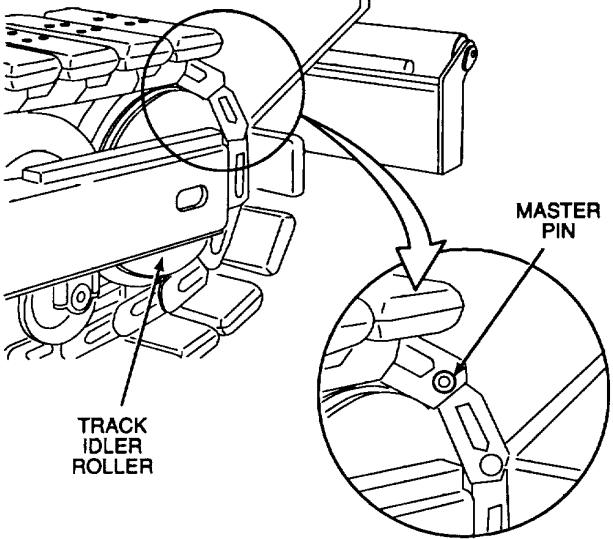
The master pin has a cone shaped indent at its center. All other chain link pins are flat faced.

- a. Start paving machine per TM 5-3895-373-10. Rotate track until master pin is at upper front portion of track idler roller.

**WARNING**

Shut off engine and remove key from ignition switch prior to performing track chain assembly maintenance. Failure to do so may result in sudden equipment movement causing serious injury or death to personnel.

- b. Shut off engine and remove key from ignition switch per TM 5-3895-373-10.
- c. Remove track pads on each side of chain master pin per TM 5-3895-373-20.



**GO TO NEXT PAGE**

**2.41 REPLACE TRACK CHAIN ASSEMBLY - Continued.****A. REMOVE - Continued.****WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves.

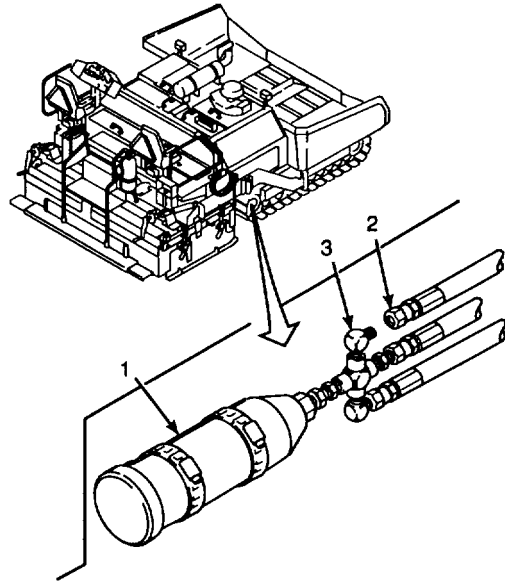
Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint of Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

Thoroughly clean hydraulic hoses, tubes, and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- d. Use cleaning solvent and cleaning cloth to clean all dust, dirt, and oil or grease residue from hydraulic fittings at accumulator (1).
- e. Place drip pan on track below hose (2) and elbow (3) at accumulator (1).



**GO TO NEXT PAGE**

A. REMOVE - Continued.

**WARNING**

Track tensioning cylinder hose connections must be shielded and hydraulic pressure slowly bled off before removing hydraulic hoses. If line pressure is not allowed to bleed off, hose connection will emit a high-energy spray when opened. Failure to shield connection and slowly bleed off hydraulic pressure may result in serious injuries to personnel.

**WARNING**

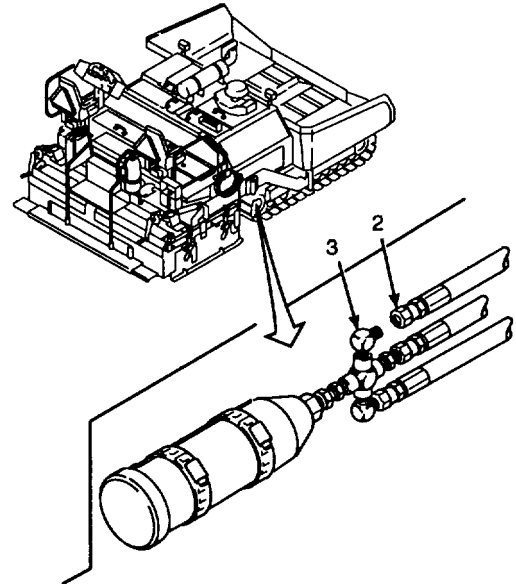
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- f. Place a wrench on hose (2). Cover hoses with machinery wiping towels. Fold machinery wiping towels as necessary to cover hoses with 3 to 4 thicknesses of material.
- g. Carefully crack open hose (2) and wait for hydraulic oil to start dripping.

**NOTE**

**Track chain assembly weight should retract track tensioning cylinder.**

- h. Allow 15 minutes for all hydraulic pressure to bleed off, then open hose a little more. Track tensioning cylinder should fully retract.
- i. After all hydraulic pressure is relieved, disconnect hose (2) from elbow (3). Drain hydraulic oil into drip pan.
- j. Plug hose (2) and install tube cap on elbow (3).
- k. Dispose of hydraulic oil in accordance with local procedures.



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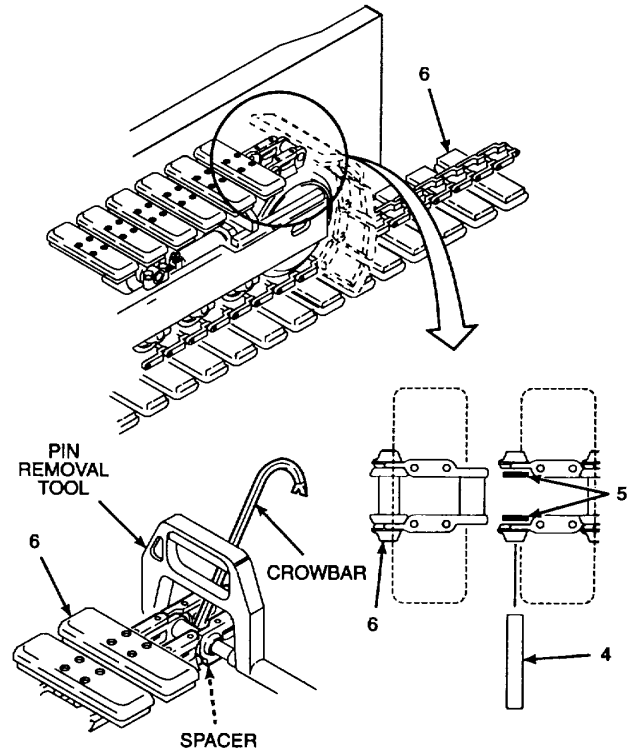
**2.41 REPLACE TRACK CHAIN ASSEMBLY- Continued.**

- A. REMOVE - Continued.
- 2. REMOVE TRACK CHAIN ASSEMBLY.

**WARNING**

The track chain assembly weighs 300 lbs (136 kg). When removing master pin, keep yourself and other personnel clear of falling chain assembly. Failure to keep personnel clear of falling chain assembly may result in serious injury.

- a. Use universal puller kit and pin removal tool kit to drive out master pin (4). Remove and discard special spacers (5).
- b. Use a crowbar to take weight off pin removal tool to allow for removal of master pin (4). Pull crowbar from track chain assembly (6) and allow track chain assembly to separate.
- c. Start paving machine per TM 5-3895-373-10 and slowly rotate track drive in reverse. Pull on leading end of track chain assembly (6) until chain assembly is free of track drive sprocket gear.
- d. Remove remaining track pads per TM 5-3895-373-20.

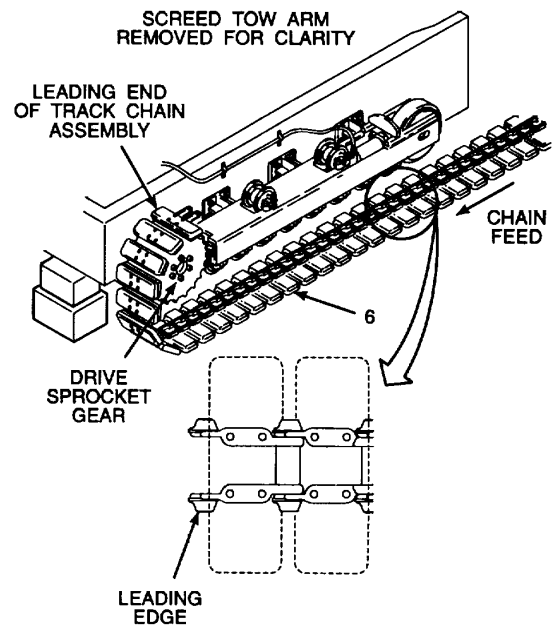


- B. INSTALL.
- 1. INSTALL TRACK CHAIN ASSEMBLY.
- a. Install track pads except leading edge and trailing edge of track chain assembly per TM 5-3895-373-20.

**NOTE**

Ensure widest part of leading end of track chain assembly will face front of machine when installed onto track frame.

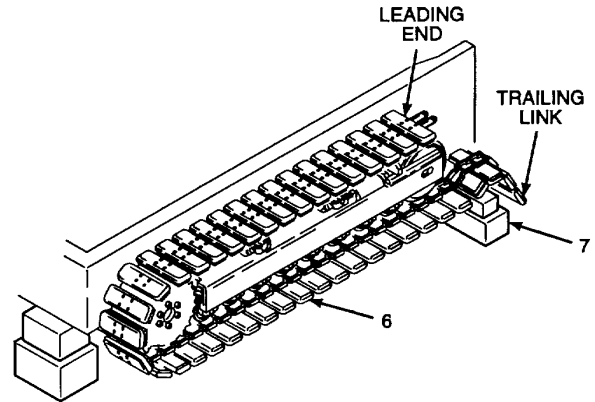
- b. With the help of another person, position track chain assembly (6) below track frame with leading end just below drive sprocket gear. Lift and drape leading end of track chain assembly over drive sprocket gear.
- c. Start paving machine per TM 5-3895-373-10 and slowly rotate track drive forward. As track chain assembly feeds, pull leading end of track chain assembly over track rollers.



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B. INSTALL - Continued.

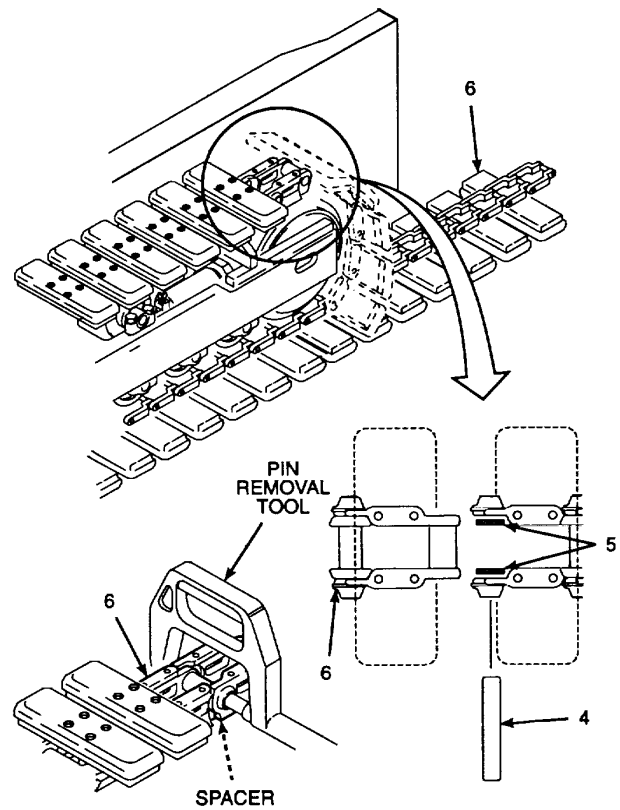
- d. Stop track drive when leading end of track chain assembly (6) is at upper front portion of track idler roller.
- e. Lift trailing section of track chain assembly (6) to meet lower front edge of track idler roller. Wedge cribbing (7) between trailing link and floor.
- f. Slowly move track drive forward until slack is removed from bottom half of track chain assembly (6).
- g. Shut off engine and remove key from ignition per TM3895-373-10.
- h. Match up leading and trailing ends of track chain assembly (6).



**WARNING**

**Anti-seize compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- i. Apply anti-seize compound to spacers (5) and master pin (4).
- j. Install spacers (5) and master pin (4) using universal tool kit and pin removal tool kit.
- k. Start paving machine and rotate track drive slowly, in reverse, to free cribbing (7). Refer to TM 5-3895-37310.
- l. As cribbing is loosened, stop track drive and remove cribbing (7).
- m. Rotate track drive slowly, in reverse, for track pad replacement. Refer to TM 5-3895-373-20.
- n. Stop track drive. Shut off engine and remove key from ignition switch per TM 5-3895-373-10.



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**2.41 REPLACE TRACK CHAIN ASSEMBLY - Continued.**

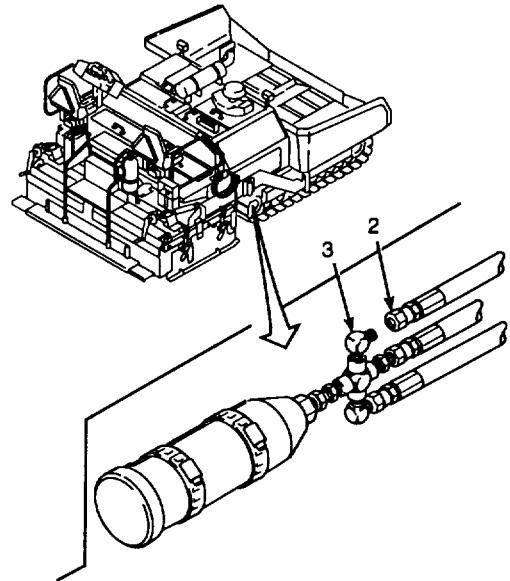
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- B. INSTALL - Continued.
2. CONNECT TRACK TENSIONING CYLINDER HOSE.
- a. Remove tube cap from elbow (3).
- b. Clean threads of elbow (3) with a cleaning cloth.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply hydraulic fitting sealant to threads of elbow (3).
- d. Remove plug from hose (2). Connect hydraulic supply hose to elbow (3) and tighten hose.
- e. Install track pads on each side of chain master pin per TM 5-3895-373-20.

**NOTE**

**FOLLOW-ON-TASKS:** Remove jacks and cribbing per TM 5-3895-373-20.  
Service hydraulic system per LO 5-3895-373-12.

**END OF TASK**

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**SECTION IX. HYDRAULIC SYSTEMS MAINTENANCE**

	Para	Page
Adjust Unloading and Relief Valves .....	2.51	2-683
Repair Auger/Conveyor Control Valve .....	2.45	2-620
Repair Auger/Conveyor Speed Control Valve.....	2.48	2-649
Repair Auger/Conveyor, Valve and Cylinder, and Tow Point Flow Dividers.....	2.49	2-663
Repair Stack Valve and Stack Valve Wiring Harness .....	2.44	2-603
Repair Tow Point Control Valve .....	2.46	2-631
Repair Tow Point Cylinder.....	2.52	2-689
Repair Tow Point Flow Control Valve.....	2.50	2-675
Replace Hydraulic Hoses, Tubes, and Fittings .....	2.54	2-720
Replace Screed Travel Lock Valve .....	2.57	2-795
Replace Screed Vibration Control Valve .....	2.56	2-791
Replace Valve Panel Control Valves and Flow Dividers.....	2.55	2-735
Replace/Repair Auxiliary Pump.....	2.42	2-565
Replace/Repair Auxiliary Vibration Pump.....	2.43	2-583
Replace/Repair Hydraulic Reservoir Components.....	2.53	2-699
Replace/Repair Screed Vibration Solenoid Valve.....	2.47	2-643

**2.42 REPLACE/REPAIR AUXILIARY PUMP**

- This task covers:**
- |            |                |            |  |
|------------|----------------|------------|--|
| a. Remove  | b. Disassemble | c. Clean   |  |
| d. Inspect | e. Assemble    | f. Install |  |

**INITIAL SETUP:**

Tools:

- General mechanic's automotive tool kit  
(Item 106, Appendix D)
- Combination wrench (Item 116, Appendix D)
- Deep style socket (Item 83, Appendix D)
- O-ring tool (Item 103, Appendix D)
- Outside micrometer (Item 15, Appendix D)
- Plastic hammer (Item 49, Appendix D)
- Slide caliper (Item 20, Appendix D)
- Telescoping gage set (Item 45, Appendix D)
- Torque wrench (Item 132, Appendix D)

Materials/Parts:

- Cleaning solvent (Item 31, Appendix B)
  - Emery cloth (Item 5, Appendix B)
  - Hydraulic fitting sealant (Item 26, Appendix B)
  - Hydraulic oil (Item 21, Appendix B)
  - Lint-free cloth (Item 7, Appendix B)
  - Machinery wiping towel (Item 37, Appendix B)
  - Plastic bags (Item 1, Appendix B)
  - Protective caps (Item 3, Appendix B)
  - Sealing compound (Item 12, Appendix B)
  - Tags (Item 34, Appendix B)
  - Thread locking compound (Item 14, Appendix B)
  - Tie wraps (Item 36, Appendix B)
  - Petrolatum (Item 24, Appendix B)
- procedure.

- Backplate repair kit
- Drive gear assembly
- Port adapter gasket
- Idler gear assembly
- Lockwashers
- O-ring
- Preformed packings
- Seal kit
- Seal repair kit

References:

- TM 5-3895-373-10
- TM 5-3895-373-24P

Equipment Condition:

- Front top right access door opened per TM 5-3895-373-10.
- Right access door opened per TM 5-3895-373-10.
- Right access cover removed per TM 5-3895-373-10.
- Hydraulic system evacuated per paragraph 2.54.

**NOTE**

**There is a left hand and a right hand auxiliary pump on the paving machine. This procedure refers to replacement and repair of left hand auxiliary pump. Procedure is identical for right and auxiliary pump except where noted in text. Left hand auxiliary pump is shown in this**

## 2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.

### A. REMOVE.

#### WARNING

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

#### CAUTION

Cleanliness is extremely important when repairing a hydraulic pump or motor. Work in a clean area. Place internal parts in clean partitioned parts trays filled with clean hydraulic oil during disassembly to avoid corrosion or contamination. Failure to do so may result in excessive component wear or failure.

#### CAUTION

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

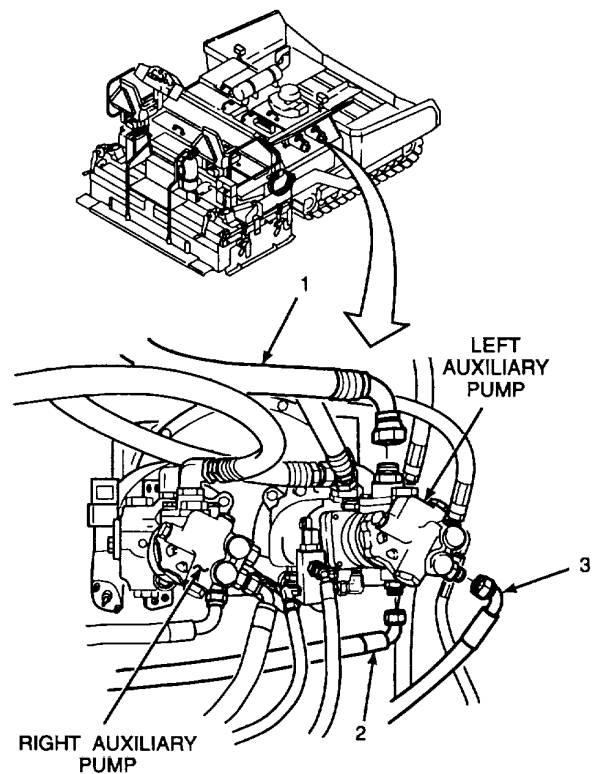
### 1. DISCONNECT HOSES FROM AUXILIARY PUMP.

- a. Place machinery wiping towel below auxiliary pump.

#### NOTE

Disconnection of hoses is the same for left and right auxiliary pumps.

- b. Using combination wrench, tag and disconnect suction hose (1). Plug suction hose end with protective caps.
- c. Tag and disconnect outlet hoses (2 and 3). Plug outlet hose ends with protective caps.
- d. If saturated, dispose of machinery wiping towel in accordance with local procedures.



**GO TO NEXT PAGE**

- A. REMOVE - Continued.
- 2. REMOVE HYDRAULIC FITTINGS FROM AUXILIARY PUMP.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

On right auxiliary pump, an elbow will be removed in place of straight adapter (4).

- a. Using combination wrench, remove straight adapter (4) and preformed packing (5). Discard preformed packing.
- b. Remove straight adapter (6) and preformed packing (7). Discard preformed packing.
- c. Remove straight adapter (8) and preformed packing (9). Discard preformed packing.
- d. Remove cap screws (10), lockwashers (11), port adapter (12), and gasket (13). Discard lockwashers and port adapter gasket.
- e. If not disassembling auxiliary pump, plug all open ports with protective caps.

- 3. REMOVE AUXILIARY PUMP FROM ENGINE COMPARTMENT.

**NOTE**

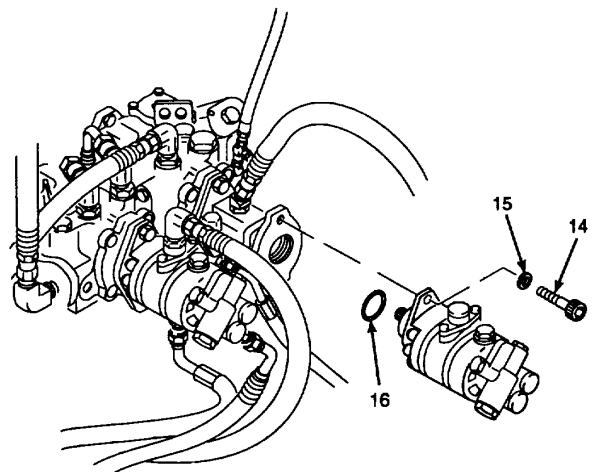
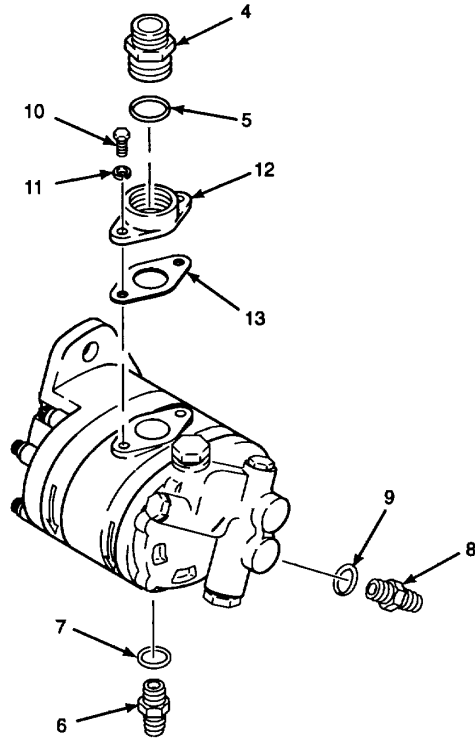
When removing right auxiliary pump, cap screws and lockwashers will be removed.

- a. Remove socket head cap screws (14) and lockwashers (15). Discard lockwashers.

**NOTE**

When removing left auxiliary pump, coupling between pumps must remain with auxiliary vibration pump.

- b. Remove auxiliary pump from engine compartment.
- c. Remove preformed packing (16). Discard preformed packing.
- d. Cover exposed end of propulsion pump or auxiliary vibration pump with plastic bag. Secure bag with rubber band or tie wrap.



GO TO NEXT PAGE

**2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.****B. DISASSEMBLE.**

1. DISASSEMBLE FRONT PLATE ASSEMBLY, PUMP BODIES, ADAPTER PLATE ASSEMBLY, AND BACKPLATE ASSEMBLY.

**WARNING**

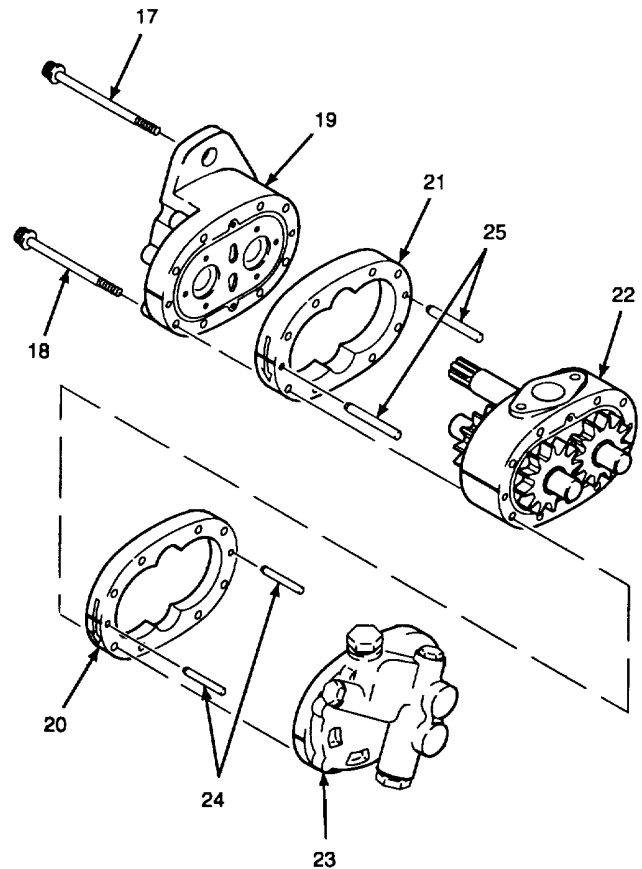
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Use the tip of a file to scribe a matchmark line across auxiliary pump sections for alignment during reassembly.
- b. Remove hex head cap screws (17 and 18).

**NOTE**

**Oil lock between pump components may make disassembly difficult.**

- c. Using plastic hammer, lightly tap end of drive shaft to separate front plate assembly (19), pump bodies (20 and 21), adapter plate assembly (22), and backplate assembly (23).

**CAUTION**

Matchmark drive gears and idler gears before disassembly. Excessive pump noise and rapid gear wear may result when reused gears are not realigned at assembly.

- d. Matchmark positions of mating gear teeth with marker.
- e. Using drift punch, drive dowel pins (24 and 25) from pump bodies (20 and 21).

**GO TO NEXT PAGE**

- B. DISASSEMBLE - Continued.
2. REMOVE DIAPHRAGM, BACKUP GASKET, PROTECTOR GASKET, DIAPHRAGM SEAL, SPRINGS, AND STEEL BALLS FROM FRONT PLATE ASSEMBLY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

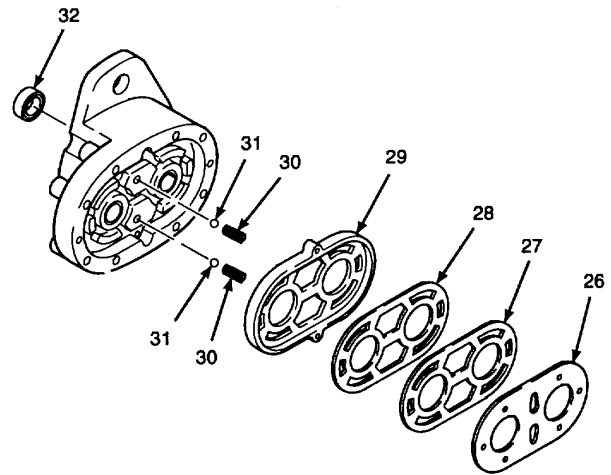
Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force. Use an o-ring tool to remove seals and preformed packings.

- a. Use an o-ring tool to remove diaphragm (26), backup gasket (27), protector gasket (28), and diaphragm seal (29). Discard diaphragm, backup gasket, protector gasket, and diaphragm seal.
- b. Remove springs (30) and steel balls (31). Discard springs and steel balls.

**CAUTION**

Use caution when removing shaft seal. Scratched or dented seal seat can cause bypass leakage. Do not scratch or dent seal seat when removing shaft seal.

- c. Use a flat-blade screwdriver to pry shaft seal (32) from seal groove without scratching or denting seal groove. Discard shaft seal.



**GO TO NEXT PAGE**

**2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.**

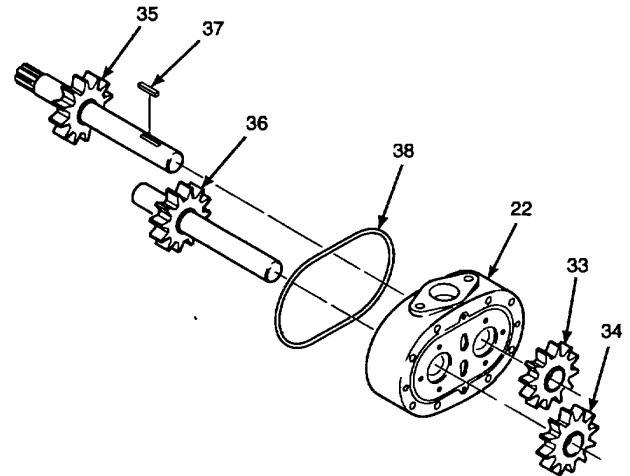
- B. DISASSEMBLE Continued.
3. REMOVE DRIVE GEAR ASSEMBLY, IDLER GEAR ASSEMBLY, KEYS, SHAFTS, AND PREFORMED PACKING FROM ADAPTER PLATE ASSEMBLY.

**WARNING**

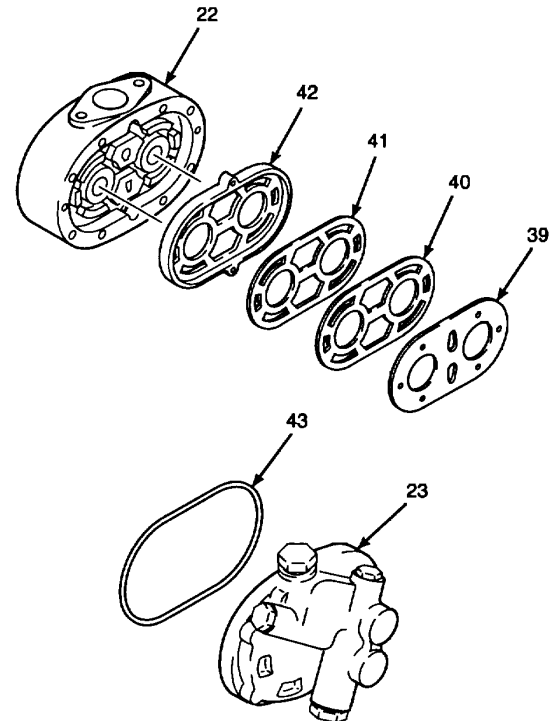
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

Position of indent markings on gears is not relevant to reassembly. Gears must be matchmarked for proper reassembly.



- a. Use a marker to matchmark gear teeth positions for alignment during reassembly. Matchmark drive gear (33), idler gear (34), drive gear assembly (35), and idler gear assembly (36).
- b. Remove drive gear (33), idler gear (34), and key (37).
- c. Remove drive gear assembly (35) and idler gear assembly (36) from adapter plate assembly (22).
- d. Remove preformed packing (38). Discard preformed packing.
4. REMOVE DIAPHRAGM, BACKUP GASKET, PROTECTOR GASKET, DIAPHRAGM SEAL, AND PREFORMED PACKING FROM ADAPTER PLATE ASSEMBLY.



**CAUTION**

Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force. Use an o-ring tool to remove seals and preformed packings.

- a. Use an o-ring tool to remove diaphragm (39), backup gasket (40), protector gasket (41), and diaphragm seal (42) from adapter plate assembly (22). Discard diaphragm, backup gasket, protector gasket, and diaphragm seal.

- b. Remove preformed packing (43) from backplate assembly (23). Discard preformed packing.

**GO TO NEXT PAGE**

## B. DISASSEMBLE Continued.

## 5. REMOVE BACKPLATE ASSEMBLY PLUGS, SPRINGS, AND VALVES.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

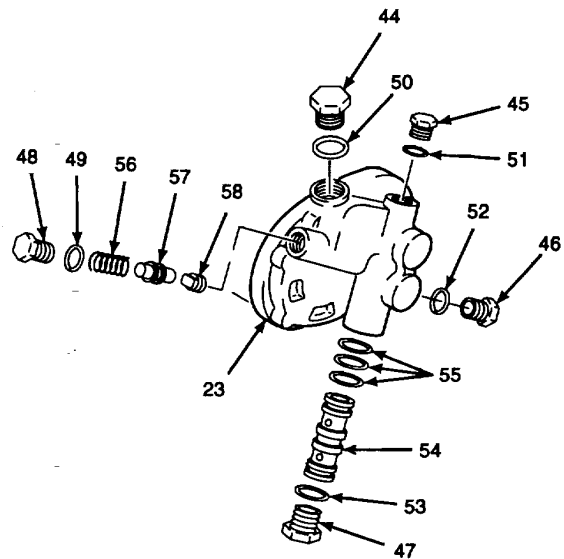
Removal of port plugs, valves, and springs is not recommended unless relief pressure is out of specification or port plugs or valves are leaky.

- a. Remove plugs (44 through 48). Remove and discard preformed packings (49 and 51 through 53) and o-ring (50).
- b. Remove valve sleeve (54). Remove and discard preformed packings (55).
- c. Remove spring (56) and poppet (57).

**NOTE**

Manufacturer recommends against removal of valve seat (58) from backplate assembly (23).

- d. If necessary, use long nose pliers to unscrew valve seat (58). Discard used valve seat if removed.



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**2.42 EPLACE/REPAIR AUXILIARY PUMP - Continued.**

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**C. CLEAN.****WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93, 3aC). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**1. RINSE ALL METAL PARTS IN CLEANING SOLVENT.****WARNING**

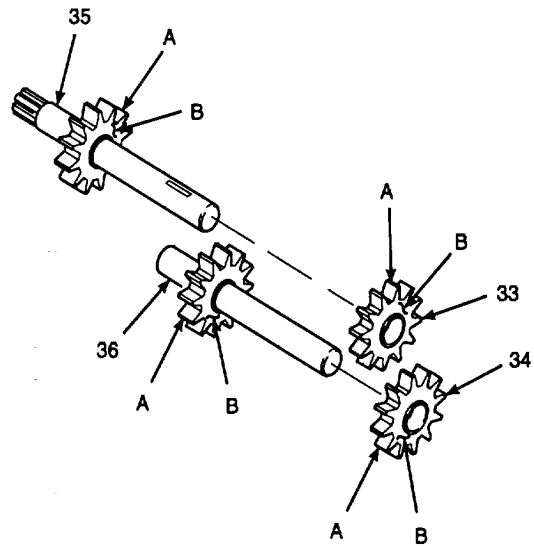
Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

**2. USE 30 PSI MAXIMUM (207 kPa) COMPRESSED AIR TO REMOVE ANY FOREIGN MATERIAL FROM FRONT PLATE ASSEMBLY, PUMP BODIES, AND GEARS.****3. DRY ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.****GO TO NEXT PAGE**

D. INSPECT.

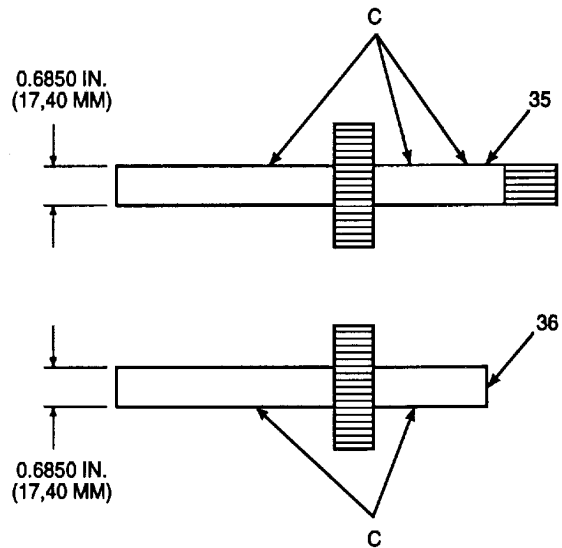
1. INSPECT GEARS FOR BURRS, SCORING, AND WEAR.

- a. Visually inspect drive gear (33), idler gear (34), drive gear assembly (35), and idler gear assembly (36) gears, surfaces A, for burrs. Inspect gear surfaces B for scoring.
- b. Use emery cloth to smooth any burrs on gear teeth. Clean gears and shafts after polishing. Refer to cleaning procedure.
- c. Use emery cloth to remove scoring that can be felt with a fingernail on gears. Clean gears and shafts after polishing. Refer to cleaning procedure.
- d. Replace drive and idler gear assemblies (35 and 36) or drive and idler gears (33 and 34) if burrs or scoring cannot be removed or if gear teeth are worn to a point.



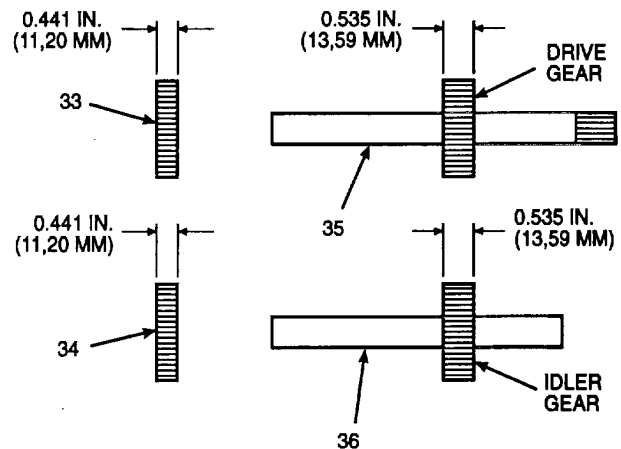
2. INSPECT DRIVE SHAFT AND IDLER SHAFT FOR WEAR.

- a. Use an outside micrometer to measure shaft diameters C of bearing journals on drive gear assembly (35) and idler gear assembly (36).
- b. If bearing journal diameter is less than 0.6850 in. (17, 40 mm) replace gear assembly.



3. INSPECT DRIVE AND IDLER GEAR WIDTHS FOR WEAR.

- a. Use an outside micrometer to measure drive gear (33) and idler gear (34) width. If gear width is less than 0.441 in. (11, 20 mm), replace drive gear and idler gears.
- b. Use an outside micrometer to measure drive gear assembly (35) gear width and idler gear assembly (36) gear width. If gear width is less than 0.535 in. (13, 59 mm) replace gear assembly.
- c. Inspect drive spline of drive gear assembly (35) for cracks, chips, or wear steps. Replace gear assembly if drive spline is worn or damaged.



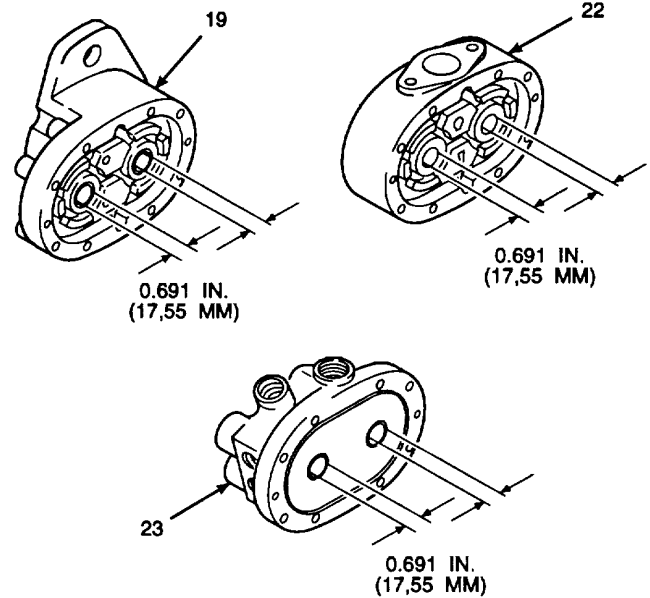
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2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.

D. INSPECT Continued.

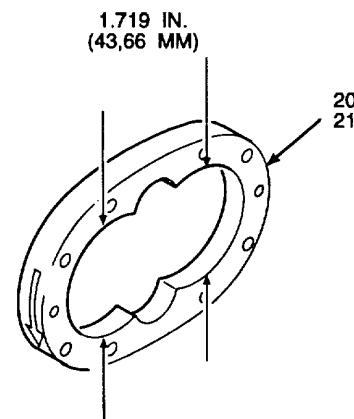
4. INSPECT FRONT PLATE, BACKPLATE, AND ADAPTER PLATE ASSEMBLY BEARINGS FOR WEAR.

- a. Use a telescoping gage set and slide caliper to measure inside diameters of bearings inside front plate assembly (19), backplate assembly (23), and adapter plate assembly (22).
- b. If inside bearing diameter is greater than 0.691 in. (17, 55 mm) replace front plate assembly (19), backplate assembly (23), or adapter plate assembly (22).
- c. Check position of oil grooves in front plate assembly (19) and backplate assembly (23) bearings. Verify that oil groove in upper bearing is at 12 o'clock position and that oil groove in lower bearing is at 6 o'clock. If oil groove is out of position, replace front plate assembly or backplate assembly.
- d. Check that bearing faces are flush with island faces of front plate assembly (19). Replace front plate assembly if bearings are not flush with islands.



5. INSPECT PUMP BODY INNER DIAMETERS FOR WEAR.

- a. Use a telescoping gage set and slide caliper to measure inner diameters of pump bodies (20 and 21).
- b. If largest inside diameter of pump body (20 or 21) is greater than 1.719 in. (43, 66 mm), replace pump body.
- c. Inspect faces of adapter plate assembly (22) and backplate assembly (23) for scoring and material loss due to gear wear. If depth of wear exceeds 0.0015 in. (0, 038 mm), replace worn plate assembly.



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E. ASSEMBLE.

1. INSTALL BACKPLATE ASSEMBLY VALVES, SPRINGS, AND PLUGS.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. If valve seat (58) was removed, apply thread locking compound to replacement valve seat and use long nose pliers to screw valve seat into backplate assembly (23).

**WARNING**

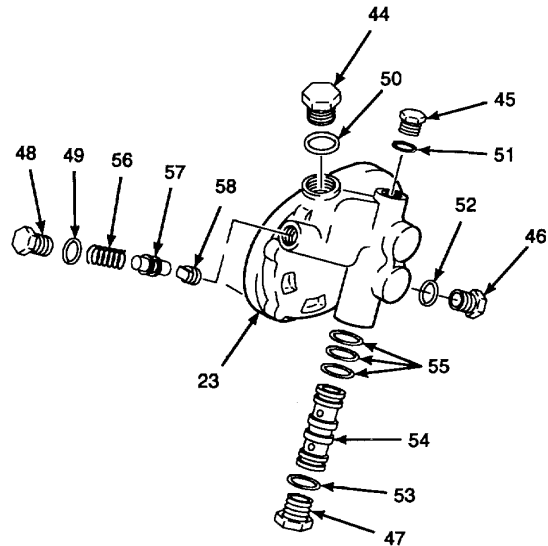
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Lubricate plugs (44 through 48), o-ring (50), and preformed packings (49, 51 through 53, and 55) with clean hydraulic oil.

**CAUTION**

Be careful not to damage preformed packings and o-rings when sliding over threads. Sharp edges of threads can cut or damage preformed packings and o-rings. Damaged packings and o-rings will cause leakage and affect performance.

- c. Carefully install o-ring (50) and preformed packings (49 and 51 through 53) on plugs (44 through 48). Avoid cutting preformed packings and o-ring on screw threads.
- d. Install preformed packings (55) on valve sleeve (54).



**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Clean threads of plugs (44 through 48) with cleaning cloth. Apply hydraulic fitting sealant to threads of plugs.
- f. Install valve sleeve (54) and plug (47). Tighten plug to 38 lb-ft (51 N.m).
- g. Install poppet (57), spring (56), and plug (48). Tighten plug to 11 lb-ft (15 N.m).
- h. Install and tighten plugs (44 and 46).
- i. Install plug (45) and tighten to 23 lb-ft (31 N.m).

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## 2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.

### E. ASSEMBLE - Continued.

2. INSTALL DIAPHRAGM SEAL, PROTECTOR GASKET, BACKUP GASKET, DIAPHRAGM, DOWEL PINS, AND REAR PUMP BODY.

#### WARNING

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- Lubricate diaphragm seal (42) with clean hydraulic oil.
- Install diaphragm seal (42), with open part of "V" section facing adapter plate assembly (22).
- Use a dull tool to seat diaphragm seal (42) in adapter plate assembly (22). Ensure diaphragm seal is fully seated before proceeding.
- Install protector gasket (41) and backup gasket (40).

#### NOTE

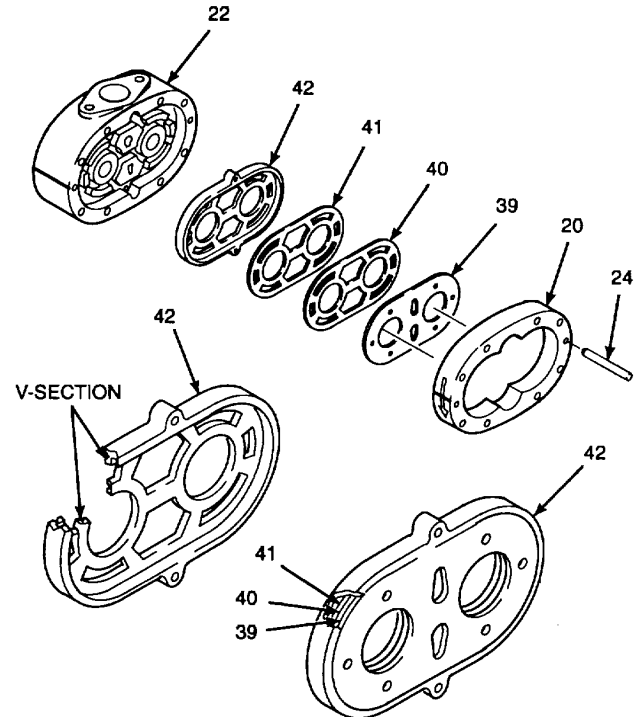
Entire diaphragm must fit inside the raised rim of diaphragm seal.

- Install diaphragm (39) bronze face out.

#### NOTE

Shortest dowel pins (24) are used in thickest pump body (20).

- Use drift punch and hammer to install dowel pins (24) in rear pump body (20). Non-tapered ends of dowel pins should protrude about 1/4 in. (6 mm) above backplate side of pump body.
- Align matchmarks and install rear pump body (20) on adapter plate assembly (22) to hold diaphragm (39) in place.



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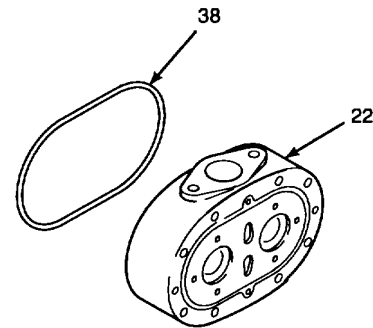
E. ASSEMBLE - Continued.

3. INSTALL PREFORMED PACKINGS, KEY, AND GEAR ASSEMBLIES.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

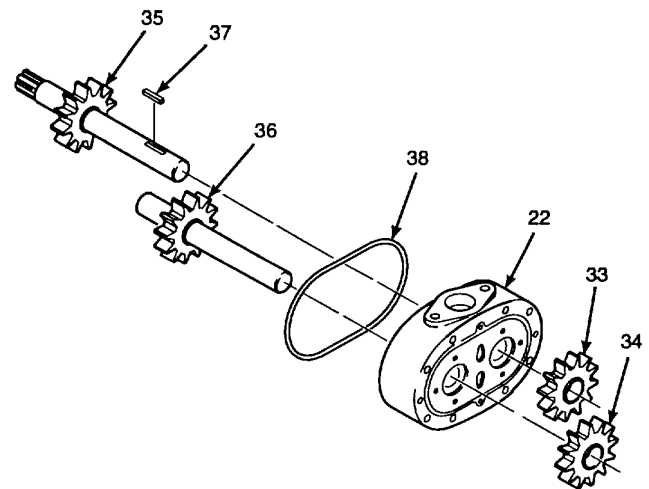
- a. Lubricate preformed packing (38) with clean hydraulic oil.
- b. Install preformed packing (38) into adapter plate assembly (22).



**CAUTION**

Matchmarks on drive gears and idler gears must be aligned prior to assembly. Do not install reused drive gears and idler gears indiscriminately. Excessive pump noise and rapid gear wear may result from misaligned, reused, gears. Line up matchmarks prior to assembly of reused drive gears and idler gears.

- c. If reusing idler and drive gear assemblies (36 and 35) removed at disassembly, line up match marks on mating idler gear (34) and drive gear (33).
- d. Install idler gear assembly (36) and drive gear assembly (35) through adapter plate assembly (22).
- e. If reusing idler gear (34) and drive gear (33) removed at disassembly, line up matchmarks on idler gear and drive gear.
- f. Install key (37), idler gear (34), and drive gear (33) on idler gear assembly (36) and drive gear assembly (35).



GO TO NEXT PAGE

**2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.****E. ASSEMBLE - Continued.**

4. INSTALL DIAPHRAGM SEAL, PROTECTOR GASKET, BACKUP GASKET, DIAPHRAGM, STEEL BALLS, AND SPRINGS INTO FRONT PLATE ASSEMBLY.

- a. Use dull tool to install diaphragm seal (29) with open part of "V" section facing front plate assembly (19).

Ensure diaphragm seal is fully seated before proceeding.

- b. Install protector gasket (28) and backup gasket (27).
- c. Install steel balls (31) and springs (30).

**NOTE**

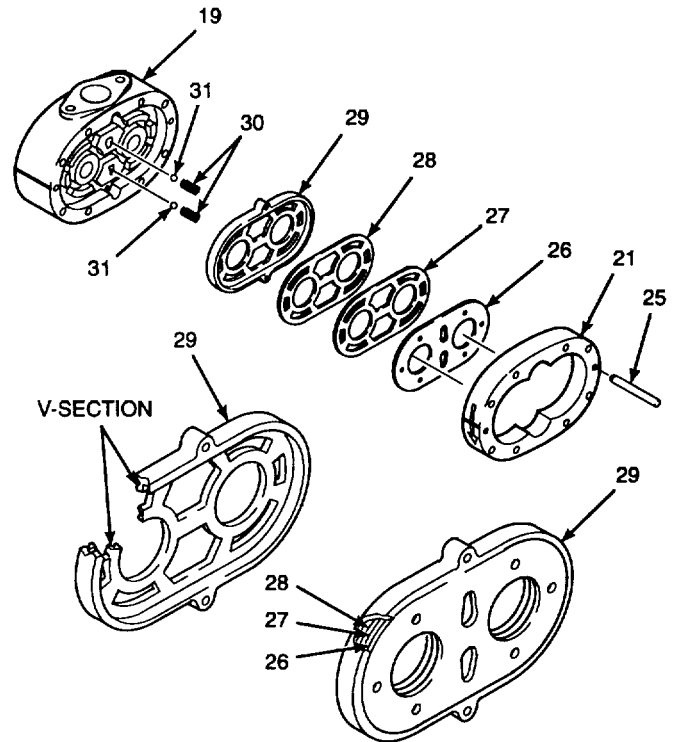
**Entire diaphragm must fit inside the raised rim of diaphragm seal.**

- d. Install diaphragm (26) bronze face out.

**NOTE**

**Longest dowel pins (25) are used in thinnest pump body (21).**

- e. Use drift punch and hammer to install dowel pins (25) in front pump body (21). Tapered ends of dowel pins should protrude about 1/4 in. (6 mm) beyond front plate side of front pump body.
- f. Align matchmarks and install front pump body (21) on front plate assembly (19) to hold diaphragm (26) in place.



**GO TO NEXT PAGE**

E. ASSEMBLE - Continued.

5. ASSEMBLE BACKPLATE ASSEMBLY, ADAPTER PLATE ASSEMBLY, AND FRONT PLATE ASSEMBLY.

- a. Apply petrolatum to preformed packing (43). Install packing in mating groove of backplate assembly (23).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Dip adapter plate assembly (22) with installed drive and idler gears (33 and 34) and drive and idler gear assemblies (35 and 36) in clean hydraulic oil.

**NOTE**

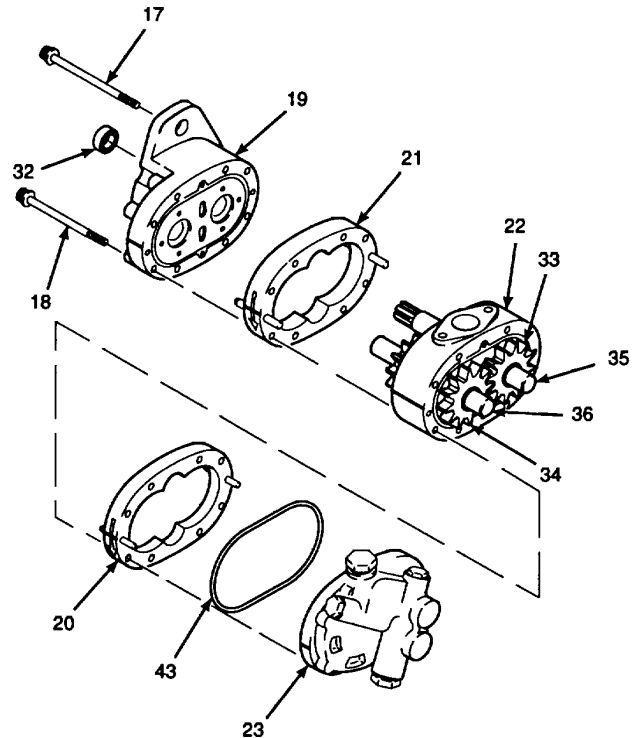
**Pump components must be assembled in same positions as they were prior to disassembly.**

- c. Apply a thin coat of clean hydraulic oil to insides of pump bodies (20 and 21).
- d. Align matchmarks on adapter plate assembly (22) and installed rear pump body (20) with backplate assembly (23). Install backplate assembly on assembled adapter plate assembly and pump body.
- e. Align matchmarks and join front plate assembly (19) and installed front pump body (21) with adapter plate assembly (22).

**NOTE**

**Longer hex head cap screws (17) are installed inside pilot diameter of pump mounting flange f. Install hex head cap screws (18 and 17). Tighten to 26 lb-ft (35 N•m).**

- g. Lubricate shaft seal (32) with clean hydraulic oil.



**CAUTION**

**Use caution when installing shaft seal. Sharp edges on drive shaft may cut seal. Install shaft seal slowly. Do not use excessive pressure to install shaft seal.**

- h. Using 3/4 in. deep well socket install shaft seal (32) over shaft of drive gear assembly (35) and into bore of front plate assembly (19). Tap on 3/4 in. deep well socket until shaft seal is fully seated. Ensure spring loaded lip faces front plate assembly.
- i. Rotate shaft of drive gear assembly (35) by hand. Shaft should have slight resistance.

**GO TO NEXT PAGE**



2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.

F. INSTALL.

1. INSTALL HYDRAULIC FITTINGS ON AUXILIARY PUMP.

- a. Remove protective caps.
- b. Install lockwashers (11) onto cap screws (10).

**WARNING**

Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Coat gasket (13) with a thin coat of sealing compound.
- d. Install gasket (13) and port adapter (12).
- e. Install cap screws (10). Tighten to 14 lb-ft (19 N.m).
- f. Lubricate preformed packings (5, 7, and 9) with , petrolatum.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of threads can cut or damage preformed packing. Damaged packing will cause leakage and affect performance.

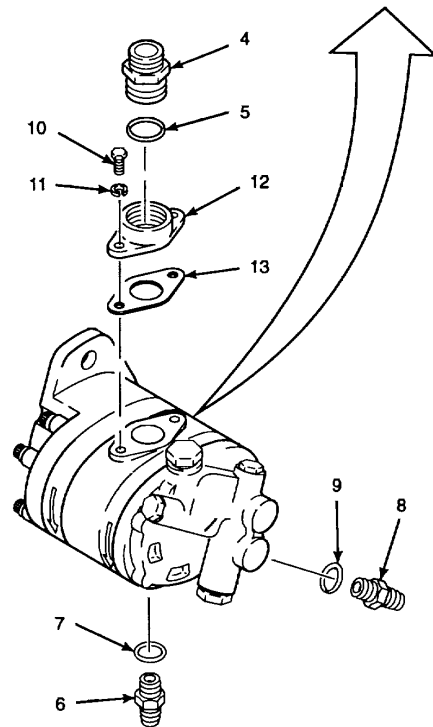
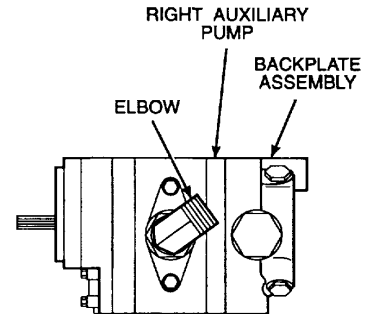
**NOTE**

When installing hydraulic fittings on right auxiliary pump, an elbow will be installed in place of straight adapter (4).

- g. Using combination wrench, install preformed packing (5) onto straight adapter (4). Install straight adapter into port adapter (12).

**NOTE**

When installing elbow in place of straight adapter (4), orient elbow to point toward backplate assembly.



- h. Install preformed packing (7) onto straight adapter (6). Install straight adapter into pump housing.
- i. Install preformed packing (9) onto straight adapter (8). Install straight adapter into pump housing.

**GO TO NEXT PAGE**

F. INSTALL Continued.

2. INSTALL AUXILIARY PUMP ON PAVING MACHINE.

- a. Install lockwasher (15) onto socket head cap screws (14).
- b. Lubricate preformed packing (16) with petrolatum.
- c. Install preformed packing (16) on pilot flange of auxiliary pump.

**NOTE**

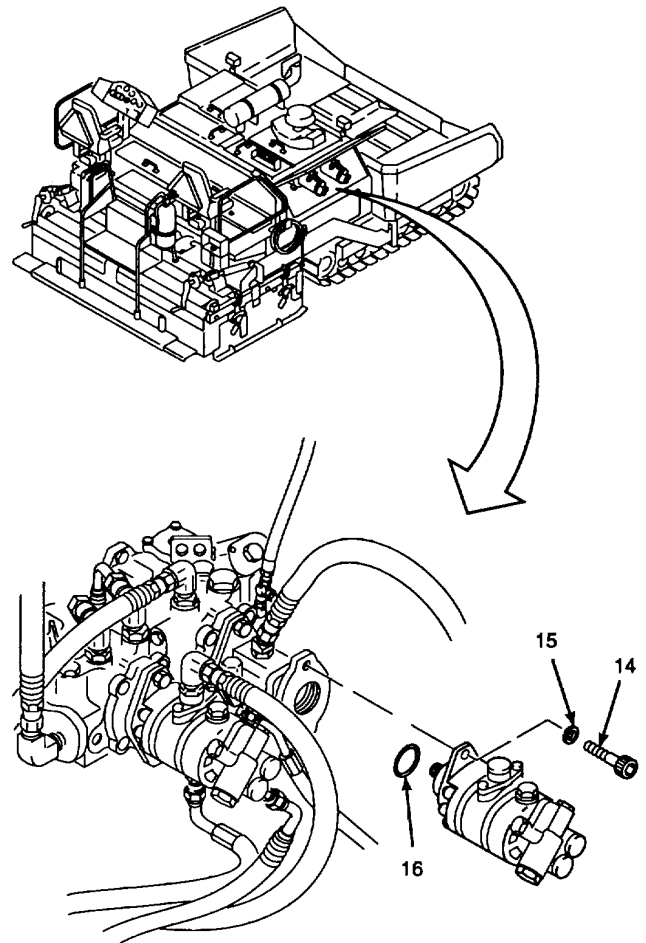
**Coupling for auxiliary vibration pump must be installed on vibration pump shaft prior to installation of left auxiliary pump.**

- d. Align and install auxiliary pump.

**NOTE**

**When installing right auxiliary pump, socket head cap screws and lockwashers will be installed and tightened to 37 lb-ft (50 N•m).**

- e. Install socket head cap screws (14).



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**2.42 REPLACE/REPAIR AUXILIARY PUMP - Continued.**

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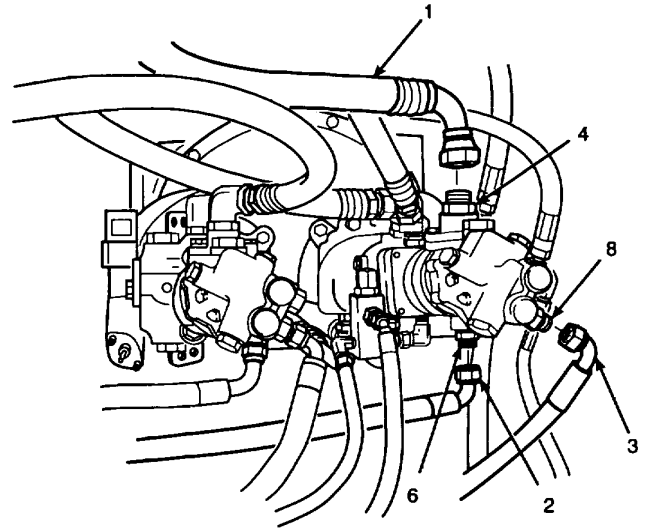
F. INSTALL Continued.

3. CONNECT OUTLET HOSES AND SUCTION HOSE TO AUXILIARY PUMP.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Coat exposed threads of straight adapter (6 and 8) with hydraulic fitting sealant. Install and tighten outlet hoses (2 and 3).
- b. Coat exposed threads of straight adapter (4) with hydraulic fitting sealant. Using combination wrench, install and tighten suction hose (1).

**NOTE**

**FOLLOW-ON-TASKS:** Prime hydraulic pump per paragraph 2.54.  
Install right access cover per TM 5-3895-373-10.  
Close right access door per TM 5-3895-373-10.  
Close front top right access door per TM 5-3895-373-10.

**END OF TASK**

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**2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP.**


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This task covers:

- |            |                |            |
|------------|----------------|------------|
| a. Removal | b. Disassemble | c. Clean   |
| d. Inspect | e. Assemble    | f. Install |

---

**INITIAL SETUP**

Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Combination wrench (Item 115, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Pry bar (Item 9, Appendix D)  
Shaft seal driver tool (Item 19, Appendix C)  
Snap ring pliers (Item 66, Appendix D)  
Torque wrench (Item 132, Appendix D)  
Vise jaw caps (Item 23, Appendix D)

References:

TM 5-3895-373-10  
TM 5-3895-373-24P

Equipment Condition:

Right access door open per TM 5-3895-373-10.  
Right access cover removed per TM 5-3895-373-10.  
Front top right access door open per TM 5-3895-373-10.  
Hydraulic system evacuated per paragraph 2.54.  
Left auxiliary pump removed per paragraph 2.42.

Materials/Parts:

Cleaning cloths (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Plastic bag (Item 1, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Tie wraps (Item 36, Appendix B)  
O-ring  
Preformed packings  
Seal kit

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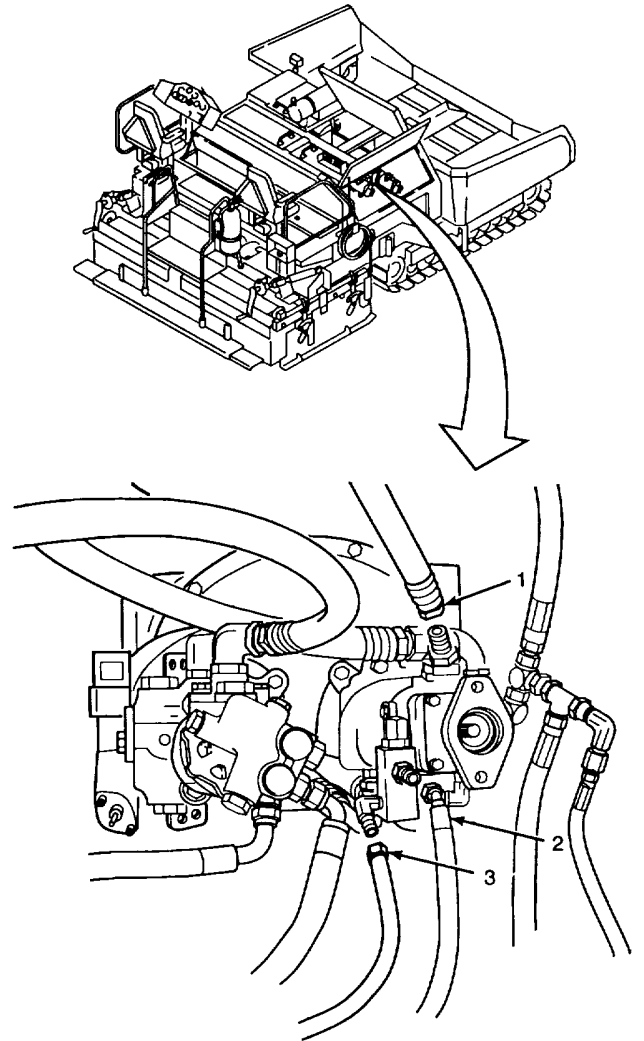
**2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued****A. REMOVE.****WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

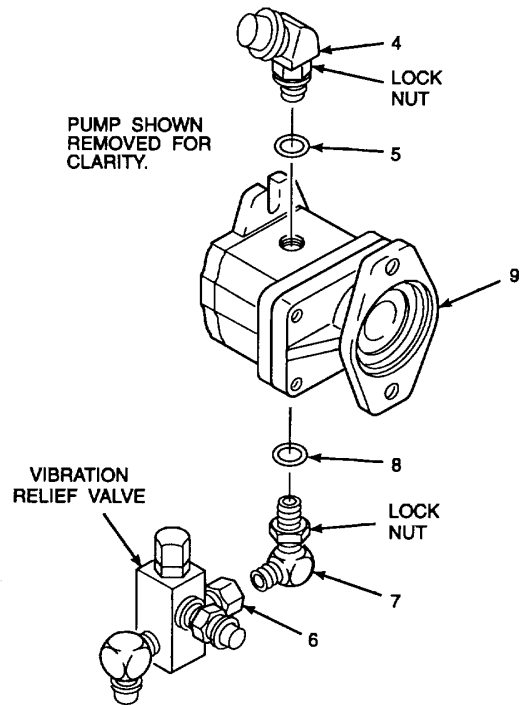
1. REMOVE HYDRAULIC HOSES.
  - a. Place machinery wiping towel below auxiliary vibration pump.
  - b. Using combination wrench, tag and disconnect suction hose (1), return hose (2), and outlet hose (3).
  - c. Plug hoses (1, 2, and 3) and cap exposed adapters with protective caps.
  - d. Dispose of machinery wiping towel in accordance with local procedures.

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A. REMOVE - Continued.

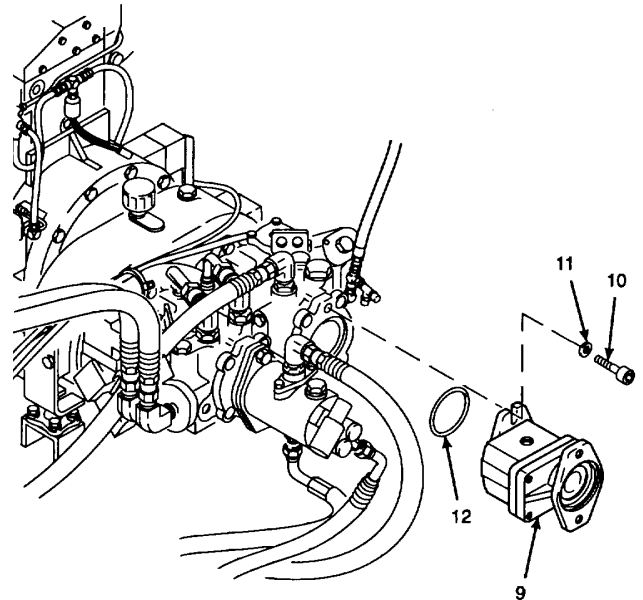
2. REMOVE VIBRATION RELIEF VALVE AND ADAPTERS.

- a. Using combination wrench, loosen lock nut and remove elbow (4) and preformed packing (5). Discard preformed packing.
- b. Unscrew vibration relief valve straight adapter (6) from elbow (7) and remove relief valve.
- c. Loosen lock nut and remove elbow (7) and preformed packing (8). Discard preformed packing.
- d. If auxiliary vibration pump (9) does not require disassembly, plug hydraulic ports with protective caps.



3. REMOVE AUXILIARY VIBRATION PUMP.

- a. Remove socket head cap screws (10) and flat washers (11) and auxiliary vibration pump (9).
- b. Remove auxiliary vibration pump (9) from engine compartment.
- c. Remove and discard preformed packing (12).
- d. Place auxiliary vibration pump (9) on a clean work surface.
- e. Cover exposed end of propulsion pump with a plastic bag. Secure bag with rubber band or tie wraps.



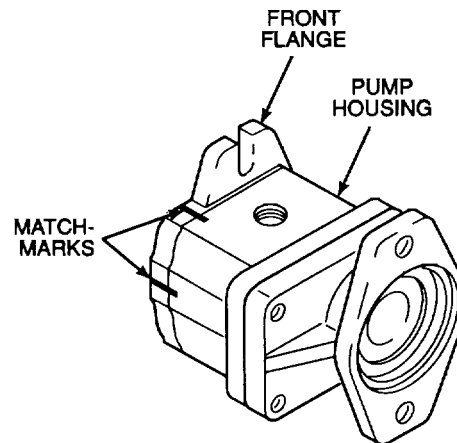
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## 2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

## B. DISASSEMBLE.

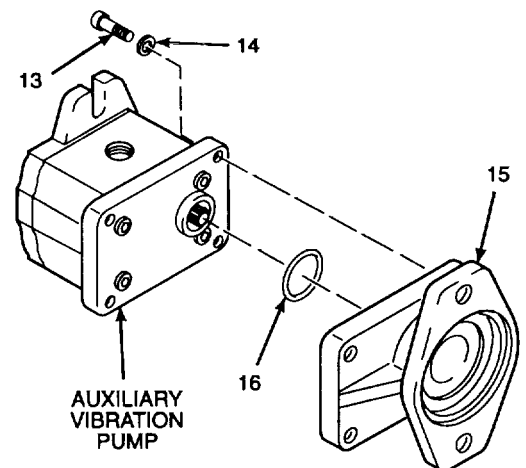


Cleanliness is extremely important when repairing a hydraulic pump. Work in a clean area to avoid corrosion or contamination. Failure to do so may result in excessive component wear or failure.



## 1. DISASSEMBLE AUXILIARY VIBRATION PUMP AND ADAPTER BODY.

- a. Use marker or scribe to matchmark pump housing two places.
- b. Remove socket head cap screws (13) and flat washer (14).
- c. Remove adapter body (15) and o-ring (16). Discard o-ring.



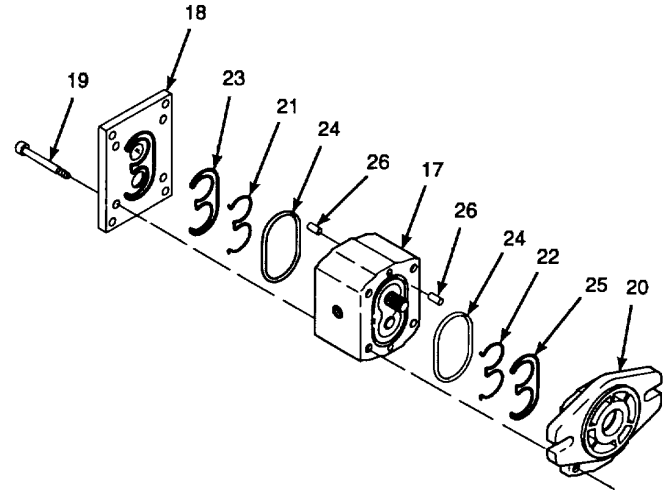
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- B. DISASSEMBLE Continued.
- 2. DISASSEMBLE AUXILIARY VIBRATION PUMP.



**Do not clamp vise jaws against pump housing (17). Clamping against pump housing walls can deform internal cavities and cause permanent damage to the auxiliary vibration pump.**

- a. Clamp auxiliary vibration pump in vise jaw caps of bench vise. Clamp across side walls of rear cover (18).



Remove socket head cap screws (19)

- b. Remove auxiliary vibration pump from bench vise and place pump on its side.
- c. Separate front flange (20), pump housing (17), and rear cover (18).



**Use caution when removing packing retainers and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing packing retainers and preformed packings. Use an o-ring tool to remove packing retainers and preformed packings.**

- d. Use an o-ring tool to remove expansion rings (21 and 22) seal (23), preformed packings (24) and seal (25). Discard expansion rings, seals, and preformed packings.
- e. Remove guide pins (26).

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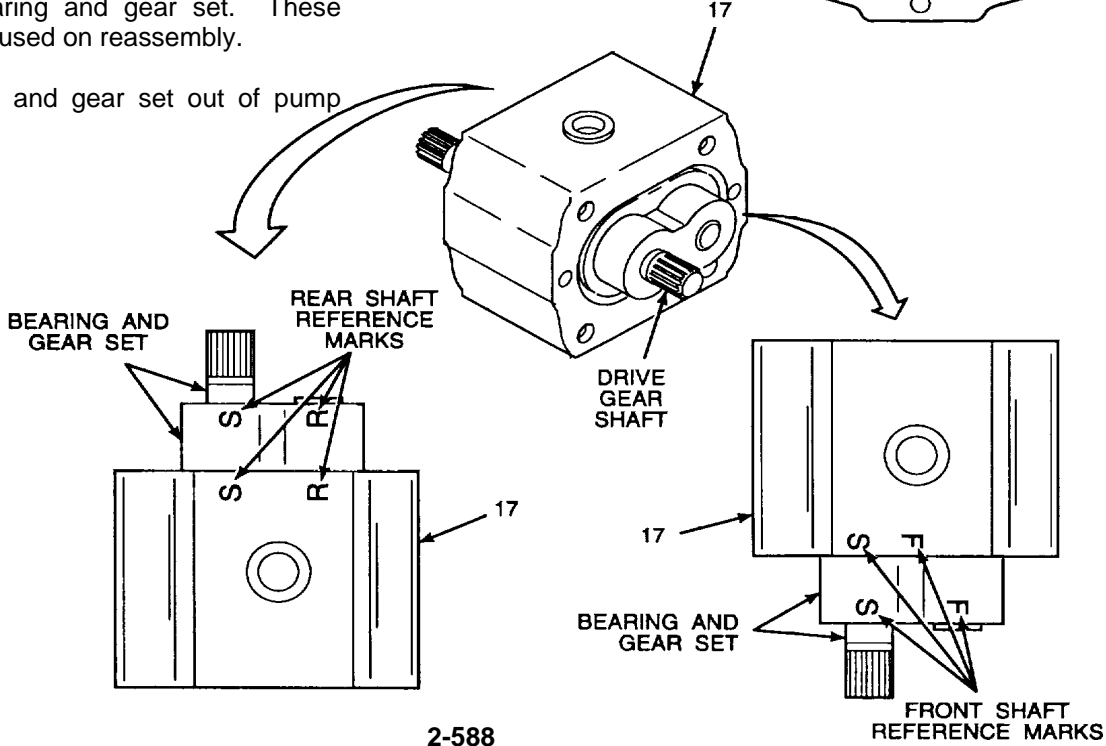
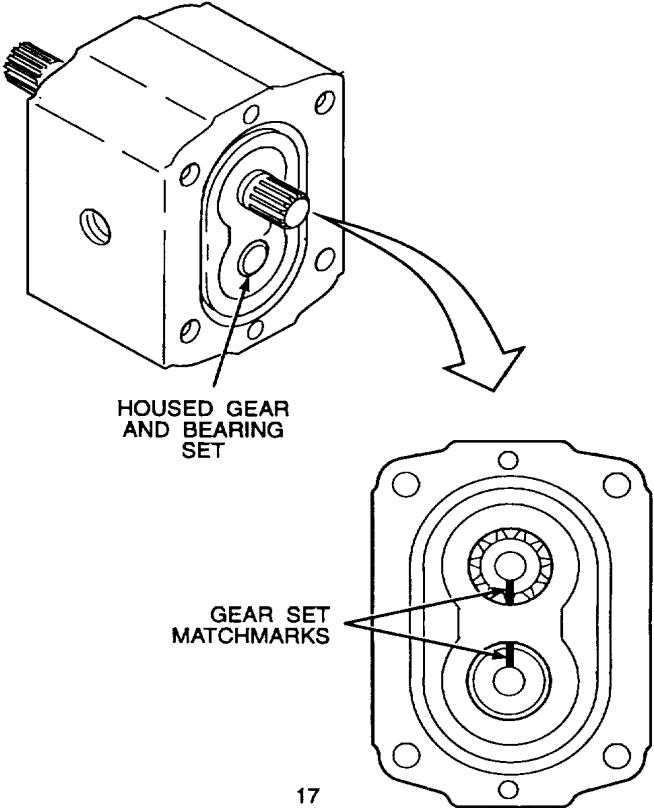
2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

B. DISASSEMBLE - Continued.

**NOTE**

**Gear set matchmarks are required for proper meshing of gear teeth upon assembly when reusing gear set.**

- f. Use marker to matchmark shaft ends at front end of housed gear and bearing set.
- g. Lay pump housing (17) on its side with drive gear shaft on the left, as shown.
- h. From rear of pump housing (17), push bearing and gear set part way out of pump housing.
- i. Use marker to mark F (front) and S (shaft) reference marks on front of pump housing (17) and bearing and gear set. These marks will be used on reassembly.
- j. Use marker to mark R (rear) and S (shaft) reference marks on rear of pump housing (17) and bearing and gear set. These marks will be used on reassembly.
- k. Push bearing and gear set out of pump housing (17).



## 2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

## B. DISASSEMBLE Continued.

**WARNING**

Use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

1. Use snap ring pliers to remove retaining ring (27) from front flange (20). Discard retaining ring.

**CAUTION**

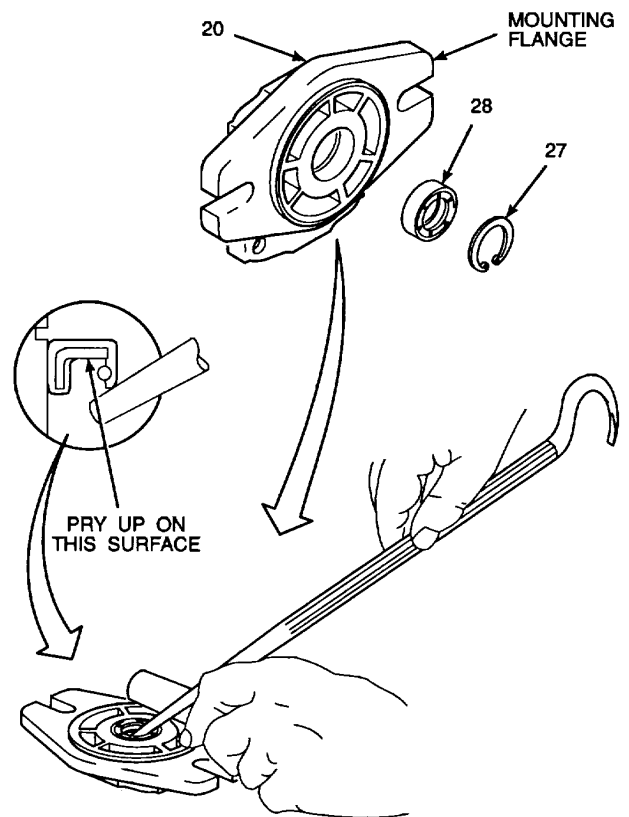
Do not clamp front flange between steel jaws of bench vise. Use vise jaw caps in bench vise. Failure to use vise jaw caps may result in distortion of flange walls.

- m. Clamp front flange (20) between vise jaw caps of bench vise. Clamp across mounting flange with seal side up.

**CAUTION**

Use caution when removing shaft seal. Scratched or dented seal seat can cause bypass leakage. Do not allow pry bar to contact seal seat or top face of seal bore.

- n. Use rounded end of pry bar under top flange of shaft seal (28).
- o. Place a small piece of wood between pry bar and face of front flange.
- p. Work pry bar around edge of seal and pry out shaft seal (28). Discard shaft seal.



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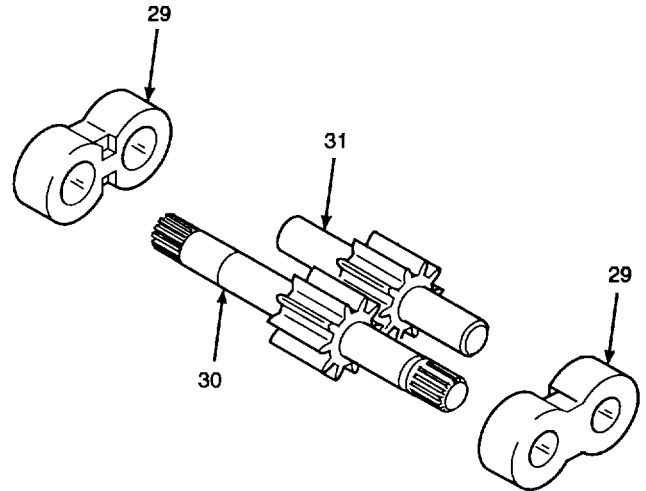
## 2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

## B. DISASSEMBLE - Continued.

**CAUTION**

Drive and idler gear teeth are highly polished. Avoid contact with bare fingers. Skin oils can erode polished surfaces. Wear clean cotton or polyester gloves when handling gears.

- q. Remove bearing units (29).
- r. Place bearing units (29), drive gear (30), and idler gear (31) in separate plastic bags to protect against contamination.



## C. CLEAN.

- 1. CLEAN ALL METAL PARTS WITH CLEANING SOLVENT.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all parts with cleaning solvent. Do not clean off matchmarks on pump housing, covers, drive gear, or idler gear.

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## C. CLEAN Continued.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

**CAUTION**

If replacing gears with new gears, preservative coating on new gears must be thoroughly cleaned away with cleaning solvent. Failure to clean replacement gears may cause pump failure.

- b. Use a maximum of 30 psi (207 kPa) compressed air to remove foreign material from front flange, pump housing, rear cover, and gears.
- c. Dry all parts with a clean, lint-free cloth.

## 2. CLEAN SCREW THREADS.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean screw threads with thread locking compound solvent.
- b. Dry fasteners with a cleaning cloth.

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2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

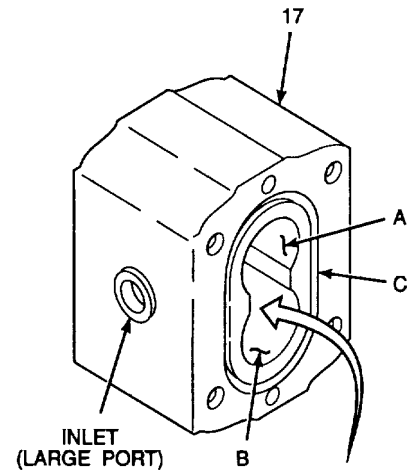
D. INSPECT.

1. INSPECT PUMP HOUSING.

**NOTE**

**Gear tracking on inlet (large port) side of pump housing will create a stepped wear path. A uniform wear path is normal and should not be considered reason for rejecting pump housing.**

- a. Visually inspect pump housing (17) interior surfaces A and B for scoring and grooving of gear paths.
- b. Replace auxiliary vibration pump if scoring or grooves are found in gear paths.
- c. Inspect seal grooves C on both ends of pump housing for sharp edges caused by scratches, nicks, or burrs. Remove sharp edges with emery cloth.
- d. If scratches or nicks cause leakage paths more than halfway across seal groove, replace auxiliary vibration pump.



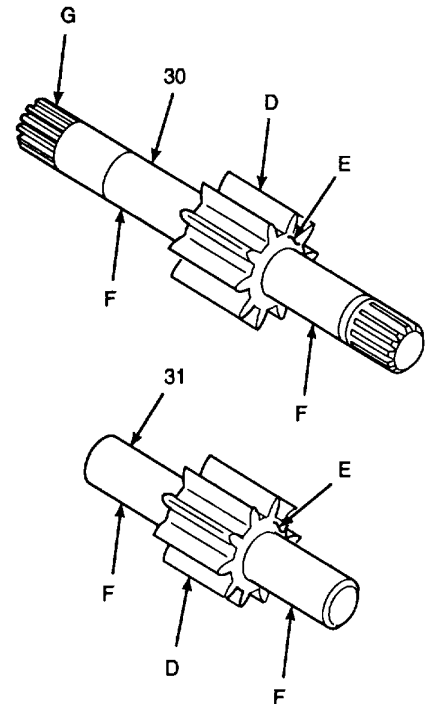
**NOTE: GEAR WEAR PATH IS NORMAL ON INLET SIDE OF SURFACES A AND B.**

2. INSPECT DRIVE GEARS AND IDLER GEARS.



**Drive gear and idler gear teeth are highly polished. Avoid contact with bare fingers. Skin oils can erode polished surfaces. Wear clean cotton or polyester gloves when handling gears.**

- a. Visually inspect drive gear (30) and idler gear (31), teeth surfaces D and gear faces E, for nicks, chips, scoring, or discoloration.
- b. Replace drive and idler gears (30 and 31) if any damage is found on surfaces D or E, or if scoring or burnishing is found on surfaces F.
- c. Remove small burrs or scratches from surfaces with emery cloth. Clean gears after polishing. Refer to cleaning procedure.
- d. Inspect splines G for nicks, chipping, and wear indicated by rounding of spline teeth. If spline damage is indicated, replace both the drive and idler gears (30 and 31).



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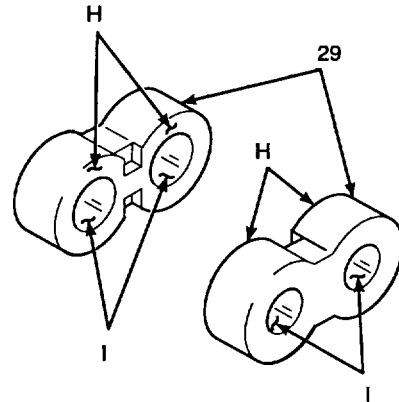
D. INSPECT Continued.

3. INSPECT BEARING UNITS.



**Bearing units are highly polished. Avoid contact with bare fingers. Skin oils can erode polished surfaces. Wear clean cotton or polyester gloves when handling bearing units.**

- a. Visually inspect bearing units (29), surfaces H, for nicks, chips, scoring, or discoloration.
- b. Visually inspect interior surfaces I for signs of out-of-roundness and scoring. Insert shafts of drive gear and idler gear into bearing units. Shafts should fit snug with no looseness when shaft is wiggled from side to side in any direction.
- c. If nicks, chips, scoring, discoloration, or out-of-roundness are found on bearing units (29), replace both bearing units.



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2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

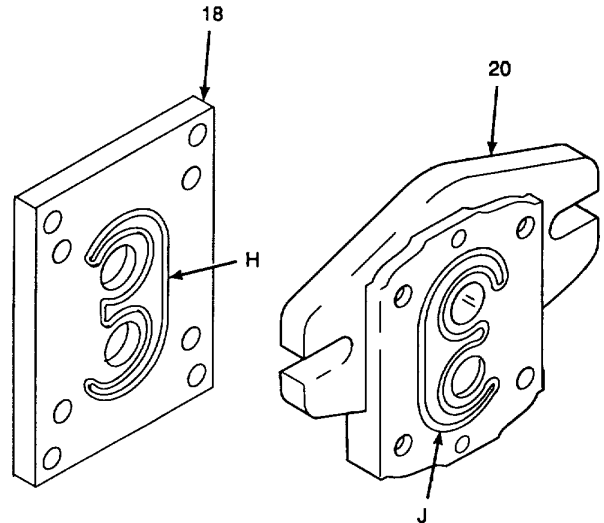
D. INSPECT - Continued.

4. INSPECT REAR COVER AND FRONT FLANGE.

- a. Inspect seal grooves H and J in rear cover (18) and front flange (20) for sharp edges caused by scratches, nicks, or burrs. Remove sharp edges with emery cloth.
- b. If scratches or nicks cause leakage paths more than halfway across seal groove H or J, replace damaged component.

E. ASSEMBLE.

1. ASSEMBLE AUXILIARY VIBRATION PUMP.



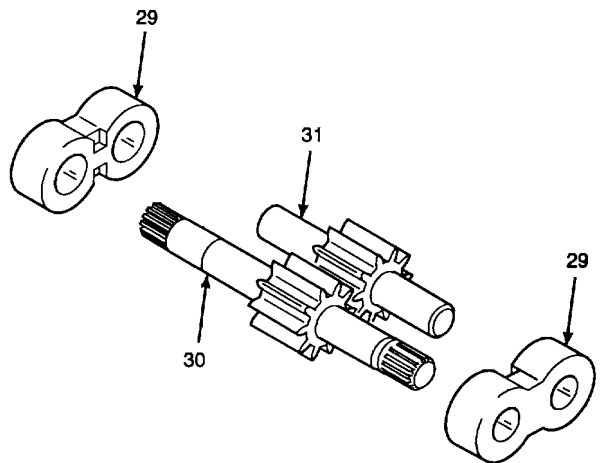
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Drive and idler gear teeth are highly polished. Avoid contact with bare fingers. Skin oils can erode polished surfaces. Wear clean cotton or polyester gloves when handling gears.

- a. Lubricate bearing units (29), drive gear (30), and idler gear (31) with clean hydraulic oil.



**CAUTION**

Slotted side of bearing units must be installed against gear faces. Improper installation of bearing units will cause auxiliary vibration pump to fail.

- b. Install matchmarked idler gear (31) into F marked idler side of bearing unit (29).

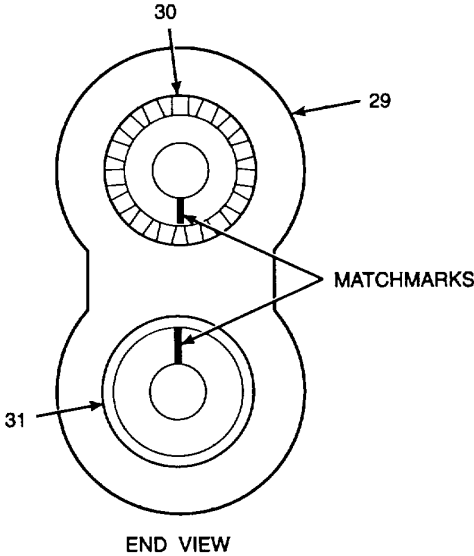
**NOTE**

If installing new gears, disregard instructions for matchmarks. New gears are not matchmarked.

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2-594

E. ASSEMBLE Continued.

- c. Rotate idler gear (31) to aim matchmark toward center of opposite shaft bore.
- d. Rotate drive gear (30) to align matchmark at end of gear shaft with matchmark on idler gear (31). Install drive gear.
- e. Install remaining bearing unit (29) on shafts of idler gear and drive gears (31 and 30). Ensure F, R, and S sides are aligned.



2. INSTALL SHAFT SEAL.

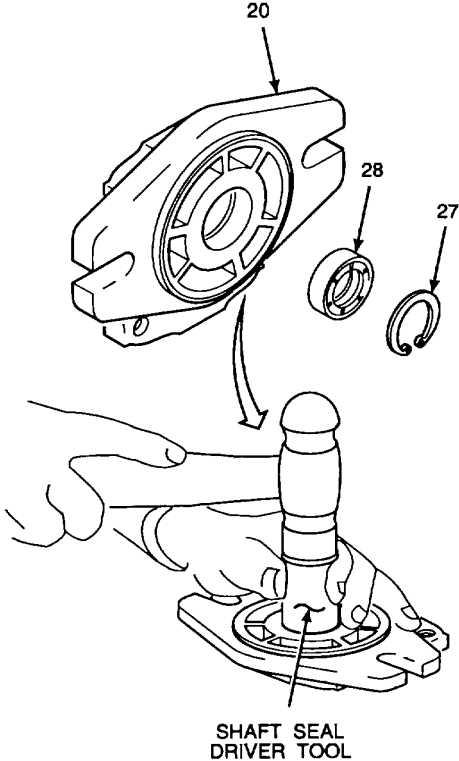
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate inside and outside diameters of shaft seal (28) and inner bore with clean hydraulic oil.
- b. With spring side of seal down, center and start shaft seal (28) into bore of front flange (20).
- c. Using shaft seal driver tool and hammer, gently drive shaft seal (28) into bore. Shaft seal is properly seated when flange of tool is flush against face of front flange (20).

**WARNING**

Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.



- d. Install retaining ring (27) with snap ring pliers. Make sure retaining ring is fully seated in retaining ring groove.



2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

E. ASSEMBLE - Continued.

3. ASSEMBLE AUXILIARY VIBRATION PUMP.

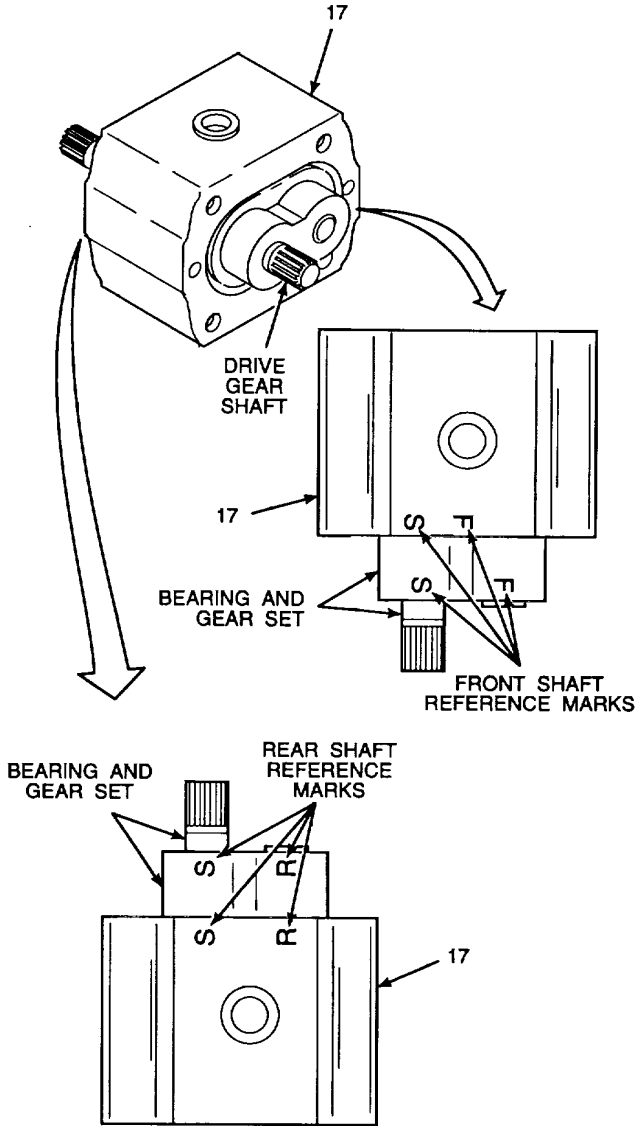
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the eyes, skin, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Hydraulic pump components must be thoroughly clean upon assembly. Always flush internal component surfaces with clean hydraulic oil to wash away fine contaminant particles. Failure to properly clean and thoroughly flush components prior to assembly may result in equipment damage or failure.

- a. Immerse pump housing (17) in clean hydraulic oil. Drain away excess oil. Wipe off external surface of housing with lint-free cleaning cloths. Set housing on clean work surface, with F and S reference marks facing up.
- b. Dip assembled bearing and gear set into hydraulic oil. Drain away excess oil.
- c. With long end of drive gear shaft in line with S marked port, insert assembled bearing and gear set into pump housing (17). Wipe away excess oil seepage with lint-free cleaning cloths. Ensure that F and S, and R and S, reference marks are aligned.



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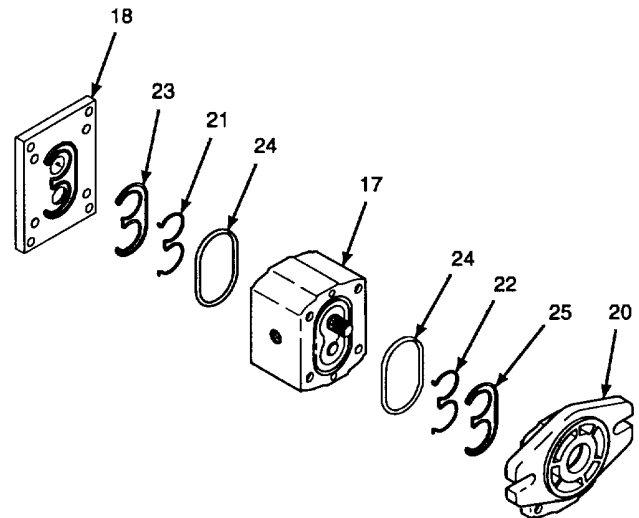
## E. ASSEMBLE - Continued.

- d. Use petrolatum to lubricate seals (23 and 25), expansion rings (21 and 22), and seal grooves in rear cover (18) and front flange (20). In each case, apply a thin, even film of pure, clean petrolatum.
- e. Seat rounded sides of seals (23 and 25) in bottom of mating seal grooves in rear cover (18) and front flange (20). Seat central section of seal first. Gently tamp down remaining sections with forefinger.



**Make sure that expansion ring grooves in installed seals (23 and 25) are facing up. Improper mating of seals and expansion rings (21 and 22) will result in auxiliary vibration pump failure.**

- f. Repeat installation method in step e for expansion rings (21 and 22).
- g. Using clean, dry, lint-free cleaning cloth, press seals (23 and 25) and expansion rings (21 and 22) firmly into expansion ring grooves.
- h. Apply thin, even film of clean petrolatum to preformed packings (24). Install packings in mating grooves on both sides of pump housing (17).



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## 2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

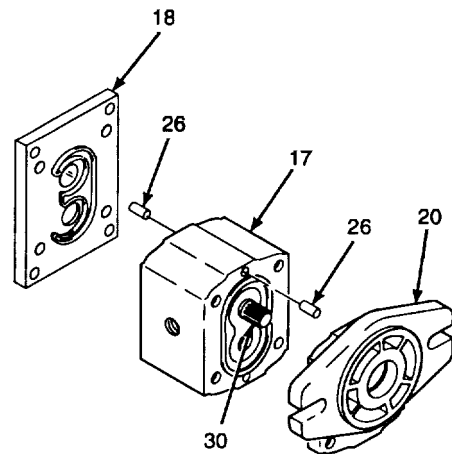
## E. ASSEMBLE - Continued.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 30C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

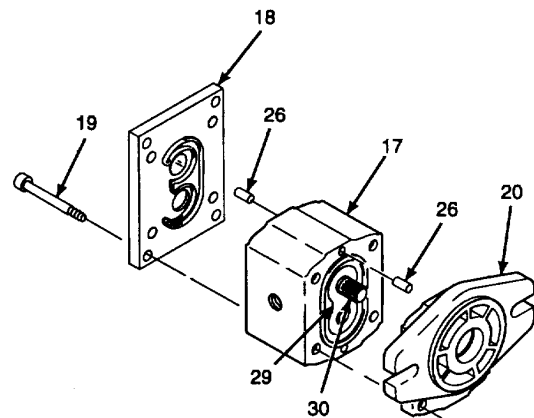
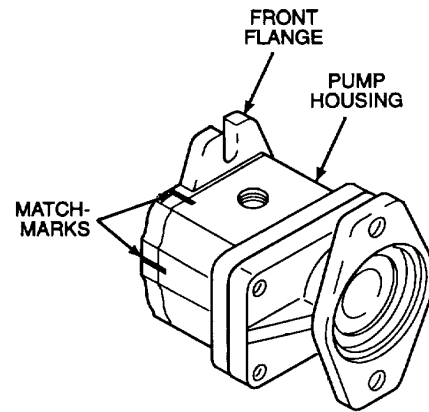
- i. Using lint-free cloth dampened with cleaning solvent, carefully wipe excess petrolatum from faces of rear cover (18), front flange (20), and end faces of pump housing (17). Do not dislodge installed seals and packings.
- j. Dry clean surfaces with clean, dry, lint-free cloths. Make sure all sealing faces are completely clean and dry.
- k. Apply light coating of petrolatum to exposed shaft surfaces of drive gear (30). Petrolatum will prevent cutting of seal surfaces on spline during installation of front flange (20).
- l. Install guide pins (26) in guide pin holes of pump housing (17).



**GO TO NEXT PAGE**

E. ASSEMBLE - Continued.

- m. Carefully pick up front flange and rotate seal face to vertical position. Align matchmarks on flange perimeter with matchmarks on pump housing.
- n. Carefully support installed bearing unit (29) at rear of pump housing (17) with one hand, and slide front flange (20) squarely over long end shaft of drive gear (30) with the other hand.
- o. Line up installed guide pins (26) with guide pin holes in front flange (20). Fully seat face of front flange against face of pump housing (17).
- p. Carefully pick up rear cover (18) and rotate seal face to vertical position. Align matchmarks and line up guide pin holes in rear cover with installed guide pins (26). Fully seat face of rear cover against face of pump housing (17).
- q. With both ends of auxiliary vibration pump clamped firmly in one hand, install and finger tighten socket head cap screws (19).



**CAUTION**

**Do not clamp vise jaws against pump housing. Clamping against pump housing walls can deform internal cavities and cause permanent damage to the auxiliary vibration pump.**

- r. Clamp rear cover (18) in vise jaw caps of bench vise to secure auxiliary vibration pump. Evenly tighten socket head cap screws (19) in increments, using a diagonal tightening pattern. Tighten cap screws to 39 lb-ft (53 N•m).

**WARNING**

**Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

- s. Pour a small amount of clean hydraulic oil into inlet port of auxiliary vibration pump. Place pump on machinery wiping towel.

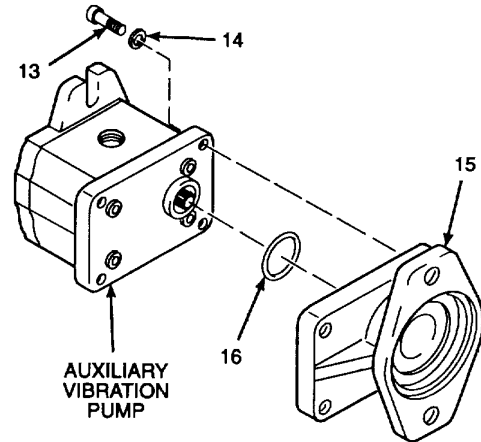
## 2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued

### E. ASSEMBLE Continued.

- t. Use pliers to rotate long end of drive shaft counterclockwise to check for proper shaft rotation and oil flow from outlet port.
- u. Plug hydraulic ports with protective caps.
- v. Dispose of machinery wiping towel in accordance with local procedures.

### 4. ASSEMBLE AUXILIARY VIBRATION PUMP AND ADAPTER BODY.

- a. Coat o-ring (16) with petrolatum.
- b. Install o-ring (16) on rear face of auxiliary vibration pump.



**WARNING**

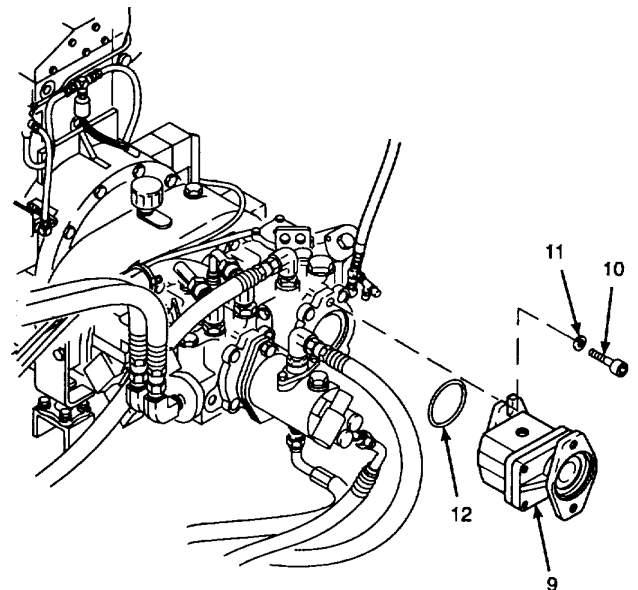
**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Place flat washers (14) onto socket head cap screws (13) and apply thread locking compound to threads of cap screws.
- d. Install adapter body (15) and secure with socket head cap screws (13). Tighten cap screws.

### F. INSTALL.

#### 1. INSTALL AUXILIARY VIBRATION PUMP.

- a. Coat preformed packing (12) with petrolatum. Install packing onto mating flange of auxiliary vibration pump (9).
- b. Seat auxiliary vibration pump (9) onto propulsion pump.



- c. Install flat washers (11) and socket head cap screws (10) Tighten

**GO TO NEXT PAGE**

F. INSTALL - Continued.  
 2. INSTALL VIBRATION RELIEF VALVE AND ADAPTERS.

- a. Remove protective caps from auxiliary vibration pump (9).
- b. Lubricate preformed packings (5 and 8) with petrolatum.

**CAUTION**

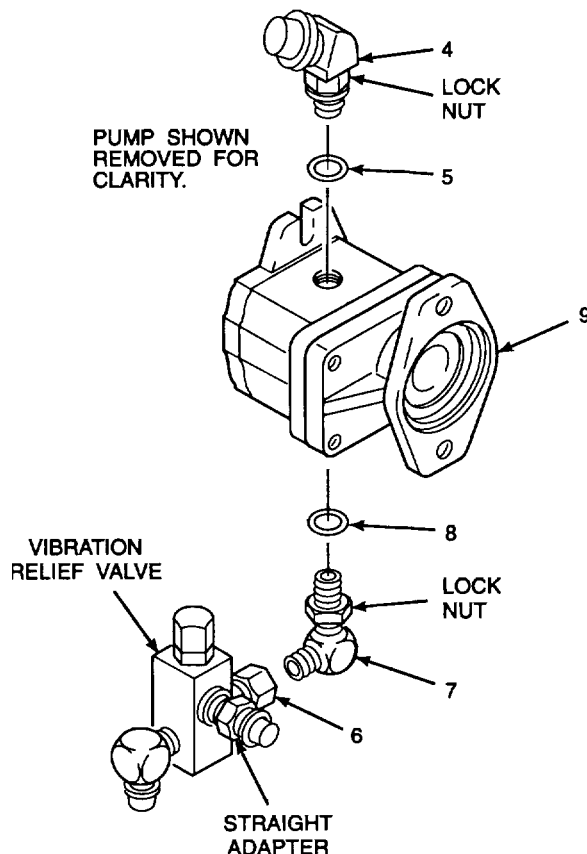
Be careful not to damage preformed packings when sliding over threads. Sharp edges of threads can cut or damage preformed packings. Damaged preformed packings will cause leakage and affect performance.

- c. Install preformed packing (5) in packing groove of elbow (4). Using combination wrench, screw elbow into mating port until preformed packing meets seat.
- d. Aim elbow (4) at a 45° angle toward right rear side of paving machine and tighten lock nut.
- e. Install preformed packing (8) in packing groove of elbow (7). Screw elbow into mating port until preformed packing meets seat. Aim elbow toward rear of paving machine and tighten lock nut.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- f. Apply hydraulic fitting sealant to threads of installed elbow (7). Install and tighten vibration relief valve straight adapter (6), while holding relief valve upright with straight adapter facing right side of paving machine.



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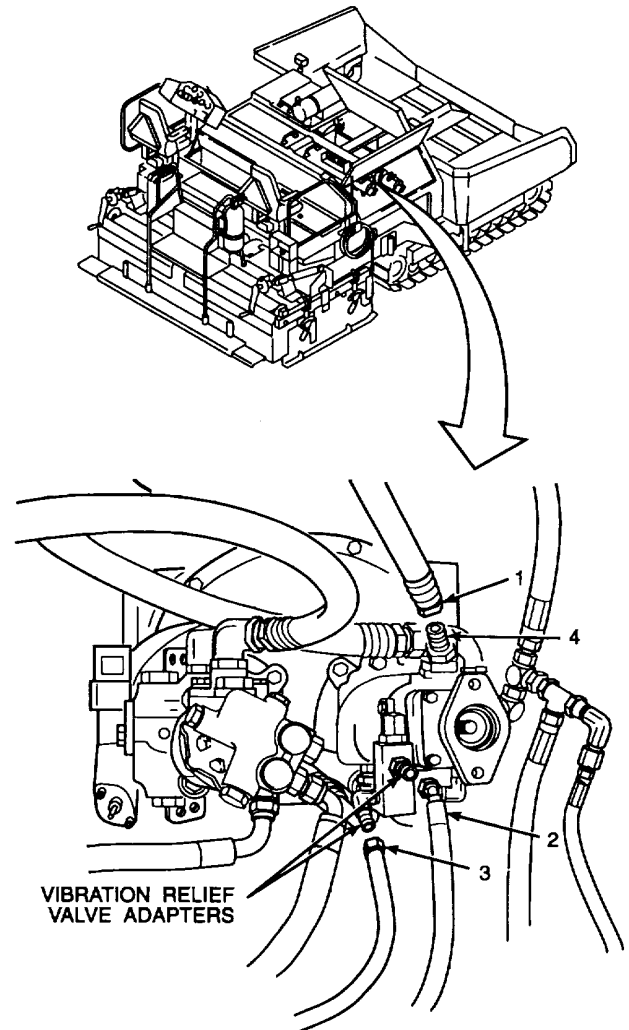
**2.43 REPLACE/REPAIR AUXILIARY VIBRATION PUMP - Continued.**

- F. INSTALL - Continued.
3. INSTALL HYDRAULIC HOSES.

<b>WARNING</b>
----------------

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to threads of installed elbow (4) and adapters on vibration relief valve.
- b. Using combination wrench, install and tighten hoses (3, 2, and 1).

**NOTE**

**FOLLOW-ON-TASKS:** Install left auxiliary pump per paragraph 2.42.  
 Prime hydraulic pump per paragraph 2.54.  
 Install right access cover per TM 5-3895-373-10.  
 Close right access door per TM 5-3895-373-10.  
 Close front top right access door per TM 5-3895-373-10.

**END OF TASK**

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**2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS.**

---

This task covers:

- a. Remove                      b. Clean                      c. Install
- 

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Crowfoot wrench (Item 122, Appendix D)  
Crowfoot wrench (Item 124, Appendix D)  
Hex head driver socket (Item 84, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Socket wrench adapter (Item 7, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Torque wrench, 5 to 150 lb-in (Item 129, Appendix D)

References:

TM 5-3895-373-24P

Equipment Condition:

Stack valve removed per paragraph 2.55.

Materials/Parts:

Cleaning solvent (Item 31, Appendix B)  
Electrical insulating compound (Item 10, Appendix B)  
Electrical insulating varnish (Item 38, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Electrical coil connectors  
Preformed packings  
Seal kit

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**2-603**



2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued.

A. REMOVE.

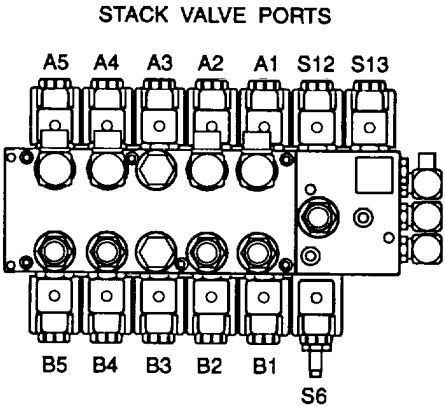
**NOTE**

The illustration presented here is for reference only. Use the reference views to identify the location and description of each valve and function of each valve on the paving machine.

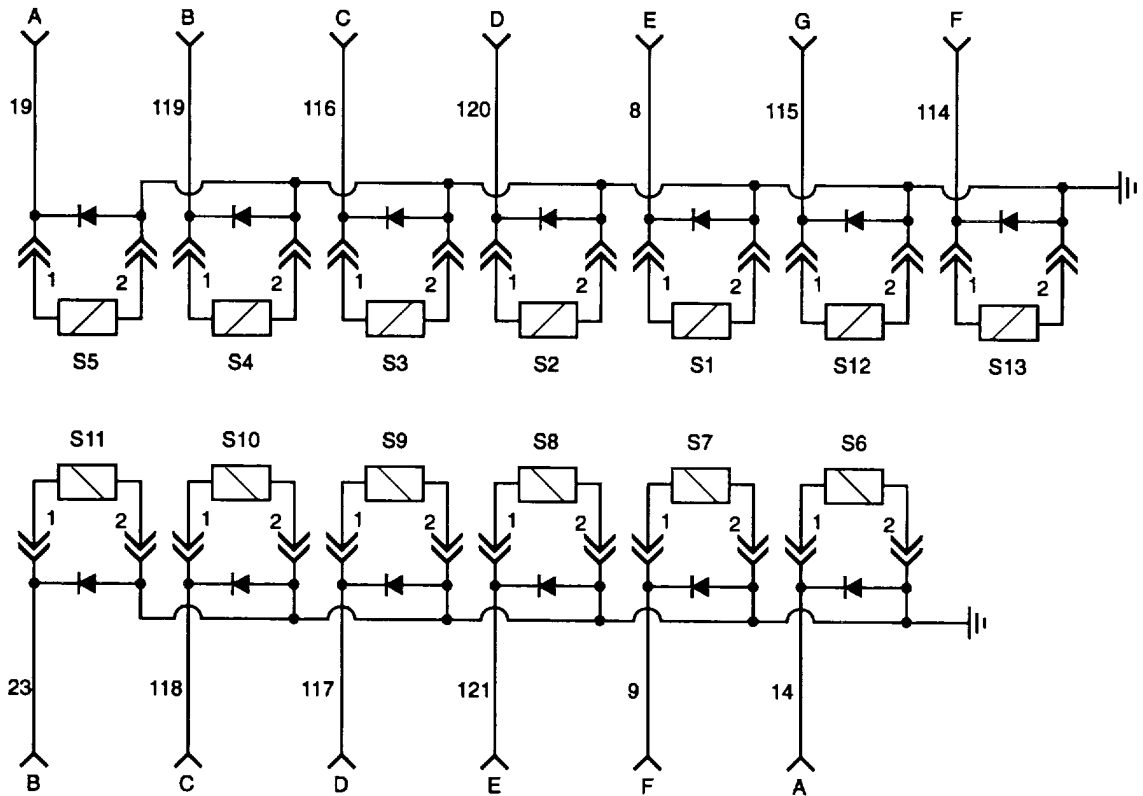
Stack valve ports A3 and B3 and associated valve electrical coils S3 and S9 are not used.

Perform procedural steps only as needed to replace damaged or faulty components.

SOL.	FUNCTION
S1/A1	LH EXT EXTEND
S2/A2	LH HOP DOWN
S3/A3	HITCH IN
S4/A4	RH HOP DOWN
S5/A5	RH EXT EXTEND
S6	POWER-BEYOND
S7/B1	LH EXT RETRACT
S8/B2	LH HOP UP
S9/B3	HITCH OUT
S10/B4	RH HOP UP
S11/B5	RH EXT RETRACT
S12	LIFT UP
S13	LIFT FLOAT



STACK VALVE ELECTRICAL COIL WIRING



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## A. REMOVE - Continued.

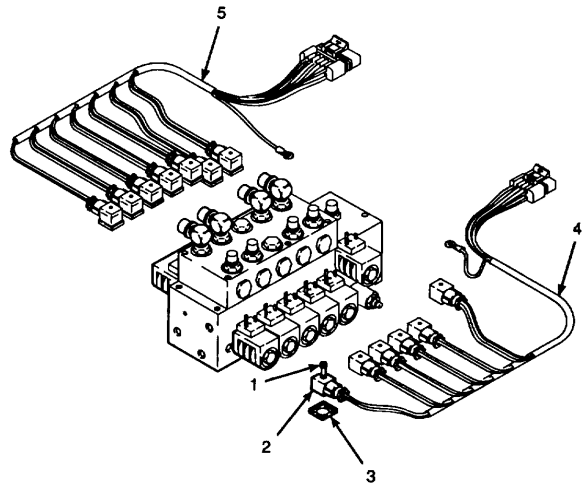
**NOTE**

Most of the following procedures will show stack valve wiring harnesses removed for clarity of view.

For maintenance purposes, remove stack valve wiring harnesses only as needed to replace damaged harness, stack valve, or stack valve components.

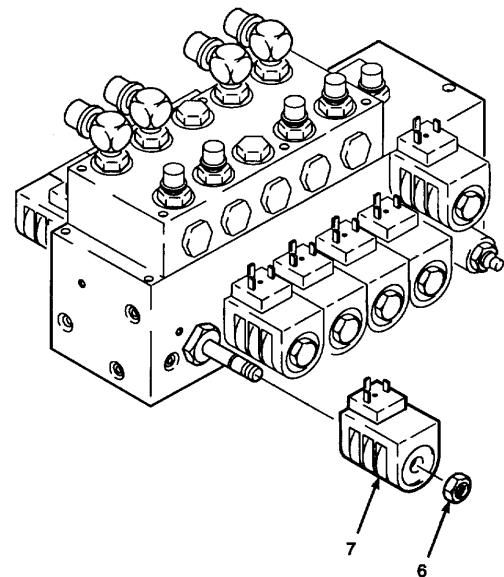
## 1. REMOVE STACK VALVE WIRING HARNESSSES.

- a. Loosen screws (1) and unplug electrical coil connectors (2).
- b. Remove moisture seal (3). If moisture seal is damaged, discard it. Otherwise, retain moisture seal for reassembly.
- c. Remove stack valve wiring harnesses (4 and 5).



## 2. REMOVE ELECTRICAL COIL.

- a. Remove hex nut (6).
- b. Remove electrical coil (7) from stack valve.



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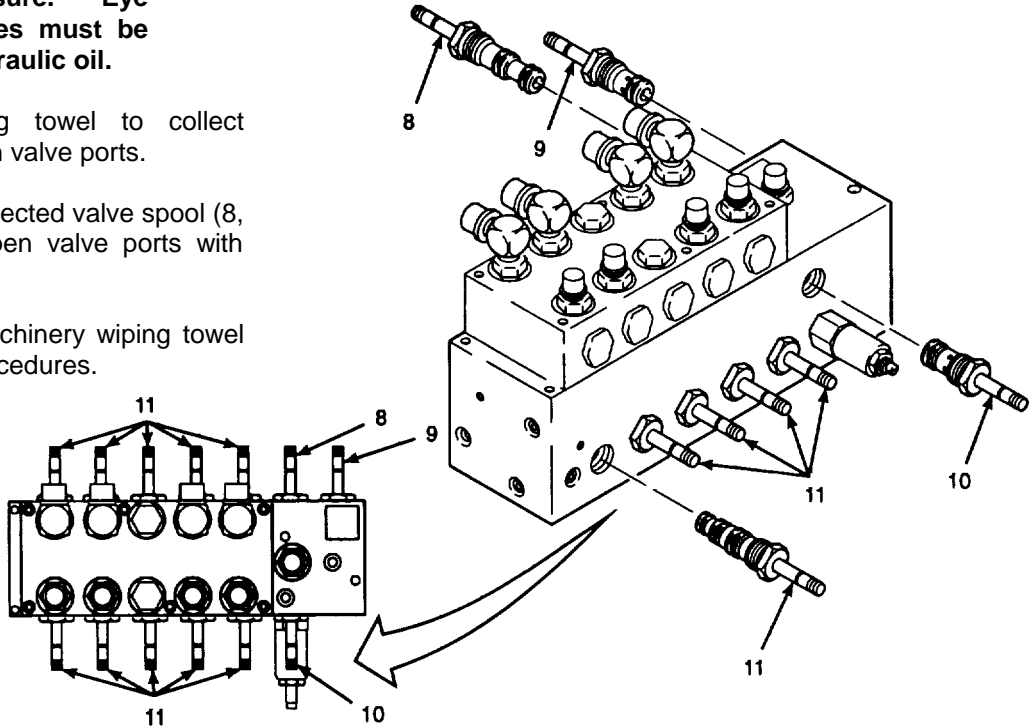
2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued. -k

- A. REMOVE - Continued.
- 3. REMOVE VALVE SPOOL.

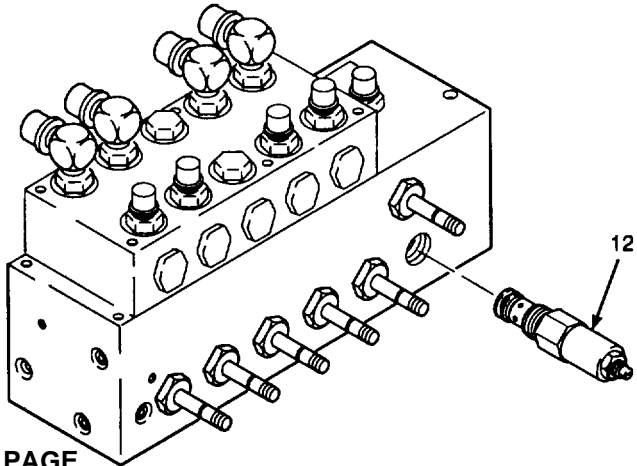
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Position machinery wiping towel to collect residual hydraulic oil in open valve ports.
- b. Tag, loosen, and remove affected valve spool (8, 9, 10, or 11). Cap off open valve ports with protective caps.
- c. If saturated, dispose of machinery wiping towel in accordance with local procedures.



- 4. REMOVE SAFETY RELIEF VALVE.
- a. Position machinery wiping towel to collect residual hydraulic oil in open safety relief valve port.
- b. Loosen and remove safety relief valve (12). Cap off open valve port with protective cap.
- c. If saturated, dispose of machinery wiping towel in accordance with local procedures.



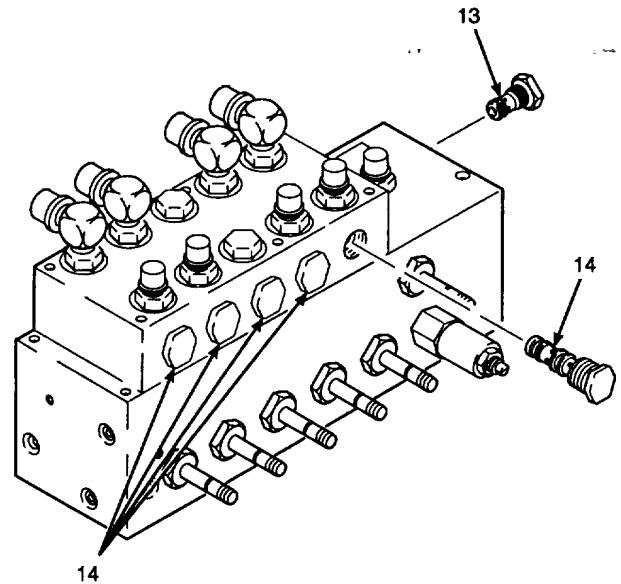
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- A. REMOVE - Continued.
- 5. REMOVE CHECK VALVE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Position machinery wiping towel to collect residual hydraulic oil in open check valve port.
- b. Loosen and remove check valve (13 or 14). Cap off open valve ports with protective caps.
- c. If saturated, dispose of machinery wiping towel in accordance with local procedures.



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**2-607**

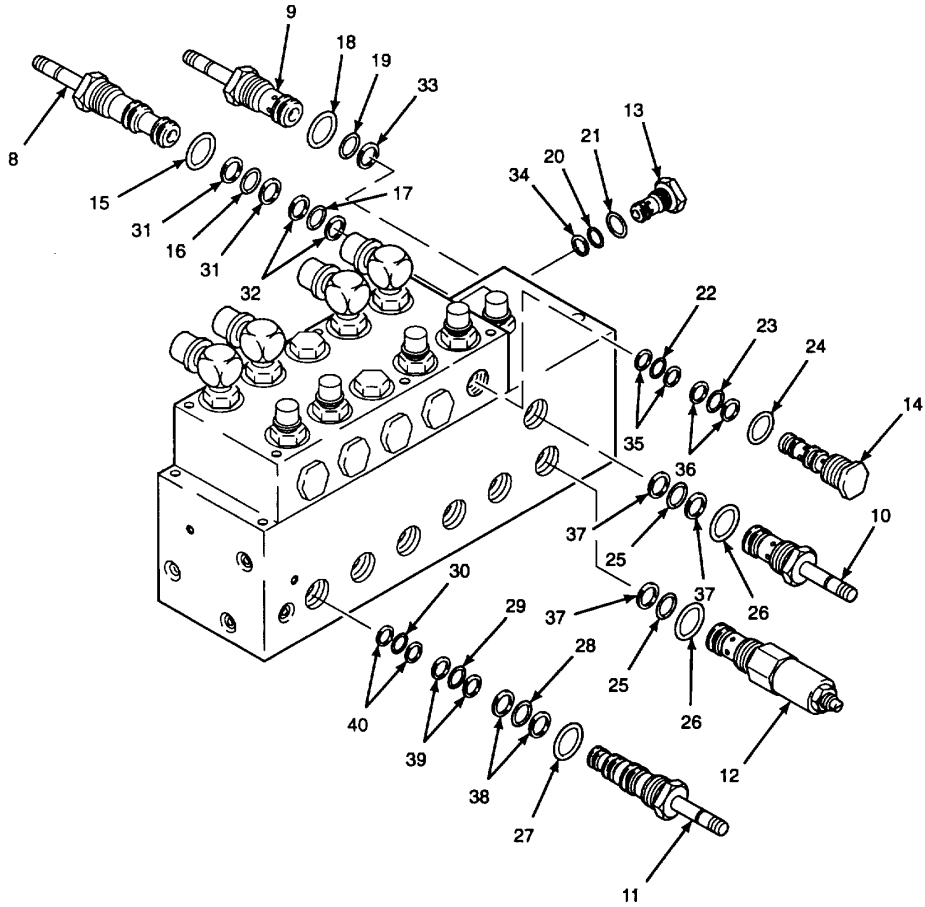
2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued.

- A. REMOVE - Continued.
- 6. REMOVE PREFORMED PACKINGS AND PACKING RETAINERS.

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force. Use an o-ring tool. Careless removal of packings and seals can result in bypass leakage and equipment failure.

- a. Using o-ring tool, remove applicable preformed packings (15 through 30) and packing retainers (31 through 40) from valve spool (8, 9, 10, or 11), safety relief valve (12), or check valve (13 or 14).
- b. Discard preformed packings and packing retainers.



GO TO NEXT PAGE

A. REMOVE - Continued.

7. REMOVE MANIFOLD INTERFACE O-RINGS.

- a. Remove socket head cap screws (41) and check valve manifold (42) from electrical coil valve manifold (43).

**CAUTION**

Use caution when removing seals and o-rings. Do not use excessive force. Use an o-ring tool. Careless removal of o-rings and seals can result in bypass leakage and equipment failure.

- b. Use o-ring tool to remove o-rings (44) from check valve manifold (42). Discard o-rings.

**CAUTION**

Cap off all exposed manifold ports prior to further processing. Failure to cap off exposed ports may result in contamination of stack valve and equipment failure.

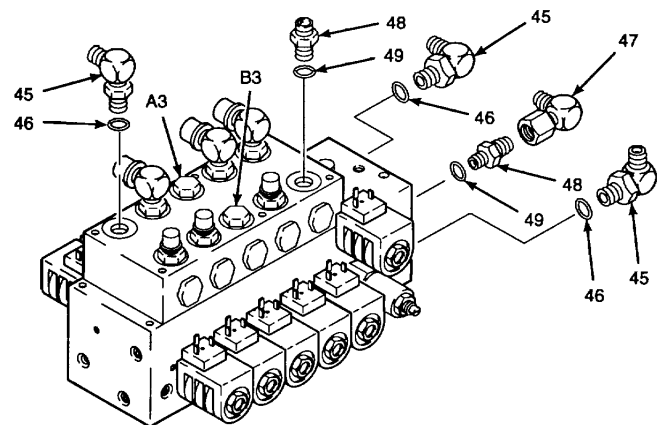
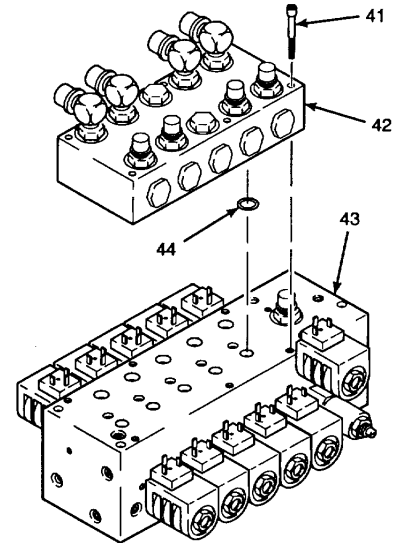
- c. Cap off all open manifold ports with protective caps. Do not leave manifold ports open to contamination.

8. REMOVE HOSE OR TUBE ADAPTERS.

**NOTE**

Remove adapters only as needed to replace damaged or leaky components. Components at ports A3 and B3 are not used.

- a. Loosen locking nuts of elbows (45). Remove elbows and preformed packings (46). Discard preformed packings.
- b. Remove elbow (47).
- c. Remove straight adapters (48) and preformed packings (49). Discard preformed packings.
- d. Cap off open ports or fittings with protective caps.



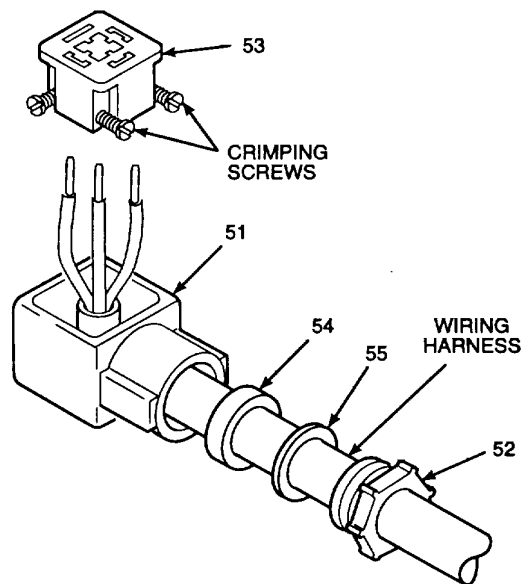
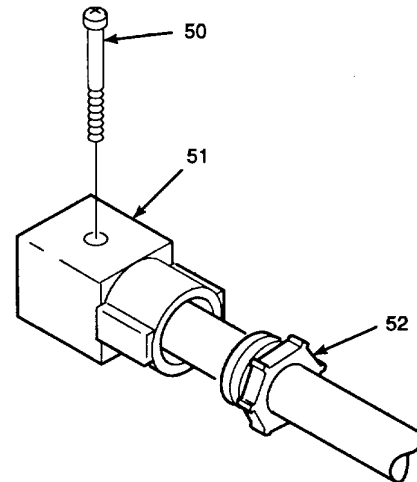
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**2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued.**

A. REMOVE - Continued.

9. REMOVE VALVE ELECTRICAL COIL CONNECTOR FROM STACK VALVE WIRING HARNESS.

- a. Unscrew screw (50) from connector body (51).
- b. Unscrew packing nut (52) and slide nut back along harness wiring.
- c. Use petrolatum to lubricate harness wiring inside packing nut port of connector body (51). Push harness wiring forward, into connector body.
- d. Pry contact housing (53) from connector body (51) with small screwdriver. When contact housing pops out, pull housing and attached harness wiring from connector body.
- e. Tag lead wires with mating terminal number (1, 2, or 3). Loosen crimping screws securing harness leads to terminals in contact housing (53). Remove harness wiring from contact housing and connector body.
- f. Slide packing (54), packing retainer (55), and packing nut (52) from wiring harness. Discard all connector parts.



**GO TO NEXT PAGE**

## B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. WIPE OFF MANIFOLDS, VALVE SPOOL, SAFETY RELIEF VALVE, AND/OR CHECK VALVE WITH LINT-FREE CLOTH DAMPENED WITH CLEANING SOLVENT IF REMOVED OR DISASSEMBLED.
2. DRY CLEANED COMPONENTS WITH CLEAN, DRY, LINT-FREE CLOTHS.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

3. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO REMOVE ANY FOREIGN MATTER FROM THREADED SURFACES, BORES, AND SEAL GROOVES ON VALVE SPOOL, SAFETY RELIEF VALVE, AND/OR CHECK VALVE.
4. DRY ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.

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**2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued.**

## B. CLEAN - Continued.

**WARNING**

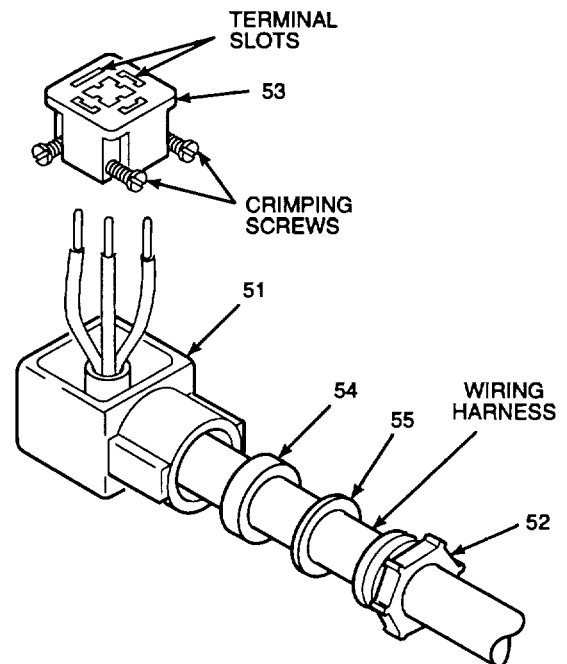
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

5. SUBMERGE MANIFOLDS, VALVE SPOOL, SAFETY RELIEF VALVE, AND/OR CHECK VALVE IN CLEAN HYDRAULIC OIL AFTER DRYING. COVER CONTAINER UNTIL COMPONENTS ARE READY TO BE INSTALLED.

## C. INSTALL.

1. INSTALL VALVE ELECTRICAL COIL CONNECTOR ON STACK VALVE WIRING HARNESS.

- a. Lubricate first 2 in. (76 mm) of wiring harness sleeving with petrolatum. Slide packing nut (52), packing retainer (55), and packing (54) onto wiring harness.
- b. Insert harness wiring through wiring port of connector body (51). Loosen crimping screws in contact housing (53).
- c. Insert stripped harness lead ends onto mating terminals per lead wire markings made during removal. Tighten lead wire crimping screws.

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- d. Coat wiring terminals with electrical insulating varnish. Allow 30 minutes for varnish to air dry before handling contact housing (53).

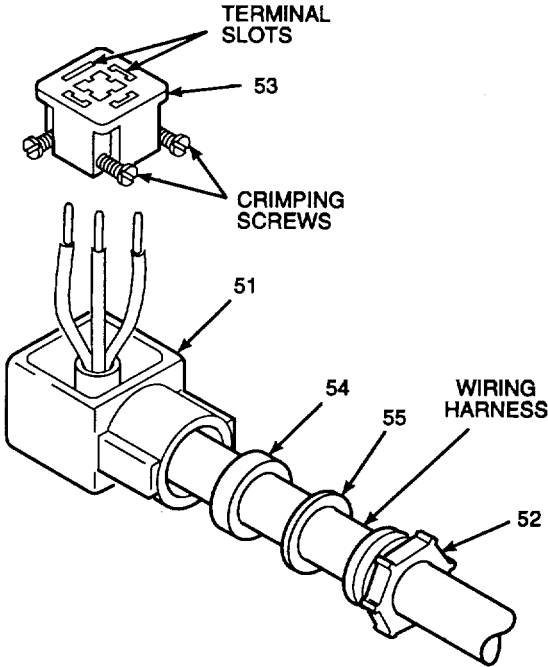
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C. INSTALL - Continued.

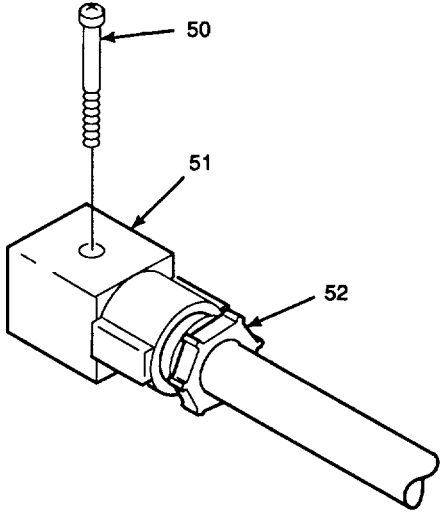
**NOTE**

For proper solenoid operation, contact housing (53) must be positioned with terminal slots oriented as shown when inserted in connector body (51).

- e. Pull harness wiring from packing port of connector body (51) until contact housing (53) is nearly seated. Press contact housing down to seat housing in connector body.
- f. Slide packing (54) and packing retainer (55) into packing port of connector body (51). Slide packing nut (52) forward. Screw packing nut into packing port and finger tighten.



- g. Thread screw (50) into connector body (51).
- h. Apply electrical insulating compound to exposed terminals of mating stack valve electrical coil.
- i. Tighten installed packing nut (52) 3/4 turn beyond finger tight.



**GO TO NEXT PAGE**

**2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued.**

- C. INSTALL - Continued.
2. INSTALL HOSE OR TUBE ADAPTERS.

**CAUTION**

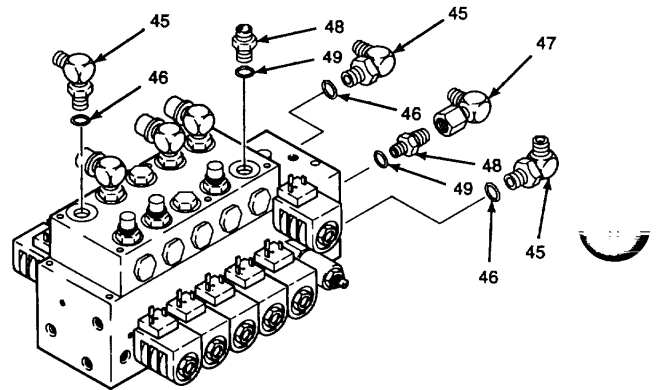
Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- a. Lubricate preformed packings (49) with petrolatum. Seat preformed packings on straight adapters (48). Install and firmly tighten adapters.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. If installing fittings at port marked TK, apply hydraulic fitting sealant to exposed threads of installed straight adapter (48).
- c. Install and tighten elbow (47). Elbow hose end should point to direction shown. Refer to illustration.
- d. Lubricate preformed packings (46) with petrolatum. Carefully seat preformed packings on elbows (45)
- e. Screw elbows (45) into mating manifold ports until preformed packings (46) seat in elbow packing grooves.
- f. Adjust hose end of elbows (45) to position shown. Refer to illustration. Tighten elbow locking nuts until fully seated.
- g. Install protective caps on all exposed adapter ports.

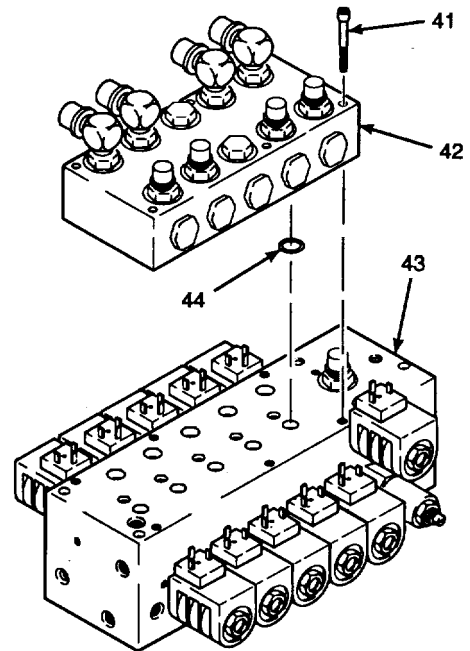


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C. INSTALL - Continued.

3. INSTALL MANIFOLD INTERFACE O-RINGS.

- a. Lubricate o-rings (44) with petrolatum.
- b. Install o-rings (44) in mating seats of check valve manifold (42).
- c. Position check valve manifold (42) on electrical coil manifold (43).
- d. Install socket head cap screws (41). Using socket wrench adapter and hex head driver socket, evenly tighten cap screws to 9 lb-ft (12 N•m).



**GO TO NEXT PAGE**

2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued.

C. INSTALL - Continued.

4. INSTALL PREFORMED PACKINGS AND PACKING RETAINERS.

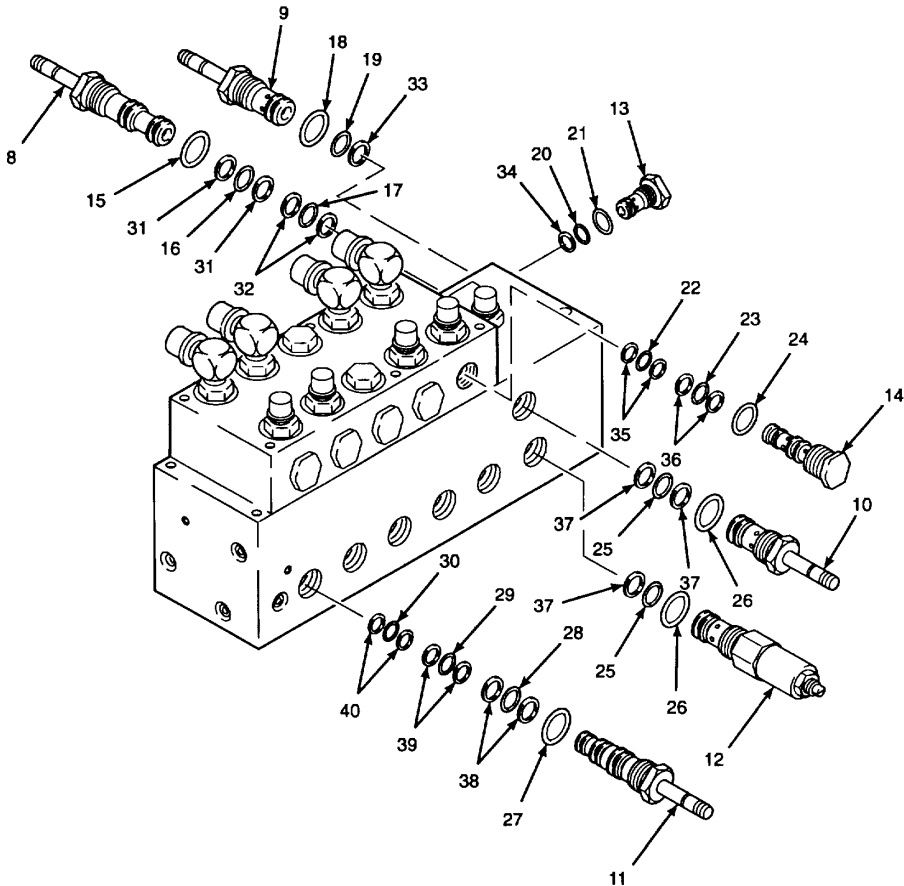
**CAUTION**

New seals and packings are distorted during installation. Use care during installation to prevent damage to seals, preformed packings, and seal grooves. Bypass leakage can result from poor installation.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- a. Lubricate preformed packings (15 through 30) and packing retainers (31 through 40) with petrolatum.
- b. Install preformed packings (15 through 30) and packing retainers (31 through 40) on valve spool (8, 9, 10, or 11), safety relief valve (12), or check valve (13 or 14).



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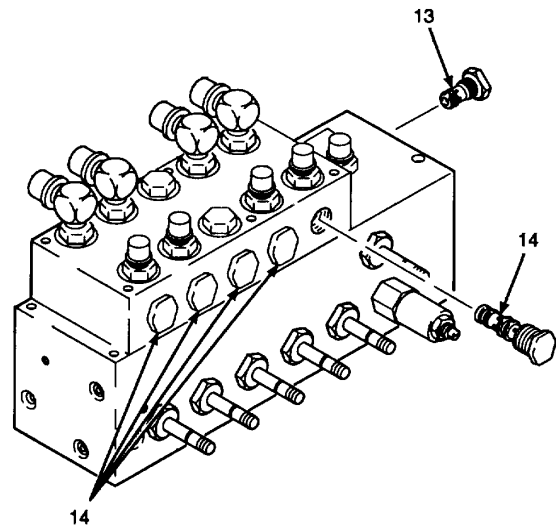
C. INSTALL - Continued.

5. INSTALL CHECK VALVE.

**WARNING**

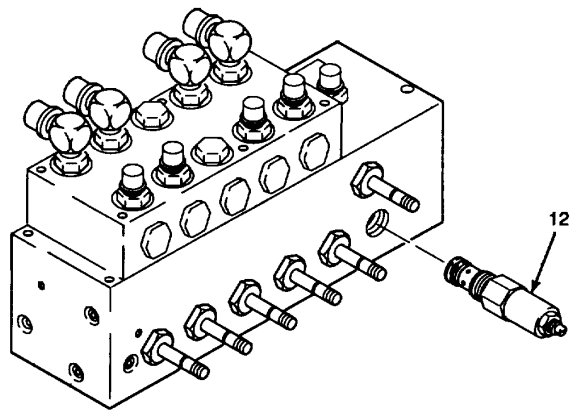
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Dip check valve (13 or 14) into clean bath of hydraulic oil.
- b. Install check valve (13 or 14). Using crowfoot wrench (Item 124, Appendix D) and socket wrench adapter, tighten check valve to 30 lb-ft (40 N•m).



6. INSTALL SAFETY RELIEF VALVE.

- a. Dip safety relief valve (12) into clean bath of hydraulic oil.
- b. Install safety relief valve (12). Using crowfoot wrench (Item 124, Appendix D) and socket wrench adapter, tighten relief valve to 30 lb-ft (4 N•m).



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2.44 REPAIR STACK VALVE AND STACK VALVE WIRING HARNESS - Continued. -

C. INSTALL - Continued.

**WARNING**

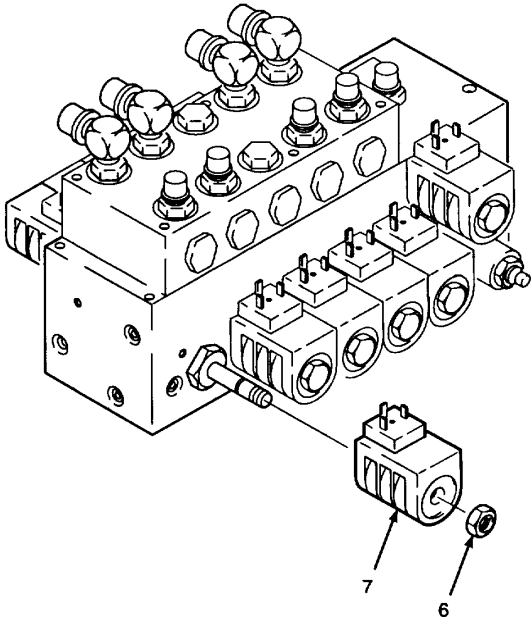
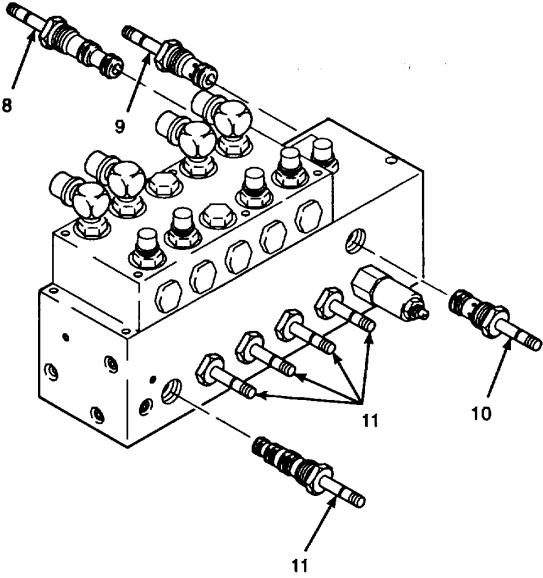
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

7. INSTALL VALVE SPOOL.

- a. Dip valve spool (8, 9, 10, or 11) in clean bath of hydraulic oil.
- b. Install valve spool (8, 9, 10, or 11). Using crowfoot wrench (Item 122, Appendix D) and socket wrench adapter, tighten valve spool to 30 lb-ft (41 N•m).

8. INSTALL ELECTRICAL COIL.

- a. Slide electrical coil (7) onto valve spool (8, 9, 10, or 11).
- b. Install hex nut (6) and tighten to 18 lb-in (2 N•m).



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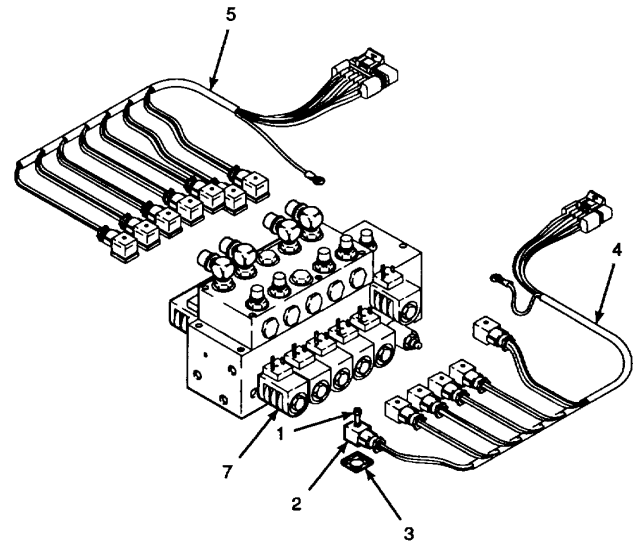
C. INSTALL - Continued.

9. INSTALL STACK VALVE WIRING HARNESSSES.

- a. Apply electrical insulating compound to terminals of electrical coils (7).
- b. Install moisture seals (3) on electrical coil connectors (2).
- c. Install stack valve wiring harnesses (4 and 5).

Plug electrical coil connectors (2) onto electrical coils (7).

- d. Install and tighten screws (1). Do not overtighten screws.



**NOTE**

**FOLLOW-ON-TASK:** Install stack valve on valve panel per paragraph 2.55.  
Adjust stack valve relief pressure per paragraph 2.51.

**END OF TASK**



---

**2.45 REPAIR AUGER/CONVEYOR CONTROL VALVE.**

---

This task covers:

- a. Disassemble
- b. Clean
- c. inspect
- d. Assemble

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Combination wrench (Item 116, Appendix D)  
Crowfoot wrench (Item 127, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Torque wrench, 5 to 150 lb-in (Item 129, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)

**References:**

TM 5-3895-373-24P

**Equipment Condition:**

Auger/conveyor control valve removed from valve panel per paragraph 2.55.

**Materials/Parts:**

Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Electrical insulating varnish (Item 38, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Linear direction tube parts kit  
Packing retainer  
Preformed packings  
Relief valve assembly seal kit  
Special shim  
Self-locking hex nuts

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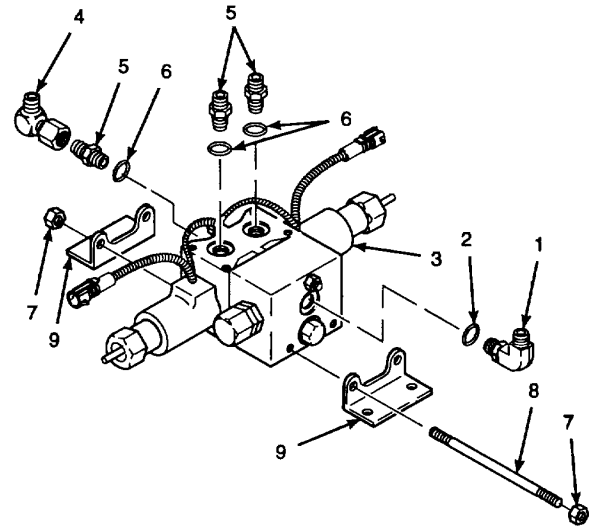
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**2-620**

A. DISASSEMBLE.

**NOTE**

**Use bench vise, as required, to support auger/conveyor control valve during disassembly.**

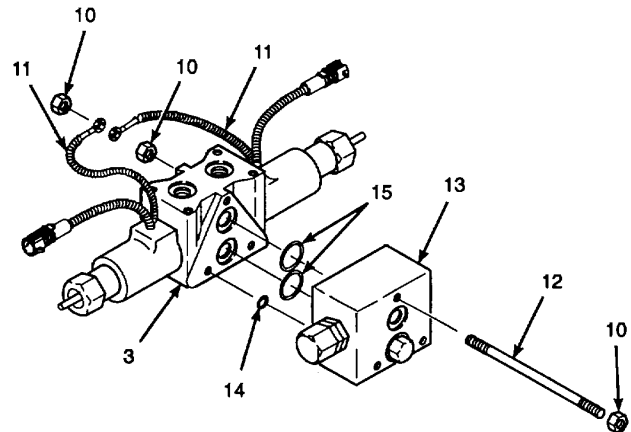


1. REMOVE ELBOW, SWIVEL ELBOW, STRAIGHT ADAPTERS, THREADED END RODS, AND ANGLE BRACKETS FROM AUGER/CONVEYOR CONTROL VALVE.

- a. Loosen elbow locking nut and remove elbow (1) and preformed packing (2) from auger/conveyor control valve (3). Discard preformed packing.
- b. Remove swivel elbow (4), straight adapters (5) and preformed packings (6) from auger/conveyor control valve (3). Discard preformed packings.
- c. Remove self-locking hex nuts (7) from threaded end rods (8). Discard self-locking hex nuts.
- d. Remove threaded end rods (8) and angle brackets (9) from auger/conveyor control valve (3).

2. REMOVE RELIEF VALVE ASSEMBLY AND THREADED END RODS FROM AUGER/CONVEYOR CONTROL VALVE.

- a. Remove self-locking hex nuts (10) and ground wires (11) from threaded end rod (12). Discard self-locking hex nuts.
- b. Remove threaded end rod (12) from auger/conveyor control valve (3).
- c. Separate relief valve assembly (13) from auger/conveyor control valve (3).
- d. Remove special shims (14) from relief valve assembly. Discard special shims.



**Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.**

- e. Use o-ring tool to remove preformed packings (15) from relief valve assembly (13). Discard preformed packings.

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**2.45 REPAIR AUGER/CONVEYOR CONTROL VALVE**

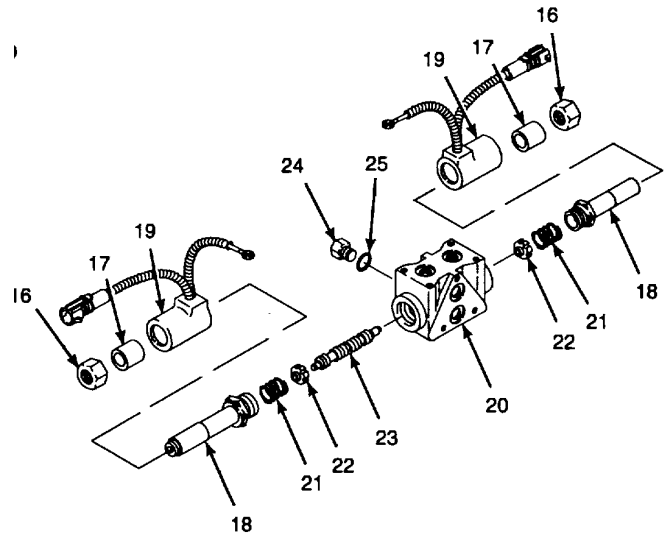
A. DISASSEMBLE - Continued.

3. REMOVE ELECTRICAL COILS, SLEEVES, TUBES, AND SPOOL FROM VALVE BODY.

a. Remove hex nuts (16) and sleeves (17) from tubes (18).

**CAUTION**

**Tubes are fragile and easily dented. Use extreme caution when removing electrical coils from tubes. Dented tubes may impair electrical coil operation.**



b. Slide electrical coils (19) from tubes (18).

**NOTE**

**Spring and retainer may fall from valve body after tubes are removed.**

c. Use the combination wrench and remove tubes (18) from valve body (20).

d. Remove springs (21) and retainers (22) from valve body (20).

**CAUTION**

**Do not drop spool or allow it to scrape across threads in valve body. Handle spool with care. Damage to surface of spool can prevent it from working properly.**

e. Remove spool (23) from valve body (20).

f. Remove plug (24) and preformed packing (25) from valve body (20). Discard preformed packing.

4. DISASSEMBLE RELIEF VALVE ASSEMBLY.

a. Remove plug (26) and preformed packing (27) from relief valve assembly body (28). Discard preformed packing.

b. Remove cap (29) and compression nut (30).

**CAUTION**

**Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.**

c. Use an o-ring tool to remove preformed packings (31 and 32). Discard preformed packings.

d. Remove relief valve (33) from relief valve assembly body (28).

e. Use an o-ring tool to remove preformed packings (34 and 35) and packing retainer (36). Discard preformed packings and packing retainer.

**GO TO NEXT PAGE**

## B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. RINSE ALL METAL PARTS IN CLEANING SOLVENT.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO REMOVE ANY FOREIGN MATTER FROM VALVE BODY, THREADED SURFACES, BORES, AND SEAL GROOVES.
3. DRY ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.

**GO TO NEXT PAGE**

**2.45 REPAIR AUGER/CONVEYOR CONTROL VALVE - Continued.****C. INSPECT.**

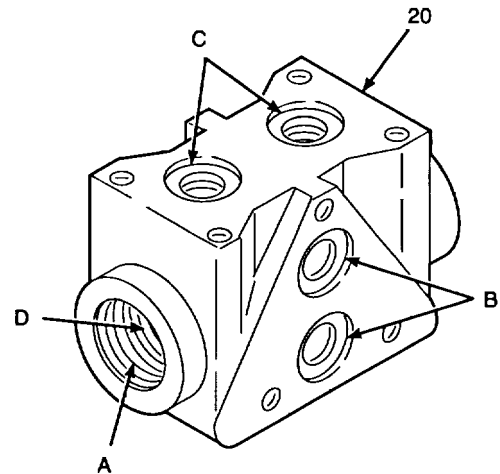
1. INSPECT VALVE BODY FOR STRIPPED THREADS, WEAR, SCRATCHES, DENTS AND FOREIGN MATERIAL, AND SPRINGS FOR DAMAGE AND WEAR.
  - a. Visually inspect valve body (20) surface A for stripped threads. Inspect seal grooves B and C for scratches or dents. Use a strong light and inspect inner bore D for foreign material, scoring, or excessive wear.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

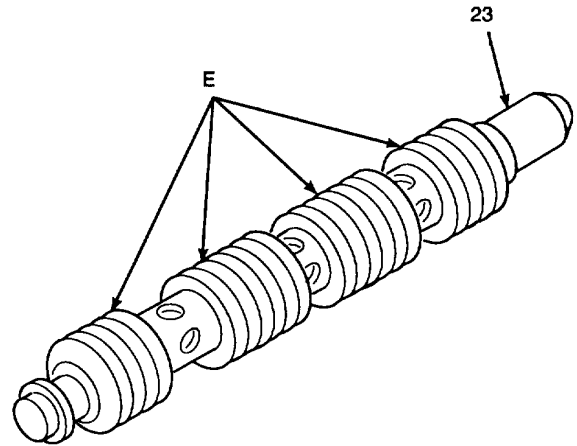
- b. Flush valve body (20) with cleaning solvent to remove any foreign material present. Use a culture swab to remove foreign material from valve body inner bore.
- c. Replace valve body (20) and spool if stripped threads, damaged seal grooves, scoring, or excessive wear is detected.
- d. Inspect springs for distortion or compression.
- e. Replace springs if distortion or compression is detected.

**GO TO NEXT PAGE**

C. INSPECT - Continued.

2. INSPECT SPOOL FOR DAMAGE AND WEAR.

- a. Inspect spool (23), surface E, for scoring and excessive wear.
- b. Replace spool (23) and valve body if scoring or excessive wear is detected on spool.
- c. Slide spool (23) into valve body. Check for looseness and chatter. Spool should be a tight slide fit. Replace spool if looseness or chattering are detected.



**WARNING**

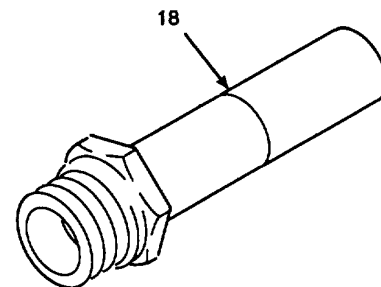
Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- d. If spool (23) does not fit into valve body, inspect spool for burrs. Remove burrs with emery cloth. Rinse spool with cleaning solvent after removing burrs.

3. INSPECT TUBES FOR DENTS OR SCRATCHES.

- a. Visually inspect outside surfaces of tubes (18) for dents or scratches.
- b. Replace tubes (18) if dents or scratches are detected.



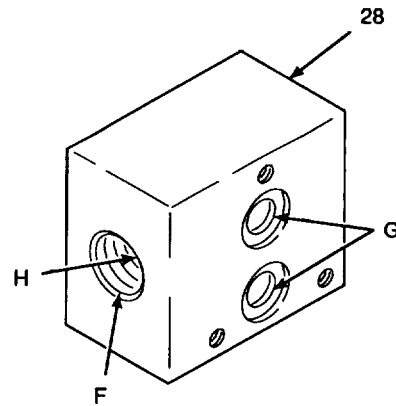
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**2.45 REPAIR AUGER/CONVEYOR CONTROL VALVE - Continued.**

C. INSPECT - Continued.

4. INSPECT RELIEF VALVE ASSEMBLY BODY.

- a. Visually inspect relief valve assembly body (28), surface F, for stripped threads. Inspect seal, grooves G, for scratches or dents. Use a strong light and inspect inner bore H for foreign material.



**WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- b. Flush relief valve assembly body (28) with cleaning solvent to remove any foreign material present. Use a culture swab to remove foreign material from relief valve assembly body inner bore.
- c. Replace relief valve assembly body (28) if stripped threads or damaged seal grooves are detected.

**GO TO NEXT PAGE**

## D. ASSEMBLE.

**NOTE**

Use bench vise, as required, to support auger/ conveyor control valve during assembly.

## 1. ASSEMBLE RELIEF VALVE ASSEMBLY.

**WARNING**

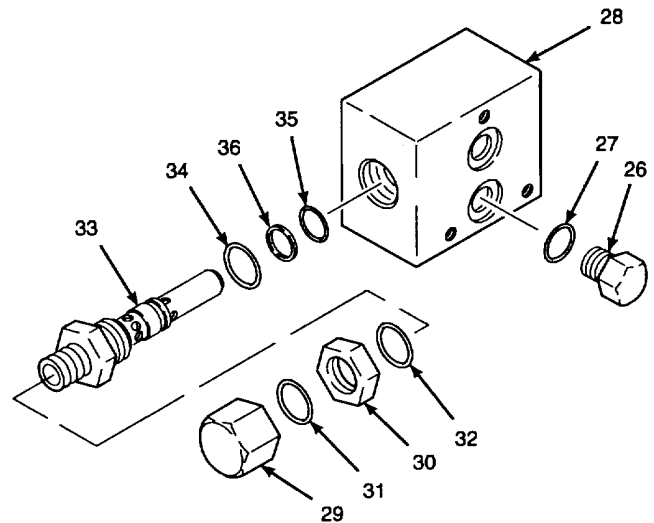
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate preformed packings (35, 34, 32, and 31) and packing retainer (36) with clean hydraulic oil.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- b. Install preformed packing (34), packing retainer (36), and preformed packing (35) onto relief valve (33).
- c. Install relief valve (33) into relief valve assembly body (28).
- d. Install preformed packing (32) into seat in compression nut (30).
- e. Install compression nut (30) onto relief valve (33).
- f. Install preformed packing (31) into seat in cap (29).
- g. Install cap (29) onto relief valve (33).
- h. Install preformed packing (27) onto plug (26). Install and tighten plug.



**GO TO NEXT PAGE**



2.45 REPAIR AUGER/CONVEYOR CONTROL VALVE-

D. ASSEMBLE - Continued.

2. INSTALL SPOOL, TUBES, SLEEVES, AND ELECTRICAL COILS INTO VALVE BODY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

a. Lubricate all parts with clean hydraulic oil.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

b. Install preformed packing (25) onto plug (24) and install into valve body (20). Tighten plug to 35 lb-ft (48 N•m).

**CAUTION**

Do not drop spool or allow it to scrape across threads in valve body. Handle spool with care. Damage to surface of spool can prevent it from working properly.

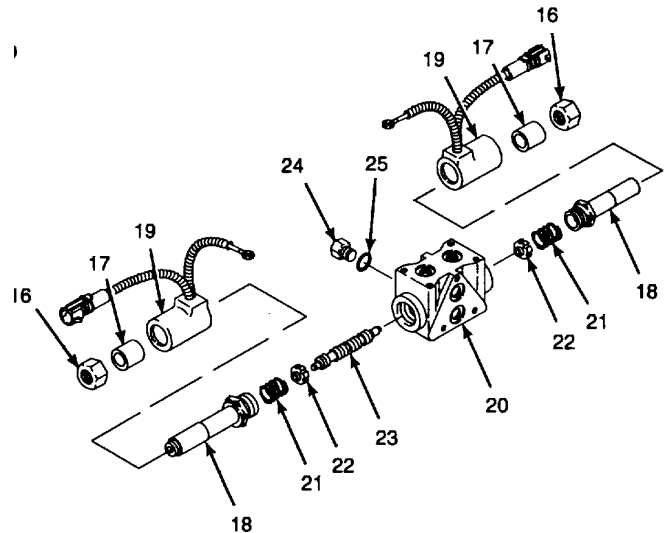
c. Dip spool (23) and valve body (20) into clean hydraulic oil. Install spool into valve body.

d. Install retainers (22) and springs (21) onto spool (23) inside valve body (20).

**CAUTION**

Tubes are fragile and easily dented. Use extreme caution when installing electrical coils onto tubes. Dented tubes may impair electrical coil operation.

e. Install tubes (18) onto valve body (20). With crowfoot wrench at a 90° angle to torque wrench, tighten tubes to 35 lb-ft (48 N•m).



f. Slide electrical coils (19) onto tubes (18).

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

g. Clean threads of tubes (18) with thread locking compound solvent.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

h. Apply thread locking compound to threads of tubes (18).

i. Install sleeves (17) and hex nuts (16) onto tubes (18). Tighten hex nuts to 12 lb-in (1,4 N•m).

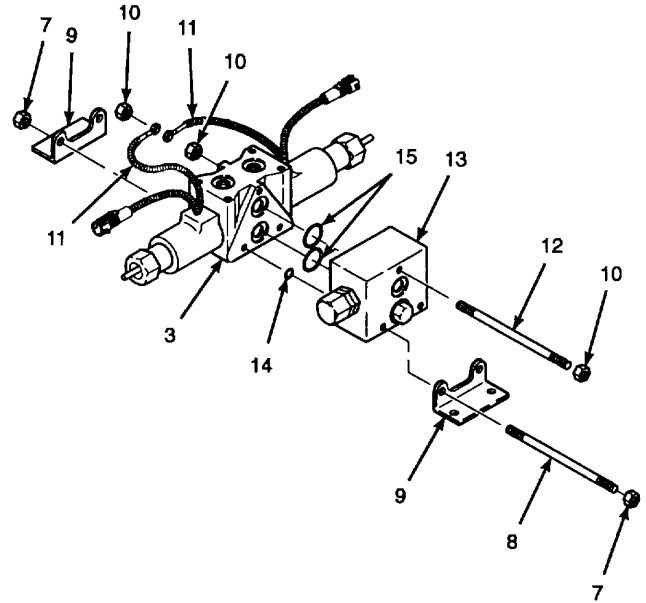
D. ASSEMBLE - Continued.

3. INSTALL RELIEF VALVE ASSEMBLY AND THREADED END RODS ONTO AUGER/CONVEYOR CONTROL VALVE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate preformed packings (15) with clean hydraulic oil and install preformed packings onto relief valve assembly (13).
- b. Install self-locking hex nuts (7 and 10) onto one side of threaded end rods (8 and 12).
- c. Install threaded end rods (8) through angle brackets (9), relief valve assembly (13), special shims (14), and auger/conveyor control valve (3).
- d. Install self-locking hex nuts (7) to open end of threaded end rods (8) and one self-locking hex nut (10) onto open end of threaded end rod (12). Tighten hex nuts on threaded end rods in three steps: 75 lb-in (8 N•m), 100 lb-in (11 N•m), then 125 lb-in (14 N•m).
- e. Install ground wires (11) onto threaded end rod (12). Install and tighten second self-locking hex nut (10).



**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- f. Apply electrical insulating varnish to ground wires (11).

GO TO NEXT PAGE

**2.45 REPAIR AUGER/CONVEYOR CONTROL VALVE - Continued. -:****D. ASSEMBLE - Continued.**

4. INSTALL STRAIGHT ADAPTERS, SWIVEL ELBOW, AND ELBOW ONTO AUGER/CONVEYOR CONTROL VALVE.

<b>WARNING</b>
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Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

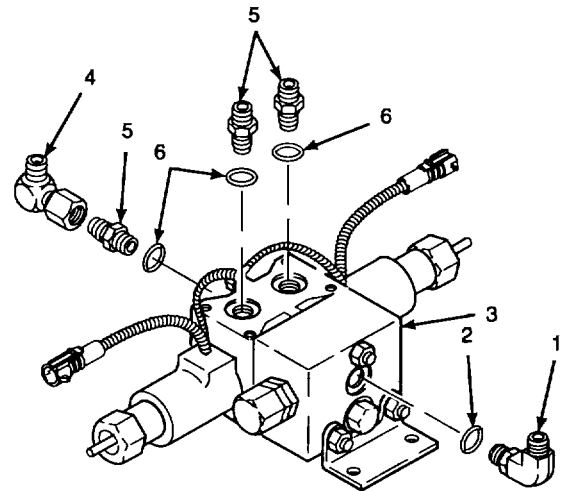
<b>CAUTION</b>
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Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- a. Lubricate preformed packings (6) with clean hydraulic oil and install preformed packings onto straight adapters (5).
- b. Install straight adapters (5) into auger/conveyor control valve (3).

<b>WARNING</b>
----------------

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- c. Coat threads of straight adapter (5) with hydraulic fitting sealant to receive swivel elbow (4).
- d. Install swivel elbow (4) onto straight adapter (5). Position swivel elbow to face upward toward top of auger/conveyor control valve.
- e. Lubricate preformed packing (2) with clean hydraulic oil and install preformed packing onto elbow (1).
- f. Install elbow (1) onto auger/conveyor control valve (3). Position elbow to face upward toward top of auger/conveyor control valve. Tighten elbow locking nut.

**NOTE**

**FOLLOW-ON-TASKS:** Install auger/conveyor control valve on valve panel per paragraph 2.55.  
Adjust auger/conveyor relief valve per paragraph 2.51.

**END OF TASK**

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**2.46 REPAIR TOW POINT CONTROL VALVE.**

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This task covers:  
d. Assemble

a. Disassemble b. Clean c. Inspect

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Crowfoot wrench (Item 126, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Torque wrench, 5 to 150 lb-in (Item 129, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)

References:

TM 5-3895-373-24P

Equipment Condition:

Tow point control valve removed from valve panel  
per paragraph 2.55.

Materials/Parts:

Cleaning solvent (Item 6, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Lockwashers  
Preformed packings  
Self-locking hex nut  
Tube assemblies

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**2.46 REPAIR TOW POINT CONTROL VALVE - Continued.****A. DISASSEMBLE.****NOTE**

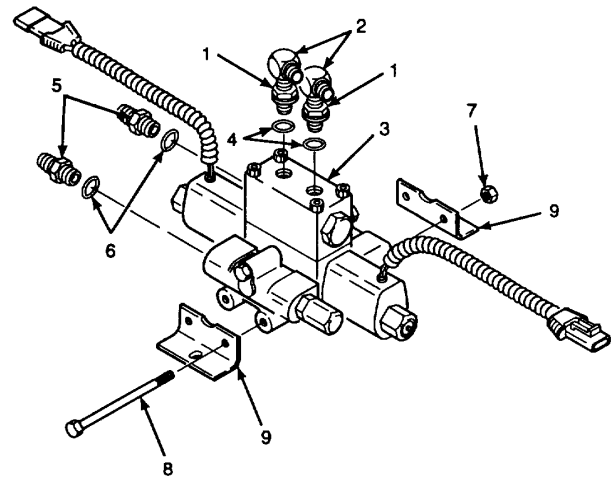
**Use bench vise, as required, to support tow point control valve during disassembly.**

**1. REMOVE ELBOWS AND STRAIGHT ADAPTERS FROM TOW POINT CONTROL VALVE.**

- a. Loosen elbow nuts (1) and remove elbows (2) from tow point control valve (3).
- b. Remove preformed packings (4) from elbows (2). Discard preformed packings.
- c. Remove straight adapters (5).
- d. Remove preformed packings (6) from straight adapters (5). Discard preformed packings.

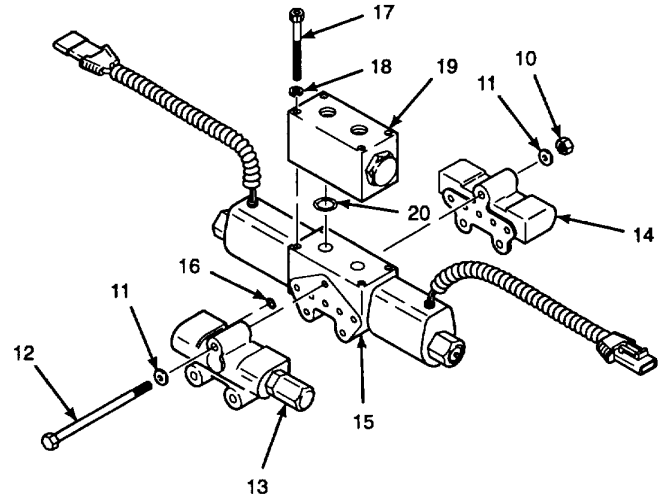
**2. REMOVE THREADED END RODS AND MOUNTING BRACKETS FROM TOW POINT CONTROL VALVE.**

- a. Remove hex nuts (7) from threaded end rods (8).
- b. Remove threaded end rods (8) and mounting brackets (9) from tow point control valve (3).



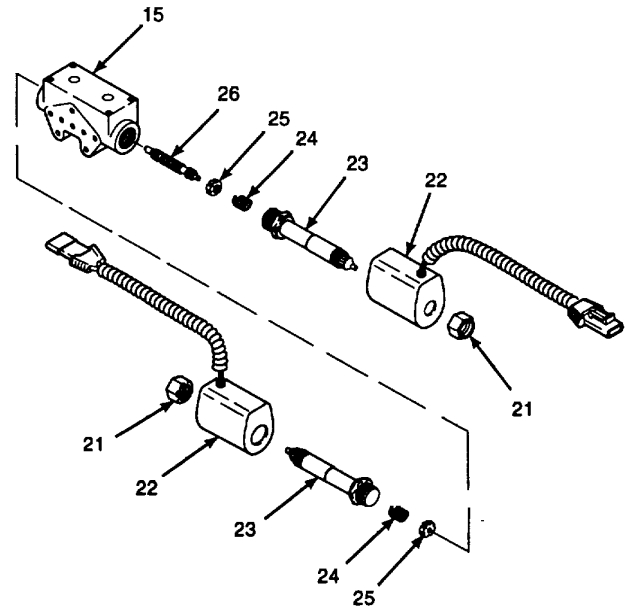
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- A. DISASSEMBLE - Continued.
3. REMOVE THREADED END RODS, OUTLET AND INLET MANIFOLDS, AND LOCK VALVE FROM TOW POINT CONTROL VALVE.



- a. Remove hex nut (10), flat washers (11), and threaded end rods (12) from tow point control valve.
- b. Separate inlet manifold (13) and outlet manifold (14) from valve body (15).
- c. Remove preformed packings (16) from inlet manifold (13) and from outlet side of valve body (15). Discard preformed packings.
- d. Remove socket head cap screws (17) and lockwashers (18) from lock valve (19). Discard lockwashers.
- e. Remove lock valve (19) from valve body (15).
- f. Remove preformed packings (20) from lock valve (19). Discard preformed packings.

4. REMOVE ELECTRICAL COILS, TUBE ASSEMBLIES, AND SPOOL FROM VALVE BODY.



- a. Remove hex nuts (21) from electrical coils (22).
- b. Slide electrical coils (22) from tube assemblies (23).

**NOTE**

**Spring and spring retainer may fall from valve body after tube assemblies are removed.**

- c. Remove tube assemblies (23) from valve body (15).
- d. Remove spring (24) and spring retainer (25) from valve body (15).



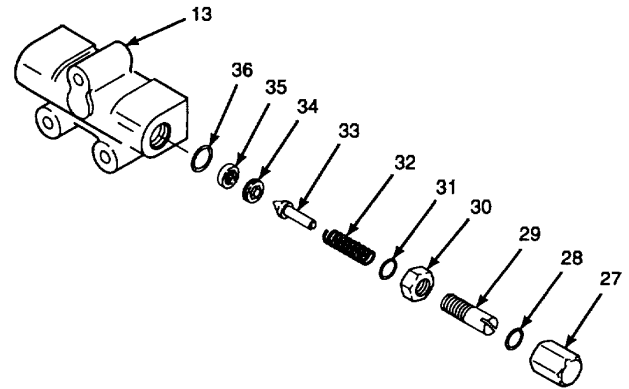
**Do not drop spool or allow it to scrape across threads in valve body. Handle spool with care. Damage to surface of spool can prevent it from working properly.**

- e. Note orientation of spool on removal for proper installation. Remove spool (26) from valve body (15).

**GO TO NEXT PAGE**

**2.46 REPAIR TOW POINT CONTROL VALVE - Continued.**

- A. DISASSEMBLE - Continued.
5. REMOVE VALVE CAP NUT, ADJUSTMENT SCREW, SPRING, AND POPPET FROM INLET MANIFOLD.
- Remove valve cap nut (27) and preformed packing (28) from inlet manifold (13). Discard preformed packing.
  - Remove adjustment screw (29), self-locking hex nut (30), and preformed packing (31) from inlet manifold (13). Discard preformed packing and self-locking hex nut.
  - Remove spring (32) and poppet (33).
  - Use an allen wrench to remove retainer (34) and seat (35) from inlet manifold (13).



**CAUTION**

Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.

- Use an o-ring tool to remove preformed packing (36) from inlet manifold (13). Discard preformed packing.

**GO TO NEXT PAGE**

## B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. RINSE ALL METAL PARTS IN CLEANING SOLVENT.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO REMOVE ANY FOREIGN MATTER FROM VALVE BODY, THREADED SURFACES, BORES, AND SEAL GROOVES.
3. FLUSH VALVE BODY WITH CLEANING SOLVENT TO REMOVE ANY FOREIGN MATERIAL PRESENT. USE A CULTURE SWAB TO REMOVE FOREIGN MATERIAL FROM VALVE BODY INNER BORE.
4. FLUSH INLET MANIFOLD BODY WITH CLEANING SOLVENT TO REMOVE ANY FOREIGN MATERIAL PRESENT. USE A CULTURE SWAB TO REMOVE ANY MATERIAL FROM INLET MANIFOLD INNER BORE.

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**2.46 REPAIR TOW POINT CONTROL VALVE - Continued.**

B. CLEAN - Continued.

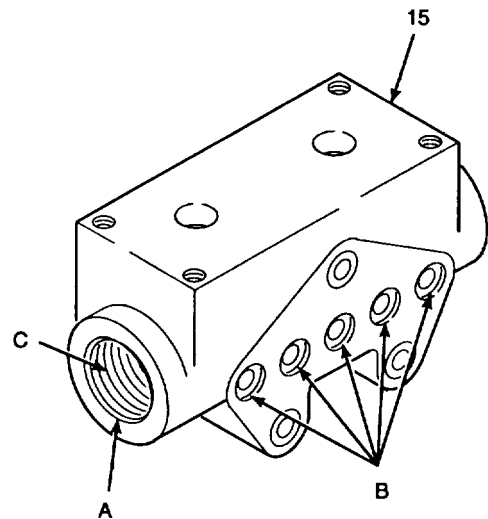
**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

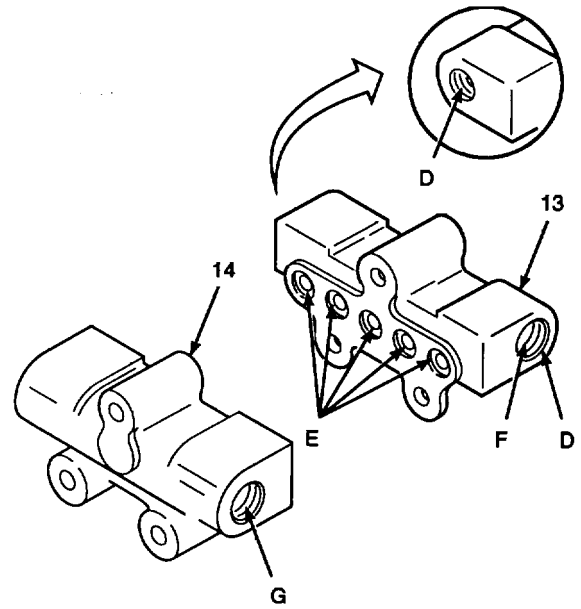
5. FLUSH OUTLET MANIFOLD BODY WITH CLEANING SOLVENT TO REMOVE ANY FOREIGN MATERIAL PRESENT. USE A CULTURE SWAB TO REMOVE ANY MATERIAL FROM OUTLET MANIFOLD INNER BORE.
  6. DRY ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.
- C. INSPECT.
1. INSPECT VALVE BODY FOR WEAR AND DAMAGE.
    - a. Visually inspect valve body (15), surface A, for stripped threads. Inspect seal grooves B for scratches or dents. Use a strong light and inspect inner bore C for foreign material, scoring, or excessive wear.
    - b. Replace valve body (15) and spool if stripped threads, damaged seal grooves, scoring, or excessive wear are detected.

NOTE: OUTLET SIDE SHOWN.  
INLET SIDE DOES NOT  
HAVE COUNTERBORES.



**GO TO NEXT PAGE**

- C. INSPECT - Continued.
2. INSPECT INLET MANIFOLD AND OUTLET MANIFOLD FOR DAMAGE AND WEAR.
- a. Visually inspect inlet manifold (13), surfaces D, for stripped threads and seal grooves E for scratches or dents. Use a strong light and inspect inlet manifold inner bore F for foreign material.
  - b. Replace inlet manifold (13) body if stripped threads or damaged seal grooves are detected.
  - c. Visually inspect outlet manifold (14) surface G for stripped threads.
  - d. Replace outlet manifold (14) body if stripped threads are detected.



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**2.46 REPAIR TOW POINT CONTROL VALVE - Continued.**

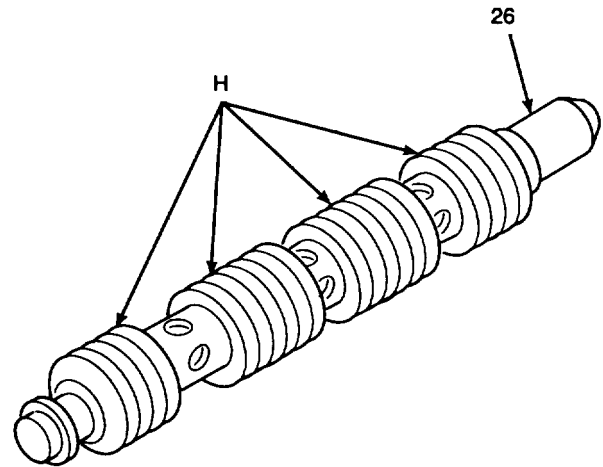
- C. INSPECT - Continued.
3. INSPECT SPOOL FOR SCORING AND WEAR.
- Inspect spool (26) surface H for scoring and excessive wear.
  - Replace spool (26) and valve body if scoring or excessive wear are detected on spool.
  - Slide spool (26) into valve body. Check for looseness and chatter. Spool should be a tight slide fit. Replace spool if looseness or chattering is detected.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC and flammable**. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- If spool (26) does not fit into valve body, inspect spool for burrs. Remove burrs with emery cloth. Rinse spool with cleaning solvent after brushing.



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D. ASSEMBLE.

**NOTE**

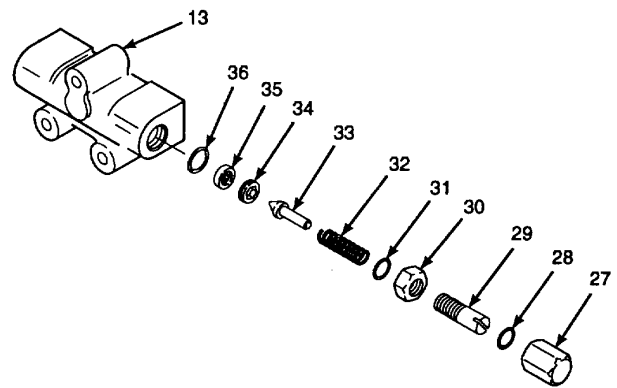
Use bench vise, as required, to support tow point control valve during assembly.

1. INSTALL POPPET, SPRING, ADJUSTMENT SCREW, AND VALVE CAP NUT ONTO INLET MANIFOLD.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Coat all parts with clean hydraulic oil. Do not dry. Place on a clean, lint-free cloth.
- b. Install preformed packing (36) into inlet manifold (13).
- c. Install seat (35) with counter bore side out.
- d. Install and tighten retainer (34) using an alien wrench.
- e. Install poppet (33) and spring (32) into inlet manifold (13).



**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of threads can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- f. Install preformed packing (31), adjustment screw (29), and self-locking hex nut (30) into inlet manifold (13).
- g. Install preformed packing (28) and valve cap nut (27) onto inlet manifold (13).

**2.46 REPAIR TOW POINT CONTROL VALVE - Continued.**

- D. ASSEMBLE - Continued.
2. INSTALL SPOOL, TUBE ASSEMBLIES, AND ELECTRICAL COILS ONTO VALVE BODY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

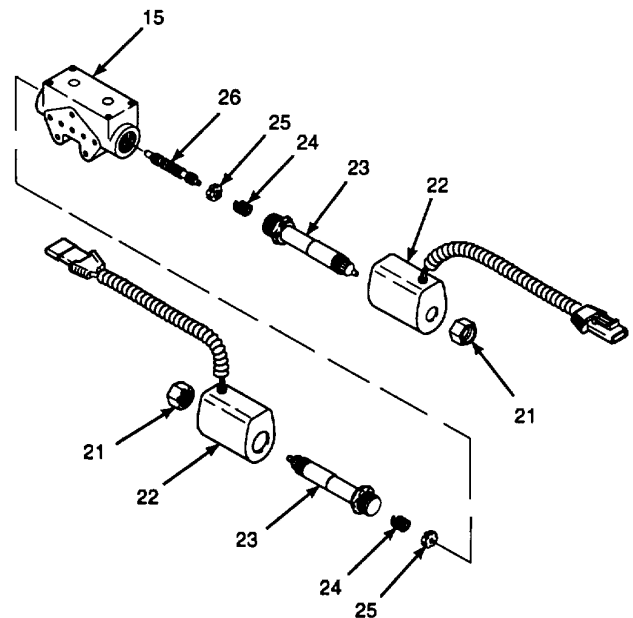
Do not drop spool or allow it to scrape across threads in valve body. Handle spool with care. Damage to surface of spool can prevent it from working properly.

- a. Dip spool (26) and valve body (15) into clean hydraulic oil. Install spool into valve body. Ensure spool is oriented correctly.
- b. Install spring retainers (25) and springs (24) onto spool inside valve body.
- c. Install tube assemblies (23) onto valve body (15). With crowfoot wrench at 90° to torque wrench, tighten tube assemblies to 35 lb-ft (48 N•m).
- d. Slide electrical coils (22) onto tube assemblies (23).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply thread locking compound to threads of tube assemblies (23).
- f. Install hex nuts (21) onto tube assemblies (23). Tighten hex nuts to 12 lb-in (1,4 N•m).



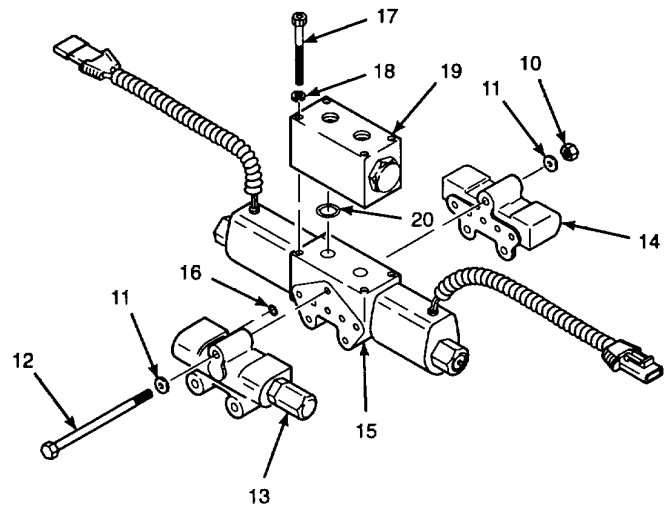
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- D. ASSEMBLE - Continued.
3. INSTALL LOCK VALVE, INLET AND OUTLET MANIFOLDS, AND THREADED END RODS ONTO TOW POINT CONTROL VALVE.

**WARNING**

**Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

- a. Lubricate preformed packings (20) with clean hydraulic oil and install onto lock valve (19).
- b. Position lock valve (19) on valve body (15).
- c. Install lockwashers (18) onto socket head cap screws (17).
- d. Install socket head cap screws (17) through lock valve (19) and into valve body (15).
- e. Lubricate preformed packings (16) with clean hydraulic oil and install onto inlet manifold (13) and outlet side of valve body (15).
- f. Install one flat washer (11) onto threaded end rod (12).
- g. Install threaded end rod (12) through inlet manifold (13), valve body (15), and outlet manifold (14). Install flat washer (11) and hex nut (10) onto end of threaded end rod.
- h. Do not tighten hex nut (10) at this time.



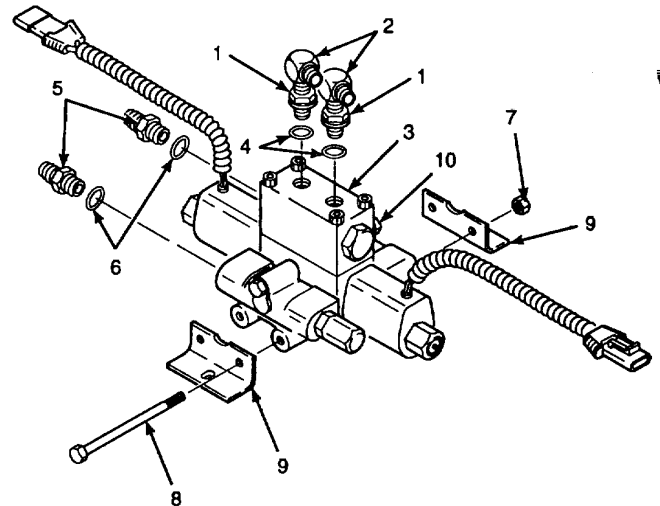
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2.46 REPAIR TOW POINT CONTROL VALVE - Continued. ADS

D. ASSEMBLE - Continued.

4. INSTALL MOUNTING BRACKETS AND THREADED END RODS ON TOW POINT CONTROL VALVE.

- a. Install threaded end rods (8) through mounting bracket (9) and through tow point control valve (3).
- b. Install second mounting bracket (9) over threaded end rods (8).
- c. Install hex nuts (7) on threaded end rods (8).
- d. Tighten hex nuts (7 and 10) on threaded end rods in three steps: 75 lb-in (8 N•m), 100 lb-in (11 N•m), then 125 lb-in (14 N•m).



5. INSTALL STRAIGHT ADAPTERS AND ELBOWS ON TOW POINT CONTROL VALVE.

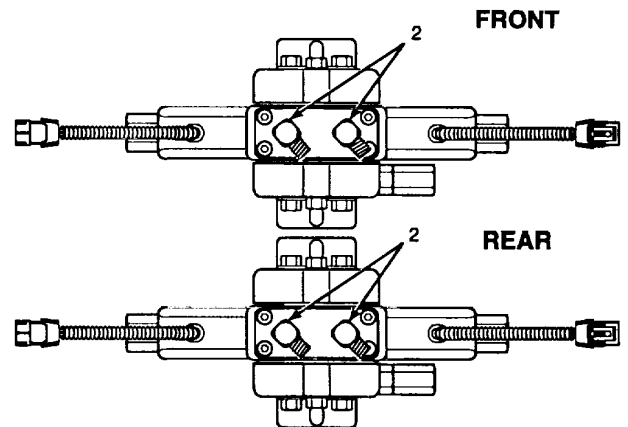
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of threads can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- a. Lubricate with clean hydraulic oil and install preformed packings (4 and 6) onto straight adapters (5) and elbows (2).



- b. Install straight adapters (5) into tow point control valve (3).
- c. Install elbows (2) into tow point control valve. Screw elbows into mating ports until preformed packings (4) seat on lock valve.
- d. Adjust threaded end of elbows (2) to position shown. Tighten elbow nuts (1).

**NOTE**

**FOLLOW-ON-TASKS:** Install tow point control valve on valve panel per paragraph 2.55.  
Adjust tow point relief valve per paragraph 2.51.

**END OF TASK**

---

**2.47 REPLACE/REPAIR SCREED VIBRATION SOLENOID VALVE.**

---

This task covers: a. Remove b. Repair c. Install

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Torque wrench (Item 132, Appendix D)

References:

TM 5-3895-373-24P

Equipment Condition:

Return manifold removed per paragraph 2.55.

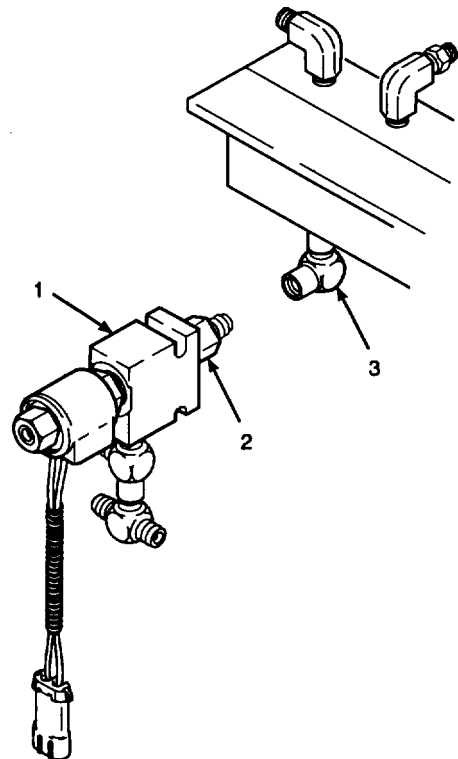
Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Seal kit

---

**A. REMOVE.**

1. REMOVE SCREED VIBRATION SOLENOID VALVE (1) BY UNTHREADING PIPE NIPPLE (2) FROM RETURN MANIFOLD ELBOW (3).



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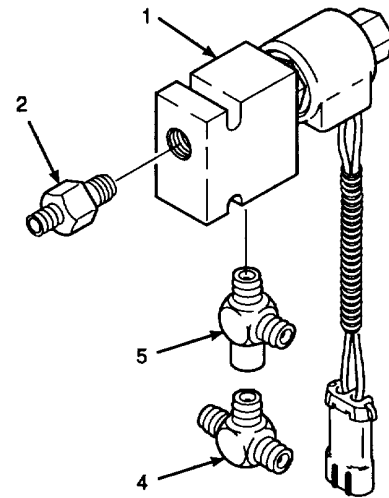


**2.47 REPLACE/REPAIR SCREED VIBRATION SOLENOID VALVE - Continued.**

A. REMOVE - Continued.

2. REMOVE FITTINGS FROM SCREED VIBRATION SOLENOID VALVE.

- a. Remove tees (4 and 5) from screed vibration solenoid valve (1).
- b. Remove pipe nipple (2) from screed vibration solenoid valve.



B. REPAIR.

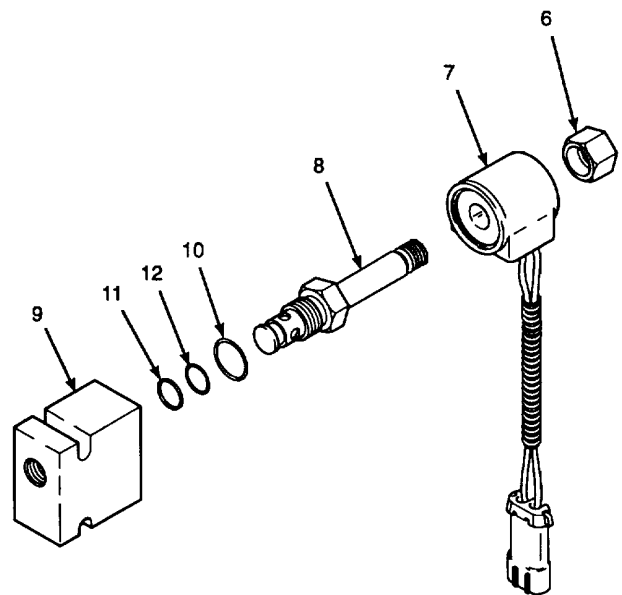
1. DISASSEMBLE SCREED VIBRATION SOLENOID VALVE.

- a. Remove hex nut (6) and solenoid coil (7).
- b. Remove valve cartridge (8) from valve body (9).

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings. Scratched or dented seal grooves can cause valve leakage.

- c. Use an o-ring tool and remove preformed packing (10). Discard preformed packing.
- d. Use an o-ring tool and remove packing retainer (11) and preformed packing (12). Discard packing retainer and preformed packing.



**GO TO NEXT PAGE**

- B. REPAIR - Continued.
2. CLEAN VALVE BODY AND VALVE CARTRIDGE.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse valve body and valve cartridge in cleaning solvent.
- b. Use a culture swab to wipe out valve body inner bores.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- c. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from valve body bore, threaded surfaces, and seal grooves. Dry all parts with a clean, lint-free cloth.

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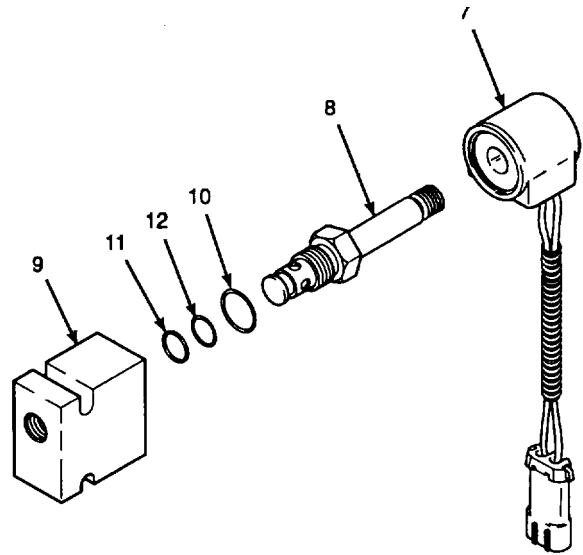
**2.47 REPLACE/REPAIR SCREED VIBRATION SOLENOID VALVE - Continued.**

- B. REPAIR - Continued.
3. ASSEMBLE SCREED VIBRATION SOLENOID VALVE.

<b>WARNING</b>
----------------

Hydraulic oil can be moderately flammable and can be an irritant to skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate valve body (9) and valve cartridge (8) with clean hydraulic oil.
- b. Lubricate preformed packings (10 and 12) and packing retainer (11) with petrolatum.
- c. Install preformed packing (12) and packing retainer (11) onto valve cartridge (8).
- d. Install preformed packing (10) onto valve cartridge (8).
- e. Install valve cartridge (8) into valve body (9). Thread valve cartridge on by hand until preformed packing rests against valve body. Tighten securely with wrench. Do not overtighten.

**NOTE**

One end of the solenoid coil has lettering on the face. When the solenoid coil is installed the lettering must be facing away from the valve body or the screed vibration solenoid valve will not operate properly.

- f. Install solenoid coil (7) onto valve cartridge (8) with the lettered end facing away from valve body (9). Rotate the solenoid coil so the wiring is facing in the same direction as the port on the bottom of valve body. This port is stamped with the number 2.

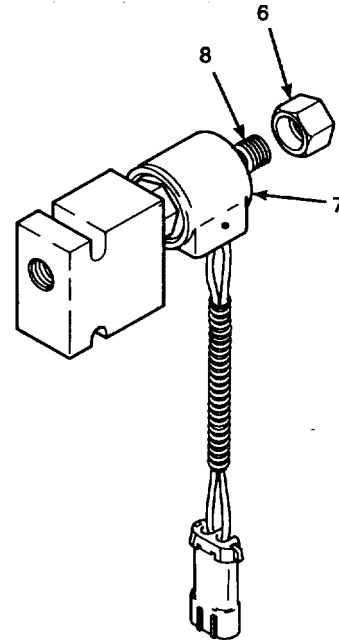
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B. REPAIR - Continued.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- g. Apply thread locking compound to threads of valve cartridge (8).
- h. Install hex nut (6) onto valve cartridge (8). The counter-bored end of the hex nut goes against solenoid coil (7). Tighten to 5 lb-ft (7 N•m).



C. INSTALL.

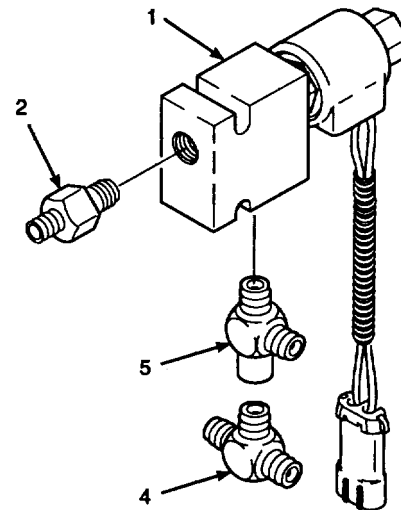
1. INSTALL FITTINGS ONTO SCREED VIBRATION SOLENOID VALVE.

- a. Use cleaning cloth to wipe residue from threads of pipe nipple (2) and tees (4 and 5).

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply pipe sealant to threads on one end of pipe nipple (2). Install pipe nipple into the rear port, port stamped 1, of screed vibration solenoid valve (1). Tighten pipe nipple.
- c. Apply pipe sealant to pipe threads of tee (5). Install tee so that when tightened, tee points to the right when viewed from the pipe nipple end of the screed vibration solenoid valve. Refer to illustration. Tighten tee.
- d. Apply pipe sealant to pipe thread ends of tee (4). Install tee so that when tightened, tee is at a right angle to valve body. Refer to illustration. Tighten tee.



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**2.47 REPLACE/REPAIR SCREED VIBRATION SOLENOID VALVE - Continued.**

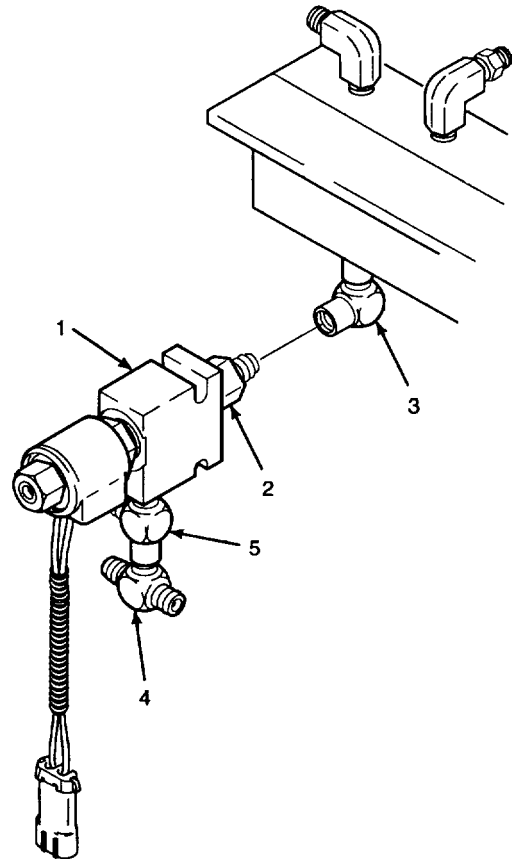
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- C. INSTALL - Continued.
2. INSTALL SCREED VIBRATION SOLENOID VALVE ONTO RETURN MANIFOLD.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply pipe sealant to exposed end of pipe nipple (2).
- b. Install screed vibration solenoid valve (1) into elbow (3). Use a wrench on pipe nipple (2) and tighten until solenoid valve is in the correct position with tees (4 and 5) pointing down.

**NOTE**

**FOLLOW-ON-TASK:** Install return manifold per paragraph 2.55.

**END OF TASK**

---

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**2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE.**

---

This task covers: a. Disassemble b. Clean c. Inspect  
d. Assemble

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Combination wrench (Item 116, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Torque wrench (Item 132, Appendix D)

References:

TM 5-3895-373-24P

Equipment Conditions:

Auger/conveyor speed control valve removed  
per paragraph 2.55.

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Emery cloth (Item 23, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towel (item 37, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers  
Orifice  
O-rings  
Packing retainer  
Preformed packing  
Roll pin

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**GO TO NEXT PAGE**

2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE - Continued.

NOTE

This procedure applies to both the left and right auger/conveyor speed control valves. Follow the procedure for both the left and right valve, any differences are noted in the text. Both the left and right valves are illustrated to show the differences during disassembly and assembly.

Use a bench vise, as required, to support auger/conveyor speed control valve during disassembly and assembly.

A. DISASSEMBLE.

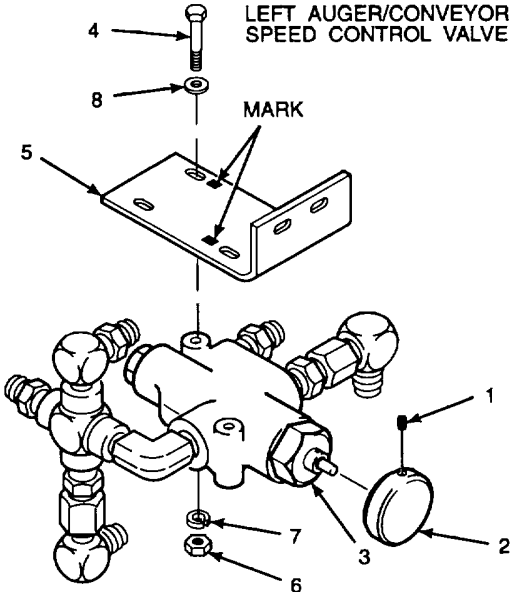
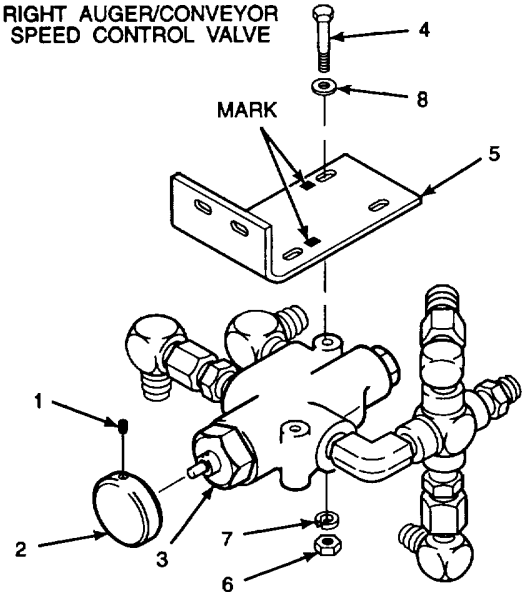


Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

NOTE

Perform disassembly procedures over a machinery wiping towel to catch any hydraulic oil still in the auger/conveyor speed control valve.

1. DISASSEMBLE KNOB AND AUGER/CONVEYOR SPEED CONTROL VALVE MOUNTING BRACKET.
  - a. Loosen set screw (1). Remove knob (2) from auger/conveyor speed control valve (3).
  - b. Mark position of hex head cap screws (4) on mounting bracket (5) for positioning during reassembly.
  - c. Remove hex nuts (6), lockwashers (7), hex head cap screws (4) and flat washers (8). Separate mounting bracket (5) from auger/conveyor speed control valve (3). Discard lockwashers.

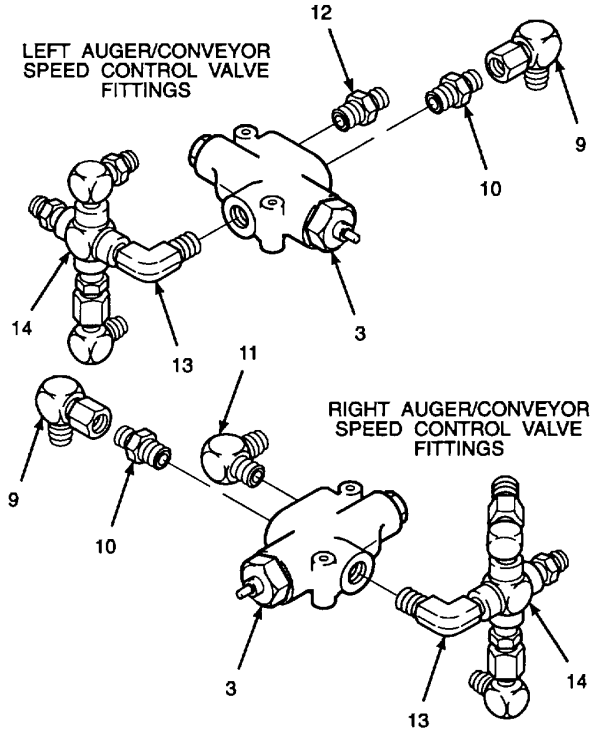


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A. DISASSEMBLE - Continued.

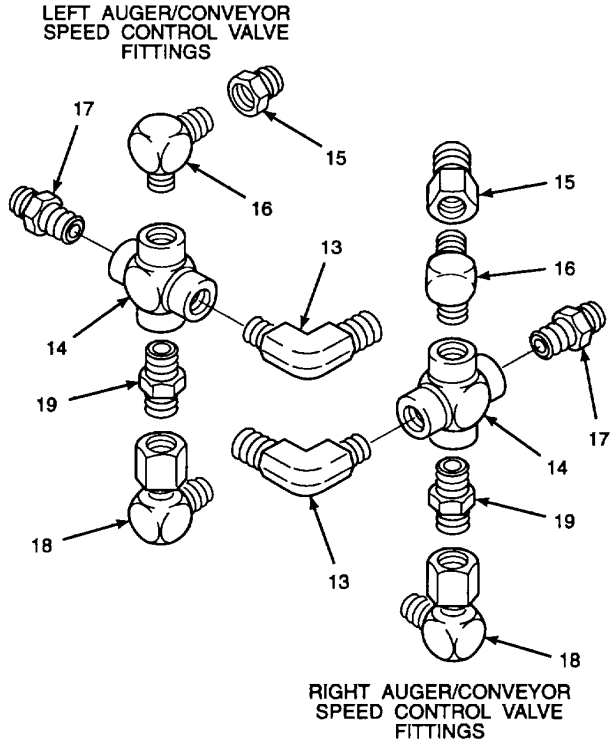
2. REMOVE HYDRAULIC FITTINGS FROM AUGER/CONVEYOR SPEED CONTROL VALVE.

- a. Remove swivel elbow (9) from straight adapter (10) and remove the straight adapter from auger/conveyor speed control valve (3).
- b. Remove elbow (11) from right auger/conveyor speed control valve (3). On the left valve remove straight adapter (12).
- c. Remove elbow (13) with cross (14) attached from auger/conveyor speed control valve (3).



3. DISASSEMBLE CROSS.

- a. Remove elbow (13).
- b. Remove tube reducer (15) from elbow (16) and remove elbow from cross (14).
- c. Remove straight adapter (17).
- d. Remove swivel elbow (18) from straight adapter (19) and remove straight adapter from cross (14).

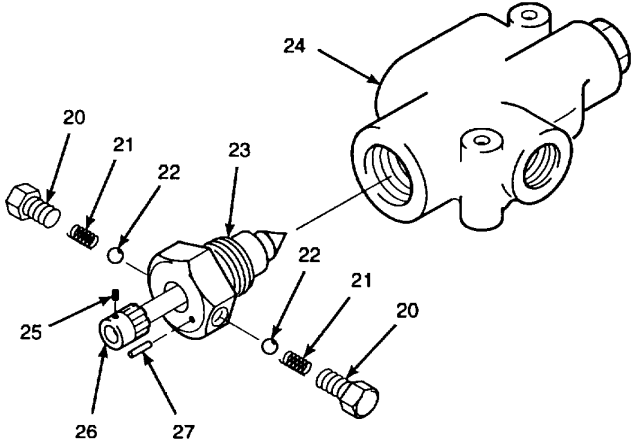


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2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE - Continued. am

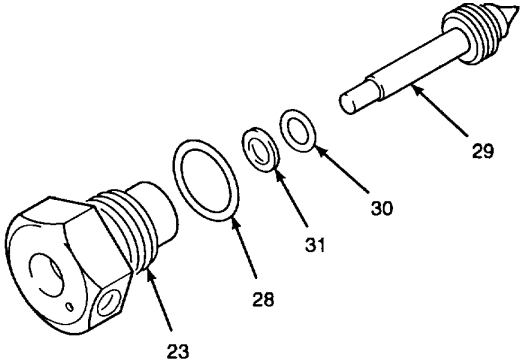
- A. DISASSEMBLE - Continued.
- 4. DISASSEMBLE AUGER/CONVEYOR SPEED CONTROL VALVE.
  - a. Remove spring caps (20), springs (21), and balls (22) from adapter (23).
  - b. Remove adapter (23) from valve body (24).
  - c. Remove set screw (25) from detent ring (26) and remove detent ring.



**NOTE**

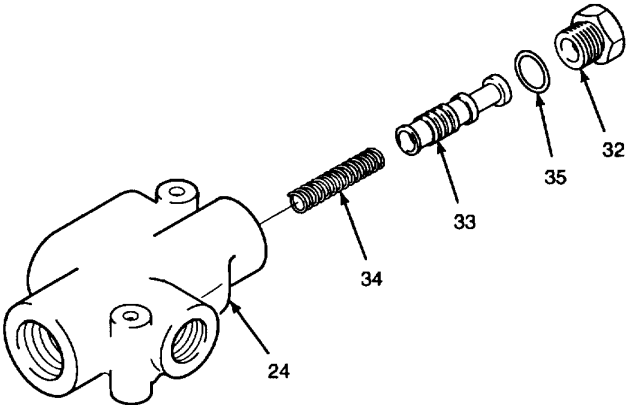
**It is only necessary to remove the roll pin if damaged.**

- d. Remove roll pin (27) from adapter (23). Discard roll pin.
- e. Remove preformed packing (28) from adapter (23). Discard preformed packing.
- f. Unscrew and remove rivet (29) from adapter (23).



**Use caution when removing seals and o-rings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and o-rings. Use an o-ring tool to remove seals and o-rings.**

- g. Use an o-ring tool and remove o-ring (30) and packing retainer (31) from adapter (23). Discard o-ring and packing retainer.
- h. Remove plug (32), spool (33), and spring (34) from valve body (24).
- i. Remove o-ring (35) from plug (32). Discard o-ring.



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A. DISASSEMBLE - Continued.

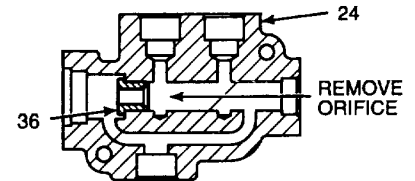
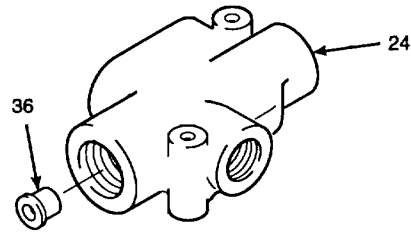
**NOTE**

It is only necessary to remove the orifice if it is to be replaced.

- j. Use a punch and remove orifice (36) from rivet end of valve body (24). Discard orifice.

B. CLEAN.

- 1. CLEAN AUGER/CONVEYOR SPEED CONTROL VALVE PARTS.



**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent.
- b. Flush valve body with cleaning solvent to remove any foreign material present. Use a culture swab to remove foreign material from valve body inner bore.

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**2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE - Continued.**

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**B. CLEAN - Continued.****WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- c. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from valve body, threaded surfaces, bores and seal grooves. Dry all parts with a clean, lint-free cloth.

**2. CLEAN HEX HEAD CAP SCREWS AND SET SCREWS.****WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean threads of hex head cap screws and set screws with thread locking compound solvent.
- b. Dry with a clean, cleaning cloth.

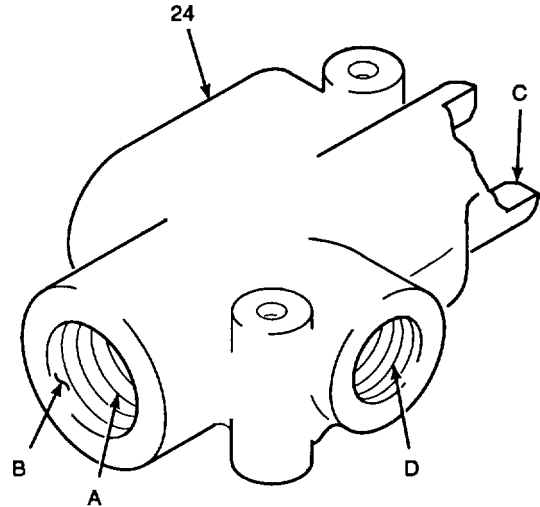
**C. INSPECT.**

1. INSPECT VALVE BODY, SPRINGS, AND SPOOL FOR STRIPPED THREADS, WEAR, SCRATCHES, DENTS, AND FOREIGN MATERIAL, AND SPRINGS FOR DAMAGE AND WEAR.

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## C. INSPECT - Continued.

- a. Visually inspect valve body (24), surface A, for stripped threads. Inspect seal grooves B and C for scratches and dents. Use a strong light and inspect inner bore D for foreign material, scoring, or excessive wear.
- b. Replace valve body (24) and spool if stripped threads, damaged seal grooves, scoring, or excessive wear is detected.
- c. Replace spring if damaged or worn.



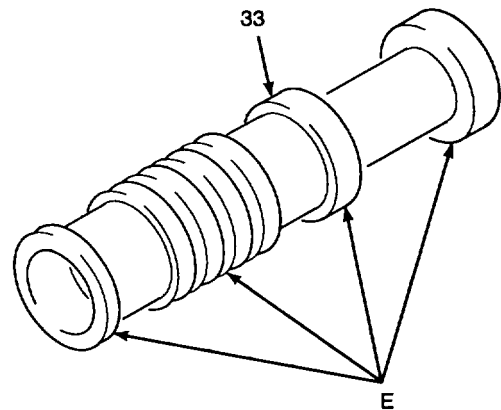
## 2. INSPECT SPOOL FOR DAMAGE AND WEAR.

- a. Inspect spool (33), surface E, for scoring and excessive wear.
- b. Replace spool (33) and valve body if scoring or excessive wear is detected on spool.
- c. Slide spool (33) into valve body spring end first. Check for looseness and chatter. Spool should be a tight slide fit. Replace spool if looseness or chattering are detected.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.



d. If spool (33) does not fit into valve body smoothly, inspect spool for burrs. Remove burrs with emery cloth. Rinse spool with cleaning solvent after removing burrs.

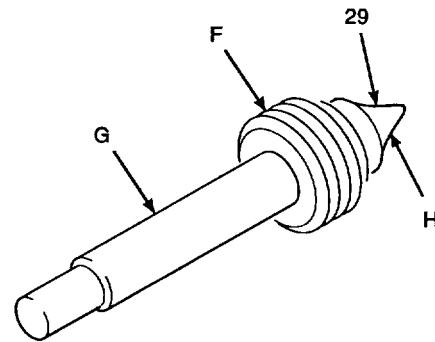
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**2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE - Continued.**

C. INSPECT - Continued.

3. INSPECT RIVET.

- a. Inspect rivet (29), surface F, for thread damage. Replace rivet if threads are damaged.
- b. Replace rivet (29) if rivet shaft G is bent.
- c. Inspect surface (H) for scoring or wear. Replace if scoring or wear is detected.



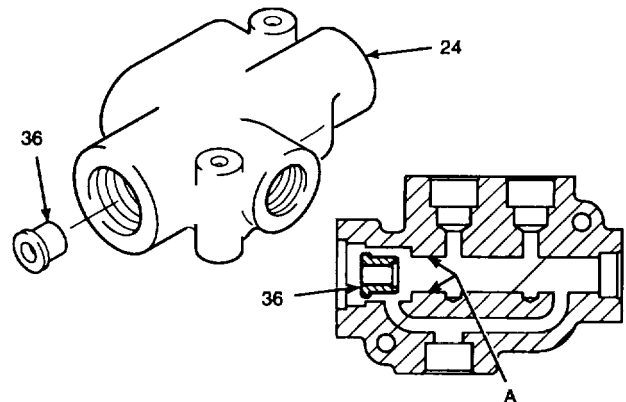
D. ASSEMBLE.

1. ASSEMBLE AUGER/CONVEYOR SPEED CONTROL VALVE.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Ensure that valve body (24) is completely dry. Apply a thin coating of thread locking compound (Item 13, Appendix B) to orifice (36), mating surface A, inside of valve body.
- b. Install orifice (36) into rivet end of valve body (24).



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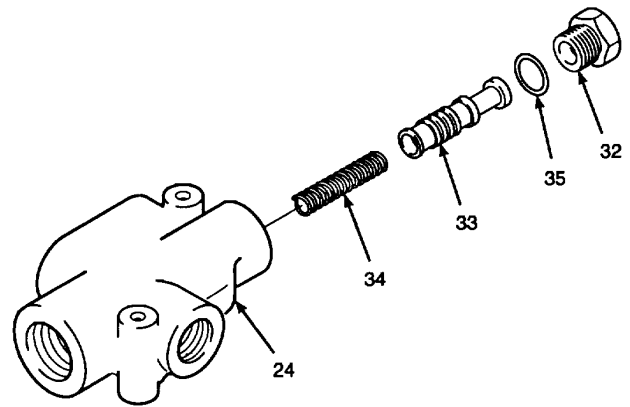
D. ASSEMBLE - Continued.

**WARNING**

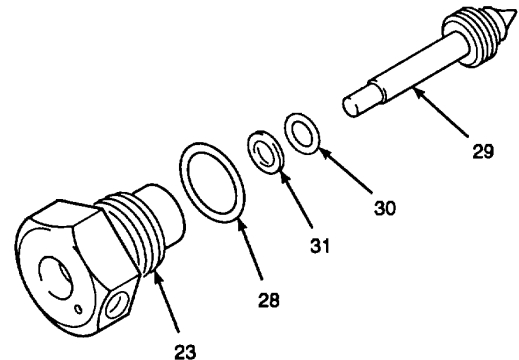
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Be careful not to damage o-rings when sliding over threads. Sharp edges of threads can cut or damage o-rings. Damaged o-rings will cause leakage and affect performance.



- c. Lubricate o-ring (35) with clean hydraulic oil and install onto plug (32).
- d. Install spring (34) and spool (33) into valve body (24). Install and tighten plug (32).
- e. Lubricate o-ring (30) with clean hydraulic oil.
- f. Install packing retainer (31) and o-ring (30) into adapter (23).
- g. Screw rivet (29) all the way into adapter (23).
- h. Lubricate preformed packing (28) with clean hydraulic oil and install onto adapter (23). Ensure not to damage packing when installing over the adapter threads.



**GO TO NEXT PAGE**

**2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE - Continued. ',\_****D. ASSEMBLE - Continued.**

- i. Use a hammer and drive roll pin (27) halfway into adapter (23). Ensure that the roll pin is not damaged during installation.

**NOTE**

**If new detent ring is being installed, roll pin (37) will be present. Remove roll pin.**

- j. If installed, remove roll pin (37) from detent ring (26).
- k. Install detent ring (26).

**WARNING**

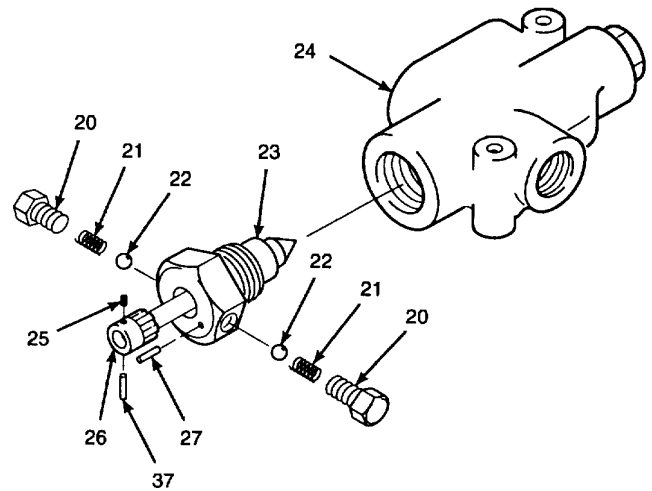
**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- l. Apply thread locking compound (Item 14, Appendix B) to threads of set screw (25).
- m. Install and tighten set screw (25) into detent ring (26).
- n. Install and tighten adapter (23) into valve body (24) using the combination wrench.

**WARNING**

**Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.**

- o. Apply pipe sealant to threads of spring caps (20).
- p. Install balls (22) and springs (21) and tighten spring caps (20) into adapter (23).

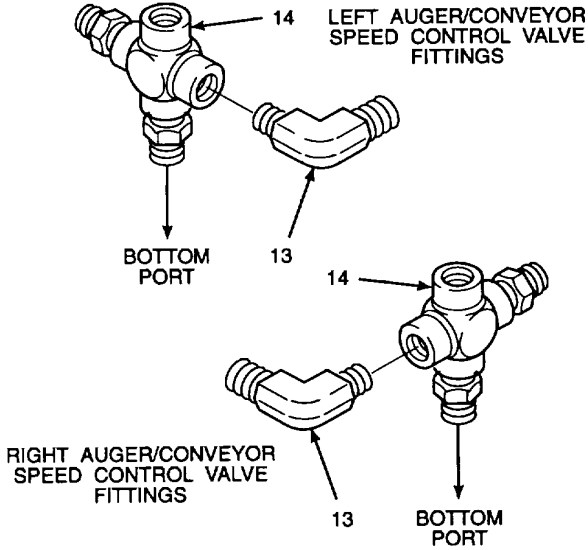
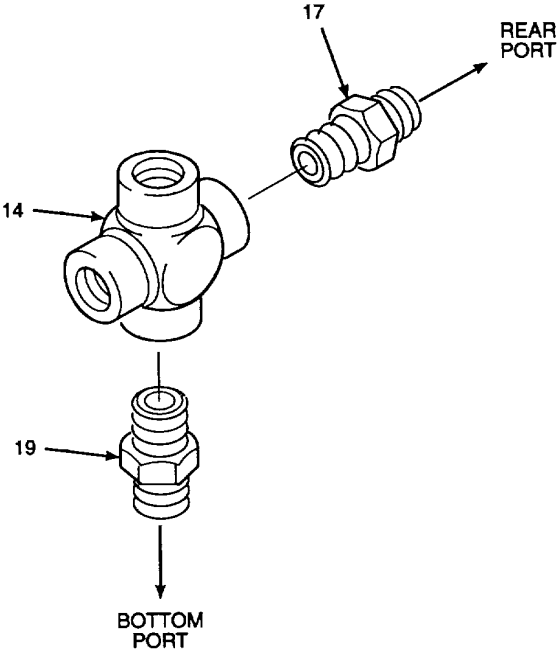
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- D. ASSEMBLE - Continued.
- 2. ASSEMBLE CROSS.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply pipe sealant to pipe threads of straight adapter (19) and install into cross (14). This is the bottom of the cross. Tighten straight adapter.
- b. Apply pipe sealant to pipe threads of straight adapter (17) and install into either side of cross (14). Tighten straight adapter. This is the rear port of the cross. When the cross is installed, this straight adapter will point to the front of the paving machine.
- c. Apply pipe sealant to pipe threads of elbow (13) and install into the front port on cross (14). Orient elbow so that when tightened it points at a 90° angle from the bottom port as shown.



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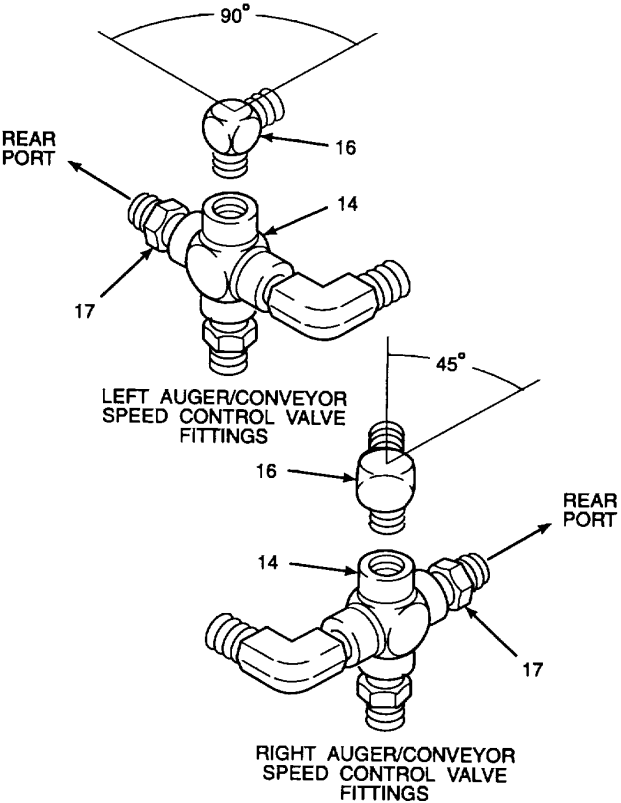
2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE - Continued. '4

D. ASSEMBLE - Continued.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

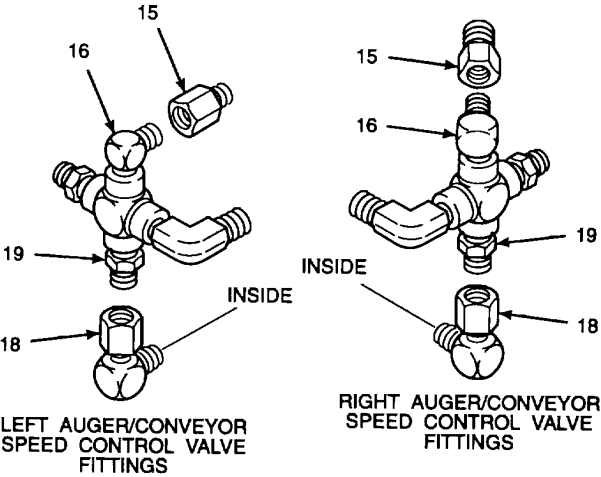
- d. Apply pipe sealant to threads of elbow (16).
- e. On the right auger/conveyor speed control valve, install elbow (16) into the top port of cross (14). Position the elbow so that when tightened it is at a 45° angle from straight adapter (17) rear port. On the left valve position elbow so that when tightened it is at a 90° angle from straight adapter.



**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- f. Apply hydraulic fitting sealant to exposed threads of straight adapter (19) and elbow (16).
- g. Install swivel elbow (18) onto straight adapter (19). Position the swivel elbow so that when tightened it points to the inside of paving machine as shown.
- h. Install tube reducer (15) onto elbow (16).



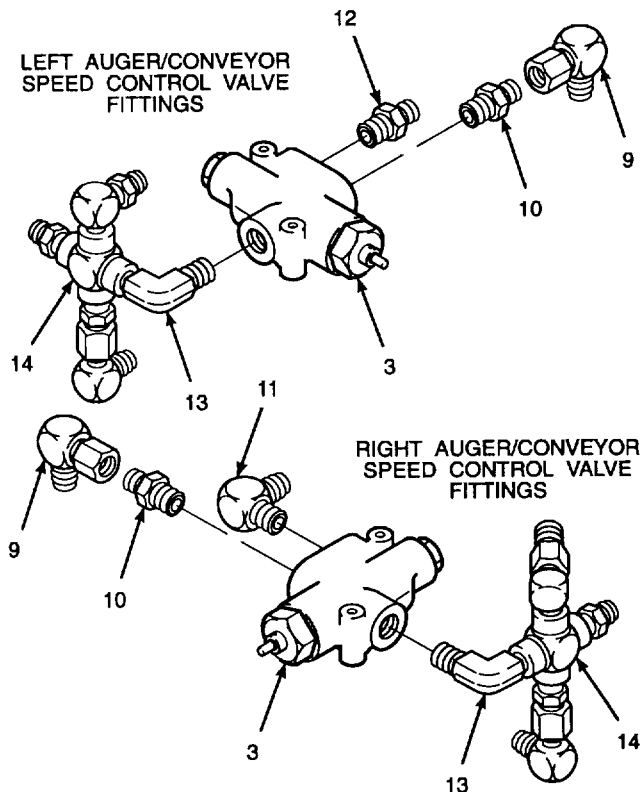
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- D. ASSEMBLE - Continued.
3. INSTALL ASSEMBLED CROSS AND MOUNTING BRACKET.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply pipe sealant to threads of elbow (13).
- b. Install elbow (13) and cross (14) into the single port side of auger/conveyor speed control valve (3) as shown.
- c. Apply pipe sealant to elbow (11) and install into rear port on the two port side of auger/conveyor speed control valve (3) for the right side valve, and a straight adapter (12) for the left side valve.
- d. Apply pipe sealant to threads of straight adapter (10) and install into the front port on the two port side of auger/conveyor speed control valve (3).



**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply hydraulic fitting sealant to exposed thread end of straight adapter (10).
- f. Install swivel elbow (9) onto straight adapter (10). Orient swivel elbow as shown.

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2.48 REPAIR AUGER/CONVEYOR SPEED CONTROL VALVE - Continued. '4

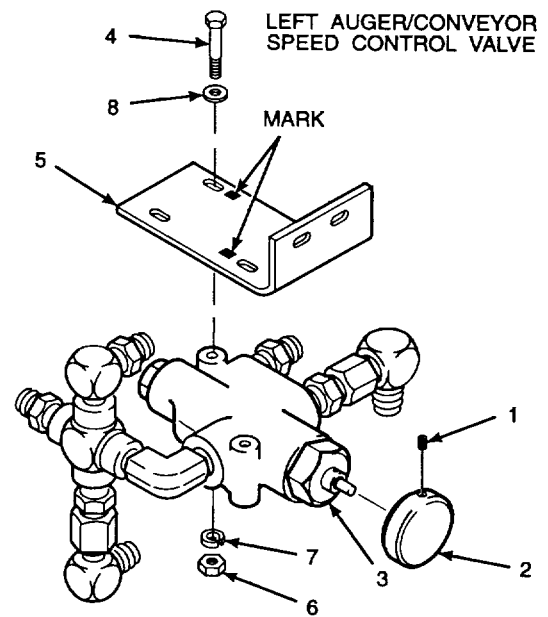
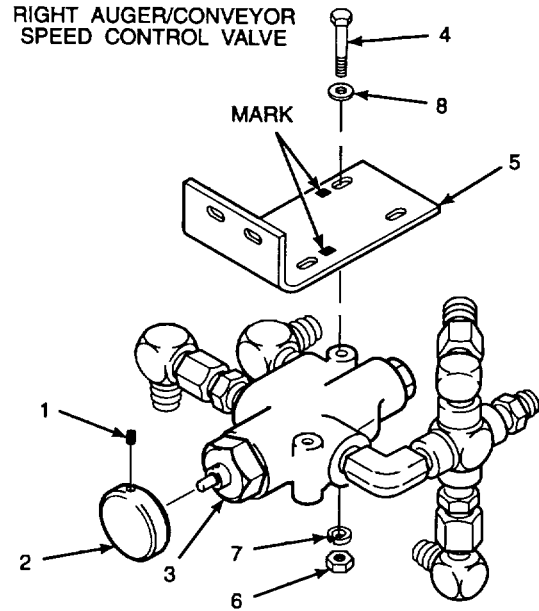
D. ASSEMBLE Continued.

- g. Align mounting bracket (5) onto the top of auger/conveyor speed control valve (3) using marks made during disassembly.
- h. Install hex head cap screws (4) and flat washers (8) through the front and rear holes of mounting bracket (5) as marked during disassembly and auger/conveyor speed control valve (3) and line up the marks on the bracket with the cap screw heads.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- i. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (4).
- j. Install lockwashers (7) and hex nuts (6). Tighten hex nuts to 9 lb-ft (12 N•m).
- k. Install knob (2) onto auger/conveyor speed control valve (3). Tighten set screw (1) into knob.



**NOTE**

**FOLLOW-ON-TASK:** Install auger/conveyor speed control valve per paragraph 2.55.

**END OF TASK**

**2.49 REPAIR AUGER/CONVEYOR, VALVE AND CYLINDER, AND TOW POINT FLOW DIVIDERS.**

This task covers: a. Disassemble b. Clean c. Inspect  
d. Assemble

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Hack saw (Item 47, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Snap ring pliers (Item 66, Appendix D)  
Torque wrench (Item 132, Appendix D)

References:

TM 5-3895-373-24P

Equipment Condition:

Remove flow divider being repaired per paragraph 2.55.

Materials/Parts:

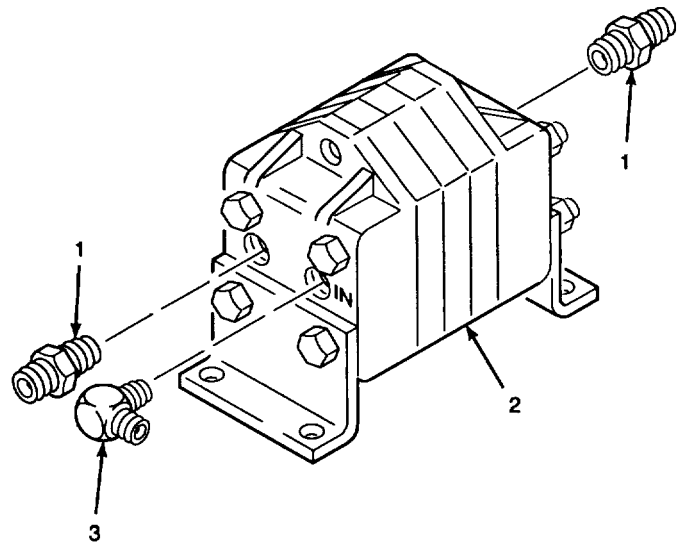
Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Preformed packings

**A. DISASSEMBLE.****1. REMOVE HYDRAULIC FITTINGS FROM FLOW DIVIDERS.**

a. Remove hydraulic fittings from auger/conveyor flow divider.

(1) Remove straight adapters (1) from auger/conveyor flow divider (2).

(2) Remove elbow (3) from auger/conveyor flow divider (2).



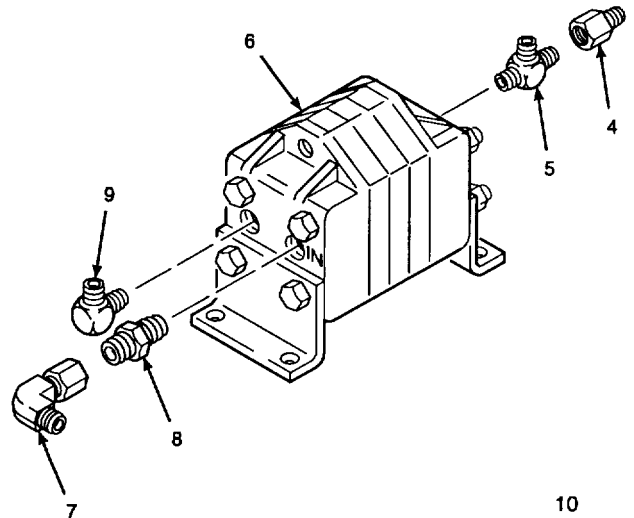
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**2.49 REPAIR AUGER/CONVEYOR, VALVE AND CYLINDER, AND TOW POINT FLOW DIVIDERS- Continued.**

**A. DISASSEMBLE Continued.**

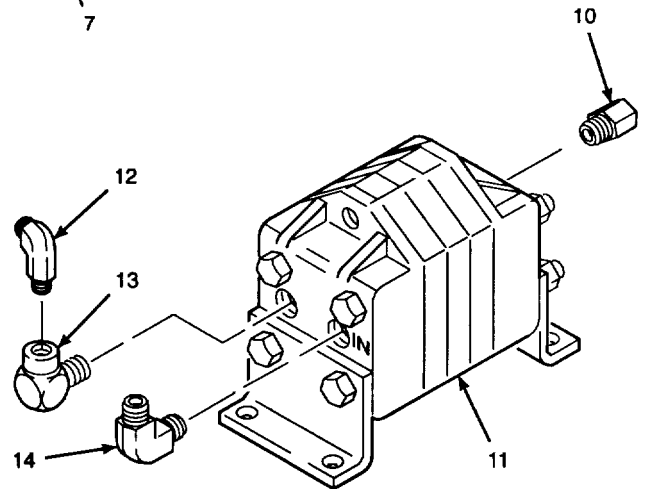
**b. Remove hydraulic fittings from valve and cylinder flow divider.**

- (1) Remove tube reducer (4) from tee (5).
- (2) Remove tee (5) from valve and cylinder flow divider (6).
- (3) Remove elbow (7) from straight adapter (8).
- (4) Remove straight adapter (8).
- (5) Remove elbow (9) from valve and cylinder flow divider (6).



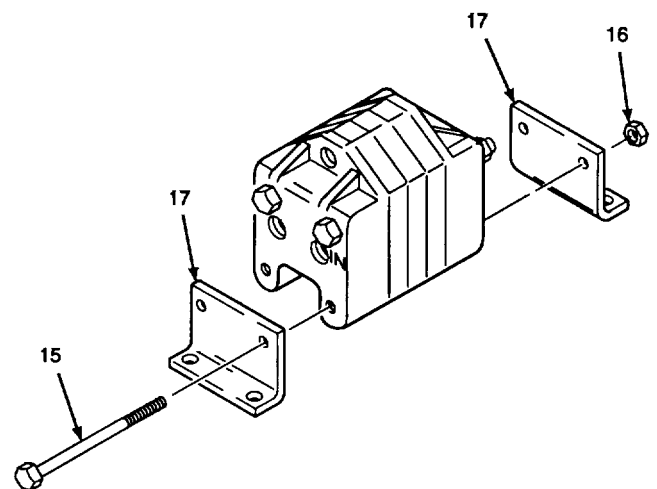
**c. Remove hydraulic fittings from tow point flow divider.**

- (1) Remove elbow (10) from tow point flow divider (11).
- (2) Remove elbow (12).
- (3) Remove elbows (13 and 14) from tow point flow divider (11).



**2. REMOVE MOUNTING BRACKETS FROM FLOW DIVIDER.**

- a. Remove hex head cap screws (15) and hex nuts (16) from flow divider.
- b. Remove mounting brackets (17) from flow divider.



**GO TO NEXT PAGE**

- A. DISASSEMBLE - Continued.
- 3. REMOVE END PLATES, CASES, AND DOWEL PINS FROM FLOW DIVIDER.
  - a. Remove hex head cap screws (18) and hex nuts (19).

**NOTE**

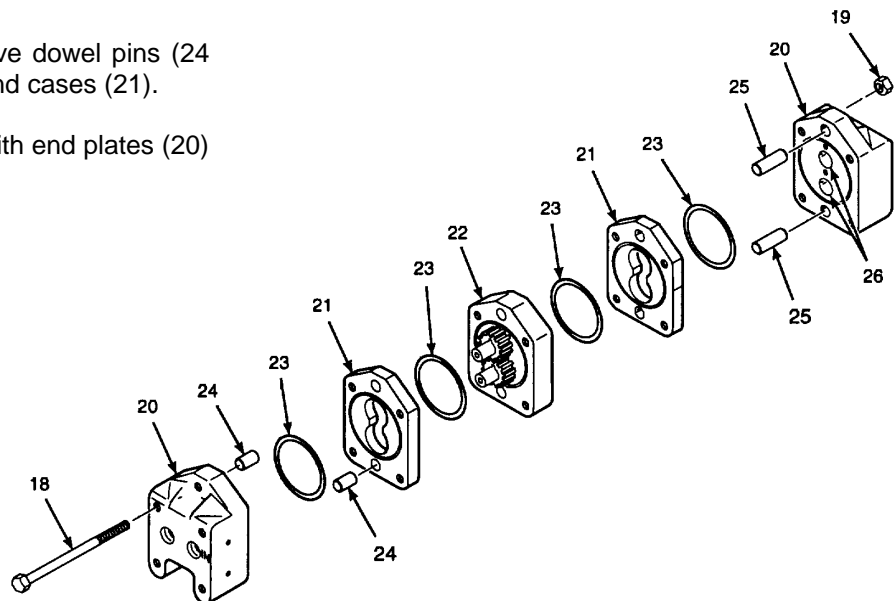
**Cases (21) on tow point flow divider are thinner than cases on auger/conveyor flow divider and valve and cylinder flow divider. Procedure for disassembly is the same for all units.**

- b. Pull flow divider apart and separate end plates (20) from cases (21) and spacer plate (22).

**CAUTION**

**Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.**

- c. Use an o-ring tool and remove preformed packings (23) from end plates (20), cases (21), and spacer plate (22). Discard preformed packings.
- d. Use a pair of pliers and remove dowel pins (24 and 25) from end plates (20) and cases (21).
- e. Ensure bearings (26) remain with end plates (20) and spacer plate (22).



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**2.49 REPAIR AUGER/CONVEYOR, VALVE AND CYLINDER, AND TOW POINT FLOW DIVIDERS - Continued.**

- A. DISASSEMBLE - Continued.
- 4. REMOVE RETAINING RINGS, GEARS, DOWEL KEYS, AND SHAFTS FROM SPACER PLATE.

**WARNING**

Use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Remove retaining rings (27) on outer side of shafts (28) with snap ring pliers.

**NOTE**

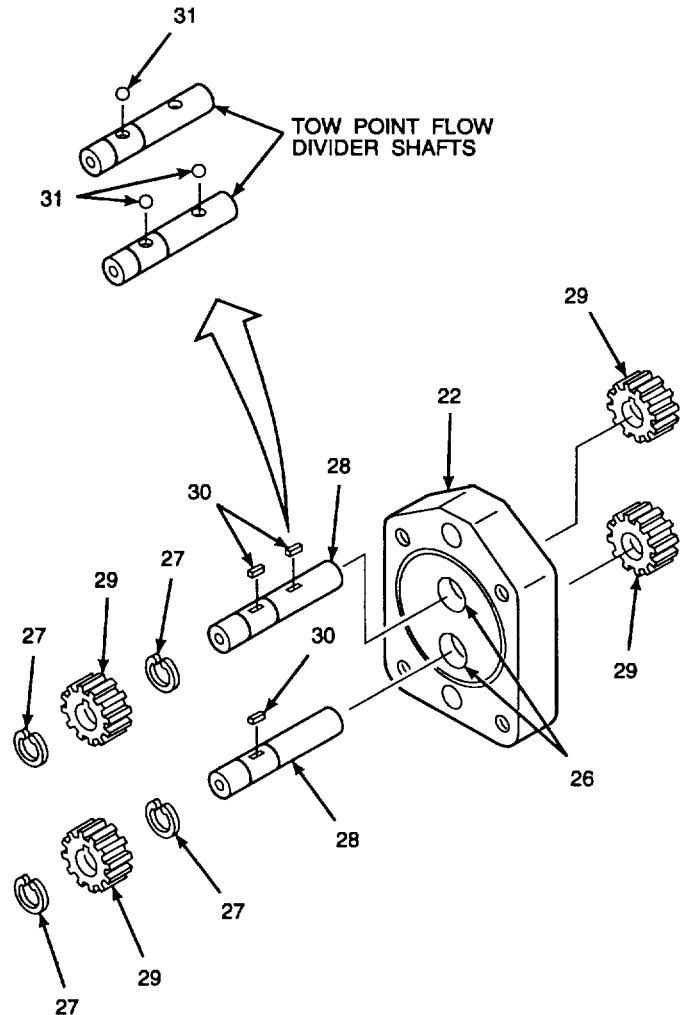
Gears shown are for auger/conveyor and valve and cylinder flow dividers. Gears for tow point flow divider are narrower than those in auger/conveyor and valve and cylinder flow dividers. Procedure for removal is the same for all units.

- b. Slide gears (29) off of shafts (28).

**NOTE**

Illustration shown is for auger/conveyor and valve and cylinder flow dividers. If tow point flow divider gear and shaft assembly is being disassembled, metal balls will be removed from shaft instead of dowel keys. Only 3 metal balls are used. Procedure for disassembly is the same for all units.

- c. Remove dowel keys (30) or metal balls (31) from shafts (28).
- d. Slide shafts (28) through bearings (26) in spacer plate (22).
- e. Remove retaining rings (27) on inner side of shafts (28) with snap ring pliers.



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- B. CLEAN.
- 1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from flow divider body, threaded surfaces, bores, and gears.
- c. Dry all parts with a clean, lint-free cloth.

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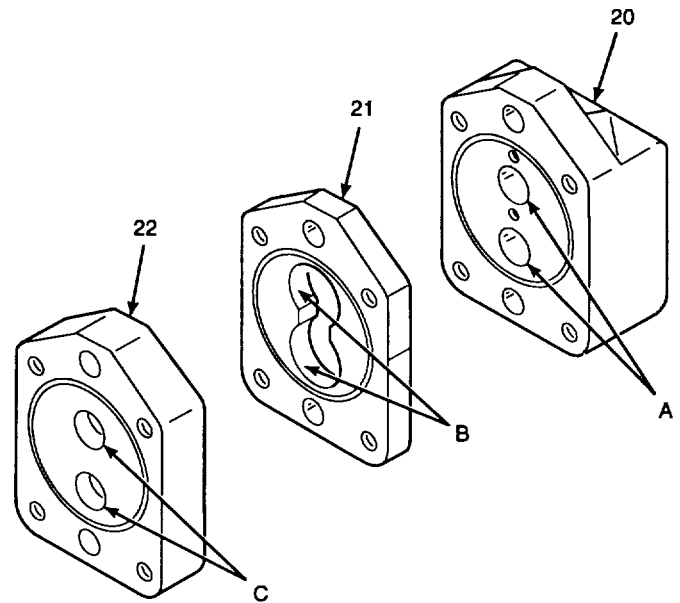
**2.49 REPAIR AUGER/CONVEYOR, VALVE AND CYLINDER, AND TOW POINT FLOW DIVIDERS - Continued.**

- B. CLEAN Continued.
2. CLEAN FASTENER THREADS.

**WARNING**

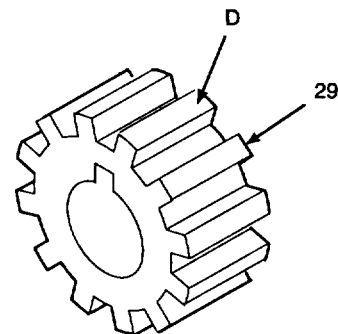
**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Clean all hex head cap screws with thread locking compound solvent.
- b. Wipe hex head cap screws dry with a cleaning cloth.
- c. Wipe hydraulic fittings with a cleaning cloth to remove hydraulic fitting sealant residue.



- C. INSPECT.
1. INSPECT END PLATES, CASES, AND SPACER PLATE FOR WEAR.
    - a. Visually inspect end plates (20), surface A, cases (21), surface B, and spacer plate (22), surface C, for wear from gear movement.
    - b. Replace either end plate (20), case (21), or spacer plate (22) if excessive wear is detected.
  2. INSPECT GEARS FOR DAMAGE.

- a. Visually inspect gears (29), surface D, for damaged or chipped teeth.
- b. If auger/conveyor flow divider or valve and cylinder flow divider gears are being inspected, replace gear if damaged or chipped teeth are detected.
- c. If tow point flow divider gear is being inspected, replace entire flow divider if damaged or chipped teeth are detected.



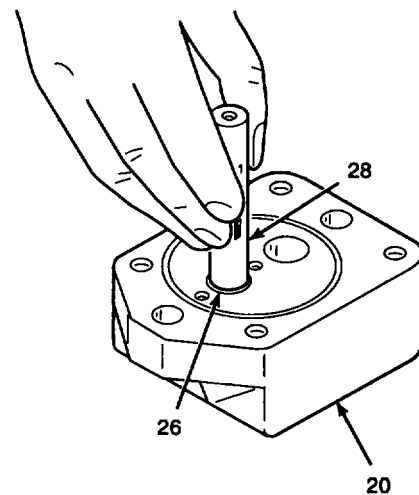
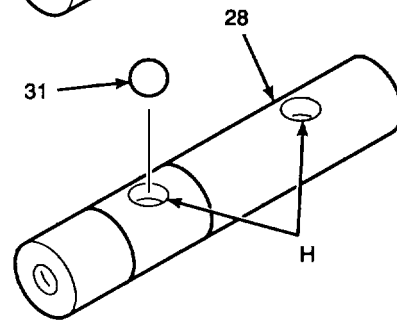
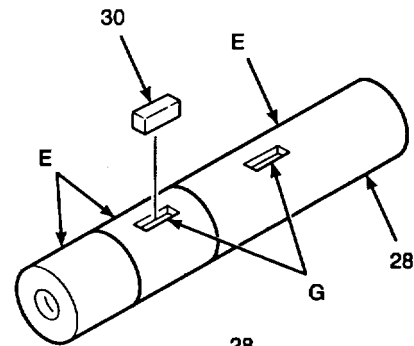
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- C. INSPECT - Continued.
- 3. INSPECT SHAFT FOR SCORING AND WEAR.

**NOTE**

**Auger/conveyor and valve and cylinder flow divider shaft is shown. Procedure for inspection is the same for tow point flow divider shaft.**

- a. Visually inspect shaft (28), bearing surface E, for scoring.
  - b. Run your fingernail along shaft bearing surface E and feel for excessive wear.
  - c. Inspect dowel key slots G and metal ball sockets H for nicks or damage that would affect installation of dowel keys (30) and metal balls (31).
  - d. Inspect dowel keys (30) and metal balls (31) for nicks, dents, or misshapening that would affect the installation of the slide gears. Replace any damaged dowel keys or metal balls.
  - e. If auger/conveyor flow divider or valve and cylinder flow divider shaft is being inspected, replace shaft if scoring or excessive wear is detected.
  - f. If tow point flow divider shaft is being inspected, replace entire flow divider if scoring or excessive wear is detected.
- 4. INSPECT BEARINGS FOR ROUGHNESS AND WEAR.
    - a. Insert shaft (28) in end plates (20), seating shaft on bearings (26).
    - b. Turn shaft (28) by hand in end plates (20) and spacer plate. Feel for roughness or wear on bearings.
    - c. If bearings turn rough or feel excessively worn, replace end plates (20) or spacer plate.



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D. ASSEMBLE.

1. INSTALL SHAFTS, DOWEL KEYS, GEARS, AND RETAINING RINGS ONTO SPACER PLATE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Dip all metal spacer plate parts being assembled in clean hydraulic oil prior to assembly.
- b. Install shafts (28) through bearings (26) in spacer plate (22).

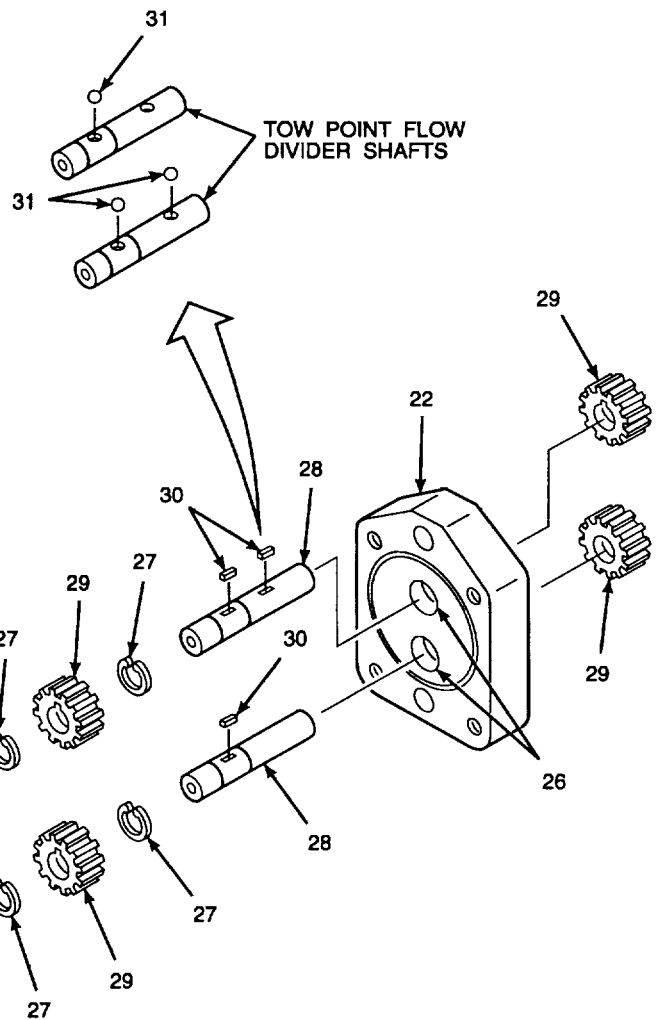
**WARNING**

Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- c. Use snap ring pliers and install inner retaining rings (27) onto shaft (28).

**NOTE**

Illustration shown is for auger/conveyor and valve and cylinder flow dividers. If tow point flow divider gear and shaft assembly is being assembled, metal balls will be installed on shaft instead of dowel keys. Procedure is the units.



**NOTE**

Gears shown are for auger/conveyor and valve and cylinder flow dividers. Gears for tow point flow divider are narrower than those in auger/conveyor and valve and cylinder flow dividers. Procedure for installation is the same for all same for all units.

- e. Install gears (29) on each shaft (28).
- d. Install dowel keys (30) or metal balls (31) on each shaft (28). f. Use snap ring pliers and install outer retaining rings (27).

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- D. ASSEMBLE Continued.
- 2. INSTALL DOWEL PINS, CASES, AND END PLATES ONTO FLOW DIVIDER.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

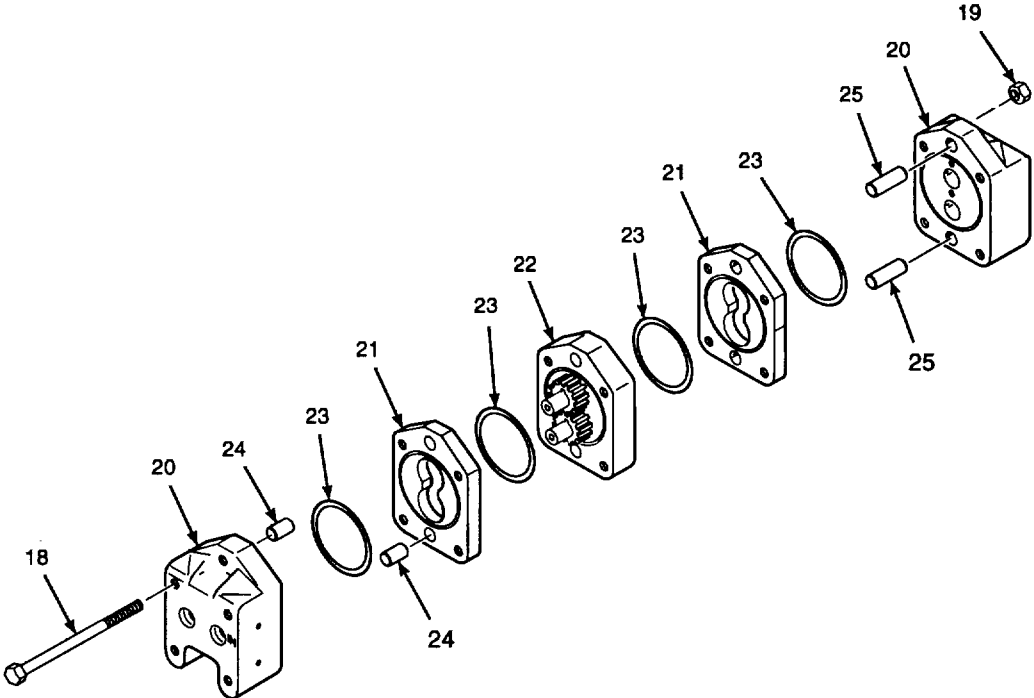
- a. Dip all metal flow divider parts being assembled in clean hydraulic oil prior to assembly.
- b. Install dowel pins (24 and 25) into end plates (20).
- c. Lubricate preformed packings (23) with petrolatum. Install preformed packings into end plate (20) and spacer plate (22).

- d. Assemble end plates (20), spacer plate (22), and cases (21). Ensure preformed packings (23) are seated in seal grooves.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply thread locking compound to hex head cap screws (18).
- f. Install hex head cap screws (18) through flow divider.
- g. Install hex nuts (19) on hex head cap screw threads. Tighten hex nuts to 15 lb-ft (20 N•m).



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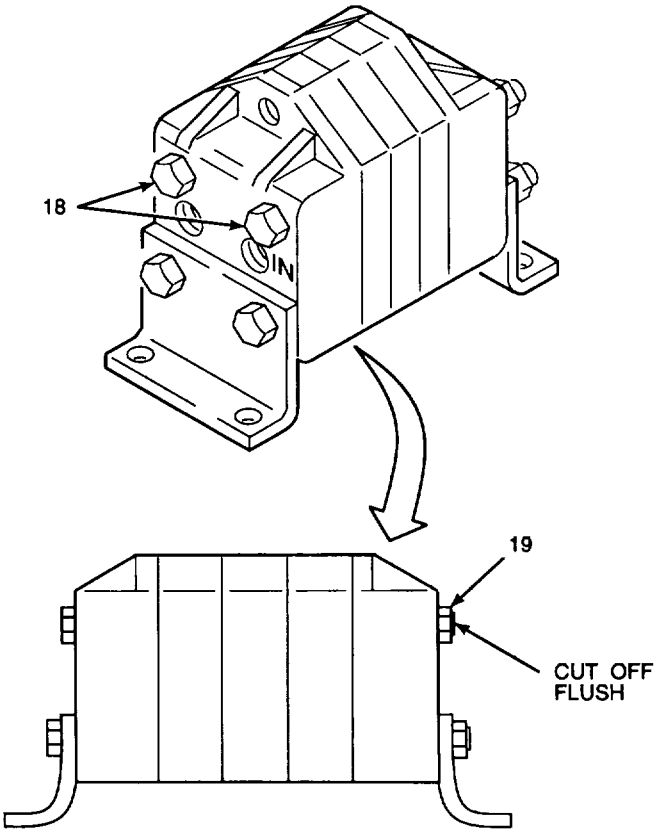
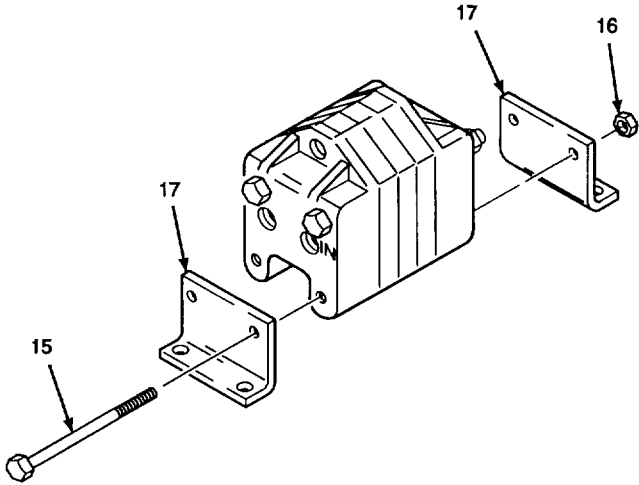
2.49 REPAIR AUGER/CONVEYOR, VALVE AND CYLINDER, AND TOW POINT FLOW DIVIDERS - Continued.

- D. ASSEMBLE - Continued.
- 3. INSTALL MOUNTING BRACKETS ON FLOW DIVIDER.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply thread locking compound to hex head cap screws (15).
  - b. Position mounting brackets (17) on flow divider.
  - c. Install hex head cap screws (15) through mounting brackets (17) and flow divider.
  - d. Install hex nuts (16) on hex head cap screws (15). Tighten hex nuts to 15 lb-ft (20 N•m).
4. IF NEW HEX HEAD CAP SCREWS HAVE BEEN INSTALLED, USE A HACK SAW TO CUT OFF THREADS OF HEX HEAD CAP SCREW (18) THAT PROTRUDE BEYOND HEX NUT (19).

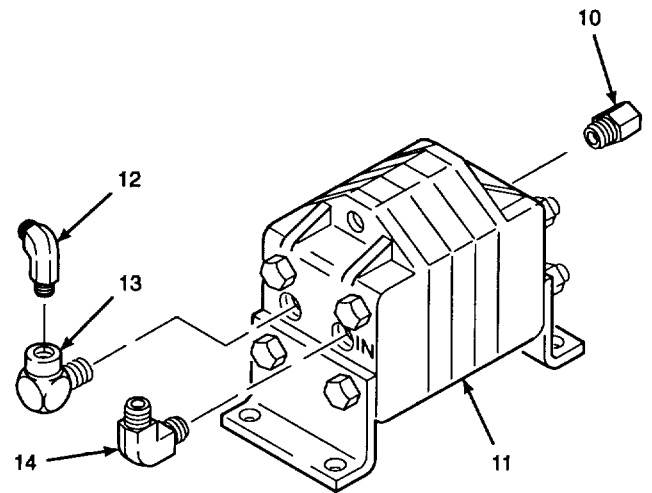


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- D. ASSEMBLE - Continued.
5. INSTALL HYDRAULIC FITTINGS ON FLOW DIVIDER.
- a. Install hydraulic fittings on tow point flow divider.

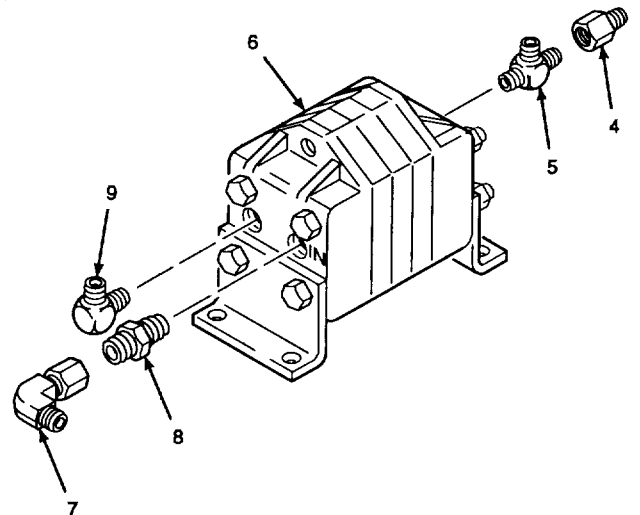
**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- (1) Apply pipe sealant to one end of elbow (14), male end of elbow (13), and to pipe thread end of elbows (10 and 12).
- (2) Install elbows (14 and 13), with both elbows pointing toward top of tow point flow divider (11).
- (3) Install elbow (12), with elbow pointing away from tow point flow divider (11) as shown.
- (4) Install elbow (10), with elbow pointing down approximately 45° toward base of tow point flow divider (11).

- b. Install hydraulic fittings on valve and cylinder flow divider.



- (1) Apply pipe sealant to pipe thread ends of elbow (9), straight adapter (8), and tee (5).
- (2) Install elbow (9), with elbow pointing toward top of valve and cylinder flow divider (6).
- (3) Install straight adapter (8).
- (4) Install elbow (7) onto straight adapter (8) pointing straight out to the side as shown.
- (5) Install tee (5), with tee pointing toward top of valve and cylinder flow divider (6).
- (6) Install tube reducer (4) onto tee (5).

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2-673

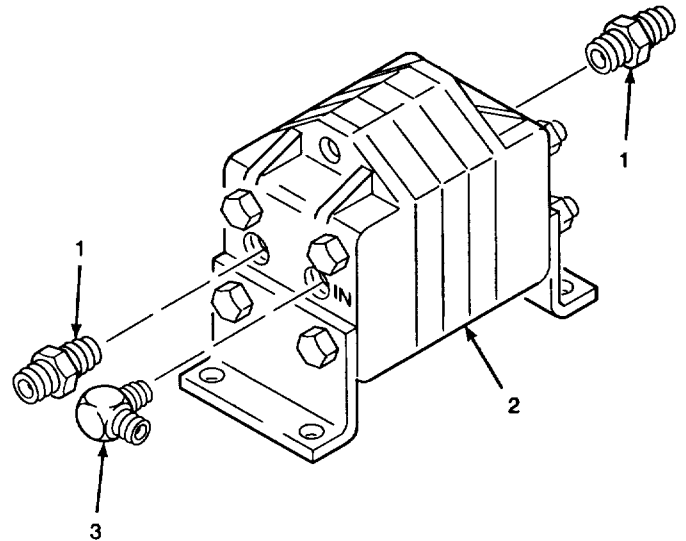
**2.49 REPAIR AUGER/CONVEYOR, VALVE AND CYLINDER, AND TOW POINT FLOW DIVIDERS - Continued.****D. ASSEMBLE - Continued.**

- c. Install hydraulic fittings onto auger/conveyor flow divider.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- (1) Apply pipe sealant to pipe thread end elbow (3) and straight adapters (1).
- (2) Install elbow (3) onto auger/conveyor flow divider (2), with elbow pointing away from flow divider.
- (3) Install straight adapters (1).

**NOTE**

**FOLLOW-ON-TASK: Install flow divider repaired per paragraph 2.55.**

**END OF TASK**

**2.50 REPAIR TOW POINT FLOW CONTROL VALVE.**

This task covers: a. Disassemble b. Clean c. Inspect  
d. Assemble

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)

Bench vise (Item 112, Appendix D)

O-ring tool (Item 103, Appendix D)

**References:**

TM 5-3895-373-24P

**Equipment Condition:**

Tow point flow control valve removed per paragraph 2.55.

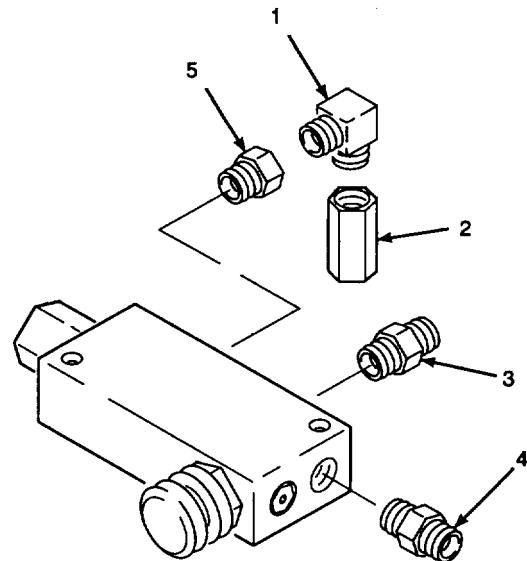
**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Packing retainers  
Preformed packings

**A. DISASSEMBLE.****NOTE**

**Use bench vise, as required, to support tow point flow control valve during disassembly.**

1. REMOVE FITTINGS FROM TOW POINT FLOW CONTROL VALVE.
  - a. Remove elbow (1) and pipe coupling (2).
  - b. Remove straight adapters (3 and 4) and pipe bushing (5).



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**2.50 REPAIR TOW POINT FLOW CONTROL VALVE - Continued.**

- A. DISASSEMBLE - Continued.
2. DISASSEMBLE TOW POINT FLOW CONTROL VALVE.
- Remove knobs (6 and 7). Outer knob (6) is press fit. Inner knob (7) is threaded.
  - Remove flow adjustment assembly (8) from valve body (9).
  - Remove cap nut (10) and packing retainer (11). Discard packing retainer.
  - Remove spring (12).

**CAUTION**

Do not remove spool and sleeve unless spool or sleeve are known to be defective or leaking hydraulic oil. Do not scratch inside surfaces of sleeve when removing sleeve from valve body. Damage to sleeve and spool may result from improper removal. Use an o-ring tool to remove sleeve from valve body.

- If necessary, remove spool (13) from valve body (9).

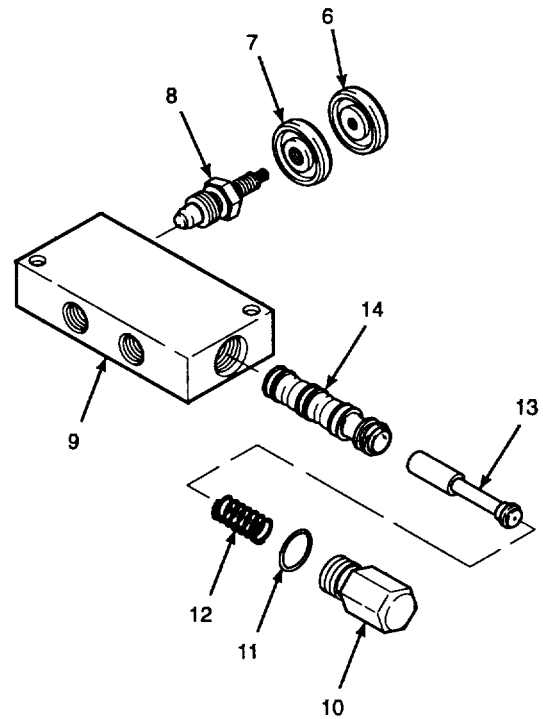
**CAUTION**

Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.

**NOTE**

It may be necessary to tap sleeve lightly to allow removal.

- Use an o-ring tool to grasp sleeve (14) on inside surfaces and pull sleeve from valve body (9).
- After sleeve (14) is removed, insert spool (13) into sleeve for protection and ease of handling.



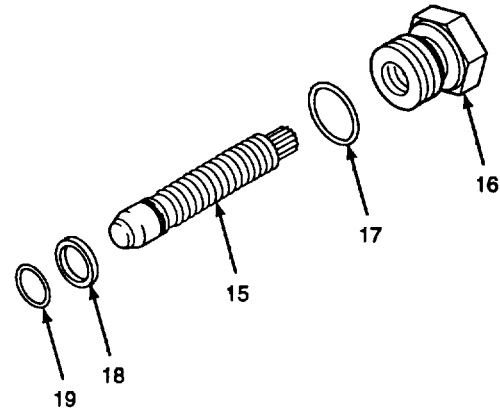
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- A. DISASSEMBLE - Continued.
- 3. DISASSEMBLE FLOW ADJUSTMENT ASSEMBLY.

- a. Remove stem (15) from plug (16).

**CAUTION**

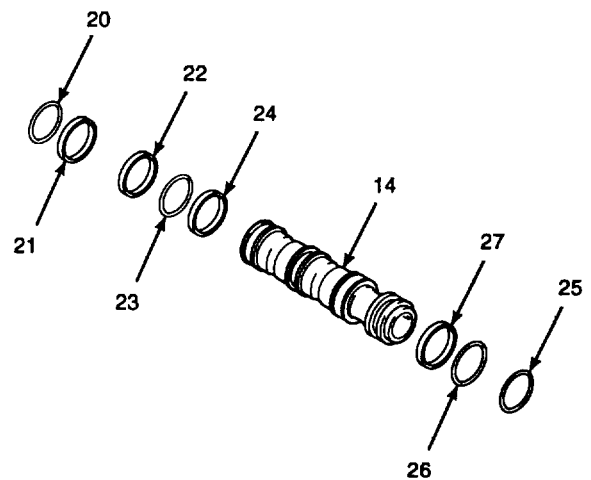
**Use caution when removing seals and preformed packings. Scratched or dented seal grooves can cause bypass leakage. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.**



- b. Use an o-ring tool to remove preformed packing (17) from plug (16). Discard preformed packing.
- c. Use an o-ring tool to remove packing retainer (18) and preformed packing (19). Discard packing retainer and preformed packing.

- 4. REMOVE PREFORMED PACKINGS AND PACKING RETAINERS FROM SLEEVE.

- a. Use an o-ring tool to remove preformed packing (20), packing retainers (21 and 22), preformed packing (23) and packing retainer (24) from sleeve (14). Discard preformed packings and packing retainers.
- b. Use an o-ring tool to remove preformed packings (25 and 26) and packing retainer (27). Discard preformed packings and packing retainer.



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**2.50 REPAIR TOW POINT FLOW CONTROL VALVE - Continued.**

---

- B. CLEAN.  
1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to remove any foreign matter from valve body bore, threaded surfaces, and seal grooves. Dry all parts with a clean, lint-free cloth.

2. FLUSH VALVE BODY.

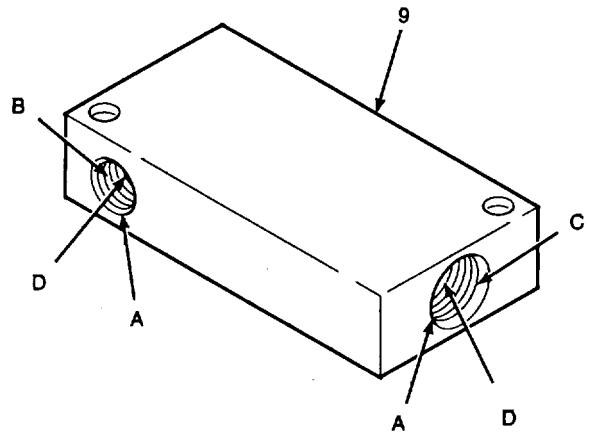
- a. Flush valve body with cleaning solvent to remove any foreign material from valve body passages.
- b. Use a culture swab to wipe out valve body inner bore.

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2-678**

C. INSPECT.

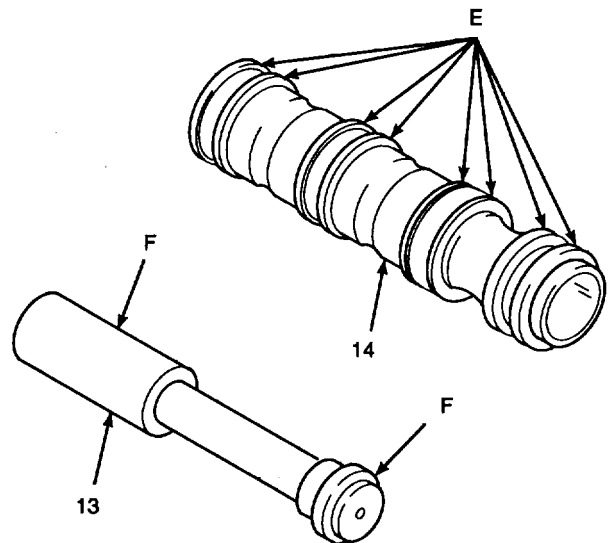
1. INSPECT VALVE BODY FOR STRIPPED THREADS, SCRATCHED OR DENTED SEAL GROOVES, AND FOREIGN MATERIAL.

- a. Visually inspect surface A on valve body (9) for stripped threads. Inspect seal grooves B and C for scratches or dents. Use a strong light and inspect inner bore D for foreign material, scoring, or excessive wear.
- b. Replace entire tow point flow control valve if stripped threads, damaged seal grooves, scoring, or excessive wear are detected.



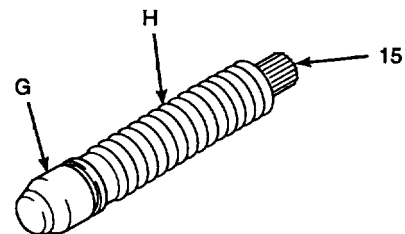
2. INSPECT SLEEVE AND SPOOL FOR SCORING OR SCRATCHING FROM FOREIGN MATERIAL.

- a. Inspect surfaces E on sleeve (14) and F on spool (13) for scoring and scratches from foreign material.
- b. Replace entire tow point flow control valve if scoring or scratching from foreign material is detected on sleeve (14) or spool (13).



3. INSPECT STEM FOR SCORING OR SCRATCHING FROM FOREIGN MATERIAL.

- a. Inspect surface G on stem (15) for scoring or scratching from foreign material. Inspect surface H for stripped threads.
- b. Replace entire tow point flow control valve if scoring or scratching from foreign material or stripped threads is detected.



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2.50 REPAIR TOW POINT FLOW CONTROL VALVE - Continued.

D. ASSEMBLE.

**NOTE**

Use bench vise, as required, to support tow point flow valve during assembly.

1. INSTALL PREFORMED PACKINGS AND PACKING RETAINERS ON SLEEVE.

**CAUTION**

New seals and packings are distorted during installation. Use care during installation to prevent damage to seals, preformed packings, and seal grooves. Bypass leakage can result from poor installation.

- a. Lubricate preformed packings (20, 23, 25, and 26) and packing retainers (21, 22, 24, and 27) with petrolatum.
- b. Install packing retainer (27) and preformed packings (26 and 25) on sleeve (14).
- c. Install packing retainer (24), preformed packing (23), packing retainers (22 and 21), and preformed packing (20) on sleeve (14).

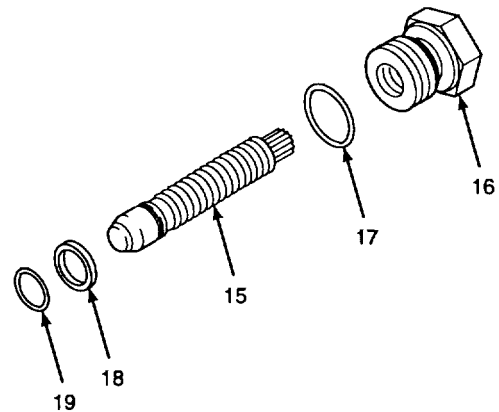
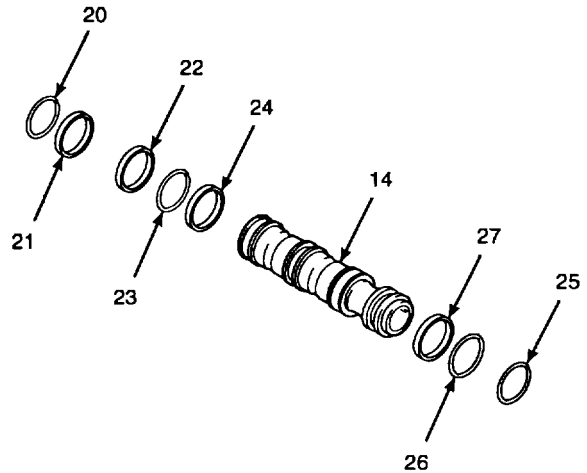
2. ASSEMBLE FLOW ADJUSTMENT ASSEMBLY.

- a. Lubricate all preformed packings and packing retainers with petrolatum.
- b. Install preformed packing (19) and packing retainer (18) on stem (15).

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- c. Install preformed packing (17) onto plug (16).
- d. Install stem (15) into plug (16).



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- D. ASSEMBLE - Continued.  
 3. ASSEMBLE TOW POINT FLOW CONTROL VALVE.

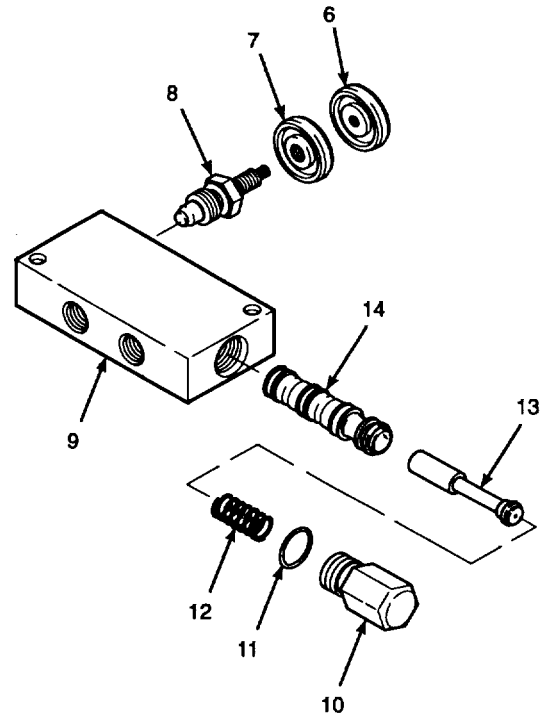
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

New packing retainers and preformed packings are distorted after installation. Allow a minimum of one hour for packing retainers and preformed packings to conform to original shape before assembling sleeve and flow adjustment assembly into valve body. Bypass leakage can result from poor installation.

- a. Lubricate flow adjustment assembly (8), sleeve (14), and spool (13) with clean hydraulic oil.
- b. Install sleeve (14) into valve body (9). When inserting sleeve, orient sleeve as shown in illustration.
- c. Carefully insert spool (13) into valve body (9). When inserting spool into sleeve, orient spool as shown in illustration.
- d. Install spring (12) into valve body (9).



**CAUTION**

Be careful not to damage packing retainer when sliding over threads. Sharp edges of thread can cut or damage packing retainer. Damaged packing retainer will cause leakage and affect performance.

- e. Lubricate packing retainer (11) with petrolatum. Install packing retainer onto cap nut (10). Install cap nut onto valve body (9).
- f. Install flow adjustment assembly (8) into valve body (9).
- g. Install knobs (7 and 6) onto flow adjustment assembly (8). Inner knob (7) is threaded on. Outer knob (6) is press fit.

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 2-681

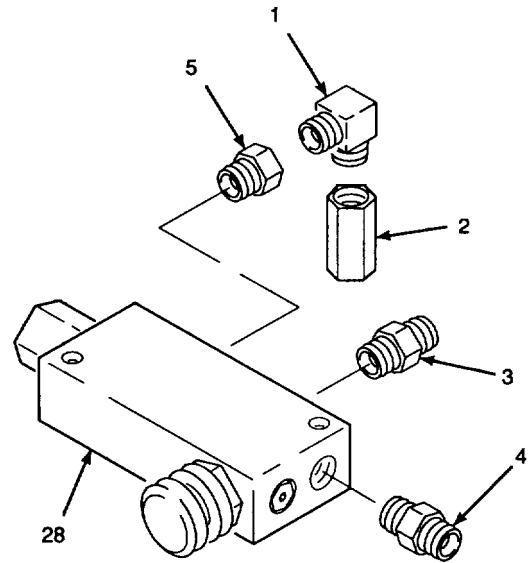
**2.50 REPAIR TOW POINT FLOW CONTROL VALVE - Continued.**

- D. ASSEMBLE - Continued.
4. INSTALL FITTINGS ONTO TOW POINT FLOW CONTROL VALVE.
- a. Use cleaning cloth to wipe residue from threads of all fittings.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply pipe sealant to pipe threads of straight adapters (3 and 4) and male threads of pipe bushing (5). Install and tighten straight adapters and pipe bushing.
- c. Apply pipe sealant to only one end of elbow (1). Install treated side of elbow into pipe bushing (5). Position elbow to face toward bottom of tow point flow control valve (28). Tighten elbow.
- d. Apply pipe sealant to exposed threads of elbow (1).
- e. Install pipe coupling (2) onto elbow (1). Tighten pipe coupling.

**NOTE**

**FOLLOW-ON-TASK:** Install tow point flow control valve on valve panel per paragraph 2.55.

**END OF TASK**

**2.51 ADJUST UNLOADING AND RELIEF VALVES.**

This task covers: a. Check b. Adjust

**INITIAL SETUP**

Tools:

- General mechanic's automotive tool kit  
(Item 106, Appendix D)
- Hydraulic systems test and repair tool outfit (HSTRU)  
(Item 108, Appendix D)
- O-ring tool (Item 103, Appendix D)

References:

- TM 5-3895-373-10
- TM 5-3895-373-24P
- TM 9-4940-468-14

Materials/Parts:

- Hydraulic oil (Item 21, Appendix B)
- Preformed packings

**NOTE**

**Hydraulic valves can be checked and adjusted on or off the paving machine. In both cases, the hydraulic systems test and repair tool outfit (HSTRU) is used. Off-machine checks and adjustments apply to valves returned to the DS/GS level for repair. On-machine checks and adjustments apply to valves installed in their respective hydraulic systems.**

- b. Slowly increase hydraulic test pressure to approach relief pressure setting cited in the following table. If valve opens before cited relief pressure is reached, adjust valve to increase relief pressure per applicable ADJUST procedure. If valve fails to open when cited relief pressure is reached, adjust valve to reduce relief pressure setting. If valve adjustment does not achieve cited relief pressure setting, repair or replace valve.

**A. CHECK.**

**1. CHECK OFF-MACHINE UNLOADING AND RELIEF VALVES.**

- a. Set up valve for relief pressure check and adjustment per TM 9-4940-468-14.

VALVE TO BE CHECKED	RELIEF PRESSURE SETTING PSI (kPa)
Stack Relief Valve	2500 (17 238)
Track Tensioning Relief Valve	1800 (12 411)
Track Tensioning Unloading Valve	900 (6 206)
Vibration Relief Valve	2000 (13 790)
Auger/Conveyor Relief Valves	2750 (18 961)
Tow Point Control Valves	1500 (10 343)

**GO TO NEXT PAGE**



**2.51 ADJUST UNLOADING AND RELIEF VALVES - Continued.**

- A. CHECK Continued.
2. CHECK ON-MACHINE UNLOADING AND RELIEF VALVES.

a. With paving machine shut down and load removed from applicable hydraulic circuit, set up paving machine and test equipment for relief pressure check. Equipment setup procedures and required relief pressure settings for each valve are referenced in the following table. Refer to TM 9-4940-468-14 for test equipment setup.

VALVE TO BE CHECKED	SETUP AND TEST PROCEDURES	PRESSURE SETTING PSI (kPa)
Stack Relief Valve	Para. 2.11, Malfunction 1, Step 2	2500 (17 238)
Track Tensioning Relief Valve	Para. 2.7, Malfunction 1, Step 2	1800 (12 411)
Track Tensioning Unloading Valve	Para. 2.7, Malfunction 1, Step 2	900 (6 206)
Vibration Relief Valve	Para. 2.13, Malfunction 1, Step 1	2000 (13 790)
Auger/Conveyor Relief Valves	Para. 2.12, Malfunction 1, Step 2	2750 (18 961)
Tow Point Control Valves	Para. 2.9, Malfunction 1, Step 2	1500 (10 343)

- b. Start paving machine and set throttle control switch to MAX position per TM 5-3895-373-10.
- c. Measure relief pressure and/or flow of valve per test procedures referenced in table. If measured relief pressure is less than or greater than relief pressure cited in table, adjust relief pressure setting per applicable ADJUST procedure. If valve adjustment does not achieve cited relief pressure setting, replace valve.

**GO TO NEXT PAGE**

B. ADJUST.

**NOTE**

Valves are illustrated as located on the paving machine for on-machine adjustment. Valve settings are measured using hydraulic systems test and repair tool outfit. Refer to TM 9-4940468-14 for procedures.

Before adjusting a valve installed on the machine, you should perform equipment setup per step A.2.

1. ADJUST STACK RELIEF VALVE.

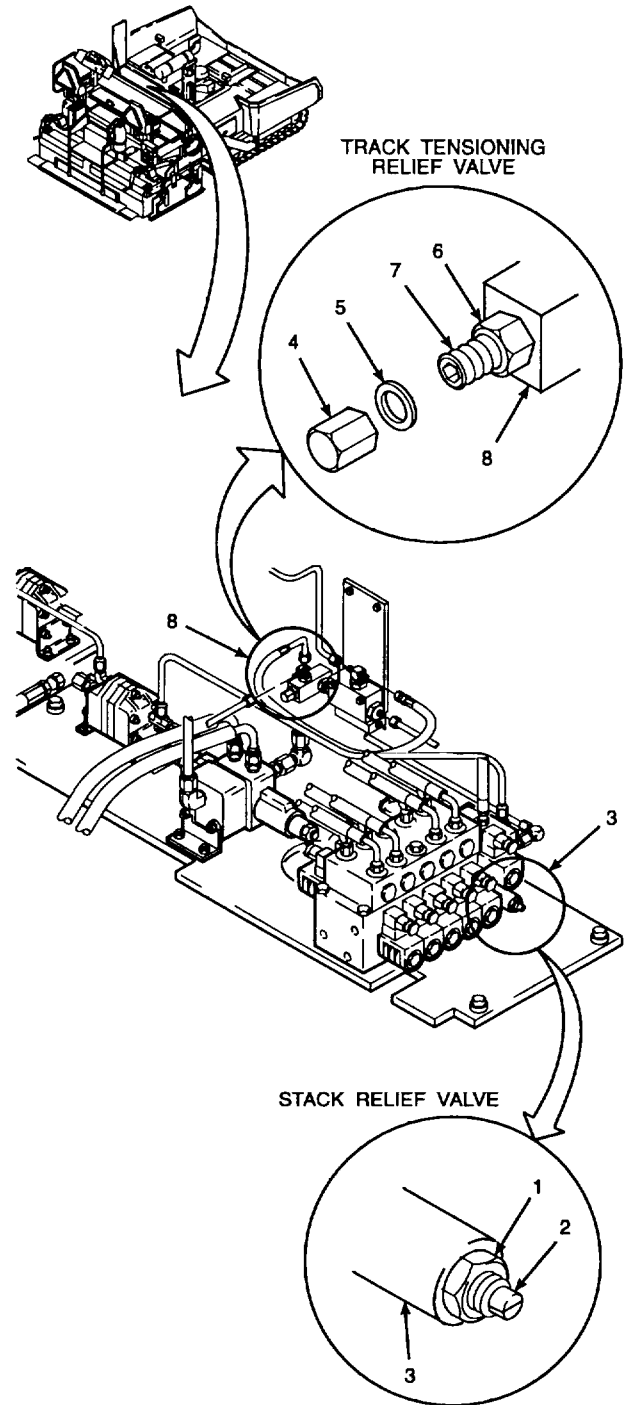
- a. Loosen jam nut (1).
- b. Turn adjustment screw (2) clockwise to increase relief valve setting or counterclockwise to decrease relief valve setting.
- c. Set stack valve safety relief valve (3) to 2500 psi (17 238 kPa).
- d. Tighten jam nut (1). Ensure adjustment screw (2) does not turn while tightening jam nut.
- e. Recheck pressure setting.

2. ADJUST TRACK TENSIONING RELIEF VALVE.

**NOTE**

Before adjusting track tensioning relief pressure while the valve is in the machine, loosen hex nut and turn adjustment screw on track tensioning unloading valve clockwise until it is all the way in. Refer to step 3.b.

- a. Remove cap nut (4) and flat washer (5).
- b. Loosen hex nut (6).
- c. Turn adjusting screw (7) clockwise to increase relief pressure setting or counterclockwise to decrease relief setting. Ensure stack valve relief pressure is set to 2500 psi (17 238 kPa) per step 1.c.
- d. Set track tensioning relief valve (8) to 1800 psi (12 411 kPa).



- e. Tighten hex nut (6). Ensure adjusting screw (7) does not turn while tightening hex nut.
- f. Recheck pressure setting.
- g. Install flat washer (5) and cap nut (4). Tighten cap nut.

2.51 ADJUST UNLOADING AND RELIEF VALVES - Continued. --

B. ADJUST - Continued.

3. ADJUST TRACK TENSIONING UNLOADING VALVE.

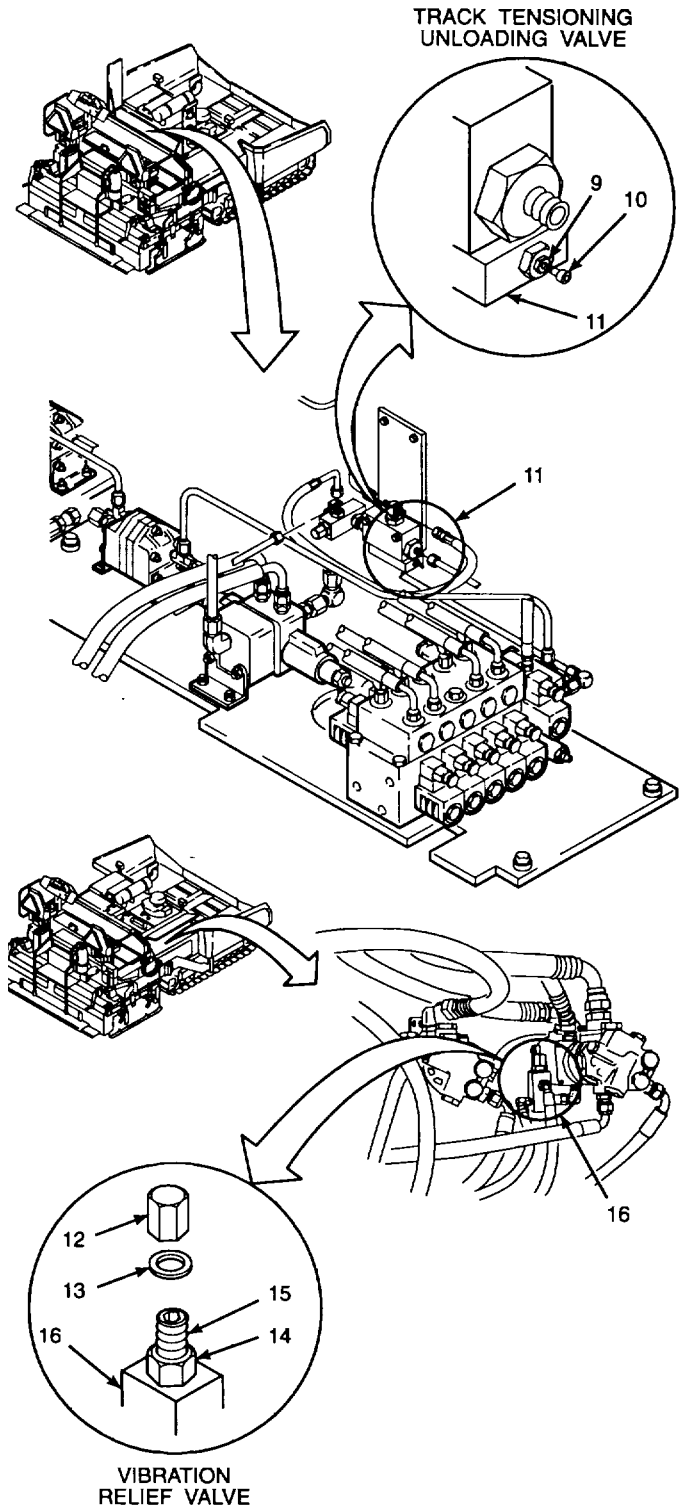
**NOTE**

Before adjusting track tensioning unloading valve pressure while the valve is in the machine, ensure stack valve relief pressure is set to 2500 psi (17 238 kPa) and track tensioning relief valve pressure is set to 1800 psi (12 411 kPa). Refer to steps 1.c and 2.d.

- a. Loosen hex nut (9). Turn adjustment screw (10) counterclockwise all the way out.
- b. Turn adjustment screw (10) clockwise to increase valve setting.
- c. Set track tensioning unloading valve (11) to 900 psi (6206 kPa). If setting causes valve to stay closed at pressures greater than 900 psi, repeat steps a and b.
- d. Tighten hex nut (9). Ensure adjustment screw (10) does not turn while tightening hex nut.
- e. Recheck pressure setting.

4. ADJUST VIBRATION RELIEF VALVE.

- a. Remove cap nut (12) and flat washer (13).
- b. Loosen hex nut (14).
- c. Turn adjusting screw (15) clockwise to increase relief pressure setting or counterclockwise to decrease relief pressure setting.
- d. Set vibration relief valve (16) to 2000 psi (13 790 kPa).
- e. Tighten hex nut (14). Ensure adjusting screw (15) does not turn while tightening hex nut.
- f. Recheck pressure setting.
- g. Install flat washer (13) and cap nut (12). Tighten cap nut.



- B. ADJUST - Continued.
5. ADJUST AUGER/CONVEYOR RELIEF VALVES.

**NOTE**

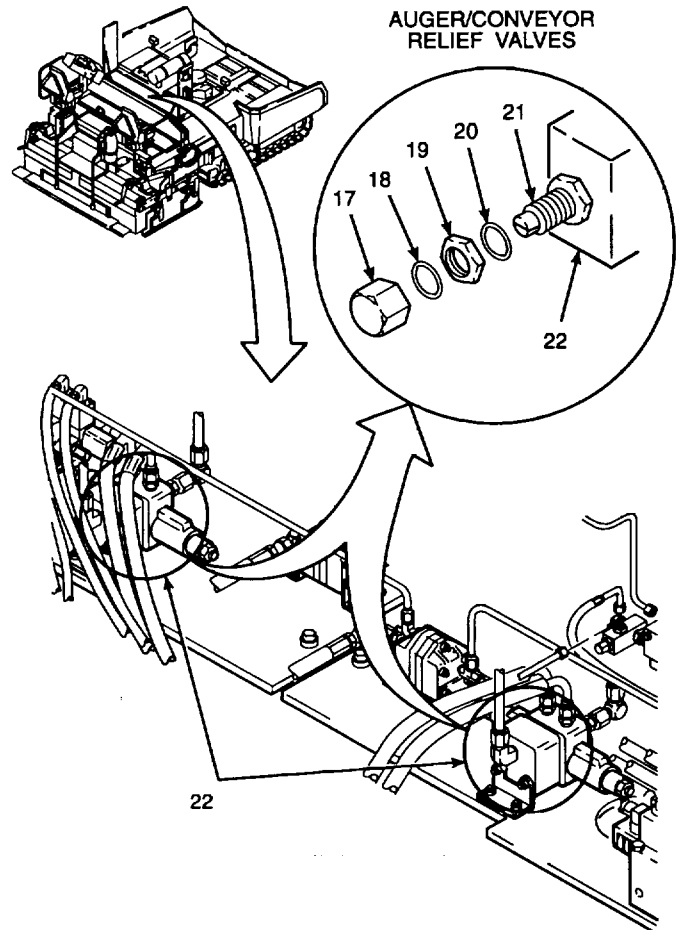
This procedure applies to both left hand and right hand auger/conveyor relief valves.

- a. Remove valve cap (17).

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.

- b. Use an o-ring tool to remove preformed packing (18) from valve cap (17).
- c. Remove compression nut (19).
- d. Use an o-ring tool to remove preformed packing (20) from compression nut (19).
- e. Turn adjustment screw (21) clockwise to increase relief valve setting or counterclockwise to decrease relief valve setting.
- f. Set auger/conveyor relief valves (22) to 2750 psi (18 961 kPa).



**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure.

Eye protection and rubber gloves must be worn when working with hydraulic oil.

- g. Lubricate preformed packings (18 and 20) with clean hydraulic oil.
- h. Install preformed packing (18) onto valve cap (17).
- i. Install preformed packing (20) onto compression nut (19).

**CAUTION**

Be careful not to damage preformed packings when sliding over threads. Sharp edges of threads can cut or damage preformed packings. Damaged preformed packings will cause leakage and affect performance.

- j. Install compression nut (19) onto auger/conveyor relief valve (22).
- k. Recheck pressure setting.
- l. Install valve cap (17). Tighten valve cap.

**2.51 ADJUST UNLOADING AND RELIEF VALVES - Continued.**

- B. ADJUST Continued.
6. ADJUST TOW POINT CONTROL VALVES.

**NOTE**

This procedure applies to both left hand and right hand tow point control valves.

- a. Remove cap nut (23).

**CAUTION**

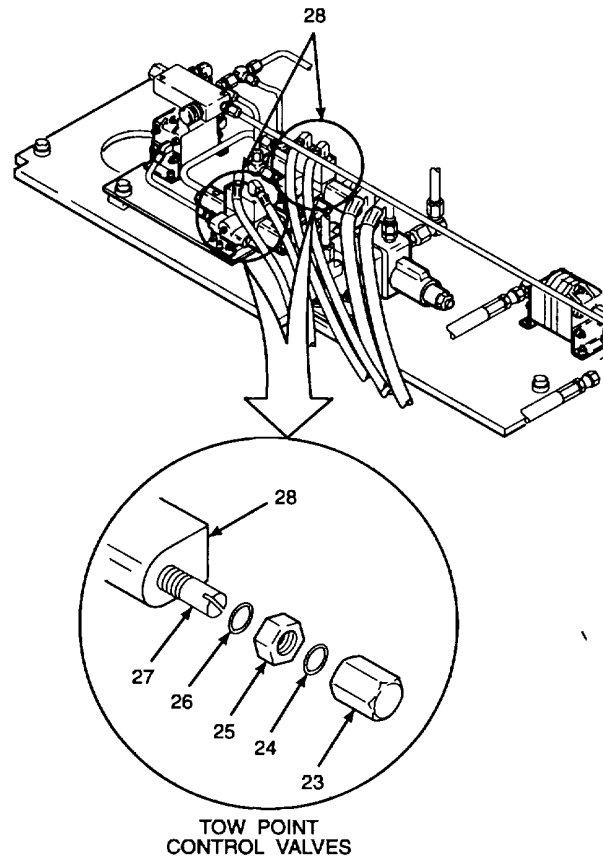
Use caution when removing seals and preformed packings. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool to remove seals and preformed packings.

- b. Use an o-ring tool to remove preformed packing (24) from cap nut (23).
- c. Remove self-locking hex nut (25).
- d. Use an o-ring tool to remove preformed packing (26) from self-locking hex nut (25).
- e. Turn adjustment screw (27) clockwise to increase valve setting or counterclockwise to decrease valve setting.
- f. Set tow point control valve (28) to 1500psi (10 343 kPa).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and preformed packings will cause leakage and affect respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- g. Lubricate preformed packings (24 and 26) with clean hydraulic oil.
- h. Install preformed packing (24) onto cap nut (23).



- i. Install preformed packing (26) onto self-locking hex nut (25).

**CAUTION**

Be careful not to damage preformed packings when sliding over threads. Sharp edges of threads can cut or damage preformed packings. Damaged preformed packings will cause leakage and affect.

- j. Install self-locking hex nut (25) onto tow point relief valve (28).
- k. Recheck pressure setting.
- l. Install cap nut (23). Tighten cap nut.

**END OF TASK**

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**2.52 REPAIR TOW POINT CYLINDER.**


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This task covers: a. Disassemble b. Clean c. Inspect  
d. Assemble

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Torque wrench (Item 132, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

References:

TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

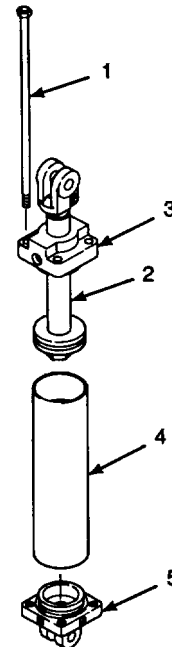
Tow point cylinder removed from paving machine  
per TM 5-3895-373-20.

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Crocus cloth (Item 4, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Lock nut  
Preformed packings  
Seal kit

**A. DISASSEMBLE.****1. REMOVE PISTON ROD.**

- a. Extend cylinder. Remove tie rods (1) and pull piston rod (2) with cylinder head (3) from cylinder tube (4).
- b. Remove cylinder cap (5) from cylinder tube (4).



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**2.52 REPAIR TOW POINT CYLINDER - Continued.**

- A. DISASSEMBLE Continued.
- 2. REMOVE CLEVIS, CYLINDER HEAD, AND PISTON.

**CAUTION**

**Do not clamp piston rod in bench vise. Damage to chrome surface of piston rod can result from contact with metal vise jaws.**

- a. Clamp clevis (6) in bench vise.
- b. Remove lock nut (7) and piston (8). Discard lock nut.

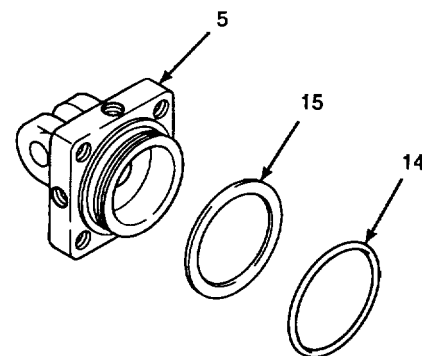
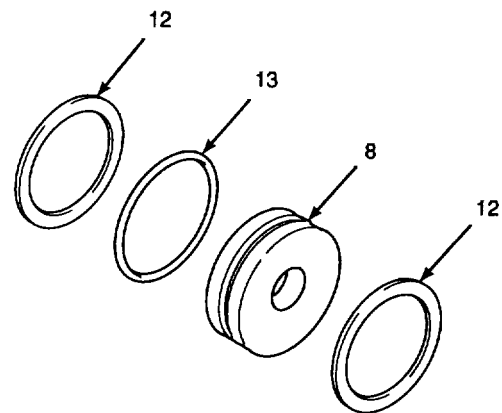
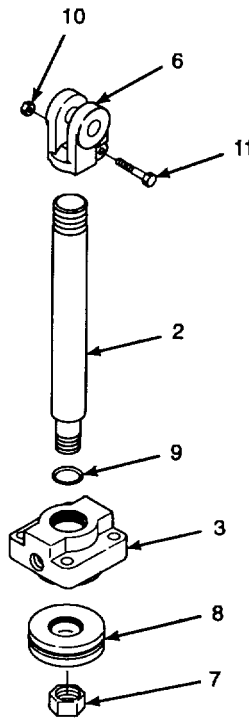
**CAUTION**

**Use caution when removing seals and preformed packings. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool. Scratched or dented seal grooves can cause bypass leakage.**

- c. Use an o-ring tool to remove preformed packing (9). Discard preformed packing.
- d. Remove cylinder head (3).
- e. Remove clevis (6) from bench vise.
- f. Remove hex nut (10), hex head cap screw (11), and clevis (6) from piston rod (2).

- 3. REMOVE PACKING RETAINERS, PREFORMED PACKINGS, AND SEALS.

- a. Use an o-ring tool to remove packing retainers (12) and preformed packing (13) from piston (8). Discard packing retainers and preformed packing.
- b. Use an o-ring tool to remove preformed packing (14) and packing retainer (15) from cylinder cap (5). Discard packing retainer and preformed packing.

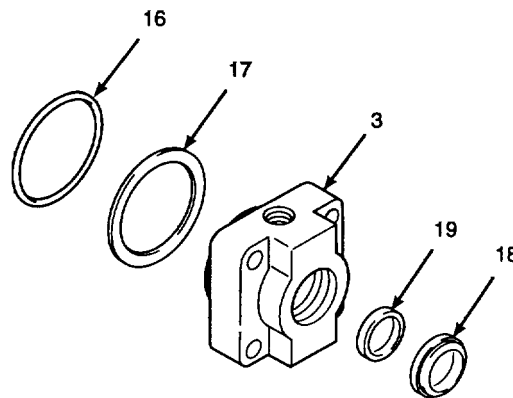


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A. DISASSEMBLE - Continued.

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force when removing seals and preformed packings. Use an o-ring tool. Scratched or dented seal grooves can cause bypass leakage.



- c. Use an o-ring tool to remove preformed packing (16) and packing retainer (17) from cylinder head (3). Discard preformed packing and packing retainer.
- d. Remove ring wiper (18) and compression cup (19). If necessary, use an o-ring tool. Discard ring wiper and compression cup.

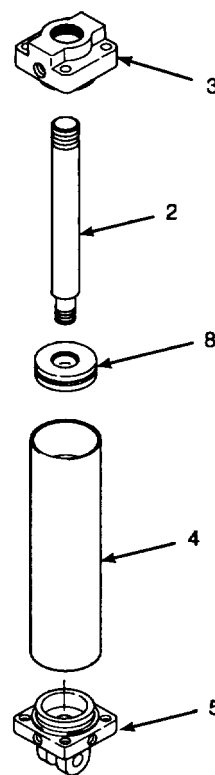
B. CLEAN.

- 1. CLEAN CYLINDER AND PISTON COMPONENTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.



- a. Rinse piston rod (2), cylinder head (3), cylinder tube (4), cylinder cap (5), and piston (8) with cleaning solvent.

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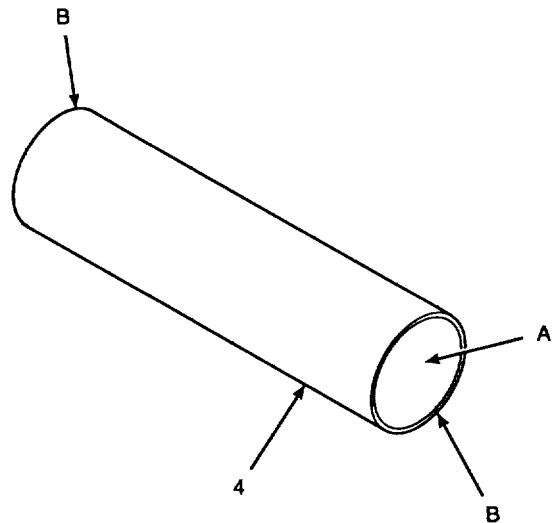
**2.52 REPAIR TOW POINT CYLINDER - Continued.****B. CLEAN - Continued.****WARNING**

**Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.**

- b. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from seal grooves, inside of cylinder tube, and all threaded surfaces.
- c. Dry parts with compressed air and lint-free cloths.

**2. WIPE OFF THREADS OF ELBOWS WITH CLEANING CLOTH.****C. INSPECT.****1. INSPECT CYLINDER TUBE.**

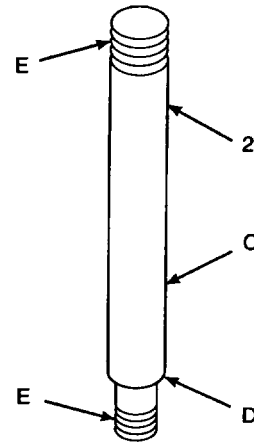
- a. Visually inspect cylinder tube (4) surface A for pitting or scoring using a strong light.
- b. Replace cylinder tube (4) if pitting or scoring is detected.
- c. Check leading edges B of inside diameter. Feel for any nicks, scratches, or sharp edges that may damage preformed packings and seals.
- d. Remove sharp edges of nicks, scratches, or burrs using crocus cloth. If nicks, scratches, or burrs cannot be removed, replace cylinder tube (4).

**GO TO NEXT PAGE**

C. INSPECT - Continued.

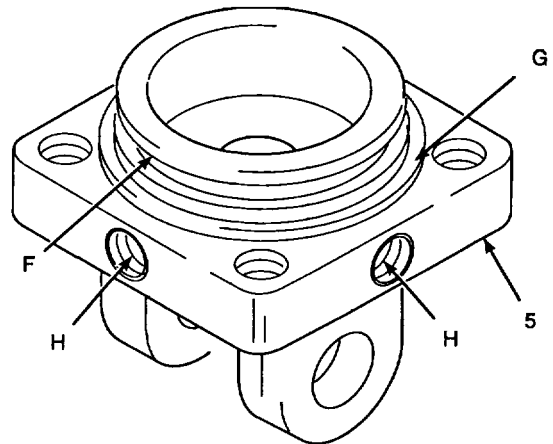
2. INSPECT PISTON ROD.

- a. Run your finger along piston rod (2) surface C. Feel for any scratches or sharp edges that may damage preformed packings and seals. Inspect surface C for scratches, pits, cracking or wear that exposes base metal through chrome plating.
- b. Remove sharp edges of nicks and scratches using crocus cloth.
- c. Replace piston rod (2) if scratches or pits cannot be polished out, if scratch exceeds 0.5 in. (12,7 mm) in length, or if base metal is exposed through chrome plating.
- d. Run your finger along edge of surface D and feel for nicks and sharp edges. Remove sharp edges using crocus cloth.
- e. If edge of surface D is cracked or broken off, replace piston rod (2).
- f. Inspect threads E. If threads are distorted, replace piston rod (2).



3. INSPECT CYLINDER CAP.

- a. Visually inspect cylinder cap (5), preformed packing groove F, and cylinder tube seating surface G. Feel for any raised edges or nicks that may damage preformed packings or impair sealing.
- b. Remove raised edges and nicks with crocus cloth.
- c. Replace cylinder cap (5) if raised edges or nicks cannot be polished out.
- d. Inspect threads H. If threads are distorted, replace cylinder cap (5).



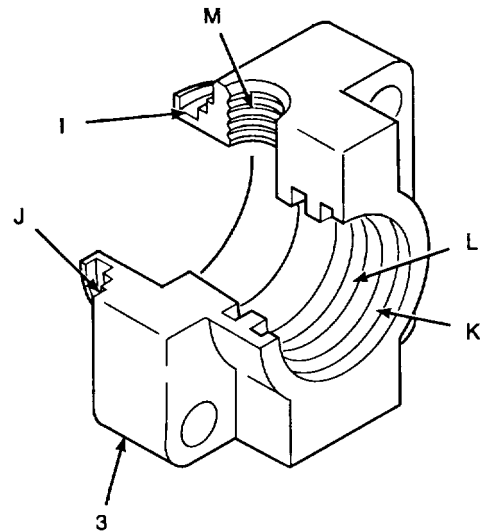
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**2.52 REPAIR TOW POINT CYLINDER - Continued.**

C. INSPECT - Continued.

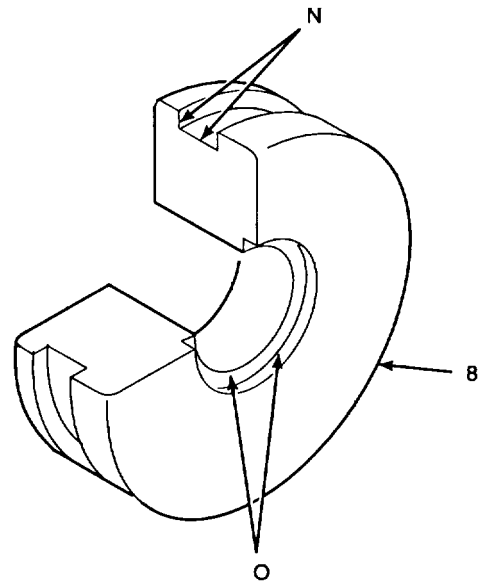
4. INSPECT CYLINDER HEAD.

- a. Visually inspect cylinder head (3), preformed packing groove I, and cylinder tube seating surface J. Check for any raised edges or nicks that may damage preformed packings or impair sealing.
- b. Remove raised edges or nicks with crocus cloth.
- c. Visually inspect ring wiper seating surface K and compression cup surface L. Check for any raised edges or nicks that may damage ring wiper and compression cup.
- d. Remove raised edges and nicks with crocus cloth.
- e. Replace cylinder head (3) if scratches, pits, and sharp edges cannot be polished out.
- f. Inspect threads M. If threads are distorted, replace cylinder head.



5. INSPECT PISTON.

- a. Run your finger along edges of piston (8) packing retainer and preformed packing seating surfaces N and O. Feel for any sharp edges or nicks that can damage packing retainers and seals.
- b. Remove sharp edges and nicks with crocus cloth.
- c. Replace piston (8) if sharp edges or nicks cannot be polished out.



**GO TO NEXT PAGE**

- D. ASSEMBLE.
1. CLEAN CYLINDER AND PISTON COMPONENTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves.

Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type Im cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse cylinder tube and piston components in cleaning solvent.

**WARNING**

Compressed air for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from seal grooves, inside surfaces of cylinder tube, and threaded surfaces.
- c. Dry parts with compressed air and a clean, lint-free cloth. Set dry parts on clean surface. Place a clean, lint-free cloth in open ends of cylinder tube to prevent contamination.

**GO TO NEXT PAGE**

**2.52 REPAIR TOW POINT CYLINDER - Continued.**

- D. ASSEMBLE - Continued.
2. INSTALL PREFORMED PACKINGS AND SEALS.

**WARNING**

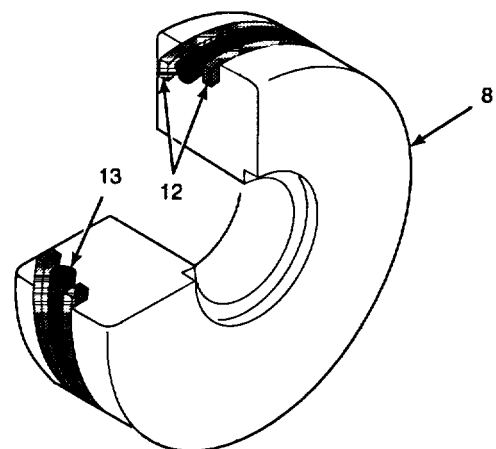
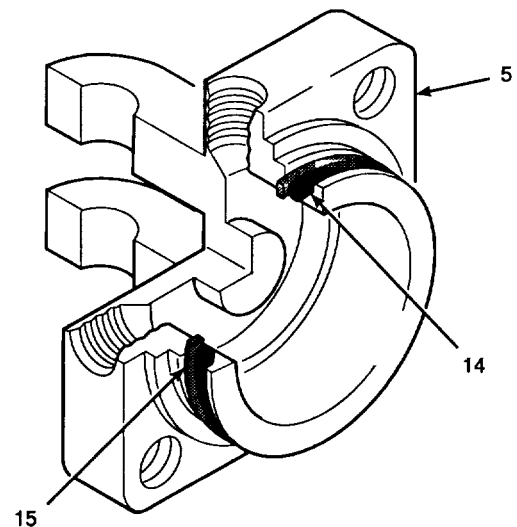
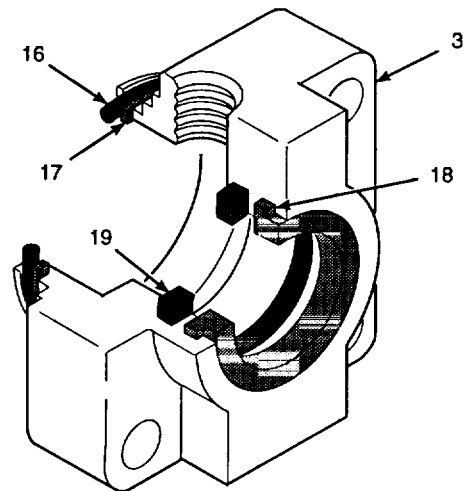
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate seals and preformed packings with clean hydraulic oil.

**CAUTION**

New seals and packings are distorted during installation. Use care during installation to prevent damage to seals and preformed packings. Bypass leakage can result from careless packing or seal installation.

- b. Pinch sides of compression cup (19) together to form a C-shape. Insert one side of compression cup in mating seal groove of cylinder head (3) and let opposite side snap into place.
- c. Use same method in step b to install ring wiper (18) into cylinder head (3).
- d. Install packing retainer (17) and preformed packing (16) in mating groove of cylinder head (3).
- e. Install packing retainer (15) and preformed packing (14) on cylinder cap (5).
- f. Install packing retainers (12) on piston (8).
- g. Install preformed packing (13) between installed packing retainers (12). Gently rotate installed packing around piston (8) to ensure packing regains original form.



**GO TO NEXT PAGE**

D. ASSEMBLE - Continued.

3. ASSEMBLE PISTON COMPONENTS.

- a. Install and hand tighten clevis (6) onto piston rod (2). Clevis should have full thread engagement with piston rod. Install hex head cap screw (11) and hex nut (10). Tighten hex nut to 26 lb-ft (35 N.m).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Lubricate chrome surface of piston rod (2) with clean hydraulic oil. Rotate and slide cylinder head (3) onto piston rod.

**CAUTION**

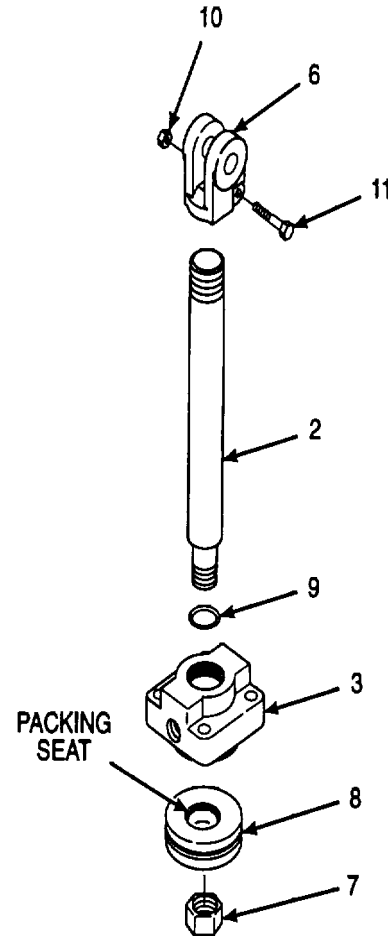
Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- c. Install preformed packing (9). Ensure preformed packing is seated against shoulder on piston rod (2).
- d. Install piston (8) on piston rod (2). Make sure packing seat on face of piston slides over installed preformed packing (9) without pinching.

**CAUTION**

Do not clamp piston rod against metal jaws of bench vise. Damage to chrome surface of piston rod can result from contact with metal vise jaws.

- e. Clamp clevis (6) in bench vise.



**CAUTION**

Make sure preformed packing (9) does not get pinched between piston rod (2) and piston (8) when tightening lock nut (7). Packing will not seal properly if pinched.

- f. Install and tighten lock nut (7) to 130 lb-ft (176 N•m).
- g. Remove assembled components from bench vise.

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**2.52 REPAIR TOW POINT CYLINDER - Continued.**

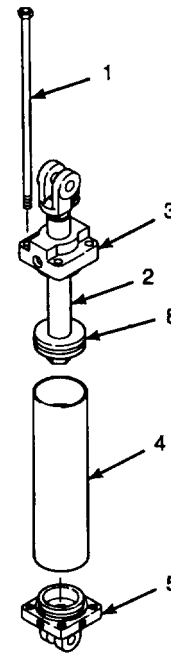
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- D. ASSEMBLE - Continued.
4. ASSEMBLE PISTON AND CYLINDER.
- a. Remove lint-free cloth from cylinder tube (4). Ensure no foreign material is present in cylinder tube.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Lubricate outer sealing surfaces of cylinder cap (5), cylinder head (3), and piston (8) with clean hydraulic oil.
- c. Slide piston (8) into cylinder tube (4).
- d. Seat cylinder head (3) flush on cylinder tube (4).
- e. Install cylinder cap (5) in cylinder tube (4). Line up adapter ports in cylinder cap and cylinder head (3).
- f. With cylinder rod extended, install tie rods (1) and evenly tighten to 20 lb-ft (27 N.m).



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**NOTE**

**FOLLOW-ON-TASK:** Install tow point cylinder per TM 5-3895-373-20.

**END OF TASK**

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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS.**


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**This task covers:**                      a. Remove                      b. Clean                      c. Install
 

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**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)  
 Combination wrench (Item 115, Appendix D)  
 Combination wrench (Item 116, Appendix D)  
 Crowbar (Item 36, Appendix D)  
 Pipe wrench (Item 117, Appendix D)  
 Sling strap, 2 ea (Item 98, Appendix D)  
 Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
 Torque wrench, 150 to 750 lb-in. (Item 130, Appendix D)

Materials/Parts:

Cleaning cloths (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Hydraulic fitting sealant (Item 26, Appendix B)  
 Hydraulic oil (Item 21, Appendix B)  
 Lint-free cloth (Item 7, Appendix B)  
 Pipe cleaner (Item 25, Appendix B)  
 Pipe sealant (Item 27, Appendix B)  
 Protective caps (Item 3, Appendix B)  
 Tags (Item 34, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Filler opening cap assembly  
 Gasket  
 Lockwashers  
 Sight liquid indicator  
 Strainer elements

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Personnel Required:

Two 62B construction equipment repairers. Second person to assist with removing and installing hydraulic reservoir.

References:

TM 5-3895-373-20  
 TM 5-3895-373-24P

Equipment Condition:

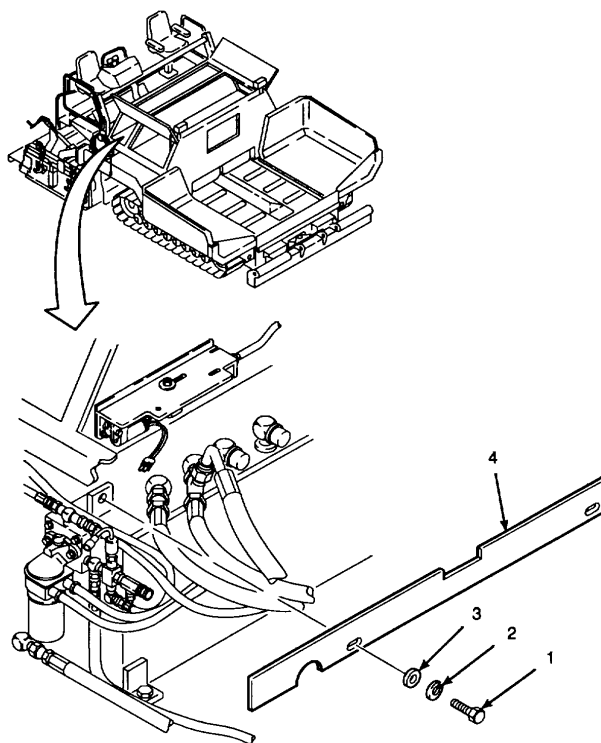
Hydraulic reservoir drained per TM 5-3895-373-20.  
 Engine removed per paragraph 2.16.  
 Fuel tank removed per paragraph 2.22.  
 Rear top right access door opened per TM 5-3895-373-10.

**GO TO NEXT PAGE**



**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

- A. REMOVE.
1. REMOVE BULKHEAD PARTITION.
    - a. Remove hex head cap screws (1), lockwashers (2), and flat washers (3). Discard lockwashers,
    - b. Remove bulkhead partition (4).



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**2-700**

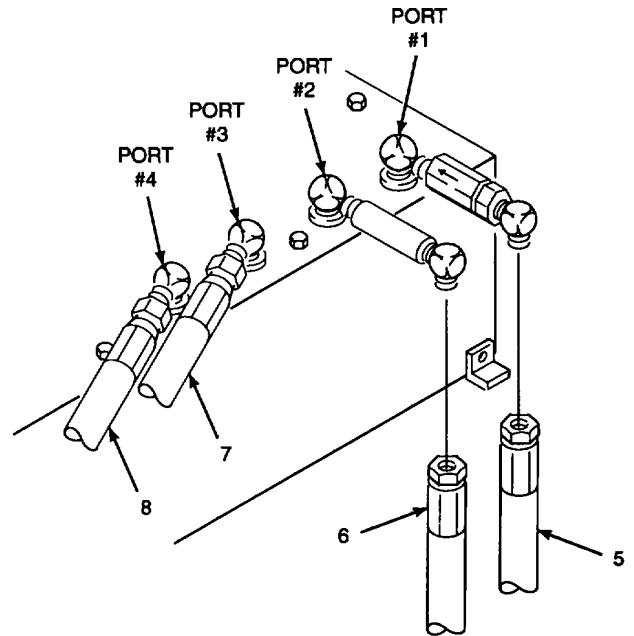
- A. REMOVE - Continued.
2. REMOVE HYDRAULIC HOSES.

**NOTE**

Use of 1-1/2 in. (Item 116, Appendix D) and 1-1/4 in. (Item 115, Appendix D) combination wrenches will be required to perform this procedure.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

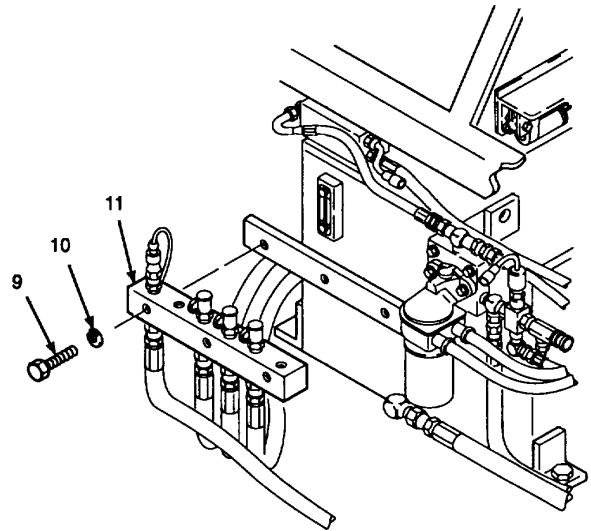


- a. Tag and disconnect oil cooler hose (5) from port #1 elbow.
- b. Tag and disconnect hydraulic hoses (6 through 8) from port #2, 3, and 4 elbows.
- c. Plug all hydraulic hoses.

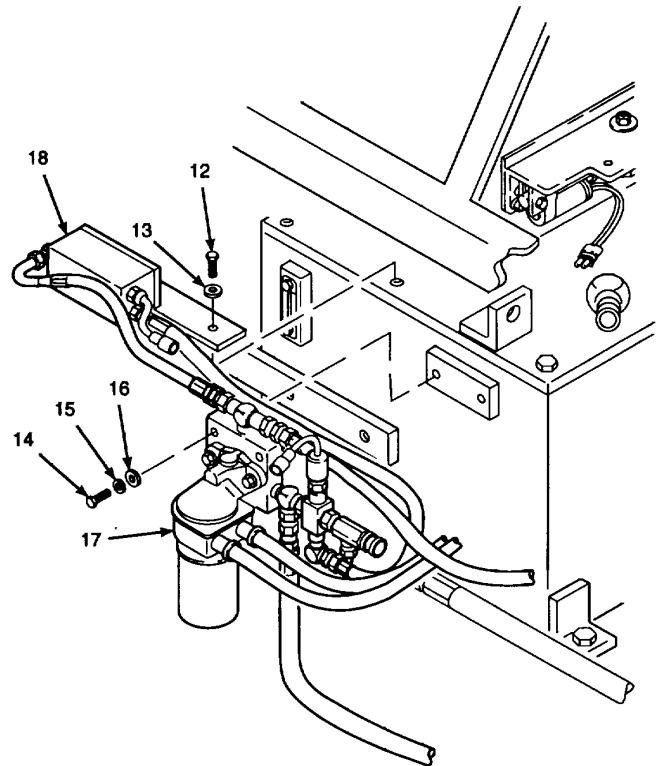
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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

- A. REMOVE - Continued.
3. DISCONNECT TEST MANIFOLD.
- Remove hex head cap screws (9) and lockwashers (10). Discard lockwashers.
  - Pull test manifold (11) from hydraulic reservoir and set aside.



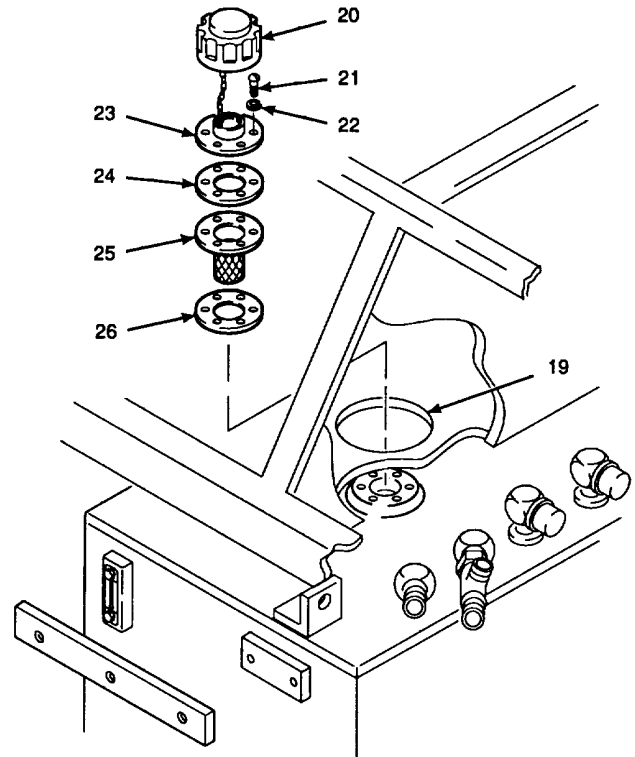
4. REMOVE ENGINE OIL COOLER, FILTER DIFFERENTIAL PRESSURE TRANSMITTER, AND ATTACHED HOSES.
- Remove bolts (12) and flat washers (13).
  - Remove hex head cap screws (14), lockwashers (15), and flat washers (16). Discard lockwashers.
  - Remove engine oil cooler (17) and filter differential pressure transmitter (18) with attached hoses from paving machine.



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- A. REMOVE - Continued.
5. REMOVE HYDRAULIC RESERVOIR FILLER OPENING CAP ASSEMBLY.

- a. Reach down through hole in valve panel (19), behind stack valve, and unscrew hydraulic reservoir cap (20). Remove machine screws (21) and lockwashers (22). Discard lockwashers.
- b. Remove filler neck (23) with attached hydraulic reservoir cap (20).
- c. Remove gasket (24), strainer (25), and gasket (26).



**CAUTION**

**Reuse machine screws (21) that were removed from the hydraulic reservoir. Do not use metric screws provided with replacement filler opening cap assembly. Use of metric screws will damage reservoir screw threads.**

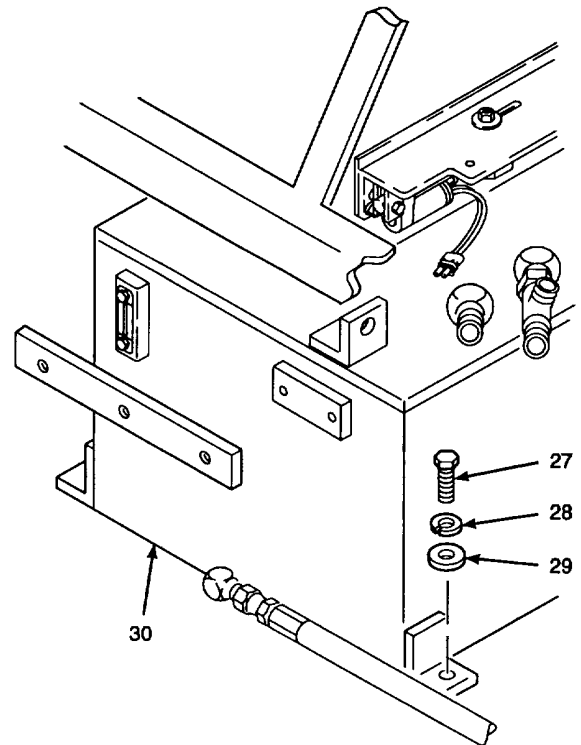
- d. Discard filler opening cap assembly.

6. REMOVE HYDRAULIC RESERVOIR.

**NOTE**

**One hex head cap screw (27) was loosened during engine removal.**

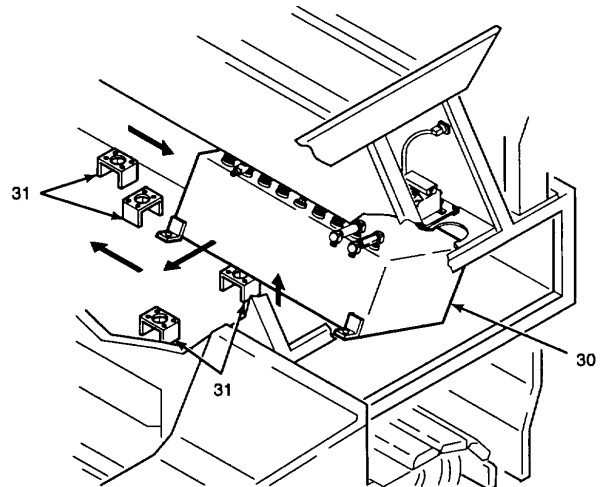
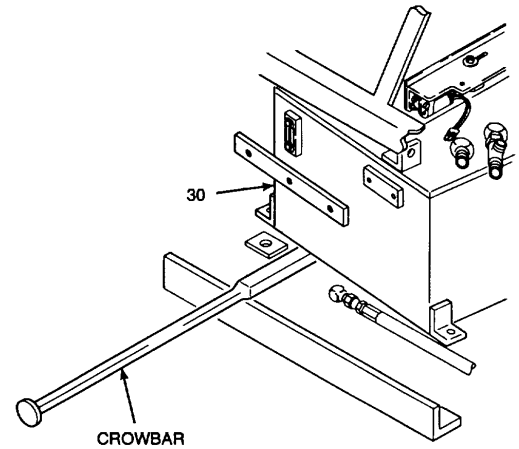
- a. Remove hex head cap screws (27), lockwashers (28), and flat washers (29) from hydraulic reservoir (30) mounting brackets. Discard lockwashers.



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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued. h**

- A. REMOVE - Continued.
- b. Use crowbar to lift rear of hydraulic reservoir (30). Wedge crowbar under rear of reservoir to provide about 2 in. (50 mm) of lift.
  - c. With the help of another person, push hydraulic reservoir (30) to left side of paving machine, lifting reservoir over hoses as needed.
  - d. Tilt hydraulic reservoir (30) up and slide onto engine mounts (31).
  - e. Slide hydraulic reservoir (30) to center of engine compartment.



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**2-704**

- A. REMOVE - Continued.
- f. Attach sling straps (32) around hydraulic reservoir (30). Ensure sling straps are evenly spaced.

**WARNING**

Hydraulic reservoir weighs approximately 150 lbs (68 kg). To avoid personnel injury, ensure all sling straps are in good condition and are of correct lifting capacity. Ensure overhead hoist is in good condition and hooks are positioned correctly.

- g. Connect overhead hoist to sling straps.

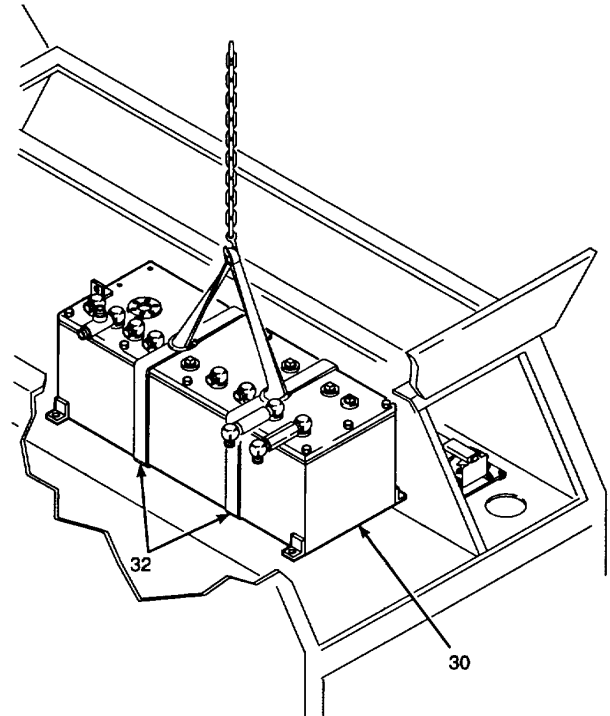
**WARNING**

Keep clear of hydraulic reservoir when reservoir is being raised or lowered. Reservoir may fall and cause serious injury or death.

Do not work on hydraulic reservoir supported only by sling straps. Use proper stands, or work bench, to support reservoir. If not supported properly reservoir may fall and cause serious injury.

Do not allow hydraulic reservoir to swing while hanging from sling straps. Reservoir may strike personnel and cause serious injury.

- h. Slowly raise hydraulic reservoir (30) out of engine compartment. Set hydraulic reservoir down in a clean shop area.



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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

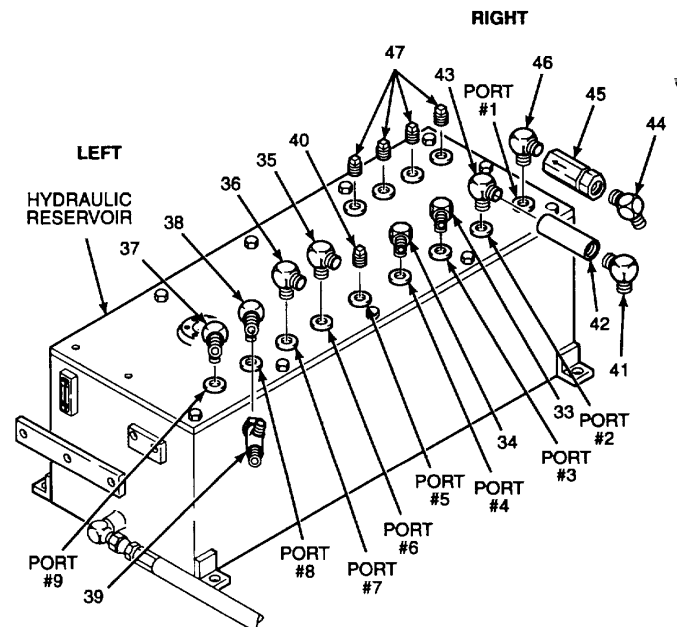
- A. REMOVE - Continued.
7. REMOVE ELBOWS AND PLUGS.

**NOTE**

Perform the following removal procedures only as needed to replace damaged components.

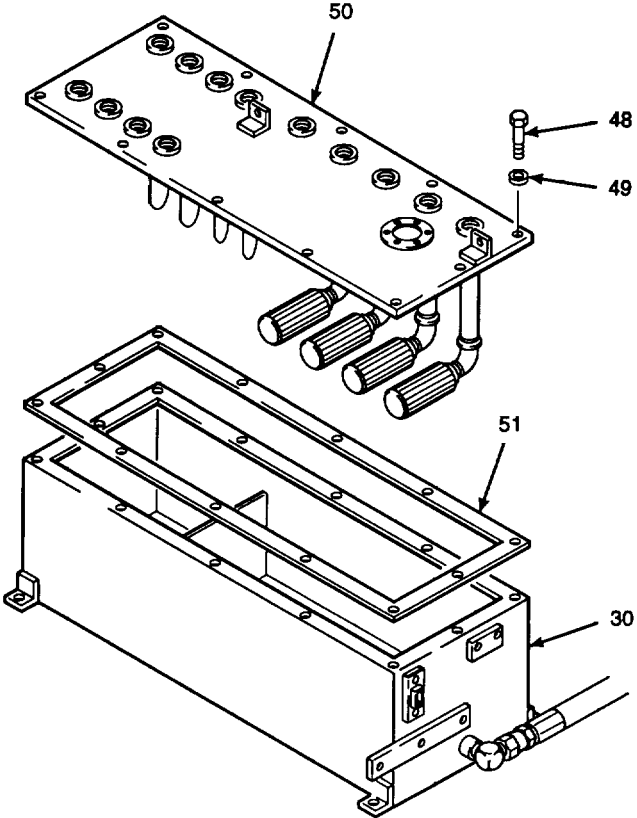
Use of 1-1/2 in. (Item 116, Appendix D) and 1-1/4 in. (Item 115, Appendix D) combination wrenches will be required to perform this procedure.

- a. Tag and remove elbows (33 through 37) from reservoir ports #3, 4, 6, 7, and 9.
- b. Tag and remove elbow (38) with attached tee (39) from reservoir port #8.
- c. Remove plug (40) from reservoir port #5.
- d. Remove elbow (41), pipe coupling (42), and elbow (43) at reservoir port #2.
- e. Remove elbow (44), check valve (45), and elbow (46) at reservoir port #1.
- f. Remove plugs (47).



**GO TO NEXT PAGE**

- A. REMOVE - Continued.
- 8. REMOVE HYDRAULIC RESERVOIR COVER AND GASKET.
  - a. Remove bolts (48) and flat washers (49).
  - b. Remove hydraulic reservoir cover (50) and gasket (51) from hydraulic reservoir (30). Discard gasket.

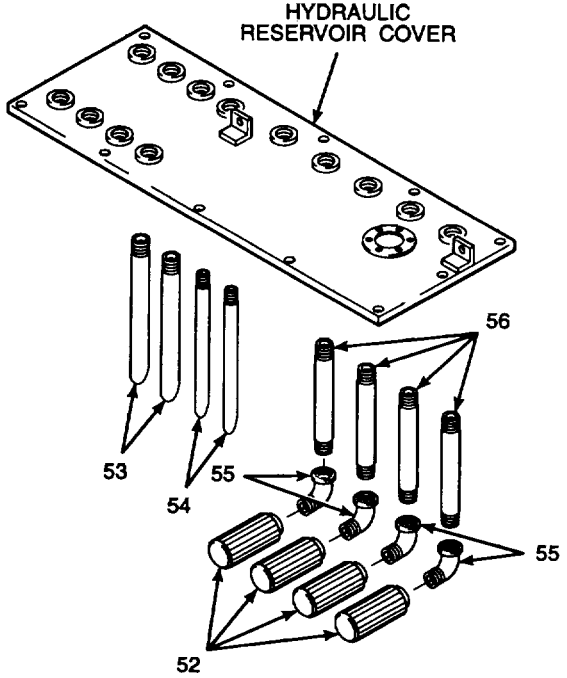


- 9. REMOVE DISCHARGE PIPES, SUCTION PIPES, AND STRAINER ELEMENTS.

**NOTE**

**Perform the following removal procedures only as needed to replace damaged components.**

- a. Remove and discard strainer elements (52).
- b. Use pipe wrench to remove discharge pipes (53 and 54).
- c. Use pipe wrench to remove street elbows (55) and suction pipes (56).

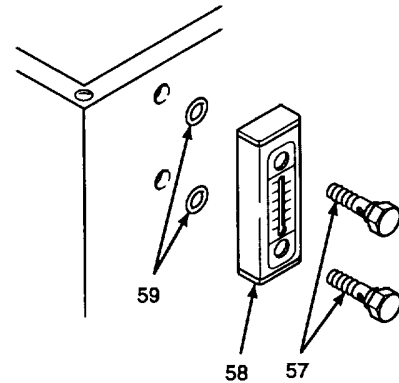


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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

- A. REMOVE - Continued.
10. REMOVE SIGHT LIQUID INDICATOR.
- Remove and discard ported screws (57) and sight liquid indicator (58).
  - Remove and discard preformed packings (59).
  - Discard all parts. Replacement sight liquid indicator includes all new parts.
11. REMOVE DRAIN PLUG (60), DRAIN HOSE (61), AND ELBOW (62).



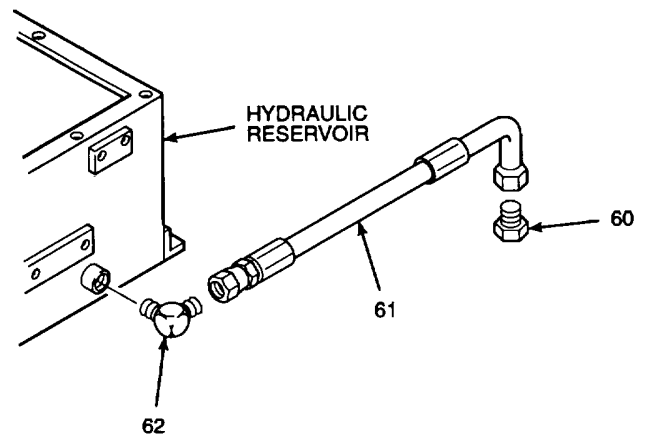
- B. CLEAN.
1. CLEAN METAL HYDRAULIC RESERVOIR COMPONENTS.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- Rinse metal parts with cleaning solvent. Use a pipe cleaner or culture swabs to remove foreign material from inside of pipes and pipe fittings.
- Saturate areas with gasket residue remaining and scrape away any residue.



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## B. CLEAN - Continued.

**WARNING**

**Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.**

- c. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from inside corners, threaded surfaces, and bore holes in hydraulic reservoir.
- d. Dry parts with a clean, lint-free cloth.

## 2. CLEAN FASTENERS.

**WARNING**

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Clean all fasteners with thread locking compound solvent.
- b. Dry fasteners with cleaning cloth.

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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.****C. INSTALL.**

1. INSTALL DISCHARGE PIPES, SUCTION PIPES, AND STRAINER ELEMENTS.

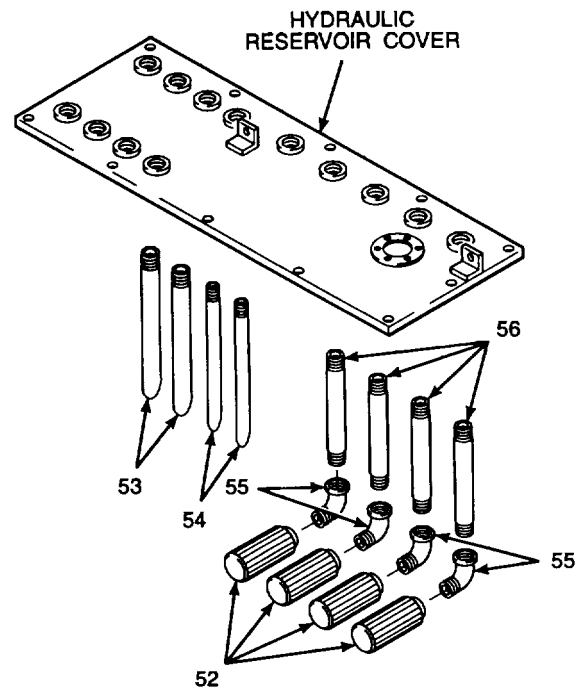
**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

Coat only leading threads of hydraulic components with pipe sealant. Excessive amounts of pipe sealant may contaminate hydraulic system.

- a. Coat leading threads on both ends of suction pipes (56) with pipe sealant.
- b. Use pipe wrench to install suction pipes (56).
- c. Install street elbows (55) onto suction pipes (56). Installed street elbows must aim toward center of hydraulic reservoir.
- d. Coat exposed threads of street elbows (55) with pipe sealant.
- e. Install strainer elements (52).
- f. Coat leading threads of discharge pipes (53 and 54) with pipe sealant.
- g. Use a pipe wrench and install discharge pipes (53 and 54). When hydraulic reservoir cover is installed, beveled face of discharge pipes must face nearest reservoir wall.

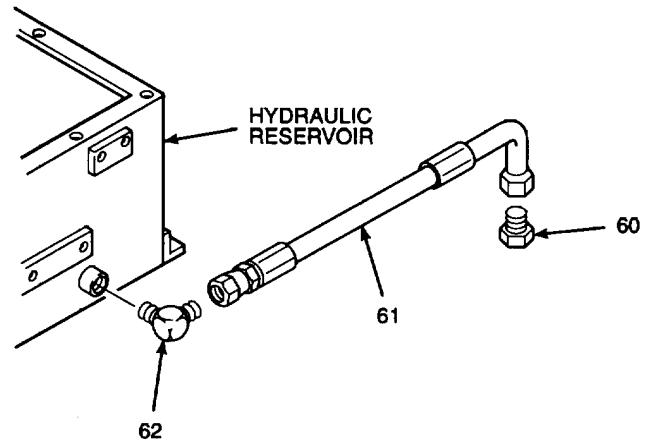


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- C. INSTALL - Continued.
- 2. INSTALL DRAIN HOSE.

**WARNING**

Pipe sealant and hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



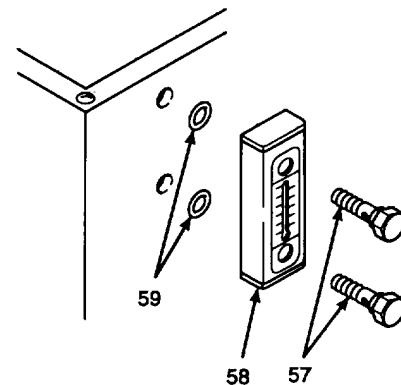
- a. Coat pipe threads of elbow (62) with pipe sealant. Install elbow into hydraulic reservoir. Orient elbow to face the front of the paving machine.
  - b. Coat exposed threads of installed elbow (62) with hydraulic fitting sealant. Install drain hose (61).
  - c. Coat threads of drain plug (60) with hydraulic fitting sealant. Install and tighten drain plug.
3. INSTALL SIGHT LIQUID INDICATOR.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**NOTE**

Before installing new sight liquid indicator, discard flat washers and nuts supplied with indicator.



- a. Lubricate preformed packings (59) with clean hydraulic oil.
- b. Install ported screws (57) through sight liquid indicator (58).

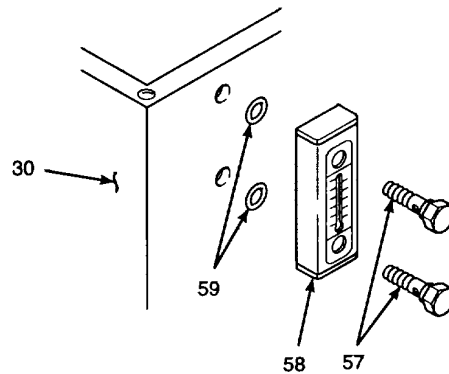
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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

C. INSTALL - Continued.

**CAUTION**

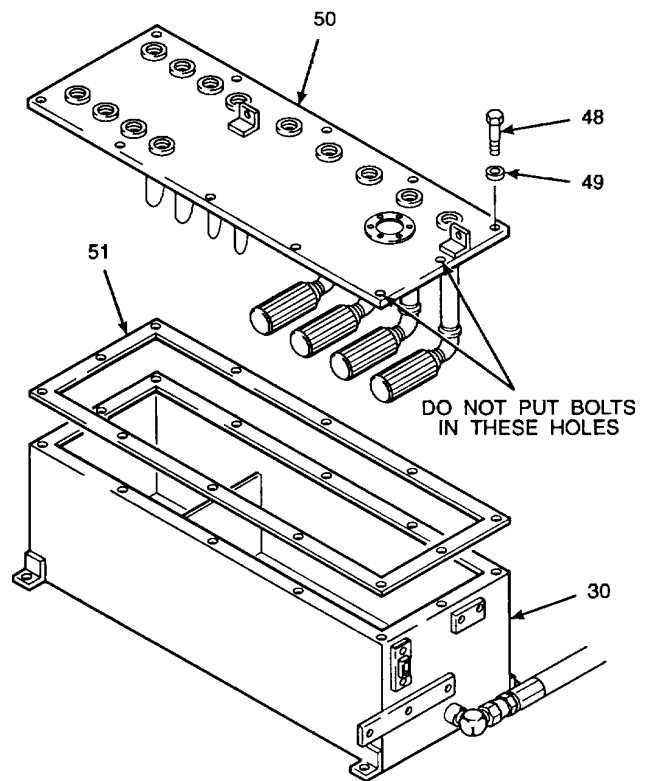
**Be careful not to damage preformed packing when sliding over threads. Sharp edges of threads can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.**



- c. Install preformed packings (59) over ported screws (57) and against rear of sight liquid indicator (58).
- d. Position sight liquid indicator on hydraulic reservoir (30) and hand tighten ported screws (57).
- e. Securely tighten ported screws (57). Do not overtighten.

4. INSTALL GASKET AND HYDRAULIC RESERVOIR COVER.

- a. Position gasket (51) on hydraulic reservoir (30).
- b. Install hydraulic reservoir cover (50). Position reservoir cover and gasket (51) to align mounting holes.



**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Install flat washer (49) onto bolt (48). Apply thread locking compound to threads of bolts.
- d. Install bolts (48) in all holes except where indicated. Install all bolts evenly before tightening. Evenly tighten bolts to 19 lb-ft (25 N.m).

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- C. INSTALL - Continued.
- 5. INSTALL PLUGS AND ELBOWS.

**WARNING**

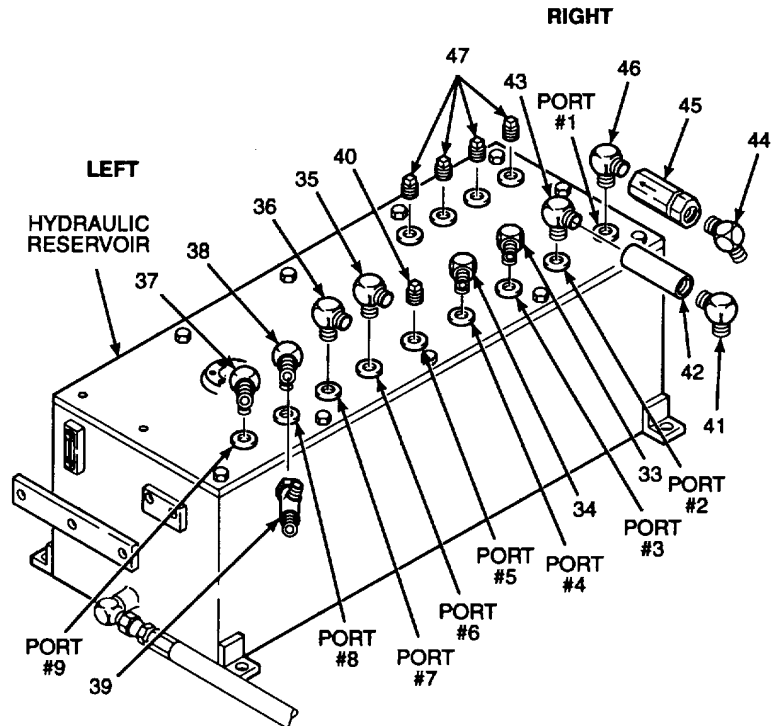
Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

Coat only leading threads of hydraulic components with pipe sealant. Excessive amounts of pipe sealant may contaminate hydraulic system.

**NOTE**

Use of 1-1/2 in. (Item 116, Appendix D) and 1-1/4 in. (Item 115, Appendix D) combination wrenches will be required to perform this procedure.



- a. Apply pipe sealant to leading threads of pipe plugs (40 and 47) and elbows (33 through 38, 41, 43, and 44).
- b. Install plugs (47).

**CAUTION**

Check valve (45) must be installed with flow directed into hydraulic reservoir. Improper installation of check valve will cause hydraulic system failure.

- c. Install port #1 elbow (46), check valve (45), and elbow (44). Check valve flow must be directed into hydraulic reservoir. Elbow (44) must point straight down.
- d. Install port #2 elbow (43), pipe coupling (42), and elbow (41). Elbow (41) must point straight down.
- e. Install port #3 and #4 elbows (33 and 34). Aim elbows to the right 45°.
- f. Install plug (40) at reservoir port #5. 45° left.
- g. Install port #6 and #7 elbows (35 and 36). Installed elbows must point straight out.
- h. Install port #8 elbow (38) with attached tee (39). Installed elbow must point 45° left. Tee points up and 45° to the left.
- i. Install port #9 elbow (37). Installed elbow must point

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**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

- C. INSTALL - Continued.
6. INSTALL HYDRAULIC RESERVOIR.
- a. Attach sling straps (32) around hydraulic reservoir (30). Ensure straps are evenly spaced.

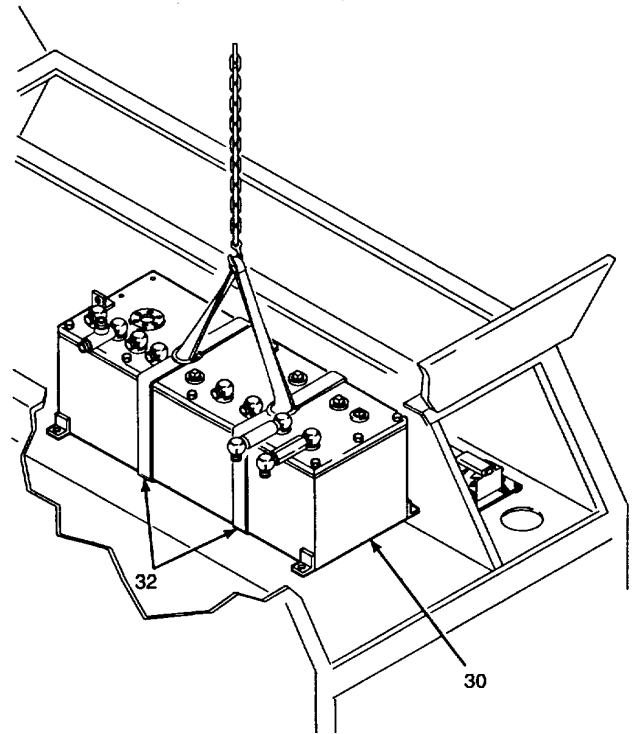
**WARNING**

Hydraulic reservoir weighs approximately 150 lb (68 kg). To avoid personnel injury, ensure all sling straps are in good condition and are of correct lifting capacity. Ensure overhead hoist is in good condition and hooks are positioned correctly.

Keep clear of hydraulic reservoir when reservoir is being raised or lowered. Reservoir may fall and cause serious injury or death.

Do not allow hydraulic reservoir to swing while hanging from sling straps. Reservoir may strike personnel and cause serious injury.

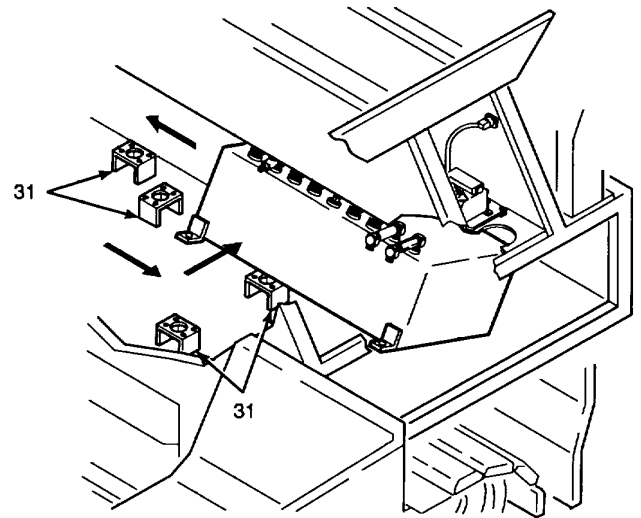
- b. Connect overhead hoist to sling straps (32) and position hydraulic reservoir (30) over engine compartment. Ensure hydraulic fittings face forward as shown.



**GO TO NEXT PAGE**

C. INSTALL - Continued.

- c. Lower hydraulic reservoir into engine compartment on top of engine mounts (31). Remove sling straps.
- d. With help of another person, tilt and move hydraulic reservoir into fuel tank mounting location.
- e. Move hydraulic reservoir (30) to right side of paving machine. Lift reservoir over hydraulic hoses as needed and tilt reservoir forward to clear obstructions using crowbar.
- f. Raise hydraulic reservoir (30) and place mounting brackets on reservoir support plates. Line up reservoir mounting brackets with threaded holes in reservoir support plates.
- g. Install lockwashers (28) and flat washers (29) onto hex head cap screws (27).

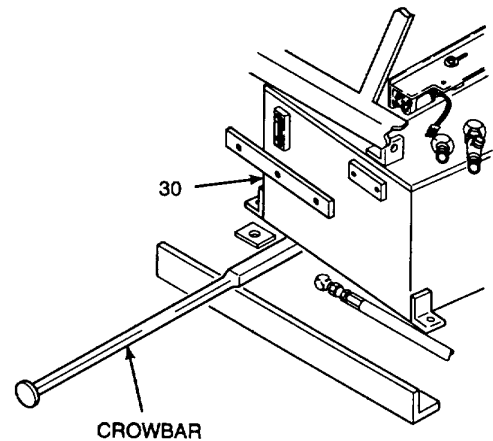


**WARNING**

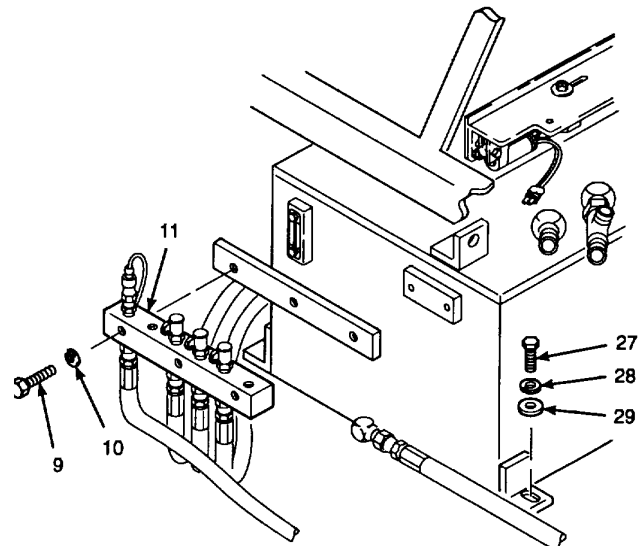
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

Front outboard hex head cap screw (27) shown will be used for ground lead mounting during engine installation. Thread locking compound will be applied at that time.



- h. Apply thread locking compound to threads of three hex head cap screws (27).
- i. Install hex head cap screws (27) into mounting brackets. Do not tighten hex head cap screws at this time.
- j. Temporarily install test manifold (11), with hex head cap screws (9); do not tighten hex head cap screws. Adjust position of hydraulic reservoir as needed.
- k. Remove hex head cap screws (9), lockwashers (10) and test manifold (11). Tighten rear and front inboard hex head cap screws (27) to 37 lb-ft (50 N.m). Leave front outboard hex head cap screw loose for ground lead installation, during engine installation.



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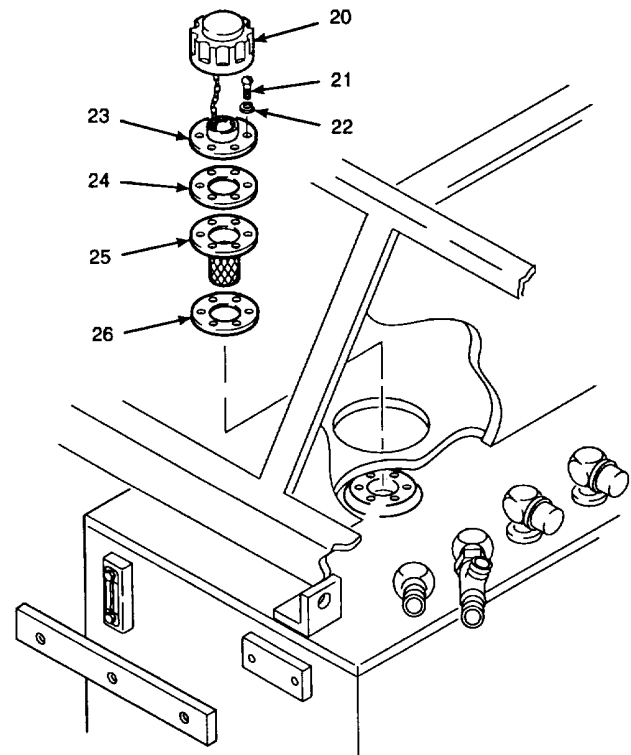
**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

- C. INSTALL - Continued.
7. INSTALL HYDRAULIC RESERVOIR FILLER OPENING CAP ASSEMBLY.
- a. Install gasket (26), strainer (25), gasket (24), and filler neck (23). Align holes in gaskets, strainer, and filler neck with threaded mounting holes.

**CAUTION**

**Do not use metric screws provided with replacement filler opening cap assembly. Reuse machine screws (21) that were removed from hydraulic reservoir. Use of metric screws will damage reservoir screw threads.**

- b. Install lockwashers (22) and machine screws (21). Make sure screw threads fit threaded holes in hydraulic reservoir before tightening.
- c. Install hydraulic reservoir cap (20).



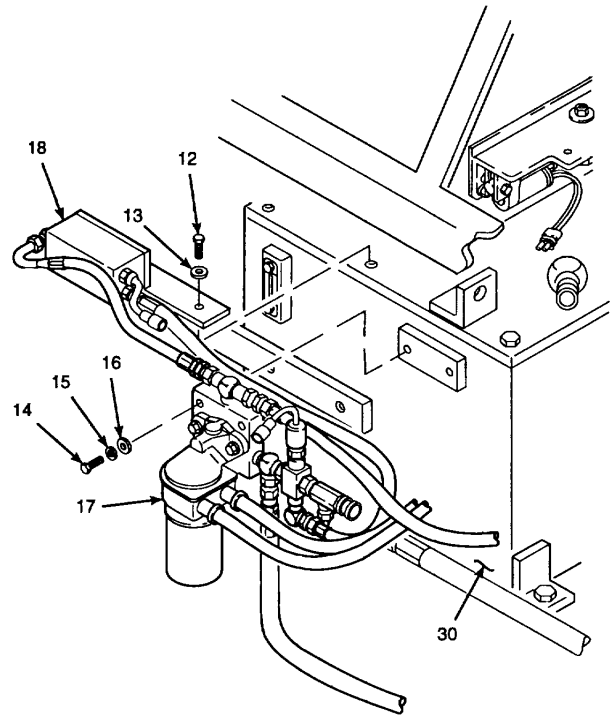
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- C. INSTALL Continued.
8. INSTALL ENGINE OIL COOLER, FILTER DIFFERENTIAL PRESSURE TRANSMITTER, AND ATTACHED HOSES.

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Install lockwasher (15) and flat washer (16) onto hex head cap screw (14). Apply thread locking compound to threads of cap screws.
- b. Position engine oil cooler (17) on hydraulic reservoir (30).
- c. Secure engine oil cooler with hex head cap screws (14). Tighten hex head cap screws to 37 lb-ft (50 N.m).
- d. Install flat washer (13) onto bolt (12). Apply thread locking compound to threads of bolts.
- e. Position filter differential pressure transmitter (18) on hydraulic reservoir (30).
- f. Secure filter differential pressure transmitter (18) with bolts (12). Tighten bolts to 228 lb-in. (25,8 N.m). Access bolts through rear top right access door.



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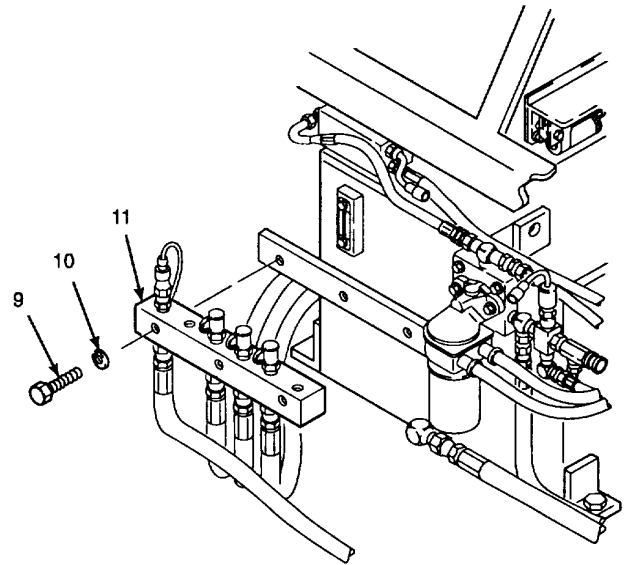
**2-717**

**2.53 REPLACE/REPAIR HYDRAULIC RESERVOIR COMPONENTS - Continued.**

- C. INSTALL - Continued.
9. INSTALL TEST MANIFOLD.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.



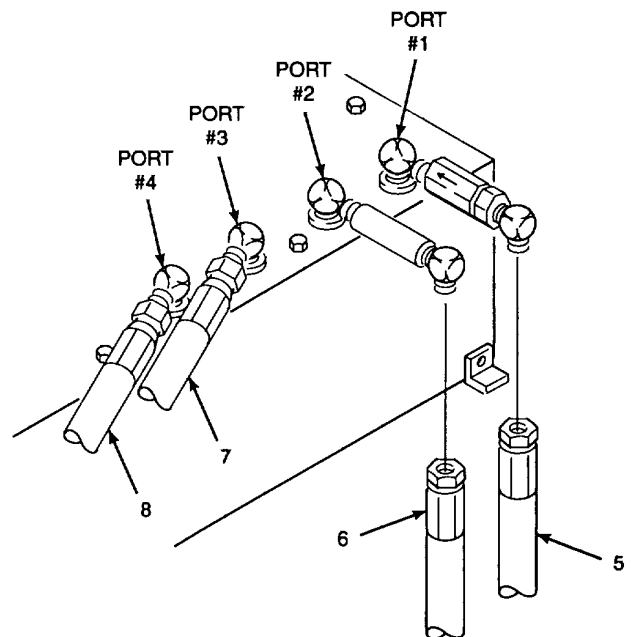
- a. Install lockwasher (10) onto hex head cap screw (9). Apply thread locking compound to threads of cap screws.
- b. Position test manifold (11) onto hydraulic reservoir and secure with hex head cap screws (9). Tighten hex head cap screws to 37 lb-ft (50 N.m).
- c. Reinstall hydraulic pressure gauges on test manifold.
10. INSTALL HYDRAULIC HOSES.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

Use of 1-1/2 in. (Item 116, Appendix D) and 1-1/4 in. (Item 115, Appendix D) combination wrenches will be required to perform this procedure.



- a. Apply hydraulic fitting sealant to threads of port #1, 2, 3, and 4 fittings.
- b. Connect oil cooler hose (5) to port #1 elbow.
- c. Connect tagged hoses (6 through 8) to elbows installed at reservoir ports #2, 3, and 4.

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C. INSTALL - Continued.

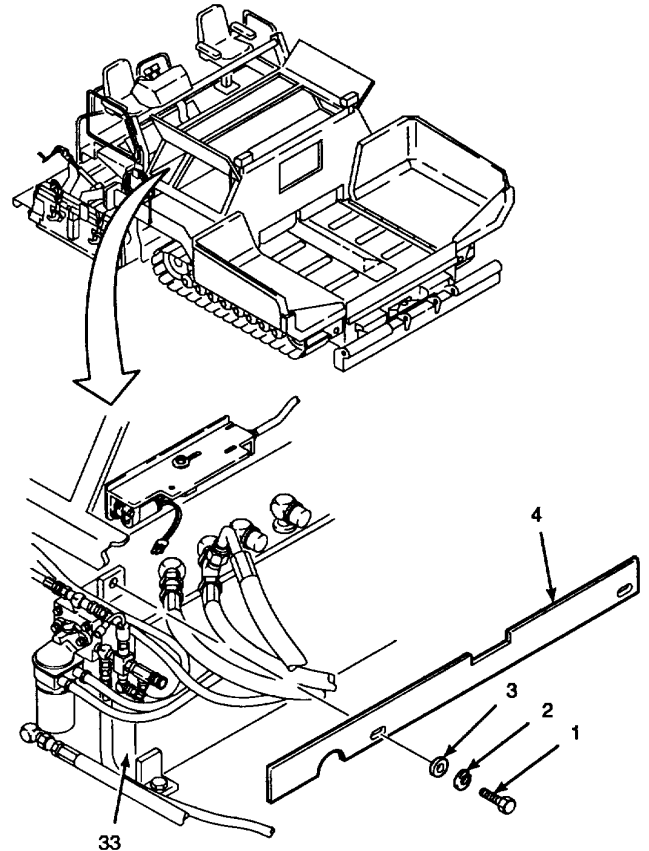
11. INSTALL BULKHEAD PARTITION.

- a. Install lockwashers (2) and flat washers (3) onto hex head cap screws (1).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- b. Apply thread locking compound to threads of hex head cap screws (1).
- c. Position bulkhead partition (4) on hydraulic reservoir (33).
- d. Install hex head cap screws (1). Tighten hex head cap screws to 9 lb-ft (12 N.m).



**NOTE**

**FOLLOW-ON-TASKS:**

Install fuel tank per paragraph 2.22.  
 Install engine per paragraph 2.16.  
 Service hydraulic oil reservoir per LO 5-3895-373-12.  
 Close rear top right access door per TM 5-3895-373-10.

**END OF TASK**

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**2.54 REPLACE HYDRAULIC HOSES, TUBES, AND FITTINGS.**

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**This task covers:**

a. Remove	b. Clean	c. Install
d. Prime	e. Charge and flush	

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**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Combination wrench (Item 115, Appendix D)  
Combination wrench (Item 116, Appendix D)  
Electric vacuum cleaner (Item 31, Appendix D)  
Hydraulic systems test and repair tool outfit (HSTRU)  
(Item 108, Appendix D)  
Pipe wrench (Item 117, Appendix D)  
Steel funnel (Item 43, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Petrolatum (Item 24, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Tie wraps (Item 36, Appendix B)  
Anti-chafing pads  
Hydraulic fittings  
Hydraulic hoses  
Hydraulic tubes  
Preformed packings

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Personnel Required:

Two 62B construction equipment repairers. Second person needed to assist with installation of large diameter hydraulic hoses.

References:

TM 5-3895-373-10  
TM 5-3895-373-24P  
TM 9-4940-468-14

Equipment Condition:

Open access doors and covers as applicable per  
TM 5-3895-373-10.

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**2-720**

- A. REMOVE.
1. EVACUATE OIL FROM HYDRAULIC SYSTEM.

**NOTE**

The following procedure creates a vacuum in the hydraulic reservoir. The vacuum draws hydraulic oil from pumps, motors, and hoses, into the reservoir. This procedure is required if replacing hydraulic hoses or tubes to the propulsion pumps or motors, auxiliary hydraulic pumps, or auxiliary vibration pump.

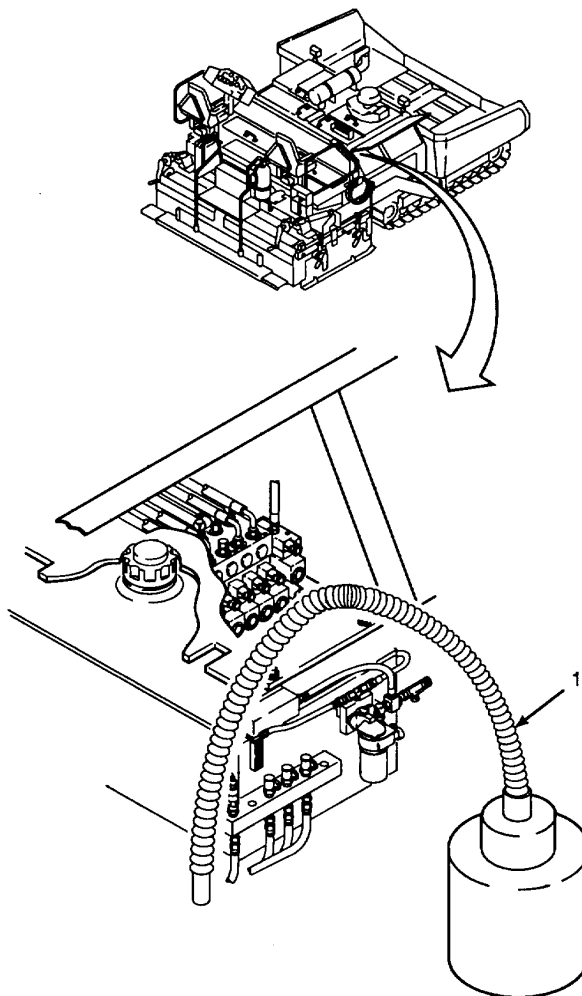
- a. Turn on electric vacuum cleaner and tap vacuum cleaner hose (1) with hammer to evacuate all loose dust and debris. Turn vacuum cleaner off. Wipe outside and inside of nozzle with a cleaning cloth.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

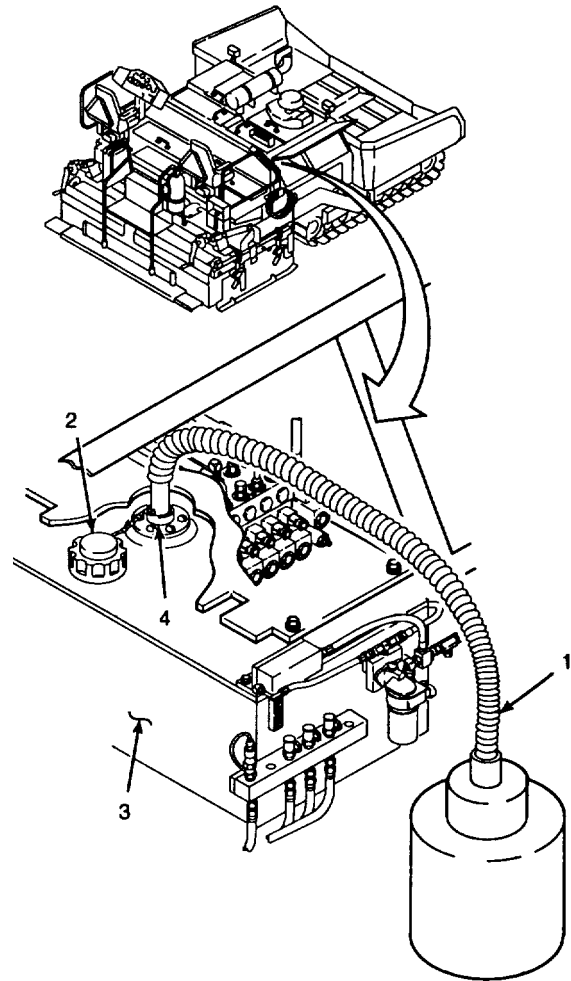
- b. Use a cleaning cloth and cleaning solvent to clean contaminants from nozzle of vacuum cleaner hose (1).



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**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued****A. REMOVE - Continued.**

- c. Remove cap (2) from hydraulic reservoir (3). Insert nozzle of electric vacuum cleaner hose (1) into reservoir filler neck (4).
- d. Protect hydraulic reservoir against contamination by wrapping a clean cleaning cloth around filler neck (4) and vacuum cleaner hose (1).
- e. Turn electric vacuum cleaner on. Run vacuum cleaner for time required to remove hoses and/or tubes and to cap or plug hoses and/or tubes.
- f. Turn electric vacuum cleaner off. Remove cleaning cloth and vacuum cleaner hose (1). Reinstall hydraulic reservoir cap (2).

**2. REMOVE HOSES, TUBES, AND FITTINGS.****WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

**CAUTION**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- a. Use compressed air at 30 psi (207 kPa) maximum, to clean away loose dust and dirt from hydraulic hoses, tubes, fittings, and nearby components.

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## A. REMOVE - Continued.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- b. Use a cleaning cloth and cleaning solvent to remove grease and other buildup deposits from connecting fittings.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Paving machine must be turned off and hydraulic line pressure bled off by slowly opening fitting prior to opening a hydraulic circuit. A pressurized hydraulic circuit can emit a high energy spray when a hose or fitting is opened under pressure. Failure to slowly bleed off hydraulic pressure may result in serious injuries to personnel.

- c. Place machinery wiping towel below connecting fittings to collect residual hydraulic oil.

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**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued**

## A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Paving machine must be turned off and hydraulic line pressure bled off by slowly opening fitting prior to opening the hydraulic circuit. A pressurized hydraulic circuit can emit a high-energy spray when a hose or fitting is opened under pressure. Failure to slowly bleed off hydraulic pressure may result in serious injuries to personnel.

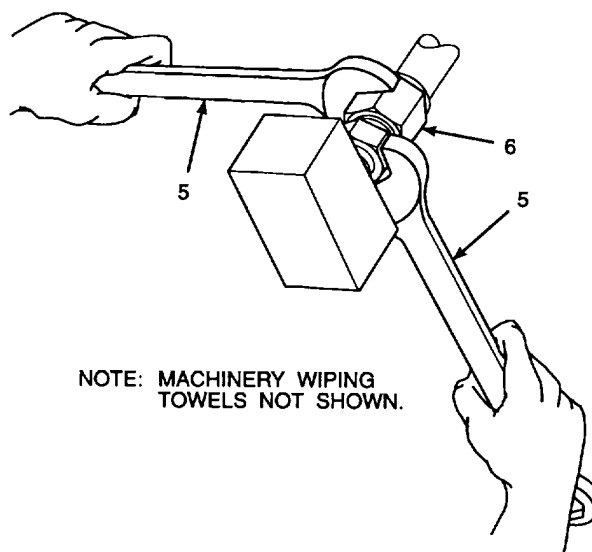
**CAUTION**

When loosening a tube coupling nut, secure - mating fitting with backup wrench. Failure to secure mating fitting can stress connecting components and may result in failure of tubes and accessories.

- d. Install combination wrench or wrenches (5) (Items 115 and 116, Appendix D) on connecting fittings. Wrap connection fittings with machinery wiping towel (three layers, minimum) to protect against contact with high energy spray.
- e. Slowly loosen tube coupling nut (6) about 1/8 turn. Allow several seconds for pressure to bleed off, then unscrew tube coupling nut another 1/8 turn. Continue this procedure until pressure is bled off and tube coupling nut is loose.

**NOTE**

If hydraulic hose is tightly embedded in contamination, equipment, delay hose removal. Embedded hose replacement is covered in INSTALL procedures, step C.4.a.



- f. Tag and remove hoses, tubes, and fittings as needed to replace faulty equipment or correct hydraulic leaks. Plug and cap all open hose fittings, tube fittings, and hydraulic circuit fittings to protect against system contamination.
- g. Remove preformed packings from o-ring boss (ORB) type fittings. Discard preformed packings.

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## B. CLEAN.

## 1. CLEAN REPLACEMENT HOSES AND TUBES.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

**CAUTION**

Thoroughly clean hydraulic hoses, tubes, and fittings before installing. Plug or cap off cleaned hoses, tubes, and fittings to prevent intrusion of contaminants. Failure to properly clean and cap off hose, tubes, and fittings may result in hydraulic system contamination and equipment damage.

- a. Use compressed air at 30 psi (207 kPa) maximum, to remove dust from inside of replacement hoses and tubes.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- b. Wipe off replacement hose and tube screw threads using cleaning cloths with cleaning solvent.
- c. Install protective caps on cleaned hose and tube fittings to protect against contamination.

2. USE CLEAN, DRY, CLEANING CLOTHS TO WIPE RESIDUE FROM SCREW THREADS OF USED HYDRAULIC FITTINGS.

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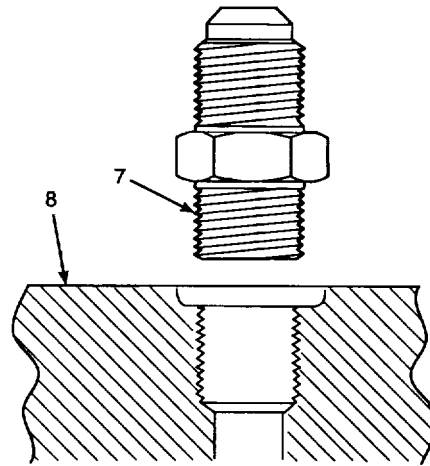
**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued**

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**C. INSTALL.****1. INSTALL STRAIGHT FITTINGS.****WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If hydraulic fitting sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to male threads of straight fitting (7). To avoid clogging hydraulic system, do not apply sealant to first thread turn of fitting.
- b. Install straight fitting in mating component (8) and tighten until firmly seated. Connect tube or hose per step c.
- c. Check hydraulic fitting for leaks during system startup. If leaking, loosen connecting tube or hose and tighten hydraulic fitting, then retighten to be on hose.

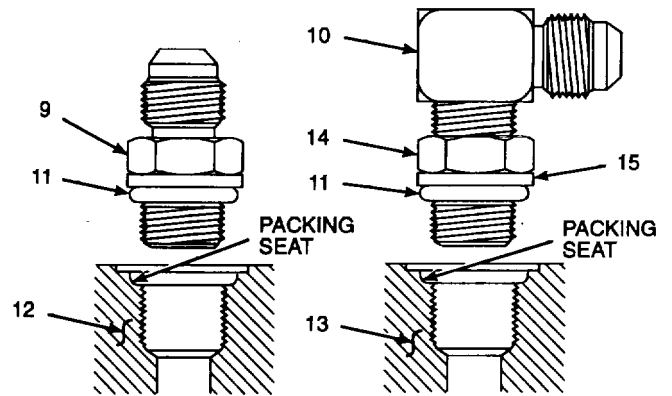
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C. INSTALL - Continued.

2. INSTALL O-RING BOSS (ORB) FITTINGS.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.



- a. Straight and swivel type ORB fittings (9 and 10) are used on the paving machine. Each requires a preformed packing (11) to achieve a seal. Whenever the seal is broken, the preformed packing must be replaced.
- b. Lubricate preformed packing (11) with petrolatum. Carefully install packing in mating packing groove of ORB fittings (9 or 10).
- c. When installing straight type ORB fitting (9), screw fitting into mating component (12) until preformed packing (11) is fully seated in mating packing seat. Tighten fitting until snug.
- d. When installing swivel type ORB swivel fitting (10), screw fitting into mating component (13) until preformed packing (11) just meets packing seat of mating component. Be careful not to dislodge preformed packing from packing groove in fitting.
- e. Rotate swivel type ORB fitting (10) counterclockwise to desired alignment angle. Tighten lock nut (14) until backup washer (15) seats on machined surface of mating component (13). Tighten lock nut until snug.
- f. Connect tube or hose per step c. Check ORB fitting for leakage during system startup. If leaking, loosen connecting tube or hose and tighten ORB fitting. Retighten tube or hose.

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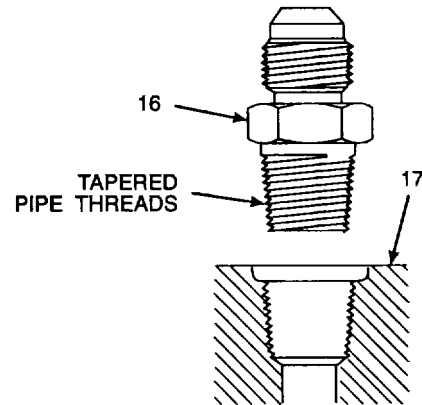
**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued**

C. INSTALL - Continued.

3. INSTALL TAPERED PIPE THREAD FITTINGS.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- a. Apply pipe sealant to tapered pipe threads of fitting (16).
- b. Install and tighten fitting (16) in mating component (17) until snug. Connect tube or hose per step c.
- c. Check fitting for leaks during system startup. If leaking, loosen connecting tube or hose and tighten hydraulic fitting, then retighten tube or hose.

4. INSTALL HYDRAULIC HOSES AND TUBES.

**CAUTION**

Use caution when installing tubes. Do not bend, kink, or twist tubes during installation. Bends, kinks, and twists can lead to tubing breaks during equipment operation.

**NOTE**

If installing auxiliary or propulsion system hoses and/or tubes, you should perform pump priming procedure per step D at this time. Some of the hydraulic hoses used in the paving machine are routed between and under other hoses and components. This task refers to these hoses as "embedded hoses"

- a. If replacing an embedded hose, use a male-to-male adapter from hydraulic systems test and repair tool outfit (HSTRU) to connect used and replacement hoses. Lubricate outer surface of replacement hose and if possible, outer surface of embedded hose, where it can be reached, with petrolatum. With help from another person, route replacement hose by pulling free end of used hose from equipment.

**NOTE**

Refer to paragraph 2.55 for installation details applicable to specific valve panel components.

- b. Route new hoses and tubes. Do not allow tubes to bend, crimp, or twist. Provide maximum bend radius at hose turns to prevent hose crimping.

**GO TO NEXT PAGE**

C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply hydraulic fitting sealant to male threads of 37° flare fittings. To protect against hydraulic system clogging, do not apply sealant to first thread turn of fittings.

**CAUTION**

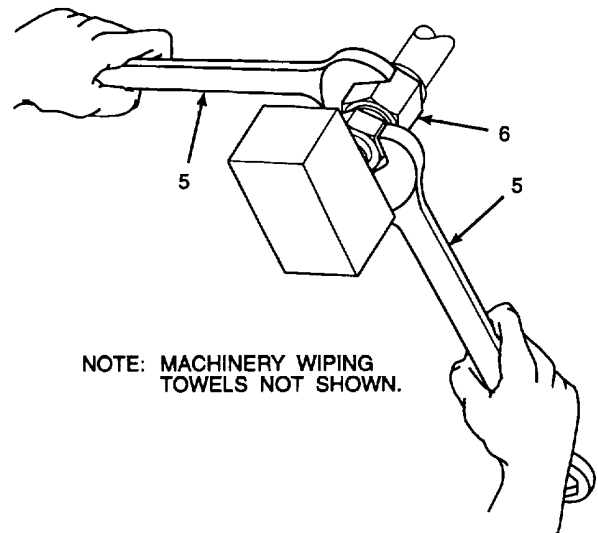
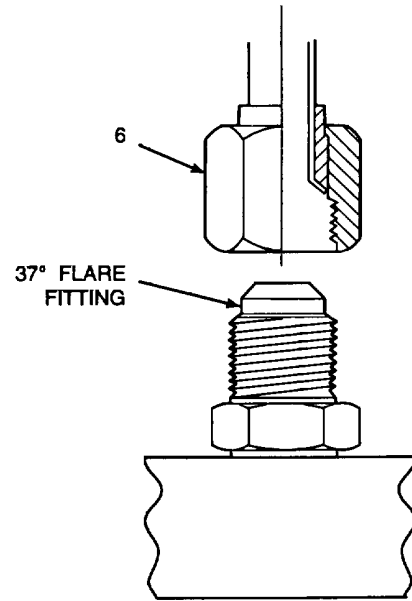
When tightening a tube or hose coupling nut (6), secure mating fitting with backup wrench (5). Failure to secure mating fitting can stress connecting components and may result in failure of tube and accessories.

- d. Install and tighten coupling nut (6) on 37° flare fitting. Using backup wrench, tighten coupling nut until firmly seated. Check 37° flare fittings for leakage during system startup. At that time, leaking 37° flare fittings can be tightened as needed to stop leakage.

**NOTE**

Large diameter hydraulic hoses take a set during initial hours of operation. When installing a replacement hose, it must be manually shaped to duplicate curvature and orientation of the hose it replaces.

- e. When replacing a 1-1/2 in. (38 mm) diameter hose, install and finger tighten one end of hose first. With help of another person, use pipe wrenches to rotate and bend hose to approximate curvature of used hose and connect remaining loose end of hose to fitting.

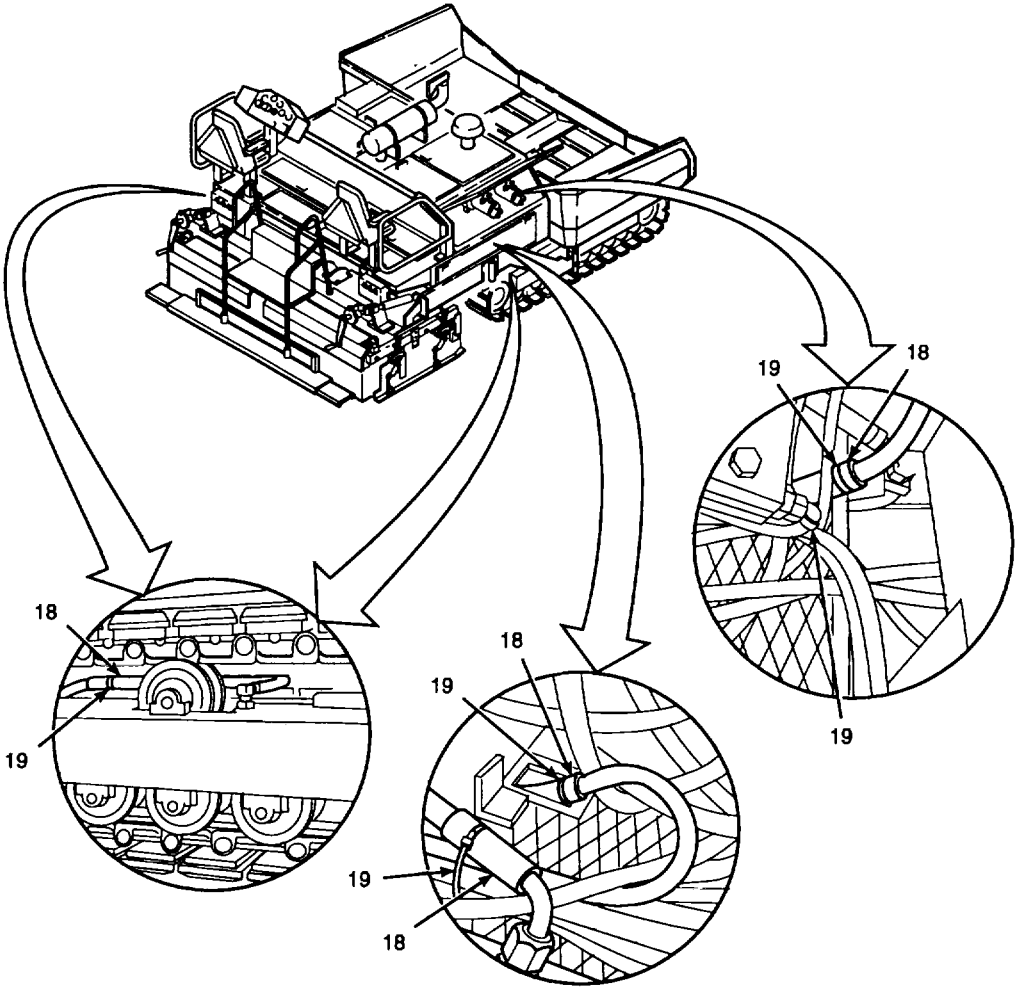


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**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued**

C. INSTALL - Continued.

- f. Install anti-chafing pads (18) on hoses routed through engine compartment bulkheads and other points of incidental contact with metal. Secure anti-chafing pads with tie wraps (19).



GO TO NEXT PAGE

D. PRIME.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

**CAUTION**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

**NOTE**

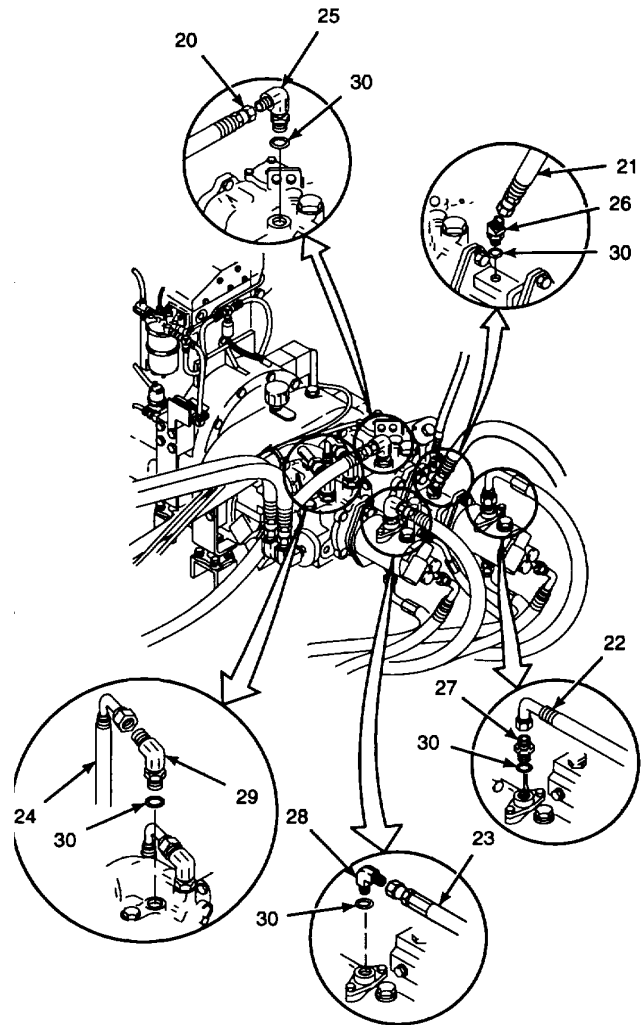
The following procedure is required only if the hydraulic system was drained or if a hydraulic motor or pump was replaced.

- a. Use compressed air at 30 psi (207 kPa) maximum, to clean loose dust and dirt from pump end fittings of hoses (20 through 24) and fittings (25 through 29). Blow away dust from surrounding components.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention and fittings (20 through 29).



- b. Use cleaning cloths soaked with cleaning solvent to remove grease and other buildup deposits from hoses and fittings (20 through 29).

GO TO NEXT PAGE



**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued**

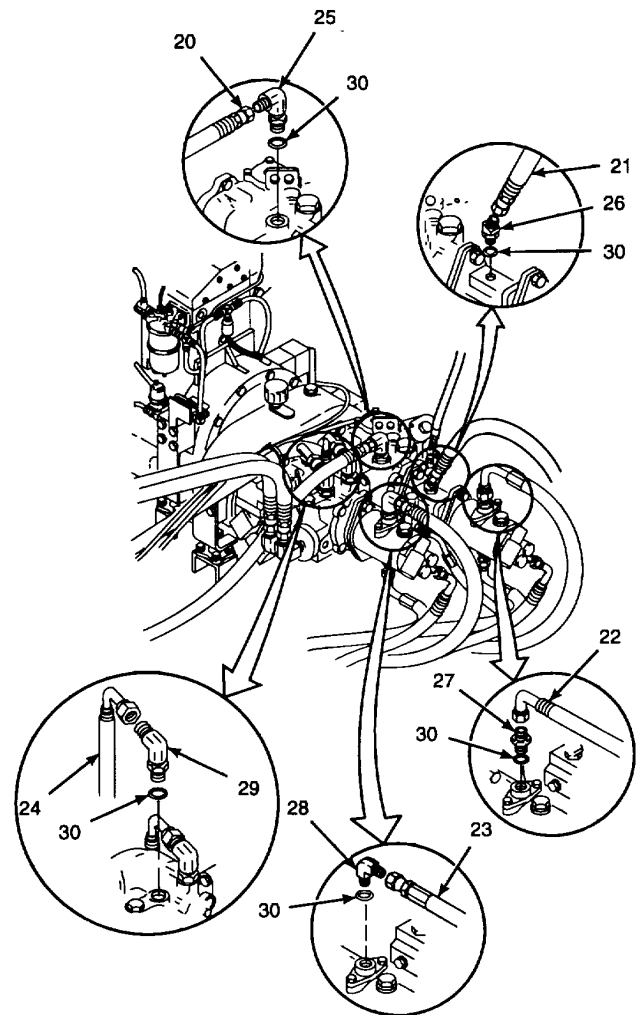
D. PRIME - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

Paving machine must be turned off and hydraulic line pressures slowly bled off prior to opening a hydraulic circuit. A pressurized hydraulic circuit can emit a high energy spray when a hose or fitting is opened under pressure. Failure to slowly bleed off hydraulic pressure may result in serious injuries to personnel.

- c. Place machinery wiping towel below hydraulic pumps to collect residual hydraulic oil leaking from open fittings.
- d. Tag, disconnect, and plug hoses (20 through 24).
- e. Tag and remove fittings (25 through 29). Remove and discard preformed packings (30).
- f. Using a steel funnel, fill propulsion and auxiliary pumps with clean hydraulic oil.
- g. Install fittings and preformed packings (25 through 30) per instructions in step C.2.
- h. Install and tighten hoses (20 through 24).
- i. Wipe up all spilled hydraulic oil with machinery wiping towel. Clean away oil residue with cleaning cloths and cleaning solvent.

**GO TO NEXT PAGE**

## E. CHARGE AND FLUSH.

**NOTE**

Charge and flush will only be required when a system has been confirmed contaminated through oil analysis samples.

- a. Hook up HSTRU flushing filter to paving machine hydraulic system per instructions in TM 9-4940-468-14.

**WARNING**

Do not operate any hydraulic functions until system is fully charged with oil and oil temperature reaches 1800F (82°C). Operating hydraulics under low oil temperature or flow conditions can damage hydraulic pumps and motors.

- b. Turn all hydraulic functions off at operator switch panel and screed control panels. Start paving machine and run at IDLE speed until hydraulic oil temperature reaches 1800F (820C). Refer to TM 5 3895-373-10.

**WARNING**

Hydraulic oil under pressure can penetrate skin or damage eyes. Oil leaks under pressure may not be visible. Severe injury or loss of limb may result from contact with high pressure oil leaks.

Do not use bare hands to find leaks; use a piece of cardboard or wood instead. Wear safety goggles for protection. If oil enters skin or eye, get immediate medical attention.

- c. Flush and filter hydraulic system per TM 9-4940-468-14. During flushing operations, check for proper operation of hydraulic system. Check installed hoses, tubes, and fittings for leakage. Tighten leaky fittings.

**GO TO NEXT PAGE**

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**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued**

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**E. CHARGE AND FLUSH - Continued.****WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- d. Shut off engine and remove key from ignition switch per TM 5-3895-373-10. Wipe up all spilled hydraulic oil with machinery wiping towel. Clean away oil residue with cleaning cloths and cleaning solvent.

**NOTE**

**FOLLOW-ON-TASK:** Close access doors and covers as applicable per TM 5-3895-373-10.

**END OF TASK**

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**2.54. REPAIR HYDRAULIC HOSES, TUBES, AND FITTINGS - Continued**

This task covers:            a. Remove            b. Clean            c. Install

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)  
 Bench vise (Item 112, Appendix D)  
 Combination wrench (Item 116, Appendix D)  
 Torque wrench (Item 132, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Electrical insulating compound (Item 10, Appendix B)  
 Electrical insulating varnish (Item 38, Appendix B)  
 Hydraulic fitting sealant (Item 26, Appendix B)  
 Machinery wiping towel (Item 37, Appendix B)  
 Pipe sealant (Item 27, Appendix B)  
 Protective caps (Item 3, Appendix B)  
 Tags (Item 34, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Tie wraps (Item 36, Appendix B)  
 Lock screws  
 Lockwashers  
 Self-locking nuts

References:

TM 5-3895-373-10  
 TM 5-3895-373-24P

Equipment Condition:

Center top left access door opened per TM 5-3895-373-10.  
 Center top right access door opened per TM 5-3895-373-10.  
 Right access door opened per TM 5-3895-373-10.  
 Left access door opened per TM 5-3895-373-10.  
 Hopper wings lowered per TM 5-3895-373-10.

A. REMOVE.

**NOTE**

**This procedure covers removal and installation of control valves and flow dividers located on the machine valve panel. Before removing any component, refer to general removal instructions in paragraph A. 1. This paragraph provides a listing of those components that need to be removed to provide access to a specific control valve or flow divider. Perform only those procedures listed to remove the item being replaced.**

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**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued**

A. REMOVE - Continued.

1. GENERAL REMOVAL INSTRUCTIONS.

a. The following components are located on the valve panel and will be removed and replaced in this paragraph. Refer to the illustration for the location of these items on the valve panel.

Tow point flow divider (A)

Tow point control valves (B)

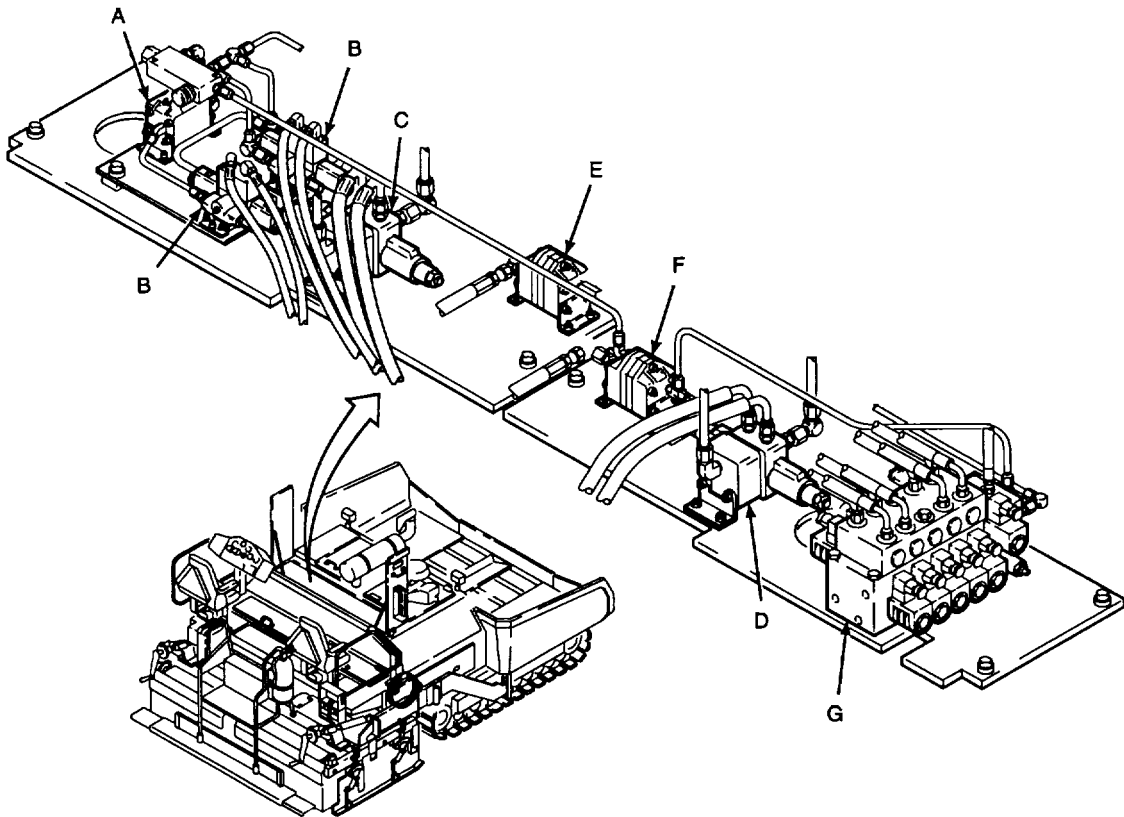
Left auger/conveyor control valve (C)

Right auger/conveyor control valve (D)

Auger/conveyor flow divider (E)

Valve and cylinder flow divider (F)

Stack valve (G)



GO TO NEXT PAGE

2-736

A. REMOVE - Continued.

- b. When removing a control valve or flow divider, it may be necessary to remove other components that prevent access to the item being removed. The following components need to be removed to access specific control valves and flow dividers located on the valve panel.

Tow point flow control valve  
 Auger/conveyor speed control valves  
 Tow point mount plate  
 Return manifold  
 DCA housing

- c. Refer to chart below for a listing of the items to be removed. The center column lists the items which need to be removed first before a specific control valve or flow divider can be removed. The referenced paragraph provides instructions to remove the item listed.

ITEM TO BE REMOVED	REMOVE THIS ITEM FIRST	PARAGRAPH
Tow point flow divider	None	
Tow point control valves	Tow point mount plate	A.4
Left auger/conveyor control valve	Left auger/conveyor speed control valve	A.6 and A.7
Right auger/conveyor control valve	DCA housing right auger/conveyor speed control valve	A.2 A.5 and A.7
Auger/conveyor flow divider	Return manifold A.3	
Valve and cylinder flow divider	Return manifold A.3	
Stack valve	None	
Right auger/conveyor speed control valve	DCA housing A.2	
Left auger/conveyor speed control valve	None	

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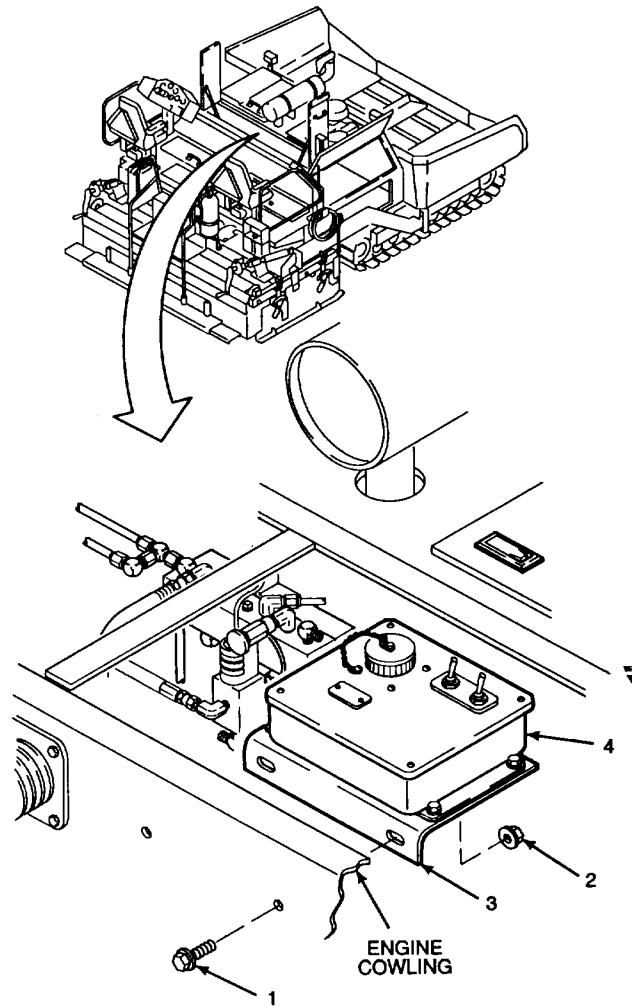
**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued**

- A. REMOVE - Continued.
2. REMOVE DCA HOUSING.

**NOTE**

The DCA housing only needs to be removed if removing the right auger/conveyor control valve and the right auger/conveyor speed control valve.

- a. Remove lock screws (1) and self-locking nuts (2) from housing bracket (3). Discard lock screws and self-locking nuts.
- b. Remove DCA housing (4) and housing bracket (3) from engine cowling. Do not disconnect wires from DCA housing. Set DCA housing on top of engine cowling.



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**2-738**

- A. REMOVE - Continued.
- 3. REMOVE RETURN MANIFOLD.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination or equipment damage.

**NOTE**

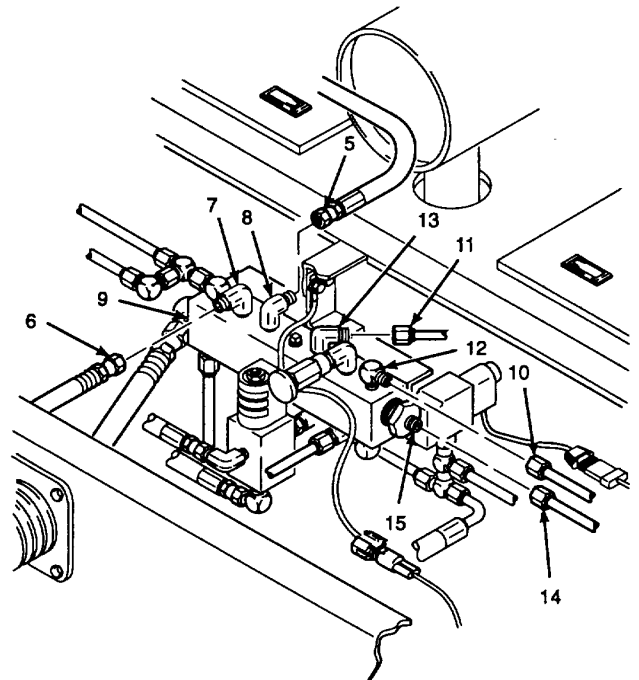
The return manifold needs to be removed if removing the auger/conveyor flow divider or valve and cylinder flow divider.

- a. Wipe all dirt and dust from fittings with cleaning cloths.
- b. Place machinery wiping towels below return manifold.
- c. Tag and disconnect hoses (5 and 6) from elbows (7 and 8) on return manifold (9). Plug hoses and cap elbows.

**NOTE**

It may be necessary to loosen and/or remove hydraulic tubes at both ends to allow removal of the return manifold.

- d. Tag and disconnect tubes (10 and 11) from elbows (12 and 13) on return manifold (9). Plug tubes and cap elbows.
- e. Tag and disconnect tube (14) from straight adapter (15) on end of return manifold (9). Plug tube and cap straight adapter.



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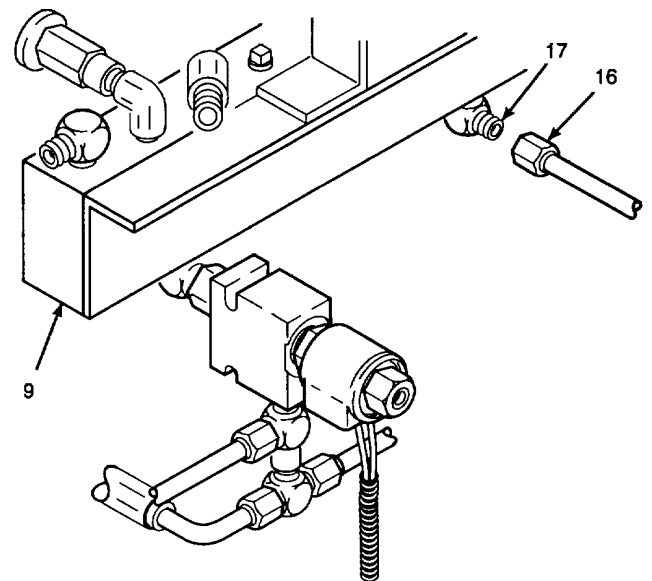
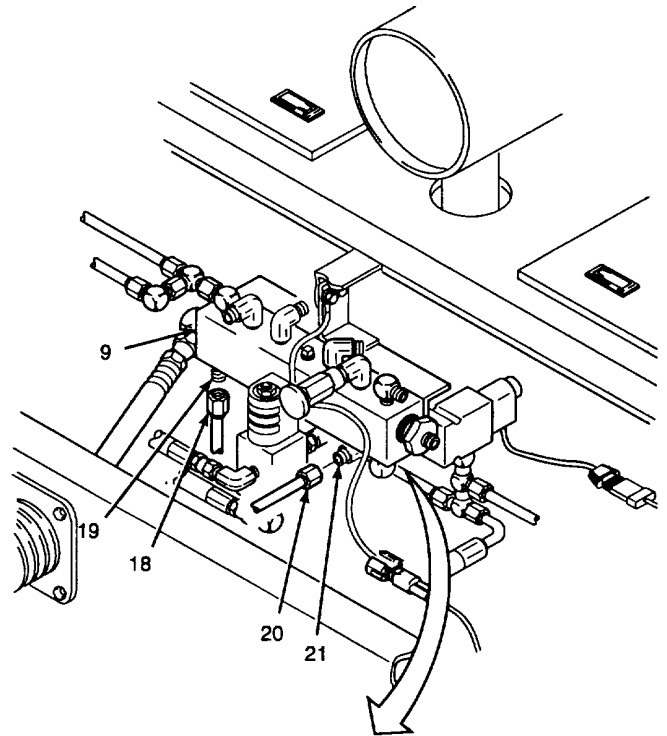
**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIMDERS - Continued**

## A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- f. Tag and disconnect tube (16) from elbow (17) located on bottom of return manifold (9). Plug tube and cap elbow.
- g. Tag and disconnect tube (18) from straight adapter (19) located on bottom of return manifold (9). Plug tube and cap straight adapter.
- h. Tag and disconnect tube (20) from elbow (21) located on bottom of return manifold (9).



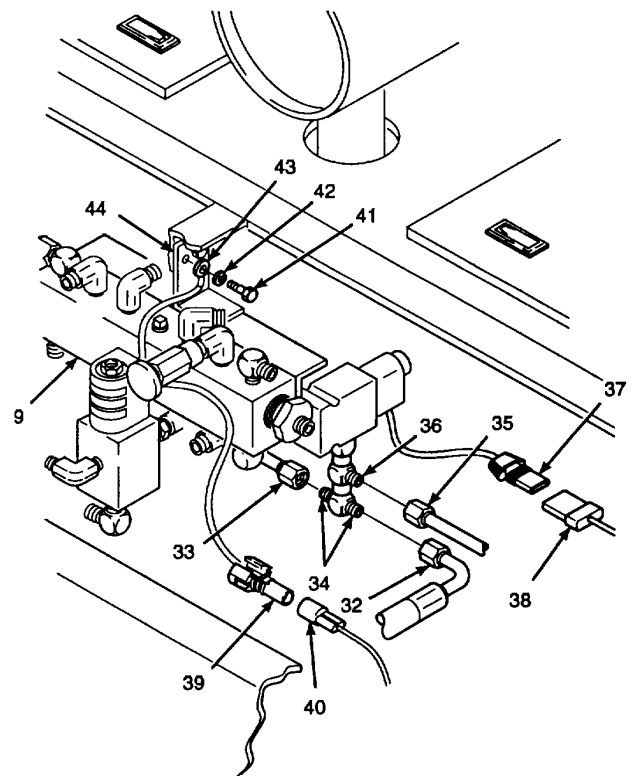
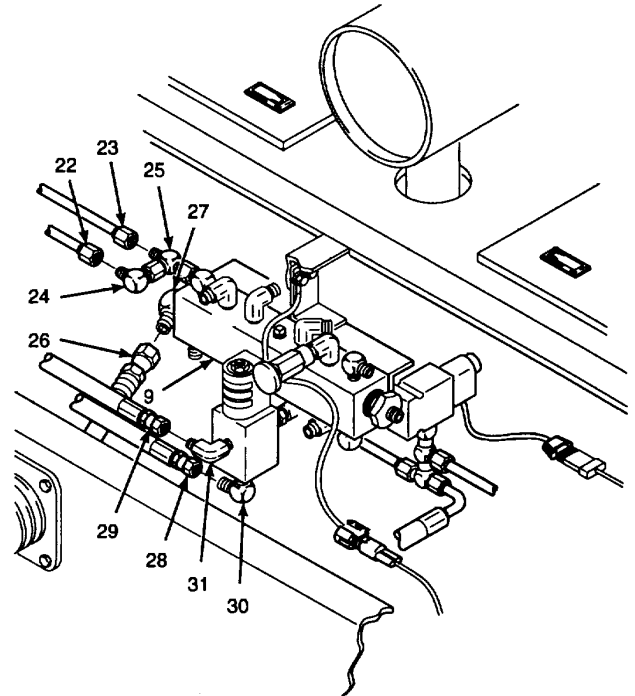
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A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- i. Tag and disconnect tubes (22 and 23) from elbow (24) and swivel tee (25). Plug tubes and cap elbow and swivel tee. Loosen but do not remove swivel tee to allow for removal of hose (26).
- j. Tag and disconnect hose (26) from elbow (27) using a combination wrench.
- k. Tag and disconnect hoses (28 and 29) from elbows (30 and 31) on brake valve. Plug hoses and cap elbows.
- l. Tag and disconnect hose (32) and tube (33) from tee (34) at screed vibration solenoid valve. Plug hose and tube and cap tee.
- m. Tag and disconnect tube (35) from tee (36) at screed vibration solenoid valve. Plug tube and cap tee.
- n. Disconnect screed vibration solenoid valve electrical connector (37) from harness electrical connector (38).
- o. Disconnect brake valve electrical connector (39) from harness electrical connector (40).
- p. Remove hex head cap screws (41), lockwashers (42), and ground wire lead (43) from return manifold bracket (44). Discard lockwashers.
- q. Remove return manifold (9) and set aside.



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**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued**

- A. REMOVE - Continued.
4. REMOVE TOW POINT MOUNT PLATE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

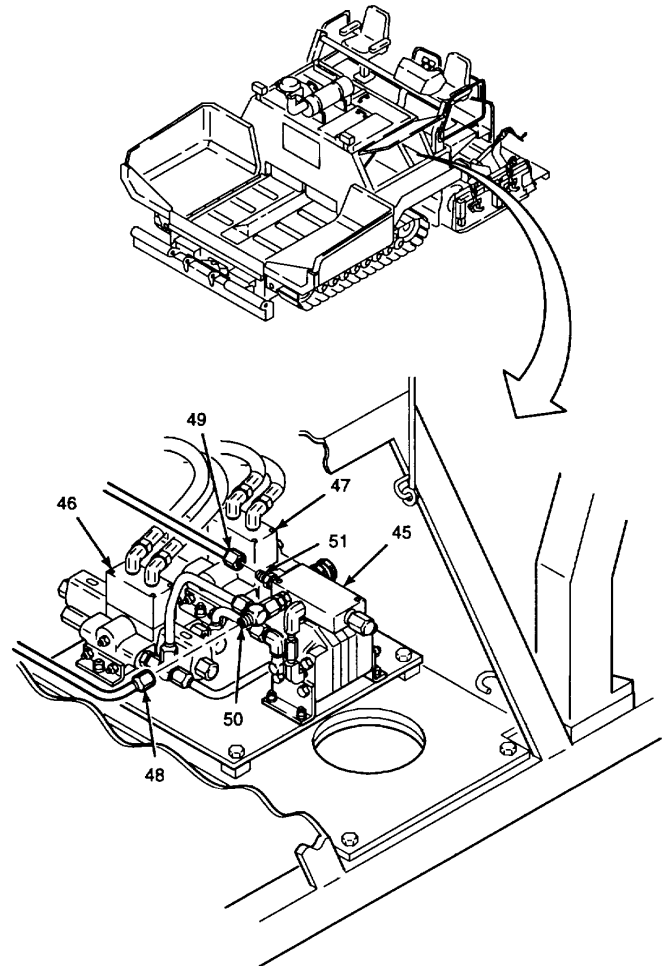
**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination or equipment damage.

**NOTE**

The tow point mount plate only needs to be removed when removing the tow point control valves.

- Wipe all dirt and dust from fittings with cleaning cloths.
- Place machinery wiping towels below tow point flow control valve (45) and around both tow point control valves (46 and 47).
- Tag and disconnect tubes (48 and 49) from tow point flow control valve (45), swivel tee (50), and straight adapter (51). Plug tubes and cap swivel tee and straight adapter.



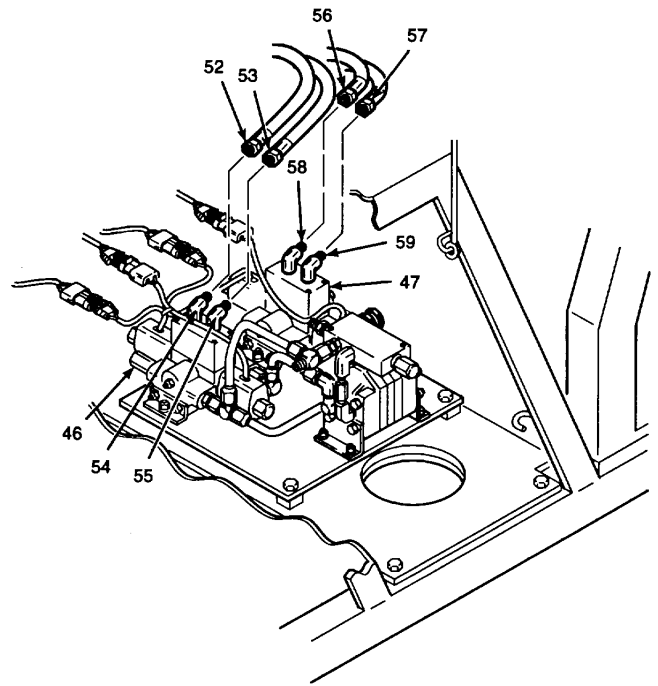
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## A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- d. Tag and disconnect hoses (52 and 53) from front tow point control valve (46) elbows (54 and 55). Plug hoses and cap elbows.
- e. Tag and disconnect hoses (56 and 57) from rear tow point control valve (47) elbows (58 and 59). Plug hoses and cap elbows.



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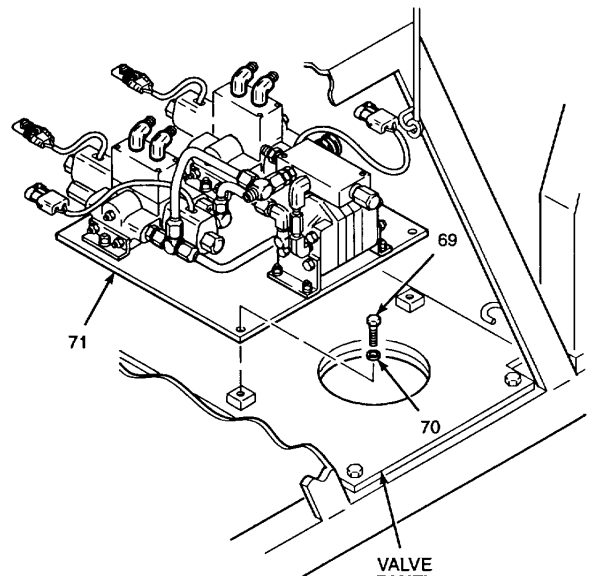
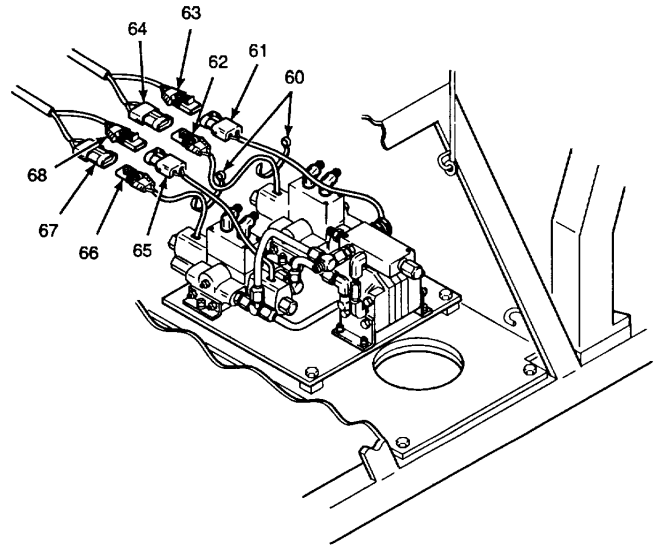
**2-743**

**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued**

A. REMOVE - Continued.

**NOTE****Tie wraps are located as needed.**

- f. Cut and remove tie wraps (60).
- g. Tag and disconnect rear tow point control valve electrical connectors (61 and 62) from harness electrical connectors (63 and 64).
- h. Tag and disconnect front tow point control valve electrical connectors (65 and 66) from harness electrical connectors (67 and 68).
- i. Remove bolts (69) and flat washers (70) from tow point mount plate (71). Remove mount plate from valve panel.

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- A. REMOVE- Continued.
- 5. REMOVE TUBES AND HOSES FROM RIGHT AUGER/CONVEYOR SPEED CONTROL VALVE.

will need to be loosened to allow removal of right auger/conveyor speed control valve (72).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure.

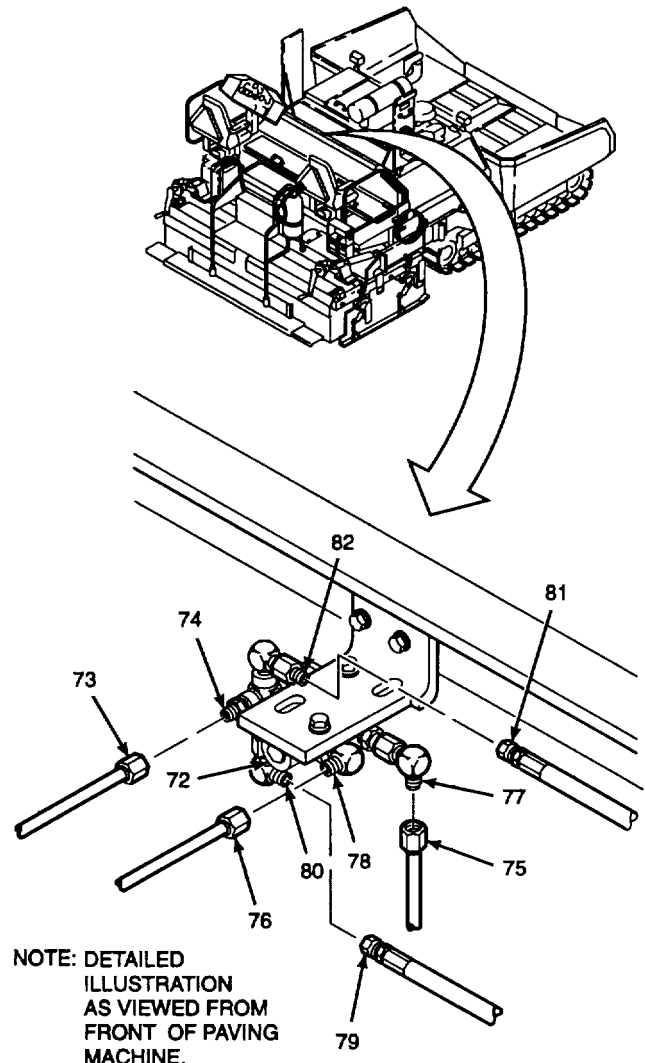
Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.

**NOTE**

The auger/conveyor speed control valve only needs to be removed when removing the auger/conveyor control valve. Remove left speed control valve if removing left control valve. Remove right speed control valve if removing right control valve.



- a. Wipe all dirt and dust from fittings with cleaning cloths.
- b. Place a machinery wiping towel beneath right auger/ conveyor speed control valve (72).

**NOTE**

It may be necessary to plug and cap fittings after auger/conveyor speed control valve removal, step A.7.

- c. Tag and disconnect tube (73) from straight adapter (74). Plug tube and cap straight adapter.
- d. Tag and disconnect tubes (75 and 76) from elbows (77 and 78). Both ends of tube (76)

- e. Tag and disconnect hose (79) from elbow (80). Plug hose and cap elbow.
- f. Tag and disconnect hose (81) from tube reducer (82). Plug hose and cap tube reducer.
- g. Plug tubes (75 and 76) and cap elbows (77 and 78).

**GO TO NEXT PAGE**

**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued**

- A. REMOVE - Continued.
- 6. REMOVE TUBES AND HOSES FROM LEFT AUGER/CONVEYOR SPEED CONTROL VALVE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.

**NOTE**

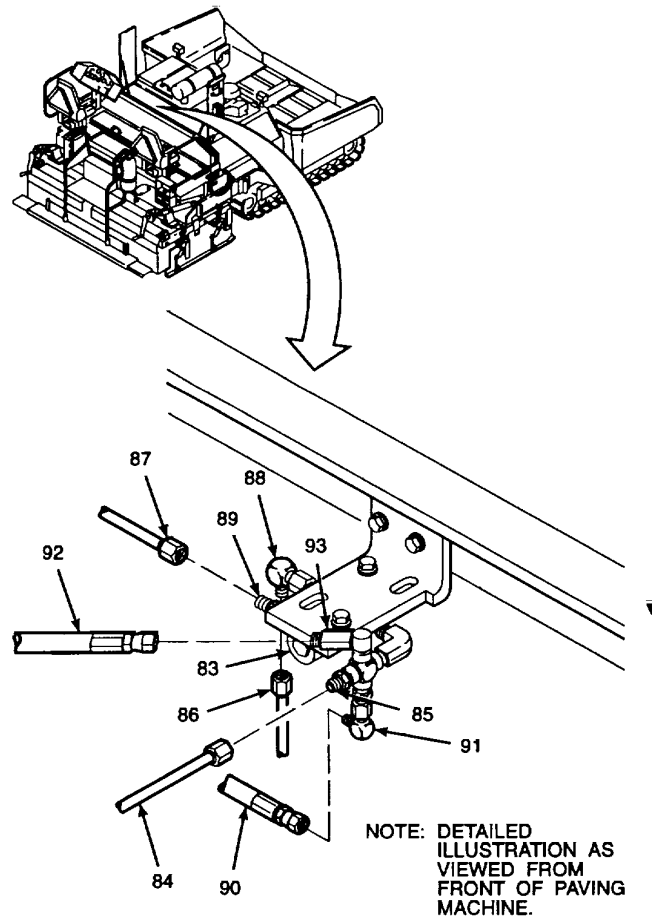
The auger/conveyor speed control valve only needs to be removed when removing the auger/conveyor control valve. Remove left speed control valve if removing left control valve. Remove right speed control valve if removing right control valve.

- a. Wipe all dirt and dust from fittings with cleaning cloths.
- b. Place a machinery wiping towel beneath left auger/conveyor speed control valve (83).

**NOTE**

**It may be necessary to plug and cap fittings after auger/conveyor speed control valve removal, step A.7.**

- c. Tag and disconnect tube (84) from straight adapter (85). Plug tube and cap straight adapter.



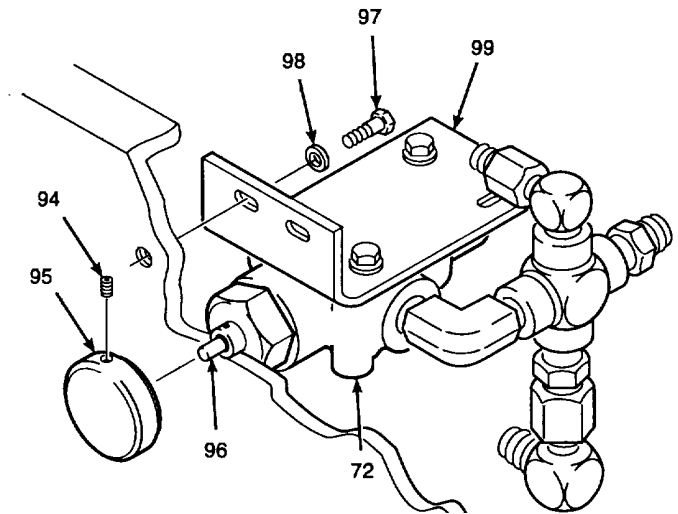
- d. Tag and disconnect tubes (86 and 87) from elbow (88) and straight adapter (89). Plug tubes and cap elbow and straight adapter.
- e. Tag and disconnect hose (90) from elbow (91). Plug hose and cap elbow.
- f. Tag and disconnect hose (92) from tube reducer (93). Plug hose and cap tube reducer.

- A. REMOVE - Continued.
7. REMOVE AUGER/CONVEYOR SPEED CONTROL VALVE.

**NOTE**

Removal procedures for both the left and right auger/conveyor speed control valve are the same. The illustrations in this procedure are for the right auger/conveyor speed control valve. The fittings may be positioned slightly different for the left speed control valve.

- a. Loosen set screw (94) on knob (95). Remove knob from adjustment screw (96).
- b. Remove bolts (97) and sleeve spacers (98) from mounting bracket (99) and remove auger/conveyor speed control valve (72). Install knob (95) back onto adjustment screw (96) and tighten set screw (94).



**NOTE: RIGHT AUGER/CONVEYOR SPEED CONTROL VALVE SHOWN.**

**GO TO NEXT PAGE  
2-747**



**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued**

- A. REMOVE - Continued.
- 8. REMOVE TOW POINT FLOW DIVIDER AND TOW POINT FLOW CONTROL VALVE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

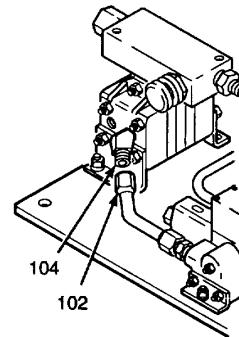
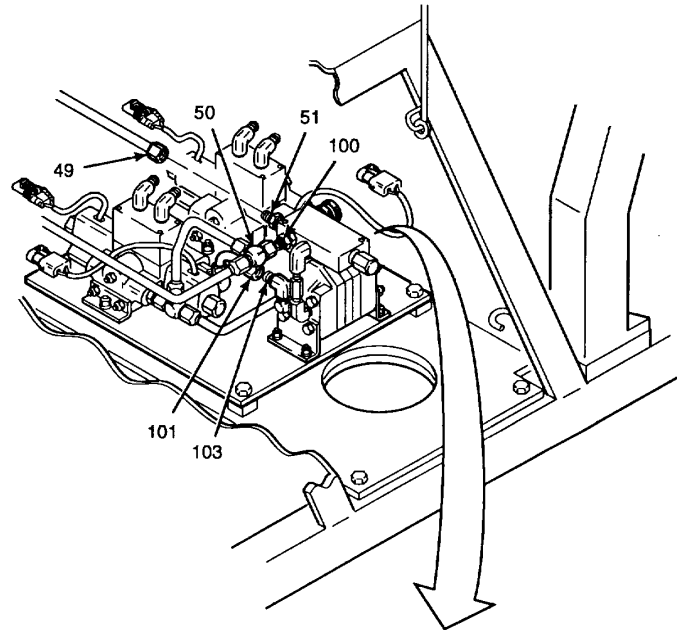
Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.

- a. Wipe all dirt and dust from fittings with cleaning cloths.

**NOTE**

It may be necessary to remove hydraulic tubes and plug and cap fittings after removal of tow point flow divider and tow point flow control valve, step f.

- b. Tag and disconnect swivel tee (50) from straight adapter (100). Plug swivel tee and cap straight adapter.
- c. Tag and disconnect tubes (101 and 102) from elbows (103 and 104). Plug tubes and cap elbows.
- d. Tag and disconnect tube (49) from straight adapter (51).



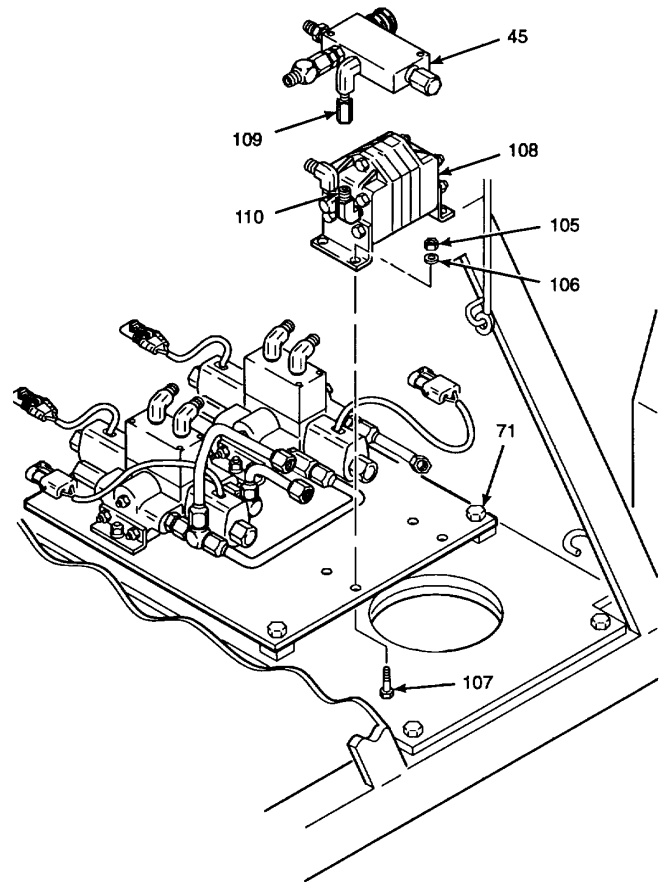
## A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system.

Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- e. Remove hex nuts (105), flat washers (106) from bolts (107).
- f. Remove tow point flow divider (108) and tow point flow control valve (45) from tow point mount plate (71).
- g. Place tow point flow divider (108) in a bench vise. Using an open end wrench, unscrew pipe coupling (109) from elbow (110) and remove tow point flow control valve (45) from tow point flow divider. Plug pipe coupling and cap elbow.



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**2.55. REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued**

- A. REMOVE - Continued.
9. REMOVE TOW POINT CONTROL VALVES.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.

**NOTE**

Before removing tow point control valves, the tow point mount plate must be removed.

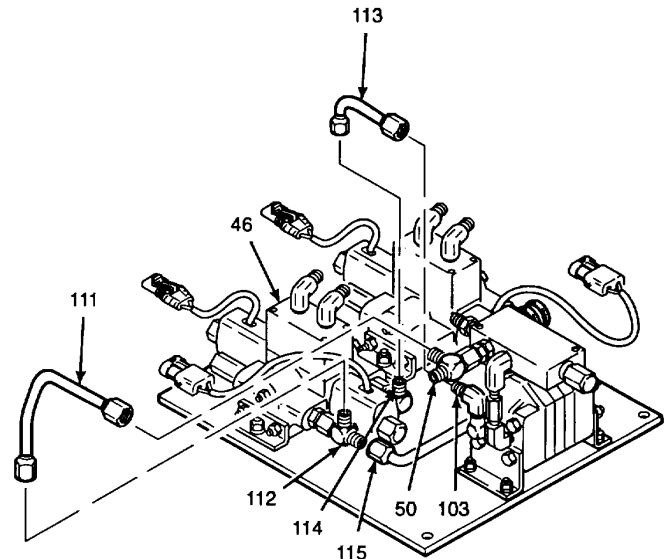
- a. Wipe all dirt and dust from fittings with cleaning cloths.
- b. Place machinery wiping towels around tow point control valve to be removed.

**NOTE**

Step c is for the front tow point control valve and step d is for the rear tow point control valve.

**NOTE**

It may be necessary to remove hydraulic tubes, and plug and cap fittings after tow point control valve is removed, step f.



- c. To disconnect front tow point control valve (46) from hydraulic tubes, perform the following procedures.
  - (1) Tag and remove tube (111) by disconnecting tube from swivel tee (50) and tee (112). Plug tube and cap swivel tee and tee.
  - (2) Tag and remove tube (113) by disconnecting from elbows (103 and 114). Plug tube and cap elbows.
  - (3) Disconnect tube (115) at tee (112). Plug tube and tee.

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2-750

A. REMOVE - Continued.

**WARNING**

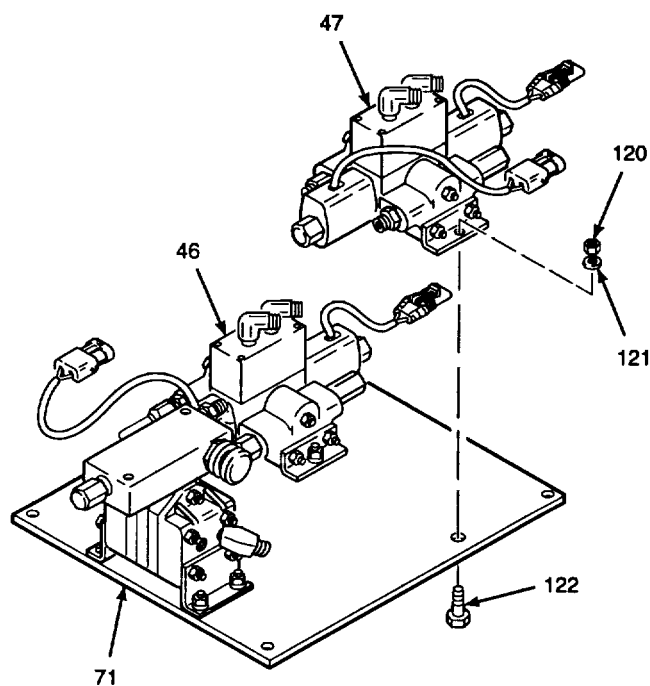
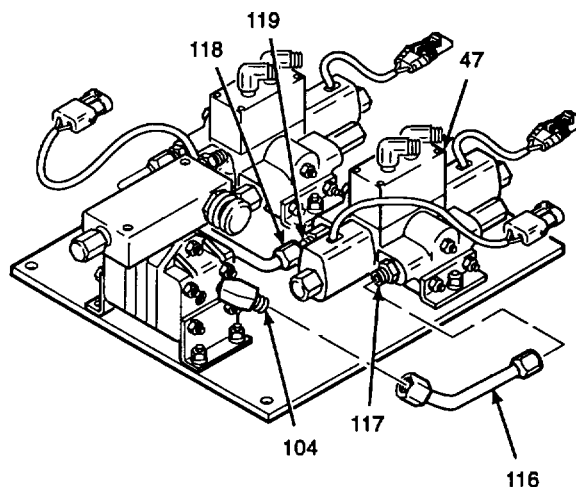
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

d. To disconnect rear tow point control valve (47) from hydraulic fittings, perform the following procedures.

- (1) Tag and remove tube (116) by disconnecting tube from elbow (104) and straight adapter (117). Plug tube and cap elbow and straight adapter.
- (2) Remove tube (118) from straight adapter (119).

e. Remove hex nuts (120), flat washers (121), and bolts (122).

f. Remove tow point control valves (46 or 47) from the tow point mount plate (71).



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**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

---

A. REMOVE Continued.

10. REMOVE AUGER/CONVEYOR CONTROL VALVES.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.

**NOTE**

Before removing auger/conveyor control valve the auger/conveyor speed control valve must be removed. Remove right speed control valve and DCA housing to remove the right control valve. Remove left speed control valve to remove the left control valve.

Removal procedures for both the left and right auger/conveyor control valves are the same. The illustrations in this procedure are for the right control valve. The fittings may be positioned slightly different for the left control valve.

- a. Wipe all dirt and dust from fittings with cleaning cloths.
- b. Place machinery wiping towels around the auger/ conveyor control valve to be removed.

**GO TO NEXT PAGE**

A. REMOVE - Continued.

**WARNING**

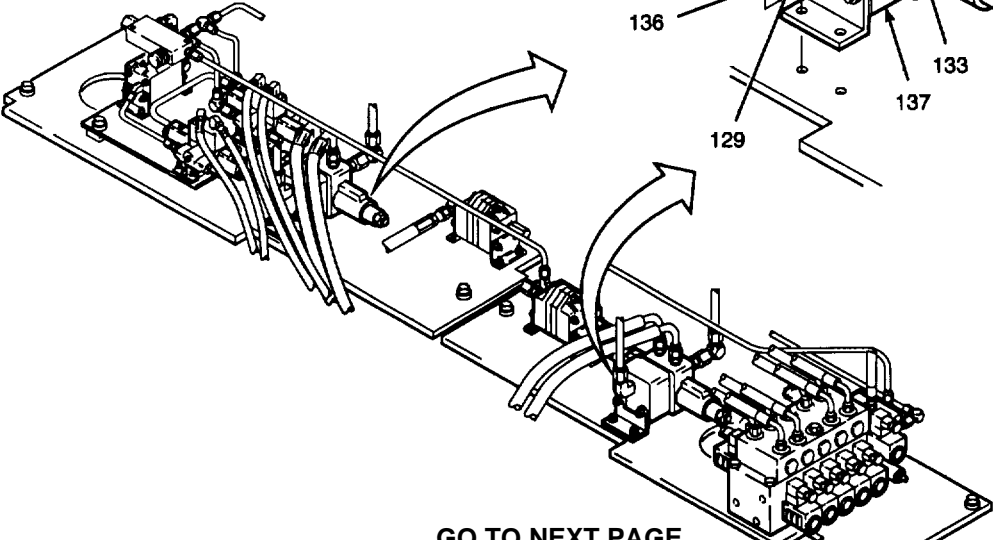
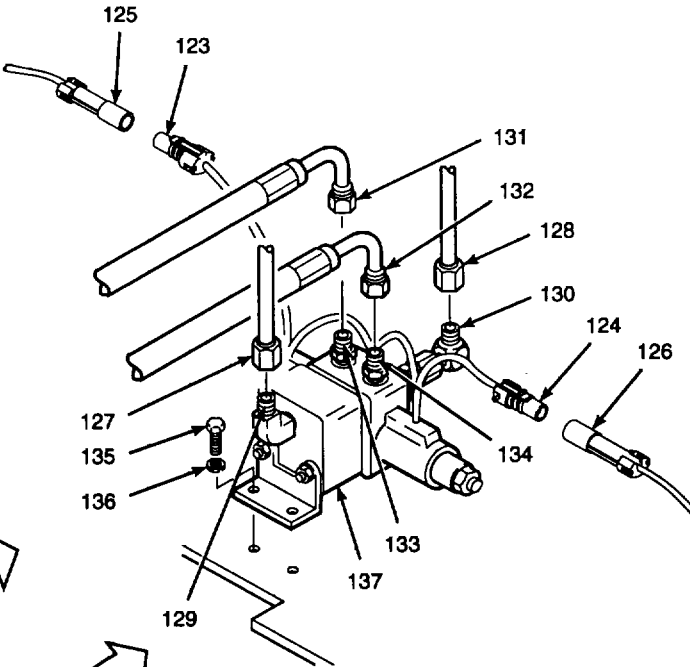
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- c. Tag and disconnect auger/conveyor control valve electrical connectors (123 and 124) from harness electrical connectors (125 and 126).

**NOTE**

Tube (128) may need to be loosened at both ends and removed for removal of auger/conveyor control valve.

- d. Tag and disconnect tubes (127 and 128) from elbows (129 and 130). Plug tubes and cap elbows.
- e. Tag and disconnect hoses (131 and 132) from straight adapters (133 and 134). Plug hoses and cap straight adapters.
- f. Remove bolts (135) and lockwashers (136). Discard lockwashers.
- g. Remove auger/conveyor control valve (137) from paving machine.



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**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

---

A. REMOVE - Continued.

11. REMOVE VALVE AND CYLINDER FLOW DIVIDER.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.

**NOTE**

Before valve and cylinder flow divider can be removed, the return manifold must be removed.

- a. Wipe all dirt and dust from fittings with cleaning cloths.

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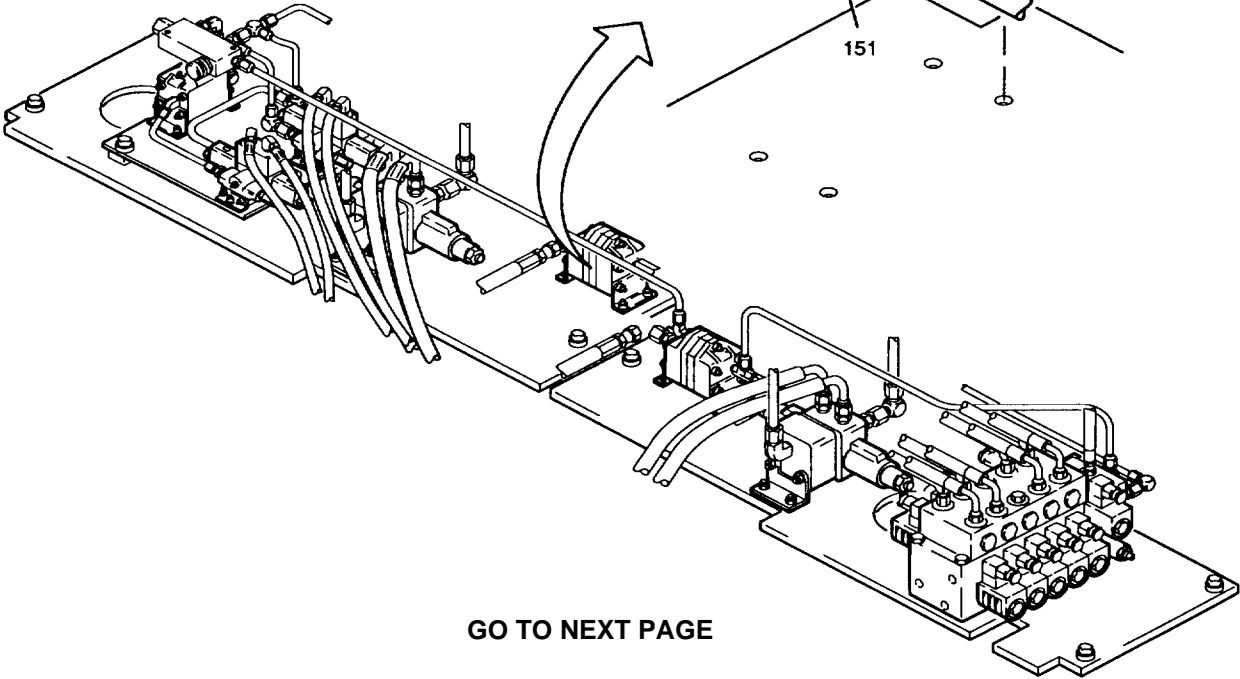
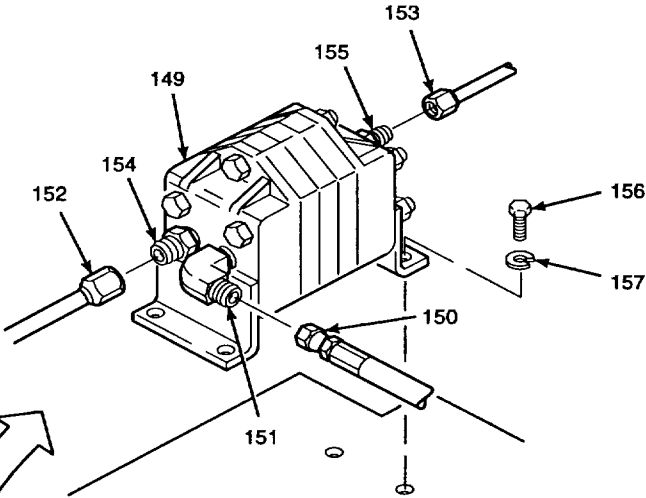
**2-754**

A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Place machinery wiping towels around valve and cylinder flow divider (138).
- c. Tag and disconnect tube (139) from elbow (140). Plug tube and cap elbow.
- d. Tag and disconnect hose (141) from swivel elbow (142). Plug hose and cap swivel elbow.
- e. Tag and disconnect tube (143) from tee (144). Plug tube and cap tee.
- f. Tag and disconnect swivel elbow (145) from tube 47 reducer (146). Plug swivel elbow and cap tube reducer.
- g. Remove bolts (147) and lockwashers (148). Remove 48 valve and cylinder flow divider (138) from paving machine. Discard lockwashers.



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**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

---

- A. REMOVE - Continued.
- 12. REMOVE AUGER/CONVEYOR FLOW DIVIDER.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.

**NOTE**

Before removing auger/conveyor flow divider the return manifold must be removed.

- a. Wipe all dust and dirt from fittings with cleaning cloths.

**GO TO NEXT PAGE**

**2-756**

A. REMOVE - Continued.

**WARNING**

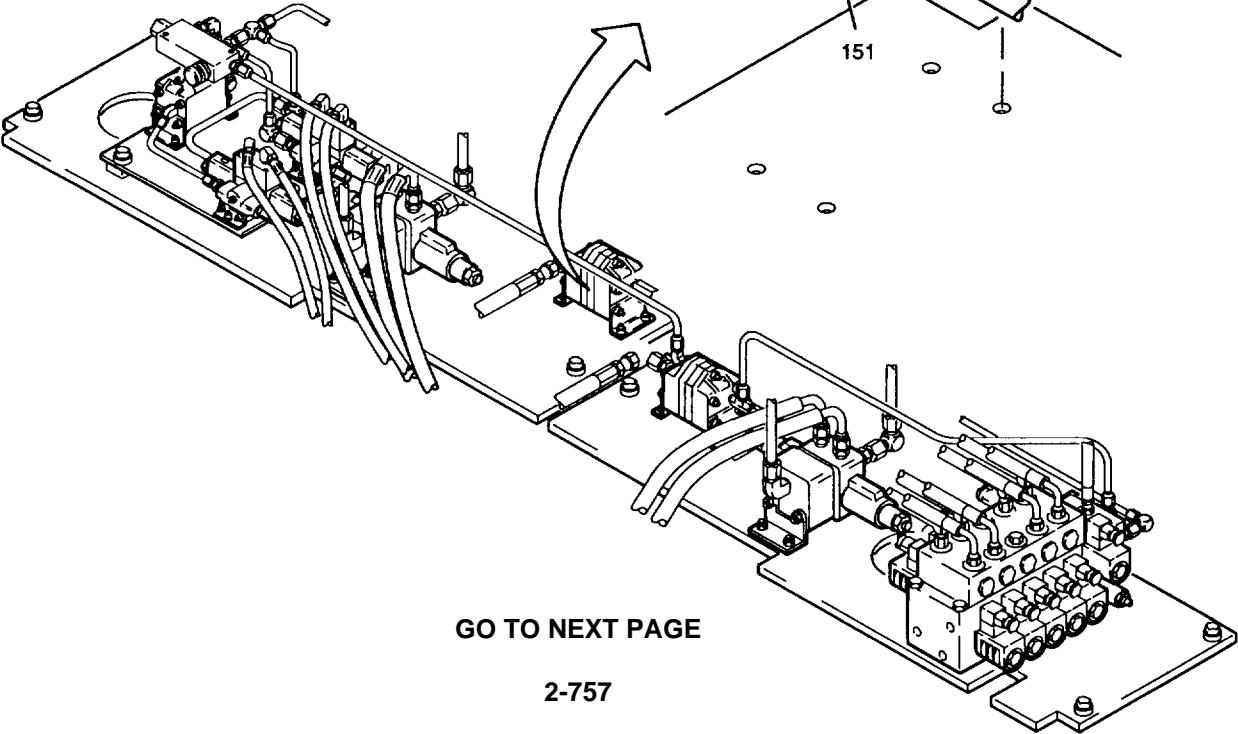
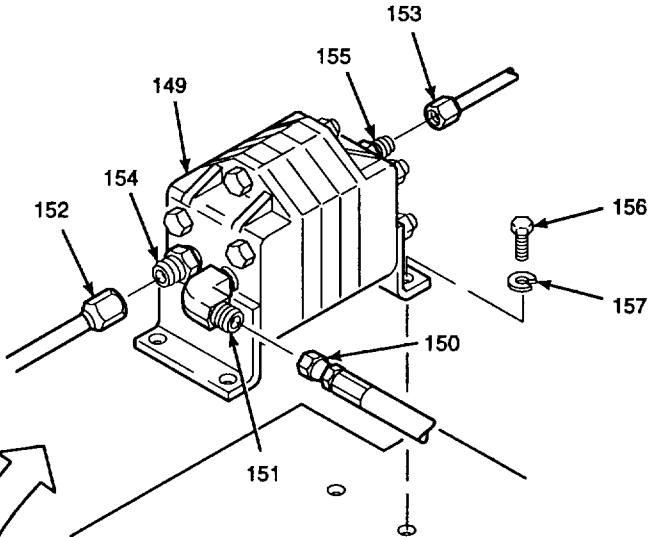
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Place machinery wiping towels around auger/conveyor flow divider (149).

**NOTE**

It may be necessary to remove hydraulic tubes and plug and cap fittings after auger/conveyor flow divider removal, step e.

- c. Tag and disconnect hose (150) from elbow (151). Plug hose and cap elbow.
- d. Tag and disconnect tubes (152 and 153) from straight adapters (154 and 155). Plug tubes and cap straight adapters.
- e. Remove bolts (156) and lockwashers (157). Remove auger/conveyor flow divider (149) from paving machine. Discard lockwashers.



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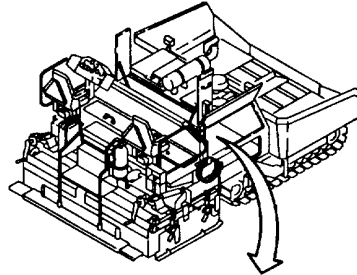
**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

A. REMOVE - Continued.

13. REMOVE STACK VALVE.

**WARNING**

Ensure screed and hopper wings are lowered before any tubes or hoses are disconnected from stack valve. Serious injury may result if pressure is removed from lines and screed or hopper wings are not lowered.

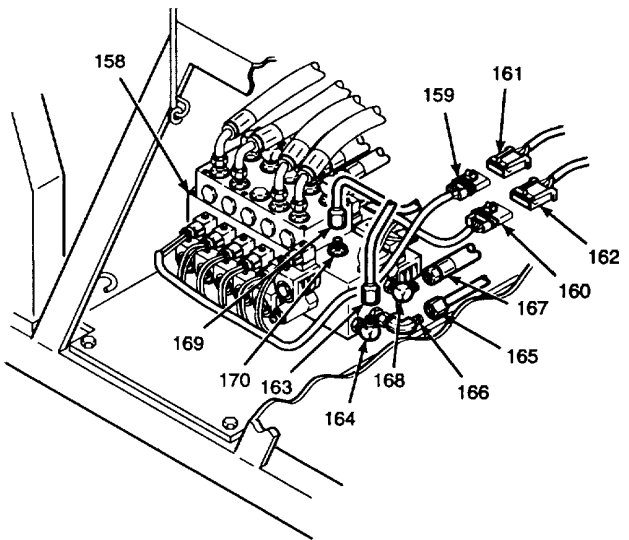


**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in system contamination and equipment damage.



- a. Wipe all dirt and dust from fittings with cleaning cloths.
- b. Place machinery wiping towels around stack valve (158) and fittings to be disconnected.
- c. Tag and disconnect stack valve electrical connectors (159 and 160) from harness electrical connectors (161 and 162).

- e. Tag and disconnect tube (165) from swivel elbow (166). Plug tube and cap swivel elbow.
- f. Tag and disconnect hose (167) from elbow (168). Plug hose and cap elbow.

**NOTE**

It may be necessary to remove hydraulic tubes, and plug and cap fittings after stack valve removal, step m.

**NOTE**

Tube (169) may require loosening at both ends to allow removal.

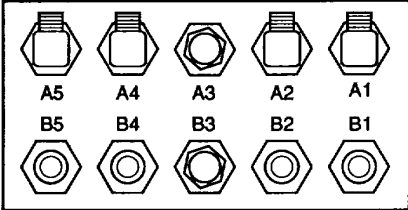
- d. Tag and disconnect tube (163) from elbow (164). Plug tube and cap elbow.

- g. Tag and disconnect tube (169) from straight adapter(170). Plug tube and cap straight adapter.

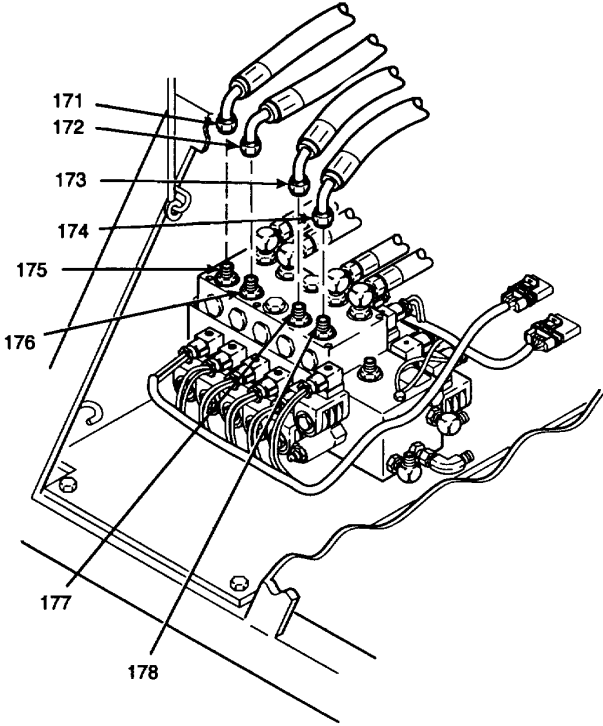
A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.



- h. Tag and disconnect hoses (171, 172, 173, and 174) from straight adapters (175, 176, 177, and 178). Plug hoses and cap straight adapters.



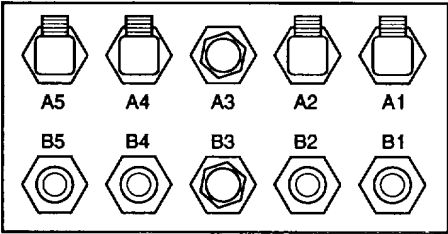
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2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.

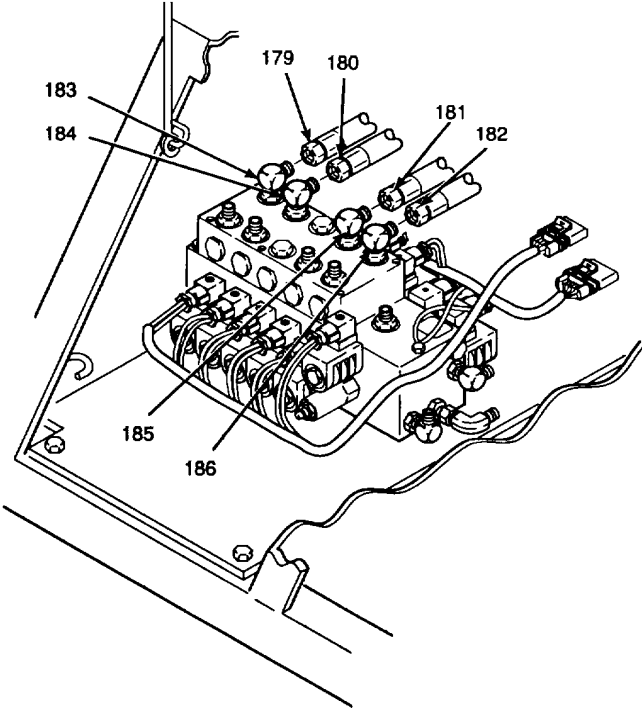
A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.



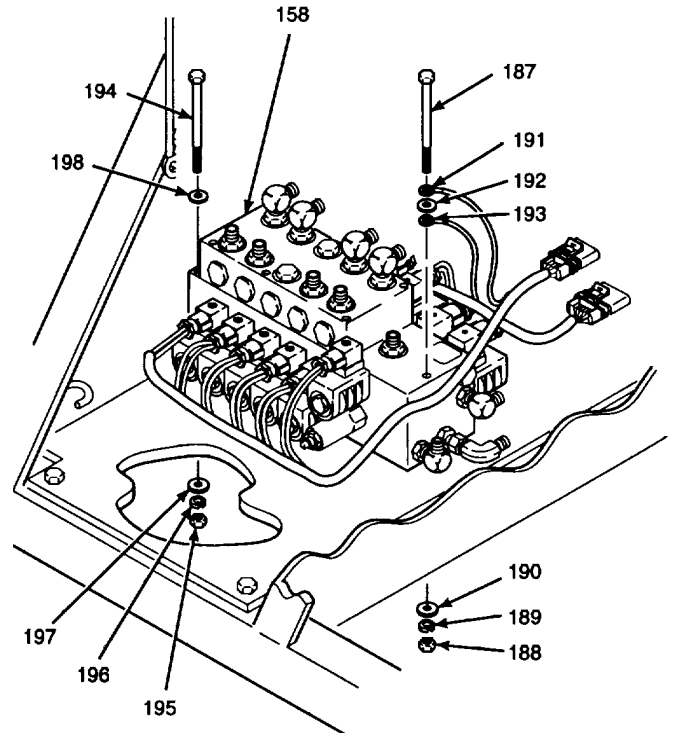
- i. Tag and disconnect hoses (179, 180, 181, and 182) from elbows (183, 184, 185, and 186). Plug hoses and cap elbows.



GO TO NEXT PAGE

A. REMOVE - Continued.

- j. While holding hex head cap screw (187) with a wrench, remove hex nut (188), lockwasher (189), and flat washer (190) from underneath valve panel. Discard lockwasher.
- k. Remove hex head cap screw (187), ground wire lead (191), flat washer (192), and ground wire lead (193).
- l. While holding hex head cap screws (194) with a wrench, remove hex nuts (195), lockwashers (196), and flat washers (197) from underneath valve panel. Discard lockwashers.
- m. Remove hex head cap screws (194) and flat washers (198). Remove stack valve (158) from paving machine.
- n. If replacing stack valve (158), remove the wiring harnesses per paragraph 2.44 and reinstall on replacement stack valve.



B. CLEAN.

- 1. CLEAN ALL FASTENERS WITH THREAD LOCKING COMPOUND SOLVENT.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean all fasteners with thread locking compound solvent.
- b. Wipe fasteners dry with a cleaning cloth.

**GO TO NEXT PAGE**

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**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

---

- B. CLEAN - Continued.
2. CLEAN VALVE PANEL AREA WHERE CONTROL VALVE OR FLOW DIVIDER HAS BEEN REMOVED.

<b>WARNING</b>
----------------

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean area of valve panel, where control valve or flow divider has been removed, with a cleaning cloth soaked with cleaning solvent to remove grease, dirt, and hydraulic oil.
- b. Wipe cleaned valve panel area dry with a cleaning cloth.

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**2-762**

C. INSTALL.

1. INSTALL STACK VALVE.

- a. Place stack valve (158) into valve panel over mounting holes.
- b. Install flat washer (198) onto hex head cap screw (194).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

**NOTE**

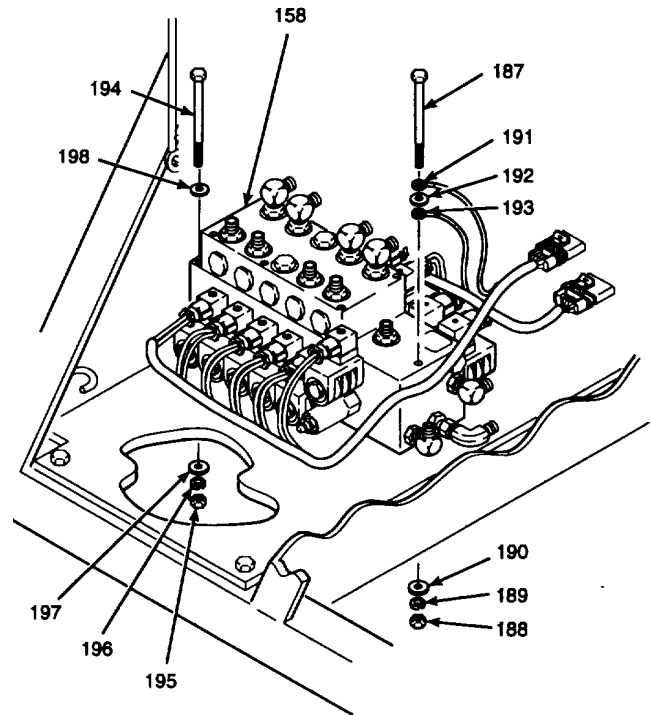
It may be necessary to connect hydraulic tubes to stack valve ports per step n before hex head cap screws are tightened.

- c. Apply thread locking compound to threads of hex head cap screw (194) and insert through stack valve (158).
- d. From underneath panel, install flat washers (197), lockwashers (196), and hex nuts (195).
- e. Install ground wire lead (191), flat washer (192), and ground wire lead (193) onto hex head cap screw (187). Apply thread locking compound to threads of cap screw and insert cap screw through stack valve mounting hole.
- f. From underneath panel, install flat washer (190), lockwasher (189), and hex nut (188). Tighten hex nuts (188 and 195) to 9 lb-ft (12 N•m).

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- g. Apply electrical insulating varnish to ground wire leads (191 and 193) and hex head cap screw (187).



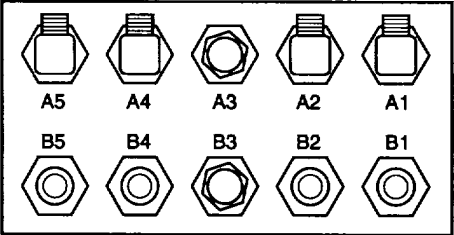


2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.

C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

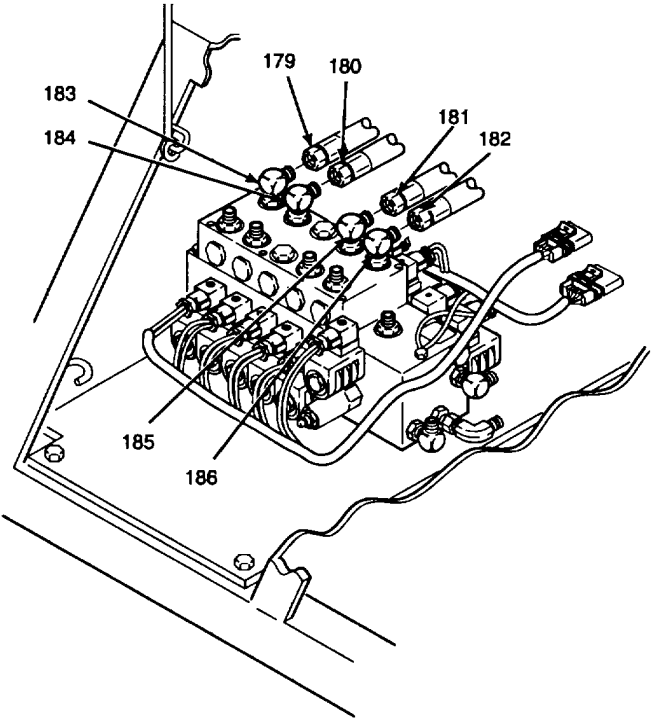


- h. Apply hydraulic fitting sealant to exposed threads of elbows (183, 184, 185, and 186).

**NOTE**

Make sure that hydraulic hoses are connected to the correct elbows.

- i. Connect hoses (179, 180, 181, and 182) to elbows (183, 184, 185, and 186). Hoses connect to stack valve ports as follows: (179) to A5, (180) to A4, (181) to A2, and (182) to A1.

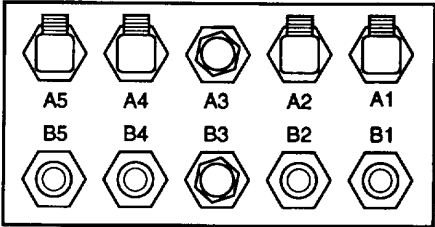


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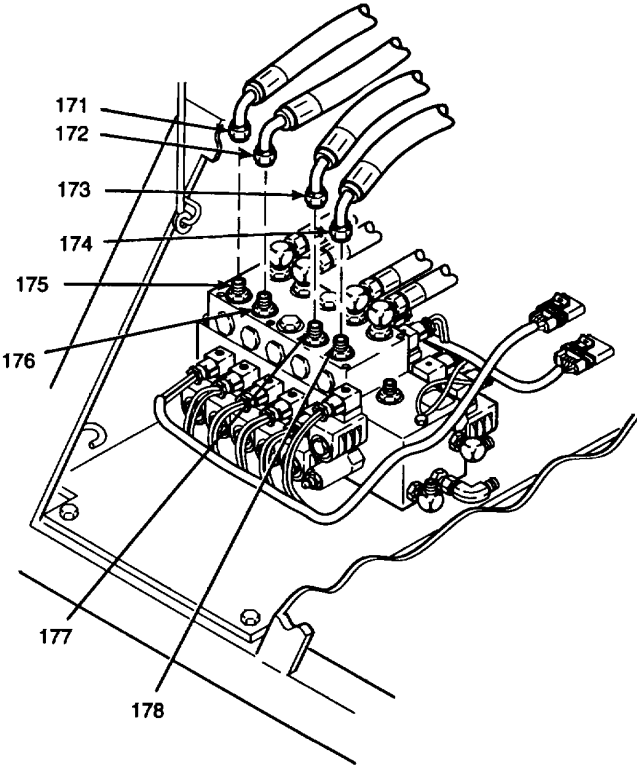
C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- j. Apply hydraulic fitting sealant to exposed threads of straight adapters (175, 176, 177, and 178).
- k. Connect hoses (171, 172, 173, and 174) to straight adapters (175, 176, 177 and 178). Hoses connect to stack valve ports as follows: (171) to B5, (172) to B4, (173) to B2, and (174) to B1.



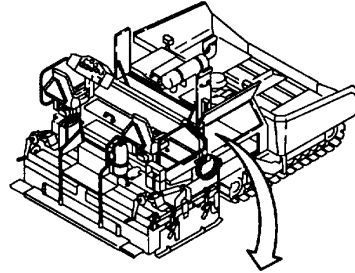
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**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

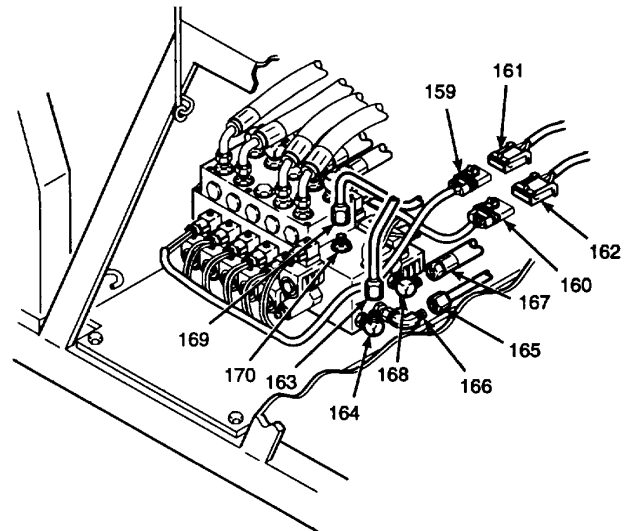
## C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- l. Apply hydraulic fitting sealant to exposed threads of elbows (164 and 168), swivel elbow (166), and straight adapter (170).
- m. Connect hose (167) to elbow (168). Tighten hose.
- n. Connect tube (165) to swivel elbow (166). Tighten tube.
- o. Connect tube (163) to elbow (164). Tighten tube.
- p. Connect tube (169) to straight adapter (170). Tighten tube. Ensure opposite end of tube is tightened.
- q. Apply electrical insulating compound to male ends of stack valve electrical connectors (159 and 160). Plug stack valve electrical connectors into harness electrical connectors (161 and 162).
- r. Install tie wraps to electrical harnesses as needed.

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C. INSTALL - Continued.

2. INSTALL AUGER/CONVEYOR FLOW DIVIDER.

**WARNING**

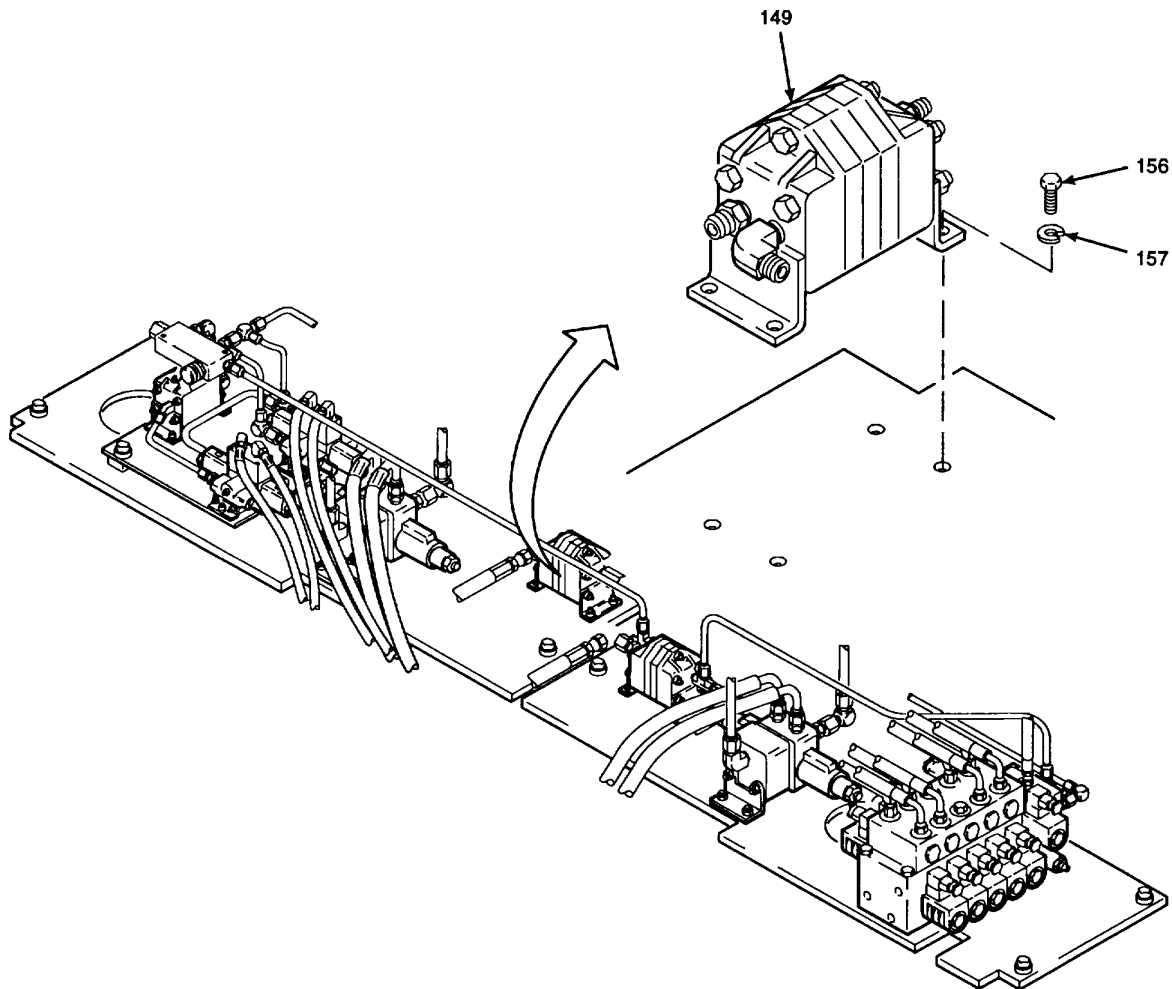
**NOTE**

It may be necessary to connect hydraulic tubes to auger/conveyor flow divider before bolts are tightened per step d.

- a. Place auger/conveyor flow divider (149) into valve panel over flow divider mounting holes.
- b. Install lockwashers (157) onto bolts (156).

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to threads of bolts (156).
- d. Install lockwashers (157) and bolts (156). Tighten bolts.



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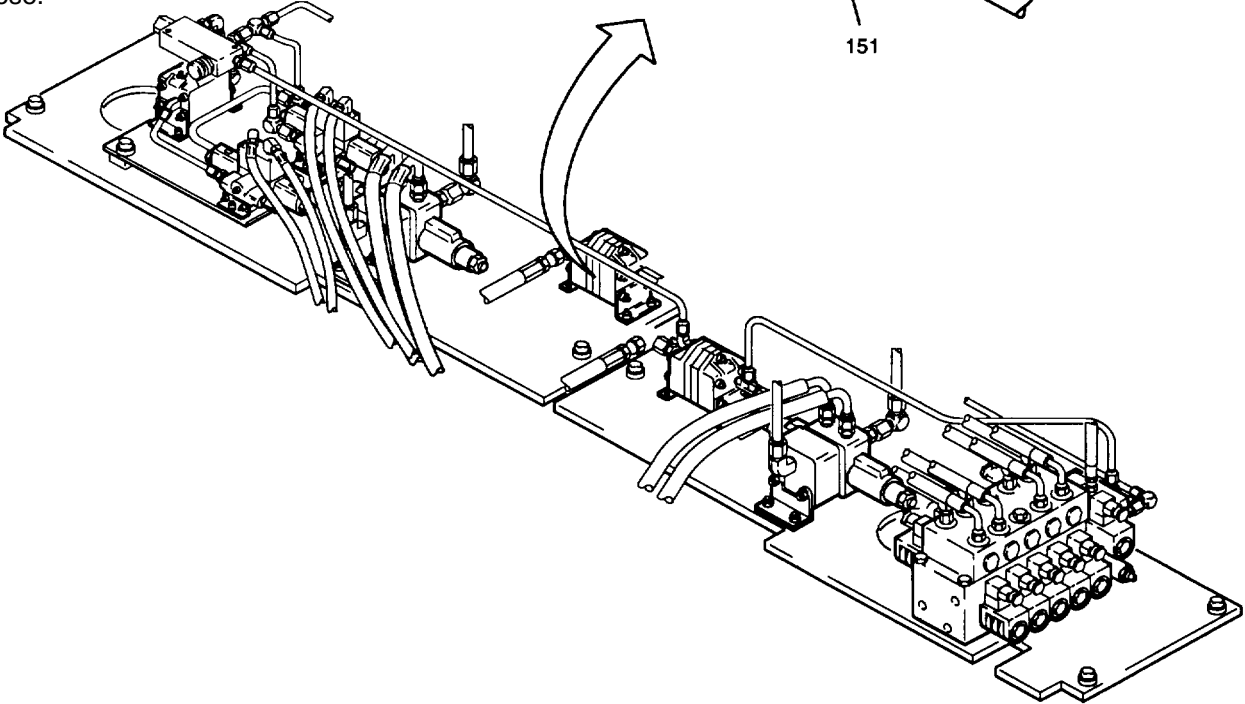
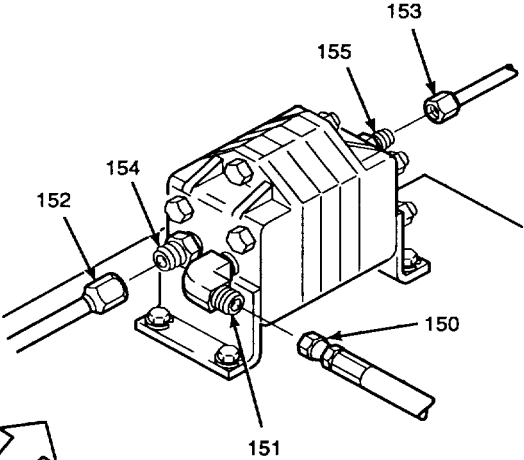
2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.

C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply hydraulic fitting sealant to exposed threads of straight adapters (154 and 155) and elbow (151).
- f. Connect tubes (152 and 153) to straight adapters (154 and 155). Tighten tubes.
- g. Connect hose (150) to elbow (151). Tighten hose.



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C. INSTALL - Continued.

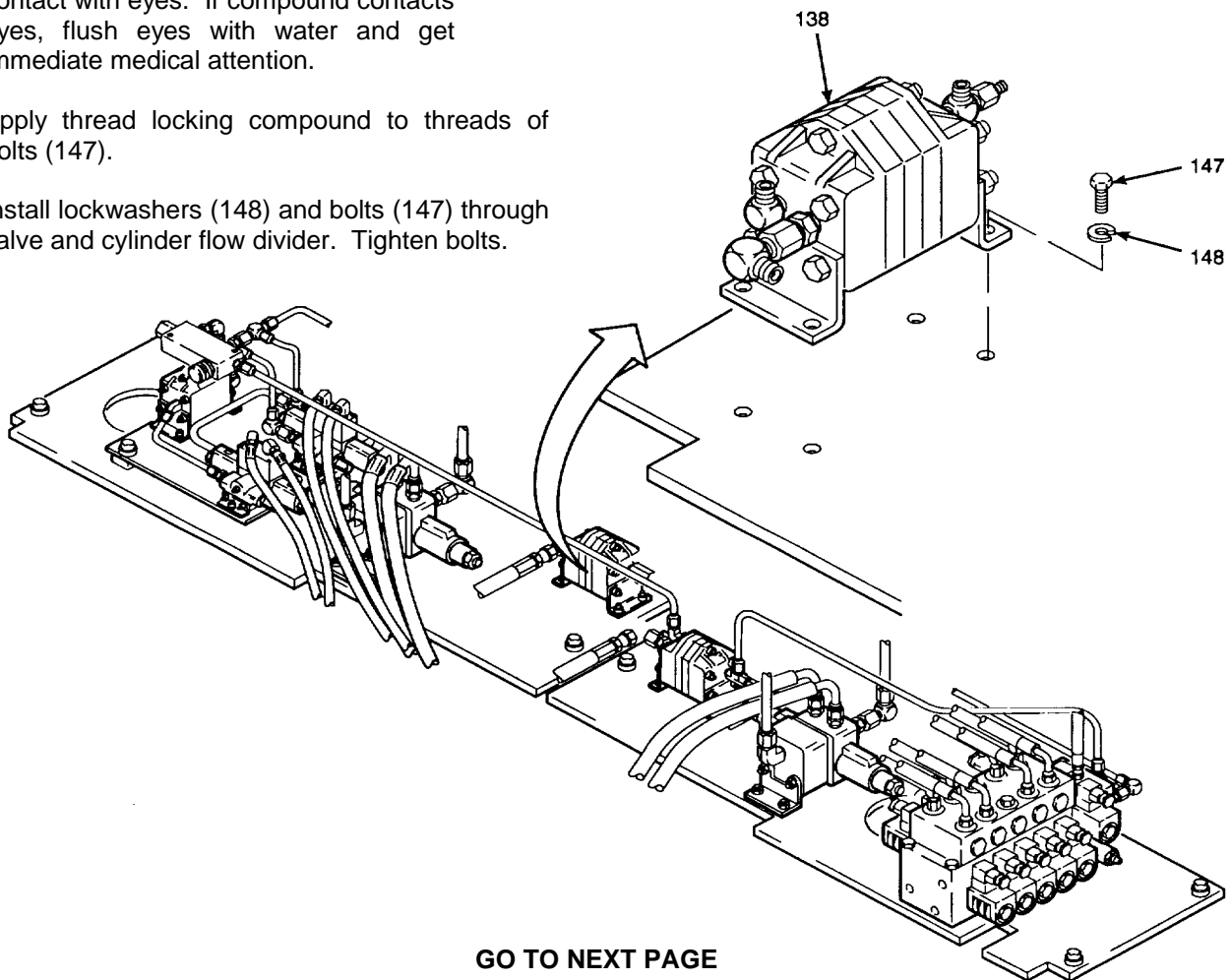
3. INSTALL VALVE AND CYLINDER FLOW DIVIDER.

- a. Place valve and cylinder flow divider (138) into valve panel over flow divider mounting holes.
- b. Install lockwashers (148) onto bolts (147).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to threads of bolts (147).
- d. Install lockwashers (148) and bolts (147) through valve and cylinder flow divider. Tighten bolts.



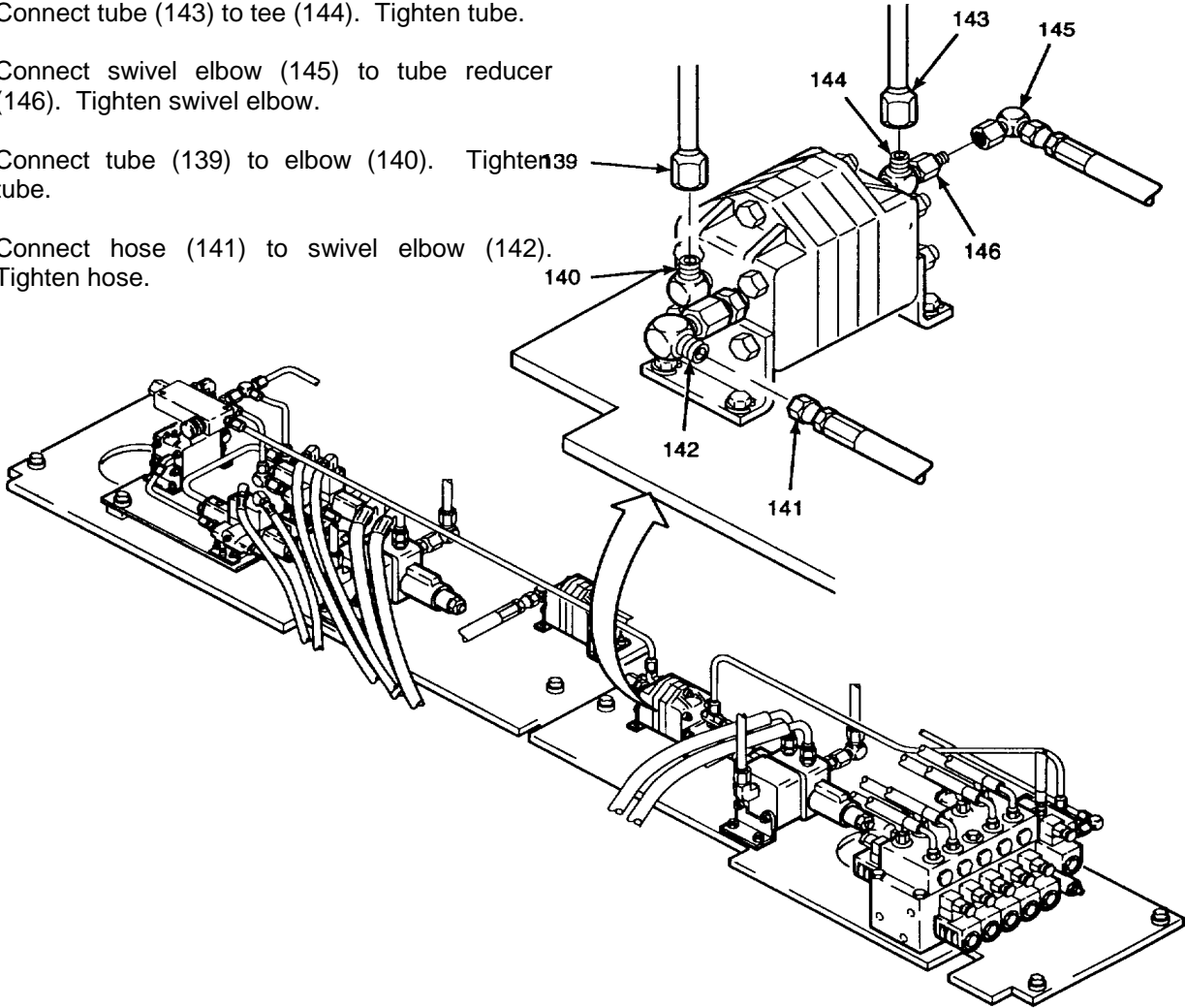
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2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.

C. INSTALL - Continued.

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply hydraulic fitting sealant to the exposed threads of tube reducer (146), tee (144), elbow (140), and swivel elbow (142).
- f. Connect tube (143) to tee (144). Tighten tube.
- g. Connect swivel elbow (145) to tube reducer (146). Tighten swivel elbow.
- h. Connect tube (139) to elbow (140). Tighten tube.
- i. Connect hose (141) to swivel elbow (142). Tighten hose.



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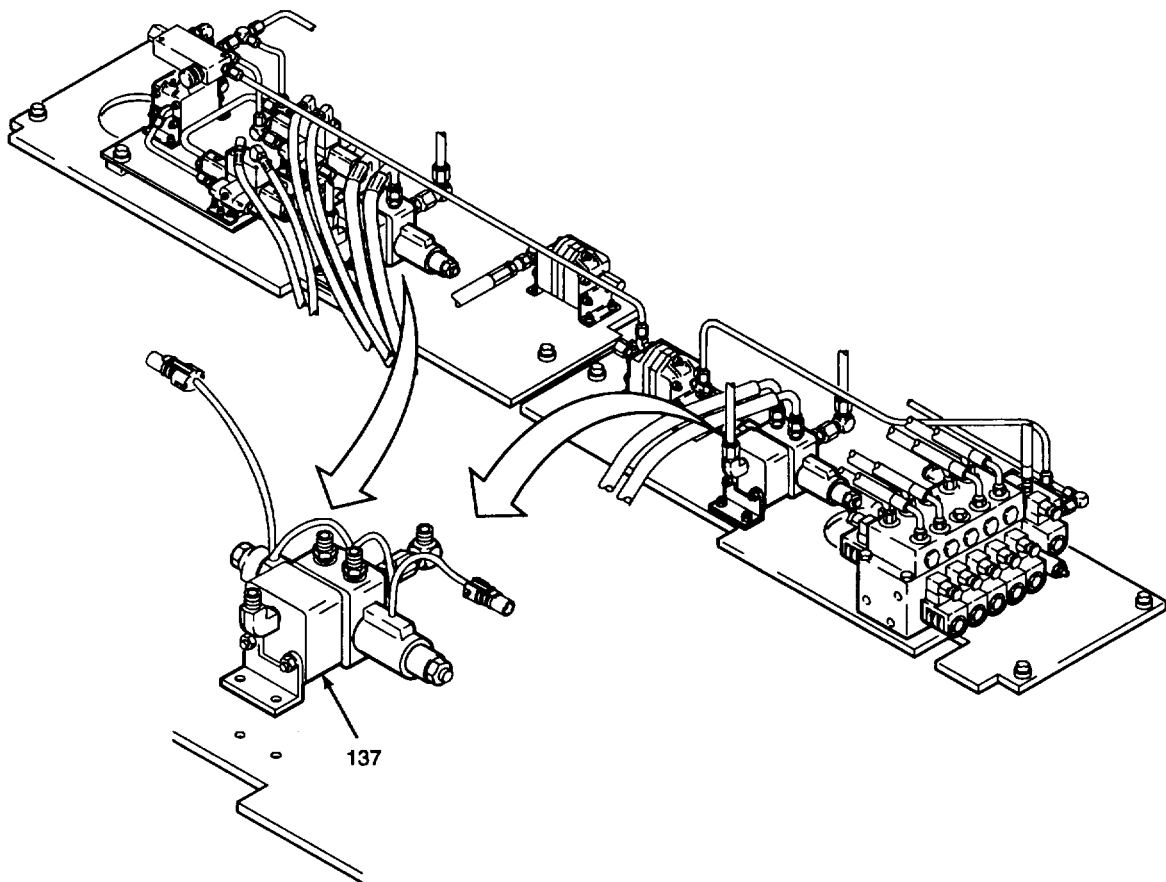
C. INSTALL - Continued.

4. INSTALL AUGER/CONVEYOR CONTROL VALVES.

**NOTE**

Installation procedures for both the left and right auger/conveyor control valves are the same. The illustrations in this procedure are for the right control valve. The fittings may be positioned slightly different for the left control valve.

- a. Place auger/conveyor control valve (137) onto valve panel over control valve mounting holes.



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**2-771**



**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.****C. INSTALL - Continued.****NOTE**

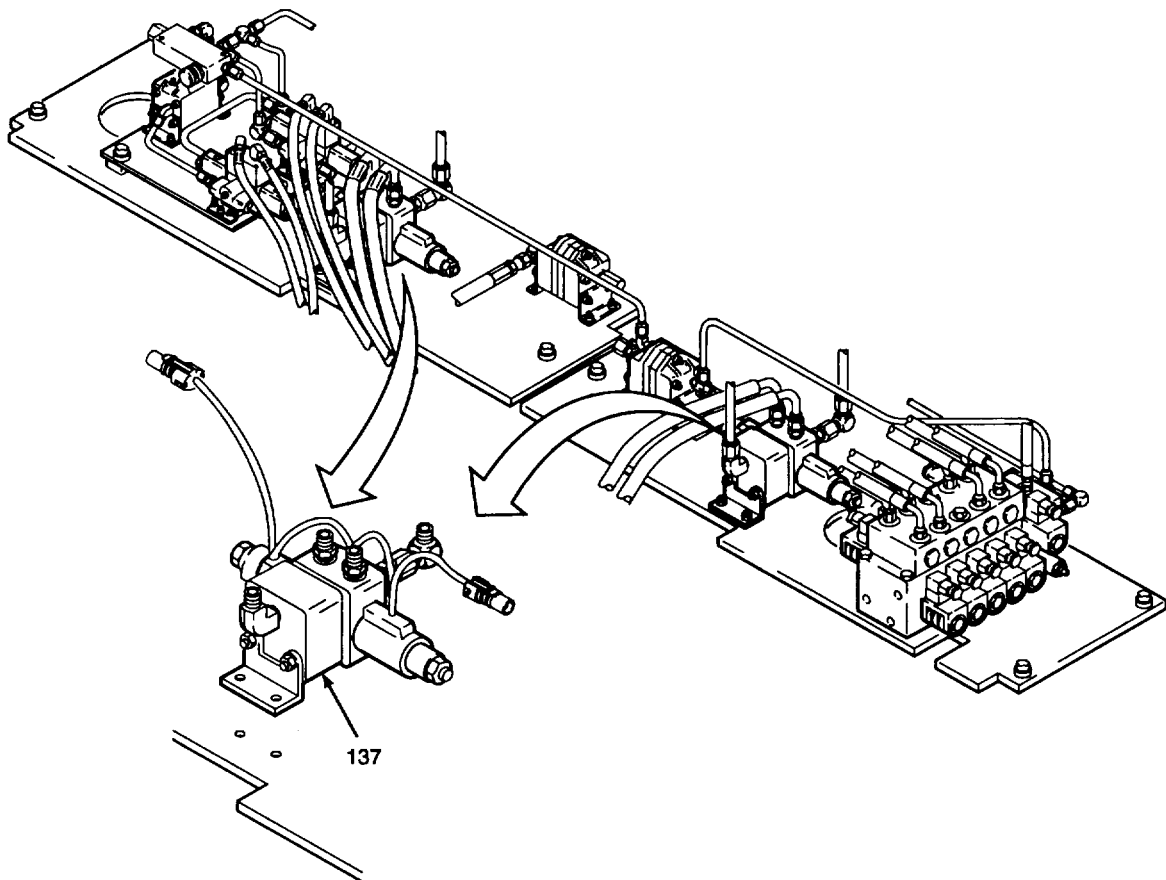
It may be necessary to connect hydraulic tubes to auger/conveyor control valve ports before bolts are tightened per step d.

- b. Install lockwashers (136) onto bolts (135).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to the threads of bolts (135).
- d. Install lockwashers (136) and bolts (135). Tighten bolts to 19 lb-ft (26 N•m).



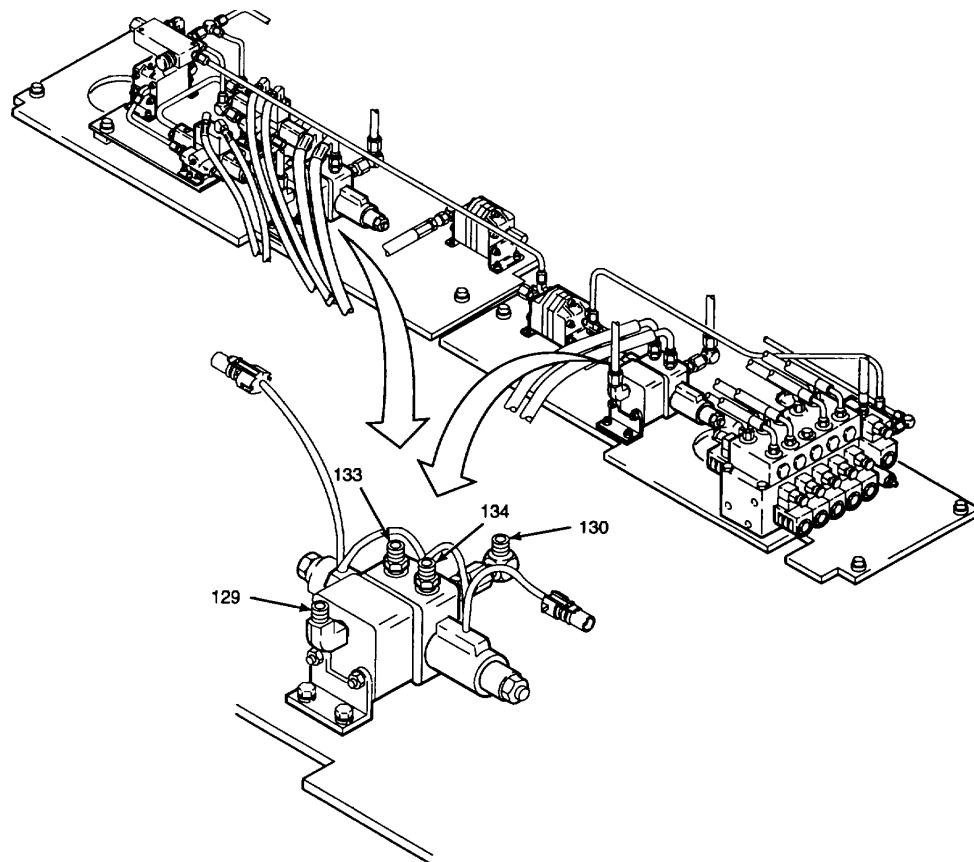
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## C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply hydraulic fitting sealant to the exposed threads of elbows (129 and 130) and straight adapters (133 and 134).



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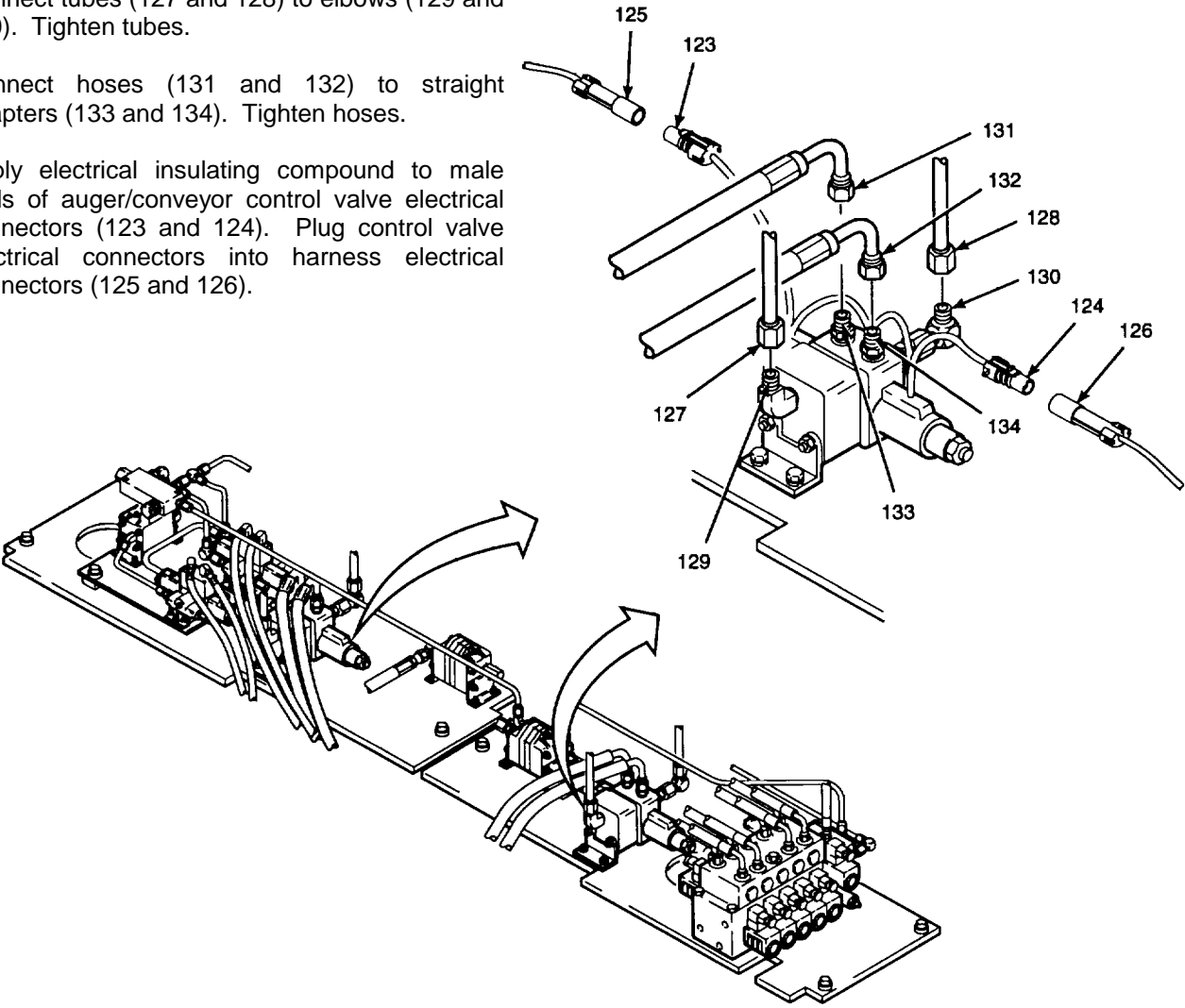
2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.

C. INSTALL - Continued.

**NOTE**

If both ends of tube (128) were loosened during removal, both must be tightened after installation.

- f. Connect tubes (127 and 128) to elbows (129 and 130). Tighten tubes.
- g. Connect hoses (131 and 132) to straight adapters (133 and 134). Tighten hoses.
- h. Apply electrical insulating compound to male ends of auger/conveyor control valve electrical connectors (123 and 124). Plug control valve electrical connectors into harness electrical connectors (125 and 126).



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C. INSTALL - Continued.

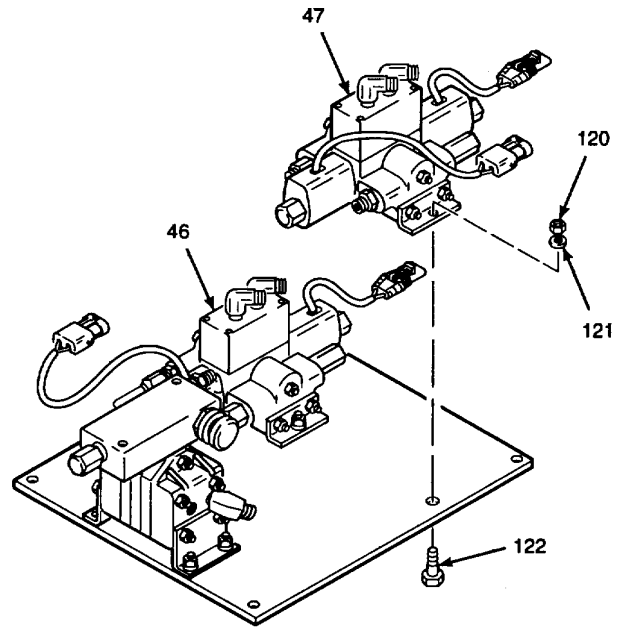
5. INSTALL TOW POINT CONTROL VALVES.

- a. Place tow point control valve (46 or 47) onto mounting holes on tow point mount plate.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to the threads of bolts (122).
- c. Install bolts (122), flat washers (121), and hex nuts (120). Do not tighten hex nuts.



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**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.****C. INSTALL - Continued.****NOTE**

Step d is for installing the rear tow point control valve and step e is for installing the front tow point control valve.

- d. Connect rear tow point control valve (47) to hydraulic fittings. Perform the following procedures.

**WARNING**

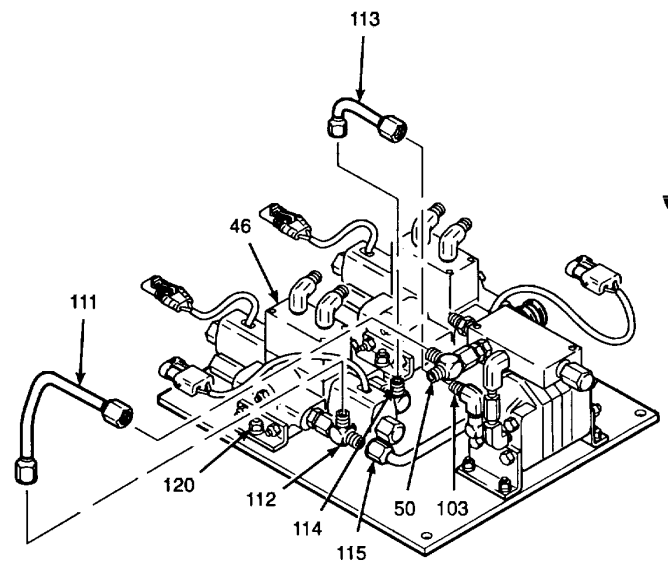
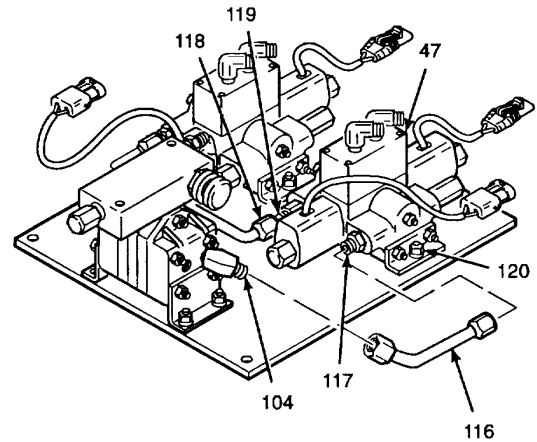
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- (1) Apply hydraulic fitting sealant to exposed threads of straight adapters (117 and 119) and elbow (104).
- (2) Connect tube (118) to straight adapter (119). Do not tighten tube.
- (3) Install tube (116) between straight adapter (117) and elbow (104). Do not tighten tube.

- e. Connect front tow point control valve (46) to hydraulic fittings. Perform the following procedures.

- (1) Apply hydraulic fitting sealant to threads of swivel tee (50), elbow (103), tee (112), and elbow (114).
- (2) Install tube (111) between swivel tee (50) and tee (112). Do not tighten tube.
- (3) Connect tube (115) to tee (112). Do not tighten tube.
- (4) Install tube (113) between elbow (103) and elbow (114). Do not tighten tube.

- f. Tighten hex nuts (120) to 19 lb-ft (26 N•m) and tighten all tubes in steps d and e.



**GO TO NEXT PAGE**  
**2-776**

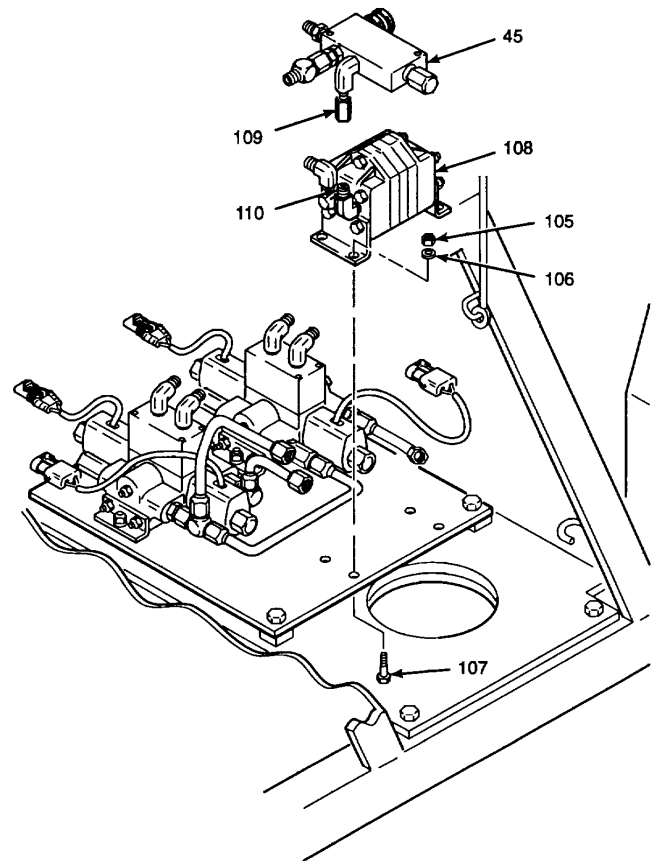
C. INSTALL - Continued.

6. INSTALL TOW POINT FLOW DIVIDER.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Place tow point flow divider (108) into a bench vise. Apply pipe sealant to exposed threads of elbow (110).
- b. Connect pipe coupling (109) on tow point flow control valve (45) to elbow (110). Tighten coupling so that flow control valve is positioned across top of tow point flow divider (108) as shown in illustration.
- c. Remove tow point flow divider (108) from bench vise. Place tow point flow divider onto mounting holes on tow point mount plate while aligning elbows with hydraulic tubes.



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply thread locking compound to threads of bolts (107).
- e. Install bolts (107) through bottom of tow point mount plate. Install flat washers (106) and hex nuts (105). Tighten hex nuts.

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2-777

**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.****C. INSTALL - Continued.****WARNING**

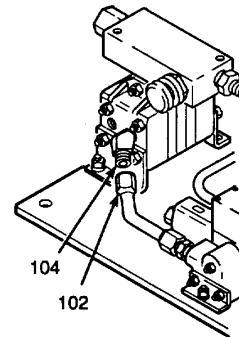
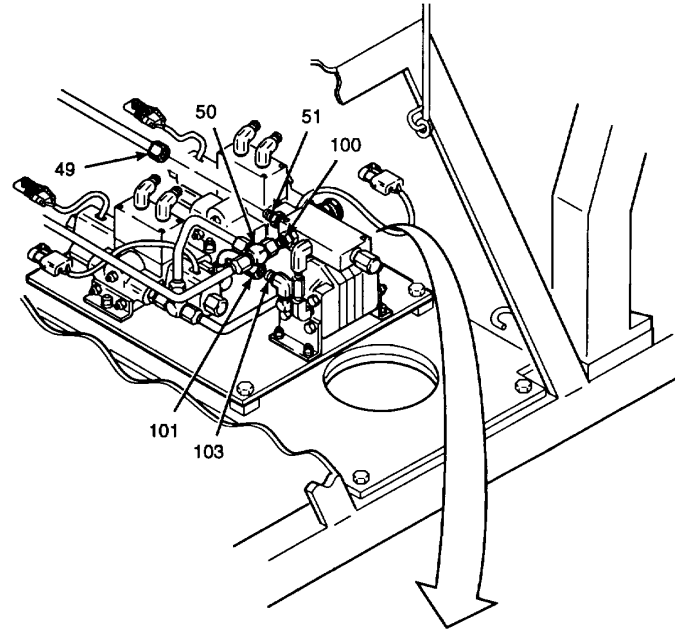
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- f. Apply hydraulic fitting sealant to elbows (103 and 104) and straight adapters (51 and 100).
- g. Connect swivel tee (50) to straight adapter (100).

**NOTE**

It may be necessary to loosen tube fittings on opposite ends of tubes to align tubes with mating fittings on tow point flow divider.

- h. Connect tube (101) to elbow (103). Tighten tube.
- i. Connect tube (102) to elbow (104). Tighten tube.
- j. Connect tube (49) to straight adapter (51). Tighten tube.

**GO TO NEXT PAGE**

C. INSTALL - Continued.

7. INSTALL AUGER/CONVEYOR SPEED CONTROL VALVE.

**NOTE**

Installation procedures for both the left and right auger/conveyor speed control valves are the same. The illustrations in this procedure are for the right speed control valve. The fittings may be positioned slightly different for the left speed control valve.

- a. Install sleeve spacers (98) onto bolts (97).

**WARNING**

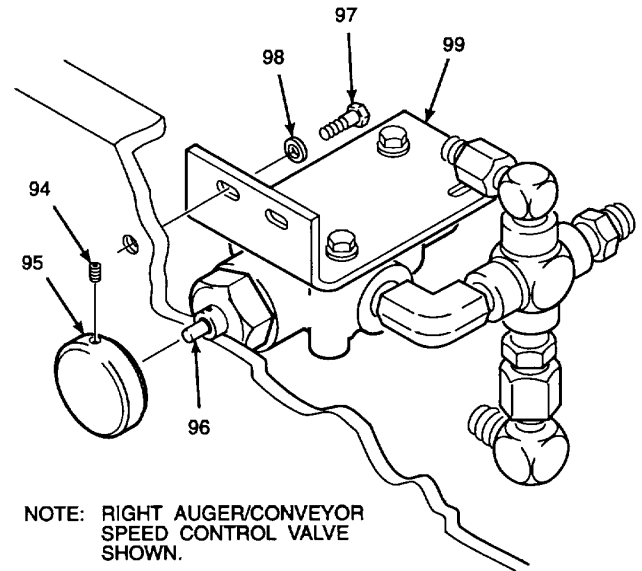
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of bolts (97).

**NOTE**

Ensure tubes will align with fittings on valve before tightening bolts.

- c. If installed, remove set screw (94) and knob (95) from adjustment screw (96) prior to installation.
- d. Position mounting bracket (99) in place and secure with bolts (97). Tighten bolts to 19 lb-ft (26 N•m).
- e. Position knob (95) on adjustment screw (96) so that set screw (94) will tighten onto flat on adjustment screw. Tighten set screw.



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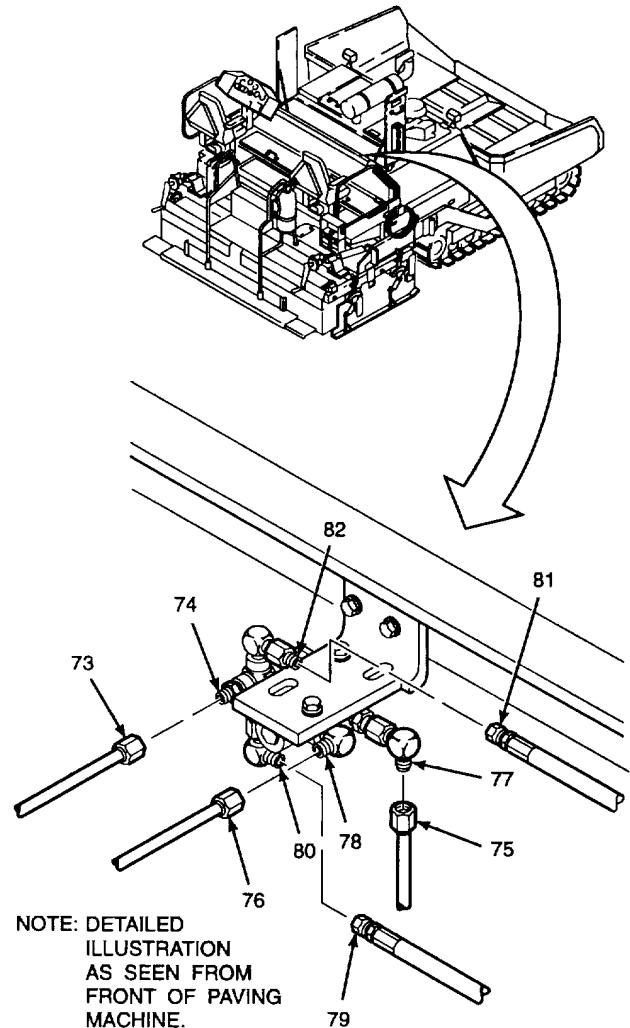
**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

- C. INSTALL Continued.
8. INSTALL TUBES AND HOSES ONTO RIGHT AUGER/CONVEYOR SPEED CONTROL VALVE.

<b>WARNING</b>
----------------

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to exposed threads on straight adapter (74), tube reducer (82), and elbows (77, 78, and 80).
- b. Connect tubes (75 and 76) to elbows (77 and 78). Tighten tubes. Ensure tube (76) is tightened at both ends, as it was loosened during removal.
- c. Connect hose (79) to elbow (80). Tighten hose.
- d. Connect tube (73) to straight adapter (74). Tighten tube.
- e. Connect hose (81) to tube reducer (82). Tighten hose.



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**2-780**

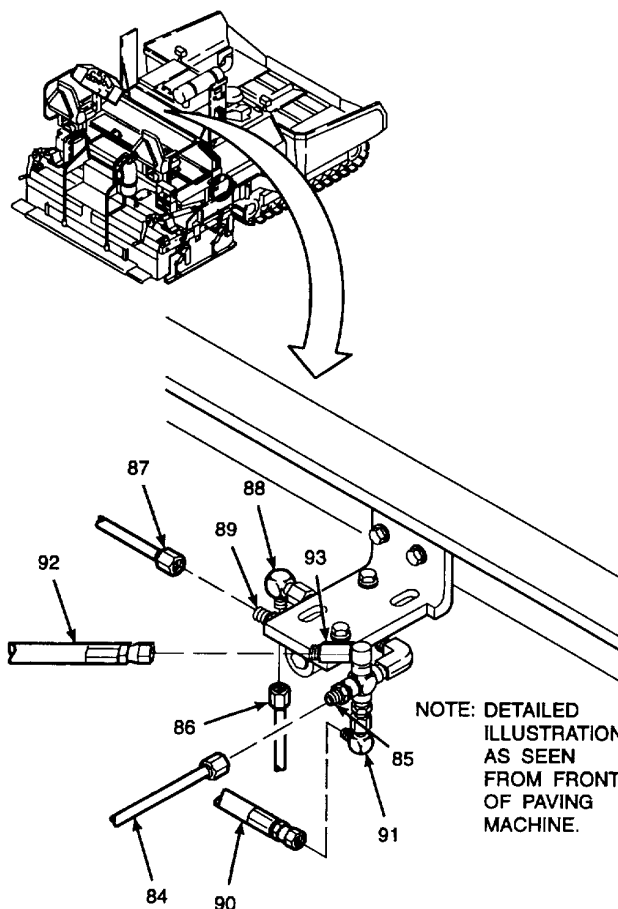
C. INSTALL - Continued.

9. INSTALL TUBES AND HOSES ONTO LEFT AUGER/CONVEYOR SPEED CONTROL VALVE.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to exposed threads on tube reducer (93), straight adapters (89 and 85), and elbows (88 and 91).
- b. Connect tube (86) to elbow (88). Tighten tube.
- c. Connect tubes (87 and 84) to straight adapters (89 and 85). Tighten tubes.
- d. Connect hoses (90 and 92) to elbow (91) and tube reducer (93). Tighten hoses.



GO TO NEXT PAGE

**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

C. INSTALL Continued.

10. INSTALL TOW POINT MOUNT PLATE.

- a. Position tow point mount plate (71) onto the valve panel over mounting holes.
- b. Install flat washers (70) onto bolts (69).

**WARNING**

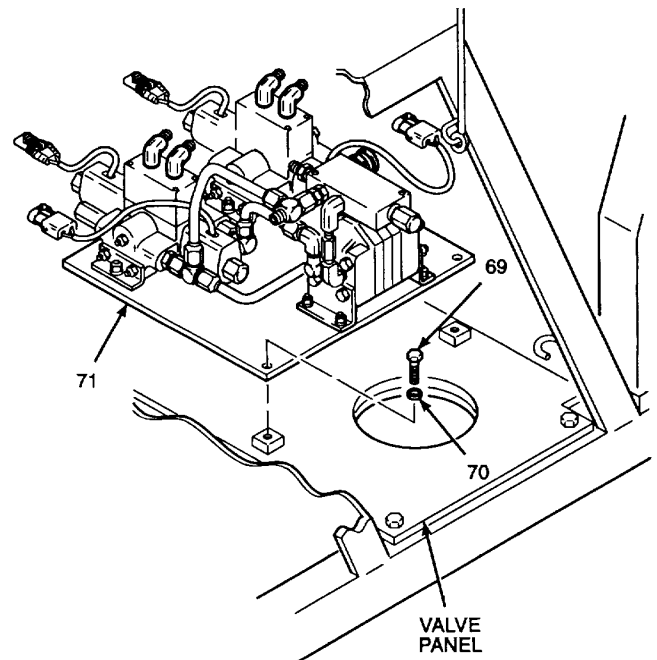
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to threads of bolts (69).

**NOTE**

Connect hydraulic tubes loosely prior to tightening bolts, to ensure alignment of hydraulic tubes.

- d. Install bolts (69) through tow point mount plate (71) and into valve panel. Tighten bolts to 37 lb-ft (50 N.m).



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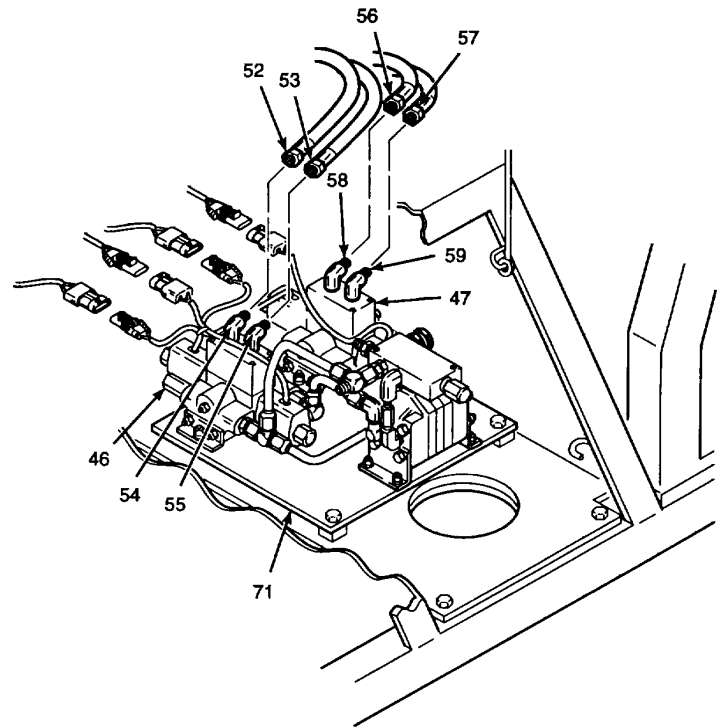
**2-782**

## C. INSTALL Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply hydraulic fitting sealant to exposed threads of elbows (54, 55, 58, and 59)
- f. Connect hoses (52 and 53) to front tow point control valve (46) elbows (54 and 55). Tighten hose.
- g. Connect hoses (56 and 57) to rear tow point control valve (47) elbows (58 and 59). Tighten hoses.
- h. Disconnect tube nuts loosely connected for alignment of tow point mount plate (71).



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**2-783**

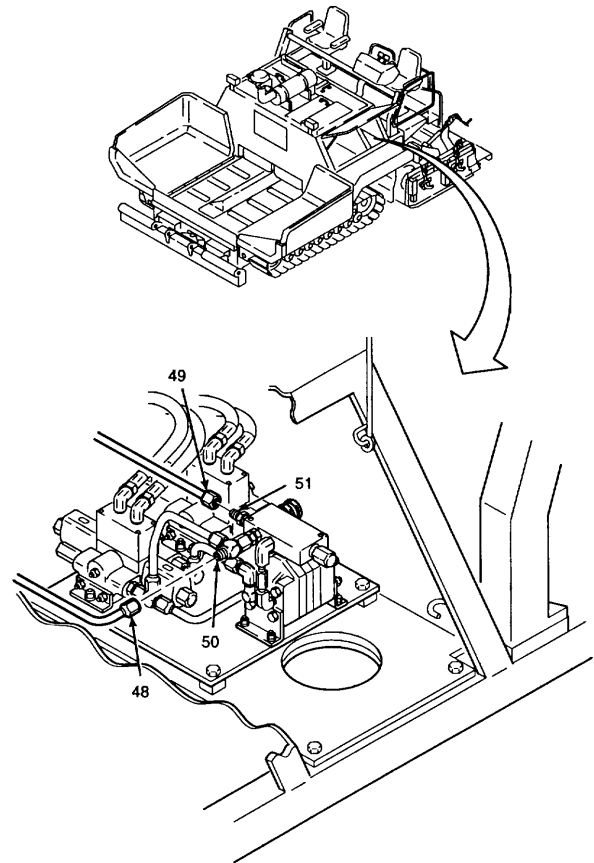
**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

## C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

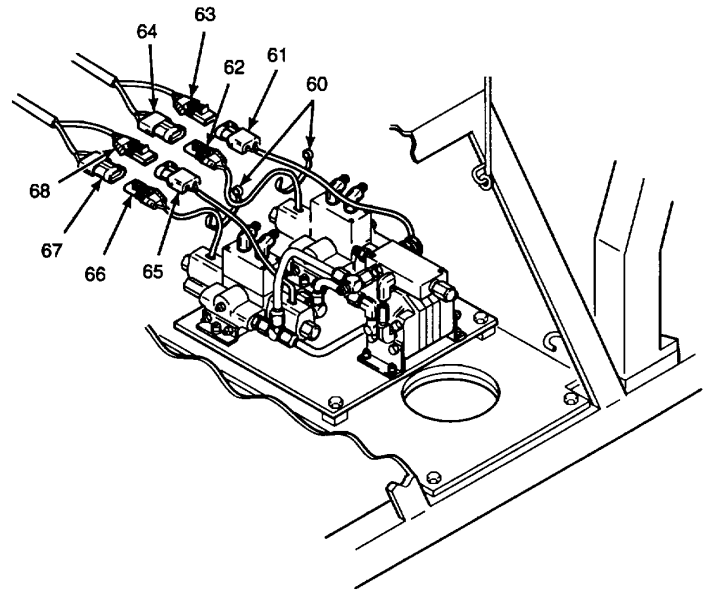
- i. Apply hydraulic fitting sealant to exposed threads of swivel tee (50) and straight adapter (51).
- j. Connect tubes (48 and 49) to swivel tee (50) and straight adapter (51). Tighten tubes.

**GO TO NEXT PAGE**

2-784

## C. INSTALL Continued.

- k. Apply electrical insulating compound to male ends of front tow point control valve electrical connector (65) and harness electrical connector (67). Plug control valve electrical connectors (65 and 66) into harness electrical connectors (67 and 68).
- l. Apply electrical insulating compound to male ends of rear tow point control valve electrical connector (61) and harness electrical connector (64). Plug control valve electrical connectors (61 and 62) into harness electrical connectors (63 and 64).
- m. Install tie wraps (60) onto harnesses as needed.



**GO TO NEXT PAGE**

**2-785**

**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

C. INSTALL - Continued.

11. INSTALL RETURN MANIFOLD ON ENGINE COWLING.

- a. Install lockwashers (42) onto hex head cap screws (41).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (41).

**NOTE**

It may be necessary to connect hydraulic tubes to return manifold ports before hex head cap screws are tightened per step c.

- c. Position return manifold bracket (44) and ground wire lead (43) in place and secure with hex head cap screws (41). Tighten cap screws to 37 lb-ft (50 N.m).

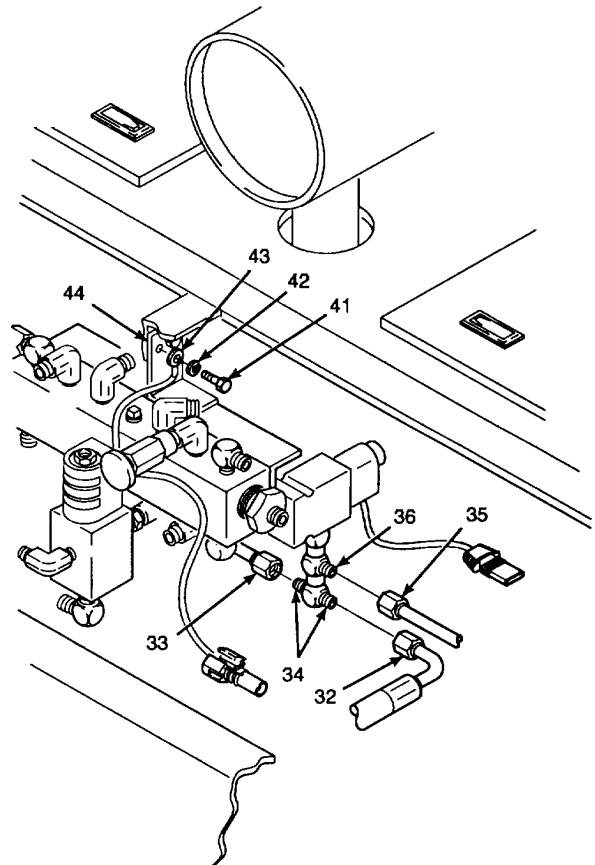
**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- d. Apply electrical insulating varnish to ground wire lead (43).

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



- e. Apply hydraulic fitting sealant to exposed threads of screed vibration solenoid valve tees (34 and 36).

**NOTE**

Ensure hydraulic tubes loosened or removed at both ends during return manifold removal are tightened.

- f. Connect tube (33) and hose (32) to tee (34). Tighten tube and hose.
- g. Connect tube (35) to tee (36). Tighten tube.

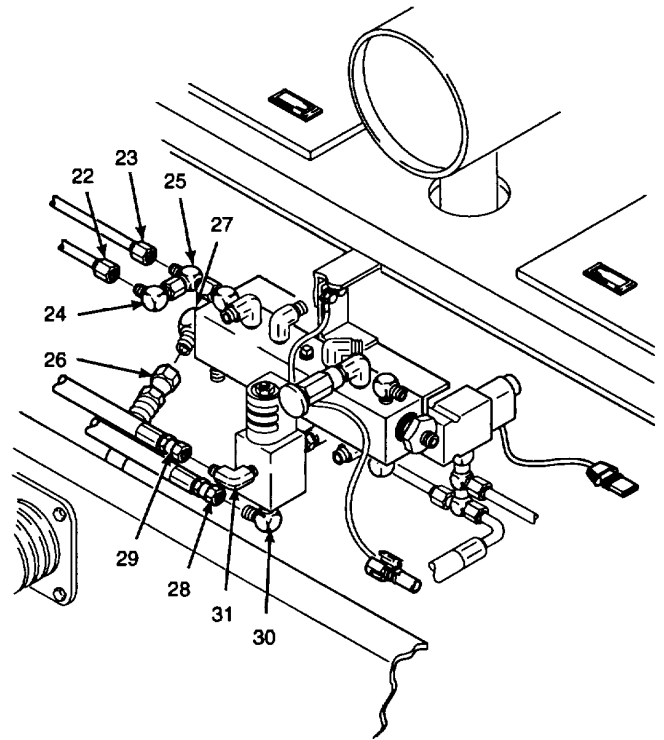
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## C. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- h. Apply hydraulic fitting sealant to exposed threads on elbows (30 and 31).
- i. Connect hoses (28 and 29) to elbows (30 and 31). Tighten hoses.
- j. Apply hydraulic fitting sealant to threads of elbow (27). Connect hose (26) to elbow using a combination wrench. Tighten hose.
- k. Apply hydraulic fitting sealant to threads of swivel tee (25). Align swivel tee with tubes (22 and 23) and connect tubes to elbow (24) and swivel tee. Tighten tubes and swivel tee.



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**2-787**



2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.

C. INSTALL - Continued.

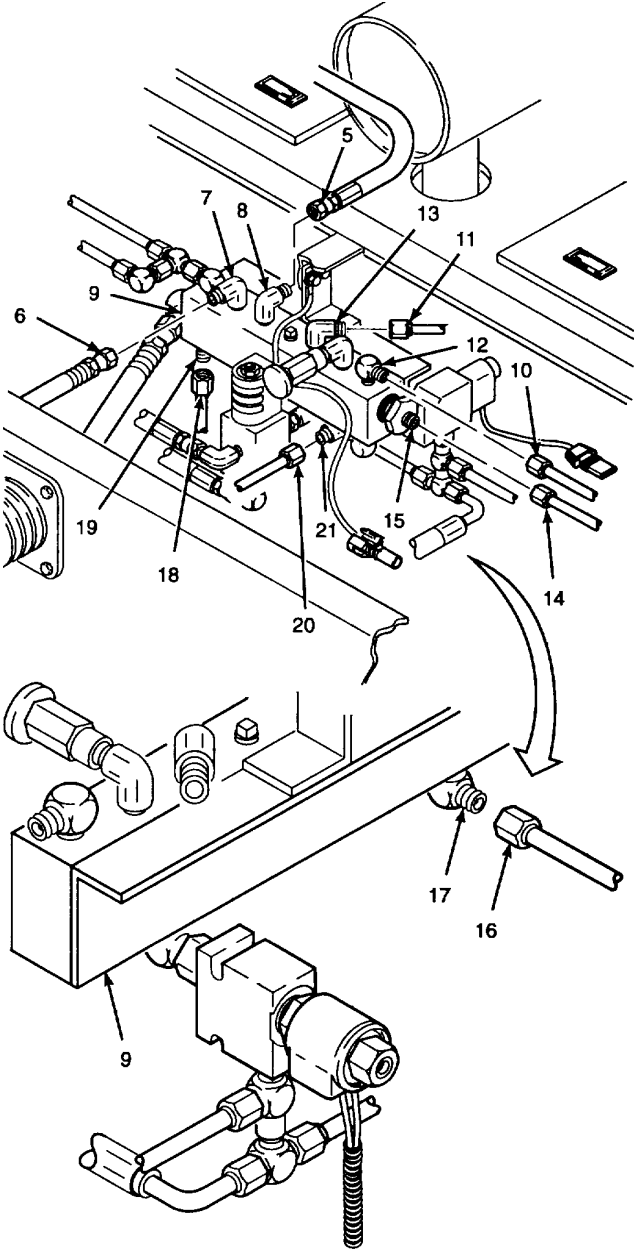
**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- i. Apply hydraulic fitting sealant to exposed threads on elbows (7, 8, 12, 13, 17, and 21) and straight adapters (15 and 19).
- m. Connect tube (20) to elbow (21). Tighten tube.
- n. Connect hoses (5 and 6) to elbows (7 and 8).

Tighten hoses.

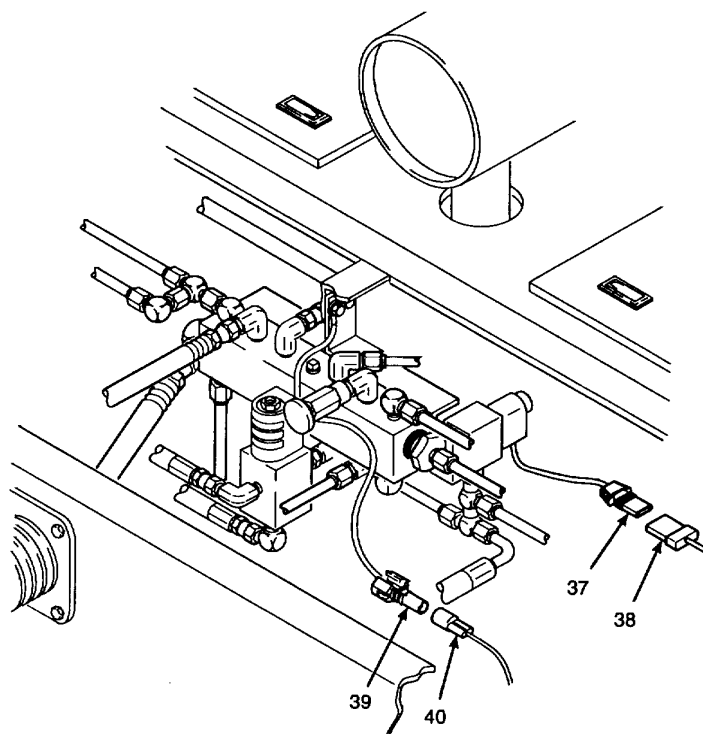
- o. Connect tubes (16 and 18) to elbow (17) and straight adapter (19) on bottom of return manifold (9). Tighten tubes.
- p. Connect tubes (10 and 11) to elbows (12 and 13) on top of return manifold (9). Tighten tubes.
- q. Connect tube (14) to straight adapter (15) at end of return manifold (9). Tighten tube.



GO TO NEXT PAGE

## C. INSTALL - Continued.

- r. Apply electrical insulating compound to male fittings of electrical connectors (37 and 39). Plug electrical connectors into harness electrical connectors (38 and 40)
- s. Install tie wraps as needed.



**GO TO NEXT PAGE**

**2-789**

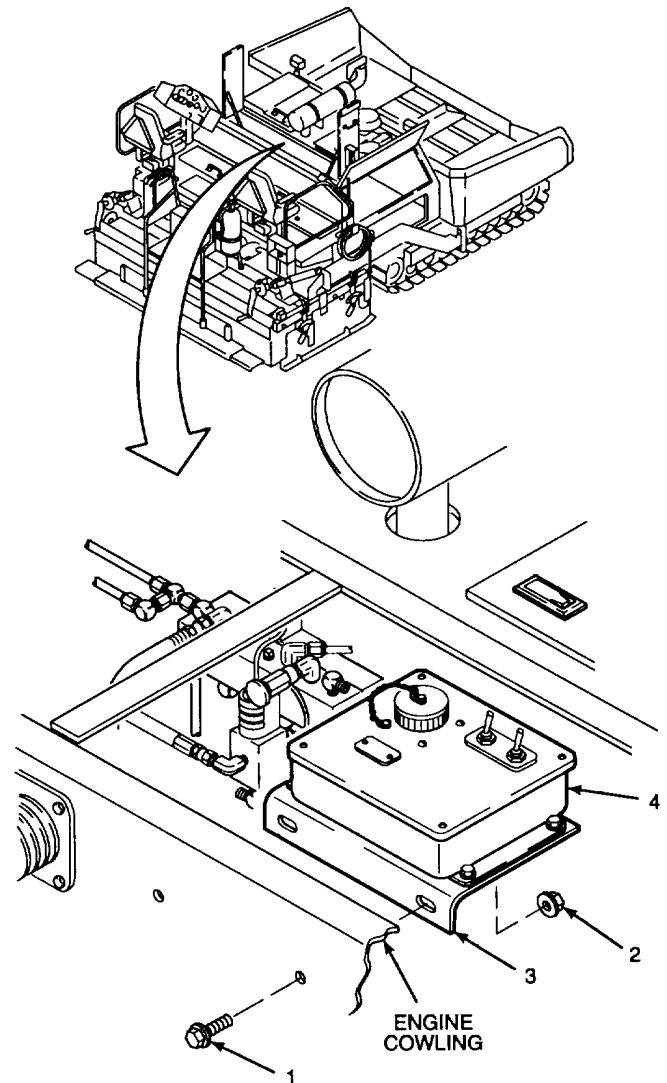
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**2.55 REPLACE VALVE PANEL CONTROL VALVES AND FLOW DIVIDERS - Continued.**

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**C. INSTALL - Continued.****12. INSTALL DCA HOUSING AND HOUSING BRACKET ON ENGINE COWLING.**

- a. Install lock screws (1) through engine cowling.
- b. Position DCA housing (4) and housing bracket (3) onto the engine cowling over lock screws (1).
- c. Install self-locking nuts (2) onto lock screws (1). Tighten self-locking nuts.

**NOTE**

**FOLLOW-ON-TASKS:** Close center top right access door per TM 5-3895-373-10.  
Close center top left access door per TM 5-3895-373-10.  
Close left access door per TM 5-3895-373-10.  
Close right access door per TM 5-3895-373-10.

**END OF TASK**

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**2.56 REPLACE SCREED VIBRATION CONTROL VALVE.**

---

This task covers:

- a. Remove
  - b. Install
- 

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix E)

**Reference:**

TM 5-3895-373-10  
TM 5-3895-373-24P

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Protective caps (Item 3, Appendix B)  
Thread locking compound (Item 14, Appendix B)

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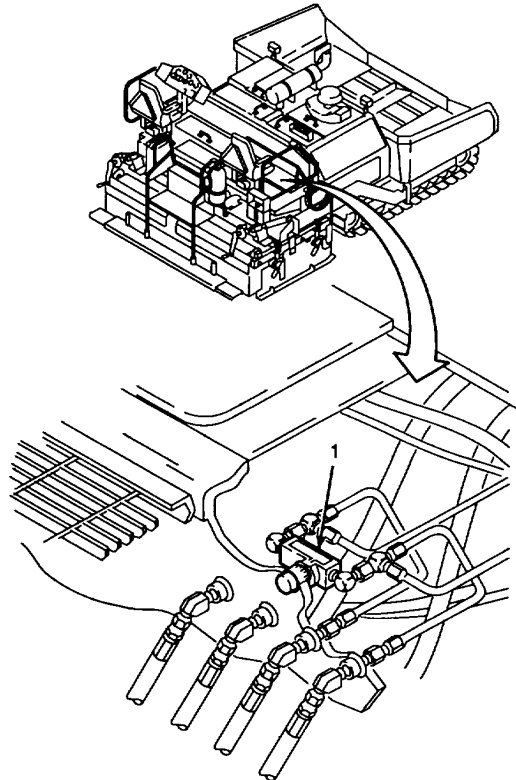
**Equipment Condition:**

Rear top right access door open per TM 5-3895-373-10.

**A. REMOVE.****1. REMOVE SCREED VIBRATION CONTROL VALVE.**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- a. Wipe all dirt and dust from fittings at screed vibration control valve (1) with cleaning cloths.
- b. Place machinery wiping towel under screed vibration control valve (1).



**GO TO NEXT PAGE**

2.56 REPLACE SCREED VIBRATION CONTROL VALVE - Continued

A. REMOVE Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

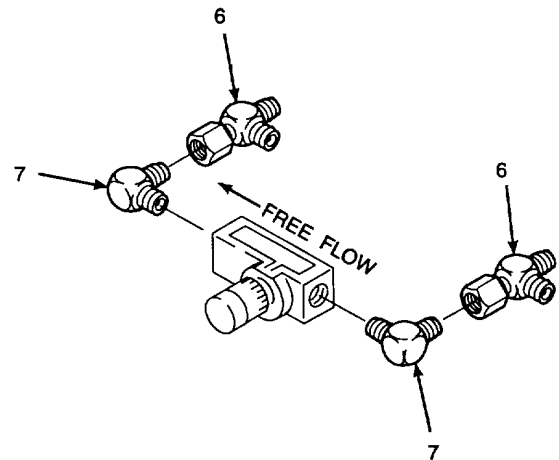
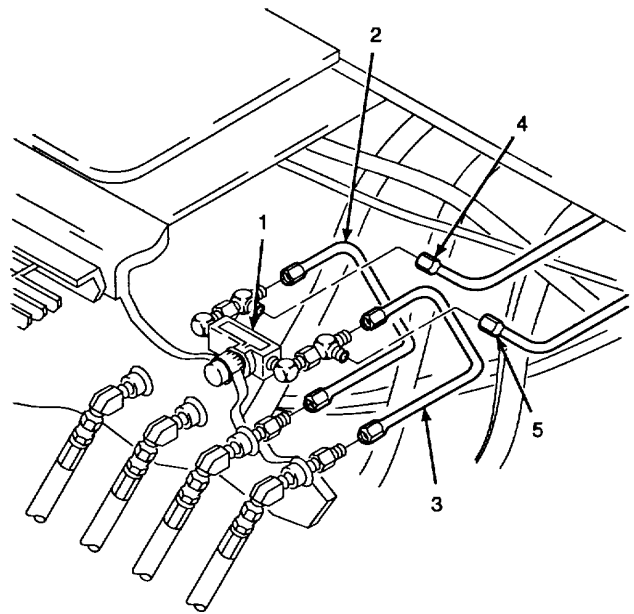
**CAUTION**

The screed vibration control valve is held into position only by hydraulic tubes. Hold the control valve securely in place when loosening tube nuts to prevent bending the hydraulic tubes.

- c. Disconnect tube nuts at both ends of tubes (2 and 3) and remove tubes. Catch hydraulic oil from tubes in machinery wiping towel.
- d. Disconnect tubes (4 and 5). Remove screed vibration control valve (1).
- e. Plug tubes (2 and 3) and tubes (4 and 5) to prevent contamination.

2. REMOVE TEES AND ELBOWS FROM SCREED VIBRATION CONTROL VALVE.

- a. Remove tees (6).
- b. Remove elbows (7).



GO TO NEXT PAGE

B. INSTALL.

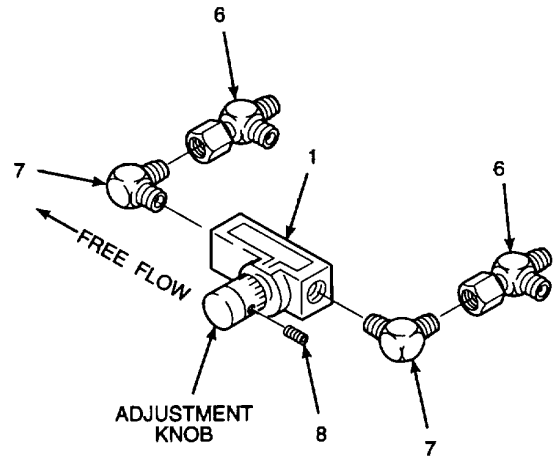
1. INSTALL TEES AND ELBOWS ONTO SCREED VIBRATION CONTROL VALVE.

- a. Use cleaning cloth to wipe residue from threads of tees (6) and elbows (7).
- b. Remove set screw (8) from screed vibration control valve (1).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to threads of set screw (8).
- d. Reinstall set screw (8) into screed vibration control valve (1) adjustment knob. Do not tighten set screw; make sure adjustment knob turns freely.



**WARNING**

Hydraulic fitting sealant and pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply pipe sealant to pipe threads of elbows (7).
- f. Install elbows (7) onto screed vibration control valve (1). Tighten elbows so that the elbows will face away from the adjustment knob.
- g. Apply hydraulic fitting sealant to threads of elbows (7).

**NOTE**

Ensure free flow arrow is positioned correctly when installing fittings.

- h. Install tees (6). Tighten tees so that the side opening on tees will face as shown in the illustration.

**GO TO NEXT PAGE**

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**2.56 REPLACE SCREED VIBRATION CONTROL VALVE - Continued**


---

B. INSTALL Continued.

2. INSTALL SCREED VIBRATION CONTROL VALVE.

- a. Use cleaning cloth to wipe residue from threads of exposed straight adapters (9).

**WARNING**

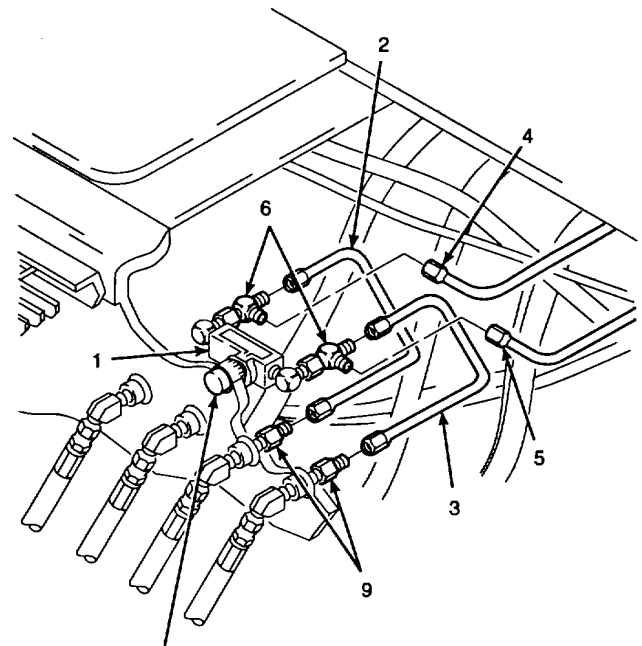
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply hydraulic fitting sealant to threads of tees (6) and straight adapters (9).

**NOTE**

Ensure free flow arrow is on top of screed vibration control valve. TION c. Install screed vibration control valve (1) through rear top right access door. Place adjustment knob in hole in rear bulkhead. Ensure free flow arrow is on top of control valve.

- d. Connect tubes (4 and 5). Do not tighten tubes at this time.
- e. Install tubes (2 and 3) between tees (6) and straight and adapters (9). Do not tighten tubes at this time.



ADJUSTMENT  
KNOB

**CAUTION**

- The screed vibration control valve is held into position only by hydraulic tubes. Hold the control valve securely in place when tightening tubes to prevent bending the hydraulic tubes.
- f. Ensure screed vibration control valve (1) is properly aligned in the rear bulkhead and no stress is being placed on tubes (4 and 5) and tubes (2 and 3).
- g. Hold screed vibration control valve (1) in position and tighten tubes (4 and 5) and tubes (2 and 3).

**NOTE**

FOLLOW-ON-TASK: Close rear top right access door per TM 5-3895-373-10.

**END OF TASK**

---

---

**2.57 REPLACE SCREED TRAVEL LOCK VALVE.**

---

**This task covers:**

- a. Remove                      b. Install
- 

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Drip pan (Item 64, Appendix D)

**References:**

TM 5-3895-373-10  
TM 5-3895-373-24P

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Machinery wiping towels (Item 37, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Thread locking compound (Item 14, Appendix B)

**Equipment Condition:**

Screed fully lowered per TM 5-3895-373-10.  
Screed steps lowered per TM 5-3895-373-10.

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**GO TO NEXT PAGE**

**2-795**



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**2.57 REPLACE SCREED TRAVEL LOCK VALVE - Continued**


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## A. REMOVE.

## 1. DISCONNECT HYDRAULIC HOSES.

**CAUTION**

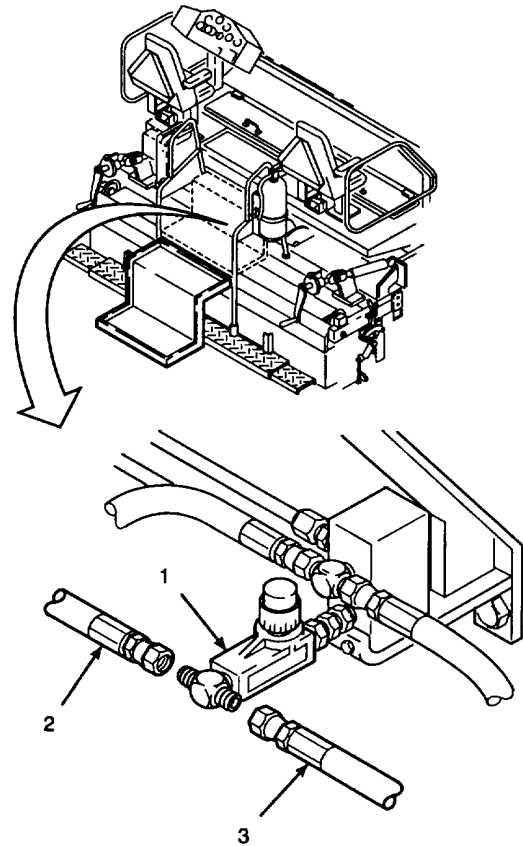
Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- a. Wipe all dirt and dust from hydraulic fittings around screed travel lock valve (1) with a cleaning cloth. Tag hoses (2 and 3).

**WARNING**

Hydraulic oil under pressure can penetrate skin or damage eyes. Severe injury or loss of limb may result from contact with high pressure fluid leaks. Wear safety goggles/glasses at all times. If hydraulic oil enters skin or eyes, get immediate medical attention. Severe injury can result from contact with high pressure oil.

- b. Shield screed travel lock valve (1) with layered machinery wiping towels.
- c. Hold drip pan under screed travel lock valve (1) and slowly loosen hoses (2 and 3) to relieve pressure from the hydraulic system. When the pressure is relieved, disconnect and plug hoses.

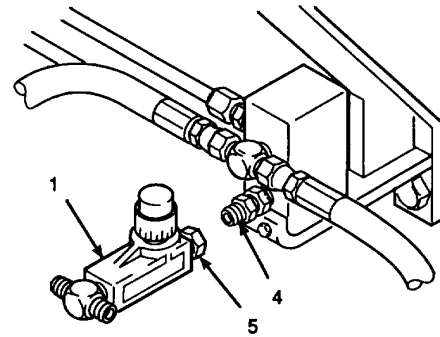


**GO TO NEXT PAGE**

- A. REMOVE - Continued.
- 2. REMOVE SCREED TRAVEL LOCK VALVE.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.



- a. Hold pipe nipple (4) with a wrench. Remove screed travel lock valve (1) by removing pipe reducer (5). Drain any excess hydraulic oil into drip pan. Cap nipple with protective cap.
- b. Dispose of hydraulic oil in drip pan in accordance with local procedures.
- c. Remove pipe reducer (5) and tee (6) from screed travel lock valve (1).

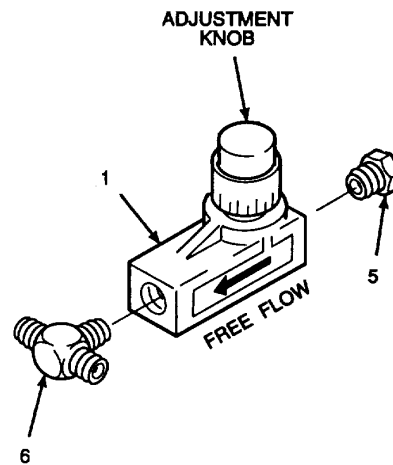
**B. INSTALL.**

- 1. INSTALL SCREED TRAVEL LOCK VALVE.

- a. Use cleaning cloth to wipe residue from threads of pipe reducer (5), tee (6), and pipe nipple (4).

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.



Ensure fittings are installed correctly into screed travel lock valve. If fittings are installed incorrectly into screed travel lock valve, screed may drop suddenly, causing serious injury or death.

- b. Apply pipe sealant to male threads of pipe reducer (5) and install reducer onto screed travel lock valve (1) at end closest to adjustment knob. Tighten reducer.

- c. Apply pipe sealant to pipe threads of tee (6) and install tee onto screed travel lock valve (1) at end closest to arrow (free flow end). Tighten tee so that tee is aligned as shown in illustration
- d. Apply pipe sealant to threads of pipe nipple (4).
- e. Install screed travel lock valve (1) onto pipe nipple (4). Tighten pipe reducer (5) and position screed travel lock valve with adjustment knob on top

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**2.57 REPLACE SCREED TRAVEL LOCK VALVE - Continued**


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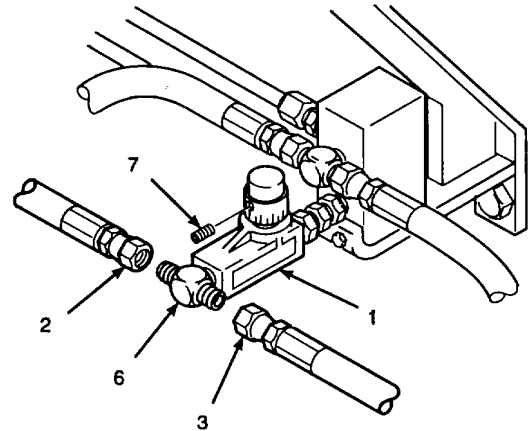
B. INSTALL Continued.

2. CONNECT HYDRAULIC HOSES.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to threads of tee (6).
- b. Connect hoses (2 and 3) to tee (6). Tighten hoses.



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention. c. Remove set screw (7). Apply thread locking compound to threads of set screw and reinstall into adjustment knob. Do not tighten set screw.

- d. Ensure adjustment knob turns freely

**WARNING**

Ensure screed lock valve is fully closed before operation of paving machine. If valve is not fully closed, screed may drop suddenly, causing serious injury or death to personnel.

- e. Ensure screed travel lock valve (1) is fully closed per TM 5-3895-373-10.

**NOTE**

FOLLOW-ON-TASK: Raise screed steps per TM 5-3895-373-10.

**END OF TASK**

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**SECTION X. PAVING MACHINE COMPONENTS MAINTENANCE**

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**2.58 REPLACE/REPAIR EXTENSION SCREED HEIGHT ADJUSTMENT.**

---

**This task covers:**

- |           |            |            |
|-----------|------------|------------|
| a. Remove | b. Install | c. Install |
| d. Adjust |            |            |
- 

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix B)  
Hex head driver socket (Item 86, Appendix D)  
High pressure cap (Item 21, Appendix D)  
Hydraulic press frame (Item 41, Appendix D)  
Plastic hammer (Item 49, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Socket wrench adapter (Item 7, Appendix D)  
Straightedge, 8 ft (Item 27, Appendix C)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Torque wrench, 100 to 500 lb-ft (Item 133, Appendix D)  
Universal puller kit (Item 69, Appendix D)

**References:**

LO 5-3895-373-12  
TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Endgates removed per TM 5-3895-373-20.  
Extension screed cover plates removed per TM 5-3895-373-20.  
Extension screed extended halfway per TM 5-3895-373-10.  
Blower motor removed per TM 5-3895-373-20.  
Burner chamber removed per TM 5-3895-373-20.

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Grease (Item 18, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towels (Item 37, Appendix B)  
Tags (Item 34, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Cotter pins  
Hex nuts  
Lockwashers  
Plain encased seals  
Self-locking hex nuts  
Sleeve bushings  
Spring pins

---

**GO TO NEXT PAGE****2-800**

**NOTE**

This procedure applies to both the left and right extension screed. For this procedure, the right extension screed is shown. Throughout this procedure, the main screed is not shown for clarity.

**A. REMOVE.**

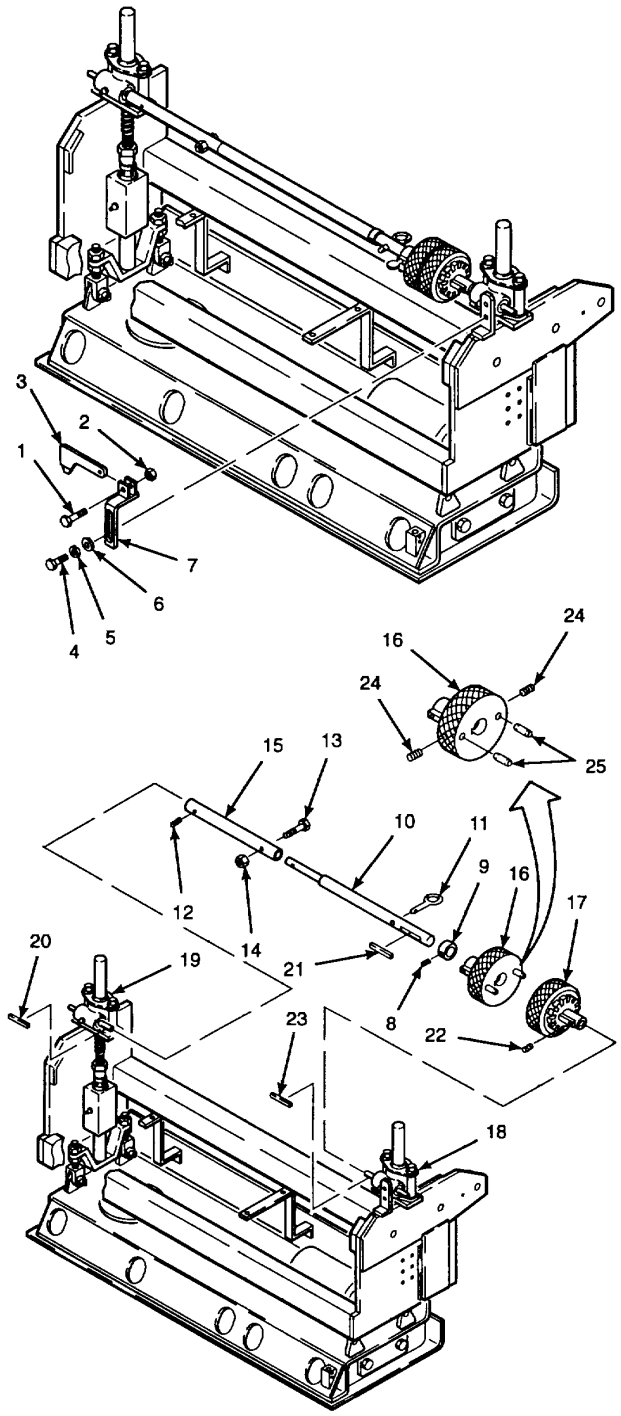
1. ROTATE HEIGHT ADJUSTMENT KNOBS TO LOWER EXTENSION SCREED PLATE UNTIL IT IS RESTING FLAT ON A LEVEL SURFACE PER TM 5-3895-373-10.

2. REMOVE MOUNTING BRACKET AND CATCH PLATE.

- a. Remove hex head cap screw (1), self-locking hex nut (2), and catch plate (3). Discard self-locking hex nut.
- b. Remove hex head cap screws (4), lockwashers (5), and flat washers (6). Discard lockwashers.
- c. Remove mounting bracket (7).

3. REMOVE LIFT JACK ASSEMBLY CONNECTING SHAFT AND HEIGHT ADJUSTMENT KNOBS.

- a. Remove set screw (8).
- b. Slide stop ring (9) toward center of shaft (10).
- c. Pull quick release pin (11) free of shaft (10).
- d. Remove set screws (12), hex head cap screw (13), and self-locking hex nut (14) from coupling (15). Discard self-locking hex nut.
- e. Slide shaft (10) into coupling (15) and separate shaft and inner height adjustment knob (16) from outer height adjustment knob (17).
- f. Slide coupling (15) with shaft (10) and inner height adjustment knob (16) from outer lift jack assembly (18) and inner lift jack assembly (19). Remove from extension screed.
- g. Remove key (20) from inner lift jack assembly (19) shaft.
- h. Remove coupling (15), inner height adjustment knob (16), key (21), and stop ring (9) from shaft (10).
- i. Remove set screw (22), outer height adjustment knob (17), and key (23) from outer lift jack assembly (18).



- j. Remove set screws (24) from inner height adjustment knob (16) and remove pins (25) using a pair of pliers

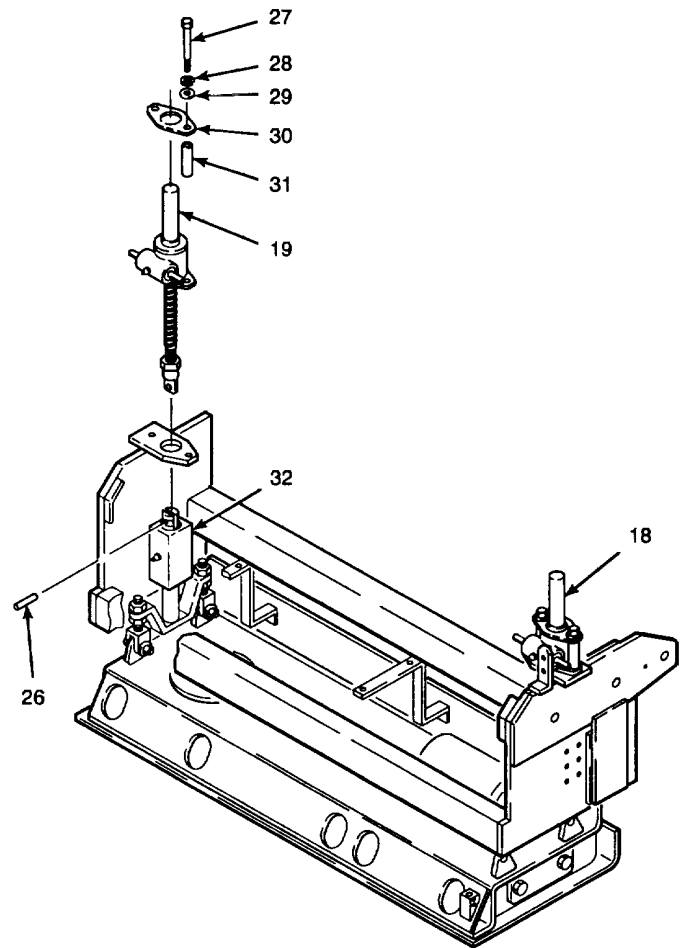
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**2.58 REPLACE/REPAIR EXTENSION SCREED HEIGHT ADJUSTMENT - Continued**

A. REMOVE Continued.

4. REMOVE LIFT JACK ASSEMBLY.

- a. Remove and discard spring pins (26).
- b. Remove hex head cap screws (27), lockwashers (28), and flat washers (29). Discard lockwashers.
- c. Remove flange plates (30) and spacers (31).
- d. Pull outer and inner lift jack assemblies (18 and 19) free of vertical adjustment block assemblies (32) and lift entire assemblies up and free of extension screed frame.



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A. REMOVE - Continued.

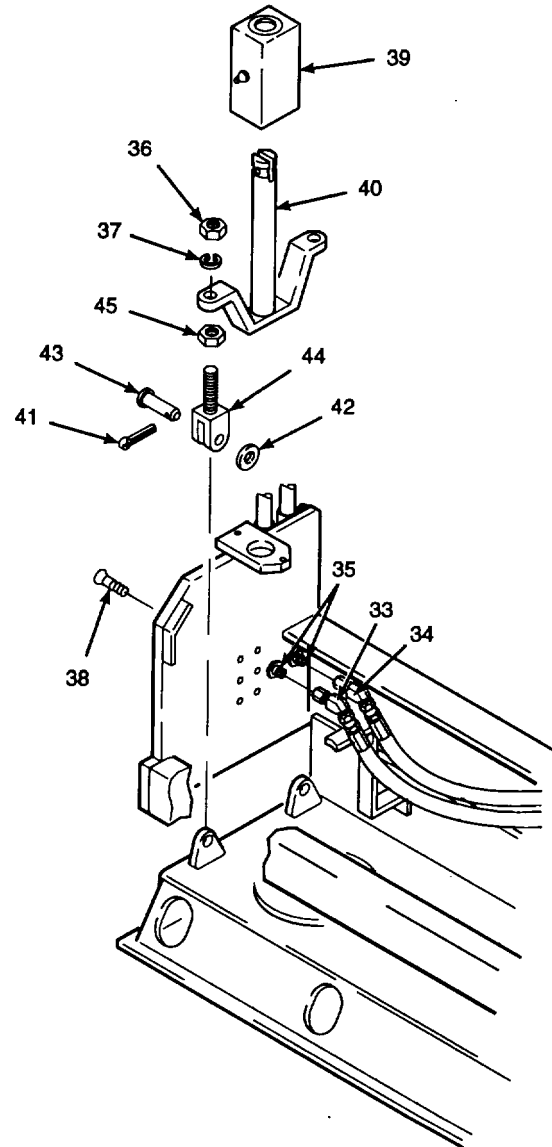
5. REMOVE VERTICAL ADJUSTMENT BLOCK ASSEMBLY.

- a. Place machinery wiping towels below hoses (33 and 34) at inboard wall of extension screed frame.
- b. Tag and disconnect hydraulic hoses (33 and 34).
- c. Cap elbows (35) using high pressure caps.
- d. Remove hex nuts (36) and lockwashers (37). Remove socket head cap screws (38). Discard lockwashers.
- e. Remove guide blocks (39) and lift brackets (40).
- f. Remove cotter pins (41) and flat washers (42). Discard cotter pins.
- g. Start the paving machine. Raise screed as necessary to allow for removal of clevis pins (43). Once the pins are removed, lower screed, shut off engine, and remove key from ignition switch per TM 5-3895-373-10.
- h. Drive out clevis pins (43).
- i. Remove clevis (44).

**NOTE**

Before removing hex nuts, observe the position of each hex nut on clevis. Hex nuts must be oriented in same position during reassembly.

- j. Measure the threads of clevis (44) from the top of hex nut (45) to the end of the threaded rod. Record this measurement. This measurement will be used during installation.
- k. Remove hex nuts (45) and discard.



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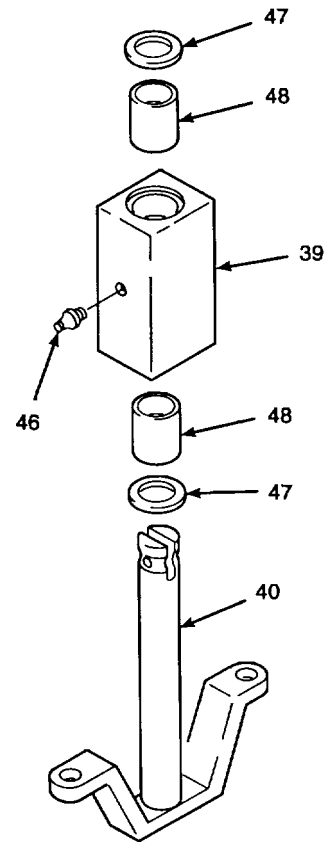


**2.58 REPLACE/REPAIR EXTENSION SCREED HEIGHT ADJUSTMENT - Continued**

A. REMOVE - Continued.

6. DISASSEMBLE VERTICAL ADJUSTMENT BLOCK ASSEMBLY.

- a. Remove lubrication fittings (46) from guide blocks (39).
- b. Slide lift brackets (40) free of guide blocks (39).
- c. Remove plain encased seals (47) and discard.
- d. Use a universal puller kit and pull sleeve bushings (48) free of guide block (39). Discard sleeve bushings.



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**2-804**

## B. CLEAN.

## 1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 30C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts in cleaning solvent with the exception of inner and outer lift jack assemblies.
- b. Use a culture swab to clean the threads of the lubrication fitting port.
- c. Dry parts with a cleaning cloth.

## 2. CLEAN ALL FASTENERS TREATED WITH THREAD LOCKING COMPOUND.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean all threads of cap screws and set screws with thread locking compound solvent.
- b. Dry cap screws and set screws with a cleaning cloth.

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## 2.58 REPLACE/REPAIR EXTENSION SCREED HEIGHT ADJUSTMENT - Continued

## C. INSTALL.

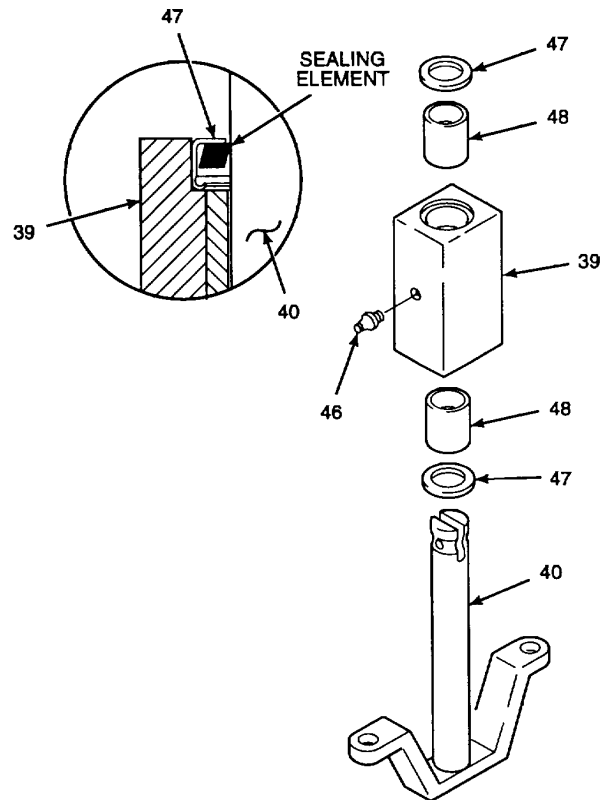
## 1. ASSEMBLE VERTICAL ADJUSTMENT BLOCK ASSEMBLY.

- a. Use a hydraulic press frame and spacer from universal puller kit and press one sleeve bushing (48) into each end of guide block (39). Fully seat bushings against seating edge in guide block.
- b. Lubricate sealing element of plain encased seals (47) with light coating of grease.



Lubrication problems can cause poor performance and equipment damage. Ensure new seals are properly installed. Improper installation of plain encased seals can lead to inadequate lubrication and lubricant contamination.

- c. Place plain encased seal (47) in position on guide block (39). Make sure sealing element is facing outer edge of guide block as shown.
- d. Press or evenly tap outer area of plain encased seal (47) with plastic hammer and seat seal in guide block (39).
- e. Lubricate lift brackets (40) with light coating of grease.
- f. Slide lift brackets (40) through guide blocks (39).
- g. Thread lubrication fittings (46) into guide blocks (39).

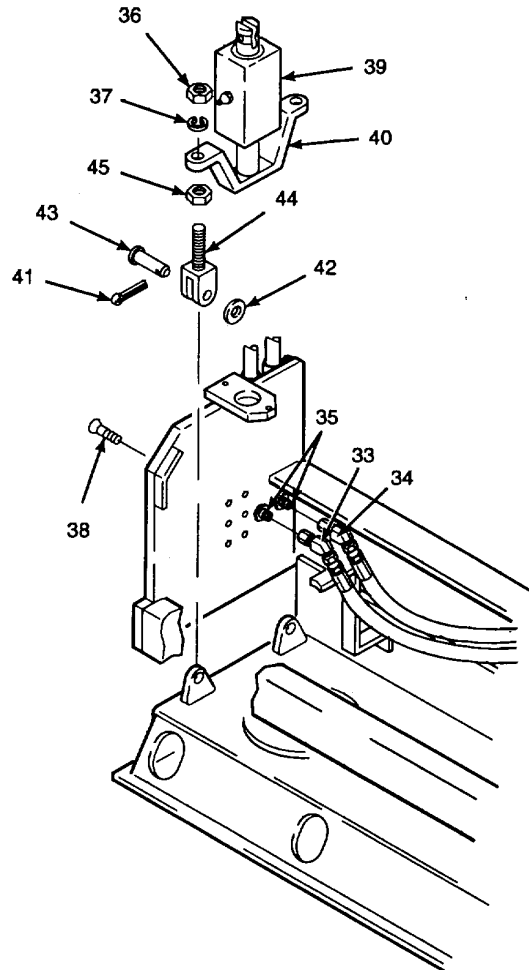


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C. INSTALL - Continued.

2. INSTALL VERTICAL ADJUSTMENT BLOCK ASSEMBLY.

- a. Thread hex nuts (45) onto each clevis (44). Position hex nuts at same thread positions noted in step A.5j.
- b. Start paving machine. Raise screed to allow access to clevis pin (43) mounting holes.
- c. Install clevis (44) onto extension screed base and secure with clevis pins (43), flat washers (42), and cotter pins (41).
- d. Lower screed fully. Shut off engine and remove key from ignition switch per TM 5-3895-373-10.
- e. Position guide blocks (39) and lift brackets (40) onto devises (44).



**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- f. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screws (38).
- g. Secure guide blocks (39) to screed frame with socket head cap screws (38). Tighten cap screws to 30 lb-ft (41 N.m) using a hex head driver socket and socket wrench adapter (Item 7, Appendix D).
- h. Secure lift brackets (40) to each clevis (44) with lockwashers (37) and hex nuts (36). Ensure hex nuts are snug.
- i Place a machinery wiping towel below elbows (35) at inboard wall of extension screed frame.
- j. Remove high pressure caps from elbows (35).
- k. Wipe threads of elbows (35) clean with a lint-free cloth.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- l. Apply hydraulic fitting sealant to threads of elbows (35).
- m. Connect hydraulic hoses (34 and 33) to elbows (35).

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**2.58 REPLACE/REPAIR EXTENSION SCREED HEIGHT ADJUSTMENT - Continued**

C. INSTALL - Continued.

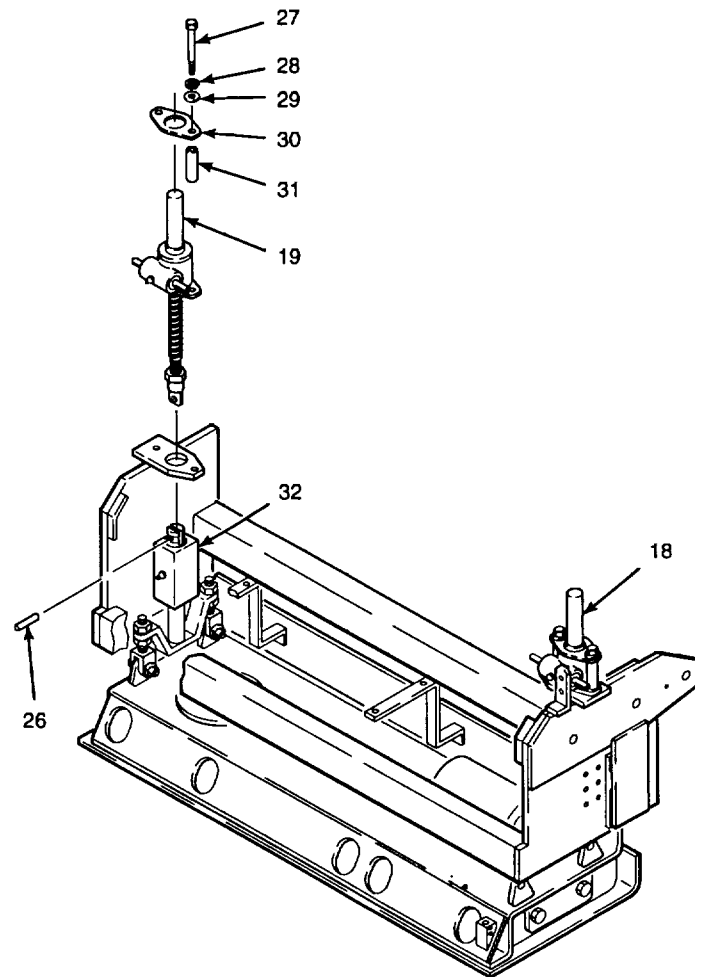
## 3. INSTALL LIFT JACK ASSEMBLY.

- a. Lubricate outer and inner lift jack assemblies (18 and 19) per LO 5-3895-373-12.
- b. Position outer and inner lift jack assemblies (18 and 19) onto extension screed frame and insert lower end of assembly into groove on vertical adjustment block assemblies (32).
- c. Drive spring pins (26) through pin holes of vertical adjustment block assemblies (32) and outer and inner lift jack assemblies (18 and 19).
- d. Install lockwashers (28) and flat washers (29) onto hex head cap screws (27).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (27).
- f. Secure outer and inner lift jack assemblies (18 and 19) to extension screed frame with spacers (31), flange plates (30), and hex head cap screws (27).
- g. Tighten hex head cap screws (27) to 37 lb-ft (50 N•m).

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C. INSTALL - Continued.

4. INSTALL LIFT JACK ASSEMBLY CONNECTING SHAFT AND HEIGHT ADJUSTMENT KNOBS.

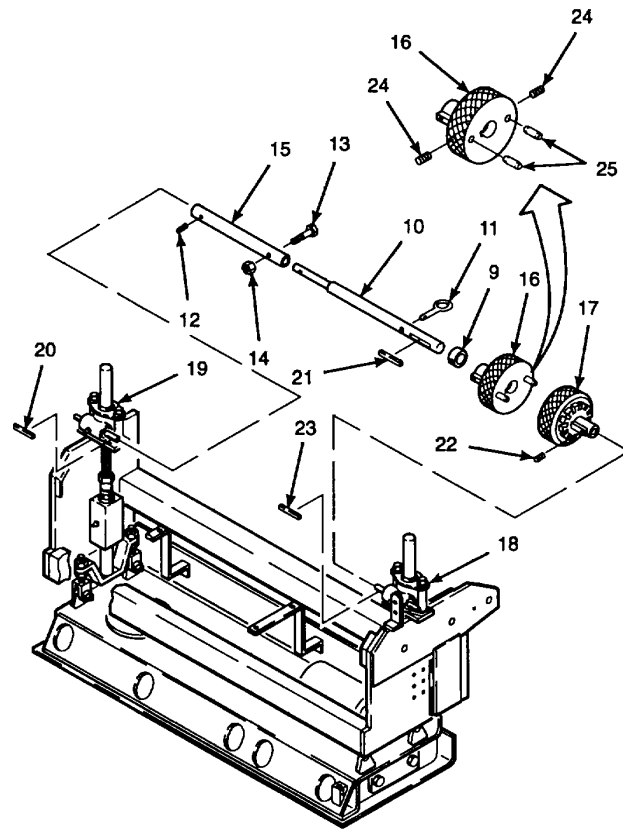
**NOTE**

Before tightening any components, ensure the alignment of the holes in the shafts and the height adjustment knobs. Repositioning of these components may be required to obtain proper alignment.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply thread locking compound (Item 14, Appendix B) to threads of set screw (22).
- b. Position and secure outer height adjustment knob (17) to shaft of outer lift jack assembly (18) with key (23) and set screw (22). Ensure outer height adjustment knob is positioned as close as possible to outer lift jack assembly to allow for engagement of catch plate in step 5.f.
- c. Position key (20) onto inner lift jack assembly (19).
- d. Place stop ring (9), key (21), and coupling (15) on shaft (10).
- e. Position two pins (25) in holes of inner height adjustment knob (16) face. Make sure chamfer ends of pins face out, and press pins into knob. Apply thread locking compound (Item 14, Appendix B) to threads of set screws (24). Thread set screws into knob and tighten.
- f. Insert shaft (10) into and through inner height adjustment knob (16).
- g. Apply thread locking compound (Item 14, Appendix B) to threads of hex head cap screw (13) and set screw (12).



**NOTE**

- When positioning coupling onto shaft of inner lift jack assembly, ensure hole for placement of quick release pin (11) is exposed when inner and outer height adjustment knobs (16 and 17) are pushed together.
- h. Position coupling (15) over key (20) and shaft of inner lift jack assembly (19).
  - i. Insert outer end of shaft (10) into outer height adjustment knob (17).
  - j. Align large diameter hole of coupling (15) with screw hole of shaft (10) and secure with hex head cap screw (13), self-locking hex nut (14), and set screw (12).
  - k. Tighten hex head cap screw (13) to 12 lb-ft (16 N•m).

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**2.58 REPLACE/REPAIR EXTENSION SCREED HEIGHT ADJUSTMENT - Continued**

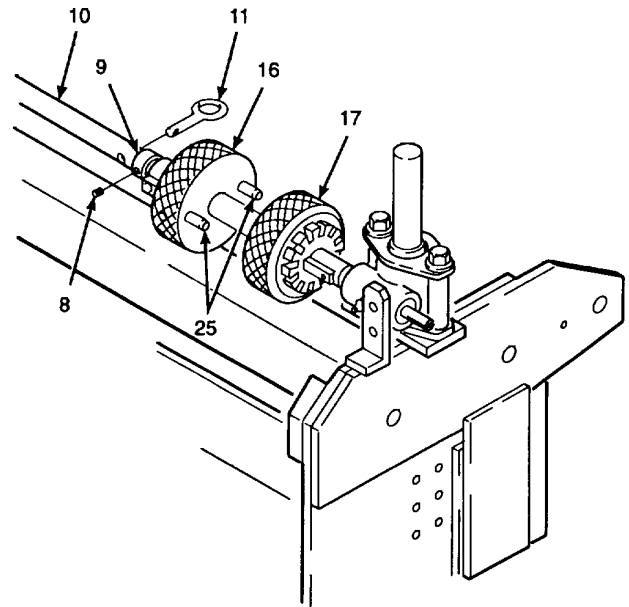

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## C. INSTALL - Continued.

<b>WARNING</b>
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Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- l. Apply thread locking compound (Item 14, Appendix B) to threads of set screw (8).
- m. Slide inner height adjustment knob (16) away from outer height adjustment knob (17). Pins (25) should be clear of outer height adjustment knob.
- n. Position stop ring (9) near base of inner height adjustment knob (16) while knob is still separate from outer height adjustment knob (17).
- o. Secure stop ring (9) with set screw (8).
- p. Align two pins of inner height adjustment knob (16) with alignment holes of outer height adjustment knob (17) and push knobs together.
- q. Insert quick release pin (11) through hole in shaft (10).



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C. **INSTALL - Continued.**

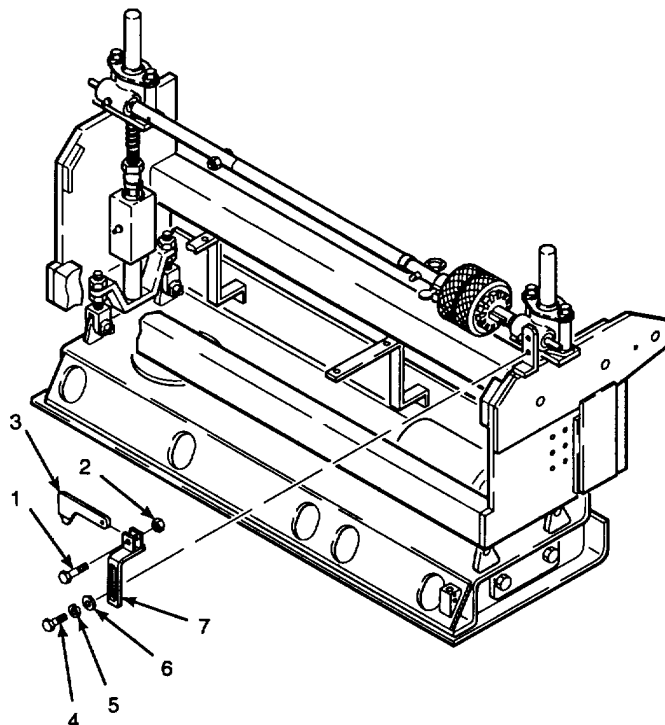
5. **INSTALL MOUNTING BRACKET AND CATCH PLATE.**

- a. Install lockwashers (5) and flat washers (6) onto hex head cap screws (4).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound (Item 14, Appendix B) to threads of hex head cap screws (4).
- c. Position mounting bracket (7) onto extension screed frame and secure with flat washers (6), lockwashers (5), and hex head cap screws (4).
- d. Tighten hex head cap screws (4) to 9 lb-ft (12 N.m).
- e. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screw (1).
- f. Secure catch plate (3) on mounting bracket (7) with hex head cap screw (1) and self-locking hex nut (2).
- g. Tighten self-locking hex nut (2) only enough so that catch plate (3) will still move. Do not overtighten.



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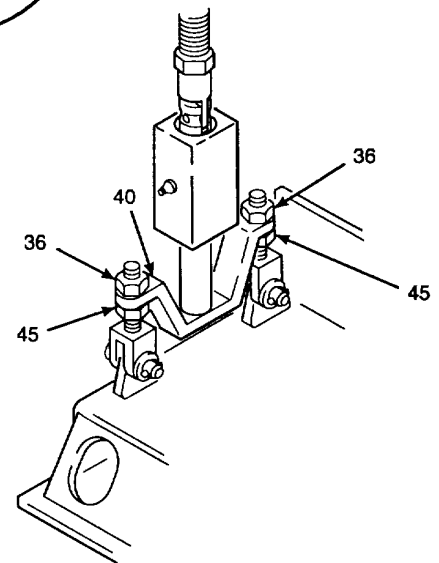
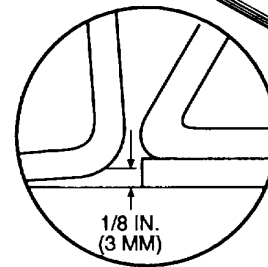
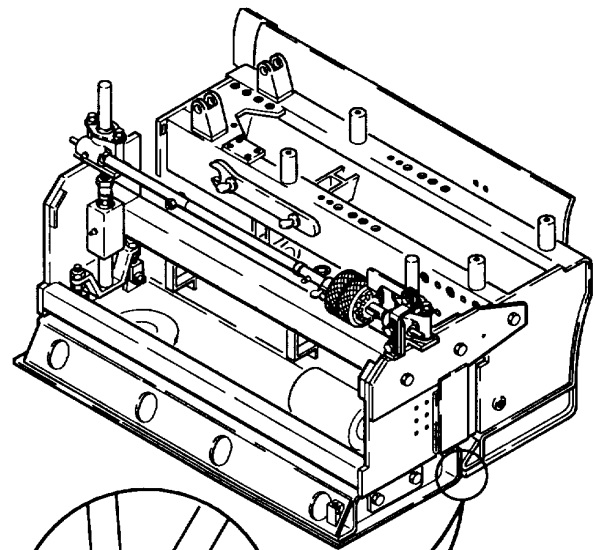
## 2.58 REPLACE/REPAIR EXTENSION SCREED HEIGHT ADJUSTMENT- Continued.

## D. ADJUST.

## NOTE

Lift jack assemblies may be adjusted independently of each other by separating inner and outer height adjustment knobs.

1. ROTATE HEIGHT ADJUSTMENT KNOBS AND RAISE EXTENSION SCREED BASE INTO EXTENSION SCREED FRAME.
2. RETRACT EXTENSION SCREED PER TM 5-3895373-10.
3. USE STRAIGHTEDGE TO VERIFY THAT TRAILING EDGE OF EXTENSION SCREED PLATE IS ON SAME PLANE AS MAIN SCREED PLATE.
4. USE STRAIGHTEDGE TO VERIFY THAT LEADING EDGE OF EXTENSION SCREED PLATE IS 1/8 IN. (3 MM) ABOVE BOTTOM SURFACE OF TRAILING EDGE OF MAIN SCREED PLATE.
5. LOOSEN HEX NUTS (45). ADJUST HEX NUTS (36) SO THAT THE LEADING EDGE OF THE EXTENSION SCREED PLATE IS 11/8 IN. (3 MM) ABOVE THE BOTTOM SURFACE OF THE MAIN SCREED PLATE.
6. TIGHTEN HEX NUTS (45) SO THAT THEY ARE FLUSH AGAINST THE BOTTOM OF LIFT BRACKET (40).
7. TIGHTEN HEX NUTS (36) TO 320 lb-ft (434 N.m) USING SOCKET WRENCH ADAPTER (ITEM 6, APPENDIX D).



## NOTE

**FOLLOW-ON-TASKS:** Burner chamber installed per TM 5-3895-373-20.  
Blower motor installed per TM 5-3895-373-20.  
Replace extension screed cover plates per TM 5-3895-373-20.  
Install endgates per TM 5-3895-373-20.

END OF TASK

**2.59 REPLACE HOPPER WING.**

**This task covers:** a. Remove b. Install

**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
C-clamp, 2 ea (Item 30, Appendix D)  
Chain assembly, 2 ea (Item 29, Appendix D)  
Hex head cap screw (Item 24, Appendix D)  
Hex head socket driver (Item 86, Appendix D)  
Torque wrench (Item 132, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Grease (Item 18, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Flat washer  
Headless straight rod  
Hex head cap screw

Personnel Required:

Two 62B construction equipment repairers. Second person needed for hoisting hopper wing and removing and installing extension bracket.

References:

TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

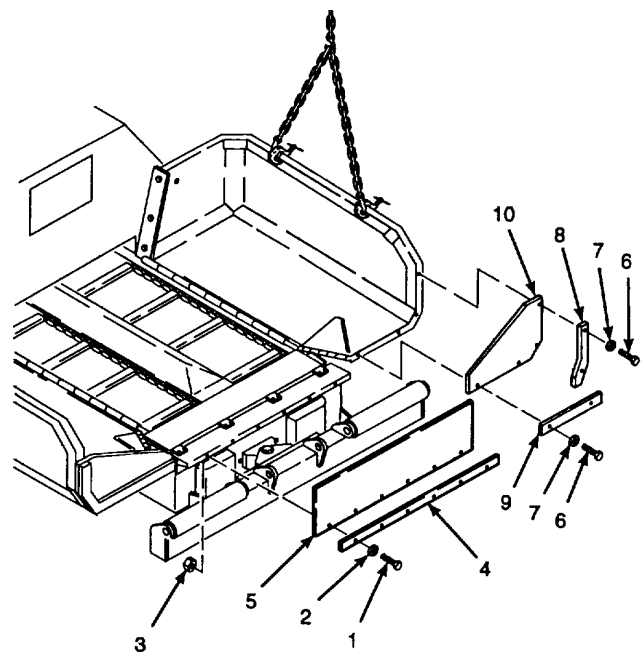
Remove hopper lift cylinder per TM 5-3895-373-20.

**NOTE**

**There is a left hand and a right hand hopper wing on the paving machine. This procedure refers to replacement of the left hand hopper wing. Only remove hopper lift cylinder on hopper wing being replaced. Procedure is identical for right hand hopper wing. Left hand hopper wing is shown in this procedure.**

**A. REMOVE.****1. REMOVE FLASHING, CONVEYOR ACCESS DOOR, AND EXTENSION BRACKET.**

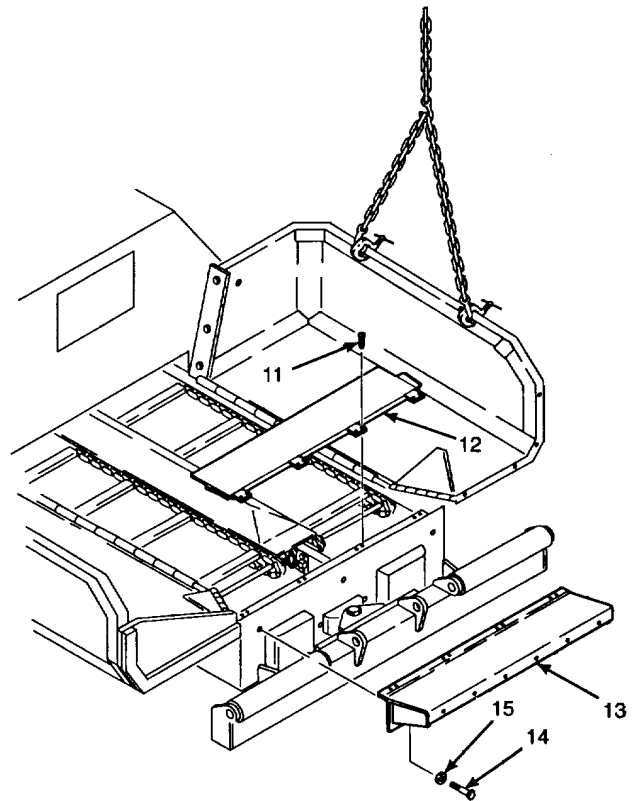
- a. Remove hex head cap screws (1), flat washers (2), and hex nuts (3).
- b. Remove retaining plate (4) and center flashing (5).
- c. Remove hex head cap screws (6) and flat washers (7).
- d. Remove retaining plates (8 and 9) and wing flashing (10).



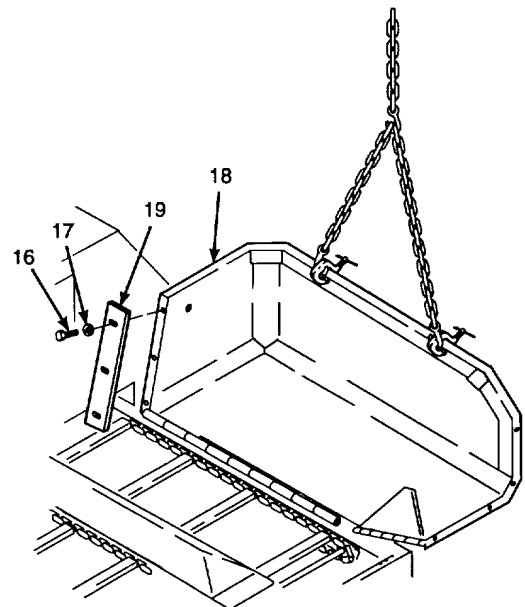
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**2.59 REPLACE HOPPER WING - Continued.****A. REMOVE - Continued.**

- e. Remove socket head cap screws (11) and conveyor access door (12).
- f. With the help of a second person supporting extension bracket (13), remove hex head cap screws (14), flat washers (15), and the extension bracket.

**2. REMOVE SCRAPER.**

- a. Remove hex head cap screws (16) and flat washers (17) from hopper wing (18).
- b. Remove scraper (19).

**GO TO NEXT PAGE 2-814**

- A. REMOVE - Continued.
3. SUPPORT HOPPER WING WITH OVERHEAD HOIST.

**NOTE**

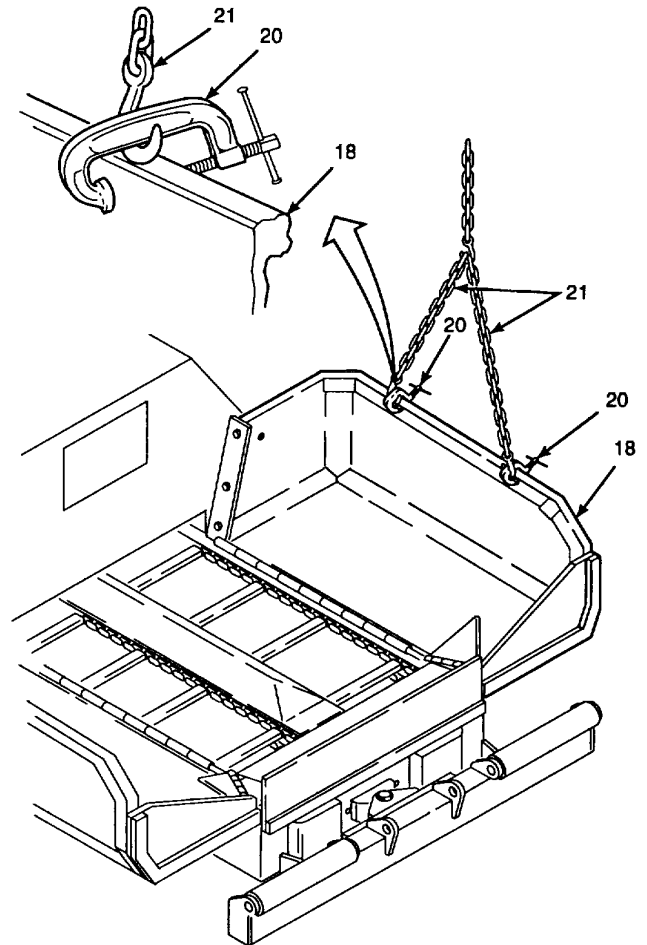
If C-clamps and chain assemblies are not installed, continue with step 3. If they are still in position from removing the hopper lift cylinder, fully lower the hopper wing and proceed to step 4.

- a. Attach two C-clamps (20) to hopper wing (18). Position C-clamps 1 ft (0,3 m) from each end of hopper wing. Tighten C-clamps securely to prevent slippage.

**WARNING**

Hopper wing weighs 875 lbs (397 kg). To avoid personal injury, ensure all chains and hooks are in good condition and are of correct capacity. Ensure overhead hoist is in good working condition and hooks are positioned correctly. Lifting hooks must not be side loaded. Damage to equipment and personnel injury may result from unexpected movement of hopper wing.

- b. Hook up chain assemblies (21) to C-clamps (20) and overhead hoist. Take up the slack on the chain assemblies.
- c. Ensure hopper wing (18) is fully lowered.



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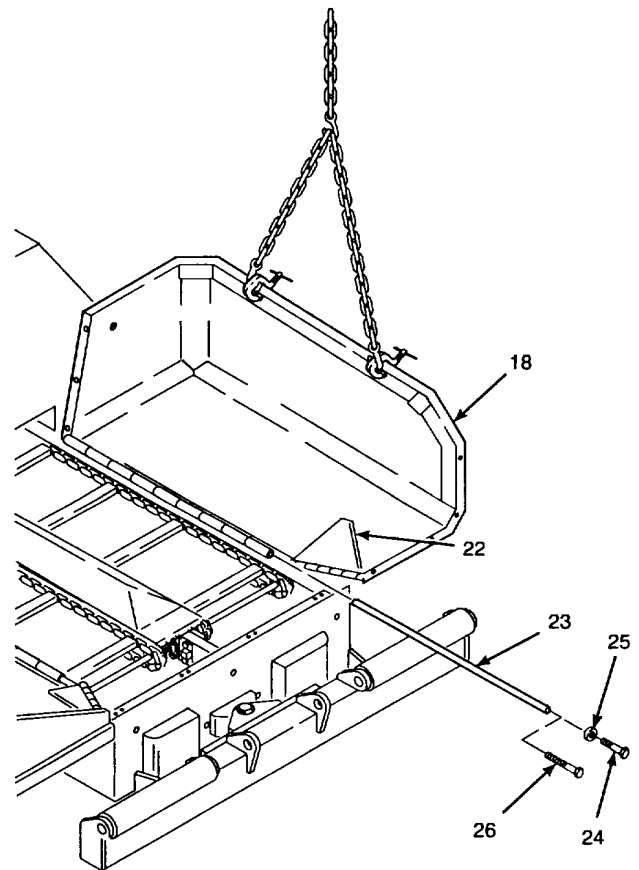
**2.59 REPLACE HOPPER WING - Continued.****A. REMOVE - Continued.****4. REMOVE HEADLESS STRAIGHT ROD.**

- a. Lift corner flap (22) to access headless straight rod (23).
- b. Remove hex head cap screw (24) and flat washer (25). Discard hex head cap screw and flat washer.
- c. Install hex head cap screw (26) from tools list into end of straight rod (23).
- d. Attach vise grip to head of hex head cap screw (26).

**WARNING**

**Do not raise hopper wing (18) to its full height. Raise hopper wing only as far as needed to relieve weight on headless straight rod (23). Hopper wing can move unexpectedly when straight rod is pulled out. Personnel injury, and equipment damage, can result from unexpected movement.**

- e. Raise hopper wing (18) using overhead hoist, enough to relieve weight of hopper wing on headless straight rod.
- f. Use vice grip to turn installed hex head cap screw (26) and headless straight rod (23) clockwise. Keep pulling on straight rod while turning. Work straight rod out of hopper wing hinge. Discard headless straight rod.
- g. Remove vise grip and hex head cap screw (26) from straight rod (23).



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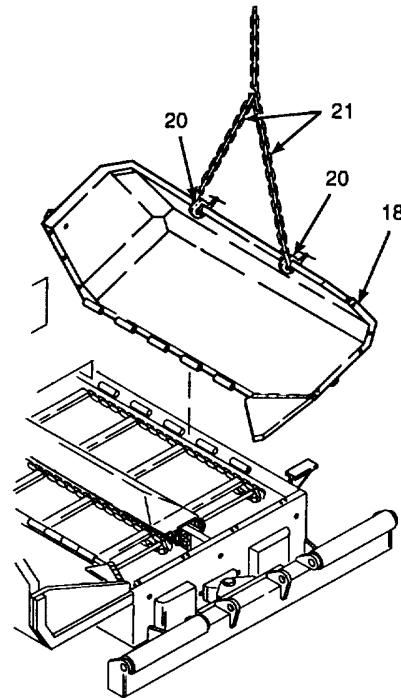
**A. REMOVE - Continued.**

**5. REMOVE HOPPER WING.**

**WARNING**

All personnel must stand clear during lifting operations. Do not allow hopper wing to swing while hanging from overhead hoist. Equipment may strike personnel and cause injury.

- a. With the help of another person, to steady hopper wing (18), raise overhead hoist until hopper wing clears paving machine.
- b. Transport hopper wing (18) to temporary storage or repair area.
- c. Disconnect chain assemblies (21) and remove C-clamps (20).



**B. INSTALL.**

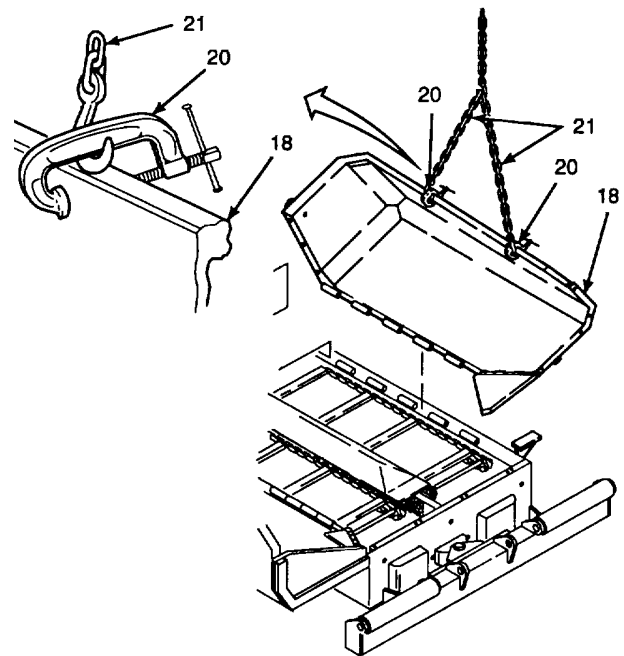
**1. INSTALL HOPPER WING.**

- a. Attach two C-clamps (20) 1 ft (0,3 m) from each end of hopper wing (18). Tighten clamps securely to prevent slippage.

**WARNING**

Hopper wing weighs 875 lbs (397 kg). To avoid personal injury, ensure all chains and hooks are in good condition and are of correct capacity. Ensure overhead hoist is in good working condition and hooks are positioned correctly. Lifting hooks must not be side loaded. Damage to equipment and personnel injury may result from unexpected movement of hopper wing.

- b. Connect chain assemblies (21) to C-clamps (20).
- c. Attach overhead hoist to chain assemblies (21).

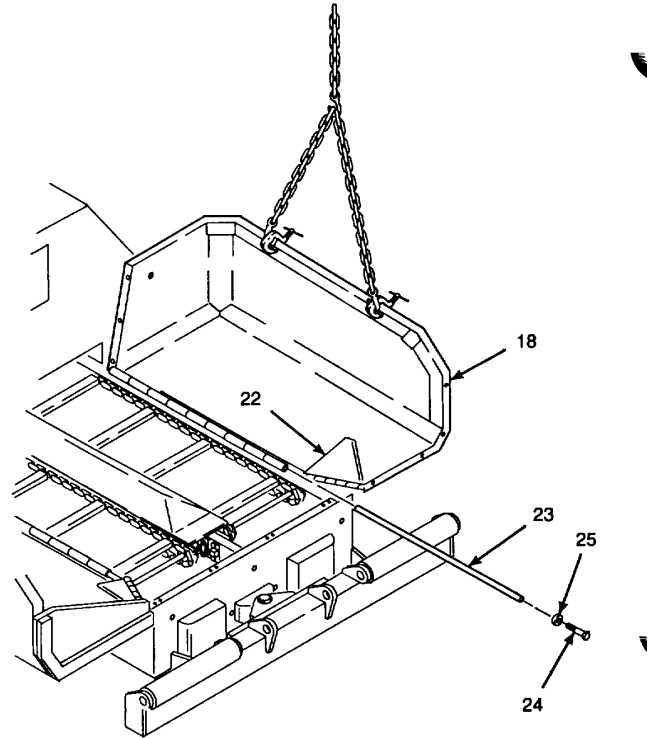


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**2.59 REPLACE HOPPER WING - Continued.****B. INSTALL - Continued.****WARNING**

All personnel must stand clear during lifting operations. Do not work or move beneath hopper wing while it is being removed. Serious injury or death to personnel can occur.

- d. With the help of another person to steady hopper wing (18), lift and align hopper wing hinge with mating hinge on paving machine.

**2. INSTALL HEADLESS STRAIGHT ROD.**

- a. Lubricate full length of headless straight rod (23) with a thin coat of grease.
- b. Lift corner flap (22) on hopper wing (18).

**CAUTION**

Do not hammer directly on headless straight rod. Install hex head cap screw and use a wooden block to cushion impact. Failure to use cap screw and wooden block will cause damage to straight rod.

- c. Install and hand tighten hex head cap screw (24) in threaded end of headless straight rod (23).
- d. With hopper wing hinge and mating hinge on paving machine aligned, insert tapered end of headless straight rod (23) into hopper wing hinge.
- e. Place a wooden block over headless straight rod and drive into hinge. Drive until straight rod is about 4 in. (100 mm) from end of hinge.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- f. Remove hex head cap screw (24). Install flat washer (25) and apply thread locking compound to threads of hex head cap screw.
- g. Install hex head cap screw (24). Tighten hex head cap screw.
- h. Place a wooden block against hex head cap screw (24) and drive headless straight rod (23) into hinge until fully seated.

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**B. INSTALL - Continued.**

**3. INSTALL SCRAPER.**

**WARNING**

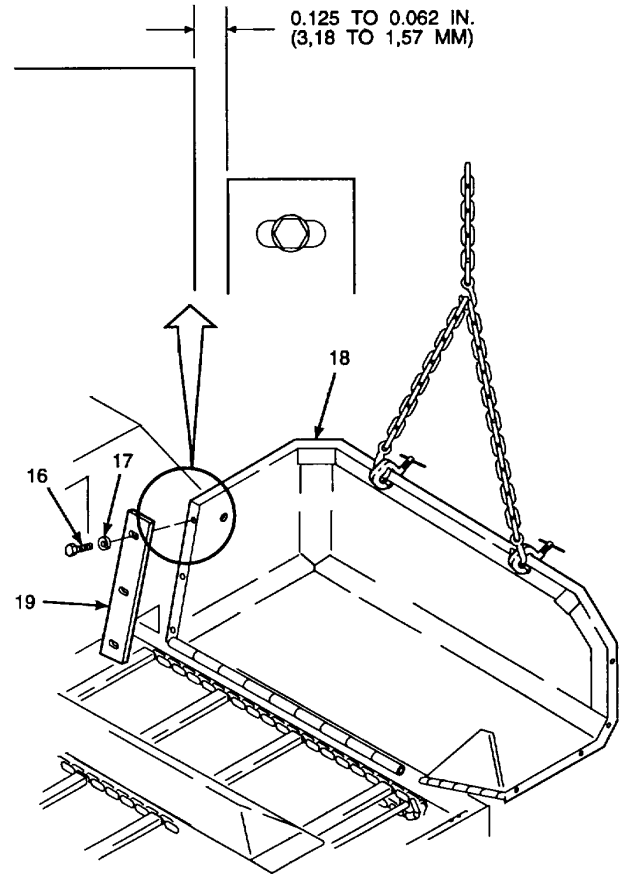
Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Remove thread locking compound from hex head cap screws (16) with thread locking compound solvent.
- b. Dry parts with a clean, cleaning cloth.
- c. Install flat washers (17) onto hex head cap screws (16).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply thread locking compound to threads of hex head cap screws (16).
- e. Install hex head cap screws (16) and scraper (19) onto hopper wing (18).
- f. Position scraper (19) so there is a gap of 1/16 to 1/8 in. (1,5 to 3 mm) between the leading edge of the scraper and the engine compartment bulkhead.
- g. Raise and lower hopper wing (18) per TM 5-3895-37310 to check clearance of scraper (19) at compartment bulkhead. Ensure 1/16 to 1/8 in. gap is held at closest point between scraper and compartment bulkhead.
- h. Tighten hex head cap screws (16) to 59 lb-ft (80 N.m)



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**2.59 REPLACE HOPPER WING - Continued.****B. INSTALL - Continued.****4. INSTALL FLASHING, CONVEYOR ACCESS DOOR, AND EXTENSION BRACKET.****WARNING**

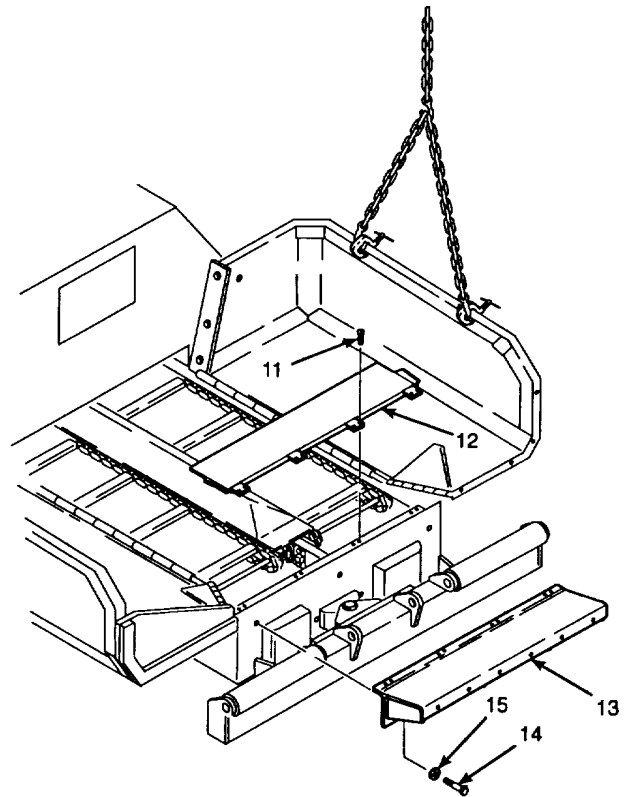
Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Remove thread locking compound from cap screws (11 and 14) with thread locking compound solvent.
- b. Dry parts with a clean, cleaning cloth.
- c. Install flat washers (15) onto hex head cap screws (14).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply thread locking compound to threads of hex head cap screws (14).
- e. With the help of a second person supporting extension bracket (13) in position, install hex head cap screws (14). Do not tighten at this time.
- f. Apply thread locking compound to threads of socket head cap screws (11).
- g. Align conveyor access door (12) onto extension bracket (13) and install socket head cap screws (11).
- h. Evenly tighten socket head cap screws (11) and hex head cap screws (14) to ensure proper alignment. Tighten cap screws (14) to 59 lb-ft (80 N.m).
- i. Tighten socket head cap screws (11) to 19 lb-ft (26 N.m) using hex head socket driver.



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B. INSTALL - Continued.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- j. Remove thread locking compound from hex head cap screws (1 and 6) with thread locking compound solvent.
- k. Install flat washers (7) onto hex head cap screws (6)

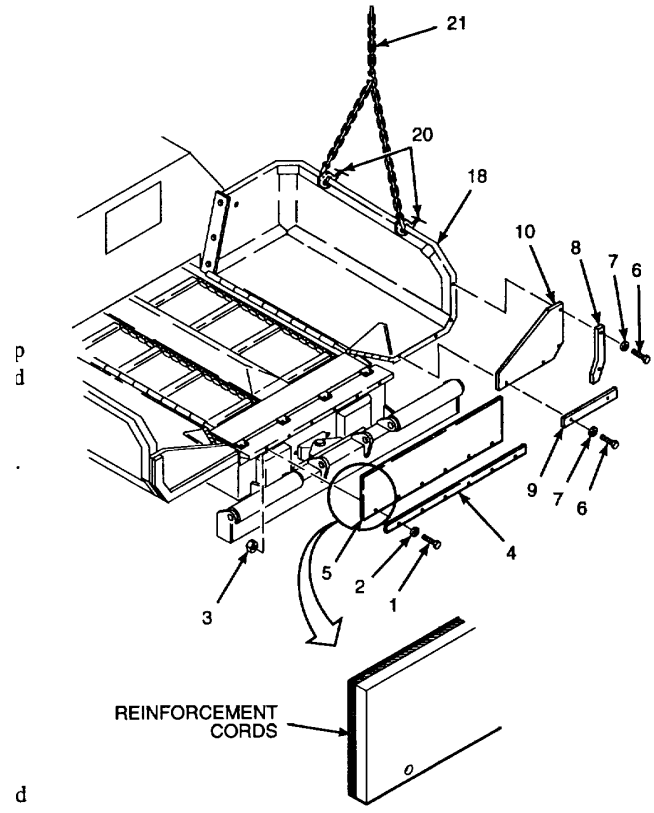
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- l. Apply thread locking compound to threads of hex head cap screws (6).
- m. Install retaining plate (8), retaining plate (9), and wing flashing (10) and tighten hex head cap screws (6).
- n. Install flat washers (2) onto hex head cap screws (1).
- o. Apply thread locking compound to threads of hex head cap screws (1).

**CAUTION**

Ensure that center flashing is not installed backward. Place reinforcement cords toward the inside of the hopper.



- p. Install retaining plate (4), center flashing (5), and hex head cap screws (1). Ensure that reinforcement cords are toward the inside of the hopper.
- q. Install and tighten hex nuts (3).

**NOTE**

If immediately replacing hopper lift cylinder, do not remove chain assemblies.

- r. Lower overhead hoist and remove chain assemblies (21) and C-clamps (20) from hopper wing (18).

**NOTE**

**FOLLOW-ON-TASK:** Install hopper lift cylinder per TM 5-3895-373-20.

**END OF TASK**

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**2.60 REPAIR HOPPER LIFT CYLINDER.**

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<b>This task covers:</b>	a. Disassemble	b. Clean	c. Inspect
	d. Repair	e. Assemble	

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**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Hydraulic press (Item 41, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Spanner wrench (Item 128, Appendix D)  
Torque wrench (Item 133, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Vise jaw caps (Item 23, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

References:

TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Hopper lift cylinder removed from paving machine  
per TM 5-3895-373-20.

Materials/Parts:

Cleaning cloths (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Crocus cloth (Item 4, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
O-rings  
Preformed packings  
Seal kit  
Self-locking hex nut

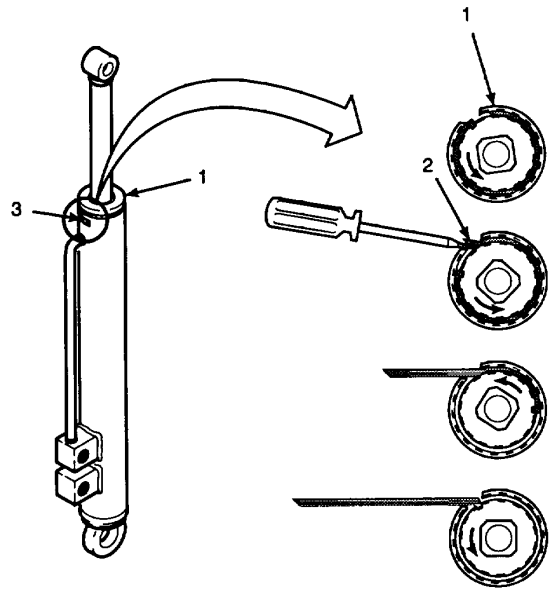
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**A. DISASSEMBLE - Continued.**

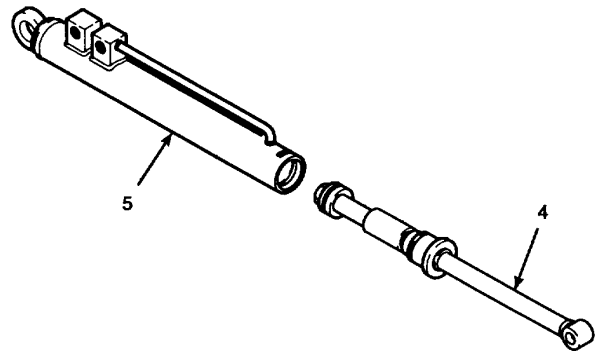
**1. REMOVE RETAINING RING.**

- a. Insert spanner wrench into spanner hole on cylinder head (1).
- b. Hold hopper lift cylinder and turn cylinder head (1) in direction of least resistance until beveled edge of retaining ring (2) appears in milled opening (3).
- c. Insert flat blade screwdriver under beveled edge of retaining ring (2).
- d. Rotate cylinder head (1) in opposite direction of step b to force until retaining ring (2) emerges through milled opening (3).
- e. Continue to rotate cylinder head (1) and pull retaining ring (2) from milled opening (3).



**2. REMOVE PISTON COMPONENTS.**

- a. Pull piston rod (4) and attached parts from cylinder tube (5).



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## 2.60 REPAIR HOPPER LIFT CYLINDER - Continued.

## A. DISASSEMBLE - Continued.

**CAUTION**

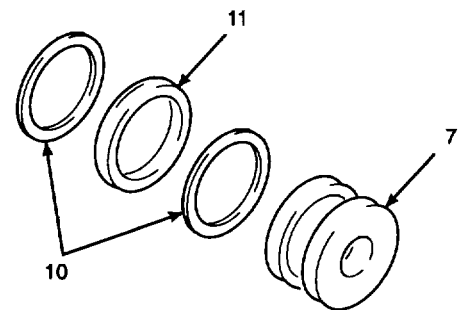
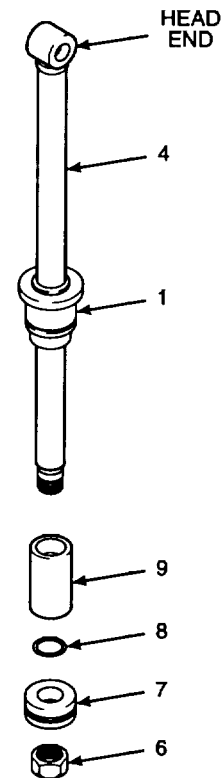
Do not clamp chrome surface of piston rod in vise. Damage to chrome surface of piston rod can result from contact with steel vise jaws.

- b. Clamp head end of piston rod (4) in bench vise using vise jaw caps.
- c. Remove self-locking hex nut (6). Discard self-locking hex nut.
- d. Remove piston (7) and preformed packing (8). Discard preformed packing.
- e. Remove sleeve spacer (9) and cylinder head (1).
- f. Remove piston rod (4) from bench vise.

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force. Use an o-ring tool. Careless removal of packings and seals can result in bypass leakage and equipment failure.

- g. Use an o-ring tool to remove packing retainers (10) and seal (11) from piston (7). Discard seal and packing retainers.



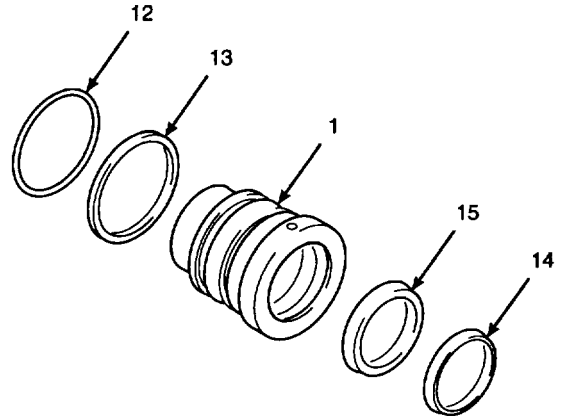
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A. **DISASSEMBLE - Continued.**

**CAUTION**

Use caution when removing seals and o-rings. Do not use excessive force. Use an o-ring tool. Careless removal of o-rings and seals can result in bypass leakage and equipment failure.

- h. Use an o-ring tool to remove o-ring (12) and packing retainer (13). Discard o-ring and packing retainer.
- i. Remove ring wiper (14) and compression cup (15) from inside of cylinder head (1). Discard ring wiper and compression cup.



B. **CLEAN.**

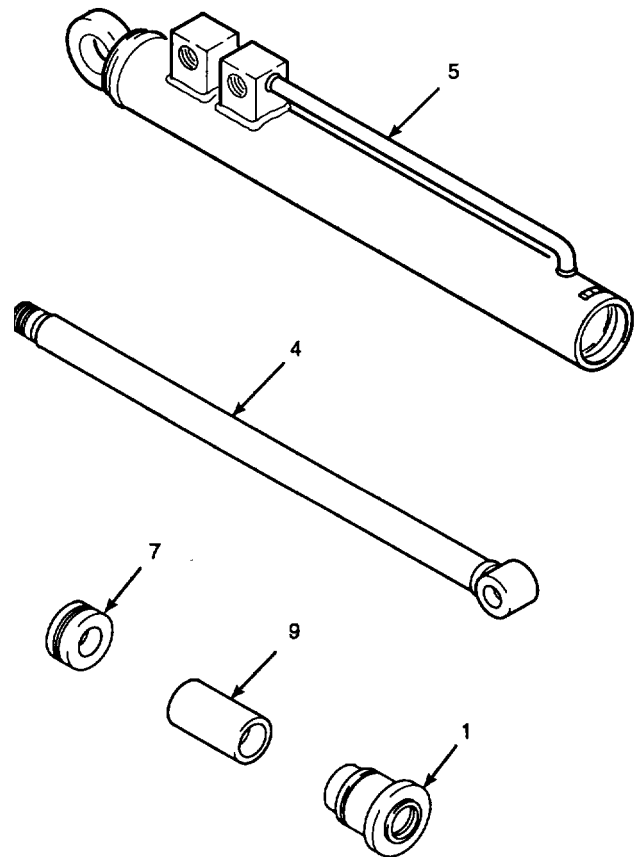
1. **CLEAN ALL METAL PARTS.**

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type Im cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- 2. **RINSE PISTON ROD (4), CYLINDER HEAD (1), PISTON (7), CYLINDER TUBE (5), AND SLEEVE SPACER (9) WITH CLEANING SOLVENT.**



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**2.60 EPAIR HOPPER LIFT CYLINDER - Continued.**


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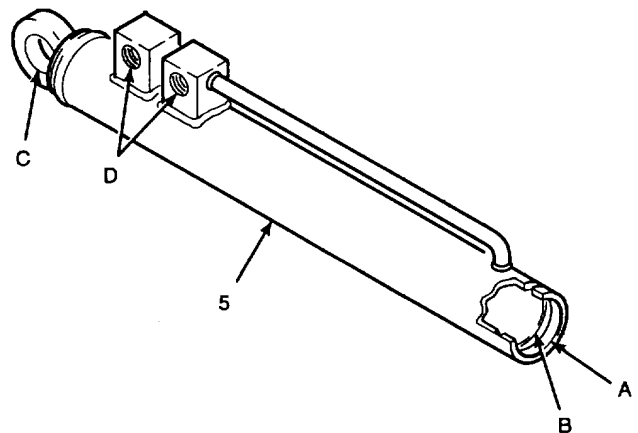
**B. CLEAN - Continued.****WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and glove). Failure to take proper precautions may result in severe injury or loss of vision.

3. **USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO BLOW ANY FOREIGN MATERIAL FROM SEAL GROOVES, INSIDE DIAMETER OF CYLINDER TUBE, AND THREADED SURFACES. DRY PARTS WITH CLEANING CLOTHS.**

**C. INSPECT.****1. INSPECT CYLINDER TUBE.**

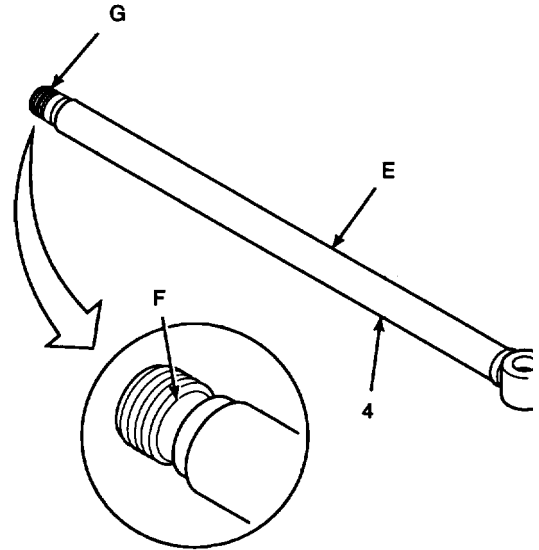
- a. Run your finger along surface A of cylinder tube (5) and retaining ring groove surface B. Feel for any nicks, scratches, or sharp edges that may damage preformed packings and seals.
- b. Remove sharp edges of nicks or scratches using crocus cloth or replace cylinder tube.
- c. Use a strong light to visually inspect cylinder tube (5) interior for scoring or scratches. If scoring or scratches are detected, replace hopper lift cylinder.
- d. Check spherical bearing C for pitting, cracks, or looseness. If damaged or loose, replace spherical bearing per instructions in step D of this task.
- e. Inspect threads D. If threads are distorted, replace cylinder tube (5).

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**C. INSPECT - Continued.**

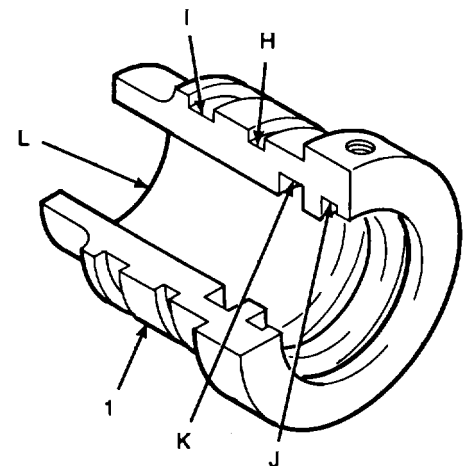
**2. INSPECT PISTON ROD.**

- a. Run your finger along piston rod (4), surface E. Feel for any scratches or sharp edges that may damage preformed packings and seals. Inspect surface of piston rod for scratches, pits, or wear that expose base metal through chrome plating.
- b. Remove sharp edges of nicks or scratches using crocus cloth.
- c. Replace piston rod (4) if scratches or pits cannot be polished out, if scratch exceeds 0.5 in. (12,7 mm) in length, or if base metal is exposed through chrome plating.
- d. Visually inspect packing groove, surface F, and feel for nicks and sharp edges. Remove sharp edges using crocus cloth.
- f. If packing groove, surface F. If packing groove edge is cracked or chipped, replace hopper lift cylinder.
- g. Inspect threads G. If threads are distorted, replace piston rod (4).



**3. INSPECT CYLINDER HEAD.**

- a. Visually inspect cylinder head (1) retaining ring groove H and o-ring groove I for raised edges or nicks that may damage retaining ring or o-ring. Remove raised edges and nicks with crocus cloth or replace cylinder head.
- b. Inspect inside bore ring wiper groove J and compression cup groove K for raised edges or nicks that may damage ring wiper or compression cup. Remove raised edges and nicks with crocus cloth or replace cylinder head (1)
- c. Inspect cylinder head (1) inside bore surface L for nicks, pits, or scratches. Remove nicks, pits, and scratches of less than 0.5 in. (12,7 mm) in length with crocus cloth.
- d. Replace cylinder head (1) if nicks, pits, or scratches cannot be polished out of bore, surface L.

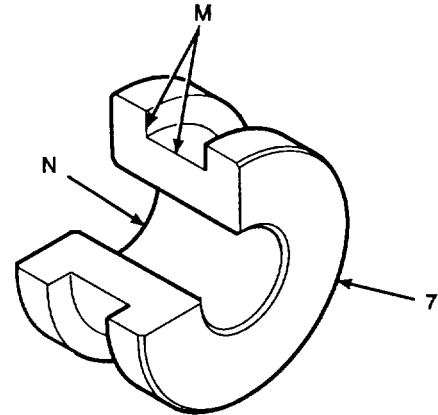


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**2.60 REPAIR HOPPER LIFT CYLINDER - Continued.****C. INSPECT - Continued.****4. INSPECT PISTON.**

- a. Inspect piston (7), seal groove M, and inside bore surface N. Check for any sharp edges or nicks that may damage packing retainers or seals. Remove sharp edges and nicks with crocus cloth.
- b. Replace piston (7) if scratches, pits, sharp edges, or nicks cannot be polished out, or if surface defect exceeds 0.5 in. (12,7 mm) in length.

**5. CLEAN ALL METAL PARTS AFTER INSPECTION.****WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts with cleaning solvent.

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**C. INSPECT - Continued.****WARNING**

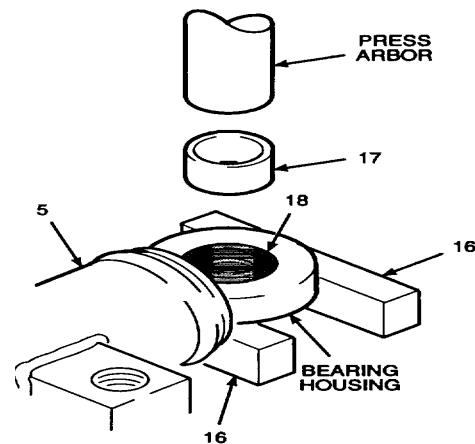
Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from preformed packing grooves, seal grooves, inside of tube, and threaded surfaces.
- c. Dry parts with a clean, lint-free cloth. Set dry parts on clean surface. Place a clean, lint-free cloth into open end of cylinder tube to prevent contamination.

**D. REPAIR.****1. PRESS OUT SPHERICAL BEARING.****CAUTION**

Place cylinder tube support blocks close to bearing bore when pressing out spherical bearing. Failure to place support blocks correctly may lead to warping of the cylinder tube.

- a. Set up cylinder tube (5) on hydraulic press. Place parallel blocks (16) under bearing housing for support.
- b. Place spacer (17) from universal puller kit on outer race of spherical bearing (18). Press spherical bearing squarely out of bearing bore.



**GO TO NEXT PAGE**

## 2.60 REPAIR HOPPER LIFT CYLINDER - Continued.

## D. REPAIR - Continued.

## 2. INSTALL SPHERICAL BEARING.

**CAUTION**

Place cylinder tube parallel blocks (16) close to bearing bore when pressing spherical bearing (18). Failure to place parallel blocks correctly may lead to warping of the cylinder tube (5).

- a. Set up cylinder tube (5) on hydraulic press. Use parallel blocks (16) to support bearing housing.

**CAUTION**

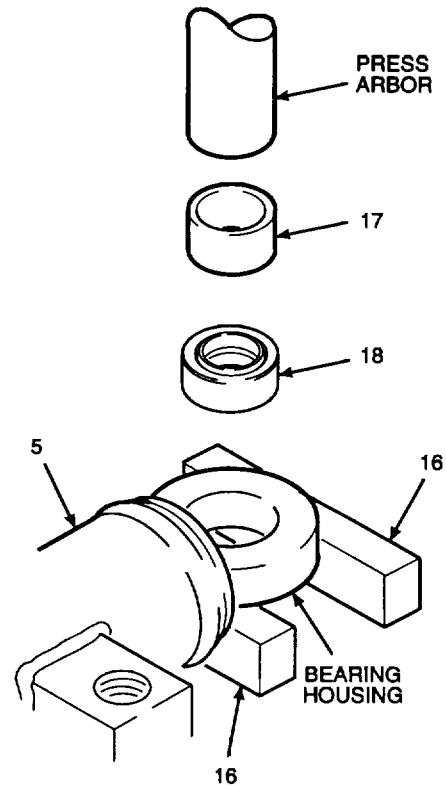
Spherical bearing (18) must be pressed straight into bearing bore. If spherical bearing is allowed to tilt, damage may result to both the spherical bearing and bearing bore.

- b. Start spherical bearing (18) in bearing bore of cylinder tube (5).

**NOTE**

Spherical bearing installation will require 500 to 700 lbs (2224 to 3114 N.m) force when pressed into bearing bore.

- c. Place a 1.25 in. (32 mm) diameter spacer (17) from universal puller kit onto outer race of spherical bearing (18). Bring hydraulic press down to meet spacer. Square spacer with face of press arbor. Press spherical bearing squarely into base bearing bore.



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## E. ASSEMBLE.

## 1. INSTALL O-RINGS AND SEALS.

**WARNING**

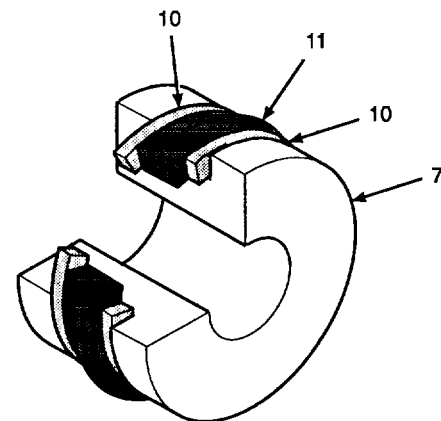
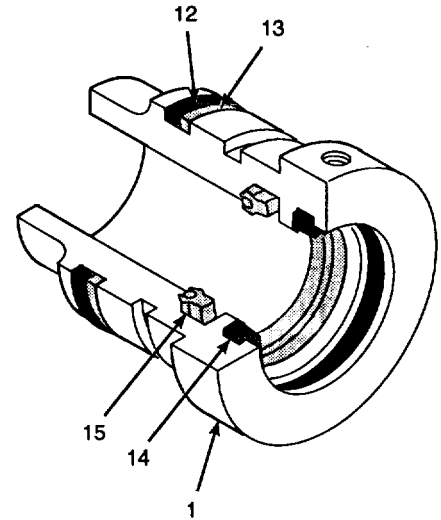
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate cylinder head, piston, seals, and o-rings with clean hydraulic oil.

**CAUTION**

New seals and o-rings are distorted during installation. Use care during installation to prevent damage to seals, o-rings, and seal grooves. Bypass leakage can result from poor installation.

- b. Pinch sides of compression cup (15) together to form a C-shape. Install compression cup carefully in one side of mating groove of cylinder head (1), and allow opposite side to snap into place.
- c. Pinch sides of ring wiper (14) together to form a C-shape. Install ring wiper carefully in one side of mating groove, and allow opposite side to snap into place.
- d. Install packing retainer (13) and o-ring (12).
- e. Install seal (11) onto piston (7).
- f. Install packing retainers (10) on each side of installed seal (11).



GO TO NEXT PAGE

## 2.60 REPAIR HOPPER LIFT CYLINDER - Continued.

## E. ASSEMBLE - Continued.

## 2. ASSEMBLE PISTON COMPONENTS.

**CAUTION**

Do not clamp chrome surface of piston rod in vise. Damage to chrome surface of piston rod can result from contact with steel vise jaws.

- a. Clamp head end of piston rod (4) in bench vise using vise jaw caps.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure.

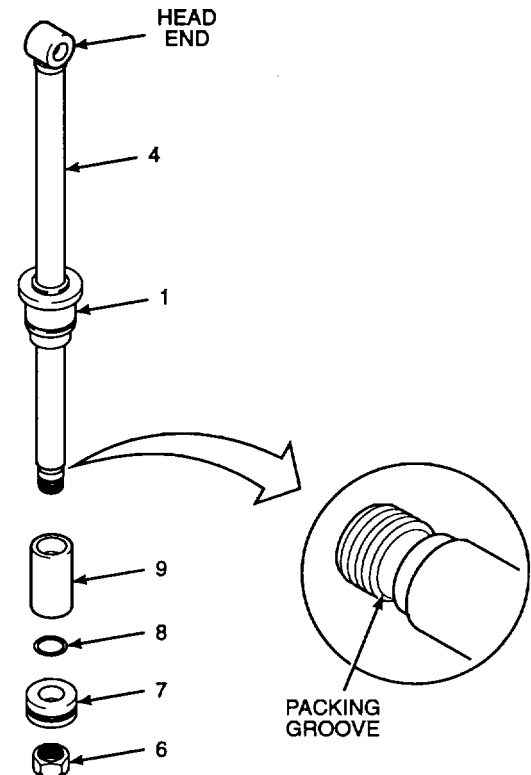
Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Lubricate piston rod (4), cylinder head (1), and piston (7) with clean hydraulic oil.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- c. Install cylinder head (1) and sleeve spacer (9). Carefully rotate and slide cylinder head down length of piston rod (4) to pivot end.
- d. Install preformed packing (8) into packing groove on piston rod (4).
- e. Carefully rotate and slide piston (7) onto threaded end of piston rod (4).
- f. Install self-locking hex nut (6). Using a socket wrench adapter, tighten hex nut to 200 lb-ft (271 N.m).

**CAUTION**

Internal seals and preformed packings are distorted during installation. Allow one hour for seals and preformed packings to resume original shape after installing cylinder head and piston on piston rod.

- g. Remove piston rod (4) from bench vise. Allow one hour for installed seals and packings to resume their original shape.

**GO TO NEXT PAGE**

## E. ASSEMBLE - Continued.

## 3. ASSEMBLE PISTON ROD AND CYLINDER TUBE.

**WARNING**

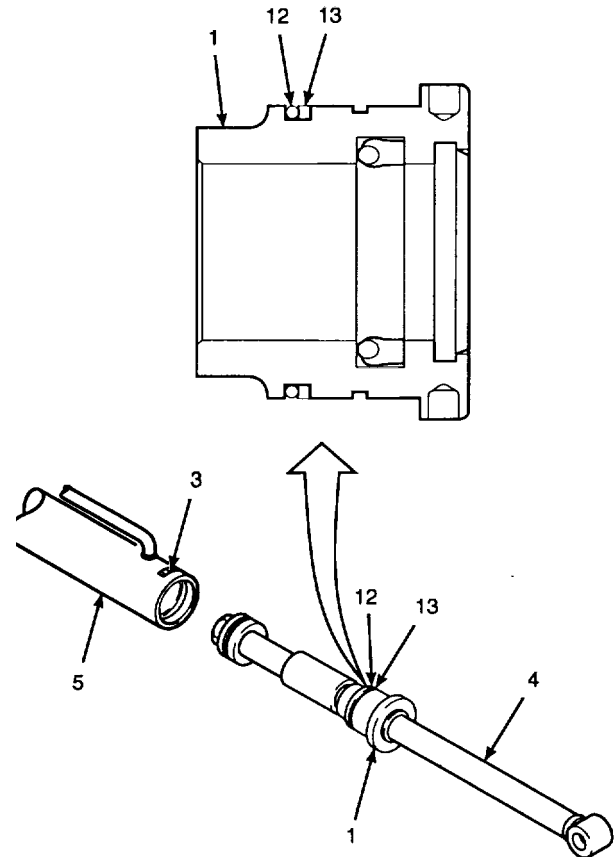
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Apply hydraulic oil to outer sealing surfaces of cylinder head (1), o-ring (12), and packing retainer (13).
- b. Remove lint-free cloth from cylinder tube (5). Ensure no foreign material is present in cylinder tube and on piston rod (4).
- c. Dip cylinder tube (5) and piston rod (4) in bath of clean hydraulic oil. Remove cylinder tube and piston rod and allow excess oil to drain back into oil bath.

**CAUTION**

Inside edges of milled opening are sharp. Use caution when installing piston to ensure preformed packings and packing retainers are not cut by sharp edges. Bypass leakage can result from damaged preformed packings or packing retainers.

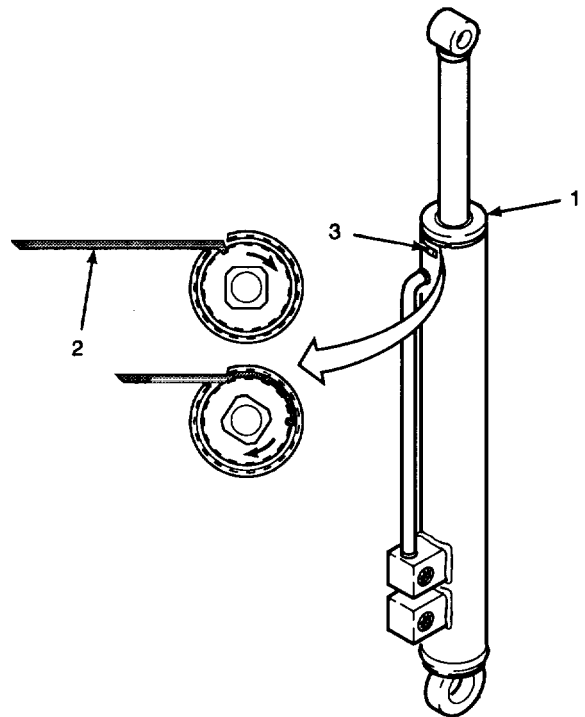
- d. Carefully slide piston rod (4) into cylinder tube (5). Rotate sealed components to ease installation. Ensure packing retainer (13) does not extrude into milled opening (3).
- e. Seat flange of cylinder head (1) flush with leading face of cylinder tube (5).



**GO TO NEXT PAGE**

**2.60 REPAIR HOPPER LIFT CYLINDER - Continued.****E. ASSEMBLE - Continued.**

- f. Using spanner wrench, rotate cylinder head (1). Locate retaining ring groove in milled opening (3).
- g. Insert retaining ring (2) hook-end first into milled opening (3). Ensure retaining ring catches in retaining ring groove.
- h. Rotate cylinder head (1), in same direction that retaining ring (2) was inserted, 1-1/4 turns to pull in retaining ring. Ensure retaining ring is fully seated.

**NOTE**

**FOLLOW-ON-TASK:** Install hopper lift cylinder per TM 5-3895-373-20.

**END OF TASK**

2-834

2.61 REPLACE CONVEYOR CHAIN ASSEMBLY.

- This task covers:
- a. Remove
  - b. Clean
  - c. Inspect
  - d. Replace

INITIAL SETUP:

- Tools:
- General mechanic's automotive tool kit (Item 106, Appendix D)
  - Combination wrench (Item 116, Appendix D)
  - Elastic cord assembly (Item 34, Appendix D)
  - Hex head driver socket (Item 86, Appendix D)
  - Hex head driver socket (Item 87, Appendix D)
  - Outside micrometer (Item 15, Appendix D)
  - Outside micrometer (Item 18, Appendix D)
  - Socket wrench adapter (Item 7, Appendix D)
  - Torque wrench (Item 132, Appendix D)
  - Wire scratch brush (Item 13, Appendix D)

- Materials/Parts:
- Cleaning cloth (Item 6, Appendix B)
  - Cleaning solvent (Item 31, Appendix B)
  - Rope, 2 ea (24 ft, cut from Item 73, Appendix D)
  - Thread locking compound (Item 13, Appendix B)
  - Thread locking compound solvent (Item 32, Appendix B)
  - Cotter pins

Personnel Required:

Three 62B construction equipment repairers. One person to operate conveyor manually. Two persons needed for removal and replacement of conveyor chain assembly.

- References:
- TM 5-3895-373-10
  - TM 5-3895-373-20
  - TM 5-3895-373-24P

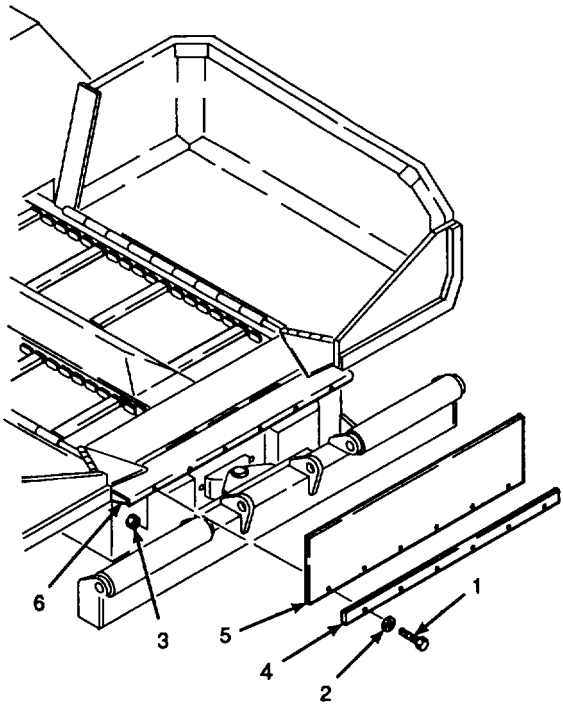
Equipment Condition:

Paving machine jacked and chocked per TM 5-3895-373-20.  
Flow gates fully raised per TM 5-3895-373-10.  
Hopper wings fully lowered per TM 5-3895-373-10.  
Screed removed per TM 5-3895-373-20.

NOTE

This task covers replacement of the right side conveyor chain assembly only. Procedures for replacement of the left conveyor chain assembly are identical to those for the right side.

- A. REMOVE.
1. REMOVE CENTER FLASHING.
    - a. Remove hex head cap screws (1), flat washers (2), and hex nuts (3).
    - b. Remove retaining plate (4) and center flashing (5) from extension bracket (6).



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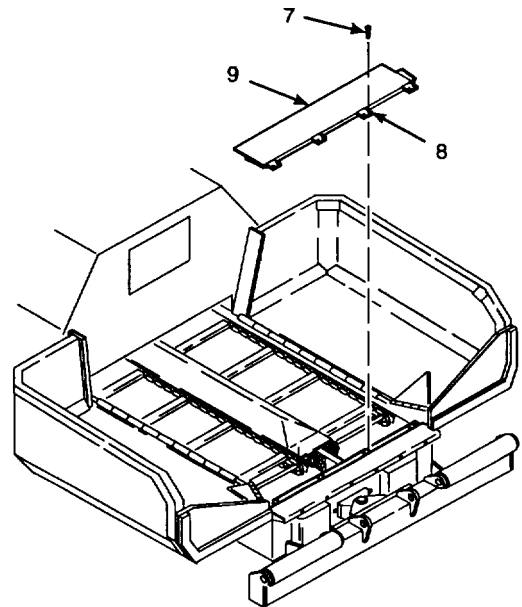


## 2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued. -#1

## A. REMOVE - Continued.

## 2. REMOVE CONVEYOR ACCESS DOOR.

- a. Remove socket head cap screws (7) from hinges (8).
- b. Lift and remove conveyor access door (9).

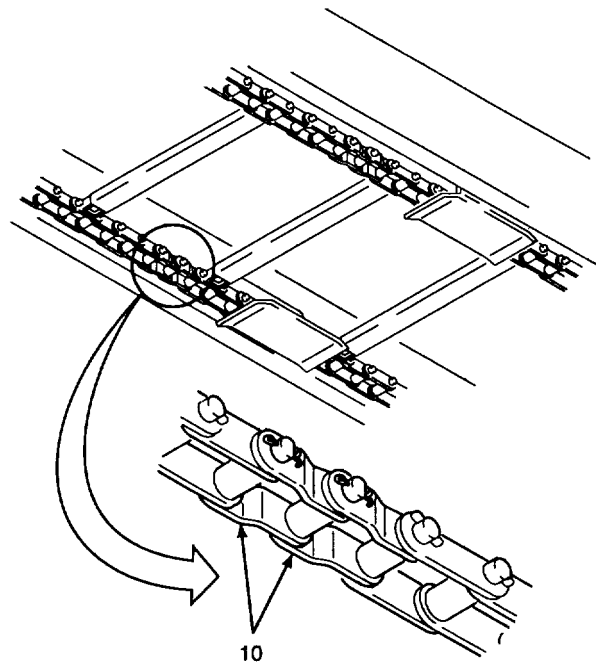


## 3. POSITION CONVEYOR CHAIN ASSEMBLY OFFSET LINKS UNDERNEATH PAVING MACHINE.

**WARNING**

Unexpected equipment movement may cause serious injury or death. Stay clear of moving and rotating parts during equipment operation. Ensure engine is off when conveyor operation is not required.

- a. Start paving machine engine per TM 5-3895-373-10.
- b. Manually jog conveyor to position chain assembly offset links (10) underneath and near center of conveyor.
- c. Shut off engine and remove key from ignition switch.



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**A. REMOVE - Continued.**

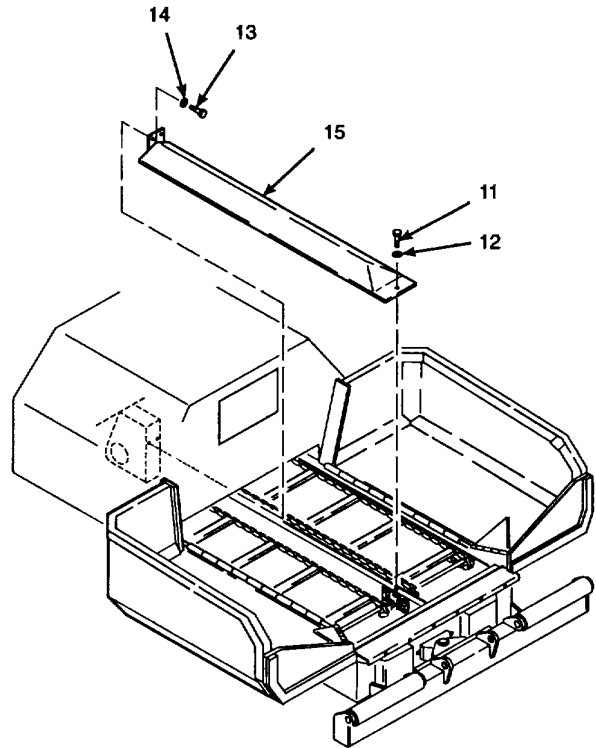
**4. REMOVE CONVEYOR DRAG PLATE GUARD.**

- a. Remove hex head cap screw (11) and flat washer (12).

**NOTE**

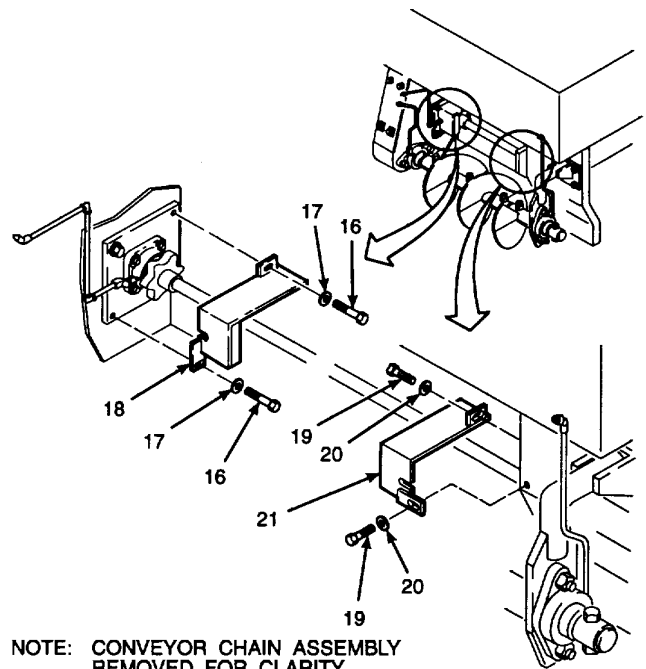
Hex head cap screws (13) are accessed by reaching from rear of paving machine.

- b. Remove hex head cap screws (13) and flat washers (14).
- c. With the help of another person, lift and slide conveyor drag plate guard (15) forward. Remove drag plate guard over front end of hopper.



**5. REMOVE INNER AND OUTER CONVEYOR CHAIN GUARDS.**

- a. Remove two hex head cap screws (16) and flat washers (17) as shown.
- b. Remove inner conveyor chain guard (18).
- c. Remove hex head cap screws (19) and flat washers (20).
- d. Remove outer conveyor chain guard (21).



NOTE: CONVEYOR CHAIN ASSEMBLY REMOVED FOR CLARITY.

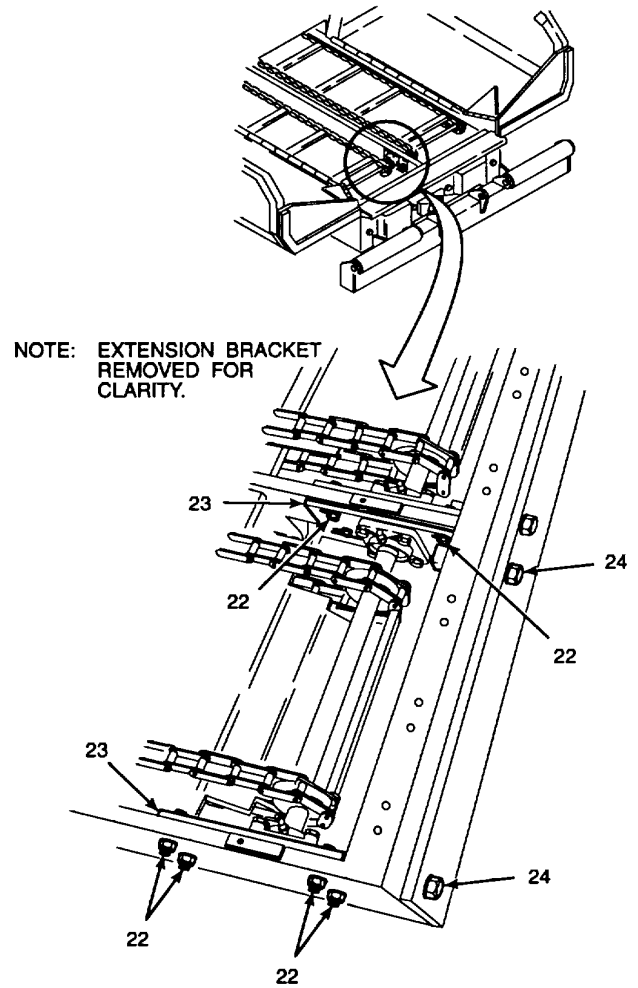
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2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued.

A. REMOVE - Continued.

6. REDUCE CHAIN TENSION.

- a. Loosen, but do not remove, hex nuts (22) attaching bearing support plates (23).
- b. Use a 1-1/2 in. combination wrench and loosen tension bolts (24) in equal increments until tension is removed and bearing support plates (23) are fully retracted.

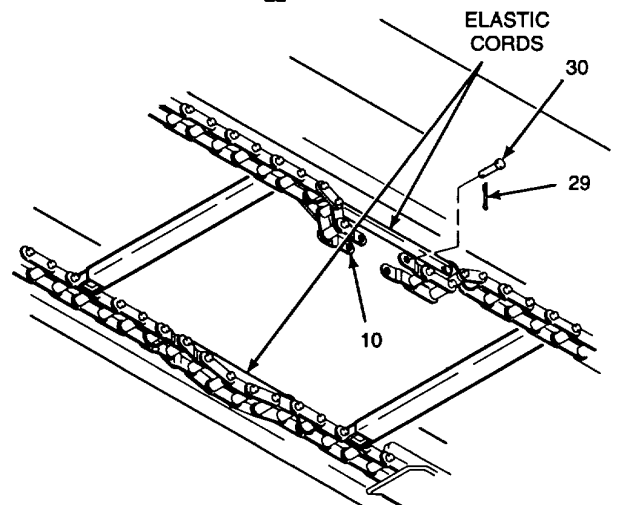


7. DISCONNECT CONVEYOR CHAIN ASSEMBLY AT OFFSET LINKS.

**WARNING**

Wear safety goggles/glasses when working underneath paving machine. Falling material may cause eye damage. If material contacts eyes, flush eyes with water and get immediate medical attention.

- a. From underneath the conveyor, attach two elastic cord assemblies through conveyor chain links.
- b. Straighten cotter pins (29) using pliers.
- c. Pull cotter pins (29) from link pins (30). Discard cotter pins.
- d. Drive link pins (30) from offset links (10) using a 1/4 in. (6,35 mm) diameter pin drive punch.
- e. Disconnect one elastic cord at a time and allow conveyor chain to lay across frame supports.



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- A. REMOVE - Continued.
- 8. REMOVE CONVEYOR CHAIN ASSEMBLY.

**WARNING**

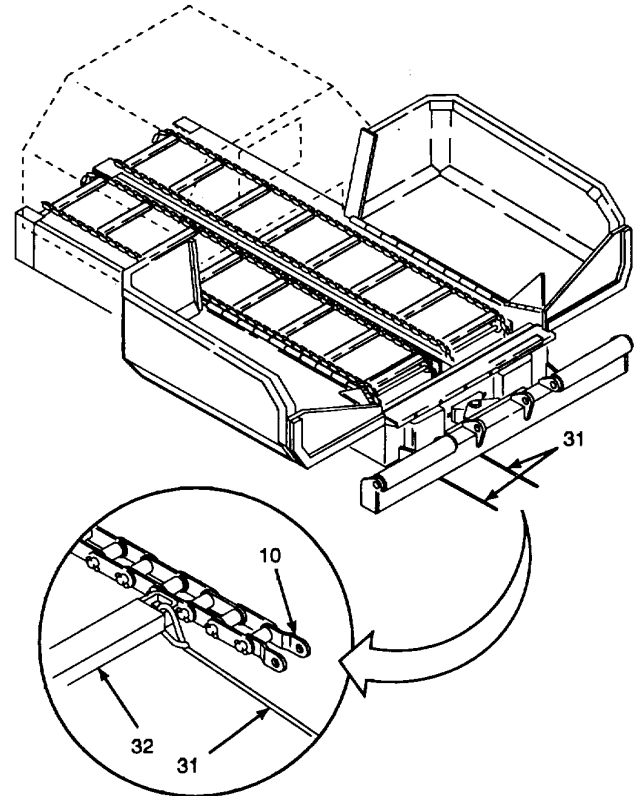
**Wear safety goggles/glasses when working underneath paving machine. Falling material may cause eye damage. If material contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Attach two guide ropes (31) to rear section of conveyor chain assembly at first conveyor drag bar (32).
- b. Run loose end of guide ropes (31) underneath conveyor toward front of paving machine.
- c. Start paving machine engine per TM 5-3895-373-10. and manually jog the conveyor in the normal (forward) direction while two other persons maintain tension on the guide ropes.
- d. As the loose end of the conveyor chain assembly appears from underneath the conveyor, stop conveyor movement. Shut off engine and remove key from ignition switch per TM 5-3895-373-10.
- e. Drape loose end of conveyor chain assembly over the front of the paving machine.

**NOTE**

**When conveyor is operated in the reverse mode, the conveyor chain assembly will feed toward the front of the machine. It may be necessary to help manually feed chain assembly over the front of the machine.**

- f. Start engine and operate conveyor in reverse using manual operation procedures per TM 5-3895-373-10 until end links feed off the conveyor sprocket wheels.
- g. Shut off engine and remove key from ignition switch per TM 5-3895-373-10.



**WARNING**

**Conveyor chain assembly weighs 260 lbs (118 kg). To avoid personal injury ensure two or more persons are involved in removal and installation of the conveyor chain assembly. Failure to do so could result in back injury.**

- h. Manually pull conveyor chain assembly over the front of the paving machine until entire chain assembly is off.
- i. Detach ropes (31) from conveyor drag bar (32). Leave guide ropes lie in place for use when installing replacement conveyor chain assembly.

**GO TO NEXT PAGE**

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**2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued.**

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**B. CLEAN.****1. CLEAN ALL REMOVED METAL PARTS.****WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse metal parts in cleaning solvent to remove paving material buildup. Use a wire scratch brush to remove hard deposits.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- b. Clean all fasteners coated with thread locking compound with thread locking compound solvent.

**2. CLEAN CONVEYOR AND COMPONENT MOUNTING SURFACES.**

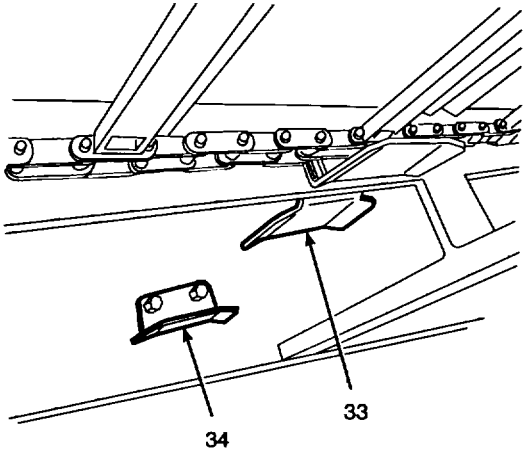
- a. Clean conveyor chain assembly path and conveyor drag plates with rags soaked in cleaning solvent. Use a scraper and wire scratch brush to remove hard deposits. Use a hammer and chisel where necessary.
- b. Clean mounting surfaces of parts removed from main frame and extension bracket with rags and cleaning solvent. Ensure threaded holes are wiped clean of all residue.

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C. INSPECT.

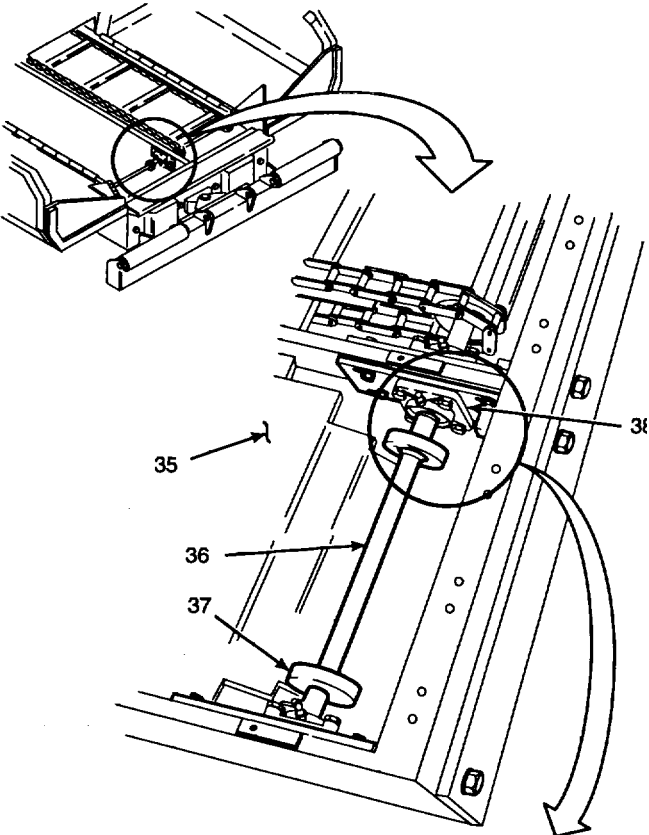
1. INSPECT CHAIN GUIDE BARS.

- a. Inspect inner (33) and outer (34) chain guide bars for cracks and wear.
- b. Replace chain guide bars if chain has worn guide bars 1/2 way through.



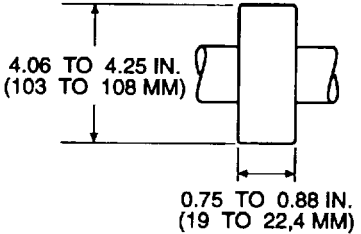
2. INSPECT CONVEYOR DRAG PLATES.

- a. Visually inspect conveyor drag plates (35) for cracks, holes, and loose or missing fasteners.
- b. Replace conveyor drag plates (35) if cracked or holes are present. Refer to paragraph 2.62 for replacement instructions.



3. INSPECT CONVEYOR ROLLER AND BEARING UNITS.

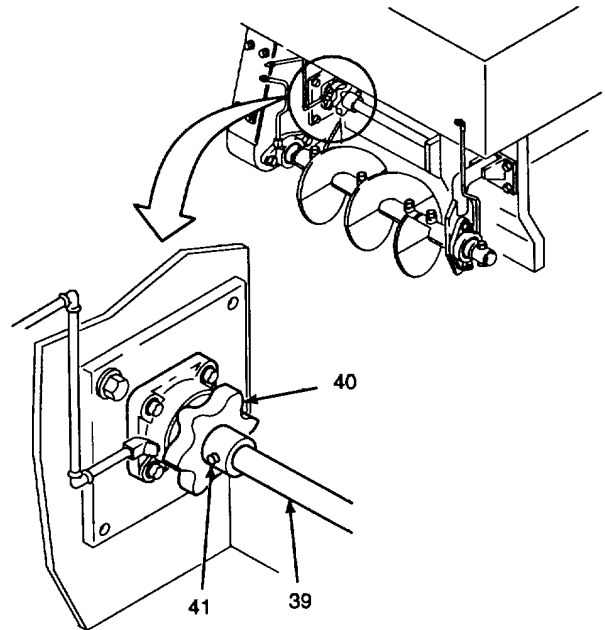
- a. Visually inspect conveyor roller shaft (36) for cracks, bends and wear. If conveyor roller appears worn, measure conveyor roller wheel (37) width and diameter with a micrometer.
- b. Measure conveyor roller wheel (37) width using outside micrometer (Item 15, Appendix D) and roller wheel diameter using outside micrometer (Item 18, Appendix D). Replace conveyor roller if roller wheel width is not between 0.75 to 0.88 in. (19 to 22,4 mm) and diameter not between 4.06 to 4.25 in. (103 to 108 mm). Refer to paragraph 2.65 for replacement instructions.
- c. Rotate conveyor roller shaft (36) by hand. If conveyor roller shaft fails to rotate easily, or if bearing units (38) appear damaged, replace bearing units per paragraph 2.65.



GO TO NEXT PAGE

**2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued.****C. INSPECT - Continued.****4. INSPECT CONVEYOR DRIVE SHAFT, BEARING UNITS, AND SPROCKET WHEELS.**

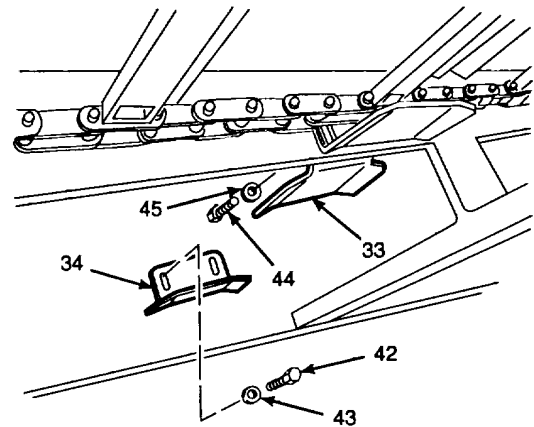
- a. Visually inspect conveyor drive shaft (39) for bends and cracks. Replace damaged drive shaft per paragraph 2.64.
- b. Inspect sprocket wheels (40) for worn, broken, or sharpened teeth. Replace sprocket wheels per paragraph 2.64 if worn or damaged.
- c. Move sprocket wheels (40) by hand to the left and right to check for looseness. If sprocket wheels are loose, tighten set screws (41) to 90 lb-ft (122 N•m) using socket wrench adapter and hex head driver socket (Item 86, Appendix D).
- d. Check bearing units by spinning conveyor drive shaft. Drive shaft should spin free and easy with no grinding sound from bearing units, or rough or binding movement in bearing units. Replace damaged bearing units per paragraph 2.64.

**D. REPLACE.****1. REMOVE WORN OR DAMAGED OUTER AND INNER CHAIN GUIDE BARS.**

**WARNING**

**Wear safety goggles/glasses when working underneath paving machine. Falling material may cause eye damage. If material contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Remove hex head cap screws (42) and flat washers (43) from outer chain guide bar (34).
- b. Remove outer chain guide bar (34).
- c. Remove hex head cap screws (44) and flat washers (45) from inner chain guide bar (33).
- d. Remove inner chain guide bar (33).



**WARNING**

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- e. Clean threads of hex head cap screws (42 and 44) with thread locking compound solvent and a cleaning cloth. Dry cap screws with a clean, cleaning cloth.

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D. REPLACE - Continued.

2. INSTALL INNER AND OUTER CHAIN GUIDE BARS.

**WARNING**

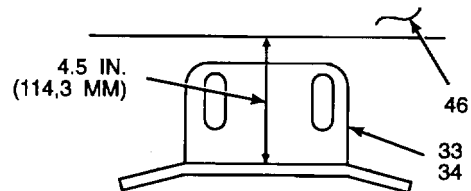
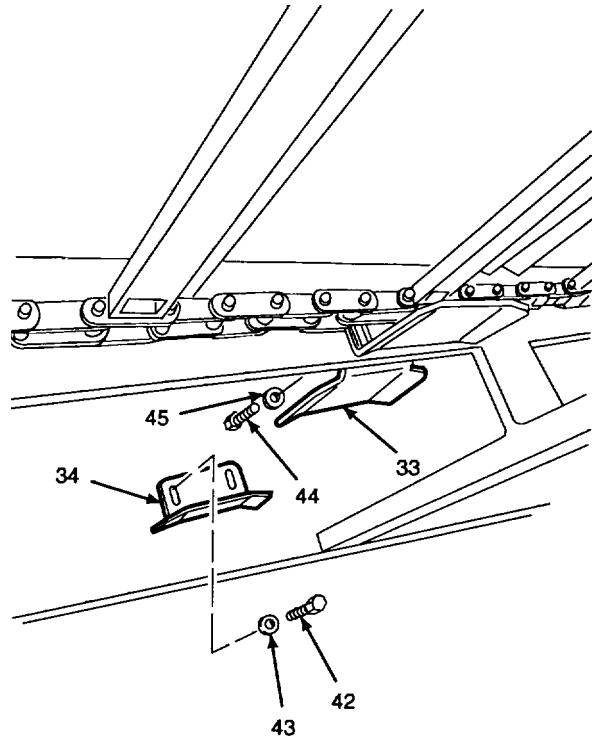
Wear safety goggles/glasses when working underneath paving machine. Falling material may cause eye damage. If material contacts eyes, flush eyes with water and get immediate medical attention.

- a. Place flat washers (45) on hex head cap screws (44).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (44).
- c. Install hex head cap screws (44) and flat washers (45).
- d. Position and hold inner chain guide bar (33) 4.5 in. (114,3 mm) below bottom of conveyor drag plate (46).
- e. Tighten hex had cap screws (44) to 90 lb-ft (122 N•m).
- f. Place flat washers (43) on hex head cap screws (42).
- g. Apply thread locking compound to threads of hex head cap screws (42).
- h. Install hex head cap screws (42) and flat washers (43).
- i. Position and hold outer chain guide bar (34) 4.5 in. (114,3 mm) below bottom of conveyor drag plate (46).
- j. Tighten hex head cap screws (42) to 90 lb-ft (122 N•m).



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## 2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued.

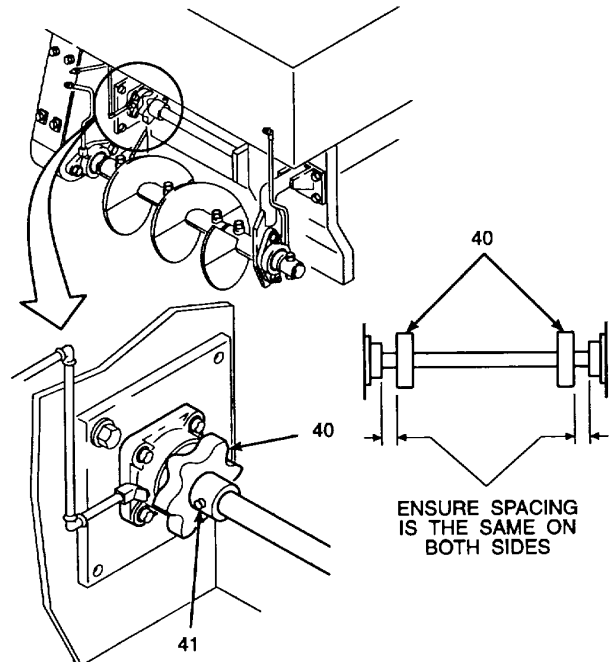
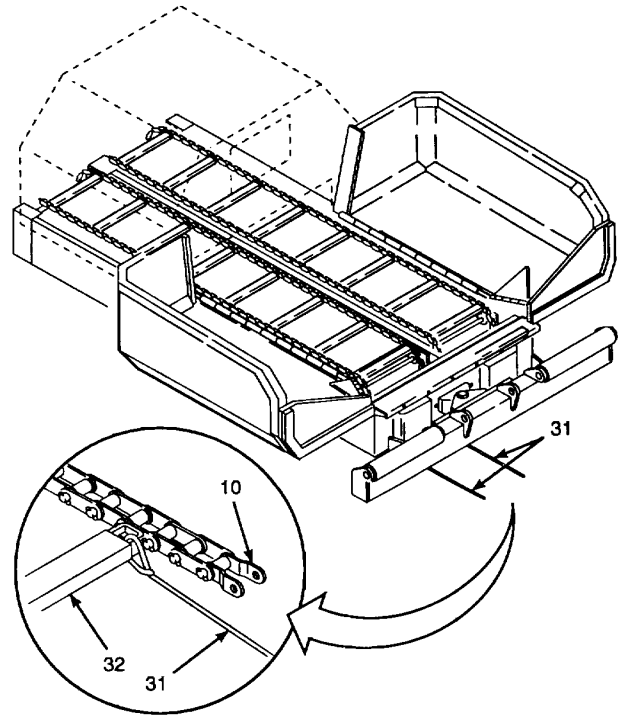
## D. REPLACE - Continued.

## 3. INSTALL CONVEYOR CHAIN ASSEMBLY ONTO SPROCKET WHEEL AND CONVEYOR DRIVE SHAFT.

## NOTE

Install the conveyor chain assembly with the offset link wide end facing into the hopper toward the rear of the paving machine.

- With the help of another person, lay conveyor chain assembly over front of paving machine and onto conveyor drag plates. Ensure wide end of offset links (10) are facing into the hopper toward the rear of the paving machine.
- Attach guide ropes (31) to conveyor chain assembly at leading conveyor drag bar (32).
- Pull conveyor chain assembly across length of conveyor toward the rear of the paving machine using guide ropes (31).
- Lay conveyor chain assembly over conveyor sprocket wheels (40). Ensure sprocket wheel teeth engage chain links without binding.
- Check location of sprocket wheels for alignment with conveyor chain assembly. Sprocket wheels should be set at same width as conveyor chain assembly.
- If necessary, loosen set screws (41) and adjust position of sprocket wheels (40). Tighten set screws.
- Ensure spacing from sprocket wheel (40) to the bearing unit is the same on both sides of the conveyor.



GO TO NEXT PAGE

D. REPLACE - Continued.

4. POSITION OFFSET LINKS FOR RECONNECTING CONVEYOR CHAIN ASSEMBLY.

- a. Pull guide ropes taunt and maintain tension on conveyor chain assembly.

**WARNING**

Use extreme caution when conveyor and auger are operating. Stay clear of all moving parts. Watch for pinch points when guiding conveyor chain assembly underneath paving machine. Failure to do so may result in tools, clothing, hands, or feet getting caught and causing serious injury or death to personnel.

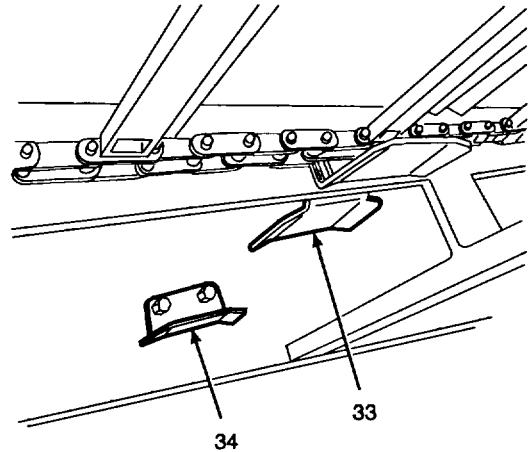
**WARNING**

Wear safety goggles/glasses when working underneath paving machine. Falling material may cause eye damage. If material contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

Feed conveyor chain assembly onto conveyor slowly to prevent loose chain from jumping off drive sprocket wheels and jamming. Failure to do so may result in damage to conveyor chain assembly and drive shaft sprocket wheel.

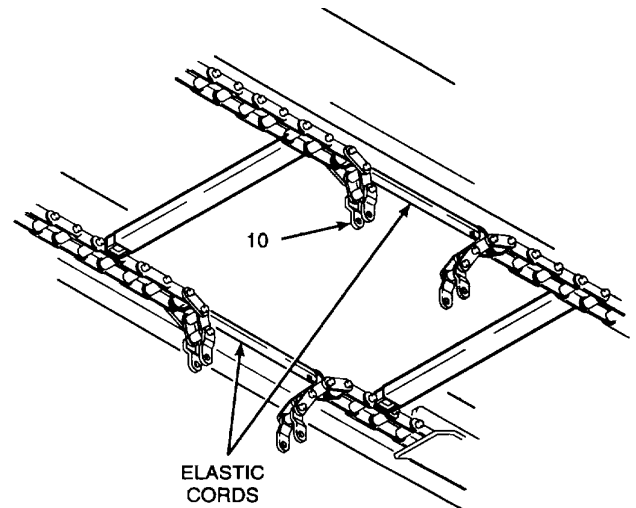
- b. Position one person underneath the conveyor with second person pulling on guide ropes. Start engine and slowly jog conveyor in normal (forward) direction using manual operation procedures per TM 5-3895-373-10.
- c. Guide conveyor chain assembly over main frame and chain guide bars (33 and 34) toward front of paving machine. Stop conveyor when leading edge of conveyor chain assembly has been fed about three-quarters of the way to the front of the paving machine. Shut engine off and remove key from ignition switch per TM 5-3895-373-10.
- d. Manually feed remaining portion of trailing edge of conveyor chain assembly to the person underneath the conveyor. Ensure that chain assembly feeds over conveyor roller. Pull ends of chain assembly together as much as possible.



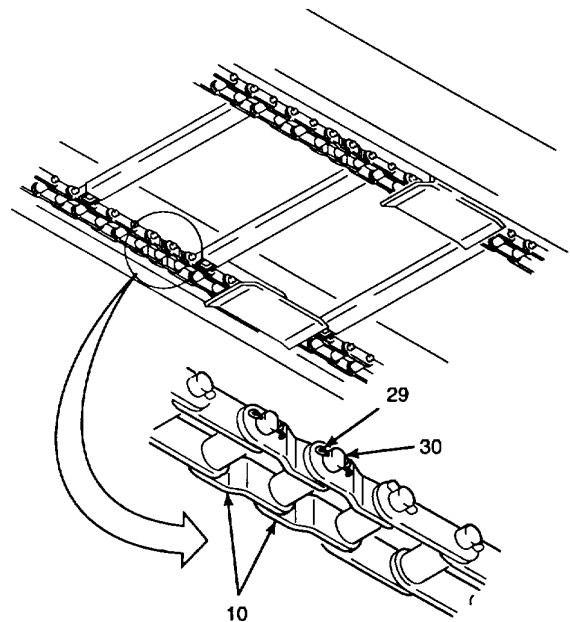
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**2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued.****D. REPLACE - Continued.****5. CONNECT LOOSE END OF CONVEYOR CHAIN ASSEMBLY AT OFFSET LINKS.**

- a. Use elastic cords to draw loose ends of conveyor chain assembly together until offset links (10) can be easily connected.



- b. Align offset links (10) to fit together and insert link pins (30).
- c. Insert cotter pins (29). Use pliers to bend cotter pins back.
- d. Unhook elastic cords from chain assembly.
- e. Set conveyor chain assembly tension per TM 5-3895-373-20.



**GO TO NEXT PAGE**

D. REPLACE - Continued.

6. ALIGN CONVEYOR CHAIN ASSEMBLY.

- a. Visually check conveyor chain assembly in tunnel opening. Chain assembly should be centered in tunnel opening with sprocket wheels (40) equal distance from bearing units (47). If not, remove set screws (41) on both sprocket wheels and move sprocket wheels to center conveyor chain assembly in tunnel opening. Keep the distance between sprocket wheels the same as the chain assembly width.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of set screws (41).
- c. Install set screw (41). Tighten set screws using socket wrench adapter and hex head driver socket (Item 86, Appendix D) to 90 lb-ft (122 N•m).

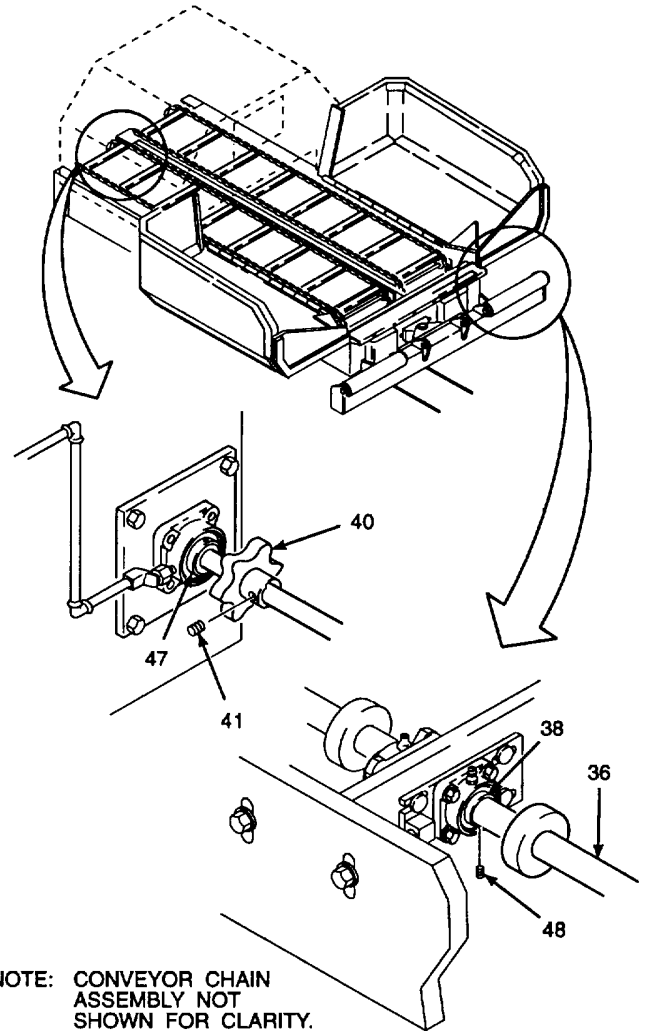
**NOTE**

After the conveyor chain assembly is installed on conveyor roller wheels and sprocket wheels, it will be necessary to run the conveyor to center the idler end of the chain assembly and conveyor roller shaft.

- d. Loosen set screws (48) on bearing units (38) at both ends of conveyor roller shaft (36).

**WARNING**

Use extreme caution when conveyor and auger are operating. Stay clear of all moving parts. Failure to do so may result in tools, clothing, hands, or feet getting caught and causing serious injury or death to personnel.



- e. Start engine and run conveyor in forward direction using manual operation procedures per TM 5-3895-373-10. Visually check alignment of conveyor chain assembly and roller shaft (36). Chain assembly should be running either in center, or slightly off center without hitting sides of machine frame. Stop conveyor. Shut off engine and remove key from ignition switch per TM 5-3895-373-10.

GO TO NEXT PAGE

**2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued.****D. REPLACE - Continued.**

- f. If conveyor chain assembly is running okay and not hitting the sides of the main frame, remove set screws (48).

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- g. Clean threads of set screws (48) with thread locking compound solvent and a cleaning cloth. Dry set screws using a clean, cleaning cloth.

**WARNING**

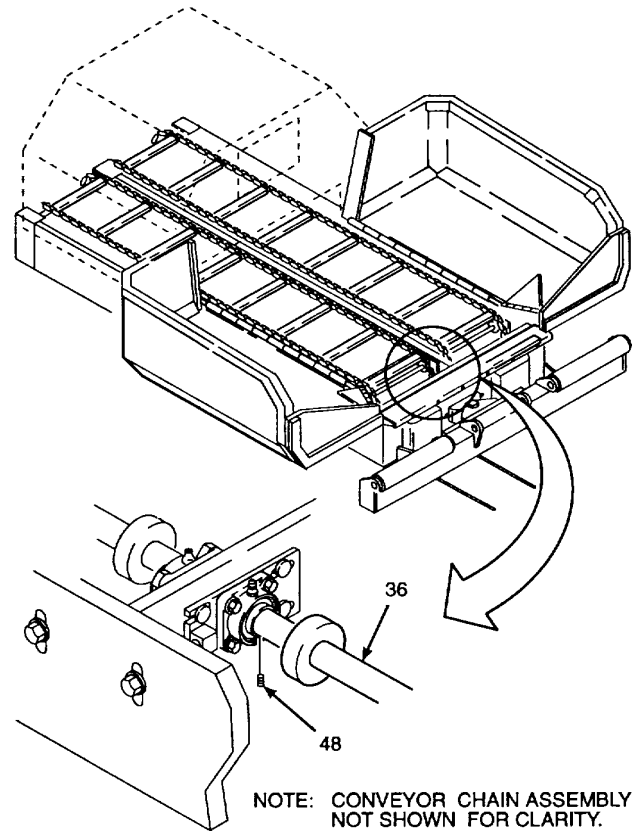
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- h. Apply thread locking compound to the threads of the set screws. Install set screws. Tighten set screws using a socket wrench adapter and hex head driver socket (Item 86, Appendix D) to 19 lb-ft (26 N•m).
- i. If the conveyor chain assembly is rubbing against either side of the main frame, proceed as follows:

**NOTE**

It may be necessary to move the conveyor manually to access set screws (48).

- (1) Remove set screws (48).
- (2) Move conveyor chain assembly 1/4 in. away from the main frame rail where the chain assembly is hitting the main frame.



- (3) Clean threads of set screws (48) with thread locking compound solvent and a cleaning cloth. Dry set screws using a clean, cleaning cloth.
- (4) Apply thread locking compound to the threads of the set screws (48). Install set screws. Tighten set screws using a socket wrench adapter and a hex head driver socket (Item 86, Appendix D) to 19 lb-ft (26 N•m).
- (5) Start engine and run conveyor in forward direction using manual operation procedures per TM 5-3895-373-10. Visually check alignment of conveyor chain assembly and roller shaft (36). Chain assembly should be running either in center, or slightly off center without hitting sides of main frame. Stop conveyor and shut off engine and remove key from ignition switch per TM 5-3895-373-10.

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**D. REPLACE - Continued.**

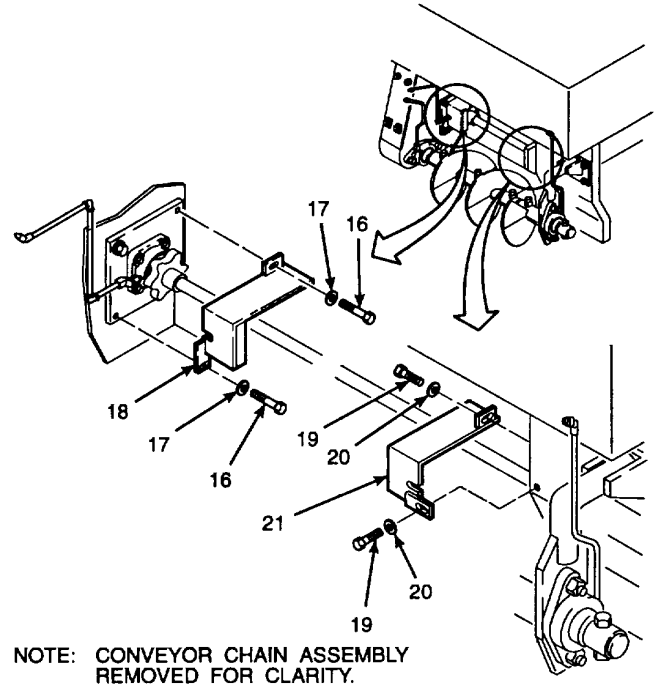
**7. REPLACE CONVEYOR CHAIN GUARDS.**

- a. Place flat washers (17) onto hex head cap screws (16).

**WARNING**

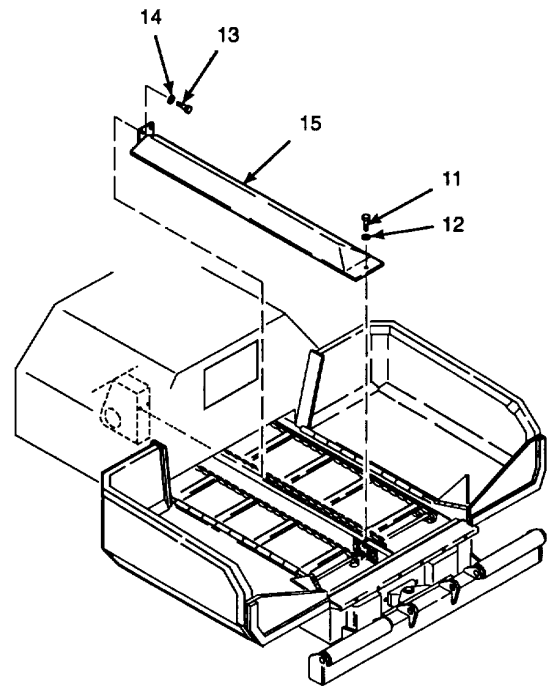
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (16).
- c. Install inner conveyor chain guard (18) with flat washers (17) and hex head cap screws (16).
- d. Tighten hex head cap screws (16) to 37 lb-ft (50 N•m).
- e. Place flat washers (20) onto hex head cap screws (19).
- f. Apply thread locking compound to threads of hex head cap screws (19).
- g. Install outer conveyor chain guard (21) with flat washers (20) and hex head cap screws (19).
- h. Tighten hex head cap screws (19) to 37 lb-ft (50 N•m).



**8. REPLACE CONVEYOR DRAG PLATE GUARD.**

- a. Position conveyor drag plate guard (15) in hopper and align mounting holes.
- b. Place flat washers (14) on hex head cap screws (13).
- c. Apply thread locking compound to threads of hex head cap screws (13).
- d. Install conveyor drag plate guard (15) with flat washers (14) and hex head cap screws (13).
- e. Tighten hex head cap screws to 37 lb-ft (50 N•m).
- f. Place flat washer (12) onto hex head cap screw (11).
- g. Apply thread locking compound to threads of hex head cap screw (11).
- h. Install flat washer (12) and hex head cap screw (11).
- i. Tighten hex head cap screw (11) to 90 lb-ft (122 N•m).



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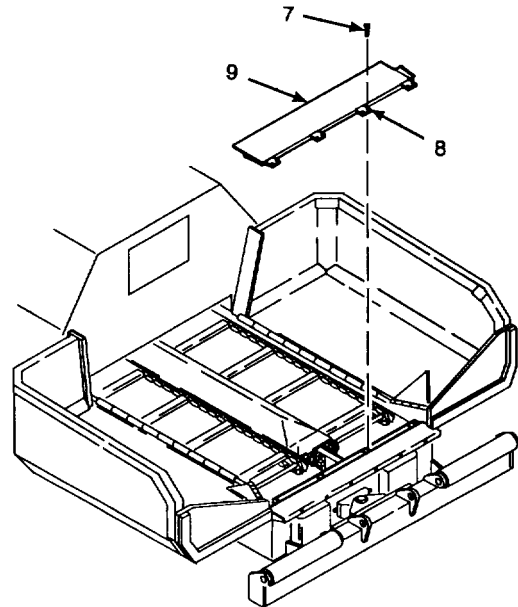
**2.61 REPLACE CONVEYOR CHAIN ASSEMBLY - Continued.****D. REPLACE - Continued.****9. REPLACE CONVEYOR ACCESS DOOR.**

- a. With the help of another person, align conveyor access door (9) hinges (8) with hinge mounting holes on main frame.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of socket head cap screws (7).
- c. Install socket head cap screws (7).
- d. Using socket wrench adapter and hex head driver socket (Item 87, Appendix D), tighten socket head cap screws (7) to 19 lb-ft (26 N•m).

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## D. REPLACE - Continued.

## 10. INSTALL CENTER FLASHING.

- a. Install flat washer (2) onto hex head cap screw (1).

**WARNING**

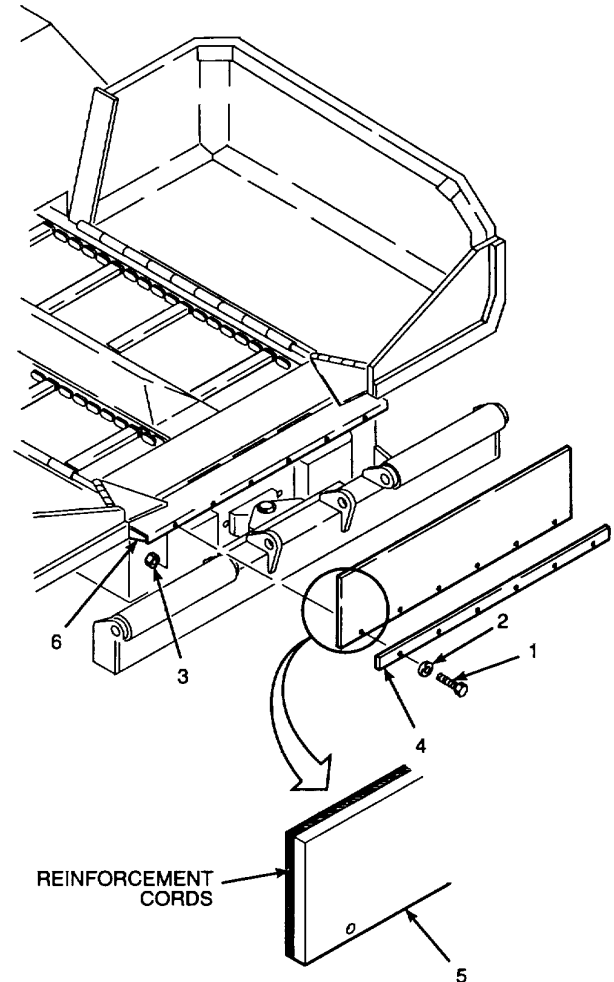
Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (1).

**CAUTION**

Ensure that center flashing is not installed backward. Place reinforcement cords toward the inside of the hopper.

- c. With the help of another person, position center flashing (5) and retaining plate (4) on extension bracket (6). Ensure that center reinforcement cords are toward the inside of the hopper.
- d. Install hex nuts (3), flat washers (2), and hex head cap screws (1).
- e. Tighten hex head cap screws (1).

**NOTE**

**FOLLOW-ON-TASKS:** Remove paving machine from cribbing and jacks per TM 5-3895-373-20.  
Install screed per TM 5-3895-373-20.

**END OF TASK**



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**2.62 REPLACE CONVEYOR DRAG PLATES AND ENGINE INSULATION PAN.**


---

This task covers: a. Remove    b.    Clean    c.    Replace

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)  
 Crowbar (Item 35, Appendix D)  
 Torque wrench (Item 132, Appendix D)  
 Wire scratch brush (Item 13, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound (Item 14, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Chain plate lid  
 Engine insulation pan  
 Front conveyor drag plate  
 Insulation  
 Lockwashers  
 Rear conveyor drag plate

Personnel Required:

Two 62B construction equipment repairers. Two persons required to lift and remove damaged conveyor drag plates and install new conveyor drag plates.

References:

TM 5-3895-373-20  
 TM 5-3895-373-24P

Equipment Condition:

Paving machine jacked and cribbed per TM 5-3895-373-20.  
 Conveyor chain assembly removed per paragraph 2.61.

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**NOTE**

This procedure is the same for both the left and right side conveyor drag plates. In this procedure only the left side is shown.

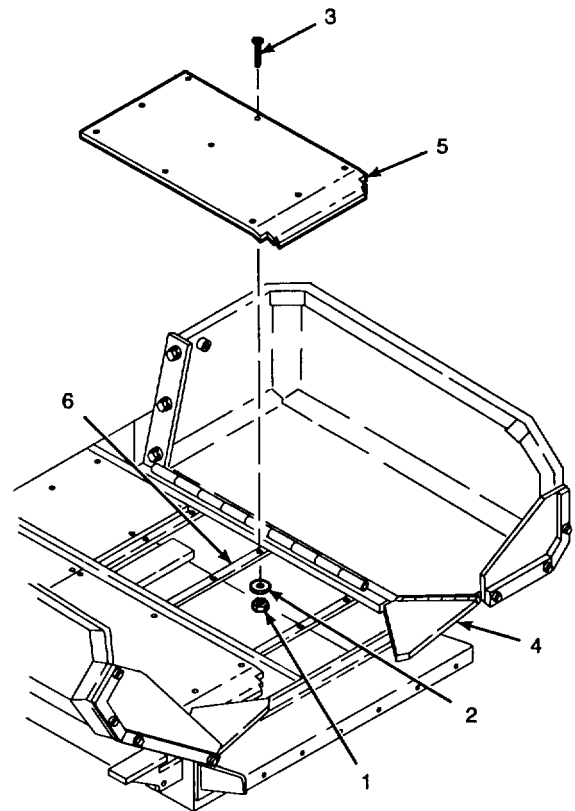
**A. REMOVE.****1. REMOVE FRONT CONVEYOR DRAG PLATE.**

- a. Remove hex nut (1), flat washers (2), and socket head cap screws (3).
- b. Raise cover flap (4).
- c. Pry front conveyor drag plate (5) loose from main frame supports (6) with a crowbar.

<b>WARNING</b>
----------------

Front conveyor drag plate weighs 80 lb (36 kg). To avoid personal injury, ensure two persons are used for removing drag plate. Failure to do so may cause a serious injury.

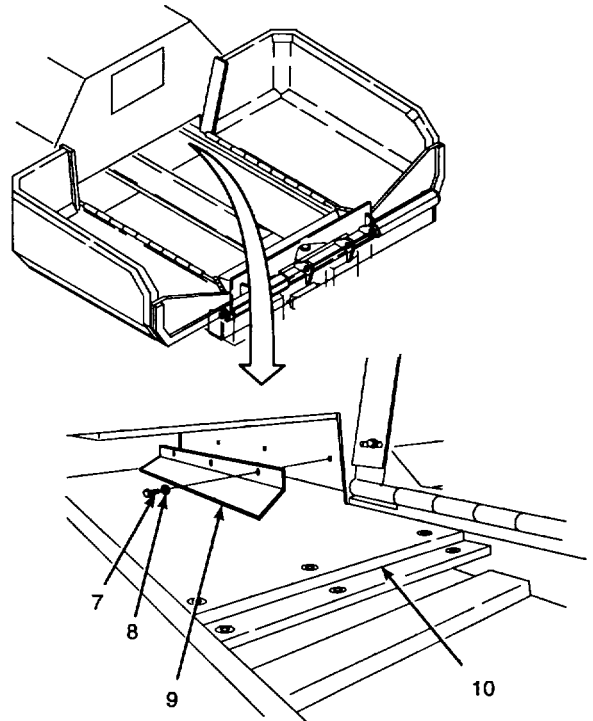
- d. Slide front conveyor drag plate (5) to center of the hopper.
- e. Pull front conveyor drag plate forward and slide drag plate over front of paving machine. Discard conveyor drag plate.



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**2.62 REPLACE CONVEYOR DRAG PLATES AND ENGINE INSULATION PAN - Continued.****A. REMOVE - Continued.****2. REMOVE CHAIN PLATE LID.**

- a. Remove hex head cap screws (7) and flat washers (8).
- b. Remove chain plate lid (9) from above outboard side of rear conveyor drag plate (10). Discard chain plate lid.

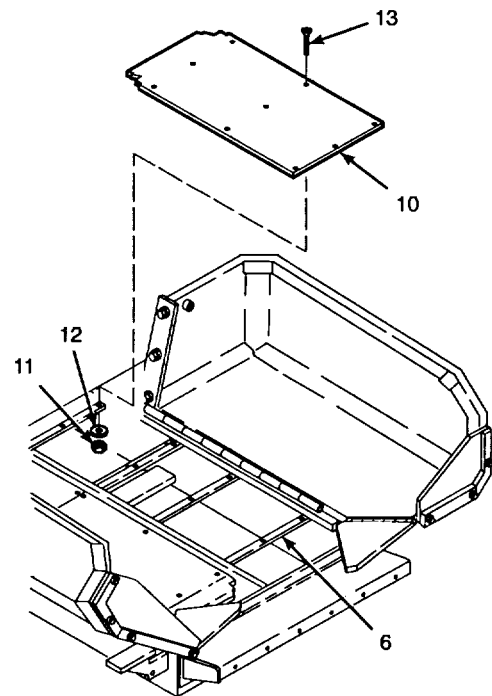
**3. REMOVE REAR CONVEYOR DRAG PLATE.**

- a. Remove hex nuts (11), flat washers (12), and socket head cap screws (13).
- b. Pry rear conveyor drag plate (10) loose from main frame supports (6) with a crowbar.

**WARNING**

Rear conveyor drag plate weighs 75 lbs (34 kg). To avoid personal injury, ensure two persons are used for removing drag plate. Failure to do so may cause a serious injury.

- c. Pull rear conveyor drag plate (10) forward and slide drag plate over front of paving machine. Discard conveyor drag plate.

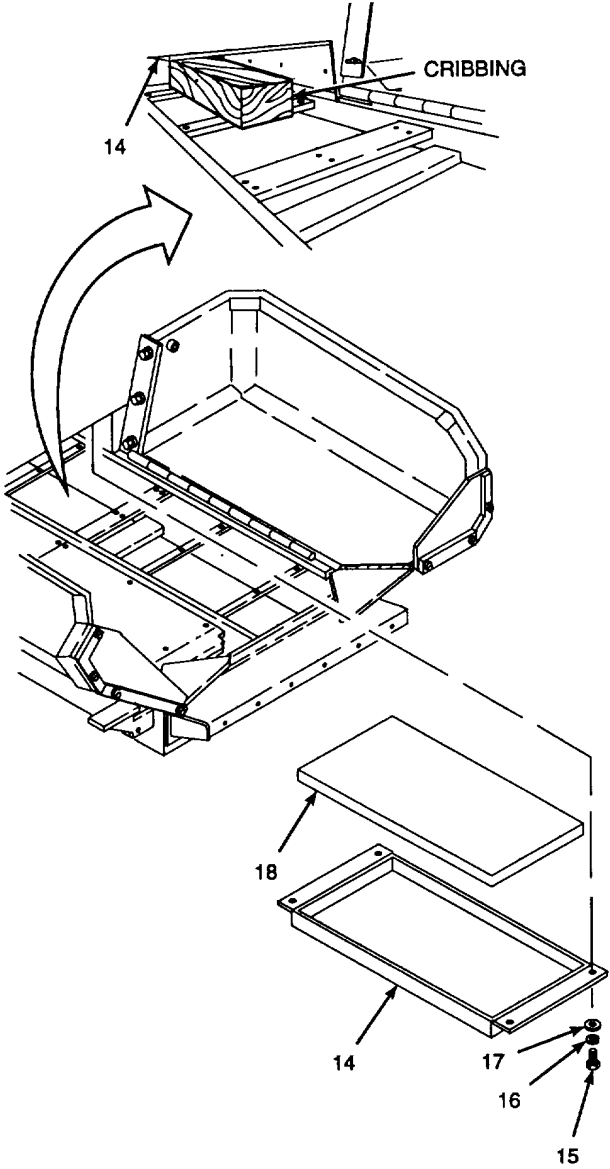
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- A. REMOVE - Continued.
- 4. REMOVE ENGINE INSULATION PAN AND INSULATION.

**NOTE**

There is a left hand and a right hand engine insulation pan on the paving machine. Left hand engine insulation pan is shown in this procedure. Procedure is identical for right hand engine insulation pan.

- a. Place cribbing beneath front and rear of engine insulation pan (14) to prevent pan from falling when fasteners are removed.
- b. Remove bolts (15), lockwashers (16), and flat washers (17). Lower engine insulation pan (14) along with insulation (18) onto cribbing. Discard lockwashers.
- c. Remove engine insulation pan (14) from cribbing.
- d. Discard engine insulation pan (14) and insulation (18).



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**2.62 REPLACE CONVEYOR DRAG PLATES AND ENGINE INSULATION PAN - Continued.**

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**B. CLEAN.****1. CLEAN ALL METAL PARTS.****WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean all metal parts in contact with conveyor drag plates with cleaning solvent. Use a wire scratch brush to remove hard deposits.
- b. Clean cap screw and bolt holes in main frame supports to remove any hard deposits.

**2. CLEAN MOUNTING HARDWARE.****WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Use thread locking compound solvent to remove thread locking compound from all fasteners.
- b. Dry parts with a cleaning cloth.

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C. REPLACE.

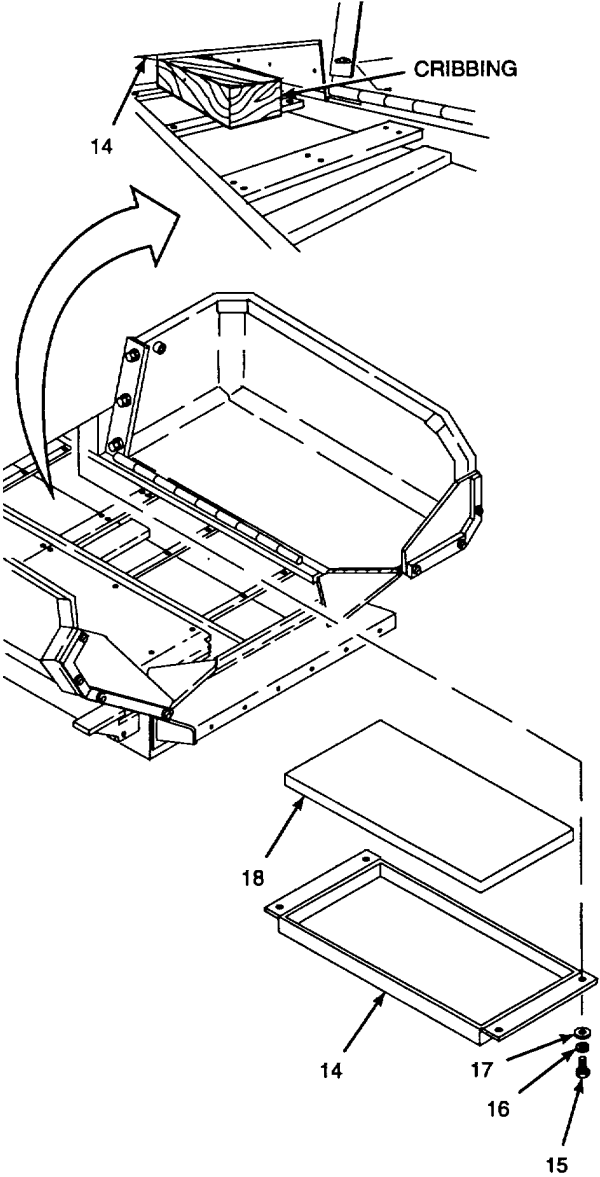
1. INSTALL INSULATION AND ENGINE INSULATION PAN.

- a. Install insulation (18) into engine insulation pan (14).
- b. Install engine insulation pan (14) onto cribbing inside paving machine.
- c. Install lockwashers (16) and flat washers (17) onto bolts (15).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply thread locking compound (Item 14, Appendix B) to threads of bolts (15).
- e. Install engine insulation pan (14) and secure with bolts (15). Tighten bolts to 19 lb-ft (26 N•m).
- f. Remove cribbing from inside of paving machine.



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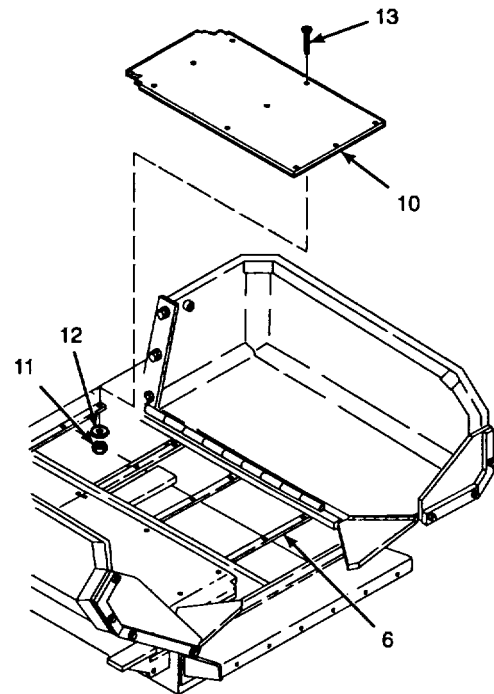
**2.62 REPLACE CONVEYOR DRAG PLATES AND ENGINE INSULATION PAN****C. REPLACE - Continued.****2. REPLACE REAR CONVEYOR DRAG PLATE.****WARNING**

Rear conveyor drag plate weighs 75 lbs (34 kg). To avoid personal injury, ensure two persons are used for replacing drag plate. Failure to do so may cause a serious injury.

**NOTE**

When rear conveyor drag plate is installed, ensure the trailing curved edge of the drag plate is toward the rear of the paving machine and facing downward.

- a. Slide rear conveyor drag plate (10) over front of paving machine and across front conveyor drag plate. Ensure trailing curved edge of drag plate is toward the rear of paving machine and facing downward.
- b. Align cap screw holes on rear conveyor drag plate (10) with cap screw holes on main frame supports.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screws (13).
- d. Insert socket head cap screws (13) through rear conveyor drag plate (10) and into main frame support (6).
- e. Install flat washers (12) and hex nuts (11) onto socket head cap screws (13) from beneath paving machine.
- f. Tighten hex nuts (11) to 37 lb-ft (50 N•m).

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C. REPLACE - Continued.

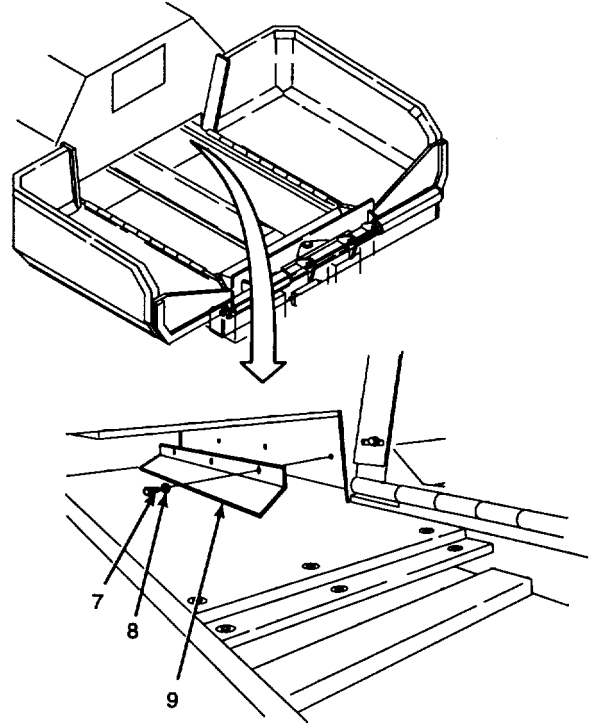
3. REPLACE CHAIN PLATE LID.

- a. Install flat washers (8) onto hex head cap screws (7).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (7).
- c. Install chain plate lid (9) using hex head cap screws (7).
- d. Tighten hex head cap screws to 90 lb-ft (122 N•m).



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**2.62 REPLACE CONVEYOR DRAG PLATES AND ENGINE INSULATION PAN - Continued.****C. REPLACE - Continued.****4. REPLACE FRONT CONVEYOR DRAG PLATE.**

- a. Lift cover flap (4).

**WARNING**

Front conveyor drag plate weighs 80 lbs (36 kg). To avoid personal injury, ensure two persons are used for replacing drag plate. Failure to do so may cause a serious injury.

**NOTE**

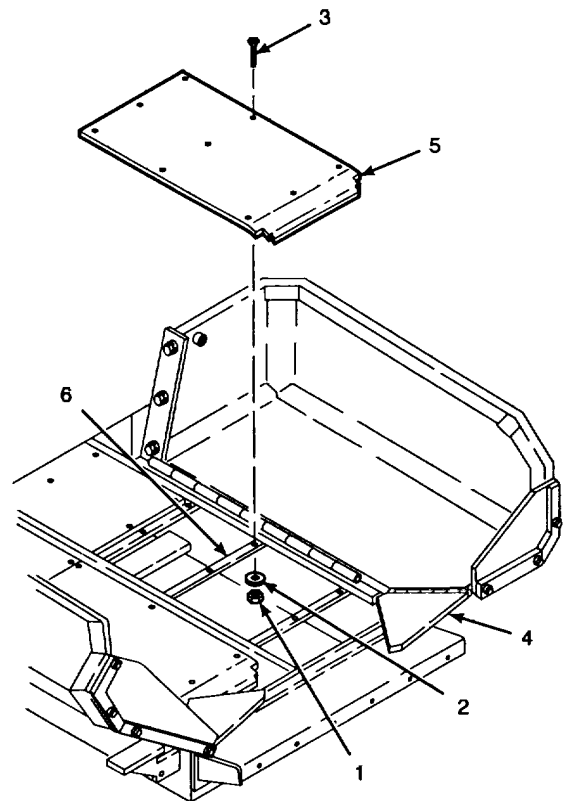
When front conveyor drag plate is installed, ensure the leading curved edge of the drag plate is toward the front of the paving machine and facing downward.

- b. Slide front conveyor drag plate (5) over front of the paving machine onto main frame supports (6). Ensure the leading curved edge of the drag plate is toward the front of the paving machine and facing downward.
- c. Align cap screw holes on front conveyor drag plate (5) with cap screw holes on main frame supports (6).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screws (3).
- e. Insert socket head cap screws through front conveyor drag plate (5) and into main frame support (6).



- f. Install flat washers (2) and hex nuts (1) onto socket head cap screws (3) from beneath paving machine.
- g. Tighten hex nuts (1) to 37 lb-ft (50 N•m).

**NOTE**

**FOLLOW-ON-TASKS:** Install conveyor chain assembly per paragraph 2.61.  
Remove cribbing and jacks per TM 5-3895-373-20.

**END OF TASK**

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**2.63 REPLACE AND ADJUST AUGER/CONVEYOR DRIVE CHAIN.**


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This task covers:

d. Adjust

a. Remove

b. Clean

c. Replace

e. Install

**INITIAL SETUP**Tools:General mechanic's automotive tool kit  
(Item 106, Appendix D)

Cleaning brush (Item 12, Appendix D)

Combination wrench (Item 116, Appendix D)

Crowfoot wrench (Item 127, Appendix D)

Torque wrench (Item 132, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)

Cleaning solvent (Item 31, Appendix B)

Electrical insulating compound (Item 10, Appendix B)

Grease (Item 18, Appendix B)

Thread locking compound (Item 13, Appendix B)

Thread locking compound solvent (Item 32, Appendix B)

Detachable chain link

Master chain link

Personnel Required:

Two 62B construction equipment repairers. Second person to operate auger/conveyor controls.

References:

LO 5-3895-373-12

TM 5-3895-373-10

TM 5-3895-373-24P

Equipment Condition:

Screed fully lowered per TM 5-3895-373-10.

Steps removed per TM 5-3895-373-20.

Rear top right access door open per TM 5-3895-373-10.

Rear top left access door open per TM 5-3895-373-10.

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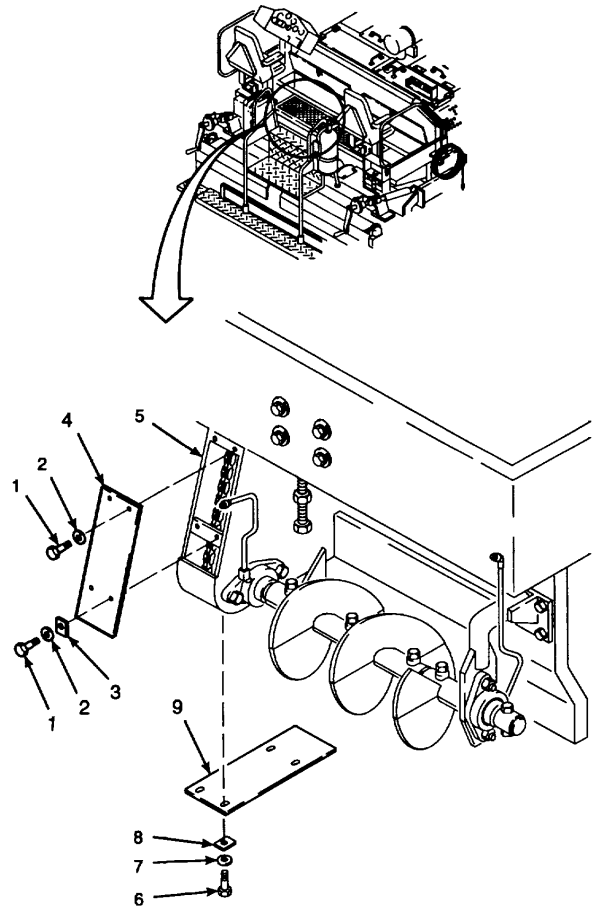
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**2.63 REPLACE AND ADJUST AUGER/CONVEYOR DRIVE CHAIN - Continued.****A. REMOVE.****NOTE**

There is a left hand and a right hand auger/conveyor drive chain on the paving machine. This procedure addresses the right hand auger/conveyor drive chain. Procedure is identical for left hand auger/conveyor drive chain. Right hand auger/conveyor drive chain is shown in this procedure.

**1. REMOVE REAR COVER PLATE FROM AUGER/CONVEYOR DRIVE CHAIN HOUSING.**

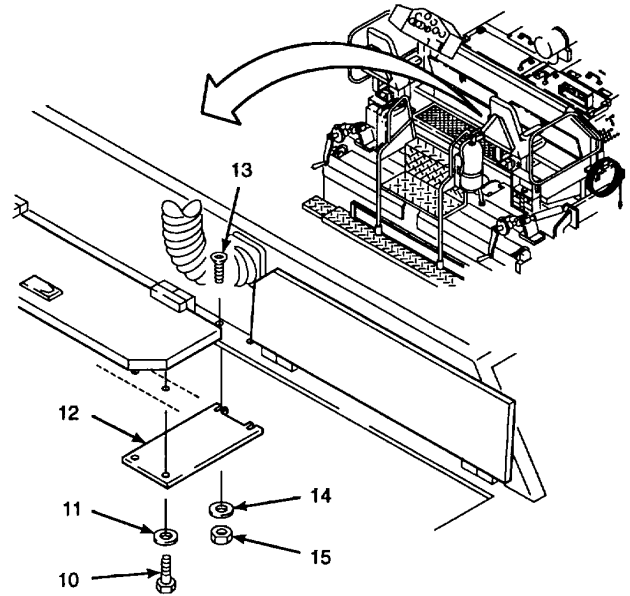
- a. Remove hex head cap screws (1), flat washers (2), and square flat washers (3) from rear cover plate (4).
- b. Remove rear cover plate (4) from auger/conveyor drive chain housing (5).
- c. Remove hex head cap screws (6), flat washers (7), and square flat washers (8) from bottom cover plate (9).
- d. Remove bottom cover plate (9) from auger/conveyor drive chain housing (5).

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**A. REMOVE - Continued.**

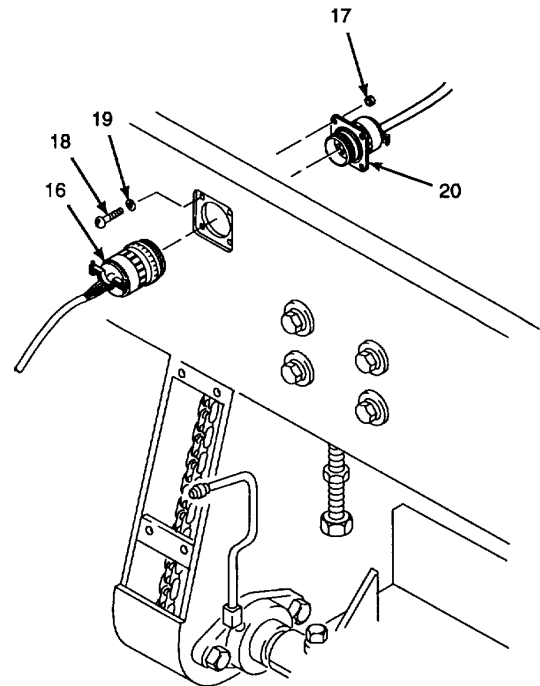
**2. REMOVE CENTER COVER.**

- a. Remove hex head cap screw (10) and flat washer (11) from center cover (12).
- b. Close left rear top access door and remove socket head cap screw (13), flat washer (14), and hex nut (15) securing left side of center cover (12).
- c. Open left rear top access door and close right rear top access door and remove socket head cap screw (13), flat washer (14), and hex nut (15) from right side of center cover (12).
- d. Turn center cover (12) sideways and remove from cowling frame.
- e. Open right rear top access door.



**3. REMOVE SCREED HARNESS ELECTRICAL PLUG AND RECEPTACLE.**

- a. Disconnect screed harness electrical plug (16).
- b. Remove hex nuts (17), machine screws (18), and flat washers (19).
- c. Remove screed harness electrical receptacle (20) from the rear wall of the paving machine. Position the receptacle so that it does not interfere with auger/conveyor drive chain removal.

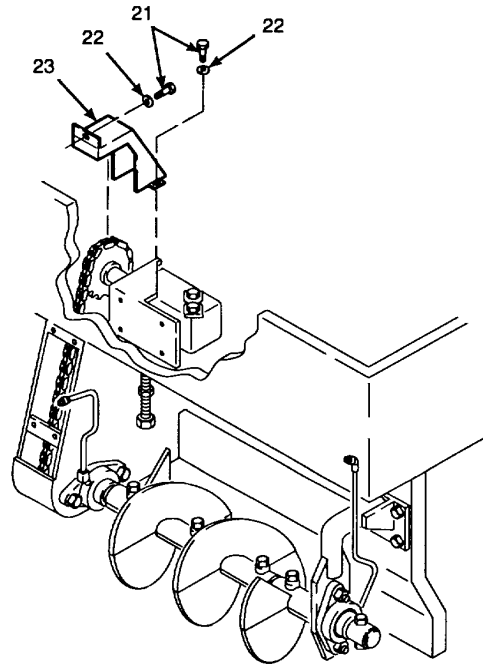


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**2.63 REPLACE AND ADJUST AUGER/CONVEYOR DRIVE CHAIN - Continued.****A. REMOVE - Continued.****4. REMOVE TOP CHAIN COVER PLATE FROM AUGER/CONVEYOR DRIVE CHAIN HOUSING.****NOTE**

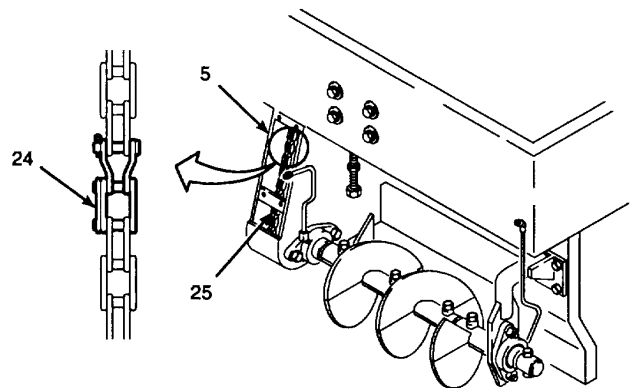
Hydraulic hoses routed over the top of top chain cover plate may need to be repositioned temporarily to gain access to hex head cap screws and to allow removal of top chain cover plate.

- a. Remove hex head cap screws (21) and flat washers (22) from top chain cover plate (23).
- b. Remove top chain cover plate from auger/conveyor drive chain housing.

**5. POSITION OFFSET CHAIN LINK TO DISCONNECT AUGER/CONVEYOR DRIVE CHAIN.****WARNING**

Do not allow hands or loose clothing into auger/conveyor drive chain housing while auger/conveyor is rotating. Keep hands and loose clothing clear of auger/conveyor drive chain housing when drive chain is moving. Severe injury to personnel can result from hands or loose clothing being caught in sprocket wheels when drive chain is moving.

- a. With the help of another person, operate auger/conveyors at very low speed to locate master chain link (24) on auger/conveyor drive chain (25) per TM 5-3895-373-10.
- b. Stop auger/conveyors when master chain link (24) is visible in auger/conveyor drive chain housing (5).

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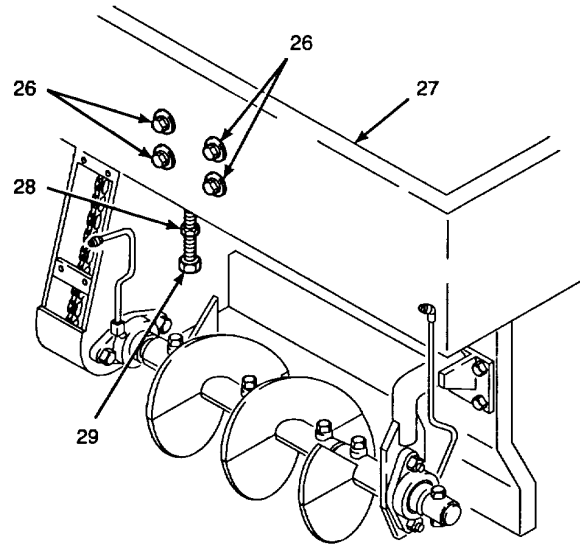
A. REMOVE - Continued.

6. LOOSEN AUGER/CONVEYOR DRIVE CHAIN.

**WARNING**

Do not operate auger/conveyor when removing auger/conveyor drive chain. Ensure ignition switch is off and key removed during drive chain removal and replacement. Severe injury to personnel can result from operation of equipment during drive chain removal and replacement.

- a. Loosen but do not remove hex head cap screws (26) on rear main frame weldment (27).
- b. Loosen hex nut (28) on tension bolt (29).
- c. Using the combination wrench, turn tension bolt (29) until auger/conveyor drive chain is visibly slack.

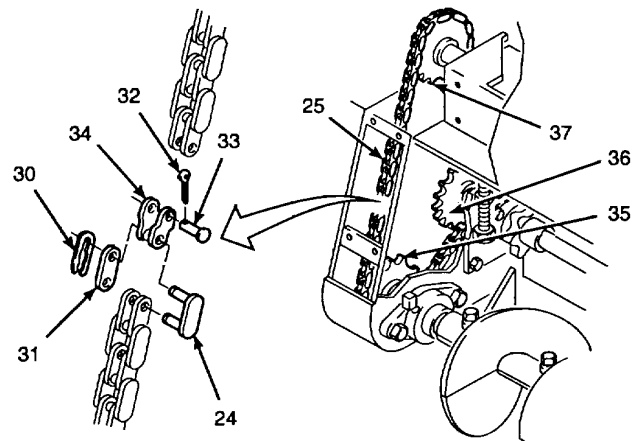


7. DISCONNECT AUGER/CONVEYOR DRIVE CHAIN.

**NOTE**

Master chain link may be secured by either a spring clip or by cotter pins.

- a. Remove spring clip (30) and cover plate (31) from master chain link (24) on auger/conveyor drive chain (25).
- b. Remove master chain link (24) and disconnect auger/conveyor drive chain (25).
- c. Remove cotter pin (32), connecting pin (33), and detachable chain link (34) from auger/conveyor drive chain (25).



8. REMOVE AUGER/CONVEYOR DRIVE CHAIN FROM AUGER/CONVEYOR DRIVE CHAIN HOUSING.

- a. Remove auger/conveyor drive chain (25) from auger sprocket wheel (35) and conveyor sprocket wheel (36).
- b. Lift auger/conveyor drive chain off top of auger/conveyor drive sprocket wheel (37).
- c. Remove auger/conveyor drive chain (25) through top of auger/conveyor drive chain housing.

**NOTE**

If auger/conveyor drive chain is being replaced, discard drive roller chain. If drive chain is being reused, clean drive chain per step B.

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**2.63 REPLACE AND ADJUST AUGER/CONVEYOR DRIVE CHAIN - Continued.**

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**B. CLEAN.****1. CLEAN AUGER/CONVEYOR DRIVE CHAIN AND COMPONENT PARTS.****WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Soak auger/conveyor drive chain in cleaning solvent. Use a cleaning brush to remove grease buildup. Dry the auger/conveyor drive chain with a cleaning cloth.
- b. Use a cleaning cloth soaked with cleaning solvent to clean all cover plates.
- c. Use a parts cleaning brush and cleaning solvent to remove any hard deposits.

**2. CLEAN CAP SCREWS.****WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

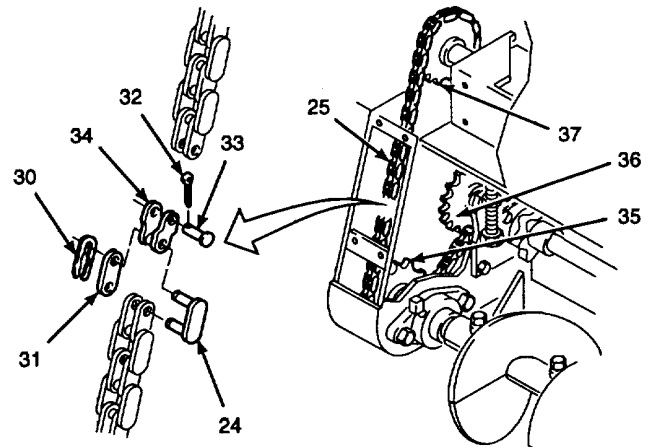
- a. Clean threads of cap screws with thread locking compound solvent.
- b. Dry with a clean, cleaning cloth.

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**C. REPLACE.**

**1. REPLACE AUGER/CONVEYOR DRIVE CHAIN.**

- a. Install auger/conveyor drive chain (25) through top of auger/conveyor drive chain housing.
- b. Position auger/conveyor drive chain (25) on top of auger/conveyor drive sprocket wheel (37) so that master chain link (24) is located in the center of auger/conveyor drive chain housing.
- c. Position auger/conveyor drive chain (25) on conveyor sprocket wheel (36) and auger sprocket wheel (35).



**2. RECONNECT AUGER/CONVEYOR DRIVE CHAIN.**

**NOTE**

**Master chain link may be secured by either a spring clip or by cotter pins.**

- a. Install detachable chain link (34), connecting pin (33), and cotter pin (32) onto auger/conveyor drive chain (25).
- b. Pull ends of auger/conveyor drive chain (25) together and connect them with master chain link (24).
- c. Install cover plate (31) onto master chain link (24).
- d. Install spring clip (30) onto master chain link (24) over cover plate (31).

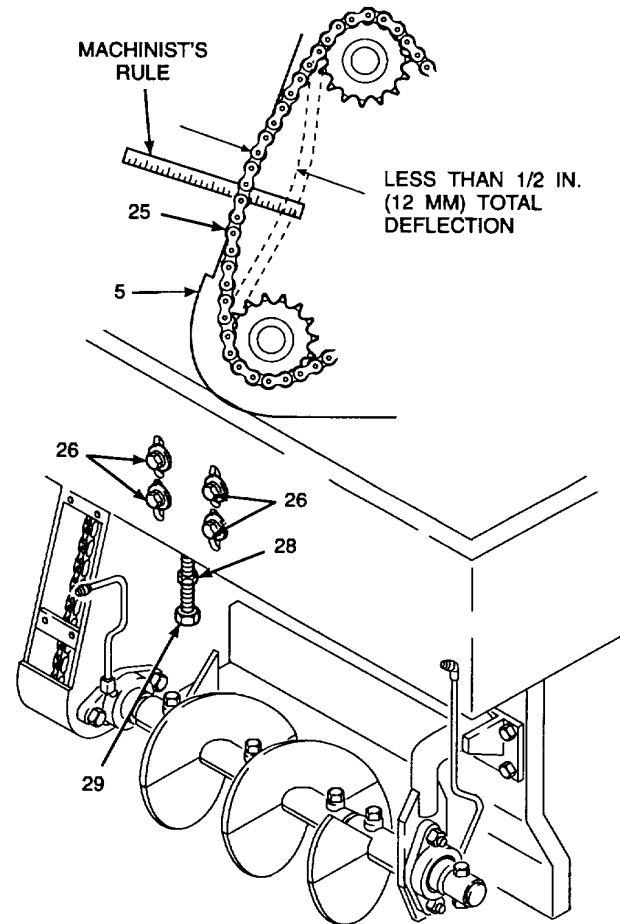
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## 2.63 REPLACE AND ADJUST AUGER/CONVEYOR DRIVE CHAIN - Continued.

## D. ADJUST.

1. USING THE COMBINATION WRENCH, TURN TENSION BOLT (29) UNTIL AUGER/CONVEYOR DRIVE CHAIN HAS LESS THAN 1/2 IN. (12 MM) DEFLECTION IN MIDDLE. HOLD A MACHINIST'S RULE AGAINST INSIDE OF AUGER/CONVEYOR DRIVE CHAIN HOUSING (5). MOVE DRIVE CHAIN (25) IN AND OUT TO MEASURE TOTAL DRIVE CHAIN DEFLECTION.
2. HOLD TENSION BOLT (29) AND TIGHTEN HEX NUT (28) TO 80 LB-FT (100 N•M) USING A CROWFOOT SOCKET WRENCH WITH THE CROWFOOT SOCKET WRENCH AT A 90° ANGLE TO THE TORQUE WRENCH.
3. TIGHTEN HEX HEAD CAP SCREWS (26) ON REAR OF MAIN FRAME WELDMENT TO 90 LB-FT (122 N•M).



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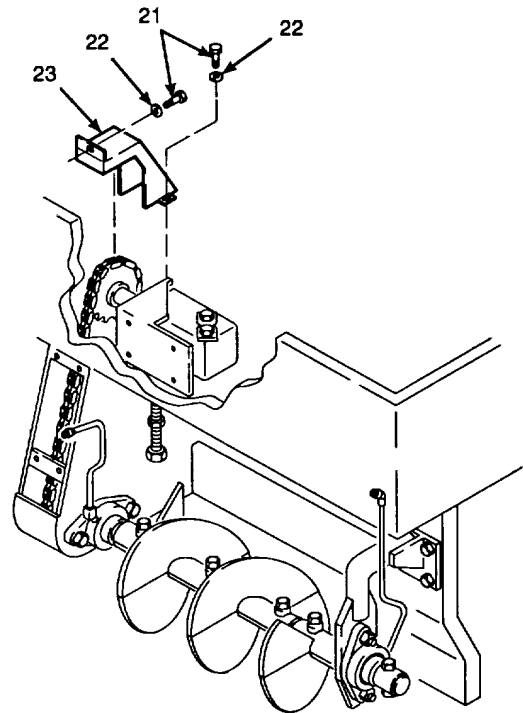
**E. INSTALL.**

**1. INSTALL TOP CHAIN COVER PLATE ONTO AUGER/CONVEYOR DRIVE CHAIN HOUSING.**

**NOTE**

Hydraulic hose routed over the top of top chain cover plate may need to be repositioned temporarily to gain access to hex head cap screws and to allow for installation of top chain cover plate.

- a. Position top chain cover plate (23) on top of auger/conveyor drive chain housing.
- b. Install flat washers (22) onto hex head cap screws (21).



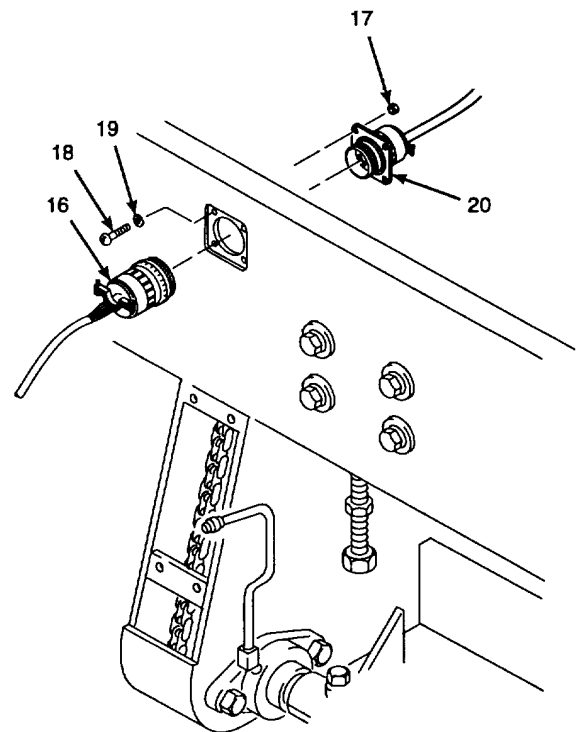
**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to threads of hex head cap screws (21).
- d. Install hex head cap screws (21). Tighten cap screws to 37 lb-ft (50 N•m).

**2. INSTALL SCREED HARNESS ELECTRICAL RECEPTACLE AND PLUG.**

- a. Position screed harness electrical receptacle (20) into the rear wall of the paving machine.
- b. Install flat washers (19), machine screws (18), and hex nuts (17).
- c. Apply electrical insulating compound to pins of screed harness electrical plug (16).
- d. Connect screed harness electrical plug (16) to screed harness electrical receptacle (20).



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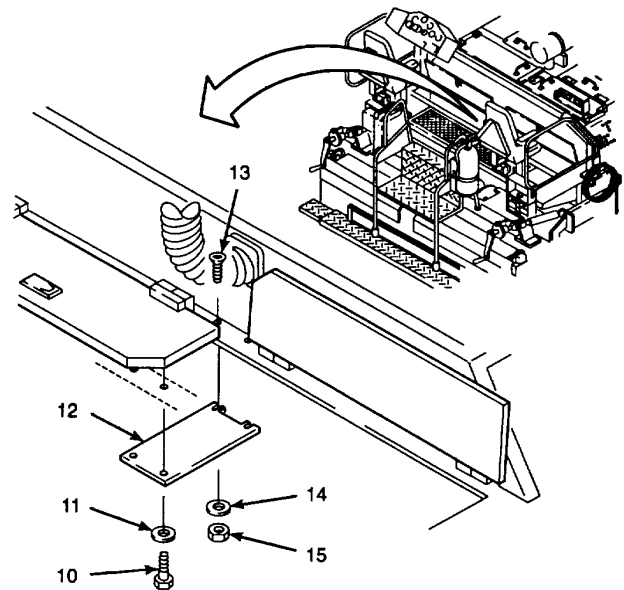
**2.63 REPLACE AND ADJUST AUGER/CONVEYOR DRIVE CHAIN - Continued.****E. INSTALL - Continued.****3. INSTALL CENTER COVER.**

- a. Install flat washers (11) onto hex head cap screws (10).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- b. Apply thread locking compound to threads of hex head cap screws (10) and socket head cap screws (13).
- c. Align holes of center cover (12) with holes on the paving machine.
- d. Close left rear top access door and open right rear top access door and install socket head cap screw (13), flat washer (14), and hex nut (15) into left side of center cover (12).
- e. Open left rear top access door and close right rear top access door and install socket head cap screw (13), flat washer (14), and hex nut (15) into right side of center cover (12).
- f. Open left rear top access door.
- g. Install hex head cap screw (10) with flat washer (11) into center cover (12).
- h. Tighten hex nuts (15) and hex head cap screws (10) to 37 lb-ft (50 N•m).
- i. Lubricate auger/conveyor drive chain in accordance with LO 5-3895-373-12.



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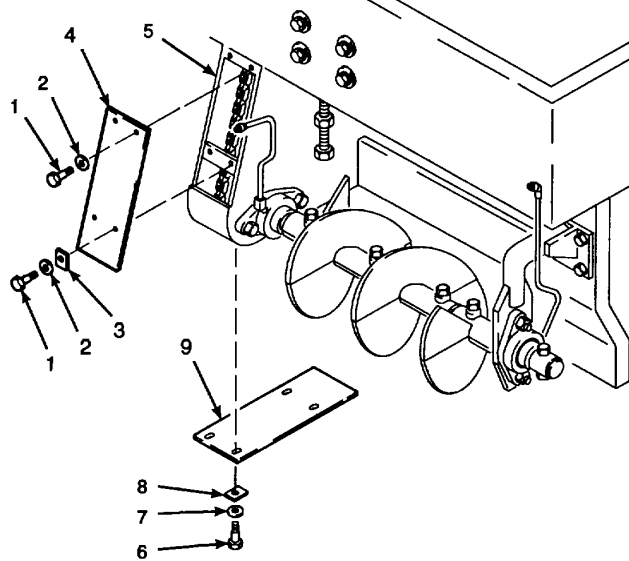
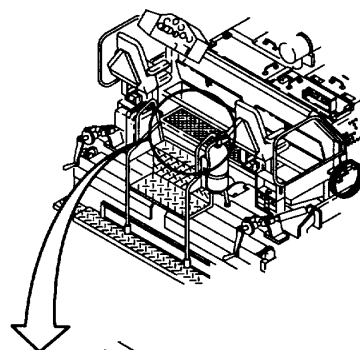
- E. INSTALL - Continued.
- 4. INSTALL BOTTOM COVER PLATE AND REAR COVER PLATE ON AUGER/CONVEYOR DRIVE CHAIN HOUSING.

- a. Install flat washers (7) and square flat washers (8) onto hex head cap screws (6).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (6).
- c. Position bottom cover plate (9) on auger/conveyor drive chain housing (5).
- d. Install bottom cover plate (9) using hex head cap screws (6). Tighten hex head cap screws to 37 lb-ft (50 N.m).
- e. Install flat washers (2) and square flat washers (3) onto hex head cap screws (1).
- f. Apply thread locking compound to threads of hex head cap screws (1).
- g. Position rear cover plate (4) on auger/conveyor drive chain housing (5).
- h. Install rear cover plate (4) using hex head cap screws (1). Tighten hex head cap screws to 37 lb-ft (50 N.m).



**NOTE**

FOLLOW-ON-TASKS: Steps installed per TM 5-3895-373-20.  
 Close rear top left access door per TM 5-3895-373-10.  
 Close rear top right access door per TM 5-3895-373-10.

**END OF TASK**

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**2.64 REPLACE/REPAIR CONVEYOR DRIVE SHAFT, BEARING UNITS, AND SPROCKET WHEELS.**

---

This task covers:

- |            |          |            |
|------------|----------|------------|
| a. Remove  | b. Clean | c. Inspect |
| d. Install |          |            |

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Hex head driver socket (Item 84, Appendix D)  
Level and plumb, 2 ea (Item 54, Appendix D)  
Sledge hammer (Item 48, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Torque wrench, 0 to 300 lb-in (Item 131, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Grease (Item 18, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers

Personnel Required:

Two 62B construction equipment repairers. Second person to support sprocket wheels and shaft during removal and installation.

References:

LO 5-3895-373-12  
TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Screed removed per TM 5-3895-373-20.  
Conveyor chain assembly removed per paragraph 2.61.  
Auger/conveyor drive chain removed per paragraph 2.63.

**NOTE**

Remove the auger/conveyor drive chain only on the side that is being worked on.

**NOTE**

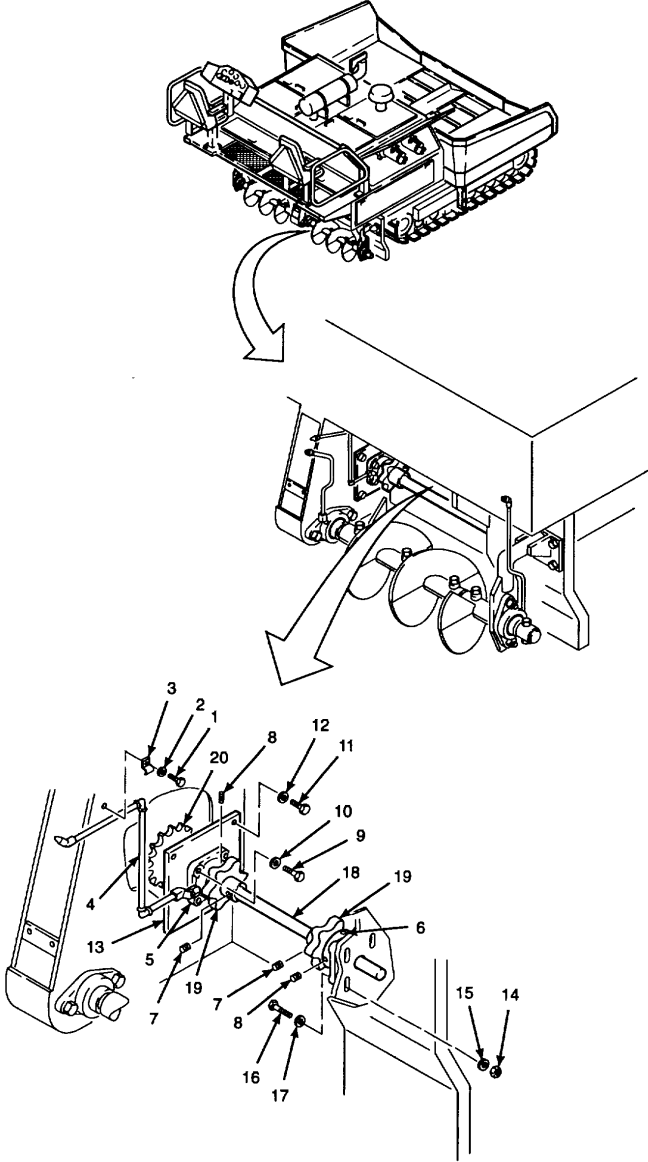
There is both a right hand and left hand set of conveyor bearing units, drive shafts, and sprocket wheels on the paving machine. This procedure refers to replacement of the right hand conveyor bearing units, drive shafts, and sprocket wheels. The procedure is identical for the left side. The right hand side is shown in this procedure.

**GO TO NEXT PAGE****2-872**

A. REMOVE.

1. REMOVE DRIVE SHAFT, BEARING UNITS, AND SPROCKET WHEELS AS AN ASSEMBLY.

- a. Remove hex head cap screws (1), lockwashers (2), and clamps (3) from lubrication lines (4) at inner and outer bearing units (5 and 6). Discard lockwashers.
- b. Loosen but do not remove set screws (7 and 8).
- c. Remove hex head cap screws (9) and flat washers (10) from inner bearing unit (5).
- d. Remove hex head cap screws (11) and flat washers (12) from bearing plate (13).
- e. Remove hex nuts (14), flat washers (15), hex head cap screws (16), and flat washers (17) from outer bearing unit (6).
- f. With the help of a second person, push the inner end of drive shaft (18) into the auger/conveyor drive chain well and slide the outer end of the drive shaft toward the back of the paving machine. Remove the assembled conveyor drive shaft, sprocket wheels (19), inner and outer bearing units (5 and 6), bearing plate (13), and sprocket wheel (20) from the paving machine.



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**2.64 REPLACE/REPAIR CONVEYOR DRIVE SHAFT, BEARING UNITS, AND SPROCKETWHEELS- Continued.**

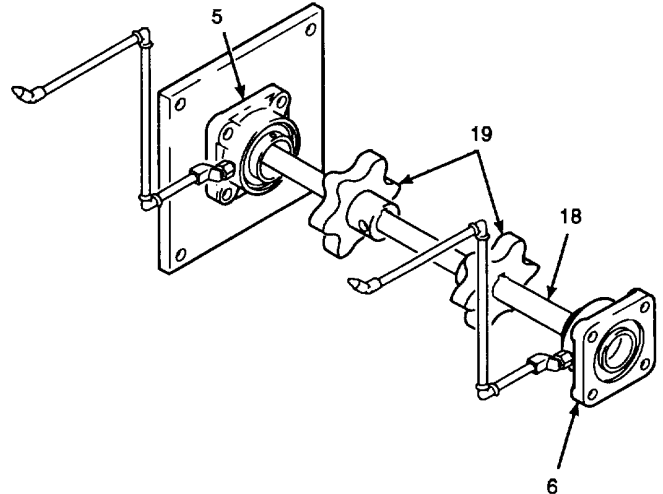
- A. REMOVE Continued.
2. CLEAN ASSEMBLED CONVEYOR DRIVE SHAFT.

<b>WARNING</b>
----------------

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Wrap cleaning cloths soaked in cleaning solvent around drive shaft (18) on both sides of sprocket wheels (19). Leave on the drive shaft long enough to soften paving material around the sprocket wheel and shaft area.
- b. Use a wire scratch brush to remove paving material buildup around sprocket wheels (19) and inner and outer bearing units (5 and 6).
- c. Wipe drive shaft (18) with a cleaning cloth and cleaning solvent to remove all traces of paving material.
- d. Dispose of waste cleaning solvent in accordance with local procedures.

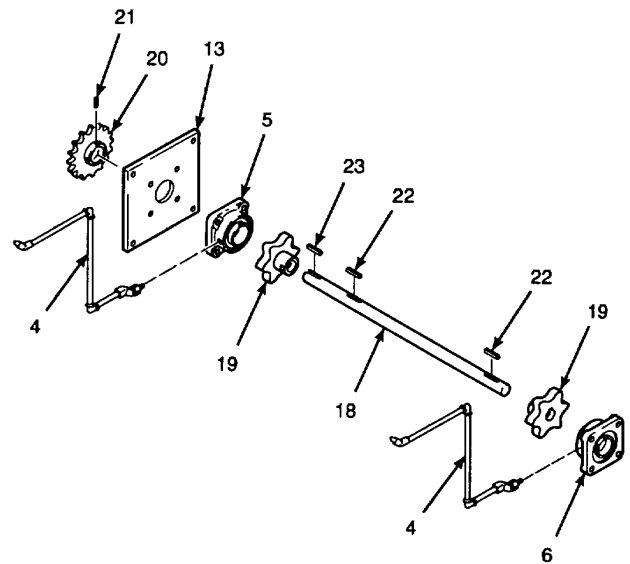


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A. REMOVE - Continued.

3. DISASSEMBLE CONVEYOR DRIVE SHAFT ASSEMBLY.

- a. Remove set screws (21) and sprocket wheel (20).
- b. Remove bearing plate (13) from drive shaft (18).
- c. Slide inner and outer bearing units (5 and 6) off of drive shaft (18).
- d. Slide sprocket wheels (19) off of drive shaft (18). Paving material buildup may interfere with easy removal of the sprocket wheels; use a sledge hammer if necessary to tap the sprocket wheels off of the drive shaft.
- e. Remove keys (22 and 23) from drive shaft (18).
- f. Remove lubrication lines (4) from inner and outer bearing units (5 and 6).

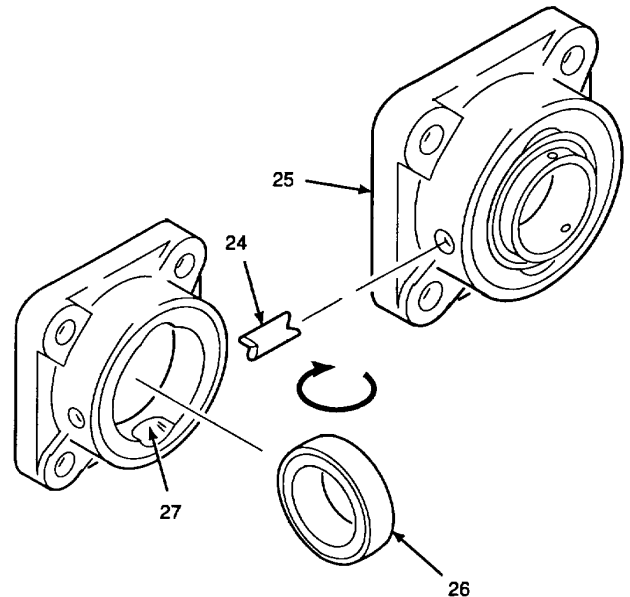


4. REMOVE BEARING FROM BEARING HOUSING.

**NOTE**

Only bearing units difficult to spin need to be disassembled.

- a. Pull lock pin (24) from bearing housing (25) using needle nose pliers.
- b. Rotate bearing (26) until perpendicular to bearing housing (25) and in alignment with housing slots (27).
- c. Pull bearing (26) free of bearing housing (25) from the front of the bearing unit.



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**2.64 REPLACE/REPAIR CONVEYOR DRIVE SHAFT, BEARING UNITS, AND SPROCKETWHEELS- Continued.**

---

B. CLEAN.

1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse and clean all metal parts in cleaning solvent. Give special attention to bearing lubrication holes. Wipe away all residue with a cleaning cloth.
- b. Clean lubrication fittings of old grease.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- c. Clean all fastener threads using thread locking compound solvent.
- d. Dry all parts with a cleaning cloth.

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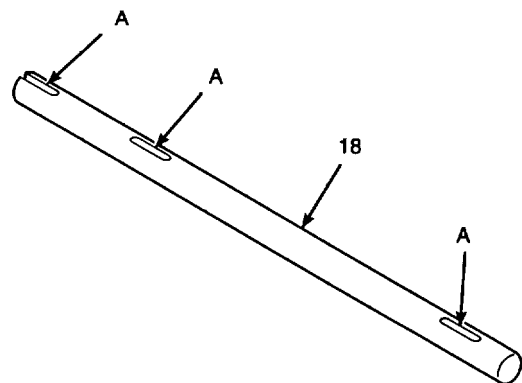
- B. CLEAN - Continued.
2. CLEAN MAIN FRAME AT BEARING PLATE MOUNTING SURFACES AND DRIVE SHAFT THROUGH-WAYS.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean paving machine main frame at bearing plate mounting surfaces using cleaning cloths in cleaning solvent. If necessary, use a wire scratch brush to remove built-up dirt and residue. Give special attention to cap screw holes. Wipe away all residue.
- b. Clean inner edges and area around drive shaft throughways with cleaning solvent. Wipe away all residue with a cleaning cloth.
- c. Dry all parts with a cleaning cloth.
- C. INSPECT.
1. INSPECT DRIVE SHAFT FOR WEAR OR DAMAGE.
- a. Inspect drive shaft (18) for cracks or bends. Replace the drive shaft if cracked or bent.
- b. Inspect key slots A for worn or broken edges. Replace drive shaft (18) if slot edges are broken or worn.



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**2.64 REPLACE/REPAIR CONVEYOR DRIVE SHAFT, BEARING UNITS, AND SPROCKETWHEELS -Continued. -**

**C. INSPECT - Continued.**

**2. INSPECT SPROCKET WHEEL TEETH AND KEYWAY.**

- a. Inspect sprocket wheel (20) for broken, missing, and worn teeth B. Replace damaged sprocket wheel.
- b. Inspect sprocket wheel keyway C for worn or broken edges. Replace sprocket wheel (20) if keyways are worn or broken.
- c. Inspect threads of set screw holes. If threads are damaged, replace sprocket wheel (20).

**3. INSPECT SPROCKET WHEELS FOR DAMAGED TEETH AND KEYWAYS.**

- a. Inspect sprocket wheels (19) for sharp, broken, or missing teeth D. Replace defective sprocket wheels.
- b. Inspect sprocket wheel keyway E for worn or broken edges. Replace sprocket wheel (19) having worn or broken edges.
- c. Inspect threads of set screw holes. If threads are damaged, replace sprocket wheel (19).

**4. INSPECT BEARINGS (26) FOR LOOSENESS OR RADIAL FREE PLAY. REPLACE IF LOOSENESS OR RADIAL FREE PLAY IS PRESENT.**

**D. INSTALL.**

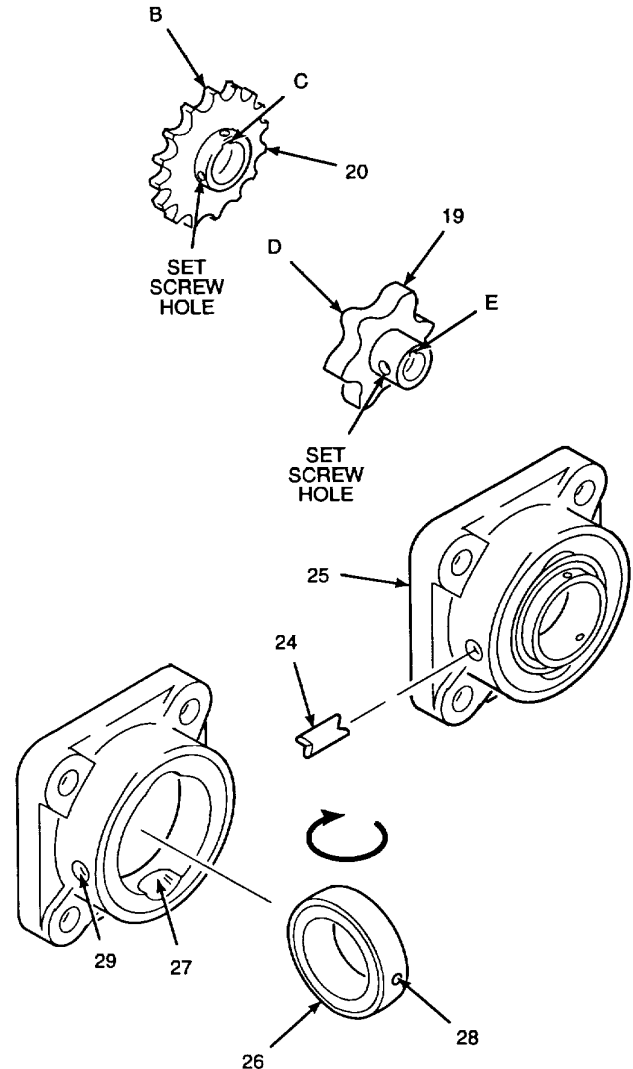
**1. INSTALL BEARING INTO BEARING HOUSING.**

- a. Hold bearing (26) perpendicular to bearing housing (25) and align with housing slots (27).
- b. Push bearing (26) into housing slots (27). Stop when the bearing is halfway inserted.

**NOTE**

**Orient bearing to ensure lock pin hole alignment with bearing housing lock pin hole.**

- c. Rotate bearing (26) until parallel with bearing housing (25).



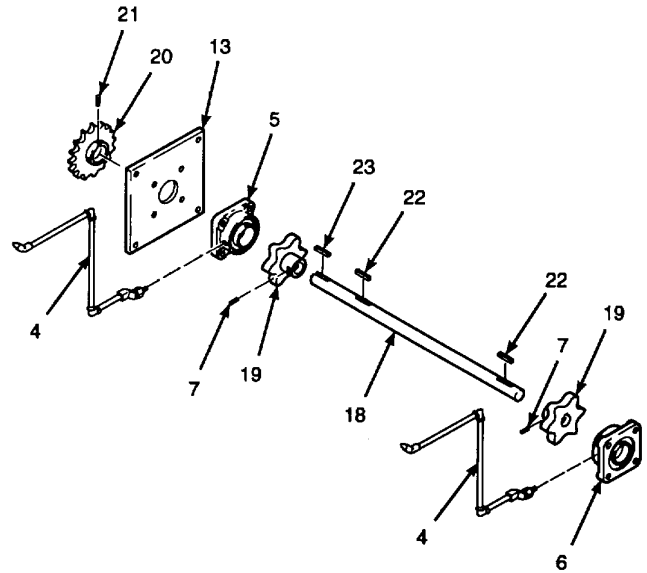
- d. Align bearing lock pin hole (28) with bearing housing lock pin hole (29).
- e. Insert lock pin (24) through lock pin holes (28 and 29).
- f. Push lock pin (24) below the surface of bearing housing (25).

**GO TO NEXT PAGE**

## D. INSTALL - Continued.

## 2. ASSEMBLE DRIVE SHAFT.

- a. Slide sprocket wheels (19) onto drive shaft (18) with hubs oriented toward the middle of the drive shaft.
- b. Place keys (22 and 23) into key slots on drive shaft (18) and slide sprocket wheels (19) over the top of the keys. Snug set screws (7) enough to keep the sprocket wheels in place. Do not tighten set screws at this time.
- c. Install lubrication lines (4) into inner and outer bearing units (5 and 6).
- d. Slide inner bearing unit (5) onto the drive end (keyed end) of drive shaft (18) with the bearing facing to the middle of the drive shaft.
- e. Slide outer bearing unit (6) onto the opposite end of drive shaft (18) with the bearing facing to the middle of the drive shaft.
- f. Position bearing plate (13) over drive shaft (18).
- g. Install sprocket wheel (20) and set screw (21) onto drive shaft (18). Snug, but do not tighten set screw.



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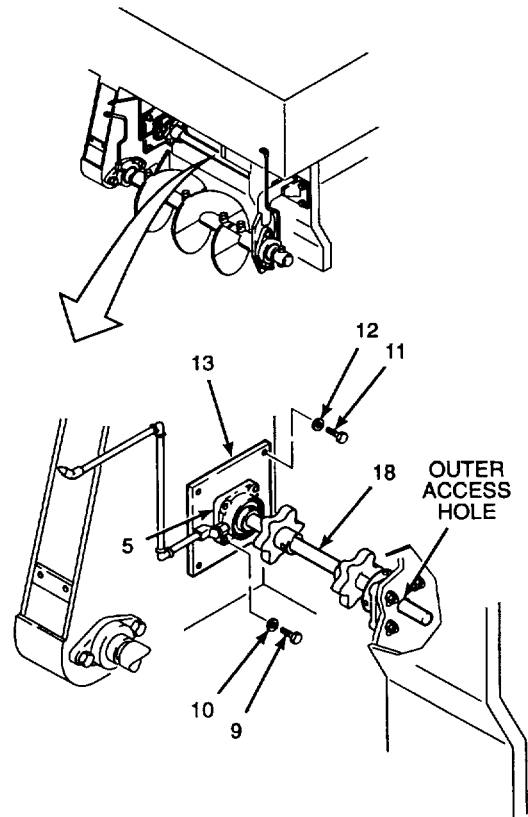
**2.64 REPLACE/REPAIR CONVEYOR DRIVE SHAFT, BEARING UNITS, AND SPROCKETWHEELS-Continued.**

- D. INSTALL - Continued.
3. INSTALL DRIVE SHAFT AS AN ASSEMBLY.
- With the help of a second person, slide the outside end (non-keyed end) of the drive shaft (18) through the outer access hole. Position the drive shaft so the keyed end slides into the inner access hole.
  - Install flat washers (12) onto hex head cap screws (11).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- Apply thread locking compound to the threads of hex head cap screws (11).
- Install hex head cap screws (11) through bearing plate (13) and into the paving machine. Tighten cap screws to 90 lb-ft (122 N.m).
- Install flat washers (10) onto hex head cap screws (9).
- Apply thread locking compound to threads of hex head cap screws (9).
- Install hex head cap screws (9) through inner bearing unit (5) and into bearing plate (13).
- Tighten hex head cap screws (9) to 90 lb-ft (122 N.m).



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D. INSTALL - Continued.

4. LEVEL DRIVE SHAFT.

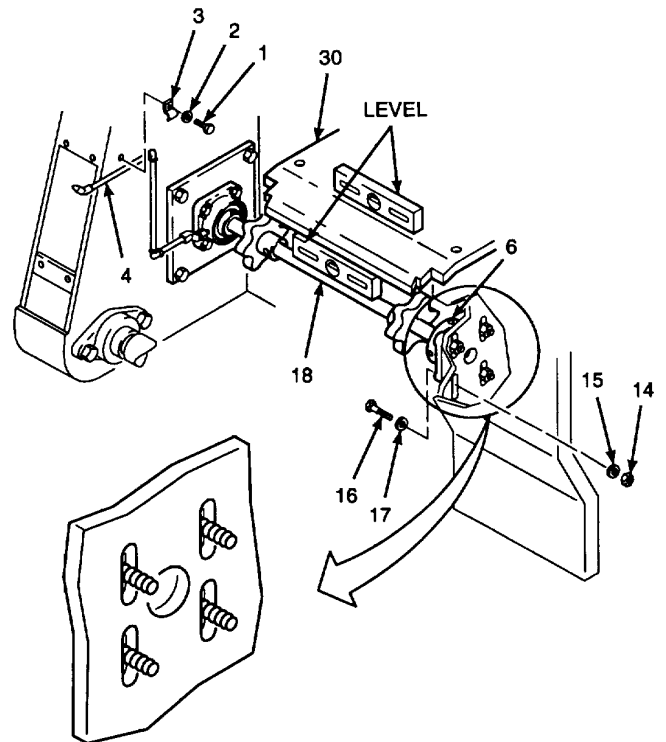
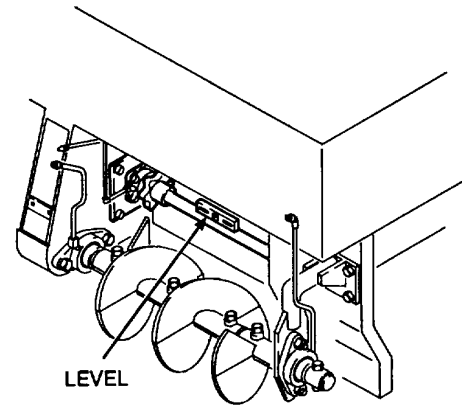
- a. Install flat washers (17) onto hex head cap screws (16).

**WARNING**

Thread locking compound can cause eye damage.

**Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- b. Apply thread locking compound to the threads of hex head cap screws (16).
- c. Install hex head cap screws (16), flat washers (15), and hex nuts (14) and secure outer bearing unit (6) into place. Do not tighten at this time.
- d. Place a level along the surface of conveyor drag plate (30). Place a second level along the top side of drive shaft (18). Adjust outer bearing unit (6) so the second level on the drive shaft matches the level on the drag plate.
- e. Tighten hex nuts (14) to 90 lb-ft (122 N.m).
- f. Install lockwasher (2) to hex head cap screw (1).
- g. Apply thread locking compound to threads of hex head cap screw (1).
- h. Secure lubrication line (4) in place with clamp (3) and hex head cap screw (1). Tighten cap screw to 108 lb-in (13 N-m).
- i. Repeat steps f through i for outer bearing unit (6) lubrication line.



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**2.64 REPLACE/REPAIR CONVEYOR DRIVE SHAFT, BEARING UNITS, AND SPROCKETWHEELS- Continued.**

- D. INSTALL - Continued.
- 5. ALIGN DRIVE SHAFT AND SPROCKET WHEELS.

**NOTE**

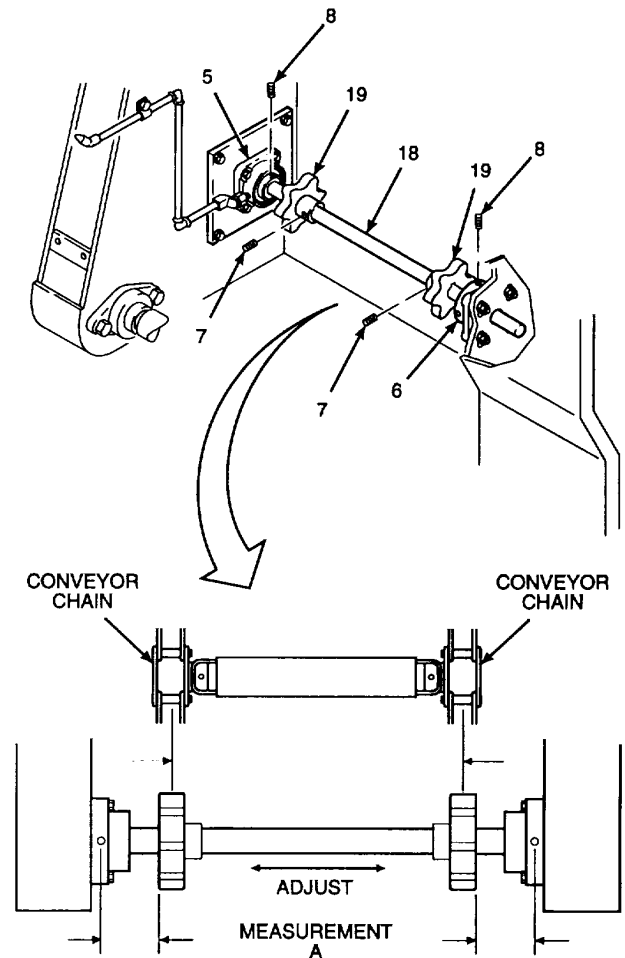
**Before setting sprocket wheel width distance, ensure drive shaft is oriented to allow proper adjustment of sprocket wheel per step 6.**

- a. Measure the width of the conveyor chain from center of the chain links on the left and right side. Set distance between sprocket wheels (19) measuring from the center of the sprocket wheel so it is the same as chain width. Secure sprocket wheels in place with set screws (7), but do not tighten at this time. Further adjustments may have to be made during conveyor chain assembly installation.
- b. Adjust drive shaft (18) so there is equal distance between the outside edges of sprocket wheels (19) and center of lubrication line hole in bearings, measurement A, on inner and outer bearing units (5 and 6).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Remove set screws (8) and apply thread locking compound to threads.
- d. Install set screws (8) and tighten to 19 lb-ft (26 N.m) using hex head driver socket.



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D. INSTALL - Continued.

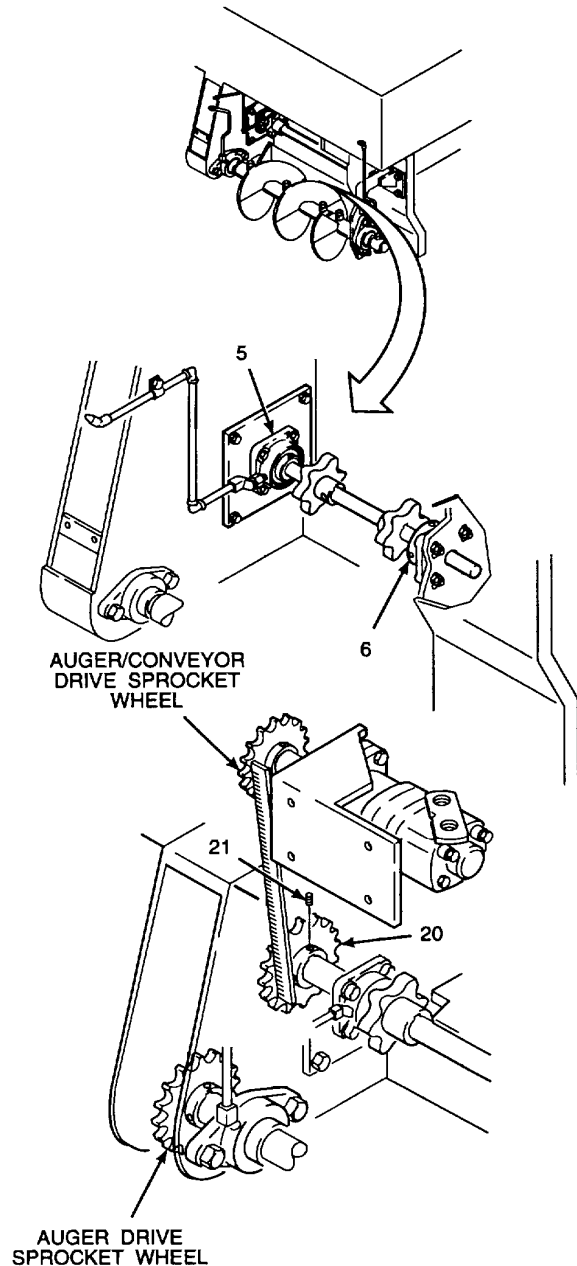
6. ALIGN SPROCKET WHEEL.

- a. Use a machinist's rule and align sprocket wheel (20) with the auger/conveyor drive sprocket wheel. Verify this alignment with the auger sprocket wheel.

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- b. Remove set screws (21) and apply thread locking compound to the threads.
- c. Install set screws (21) into sprocket wheel (20) and tighten to 19 lb-ft (26 N.m) using hex head driver socket.
- d. Lubricate inner and outer bearing units (5 and 6) per LO 5-3895-373-12.



**NOTE**

**FOLLOW-ON-TASKS:**

**Install auger/conveyor drive chain per paragraph 2.63.  
Install conveyor chain assembly per paragraph 2.61.  
Install screed per TM 5-3895-373-20.  
Lubricate bearings per LO 5-3895-373-12.**

**END OF TASK**



---

**2.65 REPLACE/REPAIR CONVEYOR ROLLER AND BEARING UNITS.**

---

**This task covers:**

a. Remove	b. Clean	c. Inspect
d. Replace		

---

**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Torque wrench (Item 132, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Grease (Item 18, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers

Personnel Required:

Two 62B construction equipment repairers. Second person to assist in support of components during removal and installation.

References:

TM 5-3895-373-10  
LO 5-3895-373-12  
TM 5-3895-373-24P

Equipment Condition:

Hopper wings lowered per TM 5-3895-373-10.  
Conveyor chain assembly removed per paragraph 2.61.

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**NOTE**

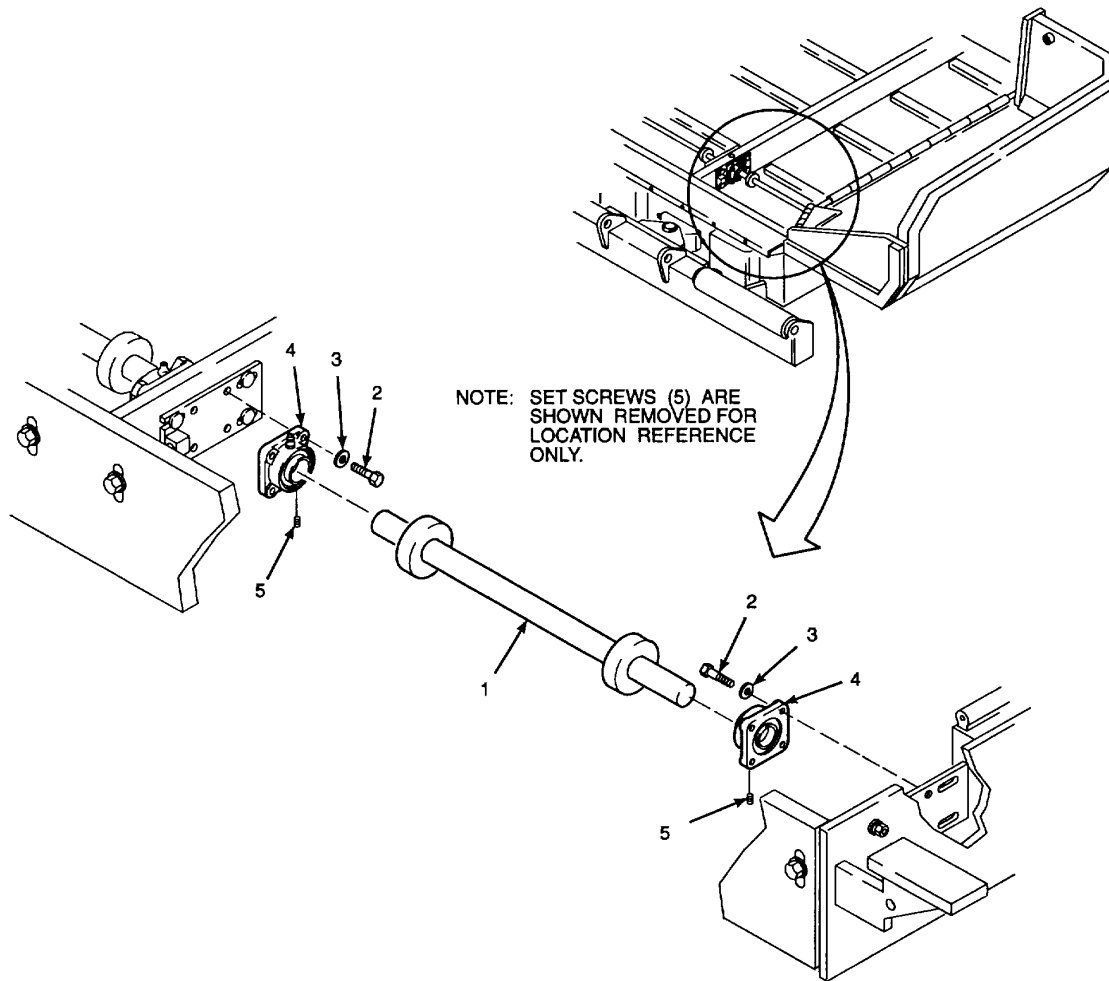
**There is a left hand and a right hand set of conveyor rollers and bearing units on the paving machine. This procedure refers to replacement of the left hand conveyor rollers and bearing units. Procedure is identical for right hand conveyor rollers and bearing units. Left hand conveyor rollers and bearing units are shown in this procedure.**

**GO TO NEXT PAGE**

A. REMOVE.

1. REMOVE CONVEYOR ROLLER AND BEARING UNITS AS AN ASSEMBLY.

- a. With the help of another person, support conveyor roller (1) and remove hex head cap screws (2) and flat washers (3).
- b. Lift and remove conveyor roller with bearing units (4) attached.



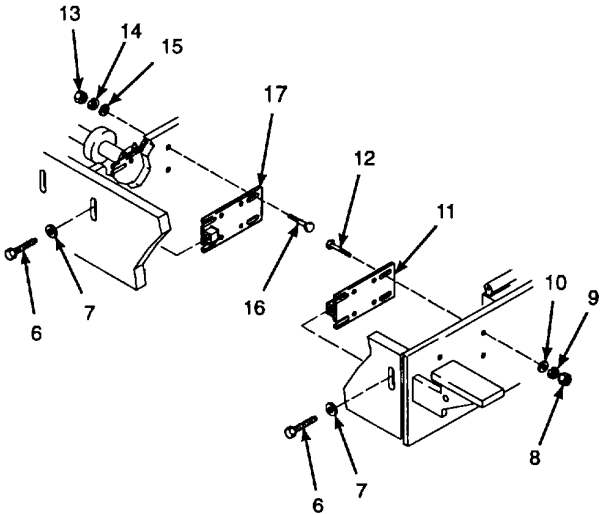
2. REMOVE BEARING UNITS FROM CONVEYOR ROLLER.

- a. Loosen, but do not remove, set screws (5).
- b. Remove bearing units (4) from conveyor roller (1).

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2.65 REPLACE/REPAIR CONVEYOR ROLLER AND BEARING UNITS - Continued.

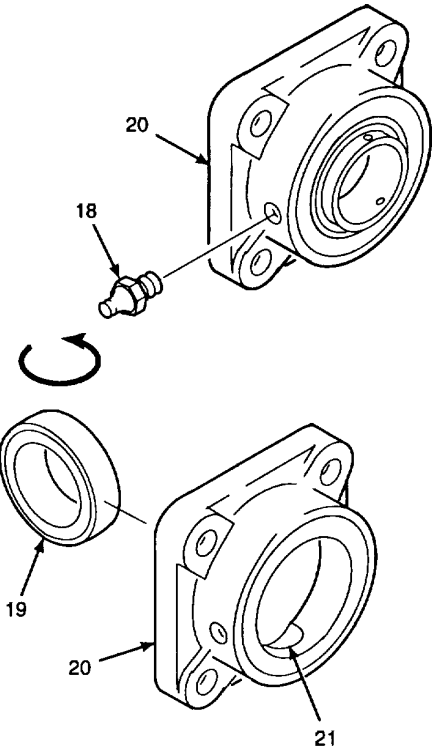
- A. REMOVE - Continued.
- 3. REMOVE TENSION BOLTS AND BEARING SUPPORT PLATES.
  - a. Remove tension bolts (6) and washers (7).
  - b. Remove hex nuts (8), lockwashers (9), and flat washers (10) from outer bearing support plate (11). Discard lockwashers.
  - c. Remove square neck bolts (12) and outer bearing support plate (11).
  - d. Remove both rear hex nuts (13), lockwashers (14), flat washers (15), and square neck bolts (16). Discard lockwashers.
  - e. Loosen, but do not remove, both front hex nuts (13), lockwashers (14), and flat washers (15) from front of inner bearing support plate (17).
  - f. Slide inner bearing support plate (17) toward rear of paving machine and remove from square neck bolts (16).
  - g. Reinstall rear square neck bolts (16) back into main frame to help support opposite side inner bearing support plate.
- 4. DISASSEMBLE BEARING UNITS.



**NOTE**

**Only bearing units with difficult to spin or rough spinning bearings need to be disassembled.**

- a. Remove lubrication fitting (18).
- b. Rotate bearing (19) until perpendicular to bearing housing (20).
- c. Align bearing with housing slots (21).
- d. Pull bearing free of bearing housing (20).



**GO TO NEXT PAGE**

- B. CLEAN.
- 1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse and clean all metal parts in cleaning solvent. Give special attention to bearing lubrication hole. Wipe away all residue with a cleaning cloth.
- b. Clean lubrication fitting of old grease.

**WARNING**

Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- c. Clean all fastener threads using thread locking compound solvent.
- d. Dry all parts with a cleaning cloth.

**GO TO NEXT PAGE**

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**2.65 REPLACE/REPAIR CONVEYOR ROLLER AND BEARING UNITS - Continued.**

---

- B. CLEAN - Continued.
2. CLEAN BEARING SUPPORT PLATE  
MOUNTING SURFACES.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC and flammable**. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

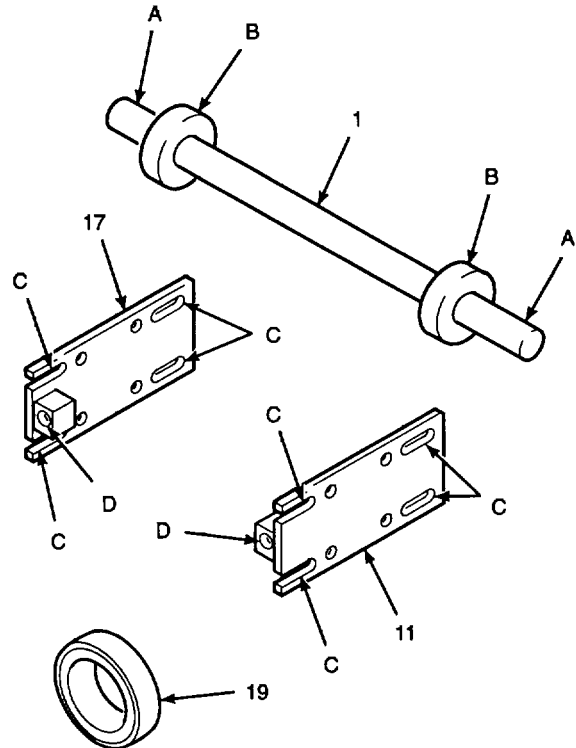
- a. Clean paving machine main frame at bearing support plate mounting surfaces using cleaning cloths soaked in cleaning solvent. If necessary, use a wire scratch brush to remove built up dirt and residue. Give special attention to bolt holes. Wipe away all residue.
- b. Clean outer edges of tension bolt through-holes on bearing support plate with cleaning solvent. Wipe away all residue with a cleaning cloth.
- c. Dry all parts with a cleaning cloth.

**GO TO NEXT PAGE**

C. INSPECT.

1. INSPECT CONVEYOR ROLLER.

- a. Inspect conveyor roller (1) for a bent or warped condition. Replace if bent or warped.
- b. Inspect bearing mating surface A on conveyor roller (1) for damage that may affect performance of bearings (19). Replace conveyor roller if damage is found.
- c. Inspect conveyor chain assembly roller surfaces B of conveyor roller (1) for cracks, gouges or a condition that could damage the conveyor chain assembly, or cause a chain derailment. Replace the conveyor roller if damage is found.



2. INSPECT BEARING SUPPORT PLATES

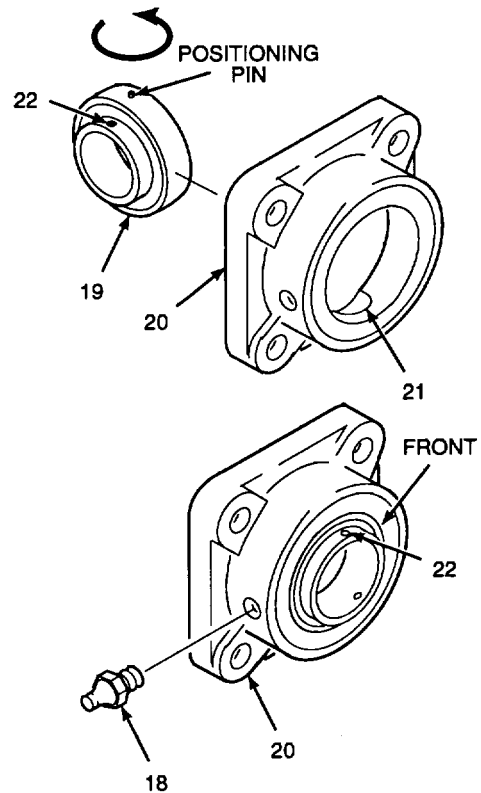
- a. Inspect mounting slots C of bearing support plates (11 and 17) for wear and damage caused by vibration and loose bolts. Replace bearing support plate if wear or damage is found.
- b. Inspect tension bolt hole, area D, threads on bearing support plates (11 and 17) for a cracked or stripped condition. Replace bearing support plates if threads are cracked or stripped.

3. INSPECT BEARINGS (19). REPLACE BEARING IF LOOSENESS OR RADIAL FREE PLAY IS PRESENT.

D. REPLACE.

1. ASSEMBLE BEARING UNITS.

- a. Hold bearing (19) perpendicular to bearing housing (20) flange. Positioning pin on the bearing should engage with one of the housing slots (21).
- b. Push bearing (19) into housing slots (21).
- c. Rotate bearing (19) until parallel with bearing housing (20). Ensure bearing is rotated so that set screw holes (22) are facing the front of the housing.
- d. Thread lubrication fitting (18) into bearing housing (20).
- e. Tighten lubrication fitting (18) snug. Do not overtighten.



**2.65 REPLACE/REPAIR CONVEYOR ROLLER AND BE**

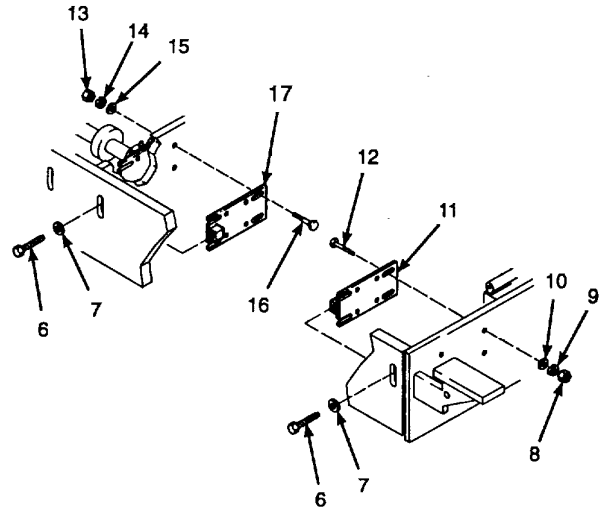
- D. REPLACE - Continued.
2. INSTALL BEARING SUPPORT PLATES AND TENSION BOLTS.

- a. Position outer bearing support plate (11) on main frame and hold in place.

**NOTE**

**Do not apply thread locking compound to threads of bearing support plate fasteners and do not fully tighten bearing support plate fasteners. Bearing support plates will be adjusted after replacement of conveyor chain assembly.**

- b. Place square neck bolts (12) through slots in outer bearing support plate (11).
- c. Install flat washers (10), lockwashers (9), and hex nuts (8).
- d. Tighten hex nuts (8) snug, but do not fully tighten.
- e. Remove two square neck bolts (16) reinstalled in both rear inner bearing support plate (17) holes.
- f. Slide inner bearing support plate (17) under front square neck bolts (16). Install both rear square neck bolts (16), flat washers (15), lockwashers (14), and hex nuts (13). Tighten hex nuts snug, but do not fully tighten.
- g. Remove both front hex nuts (13) and lockwashers (14) from inner bearing support plate (17). Discard lockwashers. Reinstall hex nuts with new lockwashers. Tighten hex nuts snug, but do not fully tighten.
- h. Place washers (7) onto tension bolts (6) so recessed side of washer is against head of tension bolt.
- i. Lubricate threads of tension bolts (6) with a light coating of grease.

**NOTE**

**Do not fully thread tension bolts into bearing support plates. Bearing support plates will be adjusted after replacement of conveyor chain assembly.**

- j. Install tension bolts (6) through the main frame and engage threads into bearing support plates (11 and 17). Do not tighten at this time.

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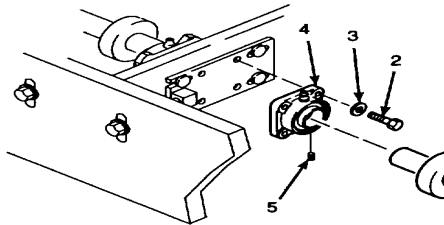
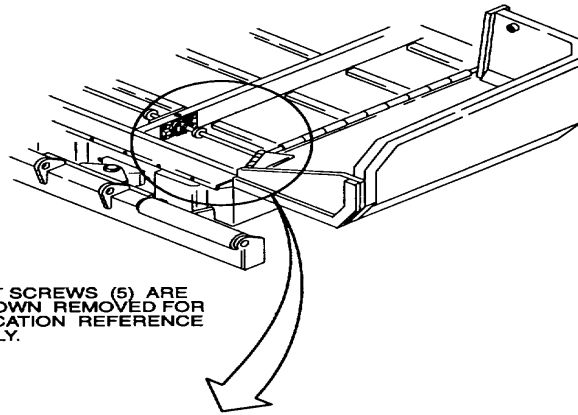
D. REPLACE Continued.

3. INSTALL CONVEYOR ROLLER AND BEARING UNITS AS AN ASSEMBLY.

- a. Place bearing units (4) onto conveyor roller (1).
- b. With the help of another person, position and support bearing units and conveyor roller on paving machine.

**NOTE**

Ensure bearing units are positioned with lubrication fittings facing upward.

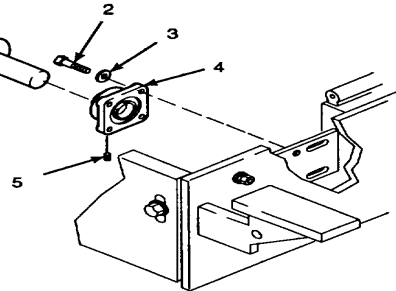


NOTE: SET SCREWS (5) ARE SHOWN REMOVED FOR LOCATION REFERENCE ONLY.

- c. Install flat washers (3) onto hex head cap screws (2).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.



- d. Apply thread locking compound to threads of hex head cap screws (2).
- e. Secure bearing units (4) with hex head cap screws (2).
- f. Tighten hex head cap screws (2) to 100 lb-ft (135 N.m).
- g. Snug set screws (5) in place, but do not fully tighten. Set screws will be tightened after conveyor chain assembly has been installed and aligned.

**NOTE**

**FOLLOW-ON-TASKS:** Install conveyor chain assembly per paragraph 2.61. Lubricate bearing per LO 5-3895-373-12.

**END OF TASK**

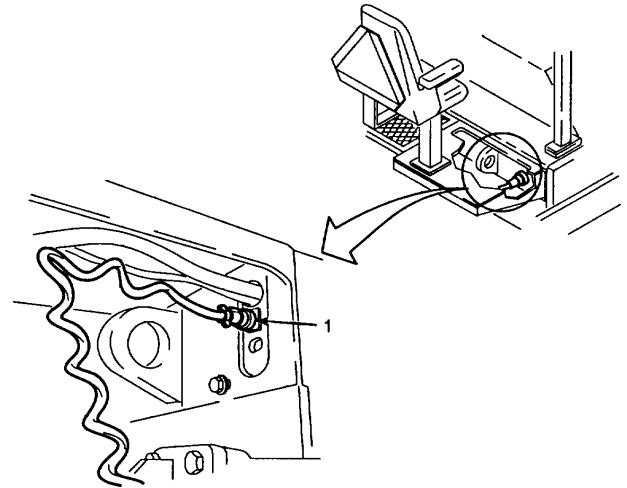




A. REMOVE.

1. REMOVE ENDGATE.

- a. Disconnect feed limit switch connector (1) from rear wall of tractor.
- b. Using hinged handle and socket from socket wrench set, remove hex nut (2), lockwasher (3), and flat washer (4). Do not discard lockwasher at this time.
- c. Remove self-locking nuts (5), flat washers (6 and 7), and hex head cap screws (8 and 9). Discard self-locking nuts.
- d. While second person holds endgate (10) upright, remove hex head cap screws (11) and flat washers (12) securing endgate support arm (13) to extension screed (14).



**WARNING**

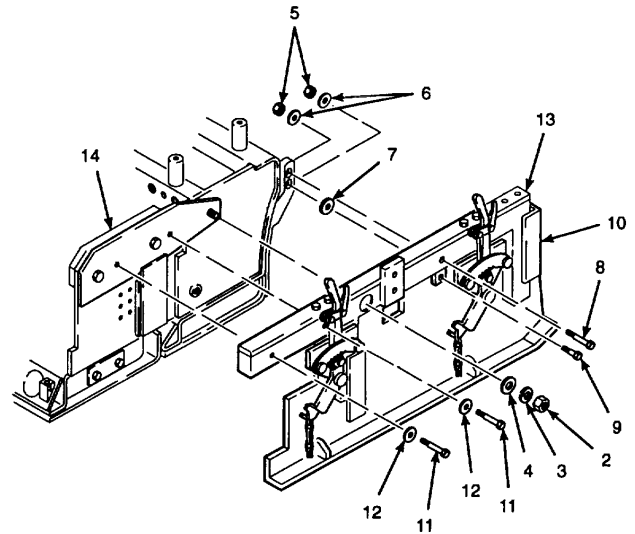
**Endgate weighs approximately 126 lbs (57 kg). To avoid personal injury, do not attempt to lift and remove the endgate. Use a second person to help remove the endgate. Failure to do so may result in serious injury.**

- e. With help of second person, lift and remove endgate (10) from extension screed (14).

**NOTE**

**Screed extension cylinder piston rod hardware (2, 3, and 4) should be reinstalled to allow extension screed to be repositioned during components removal procedures.**

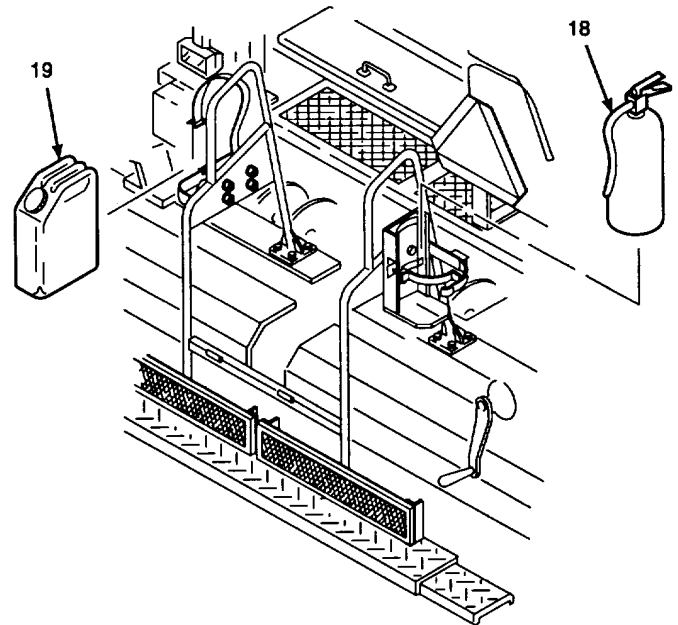
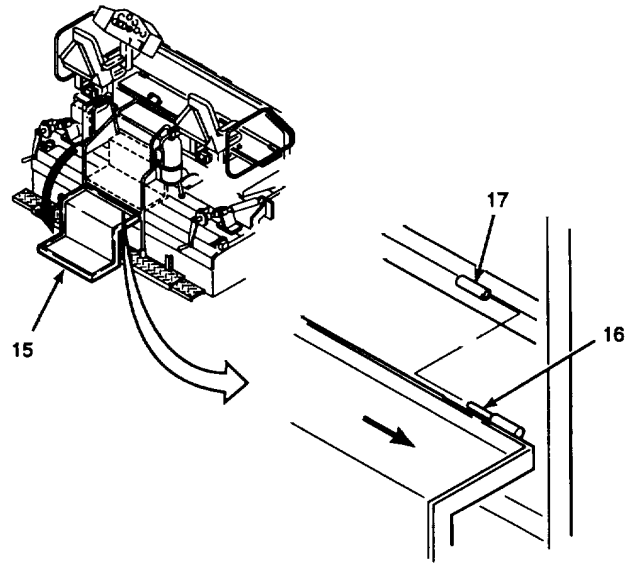
- f. Reinstall flat washer (4), lockwasher (3), and hex nut (2). Using hinged handle and socket from socket wrench set, tighten hex nut.



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**2.66 REPLACE EXTENSION SCREED FRAME - Continued.**

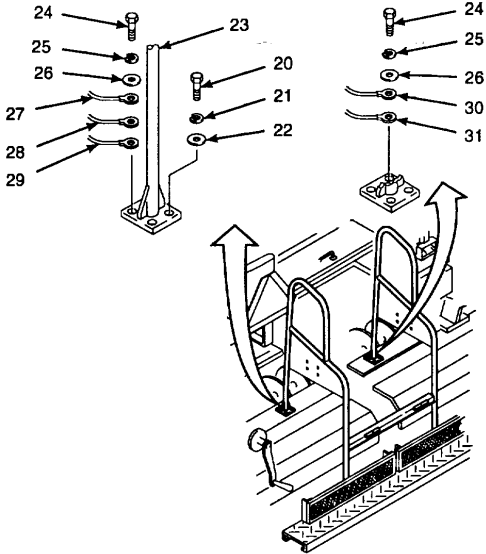
- A. REMOVE - Continued.
2. REMOVE SCREED STEPS, AND HANDRAIL.
- a. Grab screed steps (15) at back edge of top step. Lift and pull the step up and away from tractor.
- b. With steps fully back, slide the screed steps to the right to separate hinge pins (16) from hinges (17).
- c. Remove fire extinguisher (18) and decontamination can (19).



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A. REMOVE - Continued.

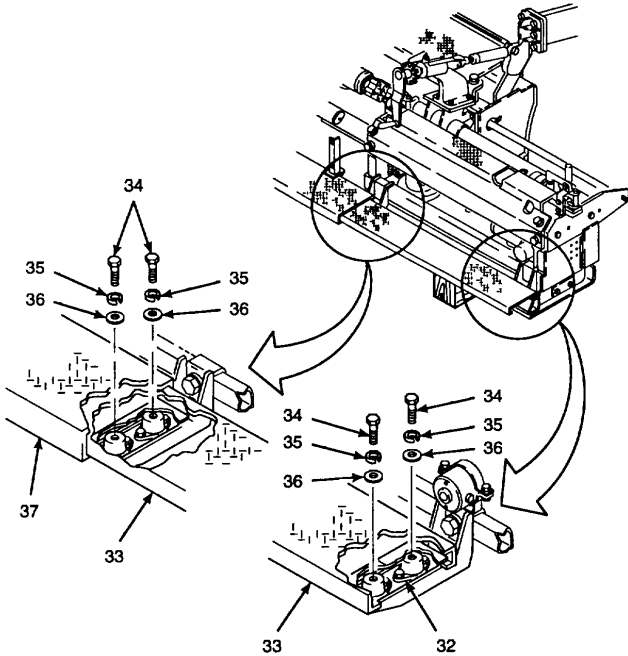
- d. Remove hex head cap screws (20), lockwashers (21), and flat washers (22) from three locations at mounting base of each screed handrail (23). Discard lockwashers.
- e. Remove hex head cap screw (24), lockwasher (25), flat washer (26), and ground wires (27, 28, and 29). Discard lockwasher.
- f. Remove hex head cap screw (24), lockwasher (25), flat washer (26), and ground wires (30 and 31). Discard lockwasher.
- g. Fully raise and extend extension screeds per TM 53895-373-10. Crib as shown on both ends of screed. Lower screed onto cribbing per TM 5-3895-373-10.



**NOTE**

**There are two vibration mounts (32) located on each end of the left and right extension steps (33).**

- h. Remove hex head cap screws (34), lockwashers (35), and flat washers (36) from vibration mounts (32). Discard lockwashers.
- i. Slide extension step (33) into main step (37).



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2.66 REPLACE EXTENSION SCREED FRAME - Continued. "11

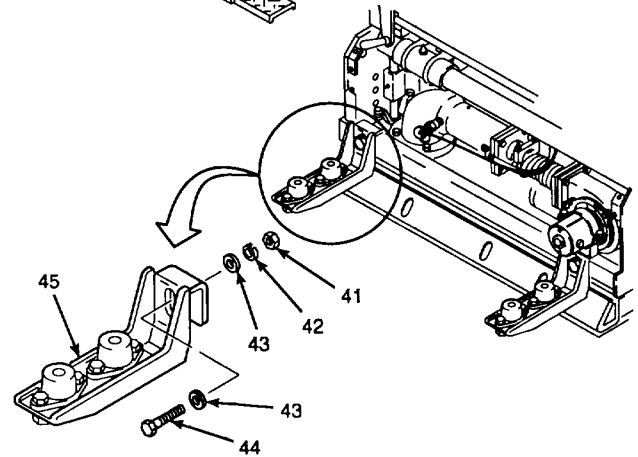
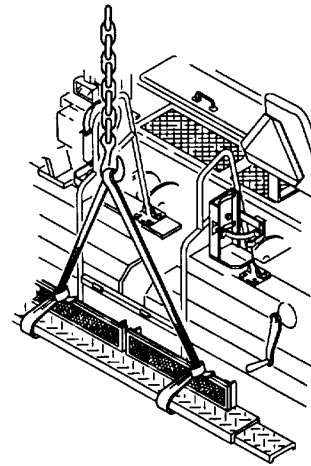
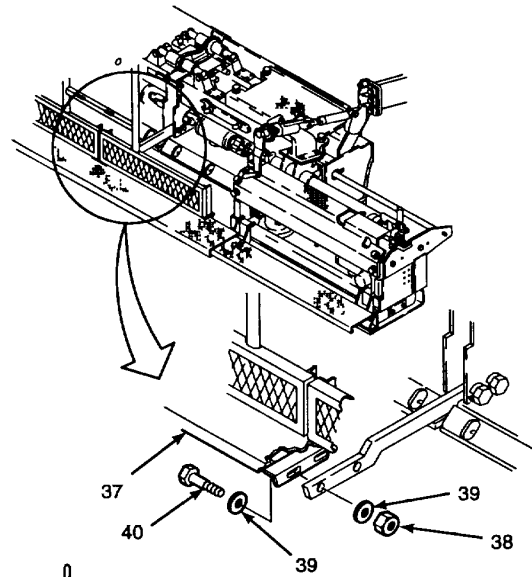
A. REMOVE - Continued.

- j. Remove hex nuts (38), washers (39), and hex head cap screws (40) from main step (37).
- k. Remove screed cribbing and fully lower screed onto flat work surface. Refer to TM 5-3895-373-10.

**WARNING**

Handrail with attaching steps weigh approximately 120 lbs (55 kg). Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.

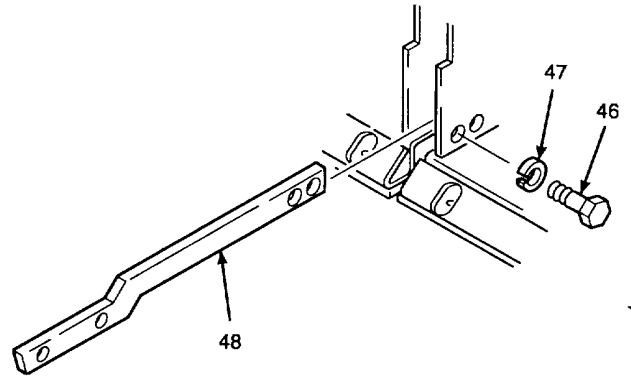
- l. With overhead lifting device, sling straps, and the help of a second person, lift and remove handrail with attached steps from screed.
- m. Remove hex nut (41), lockwasher (42), flat washers (43), and hex head cap screw (44) from inner step support (45). Discard lockwasher.
- n. Remove inner step support (45).



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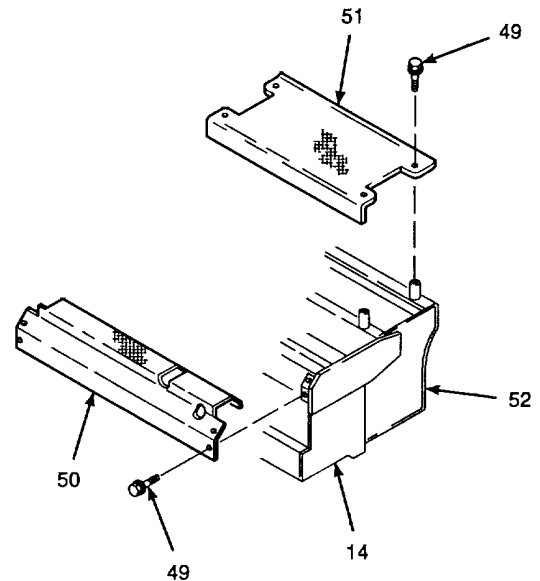
A. REMOVE - Continued.

- o. If replacing right hand main screed, remove hex head cap screws (46), lockwashers (47), and center step support (48). Discard lockwashers.



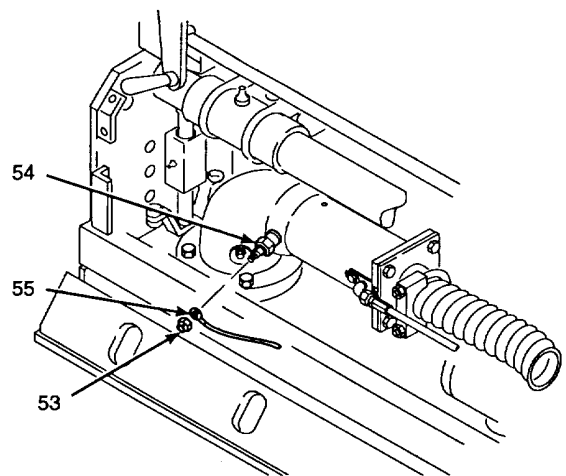
3. REMOVE SCREED COVER PLATES.

- a. Remove and discard self-locking machine screws (49).
- b. Remove screed cover plate (50) from extension screed (14).
- c. Remove screed cover plate (51) from main screed (52).



4. REMOVE ELECTRICAL HARNESS FROM EXTENSION SCREED.

- a. Remove terminal nut (53) from glow plug (54).
- b. Tag and disconnect lead wire (55).

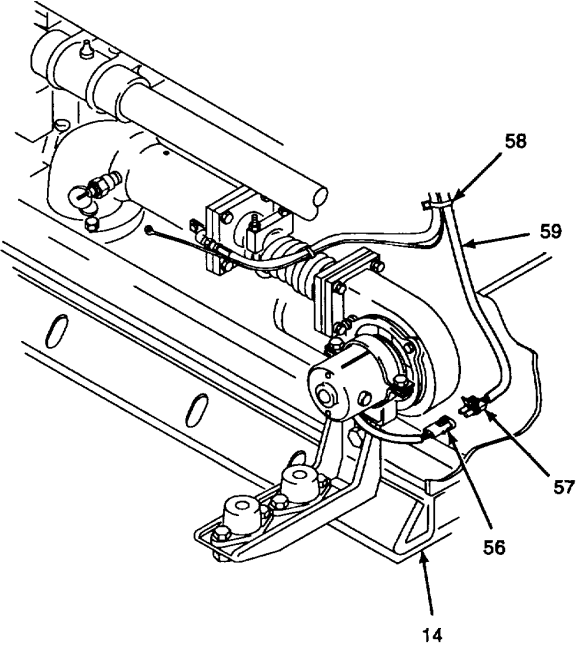


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**2.66 REPLACE EXTENSION SCREED FRAME - Continued.**

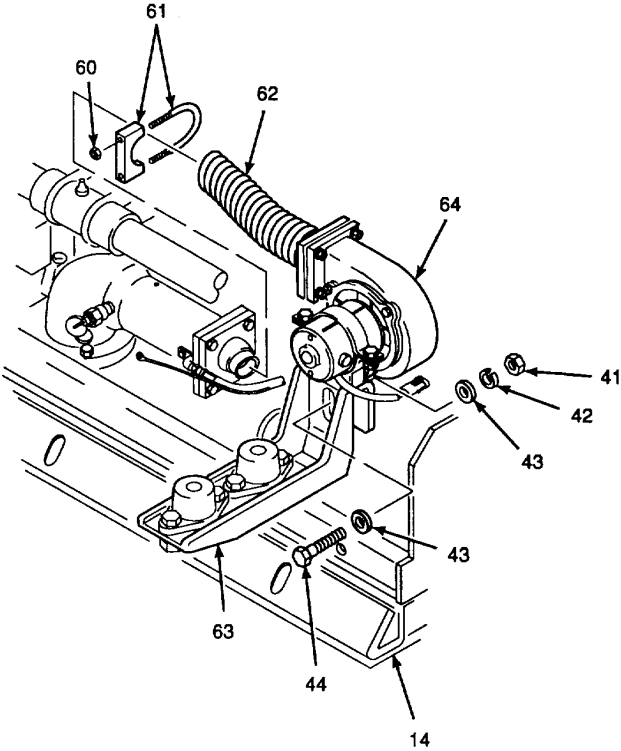
**A. REMOVE - Continued.**

- c. Tag and disconnect blower motor electrical connector (56) from screed harness electrical connector (57).
- d. Cut all tie wraps (58) from screed harness (59). Remove harness wiring from extension screed (14).



**5. REMOVE EXTENSION SCREED BLOWER.**

- a. Remove hex nuts (60) and clamp (61) from flexible pipe (62). Discard exhaust clamp.
- b. Remove hex nut (41), lockwasher (42), flat washers (43), and hex head cap screw (44) from outer step support (63). Discard lockwasher.
- c. Remove outer step support (63) with attached blower (64) and flexible pipe (62) from extension screed (14).



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- A. REMOVE Continued.
- 6. REMOVE EXTENSION SCREED BURNER CHAMBER ASSEMBLY.
  - a. Turn screed burner solenoid valve (65) to the 3 o'clock position per TM 5-3895-373-10.

**WARNING**

**Fuel is very flammable and can explode easily. To avoid serious injury or death:**

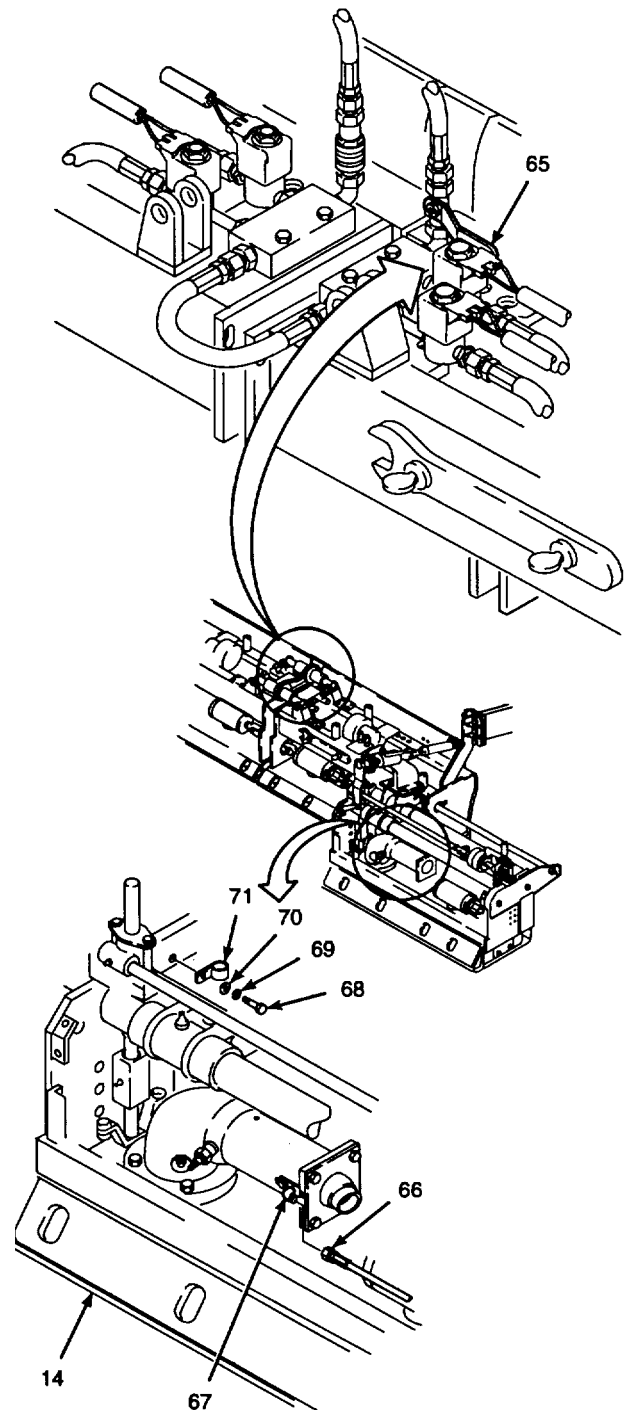
**Always wear safety glasses/goggles at all times.**

**Keep fuel away from open flame or any spark (ignition source).**

**Keep at least a B-C fire extinguisher within easy reach when working with fuel or any fuel system.**

**Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.**

- b. Place machinery wiping towel beneath screed burner fuel hose (66).
- c. Tag and disconnect screed burner fuel hose (66) from elbow (67). Plug hose and cap elbow to prevent fuel system contamination.
- d. Remove hex head cap screw (68), lockwasher (69), flat washer (70), and clamp (71) from inner extension screed end plate. Discard lockwasher. Remove screed burner fuel hose (66) from extension screed (14).

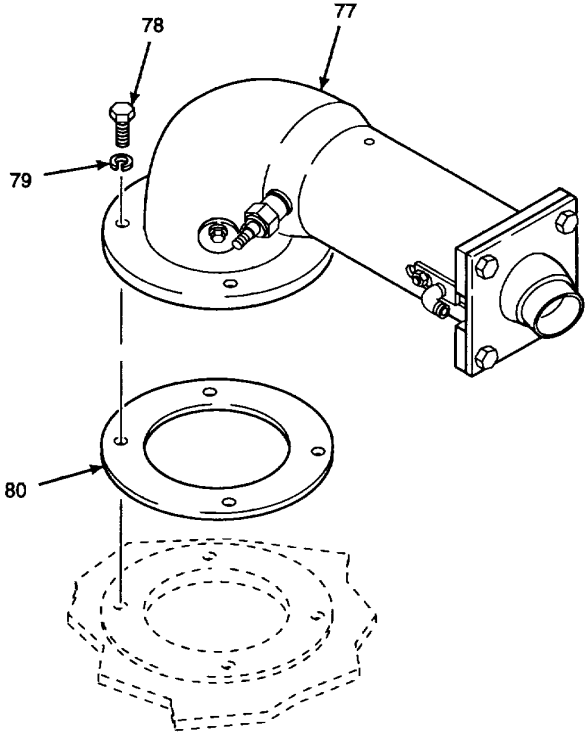
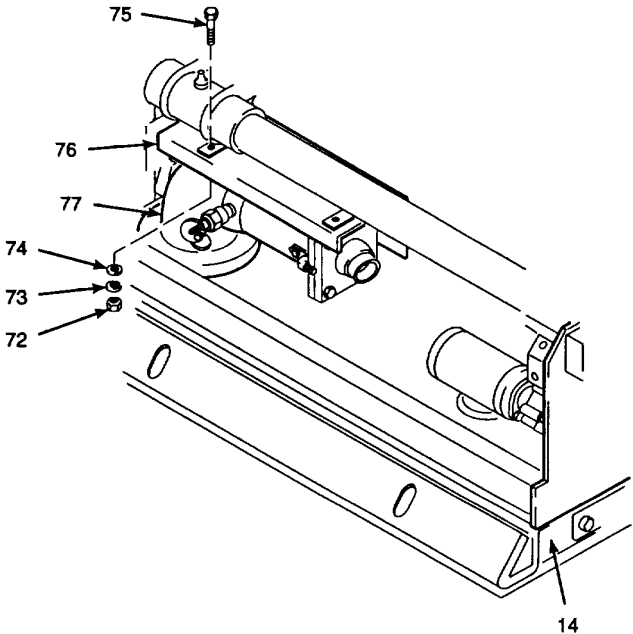


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**2.66 REPLACE EXTENSION SCREED FRAME - Continued.**

- A. REMOVE - Continued.
  - e. Remove hex nuts (72), lockwashers (73), flat washers (74), and bolts (75) from shield (76). Discard lockwashers.
  - f. Slide shield (76) outward, away from burner chamber assembly (77) and shield brackets. Remove shield from extension screed (14).
  - g. Remove hex head cap screws (78) and lockwashers (79). Discard lockwashers.
  - h. Remove burner chamber assembly (77) and gasket (80). Discard gasket.

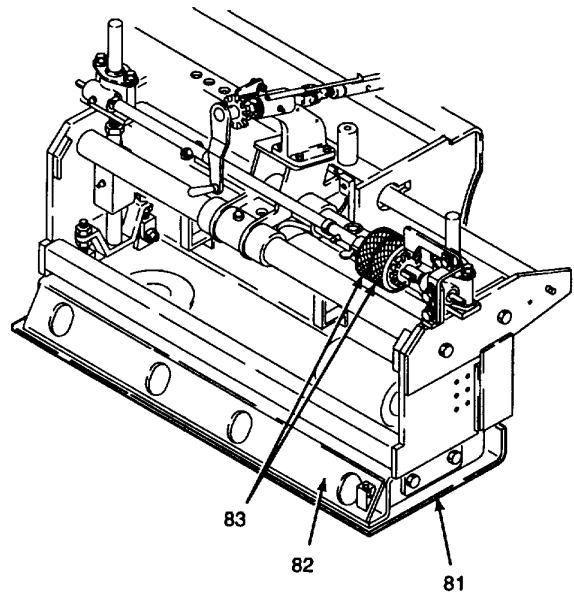


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A. REMOVE - Continued.

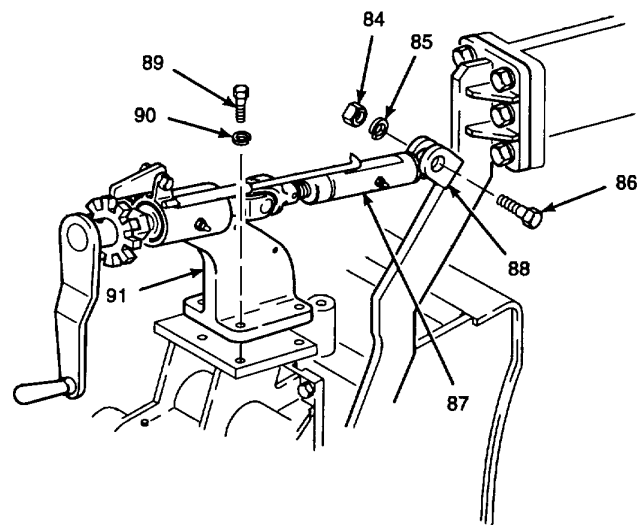
7. REMOVE EXTENSION SCREED PLATE.

- a. Raise screed about 12 in. (305 mm) per TM 5-3895-373-10. Place cribbing under main screed only as safety precaution from screed lowering.
- b. Remove extension screed plate (81) per paragraph 2.71.
- c. Retract extension screed halfway per TM 5-3895-373-10.
- d. Remove cribbing and fully lower screed per TM 5-3895-373-10.
- e. Lower extension screed base (82) to floor surface using height adjustment knobs (83). Refer to TM 5-3895-373-10.



8. THICKNESS CONTROL COMPONENTS.

- a. Remove hex nut (84), lockwasher (85), and hex head cap screw (86). Lift link (87) from screed arm bracket (88). Discard lockwasher.
- b. Remove hex head cap screws (89), and lockwashers (90). Discard lockwashers.
- c. Remove screed thickness control mounting bracket (91) and attached components from extension screed.



**GO TO NEXT PAGE**  
**2-901**

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**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

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- A. REMOVE - Continued.
9. DISCONNECT EXTENSION SCREED HYDRAULIC LINES.

**CAUTION**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent dirt and contaminants from entering the system. Failure to clean hoses and fittings, and plug or cap open fittings may result in hydraulic system contamination and equipment damage.

- a. Wipe hydraulic hoses (92) clean with cleaning cloth. Place machinery wiping towel beneath hoses.

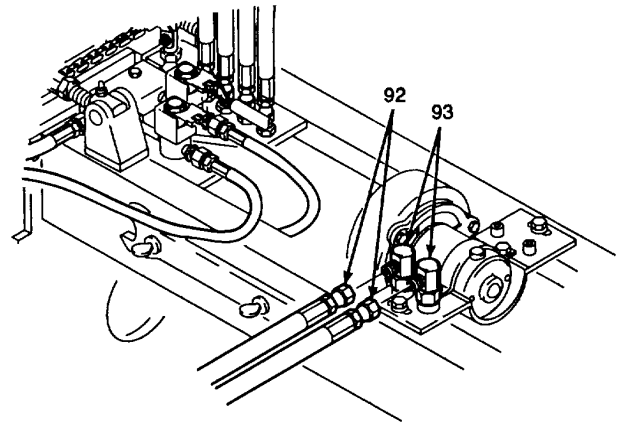
**CAUTION**

Proper operation of screed vibrator depends on correct rotation of screed vibration motor. Hydraulic flow to and from vibration motor determines direction of motor rotation. Failure to connect hydraulic hoses to correct ports and fittings may result in faulty operation of vibration system, and could result in equipment damage.

**NOTE**

Hoses (92) connected to elbows (93) should be tagged "left" and "right".

- b. Tag and disconnect hoses (92) from elbows (93). Plug hoses and cap elbows to prevent hydraulic system contamination.
- c. If saturated, dispose of machinery wiping towel in accordance with local procedures.



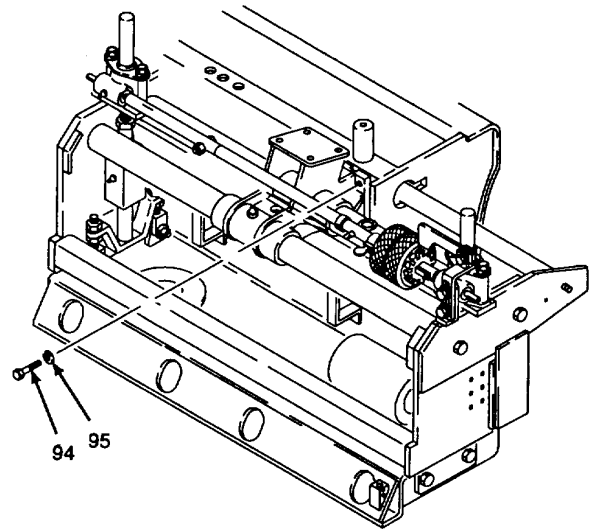
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**2-902**

A. REMOVE - Continued.

10. REMOVE EXTENSION SCREED.

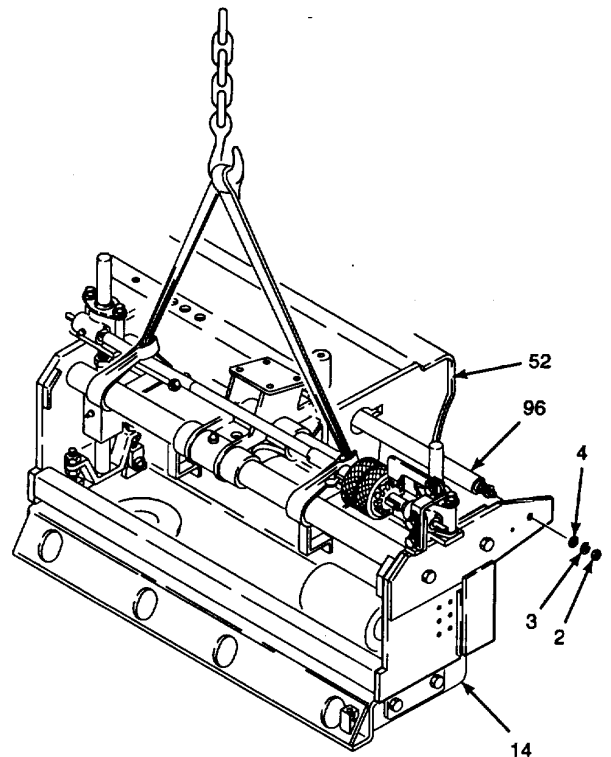
- a. Using socket wrench set, remove upper three hex head cap screws (94) and lockwashers (95). Discard lockwashers.
- b. Using socket, hinged handle, and 6-inch and 12-inch extensions from socket wrench set, remove lower three hex head cap screws (94) and lockwashers (95). Discard lockwashers.
- c. Using hinged handle and socket from socket wrench set, remove hex nut (2), lockwasher (3), and flat washer (4). Discard lockwasher.
- d. Start paving machine and retract screed extension cylinder piston rod (96) from extension screed (14). Refer to TM 5-3895-373-10.



**WARNING**

Extension screed weighs approximately 700 lbs (318 kg). Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.

- e. Using sling straps and overhead lifting device, evenly lift extension screed (14) and remove from main screed (52).
- f. Lower extension screed (14) to floor, but keep sling straps in place.



**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

A. REMOVE - Continued.

11. REMOVE EXTENSION SCREED HYDRAULIC LINES AND FITTINGS.

- a. Cut tie wraps (97).
- b. Remove hex head cap screws (98), lockwashers (99), and flat washers (100) securing clamps (101). Discard lockwashers.

**CAUTION**

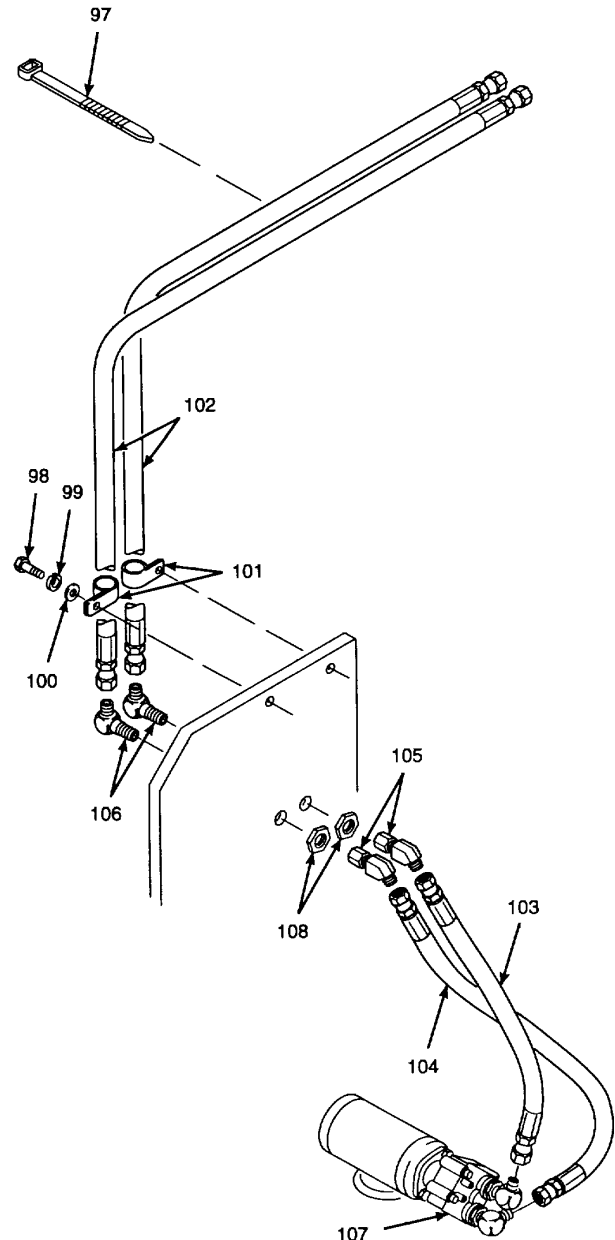
Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent dirt and contaminants from entering the system. Failure to clean hoses and fittings, and plug or cap open fittings may result in hydraulic system contamination and equipment damage.

- c. Wipe fittings of hydraulic hoses (102, 103, and 104) clean with cleaning cloth. Place machinery wiping towel beneath hoses.

**NOTE**

Fittings of hoses (102, 103, and 104) at swivel elbows (105) and elbows (106) should be tagged "front" and "rear".

- d. Tag and remove hoses (103 and 104) from swivel elbows (105). Tag and remove hoses (102) from elbows (106).
- e. Tag and remove hydraulic hoses (103 and 104) from extension screed vibration motor (107). Remove hoses from extension screed.
- f. Remove swivel elbows (105) from elbows (106).
- g. Remove lock nuts (108) from elbows (106). Remove elbows from extension screed.
- h. Plug hoses and cap elbows to prevent hydraulic system contamination. If saturated, dispose of machinery wiping towel in accordance with local procedures.



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2-904**

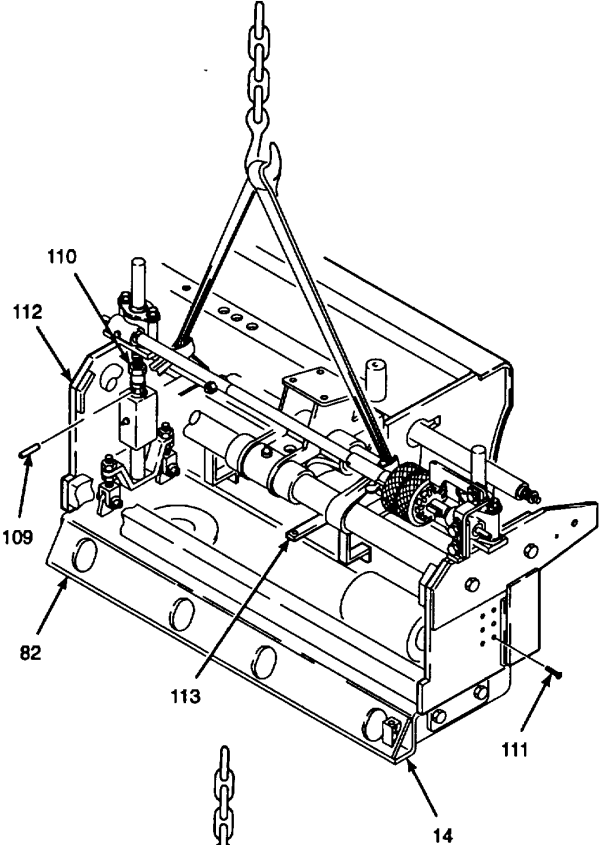
A. REMOVE - Continued.

12. REMOVE EXTENSION SCREED BASE.

**WARNING**

Extension screed weighs approximately 700 lbs (318 kg). Keep weight of extension screed supported with overhead lifting device. If not supported, extension screed frame can drop when height adjustment components are removed. Falling extension screed frame can cause serious personnel injury.

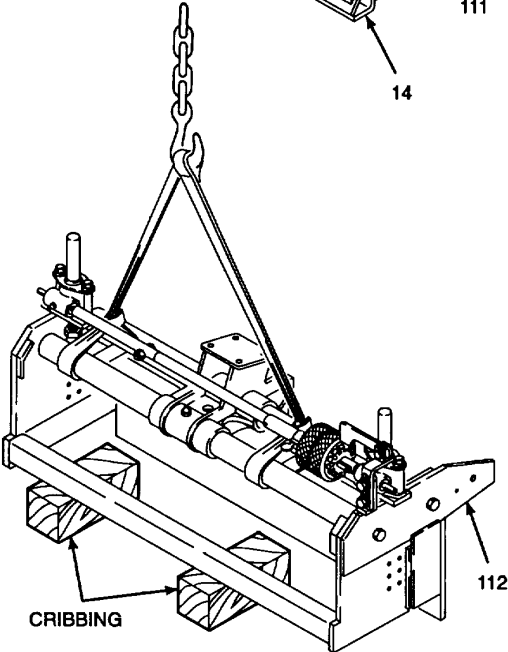
- a. Place lifting force on extension screed (14) with overhead lifting device. Keep sling straps tight. If not properly supported, extension screed frame can drop when height adjustment components are removed.
- b. Using hammer and 3/8 diameter drift punch, drive spring pins (109) from mating holes in height adjustment shafts (110). Discard spring pins.
- c. Remove socket head cap screws (111) at both ends of extension screed (14). If necessary, heat cap screws to about 500°F (260°C) with heater gun to soften thread locking compound.



**CAUTION**

When lifting extension screed frame from extension screed base, screed frame must be tilted forward to avoid contact between screed frame and shield bracket. If screed frame is not tilted properly, shield bracket will be bent or broken.

- d. Carefully raise extension screed frame (112) from extension screed base (82). Tilt screed frame forward to clear outermost shield bracket (113).
- e. Set extension screed frame (1 12) on cribbing as shown. Leave sling straps in place.



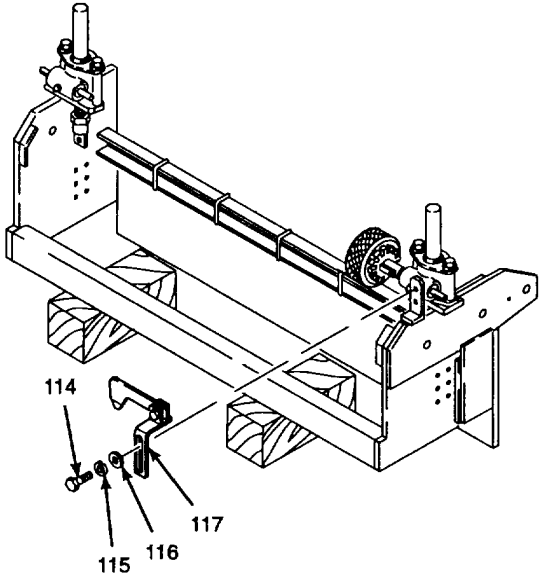
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2-905

**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

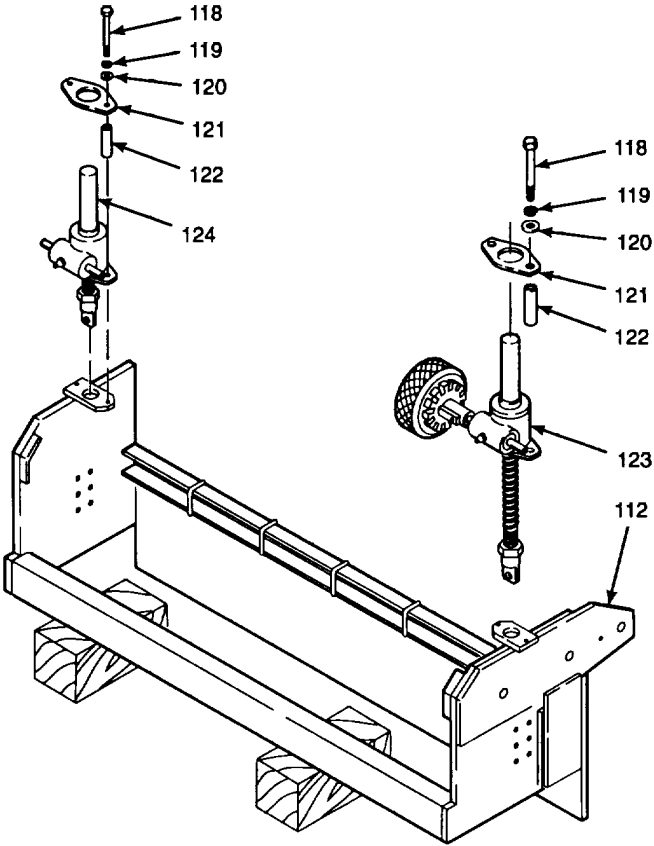
A. REMOVE - Continued.

**13. REMOVE HEIGHT ADJUST COMPONENTS.**

- a. Remove hex head cap screws (114), lockwashers (115), flat washers (116), and catch plate mounting bracket (117). Discard lockwashers.



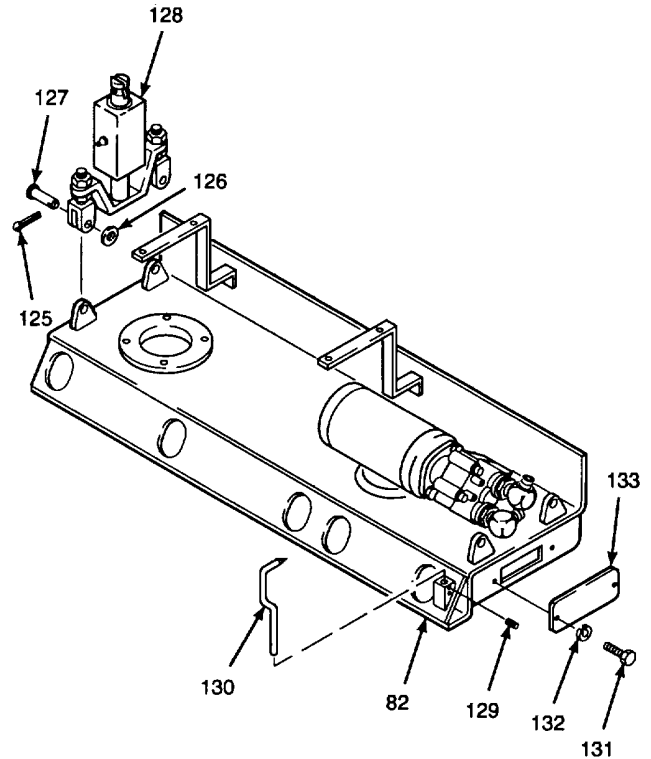
- b. Remove hex head cap screws (118), lockwashers (119), and flat washers (120). Discard lockwashers.
- c. Remove flange plates (121), spacers (122), and lift jack assemblies (123 and 124) from extension screed frame (112).



**GO TO NEXT PAGE**  
**2-906**

A. REMOVE - Continued.

- d. Remove cotter pins (125), flat washers (126), and clevis pins (127). Discard cotter pins.
  - e. Remove vertical adjustment block assemblies (128) with attached components from extension screed base (82).
  - f. Remove socket set screws (129) and height adjustment indicator (130).
  - g. Remove hex head cap screws (131), lockwashers (132), and cover plate (133). Discard lockwashers.
14. REMOVE EXTENSION SCREED GUIDE SUPPORT ASSEMBLY AND SHAFTS PER PARAGRAPH 2.73, A.2.a through e and A.2.g and h.
15. REMOVE EXTENSION SCREED VIBRATOR COMPONENTS PER PARAGRAPH 2.75.



B. CLEAN.

- 1. CLEAN BOLT AND CAP SCREW THREADS.

**WARNING**

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Clean threads of all bolts and cap screws with thread locking compound solvent.
  - b. Wipe bolt and cap screw threads dry with cleaning cloth.
2. USE CLEANING CLOTH TO WIPE RESIDUE FROM THREADS OF ELBOWS.

**GO TO NEXT PAGE  
2-907**

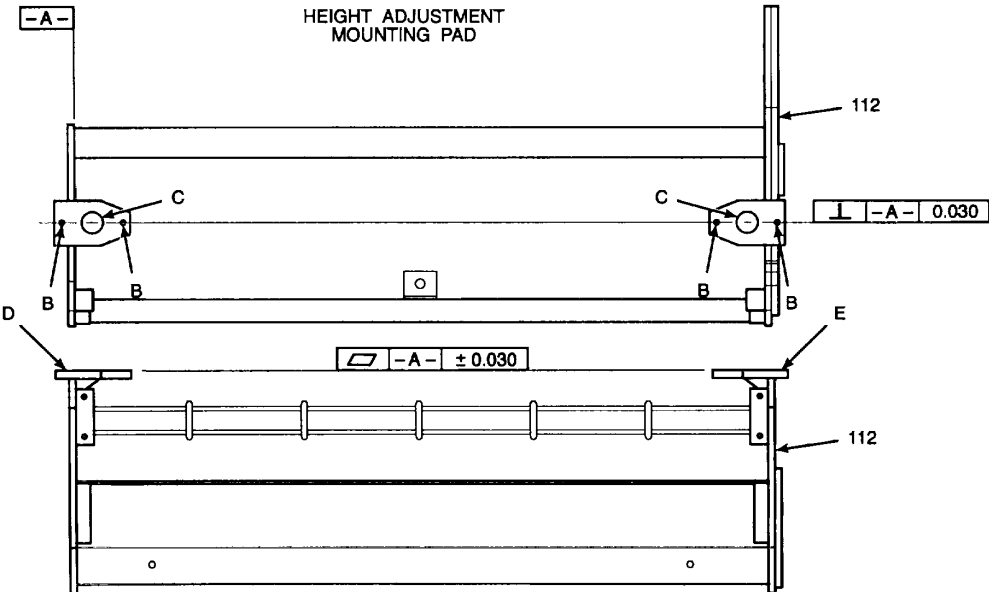
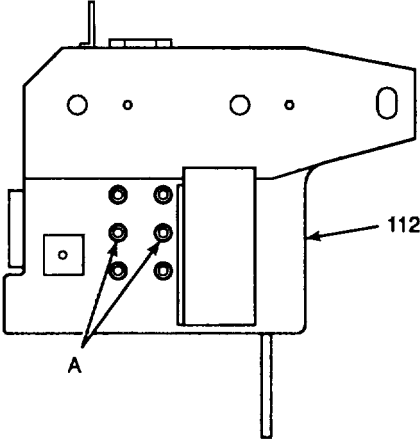


**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

**C. INSPECT.**

**1. INSPECT EXTENSION SCREED FRAME.**

- a. Install four 3/8-16 UNC x 4 in. hex head cap screws in holes A, located at each end of extension screed frame (112). Secure each cap screw with a 3/8-16 UNC hex nut on each side of extension screed frame plate.
- b. Suspend extension screed frame (112) on inspection angle plates. The screed frame must be supported only by the hex head cap screws installed in holes A.
- c. Check for perpendicularity between surface A and the lines that pass through the centers of threaded holes B and bores C of each height adjustment mounting pad.  
If either mounting pad centerline, when projected 46 in. (1168 mm) from surface A, is not within 1/16 in. (1,6 mm) of the line perpendicular to surface A, replace warped screed frame.
- d. Place a straightedge (at least 4 feet long) across surfaces D and E. If any point on surface D or E is not within 1/16 in. (1,6 mm) of the straightedge, replace warped extension screed frame.
- e. Visually inspect extension screed frame weld joints for cracks or breaks. If cracks or breaks are found, replace screed frame.

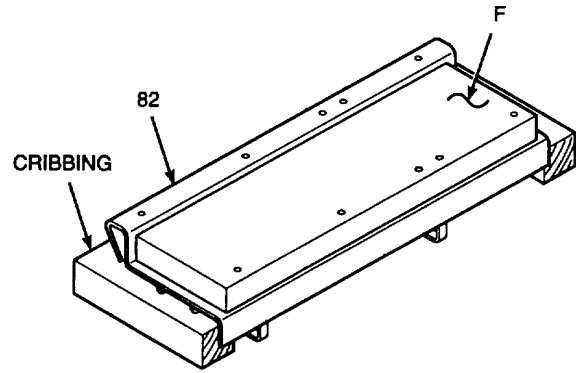


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2-908**

C. INSPECT - Continued.

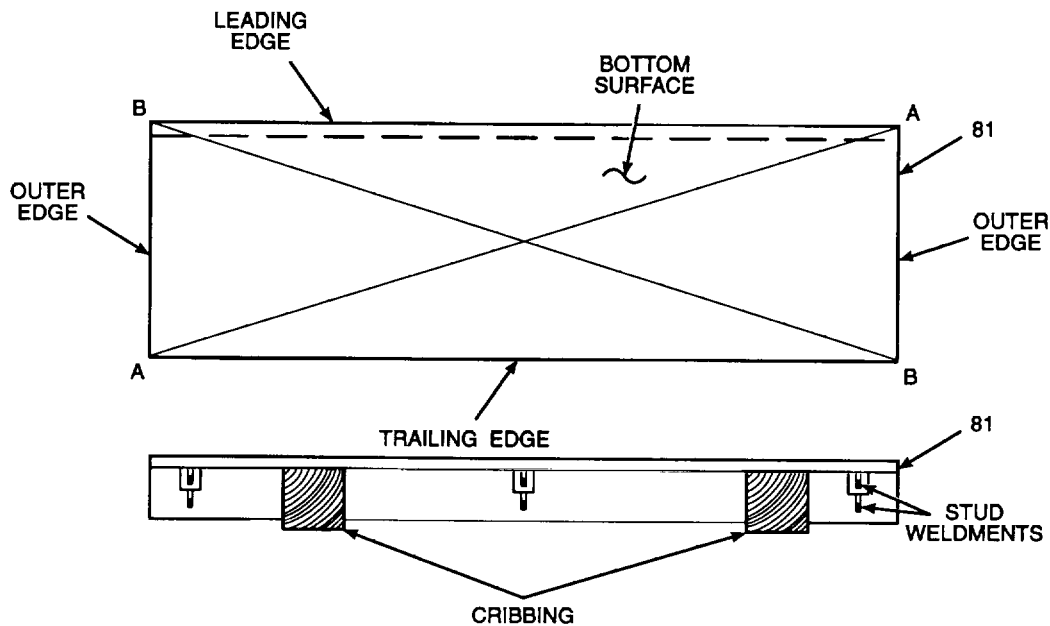
2. INSPECT EXTENSION SCREED BASE.

- a. Turn extension screed base (82) upside down. Support screed base with cribbing.
- b. Place straightedge diagonally between corners, along bottom surface F. If any point on surface F is not within 1/16 in. (1, 6 mm) of the straightedge, replace warped extension screed base.
- c. Visually inspect extension screed base (82) for cracks, breaks, or holes. If cracks, breaks, holes, other indications of damage are found, replace screed base.



3. INSPECT EXTENSION SCREED PLATE.

- a. Place extension screed plate (81), bottom up, on a flat surface.



- b. Place a straightedge diagonally across extension screed plate (81) along lines A-A and B-B. If any surface deformity along line A-A or B-B is greater than 0.060 in. (1,5 mm), replace warped screed plate.
- c. Inspect bottom surface of extension screed plate (81) for cracks or holes. If cracks or holes are seen, replace screed plate.
- d. Turn extension screed plate (81) over. Inspect stud weldments for weld cracks. If weld cracks are seen, replace screed plate.
- e. Inspect leading, trailing, and outer edges of extension screed plate (81) for dents that would affect the smoothness of the paving mat. If dents or other flaws are found, replace screed plate.

**GO TO NEXT PAGE**  
2-909

## D. INSTALL.

**NOTE**

The following procedures show right hand extension screed components only. The left hand extension screed is a mirror image of the right hand extension screed. All installation procedures are the same, unless otherwise indicated.

1. INSTALL EXTENSION SCREED VIBRATOR COMPONENTS PER PARAGRAPH 2.75.
2. INSTALL COVER PLATE AND HEIGHT ADJUSTMENT INDICATOR ON EXTENSION SCREED BASE.

**WARNING**

Thread locking compound can cause eye damage.

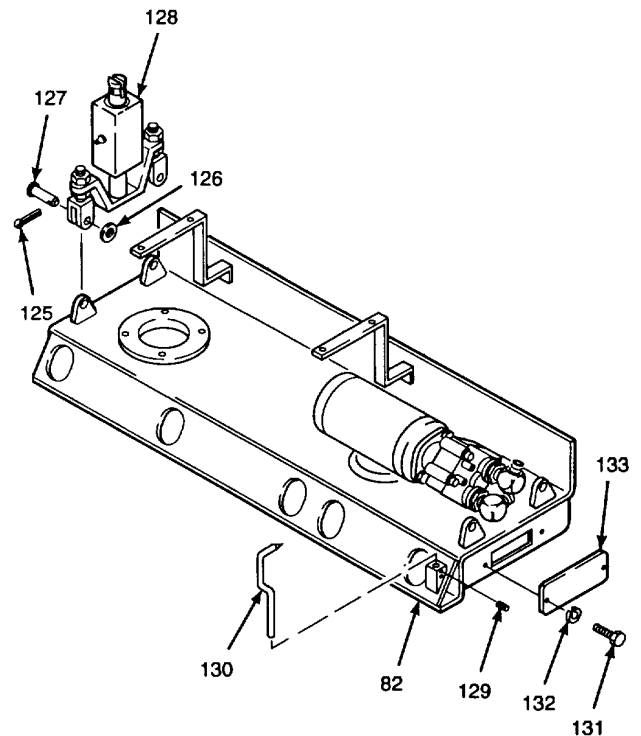
Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Install lockwashers (132) on hex head cap screws (131). Apply thread locking compound (Item 14, Appendix B) to cap screw threads.
- b. Install cover plate (133) and hex head cap screws (131). Tighten cap screws to 9 lb-ft (12 N•m).

**NOTE**

Height adjustment indicator will be repositioned during screed plate alignment procedure. Position of indicator in its mounting is not important at this time.

- c. Install height adjustment indicator (130) and secure with socket set screws (129).
3. INSTALL EXTENSION SCREED GUIDE SUPPORT ASSEMBLY AND SHAFTS PER PARAGRAPH 2.73.



4. INSTALL HEIGHT ADJUSTMENT COMPONENTS.
  - a. Line up devices on vertical adjustment block assemblies (128) with mating bosses on extension screed base (82).
  - b. Install clevis pins (127), flat washers (126), and cotter pins (125). Spread cotter pins to secure clevis pins.

**GO TO NEXT PAGE**  
**2-910**

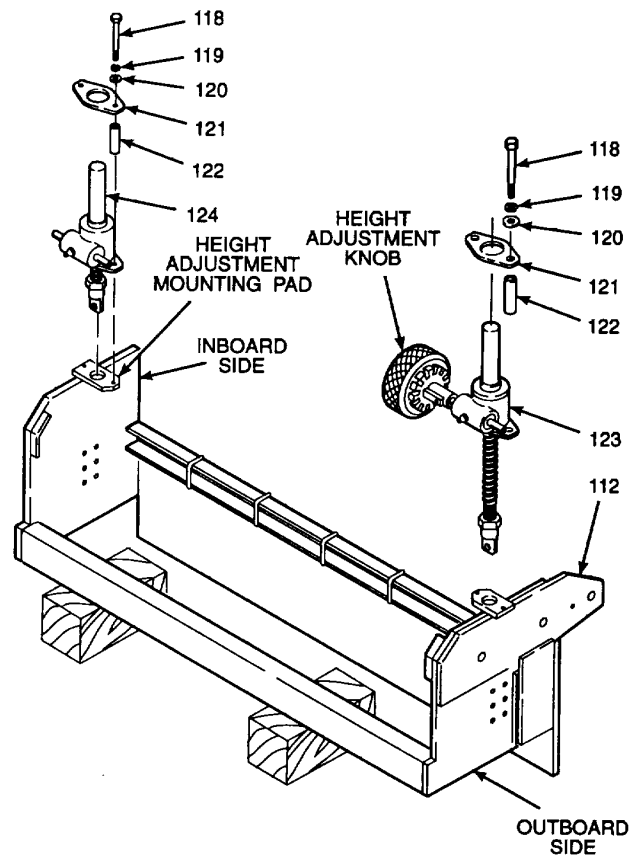
D. INSTALL - Continued.

- c. Insert lift jack assemblies (124 and 123) into mating bores of extension screed frame (112). The lift jack equipped with a height adjustment knob goes on outboard side of screed frame.
- d. Install lockwashers (119) and flat washers (120) on hex head cap screws (118). Insert cap screws through flange plate (121) and spacers (122).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- e. Apply thread locking compound (Item 14, Appendix B) to threads of hex head cap screws (118).
- f. Place flange plates (121) with installed spacers (122) and hex head cap screws (118) over lift jack assemblies (124 and 123).
- g. Line up hex head cap screws (118) with holes in lift jack assemblies (124 and 123) and height adjustment mounting pads. Install cap screws. Tighten cap screws to 37 lb-ft (50 N•m).



**GO TO NEXT PAGE**  
2-911

**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

## D. INSTALL - Continued.

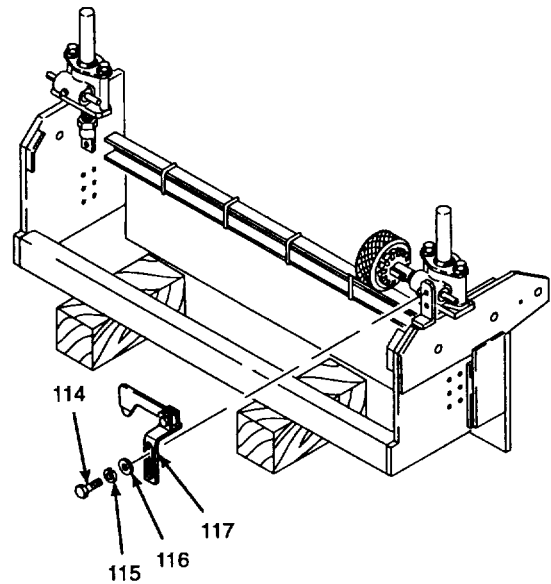
**WARNING**

Thread locking compound can cause eye damage.

Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- h. Install lockwashers (115) and flat washers (116) on hex head cap screws (114). Apply thread locking compound (Item 14, Appendix B) to threads of cap screws.
- i. Position catch plate mounting bracket (117) on mating strap bracket of extension screed frame. Lightly secure mounting bracket with lockwashers (115), flat washers (116), and hex head cap screws (114).
- j. Adjust catch plate mounting bracket (117) for proper seating of catch plate in height adjustment knob lock slot. When properly adjusted, tighten hex head cap screws (114) to  

12	lb-ft	(16	N•m).
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**GO TO NEXT PAGE**  
**2-912**

- D. INSTALL - Continued.
5. COUPLE EXTENSION SCREED FRAME TO EXTENSION SCREED BASE.

**WARNING**

Extension screed weighs approximately 700 lbs (318 kg). Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.

- a. Using sling straps and overhead lifting device, lift extension screed frame (112) just above floor level. Adjust sling straps until both sides of screed frame are about the same height above floor surface.

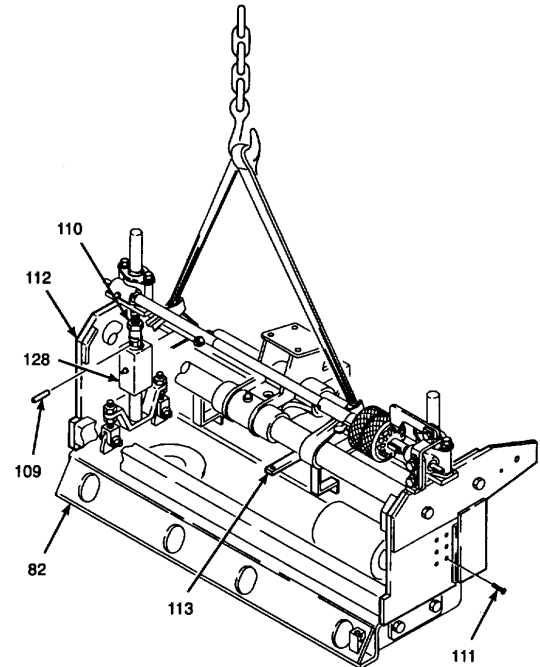
**CAUTION**

When lowering extension screed frame onto extension screed base, screed frame must be tilted forward to avoid contact between screed frame and shield bracket. If screed frame is not tilted properly, shield bracket will be bent or broken.

- b. Position extension screed frame (112) over extension screed base (82). Carefully lower screed frame over screed base. Tilt screed frame forward to clear outermost shield bracket (113).
- c. When beyond shield bracket (113), line up extension screed frame (112) to clear guide blocks on vertical adjustment block assembly (128). Slowly lower screed frame until sides are about 8 in. (200 mm) above floor surface.
- d. Slide guide blocks up on vertical adjustment block assembly (128). Line up guide block screw holes with through holes in sides of extension screed frame (112).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.



- e. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screws (111). Install cap screws.
- f. Using a hex head driver socket and socket wrench adapter, evenly tighten socket head cap screws (111) to 30 lb-ft (41 N•m).
- g. Using overhead lifting device, raise or lower extension screed frame (112) to align spring pin holes in height adjustment shafts (110).
- h. Use hammer and 3/8 in. drift punch to drive spring pins (109) to seat in height adjustment shafts (110).

**GO TO NEXT PAGE**  
2-913

**2.66. REPLACE EXTENSION SCREED FRAME - Continued****D. INSTALL - Continued.****6. INSTALL EXTENSION SCREED HYDRAULIC LINES AND FITTINGS.**

- a. Install elbows (106) through mating ports of extension screed frame (112). Install and tighten lock nuts (108) on elbows.

**WARNING**

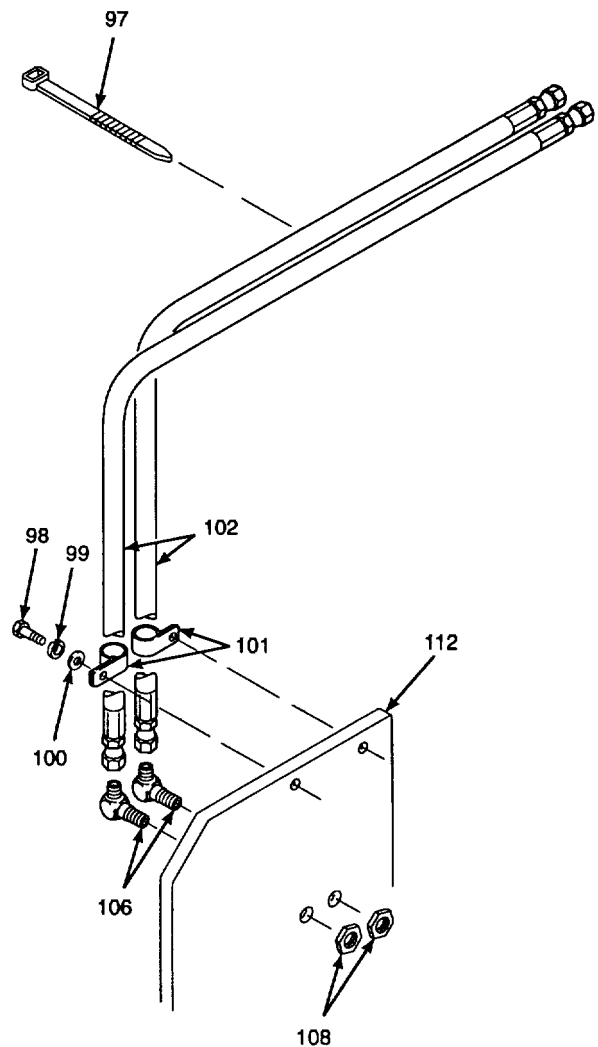
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply hydraulic fitting sealant to threads of elbows (106).
- c. Install and tighten hoses (102) on elbows (106). Ensure that hose fitting tagged "front" is installed on front elbow.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- d. Install lockwashers (99) and flat washers (100) on hex head cap screws (98). Apply thread locking compound (Item 14, Appendix B) to threads of cap screws.
- e. Secure clamps (101) to extension screed frame (112) with hex head cap screws (98), lockwashers (99), and flat washers (100). Tighten cap screws to 9 lb-ft (12 N•m).
- f. Install tie wraps (97) as needed to secure hoses (102).



**GO TO NEXT PAGE**  
**2-914**

D. INSTALL - Continued.

- g. Route extension screed vibrator hoses (103 and 104) through conduit channel of extension screed frame (112).

**WARNING**

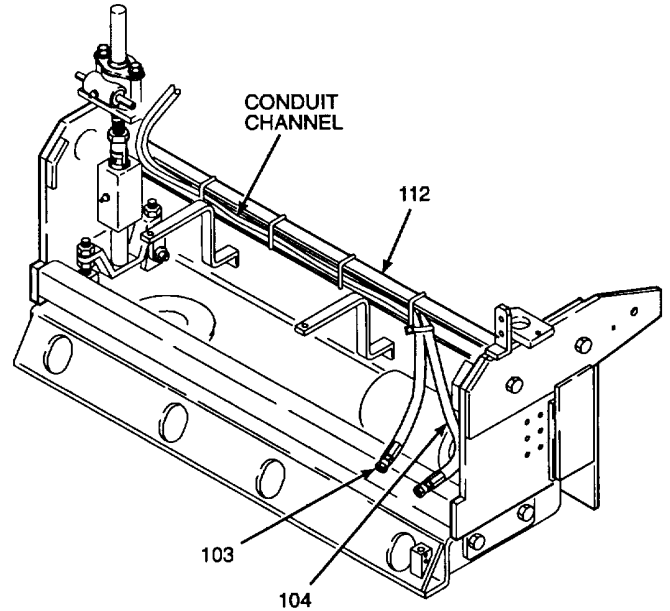
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- h. Apply hydraulic fitting sealant to threads of elbows (106). Install and tighten swivel elbows (105) on elbows in direction shown.
- i. Apply hydraulic fitting sealant to threads of swivel elbows (105).

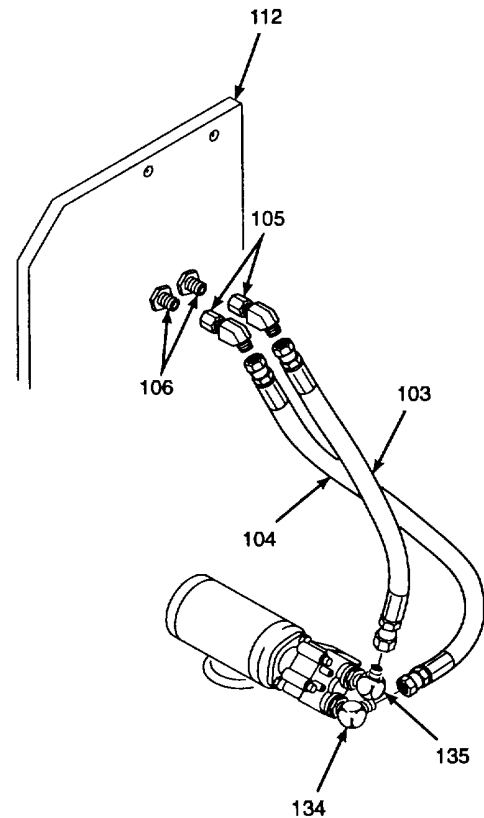
**CAUTION**

Proper operation of screed vibrator depends on correct rotation of screed vibration motor. Hydraulic flow to and from vibration motor determines direction of motor rotation. Failure to connect hydraulic hoses to correct ports and fittings may result in faulty operation of vibration system, and could result in equipment damage.

- j. Install and tighten hoses (103 and 104) on swivel elbows (105).
- k. Apply hydraulic fitting sealant to threads of elbows (134 and 135).
- l. Install and tighten hoses (103 and 104) on elbows (134 and 135).



NOTE: EXTENSION SCREED GUIDE SUPPORT ASSEMBLY AND SHAFTS REMOVED FOR CLARITY.





**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

D. INSTALL - Continued.

7. INSTALL EXTENSION SCREED.

**WARNING**

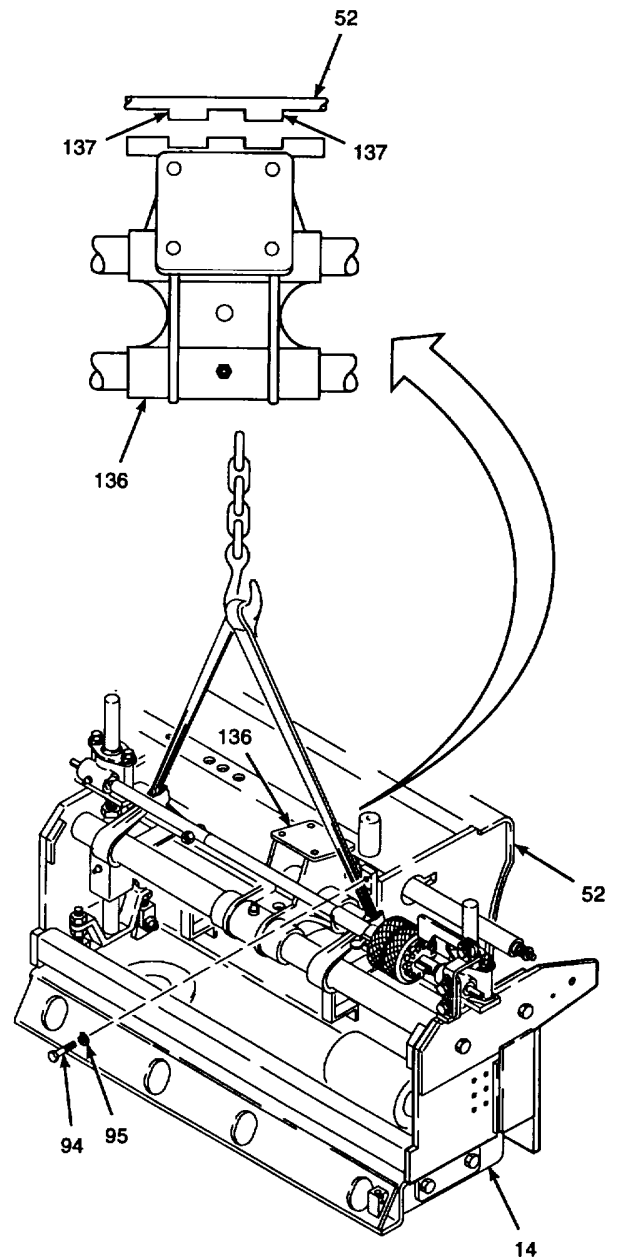
**Extension screed weighs approximately 700 lbs (318 kg). Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.**

- a. Using overhead lifting device and installed sling straps, raise extension screed (14).
- b. Position extension screed (14) to mate way slots in guide shaft support (136) with guide bars (137) on main screed (52). Slowly lower extension screed to align mounting holes in guide shaft support and main screed.

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Install lockwashers (95) on hex head cap screws (94). Apply thread locking compound (Item 13, Appendix B) to threads of cap screws.
- d. Install hex head cap screws (94) and lockwashers (95) in mounting holes of guide shaft support (136). Using socket wrench set, tighten upper three cap screws.
- e. Using 6- and 12-in. extensions from socket wrench set, tighten lower three hex head cap screws (94) to 180 lb-ft (244 N•m).
- f. Lower overhead lifting device and remove sling straps from extension screed (14).



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2-916

## D. INSTALL - Continued.

**WARNING**

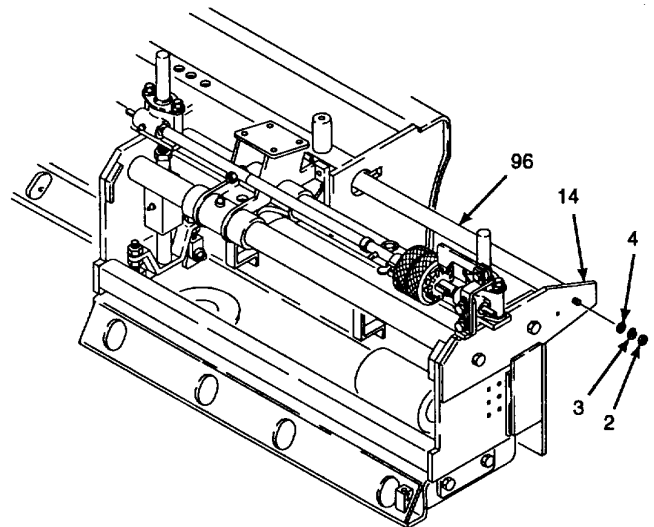
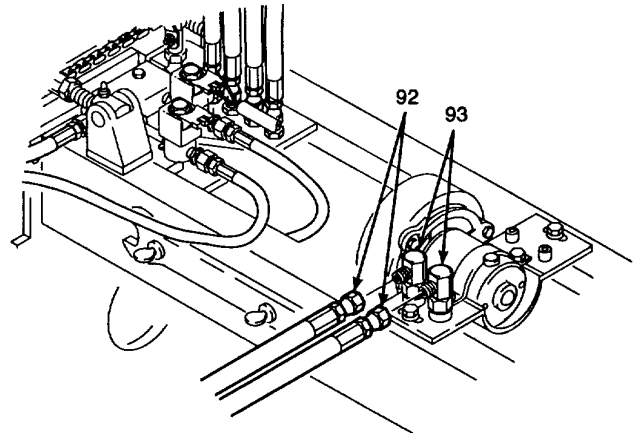
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- g. Apply hydraulic fitting sealant to threads of elbows (93). Install and tighten hoses (92) on elbows.
- h. Start paving machine and raise screed 4 to 6 in. Above floor per TM 5-3895-373-10.
- i. Extend screed extension cylinder per TM 5-3895-373-10. Jog screed extension cylinder piston rod (96) slowly until piston rod is seated in mating hole of extension screed (14).
- j. Lower screed and shut down paving machine per TM 5-3895-373-10.

**NOTE**

Screed extension cylinder piston rod hardware (2, 3, and 4) should be installed to allow extension screed to be repositioned during components installation procedures.

- k. Install and tighten flat washer (4), lockwasher (3), and hex nut (2). This hardware will be removed and reinstalled during installation of endgate.



**GO TO NEXT PAGE**  
2-917

**2.66. REPLACE EXTENSION SCREED FRAME - Continued****D. INSTALL - Continued.**

1. Route screed harness (59) and screed burner fuel hose (66) through conduit channel of extension screed frame (112).
- m. Install lockwasher (69) and flat washer (70) to hex head cap screw (68).

**WARNING**

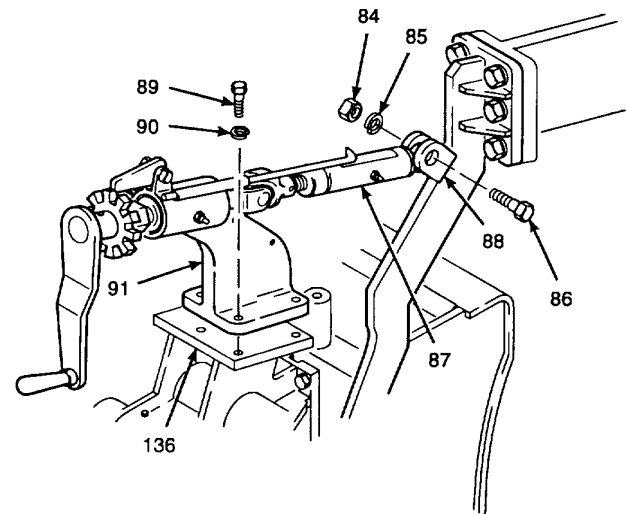
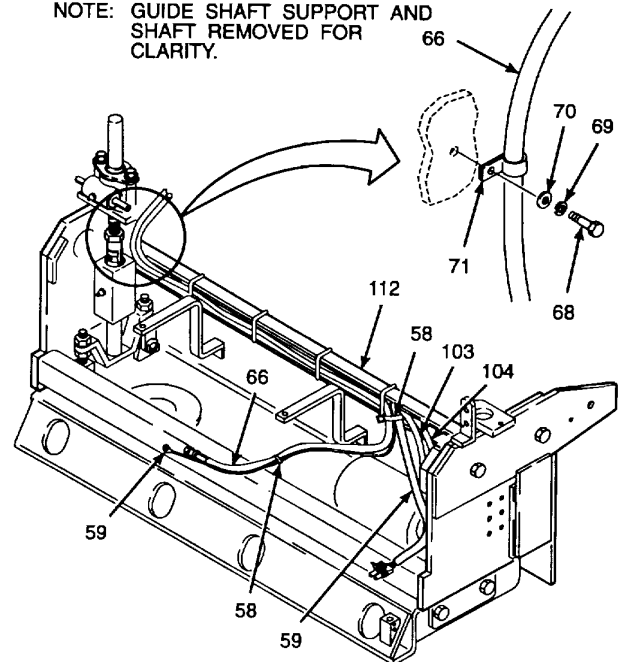
**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- n. Apply thread locking compound (Item 14, Appendix B) to hex head cap screw (68) and secure clamp (71) and burner fuel hose (66) to extension screed frame inner plate.
- o. Install tie wraps (58) on screed harness (59), screed burner fuel hose (66), and hydraulic hoses (103 and 104). Refer to opposite extension screed for proper tie wrap locations.

**8. INSTALL THICKNESS CONTROL COMPONENTS.**

- a. Set screed thickness control mounting bracket (91) on guide shaft support (136). Align mounting bracket mounting holes.
- b. Install lockwashers (90) onto hex head cap screws (89).
- c. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (89).
- d. Install hex head cap screws (89) and lockwashers (90). Tighten hex head cap screws to 90 lb-ft (122 N•m).
- e. Insert link (87) in screed arm bracket (88) and install hex head cap screw (86) and lockwasher (85). Apply thread locking compound (Item 13, Appendix B) to threads of cap screw.
- f. Install hex nut (84). Tighten hex nut to 180 lb-ft (244 N•m)

NOTE: GUIDE SHAFT SUPPORT AND SHAFT REMOVED FOR CLARITY.

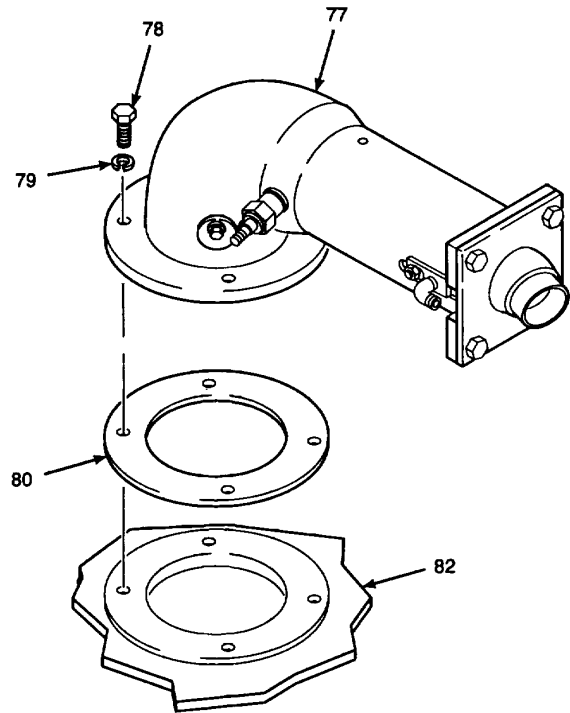


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2-918**

D. INSTALL- Continued.

9. INSTALL BURNER CHAMBER ASSEMBLY.

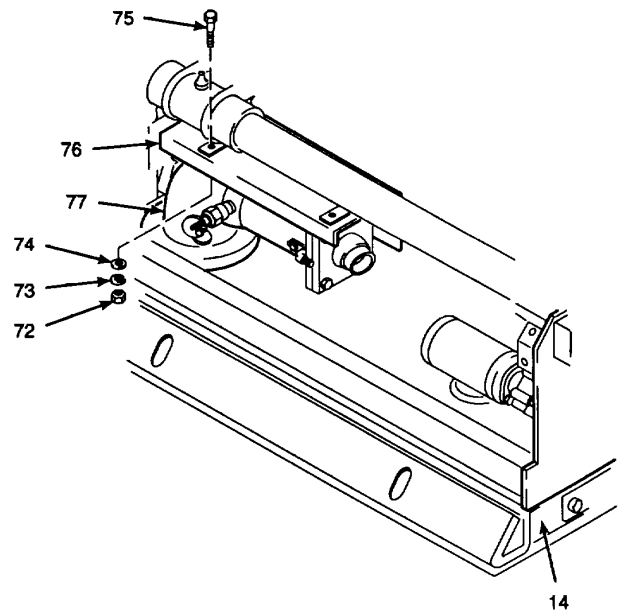
- a. Install gasket (80). Align mounting holes in gasket and extension screed base (82).
- b. Install burner chamber assembly (77). Align mounting holes in burner chamber with gasket (80) and extension screed base (82).



**WARNING**

**Sealing compound and thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Install lockwashers (79) on hex head cap screws (78). Apply sealing compound to threads of cap screws.
- d. Install hex head cap screws (78) and lockwashers (79). Tighten cap screws to 37 lb-ft (50 N•m).
- e. Insert shield (76) into extension screed (14). Slide shield inward, between burner chamber assembly (77) and shield brackets.
- f. Instruct second person to hold shield (76) up against shield brackets and align mounting holes.
- g. Apply thread locking compound (Item 14, Appendix B) to threads of bolts (75). Insert bolts down through shield brackets and shield (76).
- h. Install flat washers (74), lockwashers (73), and hex nuts (72). Tighten hex nuts to 19 lb-ft (26 N•m).



**GO TO NEXT PAGE  
2-919**

**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

## D. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

**CAUTION**

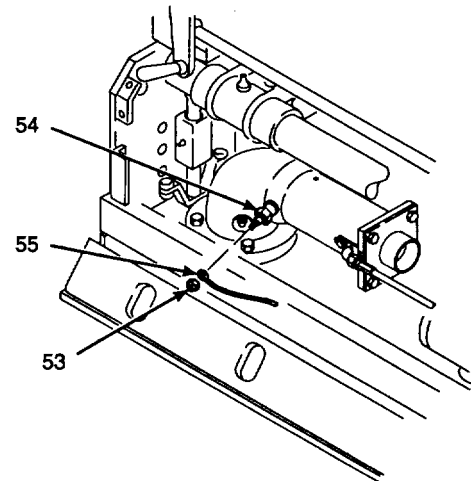
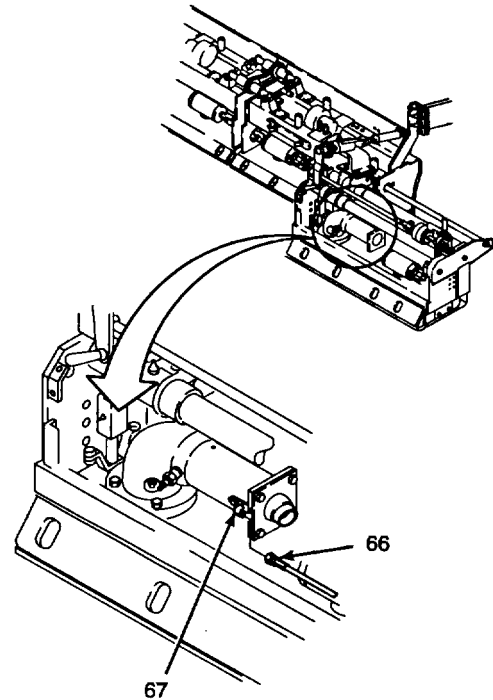
Do not apply hydraulic fitting sealant to leading threads of elbow. Seepage of sealant into fuel system may clog fuel nozzle.

- i. Apply hydraulic fitting sealant to threads of elbow (67). Avoid getting sealant on leading threads.
- j. Install and tighten screed burner fuel hose (66) on elbow (67).

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- k. Install lead wire (55) and terminal nut (53) on terminal of glow plug (54). Apply electrical insulating varnish to glow plug terminal.



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2-920

D. INSTALL - Continued.

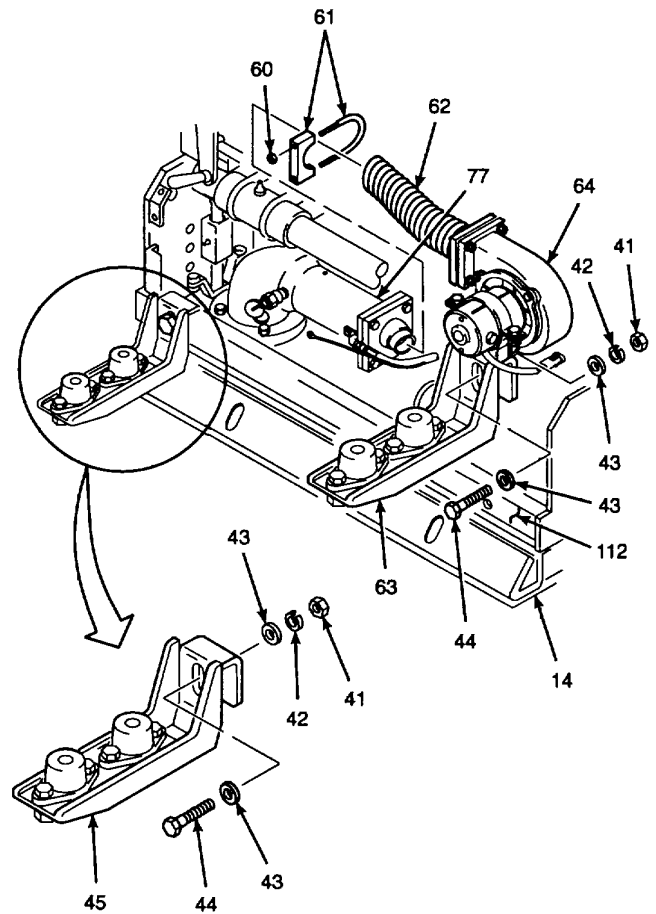
10. INSTALL BLOWER.

- a. Install flexible pipe (62) to open end of burner chamber assembly (77).
- b. Install step supports (45 and 63), with attached blower (64), on extension screed (14). Align mounting holes in step support and extension screed frame (112).
- c. Install one flat washer (43) on hex head cap screws (44).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

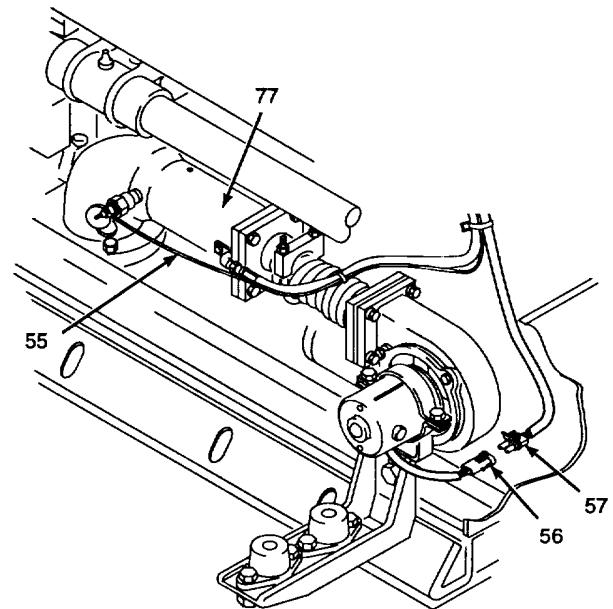
- d. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screws (44). Insert cap screws through step supports (63 and 45) and extension screed frame (112).
- e. Install second flat washer (43), lockwasher (42), and hex nut (41). Tighten hex nut to 19 lb-ft (26 N•m).
- f. Apply thread locking compound (Item 14, Appendix B) to threads of clamp (61).
- g. Install clamp (61) on flexible pipe (62) and secure with hex nuts (60). Tighten hex nuts evenly to 9 lb-ft (12 N•m).



**GO TO NEXT PAGE  
2-921**

**2.66. REPLACE EXTENSION SCREED FRAME - Continued****D. INSTALL - Continued.**

- h. Apply electrical insulating compound to screed harness electrical connector (57).
- i. Plug blower motor electrical connector (56) into screed harness electrical connector (57).
- j. Install tie wraps to secure lead wire (55) away from burner chamber (77).
- k. Start engine per TM 5-3895-373-10. Raise screed. Extend and retract extension screed to ensure freedom of movement of hydraulic and fuel hoses. Remove and relocate tie wraps as required.
- l. Shut down engine per TM 5-3895-373-10.

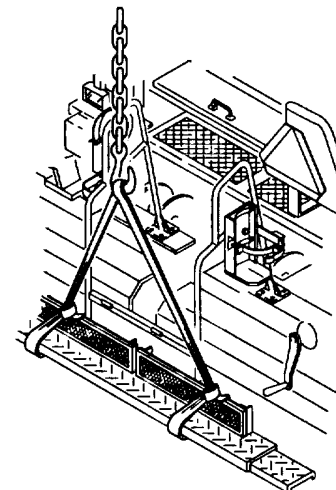
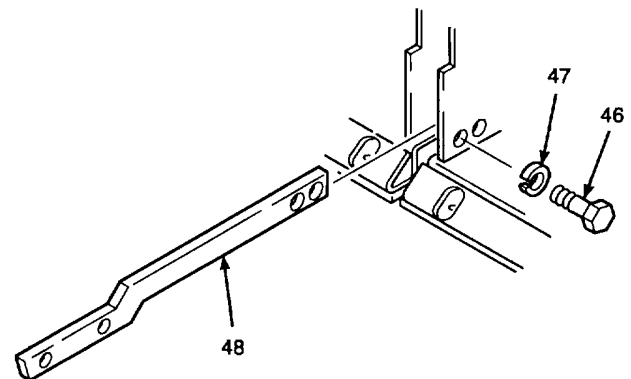
**11. INSTALL SCREED STEPS.**

- a. If only left hand main screed was removed, proceed to step b. If right hand main screed was removed, temporarily secure center step support (48) to main screed with hex head cap screws (46) and lockwashers (47). Do not fully tighten cap screws at this time.

**WARNING**

**Handrail and attaching steps weigh approximately 120 lbs (55 kg). Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.**

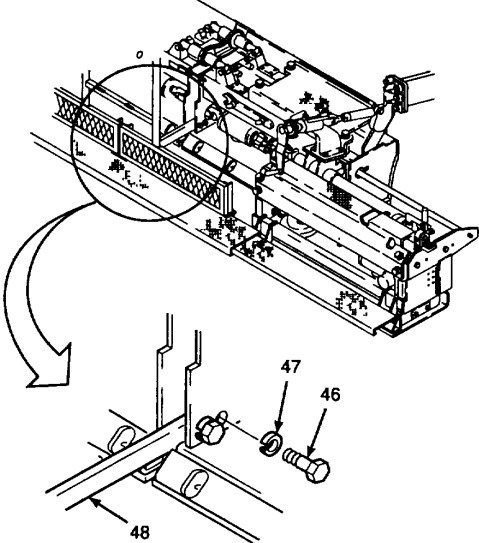
- b. With overhead lifting device, sling straps, and the help of a second person, raise handrail with attached steps. Position and lower handrail and steps into approximate mounting location on screed.



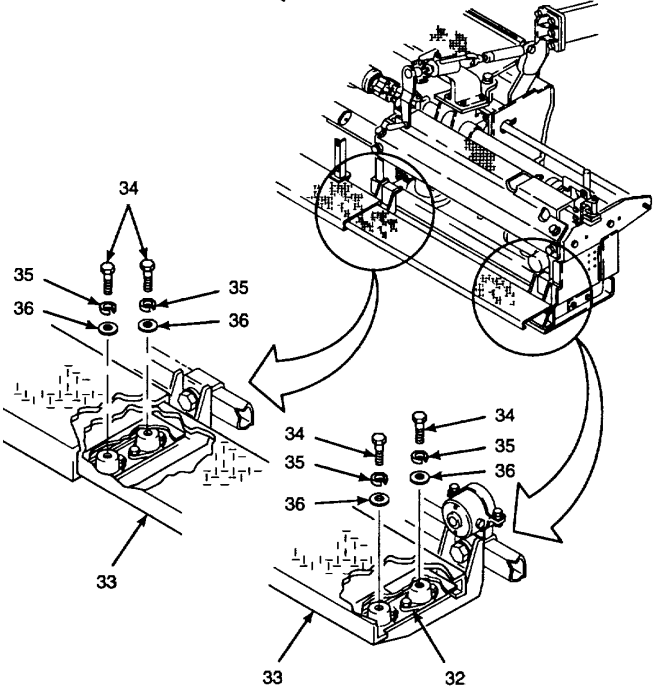
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2-922**

D. INSTALL - Continued.

c. With the help of another person, align central mount holes of main step (37) with mount holes of center step support (48). Temporarily install hex head cap screws (40), washers (39), and hex nuts (38).



d. Align mounting holes of extension steps (33) with vibration mounts (32).



GO TO NEXT PAGE  
2-923



**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

D. INSTALL - Continued.

- e. Remove one of two hex head cap screws (46) along with lockwasher (47) from mounting holes of center step support (48).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- f. Apply thread locking compound (Item 13, Appendix B) to the threads of hex head cap screw (46).
- g. Install hex head cap screw (46). Do not tighten at this time.
- h. Remove second hex head cap screw (46) along with lockwasher (47).
- i. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screw (46).
- j. Install second hex head cap screw (46).
- k. Tighten hex head cap screws (46) to 90 lb-ft (122 N•m).

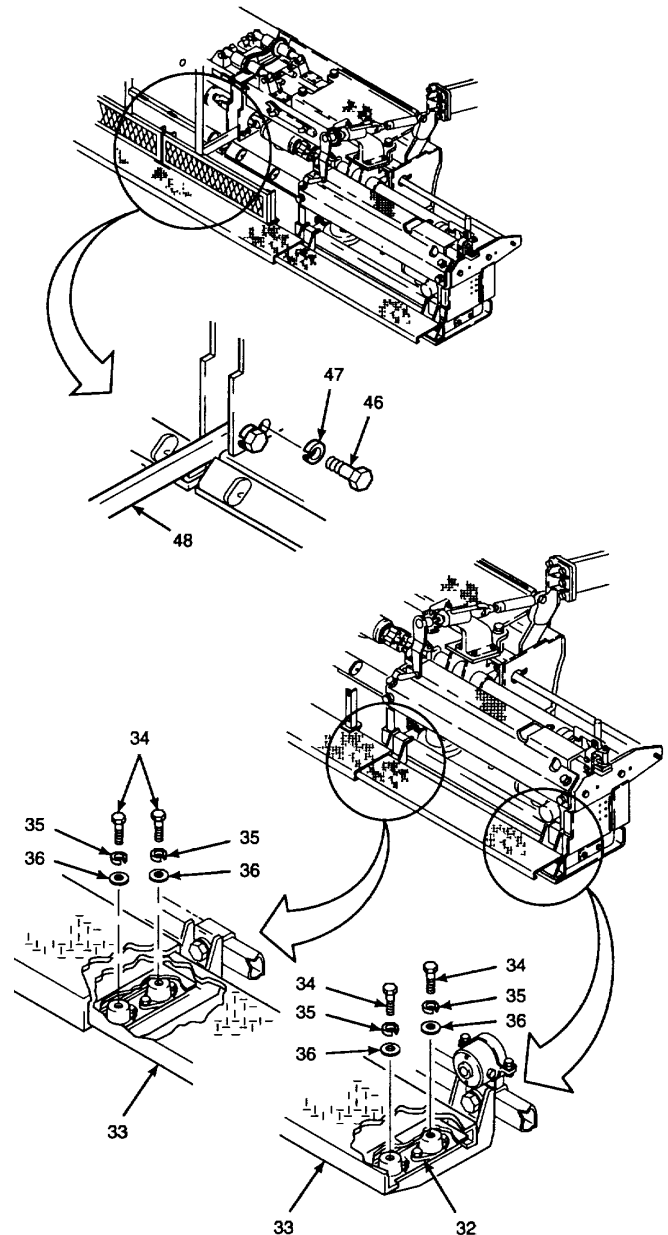
**CAUTION**

**Do not apply thread locking compound to hex head cap screws (34). Damage to vibration mounts (32) could occur during removal if thread locking compound is applied.**

**NOTE**

There are two vibration mounts on each end of the right and left extension steps.

- l. Secure extension steps (33) to vibration mounts (32) using hex head cap screws (34), flat washers (36), and lockwashers (35). Do not apply thread locking compound to hex head cap screws. m. Tighten hex head cap screws (34) snug.



- m. Tighten hex head cap screws (34) snug.

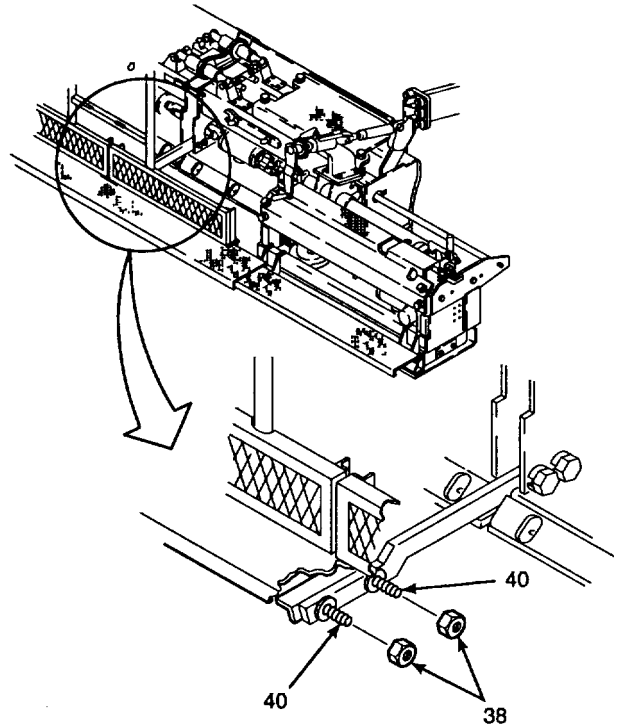
## D. INSTALL - Continued.

- n. Remove one of two hex nuts (38).

<b>WARNING</b>
----------------

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- o. Apply thread locking compound (Item 13, Appendix B) to threads of installed hex head cap screw (40).
- p. Install hex nut (38). Do not tighten at this time.
- q. Remove second hex nut (38).
- r. Apply thread locking compound (Item 13, Appendix B) to threads of installed hex head cap screw (40).
- s. Install hex nut (38). Tighten both hex nuts to 37 lb-ft (50 N•m).
- t. Remove cribbing from screed per TM 5-3895-373-20.
- u. Retract extension screeds and lower screed per TM 5-3895-373-10.



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2-925

**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

D. INSTALL - Continued.

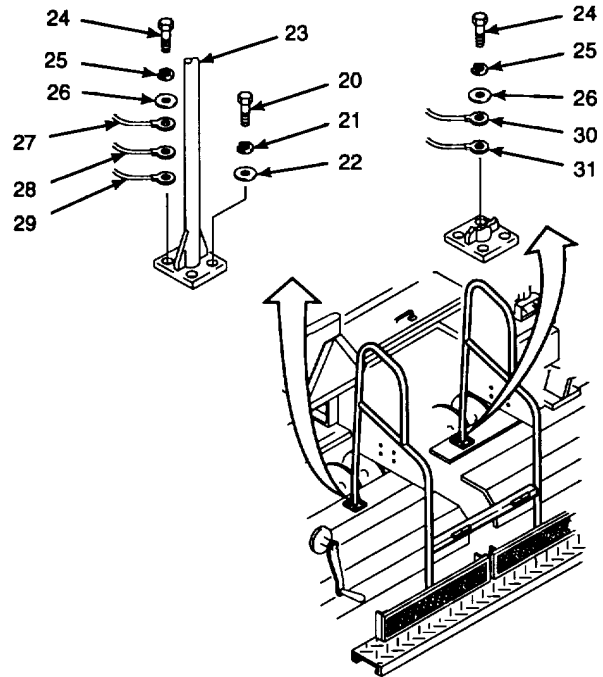
12. INSTALL SCREED HANDRAIL.

- a. With the help of another person, line up right leg of screed handrail (23) with mounting holes in screed frame.
- b. Install lockwasher (25) and flat washer (26) onto hex head cap screw (24).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Apply thread locking compound (Item 13, Appendix B) to threads of hex head cap screw (24).
- d. Install but do not tighten hex head cap screw (24) and ground wires (30 and 31) into forward right hand screw hole on right side handrail mounting base.
- e. Install lockwasher (25) and flat washer (26) onto hex head cap screw (24).
- f. Apply thread locking compound (Item 14, Appendix B) to threads of hex head cap screw (24).
- g. Install but do not tighten hex head cap screw (24) and ground wires (27, 28, and 29) into forward left hand screw hole on left side handrail mounting base.
- h. Install lockwashers (21) and flat washers (22) onto hex head cap screws (20).
- i. Apply thread locking compound (Item 14, Appendix B) to threads of hex head cap screws (20).
- j. Install hex head cap screws (20) into remaining screw personnel become dizzy or drowsy during use, holes on handrail mounting bases.
- K Tighten hex head cap screws (20 and 24) to 37 lb-ft (50 N•m).



**WARNING**

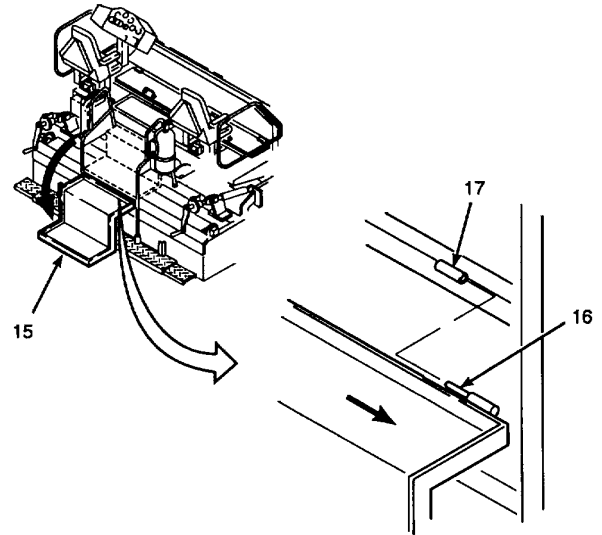
**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- l. Apply electrical insulating varnish to ring terminals of ground wires (27 through 31).

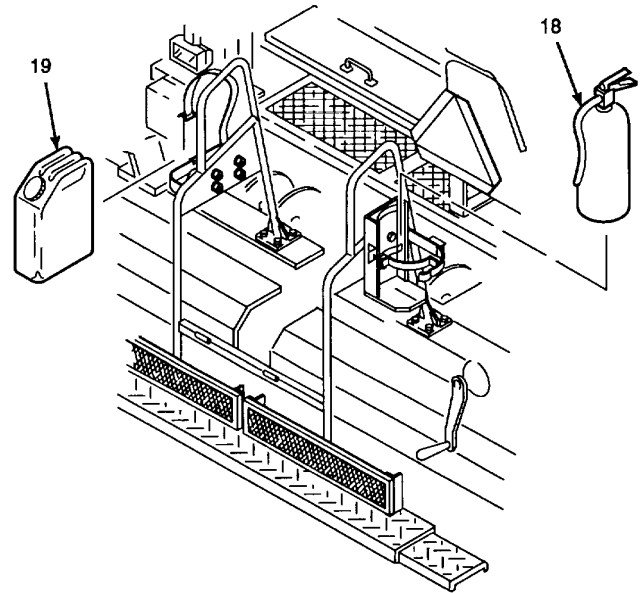
D. INSTALL - Continued.

13. INSTALL SCREED STEPS.

- a. Position screed steps (15) to align the-hinge pins (16) with the hinges (17).
- b. With screed steps (15) full back, slide the steps to the left, so the hinge pins (16) fit into the hinges (17).
- c. Lift the push screed steps (15) forward until fully seated.



- d. Install fire extinguisher (18) and decontamination can (19).



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2-927

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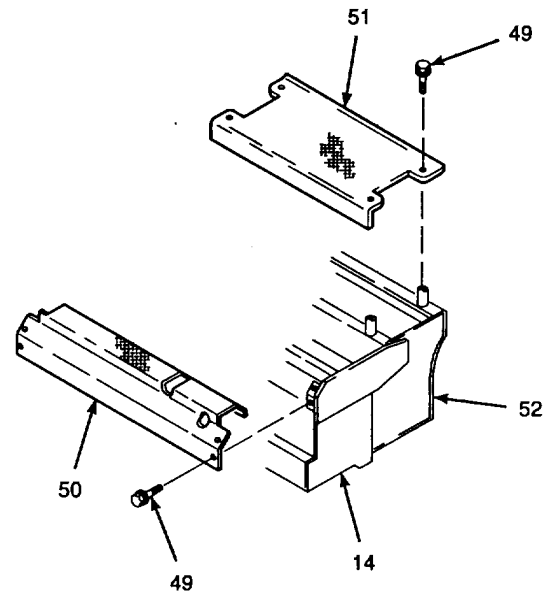
**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

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D. INSTALL - Continued.

14. INSTALL SCREED COVER PLATES.

- a. Install screed cover plate (50) and self-locking machine screw (49) onto screed extension (14).
- b. Install screed cover plate (51) and self-locking machine screw (49) onto main screed (52).
- c. Tighten self-locking machine screws (49) to 19 lb-ft (26 N•m).



**NOTE**

FOLLOW-ON-TASKS: Install extension screed plate per paragraph 2.71.  
Align extension screed plates per TM 5-3895-373-20.

**END OF TASK**

---

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**2.67 REPLACE MAIN SCREED FRAME.**

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**This task covers:**      **a. Removal**                      **b. Install**                      **c. Inspect**  
                                  **d. Install**

---

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)  
 Chain assembly (Item 29, Appendix D)  
 Combination square (Item 96, Appendix D)  
 Hex head driver socket (Item 85, Appendix D)  
 Hex head screw caps, 2 ea (Item 76, Appendix D)  
 Plastic hammer (Item 50, Appendix D)  
 Snap ring pliers (Item 66, Appendix D)  
 Socket wrench adapter (Item 6, Appendix D)  
 Straightedge (Item 27, Appendix C)  
 Torque wrench (Item 132, Appendix D)  
 Wire scratch brush (Item 13, Appendix D)

Materials/Parts:

Anti-seize compound (Item 8, Appendix B)  
 Cleaning cloths (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Electrical insulating compound (Item 10, Appendix B)  
 Electrical insulating varnish (Item 38, Appendix B)  
 Grease (Item 18, Appendix B)  
 Hydraulic fitting sealant (Item 26, Appendix B)  
 Machinery wiping towels (Item 37, Appendix B)  
 Protective caps (Item 3, Appendix B)  
 Sealing compound (Item 30, Appendix B)  
 Tags (Item 34, Appendix B)  
 Thread locking compound (Item 13, Appendix B)  
 Thread locking compound (Item 14, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Tie wraps (Item 36, Appendix B)  
 Exhaust clamps  
 Gasket  
 Lockwashers  
 Sleeve bushings  
 Spring pins

Personnel Required:

Two 62B construction equipment repairers. Extra person to assist with separating and assembling main screed frames.

References:

LO 5-3895-373-12  
 TM 5-3895-373-10  
 TM 5-3895-373-20  
 TM 5-3895-373-24P

Equipment Condition:

Screed removed per TM 5-3895-373-20.  
 Screed tow arms removed per TM 5-3895-373-20.  
 Screed extension cylinder removed per TM 5-3895-373-20.

Strikeoff components removed per TM 5-3895-373-20.  
 Main screed plate removed per paragraph 2.71.  
 Extension screed frame (both extensions) removed per paragraph 2.66.

**NOTE**

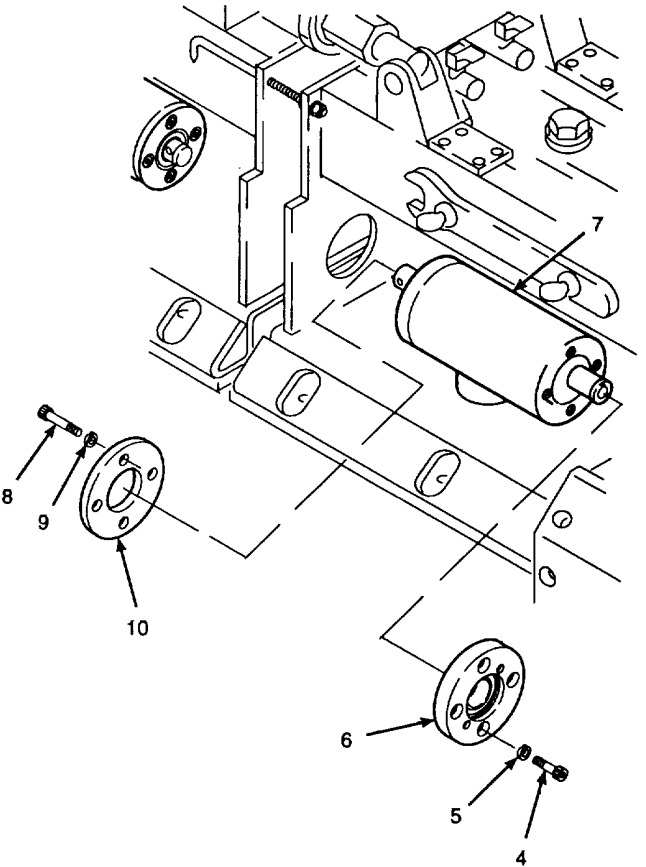
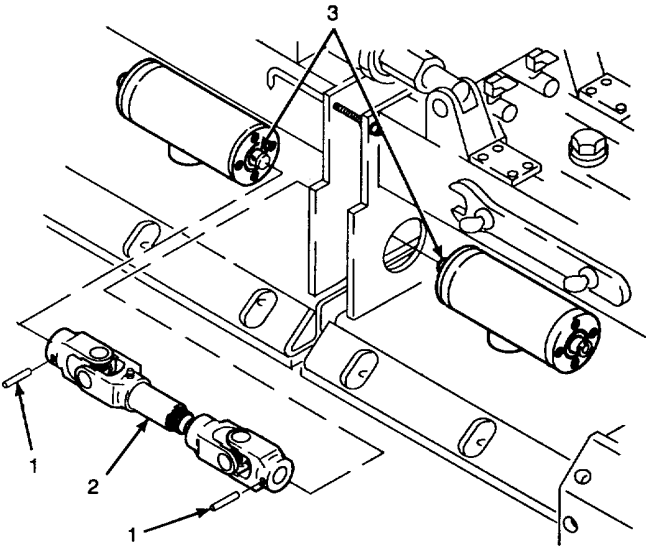
There is a left hand and a right hand main screed frame. This task can be used for replacement of both left hand and right hand main screed frames. Differences between left hand and right hand main screed frame components are addressed in text. Perform only those steps necessary to replace left hand or right hand main screed frames.

**GO TO NEXT PAGE**  
**2-929**

**2.66. REPLACE EXTENSION SCREED FRAME - Continued**

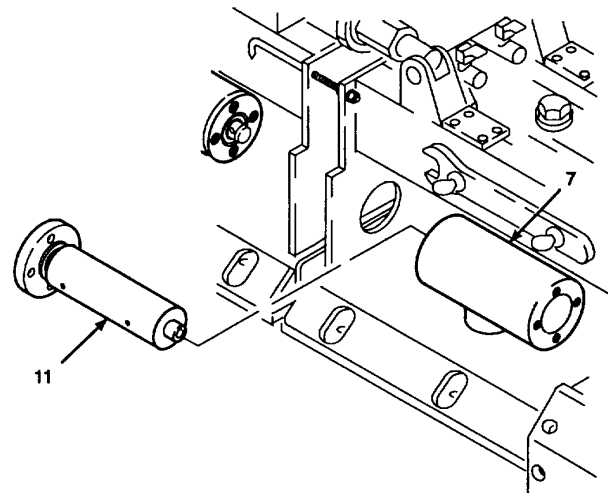
A. REMOVE.

- 1. REMOVE MAIN SCREED VIBRATION MOTOR PER TM 5-3895-373-20.
- 2. REMOVE MAIN SCREED VIBRATOR COMPONENTS FROM MAIN SCREED.
  - a. Remove spring pins (1) from universal joint (2) and drive shafts (3) by using a 3/8 in. drive pin punch and pliers. Discard spring pins.
  - b. Free universal joint from one of the drive shafts by pushing one end of universal joint toward the center. Use a large screwdriver to pry end of universal joint off of drive shaft if necessary.
  - c. Remove universal joint (2) from main screed.
  - d. Remove socket head cap screws (4) and lockwashers (5). Discard lockwashers.
  - e. Remove motor mount (6) from vibrator housing (7).
  - f. Remove socket head cap screws (8) and lockwashers (9). Discard lockwashers.
  - g. Remove retainer plate (10).



**GO TO NEXT PAGE**  
**2-930**

- A. REMOVE - Continued.
- h. Remove assembled drive shaft (11) from vibrator housing (7).



- 3. REMOVE BURNER CHAMBER ASSEMBLY FROM MAIN SCREED.
  - a. Cut and remove tie wraps as required.
  - b. Remove terminal nut (12) and lead wire (13) from glow plug (14).

**WARNING**

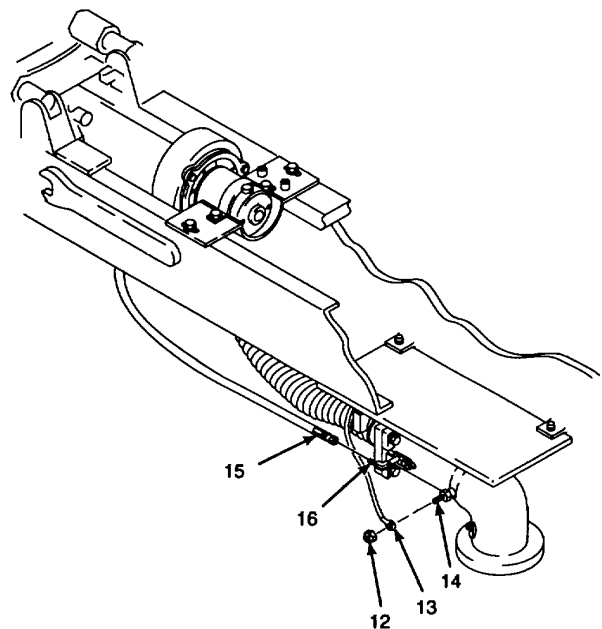
**Fuel is very flammable and can explode easily. To avoid serious injury or death:**

**Always wear safety glasses/goggles at all times.**

**Keep fuel away from open flame or any spark (ignition source).**

**Keep at least a B-C fire extinguisher within easy reach when working with fuel or any fuel system.**

**Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.**



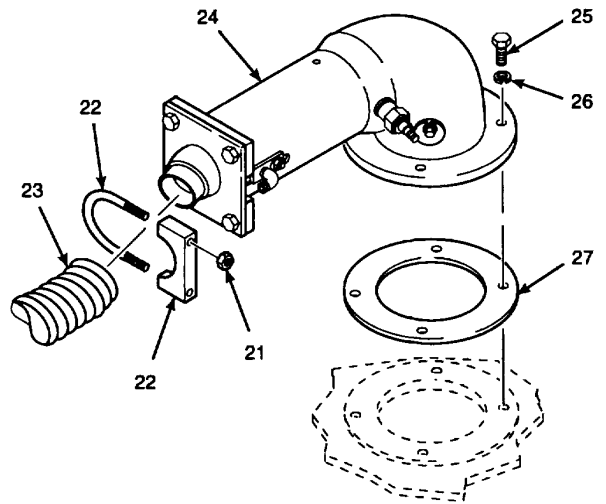
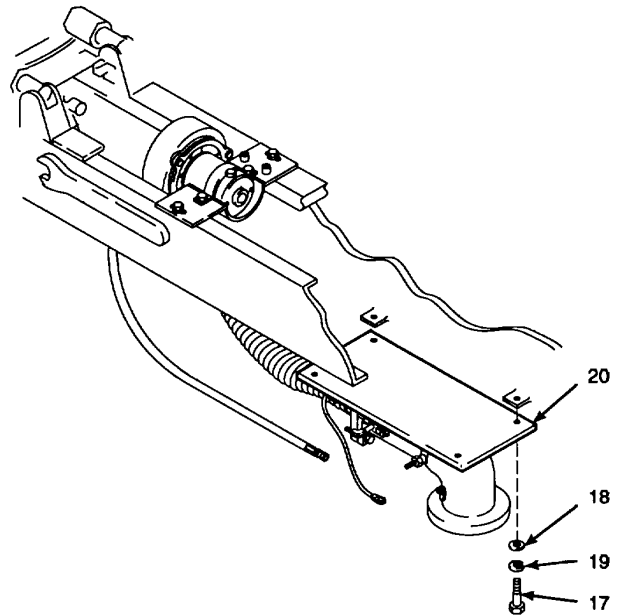
- c. Place a machinery wiping towel beneath hose (15).
- d. Tag and disconnect hose (15) from elbow (16). Plug hose and cap elbow.

**GO TO NEXT PAGE**



**2.67 REPLACE MAIN SCREED FRAME - Continued.**

- A. REMOVE - Continued.
- e. Remove bolts (17), flat washers (18), and lockwashers (19) from shield plate (20). Discard lockwashers.
  - f. Remove shield plate (20).
  - g. Remove hex nuts (21) and clamps (22). Discard exhaust clamps.
  - h. Remove flexible pipe (23) from burner chamber assembly (24).
  - i. Remove hex head cap screws (25) and lockwashers (26) from burner chamber assembly (24). Discard lockwashers.
  - j. Remove burner chamber assembly (24) and gasket (27) from main screed. Discard gasket.
4. REMOVE SCREED VIBRATION FLOW DIVIDER PER PARAGRAPH 2.77.



**GO TO NEXT PAGE**

- A. REMOVE - Continued.
- 5. REMOVE SCREED ARM.
  - a. Remove socket head cap screw (28) and retainer (29).
  - b. Use drive pin punch to drive out screed arm pivot pin (30).
  - c. Remove sleeve bushings (31) from main screed pivot bores (32).
  - d. Lift screed arm (33) from main screed frame.
- 6. REMOVE HYDRAULIC HOSES, TUBES, AND FITTINGS FROM LEFT HAND MAIN SCREED FRAME.
  - a. Place machinery wiping towels beneath hydraulic hoses and fittings.

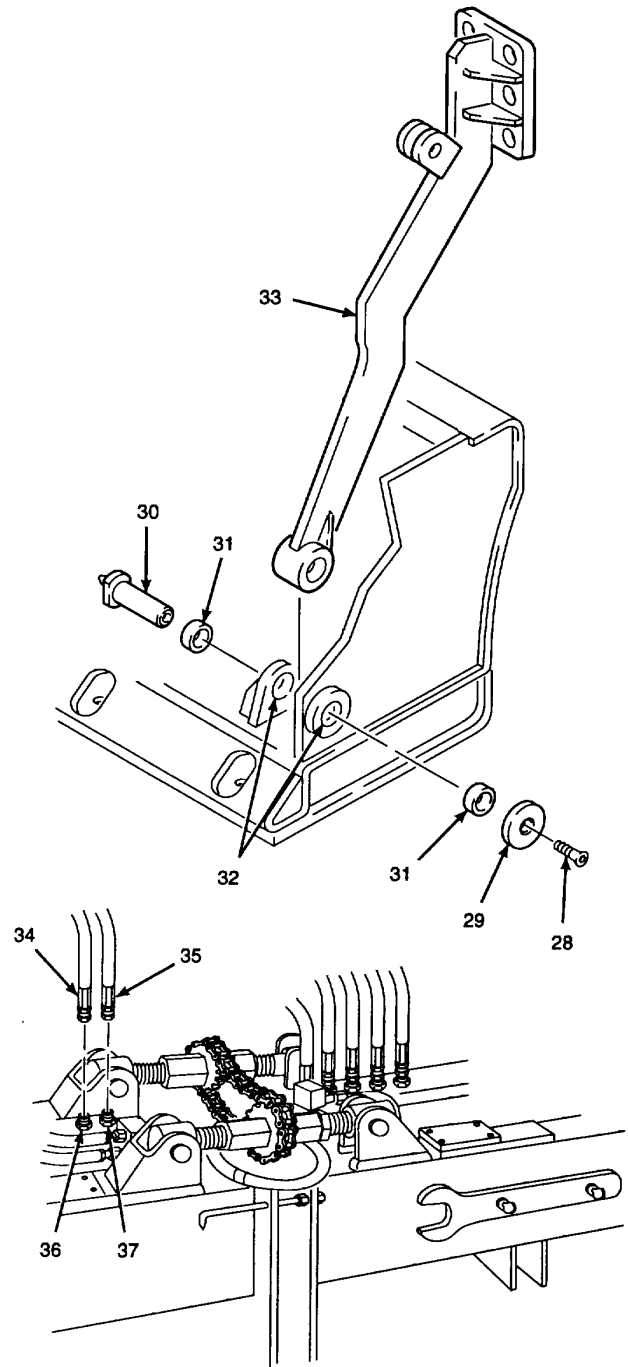
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- b. Tag and disconnect left hand screed extension cylinder hoses (34 and 35) from straight adapters (36 and 37). Plug hoses and cap adapters with protective caps.



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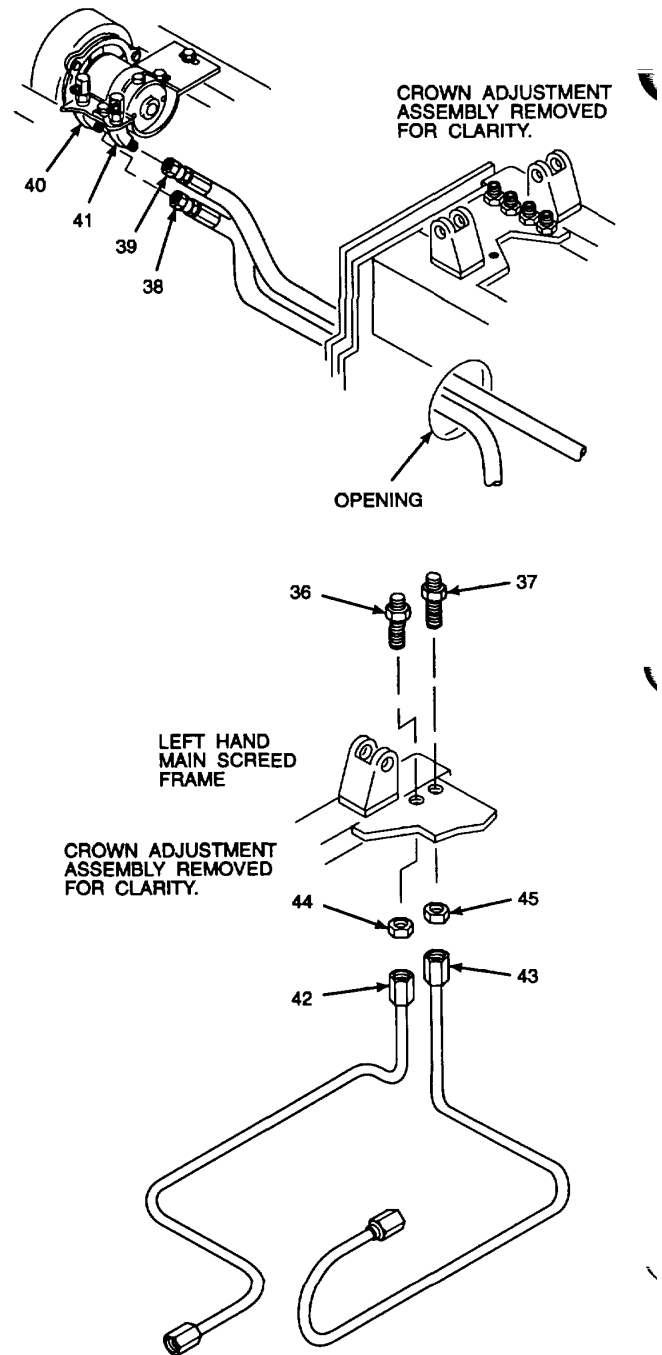
2.67 REPLACE MAIN SCREED FRAME - Continued.

A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- c. Tag and disconnect left hand extension screed vibration hoses (38 and 39) from elbows (40 and 41). Plug hoses and cap elbows with protective caps.
- d. From inside of right hand main screed frame, pull extension screed vibration hoses (38 and 39) through openings in between main screed frames until they are completely inside right hand main screed frame.
- e. Tag and disconnect left hand screed extension cylinder tubes (42 and 43) from straight adapters (36 and 37). Plug tubes and cap adapters with protective caps. Remove tubes from main screed frame.
- f. Remove hex nuts (44 and 45) and straight adapters (36 and 37) from left hand main screed frame.



GO TO NEXT PAGE

- A. REMOVE Continued.
- 7. REMOVE HYDRAULIC HOSES, TUBES, AND FITTINGS FROM RIGHT HAND MAIN SCREED FRAME.

- a. Place machinery wiping towels beneath hydraulic hoses and fittings.

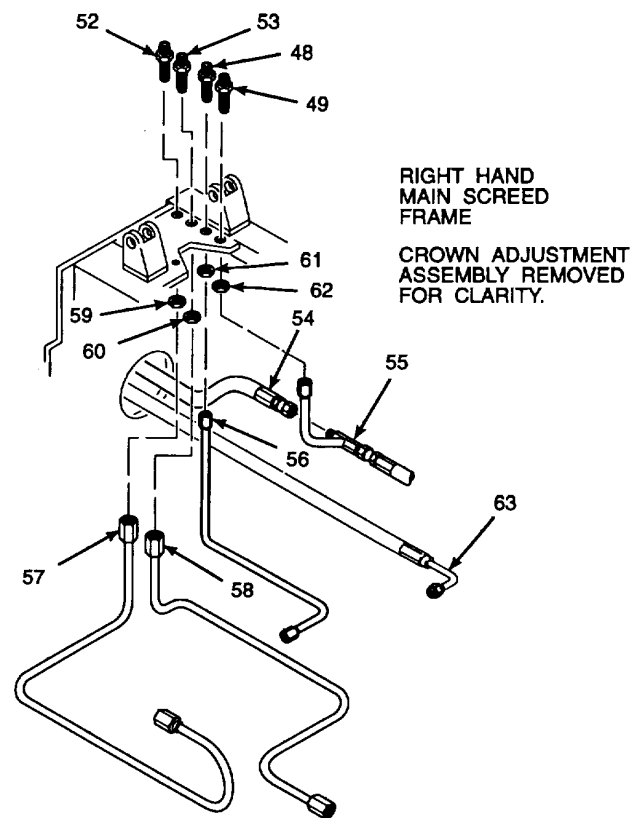
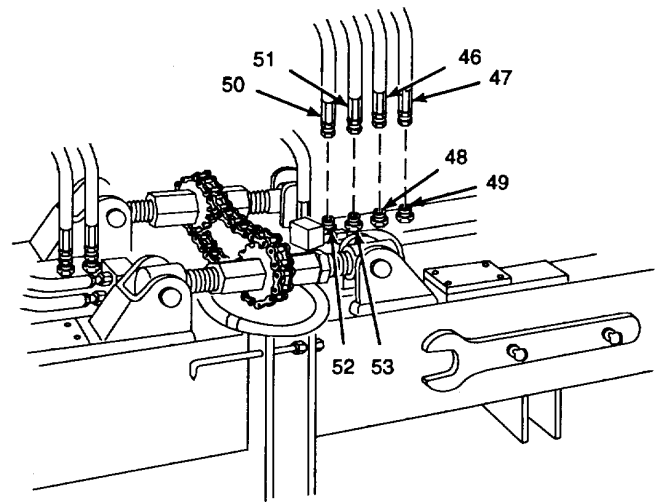
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Thoroughly clean hydraulic hoses and fittings before disconnecting. Always plug or cap off disconnected fittings to prevent intrusion of contaminants. Failure to properly clean and cap off connectors may result in hydraulic system contamination and equipment damage.

- b. Tag and disconnect main screed vibration hoses (46 and 47) from straight adapters (48 and 49). Plug hoses and cap adapters with protective caps.
- c. Tag and disconnect screed extension cylinder hoses (50 and 51) from straight adapters (52 and 53). Plug hoses and cap adapters with protective caps.
- d. Tag and disconnect left hand extension screed vibration hose (54) from vibration motor tube (55). Plug hose and cap tube with protective caps.
- e. Tag and disconnect vibration motor tubes (55 and 56) from straight adapters (48 and 49). Plug tubes and cap adapters with protective caps. Remove tube (56) from main screed frame.
- f. Tag and disconnect screed extension cylinder tubes (57 and 58) from straight adapters (52 and 53). Plug tubes and cap adapters with protective caps. Remove tubes from main screed frame.
- g. Remove nuts (59 through 62) and straight adapters (52 and 53) and (48 and 49) from main screed frame.



- h. From inside of left hand main screed frame, pull extension screed vibration hoses (54 and 63) through openings in between main screed frames until they are completely inside left hand main screed frame.

GO TO NEXT PAGE

**2.67 REPLACE MAIN SCREED FRAME - Continued.**

- A. REMOVE - Continued.
8. DISCONNECT AND LAY ASIDE SCREED BURNER MANIFOLD.

**NOTE**

Disconnect and lay aside only the screed burner manifold from main screed frame being replaced. Right hand screed burner manifold is shown in this procedure.

- a. Tag and disconnect screed burner solenoid valve electrical connectors (64) from screed harness electrical connectors (65).

**WARNING**

**Fuel is very flammable and can explode easily. To avoid serious injury or death:**

**Always wear safety glasses/goggles at all times.**

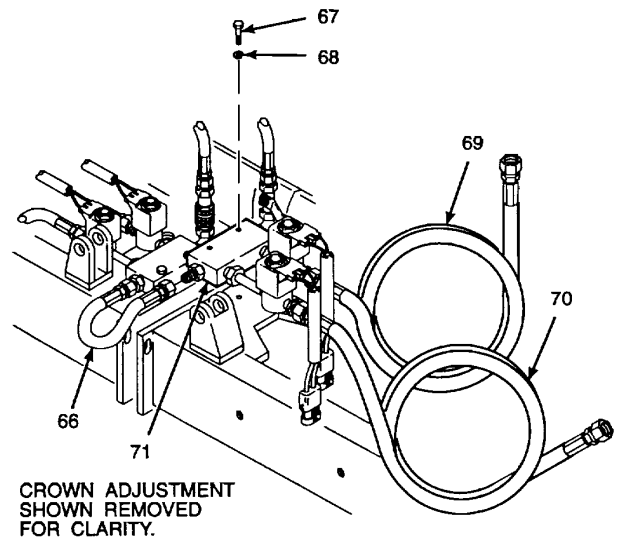
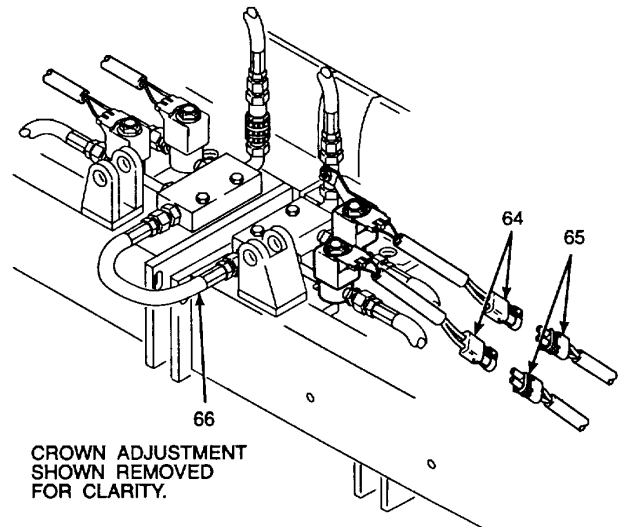
**Keep fuel away from open flame or any spark (ignition source).**

**Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.**

**Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.**

**Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.**

- b. Remove hose (66) from screed burner manifold being removed.
- c. Remove bolts (67) and lockwashers (68). Discard lockwashers.
- d. Pull main screed burner hose (69) from inside of main screed frame. Coil hose and secure hose with tie wraps.
- e. Coil extension screed burner hose (70) and secure with tie wraps.



- f. Lift screed burner manifold (71) and hoses and lay to one side, away from main screed frame being replaced.

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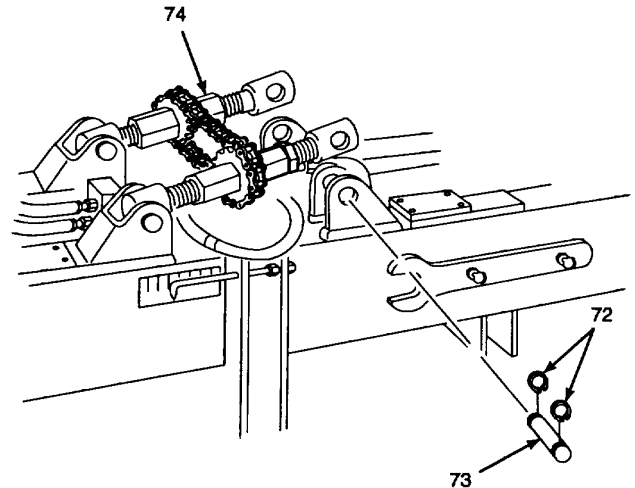
- A. REMOVE - Continued.
- 9. DISCONNECT AND LAY ASIDE CROWN ADJUSTMENT ASSEMBLY.

**WARNING**

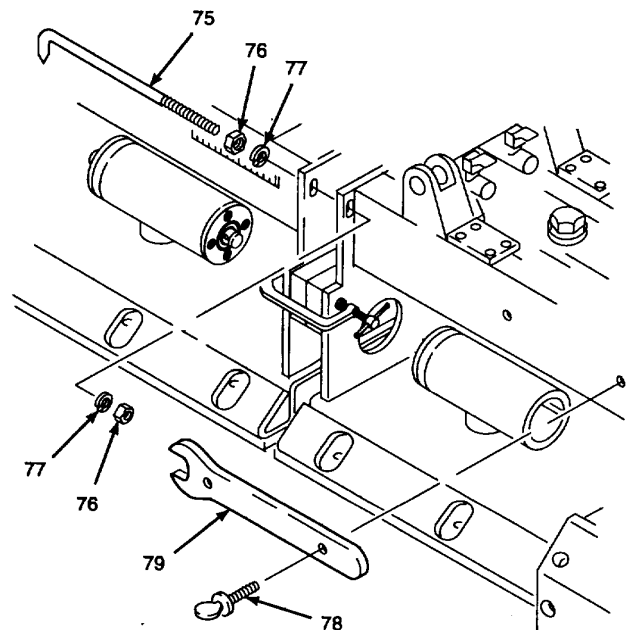
Use care when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

**NOTE**

Remove only the side of the crown adjustment assembly from main screed frame being replaced. Right hand main screed frame is shown in this procedure.



- a. Remove retaining rings (72) using snap ring pliers.
- b. Remove both mounting pins (73) from side of main screed frame being replaced.
- c. Lift loosened side of crown adjustment assembly (74) and lay to one side, against other main screed frame.
- d. Use a marker and mark position of pointer (75) for reassembly.
- e. Remove hex nuts (76), lockwashers (77), and pointer (75) from right hand main screed frame. Discard lockwashers.
- f. Remove thumbscrews (78) and crown adjustment wrench (79), if required, from right hand main screed frame.
- g. Measure distance between main screed frames with a machinist's steel rule. Record this measurement. It will be used to align main screed frames in step D.1.e and D.5.h.
- h. Remove C-clamp and spacer wedges from between left hand and right hand main screed frames installed in paragraph 2.71 step B.3.



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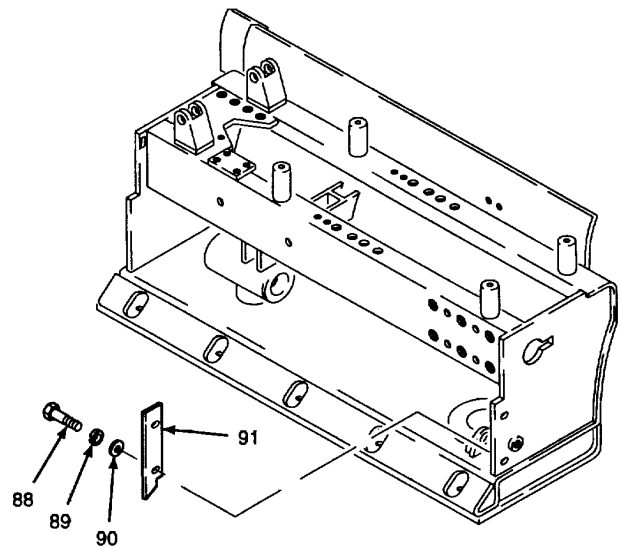
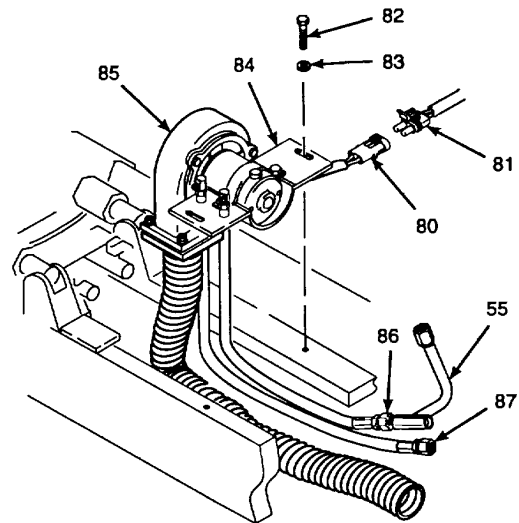
**2.67 REPLACE MAIN SCREED FRAME- Continued.**

- A. REMOVE - Continued.
10. REMOVE BLOWER ASSEMBLY.
- Disconnect blower motor electrical connector (80) from screed harness electrical connector (81).
  - Remove hex head cap screws (82), flat washers (83), and blower mounting bracket (84).

**NOTE**

**If removing left hand main screed blower motor, there will be no hydraulic hoses attached to blower mounting bracket.**

- Remove blower mounting bracket (84), with blower assembly (85).
  - Pull hydraulic hoses (86 and 87) from main screed frame, leaving tube (55) attached to hose (86).
11. PULL SCREED HARNESS FROM MAIN SCREED FRAME. COIL AND SECURE SCREED HARNESS WITH TIE WRAPS.
12. REMOVE SIDE PLATE.
- Remove hex head cap screws (88), lockwashers (89), and flat washers (90). Discard lockwashers.
  - Remove side plate (91).

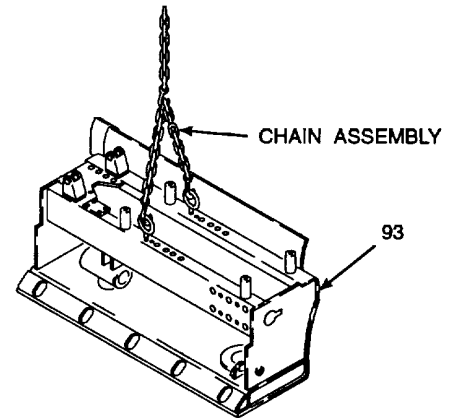


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A. REMOVE - Continued.

13. SEPARATE MAIN SCREED FRAMES.

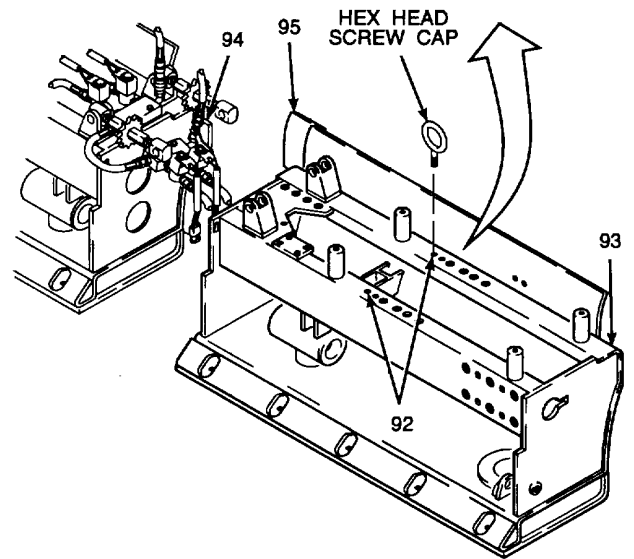
- a. Install hex head screw caps (92) into threaded bores (93) in main screed frame (93).
- b. Attach a chain assembly to hex head screw caps.
- c. Attach a lifting device to chain assembly.



**WARNING**

**Screed frame weighs approximately 700 lbs (318 kg). Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.**

- d. With the help of another person to steady main screed frame (93) as it is lifted, lift main screed frame slightly off the floor. Separate frame flashings (94 and 95) by sliding main screed frame away from other main screed frame.
- e. Use a lifting device to lift main screed frame (93) to work area.



**GO TO NEXT PAGE**



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**2.67 REPLACE MAIN SCREED FRAME - Continued.**

---

- B. CLEAN.
- 1. CLEAN REMOVED SCREED FRAME.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Use cleaning solvent and a wire scratch brush to remove heavy buildup of paving material from corners and angles of main screed frame.
- b. Use a cleaning cloth soaked in cleaning solvent to remove grime and oil from inside main screed frame.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- c. Use 30 psi (207 kPa) maximum compressed air to remove foreign material and loose grime from inside of main screed frame.

**GO TO NEXT PAGE**

- B. CLEAN - Continued.
- 2. CLEAN ALL FASTENERS TREATED WITH THREAD LOCKING COMPOUND.

**WARNING**

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Clean all threads of fasteners with thread locking compound solvent.
  - b. Dry fasteners with a cleaning cloth.
- 3. WIPE THREADS OF HYDRAULIC FITTINGS, TUBES, AND HYDRAULIC HOSES WITH A CLEANING CLOTH TO REMOVE HYDRAULIC FITTINGS SEALANT.

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**2.67 REPLACE MAIN SCREED FRAME - Continued.**

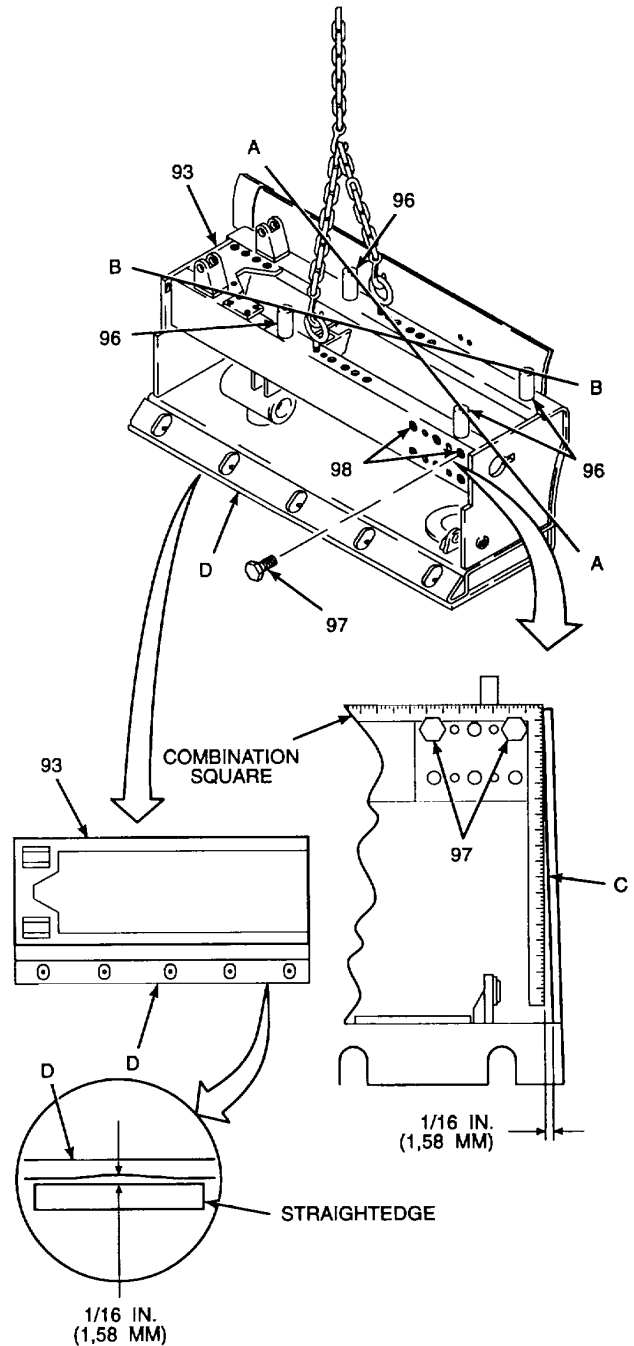
**C. INSPECT.**

**1. INSPECT MAIN SCREED FRAME.**

**WARNING**

Main screed frame weighs approximately 700 lbs (318 kg). Main screed frame will be suspended by a chain hoist during inspection. Do not allow personnel to move or work beneath main screed frame while suspended. Severe injury or death can result from main screed frame falling or dropping while suspended.

- a. With hex head screw caps installed in main screed frame (93), suspend main screed frame at a height of 1.0 to 2.0 in. (25,4 to 50,8 mm) over work surface. Main screed frame must be supported only by hex head screw caps.
- b. Measure distance between threaded bore (96) centers, between points A-A and B-B, using a straightedge.
- c. If distances between threaded bore center points A-A and B-B vary greater than 1/16 in. (1,58 mm) between the two points, replace main screed frame (93).
- d. Install hex head cap screws (97), used to hold extension screed guide shaft support to main screed, into threaded bores (98).
- e. Place a combination square against top shank surface of hex head cap screws (97) and hold against surface C of main screed frame (93), holding top part of square flat against shank of hex head cap screws.
- f. If surface C of main screed frame (93) is greater than 1/16 in. (1,58 mm) from edge of carpenter's square at any point, replace main screed frame.
- g. Place a straightedge across surface D. If any point on surface D is greater than 1/16 in. (1,58 mm) from straightedge, replace main screed frame (93).
- h. Visually inspect main screed frame (93) weld joints and lower burner box for cracks or breaks. Replace main screed frame if cracks or breaks are detected at any point on frame.

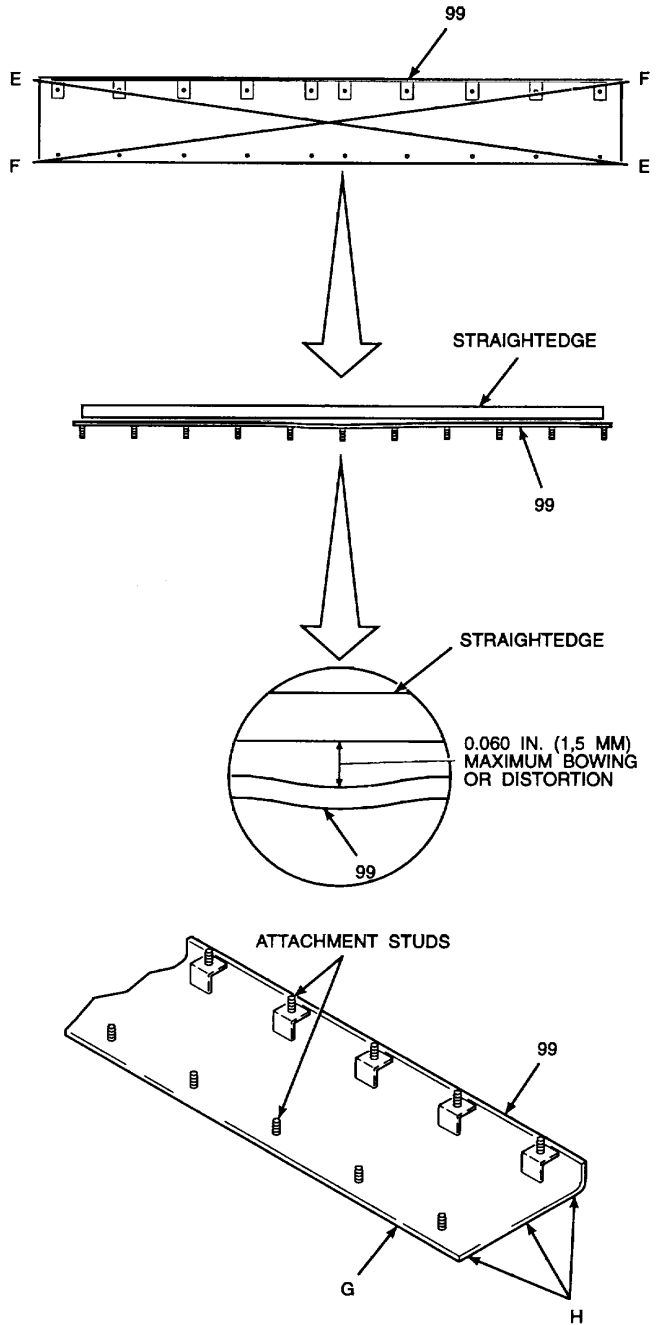


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C. INSPECT Continued.

2. INSPECT MAIN SCREED PLATE.

- a. Place main screed plate (99) on a flat surface with the bottom of the screed plate facing up.
- b. Place a straightedge diagonally across main screed plate lines E-E and F-F.
- c. Check for bowing or surface distortion greater than 0.060 in. (1,5 mm) along lines E-E and F-F.
- d. If surface deformity is greater than 0.060 in. (1,5 mm), replace main screed plate (99).
- e. Inspect main screed plate (99) for cracks in bottom paving surface G and around attachment studs.
- f. Inspect leading, trailing, and outside main screed plate (99) edge surfaces H for dents that would affect the paving machine's ability to lay a smooth asphalt mat.
- g. If the damage mentioned above is found, or any other damage that would affect the paving machine's ability to lay a smooth asphalt mat, replace main screed plate (99).



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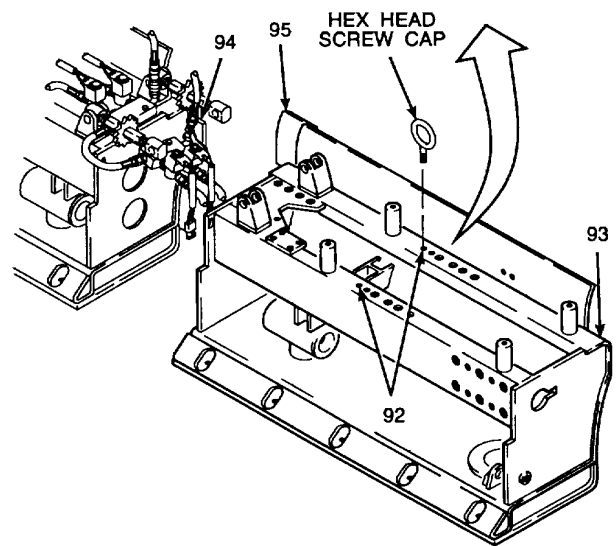
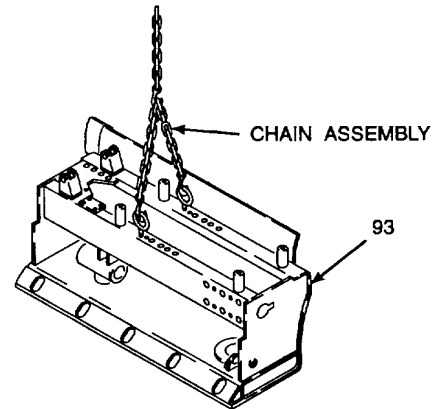
**2.67 REPLACE MAIN SCREED FRAME - Continued.****D. INSTALL.****1. ASSEMBLE AND ALIGN MAIN SCREED FRAMES.**

- a. If replacing main screed frame (93), install hex head screw caps into threaded bores (92) in main screed frame.
- b. Attach a chain assembly to hex head screw caps.
- c. Attach a lifting device to chain assembly.

**WARNING**

**Main screed frame weighs approximately 700 lbs (318 kg). Personnel shall stay clear of objects being lifted during hoist operations. Do not work on objects suspended by a hoist. A swinging or shifting load may cause injury or death to personnel.**

- d. Use a chain hoist to lift main screed frame (93) into position next to main screed frame not being replaced.
- e. With the help of another person to steady main screed frame (93) as it is lifted, lower main screed frame until it is slightly off the floor, enough to slide halves together. Ensure frame flashings (94 and 95) are meshed. Space main screed frames to measurements recorded in step A.9.g.
- f. Lower and disconnect chain hoist. Remove hex head screw caps.

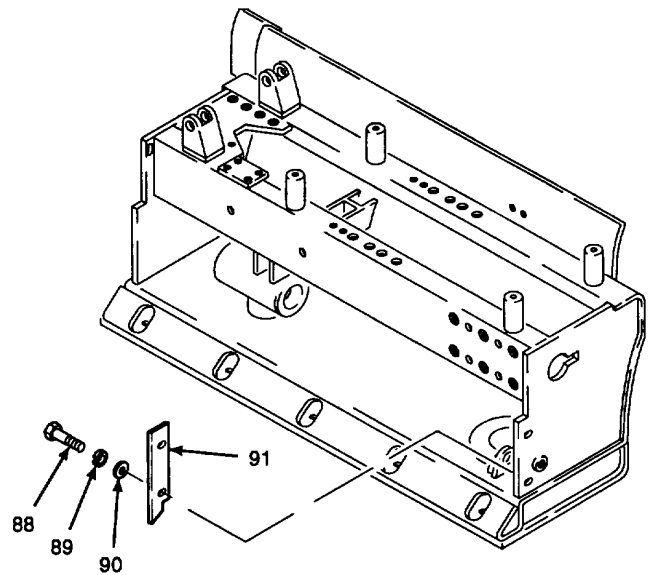
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- D. INSTALL - Continued.
2. INSTALL SIDE PLATE.
- a. Install lockwashers (89) and flat washers (90) onto hex head cap screws (88).

**WARNING**

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- b. Apply thread locking compound (Item 13, Appendix B) to hex head cap screws (88).
- c. Install side plate (91) and secure with hex head cap screws (88). Tighten cap screws to 37 lb-ft (50 N.m).
3. REMOVE TIE WRAPS FROM COILED SCREED HARNESS AND INSTALL SCREED HARNESS INTO MAIN SCREED FRAME. ROUTE THROUGH SCREED.



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**2.67 REPLACE MAIN SCREED FRAME - Continued.**

- D. INSTALL - Continued.
4. INSTALL BLOWER ASSEMBLY.

**NOTE**

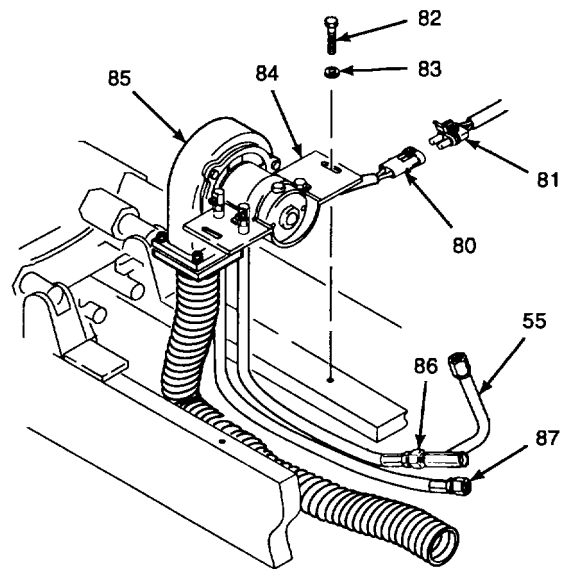
**If installing left hand main screed blower assembly, there will be no hydraulic hoses attached to blower mounting bracket.**

- a. Install blower mounting bracket (84), with blower assembly (85), hydraulic hoses (86 and 87), and tube (55) attached, where applicable, onto main screed frame. Feed hydraulic hoses into main screed frame.
- b. Install flat washer (83) onto hex head cap screw (82).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Apply thread locking compound (Item 14, Appendix B) to hex head cap screw (82).
- d. Install hex head cap screw (82). Ensure blower mounting bracket (84) with blower assembly (85) is positioned as far outboard as possible (screw should be on inboard end of screw slot). Tighten to 37 lb-ft (50 N.m).
- e. Apply electrical insulating compound to screed harness electrical connector (81).
- f. Connect blower motor electrical connector (80) to screed harness electrical connector (81).
- g. Install tie wraps as needed.

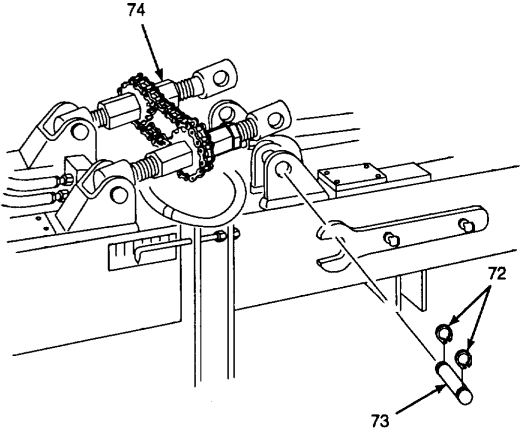


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D. INSTALL - Continued.

5. CONNECT CROWN ADJUSTMENT ASSEMBLY.

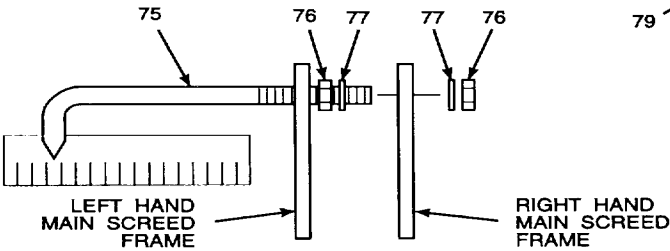
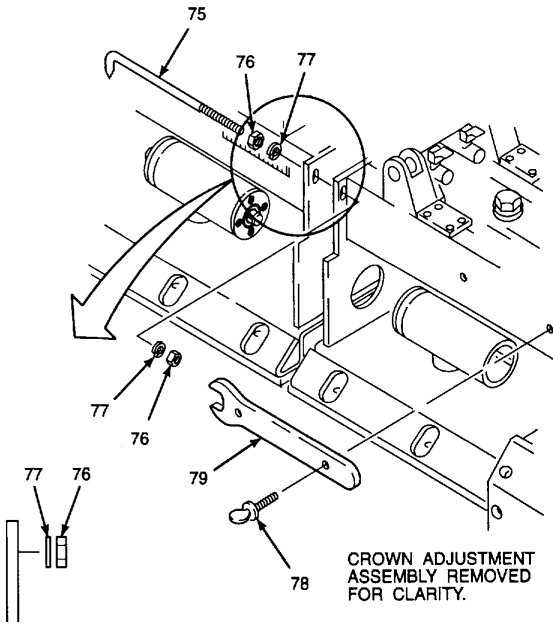
- a. Lift loosened side of crown adjustment assembly (74) and install onto main screed frame.
- b. Install mounting pins (73) into main screed frame.



**WARNING**

Use care when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- c. Install retaining rings (72) using snap ring pliers.
- d. Install pointer (75) through left hand main screed frame, with threaded end positioned between left hand and right hand main screed frames.
- e. Install hex nut (76) and lockwasher (77) onto pointer (75), as far as is required to align matchmark made during removal. Slide threaded end of pointer through right hand main screed frame.
- f. With matchmarks aligned, install lockwasher (77) and hex nut (76) onto threaded end of pointer (75). Do not tighten hex nuts at this time.
- g. Install thumbscrews (78) through crown adjustment wrench (79) and attach crown adjustment wrench onto right hand main screed frame.
- h. Install C-clamp and spacer wedges between left hand and right hand main screed frames per paragraph 2.71, step B.3. Set spacer wedges to measurement recorded in A.9.g.



GO TO NEXT PAGE



**2.67 REPLACE MAIN SCREED FRAME - Continued.**

- D. INSTALL - Continued.
6. CONNECT SCREED BURNER MANIFOLD.
- Position screed burner manifold (71) onto main screed frame.
  - Install lockwashers (68) onto bolts (67).

**WARNING**

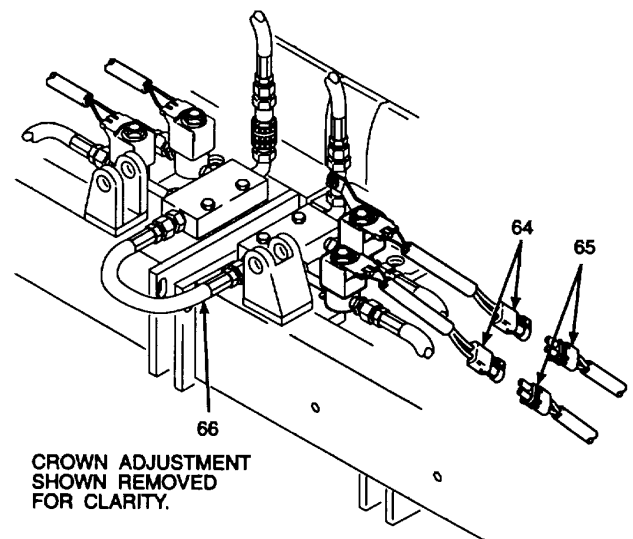
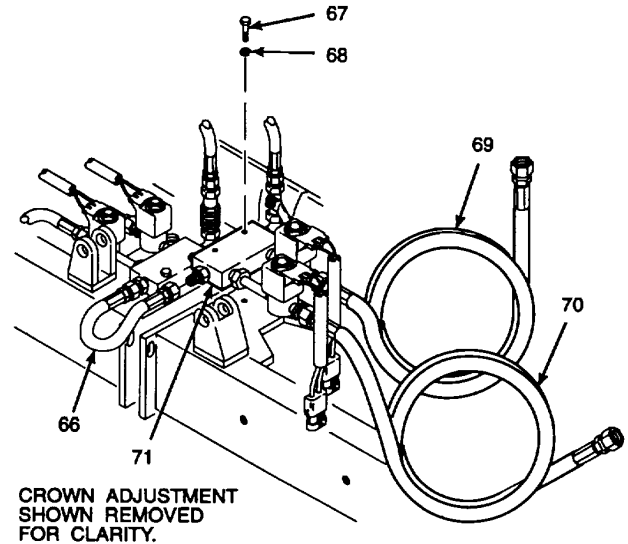
**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- Apply thread locking compound (Item 14, Appendix B) to bolts (65).
- Install screed burner manifold (71) using bolts (67). Tighten to 9 lb-ft (12 N.m).
- Cut tie wraps, uncoil, and route main screed burner hose (69) and extension screed burner hose (70) through main screed frame.
- Apply electrical insulating compound to screed harness electrical connectors (65).
- Connect screed burner solenoid valve electrical connectors (64) to screed harness electrical connectors (65).

**WARNING**

**Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.**

- Apply hydraulic fitting sealant to threads of straight adapter on screed burner manifold (71) being installed.
- Install hose (66) at screed burner manifold (71) being installed.



**GO TO NEXT PAGE**

- D. INSTALL - Continued.
7. INSTALL FITTINGS, TUBES AND HYDRAULIC HOSES ONTO RIGHT HAND MAIN SCREED FRAME.

- a. Place machinery wiping towels beneath hydraulic hoses and fittings.

**WARNING**

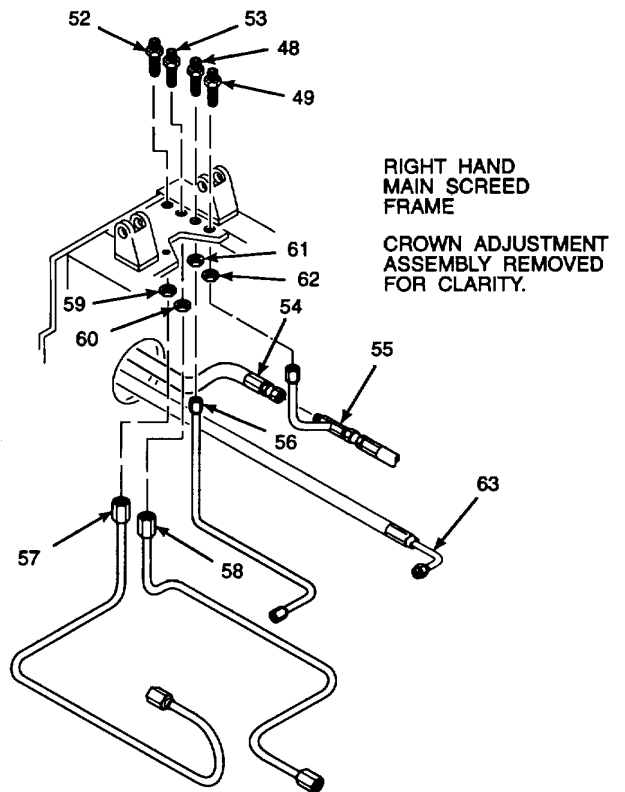
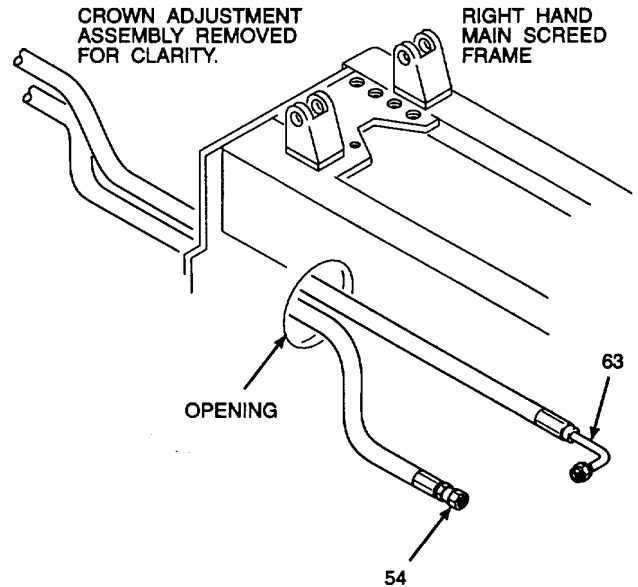
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. From inside of left hand main screed frame, pull extension screed vibration hoses (54 and 63) through openings in between main screed frames until they are completely inside right hand main screed frame.
- c. Install straight adapters (52 and 53) and (48 and 49) onto main screed frame and secure with hex nuts (59 through 62).

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply hydraulic fitting sealant to threads of straight adapters (52 and 53) and (48 and 49) and to male threads of vibration motor tube (55).
- e. Connect screed extension cylinder tubes (57 and 58) to straight adapters (52 and 53).
- f. Install vibration motor tubes (55 and 56) onto straight adapters (48 and 49).
- g. Connect left hand extension screed vibration hose (54) to vibration motor tube (55).



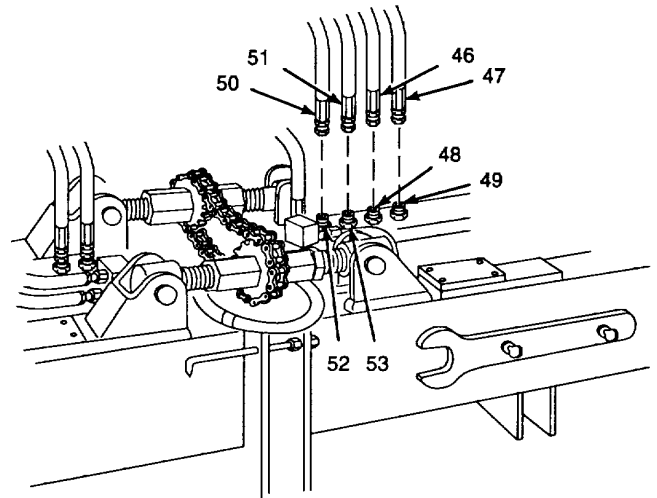
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**2.67 REPLACE MAIN SCREED FRAME - Continued.**

D. INSTALL - Continued.

- h. Connect screed extension cylinder hoses (50 and 51) to straight adapters (52 and 53).
- i. Connect main screed vibration hoses (46 and 47) to straight adapters (48 and 49).

8. INSTALL FITTINGS, TUBES, AND HYDRAULIC HOSES ONTO LEFT HAND MAIN SCREED FRAME.



**WARNING**

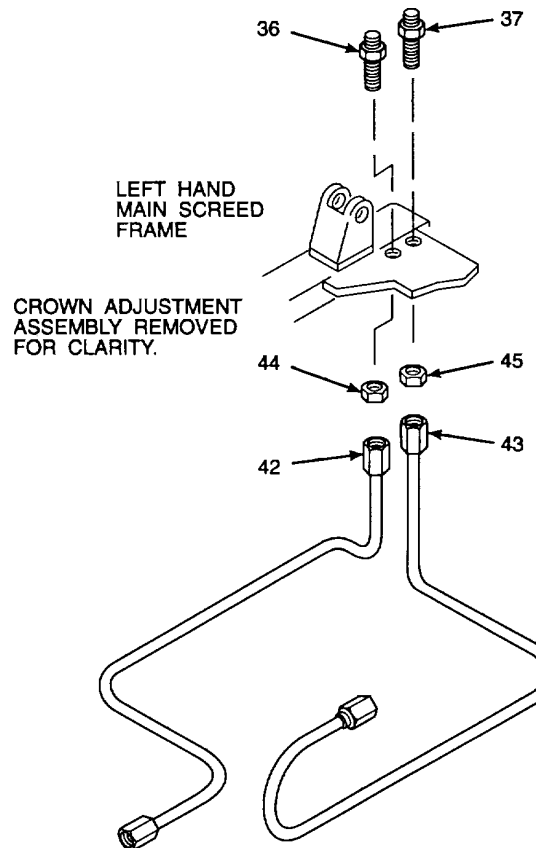
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Place machinery wiping towels beneath hydraulic hoses and fittings.
- b. Install straight adapters (36 and 37) onto main screed frame and secure with hex nuts (44 and 45).

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply hydraulic fitting sealant to threads of straight adapters (36 and 37).
- d. Connect left hand screed extension cylinder tubes (42 and 43) to straight adapters (36 and 37).



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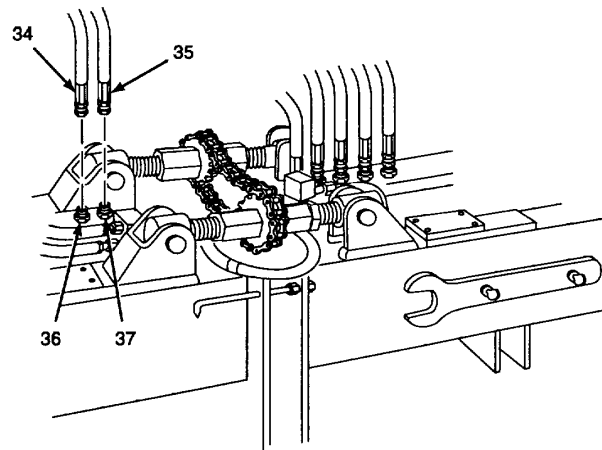
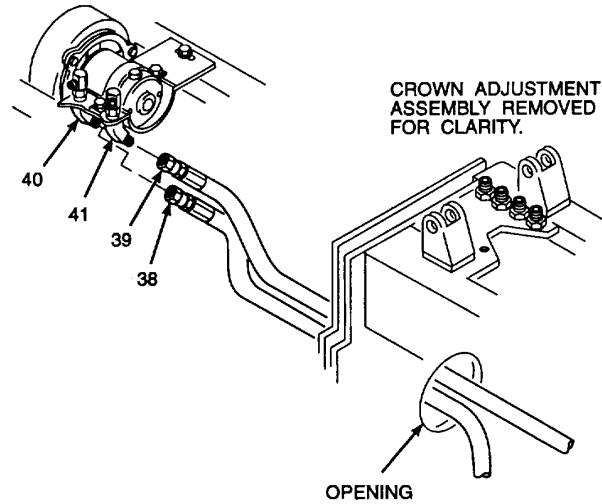
D. INSTALL - Continued.

- e. From inside of right hand main screed frame, pull extension screed vibration hoses (38 and 39) through openings in between main screed frames until they are completely inside left hand main screed frame.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- f. Apply hydraulic fitting sealant to threads of elbows (40 and 41).
- g. Connect left hand extension screed vibration hoses (38 and 39) to elbows (40 and 41).
- h. Connect left hand extension screed cylinder hoses (34 and 35) to straight adapters (36 and 37).



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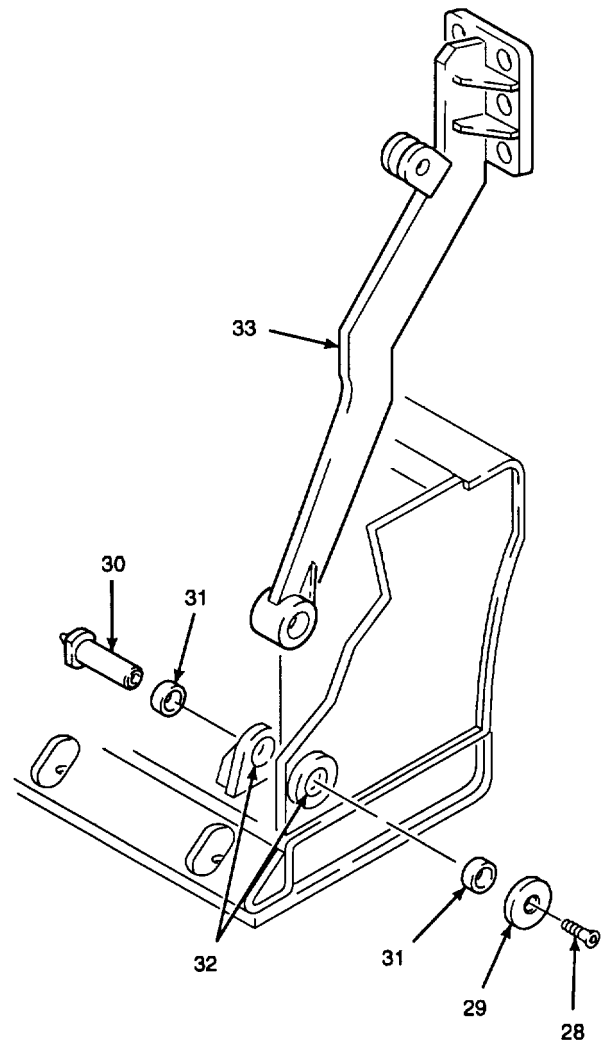
**2.67 REPLACE MAIN SCREED FRAME - Continued.**

- D. INSTALL - Continued.
9. INSTALL SCREED ARM.
- Install sleeve bushings spacers (31) into main screed pivot bores (32). If necessary, use a plastic hammer to drive bushing flush with main screed pivot bores.
  - With the help of another person, line up screed arm (33) pivot boss with main screed pivot bores (32).
  - Rotate flats of screed arm pivot pin (30) to vertical. From inside of main screed, install pivot pin into main screed pivot bores.

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screw (28).
  - Install retainer (29) and socket head cap screw (28). Tighten cap screw to 37 lb-ft (50 N.m).
  - Lubricate screed arm pivot pin (30) with grease until grease can be seen at main screed pivot bores.
10. INSTALL SCREED VIBRATION FLOW DIVIDER PER PARAGRAPH 2.77.



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D. INSTALL - Continued.

11. INSTALL BURNER CHAMBER ASSEMBLY.

**NOTE**

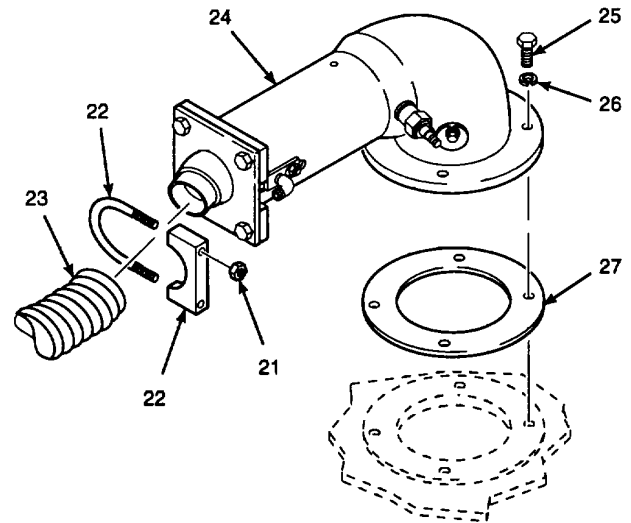
**When installing the burner chamber assembly, make sure that glow plug is pointing out toward the rear of paving machine.**

- a. Position gasket (27) and burner chamber assembly (24) onto main screed frame.
- b. Connect flexible pipe (23) to burner chamber assembly (24).
- c. Install lockwashers (26) onto hex head cap screws (25).

**WARNING**

**Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- d. Apply sealing compound to threads of hex head cap screws (25).
- e. Install hex head cap screws (25) into burner chamber assembly (24). Tighten cap screws to 37 lb-ft (50 N.m).
- f. Apply sealing compound to threads of clamp (22).
- g. Install clamp (22) and hex nuts (21). Tighten hex nuts evenly to 9 lb-ft (12 N.m).



**GO TO NEXT PAGE**

2.67 REPLACE MAIN SCREED FRAME Continued.

D. INSTALL Continued.

- h. Install lockwashers (19) and flat washers (18) onto bolts (17).

**WARNING**

Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- i. Apply sealing compound to threads of bolts (17).
- j. Install shield plate (20) and secure with bolts (17). Tighten bolts to 19 lb-ft (26 N.m).

**WARNING**

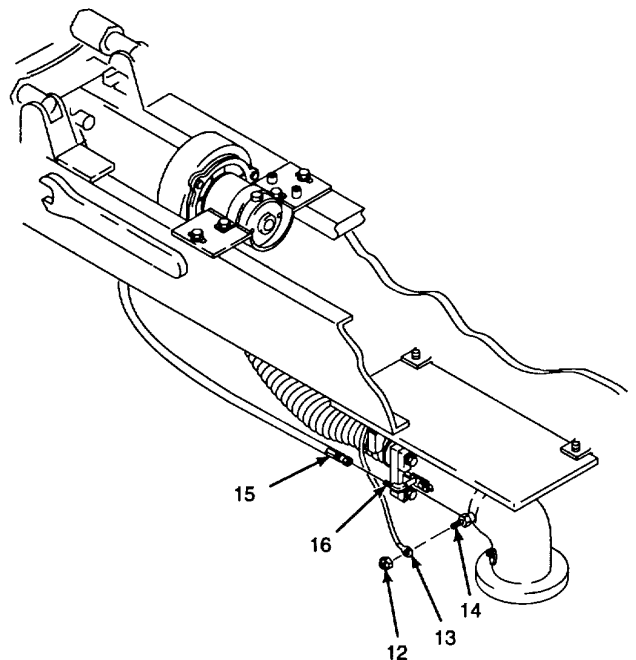
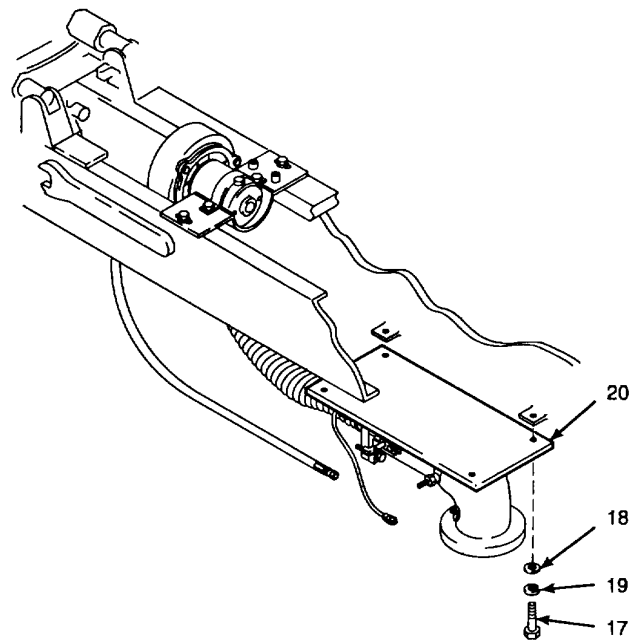
Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- k. Apply hydraulic fitting sealant to threads of elbow (16).
- l. Connect hose (15) to elbow (16).

**WARNING**

Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well-ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.

- m. Install lead wire (13) and terminal nut (12) onto glow plug (14). Apply electrical insulating varnish to glow plug terminal.
- n. Use tie wraps as necessary to secure wiring and hoses away from the burner chamber assembly.



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D. INSTALL - Continued.

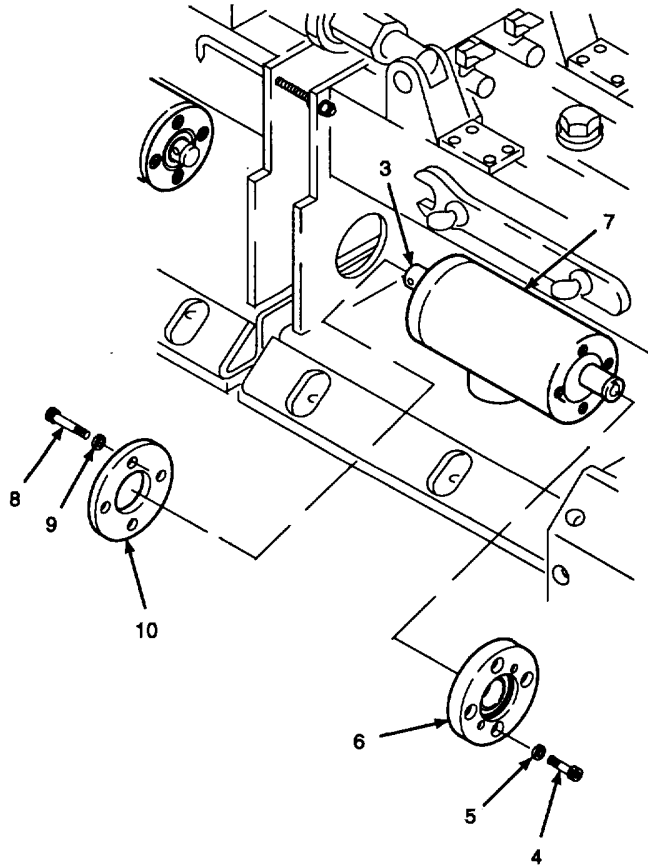
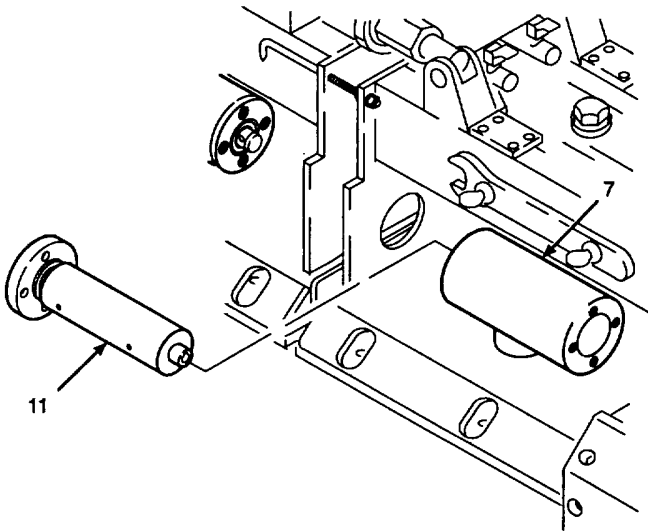
12. INSTALL MAIN SCREED VIBRATOR COMPONENTS.

- a. Insert assembled drive shaft (11) into vibrator housing (7).
- b. Install lockwasher (9) onto socket head cap screw (8).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screw (8).
- d. Install retainer plate (10) onto end of drive shaft (3).
- e. Install socket head cap screws (8). Tighten socket head cap screws to 42 lb-ft (57 N.m) using a hex head driver socket and socket wrench adapter.
- f. Install lockwasher (5) onto socket head cap screw (4).
- g. Apply thread locking compound (Item 13, Appendix B) to threads of socket head cap screw (4).
- h. Position motor mount (6) over drive shaft (3) in vibrator housing (7).
- i. Install socket head cap screws (4). Tighten socket head cap screws to 42 lb-ft (57 N.m) using a hex head driver socket and socket wrench adapter.



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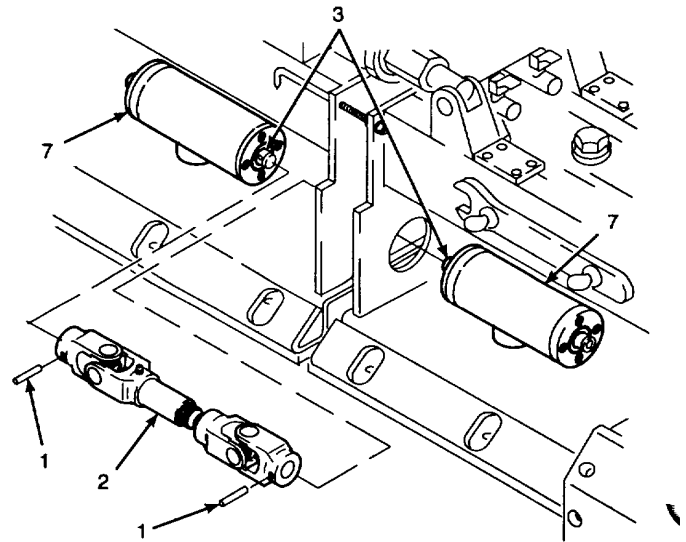
**2.67 REPLACE MAIN SCREED FRAME - Continued.****D. INSTALL - Continued.**

- j. Rotate drive shafts (3) by hand to place eccentric weights in the bottom position prior to connecting shafts with universal joint (2). Drive shafts must remain in this position to ensure proper alignment of eccentric shaft weights.

**WARNING**

**Anti-seize compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- k. Apply anti-seize compound to the ends of drive shafts (3).
- l. Position universal joint between vibrator housings (7).
- m. Install universal joint (2) onto drive shafts (3). Align pin holes of universal joint and drive shafts.
- n. Install spring pins (1).
- o. Lubricate universal joint per LO 5-3895-373-12.
13. **INSTALL MAIN SCREED VIBRATION MOTOR PER TM 5-3895-373-20.**

**NOTE**

**FOLLOW-ON-TASKS:** Install extension screed frames per paragraph 2.66.  
 Install main screed plate per paragraph 2.71.  
 Install strikeoff components per TM 5-3895-373-20.  
 Install screed extension cylinder per TM 5-3895-272-20.  
 Install screed tow arm per TM 5-3895-373-20.  
 Install screed per TM 5-3895-373-20.  
 Align main and extension screed plates per TM 5-3895-373-20.

**END OF TASK**

---

**2.68 REPLACE AUGER BEARING UNITS, SHAFT, AND SPROCKET WHEEL.**


---

**This task covers:**            a. Remove                    b. Clean                    c. Inspect  
                                       d. Install

---

**INITIAL SETUP:**Tools:

General mechanic's automotive tool kit  
 (Item 106, Appendix D)  
 Hydraulic press (Item 41, Appendix D)  
 Level and plumb (Item 54, Appendix D)  
 Outside micrometer (Item 16, Appendix D)  
 Retaining ring pliers (Item 65, Appendix D)  
 Slide caliper (Item 20, Appendix D)  
 Socket wrench adapter (Item 6, Appendix D)  
 Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
 Torque wrench, 100 to 500 lb-ft (Item 133, Appendix D)  
 Wire scratch brush (Item 13, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
 Cleaning solvent (Item 31, Appendix B)  
 Grease (Item 18, Appendix B)  
 Sealing compound (Item 30, Appendix B)  
 Thread locking compound solvent (Item 32, Appendix B)  
 Lockwashers

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Personnel Required:

Two 62B construction equipment repairers. Second person needed to lift bearing mount and shaft.

References:

LO 5-3895-373-12  
 TM 5-3895-373-20  
 TM 5-3895-373-24P

Equipment Condition:

Remove screed per TM 5-3895-373-20.  
 Remove auger flights per TM 5-3895-373-20.  
 Remove auger/conveyor drive chain per 2.63.

**GO TO NEXT PAGE**

**2-957**

**2.68 REPLACE AUGER BEARING UNITS, SHAFT, AND SPROCKET WHEEL - Continued.****NOTE**

This procedure applies to both the left and right auger shaft assemblies. Only the right side is shown in this procedure.

- A. REMOVE.
1. DISCONNECT SHAFT ASSEMBLY FROM THE AUGER/CONVEYOR DRIVE CHAIN HOUSING.

**WARNING**

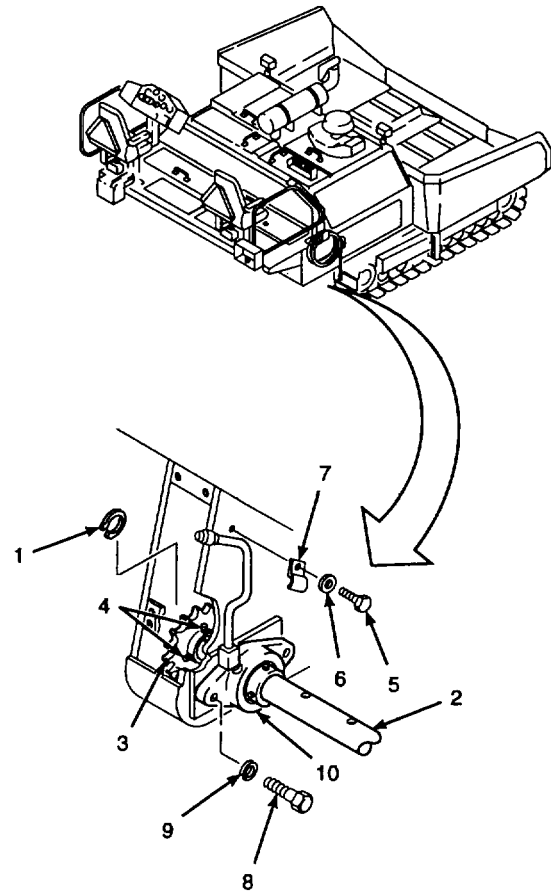
Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Remove retaining ring (1) from the end of shaft (2).

**NOTE**

Rotate shaft (2) and sprocket wheel (3) to access set screws (4) on the sprocket wheel, if necessary.

- b. Loosen set screws (4) on sprocket wheel (3).
- c. Remove hex head cap screw (5), washer (6), and clamp (7) from auger/conveyor drive chain housing.
- d. Remove hex head cap screws (8) and lockwashers (9) from bearing unit (10). Discard lockwashers.



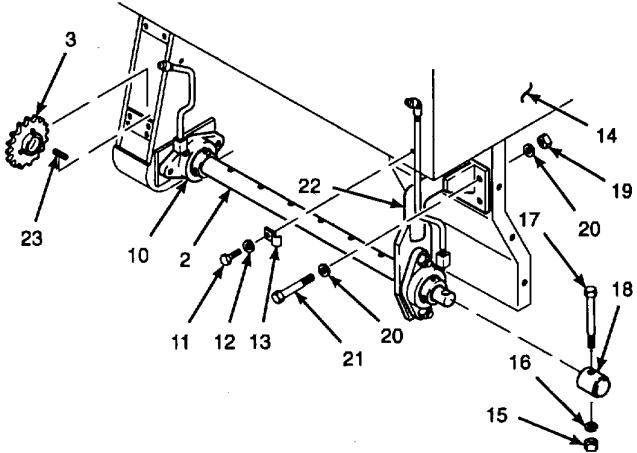
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- A. REMOVE - Continued.
- 2. REMOVE SHAFT AND BEARING UNITS FROM THE PAVING MACHINE.
  - a. Remove hex head cap screw (11), flat washer (12), and clamp (13) from main frame (14).
  - b. Remove hex nut (15), lockwasher (16), and hex head cap screw (17) from shaft cover (18), and remove the shaft cover from shaft (2). Discard lockwasher.

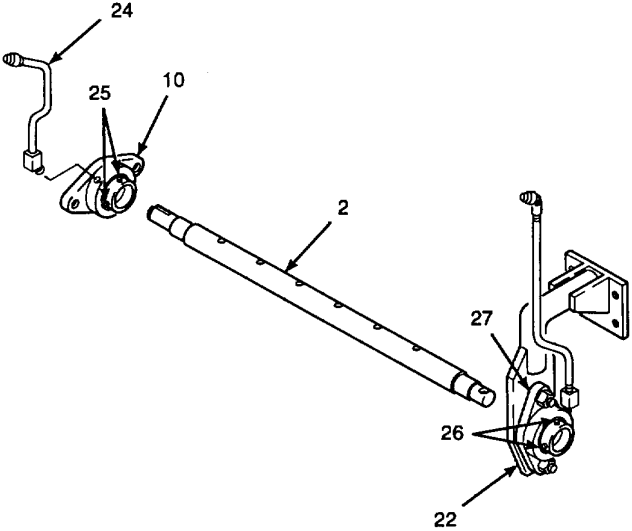
**WARNING**

**Bearing mount and shaft weigh 61 lbs (28 kg). Equipment damage and personnel injury could result from dropping bearing mount and shaft when removing from paving machine.**

- c. With the help of another person, support the weight of shaft (2) and bearing unit (10).
- d. Remove hex nuts (19), flat washers (20), and hex head cap screws (21) from bearing mount (22) and main frame (14). Remove sprocket wheel (3) and square key (23) while pulling shaft (2), bearing unit (10), and bearing mount from the paving machine.



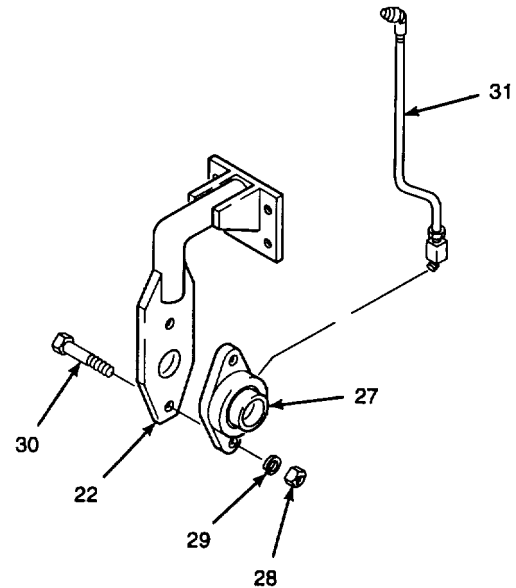
- 3. REMOVE BEARING UNIT AND BEARING MOUNT FROM SHAFT.
  - a. Remove lubrication pipe (24) from bearing unit (10).
  - b. Loosen set screws (25 and 26) on bearing units (10 and 27).
  - c. Use a hydraulic press and press shaft (2) from bearing unit (10).
  - d. Use a hydraulic press and press shaft (2) from bearing unit (27) and bearing mount (22).



**GO TO NEXT PAGE**

**2.68 REPLACE AUGER BEARING UNITS, SHAFT, AND SPROCKET WHEEL - Continued.**

- A. REMOVE - Continued.
4. REMOVE BEARING UNIT FROM BEARING MOUNT.
- Remove hex nuts (28), lockwashers (29), and hex head cap screws (30) from bearing mount (22).
  - Separate bearing unit (27) from bearing mount (22).
  - Remove lubrication tube (31) from bearing unit (27).
- B. CLEAN.
1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC and flammable**. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- Clean all metal parts with cleaning solvent. Scrub off hard deposits with a wire scratch brush. Wipe dry with a clean, cleaning cloth.
- Clean lubrication fittings on lubrication tube and pipe.

**GO TO NEXT PAGE**

B. CLEAN - Continued.

2. CLEAN FASTENERS TREATED WITH THREAD LOCKING COMPOUND.

**WARNING**

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Remove set screws from sprocket wheel. Clean set screws with thread locking compound solvent. Wipe dry with a clean, cleaning cloth and reinsert set screws into sprocket wheel.
- b. Remove set screw from bearing unit. Clean set screw with cleaning solvent. Wipe dry with a cleaning cloth.

Reinsert set screw into bearing unit.

- c. Clean outer lubrication tube hex head cap screws, bearing mount hex head cap screws, inner lubrication pipe hex head cap screws, inner bearing unit hex head cap screws, and outer bearing unit hex head cap screws with thread locking compound solvent. Wipe dry with a clean, cleaning cloth.

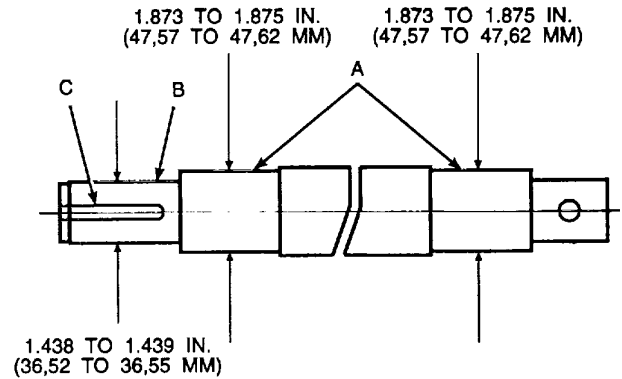
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2.68 REPLACE AUGER BEARING UNITS, SHAFT, AND SPROCKET WHEEL - Continued

C. INSPECT.

1. INSPECT SHAFT.

- a. Visually inspect shaft for straightness. Roll shaft across a clean level surface. Check for out-of-roundness. Replace shaft if bent or out-of-round.
- b. Inspect bearing surfaces A on shaft for scoring and gouging. Replace shaft if scoring or gouging is detected.
- c. Use outside micrometer and measure bearing surface diameters (A) on shaft. Bearing surface diameters on shaft should measure between 1.873 and 1.875 in. (47, 57 and 47, 62 mm). If bearing surface diameters on shaft measure less than 1.873 in. (47, 57 mm), replace shaft.
- d. Inspect sprocket wheel surface B on shaft for scoring or gouging. Replace shaft if scoring or gouging is detected.
- e. Use outside micrometer and measure sprocket wheel surface (B) on shaft for wear. Sprocket wheel surface diameter on shaft should measure between 1.438 and 1.439 in. (36, 52 and 36, 55 mm). If sprocket wheel surface diameter on shaft is less than 1.438 in. (36, 52 mm), replace shaft.
- f. Inspect shaft keyway C for damage. Replace shaft if keyway is visibly damaged.

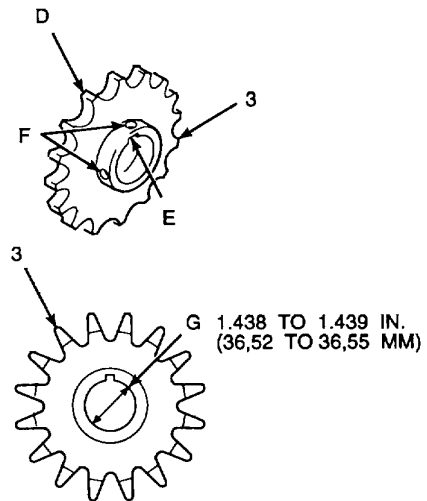


2. INSPECT BEARINGS.

- a. Spin bearing by hand.
- b. If bearing does not spin freely, or radial free play is detected, discard and replace ball bearing unit.

3. INSPECT SPROCKET WHEEL.

- a. Inspect sprocket wheel (3) for broken, missing, and worn teeth D. Replace damaged sprocket wheel.
- b. Inspect sprocket wheel (3) keyway E for worn or broken edges. Replace sprocket wheel if keyway is worn or damaged.



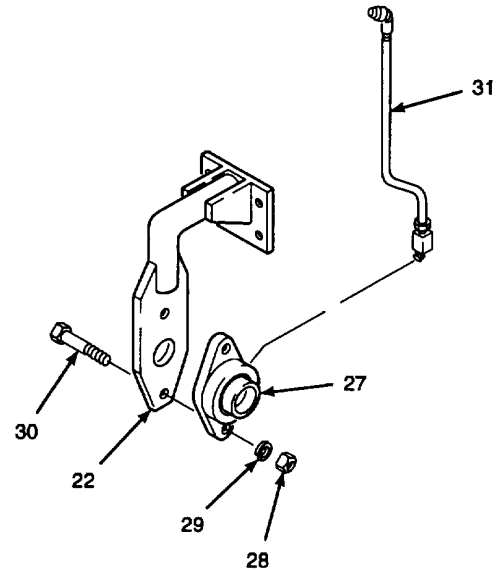
- c. Inspect sprocket wheel (3) for stripped or damaged set screw threads F. Replace sprocket wheel if set screw threads are damaged.
- d. Using a slide caliper measure the inside diameter G of sprocket wheel (3). The inside diameter should measure between 1.438 and 1.439 in. (36,52 and 36,55 mm). If the inside diameter is more than 1.439 in. (36,55 mm), replace sprocket wheel.

GO TO NEXT PAGE

D. INSTALL.

1. INSTALL BEARING UNIT ON BEARING MOUNT.

- a. Install lubrication tube (31) onto bearing unit (27). Ensure lubrication fitting is positioned on bearing unit to point toward rear of paving machine when bearing unit is mounted on main frame.
- b. Install hex head cap screws (30) through bearing mount (22) and into bearing unit.
- c. Install lockwasher (29) onto hex head cap screw (30).



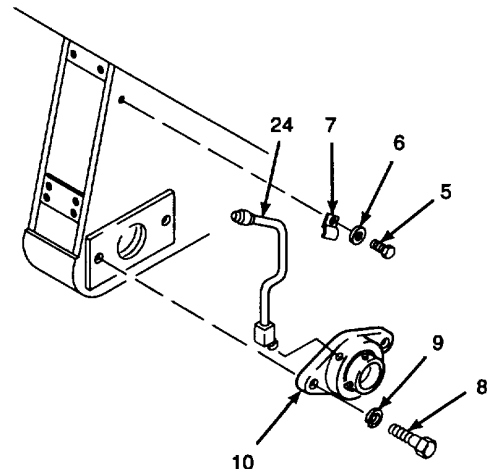
**WARNING**

**Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- d. Apply sealing compound to threads of hex head cap screw (30).
- e. Install hex nuts (28). Tighten hex nuts to 180 lb-ft (244 N.m) using socket wrench adapter.

2. INSTALL BEARING UNIT ON AUGER/CONVEYOR DRIVE CHAIN HOUSING.

- a. Install lubrication pipe (24) onto bearing unit (10). Ensure lubrication fitting is positioned on bearing unit to point toward rear of paving machine when bearing unit is mounted on auger/conveyor drive chain housing.
- b. Place lockwashers (9) onto hex head cap screws (8).
- c. Apply sealing compound to threads of hex head cap screw (8).
- d. Install hex head cap screws (8) through bearing unit (10) and into auger/conveyor drive chain housing. Tighten to 180 lb-ft (244 N.m) using socket wrench adapter.
- e. Install washer (6) on hex head cap screw (5).



- f. Apply sealing compound to threads of hex head cap screw (5).
- g. Install hex head cap screw (5) with washer (6) and clamp (7) into main frame. Tighten to 9 lb-ft (12 N•m).

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2.68 REPLACE AUGER BEARING UNITS, SHAFT, AND SPROCKET WHEEL - Continued

D. INSTALL - Continued

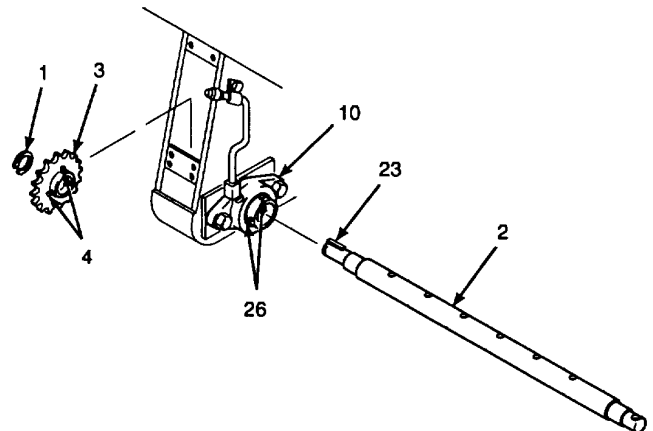
3. INSTALL SHAFT



Shaft weighs 37 lbs (16,76 kg). Equipment damage and personnel injury could result from dropping the shaft when attaching to main frame

**NOTE**

Square key must be inserted before shaft and sprocket wheel are installed. Ensure that sprocket wheel keyway is in line with shaft keyway prior to installing shaft.



- a. Insert square key (23) into shaft (2).
- b. Insert and hold sprocket wheel (3) in place in auger/conveyor drive chain housing.
- c. With a second person supporting the weight of shaft (2), install shaft and square key (23) into bearing unit (10).
- d. Align sprocket wheel keyway with shaft keyway. Slide shaft (2) and square key (23) into sprocket wheel (3) until it stops.



Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.



Use care when installing snap and retaining rings Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury

- e. Apply sealing compound to threads of set screws (26).
- f. Install set screws (26) and tighten.
- g. Apply sealing compound to threads of set screws (4).
- h. Install set screws (4) and tighten.

- i. Install retaining ring (1) on shaft

GO TO NEXT PAGE

D. INSTALL - Continued

4. INSTALL BEARING MOUNT ON MAIN FRAME



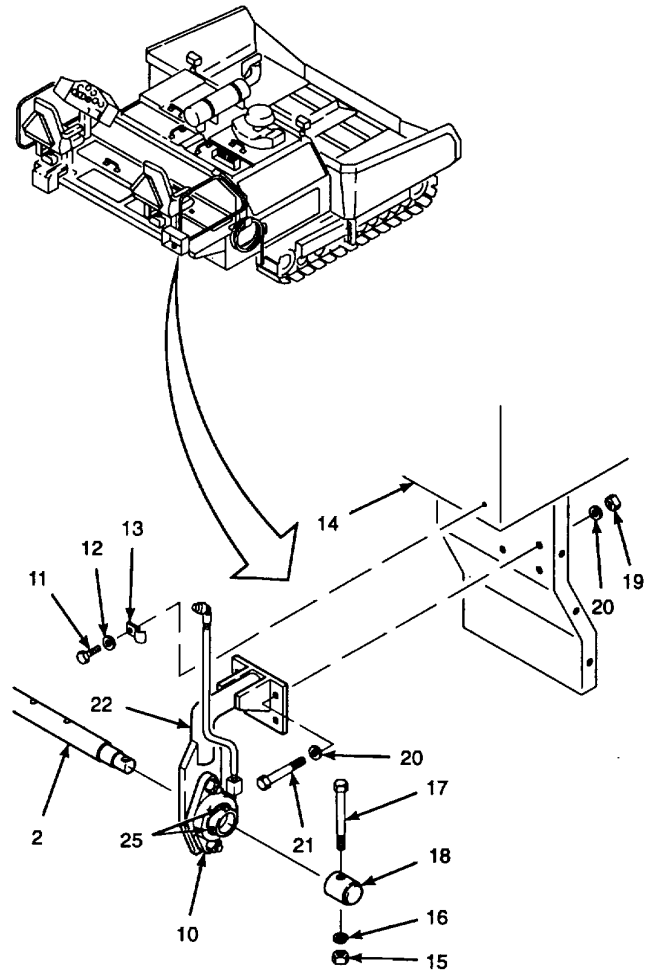
**Bearing mount and shaft weigh 61 lb (28 kg). Equipment damage and personnel injury could result from dropping the bearing mount and shaft when installing on main frame.**

- a. With the help of another person, support the weight of shaft (2), and install bearing mount (22) onto the shaft.



**Sealing compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- b. Install flat washer (20) onto hex head cap screw (21). Apply thread locking compound to threads of hex head cap screws.
- c. Install hex head cap screws (21) through bearing mount and into main frame.
- d. Install flat washers (20) and hex nuts (19) onto cap screws and hand tighten hex nuts. Do not tighten hex nuts at this time.
- e. Use a level and plumb and position shaft (2) so that it is level with the paving machine. Tighten hex nuts (19) to 90 lb-ft (122 N•m).
- f. Install flat washer (12) onto hex head cap screw (11). Apply thread locking compound to threads of hex head cap screw.
- g. Install hex head cap screw (11), flat washer (12), and clamp (13) into main frame (14). Tighten to 9 lb-ft (11 N•m).
- h. Remove set screws (25) on bearing unit (10) and apply thread locking compound to threads of set screws.



- i. Install set screws (25) into bearing unit (10) and tighten
- j. Place shaft cover (18) on end of shaft (2) and align mounting holes
- k. Install hex head cap screw (17), lockwashers (16), and hex nut (15). Tighten hex nut to 45 lb-ft (61 N•m).

**GO TO NEXT PAGE**

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**2.68 REPLACE AUGER BEARING UNITS, SHAFT, AND SPROCKET WHEEL - Continued**

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D. INSTALL - Continued

**NOTE**

**FOLLOW-ON-TASKS:** Install auger/conveyor drive chain per paragraph 2.63  
Install auger flights per TM 5-3895-373-20  
Install screed per TM 5-3895-373-20  
Lubricate bearings per LO 5-3895-373-12

**END OF TASK**

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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL**


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This task covers:

- |            |                |            |
|------------|----------------|------------|
| a. Remove  | b. Disassemble | c. Clean   |
| d. Inspect | e. Assemble    | f. Install |
- 

**INITIAL SETUP**
Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Alignment stud (Item 1, Appendix C)  
Bench vise (Item 112, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Combination wrench (Item 116, Appendix D)  
Crowfoot wrench (Item 125, Appendix D)  
Drip pan (Item 64, Appendix D)  
Hydraulic press frame (Item 41, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Shaft face seal tool (Item 16, Appendix C)  
Shaft face seal tool (Item 17, Appendix C)  
Shaft seal bullet (Item 20, Appendix C)  
Sling strap (Item 98, Appendix D)  
Steel machinist's rule (Item 74, Appendix D)  
Torque wrench, 5 to 150 lb-in (Item 129, Appendix D)  
Torque wrench, 150 to 750 lb-in (Item 130, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Vise jaw caps (Item 23, Appendix D)

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Electrical insulating compound (Item 10, Appendix B)  
Electrical insulating varnish (Item 38, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Grease (Item 18, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Protective caps (Item 3, Appendix B)  
Tags (Item 34, Appendix B)  
Tape (Item 35, Appendix B)  
Thread locking compound (Item 13, Appendix D)  
Thread locking compound solvent (Item 32, Appendix B)  
Tie wraps (Item 36, Appendix B)

Gasket  
Plain seal  
Preformed packings  
Rear motor seal kit  
Seal kit  
Shaft seal kit

Personnel Required:

Two 62B construction equipment repairers to assist in the removal and replacement of the auger/conveyor motor

References:

TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P

Equipment Condition:

Screed removed per TM 5-3895-373-20  
Center top right access door opened per TM 5-3895-373-10  
Center top left access door opened per TM 5-3895-373-10  
Rear top right access door opened per TM 5-3895-373-10  
Rear top left access door opened per TM 5-3895-373-10  
Evacuate oil from hydraulic system per paragraph 2.54  
Remove field relay per TM 5-3895-373-20 if removing left auger/conveyor motor

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**GO TO NEXT PAGE**

## 2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued

## NOTE

Procedures for right and left auger/conveyor motors are the same except where noted in the text.

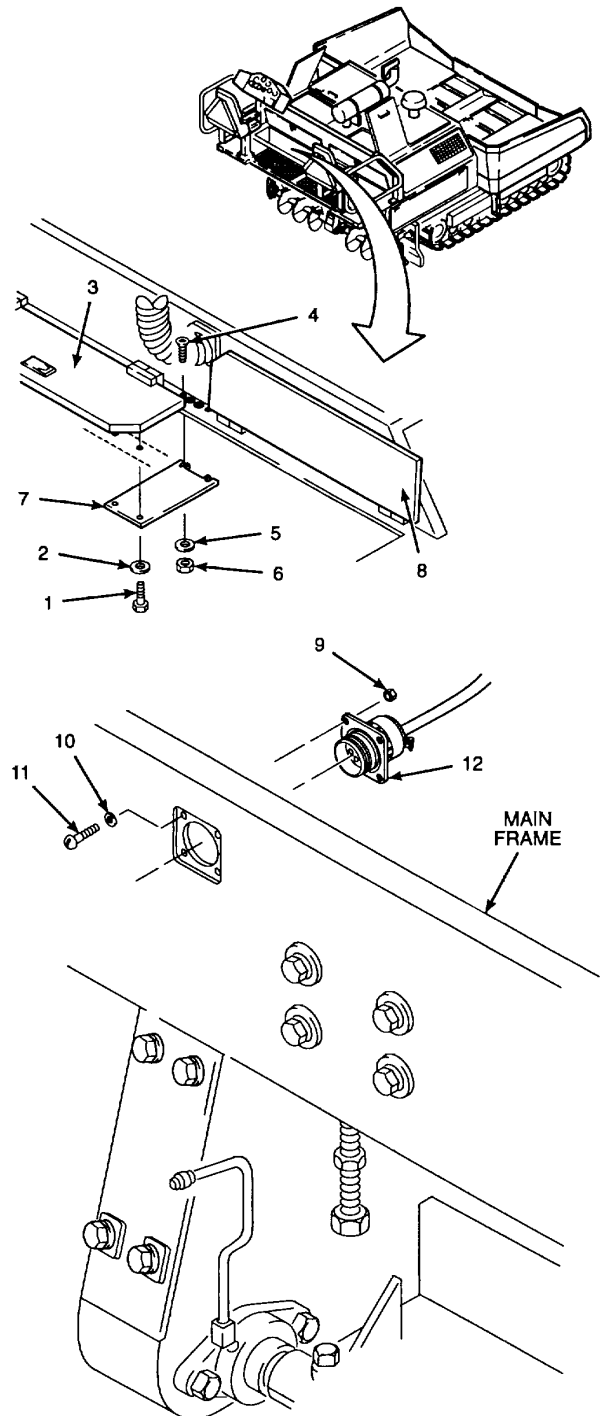
## A. REMOVE.

## 1. REMOVE COVER.

- a. Remove hex head cap screws (1) and flat washers (2).
- b. Close rear top left access door (3) and remove socket head cap screw (4), flat washer (5), and hex nut (6) securing left side of cover (7).
- c. Open rear top left access door (3) and close rear top right access door (8) and remove socket head cap screw (4), flat washer (5), and hex nut (6) from right side of cover (7).
- d. Turn cover (7) sideways and remove from cowling frame.
- e. Open rear top right access door (8).

## 2. REMOVE SCREED HARNESS ELECTRICAL RECEPTACLE.

- a. Remove hex nut (9), flat washer (10), and machine screw (11) from screed harness electrical receptacle (12).
- b. Remove screed harness electrical receptacle (12) from main frame and position so that the receptacle does not interfere with auger/conveyor motor removal.



GO TO NEXT PAGE

A. REMOVE - Continued.

**NOTE**

Perform steps 3 and 4 if removing left auger/ conveyor motor. Go to step 5 if removing right auger/conveyor motor.

3. REMOVE INBOARD BATTERY.

**WARNING**

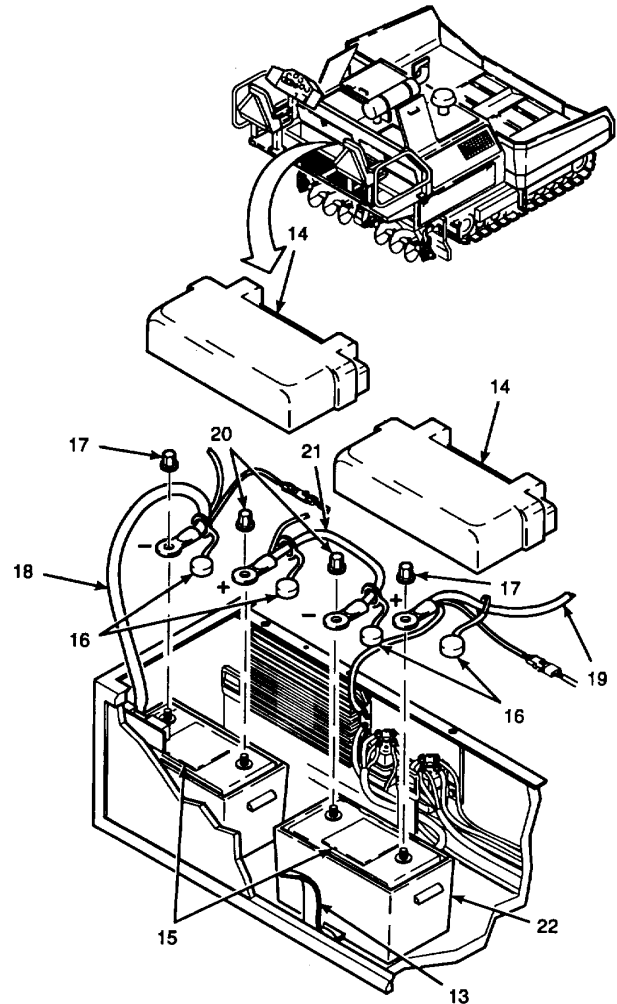
Disconnect batteries prior to performing maintenance in immediate battery area. Failure to disconnect batteries may lead to electrical shock or short circuit and result in severe personnel injury or damage to equipment.

- a. Unbuckle battery box holddown straps (13) and remove battery box covers (14) from both batteries.
- b. Remove panels (15).

**WARNING**

When disconnecting batteries, disconnect negative battery cable before disconnecting positive battery cable. Failure to disconnect batteries in the proper sequence may lead to electrical shock or short circuit and result in severe personnel injury.

- c. Remove battery terminal caps (16).
- d. Remove battery nut (17) and negative battery cable (18) from negative terminal of outboard battery.
- e. Remove battery nut (17) and positive battery cable (19) from positive terminal of inboard battery.
- f. Remove battery nuts (20).
- g. Remove jumper battery cable (21) from positive terminal of outboard battery and from negative terminal of inboard battery.
- h. Remove inboard battery and battery box (22) from paving machine.



**GO TO NEXT PAGE**

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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL- Continued**

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A. REMOVE - Continued.

**NOTE**

Perform step 4 if removing left auger/conveyor motor. Go to steps 5 and 6 if removing right auger/conveyor motor.

4. DISCONNECT SCREED BURNER FUEL LINE, SCREED HYDRAULIC HOSES, AND TUBES AT TRACTOR REAR BULKHEAD.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C) Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean area around screed fuel, hydraulic hose and tube fittings with a cleaning cloth moistened with cleaning solvent.

**GO TO NEXT PAGE**

A. REMOVE - Continued.

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death: Always wear safety glasses/goggles at all times.

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

Post signs that read "NO SMOKING WITHIN 50 FEET" when working with open fuel lines or fuel tanks.

- b. Tag and disconnect screed burner fuel hose (23). Drain residual fuel into a drip pan and dispose of fuel in accordance with local procedures. Plug hose and cap straight adapter.

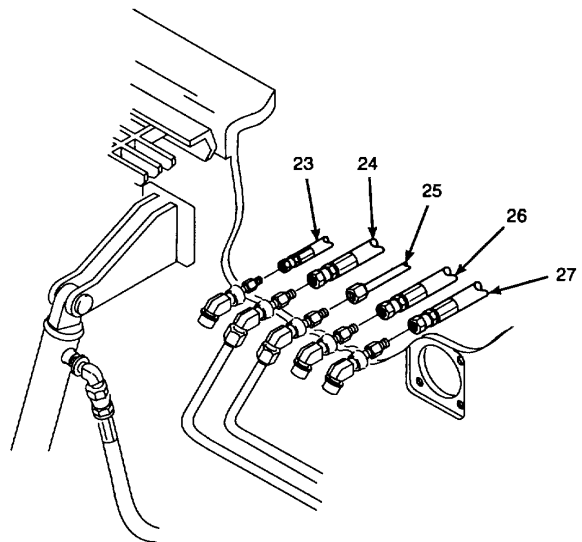
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Be careful not to bend metal tube during removal or moving out of the way during maintenance. Tube may develop cracks or burst if damaged by bends or cracks.

- c. Tag and disconnect screed travel lock valve hose (24) and tube (25). Plug tube and hose and cap straight adapters.
- d. Tag and disconnect left screed extension cylinder retract hose (26) and extend hose (27). Plug hoses and cap straight adapters.



**GO TO NEXT PAGE**



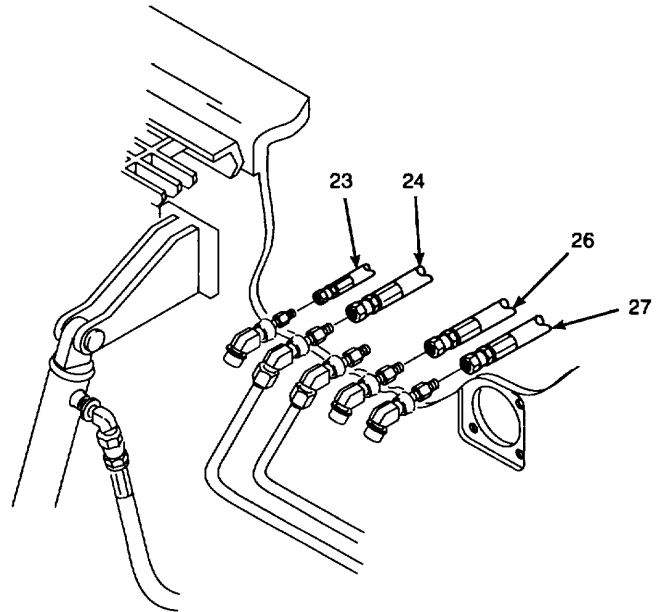
**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued****A. REMOVE - Continued.**

- e. Tie screed burner fuel hose (23), left screed extension cylinder retract hose (26), and extend hose (27) together with tie wraps and set aside.
- f. Tie screed travel lock valve hose (24) to screed burner fuel filter with a tie wrap.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- g. Wipe up any spilled fuel or hydraulic oil with a cleaning cloth and dispose of hydraulic oil in accordance with local procedures.

**GO TO NEXT PAGE**

A. REMOVE - Continued.

**NOTE**

Perform steps 5 and 6 if removing right auger/ conveyor motor. Go to step 7 if removing left auger/conveyor motor.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

5. DISCONNECT SCREED EXTENSION CYLINDER EXTEND AND RETRACT HYDRAULIC HOSES AND SCREED VIBRATION CONTROL VALVE TUBES AT TRACTOR REAR BULKHEAD.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

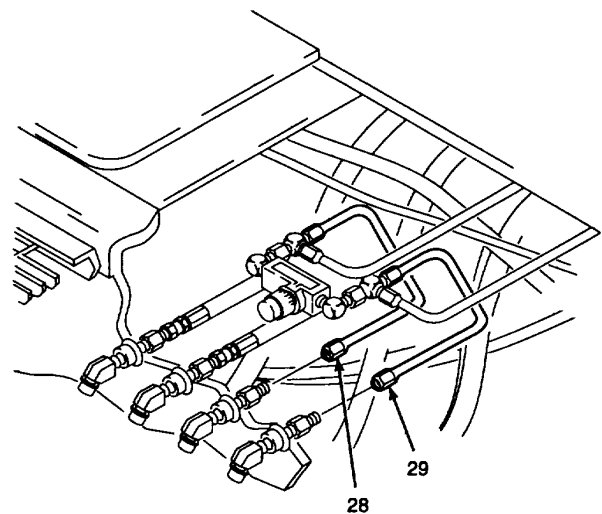
If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean area around hydraulic hose and tube fittings with a cleaning cloth moistened with cleaning solvent.

**CAUTION**

Be careful not to bend metal tubes during removal or moving out of the way during maintenance. Tubes may develop cracks or burst if damaged by bends or cracks.

- b. Tag and disconnect screed vibration control valve tubes (28 and 29) from straight adapters.



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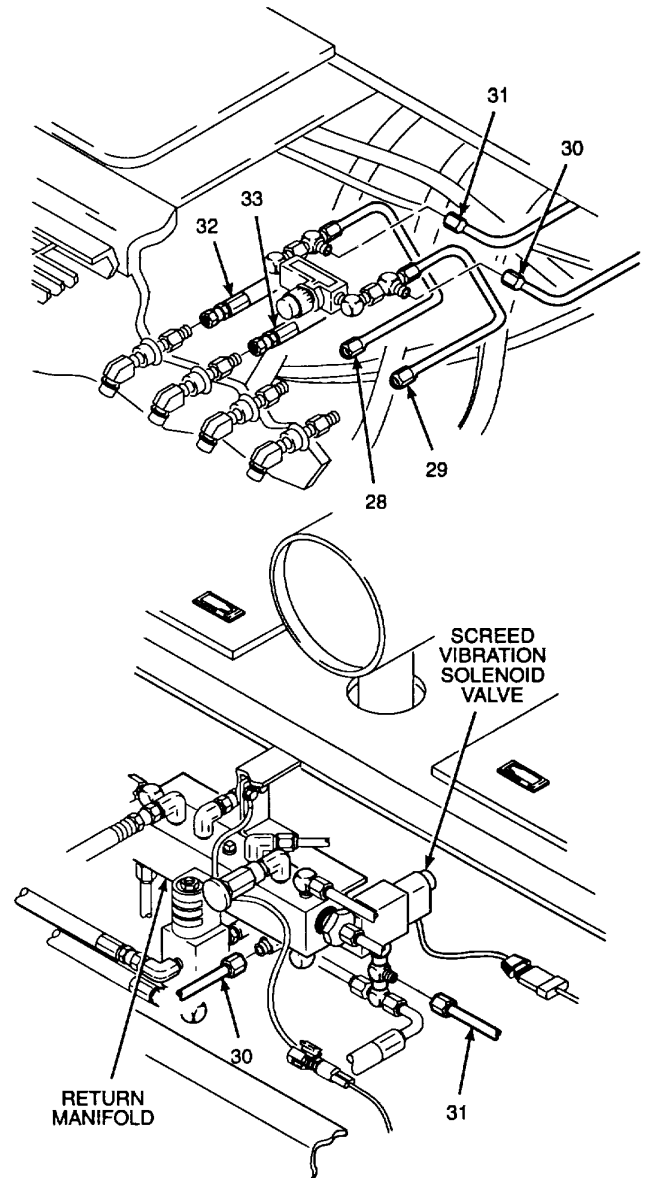
2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued

A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- c. Tag and disconnect end of screed extension cylinder return line tube (30) at the screed vibration control valve. Plug tube and cap valve tee.
  - d. Tag and disconnect end of screed vibration solenoid valve tube (31) at the screed vibration control valve. Plug tube and cap control valve tee.
  - e. Remove screed vibration control valve and set aside. Plug control valve tubes (28 and 29) and cap mating straight adapters.
  - f. Tag and disconnect right screed extension cylinder retract hose (32) and extend hose (33). Plug hoses and cap straight adapters.
  - g. Tie right screed extension cylinder retract hose (32) and extend hose (33) together with tie wraps and set aside.
  - h. Wipe up any spilled hydraulic oil with a cleaning cloth and dispose of hydraulic oil in accordance with local procedures.
6. DISCONNECT SCREED EXTENSION CYLINDER RETURN LINE TUBE FROM RETURN MANIFOLD AND SET ASIDE. DISCONNECT SCREED VIBRATION SOLENOID VALVE TUBE 5 FROM SCREED VIBRATION SOLENOID VALVE AND SET ASIDE.
- a. Tag and disconnect screed extension cylinder return line tube (30) from return manifold. Plug tube and cap return manifold elbow.



- b. Tag and disconnect screed vibration solenoid valve tube (31) from screed vibration solenoid valve mounted on return manifold. Plug tube and cap tee cap
- c. Move tubes out of the way of right auger/conveyor

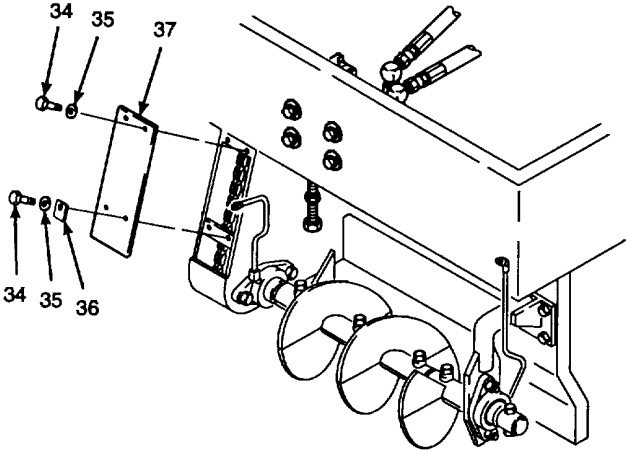
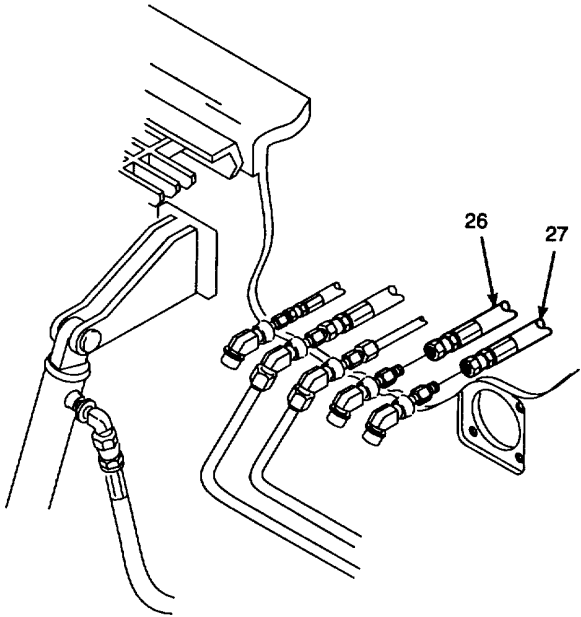
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A. REMOVE - Continued.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- d. Tag and disconnect left screed extension cylinder extend hose (27) and position out of the way. Plug hose and cap straight adapter.
  - e. Tag and disconnect left screed extension cylinder retract hose (26) and position out of the way. Plug hose and cap straight adapter.
7. REMOVE REAR COVER PLATE FROM AUGER/CONVEYOR DRIVE CHAIN HOUSING.
- a. Remove hex head cap screws (34), flat washers (35), and square flat washers (36).
  - b. Remove rear cover plate (37).



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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued**

A. REMOVE Continued.

**WARNING**

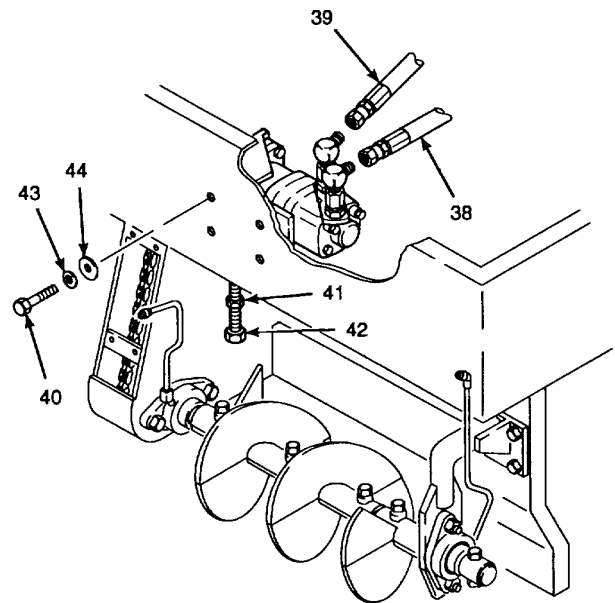
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

8. DISCONNECT HYDRAULIC HOSES FROM AUGER/CONVEYOR MOTOR IN AND OUT PORTS.

**NOTE**

The right auger/conveyor motor turns counterclockwise and the left auger/conveyor motor turns clockwise. Porting on the motors are reversed when going from the right motor to the left motor.

- a. Tag and disconnect hydraulic hose (38) from auger/conveyor motor in port B elbow. Plug hose and cap elbow.
  - b. Tag and disconnect hydraulic hose (39) from auger/ conveyor motor out port A elbow. Plug hose and cap elbow.
9. LOOSEN TENSION BOLTS AND REMOVE HEX HEAD CAP SCREWS.
- a. Loosen, but do not remove, hex head cap screws (40).
  - b. Loosen hex nut (41).
  - c. Back tension bolt (42) all the way down, but do not remove hex nut and tension bolt.
  - d. Remove hex head cap screws (40), washers (43), and flat washers (44).

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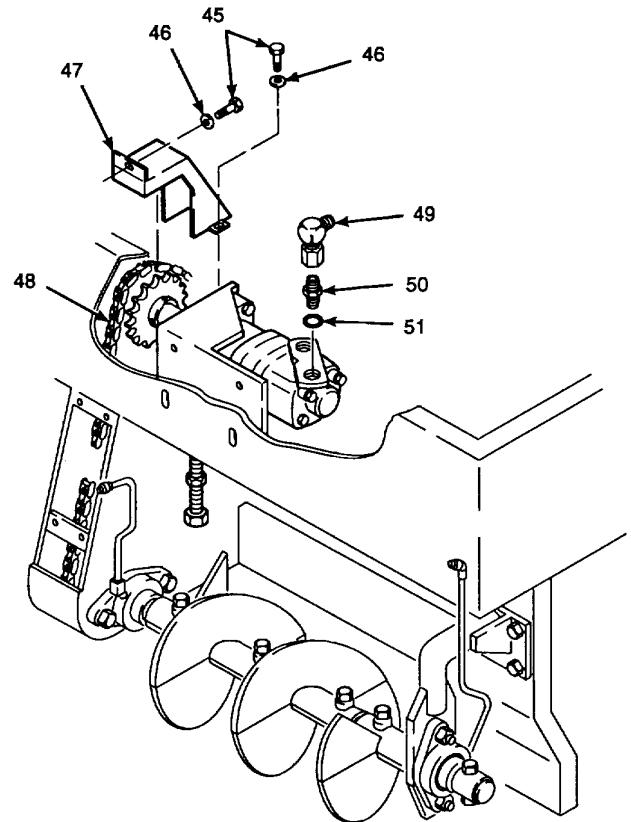
A. REMOVE - Continued.

10. REMOVE TOP CHAIN COVER PLATE, LIFT AUGER/CONVEYOR DRIVE CHAIN OFF SPROCKET WHEEL, AND REMOVE ELBOWS.

**NOTE**

Hydraulic hoses routed over the top of top chain cover plate may need to be repositioned temporarily to gain access to hex head cap screws and to allow the removal of the top chain cover plate.

- a. Remove hex head cap screws (45) and flat washers (46).
  - b. Remove top chain cover plate (47).
  - c. Lift auger/conveyor drive chain (48) off of drive sprocket wheel and secure with a string tied where hex head cap screw (1, step A.1.a) was secured.
  - d. Remove elbows (49) from straight adapters (50). Cap straight adapters.
11. REMOVE STRAIGHT ADAPTERS AND AUGER/CONVEYOR MOTOR FROM PAVING MACHINE AND DISCONNECT AUGER/CONVEYOR DRIVE CHAIN.

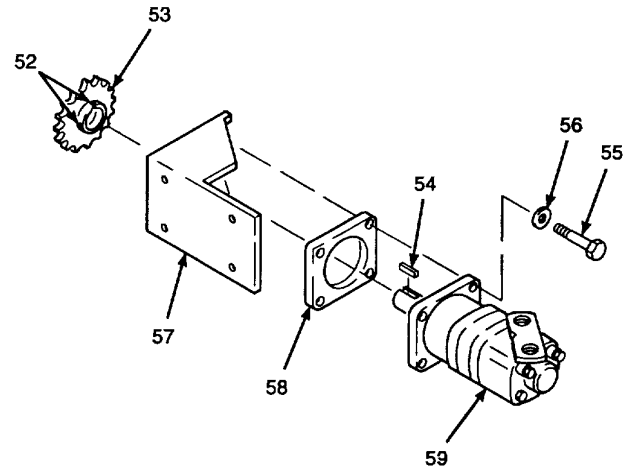


- a. For the RH auger/conveyor motor, turn the motor and motor mount 90° clockwise as seen from the drive sprocket wheel.
- b. For the LH auger/conveyor motor, turn the motor and motor mount 90° counterclockwise as seen from the drive sprocket wheel.
- c. Place a machinery wiping towel beneath elbow and straight adapters installed on the auger/conveyor motor to be removed.
- d. Using a 1-1/2 in. combination wrench, remove straight adapters (50) and preformed packings (51). Discard preformed packings.
- e. Using an overhead hoist and sling strap, lift auger/conveyor motor out of the paving machine and move to a clean work area.
- f. Manually reposition auger/conveyor drive chain (48) over auger sprocket wheel and conveyor sprocket gear to allow access to the master link.
- g. Disconnect auger/conveyor drive chain (48) paragraph 2.63, step A.7.

**GO TO NEXT PAGE**

**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued****B. DISASSEMBLE.**

1. REMOVE DRIVE SPROCKET WHEEL AND MOTOR MOUNT FROM AUGER/CONVEYOR MOTOR.
  - a. Loosen set screws (52) and remove drive sprocket wheel (53) and key (54).
  - b. Remove hex head cap screws (55) and washers (56).
  - c. Remove motor mount (57) and shim (58) from auger/ conveyor motor (59).
  - d. Place key (54) back in key slot on auger/conveyor motor (59) drive shaft and secure in place with masking tape.

**CAUTION**

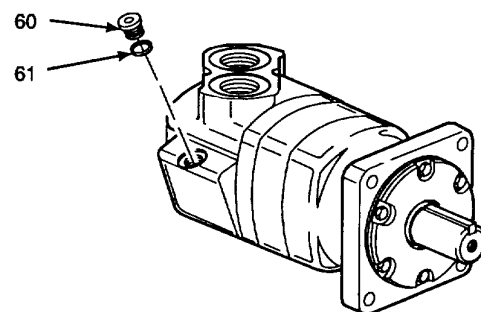
Cleanliness is extremely important when repairing a hydraulic motor. Work in a clean area. Ensure all parts are coated with clean hydraulic oil during disassembly to avoid corrosion or contamination. Failure to do so may result in excessive component wear or failure.

2. DRAIN HYDRAULIC OIL FROM AUGER/ CONVEYOR MOTOR.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Remove fill/drain plug (60) and preformed packing (61). Discard preformed packing.
- b. Drain hydraulic oil from auger/conveyor motor into a drip pan. Dispose of hydraulic oil in accordance with local procedures.

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## B. DISASSEMBLE - Continued.

**NOTE**

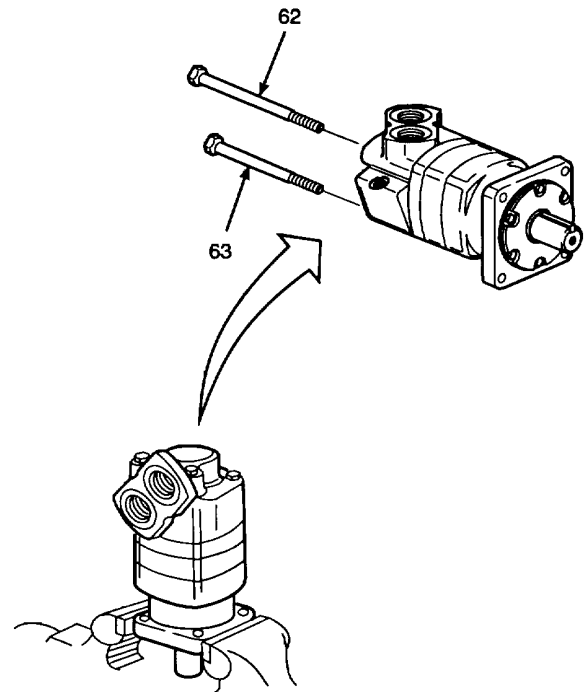
There are two seal kits used in repair of the auger/conveyor motor. If using a seal kit, disassemble the motor only as far as needed to replace the items contained in the seal kit being used.

3. REMOVE CHECK VALVE, SEPARATE VALVE HOUSING FROM AUGER/CONVEYOR MOTOR, COUNTERBALANCE WEIGHT ASSEMBLY, COMPRESSION SPRINGS, AND VALVE.



Use caution when clamping the auger/conveyor motor in a vise. Excessive clamp pressure on housing in a vise will cause distortion and leakage. Use vise jaw caps to prevent damage to housing.

- a. Place auger/conveyor motor in a bench vise with output shaft down. Do not overtighten vise jaw caps.
- b. Remove hex head cap screws (62 and 63).



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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued**

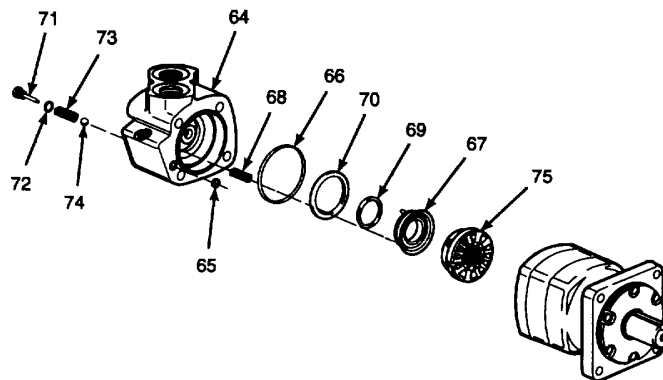

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## B. DISASSEMBLE - Continued.



Remove valve housing carefully from auger/conveyor motor to prevent compression springs and counterbalance weight assembly from falling out of valve housing. Failure to do so may result in damage to parts.

- c. Lift valve housing (64) straight up off auger/conveyor motor. Do not allow parts to fall from valve housing.
- d. Use an o-ring tool and remove preformed packings (65) and gasket (66). Discard preformed packings and gasket.
- e. Remove counterbalance weight assembly (67) and compression springs (68).
- f. Use an o-ring tool and remove inner face seal ring (69) and outer face seal ring (70). Discard seal rings.
- g. Remove plugs (71), preformed packings (72), compression springs (73) and check balls (74). Discard preformed packings.
- h. Lift valve (75) off valve plate and valve drive shaft.



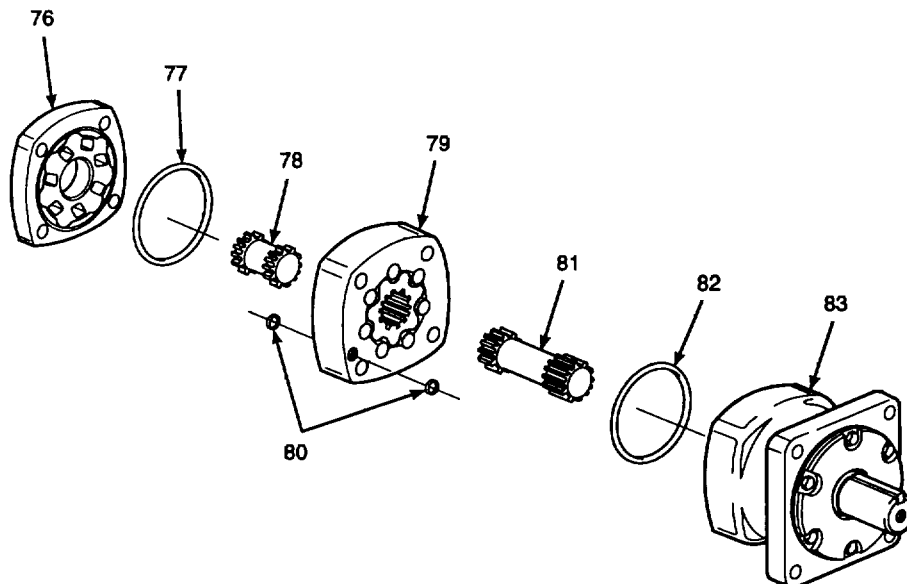
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- B. DISASSEMBLE - Continued.
4. REMOVE VALVE PLATE, VALVE DRIVE SHAFT, GEAR SET, AND MULTIPLE GEAR SHAFT FROM BEARING HOUSING AND SHAFT ASSEMBLY.
- Remove valve plate (76).
  - Remove and discard preformed packing (77).
  - Lift valve drive shaft (78) out of gear set (79).

**NOTE**

**The gear set rollers may be loose when removing gear set from multiple gear shaft. Retain gear set rollers in gear set outer ring if loose. Do not lose gear set rollers.**

- Remove gear set (79). Ensure gear set rollers are retained in gear set outer ring if loose.
- Remove and discard preformed packings (80).
- Remove multiple gear shaft (81).
- Remove preformed packing (82) from bearing housing and shaft assembly (83). Discard preformed packing.



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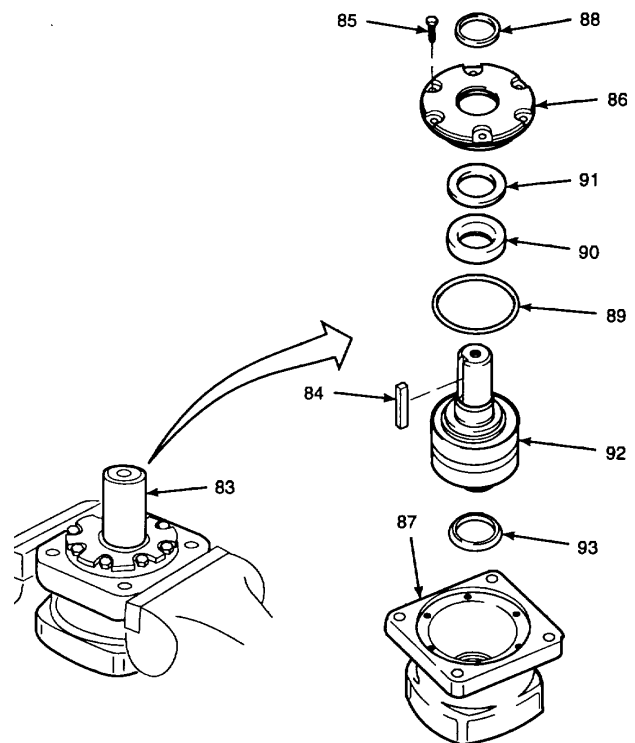
2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued

- B. DISASSEMBLE Continued.
- 5. REMOVE SHAFT COUPLING ASSEMBLY FROM BEARING HOUSING.
  - a. Loosen bench vise and position bearing housing and shaft assembly (83) so shaft is up. Do not overtighten vise.
  - b. Remove key (84).
  - c. Remove hex head cap screws (85).



**Do not damage seal surfaces when prying motor end cap and bearing housing apart. Use caution and pry evenly around all edges of retainer to avoid damage.**

- d. Pry motor end cap (86) from bearing housing (87) by evenly prying around edges with a putty knife. Use caution and do not damage sealing surfaces.
- e. Remove dust seal (88). Discard dust seal.
- f. Remove preformed packing (89), seal (90), and packing retainer (91). Discard preformed packing and plain seal.
- g. Remove shaft coupling assembly (92) from bearing housing (87). If shaft coupling assembly is difficult to remove, press shaft coupling assembly from bearing housing using a hydraulic press frame and universal puller kit.
- h. Remove and discard shaft face plain seal (93).



**GO TO NEXT PAGE**

## C. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type Im cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. CLEAN ALL METAL PARTS WITH CLEANING SOLVENT.
  - a. Rinse all metal parts in cleaning solvent. Do not submerge shaft coupling assembly bearing in cleaning solvent.
  - b. Use a cleaning brush to remove foreign material and debris from exterior auger/conveyor motor parts. Rinse with cleaning solvent.
  - c. Flush dirt and foreign material from fluid passages in valve housing, bearing housing, valve plate, and gear set.
  - d. Use a lint-free cloth to wipe away dirt from seal and packing grooves.
  - e. Dry all parts with a clean, lint-free cloth.

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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued**

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C. CLEAN - Continued.

2. CLEAN ALL FASTENERS WITH THREAD LOCKING COMPOUND SOLVENT.

<b>WARNING</b>
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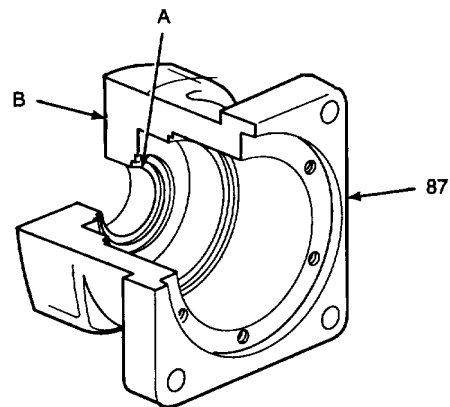
**Thread locking compound solvent can cause eye damage. Wear safety goggles when cleaning fasteners with locking compound solvent. If solvent contacts eyes, flush with water and get immediate medical attention.**

- a. Clean hex head cap screws and socket head cap screws with thread locking compound solvent.
- b. Dry all fasteners with a clean, cleaning cloth.

D. INSPECT.

1. INSPECT BEARING HOUSING.

- a. Inspect bearing housing (87) shaft face seal, groove A, for scratches, nicks, and burrs.
- b. Replace bearing housing (87) if scratches, nicks, and burrs cannot be removed with emery cloth.
- c. Inspect surface B for scoring. Replace if scratches cannot be removed with emery cloth.

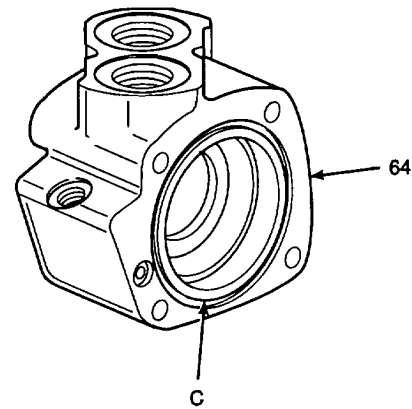


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D. INSPECT - Continued.

2. INSPECT VALVE HOUSING.

- a. Inspect valve housing (64) seal groove C for contamination, foreign material, nicks, burrs, sharpened, or broken edges.
- b. Replace valve housing (64) if nicks, burrs, sharpened, or broken edges cannot be removed with emery cloth.

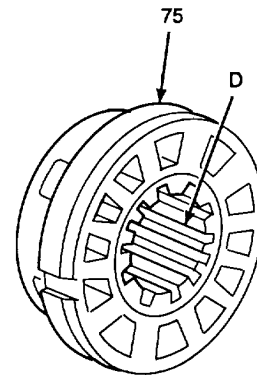


**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type Im cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

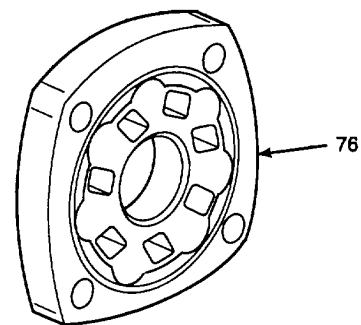
If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- c. Rinse contamination and foreign matter from valve housing passages with cleaning solvent.



3. INSPECT VALVE AND VALVE PLATE.

- a. Inspect valve (75) internal gear, splines D, for sharpened, chipped, or broken gear splines. Replace valve if gear splines are damaged.
- b. Inspect valve plate (76) for nicks, burrs, sharpened or broken edges. Replace valve plate if damage cannot be removed with emery cloth.



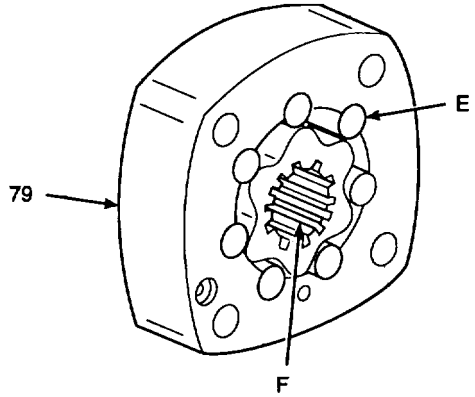
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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued**

D. INSPECT - Continued.

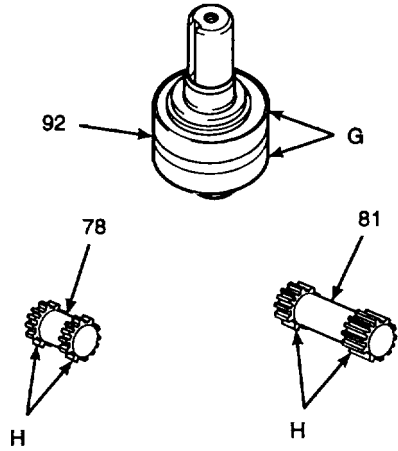
4. INSPECT GEAR SET.

- a. Inspect gear set (79), gear rollers E, for contamination, looseness, and wear. Replace gear set if rollers are worn.
- b. Inspect valve internal gear, splines F, for sharpened, chipped, or broken gear splines. Replace gear set if gear splines are damaged.



5. INSPECT SHAFT COUPLING ASSEMBLY (92). REPLACE SHAFT COUPLING ASSEMBLY IF BEARINGS G DO NOT SPIN FREELY, OR EXHIBIT RADIAL FREE PLAY.

6. INSPECT SPLINES H OF VALVE DRIVE SHAFT (78) AND MULTIPLE GEAR SHAFT (81) FOR NICKS, CHIPS, OR BURRS. REPLACE PARTS IF DAMAGE IS FOUND.



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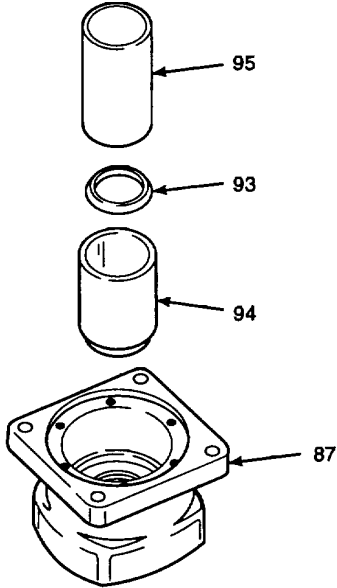
E. ASSEMBLE.

1. LUBRICATE AND INSTALL BEARING HOUSING SHAFT FACE SEAL.

- a. Place bearing housing (87) on smooth flat surface with large diameter end of housing up.
- b. Align small chamfered end of shaft face seal tool (Item 16, Appendix C) (94) with seal seat in bearing housing.

**WARNING**

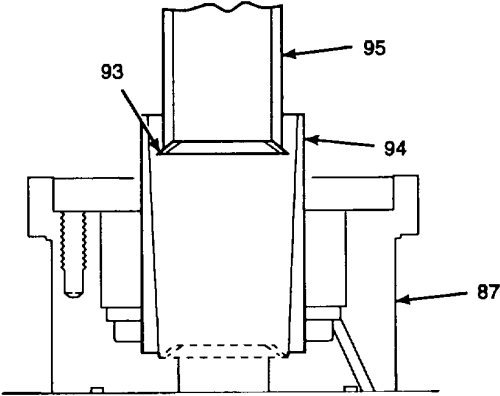
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.



- c. Apply clean hydraulic oil to shaft face seal (93).
- b. Install small diameter end of shaft face seal (93) into bore of shaft face seal tool (95).
- e. Insert shaft face seal tool (Item 17, Appendix C) (95) with shaft face seal (93) into bore of shaft face seal tool (Item 16, Appendix C) (94).

**CAUTION**

Do not damage shaft face seal during installation. Ensure shaft face seal is seated properly. A damaged or improperly installed shaft face seal may cause internal lubrication loss and damage to internal parts.



- f. Rotate and push shaft face seal tool (Item 17, Appendix C) (95) until shaft face seal (93) seats at bottom of bearing housing (87).
- g. Remove shaft face seal tool (Item 17, Appendix C) (95) and shaft face seal tool (Item 16, Appendix C) (94).

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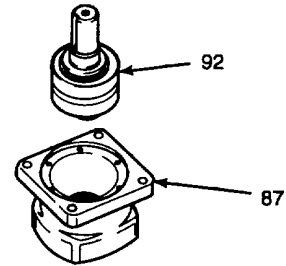


2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued

E. ASSEMBLE Continued.

2. INSTALL SHAFT COUPLING ASSEMBLY IN BEARING HOUSING.

- a. Install shaft coupling assembly (92) with shaft end up into bearing housing (87) bore. Use care to avoid damage to shaft face seal (93) installed in bearing housing.
- b. If installation of shaft coupling assembly by hand is difficult, use a hydraulic press to install shaft coupling assembly. Press on inside diameter of shaft.

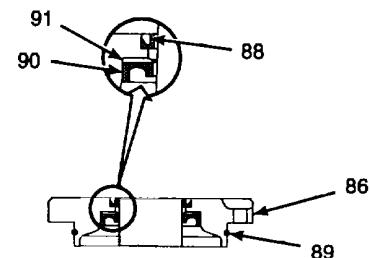
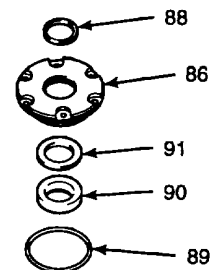
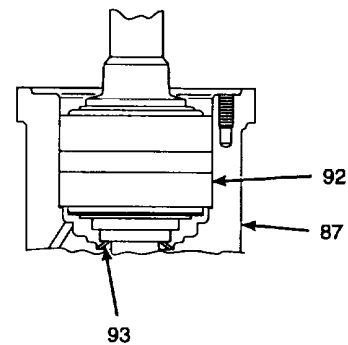


3. INSTALL PREFORMED PACKINGS AND SEALS ONTO MOTOR END CAP.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Apply clean hydraulic oil to dust seal (88).
  - b. Place metal side of dust seal (88) into seal recess of motor end cap (86).
  - c. Use even thumb pressure and press dust seal (88) into motor end cap (86).
  - d. Apply clean hydraulic oil to preformed packing (89), seal (90) and packing retainer (91).
  - e. Place preformed packing (89) into packing groove on motor end cap (86).
  - f. Set packing retainer (91) in motor end cap (86).
  - g. Install seal (90) into motor end cap (86) with flat side against packing retainer (91).
4. INSTALL MOTOR END CAP AND KEY ONTO SHAFT AND BEARING HOUSING ASSEMBLY.
- a. Apply clean hydraulic oil to inner diameters of seals installed on motor end cap.



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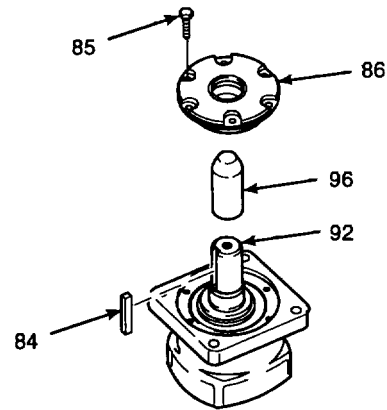
E. ASSEMBLE Continued.

- b. Place shaft seal bullet (96) over shaft portion of shaft coupling assembly (92).
- c. Position motor end cap (86) onto shaft seal bullet (96).



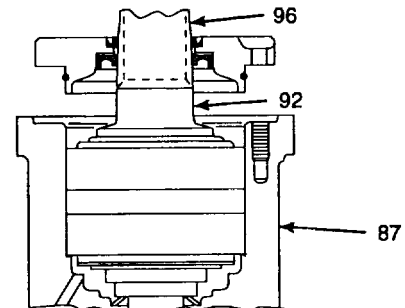
**Do not cut or distort shaft face seal during motor end cap installation. A damaged or improperly installed shaft face seal may cause internal lubrication loss and damage to internal parts.**

- d. Install motor end cap (86) over shaft seal bullet (96) with a twisting motion to prevent damage to seals. Use care to avoid cutting or distorting seals.
- e. Remove shaft seal bullet (96).
- f. Insert key (84) in keyway on shaft.



**Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

- g. Lubricate threads of hex head cap screws (85) with clean hydraulic oil.



**Improper tightening of fasteners can damage equipment and fasteners. Tightening hex head cap screws in improper sequence, or at values not incremental can damage motor end cap and cap screws. Tighten cap screws only as specified.**

- h. Install and tighten finger tight hex head cap screws (85) through motor end cap (86) and into bearing housing (87).

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2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued

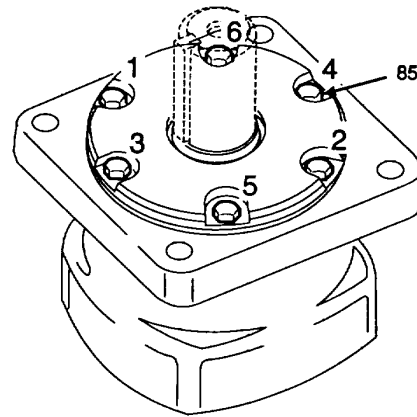
E. ASSEMBLE - Continued.

- i. Tighten hex head cap screws (85) in two stages. Tighten in the sequence illustrated to 50 lb-in (6 N.m) and then to 25 lb-ft (34 N.m).

5. INSTALL ALIGNMENT STUDS IN BEARING HOUSING AND SHAFT ASSEMBLY.

- a. Place bearing housing and shaft assembly (83) with shaft down, in a bench vise. Do not over tighten vise jaw caps.
- b. Thread two alignment stud (97) tools in diagonally opposed holes of bearing housing and shaft assembly (83) and tighten finger tight.

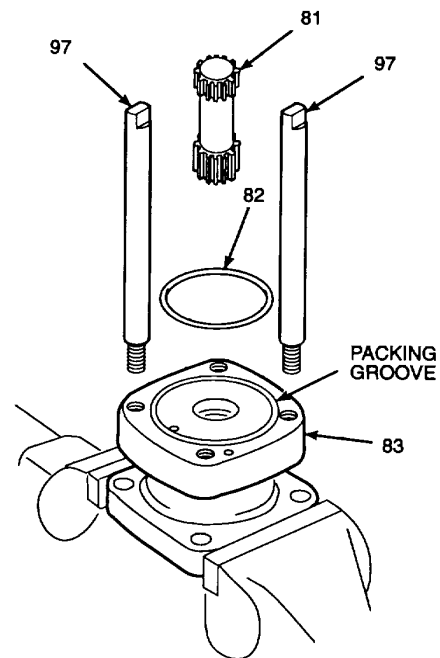
6. LUBRICATE AND INSTALL MULTIPLE GEAR SHAFT AND PREFORMED PACKING INTO BEARING HOUSING AND SHAFT ASSEMBLY.



**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Fill bearing housing and shaft assembly with clean hydraulic oil.
- b. Install long-splined end of multiple gear shaft (81) into shaft opening and align shaft splines with internal gear splines.
- c. Apply clean hydraulic oil to preformed packing (82) and install in packing groove on bearing housing and shaft assembly (83).

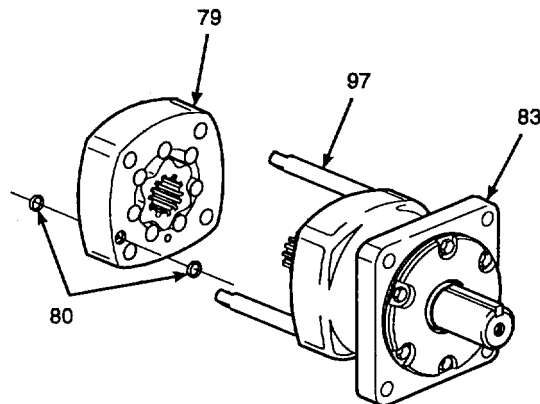


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E. ASSEMBLE - Continued.

**NOTE**

Installation at this point involves procedures that result in timing the auger/conveyor motor. Timing determines the direction of rotation of the output shaft. Components involved in motor timing are gear set, valve drive shaft, valve plate, and valve.



7. ALIGN AND INSTALL GEAR SET ONTO BEARING HOUSING AND SHAFT ASSEMBLY.

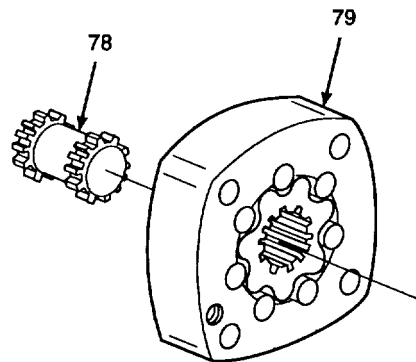
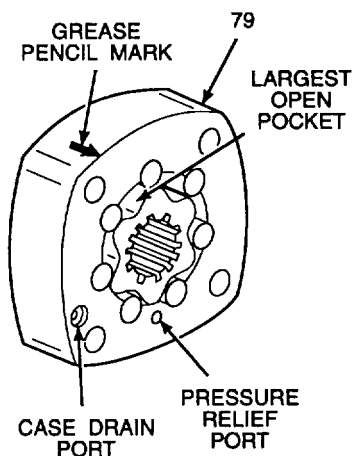
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Apply clean hydraulic oil to preformed packings (80) and install in case drain packing grooves on gear set (79).
- b. Locate largest open pocket between gear and rollers in gear set (79).
- c. Use a grease pencil and mark this location of pocket on outside edge of gear set (79).
- d. Align case drain port and pressure relief port of gear set (79) with case drain port and pressure relief port of bearing housings and shaft assembly (83).
- e. Install gear set (79) onto bearing housing and shaft assembly (83) using alignment studs (97).

8. INSTALL VALVE DRIVE SHAFT INTO GEAR SET.

- a. Fill auger/conveyor motor with clean hydraulic oil.
- b. Install valve drive shaft (78) into gear set (79).



**NOTE:** BEARING HOUSING AND SHAFT ASSEMBLY NOT SHOWN FOR CLARITY.

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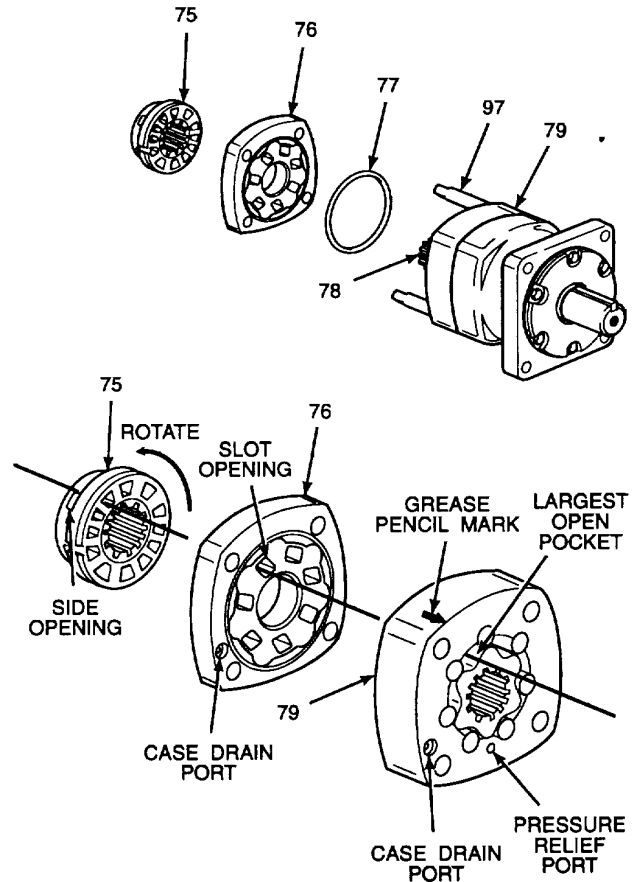
**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.**

- E. ASSEMBLE - Continued.
- 9. INSTALL VALVE PLATE ONTO GEAR SET.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Apply clean hydraulic oil to preformed packing (77) and install in groove of valve plate (76).
  - b. Align case drain port in valve plate (76) with case drain port in gear set (79).
  - c. Install valve plate (76) preformed packing side onto gear set (79) using alignment studs (97).
  - d. Locate slot opening in valve plate (76) which is in line with largest open pocket in gear set (79).
10. ALIGN AND INSTALL VALVE ONTO VALVE PLATE.
- a. Locate any one of the side openings of valve (75) that goes through to the face of the valve.
  - b. Line up this side opening with open slot of valve plate (76) that is in line with the largest open pocket of gear set (79) marked with a grease pencil.



NOTE: BEARING HOUSING AND SHAFT ASSEMBLY NOT SHOWN FOR CLARITY.

**NOTE**

**Clockwise rotation of valve is from perspective of looking down at valve with valve being at top of stacked components. Ensure valve is rotated clockwise to align. If valve is rotated counterclockwise motor will run backward.**

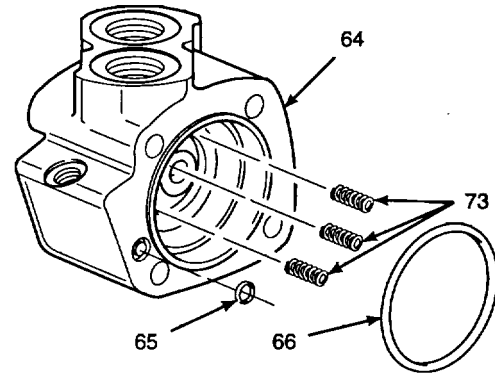
- c. Install valve (75) onto splined end of valve drive shaft (78) against valve plate (76). Rotate valve clockwise a distance of 1/2 spline tooth to engage spline teeth of valve drive shaft.

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- E. ASSEMBLE - Continued.
11. ASSEMBLE COMPRESSION SPRINGS, PREFORMED PACKING, AND GASKET INTO VALVE HOUSING.
- a. Apply a light coating of grease to compression springs (73).
  - b. Install compression springs (73) in spring holes inside bore face of valve housing (64).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.



- c. Apply clean hydraulic oil to preformed packing (65) and gasket (66).
- d. Install preformed packing (65) in case drain groove of valve housing (64).
- e. Install gasket (66) in seal groove of valve housing (64).

**GO TO NEXT PAGE**

2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.

E. ASSEMBLE - Continued.

12. INSTALL COUNTERBALANCE WEIGHT ASSEMBLY AND FACE SEAL RINGS INTO VALVE HOUSING.

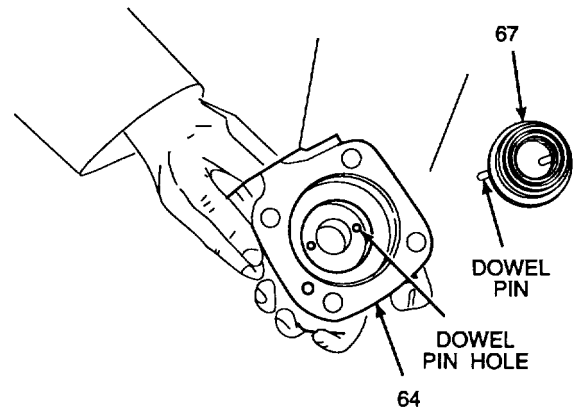
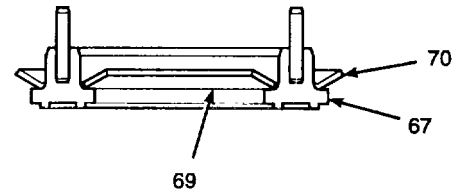
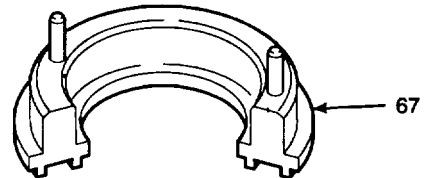
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Use caution when installing seals on counterbalance weight assembly. Do not force or bend seal rings. Damaged or improperly installed seal rings will cause internal leakage affecting motor performance.

- a. Apply clean hydraulic oil to inner face seal ring (69) and outer face seal ring (70).
- b. Place large diameter end of inner face seal ring (69) on inner seat of counterbalance weight assembly (67).
- c. Place small diameter end of outer face seal ring (70) on outer seat of counterbalance weight assembly (67).
- d. Ensure both seal rings are fully seated.
- e. Align counterbalance weight assembly (67) dowel pins with two holes in valve housing (64).
- f. Install counterbalance weight assembly (67) into valve housing (64).

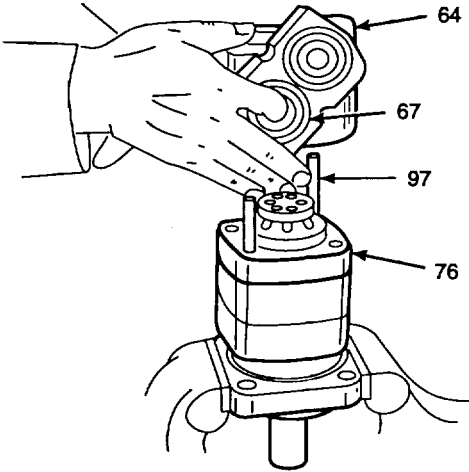


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E. ASSEMBLE - Continued.

13. INSTALL VALVE HOUSING AND COUNTERBALANCE WEIGHT ASSEMBLY ONTO ASSEMBLED VALVE PLATE.

- a. Insert fingers through valve housing (64) ports and hold counterbalance weight assembly (67) in place.
- b. Align case drain port in valve housing (64) with case drain port of valve plate (76).



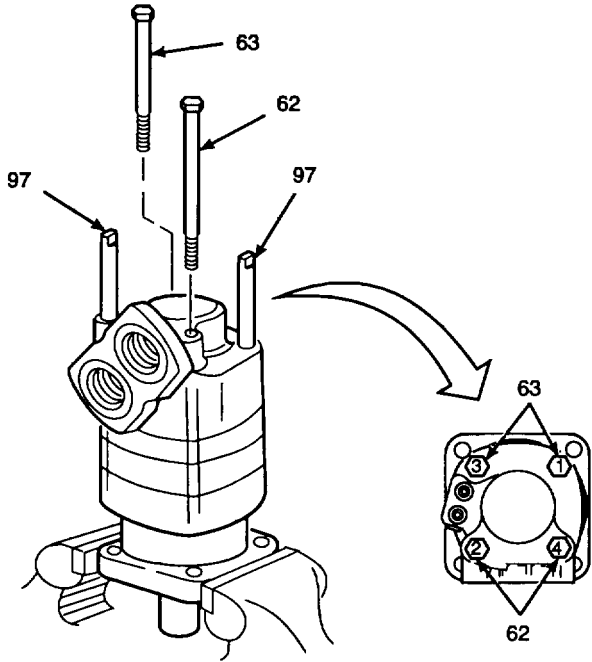
**NOTE**

**Ensure pins of counterbalance weight assembly are engaged into dowel pin holes of valve housing during installation.**

- c. Install valve housing (64) with counterbalance weight assembly (67) over alignment studs (97) and onto valve plate (76).

14. INSTALL HEX HEAD CAP SCREWS SECURING AUGER/CONVEYOR HYDRAULIC MOTOR TOGETHER.

- a. Place one long hex head cap screw (62) and one short hex head cap screw (63) through valve housing screw holes and tighten finger tight.
- b. Remove alignment studs (97).
- c. Place remaining long hex head cap screw (62) and short hex head cap screw (63) in place of alignment studs and tighten finger tight.
- d. Tighten hex head cap screws (62 and 63) evenly in a crisscross pattern to 750 lb-in (85 N•m) in sequence as shown.



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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.**

## E. ASSEMBLE - Continued.

**WARNING**

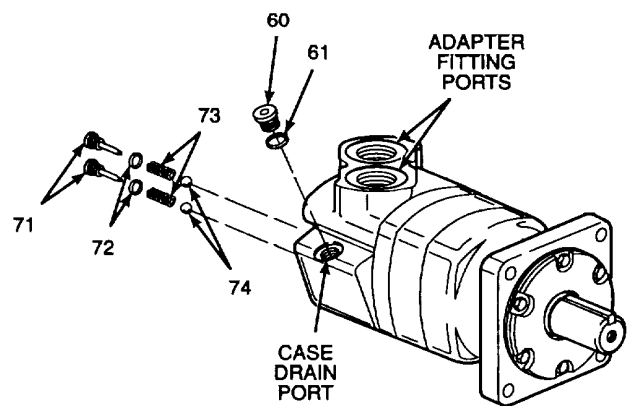
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

15. INSTALL CHECK VALVES AND FILL/DRAIN PLUG. FILL AUGER/CONVEYOR MOTOR WITH HYDRAULIC OIL.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of threads can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- a. Apply clean hydraulic oil to preformed packings (72) and install onto plugs (71).
- b. Install compression springs (73) onto plugs (71).
- c. Install check balls (74) in check plug ports.
- d. Install plugs (71) with preformed packings (72) and compression springs (73) into check plug ports and tighten.
- e. Fill auger/conveyor motor with clean hydraulic oil through check valve case drain port.
- f. Apply clean hydraulic oil to preformed packing (61) and install onto fill/drain plug (60).
- g. Install fill/drain plug (60) into case drain port on valve housing and tighten.
- h. Plug adapter fitting ports to prevent contamination.



**GO TO NEXT PAGE**

- E. ASSEMBLE - Continued.
16. ASSEMBLE AUGER/CONVEYOR MOTOR, SHIM, DRIVE SPROCKET WHEEL, AND MOTOR MOUNT.

**NOTE**

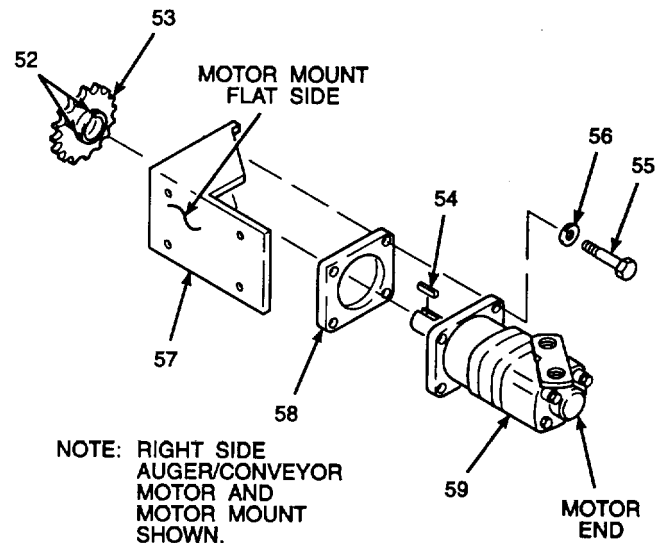
**When assembling the left side auger/conveyor motor the motor mount flat side will face the right when viewed from the motor end with adapter fitting ports facing up. The motor mount flat side will face to the left when assembling the right side auger/conveyor motor.**

- a. Place shim (58) and motor mount (57) onto auger/conveyor motor (59) mounting flange. Position the motor mount flat side to the left, as shown, for right auger/conveyor motor. Position the motor mount flat side to the right for left auger/conveyor motor.
- b. Install washers (56) onto hex head cap screws (55).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Apply thread locking compound to threads of hex head cap screws (55).
- d. Install and tighten hex head cap screws (55) to secure auger/conveyor motor (59) to motor mount (57).
- e. Install key (54) and drive sprocket wheel (53) onto output shaft of auger/conveyor motor (59). Snug, up but do not tighten, sprocket wheel set screws (52).



**GO TO NEXT PAGE**

**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.****F. INSTALL.**

1. INSTALL AUGER/CONVEYOR MOTOR ONTO PAVING MACHINE MAIN FRAME.
  - a. Position auger/conveyor motor and motor mount with flat area of motor mount down.
  - b. Using an overhead hoist and sling strap, lower auger/conveyor motor into mounting location in main frame.

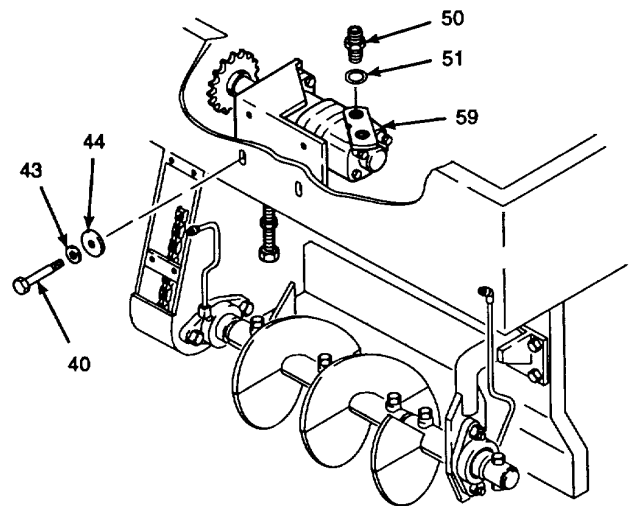
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

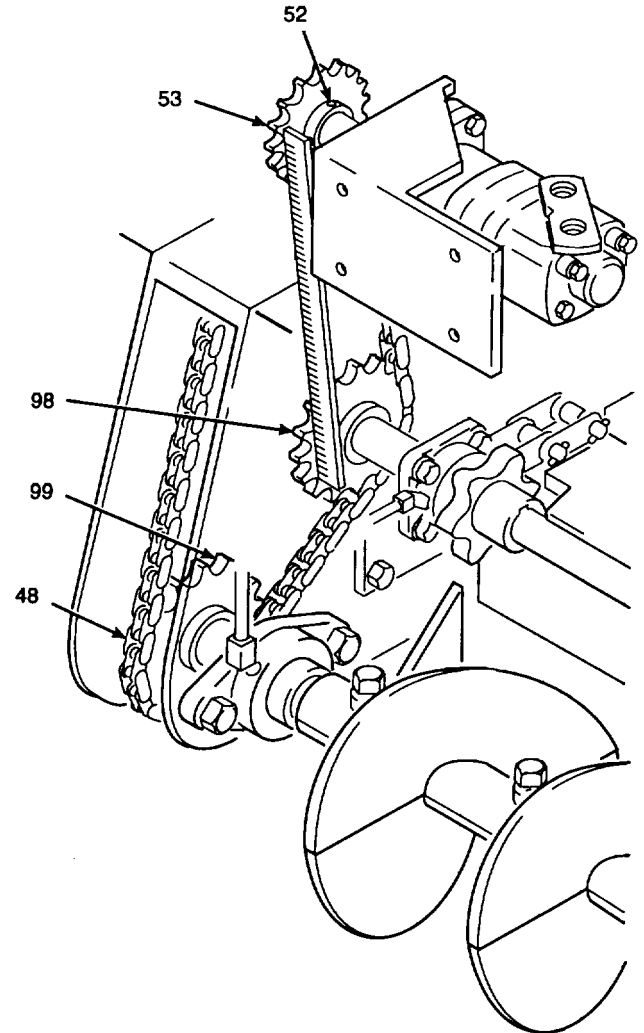
- c. Lubricate preformed packings (51) with clean hydraulic oil and install onto straight adapters (50).
- d. Use a 1-1/2 in. combination wrench and install and tighten straight adapters (50) into the ports of auger/conveyor motor (59).
- e. Rotate motor mount and align motor mount with mounting holes in paving machine main frame.
- f. Install flat washers (44), washers (43), and hex head cap screws (40). Snug, but do not tighten, cap screw.

**GO TO NEXT PAGE**

## F. INSTALL - Continued.

## 2. ALIGN AUGER/CONVEYOR DRIVE SPROCKET WHEEL WITH AUGER SPROCKET WHEEL AND CONVEYOR SPROCKET WHEEL IN THE AUGER/ CONVEYOR DRIVE SYSTEM AND CONNECT AUGER/CONVEYOR DRIVE CHAIN.

- a. Loosen set screws (52) in drive sprocket wheel (53) and position to place auger/conveyor drive chain (48) onto drive sprocket wheel.
- b. Lay the edge of a steel machinist's rule against inside of conveyor sprocket wheel (98) and align position of drive sprocket wheel (53) with the straightedge. Tighten drive sprocket wheel set screws.
- c. Check this position by checking alignment with auger sprocket wheel (99) and drive sprocket wheel (53) with a second steel machinist's rule.
- d. Connect auger/conveyor drive chain per paragraph 2.63, step C.2.
- e. Make any adjustments necessary to align drive sprocket wheel (53) with conveyor sprocket wheel (98) and auger sprocket wheel (99) to ensure auger/conveyor drive chain runs evenly and smoothly.



GO TO NEXT PAGE

**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL- Continued.**

- F. INSTALL - Continued.
3. INSTALL TOP CHAIN COVER PLATE AND ELBOWS.

**NOTE**

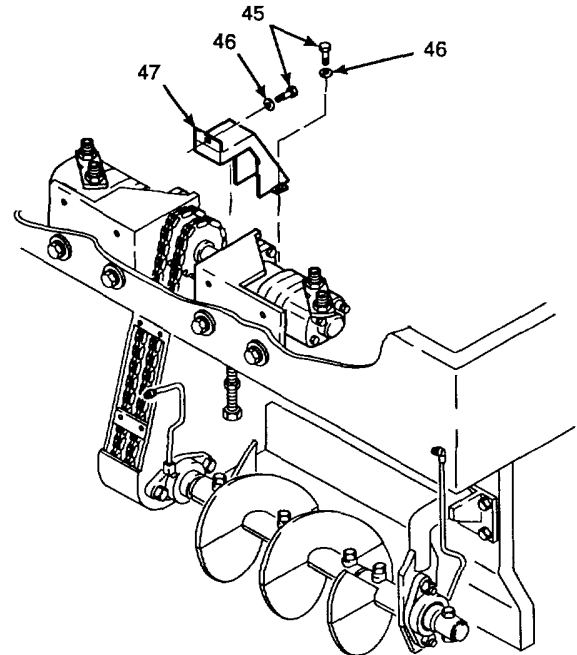
Hydraulic hoses routed over the top of the top chain cover plate may have to be repositioned temporarily to gain access to hex head cap screws and to allow installation of the top chain cover plate.

- a. Place top chain cover plate (47) over drive sprocket wheels and position over mounting holes.
- b. Install flat washers (46) onto hex head cap screws (45).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- c. Apply thread locking compound to threads of hex head cap screws (45).
- d. Install and tighten hex head cap screws (45) into top chain cover plate (47). Tighten to 37 lb-ft (50 N•m).



**GO TO NEXT PAGE**

F. INSTALL - Continued.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- e. Apply hydraulic fitting sealant to exposed threads of straight adapters (50).
- f. Install, but do not tighten, elbows (49) onto straight adapters (50).
- g. Orient and tighten elbows (49) installed on left and right auger/conveyor motors (59) as shown.

4. CONNECT HYDRAULIC HOSES TO AUGER/CONVEYOR MOTOR IN AND OUT PORTS.

- a. Apply hydraulic fitting sealant to threads of elbows (49) on auger/conveyor motor (59).

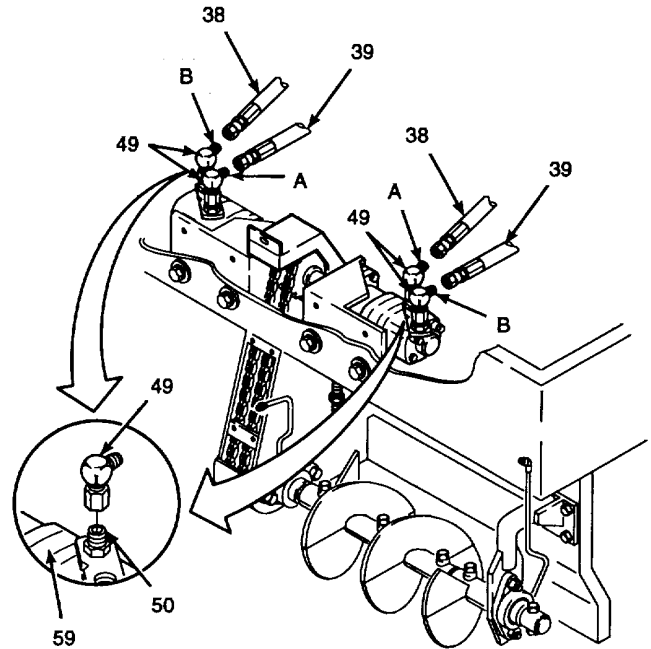
**CAUTION**

Ensure auger/conveyor motor hydraulic hoses are reconnected to the correct motor in and out ports. Failure to do so may cause the auger/conveyor drive system to jam, damaging the equipment.

**NOTE**

The right auger/conveyor motor turns counterclockwise and the left auger/conveyor motor turns clockwise. Porting on the motors is reversed when going from the right motor to the left motor.

- b. For the left auger/conveyor motor connect hydraulic hose (39) to auger/conveyor motor (59) A port. For the right motor connect hydraulic hose to motor B port.
- c. For the left auger/conveyor motor connect hydraulic hose (38) to auger/conveyor motor (59) B port. For the right motor connect hydraulic hose to motor A port.



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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.**

F. INSTALL - Continued.

**NOTE**

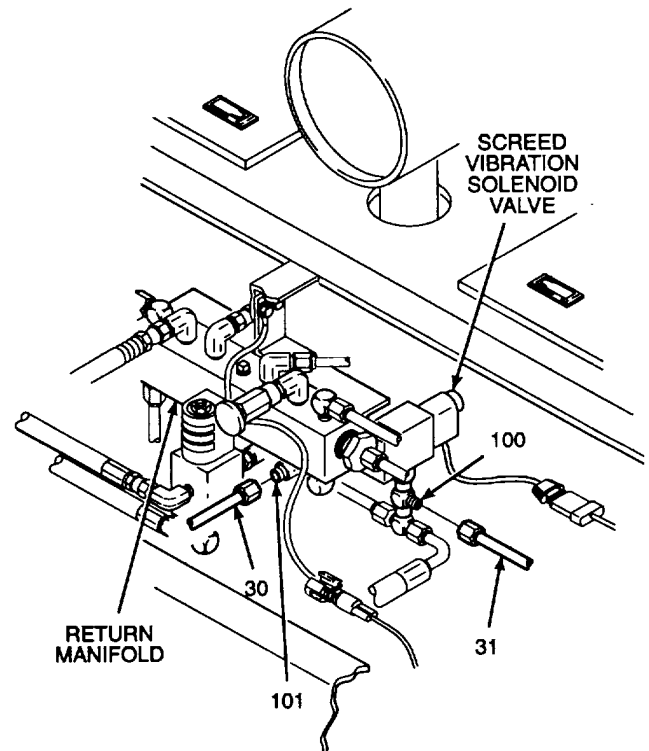
Perform steps 5 and 6 if installing right auger/conveyor motor. Go to step 7 if installing left auger/conveyor motor.

5. CONNECT SCREED EXTENSION CYLINDER RETURN LINE TO RETURN MANIFOLD. CONNECT SCREED VIBRATION SOLENOID VALVE TUBE TO SCREED VIBRATION SOLENOID VALVE.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to threads of tee (100) and elbow (101).
- b. Connect screed extension cylinder return line tube (30) to return manifold.
- c. Connect screed vibration solenoid valve tube (31) to screed vibration solenoid valve mounted on return manifold.

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F. INSTALL - Continued.

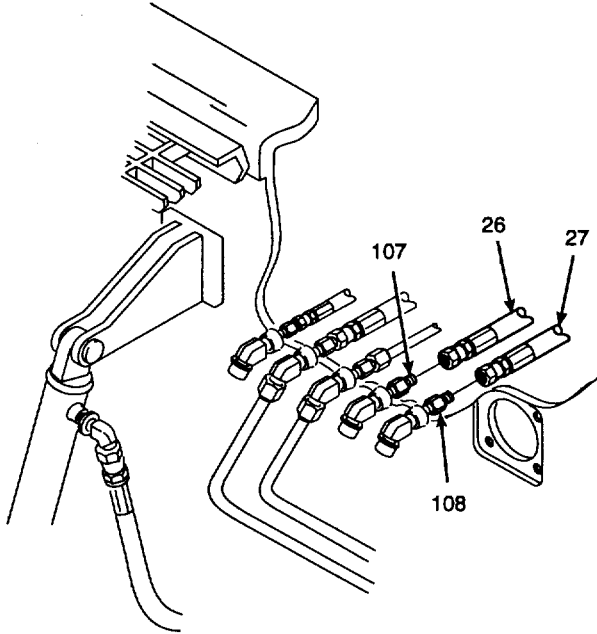
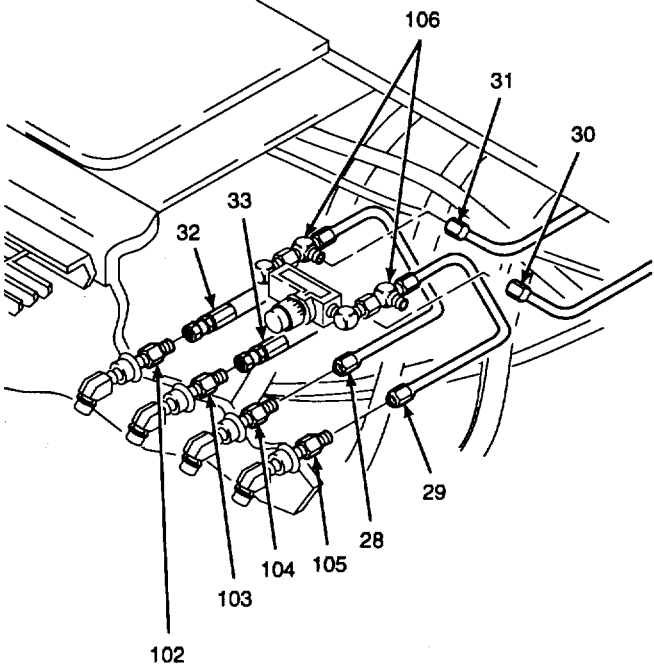
6. INSTALL SCREED EXTENSION CYLINDER EXTEND AND RETRACT HYDRAULIC HOSES. INSTALL SCREED VIBRATION CONTROL VALVE AND VALVE TUBES.

- a. Cut tie wraps securing right screed extension cylinder extend hose (33) and retract hose (32) together.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply hydraulic fitting sealant to threads of straight adapters (102 through 105) and screed vibration control valve tees (106).
- c. Connect right screed extension cylinder retract hose (32) and extend hose (33) to straight adapters (102 and 103).
- d. Position screed vibration control valve in place and install screed vibration control valve tubes (28 and 29) to straight adapters (104 and 105).
- e. Connect screed extension cylinder return line tube (30) and screed vibration solenoid valve tube (31) to screed vibration control valve tees (106).
- f. Apply hydraulic fitting sealant to threads of straight adapters (107 and 108).
- g. Connect screed extension cylinder retract hose (26) and extend hose (27) to straight adapters (107 and 108).



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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.**

F. INSTALL - Continued.

**NOTE**

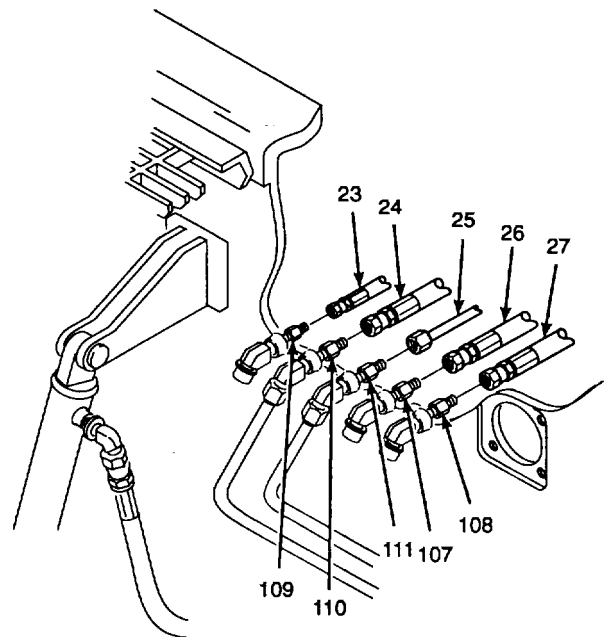
Perform steps 7 and 8 if installing left auger/conveyor motor. Go to step 9 if installing right auger/conveyor motor.

7. CONNECT LEFT SIDE SCREED BURNER FUEL LINE, AND SCREED HYDRAULIC HOSES AND TUBE TO STRAIGHT ADAPTERS.

**WARNING**

Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply hydraulic fitting sealant to threads of left side rear tractor straight adapters (107 through 111).
- b. Cut tie wraps securing fuel and hydraulic hoses together and tie wrap securing screed travel lock hose (24).
- c. Reconnect screed burner fuel hose (23) to straight adapter (109).
- d. Reconnect screed travel lock valve hose (24) and tube (25) to straight adapters (110 and 111).
- e. Reconnect screed extension cylinder retract hose (26) and extend hose (27) to straight adapters (107 and 108).

**GO TO NEXT PAGE**

F. INSTALL - Continued.

8. INSTALL INBOARD BATTERY.

- a. Place battery and battery box (22) into battery compartment. Ensure battery box holddown strap (13) is not twisted. Make sure terminals are oriented the same as outboard battery.
- b. Reconnect jumper battery cable (21) to positive terminal of outboard battery and to negative terminal of inboard battery.
- c. Install battery nuts (20).

**WARNING**

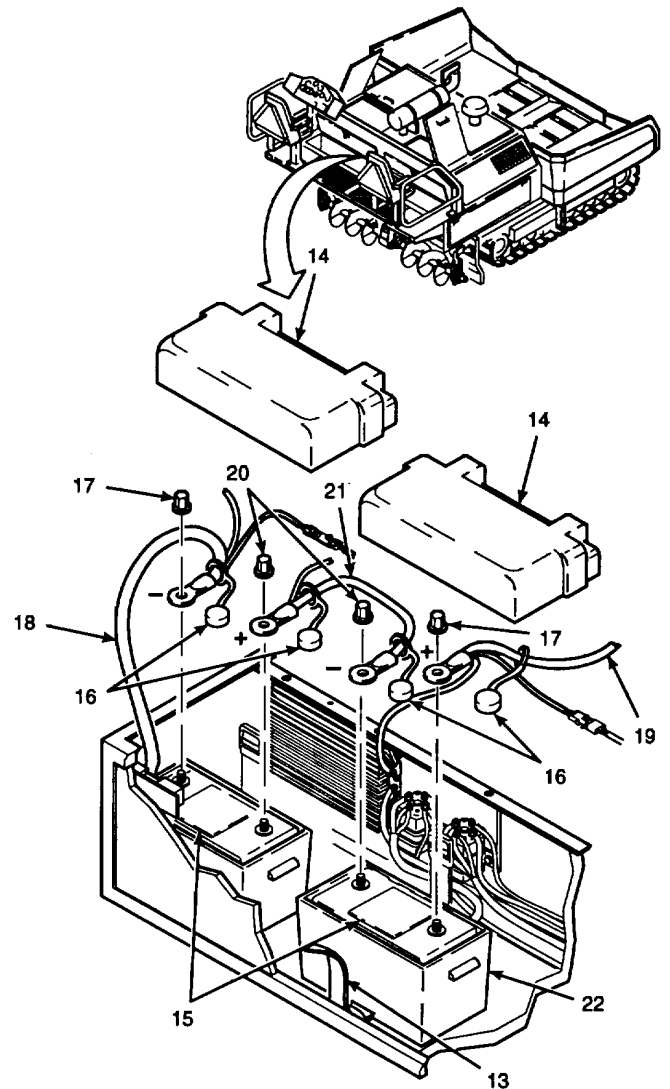
**When connecting batteries, connect positive battery cable before connecting negative battery cable. Failure to connect batteries in the proper sequence may lead to electrical shock or short circuit and result in severe personnel injury.**

- d. Reconnect positive battery cable (19) and battery nut (17) to positive terminal of inboard battery.
- e. Reconnect negative battery cable (18) and battery nut (17) to negative terminal of outboard battery.

**WARNING**

**Electrical insulating varnish fumes can be harmful if inhaled. Use only in a well ventilated area. Avoid prolonged exposure to fumes. If personnel become dizzy or drowsy during use, get immediate medical attention.**

- f. Apply electrical insulating varnish to terminals of battery and cover terminals with battery terminal caps (16).
- g. Install panels (15).
- h. Install battery box covers (14) and buckle battery box holddown straps (13) on both batteries.



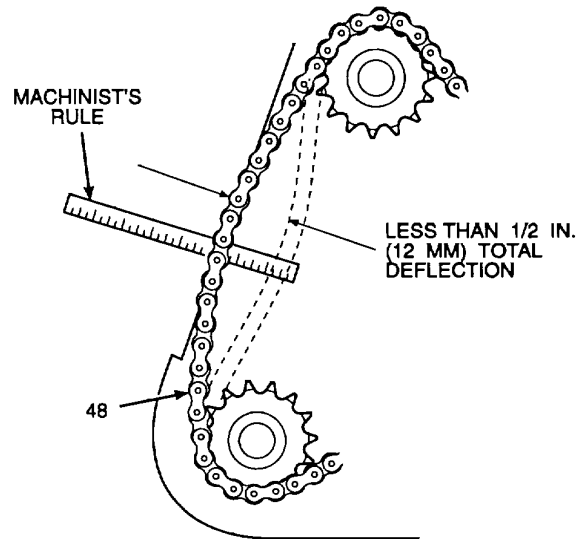
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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.**

F. INSTALL - Continued.

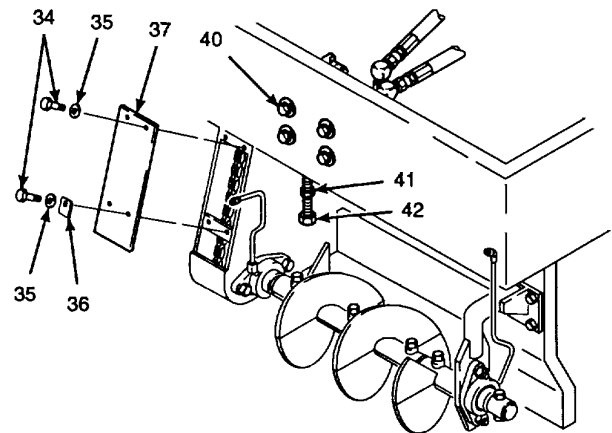
9. ADJUST AUGER/CONVEYOR DRIVE CHAIN TENSION AND REPLACE TOP CHAIN COVER PLATE ONTO AUGER/CONVEYOR DRIVE CHAIN HOUSING.

- Using the combination wrench, turn tension bolt (42) clockwise until auger/conveyor drive chain (48) has less than 1/2 in. (12 mm) deflection in middle. Hold a machinist's rule against inside of auger/conveyor drive chain housing. Move drive chain in and out to measure total drive chain deflection.
- Hold tension bolt (42) and tighten hex nut (41) to 80 lb-ft (108 N•m) using a 1-1/8 in. crowfoot wrench.
- Tighten hex head cap screws (40) on rear of main frame to 90 lb-ft (122 N•m).
- Position rear cover plate (37) on top of auger/conveyor drive chain housing.
- Install flat washers (35) onto four hex head cap screws (34) and install square flat washers (36) onto two hex head cap screws.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- Apply thread locking compound to threads of hex head cap screws (34).
- Install hex head cap screws (34) without square flat washers (36) into top mounting holes of rear cover plate (37).
- Install hex head cap screws (34) with square flat washers (36) into bottom mounting holes of rear cover plate (37).
- Tighten all hex head cap screws (34) to 37 lb-ft (50 N•m).

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F. INSTALL - Continued.

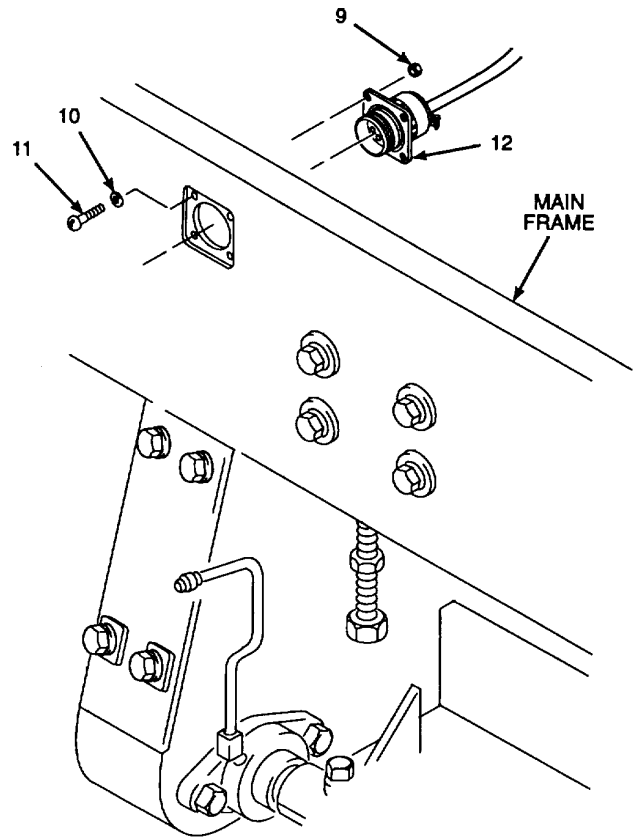
10. INSTALL SCREED HARNESS ELECTRICAL RECEPTACLE.

- a. Place screed harness electrical receptacle (12) into main frame.

**NOTE**

**When installing screed harness electrical receptacle into main frame, ensure receptacle pin letters on face of receptacle are facing up.**

- b. Install machine screw (11), flat washer (10), and hex nut (9) through screed harness electrical receptacle (12) and main frame and tighten hex nut.
- c. Apply electrical insulating compound to screed harness electrical receptacle (12).



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**2.69 REPLACE/REPAIR AUGER/CONVEYOR MOTOR AND DRIVE SPROCKET WHEEL - Continued.**

F. INSTALL - Continued.

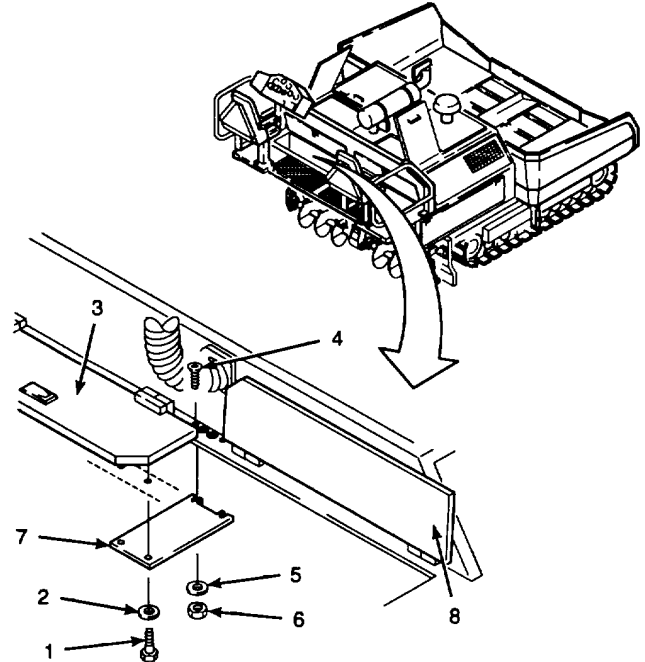
11. REPLACE COVER.

- a. Turn cover (7) sideways and place under cowling frame mounting holes.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Close rear top left access door (3).
- c. Apply thread locking compound to threads of socket head cap screw (4) and install through cowling frame and cover mounting holes.
- d. Install flat washer (5) and hex nut (6). Tighten hex nut snug.
- e. Open rear top left access door (3) and close rear top right access door (8).
- f. Apply thread locking compound to remaining socket head cap screw (4) and install.
- g. Install flat washer (2) onto hex head cap screw (1). Apply thread locking compound to threads of hex head cap screw.
- h. Open rear top right access door (8).



- i. Install hex head cap screws (1) with flat washers (2) through cowling frame and cover mounting holes. Tighten cap screw to 90 lb-ft (122 N•m).
- j. Tighten socket head cap screws (4) to 37 lb-ft (50 N•m).

**NOTE**

**FOLLOW-ON-TASKS:** Install field relay per TM 5-3895-373-20.  
 Replace screed per TM 5-3895-373-20.  
 Rear top left access door closed per TM 5-3895-373-10.  
 Rear top right access door closed per TM 5-3895-373-10.  
 Center top left access door closed per TM 5-3895-373-10.  
 Center top right access door closed per TM 5-3895-373-10.

**END OF TASK**

---

**2.70 REPAIR SCREED LIFT CYLINDER.**

---

**This task covers:**            a. Disassemble            b. Clean            c. Inspect  
   d. Repair                    e. Assemble

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Hydraulic press frame (Item 41, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Spanner wrench (Item 95, Appendix D)  
Torque wrench (Item 133, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Wire scratch brush (Item 13, Appendix D)

**References:**

TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Screed lift cylinder removed from paving machine per  
TM 5-3895-373-20.

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Crocus cloth (Item 4, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Self-locking hex nut  
Seal kit

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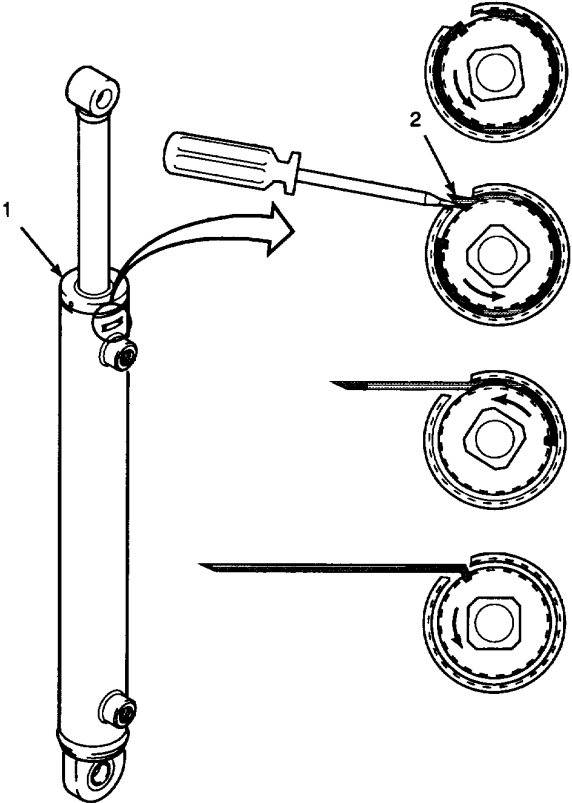
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**2.70 REPAIR SCREED LIFT CYLINDER - Continued.**

A. DISASSEMBLE - Continued.

1. REMOVE RETAINING RING.

- a. Insert spanner wrench in spanner holes on cylinder head (1).
- b. Hold screed lift cylinder and turn cylinder head (1) in direction of least resistance until beveled edge of retaining ring (2) appears in milled opening.
- c. Insert flat-blade screwdriver under beveled edge of retaining ring (2).
- d. Rotate cylinder head (1) in opposite direction of step b until retaining ring emerges through milled opening.
- e. Continue to rotate cylinder head (1) and pull retaining ring (2) from milled opening. Discard retaining ring.



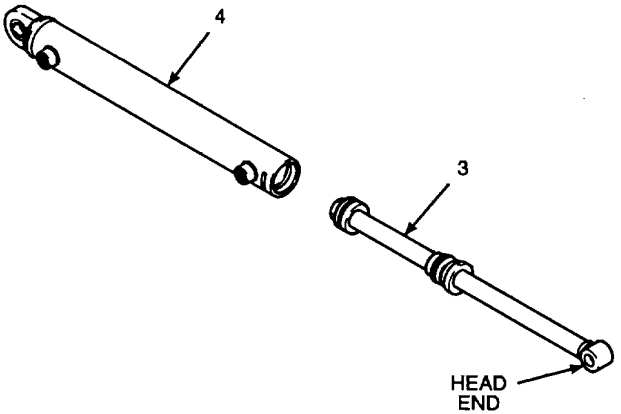
2. REMOVE PISTON COMPONENTS.

- a. Pull piston rod (3) and attached parts from cylinder tube (4).

**CAUTION**

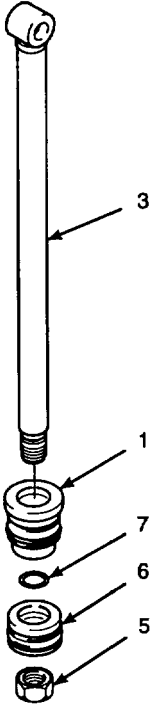
Do not clamp chrome surface of piston rod in vise. Damage to chrome surface of piston rod can result from contact with metal vise jaws.

- b. Clamp head end of piston rod (3) in bench vise.



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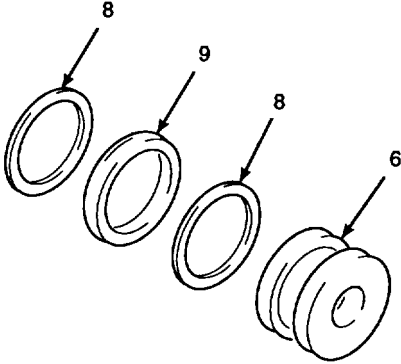
- A. DISASSEMBLE - Continued.
- c. Remove and discard self-locking hex nut (5).
- d. Remove piston (6), preformed packing (7), and cylinder head (1) from piston rod (3). Discard preformed packing.



**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force. Use an o-ring tool. Scratched or dented seal grooves can cause bypass leakage.

- e. Use an o-ring tool to remove packing retainers (8) and seal (9) from piston (6). Discard seal and packing retainers.



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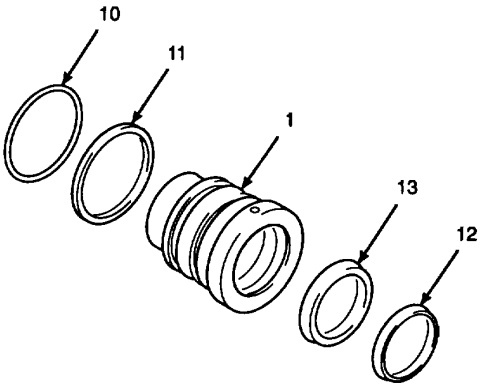


2.70 REPAIR SCREED LIFT CYLINDER - Continued.

A. DISASSEMBLE - Continued.

**CAUTION**

Use caution when removing seals and preformed packings. Do not use excessive force. Use an o-ring tool. Scratched or dented seal grooves can cause bypass leakage.

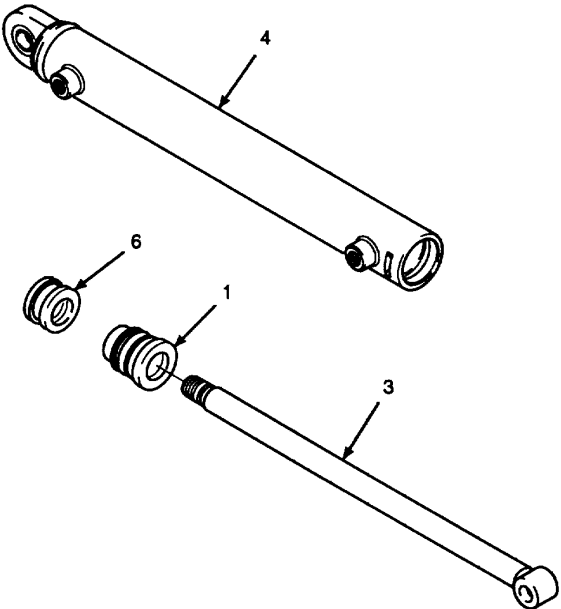


- f. Use an o-ring tool to remove o-ring (10) and packing retainer (11) from cylinder head (1). Discard o-ring and packing retainer.
- g. Remove ring wiper (12) and compression cup (13) from inside cylinder head (1). Discard ring wiper and compression cup.

B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,30C). Failure to do so may result in injury or death to personnel.



If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- 1. RINSE PISTON ROD (3), CYLINDER HEAD (1), PISTON (6), AND CYLINDER TUBE (4) WITH CLEANING SOLVENT.

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## B. CLEAN - Continued.

<b>WARNING</b>
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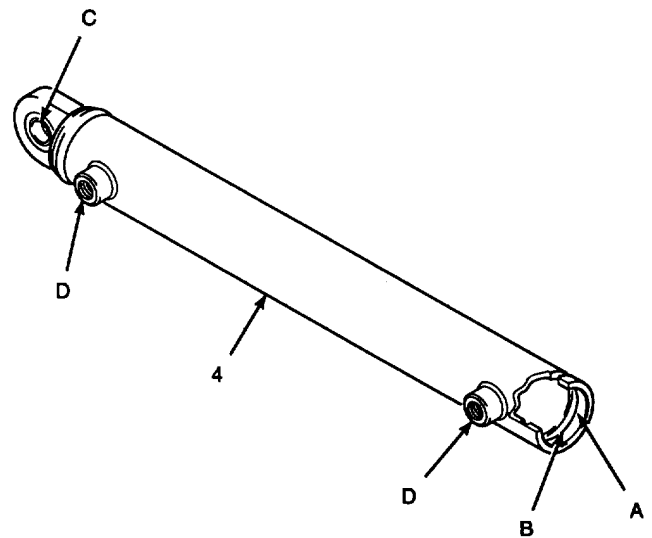
Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO BLOW ANY FOREIGN MATERIAL FROM SEAL GROOVES, INSIDE DIAMETER OF CYLINDER TUBE, AND THREADED SURFACES. DRY PARTS WITH CLEANING CLOTHS.

## C. INSPECT.

## 1. INSPECT CYLINDER TUBE.

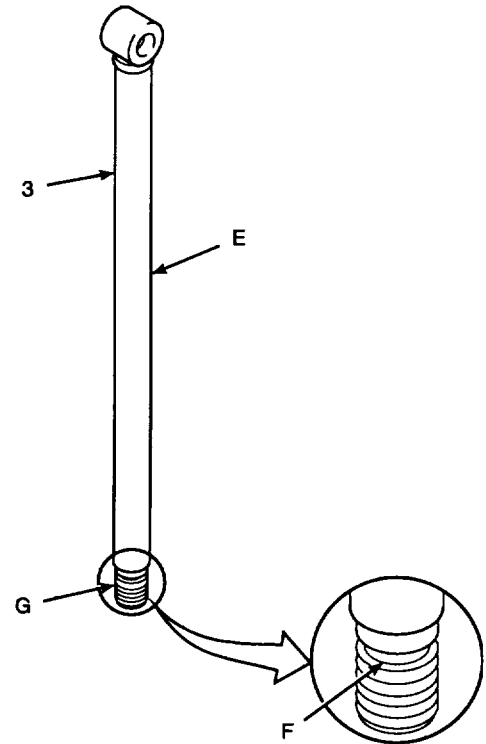
- a. Run your finger along cylinder tube (4) inner wall, surface A, and retaining ring, groove B. Feel for any nicks, scratches, or sharp edges that may damage preformed packings and seals.
- b. Remove sharp edges of nicks or scratches using crocus cloth.
- c. Replace cylinder tube if scratches or pits cannot be polished out, or if scratch exceeds 0.5 in. (12,7 mm) in length.
- d. Use strong light to visually inspect interior for scoring or scratches. If scoring or scratches are detected, replace cylinder tube.
- e. Check spherical bearing C for pitting, cracks, or looseness. If damaged or loose, replace spherical bearing per instructions in step D.
- f. Inspect threads D. If threads are distorted, replace cylinder tube.



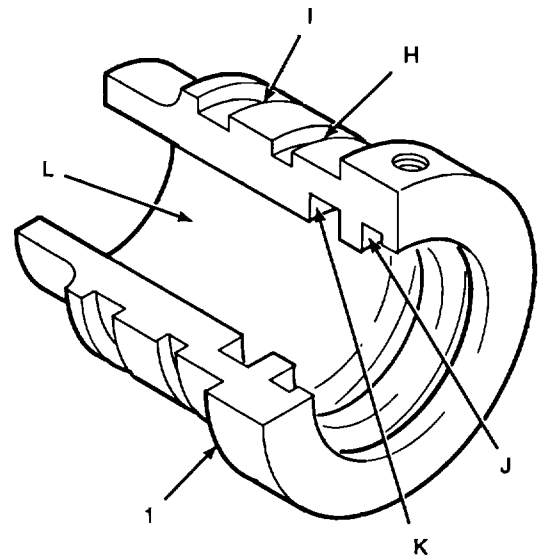
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**2.70 REPAIR SCREED LIFT CYLINDER - Continued.****C. INSPECT- Continued.****2. INSPECT PISTON ROD.**

- a. Run your finger along piston rod (3), surface E. Feel for any scratches or sharp edges that may damage preformed packings and seals. Inspect surface of piston rod for scratches, pits, or wear that expose base metal through chrome plating.
- b. Remove sharp edges of nicks or scratches using crocus cloth.
- c. Replace piston rod if scratches or pits can not be polished out, if scratch exceeds 0.5 in. (12,7 mm) in length, or if base metal is exposed through chrome plating.
- d. Visually inspect packing groove F and feel for nicks and sharp edges. Remove sharp edges using crocus cloth. If packing groove edge is cracked or chipped replace piston rod.
- e. Inspect threads G. If threads are distorted, replace piston rod.

**3. INSPECT CYLINDER HEAD.**

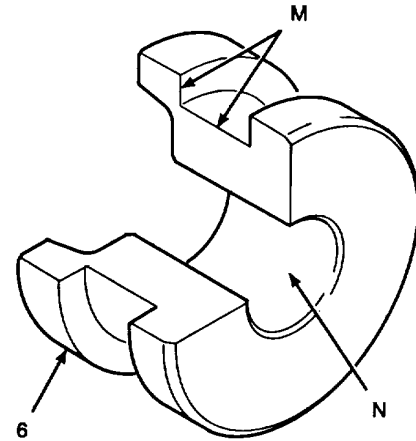
- a. Visually inspect cylinder head (1) retaining ring groove H, preformed packing groove I, ring wiper groove J, and compression cup groove K. Check for any raised edges, or nicks that may damage packings or seals. Remove raised edges and nicks with crocus cloth.
- b. Replace cylinder head if raised edges or nicks cannot be polished out.
- c. Inspect bore surface L, for nicks, pits, or scratches. Remove nicks, pits, or scratches of less than 0.5 in. (12,7 mm) in length with crocus cloth.
- d. Replace cylinder head if nicks, pits, or scratches cannot be polished out of bore surface L.

**GO TO NEXT PAGE .**

C. INSPECT - Continued.

4. INSPECT PISTON.

- a. Inspect piston (6) packing groove M, and bore surface N. Check for any sharp edges or nicks that may damage packings or seals. Remove sharp edges and nicks with crocus cloth.
- b. Replace piston if scratches, pits, sharp edges, or nicks cannot be polished out, or if surface defect exceeds 0.5 in. (12,7 mm) in length.



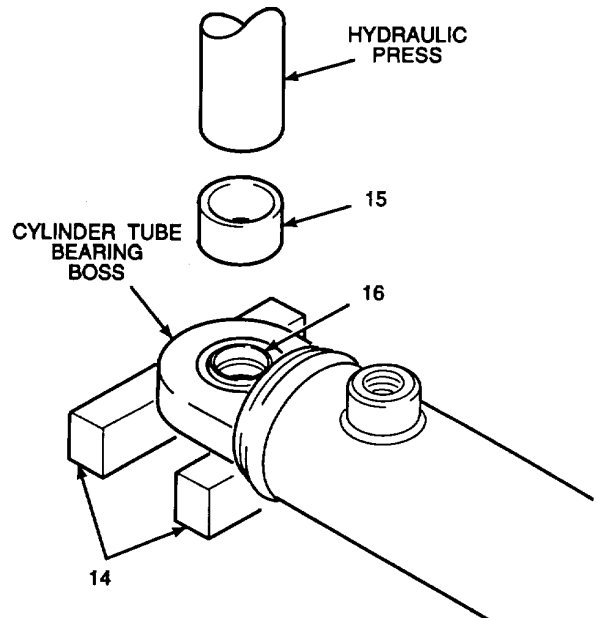
D. REPAIR.

1. PRESS OUT SPHERICAL BEARING.



Place support blocks close to bushing seat when pressing out spherical bearing. Failure to place support blocks correctly may lead to warping of the cylinder tube bearing boss.

- a. Place cylinder end on hand operated arbor press. Make sure support blocks (14) are placed under the cylinder tube base.
- b. Use hydraulic press frame and hollow spacer (15) from universal puller kit to remove spherical bearing (16) from bore.



2. PRESS IN REPLACEMENT BEARING.



Place support blocks close to bushing seat when pressing in spherical bearing. Failure to place support blocks correctly may lead to warping of the cylinder tube bearing boss.

- a. Place cylinder base end on hand operated arbor press. Use press fixture support blocks (14) to support bearing boss.

GO TO NEXT PAGE

**2.70 REPAIR SCREED LIFT CYLINDER - Continued.**

D. REPAIR - Continued.

- b. Center spherical bearing (16) in bore of cylinder tube bearing boss.

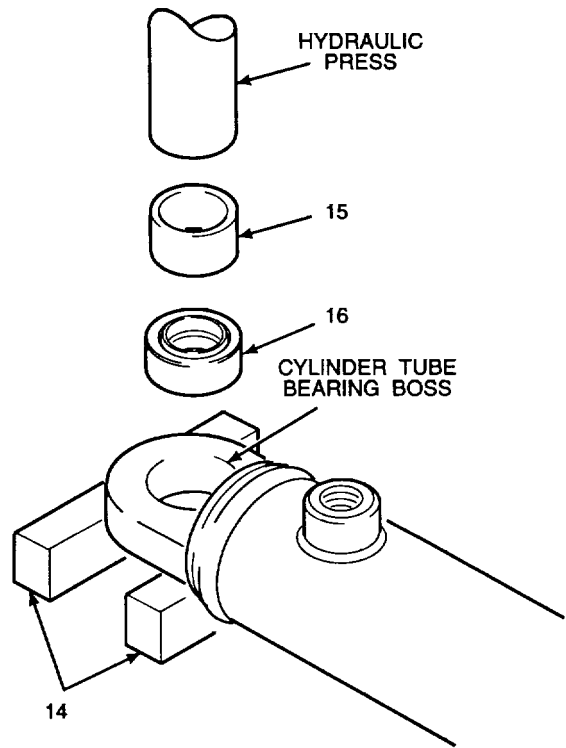
**CAUTION**

Spherical bearing must be pressed straight into bearing bore. If spherical bearing is allowed to tilt, damage may result to both the spherical bearing and the bearing bore.

**NOTE**

Spherical bearing should require 500 to 700 lb (2224 to 3114 N•m) force when pressed into bearing bore.

- c. Use hydraulic press frame and hollow spacer (15) from universal puller kit to press spherical bearing squarely into bearing bore until fully seated.



E. ASSEMBLE.

- 1. CLEAN CYLINDER AND PISTON COMPONENTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal cylinder and piston components in cleaning solvent.

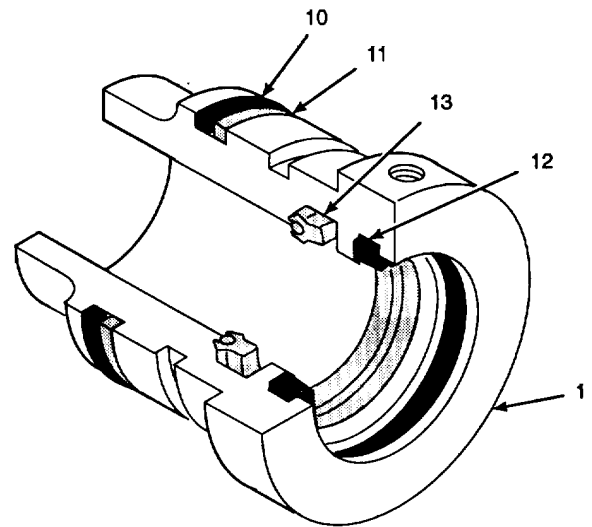
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E. ASSEMBLE - Continued.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from seal grooves, inside of cylinder tube, and threaded surfaces.
- c. Dry parts with a clean, lint-free cloth. Set dry parts on clean surface. Place a clean, lint-free cloth into open end of cylinder tube to prevent contamination.



2. INSTALL PACKINGS AND SEALS.

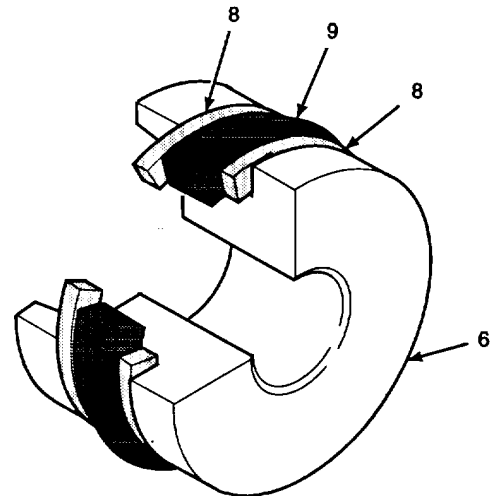
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate all internal components with clean hydraulic oil.

**CAUTION**

New seals and preformed packings are distorted during installation. Use care during installation to prevent damage to seals and preformed packings. Bypass leakage can result from careless packing or seal installation.



- b. Pinch sides of compression cup (13) together to form a C-shape. Insert one side of compression cup in mating seal groove of cylinder head (1), and let opposite side snap into place.
- c. Install ring wiper (12) into cylinder head (1) using same method used in step b.

- d. Install packing retainer (11) and o-ring (10) in mating groove of cylinder head (1).
- e. Install packing retainers (8) and seal (9) on piston (6). Make sure seal is seated between installed packing retainers.

**GO TO NEXT PAGE**

2.70 REPAIR SCREED LIFT CYLINDER - Continued.

E. ASSEMBLE - Continued.

3. REASSEMBLE PISTON COMPONENTS.

**CAUTION**

Do not clamp chrome surface of piston rod in bench vise. Damage to chrome surface of piston rod can result.

- a. Clamp head end of piston rod (3) in bench vise.

**CAUTION**

Internal seals and preformed packings are distorted during installation. Allow one hour for seals and preformed packings to resume original shape after installing cylinder head and piston on piston rod.

**WARNING**

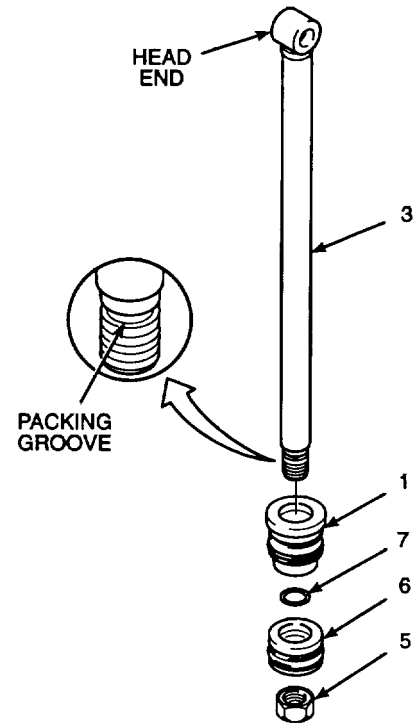
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Relubricate piston rod (3), cylinder head (1), and piston (6) with clean hydraulic oil.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- c. Carefully rotate and slide seal end of cylinder head (1) onto piston rod (3).



- d. Install preformed packing (7) in packing groove of piston rod (3).
- e. Carefully rotate and slide flush face of piston (6) onto piston rod (3). Ensure concave end of piston is facing outward.
- f. Install self-locking hex nut (5) onto threaded end of rod. Using socket wrench adapter, tighten hex nut to 200 lb-ft (271 N•m).
- g. Remove piston rod (3) from bench vise. Allow one hour for installed seals and packings to resume their original shape.

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- E. ASSEMBLE - Continued.
4. ASSEMBLE PISTON AND SCREED LIFT CYLINDER.

**WARNING**

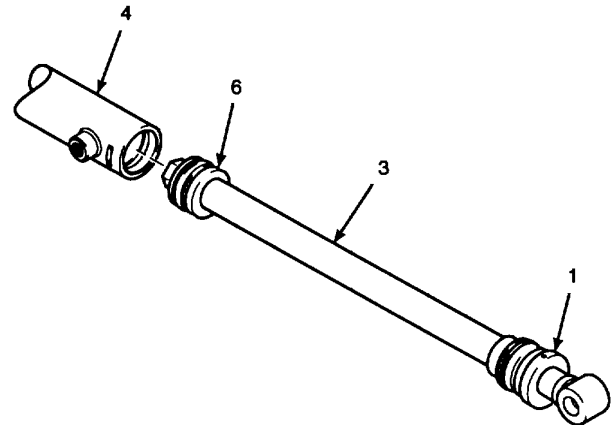
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Apply a liberal coating of hydraulic oil to cylinder head (1).
- b. Remove lint-free cloth from cylinder tube (4). Ensure no foreign material is present in cylinder tube.
- c. Dip piston rod (3) and installed components in bath of clean hydraulic oil.

**CAUTION**

Inside edges of retaining ring slot are sharp. Use caution when installing cylinder tube to ensure preformed packing and packing retainer are not cut by sharp edges in screed lift cylinder. Bypass leakage can result from damaged preformed packing or packing retainer.

- d. Carefully rotate and slide installed piston (6) into cylinder tube (4).
- e. Rotate and slide cylinder head (1) into cylinder tube (4). Seat cylinder head flush with cylinder tube.



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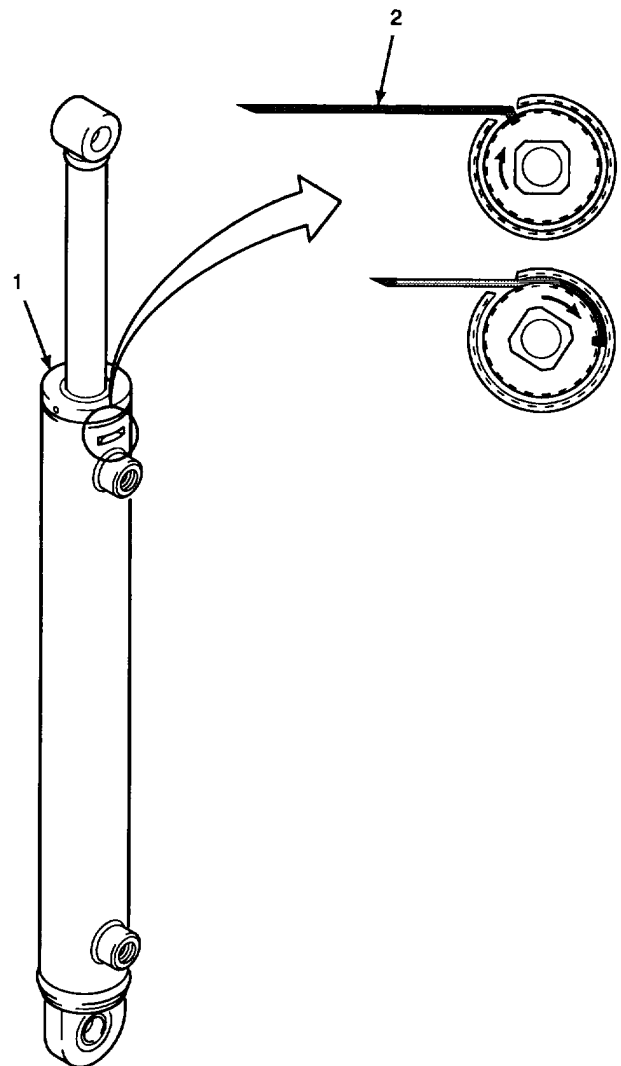
**2.70 REPAIR SCREED LIFT CYLINDER - Continued.**

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E. ASSEMBLE - Continued.

## 5. INSTALL RETAINING RING.

- a. Using spanner wrench, rotate cylinder head (1). Locate retaining ring groove in milled opening.
- b. Insert retaining ring (2) hook-end first into milled opening. Ensure retaining ring catches on cylinder head.
- c. Rotate cylinder head, in same direction that retaining ring (2) was inserted, 1-1/4 turns to pull in retaining ring. Ensure retaining ring is fully seated.

**NOTE****FOLLOW-ON-TASK: Install screed lift cylinder per TM 5-3895-373-20.****END OF TASK**

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**2.71 REPLACE MAIN AND EXTENSION SCREED PLATES.**

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This task covers:           a. Clean                           b. Remove                   c. Inspect  
                                  d. Replace

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
C-clamps, 3 ea. (Item 30, Appendix D)  
Outside micrometer (Item 15, Appendix D)  
Pry bar (Item 9, Appendix D)  
Spacer wedges, 6 ea. (Item 22, Appendix C)  
Straightedge (Item 27, Appendix C)  
Torque wrench (Item 132, Appendix D)  
Wire scratch brush (Item 13, Appendix D)  
Endgates removed per

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Self-locking nuts

**Personnel Required:**

Three 62B construction equipment repairers. Second and third person to assist in screed plate removal and replacement.

**References:**

TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

TM 5-3895-373-10.

Main screed cover plates removed per TM 5-3895-373-20 if replacing main screed plate.

---

**NOTE**

**This procedure describes the removal of all screed plates. Use only those steps required to remove the screed plate requiring replacement.**

- A. CLEAN.
1. START PAVING MACHINE ENGINE. RAISE SCREED TO FULL HEIGHT. FULLY EXTEND EXTENSION SCREEDS. CLOSE SCREED TRAVEL LOCK VALVE. SHUT OFF ENGINE AND REMOVE KEY FROM IGNITION SWITCH PER TM 5-3895-373-10.

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**2-1021**

## 2.71 REPLACE MAIN AND EXTENSION SCREED PLATES - Continued.

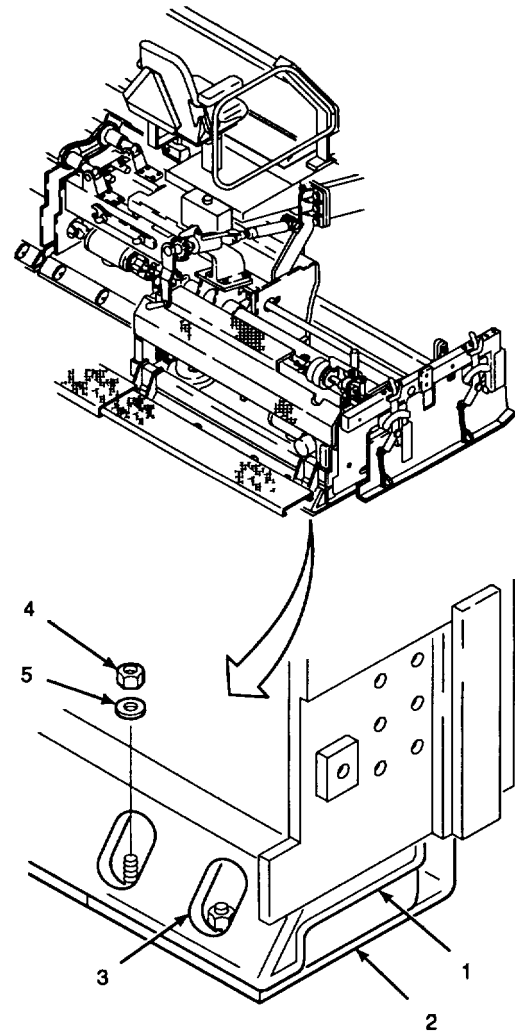
A. CLEAN - Continued.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

2. CLEAN AREA BETWEEN SCREED FRAME (1) AND SCREED PLATE (2) WITH A CLEANING CLOTH AND CLEANING SOLVENT. SCRUB OFF HARD DEPOSITS WITH A WIRE SCRATCH BRUSH. USE SPRAY WASHDOWN IN APPROVED AREA IF NEEDED.
3. CLEAN AND REMOVE PAVING MATERIAL, DIRT, AND FOREIGN MATTER FROM SCREED PLATE MOUNTING STUD ACCESS AREAS (3).
4. CLEAN STUDS AND SELF-LOCKING NUTS IN ACCESS AREAS WITH CLEANING SOLVENT AND WIRE SCRATCH BRUSH TO ALLOW REMOVAL OF SELF-LOCKING NUTS (4) AND FLAT WASHERS (5).

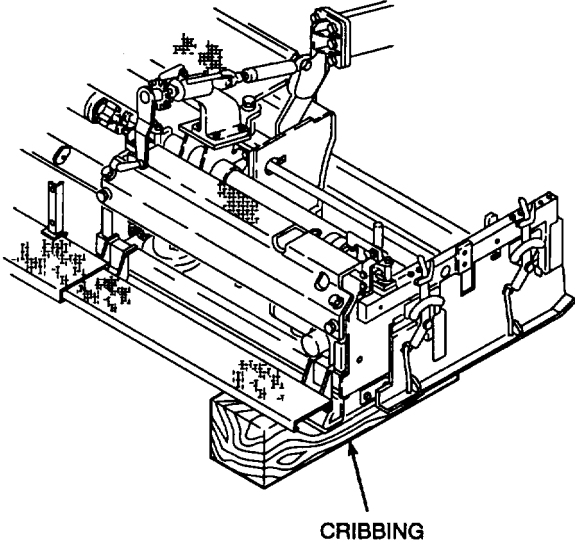


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B. REMOVE.

1. SET SCREED THICKNESS CONTROLS AND CROWN ADJUSTMENT TO NULL POSITION WITH SCREED RAISED.

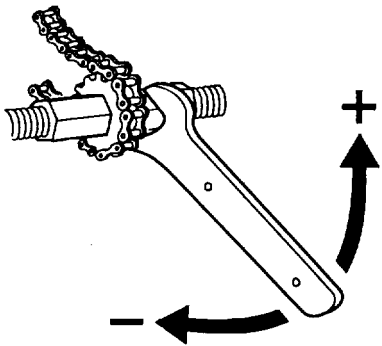
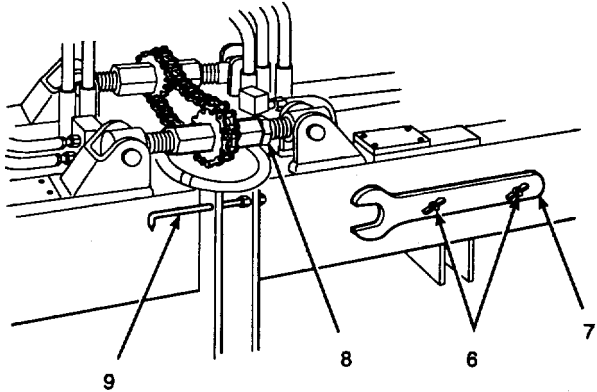
- a. Place cribbing beneath outer edges of extension screed, but do not allow screed to rest on cribbing.
- b. Set screed thickness controls to read the same on indicators for both the left and right side per TM 5-3895-373-10.
- c. Lower hinged steps on main screed. Refer to TM 5-3895-373-10.
- d. Remove thumbscrews (6) and crown adjustment wrench (7) from main screed.
- e. Use crown adjustment wrench to loosen hex nut (8).



NOTE

The main screed plate has a positive lead crown that cannot be nulled by crown adjustment. Sized spacers between main screed plate and main screed frame on leading edge of main screed hold the crown in position. Only main screed plate trailing edge crown can be nulled by crown adjustment.

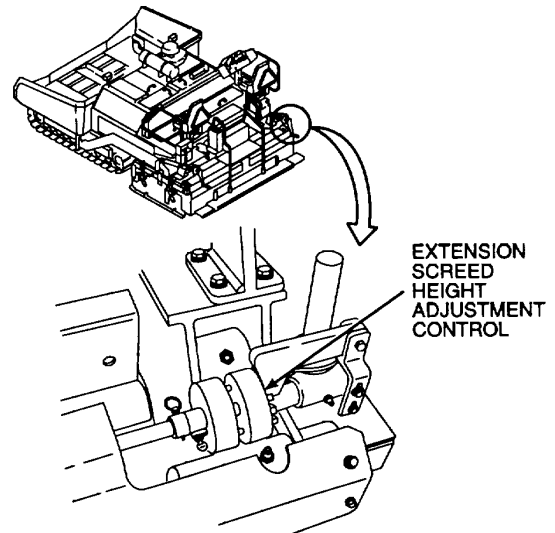
- f. Determine if a crown is present by reading crown pointer (9) on main screed. If no crown is present, pointer will read zero.
- g. To null a positive crown on main screed trailing edge, pull crown adjustment wrench (7) down toward screed trailing edge until crown pointer (9) reads approximately zero and no resistance is felt on wrench.
- h. To null a negative crown on main screed trailing edge, push crown adjustment wrench (7) up toward screed leading edge until crown pointer (9) reads approximately zero and no resistance is felt on wrench.
- i. Place a straightedge along underside of main screed trailing edge. Have a second person turn crown adjustment until trailing edge of main screed plate is flush with straightedge.
- j. Tighten hex nut (8) on crown adjustment with crown adjustment wrench (7).
- k. Replace crown adjustment wrench (7) on main screed and secure with thumbscrews (6).



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**2.71 REPLACE MAIN AND EXTENSION SCREED PLATES - Continued. --**

- B. REMOVE - Continued.
2. ALIGN EXTENSION SCREED PLATES FLUSH WITH MAIN SCREED PLATE.
- Lay a straightedge across extension screed plate and main screed plate trailing edges.
  - Have second person use extension screed height adjustment per TM 5-3895-373-10 and raise or lower extension screed until extension screed plate is flush with main screed plate.
  - Repeat procedure for remaining extension screed.
3. CLAMP SPACER WEDGES BETWEEN MAIN SCREED HALVES.

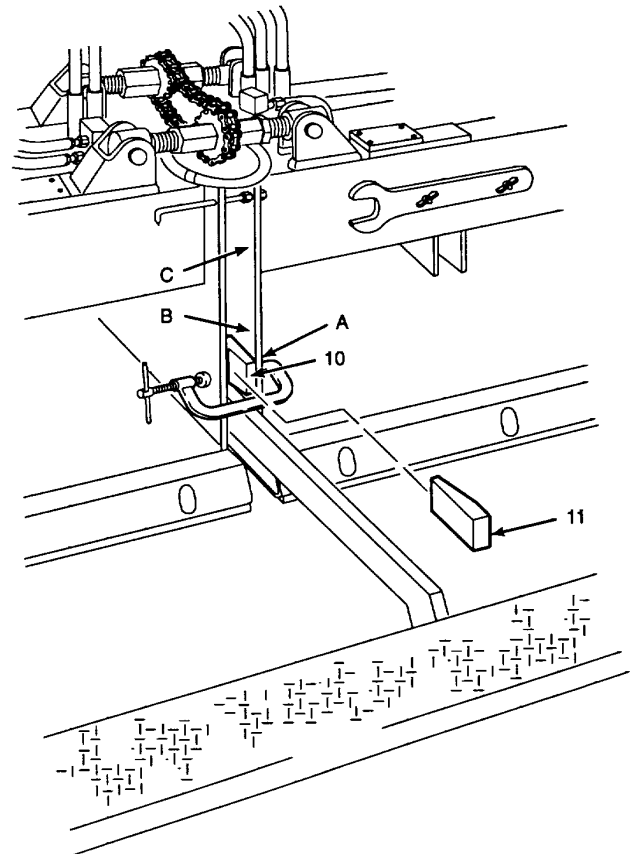
**WARNING**

Screed halves are heavy and are secured together and supported by main screed plate. Do not remove main screed plates without inserting spacer wedges between halves of main screed. Equipment damage and personnel injury may result from failure to reinforce main screed halves.

**NOTE**

A total of six spacer wedges will be required to keep the main screed halves separate.

- Place spacer wedge (10), with the large end toward the front of the paving machine, in between the two main screed halves. Place the wedge at position A of the screed halves.
- Place second spacer wedge (11), with the thin end toward the front of the paving machine and with the tapered edge against spacer wedge (10).
- Use a hammer and drive spacer wedge (11) against spacer wedge (10) until the gap between the two main screed halves is filled and maintained.
- Install a C-clamp across the main screed halves, securing spacer wedges (10 and 11) in position.
- Repeat steps a through d, placing spacer wedges in position B and position C of the gap between the main screed halves.



**GO TO NEXT PAGE**

- B. REMOVE - Continued.
- 4. LOWER SCREED TO THE GROUND AND REMOVE FASTENERS FROM MAIN AND EXTENSION SCREED PLATES.
  - a. Remove cribbing from beneath extension screed.
  - b. Lower screed to the ground. Refer to TM 5-3895-373-10.

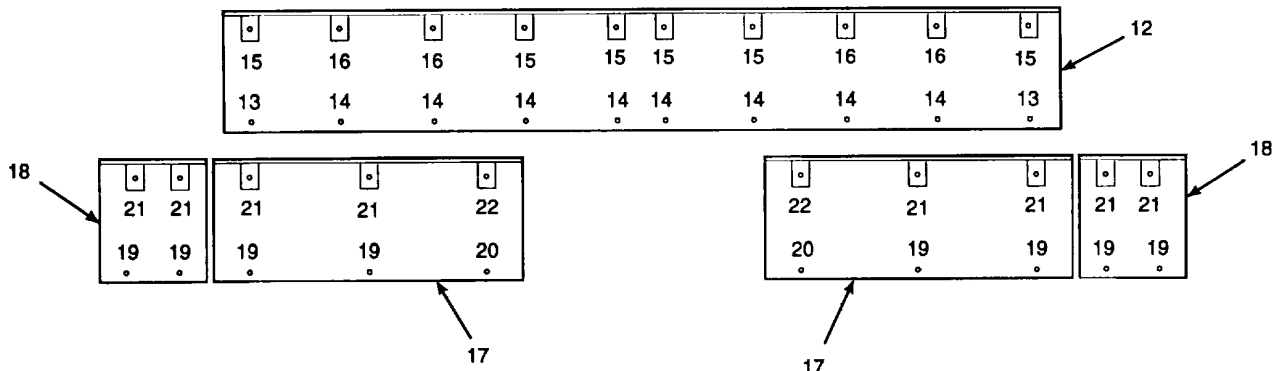
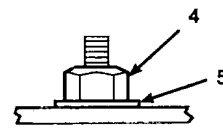
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**2-1025**

**2.71 REPLACE MAIN AND EXTENSION SCREED PLATES - Continued.**

**B. REMOVE - Continued.**

- c. Remove main screed plate (12) by removing self-locking nuts (4) and flat washers (5) at stud (13) through (16) locations. Refer to chart below for tools required and removal comments. Use self-locking nuts to secure shims, plate spacers, and spacers while performing steps in step C.
- d. To remove inner and outer extension screed plates (17 and 18), remove self-locking nuts (4) and flat washers (5) at stud (19 through 22) locations. Refer to chart below for tools required and removal comments. Use self-locking nuts to secure shims, plate spacers, and spacers while performing steps in step C.



Stud	Tools	Removal Comments
13	3/4 in. socket, 1/2 in. drive ratchet, 10 in. extension	Reach into trailing edge of main screed. Locate and remove self-locking nuts from outer edges with aid of extension and socket.
14	3/4 in. socket, 1/2 in. drive ratchet, 6 in. extension	Access directly.
15	3/4 in. socket, 1/2 in. drive ratchet, 6 in. extension	Reach through trailing edge of main screed. Locate and remove self-locking nuts from forward corners of screed with aid of 6 in. extension and socket.
16	3/4 in. socket, 1/2 in. drive ratchet	Reach through trailing edge of main screed.
19	3/4 in. socket, 1/2 in. drive ratchet, 10 in. extension	Access directly. 10 inch extension prevents step interference.
20	3/4 in. socket, 1/2 in. drive ratchet, universal adapter, 10 in. extension	Use universal adapter to bypass interference from step support.
21	3/4 in. socket, 1/2 in. drive ratchet, 10 in. and 6 in. extensions	Combine extensions. Gain access to self-locking nuts through top of extension screeds.
22	3/4 in. socket, 1/2 in. drive ratchet, 6 in. extension, universal adapter, 10 in. extension	Access directly.

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- B. REMOVE - Continued.
- 5. REMOVE SCREED PLATES FROM MAIN AND EXTENSION SCREEDS WITH SCREED RAISED.

#### NOTE

**The same method is used for removing main and extension screed plates. Only one plate removal is discussed.**

- a. Start paving machine engine. Raise screed 1.0 to 2.0 in. (25 to 51 mm) above ground. Close screed travel lock valve. Refer to TM 5-3895-373-10.

**WARNING**

**Screed plates weigh approximately 175 lbs (80 kg) and present a crushing hazard. Keep hands and feet clear of screed plate during screed operation and during removal of screed plates. Failure to do so may result in personnel injury or death.**

- b. Use a pry bar and pry screed plate evenly around edges until plate drops onto ground.
- c. Raise screed to full height to allow removal of screed plate from beneath screed. Refer to TM 5-3895-373-10.
- d. If removing main screed plate, install cribbing under extension screeds.
- e. If removing extension screed plates, install cribbing under main screed.
- f. Lower screed down onto cribbing. Shut off engine and remove key from ignition switch. Close screed travel lock valve. Refer to TM 5-3895-373-10.

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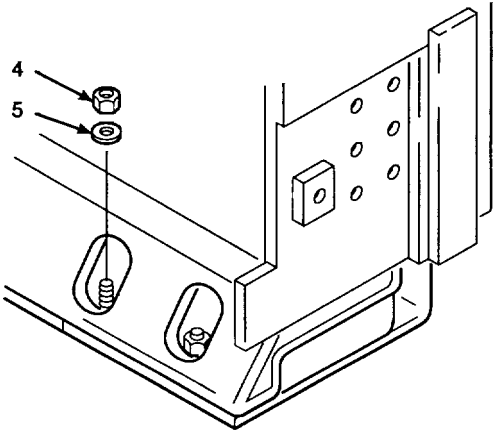


**2.71 REPLACE MAIN AND EXTENSION SCREED PLATES - Continued.**

**B. REMOVE - Continued.**

**NOTE**

When removing screed plates from beneath screeds, ensure all shims, plate spacers, and spacers remain with corresponding studs. Shims, plate spacers, and spacers will be transferred to replacement screed plates in the same corresponding locations.



- g. Check for shims and plate spacers sticking to bottom of screed frame. Remove sticking shims and plate spacers from screed frame and place on corresponding studs.
- h. With screed resting on cribbing, with the help of two persons, remove screed plate from beneath screed frame. Ensure all spacers (23 through 26), shims, and plate spacers remain with corresponding studs.
- i. Ensure all shims, plate spacers, and spacers are in correct locations and install flat washers (5) and self-locking nuts (4) to secure them while performing steps in step C.

25	25	25	24	23	23	24	25	25	25
26	26	26	26	26	26	26	26	26	26

25	25	25	25	25
26	26	26	26	26

25	25	25	25	25
26	26	26	26	26

ITEM NO.	SPACER	THICKNESS
23	0.38 in.	(9,525 mm)
24	0.44 in.	(11,113 mm)
25	0.50 in.	(12,70 mm)
26	0.25 in.	(6,35 mm)

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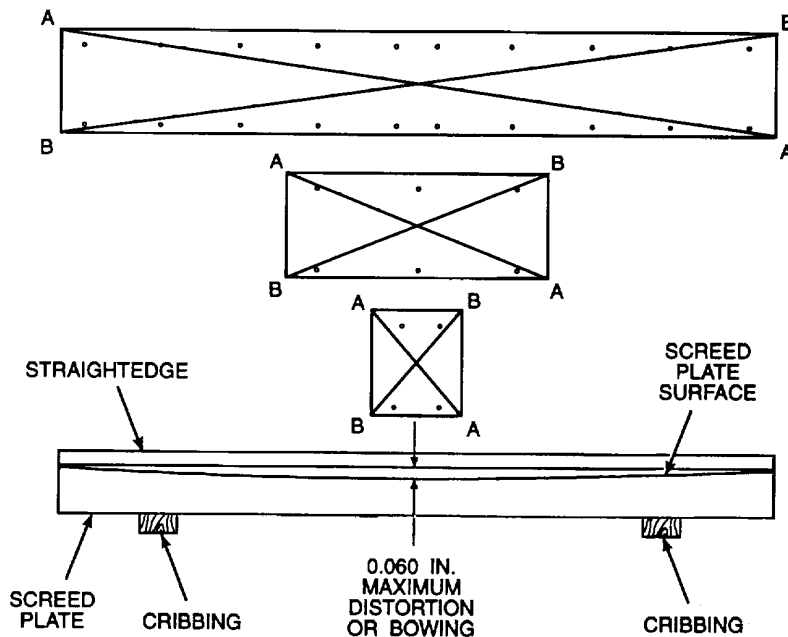
C. INSPECT.

1. INSPECT SCREED PLATE FOR BOWING OR SURFACE DISTORTION.

- a. Place screed plate to be inspected on a flat surface with the bottom of the screed plate facing up.
- b. Place a straightedge diagonally across screed plate along lines A and B as seen in the illustration.
- c. Check for bowing or surface distortion greater than 0.060 in. (1,5 mm) along lines A and B.
- d. If surface deformity is greater than 0.060 in. (1,5 mm) in either direction, screed plate is to be replaced.

2. INSPECT SCREED PLATE FOR CRACKS, DENTS, AND OTHER DAMAGE.

- a. Inspect screed plate for cracks in bottom paving surface and around attachment studs.
- b. Inspect leading, trailing, and outside screed plate edges for dents that would affect the ability of the paving machine to lay a smooth asphalt mat.
- c. If the damage mentioned above is found, or any other damage that would affect the ability of the paving machine to lay a smooth asphalt mat, that screed plate is to be replaced.



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**2.71 REPLACE MAIN AND EXTENSION SCREED PLATES - Continued. ma**

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- D. REPLACE.
1. CLEAN SCREED BASE.

<b>WARNING</b>
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Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean base of screed with cleaning cloth and cleaning solvent.
  - b. Clean shims, plate spacers, and spacers with cleaning cloth and cleaning solvent. Be careful not to mix shims, plate spacers, and spacers together.
  - c. Remove hard deposits with cleaning solvent and a wire scratch brush.
2. TRANSFER SPACERS, SHIMS, AND PLATE SPACERS FROM OLD SCREED PLATE TO NEW SCREED PLATE.
- a. Remove and discard protective caps from plate studs on screed plate.

**NOTE**

**When replacing extension screed plates, ensure beveled edge of screed plate is on the inside edge on the paving machine.**

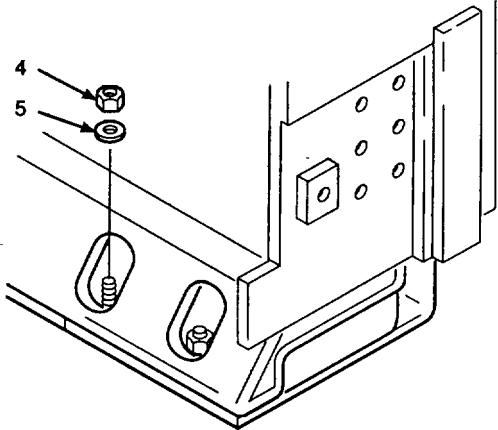
- b. Lay new and old screed plates side by side, facing in the same direction, in order to remove spacers, shims, and plate spacers.

**GO TO NEXT PAGE**

D. REPLACE - Continued.

**NOTE**

Ensure shims, plate spacers, and spacers are placed on new screed plates in same stud location and position as on old plates. Transfer shims, plate spacers, and spacers one stud at a time to avoid error. Ensure spacers transferred from trailing edge of old screed plates are installed bevel side down on trailing edge of new screed plates.



- c. Remove self-locking nuts (4) and flat washers (5). Discard self-locking nuts.
- d. Transfer all spacers, shims, and plate spacers from studs of old plate to corresponding studs of new plate.
- e. Substitute new shims, plate spacers, and spacers of same dimensions in place of visually defective parts. Refer to diagram for factory location of spacers (23 through 26) by size.
- f. If replacing a damaged shim or plate spacer, measure damaged shim or plate spacer with an outside micrometer and replace with one of a comparable size.
- g. Move new screed plate and installed shims, plate spacers, and spacers into mounting position under screed frame. Ensure spacers stay in position while moving screed plate.

3. ASSEMBLE SCREED PLATE TO SCREED.

- a. Align screed plate studs with mounting holes on screed base.

25	25	25	24	23	23	24	25	25	25
26	26	26	26	26	26	26	26	26	26

25	25	25	25	25
26	26	26	26	26

25	25	25	25	25
26	26	26	26	26

ITEM NO.	SPACER	THICKNESS
23	0.38 in.	(9,525 mm)
24	0.44 in.	(11,113 mm)
25	0.50 in.	(12,70 mm)
26	0.25 in.	(6,35 mm)

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**2.71 REPLACE MAIN AND EXTENSION SCREED PLATES - Continued.**

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- D. REPLACE - Continued.
- b. Start paving machine engine. Refer to TM 5-3895-373-10. Raise screed from cribbing and remove cribbing.



**Damage to studs is possible. Lowering screed onto a misaligned screed plate can break, bend, or shear off threads of studs. Use caution when repositioning screed plate as required to ensure screed and screed plate are properly aligned.**

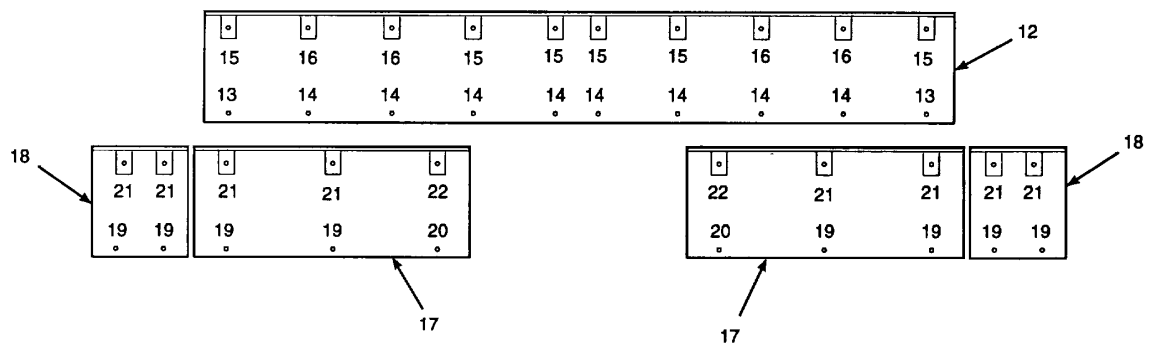
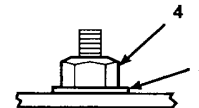
- c. Lower screed per TM 5-3895-373-10 until it is about 3 in. (76 mm) above screed plate studs. Have a second person inform operator when to stop lowering screed to prevent damage to studs.
- d. Visually realign screed plate as required.
- e. Lower screed until base rests on screed plate.
- f. Shut off engine and remove key from ignition switch per TM 5-3895-373-10.

**GO TO NEXT PAGE**

D. REPLACE - Continued.

- g. If mounting main screed plate (12), place flat washers (5) and self-locking nuts (4) over studs (13 through 16). Refer to chart below for tools required and installation comments. Tighten self-locking nuts to 37 lb-ft (50 N•m).
- h. If mounting inner and outer extension screed plates (17 and 18), place flat washers and self-locking nuts onto studs (19 through 22). Refer to chart below for tools required and installation comments. Tighten self-locking nuts to 37 lb-ft (50 N•m).

- i. Remove C-clamps and spacer wedges from between screed halves.



Stud	Tools	Removal Comments
13	3/4 in. socket, 1/2 in. drive ratchet, 10 in. extension	Reach into trailing edge of main screed.
14	3/4 in. socket, 1/2 in. drive ratchet, 6 in. extension	Place self-locking nuts on studs.
15	3/4 in. socket, 1/2 in. drive ratchet, 6 in. extension	Reach through trailing edge of main screed.
16	3/4 in. socket, 1/2 in. drive ratchet	Reach through trailing edge of main screed.
19	3/4 in. socket, 1/2 in. drive ratchet, 10 in. extension	Access directly. 10 inch extension prevents step interference.
20	3/4 in. socket, 1/2 in. drive ratchet, universal adapter, 10 in. extension	Use universal adapter to bypass interference from walkway support.
21	3/4 in. socket, 1/2 in. drive ratchet, 10 in. and 6 in. extensions	Combine extensions. Gain access to nuts through top of extension screeds.
22	3/4 in. socket, 1/2 in. drive ratchet, 6 in. extension, universal adapter, 10 in. extension	Access directly

**NOTE**

**FOLLOW-ON-TASKS:** Adjust and align main and extension screed plates per TM 5-3895-373-20.  
 Install main screed cover plates, if removed, per TM 5-3895-373-20.  
 Install endgates per TM 5-3895-373-20.

**END OF TASK**

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**2.72 REPAIR SCREED EXTENSION CYLINDER.**

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This task covers:           a. Disassemble           b. Clean           c. Inspect  
                                  d. Repair                e. Assemble

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Hydraulic press frame (Item 41, Appendix D)  
O-ring tool (Item 103, Appendix D)  
Plastic hammer (Item 49, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Spanner wrench (Item 128, Appendix D)  
Torque wrench (Item 133, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Vise jaw caps (Item 23, Appendix D)

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Crocus cloth (Item 4, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Seal kit  
Self-locking hex nut

**Personnel Required:**

Two 62B construction equipment repairers. Second person required to hold opposite end of piston rod while removing piston retaining nut or tightening hex nut while assembling.

**References:**

TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Screed extension cylinder removed per TM 5-3895-373-20.

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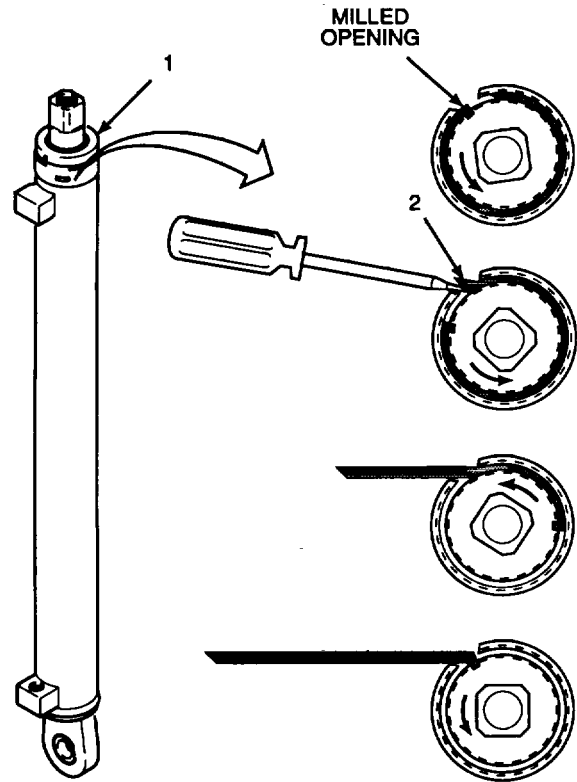
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**2-1034**

A. DISASSEMBLE.

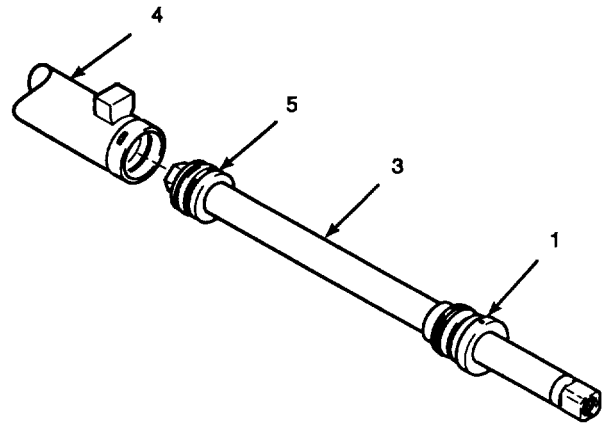
1. REMOVE RETAINING RING FROM CYLINDER HEAD.

- a. Insert spanner wrench into holes on cylinder head (1).
- b. Hold screed extension cylinder and rotate cylinder head (1) in direction of least resistance until beveled edge of retaining ring (2) appears in milled opening.
- c. Insert flat-blade screwdriver under beveled edge of retaining ring (2).
- d. Rotate cylinder head (1) in opposite direction of step b until retaining ring (2) emerges through milled opening.
- e. Continue to rotate cylinder head (1) and pull retaining ring (2) from milled opening with pliers.



2. REMOVE PISTON ROD, CYLINDER HEAD, AND PISTON FROM CYLINDER TUBE.

- a. Manually extend piston rod (3) to its full length.
- b. Tap side of cylinder tube (4) with plastic hammer to jar cylinder head (1) and piston (5) loose from cylinder tube.
- c. Pull piston rod (3), cylinder head (1), and piston (5) as an assembly from cylinder tube (4).



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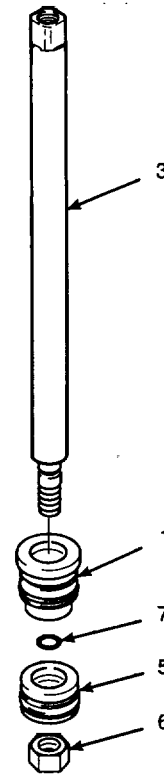
**2.72 REPAIR SCREED EXTENSION CYLINDER - Continued.**

- A. DISASSEMBLE - Continued.
3. REMOVE PISTON AND CYLINDER HEAD FROM PISTON ROD.

**CAUTION**

Do not clamp piston rod against metal jaws in vise. Use vise jaw caps between vise jaws and piston rod. Damage to chrome surface of piston rod can result from contact with metal vise jaws.

- a. Clamp piston rod (3) in a bench vise on square end. Pad vise jaws with vise jaw caps.
- b. Have a second person support unclamped end of the piston rod. Remove self-locking hex nut (6) from piston rod. Discard self-locking hex nut.
- c. Remove piston (5) and preformed packing (7) from piston rod (3). Discard preformed packing.
- d. Slide cylinder head (1) from piston rod (3).
- e. Remove piston rod (3) from bench vise.

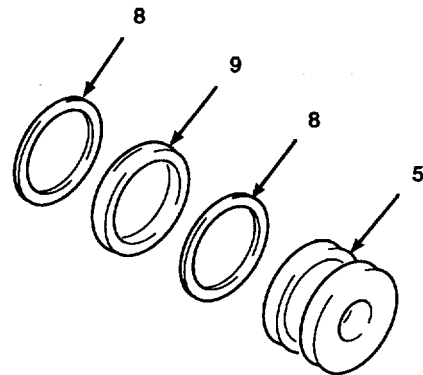


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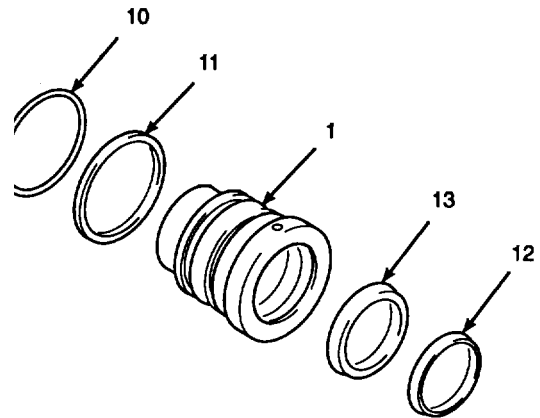
- A. DISASSEMBLE - Continued.
4. REMOVE SEAL AND PACKING RETAINERS FROM PISTON.



Use caution when removing seals and o-rings. Do not use excessive force. Use an o-ring tool to remove seals and o-rings. Scratched or dented seal grooves can cause bypass leakage.



- a. Use an o-ring tool to remove packing retainers (8) from piston (5). Do not use a screwdriver or other sharp metal tool. Discard packing retainers.
- b. Use an o-ring tool to remove seal (9) from piston. Discard seal.
5. REMOVE O-RING, PACKING RETAINER, RING WIPER, AND COMPRESSION CUP FROM CYLINDER HEAD.



- a. Use an o-ring tool to remove o-ring (10) and packing retainer (11) from cylinder head (1). Do not use a screwdriver or other sharp metal tool. Discard o-ring and packing retainer.
- b. Remove ring wiper (12) and compression cup (13) from inside of cylinder head. Discard ring wiper and compression cup.

GO TO NEXT PAGE

**2.72 REPAIR SCREED EXTENSION CYLINDER - Continued.**

B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

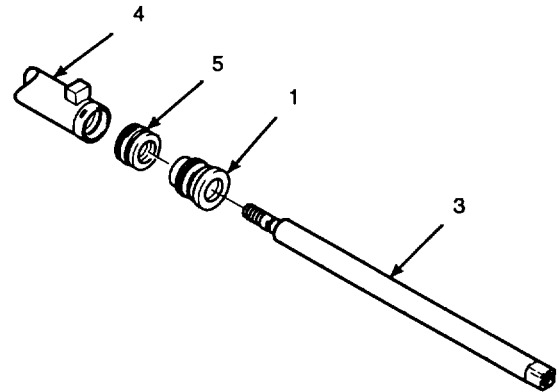
If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. RINSE PISTON ROD (3), CYLINDER HEAD (1), PISTON (5), AND CYLINDER TUBE (4) WITH - CLEANING SOLVENT.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

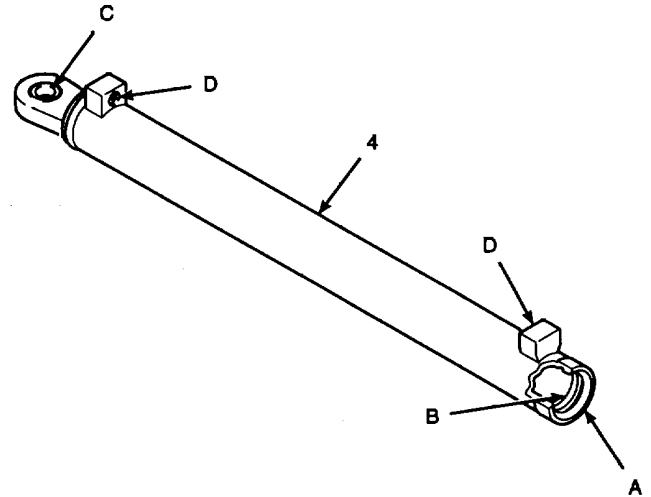
2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO BLOW ANY FOREIGN MATERIAL FROM SEAL GROOVES, INSIDE OF CYLINDER TUBE, AND THREADED SURFACES. DRY PARTS WITH A CLEAN, LINT-FREE CLOTH.

**GO TO NEXT PAGE**

C. INSPECT.

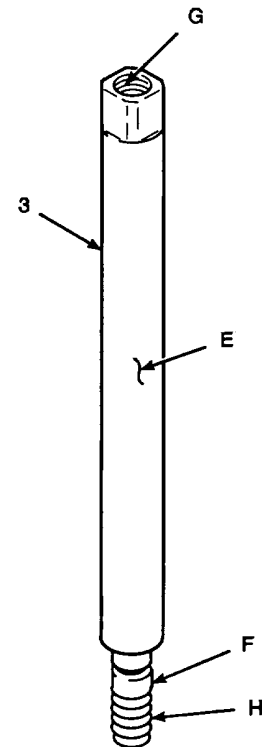
1. INSPECT CYLINDER TUBE.

- a. Run your finger along the inside surface A of cylinder tube (9) and retaining ring groove surface B. Feel for any nicks, scratches, or sharp edges that may damage preformed packings and seals.
- b. Remove sharp edges of nicks or scratches using crocus cloth.
- c. Replace cylinder tube (4) if scratches or pits cannot be polished out, and if scratch exceeds 0.5 in. (12,7 mm) in length.
- d. Visually inspect cylinder tube (4) interior for scoring or glazing using a strong light. If scoring or glazing is detected, replace cylinder tube.
- e. Check spherical bearing C for damage or looseness. Replace spherical bearing if damaged or loose. Refer to step D.1.
- f. Inspect cylinder tube (4) port threads D for stripped or damaged threads.
- g. Replace cylinder tube (4) if stripped or damaged threads are detected.



2. INSPECT PISTON ROD.

- a. Run your finger along piston rod (3) surface E. Feel for any scratches or sharp edges that may damage preformed packings and seals. Inspect circumference of piston rod for scratches, pits, or wear that expose base metal through chrome plating.
- b. Remove sharp edges of nicks or scratches using crocus cloth.
- c. Replace piston rod (3) if scratches or pits cannot be polished out, if scratch exceeds 0.5 in. (12,7 mm) in length, and base metal is exposed through chrome plating.
- d. Run your finger along edge of packing groove surface F and feel for nicks and sharp edges. Remove sharp edges using crocus cloth. If packing groove surface is cracked or chipped, replace piston rod (3).
- e. Inspect piston rod (3) threaded surfaces G and H for stripped or damaged threads.
- f. Replace piston rod (3) if stripped or damaged threads are detected.



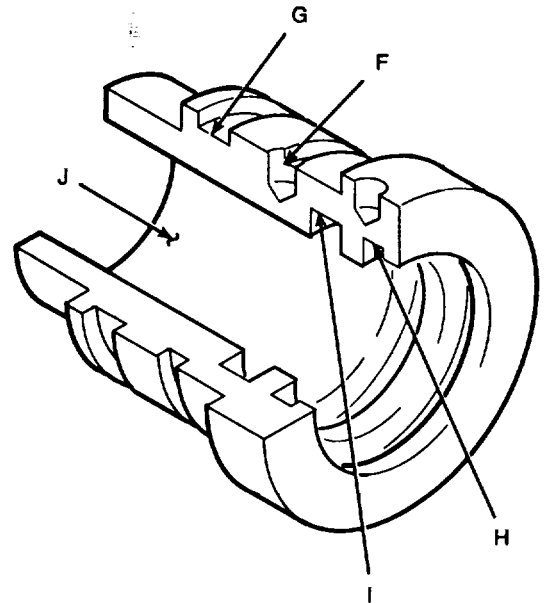
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**2.72 REPAIR SCREED EXTENSION CYLINDER - Continued.**

C. INSPECT - Continued.

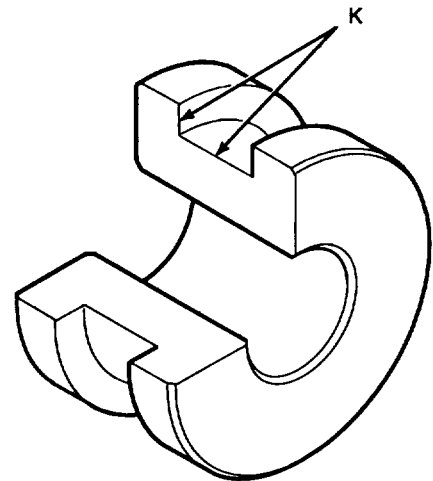
3. INSPECT CYLINDER HEAD.

- a. Run your finger along the edges of retaining ring groove surface F and o-ring and packing retainer groove surface G. Feel for any raised edges or nicks that may damage retaining ring or cylinder tube interior surfaces. Remove raised edges and nicks with crocus cloth.
- b. Run your finger along inside bore ring wiper groove surface H and compression cup groove surface I. Feel for any raised edges or nicks that may damage ring wiper and compression cup. Remove raised edges and nicks with crocus cloth.
- c. Run your finger over cylinder head inside bore surface J. Feel for any nicks, pits, or scratches. Remove nicks, pits, or scratches of less than 0.5 in. (12,7 mm) in length with crocus cloth.



4. INSPECT PISTON.

- a. Run your finger along edges of packing retainer and seal groove surface K. Feel for any sharp edges or nicks that may damage packing retainers and seals. Remove sharp edges and nicks with crocus cloth.
- b. Replace piston if sharp edges or nicks cannot be polished out, or if surface defect exceeds 0.5 in. (12,7 mm) in length.



**GO TO NEXT PAGE**

- C. INSPECT - Continued.
5. CLEAN ALL METAL PARTS AFTER INSPECTION.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Rinse all metal parts with cleaning solvent.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- b. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from seal grooves, inside of cylinder tube, and threaded surfaces.
- c. Dry parts with a clean, lint-free cloth. Set dry parts on clean surface. Place a clean, lint-free cloth into open end of cylinder tube to prevent contamination.

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2.72 REPAIR SCREED EXTENSION CYLINDER - Continued.

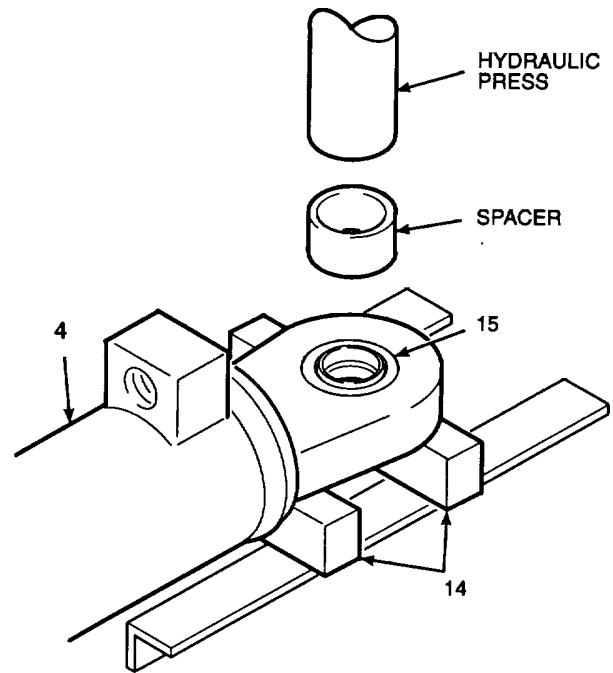
D. REPAIR.

1. PRESS OUT SPHERICAL BEARING FROM CYLINDER TUBE BASE.

**CAUTION**

Place cylinder tube base support blocks close to bearing bore when pressing out spherical bearing. Failure to place support blocks correctly may lead to warping of the cylinder tube base.

- a. Place cylinder tube (4) base on hydraulic press frame. Use parallel support blocks (14) under cylinder tube to support base.
- b. Place a spacer from universal puller kit onto outer race of spherical bearing (15). Press spherical bearing out of base bearing bore.



2. REPLACE SPHERICAL BEARING.

**CAUTION**

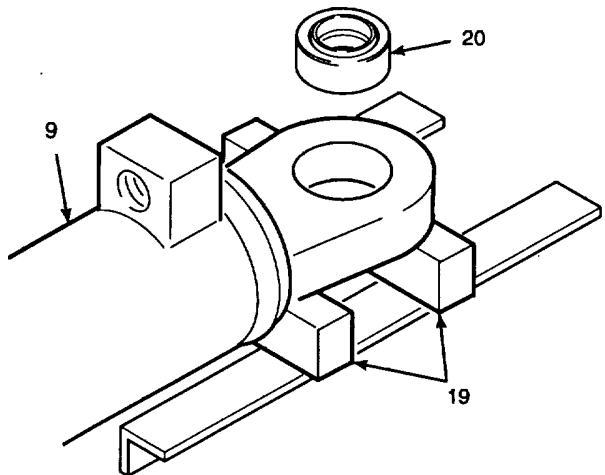
Place cylinder base tube support blocks close to bearing bore when pressing spherical bearing. Failure to place support blocks correctly may lead to warping of the cylinder tube base.

- a. Place cylinder tube (4) base on hydraulic press frame. Use parallel support blocks (14) under the cylinder tube to support base.

**CAUTION**

Spherical bearing must be pressed straight into bearing bore. If spherical bearing is allowed to tilt, damage may result to both the spherical bearing and the bearing bore.

- b. Position spherical bearing (15) over bearing bore on base of cylinder tube (4).



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D. REPAIR - Continued.

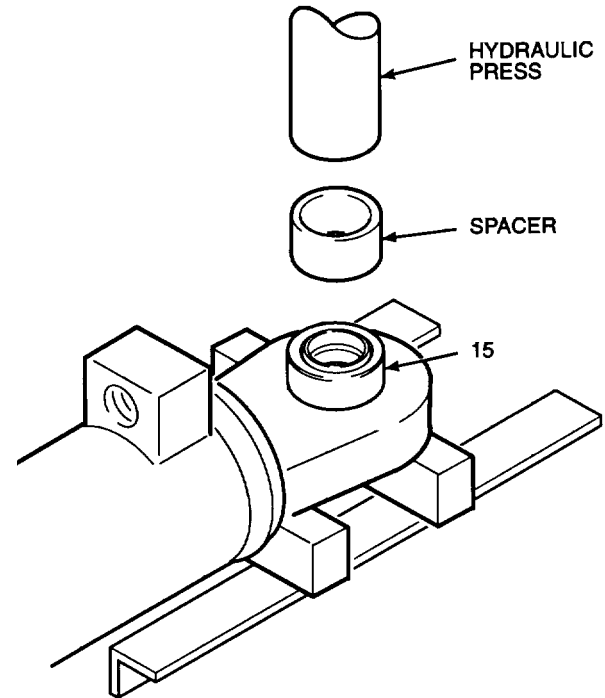
**NOTE**

**Spherical bearing will require 500 to 700 lb-ft (2224 to 3114 N•m) to press into cylinder tube base bearing bore.**

- c. Place a spacer from universal puller kit onto outer race of spherical bearing (15). Press spherical bearing into base bearing bore.

E. ASSEMBLE.

- 1. INSTALL COMPRESSION CUP, RING WIPER, PACKING RETAINER, AND O-RING INTO CYLINDER HEAD.



**WARNING**

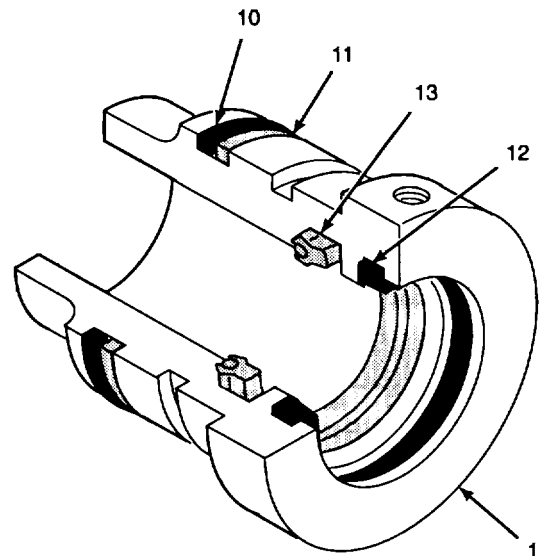
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate compression cup, ring wiper, packing retainer, and o-ring with clean hydraulic oil.

**CAUTION**

New seals and o-ring are distorted during installation. Use care during installation to prevent damage to seals, o-rings, and seal grooves. Bypass leakage can result from poor installation.

- b. Twist compression cup (13) into a C-shape. Install compression cup inside cylinder head (1) and allow to snap into seal groove.
- c. Twist ring wiper (12) into a C-shape. Install ring wiper inside cylinder head (1) and allow to snap into seal groove.
- d. Install packing retainer (11) and o-ring (10) on cylinder head (1).



**GO TO NEXT PAGE**



**2.72 REPAIR SCREED EXTENSION CYLINDER - Continued.**

- E. ASSEMBLE - Continued.
- e. Allow one hour for seals and o-rings to conform to shape before installing cylinder head onto piston rod.
2. INSTALL SEAL AND PACKING RETAINERS ONTO PISTON.

<b>WARNING</b>
----------------

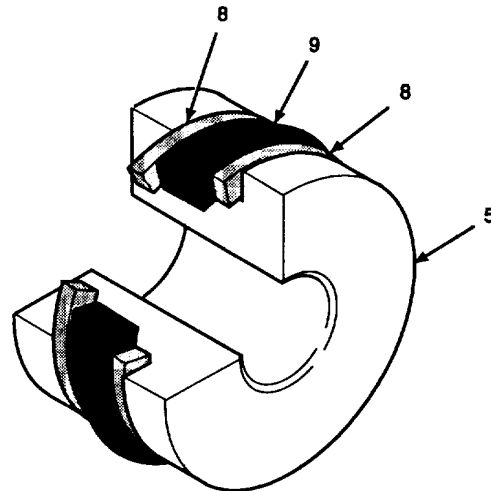
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate seal and packing retainers with clean hydraulic oil.

<b>CAUTION</b>
----------------

New seals and packings are distorted during installation. Use care during installation to prevent damage to seals, preformed packings, and seal grooves. Bypass leakage can result from poor installation.

- b. Install seal (9) on piston (5). Center the seal in groove to allow for packing retainers on each side.
- c. Install packing retainers (8) on each side of seal (9) in groove.



**GO TO NEXT PAGE**

E. ASSEMBLE - Continued.

3. REASSEMBLE PISTON ROD.



Do not clamp piston rod against metal jaws in vise. Use vise jaw caps between vise jaws and piston rod. Damage to chrome surface of piston rod can result.

- a. Clamp piston rod (3) in a bench vise on square end. Pad vise jaws with vise jaw caps.



New seals and preformed packings are distorted during installation. Allow a minimum of one hour for seals and preformed packings to conform to original shape before installing cylinder head and piston on rod. Bypass leakage can result from poor installation.

- b. Allow one hour for seals and preformed packings to conform to original shape.



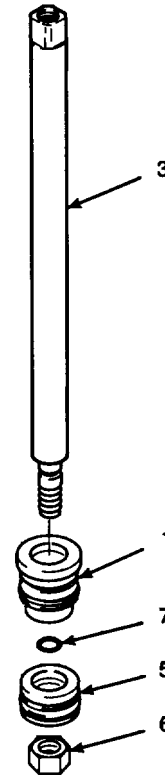
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- c. Lubricate piston, cylinder head, and preformed packing with clean hydraulic oil.
- d. Install cylinder head (1) onto piston rod (3). Slide cylinder head down length of piston rod.



Be careful not to damage preformed packings when sliding over threads. Sharp edges of threads can cut or damage preformed packings. Damaged preformed packings will cause leakage and affect performance.

- e. Install preformed packing (7) onto piston rod. Ensure preformed packing seats in groove on rod (3).



- f. Slide piston (5) onto piston rod (3).
- g. Have a second person support unclamped end of the piston rod and install self-locking hex nut (6) onto threaded end of rod. Tighten to 200 lb-ft (271 N•m) using socket wrench adapter.
- h. Remove piston rod from bench vise.

GO TO NEXT PAGE

**2.72 REPAIR SCREED EXTENSION CYLINDER - Continued. V**

- E. ASSEMBLE - Continued.
4. INSERT PISTON ROD AND CYLINDER HEAD INTO SCREED EXTENSION CYLINDER.

**WARNING**

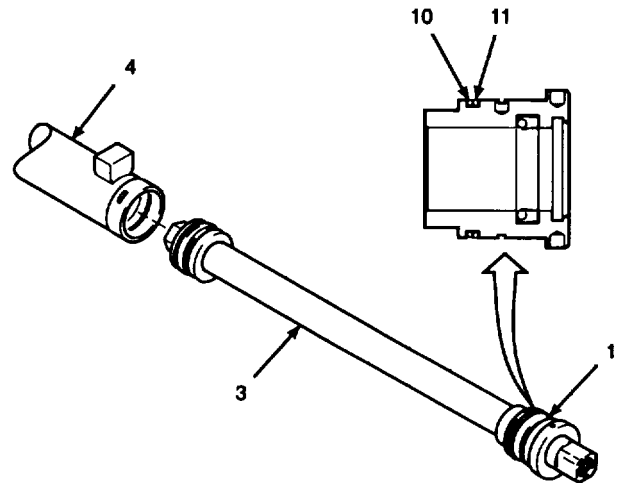
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- Apply clean hydraulic oil to cylinder head (1) and outside surfaces of o-ring (10) and packing retainer (11).
- Remove lint-free cloth from end of cylinder tube (4). Ensure no foreign material is present in cylinder tube or on piston rod (3).
- Dip entire piston rod (3) assembly in clean hydraulic oil.

**CAUTION**

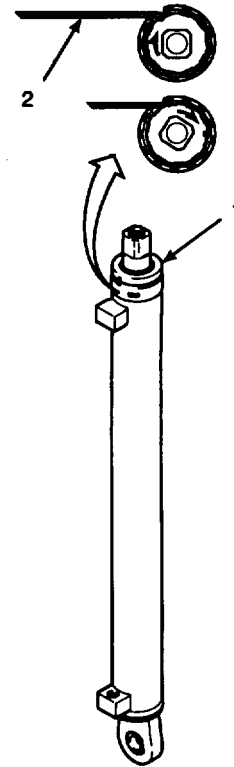
Inside edges of cylinder tube are sharp. Ensure o-ring and packing retainer are not cut by sharp edges in cylinder tube opening. Bypass leakage can result from damaged o-ring and packing retainer.

- Slide piston rod (3) into cylinder tube (4). Ensure packing retainer (11) does not extrude into milled opening.
- Seat cylinder head (1) flush with cylinder tube (4).



**GO TO NEXT PAGE**

- E. ASSEMBLE - Continued.
5. SECURE CYLINDER HEAD WITH RETAINING RING.
- Insert spanner wrench into holes on cylinder head (1).
  - Rotate cylinder head (1) to locate retaining ring groove in milled opening.
  - Insert retaining ring (2) hook-end first into milled opening. Ensure retaining ring catches on cylinder head (6).
  - Rotate cylinder head (1), in same direction that retaining ring was inserted, 1-1/4 turns to pull in retaining ring (2). Ensure retaining ring is fully seated and cylinder head is secured tightly.



**NOTE**

**FOLLOW-ON-TASKS:** Install screed extension cylinder per TM 5-3895-373-20.

**END OF TASK**

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**2.73 REPLACE EXTENSION SCREED GUIDE SHAFT SUPPORT, GUIDE SHAFTS, AND SLEEVE BUSHINGS.**

---

**This task covers:**            a. Remove                    b. Clean                    c. Inspect  
   d. Install

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Hex head driver socket (Item 86, Appendix D)  
Hydraulic press frame (Item 40, Appendix D)  
Inside caliper (Item 14, Appendix D)  
Mechanical puller kit (Item 68, Appendix D)  
Sling strap, 2 ea (Item 98, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Socket wrench adapter (Item 7, Appendix D)  
Socket wrench set (Item 135, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Torque wrench, 0 to 1200 lb-ft (Item 134, Appendix D)  
Universal puller kit (Item 69, Appendix D)

**Materials/Parts:**

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Emery cloth (Item 5, Appendix B)  
Grease (Item 18, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers  
Plain seals

**Personnel Required:**

Two 62B construction equipment repairers. Second person needed for removal of guide shafts and to assist in hoisting of guide shaft support assembly.

**References:**

LO 5-3895-373-12  
TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P

**NOTE**

**Before performing equipment condition tasks, extend extension screed that is to be worked on halfway. The extension screed must be extended halfway to make support guide and shaft removal possible. Also ensure that the main and extension screeds are aligned on a flat and level surface to ensure proper bolt hole alignment during installation.**

**Equipment Condition:**

Extension screed extended halfway per TM 5-3895-373-10.  
Endgates removed per TM 5-3895-373-10.  
Extension screed height adjustment controls removed per paragraph 2.58, steps A.3.a thru A.3.g and step A.3.i.

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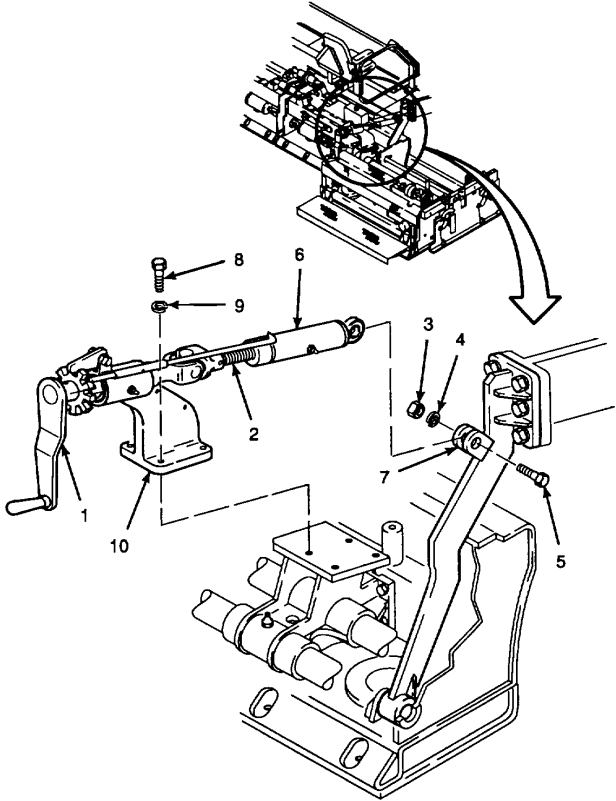
A. REMOVE.

**NOTE**

This procedure applies to both the left and right guide shaft support assemblies. In this procedure the right guide shaft support assembly is shown.

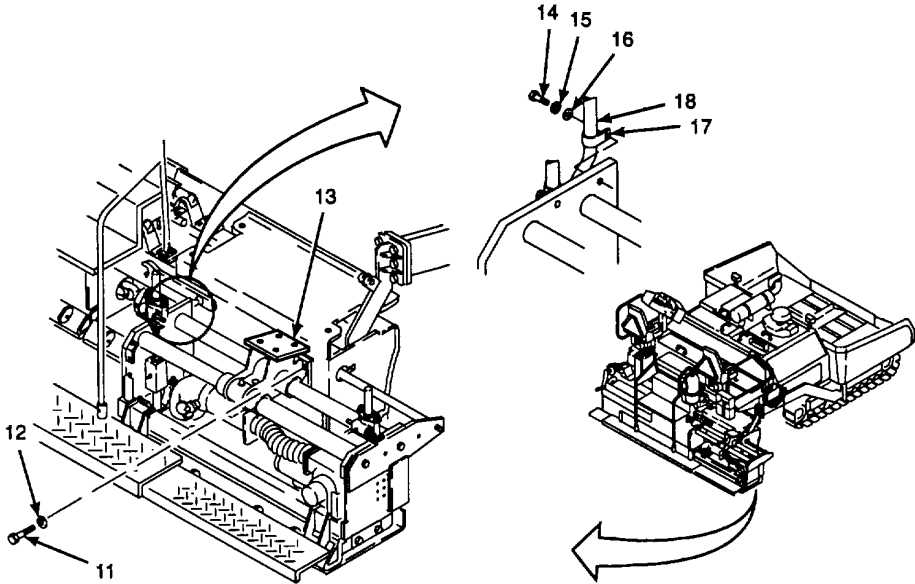
1. REMOVE THICKNESS CONTROL ASSEMBLY.

- a. Rotate hand crank (1) to remove all tension from threaded rod (2).
- b. Remove hex nut (3), lockwasher (4), and hex head cap screw (5). Lift link (6) away from screed arm bracket (7). Discard lockwasher.
- c. Remove hex head cap screws (8) and lockwashers (9) from thickness control assembly (10) and remove thickness control assembly from paving machine.



2. REMOVE GUIDE SHAFT SUPPORT ASSEMBLY AND GUIDE SHAFTS FROM THE PAVING MACHINE.

- a. Remove hex head cap screws (11) and lockwashers (12) from guide shaft support assembly (13). Discard lockwashers.
- b. Remove hex head cap screw (14), lockwasher (15), and flat washer (16) from clamp (17) on front extension screed hydraulic hose (18). Discard lockwashers.



GO TO NEXT PAGE

## 2.73 REPLACE EXTENSION SCREED GUIDE SHAFT SUPPORT, GUIDE SHAFTS, AND SLEEVE BUSHINGS - Continued.

### A. REMOVE - Continued.

- c. Place two sling straps (19) around guide shafts (20) and up against guide shaft support assembly (13).
- d. Hook the loop ends of sling straps (19) onto the hook of overhead hoist (21) and take the slack out of the sling strap.
- e. Remove hex head cap screws (22) and lockwashers (23) from the ends of guide shafts (20). Discard lockwashers.
- f. Remove lubrication fittings (24) from inner and outer lift jack assemblies (25 and 26).

### WARNING

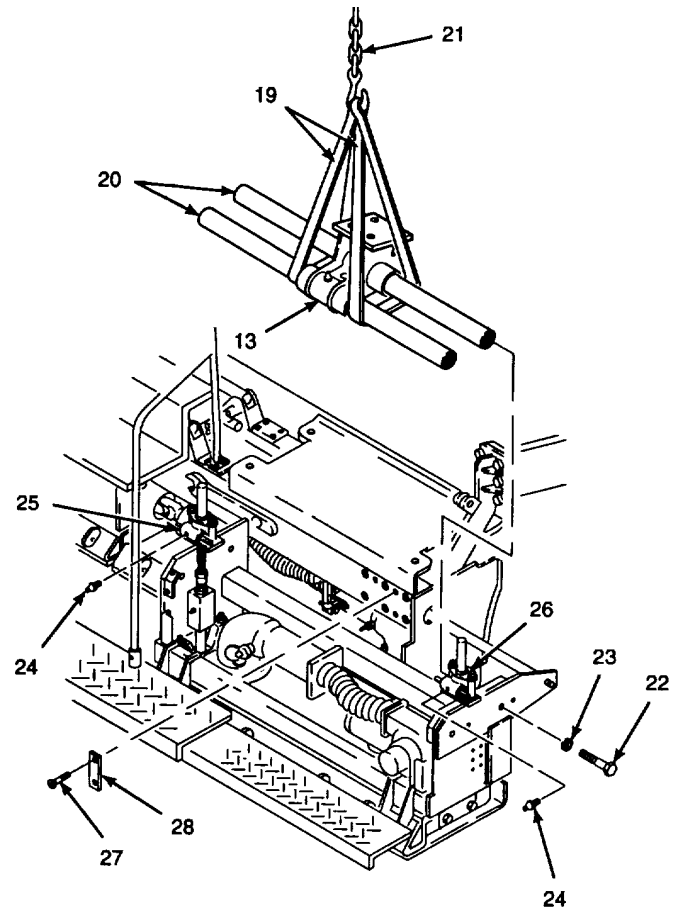
Guide shaft weighs approximately 200 lbs (91 kg). Ensure sling straps and guide shaft support assembly are centered on guide shafts while lifting. Guide shafts may slide in guide shaft support.

### NOTE

When lifting the guide shaft support assembly (13) and guide shafts (20) from the paving machine, have a second person reposition any hydraulic hoses and electrical wiring that may interfere with removal.

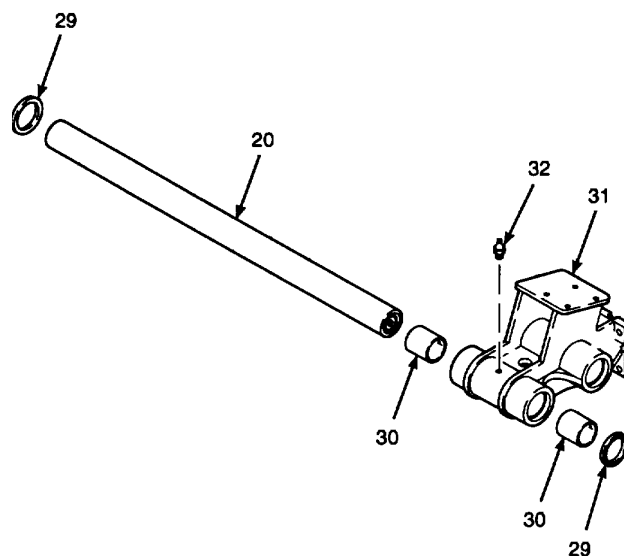
It may be necessary to use the universal puller kit and spread extension screed frame outer walls apart to allow removal of guide shaft support assembly.

- g. With the help of a second person as a guide, lift the guide shaft support assembly (13) and guide shafts (20) from the paving machine. Place the assembly on a clean, flat work surface. Disconnect overhead hoist (21) and remove sling straps (19).
- h. Remove socket head cap screws (27) and guide bars (28) from the paving machine.



GO TO NEXT PAGE

- A. REMOVE - Continued.
3. REMOVE GUIDE SHAFTS, PLAIN SEALS, AND SLEEVE BUSHINGS FROM GUIDE SHAFT SUPPORT ASSEMBLY.
- With the help of a second person holding guide shaft support assembly, slide guide shafts (20) from the guide shaft support of the guide shaft support assembly.
  - Remove plain seals (29) from both sides of guide shaft support assembly. Discard plain seals.
  - While still installed, inspect sleeve bushing (30) inner surface and outer edges for gouges, cracks, pitting, or other damage that will affect the full extension of the extension screeds. If damage is found that requires the replacement of the sleeve bushings, use the mechanical puller kit and remove the sleeve bushings from guide shaft support (31). Discard sleeve bushings.
  - Remove lubrication fittings (32) from guide shaft support (31).
- B. CLEAN.
1. CLEAN GUIDE SHAFTS, GUIDE BARS, AND GUIDE SHAFT SUPPORT.



**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- Use a cleaning cloth and cleaning solvent and clean surface of guide shafts.
- Dry with a clean, cleaning cloth.

GO TO NEXT PAGE



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**2.73 REPLACE EXTENSION SCREED GUIDE SHAFT SUPPORT, GUIDE SHAFTS, AND SLEEVE BUSHINGS - Continued.**

---

**B. CLEAN Continued.****WARNING**

Cleaning solvent, P-D-680, is **TOXIC** and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- c. Rinse guide bars and guide shaft support in cleaning solvent. Use a cleaning brush to remove hardened deposits and excessive dirt build up.
- d. Dry guide bars and guide shaft support with a clean, cleaning cloth.

**2. CLEAN MOUNTING HARDWARE.****WARNING**

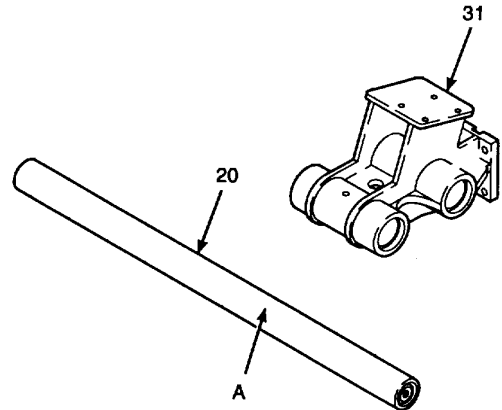
Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean threads of hex head cap screws and socket head cap screws with thread locking compound solvent.
- b. Dry with a clean, cleaning cloth.

**GO TO NEXT PAGE**

C. INSPECT.

1. INSPECT GUIDE SHAFT (20) OUTER SURFACE A FOR CRACKS, NICKS, CRACKS, OR DAMAGE THAT WOULD AFFECT THE FULL EXTENSION OF THE EXTENSION SCREEDS. POLISH RAISED EDGES OF SMALL NICKS AND SCRATCHES OUT USING EMERY CLOTH. IF CRACKS, WEAR THROUGH THE CHROME PLATING, EXCESSIVE PITTING, OR OTHER DAMAGE IS FOUND THAT CANNOT BE REPAIRED BY BEING POLISHED OUT WITHOUT REMOVING THE CHROME FINISH OF THE GUIDE SHAFT, REPLACE THE GUIDE SHAFT.

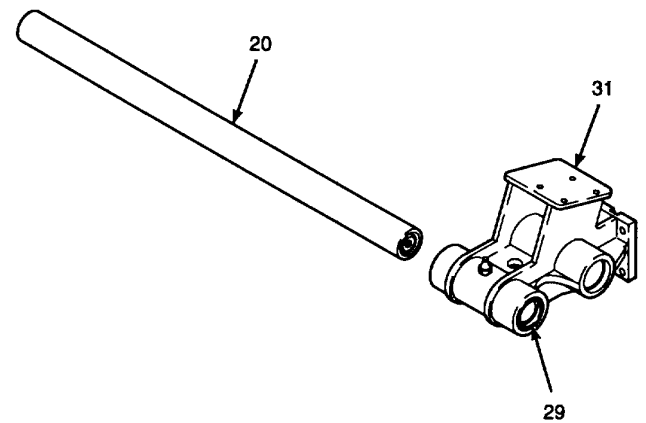
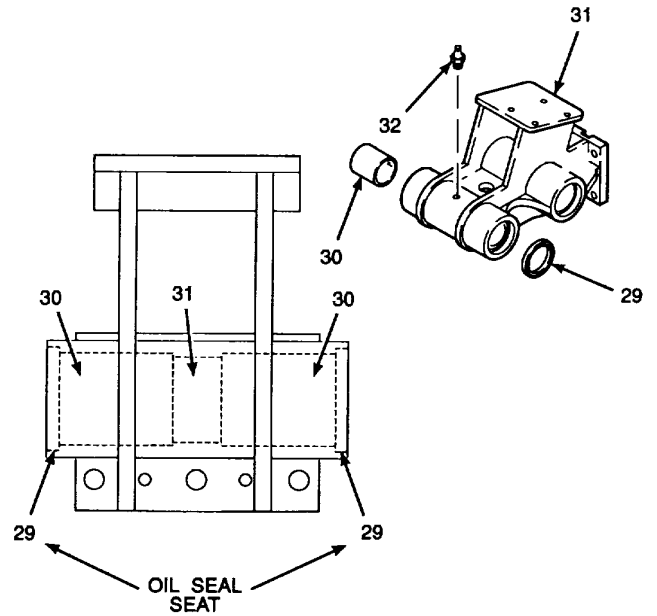


2. INSPECT GUIDE SHAFT SUPPORT (31) FOR CRACKS OR DAMAGE THAT WOULD AFFECT THE OPERATION OF THE GUIDE SHAFT OR INTERFERE WITH THE FULL EXTENSION OF THE EXTENSION SCREEDS. REPLACE THE GUIDE SHAFT SUPPORT IF DAMAGE IS FOUND.

D. INSTALL.

1. INSTALL SLEEVE BUSHINGS, PLAIN SEALS AND GUIDE SHAFTS INTO GUIDE SHAFT SUPPORT ASSEMBLY.

- a. Use a hydraulic press frame and install sleeve bushings (30) into guide shaft support (31) until fully seated.
- b.hone sleeve bushing (30) to 8 microinches. Ensure that the inside diameter of the sleeve bushing is between 2.753 and 2.751 in. (69, 926 to 69, 875 mm) using inside calipers.
- c. Press plain seals (29) into the plain seal seats on both ends of guide shaft support (31) with the beveled edge facing out.
- d. Install lubrication fittings (32) into guide shaft support (31).
- e. Apply a light coating of grease to the inner diameter of plain seals (29) and to guide shaft (20).
- f. With the help of a second person holding guide shaft support assembly, slide guide shafts (20) through plain seals (29) and center the shafts in the guide shaft support assembly.



GO TO NEXT PAGE

**2.73 REPLACE EXTENSION SCREED GUIDE SHAFT SUPPORT, GUIDE SHAFTS, AND SLEEVE BUSHINGS - Continued.**

D. INSTALL - Continued.

2. INSTALL GUIDE SHAFT SUPPORT ASSEMBLY AND GUIDE SHAFTS INTO THE PAVING MACHINE.

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- a. Apply thread locking compound to threads of socket head cap screws (27).
- b. Install guide bars (28) and secure with socket head cap screws (27).
- c. Tighten socket head cap screws (27) to 37 lb-ft (50 N.m) using a socket wrench adapter (Item 7, Appendix D) and hex head driver socket.
- d. Place two sling straps (19) around portion of guide shafts (20) up against guide shaft support assembly (13).
- e. Place loop ends of sling straps (19) into hook of overhead hoist (21).

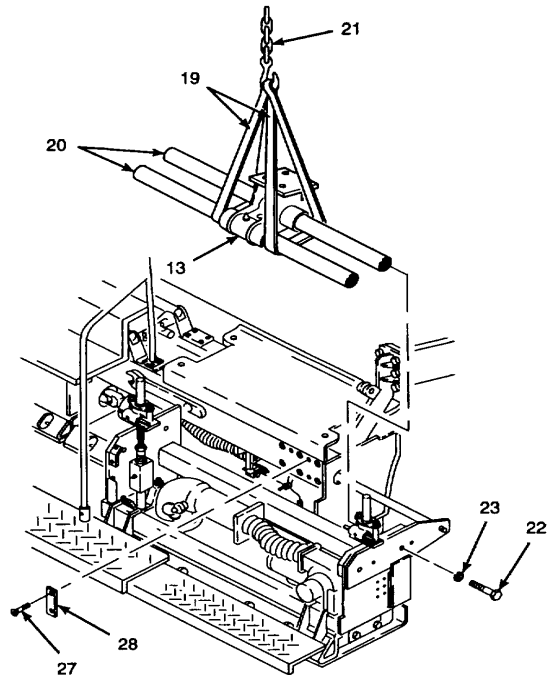
**WARNING**

Guide shafts weigh approximately 200 lbs (91 kg). Ensure sling straps and guide shaft support are centered on guide shafts while lifting. Guide shafts may slide in guide shaft support.

**NOTE**

When lifting the guide shaft support assembly (13) and guide shafts (20) into the paving machine, have a second person reposition any hydraulic hoses and electrical wiring that may interfere with installation.

It may be necessary to spread apart extension screed frame with universal puller kit to allow for installation of the guide shaft support assembly.



- f. With the help of a second person as a guide, lift the guide shaft support assembly (13) and guide shafts (20) into the paving machine. Align the guide shaft support assembly with guide bars (28).
- g. Install lockwashers (23) onto hex head cap screws (22).
- h. Apply thread locking compound to threads of hex head cap screws (22).
- i. Install hex head cap screws (22) through the outer walls of extension screed and into the ends of guide shafts (20). Do not tighten at this time.

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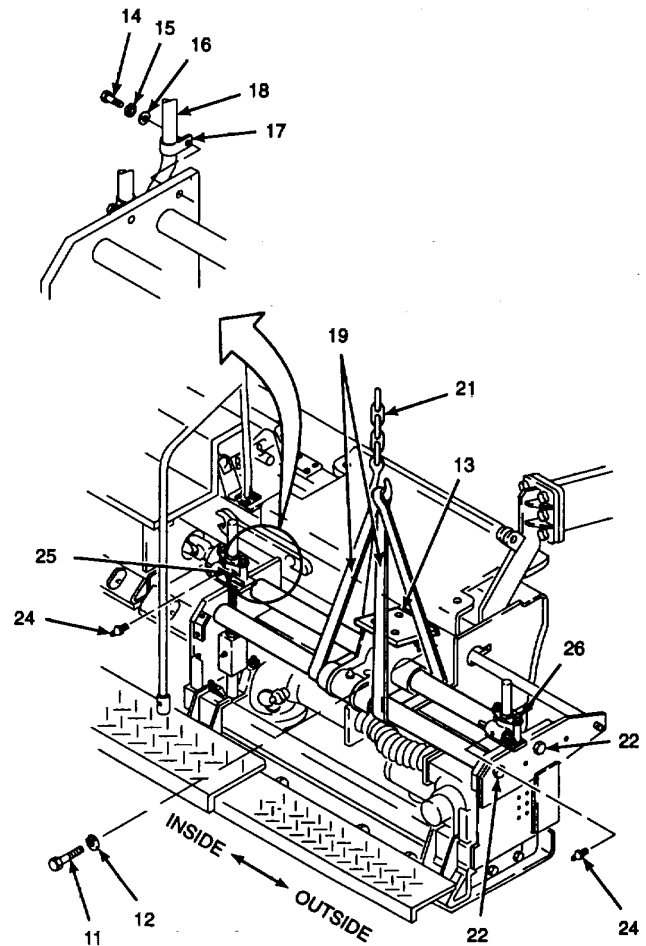
D. INSTALL - Continued.

- j. Install lockwashers (12) onto hex head cap screws (11).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- k. Apply thread locking compound to threads of hex head cap screws (11).
- l. Install hex head cap screws (11) through guide shaft support assembly (13) and into the front wall of the extension screed.
- m. Tighten bottom three hex head cap screws (11) to 180 lb-ft (244 N.m) using socket wrench adapter (Item 6, Appendix D). Repeat tightening with top three hex head cap screws.
- n. Install lubrication fittings (24) into inner and outer lift jack assemblies (25 and 26).
- o. Lubricate screed extension shaft support bushings on guide shaft support assembly (13) per LO 5-3895373-12.
- p. Fully extend screed per TM 5-3895-373-10 and tighten inside hex head cap screws (22) to 515 lb-ft (698 N.m) using the socket wrench set.
- q. Full retract screed per TM 5-3895-373-10 and tighten outside hex head cap screws (22) to 515 lb-ft (698 N.m) using the socket wrench set.
- r. Run extension screed full in and out per TM 5-3895373-10 and check for any binding during travel. If binding is found, loosen hex head cap screws (22) and repeat steps n and o until no binding is found.
- s. Disconnect overhead hoist (21) from sling straps (19) and remove the sling straps from the paving machine.
- t. Install lockwasher (15) and flat washer (16) onto hex head cap screw (14).



- u. Apply thread locking compound to threads of hex head cap screw (14).
- v. Secure hydraulic hose (18) with clamp (17) to extension screed frame using hex head cap screw (14).

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## 2.73 REPLACE EXTENSION SCREED GUIDE SHAFT SUPPORT, GUIDE SHAFTS, AND SLEEVE BUSHINGS - Continued.

D. INSTALL - Continued.

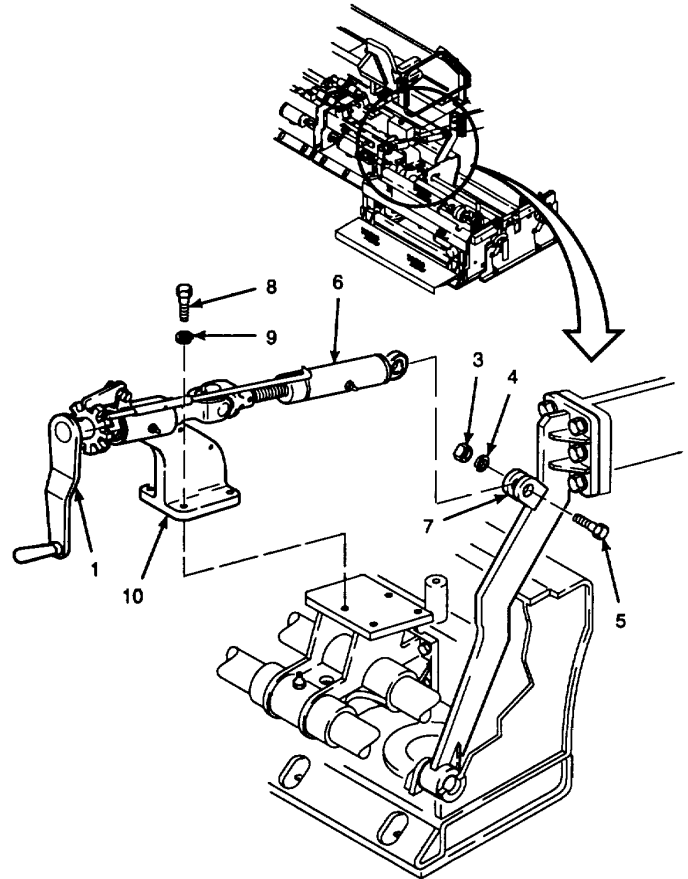
### 3. INSTALL THICKNESS CONTROL ASSEMBLY.

- a. Install lockwashers (9) onto hex head cap screws (8).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply thread locking compound to threads of hex head cap screws (8).
- c. Install thickness control assembly (10) and secure with hex head cap screws (8).
- d. Tighten hex head cap screws (8) to 90 lb-ft (122 N.m).
- e. Turn hand crank (1) to align link (6) with screed arm bracket (7).
- f. Apply thread locking compound to threads of hex head cap screw (5).
- g. Install hex head cap screw (5), lockwasher (4), and hex nut (3). Tighten hex nut to 180 lb-ft (244 N.m) using socket wrench adapter (Item 6, Appendix D).



### NOTE

**FOLLOW-ON-TASKS:** Install extension screed height adjustment controls per paragraph 2.58 step B.2, steps C.4.a through C.4.c, steps C.4.g through C.4.k, and steps C.4.p and C.4.q. Install endgates per TM 5-3895-373-10. Fully retract extension screed per TM 5-3895-373-10. Align extension screed per TM 5-3895-373-20.

**END OF TASK**

---

**2.74 REPLACE MAIN SCREED VIBRATOR COMPONENTS.**

---

This task covers:

- a. Remove
- b. Clean
- c. Inspect
- d. Install

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Hex head driver socket (Item 85, Appendix D)  
Plastic hammer (Item 49, Appendix D)  
Snap ring pliers (Item 66, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Torque wrench (Item 132, Appendix D)  
Universal puller kit (Item 69, Appendix D)

**References:**

LO 5-3895-373-12  
TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Extension screeds extended per TM 5-3895-373-10.  
Screed steps removed per TM 5-3895-373-20.  
Main screed vibration motor removed per TM 5-3895-373-20.

**Materials/Parts:**

Anti-seize compound (Item 8, Appendix B)  
Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Grease (Item 18, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers  
Retaining rings  
Spring pins  
Universal joint spiders

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**2-1057**

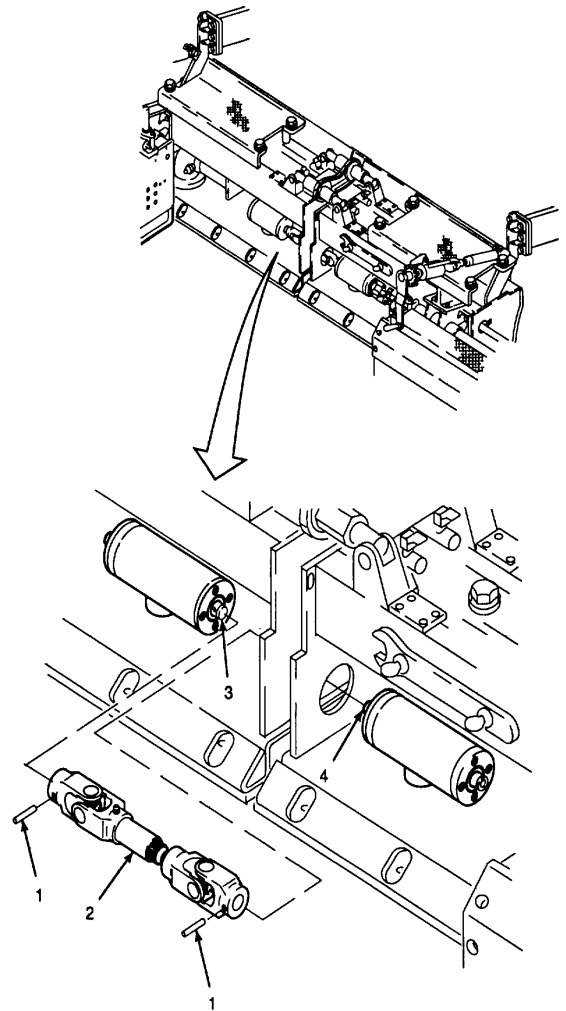
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**2.74 REPLACE MAIN SCREED VIBRATOR COMPONENTS.**

---

**A. REMOVE.****1. REMOVE UNIVERSAL JOINT FROM DRIVE SHAFTS.**

- a Remove spring pins (1) from universal joint (2) and drive shafts (3 and 4) using a 3/8 inch drive pin punch and pliers. Discard spring pins.
- b. Free universal joint from one of the drive shafts by pushing one end of universal joint toward the center. Use a large screwdriver to pry end of universal joint off of drive shaft if necessary.
- c. Remove universal joint (2) from paving machine.

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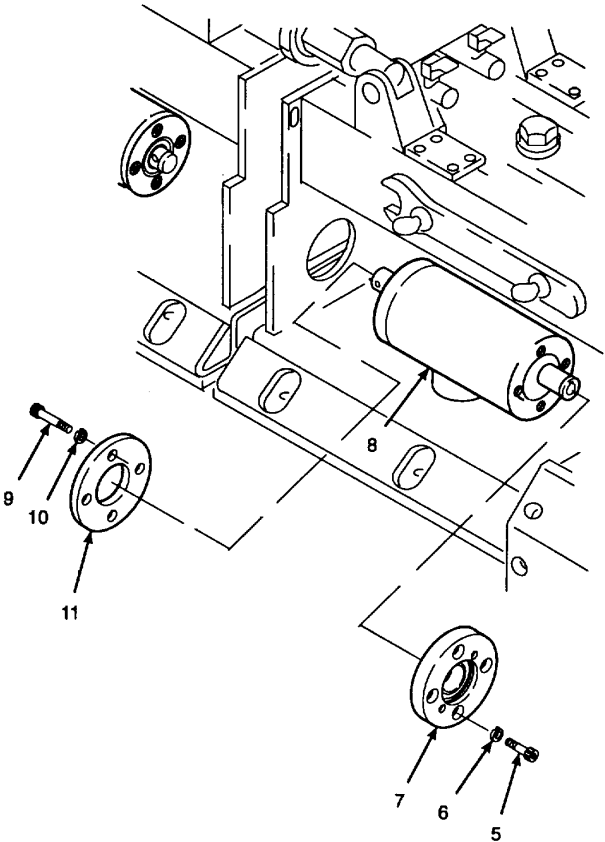
A. REMOVE - Continued.

**NOTE**

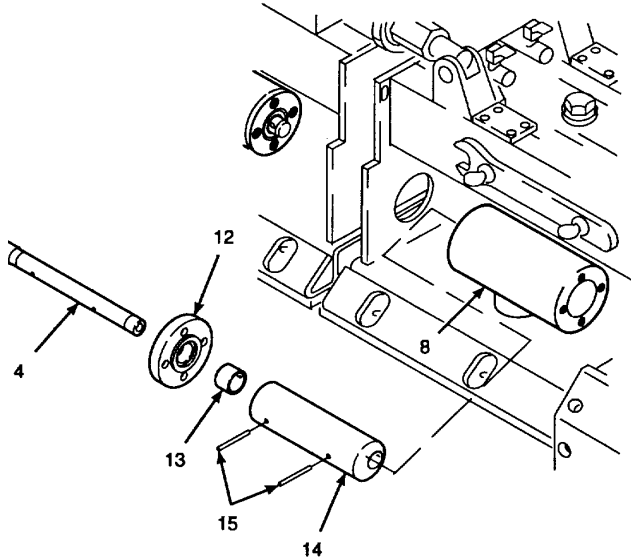
The remainder of main screed vibrator references, unless otherwise indicated, pertain to the motorside vibrator. Procedures for the left-side vibrator are the same with exception that the left side vibrator has a retainer plate and bearing plate in place of a motor mount. Also, the left-side vibrator drive shaft is not keyed.

2. REMOVE MOTOR MOUNT, RETAINER PLATE, AND BEARING PLATE.

- a. Remove socket head cap screws (5) and lockwashers (6). Discard lockwashers.
- b. Remove motor mount (7) from vibrator housing (8).
- c. Remove socket head cap screws (9) and lockwashers (10). Discard lockwashers.
- d. Remove retainer plate (11).



- e. Remove bearing plate (12), spacer (13), drive shaft (4), and eccentric shaft (14) from vibrator housing (8).
- f. Remove spring pins (15) and eccentric shaft (14) from drive shaft (4).
- g. Remove spacer (13) and bearing plate (12) from drive shaft (4).



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2.74 REPLACE MAIN SCREED VIBRATOR COMPONENTS - Continued

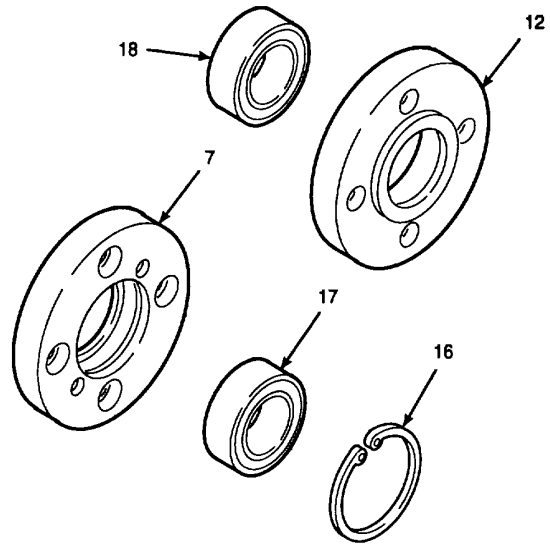
A. REMOVED Continued.

3. REMOVE BEARINGS FROM BEARING PLATE AND MOTOR MOUNT.

**WARNING**

Use care when removing or installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Remove retaining ring (16) from motor mount (7) using snap ring pliers. Discard retaining ring.
- b. Remove bearing (17) from motor mount (7) using an internal bearing puller from universal puller kit.
- c. Remove bearing (18) from bearing plate (12) using an internal bearing puller from universal puller kit.

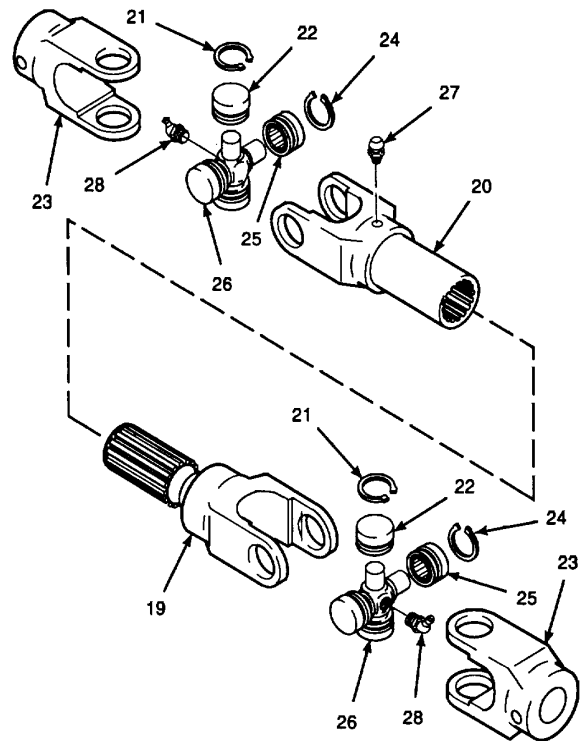


4. DISASSEMBLE UNIVERSAL JOINT.

**NOTE**

Use a bench vise as needed to assist in separating component parts.

- a. Separate external spline yoke (19) from internal spline yoke (20).
- b. Using a flat blade screwdriver and a hammer, drive out retaining rings (21) from spider bearings (22). Discard retaining rings.
- c. Lightly tap on both sides of outer yokes (23) with a hammer to drive out spider bearings (22). Remove and discard spider bearings.
- d. Using a flat blade screwdriver and a hammer, drive out retaining rings (24) from spider bearings (25). Discard retaining rings.
- e. Lightly tap both sides of external spline yoke (19). While holding spider (26), drive out spider bearings (25). Remove and discard spider bearings. Repeat for internal spline yoke (20).
- f. Remove lubrication fitting (27) from internal spline yoke (20).
- g. Remove spiders (26). Remove lubrication fittings (28) from spiders. Discard universal joint spiders.



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## B. CLEAN.

## 1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93, 30C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean all metal parts except bearings in cleaning solvent. Remove hard deposits with a cleaning brush.
- b. Wipe bearings off with a lint-free cloth.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

- c. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from grooves, threaded surfaces, and holes. Do not use compressed air on bearings.

**GO TO NEXT PAGE**

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**2.74 REPLACE MAIN SCREED VIBRATOR COMPONENTS - Continued**


---

## B. CLEAN Continued.

<b>WARNING</b>
----------------

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

2. CLEAN MOTOR MOUNT, SOCKET HEAD CAP SCREWS, AND RETAINER PLATE SOCKET HEAD CAP SCREWS WITH THREAD LOCKING COMPOUND SOLVENT.
3. DRY SOCKET HEAD CAP SCREWS WITH A CLEANING CLOTH.

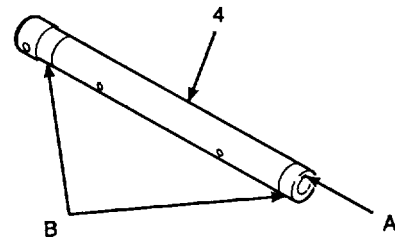
## C. INSPECT.

1. INSPECT BEARINGS FOR WEAR OR DAMAGE.
  - a. Spin bearing by hand.
  - b. If bearing does not spin freely, or radial free play is detected, replace bearing.
2. INSPECT DRIVE SHAFT FOR DAMAGE.

**NOTE**

**Only the motor-side vibrator drive shaft has a keyway.**

- a. Visually inspect drive shaft keyway A for sharp or worn edges. Replace drive shaft (4) if keyway is damaged.
- b. Visually inspect drive shaft (4) for straightness. Slowly roll drive shaft on a clean flat surface and check for wobble. Replace drive shaft if bent.
- c. Inspect bearing surface B of drive shaft (4) for scoring or galling. Replace drive shaft if any damage is found.



**GO TO NEXT PAGE**

D. INSTALL.

1. ASSEMBLE UNIVERSAL JOINT YOKES AND SPIDERS.

**NOTE**

**Use a bench vise as needed to assist in assembling component parts.**

- a. Install and tighten lubrication fittings (28) into spiders (26).

**NOTE**

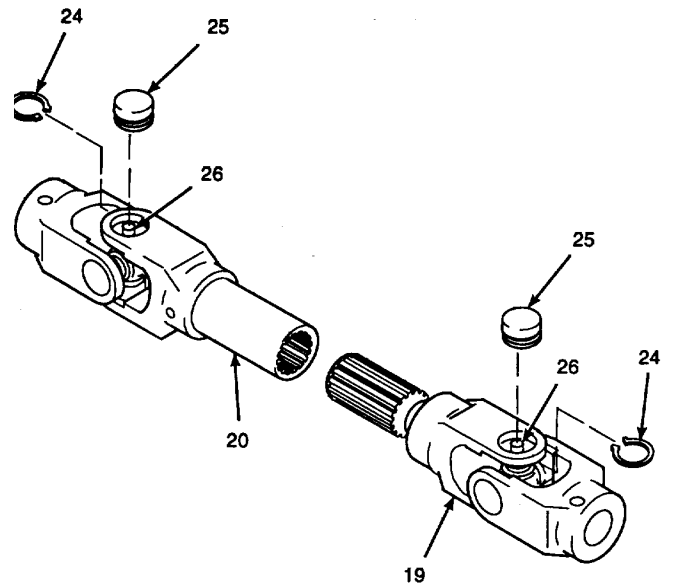
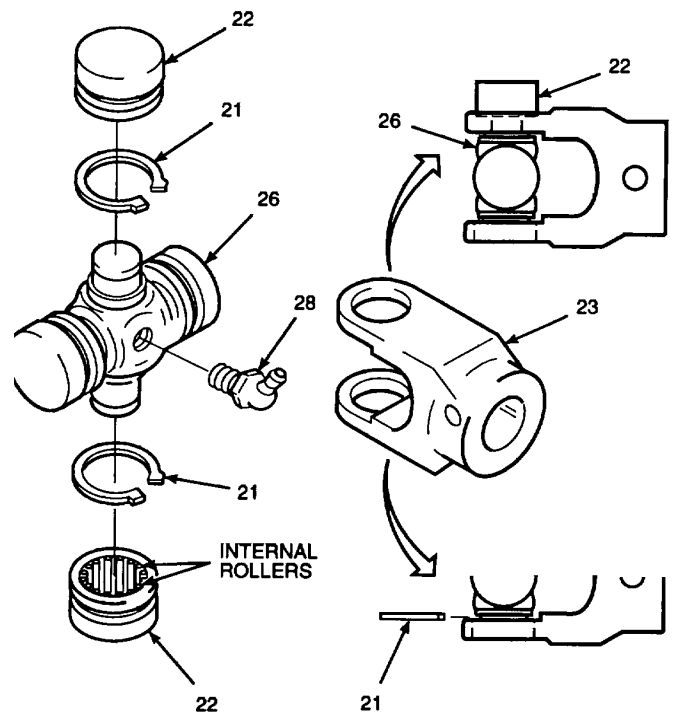
**Use care when removing and installing spider bearings. Internal rollers could fall free. Keeping spider bearings upright during installation will prevent rollers from falling out.**

- b. Carefully remove spider bearings (22) from spiders (26). Use care to avoid loss of internal rollers.
- c. Position spiders (26) in outer yokes (23).
- d. Install spider bearings (22) through outer yokes (23) and onto spiders (26). Make sure spider bearings are installed far enough onto spiders so that internal rollers do not fall.
- e. Place outer yokes into bench vise putting pressure on spider bearings. Tighten bench vise until spider bearing are flush with outer yokes.

**WARNING**

**Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- f. Install retaining rings (21).
- g. Carefully remove spider bearings (25) from spiders (26). Position internal spline yoke (20) and external spline yoke (19) onto spiders.
- h. Install spider bearings (25). Make sure spider bearings are installed far enough onto spiders so that internal rollers do not fall.
- i. Place internal spline yoke (20) into bench vise putting pressure on spider bearing. Tighten bench vise until spider bearings are flush with internal spline yoke. Repeat for external spline yoke (19).



- j. Install retaining rings (24).

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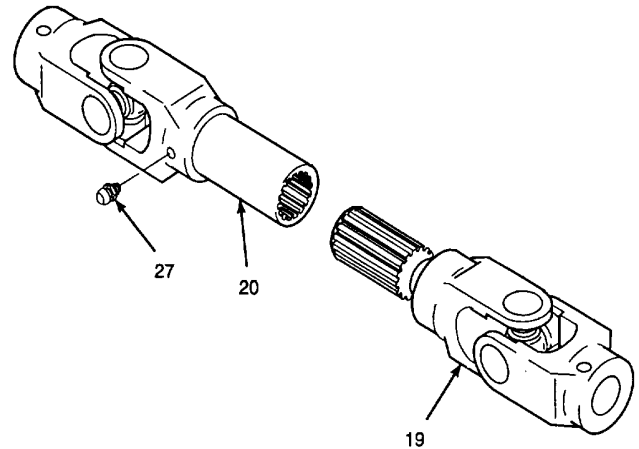
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**2.74 REPLACE MAIN SCREED VIBRATOR COMPONENTS - Continued**


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**D. INSTALL Continued.**

- k Thread lubrication fitting (27) into place on internal spline yoke (20). Tighten fitting until snug.
- l. Lubricate splines of external spline yoke (19) with a coating of grease.
- m. Press internal spline yoke (20) and external spline yoke (19) together.

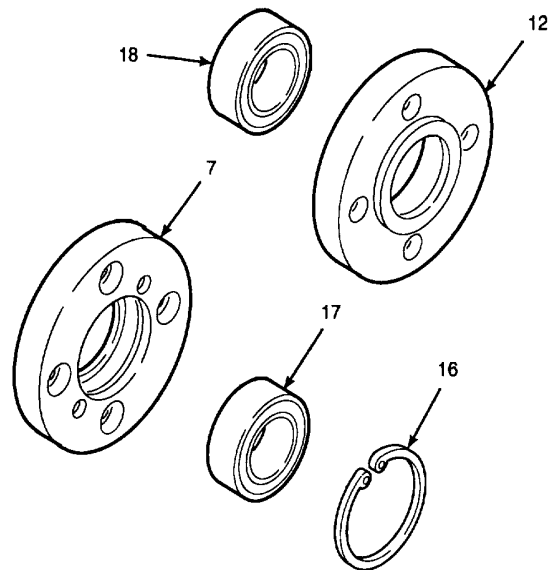
**2. INSTALL BEARINGS ON BEARING PLATE AND MOTOR MOUNT.**

- a. Evenly tap bearings (17 and 18) into motor mount (7) and bearing plate (12) using a plastic hammer.

<b>WARNING</b>
----------------

**Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- b. Install retaining ring (16) into motor mount (7) using snap ring pliers.

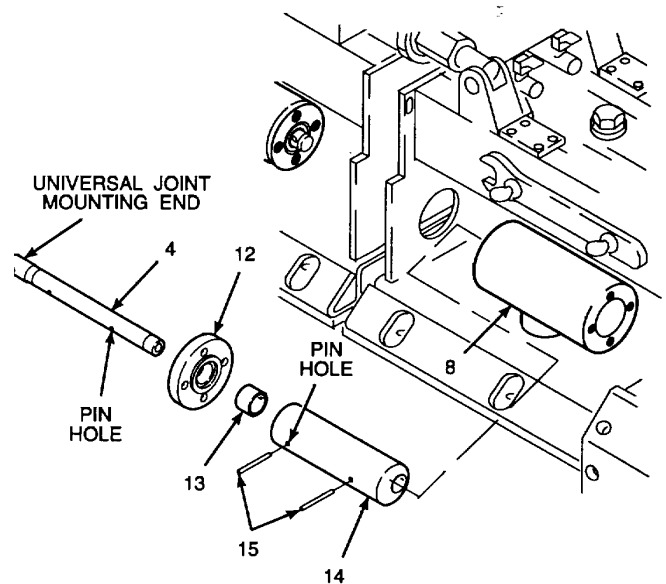


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D. INSTALL - Continued.

3. INSTALL BEARING PLATE, RETAINER PLATE, AND MOTOR MOUNT.

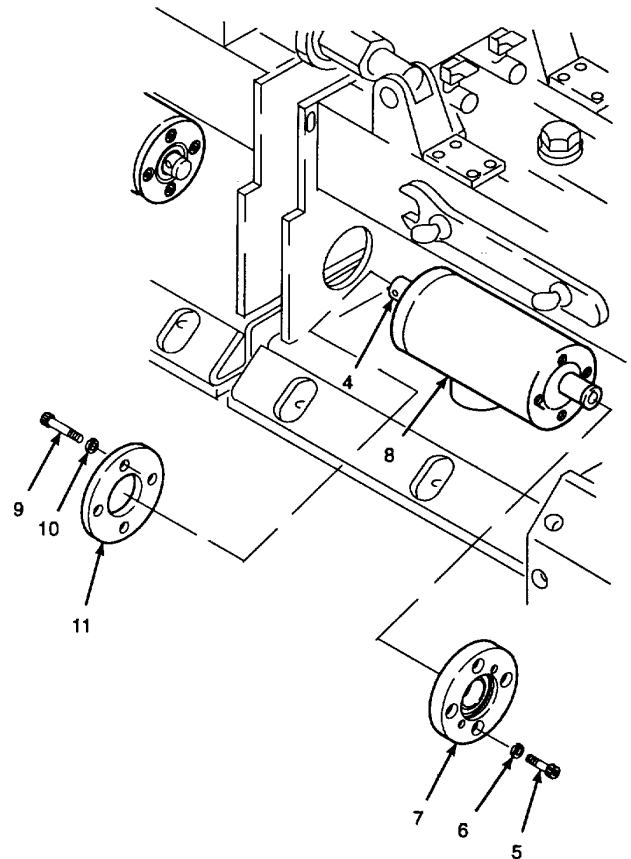
- a. Install bearing plate (12) and spacer (13) onto drive shaft (4).
- b. Insert drive shaft (4) into eccentric shaft (14). Rotate drive shaft as required to align pin holes in drive shaft and eccentric shaft.
- c. Drive spring pins (15) into pin holes of eccentric shaft (14) and through drive shaft (4). Ensure pins are flush with, or slightly below, outer surface of the eccentric shaft.
- d. Install eccentric shaft (14), drive shaft (4), spacer (13), and bearing plate (12) into vibrator housing (8).
- e. Install lockwasher (10) on socket head cap screw (9).



**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- f. Apply thread locking compound to threads of socket head cap screws (9).
- g. Install retainer plate (11) onto end of drive shaft (4). Align mounting holes.
- h. Install socket head cap screws (9). Tighten socket head cap screws to 42 lb-ft (57 N.m) using a hex head driver socket and socket wrench adapter.
- i. Install lockwasher (6) onto socket head cap screws (5).
- j. Apply thread locking compound to threads of socket head cap screws (5).
- k. Position motor mount (7) over drive shaft (4) in vibrator housing (8).
- l. Install socket head cap screws (5). Tighten socket head cap screws to 42 lb-ft (57 N.m) using a hex head driver socket and socket wrench adapter.



**GO TO NEXT PAGE**

## 2.74 REPLACE MAIN SCREED VIBRATOR COMPONENTS - Continued

D. INSTALL Continued.

## 4. INSTALL UNIVERSAL JOINT ON DRIVE SHAFTS.

**NOTE**

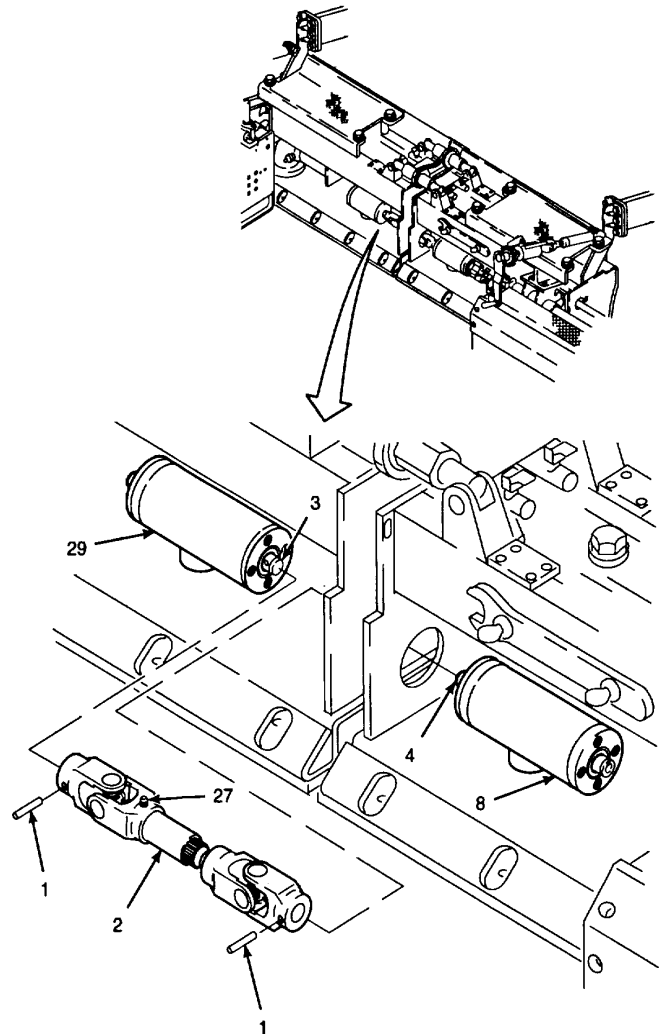
For proper operation of main screed vibrators, eccentric weights must be aligned.

- a. Rotate both drive shafts (3 and 4) by hand to place eccentric shaft weights in the bottom position prior to connecting shafts with universal joint (2). Drive shafts must remain in this position to ensure proper alignment of eccentric shaft weights.

**WARNING**

Anti-seize compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- b. Apply anti-seize compound to the ends of drive shafts (3 and 4).
- c. Position universal joint (2) between vibrator housings (8 and 29).
- d. Install universal joint (2) onto drive shafts (3 and 4). Align pin holes of universal joint and drive shafts.
- e. Install spring pins (1).

**NOTE**

**FOLLOW-ON-TASKS:** Lubricate universal joint (2) per LO 5-3895-373-12.  
 Replace main screed vibration motor per TM 5-3895-373-20.  
 Retract extension screeds per TM 5-3895-373-10.  
 Install screed steps per TM 5-3895-373-20.

**END OF TASK**

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**2.75 REPLACE EXTENSION SCREED VIBRATOR COMPONENTS.**

---

This task covers:

- a. Remove
- b.. Clean
- c.. Inspect
- d. Install

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Cleaning brush (Item 12, Appendix D)  
Hex head driver socket (Item 85, Appendix D)  
Plastic hammer (Item 49, Appendix D)  
Snap ring pliers (Item 66, Appendix D)  
Socket wrench adapter (Item 6, Appendix D)  
Torque wrench (Item 132, Appendix D)  
Universal puller kit (Item 69, Appendix D)

**Materials/Parts:**

Cleaning solvent (Item 31, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Thread locking compound (Item 13, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers  
Retaining ring  
Spring pins

**References:**

TM 5-3895-373-10  
TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment Condition:**

Extension screeds extended per TM 5-3895-373-10.  
Extension screed cover plate removed per TM 5-3895-373-20.  
Extension screed vibration motor removed per  
TM 5-3895-373-20.  
Extension screed blower motor removed per  
TM 5-3895-373-20.  
Extension screed burner chamber assembly removed per  
TM 5-3895-373-20.

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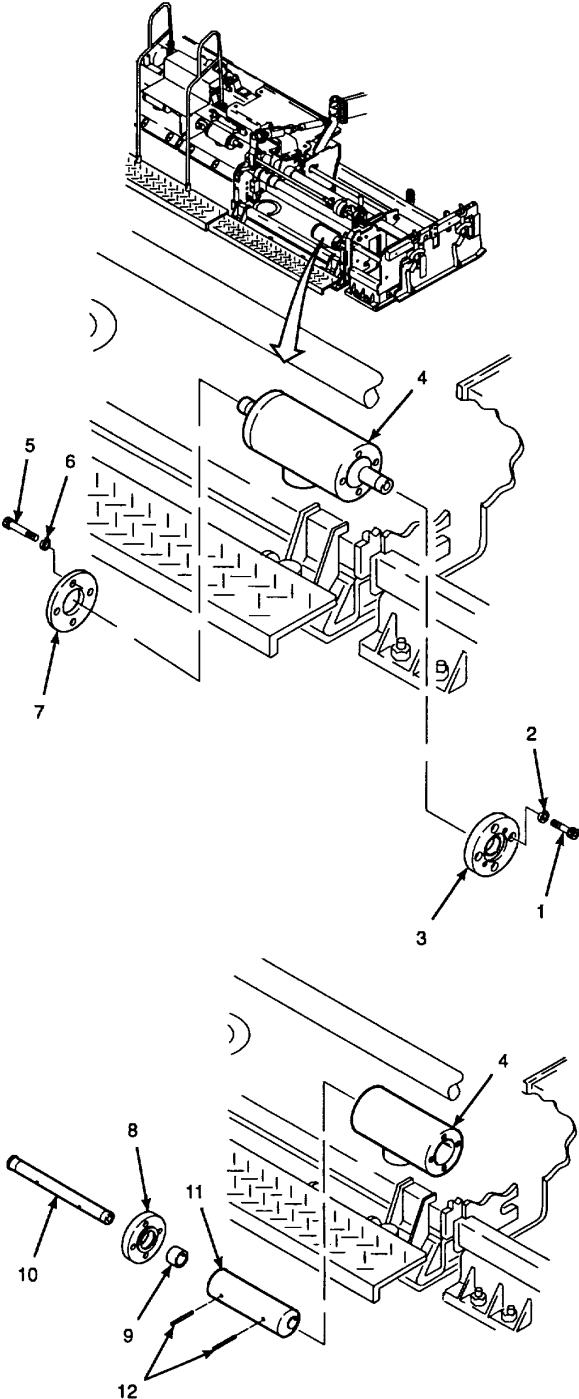
2.75 REPLACE EXTENSION SCREED VIBRATOR COMPONENTS - Continued

A. REMOVE.

**NOTE**

Left and right side extension screed vibrators are mirror images of each other. This task describes repair of right vibrator only.

- 1. REMOVE MOTOR MOUNT, RETAINER PLATE, AND BEARING PLATE.
  - a. Remove socket head cap screws (1) and lockwashers (2). Discard lockwashers.
  - b. Remove motor mount (3) from vibrator housing (4).
  - c. Remove socket head cap screws (5) and lockwashers (6). Discard lockwashers.
  - d. Remove retainer plate (7).
  - e. Remove bearing plate (8), spacer (9), drive shaft (10), and eccentric shaft (11) from vibrator housing (4).
  - f. Remove spring pins (12) and eccentric shaft (11) from drive shaft (10). Discard spring pins.
  - g. Remove spacer (9) and bearing plate (8) from drive shaft (10).



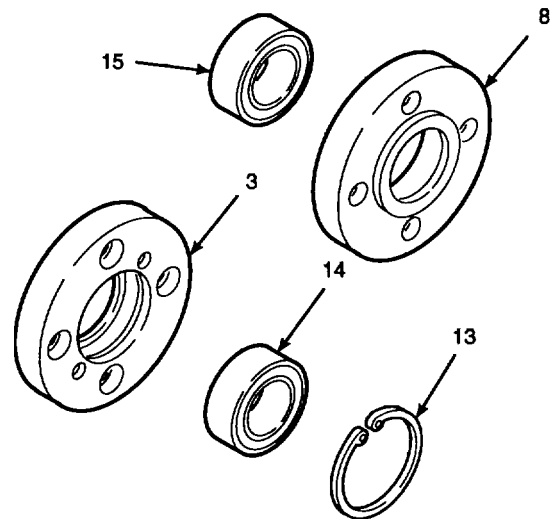
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- A. REMOVE - Continued.
2. REMOVE BEARINGS FROM MOTOR MOUNT AND BEARING PLATE.

**WARNING**

Use care when removing or installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Remove retaining ring (13) from motor mount (3) using snap ring pliers. Discard retaining ring.
- b. Remove bearing (14) from motor mount (3) using an internal bearing puller from universal puller kit.
- c. Remove bearing (15) from bearing plate (8) using an internal bearing puller from universal puller kit.



B. CLEAN.

1. CLEAN ALL METAL PARTS.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Clean all metal parts except bearings in cleaning solvent. Remove hard deposits with a cleaning brush.
- b. Wipe off bearings with a lint-free cloth.

**GO TO NEXT PAGE**

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**2.75 REPLACE EXTENSION SCREED VIBRATOR COMPONENTS - Continued**

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**B. CLEAN - Continued.****WARNING**

**Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.**

- c. Use 30 psi (207 kPa) maximum compressed air to blow any foreign material from grooves, threaded surfaces, and holes. Do not use compressed air on bearings.

**WARNING**

**Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.**

2. CLEAN THREADS OF SOCKET HEAD CAP SCREWS WITH THREAD LOCKING COMPOUND SOLVENT.

**C. INSPECT.**

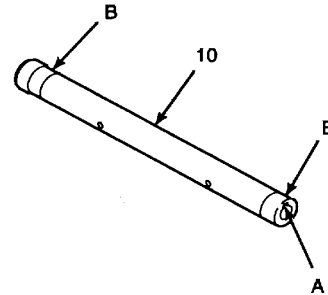
1. INSPECT BEARINGS FOR WEAR OR DAMAGE.
  - a. Spin bearings by hand.
  - b. If bearings do not spin freely, or if radial free play is detected, replace bearings.

**GO TO NEXT PAGE**

C. INSPECT - Continued.

2. INSPECT DRIVE SHAFT FOR DAMAGE.

- a. Visually inspect drive shaft keyway A for sharp or worn edges. Replace drive shaft (10) if keyway is damaged.
- b. Visually inspect drive shaft (10) for straightness. Slowly roll drive shaft on a clean flat surface and check for wobble. Replace drive shaft if bent.
- c. Inspect bearing surfaces B of drive shaft (10) for scoring or galling. Replace drive shaft if any damage is found.



D. INSTALL.

1. INSTALL BEARINGS INTO BEARING PLATE AND MOTOR MOUNT.

- a. Tap bearings (14 and 15) into motor mount (3) and bearing plate (8) until fully seated by tapping on outer race of bearing with a plastic hammer.

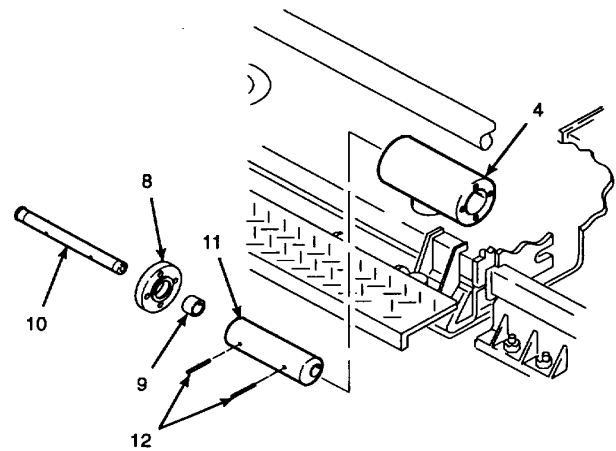
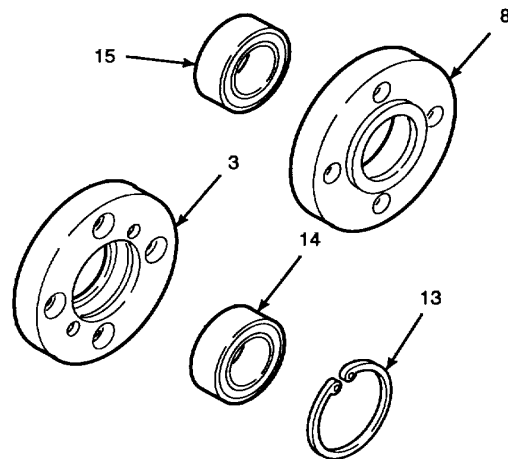
**WARNING**

**Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- b. Install retaining ring (13) into motor mount (3) using snap ring pliers.

2. ASSEMBLE BEARING PLATE AND MOTOR MOUNT TO VIBRATOR HOUSING.

- a. Install bearing plate (8) and spacer (9) onto drive shaft (10).
- b. Insert drive shaft (10) into eccentric shaft (11). Rotate drive shaft as required to align pin holes in drive shaft and eccentric shaft.
- c. Drive spring pins (12) into pin holes of eccentric shaft (11) and through drive shaft (10). Ensure pins are flush with, or slightly below, outer surface of eccentric shaft.
- d. Install eccentric shaft (11), drive shaft (10), spacer (9), and bearing plate (8) into vibrator housing (4).



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**2.75 REPLACE EXTENSION SCREED VIBRATOR COMPONENTS.**


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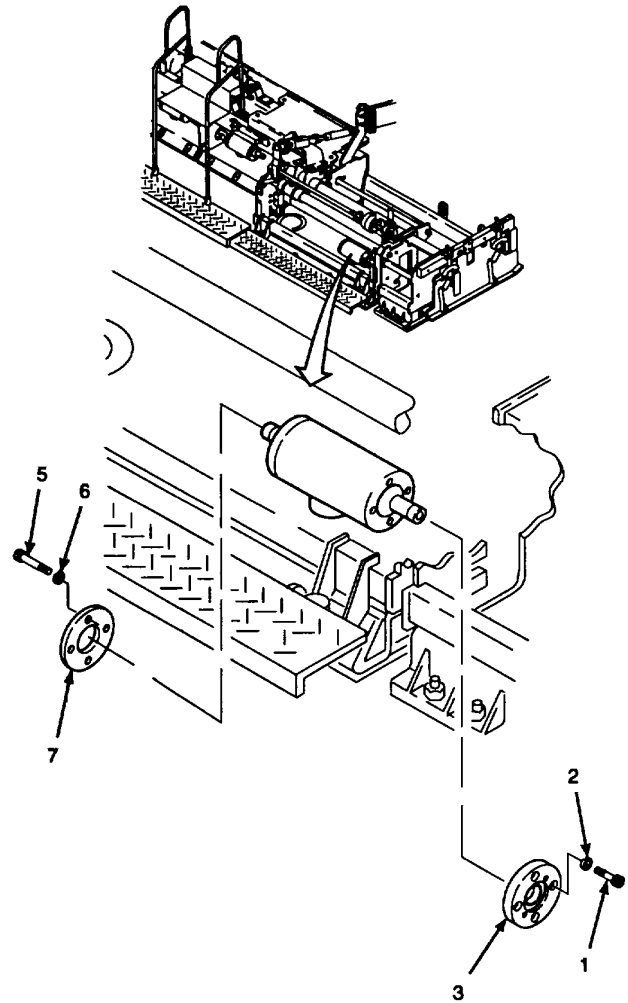
## D. INSTALL - Continued.

- e. Install lockwashers (6 and 2) onto socket head cap screws (5 and 1).

**WARNING**

Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.

- f. Apply thread locking compound to threads of socket head cap screws (1 and 5).
- g. Install retainer plate (7).
- h. Install motor mount (3).
- i. Install socket head cap screws (1 and 5). Using a hex head driver socket and socket wrench adapter, tighten cap screws to 42 lb-ft (57 N•m).

**NOTE**

**FOLLOW-ON-TASKS:** Install extension screed burner chamber assembly per TM 5-3895-373-20.  
 Install extension screed blower motor per TM 5-3895-373-20.  
 Install extension screed vibration motor per TM 5-3895-373-20.  
 Install extension screed cover plate per TM 5-3895-373-20.

**END OF TASK**

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**2.76 REPAIR SCREED VIBRATION MOTOR.**

---

This task covers:

- a. Disassemble
- b. Clean
- c. Inspect
- d. Assemble

---

**INITIAL SETUP****Tools:**

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Bench vise (Item 112, Appendix D)  
Hex head driver socket (Item 92, Appendix D)  
Hydraulic press frame (Item 41, Appendix D)  
Micrometer depth gage (Item 44, Appendix D)  
Plastic hammer (Item 49, Appendix D)  
Portable electric drill (Item, 67, Appendix D)  
Shaft seal assembly tool (Item 18, Appendix C)  
Snap ring pliers (Item 66, Appendix D)  
Torque wrench, 5 to 150 lb-in (Item 129, Appendix D)  
Torque wrench, 0 to 175 lb-ft (Item 132, Appendix D)  
Twist drill set (Item 110, Appendix D)  
Universal puller kit (Item 69, Appendix D)  
Valve seat installation tool (Item 25, Appendix C)

**References:**

TM 5-3895-373-20  
TM 5-3895-373-24P

**Equipment condition:**

Screed vibration motor removed per TM 5-3895-373-20.

**Materials/Parts:**

Cleaning solvent (Item 31, Appendix B)  
Culture swabs (Item 33, Appendix B)  
Hydraulic oil (Item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Check valve kit  
Check valve seat  
Needle bearing  
Nonmetallic seal cap  
Plain encased seal  
Preformed packings  
Retaining ring  
Seal kit  
Spacer ring

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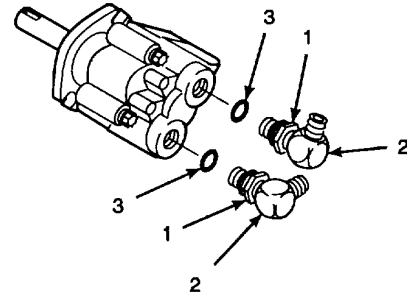
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## 2.76 REPAIR SCREED VIBRATION MOTOR - Continued

### A. DISASSEMBLE.

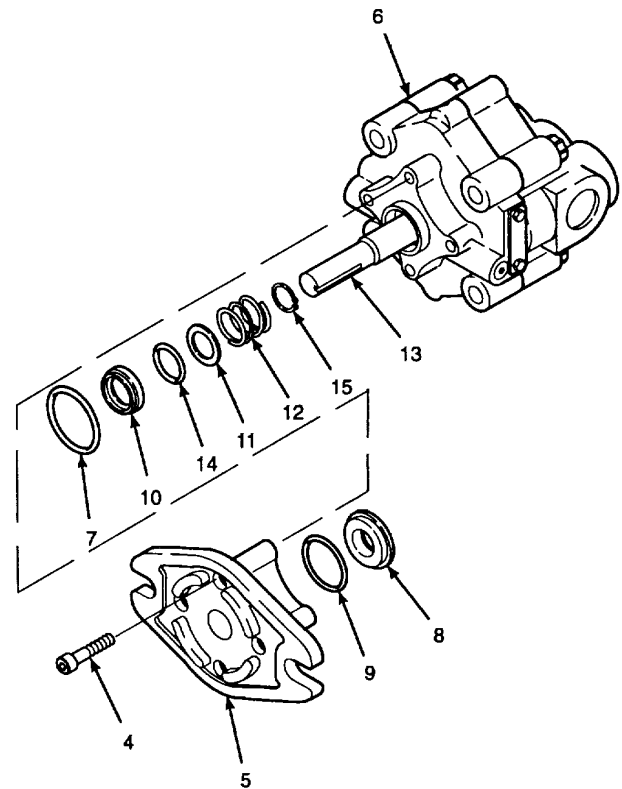
#### 1. REMOVE ELBOWS AND PREFORMED PACKINGS.

- a. Loosen lock nut (1) and remove elbows (2) from the back of the screed vibration motor.
- b. Remove preformed packings (3) from elbows (2). Discard preformed packings.



#### 2. REMOVE MOTOR MOUNTING PLATE, ENCASED SEAL, AND PREFORMED PACKINGS.

- a. Remove socket head cap screws (4) from motor mounting plate (5).
- b. Separate motor mounting plate (5) from motor cover (6) and remove preformed packing (7). Discard preformed packing.
- c. Remove encased seal (8) from inside of motor mounting plate (5).
- d. Remove preformed packing (9) from the inside of encased seal (8). Discard preformed packing and plain encased seal.
- e. Remove seal cap (10), spacer ring (11), and spring (12) from motor shaft (13).
- f. Discard preformed packing (14) and nonmetallic seal cap (10).



**WARNING**

**Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- g. Remove retaining ring (15) from motor shaft (13).

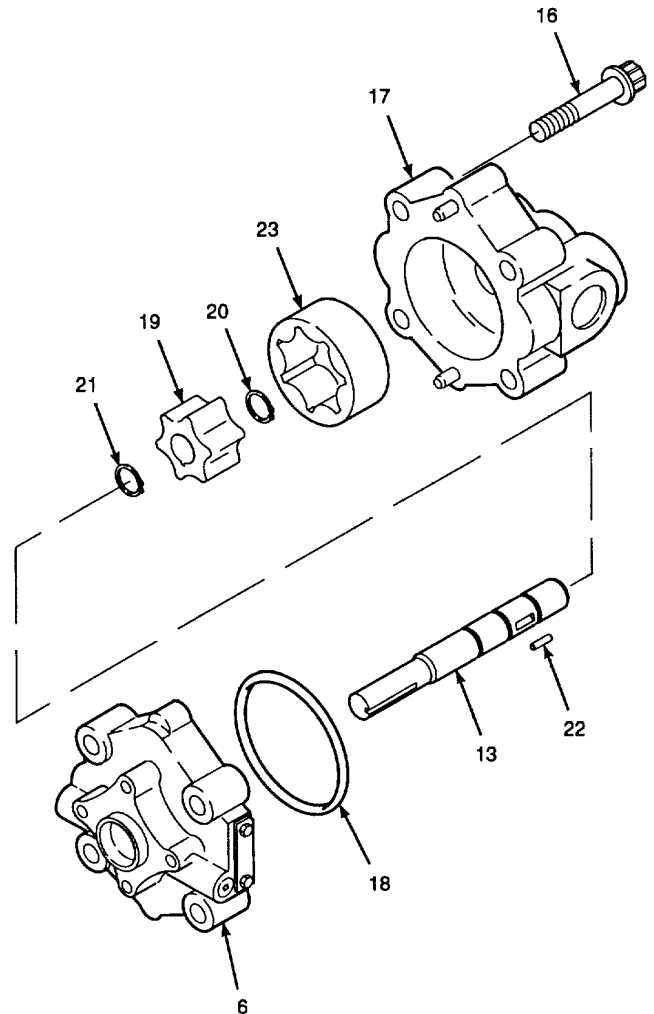
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- A. DISASSEMBLE - Continued.
- 3. REMOVE AND DISASSEMBLE MOTOR SHAFT.



**Screed vibration motor body damage can occur from clamping in a bench vise. Use vise jaw caps between the vise clamps and the motor body to protect the aluminum motor body when clamping. Failure to do so may result in damage to the motor body.**

- a. Place the screed vibration motor in a bench vise. Protect the aluminum motor body from damage by placing vise jaw caps between the vise clamps and the motor.
- b. Remove motor body screws (16) from motor body (17) and remove screed vibration motor from the bench vise.
- c. Separate motor body (17) from motor cover (6) and remove preformed packing (18). Discard preformed packing.
- d. Slide motor shaft (13) and inner gerotor gear (19) from motor cover (6) or motor body (17).



**Use care when removing or installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- e. Use snap ring pliers and remove retaining rings (20 and 21) from motor shaft (13).
- f. Remove drive pin (22) and inner gerotor gear (19) from motor shaft (13).
- g. Remove outer gerotor gear (23) from gear pocket in motor body (17).

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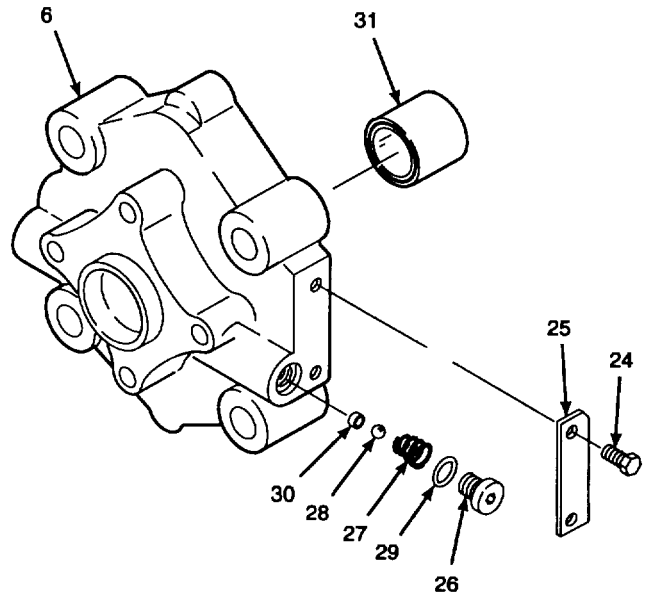


2.76 REPAIR SCREED VIBRATION MOTOR - Continued

A. DISASSEMBLE - Continued.

4. REMOVE CHECK VALVE AND NEEDLE BEARING FROM MOTOR COVER.

- a. Remove machine screws (24) and identification plate (25) from motor cover (6).
- b. Remove hex socket plugs (26), springs (27), and balls (28) from motor cover (6).
- c. Remove preformed packings (29) from hex socket plugs (26). If preformed packings are damaged or worn, discard preformed packings and hex socket plugs as a set.
- d. Inspect check valve seats (30) while still installed for damage that would affect the seating of balls (28). If no damage is found, do not remove.
- e. If damage is found to check valve seats (30), use a #1 drill bit, size 0.228 in. (7, 75 mm) and a portable electric drill, and drill out the check valve seat.



**NOTE**

The needle bearing should only be removed if obvious damage is observed. Refer to step C.1 for damage criteria.

- f. Use a hydraulic press and universal puller kit to remove needle bearing (31) from motor cover (6). Discard needle bearing.

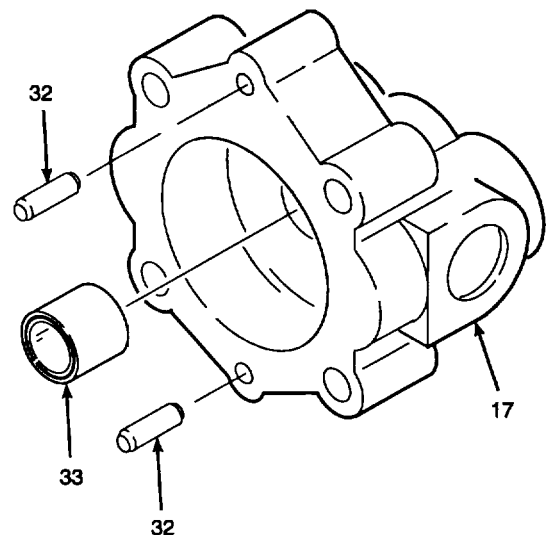
5. DISASSEMBLE MOTOR BODY.

- a. Use a pair of pliers and remove dowel pins (32) from motor body (17). Ensure not to damage outer surface of dowel pins when removing.

**NOTE**

The needle bearing should only be removed if obvious damage is observed. Refer to step C.2 for damage criteria.

- b. Use internal bearing puller from universal puller kit and remove needle bearing (33) from motor body (17). Discard needle bearing.



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## B. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is **TOXIC and flammable**. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93, 3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

1. RINSE ALL METAL PARTS IN CLEANING SOLVENT.
2. USE CULTURE SWABS TO CLEAN THREADED PORTS, SEAL GROOVES, AND INTERNAL GROOVES ON ALL COMPONENTS.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

3. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO REMOVE ANY FOREIGN MATTER FROM SCREED VIBRATION MOTOR COMPONENT BORES, THREADED SURFACES, AND SEAL GROOVES.
4. DRY ALL PARTS WITH A CLEAN, LINT-FREE CLOTH.

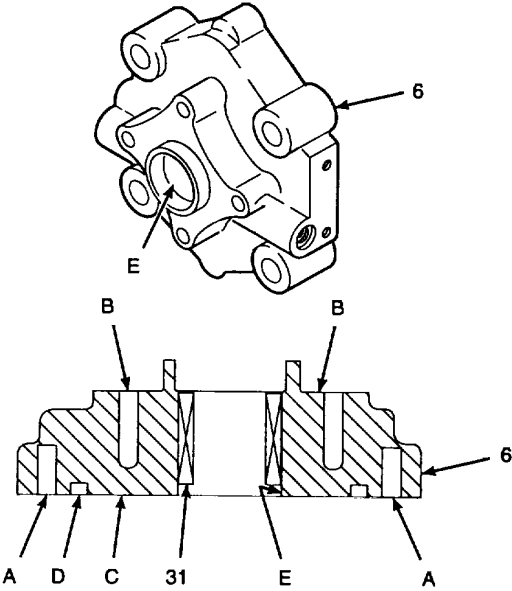
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2.76 REPAIR SCREED VIBRATION MOTOR - Continued

C. INSPECT.

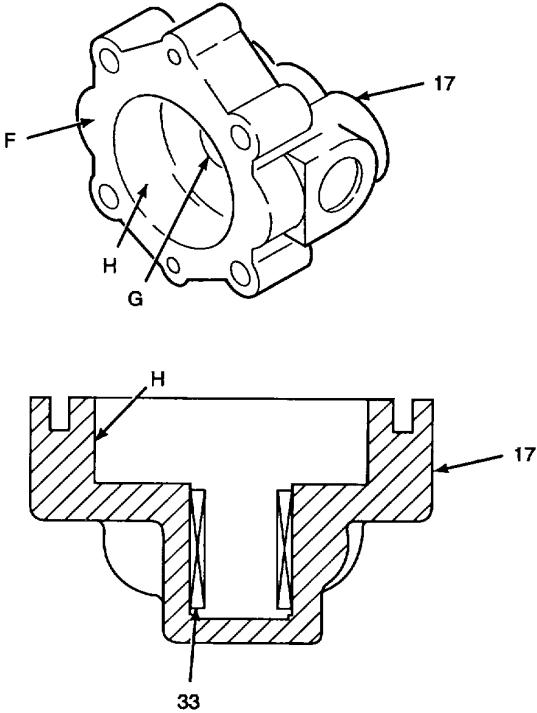
1. INSPECT MOTOR COVER AND COMPONENTS.

- a. Spin needle bearing (31) and inspect for bearing surface wear and rough or impeded bearing rotation. Replace the bearing if any damage is found.
- b. Inspect motor cover (6) threaded holes A and B for damaged or stripped threads. Inspect mating surface C and seal groove D for wear, cracks, or damage that affect the seal of the screed vibration motor.
- c. If needle bearing (31) has been removed, inspect inner bearing surface E of motor cover (6) for surface wear, cracks, or any damage that would affect the proper operation of the bearing.
- d. If any damage is found to motor cover (6), discard motor cover.



2. INSPECT MOTOR BODY AND COMPONENTS.

- a. Spin needle bearing (33) and inspect for bearing surface wear and rough or impeded bearing rotation. Replace the bearing if any damage is found.
- b. Inspect motor body (17), sealing surface F, for wear, cracks, or damage that would affect the seal of the screed vibration motor.
- c. If needle bearing (33) has been removed, inspect inner bearing, surface G, of motor body (17) for surface wear, cracks, or any damage that would affect the proper operation of the bearing.
- d. Inspect gear pocket, surface H, on motor body (17) for surface wear, cracks, or damage that would affect the proper operation of the gerotor.
- e. If any damage is found to motor body (17), discard motor body.

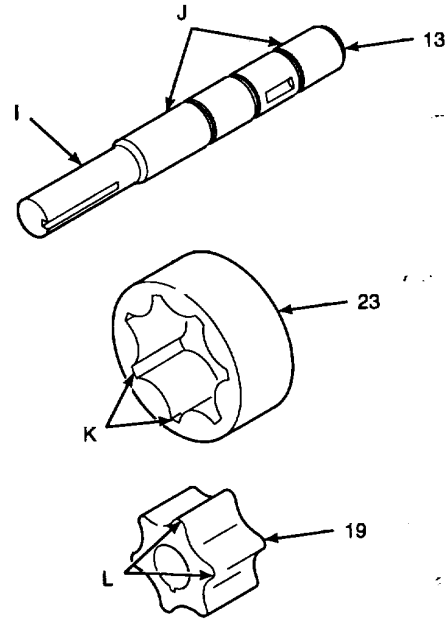


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C. INSPECT - Continued.

3. INSPECT MOTOR SHAFT, OUTER GEROTOR GEAR, AND INNER GEROTOR GEAR.

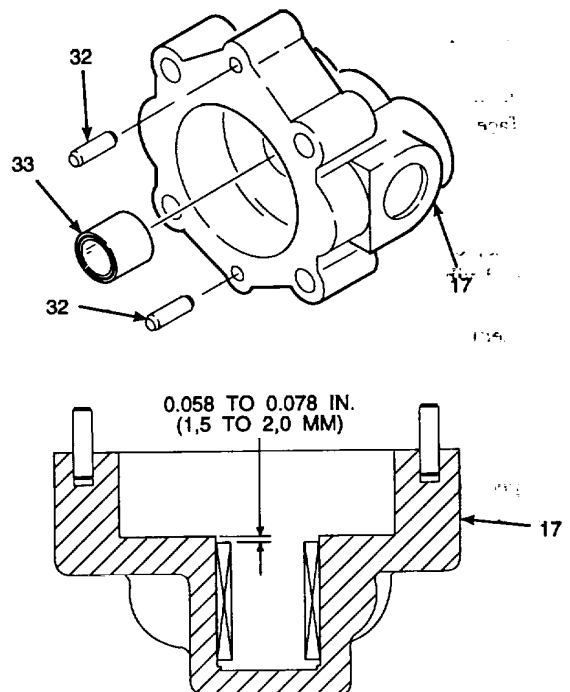
- a. Inspect motor shaft (13), surfaces I and J, for scoring, gouges, cracks, out-of-roundness or shaft warping.
- b. Inspect outer gerotor gear (23) for chipped, worn, or gouged gear, surfaces K. Inspect inner gerotor gear (19) for excessively rounded, chipped and worn drive gear lobes L. Replace both outer gerotor and inner gerotor gears as a set if any damage is found.



D. ASSEMBLE.

1. ASSEMBLE MOTOR BODY.

- a. Use a hydraulic press and spacers from universal puller kit and install needle bearing (33) into motor body (17). Use micrometer depth gage and ensure that the clearance between the top of the bearing and the motor body gear pocket is between 0.058 to 0.078 in. (1, 5 to 2, 0 mm). This is to ensure that the bearing does not contact the retaining rings.
- b. Use a plastic hammer and tap dowel pins (32) into motor body (17).



GO TO NEXT PAGE

2.76 REPAIR SCREED VIBRATION MOTOR - Continued

D. ASSEMBLE - Continued.

2. INSTALL NEEDLE BEARING AND CHECK VALVE INTO MOTOR COVER.

- a. Use a hydraulic press and spacer from universal puller kit and install needle bearing (31) into motor cover (6). Use micrometer depth gage and ensure that the clearance between the top of the bearing and the motor body mating surface of the motor cover is between 0.058 to 0.078 in. (1, 5 to 2, 0 mm). This is to ensure that the bearing does not contact the retaining ring.
- b. Use a hydraulic press and the valve seat installation tool and press check valve seats' (30) into motor cover (6).

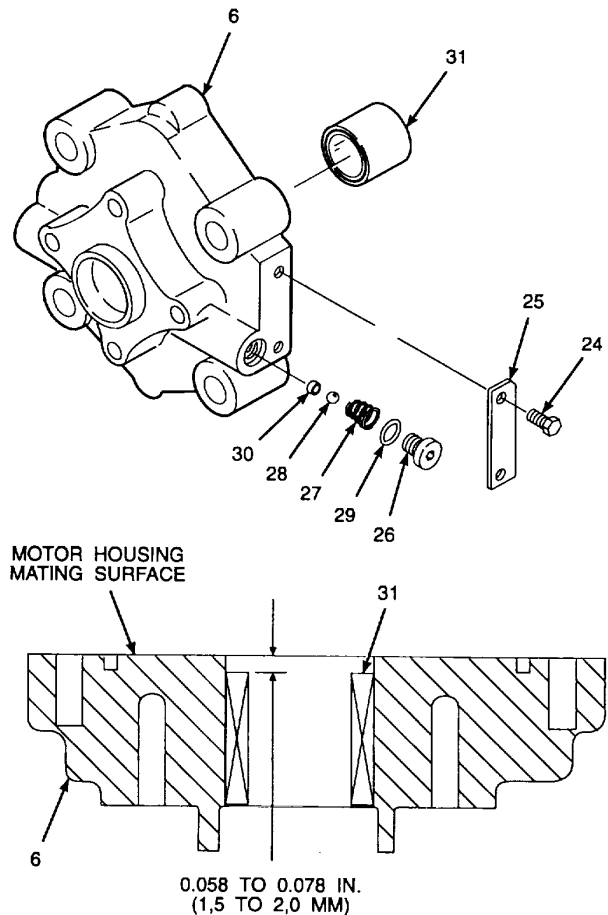
**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn m. when working with hydraulic oil.

**CAUTION**

Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- c. Lubricate preformed packings (29) with clean hydraulic oil and install onto hex socket plugs (26). Ensure that the packing is not damaged by the threads of the plug.
- d. Install balls (28), springs (27), and hex socket plugs (26) into motor cover (6).
- e. Install identification plate (25) and machine screws (24) into motor cover (6).



**GO TO NEXT PAGE**

D. ASSEMBLE - Continued.

3. ASSEMBLE AND INSTALL MOTOR SHAFT.

- a. Place drive pin (22) onto motor shaft (13).

**WARNING**

**Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

- b. Slide inner gerotor gear (19) onto motor shaft (13) and align onto drive pin (22). Use snap ring pliers and secure the gerotor in position with retaining rings (20 and 21).
- c. Place outer gerotor gear (23) into gear pocket of motor body (17).
- d. Slide motor shaft (13) into the motor body side of motor cover (6).

**WARNING**

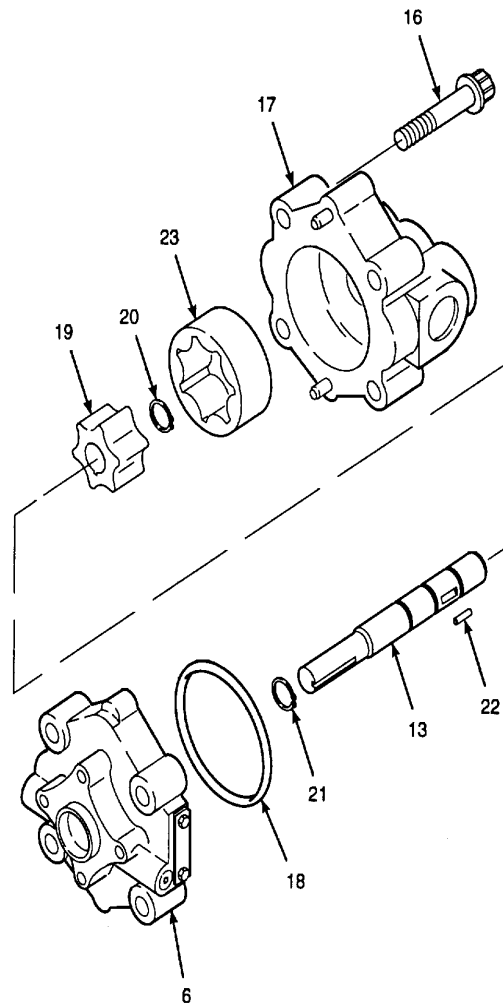
**Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.**

- e. Lubricate performed packing (18) with clean hydraulic oil and install into packing groove of motor cover (6).
- f. Slide motor cover (6) and motor body (17) together.

**CAUTION**

**Screed vibration motor body damage can occur. from clamping in a bench vise. Use vise jaw caps between the vise clamps and the motor to protect the aluminum motor body when clamping. Failure to do so may result in damage to the motor body.**

- g. Secure motor cover (6) into a bench vise. Protect aluminum motor body from damage by placing vise jaw caps between the vise clamps and the motor cover.



**NOTE**

**Motor shaft must be able to spin freely after tightening the body screws**

- h. Install motor body screws (16) into motor body (17) and tighten to 22 lb-ft (29 N•m). Remove the screed vibration motor from the bench vise. After tightening the motor body screws, ensure that motor shaft (13) spins freely. If shaft does not spin freely, disassemble per step A and check needle bearing clearance measured in step D. 1 and D.2.

2.76 REPAIR SCREED VIBRATION MOTOR - Continued.

D. ASSEMBLE - Continued.

4. INSTALL MOTOR MOUNTING PLATE, ENCASED SEAL, AND PREFORMED PACKINGS.

**WARNING**

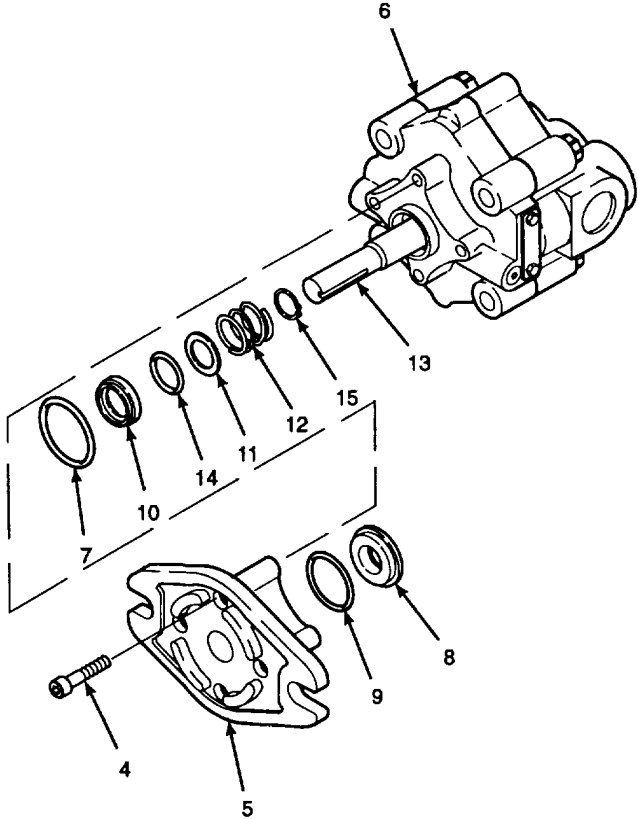
Use care when installing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

- a. Use snap ring pliers and install retaining ring (15) onto motor shaft (13).

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- b. Lubricate preformed packing (14) with clean hydraulic oil and install into seal cap (10).
- c. Install spring (12) and spacer ring (11) onto motor shaft (13).
- d. Using the shaft seal assembly tool, press assembled seal cap (10) onto motor shaft (13).
- e. Lubricate preformed packing (9) with clean hydraulic oil and install into encased seal (8).
- f. Install assembled encased seal (8) into the bottom seal groove of motor mounting plate (5).
- g. Lubricate preformed packing (7) with clean hydraulic oil and install into top seal groove of motor mounting plate (5).
- h. Align motor mounting plate (5) mounting holes with mounting holes on motor cover (6). Ensure that the mounting flanges on the mounting plate are aligned with the check valve sides of the screed vibration motor.



- i. Install socket head cap screws (4) and tighten to 50 lb.-in (5, 7 N•m) using hex head driver socket.

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2-1082

D. ASSEMBLE - Continued.

5. INSTALL ELBOWS AND PREFORMED PACKINGS.

**WARNING**

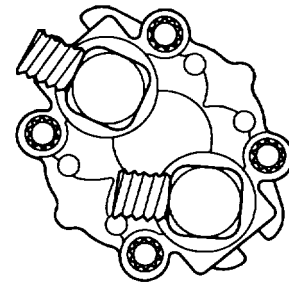
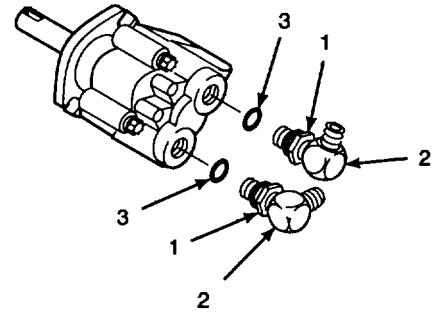
Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Apply a light coating of hydraulic oil onto preformed packings (3).

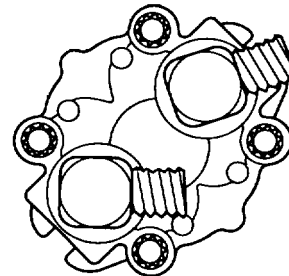
**CAUTION**

Use caution when installing preformed packings over threads. Threads can cut and damage preformed packings. Ensure threads do not damage preformed packings during installation.

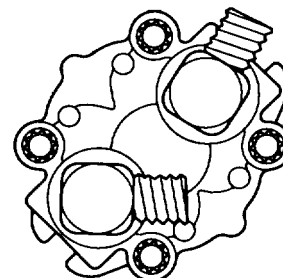
- b. Install preformed packings (3) onto elbows (2).
- c. Screw elbows (2) into mating motor port until preformed packings (3) seat in packing recess.
- d. Adjust threaded end of elbows (2) to position shown for screed vibration motor being assembled. Tighten lock nut (1).



LH EXTENSION SCREED VIBRATION MOTOR



RH EXTENSION SCREED VIBRATION MOTOR



MAIN SCREED VIBRATION MOTOR

**NOTE**

**FOLLOW-ON-TASK:** Screed vibration motor installed per TM 5-3895-373-10.  
**END OF TASK**



**2.77 REPLACE/REPAIR SCREED VIBRATION FLOW DIVIDER.**

This task covers:

- |            |                |            |
|------------|----------------|------------|
| a. Remove  | b. Disassemble | c. Clean   |
| d. Inspect | e. Assemble    | f. Replace |

**INITIAL SETUP**Tools:

General mechanic's automotive tool kit  
(Item 106, Appendix D)  
Drain pan (Item 63, Appendix D)  
Torque wrench (Item 132, Appendix D)

References

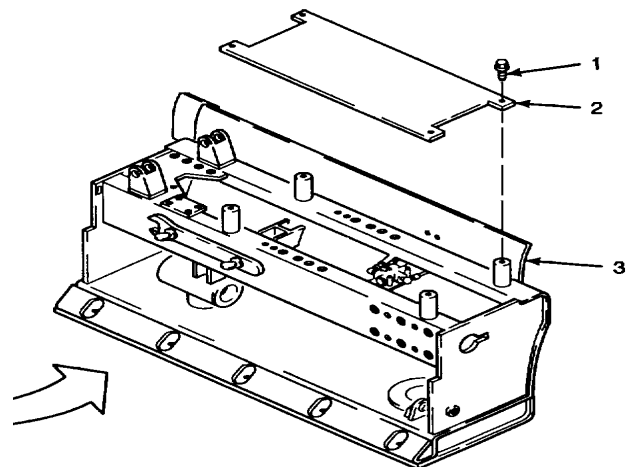
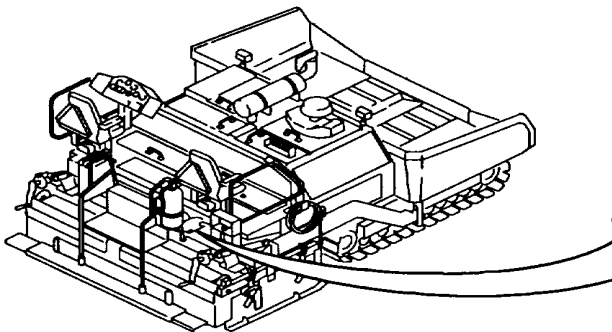
TM 5-3895-373-24P

Materials/Parts:

Cleaning cloth (Item 6, Appendix B)  
Cleaning solvent (Item 31, Appendix B)  
Culture swab (Item 33, Appendix B)  
Hydraulic fitting sealant (Item 26, Appendix B)  
Hydraulic oil (item 21, Appendix B)  
Lint-free cloth (Item 7, Appendix B)  
Machinery wiping towel (Item 37, Appendix B)  
Pipe cleaner (Item 25, Appendix B)  
Pipe sealant (Item 27, Appendix B)  
Protective caps (Item 3, Appendix B)  
Thread locking compound (Item 14, Appendix B)  
Thread locking compound solvent (Item 32, Appendix B)  
Lockwashers  
Preformed packings  
Self-locking machine screws

**A. REMOVE.****1. REMOVE COVER PLATE.**

- a. Remove self-locking machine screws (1) from cover plate (2). Discard self-locking machine screws.
- b. Remove cover plate (2) from screed (3).



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**2-1084**

- A. REMOVE - Continued.
2. CLEAN SCREED VIBRATION FLOW DIVIDER AND ELBOWS.

**WARNING**

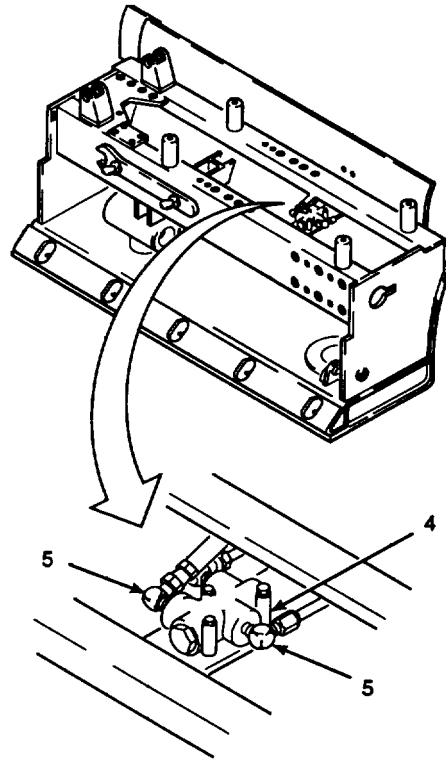
Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves.

Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type m cleaning solvent is 200°F (93,3°C).

Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- a. Wipe exterior of screed vibration flow divider (4) with a cleaning cloth soaked in cleaning solvent to remove grease and dirt.
- b. Clean elbows (5) to remove any grease and dirt.



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2-1085

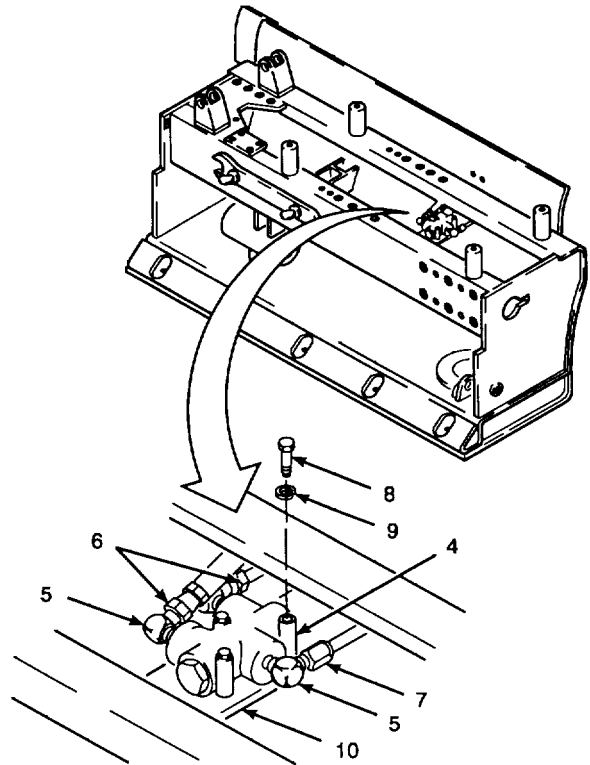
**2.77 REPLACE/REPAIR SCREED VIBRATION FLOW DIVIDER.**

- A. REMOVE - Continued.
3. REMOVE SCREED VIBRATION FLOW DIVIDER FROM SCREED.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Place machinery wiping towel below hydraulic fittings to absorb any hydraulic oil that may leak from hoses when removed. Discard used machinery wiping towels in accordance with local procedures.
- b. Disconnect hoses (6) and tube (7) from elbows (5). Cap off elbows, plug hose, and tube with protective caps.
- c. Remove bolts (8) and lockwashers (9) from screed vibration flow divider (4). Discard lockwashers.
- d. Remove screed vibration flow divider (4) from mounting bracket (10) in screed.
- e. Drain hydraulic oil from screed vibration flow divider (4) into a drain pan. Dispose of hydraulic oil in accordance with local procedures.



**GO TO NEXT PAGE  
2-1086**

B. DISASSEMBLE.

1. REMOVE ELBOWS, PLUGS, AND PREFORMED PACKINGS FROM BODY.

- a. Remove elbows (5) from body (11).
- b. Remove plugs (12) and preformed packings (13) from body. Discard preformed packings.

2. REMOVE SPOOL FROM BODY.

- a. Turn body (11) on its side.
- b. Remove spool (14) from inside of body (11).

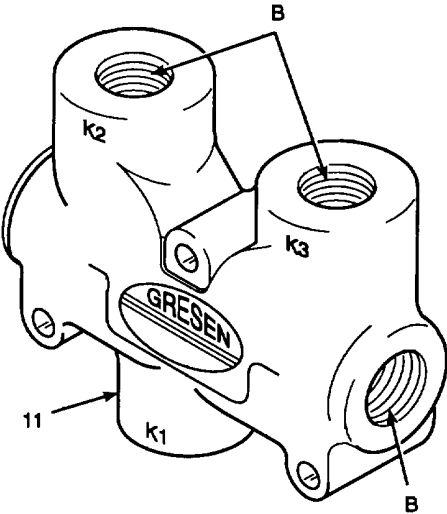
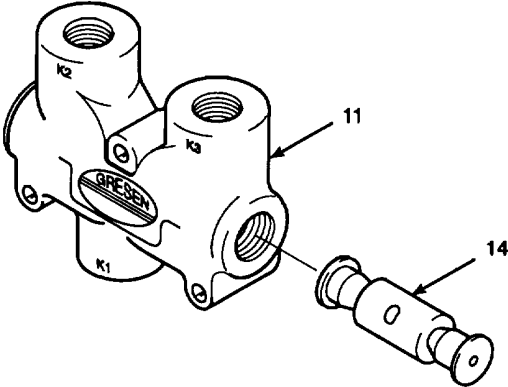
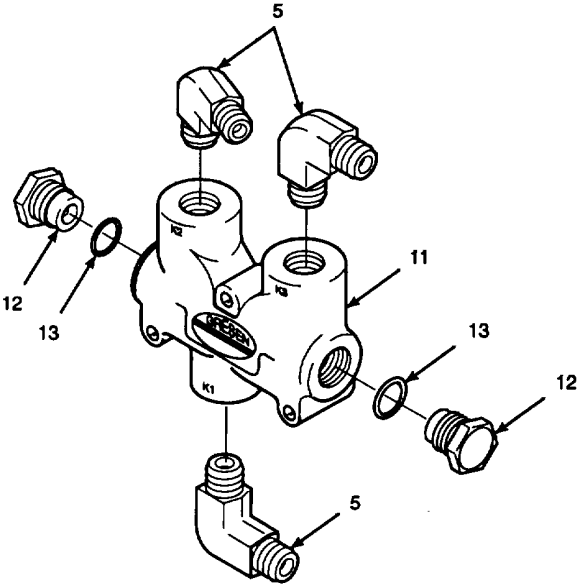
C. CLEAN.

**WARNING**

Cleaning solvent, P-D-680, is TOXIC and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for Type III cleaning solvent is 200°F (93,3°C). Failure to do so may result in injury or death to personnel.

If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

- 1. RINSE ALL METAL PARTS IN CLEANING SOLVENT. FLUSH BODY (11) WITH CLEANING SOLVENT. USE A CULTURE SWAB TO REMOVE ANY MATERIAL FROM INTERIOR SCREED VIBRATION FLOW DIVIDER PASSAGES B.



**2.77 REPLACE/REPAIR SCREED VIBRATION FLOW DIVIDER - Continued.**

## C. CLEAN - Continued.

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/face shield and gloves). Failure to take proper precautions may result in severe injury or loss of vision.

2. USE 30 PSI (207 kPa) MAXIMUM COMPRESSED AIR TO BLOW ANY FOREIGN MATERIAL FROM INSIDE OF BODY, SPOOL, AND THREADED SURFACES. DRY PARTS WITH A CLEAN, LINT-FREE CLOTH.

**WARNING**

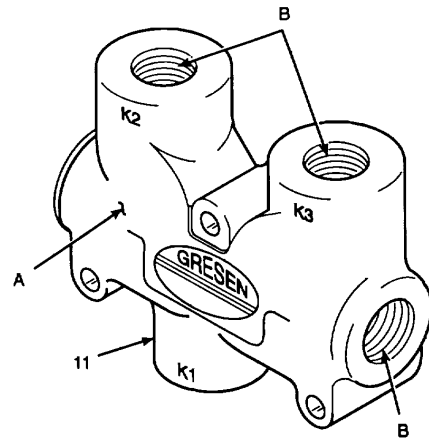
Thread locking compound solvent can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If solvent contacts eyes, flush eyes with water and get immediate medical attention.

3. CLEAN BOLTS WITH THREAD LOCKING COMPOUND SOLVENT. WIPE DRY WITH A CLEAN, LINT-FREE CLOTH.

## D. INSPECT.

1. INSPECT BODY.

- a. Inspect body (11), surface A, visually for cracks and stripped threads. Use a strong light and inspect body interior B for foreign material.
- b. Replace entire screed vibration flow divider if cracks or stripped threads are detected.

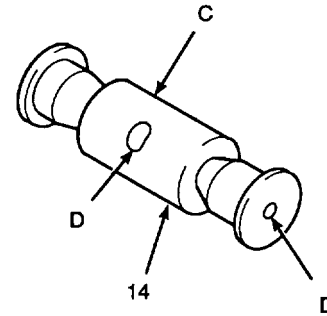


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2-1088**

D. INSPECT - Continued.

2. INSPECT SPOOL.

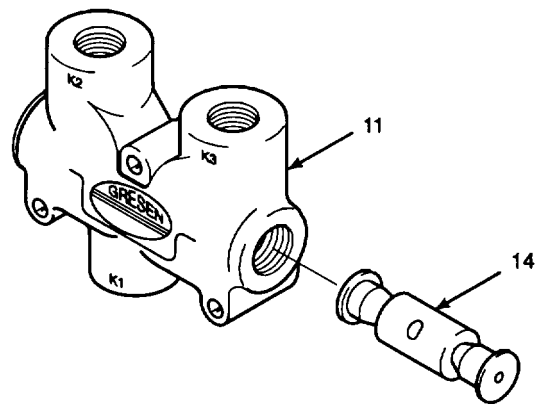
- a. Inspect spool (14), surfaces C, visually for grooves and excessive wear.
- b. Inspect spool bore D for foreign material. If foreign material is found clean spool bore D with a pipe cleaner to remove any foreign material. Ensure bore passages are clear.
- c. Fit spool (14) into body bore. Spool should fit snug and require slight pressure to insert into body bore.
- d. If spool is loose or has grooves worn in it, replace entire screed vibration flow divider.



E. ASSEMBLE.

1. INSTALL SPOOL INTO BODY.

- a. Insert spool (14) into body (11).
- b. Ensure spool (14) is centered in body (11).



**GO TO NEXT PAGE**  
**2-1089**

**2.77 REPLACE/REPAIR SCREED VIBRATION FLOW DIVIDER.**

- E. ASSEMBLE - Continued.
2. INSTALL PREFORMED PACKINGS, PLUGS, AND ELBOWS ONTO BODY.

**WARNING**

Hydraulic oil can be moderately flammable and can be an irritant to the skin, eyes, and respiratory system. Avoid prolonged exposure. Eye protection and rubber gloves must be worn when working with hydraulic oil.

- a. Lubricate preformed packings (13) with hydraulic oil prior to installing on plugs (12).

**CAUTION**

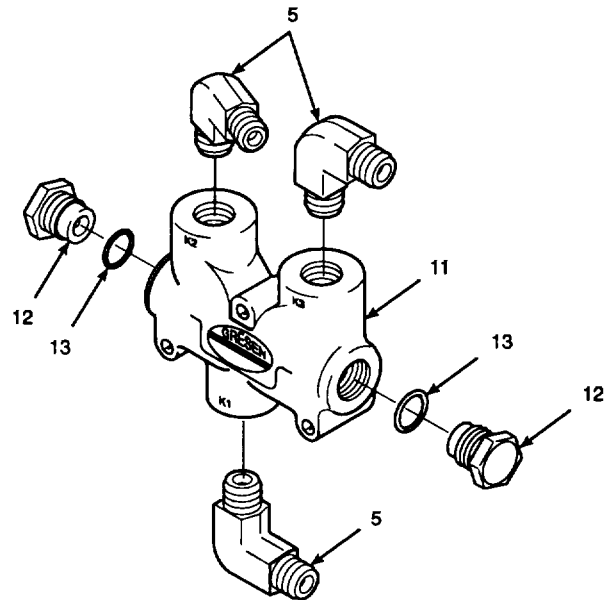
Be careful not to damage preformed packing when sliding over threads. Sharp edges of thread can cut or damage preformed packing. Damaged preformed packing will cause leakage and affect performance.

- b. Install preformed packings (13) on plugs (12).
- c. Thread plugs (12) into body (11). Tighten plugs.

**WARNING**

Pipe sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

- d. Apply pipe sealant to pipe thread ends of elbows (5).
- e. Install elbows (5) onto body. Tighten until positioned correctly for reinstallation. Refer to illustration.



F. REPLACE.

1. INSTALL SCREED VIBRATION FLOW DIVIDER IN SCREED.

- a. Position screed vibration flow divider (4) on mounting bracket (10) in screed (3).
- b. Install lockwashers (9) onto bolts (8).

**WARNING**

**Thread locking compound can cause eye damage. Wear safety goggles/glasses when using. Avoid contact with eyes. If compound contacts eyes, flush eyes with water and get immediate medical attention.**

- c. Coat threads of bolts (8) with thread locking compound.
- d. Install bolts (8) through screed vibration flow divider (4) into mounting bracket (10). Tighten bolts to 19 lb.-ft (26 N•m).

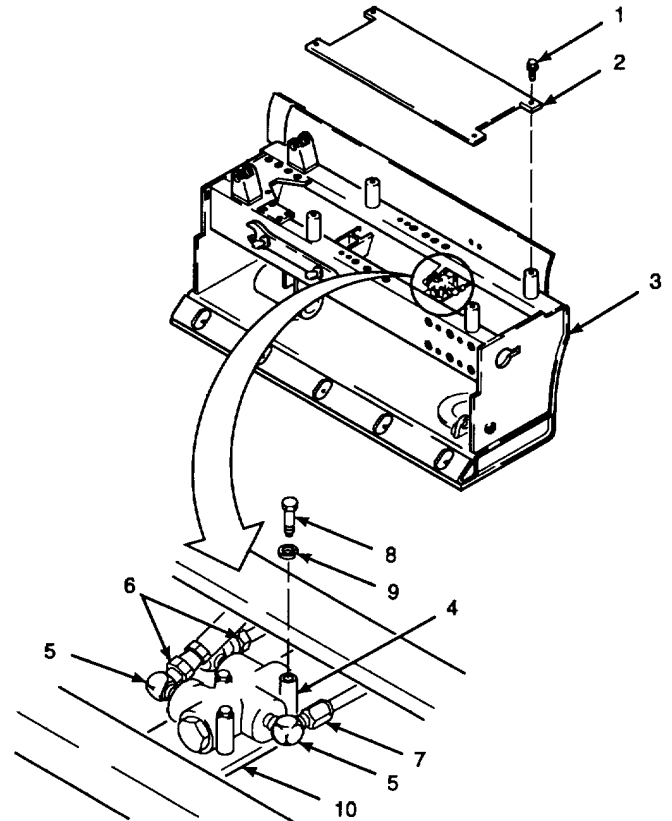
2. CONNECT HYDRAULIC FITTINGS AND INSTALL COVER PLATE.

**WARNING**

**Hydraulic fitting sealant can cause eye damage or skin irritation. Wash after skin contact. Wear safety goggles/glasses when using. Avoid contact with eyes or skin. If sealant contacts eyes, flush eyes with water and get immediate medical attention.**

- a. Coat threads of elbows (5) with hydraulic fitting sealant.

- b. Attach hoses (6) and tube (7) to elbows (5). Tighten all connections.
- c. Position cover plate (2) on screed (3).
- d. Install self-locking machine screws (1) through cover plate and into screed.



**END OF TASK**



**APPENDIX A**

**REFERENCES**

**A.1 SCOPE.**

This appendix lists all forms, field manuals, technical manuals, and other publications referenced in this manual. Also listed are publications that can be consulted for additional information regarding the repair of the 780T bituminous asphalt paving machine and component parts.

**A.2 PUBLICATION INDEX.**

The following index should be consulted frequently for late changes or revisions to documents listed herein. This index lists new publications relating to material covered in this manual.

Consolidated Index of Army Publications and Blank Forms (DA PAM 25-30).

**A.3 FORMS.**

The following forms are referenced within this manual. Refer to DA PAM 25-30 for index of blank forms.

d.

Recommended Changes to DA Publications and Blank Forms (DA Form 2028, 2028-2).

Product Quality Deficiency Report (Form SF 368).

Refer to DA PAM 738-750, The Army Maintenance Management System (TAMMS), for instructions to the forms required during the use of this manual.

**A.4 OTHER PUBLICATIONS.**

a. SAFETY.

Safety Inspection and Testing of Lifting Devices..... TB 43-0124

First Aid for Soldiers..... FM 21-11

Hand Portable Fire Extinguishers Approved for Army Users.....TB 5-4200-200-1

Paving Machine, Bituminous Material;.. Crawler Mounted, Diesel Engine Driven, Ingersoll-Rand Company Model 780T .. Warranty Information.....TB 5-3895-373-14

b. VEHICLE OPERATION.

Paving Machine, Bituminous Material; Crawler Mounted, Diesel Engine Driven, Ingersoll-Rand Company Model 780T Operator's Manual ..... TM 5-3895-373-10

Paving and Surfacing Operations.....TM 5-337

Utilization of Engineer Construction Equipment:

Volume D-I; Asphalt and Concrete Equipment..... ..TM 5-331D

c. COLD WEATHER OPERATION AND MAINTENANCE.

Basic Cold Weather Manual.....FM 31-70

MAINTENANCE AND REPAIR.

Paving Machine, Bituminous Material; Crawler Mounted, Diesel Engine Driven, Ingersoll-Rand Company Model 780T Organizational Maintenance Manual.....TM 5-3895-373-20

Paving Machine, Bituminous Material; Crawler Mounted, Diesel Engine Driven,

Ingersoll-Rand Company Model 780T Unit, Direct Support and General Support Maintenance Repair Parts and Special Tools List..... TM 5-3895-373-24P

Cooling System: Tactical Vehicles.....TM 750-254

Metal Body Repair and Related Operations.....TC 9-510

Description, Use, Bonding Techniques, and Properties of Adhesives.....TB ORD 1032

Painting Instructions for Field Use..... TM 43-0139

Purging, Cleaning, and  
Coating Ferrous and Terne  
Sheet Vehicle Fuel Tanks.....TB 43-0212

Use of Antifreeze Solutions,  
Antifreeze Extender, Cleaning  
Compounds, and Test Kit in  
Engine Cooling Systems.....TB 750-651

Inspection, Care, and  
Maintenance of Antifriction  
Bearings..... TM 9-214

Welding Theory and  
Application..... TM 9-237

Welding Design, Procedures  
and Inspection..... TM 5-805-7

Care and Use of Hand Tools  
and Measuring Tools..... TM 9-243

Inspection, Use and  
Tightening of Metal  
Fasteners Used on  
Tank-Automotive Equipment..... TB 430218  
Mechanics, Automotive.....

Terminating and Soldering  
Electrical Connections..... FM 11 887-14

Soldering Methods Light Truck Mounted.....  
and Equipment.....MIL-STD 2000A

Simplified Test Equipment  
for Internal Combustion  
Engines - Reprogrammable  
(STE/ICE-R) [Operator's  
and Organizational  
Maintenance]..... TM 9-4910-571-12&P  
Organizational Maintenance  
Simplified Test Equipment  
for Internal Combustion  
Engines - Reprogrammable  
(STE/ICE-R) [Direct and Shop Equipment,  
General Support  
Maintenance]..... TM 9-4910-571-34&P

Calibration Procedure  
for STE/ICE-R..... TB 9-4910-555-35

Tool Outfit, Hydraulic  
Systems Test and Repair  
(HSTRU) [Maintenance  
Manual]..... TM 9-4940-468-14

Tool Outfit, Hydraulic  
Systems Test and Repair  
(HSTRU) [Repair Parts  
and Special Tools List].....TM 9-4940-468-24P

Paving Machine, Bituminous Material;  
Crawler Mounted, Diesel Engine Driven,  
Ingersoll-Rand Company Model 780T  
Lubrication Order.....LO 5-3895-373-12

e. GENERAL.

Principles of Automotive  
Vehicles.....TM 9-8000  
Procedures for Destruction  
of Tank-Automotive

Equipment to Prevent  
Enemy Use.....TM 750-244-6  
Logistic Assistance Program.....AR 700-4

f. DEPARTMENT OF ARMY SUPPLY  
CATALOGS; SETS, KITS AND OUTFITS  
COMPONENT LISTS.

Tool Kit, General  
.SC 5180-90-N26

Shop Equipment,  
Organizational Repair,  
SC 4940-95-CL-B03

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance  
Common No.1, Less  
Power.....SC 4910-95-CL-A74

Shop Equipment, Automotive  
Maintenance and Repair:

Supplemental No. 1, Less  
Power.....SC 4910-95-CL-A73

Contact Maintenance,  
Truck Mounted.....SC 4940-95-CL-B04

Shop Equipment,  
General Purpose Repair,  
Semitrailer Mounted.....SC 4940-95-CL-B02

Tool Outfit, Hydraulic  
Systems Test and Repair  
(HSTRU).....SC 4940-95-CL-B07

## APPENDIX B

## EXPENDABLE AND DURABLE ITEMS LIST

## SECTION I. INTRODUCTION

**B.1 SCOPE.**

This appendix lists expendable and durable items you will need to maintain the paving machine. This listing is for information purposes only and is not the authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

**B.2 EXPLANATION OF COLUMNS.**

- a. Column (1) - Item Number. This number is assigned to the entry in the listing for referencing when required.
- b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.
- c. Column (3) - National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the item.
- d. Column (4) - Description. Indicates the federal item name and, if required, a description to identify the item.
- e. Column (5) - Unit of Measure (U/M)/Unit of Issue (U/I). This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue as shown in the Army Master Data File (AMDF), requisition the lowest unit of issue that will satisfy your requirements.

F - Direct Support  
H - General Support

## SECTION II. EXPENDABLE AND DURABLE ITEMS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NUMBER AND CAGE	(5) UNIT OF MEAS
1	F, H	8105-00-137-913 8105-00-137-9134 8105-00-137-9136 8105-00-837-7757	Bag plastic, self-sealing: 8 in. by 6 in. 10 in. by 8 in. 12 in. by 10 in. 12 in. by 12 in.	EA EA EA EA
2	H	6850-00-264-5771	Calibrating fluid, ISO 4113, 55 gal drum	GL
3	F, H	5340-00-450-5718	Cap, protective, dust and moisture seal, bag of 156	EA
4	F	5350-00-221-0872	Cloth, abrasive, crocus, 50 sheet package	SH
5	F	5350-00-584-4653	Cloth, abrasive, emery, 50 sheet package	SH
6	F, H	8305-00-753-2967	Cloth, cleaning, non-woven fabric, 50 yd roll	YD
7	F, H	7920-00-044-9281	Cloth, lint-free, Type II, 10 lb box: MIL-C-85043	LB
8	F	8030-01-138-1666	Compound, anti-seize, graphite and petroleum, 250 g: MIL-T-5544	GM
9	F	6850-00-965-2332	Compound, carbon removing, 5 gal can	GL
10	F	6850-00-880-7616	Compound, electrical insulating, 8 oz tube: MIL- S-8660C	OZ
11	H	8030-00-247-2545 8030-00-247-2525	Compound, gasket sealing 2 oz tube 11 oz tube	OZ OZ
12	F	8030-00-543-4384	Compound, sealing, thread and gasket, 1 pt can: MIL-S-7916	PT
13	F	8030-01-158-6070	Compound, thread locking, Type I, Grade K, 50 cc bottle: MIL-S-46163	CC
14	F	8030-01-014-5869	Compound, thread locking, Type II, Grade N, 50 cc bottle: MIL-S-46163	CC
15	H	8030-01-303-0502	Compound, thread locking, 50 ml bottle: MIL-S- 46163	ML
16	F	9130-01-305-5597	Fuel, aviation turbine, JP-8, NATO F-34: MIL-L-83133	GL
			<b>B-2</b>	

## SECTION II. EXPENDABLE AND DURABLE ITEMS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NUMBER AND CAGE	(5) UNIT OF MEAS
17	F	9150-00-935-5851	Grease, aircraft general purpose, wide temperature range, NATO G-395: MIL-G-81322E 35 lb. can	CN
18	F	9150-01-197-7688 9150-00-197-7690 9150-01-197-7689	Grease, automotive and artillery: MIL-G-10924 2.25 oz tube 1.75 lb. can 6.5 lb. can	OZ LB LB
19	H	9150-00-223-4133	Lubricating oil, mineral, 1 gal can	GL
20	F	9150-01-035-5392 9150-01-035-5393	Oil, lubricating, gear, GO 80/90: MIL-L-2105 1 qt can 5 gal can	QT GL
21	F	9150-00-189-6727 9150-00-186-6668	Oil, lubricating, hydraulic, OE/HDO 10: MIL-L-2104 1 qt can 5 gal drum	QT GL
22	F	9150-01-152-4117 9150-01-152-4118	Oil, lubricating, internal combustion engine, tactical service, OE/HDO 15/40: MIL-L-2104 1 qt can 5 gal drum	QT GL
23	F	5350-00-186-8855	Paper, abrasive, emery (400 grit), 100 sheets	EA
24	F	6505-00-133-8025	Petrolatum, white technical, 1.5 lb can: MIL-P-37649	LB
25	F	9920-00-292-9946	Pipe cleaner, 32 per package	PG
26	F	8030-00-081-2328	Sealant, hydraulic fitting, 50 cc bottle	CC
27	F	8030-01-054-0740	Sealant, pipe, with teflon, 250 ml tube	ML
28	H	8030-00-181-7529	Sealing compound, 250 cc bottle	CC
29	F, H	8030-01-142-3131	Sealing compound, 250 cc bottle	CC
30	F	8030-01-171-7628	Sealing compound, 50 cc bottle	CC
31	F	6850-01-331-3349	Solvent, cleaning, P-D-680 Type ml, 5 gal can	GL
32	F	8030-01-298-1346	Solvent, thread locking compound 50 cc bottle	CC
33	F	6515-00-357-4855	Swabs, culture, box of 100	BX
34	F, H	8135-00-178-9200	Tags, stock marking, 1,000 per carton	EA
<b>B-3</b>				

SECTION II. EXPENDABLE AND DURABLE ITEMS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NUMBER AND CAGE	(5) UNIT OF MEAS
35	F	7150-00-266-6712	Tape, pressure sensitive, 60 yd roll	YD
36	F	5975-00-074-2072 5975-00-570-9598 5975-00-156-3253	Tie wraps, package of 100 6.5 in. length 10.25 in. length 13.25 in. length	EA EA EA
37	F, H	7920-01-233-0483	Towel, machinery wiping, 12 x 17 in., six boxes of 50 sheets ea.	BX
38	F, H	5970-00-962-3335	Varnish, insulating, electrical coating, 15 oz can	OZ

**APPENDIX C**

**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

**SECTION I. INTRODUCTION**

**C.1 SCOPE.**

a. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at direct and general support maintenance levels.

b. An item number index in alphanumeric order is provided for cross-referencing the item to be manufactured to the figure that covers fabrication criteria.

c. All bulk materials needed for manufacture of an item are listed by part number or specification number on the illustration.

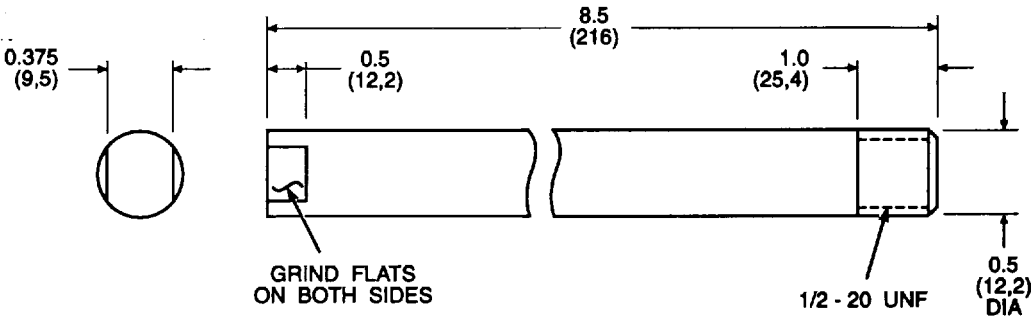
## SECTION II. LIST OF MANUFACTURED ITEMS

C.2 MANUFACTURED ITEMS INDEX.

Item Number	Nomenclature	Figure Number
1	Alignment stud	1
2	Centering jig	2
3	Driver	3
4	Driver	4
5	Driver	5
6	Input bearing driver	6
7	Flywheel guide pin	7
8	Hollow pipe	8
9	Lock nut torquing adapter	9
10	Mandrel	10
11	Mandrel	11
12	Mandrel	12
13	Mandrel	13
14	Pinion stop support block	14
15	Shaft bearing removal tool	15
16	Shaft face seal tool	16
17	Shaft face seal tool	17
18	Shaft seal assembly tool	18
19	Shaft seal driver tool	19
20	Shaft seal bullet	20
21	Shaft seal installation tool	21
22	Spacer wedge	22
23	Support cylinder	23
24	Track frame offset wrench	24
25	Valve seat installation tool	25
26	Valve sleeve installation tool	26
27	Straightedge	27



**C.3 MANUFACTURED ITEMS ILLUSTRATIONS.**

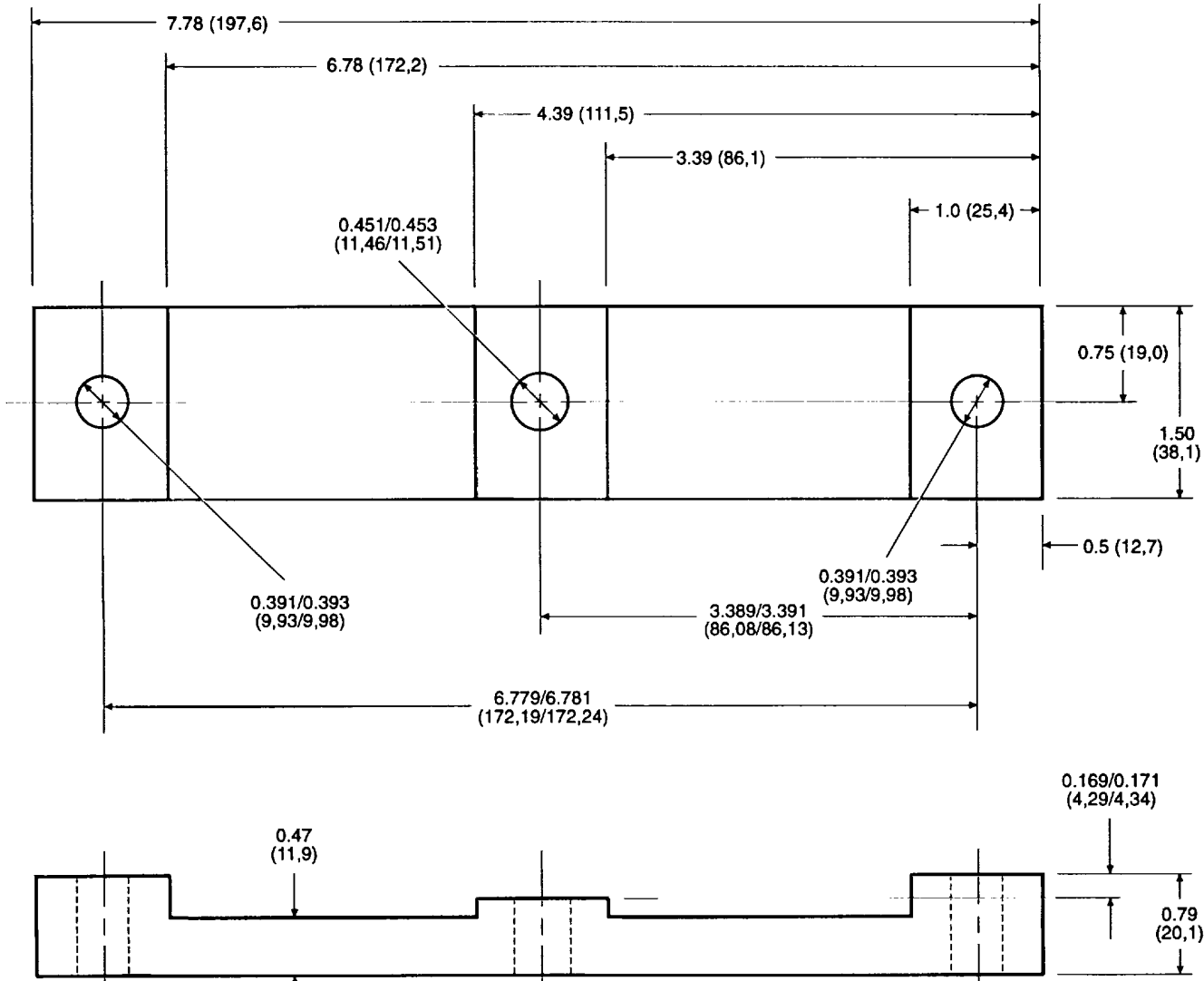


MATERIAL: 112 IN. (12,7 MM) DIA ROD, 1020 MILD STEEL

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. LINEAR TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. BREAK SHARP EDGES AND CORNERS.

*Figure 1. Alignment Stud*

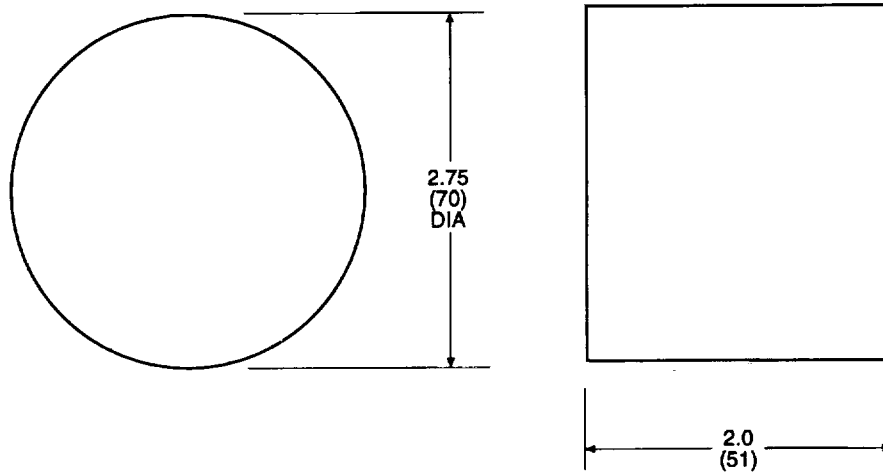


MATERIAL: 1020 MILD STEEL

NOTES:

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. MACHINED SURFACES TO BE 125 MICRINCHES UNLESS OTHERWISE INDICATED.
- 4. BREAK SHARP EDGES AND CORNERS.

Figure 2. Centering Jig

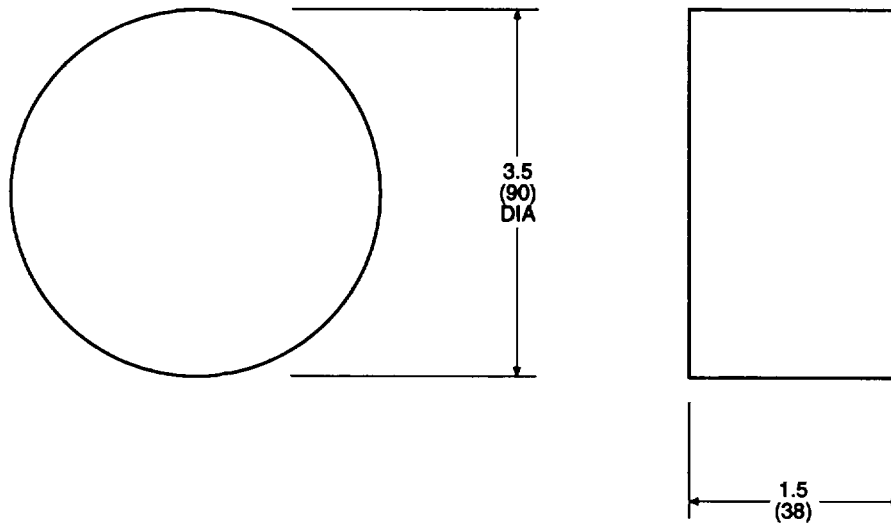


MATERIAL: 3 IN. (76 MM) DIA BAR STOCK, 1020 MILD STEEL

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. MACHINED SURFACES TO BE 125 MICRINCHES UNLESS OTHERWISE INDICATED.
4. BREAK SHARP EDGES.

*Figure 3. 2.75 In. Diameter Driver*

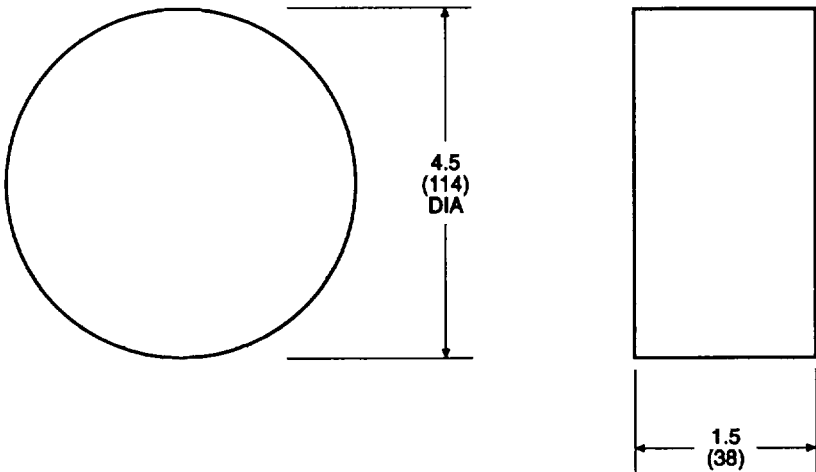


MATERIAL: 4 IN. (101,6 MM) DIA BAR STOCK, 1020 MILD STEEL

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE -0.030 IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
4. BREAK SHARP EDGES.

*Figure 4. 3.5 In. Diameter Driver*

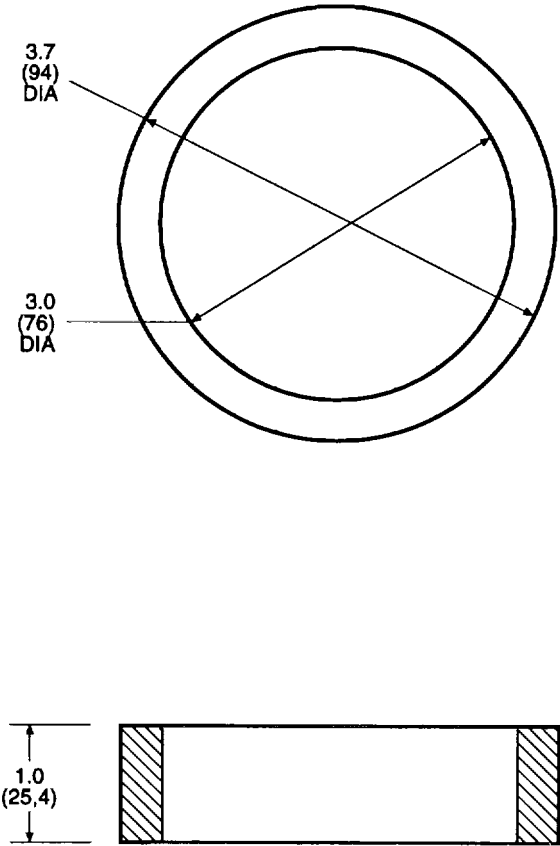


MATERIAL: 4-1/2 IN. (114,3 MM) DIA BAR STOCK, 1020 MILD STEEL

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE -0.030 IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. MACHINED SURFACES TO BE 125 MICRORINCHES UNLESS OTHERWISE INDICATED.
- 4. BREAK SHARP EDGES.

*Figure 5. 4.5 In. Diameter Driver*

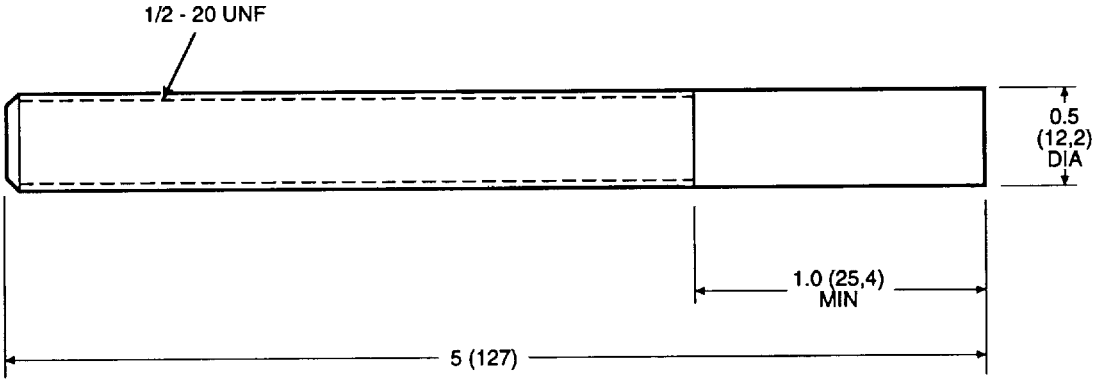


MATERIAL: 3 IN. (76,2 MM) DIA STEEL PIPE, SCHEDULE 40S

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE 00.030 IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
- 4. BREAK SHARP EDGES.

*Figure 6. Input Bearing Driver*

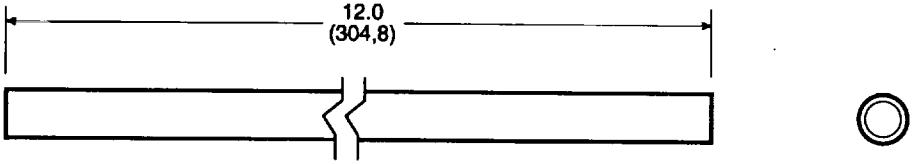


MATERIAL: 1/2-20 UNF X 6 IN. HEX HEAD CAP SCREW

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $i0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. CUT SCREW SHANK TO LENGTH.
- 4. BREAK SHARP EDGES.

*Figure 7. Flywheel Guide Pin*



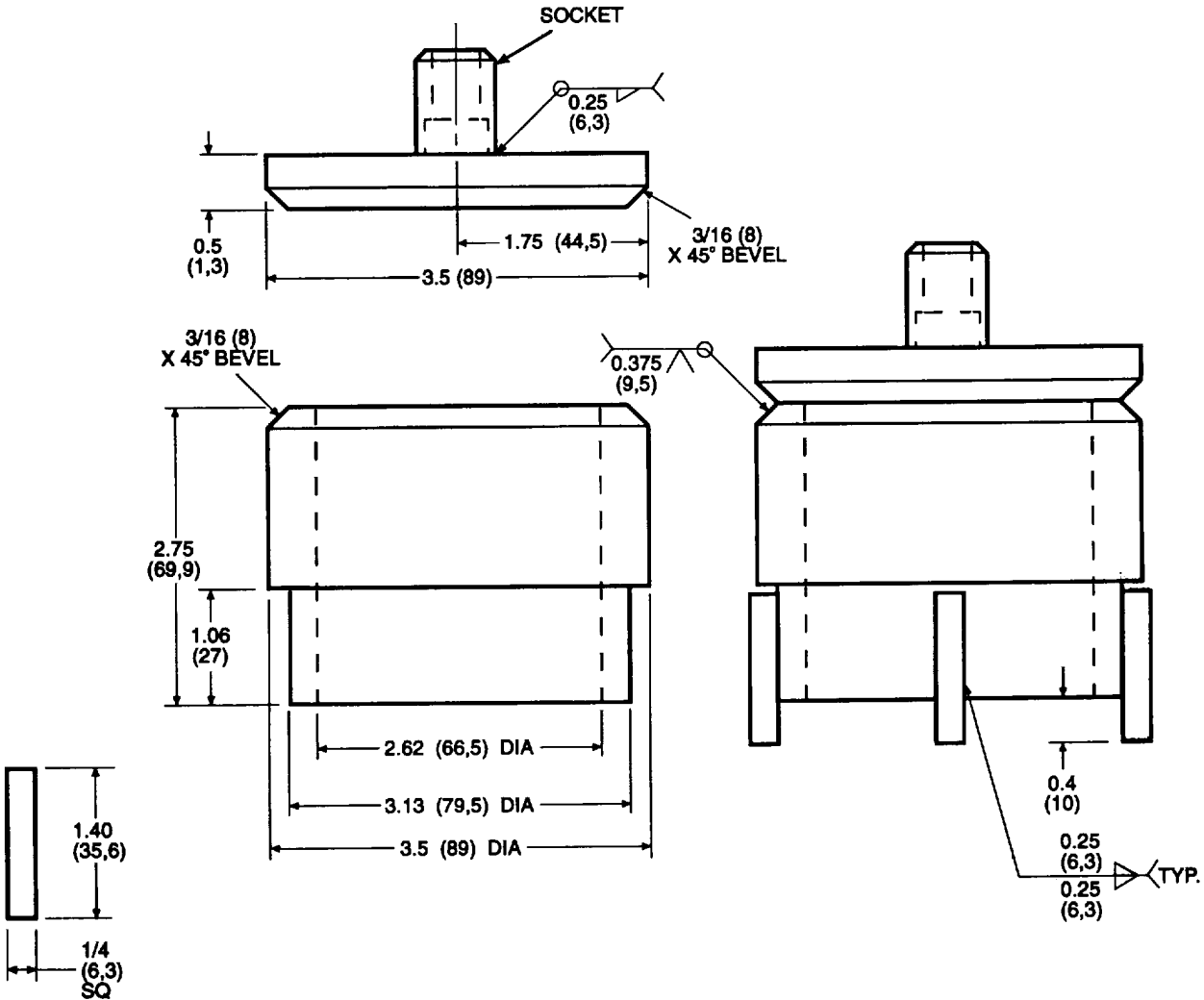
MATERIAL: 1/4 IN. (6 MM) DIA STEEL PIPE, SCHEDULE 40S

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. BREAK SHARP EDGES.

*Figure 8. Hollow Pipe*

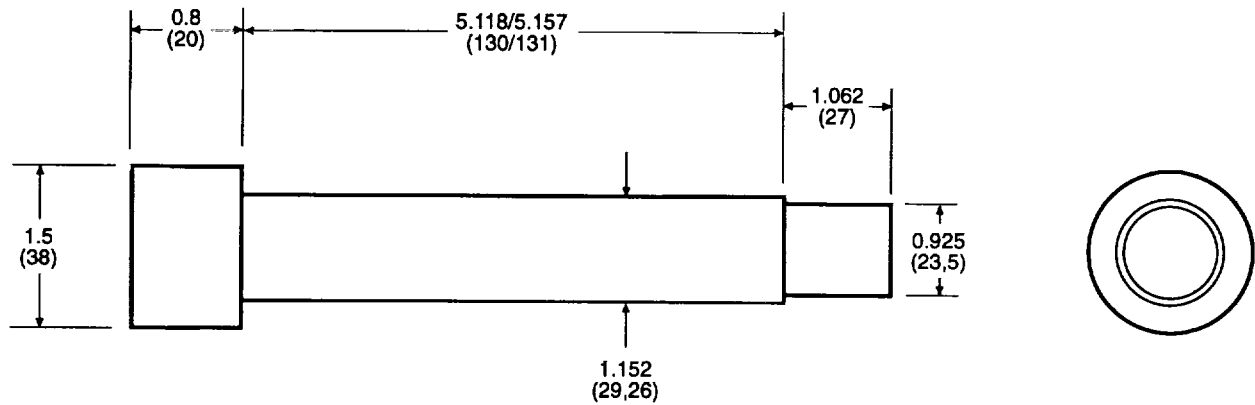




**MATERIAL:** 3 IN. (76,2 MM) DIA STEEL PIPE, SCHEDULE 40S;  
 1/2 IN. (12, 7 MM) THICK STEEL PLATE, 1020 MILD  
 STEEL; 1/2 IN. DRIVE IMPACT SOCKET; 1/4 IN.  
 (6 MM) SQUARE CUTTING TOOL STOCK

- NOTES:**
1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
  2. TOLERANCES ARE -0.030 IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
  3. ALL MACHINED DIAMETERS TO BE CONCENTRIC -0.008 IN. (0, 2 MM).
  4. MACHINED SURFACES TO BE 125 MICRINCHES UNLESS OTHERWISE INDICATED.
  5. WELD ALL ITEMS PER AWS SPECIFICATIONS.
  6. BREAK SHARP EDGES AND CORNERS.

Figure 9. Lock Nut Torquing Adapter

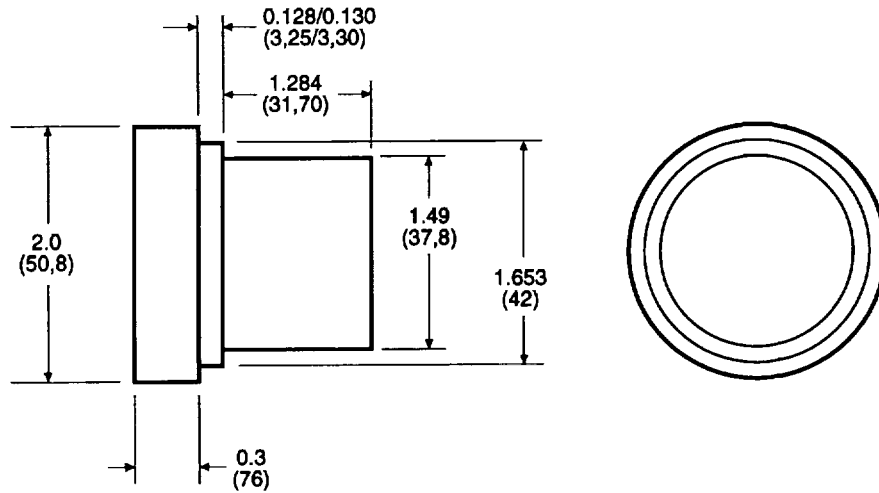


**MATERIAL: 1-1/2 IN. (38,1 MM) DIA ROUND BAR STOCK, 1020 MILD STEEL**

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE :0.030 IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. ALL MACHINED DIAMETERS TO BE CONCENTRIC :0.008 IN. (0,2 MM).
4. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
5. BREAK SHARP EDGES.

*Figure 10. Mandrel*

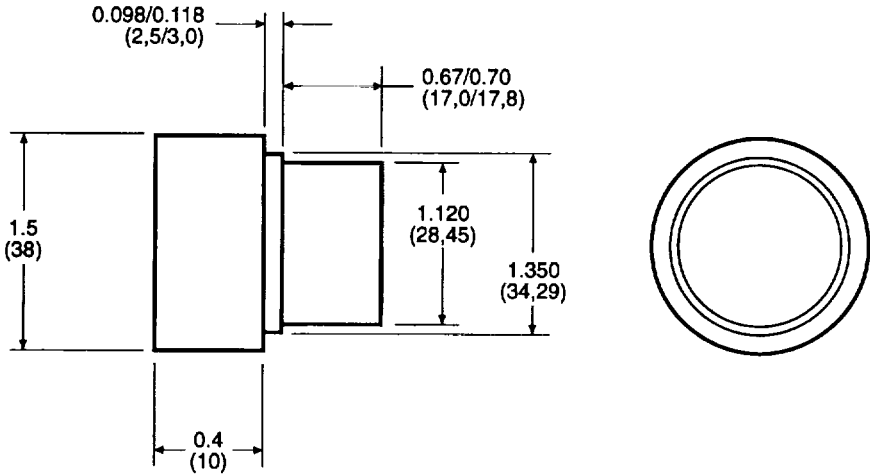


**MATERIAL: 2 IN. (50,8 MM) DIA ROUND BAR STOCK, 1020 MILD STEEL**

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. ALL MACHINED DIAMETERS TO BE CONCENTRIC  $\pm 0.008$  IN. (0, 2 MM).
4. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
5. BREAK SHARP EDGES.

*Figure 11. Mandrel*

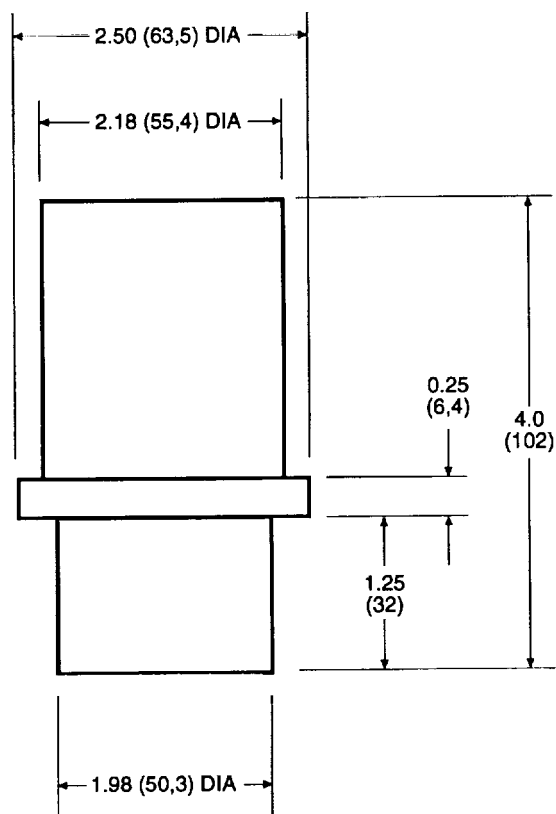


MATERIAL: 1-1/2 IN. (38,1 MM) DIA ROUND BAR STOCK, 1020 MILD STEEL

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 0.030$  IN. (0, 8 MM) UNLESS OTHERWISE INDICATED.
- 3. ALL MACHINED DIAMETERS TO BE CONCENTRIC  $\pm 0.008$  IN. (0,2 MM).
- 4. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
- 5. BREAK SHARP EDGES.

Figure 12. Mandrel

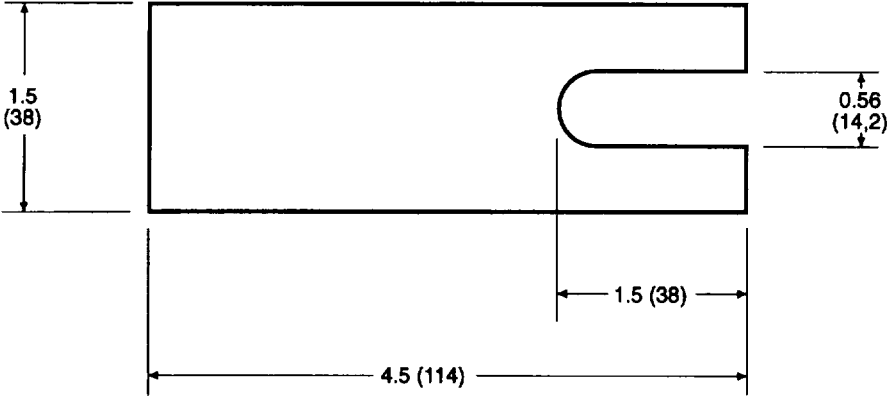


MATERIAL: 2-1/2 IN. (63,5 MM) DIA ROUND BAR STOCK, 1020 MILD STEEL

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. ALL MACHINED DIAMETERS TO BE CONCENTRIC  $\pm 0.008$  IN. (0,2 MM).
4. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
5. BREAK SHARP EDGES.

*Figure 13. Mandrel*

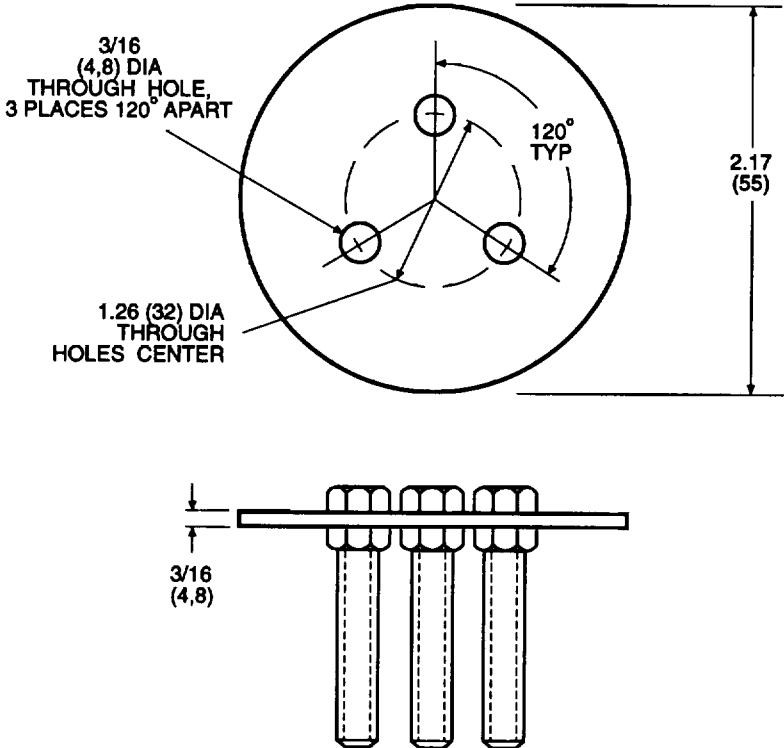


MATERIAL: 3/16 IN. (4,8 MM) THICK PLATE, 1020 MILD STEEL

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. MACHINED SURFACES TO BE 125 MICRINCHES UNLESS OTHERWISE INDICATED.
- 4. BREAK SHARP EDGES AND CORNERS.

*Figure 14. Pinion Stop Support Block*

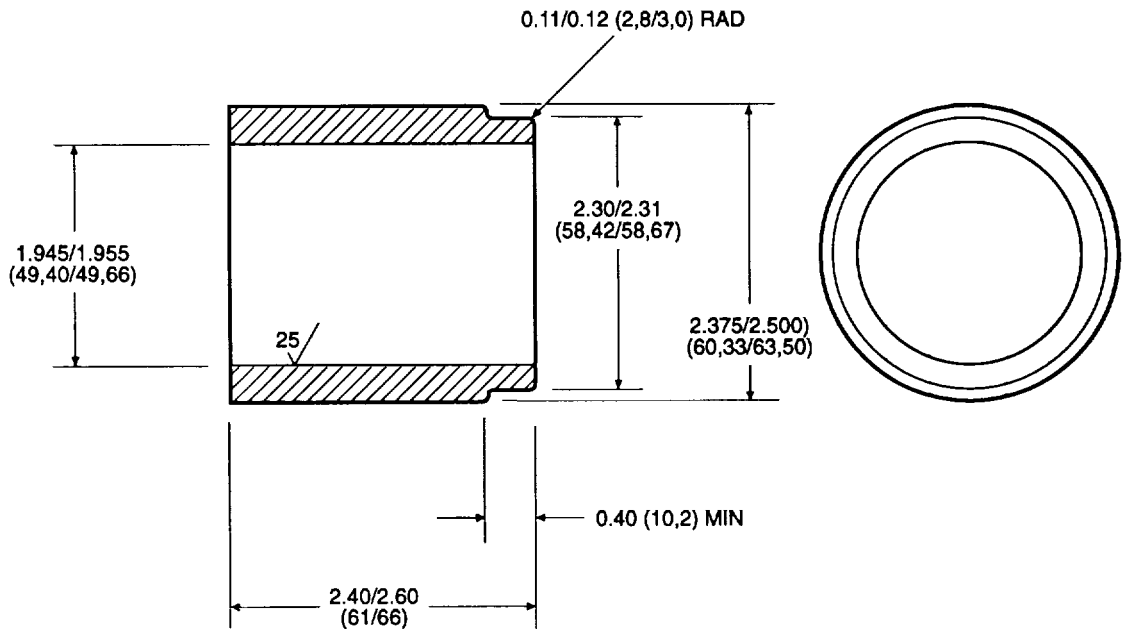


MATERIALS: 3/16 IN. (4,8 MM) THICK PLATE, 1020 MILD STEEL; 3 EA 3/16 UNC X 2 IN. HEX HEAD CAP SCREWS; 3 EA 3/16 UNC HEX NUTS

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE ±0.030 IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
- 4. BREAK SHARP EDGES.

Figure 15. Shaft Bearing Removal Tool



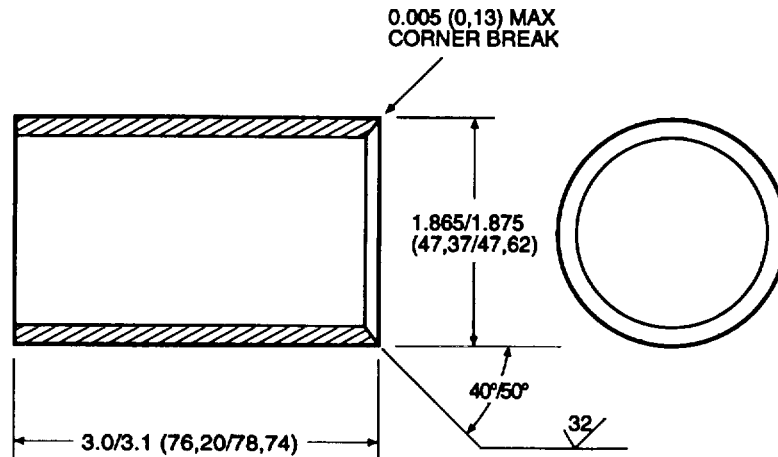
MATERIAL: 1-7/8 IN. (47,6 MM) DIA SCHEDULE 80 PVC PIPE

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. ALL DIAMETERS TO BE CONCENTRIC  $\pm 0.005$  IN. (0,13 MM).
- 4. BREAK ALL EDGES 0.01/0.03 IN. (0,3/0,8 MM) UNLESS OTHERWISE INDICATED.
- 5. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.

Figure 16. Shaft Face Seal Tool



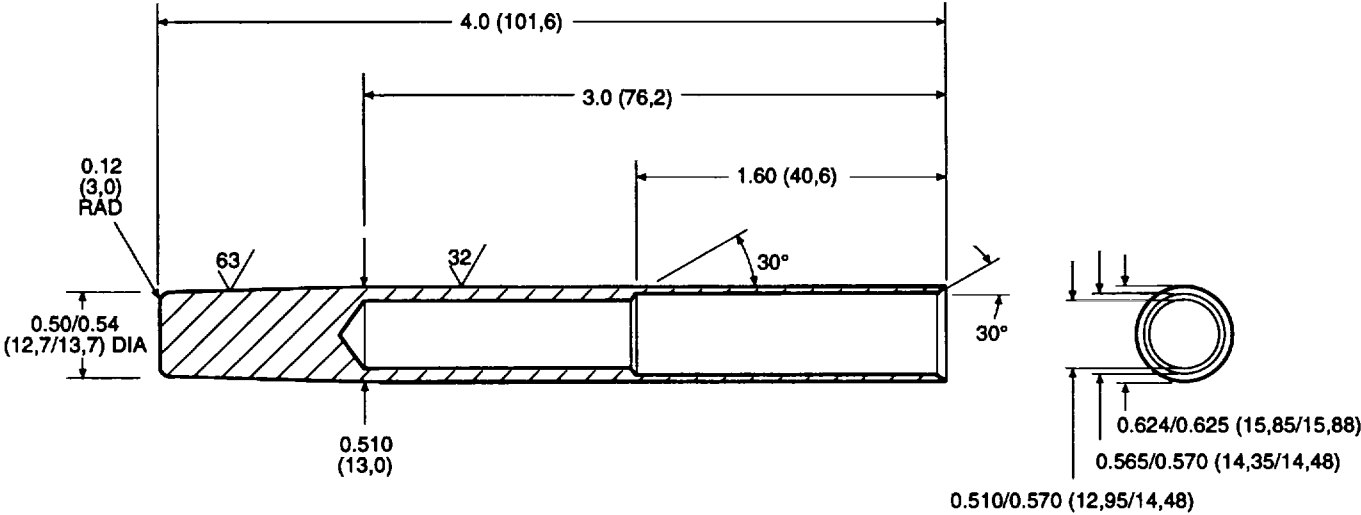


MATERIAL: 1-1/2 IN. (38,1 MM) DIA SCHEDULE 40 PVC PIPE

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. BREAK ALL EDGES 0.01/0.03 IN. (0,3/0,8 MM) UNLESS OTHERWISE INDICATED.
4. MACHINED SURFACES TO BE 125 MICRINCHES UNLESS OTHERWISE INDICATED.

*Figure 17. Shaft Face Seal Tool*

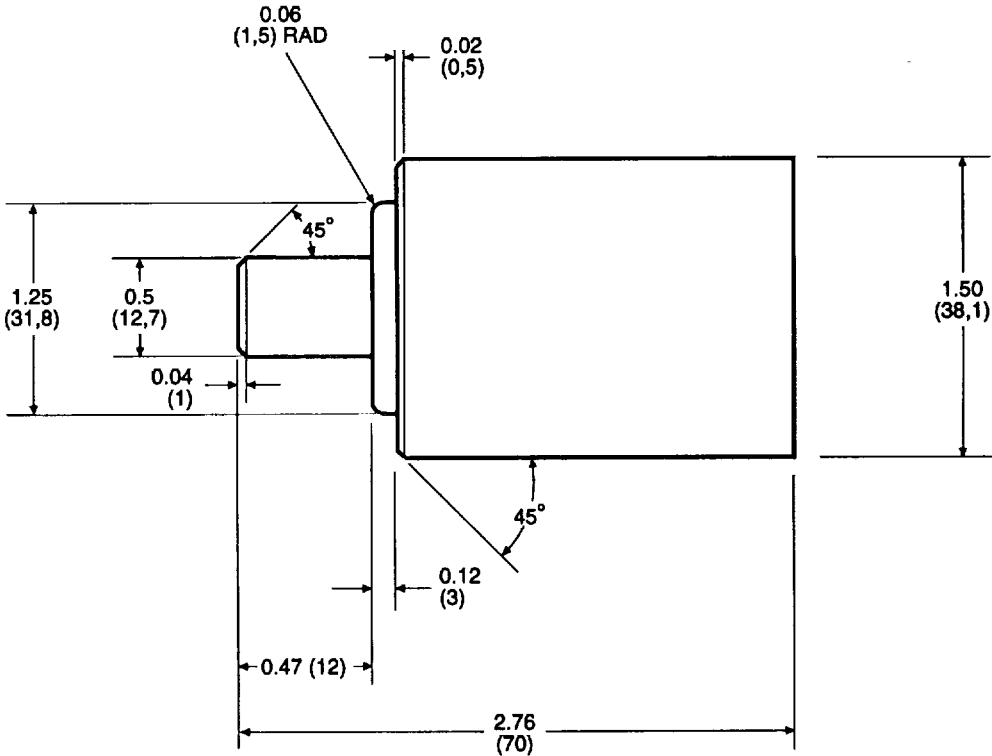


MATERIAL: 1020 MILD STEEL

NOTES:

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 0.030$  IN. (0, 8 MM) UNLESS OTHERWISE INDICATED.
- 3. ALL MACHINED DIAMETERS TO BE CONCENTRIC  $\pm 0.008$  IN. (0,2 MM).
- 4. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
- 5. BREAK SHARP EDGES.

Figure 18. Shaft Seal Assembly Tool

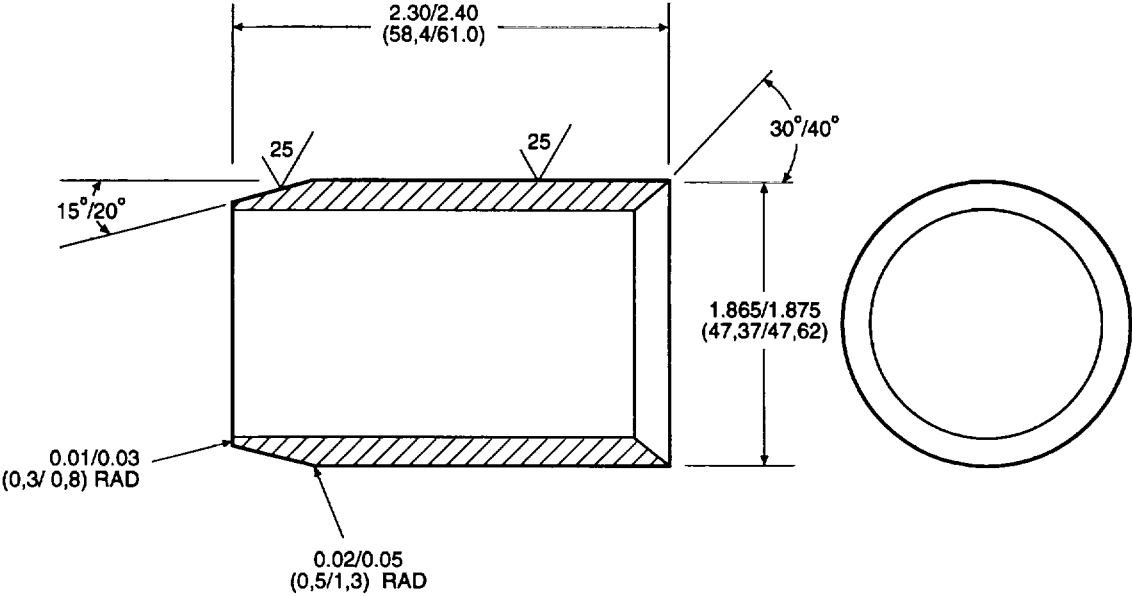


MATERIAL: 1-1/2 IN. (38,1 MM) DIA BAR STOCK, 1020 MILD STEEL

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE ±0.030 IN. (0, 8 MM) UNLESS OTHERWISE INDICATED.
- 3. ALL MACHINED DIAMETERS TO BE CONCENTRIC i0.008 IN. (0,2 MM).
- 4. MACHINED SURFACES TO BE 125 MICRONS UNLESS OTHERWISE INDICATED.
- 5. BREAK SHARP EDGES.

Figure 19. Shaft Seal Driver Tool

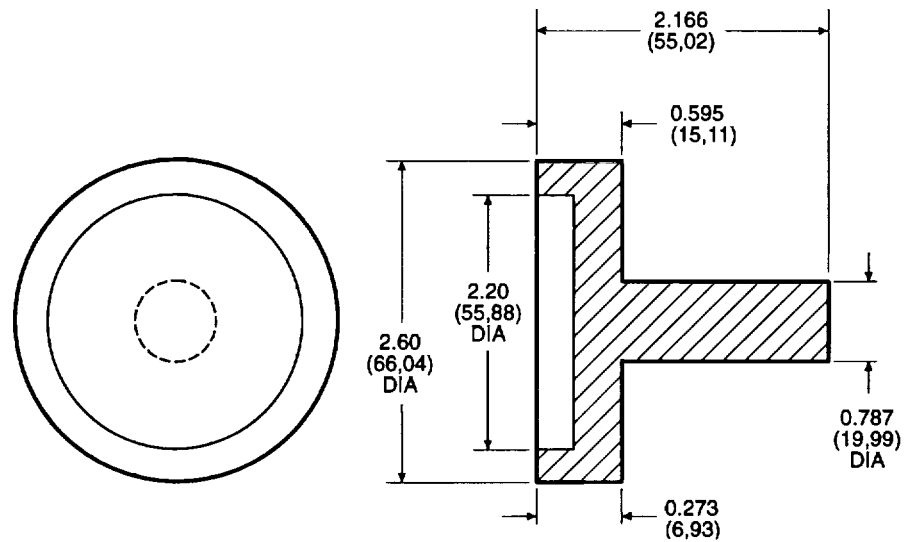


MATERIAL: 1.25 IN. (31,8 MM) DIA SCHEDULE 80 PVC PIPE

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. LINEAR TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. DIAMETERS TO BE CONCENTRIC  $\pm 0.008$  IN. (0,20 MM).
- 4. BREAK ALL EDGES 0.01/0.03 IN. (0, 3/0, 8 MM) UNLESS OTHERWISE INDICATED.
- 5. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.

Figure 20. Shaft Seal Bullet

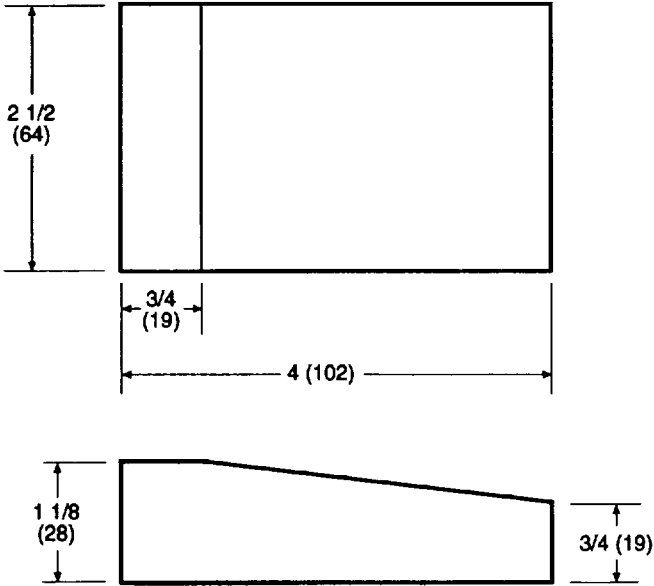


MATERIAL: 3 IN. (76,2 MM) DIA BAR STOCK, 1020 MILD STEEL

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. ALL MACHINED DIAMETERS TO BE CONCENTRIC  $\pm 0.008$  IN. (0,2 MM).
4. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
5. BREAK SHARP EDGES.

*Figure 21. Shaft Seal Installation Tool*

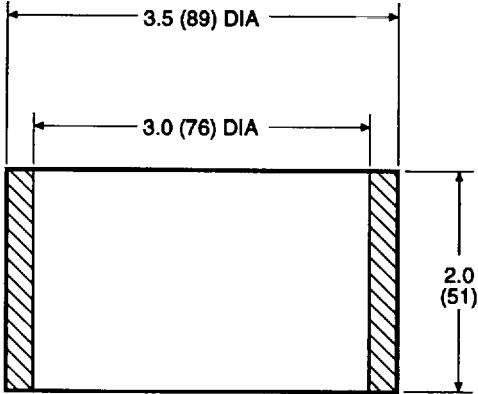
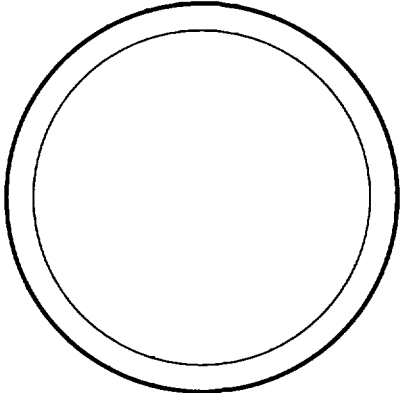


MATERIAL: 2-1/4 IN. (57 MM) SQ BAR STOCK,  
1020 MILD STEEL

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 1/16$  IN. (2 MM) UNLESS OTHERWISE INDICATED.
- 3. BREAK SHARP EDGES AND CORNERS.

*Figure 22. Spacer Wedge*

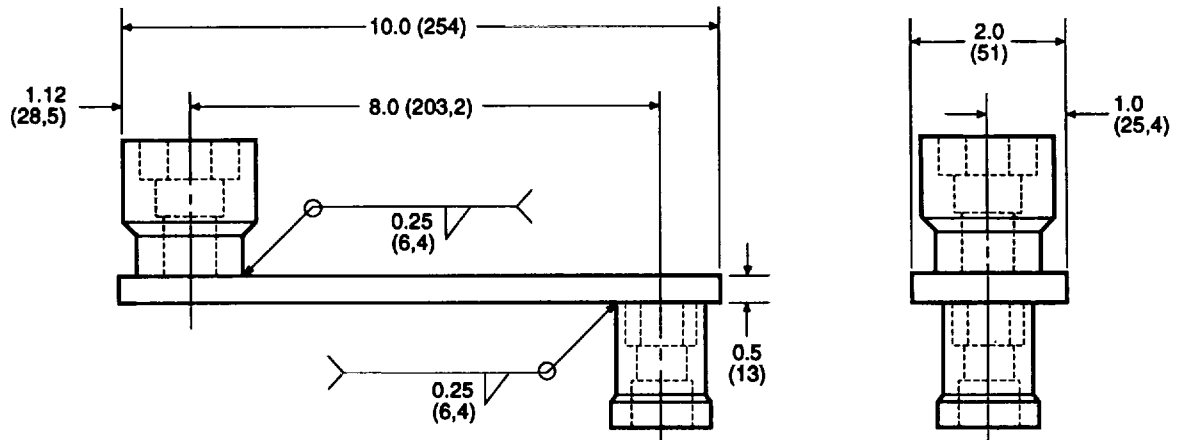


MATERIAL: 3 IN. (76,2 MM) DIA SCHEDULE 40S STEEL PIPE

**NOTES:**

- 1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
- 2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
- 3. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
- 4. BREAK SHARP EDGES.

*Figure 23. Support Cylinder*



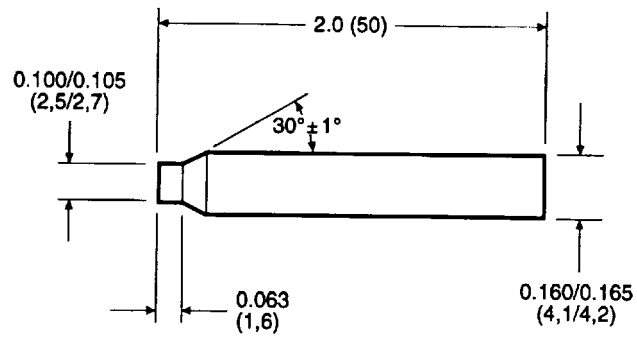
MATERIALS: 1/2 X 2 X 10 IN. (13 X 51 X 254 MM) FLAT STOCK,  
 ASTM A36 HARD ROLLED STEEL; 7/8 X 3/4 IN.  
 DRIVE, 6 POINT, IMPACT SOCKET; 1-5/16 X 3/4 IN.  
 DRIVE IMPACT SOCKET

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. PERFORM DOUBLE-PASS WELD PER AWS REQUIREMENTS FOR 1/4 IN. (6 MM) WELD BEADS ON FULL CIRCUMFERENCE OF SOCKETS.
4. BREAKS SHARP EDGES.

*Figure 24. Track Frame Offset Wrench*



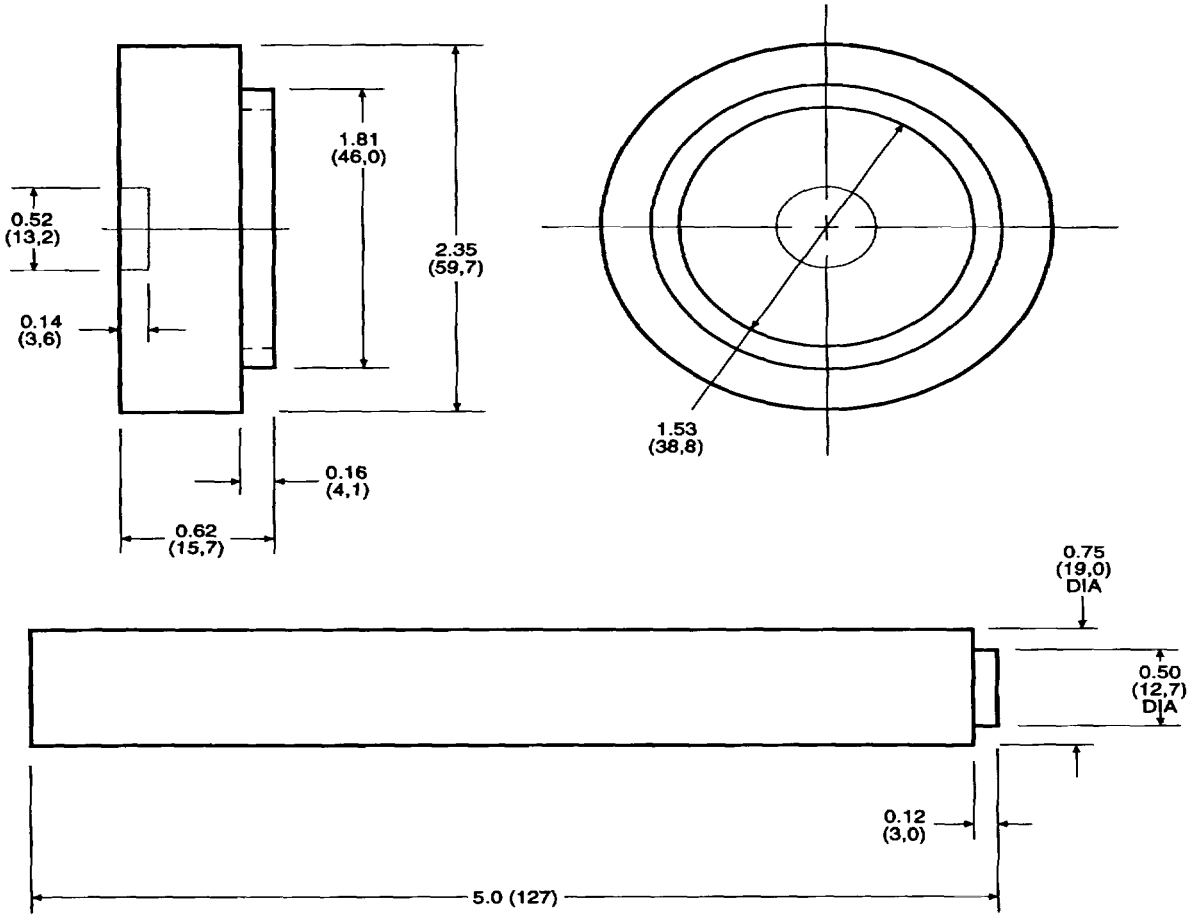


MATERIAL: 1/4 IN. (6 MM) DIA ROD, 1020 MILD STEEL

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE  $\pm 0.030$  IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. ALL MACHINED DIAMETERS TO BE CONCENTRIC  $\pm 0.008$  IN. (0,2 MM).
4. MACHINED SURFACES TO BE 125 MICROINCHES UNLESS OTHERWISE INDICATED.
5. BREAK SHARP EDGES.

*Figure 25. Valve Seat Installation Tool*

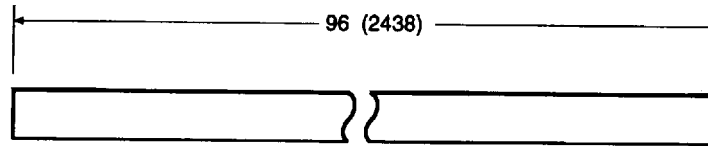


MATERIAL : 3/4 IN. (12,7 MM) DIA BAR STOCK AND 5/8 IN. (19,2 MM) THICK PLATE, 1020 MILD STEEL

**NOTES:**

1. ALL DIMENSIONS SHOWN ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. TOLERANCES ARE ±0.030 IN. (0,8 MM) UNLESS OTHERWISE INDICATED.
3. ALL MACHINED DIAMETERS TO BE CONCENTRIC \*0.008 IN. (0,2 MM).
4. MACHINED SURFACES TO BE 125 MICRORINCH UNLESS OTHERWISE INDICATED.
5. BREAK SHARP EDGES.
6. SEAT MACHINED BAR IN MATING BORE OF MACHINED DISK AND WELD PER AWS SPECIFICATIONS.

Figure 26. Valve Sleeve Installation Tool



MATERIAL: METAL STRIP, 0.125 IN. (3,17 MM) X 2.75 IN. (69,8 MM) X 18 FT (5,5 M),  
NSN 9515-00-045-7811  
OR  
METAL STRIP, 0.188 IN. (4,78 MM) X 1.5 IN. (38 MM) X 18 FT (5,5 M), NSN  
9515-00-045-7808

**NOTES:**

1. ALL DIMENSIONS ARE IN INCHES WITH MILLIMETERS IN PARENTHESES.
2. CUT TO LENGTH.

*Figure 27. Straightedge*

**C-29/(C-30 blank)**

**APPENDIX D****TOOL IDENTIFICATION LIST****SECTION I. INTRODUCTION****D.1 SCOPE.**

This appendix lists and identifies tools authorized for use by the automotive mechanic but not included in the general automotive mechanic's tool kit. This listing is for reference only and does not authorize you to requisition the tools listed.

**D.2 EXPLANATION OF COLUMNS.**

a. Column (1) Item Number. This number is assigned to the tool for quick reference from the maintenance manual.

b. Column (2) Item Name. This is the name assigned to the tool per the referenced Army supply catalog. A summary listing of the tool's main features and/or dimensions may also be provided for reference.

c. Column (3) National Stock Number. This is the national stock number assigned to the tool. Use it to request or requisition the tool.

d. Column (4) Part Number. This is the part number assigned to the tool per the referenced Army supply catalog. Not all tools are assigned a part number.

e. Column (5) Reference. This is the publication number of the Army supply catalog that lists the tool.

This appendix lists and identifies tools used in addition to those included in the tool kit specified for a particular task. This listing is for informational purposes only and does not authorize the requisition of listed tools.

SECTION II. TOOL IDENTIFICATION LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
1	Adapter, 0.492 in. ID, 0.622 in. OD	4730-00-371-9572		SC-4940-95-CL-B02
2	Adapter, 0.555 in. ID, 0.622 in. OD	4730-00-371-9573		SC-4940-95-CL-B02
3	Adapter, 0.742 in. ID, 0.997 in. OD	4730-00-371-9579		SC-4940-95-CL-B02
4	Adapter, 1.034 in. ID, 1.136 in. OD	5120-01-004-2672		SC-4940-95-CL-B02
5	Adapter, socket wrench, 1/4 in. male to 3/8 in. female	5120-00-227-8095		CTA 50-970
6	Adapter, socket wrench, 1/2 in. male to 3/4 in. female	5120-00-240-8703		CTA 50-970
7	Adapter, socket wrench, 3/8 in. male to 1/2 in. female	5120-00-240-8702		CTA 50-970
8	Bar, metal, 3/8 in. diameter, 1-1/2 in. length	9510-00-229-4985		SC-4940-95-CL-B03
9	Bar, pry, 17/32 in. diameter, 15 to 16 in. length	5120-00-224-1389		SC-4940-95-CL-B02
10	Bit set, screwdriver	5120-01-170-4454		SC-4910-95-CL-A74
11	Blowtorch, gasoline	5120-00-222-1371		SC-4940-95-CL-B02
12	Brush, cleaning, tool and parts	7920-00-062-5468		SC-5180-90-N26
13	Brush, scratch, wire	7920-00-291-5815		SC-4910-95-CL-A74
14	Caliper, inside, 3 in. size	5210-00-229-3076		SC-4940-95-CL-B02
15	Caliper, micrometer, outside, 0.0 to 1.0 in. range	5210-00-540-2973		SC-4940-95-CL-B02
16	Caliper, micrometer, outside, 1.0 to 2.0 in. range	5210-00-243-2933		SC-4940-95-CL-B02
17	Caliper, micrometer, outside, 2.0 to 3.0 in. range	5210-00-221-1945		SC-4940-95-CL-B02
18	Caliper, micrometer, outside, 4.0 to 5.0 in. range	5210-00-255-7564		SC-4940-95-CL-B02
19	Caliper, micrometer, outside, 5.0 to 6.0 in. range	5210-00-221-1948		SC-4940-95-CL-B04
20	Caliper, slide, 0.0 - 3-3/4 in. external range, 1/4 in. - 4.0 in. internal range	5210-00-221-2091	SC-4940-95-CL-B03	

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
21	Cap, high pressure, 9/16-18 UNF	4730-00-540-1525		SC-4940-95-CL-B07
22	Cap, tube, pressure, size 7/8-1410		1240	TM 9-4940-468-14
23	Caps, vise jaw, 4.0 in.	5120-00-221-1506		SC-4910-95-CL-A74
24	Cap screw, hex head, 3/8-16nc, 4 in length	5305-00-269-3224		SC-4940-95-CL-B03
25	Cap screw, hex head, 7/16-20 UNF, 4 in. length	5305-00-710-4205		SC-4940-95-CL-B03
26	Cap screw, hex head, metric, M6x85x8.8	5305-01-286-2631	CTA 50-970	
27	Cap screw, hex head, metric, M8x 100x8.8	5305-01-160-2002	CTA 50-970	
28	Centering tool		PD.162B	
29	Chain assembly, single leg, S	4010-00-176-7937		SC-4940-95-CL-B02
30	Clamp, C, medium service rating, 12 in. deep throat, 8 in. size	5120-00-595-8274		SC-4940-95-CL-B02
31	Cleaner, vacuum, electric, hand, w/ attachments			LIN E32946
32	Compressor, piston ring	5120-00-894-0753		SC-4940-95-CL-B02
33	Compressor, valve spring	5120-00-516-4226		SC-4940-95-CL-B02
34	Cord assembly, elastic	4020-00-083-5936		CTA 50-970
35	Crowbar, 1 in. diameter, 48 in. length	5120-00-240-6040	GGG-B-101	SC-494d-95-CL-B03
36	Crowbar, 1-1/4 in. diameter, 59-62 in. length	5120-00-224-1390		CTA 50-970
37	Dresser, contact point	5345-00-250-1345		SC-4940-95-CL-B02
38	Expander, piston ring	5120-00-393-0549		SC-4940-95-CL-B02
39	Extension, wrench, socket, 10 in. length, 1/2 in. drive	5120-00-227-8074		SC-5180-90-N26
40	Extractor set, screw	5120-00-540-1416		SC-4940-95-CL-B02
41	Frame, hydraulic press, 17-1/2 ton	3442-00-690-8076		SC-4940-95-CL-B02
42	Frame, hydraulic press, 50 ton	3442-00-690-8077		SC-4940-95-CL-B02

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
43	Funnel, steel, 1 qt capacity, 8 in. long flex spout	7240-00-559-7364		SC-4940-95-CL-B04
44	Gage, depth, micrometer, 0 to 6 in. range, 0.001 in. gradations	5210-00-619-4045		SC4940-95-CL-B02
45	Gage set, telescoping	5210-00-473-9350		SC4940-95-CL-B02
46	Gage, thickness, 0.0015 through 0.015 in. thickness	5210000-517-8097		SC4940-95-CLB02
47	Hacksaw, 3 to 3-7/8 in. deep throat, with blades	5110-00-289-9657		SC-4910-95-CL-A74
48	Hammer, blacksmith's sledge, dbl face, 12 lb head	5120-00-900-6098		SC4940-95-CL-B04
49	Hammer, hand, plastic, soft head, 1.5 lb	5120-01-0974520		SC4940-95-CL-B04
50	Hammer, hand, plastic, soft head, 3.0 lb	5120-01-065-9037		SC4940-95-CL-B04
51	Heater gun	4940-00-314-9789		CTA 50-970
52	Indicator, dial, 0.200 in. range, 0.001 in. gradation, w/case	5210-00-277-8840		SC4940-95-CL-B02
53	Jig, fuel injection pump mounting		HM-928	
54	Level and plumb	5210-00-277-2430		SC4940-95CLB02
55	Lift, transmission and differential, mechanical screw activated, 2000 lb lift cap.			LIN L59718
56	Liner puller and adapter		PD. 150B	
57	Liner puller adapter		PD. 150-9	
58	Mirror, inspection, hand held	5128-01-278-8257		
59	Multimeter, digital	6625-01-139-2512		SC4940-95-CL-B04
60	Nut, hex, 3/8-16 UNC	5310-00-732-0558		SC4940-95-CL-B03
61	Nut, hex, 5/8 UNC	5310-00-763-8920		SC4940-95-CL-B03
62	Pail, utility, galvanized, 14 qt capacity	7240-00-160-0455		SC4940-95-CL-B04
63	Pan, drain, with handles, 4 gal capacity	4910-00-387-9592		SC4910-95-CL-A74
64	Pan, drip, 8-1/2 length x 3-1/4 width x 1-1/2 in. depth	4940-01-327-3003		CTA 50-970
<b>D-4</b>				

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
65	Pliers, retaining ring	5120-00-293-0049		SC4940-95-CL-B02
66	Pliers, snap ring	5120-00-789-0492		SC4940-95-CL-B02
67	Portable electric drill	5130-00-889-8996		SC4940-95-CL-B02
68	Puller kit, mechanical	5120-00-089-3660		SC4940-95-CL-B02
69	Puller kit, universal	5180-00-701-8046		SC-4940-95-CL-B02
70	Punch, drift	5120-00-242-0764		SC4940-95-CL-B02
71	Remover and replacer, insert valve	5120-00-473-7393		SC4940-95-CL-B02
72	Remover and replacer, valve guide seat		PD. 1D	
73	Rope, fibrous	4020-00-238-7732		SC-4940-95-CL-B02
74	Rule, steel machinist's	5210-00-293-0565		CTA 50-970
75	Screw cap, hex head, 1/2-13, 3 in. length	5305-00-071-2075		CTA 50-970
76	Screw cap, hex head, 5/8-11, 3 in. length	5305-00-724-5914		CTA 50-970
77	Screw cap, hex head, 7/16-20, 4 in. length	5305-00-709-8340		CTA 50-970
78	Screwdriver set, jeweler's swivel	5120-00-288-8739		SC-4940-95-CL-B02
79	Screwdriver set, six-point tip	5120-01-167-1667		CTA 50-970
80	Seal installer, front timing case		PD.170-4	
81	Seal installer, rear crankshaft		PD.145	
82	Shackle, lifting	4030-00-433-2767		CTA 50-970
83	Socket, deep style, 3/4 in. opening, 1/2 in. drive	5120-00-242-3349		SC-4910-95-CL-A74
84	Socket, hex head driver, 3/16 in. hexagonal drive, 3/8 in. female drive	5120-00-683-8597		CTA 50-970
85	Socket, hex head driver, 5/16 in. hexagonal drive, 3/8 in. female drive	5120-00-224-7362		CTA 50-970
86	Socket, hex head driver, 7/32 in. hexagonal drive, 3/8 in. female drive	5120-00-061-3186		CTA 50-970
87	Socket, hex head driver, 1/4 in. hexagonal drive, 3/8 in. female drive	5120-00-243-1673		CTA 50-970



(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
88	Socket, hex head driver, 3/8 in. hexagonal drive, 3/8 in. female drive	5120-00-596-1199		CTA 50-970
89	Socket, hex head driver, 5 mm hexagonal drive, 3/8 in. female drive	5120-01-118-4061		CTA 50-970
90	Socket, hex head driver, 6 mm hexagonal drive, 3/8 in. female drive	5120-01-112-8309		CTA 50-970
91	Socket, hex head driver, 8 mm hexagonal drive, 3/8 in. female drive	5120-01-113-9556		CTA 50-970
92	Socket, hex head driver, 5/32 in. hexagonal drive, 1/4 in. female drive	5120-00-596-0942		CTA 50-970
93	Solder, lead alloy, rosin core	3439-00-243-1882		SC-4940-95-CL-B02
94	Soldering iron, electric	3439-00-223-2528		SC-4940-95-CL-B02
95	Spanner wrench, 1/4 in. diameter pin	5120-00-157-2133		CTA 50-970
96	Square, combination	5210-00-241-3599		SC-4940-95-CL-B03
97	Stand, maintenance, automotive engine	4910-00-529-8387		LIN U25372
98	Strap, sling	8465-00-269-0682		CTA 50-970
99	Stud remover and setter	5120-00-541-0502		SC-4910-95-CL-A73
100	Test set, fuel injector	4910-00-317-8265		SC-4940-95-CL-B02
101	Test stand, automotive generator and starter, 6 to 24V range, 500 amp, 22-1/2 HP, AC/DC, 800 -11,000			LIN V99843
102	Test stand, fuel injector	4910-01-194-7667		TM 9-4910-778-14&P
103	Tool, o-ring	5120-01-406-7266	(96652) 98-40050	
104	Tool kit, DPA		DPA 99-705	
105	Tool kit, DPA workbench		DPA 99-890	
106	Tool Kit, General Mechanic's Automotive	5180-00-177-7033		SC-5180-90-N26
107	Tool kit, pin removal, 100-ton press	5180-00-460-2177		SC-4940-95-CL-B02
108	Tool Outfit, Hydraulic Systems Test and Repair (HSTRU)	4940-01-036-5784		LIN T30377
109	Twist drill set	5133-00-293-0983		SC-4940-95-CL-B02

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
110	Twist drill set	5133-00-449-6775		SC-4940-95-CL-B02
111	V-blocks, matched pair	3460-00-725-5076		SC-4940-95-CL-B02
112	Vise, bench and pipe	5120-00-243-9072		SC-4940-95-CL-B02
113	Washer, flat, 7/8 in.ID, 2-1/2 in.OD	5310-00-982-6584		SC-4940-95-CL-B03
114	Wrench,adjustable,0 to 2.06 in. range	5120-00-240-1414		SC-4940-95-CL-B07
115	Wrench, combination, 1-1/4 in.	5120-00-228-9517		SC-4910-95-CL-A74
116	Wrench, combination, 1-1/2 in.	5120-00-227-8834		SC-4910-95-CL-A74
117	Wrench, pipe, 1 to 2 in. jaw, 18 in. length	5120-00-277-1479		SC-4940-95-CL-B03
118	Wrench, socket, crowfoot, 1/2 in. opening, 5/16 in. deep head, 1/4 in. drive	5120-00-541-4072		CTA 50-970
119	Wrench, socket, crowfoot, 9/16 in. opening, 5/16 in. deep head, 1/4 in. drive	5120-00-541-4074		CTA 50-970
120	Wrench, socket, crowfoot, 11/16 in. opening, 11/16 in. deep head, 3/8 in. drive	5120-00-189-7896		CTA 50-970
121	Wrench, socket, crowfoot, 3/4 in. opening, 23/32 in. deep head, 3/8 in. drive	5120-00-189-7898		CTA 50-970
122	Wrench, socket, crowfoot, 7/8 in. opening, 3/4 in. deep head, 3/8 in. drive	5120-00-181-6765		CTA 50-970
123	Wrench, socket, crowfoot, 15/16 in. opening, 3/4 in. deep head, 3/8 in. drive	5120-00-541-4075		CTA 50-970
124	Wrench, socket, crowfoot, 1 in. opening, 25/32 in. deep head, 3/8 in. drive	5120-00-229-2772		CTA 50-970
125	Wrench, socket, crowfoot, 1-1/8 in. opening, 7/8 in. deep head, 1/2 in. drive	5120-00-229-2773		CTA 50-970
126	Wrench, socket, crowfoot, 1-1/4 in. opening, 7/8 in. deep head, 1/2 in. drive	5120-00-181-6759		CTA 50-970
127	Wrench, socket, crowfoot, 1-1/2 in. opening, 15/16 in. deep head, 1/2 in. drive	5120-00-181-6755		CTA 50-970
		<b>D-7</b>		

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
128	Wrench, spanner, 2 to 4-3/4 in. range	5120-00-277-9075		SC-4940-95-CL-B03
129	Wrench, torque, 1/4 in. drive, 5 to 150 lb-in range	5120-00-542-4489		SC-4940-95-CL-B03
130	Wrench, torque, 3/8 in. drive, 150 to 750 lb-in range	5120-00-821-3441		SC-4940-95-CL-B02
131	Wrench, torque, 3/8 in. drive 0 to 300 lb-in range	5120-00-958-6906		SC-4940-95-CL-B02
132	Wrench, torque, 1/2 in. drive, 0 to 175 lb-ft range	5120-00-640-6364		SC-4940-95-CL-B02
133	Wrench, torque, 3/4 in. drive, 100 to 500 lb-ft range	5120-00-542-5577		SC-4940-95-CL-B03
134	Wrench, torque, 3/4 in. drive, 0 to 1200 lb-ft range	5120-00-169-2986		SC 4940-95-CL-B04
135	Wrench set, socket, 3/4 in. drive	5120-00-204-1999		SC-4940-95-CL-B02

APPENDIX E

TORQUE LIMITS

SECTION I. INTRODUCTION

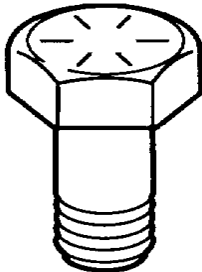
E.1 SCOPE.

This appendix provides general torque limits for cap screws, bolts, and set screws for the 780T bituminous asphalt paving machine.

E.2 EXPLANATION OF TABLES FOR CAP SCREWS, BOLTS, AND SET SCREWS.

a. Torque values are based on plain, unplaced hardware that has been degreased and dried. The values are also based on clamping steel to steel. All torque values, including special cases, are identified in the applicable task. If a task torque value differs from a corresponding table value, the task value must be used.

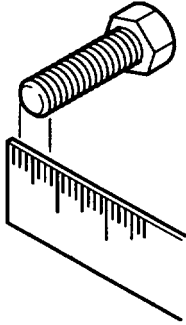
b. Section II. Torque Limits for Cap Screws and Bolts. This table lists torque values for SAE Grade 8 fasteners. Grade 8 fasteners can be identified by 6 radial dashes on the head, each set 60° apart.



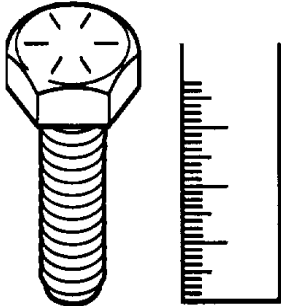
c. Section III. Torque Limits for Set Screws. This section consists of two tables that list torque values for U.S. standard and metric set screws. Torque values will be for SAE Grade 5 or ISO Class 8.8 unless otherwise stated.

E.3 HOW TO USE TORQUE TABLES FOR CAP SCREWS, BOLTS, AND SET SCREWS.

a. Measure the shaft diameter of the cap screw, bolt, or set screw to be installed.



b. Determine the number of threads per inch.



c. Locate the fastener in the left-hand column by both diameter and threads per inch.

d. Look across the row to obtain the torque limit in lb-ft or N.m.

## SECTION II. TORQUE LIMITS FOR CAP SCREWS AND BOLTS

## NOTE

These are modified torque values for use with Loctite #271 (except where noted). Loctite #242 is used on fasteners 5/16 (M8) or smaller.

Size			Torque (Modified SAE Grade 8)	
Bolt Size Diameter	Threads Per Inch	Millimeters	Pound-Feet (lb-ft)	Newton-Meters (N•m)
1/4	20	6.35	9	12
1/4	28	6.35	11	15
5/16	18	7.94	19	26
5/16	24	7.94	21	28
3/8	16	9.53	37	50
3/8	24	9.53	42	57
7/16	14	11.11	59	80
7/16	20	11.11	66	89
1/2	13	12.70	90	122
1/2	20	12.70	100	136
9/16	12	14.29	130	176
9/16	18	14.29	145	197
5/8	11	15.88	180	244
5/8	18	15.88	205	278
3/4	10	19.05	320	434
3/4	16	19.05	355	481
7/8	9	22.23	515	698
7/8	14	22.23	570	773
1	8	25.40	775	1051
1	12	25.40	845	1146
1-1/8	7	25.58	1100	1491
1-1/8	12	25.58	1230	1668
1-1/4	7	31.75	1540	2088
1-1/4	12	31.75	1710	2318
1-3/8	6	34.93	2020	2739
1/38	12	34.93	2300	3118
1-1/2	6	38.10	2690	3647
1-1/2	12	38.10	3020	4095

## Tightening Torque - Metric Class 8.8

Bolt Size	Torque	
	Pound-Feet (lb-ft)	Newton-Meters (N•m)
M6 x 1.0	9	12
M8 x 1.25	21	28
M10 x 1.5	45	61
M12 x 1.75	79	105
M14 x 2.0	125	170
M16 x 2.0	195	265
M20 x 2.5	380	515
M24 x 3.0	660	895
M30 x 3.5	1310	1780
M36 x 4.0	2290	3100

**SECTION III. TORQUE LIMITS FOR SET SCREWS**

Size			Torque (Modified SAE Grade 5)	
Diameter	Threads Per Inch	Millimeters	Pound- Feet (lb-ft)	Newton- Meters(N•m)
1/4	20	6.35	8	11
1/4	28	6.35	10	14
5/16	18	7.94	17	23
5/16	24	7.94	19	26
3/8	16	9.53	30	41
3/8	24	9.53	35	47

Metric Designation	Torque Values (ISO Class 8.8)	
	U.S. Standard	Newton-Meters (N•m)
M6	93 lb-in	11
M8	225 lb-in	25
M10	40 lb-ft	54

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**By Order of the Secretary of the Army:**

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## THE METRIC SYSTEM AND EQUIVALENTS

### LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters =  
0.3937 Inches  
1 Meter = 100 Centimeters = 1,000 Millimeters =  
39.37 Inches  
1 Kilometer = 1,000 Meters = 0.621 Miles

### SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches  
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet  
1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

### CUBIC MEASURE

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches  
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

### LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

### TEMPERATURE

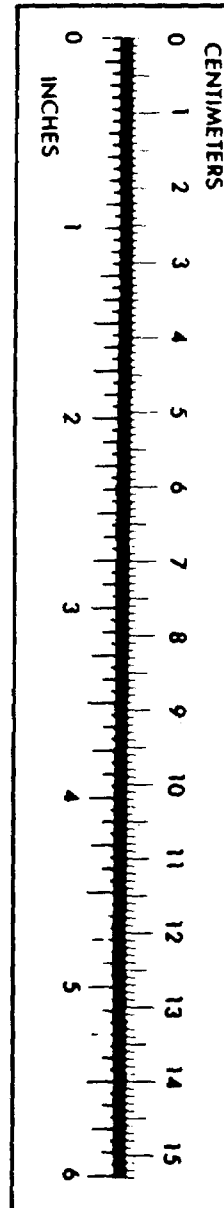
$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
212 $^{\circ}$  Fahrenheit is equivalent to 100 $^{\circ}$  Celsius  
90 $^{\circ}$  Fahrenheit is equivalent to 32.2 $^{\circ}$  Celsius  
32 $^{\circ}$  Fahrenheit is equivalent to 0 $^{\circ}$  Celsius  
 $9/5 ^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

### WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams =  
0.035 Ounces  
1 Kilogram = 1,000 Grams = 2.2 lb.  
1 Metric Ton = 1,000 Kilograms = 1 Megagram =  
1.1 Short Tons

### APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds Per Square Inch	Kilopascals	6.895
Miles Per Gallon	Kilometers Per Liter	0.425
Miles Per Hour	Kilometers Per Hour	1.609
TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds Per Square Inch	0.145
Kilometers Per Liter	Miles Per Gallon	2.354
Kilometers Per Hour	Miles Per Hour	0.621





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